



NATIONAL KEY DEER REFUGE TRANSPORTATION STUDY

Transportation Study Report

Contract No: DTFH71-09-D-00001, Task Order: 10-009



US Department of Transportation, Federal Highway Administration, Eastern Federal Lands Highway Division
in cooperation with US Fish and Wildlife Service and the National Key Deer Refuge



Kimley-Horn
and Associates, Inc.

July 2011

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Executive Summary

The Florida Keys National Wildlife Refuges Complex is a chain of four National Wildlife Refuges (NWRs) in Monroe County, Florida. This plan focuses on the National Key Deer Refuge (NKDR). The NKDR encompasses a series of islands within the Lower Keys that include No Name Key, Big Pine Key, Little Torch Key, Ramrod Key, Summerland Key, Cudjoe Key, and Sugarloaf Key. It is the primary habitat for numerous federally endangered or threatened species including the Lower Keys Marsh Rabbit, the Silver Rice Rat, and the widely recognized Key Deer. The Refuge's approved acquisition boundary encompasses over 84,000 acres of lands and waters with nearly 9,200 acres of land owned or managed by the US Fish and Wildlife Service (USFWS) of the US Department of the Interior.

The Transportation Study Report reviewed the surrounding roadways and parking areas of the National Key Deer Refuge (NKDR) and provides short, medium, and long range recommendations for the improvements to the existing multimodal transportation system. The study included development of a public involvement plan, inventory of existing conditions at the Refuge, and identification of traffic safety and access needs for the Refuge. Based on these reports, preliminary candidate alternatives were developed and responsible stakeholder partners were identified. The preliminary candidate alternatives were divided into potential roadway improvements and additional recommendations for initial screening. The roadway alternatives were then evaluated in further detail to determine the preferred alternatives and developed into a short, medium, and long range implementation plan. The implementation plan presented herein includes a summary of the environmental, social, and financial impacts of the conceptual roadway alternatives. Additional detailed information on the planning process is provided in this report.

Based on the results of the study, short, medium and long range transportation roadway recommendations for the NKDR include the following:

Short Range (2015)

Alternative 1. Reconfigure Blue Hole Interpretive Site parking lot with defined entrances and exits

Alternative 2a. Stripe and sign a mid-block pedestrian crosswalk across Key Deer Boulevard at the Blue Hole Interpretive Site from the existing shared pathway on Key Deer Boulevard

Alternative 2b. Stripe sharrows (shared lane markings for bicycles) on Watson Boulevard from Key Deer Boulevard to Avenue B, Watson Boulevard on No Name Key, Watson Boulevard from Key Deer Boulevard to the western terminus, along Big Pine Street, and along Koehn Avenue

Medium Range (2020)/Long Range (2030)

As identified during the project process, Alternatives 2c, 3, and 4 have impacts to the environment that may not be considered acceptable to the community. Using the discussion in **Section 7** and **Table 7.1** as a guide, the implementation of the remaining consultant roadway improvement alternatives should be carefully assessed against all potential physical impacts and public concerns, with a determination by

the Refuge and other USFWS staff as to whether or not the implementation of the alternatives should move forward.

Alternative 2c. The following priorities have been developed for improvements to bicycle/pedestrian/shoulder facilities proposed in Alternative 2:

- Upgrade shoulder/widen Watson Boulevard to standard width from Key Deer Boulevard to Avenue B
- Upgrade shoulder/widen Watson Boulevard to standard width from No Name Key bridge to eastern terminus
- Upgrade shoulder/widen Watson Boulevard to standard width from Key Deer Boulevard to the western terminus
- Upgrade shoulder on Key Deer Boulevard from Watson Boulevard to Big Pine Street
- Upgrade shoulder on Key Deer Boulevard from Big Pine Street to Kyle Boulevard
- Upgrade shoulder/widen entire length of Big Pine Street to standard width
- Upgrade shoulder/widen entire length of Koehn Avenue to standard width

Alternative 3. Extend the shared pathway on Key Deer Boulevard to the northern terminus of Key Deer Boulevard (approximately 0.25 miles) and improve the shoulder facilities on Key Deer Boulevard in that area

Alternative 4. Widen the shared pathway on Key Deer Boulevard from eight to ten feet to allow for two-way bicycle and pedestrian traffic. This action would improve the safety of the path for both users. An associated alternative might consider the realignment of the sections adjacent to the vehicle traveled way.

The non-roadway improvements to be implemented as time and monies permit include:

Alternative 5. Trim vegetation at pullouts and intersections to increase sight distances where needed (i.e. Key Deer Boulevard)

Alternative 6. Perform routine trimming of vegetation around signs for visibility

Alternative 7. Review Monroe County's US 1 sign inventory sign study and implement sign improvements

Alternative 8. Once constructed, the new Visitors Center should tie into existing bicycle and pedestrian facilities already in place on US 1 and also potentially the back side of the property

Alternative 9. Purchase a radar speed check trailer to notify drivers of their travel speed on County roads within the Refuge area

Alternative 10. Perform traffic calming studies on key roadways around the Refuge to determine if traffic calming measures are appropriate to help reduce vehicle speeds

Alternative 11. In coordination with a local vendor, implement a bike rental station at the new Visitors Center for Refuge visitors

Alternative 12. Upgrade all existing USFWS Refuge signage for conformance with the Manual on Uniform Traffic Control Devices (MUTCD) criteria for standard lettering, text message, sign color, size and placement

Alternative 13. Survey Refuge visitors at the existing Visitors Center and the Blue Hole Interpretive Site on their trip characteristics to develop visitor pass-by information

Alternative 14. Install a kiosk at the new Visitors Center where multiple entities could provide information to reduce signage needs

Alternative 15. Update, add, relocate, replace or remove, as appropriate, Key Deer Warning Signs on US 1 through entire Key Deer habitat (including Sugarloaf Key, Cudjoe Key, Summerland Key, Ramrod Key, Little Torch Key, and West Summerland Key) based on discussions with USFWS, FDOT, Monroe County, and animal vehicle collision experts

Alternative 16. Continue awareness of Key Deer and other threatened and endangered species crossing area roadways

Alternative 17. Implement Intelligent Transportation System application to notify drivers of deer entering roadways

Alternative 18. Ongoing coordination with stakeholders

1. Introduction

The Florida Keys National Wildlife Refuges Complex is a chain of four National Wildlife Refuges (NWR) in Monroe County, Florida. This plan focuses on the National Key Deer Refuge (NKDR). The NKDR encompasses a series of islands within the Lower Keys that include No Name Key, Big Pine Key, Little Torch Key, Ramrod Key, Summerland Key, Cudjoe Key, and Sugarloaf Key. It is the primary habitat for numerous federally endangered or threatened species including the Lower Keys Marsh Rabbit, the Silver Rice Rat, and the widely recognized Key Deer. The Refuge's approved acquisition boundary encompasses over 84,000 acres of lands and waters with nearly 9,200 acres of land owned or managed by the US Fish and Wildlife Service (USFWS).

1.1 USFWS Mission and Goals

The NWR System is administered through the USFWS under the US Department of the Interior. The mission of the USFWS is to:

“Work with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.”

The goals of the USFWS are aimed at fulfilling this mission. Primary USFWS goals are to:

- Sustain fish and wildlife populations including migratory birds, endangered species, anadromous fish, and marine animals;
- Conserve a network of lands and waters, including the NWR System; and
- Provide Americans the opportunity to understand and participate in the conservation and use of fish and wildlife resources.

The USFWS manages refuges across the country. The passage of the NWR System Improvement Act of 1997 defines the mission of the NWR System as follows:

“To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, plant resources and their habitats within the United States for the benefit of present and future generations of Americans.”

The goals of the Wildlife Refuge System are to:

- Preserve, restore, and enhance threatened and endangered species in their natural ecosystems;
- Perpetuate the migratory bird resource;
- Preserve a natural diversity and abundance of fish and wildlife ecology;
- Help the public gain an understanding and appreciation of fish and wildlife ecology; and
- Provide Americans the opportunity to understand and participate in the conservation and use of fish and wildlife resources.

The NWR System Improvement Act of 1997 identified six wildlife-dependent recreational uses that are recognized as priority public uses of refuge lands, including:

- Hunting
- Fishing
- Wildlife Observation
- Wildlife Photography
- Environmental Education
- Environmental Interpretation

1.2 Project Location

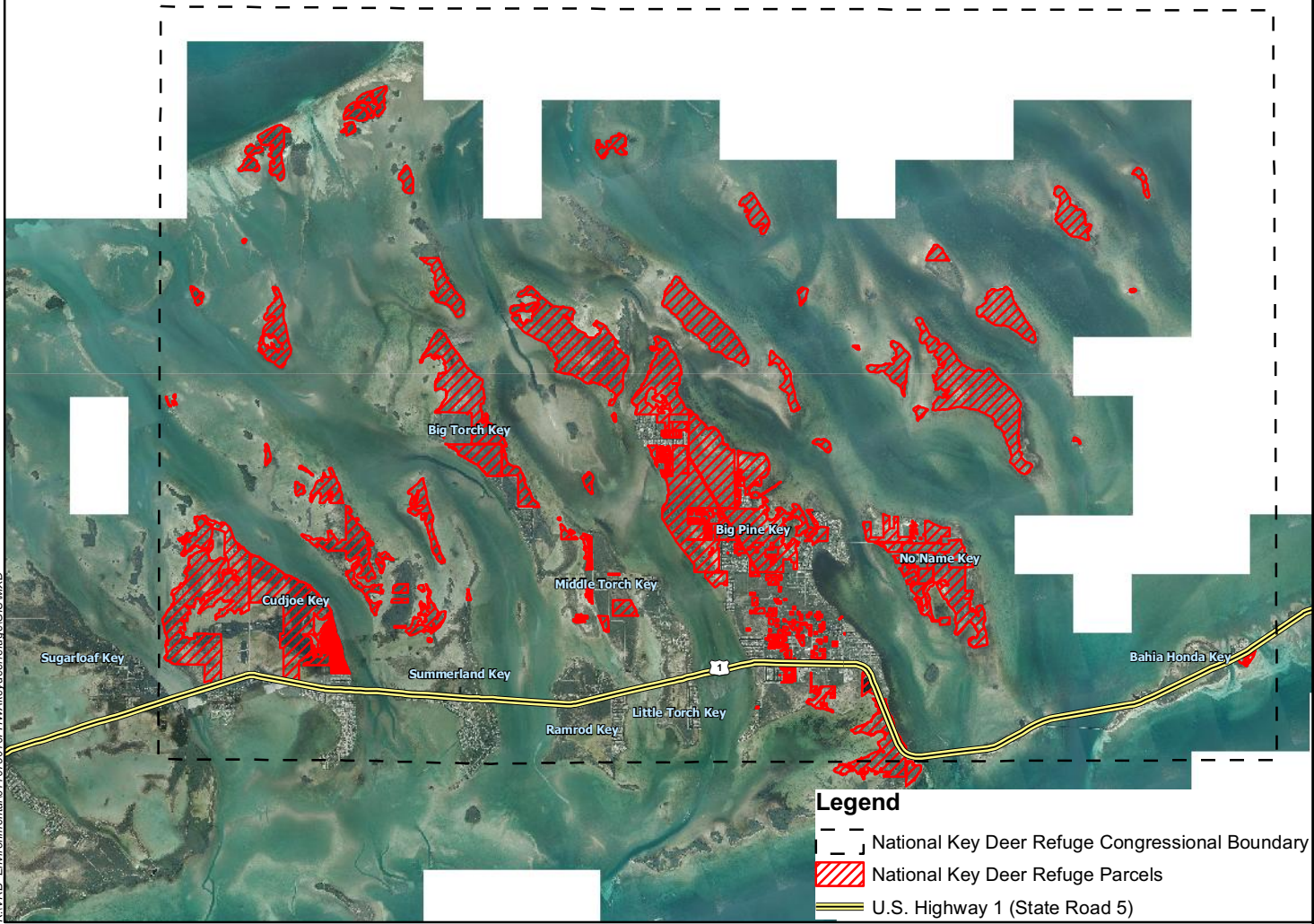
The NKDR is located in the Lower Keys Region of the Florida Keys in Monroe County, Florida. The overall boundary for the NKDR is shown in **Figure 1.1**. The transportation study area for the NKDR (**Figure 1.2**) focuses on areas that are readily accessible to the public on Big Pine Key and No Name Key. General transportation issues such as signage and wayfinding will be addressed for other islands accessible from US 1.

1.3 Project Background and Purpose

The Transportation Study documents the existing transportation infrastructure within and around the Refuge and looks at the roads and other regional transportation facilities adjacent to or providing access to the Refuge. The Transportation Study evaluates these existing conditions and proposes short, medium, and long range transportation solutions to improve the mobility for visitors and staff to and within the Refuge. More importantly, it will address safety concerns associated with deer-vehicle collisions that occur in the vicinity of the Refuge. The information presented in this report can be used in the next Comprehensive Conservation Plan (CCP) and US Fish and Wildlife Service Southeastern Regional Long Range Transportation Plan. The key points and the proposed alternatives in this report should be considered in these future planning efforts to assist in investment decisions for the future.

During the data collection and analysis for the Transportation Study, the following existing studies and data were reviewed and referenced. The data and results from these reports were used to derive the methodology applied to the Transportation Study, and to provide a baseline of data for the analysis. General consistency with these studies improved the likelihood of stakeholder consensus, and should increase the ease of implementation of the outlined recommendations.

- URS. 2010 US 1 Arterial Travel Time and Delay Study Monroe County Florida. December 2010
- Monroe County Growth Management Division. A Layman's Guide to Big Pine and No Name Key.
- Hellmuth, Obata + Kassabaum, Inc. Big Pine Key/US 1 Corridor Area Enhancement Plan. June 2003
- Florida Department of Environmental Protection, Office of Greenways and Trails. Contract Plans for the Florida Keys Overseas Heritage Trail Spanish Harbor to Seven-Mile Bridge MM 30.0 to 40.0. October 2009.



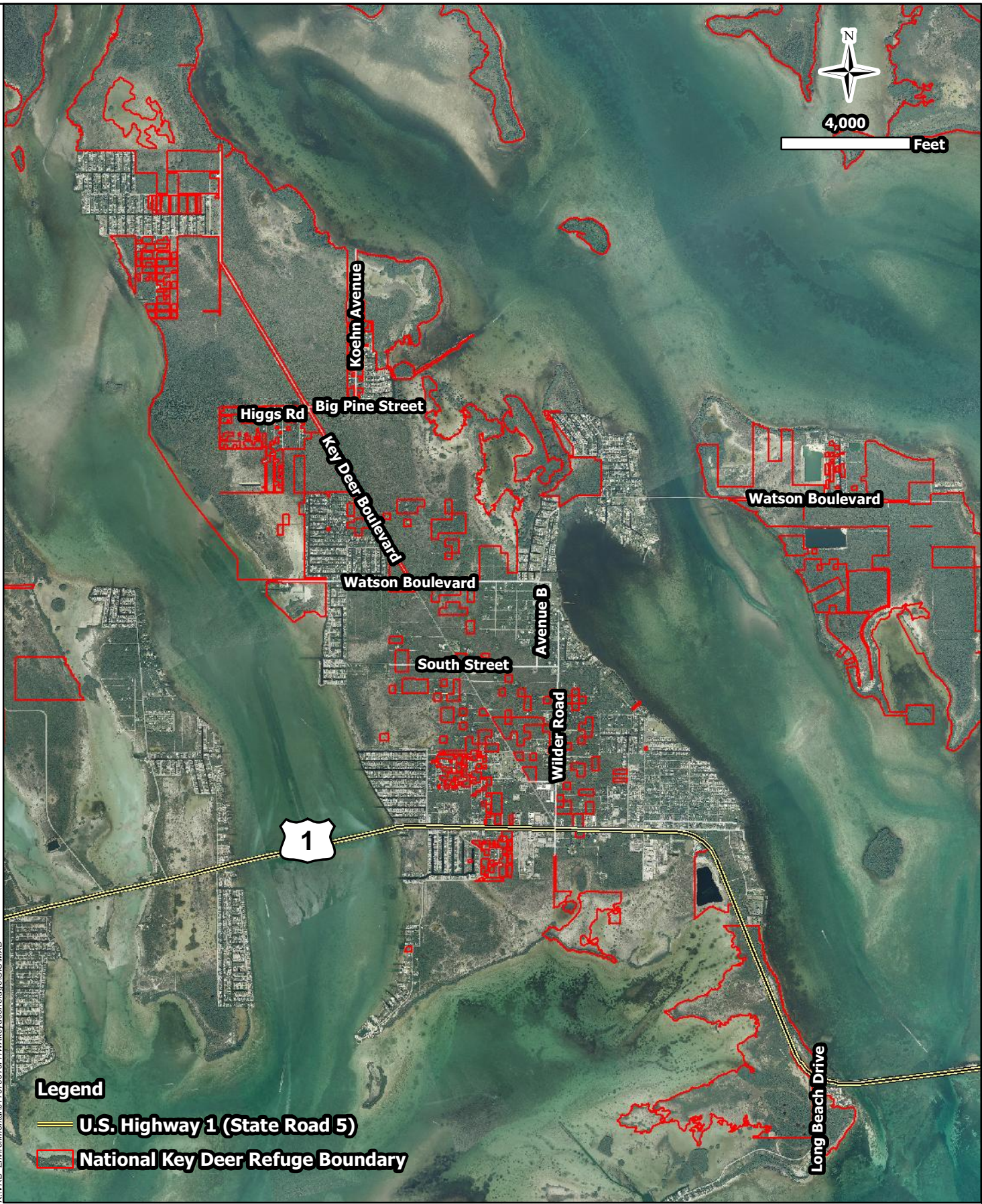
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Raster data courtesy of Monroe County Property Appraiser



Location Map
National Key Deer Refuge
Transportation Study
Contract No.: DTFH71-09-D-00001



Figure 1.1: Overall Site Location Map



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Raster data courtesy of Monroe County Property Appraiser

Legend

-  U.S. Highway 1 (State Road 5)
-  National Key Deer Refuge Boundary



Big Pine Key Street Map
National Key Deer Refuge
Transportation Study
 Contract No.: DTFH71-09-D-00001

Figure 1.2: Location Map

- USFWS Southeast Region. 5-year Review: Summary and Evaluation Eastern Indigo Snake (*Drymarchon Couperi*). April 2008.
- USFWS Southeast Region. 5-year Review: Summary and Evaluation Rice Rat (*Oryzomys palustris natator*). August 2008.
- USFWS Southeast Region. 5-year Review: Summary and Evaluation Key Deer (*Odocoileus virginianus clavium*). August 2010.
- USFWS Southeast Region. 5-year Review: Summary and Evaluation. Lower Keys Marsh Rabbit (*Sylvilagus palustris hefneri*). September 2007.
- Monroe County. Habitat Conservation Plan for Florida Key Deer (*Odocoileus virginianus clavium*) and other Protected Species on Big Pine Key and No Name Key. Monroe County, Florida. April 2003: April 2006 Revision.
- Monroe County Planning and Environmental Resources Department. Livable CommuniKeys Master Plan for Big Pine Key and No Name Key. Original BOCC Adoption 08/2004: Amended by Ordinance 020-2009.
- USFWS Southeast Region. Lower Florida Keys National Wildlife Refuges Comprehensive Conservation Plan. October 2009.
- Monroe County. Monroe County Comprehensive Plan Update 2009.
- USFWS Southeast Region. Multi Species Recovery Plan for South Florida. May 1999.
- Parker, et al. Effects of US 1 Project on Florida Key Deer Mortality. Journal of Wildlife Management, 72(2): 354-359; 2008
- Schmidt, Jason A.; Lopez, Roel R. and Silvy, Nova J. Evaluation of The US 1 Crossing Project in Reducing Key Deer Mortality (4 Year Post-Project Report). Texas A&M University, February 2007.
- FHWA Central Federal Lands Highway Division. The Road Inventory of National Key Deer National Wildlife Refuge. June 2010.
- URS. Florida Keys Carrying Capacity Study. September 2002.
- FDOT. Contract Plans State Road No. 5 US 1/Overseas Highway at Key Deer Boulevard. March 2010.
- FDOT. Florida Greenbook. May 2011
- Area Traffic Counts

Internet Resources:

- 2009 Aerial Imagery: http://www.monroecounty-fl.gov/Pages/MonroeCoFL_WebDocs/mcpa
- Census 2000 Data: <http://factfinder.census.gov/home/saff/main.html?lang=en>
- Community Services, FEMA Flood Zones and NWI Wetlands data: www.fgdl.org
- Endangered Species Act Review of the National Flood Insurance Program in the Florida Keys: <http://www.fws.gov/verobeach/images/pdflibrary/FEMA%20Flood%20Insurance%20Biological%20Opinion%20-%20August%2009,%202006%20Q&As.pdf>
- Estimates of Population by County and City in Florida: April 1, 2008: http://www.bebr.ufl.edu/files/2008_Estimates_Table01_0.pdf
- Existing Land Use, Future Land Use, Habitat and Tier System Data: http://www.monroecounty-fl.gov/Pages/MonroeCoFL_GIS/index

- Facts About Monroe County: http://www.monroecounty-fl.gov/Pages/MonroeCoFL_admin/about
- State Historical Preservation Officer Master Site File Data: <http://dhr.dos.state.fl.us/preservation/sitefile/>
- Species Focus Areas and Key Deer Mortality data: <http://www.fws.gov/verobeach/>

Appendix A: Supporting Documentation and References contains additional supporting documentation and reference information.

1.4 Overview of Transportation Study

The Transportation Study Report reviews the surrounding roadways and parking areas of the NKDR and provides short, medium, and long range recommendations for the transportation system. This document is a compilation of four previously completed reports:

- Existing Conditions Report – January 2011
- Traffic Needs and Safety Report – February 2011
- Preliminary Candidate Alternatives Report – March 2011
- Short and Long Range Improvement Plan – July 2011

The comments received from the stakeholder and public meetings have been incorporated into the overall study and final recommendations.

2. Public Involvement

A public involvement plan was created to outline the public and stakeholder involvement efforts for the study. The public involvement plan including the project stakeholder list and notes from the three stakeholder meetings are included in **Appendix B: Public Involvement Plan** and **Appendix C: Stakeholder Meeting Notes**, respectively.

2.1 Stakeholder and Public Meetings

The first stakeholder meeting was conducted on October 13, 2010 (**Figure 2.1**) at the NKDR Headquarters in Big Pine Key, Florida. The focus of this meeting was to inform the stakeholders of the study, build consensus around the transportation challenges and opportunities at the Refuge, and establish what available data existed for the project team. Major project tasks, project schedule, project objectives, data/information requests, and the public involvement plan were reviewed. During the meeting specific transportation issues within the Refuge including safety, pedestrian/bicycle access, circulation, parking, and assessment of current Key Deer warning systems were discussed.

The second stakeholder meeting took place on January 31, 2011 at the NKDR Headquarters in Big Pine Key, Florida. The purpose of this meeting was to discuss the project reports that had been submitted to date and collect feedback from the stakeholders on the preliminary recommendations. Discussion at the meeting included a wide range of topics including potential bicycle and pedestrian and shoulder upgrades, currently planned improvements, traffic calming alternatives, and some possible funding options for improvements.



Figure 2.1: October 13, 2010 Stakeholder Kickoff Meeting

The first public meeting followed the stakeholder meeting on January 31, 2011. The project was presented and existing conditions were reviewed. The public provided feedback on the study, existing conditions, and potential opportunities around the Refuge.

The third stakeholder meeting was held on April 7, 2011 at the NKDR Headquarters in Big Pine Key, Florida. The Short and Long Range Improvement Plan recommendations were presented and discussed. Discussion included but was not limited to the aspects of each alternative, the limitations on improvements related to the HCP, the location of the new Visitors Center, potential implementation of sharrows, and the Monroe County sign inventory. Comments received during this meeting were incorporated into the study's recommendations.

The second public meeting followed the stakeholder meeting (**Figure 2.2**) on April 7, 2011. The details of the project were presented again as well as potential conceptual alternatives for public feedback. The public discussed issues around the Refuge such as vehicles speeding on Watson Boulevard on No Name Key.



Figure 2.2: April 7, 2011 Public Meeting

3. Existing Conditions

Existing internal transportation conditions and external transportation systems providing access to the NKDR were reviewed as the first step of this study. This section identifies the findings of this review and presents the existing conditions.

3.1 Refuge History

The NKDR was established in 1957 to protect and preserve Key Deer and other wildlife resources in the Florida Keys. The NKDR is located in the lower Florida Keys and currently consists of approximately 9,200 acres of land that includes pine rockland forests, tropical hardwood hammocks, freshwater wetlands, salt marsh wetlands, and mangrove forests. These natural communities are critical habitat for hundreds of endemic and migratory species including 17 federally-listed species such as the Key Deer, Lower Keys Marsh Rabbit, and Silver Rice Rat.

3.2 Regional Location

The NKDR is located in the Lower Keys Region of the Florida Keys in Monroe County, Florida. Its uplands are comprised of a series of islands some of which are accessible from US 1.

3.3 Entrances to the Refuge

Access to Refuge lands is provided through various County-maintained public roadways and Refuge trails as Refuge lands are not contiguous. The majority of public access to the NKDR on Big Pine and No Name Keys is provided via US 1. Secondary Refuge access routes that connect to US 1 include Key Deer Boulevard, Wilder Road, and Long Beach Road. There are driving, bicycling, and walking activities available at NKDR to experience wildlife observation and photography (**Figure 3.1**). The Visitors Center provides opportunities for wildlife education and interpretation. Saltwater fishing is allowed. Prohibited activities include, but are not limited to, hunting, camping, unleashed pets, and campfires.



Figure 3.1: Visitor Signage at NKDR

At the intersection of US 1 and Key Deer Boulevard, there is a collection of recreational guide signs (**Figure 3.2**) providing wayfinding messages for the Refuge Headquarters, the Visitors Center, and points of interest including the Blue Hole Interpretive Site and the Jack Watson and Fred Mannillo Wildlife Trails.



Figure 3.2: Wayfinding Signs at the intersection of US 1 and Key Deer Boulevard

3.4 Refuge Visitors Center

The NKDR Visitors Center, shown in **Figure 3.3**, is currently located in the Big Pine Key Plaza on Key Deer Boulevard near mile marker (MM) 30.5 on US 1. Parking for the Visitors Center is shared with retail uses within the plaza.



Figure 3.3: Existing Visitors Center

A one-acre site for a new Visitors Center has been acquired along US 1. The site is located near MM 30.6 on the north side of US 1 with vehicular access from US 1. **Figure 3.4** shows the site on US 1 planned to be developed as the new Visitors Center facility. Specific details including the total size of the new facility have not been confirmed so the number and types of parking spaces to be provided at the new facility cannot be determined at this time.



Figure 3.4: Future Site of New Refuge Visitors Center on US 1

The NKDR Headquarters building is located at the western terminus of Watson Boulevard. The facility provides administrative and meeting space for Refuge staff. Gated access to the facility and parking are provided.

3.5 Water Transportation Access

There are no public boat access points on Refuge property. However, a public boat ramp maintained by Monroe County is located at the northern terminus of Koehn Avenue within the Eden Pines community. There are also numerous state and county boat public boat ramps within the NKDR boundary.

3.6 Refuge's Major Points of Interest

There are two major points of interest located in the transportation study area, the Blue Hole Interpretive Site and the Jack Watson and Fred Mannillo Wildlife Trails.

The Blue Hole Interpretive site is an old quarry with freshwater with a viewing platform and interpretive kiosk. It is shown in **Figure 3.5**.

The Jack Watson Nature Trail is a 2/3 mile trail through pine rockland forest and freshwater wetlands, **Figure 3.6**.

The Fred Mannillo Nature Trail is a wheelchair accessible trail with a viewing platform at its terminus, **Figure 3.7**.

3.7 Visitation Summary and Profile

Approximately 207,000 people visited the NKDR in 2009. The unique geographical boundaries of the Refuge and the interspersed private lands within the Refuge make visitor quantifications difficult. Visitation data is tracked from various sources including Visitors Center counts and automated counters located at several Refuge destinations including the Blue Hole Interpretive Site and the Jack Watson and Fred Mannillo Nature Trails. **Table 3.1** shows the estimated number of annual visitors to the Refuge over the past 10 years.



Figure 3.5: Blue Hole Interpretive Site



Figure 3.6: Jack Watson Nature Trail



Figure 3.7: Fred Mannillo Nature Trail

Table 3.1: NKDR Visitation Summary	
Fiscal Year	Annual Visitors
2000	86,096
2001	93,440
2002	95,000
2003	75,000
2004	86,810
2005	280,125
2006	250,000
2007	250,000
2008	250,000
2009	207,068

Source: NKDR staff

4. Traffic Needs and Safety

The core of the Refuge is on Big Pine Key as the majority of accessible areas, points of interest, and Refuge facilities are located there. Most of public access to the NKDR is provided on Big Pine and No Name Keys via US 1. Roadways on Big Pine Key that provide primary access to the Refuge include Key Deer Boulevard, Wilder Road, and Long Beach Road.

4.1 Regional Roadway Infrastructure

US 1 – US 1 functions as both a local and regional facility throughout the Florida Keys region carrying approximately 20,000 average annual daily traffic. It is a lifeline for the regional economy and the only hurricane evacuation route for Keys residents and visitors. For the purposes of this report due to the orientation of US 1 in the study area, US 1 will be referred to as an east/west facility. Immediately outside of Big Pine Key, the typical cross section includes two (2) 12-ft travel lanes with 4-foot shoulders. From Ships Way (MM 29.8) to 1st Street (MM 31.1), US 1 has recently been widened to provide between three and five total lanes. The three-lane section includes a center two-way, continuous left-turn lane. Within the five-lane section from Loma Lane (MM 30.2) to Chambers Street (MM 30.8), an additional eastbound through lane is provided along with turning lanes at the intersection of Key Deer Boulevard.

The proposed Visitors Center is located on the north side of US 1, east of the Key Deer Boulevard intersection where the eastbound travel lanes merge from two (2) lanes to one (1) lane and there is one (1) lane in the westbound direction.

The posted speed limit within this area is 45 mph with a night speed limit of 35 mph as a mitigation measure primarily to reduce deer vehicle collisions. The speed limit is strictly enforced within the Big Pine Key area on US 1. The Florida Keys Overseas Heritage Trail (FKOHT) exists along portions of US 1 within the NKDR and is discussed later in this report.

In an effort to reduce the number of vehicular collisions with Key Deer along the US 1 corridor, fencing exists along both sides of the roadway from the east side of Big Pine Key (MM 33) to approximately MM 30.6 near St. Peter's Catholic Church. **Figure 4.1** depicts an example of the fenced area. Two wildlife underpasses (**Figure 4.2**) exist within this section of US 1, and deer grates (**Figure 4.3**) also have been installed at all intersecting roadways to deter Key Deer from entering the roadway.

4.1.1 Key Deer Boulevard

Key Deer Boulevard serves as the primary access to a majority of the Refuge facilities and areas of interest, as well as several churches and community centers, parks and residential neighborhoods. The roadway is generally oriented in the northwest-southeast direction and has a posted speed limit of 30 mph. A signed speed zone with an overhead flashing beacon exists approximately 50 feet south of South Street for Watson Field (**Figure 4.4**) when it is in use for sports activities.



Figure 4.1: Section of Key Deer Fencing on US 1



Figure 4.2: Example of a Key Deer Underpass



Figure 4.3: Example of Key Deer Grates in Fenced Areas



Figure 4.4: Key Deer Boulevard near South Street

Key Deer Boulevard terminates into NKDR lands to the north and intersects US 1 at a signalized intersection at its southern terminus. The typical cross section includes two 11-foot travel lanes, no paved shoulders, and no turn lanes. Signalization features are provided at the US 1 intersection allowing pedestrians to cross Key Deer Boulevard and US 1 in this area. Unsignalized crosswalks also allow pedestrians to cross Wilder Road in the area of this intersection.

Originating from the existing FKOHT along US 1, a County-maintained shared used path exists on both sides of the roadway to the north side of the Big Pine Key Plaza where the west side path terminates and a midblock pedestrian crossing is provided.

The east side shared use path continues north along Key Deer Boulevard to Kyle Boulevard. In a number of locations, the shared use path is immediately adjacent to the travel lane (**Figure 4.5**) rather than physically separated from the roadway. At Kyle Boulevard, the shared use pathway ends.



Figure 4.5: Key Deer Boulevard Shared Use Pathway Adjacent to the Travel Lane

4.1.2 Wilder Road

Wilder Road is a north-south oriented two-lane roadway with 10.5-ft lanes and 5-ft shoulders designated as bicycle lanes. The roadway intersects Key Deer Boulevard just north of the signalized intersection with US 1 to the south and terminates at a four-way stop-controlled intersection at South Street/Avenue A to the north. The roadway has a posted speed of 25 mph. This roadway provides access to numerous residential homes as well as the NKDR maintenance facility located near Raccoon Run.

4.1.3 Long Beach Road

Long Beach Road has a stop-controlled intersection with US 1, at MM 32.9. The intersection of Long Beach Road at US 1 is within the restricted access section and deer-gated section of US 1 on Big Pine Key. The roadway consists of 25.5 feet of total pavement with 3.5-ft paved shoulders designated as bicycle lanes. The posted speed limit is 30 mph. Speed humps exist along the roadway intermittently. This roadway provides access to the NKDR's Long Beach Trail and private residences.

4.1.4 Watson Boulevard

Watson Boulevard (**Figure 4.6**) is a generally an east-west oriented roadway running from Big Pine Key's western shore at the Refuge Headquarters to a point near the east shoreline of No Name Key. The roadway crosses Key Deer Boulevard and Avenue B at stop controlled intersections. The posted speed limit is 30 mph. The typical cross section includes 10-ft lanes and unpaved shoulders from the western terminus to Avenue B. Paved shoulders are provided from Avenue B east to the bridge to No Name Key. From the bridge to the eastern terminus on No Name Key, shoulders are gravel.



Figure 4.6: Watson Boulevard near the NKDR Administrative offices, west of Key Deer Boulevard

Three bridges exist along the roadway: Watson Cut Bridge, SR 940 Leg A Bridge, and the No Name Bridge. The Watson Cut Bridge is located near the Refuge headquarters. The SR 940 Leg A bridge is located immediately north of the Avenue B intersection. The No Name Bridge connects Big Pine Key to No Name Key. Each bridge is routinely inspected and assigned a sufficiency rating by Monroe County. A

sufficiency rating is defined as a numerical rating of a bridge based on its structural adequacy and safety, essentiality for public use, and its serviceability and functional obsolescence. The result of the sufficiency rating formula is a percentage in which 100 is an entirely sufficient bridge and 0 is an entirely deficient bridge. To be eligible for federal aid to replace the bridge, the sufficiency rating must be less than 50. The sufficiency ratings for each bridge in the study area are summarized in **Table 4.1**.

Table 4.1: Bridge Sufficiency Summary		
Bridge Name	Bridge No.	Sufficiency Rating (0 to 100)
Watson Cut	90-4305	74.5
SR 940 Leg A	90-4310	39
No Name	90-4320	36

Source: Monroe County

4.1.5 South Street

South Street is an east-west facility traversing Big Pine Key. The portion of South Street from Key Deer Boulevard to Avenue B was considered as part of this report. The section of the roadway is a native roadway from Key Deer Boulevard to Avenue B. The roadway provides access to several community facilities including Watson Field, the Susann Thisler Tennis Courts, and the Big Pine Key Boys and Girls Club. Within this area, there are no speed limit signs posted.

South Street is a paved roadway from Avenue B to Wilder Road with a posted speed limit of 25 mph. At the intersection of Avenue B, the eastbound approach is stop-controlled. Although the westbound approach operates under free-flow conditions, a stop bar exists on the pavement. The intersection of South Street and Wilder Road is four-way stop controlled.

4.1.6 Big Pine Street

Big Pine Street is primarily a residential roadway in the northern portion of Big Pine Key from Key Deer Boulevard to a residential community east of Koehn Avenue. The posted speed is 25 mph and the total pavement width is 17.5 feet. The existing pavement surface is coarse on this facility.

4.1.7 Koehn Avenue

Koehn Avenue is a north-south roadway from Big Pine Street to the north shoreline of Big Pine Key. A Monroe County boat ramp exists at the northern terminus. The roadway is 18 feet wide and has a posted speed limit of 25 mph. The pavement surface is similar to Big Pine Street.

4.1.8 Avenue B

Avenue B is a north-south roadway connecting South Street to Watson Boulevard. The roadway is posted at 25 mph and has a typical cross section that includes 10-ft lanes and 4-ft designated bicycle lanes.

4.2 Parking Areas

As discussed, parking is available at the existing Visitors Center and is shared with retail uses at the plaza. There is a 10-space paved parking area at the Blue Hole Interpretive Site (**Figure 4.7**). An unpaved parking area exists at the Jack Watson and Fred Mannillo Wildlife Trails. Parking areas are not provided at any other Key Deer and wildlife viewing areas which are typically gated. Visitors often park their vehicles along the gravel shoulders at key viewing locations such as the north terminus of Key Deer Boulevard and the east terminus of Watson Boulevard (**Figure 4.8**) and enter the Refuge by foot. Based on the Refuge’s mission of resource protection and stakeholder input, establishing parking at these locations is not preferred.



Figure 4.7: Blue Hole Interpretive Site Parking Area



Figure 4.8: Gravel Shoulder at Watson Boulevard Terminus on No Name Key

4.3 Regional Traffic Volume Summary

Traffic volumes within the NKDR transportation study area have been collected and maintained by the Florida Department of Transportation (FDOT). **Table 4.2** shows the available average annual daily traffic (AADT) volumes from the past five years, where available.

Supplemental traffic volume information was obtained at the intersection of US 1 and Key Deer Boulevard/Wilder Road. Intersection turning movement counts (TMCs) were conducted during peak and non-peak periods. Based upon hourly traffic count information collected by FDOT along US 1, the peak period generally occurs on a Friday from 4:00 PM to 6:00 PM. An off-peak count was also conducted from 9:00 AM to 11:00 AM on a Friday. The turning movement counts were conducted on Friday, November 5, 2010. Peak times during the collection period were from 10:00 AM to 11:00 AM

Roadway	Location	2005 AADT	2006 AADT	2007 AADT	2008 AADT	2009 AADT
Key Deer Boulevard	North of Gulf Boulevard	-	-	-	-	700
	North of Watson Boulevard	-	-	-	-	2,500
	North of US 1/Wilder Road	7,600	9,900	11,000	10,700	10,700
US 1	East of North Pine Channel	18,000	26,500	20,000	16,600	18,600
	East of 1 st Street	18,800	18,700	18,200	16,300	19,600

Source: FDOT Traffic Information 2009

Note: - Indicates data was not available

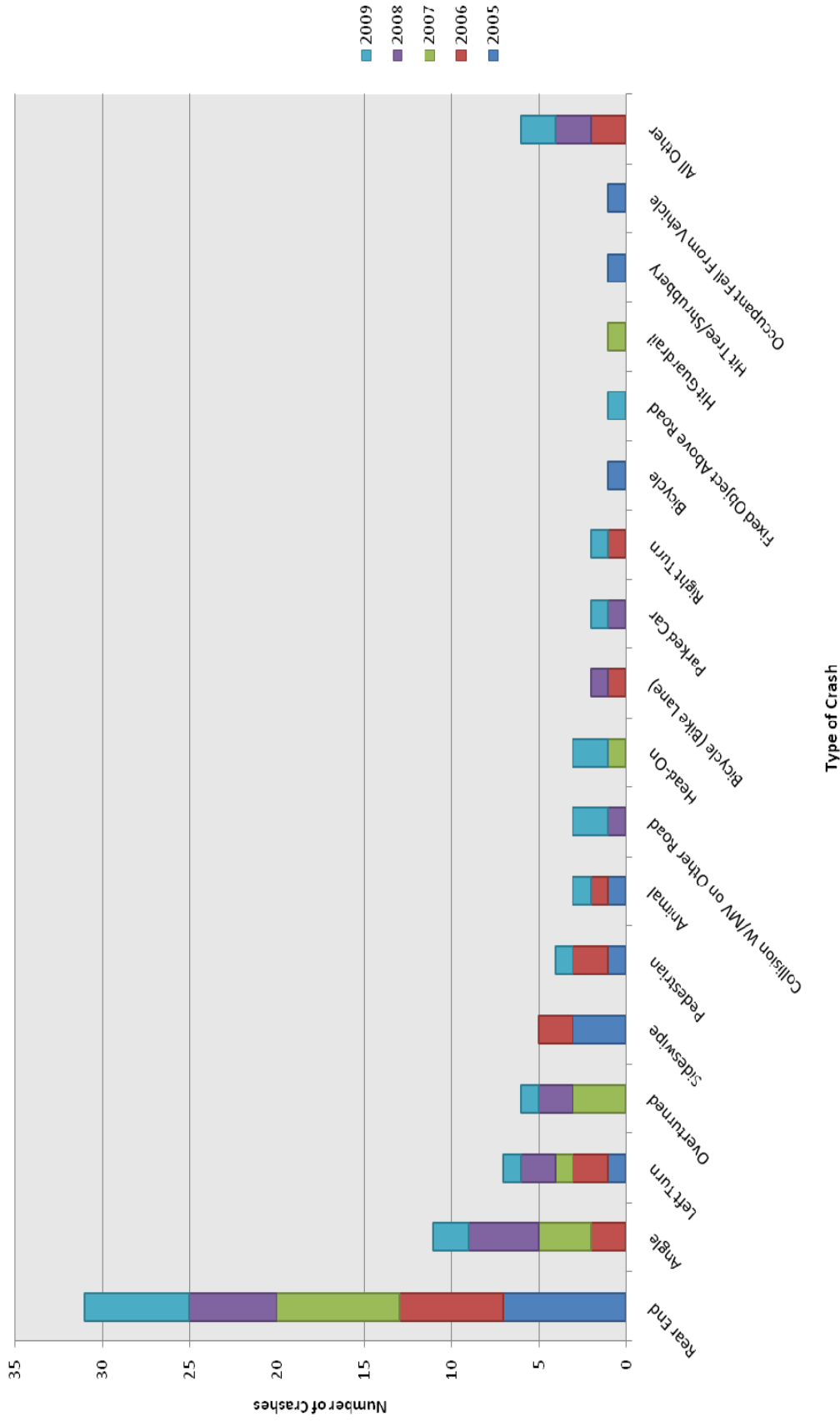
and from 4:45 PM to 5:45 PM. Based on the count data there is limited pedestrian travel at this intersection. Key movements at this intersection are the eastbound left-turn from US 1 to Key Deer Boulevard and its reciprocal movement. A summary of the collected traffic count data is presented in **Appendix D: Supporting Data**.

