



STATE OF FLORIDA

# DEPARTMENT OF COMMUNITY AFFAIRS

*"Dedicated to making Florida a better place to call home"*

CHARLIE CRIST  
Governor

THOMAS G. PELHAM  
Secretary

November 30, 2010

The Honorable Charlie Crist, Governor  
Members of the Administration Commission  
The Capitol  
Tallahassee, Florida 32399-0001

Re: 2010 Removal of Designation Report, Florida Keys Area of Critical State Concern

Dear Governor and Members of the Administration Commission:

Pursuant to Section 380.0552(4)(b), Florida Statutes (F.S.), the Florida Department of Community Affairs (Department) is pleased to transmit its 2010 Removal of Designation Report for the Florida Keys Area of Critical State Concern. Section 380.0552(4)(b), F.S., requires the preparation of a report that describes the progress of the Florida Keys Area of Critical State Concern toward completing the tasks of the work program.

Last year, the Administration Commission found that substantial progress toward accomplishing the tasks of the work program had not been achieved. As required by Section 380.0552(4), F.S., the Administration Commission issued a 30-Day Report on November 17, 2009, to Monroe County, the City of Marathon and the Village of Islamorada outlining the strategies necessary for completion of work program tasks. The 2009 30-Day Report was issued in the form of a table detailing the strategies and the tasks under the work program that must be accomplished.

The Department has utilized the 2009 30-Day Report as a template for its 2010 Removal of Designation Report. The Department's report includes information submitted by Monroe County, the City of Marathon, the Village of Islamorada, Key Largo Wastewater Treatment District, Florida Department of Health (DOH), and the Florida Department of Environmental Protection (DEP). Based upon this input, the Department's own review, and coordination with the local governments on the chief findings, the attached report is provided for your review.

The 2009 report to the Administration Commission included draft legislation that represented a coordinated strategy between the Florida Keys local governments, Department of Environmental Protection and Department of Health to extend the deadlines for upgrading septic and wastewater facilities. The legislation was enacted and included:

- Amendments to Section 215.619, F.S., to allow the DEP to manage the proceeds from Everglades restoration bonds for the purpose of entering into financial assistance

2555 SHUMARD OAK BOULEVARD ♦ TALLAHASSEE, FL 32399-2100  
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agreements with local governments located in the Florida Keys Area of Critical State Concern to finance facilities.

- Amendments to Section 380.0552(4), F.S., to revise the removal of designation process to reflect the strategies in the Administration Commission's 30-Day Report, as well as to extend designation until the legislative intent is fulfilled and all work program tasks have been completed.
- Amendments to Section 381.0065(4), F.S., and Section 403.086(10), F.S., to incorporate the wastewater treatment and disposal standards of Chapter 99-395, Laws of Florida, and to provide existing package plants and onsite systems until 2015 to upgrade to the wastewater treatment and disposal standards and to adopt wastewater construction schedules by Administration Commission rule.

As a result of the enactment of the legislation, all wastewater project due dates have been moved forward one year on the 30-Day Report and within the draft rules.

The Department has evaluated the information provided by the local governments and state agencies against the 30-Day Report and the Work Program tasks found in Rule 28-20.110, Florida Administrative Code (F.A.C.). The Department recommends that the City of Marathon and Monroe County have made substantial progress towards accomplishing the strategies of the 30-Day Report.

In accordance with its statutory charge found in Section 380.0552(4)(c), F.S., the Department recommends the following actions:

- (1) Accept the 2010 Annual Report for Monroe County, City of Marathon and Islamorada;
- (2) Continue the Florida Keys Area of Critical State Concern designation;
- (3) Accept the Department's recommendation that substantial progress toward accomplishing the strategies of the work program have been achieved for Marathon and Monroe County;
- (4) Accept the Department's recommended completion dates for strategies in the 2010 30-Day Report;
- (5) Determine that the Village of Islamorada has made substantial progress in addressing habitat protection through revisions to the comprehensive plan and land development regulations, but has not made substantial progress toward accomplishing the tasks of the work program with respect to wastewater planning, financing and construction. As a result the Department recommends the Administration Commission accept the Department's recommendation that substantial progress toward accomplishing the strategies of the work program has not been achieved for the Village of Islamorada and consider the following two options:
  - (a) Resume rulemaking and reduce the Village of Islamorada building permit allocations by twenty percent; or

- (b) Direct the Village of Islamorada to provide a report by June 1, 2011, that includes a wastewater financing plan. The requirement to adopt a wastewater facility treatment construction schedule is found in the legislation recently enacted in Section 403.086(10)(b), F.S. In the event the Village does not satisfy the June 1, 2011, reporting requirement, the Department recommends the Administration Commission promulgate rulemaking that would result in an amendment to the comprehensive plan reducing building permit allocation by twenty percent as provided in Section 380.0552(9)(b), F.S.
- (6) Authorize staff of the commission working with the Department to resume rulemaking to adopt the schedule for wastewater, stormwater and carrying capacity tasks for Monroe, Marathon, and Islamorada.

The Department appreciates the efforts of Monroe County, City of Marathon, Village of Islamorada, Key Largo Wastewater Treatment District, Florida Keys Aqueduct Authority, Florida Department of Health, Florida Department of Environmental Protection, and the Administration Commission for their collaborative participation in this process. We look forward to continuing our cooperative relationship with the Florida Keys communities and working with them to fully achieve the goals of the work program.

Sincerely yours,



Thomas G. Pelham  
Secretary

TGP/rj

Enclosures: Department of Community Affairs 2010 Removal of Designation Reports.

cc: Sylvia Murphy, Mayor, Monroe County  
Ginger Snead, Mayor, City of Marathon  
Michael Reckwerdt, Mayor, Islamorada, Village of Islands

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### **Contents of Technical Appendix (included on CD)**

Section 163.3178, Florida Statutes

Section 380.0552, Florida Statutes

Section 381.0065(4)(1), Florida Statutes

Section 403.086(10), Florida Statutes

Rule 28-20.110, Florida Administrative Code

FDOT Technical Memorandum Site Specific Capacity Study (April 21, 2010)

FDOT Technical Memorandum – Maximum Sustainable Evacuation Flow Rates (June 18, 2010)

FDOT Roadway Configuration US Highway 1 – Table 1

Final Order DCA07-GM 166

Final Order DOAH 04-002756RP

DCA Hurricane Evacuation Scenarios

Islamorada letter regarding lack of substantial progress

# Florida Keys Area of Critical State Concern 2010 Removal of Designation Report

Florida Department of Community Affairs  
Division of Community Planning  
Areas of Critical State Concern Section



Thomas G. Pelham, Secretary

## **BACKGROUND**

Section 380.0552(4), Florida Statutes (F.S.), directs the state land planning agency to submit a report to the Administration Commission, describing in detail the progress of the Florida Keys Area toward accomplishing the tasks of the work program and to provide a recommendation as to whether substantial progress toward accomplishing the tasks of the work program has been achieved. Section 380.0552(4), F.S. provides that:

(b) Beginning November 30, 2010, the state land planning agency shall annually submit a written report to the Administration Commission describing the progress of the Florida Keys Area toward completing the work program tasks specified in commission rules. The land planning agency shall recommend removing the Florida Keys Area from being designated as an area of critical state concern to the commission if it determines that:

1. All of the work program tasks have been completed, including construction of, operation of, and connection to central wastewater management facilities pursuant to Section 403.086(10), F.S. and upgrade of onsite sewage treatment and disposal systems pursuant to Section 381.0065(4)(1), F.S.;
2. All local comprehensive plans and land development regulations and the administration of such plans and regulations are adequate to protect the Florida Keys Area, fulfill the legislative intent specified in subsection (2), and are consistent with and further the principles guiding development; and
3. A local government has adopted a resolution at a public hearing recommending the removal of the designation.

## **FINDINGS**

The Work Program referenced above is based in Rule 28-20.110, Florida Administrative Code (F.A.C.). The Administration Commission issued Monroe County, the City of Marathon and the Village of Islamorada a 30-Day Report on November 17, 2009, outlining the strategies necessary for completion of work program tasks and potential removal of the designation as an Area of Critical State Concern.

The 30-Day Report is in the form of a table, organized by major themes, listing both the tasks under the work program that must be accomplished for substantial progress to be achieved and the specific, proposed strategies that were developed with the Florida Keys communities to achieve the work program tasks. The Department utilized the 30-Day Report as a template for its 2010 Removal of Designation Report.

The Department's 30-Day Report contains the status of Rule 28-20.110, F.A.C., work program tasks in the third column (column C) as either "substantial progress achieved" or "substantial progress not achieved." Additionally, the Department provides

the status of the proposed work program strategies in the third column (column C) as either “complete” or “incomplete.” The strategies in the 30-Day Report originate from the original tasks of the work program, found in rule 28-20.110, Florida Administrative Code (FAC) and located on the following page. The strategies in the 30-Day Report provide specificity that, if completed, will lead to the achievement of the original work Program Tasks. The 30-Day Report includes comments and information submitted by Monroe County, the City of Marathon, the Village of Islamorada, Key Largo Wastewater Treatment District, Florida Department of Health, and the Florida Department of Environmental Protection. The Executive Summary should be used in combination with the 30-Day Report to expedite review.

In the Department’s 2009 report to the Administration Commission, the Department recommended that the Administration Commission make a determination that substantial progress had not been made on the following table of work program tasks found in Rule 28-20.110, Florida Administrative Code (FAC):

**MONROE COUNTY 10-YEAR WORK PROGRAM  
WORK PROGRAM TASKS REMAINING INCOMPLETE OR IN PROGRESS**

**YEAR FOUR (July 13, 2000 through July 12, 2001).**

A. Continue implementation of Wastewater Master Plan, execute interagency agreements to define construction schedule by phases, and continue developing facility plans for selected Hot Spots in each ROGO area. Secure funding to implement the Wastewater Master Plan. Document that reduction in nutrients has been achieved within each of the sub-areas.

**YEAR SIX (July 13, 2002 through July 12, 2003).**

A. Continue construction of wastewater facilities in Hot Spots begun in previous year. Contract to design and construct additional wastewater treatment facilities in Hot Spots in accordance with the schedule of the Wastewater Master Plan. Continue implementation of Wastewater Master Plan with emphasis on Hot Spots.

C. Implement the carrying capacity study by, among other things, the adoption of all necessary plan amendments to establish a rate of growth and a set of development standards that ensure that any and all new development does not exceed the capacity of the county's environment and marine system to accommodate additional impacts. Plan amendments will include a review of the County's Future Land Use Map series and changes to the map series and the "as of right" and "maximum" densities authorized for the plan's future land use categories based upon the natural character of the land and natural resources that would be impacted by the currently authorized land uses, densities and intensities.

**YEAR SEVEN (July 13, 2003 through July 12, 2004).**

A. Finalize construction and begin operating wastewater facilities in Hot Spots. Continue implementation of Wastewater Master Plan with continued emphasis on Hot Spots.

**YEAR EIGHT (July 13, 2004 through July 12, 2005).**

F. Adopt amendments to the comprehensive plan and land development regulations to enact overlay designations, and eliminate or revise the Habitat Evaluation Index, and modify the ROGO/NROGO system to guide development away from environmentally sensitive lands.

M. Complete projects identified in the Stormwater Management Master Plan.

Q. Complete a comprehensive analysis of hurricane evacuation issues in the Florida Keys and develop strategies to reduce actual hurricane clearance times and thereby reduce potential loss of life from hurricanes.

**YEAR NINE (July 13, 2005 through July 12, 2006).**

A. In coordination with the Florida Keys Aqueduct Authority and the Key Largo Sewer District, initiate the process to obtain \$80 million in bond financing secured by connection fees.

B. Secure site for lower Keys and Key Largo wastewater facilities

**YEAR TEN (July 13, 2006 through July 12, 2007).**

A. Award contract for design, construction and operation for the lower Keys and Key Largo wastewater facilities.

B. Begin construction of the lower Keys and Key Largo wastewater plants.

C. Initiate connections to lower Keys and Key Largo wastewater systems.

D. Complete construction and hookups for Baypoint, Conch Key and Key Largo Trailer Islamorada/Key Largo Park.

E. Obtain \$80 million in bond financing secured by connection fees.



In November 2009, the Administration Commission directed the Department of Community Affairs to place draft Administration Commission rules in abeyance while the Florida Keys communities proposed legislation to amend Chapter 99-395, Laws of Florida. The legislation was needed to extend the deadline from 2010 to 2015 for the upgrade of wastewater treatment facilities to advanced treatment standards in the Florida Keys. Senate Bill 550 was enacted and provided an additional 5 years for the local governments to seek financing and construct wastewater treatment facilities. The schedule for construction of the wastewater facilities is found within the draft Administration Commission rules for Marathon, Islamorada, and Monroe County. The schedule for completion of wastewater treatment facilities has been moved forward one year to accommodate the time taken to have the legislation enacted.

This narrative summarizes the attached 2010 30-Day Report tables for Monroe County, Islamorada and Marathon and is organized by the major themes (i.e., Carrying Capacity & Habitat Protection, Hurricane Evacuation and Water Quality) that are the basis for the region's designation as an Area of Critical State Concern. The narrative additionally contains recommendations regarding hurricane evacuation modeling and clearing of tropical hardwood hammock.

Completion of the remaining strategies in the 30-Day Report is critical to the completion of the years 4-10 Work Program Tasks. Many of the incomplete strategies may be considered to be in progress; however, the construction of wastewater facilities will require several years to complete.

Of the strategies assigned, Marathon and Monroe County completed approximately 50 percent. The strategies completed by Marathon focused on constructing wastewater and stormwater facilities that will result in improvements in near shore water quality. The strategies not completed were administrative in nature and are going through public hearings at the time of this report's preparation. Monroe County made substantial progress addressing habitat protection with the implementation of the Tier Review Committee and subsequent recommendations for parcels previously challenged in an administrative proceeding. The strategies not completed for Monroe County primarily relate to wastewater facilities in the Lower Keys. While Monroe County did not meet some of the scheduled wastewater strategies for the Cudjoe Facility, they contributed funding to the Key Largo Wastewater District, completed the Big Coppitt wastewater facility, and contributed funding for the Duck Key wastewater facility.

Out of the strategies assigned, Islamorada completed 20 percent. The strategies completed by Islamorada are related to growth management issues. Islamorada made no advances in wastewater, abandoned any progress made to date in wastewater and has no definite plan for the future as to how it will address wastewater upgrades that must be met by 2015. On October 25, 2010, the Department provided a letter to the Village of Islamorada indicating the Department is considering a recommendation to the Administration Commission to reduce the building permit allocation by 20 percent due to lack of substantial progress and the forfeiture of \$22 million of federal, state and local funding.

When Islamorada incorporated and adopted a comprehensive plan in 2001, the Village requested that the Department allow the Village to move forward without an adopted rule with a stipulation that if substantial progress was not achieved on schedule, a rule could be adopted. Existing Rules 28-19.100 and 28-19.200, F.A.C., relate to the purpose of the Islamorada transitional comprehensive plan and do not address permit reductions or contain a wastewater construction schedule. Rule adoption is needed for the Village to establish a wastewater treatment construction schedule and funding program that is consistent with the intent of the Administration Commission's 2009 30-Day Report.

The Monroe County Rule 28-20.110, F.A.C., provides that the Department of Community Affairs shall annually report to the Administration Commission documenting the degree to which the work program objectives for the work program year have been achieved. The Commission shall consider the findings and recommendations provided in those reports and shall determine whether substantial progress has been achieved. If the Commission determines that substantial progress has not been made, the unit cap for residential development shall be reduced by at least 20 percent for the following ROGO year.

Rulemaking for the Village of Islamorada is necessary because major wastewater projects identified in the 2009 30-Day Report have not been completed. The Village does not have committed funding sources to construct identified wastewater treatment facilities. If the Village of Islamorada makes progress during the 2011 annual report, the building permit allocation may be restored through a comprehensive plan amendment.

### RECOMMENDATIONS

Section 380.0552(4)(b), F.S., directs the Department to provide a recommendation regarding whether substantial progress has been made towards accomplishing the tasks of the work program. The Department makes the following recommendations:

- (1) Accept the 2010 Annual Report for Monroe County, City of Marathon and Islamorada;
- (2) Accept the Department's recommendation that substantial progress toward accomplishing the strategies of the work program have been achieved for Marathon and Monroe County;
- (3) Accept the Department's recommended completion dates for strategies in the 2010 30-Day Report;
- (4) Determine that the Village of Islamorada has made substantial progress in addressing habitat protection through revisions to the comprehensive plan and land development regulations, but has not made substantial progress toward accomplishing the tasks of the work program with respect to wastewater planning, financing and construction. As a result the Department recommends the Administration Commission accept the

Department's recommendation that substantial progress toward accomplishing the strategies of the work program has not been achieved for the Village of Islamorada and consider the following:

- (5) Determine that the Village of Islamorada has made substantial progress in addressing habitat protection through revisions to the comprehensive plan and land development regulations, but has not made substantial progress toward accomplishing the tasks of the work program with respect to wastewater planning, financing and construction. As a result the Department recommends the Administration Commission accept the Department's recommendation that substantial progress toward accomplishing the strategies of the work program has not been achieved for the Village of Islamorada and consider the following two options:
  - (a) Resume rulemaking and reduce the Village of Islamorada building permit allocations by twenty percent; or
  - (b) Direct the Village of Islamorada to provide a report by June 1, 2011, that includes a wastewater financing plan. The requirement to adopt a wastewater facility treatment construction schedule is found in the legislation recently enacted in Section 403.086(10)(b), F.S. In the event the Village does not satisfy the June 1, 2011, reporting requirement, the Department recommends the Administration Commission promulgate rulemaking that would result in an amendment to the comprehensive plan reducing building permit allocation by twenty percent as provided in Section 380.0552(9)(b), F.S.
- (6) Authorize staff of the commission working with the Department to resume rulemaking to adopt the schedule for wastewater, stormwater and carrying capacity tasks for Monroe, Marathon, and Islamorada.

# Habitat Protection

**30-Day Report Strategy: The Administration Commission directed Monroe County and the Department of Community Affairs to establish a Tier Designation Review Committee with representatives from the Department of Environmental Protection, US Fish and Wildlife, Florida Fish and Wildlife Conservation Council, Monroe County, the Department of Community Affairs and other relevant interests. Using best available data, the committee was directed to adjust the Tier I and Tier IIIA boundaries to more accurately reflect the criteria for that Tier as amended by Final Order DCA07-GM-166A and implement the Florida Keys Carrying Capacity Study.**

**Status: This strategy is partially complete.**

Monroe County's permit allocation and Tier System were developed to direct growth to areas served by paved roads, electricity, potable water and sewer and to guide development away from sensitive environmental areas. Monroe County adopted the Tier System criteria and Tier Overlay District Maps into the Land Development Regulations in March 2006. The Department's final orders approving these amendments were challenged in July 2006.<sup>1</sup> The Final Order issued for the challenged Tier Overlay District Maps requires Monroe County to complete additional refinements to address map inaccuracies and revise certain challenged Tier System criteria.

The Department has established a Tier Designation Review Committee with representation from the Florida Fish and Wildlife Conservation Commission, the Department of Environmental Protection, the United States Fish and Wildlife Services, Monroe County, the environmental community and other relevant interests.

While this strategy is partially complete, significant funding, time, and effort have been expended in creating maps and conducting approximately 80 hours of committee meetings to evaluate the tier designations. The recommendations are currently being considered by the Monroe County Planning Commission.

During the past year, the Tier Designation Review Committee has reviewed 3,200 parcels to consider the appropriateness of the tier designation. The County hired a consultant who assisted the County biologists and committee members in conducting site visits. The committee conducted public hearings and heard testimony from the property owners prior to making a final recommendation regarding the parcel's designation. A court reporter was employed to ensure proper record keeping. Aerial photography notebooks were mailed to each committee member prior to the 5 committee meetings. Two of the committee members and DCA staff traveled to the Keys to participate in the meetings. The Monroe County Board of County Commissioners will take action on the proposed adjustments to the Tier I and Tier IIIA boundaries during the first quarter of 2011.

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<sup>1</sup> State of Florida, Department of Community Affairs Final Order DCA07-GM-166A (DOAH Case No. 06-2449GM)

**30-Day Report Strategy:** The Administration Commission directed the local governments to develop a process to coordinate the acquisition of land for which building permits have been denied for four years for property located within an area targeted for land acquisition. Depending upon the natural resources of the parcel and available funds, the Division of State Lands will consider the parcel for purchase. The County Land Authority shall submit a report annually on the land acquisition funding and efforts in the Florida Keys.

**Status:** The coordination process has been adopted into the comprehensive plans by Monroe County and the Village of Islamorada. Marathon anticipates transmitting a plan amendment adopting the procedure within the next 30 days.

The coordination procedure was developed to ensure that the Division of State Land or the local government has an opportunity to offer to purchase environmentally sensitive land that has been targeted for acquisition prior to the local government offering a building permit through the administrative relief procedure. During this period, Monroe County purchased two parcels scheduled for administrative relief. The Village of Islamorada and the City of Marathon had no applications for Administrative Relief.

Land acquisition and management is also a critical component to the protection of the natural resources and quality of life in the Florida Keys. The Monroe County Land Authority is empowered to acquire and dispose of property for a range of public purposes, including recreation, affordable housing, environmental protection, and the protection of private property rights. The Land Authority serves all the Keys, not just unincorporated Monroe County.

Monroe County adopted a Land Acquisition and Management Master Plan in August 2006 to address strategies, funding, and non-funding sources for acquisition and management of conservation lands, retirement of development rights, and acquisition of affordable housing sites. This report projected a need for approximately \$443 million to purchase lands targeted for acquisition.

The Land Authority receives funding from two sources of recurring revenue. One source contributes approximately \$400,000 per year from a surcharge on admissions and overnight occupancy at state parks within the Florida Keys Area of Critical State Concern. Additionally, the Land Authority receives a half-cent of tourist impact tax revenue charged on lodging in the Keys, which generates approximately \$1 million per year within both the Florida Keys Area of Critical Concern and the Key West Area of Critical Concern. However, revenue generated within the City of Key West and provided to the Land Authority must be spent within the area where the funding was collected. During the 2009-2010 work program reporting year, the Land Authority acquired 19.9 acres (35 parcels) for \$674,423. The Department of Environmental Protection has also acquired an additional 5 parcels, totaling 33.84 acres, for \$7,605,013.94. No land was purchased by Islamorada or Marathon during this year. Marathon and the County submitted applications for land acquisition financing this year, however neither application has been funded to date. Marathon submitted an application to the Coastal

Zone Management Program and may receive funding from Department of Environmental Protection toward the acquisition of Boot Key Island. Islamorada did not apply for funding.

### **Clearing Tropical Hardwood Hammock**

**30-Day Report Strategy: The Department and the Florida Keys communities were directed by the Administration Commission to collaboratively evaluate the adopted clearing limits for high and moderate quality hammocks and to make recommendations to bring parity between the local governments and to strengthen the protection of hardwood hammocks. If necessary, amend the comprehensive plan to implement the recommendations.**

**Status: This strategy is partially complete. The recommendations need to be amended into the comprehensive plan and land development regulations.**

This strategy requires the collaboration between Monroe County, Marathon, and Islamorada, to evaluate the adopted clearing limits for high and moderate quality tropical hardwood hammocks. The allowable amount of clearing of hardwood hammock is determined by the quality of the hammock. Both Marathon and Islamorada classify hammock as low, moderate, or high quality. Monroe County classifies Tier I as high quality; Tier II as moderate quality and Tier III and Tier IIIa (Special Protection Area) as low quality.

Monroe County implements its clearing limits through the Tier System. The Tier system assigns the Tier designation for parcels based on the extent of hammock. Parcels designated Tier I contain large intact hammocks and allow clearing of 20 percent of the native vegetation on the site. Islamorada and Marathon allow parcels that are vegetated with high quality hammock to clear 10 percent. Islamorada considers any parcel consisting of 5 acres of hammock to be high quality, whereas Marathon requires 12.5 acres to be considered high quality. The County originally mapped any 4 acre contiguous hammock or land targeted for acquisition by the state as Tier I – high quality hammock.

In Monroe County, parcels designated Tier IIIa Special Protection Area that contain significant hammock fragments may clear 40 percent of the native vegetation on the site or 3,000 square feet, whichever is greater; however, the total clearing of native vegetation cannot exceed 7,500 square feet. Parcels that are 18,075 square feet are at the breakeven point, where 40 percent clearing equals the 7,500 square foot clearing maximum. All parcels greater than 18,075 square feet are limited to 7,500 square feet of clearing. Islamorada and Marathon allow 30 percent clearing in moderate quality hardwood hammock with no cap on clearing.

The local governments also have additional land development regulations that address clearing where lots have been united in order to gain points in the competitive building permit allocation system.

Islamorada and Marathon use site evaluation processes to determine the quality of the hammock and the clearing allowed on a parcel. The following chart compares the clearing limits for the three local governments based on lot size and quality of hammock.



<b>Existing Scenarios: Permitted Clearing by Lot Size in Square Feet</b>				
<b>High Quality Hammock Clearing Allowed</b>				
<u>Lot Size</u>	<b>Monroe (Tier I)</b>		<b>Marathon</b>	<b>Islamorada</b>
	20% Clearing		10% Clearing	10% Clearing
108,900	21,780		10,890	10,890
87,120	17,424		8,712	8,712
65,340	13,068		6,534	6,534
43,560	8,712		4,356	4,356
25,000	5,000		2,500	2,500
20,000	4,000		2,000	2,000*
15,000	3,000		1,500	1,500*
10,000	2,000		1,000	1,000*
5,000	1,000		500	500*
3,000	600		300	300*
<b>Moderate Quality Hammock Clearing Allowed</b>				
<u>Lot Size</u>	<b>Monroe (Tier II)</b>	<b>Monroe (Tier III-A)</b>	<b>Marathon</b>	<b>Islamorada</b>
	40% Clearing (Big Pine & No Name)	3,000 or 40% but no more than 7,500	30% Clearing	30% Clearing
108,900	43,560	7,500	32,670	32,670
87,120	34,848	7,500	26,136	26,136
65,340	26,136	7,500	19,602	19,602
43,560	17,424	7,500	13,068	13,068
25,000	10,000	7,500	7,500	7,500
20,000	8,000	7,500	6,000	6,000*
15,000	6,000	6,000	4,500	4,500*
10,000	4,000	4,000	3,000	3,000*
5,000	2,400	3,000	1,500	1,500*
3,000	1,200	3,000	900	900*
<b>Low Quality Hammock Clearing Allowed</b>				
<u>Lot Size</u>	<b>Monroe (Tier III)</b>		<b>Marathon</b>	<b>Islamorada</b>
	3,000 or 40% but no greater than 7,500		50% Clearing	50% Clearing
108,900	7,500		54,450	54,450
87,120	7,500		43,560	43,560
65,340	7,500		32,670	32,670
43,560	7,500		21,780	21,780
25,000	7,500		12,500	12,500
20,000	7,500		10,000	10,000
15,000	6,000		7,500	7,500
10,000	4,000		5,000	5,000
5,000	3,000		3,000	3,000
3,000	3,000		1,500	1,500
*Residential Medium (RM) future land use categories that score as High or Moderate quality and are one-half acre or less in size may allow 50 percent clearing.				

<b>Scenarios Resulting from Recommendations by Lot Size in Square Feet</b>				
<b>High Quality Hammock Clearing Allowed</b>				
<u>Lot Size</u>	<b>Monroe (Tier I)</b>		<b>Marathon</b>	<b>Islamorada</b>
	3,000 or 20% but no greater than 7,500		3,000 or 10% but no greater than 7,500	3,000 or 10% but no greater than 7,500
108,900	7,500^		7,500^	7,500^
87,120	7,500^		7,500^	7,500^
65,340	7,500^		6,534^	6,534^
43,560	7,500^		4,356^	4,356^
25,000	5,000^		3,000^	3,000^
20,000	4,000^		3,000^	3,000^
15,000	3,000^		3,000^	3,000^*
10,000	3,000		3,000	3,000*
5,000	3,000		3,000	3,000*
3,000	3,000		3,000	3,000*
<b>Moderate Quality Hammock Clearing Allowed</b>				
<u>Lot Size</u>	<b>Monroe (Tier II)</b>	<b>Monroe (Tier III-A)</b>	<b>Marathon</b>	<b>Islamorada</b>
	3,000 or 40% but no greater than 7,500 (Big Pine and No Name)	3,000 or 40% but no greater than 7,500	3,000 or 30% but no greater than 7,500	3,000 or 30% but no greater than 7,500
108,900	7,500	7,500	7,500	7,500
87,120	7,500	7,500	7,500	7,500
65,340	7,500	7,500	7,500	7,500
43,560	7,500	7,500	7,500	7,500
25,000	7,500	7,500	7,500	7,500
20,000	7,500	7,500	6,000	6,000
15,000	6,000	6,000	4,500	4,500*
10,000	4,000	4,000	3,000	3,000*
5,000	3,000	3,000	3,000	3,000*
3,000	3,000	3,000	3,000	3,000*
<p>^ In High Quality Hammock, one driveway of reasonable configuration shall not count toward the clearing area in order to provide reasonable access to the property.</p> <p>*Residential Medium (RM) future land use categories that score as High or Moderate quality and are one-half acre or less in size may allow 50 percent clearing.</p>				
<b>Low Quality Hammock Clearing Allowed</b>				
Low Quality Hammock distinction removed.				

## Conclusions

In high quality hammock areas, Monroe County allows twice as much clearing as Islamorada and Marathon. The 10 percent allowed by the two municipalities is low for lots less than 15,000 square feet in size and may result in a clearing allowance that is not large enough to provide a buildable area. In the County, the amount of clearing allowed is high for lots 1 acre in size and larger.

Regarding moderate quality hammock, the municipalities allow a greater amount of clearing for lots over 15,000 square feet but lesser amounts of clearing for lots smaller than 5,000 square feet.

**Consensus Recommendations:** As a result of this analysis by the planning staff from the Department of Community Affairs, Monroe County, the city of Marathon and the Village of Islamorada, the following recommendations were made:

1. In Monroe County, the clearing of lots in Tier I shall be limited to 7,500 square feet per principal dwelling unit and associated accessory structures per buildable acres. For lots greater than 10,000 square feet, clearing for one driveway of reasonable configuration up to 18 feet in width is permitted for each parcel and shall be exempt from the clearing limitations to provide reasonable access to the property. Clearing for a driveway that is exempt from clearing limits shall be recommended by a County biologist and approved by the Planning Director. In no case shall clearing exceed 20 percent of the entire site.
2. In Monroe County, the clearing of lots in Tier II (Big Pine and No Name Key) shall be limited to 3,000 square feet or 40 percent, whichever is greater; however, clearing shall not exceed 7,500 square feet, regardless of the amount of upland native vegetation.
3. In Monroe County, add clearing limits for Tier IIIa (Special Protection Area). Clearing of Tier IIIa (Special Protection Area) shall be limited to 3,000 square feet or 40 percent, whichever is greater; however, clearing shall not exceed 7,500 square feet, regardless of the amount of upland native vegetation.
4. In Marathon, limit clearing of high quality hammock to a 7,500 square foot footprint for the principle structure. Additionally, allow one driveway no wider than 18 feet per parcel in high quality hammock that is exempt from clearing requirements; however, in no case shall clearing exceed 10 percent of the entire site.
5. In Islamorada and Marathon, limit the clearing of moderate quality hammock to 7,500 square feet or 30 percent, whichever is less.
6. For Marathon, Islamorada, and Monroe County, a minimum clearing area of 3,000 square feet shall be allowed to provide reasonable use of property.
7. Revise Monroe County Policy 101.5.4(3) to allow ROGO points for aggregated Tier IIIa Special Protection Area lots provided that no more than 7,500 square feet of upland native vegetation clearing is proposed.
8. Revise Monroe County Comprehensive Plan lot aggregation policies, land development regulations, and Rule 28-20.120(4)(e), F.A.C., to limit clearing of aggregated lots that

receive points in the building permit allocation system from 5,000 square feet to a maximum of 7,500 square feet.

9. Revise Marathon Land Development Regulations to require that any parcel located within a contiguous hammock 5 acres in size shall be considered high quality hammock.
10. Eliminate the distinction between low and moderate quality hammock.

# Water Quality

**30-Day Report Strategy: The Administration Commission directed the local governments to continue implementation of the Wastewater Master Plan, to define construction schedule by phases, to develop facility plans and secure funding to implement the plan. Local governments were also directed to complete projects identified in the Stormwater Management Master Plan.**

**Status: This task is incomplete.**

The construction of modern, centralized wastewater infrastructure is essential to the marine environment, public health, and quality of life and economy of the Florida Keys. Both the Florida Legislature and the Florida Cabinet, acting as the Administration Commission, through the Area of Critical State Concern Work Program, have established specific requirements for completion of central wastewater facilities. Beginning in 1987, the Administration Commission promoted a comprehensive wastewater system strategy for the Keys. The strategy involves construction of local government wastewater facilities, higher levels of treatment, better methods of disposal, and elimination (through connection to the central systems) of small, older wastewater plants and most septic tanks and cesspits. Based on significant evidence that poor water quality in the Keys was related to inadequate wastewater management, the Legislature enacted Section 6 of Chapter 99-395, Laws of Florida, as amended, to require all sewage facilities in Monroe County, including septic tanks, package plants and cesspits, to comply with the treatment standards by 2010.

**2015 Wastewater Treatment Standards**

Wastewater facilities having design capacities of less than 100,000 gallons per day and onsite sewage treatment and disposal systems.

- a. Biochemical Oxygen Demand (CBOD5) of 10 mg/l.
- b. Suspended Solids of 10 mg/l.
- c. Total Nitrogen, expressed as N, of 10 mg/l.
- d. Total Phosphorus, expressed as P, of 1 mg/l.

Wastewater facilities having design capacities greater than or equal to 100,000 gallons per day.

- a. Biochemical Oxygen Demand (CBOD5) of 5 mg/l.
- b. Suspended Solids of 5 mg/l.
- c. Total Nitrogen, expressed as N, of 3 mg/l.
- d. Total Phosphorus, expressed as P, of 1 mg/l.

In November 2009, the Administration Commission also directed the Department of Community Affairs to place draft Administration Commission rules in abeyance while the Florida Keys communities proposed legislation to amend Chapter 99-395, Laws of Florida. The legislation was needed to extend the deadline from 2010 to 2015 for the upgrade of wastewater treatment facilities to advanced treatment standards. Senate Bill 550 was enacted and provided an additional 5 years for

the local governments to seek financing and construct wastewater treatment facilities.

Marathon and the Key Largo Wastewater District are making good progress in building the facilities necessary to serve their citizens and protect local water quality. They have developed construction programs and financing plans and continue to take advantage of available state and federal resources to assist their efforts. Monroe County and Islamorada have stated hesitancy to continue moving forward unless the state and federal governments pay a much larger share of the cost of the facilities. Monroe County and Islamorada's serious funding shortages are slowing their progress. Additionally, Islamorada has experienced delays because of the Plantation Key facility lawsuit.

## **Marathon - Wastewater and Stormwater**

Marathon has made great strides in providing central wastewater to the 7 wastewater sub-areas. Three of the 7 sub-areas are complete with connections increasing daily. Two systems are more than 85% complete. The Knight's Key facility was delayed by a lawsuit; however, the plant and collection system design is complete and construction is underway and anticipated completion date is December 2010. The Tom Harbor facility is under construction with completion anticipated in 2011. Marathon has the financing in hand to complete the construction of its planned wastewater facilities. Marathon's financing strategy includes more than \$57 million in assessments. As of this writing, Marathon has completed 9% of the connections and has spent more than \$11 million during the evaluation period on wastewater projects. Within this section is a table that indicates the progress of planned connections for each facility in the Keys.

As the wastewater collection lines are installed, Marathon is also constructing stormwater treatment facilities. Marathon has applied for and received \$300,000 in stormwater funding. In addition, two direct stormwater discharges were eliminated this year.

## **Monroe County - Wastewater and Stormwater**

The Key Largo Wastewater District spent \$46 million this year on wastewater projects and received \$12 million in grants this year. The total cost of the facility is estimated at \$121 million with assessments of \$5,000 per user. The District is currently inspecting final residential connections at a rate of approximately 100 per week.

The County has upgraded the Hawk's Cay facility and construction is underway to serve residents on Duck Key. The County has \$9.6 million in committed funds for fiscal year 2011 and another \$3 million in committed funds in fiscal year 2012. Construction of the Big Coppitt facility is complete and more than 70% of connections have been made.

The design for the Cudjoe Regional facility is complete, but is not expected to be bid out until February 2011. Funding for the Cudjoe facility has not been identified and assessments have not been levied. The projected cost for the facility is approximately \$180 million with connection fees estimated at \$23,000 per household. It is unlikely that the County will be able to complete this system by the 2015 deadline. If committed funding is not identified quickly, the County should designate the area as a non-service area and take steps to notify residents of their responsibility to upgrade the existing septic systems and package plants and develop an enforcement program in conjunction with the Department of Health and the Department of Environmental Protection. The County has agreed to schedule an agenda item during the first quarter of 2011 to discuss assessments for the Cudjoe Regional facility.

Construction of stormwater facilities was completed at mile marker 11-12 through an agreement with the Florida Department of Transportation. Monroe County has also applied for stormwater funding and received \$250,000.

## Islamorada - Wastewater and Stormwater

There has been inadequate progress in the construction of central wastewater facilities to bring about improvement of near shore water quality as required by Section 380.0552, F.S. Islamorada has refunded approximately \$4 million in property assessments that had been collected for the construction of central wastewater facilities and has returned over \$5 million in funding from the Environmental Protection Agency that would have upgraded septic tanks. Islamorada also returned over \$6 million in funding from the Army Corps of Engineers. As a result, Islamorada was unable to execute loan agreements offered by the Department of Environmental Protection for another \$6 million for the construction of wastewater facilities. Consequently, more than \$22 million has been forfeited. Islamorada does not have a viable plan or funding to meet the December 2015 deadline for meeting the advanced wastewater treatment standards required by Section 403.086(10) and Section 381.0065(4)(1), F.S.

Islamorada and the Plantation Key contractor are in litigation. The litigation and equipment failures have contributed to the lack of progress in constructing wastewater. A contingent from Islamorada recently travelled to a suburb outside of Mobile, Alabama to view a Septic Tank Effluent Pump (STEP) system as a wastewater management option. The costs and feasibility of these systems have not yet been determined. Islamorada is also negotiating with the Key Largo Wastewater District to treat wastewater originating in the Village of Islamorada.

Islamorada did not apply for stormwater funding and has not identified any stormwater projects in the 30-Day Report or the capital improvements program.

### Wastewater Connection Progress

Monroe	Potential EDUs	Connected EDUs	Assessment	Total Assessment to be Collected	Percent Connected
Baypoint	429	379	2,700	1,158,300	88%
Conch Key	150	112	2,700	405,000	75%
Duck Key	1,302	909	4,500	5,859,000	70%
Big Coppitt	1,711	1,237	4,500	7,699,500	72%
Stock Island	1,100	1,000	2,700	2,970,000	91%
Basin a	1,066	175	4,970	5,298,020	16%
Basin b	1,784	165	5,050	9,009,200	9%
Basin c	1,034	393	5,050	5,221,700	38%
Basin d	1,004	379	4,970	4,989,880	38%
Basin e	1,353	1,035	4,770	6,453,810	76%
Basin f	2,470	93	5,200	12,844,000	4%
Basin g	2,051	0	5,200	10,665,200	0%
Basin h	768	0	5,200	3,993,600	0%
<b>Total Monroe</b>	16,222	5,877		\$ 76,567,210	36%
<b>Islamorada</b>	9,268	750			8%
<b>Marathon</b>	10,087	880	5,730	\$57,798,510	9%



## **Recommendations**

- The Department recommends that Marathon continue with its excellent progress on completing wastewater and stormwater projects.
- The Department encourages Monroe County to identify funding for the Cudjoe wastewater system or develop an alternate plan to consider the area a non-wastewater service area and determine how upgrades and enforcement will be implemented.
- The Department encourages the Village of Islamorada Council to make a decision regarding how wastewater treatment facilities will be upgraded; and to submit a wastewater construction schedule that can be adopted into a rule or designate Islamorada a non-service area and develop a notification and enforcement procedure that will ensure that package plants and onsite sewage treatment and disposal systems will meet the 2015 treatment standards.

# **Hurricane Evacuation**

## Introduction

One of the guiding principles of growth management is the protection of public health, safety and welfare. The most common threat to public safety in the Florida Keys is the potential loss of life and property from storm surge, flooding, and high winds associated with hurricanes. The Florida Keys are located within an area of high hurricane activity. The area's elongated configuration of coastal barrier islands, single evacuation route, and extensive shoreline in a high hazard zone make the area extremely vulnerable. US Highway 1 is a long causeway (146 miles) connecting multiple islands, with the majority of the roadway segments limited to two lanes. Widening the two lane segments of US Highway 1 is impractical due to potential marine, wetlands and sea grass impacts, engineering constraints, cost, etc. Past efforts in 2000 to widen the highway resulted in litigation. Since 2000, some improvements have included the elevation and addition of a northbound lane along the 18 Mile Stretch of US Highway 1 and the replacement of Jew Fish Bridge.

The ability to safely evacuate the Florida Keys in the event of a hurricane is a limiting factor that affects growth in the Florida Keys. The Florida Division of Emergency Management requires that barrier islands be evacuated during category 3-5 hurricanes and also discourages the construction of hurricane shelters. Any population remaining during a mandatory evacuation would be vulnerable after a hurricane event due to potential damage to bridges, water supply and electricity. Power and potable water originate in Florida City on the mainland. There are no designated hurricane shelters within Monroe County for major hurricane events because the Florida Keys are coastal barrier islands.

Further, hurricane evacuation within the Florida Keys is regulated by Section 380.0552, F.S., which provides the following regarding hurricane evacuation:

### (9) MODIFICATION TO PLANS AND REGULATIONS.—

(a) Any land development regulation or element of a local comprehensive plan in the Florida Keys Area may be enacted, amended, or rescinded by a local government, but the enactment, amendment, or rescission becomes effective only upon approval by the state land planning agency. The state land planning agency shall review the proposed change to determine if it is in compliance with the principles for guiding development specified in Chapter 27F-8, Florida Administrative Code, as amended effective August 23, 1984, and must approve or reject the requested changes within 60 days after receipt. Amendments to local comprehensive plans in the Florida Keys Area must also be reviewed for compliance with the following:

1. Construction schedules and detailed capital financing plans for wastewater management improvements in the annually adopted capital improvements element, and standards for the construction of wastewater treatment and disposal facilities or collection systems that meet or exceed the criteria in Section 403.086(10), F.S. for wastewater treatment and disposal facilities or Section 381.0065(4)(1), F.S., for onsite sewage treatment and disposal systems.

2. Goals, objectives, and policies to protect public safety and welfare in the event of a natural disaster by maintaining a hurricane evacuation clearance time for permanent residents of no more than 24 hours. The hurricane evacuation clearance time shall be determined by a hurricane evacuation study conducted in accordance with a professionally accepted methodology and approved by the state land planning agency.

**30-Day Report Strategy: The Administration Commission directed the Department of Community Affairs and Monroe County to update the data for the Florida Keys Hurricane Evacuation Model utilizing professionally acceptable sources of information such as the Census, American Communities Survey, Bureau of Business and Economic Research, and other studies.**

**Status: This strategy is complete**

Since adopting its first comprehensive plan, Monroe County has recognized the finite ability to evacuate its population safely with only one route out of the Keys and has limited the number of new dwelling units that can be constructed annually to ensure the safe evacuation of the public. The comprehensive plans for the Florida Keys communities contain policies requiring the maintenance of a 24 hour hurricane evacuation clearance time for major storms. Other policies include a phased evacuation procedure that is implemented 48 hours prior to the forecasted landfall of tropical storm winds.

The Department has utilized the Florida Keys Hurricane Evacuation Model (also known as the “Miller Model”) to determine hurricane evacuation clearance time for the Florida Keys since 1999. The Florida Keys Hurricane Evacuation Model evolved from a US Army Corps of Engineers Traffic Flow model that was modified by the Post, Buckley, Schuh & Jernigan consulting firm in 1990.

In 2001, the model indicated that evacuation clearance time was 25 hours and 32 minutes. This clearance time was based upon the simultaneous evacuation of tourists and permanent residents. In 2005, a Hurricane Evacuation Committee convened by the Department of Community Affairs recommended the formal adoption of an existing practice that advised tourists to evacuate 48 hours prior to the forecasted landfall of tropical storm winds. Each local government, with the exception of the city of Key West, adopted the phased evacuation procedure into its comprehensive plan. Using phased evacuation, the evacuation clearance time was reduced to 22 hours and 6 minutes.

To address direction provided by the Administration Commission to update the Florida Keys Hurricane Evacuation Model, the Department assembled a technical focus group that included several transportation engineers and behavior experts who have developed evacuation models in Florida. Human behavioral expert, Dr. Jay Baker from Florida State University also participated on the focus group. The Florida Department of Transportation provided funding to update human behavioral studies in Monroe County. The Florida Department of Transportation also engaged Dr. Brian Wolshon, an expert on transportation and emergency evacuation from

Louisiana State University, to provide input regarding the Florida Keys Model. The technical focus group has conducted numerous meetings over the past two years to evaluate hurricane modeling approaches.

The technical focus group reviewed the Florida Keys Hurricane Evacuation Model assumptions and variables and noted that, while there are more modern dynamic models available, the Florida Keys Hurricane Evacuation Model is an “acceptable” mechanism to measure clearance time.

The technical focus group recommended that the highway capacity levels be re-evaluated. Highway capacity levels represent the number of cars that can be processed through a particular link per hour. Capacity levels assumed in the Florida Keys Hurricane Evacuation Model were established by a 1999 committee of state and local representatives. The committee used the Florida Highway Capacity guide to establish the capacity of each link and reduced the highway capacity by up to 30 percent to account for background traffic and side friction created by automobiles entering the highway. The technical focus group recommended that the Florida Department of Transportation conduct additional traffic studies and update the link capacities to provide more confidence on the capacity numbers utilized in the model.

As a result of the focus group discussion, the Florida Department of Transportation consulted with professional transportation engineers to evaluate the sustainable capacity of US Highway 1 and made adjustments to the capacity for the various links. These adjustments resulted in an overall decrease in capacity. Additionally, the technical focus group recommended that the Florida Department of Transportation provide a table indicating any changes to the evacuation clearance time that have resulted from the improvements to US Highway 1 that have been completed to date and to project any changes that would result to the evacuation clearance time from any funded improvements listed in the Florida Department of Transportation 5 Year Construction Plan.

The technical focus group discussed the need to clarify the definition of clearance time. Utilizing phased evacuation, clearance begins when the permanent population has received the evacuation order for a Category 3-5 hurricane event and ends when the last car arrives at U.S. Highway 1 at the Florida Turnpike in Homestead/Florida City. This definition is based in part on an Administrative Law Judge’s Final Order (DOAH Case No. 04-2756RP). This location is preferred as it is situated outside the Category 3 vulnerability zone concurrent with behavioral studies, and allows for the dispersal of Florida Keys evacuees into multiple directions. Additionally, human behavioral studies indicate that less than 3 percent of the population will go to emergency shelters, so an out-of-county terminus is warranted. **The Department recommends adding this definition of clearance time to the draft rules.**

**30-Day Report Strategy:** Monroe County shall enter into a memorandum of understanding with the Department of Community Affairs (DCA), Marathon, Islamorada, Key West, Key Colony Beach and Layton after a notice and comment period of at least 30 days for interested parties. The memorandum of understanding shall stipulate, based on professionally acceptable data and analysis, the input variables and assumptions, including regional considerations, for utilizing the Florida Keys Hurricane Evacuation Model or other models acceptable to DCA to accurately depict evacuation clearance times for the population of the Florida Keys.

**Status:** This strategy is incomplete.

The Department has not engaged the local governments to develop the memorandum of understanding. Instead the Department has invested significant time in exploring hurricane evacuation clearance time models and obtained guidance from a number of experts. During this exploratory phase, the Department worked with the Division of Emergency Management and the South Florida Regional Evacuation Study's uniform modeling methodology. During this evaluation it has become clear that the outcomes of the model runs are influenced more by the assumptions of the model than the type of model used. It will be necessary through model run scenarios how the assumptions of the model impact clearance time in order to develop the memorandum of understanding.

### **Monroe County Hurricane Evacuation Study**

To advance the reliability of the Florida Keys Hurricane Evacuation Model, Monroe County hired Dr. Reid Ewing to update the Florida Keys Hurricane Evacuation Model with current dwelling unit data and to reflect the phasing evacuation procedures. The Florida Keys Hurricane Evacuation Model has been updated using the best available data from recent transportation and behavioral studies, the 2000 Census, American Communities Surveys, and building permit data through 2008. The Ewing report can be found in the Technical Appendix. Table 32 of the report provides results for several scenarios. The hurricane evacuation scenarios below assume:

- Tourists and mobile home occupants responded to the early evacuation notice;
- One hundred percent of the mobile home occupants participate in the evacuation;
- The response curve is 12 hours;
- The storm event calls for an evacuation of Monroe County only; and
- The evacuation event is modeled to US Highway 1 at the Florida Turnpike in Homestead/Florida City.

Table 32 Highway Configuration	Low Occupancies (27-67%)		High Occupancies (32-84%)	
	Scenario 1: Low Participation (70-75%)	Scenario 2: High Participation (90-95%)	Scenario 3: Low Participation (70-75%)	Scenario 4: High Participation (90-95%)
A. 2001 Lanes/Miller Flow Rates	16 hours 16 minutes	18 hours 50 minutes	18 hours 32 minutes	22 hours 6 minutes
B. 2001 Lanes/FDOT Flow Rates	18 hours 58 minutes	22 hours 28 minutes	22 hours 8 minutes	27 hours 2 minutes
C. 2015 Lanes/FDOT Flow Rates	16 hours 16 minutes	16 hours 16 minutes	16 hours 16 minutes	18 hours 40 minutes
D. 2015 Lanes/FDOT Flow Rates (without shoulder from mile marker 90 to mile marker 106)	16 hours 16 minutes	17 hours 16 minutes	17 hours 4 minutes	20 hours 16 minutes

Line A of the table provides the evacuation clearance time scenarios based upon the traffic flow rates used in the original Florida Keys Model combined with phased evacuation. Line A of the table is based on the capacity of US Highway 1 in the year 2000. The Florida Department of Transportation is the agency with the authority to determine the sustainable traffic flows of US Highway 1; therefore this scenario has only been included as a historical reference.

Line B of the table provides four scenarios when combined with the values from the Occupancy Rate of permanent dwelling units. Scenario 1 utilizes the updated sustainable flow rates for US Highway 1. Scenario 1 assumes a low participation rate of 70-75% of the permanent population will evacuate and assumes a low occupancy rate of permanent dwelling units of 27 to 67 percent. Scenario 1 provides an evacuation clearance time of 18 hours and 58 minutes. If the participation rate is increased to 90-95% from Scenario 2, the evacuation clearance time rises to 22 hours and 28 minutes.

**Line B, Scenario 3** also provides an evacuation clearance time based upon low participation rate of 70-75% of the permanent population with a higher occupancy rate of 32-84 percent of the permanent dwelling units. **This result provides an evacuation time of 22 hours and 8 minutes.**

Line C of the table provides a projection of the evacuation time in 2015. The model assumes that all the work projects included within the Florida Department of Transportation 5-year plan have been constructed and that a continuous enhanced shoulder 10 feet wide has been added between mile markers 90-106 that would count toward evacuation capacity. This scenario provides a clearance time of less than 24 hours using low and high participation and low and high occupancy rates.

Line D of the table provides a projection of the evacuation time in 2015. The model assumes that all the work projects that have been included within the Florida Department of Transportation 5 Year Plan have been constructed and that an enhanced shoulder four feet wide

has been added between mile markers 90-106 that would count toward evacuation capacity. This scenario provides a clearance time of less than 24 hours using low and high participation and low and high occupancy rates. This scenario does not include the potential 2015 population and additional dwelling units.

**Scenario 3 with the high participation rate, low occupancy rate and clearance time of 22 hour and 8 minutes is the evacuation clearance time that DCA supports as the most probable and the most credible.** This scenario is based upon limited data provided by the American Communities Survey and the limited survey may not provide data that is reliable enough for county-wide application. The occupancy rate of permanent dwelling units needs to be monitored and confirmed when the 2010 Census data is released.

Lines C and D and the resulting scenarios do not include an evaluation of the time necessary to set up cones on the bridges or requirements for dedicated police officers at each bridge to direct traffic. In addition, the Monroe County Board of County Commissioners adopted a resolution indicating support for only four feet of the proposed ten feet shoulder enhancements proposed by the Florida Department of Transportation between mile markers 90-106. The Department agrees that the enhancements will improve safety conditions and allow for emergency vehicles and areas for vehicles to be pushed off the highway. The Department does not have sufficient information to support the 2015 projection scenario that uses shoulder enhancement as the basis for capacity.

### **Division of Emergency Management Statewide Studies**

Section 163.3178, F.S., requires the Division of Emergency Management to manage the update of the statewide hurricane evacuation studies, ensure that the studies are done in a consistent manner, and ensure that the methodology used for modeling storm surge is that used by the National Hurricane Center. The Division of Emergency Management has contracted with Florida's Regional Planning Councils to carry out statewide regional evacuation studies in collaboration with county emergency management agencies to facilitate consistent methodology integrated mapping and analysis of evacuations across Florida. The model includes updated elevation data, surge modeling, behavioral analysis and an evacuation transportation analysis.

Section 163.3178, F.S., also requires comprehensive plans to address hazard mitigation and protection of human life against the effects of natural disaster, including the capability to safely evacuate the density of coastal population proposed in the future land use plan element in the event of an impending natural disaster. Further, local governments must maintain their adopted level of service for out-of-county hurricane evacuation for a category 5 storm event.

The Division of Emergency Management has developed a statewide modeling approach that included hazards, behavioral, shelter and regional evacuation transportation networks analysis. Behavioral surveys were conducted in each region. Planning assumptions regarding evacuation participation rates, perception of risk, destination assignments, and vehicle usage, were identified. The surge zones for each region were delineated. The analysis considers a wide variety and complexity of regional evacuations and multiple scenarios. The modeling tested



various evacuation routes, timing strategies, shelter/refuge strategies, and traffic control measures in order to minimize clearance times.

Regional (multi-county) and multi-regional impacts, as well as impacts from or evacuees crossing from one county to another to other counties in the state were evaluated. Impacts on county and regional shelter supply, and the county and regional evacuation routes clearance times were determined based on scenarios, which affect part of the region, the entire region, and multiple regions. The modeling analyzes how evacuation can be handled for multiple regions evacuating at the same time

For example, the South Florida Regional Evacuation Study, sponsored by the Division of Emergency Management, is based on values that are proximal to the Florida Keys Model which yields a similar evacuation clearance time, relying upon similar assumptions. The South Florida Regional Evacuation Study model and the Florida Keys Model utilize the 2000 Census data updated by subsequent building permit data provided by the local governments. Both models utilize occupancy rates, participation rates, response curves, and the revised flow rate capacities for US Highway 1 provided by the Florida Department of Transportation. Both models assume that tourists and mobile home occupants left when the phased evacuation order was issued.

The primary differences between the models pertain to participation and occupancy rates. The South Florida Regional Evacuation Study model uses a participation rate of 100 percent in its base scenario instead of the 90-95 percent participation rate used in the Florida Keys Hurricane Evacuation Model. The South Florida Regional Evacuation Study model relies upon the 2000 Census data for the occupancy rate because the Census data is more reliable with a broader base. The Florida Keys Model discounts the occupancy rate by 20 percent in recognition of the American Communities Survey which shows a decline in the occupancy rate for permanent units

Consistent with Section 163.3178, F.S., the base scenario of the South Florida Regional Evacuation Study will be used to evaluate requests for plan amendments that increase density and intensity within the Coastal High Hazard Area. Operational scenarios depict evacuation from Monroe County based upon hurricanes approaching from different directions. Operational scenario 8 of the operational scenarios indicates that the evacuation time for permanent residents with no other area being evacuated is currently **22 hours and 30 minutes**.

While the South Florida Regional Evacuation Study results have not been published at the time of report preparation, preliminary results indicate that **a regional evacuation** from Monroe County and Miami-Dade County for an order requiring **simultaneous** evacuation **would result in a clearance time that exceeds 24 hours**.

## Conclusions

The hurricane evacuation clearance time has been estimated utilizing different models, highway configurations and behavioral data. The resulting clearance times are between 16 hours and 16 minutes to 27 hours and 2 minutes. Both the Florida Keys Models and the South Florida Regional Evacuation Study provide model runs that reflect a clearance time of 22 hours and up

to 30 minutes. Over the past two years the Department has updated the Florida Keys Hurricane Evacuation Model assisted by numerous technical experts. It is clear that hurricane evacuation models provide different outcomes based upon the assumptions made.

When reliable data are available, additional modeling should be done to evaluate how hurricane evacuation clearance time will be affected by the increase and distribution of development along US Highway 1 and the increase in occupancy of permanent units that are occupied on a seasonal basis. The results of the 2010 Census will begin their release in April 2011, with other data such as demographic profiles, summary files of aggregated data, and reports becoming available through September 2013. The 2010 Census data should be used to refine the occupancy rate for future model scenarios.

The Department proposes to conduct workshops over the next six months with the local governments, the Division of Emergency Management, and the South Florida Regional Planning Council to discuss the Memorandum of Understanding, evaluate the model parameters and the modifiable assumptions of the model. The Memorandum of Understanding should address the model that will be utilized as well as the assumptions that will be employed by the local governments and the Department to run the model. Workshop discussions will also include an evaluation of the continued usefulness of the Florida Keys Hurricane Evacuation Model. The model was created more than ten years ago and more sophisticated, dynamic models are currently available, such as the South Florida Regional Evacuation Study. This model developed by the Division of Emergency Management which utilizes uniform criteria and modeling parameters that have been developed for use throughout Florida. The Memorandum of Understanding should address the model that will be utilized in the Florida Keys as well as the assumptions that will be employed by the local governments and the Department to run the model. The results of the evacuation clearance time are necessary to evaluate the number of new dwelling units that can be constructed in the Keys and still maintain the 24-hour hurricane evacuation clearance time.

Additional dialogue is needed among the Department, the Florida Keys local governments, the Division of Emergency Management and the Florida Department of Transportation to evaluate the use of South Florida Regional Hurricane Evacuation Study and to reach consensus on the assumptions that will be used in the model. Decisions are needed regarding the utilization of the South Florida Regional Hurricane Evacuation Study for hurricane evacuation in the future. Additional modeling should be conducted at the local government level to evaluate how evacuation clearance time is affected by the distribution of units along US Highway 1. A sensitivity test of the values and assumptions of the South Florida Regional Evacuation Study should be conducted.

## Build Out Capacity of the Florida Keys

**30-Day Report Strategy:** The Department of Community Affairs shall apply the derived clearance time to assess and determine the remaining allocations for the Florida Keys Areas of Critical State Concern. The Department will recommend appropriate revisions to the Administration Commission regarding the allocation rates and distribution of allocations to Monroe County, Marathon, Islamorada, Key West, Layton and Key Colony Beach or identify alternative evacuation strategies that support the 24 hour evacuation clearance time. If necessary, the Department of Community Affairs shall work with each local government to amend the Comprehensive Plans to reflect revised allocation rates and distributions or propose rulemaking to the Administration Commission.

**Status:** This strategy is incomplete.

Building permits in the Florida Keys have been limited to an annual building permit cap since 1996 in order to maintain a 24-hour evacuation clearance time. Monroe County, Marathon, and Islamorada allocate the permits based on a competitive point system which guides development toward areas with infrastructure and away from velocity zones and environmentally sensitive areas such as habitat for threatened or endangered species. When a building permit application is received, it is scored by the local government and enters the building permit allocation pool. The pool is evaluated at quarterly intervals and the top ranked applicants receive an allocation. Those applications that are not awarded remain in the building permit pool and accumulate perseverance points for a maximum of four years. Applicants that are not successful in obtaining a building permit within four years may continue to wait for an allocation. If the property is in an area targeted for land acquisition, the local government may offer to purchase the property. If the parcel is not located within an areas targeted for acquisition, the local government may grant a permit under the existing Administrative Relief provisions of the land development regulations. Table 1 below provides allocation by local government.

**Table 1 - Annual Allocation by Local Government**

Local Government	Annual Allocation
Monroe County	197
Marathon	30
Islamorada	28
Key West*	92
Layton	3
Key Colony Beach	10

\*Key West currently has no annual allocation because it is prohibited from amending their plan until the EAR based amendments and other statutory requirements are met.

Land owners whose applications do not compete well in the building permit allocation system due to the environmental sensitivity of the parcel sometimes file lawsuits claiming the property has been taken by inverse condemnation. Regulations that have been adopted to protect

highly functioning wetlands and to limit clearing of tropical hardwood hammock that provides habitat for endangered species are often cited as the basis for filing Bert Harris Private Property Rights, or takings, cases against the local government and the Department of Community Affairs. These cases are expensive and time consuming to litigate. Currently, the Department is a co-defendant in nine cases, some with multiple petitioners. The Department has utilized the Office of the Attorney General to assist in litigating takings cases. Reducing the permit allocation in the Keys may increase the exposure to takings cases and must be carefully balanced against development limitations. As the Memorandum of Understanding is discussed, there will be concurrent workshops with local governments regarding allocations and distributions that will form the basis for a build-out scenario.

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									Future Actions			
	Status	Department of Community Affairs Comments	Monroe County Comments**	Key Largo Wastewater Treatment District Comments***	Department of Environmental Protection Comments	Department of Health Comments	Required for Removal of Designation in 2010	Department of Community Affairs Recommended Completion Date	Monroe County's Proposed Scheduled Completion Date	To be Reflected in Commission Rule	Comprehensive Plan Amendment Required	
1	Substantial Progress Not Achieved						Yes					
2 Proposed Work Program Strategies pursuant to the 2009 30-Day Report												
3 Habitat Protection												
4	Phase I a. Monroe County is to adopt conservation planning mapping (the Tier Zoning Overlay Maps and System) into the Comprehensive Plan based upon the recommendations of the Tier Designation Review Committee, to be completed prior to September 30, 2009. (See 4b of 9/29/08 memo from Monroe County.)  b. Prepare new habitat data for the program area based on the best available orthophotography in possession of Monroe County.  c. Establish a Tier Designation Review Committee with members selected by the Florida Department of Community Affairs to include representatives from the Florida Fish and Wildlife Conservation Commission, the Department of Environmental Protection, the United States Fish and Wildlife Services, Monroe County, environmental and other relevant interests. The Tier Designation Review Committee shall make recommendations to the Monroe County Board of County Commissioners on proposed adjustments to the Tier I and Tier IIIA boundaries.  d. Adjust the Tier I and Tier IIIA (SPA) boundaries to more accurately reflect the criteria for that Tier as amended by Final Order DCA07-GM166 and implement the Florida Keys Carrying Capacity Study, utilizing the above-referenced updated habitat data.	Incomplete  Complete  Complete  Incomplete	The DCA recommends date change to 2011 with concurrence from Last Stand, the intervenor.	The schedule needs to be revised. Monroe County has completed the creation of new habitat mapping. The TDRC has been meeting since March 2010. As of the date of this County update to the 30-day report, the TDRC has made preliminary recommendations and the public has been invited to present data to the committee for their consideration in the final recommendation to the Commissioners. With over 3,400 parcels affected by the challenge, made tierless, the process for amending the maps requires Development Review Committee, Planning Commission, and Board of County Commission review and approval. The earliest the Tier Maps may be amended is in the Fall 2011. In addition, Last Stand representative has requested additional parcels be reviewed and those also need to be amended. In summary, adopting the maps into the Comprehensive Plan should occur in 2012. The County is underway with this process to amend the existing Tier Maps, which are included in the Land Development Code as an overlay district to the Land Use District (zoning) maps. Until these maps are amended, adding them to the Comprehensive Plan is premature. After they are adopted and found in compliance by the DCA without challenge, the County will adopt into the Comprehensive Plan. The Tier 1 and Tier IIIA boundaries will be adjusted after the TDRC recommends final designations and the BOCC adopts the amended maps.	None	The Tier Designation Review Committee (TDRC) has been established and meeting since February 2010. New habitat maps have been completed. The TDRC is in the final stages of completing the map review and recommending tier changes for Tiers 1, 3A and 3.	None	Yes	July 2011  July 2010  July 2010  July 2011	Yes	Yes	
5	Phase II a. The Administration Commission to approve adoption of new rule sections to 28-20.110, FAC, for Monroe County which will create, in part, Goal 106 to complete the 10 Year Work Program found in Policy 101.2.13, and to establish objectives to develop a build-out horizon in the Florida Keys and adopt conservation planning mapping into the Comprehensive Plan.  b. Create Objective 106.2 to adopt conservation planning mapping (Tier Maps) into the Monroe County Comprehensive Plan based upon the recommendations of the Tier Designation Review Committee prior to September 30, 2009. (See 6a.ii of 9/29/08 memo from Monroe County.)  c. Adopt Policy 106.2.1 to require the preparation of updated habitat data and establish a regular schedule for continued update to coincide with Evaluation and Appraisal Report timelines.  d. Adopt Policy 106.2.2 to establish the Tier Designation Review Committee to consist of representatives selected by the Florida Department of Community Affairs from Monroe County, Florida Fish & Wildlife Conservation Commission, United States Fish & Wildlife Service, Department of Environmental Protection and environmental and other relevant interests. This Committee shall be tasked with the responsibility of Tier designation review utilizing the criteria for Tier placement and best available data to recommend amendments to ensure implementation of and adherence to the Florida Keys Carrying Capacity Study. These proposed amendments shall be recommended during 2009 and subsequently coincide with the Evaluation and Appraisal Report timelines beginning with the second Evaluation and Appraisal review which follows the adoption of the revised Tier System and Maps as required above in Phase I.	Incomplete	The DCA recommends date change to 2011 with concurrence from Last Stand, the intervenor.	This schedule needs to be revised. In addition, the anticipated Objective 106.2 has been delayed because the Tier Maps should be amended in the Land Use District Overlay. After that is completed, estimated above to be 2012, the maps can be adopted into the Comprehensive Plan. Alternatively, we are proposing a text amendment to establish Objective 106 as follows: Goal 106 Monroe County shall adopt updated conservation mapping (Tier District Maps), utilizing habitat land cover data, including orthophotographic aerial maps into the Land Development Code as a Land Use District (Zoning) Overlay District by December 31, 2011 and into the Comprehensive Plan Map series upon completion of the Land Use District Overlay District amendments by December 31, 2012. Monroe County shall update the Tier District Maps, if necessary, every seven years, or coinciding with each Evaluation and Appraisal Report (EAR) required by the State of Florida. This will assure consistency with the Florida Keys Carrying Capacity Study.  Objective 106.1 Monroe County shall update the habitat land cover data including new orthophotographic/aerial maps every seven years, two years prior to the County Evaluation and Appraisal Report (EAR) due date to use to evaluate the adequacy of the Tier Maps and Tier Designations.  Policy 106.1.1 After development of the habitat land cover data including orthophotographic/aerial maps, Monroe County shall convene a Tier Designation Review Committee made up of members selected by the State of Florida Department of Community Affairs, including representatives from the Florida Fish and Wildlife Conservation Commission, United States Fish and Wildlife Service, Department of Environmental Protection, and other representatives of relative interests to evaluate and make recommendations to the County Commissioners of appropriate tier designations based on updated habitat land cover data to assure adherence to the Florida Keys Carrying Capacity Study.	None	None	None	Yes	July 2011  September 30, 2009	Yes	Yes	
6	Monroe County, in conjunction with the Department of Community Affairs, Islamorada and Marathon, shall collaboratively evaluate the adopted clearing limits for high quality and moderate quality tropical hammocks. This evaluation shall consider the various procedures and standards used by the three local governments, and shall make recommendations that will bring parity between the local governments and thereby strengthen the protection of tropical hardwood hammocks. If necessary, the Comprehensive Plan shall be revised to implement the recommendations.	Complete	Complete. Recommendation for minimum clearing of 3,000 square feet and maximum clearing of 7,500 square feet.	However, Monroe County staff are in the process of evaluating the clearing regulations and may recommend alternative limits in 2011.	None	None	None	Yes	July 2010  July 2010	Yes	Yes	

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									Future Actions			
	Status	Department of Community Affairs Comments	Monroe County Comments**	Key Largo Wastewater Treatment District Comments***	Department of Environmental Protection Comments	Department of Health Comments	Required for Removal of Designation in 2010	Department of Community Affairs Recommended Completion Date	Monroe County's Proposed Scheduled Completion Date	To be Reflected in Commission Rule	Comprehensive Plan Amendment Required	
<b>7 Proposed Work Program Strategies pursuant to the 2009 30-Day Report</b>												
<b>8 Land Acquisition</b>												
9	Complete	None	Completed. All parties required have established needed procedures and have been adhering to it for many years. In an effort to solidify this strategy Monroe County adopted Transmittal Resolution #184-2009 on July 13, 2009 proclaiming intent to adopt a new policy 101.6.6 as part of the Monroe County Comprehensive Plan to satisfy this requirement. A final adoption hearing was held on October 22, 2009 and adopted by ordinance #034-2009.	None	None	None	n/a	n/a	July 2009	Yes	No	
10	Complete	Monroe County Land Authority spent \$674,423 on 35 parcels (19.9 acres) DEP spent \$7,545,013.94 on 2 parcels (33.84 acres)	Completed	None	None	None	Yes	July 2010 July 2011 July 2012	July 2009 July 2010 July 2011 July 2012	Yes	No	
11	Complete	None	Monroe County adopted Transmittal Resolution #184-2009 on July 13, 2009 proclaiming intent to adopt a new policy 101.6.6 as part of the Monroe County Comprehensive Plan to satisfy this requirement. A final adoption hearing was held on October 22, 2009 and adopted by ordinance #034-2009.	None	None	None	n/a	n/a	July 2009	Yes	Yes	
12	Incomplete	None	None	None	None	None	Yes	July 2010	July 2010	Yes	No	
13	Incomplete	The amendment was transmitted but not adopted.	Monroe County adopted Transmittal Resolution #183-2009 on July 13, 2009 proclaiming attempt to adopt a new Objective 105.4 and Policy 105.4.1 as part of the Monroe County Comprehensive Plan to satisfy this requirement. This item was not adopted by the Board of County Commissioners at the public hearing held October 22, 2009. During the hearing, the Ocean Reef property became an issue and the owners there requested Ocean Reef be excluded from this policy. Monroe County would like to consider as an alternative to discouraging future land use map amendments that increase allowable density/intensity to developing policy for Commission consideration to require increased density/intensity through future land use map amendments by transfer of density/intensity within planning subareas.	None	None	None	Yes	July 2010	July 2009	Yes	Yes	
<b>14 Proposed Work Program Strategies pursuant to the 2009 30-Day Report</b>												
<b>15 Funding</b>												
16	Complete	None	Completed. Monroe County Land Authority applied for a federal land acquisition grant from the US Army Corp of Engineers. The application was not funded. The ACOE selected and funded a competing application.	None	None	None	Yes	July 2010 July 2011 July 2012	July 2009 July 2010 July 2011 July 2012	Yes	No	

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								Future Actions			
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17	Substantial Progress Not Achieved						Yes				
18 Proposed Work Program Strategies pursuant to the 2009 30-Day Report											
19	Incomplete	The MOU has not been initiated. The model has been updated with population data, human behavioral surveys completed and evaluation of sustained flow rates. The DCA recommends date revision 2011 to allow time to work with local governments regional planning council, and Division of Emergency Management to address evacuation issues.	Recommend revised completion date. Monroe County has contracted with two consultants to evaluate the variables which are crucial to the accuracy of the Miller Model projections for Florida Keys evacuation clearance time. Ken Metcalf of Greenburg Traurig in Tallahassee has prepared a final report detailing his findings and recommendations for further use of the Miller Model to determine Keys clearance times. Dr. Reid Ewing is preparing a similar report and has submitted a preliminary draft. The County is now awaiting a final draft. The County is also waiting on the DCA to select meeting dates to review these findings and establish the terms of the MOU.	None	None	None	Yes	July 2011	March 2009	Yes	No
20	Incomplete	Population and behavioral data has been revised. Model has been run with various scenarios but the variables have not been agreed upon. The range of evacuation clearance times to U.S. Highway 1 and the Florida Turnpike at Homestead/Florida City is from 18 hours and 58 minutes to 27 hours and 2 minutes.	Recommend revised completion date.	None	None	None	Yes	July 2011	December 2009	Yes	No
21	Incomplete	Model updated.	Recommend revised completion date. This task is dependent on the results of the first task in this work program theme.	None	None	None	Yes	July 2011	July 2009	Yes	No
22	Incomplete	The range of evacuation clearance times to U.S. Highway 1 and the Florida Turnpike at Homestead/Florida City is from 18 hours and 58 minutes to 27 hours and 2 minutes. The DCA recommends date revision to 2011 to collaborate with local governments to develop allocation and distribution of units that facilitate connection to central sewer and decrease evacuation clearance time.	None	None	None	None	Yes	July 2011	July 2010	Yes	Yes
23	Incomplete	The range of evacuation clearance times to U.S. Highway 1 and the Florida Turnpike at Homestead/Florida City is from 18 hours and 58 minutes to 27 hours and 2 minutes. The DCA recommends date revision to 2011 to collaborate with local governments to develop allocation and distribution of units that facilitate connection to central sewer and decrease evacuation clearance time.	None	None	None	None	Yes	July 2011	July 2011	Yes	Yes

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								Future Actions				
	Status	Department of Community Affairs Comments	Monroe County Comments**	Key Largo Wastewater Treatment District Comments***	Department of Environmental Protection Comments	Department of Health Comments	Required for Removal of Designation in 2010	Department of Community Affairs Recommended Completion Date	Monroe County's Proposed Scheduled Completion Date	To be Reflected in Commission Rule	Comprehensive Plan Amendment Required	
24	<p><b>Water Quality: Wastewater</b> (Wastewater treatment and disposal in Monroe County is governed by the requirements of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended. The requirements of that law, including the July 1, 2010 deadline for achieving the treatment levels set forth therein, apply to all wastewater projects identified in the Work Program regardless of Monroe County's "scheduled completion date" identified in this document. Scheduled completion dates in the Work Program will be taken into consideration by the Department of Environmental Protection and Department of Health in the enforcement of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended.)</p>											
25	<p><b>WORK PROGRAM REQUIREMENTS PURSUANT TO RULE 28-20.110, F.A.C. WATER QUALITY - WASTEWATER</b>                      YEAR 4, TASK A (July 12, 2001); YEAR 6, TASK A (July 12, 2003); YEAR 7, TASK A (July 12, 2004); YEAR 9, TASKS A &amp; B (July 12, 2006); and YEAR 10, TASKS A, B, C, D &amp; E (July 12, 2007)</p>											
26	Proposed Work Program Strategies pursuant to the 2009 30-Day Report											
27	Planning											
28	Monroe County shall annually evaluate and allocate funding for wastewater implementation. Monroe County shall identify any funding in the annual update to the Capital Improvements Element of the Comprehensive Plan.	Complete	None	Capital Improvement Element Update scheduled for late September. In 2010, an additional \$2 million was appropriated for Big Coppitt and \$5.1 million was appropriated for the Hawk's Cay WWTP upgrade/expansion.	None	None	None	Yes	July 2010	July 2009	Yes	Yes
									July 2011	July 2011		
									July 2012	July 2012		
									July 2013	July 2013		
29	Monroe County shall provide a final determination of cold spots requiring upgrade to meet Sections 403.086(10) and 381.0065(4)(l), Florida Statutes, wastewater treatment and disposal standards. The determination shall be adopted by resolution and shall include a map delineating the non-service areas.	Complete	The DCA recommends date revision to 2011 as some service areas are not funded.	Completed. The Florida Keys Aqueduct Authority completed a "cold spot implementation plan" which identifies planned service areas both hot and cold. FCAA presented their findings to the BOCC on January 28, 2009 and the BOCC accepted the planned service areas as outlined. On June 17, 2009, the BOCC approved resolution # 179-2009 identifying planned service areas and non-service areas. This includes an onsite system assistance program for residents outside of service areas who will need a compliant onsite system. This product has been rendered to DCA.	None	None	Date should be extended to July 2011.	n/a	July 2011	July 2009	Yes	No
30	Monroe County shall work with the owners of wastewater facilities throughout the County and the Department of Environmental Protection (DEP) and the Department of Health (DOH) to fulfill the requirements of Sections 403.086 (10) and 381.0065(4)(l), Florida Statutes, regarding wastewater treatment and disposal. This will include coordination of actions with DOH and DEP to notify owners regarding systems that will not meet the advanced wastewater treatment standards.	Incomplete	The DCA recommends date revision to recognize changes in legislation and non-funded service areas.	None	None	The FDEP has notified all the owners of wastewater facilities permitted by FDEP of the requirements of Chapter 99-395, L.O.F., and of the new legislation, Section 403.086(10), F.S., which now contains the wastewater requirements.	Date should be extended to July 2011.	Yes	August 2011	July 2009	Yes	No
31	Adopt an ordinance establishing the upgrade program with implementation dates, time frames, and enforcement for upgrading on-site systems and package plants.	Incomplete	The DCA recommends date revision. The adopted ordinance does not address wastewater systems in non-funded service areas.	None	None	We have not seen an ordinance that addresses this requirement. We are aware of the County ordinance that requires property owners to connect to the centralized systems within 30 days of receiving notification that sewers are available.	Date should be extended to July 2011.	Yes	August 2011	December 2009	Yes	No



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<p>32 <b>Water Quality: Wastewater</b> (Wastewater treatment and disposal in Monroe County is governed by the requirements of Sections 381.0065(4)(f) and 403.086(10), Florida Statutes, as amended. The requirements of that law, including the July 1, 2010 deadline for achieving the treatment levels set forth therein, apply to all wastewater projects identified in the Work Program regardless of Monroe County's "scheduled completion date" identified in this document. Scheduled completion dates in the Work Program will be taken into consideration by the Department of Environmental Protection and Department of Health in the enforcement of Sections 381.0065(4)(f) and 403.086(10), Florida Statutes, as amended.)</p>											
33	Coordinate with the Department of Environmental Protection, Department of Health, U.S. Environmental Protection Agency, City of Marathon and Islamorada to develop a mechanism and funding source in concert with other Florida Keys local governments to continue the Little Venice Facility nutrient monitoring program to demonstrate nutrient reductions.	Complete	A final report for the Little Venice Water Quality Monitoring Project was submitted. The Florida Keys National Marine Sanctuary funds a water quality monitoring program at numerous stations throughout the Keys.	The Florida Keys National Marine Sanctuary funds the monitoring program through an application based grant program.	None	None	n/a	n/a	July 2009	Yes	No
34 <b>Proposed Work Program Strategies pursuant to the 2009 30-Day Report</b>											
35 <b>Funding</b>											
36	Monroe County shall annually draft a resolution requesting the issuance of \$50 million of the \$200 million of bonds authorized under s. 215.619, F.S., and an appropriation of sufficient debt service for those bonds, for the construction of wastewater projects within the Florida Keys.	Complete	Monroe County adopted a resolution, however bonds were not available.	Completed in 2010.	None	None	None	Yes	July 2010 July 2011 July 2012 July 2013	July 2009 July 2010 July 2011 July 2012 July 2013	No No
37	Develop a mechanism to provide accurate and timely information and establish annual funding allocations necessary to support the issuance of bonds authorized under s. 215.619, F.S., and to assure the timely completion of work as necessary to fulfill any terms and conditions associated with bonds.	Incomplete	Renewed efforts are needed that could include Monroe County underwriting the bonds.	None	None	None	None	Yes	July 2010 July 2011 July 2012	July 2009 July 2010 July 2011 July 2012	No No
38	Monroe County shall evaluate its wastewater needs and state and federal funding opportunities and apply annually to at least one state or federal grant program for wastewater projects and connections.	Complete	None	Completed for 2010 - Monroe County and FCAA applied for and were awarded EPA grant to fund decentralized (onsite) systems. County actively pursuing funding opportunities with USDA. If time is available, we may consider reviewing our 2010 correspondence to identify all the requests for funding we submitted if documentation of this is necessary.	None	None	None	Yes	July 2010 July 2011 July 2012 July 2013	July 2009 July 2010 July 2011 July 2012 July 2013	Yes No
39	Monroe County shall continue to develop and implement local funding programs necessary to timely fund wastewater construction and future operation, maintenance and replacement of facilities.	Complete	\$7.1 million was identified and appropriated.	Completed for 2010 - Anticipate initial assessment resolution for system development fee for Cudjoe Regional System in March 2011. Under the September 6, 2005 Interlocal Agreement, FCAA is responsible for setting and collection of monthly rates to fund future operation, maintenance, and replacement of facilities. \$7.1 million was identified and appropriated.	None	None	None	Yes	July 2010 July 2011 July 2012 July 2013	July 2009 July 2010 July 2011 July 2012 July 2013	Yes No

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	Status	Department of Community Affairs Comments	Monroe County Comments**	Key Largo Wastewater Treatment District Comments***	Department of Environmental Protection Comments	Department of Health Comments	Required for Removal of Designation in 2010	Department of Community Affairs Recommended Completion Date	Monroe County's Proposed Scheduled Completion Date	To be Reflected in Commission Rule	Comprehensive Plan Amendment Required	
<p>40 <b>Water Quality: Wastewater</b> (Wastewater treatment and disposal in Monroe County is governed by the requirements of Sections 381.0065(4)(f) and 403.086(10), Florida Statutes, as amended. The requirements of that law, including the July 1, 2010 deadline for achieving the treatment levels set forth therein, apply to all wastewater projects identified in the Work Program regardless of Monroe County's "scheduled completion date" identified in this document. Scheduled completion dates in the Work Program will be taken into consideration by the Department of Environmental Protection and Department of Health in the enforcement of Sections 381.0065(4)(f) and 403.086(10), Florida Statutes, as amended.)</p>												
41 Proposed Work Program Strategies pursuant to the 2009 30-Day Report												
42 Implementation/Construction												
43 Key Largo Wastewater Treatment Facility												
44	Continue to construct Key Largo Regional Wastewater Treatment Plant (WWTP).	Complete	None	None	Initiated construction October 2008. Completed construction August 2010. Service available to 7,000 EDU's.	None	None	n/a	n/a	July 2009	Yes	No
45	Complete construction of Key Largo Regional WWTP.	Complete	None	Construction completed.	Initiated construction October 2008. Completed construction August 2010. Service available to 7,000 EDU's.	Key Largo Regional WWTP is currently in operation.	None	Yes	July 2010	July 2010	Yes	No
46	Finalize design of South Transmission Line and schedule construction.	Complete	None	Completed. Engineering and design complete. Construction bid opening September 16, 2009. Anticipate construction will commence in October 2009.	Engineering and design complete. Construction commenced in November 2009.	Complete	None	n/a	n/a	July 2009	Yes	No
47	Complete construction of South Transmission Line.	Incomplete	None	None	Completion of construction no later than October 2010.	The facility is permitted and nearing completion.	None	Yes	July 2011	July 2010	Yes	No
48	Complete construction of Collection basin A, Collection basin B, and Collection basin D.	Complete	Confirmed completion of Basin B.	None	Completed construction, including vacuum pump stations, in July 2010.	Complete	None	Yes	July 2010	July 2009	Yes	No
49	Complete design of Collection basin C, E, F, G, H, I, J, and K.	Complete	Check G, H, I, J and K; Completion projected March 2011.	None	Engineering and design for all basins is complete.	Complete	None	Yes	July 2011	July 2009	Yes	No
50	Complete construction of Collection basin C.	Complete	Confirmed completion of Basin C.	Completed	Construction is complete in Basin C except for final restoration punch list.	Complete	None	Yes	July 2010	July 2010	Yes	No

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51	<b>Water Quality: Wastewater</b> (Wastewater treatment and disposal in Monroe County is governed by the requirements of Sections 381.0065(4)(f) and 403.086(10), Florida Statutes, as amended. The requirements of that law, including the July 1, 2010 deadline for achieving the treatment levels set forth therein, apply to all wastewater projects identified in the Work Program regardless of Monroe County's "scheduled completion date" identified in this document. Scheduled completion dates in the Work Program will be taken into consideration by the Department of Environmental Protection and Department of Health in the enforcement of Sections 381.0065(4)(f) and 403.086(10), Florida Statutes, as amended.)											
52	Schedule construction for Collection basins E-H.	Complete	Construction has been scheduled for collection basins E-H. Construction in collection Basins E & F has commenced.	Construction in collection Basins E & F has commenced. Construction in Basins I, J & K will commence before November 2009. Construction in Basins G & H will commence in January 2010.	All construction in Basins E - H has been contracted except one small phase in Basin G to be awarded by change order in September 2010.	Complete	None	n/a	n/a	July 2009	Yes	No
53	Complete construction of Collection basins E-H.	Incomplete	Completion scheduled for March 2011.	None	Construction in all Basins E - H. Completion is scheduled no later than December 2010.	These Collection basins have been permitted and are approximately 85% complete.	None	Yes	July 2011	July 2010	Yes	No
54	Schedule construction of Collection basins I-K.	Complete	None	Completed	Over 50% of construction in Basins I - K has been contracted. The balance will be awarded by change orders no later than October 2010.	Complete	None	Yes	July 2011	July 2010	Yes	No
55	Complete construction of Collection basins I-K.	Incomplete	50% of construction completed.	None	Construction in all or portions of collection Basins I, J and K will be completed no later than November 2010, with full completion of all phases in these basins no later than March 2011.	None	None	Yes	July 2011	July 2011	Yes	No
56	Complete 50% of hook-ups to Key Largo Regional WWTP.	Incomplete	None	None	In October 2010, after the Regional Treatment Plant is fully operational, Basins A - F and the North and South Transmissin mains will also be completed. This will provide service availability to 84% of the District's EDU's. Completion of 50% EDU hookups is targeted by March 2011.	None	None	Yes	July 2011	July 2011	Yes	No
57	Complete 75% of hook-ups to Key Largo Regional WWTP.	Incomplete	None	None	None	None	None	Yes	July 2012	July 2012	Yes	No
58	Complete all remaining connections to Key Largo Regional WWTP.	Incomplete	None	None	None	None	None	Yes	July 2013	July 2013	Yes	No

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<p>59 <b>Water Quality: Wastewater</b> (Wastewater treatment and disposal in Monroe County is governed by the requirements of Sections 381.0065(4)(f) and 403.086(10), Florida Statutes, as amended. The requirements of that law, including the July 1, 2010 deadline for achieving the treatment levels set forth therein, apply to all wastewater projects identified in the Work Program regardless of Monroe County's "scheduled completion date" identified in this document. Scheduled completion dates in the Work Program will be taken into consideration by the Department of Environmental Protection and Department of Health in the enforcement of Sections 381.0065(4)(f) and 403.086(10), Florida Statutes, as amended.)</p>												
<p>60 <b>Hawk's Cay Wastewater Treatment Facility (The Conch Key's existing collection system and treatment facility and Duck Key's future collection system - wastewater is pumped and treated at Hawk's Cay WWTP)</b></p>												
61	Complete design of Hawk's Cay WWTP upgrade to Advanced Wastewater Treatment Standards and plant expansion.	Complete	None	Completed. The FKAA has completed design of the plant upgrade and expansion.	None	Complete	None	n/a	n/a	July 2009	Yes	No
62	Initiate construction of Hawk's Cay upgrade/expansion, transmission and collection system.	Complete	None	The Notice to Proceed for the WWTP upgrade/expansion was issued on March 16, 2010.	None	Complete	None	Yes	July 2010	July 2009	Yes	No
63	Complete construction of Hawk's Cay WWTP upgrade/expansion, transmission and collection system.	Incomplete	None	The Notice to Proceed for the WWTP upgrade/expansion was issued on March 16, 2010 with a 23 month final completion date.	None	Ongoing. Construction started 3/16/2010.	None	Yes	July 2011	July 2010	Yes	No
64	Complete connections to the existing Conch Key collection system and treatment facility.	Complete	None	All connections have been made with the exception of one code enforcement action requiring additional equipment.	None	Connections are available and may have been completed. DCA should verify status of connections with FKAA or County. Single service connections from residential homes are exempt from FDEP permits, so we don't have a permitting database to verify individual connections.	None	n/a	n/a	July 2009	Yes	No
65	Complete construction of the Duck Key collection system.	Incomplete	None	Design complete; BOCC authorized funding August 18, 2010. Anticipate bid request to be issued in September 2010.	None	Design has been completed, but construction has not begun.	None	Yes	July 2011	July 2013	Yes	No
66	Initiate property connections to Hawk's Cay WWTP.	Incomplete	None	None	None	Not started.	None	Yes	July 2011	July 2013	Yes	No
67	Complete 50% of hook-ups to Hawk's Cay WWTP.	Incomplete	None	None	None	None	None	Yes	July 2012	July 2014	Yes	No
68	Complete 75% of hook-ups to Hawk's Cay WWTP.	Incomplete	None	None	None	None	None	Yes	July 2013	July 2015	Yes	No
69	Complete all remaining connections to Hawk's Cay WWTP.	Incomplete	None	None	None	None	None	Yes	July 2014	July 2015	Yes	No

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								Future Actions				
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70	Water Quality: Wastewater (Wastewater treatment and disposal in Monroe County is governed by the requirements of Sections 381.0065(4)(f) and 403.086(10), Florida Statutes, as amended. The requirements of that law, including the July 1, 2010 deadline for achieving the treatment levels set forth therein, apply to all wastewater projects identified in the Work Program regardless of Monroe County's "scheduled completion date" identified in this document. Scheduled completion dates in the Work Program will be taken into consideration by the Department of Environmental Protection and Department of Health in the enforcement of Sections 381.0065(4)(f) and 403.086(10), Florida Statutes, as amended.)											
71	South Lower Keys Wastewater Treatment Facility (Big Coppitt Regional System)											
72	Complete construction of South Lower Keys WWTP.	Complete	None	Completed. This project is complete.	None	Complete	None	n/a	n/a	July 2009	Yes	No
73	Initiate property connections to South Lower Keys WWTP.	Complete	None	Completed. Connections have been initiated.	None	Complete	None	n/a	n/a	July 2009	Yes	No
74	Complete 50% hookups to South Lower Keys WWTP.	Complete	None	Completed	None	This facility is in operation and some connections have been made.	None	Yes	July 2010	July 2010	Yes	No
75	Complete 75% hookups to South Lower Keys WWTP.	Incomplete	None	None	None	None	None	Yes	July 2012	July 2011	Yes	No
76	Complete all remaining connections to South Lower Keys WWTP.	Incomplete	None	None	None	None	None	Yes	July 2013	July 2012	Yes	No

Monroe County 30-Day Report 2010

								Future Actions				
	Status	Department of Community Affairs Comments	Monroe County Comments**	Key Largo Wastewater Treatment District Comments***	Department of Environmental Protection Comments	Department of Health Comments	Required for Removal of Designation in 2010	Department of Community Affairs Recommended Completion Date	Monroe County's Proposed Scheduled Completion Date	To be Reflected in Commission Rule	Comprehensive Plan Amendment Required	
77	<b>Water Quality: Wastewater</b> (Wastewater treatment and disposal in Monroe County is governed by the requirements of Sections 381.0065(4)(f) and 403.086(10), Florida Statutes, as amended. The requirements of that law, including the July 1, 2010 deadline for achieving the treatment levels set forth therein, apply to all wastewater projects identified in the Work Program regardless of Monroe County's "scheduled completion date" identified in this document. Scheduled completion dates in the Work Program will be taken into consideration by the Department of Environmental Protection and Department of Health in the enforcement of Sections 381.0065(4)(f) and 403.086(10), Florida Statutes, as amended.)											
78	<b>Cudjoe Regional Wastewater Treatment Facility (includes Lower Sugarloaf north to No Name Key) [The Cudjoe Regional Wastewater Treatment Facility will be completed in two phases.]</b>											
79	Complete planning and design documents for the Cudjoe Regional Wastewater Treatment Facility for Phases 1 and 2 (WWTP: transmission main and collection system).	Incomplete	None	Project ready to bid in February 2011.	None	Design is nearly complete. Permit for Wastewater Treatment Plant Phase 1 has been issued.	None	Yes	July 2011	July 2009	Yes	No
80	Complete construction of Wastewater Treatment Plant Phase 1 and collection systems (Phase 1 is the initial WWTP construction to treat flows from a central collection area).	Incomplete	None	None	None	None	None	Yes	July 2012	July 2011	Yes	No
81	Initiate construction of Wastewater Treatment Plant Phase 2 (Phase 2 is the planned WWTP expansion to provide additional capacity to treat flows from the expanded collection area).	Incomplete	None	None	None	None	None	Yes	July 2012	July 2011	Yes	No
82	Complete construction of Wastewater Treatment Plant Phase 2 Expansion.	Incomplete	None	None	None	None	None	Yes	July 2013	July 2012	Yes	No
84	Complete construction of <u>central collection lines and</u> transmission main.	Incomplete	None	None	None	None	None	Yes	July 2013	December 2010	Yes	No
85	Initiate property connections – complete 25% of hook-ups to Cudjoe Regional WWTP.	Incomplete	None	None	None	None	None	Yes	July 2013	July 2011	Yes	No
86	Complete 50% of hook-ups to Cudjoe Regional WWTP.	Incomplete	None	None	None	None	None	Yes	July 2012	July 2012	Yes	No
87	Complete 75% of hook-ups to Cudjoe Regional WWTP.	Incomplete	None	None	None	None	None	Yes	July 2014	July 2013	Yes	No
88	Complete all remaining connections to Cudjoe Regional WWTP.	Incomplete	None	None	None	None	None	Yes	January 2015	January 2014	Yes	No

Monroe County 30-Day Report 2010

								Future Actions				
	Status	Department of Community Affairs Comments	Monroe County Comments**	Key Largo Wastewater Treatment District Comments***	Department of Environmental Protection Comments	Department of Health Comments	Required for Removal of Designation in 2010	Department of Community Affairs Recommended Completion Date	Monroe County's Proposed Scheduled Completion Date	To be Reflected in Commission Rule	Comprehensive Plan Amendment Required	
89	WORK PROGRAM REQUIREMENTS PURSUANT TO RULE 28-20.110, F.A.C. WATER QUALITY – STORMWATER YEAR 8, TASK M (July 12, 2005)	Substantial Progress Not Achieved					Yes					
90	Proposed Work Program Strategies pursuant to the 2009 30-Day Report											
91	Planning											
92	Monroe County shall annually evaluate and allocate funding for stormwater implementation. Monroe County shall identify any funding in the annual update to the Capital Improvements Element of the Comprehensive Plan.	Incomplete	None	Monroe County will provide the annual CIE element following the budget adoption.	None	None	None	Yes	July 2011	July 2009 July 2010	Yes	Yes
93	Proposed Work Program Strategies pursuant to the 2009 30-Day Report											
94	Funding											
95	Monroe County shall annually apply for stormwater grants from the South Florida Water Management District.	Complete	None	Completed. The County applied for and received \$250,000.00 in grant funding from SFWMD for stormwater improvements.	None	None	None	Yes	July 2010	July 2009 July 2010	Yes	No
96	Proposed Work Program Strategies pursuant to the 2008 30-Day Report											
97	Implementation/Construction											
98	Mile Marker 11-12 stormwater runoff management along U.S. 1 - Complete design and initiate construction through Joint Participation Agreement with the Florida Department of Transportation (FDOT).	Complete	None	The County is no longer a joint participant with FDOT in this project. FDOT is pursuing completion independently.	None	Municipal stormwater drainage systems are under permitting jurisdiction of the SFWMD and we don't have information on the status of these projects.	None	Yes	July 2010	July 2009	Yes	No
99	Mile Marker 11-12 stormwater runoff management along U.S. 1 - Complete construction through Joint Participation Agreement with FDOT.	Complete	None	None	None	None	None	Yes	July 2010	July 2010	Yes	No
100	Mile Marker 20-22 stormwater runoff management along U.S. 1 - Complete design and initiate construction through Joint Participation Agreement with FDOT.	Complete	Project completed by FDOT on August 31, 2009.	None	None	None	None	n/a	n/a	July 2009	Yes	No
101	Mile Marker 20-22 stormwater runoff management along U.S. 1 - Complete construction through Joint Participation Agreement with FDOT.	Complete	Project completed by FDOT on August 31, 2009.	None	None	None	None	n/a	n/a	July 2010	Yes	No
102	Mile Marker 17-19 stormwater runoff management - Design and construct stormwater improvements along U.S. 1 through Joint Participation Agreement with FDOT.	Incomplete	Construction planned for June 2011.	None	None	None	None	Yes	July 2011	July 2010	Yes	No
103	Complete Card Sound Road stormwater improvements.	Incomplete	Construction planned for October 2010.	None	None	None	None	Yes	July 2011	July 2010	Yes	No

# Marathon 30-Day Report 2010

							Future Actions				
	Status	Department of Community Affairs Comments	Marathon Comments	Department of Environmental Protection Comments	Department of Health Comments	Required for Removal of Designation in 2010	Department of Community Affairs Recommended Completion Date	Marathon's Proposed Scheduled Completion Date	To be Reflected in Commission Rule	Comprehensive Plan Amendment Required	
1	Substantial Progress Not Achieved					Yes					
2 Proposed Work Program Strategies pursuant to the 2009 30-Day Report											
3 Land Acquisition											
4	Complete	Coordination mechanism has been developed.	In Progress. The City of Marathon, in cooperation with the County and other municipalities, coordinated on the addition of lands within the City of Marathon to the Florida Forever list. This occurred in 2005. Since that time, the City, by cooperative agreement with the State has accepted management responsibility for parcels acquired under the Florida Forever program. Currently, the City manages 220 conservation lands; 115 Florida Forever properties and 105 ROGO/BPAS lot dedications.	None	None	n/a	n/a	July 2009	Yes	Yes	
5	Incomplete	None	In Progress, to be complete by end of 2010.	None	None	Yes	July 2010	July 2009	Yes	Yes	
6	Incomplete	None	In Progress, to be complete by early 2011.	None	None	Yes	July 2010	July 2010	Yes	No	



# Marathon 30-Day Report 2010

							Future Actions				
		Status	Department of Community Affairs Comments	Marathon Comments	Department of Environmental Protection Comments	Department of Health Comments	Required for Removal of Designation in 2010	Department of Community Affairs Recommended Completion Date	Marathon's Proposed Scheduled Completion Date	To be Reflected in Commission Rule	Comprehensive Plan Amendment Required
7	<b>Proposed Work Program Strategies pursuant to the 2009 30-Day Report</b>										
8	<b>Habitat Protection</b>										
9	Marathon, in conjunction with the Department of Community Affairs, Islamorada and Monroe County, shall collaboratively evaluate the adopted clearing limits for high quality and moderate quality tropical hammocks. This evaluation shall consider the various procedures and standards used by the three local governments, and shall make recommendations that will bring parity between the local governments and thereby strengthen the protection of tropical hardwood hammocks. If necessary, the Comprehensive Plan shall be revised to implement the recommendations.	Complete	Recommendation for minimum clearing of 3,000 square feet and maximum clearing of 7,500 square feet.	In Progress.	None	None	Yes	July 2010	July 2009	Yes	Yes
10	Amend the Comprehensive Plan to limit allocations into high quality hammock.	Incomplete	None	In Progress, to be completed by end of 2010.	None	None	Yes	July 2010	July 2009	Yes	Yes
11	Amend the Land Development Regulations to limit allocations into high quality hammock.	Incomplete	None	In Progress, to be completed by early 2011.	None	None	Yes	July 2011	July 2011	Yes	No
12	Adopt a Comprehensive Plan policy discouraging private applications for future land use map amendments which increase allowable density/intensity on lands in the Florida Keys.	Incomplete	None	In Progress, to be completed by end of 2010.	None	None	Yes	July 2010	July 2010	Yes	Yes
13	<b>Proposed Work Program Strategies pursuant to the 2009 30-Day Report</b>										
14	<b>Funding</b>										
15	Marathon shall evaluate its land acquisition needs and state and federal funding opportunities and apply annually to at least one state or federal land acquisition grant program.	Complete	Marathon has applied to NOAA for funding.	In Progress. The most significant single remaining acquisition in the City of Marathon is Boot Key. The City is working toward this acquisition, state & federal programs, focused lobbying efforts and land acquisition programs. The other general area requiring additional acquisition is Grassy Key and though Florida Forever has acquired much of the property proposed for acquisition in that area, land slated for acquisition remains. Grassy Key is the area where most of the City's land management efforts exist, including through grants for exotic removal and habitat restoration.	The City submitted and was awarded a CELCP grant for Boot Key. The grant required a 50% match.	None	Yes	July 2010	July 2009 July 2010	Yes	No
								July 2011	July 2011		

# Marathon 30-Day Report 2010

							Future Actions				
		Status	Department of Community Affairs Comments	Marathon Comments	Department of Environmental Protection Comments	Department of Health Comments	Required for Removal of Designation in 2010	Department of Community Affairs Recommended Completion Date	Marathon's Proposed Scheduled Completion Date	To be Reflected in Commission Rule	Comprehensive Plan Amendment Required
16	WORK PROGRAM REQUIREMENTS PURSUANT TO RULE 28-20.110, F.A.C. HURRICANE EVACUATION – CARRYING CAPACITY IMPLEMENTATION YEAR 8, TASK Q (July 12, 2005)	Substantial Progress Not Achieved					Yes				
17	<b>Proposed Work Program Strategies pursuant to the 2009 30-Day Report</b>										
18	Marathon shall enter into a memorandum of understanding with the Department of Community Affairs, Monroe County, Islamorada, Key West, Key Colony Beach and Layton after a notice and comment period of at least 30 days for interested parties. The memorandum of understanding shall stipulate, based on professionally acceptable data and analysis, the input variables and assumptions, including regional considerations, for utilizing the Florida Keys Hurricane Evacuation Model or other models acceptable to DCA to accurately depict evacuation clearance times for the population of the Florida Keys.	Incomplete	The MOU has not been initiated. The model has been updated with population data, human surveys completed, evaluation of sustained flow rate. The DCA recommends the date revision to 2011 to allow time to work with local governments, regional planning council, and Division of Emergency Management to address evacuation issues.	In Progress.	None	None	Yes	July 2011	March 2009	Yes	No
19	The Florida Keys Hurricane Evacuation Model shall be run with the agreed upon variables from the memorandum of understanding. Marathon and the Department of Community Affairs shall update the data for the Florida Keys Hurricane Evacuation Model as professionally acceptable sources of information are released (such as the Census, American Communities Survey, Bureau of Business and Economic Research, and other studies). The City shall also evaluate and address appropriate adjustments to the hurricane evacuation model within each Evaluation and Appraisal Report.	Incomplete	Population and behavioral data has been revised. Model has been run with various scenarios but the variables have not been agreed upon. The range of evacuation clearance times to U.S. Highway 1 and the Florida Turnpike at Homestead/Florida City is from 18 hours and 58 minutes to 27 hours and 2 minutes.	In Progress.	None	None	Yes	July 2011	July 2009	Yes	No
20	Complete an analysis of maximum build-out capacity for the Florida Keys Areas of Critical State Concern, consistent with the requirement to maintain a 24-hour evacuation and the Florida Keys Carrying Capacity Study constraints. This analysis shall be prepared in coordination with the Department of Community Affairs, Monroe County and each municipality in the Keys.	Incomplete	The DCA recommends date revision to 2011 to collaborate with local governments to develop allocation and distribution of units that facilitate connection to central sewer and decrease evacuation clearance time.	In Progress.	None	None	Yes	July 2011	July 2009	Yes	No
21	The Department of Community Affairs shall apply the derived clearance time to assess and determine the remaining allocations for the Florida Keys Areas of Critical State Concern. The Department will recommend appropriate revisions to the Administration Commission regarding the allocation rates and distribution of allocations to Monroe County, Marathon, Islamorada, Key West, Layton and Key Colony Beach or identify alternative evacuation strategies that support the 24 hour evacuation clearance time. If necessary, the Department of Community Affairs shall work with each local government to amend the Comprehensive Plans to reflect revised allocation rates and distributions or propose rulemaking to the Administration Commission.	Incomplete	The DCA recommends date revision to further assess the allocation and distribution of development.	None	None	None	Yes	July 2011 December 2011	July 2010 December 2010	Yes	Yes
22	Based on the Department of Community Affairs' recommendations, Marathon shall amend the current building permit allocation system (ROGO/NROGO in the Comprehensive Plan and Land Development Regulations) based on infrastructure availability, level of service standards, environmental carrying capacity, and hurricane evacuation clearance time.	Incomplete	None	None	None	None	Yes	July 2011	July 2011	Yes	Yes

# Marathon 30-Day Report 2010

							Future Actions				
	Status	Department of Community Affairs Comments	Marathon Comments	Department of Environmental Protection Comments	Department of Health Comments	Required for Removal of Designation in 2010	Department of Community Affairs Recommended Completion Date	Marathon's Proposed Scheduled Completion Date	To be Reflected in Commission Rule	Comprehensive Plan Amendment Required	
23	Water Quality: Wastewater (Wastewater treatment and disposal in Monroe County is governed by the requirements of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended. The requirements of that law, including the July 1, 2010 deadline for achieving the treatment levels set forth therein, apply to all wastewater projects identified in the Work Program regardless of the City of Marathon's "scheduled completion date" identified in this document. Scheduled completion dates in the Work Program will be taken into consideration by the Department of Environmental Protection and Department of Health in the enforcement of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended.)										
24	WORK PROGRAM REQUIREMENTS PURSUANT TO RULE 28-20.110, F.A.C. WATER QUALITY - WASTEWATER YEAR 4, TASK A (July 12, 2001); YEAR 6, TASK A (July 12, 2003); YEAR 7, TASK A (July 12, 2004)	Substantial Progress Not Achieved				Yes					
25	Proposed Work Program Strategies pursuant to the 2009 30-Day Report										
26	Planning										
27	Marathon shall annually evaluate and allocate funding for wastewater implementation. Marathon shall identify any funding in the annual update to the Capital Improvements Element of the Comprehensive Plan.	Complete	None	Complete. All funding obligations to complete construction of Areas 1 through 7 are in place.	Complete. Funds necessary to complete all wastewater projects have been identified.	None	Yes	July 2010	July 2009 July 2010 July 2011	Yes Yes Yes	Yes
28	Marathon shall provide a final determination of cold spots requiring upgrade to meet Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, wastewater treatment and disposal standards. This should be in the form of a resolution, including a map of the non-service areas.	Incomplete	Letters mailed to 3 individuals that will not be connected to sewer.	Marathon is providing wastewater throughout the City. The Boot Key island is the only cold spot in the City. Marathon has all seven service areas under contract.	None	While DOH has not received a formal written notification, it is our understanding that the entire jurisdiction will be sewer.	n/a	July 2009 July 2011	July 2009 July 2011	Yes Yes	No
29	Marathon shall work with the owners of wastewater facilities throughout the City and the Department of Environmental Protection (DEP) and the Department of Health (DOH) to fulfill the requirements of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, regarding wastewater treatment and disposal. This will include coordination of actions with DOH and DEP to notify owners regarding systems that will not meet 2015 treatment standards.	Incomplete	The DCA recommends date revision in recognition of statutory changes that extended the time frame for upgrading systems.	Senate Bill 550 amended Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, with new completion dates and negated the need for agreements between municipalities and DOH or DEP.	The FDEP has already notified all the owners of wastewater facilities permitted by FDEP of the requirements of Chapter 99-395, L.O.F., and of the new legislation, Section 403.086(10), F.S., which now contains the wastewater requirements.	While DOH has not received a formal written notification, it is our understanding that the entire jurisdiction will be sewer.	Yes	July 2011	July 2009	Yes	No
30	Adopt an ordinance establishing the upgrade program with implementation dates, time frames, and enforcement for upgrading on-site systems and package plants in non-service areas.	Incomplete	The DCA recommends date revision with concurrence from DEP and DOH. The adopted ordinance does not address upgrades to septic tanks in non-service areas.	This item complete pursuant to adopted wastewater ordinance.	We have not seen an ordinance that addresses this requirement. We are aware of the City ordinance that requires property owners to connect to the centralized systems within 30 days of receiving notification that sewers are available.	While DOH has not received a formal written notification, it is our understanding that the entire jurisdiction will be sewer.	Yes	July 2011	July 2009	Yes	No

### Marathon 30-Day Report 2010

								Future Actions			
		Status	Department of Community Affairs Comments	Marathon Comments	Department of Environmental Protection Comments	Department of Health Comments	Required for Removal of Designation in 2010	Department of Community Affairs Recommended Completion Date	Marathon's Proposed Scheduled Completion Date	To be Reflected in Commission Rule	Comprehensive Plan Amendment Required
31	Coordinate with the Department of Environmental Protection and the Department of Health, the Environmental Protection Agency, Monroe County and Islamorada to develop a mechanism and funding source in concert with other Florida Keys local governments to continue the Little Venice Facility nutrient monitoring program to demonstrate nutrient reductions.	Complete	The Florida Keys National Marine Sanctuary funds a water quality monitoring program at numerous stations throughout the Keys.	Recent discussions through the WQPP Management Committee do not indicate that continuation of Little Venice Water Quality Monitoring will occur.	The Little Venice monitoring program was completed and no funding is needed for this fiscal year. However, the Steering Committee of the Water Quality Protection Program (WQPP) is reviewing future WQ monitoring needs and it is possible that the WQPP may conduct additional monitoring in Little Venice in the future to further document the effects of improving wastewater and stormwater systems in that area.	None	n/a	n/a	July 2009	Yes	No

# Marathon 30-Day Report 2010

								Future Actions			
		Status	Department of Community Affairs Comments	Marathon Comments	Department of Environmental Protection Comments	Department of Health Comments	Required for Removal of Designation in 2010	Department of Community Affairs Recommended Completion Date	Marathon's Proposed Scheduled Completion Date	To be Reflected in Commission Rule	Comprehensive Plan Amendment Required
32	Water Quality: Wastewater (Wastewater treatment and disposal in Monroe County is governed by the requirements of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended. The requirements of that law, including the July 1, 2010 deadline for achieving the treatment levels set forth therein, apply to all wastewater projects identified in the Work Program regardless of the City of Marathon's "scheduled completion date" identified in this document. Scheduled completion dates in the Work Program will be taken into consideration by the Department of Environmental Protection and Department of Health in the enforcement of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended.)										
33	Proposed Work Program Strategies pursuant to the 2009 30-Day Report										
34	Funding										
35	Marathon shall evaluate its wastewater needs and state and federal funding opportunities and apply annually to at least one state or federal grant program for wastewater projects and connections.	Complete	Marathon applied to DEP for SRF loans and ACOE funding.	Complete. The City of Marathon has fully committed funding for all of its wastewater project areas. Through state and federal representation, City lobbyists and others, the City is continually seeking to reduce its wastewater (and stormwater) costs through grants and sources providing lower interest rates.	Complete. Funding from the USACOE and DEP's CWSRF program have been obligated for Marathon's wastewater projects.	None	Yes	July 2009	July 2009	Yes	No
								July 2010	July 2010		
								July 2011	July 2011		
36	Marathon shall continue to develop and implement local funding programs necessary to timely fund wastewater construction and future operation, maintenance and replacement of facilities.	Complete	Marathon has established an annual assessment. All parcels have been assessed \$5,700.	Complete. See above.	Complete. Funding needs have been met.	None	Yes	July 2009	July 2009	Yes	No
								July 2010	July 2010		
								July 2011	July 2011		
37	Marathon shall annually draft a resolution requesting the issuance of a portion of the \$200 million of bonds authorized under s. 215.619, F.S., and an appropriation of sufficient debt service for those bonds, for the construction of wastewater projects within the Florida Keys.	Incomplete	None	None	None	None	Yes	July 2010	July 2009	No	No
									July 2010		
								July 2011	July 2011		
								July 2012	July 2012		
38	Develop a mechanism to provide accurate and timely information and establish annual funding allocations necessary to support the issuance of bonds authorized under s. 215.619, F.S., and to assure the timely completion of work as necessary to fulfill any terms and conditions associated with bonds.	Incomplete	None	None	None	None	Yes	July 2010	July 2009	No	No
									July 2010		
								July 2011	July 2011		
								July 2012	July 2012		
								July 2013	July 2013		

# Marathon 30-Day Report 2010

							Future Actions				
		Status	Department of Community Affairs Comments	Marathon Comments	Department of Environmental Protection Comments	Department of Health Comments	Required for Removal of Designation in 2010	Department of Community Affairs Recommended Completion Date	Marathon's Proposed Scheduled Completion Date	To be Reflected in Commission Rule	Comprehensive Plan Amendment Required
39	Water Quality: Wastewater (Wastewater treatment and disposal in Monroe County is governed by the requirements of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended. The requirements of that law, including the July 1, 2010 deadline for achieving the treatment levels set forth therein, apply to all wastewater projects identified in the Work Program regardless of the City of Marathon's "scheduled completion date" identified in this document. Scheduled completion dates in the Work Program will be taken into consideration by the Department of Environmental Protection and Department of Health in the enforcement of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended.)										
40	Proposed Work Program Strategies pursuant to the 2009 30-Day Report										
41	Implementation/Construction										
42	Sub area 1: Knight's Key										
43	Secure plant site	Incomplete	The DCA recommends date revision with concurrence from DEP and DOH.	The eminent domain procedure was granted in court on 09/01/10.	Ongoing	None	Yes	July 2011	July 2009	Yes	No
44	Construct Knight's Key Wastewater plant	Incomplete	The DCA recommends date revision with concurrence from DEP and DOH. Marathon is no longer acquiring a plant from the Key Largo Wastewater Treatment District.	The City of Marathon has designed and will construct its own WWTP. The City does not plan at this time to acquire the Key Largo plant.	A new plant will be constructed. Permits have been issued for the plant, but construction has not started.	None	Yes	December 2011	July 2009	Yes	No
45	Design collection system	Complete	None	Collection has been designed and is ready for bid.	Complete	None	n/a	n/a	July 2009	Yes	No
46	Complete construction of collection system	Complete	Complete as of report preparation.	Collection system 95% complete.	Ongoing	None	Yes	July 2011	July 2009	Yes	No
47	Initiate connections	Incomplete	The DCA recommends date revision with concurrence from DEP and DOH.	None	Not Started	None	Yes	May 2012	July 2010	Yes	No
48	Complete connections (100%)	Incomplete	None	None	None	None	Yes	July 2012	July 2011	Yes	No
49	Sub area 2: Boot Key (a cold spot - an area not anticipated to be served by a central wastewater system)										
50	Notify owners of responsibility to upgrade onsite systems by 2015	Complete	Pending copy of letter the City has written to septic tank owners.	Complete. Owners of property on Boot Key are aware of wastewater regulations and responsibilities under 99-395 Laws of Florida.	Onsite systems are under the jurisdiction of FDOH. We don't have any information on the status of these systems.	None	Yes	July 2010	July 2009	Yes	No
51	Ensure completion of upgrade	Incomplete	The DCA recommends date revision with concurrence from DEP and DOH.	In Progress. Will need to work with FDOH on Boot Key upgrades.	Same response as for #50.	None	Yes	July 2011	July 2010	Yes	No

# Marathon 30-Day Report 2010

							Future Actions				
		Status	Department of Community Affairs Comments	Marathon Comments	Department of Environmental Protection Comments	Department of Health Comments	Required for Removal of Designation in 2010	Department of Community Affairs Recommended Completion Date	Marathon's Proposed Scheduled Completion Date	To be Reflected in Commission Rule	Comprehensive Plan Amendment Required
52	Water Quality: Wastewater (Wastewater treatment and disposal in Monroe County is governed by the requirements of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended. The requirements of that law, including the July 1, 2010 deadline for achieving the treatment levels set forth therein, apply to all wastewater projects identified in the Work Program regardless of the City of Marathon's "scheduled completion date" identified in this document. Scheduled completion dates in the Work Program will be taken into consideration by the Department of Environmental Protection and Department of Health in the enforcement of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended.)										
53	Sub area 3: 11 Street - 39 Street (Vaca Key)										
54	Complete plant design	Complete	None	Complete	Complete	None	n/a	n/a	July 2009	Yes	No
55	Initiate construction of plant	Complete	None	Plant construction 85% complete.	Complete	None	n/a	n/a	July 2009	Yes	No
56	Complete construction of plant	Incomplete	None	Plant construction 85% complete.	Under construction. Estimated completion March 2011.	None	Yes	July 2011	July 2010	Yes	No
57	Bid out vacuum collection system contract	Complete	None	Complete	Complete	None	n/a	n/a	July 2009	Yes	No
58	Complete construction of collection system	Incomplete	The DCA recommends date revision with concurrence from DEP and DOH.	Collection system 70% complete.	Under construction. Problems with original contractor has the project behind schedule. Estimated completion	None	Yes	July 2011	July 2010	Yes	No
59	Initiate connections	Incomplete	None	None	Not Started	None	Yes	July 2011	July 2010	Yes	No
60	Complete connections (100%)	Incomplete	None	None	None	None	Yes	July 2012	July 2011	Yes	No

# Marathon 30-Day Report 2010

							Future Actions				
		Status	Department of Community Affairs Comments	Marathon Comments	Department of Environmental Protection Comments	Department of Health Comments	Required for Removal of Designation in 2010	Department of Community Affairs Recommended Completion Date	Marathon's Proposed Scheduled Completion Date	To be Reflected in Commission Rule	Comprehensive Plan Amendment Required
61	Water Quality: Wastewater (Wastewater treatment and disposal in Monroe County is governed by the requirements of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended. The requirements of that law, including the July 1, 2010 deadline for achieving the treatment levels set forth therein, apply to all wastewater projects identified in the Work Program regardless of the City of Marathon's "scheduled completion date" identified in this document. Scheduled completion dates in the Work Program will be taken into consideration by the Department of Environmental Protection and Department of Health in the enforcement of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended.)										
62	Sub area 4: Gulfside - 39 Street (Vaca Key Central) [under construction]										
63	Complete plant design	Complete	None	Complete	Complete	None	n/a	n/a	July 2010	Yes	No
64	Bid and award construction of plant	Complete	None	Complete	Complete	None	n/a	n/a	July 2010	Yes	No
65	Complete construction of treatment plant	Complete	None	Complete	Complete	None	Yes	July 2011	July 2010	Yes	No
66	Bid and award design of collection system	Complete	None	Complete	Complete	None	n/a	n/a	July 2010	Yes	No
67	Complete construction of collection system	Complete	None	Complete	Complete	None	Yes	July 2011	July 2010	Yes	No
68	Initiate connections	Complete	None	All connections have received 30 day notice to connect.	Complete	None	Yes	July 2011	July 2010	Yes	No
69	Complete connections (100%)	Incomplete	None	238 connections	None	None	Yes	July 2013	July 2012	Yes	No



# Marathon 30-Day Report 2010

							Future Actions				
		Status	Department of Community Affairs Comments	Marathon Comments	Department of Environmental Protection Comments	Department of Health Comments	Required for Removal of Designation in 2010	Department of Community Affairs Recommended Completion Date	Marathon's Proposed Scheduled Completion Date	To be Reflected in Commission Rule	Comprehensive Plan Amendment Required
70	Water Quality: Wastewater (Wastewater treatment and disposal in Monroe County is governed by the requirements of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended. The requirements of that law, including the July 1, 2010 deadline for achieving the treatment levels set forth therein, apply to all wastewater projects identified in the Work Program regardless of the City of Marathon's "scheduled completion date" identified in this document. Scheduled completion dates in the Work Program will be taken into consideration by the Department of Environmental Protection and Department of Health in the enforcement of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended.)										
71	Sub area 5: Little Venice (60 Street – Vaca Cut East) [Phase I completed]										
72	Complete plant design for Phase II addition	Complete	None	Complete	Complete	None	n/a	n/a	July 2009	Yes	No
73	Bid and award contract for collection system for Phase II	Complete	None	Complete	Complete	None	n/a	n/a	July 2009	Yes	No
74	Complete construction of collection system	Incomplete	None	Collection system 95% complete.	None	None	Yes	July 2012	July 2011	Yes	No
75	Initiate connections for Phase II	Incomplete	None	None	None	None	Yes	July 2012	July 2011	Yes	No
76	Complete connections (100%) for Phase II	Incomplete	None	None	None	None	Yes	July 2013	July 2012	Yes	No
77	Sub area 6: Vaca Cut - Coco Plum (Fat Key Deer West) [under construction]										
78	Complete construction of plant	Complete	None	Complete.	Complete	None	n/a	n/a	July 2009	Yes	No
79	Complete construction of collection system	Complete	None	Complete	Complete	None	n/a	n/a	July 2009	Yes	No
80	Initiate connections	Complete	None	All connections have received 30 day notice to connect.	Complete	None	n/a	n/a	July 2009	Yes	No
81	Complete connections (100%)	Incomplete	None	89 connections	Not complete. Connections were started in March 2010.	None	Yes	July 2011	July 2010	Yes	No
82	Water Quality: Wastewater (Wastewater treatment and disposal in Monroe County is governed by the requirements of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended. The requirements of that law, including the July 1, 2010 deadline for achieving the treatment levels set forth therein, apply to all wastewater projects identified in the Work Program regardless of the City of Marathon's "scheduled completion date" identified in this document. Scheduled completion dates in the Work Program will be taken into consideration by the Department of Environmental Protection and Department of Health in the enforcement of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended.)										
83	Sub area 7: Tom Harbor Bridge - Grassy Key [under construction]										
84	Complete construction of plant	Incomplete	None	One plant will service entire area. Construction began June 2010.	Ongoing. Permit has been issued.	None	Yes	July 2012	July 2011	Yes	No
85	Bid and award design of collection system	Complete	None	Complete	Ongoing. Permit for Area 7 Dryline has been issued.	None	Yes	July 2012	July 2011	Yes	No
86	Complete construction of collection system	Incomplete	None	Construction began August 2010.	None	None	Yes	July 2012	July 2011	Yes	No
87	Initiate connections	Incomplete	None	None	None	None	Yes	July 2012	July 2011	Yes	No
88	Complete connections (100%)	Incomplete	None	None	None	None	Yes	July 2013	July 2012	Yes	No

