3.3 Florida Keys Sites

3.3 FLORIDA KEYS SITES

NEPA and its implementing regulations require that, for major Federal actions significantly affecting the human environment, the proponent of the action prepare an EIS describing the proposal and its effects on the environment. This requirement applies to Federal actions occurring in or affecting U.S. territory. EO 12114 requires that for similar actions and effects occurring outside of the territorial limits of the United States, within the global commons, the proponent prepare an EIS describing its effects on the environment of the global commons. While the EO does not require exactly the same procedure and formality as NEPA, the substantive analysis required is comparable. In the interest of brevity and efficiency, this document will not identify each instance in which the analysis is conducted pursuant to NEPA or in which it is conducted pursuant to the EO. Rather, it will simply identify the action and its impacts and the location of each. The SEIS is being prepared using the procedures applicable to NEPA, including the required public notices and involvement within the United States.

The Florida Keys are an alternative under consideration as a land launched target location. A single characterization of the regional climate and air quality is presented for all locations in the Florida Keys including Cudjoe Key, Saddlebunch Keys, and other islands. Similarly, potential environmental impacts and mitigation are presented in common for affected sites in the Florida Keys where there were no locational differences identified in the analysis. Where site-specific impacts were identified, they are presented and described separately including recommended mitigations, where applicable.

3.3.1 AIR QUALITY

The impacts on air quality at alternative sites in the Florida Keys would not cause an exceedance of the NAAQS, would not be subject to PSD review, and would not expose the public or operational personnel to hazardous levels of HAPs.

3.3.1.1 Resource Description and Evaluative Methods

The air quality analysis of the Florida Keys was conducted in a progressively detailed manner. Initially, it was determined that the keys are in attainment for NAAQS. Along with this, a determination was made that the Prevention of Significant Deterioration review requirements would not be applicable to the proposed action in a regulatory sense. The majority of actions as described in Chapter 2 that would impact air quality are of a mobile nature. The PSD review process addresses stationary source emission. Further analysis determined whether the proposed action would have the potential to cause an exceedance of the NAAQS or applicable HAPs requirements. For those pollutants with no applicable regulatory restrictions, analysis of applicable health-base guidance levels was conducted.

Section 3.1.1 contains additional information as to specific methodologies.

3.3.1.2 Region of Influence

For the air quality analysis of the Florida Keys, the ROI for project construction and operational activities would be the existing airsheds surrounding the various launch sites, instrumentation sites, and missile storage and assembly locations. For regulatory purposes, project emissions would be compared to emissions generated in Monroe County.

3.3.1.3 Affected Environment—Cudjoe Key and Saddlebunch Keys

Regional Climate

The Florida Keys have a tropical maritime climate with moderate temperatures, and essentially two seasons: long, wet summers and mild, dry winters. (U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 1995)

The Florida Keys have the most moderate temperatures in Florida. Easterly winds pass over the Gulf Stream and transport warm air across the islands, while cold fronts reaching the area are quickly modified by the warm waters of the Gulf and Florida Bay. Temperatures are also influenced by the amount of solar radiation the area receives. At Key West, the average annual maximum temperature is 28°C (82.4°F), and the average annual minimum is 23°C (73.4°F).

The Florida Keys are the driest area in Florida, with an average of 124.5 centimeters (49 inches) of precipitation per year. The highest monthly mean rainfall, 16.5 centimeters (6.5 inches), generally occurs in September and the lowest, 3.3 centimeters

(1.3 inches), in March (U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 1995a). The period of December through April receives abundant sunshine and slightly less than 25 percent of the annual rainfall. June through October is normally the wet season, receiving approximately 53 percent of the yearly total rainfall in numerous showers and thunderstorms.

South Florida experiences more tropical depressions and hurricanes than any other area in the United States. Storms normally occur between June and November, peaking in late September or early October. On average, there is a 13 to 16 percent annual probability of a hurricane occurring in the Florida Keys.

Weather in the Florida Keys is directly related to the tropical maritime air associated with the Bermuda/Azores high-pressure system. Its movement, seasonal position, and interaction with other pressure systems affect wind direction and speed, temperature, and precipitation. Winds are from the east-southeast during the summer and the east-northeast during the winter, shifting to the northwest infrequently and for short periods during the passage of cold fronts.

Humidity levels reflect the maritime environment. The mean average humidity is 75 percent, and does not vary significantly by month. The highest humidities occur early in the morning and the lowest in the late afternoon (U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 1995a).

Daytime mixing heights for the Florida Keys are higher than for most of the continental United States. Morning mixing heights average 1,100 meters (3,600 feet) in the summer and 700 meters (2,300 feet) in the winter. Afternoon mixing heights average 1,400 meters (4,600 feet) in the summer and 1,200 meters (3,900 feet) in the winter (U.S. Environmental Protection Agency, National Technical Information Service, 1972).

Regional Air Quality

Monroe County, including the Florida Keys, is in attainment or unclassifiable for all criteria pollutants. The only air pollutant monitored by the FDEP DARM in the Florida Keys is particulate matter (PM). This is monitored by two sites, one on Marathon Key and one at Key West. Figure 3.3.1-1 shows relative locations of air monitoring stations in the Northwest and Southwest FDEP Districts. The only exceedances experienced have been attributed to dust storms in the Sahara Desert blowing dust across the Atlantic Ocean.

No proposed site in the Florida Keys is in an industrial or heavily populated area. As such, air quality at these sites is anticipated to be comparable to or better than the air quality represented by the county air emissions summary.

Due to the lack of industry, there has been no general need for PSD increment determination in the Florida Keys. Several years ago, Key West Utilities, in an attempt to estimate the PSD increment power generation would consume, used radials 10 degrees apart and over 161 kilometers (100 miles) away to determine the effects of their

Source: Florida Department of Environmental Protection, Division of Air Resources Management, 1997; Hanks, 1997; U.S. Army Space and Strategic Defense Command, 1994a.

EXPLANATION

- Pertinent Air Monitoring Site
- Air Monitoring Site
- State Boundary
- County Boundary
- Florida Department of Environmental Protection (FDEP) District

NORTH

Scale 1:6,000,000

0 50 100 Miles

0 100 200 Kilometers

Air Quality Region of Influence and FDEP Districts, Air Quality Monitoring, and Class I Areas

Eastern Gulf of Mexico

Figure 3.3.1-1

gom-6m-3aq001b

operations on PSD increment. The results were inconclusive, but demonstrated to the regulatory agency that the PSD increment would be minimally impacted. Sea winds tend to disperse any airborne pollutants.

Air Pollution Emissions Sources

NASKW, Marathon Airport, and Key West International Airport aircraft traffic may be significant sources of emissions. However, no aircraft emissions are tracked or monitored.

3.3.1.4 Environmental Impacts and Mitigations—Cudjoe Key and Saddlebunch Keys

No-action Alternative

Under the no-action alternative on Cudjoe Key, aerostat missions would continue at their current planned levels. No project-related construction or activities would take place. As such, air quality would remain at the current level. Similarly, at Saddlebunch Keys the naval transmitter site would continue current operations. Continuing operation of Air Force facilities on Cudjoe Key and adjacent keys would have no added effects on air quality. Continuing Navy and VOA transmission activities from Saddlebunch Keys would also have no added effects on air quality.

Site Preparation Activities

Construction of TMD test facilities at Cudjoe Key or Saddlebunch Keys may cause a short-term increase in the fugitive dust in the immediate vicinity of the construction work. Construction of facilities in support of TMD testing would disturb 0.23 hectare (0.58 acre) of ground at Cudjoe Key.

Construction of TMD test facilities at Saddlebunch Keys may cause a short-term increase in the fugitive dust in the immediate vicinity of the construction work. Construction of facilities in support of TMD testing would disturb 0.63 hectare (1.56 acres) of ground at Saddlebunch Keys Option 1. Construction of facilities in support of TMD testing would disturb 0.9 hectare (2.23 acres) of ground at Saddlebunch Keys Option 2.

Site preparation emissions would be similar to those described in section 3.1.1. The construction related to the proposed use of Cudjoe Key or Saddlebunch Keys as a launch site would potentially result in temporary localized elevation of carbon monoxide, sulfur dioxide, nitrogen oxides, PM-10, and VOC concentrations in and around the construction site. No exceedances of NAAQS would be anticipated, and temporary effects on air quality would be anticipated to be minimal beyond the immediate construction site.

Flight Test Activities

If Cudjoe Key or Saddlebunch Keys is selected as a site for target missile preparation and launch, flight test activities would include missile storage, assembly, and

preparation; actual launch operations; site maintenance; and operation of up to six remote instrumentation stations.

Potential air quality impacts due to instrumentation operations would be similar to those described in section 3.1.1, and could include use of portable generators as power sources. Use of portable generators would be subject to required permits and regulated use. Specifics regarding representative generator emissions are presented in appendix K.

Missile preparation activities would also be similar to those described in section 3.1.1 and could result in minimal VOC emissions. Test support and maintenance operations would have temporary effects on air quality in the Florida Keys.

The single source of emissions that would be likely to result due to the proposed action would be the exhaust of the missile during launch. However, the missiles are not considered stationary sources, and thus are not subject to the PSD review process.

The mechanics of plume dispersions and potential for impacts due to normal launch operations are described in detail in section 3.1.1. Since the same solid-fueled missiles are planned for launch in the Florida Keys, potential for impacts would also be equivalent. No liquid-fueled missiles would be launched from Cudjoe Key or Saddlebunch Keys. Therefore, no UDMH and IRFNA would be present.

The proposed launch of up to 12 Hera target missiles from the Cudjoe Key or Saddlebunch launch site would not be anticipated to result in exceedance of health-based guidance levels of aluminum oxide, carbon monoxide, or hydrogen chloride beyond the boundary of the LHA. The potential does exist for limited deposition of hydrogen chloride as hydrochloric acid. Computer modeling using OBODM has indicated that deposition would not be likely to exceed 1.642 g/m^2 and that potential deposition would be less than 1 g/m^2 beyond 117 meters (383.9 feet) for normal launches. Potential impacts to the environment due to acidic deposition are addressed in sections 3.1.3 (Biological Resources), 3.1.5 (Geology and Soils), and 3.1.14 (Water Resources).

Cumulative Impacts

Construction of the TMD test facilities at Cudjoe Key would take place within property owned by the U.S. Air Force Air Combat Command which was originally developed in 1959 for monitoring missile testing over the Gulf of Mexico. This complex was altered to accommodate balloon radar surveillance of the southern Gulf and Cuba, which will continue for the foreseeable future. Residential and commercial development has continued at a moderate rate in Monroe County with some increase in population on Cudjoe Key.

Construction of the TMD test facilities on Saddlebunch Keys would take place on land owned by NASKW. This site was developed and is operated by the Naval Computer Telecommunications Area Master Station Atlantic Detachment. Current transmission and support activity will continue for the foreseeable future and there are no current plans for additional DOD projects. Residential and commercial development has continued at a moderate rate in Monroe County with some increase in population on Cudjoe Key.

Air emissions from the proposed action would be periodic in nature rather than continuous. Each missile launch would be a discrete air emission event. Emissions generated during one launch (including associated support emissions) would dissipate prior to the next series taking place. Since each launch event will not cause an exceedance of the NAAQS, it is reasonable to assume the proposed action will not cause an exceedance of the NAAQS.

There are currently nine title V permits issued throughout the Florida Keys. These include power generation stations, incinerators, an asphalt plant, and a dry cleaner. The Stock Island Steam Electric Plant was required to do a PSD analysis several years ago and found there was minimal impact to the PSD increment. Construction in the Florida Keys is generally slow, and no specific future projects have been identified that would have a potential cumulative impact when combined with the proposed action.

The majority of emissions due to the proposed action would be due to individual launches and would not have a cumulative impact with existing or foreseeable activities in the Florida Keys. The proposed action includes only minimal emissions from stationary sources (maintenance and target preparation activities), as such there would also be no regulatory cumulative impact to air quality in the Florida Keys.

Mitigations Considered

Standard procedures implement emergency response plan similar to appendix J prior to test activities which includes notification procedures and an onsite recovery team for response to spill recovery.

Possible mitigations would include:

- Ensure that dust suppression measures are implemented during construction.
- Conduct monitoring of surface and wind conditions prior to launch.
- Conduct air quality monitoring in the vicinity of the launch pad before and after initial launch.

3.3.2 AIRSPACE USE

Controlled and uncontrolled airspace would not be affected by TMD activities at either alternative location, Cudjoe Key or Saddlebunch Keys.

3.3.2.1 Resource Description and Evaluative Methods

Information on airspace use and the evaluation methods used are given in section 3.1.2.1.

3.3.2.2 Region of Influence

The ROI is defined as that area that would be potentially affected by the alternative to the proposed action that would utilize portions of the NAS and/or International Airspace. It includes the airspace, from the surface to unlimited altitude, surrounding the proposed TMD missile program test area in the Florida Keys, and is shown in figure 3.3.2-1. This includes principally overwater airspace, with the exceptions of the controlled airspace and special use airspace over the westernmost islands of the Florida Keys.

3.3.2.3 Affected Environment

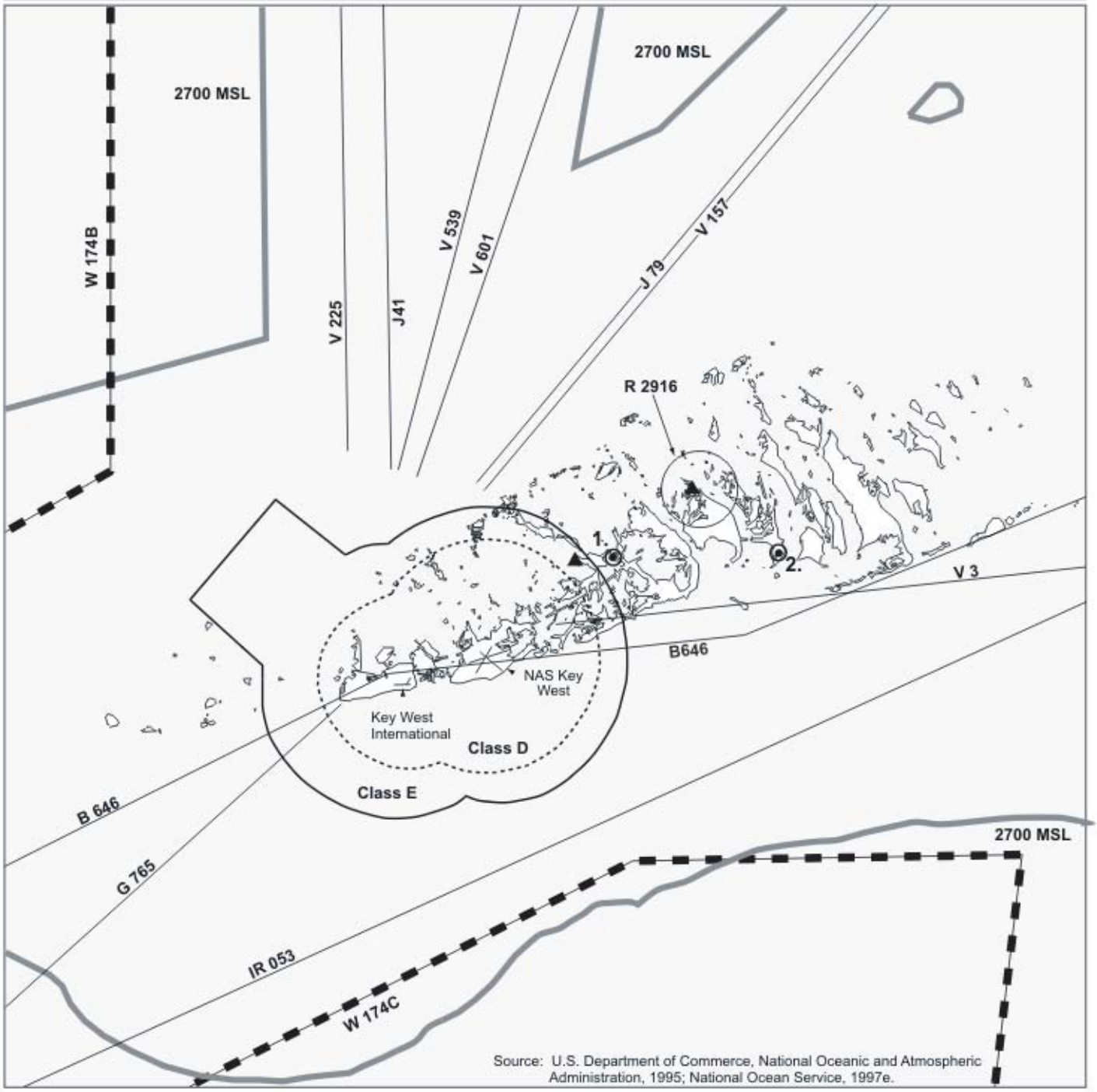
The affected airspace use environment in the Florida Keys is described below in terms of its principal attributes, namely: controlled and uncontrolled airspace; special use airspace; military training routes; en route airways and jet routes; airports and airfields; and air traffic control. Although special use airspace is also considered as controlled or uncontrolled airspace, depending on its location, it is discussed separately.