4.4 Crash Summary

Based on data obtained from the Monroe County Sherriff Office, 90 crashes occurred along the portion of US 1 within Big Pine Key from 2005 through 2009. Over the five-year period, 16 crashes occurred at or adjacent to the signalized intersection at Key Deer Boulevard. No more than two crashes occurred within the five-year period at any other locations. Over one-third of the crashes within the study area were rear-end crashes. Collisions with an animal only accounted for three of the 90 crashes reported; however, collisions with animals are often not reported to law enforcement agencies unless property damage occurs.

Crash report summaries for major Refuge area roadways were obtained from Monroe County's Sheriff Office. **Table 4.3** summarizes crash frequency by street. As shown, Key Deer Boulevard has the highest number of crashes from 2005-2009. **Figure 4.9** also shows crashes by type.

Crashes by Type



Source: Monroe County Sheriff's Department

Figure 4.9: US 1 Crash Summary by Type

Roadway	2005	2006	2007	2008	2009	Total
Key Deer Boulevard	38	48	38	33	61	218
Wilder Road	1	6	2	2	1	12
Long Beach Road	0	0	0	4	0	4
Watson Boulevard	3	6	4	6	5	24
South Street	0	2	2	0	1	5
Big Pine Street	2	1	2	0	0	5
Koehn Avenue	1	0	0	0	0	1
Avenue B	1	3	1	1	1	7

Source: Monroe County Sheriff's Department

4.5 Future Land Use

It is the goal of Monroe County to manage future growth to preserve the rural or low density community character, protect the natural environment of the Lower Keys, and maintain and encourage commercial revitalization along US 1 corridor, including promotion of small businesses.

For many years, there was a moratorium on residential development on Big Pine Key and No Name Key because the segment of US 1 that passes through Big Pine had been found to have an inadequate level of service. This has limited residential development and other development on the island.

During the Livable CommuniKeys Program process the community indicated that additional commercial development should be oriented to the local community rather than the regional or tourist economy.¹ New development should be kept at a small scale to maintain the rural and suburban character of the islands envisioned by the community. Currently, Big Pine Key has a mix of locally owned businesses, franchises and national chain stores. Many of the businesses, such as grocery stores, drug stores, banks, and restaurants serve not only the residents of Big Pine Key, but also other areas of the Lower Keys. The Monroe County Future Land Use Map is shown in **Figure 4.10**. The types of land use vary from Residential High (RH) density to commercial designations such as Mixed Use/Commercial (MC).

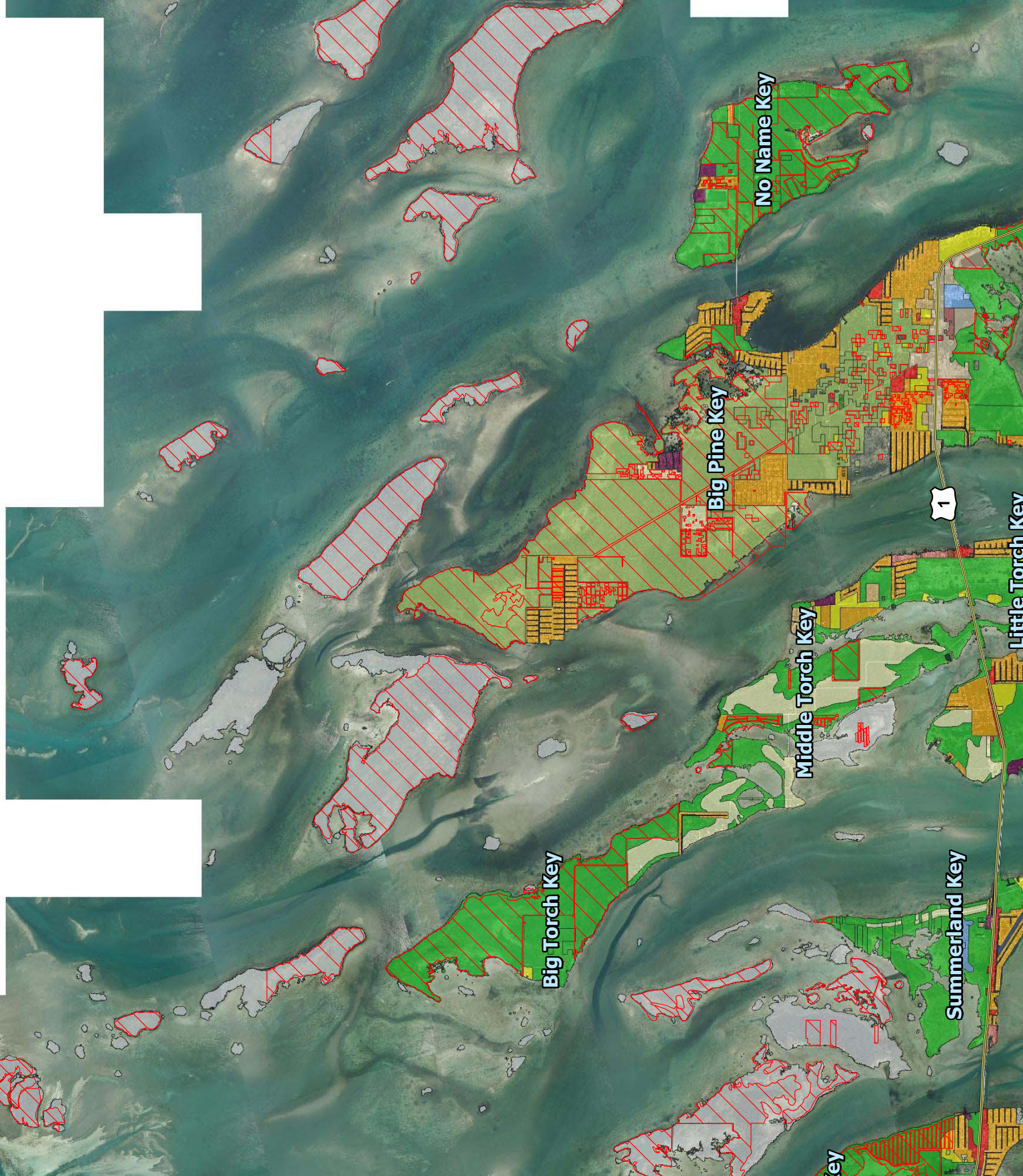
Future development within the study area is governed by the Habitat Conservation Plan (HCP)². The HCP uses a Population Viability Analysis model to evaluate the impacts of development scenarios on the Key Deer population. The Master Plan for Future Development of Big Pine Key and No Name Key, developed in accordance with the HCP and adopted by Monroe County in December 2004, determines the rate of growth and development standards in the project area over the next 20 years.

¹ Monroe County Planning and Environmental Resources Department. Livable CommuniKeys Master Plan for Big Pine Key and No Name Key Original BOCC Adoption 08/2004: Amended by Ordinance 020-2009.

² Monroe County. Habitat Conservation Plan for Florida Key Deer (*Odocoileus virginianus clavium*) and other Protected Species on Big Pine Key and No Name Key. Monroe County, Florida. April 2003: April 2006 Revision.

Legend

- U.S. Highway 1 (State Road)
- National Key Deer Refuge
- National Key Deer Refuge
- Monroe County - Land Use**
- RESOLUTION 217-1984
- ACCC
- AD - AIRPORT
- CD - CONSERVATION DIS
- CFA - COMMERCIAL FIS
- CFSD - COMMERCIAL FIS
- CFV - COMMERCIAL FIS
- DR - DESTINATION RES
- I - INDUSTRIAL
- INC - INCORPORATED
- IS - IMPROVED SUBDIV
- MF - MILITARY FACILITIES
- MI - MARITIME INDUSTRIAL
- MN - MAINLAND NATIVE
- MU - MIXED USE
- NA - NATIVE AREA
- OS - OFFSHORE ISLAND
- PR - PARK AND REFUGE
- RV - RECREATIONAL VE
- Research
- SC - SUBURBAN COMM
- SR - SUBURBAN RESID
- SR-L - SUBURBAN RESI
- SS - SPARSELY SETTLE
- UC - URBAN COMMERC
- UR - URBAN RESIDENT
- URM - URBAN RESIDEN
- URM-L - URBAN RESIDE



Bah

4.6 Planned Area Transportation Improvement Projects

The FDOT has numerous projects programmed within the Refuge boundary within the next five years. Project types include resurfacing as well as improvements to the Florida Keys Overseas Heritage Trail (FKOHT). Relevant FDOT projects are summarized in **Table 4.4**.

Table 4.4: FDOT Work Program Summary			
Financial Management No.	Fiscal Year	Project Limits	Project Type
423136-1	2011	US 1 from E. Circle Drive to Crane Boulevard	Resurfacing
423137-1	2011	US 1 from West Indies Drive to Palmetto Avenue	Resurfacing
405612-2	2011	US 1 from Ships Way to Sand Road/from Sands Road to West of Key Deer Crossing	Widen/Resurfacing Existing Lanes
418396-1	2012	FKOHT - Kemp Channel Bridge (MM 23.6)	Bike Path/Trail
422629-1	2012	FKOHT - South Pine Channel Bridge (MM 29)	Bike Path/Trail
250589-3	2011	US 1 - Big Spanish Canal (Bahia Honda)	Bridge Repair
422628-1	2012	FKOHT - Spanish Harbor Bridge (MM 33)	Bike Path/Trail
425401-1	2011	US 1 – Spanish Harbor Bridge	Bridge Repair
426119-1	2012	US 1-Bahia Honda Bridge	Bridge Repair
428298-1	2011	US 1 from MM 0 to MM 106	Signage Improvements

Source: FDOT

No roadway capital improvement projects are programmed on Big Pine Key in the most recent version of Monroe County’s Capital Improvement Program.

4.7 FKOHT User Volume Summary

The Florida Department of Environmental Protection (FDEP) maintains the existing FKOHT that parallels US 1 within the study area. A count station is located on the trail within the study area and the user volumes are summarized in **Table 4.5**. Note there are two spikes in the data but it is understood that the equipment was working properly. Also note that this area was actively under construction from May 2010 to December 2010.

The average monthly pedestrian/bicyclist volume on FKOHT was over 7,400 people with the inclusion of the peak months and over 6,300 people excluding the peak months.

Table 4.5: FKOHT User Volume Summary			
Month	Visitor Volumes		
	2009	2010	2011
January	n/a	4,822	3,729
February	n/a	8,088	4,855
March	n/a	8,325	6,387
April	n/a	7,615	14,335
May	3,047	n/a	5,726
June	7,040	n/a	9,202
July	6,303	n/a	n/a
August	7,995	n/a	n/a
September	4,595	n/a	n/a
October	18,418	n/a	n/a
November	8,321	n/a	n/a
December	5,064	n/a	n/a

n/a = not available or under construction

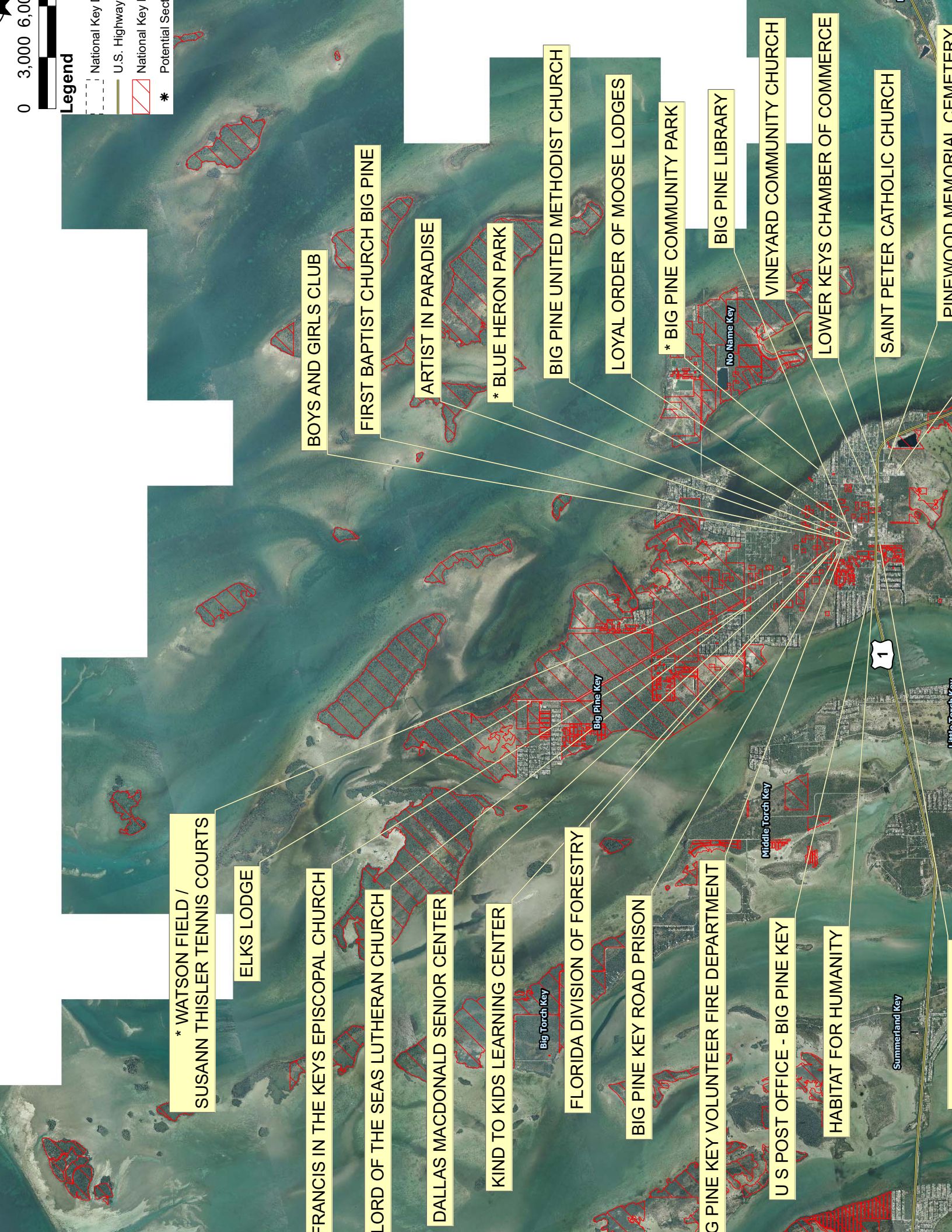
Source: FDEP

5. Community and Environment

5.1 Community Features and Potential 4(f) Resources





A review of parks and campgrounds, places of worship, community centers, social services, government facilities, daycare facilities, cultural centers, cemeteries, schools, fire stations, correctional facilities, law enforcement facilities, hospitals and health centers in the vicinity of the NKDR was performed using GIS data available from the Florida Geographic Library (www.fgdl.org). Ground truthing of the data was performed during the field reconnaissance conducted on October 26, 2010. A summary of the observed community features on Big Pine Key and No Name Key is shown in **Table 5.1**, with the locations depicted in **Figure 5-1**. It is expected that the parks would be considered potential 4(f) resources.

Community Feature	Name	Location
Parks	Watson Field/Susann Thisler Tennis Courts	Key Deer Boulevard
	Big Pine Community Park	31009 Atlantis Drive
	Blue Heron Park	Wilder Road and Lytton Road
Places of worship	Saint Peter Catholic Church	31300 US 1
	Big Pine United Methodist Church	280 Key Deer Boulevard
	First Baptist Church Big Pine	300 Key Deer Boulevard
	Vineyard Community Church	100 County Road
	Lord of the Seas Lutheran Church	1250 Key Deer Boulevard
	Saint Francis in the Keys Episcopal Church	1600 Key Deer Boulevard
Community centers	Lower Keys Chamber of Commerce	31020 US 1
	Dallas McDonald Senior Center	380 Key Deer Boulevard
	Loyal Order of Moose Lodges	21st St & Wilder Road
	Elks Lodge	28481 Kyle Boulevard
Social services	Boys and Girls Club	30150 South Street
	Habitat for Humanity	30320 US 1
Government facilities	Big Pine Key U.S. Post Office	29959 US 1
	Florida Division of Forestry	400 Key Deer Boulevard
	Monroe County Animal Shelter	Industrial Street
Daycare facilities	Kind to Kids Learning Center	30070 Pond Lane
Cultural centers	Artist in Paradise	221 Key Deer Boulevard
	Big Pine Library	213 Key Deer Boulevard
Cemetery	Pinewood Memorial Cemetery	31140 US 1
School	Big Pine Academy	30220 US 1
Fire Station	Big Pine Key Volunteer Fire Department	400 Key Deer Boulevard
Correctional Facility	Big Pine Key Road Prison	450 Key Deer Boulevard



0 3,000 6,000

Legend

-  National Key I
-  U.S. Highway
-  National Key
-  Potential Sect

* WATSON FIELD /
SUSANN THISLER TENNIS COURTS

ELKS LODGE

FRANCIS IN THE KEYS EPISCOPAL CHURCH

LORD OF THE SEAS LUTHERAN CHURCH

DALLAS MACDONALD SENIOR CENTER

KIND TO KIDS LEARNING CENTER

FLORIDA DIVISION OF FORESTRY

BIG PINE KEY ROAD PRISON

BIG PINE KEY VOLUNTEER FIRE DEPARTMENT

U S POST OFFICE - BIG PINE KEY

HABITAT FOR HUMANITY

BOYS AND GIRLS CLUB

FIRST BAPTIST CHURCH BIG PINE

ARTIST IN PARADISE

* BLUE HERON PARK

BIG PINE UNITED METHODIST CHURCH

LOYAL ORDER OF MOOSE LODGES

* BIG PINE COMMUNITY PARK

BIG PINE LIBRARY

VINEYARD COMMUNITY CHURCH

LOWER KEYS CHAMBER OF COMMERCE

SAINT PETER CATHOLIC CHURCH

PINEWOOD MEMORIAL CEMETERY

Big Torch Key

Big Pine Key

Middle Torch Key

Summerland Key

No Name Key



5.2 Demographic Profile of Study Area

The NKDR study area on Big Pine Key is located in Monroe County between Sunshine and Ramrod Keys. According to the US. Census Bureau, the study area is located within Census Blocks 9714 and 9715. The population of Monroe County has decreased over the past decade, experiencing almost 10% decline from 2000 to 2010. Note that detailed 2010 census data was not yet available for this area at the time of publication of this report.

Tourism and tourist related industries are the major sources of revenue in Monroe County. According to Monroe County Growth Management Department, 2005 saw a slight decrease in the number of cruise ships stopping in Key West’s port and the number of visitors driving by car. This can be partly attributed to four hurricane events.³ However, the Key West International Airport continues to see an increase in the number of passenger enplanements from five commercial airline services. Top recreational activities in the area include (in order by ranking) dining out/night life, sightseeing/attractions, beach activities, viewing wildlife and museums/historic areas. US 1 on Big Pine Key carries traffic volumes approaching 20,000 vehicles per day, with considerably heavier volumes during peak season.

The Livable CommuniKeys Masterplan, a planning effort carried out by Monroe County based on community participation, indicates that most of the population on Big Pine Key lives north of U.S. 1. Nearly 25% of the permanent household population is in rented units. During the winter season the population increases by nearly 38% to an estimated 6,944 people. The average persons per household on Big Pine Key are 2.21 and on No Name Key it is 2.48. The 2000 Census reports that the per capita income on Big Pine Key was \$23,169. The per capita income of Monroe County was \$26,102. Within the County a reported 7,977 individuals had incomes that placed them below the poverty level, roughly 10.2%. On Big Pine Key the ratio remains similar, with 472 individuals below the poverty level (roughly 9.5%)⁴. **Table 5.2** shows the population figures in Monroe County and cities in proximity to NKDR.

Location	April 1, 2008	April 1, 2000	Total Change	Percent Change
Monroe	76,081	79,589	-3,508	-4.4%
Islamorada	7,113	6,846	267	3.9%
Key Colony Beach	854	788	66	8.4%
Key West	23,024	25,478	-2,454	-9.6%
Layton	205	186	19	10.2%
Marathon	10,097	10,255	-158	-1.5%
UNINCORPORATED	34,788	36,036	-1,248	-3.5%

Source: Estimates of Population by County and City in Florida: April 1, 2008:

http://www.bebr.ufl.edu/files/2008_Estimates_Table01_0.pdf

³ http://www.monroecounty-fl.gov/Pages/MonroeCoFL_admin/about

⁴ Monroe County Planning and Environmental Resources Department. Livable CommuniKeys Master Plan for Big Pine Key and No Name Key. Original BOCC Adoption 08/2004: Amended by Ordinance 020-2009.

5.3 Environmental Justice Impacts

According to the U.S. Environmental Protection Agency (EPA) Compliance and Enforcement department:

“Environmental Justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. EPA has this goal for all communities and persons across this Nation. It will be achieved when everyone enjoys the same degree of protection from environmental and health hazards and equal access to the decision-making process to have a healthy environment in which to live, learn, and work.”⁵

For the purposes of this report, population, income, and race in Monroe County and municipalities surrounding the NKDR are reported in the following sections.

5.3.1 Poverty

According to the U.S. Census Bureau, Census 2000 summary data, the percentage of families and individuals below the poverty level at both the state and national levels is 12%. The poverty level of Monroe County is 10%, lower than both state and national poverty levels.

Table 5.3 shows the percentage of individuals below the poverty level in the study area and within select municipalities relative to the national total. Detailed information on income can be found in **Appendix D: Supporting Data**.

Table 5.3: Poverty Level in Study Area and Select Municipalities							
	United States	Big Pine Key	Islamorada	Key Colony Beach	Key West	Layton	Marathon
Total:	273,882,232	4,988	6,718	740	24,757	240	10,030
Income in 1999 below poverty level:	33,899,812	472	466	55	2,535	37	1,422
% below poverty level	12%	9%	7%	7%	10%	15%	14%

Source: US Census Bureau, 2000 Census

5.3.2 Income

Based on US Census data, median household income in the study area, \$43,021, exceeds the national median household income of \$41,994. Median household income in Big Pine Key was \$44,514, Islamorada, \$41,552, and Key West, \$43,021.

⁵ www.epa.gov/environmentaljustice/index.html

Table 5.4 shows the median household income in the study area and within select municipalities relative to the national median. Detailed information on income can be found in **Appendix D: Supporting Data**.

Table 5.4: Median Household Income in the Study Area and Select Municipalities (in dollars)							
	United States	Big Pine Key	Islamorada	Key Colony Beach	Key West	Layton	Marathon
Median household income in 1999	\$41,994	\$44,514	\$41,522	\$45,577	\$43,021	\$53,750	\$36,010

Source: US Census Bureau 2000

5.3.3 Race

Whites make up the largest race category within the study area at 88.98%. Blacks or African Americans comprise 6.12%. The state average of Blacks or African Americans is 14.47% and the national average is 12.21%. Although not the majority, Blacks or African Americans comprise a significant portion (9.16%) of the population in Key West. No other race categories make up a significant percentage of the population in the study area.

Table 5.5 shows the number of individuals by race in the study area and within select municipalities relative to national values. Detailed information on income can be found in **Appendix D: Supporting Data**.

Table 5.5: Individuals by Race in the Study Area and Select Municipalities							
	United States	Big Pine Key	Islamorada	Key Colony Beach	Key West	Layton	Marathon
White alone	211,353,725	4,718	6,716	730	21,575	221	9,241
Black or African American alone	34,361,740	89	8	0	2,335	0	541
American Indian and Alaska Native alone	2,447,989	0	7	3	131	0	15
Asian alone	10,171,820	82	39	2	199	13	28
Native Hawaiian and Other Pacific Islander alone	378,782	0	13	0	0	0	0
Some other race alone	15,436,924	39	18	0	538	0	245
Two or more races	7,270,926	121	46	9	702	6	124
Total:	281,421,906	5,049	6,847	744	25,480	240	10,194

Source: US Census Bureau, 2000 Census

5.4 Air Quality

The NKDR is located in Monroe County, Florida, which is currently in attainment for all of the National Ambient Air Quality Standards (NAAQS) criteria pollutants (ozone, nitrogen dioxide, particulate matter, sulfur oxides, carbon monoxide and lead).

5.5 Habitat

The NKDR is comprised of saltwater wetlands and uplands consisting of pinelands, hammock, salt marsh, buttonwood, mangrove and scrub mangrove. These habitats are the primary habitat for numerous federally endangered or threatened species including the Lower Keys Marsh Rabbit, the Silver Rice Rat, and the Key Deer.

5.5.1 Biotic Communities

The study area is underlain by Key Largo Limestone, formed from ancient reefs and made up of mostly very porous material. The Lower Keys are known as the Oolitic Keys because they are primarily composed of oolites, small spherical grains of calcium carbonate cemented together to form a limestone. Geological and biological processes that date to the Pleistocene Period were instrumental in forming the reefs and the Florida Keys of today.

The warm temperatures and shallow waters typical to the Keys provide ideal conditions for the growth of coral reefs, which predominate along the Keys island chain.

According to the County's Advanced Identification of Wetlands (ADIA) Program, the main types of habitat in the study area are saltwater wetlands and uplands consisting of pinelands, hammock, salt marsh, buttonwood, mangrove and scrub mangrove.

Figure 5.2 shows the estuarine and marine deepwater as well as the estuarine and marine wetlands.

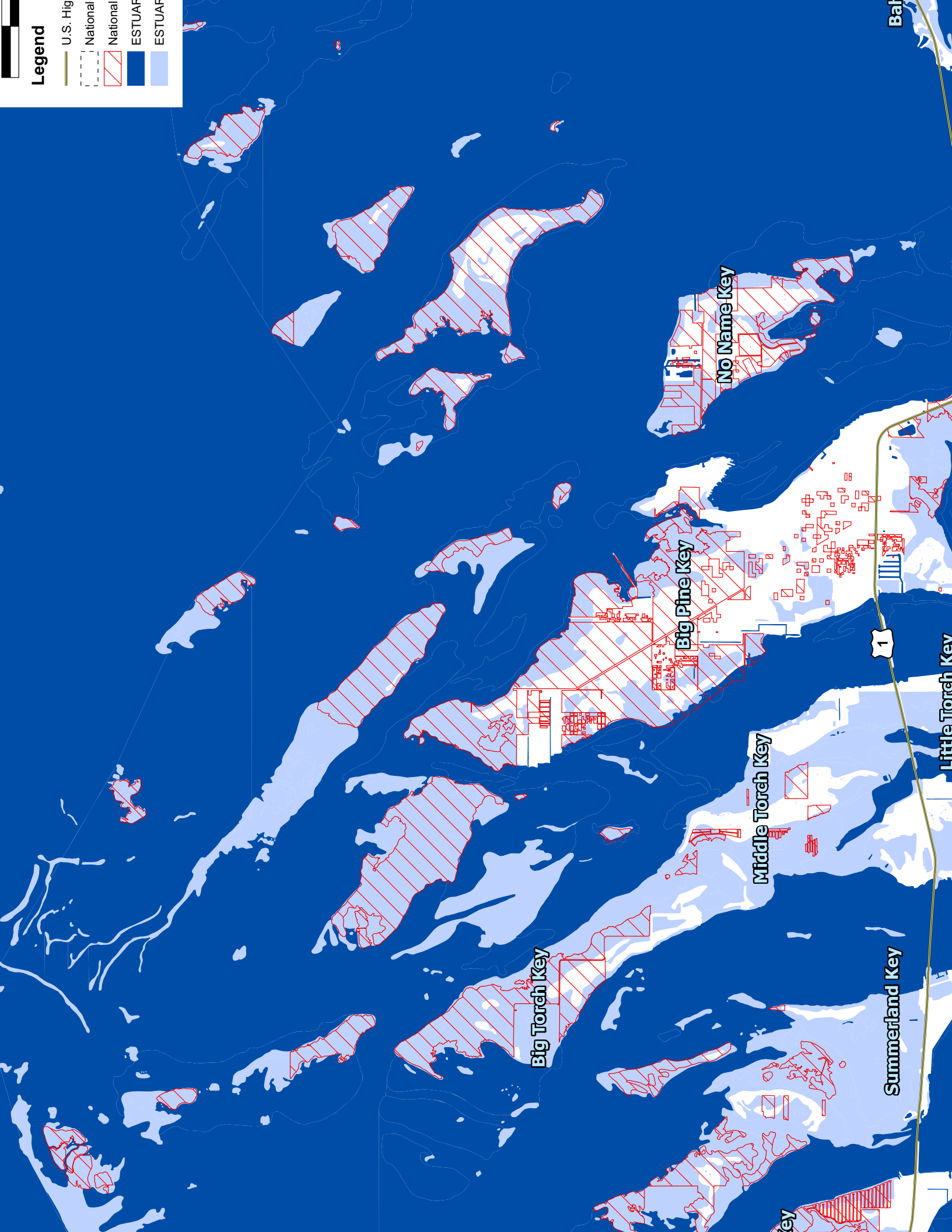
The following habitat descriptions were excerpted from the HCP⁶.

5.5.1.1 Pineland

Pinelands (**Figure 5.3**) are upland forest communities with an open canopy dominated by native slash pine (*Pinus elliottii* var. *densa*). Keys pinelands are fire-adapted and dependent on periodic fires for their long-term persistence. Surrounded by wet prairie habitats and/or mangroves, pinelands typically occur on locally elevated areas of bedrock, which may flood seasonally or during extreme storm events. Xeric conditions in this habitat are partly caused by locally low rainfall and the exposed rock ground cover.

The extent of sub canopy development in a pineland is dependent upon the frequency of surface fires. Pinelands on Big Pine Key typically have a well-developed sub canopy consisting of palms (silver thatch

⁶ Monroe County. Habitat Conservation Plan for Florida Key Deer (*Odocoileus virginianus clavium*) and other Protected Species on Big Pine Key and No Name Key. Monroe County, Florida. April 2003: April 2006 Revision.



Bah

Legend

- U.S. Hig
- National
- National
- ESTUAF
- ESTUAF

No Name Key

Big Pine Key

Middle Torch Key

Big Torch Key

1

Summerland Key

Little Torch Key

Key



Figure 5.3: Pinelands (typ.) after recent controlled burn

palm, *Coccothrinax argentata*; Key thatch palm, *Thrinax morissii*; thatch palm, *T. radiata*; saw palmetto *Serenoa repens*⁷. Other species found in the pineland understory include strongbark (*Bourreria cassinifolia*), locust berry (*Byrsonima lucida*), silver thatch palm, pineland croton (*Croton linearis*), rough velvetseed (*Guettarda scabra*), wild sage (*Lantana involucrata*), and long-stalked stopper (*Psidium longipes*). Shrub vegetation in Lower Keys pinelands varies in composition and density. For example, Big Pine Key pinelands have a low and sparse ground covering of grasses and bare limestone, whereas on Cudjoe, Little Pine, and No Name Keys a continuous hardwood understory of six meters height or more is present due to prolonged absence of fire.

More tropical plant species also occur in the Lower Keys pineland shrub stratum including *Caesalpinia* (*Caesalpinia pauciflora*), dune lily-thorn (*Catesbaea parviflora*), pisonia (*Pisonia rotundata*), and pride-of-Big-Pine (*Strumpfia maritima*). Plant species from adjacent habitats may invade at the pineland margins. For example, gumbo limbo (*Bursera simaruba*), inkwood (*Exothea paniculata*), and wild tamarind (*Lysiloma latisiliquum*) occur in pinelands sited adjacent to a hammock. Only four plant species endemic to South Florida pinelands: partridge pea (*Chamescista lineate*), small-leaved melanthera (*Melanthera parvifolia*), rockland spurge (*Chamaesyce deltoidea* var. *serpyllum*) and sand flax (*Linum arenicola*) occur on Big Pine Key, likely as a result of water table depth, salinity, and other physical variables.

Pinelands occur throughout the project area. Key Deer preferentially utilize this habitat for the permanent freshwater sources that are critical to survival of the species. Key Deer also feed on herbaceous species and the fruits of woody species found in pinelands. The USFWS performs controlled burns within the Refuge to maintain the pineland habitat where possible.

⁷ Habitat Conservation Plan for Florida Key Deer (*Odocoileus virginianus clavium*) and other Protected Species on Big Pine Key and No Name Key, Monroe County, Florida. April 2003: April 2006 Revision.

5.5.1.2 Hammock

Tropical hardwood hammocks represent the climax upland community type in the Florida Keys and are second to pinelands in terms of biodiversity. Tropical hardwood hammocks in the Florida Keys are closed, broad-leaved forests that occupy elevated, well-drained and relatively fire-free areas. Hammocks in the Lower Keys are more widespread than pinelands, except for Big Pine Key where the area of pineland is greater than that of hammock. Approximately 560 acres of hammock occur on Big Pine Key and 385 acres on No Name Key.

Canopy trees of the Lower Keys hammocks tend to be smaller than those in hammocks occurring in other parts of Florida, and are often referred to as “low hammock” or “Keys hammock thicket.” Trees commonly found in low hammock generally have a smaller trunk diameter and grow closer together. Species include poisonwood (*Metopium toxiferum*), buttonwood (*Conocarpus erectus*), blolly (*Guapira discolor*), Key thatch palm, Spanish stopper (*Eugenia foetida*), wild dilly (*Manilkara bahamensis*), Jamaica dogwood (*Piscidia piscipula*), and white stopper (*Eugenia axillaris*). Other species present on the windward side of low hammocks, referred to as transitional hammock or thorn scrub, include black torch (*Erithalis fruticosa*), saffron plum (*Bumelia celastrina*), sea grape (*Coccoloba uvifera*), blackbead (*Pithecellobium guadalupense*), indigo berry (*Randia aculeata*), tallowwood (*Ximenia americana*), darling plum (*Reynosia septentrionalis*), joewood (*Jacquinia keyensis*), barbed-wire cactus (*Cereus pentagonus*), and prickly pear cactus (*Opuntia stricta*).

Herbaceous plants are largely absent from Keys hammocks. Grasses include low panicum (*Panicum* spp.) and sour paspalum (*Paspalum conjugatum*). In addition, hammocks support a diverse flora of orchids, ferns, bromeliads, and other epiphytes, and are home to the federally endangered Key tree-cactus (*Pilosocereus robinii*).

Tropical hammocks provide shelter for many animals during periods of high water and also nesting, feeding and roosting sites for many local and migratory birds. Key Deer primarily utilize this habitat for cover, cool shelter, fawning and bedding. Other endangered and threatened species found in these areas in the Florida Keys include the Lower Keys marsh rabbit and eastern indigo snake. Additionally, tropical hardwood hammocks in south Florida provide essential habitat for the white-crowned pigeon (*Columba leucocephala*), Schaus’ swallowtail butterfly (*Papilio aristodemus ponceanus*), and tree snails (*Liguus* spp.).

5.5.1.3 Freshwater Wetlands

Freshwater wetlands are restricted to areas landward of the seasonal high tide line and in the Lower Keys are found in areas underlain by freshwater lenses. The persistence of freshwater ecosystems is limited primarily by freshwater availability, tidal influence, and human activities, including direct and indirect effects of development such as draw-down and contamination. During the dry season, freshwater lenses of Big Pine Key can diminish by as much as 50 percent. Freshwater wetlands are located in the northern and central portions of Big Pine Key and are present in one parcel on No Name Key, representing 689.4 and 3.4 acres, respectively.

This habitat type is dominated by saw grass (*Cladium jamaicense*) and spike rush (*Eleocharis* spp.). Forested freshwater systems in the Keys are generally pinelands with a saw grass understory. Freshwater wetlands are typically found in isolated, seasonally flooded depressions with elevations of +3.0 feet National Geodetic Vertical Datum (NGVD) or less and may be found in conjunction with pinelands. Freshwater wetlands provide critical habitat for several listed species, in particular the Key Deer and Lower Keys marsh rabbit (*Sylvilagus palustris hefneri*). These habitats and surface waters represent the only dry season source of freshwater for wildlife and play an important role in attenuating nutrients and other contaminants in surface water runoff.

5.5.1.4 Salt Marsh and Buttonwood

Salt marshes and buttonwood associations (**Figure 5.4**) occur in coastal locations similar to mangrove wetlands. Salt marshes are non-woody, salt-tolerant communities that are occasionally inundated with salt water. Two types of salt marsh are found in the Florida Keys, low marsh and high marsh. Low marsh species include salt-tolerant herbs such as glasswort (*Salicornia* spp.) and Keygrass (*Monanthochloe littoralis*), while high marsh is dominated by Gulf cord grass (*Spartina spartinae*), fringe rushes (*Fimbristylis* spp.), and sea-oxeye daisy (*Borrchia frutescens*).



Figure 5.4: Salt Marsh and Buttonwood

Buttonwood associations border high marsh communities and have similar ecological characteristics. Plant species that inhabit this community prefer low-energy waves with little tidal disturbance. Buttonwood forests are dominated by the silver buttonwood (*Conocarpus erectus*). Other species include salt-tolerant herbaceous perennials and woody shrubs such as fringe-rushes, Keygrass, Gulf cordgrass, and seashore dropseed (*Sporobolus virginianus*). There are approximately 685 acres of buttonwood marsh on Big Pine Key and 170 acres on No Name Key.

Salt marsh/buttonwood marsh communities provide important habitat for terrestrial species including the Federally endangered Lower Keys marsh rabbit, Silver Rice Rat (*Oryzomys argentatus*), and diamondback terrapin (*Malaclemys terrapin*). Buttonwood areas provide herbaceous foods and loafing areas for Key Deer. Common residents include polychaetes, gastropod mollusks, bivalve mollusks and

crustaceans. Birds tend to use the marsh for feeding rather than for nesting. A few species of birds, fish, reptiles, or mammals can be considered residents of salt marshes; larger longer-lived organisms are not tolerant of the environmental fluctuations.

5.5.1.5 Mangrove and scrub mangrove

Mangrove communities consist of facultative halophytes, which are tolerant of anaerobic saline soils and tidal inundation. Three species are found in Florida: the red mangrove (*Rhizophora mangle*), black mangrove (*Avicennia germinans*), and white mangrove (*Laguncularia racemosa*).

In general, the zonation of mangrove communities is regulated by elevation. Red mangroves occur in the middle and lower intertidal zone and upper subtidal zone. Black mangroves dominate the upper intertidal zone and are generally found between the red and white species. White mangroves occur on the landward edge of mangrove forests, throughout the intertidal and in the upper portions of the swamp. Ground cover within a mangrove forest consists of leaf litter and decomposing forest debris.