# Marathon 30-Day Report 2010

								Future Actions			
		Status	Department of Community Affairs Comments	Marathon Comments	Department of Environmental Protection Comments	Department of Health Comments	Required for Removal of Designation in 2010	Department of Community Affairs Recommended Completion Date	Marathon's Proposed Scheduled Completion Date	To be Reflected in Commission Rule	Comprehensive Plan Amendment Required
89	<b>WORK PROGRAM REQUIREMENTS PURSUANT TO RULE 28-20.110, F.A.C. WATER QUALITY – STORMWATER YEAR 8, TASK M (July 12, 2005)</b>	Substantial Progress Not Achieved					Yes				
90	<b>Proposed Work Program Strategies pursuant to the 2009 30-Day Report</b>										
91	<b>Planning</b>										
92	Marathon shall annually evaluate and allocate funding for stormwater implementation. Marathon shall identify any funding in the annual update to the Capital Improvements Element of the Comprehensive Plan.	Complete	None	Complete. The City of Marathon has a dedicated Stormwater Utility which annually collects 120 per ERU. Though the City is continuously seeking grants and low interest loans to complete its projects, the Stormwater system which underlies or will underlie the wastewater system is completely funded. The South Florida Water Management District and others have assisted tremendously in this funding effort.	Complete	None	Yes	July 2010 July 2011 July 2012	July 2009 July 2010 July 2011	Yes	Yes
93	<b>Proposed Work Program Strategies pursuant to the 2009 30-Day Report</b>										
94	<b>Funding</b>										
95	Marathon shall annually apply for stormwater grants from the South Florida Water Management District.	Complete	The City will receive \$300,000 in funding.	Complete. As noted, the SFWMD has greatly assisted the City in the development and construction of its innovative stormwater system.	Complete.	None	Yes	July 2010 July 2011 July 2012	July 2009 July 2010 July 2011	Yes	No

# Marathon 30-Day Report 2010

							Future Actions				
		Status	Department of Community Affairs Comments	Marathon Comments	Department of Environmental Protection Comments	Department of Health Comments	Required for Removal of Designation in 2010	Department of Community Affairs Recommended Completion Date	Marathon's Proposed Scheduled Completion Date	To be Reflected in Commission Rule	Comprehensive Plan Amendment Required
96	<b>Proposed Work Program Strategies pursuant to the 2009 30-Day Report</b>										
97	<b>Implementation/Construction</b>										
98	Sub area 1: Knights Key: Stormwater Treatment Facilities to be completed simultaneously with wastewater projects.	Complete	None	Stormwater collection system complete.	Under Construction	None	Yes	July 2010	July 2010	Yes	No
99	Sub area 2: Boot Key: Stormwater Treatment Facilities to be completed simultaneously with wastewater projects.	Incomplete	Stormwater and wastewater central services will not be provided to this island.	N/A. No stormwater improvements are anticipated.	N/A	None	Yes	n/a	July 2009	Yes	No
100	Sub area 3: 11 Street - 37 Street (Vaca Key West): Stormwater Treatment Facilities to be completed simultaneously with wastewater projects.	Incomplete	None	Stormwater collection system 70% complete.	Under Construction	None	Yes	July 2011	July 2010	Yes	No
101	Sub area 4: Gulfside - 37 Street (Vaca Key Central): Stormwater Treatment Facilities to be completed simultaneously with wastewater projects.	Complete	None	Complete	Complete	None	n/a	n/a	July 2010	Yes	No
102	Sub area 5: Little Venice (60 Street - Vaca Cut East): Stormwater Treatment Facilities to be completed simultaneously with wastewater projects.	Incomplete	None	Stormwater collection system 95% complete.	Under Construction	None	Yes	July 2012	July 2011	Yes	No
103	Sub area 6: Vaca Cut-Coco Plum (Fat Key Deer West): Stormwater Treatment Facilities to be completed simultaneously with wastewater projects.	Complete	None	Complete	Complete	None	n/a	n/a	July 2009	Yes	No
104	Sub area 7: Tom Harbor Bridge - Grassy Key: Stormwater Treatment Facilities to be completed simultaneously with wastewater projects.	Incomplete	None	Construction began August 2010.	None	None	Yes	July 2012	July 2011	Yes	No
105	Complete direct outfall retrofits for: 27th Street, Sombrero Isles, 24th Street, and 52nd Street	Incomplete	None	In Progress. Under the City's obligations to the NPDES program (FDEP/EPA) ALL stormwater outfalls must be eliminated. Specifically, these stormwater deficiencies have been or will be eliminated with the completion of Area 3 & 4 wastewater collection systems.	None	None	Yes	July 2012	July 2011	Yes	No
106	Design and complete stormwater improvements along U.S. 1 through Joint Participation Agreement with the Florida Department of Transportation at 107th and 109th Street and intersecting avenues (Mile Markers 52.5 to 52.6)	Complete	None	Continuous. The City coordinates with FDOT through Florida Keys Project Coordination Committee and will continue to do so on such projects.	None	None	n/a	n/a	July 2009	Yes	No

# Islamorada 30-Day Report 2010

							Future Actions				
	Status	Department of Community Affairs Comments	Islamorada Comments	Department of Environmental Protection Comments	Department of Health Comments	Required for Removal of Designation in 2010	Department of Community Affairs Recommended Completion Date	Islamorada's Proposed Scheduled Completion Date	To be Reflected in Commission Rule	Comprehensive Plan Amendment Required	
1	Substantial Progress Not Achieved					Yes					
2 Proposed Work Program Strategies pursuant to the 2009 30-Day Report											
3 Land Acquisition											
4	Complete	None	None	None	None	n/a	n/a	July 2009	Yes	Yes	
5	Complete	None	Completed. Ordinance 09-23 amended Policy 1-3.1.6.	None	None	Yes	July 2010	July 2009	Yes	Yes	
6	Complete	None	Completed. Ordinance 10-10 created subsection 30-477(a)(5).	None	None	Yes	July 2010	July 2010	Yes	No	
7 Proposed Work Program Strategies pursuant to the 2009 30-Day Report											
8 Habitat Protection											
9	Complete	Recommendation for minimum clearing of 3,000 square feet and maximum clearing of 7,500 square feet.	Completed. This item was discussed and agreed upon as completed by DCA and the local governments of Monroe County.	None	None	Yes	July 2010	July 2010	Yes	Yes	
10	Complete	None	Completed	None	None	n/a	n/a	July 2010	Yes	Yes	
11	Complete	Council approved on October 21, 2010.	Completion expected in October 2010. Council unanimously approved on first reading on October 7, 2010. Adoption scheduled for October 21, 2010.	None	None	Yes	July 2011	July 2011	Yes	No	
12	Complete	None	Completed. Ordinance 09-23 created Policy 1-2.1.13.	None	None	Yes	July 2010	July 2010	Yes	Yes	

### Islamorada 30-Day Report 2010

							Future Actions				
		Status	Department of Community Affairs Comments	Islamorada Comments	Department of Environmental Protection Comments	Department of Health Comments	Required for Removal of Designation in 2010	Department of Community Affairs Recommended Completion Date	Islamorada's Proposed Scheduled Completion Date	To be Reflected in Commission Rule	Comprehensive Plan Amendment Required
13	Proposed Work Program Strategies pursuant to the 2009 30-Day Report										
14	Funding										
15	Islamorada shall evaluate its land acquisition needs and state and federal funding opportunities and apply annually to at least one state or federal land acquisition grant program.	Incomplete	None	Completed for 2009. Islamorada was unsuccessful in locating and applying for a state or federal land acquisition grant thus far in 2010.	None	None	Yes	July 2009 July 2010 July 2011	July 2009 July 2010 July 2011	Yes	No
16	<b>WORK PROGRAM REQUIREMENTS PURSUANT TO RULE 28-20.110, F.A.C. HURRICANE EVACUATION – CARRYING CAPACITY IMPLEMENTATION YEAR 8, TASK Q (July 12, 2005)</b>	Substantial Progress Not Achieved					Yes				
17	Proposed Work Program Strategies pursuant to the 2009 30-Day Report										
18	Islamorada shall enter into a memorandum of understanding with the Department of Community Affairs, Monroe County, Marathon, Key West, Key Colony Beach and Layton after a notice and comment period of at least 30 days for interested parties. The memorandum of understanding shall stipulate, based on professionally acceptable data and analysis, the input variables and assumptions, including regional considerations, for utilizing the Florida Keys Hurricane Evacuation Model or other models acceptable to DCA to accurately depict evacuation clearance times for the population of the Florida Keys.	Incomplete	The MOU has not been initiated. The model has been updated with population data, human behavioral surveys completed, evaluation of sustained flow rate. The DCA recommends date revision 2011 to allow time to work with local governments regional planning council, and Division of Emergency Management to address evacuation issues.	None	None	None	Yes	July 2011	March 2009	Yes	No
19	The Florida Keys Hurricane Evacuation Model shall be run with the agreed upon variables from the memorandum of understanding. Islamorada and the Department of Community Affairs shall update the data for the Florida Keys Hurricane Evacuation Model as professionally acceptable sources of information are released (such as the Census, American Communities Survey, Bureau of Business and Economic Research, and other studies). Islamorada shall also evaluate and address appropriate adjustments to the hurricane evacuation model within each Evaluation and Appraisal Report.	Incomplete	Population and behavioral data has been revised. Model has been run with various scenarios but the variables have not been agreed upon. The range of evacuation clearance times to U.S. Highway 1 and the Florida Turnpike at Homestead/Florida City is from 18 hours and 58 minutes to 27 hours and 2 minutes.	None	None	None	Yes	July 2011	July 2009	Yes	No
20	Complete an analysis of maximum build-out capacity for the Florida Keys Areas of Critical State Concern, consistent with the requirement to maintain a 24-hour evacuation and the Florida Keys Carrying Capacity Study constraints. This analysis shall be prepared in coordination with the Department of Community Affairs, Monroe County and each municipality in the Keys.	Incomplete	The DCA recommends date revision to collaborate with local governments to develop allocation and distribution of units that facilitate connection to central sewer and decrease evacuation clearance time.	None	None	None	Yes	July 2011	July 2009	Yes	No
21	The Department of Community Affairs shall apply the derived clearance time to assess and determine the remaining allocations for the Florida Keys Areas of Critical State Concern. The Department will recommend appropriate revisions to the Administration Commission regarding the allocation rates and distribution of allocations to Monroe County, Marathon, Islamorada, Key West, Layton and Key Colony Beach or identify alternative evacuation strategies that support the 24 hour evacuation clearance time. If necessary, the Department of Community Affairs shall work with each local government to amend the Comprehensive Plans to reflect revised allocation rates and distributions or propose rulemaking to the Administration Commission.	Incomplete	The DCA recommends date revision to collaborate with local governments to develop allocation and distribution of units that facilitate connection to central sewer and decrease evacuation clearance time.	None	None	None	Yes	July 2011 July 2011	July 2010 December 2010	Yes	Yes
22	Based on the Department of Community Affairs' recommendations, Islamorada shall amend the current building permit allocation system (ROGO/NROGO in the Comprehensive Plan and Land Development Regulations) based on infrastructure availability, level of service standards, environmental carrying capacity constraints, and hurricane evacuation clearance time.	Incomplete	The DCA recommends date revision to collaborate with local governments to develop allocation and distribution of units that facilitate connection to central sewer and decrease evacuation clearance time.	Incomplete. Construction of language would be appropriate only in the land development regulations (see Policy 1-3.1.1).	None	None	Yes	July 2011	July 2011	Yes	Yes

### Islamorada 30-Day Report 2010

							Future Actions				
			Department of Community Affairs Comments	Islamorada Comments	Department of Environmental Protection Comments	Department of Health Comments	Required for Removal of Designation in 2010	Department of Community Affairs Recommended Completion Date	Islamorada's Proposed Scheduled Completion Date	To be Reflected in Commission Rule	Comprehensive Plan Amendment Required
23	<b>Water Quality: Wastewater</b> (Wastewater treatment and disposal in Monroe County is governed by the requirements of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended. The requirements of that law, including the July 1, 2010 deadline for achieving the treatment levels set forth therein, apply to all wastewater projects identified in the Work Program regardless of the Village of Islamorada's "scheduled completion date" identified in this document. Scheduled completion dates in the Work Program will be taken into consideration by the Department of Environmental Protection and Department of Health in the enforcement of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended.)										
24	<b>WORK PROGRAM REQUIREMENTS PURSUANT TO RULE 28-20.110, F.A.C. WATER QUALITY - WASTEWATER YEAR 4, TASK A (July 12, 2001); YEAR 6, TASK A (July 12, 2003); YEAR 7, TASK A (July 12, 2004)</b>	Substantial Progress Not Achieved			This narrative under the "Water Quality : Wastewater" heading should be revised to reflect the new legislation that		Yes				
25	Proposed Work Program Strategies pursuant to the 2009 30-Day Report										
26	Planning										
27	Islamorada shall annually evaluate and allocate funding for wastewater implementation. Islamorada shall identify any funding in the annual update to the Capital Improvements Element of the Comprehensive Plan.	Complete	None	Completed for 2009. Completed for 2010 by amending Table 9-1 through Ordinance #10-11.	None	None	Yes	July 2010	July 2009	Yes	Yes
								July 2011	July 2011		
								July 2012	July 2012		
28	Islamorada shall provide a final determination of cold spots requiring upgrade to meet Sections 381.0065(4)(l) and 403.086(10), F.S., wastewater treatment and disposal standards. This shall be in the form of a resolution including a map of the non-service areas.	Incomplete	The DCA recommends the date be revised with concurrence from DEP and DOH.	None	None	Date should be extended to July 2011.	Yes	July 2011	July 2009	Yes	No
29	Islamorada shall work with the owners of wastewater facilities throughout the Village and the Department of Environmental Protection (DEP) and the Department of Health (DOH) to fulfill the requirements of Sections 381.0065(4)(l) and 403.086(10), F.S., regarding wastewater treatment and disposal. This will include coordination of actions with DOH and DEP to notify owners regarding systems that will not meet 2015 treatment standards.	Incomplete	The DCA recommends the date be revised with concurrence from DEP and DOH.	None	The FDEP has already notified all the owners of wastewater facilities permitted by FDEP of the requirements of Chapter 99-395, L.O.F., and of the new legislation, Section 403.086(10), F.S., which now contains the wastewater requirements.	Date should be extended to July 2011.	Yes	July 2011	July 2009	Yes	No
30	Adopt an ordinance establishing the upgrade program with implementation dates, time frames, and enforcement for upgrading on-site systems and package plants in non-service areas.	Incomplete	The DCA recommends the date be revised with concurrence from DEP and DOH.	None	We have not seen an ordinance that addresses this requirement. We are aware of the Village ordinance that requires property owners to connect to the centralized systems within 30 days of receiving notification that sewers are available.	Date should be extended to July 2011.	Yes	July 2011	December 2009	Yes	No
31	Coordinate with the Department of Environmental Protection, Department of Health, U.S. Environmental Protection Agency, Monroe County and City of Marathon to develop a mechanism and funding source in concert with other Florida Keys local governments to continue the Little Venice Facility nutrient monitoring program to demonstrate nutrient reductions.	Complete	None	None	The Little Venice monitoring study has been completed and no funding is needed for this fiscal year. However, the Steering Committee of the Water Quality Protection Program (WQPP) is reviewing future WQ monitoring needs and it is possible that the WQPP may conduct additional monitoring in Little Venice in the future to further document the effects of improving wastewater and stormwater systems in that area.	None	n/a	n/a	July 2009	Yes	No

# Islamorada 30-Day Report 2010

							Future Actions				
			Department of Community Affairs Comments	Islamorada Comments	Department of Environmental Protection Comments	Department of Health Comments	Required for Removal of Designation in 2010	Department of Community Affairs Recommended Completion Date	Islamorada's Proposed Scheduled Completion Date	To be Reflected in Commission Rule	Comprehensive Plan Amendment Required
32	<b>Water Quality: Wastewater</b> (Wastewater treatment and disposal in Monroe County is governed by the requirements of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended. The requirements of that law, including the July 1, 2010 deadline for achieving the treatment levels set forth therein, apply to all wastewater projects identified in the Work Program regardless of the Village of Islamorada's "scheduled completion date" identified in this document. Scheduled completion dates in the Work Program will be taken into consideration by the Department of Environmental Protection and Department of Health in the enforcement of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended.)										
33	<b>Proposed Work Program Strategies pursuant to the 2009 30-Day Report</b>										
34	<b>Funding</b>										
35	Islamorada shall evaluate its wastewater needs and state and federal funding opportunities and apply annually to at least one state or federal grant program for wastewater projects and connections.	Incomplete	None	None	The Village did not apply for wastewater funding from FDEP during the last year.	None	Yes	July 2010	July 2009	Yes	No
								July 2011	July 2011		
								July 2010	July 2009		
36	Islamorada shall continue to develop and implement local funding programs necessary to timely fund wastewater construction and future operation, maintenance and replacement of facilities.	Incomplete	None	None	None	None	Yes	July 2010	July 2009	Yes	No
								July 2011	July 2011		
								July 2012	July 2012		
37	Islamorada shall annually draft a resolution requesting the issuance of a portion of the \$200 million of bonds authorized under s. 215.619, F.S., and an appropriation of sufficient debt service for those bonds, for the construction of wastewater projects within the Florida Keys.	Incomplete	Renewed efforts are needed that could include the Village underwriting the bonds.	None	None	None	Yes	July 2010	July 2009	No	No
								July 2011	July 2011		
								July 2012	July 2012		
								July 2013	July 2013		
38	Develop a mechanism to provide accurate and timely information and establish annual funding allocations necessary to support the issuance of bonds authorized under s. 215.619, F.S., and to assure the timely completion of work as necessary to fulfill any terms and conditions associated with bonds.	Incomplete	None	None	None	None	Yes	July 2010	July 2009	No	No
								July 2011	July 2011		
								July 2012	July 2012		
								July 2013	July 2013		
39	<b>Water Quality: Wastewater</b> (Wastewater treatment and disposal in Monroe County is governed by the requirements of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended. The requirements of that law, including the July 1, 2010 deadline for achieving the treatment levels set forth therein, apply to all wastewater projects identified in the Work Program regardless of the Village of Islamorada's "scheduled completion date" identified in this document. Scheduled completion dates in the Work Program will be taken into consideration by the Department of Environmental Protection and Department of Health in the enforcement of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended.)										
40	<b>Proposed Work Program Strategies pursuant to the 2009 30-Day Report</b>										
41	<b>Implementation/Construction</b>										
42	<b>Employ a wastewater program manager</b>										
43	Select program manager	Complete	None	None	None	None	n/a	n/a	July 2009	Yes	No
44	Begin drafting wastewater schedule & funding plan	Complete	None	None	None	None	n/a	n/a	July 2009	Yes	No
45	Finalize wastewater schedule & funding plan	Incomplete	None	None	The Village of Islamorada has not developed the local revenue-generating mechanisms necessary to finance its wastewater system.	None	Yes	July 2010	July 2010	Yes	No
46	<b>EPA Decentralized Sewer Project</b>										
47	Award contract for design of system	Incomplete	None	Incomplete. Village is not proceeding with this project.	Islamorada did not proceed with this grant. Monroe County now has it.	DOH - Please note that Islamorada cancelled this project and returned the funds.	Yes	July 2011	July 2009	Yes	No
48	Advertise request for proposal to construct system	Incomplete	None	None	None	None	Yes	July 2011	July 2010	Yes	No

### Islamorada 30-Day Report 2010

								Future Actions			
		Status	Department of Community Affairs Comments	Islamorada Comments	Department of Environmental Protection Comments	Department of Health Comments	Required for Removal of Designation in 2010	Department of Community Affairs Recommended Completion Date	Islamorada's Proposed Scheduled Completion Date	To be Reflected in Commission Rule	Comprehensive Plan Amendment Required
49	Award contract for construction	Incomplete	None	None	None	None	Yes	July 2011	July 2010	Yes	No
50	Initiate construction	Incomplete	None	None	None	None	Yes	July 2011	July 2010	Yes	No
51	Complete construction	Incomplete	None	None	None	None	Yes	July 2011	July 2011	Yes	No
52	Connect to decentralized system	Incomplete	None	None	None	None	Yes	July 2011	July 2011	Yes	No



# Islamorada 30-Day Report 2010

							Future Actions				
		Status	Department of Community Affairs Comments	Islamorada Comments	Department of Environmental Protection Comments	Department of Health Comments	Required for Removal of Designation in 2010	Department of Community Affairs Recommended Completion Date	Islamorada's Proposed Scheduled Completion Date	To be Reflected in Commission Rule	Comprehensive Plan Amendment Required
53	<b>Water Quality: Wastewater</b> (Wastewater treatment and disposal in Monroe County is governed by the requirements of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended. The requirements of that law, including the July 1, 2010 deadline for achieving the treatment levels set forth therein, apply to all wastewater projects identified in the Work Program regardless of the Village of Islamorada's "scheduled completion date" identified in this document. Scheduled completion dates in the Work Program will be taken into consideration by the Department of Environmental Protection and Department of Health in the enforcement of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended.)										
54	<b>Plantation Key Wastewater Treatment Facility</b>										
55	Complete an additional 700 connections (Phase II) to the North Plantation Key Wastewater Treatment Plant (WWTP)	Incomplete	350 connections made (50%).	Incomplete. 50% of Phase II connected.	None	None	Yes	July 2011	July 2009	Yes	No
56	Advertise request for proposal to obtain engineering services for the design of the South Plantation Key WWTP	Incomplete	None	Incomplete	None	None	Yes	July 2011	July 2010	Yes	No
57	Award the contract for the design of the South Plantation Key WWTP	Incomplete	None	Incomplete	We are not aware of any progress with the S. Plantation Key System.	None	Yes	July 2011	July 2010	Yes	No
58	Finalize design of WWTP	Incomplete	None	Incomplete	None	None	Yes	July 2012	July 2011	Yes	No
59	Secure site for the South Plantation WWTP	Incomplete	None	Incomplete	None	None	Yes	July 2012	July 2011	Yes	No
60	Advertise for proposals for construction of WWTP	Incomplete	None	Incomplete	None	None	Yes	July 2012	July 2011	Yes	No
61	Award construction contract for WWTP	Incomplete	None	Incomplete	None	None	Yes	July 2012	July 2011	Yes	No
62	Complete construction of WWTP	Incomplete	None	Incomplete	None	None	Yes	July 2012	July 2011	Yes	No
63	Design collection system	Incomplete	None	Incomplete	None	None	Yes	July 2012	July 2011	Yes	No
64	Advertise for proposals for the construction of the collection system	Incomplete	None	Incomplete	None	None	Yes	July 2012	July 2011	Yes	No
65	Award collection system construction contract	Incomplete	None	Incomplete	None	None	Yes	July 2012	July 2011	Yes	No
66	Construct collection system	Incomplete	None	Incomplete	None	None	Yes	July 2013	July 2012	Yes	No
67	Initiate connections to treatment facility	Incomplete	None	Incomplete	None	None	Yes	July 2013	July 2012	Yes	No
68	Complete connections (100%) to treatment facility	Incomplete	None	Incomplete	None	None	Yes	July 2014	July 2013	Yes	No

### Islamorada 30-Day Report 2010

								Future Actions			
		Status	Department of Community Affairs Comments	Islamorada Comments	Department of Environmental Protection Comments	Department of Health Comments	Required for Removal of Designation in 2010	Department of Community Affairs Recommended Completion Date	Islamorada's Proposed Scheduled Completion Date	To be Reflected in Commission Rule	Comprehensive Plan Amendment Required
69	<b>Water Quality: Wastewater</b> (Wastewater treatment and disposal in Monroe County is governed by the requirements of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended. The requirements of that law, including the July 1, 2010 deadline for achieving the treatment levels set forth therein, apply to all wastewater projects identified in the Work Program regardless of the Village of Islamorada's "scheduled completion date" identified in this document. Scheduled completion dates in the Work Program will be taken into consideration by the Department of Environmental Protection and Department of Health in the enforcement of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended.)										
70	<b>Lower Matecumbe Wastewater Treatment Facility</b>										
71	Advertise request for proposal to obtain engineering services for design of WWTP	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2011	July 2010	Yes	No
72	Award contract for design of WWTP	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2011	July 2010	Yes	No
73	Initiate WWTP design	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2011	July 2010	Yes	No
74	Finalize design of WWTP	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2012	July 2011	Yes	No
75	Secure site for WWTP	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2012	July 2011	Yes	No
76	Advertise for proposals for construction of WWTP	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2012	July 2011	Yes	No
77	Award construction contract for WWTP	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2012	July 2011	Yes	No
78	Complete construction of WWTP	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2013	July 2012	Yes	No
79	Design collection system	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2012	July 2011	Yes	No
80	Advertise for proposals for the construction of the collection system	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2012	July 2011	Yes	No
81	Award collection system construction contract	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2012	July 2011	Yes	No
82	Construct collection system	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2013	July 2012	Yes	No
83	Initiate connections to treatment facility	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2013	July 2012	Yes	No
84	Complete connections (100%) to treatment facility	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2014	July 2013	Yes	No

### Islamorada 30-Day Report 2010

							Future Actions				
		Status	Department of Community Affairs Comments	Islamorada Comments	Department of Environmental Protection Comments	Department of Health Comments	Required for Removal of Designation in 2010	Department of Community Affairs Recommended Completion Date	Islamorada's Proposed Scheduled Completion Date	To be Reflected in Commission Rule	Comprehensive Plan Amendment Required
85	<b>Water Quality: Wastewater</b> (Wastewater treatment and disposal in Monroe County is governed by the requirements of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended. The requirements of that law, including the July 1, 2010 deadline for achieving the treatment levels set forth therein, apply to all wastewater projects identified in the Work Program regardless of the Village of Islamorada's "scheduled completion date" identified in this document. Scheduled completion dates in the Work Program will be taken into consideration by the Department of Environmental Protection and Department of Health in the enforcement of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended.)										
86	<b>Upper Matecumbe Wastewater Treatment Facility</b>										
87	Advertise request for proposal to obtain engineering services for design of WWTP	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2011	July 2010	Yes	No
88	Award contract for design of WWTP	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2011	July 2010	Yes	No
89	Initiate WWTP design	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2011	July 2010	Yes	No
90	Finalize design of WWTP	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2012	July 2011	Yes	No
91	Secure site for WWTP	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2012	July 2011	Yes	No
92	Advertise for proposals for construction of WWTP	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2012	July 2011	Yes	No
93	Award construction contract for WWTP	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2012	July 2011	Yes	No
94	Complete construction of WWTP	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2013	July 2012	Yes	No
95	Design collection system	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2012	July 2011	Yes	No
96	Advertise for proposals for the construction of the collection system	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2012	July 2011	Yes	No
97	Award collection system construction contract	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2012	July 2011	Yes	No
98	Initiate connections to treatment facility	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2013	July 2012	Yes	No
99	Complete connections (100%) to treatment facility	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2014	July 2013	Yes	No

### Islamorada 30-Day Report 2010

							Future Actions				
		Status	Department of Community Affairs Comments	Islamorada Comments	Department of Environmental Protection Comments	Department of Health Comments	Required for Removal of Designation in 2010	Department of Community Affairs Recommended Completion Date	Islamorada's Proposed Scheduled Completion Date	To be Reflected in Commission Rule	Comprehensive Plan Amendment Required
100	<b>Water Quality: Wastewater</b> (Wastewater treatment and disposal in Monroe County is governed by the requirements of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended. The requirements of that law, including the July 1, 2010 deadline for achieving the treatment levels set forth therein, apply to all wastewater projects identified in the Work Program regardless of the Village of Islamorada's "scheduled completion date" identified in this document. Scheduled completion dates in the Work Program will be taken into consideration by the Department of Environmental Protection and Department of Health in the enforcement of Sections 381.0065(4)(l) and 403.086(10), Florida Statutes, as amended.)										
101	<b>Windley Wastewater Treatment Facility</b>										
102	Advertise request for proposal to obtain engineering services for design of WWTP	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2011	July 2010	Yes	No
103	Award contract for design of WWTP	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2011	July 2010	Yes	No
104	Initiate WWTP design	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2011	July 2010	Yes	No
105	Complete WWTP design	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2012	July 2011	Yes	No
106	Advertise for proposals for construction of WWTP	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2012	July 2011	Yes	No
107	Award construction contract for WWTP	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2012	July 2011	Yes	No
108	Complete construction of WWTP	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2013	July 2012	Yes	No
109	Design collection system	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2013	July 2012	Yes	No
110	Advertise request for proposal for the construction of the collection system	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2013	July 2012	Yes	No
111	Award contract for construction of collection system	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2013	July 2012	Yes	No
112	Construct collection system	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2013	July 2012	Yes	No
113	Initiate connections to treatment facility – complete 50% of hookups	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2013	July 2012	Yes	No
114	Complete connections to treatment facility	Incomplete	None	Incomplete	We are not aware of any progress with this wastewater system.	None	Yes	July 2014	July 2013	Yes	No

Legend for the attached 2010 Removal of Designation Report tables for Monroe County, Islamorada and Marathon.

Column	Explanation of table columns
1 <sup>st</sup> column (Identifies the Local Government)	Identifies Rule 28-20.110, F.A.C., tasks as well as the proposed work program strategies pursuant to the 2009 30-Day Report related to Carrying Capacity & Habitat Protection, Hurricane Evacuation and Water Quality.
Required for Removal of Designation in 2009	Identifies the tasks that are required for removal of designation in 2010. *All tasks must be completed for removal.
Department of Community Affairs Reported Status	Provides the current status of the work program tasks of Rule 28-20, F.A.C. and the proposed work program strategies. Entries for work program tasks are either “substantial progress” or “substantial progress not achieved.” Entries for proposed work program strategies are either “complete” or “incomplete.”
Department of Community Affairs Comments	Provides the Department’s 2010 comments, explanation of tasks status and recommendations.
Local Government Comments	Provides the local government’s 2010 comments and explanation of tasks status.
Key Largo Wastewater Treatment District Comments	Provides the District’s 2010 comments and explanation of tasks status. (Only for the Monroe County report)
Department of Environmental Protection Comments	Provides the Department of Environmental Protection’s 2010 comments, explanation of tasks status and recommendations.
Department of Health Comments	Provides the Department of Health’s 2010 comments, explanation of tasks status and recommendations.
Department of Community Affairs Recommended Completion Date	Identifies recommended completion dates for proposed work program strategies that are required for removal of designation. *All remaining or incomplete work program tasks and proposed strategies must be completed for removal of designation.

<b>Column</b>	<b>Explanation of table columns</b>
Local Government's Scheduled Completion Date	Identifies proposed completion dates for proposed work program strategies that are required for removal of designation.
To be Reflected in Commission Rule	Indicates that these tasks will be included in the proposed Administration Commission Rules.
Comprehensive Plan Amendment Required	Indicates if the task requires the local government to amend its Comprehensive Plan.

## Monroe County

### THE FULL TEXT OF THE PROPOSED RULE IS:

#### 28-20.130 Work Program Administration.

(1) Pursuant to Section 380.0552(4) paragraph (b), the Department of Community Affairs shall submit a written annual report to the Administration Commission on, November 30, 2011 and each year thereafter, until such time as the designation is removed, describing the progress of the Florida Keys Area toward accomplishing remaining tasks under the work program (as set out in Rules 28-20.110 and 28-20.140, F.A.C.), the fulfillment of the legislative intent and providing a recommendation as to whether progress toward accomplishing the tasks of the work program has been achieved.

(2) The Department of Community Affairs shall recommend to the Administration Commission the removal of designation when the removal of designation criteria of s. 380.0552(4), F.S., is achieved.

(3) For each water quality task in the work program, the Department of Community Affairs shall request appropriate federal, state, regional, and local agencies to contribute any relevant data, analysis and recommendations, and to take an active role in assisting the County in completing the task. Each agency shall prepare a section to be included in the Department's report which indicates the agency's actions relative to the work program. The Department of Community Affairs shall specifically request that the Florida Keys National Marine Sanctuary Water Quality Protection Program Steering Committee (Water Quality Steering Committee) take an active role in coordinating relevant local, state and federal agencies to allocate funding or provide staff to monitor nearshore waters, as necessary, for nutrient reductions.

#### 28-20.140 Comprehensive Plan.

(1) The Monroe County Comprehensive Plan Policy Document, as the same exists on January 1, 2011, is hereby amended to read as follows:

##### (2) Policy 101.2.13 Monroe County Work Program Conditions and Objectives.

(a) Monroe County shall establish and maintain a Permit Allocation System for new residential development. The Permit Allocation System shall supersede Policy 101.2.1.

(b) The number of permits issued annually for residential development under the Rate of Growth Ordinance shall not exceed a total annual unit cap of 197, plus any available unused ROGO allocations from a previous ROGO year. Each year's ROGO allocation of 197 units shall be split with a minimum of 71 units allocated for affordable housing in perpetuity and market rate allocations not to exceed 126 residential units per year. Unused ROGO allocations may be retained and made available only for affordable housing and Administrative Relief from ROGO year to ROGO year. Unused allocations for market rate shall be available for Administrative Relief. Any unused affordable allocations will roll over to affordable housing. A ROGO year means the twelve-month period beginning on July 13.

(c) This allocation represents the total number of allocations for development that may be issued during a ROGO year. No exemptions or increases in the number of allocations may be allowed, other than that which may be expressly provided for in the comprehensive plan or for which there is an existing agreement as of September 27 2005, for affordable housing between the Department and the local government in the critical areas.

(d) Allocations and permits to construct a new development or redevelopment that requires a modification or a repair to the onsite sewage treatment and disposal system, per Section 381.0065(4), F.S. and Rule 64E-6.001(4), F.A.C., shall not be issued unless the unit is connected to or will be connected to a central sewer system that has committed funding, a construction permit from the Department of Environmental Protection and the collection system is physically under construction or the unit has an onsite sewage treatment and disposal system that meets the treatment and disposal requirements of s. 381.0065(4), F.S.

(e) Through the Permit Allocation Systems, Monroe County shall direct new growth and redevelopment to areas served by a central sewer system that has committed funding, a construction permit from the Department of Environmental Protection and is physically under construction. Prior to the ranking and approval of awards for an allocation authorizing development of new principal structures, Monroe County, shall coordinate with the central wastewater facility provider and shall increase an applicant's score by four points for parcels served by a collection line within a central wastewater facility service area where a central wastewater treatment facility has been constructed that meets the treatment standards of s. 403.086(10), F.S., and where treatment capacity is available. The points shall only be awarded if a design permit has been issued for the collection system and the parcel lies within the service area of the wastewater treatment facility.

(f) Beginning November 30, 2011, Monroe County and the Department of Community Affairs shall annually report to the Administration Commission documenting the degree to which the work program objectives for the work program year have been achieved. The Commission shall consider the findings and recommendations provided in those reports and shall determine whether progress has been achieved. If the Commission determines that progress has not been made, the unit cap for residential development shall be reduced by at least 20 percent for the following ROGO year.

(g) If the Commission determines that progress has been made for the work program year, then the Commission may restore the unit cap for residential development for the following year up to a maximum of 197 allocations per ROGO year.

(h) Notwithstanding any other date set forth in this plan, the dates set forth in the work program shall control where conflicts exist.

(i) Wastewater treatment and disposal in Monroe County is governed by the requirements of s. 381.0065(4), F.S., and s. 403.086(10), F.S. Nothing in this rule shall be construed to limit the authority of the Department of Environmental Protection or the Department of Health to enforce s. 381.0065(4), F.S., and s. 403.086(10), F.S.

### (3) Policy 216.1.19. Hurricane Modeling

For the purposes of hurricane evacuation clearance time modeling purposes, clearance time shall begin when the Monroe County Emergency Management Coordinator issues the evacuation order for permanent residents to evacuate during a Category C-E event. The termination point shall be U.S. Highway One and the Florida Turnpike in Homestead/Florida City.

(4) WORK PROGRAM. Local government annual tasks to achieve progress are the remaining tasks of the Work Program originate from Rule 28-20.110, F.A.C. Hurricane Evacuation tasks originate from Year 8, Task Q of the Work Program in Rules 28-20.110, and 28-20.140., F.A.C. Carrying Capacity & Habitat Protection tasks



originate from Year 6, Task C; and Year 8, Task F of the Work Program in Rule 28-20.110, F.A.C. Wastewater tasks originate from Year 4, Task A; Year 6, Task A; Year 7, Task A; Year 9 Tasks A and B; and Year 10, Tasks A, B, C, D, and E of the Work Program in Rule 28-20.110, F.A.C. Water Quality tasks originate from Year 8, Task M of the Work Program in Rule 28-20.110, F.A.C.

**(a) Carrying Capacity Study Implementation.**

1. By July 1, 2011, Monroe County shall adopt the conservation planning mapping (the Tier Zoning Overlay Maps and System) into the Comprehensive Plan based upon the recommendations of the Tier Designation Review Committee with the adjusted Tier boundaries, into the Comprehensive Plan.

2. By July 1, 2011, Monroe County shall adjust the Tier I and Tier IIIA (SPA) boundaries to more accurately reflect the criteria for that Tier as amended by Final Order DCA07-GM166 and implement the Florida Keys Carrying Capacity Study, utilizing the updated habitat data, and based upon the recommendations of the Tier Designation Review Committee Work Group.

3. By July 1, 2011, Monroe County shall create Goal 106 to complete the 10 Year Work Program found in Rule 28-20.110 F.A.C., and to establish objectives to develop a build-out horizon in the Florida Keys and adopt conservation planning mapping into the Comprehensive Plan.

4. By July 1, 2011, Monroe County shall create Objective 106.2 to adopt conservation planning mapping (Tier Maps) into the Monroe Comprehensive Plan based upon the recommendations of the Tier Designation Review Committee. Work Group.

5. By July 1, 2011, Monroe County shall adopt Policy 106.2.1 to require the preparation of updated habitat data and establish a regular schedule for continued update to coincide with evaluation and appraisal report timelines.

6. By July 1, 2011, Monroe County shall adopt Policy 106.2.2 to establish the Tier Designation Work Group Review Committee to consist of representatives selected by the Florida Department of Community Affairs from Monroe County, Florida Fish & Wildlife Conservation Commission, United States Fish & Wildlife Service, Department of Environmental Protection and environmental and other relevant interests. This Committee shall be tasked with the responsibility of Tier designation review utilizing the criteria for Tier placement and best available data to recommend amendments to ensure implementation of and adherence to the Florida Keys Carrying Capacity Study. These proposed amendments shall be recommended during 2009 and subsequently coincide with the Evaluation and Appraisal report timelines beginning with the second Evaluation and Appraisal review which follows the adoption of the revised Tier System and Maps as required above adopted in 2011. Each evaluation and appraisal report submitted following the 2011 evaluation and appraisal report shall also include an analysis and recommendations based upon the process described above.

7. By July 1, 2011 and each July thereafter, Monroe County and the Monroe County Land Authority shall submit a report annually to the Administration Commission on the land acquisition funding and efforts in the Florida Keys to purchase Tier I and Big Pine Key Tier II lands and the purchase of parcels where a Monroe County building permit allocation has been denied for four (4) years or more. The report shall include an identification of all sources of funds and assessment of fund balances within those sources available to the County and the Monroe County Land Authority.

8. By July 1, 2011, Monroe County shall adopt Land Development Regulations to require that administrative relief in the form of the issuance of a building permit is not allowed for lands within the Florida Forever targeted acquisition areas or Tier I lands unless, after 60 days from the receipt of a complete application for administrative relief, it has been determined the parcel will not be purchased by any county, state or federal or any private entity. The County shall develop a mechanism to routinely notify the Department of Environmental Protection of upcoming administrative relief requests at least 6 months prior to the deadline for administrative relief.

9. By July 1, 2011, in order to implement the Florida Keys Carrying Capacity Study, Monroe County shall adopt a Comprehensive Plan Policy to discourage private applications for future land use changes which increase allowable density/intensity.

10. By July 1, 2011, Monroe County shall evaluate its land acquisition needs and state and federal funding opportunities and apply annually to at least one state or federal land acquisition grant program.

11. By July 1, 2011, Monroe County shall enter into a memorandum of understanding with the Department of Community Affairs, Division of Emergency Management, Marathon, Islamorada, Key West, Key Colony Beach, and Layton after a notice and comment period of at least 30 days for interested parties. The memorandum of understanding shall stipulate, based on professionally acceptable data and analysis, the input variables and assumptions, including regional considerations, for utilizing the Florida Keys Hurricane Evacuation Model or other models acceptable to the Department to accurately depict evacuation clearance times for the population of the Florida Keys.

12. By July 1, 2011, the Florida Keys Hurricane Evacuation Model shall be run with the agreed upon variables from the memorandum of understanding to complete an analysis of maximum build-out capacity for the Florida Keys Area of Critical State Concern, consistent with the requirement to maintain a 24-hour evacuation clearance time and the Florida Keys Carrying Capacity Study constraints. This analysis shall be prepared in coordination with the Department of Community Affairs and each municipality in the Keys.

13. By July 1, 2011, the County and the Department of Community Affairs shall update the data for the Florida Keys Hurricane Evacuation Model as professionally acceptable sources of information are released (such as the Census, American Communities Survey, Bureau of Economic and Business Research, and other studies). The County shall also evaluate and address appropriate adjustments to the hurricane evacuation model within each Evaluation and Appraisal Report.

14. By July 1, 2011, the Department of Community Affairs shall apply the derived clearance time to assess and determine the remaining allocations for the Florida Keys Areas of Critical State Concern. The Department will recommend appropriate revisions to the Administration Commission regarding the allocation rates and distribution of allocations to Monroe County, Marathon, Islamorada, Key West, Layton and Key Colony Beach or identify alternative evacuation strategies that support the 24 hour evacuation clearance time. If necessary, the Department of Community Affairs shall work with each local government to amend the Comprehensive Plans to reflect revised allocation rates and distributions or propose rule making to the Administration Commission.

(b) Wastewater Implementation.

1. By July 1, 2011, Monroe County shall annually evaluate and allocate funding for wastewater implementation.

Monroe County shall identify any funding in the annual update to the Capital Improvements Element of the Comprehensive Plan.

2. By July 1, 2011, Monroe County shall provide a final determination of cold spots and unfunded service areas requiring upgrade to meet s. 403.086(10) and 381.0065(4)(1), F.S., wastewater treatment and disposal standards. The determination shall be adopted by resolution and shall include a map delineating the non-service areas.

3. By August 1, 2013, Monroe County shall work with the owners of wastewater facilities and throughout the County and the Department of Environmental Protection (DEP) and the Department of Health (DOH) to fulfill the requirements of s. 403.086(10) and 381.0065(4)(1), F.S., regarding wastewater treatment and disposal. This will include coordination of actions with DOH and DEP to notify owners regarding systems that will not meet the advanced wastewater treatment standards.

4. By August 1, 2011, Monroe County shall adopt an ordinance establishing the upgrade program with implementation dates, time frames, and enforcement for upgrading on-site systems and package plants.

5. By July 1, 2011, Monroe County shall annually draft a resolution requesting the issuance of \$50 million of the \$200 million of bonds authorized under s. 215.619, F.S., and an appropriation of sufficient debt service for those bonds, for the construction of wastewater projects within the Florida Keys.

6. By July 1, 2011, Monroe County shall develop a mechanism to provide accurate and timely information and establish annual funding allocations necessary to support the issuance of bonds authorized under s. 215.619, F.S., and to assure the timely completion of work as necessary to fulfill any terms and conditions associated with bonds.

7. By July 1, 2011, Monroe County shall evaluate its wastewater needs and state and federal funding opportunities and apply annually to at least one state or federal grant program for wastewater projects and connections.

9. By July 1, 2011, Monroe County shall develop and implement local funding programs necessary to timely fund wastewater construction and future operation, maintenance and replacement of facilities.

10. By July 1, 2011, Monroe County shall, identify by County resolution the areas of the County that will be served by central sewage facilities ("service areas") and the areas of the County that will not be served by central sewage facilities ("non-service areas"). The non service areas shall be delineated in the form of a map.

11. By July 1, 2013, the Department of Health, Monroe County, and the County's wastewater provider shall develop and execute an interlocal agreement for non-service areas and unfunded service areas. The agreement shall address mechanisms for the FKAA or other appropriate entity to provide upgrades and central management of onsite sewage treatment and disposal systems located in non-service areas and unfunded service areas. The Department of Health and the Department of Environmental Protection will provide an report to the Department of Community Affairs no later than July 1, 2013, assessing the magnitude of non-compliance and enforcement mechanisms necessary to ensure upgrades of wastewater treatment facilities in accordance with Section 403.086(10) and 381.0065 (4) F.S.

12. By July 1, 2013, and each July thereafter the County shall provide a report of addresses and the property appraiser's parcel numbers of any property owner that fails or refuses to connect to the central sewer facility within the required timeframe to the Monroe County Health Department, Department of Environmental Protection, and the

Department of Community Affairs. This report shall describe the status of enforcement action and provide the circumstances of why enforcement may or may not have been initiated. The Monroe County Department of Health and Department of Community Affairs may proceed with enforcement as necessary and appropriate.

**(c) Wastewater Project Implementation.**

1. Key Largo Wastewater Treatment Facility. Key Largo Wastewater Treatment District is responsible for wastewater treatment in its service area and the completion of the Key Largo Wastewater Treatment Facility.

- a. By July 1, 2011, Monroe County shall complete construction of the South Transmission Line; and
- b. By July 1, 2011, Monroe County shall complete design of Collection basin C, E, F, G, H, I, J, and K; and
- c. By July 1, 2011, Monroe County shall complete construction of Collection basins E-H; and
- d. By July 1, 2011, Monroe County shall schedule construction of Collection basins I-K; and
- e. By July 1, 2011, Monroe County shall complete construction of Collection basins I-K; and
- f. By July 1, 2011, Monroe County shall complete 50% of hook-ups to Key Largo Regional WWTP; and
- g. By July 1, 2012, Monroe County shall complete 75% of hook-ups to Key Largo Regional WWTP; and.
- h. By July 1, 2013, Monroe County shall complete all remaining connections to Key Largo Regional WWTP.

2. Hawk's Cay, Duck Key and Conch Key Wastewater Treatment Facility.

- a. By July 1, 2011, Monroe County shall complete construction of Hawk's Cay WWTP upgrade/expansion, transmission, and collection system; and
- b. By July 1, 2011, Monroe County shall complete construction of Duck Key collection system; and
- c. By July 1, 2011, Monroe County shall initiate property connections to Hawk's Cay WWTP; and
- d. By July 1, 2012, Monroe County shall complete 50% of hook-ups to Hawk's Cay WWTP; and
- e. By July 1, 2013, Monroe County shall complete 75% of hook-ups to Hawk's Cay WWTP; and
- f. By July 1, 2014, Monroe County shall complete all remaining connections to Hawk's Cay WWTP.

3. South Lower Keys Wastewater Treatment Facility (Big Coppitt Regional System).

- a. By July 1, 2012, Monroe County shall complete 75% hookups to South Lower Keys WWTP; and
- b. By July 1, 2013, Monroe County shall complete all remaining connections to the South Lower Keys WWTP.

4. Cudjoe Regional Wastewater Treatment Facility.

- a. By July 1, 2011, Monroe County shall complete planning and design documents for the Cudjoe Regional Wastewater Treatment Facility for Phases 1 and 2 (WWTP; transmission main and collection system); and
- b. By July 1, 2012, Monroe County shall complete construction of Wastewater Treatment Plant Phase 1 and collection systems (Phase 1 is the initial WWTP construction to treat flows from a central collection area); and
- c. By July 1, 2012 Monroe County shall initiate construction of Wastewater Treatment Plant Phase 2 (Phase 2 is the planned WWTP expansion to provide additional capacity to treat flows from the expanded collection area); and
- d. By July 1, 2013 Monroe County shall complete construction of Wastewater Treatment Plant Phase 2 Expansion; and
- e. By July 1, 2013, Monroe County shall complete construction of central collection lines and transmission main; and

f. By July 1, 2013, Monroe County shall initiate property connections – complete 25% of hook-ups to Cudjoe Regional WWTP; and

g. By July 1, 2012, Monroe County shall complete 50% of hook-ups to Cudjoe Regional WWTP; and

h. By July 1, 2014, Monroe County shall complete 75% of hook-ups to Cudjoe Regional WWTP; and

i. By January 1, 2015, Monroe County shall complete all remaining connections to Cudjoe Regional WWTP.

**(d) Stormwater Treatment Facilities.**

1. By July 1, 2011, Monroe County shall evaluate and allocate funding for stormwater implementation. Monroe County shall identify any funding in the annual update to the Capital Improvements Element of the Comprehensive Plan.

2. By July 1, 2011, Monroe County shall apply for stormwater grants from the South Florida Water Management District.

3. By July 1, 2011, Monroe County shall design and construct Mile Marker 17-19 stormwater runoff management improvements along U.S. Highway One through Joint Participation Agreement with FDOT.

4. By July 1, 2011, Monroe County shall complete Card Sound Road stormwater improvements.

## **Marathon**

### THE FULL TEXT OF THE PROPOSED RULE IS:

#### **28-18.100 Purpose and Effect.**

(1) The purpose of this Chapter is to amend the Comprehensive Plan of the City of Marathon, effective date of May 5, 2005, within the Florida Keys Area of Critical State Concern, pursuant to Section 380.0552(9), F.S.) In order to provide an accurate record of the amendments approved by this chapter, each set of amendments is set forth in a separate rule section. If any provision of the comprehensive plan is amended by two rule sections, the latest amendment shall control.

(2) As provided in Sections 380.05(10) and 380.0552(7), F.S., the Comprehensive Plan of the City of Marathon adopted herein shall be superseded by amendments which are proposed by Marathon and approved by the Department of Community Affairs pursuant to Sections 380.05(6) and 380.0552(9), F.S.

#### **28-18.200 Work Program Administration.**

(1) Pursuant to Section 380.0552(4) paragraph (b), the Department of Community Affairs (Department) shall submit a written annual report to the Administration Commission on November 30, 2011 and each year thereafter, until such time as the designation is removed, describing the progress of the Florida Keys Area toward accomplishing remaining tasks under the work program (as set out in Rule 28-20.110, F.A.C. and Rule 28-18.300, F.A.C.), and providing a recommendation as to whether progress toward accomplishing the tasks of the work program has been achieved.

(2) The Department of Community Affairs shall recommend to the Administration Commission the removal of designation when the removal of designation criteria of s. 380.0552(4), F.S., is achieved.

(3) For tasks in the work program related to water quality, the Department of Community Affairs shall request assistance from appropriate federal, state, regional, and local agencies and request to contribute any relevant data, analysis and recommendations, and take an active role in assisting the City in completing the task. Each agency shall prepare a section to be included in the Department's reports which indicates the agency's actions relative to the work program. The Department of Community Affairs shall specifically request that the Florida Keys National Marine Sanctuary Water Quality Protection Program Steering Committee (Water Quality Steering Committee) take an active role to allocate funding or provide staff to monitor nearshore waters, as necessary, for nutrient reductions.

#### **28-18.300 Comprehensive Plan.**

(1) The Comprehensive Plan of the City of Marathon, as the same exists on January 1, 2011, is hereby amended to read as follows:

(2) Policy 1-3.5.18 Marathon Work Program Conditions and Objectives.

(a) The number of allocations issued annually for residential development under the Residential Building Permit Allocation System (BPAS) shall not exceed a total annual unit cap of 30, plus any available unused BPAS allocations from a previous year. Unused BPAS allocations may be retained and made available only for affordable housing and Administrative Relief from BPAS year to BPAS year. Unused market rate allocations shall be available for Administrative Relief. Any unused affordable allocations will roll over to affordable housing. This

BPAS allocation represents the total number of allocations for development that may be issued during a year. A BPAS year means the twelve-month period beginning on July 13. Policy 1-3.5.18 supersedes Policy 1-3.5.2 of the City of Marathon Comprehensive Plan.

(b) No exemptions or increases in the number of allocations may be allowed, other than that which may be expressly provided for in the comprehensive plan or for which there is an existing agreement as of September 27, 2005 for affordable housing between the Department and the local government in the critical areas.

(c) Allocations and permits to construct a new development or redevelopment that requires a modification or a repair to the onsite sewage treatment and disposal system, per s. 381.0065(4)(1) and s. 403.086(10), F.S. and Rule 64E-6.001(4), F.A.C., shall not be issued unless the unit is connected to or will be connected to a central sewer system that has committed funding, a construction permit from the Department of Environmental Protection and the collection system is physically under construction, or the unit has an onsite sewage treatment and disposal system that meets the treatment and disposal requirements of s. 381.0065(4)(1) and s. 403.086(10), F.S.

(d) Through the Permit Allocation Systems, Marathon shall direct new growth and redevelopment to areas served by a central sewer system that has committed funding, a construction permit from the Department of Environmental Protection and is physically under construction. Prior to the ranking and approval of awards for an allocation authorizing development of new principal structures, Marathon shall coordinate with the central wastewater facility provider and shall increase an applicant's score by four points for parcels served by a collection line within a central wastewater facility service area where a central wastewater treatment facility has been constructed that meets the treatment standards of s. 381.0065(4)(1) and 403.086(10), F.S., and where treatment capacity is available. The points shall only be awarded if a design permit has been issued for the collection system and the parcel lies within the service area of the wastewater treatment facility.

(e) Beginning November 30, 2011, Marathon and the Department of Community Affairs shall annually report to the Administration Commission documenting the degree to which the work program objectives for the work program year have been achieved. The Commission shall consider the findings and recommendations provided in those reports and shall determine whether progress has been achieved toward accomplishing the tasks of the work program. If the Commission determines that progress has not been made, the unit cap for residential development shall be reduced by at least 20 percent for the following year.

(f) If the Commission determines that progress has been made for the work program year, then the Commission shall restore the unit cap for residential development for the following year up to a maximum of 30 allocations per BPAS year.

(g) Notwithstanding any other date set forth in this plan, the dates set forth in the work program shall control where conflicts exist.

(h) Wastewater treatment and disposal in Marathon is governed by the requirements of s. 381.0065(4)(1) and 403.086(10), F.S., as amended. Nothing in this rule shall be construed to limit the authority of the Department of Environmental Protection or Department of Health to enforce s. 381.0065(4)(1) and 403.086(10), F.S., as amended

(3) Policy 1-2.2.4 Hurricane Modeling

(a) For hurricane evacuation clearance time modeling purposes, clearance time shall begin when the Monroe

County Emergency Management Coordinator issues the evacuation order for the permanent population for a category C-E hurricane event. The termination point shall be the intersection of U.S. Highway One and the Florida turnpike in Homestead/Florida City.

(4) WORK PROGRAM. Local government annual tasks to achieve progress are the remaining tasks of the Work Program from Rule 28-20.110, F.A.C., and Rule 28-18.300, F.A.C. Hurricane Evacuation tasks originate from Year 8, Task Q of the Work Program in Rule 28-20.110, F.A.C. Carrying Capacity & Habitat Protection tasks originate from Year 6, Task C; and Year 8, Task F of the Work Program in Rule 28-20.110, F.A.C. Wastewater tasks originate from Year 4, Task A; Year 6, Task A; Year 7, Task A of the Work Program in Rule 28-20.110, F.A.C. Water Quality tasks originate from Year 8, Task M of the Work Program in Rule 28-20.110, F.A.C.

(a) Carrying Capacity Study Implementation.

1. By July 1, 2011, Marathon shall adopt a Comprehensive Plan Policy to require that administrative relief in the form of the issuance of a building permit is not allowed for lands within the Florida Forever targeted acquisition areas unless, after 60 days from the receipt of a complete application for administrative relief, it has been determined the parcel will not be purchased by any city, county, state or federal agency. Marathon shall develop a mechanism to routinely notify the Department of Environmental Protection of upcoming administrative relief requests at least 6 months prior to the deadline for administrative relief.

2. By July 1, 2011, Marathon shall adopt Land Development Regulations to require that administrative relief in the form of the issuance of a building permit is not allowed for lands within the Florida Forever targeted acquisition areas unless, after 60 days from the receipt of a complete application for administrative relief, it has been determined the parcel will not be purchased by any city, county, state or federal agency.

3. By July 1, 2011, Marathon shall amend the Comprehensive Plan to limit allocations into high quality tropical hardwood hammock.

4. By July 1, 2011, Marathon shall amend the Land Development Regulations to limit allocations into high quality tropical hardwood hammock.

5. By July 1, 2011, Marathon shall adopt a Comprehensive Plan Policy discouraging private applications for future land use map amendments which increase allowable density/intensity on lands in the Florida Keys.

6. By July 1, 2011 and each July thereafter, Marathon shall evaluate its land acquisition needs and state and federal funding opportunities and apply annually to at least one state or federal land acquisition grant program.

7. By July 1, 2011, Marathon shall enter into a memorandum of understanding with the Department of Community Affairs, Division of Emergency Management, Monroe County, Islamorada, Key West, Key Colony Beach, and Layton after a notice and comment period of at least 30 days for interested parties. The memorandum of understanding shall stipulate, based on professionally acceptable data and analysis, the input variables and assumptions, including regional considerations, for utilizing the Florida Keys Hurricane Evacuation Model or other models acceptable to the Department of Community Affairs to accurately depict evacuation clearance times for the population of the Florida Keys.

8. By July 1, 2011, the Florida Keys Hurricane Evacuation Model shall be run with the agreed upon variables from the memorandum of understanding. Marathon and the Department of Community Affairs shall update the data



for the Florida Keys Hurricane Evacuation Model as professionally acceptable sources of information are released (such as the Census, American Communities Survey, Bureau of Business and Economic Research, and other studies). The City shall also evaluate and address appropriate adjustments to the hurricane evacuation model within each Evaluation and Appraisal Report.

9. By December 1, 2011, Marathon shall complete an analysis of maximum build-out capacity for the Florida Keys Area of Critical State Concern, consistent with the requirement to maintain a 24-hour evacuation clearance time and the Florida Keys Carrying Capacity Study constraints. This analysis shall be prepared in coordination with the Department of Community Affairs, Monroe County and each municipality in the Keys.

10. By December 1, 2011, the Department of Community Affairs shall apply the derived clearance time to assess and determine the remaining allocations for the Florida Keys Areas of Critical State Concern. The Department will recommend appropriate revisions to the Administration Commission regarding the allocation rates and distribution of allocations to Monroe County, Marathon, Islamorada, Key West, Layton and Key Colony Beach or identify alternative evacuation strategies that support the 24-hour hurricane evacuation clearance time. If necessary, the Department of Community Affairs shall work with each local government to amend the respective Comprehensive Plans to reflect revised allocation rates and distributions or propose rule making to the Administration Commission.

11. By July 1, 2012, based on the Department of Community Affairs' recommendations, Marathon shall amend the current building permit allocation system (BPAS in the Comprehensive Plan and Land Development Regulations) based on infrastructure availability, level of service standards, environmental carrying capacity, and hurricane evacuation clearance time.

(b) Wastewater Implementation.

1. By July 1, 2011 and each July 1 thereafter, Marathon shall annually evaluate and allocate funding for wastewater implementation. Marathon shall identify any funding in the annual update to the Capital Improvements Element of the Comprehensive Plan.

2. By July 1, 2011, Marathon shall provide a final determination of service areas requiring upgrade to meet s. 381.0065(4)(1) and 403.086(10), F.S., wastewater treatment and disposal standards. This shall be in the form of a resolution, including a map of the non-service areas. The Department of Health, Marathon, and the City's wastewater provider shall explore possible mechanisms to provide upgrades and central management of onsite sewage treatment and disposal systems located in non-service areas of the City. By March 1, 2013, the Department of Health will provide an update to the Department of Community Affairs describing the mechanisms discussed by the parties and the results of those discussions.

4. By July 1, 2011, Marathon shall work with the owners of wastewater facilities throughout the City and the Department of Environmental Protection (DEP) and the Department of Health (DOH) to fulfill the requirements of s. 381.0065(4)(1) and 403.086(10), F.S., regarding wastewater treatment and disposal. This will include coordination of actions with DOH and DEP to notify owners regarding systems that will not meet 2015 treatment and disposal requirements.

5. By July 1, 2011, Marathon shall adopt an ordinance establishing the upgrade program with implementation

dates, time frames, and enforcement for upgrading on-site systems and package plants in non-service areas.

6. By July 1, 2011, Marathon shall evaluate its wastewater needs and state and federal funding opportunities and apply annually to at least one state or federal grant program for wastewater projects and connections.

7. By July 1, 2011, Marathon shall continue to develop and implement local funding programs necessary to timely fund wastewater construction and future operation, maintenance and replacement of facilities.

8. By July 1, 2011 and each year through 2013, Marathon shall annually draft a resolution requesting the issuance of a portion of the \$200 million of bonds authorized under s. 215.619, F.S., and an appropriation of sufficient debt service for those bonds, for the construction of wastewater projects within the Florida Keys.

9. By July 1, 2011, Marathon shall develop a mechanism to provide accurate and timely information and establish annual funding allocations necessary to support the issuance of bonds authorized under s. 215.619, F.S., and to assure the timely completion of work as necessary to fulfill any terms and conditions associated with bonds.

10. Beginning July 1, 2013 and each July 1 thereafter, Marathon shall provide a report of addresses and the property appraiser's parcel numbers of any property owner that fails or refuses to connect to the central sewer facility within the required timeframe to the Monroe County Health Department and the Department of Community Affairs. This report shall describe the status of enforcement action and provide the circumstances of why enforcement may or may not have been initiated. The Monroe County Department of Health and Department of Community Affairs may proceed with enforcement as necessary and appropriate.

(c) Wastewater Project Implementation.

1. Sub area 1: Knight's Key.

a. By July 1, 2011, Marathon shall secure plant site; and

b. By December 1, 2011, Marathon shall construct Knight's Key Wastewater Plant; and

c. By May 1, 2012, Marathon shall initiate connections; and

d. By July 1, 2012, Marathon shall complete connections (100%).

2. Sub area 2: Boot Key (non-service area).

By July 1, 2011, Marathon shall ensure completion of upgrade.

3. Sub area 3: 11 Street - 39 Street (Vaca Key West).

a. By July 1, 2011, Marathon shall complete construction of plant; and

b. By July 1, 2011, Marathon shall complete construction of collection system; and

c. By July 1, 2011, Marathon shall initiate connections; and

d. By July 1, 2012, Marathon shall complete connections (100%).

4. Sub area 4: Gulfside 39 Street (Vaca Key Central).

By July 1, 2013, Marathon shall complete connections (100%).

5. Sub area 5: Little Venice (60 Street – Vaca Cut East).

a. By July 1, 2012, Marathon shall complete construction of collection system; and

b. By July 1, 2012, Marathon shall initiate connections for Phase II; and

c. By July 1, 2013, Marathon shall complete connections (100%) for Phase II.

6. Sub area 6-Vaca Cut-Coco Plum (Fat Key Deer West).

By July 1, 2011, Marathon shall complete connections (100%).

7. Sub area 7: Tom Harbor Bridge-Grassy Key.

a. By July 1, 2012, Marathon shall complete construction of plant; and

b. By July 1, 2012, Marathon shall bid and award design of collection system; and

c. By July 1, 2012, Marathon shall construction of collection system; and

d. By July 1, 2012, Marathon shall initiate connections; and

e. By July 1, 2013, Marathon shall complete connections (100%).

(d) Stormwater Treatment Facilities.

1. Beginning July 1, 2011 and each July 1 thereafter Marathon shall annually evaluate and allocate funding for stormwater implementation. Marathon shall identify any funding in the annual update to the Capital Improvements Element of the Comprehensive Plan.

2. Beginning July 1, 2010 and each July 1 thereafter, Marathon shall annually apply for stormwater grants from the South Florida Water Management District.

3. Sub area 3: 11 Street -37 Street (Vaca Key West): By July 1, 2011, complete Stormwater Treatment Facilities simultaneously with wastewater projects, including the direct outfall retrofits for 27th Street and 24th Street..

4. Sub area 5: Little Venice (60 Street – Vaca Cut East): By July 1, 2012, complete Stormwater Treatment Facilities simultaneously with wastewater projects.

5. Sub area 7: Tom Harbor Bridge-Grassy Key: By July 1, 2012, complete Stormwater Treatment Facilities simultaneously with wastewater projects.

6. By July 1, 2012, Marathon shall eliminate direct outfall retrofits for: 27th Street, Sombrero Islands, 24th Street, and 52nd Street.

Islamorada

THE FULL TEXT OF THE PROPOSED RULE IS:

28-19.300 Work Program Administration.

(1) Pursuant to Section 380.0552(4) paragraph (b) F.S., the Department of Community Affairs shall submit a written annual report to the Administration Commission on November 30, 2011 and each year thereafter, until such time as the designation is removed, describing the progress of the Florida Keys Area toward accomplishing remaining tasks under the work program (as set out in Rules 28-20.110 and Rule 28-19.310, F.A.C.), the fulfillment of the legislative intent and providing a recommendation as to whether progress toward accomplishing the tasks of the work program has been achieved.

(2) The Department of Community Affairs shall recommend to the Administration Commission the removal of designation when the removal of designation criteria of s. 380.0552(4), F.S., is achieved.

(3) For tasks related to water quality in the work program, the Department of Community Affairs shall request assistance from appropriate federal, state, regional, and local agencies to contribute any relevant data, analysis and recommendations, and that they take an active role in assisting the Village in completing the task. Each agency shall prepare a section to be included in the Department's reports which indicates the agency's actions relative to the work program. The Department of Community Affairs shall specifically request that the Florida Keys National Marine Sanctuary Water Quality Protection Program Steering Committee (Water Quality Steering Committee) take an active role to allocate funding or provide staff to monitor nearshore waters, as necessary, for nutrient reduction.

28-19.310 Comprehensive Plan.

(1) The Comprehensive Plan of of Islamorada, Village of Islands, as the same exists on January 1, 2011, is hereby amended to read as follows:

(2) Policy 1-3.1.1 Islamorada Work Program Conditions and Objectives.

(a). The number of permits issued annually for residential development under the Residential Building Permit Allocation System (BPAS) shall not exceed a total annual unit cap of 18 market rate units and 4 affordable housing units, plus any available unused BPAS allocations from the previous BPAS year. Unused BPAS allocations may be retained and made available only for affordable housing and Administrative Relief from BPAS year to BPAS year. Unused market rate allocations shall be available for Administrative Relief. Any unused affordable allocations will roll over to affordable housing. This BPAS allocation represents the total number of allocations for development that may be issued during a year. A BPAS year means the twelve-month period beginning on July 13.

(b) No exemptions or increases in the number of allocations may be allowed, other than that which may be expressly provided for in the comprehensive plan or for which there is an existing agreement as of September 27, 2005, for affordable housing between the Department and the local government in the area of critical state concern.

(c) Beginning November 30, 2011, the Village and the Department of Community Affairs shall annually report to the Administration Commission documenting the degree to which the work program objectives for the work program year have been achieved. The Commission shall consider the findings and recommendations provided in those reports and shall determine whether progress has been achieved toward accomplishing the tasks of the work

program. If the Commission determines that progress has not been made, the unit cap for residential development shall be reduced by at least 20 percent for the following year.

(d) Allocations and permits to construct a new development or redevelopment that requires a modification or a repair to the onsite sewage treatment and disposal system, per s. 381.0065(4)(1) and s. 403.086(10), F.S., and Rule 64E-6.001(4), F.A.C., shall not be issued unless the unit is connected to or will be connected to a central sewer system that has committed funding, a construction permit from the Department of Environmental Protection and the collection system is physically under construction or the unit has an onsite sewage treatment and disposal system that meets the treatment and disposal requirements of s. 381.0065(4)(1) and s. 403.086(10), F.S.

(e) Through the Permit Allocation Systems, Islamorada shall direct new growth and redevelopment to areas connected to or that will be connected to a central sewer system that has committed funding, a construction permit from the Department of Environmental Protection and is physically under construction. Prior to the ranking and approval of awards for an allocation authorizing development of new principal structures, the Village of Islamorada, shall coordinate with the central wastewater facility provider and shall increase an applicant's score by two points for parcels served by a collection line within a central wastewater facility service area where a central wastewater treatment facility has been constructed that meets the treatment standards of s. 381.0065(4)(1) and s. 403.086(10), F.S., and where treatment capacity is available. The points shall only be awarded if a design permit has been issued for the collection system and the parcel lies within the service area of the wastewater treatment facility.

(f) If the Commission determines that progress has been made for the work program year, then the Commission shall restore the unit cap for residential development for the following year up to a maximum of 28 allocations per BPAS year.

(g) Wastewater treatment and disposal in Islamorada is governed by the requirements of s. 381.0065(4)(1) and s. 403.086(10), F.S. Nothing in this rule shall be construed to limit the authority of the Department of Environmental Protection or Department of Health to enforce s. 381.0065(4)(1) and s. 403.086(10), F.S.

(g) Notwithstanding any other date set forth in this plan, the dates set forth in the work program shall control where conflicts exist.

### (3). Policy 2-1. 2.10 Hurricane Modeling

(a) For hurricane evacuation clearance time modeling purposes, clearance time shall begin when the Monroe County Emergency Management Coordinator issues the evacuation order for the permanent population for a category C-E hurricane event. The termination point shall be the intersection of U.S. Highway One and the Florida turnpike in Homestead/Florida City.

(3) WORK PROGRAM. Local government annual tasks to achieve progress are the remaining tasks of the Work Program from Rule 28-20.110, F.A.C. and Rule 28-19.310, F.A.C. Hurricane Evacuation tasks originate from Year 8, Task Q of the Work Program in Rule 28-20.110, F.A.C. Carrying Capacity & Habitat Protection tasks originate from Year 6, Task C; and Year 8, Task F of the Work Program in Rule 28-20.110, F.A.C. Wastewater tasks originate from Year 4, Task A; Year 6, Task A; Year 7, Task A of the Work Program in Rule 28-20.110, F.A.C.

#### (a) Carrying Capacity Implementation.

1. By July 1, 2011 and each July 1 thereafter, Islamorada shall evaluate its land acquisition needs and state and federal funding opportunities and apply to at least one state or federal land acquisition grant program.

2. By July 1, 2011, Islamorada shall enter into a memorandum of understanding with the Department of Community Affairs, Division of Emergency Management, Marathon, Islamorada, Key West, Key Colony Beach, and Layton after a notice, public workshop and comment period of at least 30 days for interested parties. The memorandum of understanding shall stipulate, based on professionally acceptable data and analysis, the input variables and assumptions, including regional considerations, for utilizing the Florida Keys Hurricane Evacuation Model or other models acceptable to the Department to accurately depict evacuation clearance times for the population of the Florida Keys.

3. By July 1, 2011, the Florida Keys Hurricane Evacuation Model shall be run with the agreed upon variables from the memorandum of understanding. Islamorada and the Department of Community Affairs shall update the data for the Florida Keys Hurricane Evacuation Model as professionally acceptable sources of information are released (such as the Census, American Communities Survey, Bureau of Business and Economic Research, and other studies). Islamorada shall also evaluate and address appropriate adjustments to the hurricane evacuation model within each Evaluation and Appraisal Report.

4. By July 1, 2011, Islamorada shall complete an analysis of maximum build-out capacity for the Florida Keys Area of Critical State Concern, consistent with the requirement to maintain a 24-hour evacuation clearance time and the Florida Keys Carrying Capacity Study constraints. This analysis shall be prepared in coordination with the Department of Community Affairs, Monroe County and each municipality in the Keys.

5. By July 1, 2011, the Department of Community Affairs shall apply the derived clearance time to assess and determine the remaining allocations for the Florida Keys Areas of Critical State Concern. The Department will recommend appropriate revisions to the Administration Commission regarding the allocation rates and distribution of allocations to Monroe County, Marathon, Islamorada, Key West, Layton and Key Colony Beach or identify alternative evacuation strategies that support the 24-hour evacuation clearance time. If necessary, Department of Community Affairs shall work with each local government to amend the Comprehensive Plans to reflect revised allocation rates and distributions or propose rule making to the Administration Commission.

6. By July 1, 2011, based on the Department of Community Affairs' recommendations, Islamorada shall amend the current building permit allocation system (BPAS in the Comprehensive Plan and Land Development Regulations) based on infrastructure availability, level of service standards, environmental carrying capacity constraints, and hurricane evacuation clearance time.

(b) Wastewater Implementation.

1. Beginning July 1, 2011 and each July 1 thereafter, Islamorada shall identify any funding for wastewater implementation. Islamorada shall identify any funding in the annual update to the Capital Improvements Element of the Comprehensive Plan.

2. By July 1, 2011, Islamorada shall provide a final determination of cold spots requiring upgrade to meet Sections 381.0065(4)(l) and 403.086(10), F.S., wastewater treatment and disposal standards. This shall be in the form of a resolution including a map of the non-service areas.

3. By July 1, 2011, Islamorada shall work with the owners of wastewater facilities and on site systems throughout the Village and the Department of Environmental Protection (DEP) and the Department of Health (DOH) to fulfill the requirements of s. 381.0065(4)(l), and s. 403.086(10), F.S., regarding wastewater treatment and disposal. This will include coordination of actions with DOH and DEP to notify owners regarding systems that will not meet 2015 treatment standards.

4. By March 2013, the Department of Health, Islamorada, and the City's wastewater provider shall explore possible mechanisms to provide upgrades and central management of onsite sewage treatment and disposal systems located in non-service areas and unfunded service areas of the City. The Department of Health will provide an update to the Department of Community Affairs describing the mechanisms discussed by the parties and the results of those discussions.

5. By July 1, 2011, Islamorada shall adopt an ordinance establishing the upgrade program with implementation dates, time frames, and enforcement for upgrading onsite systems and package plants in non-service areas.

6. By July 1, 2011 and by July 1 of each year thereafter, Islamorada shall evaluate its wastewater needs and state and federal funding opportunities and apply annually to at least one state or federal grant program for wastewater projects and connections.

7. By July 1, 2011, Islamorada shall develop and implement local funding programs necessary to timely fund wastewater construction and future operation, maintenance and replacement of facilities.

8. By July 1, 2011 and each July 1 thereafter through 2013, Islamorada shall annually draft a resolution requesting the issuance of a portion of the \$200 million of bonds authorized under s. 215.619, F.S., and an appropriation of sufficient debt service for those bonds, for the construction of wastewater projects within the Florida Keys.

9. By July 1, 2011 and each July 1 thereafter through 2013, Islamorada shall develop a mechanism to provide accurate and timely information and establish annual funding allocations necessary to support the issuance of bonds authorized under s. 215.619, F.S., and to assure the timely completion of work as necessary to fulfill any terms and conditions associated with bonds.

10. By July 1, 2013 and each July 1 thereafter, Islamorada shall provide a report of addresses and the property appraiser's parcel numbers of any property owner that fails or refuses to connect to the central sewer facility within the required timeframe to the Monroe County Health Department and the Department of Community Affairs. This report shall describe the status of enforcement action and provide the circumstances of why enforcement may or may not have been initiated. The Monroe County Department of Health and Department of Community Affairs may proceed with enforcement as necessary and appropriate.

(c) Wastewater Project Implementation.

1. By July 1, 2010, Islamorada shall finalize wastewater schedule and funding plan.

2. Environmental Protection Agency Decentralized Sewer Project.

a. By July 1, 2011, Islamorada shall award contract for design of system; and

b. By July 1, 2011, Islamorada shall advertise request for proposal to construct system; and

c. By July 1, 2011, Islamorada shall award contract for construction; and

- d. By July 1, 2011, Islamorada shall initiate construction; and
- e. By July 1, 2011, Islamorada shall complete construction; and
- f. By July 1, 2011, Islamorada shall connect to decentralized system.

3. Plantation Key Wastewater Treatment Facility.

a. By July 1, 2011, Islamorada shall complete an additional 700 connections (Phase II) to the North Plantation Key Wastewater Treatment Plant (WWTP); and

b. By July 1, 2011, Islamorada shall advertise request for proposal to obtain engineering services for the design of the South Plantation Key Wastewater Treatment Plant; and

c. By July 1, 2011, Islamorada shall award the contract for the design of the South Plantation Key wastewater treatment plant; and

d. By July 1, 2012, Islamorada shall finalize design of wastewater treatment plant; and

e. By July 1, 2012, Islamorada shall secure site for the South Plantation wastewater treatment plant; and

f. By July 1, 2012, Islamorada shall advertise for proposals for construction of wastewater treatment plant; and

g. By July 1, 2012, Islamorada shall award construction contract for wastewater treatment plant; and

h. By July 1, 2012, Islamorada shall complete construction of wastewater treatment plant; and

i. By July 1, 2012, Islamorada shall design the collection system; and

j. By July 1, 2012, Islamorada shall advertise for proposals for the construction of the collection system; and

k. By July 1, 2012, Islamorada shall award collection system construction contract; and

l. By July 1, 2013, Islamorada shall construct collection system; and

m. By July 1, 2013, Islamorada shall initiate connections to the treatment facility; and

n. By July 1, 2014, Islamorada shall complete connections (100%) to the treatment facility.

4. Lower Matecumbe Wastewater Treatment Facility.

a. By July 1, 2011, Islamorada shall advertise request for proposal to obtain engineering services for design of the Lower Matecumbe wastewater treatment plant; and

b. By July 1, 2011, Islamorada shall award contract for design of Lower Matecumbe wastewater treatment plant; and

c. By July 1, 2011, Islamorada shall initiate Lower Matecumbe wastewater treatment plant design; and

d. By July 1, 2012, Islamorada shall finalize design of Lower Matecumbe wastewater treatment plant; and

e. By July 1, 2012, Islamorada shall secure site for Lower Matecumbe wastewater treatment plant; and

f. By July 1, 2012, Islamorada shall advertise for proposals for construction of Lower Matecumbe wastewater treatment plant; and

g. By July 1, 2012, Islamorada shall award construction contract for Lower Matecumbe wastewater treatment plant; and

h. By July 1, 2012, Islamorada shall design Lower Matecumbe collection system; and

i. By July 1, 2012, Islamorada shall advertise for proposals for construction of Lower Matecumbe wastewater treatment plant; and

j. By July 1, 2012, Islamorada shall award Lower Matecumbe collection system construction contract; and



k. By July 1, 2012, Islamorada shall complete construction of Lower Matecumbe wastewater treatment plant;

and

l. By July 1, 2013, Islamorada shall construct Lower Matecumbe collection system; and

m. By July 1, 2013, Islamorada shall initiate connections to Lower Matecumbe treatment facility; and

n. By July 1, 2014, Islamorada shall complete connections (100%) to Lower Matecumbe treatment facility.

5. Upper Matecumbe Wastewater Treatment Facility.

a. By July 1, 2011, Islamorada shall advertise request for proposal to obtain engineering services for design of Upper Matecumbe wastewater treatment plant; and

b. By July 1, 2011, Islamorada shall award contract for design of Upper Matecumbe wastewater treatment plant; and

c. By July 1, 2011, Islamorada shall initiate Upper Matecumbe wastewater treatment plant design; and

d. By July 1, 2012, Islamorada shall finalize design of Upper Matecumbe wastewater treatment plant; and

e. By July 1, 2012, Islamorada shall secure site for Upper Matecumbe wastewater treatment plant; and

f. By July 1, 2012, Islamorada shall advertise for proposals for construction of Upper Matecumbe wastewater treatment plant; and

g. By July 1, 2012, Islamorada shall award construction contract for the Upper Matecumbe wastewater treatment plant; and

h. By July 1, 2013, Islamorada shall complete construction of the Upper Matecumbe wastewater treatment plant; and

i. By July 1, 2012, Islamorada shall design the Upper Matecumbe collection system; and

j. By July 1, 2012, Islamorada shall advertise for proposals for the construction of the Upper Matecumbe collection system; and

k. By July 1, 2012, Islamorada shall award the Upper Matecumbe collection system construction contract; and

l. By July 1, 2013, Islamorada shall initiate connections to the Upper Matecumbe treatment facility; and

m. By July 1, 2014, Islamorada shall complete connections (100%) to the Upper Matecumbe treatment facility.

6. Windley Wastewater Treatment Facility.

a. By July 1, 2011, Islamorada shall advertise request for proposal to obtain engineering services for design of the Windley wastewater treatment plant; and

b. By July 1, 2011, Islamorada shall award contract for design of the Windley wastewater treatment plant; and

c. By July 1, 2011, Islamorada shall initiate the Windley wastewater treatment plant design; and

d. By July 1, 2012, Islamorada shall complete design of the Windley wastewater treatment plant; and

e. By July 1, 2012, Islamorada shall advertise for proposals for construction of the Windley wastewater treatment plant; and

f. By July 1, 2012, Islamorada shall award construction contract for the Windley wastewater treatment plant; and

g. By July 1, 2013, Islamorada shall complete construction of the Windley wastewater treatment plant; and

h. By July 1, 2013, Islamorada shall design the Windley collection system; and

i. By July 1, 2013, Islamorada shall advertise request for proposals for the construction of the the Windley collection system; and

j. By July 1, 2013, Islamorada shall award the Windley collection system construction contract; and

k. By July 1, 2013, Islamorada shall construct the Windley collection system; and

l. By July 1, 2013, Islamorada shall initiate connections to the Windley treatment facility; and

m. By July 1, 2013, Islamorada shall complete 50% connections to the Windley treatment facility; and

n. By July 1, 2014, Islamorada shall Complete connections (100%) to the Windley treatment facility.



# Monroe County Hurricane Evacuation Clearance Time— Final Report

Reid Ewing, Ph.D.  
Professor of City and Metropolitan Planning  
University of Utah

## 1. Hurricane Evacuation Modeling Generally

The federal government, under FEMA, mandates that all states have comprehensive emergency operations plans for such disasters as hurricanes. The majority of states have a two-tiered approach to emergency planning and response. Evacuation planning, response, and recovery activities are done at the local level (either county or city) while the state is responsible for coordinating local emergency management activities and state-level law enforcement and transportation. The state emergency management agency in Florida plays a larger role in managing and developing evacuation plans than other states since the state of Florida is highly susceptible to hurricanes.

Evacuation models are used to estimate clearance time. Clearance time is the total time it will take to evacuate all anticipated evacuees from the vulnerable area following an evacuation order. Clearance time is calculated by adding the amount of time it takes residents of an area to prepare for an evacuation (mobilization response time) and the amount of time it takes them to leave the area (evacuation time).

Hurricane evacuation clearance times are used as emergency management tools throughout the state of Florida. However, in Monroe County only, estimated hurricane evacuation clearance times are also used for regulatory and growth management purposes. Specifically, since 1992, Monroe County has used clearance times to control the rate of growth in the county, with State of Florida oversight.

In 2005, the Monroe County Year 2010 Comprehensive Plan was amended to establish a three-phase evacuation process, as follows:

*Policy 216.1.8 In the event of a pending major hurricane (category 3-5) Monroe County shall implement the following staged/phased evacuation procedures to achieve and maintain an overall 24-hour hurricane evacuation clearance time for the resident population.*

November 8, 2010

*1. Approximately 48 hours in advance of tropical storm winds, a mandatory evacuation of non-residents, visitors, recreational vehicles (RV's), travel trailers, live-aboards (transient and non-transient), and military personnel from the Keys shall be initiated. State parks and campgrounds should be closed at this time or sooner and entry into the Florida Keys by non-residents should be strictly limited.*

*2. Approximately 36 hours in advance of tropical storm winds, a mandatory evacuation of mobile home residents, special needs residents, and hospital and nursing home patients from the Keys shall be initiated.*

*3. Approximately 30 hours in advance of tropical storm winds, a mandatory phased evacuation of permanent residents by evacuation zone (described below) shall be initiated. Existing evacuation zones are as follows:*

*a) Zone 1 – Key West, Stock Island and Key Haven to Boca Chica Bridge (MM 1-6)*

*b) Zone 2 – Boca Chica Bridge to West end of 7-mile Bridge (MM 6-40)*

*c) Zone 3 – West end of 7-Mile Bridge to West end of Long Boat Key Bridge (MM 40-63)*

*d) Zone 4 – West end of Long Boat Key Bridge to CR 905 and CR 905A intersection (MM 63-106.5)*

*e) Zone 5 – 905A to, and including Ocean Reef (MM 106.5–126.5)*

*The actual sequence of the evacuation by zones will vary depending on the individual storm.. The concepts embodied in this staged evacuation procedures should be embodied in the appropriate County operational Emergency Management Plans.*

*The evacuation plan shall be monitored and updated on an annual basis to reflect increases, decreases and or shifts in population; particularly the resident and non-resident populations. [9J-5.012(3)(c)4]*

Objective 101.2 of the Comprehensive Plan requires Monroe County to reduce hurricane clearance time to 24 hours by 2010. The Miller Model, developed specifically to estimate clearance time for the Florida Keys, has yet to be tested with a phased evacuation scenario to see if Monroe County meets this objective.

Our charge is to conduct such a test, while updating the model based on 2000 U.S. Census data, recent building permit data, the best available tourist data, all available hurricane survey results, realistic roadway link capacities, and other data that have become available since the last test. This report estimates clearance time under three-phase evacuation for a worst case Category 5 hurricane.

Clearly, estimated clearance time will vary with the assumptions made in the Miller Model update. The matrix in the Appendix at the end of this report sets forth the assumptions proposed by different agencies. This update is based on the assumptions in the Ewing column, which the author views as most realistic.

## Conventional Evacuation Models

Conventional hurricane models make use of traditional urban transportation models, the same models used in long-range transportation planning. There are more than 30 transportation modeling tools that have been used for evacuation modeling. In addition, there are also several specialized transportation planning models that were developed specifically for hurricane evacuation events, including ETIS, HEADSUP, and HURREVAC. These three models are described in more detail below.

There are three basic ways to model a traffic network: macro, micro and meso. The three models differ in terms of scale (geographic area) and the level of detail (how precise the analysis is). Therefore, “[u]nderstanding the potential of transportation modeling to support decision-making for evacuations hinges on identifying those decisions in the process that best lend themselves to the strengths of a particular modeling approach.”<sup>1</sup>

Macro models are able to represent a large geographic area such as an entire metropolitan area; however, these models cannot represent individual vehicles or people on the road network. A sub-category of macro models that are time sensitive, real-time decision support tools, are becoming increasingly popular.

Micro models represent only a portion of a road such as milemarkers along an interstate. These models are helpful in modeling smaller sections of a network such as a specific roadway corridor and are able to calculate precise results since individual vehicles are tracked on the network for a small segment of time (normally 1/10<sup>th</sup> of a second).

A third type of model, meso models, are able to represent larger geographic areas than micro models and at the same time are able to allow for more precise results than macro models. In addition, these models are able to represent individual roadway links and vehicles on a network; however, they are not able to represent individual lanes on each roadway segment.

HURREVAC is a macro model designed by the U.S. Army Corps of Engineers for FEMA to assess hurricane evacuation scenarios. The model estimates the amount of time it will take to evacuate an area and can be used to determine the best time to begin an evacuation. The model uses information from the National Hurricane Center, flood estimates from the SLOSH model, and information on the utility of all shelters in the area.

PBS&J developed the ETIS model following Hurricane Floyd. This is a macro-level modeling and analysis system which is primarily comprised of an Internet travel demand forecasting system. The system is able to predict congestion from evacuation traffic as well as traffic flows between states. It allows emergency officials to input the category of storm, the estimated participation rate, tourist occupancy rate, and destination percentages for the counties of concern. With such data, the model is able to output the level of congestion on major highways as well as tables of anticipated vehicle volumes.

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<sup>1</sup> Hardy, Matthew and Wunderlich, Karl. (2007). Evacuation Management Operations (EMO) Modeling Assessment: Transportation Modeling Inventory. Pg. 19.

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The Florida HEADSUP program is used to manage traffic proactively during an evacuation. Although HEADSUP uses the same information as ETIS, the program is more detailed and complete. The program is able to automatically process real-time traffic data from 27 strategically located traffic counters throughout Florida in order to analyze evacuation conditions and assist in emergency management decisions. The program is also able to run hourly dynamic travel demand forecasts, impact analyses of contraflow lanes, socio-economic statistics on evacuees, a map-based user interface, a traffic model that gradually loads evacuees onto the roadway network, and an archival capability which records when key events occurred during a hurricane evacuation.

The Florida Keys Hurricane Evacuation Model, widely known as the Miller Model, is a deterministic model that supplies a specific model output – clearance time – based on such inputs as the number of dwelling units and capacity of roadway links. Miller Consulting developed this hurricane evacuation model in 2000 to measure and analyze the unique characteristics of the Florida Keys and to determine the clearance time required to evacuate the Florida Keys up to Florida City, based on existing US 1 conditions.

The Miller Model was designed to model the behavior of residents and tourists in responding to a mandatory hurricane evacuation order in the Florida Keys and is able to test various scenarios in order to determine the clearance time for each scenario.

## **State-of-the-Art Evacuation Models**

Traditional urban transportation models are static. They do not take into account the dynamic changes that occur in travel behavior during the evacuation process. The static models assume stable conditions both in demand variables and traffic flows.

Haoqiang Fu and Chester Wilmot have developed a sequential logit dynamic travel demand model for hurricane evacuation. The model considers the evacuation order as a time-dependent variable rather than a static variable and thereby analyzes both the impact of the type and timing of evacuation orders. The model divides evacuation time into discrete intervals; the probability of a household evacuating in a particular interval is the product of the probability of evacuating in that time period and the product of the probability of not evacuating in all earlier time intervals. The model is also designed to test phased evacuation.

Fu and Wilmot used a small dataset from Southeast Louisiana from Hurricane Andrew to develop their dynamic model. Due to the limitations with the size of this dataset, Fu and Wilmot then estimated a similar sequential logit model using a larger dataset from South Carolina collected after Hurricane Floyd.

This model is considered state-of-the-art because it is able to analyze the impact of the type and timing of evacuation orders. Fu and Wilmot used the model to better understand household evacuation behavior under different evacuation order conditions. The model can also be used to study the impact of a variety of factors such as the type and location of the residence, and storm-specific characteristics such as wind speed, forward speed, and the path of the hurricane.

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Monroe County could benefit from developing a dynamic model for future hurricane evacuation updates. It would provide a more accurate measure of clearance time than the currently used evacuation response curves.

## **2. The 2001 Study**

While other modeling options exist and may be pursued in the future, time and budget limitations under our contract led to a decision to update a conventional model developed in the *2001 Keys Hurricane Evacuation Study* (the 2001 Study). The conventional model is widely referred to as the Miller Model. The model is a spreadsheet-based program executed in Microsoft Excel. The model is comprised of 39 Excel spreadsheets, 31 of which relate to individual roadway segments. The 31 roadway segments are defined by roadway cross-section, capacity, and mile markers. The model is deterministic, predicting evacuation movement link-by-link, in 2-minute increments, assuming a 30 mph average driving speed.

### **Clearance Time**

There are different definitions of clearance time, depending on the hurricane model that is utilized. The 2001 Study definition is:

"...the time required to clear the roadways of all vehicles evacuating in response to a hurricane situation. Clearance time begins when the first evacuating vehicle enters the road network and ends when the last evacuating vehicle reaches its destination."

This definition had to be modified to account for the phasing of evacuation and the tendency of some residents to evacuate spontaneously before an evacuation order is issued. "Clearance time" begins 36 hours prior to tropical force winds when mobile home residents are ordered to evacuate (at the beginning of Phase 2), and it ends when the last evacuating vehicle exits, or passes by the northbound entrance to Florida's Turnpike on US 1 in Florida City. For purposes of determining total time to safety for evacuating vehicles, the 2001 Study added Dade County travel time to Monroe County clearance time to reflect an approximate time to get from Florida City to the evacuation shelter at Florida International University (FIU). This additional time was assumed to be 30 minutes for Category 1-2 hurricanes, and 52 minutes for Category 3-5 hurricanes reflecting additional congestion under the worst case. As we are only interested in time to evacuate to Florida City, this update does not include this additional travel time.

### **Zone Structure**

When the 2001 Study was in process, a decision was made to delineate seven evacuation zones, as that was what the Monroe County's Emergency Management Division was using at the time. The Monroe County's Emergency Management Division has since transitioned to five hurricane evacuation zones. Moreover, the South Florida Regional Planning Council has opted to base the zone structure of its evacuation model on census geography, which simplifies model updates.

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For this application, we held to the seven-zone structure of the 2001 Study. The seven zones are defined by mile makers:

Table 1. Mile Marker Limits for each Evacuation Zone

	Evacuation Zone	Mile Marker
Lower Keys	1	0-13
	2	13-46
Middle Keys	3	46-64
Upper Keys	4	64-84
	5	84-95
	6	95-113
	7	106-ICWW

To update inputs to the Miller Model based on the 2000 Census, it was necessary to determine how census geography relates to the seven 2001 Study evacuation zones. We used a combination of maps provided in the *2001 Keys Hurricane Evacuation Study* and descriptions of the zonal boundaries to produce the following correspondence table (Table 2).

Table 2. Zone Structure for Updated Miller Model (2008)

Zone	Census Tract	Block Group	Percentage of Block Group in Zone
Zone 1 (Key West to Saddle Bunch Channel Bridge - mm 0-13)	9726	All block groups	100%
	9725	All block groups	100%
	9724	All block groups	100%
	9723	All block groups	100%
	9722	All block groups	100%
	9721	All block groups	100%
	9720	All block groups	100%
	9719	All block groups	100%
	9718	All block groups	100%
	9717	All block groups	100%
Zone 2 (Saddle Bunch Bridge to Knight Key Channel - mm 13-46)	9716	All block groups	100%
	9715	All block groups	100%
	9714	All block groups	100%
Zone 3 (Knight Key	9713	All block groups	100%



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Zone	Census Tract	Block Group	Percentage of Block Group in Zone
Channel to Long Key Viaduct - mm 46-64)	9712	All block groups	100%
	9711	All block groups	100%
	9710	2	100%
	9710	3	100%
Zone 4 (Long Key Viaduct to Whale Harbor Channel - mm 64-84)	9710	1	100%
	9709	1	40%
	9709	2	45%
	9709	3	100%
	9709	4	100%
	9709	5	100%
Zone 5 (Whale Harbor Channel to Milemarker 95 - mm 84-95)	9709	1	60%
	9709	2	55%
	9708	All block groups	100%
	9707	All block groups	100%
	9706	3	100%
Zone 6 (along U.S. 1 - mm 95-113)	9706	1	100%
	9706	2	100%
	9705	All block groups	100%
	9704	All block groups	100%
	9703	All block groups	100%
	9702	1	40%
	9702	3	60%
Zone 7 (along CR 905 - mm 106-ICWW)	9702	1	60%
	9702	2	100%
	9702	3	40%
	9701	All block groups	100%

## **Inputs**

The Miller Model requires the following inputs related to housing, evacuee behaviors, and road network performance.

- How many dwelling and tourist units exist in the evacuation area;
- What fraction of the dwelling and tourist units will be occupied at the time of evacuation;
- How many people will leave their dwellings to go someplace safer (i.e., evacuation rate or evacuation participation rate);
- When evacuees will leave, with respect to when evacuation orders are issued;
- What effect a policy of phased evacuation will have;
- Where the evacuees will go, in terms of ultimate destinations inside or outside the county;
- How many vehicles will be used in the evacuation;
- Where evacuating traffic will load onto the road network;
- How much background traffic will be using the road network at the same time;
- How much traffic can be handled by critical links in the road network;

The following chapter outlines sources of data, methods of estimation, and values for each of the above used in our update of the 2001 Study.

## **3. Update of the 2001 Study**

### **Numbers of Dwellings and Tourist Units**

#### **2001 Study**

Evacuating population comes from three types of units: 1) permanent dwelling units, 2) mobile home units, and 3) tourist units. The 2001 Study began with the official number of dwelling units as of 1990 from the U.S. Census. Monroe County Planning Department then provided numbers of new units based on certificates of occupancy (CO) issued each year. The number of COs was summed, cumulatively, from 1990 to 1999. After 1999, the methodology followed by the County shifted to the potential number of dwelling units available under the permitting guidelines of the Rate of Growth Ordinance (ROGO).

**Update**

The number of permanent dwelling units and mobile homes was determined from the 2000 U.S. Census, updated to reflect new dwellings occupied between 2000 and 2008 (see Tables 3 and 4). Permanent dwellings in 2000 included all census categories of permanent structures from single-family detached to multifamily with 50 or more units. Mobile homes included census categories of “mobile home” and “RV, boat, van, etc.” The decision to include the latter with the former was prompted by belief that permanent residents living in RVs (many in mobile home parks), boats, vans, etc. would behave more like mobile home residents than tourists in an evacuation.

Permit data for new residential units issued from 2000 through 2008 were provided by the Monroe County Building Department and the equivalent departments of the five incorporated cities in Monroe County—Key West, Islamorada, Key Colony Beach, Layton, and Marathon. Post-2000 unit counts were added to 2000 unit counts to obtain current estimates of dwelling units by evacuation zone.

Tourist unit data was collected from the Department of Profession and Business Regulation. This department licenses hotels, motels, bed and breakfasts, timeshares and vacation rental units – all of which were included in the update. The data from DPBR were geocoded by Bryan Davisson, the GIS Planner in Monroe County’s Growth Management Department.

Table 3. Permanent Dwelling Units in 2000, constructed and occupied between 2000-08, and total in 2008

Zone	2000	2000-08 Key West	2000-08 Islamorada	2000-08 Marathon	2000-08 Key Colony Beach	2000-08 Layton	2000-08 County	2008 Total
1	14,509	319					280	15,108
2	6,143						360	6,503
3	6,972			124	170		47	7,313
4	1,880					21	3	1,904
5	5,095		169				42	5,306
6	5,093						242	5,335
7	1,310						0	1,310
Total	41,002	319	169	124	170	21	974	42,779

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Table 4. Mobile Home Units in 2000, permitted between 2000 and 2008, and in 2008

Zone	2000	2000-08	2008
1	2,496		2,496
2	1,751		1,751
3	1,940		1,940
4	720	2	722
5	1,219	1	1,220
6	2,459	1	2,460
7	8		8
	10,593	4	10,597

Table 5. Tourist Units in 2008

Zone	2008 lodging	2008 vacation rental	2008 timeshare	2008 Total
1	8,148	0	0	8,148
2	491	23	0	514
3	2,997	29	19	3,045
4	1,734	2	1	1,737
5	576	0	0	576
6	1,960	3	14	1,977
7	36	0	19	55
	15,942	57	53	16,052

## Occupancy Rates

### 2001 Study

The Project Steering Committee (PSC) identified “% Occupancy of Dwelling Units” as a critical variable. The PSC used 1990 Census data to determine the occupancy rates during the month of April (when the Census data are collected).

For tourists, the occupancy rate utilized was from the 1991 Hurricane Evacuation Analysis of the Monroe County Comprehensive Plan and the 1995 update, both prepared by PBS&J. The occupancy was estimated as 45% on the low end and 75% on the upper end. The Project Steering Committee studied these numbers and decided to estimate the occupancy rate by subregion of the Keys. Actual rates, based on specific knowledge of the Project Steering Committee members, were used whenever available. For example,

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an occupancy rate of 72% was used for Key West since members knew that overall occupancy rate here was higher than the rest of the county.

### Update

Occupancy rates for permanent dwellings were determined by zone from the 2000 Census (see Table 6). Occupancy rates for the county as a whole appear to have declined by about 20 percent between the 2000 Census and the 2008 American Community Survey. We therefore produced a second set of occupancy rates, prorating 2000 occupancy rates by zone to account for this decline (see Table 6).

Table 6. Occupancy Rates for Permanent Dwellings and Mobile Homes (2000 and 2008 estimate)

Zone	Percent Occupied Housing Units – 2000 Census	Percent Occupied Housing Units – Adjusted for 2008 American Community Survey
1	84%	67%
2	67%	54%
3	59%	47%
4	44%	35%
5	58%	46%
6	65%	52%
7	34%	27%

To update tourist occupancy rates, we referred to Smith Travel Research’s latest Trend Report, submitted annually to Monroe County’s Tourist Development Council. Occupancy rates have remained relatively constant over the years. During the hurricane season (June 1 through November 30), July is the highest occupancy month, while September is the lowest. We used July 2008 values (see Table 7). This is a worst-case assumption, since the peak of Atlantic hurricane activity is in September, the month with the lowest occupancy.

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Table 7. Occupancy Rates for Tourist Units (July 2008)

Zone	Percentage Occupied Units
1 (Key West)	82%
2	71%
3	71%
4	71%
5	71%
6 (Key Largo)	77%
7	71%

## Evacuation Participation Rates

### 2001 Study

To estimate evacuation participation rates, the 2001 Study relied heavily on a survey conducted by Dr. Carnot Nelson in 1989. The assumed evacuation participation rates are shown in Tables 7 and 8. All are taken from Dr. Nelson's behavioral analysis, except participation rates for tourist units which were assumed to be 100%. Dr. Nelson had suggested lower numbers.

Nelson's survey was done before Hurricane Andrew, and it simply asked people what they intended to do in response to a number of hypothetical hurricane threats. Intended-response data may be unreliable predictors of actual evacuation behavior.

Much more information has become available since Nelson's pre-Andrew survey (Baker 2000):

- A University of Florida group conducted a survey following Andrew, not only asking what people did in Andrew, but also using the very same intended-response questions previously used by Nelson.
- James Mattson conducted a survey following Andrew, dealing with Andrew response and intended response in future storms.
- Dr. Earl Baker did a survey following Andrew for the National Science Foundation that documented response in Andrew, perceptions of vulnerability, confidence in construction, and intended responses in future threats.
- Following Georges, FIU conducted a survey documenting response to Georges as well as asking about certain subjects that could have a bearing on future response.
- Also following Georges, the Monroe County School Board had public school students take home a questionnaire asking what their households did in Georges.
- Dr. Earl Baker conducted interviews in the Lower Keys as part of a post-Georges survey for the Corps of Engineers and FEMA. It dealt with response to Georges

as well as vulnerability perception, concerns about traffic congestion, and future response.

- Dr. Earl Baker conducted an additional survey in the Lower Keys, dealing with response to Georges but also posing several hypothetical threat scenarios and evaluating the effect on intended response of roadway improvements and having refuges of last resort in Key West.
- Following Hurricane Ivan, a Post-Ivan Behavioral Analysis was prepared for the Federal Emergency Management Agency and the U.S. Army Corps of Engineers in September 2005. A total of 200 interviews were conducted in Monroe County. The questionnaire asked questions regarding evacuation decisions and behavior, home mitigation and/or preparation, household circumstances, economic impacts, and household information needs.
- The South Florida Behavioral Survey was conducted in 2007-2008 as part of Statewide Regional Evacuation Study Program. The primary aim of the survey was to provide data to assist in deriving evacuation behavioral assumptions for transportation and shelter analyses. In each non-coastal county of the state 150 interviews were conducted randomly by telephone. In each coastal county of the state, 400 interviews were conducted.

### **Baker Study**

Based on actual and intended responses to hurricanes, from several surveys after Hurricanes Georges, Andrew, and Irene, Professor Earl Baker at Florida State University derived most probable evacuation participation rates for a number of hurricane threat scenarios. Earl “Jay” Baker is an associate professor of geography and an expert in the field of hurricane evacuation. His research is focused on how people respond to warning and evacuation orders and how emergency managers are able to use forecasts to implement evacuation plans. He has studied peoples’ vulnerability perceptions and hurricane preparedness in most areas of the Gulf of Mexico and Atlantic coasts.

Table 8 provides Baker’s best estimates of participation rates for Category 5 storms approaching the Keys from the south, posing a greater risk to the Lower Keys. Table 8 also provides his best estimates of participation rates for storms at latitudes similar to Andrew, posing a greater risk to the Upper Keys. The table assumes mandatory evacuation orders and aggressive actions by public officials to educate the public about appropriate responses.

Table 8. Evacuation participation rate assumptions for Category 5 hurricanes approaching from different latitudes, aggressive mandatory evacuation ordered and improved public education regarding vulnerability (Baker 2000)

	from latitudes south of Key West	from latitudes similar to Andrew
Lower Keys	90	35
Middle Keys	95	95
Upper Keys	95	100

### South Florida Behavioral Survey

The 2008 South Florida Behavioral Survey asked whether respondents intended to evacuate their homes for some place safer if mandatory evacuation notices were issued due to potential flooding (see Table 9). The question was asked for both Category 3 and 5 hurricanes. Results weren't presented for Category 4 hurricanes. The Category 5 results are most relevant to this worst-case analysis.

Table 9. Would Leave Home if Mandatory Evacuation Notice is Given for a Category 5 Hurricane

	N	Yes	No	Don't know/depends	Yes plus Don't know/depends
Monroe	400	88%	8%	4%	92%
Key West	100	89%	9%	3%	92%
Lower Keys	100	91%	6%	3%	94%
Middle Keys	100	90%	7%	3%	93%
Upper Keys	100	84%	8%	8%	92%

Perhaps a better predictor of evacuation participation than intended response to hurricanes is perceived vulnerability to both wind and water in hurricanes of different intensities. Table 10 reports Monroe County responses to the question of whether respondents would remain safe in a Category 4 hurricane (Category 5 results weren't released).



Table 10. Safe from Wind and Water in a Category 4 Hurricane

	N	Yes	No	Don't know/depends
Monroe	400	15%	80%	5%
Key West	100	19%	76%	4%
Lower Keys	100	11%	81%	7%
Middle Keys	100	15%	83%	1%
Upper Keys	100	13%	79%	8%

Monroe County residents were also asked if they left home during Hurricanes Georges (a Category 2), Ivan (a tropical depression as it approached Florida), and Wilma (a Category 2 hurricane in Monroe County). Hurricane Georges prompted 38% of households in the Monroe County region to evacuate, with the Middle Keys reporting the highest participation (50%). Hurricane Ivan caused 28% of households in Monroe County region to evacuate, with the Upper Keys reporting the highest participation (34%). Hurricane Wilma caused 32% of households in Monroe County to evacuate, with the Lower Keys reporting the highest participation (37%). These results are for low-intensity hurricanes; no Category 4-5 hurricanes have hit the Keys in recent years.

**Update**

The worst case is a Category 5 hurricane that approaches from latitudes below Key West, with aggressive mandatory evacuation ordered and improved public education regarding vulnerability (see Table 11). Baker suggests that 90-95% of residents might evacuate under such circumstances. While no clear geographic pattern of evacuation compliance emerges from the various surveys, we will go an upper bound evacuation participation rate equal to Baker's recommended rates. In this worse case, a 100% evacuation rate will be assumed for mobile home and tourist units.

Actual evacuation rates during past hurricanes have reportedly been much lower than this worst case. True, these were less intense hurricanes than posited here, but it seems likely that respondents overstate their willingness to evacuate when asked to speculate in surveys. We will therefore conduct a sensitivity test of clearance time, assuming a lower bound evacuation participation rate of 70-75% for permanent dwellings in response to a more typical hurricane.

Table 11. Category 5 Storm Evacuation Participation Rates

	Mobile Homes	Tourist Units	Other Units
Lower Keys (Zones 1 & 2)	100%	100%	70-90%
Middle Keys (Zone 3)	100%	100%	75-95%
Upper Keys (Zones 4, 5, 6 & 7)	100%	100%	75-95%

## Evacuation Timing

Evacuation timing refers to when evacuees depart their residences. While some spontaneous evacuation occurs, it is unusual for more than 15% of the eventual evacuees to have departed before officials issue evacuation orders. Departures then occur depending upon the urgency perceived by evacuees.

### 2001 Study

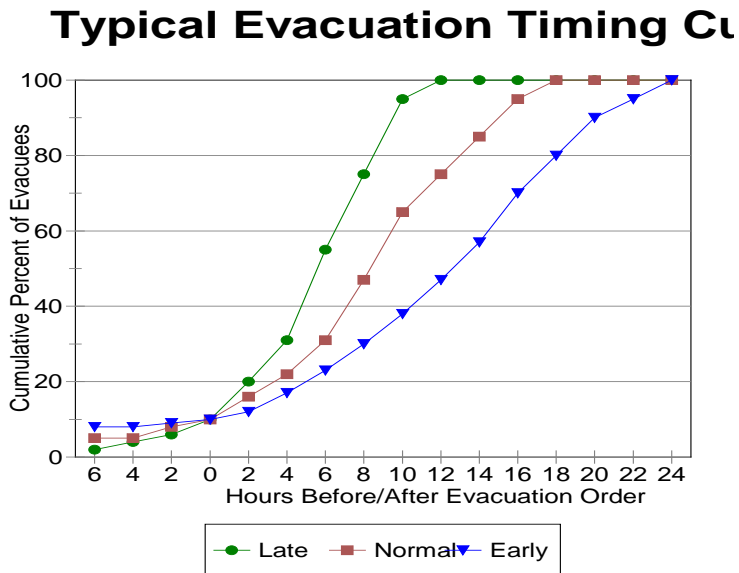
The 2001 Study uses tables to represent the rate at which evacuating traffic enters U.S. 1. The exact number of hours over which the traffic is loaded is not terribly important. The main thing is that the scenarios reflect a range of plausible response distributions, based on the timing of evacuation orders prior to landfall, to assess the sensitivity of clearance times to those variations.

The 2001 response curves don't reflect the fact that some evacuees will leave before an evacuation order is issued. That is clearly wrong. Dr. Baker calls 10% spontaneous evacuation a conservative figure.

### Baker Study

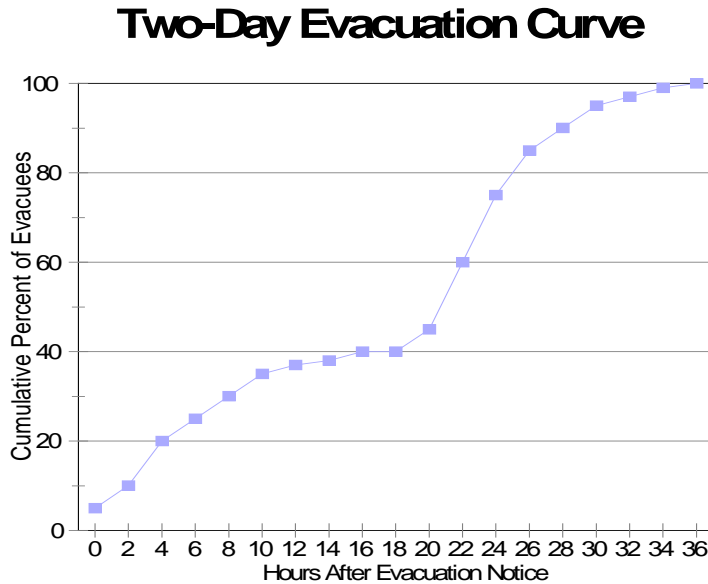
Dr. Baker developed the curves in Figure 1. They indicate how promptly evacuees depart when evacuation orders are issued under three scenarios of urgency. "Late, normal, and early" refer to when evacuation orders were issued relative to expected arrival of a hurricane. These curves assume 10% spontaneous evacuation even before the evacuation order is issued.

Figure 1. Early, normal, and late evacuation timing curves



Based on evacuation response to Hurricanes George and Andrew, Baker developed the two-day curve in Figure 2. This response curve accounts for early evacuees even before evacuation orders are issued. At least for strong hurricanes, Baker concluded that such a curve could apply to Monroe County.

Figure 2. Two-day evacuation timing response curve



### Update

The three Baker curves in Figure 1 seem most applicable to evacuation scenarios for Monroe County, where a mandatory evacuation order is issued early, at a normal time, or late. The fact that Baker provides three different curves allows us to perform sensitivity tests on evacuation timing assumptions.

One anomaly associated with the Baker curves is that the clearance time cannot be less than 24 hours when an evacuation order is issued early, which is arguably the scenario which involves the least risk to the public. Therefore, in assessing clearance time, primary emphasis will be placed on the late response scenario.

## **Effect of Phased Evacuation**

### **2001 Study**

In the 2001 Study, all residents and tourists were assumed evacuate at the same time.

### **Update**

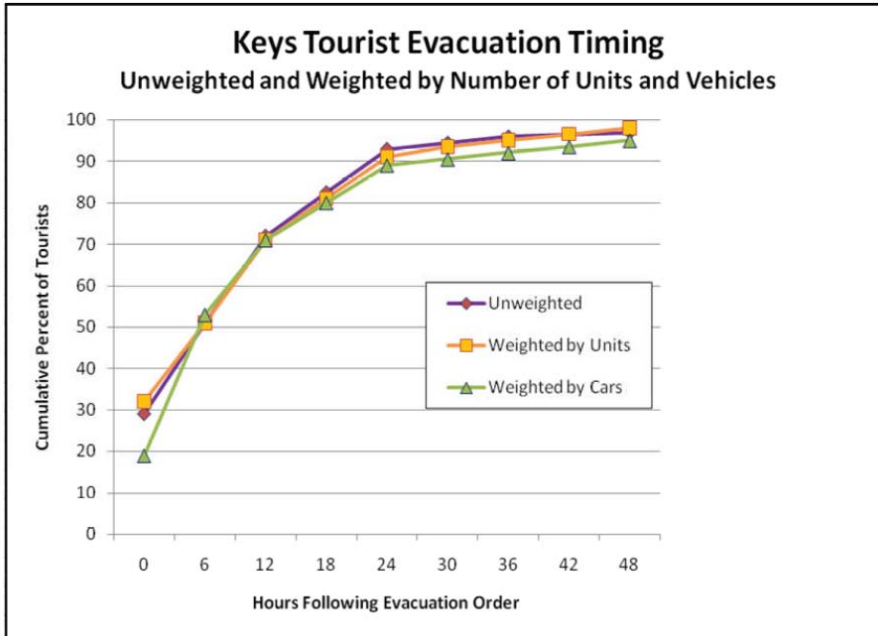
In 2005, Monroe County adopted a mandatory phased evacuation policy as part of the update of its comprehensive plan. This phased evacuation requires that all tourists, recreational vehicles, military and live aboard vessels begin to evacuate from the county 48 hours in advance of tropical force winds. Next, mobile homes and special needs residents will receive the order to evacuate 36 hours in advance of tropical force winds. Last, the residents living in permanent dwelling units will receive the order to leave 30 hours in advance of these winds.

The Miller Model had not been used to test phased evacuations before and therefore needed to be adapted. This was done by having separate response curves and trip tables for mobile home residents and permanent dwelling unit residents, with a six hour lag between the former and the latter. The two groups of evacuees are added together where their response curves and trip tables overlapped. The Miller Model had to be significantly modified to represent a phased evacuation.

Both groups of residents were assumed to evacuate according to Dr. Baker's late response curve in Figure 1, with overlap between the two groups starting at 30 hours prior to tropical force winds. Essentially, since the late response curves show evacuees leaving home over approximately a 12 hour period, there is six hours of overlap in departures between the groups. Of course, after that, they are on the road together for the remainder of the evacuation trip.

Handling tourist evacuees involved a judgment call. Under phased evacuation, the tourist evacuation order will be issued 48 hours before tropical force winds, or 12 hours before the evacuation order for mobile home residents. Dr. Baker's most recent report, based on 2009 surveys of hotels, motels, resorts, bed and breakfasts, seasonal housing rentals, and recreational vehicle parks, suggests that 30 percent of tourists evacuate spontaneously before the order is issued, and another 40 percent of tourists evacuate in the first 12 hours after the order (see Figure 3). This leaves 30 percent of tourists to evacuate at the same time as the mobile home park residents. To simplify the model calculations, this 30 percent of tourists was simply added to the mobile home park total and assumed to evacuate following the same response curve.

Figure 3. Tourist Evacuation Timing



Source: Earl J. Baker, Behavioral Assumptions for Hurricane Evacuation Planning in Monroe County, prepared for the Department of Community Affairs, September 2009, p. 4.

## Destinations

### 2001 Study

Based on Dr. Nelson’s research, the 2001 Study had four possible destinations for the resident evacuees: 1) Monroe County public shelter, 2) Monroe County motel, 3) Monroe County friend or relative, and 4) Out of Monroe County.

### Baker Study

Based on several surveys of actual and intended behavior after Hurricanes Georges and Andrew, the Baker 2000 report indicates the most likely percentage of evacuees from the three different areas of the Keys who will go to destinations outside of Monroe County for different categories of storm intensity (see Table 12).

Table 12. Planning assumptions for percent of evacuees leaving Monroe County, aggressive mandatory evacuation ordered throughout Monroe County for all categories

	Cat 3-4	Cat 5
Lower Keys	80	90
Middle Keys	90	95
Upper Keys	95	100

**South Florida Behavioral Survey**

The 2008 survey asked respondents where they would go if they evacuated for hurricanes of different intensities. Results for Category 5 hurricanes are shown in Table 13.

Table 13. Evacuation Destination (Category 5)

	N	Own neighborhood	Own county	Someplace else in Florida	Someplace outside Florida	Don't know
Monroe	304	3%	7%	65%	17%	8%
Key West	72	7%	13%	52%	14%	14%
Lower Keys	79	2%	7%	69%	19%	3%
Middle Keys	77	1%	1%	71%	21%	6%
Upper Keys	76	2%	6%	68%	15%	8%

Data are available on the destinations of evacuees during three previous hurricanes (Tables 14-16). The great majority of evacuees leave the county. Residents of Key West are most likely to leave the county, while residents of the Upper Keys are least likely to leave the county (though a majority still do).

Table 14. Destinations of Evacuees (Hurricane Georges)

	N	Own neighborhood	Own county	Someplace else in Florida	Someplace outside Florida	Don't know
Monroe	80	3%	15%	75%	6%	1%
Key West	20	2%	5%	91%	1%	0%
Lower Keys	18	0%	2%	68%	25%	5%
Middle Keys	26	1%	19%	79%	1%	0%
Upper Keys	16	8%	37%	46%	8%	0%

Table 15. Destinations of Evacuees (Hurricane Ivan)

	N	Own neighborhood	Own county	Someplace else in Florida	Someplace outside Florida	Don't know
Monroe	84	1%	10%	76%	12%	2%
Key West	22	0%	3%	93%	4%	0%
Lower Keys	25	5%	1%	75%	9%	10%
Middle Keys	17	0%	8%	79%	12%	0%
Upper Keys	20	0%	24%	56%	20%	0%

Table 16. Destinations of Evacuees (Hurricane Wilma)

	N	Own neighborhood	Own county	Someplace else in Florida	Someplace outside Florida	Don't know
Monroe	82	1%	11%	81%	5%	0%
Key West	20	4%	4%	91%	1%	0%
Lower Keys	27	0%	3%	84%	11%	2%
Middle Keys	13	0%	11%	89%	0%	0%
Upper Keys	22	0%	30%	62%	8%	0%

**Update**

The survey data indicate that the majority of evacuees from Monroe County would leave the county and evacuate to another county within the state of Florida. Beyond this generalization, the data are difficult to interpret.

The intended response and actual response questions point in different directions, with the percentages intending to leave the county increasing as you move north from the Lower Keys to Middle Keys to Upper Keys. But the percentages actually leaving during past hurricanes decrease as you move north. Most likely the small numbers of evacuees during past hurricanes are atypical of the larger populations. We will assume that 90% of evacuating residents from Lower Keys (Zones 1 and 2) will leave the county, that 95% of evacuating residents from the Middle Keys (Zone 3) will leave the county, and that 100% of evacuating residents from the Upper Keys (Zones 4 through 7) will leave the county. These assumptions are in line with Dr. Baker's recommendations and the original Miller model. 100% of tourists are assumed to leave the county.