Controlled and Uncontrolled Airspace

Controlled airspace consists of airspace within which air traffic control service is provided to IFR and VFR flights. Controlled airspace is classified A, C, D, or E with defined dimensions. The airspace above Key West International and NASKW is designated Class D airspace with a ceiling of 762 meters (2,500 feet). This Class D airspace is surrounded by Class E airspace with a floor 213.4 meters (700 feet) AGL with the exception of those areas differentiated with a floor of 823 meters (2,700 feet) above the surface. Marathon Airport to the east-northeast is surrounded by Class E airspace with a floor 213.4 meters (700 feet) above the surface. No Class B airspace, which usually surrounds the nation's busiest airports, is found in the ROI.

Special Use Airspace

The special use airspace in the Florida Keys ROI consists of portions of Warning Areas W-174C south of Key West, and W-174B to the west, and Restricted Area R-2916 above Cudjoe Key (see figure 3.3.2-1). There are no Warning Areas due north of the



EXPLANATION

- ▲ Alternative Launch Site
- Class E Airspace
- Class D Airspace ceiling 2500 feet
- Warning Area
- Class E Airspace Floor greater than 700 feet
- B 646 Oceanic Route
- G 646 Oceanic Route
- V 157 Low Altitude Airway
- IR 053 Military Training Route
- R 2916 Restricted Airspace
- J 41 High Altitude Jet Route
- ⊙ Private Airport
  1. Sugarloaf Shores
  2. Summerland Key

Scale 1:500,000

0 5 10 Miles

0 5 10 Kilometers

NORTH

key-500k-3as002

Region of Influence, Airspace

Florida Keys

Figure 3.3.2-1

Florida Keys. There are no Prohibited, Military Operations, or Alert special use airspace areas in the Florida Keys ROI.

Table 3.3.2-1 provides a listing of the Warning Areas, and Restricted Area and their effective altitudes, times used, and the manager or scheduler.

Table 3.3.2-1: Special Use Airspace in the Florida Keys Airspace Use ROI

Number	Location	Altitude in meters (feet)	Time of Use		Controlling Agency
			Days	Hours	
R-2916	Cudjoe Key	To 4,267 (14,000)	Cont[1]	Cont[1]	Miami (ZMA) CNTR
W-174B	Key West	To FL 700 21,336 (70,000)	Inter[2]	1200-0400[3]	Miami (ZMA) CNTR
W-174C	Key West	To FL 700 21,336 (70,000)	Inter[2]	1200-0400[3]	Miami (ZMA) CNTR

[1]Cont = Continuous
[2]Inter = Intermittent, other times by NOTAM
[3] During periods of daylight savings time effective hours are one hour earlier than shown

CNTR = Center
FL = Flight Level (FL 700 = 70,000 feet)
NOTAM = Notice to Airmen
R = Restricted
W = Warning

Sources: National Oceanic and Atmospheric Administration, National Ocean Service, 1997a; c; e.

Military Training Routes

There is one MTR, designated IR 053, in the Florida Keys ROI. It roughly parallels the Florida Keys, heading from a northeast to southwest direction south of the Keys, before turning 90 degrees to the northwest toward the Marquesas Keys (see figure 3.3.2-1). Its hours of operation are 0600 to 2400 hours daily (National Imagery and Mapping Agency, 1997c).

En Route Airways and Jet Routes

The Florida Keys ROI airspace is crossed, by numerous airways and jet routes (see figure 3.3.2-1). An airway is a control area, or portion thereof, established in the form of a corridor up to but not including 5,486.4 meters (18,000 feet) MSL, the centerline of which is defined by radio navigational aids. The routes are referred to as V routes, or VOR airways over land, and Colored Federal Airways or LF/MF airways over water with numbering to identify the designated route. A jet route is a route designed to serve aircraft operations from 5,486.4 meters (18,000 feet) MSL up to and including FL 450 (13,716 meters [45,000 feet]). The jet routes are referred to as J routes with numbering to identify the designated route. These low-altitude airways and high altitude jet routes lie within airspace managed by Miami ARTCC. The low altitude airways include the V225, V539, V601, V157 airways connecting Key West with the Florida peninsula to the north, and the V3 airway paralleling the Florida Keys to the south (see figure 3.3.2-1). The high altitude jet routes include the J41 and J79 jet routes from the Florida peninsula to Key West, the B646 jet route from the Atlantic Ocean into Key West, continuing on to the

Yucatan peninsula of Mexico, and the G765 jet route to Cancun, Mexico (see figure 3.3.2-1).

Airports and Airfields

The airports or airfields in the Florida Keys ROI are Key West International, NASKW airports, and the private airfields at Sugarloaf Shores and Summerland Key (see figure 3.3.2-1). Key West International Airport is the principal commercial airport for Key West and the western Florida Keys. Approximately 10 percent of the tourists to Key West arrive by plane at Key West International (Skelly, 1996). It had a total of 105,295 operations (University of Florida, Bureau of Economic Research, College of Business Administration, 1995) with 493,701 passenger arrivals and departures in 1994, up 26 percent since 1990 (figure 3.3.2-2). Private traffic comprises 60 percent of all traffic, only 40 percent of which are scheduled. Peak times are 9:00 p.m. to 10:00 a.m.; 12:00 p.m. to 2:00 p.m.; and 4:35 p.m. to 6:00 p.m. Ninety-five percent of the flights approach the airport down the north corridor, north of the Florida Keys.

Air Traffic Control

Air traffic control is provided by Miami Center and Key West Approach Control.

3.3.2.4 Environmental Impacts and Mitigations

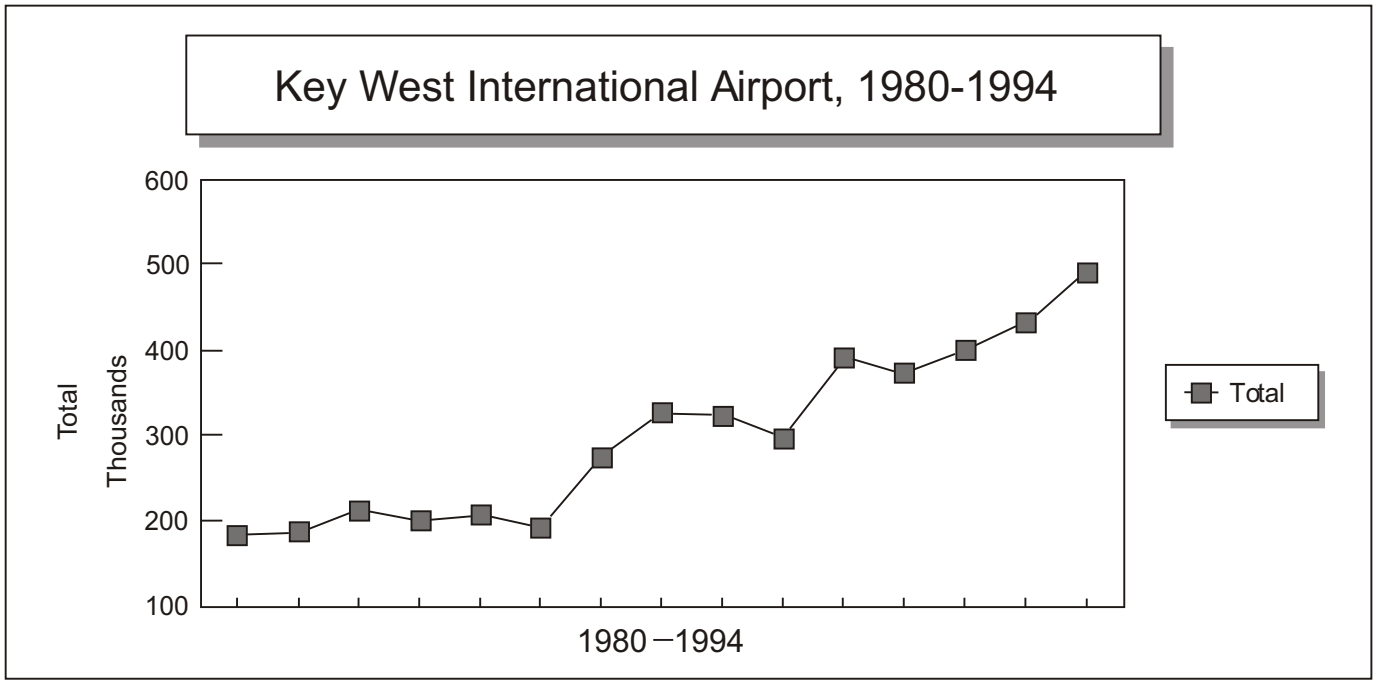
Cudjoe Key and Saddlebunch Keys are other alternatives considered to the preferred alternative under consideration as potential missile preparation and launch sites. Potential instrumentation sites for these launch options include Boca Chica Key, Fleming Key, Saddlebunch Keys, and Sugarloaf Key. General descriptions and locations of all potential sites are presented in section 2.2.2.3.

No-action Alternative

Under the proposed action or the no-action alternative, the proposed TMD test activities at the Florida Keys locations would not be implemented. Current radar or communication operations at these Florida Keys locations would continue. Neither site conducts flight operations, but the Restricted Airspace R-2916 above Cudjoe Key would remain in place, affecting the continued use of airspace in the area.

NASKW would continue to manage use of the existing special use airspace. No new special use airspace proposal, or any modification to the existing special use airspace, is contemplated to accommodate continuing mission activities. Consequently, no impacts to the controlled and uncontrolled airspace in the ROI would result from the no-action alternative.

Ongoing military activities would continue to use the existing special use airspace. Although the nature and intensity of utilization varies over time and by individual special use airspace area, the continuing mission activities represent the kinds of activities that the special use airspace was created for: namely, to accommodate national security and necessary military activities, and to confine or segregate activities considered hazardous to



Source: Skelly, 1996.

Arriving and Departing Passengers

Figure 3.3.2-2

non-participating aircraft. The continuing military airspace use activities do not adversely affect special use airspace, and do not conflict with any airspace use plans, policies and controls.

Ongoing military airspace use would not require either: a change to an existing or planned IFR minimum flight altitude, a published or special instrument procedure, or an IFR departure procedure; or, require a VFR operation to change from a regular flight course or altitude. Consequently, no impacts to the surrounding low altitude airways or high altitude jet routes would occur from the no-action alternative.

Ongoing military airspace use activities would continue to use the existing special use airspace and would not restrict access to or effect the use of the existing public use airfields and airports. Operations at Key West International, NASKW and Marathon airports, and the private airfields at Sugarloaf Shores and Summerland Key would not be affected by the no-action alternative. Consequently, there would be no airfield and/or airport conflicts in the area under the no-action alternative.

Site Preparation Activities

Site preparation activities at either launch location would have no impact on controlled or uncontrolled airspace, special use airspace, en route airways and jet routes, or airfields and airports in the ROI. As site preparation activities would also not restrict a clear view of runways, helipads, taxiways, or traffic patterns from the airport air traffic control tower; decrease airport capacity or efficiency, affect future VFR or IFR, or affect the usable length of an existing or planned runway, they would also not constitute an obstruction to air navigation.

Flight Test Activities

The following section discuss the potential for impacts to the ROI's controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, and airports and airfields.

Up to 12 Hera target missiles could be launched from a Florida Keys location per year. No interceptor missiles are proposed to be launched from the Florida Keys locations.

Establishment of the proposed CFA over either Cudjoe Key or Saddlebunch Keys would not impact the NAS system. The CFA safety precautions would be implemented involving "surveillance of the area and for distance of 8 kilometers (5 miles) therefrom is maintained immediately prior to and during the time that activity hazardous to aircraft is in progress. Surveillance may be accomplished by ground observers, radar, patrol aircraft, and/or surface vessels." (FAA Order 7400.2H, CHG 4, Chapter 33, § 3).

By definition, a CFA would only be considered for those activities which are either of short duration or of such a nature that they could be immediately suspended on notice that such activity might endanger non-participating aircraft (FAA Order 7400.2H CHG 4, Chapter 33, § 3, paragraph 770). The user of a CFA would appoint a safety officer who would be responsible to see that surveillance of the entire CFA and for a distance of 8 kilometers (5 miles) therefrom is maintained immediately prior to and during the time that

activity hazardous to aircraft is in progress. The user agrees to cease any activity which creates a hazard upon notification that an aircraft is approaching the area. To accomplish this, each observer would have continuous effective communications with the safety officer and would be thoroughly briefed as to observer responsibilities. If the approving FAA office determines that adequate radar surveillance is available, the FAA office may establish ceiling and visibility requirements as it deems necessary; however, no projectile is to enter any cloud formation. (FAA Order 74002 CHG 4, Chapter 33 § 3, paragraphs 7730-7733).

Once designated, use of either proposed CFA (figures 3.3.2-3 and 3.3.2-4) would not constitute an impact. Activities are conducted under conditions controlled to eliminate hazards with non-participating aircraft. In addition, the implementation of the stationary ALTRV for airspace utilization between the proposed CFA above Cudjoe Key or Saddlebunch Keys and Warning Area W-174 to the northwest would provide for separation between IFR aircraft and the target missile launches above FL 180.

Target missile launches out of either Cudjoe Key or Saddlebunch Keys would not affect the Military Training Route IR 053 which roughly parallels the Florida Keys, south of the Florida Keys. The proposed new CFA would extend north of either Cudjoe Key or Saddlebunch Keys, well away from IR 503 (figures 3.3.2-3 and 3.3.2-4).

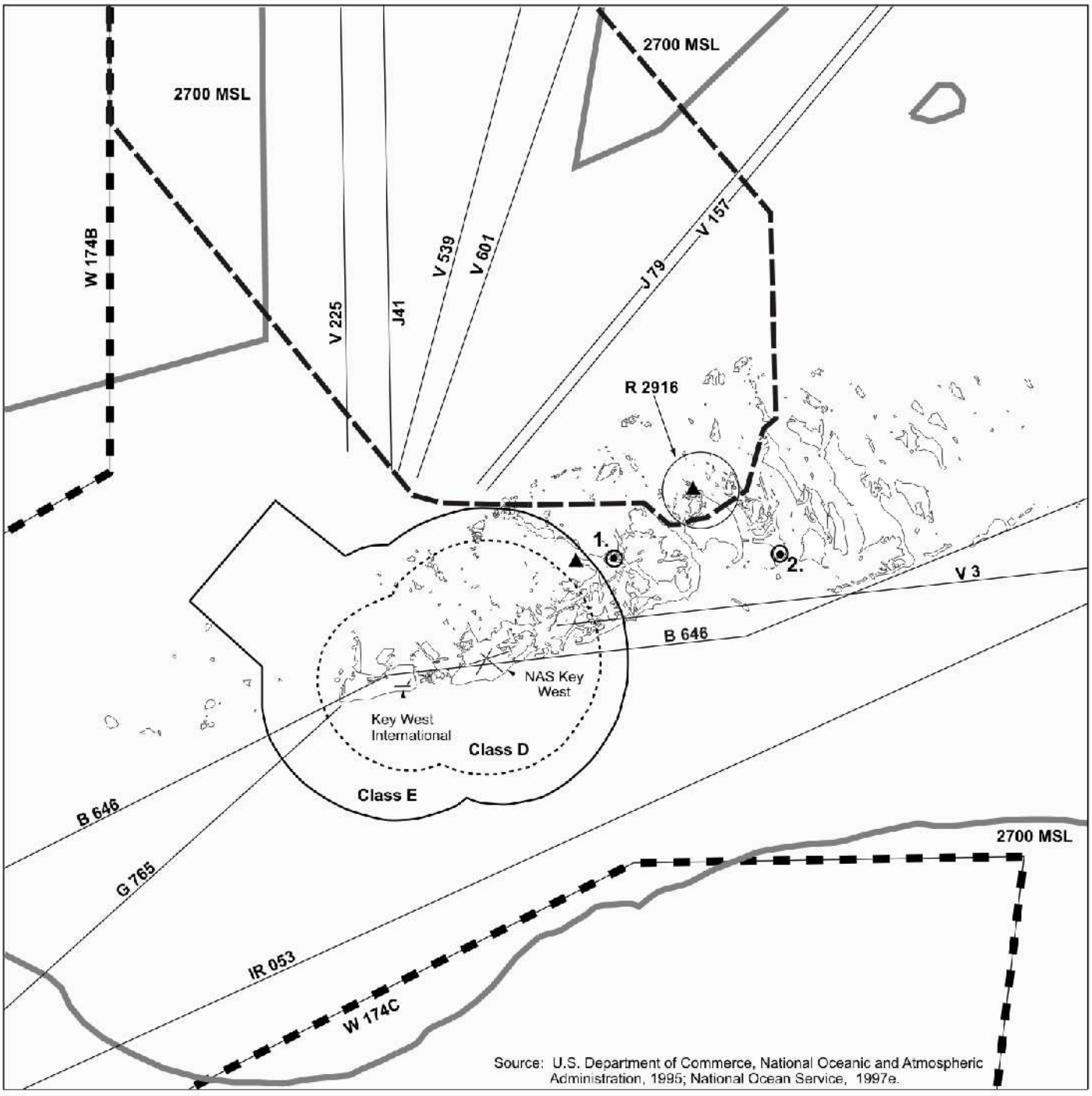
The Florida Keys ROI is crossed by numerous airways and jet routes, all lying within airspace managed by Miami ARTCC. These include the V225, V539, V601, and V157 low altitude airways, and the J41 and J79 high altitude jet routes connecting Key West with the Florida peninsula to the north. These would not be affected by the proposed target missile tests.