Throughout the Florida Keys, mangrove forests form the predominant coastal vegetation community. Mangroves are found along the edges of shorelines, bays and lagoons and on over wash areas throughout the Keys. Major limiting factors on mangrove establishment, growth and persistence in the Florida Keys appear to be water quality, substrate, and development. Mangrove habitat occurs on approximately 1,495 acres of Big Pine Key and 374 acres of No Name Key.

Mangrove communities in the Florida Keys provide essential habitat for numerous ecologically and economically important species. The leaves and fruits of red and black mangroves are a primary food source for the Key Deer, which spend considerable time foraging in tidal wetlands. In South Florida, mangroves are important habitat for at least 220 fish species, 24 reptile and amphibian species, 18 mammal species, and 181 bird species, and provide nesting habitat for a number of threatened and endangered species. Dissolved organic matter from mangroves serves as an alternate food source, the basis for heterotrophic microorganism food webs, and a source of chemical cues for estuarine species.

5.5.2 Listed Species and U.S. Fish and Wildlife Service Focus Areas

A biodiversity matrix search of the Florida Natural Areas Inventory database was performed and the CCP⁸ was reviewed to determine the potential for the occurrence of listed species within the project vicinity. A summary of the state and federally listed species potentially occurring within the project vicinity is included in **Table 5.6**.

As part of the review of the National Flood Insurance Program's (NFIP) activities in the Florida Keys USFWS re-evaluated how it reviews the impacts on listed species from the FEMA NFIP. A revised biological opinion was prepared. The review of impacts outlined an improved strategy for protecting threatened and endangered species and their habitats. Focus areas were developed for four species: Key Deer, Eastern Indigo Snake, Lower Keys Marsh Rabbit and Silver Rice Rat. For the purposes of this

⁸ USFWS Southeast Region. Lower Florida Keys National Wildlife Refuges Comprehensive Conservation Plan. October 2009.

**Table 5.6: State and Federally listed species
that have the potential to occur within the project vicinity**

Common Name	Scientific Name	Federal Status	State Status
Birds			
Piping Plover*	<i>Charadrius melodus</i>	T	T
Roseate Tern	<i>Sterna dougallii</i>	T	T
Red Knot*	<i>Calidris canutus rufa</i>	C	N
Kirtland's warbler	<i>Dendroica kirtlandii</i>	E	
Least Tern	<i>Sterna antillarum</i>	N	T
Florida burrowing owl	<i>Athene cunicularia floridana</i>	N	SSC
White-crowned Pigeon	<i>Patagioenas leucocephala</i>	N	T
Wading Birds, Little blue heron, Tricolored heron, Snowy egret, White ibis, Limpkin	<i>Egretta caerulea, Egretta tricolor, Egretta thula, Eudocimus albus, Aramus guarauna</i>	N	SSC
Mammals			
Key Deer	<i>Odocoileus virginianus clavium</i>	E	E
Silver Rice Rat	<i>Oryzomys palustris natator</i>	E	E
Lower Keys Marsh Rabbit	<i>Sylvilagus palustris hefneri</i>	E	E
West Indian manatee	<i>Trichecus manatus</i>	E	E
Reptiles			
Key Ringneck Snake	<i>Diadophis punctatus acricus</i>	N	T
Lower Keys Ribbon Snake	<i>Thamnophis sauritus</i>	N	T
Lower Keys Brown Snake	<i>Storeria dekayi</i>	N	T
Eastern Indigo Snake	<i>Drymarchon couperi</i>	T	T
American alligator	<i>Alligator mississippiensis</i>	T(S/A)	SSC
American crocodile	<i>Crocodylus acutus</i>	T	T
Green sea turtle	<i>Chelonia mydas</i>	E	E

**Table 5.6: State and Federally listed species
that have the potential to occur within the project vicinity**

Common Name	Scientific Name	Federal Status	State Status
Hawksbill sea turtle	<i>Eretmochelys imbricate</i>	E	E
Kemp's ridley sea turtle	<i>Lepidochelys kempii</i>	E	E
Leatherback sea turtle	<i>Dermochelys coriacea</i>	E	E
Loggerhead sea turtle	<i>Caretta caretta</i>	T	T
Key Mud Turtle	<i>Kinosternon baurii</i>	N	E
Fish			
Smalltooth sawfish (U.S. Distinct Population Segment)	<i>Pristis pectinata</i>	E (NMFS)	
Invertebrates			
Stock Island tree snail	<i>Orthalicus reses (not including nesodryas)</i>	T	
Bartram's hairstreak butterfly	<i>Strymon acis bartrami</i>	C	
Florida leafwing	<i>Anaea troglodyta floridalis</i>	C	
Miami blue butterfly	<i>Cyclargus thomasi bethunebaker</i>	C	
Plants			
Blodgett's silverbush	<i>Argythamnia blodgettii</i>	C	
Big pine partridge pea	<i>Chamaecrista lineata var. Keyensis</i>	C	
Wedge spurge	<i>Chamaesyce deltoridea spp. Serpyllum</i>	C	
Garber's spurge	<i>Chamaesyce garberi</i>	T	
Sand flax	<i>Linum arenicola</i>	C	
Florida semaphore cactus	<i>Consolea corallicola</i>	C	
Key tree cactus	<i>Pilosocereus robinii</i>	E	

*Possibly occurring based on Lower Florida Keys National Wildlife Refuge Comprehensive Conservation Plan (USFWS, October 2009). E=Endangered, T=Threatened, T(S/A) = Threatened due to similarity of appearance, C=Candidate Species, SSC= Species of Special Concern, N=Not listed. NMFS = National Marine Fisheries Service

study, draft copies of the spatial extent of these habitats were obtained from the USFWS South Florida Ecological Services Office in ArcGIS shape file format. The spatial extent of species focus areas within the study area are depicted in the following subsections. A HCP was prepared and the impacts to these habitats were limited under the HCP. The following provides additional detail regarding these four species. The following information is excerpted from the USFWS's Multi Species Recovery Plan for South Florida and their respective 5-year reviews by USFWS.

5.5.2.1 Florida Key Deer (*Odocoileus virginianus clavium*)⁹ - Figure 5.5

Key Deer utilize all habitat types including pine rock lands, hardwood hammocks, buttonwood salt marshes, mangrove wetlands, freshwater wetlands, and disturbed and developed lands. Key Deer use disturbed and developed lands extensively for foraging, travel, loafing, and socializing. The Key Deer feed primarily on red and black mangrove, but also feed on approximately 160 other plants to meet nutritional requirements. They may use these habitats year-round or seasonally for foraging, cover, shelter, fawning, and bedding. Pine rock lands, in particular, are very important to Key Deer because they contain permanent freshwater sources that are critical to the long-term survival of the species. Only Big Pine, Little Pine, Sugarloaf, Cudjoe, and No Name Keys, support extensive pine rock lands. Key Deer forage on mangroves in tidal wetlands and use open areas for foraging and resting. Key Deer also use residential and commercial areas extensively where they feed on ornamental plants and grasses and where they can seek refuge from biting insects.

The National Key Deer Refuge was established in the 1950s, and the Key Deer was officially listed as federally endangered on March 11, 1967 (32 FR 4001). The Key Deer was listed as an endangered species because of the loss of its habitat to residential and commercial construction and because of high, human-related mortality and human disturbances.

Historically, the maximum population of Key Deer was probably between 600 to 700 individuals occupying about 19,014 acres of habitat in the historical range. Based on the 2010 5-year review for the Key Deer, the estimated population is 646. Due to continued urbanization of Key Deer habitat, there is little opportunity to increase the carrying capacity of the Keys, although habitat enhancement on outlying islands may afford some opportunities. In addition to habitat loss, the persistence of the Key Deer is highly vulnerable to natural events such as hurricanes and sea-level rise.

5.5.2.2 Lower Keys Marsh Rabbit (*Sylvilagus palustris hefneri*)¹⁰ – Figure 5.6

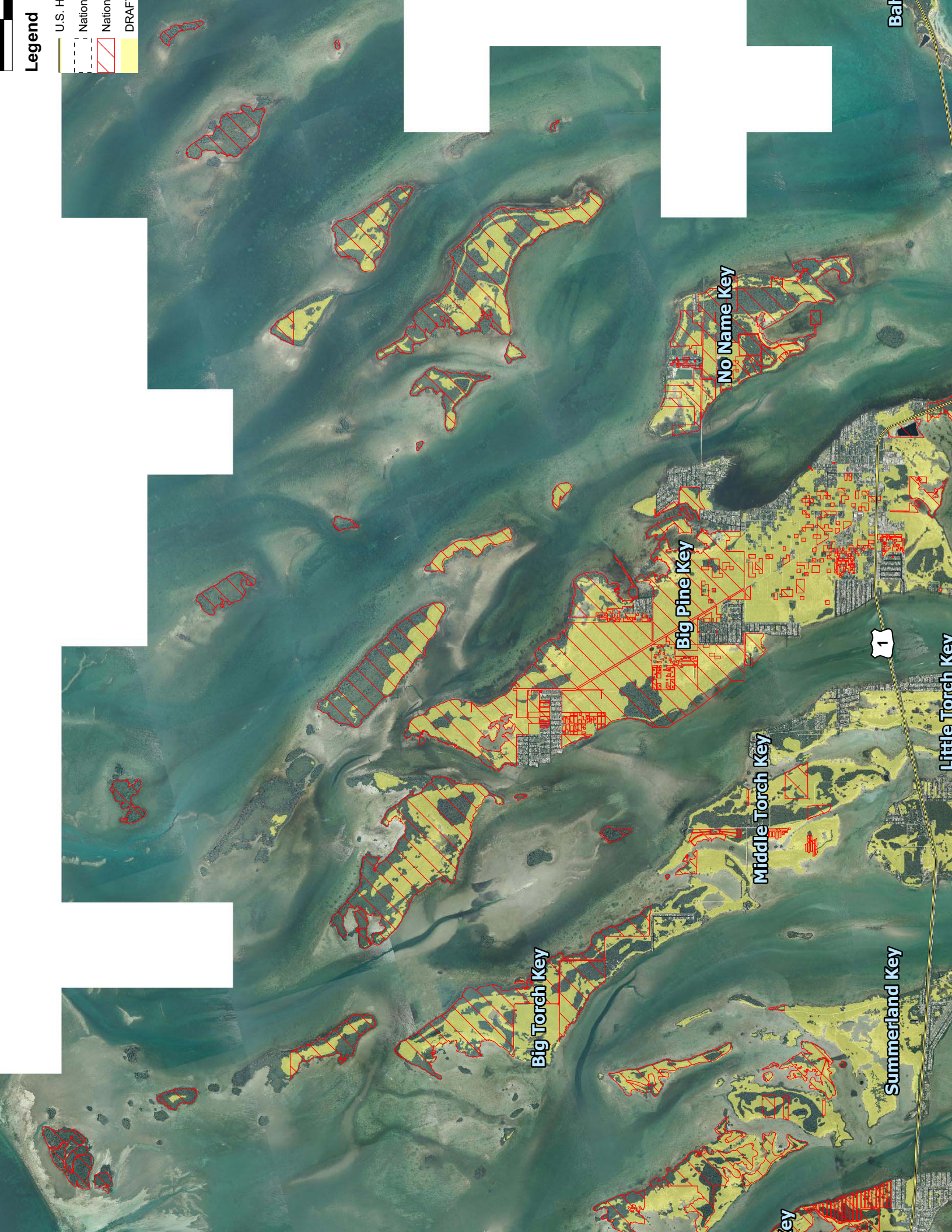
Lower Keys Marsh Rabbits (LKMR) inhabit salt marsh and buttonwood transition areas, freshwater wetlands, and coastal beach berms. As stated previously, freshwater wetlands occupy 689.4 and 3.4 acres, respectively. The LKMR builds mazes of runs, dens, and nests in coastal (saline to brackish) or freshwater, inland marsh habitats. Two plant species, fringerush (*Fimbristylis* sp.) and buttonwood (*Conocarpus erectus*), are often present in the rabbit's habitat. In freshwater marshes, cattails (*Typha*

⁹ USFWS Southeast Region. 5-year Review: Summary and Evaluation Key Deer (*Odocoileus virginianus clavium*). August 2010.

¹⁰ USFWS Southeast Region. 5-year Review: Summary and Evaluation. Lower Keys Marsh Rabbit (*Sylvilagus palustris hefneri*). September 2007.

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latifolia), sawgrass (*Cladium jamaicense*), and sedges (*Cyperus* sp.) are common associates. Sometimes, spikerush (*Eleocharis* sp.) is also found. In coastal marshes, common associates include cordgrass (*Spartina* sp.), saltwort (*Batis maritima*), glasswort (*Salicornia virginica*), sawgrass, and sea ox-eye daisy (*Borrchia frutescens*). The rabbit's runs, dens, and nests are made in cordgrass or sedges.

The LKMR's original range extended from Big Pine Key to Key West encompassing a linear distance of about 30 miles. Historically, LKMR probably occurred on all of the Lower Keys that supported suitable habitat but did not occur east of the Seven-mile Bridge where it is replaced by *S. p. paludicola*.

Based on the 5-year review, three separate metapopulations exist in the Boca Chica area (Boca Chica, Geiger, East Rockland, and Saddlehill Key), the Big Pine Key area (Big Pine, Annette, East Water, Howe, Johnson, Little Pine, Mayo, Newfound Harbor, Porpoise, and No Name Keys), and the Sugarloaf area (Sugarloaf and Saddlebranch Keys). There are also potential habitats on Cudjoe, Ramrod, the Torch Keys and several other small keys.

The LKMR was listed as a federally endangered species on June 21, 1990 (55 FR 25591). The marsh rabbit was listed because of habitat loss and fragmentation, predation by cats, and road mortalities caused by automobiles; critical habitat was not designated. The rabbit was also listed as endangered by the State of Florida in 1989 (F.A.C. 39-27). Current population estimates range between 100 and 300 rabbits in the Lower Florida Keys and numbers appear to be declining. Rangewide surveys were initiated in 2001. There were 228 patches identified and 45% were occupied during 2001 – 2003. Since 2004, suitable habitat patches have been surveyed annually for occupancy by the LKMR. Based on the 2007 USFWS 5-year review, annual patch occupancy surveys show a steep decline in occupancy. The 5-year review noted the Forsys and Humphrey study indicated that the population viability analysis estimated that there was 100% probability of extinction in 50 years. It was, however, noted that due to the larger habitat patch sizes on Big Pine Key, this metapopulation was the most resilient to cat predation and catastrophes.

As urbanization has increased over the past 20 years, construction of new roads, or the improvement of existing roads, has been necessary to accommodate more vehicles. The construction of roads results in two main threats to the LKMR: interference with its dispersal and increased road mortality. Vehicular traffic interferes with dispersal and may prevent essential interchange between subpopulations. Dispersing males are the most vulnerable to road mortality. Dispersal is needed for repopulating sites where rabbits have been extirpated. Since only a portion of the males breed during the year, the loss of these males may lower the likelihood of mating and hence decrease the reproductive potential. The threat of roads and traffic has increased in significance because of the magnitude of habitat fragmentation: the size of the remaining habitat fragments forces more adult males to disperse in order to establish territories, putting them at a greater risk of being killed by cars. Other threats to the LKMR include development, prevalence of hardwood overstories in LKMR patches, hurricane storm surges, sea level rise and invasive exotic plants.

5.5.2.3 Silver Rice Rat (*Oryzomys palustris natator*)¹¹ – Figure 5.7

The Silver Rice Rat is a small wetland rodent adapted to the unique island habitats of the Lower Keys. The Silver Rice Rat differs from the more common marsh rice rat by its rarity, larger body size, lower fecundity, and larger home range size. Populations of these rice rats are found at extremely low densities on 12 islands in the Lower Keys and were listed as endangered primarily because their wetland habitat had been destroyed by residential and commercial construction activities. With a small population size and restricted geographic range, rice rats in the Florida Keys are greatly impacted by loss of habitat. The Refuge considers black rats, exotic snakes, free-ranging cats, sea level rise, and hurricanes potential threats to the Silver Rice Rat.

Silver Rice Rats typically use three zones that are delineated by their salinity and topography: (1) low intertidal areas, (2) salt marsh flooded by spring or storm tides and (3) buttonwood transitional areas that are slightly more elevated and only flooded by storm tides. The low intertidal area is comprised primarily of red and black mangroves with white mangroves, buttonwoods, glasswort, saltwort, and Key grass found on higher elevated areas. These areas are used by Silver Rice Rats mainly during nocturnal activity periods and also for foraging, moving between habitats, and nesting. The low salt marsh area consists of the grasses salt grass (*Distichilis* spp.) and dropseed (*Sporobolus* spp.); interspersed with sea ox-eye (*Borrchia frutescens*), white and black mangrove, and buttonwood, in addition to depression areas that contain saltwort, black mangrove, and glasswort. Silver Rice Rats use this zone mainly for foraging and nesting. The buttonwood transitional salt marsh area is at a higher elevation than other salt marsh habitats, contains a denser coverage of saltgrass, dropseed, and sea ox-eye, and is used for foraging and nesting.

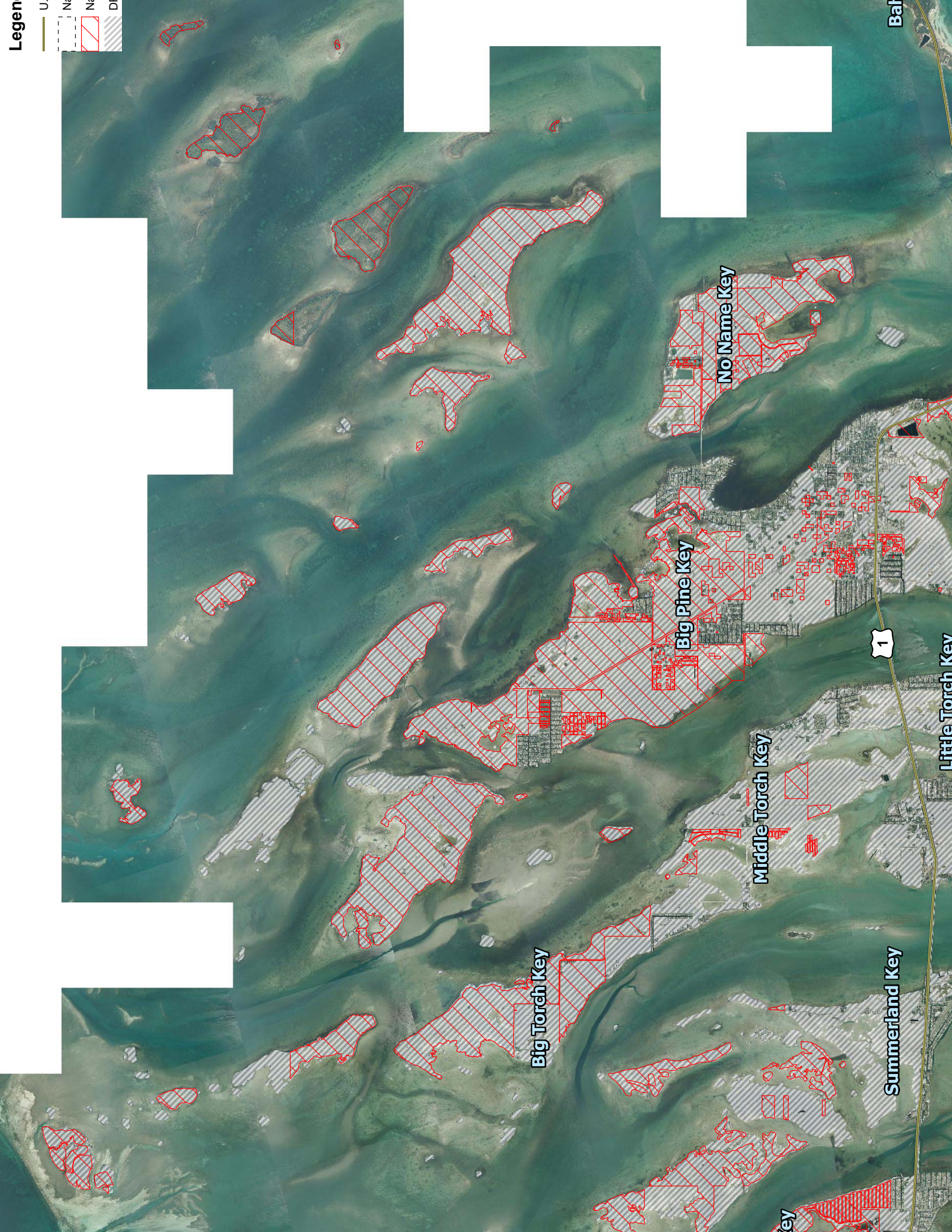
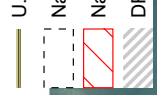
The 2008 5-year review noted that based on Perry's rangewide general survey between 2004 and 2005 resulted in captures on 12 keys (Big Pine, Big Torch, Cudjoe, Howe, Lower Sugarland, Middle Torch, Raccoon, Ramrod, Saddlebranch, Summerland, Upper Sugarloaf, and Water Keys) and rice rats were not detected on Little Pine, Big Coppit, Boca Chica, East Rockland, and Geiger Keys.

The 5-year review documented that one rice rat was found on Big Pine Key and one on Ramrod Key. Follow-up trapping on Big Pine Key resulted in no additional captures. Perry suggested that the Ramrod Key and Big Pine Key individuals may represent isolated dispersal incidents or may represent populations that "persist at low numbers or are functional sinks in an island metapopulation". Islands such as the Contents, Muds, Sawyer, and the Snipe Keys are large pristine islands but do not contain the three vegetative communities used by rice rats nor sufficient freshwater sources. Silver Rice Rats are not found in the Middle or Upper Keys presumably because of the lack of suitable habitat.

The Silver Rice Rat was listed as an endangered species on April 30, 1991 (56 Federal Register 19814). At that time, the Silver Rice Rat was extirpated from one key where it formerly occurred and was believed to be extirpated from two additional keys. The Silver Rice Rat was listed as endangered because its wetland habitat had been destroyed by residential and commercial construction; because of predation,

¹¹ USFWS Southeast Region. 5-year Review: Summary and Evaluation Rice Rat (*Oryzomys palustris natator*). August 2008.

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Bah

Little Torch Key

Summerland Key

Key

No Name Key

Big Pine Key

Middle Torch Key

Big Torch Key

competition, and habitat modification from various introduced mammals and because it's low populations make it more susceptible to reduced genetic variability.

5.5.2.4 Eastern Indigo Snake¹² – Figure 5.8

The Eastern Indigo Snake seems to be strongly associated with high, dry, well-drained sandy soils, closely paralleling the sandhill habitat preferred by the gopher tortoise. The Eastern Indigo Snake can occur in most types of hammock in Florida and southeastern Georgia, often near wetlands, and often in association with gopher tortoise burrows. It is also known to occur in mangrove swamps, seepage swamp, flowing water swamp, pond swamp, wet prairie, xeric pinelands and scrub, flatwoods, dry glades, tropical hardwood hammocks, beach dune/coastal strand, pine rockland, and muckland fields in southern Florida. Gopher tortoise burrows, tree stumps, piles of debris, land crab burrows, and other subterranean cavities are commonly used as dens and for egg laying.

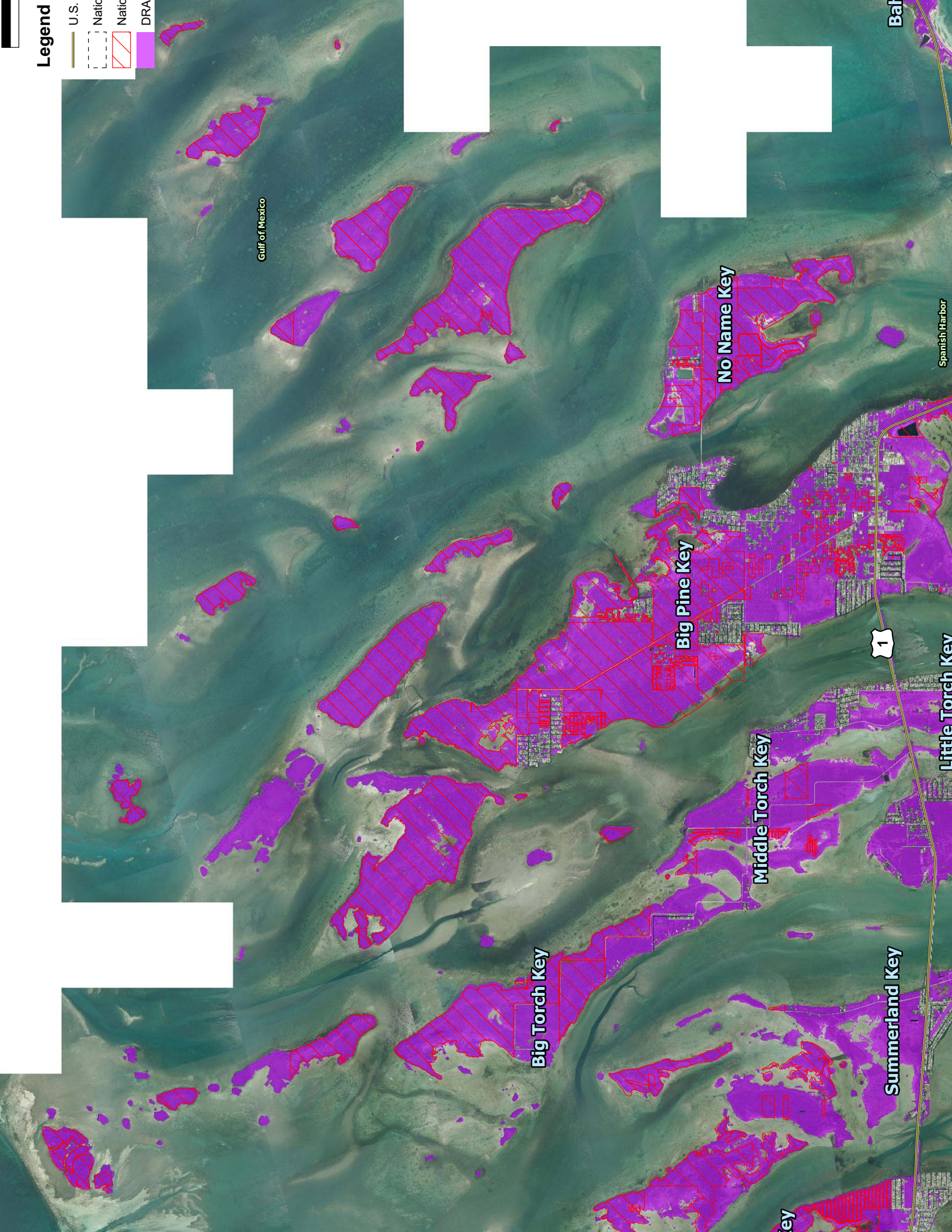
Historically, the species ranged throughout Florida, except in the Marquesas and Dry Tortugas. Museum records document specimens from the Upper Keys and the Lower Keys, but not from the in the Middle Keys. The species has declined throughout its range and has been extirpated from some areas due to habitat fragmentation, decline in the gopher tortoise populations, over-collecting, direct human-related mortality, and road mortality. The Eastern Indigo Snake was listed because of a population decline caused by habitat loss, over-collecting for the pet trade, and mortality from gassing gopher tortoise burrows to collect rattlesnakes (43 FR 4028). Even with continued habitat destruction and alterations, this species will probably persist in most localities where large, unfragmented pieces of natural habitat remain. Unfortunately, current and anticipated future habitat fragmentation will probably result in a large number of isolated, small groups of indigo snakes. Fragmented habitat patches probably cannot support a sufficient number of individuals to ensure viable populations. The Indigo snakes have not been documented in Big Pine Key for several years, despite the presence of suitable habitat throughout Big Pine and No Name Keys and according to the 2008 USFWS 5-year review for the Eastern Indigo Snake, there are no recent occurrence records for the Florida Keys.

5.5.3 HCP Three Tier System for Development¹³

Based on the Key Deer studies done under the HCP, Monroe County developed a conservation priority classification for private undeveloped lands in the study area. Lands in the study area are classified into three "Tiers," as illustrated in **Figure 5.9**. Tier 1 are lands where all or a significant portion of the land area is characterized as environmentally sensitive and important for the continued viability of HCP covered species. These lands are high quality Key Deer habitat, generally representing large contiguous patches of native vegetation that provide habitat for other protected species in addition to the Key Deer. Most of the islands are classified as Tier 1 because of their environmental sensitivity and importance for the continued viability of the endangered species. Tier 2 lands are scattered lots and

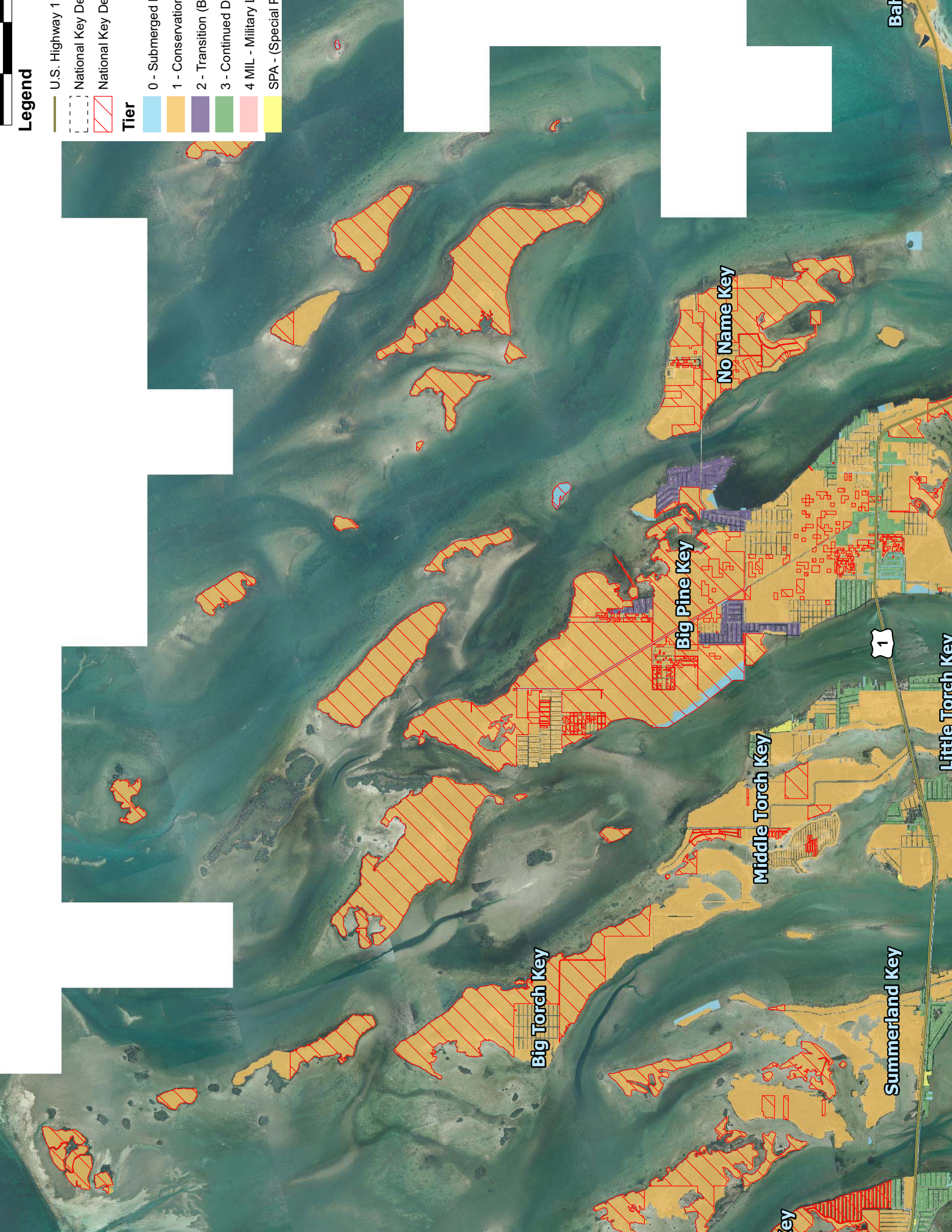
¹² USFWS Southeast Region. 5-year Review: Summary and Evaluation Eastern Indigo Snake (*Drymarchon Couperi*). April 2008.

¹³ Monroe County. Habitat Conservation Plan for Florida Key Deer (*Odocoileus virginianus clavium*) and other Protected Species on Big Pine Key and No Name Key. Monroe County, Florida. April 2003: April 2006 Revision.



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- U.S. Highway 1
- National Key De
- National Key De
- Tier
- 0 - Submerged
- 1 - Conservation
- 2 - Transition (B
- 3 - Continued D
- 4 MIL - Military I
- SPA - (Special F



Ball

Little Torch Key

Summerland Key

No Name Key

Big Pine Key

Middle Torch Key

Big Torch Key

Key

fragments of environmentally sensitive lands that may be found in platted subdivisions. A large number of these lots are located on canals and are of minimal value to the Key Deer and other protected species because the canal presents a barrier to dispersal. Tier 3 lands are scattered lots within already heavily developed areas that provide little habitat value to the Key Deer and other protected species. Some of the undeveloped lots in this Tier are located between existing developed commercial lots within the US 1 corridor or are located on canals. All of the businesses in Tier 3 are located in the US 1 corridor. Most of the parcels in Tiers 2 and 3 are interspersed among developed parcels and among canals. These areas provide little habitat value to the covered species. The tier classification helped in determining the location of potential new development and prioritizing mitigation areas.

Tiers 1 and 2 minimize development impact on natural resources and sparsely settled areas. Tier 3 encourages development in disturbed areas already heavily settled. It is envisioned that future development patterns will be accomplished through the application of minimum eligibility requirements for competing in the permit allocation system. Tier 3 applicants will be immediately eligible to compete whereas Tier 1 and Tier 2 applicants will be required to amass points via land preservation prior to being eligible for entry into the system.

The Livable CommuniKeys Masterplan envisions issuance of 200 residential dwelling units over the twenty-year planning horizon. The first 30 of those 200 permits will be issued to applicants who had already received an allocation but could not be issued a permit due to a traffic concurrency moratorium. These applicants were awarded regulatory relief through beneficial use or administrative relief after waiting for at least five years. All but two of the permits will be issued for single family lots within Tier 3. The two remaining lots are in Tier 1¹⁴. In the project area, commercial development is primarily found along US 1; the remaining private lands are residential with a few industrial sites, such as rock quarries. No Name Key is less developed and no public electrical service is available on the island. According to the HCP, 15 percent and 4.5 percent of the total landmass of Big Pine Key and No Name Key, respectively, are developed.

The HCP anticipated the FDOT will complete the addition of a third lane, a two-way left-turn lane, on the developed segment of US 1 on Big Pine Key. This involves the extension of the newly constructed turn lane east and west of the intersection improvement project. New development will be concentrated on already disturbed lands in order to minimize the loss of prime habitat for the covered species. New commercial development will be limited to infill areas mainly along the existing commercial corridor on US 1. The HCP estimates that no more than 7 acres of native vegetation will be cleared over the permit period. Wetland impacts, estimated at no more than 3 acres over 20 years, will be limited to roadside swales and ditches.

The Livable CommuniKeys Masterplan identified the need to implement solutions to the traffic congestion on US 1 and minimize the need for local trips on US 1, minimize the need for local vehicular trips on and across US 1 (from north to south), and improve the level of traffic service on US 1 to a standard that, in accordance with local regulations, would allow some development and maintain that

¹⁴ Monroe County Planning and Environmental Resources Department. Livable CommuniKeys Master Plan for Big Pine Key and No Name Key. Original BOCC Adoption 08/2004; Amended by Ordinance 020-2009.

level of service over the next 20 years. The preferred alternative identified in the HCP provides for development activities that improve the level of service on US 1, restore a low rate of growth in the study area, and offer community and public facilities improvements that satisfy community needs. The avoidance, minimization, and mitigation measures described in this HCP should ensure that populations of the covered species remain viable. According to the USFWS' 2001 Biological Opinion, the combined effect of the underpasses and intersection improvement projects could result in nine fewer human-related deer deaths per year. The model suggests that such reduction in mortality would ameliorate a significant portion of the impact of the proposed 20-year development program.

In accordance with avoidance and minimization measures outlined in the HCP, road widening activities along US 1 would occur within existing cleared and filled portions of the FDOT right-of-way. FDOT will avoid impacts to wetlands during US 1 three-laning.

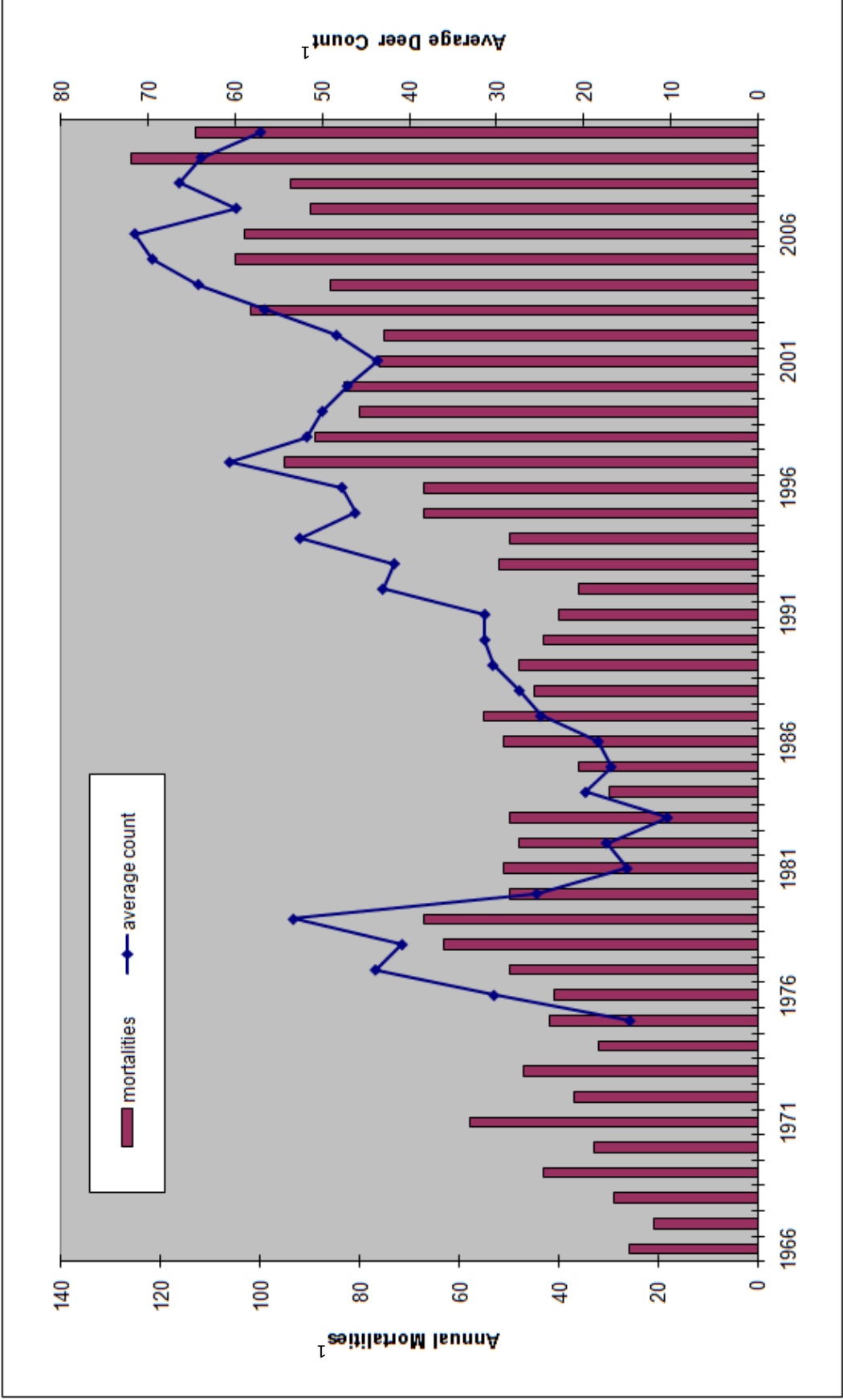
5.5.4 Key Deer Mortality

The following data on Key Deer mortality and trends is based on GIS data from 1966 – 2010 provided by the USFWS and the 2010 USFWS's 5-year review of the Key Deer. The majority of the deaths can be attributed to deer vehicle collisions. Other causes of death include drowning, disease, dogs, entanglement, poaching, and combat with other deer. There is a distinct trend of deer vehicle collisions along US 1 on Big Pine, Little Torch and Ramrod Keys, and on Key Deer Boulevard and Watson Boulevard leading to No Name Key, as well as residential roads on Big Pine Key. Big Pine and No Name Keys subpopulations of Key Deer constitute the core of the Key Deer metapopulation. Key Deer numbers on Big Pine Key and No Name Key in 2000 revealed a 240 percent increase since 1971, a population growth rate of about 5 percent annually.¹⁵ Deer vehicle collisions accounted for approximately 50% of the known mortality from 1968 to 1972 and from 1998 to 2000. There were also increased mortalities from entanglement (predominately fences) from 0 to 7.9% and disease from 0 to 5.3% for these same two time periods, while mortalities due to drowning decreased between sample periods from 9.6 to 2.6%, respectively. **Figure 5.10** shows the Key Deer abundance and mortality indices within the core (the subpopulations on Big Pine Key and No Name Key) from 1966 to 2010.