## Vehicle Use

Not all vehicles available to households are used in evacuations. Vehicle use is predicted well by hypothetical response data.

### 2001 Study

The source of the vehicle usage rates used in the 2001 Study is not specified. It was assumed that 69 to 71% of available vehicles would be used.

### Baker Study

Dr. Baker states that the normal range for vehicle usage is 65% to 75%. Based on behavior during Hurricane Georges, the Baker 2000 report recommended that for planning purposes, it be assumed that 70% of the vehicles available to evacuating households will be used, and 10% of those households will pull a camper, trailer, or boat or take a motor home.

### South Florida Behavioral Survey

The 2008 survey asked how many vehicles would be available to a household that could be used to evacuate, and how many vehicles would a household take if they evacuated? As can be seen from Table 30, the percent of available vehicles that would be used in an evacuation varies from a low of 72% in the Lower Keys to a high of 91% in Key West.

Table 30. Vehicle Availability and Use During an Evacuation

	N	Available vehicles	Vehicles used in evacuation	% of available vehicles used in evacuation	% of households with no vehicle
Monroe	400	1.9	1.4	81%	5%
Key West	100	1.5	1.5	91%	10%
Lower Keys	100	2.6	1.3	72%	2%
Middle Keys	100	1.8	1.3	79%	2%
Upper Keys	100	1.8	1.4	80%	3%

### Update

The South Florida survey data are the most recent, and we believe the most accurate data available. The one exception is the very high vehicle usage rate for residents of Key West, out of line with all the other data available. Baker reports that residents of Key West used 1.11 vehicles per evacuating household during Hurricane Georges. That amounts to about 80% of the vehicles owned by households in Key West. We therefore



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assumed the following vehicle usage rates for residents: 80% vehicle usage for Key West (Zone 1); 72% vehicle usage for the rest of the Lower Keys (Zone 2); 79% vehicle usage for the Middle Keys (Zone 3); and 80% vehicle usage for the Upper Keys (Zones 4-7). We assumed 100% vehicle usage rates for tourists.

## **Background Traffic**

Background traffic is the measure of vehicles using the roadways for reasons other than hurricane evacuation. The 2001 Study defines background traffic as including: out-of-County traffic (business trips and recreational trips), non-evacuating vehicles conducting hurricane preparation trips, typical day commuting trips, etc. In sum, this traffic is comprised of non-evacuating vehicles on the road.

Background traffic increases the level of traffic on the roadway system and therefore, has a direct effect on clearance time. This traffic is comprised of non-evacuating traffic and includes trips to run errands and buy hurricane supplies.

### **2001 Study**

The 2001 Study used approximations of background traffic based on recorded traffic volumes. This background traffic affects processing time through each of the 31 links and, eventually, this background traffic declines as the evacuation occurs and decreases to zero background vehicles at the end of the evacuation. For example, if a 12 hour response curve is selected for modeling purposes, the background traffic is 100% of the actual recorded count at hour one of the evacuation and zero at hour 12. A uniform distribution is assumed for the rate of decline of the background traffic.

### **Update**

We have no basis for refinement of the 2001 Study background traffic assumptions.

## **Number and Capacity of Critical Links**

### **2001 Study**

The Miller Model has 31 outbound evacuating links. It relies on the critical link concept. This concept means that the evacuation time is mainly affected by the link with the highest demand to service volume ratio. This link experiences the longest delay due to the overload of evacuating vehicles. This link, the critical link, is not static and can shift due to either demand changing by link or from capacity improvements to a link.

A critical variable in the determination of evacuation time is the assumed capacity of roadway links. The Miller Model takes the capacity of uninterrupted flow highways (essentially freeway quality roads) and makes downward adjustments to account for driveways and intersections. There are two potential problems with this procedure. First,

U.S. 1 isn't an uninterrupted flow facility but rather a state signalized arterial, whose capacity is determined using different formulas. Second, the downward adjustments are essentially arbitrary as opposed to empirically based.

**Update**

The Florida Department of Transportation (FDOT) has recommended updates to the 2001 Study to reflect the addition of auxiliary lanes and evacuation shoulders. These additions include:

- a. Completed projects from Table 18 of the 2001 Keys Evacuation Study
- b. Projects under construction from Table 18 of the 2001 Study
- c. Projects funded in the current work program from Table 18 in the 2001 Study

Table 31 compares the number of functional evacuation lanes in the original Miller model to and the number in the FDOT update. There will be substantial functional capacity added to critical links by 2015.

Based on the concept of “maximum sustainable evacuation traffic flow rates,” FDOT has recommended a reduction the 2001 Study flow rates for several links. The recommended rates take into account site-specific capacity studies, observational studies of actual hurricane evacuations, and traffic simulation runs. The FDOT rates are the best available. Values are compared in Table 31.

Table 31. Maximum Sustainable Flow Rates per Hour

Link Name	Milemarkers		2001 Functional Evacuation Lanes	2015 Functional Evacuation Lanes	2001 Flow Rates		2010 FDOT Flow Rates	
	From	To			Per Lane	Total	Per Lane	Total
A1	2.0	4.0	2	2	900	1,800	900	1,800
A2	4.0	9.0	2	2	900	1,800	900	1,800
B	9.0	17.0	1	1	1,350	1,350	1,100	1,100
C	17.0	22.0	1	1	1,350	1,350	1,100	1,100
D1	22.0	24.0	1	1	1,350	1,350	1,100	1,100
D2	24.0	25.0	1	1	1,350	1,350	1,100	1,100
D3	25.0	30.0	1	1	1,350	1,350	1,100	1,100
E	30.0	34.0	1	2	1,050	1,050	1,050	2,100
F1	34.0	35.2	1	1	1,350	1,350	1,100	1,100
F2	35.2	36.5	2	2	1,350	2,700	1,100	2,200
F3	36.5	37.5	1	1	1,350	1,350	1,100	1,100
G	37.5	47.0	1	1	1,500	1,500	1,200	1,200
H1	47.0	48.0	1	2	1,350	1,350	1,100	2,200
H2	48.0	50.2	2	2	900	1,800	900	1,800
I1	50.2	50.8	2	2	900	1,800	900	1,800

Link Name	Milemarkers		2001 Functional Evacuation Lanes	2015 Functional Evacuation Lanes	2001 Flow Rates		2010 FDOT Flow Rates	
	From	To			Per Lane	Total	Per Lane	Total
I2	50.8	54.0	2	2	900	1,800	900	1,800
J1	54.0	54.5	2	2	900	1,800	900	1,800
J2	54.5	58.0	1	2	1,350	1,350	1,100	2,200
K	58.0	74.0	1	2	1,350	1,350	1,100	2,200
L	74.0	80.0	1	2	1,350	1,350	1,100	2,200
M1	80.0	83.5	1	2	1,350	1,350	1,100	2,200
M2	83.5	85.6	1	2	1,350	1,350	1,100	2,200
N	85.6	90.0	1	2	1,350	1,350	1,100	2,200
O	90.0	100.0	2	3	900	1,800	900	2,700
P	100.0	105.0	2	3	900	1,800	900	2,700
Q	105.0	106.3	2	3	900	1,800	900	2,700
R1	106.3	126.5	1	2	1,500	1,500	1,200	2,400
R2	126.5	HEFT	2	3	900	1,800	900	2,700
S	106.3	Int CR 905 / CR 905 A	1	1	1,350	1,350	1,100	1,100
T	Ocean Reef	Int CR 905 / CR 905 A	1	1	1,350	1,350	1,100	1,100
U	Int CR 905 / CR 905 A	US 1	1	1	1,350	1,350	1,100	1,100

## Additional Clearance Time to Reach Shelter

### Miller Model

The Miller Model added a fixed 30 minutes (category 1 or 2) and fixed 52 minutes (category 3-5) to the clearance time for the trip from Florida City to the public shelter at FIU. One of the weaknesses of the Miller Model is that it assumes a fixed time for all vehicles to travel to the FIU shelter and it does not include the effects of traffic from Miami-Dade County. The South Florida Regional Planning Council was charged with creating a model to address this deficiency. However, that model is not available at the time of this writing.

### Updated Miller Model

Following an administrative law judge's opinion, where an opposing counsel challenged the end point of evacuation, the end point for hurricane evacuation clearance time estimates is the beginning of the Florida Turnpike in Florida City. The Department of

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Community Affairs concurs with this end point for Hurricane Evacuation Clearance Time modeling. Therefore the final clearance time estimates do not include the 30/52 minutes to travel from Florida City to FIU.

## **Clearance Time Estimates**

Table 32 provides clearance times for 12 different scenarios. The 2000 occupancies are those in the first column of Table 6. They reflect occupancies at the time of the 2000 Census. The 2008 occupancies reflect a downward adjustment in occupancies county-wide according to the 2008 American Community Survey.

The low participation rates are the suggested lower bound rates for permanent dwelling units in a Category 5 hurricane coming from the southeast (70-75%). The high participation rates are the suggested upper bound rates for the same scenario (90-95%).

The three maximum flow assumptions are those associated with the original Miller Model (2001 lane configuration with Miller maximum flow rates), a combination of Miller and FDOT assumptions (2001 lane configuration with FDOT maximum flow rates), and the FDOT update (2015 lane configuration with FDOT maximum flow rates).

Clearance time is measured from the time of the evacuation order for permanent dwelling unit residents until the last evacuating vehicle reaches Florida City. The updated Miller Model puts time zero at 36 hours before tropical force winds, when the evacuation order is issued for mobile home residents. Therefore, we subtracted six hours from the Miller Model clearance time outputs to arrive at clearance times relative to the evacuation order for permanent dwelling residents.

The longest clearance times are, of course, associated with the 2001 lane configuration and the lower FDOT maximum flow rates. The shortest are associated with the 2015 lane configuration, which includes additional lanes compared to 2001, and the FDOT maximum flow rates. Clearance times associated with the 2001 lane configuration and Miller's higher flow rates are intermediate.

The difference between these clearance time estimates and those in my report of September 17, 2010 are due entirely to the exclusion of travel time from Florida City to the FIU shelter in these most recent estimates. The earlier report erroneously said that a fixed 52 minutes had been added to the Miller Model's clearance time estimates to account for this last leg of the evacuation. In fact, 52 minutes were added to the clearance time for the "High Participation" scenario but only 30 minutes were added to the clearance time for the "Low Participation" scenario, in keeping with the reduced traffic volumes. My apologies for this erroneous statement.

The reader will note that using a simple model like the Miller Model, based on fixed capacities and speeds on the different links, clearance time is not sensitive to the assumed participation rate because there is ample capacity to handle the additional traffic with the additional lanes constructed or planned by FDOT. The clearance time reflects unimpeded travel by the last evacuating vehicle from Key West to Florida City.

Table 32. Clearance Times (relative to the permanent unit evacuation order)

	Low Occupancies (2001) Occupancy by Zone 1=67%; 2=54%; 3=47%; 4=35%; 5=46%; 6=52%; 7=27%		High Occupancies (2008) Occupancy by Zone 1=84%; 2=67%; 3=59%; 4=44%; 5=58%; 6=65%; 7=34%	
	Low Participation Approx 70%	High Participation Approx 90-95%	Low Participation Approx 70%	High Participation Approx 90-95%
2001 Lanes/2001 Miller Flow Rates	16 hours 16 minutes	18 hours 50 minutes	18 hours 32 minutes	22 hours 6 minutes
2001 Lanes/2010 FDOT Flow Rates	18 hours 58 minutes	22 hours 28 minutes	22 hours 8 minutes	27 hours 2 minutes
2015 Lanes/2010 FDOT Flow Rates	16 hours 16 minutes	16 hours 16 minutes	16 hours 16 minutes	18 hours 40 minutes
2015 Lanes/2010 FDOT Flow Rates (without outbound shoulder from mm 90 to mm 106)	16 hours 16 minutes	17 hours 16 minutes	17 hours 4 minutes	20 hours 16 minutes

## Appendix

	PBS&J Hurricane Evacuation Analysis Dec. 1991 (1990 Census)	2000 Miller Model (1990 Census & PSC) Final Report in 2001	2004 Miller Update (2000 Census)	2008 Statewide Regional Evacuation Study Program South Florida Behavioral Survey Report		Ken Metcalf Miller Model Analysis - Summary of 2000 Census	Reid Ewing Recommendations Report
	Same behavioral parameters of 1989 ACOE study			Sample size (n=400)			
	7 evac zones	7 evac zones	7 evac zones			7 evac zones	
Number of People per M.H. Unit	Zone 1 - 2.44 2 - 2.31 3 - 2.25 4 - 1.97 5 - 2.27 6 - 2.27 7 - 2.11	Zone 1 - 2.44 2 - 2.31 3 - 2.25 4 - 1.97 5 - 2.27 6 - 2.27 7 - 2.11	Zone 1 - 2.44 2 - 2.31 3 - 2.25 4 - 1.97 5 - 2.27 6 - 2.27 7 - 2.11				Zone 1 - 2.35 2 - 2.21 3 - 2.18 4 - 2.08 5 - 2.27 6 - 2.27 7 - 1.74
Number of People per Permanent Unit	Zone 1 - 2.44 2 - 2.31 3 - 2.25 4 - 1.97 5 - 2.27 6 - 2.27 7 - 2.11	Zone 1 - 2.44 2 - 2.31 3 - 2.25 4 - 1.97 5 - 2.27 6 - 2.27 7 - 2.11	Zone 1 - 2.44 2 - 2.31 3 - 2.25 4 - 1.97 5 - 2.27 6 - 2.27 7 - 2.11				Zone 1 - 2.35 2 - 2.21 3 - 2.18 4 - 2.08 5 - 2.27 6 - 2.27 7 - 1.74
Number of People per Tourist Unit	Zone 1 - 2.90 2 - 3.76 3 - 2.75 4 - 2.53 5 - 12.80 6 - 12.90 7 - 12.90	Zone 1 - 2.90 2 - 3.76 3 - 2.75 4 - 2.53 5 - 3.00 6 - 3.00 7 - 3.00	Zone 1 - 2.90 2 - 3.76 3 - 2.75 4 - 2.53 5 - 3.00 6 - 3.00 7 - 3.00				Zone 1 - 2.90 2 - 3.76 3 - 2.75 4 - 2.53 5 - 3.00 6 - 3.00 7 - 3.00
Number of Vehicles per Unit	Zone 1 - 1.80 2 - 1.80 3 - 1.82 4 - 2.00 5 - 2.00 6 - 2.00 7 - 2.00	1 - 1.35 2 - 1.76  3 - 1.39 4 - 1.65 5 - 1.76 6 - 1.61	1 - 1.36 2 - 1.74  3 - 1.56 4 - 1.65 5 - 1.71 6 - 1.83	Key West 1.5  Lower 2.6  Middle 1.8  Upper 1.8  (available	Key West 1.5  Lower 1.3  Middle 1.3  Upper 1.4  (vehicles	Vehicle/occupied unit Zone 1 - 1.36 2 - 1.73 3 - 1.56 4 - 1.63 5 - 1.69 6 - 1.83 7 - 1.43	1 - 1.36 2 - 1.73  3 - 1.60 4 - 1.34 5 - 1.75 6 - 1.83

	PBS&J Hurricane Evacuation Analysis Dec. 1991 (1990)	2000 Miller Model (1990 Census &)	2004 Miller Update (2000 Census)	2008 Statewide Regional Evacuation Study Program South Florida Behavioral		Ken Metcalf Miller Model Analysis -	Reid Ewing Recommendations Report
		7 - 1.58	7 - 1.43	vehicles - page 65)	used in evacuation - page 65)		7 - 1.44
Number of Vehicles per Tourist Unit	Zone 1 - 1.04 2 - 1.04 3 - 1.05 4 - 1.10 5 - 1.10 6 - 1.10 7 - 1.10	1 - 1.04 2 - 1.04 3 - 1.05 4 - 1.10 5 - 1.10 6 - 1.10 7 - 1.10	Zone 1 - 1.04 2 - 1.04 3 - 1.05 4 - 1.10 5 - 1.10 6 - 1.10 7 - 1.10				Zone 1 - 0.83 2 - 1.23 3 - 1.23 4 - 1.13 5 - 1.13 6 - 1.55 7 - 1.55
% Participation of M.H. Units	95%	95%	95%				100%
% Participation of Other Units	60% lower keys (1 & 2) 80% middle keys (3) 85% upper keys (4-7)	Zone 1 - 60% 2 - 60% 3 - 80% 4 - 85% 5 - 85% 6 - 85% 7 - 85%	Zone 1 - 60% 2 - 60% 3 - 80% 4 - 85% 5 - 85% 6 - 85% 7 - 85%	Would leave if mandatory evacuation notice is given for a Cat 3 Hurricane (page 36) Key West 77% Lower 69% Middle 74% Upper 71%	Would leave if mandatory evacuation notice is given for a Cat 5 Hurricane (page 36) Key West 89% Lower 91% Middle 90% Upper 84%		Zone 1 - 70-90% 2 - 70-90% 3 - 75-95% 4 - 75-95% 5 - 75-95% 6 - 75-95% 7 - 75-95% Category 5 Storm
% Occupancy of Dwelling Units		Zone 1 - 86% 2 - 71% 3 - 69% 4 - 57% 5 - 66% 6 - 65% 7 - 42%	Zone 1 - 84.10% 2 - 66.85% 3 - 58.95% 4 - 45.43% 5 - 57.99% 6 - 66.37% 7 - 32.84%			Zone 1 - 83.5% 2 - 69.8% 3 - 56.6% 4 - 47.9% 5 - 60.2% 6 - 67.6% 7 - 33.3%	Zone 1 - 67% 2 - 54% 3 - 47% 4 - 35% 5 - 46% 6 - 52% 7 - 27% 2008 Estimate
% Participation by Tourists Units at Risk	95%	100%	100%				83% 17% downward adjustment for evacuating by air
% Occupancy of Tourist Units	45% low occupancy 75% high occupancy	Zone 1 - 72% 2 - 64% 3 - 64% 4 - 70% 5 - 70% 6 - 70% 7 - 70%	45% low occupancy			63.77% - average Keys occupancy 2003-2007 73-78% June-July (peak summer months) 45-57% Sept - October (lowest) 70.38% average	July 2008 Smith Travel Research Zone 1 - 82% 2 - 71% 3 - 71% 4 - 71% 5 - 71% 6 - 77% 7 - 71%

	PBS&J Hurricane Evacuation Analysis Dec. 1991 (1990)	2000 Miller Model (1990 Census &	2004 Miller Update (2000 Census)	2008 Statewide Regional Evacuation Study Program South Florida Behavioral	Ken Metcalf Miller Model Analysis - Key West occupancy 2003-2007	Reid Ewing Recommendations Report
Vehicle Usage %	Zone 1 - 69% 2 - 69% 3 - 70% 4 - 71% 5 - 71% 6 - 71% 7 - 71%	Zone 1 - 69% 2 - 69% 3 - 70% 4 - 71% 5 - 71% 6 - 71% 7 - 71%	Zone 1 - 69% 2 - 69% 3 - 70% 4 - 71% 5 - 71% 6 - 71% 7 - 71%	Key West 91%  Lower 72%  Middle 79%  Upper 80%  (% of available vehicles used in evacuation - page 65)		Zone 1 - 80% 2 - 72% 3 - 79% 4 - 80% 5 - 80% 6 - 80% 7 - 80%
Tourist Vehicle Usage %		100%	100%			100%
% Distribution Public Shelters (Residents)		Zones 1 to 7 = 0%	Zones 1 to 7 = 0%			Out of County Zone 1 - 90% 2 - 90% 3 - 95% 4 - 100% 5 - 100% 6 - 100% 7 - 100%
(Perm. Residents) Friend/Relative		Zones 1 to 3 = 5% Zones 4-7 = 0%	Zones 1 to 3 = 5% Zones 4-7 = 0%			
Hotel/Motel		Zones 1 to 7 = 0%	Zones 1 to 7 = 0%			
Out of County		Zones 1 to 3 = 95% Zones 4-7 = 100%	Zones 1 to 3 = 95% Zones 4-7 = 100%			



**CLEARANCE TIME SUMMARY**

Run	Zone	2008 Permanent Dwelling Units	2008 Mobile Home Units	2008 Tourist Units	Units Notes	Number of Vehicles per Permanent Units	Number of Vehicles per Tourist Unit	Percent Participation of Mobile Home Units	Percent Participation of Permanent Units	Percent Occupancy of Dwelling Units	Percent Participation by Tourists Units at Risk	Percent Occupancy of Tourist Units	Permanent Resident Vehicle Usage %	Tourist Vehicle Usage %	Response Curve	Roadway Network	Diversion to Card Sound Road	Clearance Time	NOTES
1	1	15,108	2,496	8,148	Units taken from Ewing Report	1.36	1.04	95	60	84.10	0	0	69	0	12 Hours for Mobile Homes and for Permanents	Miller Model Lane Capacities and Numbers of Lanes	33%	21:50	Original Miller Model with 2008 estimates of dwelling units and complete evacuation of tourists. If tourists are NOT evacuated early, this version of the model yields a clearance time of 26:04
	2	6,503	1,751	514		1.74	1.04	95	60	66.85	0	0	69	0					
	3	7,313	1,940	3,045		1.56	1.05	95	80	58.95	0	0	70	0					
	4	1,904	722	1,737		1.65	1.10	95	85	45.43	0	0	71	0					
	5	5,306	1,220	576		1.71	1.10	95	85	57.99	0	0	71	0					
	6	5,335	2,460	1,977		1.83	1.10	95	85	66.37	0	0	71	0					
	7	1,310	8	55		1.43	1.10	95	85	32.84	0	0	71	0					
	<b>Total</b>	<b>42,779</b>	<b>10,597</b>	<b>16,052</b>		No change from Miller	No change from Miller	No change from Miller	No change from Miller	No change from Miller	No change from Miller	<b>Assume complete evacuation</b>	<b>Assume complete evacuation</b>	No change from Miller	<b>Assume complete evacuation</b>	No change from Miller	No change from Miller	No change from Miller	
2	1	15,108	2,496	8,148	Units taken from Ewing Report	1.36	0.83	100	90	67	83	82.0	80	100	12 Hours for Tourists and Mobile Homes; 18 Hours for Permanents, starting 6 hours early	Miller Model Lane Capacities and Numbers of Lanes	33%	19:42 Reflects 6 Hour Adjustment	Ewing version of Miller Model with 2008 estimates of dwelling units, phased evacuation of tourists and mobile home units, and updated behavioral data. If tourists are evacuated completely, this version of the model yields a clearance time of 18:54
	2	6,503	1,751	514		1.74	1.23	100	90	54	83	70.9	72	100					
	3	7,313	1,940	3,045		1.56	1.23	100	95	47	83	70.9	79	100					
	4	1,904	722	1,737		1.65	1.13	100	95	35	83	70.9	80	100					
	5	5,306	1,220	576		1.71	1.13	100	95	46	83	70.9	80	100					
	6	5,335	2,460	1,977		1.83	1.55	100	95	52	83	77.3	80	100					
	7	1,310	8	55		1.43	1.55	100	95	27	83	70.9	80	100					
	<b>Total</b>	<b>42,779</b>	<b>10,597</b>	<b>16,052</b>		No change from Miller	Baker, 2009	Baker, 2009	Baker, 2009	2007 ACS	Assume early evacuation	Assume early evacuation	South FL Behavioral Study	Assume early evacuation	Baker, 2009	No change from Miller	No change from Miller		
3	1	15,108	2,496	8,148	Units taken from Ewing Report	1.36	0.83	100	90	67	83	82.0	80	100	12 Hours for Tourists and Mobile Homes; 18 Hours for Permanents, starting 6 hours early	Revised FDOT "Sustainable Flow" Capacities	33%	23:20 Reflects 6 Hour Adjustment	Ewing version of Miller Model with 2008 estimates of dwelling units, phased evacuation of tourists and mobile home units, updated behavioral data, and revised FDOT lane capacities. If tourists are evacuated completely, this version of the model yields a clearance time of 22:06
	2	6,503	1,751	514		1.74	1.23	100	90	54	83	70.9	72	100					
	3	7,313	1,940	3,045		1.56	1.23	100	95	47	83	70.9	79	100					
	4	1,904	722	1,737		1.65	1.13	100	95	35	83	70.9	80	100					
	5	5,306	1,220	576		1.71	1.13	100	95	46	83	70.9	80	100					
	6	5,335	2,460	1,977		1.83	1.55	100	95	52	83	77.3	80	100					
	7	1,310	8	55		1.43	1.55	100	95	27	83	70.9	80	100					
	<b>Total</b>	<b>42,779</b>	<b>10,597</b>	<b>16,052</b>		No change from Miller	Baker, 2009	Baker, 2009	Baker, 2009	2007 ACS	Assume early evacuation	Assume early evacuation	South FL Behavioral Study	Assume early evacuation	Baker, 2009	FDOT, August 2010	No change from Miller		
4	1	15,108	2,496	8,148	Units taken from Ewing Report	1.36	0.83	100	90	84.10	83	82.0	80	100	12 Hours for Tourists and Mobile Homes; 18 Hours for Permanents, starting 6 hours early	Revised FDOT "Sustainable Flow" Capacities (August 2010)	33%	> 24:00 Reflects 6 Hour Adjustment	Ewing version of Miller Model with 2008 estimates of dwelling units, phased evacuation of tourists and mobile home units, updated behavioral data, and revised FDOT lane capacities. Model exceeds 23 hours at Link M2 and 30 hours at Link N. If tourists are evacuated completely, this version of the model exceeds 21:46 at Link M2 and 24:00 at Link N
	2	6,503	1,751	514		1.74	1.23	100	90	66.85	83	70.9	72	100					
	3	7,313	1,940	3,045		1.56	1.23	100	95	58.95	83	70.9	79	100					
	4	1,904	722	1,737		1.65	1.13	100	95	45.43	83	70.9	80	100					
	5	5,306	1,220	576		1.71	1.13	100	95	57.99	83	70.9	80	100					
	6	5,335	2,460	1,977		1.83	1.55	100	95	66.37	83	77.3	80	100					
	7	1,310	8	55		1.43	1.55	100	95	32.84	83	70.9	80	100					
	<b>Total</b>	<b>42,779</b>	<b>10,597</b>	<b>16,052</b>		No change from Miller	Baker, 2009	Baker, 2009	Baker, 2009	No change from Miller	Assume early evacuation	Assume early evacuation	South FL Behavioral Study	Assume early evacuation	Baker, 2009	No change from Miller			

General Notes:

- All model runs include 2008 estimates of units based on 2000 census information, adjusted for building permits issued.
- All model runs include a 52 minute (0:52 hours) increment for travel to FIU.
- In 2010, the numbers of units in Zones 2 through 7 should be assumed to be higher (up to 255 each year) than in 2008.
- The change in the estimated participation rates by permanent unit dwellers is a significant factor. The Miller model used behavioral data from the late 1980s; the current simulations are based on upon Jay Baker's surveys during the 2000's. The percentages shift from a range of 60-85% to 90-95% for permanent units and from 95% to 100% for mobile homes.
- The decline in occupancy rates is insufficient to offset the increases in the numbers of units and in participation rates.
- Model Run 1 (Original Miller model with 2008 units) can absorb 43 years of growth with 42 units per year added to Zones 2 through 7 before exceeding 24 hours.

## Florida Statutes

### 163.3178 Coastal management. —

- (1) The Legislature recognizes there is significant interest in the resources of the coastal zone of the state. Further, the Legislature recognizes that, in the event of a natural disaster, the state may provide financial assistance to local governments for the reconstruction of roads, sewer systems, and other public facilities. Therefore, it is the intent of the Legislature that local government comprehensive plans restrict development activities where such activities would damage or destroy coastal resources, and that such plans protect human life and limit public expenditures in areas that are subject to destruction by natural disaster.
- (2) Each coastal management element required by s. 163.3177(6)(g) shall be based on studies, surveys, and data; be consistent with coastal resource plans prepared and adopted pursuant to general or special law; and contain:
  - (a) A land use and inventory map of existing coastal uses, wildlife habitat, wetland and other vegetative communities, undeveloped areas, areas subject to coastal flooding, public access routes to beach and shore resources, historic preservation areas, and other areas of special concern to local government.
  - (b) An analysis of the environmental, socioeconomic, and fiscal impact of development and redevelopment proposed in the future land use plan, with required infrastructure to support this development or redevelopment, on the natural and historical resources of the coast and the plans and principles to be used to control development and redevelopment to eliminate or mitigate the adverse impacts on coastal wetlands; living marine resources; barrier islands, including beach and dune systems; unique wildlife habitat; historical and archaeological sites; and other fragile coastal resources.
  - (c) An analysis of the effects of existing drainage systems and the impact of point source and nonpoint source pollution on estuarine water quality and the plans and principles, including existing state and regional regulatory programs, which shall be used to maintain or upgrade water quality while maintaining sufficient quantities of water flow.
  - (d) A component which outlines principles for hazard mitigation and protection of human life against the effects of natural disaster, including population evacuation, which take into consideration the capability to safely evacuate the density of coastal population proposed in the future land use plan element in the event of an impending natural disaster. The Division of Emergency Management shall manage the update of the regional hurricane evacuation studies, ensure such studies are done in a consistent manner, and ensure that the methodology used for modeling storm surge is that used by the National Hurricane Center.
  - (e) A component which outlines principles for protecting existing beach and dune systems from human-induced erosion and for restoring altered beach and dune systems.
  - (f) A redevelopment component which outlines the principles which shall be used to eliminate inappropriate and unsafe development in the coastal areas when opportunities arise.

- (g) A shoreline use component that identifies public access to beach and shoreline areas and addresses the need for water-dependent and water-related facilities, including marinas, along shoreline areas. Such component must include the strategies that will be used to preserve recreational and commercial working waterfronts as defined in s. 342.07.
  - (h) Designation of coastal high-hazard areas and the criteria for mitigation for a comprehensive plan amendment in a coastal high-hazard area as defined in subsection (9). The coastal high-hazard area is the area below the elevation of the category 1 storm surge line as established by a Sea, Lake, and Overland Surges from Hurricanes (SLOSH) computerized storm surge model. Application of mitigation and the application of development and redevelopment policies, pursuant to s. 380.27(2), and any rules adopted thereunder, shall be at the discretion of local government.
  - (i) A component which outlines principles for providing that financial assurances are made that required public facilities will be in place to meet the demand imposed by the completed development or redevelopment. Such public facilities will be scheduled for phased completion to coincide with demands generated by the development or redevelopment.
  - (j) An identification of regulatory and management techniques that the local government plans to adopt or has adopted in order to mitigate the threat to human life and to control proposed development and redevelopment in order to protect the coastal environment and give consideration to cumulative impacts.
  - (k) A component which includes the comprehensive master plan prepared by each deepwater port listed in s. 311.09(1), which addresses existing port facilities and any proposed expansions, and which adequately addresses the applicable requirements of paragraphs (a)-(k) for areas within the port and proposed expansion areas. Such component shall be submitted to the appropriate local government at least 6 months prior to the due date of the local plan and shall be integrated with, and shall meet all criteria specified in, the coastal management element. "The appropriate local government" means the municipality having the responsibility for the area in which the deepwater port lies, except that where no municipality has responsibility, where a municipality and a county each have responsibility, or where two or more municipalities each have responsibility for the area in which the deepwater port lies, "the appropriate local government" means the county which has responsibility for the area in which the deepwater port lies. Failure by a deepwater port which is not part of a local government to submit its component to the appropriate local government shall not result in a local government being subject to sanctions pursuant to ss. 163.3167 and 163.3184. However, a deepwater port which is not part of a local government shall be subject to sanctions pursuant to s. 163.3184.
- (3) Expansions to port harbors, spoil disposal sites, navigation channels, turning basins, harbor berths, and other related inwater harbor facilities of ports listed in s. 403.021(9); port transportation facilities and projects listed in s. 311.07(3)(b); intermodal transportation facilities identified pursuant to s. 311.09(3); and facilities determined by the Department of Community Affairs and applicable general-purpose local government to be port-related industrial or commercial projects located within 3 miles of or in a port

master plan area which rely upon the use of port and intermodal transportation facilities shall not be designated as developments of regional impact if such expansions, projects, or facilities are consistent with comprehensive master plans that are in compliance with this section.

- (4) Improvements and maintenance of federal and state highways that have been approved as part of a plan approved pursuant to s. 380.045 or s. 380.05 shall be exempt from the provisions of s. 380.27(2).
- (5) The appropriate dispute resolution process provided under s. 186.509 must be used to reconcile inconsistencies between port master plans and local comprehensive plans. In recognition of the state's commitment to deepwater ports, the state comprehensive plan must include goals, objectives, and policies that establish a statewide strategy for enhancement of existing deepwater ports, ensuring that priority is given to water-dependent land uses. As an incentive for promoting plan consistency, port facilities as defined in s. 315.02(6) on lands owned or controlled by a deepwater port as defined in s. 311.09(1), as of the effective date of this act shall not be subject to development-of-regional-impact review provided the port either successfully completes an alternative comprehensive development agreement with a local government pursuant to ss. 163.3220-163.3243 or successfully enters into a development agreement with the state land planning agency and applicable local government pursuant to s. 380.032 or, where the port is a department of a local government, successfully enters into a development agreement with the state land planning agency pursuant to s. 380.032. Port facilities as defined in s. 315.02(6) on lands not owned or controlled by a deepwater port as defined in s. 311.09(1) as of the effective date of this act shall not be subject to development-of-regional-impact review provided the port successfully enters into a development agreement with the state land planning agency and applicable local government pursuant to s. 380.032 or, where the port is a department of a local government, successfully enters into a development agreement with the state land planning agency pursuant to s. 380.032.
- (6) Local governments are encouraged to adopt countywide marina siting plans to designate sites for existing and future marinas. The Coastal Resources Interagency Management Committee, at the direction of the Legislature, shall identify incentives to encourage local governments to adopt such siting plans and uniform criteria and standards to be used by local governments to implement state goals, objectives, and policies relating to marina siting. These criteria must ensure that priority is given to water-dependent land uses. Countywide marina siting plans must be consistent with state and regional environmental planning policies and standards. Each local government in the coastal area which participates in adoption of a countywide marina siting plan shall incorporate the plan into the coastal management element of its local comprehensive plan.
- (7) Each port listed in s. 311.09(1) and each local government in the coastal area which has spoil disposal responsibilities shall provide for or identify disposal sites for dredged materials in the future land use and port elements of the local comprehensive plan as needed to assure proper long-term management of material dredged from navigation channels, sufficient long-range disposal capacity, environmental sensitivity and compatibility, and reasonable cost and transportation. The disposal site selection criteria shall be developed in consultation with navigation and inlet districts and other appropriate state and federal agencies and the public. For areas owned or controlled by

ports listed in s. 311.09(1) and proposed port expansion areas, compliance with the provisions of this subsection shall be achieved through comprehensive master plans prepared by each port and integrated with the appropriate local plan pursuant to paragraph (2)(k).

- (8) Each county shall establish a county-based process for identifying and prioritizing coastal properties so they may be acquired as part of the state's land acquisition programs. This process must include the establishment of criteria for prioritizing coastal acquisitions which, in addition to recognizing pristine coastal properties and coastal properties of significant or important environmental sensitivity, recognize hazard mitigation, beach access, beach management, urban recreation, and other policies necessary for effective coastal management.

(a) (9)(a) Local governments may elect to comply with rule 9J-5.012(3)(b)6. and 7., Florida Administrative Code, through the process provided in this section. A proposed comprehensive plan amendment shall be found in compliance with state coastal high-hazard provisions pursuant to rule 9J-5.012(3)(b)6. and 7., Florida Administrative Code, if:

1. The adopted level of service for out-of-county hurricane evacuation is maintained for a category 5 storm event as measured on the Saffir-Simpson scale;
2. A 12-hour evacuation time to shelter is maintained for a category 5 storm event as measured on the Saffir-Simpson scale and shelter space reasonably expected to accommodate the residents of the development contemplated by a proposed comprehensive plan amendment is available; or
3. Appropriate mitigation is provided that will satisfy the provisions of subparagraph 1. or subparagraph 2. Appropriate mitigation shall include, without limitation, payment of money, contribution of land, and construction of hurricane shelters and transportation facilities. Required mitigation shall not exceed the amount required for a developer to accommodate impacts reasonably attributable to development. A local government and a developer shall enter into a binding agreement to memorialize the mitigation plan.

(b) For those local governments that have not established a level of service for out-of-county hurricane evacuation by July 1, 2008, but elect to comply with rule 9J-5.012(3)(b)6. and 7., Florida Administrative Code, by following the process in paragraph (a), the level of service shall be no greater than 16 hours for a category 5 storm event as measured on the Saffir-Simpson scale.

(c) This subsection shall become effective immediately and shall apply to all local governments. No later than July 1, 2008, local governments shall amend their future land use map and coastal management element to include the new definition of coastal high-hazard area and to depict the coastal high-hazard area on the future land use map.

History. — s. 7, ch. 85-55; s. 8, ch. 86-191; s. 24, ch. 87-224; s. 7, ch. 93-206; s. 899, ch. 95-147; s. 11, ch. 96-320; s. 65, ch. 99-251; s. 2, ch. 2005-157; s. 2, ch. 2006-68; s. 4, ch. 2009-85; s. 44, ch. 2010-102.



### **28-20.110 Comprehensive Plan.**

The Monroe County Comprehensive Plan Policy Document, as the same exists on January 1, 2004, is hereby amended to read as follows:

(1) Policy 101.2.13.

Monroe County shall establish an interim Permit Allocation System for new residential development. The interim Permit Allocation System shall supersede Policy 101.2.1 and remain in place until such time as Monroe County determines its future growth capacity based on hurricane evacuation, public safety and environmental needs including water quality and habitat protection, and amends its plan consistent with such determination, based on the results of the work program as set forth below. DEP, DOH, DCA and Monroe County shall develop a coordinated permit review process that will insure that no state agency shall issue a wastewater disposal permit that would allow development in excess of the number of permits that Monroe County may issue under this interim policy. Similarly, Monroe County shall not issue development permits under this interim policy in excess of wastewater disposal permits that DEP or DOH may issue. For Years 3 and 4 of the Work Program the interim Permit Allocation System shall allow a minimum of 88 new residential permits per year which may be used to address the backlog of ROGO allocations. Additional new residential permits will be allowed but limited to the number of nutrient reduction credits earned within the same unincorporated ROGO area. Nutrient reduction credits shall be earned consistent with Table 1 below. The nutrient reduction credits earned by the construction of the Little Venice system shall be earned according to the following schedule:

1. For the ROGO Year Effective July 13, 2003, 213 of the total credits estimated to be available from the full operation of the system shall be earned when the wastewater construction permit for the system is issued by DEP, the design/build contract for the system has been fully executed, and construction of the system has commenced. Of these credits, 52 shall be made available to Monroe County for affordable housing, and 67 for proposed affordable housing in the City of Marathon. Any credits not used for affordable housing shall be available for future allocation pursuant to paragraph 2. below. In addition, 52 of these credits shall be made available to Monroe County and 42 of these credits shall be made available to the City of Marathon.

2. All remaining available credits shall be earned when the construction of the system is 100 percent complete, the collection system lines have been installed, and when the final total of credits available from operation of the system has been calculated. The total credits available shall be reduced by the 213 advanced in the year 2003 prior to distribution to local governments outside the City of Marathon. Nutrient reduction credits that are earned from the construction of a central sewer system, in which state or federal funds are used, shall be allocated as follows:

1. The local government shall receive a pro rata share of the earned nutrient reduction credits in proportion to the amount of funds it contributed from its jurisdiction to the total construction costs; and

2. The remaining earned nutrient reduction credits shall be allocated between Monroe County, the City of Marathon, and the Islamorada, Village of Islands in proportion to the annual ROGO allocation of each to the total annual ROGO allocation for these local governments.

Effective July 13, 2003, Monroe County is allocated 41 nutrient credits for market rate units. These 41 credits shall be subtracted from the nutrient credits subsequently earned from hookups to the Key West Resort Utilities Wastewater Facility.

Effective July 13, 2003, Monroe County is allocated 193 nutrient credits for affordable housing units. These 193 credits shall be subtracted from the nutrient credits subsequently earned from hookups to the Key West Resort Utilities, Bay Point, and Key Largo Wastewater Facilities.

Nutrient reduction credits earned using funds provided by the State and matched by the County in fiscal years 1997-98 and 1998-99 will be used to offset the nutrient impacts of the 88 new residential permits per year, but may not be used for additional new residential permits until such time as these funds generate more than 88 nutrient reduction credits for Years 3 and 4. For Year 5, the interim Permit Allocation System shall allow a minimum of 77 new residential permits. If fewer than 77 nutrient reduction credits are earned in Year 5, the deficit shall be made up in Year 6 prior to issuance of any new permits. For Year 6 and beyond, the interim Permit Allocation System shall limit the number of permits issued for new residential development to the number of nutrient reduction credits earned within the same unincorporated ROGO area, except as otherwise authorized herein. The Administration Commission has determined that, effective July 13, 2005, no nutrient credits shall be required if the local government has made satisfactory progress, as determined by the Administration Commission, in meeting the deadlines established by the Work Program as adopted by rule after March 15, 2004.

For all years the number of permits issued for new residential development under the Rate of Growth Ordinance shall not exceed a total annual unit cap of 197, plus any available unused ROGO allocations from the previous ROGO year. Unused ROGO allocations

may be allocated in subsequent ROGO years. Each year's ROGO allocation of 197 new units shall be split with a minimum of 71 units allocated for affordable housing in perpetuity and market rate allocations not to exceed 126 new residential units per year. This allocation represents the total number of new permits for development that may be issued during a ROGO year. No exemptions or increases in the number of new permits, other than that which may be expressly authorized by this rule or provided for in the comprehensive plan or for which there is an existing agreement executed prior to January 1, 2003 for affordable housing between the Department and the local government in the critical areas, may be allowed. The Administration Commission has determined that, effective July 12, 2004, 140 ROGO allocations, which represents unused reductions for ROGO years 9-12, and 25 units lost in Year 10 due to lack of nutrient credits, are reallocated to the County exclusively for affordable housing purposes. Monroe County shall develop a tracking system for monitoring the nutrient reduction credits earned. The tracking system shall commence upon the effective date of this rule and the number of nutrient reduction credits earned shall be cumulative and may be applied to future years of the interim Permit Allocation System.

**Table 1  
Nutrient Reduction Credits**

Treatment System Upgraded to				
	On-site Treatment	Centralized Systems		
	OWNR or Equivalent	Secondary Treatment	Best Available	Advanced Wastewater
	On-site Treatment and		Treatment (BAT)	Treatment (AWT)
	Disposal Systems			
Cesspit	1EDU Credit	1 EDU Credit	1.0 EDU Credit	1.5 EDU Credit
Substandard OSTDS	0.5	0.5	1.0	1.5
Approved OSTDS	0.5	0	1	1.5
Secondary Treatment	n/a	n/a	1	1.5

\*\* If Credits were previously issued for replacement or upgrades from a cesspit or substandard system to a secondary treatment plant, when the secondary treatment plant is upgraded to an advanced treatment plant, then .5 times the total number of EDU's shall be awarded \*\*

Additionally, the unit cap for new residential development shall be linked to the following work program which identifies actions necessary to correct existing wastewater and stormwater problems, as well as actions necessary to determine appropriate future growth. Beginning September 30, 2003, and each year of the work program thereafter, Monroe County and the Department of Community Affairs shall report to the Administration Commission documenting the degree to which the work program objectives for that year have been achieved. The report for years seven and eight shall be combined and provided to the Administration Commission by September 30, 2005.

The Commission shall consider the findings and recommendations provided in those reports and shall determine whether substantial progress has been achieved toward accomplishing the tasks of the work program. If the Commission determines that substantial progress has not been made, the unit cap for new residential development shall be reduced by at least 20 percent for the following year, with the exception of ROGO Year beginning July 13, 2003. If the Commission determines that substantial progress has been made, then the Commission shall increase the unit cap for new residential development for the following year up to a maximum of 197 units. Other agencies identified in the work program, or any interested persons, may likewise report and make recommendations for consideration by the Commission. Notwithstanding any other dates set forth in this plan, the dates set forth in the work program shall control where conflicts exist. For each task in the work program, the Department of Community Affairs shall request of all relevant and appropriate federal, state, regional, and local agencies that they contribute any relevant data, analysis and recommendations, and that they take an active role in assisting the county in completing the task. Each such agency shall prepare, in coordination with the county, a section to be included in Monroe County's reports which indicates the agency's actions relative to the work plan. The Department of Community Affairs shall specifically request that the Florida Keys National Marine Sanctuary Water Quality Protection Program Steering Committee (Water Quality Steering Committee) take an active role in coordinating with Monroe County, and relevant state and federal agencies, in the implementation of the tasks related to water quality, wastewater and stormwater facilities, and in the development and implementation of the carrying capacity study. The Steering Committee will provide technical assistance and substantive comments and recommendations to ensure that the county's wastewater and stormwater



master plans and the carrying capacity study are consistent with the objectives of the Florida Keys National Marine Sanctuary Water Quality Protection Program. The Steering Committee will make recommendations on wastewater systems and Hot Spot priorities prior to implementation by the County. It is the intent of this rule to accelerate the pace, and increase the effectiveness of the current cesspit replacement effort through both a regulatory and an incentive-based program. No later than August, 1999 Monroe County shall engage in a public education program to ensure that the public understands that the County is committed to the swift identification and replacement of cesspits, as a full partner with the Department of Health. The public education program shall explain the role of cesspit removal in the overall context of the Work Plan and Wastewater Master Plan. The County and the state shall request the participation of the Steering Committee in the public education program as well as the Florida Keys Aqueduct Authority.

#### WORK PROGRAM<sup>1</sup>

<sup>1</sup>On March 9, 1999, the Administration Commission determined that substantial progress toward the work program objectives had not been made and authorized rulemaking to amend the work program beginning in Year Three. Work program tasks from Years One and Two not completed by the end of Year Two were included as tasks in subsequent years of the work program.

YEAR ONE (ending December 31, 1997).

A. Complete Phase I (data collection) for the Wastewater and Stormwater Master Plans, and secure funding for plan completion. (Ref. County obj. 901.4)

Agencies: County, DCA, DEP, DOH and SFWMD.

B. Complete a conceptual plan or scope of work to develop a carrying capacity. The carrying capacity analysis shall be designed to determine the ability of the Florida Keys ecosystem, and the various segments thereof, to withstand all impacts of additional land development activities. The analysis shall be based upon the findings adopted by the Administration Commission on December 12, 1995, or more recent data that may become available in the course of the study, and shall be based upon the benchmarks of, and all adverse impacts to, the Keys land and water natural systems, in addition to the impact of nutrients on marine resources. The carrying capacity analysis shall consider aesthetic, socioeconomic (including sustainable tourism), quality of life and community character issues, including the concentration of population, the amount of open space, diversity of habitats, and species richness. The analysis shall reflect the interconnected nature of the Florida Keys' natural systems, but may consider and analyze the carrying capacity of specific islands or groups of islands and specific ecosystems or habitats, including distinct parts of the Keys' marine system. (Ref. 1991 Stip. Settlement Agreement)

Agencies: County, DCA, DEP, DOH, DOT, FFWCC, SFWMD, NMS, SFRPC, EPA, USFWS, Army COE, and other interested parties to include representatives of environmental organizations and development interests.

C. Complete AWT/OSDS demonstration study and initiate rulemaking for new standards for OSDS. (Ref. County pol. 901.4.3)

Agencies: DOH.

D. Complete Marathon Facilities Plan and secure funding for the facility site(s). The wastewater facilities plan should implement the most cost effective method of collecting, treating, and disposing of wastewater, and shall include an investigation of the feasibility of using alternative nutrient-stripping on-site disposal systems. The development of the facilities plan shall be a component of the Wastewater Master Plan as that Plan is developed.

Agencies: County, DCA and DEP.

E. Continue cesspit elimination process with identification of Hot Spots as first priority in accordance with Objective 901.2, and seek funding for cesspit identification. Enter into an interlocal agreement with DOH to specify the responsibilities and procedures for the OSDS inspection/compliance program as required by Policy 901.2.3. Adopt an ordinance which specifies the implementation procedures for the OSDS inspection/compliance program. The ordinance shall include authorization for DOH to inspect wastewater treatment systems on private property as required by Policy 901.2.3. (Ref. County obj. 901.2)

Agencies: County, DCA and DOH.

F. Submit status of CARL and ROGO land acquisition to the Administration Commission.

Agencies: County, Land Authority and DEP.

G. Revise the Habitat Evaluation Index (HEI) based on peer review.

Agencies: County, DCA, DEP, FFWCC and Federal agencies.

YEAR TWO (ending December 31, 1998).

A. Complete the Wastewater and Stormwater Master Plans and execute interagency agreements to define construction schedule by phases. Document that significant reduction in nutrients will be achieved each year thereafter within each of the sub-areas. The

Master Plans shall include facility plans for all proposed treatment strategies, and determine retrofit and funding requirements for Hot Spots and cesspits identified in D. below.

Agencies: County, DCA, DEP and DOH.

B. Secure funding for the carrying capacity study and initiate Phase I (data collection) of the study.

Agencies: County and DCA.

C. Complete final design for Marathon Facilities Plan and secure facility site(s).

Agencies: County, DCA and DEP.

D. Complete cesspit ID process in Hot Spots, excluding the Marathon area.

Agencies: County, DCA and DOH.

E. Submit status of CARL and ROGO land acquisition to the Administration Commission.

Agencies: County, Land Authority, FFWCC and DEP.

F. Document the extent and quality of the fresh groundwater lens system on Big Pine Key; delineate the associated recharge areas; and determine the safe yield of the system. (Ref. County pol. 103.1.5)

Agencies: County, DCA, SFWMD, USFWS.

YEAR THREE (January 1, 1999 through July 12, 2000).

A. Complete and begin implementation of Wastewater Master Plan. Utilizing the findings of the Wastewater Master Plan and recommendations of the Water Quality Steering Committee relating to Hot Spots do the following: refine and prioritize areas identified as Hot Spots, determine retrofit and funding requirements for priority Hot Spots and cesspit replacement for areas outside those areas identified for central or cluster wastewater collection systems, and begin developing facility plans for priority Hot Spots. Execute interagency agreements to define facility plan, design and construction schedules for each Hot Spot facility. Establish a water quality monitoring program to document the reduction in nutrients as a result of these facilities. Complete a wastewater treatment finance plan and a service area implementation plan, and continue efforts to secure funding for Wastewater Master Plan implementation, with priority given to Hot Spots. Determine the feasibility and legal ramifications of establishing an escrow account as a means of providing long-term funding for replacing cesspits or substandard onsite sewage systems. Establish a mechanism such as special assessments, impact fees, infrastructure surcharge, or other dedicated revenues, to fund the local share of wastewater improvements in Years Four and Five. Seek to provide comparable subsidies for both wastewater collection systems and individual cesspit replacement.

Agencies: County, FCAA, DCA, DEP, DOH, SFWMD, EPA and Water Quality Protection Program Steering Committee (WQSC).

B. Secure funding for Storm Water Master Plan development, contract selected firm for development of Master Plan, and complete Phase I (data collection). Determine the feasibility of providing nutrient reduction credits for stormwater improvements.

Agencies: County, DCA, DOT, SFWMD, EPA and WQSC.

C. Conclude acquisition of North Key Largo Hammocks CARL project. Make offers to 33% of remaining private owners with property located in other CARL project boundaries.

Agencies: County, Land Authority and DEP.

D. Secure remaining funds for the carrying capacity study, conduct workshops as outlined in the Scope of Work, select prime contractor, and initiate Phase I (data collection) of the study.

Agencies: County, DCA, DEP, DOH, DOT, FFWCC, SFWMD, WQSC, SFRPC, EPA, USFWS, Army COE, and other interested parties to include representatives of environmental organizations and development interests.

E. Continue efforts to secure funding for the Marathon Facility. Complete Little Venice construction design, secure lands needed for Little Venice facility, and begin bid process and selection of construction firm. Design a water quality monitoring program to document Little Venice project impacts.

Agencies: County, FCAA, DCA, DEP, WQSC, and EPA.

F. Continue cesspit identification by providing notice to all property owners with unknown systems, outside of Hot Spots. Initiate replacement of cesspits outside of Hot Spots. Award financial assistance grants to qualified applicants using FY 1997-98 state funds to ensure a minimum of 70 cesspit replacements. Develop a low interest loan and grant program to assist all residents in replacing cesspits, with priority of funds going, in order of preference, to very low-, low- and moderate-income households. Investigate the appropriateness of transferring credits among ROGO areas and awarding nutrient reduction credits for future committed water quality treatment facilities.

Agencies: County, DCA, FCAA, WQSC and DOH.

G. Document the extent and quality of the fresh groundwater lens system on Big Pine Key; delineate the associated recharge areas; and determine the safe yield of the system. (Ref. County pol. 103.1.5)

Agencies: County, FCAA, DEP, DCA, SFWMD, EPA, WQSC and USFWS.

H. Develop an integrated funding plan for the purchase of land from ROGO applicants who have competed unsuccessfully for four consecutive years and applied for administrative relief.

Agencies: County.

I. The County, in conjunction with DCA, shall assess the feasibility of applying the nutrient reduction credit requirement to new commercial development.

Agencies: County and DCA.

YEAR FOUR (July 13, 2000 through July 12, 2001).

A. Continue implementation of Wastewater Master Plan, execute interagency agreements to define construction schedule by phases, and continue developing facility plans for selected Hot Spots in each ROGO area. Secure funding to implement the Wastewater Master Plan. Document that reduction in nutrients has been achieved within each of the sub-areas.

Agencies: County, FCAA, DCA, DEP, DOH, EPA and WQSC.

B. Complete Storm Water Master Plan. Identify priority projects for implementation and seek funding for plan implementation.

Agencies: County, DCA, DEP, DOT, SFWMD, EPA and WQSC.

C. Make offers to 50% of remaining private owners with property located in CARL project boundaries.

Agencies: County, Land Authority and DEP.

D. Complete Phase II of the carrying capacity study (data analysis) and present initial recommendations to review agencies.

Agencies: County, DCA, DEP, DOH, DOT, FFWCC, SFWMD, WQSC, SFRPC, EPA, USFWS, Army COE, and other interested parties to include representatives of environmental organizations and development interests.

E. Establish baseline water quality for surface and groundwater quality potentially impacted by Little Venice project.

Agencies: County, DCA, DEP, FCAA, WQSC and EPA.

F. Complete cesspit identification and continue cesspit replacement outside of Hot Spots, with a priority of funds going, in order of preference, to low- and moderate-income households; ensure that a minimum of 88 cesspits are replaced.

Agencies: County, FCAA, WQSC and DOH.

YEAR FIVE (July 13, 2001 through July 12, 2002).

A. Continue implementation of the Wastewater Master Plan pursuant to executed interagency agreements. Begin construction of wastewater facilities in selected Hot Spots.

Agencies: County, FCAA, DCA, DOH, DEP, EPA, and WQSC.

B. Execute interagency agreements to define construction schedule for selected storm water improvement projects. Complete land acquisition and final design for selected treatment strategies for Storm Water Master Plan.

Agencies: County, DCA, DEP, DOT, WQSC and SFWMD.

C. Conclude negotiations with all willing owners with property within CARL project boundaries. Acquire a total-to-date of 45% of the Key Deer/Coupon Bight project and 25% of the Florida Keys Ecosystems project from willing sellers.

Agencies: County, Land Authority, and DEP.

D. Complete final draft of the carrying capacity study including acceptance by review agencies.

Agencies: County, FCAA, DCA, DEP, DOH, DOT, FFWCC, SFWMD, WQSC, SFRPC, EPA, USFWS, Army COE, and other interested parties to include representatives of environmental organizations and development interests.

E. Continue eliminating cesspits and inoperative septic tanks in areas outside of Hot Spots.

Agencies: County, DOH, FCAA and WQSC.

YEAR SIX (July 13, 2002 through July 12, 2003).

A. Continue construction of wastewater facilities in Hot Spots begun in previous year. Contract to design and construct additional wastewater treatment facilities in Hot Spots in accordance with the schedule of the Wastewater Master Plan. Continue implementation of Wastewater Master Plan with emphasis on Hot Spots.

Agencies: County, FCAA, DEP, DOH, DCA, EPA and WQSC.

B. Initiate construction of selected projects as identified in the Storm Water Master Plan.

Agencies: County, SFWMD, DEP, DCA, DOT, EPA and WQSC.

C. Implement the carrying capacity study by, among other things, the adoption of all necessary plan amendments to establish a rate of growth and a set of development standards that ensure that any and all new development does not exceed the capacity of the county's environment and marine system to accommodate additional impacts. Plan amendments will include a review of the County's Future Land Use Map series and changes to the map series and the "as of right" and "maximum" densities authorized for the plan's future land use categories based upon the natural character of the land and natural resources that would be impacted by the currently authorized land uses, densities and intensities.

Agencies: County, FCAA, FFWCC, DCA, DEP, DOH, DOT, SFWMD, SFRPC, EPA, Army COE, WQSC, and USFWS, and other interested parties to include representatives of environmental organizations and development interests.

D. Complete the elimination of all cesspits in areas outside of Hot Spots.

Agencies: County, FCAA, DOH and WQSC.

E. Develop a Keys-wide master land acquisition plan which shall include:

(1) A strategy for the acquisition of those properties which should be preserved due to their habitat value as well as those other properties where future development is to be discouraged,

(2) A management plan for implementing the strategy, and

(3) A reasonable, feasible plan for securing funding for said land acquisition.

Agencies: County, Land Authority, DCA, DEP, SFWMD, Army COE, EPA, USFWS and other interested parties to include representatives of environmental organizations and development interests.

F. Initiate and complete a collaborative process for the adoption of land development regulations, and/or comprehensive plan amendments as needed, that will strengthen the protection of terrestrial habitat through processes such as the Permit Allocation System and permitting processes, and the preservation and maintenance of affordable housing stock.

Agencies: County, DCA, DEP, FFWC, USFWS, and other interested parties to include representatives of environmental organizations and development interests.

YEAR SEVEN (July 13, 2003 through July 12, 2004).

A. Finalize construction and begin operating wastewater facilities in Hot Spots. Continue implementation of Wastewater Master Plan with continued emphasis on Hot Spots.

Agencies: County, FCAA, DEP, DCA, DOH, EPA and WQSC.

B. Continue implementing selected projects as identified in the Storm Water Master Plan.

Agencies: County, DCA, DEP, DOT, SFWMD, EPA and WQSC.

The Work Program in Policy 101.2.13 for Year 8, Year 9, and Year 10 shall be established as follows:

YEAR EIGHT (July 13, 2004 through July 12, 2005).

A. Review and revise (as necessary) the Conservation and Natural Areas Map.

Agencies: County, USFWS, FFWC, DEP, DCA

B. Initiate acquisition strategy for lands identified outside the Conservation and Natural Areas identified as worthy of protection.

Agencies: County, DCA, DEP

C. Begin public hearings for Conservation and Natural Areas boundaries.

Agencies: County

D. Conclude public hearings for the adoption of the amended Conservation and Natural Areas Boundaries.

Agencies: County

E. Adopt an ordinance to implement a moratorium on ROGO/NROGO applications that involves the clearing of any portion of an upland tropical hardwood hammock or pinelands habitat contained in a tropical hardwood hammock or pinelands patch of two or more acres in size located within a Conservation and Natural Area.

Agencies: County, DCA

F. Adopt amendments to the comprehensive plan and land development regulations to enact overlay designations, and eliminate or revise the Habitat Evaluation Index, and modify the ROGO/NROGO system to guide development away from environmentally sensitive lands.

Agencies: County, DCA

G. Amend land development regulations to prohibit the designation of Conservation and Natural Areas (Tier 1) as a receiver site for ROGO exempt development from sender sites; and to further limit clearing of upland native habitat that may occur in the

Natural Areas (Tier I) and the Transition and Sprawl Reduction Area (Tier II) upon designation by the County.

Agencies: County, DCA

H. Develop Land Acquisition and Management Master Plan and address both funding and management strategies.

Agencies: County, DCA, DEP, USFWS, FWCC

I. Provide \$40 million in financing secured by infrastructure tax for wastewater facilities.

Agencies: County

J. Begin construction of wastewater plants or laying of collection lines for Baypoint, Conch Key and Key Largo Trailer Village/Key Largo Park.

Agencies: County, FCAA, DEP, Key Largo Wastewater District

K. Ensure the connection for up to 1,350 EDUs at Stock Island to Key West Resort Utilities.

Agencies: County, DEP

L. Complete lower Keys and Key Largo Feasibility Study.

Agencies: County, FCAA, DEP

M. Complete projects identified in the Stormwater Management Master Plan.

Agencies: County, DEP, DCA

N. Evaluate and implement strategies to ensure that affordable housing remains affordable in perpetuity for future generations.

Establish a partnership with non-profit organizations in order to construct affordable housing using additional state funds.

Agencies: County, FHFC, DCA

O. Identify potential acquisition sites for affordable housing proposals and include in the Land Acquisition Master Plan.

Agencies: County, FHFC, DCA

P. Provide up to \$10 million in bond financing from the Tourist Impact Tax for acquisition of land for workforce housing and affordable housing sites.

Agencies: County

Q. Complete a comprehensive analysis of hurricane evacuation issues in the Florida Keys and develop strategies to reduce actual hurricane clearance times and thereby reduce potential loss of life from hurricanes.

Agencies: County, DCA

YEAR NINE (July 13, 2005 through July 12, 2006).

A. In coordination with the Florida Keys Aqueduct Authority and the Key Largo Sewer District, initiate the process to obtain \$80 million in bond financing secured by connection fees.

Agencies: County, FCAA, Key Largo Sewer District

B. Secure site for lower Keys and Key Largo wastewater facilities.

Agencies: County, FCAA

YEAR TEN (July 13, 2006 through July 12, 2007).

A. Award contract for design, construction and operation for the lower Keys and Key Largo wastewater facilities.

Agencies: County, FCAA, Key Largo Sewer District

B. Begin construction of the lower Keys and Key Largo wastewater plants.

Agencies: County, FCAA, Key Largo Sewer District

C. Initiate connections to lower Keys and Key Largo wastewater systems.

Agencies: County, FCAA, Key Largo Sewer District

D. Complete construction and hookups for Baypoint, Conch Key and Key Largo Trailer Village/Key Largo Park.

Agencies: County, FCAA, Key Largo Sewer District

E. Obtain \$80 million in bond financing secured by connection fees.

Agencies: County, FCAA, Key Largo Sewer District

(2) Policy 101.12.4.

Upon adoption of the comprehensive plan, Monroe County shall require that the following analyses be undertaken prior to finalizing plans for the siting of any new or the significant expansion (25 percent) of any existing public facility:

(a) Assessment of needs;

(b) Evaluation of alternative sites, and design alternatives for the alternative sites;

(c) Assessment of direct and secondary impacts on surrounding land uses and natural resources.

The assessment of impacts on surrounding land uses and natural resources will evaluate the extent to which the proposed public facility involves public expenditures in the coastal high hazard area and within environmentally sensitive areas, including disturbed salt marsh and buttonwood wetlands, undisturbed beach berm areas, units of the coastal barrier resources system, undisturbed uplands (particularly high quality hammock and pinelands), habitats of species considered to be threatened or endangered by the state and/or federal governments, offshore islands, and Natural Areas (Tier I).

Except for passive recreational facilities on publicly-owned land, no new public community or utility facility other than water distribution and sewer collection lines or lift stations shall be allowed within the Natural Areas (Tier I) unless it can be accomplished without clearing of hammock or pinelands. Exceptions to this requirement may be made to protect the public health, safety, and welfare, if all the following criteria are met:

1. No reasonable alternatives exist to the proposed location; and
2. The proposed location is approved by a super-majority of the Board of County Commissioners.

The proposed site for the Key Largo Wastewater Treatment Facility (located at mile marker 100.5) with an allowed clearing area of up to 4.2 acres shall not be subject to this policy.

(3) Policy 101.3.4.

Public facilities shall be exempt from the requirements of the Permit Allocation System for new non-residential development. Certain development activity by federally tax-exempt not-for-profit educational, scientific, health, religious, social service, cultural and recreational organizations may be exempted from the Permit Allocation System by the Board of County Commissioners after review by the Planning Commission upon a finding that:

1. Such activity will predominantly serve the County’s non-transient population; and
2. Any such development activity is not planned within an area proposed for acquisition by governmental agencies for the purpose of resource protection.

All public and institutional uses that predominantly serve the County’s non-transient population and which house temporary residents shall be included in the Permit Allocation System for residential development, except on factual demonstration that such transient occupancy is of such a nature so as not to adversely affect the hurricane evacuation clearance time of Monroe County.

(4) Policy 101.5.4.3 Lot Aggregation.

Points shall be assigned to Allocation Applications for proposed dwelling unit(s) which includes a voluntary reduction of density permitted as of right within subdivisions (residential units per legally platted, buildable lots) by aggregating vacant, legally platted, buildable lots.

Weighting category	Criteria
Moderate Positive	The applicant aggregates two (2) contiguous, vacant, legally buildable lots. No points shall be awarded for lot aggregation within those areas proposed for acquisition by public agencies for the purpose of resource protection.
Moderate Positive	Each additional contiguous vacant, legally platted, buildable lot aggregated over two (2). No points shall be awarded for lot aggregation within those areas proposed for acquisition by public agencies for the purpose of resource protection.

(5) Policy 101.5.11.

If not listed in the document “Parcels Not Located in Threatened and Endangered Species Habitat and Not Subject to FWS Consultation”, or involving minor development activity exempted by the U.S. Fish and Wildlife Service (USFWS)”, any application for a ROGO or NROGO allocation shall contain a technical coordination letter from the USFWS. The County shall consider the recommendations of the USFWS’s technical coordination letter in the issuance of the subject permit, except that if a low-effect habitat conservation plan is required by USFWS, the mitigation requirements of that plan shall be incorporated in the conditions of the permit.

(6) Policy 205.2.7.

Clearing of native vegetation shall be limited to the immediate development area. For applications that receive points for lot aggregation under the Permit Allocation System for residential development, clearing of vegetation shall be limited to the open space ratios in Policy 205.2.6 or 5,000 square feet, whichever is less. The immediate development area shall be fenced throughout the duration of construction. During construction, there shall be no disturbances of the ground surface and vegetation within required open space areas.

*Specific Authority 380.0552(9) FS. Law Implemented 380.0552 FS. History--New 9-27-05.*

<sup>1</sup> 380.0552 Florida Keys Area; protection and designation as area of critical state concern.

(1) SHORT TITLE.—This section may be cited as the “Florida Keys Area Protection Act.”

(2) LEGISLATIVE INTENT.—It is the intent of the Legislature to:

- (a) Establish a land use management system that protects the natural environment of the Florida Keys.
- (b) Establish a land use management system that conserves and promotes the community character of the Florida Keys.
- (c) Establish a land use management system that promotes orderly and balanced growth in accordance with the capacity of available and planned public facilities and services.
- (d) Provide affordable housing in close proximity to places of employment in the Florida Keys.
- (e) Establish a land use management system that promotes and supports a diverse and sound economic base.
- (f) Protect the constitutional rights of property owners to own, use, and dispose of their real property.
- (g) Promote coordination and efficiency among governmental agencies that have permitting jurisdiction over land use activities in the Florida Keys.
- (h) Promote an appropriate land acquisition and protection strategy for environmentally sensitive lands within the Florida Keys.
- (i) Protect and improve the nearshore water quality of the Florida Keys through the construction and operation of wastewater management facilities that meet the requirements of ss. 381.0065(4)(1) and 403.086(10), as applicable.
- (j) Ensure that the population of the Florida Keys can be safely evacuated.

(3) RATIFICATION OF DESIGNATION.—The designation of the Florida Keys Area as an area of critical state concern, the boundaries of which are described in chapter 27F-8, Florida Administrative Code, as amended effective August 23, 1984, is hereby ratified.

(4) REMOVAL OF DESIGNATION.—

- (a) The designation of the Florida Keys Area as an area of critical state concern under this section may be recommended for removal upon fulfilling the legislative intent under subsection (2) and completion of all the work program tasks specified in rules of the Administration Commission.



- (b) Beginning November 30, 2010, the state land planning agency shall annually submit a written report to the Administration Commission describing the progress of the Florida Keys Area toward completing the work program tasks specified in commission rules. The land planning agency shall recommend removing the Florida Keys Area from being designated as an area of critical state concern to the commission if it determines that:
1. All of the work program tasks have been completed, including construction of, operation of, and connection to central wastewater management facilities pursuant to s. 403.086(10) and upgrade of onsite sewage treatment and disposal systems pursuant to s. 381.0065(4)(l);
  2. All local comprehensive plans and land development regulations and the administration of such plans and regulations are adequate to protect the Florida Keys Area, fulfill the legislative intent specified in subsection (2), and are consistent with and further the principles guiding development; and
  3. A local government has adopted a resolution at a public hearing recommending the removal of the designation.
- (c) After receipt of the state land planning agency report and recommendation, the Administration Commission shall determine whether the requirements have been fulfilled and may remove the designation of the Florida Keys as an area of critical state concern. If the commission removes the designation, it shall initiate rulemaking to repeal any rules relating <sup>2</sup>to such designation within 60 days. If, after receipt of the state land planning agency's report and recommendation, the commission finds that the requirements for recommending removal of designation have not been met, the commission shall provide a written report to the local governments within 30 days after making such a finding detailing the tasks that must be completed by the local government.
- (d) The Administration Commission's determination concerning the removal of the designation of the Florida Keys as an area of critical state concern may be reviewed pursuant to chapter 120. All proceedings shall be conducted by the Division of Administrative Hearings and must be initiated within 30 days after the commission issues its determination.
- (e) After removal of the designation of the Florida Keys as an area of critical state concern, the state land planning agency shall review proposed local comprehensive plans, and any amendments to existing comprehensive plans, which are applicable to the Florida Keys Area, the boundaries of which were described in chapter 28-29, Florida Administrative Code, as of January 1, 2006, for compliance as defined in s. 163.3184. All procedures and penalties described in s. 163.3184 apply to the review conducted pursuant to this paragraph.
- (f) The Administration Commission may adopt rules or revise existing rules as necessary to administer this subsection.

- (5) APPLICATION OF THIS CHAPTER.—Section 380.05(1)-(5), (9)-(11), (15), (17), and (21) shall not apply to the area designated by this section for so long as the designation remains in effect. Except as otherwise provided in this section, s. 380.045 shall not apply to the area designated by this section. All other provisions of this chapter shall apply, including s. 380.07.
- (6) RESOURCE PLANNING AND MANAGEMENT COMMITTEE.—The Governor, acting as the chief planning officer of the state, shall appoint a resource planning and management committee for the Florida Keys Area with the membership as specified in s. 380.045(2). Meetings shall be called as needed by the chair or on the demand of three or more members of the committee. The committee shall:
- (a) Serve as a liaison between the state and local governments within Monroe County.
  - (b) Develop, with local government officials in the Florida Keys Area, recommendations to the state land planning agency as to the sufficiency of the Florida Keys Area's comprehensive plan and land development regulations.
  - (c) Recommend to the state land planning agency changes to state and regional plans and regulatory programs affecting the Florida Keys Area.
  - (d) Assist units of local government within the Florida Keys Area in carrying out the planning functions and other responsibilities required by this section.
  - (e) Review, at a minimum, all reports and other materials provided to it by the state land planning agency or other governmental agencies.
- (7) PRINCIPLES FOR GUIDING DEVELOPMENT.—State, regional, and local agencies and units of government in the Florida Keys Area shall coordinate their plans and conduct their programs and regulatory activities consistent with the principles for guiding development as specified in chapter 27F-8, Florida Administrative Code, as amended effective August 23, 1984, which is adopted and incorporated herein by reference. For the purposes of reviewing the consistency of the adopted plan, or any amendments to that plan, with the principles for guiding development, and any amendments to the principles, the principles shall be construed as a whole and specific provisions may not be construed or applied in isolation from the other provisions. However, the principles for guiding development are repealed 18 months from July 1, 1986. After repeal, any plan amendments must be consistent with the following principles:
- (a) Strengthening local government capabilities for managing land use and development so that local government is able to achieve these objectives without continuing the area of critical state concern designation.
  - (b) Protecting shoreline and marine resources, including mangroves, coral reef formations, seagrass beds, wetlands, fish and wildlife, and their habitat.

- (c) Protecting upland resources, tropical biological communities, freshwater wetlands, native tropical vegetation (for example, hardwood hammocks and pinelands), dune ridges and beaches, wildlife, and their habitat.
- (d) Ensuring the maximum well-being of the Florida Keys and its citizens through sound economic development.
- (e) Limiting the adverse impacts of development on the quality of water throughout the Florida Keys.
- (f) Enhancing natural scenic resources, promoting the aesthetic benefits of the natural environment, and ensuring that development is compatible with the unique historic character of the Florida Keys.
- (g) Protecting the historical heritage of the Florida Keys.
- (h) Protecting the value, efficiency, cost-effectiveness, and amortized life of existing and proposed major public investments, including:
  - 1. The Florida Keys Aqueduct and water supply facilities;
  - 2. Sewage collection, treatment, and disposal facilities;
  - 3. Solid waste treatment, collection, and disposal facilities;
  - 4. Key West Naval Air Station and other military facilities;
  - 5. Transportation facilities;
  - 6. Federal parks, wildlife refuges, and marine sanctuaries;
  - 7. State parks, recreation facilities, aquatic preserves, and other publicly owned properties;
  - 8. City electric service and the Florida Keys Electric Co-op; and
  - 9. Other utilities, as appropriate.
- (i) Protecting and improving water quality by providing for the construction, operation, maintenance, and replacement of stormwater management facilities; central sewage collection; treatment and disposal facilities; and the installation and proper operation and maintenance of onsite sewage treatment and disposal systems.
- (j) Ensuring the improvement of nearshore water quality by requiring the construction and operation of wastewater management facilities that meet the requirements of ss. 381.0065(4)(l) and 403.086(10), as applicable, and by directing growth to areas served by central wastewater treatment facilities through permit allocation systems.

- (k) Limiting the adverse impacts of public investments on the environmental resources of the Florida Keys.
- (l) Making available adequate affordable housing for all sectors of the population of the Florida Keys.
- (m) Providing adequate alternatives for the protection of public safety and welfare in the event of a natural or manmade disaster and for a postdisaster reconstruction plan.
- (n) Protecting the public health, safety, and welfare of the citizens of the Florida Keys and maintaining the Florida Keys as a unique Florida resource.

(8) **COMPREHENSIVE PLAN ELEMENTS AND LAND DEVELOPMENT**

**REGULATIONS.**—The comprehensive plan elements and land development regulations approved pursuant to s. 380.05(6), (8), and (14) shall be the comprehensive plan elements and land development regulations for the Florida Keys Area.

(9) **MODIFICATION TO PLANS AND REGULATIONS.**—

- (a) Any land development regulation or element of a local comprehensive plan in the Florida Keys Area may be enacted, amended, or rescinded by a local government, but the enactment, amendment, or rescission becomes effective only upon approval by the state land planning agency. The state land planning agency shall review the proposed change to determine if it is in compliance with the principles for guiding development specified in chapter 27F-8, Florida Administrative Code, as amended effective August 23, 1984, and must approve or reject the requested changes within 60 days after receipt. Amendments to local comprehensive plans in the Florida Keys Area must also be reviewed for compliance with the following:
  1. Construction schedules and detailed capital financing plans for wastewater management improvements in the annually adopted capital improvements element, and standards for the construction of wastewater treatment and disposal facilities or collection systems that meet or exceed the criteria in s. 403.086(10) for wastewater treatment and disposal facilities or s. 381.0065(4)(l) for onsite sewage treatment and disposal systems.
  2. Goals, objectives, and policies to protect public safety and welfare in the event of a natural disaster by maintaining a hurricane evacuation clearance time for permanent residents of no more than 24 hours. The hurricane evacuation clearance time shall be determined by a hurricane evacuation study conducted in accordance with a professionally accepted methodology and approved by the state land planning agency.
- (b) The state land planning agency, after consulting with the appropriate local government, may, no more than once per year, recommend to the Administration Commission the enactment, amendment, or rescission of a land development regulation or element of a local comprehensive plan. Within 45 days following the receipt of such recommendation, the commission shall reject the recommendation, or

accept it with or without modification and adopt it by rule, including any changes. Such local development regulation or plan must be in compliance with the principles for guiding development.

History. — s. 6, ch. 79-73; s. 4, ch. 86-170; s. 1, ch. 89-342; s. 641, ch. 95-148; s. 3, ch. 2006-223; s. 34, ch. 2010-205.

<sup>1</sup> Note.— Section 7, ch. 2006-223, provides that “[i]f the designation of the Florida Keys Area as an area of critical state concern is removed, the state shall be liable in any inverse condemnation action initiated as a result of Monroe County land use regulations applicable to the Florida Keys Area as described in chapter 28-29, Florida Administrative Code, and adopted pursuant to instructions from the Administration Commission or pursuant to administrative rule of the Administration Commission, to the same extent that the state was liable on the date the Administration Commission determined that substantial progress had been made toward accomplishing the tasks of the work program as defined in s. 380.0552(4)(c), Florida Statutes. If, after the designation of the Florida Keys Area as an area of critical state concern is removed, an inverse condemnation action is initiated based upon land use regulations that were not adopted pursuant to instructions from the Administration Commission or pursuant to administrative rule of the Administration Commission and in effect on the date of the designation’s removal, the state’s liability in the inverse condemnation action shall be determined by the courts in the manner in which the state’s liability is determined in areas that are not areas of critical state concern. The state shall have standing to appear in any inverse condemnation action.”

<sup>2</sup> Note.— The word “to” was inserted by the editors.

STATE OF FLORIDA  
DIVISION OF ADMINISTRATIVE HEARINGS

FLORIDA KEYS CITIZENS )  
COALITION, INC., AND LAST )  
STAND, INC., )

Petitioners, )

vs. )

Case No. 04-2755RP

FLORIDA ADMINISTRATION )  
COMMISSION AND CITY OF )  
MARATHON, FLORIDA, )

Respondents, )

and )

DEPARTMENT OF COMMUNITY )  
AFFAIRS, )

Intervenor. )

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FLORIDA KEYS CITIZENS )  
COALITION, INC., AND LAST )  
STAND, INC., )

Petitioners, )

vs. )

Case No. 04-2756RP

FLORIDA ADMINISTRATION )  
COMMISSION AND MONROE COUNTY, )

Respondents, )

and )

DEPARTMENT OF COMMUNITY )  
AFFAIRS, )

Intervenor. )

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FINAL ORDER

Pursuant to notice, a final hearing was held in these cases on October 11 through 15 and November 15 through 18, 2004, in Tallahassee, Florida, before Carolyn S. Holifield, a duly-designated Administrative Law Judge of the Division of Administrative Hearings.

APPEARANCES

For Petitioners:

Richard Grosso, Esquire  
Environmental and Land Use  
Law Center, Inc.  
3305 College Avenue  
Fort Lauderdale, Florida 33314

For Respondent and Intervenor Florida Administration  
Commission and Department of Community Affairs:

David L. Jordan, Esquire  
Timothy E. Dennis, Esquire  
Department of Community Affairs  
2555 Shumard Oak Boulevard  
Suite 325  
Tallahassee, Florida 32399-2100

For Respondent City of Marathon:

Nancy Stroud, Esquire  
Jorge Cruz-Bustillo, Esquire  
Weiss, Serota, Helfman,  
Pastoriza & Guedes, P.A.  
3107 Stirling Road, Suite 300  
Fort Lauderdale, Florida 33312-6526

John R. Herin, Jr., Esquire  
Stearns, Weaver, Weissler,  
Alhadeff & Sitterson, P.A.  
150 West Flagler Street  
Suite 2200  
Miami, Florida 33130

For Respondent Monroe County:

Michael T. Burke, Esquire  
Tamara Schrudders, Esquire  
Johnson, Anselmo, Murdoch,  
Burke & George, P.A.  
2455 East Sunrise Boulevard  
Suite 1000  
Fort Lauderdale, Florida 33304

Richard Collins, Esquire  
Robert B. Shillinger, Jr., Esquire  
Monroe County  
Post Office Box 1026  
Key West, Florida 33041-1026

STATEMENT OF THE ISSUES

Whether the proposed Florida Administrative Code Rules 28-20.110, 28-20.120, and 28-18.210 are invalid exercises of delegated legislative authority.

PRELIMINARY STATEMENT

On August 5, 2004, Petitioners, Florida Keys Citizens Coalition, Inc. ("FKCC"), and Last Stand, Inc. ("Last Stand"), filed two separate Petitions challenging proposed Florida Administrative Code Rules 28-18.210, 28-20.110, and 28-20.120, and asserted that parts thereof were invalid exercises of delegated legislative authority.<sup>1</sup> The Petition, which challenged proposed Florida Administrative Code Rule 28-18.210 ("Proposed Rule 28-18.210"), was assigned Case No. 04-2755RP, and the Petition challenging proposed Florida Administrative Code Rules 28-20.110 and 28-20.120 ("Proposed Rule(s) 28-20.110 and



28-20.120") was assigned Case No. 04-2756RP. By separate Orders issued August 26, 2004, the cases were consolidated, and the Department of Community Affairs ("DCA") was allowed to intervene in this proceeding.

By notice issued August 12, 2004, the final hearing was scheduled for August 30, 2004. Upon Order granting the parties' Joint Motion for Continuance, issued August 27, 2004, the hearing was continued and rescheduled for September 15 through 17, 20 through 24, 27, and 28, 2004. On September 8, 2004, Respondent, the Florida Administration Commission ("Administration Commission"), and Intervenor, the DCA, filed a Second Motion for Continuance, which was unopposed by Petitioners. By Order issued September 9, 2004, the hearing was continued and rescheduled for October 11 through 15 and November 15 through 18, 2004. As noted above, the hearing was conducted as noticed.

Respondent, the City of Marathon ("City of Marathon" or "Marathon"), filed a Motion in Limine to Establish Appropriate Legal Scope of Proceeding ("Motion in Limine") on October 7, 2004, and a Motion to Dismiss for Lack of Standing ("Motion to Dismiss") on October 11, 2004. Subsequently, on November 10, 2004, Marathon filed a Supplemental Affidavit and Exhibits in Support of the Motion to Dismiss and a correction thereto on November 12, 2004.

Prior to the evidentiary part of the hearing, argument was heard on Marathon's Motion in Limine. However, argument on the Motion to Dismiss was deferred until later in the proceeding to allow Petitioners' counsel time to review and respond to the Motion to Dismiss. Following argument of counsel, the undersigned reserved ruling on the Motion in Limine and Motion to Dismiss and advised the parties that the issues would be addressed in the final order. For the reasons set forth below, the Motion to Dismiss is denied, and the Motion in Limine is granted.

On October 8, 2004, the parties filed a Pre-hearing Stipulation in which they stipulated to facts which required no proof at hearing. Those stipulated facts deemed relevant have been incorporated into this final order.

Pursuant to the Pre-hearing Statement, Petitioners dismissed five challenges and one allegation from their Petition seeking to invalidate Proposed Rule 28-20.110, which amends Policy 101.2.13 of the Monroe County Comprehensive Plan.<sup>2</sup>

During the evidentiary part of the hearing, Petitioners presented the testimony of James Quinn, Curtis R. Kruer, Deborah Sue Harrison, Charles Pattison, and Rebecca Jetton.

Petitioners' Exhibits numbered 1 through 3, 4-a through 4-o, 5 through 7, 25, 30, 36, 45, 46, 48, 56, 57, 65, 68, and 84 were admitted into evidence. Petitioners presented the deposition

testimony of 15 witnesses in Exhibits 4-a through 4-o.

Petitioners' Exhibit 36 is the deposition testimony of Ken Metcalf.

The Administration Commission and the DCA presented the testimony of Edwin O. Swift, Rebecca Jetton, James Muller, and Otti Brock, Ph.D. Respondent, Monroe County, presented the testimony of Kathleen Conaway, Ross Thomson, Richard Calvo, George Garrett, Mark Rosch, and Robert Nabors, Esquire. The DCA and Monroe County's Joint Exhibits 1 through 5, 7 through 9, 11 through 66, and 68 through 76 were received into evidence. The City of Marathon presented the testimony of Gail Kenson, and Marathon's Exhibits 1, 2, 4, 7, 8, and 10 through 12 were received into evidence.

At the conclusion of the hearing, upon request of Petitioners and agreement of the other parties, the time for filing proposed final orders was set for January 7, 2005.

On December 23, 2004, Petitioners, on behalf of all parties, filed an Agreed Motion for Enlargement of Time Within Which to File Proposed Recommended Orders and Memoranda of Law ("Agreed Motion for Enlargement of Time"), which represented that the complete Transcript of the hearing was not yet available. The Agreed Motion for Enlargement of Time was granted, and the time for filing proposed orders was extended to January 18, 2005, or 14 days after the Transcript was filed,

whichever occurred later. The Transcript, consisting of 15 volumes, was filed on January 7, 2005. Therefore, pursuant to the Order Granting the Agreed Motion for Enlargement of Time, the proposed recommended orders were due on January 21, 2005.

On January 19, 2005, Petitioners filed a Motion for Extension of Deadline to File Proposed Final Orders ("Motion for Extension of Time") to which Monroe County, the City of Marathon, and the DCA did not object. By Order issued January 21, 2005, the Motion for Extension of Time was granted, and the time for filing proposed orders was extended to January 28, 2005. By Motion for Page Limit Enlargement for Proposed Final Order, filed January 25, 2005, Petitioners requested that they be allowed a collective total of 120 pages to fully address all issues relating to the proceeding. The unopposed Motion for Page Limit Enlargement was granted.

Petitioners' Proposed Final Order and Respondents' and Intervenor's jointly-submitted Proposed Final Orders were timely filed under the extended timeframe.

The City of Marathon filed a Memorandum of Law Regarding the Scope of Review and Standing of Petitioners and a Supplemental Proposed Final Order on January 27, 2005. Petitioners filed a Memorandum of Law on January 31, 2005.

The Proposed Final Orders, Supplemental Proposed Order, and the Memoranda of Law have been carefully considered in preparation of this Final Order.

#### FINDINGS OF FACT

##### Parties

1. Petitioner, Florida Keys Citizens Coalition, Inc. ("FKCC"), is a non-profit Florida corporation whose address is 10800 Overseas Highway, Marathon, Florida 33050. The primary purpose of FKCC is to "protect the quality of life of the citizens of the Florida Keys." The primary emphasis of the organization involves issues related to the carrying capacity, the limits of the infrastructure, and the environmental qualities of the Florida Keys. Consistent with its purpose, FKCC opposes regulations which it believes will diminish the quality of the natural habitat in Monroe County and the City of Marathon and hinder safe and efficient emergency evacuation.

2. FKCC has been involved in previous Monroe County litigation, including participating as a party to at least two formal administrative challenges to the 2010 Monroe County Comprehensive Plan (Monroe County Comprehensive Plan).

3. Petitioner, Last Stand, Inc., is a non-profit Florida corporation whose address is Post Office Box 146, Key West, Florida 33041-0146. The primary purpose of Last Stand is to preserve and protect the quality of life in the City of Key

West, the Florida Keys, and their environs, with particular emphasis on the natural environment. To that end, Last Stand opposes regulations that it believes diminishes the quality of the natural habitat in the Florida Keys and regulations that hinder safe and efficient emergency evacuation in the Florida Keys.

4. Last Stand is an organizational member of FKCC. Moreover, many individual members of Last Stand are also members of FKCC.

5. A substantial number of members of both FKCC and Last Stand live, work, and/or engage in various recreational activities in the City of Marathon or in nearby areas. For example, a substantial number of members of both of those organizations regularly use and enjoy the nearshore waters of Monroe County for recreational water activities, such as boating, diving, snorkeling, and/or swimming.<sup>3</sup> A substantial number of members of both organizations also regularly use and enjoy terrestrial habitats in Monroe County, including the City of Marathon, for recreational activities such as hiking and bird-watching.

6. A substantial number of the members of both FKCC and Last Stand may be adversely affected or impacted by the issues which are in dispute in this proceeding. Moreover, the issues in this proceeding are germane to the purposes of both FKCC and

Last Stand. Also, both FKCC and Last Stand regularly represent their members' interests in formal administrative hearings and local commission meetings relative to environmental and growth management issues.

7. Respondent, Administration Commission, consists of the Governor and Cabinet and is empowered to adopt, by rule, any enactment, amendment, or rescission of a land development regulation or element of a local comprehensive plan in the Florida Keys area.

8. Respondent, Monroe County, is a local county government within the Florida Keys Area of Critical State Concern ("ACSC").

9. Respondent, City of Marathon, is a municipality within the Florida Keys ACSC.

10. Intervenor, the DCA, is the state land planning agency responsible for the general supervision of the administration and enforcement of the ACSC program. As the state planning agency, the DCA is authorized to propose changes to local comprehensive plans and land development regulations within an ACSC for adoption by the Administration Commission.

#### Economic Base of Florida Keys

11. Tourism is the economic base of the Florida Keys. Moreover, the basis for the Florida Keys' tourism is a healthy natural environment that supports fishing, diving, water sports,

boating, bird-watching habitat, visiting endangered species habitat, and other related activities.

#### History of the Florida Keys ACSC

12. The Florida Keys area is designated as an ACSC and consists of, unincorporated, Monroe County, the City of Layton, the City of Key Colony Beach, the Village of Islamorada, and the City of Marathon. See § 380.0552(3), Fla. Stat. (2004).<sup>4</sup> The City of Key West has been separately designated as an ACSC pursuant to Florida Administrative Code Rule Chapter 28-36.

13. The Florida Keys were originally designated by the Administration Commission in 1975 and re-designated by the Legislature in 1986. The legislative intent section and the Principles for Guiding Development, as set forth in Subsections 380.0552(2) and (7), Florida Statutes, together require an effective land use management system that protects the natural environment and character of the Florida Keys, maintains acceptable water quality conditions, ensures adequate public facility capacity and services, provides adequate affordable housing, supports a sound economic base, protects constitutional property rights, and requires adequate emergency and post-disaster planning to ensure public safety.

14. During the past 20 years, the growth management process has been implemented in essentially two phases. The first phase involved developing, adopting, and implementing the first



comprehensive plans and regulations under the new designation. These plans and regulations were adopted by the county and cities in the mid-1980s.

15. The 1986 plan established a growth management system that substantially increased protection of natural resources and began to reduce the over-allocation of density in the Florida Keys. It also achieved the long-term protection of North Key Largo. However, several major problems were not adequately addressed by the 1986 plan, including maintaining evacuation capability, water quality protection, sewage treatment, stormwater treatment, and community character. In addition, although the plan required a focal point plan for Big Pine Key, this planning process did not result in a viable plan that adequately protected the Florida Keys deer. The required open space ratios proved difficult to maintain within habitats once development occurred, resulting in fragmentation of habitat.

16. The second phase involved the planning process undertaken in the early 1990s to meet the requirements of the Growth Management Act and to update the plan based on lessons learned in implementing the 1986 plan. In developing, reviewing, and litigating the Monroe County Comprehensive Plan, the following critical issues emerged involving how to:

- maintain acceptable hurricane evacuation capability;

- retrofit existing development and provide new development with adequate wastewater and storm water facilities, including, where appropriate, upgrading of on-site systems;
- determine the carrying capacity of the Keys to withstand the impacts of additional land development and modify state and local plans, regulations and programs so that the carrying capacity is not exceeded;
- provide an adequate supply of affordable housing while maintaining acceptable hurricane evacuation and protecting the environment.

17. In 1996, the Administration Commission adopted a rule which included a cap of 255 residential units per year for Monroe County. The rule also adopted a five-year Work Program into the Monroe County Comprehensive Plan with the local governments to construct sewage treatment facilities, replace cesspits, and purchase land to protect natural habitat. Monroe County, the City of Marathon, and the DCA were required to submit reports to the Administration Commission each year "documenting the degree to which the Work Program objectives for that year [had] been achieved." The rule contemplated that if the local governments did not make "substantial progress" towards accomplishing the tasks of the Work Program, the unit cap for new residential permits would be reduced by at least 20 percent for the following year.

18. The Administration Commission found a lack of "substantial progress" in 1999 and adopted a rule which reduced

the annual allocation of residential permits by 20 percent and extended the five-year Work Program to seven years. The Administration Commission found "substantial progress" had been accomplished in 2001 and began rulemaking to restore the permit allocation. However, the rule was challenged, and since the Administration Commission found a lack of "substantial progress" in 2002, the Commission adopted a revised rule which did not restore permits.

#### The Carrying Capacity Study

19. The 1996 Administration Commission rule amended the Monroe County Comprehensive Plan to require the completion of a carrying capacity analysis.

The carrying capacity analysis shall be designed to determine the ability of the Florida Keys ecosystem, and the various segments thereof, to withstand all impacts of additional land development activities. The analysis shall be based upon the findings adopted by the Administration Commission on December 12, 1995, or more recent data that may become available in the course of the study, and shall be based upon the benchmarks of, and all adverse impacts to, the Keys land and water natural systems, in addition to the impact of nutrients on marine resources. The carrying capacity analysis shall consider aesthetic, socioeconomic (including sustainable tourism), quality of life and community character issues, including the concentration of population, the amount of open space, diversity of habitats, and species richness. The analysis shall reflect the interconnected nature of the Florida Keys' natural systems, but may consider and analyze the carrying capacity of specific

islands or groups of islands and specific ecosystems or habitats, including distinct parts of the Keys' marine system. (Ref. 1991 Stip. Settlement Agreement). Agencies: County, DCA, DEP, DOH, DOT, GFC, SFWMD, NMS, SFRPC, EPA, USFWS, Army COE, and other interested parties to include representatives of environmental organizations and development interests.

20. The Florida Keys Carrying Capacity Study ("FKCCS") was completed over a period of six years. Six million dollars was allocated by the DCA and the United States Army Corps of Engineers to produce the Monroe County Sanitary Wastewater Master Plan, the Stormwater Management Plan, and the FKCCS. The contractor, URS Corporation, completed the FKCCS and the Carrying Capacity/Impact Assessment Model ("CCIAM"), a separate component to be used in forecasting land use scenarios. A panel of external experts was used to peer review the scope of work. In September 2002, the study was completed.

21. The National Research Council of the National Academy of Sciences ("Council") reviewed the CCIAM and FKCCS and, as a result of its review, adjustments were made to the CCIAM. The Council's review concluded that overall, due to data constraints and other issues in certain portions of the CCIAM, the model proved insufficient to develop a comprehensive carrying capacity framework that would allow for undisputable determinations of whether future development scenarios fall within the carrying

capacity of the Florida Keys. The marine module, the most data-deficient, was subsequently removed from the CCIAM.

22. The FKCCS recommended four main guidelines for future development in the Florida Keys:

1. Prevent encroachment into native habitat. A wealth of evidence shows that terrestrial habitats and species have been severely affected by development and further impacts would only exacerbate an already untenable condition.
2. Continue and intensify existing programs. Many initiatives to improve environmental conditions and quality of life exist in the Florida Keys. They include land acquisition programs, the wastewater and stormwater master plans, ongoing research and management activities in the Florida Keys National Marine Sanctuary, and restoration efforts throughout the Florida Keys.
3. If further development is to occur, focus on redevelopment and infill. Opportunities for additional growth with small, potentially acceptable, additional environmental impacts may occur in areas ripe for redevelopment or already disturbed.
4. Increase efforts to manage the resources. Habitat management efforts in the Keys could increase to effectively preserve and improve the ecological values of remaining terrestrial ecosystems.

#### Partnership Agreement

23. While preparing the Assessment Report for 2003, the DCA Secretary concluded that the existing policy direction, consisting of imposition of the Work Program by the

Administration Commission and reduction of residential permits, due to lack of substantial progress, was not sufficient to solve the problems facing the Florida Keys. The Assessment Report described difficulties and delays in implementing the Work Program. Most of the sewage treatment facilities contemplated by the Work Program were not constructed and valuable upland habitat continued to be developed.

24. On December 16, 2003, the Administration Commission concluded that Monroe County had not made substantial progress and directed the DCA "to determine changes that would be necessary to the comprehensive plan to fully implement the requirements of the Work Program[,] as well as habitat protection provisions." The Administration Commission also accepted the staff recommendation that it "determine substantial progress has been made for the City of Marathon, and that some permits will be provided back to the City of Marathon," the number to be determined at the Administration Commission's January 27, 2004, meeting.

25. The DCA approached the Florida Keys local governments and community-based organizations and proposed a Partnership Agreement to "begin implementation of the Work Program associated with the Florida Keys Protection Act." The DCA Secretary addressed the governing boards of the Florida Keys' local governments concerning the proposed Partnership Agreement.

Monroe County, the City of Marathon, and the Village of Islamorada adopted resolutions supporting the partnership proposal.

26. By letter dated February 25, 2004, the DCA Secretary requested that the Governor, as a member of the Administration Commission, authorize the Administration Commission staff to initiate rulemaking to amend the Comprehensive Plans of Monroe County and the City of Marathon. According to the letter, this action was requested based upon a series of significant commitments made by each of these local governments which addressed issues related to habitat protection, affordable housing, wastewater and stormwater management projects, land acquisition, and nutrient credits. The letter also noted the following:

A complete follow-through on these commitments would mean over \$410 million would be spent in the coming years to address these issues in the Florida Keys.

Habitat protection will be increased, environmentally-sensitive hammock and pinelands would be purchased, new wastewater and stormwater management projects would be initiated, and 230 units of affordable housing would be made available for residents of the Florida Keys.

\* \* \*

In essence, we have developed proposals that allow additional units primarily for affordable housing in the Florida Keys, but also would ensure the most pressing issues

will be jointly addressed by local and state government.

27. Consistent with the February 25, 2004, letter, the Partnership Agreement consists of commitments by the Florida Keys' local governments and several state agencies to address habitat protection, wastewater and stormwater treatment, affordable housing, and hurricane evacuation.

28. At its March 9, 2004, meeting, the Administration Commission accepted the DCA's recommendation to initiate rulemaking to implement the Partnership Agreement.

#### The Proposed Rules

29. Proposed Rules 28-18.210, 28-20.110, and 28-20.120 were published in the Florida Administrative Weekly on July 16, 2004.<sup>5</sup>

30. According to the published notice, the purpose of Proposed Rule 28-18.210 is to amend Policy 101.2.14 of the Marathon Comprehensive Plan to address building permit allocations by increasing the annual residential permitting cap and specifying allocations authorized for market rate and affordable housing, restoring certain allocations authorized for market rate and affordable housing, authorizing certain unused rate of growth ordinance allocations to roll forward, and deleting the requirement for nutrient credits upon a date certain. The notice also provides that the Proposed Rule amends



the Work Program set forth in Policy 101.2.14 of the Marathon Comprehensive Plan to establish Year Eight and Year Nine to address tasks not yet completed in the original Work Program.

31. The published notice states that the purpose of Proposed Rules 28-20.110 and 28-20.120 is to amend Policy 101.2.13 of the Monroe County Comprehensive Plan to address building permit allocations by increasing the annual residential permitting cap and specifying allocations authorized for market rate and affordable housing, restoring certain allocations previously reduced to be targeted for affordable housing, authorizing certain unused rate of growth ordinance allocations to roll forward, and deleting the requirement for nutrient reduction credits upon a date certain. The notice also provides that the proposed rules amend the Work Program in Policy 101.2.13 of the Monroe County Comprehensive Plan to establish Work Program provisions for Year Eight, Year Nine, and Year Ten to address tasks not yet completed in the original Work Program. Finally, the notice states that the Proposed Rule amendments address the adoption of necessary land development regulations.

32. The published notice cites Subsection 380.0552(9), Florida Statutes, as the specific authority for the Administration Commission's promulgating the Proposed Rules and Section 380.0552, Florida Statutes, as the law implemented.

33. Petitioners challenge portions of Proposed Rule 28-18.210, which will amend the Marathon Comprehensive Plan and portions of Proposed Rules 28-20.110 and 28-20.120,<sup>6</sup> which will amend the Monroe County Comprehensive Plan and the Monroe County Land Development Regulations on the basis that they constituted invalid exercises of delegated legislative authority.

34. Petitioners contend that the proposed rules should comply with Section 380.0552 and Chapters 163 and 380, Florida Statutes, and, therefore, should be analyzed for such compliance in this proceeding. Notwithstanding Petitioners contention to the contrary, for the reason stated in paragraph 199 below, Proposed Rules 28-18.210, 28-20.110, and 28-20.120 will be analyzed based on their consistency with Section 380.0552, Florida Statutes, because that is the provision which the proposed rules explicitly purport to implement. The published notice does not specify the subsection of Section 380.0552, Florida Statutes, that the proposed rules implement. However, the parties agree that the proposed rules must be consistent with Subsection 380.0552(7), Florida Statutes, which set forth the Principles for Guiding Development.

Restoration/Increase of ROGO Allocations

35. The Comprehensive Plans for Monroe County and the City of Marathon include a Permit Allocation System, under which

Monroe County was originally allocated 255 permits per year for new residential units. As noted in paragraph 18 above, in 1999, the Administration Commission determined that substantial progress on the Work Program had not been accomplished and adopted a rule reducing the annual allocation of permits by 20 percent. After the incorporation of the Village of Islamorada and Marathon, and a voluntary reduction by the Village of Islamorada, the current annual allocation of residential development permits is 158 for Monroe County, 24 for Marathon, and 14 for the Village of Islamorada.

36. Proposed Rule 28-20.110(1) amends Policy 101.2.13 of the Monroe County Comprehensive Plan by increasing the annual unit cap of 158 to 197, thereby restoring the original level of permits issued for new residential development under the Rate of Growth Ordinance ("ROGO"). The proposed rule requires that "[e]ach year's ROGO allocation of 197 new units shall be split with a minimum of 71 units allocated for affordable housing in perpetuity and market rate allocations not to exceed 126 new units per year."

37. Proposed Rule 28-18.210 amends Policy 101.2.14 of the Marathon Comprehensive Plan by increasing the maximum number of permits for new residential units from 24 to 30 per year, thereby, restoring the original level of permits per year for new residential development under ROGO. The proposed rule

requires that "[e]ach year's ROGO allocation of 30 units shall consist of 24 market rate and 6 affordable units" and that the affordable housing "remain as affordable housing in perpetuity."

38. In addition to restoring the number of permits for new development to the original levels, Proposed Rule 28-20.110 amends the Comprehensive Plans of Monroe County and Marathon to restore available permit allocations that were unused in previous years and to allow unused ROGO allocations to be allocated in subsequent years.

39. Proposed Rule 28-20.110 adds a new provision to the Monroe County Comprehensive Plan, providing that "effective July 12, 2004, 140 ROGO allocations, which represent unused reductions for ROGO Years Nine through 12, and 25 units lost in Year Ten due to lack of nutrient credits, are reallocated to the County exclusively for affordable housing purposes."

40. Proposed Rule 28-18.210 adds a provision to the Marathon Comprehensive Plan that "effective July 12, 2004, 65 ROGO allocations, which represent unused ROGO allocations for ROGO Years 9 through 12, are to be reallocated to the City exclusively for affordable housing."

#### Advancing/Borrowing Nutrient Credits

41. The existing Comprehensive Plans of Monroe County and the City of Marathon include a nutrient credit system. According to the Monroe County Comprehensive Plan, nutrient

reduction credits are earned when existing treatment systems are upgraded. The amount of nutrient reduction credits earned correlate to the type of treatment system to which an old system is upgraded. Thus, if a treatment system is upgraded to the "best centralized system" or the "advanced wastewater treatment system," Monroe County would earn the most nutrient credits possible. For example, elimination of a cesspit by connection to a centralized advanced wastewater treatment system earns 1.5 nutrient credits, and the elimination of a substandard on-site disposal system by connection to a centralized secondary treatment system earns 0.5 nutrient credits.

42. Under the existing Comprehensive Plans of Monroe County and the City of Marathon, development permits for new residential development can only be issued if a nutrient reduction credit has been earned.

43. The requirement that adequate nutrient credits be earned prior to issuance of permits is to mitigate for nutrient impacts of new residential development. However, Proposed Rules 28-18.210 and 28-20.110 provide that Monroe County and the City of Marathon will be permitted to "borrow" nutrient credits from the pool of nutrient credits that are anticipated from the construction and/or completing of sewage treatment facilities.

44. The existing Comprehensive Plans of Monroe County and the City of Marathon provide that nutrient reduction credits are

earned by the construction of the Little Venice system according to the schedules prescribed in the Comprehensive Plans. The schedules in the Comprehensive Plans provide that "213 of the total credits estimated to be available from the full operation of the system shall be earned when the wastewater permit is issued, the design/build contract for the system has been fully executed and construction of the system has commenced." The Comprehensive Plans also provide that all the remaining available credits shall be earned when the construction of the Little Venice System is complete, the collection system lines have been installed, and the final total of credits available from the operation of the systems has been calculated.

45. Proposed Rules 28-20.110 and 28-18.210 amend the Comprehensive Plans of Monroe County and Marathon by allowing 213 of the total credits estimated to be available from the full operation of the Little Venice system to be earned, effective July 13, 2003. The proposed rules also provide that when the Little Venice system is completed, "[t]he total credits available shall be reduced by the 213 [credits] advanced in the year 2003."

46. Proposed Rule 28-20.110 amends the Monroe County Comprehensive Plan by allocating 41 nutrient credits for market rate units and 193 nutrient credits for affordable housing units to Monroe County. The Proposed Rule 28-20.110 provides that the 41 nutrient credits will be subtracted from the nutrient credits

subsequently earned from hookups to the Key West Resort Utilities Wastewater Facility ("Key West Resort Utilities"). The 193 nutrient credits will be subtracted from hookups to the Key West Resort Utilities, Bay Point, and Key Largo Wastewater Facilities.

Repeal of Nutrient Reduction Provision

47. As described in paragraph 42 above, the existing Comprehensive Plans of Monroe County and the City of Marathon have mandatory nutrient provisions that require nutrient credits to be earned prior to issuance of a permit for new residential units.

48. Proposed Rules 28-20.110 and 28-18.210 amend the Comprehensive Plans of Monroe County and the City of Marathon by repealing the mandatory nutrient credit provisions. Pursuant to the proposed rules, "effective July 13, 2005, no nutrient credits shall be required if the local government has made satisfactory progress as determined by the Administration Commission in meeting the deadlines established by the Work Program as adopted by rule after March 15, 2004."

Challenges to Increase/Restoration of Permits, Advancing Nutrient Credits, and Repeal of Nutrient Reduction Provision

49. Petitioners contend that the increase in new residential permits is arbitrary and capricious and contravenes the law implemented because it will increase development even though the identified thresholds for growth in the Florida

Keys--water quality, terrestrial habitat, and evacuation times-- have been exceeded and will "worsen" the water quality.

50. Petitioners challenge the provision which allows the borrowing or awarding of nutrient credits before wastewater projects are completed as arbitrary and capricious, because it will allow a net increase in the nutrient impacts into the nearshore waters of the Florida Keys and will "worsen" the water quality.

51. Proposed Rules 28-20.110(1) and 28-18.210 increase the number of permits for new residential units from the preceding years. However, the number of permits to be issued under the Monroe County Comprehensive Plan has not increased. Rather, the permits will be issued in a shorter time frame and without being subject to the previous conditions. Even though increased development could result in an increase in the nutrient impacts into the nearshore waters of the Florida Keys, the adverse effect of such nutrient loading is offset by the adequate treatment of wastewater and stormwater runoff.

52. To address the problem of nutrient loading, the Proposed Rules 28-20.110 and 28-18.210 extend the years of the Work Programs and include in those programs tasks, such as construction and completion of wastewater facilities, as well as financing for those projects. Based on the commitments of Monroe County and the City of Marathon in the Partnership



Agreement, there is a reasonable expectation that the projects included in the Work Program of the Proposed Rules will be completed. When completed, the wastewater treatment facilities will provide nutrient credits. In anticipation of the completion of the wastewater treatment facilities, Proposed Rules 28-20.110 and 28-18.210 restore the annual permits for new residential units to their original levels and allow previous unused ROGO allocations to be allocated. The Proposed Rules provide that the nutrient credits for these allocations will be borrowed from the pool of nutrient credits that are anticipated from the planned construction and completion of wastewater facilities.

53. Petitioners' contention that the repeal of the mandatory nutrient reduction credit provision is arbitrary and capricious and contravenes the law implemented because such repeal allows the water quality to worsen, is inconsistent with the "no net nutrient" provision of the Comprehensive Plans and is unjustified given that the nutrient pollution has increased since the nutrient credit provisions were adopted. Petitioners also contend that the repeal of the nutrient credit provision is arbitrary and capricious because the repeal is effective on a date certain without further action and without regard for whether it is justified.

54. Proposed Rules 28-20.110 and 28.18-210 repeal the mandatory nutrient reduction credit provisions of the Comprehensive Plans, but the condition precedent to the repeal is the Administration Commission's making a determination that Monroe County and the City of Marathon have "made satisfactory progress . . . in meeting deadlines established by the [new] Work Program." This determination must be made prior to the repeal going into effect. Presumably, the tasks in the Work Program for which satisfactory progress must be made are those relevant and reasonably related to and which result in nutrient credits. Contrary to Petitioners' assertion, the repeal of the mandatory nutrient credit provision does not automatically become effective on the date prescribed in the proposed amendments. Instead, the repeal is contingent on Monroe County's and the City of Marathon's making "satisfactory progress." The term "satisfactory" is not vague as asserted by Petitioners. In the context of Proposed Rules 28-20.110 and 28-18.210, "satisfactory" would be given its common and ordinary meaning, which is "sufficient to meet a demand or requirement."<sup>7</sup>

Annual Reporting Requirement

55. The existing Comprehensive Plans for Monroe County and the City of Marathon provide that "beginning September 30, 2003, and each year thereafter, [the respective local government] Monroe County and the [DCA] shall report to the Administration

Commission documenting the degree to which the Work Program objectives have been achieved."

56. Proposed Rules 28-20.110 and 28-18.210, will modify the annual reporting requirements in the Monroe County and Marathon Comprehensive Plans. The proposed amended provision, which is underlined, and the existing provision are as follows:

Beginning September 30, 2003, and each year of the work program thereafter, Monroe County and the Department of Community Affairs shall report to the Administration Commission documenting the degree to which the work program objectives for that year have been achieved. The report for years seven and eight shall be combined and provided to the Administration Commission by September 30, 2005. The Commission shall consider the findings and recommendations provided in those reports and shall determine whether substantial progress has been achieved toward accomplishing the tasks of the work program.

57. Petitioners contend that the proposed rules, which delete the requirement for Monroe County and for the City of Marathon to submit the September 2004 progress report to the Administration Commission, are arbitrary and capricious. Petitioners assert that by deleting the requirement for the 2004 annual progress report, the proposed rules fail to establish an annual safeguard that is required to ensure that the environmental conditions and infrastructure limitation that the annual Work Program is designed to resolve, do not worsen.

58. The proposed rules delete the requirement that Monroe County and Marathon submit their respective reports in September 2004 and delay submission of that report by a year. The time spent negotiating the Partnership Agreement and the proposed changes to the Monroe County Comprehensive Plans and the Land Development Regulations left little time for Monroe County and the City of Marathon to implement the new Work Programs. Moreover, the DCA and the Administration Commission would have had too short a time period in which to judge whether Monroe County and Marathon had made substantial progress. By combining the reports for Years Seven and Eight of the Work Program, the Administration Commission can expect a meaningful report on Monroe County's and the City of Marathon's progress in implementing their respective Work Programs.

Monroe County Work Program Under Proposed Rules

59. Proposed Rule 28-20.110 amends the Work Program Policy 101.2.13 of the Monroe County Comprehensive Plan by adding Years Eight, Nine, and Ten to the existing Work Program. Many of the tasks included therein address and are related to wastewater facilities, habitat protection, affordable housing, and hurricane evacuation and implement the Partnership Agreement.

60. Year Eight of the Work Program requires that Monroe County and other designated agencies perform the specified tasks and provide, in relevant part, the following:

Year Eight (July 13, 2004 through July 12, 2005)

A. Review and revise (as necessary) the Conservation and Natural Areas Map.

B. Initiate acquisition strategy for lands identified outside the Conservation and Natural Areas identified as worthy of protection.

C. Begin public hearings for Conservation and Natural Areas boundaries.

D. Conclude public hearings for the adoption of the amended Conservation and Natural Areas Boundaries.

E. Adopt an ordinance to implement a moratorium on ROGO/NROGO applications that involves the clearing of any portion of an upland tropical hardwood hammock or pinelands habitat contained in a tropical hardwood hammock or pinelands patch of two or more acres in size located within a Conservation and Natural Area.

F. Adopt amendments to the comprehensive plan and land development regulations to enact overlay designations, and eliminate or revise the Habitat Evaluation Index, and modify the ROGO/NROGO system to guide development away from environmentally sensitive lands.

G. Amend land development regulations to prohibit the designation of Conservation and Natural Areas (Tier 1) as a receiver site for ROGO exempt development from sender sites; and to further limit clearing of upland native habitat that may occur in the Natural Areas (Tier I) and the Transition and Sprawl Reduction Area (Tier II) upon designation by the County.

H. Develop Land Acquisition and Management Master Plan and address both funding and management strategies.

I. Provide \$40 million in financing secured by infrastructure tax for wastewater facilities.

J. Begin construction of wastewater plants or laying of collection lines for Baypoint, Conch Key and Key Largo Trailer Village/Key Largo Park.

K. Ensure the connection for up to 1,350 EDUs [equivalent development units] at Stock Island to Key West Resort Utilities.

L. Complete the Lower Keys and Key Largo feasibility study.

M. Complete projects identified in the Storm Water Management Master Plan.

N. Evaluate and implement strategies to ensure that affordable housing remains affordable in perpetuity for future generations. Establish a partnership with non-profit organizations in order to construct affordable housing using additional state funds.

O. Identify potential acquisition sites for affordable housing proposals and include in the Land Acquisition Master Plan.

P. Provide up to \$10 million in bond financing from the Tourist Impact Tax for acquisition of land for workforce housing and affordable housing sites.

Q. Complete a comprehensive analysis of hurricane evacuation issues in the Florida Keys and develop strategies to reduce actual hurricane clearance times and, thereby, reduce potential loss of life from hurricanes.

61. As discussed below, several of the tasks in Year Eight of the Work Program implement parts of Goal 105 of the Monroe County Comprehensive Plan. Goal 105 reads:

Monroe County shall undertake a comprehensive land acquisition program and smart growth initiatives in conjunction with its Livable CommuniKeys Program in a manner that recognizes the finite capacity for new development in the Florida Keys by providing economic and housing opportunities for residents without compromising the biodiversity of the natural environment and the continued ability of the natural and man-made systems to sustain livable communities in the Florida Keys for future generations.

62. Goal 105, also referred to as the "Smart Growth Goal," provides a framework to implement the FKCCS and a 20-year land acquisition program. The initial phase of implementing Goal 105 calls for the drafting and adoption of "Tier Maps" to be used as guidance for the Monroe County's Land Acquisition Program.

63. Pursuant to Policy 105.2.1 of the Monroe County Comprehensive Plan, the Tier maps will designate and map properties into one of the following three general categories for purposes of Monroe County's Land Acquisition Program and the smart growth initiatives: Natural Area (Tier I); Transition and Sprawl Reduction Area (Tier II); and Infill Area (Tier III).

64. Tier I property is property where all or a significant portion of the land is characterized as environmentally sensitive by policies of the Monroe County Comprehensive Plan

and applicable habitat conservation plan. Tier I is to be designated as a Natural Area. New development is to be severely restricted in Tier I. Tier II is any geographic property where scattered groups and fragments of environmentally-sensitive lands, as defined by the Comprehensive Plan, may be found and where subdivisions are not predominantly developed. New development is to be discouraged in Tier II, which is to be designated as Transition and Sprawl Area. Tier III is property where a significant portion of land is not characterized as environmentally sensitive, as defined by the Monroe County Comprehensive Plan, where existing platted subdivisions are substantially developed, served by complete infrastructure facilities, within close proximity to established commercial areas or where a concentration of non-residential uses exist. New development and re-development are to be highly encouraged in Tier III, which is to be designated as Infill Area.

65. Petitioners contend that Task A, which requires Monroe County to "review and revise [as necessary] the Conservation and Natural Areas ["CNA"] Map, vests unbridled discretion to the County to amend the CNA map without adequate standards or criteria." Further, Petitioners assert that Task A does not identify the purpose for which the CNA map is to be used. Based on this assertion, Petitioners contend that Task A is arbitrary and capricious and contravenes law.



66. Task A will assist in the implementation of the Comprehensive Plan by requiring Monroe County to review and revise the CNA map. In reviewing Task A, it is clear that the county must adhere to the criteria prescribed in Goal 105 of the existing Monroe County Comprehensive Plan. When Task A is read together with Goal 105 and its related policies, it is clear that the purpose of Task A is to provide guidance for the Monroe County Land Acquisition Program.

67. As a part of the review and revision process, the Partnership Agreement, which Task A implements, provides that the Monroe County staff should prepare the CNA map utilizing Florida Marine Source Resources Institute ADID maps, the most recent aerial photographs, site visits as necessary, and obtain input from DCA and the public. Moreover, when Task A is read with Task B, and other relevant parts of the Monroe County Comprehensive Plan, it is clear that a CNA map is to be used to implement Goal 105 of the Monroe County Comprehensive Plan, which is related to land acquisition and "smart growth initiatives."

68. Petitioners assert that Task B, which requires Monroe County to "initiate acquisition strategy for lands identified outside the [CNA] boundaries," is arbitrary and capricious and contravenes the law implemented, because it provides no standards or criteria.

69. Task B is consistent with Policy 105.2.1 of Goal 105 of the Monroe County Comprehensive Plan. The Partnership Agreement consistent with Goal 105 provides that Monroe County will identify lands outside the CNA boundaries for acquisition and target for purchase appropriate environmentally-sensitive lands that are contained within upland habitat of two acres or more outside the CNA.

70. Task C requires Monroe County to "begin public hearings for [CNA]." Task D requires Monroe County to conclude the public hearings for adoption of the amended [CNA] boundaries. Petitioners contend that Tasks C and D are arbitrary and capricious and contravene the law implemented, because they do not require that an end result be achieved as a result of these public meetings.

71. When the provisions of Task C and Task D are read together, with Goal 105 and the relevant provisions of the Partnership Agreement, it is clear that the end result sought as a result of the public hearings is to receive public comment regarding the identification of lands to be included in the CNA. Furthermore, this is a reasonable meaning of Tasks C and D in light of the well-known purpose of public hearings.

72. Petitioners challenge Task E, which requires Monroe County to "adopt an ordinance to implement a moratorium on ROGO/NROGO applications that involves the clearing of any

portion of an upland tropical hardwood hammock or pinelands habitat contained in a tropical hardwood hammock or pinelands patch of two or more acres in size located within a [CNA]." The purpose of the moratorium is to prevent impacts to native habitat until Monroe County adopts permanent regulations and amendments.

73. Petitioners contend that Task E of Year Eight of the Work Program, which requires Monroe County to "adopt an ordinance to implement a moratorium on ROGO/NROGO applications that involve the clearing of any portion of an upland hardwood hammock or pinelands habitat contained in a tropical hardwood hammock or pinelands patch of two acres or more . . . within a [CNA]," is arbitrary and capricious and contravenes the law implemented. Petitioners assert that the criteria for the interim ordinance required fails to protect all hammock and pineland, does not protect enough hammock to ensure that the carrying capacity of the Florida Keys terrestrial habitat to sustain degradation and loss is not exceeded, does not require that the interim protections last until replaced by permanent ones, and does not apply to ROGO-exempt allocations.

74. The criteria for the interim ordinance required by Task E is reasonable and will result in strengthening habitat protection in the areas specified in that provision. The fact that Task E authorizes the adoption of an ordinance that

protects less than "all" hammock and pineland, does not make the proposed rule arbitrary and capricious, nor does the proposed rule contravene the law implemented.

75. Petitioners contend that Task F, which requires Monroe County to "[a]dopt amendments to the comprehensive plan and land development regulations to enact overlay designations, and eliminate or revise the Habitat Evaluation Index ["HEI"], and modify the ROGO/NROGO system to guide development away from environmentally sensitive lands," is arbitrary and capricious and contravenes the law implemented.

76. Petitioners claim that the standard set forth in Task F, "to guide development away from environmentally sensitive lands," is no more specific than is statutory language. Petitioners assert that the proposed rule should specify (1) habitat types, patch sizes and other characteristics of the areas to which regulations will apply, and (2) the exact nature of the regulation (i.e. a prohibition on direct or secondary impacts, the application of negative points or open space rations, etc.) that will be relied upon to guide development away from such areas.