The V3 low altitude airway paralleling the Florida Keys to the south and the B646 and G765 jet routes would also not be affected by the proposed target missile flight tests.

The two airports in the Florida Keys ROI, Key West International and NASKW airports and the private airfields at Sugarloaf Shores and Summerland Key lie outside either proposed new CFA (figures 3.3.2-3 and 3.3.2-4). Utilization of either CFA would not restrict access to, or effect the use of, these airfields and airports and would not change airfield or airport arrival and departure traffic flows for both IFR and VFR aircraft.

Cumulative Impacts

Conducting as many as approximately 12 1-hour test events each year from Cudjoe Key or Saddlebunch Keys for 10 years would result in as much as 120 hours of airspace effects for the duration of the program. The Cudjoe Key Site has a current restricted airspace, R-2916. It was charted to protect aircraft from the tethered balloons and cables, and protect the balloons from the aircraft. This activity and the restricted airspace are expected to remain in place for the foreseeable future. Cudjoe Key is approximately 19.3 kilometers (12 miles) east of NASKW, on Boca Chica Key, which has been an operating naval air station for 40 years. Saddlebunch Keys are approximately 10 kilometers (6 miles) east of the NASKW.



EXPLANATION

- ▲ Alternative Launch Site
- Class E Airspace
- Class D Airspace ceiling 2500 feet
- Warning Area
- Class E Airspace Floor greater than 700 feet
- B 646 Oceanic Route
- G 646 Oceanic Route
- V 157 Low Altitude Airway
- IR 053 Military Training Route
- R 2916 Restricted Airspace
- J 41 High Altitude Jet Route
- ⊙ Private Airport 1. Sugarloaf Shores 2. Summerland Key
- Controlled Firing Area (CFA)

Scale 1:500,000

0 5 10 Miles

0 5 10 Kilometers

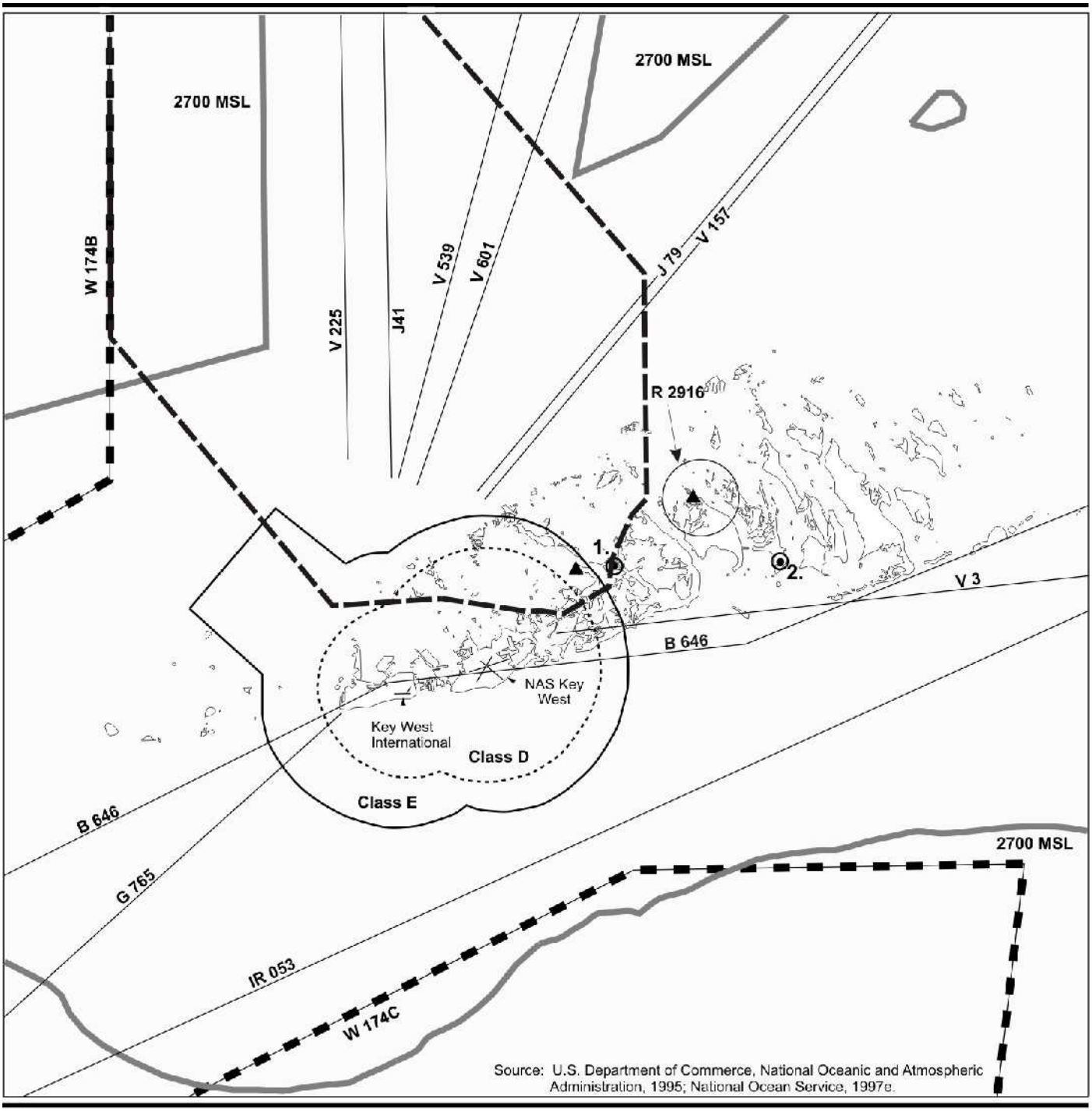
NORTH

key-500k-4as002

New Proposed Controlled Firing Area Above Cudjoe Key and Warning Area W-174 to the Northwest

Florida Keys

Figure 3.3.2-3



EXPLANATION

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- IR 053 Military Training Route
- R 2916 Restricted Airspace
- J 41 High Altitude Jet Route
- ⊙ Private Airport 1. Sugarloaf Shores 2. Summerland Key
- Controlled Firing Area (CFA)

Scale 1:500,000
0 4 8 Miles
0 6.5 13 Kilometers
NORTH

key-500k-4as003

New Proposed Controlled Firing Area Above Saddlebunch Keys and Warning Area W-174 to the Northwest

Florida Keys

Figure 3.3.2-4

The NASKW supports flight training in the overwater Warning Areas. This mission is anticipated to continue at the current level. NASKW is being studied as a candidate for hosting increased training due to base realignment and closure actions. These studies are not sufficiently mature to be considered reasonably foreseeable. The TMD use of as much as 12 hours per year is well within NASKW's airspace scheduling capacity, and would not have a cumulative effect on airspace use.

Mitigations Considered

Should a CFA prove to be inadequate, the utilization of a temporary flight restriction as cited in FAA regulation (FAR) 91.143, could exclude all aircraft, IFR and VFR, from the launch operations area as designated in a NOTAM (FAR, Part 91, Subpart B—Flight Rules). It is anticipated that this temporary flight restriction could be in place for up to 4 hours per launch. Implementation of a temporary flight restriction would require coordination and approval of the FAA.

3.3.3 BIOLOGICAL RESOURCES

Site preparation activities at the alternative site on Cudjoe Key would impact 0.23 hectare (0.58 acre), all on previously disturbed land, and no wetlands. Two osprey nests are close to proposed TMD facilities. Flight test activities could result in a temporary impact by singeing mangrove vegetation.

Site preparation activities at the alternative site on Saddlebunch Keys would have an adverse effect by disturbing either 0.63 hectare (1.56 acres) or 0.9 hectare (2.23 acres) depending upon the option selected. Option 1 would disturb 0.62 hectare (1.54 acre) of wetlands and Option 2 would disturb 0.89 hectare (2.2 acres). Flight test activities could result in a temporary impact by periodically singeing vegetation. Short duration high intensity noise levels during launch from either location could cause roosting birds in the area to flush off their nests.

3.3.3.1 Resource Description and Evaluative Methods

Refer to section 3.1.3 for a description of biological resources as presented in this document.

3.3.3.2 Region of Influence

The ROI for biological resources includes areas that may be affected by project activities, such as construction, noise, human presence, debris, and exhaust products. The ROI for launch sites would be those areas within the LHA or 92 dB noise contours. The 92 dB level was selected as a level that is likely to affect wildlife species. Noise analysis is also addressed in section 3.3.8. The ROI for instrumentation sites would be areas within potential EMR or electromagnetic inference (EMI) zones and areas disturbed by human presence.

3.3.3.3 Affected Environment

3.3.3.3.1 Cudjoe Key

For the Cudjoe Key option of the Florida Keys alternative, target launches would occur on Cudjoe Key; radars would be sited in the Saddlebunch Keys and either on Fleming Key or at the former Hawk Missile site on Boca Chica Key; optics would be sited on Saddlebunch Keys and Cudjoe Key; and RDAS would be sited on Sugarloaf Key and Cudjoe Key. The following sections describe the vegetation and wildlife resources associated with the portions of these keys that may be affected by the proposed action.

Vegetation

The upland areas of the keys are associated with outcroppings of limestone. Tropical hammocks and pinelands cover these outcroppings. Hammocks are relatively small patches of broad-leafed forest located in well-drained areas and surrounded by other types of vegetation. In the Lower Keys, there is a broad transition zone located between

the hammock and mangrove fringes. Gumbo limbo (*Bursera simaruba*), strangler fig (*Ficus aurea*), and pigeon plum (*Coccoloba diversifolia*) are likely to be found. Woody vines are common, such as muscadine (*Vitis rotundifolia*) and Virginia creeper (*Parthenocissus quinquefolia*). Fairly extensive pinelands occur on Cudjoe Key. Slash pine is the single canopy species. The main pine area of Cudjoe Key has an almost continuous hardwood understory 6 meters (19.7 feet) or greater in height, and a deep mat of pine straw and dead grasses cover the forest floor. (Myers and Ewel, 1992)

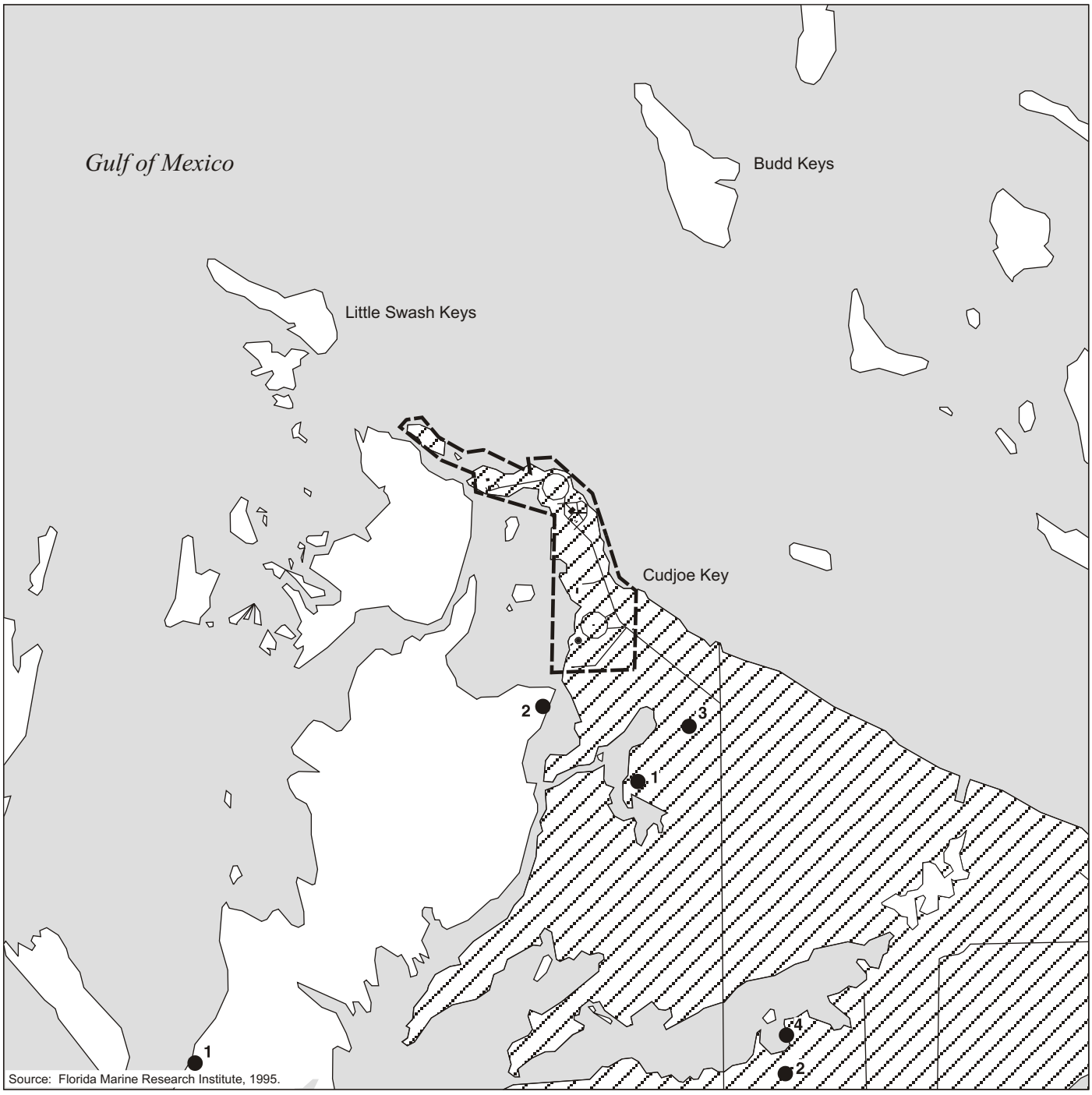
The Air Force aerostat site on Cudjoe Key is surrounded almost entirely by black, red, and white mangrove shrubs and forest. The black mangrove (*Avicennia germinans*) has a system of shallow roots that radiate out from the tree with short, vertical aerating roots that extend from 2 to 20 centimeters (0.8 to 7.9 inches) above the soil. Black mangroves have narrow oblong leaves that are often encrusted with salt. White mangroves (*Laguncularia racemosa*) occur mixed with black mangroves. The red mangrove (*Rhizophora mangle*) has a complex network of prop roots that arise from the trunk and shallowly penetrate the soil beneath the tree. This species usually grows in the intertidal zone. Its leaves are shiny, deep green above and paler green below. Grass and saltwort (*Batis maritima*)/glasswort (*Salicornia virginica*)-dominated tidal marsh occurs in association with most mangrove swamp areas on Cudjoe Key. The former Hawk Missile site at Boca Chica Key is also surrounded by dense mangrove swamp. The location proposed for instrumentation on Boca Chica Key is existing hardstand. (Myers and Ewel, 1992)

The area proposed for use as an instrumentation site on Fleming Key is currently a fenced and mowed ammunition storage bunker area. A narrow fringe of mangrove occurs between the road and the shoreline. Exotic species such as Australian pine (*Casuarina equisetifolia*) and Brazilian pepper (*Schinus terebinthifolius*) are common along the road. The site that would be used on Sugarloaf Key for RDAS is already disturbed. The surrounding vegetation is similar to that on Cudjoe Key. The potential Optics site on Saddlebunch Keys is already disturbed.