Mortality due to deer vehicle collisions is higher in the southern portion of Big Pine Key primarily due to lower quality and quantity of habitat, greater habitat fragmentation, and the urban landscape (highway length, road length, fenced areas, developed land and traffic on US 1). Survival was highest on No Name Key, intermediate on northern Big Pine Key and lowest on southern Big Pine Key. Currently, northern Big Pine Key serves as a source for Key Deer while southern Big Pine Key serves as a sink.

The high occurrence of deer vehicle collisions along this road segment prompted USFWS and FDOT biologists to address this problem. In 2001 - 2002, FDOT constructed a 2.6-km long system of fencing, two underpasses, and four experimental deer guards to address deer vehicle collisions along a portion of the US 1 roadway.

¹⁵ USFWS Southeast Region. 5-year Review: Summary and Evaluation Key Deer (*Odocoileus virginianus clavium*). August 2010.



Source: USFWS

Notes: 1)Left y-axis represents the annual count of known mortalities, right y-axis represents the yearly average of monthly road counts conducted along the Service's survey route 2)Core = subpopulations on Big Pine Key and No Name Key

Figure 5.10: Key Deer Abundance and mortality indices within the Core² 1966 – 2010

Based on the four years of post-project data (January 28, 2003 - December 31, 2006), the US 1 corridor project successfully reduced Key Deer mortality within the project area of US 1¹⁶. Key Deer mortalities within the project area have decreased from an average of 12 – 24 mortalities per year to two mortalities in 2003, one mortality in 2004, zero mortalities in 2005, and three mortalities in 2006.

In comparing Key Deer mortality pre- and post-project completion, researchers found that deer vehicle collisions along the fenced segment of the US 1 project were reduced by 83% – 92%. Improvements to the US 1 corridor project have successfully reduced deer vehicle collisions along the fenced segment of US 1. This decrease translates into increased human safety and an increase in the overall population viability of Key Deer. Based on discussions with USFWS, there has, however, been an increase of deer mortalities in the unfenced segment of US 1. Based on post fence construction monitoring, the increased deer mortalities on US 1 in the unfenced portions could be attributed to potentially several factors including natural increases in fence mortality associated with fence ends, the addition of traffic lanes, habitat improvements conducted along US 1 and an increase in the deer population.¹⁷

5.6 Floodplains

The Federal Emergency Management Agency (FEMA) administers the National Flood Insurance Program (NFIP) throughout Monroe County, Florida. During consultation on the effects of FEMA’s Federal action required under 7(a) (2) of the Endangered Species Act (ESA), the USFWS issued a biological opinion on June 16, 1997. The USFWS recommended a “reasonable and prudent alternative” whereby Monroe County, with the assistance of the USFWS and FEMA, would identify habitat and assist with regulation of development. The USFWS and FEMA generated a list administered by the County of specific lots on Big Pine Key and No Name Key, which were considered to contain important Key Deer habitat. The County coordinates with the USFWS on behalf of FEMA on permit application activities on the designated lots.

Table 5.7 lists the FEMA map panels in the study area.

12087C1200H	12087C1505H	12087C1517H	12087C1536H
12087C1225H	12087C1506H	12087C1519H	12087C1537H
12087C1480H	12087C1507H	12087C1526H	12087C1539H
12087C1485H	12087C1508H	12087C1527H	12087C1545H
12087C1490H	12087C1509H	12087C1528I	12087C0450G
12087C1491H	12087C1511H	12087C1529H	12087C1565G
12087C1492H	12087C1512H	12087C1535H	

Source: Community Services, FEMA Flood and NWI Wetlands data www.fgdl.com

¹⁶ Jason A. Schmidt, Roel R. Lopez and Nova J. Silvy, Evaluation of The US 1 Crossing Project in Reducing Key Deer Mortality (4 Year Post-Project Report). Texas A&M University. February 2007.

¹⁷ Israel D. Parker, Anthony W. Braden, Roel R. Lopez, Nova J. Silvy, Donald S. Davis and Catherine B. Owen. Effects of US 1 Project on Florida Key Deer Mortality. The Journal of Wildlife Management 72(2):354-359; 2008.

According to the FEMA maps, portions of the Refuge are located within Flood Zone X500, between the limits of the 100-year and 500-year flood; Flood Zone AE, subject to the 100-year flood; and Flood Zone VE, subject to the 100-year flood and additional velocity hazard (wave action). Low lying floodplain areas within the Refuge are vulnerable to sea level rise and flooding events such as hurricanes and other major storms. Areas that are within the velocity hazard zone are vulnerable to storm surges. These types of events can result in habitat changes where salt water inundates freshwater systems affecting the vegetative composition or the availability of freshwater for wildlife including the Key Deer. Loss of floodplain from development outside the Refuge also affects the extent of flooding.

5.7 Cultural Resources

The Comprehensive Plan contains standards for designation of historic structures and districts within the County (Objective 104). The planning area contains several archeological sites and older structures that may be of local historic importance. To date, only one structure has been designated pursuant to the County process. That structure is on the eastern shoreline of Big Pine Key at the site of a former shark fishery and processing plant. There may be other structures and sites suitable for designation. The County is currently conducting an inventory of historical sites Countywide.

Data was obtained from the State Historic Preservation Office (SHPO), Florida Master Site File (FMSF) for previously recorded cultural resources within NKDR. The FMSF included two historic structures, 24 archaeological sites, and one resource group. The cultural resources identified in the Refuge are not listed on the National Register of Historic Places (NRHP) and none have been evaluated by SHPO for eligibility for listing on the NRHP.

6. Alternatives Analysis

Based on the findings from the existing conditions review, the *Traffic Needs and Safety Report*, and comments from stakeholders, potential improvements to the Refuge's transportation network were reviewed and roadway alternatives initially screened. These alternatives were then screened environmentally, socially, and financially in more detail to develop the preferred alternatives for the Refuge.

Preliminary alternatives were initially developed then initially screened to develop conceptual alternatives. These are discussed in this section. The conceptual alternatives were further reviewed for impacts in **Section 7**.

6.1 Preliminary Alternatives

Preliminary alternatives for physical roadway construction and other improvements were selected for the Refuge. These were further categorized by implementation time periods of short (2015), medium (2020), and long range (2030). The following matrix, **Table 6.1**, was developed to identify potential alternatives and responsible partners. The partner agencies on this project include: USFWS, the Florida Department of Transportation (FDOT), Monroe County, FL, the Florida Fish and Wildlife Conservation Commission (FWC), the Florida Department of Environmental Protection Office of Greenways and Trails – Florida Keys Overseas Heritage Trail (FDEP/FKOHT), the Lower Keys Chamber of Commerce, Friends and Volunteers of Refuges (FAVOR), and the Key Deer Protection Alliance (KDPA). At stakeholder meetings, the stakeholders have agreed to work together to implement the alternatives.

6.1.1 Roadway Segment Improvements

The following recommendations were identified as potential improvements to the roadways near and adjacent to the Refuge. The suggested responsible partners are listed by each alternative.

Short Range Alternatives (2015)

- Reconfigure Blue Hole Interpretive Site parking lot with defined entrances and exits
Responsible Partner: USFWS, Monroe County

Medium Range Alternatives (2020)

- Bicycle, pedestrian and shoulder facility upgrades on Refuge access roadways
Responsible Partners: Monroe County, USFWS

Long Range Alternatives (2030)

- Upgrade shared pathway on Key Deer Boulevard including separation from Key Deer Boulevard
Responsible Partners: Monroe County, USFWS
- Continue bicycle, pedestrian and shoulder facility upgrades on Refuge access roadways
Responsible Partners: Monroe County, USFWS

Table 6.1: Proposed Stakeholder Responsibilities

	USFWS	FDOT	Monroe County	FWC	FDEP/FKOHT	Lower Keys Chamber	FAVOR	KDPA
Blue Hole Site Parking Lot Reconfiguration	X		X					
Key Deer Boulevard Vegetation Trimming/Sight Distance	X		X					
Key Deer Boulevard Vegetation Trimming/Sign Visibility	X		X					
Key Deer Awareness Campaigns	X	X	X	X	X	X	X	X
Monroe County Sign Inventory Recommendations Implementation	X	X	X		X			
Identification of Missing Bicycle/Pedestrian Facility Segments	X		X					
Purchase and Deploy Speed Check Trailer	X		X					
Perform Traffic Calming Studies	X		X					
New Visitors Center Bicycle Rental Program Implementation	X					X	X	
USFWS Signage Upgrades	X		X					
Visitor Trip Characteristics Survey	X							
Visitors Center Information Kiosk	X					X		
US 1 Deer Crossing Signage Improvements	X	X	X				X	X
Refuge Access Roadways Upgrades	X		X					
Stakeholder Coordination	X	X	X	X	X	X	X	X
Key Deer Awareness Campaigns	X	X	X	X	X	X	X	X
Intelligent Transportation Systems Improvements	X	X	X				X	X
Key Deer Boulevard Shared Pathway Extension/ Key Deer Boulevard Reconfiguration North of Kyle Boulevard	X		X					
Key Deer Boulevard Pathway Upgrades	X		X					
Refuge Access Roadways Upgrades	X		X					
Key Deer Awareness Campaigns	X	X	X	X	X	X	X	X
Stakeholder Coordination	X	X	X	X	X	X	X	X

Short Range Alternatives
 Medium Range Alternatives
 Long Range Alternatives

6.1.2 Additional Recommendations

Fourteen additional recommendations have been proposed at the NKDR. These recommendations are not anticipated to have direct impacts to the environment. These include:

Short Range Alternatives (2015)

- Trim vegetation at pullouts and intersections to increase sight distances where needed (i.e. Key Deer Boulevard)
Responsible Partner: USFWS, Monroe County
- Perform routine trimming of vegetation around all signs for visibility
Responsible Partners: USFWS, Monroe County
- Continue awareness of Key Deer and other threatened and endangered species crossing area roadways. This may include:
 - 1) Development of new materials/exhibits at the Visitors Center (existing or future)
 - 2) Run notifications in the local newspapers/radio/homeowner association newsletters
 - 3) Create unique signage for secondary roads notifying special times for the Key Deer
 - 4) Perform workshops at Visitors center and schools
Responsible Partners: All Stakeholders
- Review Monroe County's US-1 sign inventory study and implement sign improvements
Responsible Partners: FDOT, Monroe County, USFWS, FDEP/FKOHT
- Identify missing bicycle and pedestrian facility segments to serve key Refuge areas including access to the new Visitors Center¹⁸
Responsible Partners: USFWS, Monroe County
- Purchase a radar speed check trailer to notify drivers of their travel speed on County roads within the Refuge area
Responsible Partners: USFWS, Monroe County
- Perform traffic calming studies on key roadways around the Refuge to determine if traffic calming measures are appropriate to help reduce vehicle speeds.
Responsible Partners: Monroe County, USFWS
- In coordination with a local vendor, implement a bike rental station at the new Visitors Center for visitor to use to visit the Refuge
Responsible Partners: USFWS, Chamber of Commerce, FAVOR

¹⁸ Depending on the location of the bicycle and pedestrian paths leading to/from the Visitors Center, there may be some environmental impacts. These should be reviewed at that time.

- Upgrade all existing USFWS Refuge signage for conformance with the Manual on Uniform Traffic Control Devices (MUTCD) criteria for standard lettering, text message, sign color, size and placement
Responsible Partners: USFWS, Monroe County
- Survey Refuge Visitors at the existing Visitors Center and the Blue Hole Interpretive Site on their trip characteristics
Responsible Partner: USFWS
- Installation of a kiosk at new Visitors Center where multiple entities could provide information rather than have multiple signs
Responsible Partners: USFWS, Chamber of Commerce
- Update, add, relocate, replace or remove as appropriate Key Deer Warning Signs on US 1 through entire Key Deer habitat (including Sugarloaf Key, Cudjoe Key, Summerland Key, Ramrod Key, Little Torch Key, Spanish and Harbor Key)
Responsible Partners: FDOT, USFWS, Monroe County, FAVOR, KDPA

Medium Range Alternatives (2020)

- Continue awareness of Key Deer and other threatened and endangered species crossing area roadways. This may include:
 - 1) Development of new materials/exhibits at the Visitors Center (existing or future)
 - 2) Run notifications in the local newspapers/radio/homeowner association newsletters
 - 3) Create unique signage for secondary roads notifying special times for the Key Deer
 - 4) Perform workshops at Visitors Center and schools
Responsible Partners: All Stakeholders
- Implement Intelligent Transportation System application to notify drivers of deer entering roadways
Responsible Partners: FDOT, Monroe County, USFWS, FAVOR, KDPA

Long Range Alternatives (2030)

- Continue awareness of Key Deer and other threatened and endangered species crossing area roadways. This may include:
 - 1) Development of new materials/exhibits at the Visitors Center (existing or future)
 - 2) Run notifications in the local newspapers/radio/church bulletins/school papers at the start of breeding for male running seasons
 - 3) Create unique signage for secondary roads notifying special times for the Key Deer
 - 4) Perform workshops at Visitors Center and schools
Responsible Partners: All Stakeholders

- Ongoing coordination with stakeholders
Responsible Partner: USFWS

6.2 Screening Criteria

The screening criteria used for selection of the preliminary candidate roadway alternatives are detailed below. These screening criteria were established based on the conditions and issues that future improvements addressed. These were divided into four categories:

- **Environmental and Cultural Impacts** – Environmental and cultural impacts include issues pertaining to the physical environment (i.e. wetlands, floodplains, natural wildlife habitats) and social features (i.e. demographics, environmental justice, livability).
- **Constructability** – Constructability refers to the reasonable issues and elements involved with the physical construction of a recommendation. For example: this criterion would review whether or not the improvement could be effectively implemented within the physical constraints of the study area’s existing conditions.
- **Transportation Benefit** – Transportation includes the review of the properties and conditions associated with existing and future roadways, safety, connectivity, and capacity of the transportation network for the study area.
- **Cost** – Cost includes the financial obligation associated with implementing a recommendation including design, construction, maintenance, and related expenses.

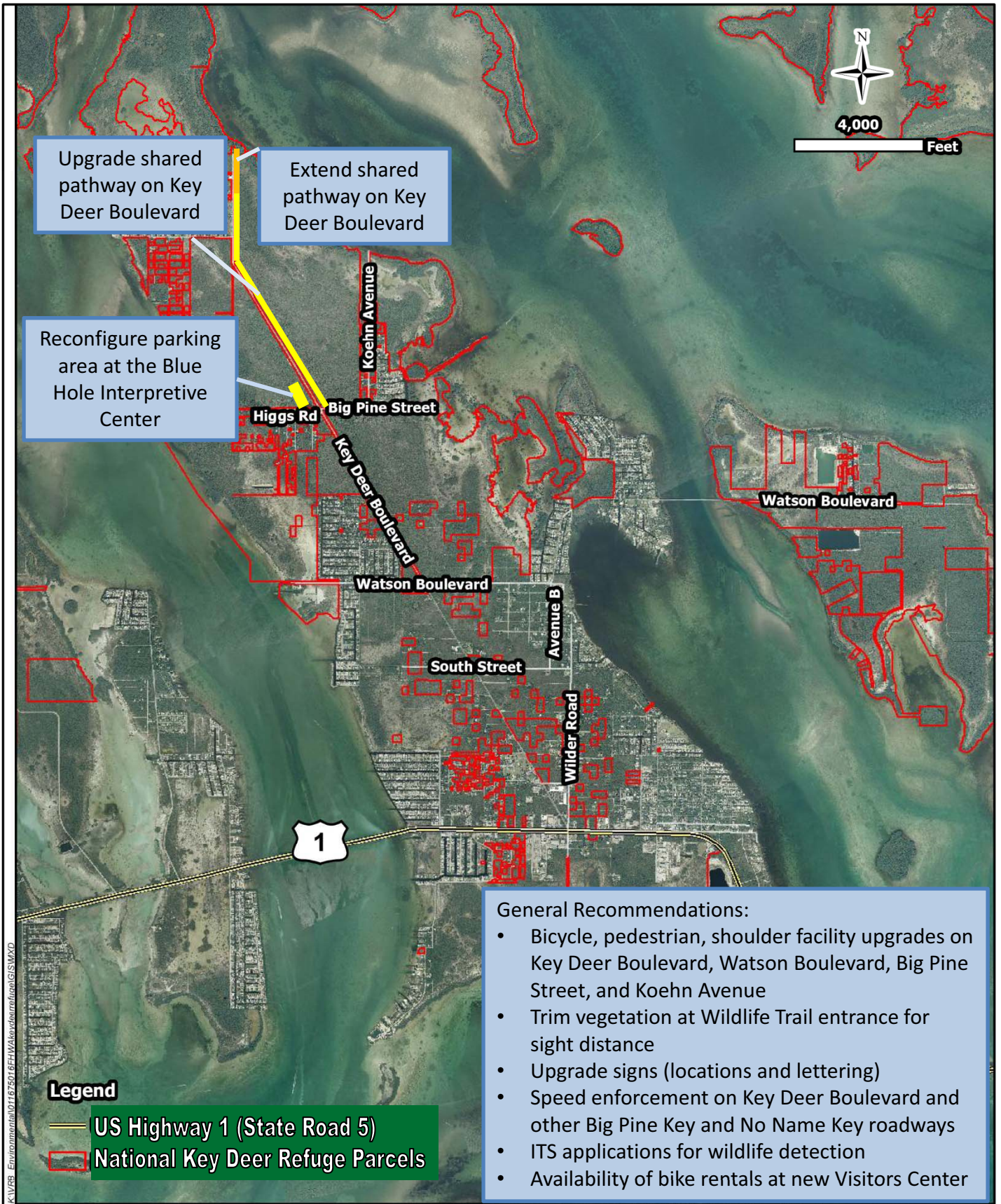
6.3 Preliminary Candidate Alternatives

Five preliminary candidate alternatives (including a No Build alternative) presented in the *Preliminary Candidate Alternatives Report* were identified as either short range (2015), medium range (2020), or long range (2030).

These alternatives are not exclusive and should all be considered for implementation in the future. Also, for some of the alternatives, improvements have been broken down into sections and prioritized. This allows improvements to be implemented in phases as monies are available. These alternatives are shown in **Figure 6.1**.

6.3.1 Alternative 1 - Reconfigure Blue Hole Interpretive Site Parking Lot with Defined Entrances and Exits – Short Range

Reconfiguring the parking area would prevent vehicles from entering and blocking travel lanes on Key Deer Boulevard while performing parking maneuvers. This safety improvement could be performed at a relatively low cost with limited or no impact to the surrounding area. This alternative will promote livability by adding a multimodal resource to the area.



Raster data courtesy of Monroe County Property Appraiser

Figure 6.1: Map of Preliminary Alternatives

National Key Deer Refuge
Transportation Study

Contract No.: DTFH71-09-D-00001



1 inch = 4,000 feet

PROJECT NUMBER: 011675016

March 2011

6.3.2 Alternative 2 - Bicycle, Pedestrian and Shoulder Facility Upgrades on Refuge Access Roadways – Medium Range

Priorities should be determined for Refuge access roadways with substandard or no shoulders based on known use of Refuge visitors and other users. These upgrades will promote multimodal transportation and increase livability. Once prioritized, improvements can be made by the County in a systematic manner starting with the highest priority project as money becomes available. There would be some impact to the natural environment as previously cleared shoulder area may not be available at all upgrade locations. Costs include design, construction, and maintenance of the facilities. There may be constructability issues at some locations.

6.3.3 Alternative 3 - Extend Shared Pathway on Key Deer Boulevard North of Kyle Boulevard – Long Range

The shared pathway on Key Deer Boulevard currently terminates at Kyle Boulevard. This extension would lengthen the pathway approximately 0.25 miles to the northern terminus of Key Deer Boulevard. While extending this pathway, it would be constructed to standards for 2-way bicycle and pedestrian traffic, expanding the multimodal transportation network, increasing livability. Costs include design, construction and maintenance of the facility. Limited environmental impact is expected.

6.3.4 Alternative 4 - Upgrade Shared Pathway on Key Deer Boulevard including separation from Key Deer Boulevard – Long Range

This alternative upgrades the existing shared pathway on Key Deer Boulevard.

Alternative 4a – Widen existing pathway to 2-way bicycle and pedestrian traffic standards: This alternative would have some impact to the natural environment as it would increase the amount of impervious area when the trail is widened. However, it would allow for two-way bicycle and pedestrian traffic to pass safely, enhancing the existing multimodal system on Big Pine Key, increasing livability. Costs would include design, construction and maintenance of the trail. The widening of the pathway is adjacent to Key Deer Boulevard may create some additional environmental impacts.

Alternative 4b – Widen existing pathway to 2-way bicycle and pedestrian traffic standards and separate sections adjacent to Key Deer Boulevard: This alternative would have impacts to the natural environment by adding impervious area and would have more impacts to the pathway sections that are directly adjacent to Key Deer Boulevard. As in Alternative 4a, it would allow for 2-way bicycle and pedestrian traffic, enhancing the existing multimodal system on Big Pine Key, increasing livability. Costs would include design, construction and maintenance of the trail.

6.4 Short and Long Range Implementation Plan Alternatives

These alternatives were further screened by developing preliminary concept drawings and construction cost estimates for the five roadway improvement alternatives prior to the impact analysis. The No Build alternative was also reviewed.

All construction cost estimates are conceptual. The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive

bidding or market conditions. Opinions of probable costs provided herein are based on the information known to the Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from opinions of probable costs.

6.4.1 No Build Alternative

The No Build alternative provides no improvements to the existing transportation facilities in the study area. Therefore, there also would be no improvement costs or impacts to the natural environment in the study area. In the No Build Alternative, the existing habitat would remain. However, there would be no improvements implemented that could minimize deer-vehicle collisions.

6.4.2 Alternative 1 - Reconfigure Parking Area at Blue Hole Interpretive Site

Alternative 1 involves reconfiguring the parking area at the Blue Hole Interpretive Site to prevent vehicles from entering and blocking travel lanes on Key Deer Boulevard while performing parking maneuvers (**Figure 6.2**). With this reconfiguration, the parking lot vehicles will not need to maneuver onto Key Deer Boulevard. This alternative would result in no impacts to the environment. The construction cost estimate for this alternative is approximately \$5,000 for restriping and the median treatment. Detailed impacts are identified in **Section 7**.

6.4.3 Alternative 2 - Bicycle, Pedestrian and Shoulder Facility Upgrades on Refuge Access Roadways

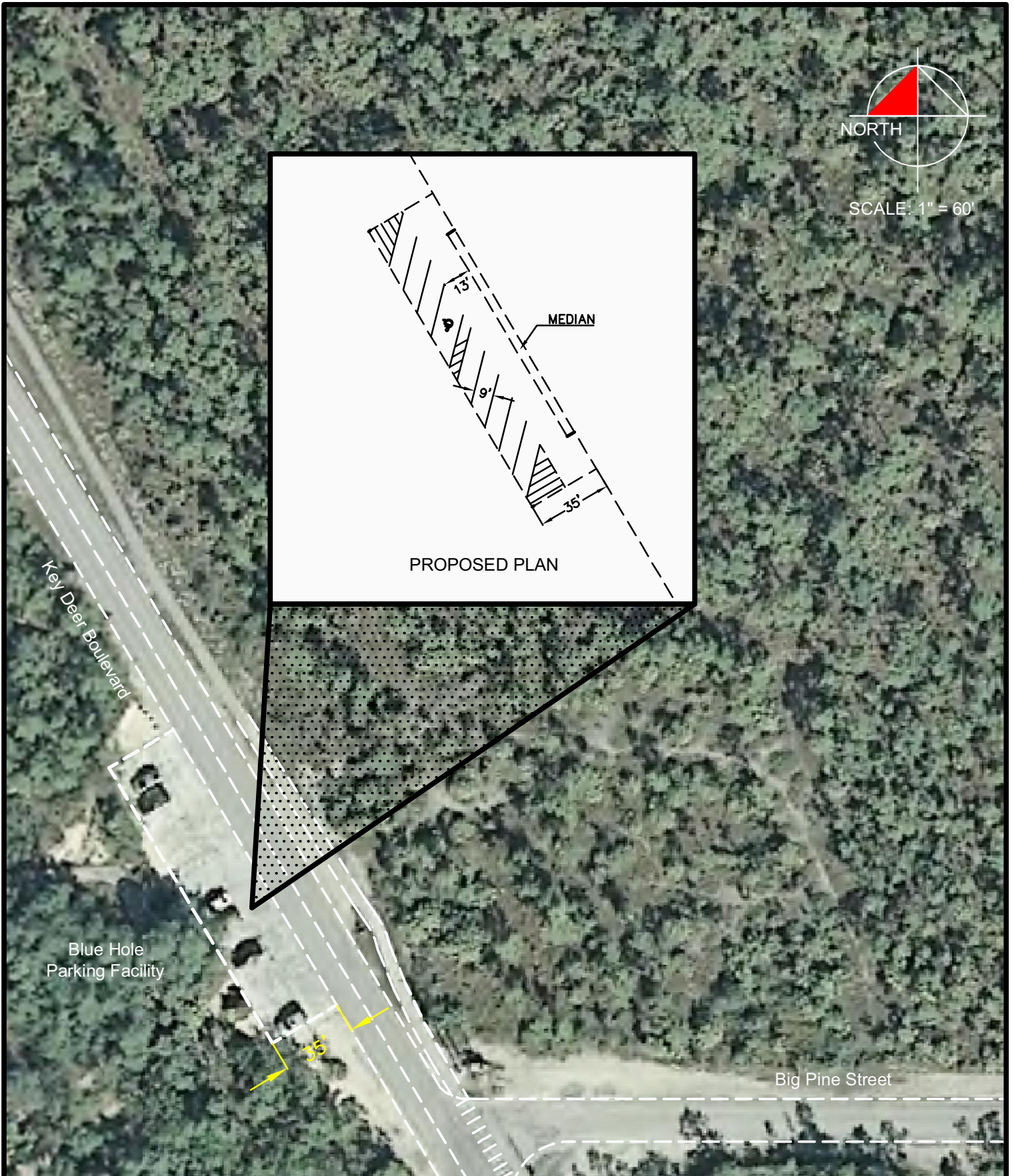
As stated in previous studies, a number of the roadways around the Refuge have substandard or no shoulders. Alternative 2 involves upgrading segments of these roadways around the Refuge. Alternative 2 is broken down into various options that can be constructed depending on the cost and implementation constraints. Detailed impacts are identified in **Section 7**.

6.4.3.1 Alternative 2a – Mid-Block Crosswalk across Key Deer Boulevard

Figure 6.3 shows an unsignalized pedestrian crossing alternative at the Blue Hole Interpretive Site. This alternative would include signing and striping and a mid-block crosswalk across Key Deer Boulevard at Blue Hole Interpretive Site. This crosswalk will facilitate visitor access from the existing shared pathway on Key Deer Boulevard to the Blue Hole Interpretive Site for bicycles and pedestrians.

6.4.3.2 Alternative 2b – Sharrow Striping

An alternative to widening the roadways for bicycle lanes is the striping of sharrow on the roadway and the installation of appropriate signage. An example of sharrow striping in Miami, Florida is shown in **Figure 6.4**. It is recommended that sharrow implementation be reviewed for Watson Boulevard from Key Deer Boulevard to Avenue B, Watson Boulevard on No Name Key, Watson Boulevard from Key Deer Boulevard to the western terminus, along Big Pine Street, and along Koehn Avenue.



**NATIONAL KEY DEER REFUGE
TRANSPORTATION STUDY**

**Reconfigure Parking Area at Blue Hole
Interpretive Site**



Figure 6.2: Reconfigure Parking Area at Blue Hole Interpretive Site

Proposed Alternative 2a



For visualization purposes.

Figure 6.3: Create Mid-Block Crosswalk at Blue Hole Interpretive Site



Figure 6.4 – Sharrow Striping Example

6.4.3.3 Alternative 2c – Shoulder Widening

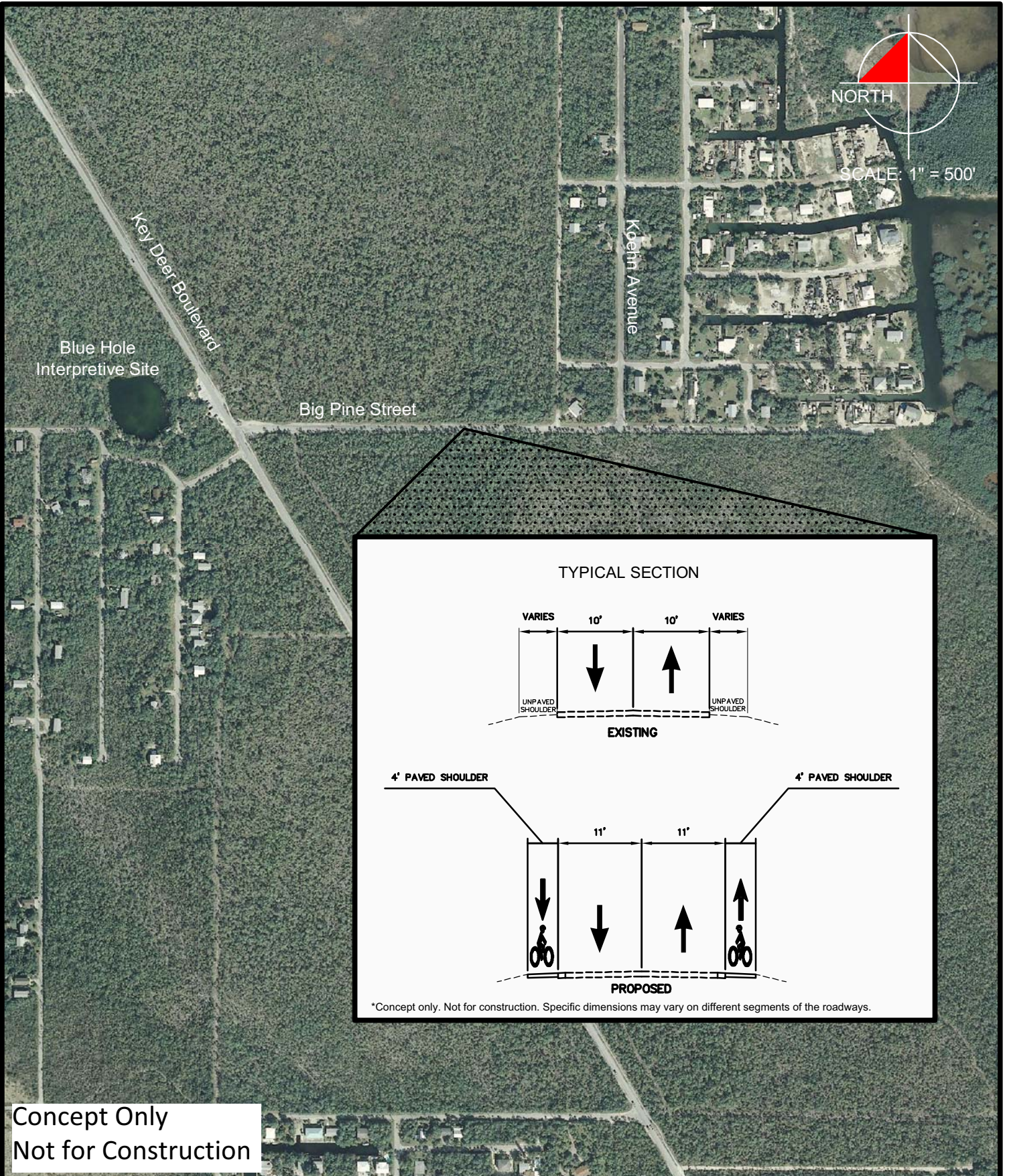
Shoulder widening for bicycle lanes has been identified as another option of this alternative. **Figure 6.5** shows an example of the widened section. Roadway segments and associated improvements have been prioritized based on their relative location and projected traffic volume. **Figure 6.6** shows the locations of these segments. The prioritized list should be submitted to the County for inclusion in the capital improvement program as indicated in the Livable CommuniKeys Masterplan. As monies become available, the County then has a systematic manner in determining the order in which projects should be completed. It is expected that the first three locations on Watson Boulevard would be medium range improvements with the remaining locations as long range improvements.

All improvements should be constructed consistent with Monroe County standards as appropriate. When upgrading for shoulders (8-foot shoulders) and widening to standard width (12-foot travel lanes), resurfacing will likely also occur. Resurfacing the existing roadway preserves the life expectancy of the road and enhances the travelers' experience driving along the road.

Limited environmental impacts are expected for the striping and marking alternative, while some environmental impacts are expected for the shoulder or widening alternative sections. Detailed impacts are discussed in **Section 7**. As these facility upgrades occur, some impacts to the natural environment are expected as previously cleared shoulder areas may not be available at all upgrade locations.

The total construction cost estimate for this alternative is approximately \$4 million. However, it is expected that these projects would be completed in phases. **Table 6.2** shows an estimated breakdown of each of these segments in priority order and the associated projected construction costs.

Proposed Alternative 2c



Concept Only
Not for Construction

NATIONAL KEY DEER REFUGE
TRANSPORTATION STUDY

EXAMPLE CROSS SECTION FOR
RECOMMENDED FACILITY UPGRADES



Figure 6.5: Example Cross Section for Recommended Facility Upgrades

Table 6.2: Alternative 2c Roadway Segment Priority List

Priority	Description	Distance	Cost ¹
1	Upgrade shoulder/widen to standard width Watson Boulevard from Key Deer Boulevard to Avenue B	3,950 Feet	\$474,000
2	Upgrade shoulder/widen to standard width Watson Boulevard from No Name Key Bridge to the east terminus	7,400 Feet	\$888,000
3	Upgrade shoulder/widen to standard width Watson Boulevard from Key Deer Boulevard to the west terminus	3,400 Feet	\$408,000
4	Upgrade shoulder on Key Deer Boulevard from Watson Boulevard to Big Pine Street	6,310 Feet	\$663,000
5	Upgrade shoulder on Key Deer Boulevard from Big Pine Street to Kyle Boulevard	7,350 Feet	\$772,000
6	Upgrade shoulder/widen to standard width Big Pine Street	1,500 Feet	\$180,000
7	Upgrade shoulder/widen to standard width Koehn Avenue	4,900 Feet	\$588,000

Notes:

1: Opinions of Probable Costs, available in Appendix E: Opinions of Probable Cost

6.4.4 Alternative 3 (Figure 6.7) - Extend Shared Pathway and Add Shoulders on Key Deer Boulevard North of Kyle Boulevard

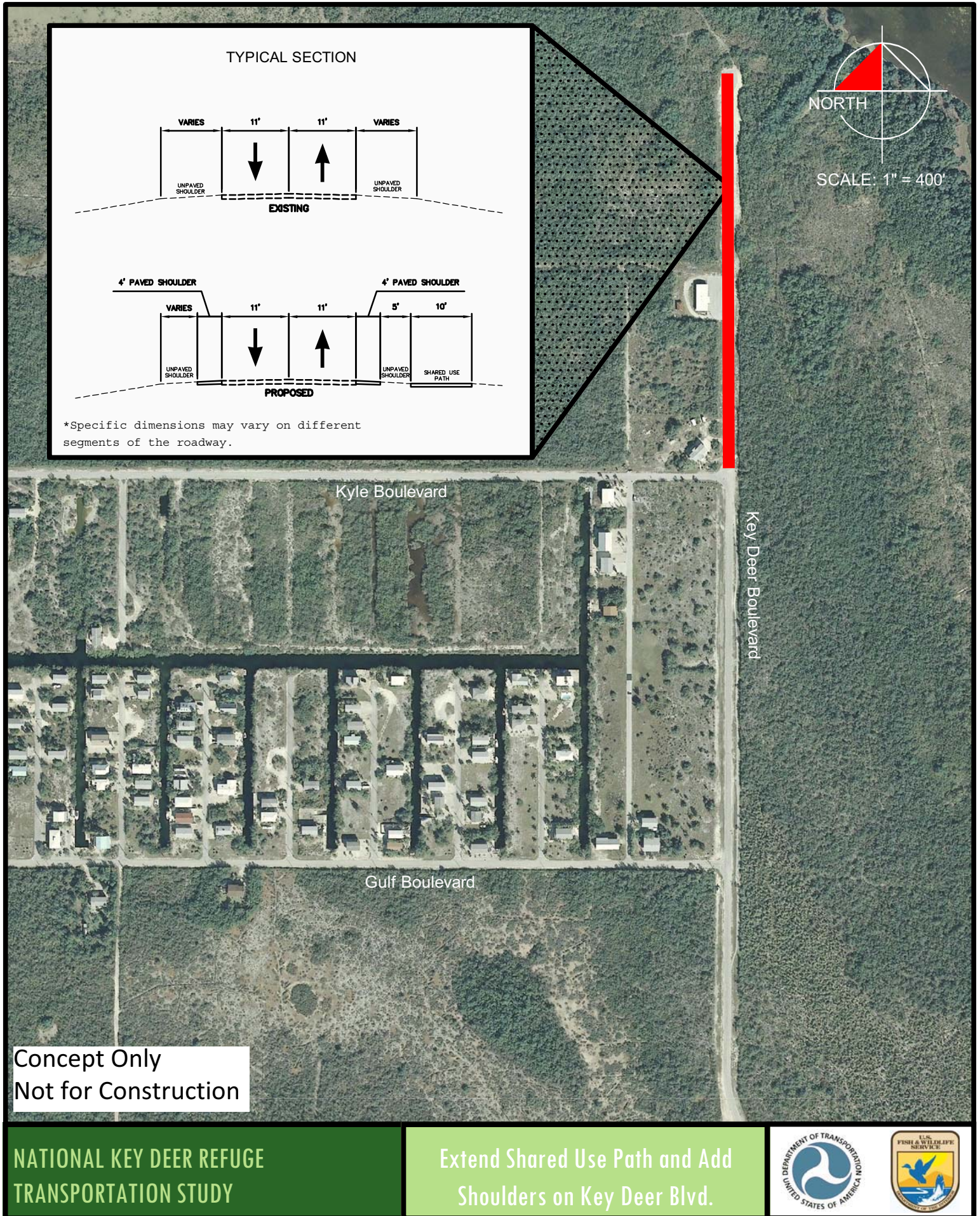
The shared pathway on Key Deer Boulevard currently terminates at Kyle Boulevard. This alternative would extend the pathway approximately 0.25 miles to the northern terminus of Key Deer Boulevard. The pathway extension would be constructed to standards for two-way bicycle and pedestrian traffic.

This alternative would also include the addition of paved shoulders (8-foot shoulders) and resurfacing of the existing roadway. Extending the shared pathway and constructing it to standards for two-way bicycle and pedestrian traffic help to provide connectivity and a better bicycle and pedestrian network for visitors around the Refuge. The addition of paved shoulders brings the road segments into compliance with County standards. Resurfacing the existing roadway preserves the life expectancy of the road and enhances the travelers' experience driving along the road. The environmental impacts to native habitat, wetlands and floodplains are minimal for this alternative because a majority of the improvements would occur within the existing cleared and maintained roadway and road shoulders. Environmental impacts are detailed in **Section 7**. The construction cost is estimated at approximately \$238,000.