77. Task F requires Monroe County to adopt amendments to the Comprehensive Plan and Land Development Regulations to enact the overlay designations requiring Monroe County to implement Policy 105.2.2 of the Monroe County Comprehensive Plan. Task F

will implement Goal 105 of the Monroe County Comprehensive Plan. This task will identify areas to which future development will be directed. Also, the overlay designations will give property owners more certainty with respect to whether they can or cannot develop their property.

78. The requirement in Task F, that the HEI be reviewed or eliminated, is reasonable in light of Goal 105 of the Monroe County Comprehensive Plan. The HEI is currently used by Monroe County to evaluate the environmental sensitivity of land and its suitability for development and acquisition. The HEI requires lot-by-lot evaluations, which fail to take into account secondary impact of development and has resulted in the loss of valuable habitat. The Tier System in Goal 105 is designed to move Monroe County away from the existing HEI. Implementation of Goal 105 requires that the existing HEI be eliminated or revised.

79. Task G of Year Eight of the Work Program requires Monroe County to "amend land development regulations to prohibit the designation of [CNA] (Tier 1) as a receiver site for ROGO exempt development from sender sites; and to further limit clearing of upland native habitat that may occur in the [CNA] (Tier I) and the Transition and Sprawl Reduction Area (Tier II) upon designation by the County." Petitioners contend that Task G is arbitrary and capricious and contravenes the law

implemented because it fails to permanently protect even that habitat which Monroe County claims is most important to protect, allows the geographic scope of the contemplated rules to be defined in the future without stated criteria or standards, and allows an unnecessary delay in the adoption of protections which the data and legal requirements demonstrate should have been adopted two years earlier.

80. Task G is intended to strengthen protection of habitat by adopting land development regulations to prohibit development in specified areas and to further limit clearing in designated areas. Goal 105, specifically, provides guidance as to the standards that such regulations must follow in Policy 105.2.1 of the Monroe County Comprehensive Plan.

81. Petitioners contend that Task K of Year Eight of the Work Program requiring Monroe County to ensure the connection for up to 1,350 units at Stock Island to Key West Resort Utilities, is arbitrary and capricious and contravenes the law implemented. Petitioners charge that the requirement in the proposed rule is vague and could be met by simply connecting one home to the referenced wastewater utility to remedy a documented, serious water quality problem.

82. When the purpose of Task K is considered, the reasonable meaning of the provision is that the task requires

that Monroe County connect approximately 1,350 units to the designated facility.

83. Petitioners contend that Task M of Year Eight of the Work Program, which requires Monroe County to "complete projects identified in the Stormwater Management Master Plan," is arbitrary and capricious and contravenes the law implemented. In support of this contention, Petitioners assert that the Proposed Rule does not identify the name or number of stormwater projects that are to be completed. Petitioners argue that by referring only to "projects," without specifying the name or number of the projects to be completed, the Proposed Rule may require that only a minimum of two projects be completed.

84. The reasonable interpretation of Task M is that Monroe County is required to complete all the remaining projects identified in the Stormwater Management Master Plan. This meaning is supported by a review of related tasks in the previous years of the Work Program. For example, Year Six of the Work Program required Monroe County and other designated agencies to "initiate construction of selected projects as identified in the Stormwater Management Master Plan." Year Seven of the Work Program required that Monroe County and other agencies "continue implementing selected projects identified in the Stormwater Management Master Plan."

85. Petitioners contend that Task P in Year Eight of the Work Program, which requires Monroe County to "provide up to \$10 million in bond financing from the Tourist Impact Tax for acquisition of land for workforce housing and affordable housing sites," is arbitrary and capricious and contravenes the law implemented. As a basis for this contention, Petitioners claim that Task P sets a vague requirement which could be met by simply providing \$1.00 in bond financing to provide a need which the State and Monroe County claim is important enough to justify the permitting increase allowed by Proposed Rules 28-18.210 and 28-20.110.

86. Contrary to Petitioners' assertions, the requirement to provide \$10 million in bond financing could not be met by providing \$1.00 in bond financing. The \$10 million figure represents the approximate amount of bond financing that will be provided. For the reasons stated above, it is not possible to include an exact amount in this Work Program requirement.

87. The Work Program for Year Nine provides that the following tasks be done between July 13, 2005, through July 12, 2006:

A. In coordination with the Florida Key Aquaduct Authority and Key Largo Sewer District, initiate the process to obtain \$80 million in bond financing secured by connection fees.



B. Secure site for lower Keys and Key Largo wastewater facilities.

88. Petitioners contend that Task A for Year Nine for the Work Program, which requires that Monroe County, "in coordination with the Florida Keys Aqueduct Authority and the Key Largo Sewer District, initiate the process to obtain \$80 million in bond financing secured by connection fees," is arbitrary and capricious and contravenes the law implemented. Petitioners contend that Task A, which requires that Monroe County only "initiate" the process necessary to obtain the required bond financing, and does not require that the funds be secured and dedicated to actual improvements, delays funding to remedy a critical water quality problem.

89. The reasonable meaning of the provision in Task A, that Monroe County will initiate the process to obtain "80 million in bond financing secured by connection fees," is that Monroe County will take all steps legally necessary to accomplish obtaining the bond financing.

90. Petitioners contend that Task B of Year Nine of the Work Program, which requires Monroe County to "secure a site for lower Keys and Key Largo wastewater facilities," is arbitrary and capricious and contravenes the law implemented, because it delays an important remedy to a critical water quality problem.

91. Task B reasonably requires that one of the first steps that must be taken prior to constructing any wastewater facility is to secure a site. Irrespective of the need for the wastewater facilities specified in Task B, unless a site is secured, no construction can occur.

92. Proposed Rule 28-20.110(1), which amends Policy 101.2.13 of the Monroe County Comprehensive Plan by adding Year Ten to the Work Program, provides the following:

Year Ten (July 13, 2006 through July 12, 2007)

A. Award Contract for design, construction, and operation of lower Keys and Key Largo wastewater facilities.

B. Begin construction of the lower Keys and Key Largo wastewater plants.

C. Initiate connections to lower keys and Key Largo wastewater systems.

D. Complete construction and hookups for Bay Point, Conch Key and Key Largo Trailer Village/Key Largo Park.

E. Obtain \$80M in bond financing secured by connection fees

93. Petitioners contend that Task A, which requires Monroe County to award a contract for design, construction, and operation of the lower Florida Keys and Key Largo wastewater facilities, is arbitrary and capricious and contravenes the law implemented, because it delays an important remedy to a critical water quality problem.

94. Petitioners also contend that Task D, which requires that construction and hookups for specified areas be completed, and Task E, which requires Monroe County to obtain \$80 million in bond financing secured by connection fees, are arbitrary and capricious and contravene the law implemented.

95. That Tasks A, D, and E are required to be completed in Year Ten of the Work Program, between July 13, 2006, and July 12, 2007, is reasonable in view of the steps that must be taken prior to completing the responsibilities provided in those tasks.

96. Petitioners contend that Task B, which requires Monroe County to "begin construction of the lower Florida Keys and Key Largo Trailer Village/Key Largo Park wastewater plants" between July 13, 2006, and July 12, 2007, is arbitrary and capricious and contravenes the law implemented. Petitioners assert that this portion of Proposed Rule 28-20.110 delays an important remedy to a critical water quality problem and does not require the completion of construction or the hookup and operation of the necessary facility.

97. Task B of the Work Program, to begin construction of the lower Florida Keys and Key Largo wastewater plants, reasonably and logically follows the task in the preceding work year that required Monroe County to secure a site for the lower Florida Keys and Key Largo wastewater facilities. Given this

chronology, it is reasonable that Task B does not require that the specified wastewater facilities be completed and fully operational the same year that construction begins.

98. Petitioners contend that Task C of Year Ten of the Work Program, which requires Monroe County and Largo Sewer District to "initiate connections to lower Keys and Key Largo wastewater systems," is arbitrary and capricious and contravenes the law implemented. As a basis for this contention, Petitioners assert that Task C does not require the completion of connections and operation of the system, but requires only the undefined "initiation" of connections.

99. Task C, which requires Monroe County to "initiate connections" to the lower Florida Keys and Key Largo wastewater facilities, is not arbitrary and capricious. Given the purpose of this task, this provision reasonably requires Monroe County to begin connecting units to the wastewater facilities. Even without a precise number, the reviewing agencies can evaluate the Work Program for Year Ten, including Task C, and determine if Monroe County has made substantial progress.

City of Marathon Work Program Under Proposed Rules

100. Proposed Rule 28-18.210 adds Year Eight and Year Nine to the existing Work Program in Policy 101.2.14 of the Marathon Comprehensive Plan. The tasks in the Work Program, many of which implement the Partnership Agreement, include tasks related to the

construction of wastewater facilities, affordable housing, and hurricane evacuation.

101. Year Eight of the Work Program of the Marathon Comprehensive Plan include, in relevant, part the following tasks:

Year Eight (July 12, 2004 through July 12, 2005)

A. Begin construction of wastewater collection lines for Little Venice Phase II by December 2004.

B. Work with the Florida Keys Aqueduct Authority to initiate bond financing for citywide sewer facilities and to develop a schedule of events necessary to initiate process by December 2004.

C. Develop and advertise a Request for Proposal for the design, construction, operation of Marathon Central Wastewater System by December 2004.

D. Obtain necessary bond financing (60% of projected sewer cost) secured by connection fees by December 2004.

E. Award contract for design, construction and operation of Marathon Central Wastewater System by December 2004.

F. By January 2005, identify potential acquisition sites for affordable work force housing. Establish a partnership with non-profit organizations in order to construct affordable housing using additional state funds.

G. Evaluate strategies to increase the time that affordable housing remains affordable; establish a maximum sales price for work force housing and establish a

ceiling on down payments that are not subsidized by public programs; and amend comprehensive plan and/or land development regulations.

\* \* \*

I. Develop a map or list of real estate numbers of lots containing environmentally sensitive lands in need of acquisition and submit to the Department of Community Affairs by July 2004.

J. Assist the state in land acquisition efforts by establishing a land acquisition advisory committee to prioritize proposed acquisitions by July 2004.

K. Complete a comprehensive analysis of hurricane evacuation issues in the Florida Keys and develop strategies to reduce actual hurricane clearance times and thereby reduce potential loss of life from hurricanes.

102. Year Nine of the Work Program of the Marathon

Comprehensive Plan includes in relevant part the following tasks:

Year Nine (July 13, 2005 through July 12, 2006)

A. Begin construction of Phase I of Marathon Central Wastewater System by January 2006.

B. Evaluate wastewater master plan and indicate areas, if any, that will not receive central sewer. For any area that will not be served by central sewer, develop a septic tank inspection program and begin implementation of the program by September 2005.

\* \* \*

E. Develop and implement a Building Permit Allocation System that discourages and limits

development in environmentally sensitive areas within the proposed Marathon comprehensive plan by July 2005.

103. Petitioners contend that Proposed Rule 28-18.210(1), which establishes the Work Program for Years Eight and Nine, is arbitrary and capricious and contravenes the law implemented, because it fails to adopt regulation and plan changes, or requires same, to protect terrestrial habitat to the extent shown necessary in the Carrying Capacity Study.

104. The mere fact that the proposed Work Plan for Years Eight and Nine of the Marathon Comprehensive Plan does not address habitat protection, does not make those provisions arbitrary or capricious. Neither does it mean that they contravene law. In this case, it reflects that the Work Plan emphasizes other issues relevant to the City of Marathon Comprehensive Plan.

#### Siting Utilities and Public Facilities

105. The siting of public facilities in Monroe County is governed by existing Policy 101.12.4 in the Monroe County Comprehensive Plan. According to that policy, Monroe County requires that an "analyses be undertaken prior to finalizing plans for the siting of any new or significant expansion (greater than 25 percent) of any existing public facility," and that the analyses include "an assessment of needs, evaluation of alternative sites and design alternatives for the selected sites

and assessment of direct and secondary impacts on surrounding land uses and natural resources."

106. With regard to the assessment impacts on surrounding land uses and natural resources, existing Policy 101.12.4 provides the following:

The assessment of impacts on surrounding land uses and natural resources will evaluate the extent to which the proposed public facility involves public expenditures in the coastal high hazard area and within environmentally sensitive areas, including disturbed salt marsh and buttonwood wetlands, undisturbed beach berm areas, units of the coastal barrier resources system, undisturbed uplands (particularly high quality hammock and pinelands), habitats of species considered to be threatened or endangered by the state and/or federal governments, consistent with 105.2.1 offshore islands, and Conservation Land Protection Areas.

107. Proposed Rule 28-20.110(2) amends existing Policy 101.12.4, which deletes the term "Conservation Land Protection Areas" from the category of areas included as environmentally sensitive areas, as quoted above, and replaces it with the term, "Natural Areas (Tier I)."

108. Proposed Rule 28-20.110(2) also adds the following provision to existing Policy 101.12.4.

Except for passive recreational facilities on publicly owned land, no new public community or utility facility other than water distribution and sewer collection lines or lift stations, and the existing Key Largo Wastewater Treatment Facility, shall



be allowed within the Natural Areas (Tier I) unless it can be accomplished without clearing of hammock or pinelands. Exceptions to this requirement may be made to protect the public health, safety and welfare, if all the following criteria are met:

1. No reasonable alternatives exist to the proposed location; and
2. The proposed location is approved by a super-majority of the Board of County Commissioners.

109. Petitioners contend that Proposed Rule 28-20.110(2), discussed above, is arbitrary and capricious and contravenes the law implemented. Petitioners assert that the Proposed Rule allows the siting of public facilities in terrestrial habitats (CNA or Tier I) and also allows water distribution and sewer collection lines or lift stations to be built as a matter of right in a CNA or Tier I, contrary to the findings of the Carrying Capacity Study. Petitioners also contend that the provision in the Proposed Rule, discussed above, is vague, because it refers to the term "natural areas," but is intended to mean CNAs.

110. In the recent past, a decision to site a sewage treatment facility in an environmentally sensitive hammock elicited considerable controversy. Ultimately, Monroe County and the DCA agreed that public facilities should not be located on environmentally sensitive land. The proposed change to Policy 101.12.4 strengthens the policy by requiring approval of

a super majority of the Monroe County Board of County Commissioners (County Commission) for an exemption. This also adds specificity to the policy and provides more protection for natural areas and, thus, improves protection of environmentally-sensitive habitat.

111. Contrary to Petitioners' assertion, the term "natural area" is not vague. The Monroe County Comprehensive Plan currently includes Goal 105, which describes a detailed land classification system. "Natural Area (Tier I)" represents natural areas that can be targeted for acquisition and is an updated term. On the other hand, the term "Conservation Land Protection Areas" refers to lands targeted for acquisition by federal and state agencies.

#### ROGO Exemption for Public Facilities

112. Both Monroe County and Marathon have a "Rate of Growth Ordinance," also known as ROGO. A site proposed for development is ranked based on the environmental sensitivity of the property and receives negative points for greater environmental sensitivity. A site proposed for development can also receive positive points for such things as providing its own water system or elevation above the minimum flood insurance elevation. Monroe County and the City of Marathon award their annual allocation of development permits to the top-scoring sites.

113. Proposed Rule 28-20.110 will make several modifications to the ROGO point allocation system in the Monroe County Comprehensive Plan.

114. Existing Policy 101.3.4 of the Monroe County Comprehensive Plan provides that "public facilities shall be exempted from the requirements of the Permit Allocation System for new non-residential development." The existing policy also provides that certain development activity by enumerated federally tax-exempt, not-for-profit organizations "may be exempted from the Permit Allocation System by the County Commission after review by the Planning Commission upon a finding that such activity will predominantly serve the County's non-transient population."

115. Proposed Rule 28-20.110(3) amends existing Policy 101.3.4 by requiring that the County Commission make an additional finding as a condition of exempting certain development activity by certain federally tax-exempt not-for-profit organizations from the Permit Allocation System. Pursuant to the proposed rule, the County Commission must also find that the "development activity is not planned within an area proposed for acquisition by governmental agencies for the purpose of resource protection."

116. Petitioners contend that the provision of Proposed Rule 28-20.110(3), discussed above, is arbitrary and capricious

and contravenes the law implemented in that the development activities of the federally tax-exempt, not-for-profit organizations covered by the proposed rule allows development activity on some environmentally-sensitive areas and is inconsistent with the Carrying Capacity Study.

117. Existing Policy 101.3.4 allows development activity by not-for-profit organizations without a permit allocation because such development does not include overnight accommodations which might impact hurricane evacuation. Since a permit allocation was not necessary, such development was not affected by the negative points awarded for development in an area proposed for acquisition for resource protection. However, some not-for-profit organizations proposed development in environmentally-sensitive areas. The proposed change will prevent ROGO-exempt development on such lands and improve the protection of environmentally-sensitive habitat.

#### Lot Aggregation

118. Existing Policy 101.5.4, of the Monroe County Comprehensive Plan addresses the issue of lot aggregation and provides that "points shall be assigned to Allocation Applications for proposed dwelling units, which include a voluntary reduction of density permitted as of right within subdivisions (residential units per legally platted, buildable lots) by aggregating vacant, legally platted, buildable lots."

This policy sought to reduce density within subdivisions by awarding or assigning positive points to applicants who aggregated two or more contiguous, vacant, legally buildable lots. The existing policy motivated and allowed applicants to purchase any contiguous property in order to be awarded additional points and, thus, increased their chances of receiving an allocation, even if the lots were in areas targeted for public acquisition for resource protection.

119. Proposed Rule 28-20.110(4) amends Policy 101.5.4, Subsection 3, by prohibiting the awarding of points to Allocation Applications "for lot aggregation within those areas proposed for acquisition by public agencies for the purpose of resource protection."

120. Petitioners assert that the proposed rule is arbitrary and capricious and contravenes the law implemented because it fails to adequately protect terrestrial habitat to the extent shown necessary in the Carrying Capacity Study. The basis of Petitioners' assertion is that under Proposed Rule 28-20.110(4), an applicant can get positive points for aggregating habitat, if the area is not proposed for acquisition by public agencies for the purpose of resource protection.

121. Proposed Rule 28-20.110(4) will direct applicants seeking to be awarded additional points for "lot aggregation away from areas proposed for acquisition by public agencies for

resource protection and, thereby, improve protection of terrestrial habitat.

Clearing of Native Vegetation

122. Existing Policy 205.2.7 of the Monroe County Comprehensive Plan provides that the "clearing of native vegetation shall be limited to the immediate development area." Under the existing policy, an applicant with aggregated lots would demand to clear a portion of both lots, so that a large portion of all of the lots would be cleared.

123. Proposed Rule 28-20.110 amends existing Policy 205.27.7 by adding the following provision relating to the clearing of vegetation areas where Allocation Applications have received points for lot aggregation:

For applications that receive points for lot aggregation under the Permit Allocation System for residential development, clearing of vegetation shall be limited to the open space ratios in Policy 205.2.6 or 5,000 square feet, whichever is less.

124. The clearing of vegetation for ROGO applications that receive points for lot aggregation is also addressed in Proposed Rules 28-20.120(4), which adds a new provision, Regulation 9.5-347(e), to the Monroe County Land Development Regulations. That new provision is as follows:

Section 9.5-347

(e) Lot Aggregation and Clearing: For ROGO applications that receive points for lot

aggregation under Section 9.5-122.3 (a)(3), clearing of vegetation shall be limited to the open space ratios in paragraph (b) above or five-thousand (5,000) square feet, whichever is less.

125. Petitioners contend that Proposed Rules 28-20.110(b) and 28-20.120(4) are arbitrary and capricious and contravene the law implemented, because they do not prohibit clearing of aggregated lots and are inconsistent with the Principles Guiding Development and with the Carrying Capacity Study.

126. Notwithstanding Petitioners' assertions, even though the proposed rules do not prohibit all clearing of native vegetation, they will limit the amount of clearing for applicants who receive a ROGO allocation based upon lot aggregation. Under Proposed Rule 28-20.120(4), the clearing will be limited to an amount necessary to construct a reasonably-sized house.

Technical Coordination Letter

127. Proposed Rule 28-20.110(5), which will add a new policy, Policy 101.5.11, to the Monroe County Comprehensive Plan, provides the following:

If not listed in the document "Parcels Not Located in Threatened and Endangered Species Habitat and Not Subject to FWS Consultation", or involving minor development activity exempted by the U.S. Fish and Wildlife Service (USFWS)", any application for a ROGO or NROGO allocation shall contain a technical coordination letter from the USFWS. The County shall

consider the recommendations of the USFWS's technical coordination letter in the issuance of the subject permit, except that if a low-effect habitat conservation plan is required by USFWS, the mitigation requirements of that plan shall be incorporated in the conditions of the permit.

128. As a result of federal litigation, the U.S. Fish and Wildlife Service ("USFWS") created a list of "Parcels Not Located in Threatened and Endangered Species Habitat and Not Subject to FWS Consultation." Monroe County and the DCA have developed the practice of requiring a technical coordination letter from the USFWS for development on parcels that are not on that list or are not otherwise exempt from USFWS review. Proposed Rule 28-20.110(5) incorporates into the Monroe County Comprehensive Plan a current practice that resulted from federal litigation.

Monroe County Land Development Regulation 9.5-120

129. Proposed Rule 28-20.120(1) adds the phrase "species of special concern" to the following terms defined in Section 9.5-120(b) of the Monroe County Land Development Regulation as shown by the underlining: (1) "Known habitat of threatened/endangered animal species or species of special concern"; (2) "Potential habitat of threatened/endangered animal species" or species of special concern; and (3) Wide-ranging threatened/endangered animal species or species of special



concern. This proposed change will conform the land development regulations to the Monroe County Comprehensive Plan by expanding the list of species that result in negative points under the Permit Allocation System to include "species of special concern."

130. Existing Regulation 9.5-120(b) includes in the definitions of "known habitat of threatened/endangered animal species" and "potential habitat of threatened/endangered species" the sentence, "The county's threatened and endangered species maps shall constitute prima facie evidence of the species unless determined otherwise by the director of environmental resources." The definition of "wide-ranging threatened/endangered animal species" includes the sentence, "The county's threatened and endangered species maps shall constitute prima facie evidence of wide-ranging threatened or endangered species unless determined otherwise by the director of environmental resources."<sup>8</sup>

131. Proposed Rule 28-20.120(1) amends Section 9.5-120(b) by deleting the phrase, "unless determined otherwise by the director of environmental resources" from the sentences quoted above.

132. Proposed Rule 28-20.120(1)(a) adds the following provision to the section of Regulation 9.5-120, which defines

the term "known habitat of threatened/endangered species or species of special concern":

(1) . . . The county's threatened and endangered species maps shall constitute prima facie evidence of the species. Within areas designated for public acquisition for the purposes of resource protection, any threatened, endangered or species of special concern species observed on site while conducting a habitat evaluation shall be noted on the adopted Threatened and Endangered Species Maps. Such observations noted while conducting a habitat evaluation by County Staff Biologists, consultants certified by the County, conducting habitat evaluations, or state or federal agency representatives conducting field inspections shall also constitute evidence of species.

133. Petitioners contend that the portion of Proposed Rule 28-20.120(1)(a), quoted above, is arbitrary and capricious. Petitioners assert that the Proposed Rule fails to account for potential observations of "known habitat of threatened/endangered animal species" on parcels that are not within "areas designated for public acquisition for purposes of resource protection." Also, Petitioners assert that the Proposed Rule limits observations of species required to be noted on the adopted threatened and endangered species maps to consultants or scientists on the parcel specifically to conduct an HEI analysis and fails to require field verification of the parcel.

134. Proposed Rule 28.20.120(1)(a) will expand the circumstances in which observations of listed species will cause modification of the adopted threatened and endangered species maps. Under the present land development regulations, Monroe County modified the maps only if a county staff biologist observed a listed species and did not take into account other professional observations.

Monroe County Land Development Regulation 9.5-122.3

135. Regulation 9.5-122.3(a)(8) of the Monroe County Land Development Regulations establishes and assigns evaluation criteria and point assignment for applications for proposed dwelling units in Monroe County. The existing regulation requires that negative points be assigned to applications that propose a dwelling unit within a "known habitat of a documented threatened/endangered species" and a "potential habitat of threatened/endangered species."

136. Proposed Rule 28-20.120(2) adds the following language to Section 9.5-122.3.(a)(8),<sup>9</sup> as shown by the underlined provisions:

Point Assignment:	Criteria:
-10	An application which proposes a dwelling unit within a known habitat of a threatened/endangered species or <u>a species of special concern. For species of special concern, negative points shall only be applied to areas</u>

designated for public acquisition for the purpose of resource protection.

-5

An application which proposes a dwelling unit within a potential habitat of a threatened/endangered species or a species of special concern. For species of special concern, negative points shall only be applied to areas designated for public acquisition purposes of resource protection.

137. Regulation 9.5-1223.(a)(8), as amended, adds "species of special concern" to the species covered by the existing regulation. Also, the amended regulation requires that negative points be assigned to applications that propose dwelling units in a habitat of a species of special concern, if the area is designated for public acquisition for purposes of resource protection.

138. Petitioners contend that Proposed Rule 28-20.120(2), which amends Regulation 9.5-122.3(a)(8), is arbitrary and capricious. As a basis for this contention, Petitioners assert that even though the Proposed Rule increases situations where an application is awarded negative points, it decreases protection of habitat by limiting the negative point award only to habitat of special concern that have been designated for public acquisition.

139. Proposed Rule 28-20.120(2) increases situations in which an application will be awarded negative points by adding

"species of special concern" to the species covered by Regulation 9.5-122.3(a)(8). By awarding negative points as provided in the proposed rule, there is increased protection of habitat for species of special concern.

Monroe County Land Development Regulation 9.5-336

140. Proposed Rule 28-20.120(3) amends Section 9.5-336(b) of the Monroe County Land Development Regulations as follows:

(b) Review and Amendment: The existing conditions map may be refined to reflect conditions legally in existence on February 28, 1986. Such refinements shall be made pursuant to the procedures for typographical and drafting errors in section 9.5-511(e). The existing conditions map as referenced throughout this chapter is intended only to serve as a general guide to habitat types for the purpose of preliminary determination of regulatory requirements. The county biologist shall make the final determination of habitat type based upon field verification, except that existing conditions that reflect disturbed with hammock shall be classified as a low quality hammock. Unlawful conditions shall not be recognized when determining regulatory requirements.

141. Petitioners contend that Proposed Rule 28-20.120(3) is arbitrary and capricious and contravenes the law implemented because it does not protect all habitat.

142. The existing conditions map was prepared in the 1980s. Many of the sites designated on the map as "disturbed with hammock" have re-vegetated since then. The proposed change will

protect those sites by requiring clustering away from the hammock and by controlling the amount of allowed clearing.

#### Hurricane Evacuation

143. Monroe County and Marathon face a unique hurricane evacuation challenge. There is only one road out of the Florida Keys, and everyone must use that road to evacuate. For a Category 3 or greater hurricane, all areas of the Florida Keys must be evacuated because of the low elevations, the vulnerability to storm surge, and the logistics of post-disaster recovery. The Monroe County Comprehensive Plan and the Marathon Comprehensive Plan currently state that each ". . . shall reduce hurricane evacuation clearance times to 24 hours by the year 2010." The 24-hour standard was adopted by the Administration Commission at the conclusion of prior litigation over the Monroe County Comprehensive Plan.

144. The term "hurricane evacuation clearance time" refers to the time that the emergency managers must call the evacuation before the arrival of tropical storm force winds. Hurricane evacuation clearance time includes both the time for citizens to mobilize (i.e., get their affairs in order, shelter their houses, take care of their belongings), and the time to evacuate the vehicles from the roadway. Tropical storm force winds typically arrive eight to 12 hours before the eye of the storm. In order to achieve a 24-hour hurricane evacuation clearance time,

emergency managers must call the evacuation 32 to 36 hours before the arrival of the eye.

145. The DCA contracted with Miller Consulting, Inc., to create a computer model to estimate the actual hurricane evacuation clearance time for the Florida Keys. The Miller model provides the best available data and analysis for estimating the clearance time. The latest run of the Miller model performed by the DCA using 2000 Census data, supplemented with development permit data up to August 2004, provides the best estimate of clearance time. This run of the Miller model estimates a hurricane evacuation time of 23 hours and 56 minutes to reach the beginning of the Homestead Extension of the Florida Turnpike on the mainland, and 24 hours and 48 minutes to reach the hurricane shelter at Florida International University ("FIU").

146. The beginning of the Florida Turnpike in Florida City is the appropriate endpoint for hurricane evacuation clearance time estimates. Florida City is a point of relative safety outside of the Category 3 vulnerability zone. Florida City is also the point of dispersal for the Florida Keys, where evacuees disperse to any number of destinations, such as South Dade, the FIU shelter, or a hotel in Orlando.

147. The Miller model estimates that if those permit allocations are restored and the annual allocation is increased as described above, the hurricane evacuation clearance time next

year will be 24 hours and four minutes. This exceeds the 24-hour standard adopted by the Administration Commission.

148. Proposed Rule 28-20.110 adds the following requirement to Year Eight of the Work Program in Policy 101.2.13 of the Monroe County Comprehensive Plan and Policy 101.2.12 of the Marathon Comprehensive Plan: "Complete a comprehensive analysis of hurricane evacuation issues in the Florida Keys and develop strategies to reduce actual hurricane clearance times and thereby reduce potential loss of life from hurricanes."

149. The Florida Keys' local governments have begun the comprehensive analysis of hurricane evacuation issues by convening a workgroup comprised of local government-elected officials and staffed by the DCA. The hurricane workgroup is considering alternative strategies to reduce clearance times, such as constructing an additional outbound lane, using transportation system management to create a temporary outbound lane, updating the assumptions for the Miller model, reducing transient occupancy, or calling the evacuation earlier.

150. The working group must develop a strategy that balances or accommodates development and also addresses hurricane clearance times. The hurricane workgroup must do much more than simply squeeze a few more minutes out of the Miller model. There are currently 13,000 to 14,000 vacant platted lots in the Florida Keys, which must be allowed to develop or must be purchased by



government. On average, 3,000 dwelling units generates about one hour of clearance time. As an example, if 8,000 or so lots were purchased for habitat protection, then two more hours of clearance time will be needed to accommodate the remaining 5,000 or 6,000 lots. The hurricane workgroup must develop a strategy to handle the amount of development permitting that can be expected and a program to acquire the balance of the vacant lots.

#### Affordable and Workforce Housing

151. There is an affordable housing crisis in the Florida Keys. The geography of the Florida Keys hinders the ability of working families in the Florida Keys to find affordable housing. Unlike other expensive areas, such as Boca Raton, working families cannot find affordable housing nearby; the nearest area where housing prices are affordable is the mainland in Dade County.

152. From 1999 to 2003, there were 693 allocations for affordable housing units in the Florida Keys. This amount includes all the allocations for affordable housing units for that time period, even those allocations for which affordable housing units were not constructed. The number of affordable housing allocations issued from 1999 to 2003 and the number being issued under the existing Comprehensive Plans of Monroe County and the City of Marathon, are not sufficient to address the need for affordable housing.

153. The Partnership Agreements recognize and address the affordable housing shortfall by increasing the number of annual affordable housing allocations, restoring residential allocations lost in previous years, and providing funding for the acquisition of land and the construction of workforce housing.

154. As discussed above, Proposed Rule 28-20.110 implements the provisions of the Partnership Agreement by amending the Monroe County Comprehensive Plan as follows: (1) increasing the number of annual affordable housing allocations from 32 to 71; (2) reallocating 140 unused allocations to affordable housing; and (3) requiring that the affordable housing remain affordable in perpetuity. Additionally, as specified in paragraph 60, the Work Program in Proposed Rule 28-20.110 requires Monroe County to complete tasks which will be an improvement of the affordable housing situation in Monroe County.

155. As discussed above, Proposed Rule 28-18.210 implements the Partnership Agreement by amending the City of Marathon Comprehensive Plan as follows: (1) increases the overall number, though not the percentage, of allocations for affordable housing to six; (2) restoring 65 unused allocations for affordable housing; and (3) requiring that the affordable housing remain affordable in perpetuity. Also, as specified in

paragraph 101, Proposed Rule 28-18.210 requires the City of Marathon to complete tasks that will result in improving the affordable housing issues in the City of Marathon.

156. Proposed Rules 28-20.110 and 28-18.210 only partially address the affordable housing shortage in the Florida Keys. Nonetheless, the proposed amendments to the Comprehensive Plans of Monroe County and the City of Marathon will improve the current affordable housing shortage by increasing the number of affordable houses and providing the financial resources to make that more likely to occur.

The Principles Guiding Development

157. Subsection 380.0552(7), Florida Statutes (2004), provides in relevant part:

(7) PRINCIPLES FOR GUIDING DEVELOPMENT.-  
-State, regional, and local agencies and units of government in the Florida Keys Area shall coordinate their plans and conduct their programs and regulatory activities consistent with the principles for guiding development . . . . For the purposes of reviewing consistency of the adopted plan or any amendments to that plan with the principles for guiding development and any amendments to the principles, the principles shall be construed as a whole and no specific provision shall be construed or applied in isolation from the other provisions. . . . [T]he following shall be the principles with which any plan amendments must be consistent:

(a) To strengthen local government capabilities for managing land use and development so that local government is

able to achieve these objectives without the continuation of the area of critical state concern designation.

(b) To protect shoreline and marine resources, including mangroves, coral reef formations, seagrass beds, wetlands, fish and wildlife, and their habitat.

(c) To protect upland resources, tropical biological communities, freshwater wetlands, native tropical vegetation (for example, hardwood hammocks and pinelands), dune ridges and beaches, wildlife, and their habitat.

(d) To ensure the maximum well-being of the Florida Keys and its citizens through sound economic development.

(e) To limit the adverse impacts of development on the quality of water throughout the Florida Keys.

(f) To enhance natural scenic resources, promote the aesthetic benefits of the natural environment, and ensure that development is compatible with the unique historic character of the Florida Keys.

(g) To protect the historical heritage of the Florida Keys.

(h) To protect the value, efficiency, cost-effectiveness, and amortized life of existing and proposed major public investments, including:

1. The Florida Keys Aqueduct and water supply facilities;

2. Sewage collection and disposal facilities;

3. Solid waste collection and disposal facilities;

4. Key West Naval Air Station and other military facilities;
5. Transportation facilities;
6. Federal parks, wildlife refuges, and marine sanctuaries;
7. State parks, recreation facilities, aquatic preserves, and other publicly owned properties;
8. City electric service and the Florida Keys Electric Co-op; and
9. Other utilities, as appropriate.
  - (i) To limit the adverse impacts of public investments on the environmental resources of the Florida Keys.
  - (j) To make available adequate affordable housing for all sectors of the population of the Florida Keys.
  - (k) To provide adequate alternatives for the protection of public safety and welfare in the event of a natural or manmade disaster and for a post-disaster reconstruction plan.
  - (l) To protect the public health, safety, and welfare of the citizens of the Florida Keys and maintain the Florida Keys as a unique Florida resource.

158. In determining whether the Proposed Rules are consistent with the principles, the principles should be considered as a whole. No specific provision should be construed or applied in isolation from other provisions.

Ability to Manage Land Use and Development

159. Principle A, set forth in Subsection 380.0552(7)(a), Florida Statutes, is "to strengthen local government capabilities for managing land use and development so that local government is able to achieve these objectives without the continuation of the area of critical state concern designation."

160. Monroe County and the City of Marathon have evidenced a willingness and commitment to provide the funding required to meet the objectives of the Principles Guiding Development. Both local governments have included in the Proposed Rules tasks which reflect their understanding of the need to provide critical facilities, such as wastewater treatment facilities. While the need for such facilities has previously been acknowledged, the Proposed Rules provide a specific source of revenue to provide the needed facilities. Moreover, with regard to Monroe County, the proposed rules/regulations at issue in this proceeding strengthen the environmental protections measures in the Comprehensive Plans while allowing reasonable development.

161. The proposed rules for Monroe County and the City of Marathon are consistent with Principle A.

## Environmental Issues

162. Subsections 380.0552(7)(b), (c), and (e), Florida Statutes, are principles which require consideration of the impacts on the environment of the Florida Keys.

a. Principle B is "to protect shoreline and marine resources, including mangroves, coral reef formations, seagrass beds, wetlands, fish and wildlife and their habitat."

b. Principle C is "to protect upland resources, tropical biological communities, freshwater wetlands, native tropical vegetation (for example, hardwood hammocks and pinelands), dune ridges and beaches, wildlife and their habitat."

c. Principle E is "to limit the adverse impacts of development on the water quality of water throughout the Florida Keys."

d. Principle I is "to limit the adverse impacts of public investments on the environmental resources of the Florida Keys."

163. The Proposed Rules of Monroe County and the City of Marathon include amendments to the Work Program which provide significant funding for sewage treatment systems that will enhance the protection of the shoreline and marine resources.

The Proposed Rules of Monroe County and the City of Marathon are consistent with Principle B.

164. The Proposed Rules of Monroe County improve protection of terrestrial habitat, limit clearing of native vegetation, and provide safeguards to ensure that parcels in threatened and endangered species habitat are protected. The proposed rules of Monroe County are consistent with Principle C.

165. The portions of the Proposed Rules of the City of Marathon that are the subject of this proceeding do not specifically address Principle C. However, the Proposed Rules of the City of Marathon are not inconsistent with Principle C. Accordingly, the proposed rules of the City of Marathon are consistent with Principle C.

166. The Proposed Rules of Monroe County and the City of Marathon limit the adverse impacts of development on the quality of water throughout the Florida Keys by the funding commitments that will hasten the construction of the sewage treatment facilities. The Proposed Rules of Monroe County and the City of Marathon are consistent with Principle E.

167. The Proposed Rules do not encourage any public investment that would have an adverse impact on environmental resources. To the contrary, the Monroe County and the City of Marathon Proposed Rules provide for public investments in waste water improvements that are accelerated. Also, the Monroe



County Proposed Rules prevent the construction of public facilities within a hammock area. The Proposed Rules of Monroe County and the City of Marathon are consistent with Principle I. Economic Development

168. Principle D in Subsection 380.0552(7)(d), Florida Statutes, is "to ensure the maximum well-being of the Florida Keys and its citizens through sound economic development.

169. The basis of the Florida Keys' economy is tourism, which is attracted by a clean and healthy environment. The increased protection of water quality that should be achieved by the hastened construction of sewage treatment facilities and the improved protection of habitat will strengthen the economy of the Florida Keys and provide the basis for a sound economic development. Also, the Proposed Rules balance environmental protection with property rights. The Proposed Rules of Monroe County and the City of Marathon are consistent with Principle D. Historical Character and Heritage

170. Principle F in Subsection 380.0552(7)(f), Florida Statutes, is "to enhance natural and scenic resources, promote the aesthetic benefits of the natural environment and ensure that development is compatible with the unique historic character of the Florida Keys."

171. Principle G in Subsection 380.0552(7)(g), Florida Statutes, is "to protect the historical heritage of the Florida Keys."

172. The Proposed Rules of Monroe County and the City of Marathon will have little or no impact on the historic character and historical heritage of the Florida Keys. Thus, the Proposed Rules do no harm to either the historic character or historical heritage of Monroe County or the City of Marathon.

Public Investments

173. Principle H in Subsection 380.0552(7)(h), Florida Statutes, is "to protect the value, efficiency, cost-effectiveness, and amortized life of existing and proposed major life investments," including:

1. The Florida Keys Aqueduct and water supply facilities;
2. Sewage collection and disposal facilities;
3. Solid waste collection and disposal facilities;
4. Key West Naval Air Station and other military facilities;
5. Transportation facilities;
6. Federal parks, wildlife refuges, and marine sanctuaries;
7. State parks, recreation facilities, aquatic preserves, and other publicly owned properties;

8. City electric service and the Florida Keys Electric Co-op; and

9. Other utilities, as appropriate. . . .

174. The Proposed Rules of Monroe County and the City of Marathon do nothing to undermine the value, efficiency, cost-effectiveness or amortized life of existing major investments. Rather, the Proposed Rules will result in funding and timely construction of the major sewage and disposal facilities that are already contemplated by Monroe County and the City of Marathon's existing Comprehensive Plans.

#### Affordable Housing

175. Principle J in Subsection 380.0552(7)(j), Florida Statutes, is "to make available adequate affordable housing for all sectors of the population of the Florida Keys."

176. The Proposed Rules include a one-time allocation of 165 permits for affordable housing in Monroe County and 65 permits for affordable housing in Marathon. The Proposed Rules will require all future affordable housing to remain as affordable in perpetuity, rather for a limited time frame. The Proposed Rules are consistent with Principle J.

#### Natural or Man-made Disaster and Post-Disaster Relief

177. Principle K in Subsection 380.0552(7)(k), Florida Statutes, is "to provide adequate alternatives for the protection of public safety and welfare in the event of a

natural disaster or man[-]made disaster and for a post[-]disaster reconstruction plan."

178. The Proposed Rules require officials of Monroe County and the City of Marathon to participate with other Florida Keys' local governments in a comprehensive analysis of hurricane evacuation issues. The Proposed Rules are consistent with Principle K.

Health, Safety, and Welfare of Citizens and Maintenance of Florida Keys as Unique Resource

179. Principle L in Subsection 380.0552(7)(1), Florida Statutes, is "to protect the health, safety, and welfare of the citizens of the Florida Keys and maintain the Florida Keys as a unique Florida resource."

180. The Proposed Rules of Monroe County include provisions that increase protection of upland habitat and require a moratorium on ROGO/NROGO applications in hammocks and pinelands, revisions to the CNA maps, and amendments to the land development regulations. The Proposed Rules for Monroe County and the City of Marathon will improve the water quality by providing funding for and hastening the construction of sewage treatment facilities.

181. The Proposed Rules of Monroe County and the City of Marathon will provide more permit allocations for affordable housing, require Monroe County to approve bond funding for the

construction of affordable housing, and provide that all future affordable housing remain affordable in perpetuity. Also, the Proposed Rules require Monroe County and the City of Marathon to participate in a Florida Keys wide analysis and solution to the hurricane evacuation problem.

182. The Proposed Rules of Monroe County and the City of Marathon further the objective of and are consistent with Principle K.

183. The Proposed Rules of Monroe County and the City of Marathon are consistent with Principle L.

CONCLUSIONS OF LAW

184. The Division of Administrative Hearings has jurisdiction over the parties to and the subject matter of this proceeding. § 120.56(1) and (2), Fla. Stat. (2004).

185. Any substantially affected person may seek an administrative determination of the invalidity of any proposed rule. § 120.56(2)(a), Fla. Stat.

186. Any person substantially affected by a rule or a proposed rule may seek an administrative determination of the invalidity of the rule on the ground that the rule is an invalid exercise of delegated legislative authority. § 120.56(1)(a), Fla. Stat.

187. The City of Marathon asserts that Petitioners lack standing to challenge Proposed Rule 28-18.210. The DCA and

Monroe County did not challenge Petitioners' right to participate in this proceeding.

188. In order for associations to have standing, they must demonstrate that:

[A] substantial number of its members, although not necessarily a majority, are "substantially affected" by the challenged rule[,] . . . the subject matter [is] within the association's general scope of interest and activity, and the relief requested [is] of the type appropriate for a trade association to receive on behalf of its members.

Florida Home Builders Association v. Department of Labor and Employment Security, 412 So. 2d 351, 353-354 (Fla. 1982).

189. The evidence established that Petitioners have standing to challenge Proposed Rule 28-18.210.

190. In a challenge to a proposed rule, the party attacking the proposed rule has the burden of going forward. The agency then has the burden to prove by a preponderance of the evidence that the proposed rule is not an invalid exercise of delegated legislative authority as to the objections raised. § 120.56(2)(a), Fla. Stat. The proposed rule is not presumed to be valid or invalid. § 120.56(2)(c), Fla. Stat.

191. Petitioners challenge Proposed Rules 28-18.210, 28-20.110, and 28-20.120 as invalid exercises of delegated legislative authority. Specifically, Petitioners assert that

the proposed rules violate Subsections 120.52 (8)(c), (d), and (e), Florida Statutes.

192. Subsection 120.52(8), Florida Statutes, provides in relevant part the following:

(8) "Invalid exercise of delegated legislative authority" means action which goes beyond the powers, functions, and duties delegated by the Legislature. A proposed or existing rule is an invalid exercise of delegated legislative authority if any one of the following applies:

\* \* \*

(c) The rule enlarges, modifies, or contravenes the specific provisions of law implemented, citation to which is required by s. 120.54(3)(a)1.;

(d) The rule is vague, fails to establish adequate standards for agency decisions, or vests unbridled discretion in the agency;

(e) The rule is arbitrary or capricious. A rule is arbitrary if it is not supported by logic or the necessary facts; a rule is capricious if it is adopted without thought or reason or is irrational; or

\* \* \*

A grant of rulemaking authority is necessary but not sufficient to allow an agency to adopt a rule; a specific law to be implemented is also required. An agency may adopt only rules that implement or interpret the specific powers and duties granted by the enabling statute. No agency shall have authority to adopt a rule only because it is reasonably related to the purpose of the enabling legislation and is not arbitrary and capricious or is within the agency's class of powers and duties, nor shall an

agency have the authority to implement statutory provisions setting forth general legislative intent or policy. Statutory language granting rulemaking authority or generally describing the powers and functions of an agency shall be construed to extend no further than implementing or interpreting the specific powers and duties conferred by the same statute.

193. The Administration Commission may enact, amend or rescind any land development regulation or comprehensive plan element within the Florida Keys area by rule. "Any such local development regulation or plan shall be in compliance with the principles for guiding development." § 380.0552(9), Fla. Stat. Further, any plan amendment "must be consistent" with the Principles Guiding Development, and

For the purposes of reviewing consistency of the adopted plan or any amendments to that plan with the principles for guiding development and any amendments to the principles, the principles shall be construed as a whole and no specific provision shall be construed or applied in isolation from the other provisions.

§ 380.0552(7), Fla. Stat.

194. Section 380.0552, Florida Statutes, is the law implemented by the Proposed Rules.

195. The parties have stipulated that the Proposed Rules should be examined for consistency with the Principles Guiding Development, which are enumerated in Subsection 380.0552(7), Florida Statutes.



196. Petitioners argue that the Proposed Rules also should be examined for consistency with the legislative intent provision of Section 380.0552, Florida Statutes.

197. Subsection 380.0552(2), Florida Statutes, sets forth the legislative intent as follows:

(2) LEGISLATIVE INTENT.-- It is hereby declared that the intent of the Legislature is:

(a) To establish a land use management system that protects the natural environment of the Florida Keys.

(b) To establish a land use management system that conserves and promotes the community character of the Florida Keys.

(c) To establish a land use management system that promotes orderly and balanced growth in accordance with the capacity of available and planned public facilities and services.

(d) To provide for affordable housing in close proximity to places of employment in the Florida Keys.

(e) To establish a land use management system that promotes and supports a diverse and sound economic base.

(f) To protect the constitutional rights of property owners to own, use, and dispose of their real property.

(g) To promote coordination and efficiency among governmental agencies with permitting jurisdiction over land use activities in the Florida Keys.

198. Amendments to the Marathon and Monroe County Comprehensive Plans and Land Development Regulations within an ACSC are not ordinarily examined for consistency with the legislative intent section. Rather, a statement of legislative intent provides guidance to the agency, but does not create separate legal rights or duties. Department of Health and Rehabilitative Services v. Doe, 659 So. 2d 697 (Fla. 1st DCA 1995); St. Joe Paper Company v. Department of Community Affairs, 657 So. 2d 27 (Fla. 1st DCA 1995). Nevertheless, if the Proposed Rules are found to be consistent with the Principles for Guiding Development, they are consistent with the legislative intent.

199. Petitioners argue that the Proposed Rules also should be reviewed for compliance with Chapter 163 and Section 187.201, Florida Statutes, and Florida Administrative Code Rule Chapter 9J-5. However, there is no provision in Section 380.0552, Florida Statutes, which confers authority for such review. See Sue Abbott, et al. v. State of Florida Administration Commission, 1997 WL 1052490, Case No. 96-2027, (Final Order issued May 21, 1997).

200. The Petitioners allege that the Proposed Rules enlarge, modify, or contravene the specific provisions of law implemented, and are vague, arbitrary and capricious.

201. Petitioners assert that the Proposed Rules contravene the specific provisions of law implemented by failing to be consistent with, or by failing to be in compliance with, the Principles for Guiding Development. The preponderance of the evidence demonstrates that the Proposed Rules are consistent with Principles A, B, C, D, E, H, I, K, and L. The Proposed Rules have little effect on Principles F and G. Therefore, the Proposed Rules are consistent with, and are in compliance with, the Principles for Guiding Development as a whole.

202. The evidence failed to establish that the Proposed Rules enlarge, modify, or contravene specific provisions of the law implemented.

203. Petitioners have not established that any provision of the Proposed Rules is vague, fails to establish adequate standards for agency discretion, or vests unbridled discretion in the agency. Petitioners elicited some testimony concerning the term "substantial progress" and whether that term establishes an adequate standard for agency discretion. However, the term "substantial progress," and the requirement that the Administration Commission assess Monroe County and the City of Marathon Comprehensive Plans annually, was adopted by an existing Administration Commission rule, and the Petitioners did not challenge any adopted rule of the Administration Commission.

In any event, the Petitioners did not establish that the term "substantial progress" is vague.

204. Petitioners also failed to establish that the term "satisfactory progress" is vague, fails to establish adequate standard for agency discretion, or vests unbridled discretion in the agency. For the reasons stated in the Findings of Fact, the term "satisfactory progress" is not vague.

205. The evidence failed to establish that the Proposed Rules are vague, failed to establish adequate standards for agency decisions, or vest unbridled discretion in the agency.

206. Petitioners did not establish that any provision of the Proposed Rules is unsupported by logic or the necessary facts. The preponderance of the evidence demonstrates that the Comprehensive Plan provisions to be adopted by the Proposed Rules are based upon the Partnership Agreement, which included specific commitments to design and implement the Comprehensive Plan.

207. Petitioners also did not establish that the Proposed Rules are being adopted without thought or reason or are irrational. The Administration Commission could have chosen to make other changes to the Comprehensive Plans of Monroe County and Marathon to address the continuing problems of habitat loss, unacceptable nearshore water quality, lengthy hurricane

evacuation, and lack of affordable housing, but that decision does not render the Proposed Rules capricious.

208. Petitioners argue that the Administration Commission should prohibit all further development in environmentally - sensitive habitat and prevent any continued development because of the hurricane evacuation problem. Rather than taking this approach, the Administration Commission attempted to take a course of action that balanced the environmental issues with property rights of landowners. The choice of Respondents to purchase environmentally-sensitive land as quickly as possible and to address hurricane evacuation in a manner that does not involve a violation of the constitution, is neither arbitrary nor capricious.

209. Petitioners would prefer that the Administration Commission continue its past policy of mandating work program items and imposing penalties on local governments that fail to make substantial progress on those items. Since that past policy has not been successful, it cannot be concluded that the Administration Commission acted arbitrarily or capriciously in choosing to endorse the Partnership Agreement and amend the City of Marathon and Monroe County Comprehensive Plans and Land Development Regulations accordingly.

210. The evidence failed to establish that the Proposed Rules are arbitrary or capricious.

ORDER

Based on the foregoing Findings of Facts and Conclusions of Law, it is

ORDERED that the Petitions challenging proposed Florida Administrative Code Rules 28-18.210, 28-20.110, and 28-20.120 are DISMISSED.

DONE AND ORDERED this 30th day of June, 2005, in Tallahassee, Leon County, Florida.

**S**

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CAROLYN S. HOLIFIELD  
Administrative Law Judge  
Division of Administrative Hearings  
The DeSoto Building  
1230 Apalachee Parkway  
Tallahassee, Florida 32399-3060  
(850) 488-9675 SUNCOM 278-9675  
Fax Filing (850) 921-6847  
www.doah.state.fl.us

Filed with the Clerk of the  
Division of Administrative Hearings  
this 30th day of June, 2005.

ENDNOTES

<sup>1/</sup> The Petitioners assert that the proposed rule is not supported by competent and substantial evidence. However, this language, which was found in Subsection 120.52(8)(f), Florida Statutes (2002), was repealed by Section 1, Chapter 2003-94, Laws of Florida, and became effective June 4, 2003. Therefore, any arguments or assertions based, thereon, will not be addressed in this Final Order.

<sup>2/</sup> Specifically, Petitioners dismissed challenges to the five tasks under the Year Eight Work Program which required Monroe County to do the following by July 12, 2005: (1) develop a Land

and Acquisition and Management Master Plan, addressing both funding and management strategies; (2) provide \$40 million in financing secured by infrastructure tax for wastewater facilities; (3) begin construction of wastewater plants by laying collection lines for Baypoint, Conch Key Largo Trailer Village/Key Largo Park; (4) complete the lower Florida Keys and Key Largo feasibility Study; and (5) evaluate and implement strategies to ensure that affordable housing remains affordable in perpetuity for future generations and to establish a partnership with non-profit organizations in order to construct affordable housing using additional state funds. Petitioners also dismissed the allegation that substantial progress was not made regarding the elimination of "Hot Spots."

<sup>3/</sup> Because of the Florida Keys' unique geology and the way in which water flows throughout the Florida Keys (multi-directional), the quality of the nearshore waters just off the City of Marathon impacts the quality of the waters offshore of unincorporated Monroe County. Therefore, the purposes of FKCC and Last Stand is not limited to or restricted by municipal boundaries, but expands to other areas of the Florida Keys that it views will be negatively impacted by regulations of any given area of the Florida Keys.

<sup>4/</sup> All citations are Florida Statutes (2004) unless otherwise indicated.

<sup>5/</sup> Florida Administrative Weekly, Vol. 30, Number 29, July 16, 2004. As published, there is no distinction in the rules as to the language of the existing rules and the language of the proposed rule, as the entire provision of each of the rules is underlined.

<sup>6/</sup> Proposed Rule 28-18.210 will amend Policy 101.2.14 of the City of Marathon Comprehensive Plan. Proposed Rule 28-20.110 will amend Policies 101.2.13, 101.12.4, 101.3.4, 101.5.4.3, 101.5.11, and 205.2.7 of the Monroe County Comprehensive Plan. Proposed Rule 28-20.120 will amend Sections 9.5-120(b), 9.5-336, and 9.5-347(e) of the Monroe County Land Development Regulations.

<sup>7/</sup> The American Heritage Dictionary of the English Language 1154 (1981). Accordingly, the repeal becomes effective on the date prescribed in the rule only if and when the Administration Commission determines that the local governments made satisfactory progress in the completion of tasks in the Work Program.

<sup>8/</sup> Petitioners allege that the portion of existing Regulation 9.5-120 that relates to the reliance of "the county's threatened and endangered species map" as prima facie evidence of the species, is arbitrary and capricious because the maps are flawed. However, this issue is not addressed in this Final Order because it is in the Monroe County Comprehensive Plan and is not included in Proposed Rule 28-20.120(1) as an amendment to Regulation 9.5-120.

<sup>9/</sup> Under the existing regulation, a negative two points is assigned to applications that propose a dwelling unit "within the habitat of a wide-ranging threatened/endangered species or species of special concern."

COPIES FURNISHED:

Richard Grosso, Esquire  
Environmental and Land Use  
Law Center, Inc.  
3305 College Avenue  
Fort Lauderdale, Florida 33314

Chanta Combs, Esquire  
Office of the Governor  
The Capital, Suite 209  
Tallahassee, Florida 32399-1001

Richard Collins, Esquire  
Robert B. Shillinger, Jr., Esquire  
Monroe County  
Post Office Box 1026  
Key West, Florida 33041-1026

John R. Herin, Jr., Esquire  
Stearns, Weaver, Weissler, Alhadeff  
& Sitterson, P.A.  
150 West Flagler Street, Suite 2200  
Miami, Florida 33130

Michael T. Burke, Esquire  
Tamara Schrudders, Esquire  
Johnson, Anselmo, Murdoch,  
Burke & George, P.A.  
2455 East Sunrise Boulevard, Suite 1000  
Fort Lauderdale, Florida 33304



David L. Jordan, Esquire  
Timothy E. Dennis, Esquire  
Department of Community Affairs  
2555 Shumard Oak Boulevard, Suite 325  
Tallahassee, Florida 32399-2100

Nancy Stroud, Esquire  
Jorge Cruz-Bustillo, Esquire  
Weiss, Serota, Helfman, Pastoriza  
& Guedes, P.A.  
3107 Stirling Road, Suite 300  
Fort Lauderdale, Florida 33312-6526

Thaddeus Cohen, Secretary  
Department of Community Affairs  
2555 Shumard Oak Boulevard, Suite 100  
Tallahassee, Florida 32399-2100

Heidi Hughes, General Counsel  
Department of Community Affairs  
2555 Shumard Oak Boulevard, Suite 325  
Tallahassee, Florida 32399-2100

Scott Boyd, Executive Director  
and General Counsel  
Joint Administrative Procedures Committee  
120 Holland Building  
Tallahassee, Florida 32399-1300

Liz Cloud, Program Administrator  
Bureau of Administrative Code  
Department of State  
R.A. Gray Building, Suite 101  
Tallahassee, Florida 32399-0250

NOTICE OF RIGHT TO JUDICIAL REVIEW

A party who is adversely affected by this Final Order is entitled to judicial review pursuant to Section 120.68, Florida Statutes. Review proceedings are governed by the Florida Rules of Appellate Procedure. Such proceedings are commenced by filing the original Notice of Appeal with the agency Clerk of the Division of Administrative Hearings and a copy, accompanied by filing fees prescribed by law, with the District Court of Appeal, First District, or with the District Court of Appeal in the Appellate District where the party resides. The notice of appeal must be filed within 30 days of rendition of the order to be reviewed.

**FINAL ORDER NO. DCA07- GM-166**

**STATE OF FLORIDA  
DEPARTMENT OF COMMUNITY AFFAIRS**

FLORIDA KEYS CITIZENS  
COALITION, INC., and PROTECT  
KEY WEST AND THE FLORIDA KEYS,  
INC., d/b/a LAST STAND,

Petitioners,

vs.

DEPARTMENT OF COMMUNITY  
AFFAIRS and MONROE COUNTY,

Respondents,

---

DOAH Case No. **06-2449GM**

FILED  
2007 OCT -1 PM 3:31  
ADMINISTRATIVE  
DIVISION

**FINAL ORDER**

This matter was considered by the Secretary of the Department of Community Affairs following receipt of a Recommended Order issued by an Administrative Law Judge of the Division of Administrative Hearings. A copy of the Recommended Order is appended to this Final Order as Exhibit A.

**Background and Summary of Proceedings**

On June 16, 2006, the Department published notice of five Final Orders determining that Ordinance Nos. 008-2006, 009-2006, 010-2006, 011-2006 and 013-2006 adopted by the County in March 2006 were, with one minor exception, consistent with the requirements of Chapter 380, Florida Statutes, and were therefore approved.

On July 7, 2006, Florida Keys Citizens Coalition, Inc. and Protect Key West and the Florida Keys, Inc., d/b/a Last Stand,

filed a Petition for administrative hearing regarding the Notice. This Petition was amended once prior to the final hearing.

The final hearing was scheduled for September 11-15, 2006. At the request of the parties, the hearing was continued twice and then held in Miami, Florida on February 6-7, 2007. A continued hearing was held on March 14-15, 2007 in Tallahassee, Florida. Upon consideration of the evidence and post-hearing filings, the Administrative Law Judge entered a Recommended Order rejecting all but three (3) of the allegations raised in the Amended Petition. The Order recommends that the Department enter a final order approving Ordinance No. 008-2006, except for the deletion of Section 9.5-342; Ordinance No. 009-2006; Ordinance No. 010-2006 except for Sections 9.5-256(c)(4)a., 9-5.256(c)(3), and 9-5.256(c)(3)b.2.; Ordinance No. 011-2006; and Ordinance No. 013-2006 except for the parcels identified in Findings of fact 65, 80, 86, and 132.

Standard of Review of Recommended Order

The Administrative Procedure Act contemplates that the Department will adopt an Administrative Law Judge's Recommended Order as the agency's Final Order in most proceedings. To this end, the Department has been granted only limited authority to reject or modify findings of fact in a Recommended Order.

Rejection or modification of conclusions of law may not form the basis for rejection or modification of findings of fact. The agency may not reject or modify the findings of fact unless the agency first determines from a review of the entire record, and states with particularity in the order, that the findings of fact were not based upon competent substantial evidence or that the proceedings on which the findings were based did not comply with essential requirements of law.

**Fla. Stat.** § 120.57(1)(1).

Absent a demonstration that the underlying administrative proceeding departed from essential requirements of law, "[a]n ALJ's findings cannot be rejected unless there is no competent, substantial evidence from which the findings could reasonably be inferred." Prysi v. Department of Health, 823 So. 2d 823, 825 (Fla. 1<sup>st</sup> DCA 2002) (citations omitted). In determining whether challenged findings are supported by the record in accord with this standard, the Department may not reweigh the evidence or judge the credibility of witnesses, both tasks being within the sole province of the Administrative Law Judge as the finder of fact. See Heifetz v. Department of Bus. Reg., 475 So. 2d 1277, 1281-83 (Fla. 1<sup>st</sup> DCA 1985).

The Administrative Procedure Act also specifies the manner in which the Department is to address conclusions of law in a Recommended Order.

The agency in its final order may reject or modify the conclusions of law over which it has substantive jurisdiction and interpretation of administrative rules over which it has substantive jurisdiction. When rejecting or modifying such conclusion of law or interpretation of administrative rule, the agency must state with particularity its reasons for rejecting or modifying such conclusion of law or interpretation of administrative rule and must make a finding that its substituted conclusion of law or interpretation of administrative rule is as or more reasonable than that which was rejected or modified.

**Fla. Stat.** § 120.57(1)(1); DeWitt v. School Board of Sarasota County, 799 So. 2d 322 (Fla. 2<sup>nd</sup> DCA 2001).

The label assigned a statement is not dispositive as to whether it is a finding of fact or conclusion of law. See Kinney v. Department of State, 501 So. 2d 1277 (Fla. 5<sup>th</sup> DCA 1987). Conclusions of law labeled as findings of fact, and findings labeled as conclusions, will be considered as a conclusion or finding based upon the statement itself and not the label assigned.

#### Rulings on Exceptions

The Recommended Order, entered June 26, 2006, contains the following Notice of Right to File Exceptions:

All parties have the right to submit written exceptions within 15 days from the date of this Recommended Order. Any exceptions to this Recommended Order should be filed with the agency that will issue the Final Order in this matter. [emphasis added]

This Notice accurately sets forth the timing and filing requirements for exceptions set forth in Section 120.57(1)(k), Florida Statutes, and Rule 28-106.217, Florida Administrative Code. Fifteen (15) days from entry of the Recommended Order is July 11, 2006.<sup>1</sup> The agency that will issue the Final Order in this case is the Department of Community Affairs.

Petitioners filed "Petitioner's Exceptions to the Recommended Order" on July 11, 2006. Respondents filed "Respondents' Exceptions to the Recommended Order" on July 11, 2006. Petitioners filed "Petitioner's Response to Respondents' Exceptions to the Recommended Order" on July 20, 2006. Finally, Respondents filed a "Joint Response to Petitioners' Exceptions to the Recommended Order" on July 23, 2006. These Exceptions and Responses were timely filed with the Department, the proper agency for such filing.

These Exceptions and that Response were considered and the Exceptions are ruled upon in turn below.

1. Petitioner Exception One: Wetlands - Findings of Fact 55-60

The Administrative Law Judge made findings about the exclusion of wetlands in the Tier I designation criteria.

---

<sup>1</sup> The fifteen (15) days for filing exceptions is not automatically extended by virtue of the manner of service. See Fla. Admin. Code r. 28-106.217(4) ("No additional time shall be added to the time limits for filing exceptions or responses to exceptions when service has been made by mail.").

Petitioner challenges this exclusion and requests that certain parcels be given a Tier I designation because they contain wetlands. The court interpreted the criteria in the Plan and Code to not require the inclusion of wetlands. Petitioner argues that the uniform testimony of the experts that the Keys ecosystem is a mix of upland and wetland that work together does not support such a finding. The Administrative Law Judge found that the criteria for Tier I designation are not vague and do not include wetland native upland habitats. He found the criteria consistent with the County's Comprehensive Plan which provides that the Plan criteria refer to "upland native vegetation" ...and..."upland native habitat" and does not refer to "upland wetlands." The court also found that wetlands were adequately protected in other sections of the County's land development regulations. A review of the record validates existence of substantial, competent evidence as the basis of the court's respective findings of fact and conclusion of law. (Comprehensive Plan Goal 205, Objective 205.4 and Policy 205.1.1, Sections 9.5-256(c), 9.5-338, 9.5-347(b), 9.5-347(c) and 9.5-348(d) of the County's Land Development Regulations.) Accordingly, Petitioners' Exception One is DENIED.



2. Petitioner Exception Two: Biological Opinion - Finding of Fact 71

Petitioner challenges the Administrative Law Judge's finding to limit Tier I protections to known locations identified on specified maps and through on-site surveys. Petitioner asks that the County be directed to use the United States Fish and Wildlife Service 2006 Biological Opinion Maps of Potentially Suitable Habitat for federally protected species. While acknowledging that these maps "would obviously be more desirable to use" the Administrative Law Judge found that, at some point, the process must come to an end and using constantly changing data and mapping studies would result in there being no finality to the process. The court also found that the Tier I designation criteria providing for inclusion of "known locations of threatened and endangered species" was consistent with the County's Comprehensive Plan. Plan Objective 205.1 is clear in providing that one criterion for Tier I designation is similarly "known locations of threatened and endangered species." Known locations are where such species have actually been observed. Conversely, the United States Fish and Wildlife Service Maps proposed for use in Petitioner's complaint map "potentially suitable habitat." In addition the new County Land Development

Regulations provide for a means to modify Tier I maps based on new information, including that which might come from the United States Fish and Wildlife Service Maps. A review of the record validates existence of substantial, competent evidence as the basis of the court's findings. (County Comprehensive Plan Objective 205.1 and Section 9.5-256(e) of the County's Land Development Regulations.) Accordingly, Petitioners' Exception Two is DENIED.

3. Respondents' Exception One: Tier I Natural Areas Above Four Acres - Findings of Fact 61-65

Policy 205.1.1 of the Monroe County Comprehensive Plan establishes the criteria for the designation of the Tiers. One of those criteria is "natural areas including old and new growth upland vegetated areas, above 4 acres in area." The Administrative Law Judge found that Policy 205.1.1 "merely sets the 'minimum' standard which the County must follow in establishing the Tier I boundary designation and does not bar a smaller threshold, if appropriate." Accordingly, the court directed re-evaluation of those parcels placed in an incorrect category due to the arbitrary four acre limitation. Respondent argues that the four acre Tier I designation criterion was a policy decision of the County and is consistent with the Principles for Guiding Development of the Florida Keys Area of

Critical State Concern, and that the parcels need not be re-evaluated. The Administrative Law Judge found that the existing County Comprehensive Plan established a four (4) acre threshold as "one criteria for Tier I designation" of such natural areas. Testimony substantiated that the relevant Plan Policy did not seek to limit Tier I designation to only hammocks exceeding four (4) acres in size. A review of the record validates existence of substantial, competent evidence as the basis of the court's findings. (Plan Policy 205.1.1, Testimony Conaway V2 at 247-250; Jetton V10 at 1212-1213, 1216-1217; Trivette V5 at 558-559; Kreur V7 at 849-852 and Calvo V3 at 340-341.) Accordingly, Respondents' Exception One is DENIED.

4. Respondents' Exception Two: Special Protection Area (SPA)  
Hardwood Hammock or Pinelands Above One Acre

As with the four acre criterion for Tier I, the Administrative Law Judge found that the County's Comprehensive Plan one acre criterion for SPA merely established a minimum standard and that a smaller size threshold is not barred. Respondent again argues that the County made a policy decision and that Goal 205 of the Comprehensive Plan leaves no room for a smaller size. The Administrative Law Judge found that the one (1) acre threshold was arbitrary, was reputed by science and represented simply a number the County Commission "felt

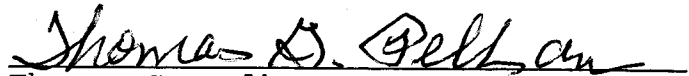
comfortable with." A review of the record validates existence of substantial, competent evidence as the basis of the court's findings. (Plan Policy 205.1.1, Testimony Calvo V3 at 340-341; Harrison V10 at 1351-1353; Conaway V2 at 186; Jetton V9 at 1176-1177, V10 at 1209-1210, 1227-1229, 1235.) Accordingly, Respondents' Exception Two is DENIED.

Order

Upon review and consideration of the entire record of this proceeding, including the Recommended Order and exceptions filed by Petitioners and Respondents, it is hereby ordered as follows:

1. The findings of fact and conclusions of law in the Recommended Order are adopted.
2. The Administrative Law Judge's recommendation is accepted.
3. Monroe County Ordinance No. 008-2006, except for the deletion of Section 9.5-342; Ordinance No. 009-2006; Ordinance No. 010-2006 except for Sections 9.5-256(c)(4)a., 9-5.256(c)(3), and 9-5.256(c)(3)b.2.; Ordinance No. 011-2006; and Ordinance No. 013-2006 except for the parcels identified in Findings of fact 65, 80, 86, and 132, are hereby approved.

DONE AND ORDERED in Tallahassee, Florida.



Thomas G. Pelham, Secretary  
DEPARTMENT OF COMMUNITY AFFAIRS  
2555 Shumard Oak Boulevard  
Tallahassee, Florida 32399-2100

NOTICE OF RIGHTS

ANY PARTY TO THIS ORDER HAS THE RIGHT TO SEEK JUDICIAL REVIEW OF THE ORDER PURSUANT TO SECTION 120.68, FLORIDA STATUTES, AND FLORIDA RULES OF APPELLATE PROCEDURE 9.030(b)(1)C. AND 9.110.

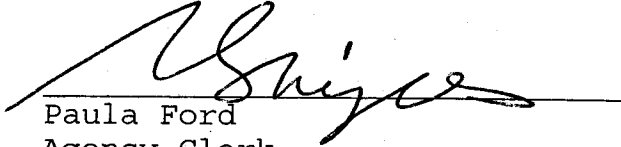
TO INITIATE AN APPEAL OF THIS ORDER, A NOTICE OF APPEAL MUST BE FILED WITH THE DEPARTMENT'S AGENCY CLERK, 2555 SHUMARD OAK BOULEVARD, TALLAHASSEE, FLORIDA 32399-2100, WITHIN 30 DAYS OF THE DAY THIS ORDER IS FILED WITH THE AGENCY CLERK. THE NOTICE OF APPEAL MUST BE SUBSTANTIALLY IN THE FORM PRESCRIBED BY FLORIDA RULE OF APPELLATE PROCEDURE 9.900(a). A COPY OF THE NOTICE OF APPEAL MUST BE FILED WITH THE APPROPRIATE DISTRICT COURT OF APPEAL AND MUST BE ACCOMPANIED BY THE FILING FEE SPECIFIED IN SECTION 35.22(3), FLORIDA STATUTES.

YOU **WAIVE** YOUR RIGHT TO JUDICIAL REVIEW IF THE NOTICE OF APPEAL IS NOT TIMELY FILED WITH THE AGENCY CLERK AND THE APPROPRIATE DISTRICT COURT OF APPEAL.

MEDIATION UNDER SECTION 120.573, FLA. STAT., IS NOT AVAILABLE WITH RESPECT TO THE ISSUES RESOLVED BY THIS ORDER.

CERTIFICATE OF FILING AND SERVICE

I HEREBY CERTIFY that the original of the foregoing has been filed with the undersigned Agency Clerk of the Department of Community Affairs, and that true and correct copies have been furnished to the persons listed below in the manner described, on this 26th day of September, 2007.

  
Paula Ford  
Agency Clerk

**Hand Delivery**

Richard E. Shine, Esq.  
Assistant General Counsel  
Department of Community Affairs  
2555 Shumard Oak Blvd.  
Tallahassee, FL 32399-2100

**Inter-Agency Mail**

Donald R. Alexander  
Administrative Law Judge  
Division of Administrative Hearings  
The DeSoto Building  
1230 Apalachee Parkway  
Tallahassee, FL 32399-3060

**By U.S. Mail**

Richard J. Grosso, Esq.  
Everglades Law Center, Inc.  
Nova Southeastern University  
3305 College Avenue  
Fort Lauderdale, FL 33314-7721

Robert N. Hartsell, Esq.  
Everglades Law Center, Inc.  
818 U. S, Highway 1, Suite 8  
North Palm Beach, FL 33408-3831

David L. Jordan, Esq.  
Greenberg Traurig, P.A.  
PO Box 1838  
Tallahassee, FL 32302-1838

Robert Shillinger, Esq.  
Monroe County Attorney's Office  
PO Box 1026  
Key West, FL 33401-1026



STATE OF FLORIDA

# DEPARTMENT OF COMMUNITY AFFAIRS

*"Dedicated to making Florida a better place to call home"*

CHARLIE CRIST  
Governor

THOMAS G. PELHAM  
Secretary

October 25, 2010

The Honorable Michael Reckwerdt  
Village of Islamorada Council  
86800 Overseas Highway  
Islamorada, Florida 33036

Dear Mayor Reckwerdt:

This letter is written to express the Department's concern regarding the Village of Islamorada's recent submittal of its report which will provide a basis for the Department's findings and recommendations to the Administration Commission. The report is required to be submitted to the Governor and Cabinet, sitting as the Administration Commission, by November 30 of each year describing the progress of the Florida Keys Area toward completing the work program tasks specified in commission rules and in accordance with s. 380.0552 (4), Florida Statutes.

The Department is in the process of summarizing progress for each local government and preparing recommendations to the Administration Commission. Our review indicates that Islamorada made progress in completing strategies related to comprehensive plan amendments, land development regulations, and other growth management implementation issues that further protect hardwood hammocks and endangered species.

While the Village has maintained a good record in the administration of the growth management plan, there has been inadequate progress in completing tasks that will result in the construction of central wastewater facilities that will result in the improvement of near shore water quality. The Village has refunded approximately \$4 million in property assessments that had been collected for the construction of central wastewater facilities and has returned over \$5 million in funding from the Environmental Protection Agency that would have upgraded septic tanks, returned over \$6 million in funding from the Army Corps of Engineers. As a result of these actions, the Village was unable to execute loan agreements offered from the Department of Environmental Protection for another \$6 million for the construction of wastewater facilities. As a result, a total of more than \$22 million has been forfeited. Currently, the Village does not have a viable plan or funding to meet the December 2015 deadline for meeting the advanced wastewater treatment standards required by s.403.086(10) and s.381.0065(4)(1), Florida Statutes.

Of the tasks identified for completion by July 2010, only twenty percent were achieved. The Department must report to the Administration Commission that substantial progress has not



been made and anticipate recommending that the building permit allocation be reduced by twenty percent. A copy of the Department report is attached. The report will be presented to the Governor and Cabinet will be presented on December 7, 2010. If you believe there are errors in the draft please let us know as soon as possible.

The Department encourages the Village to attend the meeting and to aggressively move forward in allocating funding and planning for the construction of wastewater facilities during the interim. It would be helpful if the Village could provide an interlocal agreement with the Key Largo Wastewater District that documents the intent of the district to treat wastewater from the Village of Islamorada.

Another area of concern is the wastewater schedule that is contained in the draft rule to be considered by the Administration Commission.. Currently, there is no plan or schedule that the Council has agreed upon that will result in the construction of wastewater facilities. Continued delays by the Village will place the owners of package plants and septic tanks in the position of upgrading the systems on an individual basis by 2015. The lack of action by the Council places property owners in a vulnerable position, not knowing whether to incur costs in order to avoid enforcement action for systems not upgraded by 2015 or potentially paying twice for the upgrade in the event that the Village later constructs central sewer facilities at a later. Additionally, the delays in taking action make it unlikely that the entire Village can be connected to a central system by the 2015 deadline.

We look forward to seeing you at the Administration Commission meeting. If additional information is needed, please telephone Rebecca Jetton at (850) 922-1766.

Sincerely,



Charles Gauthier, AICP, Director  
Division of Community Planning



## Florida Department of Transportation

CHARLIE CRIST  
GOVERNOR

1000 NW 111th Avenue  
Miami, Florida 33172

STEPHANIE C. KOPELOUSOS  
SECRETARY

June 18, 2010

Craig Diamond  
Florida Department of Community Affairs  
Division of Community Planning  
2555 Shumard Oak Boulevard  
Tallahassee, Florida 32399-2100

Re: Traffic Flow Rates for Emergency Evacuation in the Florida Keys

Dear Mr. Diamond:

Pursuant to your request, the Florida Department of Transportation (FDOT) was asked to provide Traffic Flow Rates for Emergency Evacuation in the Florida Keys for the Florida Department of Community Affairs' (DCA) update of the 2001 Florida Keys evacuation model. Based on our analysis, FDOT has identified "Maximum Sustainable Traffic Flow Rates per Functional Evacuation Lane" for hurricane evacuation purposes for use when conducting evacuation traffic analyses on US-1 in the Florida Keys. Please see the attached tables recommended for use in evacuation planning analyses in the Florida Keys. Table 2A identifies the existing lane configuration of US-1. Table 2B provides the maximum flow rates that could be reasonably sustained under extended periods of time for evacuation-level of demand per each segment identified.

The efforts undertaken to determine these rates included a site-specific capacity study in which traffic flow data were collected and analyzed under a variety of demand conditions. A comprehensive review of traffic conditions that have occurred during other hurricane evacuations in Florida, specifically the Florida Keys, as well as in the State of Louisiana, was also conducted.

Our studies incorporated data over a 10-year period since the original 2001 Keys Evacuation Study was conducted. Most importantly, this data includes observational studies of actual hurricane evacuations that have added to our understanding of traffic operations under mass evacuation demand conditions.

Should you have any questions or require additional information, please do not hesitate to contact me, or Ms. Barbara Culhane, AICP, Senior Project Manager, at (305) 470-5200.

Sincerely,

Aileen Boucle, AICP  
District Six PLEMO Administrator

Craig Diamond  
June 18, 2010  
Page 2

CC: Sandy Meyer, DEM  
Rebecca Jetton, DCA  
Jeff Alexander, NERFC  
Richard Ogburn, SFRPC  
Roman Gastesi, Monroe County  
Christine Hurley, Monroe County  
John Taylor, FDOT  
Vidya Mysore, FDOT  
Ed Ward, FDOT  
Gus Pego, FDOT  
Debora Rivera, FDOT  
Gary Donn, FDOT  
Omar Meitin, FDOT  
Barbara Culhane, FDOT  
Phil Steinmiller, FDOT

**TABLE 2A**  
**Roadway Configuration on US Highway 1 (Overseas Highway)**  
**and CR 905/Card Sound Road in the Florida Keys, Monroe County, Florida**

Area	Milemarkers		Location/Description	Year 2010 Configuration
	From	To		
Lower Keys	2.0	4.0	Key West to Stock Island	4L
Lower Keys	4.0	9.0	Stock Island to Big Coppitt Key	4LD
Lower Keys	9.0	17.0	Big Coppitt Key to Sugarloaf Key	2L
Lower Keys	17.0	22.0	Sugarloaf Key to Cudjoe Key	2L
Lower Keys	22.0	24.0	Cudjoe Key to Summerland Key Cove Airport	2L
Lower Keys	24.0	25.0	Summerland Key Cove Airport to Summerland Key	3L
Lower Keys	25.0	30.0	Summerland Key to Big Pine Key	2L
Lower Keys	30.0	34.0	Big Pine Key to West Summerland Keys	2L
Lower Keys	34.0	35.2	West Summerland Keys to Spanish Harbor Keys	2L
Lower Keys	35.2	36.5	Spanish Harbor Keys to Bahia Honda Bridge	4LD
Lower Keys	36.5	37.5	Bahia Honda Bridge to Bahia Honda Key	2L
Middle Keys	37.5	47.0	Bahia Honda Key to Hog Key	2L
Middle Keys	47.0	48.0	Hog Key to Boot Key	2L
Middle Keys	48.0	50.2	Boot Key to Marathon	4L
Middle Keys	50.2	50.8	Marathon to Marathon Shores	5L
Middle Keys	50.8	54.0	Marathon Shores to Key Colonial Beach	4LD
Middle Keys	54.0	54.5	Key Colonial Beach to Deer Key	4LD
Middle Keys	54.5	58.0	Deer Key to Grassy Key	2L
Upper Keys	58.0	74.0	Grassy Key to Matecumbe Harbor	2L
Upper Keys	74.0	80.0	Matecumbe Harbor to Teatable Key	2L
Upper Keys	80.0	83.5	Teatable Key to Islamorada	3L
Upper Keys	83.5	85.6	Islamorada to Windley Key	2L
Upper Keys	85.6	90.0	Windley Key to Plantation Key	2L
Upper Keys	90.0	100.0	Tavernier Key to Newport Key	4LD
Upper Keys	100.0	105.0	Newport Key to Sexton Cove	4LD
Upper Keys	105.0	106.3	Sexton Cove to Rattlesnake Key	4LD
Upper Keys	106.3	126.5	Rattlesnake Key to Card Sound Rd	2L/4L
South Dade	126.5	HEFT	Card Sound Rd to HEFT	4LD
Upper Keys	106.3	Int CR 905 / CR 905 A	Lake Surprise to Crocodile Lake	2L
Upper Keys	Ocean Reef	Int CR 905 / CR 905 A	Tanglefish Key to Crocodile Lake	2L
Upper Keys	Int CR 905 / CR 905 A	US 1	Crocodile Lake to South Miami-Dade	2L

**LEGEND**

- 2L Two-lane facility
- 2L/4L Two lanes with short four-lane sections for passing purposes
- 3L Three-lane facility (center lane is a two-way left-turn lane)
- 4L Four-lane undivided facility
- 4LD Four-lane divided facility
- 5L Five-lane facility (center lane is a two-way left-turn lane)

**TABLE 2B**

**Maximum Sustainable Traffic Flow Rates per Functional Evacuation Lane for Hurricane Evacuation Purposes  
US Highway 1 (Overseas Highway) and CR 905/Card Sound Road in the Florida Keys, Monroe County, Florida**

Area	Milemarkers		Location/Description	Suggested Maximum Sustainable Flow Rate per Hour per Functional Evacuation Lane
	From	To		
Lower Keys	2.0	4.0	Key West to Stock Island	900
Lower Keys	4.0	9.0	Stock Island to Big Coppitt Key	900
Lower Keys	9.0	17.0	Big Coppitt Key to Sugarloaf Key	1,100
Lower Keys	17.0	22.0	Sugarloaf Key to Cudjoe Key	1,100
Lower Keys	22.0	24.0	Cudjoe Key to Summerland Key Cove Airport	1,100
Lower Keys	24.0	25.0	Summerland Key Cove Airport to Summerland Key	1,100
Lower Keys	25.0	30.0	Summerland Key to Big Pine Key	1,100
Lower Keys	30.0	34.0	Big Pine Key to West Summerland Keys	1,050
Lower Keys	34.0	35.2	West Summerland Keys to Spanish Harbor Keys	1,100
Lower Keys	35.2	36.5	Spanish Harbor Keys to Bahia Honda Bridge	1,100
Lower Keys	36.5	37.5	Bahia Honda Bridge to Bahia Honda Key	1,100
Middle Keys	37.5	47.0	Bahia Honda Key to Hog Key	1,200
Middle Keys	47.0	48.0	Hog Key to Boot Key	1,100
Middle Keys	48.0	50.2	Boot Key to Marathon	900
Middle Keys	50.2	50.8	Marathon to Marathon Shores	900
Middle Keys	50.8	54.0	Marathon Shores to Key Colonial Beach	900
Middle Keys	54.0	54.5	Key Colonial Beach to Deer Key	900
Middle Keys	54.5	58.0	Deer Key to Grassy Key	1,100
Upper Keys	58.0	74.0	Grassy Key to Matecumbe Harbor	1,100
Upper Keys	74.0	80.0	Matecumbe Harbor to Teatable Key	1,100
Upper Keys	80.0	83.5	Teatable Key to Islamorada	1,100
Upper Keys	83.5	85.6	Islamorada to Windley Key	1,100
Upper Keys	85.6	90.0	Windley Key to Plantation Key	1,100
Upper Keys	90.0	100.0	Tavernier Key to Newport Key	900
Upper Keys	100.0	105.0	Newport Key to Sexton Cove	900
Upper Keys	105.0	106.3	Sexton Cove to Rattlesnake Key	900
Upper Keys	106.3	126.5	Rattlesnake Key to Card Sound Rd	1,200
South Dade	126.5	HEFT	Card Sound Rd to HEFT	900
Upper Keys	106.3	Int CR 905 / CR 905 A	Lake Surprise to Crocodile Lake	1,100
Upper Keys	Ocean Reef	Int CR 905 / CR 905 A	Tanglefish Key to Crocodile Lake	1,100
Upper Keys	Int CR 905 / CR 905 A	US 1	Crocodile Lake to South Miami-Dade	1,100

**NOTES**

A Functional Evacuation Lane has a pavement width of at least 10 feet

The above flow rates are maximum values that are expected to be sustained for extended periods (more than 8 hours). During night conditions, these flow rates may be lower than the ones shown above.



# Monroe County Hurricane Evacuation Clearance Time— Final Report

Reid Ewing, Ph.D.  
Professor of City and Metropolitan Planning  
University of Utah

## 1. Hurricane Evacuation Modeling Generally

The federal government, under FEMA, mandates that all states have comprehensive emergency operations plans for such disasters as hurricanes. The majority of states have a two-tiered approach to emergency planning and response. Evacuation planning, response, and recovery activities are done at the local level (either county or city) while the state is responsible for coordinating local emergency management activities and state-level law enforcement and transportation. The state emergency management agency in Florida plays a larger role in managing and developing evacuation plans than other states since the state of Florida is highly susceptible to hurricanes.

Evacuation models are used to estimate clearance time. Clearance time is the total time it will take to evacuate all anticipated evacuees from the vulnerable area following an evacuation order. Clearance time is calculated by adding the amount of time it takes residents of an area to prepare for an evacuation (mobilization response time) and the amount of time it takes them to leave the area (evacuation time).

Hurricane evacuation clearance times are used as emergency management tools throughout the state of Florida. However, in Monroe County only, estimated hurricane evacuation clearance times are also used for regulatory and growth management purposes. Specifically, since 1992, Monroe County has used clearance times to control the rate of growth in the county, with State of Florida oversight.

In 2005, the Monroe County Year 2010 Comprehensive Plan was amended to establish a three-phase evacuation process, as follows:

*Policy 216.1.8 In the event of a pending major hurricane (category 3-5) Monroe County shall implement the following staged/phased evacuation procedures to achieve and maintain an overall 24-hour hurricane evacuation clearance time for the resident population.*

November 8, 2010

*1. Approximately 48 hours in advance of tropical storm winds, a mandatory evacuation of non-residents, visitors, recreational vehicles (RV's), travel trailers, live-aboards (transient and non-transient), and military personnel from the Keys shall be initiated. State parks and campgrounds should be closed at this time or sooner and entry into the Florida Keys by non-residents should be strictly limited.*

*2. Approximately 36 hours in advance of tropical storm winds, a mandatory evacuation of mobile home residents, special needs residents, and hospital and nursing home patients from the Keys shall be initiated.*

*3. Approximately 30 hours in advance of tropical storm winds, a mandatory phased evacuation of permanent residents by evacuation zone (described below) shall be initiated. Existing evacuation zones are as follows:*

*a) Zone 1 – Key West, Stock Island and Key Haven to Boca Chica Bridge (MM 1-6)*

*b) Zone 2 – Boca Chica Bridge to West end of 7-mile Bridge (MM 6-40)*

*c) Zone 3 – West end of 7-Mile Bridge to West end of Long Boat Key Bridge (MM 40-63)*

*d) Zone 4 – West end of Long Boat Key Bridge to CR 905 and CR 905A intersection (MM 63-106.5)*

*e) Zone 5 – 905A to, and including Ocean Reef (MM 106.5–126.5)*

*The actual sequence of the evacuation by zones will vary depending on the individual storm.. The concepts embodied in this staged evacuation procedures should be embodied in the appropriate County operational Emergency Management Plans.*

*The evacuation plan shall be monitored and updated on an annual basis to reflect increases, decreases and or shifts in population; particularly the resident and non-resident populations. [9J-5.012(3)(c)4]*

Objective 101.2 of the Comprehensive Plan requires Monroe County to reduce hurricane clearance time to 24 hours by 2010. The Miller Model, developed specifically to estimate clearance time for the Florida Keys, has yet to be tested with a phased evacuation scenario to see if Monroe County meets this objective.

Our charge is to conduct such a test, while updating the model based on 2000 U.S. Census data, recent building permit data, the best available tourist data, all available hurricane survey results, realistic roadway link capacities, and other data that have become available since the last test. This report estimates clearance time under three-phase evacuation for a worst case Category 5 hurricane.

Clearly, estimated clearance time will vary with the assumptions made in the Miller Model update. The matrix in the Appendix at the end of this report sets forth the assumptions proposed by different agencies. This update is based on the assumptions in the Ewing column, which the author views as most realistic.

## Conventional Evacuation Models

Conventional hurricane models make use of traditional urban transportation models, the same models used in long-range transportation planning. There are more than 30 transportation modeling tools that have been used for evacuation modeling. In addition, there are also several specialized transportation planning models that were developed specifically for hurricane evacuation events, including ETIS, HEADSUP, and HURREVAC. These three models are described in more detail below.

There are three basic ways to model a traffic network: macro, micro and meso. The three models differ in terms of scale (geographic area) and the level of detail (how precise the analysis is). Therefore, “[u]nderstanding the potential of transportation modeling to support decision-making for evacuations hinges on identifying those decisions in the process that best lend themselves to the strengths of a particular modeling approach.”<sup>1</sup>

Macro models are able to represent a large geographic area such as an entire metropolitan area; however, these models cannot represent individual vehicles or people on the road network. A sub-category of macro models that are time sensitive, real-time decision support tools, are becoming increasingly popular.

Micro models represent only a portion of a road such as milemarkers along an interstate. These models are helpful in modeling smaller sections of a network such as a specific roadway corridor and are able to calculate precise results since individual vehicles are tracked on the network for a small segment of time (normally 1/10<sup>th</sup> of a second).

A third type of model, meso models, are able to represent larger geographic areas than micro models and at the same time are able to allow for more precise results than macro models. In addition, these models are able to represent individual roadway links and vehicles on a network; however, they are not able to represent individual lanes on each roadway segment.

HURREVAC is a macro model designed by the U.S. Army Corps of Engineers for FEMA to assess hurricane evacuation scenarios. The model estimates the amount of time it will take to evacuate an area and can be used to determine the best time to begin an evacuation. The model uses information from the National Hurricane Center, flood estimates from the SLOSH model, and information on the utility of all shelters in the area.

PBS&J developed the ETIS model following Hurricane Floyd. This is a macro-level modeling and analysis system which is primarily comprised of an Internet travel demand forecasting system. The system is able to predict congestion from evacuation traffic as well as traffic flows between states. It allows emergency officials to input the category of storm, the estimated participation rate, tourist occupancy rate, and destination percentages for the counties of concern. With such data, the model is able to output the level of congestion on major highways as well as tables of anticipated vehicle volumes.

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<sup>1</sup> Hardy, Matthew and Wunderlich, Karl. (2007). Evacuation Management Operations (EMO) Modeling Assessment: Transportation Modeling Inventory. Pg. 19.



November 8, 2010

The Florida HEADSUP program is used to manage traffic proactively during an evacuation. Although HEADSUP uses the same information as ETIS, the program is more detailed and complete. The program is able to automatically process real-time traffic data from 27 strategically located traffic counters throughout Florida in order to analyze evacuation conditions and assist in emergency management decisions. The program is also able to run hourly dynamic travel demand forecasts, impact analyses of contraflow lanes, socio-economic statistics on evacuees, a map-based user interface, a traffic model that gradually loads evacuees onto the roadway network, and an archival capability which records when key events occurred during a hurricane evacuation.

The Florida Keys Hurricane Evacuation Model, widely known as the Miller Model, is a deterministic model that supplies a specific model output – clearance time – based on such inputs as the number of dwelling units and capacity of roadway links. Miller Consulting developed this hurricane evacuation model in 2000 to measure and analyze the unique characteristics of the Florida Keys and to determine the clearance time required to evacuate the Florida Keys up to Florida City, based on existing US 1 conditions.

The Miller Model was designed to model the behavior of residents and tourists in responding to a mandatory hurricane evacuation order in the Florida Keys and is able to test various scenarios in order to determine the clearance time for each scenario.

## **State-of-the-Art Evacuation Models**

Traditional urban transportation models are static. They do not take into account the dynamic changes that occur in travel behavior during the evacuation process. The static models assume stable conditions both in demand variables and traffic flows.

Haoqiang Fu and Chester Wilmot have developed a sequential logit dynamic travel demand model for hurricane evacuation. The model considers the evacuation order as a time-dependent variable rather than a static variable and thereby analyzes both the impact of the type and timing of evacuation orders. The model divides evacuation time into discrete intervals; the probability of a household evacuating in a particular interval is the product of the probability of evacuating in that time period and the product of the probability of not evacuating in all earlier time intervals. The model is also designed to test phased evacuation.

Fu and Wilmot used a small dataset from Southeast Louisiana from Hurricane Andrew to develop their dynamic model. Due to the limitations with the size of this dataset, Fu and Wilmot then estimated a similar sequential logit model using a larger dataset from South Carolina collected after Hurricane Floyd.

This model is considered state-of-the-art because it is able to analyze the impact of the type and timing of evacuation orders. Fu and Wilmot used the model to better understand household evacuation behavior under different evacuation order conditions. The model can also be used to study the impact of a variety of factors such as the type and location of the residence, and storm-specific characteristics such as wind speed, forward speed, and the path of the hurricane.

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Monroe County could benefit from developing a dynamic model for future hurricane evacuation updates. It would provide a more accurate measure of clearance time than the currently used evacuation response curves.

## **2. The 2001 Study**

While other modeling options exist and may be pursued in the future, time and budget limitations under our contract led to a decision to update a conventional model developed in the *2001 Keys Hurricane Evacuation Study* (the 2001 Study). The conventional model is widely referred to as the Miller Model. The model is a spreadsheet-based program executed in Microsoft Excel. The model is comprised of 39 Excel spreadsheets, 31 of which relate to individual roadway segments. The 31 roadway segments are defined by roadway cross-section, capacity, and mile markers. The model is deterministic, predicting evacuation movement link-by-link, in 2-minute increments, assuming a 30 mph average driving speed.

### **Clearance Time**

There are different definitions of clearance time, depending on the hurricane model that is utilized. The 2001 Study definition is:

"...the time required to clear the roadways of all vehicles evacuating in response to a hurricane situation. Clearance time begins when the first evacuating vehicle enters the road network and ends when the last evacuating vehicle reaches its destination."

This definition had to be modified to account for the phasing of evacuation and the tendency of some residents to evacuate spontaneously before an evacuation order is issued. "Clearance time" begins 36 hours prior to tropical force winds when mobile home residents are ordered to evacuate (at the beginning of Phase 2), and it ends when the last evacuating vehicle exits, or passes by the northbound entrance to Florida's Turnpike on US 1 in Florida City. For purposes of determining total time to safety for evacuating vehicles, the 2001 Study added Dade County travel time to Monroe County clearance time to reflect an approximate time to get from Florida City to the evacuation shelter at Florida International University (FIU). This additional time was assumed to be 30 minutes for Category 1-2 hurricanes, and 52 minutes for Category 3-5 hurricanes reflecting additional congestion under the worst case. As we are only interested in time to evacuate to Florida City, this update does not include this additional travel time.

### **Zone Structure**

When the 2001 Study was in process, a decision was made to delineate seven evacuation zones, as that was what the Monroe County's Emergency Management Division was using at the time. The Monroe County's Emergency Management Division has since transitioned to five hurricane evacuation zones. Moreover, the South Florida Regional Planning Council has opted to base the zone structure of its evacuation model on census geography, which simplifies model updates.

For this application, we held to the seven-zone structure of the 2001 Study. The seven zones are defined by mile makers:

Table 1. Mile Marker Limits for each Evacuation Zone

	Evacuation Zone	Mile Marker
Lower Keys	1	0-13
	2	13-46
Middle Keys	3	46-64
Upper Keys	4	64-84
	5	84-95
	6	95-113
	7	106-ICWW

To update inputs to the Miller Model based on the 2000 Census, it was necessary to determine how census geography relates to the seven 2001 Study evacuation zones. We used a combination of maps provided in the *2001 Keys Hurricane Evacuation Study* and descriptions of the zonal boundaries to produce the following correspondence table (Table 2).

Table 2. Zone Structure for Updated Miller Model (2008)

Zone	Census Tract	Block Group	Percentage of Block Group in Zone
Zone 1 (Key West to Saddle Bunch Channel Bridge - mm 0-13)	9726	All block groups	100%
	9725	All block groups	100%
	9724	All block groups	100%
	9723	All block groups	100%
	9722	All block groups	100%
	9721	All block groups	100%
	9720	All block groups	100%
	9719	All block groups	100%
	9718	All block groups	100%
	9717	All block groups	100%
Zone 2 (Saddle Bunch Bridge to Knight Key Channel - mm 13-46)	9716	All block groups	100%
	9715	All block groups	100%
	9714	All block groups	100%
Zone 3 (Knight Key	9713	All block groups	100%

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Zone	Census Tract	Block Group	Percentage of Block Group in Zone
Channel to Long Key Viaduct - mm 46-64)	9712	All block groups	100%
	9711	All block groups	100%
	9710	2	100%
	9710	3	100%
Zone 4 (Long Key Viaduct to Whale Harbor Channel - mm 64-84)	9710	1	100%
	9709	1	40%
	9709	2	45%
	9709	3	100%
	9709	4	100%
	9709	5	100%
Zone 5 (Whale Harbor Channel to Milemarker 95 - mm 84-95)	9709	1	60%
	9709	2	55%
	9708	All block groups	100%
	9707	All block groups	100%
	9706	3	100%
Zone 6 (along U.S. 1 - mm 95-113)	9706	1	100%
	9706	2	100%
	9705	All block groups	100%
	9704	All block groups	100%
	9703	All block groups	100%
	9702	1	40%
	9702	3	60%
Zone 7 (along CR 905 - mm 106-ICWW)	9702	1	60%
	9702	2	100%
	9702	3	40%
	9701	All block groups	100%

## **Inputs**

The Miller Model requires the following inputs related to housing, evacuee behaviors, and road network performance.

- How many dwelling and tourist units exist in the evacuation area;
- What fraction of the dwelling and tourist units will be occupied at the time of evacuation;
- How many people will leave their dwellings to go someplace safer (i.e., evacuation rate or evacuation participation rate);
- When evacuees will leave, with respect to when evacuation orders are issued;
- What effect a policy of phased evacuation will have;
- Where the evacuees will go, in terms of ultimate destinations inside or outside the county;
- How many vehicles will be used in the evacuation;
- Where evacuating traffic will load onto the road network;
- How much background traffic will be using the road network at the same time;
- How much traffic can be handled by critical links in the road network;

The following chapter outlines sources of data, methods of estimation, and values for each of the above used in our update of the 2001 Study.

## **3. Update of the 2001 Study**

### **Numbers of Dwellings and Tourist Units**

#### **2001 Study**

Evacuating population comes from three types of units: 1) permanent dwelling units, 2) mobile home units, and 3) tourist units. The 2001 Study began with the official number of dwelling units as of 1990 from the U.S. Census. Monroe County Planning Department then provided numbers of new units based on certificates of occupancy (CO) issued each year. The number of COs was summed, cumulatively, from 1990 to 1999. After 1999, the methodology followed by the County shifted to the potential number of dwelling units available under the permitting guidelines of the Rate of Growth Ordinance (ROGO).

**Update**

The number of permanent dwelling units and mobile homes was determined from the 2000 U.S. Census, updated to reflect new dwellings occupied between 2000 and 2008 (see Tables 3 and 4). Permanent dwellings in 2000 included all census categories of permanent structures from single-family detached to multifamily with 50 or more units. Mobile homes included census categories of “mobile home” and “RV, boat, van, etc.” The decision to include the latter with the former was prompted by belief that permanent residents living in RVs (many in mobile home parks), boats, vans, etc. would behave more like mobile home residents than tourists in an evacuation.

Permit data for new residential units issued from 2000 through 2008 were provided by the Monroe County Building Department and the equivalent departments of the five incorporated cities in Monroe County—Key West, Islamorada, Key Colony Beach, Layton, and Marathon. Post-2000 unit counts were added to 2000 unit counts to obtain current estimates of dwelling units by evacuation zone.

Tourist unit data was collected from the Department of Profession and Business Regulation. This department licenses hotels, motels, bed and breakfasts, timeshares and vacation rental units – all of which were included in the update. The data from DPBR were geocoded by Bryan Davisson, the GIS Planner in Monroe County’s Growth Management Department.

Table 3. Permanent Dwelling Units in 2000, constructed and occupied between 2000-08, and total in 2008

Zone	2000	2000-08 Key West	2000-08 Islamorada	2000-08 Marathon	2000-08 Key Colony Beach	2000-08 Layton	2000-08 County	2008 Total
1	14,509	319					280	15,108
2	6,143						360	6,503
3	6,972			124	170		47	7,313
4	1,880					21	3	1,904
5	5,095		169				42	5,306
6	5,093						242	5,335
7	1,310						0	1,310
Total	41,002	319	169	124	170	21	974	42,779

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Table 4. Mobile Home Units in 2000, permitted between 2000 and 2008, and in 2008

Zone	2000	2000-08	2008
1	2,496		2,496
2	1,751		1,751
3	1,940		1,940
4	720	2	722
5	1,219	1	1,220
6	2,459	1	2,460
7	8		8
	10,593	4	10,597

Table 5. Tourist Units in 2008

Zone	2008 lodging	2008 vacation rental	2008 timeshare	2008 Total
1	8,148	0	0	8,148
2	491	23	0	514
3	2,997	29	19	3,045
4	1,734	2	1	1,737
5	576	0	0	576
6	1,960	3	14	1,977
7	36	0	19	55
	15,942	57	53	16,052

## Occupancy Rates

### 2001 Study

The Project Steering Committee (PSC) identified “% Occupancy of Dwelling Units” as a critical variable. The PSC used 1990 Census data to determine the occupancy rates during the month of April (when the Census data are collected).

For tourists, the occupancy rate utilized was from the 1991 Hurricane Evacuation Analysis of the Monroe County Comprehensive Plan and the 1995 update, both prepared by PBS&J. The occupancy was estimated as 45% on the low end and 75% on the upper end. The Project Steering Committee studied these numbers and decided to estimate the occupancy rate by subregion of the Keys. Actual rates, based on specific knowledge of the Project Steering Committee members, were used whenever available. For example,

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an occupancy rate of 72% was used for Key West since members knew that overall occupancy rate here was higher than the rest of the county.

### Update

Occupancy rates for permanent dwellings were determined by zone from the 2000 Census (see Table 6). Occupancy rates for the county as a whole appear to have declined by about 20 percent between the 2000 Census and the 2008 American Community Survey. We therefore produced a second set of occupancy rates, prorating 2000 occupancy rates by zone to account for this decline (see Table 6).

Table 6. Occupancy Rates for Permanent Dwellings and Mobile Homes (2000 and 2008 estimate)

Zone	Percent Occupied Housing Units – 2000 Census	Percent Occupied Housing Units – Adjusted for 2008 American Community Survey
1	84%	67%
2	67%	54%
3	59%	47%
4	44%	35%
5	58%	46%
6	65%	52%
7	34%	27%

To update tourist occupancy rates, we referred to Smith Travel Research’s latest Trend Report, submitted annually to Monroe County’s Tourist Development Council. Occupancy rates have remained relatively constant over the years. During the hurricane season (June 1 through November 30), July is the highest occupancy month, while September is the lowest. We used July 2008 values (see Table 7). This is a worst-case assumption, since the peak of Atlantic hurricane activity is in September, the month with the lowest occupancy.



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Table 7. Occupancy Rates for Tourist Units (July 2008)

Zone	Percentage Occupied Units
1 (Key West)	82%
2	71%
3	71%
4	71%
5	71%
6 (Key Largo)	77%
7	71%

## Evacuation Participation Rates

### 2001 Study

To estimate evacuation participation rates, the 2001 Study relied heavily on a survey conducted by Dr. Carnot Nelson in 1989. The assumed evacuation participation rates are shown in Tables 7 and 8. All are taken from Dr. Nelson's behavioral analysis, except participation rates for tourist units which were assumed to be 100%. Dr. Nelson had suggested lower numbers.

Nelson's survey was done before Hurricane Andrew, and it simply asked people what they intended to do in response to a number of hypothetical hurricane threats. Intended-response data may be unreliable predictors of actual evacuation behavior.

Much more information has become available since Nelson's pre-Andrew survey (Baker 2000):

- A University of Florida group conducted a survey following Andrew, not only asking what people did in Andrew, but also using the very same intended-response questions previously used by Nelson.
- James Mattson conducted a survey following Andrew, dealing with Andrew response and intended response in future storms.
- Dr. Earl Baker did a survey following Andrew for the National Science Foundation that documented response in Andrew, perceptions of vulnerability, confidence in construction, and intended responses in future threats.
- Following Georges, FIU conducted a survey documenting response to Georges as well as asking about certain subjects that could have a bearing on future response.
- Also following Georges, the Monroe County School Board had public school students take home a questionnaire asking what their households did in Georges.
- Dr. Earl Baker conducted interviews in the Lower Keys as part of a post-Georges survey for the Corps of Engineers and FEMA. It dealt with response to Georges

as well as vulnerability perception, concerns about traffic congestion, and future response.

- Dr. Earl Baker conducted an additional survey in the Lower Keys, dealing with response to Georges but also posing several hypothetical threat scenarios and evaluating the effect on intended response of roadway improvements and having refuges of last resort in Key West.
- Following Hurricane Ivan, a Post-Ivan Behavioral Analysis was prepared for the Federal Emergency Management Agency and the U.S. Army Corps of Engineers in September 2005. A total of 200 interviews were conducted in Monroe County. The questionnaire asked questions regarding evacuation decisions and behavior, home mitigation and/or preparation, household circumstances, economic impacts, and household information needs.
- The South Florida Behavioral Survey was conducted in 2007-2008 as part of Statewide Regional Evacuation Study Program. The primary aim of the survey was to provide data to assist in deriving evacuation behavioral assumptions for transportation and shelter analyses. In each non-coastal county of the state 150 interviews were conducted randomly by telephone. In each coastal county of the state, 400 interviews were conducted.

### **Baker Study**

Based on actual and intended responses to hurricanes, from several surveys after Hurricanes Georges, Andrew, and Irene, Professor Earl Baker at Florida State University derived most probable evacuation participation rates for a number of hurricane threat scenarios. Earl “Jay” Baker is an associate professor of geography and an expert in the field of hurricane evacuation. His research is focused on how people respond to warning and evacuation orders and how emergency managers are able to use forecasts to implement evacuation plans. He has studied peoples’ vulnerability perceptions and hurricane preparedness in most areas of the Gulf of Mexico and Atlantic coasts.

Table 8 provides Baker’s best estimates of participation rates for Category 5 storms approaching the Keys from the south, posing a greater risk to the Lower Keys. Table 8 also provides his best estimates of participation rates for storms at latitudes similar to Andrew, posing a greater risk to the Upper Keys. The table assumes mandatory evacuation orders and aggressive actions by public officials to educate the public about appropriate responses.

Table 8. Evacuation participation rate assumptions for Category 5 hurricanes approaching from different latitudes, aggressive mandatory evacuation ordered and improved public education regarding vulnerability (Baker 2000)

	from latitudes south of Key West	from latitudes similar to Andrew
Lower Keys	90	35
Middle Keys	95	95
Upper Keys	95	100

### South Florida Behavioral Survey

The 2008 South Florida Behavioral Survey asked whether respondents intended to evacuate their homes for some place safer if mandatory evacuation notices were issued due to potential flooding (see Table 9). The question was asked for both Category 3 and 5 hurricanes. Results weren't presented for Category 4 hurricanes. The Category 5 results are most relevant to this worst-case analysis.

Table 9. Would Leave Home if Mandatory Evacuation Notice is Given for a Category 5 Hurricane

	N	Yes	No	Don't know/depends	Yes plus Don't know/depends
Monroe	400	88%	8%	4%	92%
Key West	100	89%	9%	3%	92%
Lower Keys	100	91%	6%	3%	94%
Middle Keys	100	90%	7%	3%	93%
Upper Keys	100	84%	8%	8%	92%

Perhaps a better predictor of evacuation participation than intended response to hurricanes is perceived vulnerability to both wind and water in hurricanes of different intensities. Table 10 reports Monroe County responses to the question of whether respondents would remain safe in a Category 4 hurricane (Category 5 results weren't released).

Table 10. Safe from Wind and Water in a Category 4 Hurricane

	N	Yes	No	Don't know/depends
Monroe	400	15%	80%	5%
Key West	100	19%	76%	4%
Lower Keys	100	11%	81%	7%
Middle Keys	100	15%	83%	1%
Upper Keys	100	13%	79%	8%

Monroe County residents were also asked if they left home during Hurricanes Georges (a Category 2), Ivan (a tropical depression as it approached Florida), and Wilma (a Category 2 hurricane in Monroe County). Hurricane Georges prompted 38% of households in the Monroe County region to evacuate, with the Middle Keys reporting the highest participation (50%). Hurricane Ivan caused 28% of households in Monroe County region to evacuate, with the Upper Keys reporting the highest participation (34%). Hurricane Wilma caused 32% of households in Monroe County to evacuate, with the Lower Keys reporting the highest participation (37%). These results are for low-intensity hurricanes; no Category 4-5 hurricanes have hit the Keys in recent years.

**Update**

The worst case is a Category 5 hurricane that approaches from latitudes below Key West, with aggressive mandatory evacuation ordered and improved public education regarding vulnerability (see Table 11). Baker suggests that 90-95% of residents might evacuate under such circumstances. While no clear geographic pattern of evacuation compliance emerges from the various surveys, we will go an upper bound evacuation participation rate equal to Baker's recommended rates. In this worse case, a 100% evacuation rate will be assumed for mobile home and tourist units.

Actual evacuation rates during past hurricanes have reportedly been much lower than this worst case. True, these were less intense hurricanes than posited here, but it seems likely that respondents overstate their willingness to evacuate when asked to speculate in surveys. We will therefore conduct a sensitivity test of clearance time, assuming a lower bound evacuation participation rate of 70-75% for permanent dwellings in response to a more typical hurricane.

Table 11. Category 5 Storm Evacuation Participation Rates

	Mobile Homes	Tourist Units	Other Units
Lower Keys (Zones 1 & 2)	100%	100%	70-90%
Middle Keys (Zone 3)	100%	100%	75-95%
Upper Keys (Zones 4, 5, 6 & 7)	100%	100%	75-95%

## Evacuation Timing

Evacuation timing refers to when evacuees depart their residences. While some spontaneous evacuation occurs, it is unusual for more than 15% of the eventual evacuees to have departed before officials issue evacuation orders. Departures then occur depending upon the urgency perceived by evacuees.

### 2001 Study

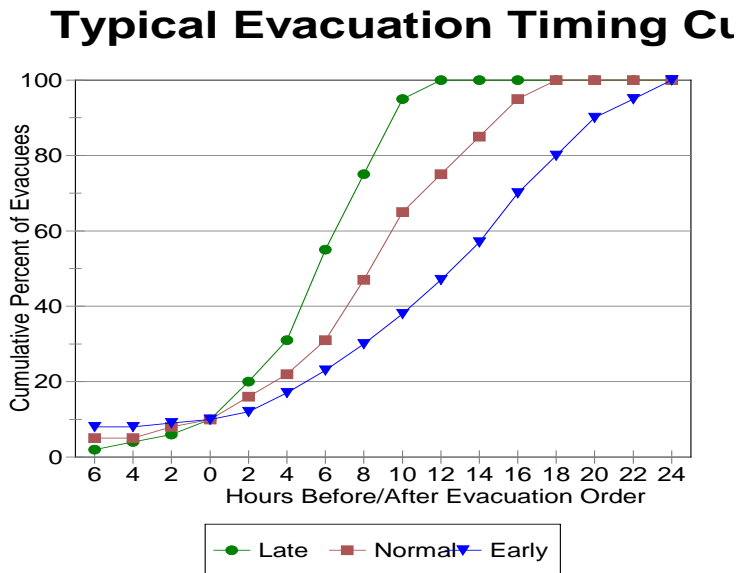
The 2001 Study uses tables to represent the rate at which evacuating traffic enters U.S. 1. The exact number of hours over which the traffic is loaded is not terribly important. The main thing is that the scenarios reflect a range of plausible response distributions, based on the timing of evacuation orders prior to landfall, to assess the sensitivity of clearance times to those variations.

The 2001 response curves don't reflect the fact that some evacuees will leave before an evacuation order is issued. That is clearly wrong. Dr. Baker calls 10% spontaneous evacuation a conservative figure.

### Baker Study

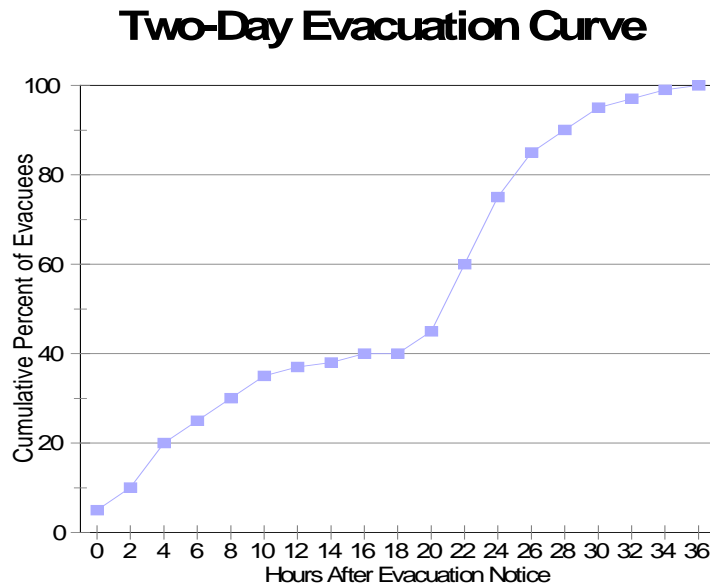
Dr. Baker developed the curves in Figure 1. They indicate how promptly evacuees depart when evacuation orders are issued under three scenarios of urgency. "Late, normal, and early" refer to when evacuation orders were issued relative to expected arrival of a hurricane. These curves assume 10% spontaneous evacuation even before the evacuation order is issued.

Figure 1. Early, normal, and late evacuation timing curves



Based on evacuation response to Hurricanes George and Andrew, Baker developed the two-day curve in Figure 2. This response curve accounts for early evacuees even before evacuation orders are issued. At least for strong hurricanes, Baker concluded that such a curve could apply to Monroe County.

Figure 2. Two-day evacuation timing response curve



### Update

The three Baker curves in Figure 1 seem most applicable to evacuation scenarios for Monroe County, where a mandatory evacuation order is issued early, at a normal time, or late. The fact that Baker provides three different curves allows us to perform sensitivity tests on evacuation timing assumptions.

One anomaly associated with the Baker curves is that the clearance time cannot be less than 24 hours when an evacuation order is issued early, which is arguably the scenario which involves the least risk to the public. Therefore, in assessing clearance time, primary emphasis will be placed on the late response scenario.

## **Effect of Phased Evacuation**

### **2001 Study**

In the 2001 Study, all residents and tourists were assumed evacuate at the same time.

### **Update**

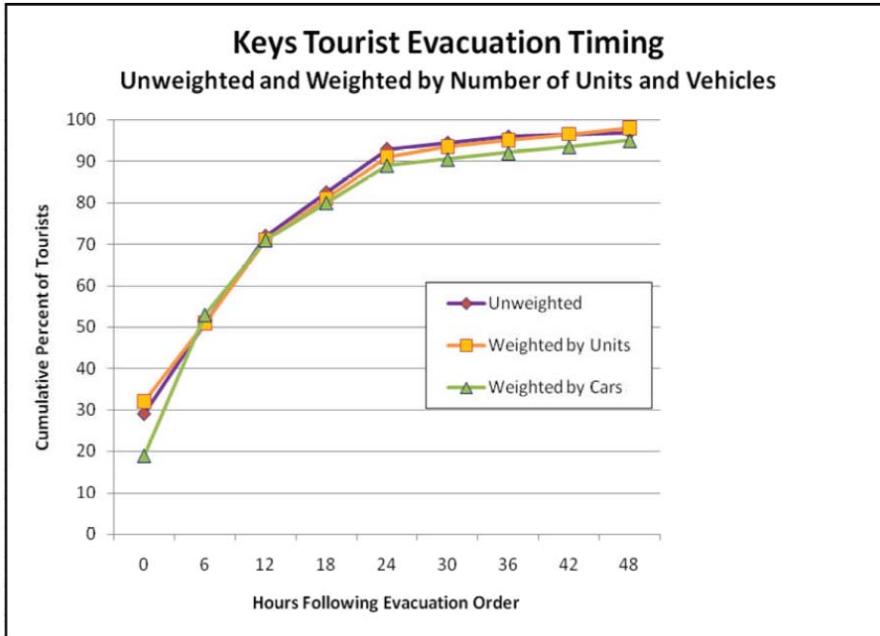
In 2005, Monroe County adopted a mandatory phased evacuation policy as part of the update of its comprehensive plan. This phased evacuation requires that all tourists, recreational vehicles, military and live aboard vessels begin to evacuate from the county 48 hours in advance of tropical force winds. Next, mobile homes and special needs residents will receive the order to evacuate 36 hours in advance of tropical force winds. Last, the residents living in permanent dwelling units will receive the order to leave 30 hours in advance of these winds.

The Miller Model had not been used to test phased evacuations before and therefore needed to be adapted. This was done by having separate response curves and trip tables for mobile home residents and permanent dwelling unit residents, with a six hour lag between the former and the latter. The two groups of evacuees are added together where their response curves and trip tables overlapped. The Miller Model had to be significantly modified to represent a phased evacuation.

Both groups of residents were assumed to evacuate according to Dr. Baker's late response curve in Figure 1, with overlap between the two groups starting at 30 hours prior to tropical force winds. Essentially, since the late response curves show evacuees leaving home over approximately a 12 hour period, there is six hours of overlap in departures between the groups. Of course, after that, they are on the road together for the remainder of the evacuation trip.

Handling tourist evacuees involved a judgment call. Under phased evacuation, the tourist evacuation order will be issued 48 hours before tropical force winds, or 12 hours before the evacuation order for mobile home residents. Dr. Baker's most recent report, based on 2009 surveys of hotels, motels, resorts, bed and breakfasts, seasonal housing rentals, and recreational vehicle parks, suggests that 30 percent of tourists evacuate spontaneously before the order is issued, and another 40 percent of tourists evacuate in the first 12 hours after the order (see Figure 3). This leaves 30 percent of tourists to evacuate at the same time as the mobile home park residents. To simplify the model calculations, this 30 percent of tourists was simply added to the mobile home park total and assumed to evacuate following the same response curve.

Figure 3. Tourist Evacuation Timing



Source: Earl J. Baker, Behavioral Assumptions for Hurricane Evacuation Planning in Monroe County, prepared for the Department of Community Affairs, September 2009, p. 4.

## Destinations

### 2001 Study

Based on Dr. Nelson’s research, the 2001 Study had four possible destinations for the resident evacuees: 1) Monroe County public shelter, 2) Monroe County motel, 3) Monroe County friend or relative, and 4) Out of Monroe County.

### Baker Study

Based on several surveys of actual and intended behavior after Hurricanes Georges and Andrew, the Baker 2000 report indicates the most likely percentage of evacuees from the three different areas of the Keys who will go to destinations outside of Monroe County for different categories of storm intensity (see Table 12).

Table 12. Planning assumptions for percent of evacuees leaving Monroe County, aggressive mandatory evacuation ordered throughout Monroe County for all categories

	Cat 3-4	Cat 5
Lower Keys	80	90
Middle Keys	90	95
Upper Keys	95	100



**South Florida Behavioral Survey**

The 2008 survey asked respondents where they would go if they evacuated for hurricanes of different intensities. Results for Category 5 hurricanes are shown in Table 13.

Table 13. Evacuation Destination (Category 5)

	N	Own neighborhood	Own county	Someplace else in Florida	Someplace outside Florida	Don't know
Monroe	304	3%	7%	65%	17%	8%
Key West	72	7%	13%	52%	14%	14%
Lower Keys	79	2%	7%	69%	19%	3%
Middle Keys	77	1%	1%	71%	21%	6%
Upper Keys	76	2%	6%	68%	15%	8%

Data are available on the destinations of evacuees during three previous hurricanes (Tables 14-16). The great majority of evacuees leave the county. Residents of Key West are most likely to leave the county, while residents of the Upper Keys are least likely to leave the county (though a majority still do).