Figure 3.3.3-1 shows the locations of several state listed species on Cudjoe Key. Table 3.3.3-1 lists the seven plant species with Federal or state status potentially occurring in the vicinity of the proposed project sites in the Florida Keys. Several state threatened, endangered, and commercially exploited plants are found on Cudjoe, Boca Chica, Fleming, and Sugarloaf keys. However, no Federally listed plants have been documented.

Wildlife

The flats and mangrove islands are used extensively by wading birds. The following species were observed at Cudjoe Key during a May 1997 visit: little blue heron (*Egretta caerulea*), cattle egret (*Bubulcus ibis*), red-winged blackbird (*Agelaius phoeniceus*), mourning dove (*Zenaida macroura*), least tern (*Sterna antillarum*), red-bellied woodpecker (*Melanerpes carolinus*), red-eyed vireo (*Vireo olivaceus*), laughing gull (*Larus atricilla*), raccoon (*Procyon lotor*), and black rat (*Rattus rattus*). The mangrove cuckoo (*Coccyzus minor*) and the black-whiskered vireo (*Vireo altiloquus*) are widespread in the Florida Keys



EXPLANATION

- Government Property
- Roads
- Designated Critical Habitat for Silver Rice Rat

Species Locations:
1. Necklace Pod
2. Key Silverside
3. Joewood
   Brittle Thatch Palm
   Florida Thatch Palm
4. Florida Keys Sheepshead Minnow
   Florida Keys Southern Longnose Killifish
   Florida Keys Rainwater Killifish
   Southern Gulf Killifish

Scale 1:24,000

0 1,000 2,000 Feet

0 250 500 Meters

NORTH

cud-24k-3bio002

Sensitive Plant and Wildlife Species Locations

Cudjoe Key, Florida

Figure 3.3.3-1

hammocks. Prairie warblers (*Dendroica discolor*) and clapper rails (*Rallus longirostris*) are common breeding species in the mangrove swamps near the sites to be used during a Cudjoe Key target launch. The gray kingbird (*Tyrannus dominicensis*) is common in open habitats in the Florida Keys. The reef gecko (*Sphaerodactylus notatus*) is extensively distributed in the tropical hammocks of the Florida Keys. (Myers and Ewel, 1992)

Table 3.3.3-1: Plants with Federal or State Status Potentially Occurring in the Vicinity of the Florida Keys Sites

		Status	
Scientific Name	**Common Name**	**State**	**Federal**
Chamaesyce porteriana var. scoparia	Porter's broom spurge*	E	I
Cordia sebestena	Geiger tree*	E	–
Gossypium hirsutum	Wild cotton	E	–
Hippomane mancinella	Manchineel	T	–
Jacquinia keyensis	Joewood**	T	–
Swieteia mahagoni	West Indian mahogany	T	–
Thrinax morrisii	Brittle thatch palm	CE	–
Thrinax radiata	Florida thatch palm	CE	–
Tillandsia flexuosa	Twisted air plant	T	–

– = Not listed
CE = Commercially exploited
E = Endangered
I = Information needed about the status of the species. Although not protected under the Endangered Species Act, the U.S. Fish and Wildlife Service encourages Federal agencies and the public to consider these species in environmental planning
T = Threatened

*Documented on Saddlebunch Keys
**Documented on Saddlebunch and Cudjoe keys
Source: Biological and Environmental Consulting, 1994; Florida Natural Areas Inventory, 1994a;b; U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 1995a; U.S. Department of the Interior, 1997.

A total of 33 species of wildlife with Federal or state status potentially occur in the vicinity of Cudjoe Key (table 3.3.3-2). The Eastern Indigo snake (*Drymarchon corais couperi*), a Federal and state threatened species, has been reported on Cudjoe, Boca Chica, and Sugarloaf keys. The snake uses tropical hardwood hammocks, slash pinelands, freshwater wetlands, tidal mangroves, transitional habitats, and disturbed land that has recolonized with non-native vegetation.

The silver rice rat (*Oryzomys argentatus*), a Federal and state endangered species, ranges from Little Pine Key to Saddlebunch Keys. There is thought to be a concentrated population on Cudjoe Key, and the entire north end of Cudjoe Key surrounding the aerostat facility has been designated as critical habitat under the Endangered Species Act (ESA) (50 CFR 17.95). Silver rice rats nest in saltmarsh and buttonwood zones. The primary threat to this species is loss of habitat due to land development. (Myers and Ewel, 1992) (figure 3.3.3-1). A silver rice rat survey was recently performed south of the aerostat site on Cudjoe Key in a mixture of red mangroves and salt marsh. No rats were

captured in traps set for 4 nights. The absence of silver rice rats was thought to be caused by an apparently abnormal increased raccoon population. (Frank, 1997)

Table 3.3.3-2: Wildlife With Federal or State Status That Occur or Potentially Occur Near Florida Keys Sites

Scientific Name	Common Name	Status	
		State	Federal
Mammals			
Odocoileus virginianus clavium	Key deer (Sugarloaf Key)	E	E
Oryzomys argentatus	Silver rice rat (Cudjoe, Saddlebunch, Sugarloaf keys)	E	E
Sylvilagus palustris hefneri	Lower Keys marsh rabbit [1]	E	E
Trichechus manatus	West Indian manatee	E	E
Birds			
Ajaia ajaia	Roseate spoonbill	SSC	–
Charadrius melodus	Piping plover	T	T
Columba leucocephala	White crowned pigeon [2]	T	I
Egretta caerulea	Little blue heron [2]	SSC	–
Egretta rufescens	Reddish egret	SSC	–
Egretta tricolor	Tricolored heron [2]	SSC	–
Egretta thula	Snowy egret [2]	SSC	–
Eudocimus albus	White ibis	SSC	–
Falco peregrinus tundrius	Arctic peregrine falcon [2]	E	T(s/a)
Haliaeetus leucocephalus	Bald eagle [2]	T	T
Pandion haliaetus	Osprey [2]	SSC	–
Pelecanus occidentalis	Brown pelican	SSC	–
Sterna antillarum	Least tern [2]	T	–
Sterna dougallii	Roseate tern	T	T
Herptiles			
Alligator mississippiensis	American alligator [2]	SSC	T(s/a)
Caretta caretta	Atlantic loggerhead turtle	T	T
Chelonia mydas	Atlantic green sea turtle	E	E
Crocodylus acutus	American crocodile (Cudjoe Key)	E	E
Dermochelys coriacea	Atlantic leatherback	E	E
Drymarchon corais couperi	Eastern indigo snake	T	T
Elphe guttata guttata	Red rat snake	SSC	–
Eretmochelys imbricata	Hawksbill sea turtle	E	E
Eumeces egregius egregius	Florida Keys mole skink (Cudjoe and Sugarloaf keys)	SSC	–
Kinosternon baurii	Striped mud turtle	E	–
Lepidochelys kempii	Kemp's Ridley sea turtle	E	E
Thamnophis sauritus	Lower Keys ribbon snake	T	–
Fish			
Fundulus jenkinsi	Saltmarsh topminnow	SSC	–
Menidia conchorum	Key silverside (Sugarloaf Key)	T	–
Rivulus marmoratus	Mangrove rivulus	SSC	–

– = Not listed T = Threatened E = Endangered
T(s/a) = Listed as threatened due to similar appearance as another listed species
I = Information needed about the status of the species. Although not protected under the Endangered Species Act, the U.S. Fish and Wildlife Service encourages Federal agencies and the public to consider these species in environmental planning
SSC = Listed as a species of concern by the Florida Game and Freshwater Fish Commission
[1] Observed on Boca Chica, Saddlebunch, and Sugarloaf keys
[2] Observed in Region of Impact
Source: U.S. Department of the Interior, 1997; Florida Natural Areas Inventory, 1994a;b.

Ospreys, which are designated as a Florida state Species of Special Concern only in Monroe County, nest throughout the lower Florida Keys. There are active nests on telephone poles and other artificial structures at the proposed Cudjoe Key launch site and potential MAB site. Lack of perching or roosting habitat has limited wildlife at the proposed site on Fleming Key, although one pair of osprey nest on the causeway leading to the key. Nesting and breeding periods of listed birds are shown in table 3.3.3-3.

The Lower Keys marsh rabbit (*Sylvilagus palustris hefneri*) has not been documented on Cudjoe Key as of 1997, although suitable habitat that is monitored for the rabbits exists to the east of the aerostat facility (Frank, 1997). A total of 82 patches of habitat suitable for the Lower Keys marsh rabbit have been identified, 50 of which were occupied by the rabbits in 1995 (Forys, Frank, and Kautz, 1996). All of the occupied patches were on Boca Chica, Saddlebunch, Sugarloaf, and Big Pine keys. The number of occupied patches on Boca Chica Key has increased since 1992 (figure 3.3.3-2). Due to habitat fragmentation, populations are socially isolated but interact through dispersal (U.S. Fish and Wildlife Service, 1989b; Forys, Frank, and Kautz, 1996). In addition to habitat loss, depredation by feral cats (*Felis catus*) and imported fire ants (*Solenopsis invieta*) are major causes of population decline (Forys, 1995; Forys, Frank, and Kautz, 1996).

Key deer (*Odocoileus virginianus clavium*) are found primarily on Big Pine and No Name keys. The Cudjoe, Boca Chica, Sugarloaf, and Saddlebunch keys are occasionally transited by key deer, but the use is limited due to the lack of suitable pine and freshwater habitat. However, the USFWS is considering repatriating the key deer to Cudjoe Key. Alligators (*Alligator mississippiensis*) have been reported in the vicinity of the Lower Keys, but they are not normally present and do not breed in the area.

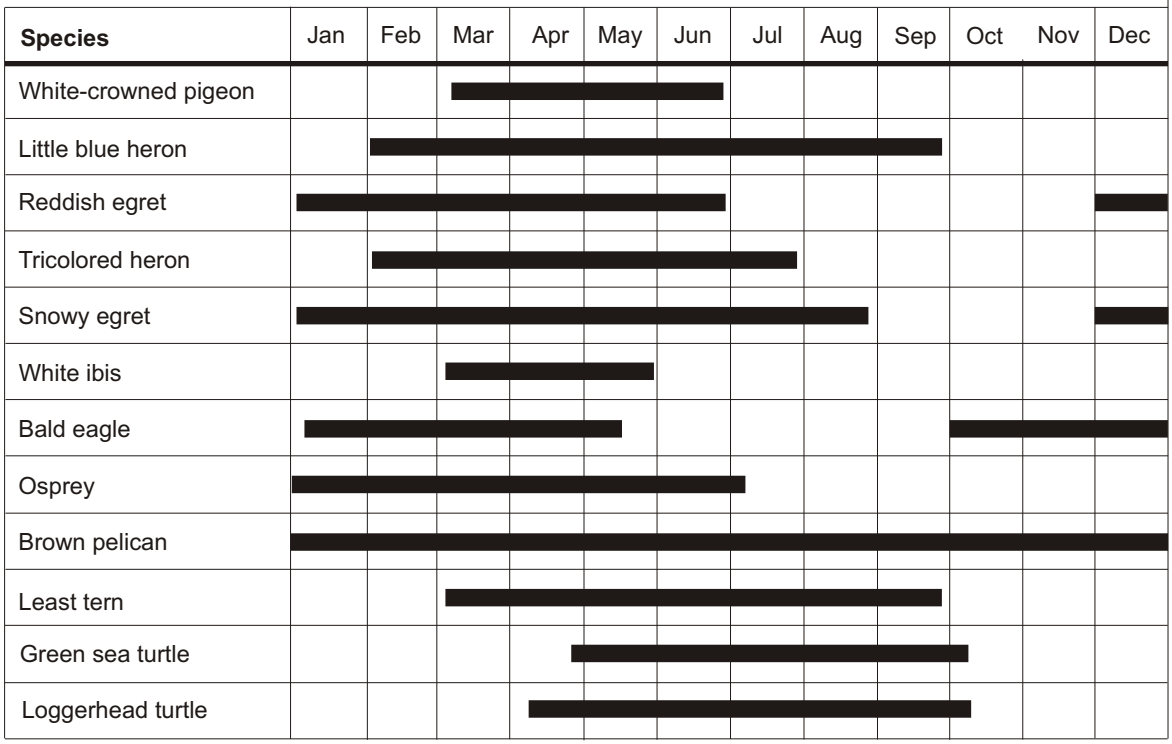
Sensitive Habitat

Virtually all of the unoccupied vegetated area surrounding the proposed sites on Cudjoe, Saddlebunch, Sugarloaf, and Boca Chica keys are jurisdictional wetlands regulated under the Clean Water Act (CWA) and by the State of Florida. Furthermore, mangroves are protected by state law. Mangroves and other wetlands species provide important habitat for more than 200 species of migratory birds. The seagrass beds and scattered coral heads are extremely sensitive habitats for a wide variety of aquatic organisms, including several Federal and state listed species of mammals, turtles, and fish. See figures 3.3.3-3 and 3.3.3-4.

3.3.3.3.2 Saddlebunch Keys

Under the Saddlebunch Keys option, target launches would occur on Saddlebunch Keys; radar would be sited on Fleming Key, Saddlebunch Keys, or Boca Chica Key; optics would be sited on Saddlebunch Keys and Cudjoe Key; and RDAS would be sited on Sugarloaf Key and Saddlebunch Keys. Range Control would be placed on Cudjoe Key or Fleming Key. The portions of Cudjoe, Boca Chica, and Sugarloaf Keys that would support instrumentation have been described in section 3.3.3.3.1. The following sections describe the vegetation and wildlife resources associated with the proposed Saddlebunch Keys launch site.

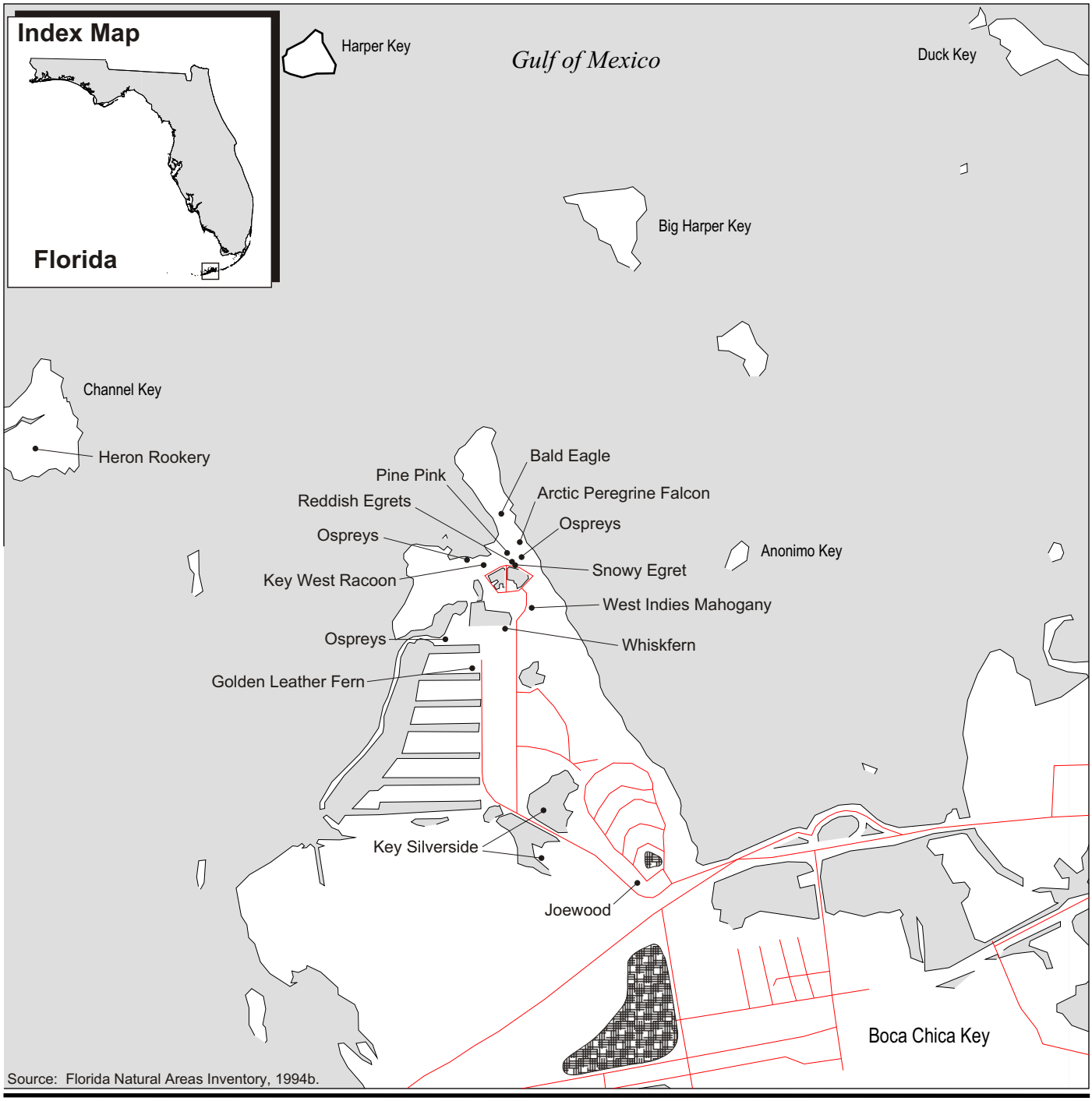
Nesting and Breeding Periods-Florida Keys



Source: Kale and Maehr, 1990.