6.4.5 Alternative 4 (Figures 6.8 and 6.9) – Widen Shared Pathway on Key Deer Boulevard

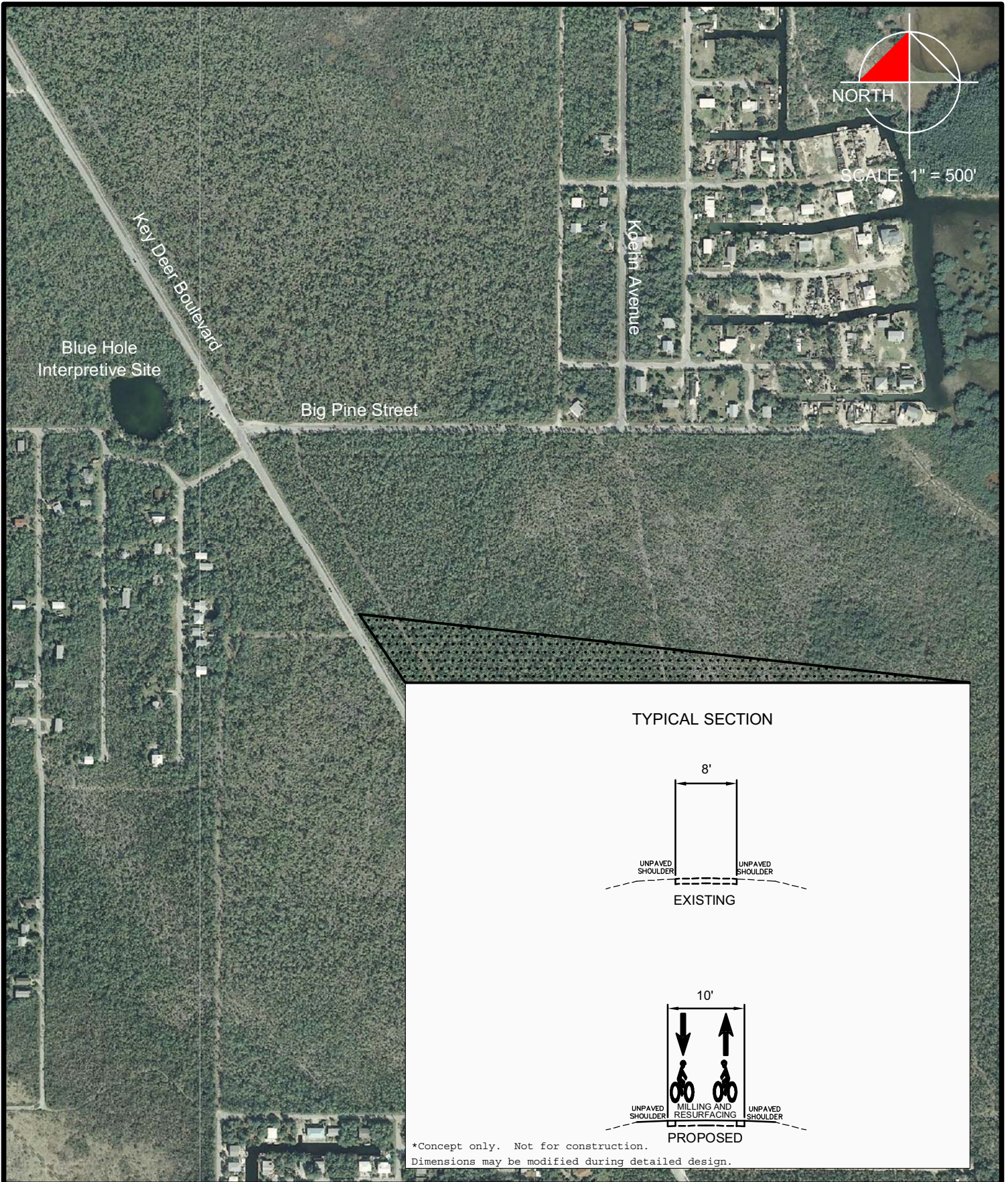
Currently the shared pathway on Key Deer Boulevard is eight feet wide. Alternative 4 has two options. Alternative 4a includes widening the existing pathway to 10 feet, two feet narrower than current Monroe County standards and therefore would require a design exception. Alternative 4b involves widening the existing pathway to 10 feet and separating the pathway from Key Deer Boulevard north of Watson Boulevard. Widening the shared pathway increases the number of visitors who can

Proposed Alternative 3



For visualization purposes

Figure 6.7: Extend Shared Use Path and Add Shoulder on Key Deer Blvd.



NATIONAL KEY DEER REFUGE
TRANSPORTATION STUDY

Widen Existing Shared Use Pathway on
Key Deer Boulevard



Figure 6.8: Widen Existing Shared Use Pathway on Key Deer Blvd.

Proposed Alternative 4b



Figure 6.9: Widen Shared Use Pathway and Separate from Key Deer Blvd.

safely and comfortably use the pathway. Environmental impacts are expected for each of these alternatives. Detailed impacts are discussed in **Section 7**. The estimated construction cost for Alternative 4a is approximately \$562,000. The estimated construction cost for Alternative 4b is approximately \$873,000.

6.5 Additional Recommendations (Non-roadway Improvements)

Fourteen additional transportation recommendations were further developed have been proposed at the NKDR. These recommendations are not anticipated to have direct impacts to the environment with a potential exception of Alternative 8 dependant on its design.

6.5.1 Alternative 5 - Trim Vegetation at Pullouts and Intersections to Increase Sight Distances Where Needed (i.e. Key Deer Boulevard)

See **Figure 6.10** for an example of the sight distance triangle on Key Deer Boulevard at the Nature Trail Entrance/Exit. Frequency schedule will be determined by vegetation growth.

6.5.2 Alternative 6 - Perform Routine Trimming of Vegetation Around Signs for Visibility

Similar to Alternative 5, trimming of vegetation around the signs will increase visibility. Partner with Monroe County and FDOT Maintenance staff for assistance.

6.5.3 Alternative 7 - Review Monroe County's US-1 Sign Inventory Sign Study and Implement Sign Improvements

The inventory task has been completed. The Refuge will coordinate with Monroe County regarding new sign locations identified in Alternative 15.

6.5.4 Alternative 8 - Once Constructed, the New Visitors Center Should Tie Into Existing Bicycle and Pedestrian Facilities Already in Place on US 1 and Also Potentially the Back Side of the Property.

Include this bicycle/pedestrian connectivity during the development of the new Visitors Center. Environmental impacts of this alternative have not been determined because the impact is subject to more specific design parameters (e.g. location of the trail at the back of the property, additional parking facilities, etc.). It is expected that there would be impacts to upland habitat with the construction of trails or bicycle facilities at the back side of the property. These impacts could be minimized depending on the size and type of trail that is designed and constructed.

6.5.5 Alternative 9 - Purchase a Radar Speed Check Trailer to Notify Drivers of Their Travel Speed on County Roads Within the Refuge Area

Coordinate with Monroe County Sheriff's Department prior to purchase. Identify if there is opportunity for shared use of an existing speed check trailer. Work with the Sheriff's Department on implementation of placement.



SCALE: 1" = 80'

SIGHT DISTANCE EQUATION

$$ISD = 1.47 * V_{major} * t_g$$

ISD = Intersection sight distance measured perpendicular from the center of the lane of the major roadway (ft.)

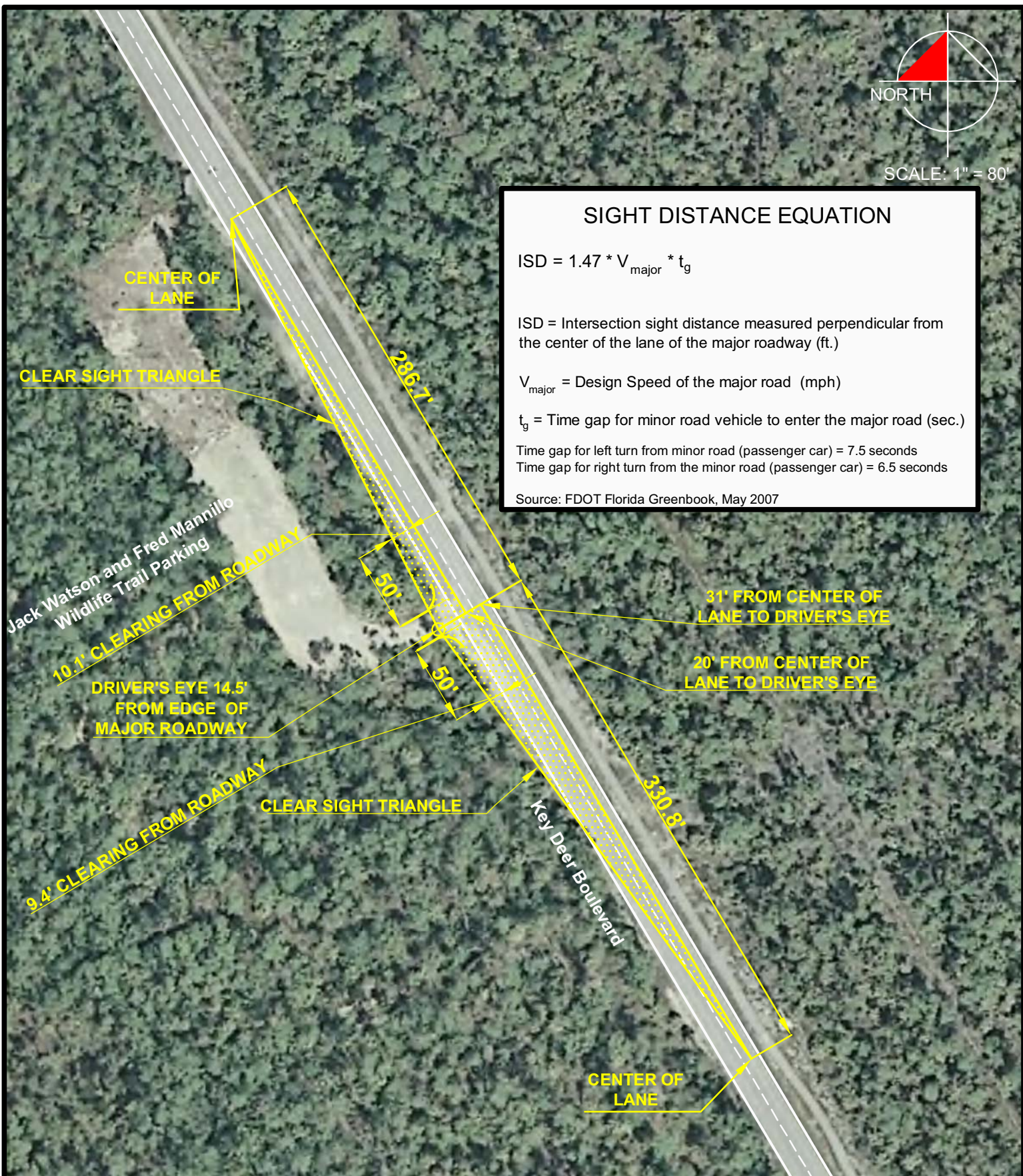
V_{major} = Design Speed of the major road (mph)

t_g = Time gap for minor road vehicle to enter the major road (sec.)

Time gap for left turn from minor road (passenger car) = 7.5 seconds

Time gap for right turn from the minor road (passenger car) = 6.5 seconds

Source: FDOT Florida Greenbook, May 2007



NATIONAL KEY DEER REFUGE
TRANSPORTATION STUDY

Sight Triangle at Nature Trail
Entrance/Exit



Figure 6.10: Sight Triangle at Nature Trail Entrance/Exit

6.5.6 Alternative 10 - Perform Traffic Calming Studies on Key Roadways Around the Refuge to Determine if Traffic Calming Measures are Appropriate to Help Reduce Vehicle Speeds

Formally request a traffic calming study to be performed on Key Deer Boulevard, Watson Boulevard (on Big Pine Key and No Name Key), and any other roadways of interest to Monroe County. When funding to conduct this analysis becomes available, Monroe County can then perform a traffic calming study for these roadways to determine what traffic calming measures would be appropriate. This was also recommended as an action item in the Livable CommuniKeys Masterplan.

6.5.7 Alternative 11 - In Coordination With a Local Vendor, Implement a Bike Rental Station at the New Visitors Center for Refuge Visitors.

Recommend this to be completed when the new Visitors Center is built.

6.5.8 Upgrade all existing USFWS Refuge signage for conformance with the Manual on Uniform Traffic Control Devices (MUTCD) criteria for standard lettering, text message, sign color, size and placement

Upgrade signs at the Blue Hole Interpretive Site and the Nature Trail to MUTCD standards. Examples of General Directional Guide signs can be seen in Figure 2M-2 on page 334 of the MUTCD, 2009 Edition.

This section can be accessed via the following weblink:

<http://mutcd.fhwa.dot.gov/pdfs/2009/part2ithu2n.pdf>

Examples have been provided to the Refuge under separate cover.

6.5.9 Alternative 13 - Survey Refuge Visitors at the Existing Visitors Center and the Blue Hole Interpretive Site on Their Trip Characteristics to Develop Visitor Pass-By Information.

If a traffic study is required for the Visitors Center, it is recommended that a survey questionnaire be prepared to determine visitor pass-by trip characteristics. This survey will need to be coordinated with the Office of Management and Budget (OMB) for approval of the survey. Also access to the site should be reviewed including turn-lane warrant analyses as necessary. The proposed survey questions are:

Thank you for visiting the National Key Deer Refuge. In an effort to better understanding our visitors, we ask that you answer the following questions related to your trip today.

1. Are you a full-time resident, part-time resident, or vacationer?
2. Prior to arriving at the Refuge today, what city, mile-marker, or zip code was your previous stop?
3. After visiting the Refuge today, will you go directly back to your previous stop?
 - a. If yes, proceed to question 4.
 - b. If no, what is the city, mile-marker, or zip code of your next destination?
4. If you had not stopped at the Refuge today, would you have traveled on U.S. 1 through Big Pine Key?

6.5.10 Alternative 14 - Installation of a Kiosk at New Visitors Center Where Multiple Entities Can Provide Information Rather Than Have Multiple Signs

Recommend a kiosk be installed when the new Visitors Center is built.

6.5.11 Alternative 15 - Update, Add, Relocate, Replace or Remove, as appropriate, Key Deer Warning Signs on US 1 Through Entire Key Deer Habitat (including Sugarloaf Key, Cudjoe Key, Summerland Key, Ramrod Key, Little Torch Key, and West Summerland Key)

Partner with FDOT to determine the permitting procedures and sign standards on US 1. Suggest placement of signs at the start of the Key Deer habitat rather than just on Big Pine Key to make motorists aware of the potential deer crossings. Recommend working with stakeholders on determining the locations and messages on signs.

6.5.12 Alternative 16 - Continue Awareness of Key Deer and Other Threatened and Endangered Species Crossing Area Roadways

Continue public outreach activities.

6.5.13 Alternative 17 - Implement Intelligent Transportation System application to Notify Drivers of Deer Entering Roadways

ITS applications are mainly research based, with many different technologies being tested worldwide with the most success being found with large (elk-size) migratory animals. Recommend coordinating with FDOT, Monroe County and animal/vehicle sign experts on proper location of signs. Some well known animal/vehicle sign experts are Dr. Marcel P. Huijser at Montana State University and Patricia White with Defenders of Wildlife. Recommend contacting animal/vehicle collision experts and request the Refuge be included in one of the research activities to help determine the proper type of ITS application.

6.5.14 Alternative 18 - Ongoing Coordination With Stakeholders

Continue partnerships with stakeholders.

7. Preliminary Impact Screening

This section describes the impact screening for the roadway improvement alternatives proposed at the NKDR. Impacts are based on the preliminary footprints of the conceptual alternatives previously described.

7.1 Summary of Screening

The following categories were considered during the preliminary impact screening process.

Land Use, Habitat Conservation Plan (HCP) Impacts and applicability to Livable CommuniKeys Masterplan – Changes to existing and proposed land uses. The conditions of the Federal Fish and Wildlife Permit No. TE 083411-0 and the supporting Habitat Conservation Plan (HCP) limits the amount of clearing of native vegetation that can occur on Big Pine Key and No Name Key to 7 acres through year 2023. Coordination with USFWS’s Ecological Services Division will be required if it is decided that alternatives described herein are selected for implementation and thus using portions of the 7-acre threshold. The Livable CommuniKeys Masterplan established a number of goals, follow-on strategies and action items related to land use and redevelopment, environmental protection, community character, economic development, traffic and transportation, and community participation. These goals will be reviewed relative to the alternatives presented.

Socioeconomic and Community Features – Socioeconomic composition of affected communities and impacts to community features.

Environmental Justice – Impacts on minority or low-income populations.

Cultural Resources – Impacts to historic or archaeological resources.

Transportation and Safety – Changes in traffic patterns and safety for drivers, pedestrians, and bicyclists.

Visitor Use and Experience – Changes to visitor facilities and experience.

Wetlands – Impacts to jurisdictional waters and wetlands based on National Wetland Inventory (NWI) mapping.

Floodplains – Changes to impervious area within floodplains and floodways based on Federal Emergency Management Agency (FEMA) mapping.

The following sections briefly describe the existing natural and human environment within the NKDR and potentially impacted areas. **Table 7.1** summarizes the screening for the roadway alternatives.

7.2 Potential Impacts to Existing Conditions

Impacts to wetlands, habitat and floodplains have been calculated for the alternatives. This study is being conducted primarily using existing Geographical Information System data. The impact acreages are approximate and were determined based on GIS mapping and aerial interpretation. The acreages

Table 7.1. Impact Summary

Impact Resource or Category	Alternative							
	Alternative 1	Alternative 2a	Alternative 2b	Alternative 2c	Alternative 3	Alternative 4a	Alternative 4b	
	Reconfigure Blue Hole parking	Stripe Crosswalk on Key Deer Blvd	Stripe Sharrows	Shoulder and Widening Improvements	Extend Shared Pathway on Key Deer Blvd.	Widen Shared Pathway on Key Deer Blvd.	Widen and Separate Shared Pathway on Key Deer Blvd.	
Upland Habitat (acres)	No Impact	No Impact	No Impact	0.5	0.05	0.13	0.14	
Community Features	Temporary construction impact to Blue Hole Interpretive site.	No Impact	No Impact	No impact	No Impact	No Impact	No Impact	
Environmental Justice	No impact	No impact	No impact	No impact	No impact	No impact	No impact	
Cultural Resources	No impact anticipated	No impact anticipated	No impact anticipated	No impact anticipated	No impact anticipated	No impact anticipated	No impact anticipated	
Transportation and Safety	Improve operation for visitors using the parking facilities and travelers on Key Deer Blvd.	Enhances bicycle and pedestrian crossing of Key Deer Blvd.	Improves bicycle facilities	improves bicycle and pedestrian facilities	Improves bicycle and pedestrian facilities	Improve shared use pathway	Improve shared use pathway and provides separation from traffic on Key Deer Blvd.	
Visitor Use and Experience	Enhances	Enhances	Enhances	Enhances	Enhances	Enhances	Enhances	
Wetlands (acres)	No impact	No impact	No impact	0.09	No impact	No impact	No impact	
Floodplains (acres)	No impact	No impact	No impact	1.03	0.68	1.04	1.44	

are provided for comparative purposes but are subject to field evaluation, wetland delineation and final engineering during future design and permitting phases including further examination by the USFWS locally and the Ecological Services Division as it relates to consistency with the HCP. It should be noted that this future screening may result in the elimination of certain alternatives from implementation.

As stated previously, the HCP dictates that the seven acres includes habitat loss due to public and private projects including roadway improvements for bicycles, paving of dirt roads, three-laning of US 1 and private development on previously disturbed land. There are no specific projects identified, except for the widening of US 1. Therefore, in general the roadway alternatives presented fall within the HCP and Livable CommuniKeys Masterplan compliance if USFWS is willing to utilize the remaining acreage for these transportation improvements.

Land Use, Habitat Conservation Plan (HCP) Impacts, and applicability to Livable CommuniKeys Masterplan – The study area contains a wide range of intensities and patterns of land use including large tracts of undeveloped lands, including property under public ownership or protected through conservation easement; pockets of low density residential use; moderate to higher density residential development concentrated in improved subdivisions; and strips of commercial and industrial development along stretches of US 1. The areas potentially impacted by the proposed alternatives are located primarily in the roadway right-of-way owned by either Monroe County or USFWS. The HCP allows for no more than 7 total acres of native vegetation to be cleared through year 2023 on Big Pine Key and No Name Key. The HCP accounts for the future roadway improvements to both paved and unpaved roadways within the Refuge generally consistent with the proposed improvements. However, it is conceivable that proposed alternatives may not be implemented if the acreage of the removed vegetation exceeds the desired amount allocated for improvements to roadway facilities. The Livable CommuniKeys Masterplan addresses these types of improvements with action items to permit bicycle and pedestrian facilities in limited right-of-way, where appropriate.

Socioeconomic and Community Features – The National Key Deer Refuge is located in Monroe County Florida. The alternatives proposed within the Refuge are concentrated on two of the islands within the National Key Deer Refuge - Big Pine Key and No Name Key. It is not expected that any community features will be adversely impacted by these improvements. Two public information meetings have occurred for this project and citizen input on the alternatives has been requested. Advertisement and notification of these meetings has been through mailers to stakeholders, news announcements, email from the Refuge to local citizens and through the project specific web page.

Environmental Justice – Although the Refuge is open to all visitors, residents of the Florida Keys and Monroe County are more likely to pass through the Refuge. US 1, the main arterial to the Refuge, functions as both a local and regional facility throughout the Florida Keys. It is a lifeline for the regional economy and the only hurricane evacuation route for Keys residents and visitors. According to 2000 Census data, 6.5% of residents in Big Pine Key are minority (primarily two or more races, Black, or Asian). The 2000 US Census indicated that 10% of families and individuals in Monroe County and 9% in Big Pine Key are below the poverty level, which is lower than both state and national poverty levels (12%). The

percentages of minority residents and the families below poverty are lower in Monroe County and specifically Big Pine Key than the state as a whole. Each of the alternatives proposed occur along existing roads and do not result disproportionate impacts to low income or minority populations.

Cultural Resources – The planning area contains several archeological sites and older structures that may be of local historic importance. No cultural resources in the Refuge are listed on the National Register of Historic Places (NRHP) and none have been evaluated by SHPO for eligibility for listing on the NRHP. There are no expected impacts to cultural resources for the alternatives considered in this study.

Transportation and Safety – The transportation study area for the project includes US 1, Key Deer Boulevard, Watson Boulevard, Long Beach Drive, Big Pine Road, South Street, Avenue B, Koehn Avenue and Wilder Road. Safety concerns within the Refuge include deer vehicle collisions, visitors backing out of parking lots into oncoming traffic, lack of standard shoulders, and lack of standard pedestrian/bicycle facilities.

Visitor Use and Experience – Vehicular access to Refuge lands is provided through various County-maintained public roadways. The majority of public access to the NKDR is provided on Big Pine and No Name Keys via US 1. Roadways on Big Pine Key that provide primary access to the Refuge via US 1 include Key Deer Boulevard, Wilder Road, and Long Beach Road. Most entrances from public streets to the NKDR are gated and not accessible to the public by vehicle. However, there are small unmarked, unpaved parking areas where visitors can park and enter the Refuge by foot at the northern terminus of Key Deer Boulevard, the eastern terminus of Watson Boulevard, Long Beach Trail, and Ohio Key Beach Trail. Parking areas are provided for the Blue Hole Interpretive Site and Watson/Mannillo Trails. The existing Visitors Center is located near US 1 MM 30.5 on Key Deer Boulevard. A one-acre site for a new Visitors Center has been acquired along US 1. The shoulder and pathways alternatives are expected to further enhance visitor mobility and experience.

Wetlands – Based on NWI and GIS land cover mapping, wetlands are located throughout all the islands in the National Key Deer Refuge. Impacts to wetlands are minimal for all alternatives.

Floodplains – FEMA mapping indicates that portions of the Refuge are located within Flood Zone X500, between the limits of the 100-year and 500-year flood; Flood Zone AE, subject to the 100-year flood; and Flood Zone VE, subject to the 100-year flood and additional velocity hazard (wave action). Low lying floodplain areas within the Refuge are vulnerable to sea level rise and flooding events such as hurricanes and other major storms. Areas that are within the velocity hazard zone are vulnerable to storm surges. These types of events can result in habitat changes where salt water inundates freshwater systems affecting the vegetative composition or the availability of freshwater for wildlife including the key deer. Loss of floodplain from development outside the Refuge also affects the extent of flooding. Some impacts to floodplains are expected.

7.3 Potential Impacts for Alternatives

7.3.1 Alternative 1 – Reconfigure Parking Area at Blue Hole Interpretive Site

Land Use, Habitat Conservation Plan (HCP) Impacts, and applicability to Livable CommuniKeys Masterplan – Alternative 1 involves reconfiguring the parking area of an existing paved parking lot at the Blue Hole Interpretive Site. Ten head-in parking spaces will be replaced with nine angled parking spaces and a median will be added to separate the parking lot from Key Deer Boulevard. No negative impacts are anticipated.

Socioeconomic and Community Features – This alternative will not directly impact any residents, communities, or community features.

Environmental Justice – There are no disproportionate impacts to low income or minority populations as a result of this alternative.

Cultural Resources – No impacts are anticipated as a result of Alternative 1.

Transportation and Safety – Alternative 1 will help improve safety on Key Deer Boulevard by preventing vehicles from entering the Blue Hole Parking Facility and blocking Key Deer Boulevard while performing parking maneuvers. It will also prevent visitors from backing out of their parking space, conflicting with Key Deer Boulevard southbound traffic positively improving traffic flow.

Visitor Use and Experience – The improvements included as part of Alternative 1 will enhance the visitor experience and safety making it easier to both park at the Blue Hole Interpretive Site and travel along Key Deer Boulevard.

Wetlands – No impacts to wetlands are anticipated.

Floodplains – No impacts to floodplains are anticipated.

7.3.2 Alternative 2 – Bicycle, Pedestrian and Shoulder Facility Upgrades on Refuge Access Roadways

7.3.2.1 Alternative 2a – Mid-Block Crosswalk across Key Deer Boulevard

Land Use, Habitat Conservation Plan (HCP) Impacts, and applicability to Livable CommuniKeys Masterplan – Alternative 2a includes striping a mid-block crosswalk at the Blue Hole Interpretive Site. No negative impacts are anticipated.

Socioeconomic and Community Features – This alternative will not directly impact any residents, communities, or community features.

Environmental Justice – There are no disproportionate impacts to low income or minority populations as a result of this alternative.

Cultural Resources – No impacts are anticipated as a result of Alternative 2a.

Transportation and Safety – The addition of a mid-block crosswalk at the Blue Hole Interpretive Site will help improve safety by providing pedestrians with a designated point to cross Key Deer Boulevard.

Visitor Use and Experience – The bicycle and pedestrian facility upgrades will make enhance pedestrian and bicyclist travel on the Refuge access roadways.

Wetlands – No impacts to wetlands are anticipated.

Floodplains – No impacts to floodplains are anticipated.

7.3.2.2 Alternative 2b – Sharrow Striping

Land Use, Habitat Conservation Plan (HCP) Impacts, and applicability to Livable CommuniKeys Masterplan – Alternative 2b provides bicycle and pedestrian upgrades by striping sharrows on key roadway facilities and installing the appropriate signage. This is consistent with the HCP and the Livable CommuniKeys Masterplan.

Socioeconomic and Community Features – This alternative will not directly impact any residents, communities, or community features.

Environmental Justice – There are no disproportionate impacts to low income or minority populations as a result of this alternative.

Cultural Resources – No impacts are anticipated as a result of Alternative 2b.

Transportation and Safety – Alternative 2b will provide a designated area for bicyclists on key area roadways.

Visitor Use and Experience – The bicycle facility upgrades will enhance bicyclist travel on the Refuge access roadways.

Wetlands – No impacts to wetlands are anticipated.

Floodplains – No impacts to floodplains are anticipated.

7.3.2.3 Alternative 2c – Shoulder Widening

Land Use, Habitat Conservation Plan (HCP) Impacts, and applicability to Livable CommuniKeys Masterplan – Alternative 2c provides bicycle and pedestrian upgrades including adding paved shoulders and widening of seven road segments. Approximately 280,000 square feet would be impacted for the shoulder/widening projects. Impacted areas are undeveloped areas containing native habitat on the edge of roadways. For the shoulder improvements, approximately 0.5 acres of upland habitat (primarily pinelands and hammocks) are projected to be impacted. The CommuniKeys Masterplan identifies widening of specific roadways for bicycle facilities as a goal with an action item to permit the necessary road widening within the right-of-way. Also it was noted to work with the County's seven-year roadway maintenance plan for these types of improvements. Implementation of this alternative should be carefully assessed by the Refuge and other USFWS staff for willingness to use some of the remaining HCP acreage.

Socioeconomic and Community Features – This alternative will not directly impact any residents, communities, or community features.

Environmental Justice – There are no disproportionate impacts to low income or minority populations as a result of this alternative.

Cultural Resources – No impacts are anticipated as a result of Alternative 2.

Transportation and Safety – The widening of road segments will help vehicles and bicyclists to more safely share the road. The addition of paved shoulders will bring the road segments into compliance with County standards while resurfacing of the road segments will enhance the safety of the roadways.

Visitor Use and Experience – The bicycle, pedestrian, and shoulder facility upgrades will enhance pedestrian and bicyclist travel on the Refuge access roadways.

Wetlands – Approximately 0.09 acres of wetland impacts would occur with this alternative. Impacts to wetlands will need to be avoided and minimized to the extent practical during final design of the improvements.

Floodplains – Approximately 1.03 acres of impact to floodplains could occur with this alternative. Impacts to floodplains will need to be minimized to the extent practical during final design of the improvements.

7.3.3 Alternative 3– Extend Shared Pathway on Key Deer Boulevard North of Kyle Boulevard Land Use, Habitat Conservation Plan (HCP) Impacts, and applicability to Livable CommuniKeys Masterplan

Alternative 3 would extend the existing shared pathway from its current terminus at Kyle Boulevard to the northern terminus of Key Deer Boulevard. The alternative is anticipated to impact 13,200 square feet of land, primarily undeveloped land containing trees and shrubs. Approximately 0.05 acres of habitat may be potentially impacted by this action. This is consistent with the Livable CommuniKeys Masterplan as an enhancement to the bicycle facility system. Implementation of this alternative should be carefully assessed by the Refuge and other USFWS staff for willingness to use some of the remaining HCP acreage.

Socioeconomic and Community Features – This alternative will not directly impact any residents, communities, or community features.

Environmental Justice – There are no disproportionate impacts to low income or minority populations as a result of this alternative.

Cultural Resources – No impacts are anticipated as a result of Alternative 3.

Transportation and Safety – Alternative 3 would improve bicycle and pedestrian safety by allowing bicyclists and pedestrians to travel on the northernmost section of Key Deer Boulevard without having to share travel lanes with vehicles.

Visitor Use and Experience – Extending the shared pathway will enhance the visitor experience by expanding the bicycle and pedestrian network available to Refuge visitors.

Wetlands – No impacts to wetlands are anticipated.

Floodplains – Impacts to approximately 0.68 acres of identified floodplains may potentially occur with this action.

7.3.4 Alternative 4– Widen Shared Pathway on Key Deer Boulevard

Land Use, Habitat Conservation Plan (HCP) Impacts, and applicability to Livable CommuniKeys Masterplan – Alternative 4 widens the shared use path along Key Deer Boulevard from US 1 to Kyle Boulevard. Alternative 4a is anticipated to impact approximately 45,000 square feet of land, primarily undeveloped land containing trees and shrubs. Alternative 4a widens the pathway at the existing location while Alternative 4b also separates the pathway from Key Deer Boulevard where it is currently adjacent. Alternative 4a is projected to impact 0.13 acres of pineland and Alternative 4b is projected to impact 0.14 acres of pineland. The enhancement of bicycle facilities where appropriate with limited right-of-way permitting is an overall action item of the Livable CommuniKeys Masterplan. Implementation of this alternative should be carefully assessed by the Refuge and other USFWS staff for willingness to use some of the remaining HCP acreage.

Socioeconomic and Community Features – This alternative will not directly impact any residents, communities, or community features.

Environmental Justice –There are no disproportionate impacts to low income or minority populations as a result of this alternative.

Cultural Resources – No impacts are anticipated as a result of Alternative 4.

Transportation and Safety – Widening the shared pathway would improve functionality of the pathway for bicycles and pedestrians by allowing two-way travel on the existing shared use pathway. In Alternative 4b, it would further provide separation of the bicyclists and pedestrians from vehicles traveling on Key Deer Boulevard.

Visitor Use and Experience – Widening the shared pathway will enhance the visitor experience by improving bicycle and pedestrian facilities near the Refuge.

Wetlands – No impacts to wetlands are anticipated.

Floodplains – Alternative 4a would impact approximately 1.04 acres of floodplains and Alternative 4b would impact approximately 1.44 acres of floodplains.

8. Implementation Priorities

Based on the preliminary impacts presented in this report and reflective of the general consensus of local public and agency representatives, the following short, medium, and long range roadway improvement alternatives are recommended:

Short Range (2015)

Alternative 1. Reconfigure Blue Hole Interpretive Site parking lot with defined entrances and exits

Alternative 2a. Stripe and sign a mid-block pedestrian crosswalk across Key Deer Boulevard at the Blue Hole Interpretive Site from the existing shared pathway on Key Deer Boulevard

Alternative 2b. Stripe sharrows (shared lane markings for bicycles) on Watson Boulevard from Key Deer Boulevard to Avenue B, Watson Boulevard on No Name Key, Watson Boulevard from Key Deer Boulevard to the western terminus, along Big Pine Street, and along Koehn Avenue

Medium Range (2020)/Long Range (2030)

As identified during the project process, Alternatives 2c, 3, and 4 have impacts to the environment that may not be considered acceptable to the community. Using the discussion in **Section 7** and **Table 7.1** as a guide, the implementation of the remaining consultant roadway improvement alternatives should be carefully assessed against all potential physical impacts and public concerns, with a determination by the Refuge and other USFWS staff as to whether or not the implementation of the alternatives should move forward.

Alternative 2c. The following priorities have been developed for improvements to bicycle/pedestrian/shoulder facilities proposed in Alternative 2:

- Upgrade shoulder/widen Watson Boulevard to standard width from Key Deer Boulevard to Avenue B
- Upgrade shoulder/widen Watson Boulevard to standard width from No Name Key bridge to eastern terminus
- Upgrade shoulder/widen Watson Boulevard to standard width from Key Deer Boulevard to the western terminus
- Upgrade shoulder on Key Deer Boulevard from Watson Boulevard to Big Pine Street
- Upgrade shoulder on Key Deer Boulevard from Big Pine Street to Kyle Boulevard

- Upgrade shoulder/widen entire length of Big Pine Street to standard width
- Upgrade shoulder/widen entire length of Koehn Avenue to standard width

Alternative 3. Extend the shared pathway on Key Deer Boulevard to the northern terminus of Key Deer Boulevard (approximately 0.25 miles) and improve the shoulder facilities on Key Deer Boulevard in that area

Alternative 4. Widen the shared pathway on Key Deer Boulevard from eight to ten feet to allow for two-way bicycle and pedestrian traffic. This action would improve the safety of the path for both users. An associated alternative might consider the realignment of the sections adjacent to the vehicle traveled way.

The non-roadway improvements to be implemented as time and monies permit include:

Alternative 5. Trim vegetation at pullouts and intersections to increase sight distances where needed (i.e. Key Deer Boulevard)

Alternative 6. Perform routine trimming of vegetation around signs for visibility

Alternative 7. Review Monroe County's US 1 sign inventory sign study and implement sign improvements

Alternative 8. Once constructed, the new Visitors Center should tie into existing bicycle and pedestrian facilities already in place on US 1 and also potentially the back side of the property

Alternative 9. Purchase a radar speed check trailer to notify drivers of their travel speed on County roads within the Refuge area

Alternative 10. Perform traffic calming studies on key roadways around the Refuge to determine if traffic calming measures are appropriate to help reduce vehicle speeds

Alternative 11. In coordination with a local vendor, implement a bike rental station at the new Visitors Center for Refuge visitors

Alternative 12. Upgrade all existing USFWS Refuge signage for conformance with the Manual on Uniform Traffic Control Devices (MUTCD) criteria for standard lettering, text message, sign color, size and placement

Alternative 13. Survey Refuge visitors at the existing Visitors Center and the Blue Hole Interpretive Site on their trip characteristics to develop visitor pass-by information

Alternative 14. Install a kiosk at the new Visitors Center where multiple entities could provide information to reduce signage needs

Alternative 15. Update, add, relocate, replace or remove, as appropriate, Key Deer Warning Signs on US 1 through entire Key Deer habitat (including Sugarloaf Key, Cudjoe Key, Summerland Key, Ramrod Key, Little Torch Key, and West Summerland Key) based on discussions with USFWS, FDOT, Monroe County, and animal vehicle collision experts

Alternative 16. Continue awareness of Key Deer and other threatened and endangered species crossing area roadways

Alternative 17. Implement Intelligent Transportation System application to notify drivers of deer entering roadways

Alternative 18. Ongoing coordination with stakeholders

9. List of Preparers

Federal Highway Administration

Christoph Jaeschke, P.E. – *Planning Engineer*

Norah M Ocel, EIT – *Community Planner - Transportation*

U.S. Fish and Wildlife Service

Anne Morkill – *Wildlife Refuge Manager, National Key Deer Refuge*

Kimley-Horn and Associates, Inc.

Jennifer Bihl, P.E. – *Project Manager*

John McWilliams, P.E. – *Project Engineer*

Lynn Kiefer – *Project Biologist*

APPENDIX A

Supporting Documentation and References

Supporting Documents:

URS. 2010 US 1 Arterial Travel Time and Delay Study Monroe County Florida. December 2010

Monroe County Growth Management Division. A Layman's Guide to Big Pine and No Name Key.

Hellmuth, Obata + Kassabaum, Inc. Big Pine Key/US 1 Corridor Area Enhancement Plan. June 2003

Florida Department of Environmental Protection, Office of Greenways and Trails. Contract Plans for the Florida Keys Overseas Heritage Trail Spanish Harbor to Seven-Mile Bridge MM 30.0 to 40.0. October 2009.

USFWS Southeast Region. 5-year Review: Summary and Evaluation Eastern Indigo Snake (*Drymarchon Couperi*). April 2008.

USFWS Southeast Region. 5-year Review: Summary and Evaluation Rice Rat (*Oryzomys palustris natator*). August 2008.

USFWS Southeast Region. 5-year Review: Summary and Evaluation Key Deer (*Odocoileus virginianus clavium*). August 2010.

USFWS Southeast Region. 5-year Review: Summary and Evaluation. Lower Keys Marsh Rabbit (*Sylvilagus palustris hefneri*). September 2007.

Monroe County. Habitat Conservation Plan for Florida Key Deer (*Odocoileus virginianus clavium*) and other Protected Species on Big Pine Key and No Name Key. Monroe County, Florida. April 2003: April 2006 Revision.

Monroe County Planning and Environmental Resources Department. Livable CommuniKeys Master Plan for Big Pine Key and No Name Key. Original BOCC Adoption 08/2004: Amended by Ordinance 020-2009.

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Parker, et al. Effects of US 1 Project on Florida Key Deer Mortality. Journal of Wildlife Management, 72(2): 354-359; 2008

Schmidt, Jason A.; Lopez, Roel R. and Silvy, Nova J. Evaluation of The US 1 Crossing Project in Reducing Key Deer Mortality (4 Year Post-Project Report). Texas A&M University, February 2007.

FHWA Central Federal Lands Highway Division. The Road Inventory of National Key Deer National Wildlife Refuge. June 2010.

URS. Florida Keys Carrying Capacity Study. September 2002.

FDOT. Contract Plans State Road No. 5 US 1/Overseas Highway at Key Deer Boulevard. March 2010.

FDOT. Florida Greenbook. May 2011

Area Traffic Counts

American Association of State Highway and Transportation Officials, A Policy on Geometric Design of Highways and Streets, 5th Edition. Washington DC. 2004.

U.S. Department of Transportation, Federal Highway Administration. Manual on Uniform Traffic Control Devices for Street and Highways. 2009 Edition.