Table 14. Destinations of Evacuees (Hurricane Georges)

	N	Own neighborhood	Own county	Someplace else in Florida	Someplace outside Florida	Don't know
Monroe	80	3%	15%	75%	6%	1%
Key West	20	2%	5%	91%	1%	0%
Lower Keys	18	0%	2%	68%	25%	5%
Middle Keys	26	1%	19%	79%	1%	0%
Upper Keys	16	8%	37%	46%	8%	0%

Table 15. Destinations of Evacuees (Hurricane Ivan)

	N	Own neighborhood	Own county	Someplace else in Florida	Someplace outside Florida	Don't know
Monroe	84	1%	10%	76%	12%	2%
Key West	22	0%	3%	93%	4%	0%
Lower Keys	25	5%	1%	75%	9%	10%
Middle Keys	17	0%	8%	79%	12%	0%
Upper Keys	20	0%	24%	56%	20%	0%

Table 16. Destinations of Evacuees (Hurricane Wilma)

	N	Own neighborhood	Own county	Someplace else in Florida	Someplace outside Florida	Don't know
Monroe	82	1%	11%	81%	5%	0%
Key West	20	4%	4%	91%	1%	0%
Lower Keys	27	0%	3%	84%	11%	2%
Middle Keys	13	0%	11%	89%	0%	0%
Upper Keys	22	0%	30%	62%	8%	0%

**Update**

The survey data indicate that the majority of evacuees from Monroe County would leave the county and evacuate to another county within the state of Florida. Beyond this generalization, the data are difficult to interpret.

The intended response and actual response questions point in different directions, with the percentages intending to leave the county increasing as you move north from the Lower Keys to Middle Keys to Upper Keys. But the percentages actually leaving during past hurricanes decrease as you move north. Most likely the small numbers of evacuees during past hurricanes are atypical of the larger populations. We will assume that 90% of evacuating residents from Lower Keys (Zones 1 and 2) will leave the county, that 95% of evacuating residents from the Middle Keys (Zone 3) will leave the county, and that 100% of evacuating residents from the Upper Keys (Zones 4 through 7) will leave the county. These assumptions are in line with Dr. Baker's recommendations and the original Miller model. 100% of tourists are assumed to leave the county.

## Vehicle Use

Not all vehicles available to households are used in evacuations. Vehicle use is predicted well by hypothetical response data.

### 2001 Study

The source of the vehicle usage rates used in the 2001 Study is not specified. It was assumed that 69 to 71% of available vehicles would be used.

### Baker Study

Dr. Baker states that the normal range for vehicle usage is 65% to 75%. Based on behavior during Hurricane Georges, the Baker 2000 report recommended that for planning purposes, it be assumed that 70% of the vehicles available to evacuating households will be used, and 10% of those households will pull a camper, trailer, or boat or take a motor home.

### South Florida Behavioral Survey

The 2008 survey asked how many vehicles would be available to a household that could be used to evacuate, and how many vehicles would a household take if they evacuated? As can be seen from Table 30, the percent of available vehicles that would be used in an evacuation varies from a low of 72% in the Lower Keys to a high of 91% in Key West.

Table 30. Vehicle Availability and Use During an Evacuation

	N	Available vehicles	Vehicles used in evacuation	% of available vehicles used in evacuation	% of households with no vehicle
Monroe	400	1.9	1.4	81%	5%
Key West	100	1.5	1.5	91%	10%
Lower Keys	100	2.6	1.3	72%	2%
Middle Keys	100	1.8	1.3	79%	2%
Upper Keys	100	1.8	1.4	80%	3%

### Update

The South Florida survey data are the most recent, and we believe the most accurate data available. The one exception is the very high vehicle usage rate for residents of Key West, out of line with all the other data available. Baker reports that residents of Key West used 1.11 vehicles per evacuating household during Hurricane Georges. That amounts to about 80% of the vehicles owned by households in Key West. We therefore

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assumed the following vehicle usage rates for residents: 80% vehicle usage for Key West (Zone 1); 72% vehicle usage for the rest of the Lower Keys (Zone 2); 79% vehicle usage for the Middle Keys (Zone 3); and 80% vehicle usage for the Upper Keys (Zones 4-7). We assumed 100% vehicle usage rates for tourists.

## **Background Traffic**

Background traffic is the measure of vehicles using the roadways for reasons other than hurricane evacuation. The 2001 Study defines background traffic as including: out-of-County traffic (business trips and recreational trips), non-evacuating vehicles conducting hurricane preparation trips, typical day commuting trips, etc. In sum, this traffic is comprised of non-evacuating vehicles on the road.

Background traffic increases the level of traffic on the roadway system and therefore, has a direct effect on clearance time. This traffic is comprised of non-evacuating traffic and includes trips to run errands and buy hurricane supplies.

### **2001 Study**

The 2001 Study used approximations of background traffic based on recorded traffic volumes. This background traffic affects processing time through each of the 31 links and, eventually, this background traffic declines as the evacuation occurs and decreases to zero background vehicles at the end of the evacuation. For example, if a 12 hour response curve is selected for modeling purposes, the background traffic is 100% of the actual recorded count at hour one of the evacuation and zero at hour 12. A uniform distribution is assumed for the rate of decline of the background traffic.

### **Update**

We have no basis for refinement of the 2001 Study background traffic assumptions.

## **Number and Capacity of Critical Links**

### **2001 Study**

The Miller Model has 31 outbound evacuating links. It relies on the critical link concept. This concept means that the evacuation time is mainly affected by the link with the highest demand to service volume ratio. This link experiences the longest delay due to the overload of evacuating vehicles. This link, the critical link, is not static and can shift due to either demand changing by link or from capacity improvements to a link.

A critical variable in the determination of evacuation time is the assumed capacity of roadway links. The Miller Model takes the capacity of uninterrupted flow highways (essentially freeway quality roads) and makes downward adjustments to account for driveways and intersections. There are two potential problems with this procedure. First,

U.S. 1 isn't an uninterrupted flow facility but rather a state signalized arterial, whose capacity is determined using different formulas. Second, the downward adjustments are essentially arbitrary as opposed to empirically based.

## Update

The Florida Department of Transportation (FDOT) has recommended updates to the 2001 Study to reflect the addition of auxiliary lanes and evacuation shoulders. These additions include:

- a. Completed projects from Table 18 of the 2001 Keys Evacuation Study
- b. Projects under construction from Table 18 of the 2001 Study
- c. Projects funded in the current work program from Table 18 in the 2001 Study

Table 31 compares the number of functional evacuation lanes in the original Miller model to and the number in the FDOT update. There will be substantial functional capacity added to critical links by 2015.

Based on the concept of "maximum sustainable evacuation traffic flow rates," FDOT has recommended a reduction the 2001 Study flow rates for several links. The recommended rates take into account site-specific capacity studies, observational studies of actual hurricane evacuations, and traffic simulation runs. The FDOT rates are the best available. Values are compared in Table 31.

Table 31. Maximum Sustainable Flow Rates per Hour

Link Name	Milemarkers		2001 Functional Evacuation Lanes	2015 Functional Evacuation Lanes	2001 Flow Rates		2010 FDOT Flow Rates	
	From	To			Per Lane	Total	Per Lane	Total
A1	2.0	4.0	2	2	900	1,800	900	1,800
A2	4.0	9.0	2	2	900	1,800	900	1,800
B	9.0	17.0	1	1	1,350	1,350	1,100	1,100
C	17.0	22.0	1	1	1,350	1,350	1,100	1,100
D1	22.0	24.0	1	1	1,350	1,350	1,100	1,100
D2	24.0	25.0	1	1	1,350	1,350	1,100	1,100
D3	25.0	30.0	1	1	1,350	1,350	1,100	1,100
E	30.0	34.0	1	2	1,050	1,050	1,050	2,100
F1	34.0	35.2	1	1	1,350	1,350	1,100	1,100
F2	35.2	36.5	2	2	1,350	2,700	1,100	2,200
F3	36.5	37.5	1	1	1,350	1,350	1,100	1,100
G	37.5	47.0	1	1	1,500	1,500	1,200	1,200
H1	47.0	48.0	1	2	1,350	1,350	1,100	2,200
H2	48.0	50.2	2	2	900	1,800	900	1,800
I1	50.2	50.8	2	2	900	1,800	900	1,800

Link Name	Milemarkers		2001 Functional Evacuation Lanes	2015 Functional Evacuation Lanes	2001 Flow Rates		2010 FDOT Flow Rates	
	From	To			Per Lane	Total	Per Lane	Total
I2	50.8	54.0	2	2	900	1,800	900	1,800
J1	54.0	54.5	2	2	900	1,800	900	1,800
J2	54.5	58.0	1	2	1,350	1,350	1,100	2,200
K	58.0	74.0	1	2	1,350	1,350	1,100	2,200
L	74.0	80.0	1	2	1,350	1,350	1,100	2,200
M1	80.0	83.5	1	2	1,350	1,350	1,100	2,200
M2	83.5	85.6	1	2	1,350	1,350	1,100	2,200
N	85.6	90.0	1	2	1,350	1,350	1,100	2,200
O	90.0	100.0	2	3	900	1,800	900	2,700
P	100.0	105.0	2	3	900	1,800	900	2,700
Q	105.0	106.3	2	3	900	1,800	900	2,700
R1	106.3	126.5	1	2	1,500	1,500	1,200	2,400
R2	126.5	HEFT	2	3	900	1,800	900	2,700
S	106.3	Int CR 905 / CR 905 A	1	1	1,350	1,350	1,100	1,100
T	Ocean Reef	Int CR 905 / CR 905 A	1	1	1,350	1,350	1,100	1,100
U	Int CR 905 / CR 905 A	US 1	1	1	1,350	1,350	1,100	1,100

## Additional Clearance Time to Reach Shelter

### Miller Model

The Miller Model added a fixed 30 minutes (category 1 or 2) and fixed 52 minutes (category 3-5) to the clearance time for the trip from Florida City to the public shelter at FIU. One of the weaknesses of the Miller Model is that it assumes a fixed time for all vehicles to travel to the FIU shelter and it does not include the effects of traffic from Miami-Dade County. The South Florida Regional Planning Council was charged with creating a model to address this deficiency. However, that model is not available at the time of this writing.

### Updated Miller Model

Following an administrative law judge's opinion, where an opposing counsel challenged the end point of evacuation, the end point for hurricane evacuation clearance time estimates is the beginning of the Florida Turnpike in Florida City. The Department of

November 8, 2010

Community Affairs concurs with this end point for Hurricane Evacuation Clearance Time modeling. Therefore the final clearance time estimates do not include the 30/52 minutes to travel from Florida City to FIU.

## **Clearance Time Estimates**

Table 32 provides clearance times for 12 different scenarios. The 2000 occupancies are those in the first column of Table 6. They reflect occupancies at the time of the 2000 Census. The 2008 occupancies reflect a downward adjustment in occupancies county-wide according to the 2008 American Community Survey.

The low participation rates are the suggested lower bound rates for permanent dwelling units in a Category 5 hurricane coming from the southeast (70-75%). The high participation rates are the suggested upper bound rates for the same scenario (90-95%).

The three maximum flow assumptions are those associated with the original Miller Model (2001 lane configuration with Miller maximum flow rates), a combination of Miller and FDOT assumptions (2001 lane configuration with FDOT maximum flow rates), and the FDOT update (2015 lane configuration with FDOT maximum flow rates).

Clearance time is measured from the time of the evacuation order for permanent dwelling unit residents until the last evacuating vehicle reaches Florida City. The updated Miller Model puts time zero at 36 hours before tropical force winds, when the evacuation order is issued for mobile home residents. Therefore, we subtracted six hours from the Miller Model clearance time outputs to arrive at clearance times relative to the evacuation order for permanent dwelling residents.

The longest clearance times are, of course, associated with the 2001 lane configuration and the lower FDOT maximum flow rates. The shortest are associated with the 2015 lane configuration, which includes additional lanes compared to 2001, and the FDOT maximum flow rates. Clearance times associated with the 2001 lane configuration and Miller's higher flow rates are intermediate.

The difference between these clearance time estimates and those in my report of September 17, 2010 are due entirely to the exclusion of travel time from Florida City to the FIU shelter in these most recent estimates. The earlier report erroneously said that a fixed 52 minutes had been added to the Miller Model's clearance time estimates to account for this last leg of the evacuation. In fact, 52 minutes were added to the clearance time for the "High Participation" scenario but only 30 minutes were added to the clearance time for the "Low Participation" scenario, in keeping with the reduced traffic volumes. My apologies for this erroneous statement.

The reader will note that using a simple model like the Miller Model, based on fixed capacities and speeds on the different links, clearance time is not sensitive to the assumed participation rate because there is ample capacity to handle the additional traffic with the additional lanes constructed or planned by FDOT. The clearance time reflects unimpeded travel by the last evacuating vehicle from Key West to Florida City.

Table 32. Clearance Times (relative to the permanent unit evacuation order)

	Low Occupancies (2001) Occupancy by Zone 1=67%; 2=54%; 3=47%; 4=35%; 5=46%; 6=52%; 7=27%		High Occupancies (2008) Occupancy by Zone 1=84%; 2=67%; 3=59%; 4=44%; 5=58%; 6=65%; 7=34%	
	Low Participation Approx 70%	High Participation Approx 90-95%	Low Participation Approx 70%	High Participation Approx 90-95%
2001 Lanes/2001 Miller Flow Rates	16 hours 16 minutes	18 hours 50 minutes	18 hours 32 minutes	22 hours 6 minutes
2001 Lanes/2010 FDOT Flow Rates	18 hours 58 minutes	22 hours 28 minutes	22 hours 8 minutes	27 hours 2 minutes
2015 Lanes/2010 FDOT Flow Rates	16 hours 16 minutes	16 hours 16 minutes	16 hours 16 minutes	18 hours 40 minutes
2015 Lanes/2010 FDOT Flow Rates (without outbound shoulder from mm 90 to mm 106)	16 hours 16 minutes	17 hours 16 minutes	17 hours 4 minutes	20 hours 16 minutes



## Appendix

	PBS&J Hurricane Evacuation Analysis Dec. 1991 (1990 Census)	2000 Miller Model (1990 Census & PSC) Final Report in 2001	2004 Miller Update (2000 Census)	2008 Statewide Regional Evacuation Study Program South Florida Behavioral Survey Report		Ken Metcalf Miller Model Analysis - Summary of 2000 Census	Reid Ewing Recommendations Report
	Same behavioral parameters of 1989 ACOE study			Sample size (n=400)			
	7 evac zones	7 evac zones	7 evac zones			7 evac zones	
Number of People per M.H. Unit	Zone 1 - 2.44 2 - 2.31 3 - 2.25 4 - 1.97 5 - 2.27 6 - 2.27 7 - 2.11	Zone 1 - 2.44 2 - 2.31 3 - 2.25 4 - 1.97 5 - 2.27 6 - 2.27 7 - 2.11	Zone 1 - 2.44 2 - 2.31 3 - 2.25 4 - 1.97 5 - 2.27 6 - 2.27 7 - 2.11				Zone 1 - 2.35 2 - 2.21 3 - 2.18 4 - 2.08 5 - 2.27 6 - 2.27 7 - 1.74
Number of People per Permanent Unit	Zone 1 - 2.44 2 - 2.31 3 - 2.25 4 - 1.97 5 - 2.27 6 - 2.27 7 - 2.11	Zone 1 - 2.44 2 - 2.31 3 - 2.25 4 - 1.97 5 - 2.27 6 - 2.27 7 - 2.11	Zone 1 - 2.44 2 - 2.31 3 - 2.25 4 - 1.97 5 - 2.27 6 - 2.27 7 - 2.11				Zone 1 - 2.35 2 - 2.21 3 - 2.18 4 - 2.08 5 - 2.27 6 - 2.27 7 - 1.74
Number of People per Tourist Unit	Zone 1 - 2.90 2 - 3.76 3 - 2.75 4 - 2.53 5 - 12.80 6 - 12.90 7 - 12.90	Zone 1 - 2.90 2 - 3.76 3 - 2.75 4 - 2.53 5 - 3.00 6 - 3.00 7 - 3.00	Zone 1 - 2.90 2 - 3.76 3 - 2.75 4 - 2.53 5 - 3.00 6 - 3.00 7 - 3.00				Zone 1 - 2.90 2 - 3.76 3 - 2.75 4 - 2.53 5 - 3.00 6 - 3.00 7 - 3.00
Number of Vehicles per Unit	Zone 1 - 1.80 2 - 1.80 3 - 1.82 4 - 2.00 5 - 2.00 6 - 2.00 7 - 2.00	1 - 1.35 2 - 1.76  3 - 1.39 4 - 1.65 5 - 1.76 6 - 1.61	1 - 1.36 2 - 1.74  3 - 1.56 4 - 1.65 5 - 1.71 6 - 1.83	Key West 1.5  Lower 2.6  Middle 1.8  Upper 1.8  (available	Key West 1.5  Lower 1.3  Middle 1.3  Upper 1.4  (vehicles	Vehicle/occupied unit Zone 1 - 1.36 2 - 1.73 3 - 1.56 4 - 1.63 5 - 1.69 6 - 1.83 7 - 1.43	1 - 1.36 2 - 1.73  3 - 1.60 4 - 1.34 5 - 1.75 6 - 1.83

	PBS&J Hurricane Evacuation Analysis Dec. 1991 (1990)	2000 Miller Model (1990 Census &)	2004 Miller Update (2000 Census)	2008 Statewide Regional Evacuation Study Program South Florida Behavioral		Ken Metcalf Miller Model Analysis -	Reid Ewing Recommendations Report
		7 - 1.58	7 - 1.43	vehicles - page 65)	used in evacuation - page 65)		7 - 1.44
Number of Vehicles per Tourist Unit	Zone 1 - 1.04 2 - 1.04 3 - 1.05 4 - 1.10 5 - 1.10 6 - 1.10 7 - 1.10	1 - 1.04 2 - 1.04 3 - 1.05 4 - 1.10 5 - 1.10 6 - 1.10 7 - 1.10	Zone 1 - 1.04 2 - 1.04 3 - 1.05 4 - 1.10 5 - 1.10 6 - 1.10 7 - 1.10				Zone 1 - 0.83 2 - 1.23 3 - 1.23 4 - 1.13 5 - 1.13 6 - 1.55 7 - 1.55
% Participation of M.H. Units	95%	95%	95%				100%
% Participation of Other Units	60% lower keys (1 & 2) 80% middle keys (3) 85% upper keys (4-7)	Zone 1 - 60% 2 - 60% 3 - 80% 4 - 85% 5 - 85% 6 - 85% 7 - 85%	Zone 1 - 60% 2 - 60% 3 - 80% 4 - 85% 5 - 85% 6 - 85% 7 - 85%	Would leave if mandatory evacuation notice is given for a Cat 3 Hurricane (page 36) Key West 77% Lower 69% Middle 74% Upper 71%	Would leave if mandatory evacuation notice is given for a Cat 5 Hurricane (page 36) Key West 89% Lower 91% Middle 90% Upper 84%		Zone 1 - 70-90% 2 - 70-90% 3 - 75-95% 4 - 75-95% 5 - 75-95% 6 - 75-95% 7 - 75-95% Category 5 Storm
% Occupancy of Dwelling Units		Zone 1 - 86% 2 - 71% 3 - 69% 4 - 57% 5 - 66% 6 - 65% 7 - 42%	Zone 1 - 84.10% 2 - 66.85% 3 - 58.95% 4 - 45.43% 5 - 57.99% 6 - 66.37% 7 - 32.84%			Zone 1 - 83.5% 2 - 69.8% 3 - 56.6% 4 - 47.9% 5 - 60.2% 6 - 67.6% 7 - 33.3%	Zone 1 - 67% 2 - 54% 3 - 47% 4 - 35% 5 - 46% 6 - 52% 7 - 27% 2008 Estimate
% Participation by Tourists Units at Risk	95%	100%	100%				83% 17% downward adjustment for evacuating by air
% Occupancy of Tourist Units	45% low occupancy 75% high occupancy	Zone 1 - 72% 2 - 64% 3 - 64% 4 - 70% 5 - 70% 6 - 70% 7 - 70%	45% low occupancy			63.77% - average Keys occupancy 2003-2007 73-78% June-July (peak summer months) 45-57% Sept - October (lowest) 70.38% average	July 2008 Smith Travel Research Zone 1 - 82% 2 - 71% 3 - 71% 4 - 71% 5 - 71% 6 - 77% 7 - 71%

	PBS&J Hurricane Evacuation Analysis Dec. 1991 (1990)	2000 Miller Model (1990 Census &	2004 Miller Update (2000 Census)	2008 Statewide Regional Evacuation Study Program South Florida Behavioral	Ken Metcalf Miller Model Analysis - Key West occupancy 2003-2007	Reid Ewing Recommendations Report
Vehicle Usage %	Zone 1 - 69% 2 - 69% 3 - 70% 4 - 71% 5 - 71% 6 - 71% 7 - 71%	Zone 1 - 69% 2 - 69% 3 - 70% 4 - 71% 5 - 71% 6 - 71% 7 - 71%	Zone 1 - 69% 2 - 69% 3 - 70% 4 - 71% 5 - 71% 6 - 71% 7 - 71%	Key West 91%  Lower 72%  Middle 79%  Upper 80%  (% of available vehicles used in evacuation - page 65)		Zone 1 - 80% 2 - 72% 3 - 79% 4 - 80% 5 - 80% 6 - 80% 7 - 80%
Tourist Vehicle Usage %		100%	100%			100%
% Distribution Public Shelters (Residents)		Zones 1 to 7 = 0%	Zones 1 to 7 = 0%			Out of County Zone 1 - 90% 2 - 90% 3 - 95% 4 - 100% 5 - 100% 6 - 100% 7 - 100%
(Perm. Residents) Friend/Relative		Zones 1 to 3 = 5% Zones 4-7 = 0%	Zones 1 to 3 = 5% Zones 4-7 = 0%			
Hotel/Motel		Zones 1 to 7 = 0%	Zones 1 to 7 = 0%			
Out of County		Zones 1 to 3 = 95% Zones 4-7 = 100%	Zones 1 to 3 = 95% Zones 4-7 = 100%			

ATTACHMENT 3

**TABLE 1**  
**Roadway Configuration on US Highway 1 (Overseas Highway)**  
**and CR 905/Card Sound Road in the Florida Keys, Monroe County, Florida**

Area	Milemarkers		Location/Description	Year 2010 (Includes Completed Roadway Improvements Projects)		Includes Roadway Improvements Projects Under Construction		Includes Projects Funded in the 5-yr Work Program	
	From	To		Configuration	Functional Evacuation Lanes	Configuration	Functional Evacuation Lanes	Configuration	Functional Evacuation Lanes
Lower Keys	2.0	4.0	Key West to Stock Island	4L	2	4L	2	4L	2
Lower Keys	4.0	9.0	Stock Island to Big Coppitt Key	4LD	2	4LD	2	4LD	2
Lower Keys	9.0	17.0	Big Coppitt Key to Sugarloaf Key	2L	1	2L	1	2L	1
Lower Keys	17.0	22.0	Sugarloaf Key to Cudjoe Key	2L	1	2L	1	2L	1
Lower Keys	22.0	24.0	Cudjoe Key to Summerland Key Cove Airport	2L	1	2L	1	2L	1
Lower Keys	24.0	25.0	Summerland Key Cove Airport to Summerland Key	3L	1	3L	1	3L	1
Lower Keys	25.0	30.0	Summerland Key to Big Pine Key	2L	1	2L	1	2L	1
Lower Keys	30.0	34.0	Big Pine Key to West Summerland Keys	3L	2	3L	2	3L	2
Lower Keys	34.0	35.2	West Summerland Keys to Spanish Harbor Keys	2L	1	2L	1	2L	1
Lower Keys	35.2	36.5	Spanish Harbor Keys to Bahia Honda Bridge	4LD	2	4LD	2	4LD	2
Lower Keys	36.5	37.5	Bahia Honda Bridge to Bahia Honda Key	2L	1	2L	1	2L	1
Middle Keys	37.5	47.0	Bahia Honda Key to Hog Key	2L	1	2L	1	2L	1
Middle Keys	47.0	48.0	Hog Key to Boot Key	2L	1	2L	1	2L	2
Middle Keys	48.0	50.2	Boot Key to Marathon	4L	2	4L	2	4L	2
Middle Keys	50.2	50.8	Marathon to Marathon Shores	5L	2	5L	2	5L	2
Middle Keys	50.8	54.0	Marathon Shores to Key Colonial Beach	4LD	2	4LD	2	4LD	2
Middle Keys	54.0	54.5	Key Colonial Beach to Deer Key	4LD	2	4LD	2	4LD	2
Middle Keys	54.5	58.0	Deer Key to Grassy Key	2L	1	2L	1	2L	2
Upper Keys	58.0	74.0	Grassy Key to Matecumbe Harbor	2L	1	2L	1	2L	2
Upper Keys	74.0	80.0	Matecumbe Harbor to Teatable Key	2L	1	2L	1	2L	2
Upper Keys	80.0	83.5	Teatable Key to Islamorada	3L	1	3L	1	3L	2
Upper Keys	83.5	85.6	Islamorada to Windley Key	2L	1	2L	1	2L	2
Upper Keys	85.6	90.0	Windley Key to Plantation Key	2L	1	2L	1	2L	2
Upper Keys	90.0	100.0	Tavernier Key to Newport Key	4LD	2	4LD	2	4LD	3
Upper Keys	100.0	105.0	Newport Key to Sexton Cove	4LD	2	4LD	2	4LD	3
Upper Keys	105.0	106.3	Sexton Cove to Rattlesnake Key	4LD	2	4LD	2	4LD	3
Upper Keys	106.3	126.5	Rattlesnake Key to Card Sound Rd	2L/4L	1	2L/4L	2	2L/4L	2
South Dade	126.5	HEFT	Card Sound Rd to HEFT	5LD	3	5LD	3	5LD	3
Upper Keys	106.3	Int CR 905 / CR 905 A	Lake Surprise to Crocodile Lake	2L	1	2L	1	2L	1
Upper Keys	Ocean Reef	Int CR 905 / CR 905 A	Tanglefish Key to Crocodile Lake	2L	1	2L	1	2L	1
Upper Keys	Int CR 905 / CR 905 A	US 1	Crocodile Lake to South Miami-Dade	2L	1	2L	1	2L	1

**LEGEND**

- 2L Two-lane facility
  - 2L/4L Two lanes with short four-lane sections for passing purposes
  - 3L Three-lane facility (center lane is a two-way left-turn lane)
  - 4L Four-lane undivided facility
  - 4LD Four-lane divided facility
  - 5L Five-lane facility (center lane is a two-way left-turn lane)
  - 5LD Five-lane divided facility
- NOTE: The "Potential Evacuation Lane" column includes existing and future 10-foot northbound shoulder improvements



## Florida Department of Transportation

CHARLIE CRIST  
GOVERNOR

1000 NW 111th Avenue  
Miami, Florida 33172

STEPHANIE C. KOPELOUSOS  
SECRETARY

June 18, 2010

Craig Diamond  
Florida Department of Community Affairs  
Division of Community Planning  
2555 Shumard Oak Boulevard  
Tallahassee, Florida 32399-2100

Re: Traffic Flow Rates for Emergency Evacuation in the Florida Keys

Dear Mr. Diamond:

Pursuant to your request, the Florida Department of Transportation (FDOT) was asked to provide Traffic Flow Rates for Emergency Evacuation in the Florida Keys for the Florida Department of Community Affairs' (DCA) update of the 2001 Florida Keys evacuation model. Based on our analysis, FDOT has identified "Maximum Sustainable Traffic Flow Rates per Functional Evacuation Lane" for hurricane evacuation purposes for use when conducting evacuation traffic analyses on US-1 in the Florida Keys. Please see the attached tables recommended for use in evacuation planning analyses in the Florida Keys. Table 2A identifies the existing lane configuration of US-1. Table 2B provides the maximum flow rates that could be reasonably sustained under extended periods of time for evacuation-level of demand per each segment identified.

The efforts undertaken to determine these rates included a site-specific capacity study in which traffic flow data were collected and analyzed under a variety of demand conditions. A comprehensive review of traffic conditions that have occurred during other hurricane evacuations in Florida, specifically the Florida Keys, as well as in the State of Louisiana, was also conducted.

Our studies incorporated data over a 10-year period since the original 2001 Keys Evacuation Study was conducted. Most importantly, this data includes observational studies of actual hurricane evacuations that have added to our understanding of traffic operations under mass evacuation demand conditions.

Should you have any questions or require additional information, please do not hesitate to contact me, or Ms. Barbara Culhane, AICP, Senior Project Manager, at (305) 470-5200.

Sincerely,

Aileen Boucle, AICP  
District Six PLEMO Administrator

Craig Diamond  
June 18, 2010  
Page 2

CC: Sandy Meyer, DEM  
Rebecca Jetton, DCA  
Jeff Alexander, NERFC  
Richard Ogburn, SFRPC  
Roman Gastesi, Monroe County  
Christine Hurley, Monroe County  
John Taylor, FDOT  
Vidya Mysore, FDOT  
Ed Ward, FDOT  
Gus Pego, FDOT  
Debora Rivera, FDOT  
Gary Donn, FDOT  
Omar Meitin, FDOT  
Barbara Culhane, FDOT  
Phil Steinmiller, FDOT

**TABLE 2A**  
**Roadway Configuration on US Highway 1 (Overseas Highway)**  
**and CR 905/Card Sound Road in the Florida Keys, Monroe County, Florida**

Area	Milemarkers		Location/Description	Year 2010 Configuration
	From	To		
Lower Keys	2.0	4.0	Key West to Stock Island	4L
Lower Keys	4.0	9.0	Stock Island to Big Coppitt Key	4LD
Lower Keys	9.0	17.0	Big Coppitt Key to Sugarloaf Key	2L
Lower Keys	17.0	22.0	Sugarloaf Key to Cudjoe Key	2L
Lower Keys	22.0	24.0	Cudjoe Key to Summerland Key Cove Airport	2L
Lower Keys	24.0	25.0	Summerland Key Cove Airport to Summerland Key	3L
Lower Keys	25.0	30.0	Summerland Key to Big Pine Key	2L
Lower Keys	30.0	34.0	Big Pine Key to West Summerland Keys	2L
Lower Keys	34.0	35.2	West Summerland Keys to Spanish Harbor Keys	2L
Lower Keys	35.2	36.5	Spanish Harbor Keys to Bahia Honda Bridge	4LD
Lower Keys	36.5	37.5	Bahia Honda Bridge to Bahia Honda Key	2L
Middle Keys	37.5	47.0	Bahia Honda Key to Hog Key	2L
Middle Keys	47.0	48.0	Hog Key to Boot Key	2L
Middle Keys	48.0	50.2	Boot Key to Marathon	4L
Middle Keys	50.2	50.8	Marathon to Marathon Shores	5L
Middle Keys	50.8	54.0	Marathon Shores to Key Colonial Beach	4LD
Middle Keys	54.0	54.5	Key Colonial Beach to Deer Key	4LD
Middle Keys	54.5	58.0	Deer Key to Grassy Key	2L
Upper Keys	58.0	74.0	Grassy Key to Matecumbe Harbor	2L
Upper Keys	74.0	80.0	Matecumbe Harbor to Teatable Key	2L
Upper Keys	80.0	83.5	Teatable Key to Islamorada	3L
Upper Keys	83.5	85.6	Islamorada to Windley Key	2L
Upper Keys	85.6	90.0	Windley Key to Plantation Key	2L
Upper Keys	90.0	100.0	Tavernier Key to Newport Key	4LD
Upper Keys	100.0	105.0	Newport Key to Sexton Cove	4LD
Upper Keys	105.0	106.3	Sexton Cove to Rattlesnake Key	4LD
Upper Keys	106.3	126.5	Rattlesnake Key to Card Sound Rd	2L/4L
South Dade	126.5	HEFT	Card Sound Rd to HEFT	4LD
Upper Keys	106.3	Int CR 905 / CR 905 A	Lake Surprise to Crocodile Lake	2L
Upper Keys	Ocean Reef	Int CR 905 / CR 905 A	Tanglefish Key to Crocodile Lake	2L
Upper Keys	Int CR 905 / CR 905 A	US 1	Crocodile Lake to South Miami-Dade	2L

**LEGEND**

- 2L Two-lane facility
- 2L/4L Two lanes with short four-lane sections for passing purposes
- 3L Three-lane facility (center lane is a two-way left-turn lane)
- 4L Four-lane undivided facility
- 4LD Four-lane divided facility
- 5L Five-lane facility (center lane is a two-way left-turn lane)

**TABLE 2B**

**Maximum Sustainable Traffic Flow Rates per Functional Evacuation Lane for Hurricane Evacuation Purposes  
US Highway 1 (Overseas Highway) and CR 905/Card Sound Road in the Florida Keys, Monroe County, Florida**

Area	Milemarkers		Location/Description	Suggested Maximum Sustainable Flow Rate per Hour per Functional Evacuation Lane
	From	To		
Lower Keys	2.0	4.0	Key West to Stock Island	900
Lower Keys	4.0	9.0	Stock Island to Big Coppitt Key	900
Lower Keys	9.0	17.0	Big Coppitt Key to Sugarloaf Key	1,100
Lower Keys	17.0	22.0	Sugarloaf Key to Cudjoe Key	1,100
Lower Keys	22.0	24.0	Cudjoe Key to Summerland Key Cove Airport	1,100
Lower Keys	24.0	25.0	Summerland Key Cove Airport to Summerland Key	1,100
Lower Keys	25.0	30.0	Summerland Key to Big Pine Key	1,100
Lower Keys	30.0	34.0	Big Pine Key to West Summerland Keys	1,050
Lower Keys	34.0	35.2	West Summerland Keys to Spanish Harbor Keys	1,100
Lower Keys	35.2	36.5	Spanish Harbor Keys to Bahia Honda Bridge	1,100
Lower Keys	36.5	37.5	Bahia Honda Bridge to Bahia Honda Key	1,100
Middle Keys	37.5	47.0	Bahia Honda Key to Hog Key	1,200
Middle Keys	47.0	48.0	Hog Key to Boot Key	1,100
Middle Keys	48.0	50.2	Boot Key to Marathon	900
Middle Keys	50.2	50.8	Marathon to Marathon Shores	900
Middle Keys	50.8	54.0	Marathon Shores to Key Colonial Beach	900
Middle Keys	54.0	54.5	Key Colonial Beach to Deer Key	900
Middle Keys	54.5	58.0	Deer Key to Grassy Key	1,100
Upper Keys	58.0	74.0	Grassy Key to Matecumbe Harbor	1,100
Upper Keys	74.0	80.0	Matecumbe Harbor to Teatable Key	1,100
Upper Keys	80.0	83.5	Teatable Key to Islamorada	1,100
Upper Keys	83.5	85.6	Islamorada to Windley Key	1,100
Upper Keys	85.6	90.0	Windley Key to Plantation Key	1,100
Upper Keys	90.0	100.0	Tavernier Key to Newport Key	900
Upper Keys	100.0	105.0	Newport Key to Sexton Cove	900
Upper Keys	105.0	106.3	Sexton Cove to Rattlesnake Key	900
Upper Keys	106.3	126.5	Rattlesnake Key to Card Sound Rd	1,200
South Dade	126.5	HEFT	Card Sound Rd to HEFT	900
Upper Keys	106.3	Int CR 905 / CR 905 A	Lake Surprise to Crocodile Lake	1,100
Upper Keys	Ocean Reef	Int CR 905 / CR 905 A	Tanglefish Key to Crocodile Lake	1,100
Upper Keys	Int CR 905 / CR 905 A	US 1	Crocodile Lake to South Miami-Dade	1,100

**NOTES**

A Functional Evacuation Lane has a pavement width of at least 10 feet

The above flow rates are maximum values that are expected to be sustained for extended periods (more than 8 hours). During night conditions, these flow rates may be lower than the ones shown above.



ATTACHMENT 3

**TABLE 1**  
**Roadway Configuration on US Highway 1 (Overseas Highway)**  
**and CR 905/Card Sound Road in the Florida Keys, Monroe County, Florida**

Area	Milemarkers		Location/Description	Year 2010 (Includes Completed Roadway Improvements Projects)		Includes Roadway Improvements Projects Under Construction		Includes Projects Funded in the 5-yr Work Program	
	From	To		Configuration	Functional Evacuation Lanes	Configuration	Functional Evacuation Lanes	Configuration	Functional Evacuation Lanes
Lower Keys	2.0	4.0	Key West to Stock Island	4L	2	4L	2	4L	2
Lower Keys	4.0	9.0	Stock Island to Big Coppitt Key	4LD	2	4LD	2	4LD	2
Lower Keys	9.0	17.0	Big Coppitt Key to Sugarloaf Key	2L	1	2L	1	2L	1
Lower Keys	17.0	22.0	Sugarloaf Key to Cudjoe Key	2L	1	2L	1	2L	1
Lower Keys	22.0	24.0	Cudjoe Key to Summerland Key Cove Airport	2L	1	2L	1	2L	1
Lower Keys	24.0	25.0	Summerland Key Cove Airport to Summerland Key	3L	1	3L	1	3L	1
Lower Keys	25.0	30.0	Summerland Key to Big Pine Key	2L	1	2L	1	2L	1
Lower Keys	30.0	34.0	Big Pine Key to West Summerland Keys	3L	2	3L	2	3L	2
Lower Keys	34.0	35.2	West Summerland Keys to Spanish Harbor Keys	2L	1	2L	1	2L	1
Lower Keys	35.2	36.5	Spanish Harbor Keys to Bahia Honda Bridge	4LD	2	4LD	2	4LD	2
Lower Keys	36.5	37.5	Bahia Honda Bridge to Bahia Honda Key	2L	1	2L	1	2L	1
Middle Keys	37.5	47.0	Bahia Honda Key to Hog Key	2L	1	2L	1	2L	1
Middle Keys	47.0	48.0	Hog Key to Boot Key	2L	1	2L	1	2L	2
Middle Keys	48.0	50.2	Boot Key to Marathon	4L	2	4L	2	4L	2
Middle Keys	50.2	50.8	Marathon to Marathon Shores	5L	2	5L	2	5L	2
Middle Keys	50.8	54.0	Marathon Shores to Key Colonial Beach	4LD	2	4LD	2	4LD	2
Middle Keys	54.0	54.5	Key Colonial Beach to Deer Key	4LD	2	4LD	2	4LD	2
Middle Keys	54.5	58.0	Deer Key to Grassy Key	2L	1	2L	1	2L	2
Upper Keys	58.0	74.0	Grassy Key to Matecumbe Harbor	2L	1	2L	1	2L	2
Upper Keys	74.0	80.0	Matecumbe Harbor to Teatable Key	2L	1	2L	1	2L	2
Upper Keys	80.0	83.5	Teatable Key to Islamorada	3L	1	3L	1	3L	2
Upper Keys	83.5	85.6	Islamorada to Windley Key	2L	1	2L	1	2L	2
Upper Keys	85.6	90.0	Windley Key to Plantation Key	2L	1	2L	1	2L	2
Upper Keys	90.0	100.0	Tavernier Key to Newport Key	4LD	2	4LD	2	4LD	3
Upper Keys	100.0	105.0	Newport Key to Sexton Cove	4LD	2	4LD	2	4LD	3
Upper Keys	105.0	106.3	Sexton Cove to Rattlesnake Key	4LD	2	4LD	2	4LD	3
Upper Keys	106.3	126.5	Rattlesnake Key to Card Sound Rd	2L/4L	1	2L/4L	2	2L/4L	2
South Dade	126.5	HEFT	Card Sound Rd to HEFT	5LD	3	5LD	3	5LD	3
Upper Keys	106.3	Int CR 905 / CR 905 A	Lake Surprise to Crocodile Lake	2L	1	2L	1	2L	1
Upper Keys	Ocean Reef	Int CR 905 / CR 905 A	Tanglefish Key to Crocodile Lake	2L	1	2L	1	2L	1
Upper Keys	Int CR 905 / CR 905 A	US 1	Crocodile Lake to South Miami-Dade	2L	1	2L	1	2L	1

**LEGEND**

- 2L Two-lane facility
  - 2L/4L Two lanes with short four-lane sections for passing purposes
  - 3L Three-lane facility (center lane is a two-way left-turn lane)
  - 4L Four-lane undivided facility
  - 4LD Four-lane divided facility
  - 5L Five-lane facility (center lane is a two-way left-turn lane)
  - 5LD Five-lane divided facility
- NOTE: The "Potential Evacuation Lane" column includes existing and future 10-foot northbound shoulder improvements

## **Technical Memorandum**

**To:** Aileen Bouclé, AICP  
District Planning, Project Development and Environmental  
Administrator, Florida DOT – District Six  
1000 NW 111<sup>th</sup> Avenue, Room 6111A  
Miami, Florida 33172

**From:** Joaquín E. Vargas, P.E.  
Brian Wolshon, Ph.D., P.E., P.T.O.E.

**Subject:** Florida Keys Site-Specific Capacity Study

**Date:** April 21, 2010

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The purpose of this technical memorandum is to document the results of a site-specific traffic operations study undertaken to evaluate traffic conditions and roadway capacity on roadway segments in the upper Keys in Monroe County, Florida. The site-specific analyses were needed to assess traffic flow rates under a variety of conditions and to determine the appropriateness of the roadway capacity values used in the 2001 Florida Keys Hurricane Evacuation Study prepared by Miller Consulting, Inc. (aka the "Miller Study"), within the Key Largo area

This work was motivated by the need to provide more detailed analyses of traffic along several critical segments along the Keys evacuation route. It is felt that during a mass movement of traffic from the Keys these segments could largely control the overall capacity of the route. An area of specific emphasis were the locations where the mainline US-1 could be impeded by various traffic control and roadway geometric features as well as driver/vehicle characteristics that, individually or combined, could adversely impact the rate of outbound flow. The analyses presented here also represents an advance over the 2001 Miller Study because they rely on finer analyses which provide a higher level of computational fidelity over the original Miller Study that permits the operational impact of specific control and roadway features to be evaluated down to the level of individual vehicles.

Additionally, the Florida Department of Transportation – District Six and its consultants have taken advantage of new and evolving knowledge and techniques that have been developed over the 10-year period since the

original 2001 Florida Keys Hurricane Evacuation Study was carried out. This includes observational studies and simulation systems that have improved our understanding of traffic operations under mass evacuation demand conditions.

## **BACKGROUND**

The Florida Keys evacuation route was divided into 31 roadway links (Link A1 through Link U) in the Miller Model. The 31 roadway links extend from Mile Marker 2.0 in Key West/Stock Island to the southern terminus of Florida's Turnpike in Florida City (a distance of approximately 125 miles). Each roadway link represents a different cross section on the highway network, such as:

- o Two-lane undivided (2L) – one through lane in each direction
- o Three lanes (3L) – one through lane in each direction with a center turn lane
- o Four-lane undivided (4L) – two through lanes in each direction
- o Four-lane with a divided median (4LD) – two through lanes in each direction with a raised or depressed median
- o Five lanes (5L) – two through lanes in each direction with a center turn lane

The "Roadway Network" module of the Miller Model, including all 31 evacuating roadway links and their assumed hurricane evacuating hourly capacity, is contained in Attachment A of this report. These original estimates were based on a combination of prior observations, experience in working in the local area, and accepted professional standards and guidelines that are used to estimate roadway capacity under various sets of conditions.

Due to the unique nature<sup>1</sup> of the transportation network in the Florida Keys, and the life-threatening nature of hurricanes, the transportation engineering profession does not have a universally-accepted methodology to calculate capacity for Overseas Highway during hurricane evacuation conditions. For these reasons, the Miller Study

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<sup>1</sup> One evacuation route with more than 100 miles in length, and roadway conditions that do not fit the typical urban or rural conditions defined in the 2000 Highway Capacity Manual.

assembled a team of traffic engineers/transportation professionals with extensive experience in roadway capacities, especially in the Florida Keys, for purposes of determining the appropriate capacity of the 31 roadway links located along US 1 within the Florida Keys and Florida City. The roadway capacity team included professionals from two engineering consulting firms, the Florida Department of Transportation (District Six and Central Office), the Department of Community Affairs, and the US Army Corps of Engineers.

The assumed capacity values that were agreed upon by the team of experts were consistent with nationally accepted professional standards and practices and have been shown to be consistent with numerous observations during emergency evacuations in several other locations (within and outside of Florida) as well as during other types of non-emergency major event scenarios. Despite all of this background evidence and the efforts of the local expert team assembled for the Miller Study, these capacity values have been frequently called into question since the release of the Miller report nearly a decade ago.

### **SITE SPECIFIC CAPACITY**

In order to evaluate and re-confirm the roadway capacities used in the Miller Model, a site-specific capacity study was undertaken on Overseas Highway<sup>2</sup> within Key Largo. The study was based on a set of traffic observations made in January 2010. While ideally it would be desirable to record traffic volumes during a live evacuation, the infrequent nature of such events required a reasonably comparable volume scenario. These conditions were then used to code and calibrate a simulation model which could then be varied to reflect a wide-range of potential conditions.

The micro-simulation analysis of US 1 included the section between Mile Marker 99.0 and Mile Marker 107, including a short segment of County Road 905. The micro-simulation used CORSIM, a nationally-recognized tool in evaluating traffic conditions on roadway networks. CORSIM was developed in the early 1970's and became recognized as one of the most accurate traffic simulation tools in the 1980's with the introduction of the Personal Computers.

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<sup>2</sup> Within Key Largo, Overseas Highway is a four-lane divided facility with a posted speed limit of 45 miles per hour.

As a micro-scale simulation system, CORSIM permits the analysis of traffic conditions on a vehicle-by-vehicle basis. As such, it is influenced by location-specific traffic control and geometric design features such as intersections, turn lanes, and median cross-overs in addition to individual driver and vehicle characteristics that govern gap-acceptance and lane-changing behaviors. The Federal Highway Administration and the State of Florida have endorsed the use of CORSIM.

Another key aspect of a micro-level modeling approach is that the flow conditions on the road segments are not pre-determined by assumed or established capacity values. Rather, the process works in somewhat the opposite direction in which the flow conditions, including maximum flows, are a reflection of the specific driver, control, design, and traffic features that exist or are assumed to exist and coded in for each specific site. As such, the maximum observed flow rates (capacity) for a road section are the result of numerous detailed interactions of driver, control, design and traffic conditions. Further, these micro-level simulations do not fix a set of static conditions or assumptions in advance. Operational conditions can change from minute-to-minute and even second-to-second. It is through this type of dynamic modeling that analysts are able to observe and analyze the occurrences of flow break downs and recoveries that are commonly associated with rush hour conditions and, even more so, during an evacuation scenario. An added dimension of simulation is that input parameters (including inflow volumes) can be added and their effects studied.

To further enhance the validity of the analyses conducted in this effort and the results gained from them, a series of base-line simulation models were first developed based on and calibrated to a set of field observed traffic volumes recorded over a recent event weekend in the Keys.

The site-specific capacity study followed the five steps listed below:

1. Network Coding
2. Model Calibration
3. Development of Side Street Volumes
4. Results of Model Runs
5. Capacity Adjustments

#### Network Coding

As indicated previously, CORSIM was coded between Mile Marker 99 and Mile Marker 107, plus a short segment along County Road 905. Table 1 on the following page documents the node network coded into CORSIM.

<b>TABLE 1</b> <b>Node Coding in CORSIM</b> <b>Florida Keys Site-Specific Capacity Study</b>		
<b>Node Number</b>	<b>Location</b>	<b>Comment</b>
106	MM 99.0	Southmost Point
1	Atlantic Boulevard	Signal (Loading Point)
2	Laguna Avenue	Loading Point
3	Ocean Drive	Loading Point
4	Sunset Boulevard	Loading Point
5	Lauderdale Drive	Loading Point
6	Kay Drive	Loading Point
7	Hibiscus Lane	Loading Point
8	Tarpon Basin Drive	Signal (Loading Point)
9	Samson Road	Loading Point
10	Michelle Drive	Loading Point
11	Mahogany Drive	Loading Point
12	Alhambra Drive	Loading Point
13	George Street	Loading Point
14	Cabrera Street	Loading Point
15	Snapper Avenue	Loading Point
16	Avenue B	Loading Point
17	Taylor Drive	Loading Point
18	Dolphin Road	Loading Point
19	N. Blackwater Lane	Loading Point
20	Linda Drive	Loading Point
21	Andros Road	Loading Point
22	Lake Surprise Avenue	Loading Point
23	18-Mile Stretch/County Road 905	Diverge Point
24	18-Mile Stretch/County Road 905	Emergency Signal
26	Mile Marker 107	Northmost Point along US 1
241	Northeast of US 1	Northmost Point along CSR

Source: CORSIM and Traf Tech Engineering, Inc.

As documented in the above table, 22 loading points were coded into the CORSIM model. A loading point<sup>3</sup> is an intersection where side-street traffic enters the evacuating traffic stream. In contrast, the Miller Model only had two loading points between Mile Marker 95 and Miler Marker 107 and therefore, the network coded into the CORSIM model for the site-

<sup>3</sup> The more loading points, the more realistic representation of local conditions.

specific capacity study incorporates a more realistic representation of local conditions within the Key Largo area.

All unsignalized side streets were coded into the CORSIM model as minor-street approach stop-control intersections to represent current field conditions. Four traffic signals are located within the study area. The four traffic signals are located:

1. at the intersection of Atlantic Boulevard/Ocean Bay Drive (fully operational signal) – south of Mile Marker 100
2. at the intersection of Tarpon Basin Drive/Tradewinds Shopping Center (fully operational signal) – north of Mile Marker 101
3. at the Key Largo School located just south of Mile Marker 105 near Bowen Drive (pedestrian signal)
4. at the intersection of Overseas Highway (US 1) and County Road 905 (emergency signal) – near Mile Marker 106

Of the four traffic signals located within the study area, only two were assumed to be fully operational during hurricane evacuation conditions. The pedestrian signal located near Mile Marker 105 was assumed to be in the “off” mode since schools close well in advance of an approaching storm. The emergency signal located near Mile Marker 106 was assumed to be in the “flashing” mode (free flowing along US 1) during hurricane evacuation conditions.

Concerned Monroe County residents and other non-traffic professionals have previously suggested that all Monroe County traffic signals should operate in the “flashing” mode. It is preferred that the traffic signals located at Atlantic Boulevard and at Tarpon Basin Drive should remain operational during hurricane evacuation conditions for the following reasons:

- o Nearly 20 percent of the evacuating vehicles will enter Overseas Highway from Key Largo. As such, drivers from this area will need adequate gaps to permit safe merging into the outbound US-1 traffic stream
- o The US 1 segment between Mile Markers 99.5 and 106.3 will carry the heaviest traffic volumes of the entire Florida Keys evacuation network

- o By maintaining full operation of the traffic signals located near Mile Markers 100 and 101, gaps will be created along US 1 which will benefit all evacuating vehicles entering the main highway from the numerous side streets.

To minimize the effects of the traffic signals on the evacuating traffic flow along Overseas Highway, the two simulated traffic signals were timed so that most of the green time was allocated to US 1. That is, the assumed signal operating plan permits one vehicle turning left from US 1 and up to two vehicles entering Overseas Highway from the side street, per signal cycle. This is an assumption that significantly benefits the evacuating flow along the US 1.

### Model Calibration

To assure that the simulation reflected actual traffic conditions during an evacuation event, it was first necessary to build and calibrate the model to a set of actual observed conditions. The calibrated CORSIM model could then be tested with any set of traffic volumes up to and even exceeding those assumed to occur under hurricane evacuation conditions and reflect the same operating conditions attained in the calibrated base model. The importance of developing a validated model calibrated to event-level traffic cannot be overstated. Validation and calibration form the cornerstone on which reliable traffic models are built. Calibration, in particular, establishes the basis on which the results of the model can be systematically and quantitatively adjusted to reflect a set of conditions actually observed in the field. It is only through this process that an analyst can state with reasonable confidence that any changes made to the model (in terms of driver, design, control, and/or traffic), would have a correspondingly similar effect in real life. Opportunities to calibrate evacuation simulation models are rare because mass evacuations are relatively infrequent and the acquisition of field traffic flow measurements under evacuation conditions is rarer still.

To perform the calibration process in this study, traffic volumes recorded during the Key West Food and Wine Festival (January 28 through January 31, 2010) at three continuous traffic count stations were used. The three traffic count stations included Station 164 near Mile Marker 106 in Key Largo, Station 165 near Mile Marker 25 in Big Pine Key, and Station 227 near Mile Marker 4 in Stock Island. The 24-hour traffic distribution during the 4-day period associated with the Key West Food and Wine Festival is graphically presented on Pages 9 and 10. The fact that these volumes were part of an event-based weekend, the level of traffic was assumed to



exceed routine daily levels. The recorded hourly volumes at each continuous traffic count station during the subject festival are contained in Attachment B.

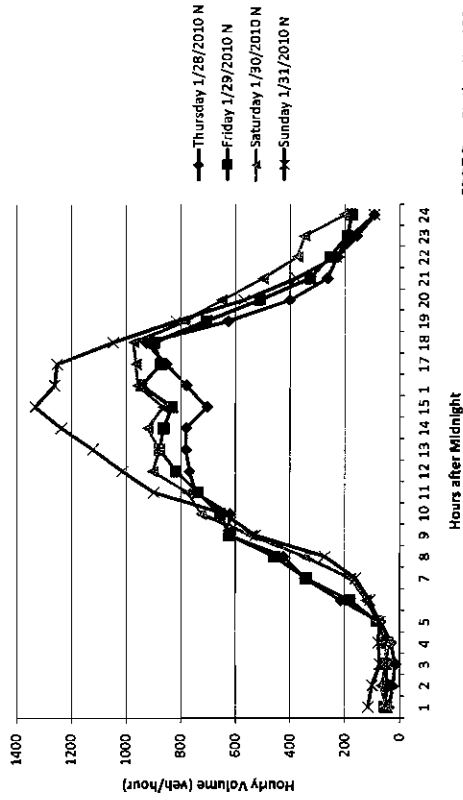
In order to calibrate the CORSIM model in this study, a set of three hourly northbound volumes recorded at the count station located near Mile Marker 106 were entered into the model. The three hourly volumes included the highest exiting volume recorded at Mile Marker 106 which was approximately 1,332 vehicles per hour between 2:00 PM and 3:00 PM. Four different CORSIM Time Periods were coded. The first time period included very low traffic volumes in order to allow the simulation to reach equilibrium (a recommended practice when the simulation includes high traffic volumes). Time periods 2, 3, and 4 included as entry volumes the traffic volumes recorded between 1:00 PM and 2:00 PM, 2:00 PM and 3:00 PM, and from 3:00 PM to 4:00 PM. The results of the 3-hour simulation run are presented in Table 2 below.

<b>TABLE 2</b>				
<b>CORSIM Calibration Run</b>				
<b>Florida Keys Site-Specific Capacity Study</b>				
<b>Time Period</b>	<b>Recorded Traffic Count</b>	<b>CORSIM Volume</b>	<b>Difference</b>	
			<b>Volume</b>	<b>% Change</b>
One	to allow network to reach equilibrium			
Two	1,258 vph	1,178 vph	-80	-6.4%
Three	1,332 vph	1,226 vph	-106	-8.0%
Four	1,261 vph	1,233 vph	-28	-2.2%

*SOURCE: CORSIM and Florida Department of Transportation*

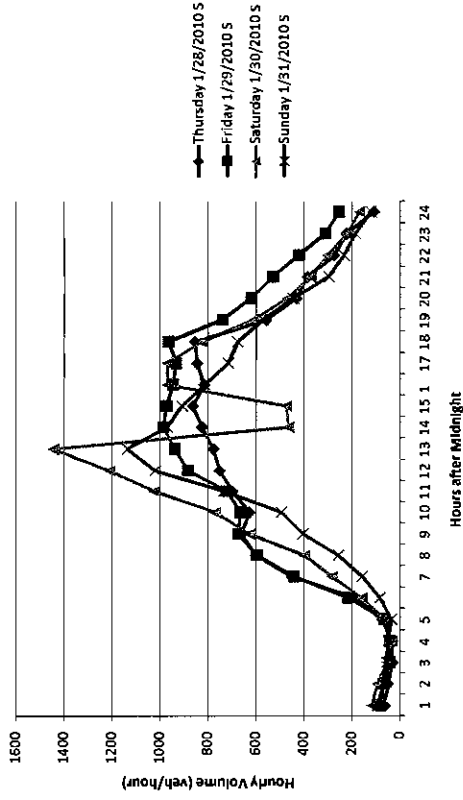
As indicated in Table 2, the CORSIM simulations produced traffic volumes that had less than 10% difference from the actual recorded traffic counts. Typically, simulation results that are within the range 5% to 10% of actual conditions are considered to be an acceptable representation of field conditions. Since Time Period 4 produced the most comparable results between the actual recorded traffic volumes and the traffic produced by CORSIM, the results obtained from Time Period 4 were used for purposes of this study.

**Graph 1a: MM 106 - Key Largo (2 NB Lanes)**  
Northbound Hourly Traffic Volume



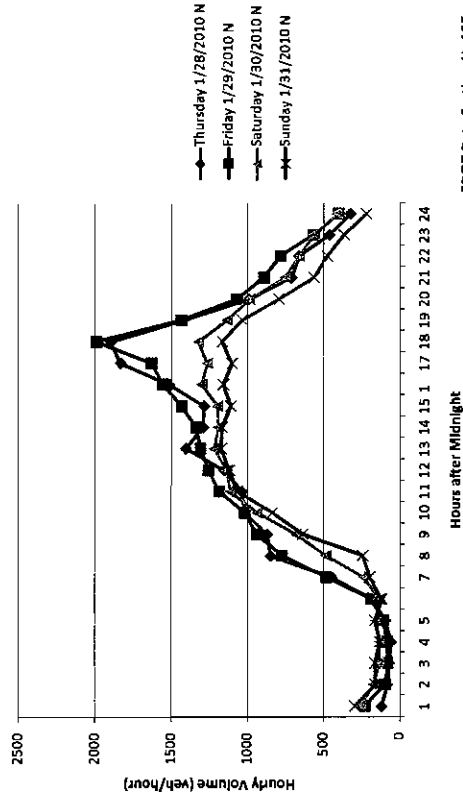
FDOT Data Station No. 164

**Graph 1b: MM 106 - Key Largo (2NB Lanes)**  
Southbound Hourly Traffic Volume



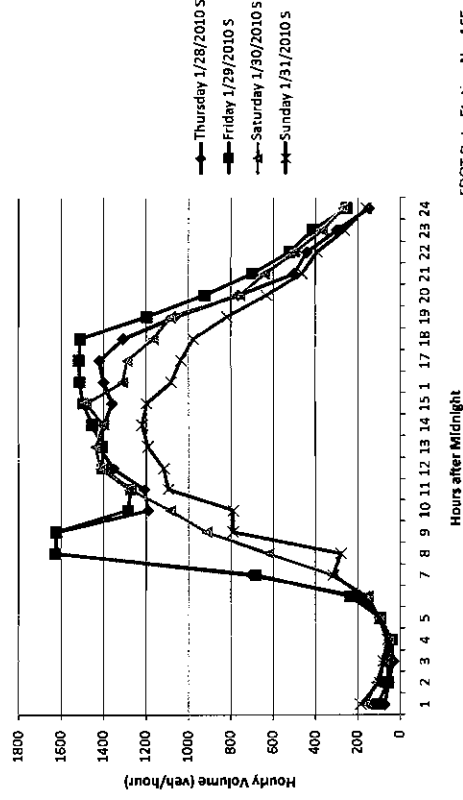
FDOT Data Station No. 164

**Graph 2a: Stock Island (2 NB Lanes)**  
Northbound Hourly Traffic Volume



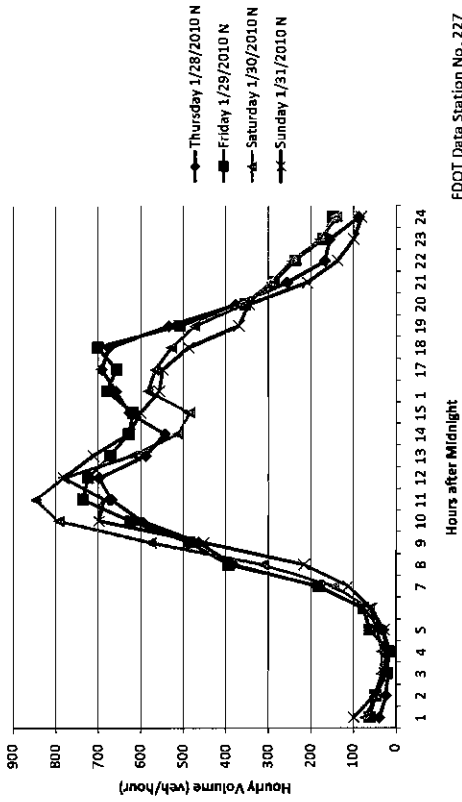
FDOT Data Station No. 165

**Graph 2b: Stock Island (2NB Lanes)**  
Southbound Hourly Traffic Volume



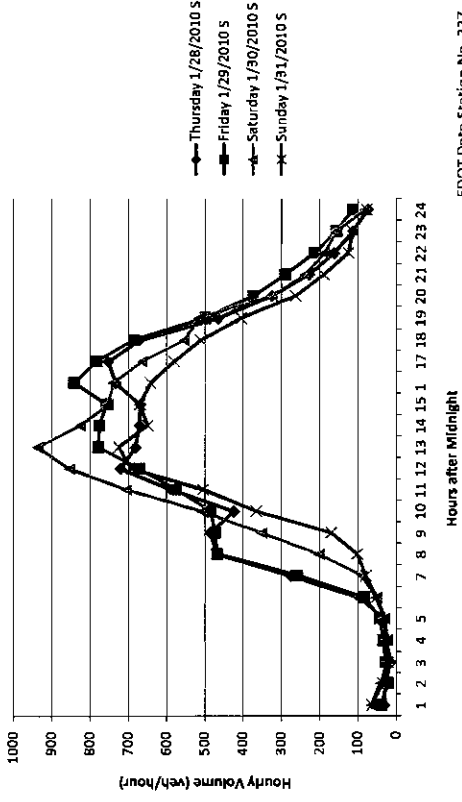
FDOT Data Station No. 165

**Graph 3a: Big Pine Key (1 NB Lane)**  
**Northbound Hourly Traffic Volume**



FDOT Data Station No. 227

**Graph 3b: Big Pine Key (1 NB Lane)**  
**Southbound Hourly Traffic Volume**



FDOT Data Station No. 227

Once the model run was completed, the animated simulations were compared with video recordings obtained during the same day and hour of the traffic volumes used for the calibration period. This process was undertaken to qualitatively assess the reasonableness of the traffic flow throughout the study area and to validate the accuracy of the CORSIM model. Based on a visual inspection of the output produced by the model, the traffic flow generated by CORSIM were reasonably consistent with the traffic conditions observed in the field.

Additionally, since CORSIM is a stochastic model that randomly assigns vehicles to the roadway network prior to the beginning of the simulation time period, CORSIM should be run multiple times using different initial network loadings and the model output should be averaged to eliminate the potential for obtaining skewed (biased) results. However, due to the linear nature of the study area, different seed numbers yielded almost identical results and therefore, multiple runs using different random seed numbers were not considered necessary for purposes of this traffic study. Table 3 documents the results obtained from using three different random seed number for the simulation period.

As shown in Table 3, the simulated roadway network does not warrant multiple runs using the CORSIM model.

<b>TABLE 3</b>			
<b>Multiple CORSIM Runs</b>			
<b>Florida Keys Site-Specific Capacity Study</b>			
<b>Random Seed Number</b>	<b>Total Number of Processed Vehicles</b>		
	<b>Time Period 2</b>	<b>Time Period 3</b>	<b>Time Period 4</b>
7581	1,178 vph	1,226 vph	1,233 vph
1359	1,178 vph	1,225 vph	1,234 vph
9823	1,177 vph	1,225 vph	1,230 vph

SOURCE: CORSIM

The three CORSIM runs conducted for calibration purposes are contained in Attachment C.

#### Development of Side Street Volumes

Based on the Miller Study, approximately 8,096 evacuating vehicles will enter Overseas Highway between Mile Marker 95 and 113. In reviewing Monroe County's Planning Analysis Area/Enumeration Districts, the population located between Mile Marker 99 and Mile Marker 107 is approximately 65.4% of the population located between Mile Markers 95

and 113. Therefore, the number of evacuating vehicles estimated to enter US 1 between Mile Markers 99 and 107 is approximately 5,295 vehicles (65.4% of 8,096).

The 5,295 evacuating vehicles were distributed within the 22 loading nodes as follows:

- o 30% will enter via nodes 1 through 5
- o 20% will enter via nodes 6 through 12
- o 20% will enter via nodes 13 through 16
- o 15% will enter via nodes 17 through 19
- o 15% will enter via nodes 20 through 22

The percentages documented above were based on the population density located within each sub-area. Moreover, once the total number of evacuating vehicles was determined for each simulated side street, (each hour with approximately 13.5% of the total evacuating traffic). As indicated previously, the CORSIM model was developed to simulate three 60-minute periods (Time Periods 2, 3, and 4).

#### Results of Model Runs

Once the side street volumes were developed for the 22 side streets, Overseas Highway near Mile Marker 99 (south terminus of study area) was loaded with 3,000 vehicles per hour (1,500 vehicles per hour per lane) in the northbound direction. If CORSIM processed all 3,000 vehicles, then the 3,000-vehicle loading was increased. However, all model runs processed less than 3,000 vehicles per hour at Mile Marker 100 and therefore, the 3,000-vehicle loading was considered appropriate for purposes of this study.

Two scenarios were tested. The first scenario assumed no incidents on the highway. The second scenario included an incident (crash, disabled vehicle, etc.) near Mile Marker 102.5. The incident scenario was simulated by entering a one-hour speed reduction to replicated potential disruptions to traffic flow caused by a minor crash, disabled vehicle, etc. The results of the two simulation scenarios are presented in Table 4.

<b>TABLE 4</b>		
<b>CORSIM Results</b>		
<b>Florida Keys Site-Specific Capacity Study</b>		
<b>Mile Marker</b>	<b>Maximum Hourly Volume (2 Lanes)</b>	
	<b>No Incident</b>	<b>With Incident</b>
100	2,767 vph	2,334 vph
102	2,797 vph	2,188 vph
104	2,902 vph	2,267 vph
106	3,003 vph	2,368 vph
<b>Average</b>	<b>2,867 vph</b>	<b>2,289 vph</b>

SOURCE: CORSIM

As documented in Table 4, with an inflow of 1,500 vphpl the Overseas Highway was shown to process up to 1,435 vehicles per hour per lane, assuming no incidents, daylight conditions, and good weather (ideal conditions). A minor incident resulting in operating speeds of 10 miles per hour reduced the capacity to approximately 1,145 vehicles per hour per lane.

The results of the two CORSIM scenarios are contained in Attachment D.

#### Capacity Adjustments

The resulting maximum flow obtained from the CORSIM simulation runs were for daylight and good weather conditions (ideal scenario). According to the 2000 Highway Capacity Manual, adverse weather or night conditions can reduce the capacity of a roadway by approximately 15%. Moreover, adverse weather conditions occurring at night can reduce the capacity of a roadway by as much as 47%, according to the 2000 Highway Capacity Manual. Table 5 summarizes all potential capacity values anticipated during a mandatory hurricane evacuation condition of the Florida Keys.

<b>TABLE 5</b>					
<b>Potential Hourly Capacity per Lane</b>					
<b>Florida Keys Site-Specific Capacity Study</b>					
<b>No Incident</b>			<b>With Incident</b>		
<b>Dry and Daylight</b>	<b>Rain or Night</b>	<b>Rain and Night</b>	<b>Dry and Daylight</b>	<b>Rain or Night</b>	<b>Rain and Night</b>
1,435 vph	1,220 vph	760 vph	1,145 vph	975 vph	610 vph

SOURCE: CORSIM and 2000 Highway Capacity Manual

## SUMMARY

In summary, many factors can affect the capacity of Overseas Highway during a mandatory hurricane evacuation order for the Florida Keys. Since a significant portion of the evacuation will likely occur during night conditions, and inclement weather could also occur during the evacuation period, the capacity of US 1 within Key Largo can vary between 760 and 1,435 vehicles per hour per lane.

These flow rates are consistent with evacuation traffic flow rates observed in several other evacuations, including those associated with Hurricanes Floyd<sup>4</sup> in Florida and South Carolina and Hurricane Katrina<sup>5</sup> in Louisiana. It is also worth noting that these one-hour maximum flow rates are under what could be considered "near-ideal" conditions. In reality, "maximum flow rates" cannot often be sustained for more than an hour because of inevitable disruptions to the smooth flow of traffic. Under capacity-level demand conditions, even slight disruptions in the traffic stream can result in the formation and propagation of traffic shockwave that move both quickly and widely throughout a traffic network.

Moreover, due to the lack of multiple evacuation routes in Monroe County, a minor incident at any location will negatively affect all upstream roadway links within the County. The micro-simulation runs indicate that an incident that reduces travel speeds to 10 miles per hour will reduce the capacity of US 1 to as low as 610 vehicles per hour per lane during night and rain conditions. This reduction is extremely important to take into consideration in a critical life-safety assessment of traffic such as this.

Based on the above, the 900 vehicles per hour per lane capacity assigned to US 1 within Key Largo, as documented in the Miller Study, is considered appropriate given the life-threatening nature of hurricanes. Hence, it is concluded that the capacities used in the Miller Study within the Key Largo area are appropriate for hurricane evacuation purposes.

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<sup>4</sup> Federal emergency Management Agency (FEMA), "Reverse Lane Standards and ITS Strategies Southeast United States Hurricane Study – Technical Memorandum 3", Final Report, prepared by Post, Buckley, Schuh & Jernigan, Inc. Tallahassee, Florida 2000.

<sup>5</sup> Wolshon B. and B. McArdle, "Temporospatial Analysis of Hurricane Katrina Regional Evacuation Traffic Patterns," *ASCE Journal of Infrastructure Systems – Special Infrastructure Planning, Design, and Management for Big Events Issues*, March 2009, Vol 15, No. 1, pp.12-20.

# Attachment A

## Miller Model Roadway Link Capacities



**Monroe County, Florida  
Roadway Network**

Link Name	Area	Milemarkers		Location/Description	Year 2,000 Configuration	Evacuation Outbound Lanes	Pavement Width (FT)	Outbound Flow Rate/ Lane	Total Flow Rate
		From	To						
A1	Lower Keys	2.0	4.0	Key West to Stock Island	4L	2		900	1,800
A2	Lower Keys	4.0	9.0	Stock Island to Big Coppitt Key	4LD	2	44'-53'	900	1,800
B	Lower Keys	9.0	17.0	Big Coppitt Key to Sugarloaf Key	2L	1	34'	1,350	1,350
C	Lower Keys	17.0	22.0	Sugarloaf Key to Cudjoe Key	2L	1	34'	1,350	1,350
D1	Lower Keys	22.0	24.0	Cudjoe Key to Summerland Key Cove Airport	2L	1	44'	1,350	1,350
D2	Lower Keys	24.0	25.0	Summerland Key Cove Airport to Summerland Key	3L	1	44'	1,350	1,350
D3	Lower Keys	25.0	30.0	Summerland Key to Big Pine Key Big Pine Key to West Summerland Keys	2L	1	33'-44'	1,350	1,350
E	Lower Keys	30.0	34.0	West Summerland Keys to Spanish Harbor Keys	2L	2	33'	1,050	2,100
F1	Lower Keys	34.0	35.2	Spanish Harbor Keys to Bahia Honda Bridge	2L	1	25'	1,350	1,350
F2	Lower Keys	35.2	36.5	Bahia Honda Bridge to Bahia Honda Key	4LD	2	width unknown	1,350	2,700
F3	Lower Keys	36.5	37.5	Bahia Honda Key to Hog Key	2L	1	33'	1,350	1,350
G	Middle Keys	37.5	47.0	Bahia Honda Key to Hog Key	2L	1	25'	1,500	1,500
H1	Middle Keys	47.0	48.0	Hog Key to Boot Key	2L	2	25'	1,350	2,700
H2	Middle Keys	48.0	50.2	Boot Key to Marathon	4L	2	25'-49'	900	1,800
I1	Middle Keys	50.2	50.8	Marathon to Marathon Shores Marathon Shores to Key Colonial Beach	5L	2	64'	900	1,800
I2	Middle Keys	50.8	54.0	Marathon Shores to Key Colonial Beach	4LD	2	58'-64'	900	1,800
J1	Middle Keys	54.0	54.5	Key Colonial Beach to Deer Key	4LD	2	58'	900	1,800
J2	Middle Keys	54.5	58.0	Deer Key to Grassy Key	2L	2	32'-58'	1,350	2,700
K	Upper Keys	58.0	74.0	Grassy Key to Matecumbe Harbor	2L	2	32'	1,350	2,700
L	Upper Keys	74.0	80.0	Matecumbe Harbor to Teatable Key	2L	2	48'	1,350	2,700
M1	Upper Keys	80.0	83.5	Teatable Key to Islamorada	3L	2	48'	1,350	2,700
M2	Upper Keys	83.5	85.6	Islamorada to Windley Key	2L	2	48'	1,350	2,700
N	Upper Keys	85.6	90.0	Windley Key to Plantation Key	2L	2	33'-48'	1,350	2,700
O	Upper Keys	90.0	100.0	Tavernier Key to Newport Key	4LD	3	44'-56'	900	2,700
P	Upper Keys	100.0	105.0	Newport Key to Sexton Cove	4LD	3	44'-52'	900	2,700
Q	Upper Keys	105.0	106.3	Sexton Cove to Rattlesnake Key	4LD	3	44'-52'	900	2,700
R1	Upper Keys	106.3	126.5	Rattlesnake Key to Card Sound Rd	2L/4L	2	24'-25'	1,500	3,000
R2	South Dade	126.5	HEFT	Card Sound Rd to HEFT	4LD	3	-	900	2,700
S	Upper Keys	106.3	Int CR 905 / CR 905 A	Lake Surprise to Crocodile Lake	2L	1	32'	1,350	1,350
T	Upper Keys	Ocean Reef	Int CR 905 / CR 905 A	Tanglefish Key to Crocodile Lake	2L	1	60'	1,350	1,350
U	Upper Keys	Int CR 905 / CR 905 A	US 1	Crocodile Lake to South Miami-Dade	2L	1	24'-25'	1,350	1,350

**LEGEND:**

- 2L = Two-lane facility
- 2L/4L = Two lanes with short four-lane sections for passing purposes
- 3L = Three-lane facility (center lane is a two-way left-turn lane)
- 4L = Four-lane undivided facility
- 4LD = Four-lane divided facility
- 5L = Five-lane facility (center lane is a two-way left-turn lane)

Source: 2001 Florida Keys Hurricane Evacuation Study

# **Attachment B**

## **4-Day Machine Traffic Counts**

**(Source: FDOT – January 2010)**

**TABLE 8-1  
Continuous Traffic Counts (January 28 to January 31, 2010)  
Monroe County, Florida**

SITE	DATE	DIR	Clock time ending at:																								TOTAL
			1:00 AM	2:00 AM	3:00 AM	4:00 AM	5:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 AM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM	12:00 AM	
0164	Thursday	N	40	25	15	31	216	345	424	625	670	746	768	781	780	704	779	851	926	626	400	263	226	155	92	10509	
0164	Friday	N	53	44	50	45	82	181	341	457	622	654	816	862	831	942	872	872	897	704	509	325	252	189	173	11534	
0164	Saturday	N	48	69	50	40	80	122	178	347	541	726	776	803	879	921	865	958	964	973	785	650	499	373	347	202	122966
0164	Sunday	N	115	100	72	78	72	109	161	273	528	658	898	1013	1122	1238	1332	1261	1252	1047	816	557	375	231	177	91	135666
0164	Thursday	S	65	49	32	32	187	451	600	660	627	695	751	776	825	863	815	845	853	558	432	385	274	223	109	11182	
0164	Friday	S	79	65	42	42	64	215	440	594	672	663	720	881	937	985	970	943	931	618	527	420	309	251	13070		
0164	Saturday	S	116	94	53	33	61	158	283	396	625	769	1022	1208	1444	1464	1135	968	969	827	608	470	371	301	220	170	12104
0164	Sunday	S	91	68	55	48	83	156	255	403	492	732	1019	1135	969	907	811	713	675	570	443	295	232	185	120	10491	
0165	Thursday	N	121	82	71	59	96	175	450	849	873	1015	1037	1154	1405	1291	1285	1513	1831	1896	1423	990	711	663	452	325	19777
0165	Friday	N	226	94	77	80	109	188	482	772	939	1016	1183	1255	1306	1335	1430	1550	1627	1988	1432	1058	890	781	567	401	20796
0165	Saturday	N	254	175	136	133	155	134	238	487	683	935	1114	1136	1218	1192	1197	1301	1264	1321	1135	988	753	663	562	411	17585
0165	Sunday	N	295	160	163	130	163	121	198	244	637	836	1064	1119	1172	1165	1109	1157	1101	1165	1035	794	563	476	367	219	15453
0165	Thursday	S	75	54	34	37	98	195	703	1621	1624	1189	1207	1353	1419	1399	1360	1400	1421	1309	1065	766	503	442	301	149	19724
0165	Friday	S	104	56	59	40	91	235	681	1627	1621	1283	1271	1402	1405	1452	1496	1512	1515	1509	1195	922	698	522	413	252	21361
0165	Saturday	S	160	114	76	55	99	152	321	622	913	1085	1277	1412	1437	1400	1483	1311	1291	1168	1086	758	642	498	370	269	17959
0165	Sunday	S	186	99	80	60	99	168	316	279	790	788	1094	1115	1191	1218	1196	1081	1036	978	818	632	464	393	264	161	14506
0227	Thursday	N	39	24	20	16	30	77	186	382	464	598	669	698	588	543	627	658	692	675	534	377	256	167	156	87	8563
0227	Friday	N	61	48	20	16	61	76	181	393	484	624	735	723	671	627	618	678	656	701	508	354	285	236	171	148	9076
0227	Saturday	N	72	49	35	34	44	63	146	312	577	793	847	782	619	512	485	583	566	528	473	358	293	244	178	139	8732
0227	Sunday	N	99	51	27	22	28	58	112	216	451	698	686	781	711	627	600	556	548	488	369	345	208	137	99	81	7998
0227	Thursday	S	31	29	15	26	34	96	276	488	486	425	588	721	682	671	670	733	753	672	466	325	229	163	113	75	6747
0227	Friday	S	39	21	27	33	43	82	257	467	472	484	576	671	778	775	757	841	783	687	498	373	289	212	156	113	9434
0227	Saturday	S	65	43	22	24	30	52	89	202	351	508	706	854	937	826	753	740	665	555	516	325	238	188	157	82	8928
0227	Sunday	S	63	35	24	24	30	51	79	102	170	36	505	692	725	650	670	642	580	511	405	263	189	125	113	77	7091

Source: Florida Department of Transportation

Counter 0164 at MM 106 in Key Largo  
Counter 0165 in Stock Island  
Counter 0227 in Big Pine Key

# Attachment C

## CORSIM Runs for Model Calibration

ELAPSED TIME IS 1:15: 0 ( 4500 SECONDS), TIME PERIOD .2 ELAPSED TIME IS 3600 SECONDS

Calibration Seed 7581

LINK	VEHICLE MILES TRIPS		VEHICLE MINUTES		RATIO		MINUTES/MILE		SECONDS / VEHICLE			AVERAGE VALUES			
	MILES	TRIPS	MOVE TIME	DELAY TIME	TOTAL TIME	MOVE/TOTAL	DELAY/TOTAL	TOTAL TIME	DELAY TIME	CONTROL DELAY	QUEUE DELAY	STOP* TIME	STOPS (%)	VOL VPH	SPEED MPH
( 106, 1)	126.14	666	168.2	39.6	207.8	0.81	1.65	0.31	18.7	3.6	2.7	2.1	21	532	36.4
( 1, 106)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 1, 2)	131.46	731	175.3	20.4	195.7	0.90	1.49	0.16	16.0	1.7	0.0	0.0	0	584	40.3
( 2, 1)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 2, 3)	84.65	764	112.9	6.1	118.9	0.95	1.40	0.07	9.3	0.5	0.0	0.0	0	611	42.7
( 3, 2)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 3, 4)	550.63	829	734.2	30.0	764.2	0.96	1.39	0.05	55.0	2.2	0.1	0.0	0	663	43.2
( 4, 3)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 4, 5)	198.46	866	264.6	12.1	276.7	0.96	1.39	0.06	19.1	0.8	0.0	0.0	0	692	43.0
( 5, 4)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 5, 6)	283.18	898	377.6	17.6	395.2	0.96	1.40	0.06	26.3	1.2	0.1	0.0	0	718	43.0
( 6, 5)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 7, 6)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 7, 7)	111.88	923	149.2	8.1	157.2	0.95	1.41	0.07	10.2	0.5	0.0	0.0	0	738	42.7
( 7, 8)	152.04	950	202.7	74.0	276.7	0.73	1.82	0.49	17.5	4.7	3.5	2.5	22	760	33.0
( 8, 7)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 8, 9)	108.03	975	144.0	28.1	172.1	0.84	1.59	0.26	10.6	1.7	0.0	0.0	0	780	37.7
( 9, 8)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 9, 10)	260.58	997	347.4	20.8	368.3	0.94	1.41	0.08	22.0	1.2	0.1	0.0	0	797	42.5
( 10, 9)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 10, 11)	299.14	1019	398.9	23.3	422.2	0.94	1.41	0.08	24.8	1.4	0.1	0.0	0	815	42.5
( 11, 10)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 11, 12)	362.13	1042	482.8	30.3	513.2	0.94	1.42	0.08	29.5	1.7	0.1	0.0	0	833	42.3
( 12, 11)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 12, 13)	600.06	1074	800.1	45.2	845.2	0.95	1.41	0.08	46.9	2.5	0.1	0.0	0	859	42.6
( 13, 12)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 13, 14)	101.78	1108	135.7	10.8	146.5	0.93	1.44	0.11	7.9	0.6	0.0	0.0	0	886	41.7
( 14, 13)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 14, 15)	314.05	1176	418.7	28.6	447.4	0.94	1.42	0.09	22.8	1.5	0.0	0.0	0	940	42.1
( 15, 14)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 15, 16)	788.01	1206	1050.7	68.2	1118.9	0.94	1.42	0.09	55.3	3.4	0.2	0.0	0	964	42.3
( 16, 15)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 16, 17)	1011.85	1239	1349.1	103.3	1452.4	0.93	1.44	0.10	69.9	5.0	0.3	0.0	0	991	41.8
( 17, 16)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 17, 18)	324.39	1283	432.5	36.2	468.7	0.92	1.44	0.11	21.9	1.7	0.0	0.0	0	1026	41.5
( 18, 17)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 18, 19)	410.92	1327	547.9	43.8	591.7	0.93	1.44	0.11	26.7	2.0	0.1	0.0	0	1061	41.7
( 19, 18)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 19, 20)	681.12	1352	908.2	76.5	984.7	0.92	1.45	0.11	43.3	3.4	0.2	0.0	0	1081	41.5
( 20, 19)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 20, 21)	486.68	1389	648.9	60.7	709.6	0.91	1.46	0.12	30.6	2.6	0.1	0.0	0	1111	41.1
( 21, 20)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 21, 22)	130.00	1430	173.3	22.8	196.1	0.88	1.51	0.17	8.2	1.0	0.1	0.0	0	1144	39.8
( 22, 21)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 22, 23)	97.64	1473	130.2	58.5	188.7	0.69	1.93	0.60	7.7	2.4	1.0	0.3	2	1178	31.0

CUMULATIVE NETSIM STATISTICS AT TIME 9:15: 0

Calibration Seed 7581

ELAPSED TIME IS 2:15: 0 ( 8100 SECONDS), TIME PERIOD 3 ELAPSED TIME IS 3600 SECONDS

LINK	VEHICLE MILES TRIPS		VEHICLE MOVE		VEHICLE MINUTES		RATIO		MINUTES/MILE		TOTAL DELAY		SECONDS / VEHICLE		AVERAGE VALUES	
	MILES	TRIPS	MOVE TIME	DELAY TIME	TOTAL TIME	TOTAL TIME	TOTAL TIME	TOTAL TIME	DELAY TIME	DELAY TIME	DELAY TIME	CONTROL DELAY	QUEUE DELAY	STOP* TIME	STOPS (%)	VOL SPEED MPH
( 106, 1)	242.99	1283	324.0	77.2	401.2	0.81	1.65	0.32	18.7	3.6	2.9	2.3	2.2	20	570	36.3
( 1, 106)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 1, 2)	252.31	1403	336.4	39.6	376.0	0.89	1.49	0.16	16.1	1.7	0.0	0.0	0.0	0	623	40.3
( 2, 1)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 2, 3)	161.98	1462	216.0	11.7	227.6	0.95	1.41	0.07	9.3	0.5	0.0	0.0	0.0	0	649	42.7
( 3, 2)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 3, 4)	1049.44	1580	1399.3	59.2	1458.5	0.96	1.39	0.06	55.2	2.2	0.2	0.0	0.0	0	702	43.2
( 4, 3)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 4, 5)	375.60	1639	500.8	23.7	524.5	0.95	1.40	0.06	19.2	0.9	0.0	0.0	0.0	0	728	43.0
( 5, 4)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 5, 6)	536.39	1701	715.2	34.5	749.7	0.95	1.40	0.06	26.4	1.2	0.1	0.0	0.0	0	756	42.9
( 6, 5)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 7, 6)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 6, 7)	211.39	1744	281.9	16.1	298.0	0.95	1.41	0.08	10.2	0.6	0.0	0.0	0.0	0	775	42.6
( 7, 8)	286.15	1788	381.5	144.8	526.3	0.72	1.84	0.51	17.6	4.9	3.7	2.8	2.6	22	794	32.6
( 8, 7)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 8, 9)	202.64	1829	270.2	53.5	323.7	0.83	1.60	0.26	10.6	1.8	0.0	0.0	0.0	0	812	37.6
( 9, 8)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 9, 10)	490.06	1875	653.4	42.6	696.0	0.94	1.42	0.09	22.2	1.4	0.1	0.0	0.0	0	833	42.2
( 10, 9)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 10, 11)	562.46	1916	749.9	47.5	797.4	0.94	1.42	0.08	25.0	1.5	0.1	0.0	0.0	0	851	42.3
( 11, 10)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 11, 12)	680.13	1957	906.8	61.2	968.0	0.94	1.42	0.09	29.7	1.9	0.1	0.0	0.0	0	869	42.2
( 12, 11)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 12, 13)	1120.78	2006	1494.4	93.6	1587.9	0.94	1.42	0.08	47.3	2.8	0.1	0.0	0.0	0	891	42.3
( 13, 12)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 13, 14)	190.14	2070	253.5	22.0	275.5	0.92	1.45	0.12	8.0	0.6	0.0	0.0	0.0	0	920	41.4
( 14, 13)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 14, 15)	587.23	2199	783.0	58.5	841.5	0.93	1.43	0.10	22.9	1.6	0.1	0.0	0.0	0	977	41.9
( 15, 14)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 15, 16)	1476.05	2259	1968.1	140.6	2108.6	0.93	1.43	0.10	55.9	3.7	0.2	0.0	0.0	0	1004	42.0
( 16, 15)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 16, 17)	1893.85	2319	2525.1	203.6	2728.8	0.93	1.44	0.11	70.3	5.3	0.4	0.0	0.0	0	1030	41.6
( 17, 16)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 17, 18)	605.81	2396	807.7	74.6	882.3	0.92	1.46	0.12	22.1	1.9	0.1	0.0	0.0	0	1064	41.2
( 18, 17)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 18, 19)	766.10	2474	1021.5	93.1	1114.5	0.92	1.45	0.12	27.0	2.3	0.1	0.0	0.0	0	1099	41.2
( 19, 18)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 19, 20)	1276.09	2533	1701.5	161.9	1863.4	0.91	1.46	0.13	43.9	3.8	0.2	0.0	0.0	0	1125	41.1
( 20, 19)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 20, 21)	912.39	2604	1216.5	127.0	1343.6	0.91	1.47	0.14	30.9	2.9	0.1	0.0	0.0	0	1157	40.7
( 21, 20)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 21, 22)	243.64	2680	324.8	50.0	374.8	0.87	1.54	0.21	8.4	1.1	0.1	0.0	0.0	0	1191	39.0
( 22, 21)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 22, 23)	182.89	2759	243.9	140.7	384.5	0.63	2.10	0.77	8.4	3.1	1.3	0.6	0.4	2	1226	28.5

CUMULATIVE NETSIM STATISTICS AT TIME 10:15: 0

Calibration Seed 7581

ELAPSED TIME IS 3:15: 0 (11700 SECONDS), TIME PERIOD 4 ELAPSED TIME IS 3600 SECONDS

LINK	VEHICLE TRIPS		VEHICLE MINUTES		RATIO		MINUTES/MILE		SECONDS / VEHICLE			AVERAGE VALUES -				
	MILES	TRIPS	MOVE TIME	DELAY TIME	TOTAL MOVE TIME	TOTAL DELAY TIME	TOTAL TIME	DELAY TIME	TOTAL TIME	DELAY TIME	CONTROL DELAY	QUEUE DELAY	STOP* TIME	STOPS (%)	VOL VPH	SPEED MPH
( 106, 1)	346.40	1829	461.9	109.6	571.5	0.81	1.65	0.32	18.7	3.6	2.8	2.2	2.1	20	562	36.4
( 1, 106)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 1, 2)	360.21	2003	480.3	55.8	536.1	0.90	1.49	0.15	16.1	1.7	0.0	0.1	0.0	0	616	40.3
( 2, 1)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 2, 3)	231.56	2090	308.8	16.5	325.2	0.95	1.40	0.07	9.3	0.5	0.0	0.0	0.0	0	643	42.7
( 3, 2)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 3, 4)	1503.76	2264	2005.0	86.2	2091.2	0.96	1.39	0.06	55.3	2.3	0.2	0.0	0.0	0	696	43.1
( 4, 3)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 4, 5)	539.00	2352	718.7	35.9	754.6	0.95	1.40	0.07	19.2	0.9	0.0	0.0	0.0	0	723	42.9
( 5, 4)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 5, 6)	769.12	2439	1025.5	53.0	1078.5	0.95	1.40	0.07	26.5	1.3	0.1	0.0	0.0	0	750	42.8
( 6, 5)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 7, 6)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 6, 7)	303.39	2503	404.5	24.6	429.2	0.94	1.41	0.08	10.3	0.6	0.0	0.0	0.0	0	770	42.4
( 7, 8)	411.14	2569	548.2	211.7	759.9	0.72	1.85	0.51	17.7	4.9	3.7	2.8	2.6	22	790	32.5
( 8, 7)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 8, 9)	291.50	2631	388.7	78.7	467.3	0.83	1.60	0.27	10.7	1.8	0.0	0.0	0.0	0	809	37.4
( 9, 8)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 9, 10)	703.85	2693	938.5	64.3	1002.8	0.94	1.42	0.09	22.3	1.4	0.1	0.0	0.0	0	828	42.1
( 10, 9)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 10, 11)	809.64	2758	1079.5	69.6	1149.2	0.94	1.42	0.09	25.0	1.5	0.1	0.0	0.0	0	848	42.3
( 11, 10)	980.75	2822	1307.7	89.1	1396.8	0.94	1.42	0.09	29.7	1.9	0.1	0.0	0.0	0	868	42.1
( 12, 11)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 12, 13)	1611.33	2884	2148.4	136.2	2284.7	0.94	1.42	0.08	47.4	2.9	0.1	0.0	0.0	0	887	42.3
( 13, 12)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 13, 14)	273.46	2977	364.6	32.4	397.0	0.92	1.45	0.12	8.0	0.7	0.0	0.0	0.0	0	916	41.3
( 14, 13)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 14, 15)	844.66	3163	1126.2	86.2	1212.4	0.93	1.44	0.10	23.0	1.6	0.1	0.0	0.0	0	973	41.8
( 15, 14)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 15, 16)	2124.89	3252	2833.2	207.5	3040.6	0.93	1.43	0.10	55.9	3.8	0.2	0.0	0.0	0	1000	41.9
( 16, 15)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 16, 17)	2727.67	3340	3636.9	291.5	3928.4	0.93	1.44	0.11	70.4	5.2	0.4	0.0	0.0	0	1027	41.7
( 17, 16)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 17, 18)	872.81	3452	1163.7	104.3	1268.1	0.92	1.45	0.12	22.0	1.8	0.1	0.0	0.0	0	1062	41.3
( 18, 17)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 18, 19)	1104.86	3568	1473.2	130.2	1603.4	0.92	1.45	0.12	26.9	2.2	0.1	0.0	0.0	0	1097	41.3
( 19, 18)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 19, 20)	1850.41	3673	2467.2	228.3	2695.5	0.92	1.46	0.12	43.9	3.7	0.2	0.0	0.0	0	1130	41.2
( 20, 19)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 20, 21)	1325.13	3782	1766.8	175.9	1942.8	0.91	1.47	0.13	30.8	2.8	0.1	0.0	0.0	0	1163	40.9
( 21, 20)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 21, 22)	354.00	3894	472.0	70.6	542.6	0.87	1.53	0.20	8.4	1.1	0.1	0.0	0.0	0	1198	39.1
( 22, 21)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 22, 23)	265.81	4010	354.4	193.3	547.7	0.65	2.06	0.73	8.2	2.9	1.2	0.5	0.3	2	1233	29.1

LINK	VEHICLE MILES TRIPS		VEHICLE MINUTES		RATIO		MINUTES/MILE		TOTAL			SECONDS / VEHICLE			AVERAGE VALUES		
	MILES	TRIPS	MOVE	DELAY	TOTAL	MOVE/	TOTAL	DELAY	TIME	TIME	TIME	DELAY	CONTROL	QUEUE	STOP*	STOPS	DELAY
( 106, 1)	126.14	666	168.2	39.5	207.7	0.81	1.65	0.31	18.7	3.6	2.7	2.2	2.1	21	532	36.4	
( 1, 106)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 1, 2)	131.46	731	175.3	20.4	195.6	0.90	1.49	0.15	16.0	1.7	0.0	0.0	0.0	0	584	40.3	
( 2, 1)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 2, 3)	84.65	764	112.9	6.0	118.8	0.95	1.40	0.07	9.3	0.5	0.0	0.0	0.0	0	611	42.7	
( 3, 2)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 3, 4)	549.96	828	733.3	30.6	763.9	0.96	1.39	0.06	55.1	2.2	0.2	0.0	0.0	0	662	43.2	
( 4, 3)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 4, 5)	198.46	866	264.6	12.0	276.6	0.96	1.39	0.06	19.2	0.8	0.0	0.0	0.0	0	692	43.1	
( 5, 4)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 5, 6)	283.18	898	377.6	18.1	395.7	0.95	1.40	0.06	26.3	1.2	0.1	0.0	0.0	0	718	42.9	
( 6, 5)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 7, 6)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 7, 7)	111.88	923	149.2	7.9	157.1	0.95	1.40	0.07	10.2	0.5	0.0	0.0	0.0	0	738	42.7	
( 7, 8)	151.88	949	202.5	74.2	276.7	0.73	1.82	0.49	17.5	4.7	3.6	2.7	2.5	21	759	32.9	
( 8, 7)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 8, 9)	108.03	975	144.0	28.7	172.7	0.83	1.60	0.27	10.6	1.8	0.0	0.0	0.0	0	780	37.5	
( 9, 8)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 9, 10)	260.32	996	347.1	21.2	368.3	0.94	1.41	0.08	22.1	1.3	0.1	0.0	0.0	0	796	42.4	
( 10, 9)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 10, 11)	298.84	1018	398.5	23.4	421.8	0.94	1.41	0.08	24.8	1.4	0.0	0.0	0.0	0	814	42.5	
( 11, 10)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 11, 12)	362.48	1043	483.3	31.7	515.0	0.94	1.42	0.09	29.5	1.8	0.1	0.0	0.0	0	834	42.2	
( 12, 11)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 12, 13)	599.50	1073	799.3	48.9	848.2	0.94	1.41	0.08	47.1	2.7	0.1	0.0	0.0	0	858	42.4	
( 13, 12)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 13, 14)	101.78	1108	135.7	11.5	147.2	0.92	1.45	0.11	8.0	0.6	0.0	0.0	0.0	0	886	41.5	
( 14, 13)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 14, 15)	314.31	1177	419.1	29.3	448.4	0.93	1.43	0.09	22.8	1.5	0.0	0.0	0.0	0	941	42.1	
( 15, 14)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 15, 16)	785.40	1202	1047.2	71.1	1118.3	0.94	1.42	0.09	55.4	3.6	0.2	0.0	0.0	0	961	42.1	
( 16, 15)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 16, 17)	1010.22	1237	1347.0	109.6	1456.6	0.92	1.44	0.11	70.4	5.3	0.3	0.0	0.0	0	989	41.6	
( 17, 16)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 17, 18)	324.39	1283	432.5	36.2	468.8	0.92	1.44	0.11	21.9	1.7	0.1	0.0	0.0	0	1026	41.5	
( 18, 17)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 18, 19)	411.23	1328	548.3	45.7	594.0	0.92	1.44	0.11	26.8	2.1	0.1	0.0	0.0	0	1062	41.5	
( 19, 18)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 19, 20)	682.13	1354	909.5	81.9	991.4	0.92	1.45	0.12	43.5	3.6	0.2	0.0	0.0	0	1083	41.3	
( 20, 19)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 20, 21)	487.38	1391	649.8	63.1	713.0	0.91	1.46	0.13	30.7	2.7	0.1	0.0	0.0	0	1112	41.0	
( 21, 20)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 21, 22)	130.18	1432	173.6	22.4	196.0	0.89	1.51	0.17	8.2	0.9	0.0	0.0	0.0	0	1145	39.9	
( 22, 21)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 22, 23)	97.64	1473	130.2	61.3	191.5	0.68	1.96	0.63	7.8	2.5	1.2	0.5	0.3	2	1178	30.6	



LINK	VEHICLE MILES TRIPS		VEHICLE MINUTES		RATIO		MINUTES/MILE		SECONDS / VEHICLE			AVERAGE VALUES							
	VEHICLE	MOVE	VEHICLE	MOVE	TOTAL	MOVE/	TOTAL	DELAY	DELAY	CONTROL	QUEUE	STOP*	STOPS	DELAY	STOP	DELAY	STOP	DELAY	STOP
		TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME
( 106, 1)	242.99	1283	324.0	77.1	401.1	0.81	1.65	0.32	18.7	3.6	2.8	2.3	2.2	20	570	36.3			
( 1, 106)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0			
( 1, 2)	252.31	1403	336.4	39.7	376.1	0.89	1.49	0.16	16.1	1.7	0.0	0.0	0.0	0	623	40.3			
( 2, 1)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0			
( 2, 3)	161.98	1462	216.0	11.7	227.6	0.95	1.41	0.07	9.3	0.5	0.0	0.0	0.0	0	649	42.7			
( 3, 2)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0			
( 3, 4)	1049.44	1580	1399.3	60.8	1460.1	0.96	1.39	0.06	55.3	2.3	0.2	0.0	0.0	0	702	43.1			
( 4, 3)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0			
( 4, 5)	375.60	1639	500.8	24.0	524.8	0.95	1.40	0.06	19.2	0.9	0.0	0.0	0.0	0	728	42.9			
( 5, 4)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0			
( 5, 6)	536.39	1701	715.2	36.0	751.2	0.95	1.40	0.07	26.5	1.3	0.1	0.0	0.0	0	756	42.8			
( 6, 5)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0			
( 7, 6)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0			
( 6, 7)	211.39	1744	281.9	16.2	298.1	0.95	1.41	0.08	10.2	0.6	0.0	0.0	0.0	0	775	42.6			
( 7, 8)	285.67	1785	380.9	142.8	523.7	0.73	1.83	0.50	17.6	4.8	3.6	2.7	2.6	22	793	32.7			
( 8, 7)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0			
( 8, 9)	202.64	1829	270.2	54.0	324.2	0.83	1.60	0.27	10.6	1.8	0.0	0.0	0.0	0	812	37.5			
( 9, 8)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0			
( 9, 10)	490.06	1875	653.4	43.6	697.0	0.94	1.42	0.09	22.3	1.4	0.1	0.0	0.0	0	833	42.2			
( 10, 9)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0			
( 10, 11)	562.17	1915	749.6	48.9	798.4	0.94	1.42	0.09	25.0	1.5	0.1	0.0	0.0	0	851	42.2			
( 11, 10)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0			
( 11, 12)	679.78	1956	906.4	64.2	970.6	0.93	1.43	0.09	29.8	2.0	0.1	0.0	0.0	0	869	42.0			
( 12, 11)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0			
( 12, 13)	1120.78	2006	1494.4	99.1	1593.5	0.94	1.42	0.09	47.5	3.0	0.2	0.0	0.0	0	891	42.2			
( 13, 12)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0			
( 13, 14)	190.14	2070	253.5	22.4	275.9	0.92	1.45	0.12	8.0	0.6	0.0	0.0	0.0	0	920	41.4			
( 14, 13)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0			
( 14, 15)	587.23	2199	783.0	58.4	841.3	0.93	1.43	0.10	22.9	1.6	0.1	0.0	0.0	0	977	41.9			
( 15, 14)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0			
( 15, 16)	1475.40	2258	1967.2	142.8	2110.0	0.93	1.43	0.10	55.9	3.8	0.2	0.0	0.0	0	1003	42.0			
( 16, 15)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0			
( 16, 17)	1890.58	2315	2520.8	201.7	2722.5	0.93	1.44	0.11	70.3	5.2	0.3	0.0	0.0	0	1028	41.7			
( 17, 16)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0			
( 17, 18)	605.55	2395	807.4	70.1	877.5	0.92	1.45	0.12	22.0	1.8	0.1	0.0	0.0	0	1064	41.4			
( 18, 17)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0			
( 18, 19)	764.24	2468	1019.0	89.5	1108.5	0.92	1.45	0.12	26.9	2.2	0.1	0.0	0.0	0	1096	41.4			
( 19, 18)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0			
( 19, 20)	1276.60	2534	1702.1	156.4	1858.5	0.92	1.46	0.12	43.8	3.7	0.2	0.0	0.0	0	1126	41.2			
( 20, 19)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0			
( 20, 21)	912.04	2603	1216.0	119.9	1335.9	0.91	1.46	0.13	30.7	2.8	0.1	0.0	0.0	0	1156	41.0			
( 21, 20)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0			
( 21, 22)	243.64	2660	324.8	44.2	369.1	0.88	1.51	0.18	8.3	1.0	0.1	0.0	0.0	0	1191	39.6			
( 22, 21)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0			
( 22, 23)	182.76	2757	243.7	115.6	359.3	0.68	1.97	0.63	7.8	2.5	1.1	0.5	0.3	2	1225	30.5			

CUMULATIVE NETSIM STATISTICS AT TIME 10:15: 0

ELAPSED TIME IS 3:15: 0 (11700 SECONDS), TIME PERIOD 4 ELAPSED TIME IS 3600 SECONDS

Calibration Seed 1359

LINK	VEHICLE MILES TRIPS		VEHICLE MOVE		VEHICLE MINUTES		RATIO		MINUTES/MILE		TOTAL DELAY		SECONDS / VEHICLE		STOP* STOPS		AVERAGE VALUES -		
			TIME	TIME	TIME	TIME	TOTAL	TOTAL	TOTAL	TIME	TIME	TIME	TIME	DELAY	CONTROL	QUEUE	TIME	(%)	VPH
( 106, 1)	346.40	1829	461.9	109.5	571.4	0.81	0.81	1.65	0.32	18.7	3.6	2.8	2.2	2.1	20	562	36.4		
( 1, 106)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 1, 2)	360.21	2003	480.3	55.9	536.2	0.90	0.90	1.49	0.16	16.1	1.7	0.0	0.0	0.0	0	616	40.3		
( 2, 1)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 2, 3)	231.56	2090	308.8	16.4	325.2	0.95	0.95	1.40	0.07	9.3	0.5	0.0	0.0	0.0	0	643	42.7		
( 3, 2)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 3, 4)	1503.76	2264	2005.0	87.6	2092.6	0.96	0.96	1.39	0.06	55.3	2.3	0.2	0.0	0.0	0	696	43.1		
( 4, 3)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 4, 5)	539.23	2353	719.0	36.2	755.2	0.95	0.95	1.40	0.07	19.2	0.9	0.0	0.0	0.0	0	724	42.8		
( 5, 4)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 5, 6)	769.12	2439	1025.5	54.3	1079.8	0.95	0.95	1.40	0.07	26.5	1.3	0.1	0.0	0.0	0	750	42.7		
( 6, 5)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 7, 6)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 6, 7)	303.39	2503	404.5	24.7	429.3	0.94	0.94	1.41	0.08	10.3	0.6	0.0	0.0	0.0	0	770	42.4		
( 7, 8)	410.98	2568	548.0	209.7	757.7	0.72	0.72	1.84	0.51	17.7	4.9	3.7	2.8	2.6	22	790	32.5		
( 8, 7)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 8, 9)	291.61	2632	388.8	79.7	468.5	0.83	0.83	1.61	0.27	10.7	1.8	0.0	0.0	0.0	0	809	37.3		
( 9, 8)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 9, 10)	703.59	2692	938.1	64.3	1002.5	0.94	0.94	1.42	0.09	22.3	1.4	0.1	0.0	0.0	0	828	42.1		
( 10, 9)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 10, 11)	809.35	2757	1079.1	70.7	1149.8	0.94	0.94	1.42	0.09	25.0	1.5	0.1	0.0	0.0	0	848	42.2		
( 11, 10)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 11, 12)	980.75	2822	1307.7	92.8	1400.5	0.93	0.93	1.43	0.09	29.7	2.0	0.1	0.0	0.0	0	868	42.0		
( 12, 11)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 12, 13)	1611.33	2884	2148.4	143.4	2291.9	0.94	0.94	1.42	0.09	47.5	3.0	0.1	0.0	0.0	0	887	42.2		
( 13, 12)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 13, 14)	273.46	2977	364.6	32.4	397.0	0.92	0.92	1.45	0.12	8.0	0.7	0.0	0.0	0.0	0	916	41.3		
( 14, 13)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 14, 15)	844.66	3163	1126.2	86.1	1212.3	0.93	0.93	1.44	0.10	23.0	1.6	0.1	0.0	0.0	0	973	41.8		
( 15, 14)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 15, 16)	2125.54	3253	2834.1	208.4	3042.4	0.93	0.93	1.43	0.10	56.0	3.8	0.2	0.0	0.0	0	1000	41.9		
( 16, 15)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 16, 17)	2723.58	3335	3631.4	292.5	3923.9	0.93	0.93	1.44	0.11	70.4	5.2	0.4	0.0	0.0	0	1026	41.6		
( 17, 16)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 17, 18)	872.81	3452	1163.7	98.4	1262.2	0.92	0.92	1.45	0.11	21.9	1.7	0.1	0.0	0.0	0	1062	41.5		
( 18, 17)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 18, 19)	1104.86	3568	1473.2	127.1	1600.3	0.92	0.92	1.45	0.12	26.9	2.1	0.1	0.0	0.0	0	1097	41.4		
( 19, 18)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 19, 20)	1850.92	3674	2467.9	223.9	2691.8	0.92	0.92	1.45	0.12	43.9	3.7	0.2	0.0	0.0	0	1130	41.3		
( 20, 19)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 20, 21)	1326.18	3785	1768.2	173.0	1941.3	0.91	0.91	1.46	0.13	30.8	2.7	0.1	0.0	0.0	0	1164	41.0		
( 21, 20)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 21, 22)	354.18	3896	472.2	66.2	538.4	0.88	0.88	1.52	0.19	8.3	1.0	0.1	0.0	0.0	0	1198	39.5		
( 22, 21)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 22, 23)	265.88	4011	354.5	170.6	525.1	0.68	0.68	1.97	0.64	7.9	2.6	1.1	0.5	0.3	2	1234	30.4		

LINK	VEHICLE		VEHICLE MINUTES		RATIO		MINUTES/MILE		SECONDS / VEHICLE			AVERAGE VALUES				
	MILES	TRIPS	MOVE	DELAY	TOTAL	MOVE	TOTAL	TOTAL	DELAY	CONTROL	QUEUE	STOP*	STOPS	VOL	SPEED	
			TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	DELAY	TIME	TIME	(%)	VPH	MPH
( 106, 1)	126.14	666	168.2	39.5	207.7	0.81	1.65	0.31	18.7	3.6	2.7	2.2	2.1	21	532	36.4
( 1, 106)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 1, 2)	131.46	731	175.3	20.4	195.6	0.90	1.49	0.15	16.0	1.7	0.0	0.0	0.0	0	584	40.3
( 2, 1)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 2, 3)	84.65	764	112.9	5.9	118.8	0.95	1.40	0.07	9.3	0.5	0.0	0.0	0.0	0	611	42.8
( 3, 2)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 3, 4)	550.63	829	734.2	30.2	764.3	0.96	1.39	0.05	55.0	2.2	0.1	0.0	0.0	0	663	43.2
( 4, 3)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 4, 5)	198.23	865	264.3	11.7	276.0	0.96	1.39	0.06	19.1	0.8	0.0	0.0	0.0	0	692	43.1
( 5, 4)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 5, 6)	283.18	898	377.6	17.7	395.2	0.96	1.40	0.06	26.3	1.2	0.1	0.0	0.0	0	718	43.0
( 6, 5)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 7, 6)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 6, 7)	111.88	923	149.2	7.8	157.0	0.95	1.40	0.07	10.2	0.5	0.0	0.0	0.0	0	738	42.8
( 7, 8)	151.88	949	202.5	73.1	275.6	0.73	1.81	0.48	17.4	4.6	3.5	2.7	2.5	21	759	33.1
( 8, 7)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 8, 9)	108.03	975	144.0	28.4	172.5	0.84	1.60	0.26	10.6	1.7	0.0	0.0	0.0	0	780	37.6
( 9, 8)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 9, 10)	260.32	996	347.1	21.2	368.2	0.94	1.41	0.08	22.1	1.3	0.1	0.0	0.0	0	796	42.4
( 10, 9)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 10, 11)	299.73	1021	399.6	23.7	423.4	0.94	1.41	0.08	24.8	1.4	0.1	0.0	0.0	0	816	42.5
( 11, 10)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 11, 12)	362.13	1042	482.8	34.5	517.3	0.93	1.43	0.10	29.7	2.0	0.1	0.0	0.0	0	833	42.0
( 12, 11)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 12, 13)	599.50	1073	799.3	52.2	851.5	0.94	1.42	0.09	47.3	2.9	0.1	0.0	0.0	0	858	42.2
( 13, 12)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 13, 14)	101.78	1108	135.7	12.7	148.4	0.91	1.46	0.12	8.0	0.7	0.0	0.0	0.0	0	886	41.2
( 14, 13)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 14, 15)	314.31	1177	419.1	34.0	453.1	0.92	1.44	0.11	23.0	1.7	0.0	0.0	0.0	0	941	41.6
( 15, 14)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 15, 16)	786.05	1203	1048.1	81.7	1129.8	0.93	1.44	0.10	56.0	4.1	0.2	0.0	0.0	0	962	41.7
( 16, 15)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 16, 17)	1011.85	1239	1349.1	113.3	1462.5	0.92	1.45	0.11	70.5	5.5	0.3	0.0	0.0	0	991	41.5
( 17, 16)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 17, 18)	324.39	1283	432.5	38.4	470.9	0.92	1.45	0.12	22.0	1.8	0.0	0.0	0.0	0	1026	41.3
( 18, 17)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 18, 19)	410.61	1326	547.5	50.2	597.6	0.92	1.46	0.12	27.0	2.3	0.1	0.0	0.0	0	1060	41.2
( 19, 18)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 19, 20)	681.12	1352	908.2	84.5	992.7	0.91	1.46	0.12	43.7	3.7	0.2	0.0	0.0	0	1081	41.2
( 20, 19)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 20, 21)	486.68	1389	648.9	63.8	712.7	0.91	1.46	0.13	30.7	2.8	0.1	0.0	0.0	0	1111	41.0
( 21, 20)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 21, 22)	130.18	1432	173.6	24.1	197.6	0.88	1.52	0.18	8.3	1.0	0.1	0.0	0.0	0	1145	39.5
( 22, 21)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 22, 23)	97.58	1472	130.1	65.9	196.0	0.66	2.01	0.68	8.0	2.7	1.2	0.6	0.4	2	1177	29.9

LINK	VEHICLE		VEHICLE MINUTES		RATIO		MINUTES/MILE		SECONDS / VEHICLE			AVERAGE VALUES -				
	MILES TRAPS	MOVE TIME	DELAY TIME	TOTAL TIME	TOTAL MOVE/TIME	TOTAL	DELAY TIME	TOTAL TIME	TOTAL TIME	DELAY TIME	CONTROL DELAY	QUEUE DELAY	STOP* TIME	STOPS (%)	VOL SPREAD VPH	
( 106, 1)	242.99	1283	324.0	77.1	401.1	0.81	1.65	0.32	18.7	3.6	2.9	2.3	2.2	20	570	36.3
( 1, 106)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 1, 2)	252.31	1403	336.4	39.6	376.0	0.89	1.49	0.16	16.1	1.7	0.0	0.0	0.0	0	623	40.3
( 2, 1)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 2, 3)	161.98	1462	216.0	11.5	227.4	0.95	1.40	0.07	9.3	0.5	0.0	0.0	0.0	0	649	42.7
( 3, 2)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 3, 4)	1049.44	1580	1399.3	60.6	1459.8	0.96	1.39	0.06	55.3	2.3	0.2	0.0	0.0	0	702	43.1
( 4, 3)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 4, 5)	375.38	1638	500.5	23.1	523.6	0.96	1.39	0.06	19.1	0.9	0.0	0.0	0.0	0	728	43.0
( 5, 4)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 5, 6)	536.39	1701	715.2	35.1	750.3	0.95	1.40	0.07	26.4	1.2	0.1	0.0	0.0	0	756	42.9
( 6, 5)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 7, 6)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 6, 7)	211.39	1744	281.9	16.0	297.9	0.95	1.41	0.08	10.2	0.6	0.0	0.0	0.0	0	775	42.6
( 7, 8)	285.99	1787	381.3	139.1	520.5	0.73	1.82	0.49	17.5	4.7	3.5	2.6	2.5	21	794	33.0
( 8, 7)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 8, 9)	202.53	1628	270.0	53.0	323.0	0.84	1.60	0.26	10.6	1.7	0.0	0.0	0.0	0	812	37.6
( 9, 8)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 9, 10)	490.06	1875	653.4	42.7	696.1	0.94	1.42	0.09	22.3	1.4	0.1	0.0	0.0	0	833	42.2
( 10, 9)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 10, 11)	563.05	1918	750.7	48.6	799.3	0.94	1.42	0.09	25.0	1.5	0.0	0.0	0.0	0	852	42.3
( 11, 10)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 11, 12)	679.09	1954	905.5	66.5	972.0	0.93	1.43	0.10	29.8	2.1	0.1	0.0	0.0	0	868	41.9
( 12, 11)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 12, 13)	1120.78	2006	1494.4	103.0	1597.4	0.94	1.43	0.09	47.7	3.1	0.2	0.0	0.0	0	891	42.1
( 13, 12)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 13, 14)	190.14	2070	253.5	23.8	277.4	0.91	1.46	0.13	8.0	0.7	0.0	0.0	0.0	0	920	41.1
( 14, 13)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 14, 15)	587.23	2199	783.0	63.4	846.3	0.93	1.44	0.11	23.1	1.7	0.1	0.0	0.0	0	977	41.6
( 15, 14)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 15, 16)	1474.74	2257	1966.3	152.8	2119.1	0.93	1.44	0.10	56.2	4.1	0.2	0.0	0.0	0	1003	41.8
( 16, 15)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 16, 17)	1893.85	2319	2525.1	213.6	2738.8	0.92	1.45	0.11	70.6	5.5	0.4	0.0	0.0	0	1030	41.5
( 17, 16)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 17, 18)	606.06	2397	808.1	75.2	883.3	0.91	1.46	0.12	22.1	1.9	0.1	0.0	0.0	0	1065	41.2
( 18, 17)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 18, 19)	765.17	2471	1020.2	98.0	1118.2	0.91	1.46	0.13	27.1	2.4	0.1	0.0	0.0	0	1098	41.1
( 19, 18)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 19, 20)	1276.60	2534	1702.1	167.8	1869.9	0.91	1.46	0.13	44.0	3.9	0.2	0.0	0.0	0	1126	41.0
( 20, 19)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 20, 21)	911.34	2601	1215.1	124.0	1339.1	0.91	1.47	0.14	30.8	2.9	0.1	0.0	0.0	0	1156	40.8
( 21, 20)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 21, 22)	243.55	2679	324.7	48.0	372.7	0.87	1.53	0.20	8.3	1.1	0.1	0.0	0.0	0	1190	39.2
( 22, 21)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 22, 23)	182.76	2757	243.7	130.6	374.3	0.65	2.05	0.71	8.1	2.8	1.3	0.6	0.4	2	1225	29.3

CUMULATIVE NETSIM STATISTICS AT TIME 10:15: 0

ELAPSED TIME IS 3:15: 0 (11700 SECONDS), TIME PERIOD 4 ELAPSED TIME IS 3600 SECONDS

Calibration Seed 9823

LINK	VEHICLE			VEHICLE MINUTES			RATIO		MINUTES/MILE			SECONDS / VEHICLE			AVERAGE VALUES -		
	MILES	TRIPS	TRIP	MOVE	DELAY	TOTAL	TIME	TOTAL	TOTAL	TIME	DELAY	CONTROL	QUEUE	STOP*	STOPS	VOL	SPEED
			TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	DELAY	DELAY	TIME	(%)	VPH	MPH
( 106, 1)	346.40	1829	461.9	109.5	571.4	0.81	1.65	0.32	18.7	3.6	2.8	2.2	2.1	20	562	36.4	
( 1, 106)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 1, 2)	360.21	2003	480.3	55.8	536.0	0.90	1.49	0.15	16.0	1.7	0.0	0.0	0.0	0	616	40.3	
( 2, 1)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 2, 3)	231.56	2090	308.8	16.1	324.9	0.95	1.40	0.07	9.3	0.5	0.0	0.0	0.0	0	643	42.8	
( 3, 4)	1503.76	2264	2005.0	87.5	2092.5	0.96	1.39	0.06	55.3	2.3	0.2	0.0	0.0	0	696	43.1	
( 4, 3)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 4, 5)	538.77	2351	718.4	35.1	753.5	0.95	1.40	0.07	19.2	0.9	0.0	0.0	0.0	0	723	42.9	
( 5, 4)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 5, 6)	769.12	2439	1025.5	53.9	1079.4	0.95	1.40	0.07	26.5	1.3	0.1	0.0	0.0	0	750	42.8	
( 6, 5)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 7, 6)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 6, 7)	303.39	2503	404.5	24.6	429.1	0.94	1.41	0.08	10.3	0.6	0.0	0.0	0.0	0	770	42.4	
( 7, 8)	410.98	2568	548.0	205.4	753.4	0.73	1.83	0.50	17.6	4.8	3.6	2.7	2.5	22	790	32.7	
( 8, 7)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 8, 9)	291.72	2633	389.0	77.9	466.9	0.83	1.60	0.27	10.6	1.8	0.0	0.0	0.0	0	810	37.5	
( 9, 8)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 9, 10)	703.59	2692	938.1	64.1	1002.2	0.94	1.42	0.09	22.3	1.4	0.1	0.0	0.0	0	828	42.1	
( 10, 9)	810.23	2760	1080.3	71.8	1152.1	0.94	1.42	0.09	25.0	1.6	0.1	0.0	0.0	0	849	42.2	
( 11, 10)	980.75	2822	1307.7	96.4	1404.0	0.93	1.43	0.10	29.8	2.0	0.1	0.0	0.0	0	868	41.9	
( 12, 11)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 12, 13)	1612.44	2886	2149.9	149.2	2299.1	0.94	1.43	0.09	47.7	3.1	0.2	0.0	0.0	0	888	42.1	
( 13, 12)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 13, 14)	273.36	2976	364.5	34.7	399.1	0.91	1.46	0.13	8.0	0.7	0.0	0.0	0.0	0	915	41.1	
( 14, 13)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 14, 15)	844.66	3163	1126.2	92.7	1218.9	0.92	1.44	0.11	23.1	1.8	0.1	0.0	0.0	0	973	41.6	
( 15, 14)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 15, 16)	2124.89	3252	2833.2	222.4	3055.6	0.93	1.44	0.10	56.2	4.1	0.2	0.0	0.0	0	1000	41.7	
( 16, 15)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 16, 17)	2725.22	3337	3633.6	307.2	3940.9	0.92	1.45	0.11	70.7	5.5	0.3	0.0	0.0	0	1026	41.5	
( 17, 16)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 17, 18)	872.81	3452	1163.7	105.4	1269.2	0.92	1.45	0.12	22.0	1.8	0.1	0.0	0.0	0	1062	41.3	
( 18, 17)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 18, 19)	1104.86	3568	1473.2	137.4	1610.5	0.91	1.46	0.12	27.1	2.3	0.1	0.0	0.0	0	1097	41.2	
( 19, 18)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 19, 20)	1840.84	3654	2454.5	230.6	2685.1	0.91	1.46	0.13	43.9	3.8	0.2	0.0	0.0	0	1124	41.1	
( 20, 19)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 20, 21)	1319.88	3767	1759.8	172.0	1931.8	0.91	1.46	0.13	30.8	2.7	0.1	0.0	0.0	0	1159	41.0	
( 21, 20)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 21, 22)	353.00	3883	470.7	69.4	540.1	0.87	1.53	0.20	8.3	1.1	0.1	0.0	0.0	0	1194	39.2	
( 22, 21)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 22, 23)	265.02	3998	353.4	186.2	539.5	0.65	2.04	0.70	8.1	2.8	1.2	0.5	0.3	2	1230	29.5	

# Attachment D

## CORSIM Runs – Two Hurricane Evacuation Scenarios

No Incident Scenario

ELAPSED TIME IS 3:15:0 (11700 SECONDS), TIME PERIOD 4 ELAPSED TIME IS 3600 SECONDS

LINK	VEHICLE MILES TRIPS		VEHICLE MINUTES		RATIO		MINUTES/MILE		TOTAL DELAY		SECONDS / VEHICLE		STOP* STOP		AVERAGE VALUES	
	MILES	TRIPS	MOVE TIME	DELAY TIME	TOTAL TIME	MOVE/TOTAL	DELAY/TOTAL	TOTAL TIME	DELAY TIME	TIME	DELAY	CONTROL	QUEUE	DELAY	TIME	(%)
( 106, 1)	1693.75	8943	2258.3	3438.8	5697.1	0.40	3.36	2.03	38.3	23.2	11.9	8.3	6.8	47	2751	17.8
( 1, 106)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 1, 2)	1632.27	9073	2176.4	2124.9	4301.2	0.51	2.64	1.30	28.5	14.1	5.9	1.1	0.3	7	2791	22.8
( 2, 1)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 2, 3)	1008.02	9098	1344.0	2061.1	3405.1	0.39	3.38	2.04	22.5	13.6	1.3	1.7	0.3	7	2799	17.8
( 3, 2)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 3, 4)	5973.86	8994	7965.1	15301.1	23266.2	0.34	3.89	2.56	154.9	102.5	23.5	12.3	2.3	21	2767	15.4
( 4, 3)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 4, 5)	2056.31	8973	2741.8	6686.3	9428.0	0.29	4.58	3.25	62.9	44.6	6.1	6.5	1.9	22	2760	13.1
( 5, 4)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 5, 6)	2811.58	8916	3748.8	10132.5	13881.3	0.27	4.94	3.60	93.0	68.0	12.3	12.6	5.8	41	2743	12.2
( 6, 5)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 7, 6)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 6, 7)	1080.73	8916	1441.0	4147.7	5588.7	0.26	5.17	3.84	37.6	27.9	6.7	7.0	4.5	42	2743	11.6
( 7, 8)	1422.26	8887	1896.3	5844.3	7740.6	0.24	5.44	4.11	52.1	39.4	15.6	14.4	11.9	71	2734	11.0
( 8, 7)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 8, 9)	990.51	8940	1320.7	523.0	1843.6	0.72	1.86	0.53	12.4	3.5	0.0	0.0	0.0	0	2750	32.2
( 9, 8)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 9, 10)	2352.80	9002	3137.1	644.3	3781.4	0.83	1.61	0.27	25.2	4.3	0.3	0.0	0.0	0	2769	37.3
( 10, 11)	2652.91	9037	3537.2	813.1	4350.3	0.81	1.64	0.31	28.8	5.4	0.2	0.0	0.0	0	2780	36.6
( 11, 10)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 11, 12)	3151.47	9068	4202.0	985.1	5187.0	0.81	1.65	0.31	34.3	6.5	0.2	0.0	0.0	0	2790	36.5
( 12, 11)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 12, 13)	5093.22	9116	6791.0	1636.4	8427.3	0.81	1.65	0.32	55.4	10.8	0.6	0.0	0.0	0	2804	36.3
( 13, 12)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 13, 14)	844.52	9195	1126.2	293.1	1419.2	0.79	1.68	0.35	9.3	1.9	0.0	0.0	0.0	0	2829	35.7
( 14, 13)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 14, 15)	2500.61	9364	3334.2	816.1	4150.2	0.80	1.66	0.33	26.6	5.2	0.2	0.0	0.0	0	2881	36.2
( 15, 14)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 15, 16)	6150.54	9413	8200.7	2076.7	10277.5	0.80	1.67	0.34	65.3	13.2	0.6	0.0	0.0	0	2896	35.9
( 16, 15)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 16, 17)	7704.43	9434	10272.6	2607.0	12879.6	0.80	1.67	0.34	81.6	16.5	0.9	0.0	0.0	0	2902	35.9
( 17, 16)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 17, 18)	2411.34	9537	3215.1	813.1	4028.2	0.80	1.67	0.34	25.3	5.1	0.2	0.0	0.0	0	2934	35.9
( 18, 17)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 18, 19)	2982.02	9630	3976.0	1012.4	4988.4	0.80	1.67	0.34	31.0	6.3	0.2	0.0	0.0	0	2963	35.9
( 19, 18)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 19, 20)	4892.28	9711	6523.0	1697.6	8220.6	0.79	1.68	0.35	50.7	10.5	0.6	0.0	0.0	0	2988	35.7
( 20, 19)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 20, 21)	3435.81	9806	4581.1	2977.4	7558.5	0.61	2.20	0.87	46.2	18.2	7.8	0.3	0.2	2	3017	27.3
( 21, 20)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 21, 22)	900.64	9907	1200.8	1958.6	3159.4	0.38	3.51	2.17	19.1	11.8	2.2	0.7	0.3	7	3048	17.1
( 22, 21)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 22, 23)	660.76	9968	881.0	1812.1	2693.1	0.33	4.08	2.74	16.2	10.9	2.5	1.8	0.9	6	3067	14.7

No Incident Scenario

ELAPSED TIME IS 3:15:0 (11700 SECONDS), TIME PERIOD 4 ELAPSED TIME IS 3600 SECONDS

LINK	VEHICLE MILES TRIPS		VEHICLE MINUTES		RATIO		MINUTES/MILE		TOTAL DELAY		TOTAL TIME		SECONDS / VEHICLE		STOP* STOP		AVERAGE VALUES		
	MILES	TRIPS	MOVE	DELAY	TOTAL	MOVE/	TOTAL	DELAY	TIME	DELAY	TIME	TIME	DELAY	CONTROL	QUEUE	TIME	TIME	(%)	VPK
( 106, 1)	1450.57	7659	1934.1	7877.0	9811.1	0.20	0.00	6.76	5.43	76.7	61.6	24.1	29.5	22.8	72	2356	8.9		
( 1, 106)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 1, 2)	1398.73	7775	1865.0	6788.6	8653.6	0.22	6.19	4.85	4.85	66.7	52.4	22.1	19.5	10.3	55	2392	9.7		
( 2, 1)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 2, 3)	860.22	7764	1147.0	4695.9	5842.9	0.20	6.79	5.46	5.46	45.1	36.2	8.8	14.3	6.6	52	2388	8.8		
( 3, 2)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 3, 4)	5039.32	7587	6719.1	30376.9	37096.0	0.18	7.36	6.03	6.03	290.4	238.1	60.4	97.6	38.7	71	2334	8.2		
( 4, 3)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 4, 5)	1726.77	7535	2302.4	11171.2	13473.5	0.17	7.80	6.47	6.47	106.8	88.6	21.2	35.0	16.6	70	2318	7.7		
( 5, 4)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 5, 6)	2354.02	7465	3138.7	15759.3	18898.0	0.17	8.03	6.69	6.69	150.9	125.9	33.5	51.8	29.1	79	2296	7.5		
( 6, 5)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 6, 7)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 6, 7)	904.36	7461	1205.8	6024.1	7230.0	0.17	7.99	6.66	6.66	57.9	48.3	17.9	20.7	15.3	80	2295	7.5		
( 7, 8)	1187.48	7420	1583.3	8009.5	9592.8	0.17	8.08	6.74	6.74	77.3	64.5	27.9	30.3	24.7	88	2283	7.4		
( 8, 7)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 8, 9)	825.54	7451	1100.7	4880.4	5981.1	0.18	7.25	5.91	5.91	48.1	39.2	15.7	13.3	6.6	66	2292	8.3		
( 9, 8)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 9, 10)	1925.20	7366	2566.9	14240.7	16807.7	0.15	8.73	7.40	7.40	136.1	115.3	25.1	44.0	17.7	84	2266	6.9		
( 10, 9)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 10, 11)	2131.54	7261	2842.1	16724.1	19556.2	0.15	9.18	7.85	7.85	160.6	137.3	26.8	53.7	17.3	84	2234	6.5		
( 11, 10)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 11, 12)	2497.41	7186	14651.5	6491.2	21142.6	0.69	8.47	2.60	2.60	175.2	53.8	2.4	18.3	0.5	4	2211	7.1		
( 12, 11)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 12, 13)	3929.42	7033	23052.6	8703.4	31756.0	0.73	8.08	2.21	2.21	267.4	73.3	3.6	14.8	0.1	0	2164	7.4		
( 13, 12)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 13, 14)	653.46	7114	871.3	486.8	1358.1	0.64	2.08	0.74	0.74	11.4	4.1	0.0	0.0	0.0	0	2188	28.9		
( 14, 13)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 14, 15)	1944.89	7283	2593.2	323.6	2916.8	0.89	1.50	0.17	0.17	24.0	2.7	0.3	0.0	0.0	0	2240	40.0		
( 15, 14)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 15, 16)	4791.45	7333	6388.6	1158.1	7546.7	0.85	1.58	0.24	0.24	61.6	9.5	0.9	0.0	0.0	0	2256	38.1		
( 16, 15)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 16, 17)	6018.83	7370	8025.1	1686.6	9711.8	0.83	1.61	0.28	0.28	78.8	13.7	1.0	0.0	0.0	0	2267	37.2		
( 17, 16)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 17, 18)	1887.96	7467	2517.3	559.0	3076.3	0.82	1.63	0.30	0.30	24.7	4.5	0.1	0.0	0.0	0	2297	36.8		
( 18, 17)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 18, 19)	2341.33	7561	3121.8	695.6	3817.3	0.82	1.63	0.30	0.30	30.2	5.5	0.2	0.0	0.0	0	2326	36.8		
( 19, 18)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 19, 20)	3849.95	7642	5133.3	1133.0	6266.2	0.82	1.63	0.29	0.29	49.1	8.9	0.4	0.0	0.0	0	2351	36.9		
( 20, 19)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 20, 21)	2715.09	7749	3620.1	848.1	4468.2	0.81	1.65	0.31	0.31	34.6	6.6	0.4	0.0	0.0	0	2384	36.5		
( 21, 20)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 21, 22)	713.55	7849	951.4	609.1	1560.5	0.61	2.19	0.85	0.85	11.9	4.7	1.3	0.2	0.1	2	2415	27.4		
( 22, 21)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 22, 23)	527.32	7955	703.1	1145.7	1848.8	0.38	3.51	2.17	2.17	13.9	8.6	2.8	1.7	0.9	6	2447	17.1		



# **Technical Memorandum**

**To:** Aileen Bouclé, AICP  
District Planning, Project Development and Environmental Administrator  
Florida Department of Transportation, District Six  
1000 NW 111<sup>th</sup> Avenue  
Miami, Florida 33172

**From:** Brian Wolshon, Ph.D., P.E., PTOE<sup>1</sup>  
Joaquin E. Vargas, P.E.<sup>2</sup>

**Subject:** Maximum Sustainable Evacuation Traffic Flow Rates for Hurricane Evacuation Analysis Purposes

**Date:** June 17, 2010

This technical memorandum has been prepared to document the process and results of an effort to develop a series of maximum sustainable traffic flow rates that can be used to conduct simulation modeling of US-1 within the Florida Keys during an evacuation of this area. The need for this information became apparent after numerous efforts to develop macroscopic models to estimate the evacuation clearance time for the Keys over the past decade. Because macro-level modeling typically relies on aggregate relationships between the level of travel demand and the roadway's ability to service it, the expected roadway capacity is a key factor in estimating key performance measures such as operating speeds, travel time, and delay. While not the actual "capacity" of the road, the flow rates presented here represent the practical rates that are likely to be realistically sustainable over an extended period (8 or more hours) of a mass evacuation.