Nesting/Breeding Periods

Table 3.3.3-3



EXPLANATION

Roads

Marsh Rabbits

Sensitive Plant and Wildlife Species Locations

Scale 1:24,000

0 1,000 2,000 Feet

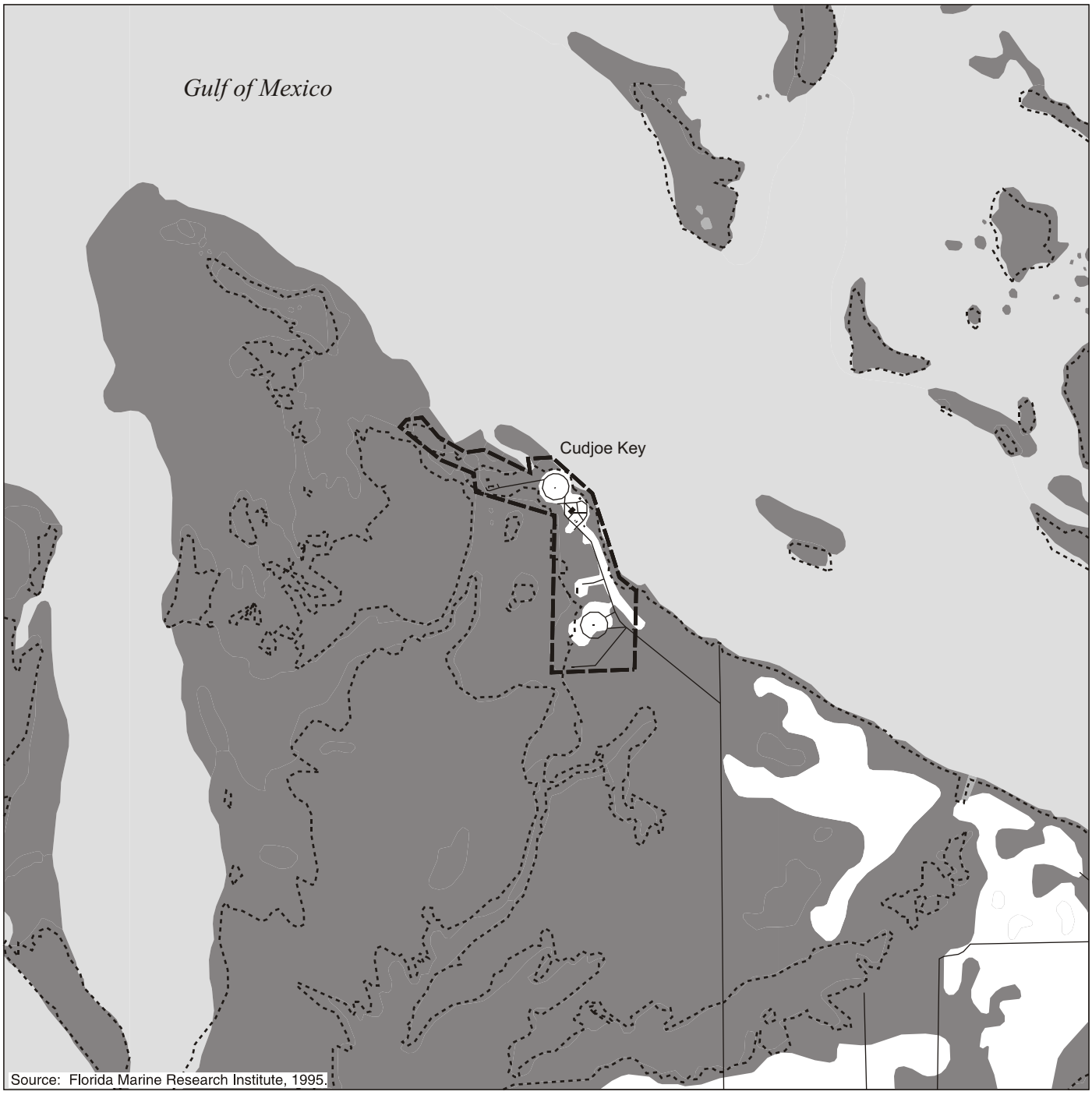
0 250 500 Meters

NORTH

Boca Chica Key, Florida

Figure 3.3.3-2

boc-24k-3bio001



EXPLANATION

- Government Property
- Shoreline
- Roads
- Upland
- Estuarine Subtidal
- Estuarine Intertidal (Mangroves)

Scale 1:24,000

0 1,000 2,000 Feet

0 250 500 Meters

NORTH

cud-24k-3bio001

Wetlands

Cudjoe Key, Florida

Figure 3.3.3-3

EXPLANATION

- Government Property
- Roads
- Seagrass
- Hardbottom w/ Dense Seagrass

Underwater Habitat

Scale 1:24,000

0 1,000 2,000 Feet

0 250 500 Meters

NORTH

002cben

Cudjoe Key, Florida

Figure 3.3.3-4

Vegetation

The general vegetation at the Saddlebunch Keys site is very similar to that at Cudjoe Key. Subcanopy species consist of silver palm (*Coccothrinax argentata*) and key thatch palm (*Thrinax morrisii*) (Myers and Ewel, 1992). The Saddlebunch Keys site is primarily composed of a mixture of red, black, and white mangrove, with saltgrass (*Distichlis spicata*) and saltwort tidal marsh (figures 3.3.3-5 through 3.3.3-7). Buttonwood (*Conocarpus erectus*) is also a common plant species in the immediate project vicinity. Much of the area immediately surrounding the VOA antennas has been modified (ground disturbance) at some time in the past. Existing Naval facilities are entirely surrounded by estuarine mangrove wetlands, and nearshore areas are dominated by seagrass beds.

No Federally listed plants are present within the Saddlebunch Keys vicinity. However, several state-listed plant species (table 3.3.3-1) either have been documented within the ESQD or have the potential to occur. Porter's broom spurge (*Chamaesyce porteriana var. scoparia*), a state endangered species, and joewood (*Jacquinia keyensis*), a state threatened species, have been documented to occur within the ESQD on Saddlebunch Keys. The state endangered Geiger tree (*Cordia sebestena*) has been documented at the Saddlebunch Keys transmitter site. The commercially exploited key thatch palm and Florida thatch palm (*Thrinax radiata*) have potential habitat within the ESQD.

Wildlife

Mangrove forests and associated waters provide valuable habitat for a variety of wildlife species. Flats and mangrove islands are used extensively by wading birds. Prairie warbler, clapper rail, and gray kingbird were heard or observed during a site visit in May 1997. Saddlebunch Keys has the most extensive and continuous available habitat on Navy land in the Lower Keys for the Lower Keys marsh rabbit. Several rabbits and their sign were observed during a site visit in May 1997. Most of the observations were noted along the existing access road and near the proposed MAB site. Table 3.3.3-2 lists wildlife with Federal or state status potentially occurring on Saddlebunch Keys.

Sensitive Habitat

Virtually all of the unoccupied vegetated area surrounding the proposed sites on Cudjoe, Saddlebunch, Sugarloaf, and Boca Chica keys are jurisdictional wetlands regulated under the CWA. Furthermore, mangroves are protected by state law. The seagrass beds and scattered coral heads are extremely sensitive habitats for a wide variety of aquatic organisms, including several species of Federal and state listed species of mammals, turtles, and fish.

3.3.3.4 Environmental Impacts and Mitigations

The impacts described are those for site preparation and launches at Cudjoe Key or Saddlebunch Keys, respectively. Impacts at the instrumentation sites result from the installation and operation of mobile equipment for short periods of time. After a test, the

EXPLANATION

- Government Property
- Roads
- ① Joewood/Porter's Broom Spurge
- ② Great White Heron/White-crowned Pigeon
- ③ Geiger Tree

Sensitive Plant and Wildlife Species Locations

Scale 1:24,000

0 1,000 2,000 Feet

NORTH

0 250 500 Meters

Saddlebunch Keys, Florida

Figure 3.3.3-5

Sad-24k-3bio001

EXPLANATION

- Government Property
- Shoreline
- Roads
- Upland
- Estuarine Subtidal
- Estuarine Intertidal (Mangroves)

Scale 1:24,000

0 1,000 2,000 Feet

0 250 500 Meters

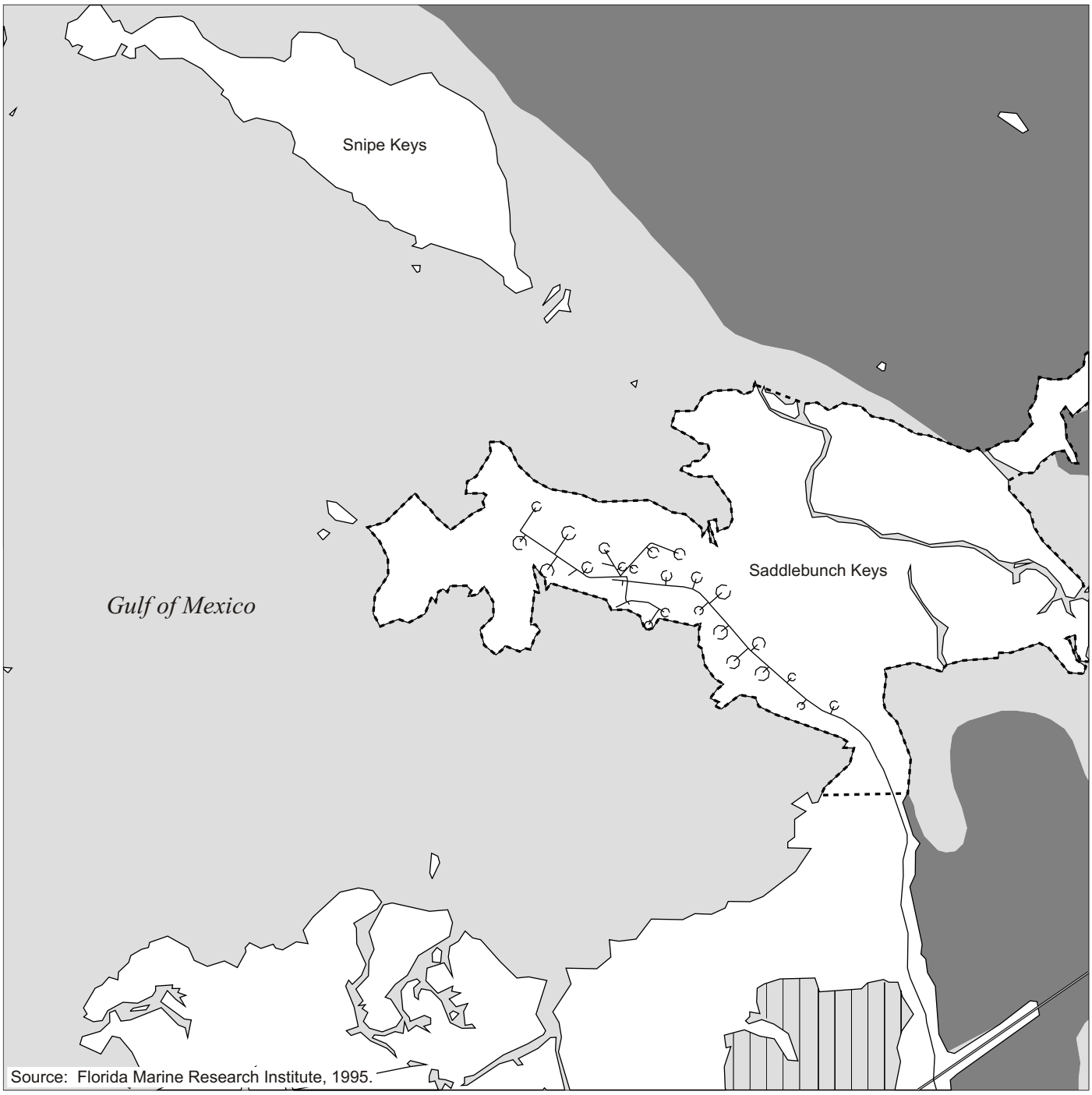
NORTH

sad-24k-3bio002

Wetlands

Saddlebunch Keys, Florida

Figure 3.3.3-6



EXPLANATION

- Government Property
- Roads
- Hardbottom w/ Dense Seagrass
- Bare Bottom
- Seagrass

Scale 1:24,000

0 1,000 2,000 Feet

NORTH

0 250 500 Meters

Underwater Habitat

Saddlebunch Keys, Florida

Figure 3.3.3-7

003sben

personnel and equipment are removed. The impacts at these sites are short-term and temporary.

3.3.3.4.1 Cudjoe Key

Site preparation activities at Cudjoe Key would impact 0.23 hectare (0.58 acre), all on previously disturbed land, and no wetlands. Two osprey nests are close to proposed TMD facilities. Flight test activities could result in temporary impact by periodically singeing mangrove vegetation. Short duration high intensity noise levels during launch could cause roosting birds in the area to fly off their nests.

No-action Alternative

Under the no-action alternative, aerostat missions would continue at their current planned levels. There would be no TMD project-related changes to activities at the potential instrumentation sites. No project-related construction or activities would take place. Continuing operation of Air Force facilities on Cudjoe Key and adjacent keys would have temporary effect on local biological resources.

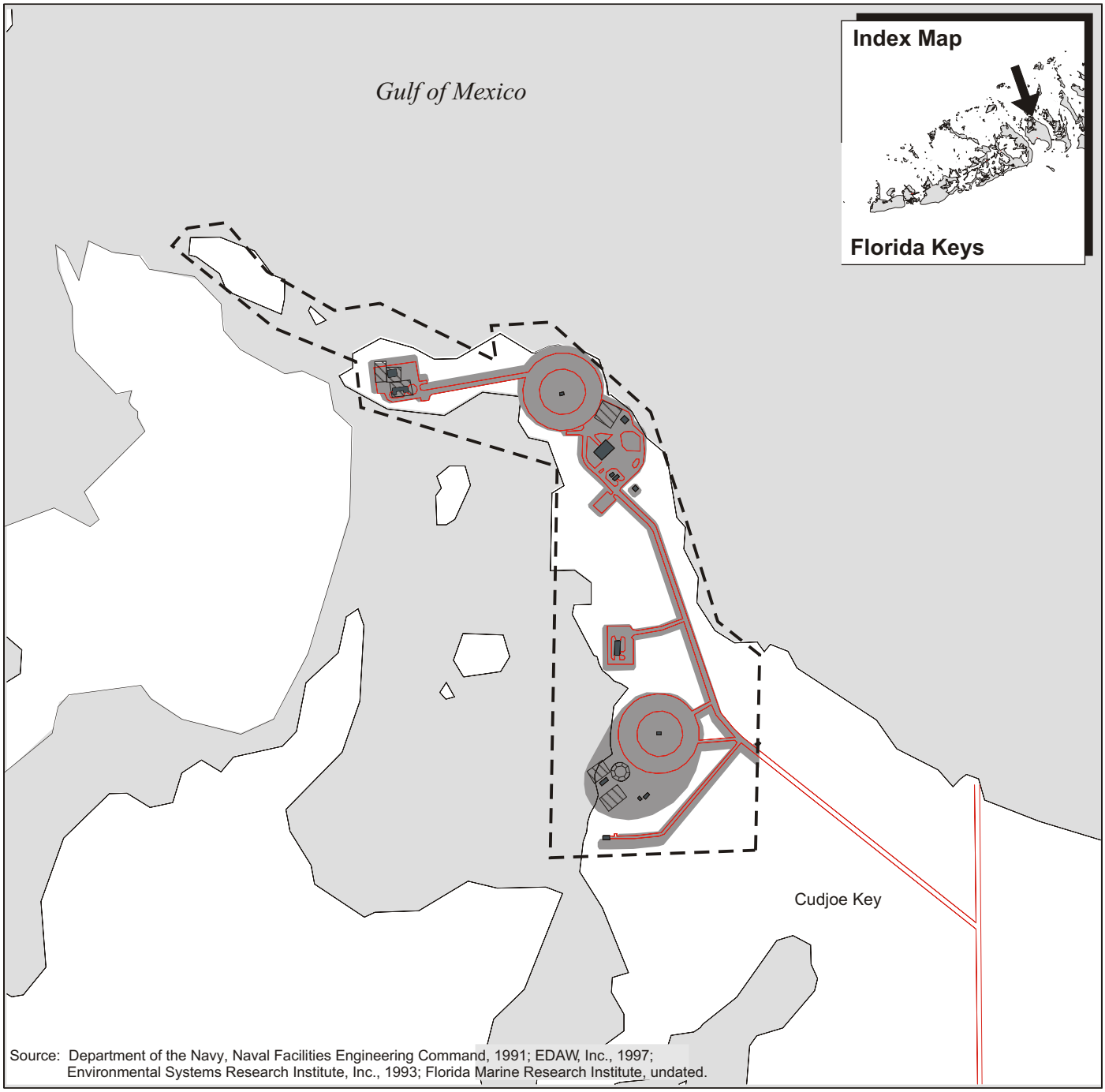
Site Preparation Activities

Installation activities for TMD support facilities would involve routine construction activities. These operations are routinely accomplished in both military and civilian construction operations.