Internet Resources:

2009 Aerial Imagery: http://www.monroecounty-fl.gov/Pages/MonroeCoFL_WebDocs/mcpa

Census 2000 Data: <http://factfinder.census.gov/home/saff/main.html? lang=en>

Community Services, FEMA Flood Zones and NWI Wetlands data: www.fgd.org

Endangered Species Act Review of the National Flood Insurance Program in the Florida Keys:
<http://www.fws.gov/verobeach/images/pdflibrary/FEMA%20Flood%20Insurance%20Biological%20Opinion%20-%20August%2009,%202006%20Q&As.pdf>

Estimates of Population by County and City in Florida: April 1, 2008:
http://www.bebr.ufl.edu/files/2008_Estimates_Table01_0.pdf

Existing Land Use, Future Land Use, Habitat and Tier System Data: http://www.monroecounty-fl.gov/Pages/MonroeCoFL_GIS/index

Facts About Monroe County: http://www.monroecounty-fl.gov/Pages/MonroeCoFL_admin/about

State Historical Preservation Officer Master Site File Data:
<http://dhr.dos.state.fl.us/preservation/sitefile/>

Species Focus Areas and Key Deer Mortality data: <http://www.fws.gov/verobeach/>

APPENDIX B

Public Involvement Plan

Public Involvement Plan

DTFH71-09-D-00001
TASK ORDER 10-009

NATIONAL KEY DEER REFUGE
BIG PINE KEY, FLORIDA
TRANSPORTATION STUDY

Prepared for:

FHWA: Eastern Federal Lands Highway Division

Prepared by:

Kimley-Horn & Associates, Inc.
710 Boundary Street, Suite 1D
Beaufort, SC 29902

September 17, 2010

1. INTRODUCTION

The preparation of a transportation study for the National Key Deer Refuge is being performed to develop short- and long-range transportation enhancements for mobility to and within the Refuge.

2. BACKGROUND

2.1. PURPOSE OF PUBLIC INVOLVEMENT

The purpose of the public involvement process is to promote and provide a variety of meaningful forums for citizens to learn about and comment on the project. A list of known stakeholders is detailed later in this plan. The outcome of this effort will be that stakeholders and interested citizens will have had meaningful opportunities to provide input regarding mobility in and around the National Key Deer Refuge.

2.2. PUBLIC INVOLVEMENT OBJECTIVES

- Disseminate information about this project to the general public and to directly affected stakeholders.
- Identify and actively solicit input from stakeholder groups affected by and interested in this project.
- Provide a variety of opportunities for public participation and involvement throughout the planning process.

2.3. PRINCIPLES GUIDING THE PUBLIC INVOLVEMENT

The project team recognizes and embraces the important role of public involvement in this project's process. Team members will be guided by the following principles when dealing with constituencies interested in this project:

- Two-way communication (i.e., the free exchange of information, ideas, and values between Federal Highway Administration: Eastern Federal Lands Highway Division (FHWA-EFLHD), US Fish and Wildlife Service (FWS), the Consultant (KHA), and citizens/stakeholders) will be sought. A specific methodology to solidify two-way communication will be established early and used routinely (e-mail contact, comment forms, etc.)

- Project information will be communicated to stakeholders and citizens identified within a defined study area through the website and public meetings.
- Reasonable input from the citizens will be given consideration by the project team.
- Citizen/public questions will be followed up on within two business days. This quick action builds trust and confidence.
- Public involvement activities and input will be documented.
- A series of formal public outreach actions including two public information meetings. Team members will be mindful of non-technical language, different cultures and the need for simple illustrations where possible. In addition, we will avoid the suit-and-tie look by using business-casual attire.
- Opportunities for multiple forms of input will be illustrated from the beginning. Interested citizens will be given the website information and the appropriate FHWA-EFLHD, FWS and KHA contact information.

3. COMMUNICATION STRATEGIES

To be effective, outreach efforts need to be tailored to the needs and concerns of specific constituent groups in a manner conducive to their involvement. Some communications can meet the diverse needs of stakeholders, such as through the use of newspaper columns. Other times, different strategies are more effective in accomplishing study objectives.

The strategies of the public involvement plan are to:

- Establish the need for better connections in clear and concise terms.
- Provide forums to encourage discussion and dialogue between the public and project team members.

4. PUBLIC INVOLVEMENT ACTION STEPS

4.1. INFORMATION GATHERING

4.1.1. PROJECT MAILING LIST

A project mailing list, prepared by FHWA-EFLHD/FWS, will be used to announce each public information meeting. Citizens who request information about the project will be added to the study's database. The mailing list will be used to distribute targeted information important to the study and to track public comments and questions. A database of mailing addresses will be maintained through the project.

KHA will add the local officials, agencies, and additional citizens to the mailing list.

Deliverable: Project mailing list database

Responsible: Develop original mailing list – FHWA-EFLHD/FWS
Maintain and update mailing list – KHA

4.2. INFORMATION DISTRIBUTION

4.2.1. MEDIA RELATIONS

KHA will develop a draft of black and white text and graphics for newspaper notices to announce the public information meetings. After review and approval by FHWA-EFLHD/FWS, KHA will submit public meeting notices to newspapers determined by the project team (see Appendix for listing of newspapers in the area).

Deliverable: Newspaper notices for public information meetings

Responsible: Example from other studies of newspaper releases – FHWA-EFLHD
Newspaper notices - KHA

4.2.2. PUBLIC INFORMATION MEETINGS

Two public information meetings are planned. The purpose of the first meeting is to present an overview of the project and begin gathering information. The purpose of the second meeting is to share the developed alternatives and receive feedback. Meetings will be structured to provide opportunities for attendees to express their preferences and ideas, both verbally and in writing. Comment sheets will be distributed to obtain input from attendees. Results of the comment sheets will be summarized by KHA for submittal to FHWA-EFLHD/FWS.

The format for the meetings will be an informal walk-in session. Citizens may drop in any time during the workshop. A short powerpoint presentation may be available (on a loop) for viewing to provide general project information. Citizens are then encouraged to view large-scale maps and talk directly with the project team.

Deliverable: Coordination, promotion and hosting of two meetings

Responsible: KHA

4.2.3. STAKEHOLDER MEETINGS

Three stakeholder meetings will be held. The first meeting will explain the project process and identify constraints, key issues and expectations. The second meeting will solicit input from stakeholders on the alternative evaluations. The third meeting will review the results of the alternatives analysis and present final recommendations. A list of potential stakeholders is shown in the Appendix along with a list of notifications for other agency officials.

Deliverable: Scheduling, development and presentation of project, summary of comments

Responsible: KHA

4.2.4. WEBSITE

Project information will be developed and provided to EFLHD/FWS in pdf format to be posted on FHWA's website. This posted information will be another avenue to disseminate information to the public. Information updates will be provided as appropriate.

Deliverable: Updated information as needed (up to 1 time per month)

Responsible: Review of material– FHWA-EFLHD and FWS

Website Information Updates - KHA

APPENDIX

NAME	ADDRESS	PHONE	WEBSITE
Key West Citizen	c/o Cooke Communications, LLC 3420 Northside Dr., Key West, FL 33040	305-292-7777	www.keysnews.com
Florida Keys Keynoter – Key West	2720-A North Roosevelt Blvd., Overseas Market, Key West, FL 33040	305-296-6989	www.keysnet.com
Florida Keys Keynoter - Marathon	3015 Overseas Hwy., Marathon, FL. 33050	305-743-5551	www.keysnet.com
WKWM-91.5 FM	172 NE 15 th Street, Miami, FL 33132	305-995-1717/ 1-866-740-9596	www.wlrn.org
Monroe County Television (MCTV/76)	Harvey Govt. Center, Suite 211 1200 Truman Ave Key West, FL 33040	305-295-5128	http://www.monroecountyfl.gov/

Table A-2: Potential Stakeholders

NAME	AGENCY & POSITION	ADDRESS	PHONE	EMAIL
Jo Ann Clark	USFWS, SER Refuge Roads/FLH Program Coordinator	1875 Century Blvd., Ste. 420 Atlanta, GA 30345	404-679-4114	JoAnn_Clark@fws.gov
Anne Morkill	USFWS, Manager, National Key Deer Refuge	179 Key Deer Boulevard, Big Pine Key Plaza, Big Pine Key, FL 33043	305-872-2239	Anne_morkill@fws.gov
Karen Hillier	USFWS, Deputy Manager, National Key Deer Refuge	179 Key Deer Boulevard, Big Pine Key Plaza, Big Pine Key, FL 33043	305-872-2239	Karen_hillier@fws.gov
Phillip Hughes	USFWS, Ecologist, National Key Deer Refuge	179 Key Deer Boulevard, Big Pine Key Plaza, Big Pine Key, FL 33043	305-872-2239	Phillip_hughes@fws.gov
Tom Wilmers	USFWS, Sr. Biologist, National Key Deer Refuge	179 Key Deer Boulevard, Big Pine Key Plaza, Big Pine Key, FL 33043	305-872-2239	Thomas_wilmers@fws.gov
Chad Anderson	USFWS, Refuge Biologist, National Key Deer Refuge	179 Key Deer Boulevard, Big Pine Key Plaza, Big Pine Key, FL 33043	305-872-2239	Chad_anderson@fws.gov
Jim Bell	USFWS, Visitor Services, National Key Deer Refuge	179 Key Deer Boulevard, Big Pine Key Plaza, Big Pine Key, FL 33043	305-872-2239	James_bell@fws.gov
Steve Berger	USFWS, Law Enforcement Officer, National Key Deer Refuge	179 Key Deer Boulevard, Big Pine Key Plaza, Big Pine Key, FL 33043	305-872-2239	Steven_berger@fws.gov
John Wrublik	USFWS, Transportation Projects Liaison	1339 20th Street, Vero Beach, FL 32960-3559	772-562-3909 x282	john_wrublik@fws.gov
Lt. Elizabeth Riesz	FWC, South Region – Marathon Office	2796 Oversees Highway #100, Marathon, FL 33050	305-289-2320	Elizabeth.riesz@MyFWC.com
Joe Medallion	Monroe County Public Works Department - Roads and Bridges Division	Upper Keys Operations 186 Key Heights Road Plantation Key, FL	305-852-7161	Medallion-Joe@monroecounty-fl.gov
Judith Clark	Monroe County, Engineering Services Director	1100 Simonton Street Suite 2-216 Key West, FL 33040	305-292-4426	Clark-Judith@monroecounty-fl.gov

Table A-2: Potential Stakeholders

NAME	AGENCY & POSITION	ADDRESS	PHONE	EMAIL
Jane Tallman	Monroe County, Scenic Highway Coordinator	Marathon Govt. Center, Suite 400 2798 Overseas Highway Marathon, FL 33050	305-289-2521	Tallman-Jane@monroecounty-fl.gov
Mitchell Harvey	Monroe County, Comprehensive Planning Manager	Marathon Govt. Center, Suite 400 2798 Overseas Highway Marathon, FL 33050	305-289-2514	Harvey-Mitchell@monroecounty-fl.gov
Patricia Smith	Monroe County, Transportation Planner	Marathon Govt. Center 2798 Overseas Highway Suite 400 Marathon, FL 33050	305- 289-2562	smith-patricia@monroecounty-fl.gov
Laura Kammerer	Deputy, Bureau of Historic Preservation	500 South Bronough Street Room 305 Tallahassee, FL 32399-0250	850-245-6333	lkammerer@dos.state.fl.us
Steven Craig James	FDOT District 6, Environmental Administrator	1000 NW 111th Avenue, Room 6109 Miami, Florida 33172 Office (305) 470-5221	305-470-5221	steven.james@dot.state.fl.us
Aileen Boucle	FDOT District 6, Planning & Environmental Management Administrator	1000 NW 111th Avenue, Room 6111-A Miami, Florida 33172	305-470-5201	Aileen.boucle@dot.state.fl.us
Patricia Ivey	FDOT District 6 Project Administrator	3100 Overseas Highway Marathon, FL 33050	305-289-6106	patty.ivey@dot.state.fl.us
Omar Meitin	FDOT District 6 Traffic Operations Engineer	1000 NW 111th Avenue Room 6206A Miami, FL 33172	305-470-5335	omar.meitin@dot.state.fl.us
Ken Jeffries	FDOT District 6 Planner & Bicycle Pedestrian Coordinator	1000 NW 111th Avenue Room 6112 Miami, FL 33172	305-470-6736	ken.jeffries@dot.state.fl.us
Anthony Knott	FDEP, Office of Greenways and Trails (OGT), FL Keys Overseas Heritage Trail Manager	3 La Croix Court Key Largo, Florida 33037	305-853-3571	Anthony.knott@dep.state.fl.us
Todd McGee	FDEP-OGT, FL Keys Overseas Heritage Trail Construction Manager	3 La Croix Court Key Largo, Florida 33037	305-420-8432	Todd.mcgee@dep.state.fl.us

Table A-2: Potential Stakeholders

NAME	AGENCY & POSITION	ADDRESS	PHONE	EMAIL
Carole Stevens	Lower Keys Chamber of Commerce – Executive Director	P.O. Box 430511 / Big Pine Key, FL 33043	305-872-2411	info@lowerkeyschamber.com
Jerry Dykhuisen	Key Deer Protection Alliance	PO Box 430224 Big Pine Key, FL 33043-0224	N/A	jdykhuisen@aol.com
Alison Higgins	Friends and Volunteers of Refuges (FAVOR – Florida Keys)	P.O. Box 431840, Big Pine Key, FL 33043-1840	305-872-0774	ahiggins@tnc.org
Chris Bergh	The Nature Conservancy, Florida Keys Program Director	4245 North Fairfax Drive, Suite 100 Arlington, VA 22203-1606	703-841-5300	cbergh@tnc.org
Mark Songer	Last Stand, President	P.O. Box 146, Key West, FL 33041	305-296-3335	admin@last-stand.org
July Hull	Florida Keys Scenic/All-American Highway Corridor Alliance, President	P.O. Box 501930 Marathon, FL 33050	305-289-2521	director@islamoramachamber.org

Table A-3: Additional Notifications				
NAME	AGENCY & POSITION	ADDRESS	PHONE	EMAIL
Paul Souza	USFWS, Field Supervisor, South Florida Ecological Services	1339 20 th Street, Vero Beach, FL 32960-3559	772-562-3909	Paul_souza@fws.gov
Trish Adams	USFWS, Habitat Conservation Program Coordinator	1339 20th Street, Vero Beach, FL 32960-3559	772-562-3909 x262	trish_adams@fws.gov
Dana Hartley	USFWS Endangered Species Recovery Coordinator	1339 20th Street, Vero Beach, FL 32960-3559	772-562-3909 x236	dana_hartley@fws.gov
Major Alfredo Escanio	FWC, Regional Law Enforcement Commander	3200 NE 151st Street, Miami, FL 33181	305-956-2500	alfredo.escanio@MyFWC.com
Chuck Collins	FWC, South Region, Regional Director	8535 Northlake Boulevard, West Palm Beach, FL	561-625-5130	chuck.collins@MyFWC.com
George Neugent	Monroe County, District 2 Commissioner	25 Ships Way Big Pine Key, FL 33043	305-872-1678	Neugent-George@monroecounty-fl.gov
Roman Gastesi	Monroe County, Administrator	1100 Simonton Street Key West, FL 33040	305-292-4441	Gastes-Roman@MonroeCounty-fl.gov
Dent Pierce	Monroe County, Public Works Director	1100 Simonton Street, Suite 2-231 Key West, FL 33040	(305) 292-4560	Pierce-Dent@MonroeCounty-FL.gov
Christine Hurley	Monroe County, Growth Management Director	Marathon Govt. Center, Suite 400 2798 Overseas Highway Marathon, FL 33050	305- 289-2517	Hurley-Christine@monroecounty-fl.gov
Townsley Schwab	Monroe County, Planning and Environmental Resources Senior Director	Marathon Govt. Center, Suite 400 2798 Overseas Highway Marathon, FL 33050	305-289-2500	Schwab-Townsley@monroecounty-fl.gov
Kathy Grasser	Monroe County, Comprehensive Planner (HCP)	Marathon Govt. Center, Suite 400 2798 Overseas Highway Marathon, FL 33050	305-289-2526	Grasser-Kathy@monroecounty-fl.gov

Table A-3: Additional Notifications				
NAME	AGENCY & POSITION	ADDRESS	PHONE	EMAIL
Michael Roberts	Monroe County, Environmental Resources Sr. Administrator	Marathon Govt. Center, Suite 400 2798 Overseas Highway Marathon, FL 33050	305-289-2502	Roberts-Michael@monroecounty-fl.gov
Rajendran Shanmugam	Monroe County, Transportation Consultant (URS Corp.)	The Exchange 3343 West Commercial Boulevard, Suite 100 Fort Lauderdale, FL, 33309	954-739-1881	Raj_shanmugam@urscorp.com
Lt. Gen Thompson	Monroe County, Sheriff's Office, Traffic Safety	Freeman Substation 20950 Overseas Hwy. Cudjoe Key, FL 33042	305-745-3184	gthompson@keysso.net
Dpty. Linda Kohout	Monroe County, Sheriff's Office, Environmental Issues	Freeman Substation 20950 Overseas Hwy. Cudjoe Key, FL 33042	305-745-3184	lkohout@keysso.net
Mr. Scott M. Stroh III	State Historic Preservation Officer, Division of Historical Resources	500 S. Bronough Street Room 305 Tallahassee, FL 32399-0250	850-245-6300	smstroh@dos.state.fl.us
John Palenchar	FDOT District 6, Environmental Permits Coordinator	1000 NW 111th Avenue Miami, FL 33172	305-470-5223	John.palenchar@dot.state.fl.us
Phil Frank	FDOT District 6 Consultant, Consulting, Engineering & Science, Inc.	10700 N. Kendall Drive, #400, Miami, FL 33176	305-378-5555	ceskeys@bellsouth.net
Omar Meitin	FDOT District 6 Traffic Operations Engineer	1000 NW 111th Avenue Room 6206A Miami, FL 33172	305-470-5335	omar.meitin@dot.state.fl.us
Rebecca Jetton	Florida Dept. of Community Affairs, Areas of Critical State Concern Administrator	2555 Shumard Oak Boulevard, Tallahassee, FL 32399-2100	850-922-1766	Rebecca.jetton@dca.state.fl.us

APPENDIX C

Stakeholder Meeting Notes

October 13, 2010

January 31, 2011

April 7, 2011

National Key Deer Refuge Transportation Study
Eastern Federal Lands Highway Division
Federal Highway Administration
Contract No. DTFH71-09-D-00001

Stakeholder Meeting #1
October 13, 2010, 1:00 PM

Kimley-Horn and Associates, Inc
5200 NW 33rd Avenue, Suite 109
Fort Lauderdale, FL 33309

MEETING NOTES

Attendees:

US Fish and Wildlife Service (FWS)

JoAnn Clark
Anne Morkill
Karen Hillier
Phillip Hughes
Jim Bell
Tom Wilmers
Dana Hartley*
Mark Salvato*

Monroe County

Judy Clarke
Mike Roberts
Jane Tallman

FDOT District 6

Ken Jeffries*
Ramon Sierra*
Susanne Travis*

Federal Highway Administration (FHWA)

Chris Jaeschke
Norah Ocel

Florida Keys Overseas Heritage Trail (FKOHT)

Anthony Knott

Kimley-Horn and Associates, Inc. (KHA)

Larry Meisner
Lynn Kiefer
John McWilliams

Florida Department of Community Affairs (DCA)

Shane Laakso

Florida State Division of Historical Resources

Alyssa McManus*
Jennifer Jones*

**Attended via conference call*

Introduction

The first stakeholder meeting for the National Key Deer Refuge Transportation Study convened on October 13, 2010 at the National Key Deer Refuge Headquarters in Big Pine Key, Florida. Anne, the refuge manager, introduced herself and thanked the stakeholders for attending. Attendees introduced themselves and Chris Jaeschke provided a brief overview of FHWA's role in the study. Chris indicated that the three main reasons for inviting the stakeholders this early in the study process was to inform them of the study, build consensus for the transportation challenges and opportunities, and request their assistance for any data they could contribute. Norah reviewed

major project tasks in final proposal. Larry Meisner and John McWilliams outlined the meeting's agenda.

Purpose of Meeting

The purpose of this meeting was to review the major project tasks, project schedule, project objectives, data/information requests, and public involvement plan. The meeting also outlined the specific transportation issues within the Refuge including safety, pedestrian/bicycle access, circulation, parking, and assessment of current Key Deer warning systems.

Discussion

Discussion of particular agenda items occurred during the meeting. Specific items of discussions are outlined below.

Study Overview/purpose

- KHA and FHWA staff provided a brief project overview and purpose. The project will include examination of access to, from, and within the Refuge and the development of improvements that address specific transportation issues unique to the Refuge. The objective of the study is to outline the transportation needs of the Refuge and evaluate those improvements with regards to cost and environmental impact.

Project Schedule

- The group reviewed the project schedule indicating that the Existing Conditions Report would be completed in November, Alternatives Analysis completed in January, and the Recommendations Report completed in May. Once the reports are finalized, they will be posted on the project website.

Stakeholder Concerns/Issues

- KHA staff presented the preliminary list of specific transportation issues identified in the Refuge which included the new visitor's center, the Overseas Heritage Trail (OHT) along US 1, deer/vehicle collisions, parking, and bicycle/pedestrian issues.
- FDOT staff inquired about the location of the proposed visitor's center. FWS staff indicated that the center would be located along US 1. The site is currently being used by FDOT for construction staging. The site will have vehicular access to US 1.
- KHA staff inquired about the location of the OHT on the eastern portion of Big Pine Key. Anthony Knott indicated that he can provide the plans or the contact for obtaining the plans for that section if KHA did not already have them.
- The group discussed the Monroe County traffic impact study requirements (i.e. US 1 Level of Service Study) of the visitor's center. KHA staff indicated that this specific study was typically performed closer to the construction of the facility which is several years from now.

- FHWA staff suggested that this study provide some design criteria for the visitor's center that would address access, parking, pedestrian/bicycle facilities, and bus maneuverability. FWS staff indicated a need for bus access for school children.
- The group discussed numerous events that impact traffic along US 1 in and around the Refuge. These events include the annual birding/wildlife festival, attracting approximately 700 people, Boy Scouts Kid's Carnival, Summerland Key's astronomy event, the weekly flea market, the Bahia Honda's Annual Earth Day event and the Seven-mile bridge race that attracts 1,000 people. The group also discussed other events that increase traffic along US 1 including lobster mini-season, Fantasy Fest, and the poker runs.
- KHA staff inquired about transit service in the area. The group indicated that the City of Key West operates the Lower Keys Shuttle from Key West to Marathon stopping at Key Deer Boulevard. The City of Key West contact for this service is Myra Wittenberg.
- KHA staff indicated that ITS technologies addressing animal-vehicle collisions are available but relatively unproven in an urban environment. The study will examine preliminary options with regard to this approach.
- It was mentioned that based on the recently completed CCP, it was decided not to advertise the key deer more than it is currently done.

Data Requirements

- KHA staff inquired about Refuge visitation data. Jim Bell indicated that he could provide the information that is available. Counters at the Blue Hole indicate that approximately 138,000 people visited last year while the site typically averages 80,000 to 100,000 people per year. The existing visitor center has approximately 20,000 visitors per year.
- KHA staff indicated that they would be reaching out to stakeholders for additional available data as necessary including cultural resources, census data, and tourism data. Tourism data would be obtained from either the Big Pine Key Chamber of Commerce, or the Tourism Development Council.
- OHT staff indicated that trail use data is available. KHA staff will contact OHT staff to obtain this information.
- Stakeholders indicated that significant information/data was included in the 2009 Habitat Conversation Plan (HCP).
- John McWilliams stated that he would formally request crash data and work program data from FDOT. A significant amount of traffic volume data has been collected and compiled by FDOT and is available online.

- Monroe County staff is currently working on the Lower Keys Communi-Keys Study that may provide some more information/data in the area.
- Jane Tallman stated that Monroe County is currently working on a US 1 sign inventory project which may be of use in this study.
- Michael Roberts recommended that the group examine the Florida Keys Carrying Capacity Study.

Public Involvement Plan

- John McWilliams indicated that the project schedule called for a total of three (3) stakeholder meetings and two (2) public information meetings. The stakeholder's group agreed that 1:00 P.M. was an acceptable time to hold future stakeholder meetings and evenings will be a good time for the public meetings.

Open Discussion

- FWS discussed the potential for Podcast tours of the Refuge in the future.

National Key Deer Refuge Transportation Study

Eastern Federal Lands Highway Division
Federal Highway Administration
Contract No. DTFH71-09-D-00001

Stakeholder Meeting #2

January 31, 2011, 2:00 PM

Kimley-Horn and Associates, Inc

5200 NW 33rd Avenue, Suite 109
Fort Lauderdale, FL 33309

MEETING NOTES

Attendees:

US Fish and Wildlife Service (FWS)

JoAnn Clark*
Anne Morkill
Karen Hillier

Federal Highway Administration (FHWA)

Norah Ocel

Kimley-Horn and Associates, Inc. (KHA)

Jennifer Bihl
John McWilliams

**Attended via conference call*

Monroe County

Judy Clarke

FDOT District 6

Ramon Sierra*
Susanne Travis*

Florida Department of Community Affairs (DCA)

Erin sitting in for Shane Laakso*
Jo Penrose*

Florida State Division of Historical Resources

Ginny Jones*

Introduction

The second stakeholder meeting for the National Key Deer Refuge Transportation Study convened on January 31, 2011 at the National Key Deer Refuge Headquarters in Big Pine Key, Florida. Jennifer thanked the stakeholders for attending and attendees introduced themselves.

Purpose of Meeting

The purpose of this meeting was to review the reports to date and to get feedback from the stakeholders on recommendations.

Discussion

Discussion of specific items occurred during the meeting and are outlined below.

- Bicycle and Pedestrian and Shoulder upgrades – Monroe County would get the request for these upgrades on County roads. The project should compile a list of priority locations and get it to Judy Clarke.
- The study will provide a typical cross section for the County to be used at these bicycle/pedestrian crossings.
- The resurfacing program in Monroe County is on hold due to bridge repair needs. There are about 5 to 6 years left to complete the needed bridge repairs in the County. We need to compile a list of priority resurfacing locations and get it to Judy Clarke. Note that before resurfacing, typically the sewer system needs to go in first, there are a few locations/neighborhoods on Big Pine Key where this would be an issue. Judy will provide their most recent list of priority roadways on Big Pine Key for resurfacing (this will be old).
- Bridges – SR 940 Leg A – This bridge has LAP funding, it is scheduled for design in the upcoming fiscal year and construction the year after. Requested from Judy that sidewalks be reviewed during design to add bicycle and pedestrian facilities on the bridge and add connectivity.
- Bridges – No Name Bridge – Not eligible for federal funding due to its functional classification. Design will begin in the fall. Construction will depend on future funding.
- Judy Clarke will get an update from June on the status of the sign inventory and let the team know the status.
- Traffic calming – Speed humps are not a standard practice on County roadways, discussed the recommendation of a traffic calming study to be performed to determine the appropriate traffic calming treatment. Speed enforcement is key to traffic calming.
- Bus Pullouts – The Refuge inquired if these be improved on Big Pine Key. Myra Wittenberg of Key West Transit has a grant to improve the one on Big Pine Key. In general, if there is not a pullout or a shelter it is because it could not physically be implemented.
- The Refuge indicated that the Visitor's Center is scheduled for a 2013 design and a 2014/2015 construction timeframe.
- Look at the potential for kiosks at the new Visitor's Center for USFWS, FDEP, etc. to put their information on. Add to the recommendations in the report.
- Scenic Highway grants are in February/March every year.
- Refuge staff liked the idea of recommending dynamic flashing signs at least along Key Deer Boulevard.
- Other recommendation would be to have sporadic "speed check stations"

National Key Deer Refuge Transportation Study

Eastern Federal Lands Highway Division
Federal Highway Administration
Contract No. DTFH71-09-D-00001

Stakeholder Meeting #2

April 7, 2011, 2:00 PM

Kimley-Horn and Associates, Inc

5200 NW 33rd Avenue, Suite 109
Fort Lauderdale, FL 33309

MEETING NOTES

Attendees:

US Fish and Wildlife Service (FWS)

Anne Morkill
Karen Hillier

Federal Highway Administration (FHWA)

Norah Ocel

Kimley-Horn and Associates, Inc. (KHA)

Jennifer Bihl
John McWilliams

Monroe County

Judy Clarke
Trish Smith*
Michael Roberts

FDOT District 6

Ramon Sierra*

Florida Department of Community Affairs (DCA)

Rebecca Jetton*
Shane Laakso*

Florida State Division of Historical Resources

Ginny Jones*
Dan McClaren*

The Last Stand/Key Deer Protection Alliance

Joyce Newman
Deb Curlee

**Attended via conference call*

Introduction

The third stakeholder meeting for the National Key Deer Refuge Transportation Study convened on April 7, 2011 at the National Key Deer Refuge Headquarters in Big Pine Key, Florida. Kimley-Horn thanked the stakeholders for attending and attendees introduced themselves.

Purpose of Meeting

The purpose of this meeting was to review the reports to date and to get feedback from the stakeholders on recommendations.

Discussion:

Discussion of specific items occurred during the meeting and is outlined below.

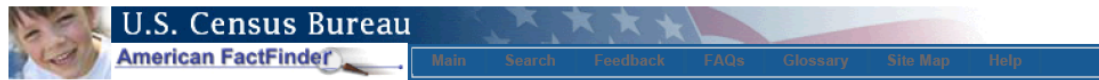
- Kimley-Horn provided a brief overview of the meeting agenda and the reports previously prepared as part of the overall transportation study. It was stated that the main focus of this meeting was to obtain input on potential alternatives presented in the Preliminary Candidates Report.
- Kimley-Horn discussed the proposed roadway alternatives including the Blue Hole Interpretive Site parking lot improvements. The conceptual plan for this improvement indicated a need to expand the concrete pavement 5-7 additional feet. Kimley-Horn provided background on the need for the expansion and the improvements to traffic flow/safety in and out of the parking area. Representatives from the Last Stand indicated that they did not support this improvement. They indicated that the improvement was not a priority and would use a portion of the limited allowable development outlined in the Habitat Conservation Plan (HCP).
- Kimley-Horn presented the proposed improvements to the existing roadways to provide for standard bicycle facilities and roadway shoulders to improve safety. A majority of roadways around the Refuge do not meet current standards and the Refuge would need to prioritize the facilities would be upgraded first.
- The group discussed the overall limitations on improvements within the Refuge as outlined in the HCP. It is not clear upgrading the existing roadway facilities up to current standards would be considered impacted area per the HCP. The group consensus was that it would be considered an impacted area because of the loss of habitat. Representatives from the Last Stand indicated that Key Deer often feed on the vegetation on the roadside that would be eliminated by roadway shoulder improvements.
- Kimley-Horn indicated that all of the proposed candidate improvements would be evaluated for environmental impacts and this evaluation would be included in the next report. It was reiterated that the planning process requires that all potential improvements be thoroughly reviewed and that not all candidate improvements would be implemented. It will be up to the stakeholders to determine which improvements provide a greater benefit despite the additional impacts the improvement would create. The final report will provide the information needed for stakeholders to make this determination.
- Rebecca Jetton voiced concerns over the compatibility of the improvements with the HCP. She asked how the future Visitors Center was related to this project. The Visitors Center project is independent of this report. Additionally, providing design criteria for the Visitors Center as part of the project was determined to be premature since the Visitors Center is not planned in the immediate future. Anne Morkill provided the group with a short overview of the future Visitors Center.

- Mike Roberts indicated that he recalled that the HCP contemplated some roadway widening and that the USFWS office in Vero Beach would need to be contacted to confirm.
- The group discussed the limitations of the HCP and that only 7 additional acres could be impacted. The Last Stand indicated that a new gas station is currently being proposed on Big Pine Key.
- The representatives from The Last Stand provided several comments on the Preliminary Candidates Report. They had concerns over the future Visitors Center and the additional traffic it would generate. Kimley-Horn indicated that a visitor survey was being developed to assess the travel patterns of current visitors to better estimate the number of new trips that the Visitors Center would potentially generate. It is anticipated that a significant portion of visitor traffic originates from locals/tourists that are already traveling on the US 1 corridor.
- The representatives from the Last Stand did not concur with the need to widen the existing 8' shared-use path to 10' as the bicycle and pedestrian traffic volumes do not warrant such an improvement. They reiterated that any increase of pavement along the roadway would eliminate the foliage that serves as a food source for Key Deer. They indicated that standard engineering practices/standards are not applicable to this area and that the overall mindset is different in and around the Refuge.
- Trish Smith stated that improvements to widen the shared-use path along US 1 (Overseas Heritage Trail) often did not provide for a continuous 12' wide bicycle path and, in some locations, the path was only constructed at 8 feet. It was clarified that the report recommends a 10' minimum path width consistent with the minimum design standards and not the current 12' FDOT requirement.
- Kimley-Horn discussed the potential of implementing share lane markings or "sharrows" along the Refuge roadways in lieu of widening of the roadway to provide bicycle lanes. The stakeholders were supportive of "sharrows" and the appropriate signage.
- The group agreed that all alternatives would need to review the U.S. Fish and Wildlife Service in Vero Beach, Florida. Anne Morkill said that USFWS Vero Beach staff is included on this project's distribution list and they've received all meeting notifications with limited participation.
- Trish Smith suggested that the lead agency identified for each improvement be revisited. She indicated that any improvement that potentially impacts the HCP should be examined by the Refuge/U.S. Fish and Wildlife Service before moving forward. If changes to the HCP are required, Monroe County would request these agencies to take the lead on that effort.
- Trish Smith provided an update on the US 1 signage inventory project. She stated that the inventory was recently completed and she expects a deliverable soon. This report will be

provided to Refuge staff. She also reiterated that any requests for changes to the existing Refuge signage along US -1 should be submitted to Monroe County as soon as possible.

- Representatives from Last Stand stated that Key Deer warning signs should also be considered on other minor roadways where signage does not exist including Crane Blvd. and Sugarloaf Blvd. on Sugarloaf Key, and Blimp Road on Cudjoe Key.
- Kimley-Horn suggested that stakeholders be identified and a workshop be conducted to review and discuss the existing signage. It was stated that it would be beneficial for stakeholders that we part of the development of the HCP and fencing project is present at that workshop.
- Kimley-Horn discussed the report recommendation for the Refuge to investigate purchasing a “speed check” trailer that could be operated by Refuge staff and moved around within the Refuge to improve driver awareness of their speeds. Representatives from Last Stand did not support this suggestion and stated that speeding motorists within the Refuge know they are speeding and the trailer would not be effective. The group agreed that increased speed enforcement on Key Deer Boulevard would be most effective. Anne Morkill stated that the Refuge, in partnership with the Key Deer Protection Alliance, has already purchased a speed indicator that will be modified to include custom cartoon messages about key deer crossing the road.
- Ramon Sierra stated that the speed study results may warrant an overall speed limit reduction from 45 mph to 40 mph on US 1. He also inquired about the enforcement of the nighttime speed limit of 35 mph. He suggested consideration for one (1) speed limit of 40 mph. Several members of the group did not support this change.
- Kimley-Horn discussed the report recommendation that the Refuge formally request to be included in a future research study examining the use of Intelligent Transportation Systems (ITS) technologies to improve safety/reduce deer collisions within the Refuge.

APPENDIX D
Supporting Data Tables



[P53. MEDIAN HOUSEHOLD INCOME IN 1999 \(DOLLARS\) \[1\] - Universe: Households](#)

Data Set: [Census 2000 Summary File 3 \(SF 3\) - Sample Data](#)

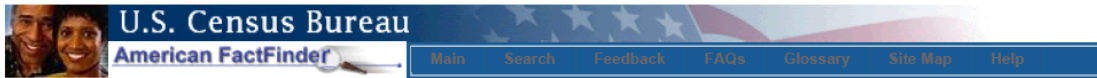
NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see <http://factfinder.census.gov/home/en/datanotes/expsf3.htm>.

	United States	Big Pine Key CDP, Florida	Islamorada, Village of Islands village; Florida	Key Colony Beach city, Florida	Key West city, Florida	Layton city, Florida	Marathon city, Florida
Median household income in 1999	41,994	44,514	41,522	45,577	43,021	53,750	36,010

U.S. Census Bureau
Census 2000

Standard Error/Variance documentation for this dataset:

[Accuracy of the Data: Census 2000 Summary File 3 \(SF 3\) - Sample Data \(PDF 141.5KB\)](#)



[PCT141. RATIO OF INCOME IN 1999 TO POVERTY LEVEL \[11\] - Universe: Population for whom poverty status is determined](#)

Data Set: [Census 2000 Summary File 4 \(SF 4\) - Sample Data](#)

NOTE: Data based on a sample. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see <http://factfinder.census.gov/home/en/datanotes/expsf4.htm>.

	United States	Big Pine Key CDP, Florida	Islamorada, Village of Islands village; Florida	Key Colony Beach city, Florida	Key West city, Florida	Layton city, Florida	Marathon city, Florida
Total:	273,882,232	4,988	6,718	740	24,757	240	10,030
Under .50	15,337,408	230	224	29	1,312	12	700
.50 to .74	8,510,306	57	157	17	472	20	432
.75 to .99	10,052,098	185	85	9	751	5	290
1.00 to 1.24	11,287,823	141	333	23	708	3	335
1.25 to 1.29	2,323,160	17	11	2	229	3	137
1.30 to 1.49	9,809,354	183	168	11	722	0	494
1.50 to 1.74	11,872,262	358	161	20	1,083	0	506
1.75 to 1.84	5,104,996	193	138	28	626	0	181
1.85 to 1.99	6,897,202	48	191	28	670	8	271
2.00 and over	192,687,623	3,576	5,250	573	18,184	189	6,684

U.S. Census Bureau
Census 2000

Standard Error/Variance documentation for this dataset:

[Accuracy of the Data: Census 2000 Summary File 4 \(SF 4\) - Sample Data \(PDF 141.5KB\)](#)



P3. RACE [71] - Universe: Total population
 Data Set: [Census 2000 Summary File 1 \(SF 1\) 100-Percent Data](#)

NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see <http://factfinder.census.gov/home/en/datanotes/expsf1u.htm>.

	United States	Big Pine Key CDP, Florida	Islamorada, Village of Islands village; Florida	Key Colony Beach city, Florida	Key West city, Florida	Layton city, Florida	Marathon city, Florida
Total:	281,421,906	5,032	6,846	788	25,478	186	10,255
Population of one race:	274,595,678	4,942	6,778	785	24,923	186	10,113
White alone	211,460,626	4,772	6,630	781	21,642	184	9,341
Black or African American alone	34,658,190	55	31	4	2,365	1	477
American Indian and Alaska Native alone	2,475,956	25	15	0	99	0	37
Asian alone	10,242,998	29	42	0	329	1	49
Native Hawaiian and Other Pacific Islander alone	398,835	1	6	0	14	0	4
Some other race alone	15,359,073	60	54	0	474	0	205
Population of two or more races:	6,826,228	90	68	3	555	0	142
Population of two races:	6,368,075	88	62	3	518	0	139
White; Black or African American	784,764	1	3	0	72	0	8
White; American Indian and Alaska Native	1,082,683	52	28	1	66	0	29
White; Asian	868,395	4	7	0	74	0	8
White; Native Hawaiian and Other Pacific Islander	112,964	0	1	0	7	0	1
White; Some other race	2,206,251	23	19	2	192	0	42
Black or African American; American Indian and Alaska Native	182,494	2	0	0	9	0	3
Black or African American; Asian	106,782	2	0	0	13	0	1
Black or African American; Native Hawaiian and Other Pacific Islander	29,876	0	0	0	1	0	4
Black or African American; Some other race	417,249	3	2	0	61	0	33
American Indian and Alaska Native; Asian	52,429	1	1	0	2	0	0
American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	7,328	0	0	0	0	0	1
American Indian and Alaska Native; Some other race	93,842	0	0	0	6	0	1
Asian; Native Hawaiian and Other Pacific Islander	138,802	0	0	0	5	0	2
Asian; Some other race	249,108	0	1	0	10	0	6
Native Hawaiian and Other Pacific Islander; Some other race	35,108	0	0	0	0	0	0
Population of three races:	410,285	2	5	0	35	0	3
White; Black or African American; American Indian and Alaska Native	112,207	1	0	0	19	0	0
White; Black or African American; Asian	21,166	0	0	0	0	0	0
White; Black or African American; Native Hawaiian and Other Pacific Islander	2,938	0	0	0	0	0	0
White; Black or African American; Some other race	43,172	0	0	0	5	0	3
White; American Indian and Alaska Native; Asian	23,766	0	0	0	3	0	0
White; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	4,843	0	0	0	0	0	0
White; American Indian and Alaska Native; Some other race	29,095	1	1	0	0	0	0
White; Asian; Native Hawaiian and Other Pacific Islander	89,611	0	0	0	1	0	0
White; Asian; Some other race	34,962	0	1	0	2	0	0
White; Native Hawaiian and Other Pacific Islander; Some other race	8,364	0	2	0	0	0	0
Black or African American; American Indian and Alaska Native; Asian	5,798	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	998	0	0	0	1	0	0
Black or African American; American Indian and Alaska Native; Some other race	7,023	0	0	0	0	0	0
Black or African American; Asian; Native Hawaiian and Other Pacific Islander	5,309	0	0	0	0	0	0
Black or African American; Asian; Some other race	8,069	0	1	0	4	0	0
Black or African American; Native Hawaiian and Other Pacific Islander; Some other race	2,167	0	0	0	0	0	0
American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	3,063	0	0	0	0	0	0
American Indian and Alaska Native; Asian; Some other race	2,544	0	0	0	0	0	0
American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	586	0	0	0	0	0	0
Asian; Native Hawaiian and Other Pacific Islander; Some other race	4,604	0	0	0	0	0	0
Population of four races:	38,408	0	1	0	1	0	0
White; Black or African American; American Indian and Alaska Native; Asian	10,672	0	0	0	0	0	0

White; Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	988	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Some other race	4,645	0	1	0	0	0	0
White; Black or African American; Asian; Native Hawaiian and Other Pacific Islander	2,128	0	0	0	0	0	0
White; Black or African American; Asian; Some other race	1,376	0	0	0	0	0	0
White; Black or African American; Native Hawaiian and Other Pacific Islander; Some other race	325	0	0	0	0	0	0
White; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	6,450	0	0	0	0	0	0
White; American Indian and Alaska Native; Asian; Some other race	1,099	0	0	0	0	0	0
White; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	309	0	0	0	0	0	0
White; Asian; Native Hawaiian and Other Pacific Islander; Some other race	7,932	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	750	0	0	0	1	0	0
Black or African American; American Indian and Alaska Native; Asian; Some other race	334	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	111	0	0	0	0	0	0
Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some other race	1,082	0	0	0	0	0	0
American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	207	0	0	0	0	0	0
Population of five races:	8,637	0	0	0	1	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	6,611	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Some other race	724	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	68	0	0	0	0	0	0
White; Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some other race	379	0	0	0	1	0	0
White; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	639	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	216	0	0	0	0	0	0
Population of six races:	823	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	823	0	0	0	0	0	0

U.S. Census Bureau
Census 2000

Standard Error/Variance documentation for this dataset:

[Accuracy of the Data: Census 2000 Summary File 1 \(SF 1\) 100-Percent Data \(PDF 44KB\)](#)

Crosroads Engineering Data, Inc.