Over the past ten years, discussions among various stakeholders and agencies charged with the civil protection of residents and visitors in the Keys and those with the authority to develop policies governing the growth and development of these areas have suggested a range of different values that should be used when assigning road capacities. Some of these have been based on Highway Capacity Manual (HCM) procedures while others have been based on professional experience and judgment. Few if any, however, have been based on direct observation during prior evacuation events.

A history of research and observation shows that the maximum amount of traffic flow that can be accommodated by a segment of roadway can be significantly impacted by factors such as the behaviors of the drivers and vehicles using it. The complex interaction of these variables and the nature of development conditions within the Keys combined with the variable nature of hurricanes and evacuee responses make it difficult to predict a maximum flow rate using traditional means.

<sup>1</sup> Department of Civil and Environmental Engineering, Gulf Coast Center for Evacuation and Transportation Resiliency, Louisiana State University, Baton Rouge, LA 70803

<sup>2</sup> Traf Tech Engineering, Inc., 8400 North University Dr., Ste. 309, Tamarac, FL 33321

Over the past 10 years, however, a considerable amount of new data and studies have become available that have increased the understanding of evacuation traffic flow conditions. These recent developments include the collection of traffic data under actual mass evacuation conditions on different functional roadway classifications and design configurations. Data also include observations from several different states from a number of different hurricane evacuation events. Some of this information has been published in government reports and technical papers, several of which are referenced in this memo.

A key point in this memo is also the development and use of the term “maximum sustainable evacuation traffic flow rate.” This term differs from prior discussions and modeling efforts which utilized the term “capacity.” It is based on years of field observation which consistently suggest that the maximum flow rates that can be sustained during an evacuation are often considerably lower than those observed during routine (non-emergency) conditions such as daily rush-hours. Explanations of why this drop occurs are varied, with some of them discussed later in this memo.

## **Background**

In mid-2009, based on previous analysis and recommendation by Dr. Brian Wolshon, a nationally recognized expert in hurricane evacuation matters, the Florida Department of Transportation (FDOT) initiated a site-specific maximum sustainable traffic flow rate study<sup>1</sup> in the Key Largo area. The purpose of this report was to assess traffic flow rates under a variety of conditions and to confirm the appropriateness of the roadway capacity values used in the 2001 Florida Keys Hurricane Evacuation Study (2001 Study) established by the 2001 Study Project Steering Committee (PSC). The 2001 Study PSC included representatives from the U.S. Army Corps of Engineers (USACOE), Florida Division of Emergency Management (DEM), Monroe County Board of County Commissioners, Monroe County Emergency Management, Florida International University (FIU), and FDOT staff and consultants, Vanasse-Hangen-Brustlin and Miller Consulting, Inc.

The site-specific capacity study was prepared for the FDOT by Dr. Brian Wolshon and Traf Tech Engineering, Inc. The analyses were conducted using CORSIM, a micro-scale simulation system (e.g., an agent-based model). As such, the model is influenced by locally prevailing traffic control and geometric design features such as intersections, turn lanes, and median crossovers in addition to individual driver and vehicle characteristics that govern gap-acceptance and lane-changing behaviors.

To further enhance the validity of the analyses conducted in this effort and the results gained from them, a series of base-line simulation models were developed and then calibrated to a set of field observed traffic volumes recorded over a recent event-weekend in the Keys. The results obtained from the site-specific capacity study indicate that the capacities used in the 2001 Study within the Key Largo area are appropriate for hurricane evacuation purposes. That is, the 900 vehicles per hour per lane (vphpl) maximum sustainable evacuation traffic flow rate assigned to US 1 within Key Largo is considered appropriate given the type of road and development conditions that exist in this area as well as the life-threatening nature of hurricanes.

This report includes new data available from the 10-year period since the original 2001 Study. It also includes observational studies and simulation systems that have improved our understanding of traffic operations under mass evacuation demand conditions.

Recently observed flow rates include those associated with Hurricanes Floyd in Florida and South Carolina (FEMA 2000) and Hurricane Katrina in Louisiana (Wolshon & McArdle 2008, and Wolshon, Catarella-Michel & Lambert 2006). These observations show that many of the highest observed flow rates cannot be sustained for periods lasting several hours because of inevitable disruptions to the smooth flow of traffic as well as flow restrictions that may exist far downstream of a particular point of measurement. Under capacity-level demand conditions, even slight disruptions in traffic streams can result in the formation and propagation of traffic shockwaves that move both quickly and widely through a network. It is for these reasons that experts in the field of evacuation transportation refer to “practical” maximum sustainable evacuation flow rates. Prior study has shown that these practical rates are 10 to 20 percent below maximum flow rates that are observed at the same location during normal daily peak periods and below rates that would be suggested under the ideal condition capacity values discussed in the HCM.

### **Recent Hurricane Evacuation Traffic Flow Rates**

To illustrate and describe the concept of practical maximum sustainable evacuation flow rates, it is helpful to review observations made in recent hurricane evacuations. Because of the high level of storm activity and related need to carry out major mass evacuations, the State of Louisiana has been one of the most studied areas of the United States for evacuation traffic movement. Over the past six years, the southeast region of the state including metropolitan New Orleans has been evacuated four times (Ivan '04, Katrina '05, Rita '05, and Gustav '08). These events have afforded the opportunity to collect and analyze traffic patterns as well as to make incremental changes to the regional evacuation plans.

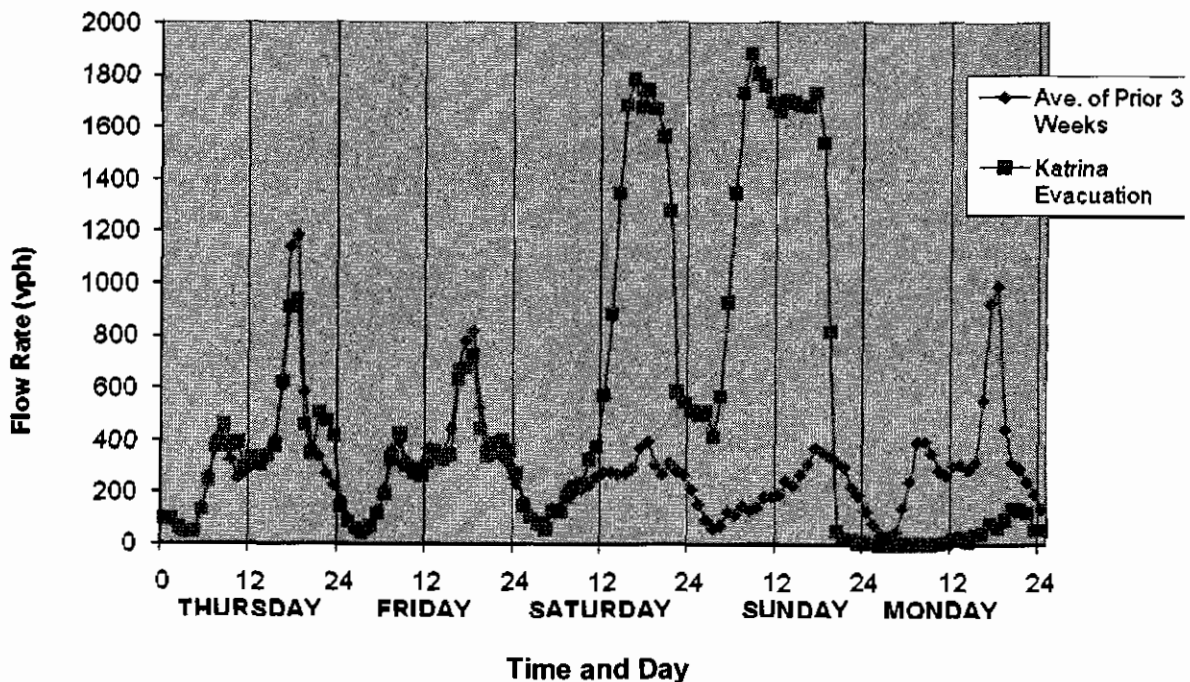
In recent studies at Louisiana State University's Gulf Coast Research Center for Evacuation and Transportation Resiliency, the flow rates recorded by the Louisiana Department of Transportation and Development (LA DOTD) on roads throughout the state during the Hurricane Katrina evacuation were used to determine practical maximum sustainable evacuation flow rates for a variety of roadway and area types (Wolshon 2008). It was suggested that these volumes could be used when performing future clearance time estimate studies in Louisiana and elsewhere.

The studies focused on four different facility types including freeways, freeways flowing under contraflow, four-lane divided highways, and two-lane highways within urbanized and non-urbanized regions. Although none of the roads and areas that were studied was exactly like US-1 through the Florida Keys, several segments were similar enough to give a reasonable approximation of the conditions. Results of the analyses from two of the most relevant of these facilities, four-lane divided highways and two-lane highways are discussed in the following sections.

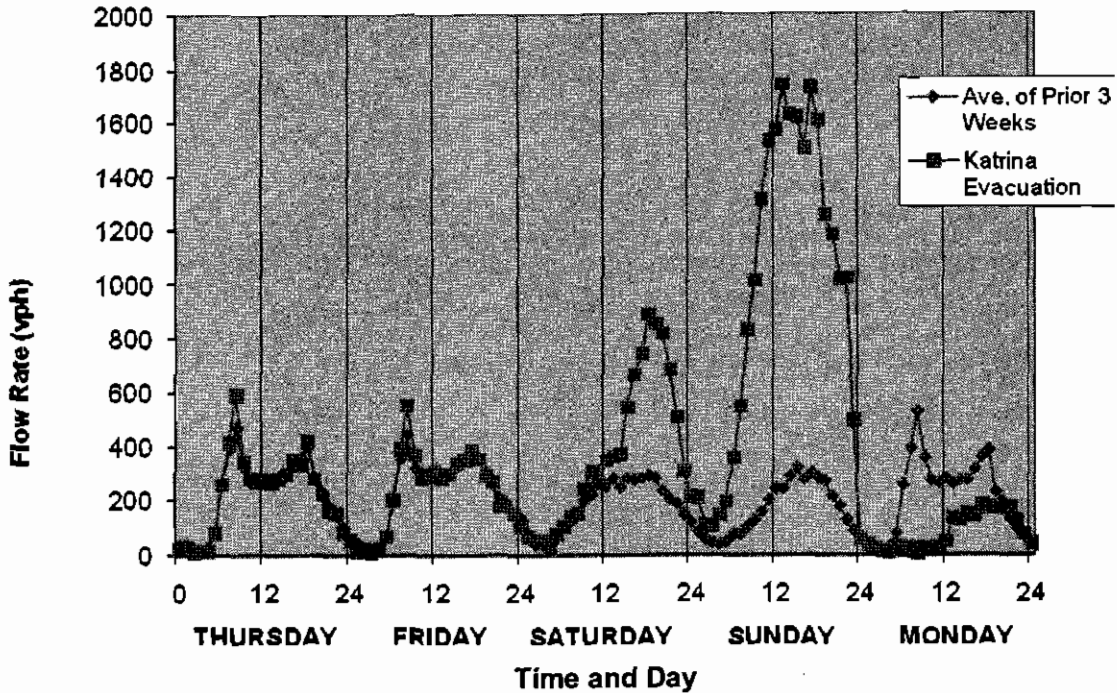
### Four-lane Divided Highways

The roads that were likely the most analogous to the four-lane divided segments of US-1 in the Upper Keys were segments of the four-lane divided highways of US-61 and LA-1 moving into the “semi-suburban” areas within the region between New Orleans and Baton Rouge. The locations of the count stations on these roads could generally be described as fringe suburban communities in which traffic moved from uninterrupted flow segments into more developed areas that include at-grade signalized intersections, similar to what occurs as traffic moves north into the upper Keys areas approaching Key Largo. These sites are also relevant to the US-1 discussion because during the evacuation they were loaded with traffic volume far-above routine peak-hour levels and the demand was sustained over two full back-to-back daylight periods. This gives an illustration of what could occur during a full evacuation of the Keys when traffic demand is expected to be sustained at such levels for about 24 hours.

On US-61 in the vicinity of LaPlace, Louisiana, represented graphically in Figure 1, the maximum hourly flow during the Katrina evacuation reached 1,881 vehicles per hour (vph) (958 vph in Lane 1 and 923 vph in Lane 2) on Day 2 (Sunday) of the event. Similarly, the maximum hourly flow on LA-1 in the vicinity of Plaquemine, Louisiana, represented graphically in Figure 2, was observed to rise to 1,740 vph (858 vph in Lane 1 and 882 vph in Lane 2) during the second day of the evacuation. Also apparent in these figures is that these flow rates were generally able to be sustained at levels of 1,650 vph to 1,720 vph in both lanes (somewhat below the peak) for about 10 continuous hours during both days of the evacuation. These flows suggest the maximum sustainable limits of these two roads without breaking down into a no-flow “gridlock” condition.



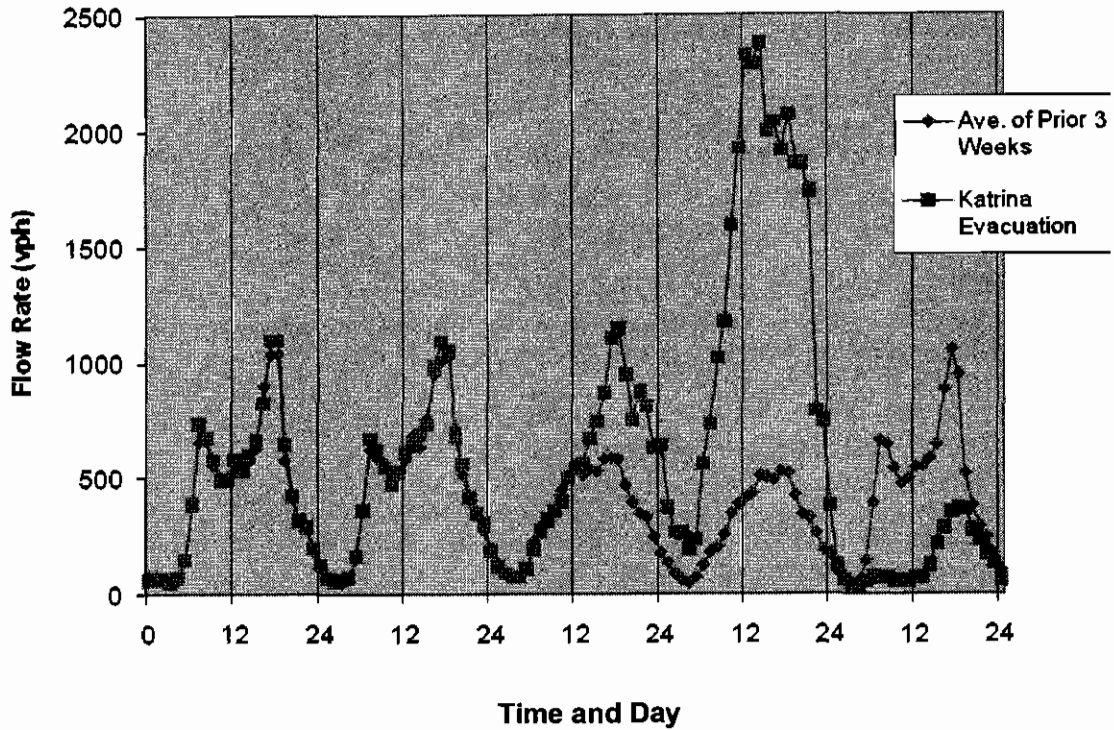
**Figure 1. Hourly Northbound Evacuation (2-lane) Traffic Volume - US-61 LaPlace Louisiana, Hurricane Katrina**



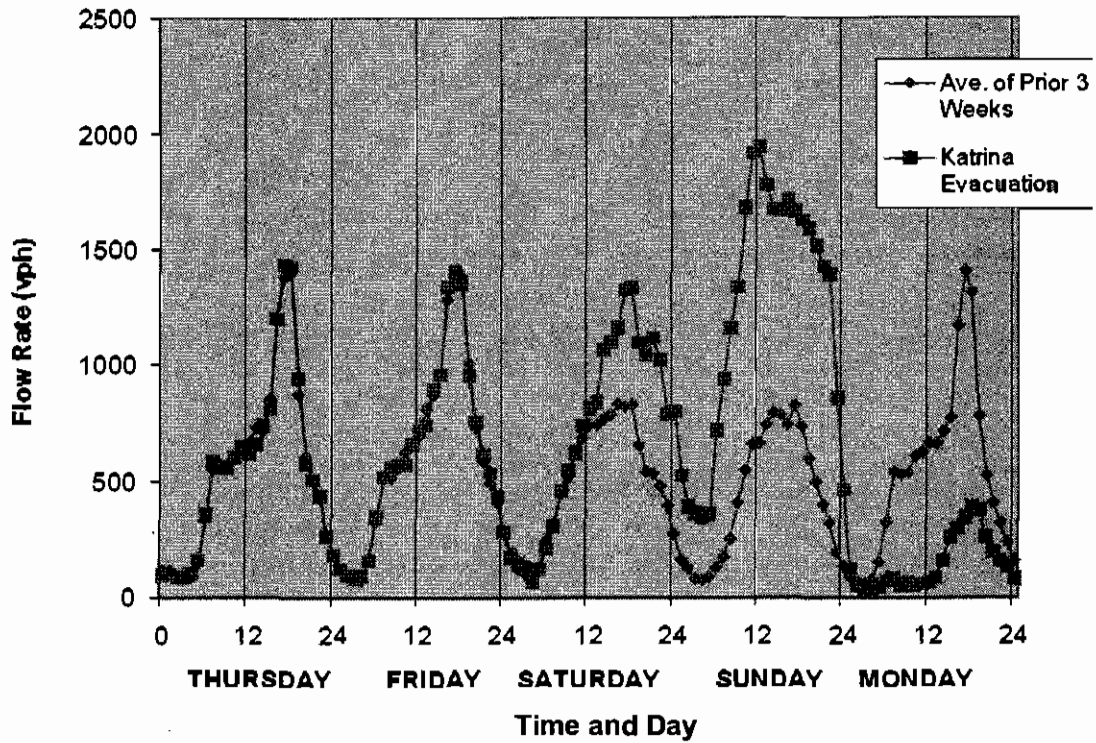
**Figure 2. Hourly Northbound Evacuation (2-lane) Traffic Volume - LA-1 Plaquemines Louisiana, Hurricane Katrina**

For comparison, two other four-lane divided highway locations are also included. These included two separate sections of US-190 in the vicinity of Baton Rouge, Louisiana. Baton Rouge is a key location for evacuees seeking to move to westerly destinations during evacuations of southeastern Louisiana because it includes two of the four Mississippi River bridge crossings within the 100 mile segment between New Orleans and Natchez, Mississippi. While these are four-lane divided highway segments, they are thought to be significantly different from US-1 and the segments of US-61 and LA-1 discussed previously because they are within areas of generally uninterrupted flow for several miles up and downstream of data recording stations. Although there are minor at-grade intersections, none of them are signalized and access to/from major routes is accomplished using grade separated interchanges.

At the outflow point of the US-190 bridge over the Mississippi River, illustrated graphically in Figure 3, maximum hourly flow reached 2,337 vehicles per hour (vph) (1,094 vph in Lane 1 and 1,283 vph in Lane 2) during the second day of the Hurricane Katrina evacuation. At a location several miles downstream of the bridge, illustrated graphically in Figure 4, a maximum flow of 1,937 vehicles per hour (vph) (560 vph in Lane 1 and 1,377 vph in Lane 2) was observed on US-190. Also relevant to the discussion of the US-1 evacuation flow rates is that even these elevated maximum flows were sustained for periods of about three hours before dropping to rates of 1,700 to 2,000 vph for the remaining 8 to 10 hours of Day 2 of the evacuation. Even with the benefit of grade separations and uninterrupted flow conditions, these flows are not significantly different from the previously discussed four-lane divided segments of US-60 and LA-1.



**Figure 3. Hourly Westbound Evacuation (2-lane) Traffic Volume - US-190 (Mississippi River Bridge departure) Port Allen Louisiana, Hurricane Katrina**



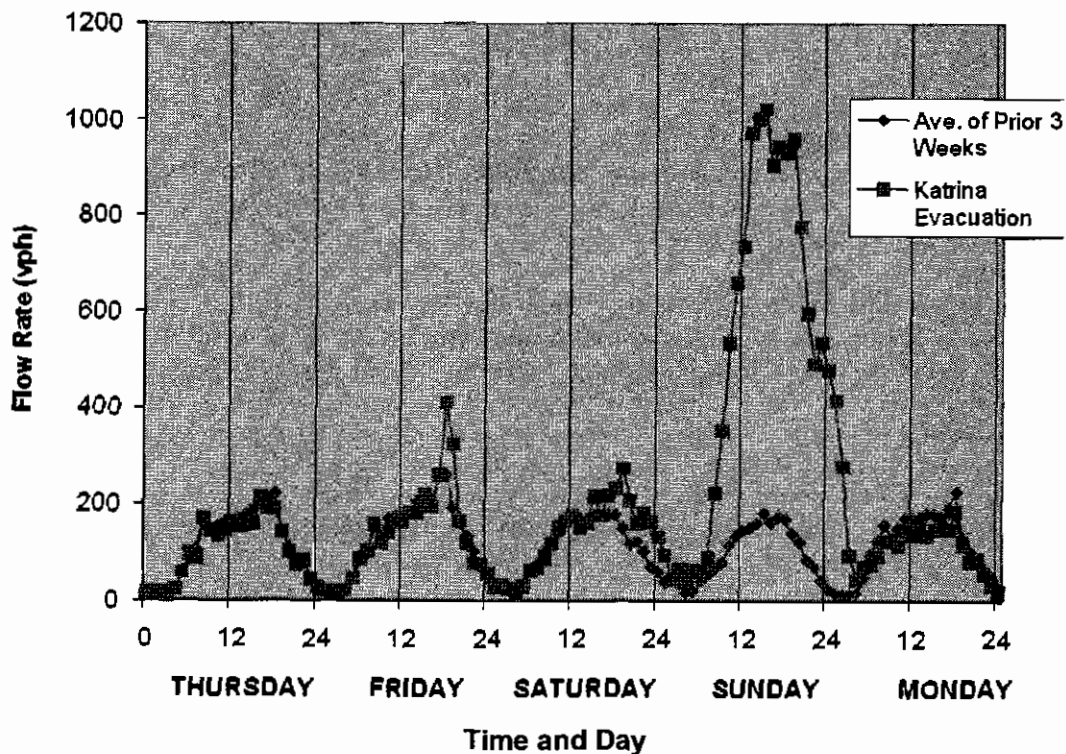
**Figure 4. Hourly Westbound Evacuation (2-lane) Traffic Volume - US-190 Port Allen Louisiana, Hurricane Katrina**

Combined, these observations suggest that the practical maximum sustainable evacuation flow rates on four-lane divided highways in relatively developed areas are likely to be about 900 to 1,000 vehicles per hour per lane (vphpl). In areas where the evacuation traffic stream is subjected to intersections with signal control or periodic interruptions from traffic enforcement police, it is further suggested that the practical maximums will be at the low end of this estimate and perhaps still lower if nighttime and/or adverse weather conditions are present. Since the Keys are required to evacuate over a period of near, or in excess of 24 hours, at least half of this evacuation process will occur in low light to total darkness conditions.

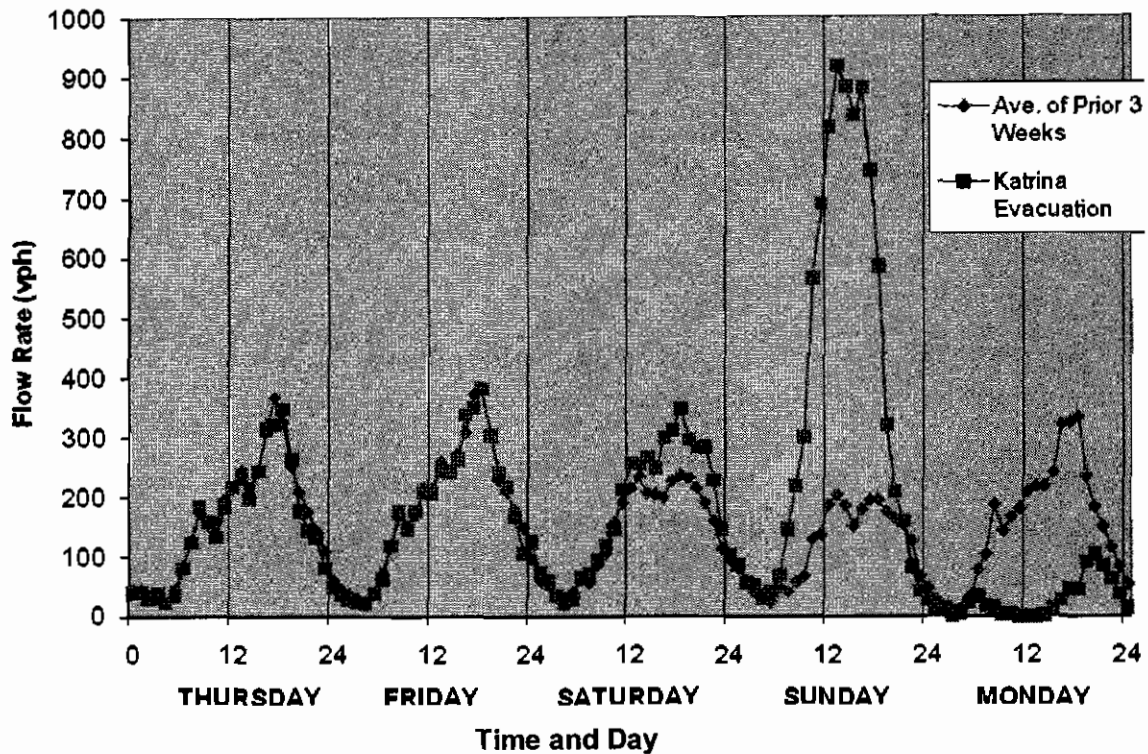
Two-lane Highways

The LSU research also included analyses of two-lane Louisiana state highways. The data collected for the Hurricane Katrina evacuation studies included roads throughout the state in areas impacted both *directly* and *indirectly* by the evacuation traffic. This research will be published in an upcoming issue of the American Society of Civil Engineer's *Natural Hazards Review* (Wolshon & McArdle 2010).

The research showed that although the highest traffic was observed on routes servicing highly populated areas nearest to the coast and closest to the projected path of the storm, two-lane roads providing access to freeway routes or serving as alternate paths to congested freeways also carried heavy traffic loads. The highest volumes observed on two-lane routes in Louisiana during the Hurricane Katrina were recorded on LA-21 near Bogalusa, Louisiana (north of New Orleans) and on US-190 near Basile, Louisiana (north of Lafayette). These are represented graphically in Figures 5 and 6.



**Figure 5. Hourly Westbound Evacuation Traffic Volume - US-190 Basile Louisiana, Hurricane Katrina**



**Figure 6. Hourly Northbound Evacuation Traffic Volume - LA-21 Bogalusa Louisiana, Hurricane Katrina**

The research also suggested that the orientation and relative proximity to Interstate freeways made them likely alternatives to the more heavily traveled (and congested) freeway routes. Data from both of these routes were also collected in predominantly rural areas of the state, with relatively low populations, and within areas of few traffic signals such as might be similar to many of the two lane segments of US-1 in the Florida Keys.

During the second day of the Hurricane Katrina evacuation on the two-lane segment of US-190 near Basile, the maximum one hour flow reached 1,021 vph. These evacuation flows were sustained throughout the day with flows of above 900 vph for about eight consecutive hours. At the LA-21 station in Bogalusa, a maximum flow of 915 vph was observed on the same day. The elevated volume of greater than 800 vph extended over a period of about five hours. However, it appears that the demand at this location was not sufficient to maintain the maximum flow for a longer period.

Although it is not clear that these study areas are representative of the conditions along rural stretches of US-1 through the Middle and Lower Keys, overall, these data suggest that it is possible to maintain sustained maximum flow rates at and above 900 to 1,000 vph during an evacuation.



## **Florida Keys Evacuation Flow Rates**

Although the flow conditions associated with evacuations in the Florida Keys have not been studied in the level of scientific detail as those in Louisiana, the fact that this area has regularly been threatened by hurricanes over the past 10 years has meant that several evacuations of the Keys have been carried out at varying levels of urgency and rates of participation. These events have also permitted the FDOT to record traffic volumes under evacuation conditions.

A review of recent history shows that in 2004 and 2005 a total of six hurricanes required some level of evacuation in the Keys. After a two-year lull in activity, two more tropical systems required evacuations in 2008. In August 2004, Hurricane Charley passed about 70 miles west of Key West, bringing tropical storm winds to the Lower Keys and requiring a mandatory evacuation of the visitor population. The Lower Keys were also evacuated in advance of the expected arrival of Hurricane Ivan in September 2004 and Hurricane Dennis in July 2005, although neither storm came close enough to cause significant damage in these areas. In 2005, Hurricane Rita grew from a tropical storm to a Category 2 hurricane as it moved westward from the Bahamas, ultimately passing south of Key West and causing serious damage and surge flooding as far north as Key Largo. In October 2005, Hurricane Wilma became the most devastating hurricane to hit the Keys in decades when it passed just northwest of Key West. The low-lying parts of the city were left under 3 to 6 feet of water from the storm surge, and major flooding was reported throughout the Keys up to Key Largo (Kasper 2005).

In 2008, Tropical Storms Fay and Ike also resulted in orders to evacuate various resident and non-resident populations. Table 1 lists the evacuation orders that were issued for these events. The table also includes the dates and times of the orders and the areas which they covered.

Although the level of threat and corresponding evacuation requirements varied for each of these events, the most relevant point to the development of the maximum sustainable evacuation flow rates is that several of these evacuations generated traffic demand at levels that were significantly above normal, resulting in traffic congestion and/or queuing along various segments of US-1 in the Keys. The occurrence of congestion and queuing is important to this discussion because it demonstrates that the demand generated by the evacuation was sufficient to exceed the available capacity of the roadway for some duration of time. As such, the hourly volumes that were recorded are assumed to reflect the maximum traffic that could be carried by US-1 at those locations during those periods.

The volumes recorded during each of these events are also included in Attachment B of this report. The data included in Attachment B comes from three stations that are part of the FDOT statewide permanent traffic data monitoring system. The first of these, Station 900165, is located on a four-lane segment of US-1 at Mile Marker (MM) 4.32 on Stock Island near Key West. The second, Station 900227, is on a two-lane section of US-1 at MM 29.6 on Big Pine Key and the third, Station 900164, from a four-lane section of US-1 at MM 106.3 on Key Largo near its intersection with County Road 905. In addition to the traffic volumes recorded during the evacuation period, each of the figures from the South Florida Regional Planning Council (SFRPC) (SFRPC 2007) also includes the:

- annual average hourly volume trends for same time period,
- average hourly volume trends for same time period for the two months preceding the evacuation, and
- the times at which orders for specific populations were issued, including:

- permanent residents
- visitors
- partial resident/visitor
- residents driving in or towing mobile homes, RVs, or boats

The graphs from Tropical Storms Fay and Ike were prepared separately and include the:

- hourly volume trends recorded during each day of the evacuation period, and
- average hourly volume trends for same time period for June, July, August, and September of 2008.

Storm	Date	Time	Location	Evacuation Ordered
<b>2004</b>				
Hurricane Charlie	08/11/04	11:00am	Key West to Craig Key (MM 72)	Limited visitor
	08/12/04	5:00am	Entire Florida Keys	Visitors
Hurricane Frances	09/02/04	8:00am	-	Visitors
Hurricane Ivan	09/09/04	8:00am	-	Visitors
	09/09/04	5:00pm	-	Mobile homes, RV, boat residents
	09/10/04	5:00am	-	Residents
<b>2005</b>				
Hurricane Dennis	07/07/05	12:00pm	-	Visitors
	07/07/05	4:00pm	West of 7 Mile Bridge to Key West	Limited Resident
Hurricane Rita	09/19/05	6:00am	-	Visitors
	09/19/05	8:00am	-	Residents
Hurricane Wilma	10/19/05	12:00pm	-	Visitors
	10/22/05	12:00pm	-	Residents
<b>2008</b>				
Tropical Storm Fay	08/17/08	8:00am	-	Visitors
	08/17/08	7:00pm	-	Mobile homes, RV, boat residents
Tropical Storm Ike	09/06/08	9:00am	-	Visitors
	09/07/08	8:00am	-	Residents

**Table 1. Monroe County Evacuation Orders 2004-2005 and 2008 (SFRPC 2007)**

Although each of the stations reveals somewhat different information, the two that are perhaps the most relevant to the discussion here are Stations 900227 and 900164. Station 900227 (Big Pine Key) is important because it is the only two-lane segment location for which traffic data was available in the Keys for these six events. Station 900164 (Key Largo) is important because it represents as near to a complete data set of out-of-county traffic movements as can be counted in the Keys since nearly all vehicles passing this point will be traveling out of Monroe County.

**Station 900227 (Big Pine Key)**

At Station 900227 it is interesting to note that the northbound direction did not always exceed the corresponding annual average hourly volumes for the same time period. In fact, this appears to have only occurred in four of the six storm events. This suggests that the forecasted conditions of Hurricanes Wilma and Frances were not sufficient to induce a major movement of evacuees. The highest traffic volumes at this location were associated with the evacuations for Rita, Dennis, and Charley. For each of these events the maximum hourly flows in the single outbound lane of this segment were in the range of 1,000 to 1,150 vph. Although this high volume lasted only an hour or two for the Hurricane Rita evacuation, elevated traffic volumes at or greater than 1,000 vph lasted for periods of four to five hours.

During the two tropical storm events of 2008, a maximum flow of 1,030 vph was recorded between 11:00am and noon on Sunday, August 17<sup>th</sup>. Flows of 909 vph and 944 vph were recorded during the preceding and following one hour periods, respectively.

Although it cannot be known with absolute certainty that these flow volumes were the absolute maximum that this segment of road could carry nor whether the demand generated by the 2004 and 2005 evacuations was sufficient to fully feed this section, the fact that the elevated volumes were significantly above any of the annual hourly average north or southbound observations and that they were maintained above these levels for several consecutive hours, suggests that they are likely the maximum evacuation traffic volumes that can be sustained at this location during such an event. It is also worth noting that these observations are also in the same range as the volumes recorded on similar functionally classified roadways in Louisiana during Hurricane Katrina in 2005.

**Station 900164 (Key Largo)**

At Station 900164 evacuating volumes significantly exceeded the annual average hourly rates during five of the seven events for which data was available (data was not recorded during the 2005 Hurricane Rita evacuation). The highest observed volumes at this location were recorded during the evacuations for Tropical Storm Fay, Hurricanes Dennis and Charley, and to a lesser extent Hurricane Ivan. During Hurricanes Dennis and Charley, the maximum hourly flows were in the range of 1,400 to 1,450 vph (for two lanes). Although there was some variation, this elevated volume lasted at these levels for periods of six to eight hours.

Similar to Station 900227, elevated volumes were apparent during the Tropical Storm Fay evacuation, but not for Tropical Storm Ike. Maximum evacuation traffic flow rates of about 1,600 vph to 1,750 vph (for two lanes) were sustained for about six to seven hours on Sunday, August 17, 2008.

Also of note on these graphs were two other trends. The first was that the elevated evacuation volumes existed over two days and for periods in excess of 30 hours. The second observation was the significant drop of the traffic volume during the overnight hours of the two-day evacuation period. Although the hourly traffic volumes were notably higher than the annual hourly average, it was clear that, similar to numerous observations in other areas of the country for other hurricanes, evacuation travel demand tends to ebb during late night hours.

Similar to the observations at the other FDOT traffic data recording stations in the Keys, the fact that the elevated volumes were significantly above any of the north or southbound observations

and that they were maintained above these levels for several consecutive hours suggests that these are likely close to the maximum evacuation traffic volumes which can be sustained at this location during such an event.

A comparison of the Keys volumes to those observed in Louisiana during Hurricane Katrina are also noteworthy because the volumes recorded on this section of US-1 were, as expected, somewhat lower than in Louisiana. This is because, as discussed earlier, the segments of four-lane divided highways in Louisiana were in areas where the amount of driveway openings, adjacent development and at-grade intersections was less than in this area of Key Largo. As such, the earlier suggestion that the practical maximum sustainable evacuation flow rates on four-lane divided highways in relatively developed areas will likely to be in the neighborhood of approximately 900 to 1,000 vphpl continues to be appropriate.

In areas like the Upper Keys and Key Largo where the evacuation traffic stream is expected to be subjected to potential periodic interruptions from traffic law enforcement and where approximately 20 percent of the total Keys evacuation traffic demand is expected to be generated and enter onto US-1, it is further suggested that the practical maximums will be at the low end of this estimate and perhaps still lower if nighttime and/or adverse weather conditions are present.

## **Conclusion**

Based on the data collected on US-1 during recent evacuations in the Keys, evacuation flow rates collected in other locations, and the specific design, control, and land development characteristics that currently exist along US-1, the table of maximum sustainable evacuation traffic flow rates shown in Attachment A are suggested for hurricane evacuation analysis purposes. Although the data recorded during prior evacuations in the Keys do not reflect the "near-worst case scenario" conditions that are currently being studied, they represent a reasonable estimate of what should realistically be sustainable, given the absence of such data. Perhaps most important is that they represent estimates that, although close to being reached, have never been exceeded during any past evacuation event for which traffic data has been available.

As noted on the table, these values also represent the anticipated maximum sustainable flow rates per "functional evacuation lane," where a functional evacuation lane is defined as any through travel lane or continuous paved shoulder with a width of at least 10 feet. Because of the possibility that some of the existing (and potential future) suitable shoulder areas could be used as an additional outbound "lane" to carry evacuation traffic on some segments of US-1 during an emergency, these values can also be used for planning models of these temporary outbound travel areas. Since shoulders have never, to our knowledge, been used in the Florida Keys as functional evacuation lanes on a formal basis or been systematically studied to assess their operational characteristics, their exact carrying capacity is not known at this time. However, prior analysis conducted for FDOT (ATEC 2008) has concluded that continuous paved shoulders of ten feet or greater in width will permit traffic operations that are effectively the same as an adjacent standard travel lane during an evacuation. This finding is based largely on the opinion that, although traffic flow conditions will vary during an evacuation, travel speeds during the main part of the evacuation are likely to be less than the free flow rate and with the likely high densities of the traffic stream the typical benefits of wide lanes may be negligible.

The values in Attachment A also represent the most relevant and applicable data currently available as well as the decades of study, experience and professional judgment of the authors. However, as in all traffic estimates and forecasts of future conditions it must be recognized that traffic conditions can vary at any specific time or location on a day-to-day or even hour-to-hour basis. Such variations result from infinite combinations of uncertain driver, environmental (nighttime, rain, flooding, etc.), traffic control, and vehicle-mix conditions. These specific conditions may bring traffic flow to a crawl for significant periods or even permit flows to be marginally higher for short periods during an evacuation. As more data become available in the future and the understanding of the specifics of traffic operations during evacuations improves, it is also possible that the flow rates shown in Attachment A may need further refinement. It is highly recommended that similar analyses be conducted periodically in the future as new hurricane evacuation traffic flow data becomes available.

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**ATTACHMENT A**  
**Maximum Sustainable Evacuation Traffic**  
**Flow Rates for the**  
**Florida Keys During Hurricane Evacuations**

**TABLE 2A**  
**Roadway Configuration on US Highway 1 (Overseas Highway)**  
**and CR 905/Card Sound Road in the Florida Keys, Monroe County, Florida**

Area	Milemarkers		Location/Description	Year 2010 Configuration
	From	To		
Lower Keys	2.0	4.0	Key West to Stock Island	4L
Lower Keys	4.0	9.0	Stock Island to Big Coppitt Key	4LD
Lower Keys	9.0	17.0	Big Coppitt Key to Sugarloaf Key	2L
Lower Keys	17.0	22.0	Sugarloaf Key to Cudjoe Key	2L
Lower Keys	22.0	24.0	Cudjoe Key to Summerland Key Cove Airport	2L
Lower Keys	24.0	25.0	Summerland Key Cove Airport to Summerland Key	3L
Lower Keys	25.0	30.0	Summerland Key to Big Pine Key	2L
Lower Keys	30.0	34.0	Big Pine Key to West Summerland Keys	2L
Lower Keys	34.0	35.2	West Summerland Keys to Spanish Harbor Keys	2L
Lower Keys	35.2	36.5	Spanish Harbor Keys to Bahia Honda Bridge	4LD
Lower Keys	36.5	37.5	Bahia Honda Bridge to Bahia Honda Key	2L
Middle Keys	37.5	47.0	Bahia Honda Key to Hog Key	2L
Middle Keys	47.0	48.0	Hog Key to Boot Key	2L
Middle Keys	48.0	50.2	Boot Key to Marathon	4L
Middle Keys	50.2	50.8	Marathon to Marathon Shores	5L
Middle Keys	50.8	54.0	Marathon Shores to Key Colonial Beach	4LD
Middle Keys	54.0	54.5	Key Colonial Beach to Deer Key	4LD
Middle Keys	54.5	58.0	Deer Key to Grassy Key	2L
Upper Keys	58.0	74.0	Grassy Key to Matecumbe Harbor	2L
Upper Keys	74.0	80.0	Matecumbe Harbor to Teatable Key	2L
Upper Keys	80.0	83.5	Teatable Key to Islamorada	3L
Upper Keys	83.5	85.6	Islamorada to Windley Key	2L
Upper Keys	85.6	90.0	Windley Key to Plantation Key	2L
Upper Keys	90.0	100.0	Tavernier Key to Newport Key	4LD
Upper Keys	100.0	105.0	Newport Key to Sexton Cove	4LD
Upper Keys	105.0	106.3	Sexton Cove to Rattlesnake Key	4LD
Upper Keys	106.3	126.5	Rattlesnake Key to Card Sound Rd	2L/4L
South Dade	126.5	HEFT	Card Sound Rd to HEFT	4LD
Upper Keys	106.3	Int CR 905 / CR 905 A	Lake Surprise to Crocodile Lake	2L
Upper Keys	Ocean Reef	Int CR 905 / CR 905 A	Tanglefish Key to Crocodile Lake	2L
Upper Keys	Int CR 905 / CR 905 A	US 1	Crocodile Lake to South Miami-Dade	2L

**LEGEND**

- 2L Two-lane facility
- 2L/4L Two lanes with short four-lane sections for passing purposes
- 3L Three-lane facility (center lane is a two-way left-turn lane)
- 4L Four-lane undivided facility
- 4LD Four-lane divided facility
- 5L Five-lane facility (center lane is a two-way left-turn lane)



**TABLE 2B****Maximum Sustainable Traffic Flow Rates per Functional Evacuation Lane for Hurricane Evacuation Purposes  
US Highway 1 (Overseas Highway) and CR 905/Card Sound Road in the Florida Keys, Monroe County, Florida**

Area	Milemarkers		Location/Description	Suggested Maximum Sustainable Flow Rate per Hour per Functional Evacuation Lane
	From	To		
Lower Keys	2.0	4.0	Key West to Stock Island	900
Lower Keys	4.0	9.0	Stock Island to Big Coppitt Key	900
Lower Keys	9.0	17.0	Big Coppitt Key to Sugarloaf Key	1,100
Lower Keys	17.0	22.0	Sugarloaf Key to Cudjoe Key	1,100
Lower Keys	22.0	24.0	Cudjoe Key to Summerland Key Cove Airport	1,100
Lower Keys	24.0	25.0	Summerland Key Cove Airport to Summerland Key	1,100
Lower Keys	25.0	30.0	Summerland Key to Big Pine Key	1,100
Lower Keys	30.0	34.0	Big Pine Key to West Summerland Keys	1,050
Lower Keys	34.0	35.2	West Summerland Keys to Spanish Harbor Keys	1,100
Lower Keys	35.2	36.5	Spanish Harbor Keys to Bahia Honda Bridge	1,100
Lower Keys	36.5	37.5	Bahia Honda Bridge to Bahia Honda Key	1,100
Middle Keys	37.5	47.0	Bahia Honda Key to Hog Key	1,200
Middle Keys	47.0	48.0	Hog Key to Boot Key	1,100
Middle Keys	48.0	50.2	Boot Key to Marathon	900
Middle Keys	50.2	50.8	Marathon to Marathon Shores	900
Middle Keys	50.8	54.0	Marathon Shores to Key Colonial Beach	900
Middle Keys	54.0	54.5	Key Colonial Beach to Deer Key	900
Middle Keys	54.5	58.0	Deer Key to Grassy Key	1,100
Upper Keys	58.0	74.0	Grassy Key to Matecumbe Harbor	1,100
Upper Keys	74.0	80.0	Matecumbe Harbor to Teatable Key	1,100
Upper Keys	80.0	83.5	Teatable Key to Islamorada	1,100
Upper Keys	83.5	85.6	Islamorada to Windley Key	1,100
Upper Keys	85.6	90.0	Windley Key to Plantation Key	1,100
Upper Keys	90.0	100.0	Tavernier Key to Newport Key	900
Upper Keys	100.0	105.0	Newport Key to Sexton Cove	900
Upper Keys	105.0	106.3	Sexton Cove to Rattlesnake Key	900
Upper Keys	106.3	126.5	Rattlesnake Key to Card Sound Rd	1,200
South Dade	126.5	HEFT	Card Sound Rd to HEFT	900
Upper Keys	106.3	Int CR 905 / CR 905 A	Lake Surprise to Crocodile Lake	1,100
Upper Keys	Ocean Reef	Int CR 905 / CR 905 A	Tanglefish Key to Crocodile Lake	1,100
Upper Keys	Int CR 905 / CR 905 A	US 1	Crocodile Lake to South Miami-Dade	1,100

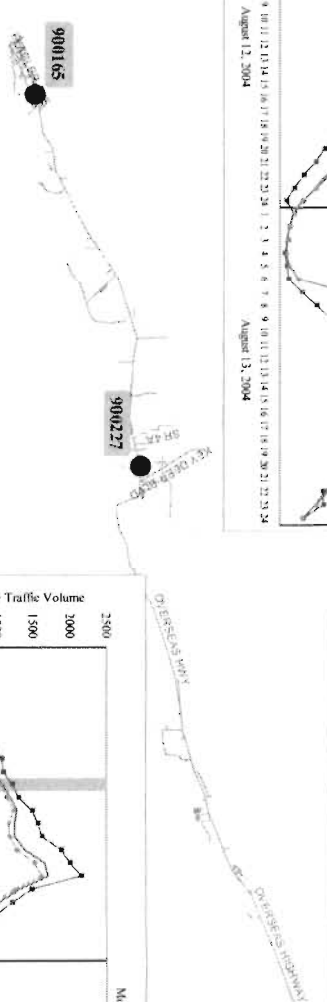
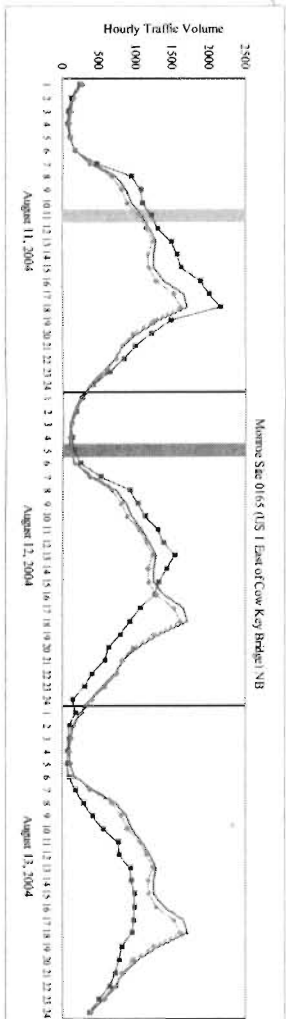
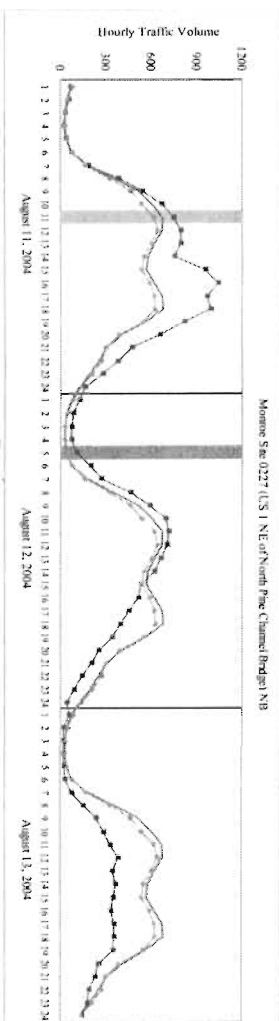
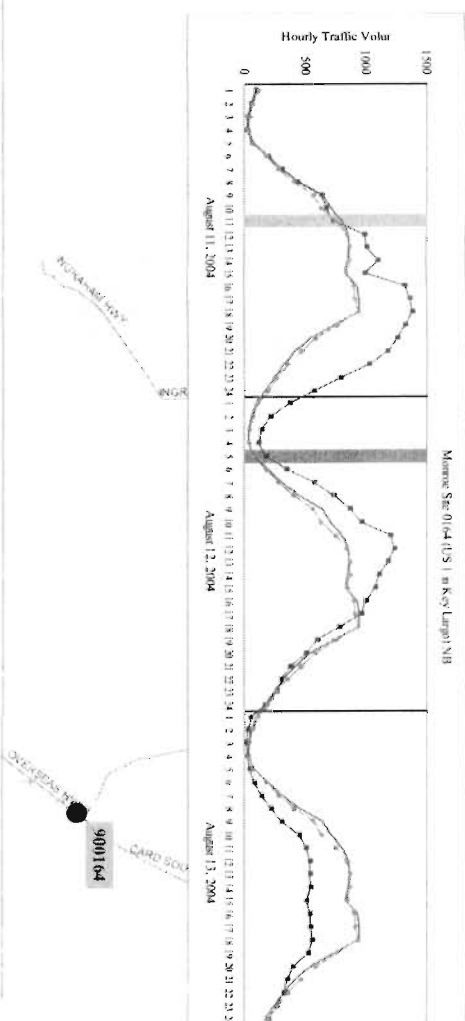
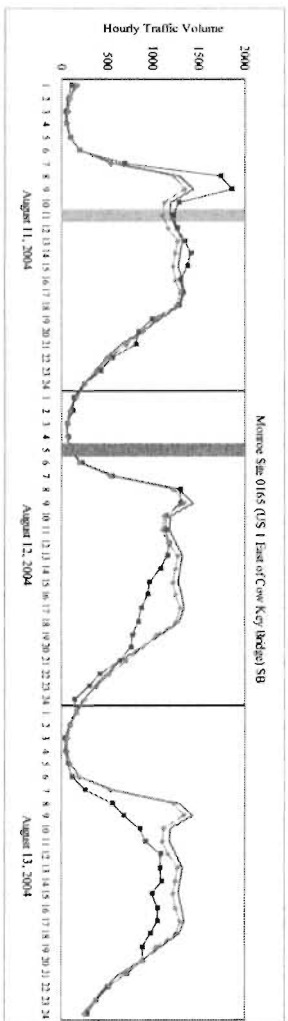
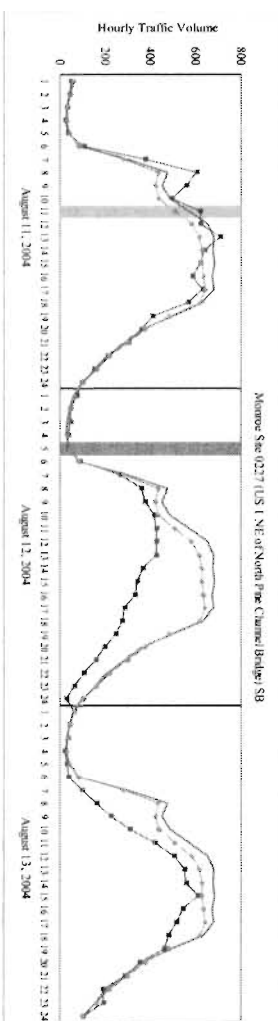
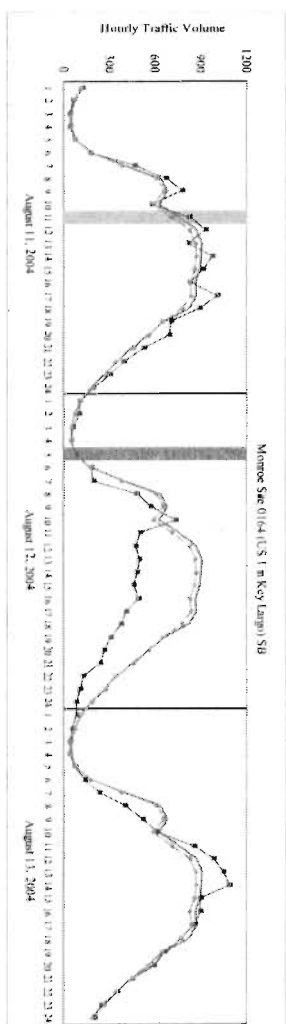
**NOTES**

A Functional Evacuation Lane has a pavement width of at least 10 feet

The above flow rates are maximum values that are expected to be sustained for extended periods (more than 8 hours). During night conditions, these flow rates may be lower than the ones shown above.

**ATTACHMENT B**  
**Hurricane Evacuation Traffic Volumes**  
**Florida Keys 2004-2005 and 2008**

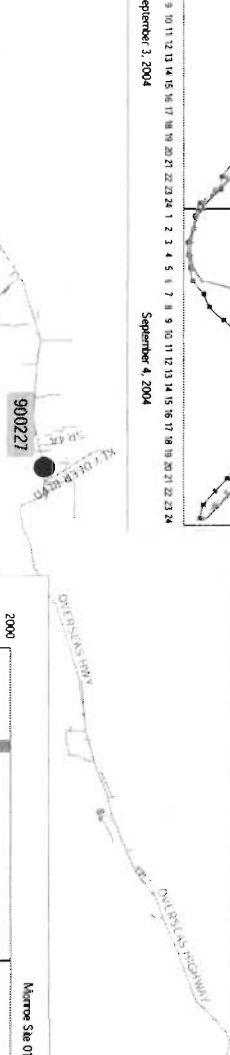
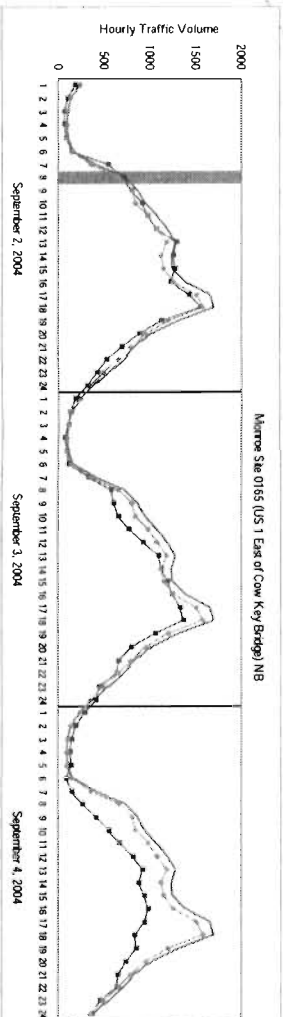
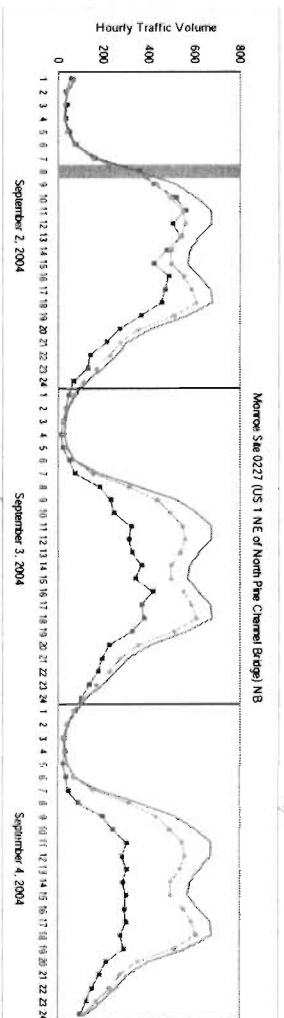
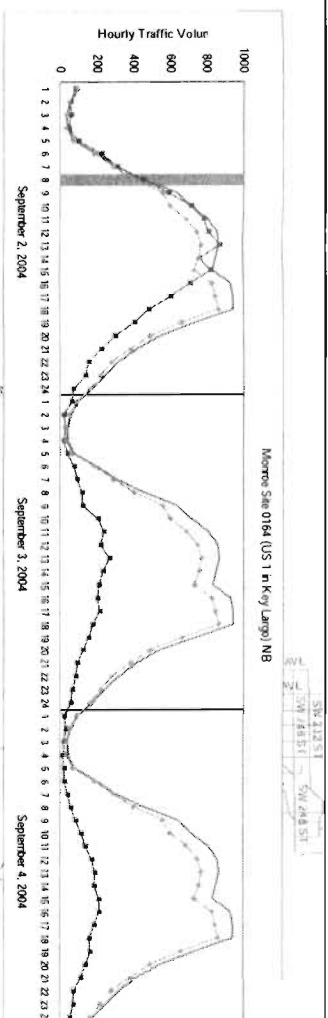
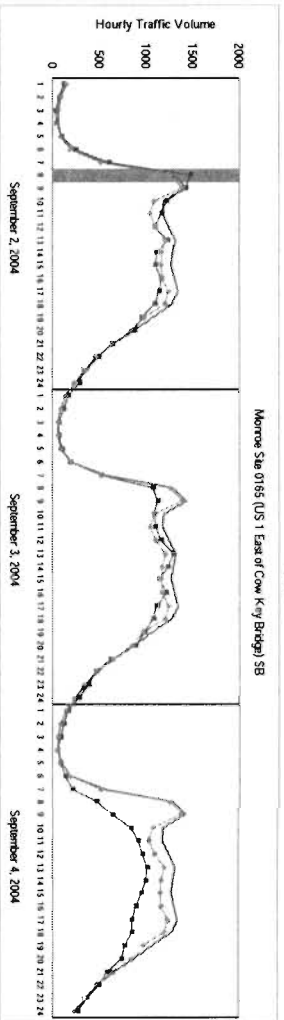
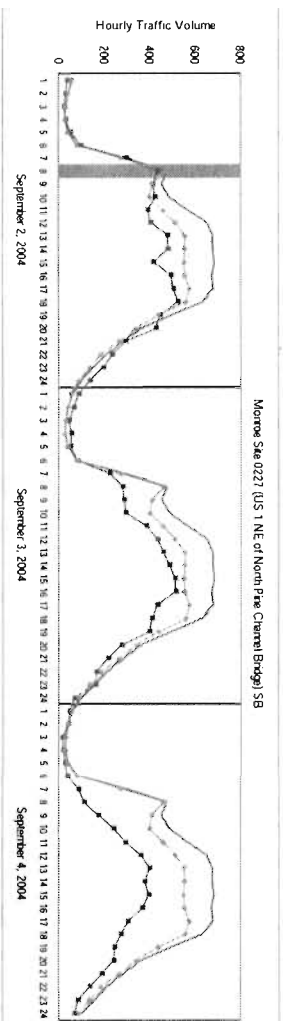
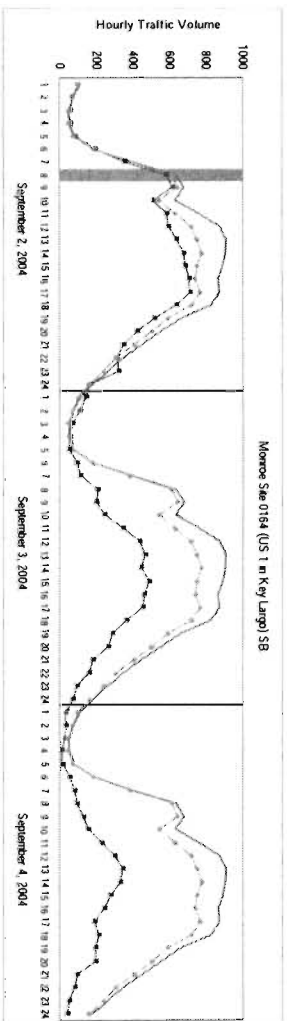
# HURRICANE CHARLEY EVACUATION TRAFFIC PATTERN



[NB] Northbound [SB] Southbound

- 2004 Hourly Average
- Evacuation Traffic
- Visitor Evacuation
- Limited Visitor Evacuation (from Key West to Craig Key)
- Visitor Evacuation

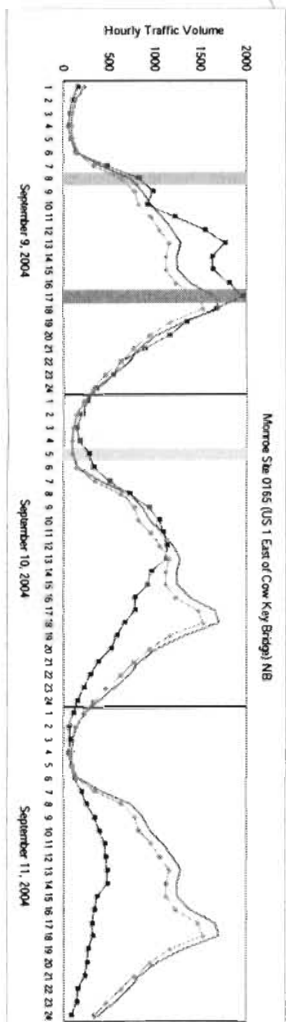
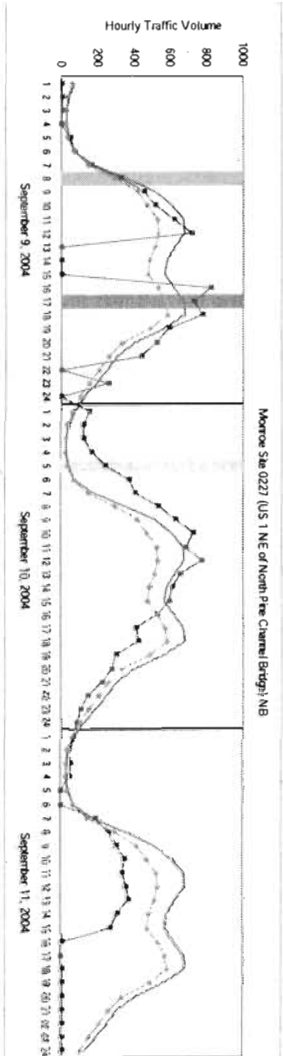
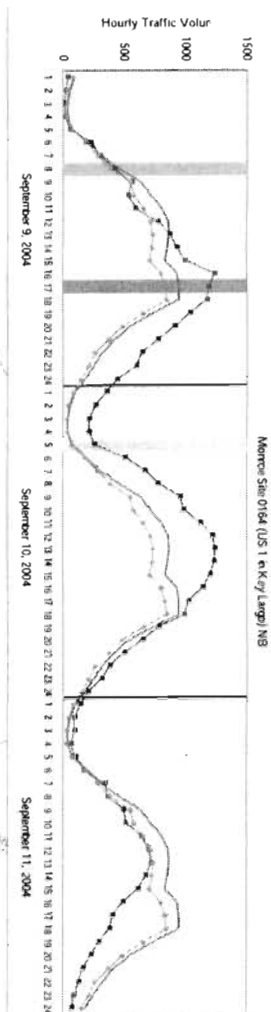
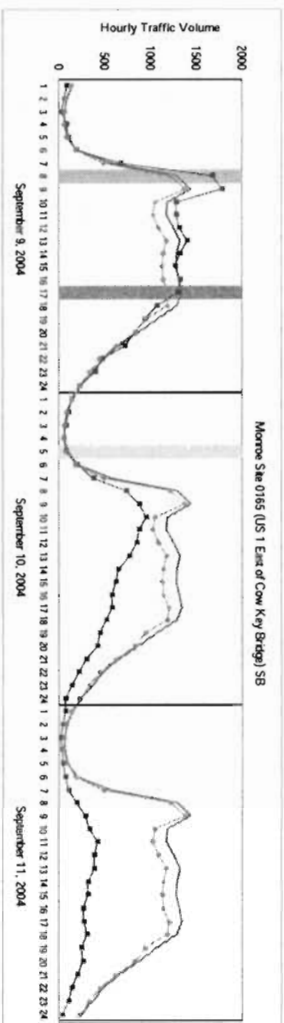
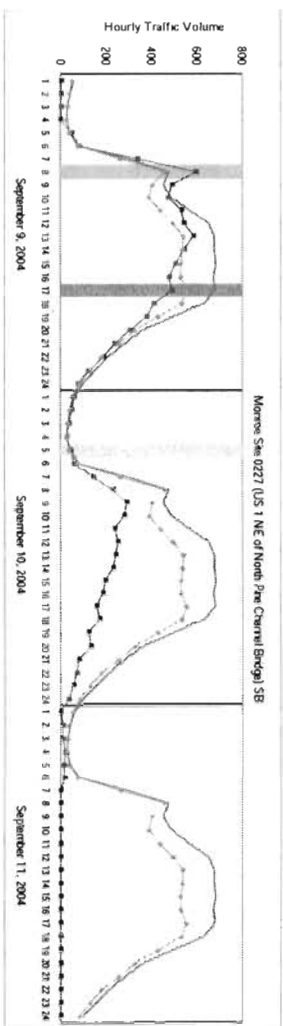
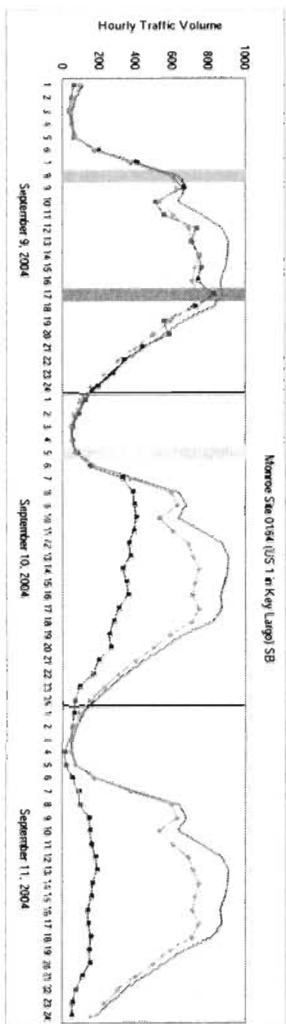
# HURRICANE FRANCES EVACUATION TRAFFIC PATTERN



[NB] Northbound [SB] Southbound

- Visitor Evacuation
- 2004 Hourly Average
- Evacuation Traffic
- 2-month Average

# HURRICANE IVAN EVACUATION TRAFFIC PATTERN



[NB] Northbound [SB] Southbound

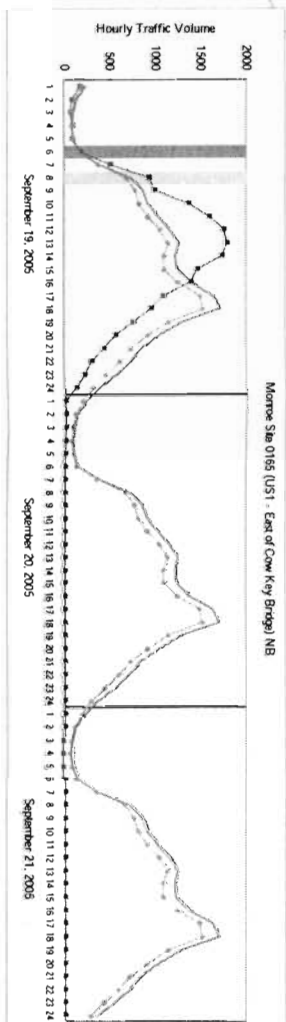
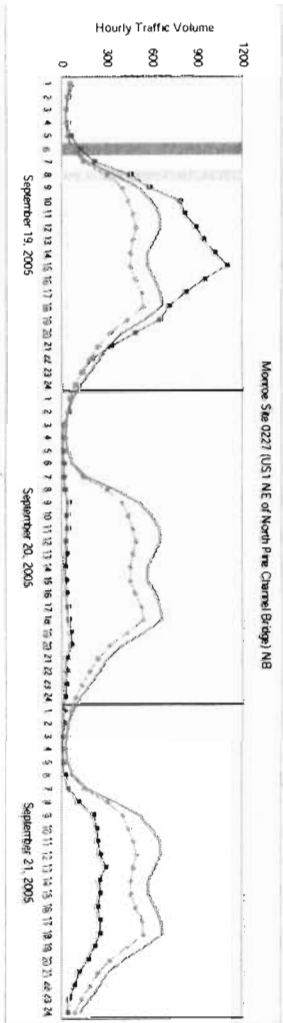
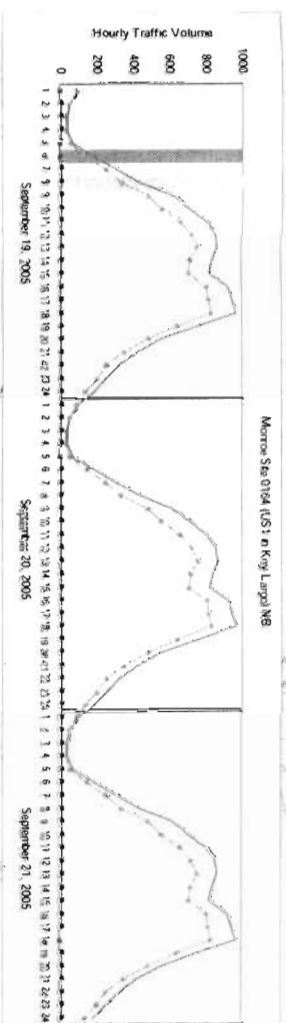
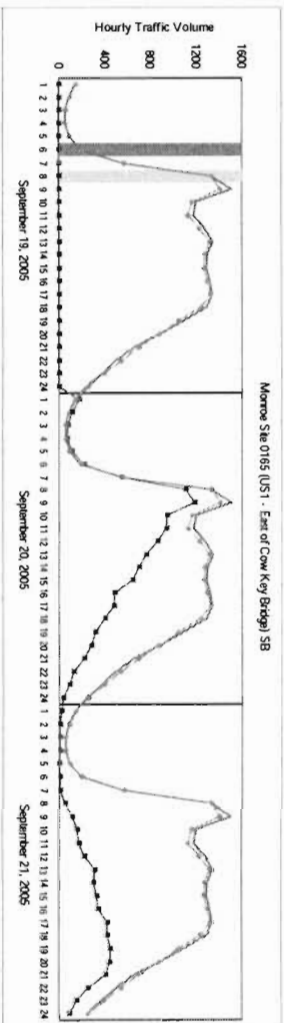
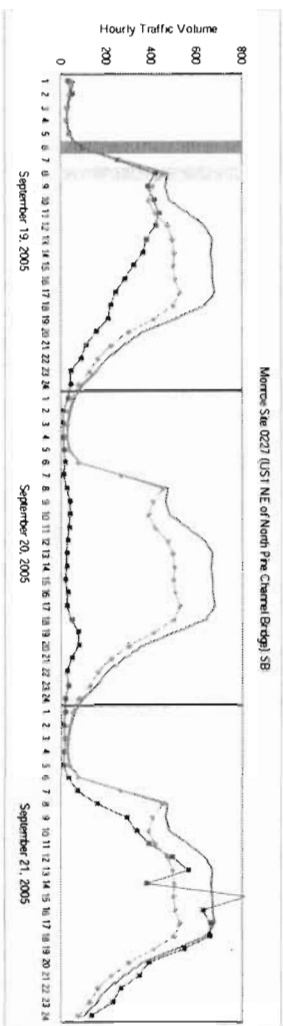
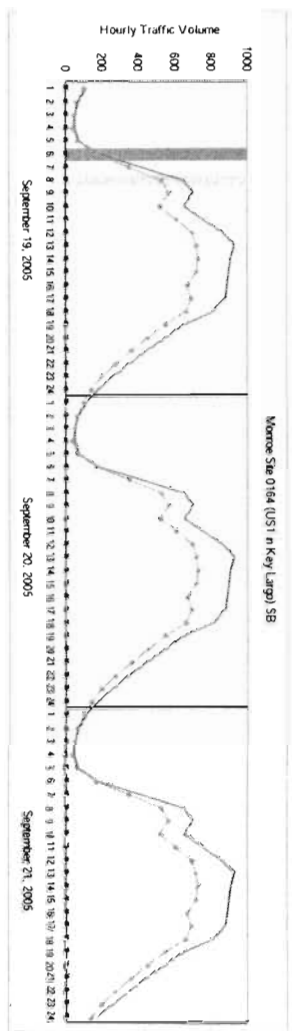
- █ Visitor Evacuation
- █ Mobile homes, RV & Boat Resident Evacuation
- █ Resident Evacuation
- 2004 Hourly Average
- Evacuation Traffic
- 2-month Average



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 DRAWN BY: SW 248/ST  
 CHECKED BY: SW 248/ST  
 PROJECT: 040744-1  
 SHEET: 11

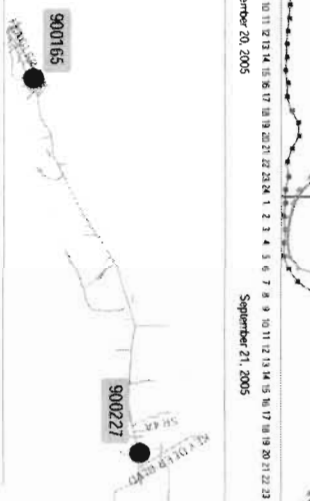


# HURRICANE RITA EVACUATION TRAFFIC PATTERN



[NB] Northbound [SB] Southbound

- Visitor Evacuation
- Resident Evacuation
- 2004 Hourly Average
- Evacuation Traffic
- 2-month Average

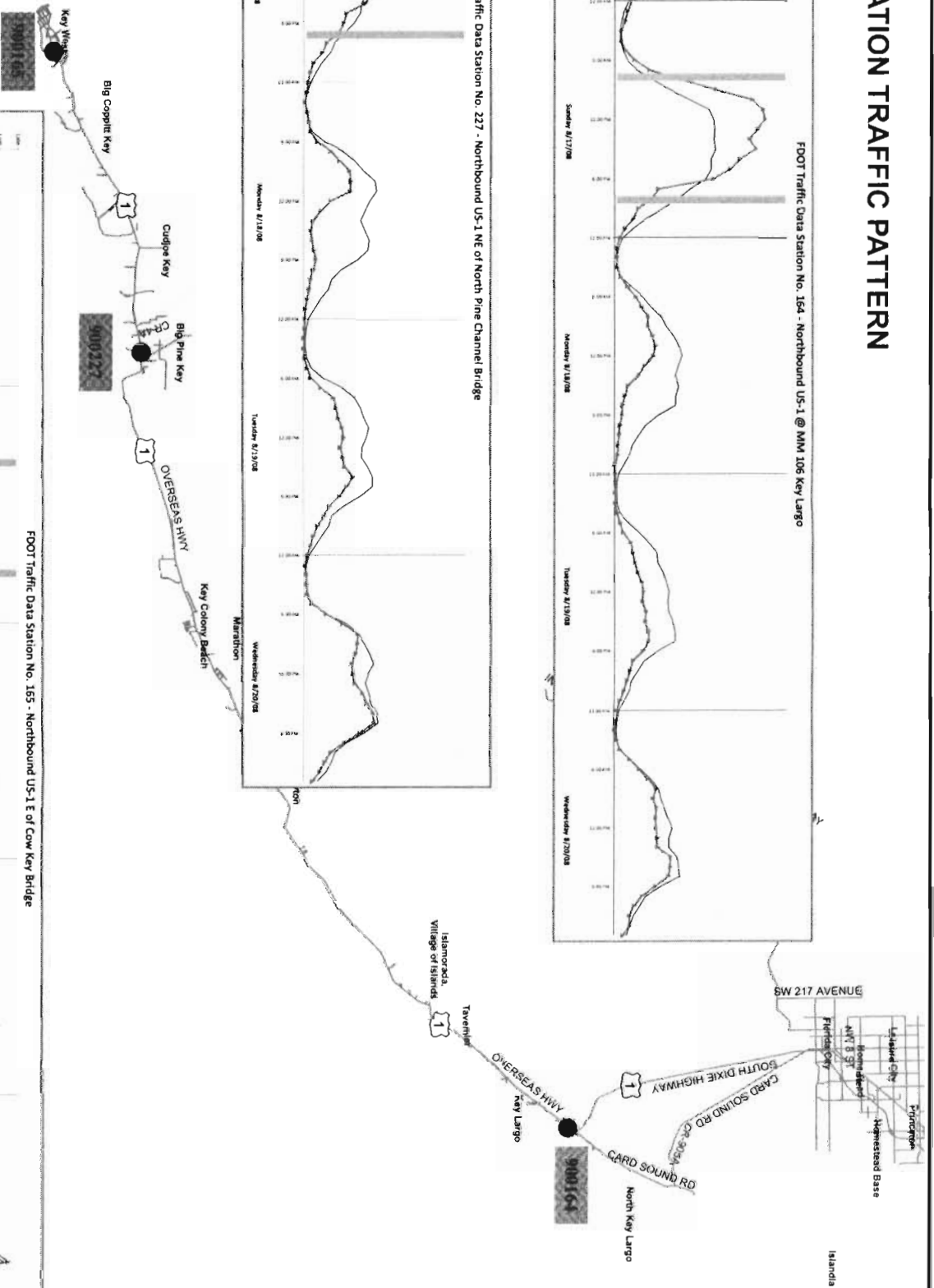
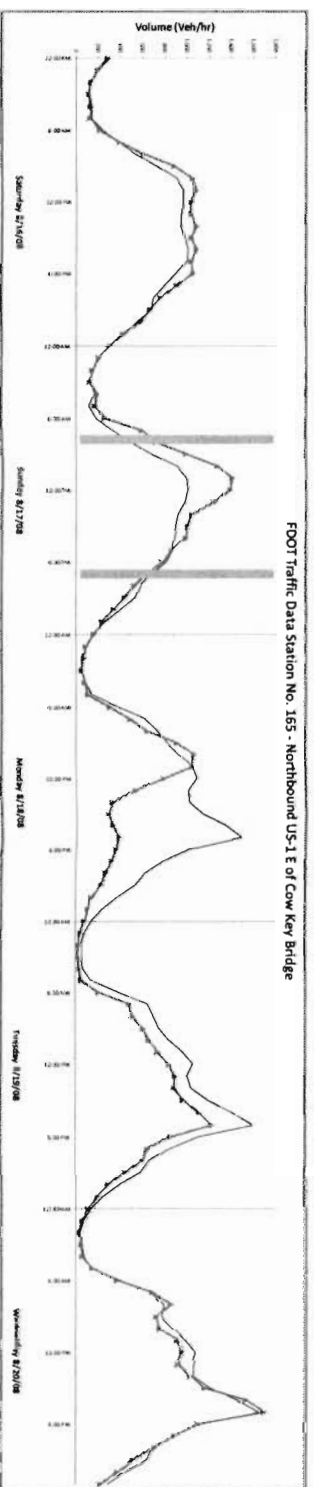
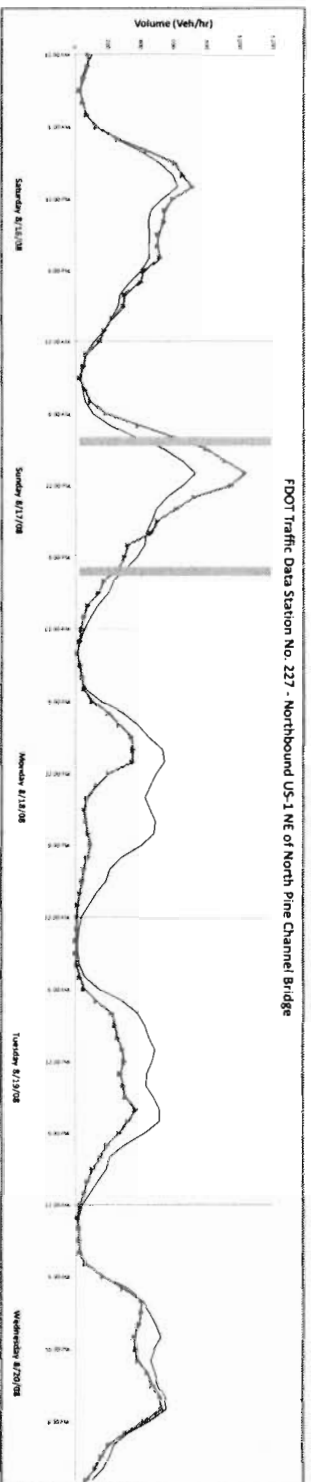
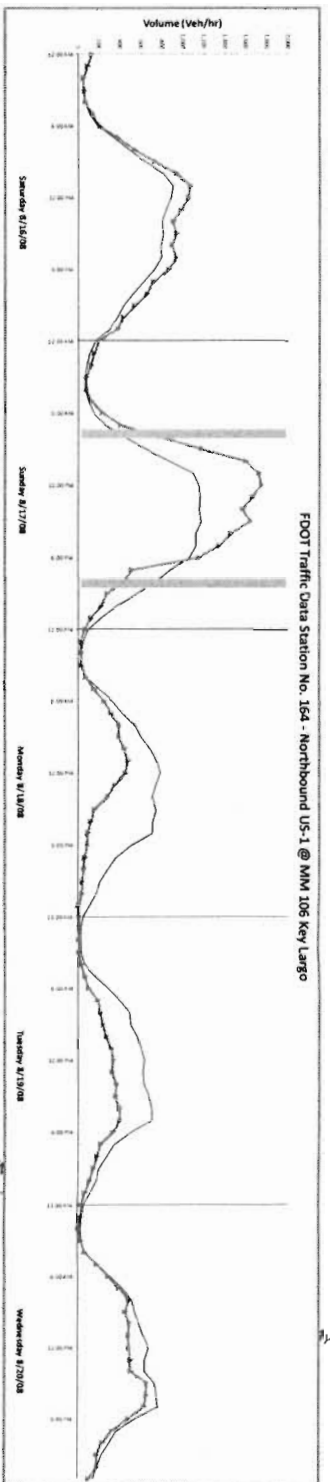


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 USER: JMS





# TROPICAL STORMS FAY EVACUATION TRAFFIC PATTERN

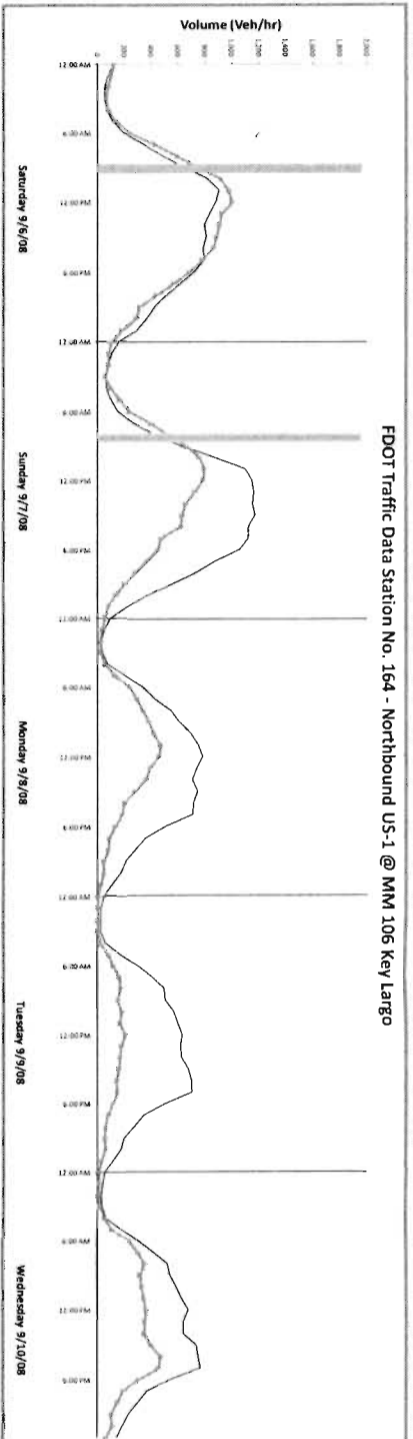


- LEGEND**
- Northbound 3-month prior average
  - Evacuation Traffic
  - Mandatory Evacuation of all Visitors and Non-Residents Evacuation Start
  - Evacuation of Mobile Home Residents and Residents in Low-Lying Areas Start

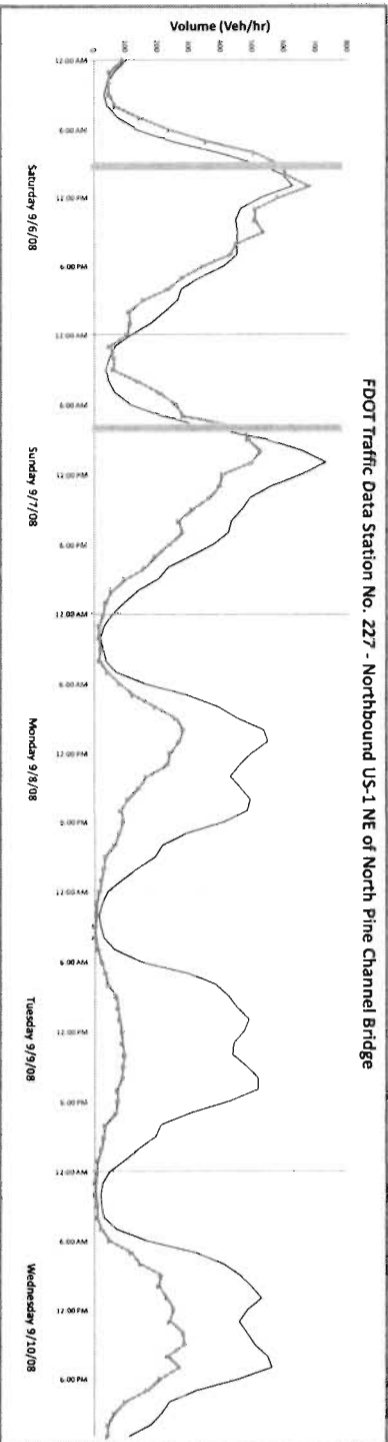
**Note:** A mandatory evacuation of all permanent residents was not ordered during Tropical Storm Fay.

# TROPICAL STORMS IKE EVACUATION TRAFFIC PATTERN

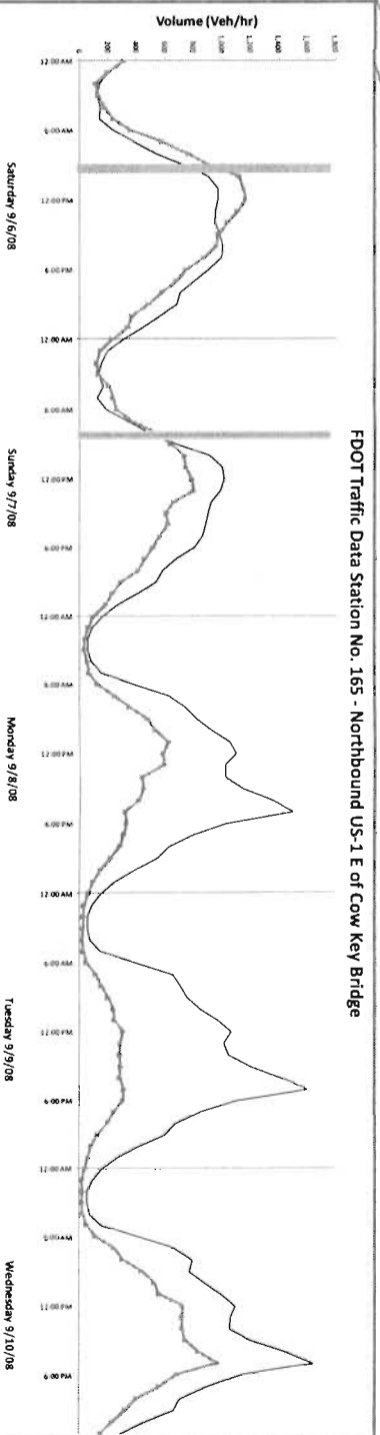
FDOT Traffic Data Station No. 164 - Northbound US-1 @ MM 106 Key Largo



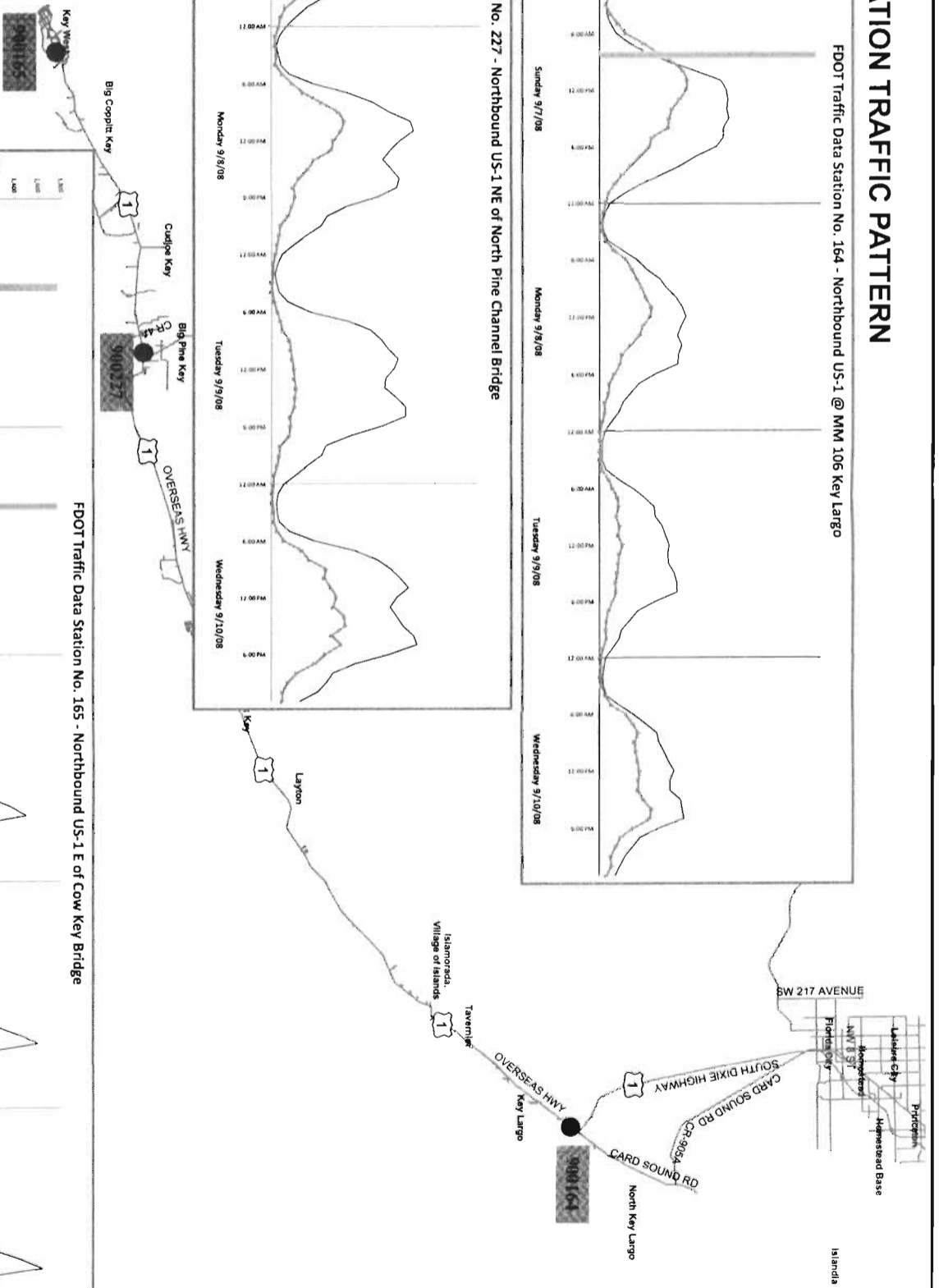
FDOT Traffic Data Station No. 227 - Northbound US-1 NE of North Pine Channel Bridge



FDOT Traffic Data Station No. 165 - Northbound US-1 E of Cow Key Bridge



- LEGEND**
- Northbound 3-month prior average
  - Evacuation Traffic
  - Mandatory Evacuation of all Visitors and Non-Residents
  - Evacuation Start
  - Mandatory of all Residents in the Florida Keys
  - Evacuation Start





### **28-20.110 Comprehensive Plan.**

The Monroe County Comprehensive Plan Policy Document, as the same exists on January 1, 2004, is hereby amended to read as follows:

#### **(1) Policy 101.2.13.**

Monroe County shall establish an interim Permit Allocation System for new residential development. The interim Permit Allocation System shall supersede Policy 101.2.1 and remain in place until such time as Monroe County determines its future growth capacity based on hurricane evacuation, public safety and environmental needs including water quality and habitat protection, and amends its plan consistent with such determination, based on the results of the work program as set forth below. DEP, DOH, DCA and Monroe County shall develop a coordinated permit review process that will insure that no state agency shall issue a wastewater disposal permit that would allow development in excess of the number of permits that Monroe County may issue under this interim policy. Similarly, Monroe County shall not issue development permits under this interim policy in excess of wastewater disposal permits that DEP or DOH may issue. For Years 3 and 4 of the Work Program the interim Permit Allocation System shall allow a minimum of 88 new residential permits per year which may be used to address the backlog of ROGO allocations. Additional new residential permits will be allowed but limited to the number of nutrient reduction credits earned within the same unincorporated ROGO area. Nutrient reduction credits shall be earned consistent with Table 1 below. The nutrient reduction credits earned by the construction of the Little Venice system shall be earned according to the following schedule:

1. For the ROGO Year Effective July 13, 2003, 213 of the total credits estimated to be available from the full operation of the system shall be earned when the wastewater construction permit for the system is issued by DEP, the design/build contract for the system has been fully executed, and construction of the system has commenced. Of these credits, 52 shall be made available to Monroe County for affordable housing, and 67 for proposed affordable housing in the City of Marathon. Any credits not used for affordable housing shall be available for future allocation pursuant to paragraph 2. below. In addition, 52 of these credits shall be made available to Monroe County and 42 of these credits shall be made available to the City of Marathon.

2. All remaining available credits shall be earned when the construction of the system is 100 percent complete, the collection system lines have been installed, and when the final total of credits available from operation of the system has been calculated. The total credits available shall be reduced by the 213 advanced in the year 2003 prior to distribution to local governments outside the City of Marathon. Nutrient reduction credits that are earned from the construction of a central sewer system, in which state or federal funds are used, shall be allocated as follows:

1. The local government shall receive a pro rata share of the earned nutrient reduction credits in proportion to the amount of funds it contributed from its jurisdiction to the total construction costs; and

2. The remaining earned nutrient reduction credits shall be allocated between Monroe County, the City of Marathon, and the Islamorada, Village of Islands in proportion to the annual ROGO allocation of each to the total annual ROGO allocation for these local governments.

Effective July 13, 2003, Monroe County is allocated 41 nutrient credits for market rate units. These 41 credits shall be subtracted from the nutrient credits subsequently earned from hookups to the Key West Resort Utilities Wastewater Facility.

Effective July 13, 2003, Monroe County is allocated 193 nutrient credits for affordable housing units. These 193 credits shall be subtracted from the nutrient credits subsequently earned from hookups to the Key West Resort Utilities, Bay Point, and Key Largo Wastewater Facilities.

Nutrient reduction credits earned using funds provided by the State and matched by the County in fiscal years 1997-98 and 1998-99 will be used to offset the nutrient impacts of the 88 new residential permits per year, but may not be used for additional new residential permits until such time as these funds generate more than 88 nutrient reduction credits for Years 3 and 4. For Year 5, the interim Permit Allocation System shall allow a minimum of 77 new residential permits. If fewer than 77 nutrient reduction credits are earned in Year 5, the deficit shall be made up in Year 6 prior to issuance of any new permits. For Year 6 and beyond, the interim Permit Allocation System shall limit the number of permits issued for new residential development to the number of nutrient reduction credits earned within the same unincorporated ROGO area, except as otherwise authorized herein. The Administration Commission has determined that, effective July 13, 2005, no nutrient credits shall be required if the local government has made satisfactory progress, as determined by the Administration Commission, in meeting the deadlines established by the Work Program as adopted by rule after March 15, 2004.

For all years the number of permits issued for new residential development under the Rate of Growth Ordinance shall not exceed a total annual unit cap of 197, plus any available unused ROGO allocations from the previous ROGO year. Unused ROGO allocations

may be allocated in subsequent ROGO years. Each year's ROGO allocation of 197 new units shall be split with a minimum of 71 units allocated for affordable housing in perpetuity and market rate allocations not to exceed 126 new residential units per year. This allocation represents the total number of new permits for development that may be issued during a ROGO year. No exemptions or increases in the number of new permits, other than that which may be expressly authorized by this rule or provided for in the comprehensive plan or for which there is an existing agreement executed prior to January 1, 2003 for affordable housing between the Department and the local government in the critical areas, may be allowed. The Administration Commission has determined that, effective July 12, 2004, 140 ROGO allocations, which represents unused reductions for ROGO years 9-12, and 25 units lost in Year 10 due to lack of nutrient credits, are reallocated to the County exclusively for affordable housing purposes. Monroe County shall develop a tracking system for monitoring the nutrient reduction credits earned. The tracking system shall commence upon the effective date of this rule and the number of nutrient reduction credits earned shall be cumulative and may be applied to future years of the interim Permit Allocation System.

**Table 1  
Nutrient Reduction Credits**

Treatment System Upgraded to	On-site Treatment	Centralized Systems		
	OWNR or Equivalent	Secondary Treatment	Best Available Treatment (BAT)	Advanced Wastewater Treatment (AWT)
Cesspit	1 EDU Credit	1 EDU Credit	1.0 EDU Credit	1.5 EDU Credit
Substandard OSTDS	0.5	0.5	1.0	1.5
Approved OSTDS	0.5	0	1	1.5
Secondary Treatment	n/a	n/a	1	1.5

**\*\* If Credits were previously issued for replacement or upgrades from a cesspit or substandard system to a secondary treatment plant, when the secondary treatment plant is upgraded to an advanced treatment plant, then .5 times the total number of EDU's shall be awarded \*\***

Additionally, the unit cap for new residential development shall be linked to the following work program which identifies actions necessary to correct existing wastewater and stormwater problems, as well as actions necessary to determine appropriate future growth. Beginning September 30, 2003, and each year of the work program thereafter, Monroe County and the Department of Community Affairs shall report to the Administration Commission documenting the degree to which the work program objectives for that year have been achieved. The report for years seven and eight shall be combined and provided to the Administration Commission by September 30, 2005.

The Commission shall consider the findings and recommendations provided in those reports and shall determine whether substantial progress has been achieved toward accomplishing the tasks of the work program. If the Commission determines that substantial progress has not been made, the unit cap for new residential development shall be reduced by at least 20 percent for the following year, with the exception of ROGO Year beginning July 13, 2003. If the Commission determines that substantial progress has been made, then the Commission shall increase the unit cap for new residential development for the following year up to a maximum of 197 units. Other agencies identified in the work program, or any interested persons, may likewise report and make recommendations for consideration by the Commission. Notwithstanding any other dates set forth in this plan, the dates set forth in the work program shall control where conflicts exist. For each task in the work program, the Department of Community Affairs shall request of all relevant and appropriate federal, state, regional, and local agencies that they contribute any relevant data, analysis and recommendations, and that they take an active role in assisting the county in completing the task. Each such agency shall prepare, in coordination with the county, a section to be included in Monroe County's reports which indicates the agency's actions relative to the work plan. The Department of Community Affairs shall specifically request that the Florida Keys National Marine Sanctuary Water Quality Protection Program Steering Committee (Water Quality Steering Committee) take an active role in coordinating with Monroe County, and relevant state and federal agencies, in the implementation of the tasks related to water quality, wastewater and stormwater facilities, and in the development and implementation of the carrying capacity study. The Steering Committee will provide technical assistance and substantive comments and recommendations to ensure that the county's wastewater and stormwater

master plans and the carrying capacity study are consistent with the objectives of the Florida Keys National Marine Sanctuary Water Quality Protection Program. The Steering Committee will make recommendations on wastewater systems and Hot Spot priorities prior to implementation by the County. It is the intent of this rule to accelerate the pace, and increase the effectiveness of the current cesspit replacement effort through both a regulatory and an incentive-based program. No later than August, 1999 Monroe County shall engage in a public education program to ensure that the public understands that the County is committed to the swift identification and replacement of cesspits, as a full partner with the Department of Health. The public education program shall explain the role of cesspit removal in the overall context of the Work Plan and Wastewater Master Plan. The County and the state shall request the participation of the Steering Committee in the public education program as well as the Florida Keys Aqueduct Authority.

#### WORK PROGRAM<sup>1</sup>

<sup>1</sup>On March 9, 1999, the Administration Commission determined that substantial progress toward the work program objectives had not been made and authorized rulemaking to amend the work program beginning in Year Three. Work program tasks from Years One and Two not completed by the end of Year Two were included as tasks in subsequent years of the work program.

YEAR ONE (ending December 31, 1997).

A. Complete Phase I (data collection) for the Wastewater and Stormwater Master Plans, and secure funding for plan completion. (Ref. County obj. 901.4)

Agencies: County, DCA, DEP, DOH and SFWMD.

B. Complete a conceptual plan or scope of work to develop a carrying capacity. The carrying capacity analysis shall be designed to determine the ability of the Florida Keys ecosystem, and the various segments thereof, to withstand all impacts of additional land development activities. The analysis shall be based upon the findings adopted by the Administration Commission on December 12, 1995, or more recent data that may become available in the course of the study, and shall be based upon the benchmarks of, and all adverse impacts to, the Keys land and water natural systems, in addition to the impact of nutrients on marine resources. The carrying capacity analysis shall consider aesthetic, socioeconomic (including sustainable tourism), quality of life and community character issues, including the concentration of population, the amount of open space, diversity of habitats, and species richness. The analysis shall reflect the interconnected nature of the Florida Keys' natural systems, but may consider and analyze the carrying capacity of specific islands or groups of islands and specific ecosystems or habitats, including distinct parts of the Keys' marine system. (Ref. 1991 Stip. Settlement Agreement)

Agencies: County, DCA, DEP, DOH, DOT, FFWCC, SFWMD, NMS, SFRPC, EPA, USFWS, Army COE, and other interested parties to include representatives of environmental organizations and development interests.

C. Complete AWT/OSDS demonstration study and initiate rulemaking for new standards for OSDS. (Ref. County pol. 901.4.3)

Agencies: DOH.

D. Complete Marathon Facilities Plan and secure funding for the facility site(s). The wastewater facilities plan should implement the most cost effective method of collecting, treating, and disposing of wastewater, and shall include an investigation of the feasibility of using alternative nutrient-stripping on-site disposal systems. The development of the facilities plan shall be a component of the Wastewater Master Plan as that Plan is developed.

Agencies: County, DCA and DEP.

E. Continue cesspit elimination process with identification of Hot Spots as first priority in accordance with Objective 901.2, and seek funding for cesspit identification. Enter into an interlocal agreement with DOH to specify the responsibilities and procedures for the OSDS inspection/compliance program as required by Policy 901.2.3. Adopt an ordinance which specifies the implementation procedures for the OSDS inspection/compliance program. The ordinance shall include authorization for DOH to inspect wastewater treatment systems on private property as required by Policy 901.2.3. (Ref. County obj. 901.2)

Agencies: County, DCA and DOH.

F. Submit status of CARL and ROGO land acquisition to the Administration Commission.

Agencies: County, Land Authority and DEP.

G. Revise the Habitat Evaluation Index (HEI) based on peer review.

Agencies: County, DCA, DEP, FFWCC and Federal agencies.

YEAR TWO (ending December 31, 1998).

A. Complete the Wastewater and Stormwater Master Plans and execute interagency agreements to define construction schedule by phases. Document that significant reduction in nutrients will be achieved each year thereafter within each of the sub-areas. The

Master Plans shall include facility plans for all proposed treatment strategies, and determine retrofit and funding requirements for Hot Spots and cesspits identified in D. below.

Agencies: County, DCA, DEP and DOH.

B. Secure funding for the carrying capacity study and initiate Phase I (data collection) of the study.

Agencies: County and DCA.

C. Complete final design for Marathon Facilities Plan and secure facility site(s).

Agencies: County, DCA and DEP.

D. Complete cesspit ID process in Hot Spots, excluding the Marathon area.

Agencies: County, DCA and DOH.

E. Submit status of CARL and ROGO land acquisition to the Administration Commission.

Agencies: County, Land Authority, FFWCC and DEP.

F. Document the extent and quality of the fresh groundwater lens system on Big Pine Key; delineate the associated recharge areas; and determine the safe yield of the system. (Ref. County pol. 103.1.5)

Agencies: County, DCA, SFWMD, USFWS.

YEAR THREE (January 1, 1999 through July 12, 2000).

A. Complete and begin implementation of Wastewater Master Plan. Utilizing the findings of the Wastewater Master Plan and recommendations of the Water Quality Steering Committee relating to Hot Spots do the following: refine and prioritize areas identified as Hot Spots, determine retrofit and funding requirements for priority Hot Spots and cesspit replacement for areas outside those areas identified for central or cluster wastewater collection systems, and begin developing facility plans for priority Hot Spots. Execute interagency agreements to define facility plan, design and construction schedules for each Hot Spot facility. Establish a water quality monitoring program to document the reduction in nutrients as a result of these facilities. Complete a wastewater treatment finance plan and a service area implementation plan, and continue efforts to secure funding for Wastewater Master Plan implementation, with priority given to Hot Spots. Determine the feasibility and legal ramifications of establishing an escrow account as a means of providing long-term funding for replacing cesspits or substandard onsite sewage systems. Establish a mechanism such as special assessments, impact fees, infrastructure surcharge, or other dedicated revenues, to fund the local share of wastewater improvements in Years Four and Five. Seek to provide comparable subsidies for both wastewater collection systems and individual cesspit replacement.

Agencies: County, FCAA, DCA, DEP, DOH, SFWMD, EPA and Water Quality Protection Program Steering Committee (WQSC).

B. Secure funding for Storm Water Master Plan development, contract selected firm for development of Master Plan, and complete Phase I (data collection). Determine the feasibility of providing nutrient reduction credits for stormwater improvements.

Agencies: County, DCA, DOT, SFWMD, EPA and WQSC.

C. Conclude acquisition of North Key Largo Hammocks CARL project. Make offers to 33% of remaining private owners with property located in other CARL project boundaries.

Agencies: County, Land Authority and DEP.

D. Secure remaining funds for the carrying capacity study, conduct workshops as outlined in the Scope of Work, select prime contractor, and initiate Phase I (data collection) of the study.

Agencies: County, DCA, DEP, DOH, DOT, FFWCC, SFWMD, WQSC, SFRPC, EPA, USFWS, Army COE, and other interested parties to include representatives of environmental organizations and development interests.

E. Continue efforts to secure funding for the Marathon Facility. Complete Little Venice construction design, secure lands needed for Little Venice facility, and begin bid process and selection of construction firm. Design a water quality monitoring program to document Little Venice project impacts.

Agencies: County, FCAA, DCA, DEP, WQSC, and EPA.

F. Continue cesspit identification by providing notice to all property owners with unknown systems, outside of Hot Spots. Initiate replacement of cesspits outside of Hot Spots. Award financial assistance grants to qualified applicants using FY 1997-98 state funds to ensure a minimum of 70 cesspit replacements. Develop a low interest loan and grant program to assist all residents in replacing cesspits, with priority of funds going, in order of preference, to very low-, low- and moderate-income households. Investigate the appropriateness of transferring credits among ROGO areas and awarding nutrient reduction credits for future committed water quality treatment facilities.

Agencies: County, DCA, FCAA, WQSC and DOH.