Because all of the required structural modifications would take place in already disturbed areas (figure 3.3.3-8), no habitat for any of the listed species would be affected, with the likely exception of moving two poles currently being used as nest sites by osprey. One nest is located adjacent to the proposed launch pad site and the other is located near the maintenance building (figure 3.3.3-9). Permits would be obtained if necessary from the FGFWFC to move the nests.

Construction noise of up to 65 dB may disturb Federally or state listed wildlife, such as silver rice rats and shorebirds, near the Cudjoe Key site during the 8-month construction period. Most of the noise and human activity would be caused by truck traffic and heavy machinery at the launch pad. The level of impact to listed species would be dependent on the time of year the work is conducted. If the activities take place during the months of February through October, the construction could disturb nesting, wading, and shorebirds, white-crowned pigeons, and local populations of the silver rice rat. However, during construction none of the major rookeries would be subjected to noise levels substantially higher than what currently occurs. As no sea turtle nesting occurs on Cudjoe Key, construction is unlikely to affect these species (table 3.3.3-3).

Construction at any time of the year could disturb foraging shorebirds, brown pelicans, herons, and egrets. However, no large concentration of these birds are located in the immediate vicinity of the Cudjoe Key site and only a small number of birds would be



EXPLANATION

- Roads
- Government Property
- Previously Disturbed Areas
- Proposed Disturbance

Disturbed Areas

NORTH

Scale 1:9,600

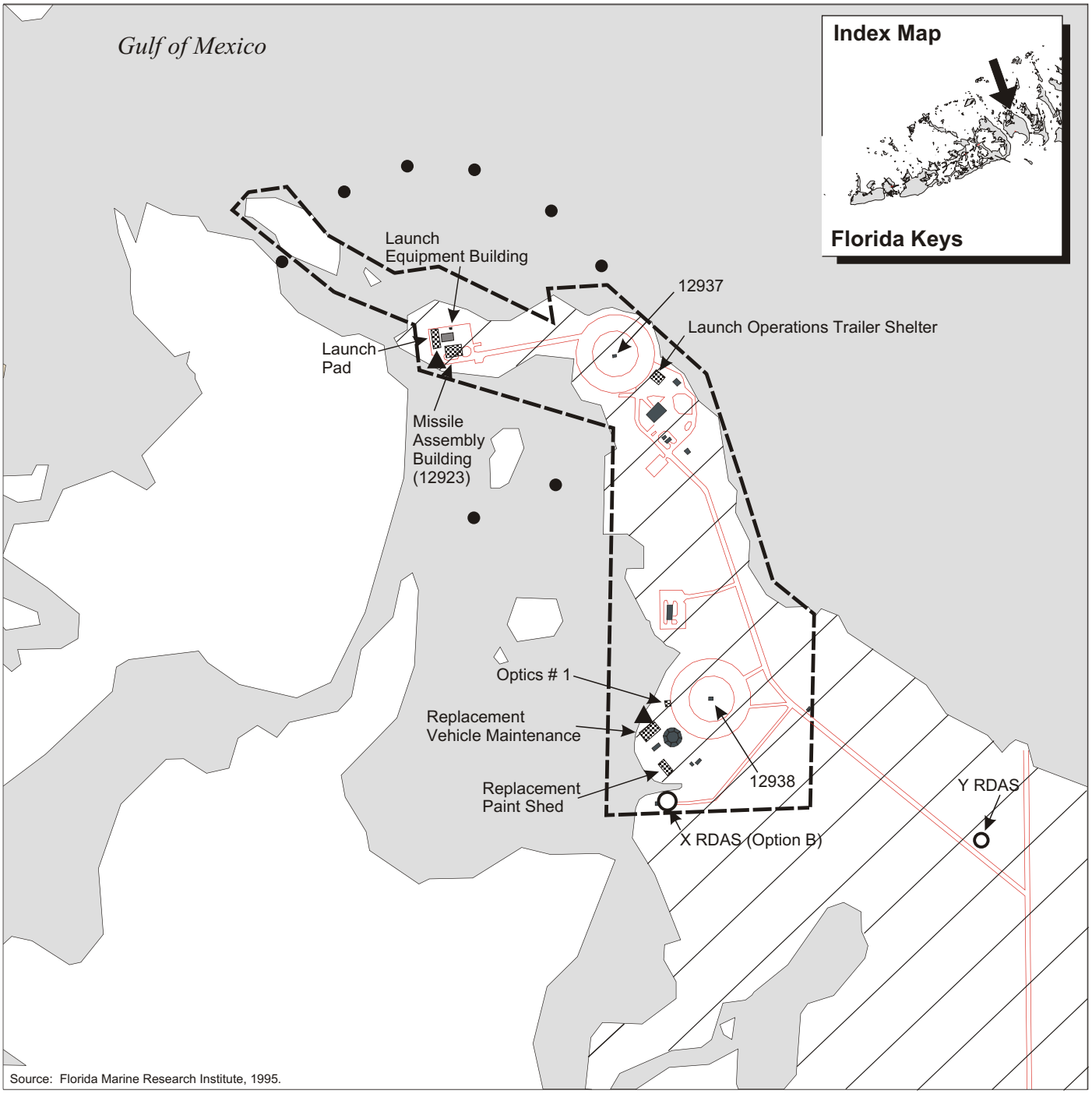
0 800 1,600 Feet

0 250 500 Meters

Cudjoe Key, Florida

Figure 3.3.3-8

cud-9600-4gen001



EXPLANATION

- Existing Building/Structure
- Proposed Building/Concrete Pad
- Designated Critical Habitat for Silver Rice Rat
- Government Property
- Warning Buoys
- Osprey Nests
- Instrumentation

Note: RDAS = Real-time Data Acquisition System

NORTH

Scale 1:9,600

0 800 1,600 Feet

0 250 500 Meters

Proposed Facilities in Relation to Important Wildlife Areas

Cudjoe Key, Florida

Figure 3.3.3-9

cud-9600-4bio001

affected by the construction noise. The flushing of the birds may slightly increase energy expenditure.

The effects of construction would not affect the Federally threatened bald eagle. The nearest eagle nest is approximately 4 kilometers (2.5 miles) away on Cudjoe Key, and not within sight of the proposed construction site. Therefore, it is unlikely that eagles at the nest would be affected. Construction activities may temporarily cause foraging bald eagles and osprey to avoid the area within approximately 0.8 kilometer (0.5 mile) over the 8 months of construction.

The use of gasoline and diesel machinery during construction has the potential to cause small-scale hydrocarbon spills that, if uncontrolled, could enter estuarine and marine habitats. Such spills could affect the Federally or state listed species that occur in the area. In particular, nesting shorebirds would be most susceptible. Proper preventive and contingency plans, however, would prevent hydrocarbon spills that could substantially affect any of the protected species.

Flight Test Activities

For 30 days before a launch, test personnel would be present at the site assembling the missile components, setting up instrumentation, and preparing for the test. During the several hours immediately preceding launch, the pre-launch activities for a target missile launch would involve test personnel making final preparations at the launch site, an aircraft flying over test area to monitor sea traffic, and law enforcement officers patrolling the LHA. The total number of launches that would occur at Cudjoe Key would not exceed 12 per year.

The increased activity at the site may result in a temporary disturbance to wildlife in the area, particularly those species that use the mangroves, tidal marsh, and shallow nearshore waters in the immediate vicinity of the launch site, such as turtles, various protected wading and shorebirds, and the white-crowned pigeon. The use of aircraft and possibly Coast Guard vessels to patrol nearby waters could cause dolphins and turtles to avoid the vessel or noise; this effect would be of short-term duration. The increased vessel traffic could slightly increase the chances for striking a manatee, but this is unlikely as very few are normally in the area.

Launch Activities

The target missile launches have the greatest potential to affect listed species. The activities, emissions, and noise associated with a single normal launch of target missiles are described in additional detail in sections 2.1.3, 3.1.1, and 3.1.8.

For each target missile launch, there would be a slight chance of direct mortality of protected bird species that are present within approximately 15 meters (50 feet) of the pad during target missile launches. As there would be increased human activity and noise during the pre-launch time period the likelihood of any listed species being directly harmed by the launch would be remote.

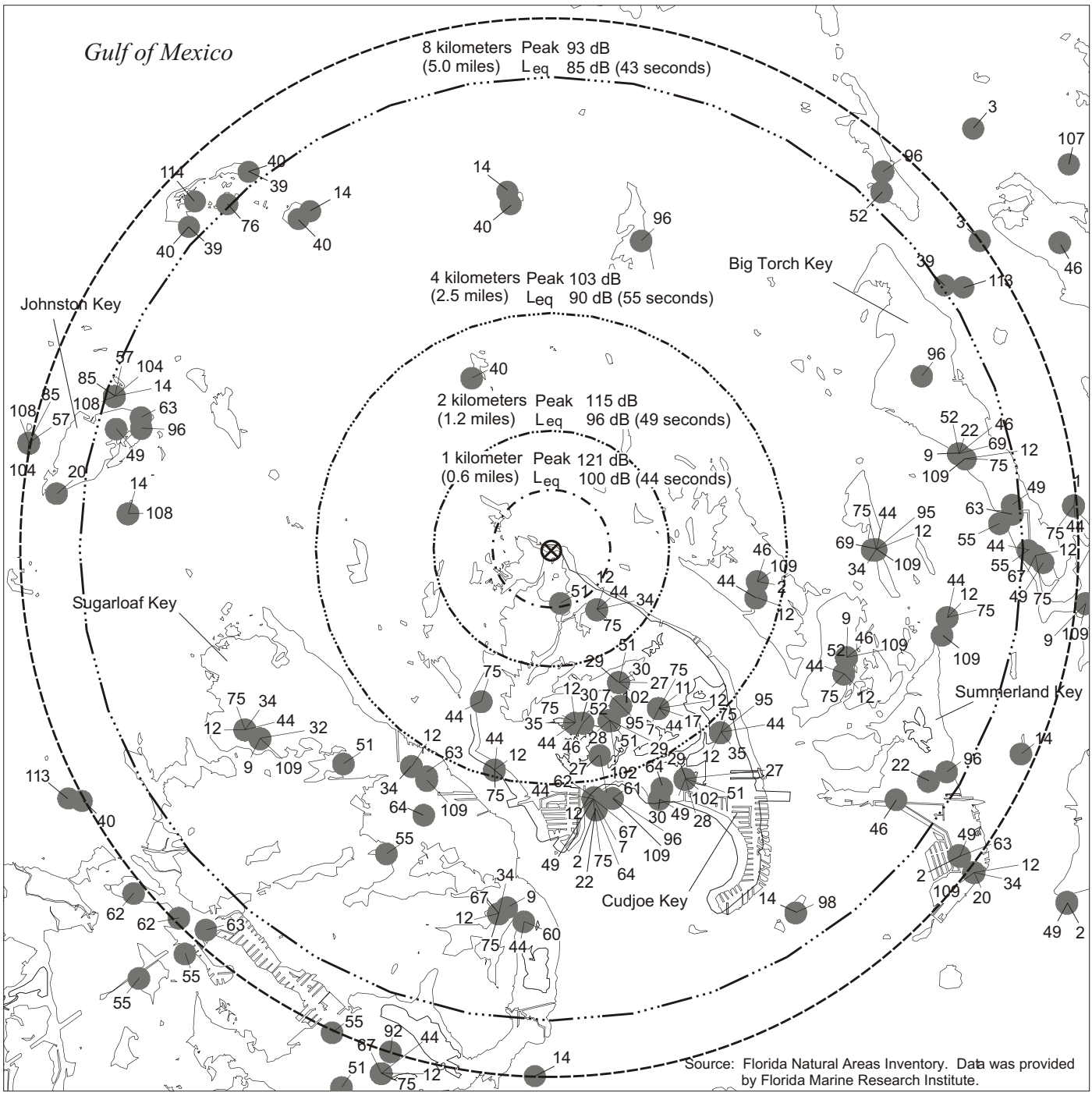
If Cudjoe Key is used as a launch site, the peak noise level of the target missile would be approximately 124 dB within approximately 0.5 kilometers (0.31 mile) of the Cudjoe Key launch pad and would drop to a level of 93 dB at 8 kilometers (5 miles) from the launch pad (figure 3.3.3-10). The launch noise would last no longer than 60 seconds.

The launch noise would generally extend over an 9-kilometer (5.6-mile) radius area and may cause nesting and foraging birds to react by either becoming alert or temporarily leaving nests (late winter, spring, and summer) or foraging areas (year-round).

Due to the short duration of the target launch noise (approximately 60 seconds), the only individuals that would likely be affected are those that are within the 90 dB and greater contours shown in figure 3.3.3-10. Those individuals that have a direct line of sight to the launch pad area and nesting birds that are in the early nest initiation or egg laying and early fledgling stages would have the greatest chance of being affected. If adult birds are flushed from their nests, eggs and young could be exposed to increased predation and effects of weather. Previous studies of jet aircraft noise have indicated that as long as noise levels drop to ambient levels and no other disturbance occurs, most birds will return to nests within only a few minutes (Black et al., 1984; U.S. Fish and Wildlife Service and Florida Department of Natural Resources, 1992). The nearest rookeries for colonial nesting birds on Little Crane, Sawyer, and Johnston keys are located 5.5 to 7.0 kilometers (3.4 to 4.3 miles) from the site and would experience peak 93 dB noise levels from an target launch (figure 3.3.3-10). Sitings of rookeries have been reported as being as close as 1 kilometer (0.6 mile) to the launch site. Riding Key (northwest of Cudjoe Key) is the fifth most important nesting site for great white herons (U.S. Department of the Interior, 1997). Missiles will be at least 2,000 meters (6,562 feet) above any rookeries downrange.

At KSC, a rookery used by wood storks and other species of wading birds is located approximately 750 meters (2,461 feet) from a Space Shuttle launch pad. This rookery continues to be utilized successfully, even though it has received peak noise levels of up to approximately 138 dB. (American Institute of Aeronautics and Astronautics, 1993) Monitoring studies of birds during the breeding season indicate that adults respond to Space Shuttle launch noise by flying away from the nest, but they return within 2 to 4 minutes. Ten minutes after the launches, adults and juveniles appeared to resume normal activities. No young were injured or pushed out of the nest. Also, birds within 250 meters (820 feet) of Titan launch complexes at CCAS have shown no mortality or reduction in habitat use. This author also reported that scrub jays subjected to noise levels of up to 145-160 dB were not affected. However, at CCAS, Titan launches may have caused a temporary hearing or behavioral change in scrub jays within the 95 dB contour (U.S. Department of the Air Force, 1990). (U.S. Department of Transportation, 1996)

During the winter, foraging shorebirds would be subjected to increased energy demands if they were flushed by the noise, but this should be a short-term, minimal effect. Bald eagles that occasionally forage near the site may avoid the area at the time of launch.



EXPLANATION

- 1 kilometer (0.6 miles)
- 2 kilometers (1.2 miles)
- 4 kilometers (2.5 miles)
- 8 kilometers (5.0 miles)
- 9 kilometers (5.6 miles)
- Indicative of where most sensitive species, and areas are located; not the entire area over which the species is known to occur.

Note: See Table 3.3.3-4 for key list of common names.