13284 SW 120th Street

Miami, Florida, 33186

Tel: 305-233-3997 Fax: 305-233-7720

CLIENT : KIMLEY-HORN
 JOB NO : 2010-47
 PROJECT: BIG PINE
 COUNTY : MONROE

File Name : BIG PINE @ US-1
 Site Code : 00000000
 Start Date : 11/5/2010
 Page No : 1

Groups Printed- AUTOS - HEAVY VEHICLES

Start Time	US-1 From East					WILDER RD. From South					US-1 From West					KEY DEER BLVD. From Northwest				Int. Total
	Right	Bear Right	Thru	Left	Peds	Right	Thru	Bear Left	Left	Peds	Right	Thru	Left	Hard Left	Peds	Hard Right	Bear Right	Bear Left	Peds	
09:00 AM	8	18	53	2	0	3	0	2	4	0	9	66	7	23	0	29	4	24	3	255
09:15 AM	5	9	68	3	0	2	0	1	5	0	8	75	6	13	0	25	2	19	0	241
09:30 AM	9	14	64	4	0	3	0	4	0	0	0	99	10	26	0	30	5	33	3	304
09:45 AM	7	8	62	5	0	7	0	0	1	0	3	99	17	15	0	37	5	17	0	283
Total	29	49	247	14	0	15	0	7	10	0	20	339	40	77	0	121	16	93	6	1083
10:00 AM	10	19	92	0	0	5	0	0	0	0	2	97	16	26	0	29	3	19	0	318
10:15 AM	4	11	79	0	0	7	0	0	2	0	3	83	5	18	0	29	1	22	0	264
10:30 AM	7	19	117	2	0	7	0	5	5	0	15	122	5	22	0	27	1	25	0	379
10:45 AM	6	24	118	3	0	4	0	3	1	0	6	112	8	51	0	26	1	25	0	388
Total	27	73	406	5	0	23	0	8	8	0	26	414	34	117	0	111	6	91	0	1349
*** BREAK ***																				
04:00 PM	11	29	138	1	0	6	1	6	5	0	5	81	12	29	0	61	0	19	0	404
04:15 PM	0	20	126	3	0	1	1	5	5	0	4	89	11	37	0	58	6	20	1	387
04:30 PM	15	35	141	2	0	10	2	2	7	0	4	98	17	49	0	36	3	30	0	451
04:45 PM	13	32	168	1	0	6	1	4	2	0	7	101	14	51	0	54	0	24	1	479
Total	39	116	573	7	0	23	5	17	19	0	20	369	54	166	0	209	9	93	2	1721
05:00 PM	15	43	140	1	0	0	1	2	5	0	10	89	23	42	0	36	2	34	0	443
05:15 PM	6	40	141	2	0	6	2	2	3	0	6	90	20	34	0	60	0	43	0	455
05:30 PM	15	38	140	1	0	4	3	2	7	0	8	90	36	59	0	55	1	42	2	503
05:45 PM	16	33	93	0	0	0	0	3	2	0	5	69	23	46	0	44	1	21	0	356
Total	52	154	514	4	0	10	6	9	17	0	29	338	102	181	0	195	4	140	2	1757
Grand Total	147	392	1740	30	0	71	11	41	54	0	95	1460	230	541	0	636	35	417	10	5910
Apprch %	6.4	17	75.4	1.3	0	40.1	6.2	23.2	30.5	0	4.1	62.8	9.9	23.3	0	57.9	3.2	38	0.9	
Total %	2.5	6.6	29.4	0.5	0	1.2	0.2	0.7	0.9	0	1.6	24.7	3.9	9.2	0	10.8	0.6	7.1	0.2	
AUTOS	147	384	1675	29	0	71	11	41	54	0	94	1403	230	536	0	632	34	412	10	5763
% AUTOS	100	98	96.3	96.7	0	100	100	100	100	0	98.9	96.1	100	99.1	0	99.4	97.1	98.8	100	97.5
HEAVY VEHICLES	0	8	65	1	0	0	0	0	0	0	1	57	0	5	0	4	1	5	0	147
% HEAVY VEHICLES	0	2	3.7	3.3	0	0	0	0	0	0	1.1	3.9	0	0.9	0	0.6	2.9	1.2	0	2.5

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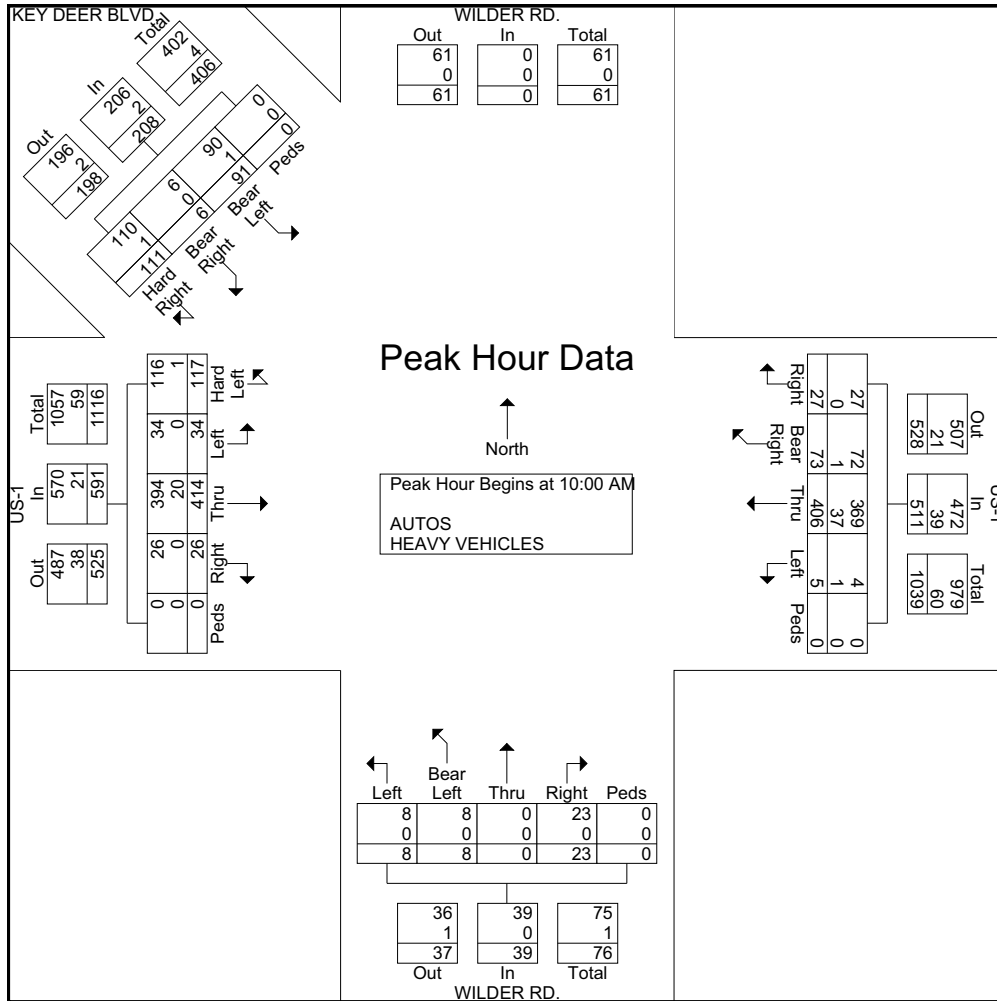
13284 SW 120th Street
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Tel: 305-233-3997 Fax: 305-233-7720

CLIENT : KIMLEY-HORN
JOB NO : 2010-47
PROJECT: BIG PINE
COUNTY : MONROE

File Name : BIG PINE @ US-1
Site Code : 00000000
Start Date : 11/5/2010
Page No : 2

Start Time	US-1 From East						WILDER RD. From South						US-1 From West						KEY DEER BLVD. From Northwest						Int. Total
	Right	Bear Right	Thru	Left	Peds	App. Total	Right	Thru	Bear Left	Left	Peds	App. Total	Right	Thru	Left	Hard Left	Peds	App. Total	Hard Right	Bear Right	Bear Left	Peds	App. Total		
Peak Hour Analysis From 09:00 AM to 11:45 AM - Peak 1 of 1																									
Peak Hour for Entire Intersection Begins at 10:00 AM																									
10:00 AM	10	19	92	0	0	121	5	0	0	0	0	5	2	97	16	26	0	141	29	3	19	0	51	318	
10:15 AM	4	11	79	0	0	94	7	0	0	2	0	9	3	83	5	18	0	109	29	1	22	0	52	264	
10:30 AM	7	19	117	2	0	145	7	0	5	5	0	17	15	122	5	22	0	164	27	1	25	0	53	379	
10:45 AM	6	24	118	3	0	151	4	0	3	1	0	8	6	112	8	51	0	177	26	1	25	0	52	388	
Total Volume	27	73	406	5	0	511	23	0	8	8	0	39	26	414	34	117	0	591	111	6	91	0	208	1349	
% App. Total	5.3	14.3	79.5	1	0		59	0	20.5	20.5	0		4.4	70.1	5.8	19.8	0		53.4	2.9	43.8	0			
PHF	.675	.760	.860	.417	.000	.846	.821	.000	.400	.400	.000	.574	.433	.848	.531	.574	.000	.835	.957	.500	.910	.000	.981	.869	
AUTOS	27	72	369	4	0	472	23	0	8	8	0	39	26	394	34	116	0	570	110	6	90	0	206	1287	
% AUTOS	100	98.6	90.9	80.0	0	92.4	100	0	100	100	0	100	100	95.2	100	99.1	0	96.4	99.1	100	98.9	0	99.0	95.4	
HEAVY VEHICLES	0	1	37	1	0	39	0	0	0	0	0	0	0	20	0	1	0	21	1	0	1	0	2	62	
% HEAVY VEHICLES	0	1.4	9.1	20.0	0	7.6	0	0	0	0	0	0	0	4.8	0	0.9	0	3.6	0.9	0	1.1	0	1.0	4.6	



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13284 SW 120th Street

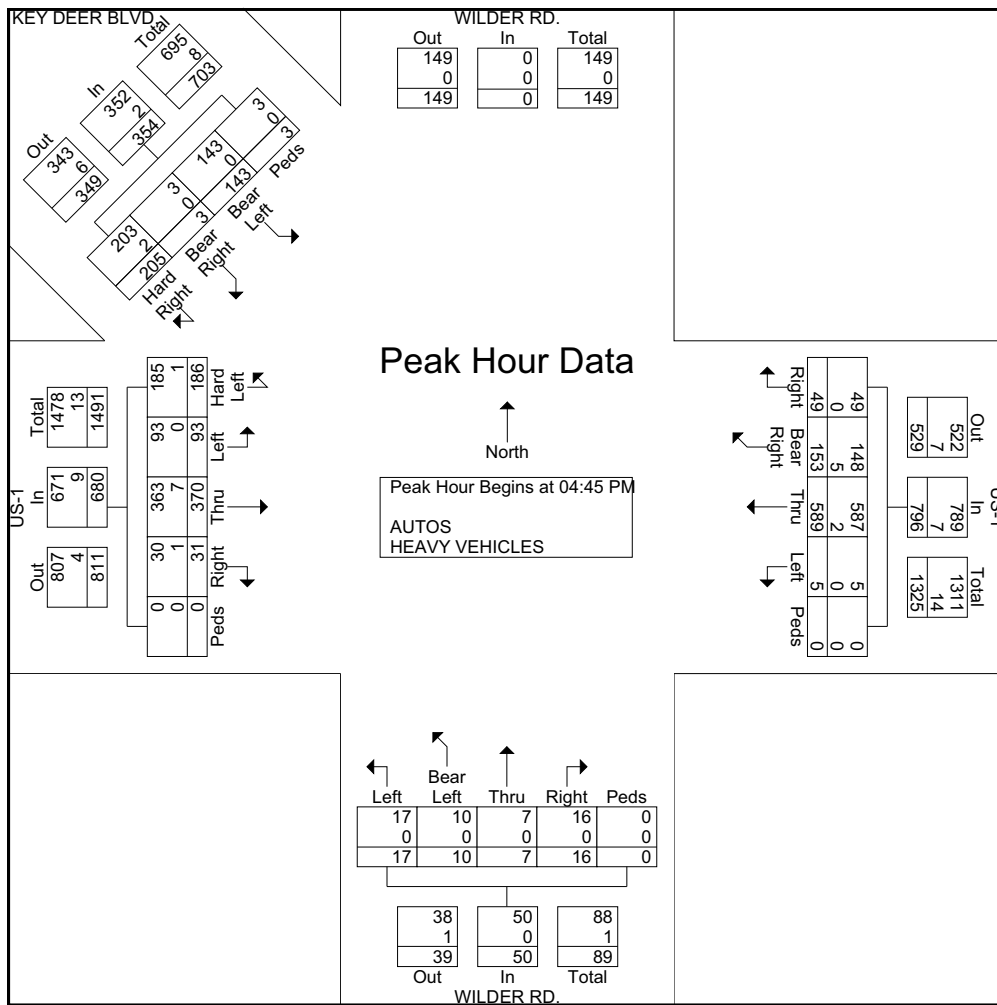
Miami, Florida, 33186

Tel: 305-233-3997 Fax: 305-233-7720

CLIENT : KIMLEY-HORN
 JOB NO : 2010-47
 PROJECT: BIG PINE
 COUNTY : MONROE

File Name : BIG PINE @ US-1
 Site Code : 00000000
 Start Date : 11/5/2010
 Page No : 3

Start Time	US-1 From East						WILDER RD. From South						US-1 From West						KEY DEER BLVD. From Northwest						Int. Total
	Right	Bear Right	Thru	Left	Peds	App. Total	Right	Thru	Bear Left	Left	Peds	App. Total	Right	Thru	Left	Hard Left	Peds	App. Total	Hard Right	Bear Right	Bear Left	Peds	App. Total		
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																									
Peak Hour for Entire Intersection Begins at 04:45 PM																									
04:45 PM	13	32	168	1	0	214	6	1	4	2	0	13	7	101	14	51	0	173	54	0	24	1	79	479	
05:00 PM	15	43	140	1	0	199	0	1	2	5	0	8	10	89	23	42	0	164	36	2	34	0	72	443	
05:15 PM	6	40	141	2	0	189	6	2	2	3	0	13	6	90	20	34	0	150	60	0	43	0	103	455	
05:30 PM	15	38	140	1	0	194	4	3	2	7	0	16	8	90	36	59	0	193	55	1	42	2	100	503	
Total Volume	49	153	589	5	0	796	16	7	10	17	0	50	31	370	93	186	0	680	205	3	143	3	354	1880	
% App. Total	6.2	19.2	74	0.6	0	.930	.32	.14	.20	.34	0	.781	.46	.54.4	.13.7	.27.4	0	.881	.57.9	.0.8	.40.4	.0.8	.859	.934	
PHF	.817	.890	.876	.625	.000	.930	.667	.583	.625	.607	.000	.781	.775	.916	.646	.788	.000	.881	.854	.375	.831	.375	.859	.934	
AUTOS	49	148	587	5	0	789	16	7	10	17	0	50	30	363	93	185	0	671	203	3	143	3	352	1862	
% AUTOS	100	96.7	99.7	100	0	99.1	100	100	100	100	0	100	96.8	98.1	100	99.5	0	98.7	99.0	100	100	100	99.4	99.0	
HEAVY VEHICLES	0	5	2	0	0	7	0	0	0	0	0	0	1	7	0	1	0	9	2	0	0	0	2	18	
% HEAVY VEHICLES	0	3.3	0.3	0	0	0.9	0	0	0	0	0	0	3.2	1.9	0	0.5	0	1.3	1.0	0	0	0	0.6	1.0	



Crossroads Engineering Data, Inc.

CLIENT : KIMLEY-HORN
 JOB NO : 2010-47
 PROJECT: BIG PINE
 COUNTY : MONROE
 NB, SB

13284 SW 120th Street
 Miami, Florida, 33186
 PH: 305-233-3997 FAX: 305-233-7720

KEY DEER COMBINED
 KEY DEER BLVD. SOUTH OF
 WATSON BLVD.
 Date Start: 12-Nov-10

Start Time	15	610	1115	1620	2125	2630	3135	3640	4145	4650	5155	5660	6165	6670	71147	Total
11/12/1																
0	0	0	0	1	0	1	4	0	0	0	0	0	0	0	0	6
00:15	0	0	0	0	0	5	5	0	0	0	0	0	0	0	0	10
00:30	0	0	0	0	0	1	7	2	1	0	0	0	0	0	0	11
00:45	0	0	0	0	0	0	2	3	1	0	0	0	0	0	0	6
01:00	0	0	0	1	0	7	18	5	2	0	0	0	0	0	0	33
01:15	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	2
01:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	2
02:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:30	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	3
02:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	0	0	0	0	1	1	3	0	1	0	0	0	0	0	5
03:15	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	2
03:30	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
03:45	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	2
04:00	0	0	0	0	1	1	2	1	0	0	1	0	0	0	0	6
04:15	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
04:30	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	2
04:45	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	3
05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15	0	0	0	0	1	0	4	2	0	0	0	0	0	0	0	6
05:30	0	0	0	0	0	1	4	0	2	1	0	0	0	0	0	8
05:45	0	0	0	0	1	2	5	3	1	0	0	0	0	0	0	12
06:00	0	0	0	0	0	5	8	2	0	0	0	0	0	0	0	15
06:15	0	0	0	0	2	8	22	5	3	1	0	0	0	0	0	41
06:30	0	0	0	0	0	3	9	1	4	0	0	0	0	0	0	17
06:45	0	0	0	0	0	1	10	4	1	1	0	0	0	0	0	17
07:00	0	0	0	0	0	6	14	5	2	0	1	0	0	0	0	28
07:15	0	0	0	0	1	6	21	9	1	1	0	0	0	0	0	39
07:30	0	0	0	0	1	16	54	19	8	2	1	0	0	0	0	101
07:45	0	0	0	0	4	11	28	20	6	0	0	0	0	0	0	69
08:00	0	0	0	0	3	2	35	17	4	0	0	0	0	0	0	61
08:15	0	0	0	0	1	5	23	17	2	0	0	0	0	0	0	48
08:30	0	0	0	0	1	6	24	21	4	1	0	0	0	0	0	57
08:45	0	0	0	0	9	24	110	75	16	1	0	0	0	0	0	235
09:00	0	0	0	0	1	7	30	17	10	1	0	0	0	0	0	66
09:15	0	0	0	0	0	9	32	11	1	1	0	0	0	0	0	54
09:30	0	0	0	0	0	6	21	15	2	0	0	0	0	0	0	44
09:45	0	0	0	1	1	13	29	22	3	0	0	0	0	0	0	69
10:00	0	0	0	1	2	35	112	65	16	2	0	0	0	0	0	233
10:15	0	0	1	0	1	10	24	10	2	1	0	1	0	0	0	50
10:30	0	0	0	1	2	7	27	10	1	0	0	0	0	0	0	48
10:45	0	0	1	0	3	9	25	8	0	1	0	0	0	0	0	47
11:00	0	0	0	0	1	13	39	13	1	0	0	0	0	0	0	67
11:15	0	0	2	1	7	39	115	41	4	2	0	1	0	0	0	212
11:30	0	0	0	0	0	7	29	14	1	1	0	0	0	0	0	52
11:45	0	0	0	1	1	11	17	8	4	0	0	0	0	0	0	42
Total	0	2	2	4	32	214	669	296	65	12	2	1	0	0	0	1299

Crossroads Engineering Data, Inc.

CLIENT : KIMLEY-HORN
 JOB NO : 2010-47
 PROJECT: BIG PINE
 COUNTY : MONROE
 NB, SB

13284 SW 120th Street
 Miami, Florida, 33186
 PH: 305-233-3997 FAX: 305-233-7720

KEY DEER COMBINED
 KEY DEER BLVD. SOUTH OF
 WATSON BLVD.
 Date Start: 12-Nov-10

Start Time	1 5	6 10	11 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 147	Total
12 PM	0	0	0	0	1	14	18	15	2	0	0	0	0	0	0	50
12:15	0	0	1	0	2	11	31	7	1	0	0	0	0	0	0	53
12:30	0	0	2	0	0	16	24	11	1	1	0	0	0	0	0	55
12:45	0	0	0	0	2	7	28	8	2	1	0	0	0	0	0	48
	0	0	3	0	5	48	101	41	6	2	0	0	0	0	0	206
13:00	0	0	0	0	2	15	30	14	3	0	0	0	0	0	0	64
13:15	0	1	0	0	0	17	34	12	0	1	0	0	0	0	0	65
13:30	0	0	0	0	1	10	24	15	2	2	0	0	0	0	0	54
13:45	0	0	0	0	3	11	31	8	2	0	0	0	0	0	0	55
	0	1	0	0	6	53	119	49	7	3	0	0	0	0	0	238
14:00	0	0	1	0	2	6	30	11	1	1	0	0	0	0	0	52
14:15	0	0	0	0	1	8	37	6	3	0	1	0	0	0	0	56
14:30	0	0	0	0	3	8	26	9	4	1	0	0	0	0	0	51
14:45	0	2	0	0	7	11	23	14	4	0	0	0	0	0	0	61
	0	2	1	0	13	33	116	40	12	2	1	0	0	0	0	220
15:00	0	0	0	0	0	14	27	11	1	0	0	0	0	0	0	53
15:15	0	0	0	0	2	7	39	19	3	0	0	0	0	0	0	70
15:30	0	1	0	0	0	10	37	12	1	1	0	0	0	0	0	62
15:45	0	0	0	0	1	10	27	8	2	0	0	0	0	0	0	48
	0	1	0	0	3	41	130	50	7	1	0	0	0	0	0	233
16:00	0	0	0	0	2	11	27	17	5	0	0	0	0	0	0	62
16:15	0	0	0	0	1	13	37	16	2	1	0	0	0	0	0	70
16:30	0	0	0	0	2	19	36	12	1	0	0	0	0	0	0	70
16:45	0	0	2	0	0	4	38	11	1	1	1	0	0	0	0	58
	0	0	2	0	5	47	138	56	9	2	1	0	0	0	0	260
17:00	0	0	0	0	0	12	30	14	2	0	0	0	0	0	0	58
17:15	0	0	0	0	2	17	45	13	2	0	0	0	0	0	0	79
17:30	0	0	1	0	2	14	50	14	4	0	0	0	0	0	0	85
17:45	0	0	1	0	4	28	42	12	1	0	0	0	0	0	0	88
	0	0	2	0	8	71	167	53	9	0	0	0	0	0	0	310
18:00	0	0	0	0	0	19	49	12	0	0	0	0	0	0	0	80
18:15	0	0	0	0	1	18	41	9	2	0	0	0	0	0	0	71
18:30	1	0	0	1	1	18	41	9	3	0	0	0	0	0	0	74
18:45	0	0	0	0	1	23	38	6	0	0	0	0	0	0	0	68
	1	0	0	1	3	78	169	36	5	0	0	0	0	0	0	293
19:00	0	0	1	0	0	20	33	3	3	0	0	0	0	0	0	60
19:15	0	0	0	0	0	12	25	11	2	0	0	0	0	0	0	50
19:30	0	0	1	0	0	8	32	8	1	0	0	0	0	0	0	50
19:45	0	0	0	0	1	8	18	9	0	0	0	0	0	0	0	36
	0	0	2	0	1	48	108	31	6	0	0	0	0	0	0	196
20:00	0	0	0	0	0	11	16	7	2	1	0	0	0	0	0	37
20:15	0	0	0	0	0	3	22	6	1	0	0	0	0	0	0	32
20:30	0	0	0	0	0	12	12	5	1	0	0	0	0	0	0	30
20:45	0	0	0	0	2	8	12	3	1	0	0	0	0	0	0	26
	0	0	0	0	2	34	62	21	5	1	0	0	0	0	0	125
21:00	0	0	0	0	0	3	13	6	0	0	0	0	0	0	0	22
21:15	0	0	0	0	0	5	22	9	0	0	0	0	0	0	0	36
21:30	0	0	0	1	0	7	21	5	2	0	0	0	0	0	0	36
21:45	1	0	0	0	0	7	11	3	0	0	0	0	0	0	0	22
	1	0	0	1	0	22	67	23	2	0	0	0	0	0	0	116
22:00	0	0	0	0	0	4	9	3	0	0	0	0	0	0	0	16
22:15	0	0	0	0	2	3	11	4	1	0	0	0	0	0	0	21
22:30	0	0	0	0	2	0	7	1	1	0	0	0	0	0	0	11
22:45	0	0	0	0	0	0	10	4	1	0	0	0	0	0	0	15
	0	0	0	0	4	7	37	12	3	0	0	0	0	0	0	63
23:00	0	0	0	0	0	2	13	1	0	0	0	0	0	0	0	16
23:15	0	0	0	0	0	4	11	4	1	0	0	0	0	0	0	20
23:30	0	0	0	0	0	3	8	5	0	0	0	0	0	0	0	16
23:45	0	0	0	0	0	5	5	2	1	0	0	0	0	0	0	13
	0	0	0	0	0	14	37	12	2	0	0	0	0	0	0	65
Total	2	4	10	2	50	496	1251	424	73	11	2	0	0	0	0	2325
Total Stats	2	6	12	6	82	710	1920	720	138	23	4	1	0	0	0	3624

15th Percentile : 29 MPH
 50th Percentile : 33 MPH
 85th Percentile : 38 MPH
 95th Percentile : 40 MPH

Mean Speed(Average) : 33 MPH
 10 MPH Pace Speed : 31-40 MPH
 Number in Pace : 2640
 Percent in Pace : 72.8%
 Number of Vehicles > 30 MPH : 2806
 Percent of Vehicles > 30 MPH : 77.4%

Crossroads Engineering Data, Inc.

CLIENT : KIMLEY-HORN
 JOB NO : 2010-47
 PROJECT: BIG PINE
 COUNTY : MONROE
 NB

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KEY DEER S. OF WATSON (NB)
 KEY DEER BLVD. SOUTH OF
 WATSON BLVD.
 Date Start: 12-Nov-10

Start Time	15	6 10	11 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 147	Total
11/12/1																
0	0	0	0	1	0	1	3	0	0	0	0	0	0	0	0	5
00:15	0	0	0	0	0	5	5	0	0	0	0	0	0	0	0	10
00:30	0	0	0	0	0	0	7	2	1	0	0	0	0	0	0	10
00:45	0	0	0	0	0	0	2	3	1	0	0	0	0	0	0	6
01:00	0	0	0	1	0	6	17	5	2	0	0	0	0	0	0	31
01:15	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
01:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
02:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:30	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	2
02:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	0	0	0	0	0	1	2	0	1	0	0	0	0	0	4
03:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
03:45	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
04:00	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	2
04:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
04:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
05:15	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
05:30	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
05:45	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	3
06:00	0	0	0	0	0	1	4	1	0	0	0	0	0	0	0	6
06:15	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
06:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:00	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
07:15	0	0	0	0	1	0	2	1	0	0	0	0	0	0	0	4
07:30	0	0	0	0	1	1	3	1	0	0	0	0	0	0	0	6
07:45	0	0	0	0	0	1	4	1	1	0	0	0	0	0	0	7
08:00	0	0	0	0	2	4	11	3	1	0	0	0	0	0	0	21
08:15	0	0	0	0	0	0	6	3	3	0	0	0	0	0	0	12
08:30	0	0	0	0	0	0	14	5	0	0	0	0	0	0	0	19
08:45	0	0	0	0	0	1	5	3	0	0	0	0	0	0	0	9
09:00	0	0	0	1	0	2	11	2	1	0	0	0	0	0	0	17
09:15	0	0	0	1	0	3	36	13	4	0	0	0	0	0	0	57
09:30	0	0	1	0	0	2	9	3	0	0	0	0	0	0	0	15
09:45	0	0	0	0	0	0	3	11	1	0	0	0	0	0	0	17
10:00	0	0	2	1	1	4	10	3	0	0	0	0	0	0	0	16
10:15	0	0	0	0	0	4	19	3	1	0	0	0	0	0	0	27
10:30	0	0	0	0	0	11	49	10	1	0	0	0	0	0	0	75
10:45	0	0	0	0	0	2	19	1	0	0	0	0	0	0	0	22
11:00	0	0	0	0	0	5	4	2	1	0	0	0	0	0	0	12
11:15	0	0	0	0	0	3	12	4	0	0	0	0	0	0	0	19
11:30	0	0	0	0	0	8	12	2	0	0	0	0	0	0	0	22
11:45	0	0	0	0	0	18	47	9	1	0	0	0	0	0	0	75
Total	0	2	2	3	4	62	241	56	12	2	1	0	0	0	0	385

Crossroads Engineering Data, Inc.

CLIENT : KIMLEY-HORN
 JOB NO : 2010-47
 PROJECT: BIG PINE
 COUNTY : MONROE
 NB

13284 SW 120th Street
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KEY DEER S. OF WATSON (NB)
 KEY DEER BLVD. SOUTH OF
 WATSON BLVD.
 Date Start: 12-Nov-10

Start Time	1 5	6 10	11 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 147	Total
12 PM	0	0	0	0	1	10	12	8	0	0	0	0	0	0	0	31
12:15	0	0	1	0	1	5	20	2	0	0	0	0	0	0	0	29
12:30	0	0	2	0	0	6	14	3	1	1	0	0	0	0	0	27
12:45	0	0	0	0	0	5	19	4	0	0	0	0	0	0	0	28
	0	0	3	0	2	26	65	17	1	1	0	0	0	0	0	115
13:00	0	0	0	0	0	8	12	6	1	0	0	0	0	0	0	27
13:15	0	1	0	0	0	7	14	4	0	0	0	0	0	0	0	26
13:30	0	0	0	0	0	3	14	9	1	0	0	0	0	0	0	27
13:45	0	0	0	0	1	7	13	3	1	0	0	0	0	0	0	25
	0	1	0	0	1	25	53	22	3	0	0	0	0	0	0	105
14:00	0	0	1	0	2	3	20	4	1	0	0	0	0	0	0	31
14:15	0	0	0	0	1	6	20	1	2	0	0	0	0	0	0	30
14:30	0	0	0	0	1	7	14	6	1	0	0	0	0	0	0	29
14:45	0	2	0	0	4	6	15	7	2	0	0	0	0	0	0	36
	0	2	1	0	8	22	69	18	6	0	0	0	0	0	0	126
15:00	0	0	0	0	0	3	10	3	1	0	0	0	0	0	0	17
15:15	0	0	0	0	0	4	25	8	0	0	0	0	0	0	0	37
15:30	0	1	0	0	0	6	23	5	0	0	0	0	0	0	0	35
15:45	0	0	0	0	0	7	19	4	1	0	0	0	0	0	0	31
	0	1	0	0	0	20	77	20	2	0	0	0	0	0	0	120
16:00	0	0	0	0	1	6	15	11	5	0	0	0	0	0	0	38
16:15	0	0	0	0	0	6	20	4	0	0	0	0	0	0	0	30
16:30	0	0	0	0	2	8	23	6	1	0	0	0	0	0	0	40
16:45	0	0	2	0	0	0	17	8	0	0	0	0	0	0	0	27
	0	0	2	0	3	20	75	29	6	0	0	0	0	0	0	135
17:00	0	0	0	0	0	8	17	6	0	0	0	0	0	0	0	31
17:15	0	0	0	0	0	10	34	6	1	0	0	0	0	0	0	51
17:30	0	0	0	0	0	8	32	8	2	0	0	0	0	0	0	50
17:45	0	0	1	0	3	20	24	6	1	0	0	0	0	0	0	55
	0	0	1	0	3	46	107	26	4	0	0	0	0	0	0	187
18:00	0	0	0	0	0	13	30	8	0	0	0	0	0	0	0	51
18:15	0	0	0	0	1	16	29	4	1	0	0	0	0	0	0	51
18:30	1	0	0	1	0	18	26	0	0	0	0	0	0	0	0	46
18:45	0	0	0	0	0	16	25	3	0	0	0	0	0	0	0	44
	1	0	0	1	1	63	110	15	1	0	0	0	0	0	0	192
19:00	0	0	1	0	0	16	23	3	1	0	0	0	0	0	0	44
19:15	0	0	0	0	0	8	16	6	2	0	0	0	0	0	0	32
19:30	0	0	1	0	0	6	29	6	0	0	0	0	0	0	0	42
19:45	0	0	0	0	1	6	12	7	0	0	0	0	0	0	0	26
	0	0	2	0	1	36	80	22	3	0	0	0	0	0	0	144
20:00	0	0	0	0	0	9	14	7	1	0	0	0	0	0	0	31
20:15	0	0	0	0	0	1	17	5	1	0	0	0	0	0	0	24
20:30	0	0	0	0	0	11	9	4	1	0	0	0	0	0	0	25
20:45	0	0	0	0	2	6	10	1	0	0	0	0	0	0	0	19
	0	0	0	0	2	27	50	17	3	0	0	0	0	0	0	99
21:00	0	0	0	0	0	2	7	4	0	0	0	0	0	0	0	13
21:15	0	0	0	0	0	4	18	8	0	0	0	0	0	0	0	30
21:30	0	0	0	1	0	5	18	3	2	0	0	0	0	0	0	29
21:45	1	0	0	0	0	7	8	3	0	0	0	0	0	0	0	19
	1	0	0	1	0	18	51	18	2	0	0	0	0	0	0	91
22:00	0	0	0	0	0	4	5	2	0	0	0	0	0	0	0	11
22:15	0	0	0	0	1	3	9	1	0	0	0	0	0	0	0	14
22:30	0	0	0	0	1	0	5	1	1	0	0	0	0	0	0	8
22:45	0	0	0	0	0	0	9	4	1	0	0	0	0	0	0	14
	0	0	0	0	2	7	28	8	2	0	0	0	0	0	0	47
23:00	0	0	0	0	0	2	11	1	0	0	0	0	0	0	0	14
23:15	0	0	0	0	0	4	11	3	0	0	0	0	0	0	0	18
23:30	0	0	0	0	0	3	6	4	0	0	0	0	0	0	0	13
23:45	0	0	0	0	0	4	4	2	1	0	0	0	0	0	0	11
	0	0	0	0	0	13	32	10	1	0	0	0	0	0	0	56
Total	2	4	9	2	23	323	797	222	34	1	0	0	0	0	0	1417
Total Stats	2	6	11	5	27	385	1038	278	46	3	1	0	0	0	0	1802

15th Percentile : 28 MPH
 50th Percentile : 33 MPH
 85th Percentile : 37 MPH
 95th Percentile : 40 MPH

Mean Speed(Average) : 33 MPH
 10 MPH Pace Speed : 26-35 MPH
 Number in Pace : 1423
 Percent in Pace : 79.0%
 Number of Vehicles > 30 MPH : 1366
 Percent of Vehicles > 30 MPH : 75.8%

Crossroads Engineering Data, Inc.

CLIENT : KIMLEY-HORN
 JOB NO : 2010-47
 PROJECT: BIG PINE
 COUNTY : MONROE
 SB

13284 SW 120th Street
 Miami, Florida, 33186
 PH: 305-233-3997 FAX: 305-233-7720

KEY DEER S. OF WATSON (SB)
 KEY DEER BLVD. SOUTH OF
 WATSON BLVD.
 Date Start: 12-Nov-10

Start Time	15	6 10	11 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 147	Total
11/12/1																
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
00:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
00:30	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
00:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:00	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	2
01:15	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
01:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
02:15	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
02:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
03:15	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2
03:30	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
03:45	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
04:00	0	0	0	0	1	1	2	0	0	0	0	0	0	0	0	4
04:15	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
04:30	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	2
04:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00	0	0	0	0	0	0	3	2	0	0	0	0	0	0	0	5
05:15	0	0	0	0	1	0	4	0	0	0	0	0	0	0	0	5
05:30	0	0	0	0	0	1	3	0	2	1	0	0	0	0	0	7
05:45	0	0	0	0	1	2	4	3	1	0	0	0	0	0	0	11
06:00	0	0	0	0	0	4	7	1	0	0	0	0	0	0	0	12
06:15	0	0	0	0	2	7	18	4	3	1	0	0	0	0	0	35
06:30	0	0	0	0	0	3	8	1	4	0	0	0	0	0	0	16
06:45	0	0	0	0	0	1	10	4	1	1	0	0	0	0	0	17
07:00	0	0	0	0	0	6	13	5	2	0	1	0	0	0	0	27
07:15	0	0	0	0	1	6	21	9	1	1	0	0	0	0	0	39
07:30	0	0	0	0	1	16	52	19	8	2	1	0	0	0	0	99
07:45	0	0	0	0	4	9	26	20	6	0	0	0	0	0	0	65
08:00	0	0	0	0	2	2	33	16	4	0	0	0	0	0	0	57
08:15	0	0	0	0	0	4	20	16	2	0	0	0	0	0	0	42
08:30	0	0	0	0	1	5	20	20	3	1	0	0	0	0	0	50
08:45	0	0	0	0	7	20	99	72	15	1	0	0	0	0	0	214
09:00	0	0	0	0	1	7	24	14	7	1	0	0	0	0	0	54
09:15	0	0	0	0	0	9	18	6	1	1	0	0	0	0	0	35
09:30	0	0	0	0	0	5	16	12	2	0	0	0	0	0	0	35
09:45	0	0	0	0	1	11	18	20	2	0	0	0	0	0	0	52
10:00	0	0	0	0	2	32	76	52	12	2	0	0	0	0	0	176
10:15	0	0	0	0	1	8	15	7	2	1	0	1	0	0	0	35
10:30	0	0	0	0	1	4	16	9	1	0	0	0	0	0	0	31
10:45	0	0	0	0	3	7	15	5	0	1	0	0	0	0	0	31
11:00	0	0	0	0	1	9	20	10	0	0	0	0	0	0	0	40
11:15	0	0	0	0	6	28	66	31	3	2	0	1	0	0	0	137
11:30	0	0	0	0	0	5	10	13	1	1	0	0	0	0	0	30
11:45	0	0	0	0	1	6	13	6	3	0	0	0	0	0	0	30
Total	0	0	0	1	28	152	428	240	53	10	1	1	0	0	0	914

Crossroads Engineering Data, Inc.