G. Document the extent and quality of the fresh groundwater lens system on Big Pine Key; delineate the associated recharge areas; and determine the safe yield of the system. (Ref. County pol. 103.1.5)

Agencies: County, FCAA, DEP, DCA, SFWMD, EPA, WQSC and USFWS.

H. Develop an integrated funding plan for the purchase of land from ROGO applicants who have competed unsuccessfully for four consecutive years and applied for administrative relief.

Agencies: County.

I. The County, in conjunction with DCA, shall assess the feasibility of applying the nutrient reduction credit requirement to new commercial development.

Agencies: County and DCA.

YEAR FOUR (July 13, 2000 through July 12, 2001).

A. Continue implementation of Wastewater Master Plan, execute interagency agreements to define construction schedule by phases, and continue developing facility plans for selected Hot Spots in each ROGO area. Secure funding to implement the Wastewater Master Plan. Document that reduction in nutrients has been achieved within each of the sub-areas.

Agencies: County, FCAA, DCA, DEP, DOH, EPA and WQSC.

B. Complete Storm Water Master Plan. Identify priority projects for implementation and seek funding for plan implementation.

Agencies: County, DCA, DEP, DOT, SFWMD, EPA and WQSC.

C. Make offers to 50% of remaining private owners with property located in CARL project boundaries.

Agencies: County, Land Authority and DEP.

D. Complete Phase II of the carrying capacity study (data analysis) and present initial recommendations to review agencies.

Agencies: County, DCA, DEP, DOH, DOT, FFWCC, SFWMD, WQSC, SFRPC, EPA, USFWS, Army COE, and other interested parties to include representatives of environmental organizations and development interests.

E. Establish baseline water quality for surface and groundwater quality potentially impacted by Little Venice project.

Agencies: County, DCA, DEP, FCAA, WQSC and EPA.

F. Complete cesspit identification and continue cesspit replacement outside of Hot Spots, with a priority of funds going, in order of preference, to low- and moderate-income households; ensure that a minimum of 88 cesspits are replaced.

Agencies: County, FCAA, WQSC and DOH.

YEAR FIVE (July 13, 2001 through July 12, 2002).

A. Continue implementation of the Wastewater Master Plan pursuant to executed interagency agreements. Begin construction of wastewater facilities in selected Hot Spots.

Agencies: County, FCAA, DCA, DOH, DEP, EPA, and WQSC.

B. Execute interagency agreements to define construction schedule for selected storm water improvement projects. Complete land acquisition and final design for selected treatment strategies for Storm Water Master Plan.

Agencies: County, DCA, DEP, DOT, WQSC and SFWMD.

C. Conclude negotiations with all willing owners with property within CARL project boundaries. Acquire a total-to-date of 45% of the Key Deer/Coupon Bight project and 25% of the Florida Keys Ecosystems project from willing sellers.

Agencies: County, Land Authority, and DEP.

D. Complete final draft of the carrying capacity study including acceptance by review agencies.

Agencies: County, FCAA, DCA, DEP, DOH, DOT, FFWCC, SFWMD, WQSC, SFRPC, EPA, USFWS, Army COE, and other interested parties to include representatives of environmental organizations and development interests.

E. Continue eliminating cesspits and inoperative septic tanks in areas outside of Hot Spots.

Agencies: County, DOH, FCAA and WQSC.

YEAR SIX (July 13, 2002 through July 12, 2003).

A. Continue construction of wastewater facilities in Hot Spots begun in previous year. Contract to design and construct additional wastewater treatment facilities in Hot Spots in accordance with the schedule of the Wastewater Master Plan. Continue implementation of Wastewater Master Plan with emphasis on Hot Spots.

Agencies: County, FCAA, DEP, DOH, DCA, EPA and WQSC.

B. Initiate construction of selected projects as identified in the Storm Water Master Plan.

Agencies: County, SFWMD, DEP, DCA, DOT, EPA and WQSC.



C. Implement the carrying capacity study by, among other things, the adoption of all necessary plan amendments to establish a rate of growth and a set of development standards that ensure that any and all new development does not exceed the capacity of the county's environment and marine system to accommodate additional impacts. Plan amendments will include a review of the County's Future Land Use Map series and changes to the map series and the "as of right" and "maximum" densities authorized for the plan's future land use categories based upon the natural character of the land and natural resources that would be impacted by the currently authorized land uses, densities and intensities.

Agencies: County, FCAA, FFWCC, DCA, DEP, DOH, DOT, SFWMD, SFRPC, EPA, Army COE, WQSC, and USFWS, and other interested parties to include representatives of environmental organizations and development interests.

D. Complete the elimination of all cesspits in areas outside of Hot Spots.

Agencies: County, FCAA, DOH and WQSC.

E. Develop a Keys-wide master land acquisition plan which shall include:

(1) A strategy for the acquisition of those properties which should be preserved due to their habitat value as well as those other properties where future development is to be discouraged,

(2) A management plan for implementing the strategy, and

(3) A reasonable, feasible plan for securing funding for said land acquisition.

Agencies: County, Land Authority, DCA, DEP, SFWMD, Army COE, EPA, USFWS and other interested parties to include representatives of environmental organizations and development interests.

F. Initiate and complete a collaborative process for the adoption of land development regulations, and/or comprehensive plan amendments as needed, that will strengthen the protection of terrestrial habitat through processes such as the Permit Allocation System and permitting processes, and the preservation and maintenance of affordable housing stock.

Agencies: County, DCA, DEP, FFWC, USFWS, and other interested parties to include representatives of environmental organizations and development interests.

YEAR SEVEN (July 13, 2003 through July 12, 2004).

A. Finalize construction and begin operating wastewater facilities in Hot Spots. Continue implementation of Wastewater Master Plan with continued emphasis on Hot Spots.

Agencies: County, FCAA, DEP, DCA, DOH, EPA and WQSC.

B. Continue implementing selected projects as identified in the Storm Water Master Plan.

Agencies: County, DCA, DEP, DOT, SFWMD, EPA and WQSC.

The Work Program in Policy 101.2.13 for Year 8, Year 9, and Year 10 shall be established as follows:

YEAR EIGHT (July 13, 2004 through July 12, 2005).

A. Review and revise (as necessary) the Conservation and Natural Areas Map.

Agencies: County, USFWS, FFWCC, DEP, DCA

B. Initiate acquisition strategy for lands identified outside the Conservation and Natural Areas identified as worthy of protection.

Agencies: County, DCA, DEP

C. Begin public hearings for Conservation and Natural Areas boundaries.

Agencies: County

D. Conclude public hearings for the adoption of the amended Conservation and Natural Areas Boundaries.

Agencies: County

E. Adopt an ordinance to implement a moratorium on ROGO/NROGO applications that involves the clearing of any portion of an upland tropical hardwood hammock or pinelands habitat contained in a tropical hardwood hammock or pinelands patch of two or more acres in size located within a Conservation and Natural Area.

Agencies: County, DCA

F. Adopt amendments to the comprehensive plan and land development regulations to enact overlay designations, and eliminate or revise the Habitat Evaluation Index, and modify the ROGO/NROGO system to guide development away from environmentally sensitive lands.

Agencies: County, DCA

G. Amend land development regulations to prohibit the designation of Conservation and Natural Areas (Tier 1) as a receiver site for ROGO exempt development from sender sites; and to further limit clearing of upland native habitat that may occur in the

Natural Areas (Tier I) and the Transition and Sprawl Reduction Area (Tier II) upon designation by the County.

Agencies: County, DCA

H. Develop Land Acquisition and Management Master Plan and address both funding and management strategies.

Agencies: County, DCA, DEP, USFWS, FWCC

I. Provide \$40 million in financing secured by infrastructure tax for wastewater facilities.

Agencies: County

J. Begin construction of wastewater plants or laying of collection lines for Baypoint, Conch Key and Key Largo Trailer Village/Key Largo Park.

Agencies: County, FCAA, DEP, Key Largo Wastewater District

K. Ensure the connection for up to 1,350 EDUs at Stock Island to Key West Resort Utilities.

Agencies: County, DEP

L. Complete lower Keys and Key Largo Feasibility Study.

Agencies: County, FCAA, DEP

M. Complete projects identified in the Stormwater Management Master Plan.

Agencies: County, DEP, DCA

N. Evaluate and implement strategies to ensure that affordable housing remains affordable in perpetuity for future generations.

Establish a partnership with non-profit organizations in order to construct affordable housing using additional state funds.

Agencies: County, FHFC, DCA

O. Identify potential acquisition sites for affordable housing proposals and include in the Land Acquisition Master Plan.

Agencies: County, FHFC, DCA

P. Provide up to \$10 million in bond financing from the Tourist Impact Tax for acquisition of land for workforce housing and affordable housing sites.

Agencies: County

Q. Complete a comprehensive analysis of hurricane evacuation issues in the Florida Keys and develop strategies to reduce actual hurricane clearance times and thereby reduce potential loss of life from hurricanes.

Agencies: County, DCA

YEAR NINE (July 13, 2005 through July 12, 2006).

A. In coordination with the Florida Keys Aqueduct Authority and the Key Largo Sewer District, initiate the process to obtain \$80 million in bond financing secured by connection fees.

Agencies: County, FCAA, Key Largo Sewer District

B. Secure site for lower Keys and Key Largo wastewater facilities.

Agencies: County, FCAA

YEAR TEN (July 13, 2006 through July 12, 2007).

A. Award contract for design, construction and operation for the lower Keys and Key Largo wastewater facilities.

Agencies: County, FCAA, Key Largo Sewer District

B. Begin construction of the lower Keys and Key Largo wastewater plants.

Agencies: County, FCAA, Key Largo Sewer District

C. Initiate connections to lower Keys and Key Largo wastewater systems.

Agencies: County, FCAA, Key Largo Sewer District

D. Complete construction and hookups for Baypoint, Conch Key and Key Largo Trailer Village/Key Largo Park.

Agencies: County, FCAA, Key Largo Sewer District

E. Obtain \$80 million in bond financing secured by connection fees.

Agencies: County, FCAA, Key Largo Sewer District

(2) Policy 101.12.4.

Upon adoption of the comprehensive plan, Monroe County shall require that the following analyses be undertaken prior to finalizing plans for the siting of any new or the significant expansion (25 percent) of any existing public facility:

(a) Assessment of needs;

(b) Evaluation of alternative sites, and design alternatives for the alternative sites;

(c) Assessment of direct and secondary impacts on surrounding land uses and natural resources.

The assessment of impacts on surrounding land uses and natural resources will evaluate the extent to which the proposed public facility involves public expenditures in the coastal high hazard area and within environmentally sensitive areas, including disturbed salt marsh and buttonwood wetlands, undisturbed beach berm areas, units of the coastal barrier resources system, undisturbed uplands (particularly high quality hammock and pinelands), habitats of species considered to be threatened or endangered by the state and/or federal governments, offshore islands, and Natural Areas (Tier I).

Except for passive recreational facilities on publicly-owned land, no new public community or utility facility other than water distribution and sewer collection lines or lift stations shall be allowed within the Natural Areas (Tier I) unless it can be accomplished without clearing of hammock or pinelands. Exceptions to this requirement may be made to protect the public health, safety, and welfare, if all the following criteria are met:

1. No reasonable alternatives exist to the proposed location; and
2. The proposed location is approved by a super-majority of the Board of County Commissioners.

The proposed site for the Key Largo Wastewater Treatment Facility (located at mile marker 100.5) with an allowed clearing area of up to 4.2 acres shall not be subject to this policy.

(3) Policy 101.3.4.

Public facilities shall be exempt from the requirements of the Permit Allocation System for new non-residential development. Certain development activity by federally tax-exempt not-for-profit educational, scientific, health, religious, social service, cultural and recreational organizations may be exempted from the Permit Allocation System by the Board of County Commissioners after review by the Planning Commission upon a finding that:

1. Such activity will predominantly serve the County's non-transient population; and
2. Any such development activity is not planned within an area proposed for acquisition by governmental agencies for the purpose of resource protection.

All public and institutional uses that predominantly serve the County's non-transient population and which house temporary residents shall be included in the Permit Allocation System for residential development, except on factual demonstration that such transient occupancy is of such a nature so as not to adversely affect the hurricane evacuation clearance time of Monroe County.

(4) Policy 101.5.4.3 Lot Aggregation.

Points shall be assigned to Allocation Applications for proposed dwelling unit(s) which includes a voluntary reduction of density permitted as of right within subdivisions (residential units per legally platted, buildable lots) by aggregating vacant, legally platted, buildable lots.

Weighting category	Criteria
Moderate Positive	The applicant aggregates two (2) contiguous, vacant, legally buildable lots. No points shall be awarded for lot aggregation within those areas proposed for acquisition by public agencies for the purpose of resource protection.
Moderate Positive	Each additional contiguous vacant, legally platted, buildable lot aggregated over two (2). No points shall be awarded for lot aggregation within those areas proposed for acquisition by public agencies for the purpose of resource protection.

(5) Policy 101.5.11.

If not listed in the document "Parcels Not Located in Threatened and Endangered Species Habitat and Not Subject to FWS Consultation", or involving minor development activity exempted by the U.S. Fish and Wildlife Service (USFWS)", any application for a ROGO or NROGO allocation shall contain a technical coordination letter from the USFWS. The County shall consider the recommendations of the USFWS's technical coordination letter in the issuance of the subject permit, except that if a low-effect habitat conservation plan is required by USFWS, the mitigation requirements of that plan shall be incorporated in the conditions of the permit.

(6) Policy 205.2.7.

Clearing of native vegetation shall be limited to the immediate development area. For applications that receive points for lot aggregation under the Permit Allocation System for residential development, clearing of vegetation shall be limited to the open space ratios in Policy 205.2.6 or 5,000 square feet, whichever is less. The immediate development area shall be fenced throughout the duration of construction. During construction, there shall be no disturbances of the ground surface and vegetation within required open space areas.

*Specific Authority 380.0552(9) FS. Law Implemented 380.0552 FS. History—New 9-27-05.*

<sup>1</sup> 380.0552 Florida Keys Area; protection and designation as area of critical state concern.

(1) **SHORT TITLE.**—This section may be cited as the “Florida Keys Area Protection Act.”

(2) **LEGISLATIVE INTENT.**—It is the intent of the Legislature to:

- (a) Establish a land use management system that protects the natural environment of the Florida Keys.
- (b) Establish a land use management system that conserves and promotes the community character of the Florida Keys.
- (c) Establish a land use management system that promotes orderly and balanced growth in accordance with the capacity of available and planned public facilities and services.
- (d) Provide affordable housing in close proximity to places of employment in the Florida Keys.
- (e) Establish a land use management system that promotes and supports a diverse and sound economic base.
- (f) Protect the constitutional rights of property owners to own, use, and dispose of their real property.
- (g) Promote coordination and efficiency among governmental agencies that have permitting jurisdiction over land use activities in the Florida Keys.
- (h) Promote an appropriate land acquisition and protection strategy for environmentally sensitive lands within the Florida Keys.
- (i) Protect and improve the nearshore water quality of the Florida Keys through the construction and operation of wastewater management facilities that meet the requirements of ss. 381.0065(4)(l) and 403.086(10), as applicable.
- (j) Ensure that the population of the Florida Keys can be safely evacuated.

(3) **RATIFICATION OF DESIGNATION.**—The designation of the Florida Keys Area as an area of critical state concern, the boundaries of which are described in chapter 27F-8, Florida Administrative Code, as amended effective August 23, 1984, is hereby ratified.

(4) **REMOVAL OF DESIGNATION.**—

- (a) The designation of the Florida Keys Area as an area of critical state concern under this section may be recommended for removal upon fulfilling the legislative intent under subsection (2) and completion of all the work program tasks specified in rules of the Administration Commission.

- (b) Beginning November 30, 2010, the state land planning agency shall annually submit a written report to the Administration Commission describing the progress of the Florida Keys Area toward completing the work program tasks specified in commission rules. The land planning agency shall recommend removing the Florida Keys Area from being designated as an area of critical state concern to the commission if it determines that:
1. All of the work program tasks have been completed, including construction of, operation of, and connection to central wastewater management facilities pursuant to s. 403.086(10) and upgrade of onsite sewage treatment and disposal systems pursuant to s. 381.0065(4)(l);
  2. All local comprehensive plans and land development regulations and the administration of such plans and regulations are adequate to protect the Florida Keys Area, fulfill the legislative intent specified in subsection (2), and are consistent with and further the principles guiding development; and
  3. A local government has adopted a resolution at a public hearing recommending the removal of the designation.
- (c) After receipt of the state land planning agency report and recommendation, the Administration Commission shall determine whether the requirements have been fulfilled and may remove the designation of the Florida Keys as an area of critical state concern. If the commission removes the designation, it shall initiate rulemaking to repeal any rules relating <sup>2</sup>to such designation within 60 days. If, after receipt of the state land planning agency's report and recommendation, the commission finds that the requirements for recommending removal of designation have not been met, the commission shall provide a written report to the local governments within 30 days after making such a finding detailing the tasks that must be completed by the local government.
- (d) The Administration Commission's determination concerning the removal of the designation of the Florida Keys as an area of critical state concern may be reviewed pursuant to chapter 120. All proceedings shall be conducted by the Division of Administrative Hearings and must be initiated within 30 days after the commission issues its determination.
- (e) After removal of the designation of the Florida Keys as an area of critical state concern, the state land planning agency shall review proposed local comprehensive plans, and any amendments to existing comprehensive plans, which are applicable to the Florida Keys Area, the boundaries of which were described in chapter 28-29, Florida Administrative Code, as of January 1, 2006, for compliance as defined in s. 163.3184. All procedures and penalties described in s. 163.3184 apply to the review conducted pursuant to this paragraph.
- (f) The Administration Commission may adopt rules or revise existing rules as necessary to administer this subsection.

(5) APPLICATION OF THIS CHAPTER.—Section 380.05(1)-(5), (9)-(11), (15), (17), and (21) shall not apply to the area designated by this section for so long as the designation remains in effect. Except as otherwise provided in this section, s. 380.045 shall not apply to the area designated by this section. All other provisions of this chapter shall apply, including s. 380.07.

(6) RESOURCE PLANNING AND MANAGEMENT COMMITTEE.—The Governor, acting as the chief planning officer of the state, shall appoint a resource planning and management committee for the Florida Keys Area with the membership as specified in s. 380.045(2). Meetings shall be called as needed by the chair or on the demand of three or more members of the committee. The committee shall:

- (a) Serve as a liaison between the state and local governments within Monroe County.
- (b) Develop, with local government officials in the Florida Keys Area, recommendations to the state land planning agency as to the sufficiency of the Florida Keys Area's comprehensive plan and land development regulations.
- (c) Recommend to the state land planning agency changes to state and regional plans and regulatory programs affecting the Florida Keys Area.
- (d) Assist units of local government within the Florida Keys Area in carrying out the planning functions and other responsibilities required by this section.
- (e) Review, at a minimum, all reports and other materials provided to it by the state land planning agency or other governmental agencies.

(7) PRINCIPLES FOR GUIDING DEVELOPMENT.—State, regional, and local agencies and units of government in the Florida Keys Area shall coordinate their plans and conduct their programs and regulatory activities consistent with the principles for guiding development as specified in chapter 27F-8, Florida Administrative Code, as amended effective August 23, 1984, which is adopted and incorporated herein by reference. For the purposes of reviewing the consistency of the adopted plan, or any amendments to that plan, with the principles for guiding development, and any amendments to the principles, the principles shall be construed as a whole and specific provisions may not be construed or applied in isolation from the other provisions. However, the principles for guiding development are repealed 18 months from July 1, 1986. After repeal, any plan amendments must be consistent with the following principles:

- (a) Strengthening local government capabilities for managing land use and development so that local government is able to achieve these objectives without continuing the area of critical state concern designation.
- (b) Protecting shoreline and marine resources, including mangroves, coral reef formations, seagrass beds, wetlands, fish and wildlife, and their habitat.

- (c) Protecting upland resources, tropical biological communities, freshwater wetlands, native tropical vegetation (for example, hardwood hammocks and pinelands), dune ridges and beaches, wildlife, and their habitat.
- (d) Ensuring the maximum well-being of the Florida Keys and its citizens through sound economic development.
- (e) Limiting the adverse impacts of development on the quality of water throughout the Florida Keys.
- (f) Enhancing natural scenic resources, promoting the aesthetic benefits of the natural environment, and ensuring that development is compatible with the unique historic character of the Florida Keys.
- (g) Protecting the historical heritage of the Florida Keys.
- (h) Protecting the value, efficiency, cost-effectiveness, and amortized life of existing and proposed major public investments, including:
  - 1. The Florida Keys Aqueduct and water supply facilities;
  - 2. Sewage collection, treatment, and disposal facilities;
  - 3. Solid waste treatment, collection, and disposal facilities;
  - 4. Key West Naval Air Station and other military facilities;
  - 5. Transportation facilities;
  - 6. Federal parks, wildlife refuges, and marine sanctuaries;
  - 7. State parks, recreation facilities, aquatic preserves, and other publicly owned properties;
  - 8. City electric service and the Florida Keys Electric Co-op; and
  - 9. Other utilities, as appropriate.
- (i) Protecting and improving water quality by providing for the construction, operation, maintenance, and replacement of stormwater management facilities; central sewage collection; treatment and disposal facilities; and the installation and proper operation and maintenance of onsite sewage treatment and disposal systems.
- (j) Ensuring the improvement of nearshore water quality by requiring the construction and operation of wastewater management facilities that meet the requirements of ss. 381.0065(4)(l) and 403.086(10), as applicable, and by directing growth to areas served by central wastewater treatment facilities through permit allocation systems.



- (k) Limiting the adverse impacts of public investments on the environmental resources of the Florida Keys.
- (l) Making available adequate affordable housing for all sectors of the population of the Florida Keys.
- (m) Providing adequate alternatives for the protection of public safety and welfare in the event of a natural or manmade disaster and for a postdisaster reconstruction plan.
- (n) Protecting the public health, safety, and welfare of the citizens of the Florida Keys and maintaining the Florida Keys as a unique Florida resource.

(8) COMPREHENSIVE PLAN ELEMENTS AND LAND DEVELOPMENT

REGULATIONS.—The comprehensive plan elements and land development regulations approved pursuant to s. 380.05(6), (8), and (14) shall be the comprehensive plan elements and land development regulations for the Florida Keys Area.

(9) MODIFICATION TO PLANS AND REGULATIONS.—

- (a) Any land development regulation or element of a local comprehensive plan in the Florida Keys Area may be enacted, amended, or rescinded by a local government, but the enactment, amendment, or rescission becomes effective only upon approval by the state land planning agency. The state land planning agency shall review the proposed change to determine if it is in compliance with the principles for guiding development specified in chapter 27F-8, Florida Administrative Code, as amended effective August 23, 1984, and must approve or reject the requested changes within 60 days after receipt. Amendments to local comprehensive plans in the Florida Keys Area must also be reviewed for compliance with the following:
  1. Construction schedules and detailed capital financing plans for wastewater management improvements in the annually adopted capital improvements element, and standards for the construction of wastewater treatment and disposal facilities or collection systems that meet or exceed the criteria in s. 403.086(10) for wastewater treatment and disposal facilities or s. 381.0065(4)(l) for onsite sewage treatment and disposal systems.
  2. Goals, objectives, and policies to protect public safety and welfare in the event of a natural disaster by maintaining a hurricane evacuation clearance time for permanent residents of no more than 24 hours. The hurricane evacuation clearance time shall be determined by a hurricane evacuation study conducted in accordance with a professionally accepted methodology and approved by the state land planning agency.
- (b) The state land planning agency, after consulting with the appropriate local government, may, no more than once per year, recommend to the Administration Commission the enactment, amendment, or rescission of a land development regulation or element of a local comprehensive plan. Within 45 days following the receipt of such recommendation, the commission shall reject the recommendation, or

accept it with or without modification and adopt it by rule, including any changes. Such local development regulation or plan must be in compliance with the principles for guiding development.

History. — s. 6, ch. 79-73; s. 4, ch. 86-170; s. 1, ch. 89-342; s. 641, ch. 95-148; s. 3, ch. 2006-223; s. 34, ch. 2010-205.

<sup>1</sup> Note.— Section 7, ch. 2006-223, provides that “[i]f the designation of the Florida Keys Area as an area of critical state concern is removed, the state shall be liable in any inverse condemnation action initiated as a result of Monroe County land use regulations applicable to the Florida Keys Area as described in chapter 28-29, Florida Administrative Code, and adopted pursuant to instructions from the Administration Commission or pursuant to administrative rule of the Administration Commission, to the same extent that the state was liable on the date the Administration Commission determined that substantial progress had been made toward accomplishing the tasks of the work program as defined in s. 380.0552(4)(c), Florida Statutes. If, after the designation of the Florida Keys Area as an area of critical state concern is removed, an inverse condemnation action is initiated based upon land use regulations that were not adopted pursuant to instructions from the Administration Commission or pursuant to administrative rule of the Administration Commission and in effect on the date of the designation’s removal, the state’s liability in the inverse condemnation action shall be determined by the courts in the manner in which the state’s liability is determined in areas that are not areas of critical state concern. The state shall have standing to appear in any inverse condemnation action.”

<sup>2</sup> Note.— The word “to” was inserted by the editors.

## I. Related Hurricane Evacuation Administrative Proceedings

Prior to Monroe County's adoption of phased hurricane evacuation, Administrative Law Judge Carolyn S. Holifield made the following findings of fact in a rule challenge proceeding. See Final Order in DOAH Case No. 04-2756RP, *Florida Keys Citizens Coalition, Inc., and Last Stand, Inc., v. Florida Administration Commission and Monroe County, and Department of Community Affairs*.

144. The **Monroe County** Comprehensive Plan and the Marathon Comprehensive Plan currently state that each ". . . **shall reduce hurricane evacuation clearance times to 24 hours by the year 2010.**" The **24-hour standard was adopted by the Administration Commission** at the conclusion of prior litigation over the Monroe County Comprehensive Plan.

145. The DCA contracted with Miller Consulting, Inc., to create a computer model to estimate the actual hurricane evacuation clearance time for the Florida Keys. **The Miller model provides the best available data and analysis for estimating the clearance time.** The latest run of the Miller model performed by the DCA using 2000 Census data, supplemented with development permit data up to August 2004, provides the best estimate of clearance time. This run of the Miller model estimates a hurricane evacuation time of 23 hours and 56 minutes to reach the beginning of the Homestead Extension of the Florida Turnpike on the mainland, and 24 hours and 48 minutes to reach the hurricane shelter at Florida International University ("FIU").

146. The **beginning of the Florida Turnpike in Florida City is the appropriate endpoint for hurricane evacuation clearance time estimates.** Florida City is a point of relative safety outside of the Category 3 vulnerability zone. Florida City is also the point of dispersal for the Florida Keys, where evacuees disperse to any number of destinations, such as South Dade, the FIU shelter, or a hotel in Orlando.

148. Proposed Rule **28-20.110 adds the following requirement to Year Eight of the Work Program** in Policy 101.2.13 of the Monroe County Comprehensive Plan and Policy 101.2.12 of the Marathon Comprehensive Plan: "**Complete a comprehensive analysis of hurricane evacuation issues in the Florida Keys and develop strategies to reduce actual hurricane clearance times and thereby reduce potential loss of life from hurricanes.**"

150. The working group must develop a **strategy that balances or accommodates development and also addresses hurricane clearance times.** The hurricane workgroup must do much more than simply squeeze a few more minutes out of the Miller model. There are currently 13,000 to 14,000 vacant platted lots in the Florida Keys, which must be allowed to develop or must be purchased by government. On average, 3,000 dwelling units generates about one hour of clearance time. As an example, if 8,000 or so lots were purchased for habitat protection, then two more hours of clearance time will be needed to accommodate the remaining 5,000 or 6,000 lots. The

hurricane workgroup must develop a strategy to handle the amount of development permitting that can be expected and a program to acquire the balance of the vacant lots.

## **II. Section 380.0552, Florida Statutes, Florida Keys Area; protection and designation as area of critical state concern**

(9) MODIFICATION TO PLANS AND REGULATIONS.—

(a) Any land development regulation or element of a local comprehensive plan in the Florida Keys Area may be enacted, amended, or rescinded by a local government, but the enactment, amendment, or rescission becomes effective only upon approval by the state land planning agency. The state land planning agency shall review the proposed change to determine if it is in compliance with the principles for guiding development specified in chapter 27F-8, Florida Administrative Code, as amended effective August 23, 1984, and must approve or reject the requested changes within 60 days after receipt. Amendments to local comprehensive plans in the Florida Keys Area must also be reviewed for compliance with the following:

1. Construction schedules and detailed capital financing plans for wastewater management improvements in the annually adopted capital improvements element, and standards for the construction of wastewater treatment and disposal facilities or collection systems that meet or exceed the criteria in s. 403.086(10) for wastewater treatment and disposal facilities or s. 381.0065(4)(l) for onsite sewage treatment and disposal systems.
2. Goals, objectives, and policies to protect public safety and welfare in the event of a natural disaster by **maintaining a hurricane evacuation clearance time for permanent residents of no more than 24 hours. The hurricane evacuation clearance time shall be determined by a hurricane evacuation study conducted in accordance with a professionally accepted methodology and approved by the state land planning agency.**

## **III. Section 163.3178, Florida Statutes, Coastal management**

(1) The Legislature recognizes there is significant interest in the resources of the coastal zone of the state. Further, the Legislature recognizes that, in the event of a natural disaster, the state may provide financial assistance to local governments for the reconstruction of roads, sewer systems, and other public facilities. Therefore, it is the intent of the Legislature that local government comprehensive plans restrict development activities where such activities would damage or destroy coastal resources, and that such plans protect human life and limit public expenditures in areas that are subject to destruction by natural disaster.

(2) Each coastal management element required by s. 163.3177(6)(g) shall be based on studies, surveys, and data; be consistent with coastal resource plans prepared and adopted pursuant to general or special law; and contain:

(d) A component which outlines principles for hazard mitigation and protection of human life against the effects of natural disaster, including population evacuation, which take into consideration the capability to safely evacuate the density of coastal population proposed in the future land use plan element in the event of an impending natural disaster. The Division of Emergency Management shall manage the update of

the regional hurricane evacuation studies, ensure such studies are done in a consistent manner, and ensure that the methodology used for modeling storm surge is that used by the National Hurricane Center.

(h) Designation of coastal high-hazard areas and the criteria for mitigation for a comprehensive plan amendment in a coastal high-hazard area as defined in subsection (9). The coastal high-hazard area is the area below the elevation of the category 1 storm surge line as established by a Sea, Lake, and Overland Surges from Hurricanes (SLOSH) computerized storm surge model. Application of mitigation and the application of development and redevelopment policies, pursuant to s. 380.27(2), and any rules adopted thereunder, shall be at the discretion of local government.

(j) An identification of regulatory and management techniques that the local government plans to adopt or has adopted in order to mitigate the threat to human life and to control proposed development and redevelopment in order to protect the coastal environment and give consideration to cumulative impacts.

(9)(a) Local governments may elect to comply with rule 9J-5.012(3)(b)6. and 7. Florida Administrative Code, through the process provided in this section. A proposed comprehensive plan amendment shall be found in compliance with state coastal high-hazard provisions pursuant to rule 9J-5.012(3)(b)6. and 7., Florida Administrative Code, if:

1. The adopted level of service for out-of-county hurricane evacuation is maintained for a category 5 storm event as measured on the Saffir-Simpson scale;
2. A 12-hour evacuation time to shelter is maintained for a category 5 storm event as measured on the Saffir-Simpson scale and shelter space reasonably expected to accommodate the residents of the development contemplated by a proposed comprehensive plan amendment is available; or
3. Appropriate mitigation is provided that will satisfy the provisions of subparagraph 1. or subparagraph 2. Appropriate mitigation shall include, without limitation, payment of money, contribution of land, and construction of hurricane shelters and transportation facilities. Required mitigation shall not exceed the amount required for a developer to accommodate impacts reasonably attributable to development. A local government and a developer shall enter into a binding agreement to memorialize the mitigation plan.

**(b) For those local governments that have not established a level of service for out-of-county hurricane evacuation by July 1, 2008, but elect to comply with rule 9J-5.012(3)(b)6. and 7., Florida Administrative Code, by following the process in paragraph (a), the level of service shall be no greater than 16 hours for a category 5 storm event as measured on the Saffir-Simpson scale.**

(c) This subsection shall become effective immediately and shall apply to all local governments. No later than July 1, 2008, local governments shall amend their future land use map and coastal management element to include the new definition of coastal high-hazard area and to depict the coastal high-hazard area on the future land use map.

## **IV. Monroe County 2010 Comprehensive Plan**

### **Objective 101.2**

Monroe County shall **reduce hurricane evacuation clearance times to 24 hours** by the year 2010.

### **Policy 216.1.8**

In the event of a pending major hurricane (category 3-5) Monroe County shall implement the following **staged/phased evacuation procedures to achieve and maintain an overall 24-hour hurricane evacuation clearance time for the resident population.**

1. Approximately 48 hours in advance of tropical storm winds, a mandatory evacuation of non-residents, visitors, recreational vehicles (RV's), travel trailers, live-aboard (transient and non-transient), and military personnel from the Keys shall be initiated. State parks and campgrounds should be closed at this time or sooner and entry into the Florida Keys by non-residents should be strictly limited.
2. Approximately 36 hours in advance of tropical storm winds, a mandatory evacuation of mobile home residents, special needs residents, and hospital and nursing home patients from the Keys shall be initiated.
3. Approximately 30 hours in advance of tropical storm winds, a mandatory phased evacuation of permanent residents by evacuation zone (described below) shall be initiated. Existing evacuation zones are as follows:
  - a) Zone 1 – Key West, Stock Island and Key Haven to Boca Chica Bridge (MM 1-6)
  - b) Zone 2 – Boca Chica Bridge to West end of 7-mile Bridge (MM 6-40)
  - c) Zone 3 – West end of 7-Mile Bridge to West end of Long Boat Key Bridge (MM 40-63)
  - d) Zone 4 – West end of Long Boat Key Bridge to CR 905 and CR 905A intersection (MM 63-106.5)
  - e) Zone 5 – 905A to, and including Ocean Reef (MM 106.5–126.5)

The actual sequence of the evacuation by zones will vary depending on the individual storm. The concepts embodied in this staged evacuation procedures should be embodied in the appropriate County operational Emergency Management Plans.

The evacuation plan shall be monitored and updated on an annual basis to reflect increases, decreases and or shifts in population; particularly the resident and non-resident populations.

For the purpose on implementing Policy 216.1.8, this Policy shall not increase the number of allocations to more than 197 residential units a year, except for workforce housing. Any increase in the number of allocations shall be for workforce housing only.

## **V. Islamorada Comprehensive Plan**

**Policy 2-1.2.8: Provide a Staged/Phased Evacuation Procedure to Maintain a 24-Hour Hurricane Evacuation Clearance Time.** In the event of a pending major hurricane (category 3-5) ISLAMORADA, VILLAGE OF ISLANDS CHAPTER 2: TRANSPORTATION ELEMENT

Islamorada, Village of Islands shall **implement the following staged/phased evacuation procedures to achieve and maintain an overall 24-hour hurricane evacuation clearance time for the resident population.**

7. Approximately 48 hours in advance of tropical storm winds, a mandatory evacuation of nonresidents, visitors, recreational vehicles (RVs), travel trailers,

live-aboards (transient and non-transient), and military personnel from the Village shall be initiated. State parks and campgrounds should be closed at this time or sooner and entry into the Village by nonresidents should be strictly limited.

8. Approximately 36 hours in advance of tropical storm winds, a mandatory evacuation of mobile home residents, special needs residents, and hospital and nursing home patients from the Village shall be initiated.
9. Approximately 30 hours in advance of tropical storm winds, a mandatory phased evacuation of permanent residents by evacuation zone shall be initiated.

Islamorada, Village of Islands is within existing evacuation Zone 4 - West end of Long Key Bridge to CR 905 and CR 905A intersection (MM 63-106.5).

The actual sequence of the evacuation by zones will vary depending on the individual storm. The concepts incorporated in this staged evacuation procedure should be embodied in the Village Comprehensive Emergency Management Plan. The evacuation plan shall be monitored and updated on an annual basis to reflect increases, decreases and or shifts in population; particularly the resident and non-resident populations.

## **VI. City of Marathon Comprehensive Plan**

### **Objective 1-2.2 Hurricane Evacuation**

**The City shall maintain an up-to-date hurricane evacuation plan and meet the required 24 hour hurricane evacuation time or other applicable state standard for hurricane evacuation.**

#### **Policy 1-2.2.1 Implement Staged/Phased Hurricane Evacuation for Major Hurricanes (Category 3 –5)**

In order to provide for safe and efficient evacuation of the residents in the event of a major hurricane (category 3 – 5), the City shall implement, in coordination with Monroe County, the **following staged/phased evacuation procedures to achieve and maintain an overall 24-hour hurricane evacuation clearance time for the resident population.**

- a. Approximately 48 hours in advance of tropical storm winds, a mandatory evacuation of non-residents, visitors, recreational vehicles (RVs), live-boards (transient and non-transient), and military personnel from the Keys shall be initiated. State parks and campgrounds should be closed at this time and entry into the Florida Keys by non-residents should be strictly limited.
- b. Approximately 36 hours in advance of tropical storm winds, a mandatory evacuation of mobile home residents, special needs residents, and hospital and nursing home patients from the Keys shall be initiated.
- c. Approximately 30 hours in advance of tropical storms winds, a mandatory phased evacuation of permanent residents, by evacuation zone shall be initiated.

The actual sequence of the evacuation by zones will vary depending on the individual storm. The concepts embodied in this staged evacuation procedures should be embodied in the appropriate county operational emergency management plans.

#### **Policy 1-2.2.2 Coordinate Evacuation Plans**

The City shall coordinate plans for evacuation of coastal area populations with appropriate local or regional hurricane evacuation plans.

## **VII. Key West Comprehensive Plan:**

Rule 28-37.002(7)(b)3.

**Objective 4: Develop a hurricane evacuation plan consistent with regional and county plans that provides an opportunity for residents and visitors to evacuate to a place of safety during a natural disaster.**

Policies:

a. It shall be the policy of the City to develop and adopt a hurricane evacuation plan consistent with regional and county plans. This plan shall be developed and adopted within twelve (12) months of the adoption of a hurricane evacuation plan by Monroe County.

b. After the adoption of a hurricane evacuation plan, any development that contains habitable units and that also meets the threshold requirements of the Community Impact Assessment Ordinance shall include in the assessment a statement of:

- i. The manner in which residents are informed of the plan.
- ii. The developer's responsibility under the plan.

c. Where appropriate, all City, County, State, Federal and other public buildings shall be built so as to incorporate hurricane mitigation measures such that the building may serve as an approved hurricane shelter in times of emergency.



## Section 381.0065(4)(I), Florida Statutes

(I) For the Florida Keys, the department shall adopt a special rule for the construction, installation, modification, operation, repair, maintenance, and performance of onsite sewage treatment and disposal systems which considers the unique soil conditions and water table elevations, densities, and setback requirements. On lots where a setback distance of 75 feet from surface waters, saltmarsh, and buttonwood association habitat areas cannot be met, an injection well, approved and permitted by the department, may be used for disposal of effluent from onsite sewage treatment and disposal systems. The following additional requirements apply to onsite sewage treatment and disposal systems in Monroe County:

1. The county, each municipality, and those special districts established for the purpose of the collection, transmission, treatment, or disposal of sewage shall ensure, in accordance with the specific schedules adopted by the Administration Commission under s. 380.0552, the completion of onsite sewage treatment and disposal system upgrades to meet the requirements of this paragraph.

2. Onsite sewage treatment and disposal systems must cease discharge by December 31, 2015, or must comply with department rules and provide the level of treatment which, on a permitted annual average basis, produces an effluent that contains no more than the following concentrations:

- a. Biochemical Oxygen Demand (CBOD5) of 10 mg/l.
- b. Suspended Solids of 10 mg/l.
- c. Total Nitrogen, expressed as N, of 10 mg/l.
- d. Total Phosphorus, expressed as P, of 1 mg/l.

In addition, onsite sewage treatment and disposal systems discharging to an injection well must provide basic disinfection as defined by department rule.

3. On or after July 1, 2010, all new, modified, and repaired onsite sewage treatment and disposal systems must provide the level of treatment described in subparagraph 2. However, in areas scheduled to be served by central sewer by December 31, 2015, if the property owner has paid a connection fee or assessment for connection to the central sewer system, an onsite sewage treatment and disposal system may be repaired to the following minimum standards:

- a. The existing tanks must be pumped and inspected and certified as being watertight and free of defects in accordance with department rule; and
- b. A sand-lined drainfield or injection well in accordance with department rule must be installed.

4. Onsite sewage treatment and disposal systems must be monitored for total nitrogen and total phosphorus concentrations as required by department rule.

5. The department shall enforce proper installation, operation, and maintenance of onsite sewage treatment and disposal systems pursuant to this chapter, including ensuring that the appropriate level of treatment described in subparagraph 2. is met.

6. The authority of a local government, including a special district, to mandate connection of an onsite sewage treatment and disposal system is governed by s. 4, chapter 99-395, Laws of Florida.

## Section 403.086(10), Florida Statutes

(10) The Legislature finds that the discharge of inadequately treated and managed domestic wastewater from dozens of small wastewater facilities and thousands of septic tanks and other onsite systems in the Florida Keys compromises the quality of the coastal environment, including nearshore and offshore waters, and threatens the quality of life and local economies that depend on those resources. The Legislature also finds that the only practical and cost-effective way to fundamentally improve wastewater management in the Florida Keys is for the local governments in Monroe County, including those special districts established for the purpose of collection, transmission, treatment, or disposal of sewage, to timely complete the wastewater or sewage treatment and disposal facilities initiated under the work program of Administration Commission rule 28-20, Florida Administrative Code, and the Monroe County Sanitary Master Wastewater Plan, dated June 2000. The Legislature therefore declares that the construction and operation of comprehensive central wastewater systems in accordance with this subsection is in the public interest. To give effect to those findings, the requirements of this subsection apply to all domestic wastewater facilities in Monroe County, including privately owned facilities, unless otherwise provided under this subsection.

(a) The discharge of domestic wastewater into surface waters is prohibited.

(b) Monroe County, each municipality, and those special districts established for the purpose of collection, transmission, treatment, or disposal of sewage in Monroe County shall complete the wastewater collection, treatment, and disposal facilities within its jurisdiction designated as hot spots in the Monroe County Sanitary Master Wastewater Plan, dated June 2000, specifically listed in Exhibits 6-1 through 6-3 of Chapter 6 of the plan and mapped in Exhibit F-1 of Appendix F of the plan. The required facilities and connections, and any additional facilities or other adjustments required by rules adopted by the Administration Commission under s. 380.0552, must be completed by December 31, 2015, pursuant to specific schedules established by the commission. Domestic wastewater facilities located outside local government and special district service areas must meet the treatment and disposal requirements of this subsection by December 31, 2015.

(c) After December 31, 2015, all new or expanded domestic wastewater discharges must comply with the treatment and disposal requirements of this subsection and department rules.

(d) Wastewater treatment facilities having design capacities:

1. Greater than or equal to 100,000 gallons per day must provide basic disinfection as defined by department rule and the level of treatment which, on a permitted annual average basis, produces an effluent that contains no more than the following concentrations:

- a. Biochemical Oxygen Demand (CBOD5) of 5 mg/l.
- b. Suspended Solids of 5 mg/l.

- c. Total Nitrogen, expressed as N, of 3 mg/l.
- d. Total Phosphorus, expressed as P, of 1 mg/l.

2. Less than 100,000 gallons per day must provide basic disinfection as defined by department rule and the level of treatment which, on a permitted annual average basis, produces an effluent that contains no more than the following concentrations:

- a. Biochemical Oxygen Demand (CBOD5) of 10 mg/l.
- b. Suspended Solids of 10 mg/l.
- c. Total Nitrogen, expressed as N, of 10 mg/l.
- d. Total Phosphorus, expressed as P, of 1 mg/l.

(e) Class V injection wells, as defined by department or Department of Health rule, must meet the following requirements and otherwise comply with department or Department of Health rules, as applicable:

1. If the design capacity of the facility is less than 1 million gallons per day, the injection well must be at least 90 feet deep and cased to a minimum depth of 60 feet or to such greater cased depth and total well depth as may be required by department rule.

2. Except as provided in subparagraph 3. for backup wells, if the design capacity of the facility is equal to or greater than 1 million gallons per day, each primary injection well must be cased to a minimum depth of 2,000 feet or to such greater depth as may be required by department rule.

3. If an injection well is used as a backup to a primary injection well, the following conditions apply:

- a. The backup well may be used only when the primary injection well is out of service because of equipment failure, power failure, or the need for mechanical integrity testing or repair;
- b. The backup well may not be used for more than a total of 500 hours during any 5-year period unless specifically authorized in writing by the department;
- c. The backup well must be at least 90 feet deep and cased to a minimum depth of 60 feet, or to such greater cased depth and total well depth as may be required by department rule; and
- d. Fluid injected into the backup well must meet the requirements of paragraph (d).

(f) The requirements of paragraphs (d) and (e) do not apply to:

1. Class I injection wells as defined by department rule, including any authorized mechanical integrity tests;

2. Authorized mechanical integrity tests associated with Class V wells as defined by department rule; or

3. The following types of reuse systems authorized by department rule:

- a. Slow-rate land application systems;
- b. Industrial uses of reclaimed water; and
- c. Use of reclaimed water for toilet flushing, fire protection, vehicle washing, construction dust control, and decorative water features.

However, disposal systems serving as backups to reuse systems must comply with the other provisions of this subsection.

(g) For wastewater treatment facilities in operation as of July 1, 2010, which are located within areas to be served by Monroe County, municipalities in Monroe County, or those special districts established for the purpose of collection, transmission, treatment, or disposal of sewage but which are owned by other entities, the requirements of paragraphs (d) and (e) do not apply until January 1, 2016. Wastewater operating permits issued pursuant to this chapter and in effect for these facilities as of June 30, 2010, are extended until December 31, 2015, or until the facility is connected to a local government central wastewater system, whichever occurs first. Wastewater treatment facilities in operation after December 31, 2015, must comply with the treatment and disposal requirements of this subsection and department rules.

(h) If it is demonstrated that a discharge, even if the discharge is otherwise in compliance with this subsection, will cause or contribute to a violation of state water quality standards, the department shall:

1. Require more stringent effluent limitations;
2. Order the point or method of discharge changed;
3. Limit the duration or volume of the discharge; or
4. Prohibit the discharge.

(i) All sewage treatment facilities must monitor effluent for total nitrogen and total phosphorus concentration as required by department rule.

(j) The department shall require the levels of operator certification and staffing necessary to ensure proper operation and maintenance of sewage facilities.

(k) The department may adopt rules necessary to carry out this subsection.

(l) The authority of a local government, including a special district, to mandate connection of a wastewater facility, as defined by department rule, is governed by s. 4, chapter 99-395, Laws of Florida.

## **Technical Memorandum**

**To:** Aileen Bouclé, AICP  
District Planning, Project Development and Environmental  
Administrator, Florida DOT – District Six  
1000 NW 111<sup>th</sup> Avenue, Room 6111A  
Miami, Florida 33172

**From:** Joaquín E. Vargas, P.E.  
Brian Wolshon, Ph.D., P.E., P.T.O.E.

**Subject:** Florida Keys Site-Specific Capacity Study

**Date:** April 21, 2010

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The purpose of this technical memorandum is to document the results of a site-specific traffic operations study undertaken to evaluate traffic conditions and roadway capacity on roadway segments in the upper Keys in Monroe County, Florida. The site-specific analyses were needed to assess traffic flow rates under a variety of conditions and to determine the appropriateness of the roadway capacity values used in the 2001 Florida Keys Hurricane Evacuation Study prepared by Miller Consulting, Inc. (aka the "Miller Study"), within the Key Largo area

This work was motivated by the need to provide more detailed analyses of traffic along several critical segments along the Keys evacuation route. It is felt that during a mass movement of traffic from the Keys these segments could largely control the overall capacity of the route. An area of specific emphasis were the locations where the mainline US-1 could be impeded by various traffic control and roadway geometric features as well as driver/vehicle characteristics that, individually or combined, could adversely impact the rate of outbound flow. The analyses presented here also represents an advance over the 2001 Miller Study because they rely on finer analyses which provide a higher level of computational fidelity over the original Miller Study that permits the operational impact of specific control and roadway features to be evaluated down to the level of individual vehicles.

Additionally, the Florida Department of Transportation – District Six and its consultants have taken advantage of new and evolving knowledge and techniques that have been developed over the 10-year period since the

original 2001 Florida Keys Hurricane Evacuation Study was carried out. This includes observational studies and simulation systems that have improved our understanding of traffic operations under mass evacuation demand conditions.

## **BACKGROUND**

The Florida Keys evacuation route was divided into 31 roadway links (Link A1 through Link U) in the Miller Model. The 31 roadway links extend from Mile Marker 2.0 in Key West/Stock Island to the southern terminus of Florida's Turnpike in Florida City (a distance of approximately 125 miles). Each roadway link represents a different cross section on the highway network, such as:

- o Two-lane undivided (2L) – one through lane in each direction
- o Three lanes (3L) – one through lane in each direction with a center turn lane
- o Four-lane undivided (4L) – two through lanes in each direction
- o Four-lane with a divided median (4LD) – two through lanes in each direction with a raised or depressed median
- o Five lanes (5L) – two through lanes in each direction with a center turn lane

The "Roadway Network" module of the Miller Model, including all 31 evacuating roadway links and their assumed hurricane evacuating hourly capacity, is contained in Attachment A of this report. These original estimates were based on a combination of prior observations, experience in working in the local area, and accepted professional standards and guidelines that are used to estimate roadway capacity under various sets of conditions.

Due to the unique nature<sup>1</sup> of the transportation network in the Florida Keys, and the life-threatening nature of hurricanes, the transportation engineering profession does not have a universally-accepted methodology to calculate capacity for Overseas Highway during hurricane evacuation conditions. For these reasons, the Miller Study

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<sup>1</sup> One evacuation route with more than 100 miles in length, and roadway conditions that do not fit the typical urban or rural conditions defined in the 2000 Highway Capacity Manual.

assembled a team of traffic engineers/transportation professionals with extensive experience in roadway capacities, especially in the Florida Keys, for purposes of determining the appropriate capacity of the 31 roadway links located along US 1 within the Florida Keys and Florida City. The roadway capacity team included professionals from two engineering consulting firms, the Florida Department of Transportation (District Six and Central Office), the Department of Community Affairs, and the US Army Corps of Engineers.

The assumed capacity values that were agreed upon by the team of experts were consistent with nationally accepted professional standards and practices and have been shown to be consistent with numerous observations during emergency evacuations in several other locations (within and outside of Florida) as well as during other types of non-emergency major event scenarios. Despite all of this background evidence and the efforts of the local expert team assembled for the Miller Study, these capacity values have been frequently called into question since the release of the Miller report nearly a decade ago.

### **SITE SPECIFIC CAPACITY**

In order to evaluate and re-confirm the roadway capacities used in the Miller Model, a site-specific capacity study was undertaken on Overseas Highway<sup>2</sup> within Key Largo. The study was based on a set of traffic observations made in January 2010. While ideally it would be desirable to record traffic volumes during a live evacuation, the infrequent nature of such events required a reasonably comparable volume scenario. These conditions were then used to code and calibrate a simulation model which could then be varied to reflect a wide-range of potential conditions.

The micro-simulation analysis of US 1 included the section between Mile Marker 99.0 and Mile Marker 107, including a short segment of County Road 905. The micro-simulation used CORSIM, a nationally-recognized tool in evaluating traffic conditions on roadway networks. CORSIM was developed in the early 1970's and became recognized as one of the most accurate traffic simulation tools in the 1980's with the introduction of the Personal Computers.

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<sup>2</sup> Within Key Largo, Overseas Highway is a four-lane divided facility with a posted speed limit of 45 miles per hour.



As a micro-scale simulation system, CORSIM permits the analysis of traffic conditions on a vehicle-by-vehicle basis. As such, it is influenced by location-specific traffic control and geometric design features such as intersections, turn lanes, and median cross-overs in addition to individual driver and vehicle characteristics that govern gap-acceptance and lane-changing behaviors. The Federal Highway Administration and the State of Florida have endorsed the use of CORSIM.

Another key aspect of a micro-level modeling approach is that the flow conditions on the road segments are not pre-determined by assumed or established capacity values. Rather, the process works in somewhat the opposite direction in which the flow conditions, including maximum flows, are a reflection of the specific driver, control, design, and traffic features that exist or are assumed to exist and coded in for each specific site. As such, the maximum observed flow rates (capacity) for a road section are the result of numerous detailed interactions of driver, control, design and traffic conditions. Further, these micro-level simulations do not fix a set of static conditions or assumptions in advance. Operational conditions can change from minute-to-minute and even second-to-second. It is through this type of dynamic modeling that analysts are able to observe and analyze the occurrences of flow break downs and recoveries that are commonly associated with rush hour conditions and, even more so, during an evacuation scenario. An added dimension of simulation is that input parameters (including inflow volumes) can be added and their effects studied.

To further enhance the validity of the analyses conducted in this effort and the results gained from them, a series of base-line simulation models were first developed based on and calibrated to a set of field observed traffic volumes recorded over a recent event weekend in the Keys.

The site-specific capacity study followed the five steps listed below:

1. Network Coding
2. Model Calibration
3. Development of Side Street Volumes
4. Results of Model Runs
5. Capacity Adjustments

#### Network Coding

As indicated previously, CORSIM was coded between Mile Marker 99 and Mile Marker 107, plus a short segment along County Road 905. Table 1 on the following page documents the node network coded into CORSIM.

<b>TABLE 1</b> <b>Node Coding in CORSIM</b> <b>Florida Keys Site-Specific Capacity Study</b>		
<b>Node Number</b>	<b>Location</b>	<b>Comment</b>
106	MM 99.0	Southmost Point
1	Atlantic Boulevard	Signal (Loading Point)
2	Laguna Avenue	Loading Point
3	Ocean Drive	Loading Point
4	Sunset Boulevard	Loading Point
5	Lauderdale Drive	Loading Point
6	Kay Drive	Loading Point
7	Hibiscus Lane	Loading Point
8	Tarpon Basin Drive	Signal (Loading Point)
9	Samson Road	Loading Point
10	Michelle Drive	Loading Point
11	Mahogany Drive	Loading Point
12	Alhambra Drive	Loading Point
13	George Street	Loading Point
14	Cabrera Street	Loading Point
15	Snapper Avenue	Loading Point
16	Avenue B	Loading Point
17	Taylor Drive	Loading Point
18	Dolphin Road	Loading Point
19	N. Blackwater Lane	Loading Point
20	Linda Drive	Loading Point
21	Andros Road	Loading Point
22	Lake Surprise Avenue	Loading Point
23	18-Mile Stretch/County Road 905	Diverge Point
24	18-Mile Stretch/County Road 905	Emergency Signal
26	Mile Marker 107	Northmost Point along US 1
241	Northeast of US 1	Northmost Point along CSR

Source: CORSIM and Traf Tech Engineering, Inc.

As documented in the above table, 22 loading points were coded into the CORSIM model. A loading point<sup>3</sup> is an intersection where side-street traffic enters the evacuating traffic stream. In contrast, the Miller Model only had two loading points between Mile Marker 95 and Miler Marker 107 and therefore, the network coded into the CORSIM model for the site-

<sup>3</sup> The more loading points, the more realistic representation of local conditions.

specific capacity study incorporates a more realistic representation of local conditions within the Key Largo area.

All unsignalized side streets were coded into the CORSIM model as minor-street approach stop-control intersections to represent current field conditions. Four traffic signals are located within the study area. The four traffic signals are located:

1. at the intersection of Atlantic Boulevard/Ocean Bay Drive (fully operational signal) – south of Mile Marker 100
2. at the intersection of Tarpon Basin Drive/Tradewinds Shopping Center (fully operational signal) – north of Mile Marker 101
3. at the Key Largo School located just south of Mile Marker 105 near Bowen Drive (pedestrian signal)
4. at the intersection of Overseas Highway (US 1) and County Road 905 (emergency signal) – near Mile Marker 106

Of the four traffic signals located within the study area, only two were assumed to be fully operational during hurricane evacuation conditions. The pedestrian signal located near Mile Marker 105 was assumed to be in the “off” mode since schools close well in advance of an approaching storm. The emergency signal located near Mile Marker 106 was assumed to be in the “flashing” mode (free flowing along US 1) during hurricane evacuation conditions.

Concerned Monroe County residents and other non-traffic professionals have previously suggested that all Monroe County traffic signals should operate in the “flashing” mode. It is preferred that the traffic signals located at Atlantic Boulevard and at Tarpon Basin Drive should remain operational during hurricane evacuation conditions for the following reasons:

- o Nearly 20 percent of the evacuating vehicles will enter Overseas Highway from Key Largo. As such, drivers from this area will need adequate gaps to permit safe merging into the outbound US-1 traffic stream
- o The US 1 segment between Mile Markers 99.5 and 106.3 will carry the heaviest traffic volumes of the entire Florida Keys evacuation network

- o By maintaining full operation of the traffic signals located near Mile Markers 100 and 101, gaps will be created along US 1 which will benefit all evacuating vehicles entering the main highway from the numerous side streets.

To minimize the effects of the traffic signals on the evacuating traffic flow along Overseas Highway, the two simulated traffic signals were timed so that most of the green time was allocated to US 1. That is, the assumed signal operating plan permits one vehicle turning left from US 1 and up to two vehicles entering Overseas Highway from the side street, per signal cycle. This is an assumption that significantly benefits the evacuating flow along the US 1.

### Model Calibration

To assure that the simulation reflected actual traffic conditions during an evacuation event, it was first necessary to build and calibrate the model to a set of actual observed conditions. The calibrated CORSIM model could then be tested with any set of traffic volumes up to and even exceeding those assumed to occur under hurricane evacuation conditions and reflect the same operating conditions attained in the calibrated base model. The importance of developing a validated model calibrated to event-level traffic cannot be overstated. Validation and calibration form the cornerstone on which reliable traffic models are built. Calibration, in particular, establishes the basis on which the results of the model can be systematically and quantitatively adjusted to reflect a set of conditions actually observed in the field. It is only through this process that an analyst can state with reasonable confidence that any changes made to the model (in terms of driver, design, control, and/or traffic), would have a correspondingly similar effect in real life. Opportunities to calibrate evacuation simulation models are rare because mass evacuations are relatively infrequent and the acquisition of field traffic flow measurements under evacuation conditions is rarer still.

To perform the calibration process in this study, traffic volumes recorded during the Key West Food and Wine Festival (January 28 through January 31, 2010) at three continuous traffic count stations were used. The three traffic count stations included Station 164 near Mile Marker 106 in Key Largo, Station 165 near Mile Marker 25 in Big Pine Key, and Station 227 near Mile Marker 4 in Stock Island. The 24-hour traffic distribution during the 4-day period associated with the Key West Food and Wine Festival is graphically presented on Pages 9 and 10. The fact that these volumes were part of an event-based weekend, the level of traffic was assumed to

exceed routine daily levels. The recorded hourly volumes at each continuous traffic count station during the subject festival are contained in Attachment B.

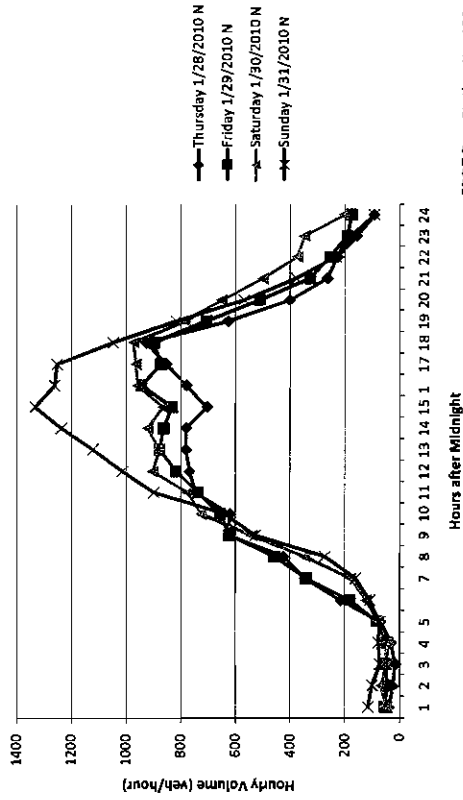
In order to calibrate the CORSIM model in this study, a set of three hourly northbound volumes recorded at the count station located near Mile Marker 106 were entered into the model. The three hourly volumes included the highest exiting volume recorded at Mile Marker 106 which was approximately 1,332 vehicles per hour between 2:00 PM and 3:00 PM. Four different CORSIM Time Periods were coded. The first time period included very low traffic volumes in order to allow the simulation to reach equilibrium (a recommended practice when the simulation includes high traffic volumes). Time periods 2, 3, and 4 included as entry volumes the traffic volumes recorded between 1:00 PM and 2:00 PM, 2:00 PM and 3:00 PM, and from 3:00 PM to 4:00 PM. The results of the 3-hour simulation run are presented in Table 2 below.

<b>TABLE 2</b>				
<b>CORSIM Calibration Run</b>				
<b>Florida Keys Site-Specific Capacity Study</b>				
<b>Time Period</b>	<b>Recorded Traffic Count</b>	<b>CORSIM Volume</b>	<b>Difference</b>	
			<b>Volume</b>	<b>% Change</b>
One	to allow network to reach equilibrium			
Two	1,258 vph	1,178 vph	-80	-6.4%
Three	1,332 vph	1,226 vph	-106	-8.0%
Four	1,261 vph	1,233 vph	-28	-2.2%

SOURCE: CORSIM and Florida Department of Transportation

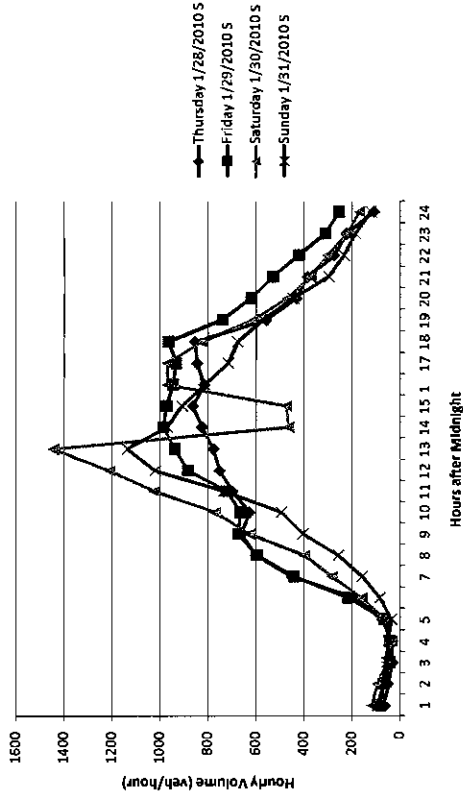
As indicated in Table 2, the CORSIM simulations produced traffic volumes that had less than 10% difference from the actual recorded traffic counts. Typically, simulation results that are within the range 5% to 10% of actual conditions are considered to be an acceptable representation of field conditions. Since Time Period 4 produced the most comparable results between the actual recorded traffic volumes and the traffic produced by CORSIM, the results obtained from Time Period 4 were used for purposes of this study.

**Graph 1a: MM 106 - Key Largo (2 NB Lanes)**  
Northbound Hourly Traffic Volume



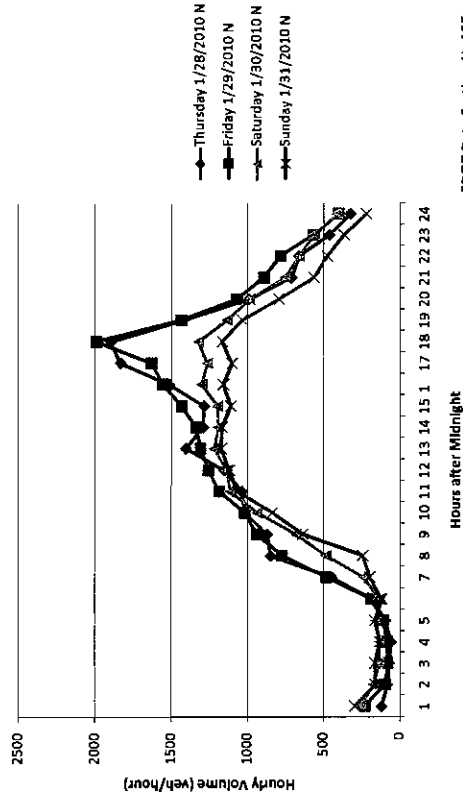
FDOT Data Station No. 164

**Graph 1b: MM 106 - Key Largo (2NB Lanes)**  
Southbound Hourly Traffic Volume



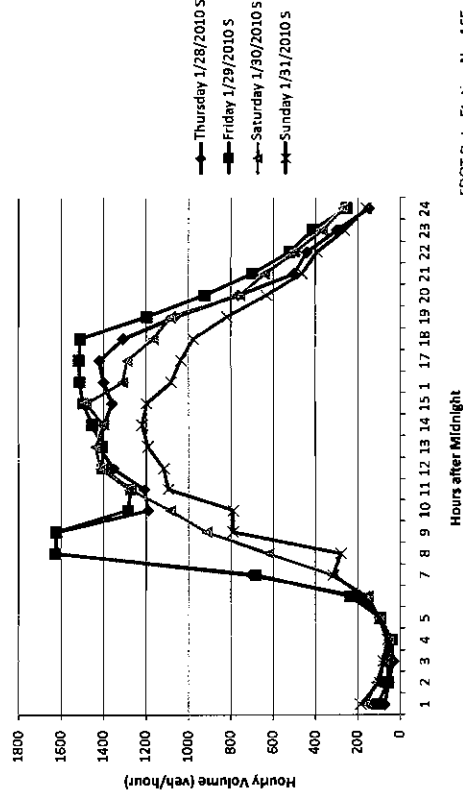
FDOT Data Station No. 164

**Graph 2a: Stock Island (2 NB Lanes)**  
Northbound Hourly Traffic Volume



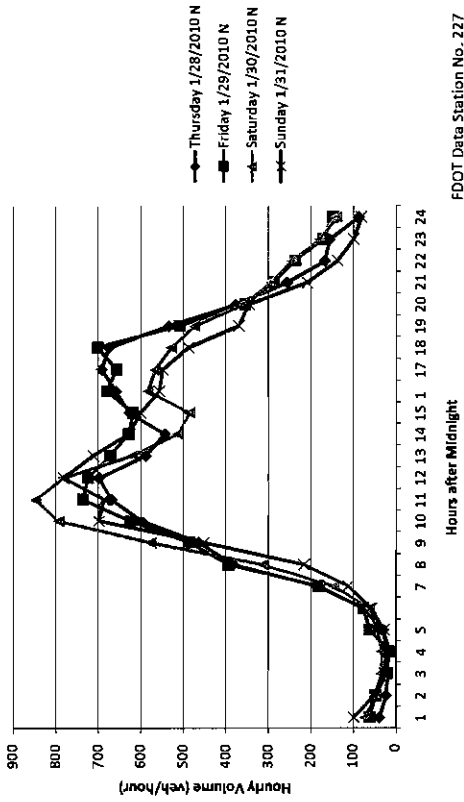
FDOT Data Station No. 165

**Graph 2b: Stock Island (2NB Lanes)**  
Southbound Hourly Traffic Volume



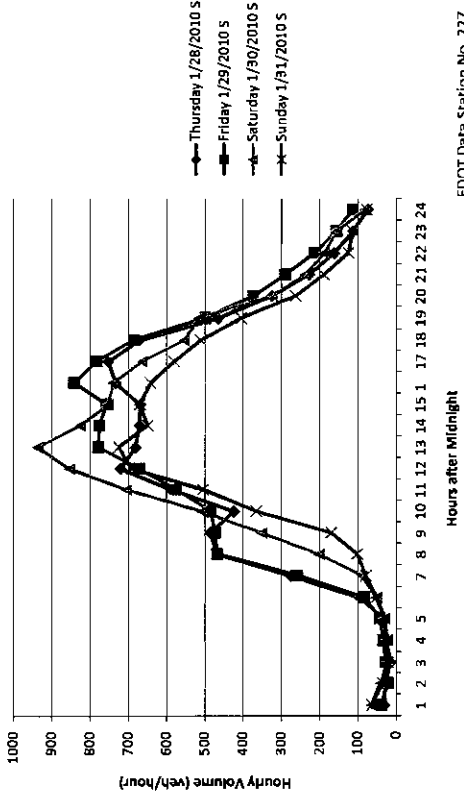
FDOT Data Station No. 165

**Graph 3a: Big Pine Key (1 NB Lane)  
Northbound Hourly Traffic Volume**



FDOT Data Station No. 227

**Graph 3b: Big Pine Key (1 NB Lane)  
Southbound Hourly Traffic Volume**



FDOT Data Station No. 227

Once the model run was completed, the animated simulations were compared with video recordings obtained during the same day and hour of the traffic volumes used for the calibration period. This process was undertaken to qualitatively assess the reasonableness of the traffic flow throughout the study area and to validate the accuracy of the CORSIM model. Based on a visual inspection of the output produced by the model, the traffic flow generated by CORSIM were reasonably consistent with the traffic conditions observed in the field.

Additionally, since CORSIM is a stochastic model that randomly assigns vehicles to the roadway network prior to the beginning of the simulation time period, CORSIM should be run multiple times using different initial network loadings and the model output should be averaged to eliminate the potential for obtaining skewed (biased) results. However, due to the linear nature of the study area, different seed numbers yielded almost identical results and therefore, multiple runs using different random seed numbers were not considered necessary for purposes of this traffic study. Table 3 documents the results obtained from using three different random seed number for the simulation period.

As shown in Table 3, the simulated roadway network does not warrant multiple runs using the CORSIM model.

<b>TABLE 3</b>			
<b>Multiple CORSIM Runs</b>			
<b>Florida Keys Site-Specific Capacity Study</b>			
<b>Random Seed Number</b>	<b>Total Number of Processed Vehicles</b>		
	<b>Time Period 2</b>	<b>Time Period 3</b>	<b>Time Period 4</b>
7581	1,178 vph	1,226 vph	1,233 vph
1359	1,178 vph	1,225 vph	1,234 vph
9823	1,177 vph	1,225 vph	1,230 vph

SOURCE: CORSIM

The three CORSIM runs conducted for calibration purposes are contained in Attachment C.

#### Development of Side Street Volumes

Based on the Miller Study, approximately 8,096 evacuating vehicles will enter Overseas Highway between Mile Marker 95 and 113. In reviewing Monroe County's Planning Analysis Area/Enumeration Districts, the population located between Mile Marker 99 and Mile Marker 107 is approximately 65.4% of the population located between Mile Markers 95



and 113. Therefore, the number of evacuating vehicles estimated to enter US 1 between Mile Markers 99 and 107 is approximately 5,295 vehicles (65.4% of 8,096).

The 5,295 evacuating vehicles were distributed within the 22 loading nodes as follows:

- o 30% will enter via nodes 1 through 5
- o 20% will enter via nodes 6 through 12
- o 20% will enter via nodes 13 through 16
- o 15% will enter via nodes 17 through 19
- o 15% will enter via nodes 20 through 22

The percentages documented above were based on the population density located within each sub-area. Moreover, once the total number of evacuating vehicles was determined for each simulated side street, (each hour with approximately 13.5% of the total evacuating traffic). As indicated previously, the CORSIM model was developed to simulate three 60-minute periods (Time Periods 2, 3, and 4).

#### Results of Model Runs

Once the side street volumes were developed for the 22 side streets, Overseas Highway near Mile Marker 99 (south terminus of study area) was loaded with 3,000 vehicles per hour (1,500 vehicles per hour per lane) in the northbound direction. If CORSIM processed all 3,000 vehicles, then the 3,000-vehicle loading was increased. However, all model runs processed less than 3,000 vehicles per hour at Mile Marker 100 and therefore, the 3,000-vehicle loading was considered appropriate for purposes of this study.

Two scenarios were tested. The first scenario assumed no incidents on the highway. The second scenario included an incident (crash, disabled vehicle, etc.) near Mile Marker 102.5. The incident scenario was simulated by entering a one-hour speed reduction to replicated potential disruptions to traffic flow caused by a minor crash, disabled vehicle, etc. The results of the two simulation scenarios are presented in Table 4.

<b>TABLE 4</b>		
<b>CORSIM Results</b>		
<b>Florida Keys Site-Specific Capacity Study</b>		
<b>Mile Marker</b>	<b>Maximum Hourly Volume (2 Lanes)</b>	
	<b>No Incident</b>	<b>With Incident</b>
100	2,767 vph	2,334 vph
102	2,797 vph	2,188 vph
104	2,902 vph	2,267 vph
106	3,003 vph	2,368 vph
<b>Average</b>	<b>2,867 vph</b>	<b>2,289 vph</b>

SOURCE: CORSIM

As documented in Table 4, with an inflow of 1,500 vphpl the Overseas Highway was shown to process up to 1,435 vehicles per hour per lane, assuming no incidents, daylight conditions, and good weather (ideal conditions). A minor incident resulting in operating speeds of 10 miles per hour reduced the capacity to approximately 1,145 vehicles per hour per lane.

The results of the two CORSIM scenarios are contained in Attachment D.

#### Capacity Adjustments

The resulting maximum flow obtained from the CORSIM simulation runs were for daylight and good weather conditions (ideal scenario). According to the 2000 Highway Capacity Manual, adverse weather or night conditions can reduce the capacity of a roadway by approximately 15%. Moreover, adverse weather conditions occurring at night can reduce the capacity of a roadway by as much as 47%, according to the 2000 Highway Capacity Manual. Table 5 summarizes all potential capacity values anticipated during a mandatory hurricane evacuation condition of the Florida Keys.

<b>TABLE 5</b>					
<b>Potential Hourly Capacity per Lane</b>					
<b>Florida Keys Site-Specific Capacity Study</b>					
<b>No Incident</b>			<b>With Incident</b>		
<b>Dry and Daylight</b>	<b>Rain or Night</b>	<b>Rain and Night</b>	<b>Dry and Daylight</b>	<b>Rain or Night</b>	<b>Rain and Night</b>
1,435 vph	1,220 vph	760 vph	1,145 vph	975 vph	610 vph

SOURCE: CORSIM and 2000 Highway Capacity Manual

## SUMMARY

In summary, many factors can affect the capacity of Overseas Highway during a mandatory hurricane evacuation order for the Florida Keys. Since a significant portion of the evacuation will likely occur during night conditions, and inclement weather could also occur during the evacuation period, the capacity of US 1 within Key Largo can vary between 760 and 1,435 vehicles per hour per lane.

These flow rates are consistent with evacuation traffic flow rates observed in several other evacuations, including those associated with Hurricanes Floyd<sup>4</sup> in Florida and South Carolina and Hurricane Katrina<sup>5</sup> in Louisiana. It is also worth noting that these one-hour maximum flow rates are under what could be considered "near-ideal" conditions. In reality, "maximum flow rates" cannot often be sustained for more than an hour because of inevitable disruptions to the smooth flow of traffic. Under capacity-level demand conditions, even slight disruptions in the traffic stream can result in the formation and propagation of traffic shockwave that move both quickly and widely throughout a traffic network.

Moreover, due to the lack of multiple evacuation routes in Monroe County, a minor incident at any location will negatively affect all upstream roadway links within the County. The micro-simulation runs indicate that an incident that reduces travel speeds to 10 miles per hour will reduce the capacity of US 1 to as low as 610 vehicles per hour per lane during night and rain conditions. This reduction is extremely important to take into consideration in a critical life-safety assessment of traffic such as this.

Based on the above, the 900 vehicles per hour per lane capacity assigned to US 1 within Key Largo, as documented in the Miller Study, is considered appropriate given the life-threatening nature of hurricanes. Hence, it is concluded that the capacities used in the Miller Study within the Key Largo area are appropriate for hurricane evacuation purposes.

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<sup>4</sup> Federal emergency Management Agency (FEMA), "Reverse Lane Standards and ITS Strategies Southeast United States Hurricane Study – Technical Memorandum 3", Final Report, prepared by Post, Buckley, Schuh & Jernigan, Inc. Tallahassee, Florida 2000.

<sup>5</sup> Wolshon B. and B. McArdle, "Temporospatial Analysis of Hurricane Katrina Regional Evacuation Traffic Patterns," *ASCE Journal of Infrastructure Systems – Special Infrastructure Planning, Design, and Management for Big Events Issues*, March 2009, Vol 15, No. 1, pp.12-20.

# Attachment A

## Miller Model Roadway Link Capacities

**Monroe County, Florida  
Roadway Network**

Link Name	Area	Milemarkers		Location/Description	Year 2,000 Configuration	Evacuation Outbound Lanes	Pavement Width (FT)	Outbound Flow Rate/ Lane	Total Flow Rate
		From	To						
A1	Lower Keys	2.0	4.0	Key West to Stock Island	4L	2		900	1,800
A2	Lower Keys	4.0	9.0	Stock Island to Big Coppitt Key	4LD	2	44'-53'	900	1,800
B	Lower Keys	9.0	17.0	Big Coppitt Key to Sugarloaf Key	2L	1	34'	1,350	1,350
C	Lower Keys	17.0	22.0	Sugarloaf Key to Cudjoe Key	2L	1	34'	1,350	1,350
D1	Lower Keys	22.0	24.0	Cudjoe Key to Summerland Key Cove Airport	2L	1	44'	1,350	1,350
D2	Lower Keys	24.0	25.0	Summerland Key Cove Airport to Summerland Key	3L	1	44'	1,350	1,350
D3	Lower Keys	25.0	30.0	Summerland Key to Big Pine Key Big Pine Key to west Summerland Keys	2L	1	33'-44'	1,350	1,350
E	Lower Keys	30.0	34.0	west Summerland Keys to Spanish Harbor Keys	2L	2	33'	1,050	2,100
F1	Lower Keys	34.0	35.2	Spanish Harbor Keys to Bahia Honda Bridge	2L	1	25'	1,350	1,350
F2	Lower Keys	35.2	36.5	Bahia Honda Bridge to Bahia Honda Key	4LD	2	width unknown	1,350	2,700
F3	Lower Keys	36.5	37.5	Bahia Honda Key to Hog Key	2L	1	33'	1,350	1,350
G	Middle Keys	37.5	47.0	Bahia Honda Key to Hog Key	2L	1	25'	1,500	1,500
H1	Middle Keys	47.0	48.0	Hog Key to Boot Key	2L	2	25'	1,350	2,700
H2	Middle Keys	48.0	50.2	Boot Key to Marathon	4L	2	25'-49'	900	1,800
I1	Middle Keys	50.2	50.8	Marathon to Marathon Shores Marathon Shores to Key Colonial Beach	5L	2	64'	900	1,800
I2	Middle Keys	50.8	54.0	Marathon Shores to Key Colonial Beach	4LD	2	58'-64'	900	1,800
J1	Middle Keys	54.0	54.5	Key Colonial Beach to Deer Key	4LD	2	58'	900	1,800
J2	Middle Keys	54.5	58.0	Deer Key to Grassy Key	2L	2	32'-58'	1,350	2,700
K	Upper Keys	58.0	74.0	Grassy Key to Matecumbe Harbor	2L	2	32'	1,350	2,700
L	Upper Keys	74.0	80.0	Matecumbe Harbor to Teatable Key	2L	2	48'	1,350	2,700
M1	Upper Keys	80.0	83.5	Teatable Key to Islamorada	3L	2	48'	1,350	2,700
M2	Upper Keys	83.5	85.6	Islamorada to Windley Key	2L	2	48'	1,350	2,700
N	Upper Keys	85.6	90.0	Windley Key to Plantation Key	2L	2	33'-48'	1,350	2,700
O	Upper Keys	90.0	100.0	Tavernier Key to Newport Key	4LD	3	44'-56'	900	2,700
P	Upper Keys	100.0	105.0	Newport Key to Sexton Cove	4LD	3	44'-52'	900	2,700
Q	Upper Keys	105.0	106.3	Sexton Cove to Rattlesnake Key	4LD	3	44'-52'	900	2,700
R1	Upper Keys	106.3	126.5	Rattlesnake Key to Card Sound Rd	2L/4L	2	24'-25'	1,500	3,000
R2	South Dade	126.5	HEFT	Card Sound Rd to HEFT	4LD	3	-	900	2,700
S	Upper Keys	106.3	Int CR 905 / CR 905 A	Lake Surprise to Crocodile Lake	2L	1	32'	1,350	1,350
T	Upper Keys	Ocean Reef	Int CR 905 / CR 905 A	Tanglefish Key to Crocodile Lake	2L	1	60'	1,350	1,350
U	Upper Keys	Int CR 905 / CR 905 A	US 1	Crocodile Lake to South Miami-Dade	2L	1	24'-25'	1,350	1,350

**LEGEND:**

- 2L = Two-lane facility
- 2L/4L = Two lanes with short four-lane sections for passing purposes
- 3L = Three-lane facility (center lane is a two-way left-turn lane)
- 4L = Four-lane undivided facility
- 4LD = Four-lane divided facility
- 5L = Five-lane facility (center lane is a two-way left-turn lane)

Source: 2001 Florida Keys Hurricane Evacuation Study

# **Attachment B**

## **4-Day Machine Traffic Counts** **(Source: FDOT – January 2010)**

**TABLE 8-1  
Continuous Traffic Counts (January 28 to January 31, 2010)  
Monroe County, Florida**

SITE	DATE	DIR	Clock time ending at:																								TOTAL
			1:00 AM	2:00 AM	3:00 AM	4:00 AM	5:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM	
0164	Thursday	N	40	25	15	31	70	216	345	424	625	670	746	768	781	780	704	779	851	926	626	400	263	226	155	92	10509
0164	Friday	N	53	44	50	45	82	181	341	457	622	654	736	816	862	831	942	872	897	704	509	325	252	189	173	11534	
0164	Saturday	N	48	69	50	40	80	122	178	347	541	726	776	803	879	921	865	958	964	973	785	650	499	373	347	202	122966
0164	Sunday	N	115	100	72	78	72	109	161	273	528	658	898	1013	1122	1238	1332	1261	1252	1047	816	557	375	231	177	91	135666
0164	Thursday	S	65	49	32	32	74	187	451	600	660	627	695	751	776	825	863	815	845	853	558	432	385	274	223	109	11182
0164	Friday	S	79	65	42	42	64	215	440	594	672	663	720	881	937	985	970	943	991	983	738	618	527	420	309	251	13070
0164	Saturday	S	116	94	53	33	61	158	283	396	625	769	1022	1208	1444	1464	1392	1301	1264	1321	1135	988	753	663	562	411	17585
0164	Sunday	S	91	68	55	48	34	83	156	255	403	492	732	1019	1135	969	907	811	713	675	570	443	295	232	185	120	10491
0165	Thursday	N	121	82	71	59	96	175	450	849	873	1015	1037	1154	1405	1291	1285	1513	1831	1896	1423	990	711	663	462	325	19777
0165	Friday	N	226	94	77	80	109	188	482	772	939	1016	1183	1255	1306	1335	1430	1550	1627	1988	1432	1068	890	781	567	401	20796
0165	Saturday	N	254	175	136	133	155	134	238	487	683	935	1114	1136	1218	1192	1197	1301	1264	1321	1135	988	753	663	562	411	17585
0165	Sunday	N	295	160	163	130	163	121	198	244	637	836	1064	1119	1172	1165	1109	1157	1101	1165	1035	794	563	476	367	219	15453
0165	Thursday	S	75	54	34	37	98	195	703	1621	1624	1189	1207	1353	1419	1399	1360	1400	1421	1309	1065	766	503	442	301	149	19724
0165	Friday	S	104	56	59	40	91	235	681	1627	1621	1283	1271	1402	1405	1452	1496	1512	1515	1509	1195	922	698	522	413	252	21361
0165	Saturday	S	160	114	76	55	99	152	321	622	913	1085	1277	1412	1437	1400	1483	1311	1291	1168	1086	758	642	498	370	269	17959
0165	Sunday	S	186	99	80	60	99	168	316	279	790	788	1094	1115	1191	1218	1196	1081	1036	978	818	632	464	393	264	161	14506
0227	Thursday	N	39	24	20	16	30	77	186	382	464	598	669	698	588	543	627	658	692	675	534	377	256	167	156	87	8563
0227	Friday	N	61	48	20	16	61	76	181	393	484	624	735	723	671	627	618	678	656	701	508	354	285	236	171	148	9076
0227	Saturday	N	72	49	35	34	44	63	146	312	577	793	847	782	619	512	485	583	566	528	473	358	293	244	178	139	8732
0227	Sunday	N	99	51	27	22	28	58	112	216	451	698	686	781	711	627	600	556	548	488	369	345	208	137	99	81	7998
0227	Thursday	S	31	29	15	26	34	96	276	488	486	425	588	721	682	671	670	733	753	672	466	325	229	163	113	75	6747
0227	Friday	S	39	21	27	33	43	82	257	467	472	484	576	671	778	775	757	841	783	687	498	373	289	212	156	113	9434
0227	Saturday	S	65	43	22	24	30	52	89	202	351	508	706	854	937	826	753	740	665	555	516	325	238	188	157	82	8928
0227	Sunday	S	63	35	24	24	30	51	79	102	170	36	505	692	725	650	670	642	580	511	405	263	189	125	113	77	7091

Source: Florida Department of Transportation

Counter 0164 at MM 106 in Key Largo  
Counter 0165 in Stock Island  
Counter 0227 in Big Pine Key

# Attachment C

## CORSIM Runs for Model Calibration



ELAPSED TIME IS 1:15: 0 ( 4500 SECONDS), TIME PERIOD .2 ELAPSED TIME IS 3600 SECONDS

LINK	VEHICLE MILES TRIPS		VEHICLE MINUTES		RATIO		MINUTES/MILE		SECONDS / VEHICLE			AVERAGE VALUES			
	MILES	TRIPS	MOVE TIME	DELAY TIME	TOTAL TIME	MOVE/TOTAL	DELAY/TOTAL	TOTAL TIME	DELAY TIME	CONTROL DELAY	QUEUE DELAY	STOP* TIME	STOPS (%)	VOL VPH	SPEED MPH
( 106, 1)	126.14	666	168.2	39.6	207.8	0.81	1.65	0.31	18.7	3.6	2.7	2.1	21	532	36.4
( 1, 106)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 1, 2)	131.46	731	175.3	20.4	195.7	0.90	1.49	0.16	16.0	1.7	0.0	0.0	0	584	40.3
( 2, 1)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 2, 3)	84.65	764	112.9	6.1	118.9	0.95	1.40	0.07	9.3	0.5	0.0	0.0	0	611	42.7
( 3, 2)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 3, 4)	550.63	829	734.2	30.0	764.2	0.96	1.39	0.05	55.0	2.2	0.1	0.0	0	663	43.2
( 4, 3)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 4, 5)	198.46	866	264.6	12.1	276.7	0.96	1.39	0.06	19.1	0.8	0.0	0.0	0	692	43.0
( 5, 4)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 5, 6)	283.18	898	377.6	17.6	395.2	0.96	1.40	0.06	26.3	1.2	0.1	0.0	0	718	43.0
( 6, 5)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 7, 6)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 7, 7)	111.88	923	149.2	8.1	157.2	0.95	1.41	0.07	10.2	0.5	0.0	0.0	0	738	42.7
( 7, 8)	152.04	950	202.7	74.0	276.7	0.73	1.82	0.49	17.5	4.7	3.5	2.5	22	760	33.0
( 8, 7)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 8, 9)	108.03	975	144.0	28.1	172.1	0.84	1.59	0.26	10.6	1.7	0.0	0.0	0	780	37.7
( 9, 8)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 9, 10)	260.58	997	347.4	20.8	368.3	0.94	1.41	0.08	22.0	1.2	0.1	0.0	0	797	42.5
( 10, 9)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 10, 11)	299.14	1019	398.9	23.3	422.2	0.94	1.41	0.08	24.8	1.4	0.1	0.0	0	815	42.5
( 11, 10)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 11, 12)	362.13	1042	482.8	30.3	513.2	0.94	1.42	0.08	29.5	1.7	0.1	0.0	0	833	42.3
( 12, 11)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 12, 13)	600.06	1074	800.1	45.2	845.2	0.95	1.41	0.08	46.9	2.5	0.1	0.0	0	859	42.6
( 13, 12)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 13, 14)	101.78	1108	135.7	10.8	146.5	0.93	1.44	0.11	7.9	0.6	0.0	0.0	0	886	41.7
( 14, 13)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 14, 15)	314.05	1176	418.7	28.6	447.4	0.94	1.42	0.09	22.8	1.5	0.0	0.0	0	940	42.1
( 15, 14)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 15, 16)	788.01	1206	1050.7	68.2	1118.9	0.94	1.42	0.09	55.3	3.4	0.2	0.0	0	964	42.3
( 16, 15)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 16, 17)	1011.85	1239	1349.1	103.3	1452.4	0.93	1.44	0.10	69.9	5.0	0.3	0.0	0	991	41.8
( 17, 16)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 17, 18)	324.39	1283	432.5	36.2	468.7	0.92	1.44	0.11	21.9	1.7	0.0	0.0	0	1026	41.5
( 18, 17)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 18, 19)	410.92	1327	547.9	43.8	591.7	0.93	1.44	0.11	26.7	2.0	0.1	0.0	0	1061	41.7
( 19, 18)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 19, 20)	681.12	1352	908.2	76.5	984.7	0.92	1.45	0.11	43.3	3.4	0.2	0.0	0	1081	41.5
( 20, 19)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 20, 21)	486.68	1389	648.9	60.7	709.6	0.91	1.46	0.12	30.6	2.6	0.1	0.0	0	1111	41.1
( 21, 20)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 21, 22)	130.00	1430	173.3	22.8	196.1	0.88	1.51	0.17	8.2	1.0	0.1	0.0	0	1144	39.8
( 22, 21)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0
( 22, 23)	97.64	1473	130.2	58.5	188.7	0.69	1.93	0.60	7.7	2.4	1.0	0.3	2	1178	31.0

CUMULATIVE NETSIM STATISTICS AT TIME 9:15: 0

ELAPSED TIME IS 2:15: 0 ( 8100 SECONDS), TIME PERIOD 3 ELAPSED TIME IS 3600 SECONDS Calibration Seed 7581

LINK	VEHICLE MILES TRIPS		VEHICLE MOVE		VEHICLE MINUTES		RATIO		MINUTES/MILE		TOTAL DELAY		SECONDS / VEHICLE		STOP* STOPS		AVERAGE VALUES	
			TIME	DELAY	TOTAL	TOTAL	TIME	TOTAL	TIME	DELAY	TIME	DELAY	CONTROL	QUEUE	TIME	(%)	VPH	MPH
( 106, 1)	242.99	1283	324.0	77.2	401.2	0.81	1.65	0.32	18.7	3.6	2.9	2.3	2.2	20	570	36.3		
( 1, 106)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 1, 2)	252.31	1403	336.4	39.6	376.0	0.89	1.49	0.16	16.1	1.7	0.0	0.0	0.0	0	623	40.3		
( 2, 1)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 2, 3)	161.98	1462	216.0	11.7	227.6	0.95	1.41	0.07	9.3	0.5	0.0	0.0	0.0	0	649	42.7		
( 3, 2)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 3, 4)	1049.44	1580	1399.3	59.2	1458.5	0.96	1.39	0.06	55.2	2.2	0.2	0.0	0.0	0	702	43.2		
( 4, 3)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 4, 5)	375.60	1639	500.8	23.7	524.5	0.95	1.40	0.06	19.2	0.9	0.0	0.0	0.0	0	728	43.0		
( 5, 4)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 5, 6)	536.39	1701	715.2	34.5	749.7	0.95	1.40	0.06	26.4	1.2	0.1	0.0	0.0	0	756	42.9		
( 6, 5)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 7, 6)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 6, 7)	211.39	1744	281.9	16.1	298.0	0.95	1.41	0.08	10.2	0.6	0.0	0.0	0.0	0	775	42.6		
( 7, 8)	286.15	1788	381.5	144.8	526.3	0.72	1.84	0.51	17.6	4.9	3.7	2.8	2.6	22	794	32.6		
( 8, 7)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 8, 9)	202.64	1829	270.2	53.5	323.7	0.83	1.60	0.26	10.6	1.8	0.0	0.0	0.0	0	812	37.6		
( 9, 8)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 9, 10)	490.06	1875	653.4	42.6	696.0	0.94	1.42	0.09	22.2	1.4	0.1	0.0	0.0	0	833	42.2		
( 10, 9)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 10, 11)	562.46	1916	749.9	47.5	797.4	0.94	1.42	0.08	25.0	1.5	0.1	0.0	0.0	0	851	42.3		
( 11, 10)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 11, 12)	680.13	1957	906.8	61.2	968.0	0.94	1.42	0.09	29.7	1.9	0.1	0.0	0.0	0	869	42.2		
( 12, 11)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 12, 13)	1120.78	2006	1494.4	93.6	1587.9	0.94	1.42	0.08	47.3	2.8	0.1	0.0	0.0	0	891	42.3		
( 13, 12)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 13, 14)	190.14	2070	253.5	22.0	275.5	0.92	1.45	0.12	8.0	0.6	0.0	0.0	0.0	0	920	41.4		
( 14, 13)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 14, 15)	587.23	2199	783.0	58.5	841.5	0.93	1.43	0.10	22.9	1.6	0.1	0.0	0.0	0	977	41.9		
( 15, 14)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 15, 16)	1476.05	2259	1968.1	140.6	2108.6	0.93	1.43	0.10	55.9	3.7	0.2	0.0	0.0	0	1004	42.0		
( 16, 15)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 16, 17)	1893.85	2319	2525.1	203.6	2728.8	0.93	1.44	0.11	70.3	5.3	0.4	0.0	0.0	0	1030	41.6		
( 17, 16)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 17, 18)	605.81	2396	807.7	74.6	882.3	0.92	1.46	0.12	22.1	1.9	0.1	0.0	0.0	0	1064	41.2		
( 18, 17)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 18, 19)	766.10	2474	1021.5	93.1	1114.5	0.92	1.45	0.12	27.0	2.3	0.1	0.0	0.0	0	1099	41.2		
( 19, 18)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 19, 20)	1276.09	2533	1701.5	161.9	1863.4	0.91	1.46	0.13	43.9	3.8	0.2	0.0	0.0	0	1125	41.1		
( 20, 19)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 20, 21)	912.39	2604	1216.5	127.0	1343.6	0.91	1.47	0.14	30.9	2.9	0.1	0.0	0.0	0	1157	40.7		
( 21, 20)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 21, 22)	243.64	2680	324.8	50.0	374.8	0.87	1.54	0.21	8.4	1.1	0.1	0.0	0.0	0	1191	39.0		
( 22, 21)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0		
( 22, 23)	182.89	2759	243.9	140.7	384.5	0.63	2.10	0.77	8.4	3.1	1.3	0.6	0.4	2	1226	28.5		

CUMULATIVE NETSIM STATISTICS AT TIME 10:15: 0

Calibration Seed 7581

ELAPSED TIME IS 3:15: 0 (11700 SECONDS), TIME PERIOD 4 ELAPSED TIME IS 3600 SECONDS

LINK	VEHICLE TRIPS		VEHICLE MILES		VEHICLE MINUTES		RATIO		MINUTES/MILE		SECONDS / VEHICLE			AVERAGE VALUES -		
	MILES	TRIPS	MOVE TIME	DELAY TIME	TOTAL MOVE TIME	TOTAL DELAY TIME	TOTAL MOVE	TOTAL DELAY	TOTAL TIME	DELAY TIME	CONTROL DELAY	QUEUE DELAY	STOP* TIME	STOPS (%)	VOL	SPEED MPH
( 106, 1)	346.40	1829	461.9	109.6	571.5	0.81	1.65	0.32	18.7	3.6	2.8	2.2	2.1	20	562	36.4
( 1, 106)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 1, 2)	360.21	2003	480.3	55.8	536.1	0.90	1.49	0.15	16.1	1.7	0.0	0.1	0.0	0	616	40.3
( 2, 1)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 2, 3)	231.56	2090	308.8	16.5	325.2	0.95	1.40	0.07	9.3	0.5	0.0	0.0	0.0	0	643	42.7
( 3, 2)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 3, 4)	1503.76	2264	2005.0	86.2	2091.2	0.96	1.39	0.06	55.3	2.3	0.2	0.0	0.0	0	696	43.1
( 4, 3)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 4, 5)	539.00	2352	718.7	35.9	754.6	0.95	1.40	0.07	19.2	0.9	0.0	0.0	0.0	0	723	42.9
( 5, 4)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 5, 6)	769.12	2439	1025.5	53.0	1078.5	0.95	1.40	0.07	26.5	1.3	0.1	0.0	0.0	0	750	42.8
( 6, 5)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 7, 6)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 6, 7)	303.39	2503	404.5	24.6	429.2	0.94	1.41	0.08	10.3	0.6	0.0	0.0	0.0	0	770	42.4
( 7, 8)	411.14	2569	548.2	211.7	759.9	0.72	1.85	0.51	17.7	4.9	3.7	2.8	2.6	22	790	32.5
( 8, 7)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 8, 9)	291.50	2631	388.7	78.7	467.3	0.83	1.60	0.27	10.7	1.8	0.0	0.0	0.0	0	809	37.4
( 9, 8)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 9, 10)	703.85	2693	938.5	64.3	1002.8	0.94	1.42	0.09	22.3	1.4	0.1	0.0	0.0	0	828	42.1
( 10, 9)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 10, 11)	809.64	2758	1079.5	69.6	1149.2	0.94	1.42	0.09	25.0	1.5	0.1	0.0	0.0	0	848	42.3
( 11, 10)	980.75	2822	1307.7	89.1	1396.8	0.94	1.42	0.09	29.7	1.9	0.1	0.0	0.0	0	868	42.1
( 12, 11)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 12, 13)	1611.33	2884	2148.4	136.2	2284.7	0.94	1.42	0.08	47.4	2.9	0.1	0.0	0.0	0	887	42.3
( 13, 12)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 13, 14)	273.46	2977	364.6	32.4	397.0	0.92	1.45	0.12	8.0	0.7	0.0	0.0	0.0	0	916	41.3
( 14, 13)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 14, 15)	844.66	3163	1126.2	86.2	1212.4	0.93	1.44	0.10	23.0	1.6	0.1	0.0	0.0	0	973	41.8
( 15, 14)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 15, 16)	2124.89	3252	2833.2	207.5	3040.6	0.93	1.43	0.10	55.9	3.8	0.2	0.0	0.0	0	1000	41.9
( 16, 15)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 16, 17)	2727.67	3340	3636.9	291.5	3928.4	0.93	1.44	0.11	70.4	5.2	0.4	0.0	0.0	0	1027	41.7
( 17, 16)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 17, 18)	872.81	3452	1163.7	104.3	1268.1	0.92	1.45	0.12	22.0	1.8	0.1	0.0	0.0	0	1062	41.3
( 18, 17)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 18, 19)	1104.86	3568	1473.2	130.2	1603.4	0.92	1.45	0.12	26.9	2.2	0.1	0.0	0.0	0	1097	41.3
( 19, 18)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 19, 20)	1850.41	3673	2467.2	228.3	2695.5	0.92	1.46	0.12	43.9	3.7	0.2	0.0	0.0	0	1130	41.2
( 20, 19)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 20, 21)	1325.13	3782	1766.8	175.9	1942.8	0.91	1.47	0.13	30.8	2.8	0.1	0.0	0.0	0	1163	40.9
( 21, 20)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 21, 22)	354.00	3894	472.0	70.6	542.6	0.87	1.53	0.20	8.4	1.1	0.1	0.0	0.0	0	1198	39.1
( 22, 21)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 22, 23)	265.81	4010	354.4	193.3	547.7	0.65	2.06	0.73	8.2	2.9	1.2	0.5	0.3	2	1233	29.1

LINK	VEHICLE MILES TRIPS		VEHICLE MINUTES		RATIO		MINUTES/MILE		TOTAL			SECONDS / VEHICLE			AVERAGE VALUES		
	MILES	TRIPS	MOVE TIME	DELAY TIME	TOTAL TIME	MOVE/TOTAL	DELAY/TOTAL	MINUTES/MILE	VEHICLE	CONTROL	QUEUE	STOP* TIME	STOPS (%)	VEHICLE	VEHICLE	VEHICLE	
( 106, 1)	126.14	666	168.2	39.5	207.7	0.81	1.65	0.31	18.7	3.6	2.7	2.1	21	532	36.4		
( 1, 106)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0		
( 1, 2)	131.46	731	175.3	20.4	195.6	0.90	1.49	0.15	16.0	1.7	0.0	0.0	0	584	40.3		
( 2, 1)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0		
( 2, 3)	84.65	764	112.9	6.0	118.8	0.95	1.40	0.07	9.3	0.5	0.0	0.0	0	611	42.7		
( 3, 2)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0		
( 3, 4)	549.96	828	733.3	30.6	763.9	0.96	1.39	0.06	55.1	2.2	0.2	0.0	0	662	43.2		
( 4, 3)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0		
( 4, 5)	198.46	866	264.6	12.0	276.6	0.96	1.39	0.06	19.2	0.8	0.0	0.0	0	692	43.1		
( 5, 4)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0		
( 5, 6)	283.18	898	377.6	18.1	395.7	0.95	1.40	0.06	26.3	1.2	0.1	0.0	0	718	42.9		
( 6, 5)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0		
( 7, 6)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0		
( 7, 7)	111.88	923	149.2	7.9	157.1	0.95	1.40	0.07	10.2	0.5	0.0	0.0	0	738	42.7		
( 7, 8)	151.88	949	202.5	74.2	276.7	0.73	1.82	0.49	17.5	4.7	3.6	2.5	21	759	32.9		
( 8, 7)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0		
( 8, 9)	108.03	975	144.0	28.7	172.7	0.83	1.60	0.27	10.6	1.8	0.0	0.0	0	780	37.5		
( 9, 8)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0		
( 9, 10)	260.32	996	347.1	21.2	368.3	0.94	1.41	0.08	22.1	1.3	0.1	0.0	0	796	42.4		
( 10, 9)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0		
( 10, 11)	298.84	1018	398.5	23.4	421.8	0.94	1.41	0.08	24.8	1.4	0.0	0.0	0	814	42.5		
( 11, 10)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0		
( 11, 12)	362.48	1043	483.3	31.7	515.0	0.94	1.42	0.09	29.5	1.8	0.1	0.0	0	834	42.2		
( 12, 11)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0		
( 12, 13)	599.50	1073	799.3	48.9	848.2	0.94	1.41	0.08	47.1	2.7	0.1	0.0	0	858	42.4		
( 13, 12)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0		
( 13, 14)	101.78	1108	135.7	11.5	147.2	0.92	1.45	0.11	8.0	0.6	0.0	0.0	0	886	41.5		
( 14, 13)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0		
( 14, 15)	314.31	1177	419.1	29.3	448.4	0.93	1.43	0.09	22.8	1.5	0.0	0.0	0	941	42.1		
( 15, 14)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0		
( 15, 16)	785.40	1202	1047.2	71.1	1118.3	0.94	1.42	0.09	55.4	3.6	0.2	0.0	0	961	42.1		
( 16, 15)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0		
( 16, 17)	1010.22	1237	1347.0	109.6	1456.6	0.92	1.44	0.11	70.4	5.3	0.3	0.0	0	989	41.6		
( 17, 16)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0		
( 17, 18)	324.39	1283	432.5	36.2	468.8	0.92	1.44	0.11	21.9	1.7	0.1	0.0	0	1026	41.5		
( 18, 17)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0		
( 18, 19)	411.23	1328	548.3	45.7	594.0	0.92	1.44	0.11	26.8	2.1	0.1	0.0	0	1062	41.5		
( 19, 18)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0		
( 19, 20)	682.13	1354	909.5	81.9	991.4	0.92	1.45	0.12	43.5	3.6	0.2	0.0	0	1083	41.3		
( 20, 19)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0		
( 20, 21)	487.38	1391	649.8	63.1	713.0	0.91	1.46	0.13	30.7	2.7	0.1	0.0	0	1112	41.0		
( 21, 20)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0		
( 21, 22)	130.18	1432	173.6	22.4	196.0	0.89	1.51	0.17	8.2	0.9	0.0	0.0	0	1145	39.9		
( 22, 21)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0	0	0.0		
( 22, 23)	97.64	1473	130.2	61.3	191.5	0.68	1.96	0.63	7.8	2.5	1.2	0.3	2	1178	30.6		

ELAPSED TIME IS 2:15: 0 ( 8100 SECONDS), TIME PERIOD 3 ELAPSED TIME IS 3600 SECONDS

LINK	VEHICLE MILES TRIPS		VEHICLE MINUTES		RATIO		MINUTES/MILE		SECONDS / VEHICLE			AVERAGE VALUES								
	VEHICLE	MOVE	VEHICLE	VEHICLE	TOTAL	TOTAL	TOTAL	DELAY	DELAY	CONTROL	QUEUE	STOP*	STOPS	DELAY	STOP	DELAY	STOP	DELAY	STOP	
		TIME	DELAY	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME
( 106, 1)	242.99	1283	324.0	77.1	401.1	0.81	1.65	0.32	18.7	3.6	2.8	2.3	2.2	20	570	36.3				
( 1, 106)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0				
( 1, 2)	252.31	1403	336.4	39.7	376.1	0.89	1.49	0.16	16.1	1.7	0.0	0.0	0.0	0	623	40.3				
( 2, 1)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0				
( 2, 3)	161.98	1462	216.0	11.7	227.6	0.95	1.41	0.07	9.3	0.5	0.0	0.0	0.0	0	649	42.7				
( 3, 2)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0				
( 3, 4)	1049.44	1580	1399.3	60.8	1460.1	0.96	1.39	0.06	55.3	2.3	0.2	0.0	0.0	0	702	43.1				
( 4, 3)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0				
( 4, 5)	375.60	1639	500.8	24.0	524.8	0.95	1.40	0.06	19.2	0.9	0.0	0.0	0.0	0	728	42.9				
( 5, 4)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0				
( 5, 6)	536.39	1701	715.2	36.0	751.2	0.95	1.40	0.07	26.5	1.3	0.1	0.0	0.0	0	756	42.8				
( 6, 5)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0				
( 7, 6)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0				
( 6, 7)	211.39	1744	281.9	16.2	298.1	0.95	1.41	0.08	10.2	0.6	0.0	0.0	0.0	0	775	42.6				
( 7, 8)	285.67	1785	380.9	142.8	523.7	0.73	1.83	0.50	17.6	4.8	3.6	2.7	2.6	22	793	32.7				
( 8, 7)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0				
( 8, 9)	202.64	1829	270.2	54.0	324.2	0.83	1.60	0.27	10.6	1.8	0.0	0.0	0.0	0	812	37.5				
( 9, 8)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0				
( 9, 10)	490.06	1875	653.4	43.6	697.0	0.94	1.42	0.09	22.3	1.4	0.1	0.0	0.0	0	833	42.2				
( 10, 9)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0				
( 10, 11)	562.17	1915	749.6	48.9	798.4	0.94	1.42	0.09	25.0	1.5	0.1	0.0	0.0	0	851	42.2				
( 11, 10)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0				
( 11, 12)	679.78	1956	906.4	64.2	970.6	0.93	1.43	0.09	29.8	2.0	0.1	0.0	0.0	0	869	42.0				
( 12, 11)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0				
( 12, 13)	1120.78	2006	1494.4	99.1	1593.5	0.94	1.42	0.09	47.5	3.0	0.2	0.0	0.0	0	891	42.2				
( 13, 12)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0				
( 13, 14)	190.14	2070	253.5	22.4	275.9	0.92	1.45	0.12	8.0	0.6	0.0	0.0	0.0	0	920	41.4				
( 14, 13)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0				
( 14, 15)	587.23	2199	783.0	58.4	841.3	0.93	1.43	0.10	22.9	1.6	0.1	0.0	0.0	0	977	41.9				
( 15, 14)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0				
( 15, 16)	1475.40	2258	1967.2	142.8	2110.0	0.93	1.43	0.10	55.9	3.8	0.2	0.0	0.0	0	1003	42.0				
( 16, 15)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0				
( 16, 17)	1890.58	2315	2520.8	201.7	2722.5	0.93	1.44	0.11	70.3	5.2	0.3	0.0	0.0	0	1028	41.7				
( 17, 16)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0				
( 17, 18)	605.55	2395	807.4	70.1	877.5	0.92	1.45	0.12	22.0	1.8	0.1	0.0	0.0	0	1064	41.4				
( 18, 17)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0				
( 18, 19)	764.24	2468	1019.0	89.5	1108.5	0.92	1.45	0.12	26.9	2.2	0.1	0.0	0.0	0	1096	41.4				
( 19, 18)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0				
( 19, 20)	1276.60	2534	1702.1	156.4	1858.5	0.92	1.46	0.12	43.8	3.7	0.2	0.0	0.0	0	1126	41.2				
( 20, 19)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0				
( 20, 21)	912.04	2603	1216.0	119.9	1335.9	0.91	1.46	0.13	30.7	2.8	0.1	0.0	0.0	0	1156	41.0				
( 21, 20)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0				
( 21, 22)	243.64	2660	324.8	44.2	369.1	0.88	1.51	0.18	8.3	1.0	0.1	0.0	0.0	0	1191	39.6				
( 22, 21)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0				
( 22, 23)	182.76	2757	243.7	115.6	359.3	0.68	1.97	0.63	7.8	2.5	1.1	0.5	0.3	2	1225	30.5				

CUMULATIVE NETSIM STATISTICS AT TIME 10:15: 0

ELAPSED TIME IS 3:15: 0 (11700 SECONDS), TIME PERIOD 4 ELAPSED TIME IS 3600 SECONDS

Calibration Seed 1359

LINK	VEHICLE MILES TRIPS		VEHICLE MOVE		VEHICLE MINUTES		RATIO		MINUTES/MILE		TOTAL DELAY		SECONDS / VEHICLE		STOP* STOPS		AVERAGE VALUES -		
			TIME	DELAY	TIME	DELAY	TIME	DELAY	TIME	DELAY	TIME	DELAY	TIME	DELAY	TIME	DELAY	TIME	DELAY	TIME
( 106, 1)	346.40	1829	461.9	109.5	571.4	0.81	1.65	0.32	18.7	3.6	2.8	2.2	2.1	20	562	36.4	0.0	0.0	
( 1, 106)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	0.0
( 1, 2)	360.21	2003	480.3	55.9	536.2	0.90	1.49	0.16	16.1	1.7	0.0	0.0	0.0	0	616	40.3	0.0	0.0	
( 2, 1)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	0.0
( 2, 3)	231.56	2090	308.8	16.4	325.2	0.95	1.40	0.07	9.3	0.5	0.0	0.0	0.0	0	643	42.7	0.0	0.0	
( 3, 2)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	0.0
( 3, 4)	1503.76	2264	2005.0	87.6	2092.6	0.96	1.39	0.06	55.3	2.3	0.2	0.0	0.0	0	696	43.1	0.0	0.0	
( 4, 3)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	0.0
( 4, 5)	539.23	2353	719.0	36.2	755.2	0.95	1.40	0.07	19.2	0.9	0.0	0.0	0.0	0	724	42.8	0.0	0.0	
( 5, 4)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	0.0
( 5, 6)	769.12	2439	1025.5	54.3	1079.8	0.95	1.40	0.07	26.5	1.3	0.1	0.0	0.0	0	750	42.7	0.0	0.0	
( 6, 5)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	0.0
( 7, 6)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	0.0
( 6, 7)	303.39	2503	404.5	24.7	429.3	0.94	1.41	0.08	10.3	0.6	0.0	0.0	0.0	0	770	42.4	0.0	0.0	
( 7, 8)	410.98	2568	548.0	209.7	757.7	0.72	1.84	0.51	17.7	4.9	3.7	2.8	2.6	22	790	32.5	0.0	0.0	
( 8, 7)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	0.0
( 8, 9)	291.61	2632	388.8	79.7	468.5	0.83	1.61	0.27	10.7	1.8	0.0	0.0	0.0	0	809	37.3	0.0	0.0	
( 9, 8)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	0.0
( 9, 10)	703.59	2692	938.1	64.3	1002.5	0.94	1.42	0.09	22.3	1.4	0.1	0.0	0.0	0	828	42.1	0.0	0.0	
( 10, 9)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	0.0
( 10, 11)	809.35	2757	1079.1	70.7	1149.8	0.94	1.42	0.09	25.0	1.5	0.1	0.0	0.0	0	848	42.2	0.0	0.0	
( 11, 10)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	0.0
( 11, 12)	980.75	2822	1307.7	92.8	1400.5	0.93	1.43	0.09	29.7	2.0	0.1	0.0	0.0	0	868	42.0	0.0	0.0	
( 12, 11)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	0.0
( 12, 13)	1611.33	2884	2148.4	143.4	2291.9	0.94	1.42	0.09	47.5	3.0	0.1	0.0	0.0	0	887	42.2	0.0	0.0	
( 13, 12)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	0.0
( 13, 14)	273.46	2977	364.6	32.4	397.0	0.92	1.45	0.12	8.0	0.7	0.0	0.0	0.0	0	916	41.3	0.0	0.0	
( 14, 13)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	0.0
( 14, 15)	844.66	3163	1126.2	86.1	1212.3	0.93	1.44	0.10	23.0	1.6	0.1	0.0	0.0	0	973	41.8	0.0	0.0	
( 15, 14)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	0.0
( 15, 16)	2125.54	3253	2834.1	208.4	3042.4	0.93	1.43	0.10	56.0	3.8	0.2	0.0	0.0	0	1000	41.9	0.0	0.0	
( 16, 15)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	0.0
( 16, 17)	2723.58	3335	3631.4	292.5	3923.9	0.93	1.44	0.11	70.4	5.2	0.4	0.0	0.0	0	1026	41.6	0.0	0.0	
( 17, 16)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	0.0
( 17, 18)	872.81	3452	1163.7	98.4	1262.2	0.92	1.45	0.11	21.9	1.7	0.1	0.0	0.0	0	1062	41.5	0.0	0.0	
( 18, 17)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	0.0
( 18, 19)	1104.86	3568	1473.2	127.1	1600.3	0.92	1.45	0.12	26.9	2.1	0.1	0.0	0.0	0	1097	41.4	0.0	0.0	
( 19, 18)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	0.0
( 19, 20)	1850.92	3674	2467.9	223.9	2691.8	0.92	1.45	0.12	43.9	3.7	0.2	0.0	0.0	0	1130	41.3	0.0	0.0	
( 20, 19)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	0.0
( 20, 21)	1326.18	3785	1768.2	173.0	1941.3	0.91	1.46	0.13	30.8	2.7	0.1	0.0	0.0	0	1164	41.0	0.0	0.0	
( 21, 20)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	0.0
( 21, 22)	354.18	3896	472.2	66.2	538.4	0.88	1.52	0.19	8.3	1.0	0.1	0.0	0.0	0	1198	39.5	0.0	0.0	
( 22, 21)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	0.0
( 22, 23)	265.88	4011	354.5	170.6	525.1	0.68	1.97	0.64	7.9	2.6	1.1	0.5	0.3	2	1234	30.4	0.0	0.0	

LINK	VEHICLE		VEHICLE MINUTES		RATIO		MINUTES/MILE		SECONDS / VEHICLE			AVERAGE VALUES				
	MILES	TRIPS	MOVE	DELAY	TOTAL	MOVE	TOTAL	TOTAL	TIME	DELAY	CONTROL	QUEUE	STOP*	STOPS	VOL	SPEED
			TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	DELAY	DELAY	TIME	(%)	VPH	MPH
( 106, 1)	126.14	666	168.2	39.5	207.7	0.81	1.65	0.31	18.7	3.6	2.7	2.2	2.1	21	532	36.4
( 1, 106)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 1, 2)	131.46	731	175.3	20.4	195.6	0.90	1.49	0.15	16.0	1.7	0.0	0.0	0.0	0	584	40.3
( 2, 1)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 2, 3)	84.65	764	112.9	5.9	118.8	0.95	1.40	0.07	9.3	0.5	0.0	0.0	0.0	0	611	42.8
( 3, 2)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 3, 4)	550.63	829	734.2	30.2	764.3	0.96	1.39	0.05	55.0	2.2	0.1	0.0	0.0	0	663	43.2
( 4, 3)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 4, 5)	198.23	865	264.3	11.7	276.0	0.96	1.39	0.06	19.1	0.8	0.0	0.0	0.0	0	692	43.1
( 5, 4)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 5, 6)	283.18	898	377.6	17.7	395.2	0.96	1.40	0.06	26.3	1.2	0.1	0.0	0.0	0	718	43.0
( 6, 5)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 7, 6)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 6, 7)	111.88	923	149.2	7.8	157.0	0.95	1.40	0.07	10.2	0.5	0.0	0.0	0.0	0	738	42.8
( 7, 8)	151.88	949	202.5	73.1	275.6	0.73	1.81	0.48	17.4	4.6	3.5	2.7	2.5	21	759	33.1
( 8, 7)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 8, 9)	108.03	975	144.0	28.4	172.5	0.84	1.60	0.26	10.6	1.7	0.0	0.0	0.0	0	780	37.6
( 9, 8)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 9, 10)	260.32	996	347.1	21.2	368.2	0.94	1.41	0.08	22.1	1.3	0.1	0.0	0.0	0	796	42.4
( 10, 9)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 10, 11)	299.73	1021	399.6	23.7	423.4	0.94	1.41	0.08	24.8	1.4	0.1	0.0	0.0	0	816	42.5
( 11, 10)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 11, 12)	362.13	1042	482.8	34.5	517.3	0.93	1.43	0.10	29.7	2.0	0.1	0.0	0.0	0	833	42.0
( 12, 11)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 12, 13)	599.50	1073	799.3	52.2	851.5	0.94	1.42	0.09	47.3	2.9	0.1	0.0	0.0	0	858	42.2
( 13, 12)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 13, 14)	101.78	1108	135.7	12.7	148.4	0.91	1.46	0.12	8.0	0.7	0.0	0.0	0.0	0	886	41.2
( 14, 13)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 14, 15)	314.31	1177	419.1	34.0	453.1	0.92	1.44	0.11	23.0	1.7	0.0	0.0	0.0	0	941	41.6
( 15, 14)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 15, 16)	786.05	1203	1048.1	81.7	1129.8	0.93	1.44	0.10	56.0	4.1	0.2	0.0	0.0	0	962	41.7
( 16, 15)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 16, 17)	1011.85	1239	1349.1	113.3	1462.5	0.92	1.45	0.11	70.5	5.5	0.3	0.0	0.0	0	991	41.5
( 17, 16)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 17, 18)	324.39	1283	432.5	38.4	470.9	0.92	1.45	0.12	22.0	1.8	0.0	0.0	0.0	0	1026	41.3
( 18, 17)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 18, 19)	410.61	1326	547.5	50.2	597.6	0.92	1.46	0.12	27.0	2.3	0.1	0.0	0.0	0	1060	41.2
( 19, 18)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 19, 20)	681.12	1352	908.2	84.5	992.7	0.91	1.46	0.12	43.7	3.7	0.2	0.0	0.0	0	1081	41.2
( 20, 19)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 20, 21)	486.68	1389	648.9	63.8	712.7	0.91	1.46	0.13	30.7	2.8	0.1	0.0	0.0	0	1111	41.0
( 21, 20)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 21, 22)	130.18	1432	173.6	24.1	197.6	0.88	1.52	0.18	8.3	1.0	0.1	0.0	0.0	0	1145	39.5
( 22, 21)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 22, 23)	97.58	1472	130.1	65.9	196.0	0.66	2.01	0.68	8.0	2.7	1.2	0.6	0.4	2	1177	29.9