Scale 1:100,000

0 1 2 Miles

0 1.5 3 Kilometers

NORTH

Target Launch Noise Levels and Rookeries

Cudjoe Key, Florida

Figure 3.3.3-10

cud-100k-3bio002

Table 3.3.3-4 Target Launch Noise Levels and Rookeries, Cudjoe Key, Florida

Identifier*	Common Name
1	A QUEENS DELIGHT
2	AMERICAN ALLIGATOR
3	AMERICAN CROCODILE
4	ANTILLEAN NIGHTHAWK
5	BAHAMA SACHSIA
6	BALD EAGLE
7	BIG PINE PARTRIDGE PEA
8	BLACK SKIMMER
9	BLACK-WHISKERED VIREO
10	BLODGETTS WILD-MERCURY
11	BOYKINS FEW-LEAVED MILKWORT
12	BRITTLE THATCH PALM
13	BROAD-LEAVED SPIDERLILY
14	BROWN PELICAN
15	BROWN-HAIRED SNOUTBEAN
16	CAPE SABLE SEASIDE SPARROW
17	CHRISTMAS BERRY
18	COASTAL ROCKLAND LAKE
19	COOPERS HAWK
20	CUPANIA
21	DOLLAR ORCHID
22	EASTERN INDIGO SNAKE
23	FLORIDA BURROWING OWL
24	FLORIDA FIVE-PETALED LEAF-FLOWER
25	FLORIDA GAMA GRASS
26	FLORIDA KEYS MOLE SKINK
27	FLORIDA KEYS RAINWATER KILLIFISH
28	FLORIDA KEYS SAILFIN MOLLY
29	FLORIDA KEYS SHEEPSHEAD MINNOW
30	FLORIDA KEYS SOUTHERN LONGNOSE KILLIFISH
31	FLORIDA PINE SNAKE
32	FLORIDA PRAIRIE WARBLER
33	FLORIDA ROYAL PALM
34	FLORIDA THATCH PALM
35	FLORIDA WHITE-TOP SEDGE
36	GEIGER TREE
37	GOLDEN LEATHER FERN
38	GOPHER TORTOISE
39	GREAT EGRET
40	GREAT WHITE HERON
41	GREEN TURTLE
42	HAWKSBILL
43	INKWOOD
44	JOEWOOD
45	KEY BLENNY
46	KEY DEER
47	KEY LARGO COTTON MOUSE
48	KEY LARGO WOODRAT
49	KEY MUD TURTLE
50	KEY RINGNECK SNAKE
51	KEY SILVERSIDE
52	KEY VACA RACCOON
53	KRUGS HOLLY
54	LEAST BITTERN
55	LEAST TERN
56	LIGNUM-VITAE
57	LITTLE BLUE HERON
58	LITTLE STRONGBARK
59	LOGGERHEAD
60	LOWER KEYS BROWN SNAKE
61	LOWER KEYS COTTON RAT
62	LOWER KEYS RABBIT
63	LOWER KEYS RED RAT SNAKE
64	LOWER KEYS RIBBON SNAKE
65	MAGNIFICENT FRIGATEBIRD
66	MALACLEMYS TERRAPIN RHIZOPHORARUM
67	MANCHINEEL
68	MANGROVE CLAPPER RAIL
69	MANGROVE CUCKOO
70	MANGROVE GAMBUSIA
71	MANGROVE TERRAPIN
72	MARINE TIDAL SWAMP
73	MARINE UNCONSOLIDATED SUBSTRATE
74	MERLIN
75	NECKLACE POD
76	OSPREY
77	PEREGRINE FALCON
78	PINELAND JACQUEMONTIA
79	PINELAND MILK-PEA
80	PINELAND NOSEBURN
81	PIPING PLOVER
82	PORTERS BROOM SPURGE
83	PORTERS HAIRY-PODDED SPURGE
84	RED STOPPER
85	REDDISH EGRET
86	RIM ROCK CROWNED SNAKE
87	ROCKLAND HAMMOCK
88	ROSEATE SPOONBILL
89	ROSEATE TERN
90	ROUGH STRONGBARK
91	ROYAL TERN
92	SAND FLAX
93	SEA LAVENDER
94	SHORT-TAILED HAWK
95	SILVER PALM
96	SILVER RICE RAT
97	SMALL-LEAVED MELANTHERA
98	SNOWY EGRET
99	SNOWY PLOVER
100	SOOTY TERN
101	SOUTHEASTERN AMERICAN KESTREL
102	SOUTHERN GULF KILLIFISH
103	SPOTTAIL GOBY
104	TRICOLORED HERON
105	TROPICAL IRONWOOD
106	WEDGE SPURGE
107	WEST INDIAN MANATEE
108	WHITE IBIS
109	WHITE-CROWNED PIGEON
110	WILD COTTON
111	WILD DILLY
112	YELLOW-CROWNED NIGHT-HERON

* This is the point identifier and common name for the FNAI data.

Launch-related noise for Space Shuttle and Titan launches has not had a substantial effect on wildlife on or near the launch complexes (U.S. Department of Transportation, 1996). Overall, the level of noise impacts resulting from target and interceptor launches in the EGTR is expected to only have minimal effect on listed species due to the following reasons:

- Species that regularly use habitats in the Keys already experience regular aircraft and watercraft noise nearby and may not react strongly to a short-term launch event.
- Human activity prior to the launch would likely cause birds to leave the immediate vicinity prior to the launch, reducing the number of individuals that would be exposed to the loudest noise levels.
- The noise level would return to near ambient levels within 60 seconds.

Over the course of a year, 12 target missiles could be launched. It is likely that many of the wildlife species would habituate to the increased visual and auditory stimuli resulting from missile launches, such as what has occurred at KSC and CCAS. Thus, the cumulative effect of the launch noise is expected to be minimal and not result in jeopardy to the continued existence of any Federally or state listed species in the area.

Birds flying through the exhaust plume may be exposed to concentrations of hydrogen chloride that could irritate eye and respiratory tract membranes. Maximum concentrations of 0.5 parts per million (ppm) of hydrogen chloride 1.9 kilometers (1.2 miles) from the launch site have been modeled. This level is well below the maximum permissible exposure of 10 ppm used by the U.S. Air Force to safeguard personnel involved in missile launches. Since most birds would be temporarily frightened away by the noise of the launch and because of these small concentrations, it is not likely that any would come into immediate contact with the exhaust plume. Physiological impacts to birds are not expected. (U.S. Department of Transportation, 1996)

Many studies have addressed noise and disturbance to various species of birds, including several Federally threatened or endangered species. The following is a summary of these studies. The USFWS and the Florida Department of Natural Resources (1992) describe the potential effects of human disturbance on avifauna and stress that there is great variation, both among and within species. The Institute for Raptor Studies (1981) found potential negative effects of disturbance on nesting raptors include temporary nest abandonment, allowing exposure of eggs or young to excess heating or cooling, reduced reproductive performance, aerie abandonment, accidental death of young due to premature fledging, and other short-term behavior responses. Female hawks left nests when they experienced shock waves, but returned to the nest within 10 minutes.

During January to May, the bald eagles nesting 4 kilometers (2.5 miles) from the launch pad would experience peak noise levels of 103 dB. This is not likely to cause abandonment of the nests or reduced egg productivity. If the birds are foraging near the launch pad at the time of launch they may show a stronger reaction. However, the habitat in the immediate vicinity of the site is only occasionally used by either species.

As launch preparation activities would be done primarily during night time hours, sea turtles coming on shore at night to nest at Sawyer Key, 7 kilometers (4.3 miles) from the site could be minimally affected.

Silver rice rats that could potentially be in the vicinity of the launch pad would likely be startled by the launch noise, causing them to seek cover, a short-term physiological response.

Emissions Impacts

As noted in section 3.1.1.4, approximately 1.64 grams per square meter (0.06 ounces per 10.8 square feet) of hydrogen chloride would be deposited within 60 meters (200 feet) of the launch pad. The amount decreases to less than 1 gram per square meter (0.04 ounce per 10.8 square feet) at a distance of 120 meters (40 feet).

If it were to rain shortly after a missile launch, the hydrogen chloride present in the exhaust plume would be dissolved in the rain droplets, which would result in a temporary reduction in rainfall pH. Depending on the buffering capacity of the receiving water, rainfall may result in an increase in surface water acidity. Surface water acidity ranging from approximately pH 4.0 to 6.0 is generally believed to result in stress to marine life and possibly death (National Aeronautics and Space Administration, 1990). The degree and duration of any increased acidity in surface waters would depend on several variables, including surface water volume and alkalinity, as well as the amount and pH level of rainfall.

The pH of shallow marine waters in the Florida Keys ranges from a low of 7.3 near Saddlebunch and Cudjoe Keys to a high of 8.2 near Plantation Key. Average alkalinity measurements range from a low of 119 mg/L calcium carbonate near Plantation Key to a high of 137 mg/L calcium carbonate near Harrison Canal (Florida Department of Environmental Protection, 1996).

Project-related changes in pH of shallow marine waters near Cudjoe Key were estimated for purposes of impact analysis. Calculations were conservative in that 100 percent of the hydrogen chloride present in the exhaust plume was assumed to be dissolved in rain droplets (as opposed to approximately 20 percent under normal conditions). Existing surface water pH and alkalinity levels were assumed to be 7.3 and 119 mg/L calcium carbonate, respectively. Due to the high buffering capacity of the shallow marine waters, this would not result in a decrease in the pH levels and would not result in impacts to aquatic species.

Vegetation, primarily red, black, and white mangroves, within 15 meters (50 feet) may be singed. The cumulative effect of 12 launches per year, may permanently remove or degrade the vegetation close to the launch pad; vegetation singed outside of this range would likely suffer only short-term non-lethal effects. No listed plant species would be affected. The singeing of vegetation may cause a minor loss of habitat for wading and migratory birds. A discussion of known effects of missile emissions is provided in section 3.1.1.4.

Post Launch

The post-launch activities at Cudjoe Key would involve personnel removing the mobile instrumentation from the site, clearing the launch pad, and securing equipment. These activities would result in continued human activity and noise in the immediate area for a period of approximately 5 days.

Currently, there is no plan to collect the boosters or intercept debris following normal launches. During a normal launch there should be no debris falling on or near the mangroves or wetlands at the launch site. Debris impact areas for normal events are expected to be 700 to 800 kilometers (435 to 497 miles) from Cudjoe Key in the Northern Gulf of Mexico.

During a normal launch there should be no debris falling on or near mangroves or wetlands at the launch site, although there is a small chance of some debris washing onshore after launches. Such debris could entangle or harm wildlife.

Cumulative Impacts

Construction of the TMD test facilities at Cudjoe Key would take place on a site owned by the U.S. Air Force Air Combat Command which was originally developed in 1959 for monitoring missile testing over the Gulf of Mexico. This complex was altered to accommodate balloon radar surveillance of the southern Gulf and Cuba which will continue for the foreseeable future. Residential and commercial development has continued at a moderate rate in Monroe County with some increase in population on Cudjoe Key.

Biological resources of interest in the vicinity of Cudjoe Key include the Lower Keys marsh rabbit and the silver rice rat, both of which are listed as endangered. Construction and site preparation would disturb two osprey nests, but would not intrude onto previously undisturbed areas. The construction would not impact the wetlands at Cudjoe Key.

Human presence, lighting, or traffic during the 8 months of construction or monthly site preparation activities would interrupt the activities of either the rabbits or rats.

Flight testing activities would include some combination of up to 12 target missile launches each year. Launch of this many missiles would mean that the site would be periodically manned with as many as 90 personnel. The heat and noise of launch events may cause mortality to those animals in the immediate vicinity (15 meters/50 feet) of the launch pad that were not previously frightened away by the increased human activity. Deposition of hydrogen chloride and aluminum oxide emissions at rates of 1.64 grams per square meter (0.06 ounces per 10.8 square feet) could cause some spotting and browning of plants within 61 meters (200 feet) of the launch pad. The long-term result would be some loss of biodiversity in the immediate vicinity of the launch pad. Plants that are tolerant of decreased pH levels would survive or thrive at the expense of those plants more sensitive to decreased pH levels. This may decrease the food and cover value of the habitat for species such as the silver rice rat or the Lower Keys marsh rabbit in the immediate 61 meters (200 feet) vicinity of the launch pad.

Nesting populations of wading birds are currently continuously disturbed by the increasing presence of humans. Energy that may otherwise be used for hunting, foraging, and maintenance is expended by the flushing reaction to this disturbance. The cumulative effect of these existing stresses combined with the stress from the proposed action may result in changes in reproductive behavior of nesting birds and force them to seek other potential nest sites which are becoming increasingly limited (U.S. Department of the Interior, 1997).

Deposition of hydrogen chloride onto the adjacent waters would not accumulate as the natural buffering of sea water and brackish estuarine waters would quickly neutralize the localized increased acidity. Currents in the local Gulf waters would also flush such acidic concentrations into larger mixing volumes.

Indirect impacts could include the benefit of clearing people from backwater sensitive habitats for 4 hours per month.

No other projects or programs have been identified as foreseeable future uses of the Cudjoe Key TARS site.

Mitigations Considered

All TMD site preparation and flight test activities would be conducted in compliance with Air Force regulations implementing compliance with the Endangered Species Act and other resource protection statutes. Specific mitigation measures would be developed in continuing consultation with the appropriate agencies. In compliance with Section 7 of the Endangered Species Act, AFDTC would continue to consult with the USFWS and NMFS to ensure that program actions are not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of lands determined by the USFWS to be critical habitat. AFDTC would also, in coordination with the USFWS, NMFS, FDEP, FDCA, and other appropriate agencies, establish and implement measures to mitigate impacts to any listed species.

Possible mitigations would include:

- Minimize nighttime activities and lighting and use low pressure sodium where lighting is required.
- Construct blast deflectors to shield mangroves.
- Design habitat enhancement measures which occur onsite and in-kind.
- Include construction contract provisions to ensure compliance with environmental protection measures and minimize habitat destruction.
- Relocate raptor roosts offsite.
- Site personnel involved in construction activities would receive an environmental awareness orientation to make the personnel aware of their responsibilities with regard to threatened and endangered species, cultural

resources, allowable activities on sensitive and protected lands, erosion control, and hazardous materials management.

- Conduct endangered species population surveys and monitor these populations within the LHA.
- Survey and monitor plants adjacent to the launch pad to assess effects of launch.
- Construct sound barriers surrounding the launch pad to reduce launch noise.
- A qualified biologist would monitor debris recovery activities following early flight termination or launch failure to reduce impacts on sensitive species or resources.
- Ensure siting layout design minimizes site disturbance.

3.3.3.4.2 Saddlebunch Keys

Site preparation activities at Saddlebunch Keys would have an adverse effect by disturbing either 0.63 hectare (1.56 acres) or 0.9 hectare (2.23 acres) depending upon the option selected. Option 1 would disturb 0.62 hectare (1.54 acres) of wetlands, and Option 2 would disturb 0.89 hectare (2.2 acres). Flight test activities could result in a temporary impact by periodically singeing vegetation. Short duration high intensity noise levels during launch could cause roosting birds in the area to flush off their nests.

No-action Alternative

Under the no-action alternative, the operations of the Saddlebunch Keys facility would continue at the current planned levels. No project-related construction or activities would take place. As such, environmental impacts would remain at their current levels. Approximately 10 people work at the Saddlebunch Keys transmitter site every day. These activities involve the operations and maintenance of the transmitter, tower, and generators. Grounds maintenance activities are the most likely to affect plants and wildlife on the site. The disturbed areas are maintained and mowed periodically. The remainder of the site is kept in its natural condition, which is primarily mangrove thickets.

Site Preparation Activities

TMD construction would consist of constructing a launch pad, a MAB, and a launch control building. There are two options for the site layout. The first option proposes a launch pad close to the radio antennas with a MAB at the eastern end of the site. The first option would disturb 0.63 hectare (1.56 acres) of land, 0.23 hectare (0.58 acres) of which is on previously disturbed areas, and 0.4 hectare (0.98 acre) on previously undisturbed land. The second option proposes a launch pad and MAB collocated approximately 122 meters (400 feet) west of the VOA antenna towers. The second option would disturb 0.9 hectare (2.23 acres) of land, 0.18 hectare (0.44 acre) of which

is on previously disturbed areas, and 0.72 hectare (1.79 acres) on previously undisturbed land.