CLIENT : KIMLEY-HORN
 JOB NO : 2010-47
 PROJECT: BIG PINE
 COUNTY : MONROE
 SB

13284 SW 120th Street
 Miami, Florida, 33186
 PH: 305-233-3997 FAX: 305-233-7720

KEY DEER S. OF WATSON (SB)
 KEY DEER BLVD. SOUTH OF
 WATSON BLVD.
 Date Start: 12-Nov-10

Start Time	1 5	6 10	11 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 147	Total
12 PM	0	0	0	0	0	4	6	7	2	0	0	0	0	0	0	19
12:15	0	0	0	0	1	6	11	5	1	0	0	0	0	0	0	24
12:30	0	0	0	0	0	10	10	8	0	0	0	0	0	0	0	28
12:45	0	0	0	0	2	2	9	4	2	1	0	0	0	0	0	20
	0	0	0	0	3	22	36	24	5	1	0	0	0	0	0	91
13:00	0	0	0	0	2	7	18	8	2	0	0	0	0	0	0	37
13:15	0	0	0	0	0	10	20	8	0	1	0	0	0	0	0	39
13:30	0	0	0	0	1	7	10	6	1	2	0	0	0	0	0	27
13:45	0	0	0	0	2	4	18	5	1	0	0	0	0	0	0	30
	0	0	0	0	5	28	66	27	4	3	0	0	0	0	0	133
14:00	0	0	0	0	0	3	10	7	0	1	0	0	0	0	0	21
14:15	0	0	0	0	0	2	17	5	1	0	1	0	0	0	0	26
14:30	0	0	0	0	2	1	12	3	3	1	0	0	0	0	0	22
14:45	0	0	0	0	3	5	8	7	2	0	0	0	0	0	0	25
	0	0	0	0	5	11	47	22	6	2	1	0	0	0	0	94
15:00	0	0	0	0	0	11	17	8	0	0	0	0	0	0	0	36
15:15	0	0	0	0	2	3	14	11	3	0	0	0	0	0	0	33
15:30	0	0	0	0	0	4	14	7	1	1	0	0	0	0	0	27
15:45	0	0	0	0	1	3	8	4	1	0	0	0	0	0	0	17
	0	0	0	0	3	21	53	30	5	1	0	0	0	0	0	113
16:00	0	0	0	0	1	5	12	6	0	0	0	0	0	0	0	24
16:15	0	0	0	0	1	7	17	12	2	1	0	0	0	0	0	40
16:30	0	0	0	0	0	11	13	6	0	0	0	0	0	0	0	30
16:45	0	0	0	0	0	4	21	3	1	1	1	0	0	0	0	31
	0	0	0	0	2	27	63	27	3	2	1	0	0	0	0	125
17:00	0	0	0	0	0	4	13	8	2	0	0	0	0	0	0	27
17:15	0	0	0	0	2	7	11	7	1	0	0	0	0	0	0	28
17:30	0	0	1	0	2	6	18	6	2	0	0	0	0	0	0	35
17:45	0	0	0	0	1	8	18	6	0	0	0	0	0	0	0	33
	0	0	1	0	5	25	60	27	5	0	0	0	0	0	0	123
18:00	0	0	0	0	0	6	19	4	0	0	0	0	0	0	0	29
18:15	0	0	0	0	0	2	12	5	1	0	0	0	0	0	0	20
18:30	0	0	0	0	1	0	15	9	3	0	0	0	0	0	0	28
18:45	0	0	0	0	1	7	13	3	0	0	0	0	0	0	0	24
	0	0	0	0	2	15	59	21	4	0	0	0	0	0	0	101
19:00	0	0	0	0	0	4	10	0	2	0	0	0	0	0	0	16
19:15	0	0	0	0	0	4	9	5	0	0	0	0	0	0	0	18
19:30	0	0	0	0	0	2	3	2	1	0	0	0	0	0	0	8
19:45	0	0	0	0	0	2	6	2	0	0	0	0	0	0	0	10
	0	0	0	0	0	12	28	9	3	0	0	0	0	0	0	52
20:00	0	0	0	0	0	2	2	0	1	1	0	0	0	0	0	6
20:15	0	0	0	0	0	2	5	1	0	0	0	0	0	0	0	8
20:30	0	0	0	0	0	1	3	1	0	0	0	0	0	0	0	5
20:45	0	0	0	0	0	2	2	2	1	0	0	0	0	0	0	7
	0	0	0	0	0	7	12	4	2	1	0	0	0	0	0	26
21:00	0	0	0	0	0	1	6	2	0	0	0	0	0	0	0	9
21:15	0	0	0	0	0	1	4	1	0	0	0	0	0	0	0	6
21:30	0	0	0	0	0	2	3	2	0	0	0	0	0	0	0	7
21:45	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	3
	0	0	0	0	0	4	16	5	0	0	0	0	0	0	0	25
22:00	0	0	0	0	0	0	4	1	0	0	0	0	0	0	0	5
22:15	0	0	0	0	1	0	2	3	1	0	0	0	0	0	0	7
22:30	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	3
22:45	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	0	0	0	0	2	0	9	4	1	0	0	0	0	0	0	16
23:00	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
23:15	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	2
23:30	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	3
23:45	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	2
	0	0	0	0	0	1	5	2	1	0	0	0	0	0	0	9
Total	0	0	1	0	27	173	454	202	39	10	2	0	0	0	0	908
Total Stats	0	0	1	1	55	325	882	442	92	20	3	1	0	0	0	1822

15th Percentile : 29 MPH
 50th Percentile : 33 MPH
 85th Percentile : 39 MPH
 95th Percentile : 42 MPH

Mean Speed(Average) : 34 MPH
 10 MPH Pace Speed : 31-40 MPH
 Number in Pace : 1324
 Percent in Pace : 72.7%
 Number of Vehicles > 30 MPH : 1440
 Percent of Vehicles > 30 MPH : 79.0%

Crossroads Engineering Data, Inc.

CLIENT : KIMLEY-HORN
 JOB NO : 2010-47
 PROJECT: BIG PINE
 COUNTY : MONROE
 EB

13284 SW 120th Street
 Miami, Florida, 33186
 PH: 305-233-3997 FAX: 305-233-7720

US-1 (EB) SPEED
 US-1 AT MM 31.3/ EAST OF
 KEY DEER BLVD.
 Date Start: 12-Nov-10

Start Time	15	610	1115	1620	2125	2630	3135	3640	4145	4650	5155	5660	6165	6670	71147	Total
11/12/1																
0	0	0	1	6	8	3	4	0	0	0	0	0	0	0	0	22
00:15	0	0	0	2	8	2	1	0	0	0	0	0	0	0	0	13
00:30	0	1	3	2	7	0	0	0	0	0	0	0	0	0	0	13
00:45	0	0	0	3	4	0	1	0	0	0	0	0	0	0	0	8
01:00	0	1	4	13	27	5	6	0	0	0	0	0	0	0	0	56
01:15	0	0	0	1	6	1	0	0	0	0	0	0	0	0	0	8
01:30	0	0	1	4	5	2	0	0	0	0	0	0	0	0	0	12
01:45	0	1	4	2	6	2	0	0	0	0	0	0	0	0	0	15
02:00	0	0	0	1	3	3	0	0	0	0	0	0	0	0	0	7
02:15	0	1	5	8	20	8	0	0	0	0	0	0	0	0	0	42
02:30	0	1	0	2	4	3	0	0	0	0	0	0	0	0	0	10
02:45	0	0	1	0	5	0	0	2	0	0	0	0	0	0	0	8
03:00	0	0	0	0	4	3	2	0	0	0	0	0	0	0	0	9
03:15	0	0	1	4	4	0	0	0	0	0	0	0	0	0	0	9
03:30	0	1	2	6	17	6	2	2	0	0	0	0	0	0	0	36
03:45	0	0	1	0	2	2	3	0	0	0	0	0	0	0	0	8
04:00	0	0	0	0	4	5	2	0	1	0	0	0	0	0	0	12
04:15	0	0	1	0	2	5	1	1	0	0	0	0	0	0	0	10
04:30	0	0	0	2	5	4	2	0	0	0	0	0	0	0	0	13
04:45	0	0	2	2	13	16	8	1	1	0	0	0	0	0	0	43
05:00	0	0	0	1	5	5	1	0	0	0	0	0	0	0	0	12
05:15	0	0	0	0	6	3	2	0	0	0	0	0	0	0	0	11
05:30	0	0	1	2	5	7	4	1	0	0	0	0	0	0	0	20
05:45	0	2	2	1	5	5	1	0	0	0	0	0	0	0	0	16
06:00	0	2	3	4	21	20	8	1	0	0	0	0	0	0	0	59
06:15	0	0	0	1	3	4	3	1	0	0	0	0	0	0	0	12
06:30	0	0	0	0	8	5	4	2	1	0	0	0	0	0	0	20
06:45	0	0	0	1	5	11	4	2	1	1	0	0	0	0	0	25
07:00	0	0	0	3	4	4	9	0	0	0	0	0	0	0	0	20
07:15	0	0	0	5	20	24	20	5	2	1	0	0	0	0	0	77
07:30	0	2	1	0	0	4	15	6	1	1	0	0	0	0	0	30
07:45	0	0	0	1	1	6	10	20	2	0	0	0	0	0	0	40
08:00	0	0	0	0	1	4	4	12	14	5	0	0	0	0	0	40
08:15	0	0	0	0	0	5	7	30	21	3	0	0	0	0	0	66
08:30	0	2	1	1	2	19	36	68	38	9	0	0	0	0	0	176
08:45	0	0	0	1	0	2	9	21	25	9	1	0	0	0	0	68
09:00	0	0	0	0	0	1	26	22	22	15	0	0	0	0	0	86
09:15	0	0	0	0	0	8	18	27	31	9	1	0	0	0	0	94
09:30	0	0	0	0	1	2	4	16	27	15	1	0	0	0	0	66
09:45	0	0	0	1	1	13	57	86	105	48	3	0	0	0	0	314
10:00	0	0	1	0	1	8	13	30	35	14	1	0	0	0	0	103
10:15	0	0	0	0	1	1	11	38	37	12	1	0	0	0	0	101
10:30	0	0	0	0	0	9	11	22	34	12	0	1	0	0	0	89
10:45	0	1	0	0	1	1	16	38	28	11	0	0	0	0	0	96
11:00	0	1	1	0	3	19	51	128	134	49	2	1	0	0	0	389
11:15	0	0	0	0	1	2	13	37	42	13	0	0	0	0	0	108
11:30	0	0	0	0	3	12	24	39	38	5	1	0	0	0	0	122
11:45	0	0	1	0	2	5	24	42	43	7	1	0	0	0	0	125
Total	1	2	4	1	12	48	98	173	126	39	7	1	0	0	0	512
Total	3	11	27	43	159	230	452	775	727	234	16	2	0	0	0	2679

Crossroads Engineering Data, Inc.

CLIENT : KIMLEY-HORN
 JOB NO : 2010-47
 PROJECT: BIG PINE
 COUNTY : MONROE
 EB

13284 SW 120th Street
 Miami, Florida, 33186
 PH: 305-233-3997 FAX: 305-233-7720

US-1 (EB) SPEED
 US-1 AT MM 31.3/ EAST OF
 KEY DEER BLVD.
 Date Start: 12-Nov-10

Start Time	1 5	6 10	11 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 147	Total
12 PM	0	0	1	0	3	10	32	47	27	6	0	0	0	0	0	126
12:15	0	0	0	0	3	20	26	46	38	12	1	1	0	0	0	147
12:30	0	0	0	0	1	0	15	38	40	11	0	0	0	0	0	105
12:45	0	0	0	0	2	4	22	26	45	15	4	0	0	0	0	118
	0	0	1	0	9	34	95	157	150	44	5	1	0	0	0	496
13:00	0	0	0	1	2	5	18	28	43	15	0	1	0	0	0	113
13:15	0	0	1	0	3	13	29	39	29	17	2	0	0	0	0	133
13:30	0	0	1	1	4	7	30	40	28	9	3	1	0	0	0	124
13:45	0	0	0	1	1	4	15	39	31	13	2	0	0	0	0	106
	0	0	2	3	10	29	92	146	131	54	7	2	0	0	0	476
14:00	0	0	1	1	1	10	23	39	41	7	5	1	0	0	0	129
14:15	0	0	0	0	0	7	7	22	42	20	2	0	0	0	0	100
14:30	0	0	0	0	1	4	8	32	46	19	1	1	0	0	0	112
14:45	1	0	0	0	4	4	24	36	32	11	1	0	0	0	0	113
	1	0	1	1	6	25	62	129	161	57	9	2	0	0	0	454
15:00	0	0	0	0	0	4	13	35	40	13	2	1	0	0	0	108
15:15	0	0	0	0	1	4	18	45	36	13	2	2	0	0	0	121
15:30	0	0	0	0	0	8	27	46	42	13	0	0	0	0	0	136
15:45	0	0	0	0	4	13	31	29	45	19	0	0	0	0	0	141
	0	0	0	0	5	29	89	155	163	58	4	3	0	0	0	506
16:00	0	0	0	0	0	12	25	38	40	17	0	0	0	0	0	132
16:15	0	0	0	0	1	11	22	36	39	18	2	0	0	0	0	129
16:30	0	0	0	0	3	6	20	32	54	13	2	0	0	0	0	130
16:45	0	0	0	0	1	8	27	53	42	14	0	0	0	0	0	145
	0	0	0	0	5	37	94	159	175	62	4	0	0	0	0	536
17:00	0	0	0	0	3	6	21	48	40	22	0	0	0	0	0	140
17:15	1	0	0	0	3	0	16	46	45	15	2	0	0	0	0	128
17:30	0	0	0	0	2	9	15	40	44	15	2	0	0	0	0	127
17:45	0	0	0	0	1	5	31	47	25	10	0	1	0	0	0	120
	1	0	0	0	9	20	83	181	154	62	4	1	0	0	0	515
18:00	0	0	0	0	0	16	42	46	16	1	0	0	0	0	0	121
18:15	1	0	0	0	1	14	45	30	9	4	1	0	0	0	0	105
18:30	0	0	0	0	1	7	38	46	11	2	1	0	0	0	0	106
18:45	0	0	0	1	0	3	39	33	7	2	1	0	0	0	0	86
	1	0	0	1	2	40	164	155	43	9	3	0	0	0	0	418
19:00	0	0	0	0	0	4	28	36	6	1	0	0	0	0	0	75
19:15	0	0	0	0	1	4	30	22	12	0	0	0	0	0	0	69
19:30	0	0	0	0	4	13	28	11	5	4	0	0	0	0	0	65
19:45	0	1	0	0	1	4	16	21	13	5	1	0	0	0	0	62
	0	1	0	0	6	25	102	90	36	10	1	0	0	0	0	271
20:00	0	0	0	0	1	1	22	13	6	1	0	0	0	0	0	44
20:15	0	1	0	0	0	9	17	25	7	2	0	0	0	0	0	61
20:30	0	0	0	0	0	2	31	27	7	2	0	0	0	0	0	69
20:45	0	0	0	0	0	4	22	8	5	2	0	0	0	0	0	41
	0	1	0	0	1	16	92	73	25	7	0	0	0	0	0	215
21:00	0	0	0	0	0	1	21	18	8	1	0	0	0	0	0	49
21:15	0	0	0	0	0	4	10	20	9	3	0	0	0	0	0	46
21:30	0	0	0	0	1	2	13	16	4	1	0	0	0	0	0	37
21:45	0	0	0	0	0	7	22	9	5	1	0	0	0	0	0	44
	0	0	0	0	1	14	66	63	26	6	0	0	0	0	0	176
22:00	1	0	0	0	2	4	14	14	4	1	0	0	0	0	0	40
22:15	0	0	0	0	0	3	6	8	4	0	0	0	0	0	0	21
22:30	0	0	0	0	0	0	11	13	6	1	0	0	0	0	0	31
22:45	0	0	0	0	0	3	15	6	4	4	0	0	0	0	0	32
	1	0	0	0	2	10	46	41	18	6	0	0	0	0	0	124
23:00	0	0	0	0	0	1	4	13	0	1	0	0	0	0	0	19
23:15	0	0	0	0	0	4	13	13	4	2	0	0	0	0	0	36
23:30	0	0	0	0	0	1	18	4	6	0	0	0	0	0	0	29
23:45	0	0	0	0	0	1	13	9	3	1	0	0	0	0	0	27
	0	0	0	0	0	7	48	39	13	4	0	0	0	0	0	111
Total	4	2	4	5	56	286	1033	1388	1095	379	37	9	0	0	0	4298
Total Stats	7	13	31	48	215	516	1485	2163	1822	613	53	11	0	0	0	6977

15th Percentile : 31 MPH
 50th Percentile : 38 MPH
 85th Percentile : 44 MPH
 95th Percentile : 48 MPH

Mean Speed(Average) : 38 MPH
 10 MPH Pace Speed : 36-45 MPH
 Number in Pace : 3985
 Percent in Pace : 57.1%
 Number of Vehicles > 40 MPH : 2499
 Percent of Vehicles > 40 MPH : 35.8%

Crossroads Engineering Data, Inc.

CLIENT : KIMLEY-HORN
 JOB NO : 2010-47
 PROJECT: BIG PINE
 COUNTY : MONROE
 WB

13284 SW 120th Street
 Miami, Florida, 33186
 PH: 305-233-3997 FAX: 305-233-7720

US-1 (WB) SPEED
 US-1 @ MM 31.3/ EAST OF
 KEY DEER BLVD.
 Date Start: 11-Nov-10

Start Time	1 5	6 10	11 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 147	Total
11/11/10	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
00:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
00:15	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
00:30	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
00:45	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:15	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
01:30	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
01:45	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:15	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
02:30	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
02:45	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:15	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
03:30	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
03:45	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
04:30	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
04:45	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
05:30	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
05:45	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
06:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:15	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
06:30	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
06:45	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
07:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
07:30	0	0	3	2	0	0	6	13	24	8	3	0	0	0	0	59
07:45	0	0	0	2	0	1	14	30	23	7	0	0	0	0	0	77
08:00	0	0	0	1	0	1	6	38	20	6	1	0	0	0	0	73
08:15	0	0	3	5	0	2	26	81	67	21	4	0	0	0	0	209
08:30	0	0	1	1	1	3	10	35	19	3	0	0	0	0	0	73
08:45	0	0	0	0	4	1	15	29	26	0	0	0	0	0	0	75
09:00	0	0	0	1	1	0	24	51	18	5	0	0	0	0	0	100
09:15	0	0	1	2	0	2	18	40	30	4	0	0	0	0	0	97
09:30	0	0	2	4	6	6	67	155	93	12	0	0	0	0	0	345
09:45	0	0	0	1	1	1	26	41	27	5	0	0	0	0	0	102
10:00	0	0	0	4	0	2	17	37	28	1	0	0	0	0	0	89
10:15	0	0	2	0	0	2	20	51	15	2	0	0	0	0	0	92
10:30	0	0	0	0	3	5	23	21	22	2	0	0	0	0	0	76
10:45	0	0	2	5	4	10	86	150	92	10	0	0	0	0	0	359
11:00	0	0	0	0	0	2	22	56	28	0	0	0	0	0	0	108
11:15	0	0	1	3	2	7	35	46	23	5	0	0	0	0	0	122
11:30	0	0	0	2	5	10	21	39	53	6	0	0	0	0	0	136
11:45	0	0	1	1	2	3	24	40	41	4	0	0	0	0	0	116
12:00	0	0	2	6	9	22	102	181	145	15	0	0	0	0	0	482
12:15	0	0	0	0	6	5	27	60	22	4	0	0	0	0	0	124
12:30	0	0	1	1	1	3	45	68	31	3	0	0	0	0	0	153
12:45	0	0	0	1	1	5	29	59	21	1	0	0	0	0	0	117
13:00	0	0	1	0	1	9	31	65	42	5	0	0	0	0	0	154
13:15	0	0	2	2	9	22	132	252	116	13	0	0	0	0	0	548
Total	0	0	11	22	28	62	413	819	513	71	4	0	0	0	0	1943

Crossroads Engineering Data, Inc.

CLIENT : KIMLEY-HORN
 JOB NO : 2010-47
 PROJECT: BIG PINE
 COUNTY : MONROE
 WB

13284 SW 120th Street
 Miami, Florida, 33186
 PH: 305-233-3997 FAX: 305-233-7720

US-1 (WB) SPEED
 US-1 @ MM 31.3/ EAST OF
 KEY DEER BLVD.
 Date Start: 11-Nov-10

Start Time	1 5	6 10	11 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 147	Total
12 PM	0	0	0	1	1	2	29	62	38	4	1	0	0	0	0	138
12:15	0	0	1	0	0	1	23	63	35	6	0	0	0	0	0	129
12:30	0	0	0	0	2	2	33	85	43	2	0	0	0	0	0	167
12:45	0	0	1	0	0	8	31	69	41	0	0	0	0	0	0	150
	0	0	2	1	3	13	116	279	157	12	1	0	0	0	0	584
13:00	0	0	0	1	1	9	49	71	42	1	0	0	0	0	0	174
13:15	0	0	0	2	1	1	27	62	37	5	0	0	0	0	0	135
13:30	0	0	0	1	1	7	24	73	45	3	0	0	0	0	0	154
13:45	0	0	1	2	2	7	45	77	36	3	0	0	0	0	0	173
	0	0	1	6	5	24	145	283	160	12	0	0	0	0	0	636
14:00	0	0	3	0	3	5	21	88	43	8	0	0	0	0	0	171
14:15	0	0	1	0	0	13	43	61	48	6	0	0	0	0	1	173
14:30	0	0	1	1	2	6	48	77	20	4	1	0	0	0	0	160
14:45	0	0	1	2	1	18	73	66	20	5	0	0	0	0	0	186
	0	0	6	3	6	42	185	292	131	23	1	0	0	0	1	690
15:00	0	0	2	3	6	21	42	72	29	3	0	0	0	0	0	178
15:15	0	0	0	1	1	9	50	81	37	3	0	0	0	0	0	182
15:30	0	0	1	0	5	6	34	83	55	0	0	0	0	0	0	184
15:45	0	0	0	2	6	18	57	59	35	9	0	0	0	0	0	186
	0	0	3	6	18	54	183	295	156	15	0	0	0	0	0	730
16:00	0	0	1	4	0	9	43	80	31	5	1	0	0	0	0	174
16:15	0	0	1	1	0	9	59	64	20	3	0	0	0	0	0	157
16:30	0	0	0	1	0	2	34	73	34	4	0	0	0	0	0	148
16:45	0	0	0	1	1	8	22	55	44	7	0	0	0	0	0	138
	0	0	2	7	1	28	158	272	129	19	1	0	0	0	0	617
17:00	0	0	1	3	2	2	38	73	27	4	0	0	0	0	0	150
17:15	0	0	1	0	0	6	36	69	29	1	0	0	0	0	0	142
17:30	0	0	0	2	2	15	62	51	19	1	0	0	0	0	0	152
17:45	0	0	0	1	2	15	54	43	19	3	0	0	0	0	0	137
	0	0	2	6	6	38	190	236	94	9	0	0	0	0	0	581
18:00	0	0	0	0	3	16	75	31	1	0	0	0	0	0	0	126
18:15	0	0	0	0	1	16	79	29	2	0	0	0	0	0	0	127
18:30	0	0	1	1	1	12	56	18	0	0	0	0	0	0	0	89
18:45	0	0	0	1	2	13	56	35	1	0	0	0	0	0	0	108
	0	0	1	2	7	57	266	113	4	0	0	0	0	0	0	450
19:00	0	0	1	0	6	15	49	13	1	0	0	0	0	0	0	85
19:15	0	0	0	1	1	23	44	7	1	0	0	0	0	0	0	77
19:30	0	0	0	1	13	15	20	3	0	0	0	0	0	0	0	52
19:45	0	0	0	0	7	34	11	1	0	0	0	0	0	0	0	53
	0	0	1	2	27	87	124	24	2	0	0	0	0	0	0	267
20:00	0	0	0	1	11	28	29	4	0	0	0	0	0	0	0	73
20:15	0	0	0	2	17	24	13	1	0	0	0	0	0	0	0	57
20:30	0	0	0	1	8	21	7	1	0	0	0	0	0	0	0	38
20:45	0	0	0	0	19	13	5	0	0	0	0	0	0	0	0	37
	0	0	0	4	55	86	54	6	0	0	0	0	0	0	0	205
21:00	0	0	1	5	34	10	1	1	0	0	0	0	0	0	0	52
21:15	0	0	2	1	9	20	3	0	0	0	0	0	0	0	0	35
21:30	0	0	1	3	8	26	7	0	0	0	0	0	0	0	0	45
21:45	0	0	1	1	8	16	2	0	0	0	0	0	0	0	0	28
	0	0	5	10	59	72	13	1	0	0	0	0	0	0	0	160
22:00	0	0	1	0	16	8	1	0	0	0	0	0	0	0	0	26
22:15	0	0	0	0	4	10	6	1	0	0	0	0	0	0	0	21
22:30	0	0	0	1	14	31	2	0	0	0	0	0	0	0	0	48
22:45	0	2	0	0	6	8	2	0	0	0	0	0	0	0	0	18
	0	2	1	1	40	57	11	1	0	0	0	0	0	0	0	113
23:00	0	0	0	1	9	11	1	0	0	0	0	0	0	0	0	22
23:15	2	1	0	0	0	2	0	0	0	0	0	0	0	0	0	5
23:30	1	1	0	0	0	11	0	0	0	0	0	0	0	0	0	13
23:45	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	3	4	24	49	236	582	1446	1802	833	90	3	0	0	0	1	5073
Total Stats	3	4	35	71	264	644	1859	2621	1346	161	7	0	0	0	1	7016

15th Percentile : 31 MPH
 50th Percentile : 37 MPH
 85th Percentile : 42 MPH
 95th Percentile : 45 MPH

Mean Speed(Average) : 36 MPH
 10 MPH Pace Speed : 31-40 MPH
 Number in Pace : 4480
 Percent in Pace : 63.9%
 Number of Vehicles > 40 MPH : 1515
 Percent of Vehicles > 40 MPH : 21.6%

APPENDIX E
Opinions of Probable Cost

OPINION OF PROBABLE COST

Restriping of Blue Hole Parking Lot

ITEM NUMBER	DESCRIPTION	UNIT	QTY.	UNIT PRICE	TOTAL COST
SIGNING AND PAVEMENT MARKING PAY ITEMS					
711-11-111	THERMOPLASTIC, WHITE SOLID, 6 INCHES	NM	0.091	\$ 3,257.00	\$ 296.40
711-11-421	THERMOPLASTIC, BLUE SOLID, 6 INCHES	LF	54	\$ 0.84	\$ 45.40
711-11-460	THERMOPLASTIC, BLUE, MESSAGE	EA	1	\$ 150.00	\$ 150.00
SIGNING & PM TOTAL					\$ 491.80
SUBTOTAL					\$ 491.80
101-1	MOBILIZATION	LS	10%	-	\$ 50.00
102-1	MAINTENANCE OF TRAFFIC	LS	10%	-	\$ 50.00
	PE & CEI	LS	30%	-	\$ 147.54
	CONTINGENCY	LS	25%	-	\$ 122.95
	SMALL PROJECT PREMIUM	LS	15%	-	\$ 73.77
GRAND TOTAL					\$ 936.06

Kimley-Horn and Associates, Inc. has no control over the cost of labor, materials, equipment, or services furnished by others, or over methods of determining price, or over competitive bidding or market conditions. Any and all professional opinions as to costs reflected herein, including but not limited to professional opinions as to the costs of construction materials, are made on the basis of professional experience and available data. Kimley-Horn and Associates, Inc. cannot and does not guarantee or warrant that proposals, bids, or actual costs will not vary from the professional opinions of costs shown herein.

Kimley-Horn and Associates, Inc.
 5200 NW 33rd Avenue
 Suite 109
 Fort Lauderdale, Florida 33309
 FBPE Number: CA 00000696



OPINION OF PROBABLE COST

Crosswalk at Blue Hole Interpretive Site

ITEM NUMBER	DESCRIPTION	UNIT	QTY.	UNIT PRICE	TOTAL COST
ROADWAY PAY ITEMS					
522-2	SIDEWALK, CONCRETE, 6" THICK	SY	2	\$ 46.00	\$ 92.00
ROADWAY TOTAL					\$ 92.00
SIGNING AND PAVEMENT MARKING PAY ITEMS					
700-20-11	SIGN, SINGLE POST, FURNISH AND INSTALL	AS	4	\$ 250.94	\$ 1,003.80
711-11-123	THERMOPLASTIC, WHITE SOLID, 12 INCHES	LF	44	\$ 2.04	\$ 89.80
711-11-125	THERMOPLASTIC, WHITE SOLID, 24 INCHES	LF	27	\$ 3.37	\$ 91.00
711-11-180	THERMOPLASTIC, WHITE, YIELD LINE	LF	44	\$ 1.20	\$ 52.80
SIGNING & PM TOTAL					\$ 1,237.40
SUBTOTAL					\$ 1,329.40
101-1	MOBILIZATION	LS	10%	-	\$ 133.00
102-1	MAINTENANCE OF TRAFFIC	LS	10%	-	\$ 133.00
	PE & CEI	LS	50%	-	\$ 664.70
	CONTINGENCY	LS	50%	-	\$ 664.70
	SMALL PROJECT PREMIUM	LS	75%	-	\$ 997.05
GRAND TOTAL					\$ 3,921.85
SAY					\$ 4,000

Kimley-Horn and Associates, Inc. has no control over the cost of labor, materials, equipment, or services furnished by others, or over methods of determining price, or over competitive bidding or market conditions. Any and all professional opinions as to costs reflected herein, including but not limited to professional opinions as to the costs of construction materials, are made on the basis of professional experience and available data. Kimley-Horn and Associates, Inc. cannot and does not guarantee or warrant that proposals, bids, or actual costs will not vary from the professional opinions of costs shown herein.

Kimley-Horn and Associates, Inc.
 5200 NW 33rd Avenue
 Suite 109
 Fort Lauderdale, Florida 33309
 FBPE Number: CA 00000696



OPINION OF PROBABLE COST
Add Paved Shoulder, Resurface Roadway

Description	Pay Item #	Width (ft)	Thickness (in)	Length (ft)	Unit	Quantity	Unit Price*	Total Cost
ROADWAY AND DRAINAGE								
CLEARING & GRUBBING	110-1-1	12		1	AC	0.000275	\$15,350.42	\$4.23
EMBANKMENT	120-6	21	12	1	CY	0.778	\$10.47	\$8.14
MILLING AND RESURFACING (Two 11' lanes)								
MILLING EXIST ASPH PAVT, 2" AVG DEPTH	327-70-5	22	2	1	SY	2.44	\$1.65	\$4.03
SUPERPAVE ASPHALTIC CONC, TRAFFIC C	334-1-13	22	1	1	TN	0.134	\$94.05	\$12.64
ASPH CONC FC, TRAFFIC C, FC-9.5, RUBBER	337-7-32	22	1	1	TN	0.134	\$118.20	\$15.89
SHOULDER NEW CONSTRUCTION/WIDENING (on each side: 4' Paved Shoulder and 2' Unpaved Shoulder)								
TYPE B STABILIZATION	160-4	12		1	SY	1.33	\$4.30	\$5.73
OPTIONAL BASE, BASE GROUP 08 (Shoulder)	285-708	8.67		1	SY	0.963	\$13.49	\$12.99
SUPERPAVE ASPHALTIC CONC, TRAFFIC C	334-1-13	8	1	1	TN	0.049	\$94.05	\$4.60
ASPH CONC FC, TRAFFIC C, FC-9.5, RUBBER	337-7-32	8	1	1	TN	0.049	\$118.20	\$5.78
THERMOPLASTIC, STD, WHITE, MESSAGE	711-11-160			1	EA	0.000758	\$91.04	\$0.07
Roadway Sub-Total								\$74.11
Maintenance of Traffic (15%)								\$11.12
Mobilization (15%)								\$11.12
Signing and Marking (5%)								\$3.71
Contingency (20%)								\$14.82
***Total								\$100.05
***Say								\$105.00

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OPINION OF PROBABLE COST
Add Paved Shoulder and Widen Roadway

Description	Pay Item #	Width (ft)	Thickness (in)	Length (ft)	Unit	Quantity	Unit Price*	Total Cost
ROADWAY AND DRAINAGE								
CLEARING & GRUBBING	110-1-1	16		1	AC	0.000367	\$15,350.42	\$5.64
EMBANKMENT	120-6	16	12	1	CY	0.593	\$10.47	\$6.20
MILLING AND RESURFACING (Two 10' lanes)								
MILLING EXIST ASPH PAVT, 2" AVG DEPTH	337-70-5	20	2	1	SY	2.22	\$1.65	\$3.67
SUPERPAVE ASPHALTIC CONC, TRAFFIC C	334-1-13	20	1	1	TN	0.122	\$94.05	\$11.50
ASPH CONC FC, TRAFFIC C, FC-9.5, RUBBER	337-7-32	20	1	1	TN	0.122	\$118.20	\$14.45
ROADWAY WIDENING (on each side: 2' Pavement)								
TYPE B STABILIZATION	160-4	0		1	SY	0.0	\$4.30	\$0.00
OPTIONAL BASE, BASE GROUP 11 (Roadway Pavement)	285-711	4.67		1	SY	0.519	\$22.00	\$11.41
SUPERPAVE ASPHALTIC CONC, TRAFFIC C	334-1-13	4	1	1	TN	0.0244	\$94.05	\$2.30
ASPH CONC FC, TRAFFIC C, FC-9.5, RUBBER	337-7-32	4	1	1	TN	0.0244	\$118.20	\$2.89
SHOULDER NEW CONSTRUCTION/WIDENING (on each side: 4' Paved Shoulder and 2' Unpaved Shoulder)								
TYPE B STABILIZATION	160-4	12		1	SY	1.33	\$4.30	\$5.73
OPTIONAL BASE, BASE GROUP 08 (Shoulder)	285-708	8.67		1	SY	0.963	\$13.49	\$12.99
SUPERPAVE ASPHALTIC CONC, TRAFFIC C	334-1-13	8	1	1	TN	0.0489	\$94.05	\$4.60
ASPH CONC FC, TRAFFIC C, FC-9.5, RUBBER	337-7-32	8	1	1	TN	0.0489	\$118.20	\$5.78
THERMOPLASTIC, STD, WHITE, MESSAGE	711-11-160			1	EA	0.000758	\$91.04	\$0.07
Roadway Sub-Total								\$87.22
Maintenance of Traffic (15%)								\$13.08
Mobilization (15%)								\$13.08
Signing and Marking (5%)								\$4.36
Contingency (20%)								\$17.44
***Total								\$117.74
***Sgty								\$120.00

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OPINION OF PROBABLE COST
Extend Shared Use Path and Add Paved Shoulders, Resurface Roadway

Description	Pay Item #	Width (ft)	Thickness (in)	Length (ft)	Unit	Quantity	Unit Price*	Total Cost
ROADWAY AND DRAINAGE								
CLEARING & GRUBBING	110-1-1	30		1	AC	0.000689	\$15,350.42	\$10.57
EMBANKMENT	120-6	21	12	1	CY	0.778	\$10.47	\$8.14
MILLING AND RESURFACING (Two 11' lanes)								
MILLING EXIST ASPH PAVT, 2" AVG DEPTH	327-70-5	22	2	1	SY	2.44	\$1.65	\$4.03
SUPERPAVE ASPHALTIC CONC, TRAFFIC C	334-1-13	22	1	1	TN	0.134	\$94.05	\$12.64
ASPH CONC FC, TRAFFIC C, FC-9.5, RUBBER	337-7-32	22	1	1	TN	0.134	\$118.20	\$15.89
SHOULDER NEW CONSTRUCTION/WIDENING (on each side: 4' Paved Shoulder and 2' Unpaved Shoulder)								
TYPE B STABILIZATION	160-4	12		1	SY	1.33	\$4.30	\$5.73
OPTIONAL BASE BASE GROUP 08 (Shoulder)	285-708	8.67		1	SY	0.963	\$13.49	\$12.99
SUPERPAVE ASPHALTIC CONC, TRAFFIC C	334-1-13	8	1	1	TN	0.0489	\$94.05	\$4.60
ASPH CONC FC, TRAFFIC C, FC-9.5, RUBBER	337-7-32	8	1	1	TN	0.049	\$118.20	\$5.78
SHARED USE PATH (10' Wide)								
TYPE B STABILIZATION	160-4	14		1	SY	1.56	\$4.30	\$6.69
OPTIONAL BASE GROUP 01	285-701	10.67		1	SY	1.19	\$32.00	\$37.93
SUPERPAVE ASPHALTIC CONC, TRAFFIC A (1")	334-1-11	10	1	1	TN	0.0611	\$97.32	\$5.95
THERMOPLASTIC, STD, WHITE, MESSAGE	711-11-160			1	EA	0.000758	\$91.04	\$0.07
						Roadway Sub-Total		\$131.02
						Maintenance of Traffic (15%)		\$19.65
						Mobilization (15%)		\$19.65
						Signing and Marking (5%)		\$6.55
						Contingency (20%)		\$26.20
						***Total		\$176.87
						***Stay		\$180.00

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OPINION OF PROBABLE COST
Widen Shared Use Path

Description	Pay Item #	Width (ft)	Thickness (in)	Length (ft)	Unit	Quantity	Unit Price*	Total Cost
ROADWAY AND DRAINAGE								
CLEARING & GRUBBING	110-1-1	8		1	AC	0.000184	\$15,350.42	\$2.82
EMBANKMENT	120-6	4	6	1	CY	0.0741	\$10.47	\$0.78
SHARED USE PATH (Widen 8' path to 10' - 2' Widening)								
TYPE B STABILIZATION	160-4	6		1	SY	0.667	\$4.30	\$2.87
OPTIONAL BASE GROUP 01	285-701	2.67		1	SY	0.296	\$32.00	\$9.48
SUPERPAVE ASPHALTIC CONC, TRAFFIC A (1")	334-1-11	2	1	1	TN	0.0122	\$97.32	\$1.19
THERMOPLASTIC, STD, WHITE, MESSAGE	711-11-160			1	EA	0.0	\$91.04	\$0.07
						Roadway Sub-Total		
						Maintenance of Traffic (15%)		
						Mobilization (15%)		
						Signing and Marking (5%)		
						Contingency (20%)		
						***Total		
						***Say		

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OPINION OF PROBABLE COST
Replace Existing Path with Shoulder and Construct Shared Use Path with Separation from Roadway

Description	Pay Item #	Width (ft)	Thickness (in)	Length (ft)	Unit	Quantity	Unit Price*	Total Cost
ROADWAY AND DRAINAGE								
CLEARING & GRUBBING	110-1-1	20		1	AC	0.000459	\$15,350.42	\$7.05
EMBANKMENT	120-6	15	12	1	CY	0.556	\$10.47	\$5.82
MILLING AND RESURFACING (Two 11' lanes)								
MILLING EXIST ASPH PAVT, 2" AVG DEPTH	327-70-5	22	2	0	SY	0.00	\$1.65	\$0.00
SUPERPAVE ASPHALTIC CONC, TRAFFIC C	334-1-13	22	1	0	TN	0.000	\$94.05	\$0.00
ASPH CONC FC, TRAFFIC C, FC-9.5, RUBBER	337-7-32	22	1	0	TN	0.000	\$118.20	\$0.00
SHOULDER NEW CONSTRUCTION/WIDENING (on each side; 4' Paved Shoulder and 2' Unpaved Shoulder)								
TYPE B STABILIZATION	160-4	6		1	SY	0.67	\$4.30	\$2.87
OPTIONAL BASE, BASE GROUP 08 (Shoulder)	285-708	4.33		1	SY	0.481	\$13.49	\$6.50
SUPERPAVE ASPHALTIC CONC, TRAFFIC C	334-1-13	4	1	1	TN	0.0244	\$94.05	\$2.30
ASPH CONC FC, TRAFFIC C, FC-9.5, RUBBER	337-7-32	4	1	1	TN	0.024	\$118.20	\$2.89
SHARED USE PATH (10' Wide)								
TYPE B STABILIZATION	160-4	14		1	SY	1.56	\$4.30	\$6.69
OPTIONAL BASE GROUP 01	285-701	10.67		1	SY	1.19	\$32.00	\$37.93
SUPERPAVE ASPHALTIC CONC, TRAFFIC A (1")	334-1-11	10	1	1	TN	0.0611	\$97.32	\$5.95
THERMOPLASTIC, STD, WHITE, MESSAGE	711-11-160			0	EA	0.000000	\$91.04	\$0.00
Roadway Sub-Total								\$77.98
Maintenance of Traffic (20%)								\$15.60
Mobilization (20%)								\$15.60
Signaling and Marking (5%)								\$3.90
Contingency (20%)								\$15.60
***Total								\$113.07
***\$Qty								\$115.00

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