ELAPSED TIME IS 2:15: 0 ( 8100 SECONDS), TIME PERIOD 3 ELAPSED TIME IS 3600 SECONDS

LINK	VEHICLE		VEHICLE MINUTES		RATIO		MINUTES/MILE		SECONDS / VEHICLE			AVERAGE VALUES				
	MILES TRAPS	MOVE TIME	DELAY TIME	TOTAL TIME	TOTAL MOVE TIME	TOTAL TIME	TOTAL TIME	DELAY TIME	TOTAL TIME	DELAY TIME	CONTROL DELAY	QUEUE DELAY	STOP* TIME	STOPS (%)	VOL VPH	SPREAD MPH
( 106, 1)	242.99	1283	324.0	77.1	401.1	0.81	1.65	0.32	18.7	3.6	2.9	2.3	2.2	20	570	36.3
( 1, 106)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 1, 2)	252.31	1403	336.4	39.6	376.0	0.89	1.49	0.16	16.1	1.7	0.0	0.0	0.0	0	623	40.3
( 2, 1)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 2, 3)	161.98	1462	216.0	11.5	227.4	0.95	1.40	0.07	9.3	0.5	0.0	0.0	0.0	0	649	42.7
( 3, 2)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 3, 4)	1049.44	1580	1399.3	60.6	1459.8	0.96	1.39	0.06	55.3	2.3	0.2	0.0	0.0	0	702	43.1
( 4, 3)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 4, 5)	375.38	1638	500.5	23.1	523.6	0.96	1.39	0.06	19.1	0.9	0.0	0.0	0.0	0	728	43.0
( 5, 4)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 5, 6)	536.39	1701	715.2	35.1	750.3	0.95	1.40	0.07	26.4	1.2	0.1	0.0	0.0	0	756	42.9
( 6, 5)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 7, 6)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 6, 7)	211.39	1744	281.9	16.0	297.9	0.95	1.41	0.08	10.2	0.6	0.0	0.0	0.0	0	775	42.6
( 7, 8)	285.99	1787	381.3	139.1	520.5	0.73	1.82	0.49	17.5	4.7	3.5	2.6	2.5	21	794	33.0
( 8, 7)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 8, 9)	202.53	1628	270.0	53.0	323.0	0.84	1.60	0.26	10.6	1.7	0.0	0.0	0.0	0	812	37.6
( 9, 8)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 9, 10)	490.06	1875	653.4	42.7	696.1	0.94	1.42	0.09	22.3	1.4	0.1	0.0	0.0	0	833	42.2
( 10, 9)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 10, 11)	563.05	1918	750.7	48.6	799.3	0.94	1.42	0.09	25.0	1.5	0.0	0.0	0.0	0	852	42.3
( 11, 10)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 11, 12)	679.09	1954	905.5	66.5	972.0	0.93	1.43	0.10	29.8	2.1	0.1	0.0	0.0	0	868	41.9
( 12, 11)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 12, 13)	1120.78	2006	1494.4	103.0	1597.4	0.94	1.43	0.09	47.7	3.1	0.2	0.0	0.0	0	891	42.1
( 13, 12)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 13, 14)	190.14	2070	253.5	23.8	277.4	0.91	1.46	0.13	8.0	0.7	0.0	0.0	0.0	0	920	41.1
( 14, 13)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 14, 15)	587.23	2199	783.0	63.4	846.3	0.93	1.44	0.11	23.1	1.7	0.1	0.0	0.0	0	977	41.6
( 15, 14)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 15, 16)	1474.74	2257	1966.3	152.8	2119.1	0.93	1.44	0.10	56.2	4.1	0.2	0.0	0.0	0	1003	41.8
( 16, 15)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 16, 17)	1893.85	2319	2525.1	213.6	2738.8	0.92	1.45	0.11	70.6	5.5	0.4	0.0	0.0	0	1030	41.5
( 17, 16)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 17, 18)	606.06	2397	808.1	75.2	883.3	0.91	1.46	0.12	22.1	1.9	0.1	0.0	0.0	0	1065	41.2
( 18, 17)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 18, 19)	765.17	2471	1020.2	98.0	1118.2	0.91	1.46	0.13	27.1	2.4	0.1	0.0	0.0	0	1098	41.1
( 19, 18)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 19, 20)	1276.60	2534	1702.1	167.8	1869.9	0.91	1.46	0.13	44.0	3.9	0.2	0.0	0.0	0	1126	41.0
( 20, 19)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 20, 21)	911.34	2601	1215.1	124.0	1339.1	0.91	1.47	0.14	30.8	2.9	0.1	0.0	0.0	0	1156	40.8
( 21, 20)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 21, 22)	243.55	2679	324.7	48.0	372.7	0.87	1.53	0.20	8.3	1.1	0.1	0.0	0.0	0	1190	39.2
( 22, 21)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 22, 23)	182.76	2757	243.7	130.6	374.3	0.65	2.05	0.71	8.1	2.8	1.3	0.6	0.4	2	1225	29.3



CUMULATIVE NETSIM STATISTICS AT TIME 10:15: 0

ELAPSED TIME IS 3:15: 0 (11700 SECONDS), TIME PERIOD 4 ELAPSED TIME IS 3600 SECONDS

Calibration Seed 9823

LINK	VEHICLE			VEHICLE MINUTES			RATIO		MINUTES/MILE			SECONDS / VEHICLE			AVERAGE VALUES -		
	MILES	TRIPS	TRIP	MOVE	DELAY	TOTAL	TIME	TOTAL	TOTAL	TIME	DELAY	CONTROL	QUEUE	STOP*	STOPS	PERCENT	VELOCITY
( 106, 1)	346.40	1829	461.9	109.5	571.4	0.81	1.65	0.32	18.7	3.6	2.8	2.2	2.1	20	562	36.4	
( 1, 106)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 1, 2)	360.21	2003	480.3	55.8	536.0	0.90	1.49	0.15	16.0	1.7	0.0	0.0	0.0	0	616	40.3	
( 2, 1)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 2, 3)	231.56	2090	308.8	16.1	324.9	0.95	1.40	0.07	9.3	0.5	0.0	0.0	0.0	0	643	42.8	
( 3, 4)	1503.76	2264	2005.0	87.5	2092.5	0.96	1.39	0.06	55.3	2.3	0.2	0.0	0.0	0	696	43.1	
( 4, 3)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 4, 5)	538.77	2351	718.4	35.1	753.5	0.95	1.40	0.07	19.2	0.9	0.0	0.0	0.0	0	723	42.9	
( 5, 4)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 5, 6)	769.12	2439	1025.5	53.9	1079.4	0.95	1.40	0.07	26.5	1.3	0.1	0.0	0.0	0	750	42.8	
( 6, 5)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 7, 6)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 6, 7)	303.39	2503	404.5	24.6	429.1	0.94	1.41	0.08	10.3	0.6	0.0	0.0	0.0	0	770	42.4	
( 7, 8)	410.98	2568	548.0	205.4	753.4	0.73	1.83	0.50	17.6	4.8	3.6	2.7	2.5	22	790	32.7	
( 8, 7)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 8, 9)	291.72	2633	389.0	77.9	466.9	0.83	1.60	0.27	10.6	1.8	0.0	0.0	0.0	0	810	37.5	
( 9, 8)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 9, 10)	703.59	2692	938.1	64.1	1002.2	0.94	1.42	0.09	22.3	1.4	0.1	0.0	0.0	0	828	42.1	
( 10, 9)	810.23	2760	1080.3	71.8	1152.1	0.94	1.42	0.09	25.0	1.6	0.1	0.0	0.0	0	849	42.2	
( 11, 10)	980.75	2822	1307.7	96.4	1494.0	0.93	1.43	0.10	29.8	2.0	0.1	0.0	0.0	0	868	41.9	
( 12, 11)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 12, 13)	1612.44	2886	2149.9	149.2	2299.1	0.94	1.43	0.09	47.7	3.1	0.2	0.0	0.0	0	888	42.1	
( 13, 12)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 13, 14)	273.36	2976	364.5	34.7	399.1	0.91	1.46	0.13	8.0	0.7	0.0	0.0	0.0	0	915	41.1	
( 14, 13)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 14, 15)	844.66	3163	1126.2	92.7	1218.9	0.92	1.44	0.11	23.1	1.8	0.1	0.0	0.0	0	973	41.6	
( 15, 14)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 15, 16)	2124.89	3252	2833.2	222.4	3055.6	0.93	1.44	0.10	56.2	4.1	0.2	0.0	0.0	0	1000	41.7	
( 16, 15)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 16, 17)	2725.22	3337	3633.6	307.2	3940.9	0.92	1.45	0.11	70.7	5.5	0.3	0.0	0.0	0	1026	41.5	
( 17, 16)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 17, 18)	872.81	3452	1163.7	105.4	1269.2	0.92	1.45	0.12	22.0	1.8	0.1	0.0	0.0	0	1062	41.3	
( 18, 17)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 18, 19)	1104.86	3568	1473.2	137.4	1610.5	0.91	1.46	0.12	27.1	2.3	0.1	0.0	0.0	0	1097	41.2	
( 19, 18)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 19, 20)	1840.84	3654	2454.5	230.6	2685.1	0.91	1.46	0.13	43.9	3.8	0.2	0.0	0.0	0	1124	41.1	
( 20, 19)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 20, 21)	1319.88	3767	1759.8	172.0	1931.8	0.91	1.46	0.13	30.8	2.7	0.1	0.0	0.0	0	1159	41.0	
( 21, 20)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 21, 22)	353.00	3883	470.7	69.4	540.1	0.87	1.53	0.20	8.3	1.1	0.1	0.0	0.0	0	1194	39.2	
( 22, 21)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	
( 22, 23)	265.02	3998	353.4	186.2	539.5	0.65	2.04	0.70	8.1	2.8	1.2	0.5	0.3	2	1230	29.5	

# Attachment D

## CORSIM Runs – Two Hurricane Evacuation Scenarios

No Incident Scenario

ELAPSED TIME IS 3:15:0 (11700 SECONDS), TIME PERIOD 4 ELAPSED TIME IS 3600 SECONDS

LINK	VEHICLE MILES TRIPS		VEHICLE MINUTES		RATIO		MINUTES/MILE		TOTAL DELAY		SECONDS / VEHICLE		STOP* STOP		AVERAGE VALUES	
	MILES	TRIPS	MOVE TIME	DELAY TIME	TOTAL TIME	MOVE/TOTAL	DELAY/TOTAL	TOTAL TIME	DELAY TIME	TIME	DELAY	CONTROL	QUEUE	TIME	(%)	STOPS
( 106, 1)	1693.75	8943	2258.3	3438.8	5697.1	0.40	3.36	2.03	38.3	23.2	11.9	8.3	6.8	47	2751	17.8
( 1, 106)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 1, 2)	1632.27	9073	2176.4	2124.9	4301.2	0.51	2.64	1.30	28.5	14.1	5.9	1.1	0.3	7	2791	22.8
( 2, 1)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 2, 3)	1008.02	9098	1344.0	2061.1	3405.1	0.39	3.38	2.04	22.5	13.6	1.3	1.7	0.3	7	2799	17.8
( 3, 2)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 3, 4)	5973.86	8994	7965.1	15301.1	23266.2	0.34	3.89	2.56	154.9	102.5	23.5	12.3	2.3	21	2767	15.4
( 4, 3)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 4, 5)	2056.31	8973	2741.8	6686.3	9428.0	0.29	4.58	3.25	62.9	44.6	6.1	6.5	1.9	22	2760	13.1
( 5, 4)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 5, 6)	2811.58	8916	3748.8	10132.5	13881.3	0.27	4.94	3.60	93.0	68.0	12.3	12.6	5.8	41	2743	12.2
( 6, 5)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 7, 6)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 6, 7)	1080.73	8916	1441.0	4147.7	5588.7	0.26	5.17	3.84	37.6	27.9	6.7	7.0	4.5	42	2743	11.6
( 7, 8)	1422.26	8887	1896.3	5844.3	7740.6	0.24	5.44	4.11	52.1	39.4	15.6	14.4	11.9	71	2734	11.0
( 8, 7)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 8, 9)	990.51	8940	1320.7	523.0	1843.6	0.72	1.86	0.53	12.4	3.5	0.0	0.0	0.0	0	2750	32.2
( 9, 8)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 9, 10)	2352.80	9002	3137.1	644.3	3781.4	0.83	1.61	0.27	25.2	4.3	0.3	0.0	0.0	0	2769	37.3
( 10, 11)	2652.91	9037	3537.2	813.1	4350.3	0.81	1.64	0.31	28.8	5.4	0.2	0.0	0.0	0	2780	36.6
( 11, 10)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 11, 12)	3151.47	9068	4202.0	985.1	5187.0	0.81	1.65	0.31	34.3	6.5	0.2	0.0	0.0	0	2790	36.5
( 12, 11)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 12, 13)	5093.22	9116	6791.0	1636.4	8427.3	0.81	1.65	0.32	55.4	10.8	0.6	0.0	0.0	0	2804	36.3
( 13, 12)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 13, 14)	844.52	9195	1126.2	293.1	1419.2	0.79	1.68	0.35	9.3	1.9	0.0	0.0	0.0	0	2829	35.7
( 14, 13)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 14, 15)	2500.61	9364	3334.2	816.1	4150.2	0.80	1.66	0.33	26.6	5.2	0.2	0.0	0.0	0	2881	36.2
( 15, 14)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 15, 16)	6150.54	9413	8200.7	2076.7	10277.5	0.80	1.67	0.34	65.3	13.2	0.6	0.0	0.0	0	2896	35.9
( 16, 15)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 16, 17)	7704.43	9434	10272.6	2607.0	12879.6	0.80	1.67	0.34	81.6	16.5	0.9	0.0	0.0	0	2902	35.9
( 17, 16)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 17, 18)	2411.34	9537	3215.1	813.1	4028.2	0.80	1.67	0.34	25.3	5.1	0.2	0.0	0.0	0	2934	35.9
( 18, 17)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 18, 19)	2982.02	9630	3976.0	1012.4	4988.4	0.80	1.67	0.34	31.0	6.3	0.2	0.0	0.0	0	2963	35.9
( 19, 18)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 19, 20)	4892.28	9711	6523.0	1697.6	8220.6	0.79	1.68	0.35	50.7	10.5	0.6	0.0	0.0	0	2988	35.7
( 20, 19)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 20, 21)	3435.81	9806	4581.1	2977.4	7558.5	0.61	2.20	0.87	46.2	18.2	7.8	0.3	0.2	2	3017	27.3
( 21, 20)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 21, 22)	900.64	9907	1200.8	1958.6	3159.4	0.38	3.51	2.17	19.1	11.8	2.2	0.7	0.3	7	3048	17.1
( 22, 21)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0
( 22, 23)	660.76	9968	881.0	1812.1	2693.1	0.33	4.08	2.74	16.2	10.9	2.5	1.8	0.9	6	3067	14.7

No Incident Scenario

ELAPSED TIME IS 3:15:0 (11700 SECONDS), TIME PERIOD 4 ELAPSED TIME IS 3600 SECONDS

LINK	VEHICLE MILES TRIPS		VEHICLE MINUTES		RATIO		MINUTES/MILE		TOTAL DELAY		TOTAL TIME		SECONDS / VEHICLE		STOP* STOP		AVERAGE VALUES	
	MILES	TRIPS	MOVE	DELAY	TOTAL	MOVE/	TOTAL	DELAY	TIME	DELAY	TIME	TIME	DELAY	CONTROL	QUEUE	TIME	STOP	STOP
( 106, 1)	1450.57	7659	1934.1	7877.0	9811.1	0.20	0.00	6.76	5.43	76.7	61.6	24.1	29.5	22.8	72	2356	8.9	0.0
( 1, 106)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0
( 1, 2)	1398.73	7775	1865.0	6788.6	8653.6	0.22	6.19	4.85	4.85	66.7	52.4	22.1	19.5	10.3	55	2392	9.7	0.0
( 2, 1)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0
( 2, 3)	860.22	7764	1147.0	4695.9	5842.9	0.20	6.79	5.46	5.46	45.1	36.2	8.8	14.3	6.6	52	2388	8.8	0.0
( 3, 2)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0
( 3, 4)	5039.32	7587	6719.1	30376.9	37096.0	0.18	7.36	6.03	6.03	290.4	238.1	60.4	97.6	38.7	71	2334	8.2	0.0
( 4, 3)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0
( 4, 5)	1726.77	7535	2302.4	11171.2	13473.5	0.17	7.80	6.47	6.47	106.8	88.6	21.2	35.0	16.6	70	2318	7.7	0.0
( 5, 4)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0
( 5, 6)	2354.02	7465	3138.7	15759.3	18898.0	0.17	8.03	6.69	6.69	150.9	125.9	33.5	51.8	29.1	79	2296	7.5	0.0
( 6, 5)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0
( 6, 7)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0
( 6, 7)	904.36	7461	1205.8	6024.1	7230.0	0.17	7.99	6.66	6.66	57.9	48.3	17.9	20.7	15.3	80	2295	7.5	0.0
( 7, 8)	1187.48	7420	1583.3	8009.5	9592.8	0.17	8.08	6.74	6.74	77.3	64.5	27.9	30.3	24.7	88	2283	7.4	0.0
( 8, 7)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0
( 8, 9)	825.54	7451	1100.7	4880.4	5981.1	0.18	7.25	5.91	5.91	48.1	39.2	15.7	13.3	6.6	66	2292	8.3	0.0
( 9, 8)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0
( 9, 10)	1925.20	7366	2566.9	14240.7	16807.7	0.15	8.73	7.40	7.40	136.1	115.3	25.1	44.0	17.7	84	2266	6.9	0.0
( 10, 9)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0
( 10, 11)	2131.54	7261	2842.1	16724.1	19556.2	0.15	9.18	7.85	7.85	160.6	137.3	26.8	53.7	17.3	84	2234	6.5	0.0
( 11, 10)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0
( 11, 12)	2497.41	7186	14651.5	6491.2	21142.6	0.69	8.47	2.60	2.60	175.2	53.8	2.4	18.3	0.5	4	2211	7.1	0.0
( 12, 11)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0
( 12, 13)	3929.42	7033	23052.6	8703.4	31756.0	0.73	8.08	2.21	2.21	267.4	73.3	3.6	14.8	0.1	0	2164	7.4	0.0
( 13, 12)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0
( 13, 14)	653.46	7114	871.3	486.8	1358.1	0.64	2.08	0.74	0.74	11.4	4.1	0.0	0.0	0.0	0	2188	28.9	0.0
( 14, 13)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0
( 14, 15)	1944.89	7283	2593.2	323.6	2916.8	0.89	1.50	0.17	0.17	24.0	2.7	0.3	0.0	0.0	0	2240	40.0	0.0
( 15, 14)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0
( 15, 16)	4791.45	7333	6388.6	1158.1	7546.7	0.85	1.58	0.24	0.24	61.6	9.5	0.9	0.0	0.0	0	2256	38.1	0.0
( 16, 15)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0
( 16, 17)	6018.83	7370	8025.1	1686.6	9711.8	0.83	1.61	0.28	0.28	78.8	13.7	1.0	0.0	0.0	0	2267	37.2	0.0
( 17, 16)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0
( 17, 18)	1887.96	7467	2517.3	559.0	3076.3	0.82	1.63	0.30	0.30	24.7	4.5	0.1	0.0	0.0	0	2297	36.8	0.0
( 18, 17)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0
( 18, 19)	2341.33	7561	3121.8	695.6	3817.3	0.82	1.63	0.30	0.30	30.2	5.5	0.2	0.0	0.0	0	2326	36.8	0.0
( 19, 18)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0
( 19, 20)	3849.95	7642	5133.3	1133.0	6266.2	0.82	1.63	0.29	0.29	49.1	8.9	0.4	0.0	0.0	0	2351	36.9	0.0
( 20, 19)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0
( 20, 21)	2715.09	7749	3620.1	848.1	4468.2	0.81	1.65	0.31	0.31	34.6	6.6	0.4	0.0	0.0	0	2384	36.5	0.0
( 21, 20)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0
( 21, 22)	713.55	7849	951.4	609.1	1560.5	0.61	2.19	0.85	0.85	11.9	4.7	1.3	0.2	0.1	2	2415	27.4	0.0
( 22, 21)	0.00	0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0.0
( 22, 23)	527.32	7955	703.1	1145.7	1848.8	0.38	3.51	2.17	2.17	13.9	8.6	2.8	1.7	0.9	6	2447	17.1	0.0

# **Technical Memorandum**

**To:** Aileen Bouclé, AICP  
District Planning, Project Development and Environmental Administrator  
Florida Department of Transportation, District Six  
1000 NW 111<sup>th</sup> Avenue  
Miami, Florida 33172

**From:** Brian Wolshon, Ph.D., P.E., PTOE<sup>1</sup>  
Joaquin E. Vargas, P.E.<sup>2</sup>

**Subject:** Maximum Sustainable Evacuation Traffic Flow Rates for Hurricane Evacuation Analysis Purposes

**Date:** June 17, 2010

This technical memorandum has been prepared to document the process and results of an effort to develop a series of maximum sustainable traffic flow rates that can be used to conduct simulation modeling of US-1 within the Florida Keys during an evacuation of this area. The need for this information became apparent after numerous efforts to develop macroscopic models to estimate the evacuation clearance time for the Keys over the past decade. Because macro-level modeling typically relies on aggregate relationships between the level of travel demand and the roadway's ability to service it, the expected roadway capacity is a key factor in estimating key performance measures such as operating speeds, travel time, and delay. While not the actual "capacity" of the road, the flow rates presented here represent the practical rates that are likely to be realistically sustainable over an extended period (8 or more hours) of a mass evacuation.

Over the past ten years, discussions among various stakeholders and agencies charged with the civil protection of residents and visitors in the Keys and those with the authority to develop policies governing the growth and development of these areas have suggested a range of different values that should be used when assigning road capacities. Some of these have been based on Highway Capacity Manual (HCM) procedures while others have been based on professional experience and judgment. Few if any, however, have been based on direct observation during prior evacuation events.

A history of research and observation shows that the maximum amount of traffic flow that can be accommodated by a segment of roadway can be significantly impacted by factors such as the behaviors of the drivers and vehicles using it. The complex interaction of these variables and the nature of development conditions within the Keys combined with the variable nature of hurricanes and evacuee responses make it difficult to predict a maximum flow rate using traditional means.

<sup>1</sup> Department of Civil and Environmental Engineering, Gulf Coast Center for Evacuation and Transportation Resiliency, Louisiana State University, Baton Rouge, LA 70803

<sup>2</sup> Traf Tech Engineering, Inc., 8400 North University Dr., Ste. 309, Tamarac, FL 33321

Over the past 10 years, however, a considerable amount of new data and studies have become available that have increased the understanding of evacuation traffic flow conditions. These recent developments include the collection of traffic data under actual mass evacuation conditions on different functional roadway classifications and design configurations. Data also include observations from several different states from a number of different hurricane evacuation events. Some of this information has been published in government reports and technical papers, several of which are referenced in this memo.

A key point in this memo is also the development and use of the term “maximum sustainable evacuation traffic flow rate.” This term differs from prior discussions and modeling efforts which utilized the term “capacity.” It is based on years of field observation which consistently suggest that the maximum flow rates that can be sustained during an evacuation are often considerably lower than those observed during routine (non-emergency) conditions such as daily rush-hours. Explanations of why this drop occurs are varied, with some of them discussed later in this memo.

## **Background**

In mid-2009, based on previous analysis and recommendation by Dr. Brian Wolshon, a nationally recognized expert in hurricane evacuation matters, the Florida Department of Transportation (FDOT) initiated a site-specific maximum sustainable traffic flow rate study<sup>1</sup> in the Key Largo area. The purpose of this report was to assess traffic flow rates under a variety of conditions and to confirm the appropriateness of the roadway capacity values used in the 2001 Florida Keys Hurricane Evacuation Study (2001 Study) established by the 2001 Study Project Steering Committee (PSC). The 2001 Study PSC included representatives from the U.S. Army Corps of Engineers (USACOE), Florida Division of Emergency Management (DEM), Monroe County Board of County Commissioners, Monroe County Emergency Management, Florida International University (FIU), and FDOT staff and consultants, Vanasse-Hangen-Brustlin and Miller Consulting, Inc.

The site-specific capacity study was prepared for the FDOT by Dr. Brian Wolshon and Traf Tech Engineering, Inc. The analyses were conducted using CORSIM, a micro-scale simulation system (e.g., an agent-based model). As such, the model is influenced by locally prevailing traffic control and geometric design features such as intersections, turn lanes, and median crossovers in addition to individual driver and vehicle characteristics that govern gap-acceptance and lane-changing behaviors.

To further enhance the validity of the analyses conducted in this effort and the results gained from them, a series of base-line simulation models were developed and then calibrated to a set of field observed traffic volumes recorded over a recent event-weekend in the Keys. The results obtained from the site-specific capacity study indicate that the capacities used in the 2001 Study within the Key Largo area are appropriate for hurricane evacuation purposes. That is, the 900 vehicles per hour per lane (vphpl) maximum sustainable evacuation traffic flow rate assigned to US 1 within Key Largo is considered appropriate given the type of road and development conditions that exist in this area as well as the life-threatening nature of hurricanes.

This report includes new data available from the 10-year period since the original 2001 Study. It also includes observational studies and simulation systems that have improved our understanding of traffic operations under mass evacuation demand conditions.

Recently observed flow rates include those associated with Hurricanes Floyd in Florida and South Carolina (FEMA 2000) and Hurricane Katrina in Louisiana (Wolshon & McArdle 2008, and Wolshon, Catarella-Michel & Lambert 2006). These observations show that many of the highest observed flow rates cannot be sustained for periods lasting several hours because of inevitable disruptions to the smooth flow of traffic as well as flow restrictions that may exist far downstream of a particular point of measurement. Under capacity-level demand conditions, even slight disruptions in traffic streams can result in the formation and propagation of traffic shockwaves that move both quickly and widely through a network. It is for these reasons that experts in the field of evacuation transportation refer to “practical” maximum sustainable evacuation flow rates. Prior study has shown that these practical rates are 10 to 20 percent below maximum flow rates that are observed at the same location during normal daily peak periods and below rates that would be suggested under the ideal condition capacity values discussed in the HCM.

### **Recent Hurricane Evacuation Traffic Flow Rates**

To illustrate and describe the concept of practical maximum sustainable evacuation flow rates, it is helpful to review observations made in recent hurricane evacuations. Because of the high level of storm activity and related need to carry out major mass evacuations, the State of Louisiana has been one of the most studied areas of the United States for evacuation traffic movement. Over the past six years, the southeast region of the state including metropolitan New Orleans has been evacuated four times (Ivan '04, Katrina '05, Rita '05, and Gustav '08). These events have afforded the opportunity to collect and analyze traffic patterns as well as to make incremental changes to the regional evacuation plans.

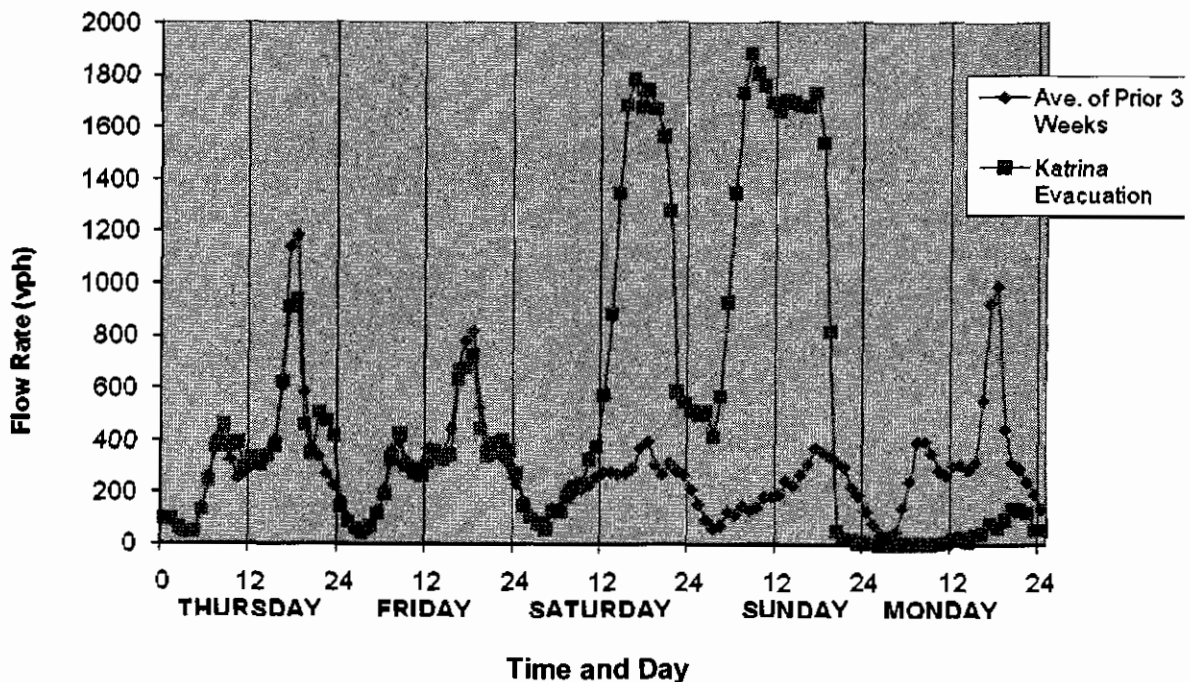
In recent studies at Louisiana State University's Gulf Coast Research Center for Evacuation and Transportation Resiliency, the flow rates recorded by the Louisiana Department of Transportation and Development (LA DOTD) on roads throughout the state during the Hurricane Katrina evacuation were used to determine practical maximum sustainable evacuation flow rates for a variety of roadway and area types (Wolshon 2008). It was suggested that these volumes could be used when performing future clearance time estimate studies in Louisiana and elsewhere.

The studies focused on four different facility types including freeways, freeways flowing under contraflow, four-lane divided highways, and two-lane highways within urbanized and non-urbanized regions. Although none of the roads and areas that were studied was exactly like US-1 through the Florida Keys, several segments were similar enough to give a reasonable approximation of the conditions. Results of the analyses from two of the most relevant of these facilities, four-lane divided highways and two-lane highways are discussed in the following sections.

### Four-lane Divided Highways

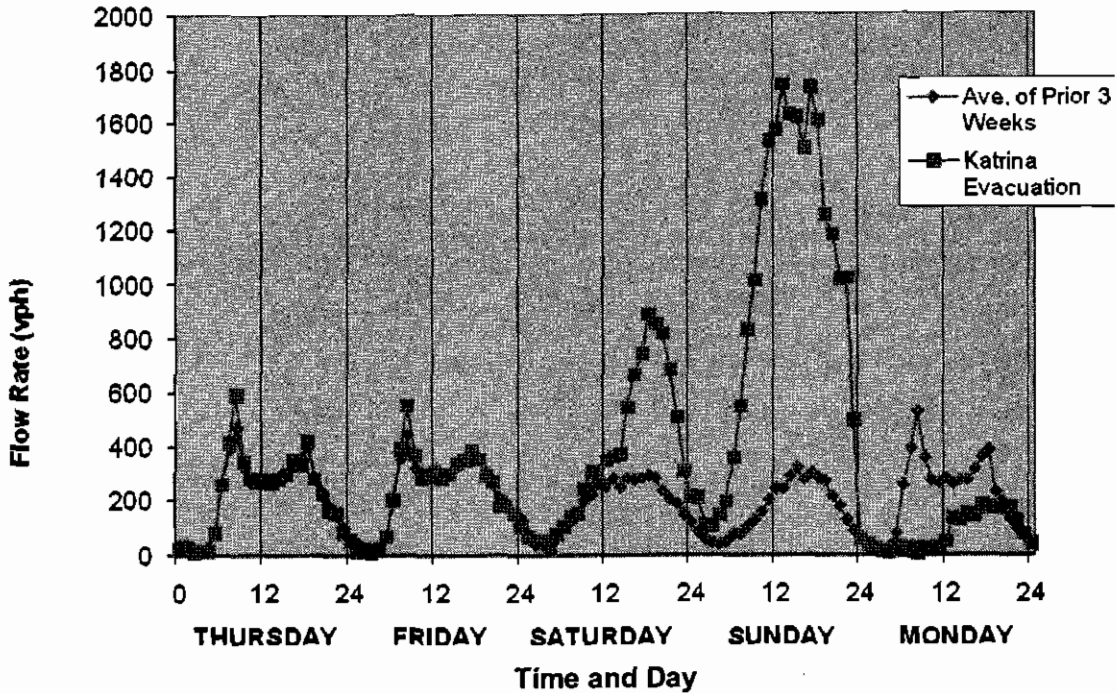
The roads that were likely the most analogous to the four-lane divided segments of US-1 in the Upper Keys were segments of the four-lane divided highways of US-61 and LA-1 moving into the “semi-suburban” areas within the region between New Orleans and Baton Rouge. The locations of the count stations on these roads could generally be described as fringe suburban communities in which traffic moved from uninterrupted flow segments into more developed areas that include at-grade signalized intersections, similar to what occurs as traffic moves north into the upper Keys areas approaching Key Largo. These sites are also relevant to the US-1 discussion because during the evacuation they were loaded with traffic volume far-above routine peak-hour levels and the demand was sustained over two full back-to-back daylight periods. This gives an illustration of what could occur during a full evacuation of the Keys when traffic demand is expected to be sustained at such levels for about 24 hours.

On US-61 in the vicinity of LaPlace, Louisiana, represented graphically in Figure 1, the maximum hourly flow during the Katrina evacuation reached 1,881 vehicles per hour (vph) (958 vph in Lane 1 and 923 vph in Lane 2) on Day 2 (Sunday) of the event. Similarly, the maximum hourly flow on LA-1 in the vicinity of Plaquemine, Louisiana, represented graphically in Figure 2, was observed to rise to 1,740 vph (858 vph in Lane 1 and 882 vph in Lane 2) during the second day of the evacuation. Also apparent in these figures is that these flow rates were generally able to be sustained at levels of 1,650 vph to 1,720 vph in both lanes (somewhat below the peak) for about 10 continuous hours during both days of the evacuation. These flows suggest the maximum sustainable limits of these two roads without breaking down into a no-flow “gridlock” condition.



**Figure 1. Hourly Northbound Evacuation (2-lane) Traffic Volume - US-61 LaPlace Louisiana, Hurricane Katrina**

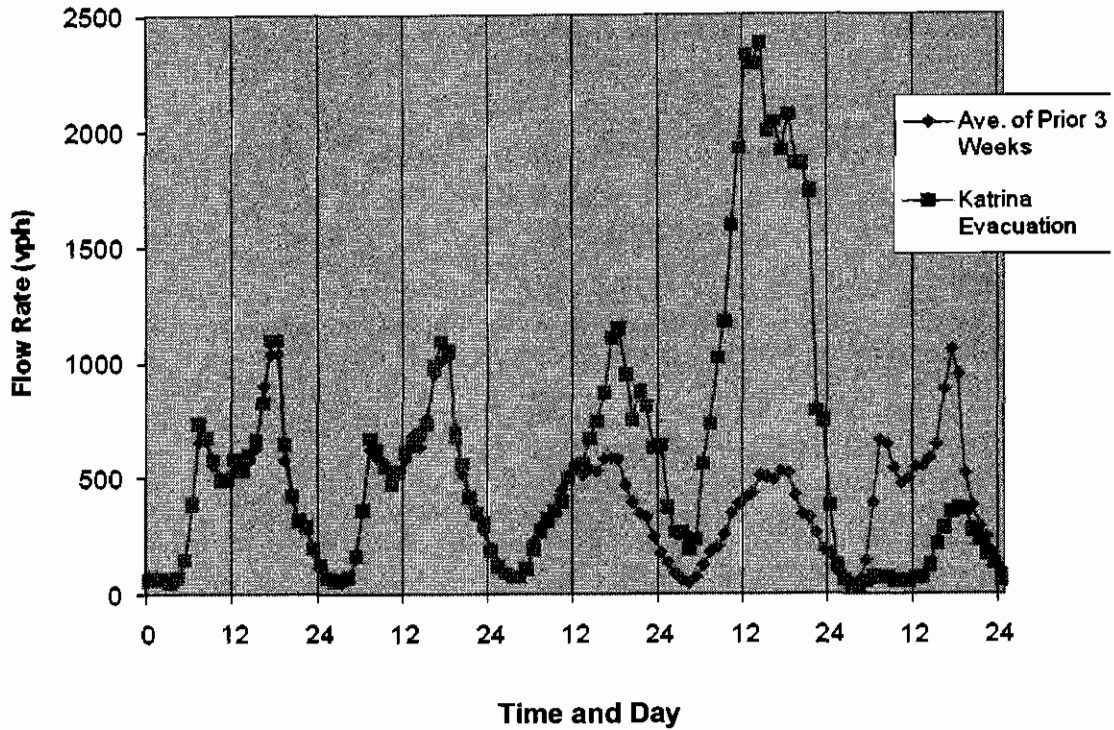




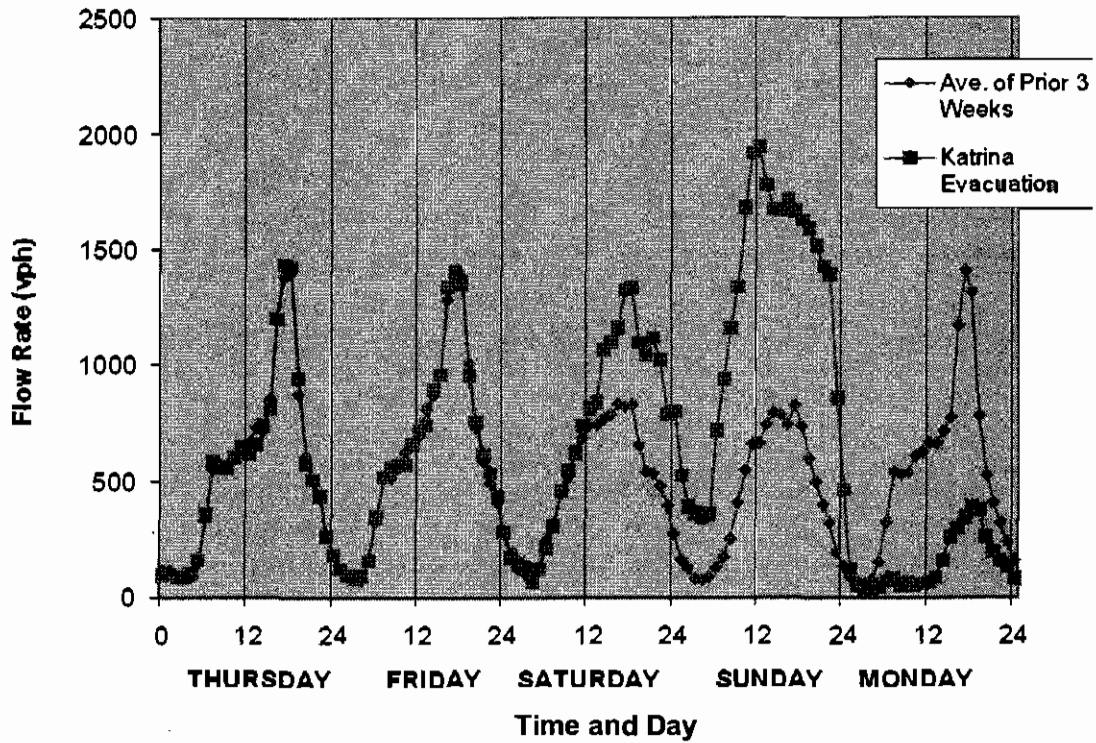
**Figure 2. Hourly Northbound Evacuation (2-lane) Traffic Volume - LA-1 Plaquemines Louisiana, Hurricane Katrina**

For comparison, two other four-lane divided highway locations are also included. These included two separate sections of US-190 in the vicinity of Baton Rouge, Louisiana. Baton Rouge is a key location for evacuees seeking to move to westerly destinations during evacuations of southeastern Louisiana because it includes two of the four Mississippi River bridge crossings within the 100 mile segment between New Orleans and Natchez, Mississippi. While these are four-lane divided highway segments, they are thought to be significantly different from US-1 and the segments of US-61 and LA-1 discussed previously because they are within areas of generally uninterrupted flow for several miles up and downstream of data recording stations. Although there are minor at-grade intersections, none of them are signalized and access to/from major routes is accomplished using grade separated interchanges.

At the outflow point of the US-190 bridge over the Mississippi River, illustrated graphically in Figure 3, maximum hourly flow reached 2,337 vehicles per hour (vph) (1,094 vph in Lane 1 and 1,283 vph in Lane 2) during the second day of the Hurricane Katrina evacuation. At a location several miles downstream of the bridge, illustrated graphically in Figure 4, a maximum flow of 1,937 vehicles per hour (vph) (560 vph in Lane 1 and 1,377 vph in Lane 2) was observed on US-190. Also relevant to the discussion of the US-1 evacuation flow rates is that even these elevated maximum flows were sustained for periods of about three hours before dropping to rates of 1,700 to 2,000 vph for the remaining 8 to 10 hours of Day 2 of the evacuation. Even with the benefit of grade separations and uninterrupted flow conditions, these flows are not significantly different from the previously discussed four-lane divided segments of US-60 and LA-1.



**Figure 3. Hourly Westbound Evacuation (2-lane) Traffic Volume - US-190 (Mississippi River Bridge departure) Port Allen Louisiana, Hurricane Katrina**



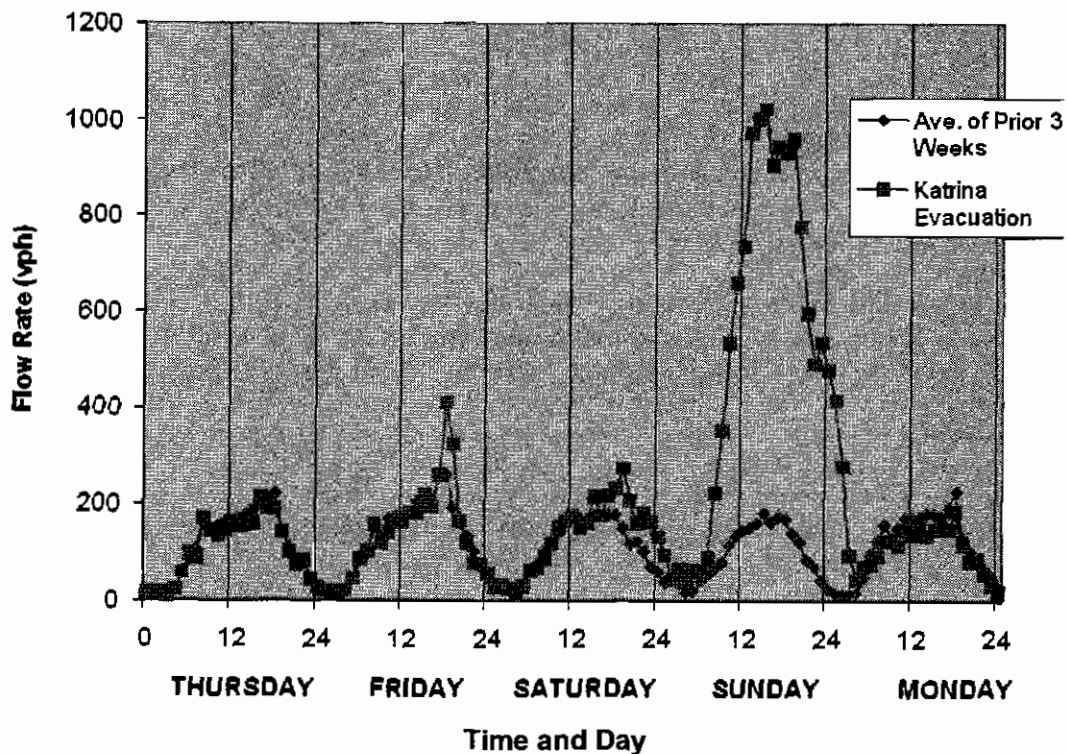
**Figure 4. Hourly Westbound Evacuation (2-lane) Traffic Volume - US-190 Port Allen Louisiana, Hurricane Katrina**

Combined, these observations suggest that the practical maximum sustainable evacuation flow rates on four-lane divided highways in relatively developed areas are likely to be about 900 to 1,000 vehicles per hour per lane (vphpl). In areas where the evacuation traffic stream is subjected to intersections with signal control or periodic interruptions from traffic enforcement police, it is further suggested that the practical maximums will be at the low end of this estimate and perhaps still lower if nighttime and/or adverse weather conditions are present. Since the Keys are required to evacuate over a period of near, or in excess of 24 hours, at least half of this evacuation process will occur in low light to total darkness conditions.

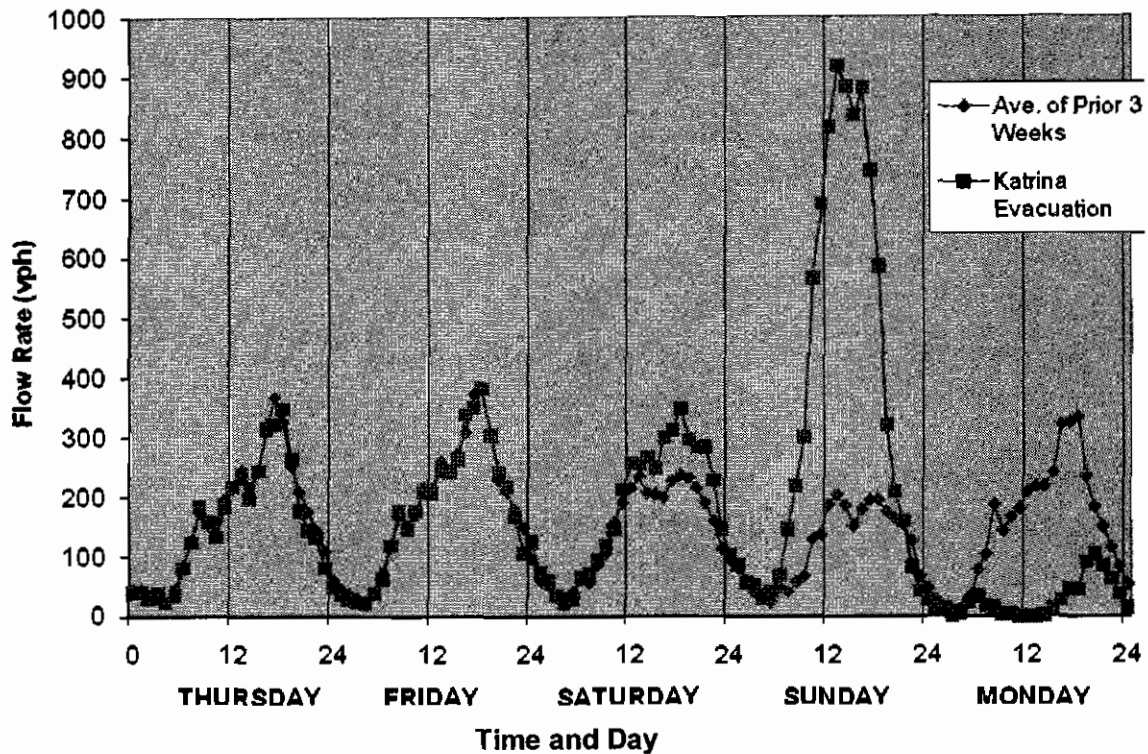
### Two-lane Highways

The LSU research also included analyses of two-lane Louisiana state highways. The data collected for the Hurricane Katrina evacuation studies included roads throughout the state in areas impacted both *directly* and *indirectly* by the evacuation traffic. This research will be published in an upcoming issue of the American Society of Civil Engineer's *Natural Hazards Review* (Wolshon & McArdle 2010).

The research showed that although the highest traffic was observed on routes servicing highly populated areas nearest to the coast and closest to the projected path of the storm, two-lane roads providing access to freeway routes or serving as alternate paths to congested freeways also carried heavy traffic loads. The highest volumes observed on two-lane routes in Louisiana during the Hurricane Katrina were recorded on LA-21 near Bogalusa, Louisiana (north of New Orleans) and on US-190 near Basile, Louisiana (north of Lafayette). These are represented graphically in Figures 5 and 6.



**Figure 5. Hourly Westbound Evacuation Traffic Volume - US-190 Basile Louisiana, Hurricane Katrina**



**Figure 6. Hourly Northbound Evacuation Traffic Volume - LA-21 Bogalusa Louisiana, Hurricane Katrina**

The research also suggested that the orientation and relative proximity to Interstate freeways made them likely alternatives to the more heavily traveled (and congested) freeway routes. Data from both of these routes were also collected in predominantly rural areas of the state, with relatively low populations, and within areas of few traffic signals such as might be similar to many of the two lane segments of US-1 in the Florida Keys.

During the second day of the Hurricane Katrina evacuation on the two-lane segment of US-190 near Basile, the maximum one hour flow reached 1,021 vph. These evacuation flows were sustained throughout the day with flows of above 900 vph for about eight consecutive hours. At the LA-21 station in Bogalusa, a maximum flow of 915 vph was observed on the same day. The elevated volume of greater than 800 vph extended over a period of about five hours. However, it appears that the demand at this location was not sufficient to maintain the maximum flow for a longer period.

Although it is not clear that these study areas are representative of the conditions along rural stretches of US-1 through the Middle and Lower Keys, overall, these data suggest that it is possible to maintain sustained maximum flow rates at and above 900 to 1,000 vph during an evacuation.

## **Florida Keys Evacuation Flow Rates**

Although the flow conditions associated with evacuations in the Florida Keys have not been studied in the level of scientific detail as those in Louisiana, the fact that this area has regularly been threatened by hurricanes over the past 10 years has meant that several evacuations of the Keys have been carried out at varying levels of urgency and rates of participation. These events have also permitted the FDOT to record traffic volumes under evacuation conditions.

A review of recent history shows that in 2004 and 2005 a total of six hurricanes required some level of evacuation in the Keys. After a two-year lull in activity, two more tropical systems required evacuations in 2008. In August 2004, Hurricane Charley passed about 70 miles west of Key West, bringing tropical storm winds to the Lower Keys and requiring a mandatory evacuation of the visitor population. The Lower Keys were also evacuated in advance of the expected arrival of Hurricane Ivan in September 2004 and Hurricane Dennis in July 2005, although neither storm came close enough to cause significant damage in these areas. In 2005, Hurricane Rita grew from a tropical storm to a Category 2 hurricane as it moved westward from the Bahamas, ultimately passing south of Key West and causing serious damage and surge flooding as far north as Key Largo. In October 2005, Hurricane Wilma became the most devastating hurricane to hit the Keys in decades when it passed just northwest of Key West. The low-lying parts of the city were left under 3 to 6 feet of water from the storm surge, and major flooding was reported throughout the Keys up to Key Largo (Kasper 2005).

In 2008, Tropical Storms Fay and Ike also resulted in orders to evacuate various resident and non-resident populations. Table 1 lists the evacuation orders that were issued for these events. The table also includes the dates and times of the orders and the areas which they covered.

Although the level of threat and corresponding evacuation requirements varied for each of these events, the most relevant point to the development of the maximum sustainable evacuation flow rates is that several of these evacuations generated traffic demand at levels that were significantly above normal, resulting in traffic congestion and/or queuing along various segments of US-1 in the Keys. The occurrence of congestion and queuing is important to this discussion because it demonstrates that the demand generated by the evacuation was sufficient to exceed the available capacity of the roadway for some duration of time. As such, the hourly volumes that were recorded are assumed to reflect the maximum traffic that could be carried by US-1 at those locations during those periods.

The volumes recorded during each of these events are also included in Attachment B of this report. The data included in Attachment B comes from three stations that are part of the FDOT statewide permanent traffic data monitoring system. The first of these, Station 900165, is located on a four-lane segment of US-1 at Mile Marker (MM) 4.32 on Stock Island near Key West. The second, Station 900227, is on a two-lane section of US-1 at MM 29.6 on Big Pine Key and the third, Station 900164, from a four-lane section of US-1 at MM 106.3 on Key Largo near its intersection with County Road 905. In addition to the traffic volumes recorded during the evacuation period, each of the figures from the South Florida Regional Planning Council (SFRPC) (SFRPC 2007) also includes the:

- annual average hourly volume trends for same time period,
- average hourly volume trends for same time period for the two months preceding the evacuation, and
- the times at which orders for specific populations were issued, including:

- permanent residents
- visitors
- partial resident/visitor
- residents driving in or towing mobile homes, RVs, or boats

The graphs from Tropical Storms Fay and Ike were prepared separately and include the:

- hourly volume trends recorded during each day of the evacuation period, and
- average hourly volume trends for same time period for June, July, August, and September of 2008.

Storm	Date	Time	Location	Evacuation Ordered
<b>2004</b>				
Hurricane Charlie	08/11/04	11:00am	Key West to Craig Key (MM 72)	Limited visitor
	08/12/04	5:00am	Entire Florida Keys	Visitors
Hurricane Frances	09/02/04	8:00am	-	Visitors
Hurricane Ivan	09/09/04	8:00am	-	Visitors
	09/09/04	5:00pm	-	Mobile homes, RV, boat residents
	09/10/04	5:00am	-	Residents
<b>2005</b>				
Hurricane Dennis	07/07/05	12:00pm	-	Visitors
	07/07/05	4:00pm	West of 7 Mile Bridge to Key West	Limited Resident
Hurricane Rita	09/19/05	6:00am	-	Visitors
	09/19/05	8:00am	-	Residents
Hurricane Wilma	10/19/05	12:00pm	-	Visitors
	10/22/05	12:00pm	-	Residents
<b>2008</b>				
Tropical Storm Fay	08/17/08	8:00am	-	Visitors
	08/17/08	7:00pm	-	Mobile homes, RV, boat residents
Tropical Storm Ike	09/06/08	9:00am	-	Visitors
	09/07/08	8:00am	-	Residents

**Table 1. Monroe County Evacuation Orders 2004-2005 and 2008 (SFRPC 2007)**

Although each of the stations reveals somewhat different information, the two that are perhaps the most relevant to the discussion here are Stations 900227 and 900164. Station 900227 (Big Pine Key) is important because it is the only two-lane segment location for which traffic data was available in the Keys for these six events. Station 900164 (Key Largo) is important because it represents as near to a complete data set of out-of-county traffic movements as can be counted in the Keys since nearly all vehicles passing this point will be traveling out of Monroe County.

**Station 900227 (Big Pine Key)**

At Station 900227 it is interesting to note that the northbound direction did not always exceed the corresponding annual average hourly volumes for the same time period. In fact, this appears to have only occurred in four of the six storm events. This suggests that the forecasted conditions of Hurricanes Wilma and Frances were not sufficient to induce a major movement of evacuees. The highest traffic volumes at this location were associated with the evacuations for Rita, Dennis, and Charley. For each of these events the maximum hourly flows in the single outbound lane of this segment were in the range of 1,000 to 1,150 vph. Although this high volume lasted only an hour or two for the Hurricane Rita evacuation, elevated traffic volumes at or greater than 1,000 vph lasted for periods of four to five hours.

During the two tropical storm events of 2008, a maximum flow of 1,030 vph was recorded between 11:00am and noon on Sunday, August 17<sup>th</sup>. Flows of 909 vph and 944 vph were recorded during the preceding and following one hour periods, respectively.

Although it cannot be known with absolute certainty that these flow volumes were the absolute maximum that this segment of road could carry nor whether the demand generated by the 2004 and 2005 evacuations was sufficient to fully feed this section, the fact that the elevated volumes were significantly above any of the annual hourly average north or southbound observations and that they were maintained above these levels for several consecutive hours, suggests that they are likely the maximum evacuation traffic volumes that can be sustained at this location during such an event. It is also worth noting that these observations are also in the same range as the volumes recorded on similar functionally classified roadways in Louisiana during Hurricane Katrina in 2005.

**Station 900164 (Key Largo)**

At Station 900164 evacuating volumes significantly exceeded the annual average hourly rates during five of the seven events for which data was available (data was not recorded during the 2005 Hurricane Rita evacuation). The highest observed volumes at this location were recorded during the evacuations for Tropical Storm Fay, Hurricanes Dennis and Charley, and to a lesser extent Hurricane Ivan. During Hurricanes Dennis and Charley, the maximum hourly flows were in the range of 1,400 to 1,450 vph (for two lanes). Although there was some variation, this elevated volume lasted at these levels for periods of six to eight hours.

Similar to Station 900227, elevated volumes were apparent during the Tropical Storm Fay evacuation, but not for Tropical Storm Ike. Maximum evacuation traffic flow rates of about 1,600 vph to 1,750 vph (for two lanes) were sustained for about six to seven hours on Sunday, August 17, 2008.

Also of note on these graphs were two other trends. The first was that the elevated evacuation volumes existed over two days and for periods in excess of 30 hours. The second observation was the significant drop of the traffic volume during the overnight hours of the two-day evacuation period. Although the hourly traffic volumes were notably higher than the annual hourly average, it was clear that, similar to numerous observations in other areas of the country for other hurricanes, evacuation travel demand tends to ebb during late night hours.

Similar to the observations at the other FDOT traffic data recording stations in the Keys, the fact that the elevated volumes were significantly above any of the north or southbound observations

and that they were maintained above these levels for several consecutive hours suggests that these are likely close to the maximum evacuation traffic volumes which can be sustained at this location during such an event.

A comparison of the Keys volumes to those observed in Louisiana during Hurricane Katrina are also noteworthy because the volumes recorded on this section of US-1 were, as expected, somewhat lower than in Louisiana. This is because, as discussed earlier, the segments of four-lane divided highways in Louisiana were in areas where the amount of driveway openings, adjacent development and at-grade intersections was less than in this area of Key Largo. As such, the earlier suggestion that the practical maximum sustainable evacuation flow rates on four-lane divided highways in relatively developed areas will likely to be in the neighborhood of approximately 900 to 1,000 vphpl continues to be appropriate.

In areas like the Upper Keys and Key Largo where the evacuation traffic stream is expected to be subjected to potential periodic interruptions from traffic law enforcement and where approximately 20 percent of the total Keys evacuation traffic demand is expected to be generated and enter onto US-1, it is further suggested that the practical maximums will be at the low end of this estimate and perhaps still lower if nighttime and/or adverse weather conditions are present.

## **Conclusion**

Based on the data collected on US-1 during recent evacuations in the Keys, evacuation flow rates collected in other locations, and the specific design, control, and land development characteristics that currently exist along US-1, the table of maximum sustainable evacuation traffic flow rates shown in Attachment A are suggested for hurricane evacuation analysis purposes. Although the data recorded during prior evacuations in the Keys do not reflect the "near-worst case scenario" conditions that are currently being studied, they represent a reasonable estimate of what should realistically be sustainable, given the absence of such data. Perhaps most important is that they represent estimates that, although close to being reached, have never been exceeded during any past evacuation event for which traffic data has been available.

As noted on the table, these values also represent the anticipated maximum sustainable flow rates per "functional evacuation lane," where a functional evacuation lane is defined as any through travel lane or continuous paved shoulder with a width of at least 10 feet. Because of the possibility that some of the existing (and potential future) suitable shoulder areas could be used as an additional outbound "lane" to carry evacuation traffic on some segments of US-1 during an emergency, these values can also be used for planning models of these temporary outbound travel areas. Since shoulders have never, to our knowledge, been used in the Florida Keys as functional evacuation lanes on a formal basis or been systematically studied to assess their operational characteristics, their exact carrying capacity is not known at this time. However, prior analysis conducted for FDOT (ATEC 2008) has concluded that continuous paved shoulders of ten feet or greater in width will permit traffic operations that are effectively the same as an adjacent standard travel lane during an evacuation. This finding is based largely on the opinion that, although traffic flow conditions will vary during an evacuation, travel speeds during the main part of the evacuation are likely to be less than the free flow rate and with the likely high densities of the traffic stream the typical benefits of wide lanes may be negligible.



The values in Attachment A also represent the most relevant and applicable data currently available as well as the decades of study, experience and professional judgment of the authors. However, as in all traffic estimates and forecasts of future conditions it must be recognized that traffic conditions can vary at any specific time or location on a day-to-day or even hour-to-hour basis. Such variations result from infinite combinations of uncertain driver, environmental (nighttime, rain, flooding, etc.), traffic control, and vehicle-mix conditions. These specific conditions may bring traffic flow to a crawl for significant periods or even permit flows to be marginally higher for short periods during an evacuation. As more data become available in the future and the understanding of the specifics of traffic operations during evacuations improves, it is also possible that the flow rates shown in Attachment A may need further refinement. It is highly recommended that similar analyses be conducted periodically in the future as new hurricane evacuation traffic flow data becomes available.

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**ATTACHMENT A**  
**Maximum Sustainable Evacuation Traffic**  
**Flow Rates for the**  
**Florida Keys During Hurricane Evacuations**

**TABLE 2A**  
**Roadway Configuration on US Highway 1 (Overseas Highway)**  
**and CR 905/Card Sound Road in the Florida Keys, Monroe County, Florida**

Area	Milemarkers		Location/Description	Year 2010 Configuration
	From	To		
Lower Keys	2.0	4.0	Key West to Stock Island	4L
Lower Keys	4.0	9.0	Stock Island to Big Coppitt Key	4LD
Lower Keys	9.0	17.0	Big Coppitt Key to Sugarloaf Key	2L
Lower Keys	17.0	22.0	Sugarloaf Key to Cudjoe Key	2L
Lower Keys	22.0	24.0	Cudjoe Key to Summerland Key Cove Airport	2L
Lower Keys	24.0	25.0	Summerland Key Cove Airport to Summerland Key	3L
Lower Keys	25.0	30.0	Summerland Key to Big Pine Key	2L
Lower Keys	30.0	34.0	Big Pine Key to West Summerland Keys	2L
Lower Keys	34.0	35.2	West Summerland Keys to Spanish Harbor Keys	2L
Lower Keys	35.2	36.5	Spanish Harbor Keys to Bahia Honda Bridge	4LD
Lower Keys	36.5	37.5	Bahia Honda Bridge to Bahia Honda Key	2L
Middle Keys	37.5	47.0	Bahia Honda Key to Hog Key	2L
Middle Keys	47.0	48.0	Hog Key to Boot Key	2L
Middle Keys	48.0	50.2	Boot Key to Marathon	4L
Middle Keys	50.2	50.8	Marathon to Marathon Shores	5L
Middle Keys	50.8	54.0	Marathon Shores to Key Colonial Beach	4LD
Middle Keys	54.0	54.5	Key Colonial Beach to Deer Key	4LD
Middle Keys	54.5	58.0	Deer Key to Grassy Key	2L
Upper Keys	58.0	74.0	Grassy Key to Matecumbe Harbor	2L
Upper Keys	74.0	80.0	Matecumbe Harbor to Teatable Key	2L
Upper Keys	80.0	83.5	Teatable Key to Islamorada	3L
Upper Keys	83.5	85.6	Islamorada to Windley Key	2L
Upper Keys	85.6	90.0	Windley Key to Plantation Key	2L
Upper Keys	90.0	100.0	Tavernier Key to Newport Key	4LD
Upper Keys	100.0	105.0	Newport Key to Sexton Cove	4LD
Upper Keys	105.0	106.3	Sexton Cove to Rattlesnake Key	4LD
Upper Keys	106.3	126.5	Rattlesnake Key to Card Sound Rd	2L/4L
South Dade	126.5	HEFT	Card Sound Rd to HEFT	4LD
Upper Keys	106.3	Int CR 905 / CR 905 A	Lake Surprise to Crocodile Lake	2L
Upper Keys	Ocean Reef	Int CR 905 / CR 905 A	Tanglefish Key to Crocodile Lake	2L
Upper Keys	Int CR 905 / CR 905 A	US 1	Crocodile Lake to South Miami-Dade	2L

**LEGEND**

- 2L Two-lane facility
- 2L/4L Two lanes with short four-lane sections for passing purposes
- 3L Three-lane facility (center lane is a two-way left-turn lane)
- 4L Four-lane undivided facility
- 4LD Four-lane divided facility
- 5L Five-lane facility (center lane is a two-way left-turn lane)

**TABLE 2B****Maximum Sustainable Traffic Flow Rates per Functional Evacuation Lane for Hurricane Evacuation Purposes  
US Highway 1 (Overseas Highway) and CR 905/Card Sound Road in the Florida Keys, Monroe County, Florida**

Area	Milemarkers		Location/Description	Suggested Maximum Sustainable Flow Rate per Hour per Functional Evacuation Lane
	From	To		
Lower Keys	2.0	4.0	Key West to Stock Island	900
Lower Keys	4.0	9.0	Stock Island to Big Coppitt Key	900
Lower Keys	9.0	17.0	Big Coppitt Key to Sugarloaf Key	1,100
Lower Keys	17.0	22.0	Sugarloaf Key to Cudjoe Key	1,100
Lower Keys	22.0	24.0	Cudjoe Key to Summerland Key Cove Airport	1,100
Lower Keys	24.0	25.0	Summerland Key Cove Airport to Summerland Key	1,100
Lower Keys	25.0	30.0	Summerland Key to Big Pine Key	1,100
Lower Keys	30.0	34.0	Big Pine Key to West Summerland Keys	1,050
Lower Keys	34.0	35.2	West Summerland Keys to Spanish Harbor Keys	1,100
Lower Keys	35.2	36.5	Spanish Harbor Keys to Bahia Honda Bridge	1,100
Lower Keys	36.5	37.5	Bahia Honda Bridge to Bahia Honda Key	1,100
Middle Keys	37.5	47.0	Bahia Honda Key to Hog Key	1,200
Middle Keys	47.0	48.0	Hog Key to Boot Key	1,100
Middle Keys	48.0	50.2	Boot Key to Marathon	900
Middle Keys	50.2	50.8	Marathon to Marathon Shores	900
Middle Keys	50.8	54.0	Marathon Shores to Key Colonial Beach	900
Middle Keys	54.0	54.5	Key Colonial Beach to Deer Key	900
Middle Keys	54.5	58.0	Deer Key to Grassy Key	1,100
Upper Keys	58.0	74.0	Grassy Key to Matecumbe Harbor	1,100
Upper Keys	74.0	80.0	Matecumbe Harbor to Teatable Key	1,100
Upper Keys	80.0	83.5	Teatable Key to Islamorada	1,100
Upper Keys	83.5	85.6	Islamorada to Windley Key	1,100
Upper Keys	85.6	90.0	Windley Key to Plantation Key	1,100
Upper Keys	90.0	100.0	Tavernier Key to Newport Key	900
Upper Keys	100.0	105.0	Newport Key to Sexton Cove	900
Upper Keys	105.0	106.3	Sexton Cove to Rattlesnake Key	900
Upper Keys	106.3	126.5	Rattlesnake Key to Card Sound Rd	1,200
South Dade	126.5	HEFT	Card Sound Rd to HEFT	900
Upper Keys	106.3	Int CR 905 / CR 905 A	Lake Surprise to Crocodile Lake	1,100
Upper Keys	Ocean Reef	Int CR 905 / CR 905 A	Tanglefish Key to Crocodile Lake	1,100
Upper Keys	Int CR 905 / CR 905 A	US 1	Crocodile Lake to South Miami-Dade	1,100

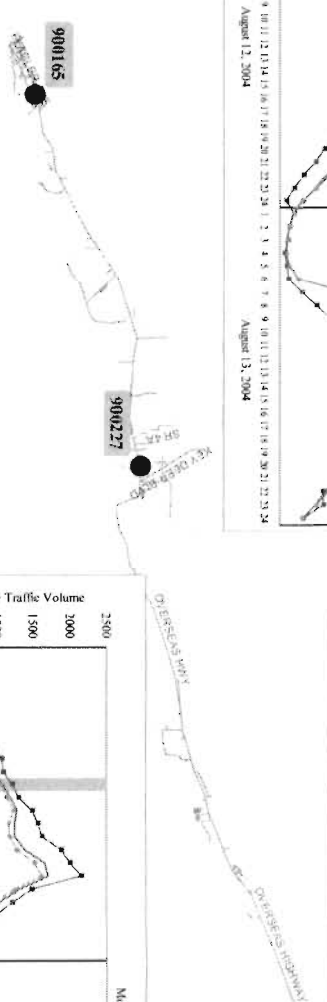
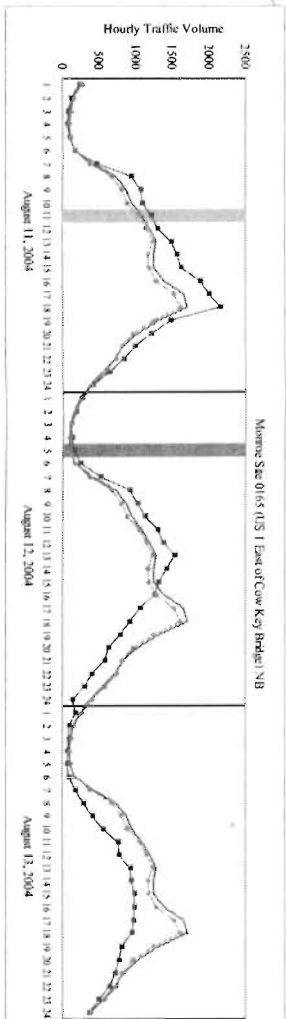
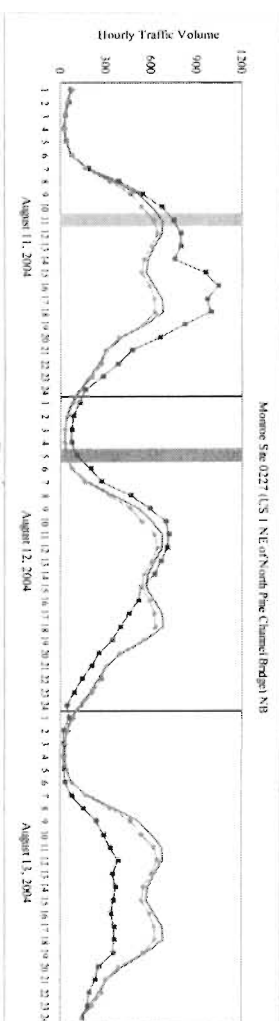
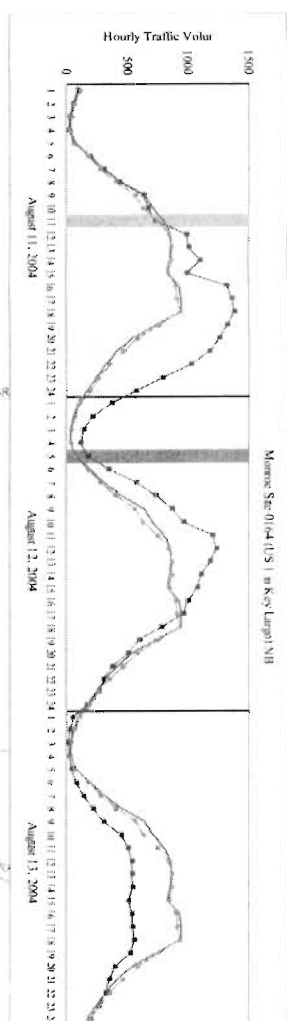
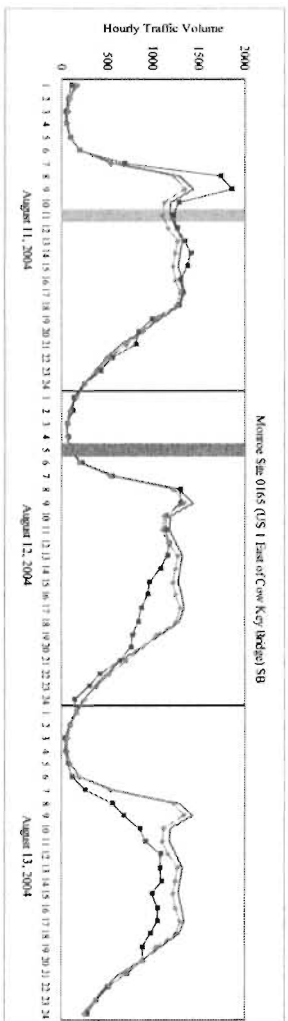
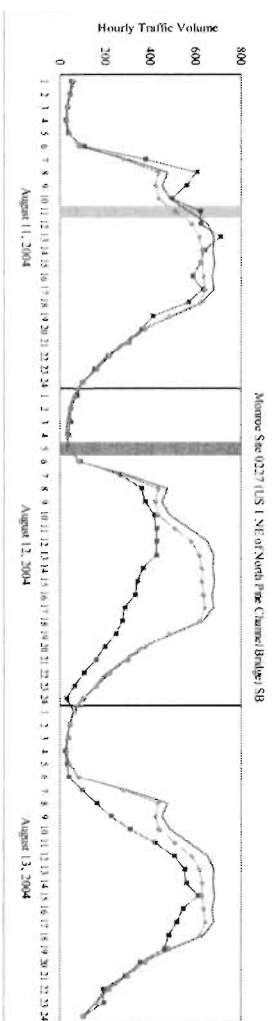
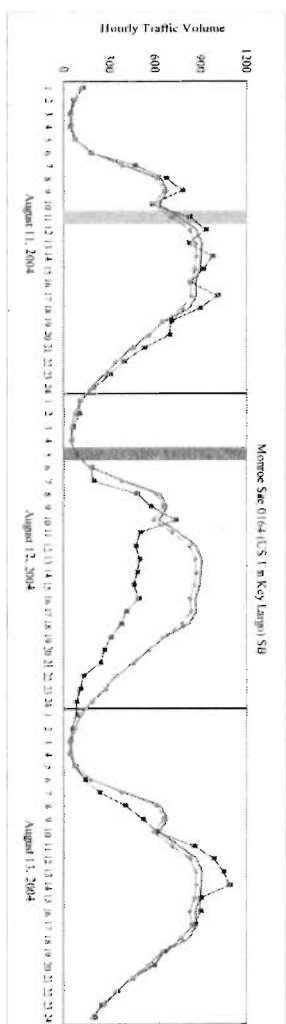
**NOTES**

A Functional Evacuation Lane has a pavement width of at least 10 feet

The above flow rates are maximum values that are expected to be sustained for extended periods (more than 8 hours). During night conditions, these flow rates may be lower than the ones shown above.

**ATTACHMENT B**  
**Hurricane Evacuation Traffic Volumes**  
**Florida Keys 2004-2005 and 2008**

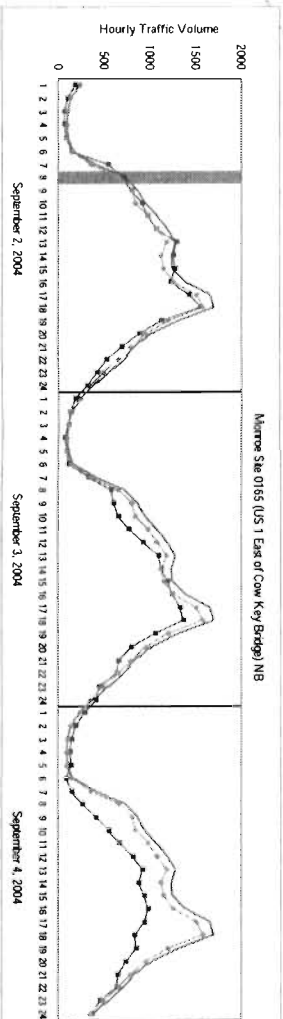
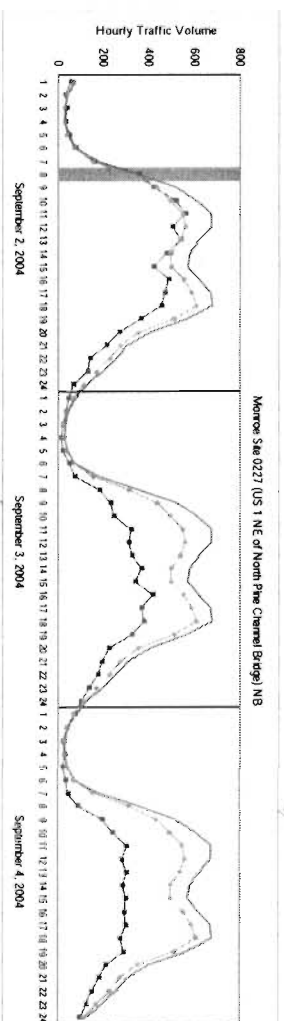
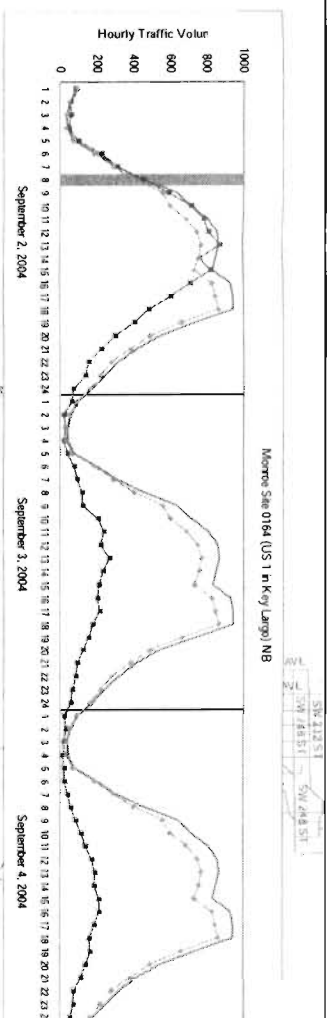
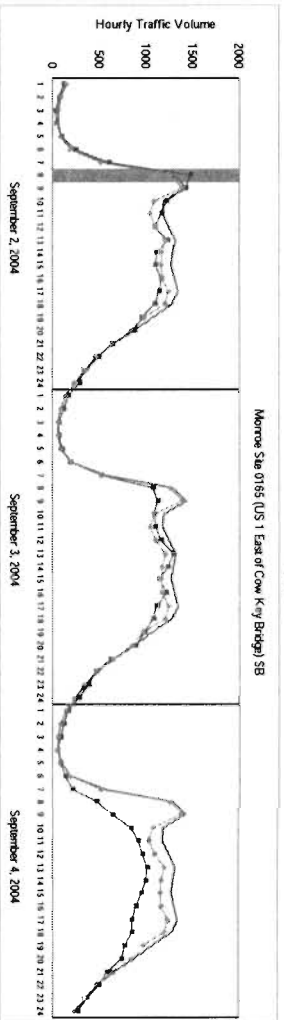
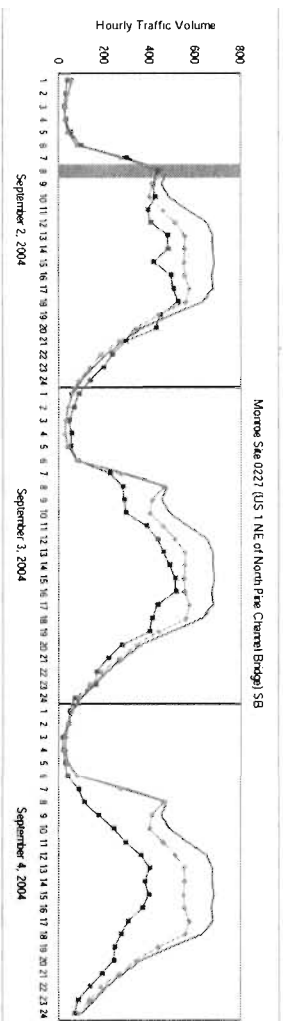
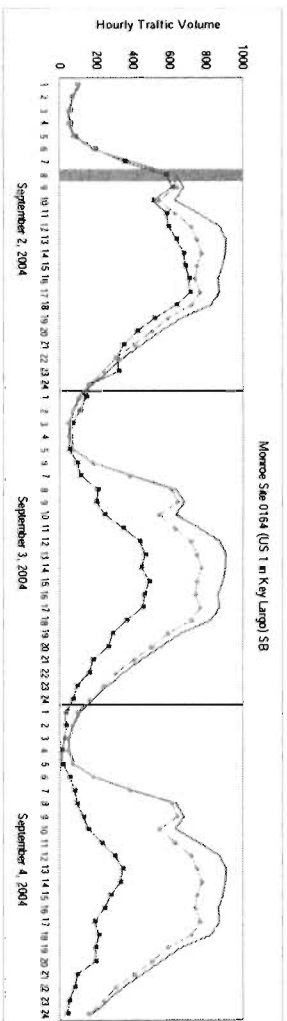
# HURRICANE CHARLEY EVACUATION TRAFFIC PATTERN



[NB] Northbound [SB] Southbound

- 2004 Hourly Average
- Evacuation Traffic
- Visitor Evacuation
- Limited Visitor Evacuation (from Key West to Craig Key)
- Visitor Evacuation

# HURRICANE FRANCES EVACUATION TRAFFIC PATTERN



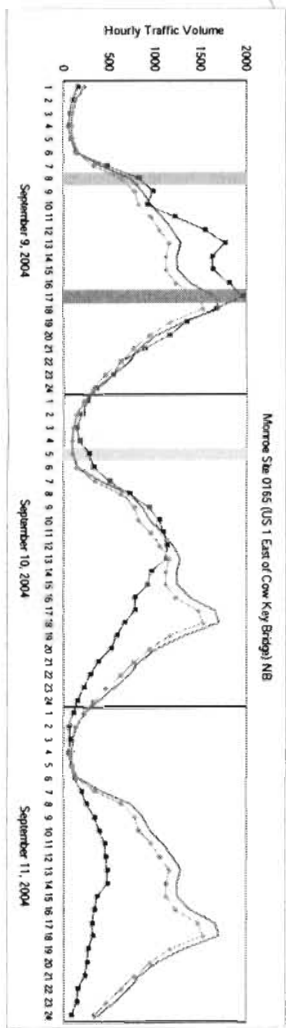
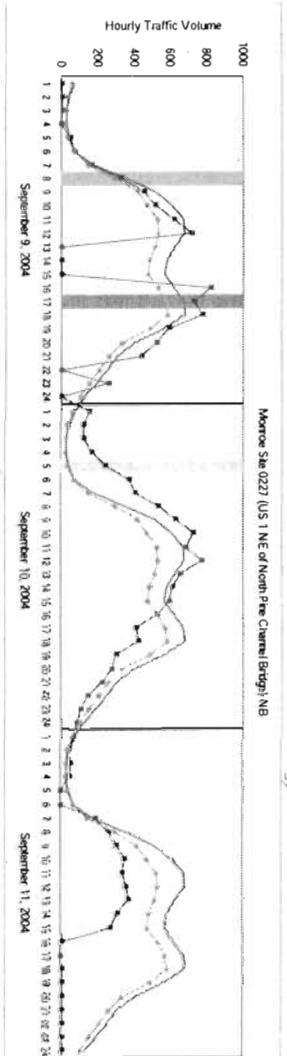
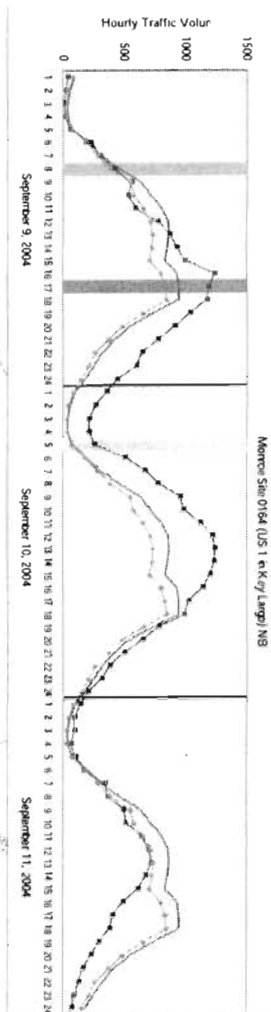
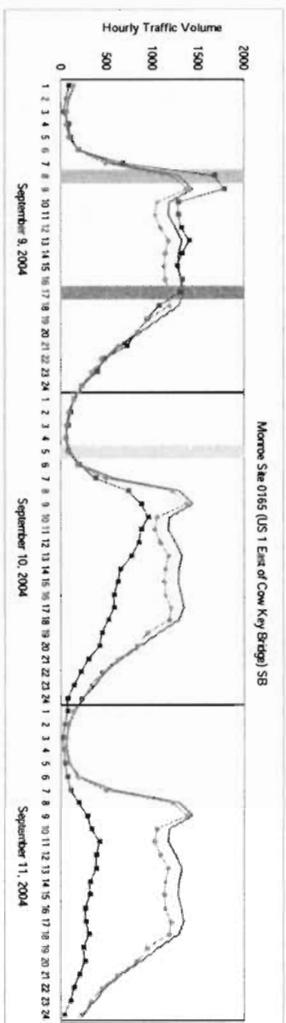
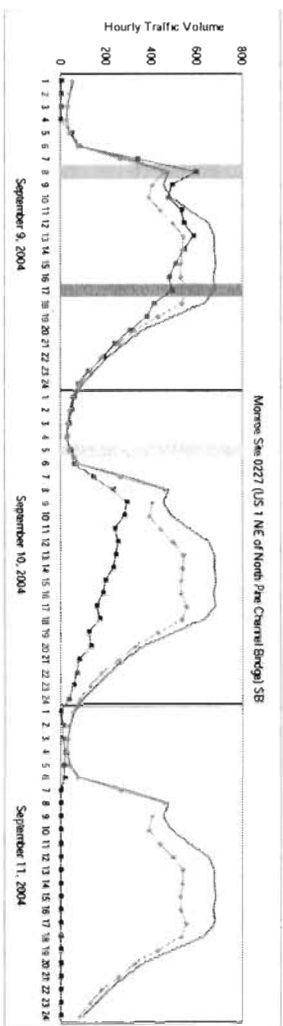
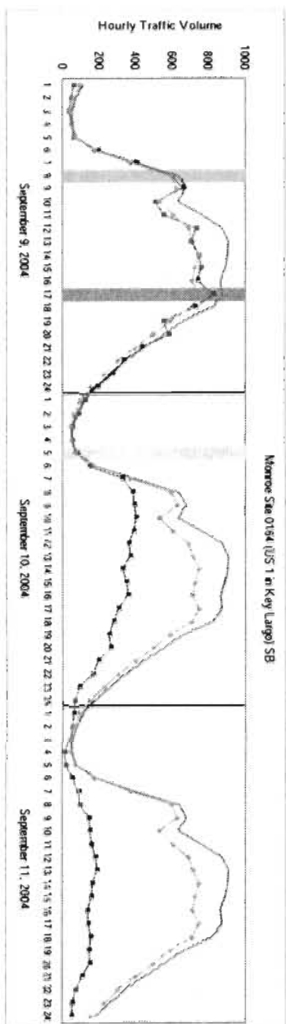
[NB] Northbound [SB] Southbound



SR 112/51  
 AVI  
 1/20/04 8:51  
 SW 748 ST



# HURRICANE IVAN EVACUATION TRAFFIC PATTERN



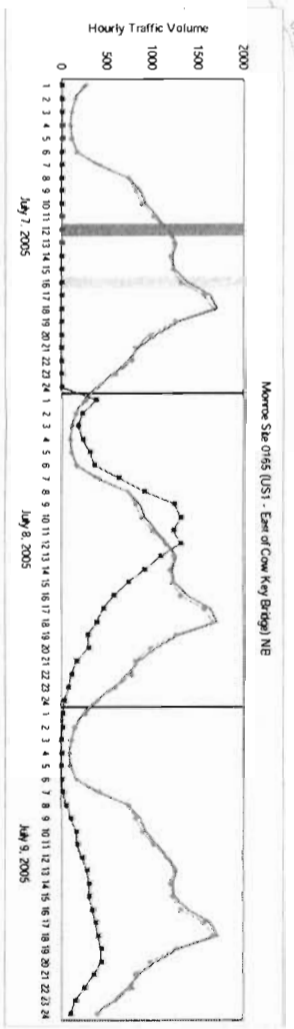
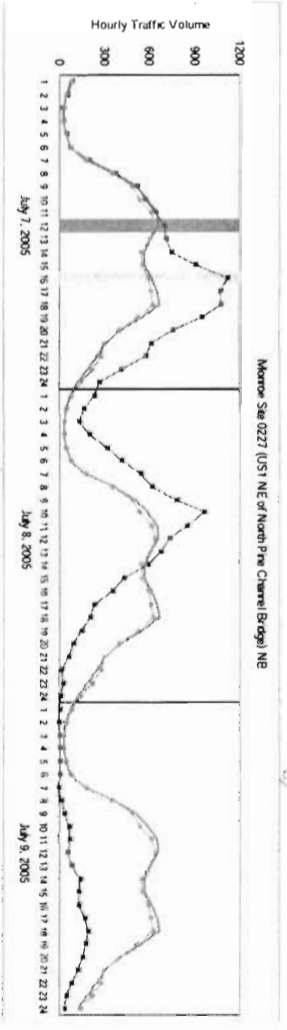
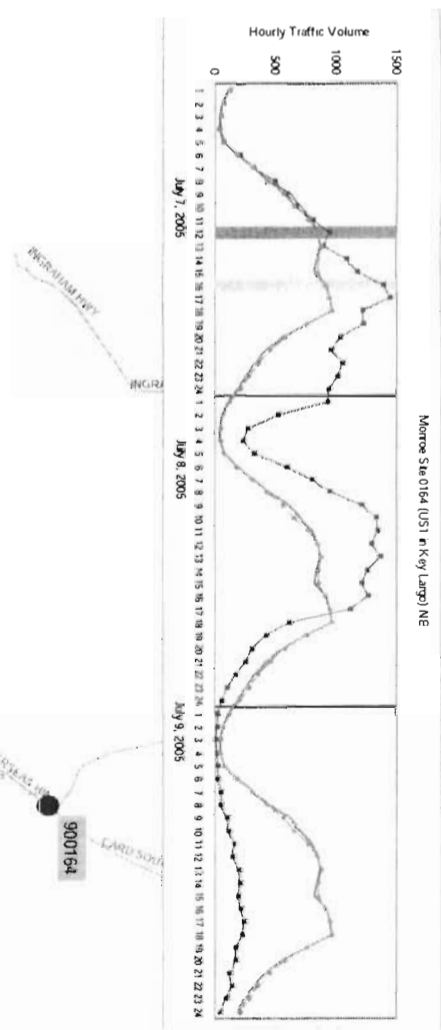
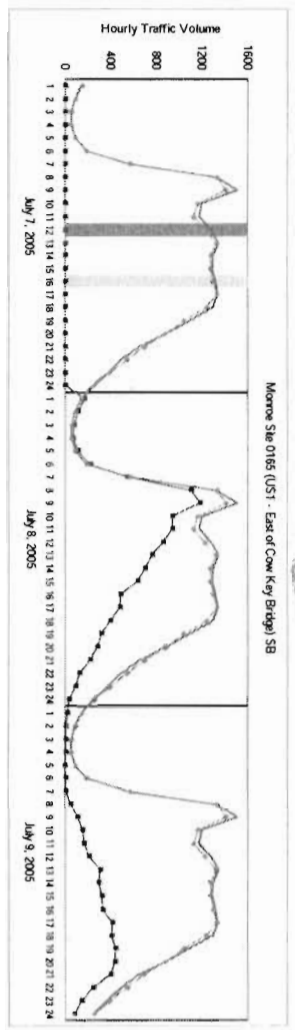
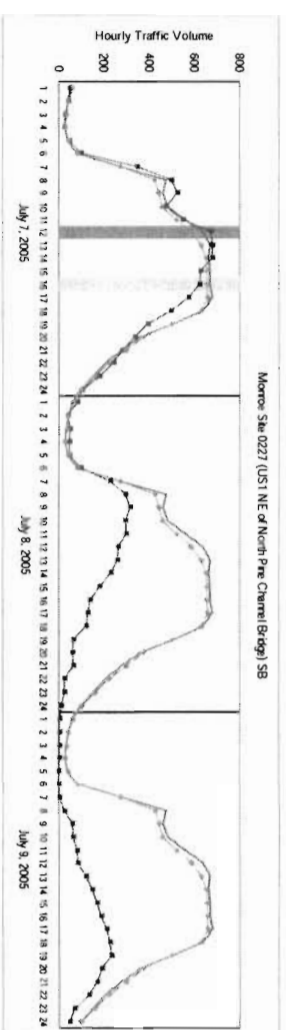
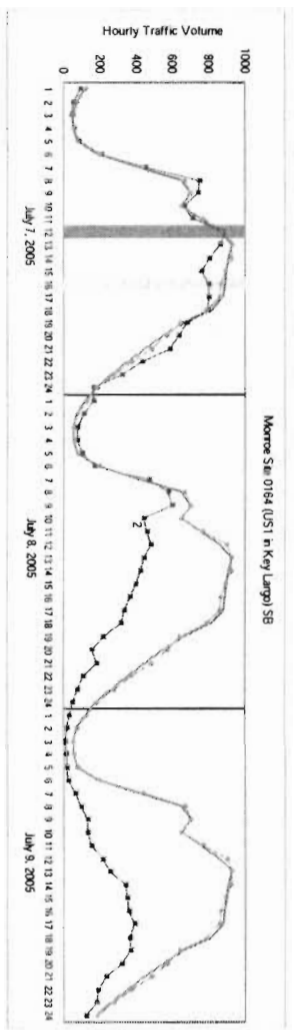
[NB] Northbound [SB] Southbound

- █ Visitor Evacuation
- █ Mobile homes, RV & Boat Resident Evacuation
- █ Resident Evacuation
- 2004 Hourly Average
- Evacuation Traffic
- 2-month Average



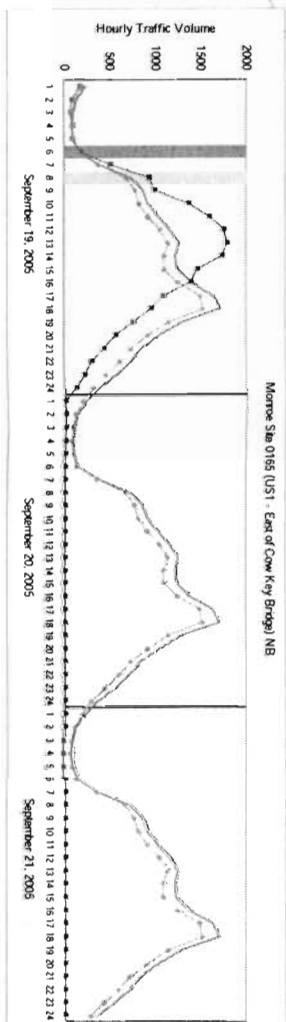
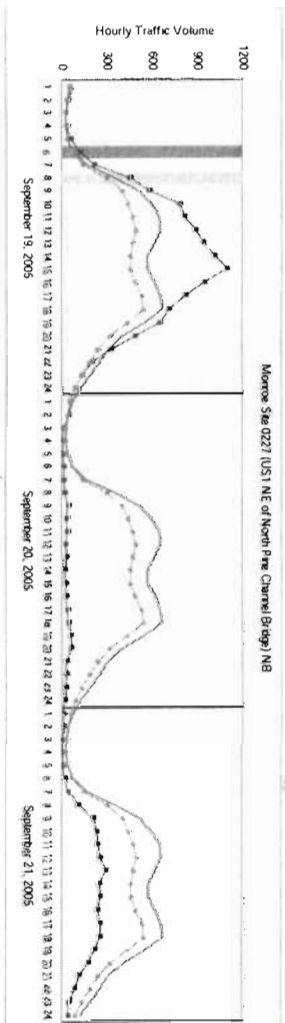
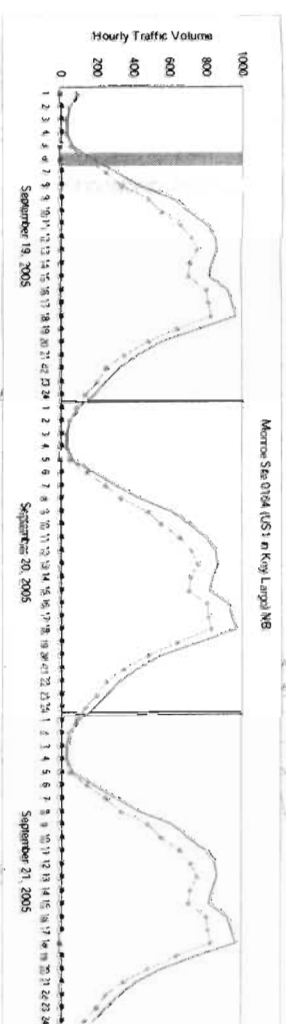
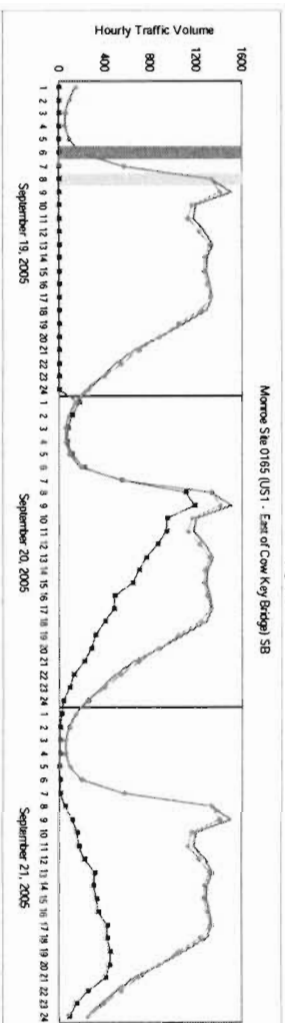
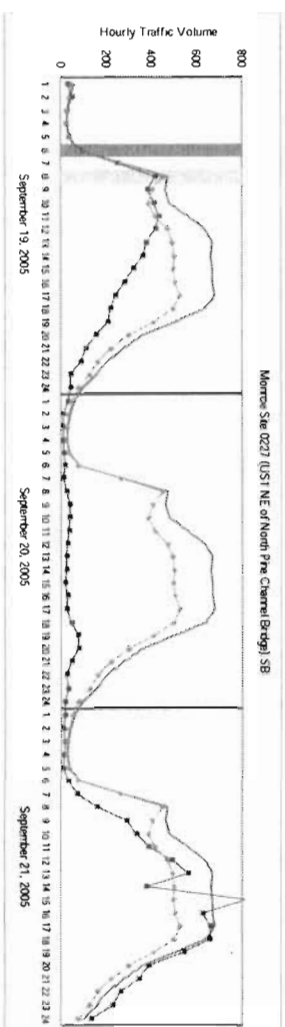
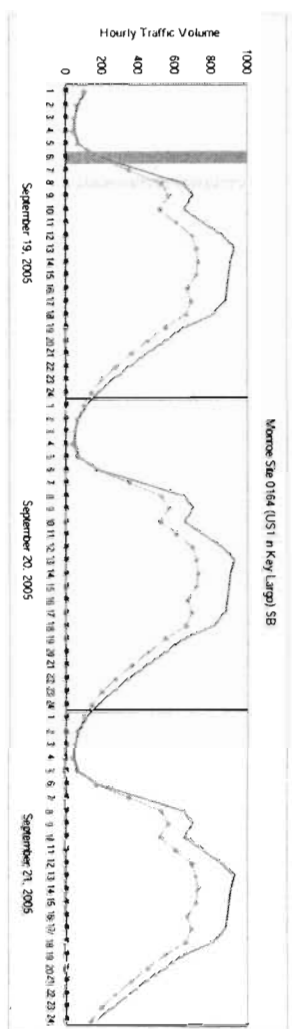
DATE: 9/21/04  
 BY: J. J. ...  
 CHECKED: ...  
 SCALE: ...

# HURRICANE DENNIS EVACUATION TRAFFIC PATTERN



- █ Visitor Evacuation
- █ Limited Resident Evacuation (W of 7-m Bridge to Key West)
- 2004 Hourly Average
- Evacuation Traffic
- 2-month Average

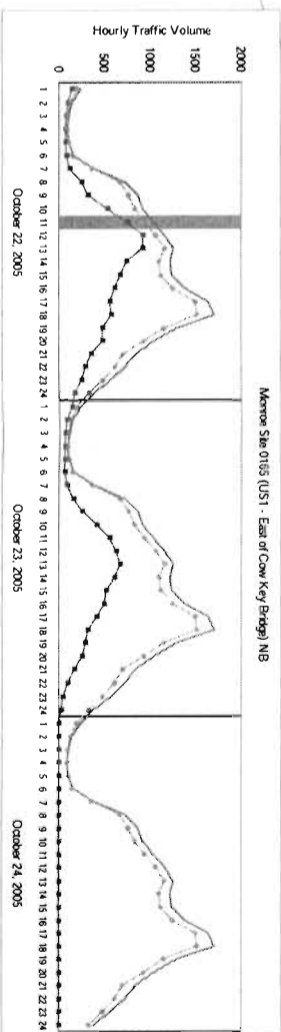
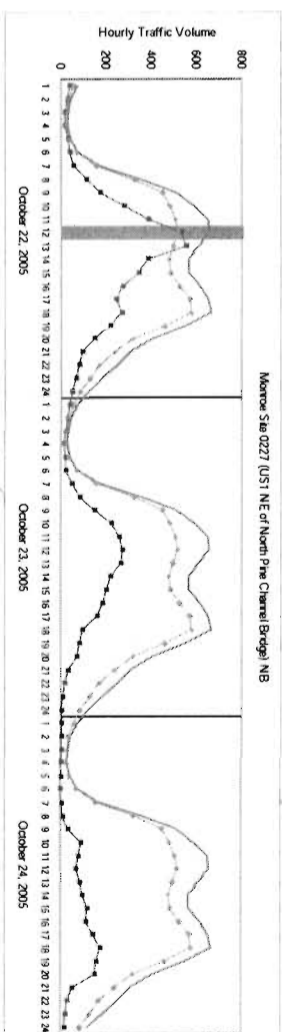
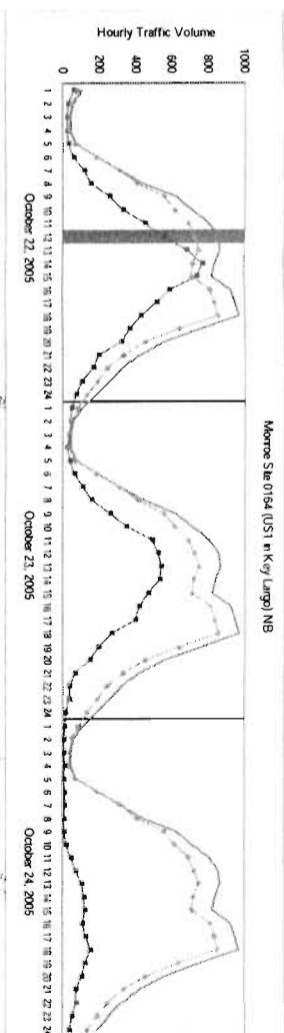
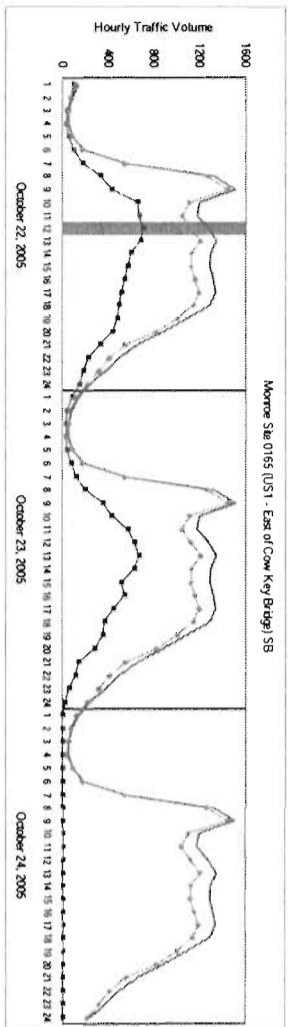
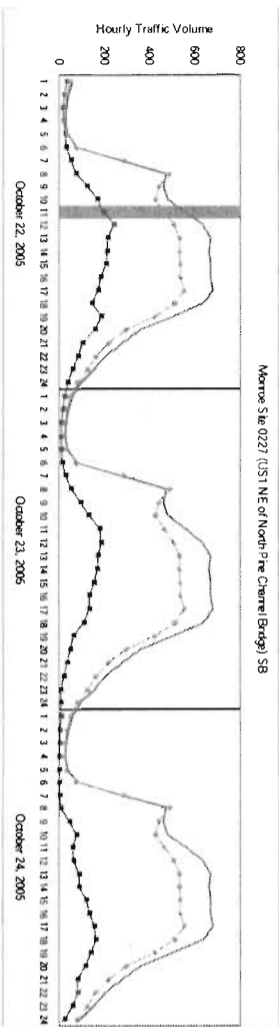
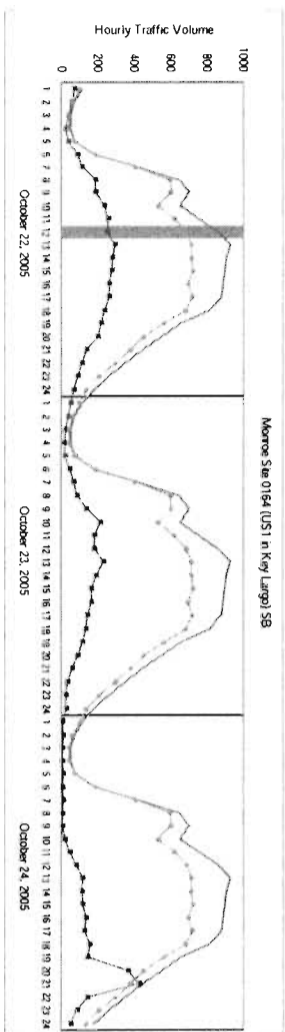
# HURRICANE RITA EVACUATION TRAFFIC PATTERN



[NB] Northbound [SB] Southbound

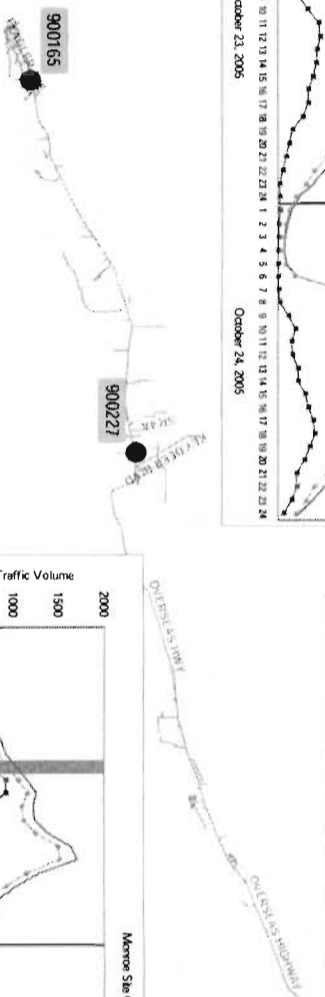
- Visitor Evacuation
- Resident Evacuation
- 2004 Hourly Average
- Evacuation Traffic
- 2-month Average

# HURRICANE WILMA EVACUATION TRAFFIC PATTERN

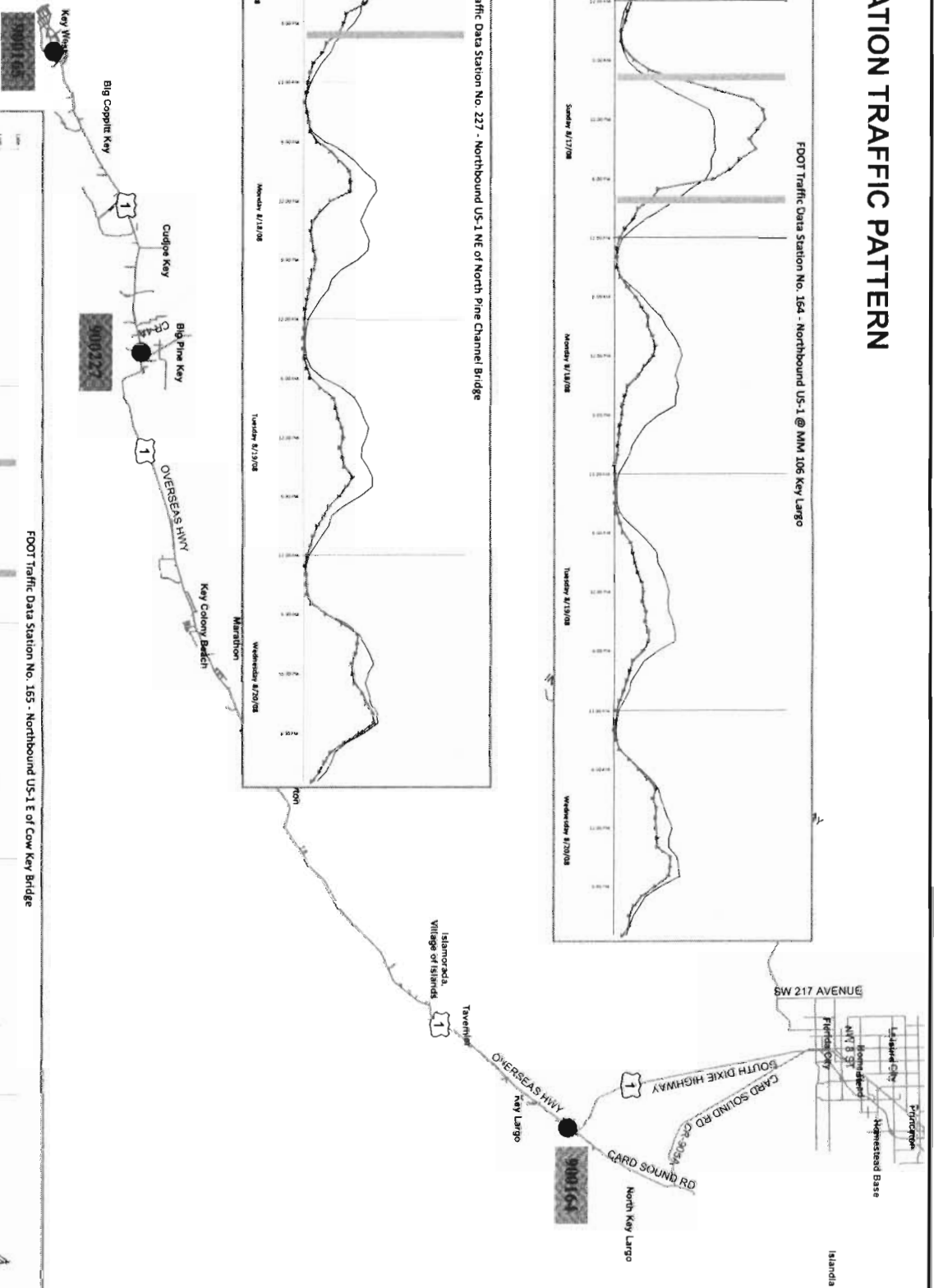
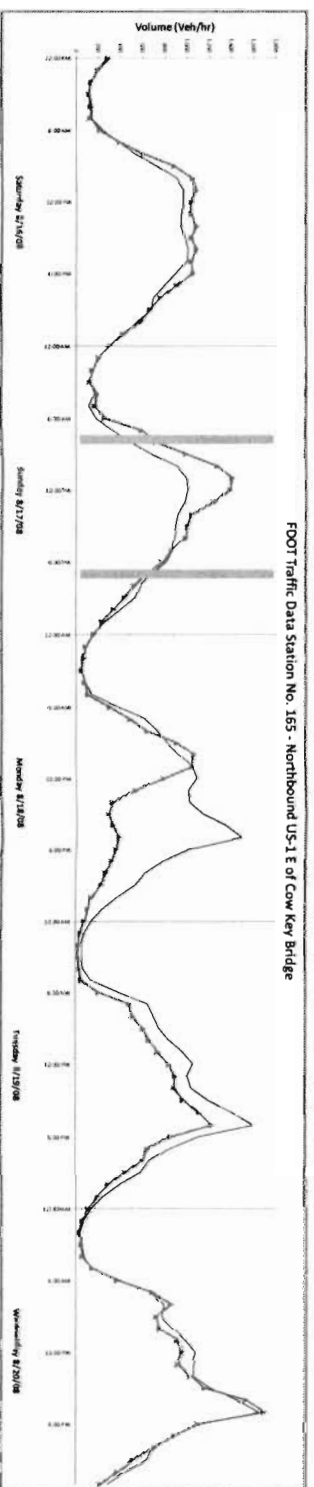
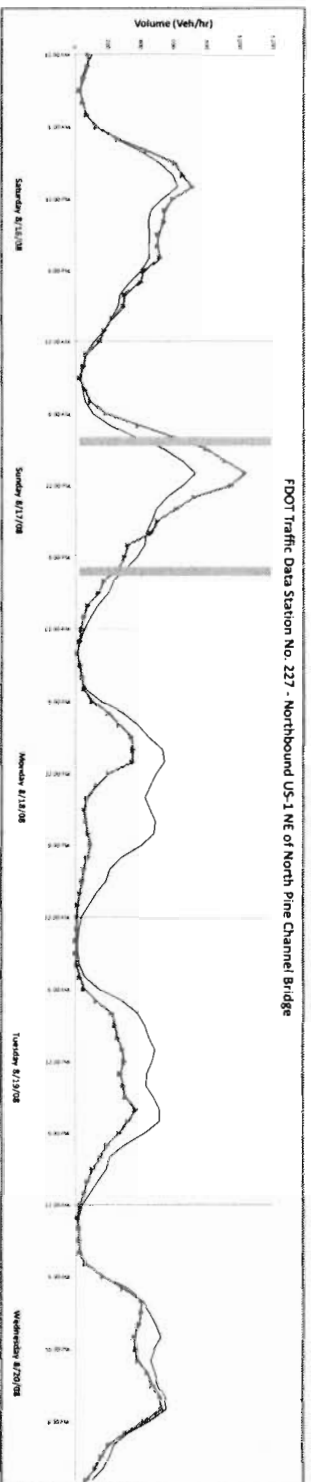
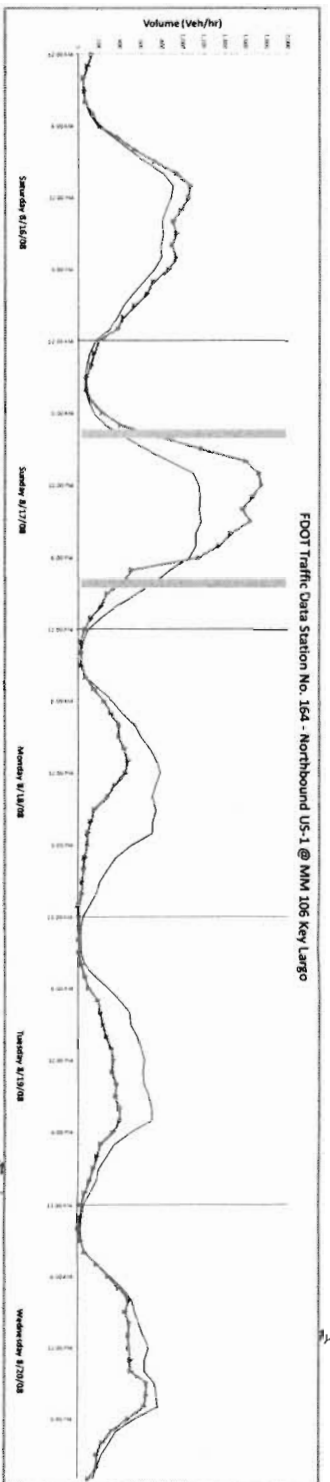


[NB] Northbound [SB] Southbound

- Resident Evacuation
- 2004 Hourly Average
- Evacuation Traffic
- 2-month Average



# TROPICAL STORMS FAY EVACUATION TRAFFIC PATTERN

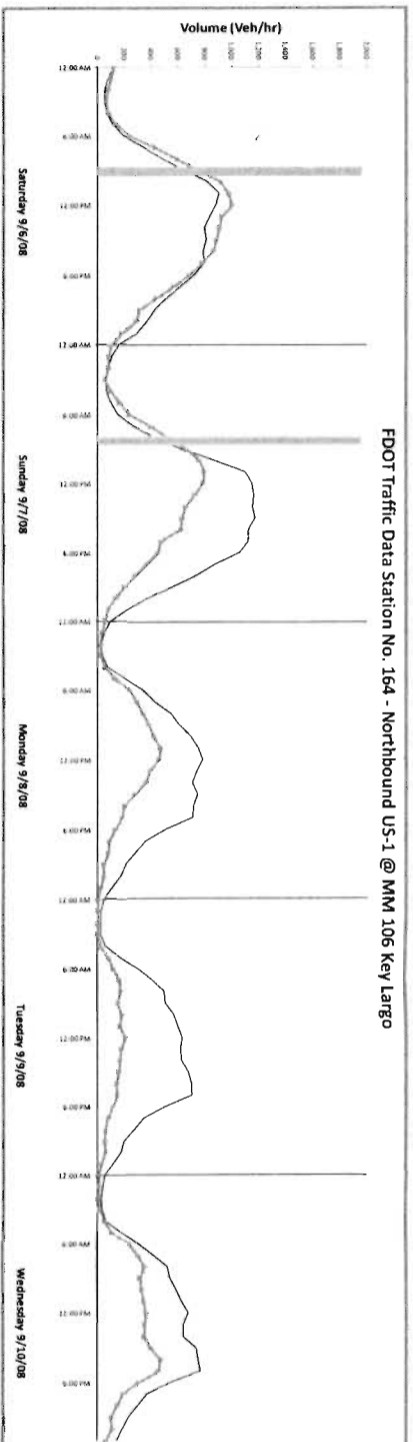


- LEGEND**
- Northbound 3-month prior average
  - Evacuation Traffic
  - Mandatory Evacuation of all Visitors and Non-Residents Evacuation Start
  - Evacuation of Mobile Home Residents and Residents in Low-Lying Areas Start

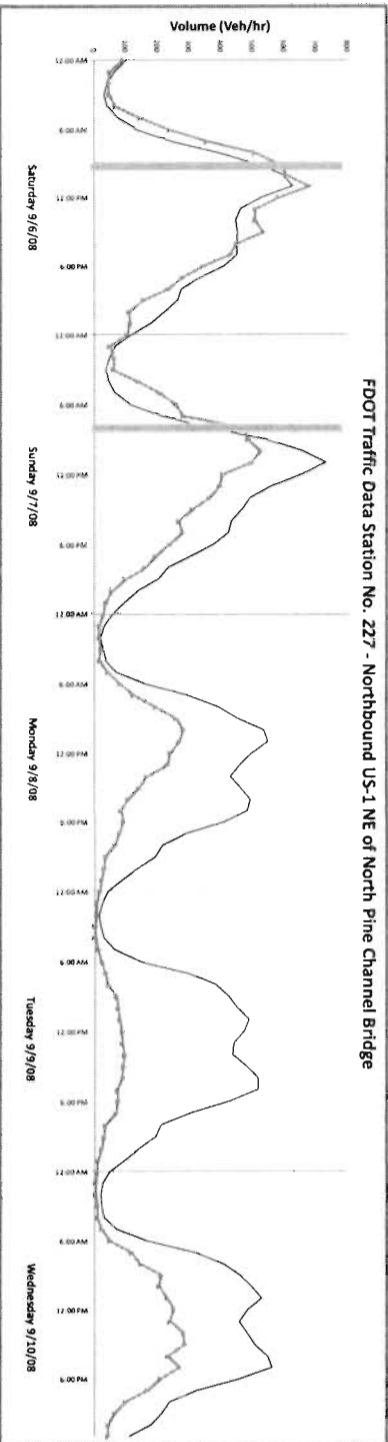
**Note:** A mandatory evacuation of all permanent residents was not ordered during Tropical Storm Fay.

# TROPICAL STORMS IKE EVACUATION TRAFFIC PATTERN

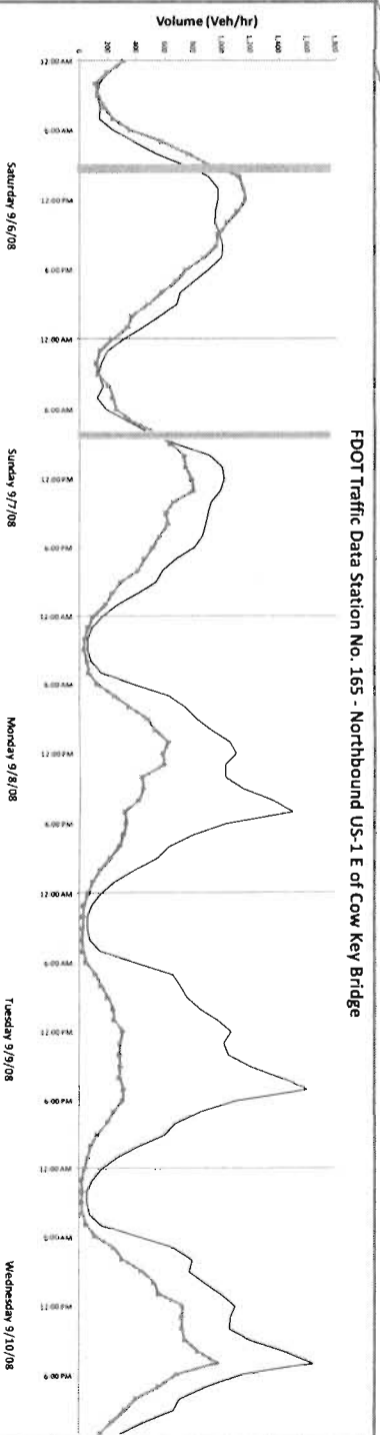
FDOT Traffic Data Station No. 164 - Northbound US-1 @ MM 106 Key Largo



FDOT Traffic Data Station No. 227 - Northbound US-1 NE of North Pine Channel Bridge



FDOT Traffic Data Station No. 165 - Northbound US-1 E of Cow Key Bridge



- LEGEND**
- Northbound 3-month prior average
  - Evacuation Traffic
  - Mandatory Evacuation of all Visitors and Non-Residents
  - Evacuation Start
  - Mandatory of all Residents in the Florida Keys
  - Evacuation Start