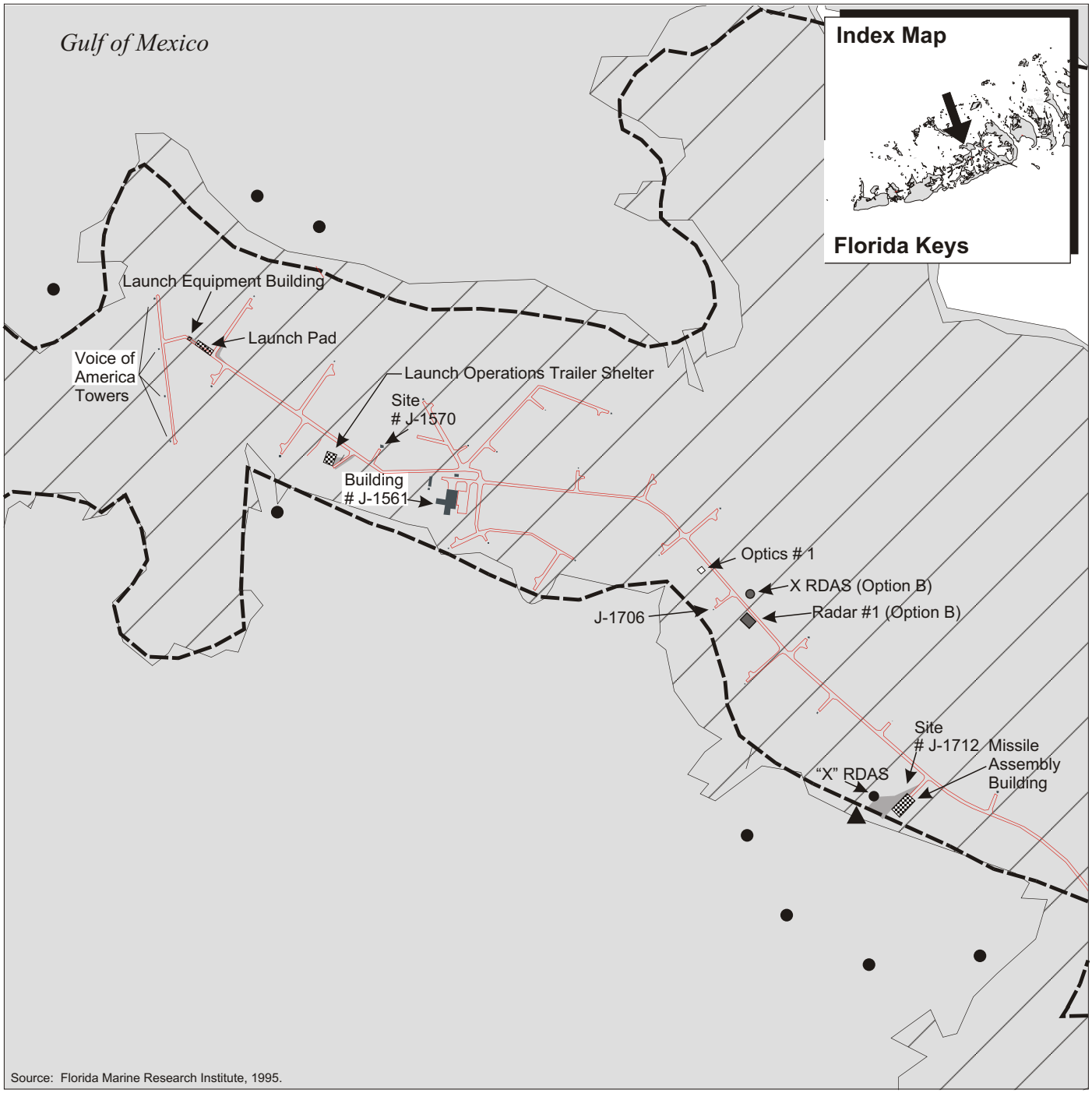
Option 1 would include construction of the launch pad complex at the north end of the existing gravel road near the VOA towers and would result in the loss of 0.62 hectare (1.54 acres) of wetlands (figures 3.3.3-11 and 3.3.3-12). If Option 2 were selected, the launch pad would be relocated to the north, and approximately 0.89 hectare (2.2 acres) of wetlands would be disturbed. The habitat that would be eliminated is prime foraging and travel corridor habitat for the Lower Keys marsh rabbit and silver rice rat. However, the habitat is not designated critical habitat for either species under the ESA, and the number of individuals at the site is likely quite low due in part to previous disturbance (figures 3.3.3-13 and 3.3.3-14). No rookeries or white-crowned pigeon nesting habitat would be affected, but foraging habitat for these species would be eliminated. No sea turtle nesting or foraging habitat would be affected. The loss of mangrove would affect several species of migratory birds, such as prairie warblers and mangrove cuckoo.

Depending on the placement of the facilities, a small number of Porter's broom spurge, joewood, or Geiger tree may be affected.

Construction noise of up to 65 dB may disturb Federally or state listed wildlife near the Saddlebunch Keys site during the 8-month construction period. Most of the noise and human activity would be caused by truck traffic and heavy machinery at the launch pad. The level of impact to listed species would be dependent on the time of year the work is completed. If the activities take place during the months of February through October, the construction could disturb nesting wading and shorebirds, white-crowned pigeons, and local populations of the silver rice rat. However, none of the major rookeries would be subjected to noise levels during construction significantly higher than what currently occurs. As no sea turtle nesting occurs on Saddlebunch Keys, construction is unlikely to affect this species.

Construction at any time of the year could disturb foraging shorebirds, white-crowned pigeons, brown pelicans, herons, and egrets. However, no large concentrations of these birds are located in the immediate vicinity of the Saddlebunch Keys site and only a small number of birds would be affected by the construction noise. The flushing of the birds may slightly increase energy expenditure. Construction activities may temporarily cause foraging osprey to avoid the area within approximately 0.8 kilometer (0.5 mile) over the 8 months of construction.

The use of gasoline and diesel machinery during construction has the potential to cause small-scale hydrocarbon spills that, if uncontrolled, could enter beach and marine habitats. Such spills could affect the Federally or state listed species that occur in the area. In particular, shorebirds would be most susceptible. Proper preventative and contingency plans, however, would avert hydrocarbon spills that could substantially affect any of the protected species.



EXPLANATION

- Existing Building/structure
- Proposed Building/Concrete Pad
- Proposed Gravel Fill Area
- Government Property
- Warning Buoys (Proposed)
- Osprey Nest
- Known Silver Rice Rat and Lower Keys Marsh Rabbit Habitat and Scattered Joewood
- Instrumentation

Note: RDAS = Real-time data Acquisition System

NORTH

Scale 1:9,600

0 800 1,600 Feet

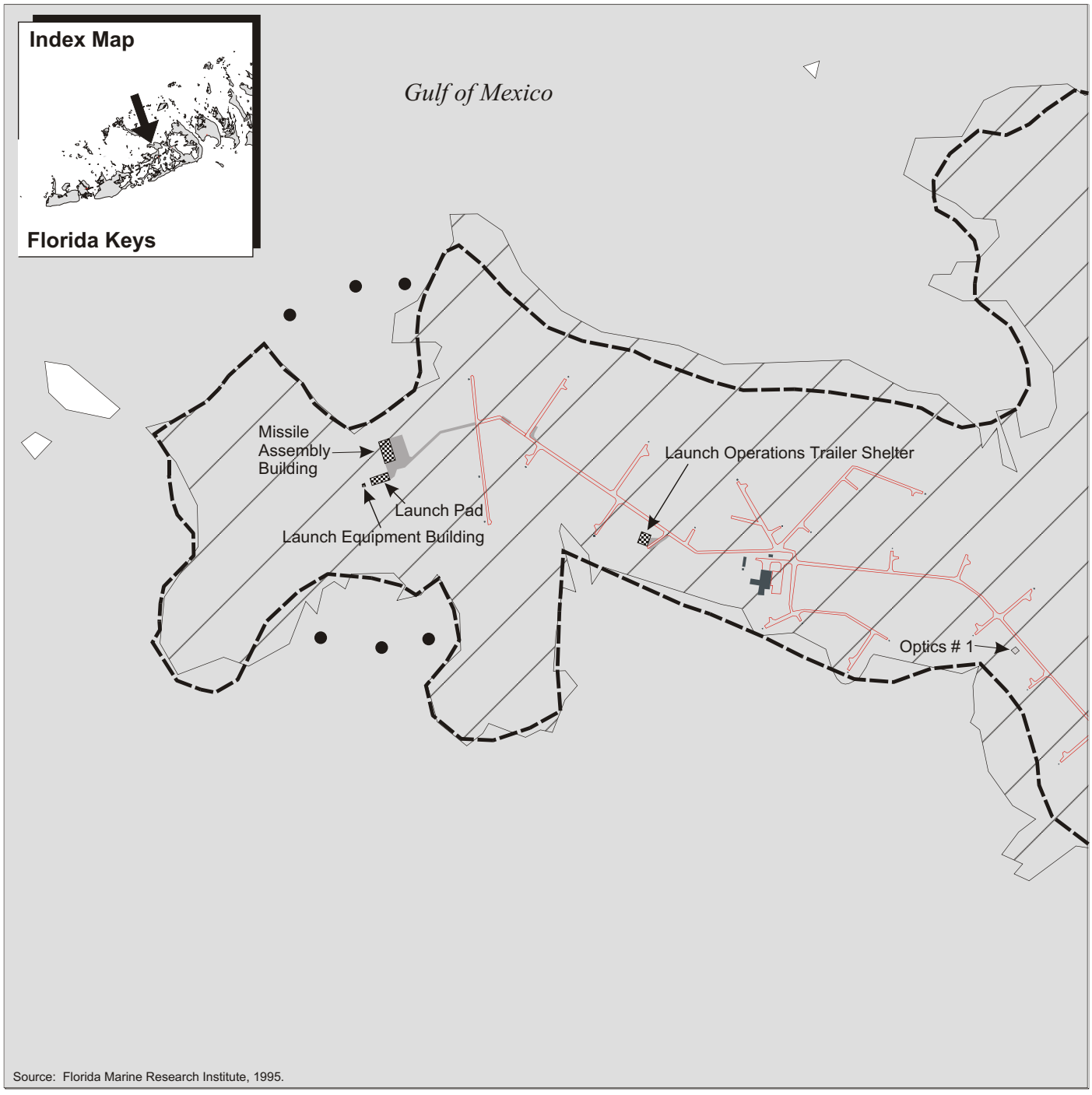
0 250 500 Meters

Proposed Facilities in Relation to Important Wildlife Habitat, Option 1

Saddlebunch Keys, Florida

Figure 3.3.3-11

sad-9600-4bio001



EXPLANATION

- Existing Building/Structure
- Proposed Building/Concrete Pad
- Proposed Gravel Fill Area
- Government Property
- Warning Buoys
- Known Silver Rice Rat and Lower Keys Marsh Rabbit Habitat and Scattered Joewood
- Instrumentation

Proposed Facilities in Relation to Important Wildlife Habitat, Option 2

Saddlebunch Keys, Florida

Figure 3.3.3-12

NORTH

Scale 1:9,600

0 800 1,600 Feet

0 250 500 Meters

sad-9600-4bio002

Source: Department of the Navy, Naval Facilities Engineering Command, 1992; EDAW, Inc., 1997; Florida Marine Research Institute, undated.

EXPLANATION

- Roads
- Previously Disturbed Areas
- Proposed Disturbance

Disturbed Areas, Option 1

Saddlebunch Keys, Florida

Figure 3.3.3-13

NORTH

Scale 1:9,600

0 800 1,600 Feet

0 250 500 Meters

sad-9600-4gen001

Source: Department of the Navy, Naval Facilities Engineering Command, 1992; EDAW, Inc., 1997; Florida Marine Research Institute, undated.

EXPLANATION

- Roads
- Previously Disturbed Areas
- Proposed Disturbances

Disturbed Areas, Option 2

Saddlebunch Keys, Florida

Figure 3.3.3-14

NORTH

Scale 1:9,600

0 800 1,600 Feet

0 250 500 Meters

sad-9600-4gen002

Flight Test Activities

For 30 days prior to a launch, test personnel would be present at the site assembling the missile components, setting up instrumentation, and preparing for the test. During the several hours immediately preceding launch, the pre-launch activities for a target missile launch would involve test personnel making final preparations at the LHA, an aircraft from NASKW flying over the LHA to monitor sea traffic, and police patrolling the LHA. The number of launches that would occur at Saddlebunch Keys would be no more than 12 per year.

The increased activity at the site may result in a temporary disturbance to wildlife in the area, particularly those species that potentially use the mangroves, tidal marsh, and shallow nearshore waters in the immediate vicinity of the launch site. Buoys to notify boaters of the ESQD would be anchored to the bottom. There would be little direct impact from these buoys which would be less intrusive than lobster pots. The use of aircraft and Coast Guard vessels to patrol nearby waters could cause dolphins and turtles to avoid the vessel or noise; this effect would be of short-term duration. The increased vessel traffic could slightly increase the chances for striking a manatee, but this is unlikely since this is well south of their normal range.

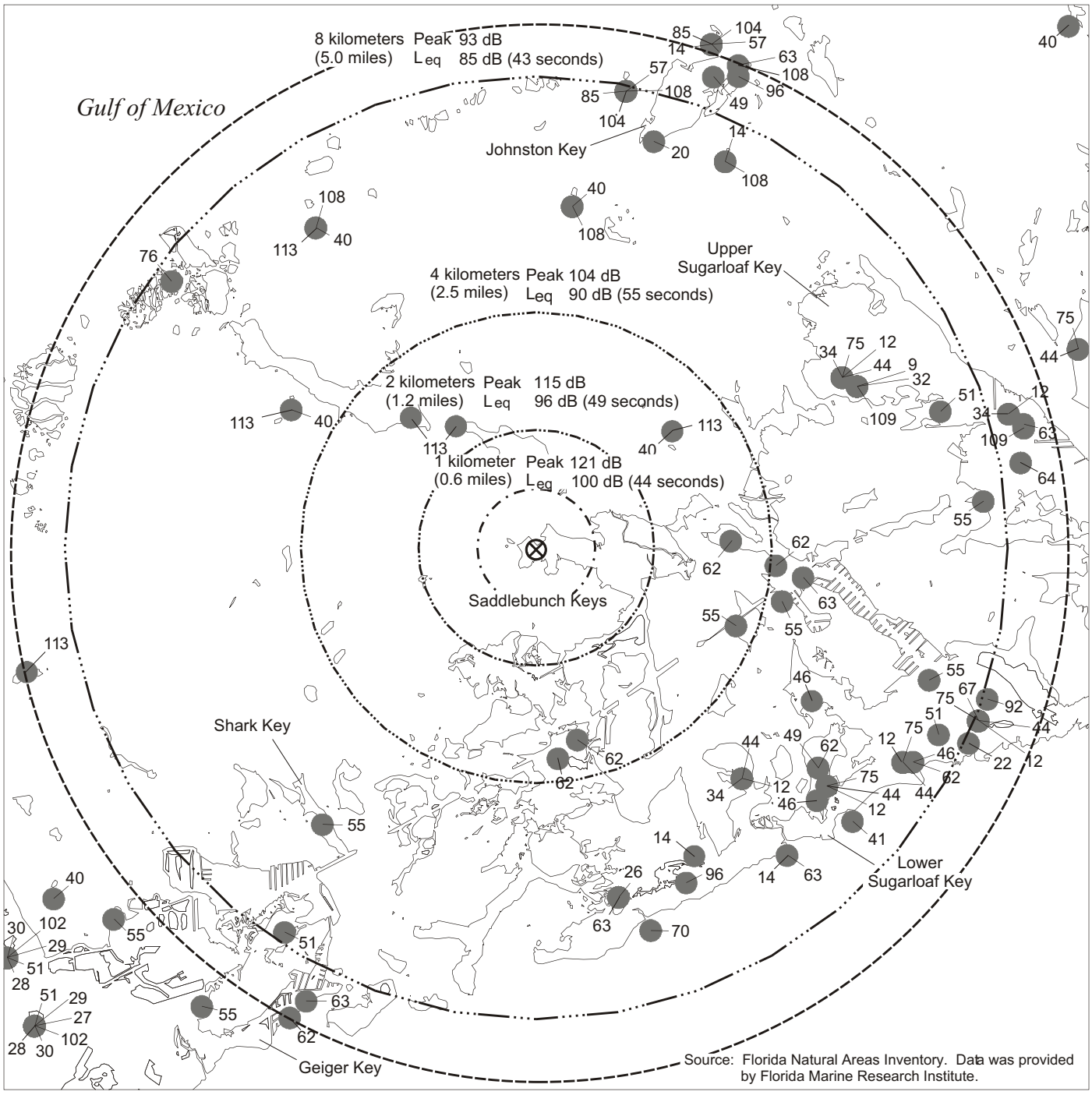
Launch Activities

If used as a launch site, the peak noise level of the representative target missile would be approximately 124 dB within approximately 0.5 kilometers (0.31 miles) of the Saddlebunch Keys launch pad and would drop to a level of 93 dB at 8 kilometers (5 miles) from the launch pad (figure 3.3.3-15). Noise from the launch would be heard on the ground for no more than 20-30 seconds during normal target missile launches.

For a target missile launch, there would be a slight chance of direct mortality of protected bird species, silver rice rats, and Lower Keys marsh rabbits that could be present within approximately 15 meters (50 feet) of the pad during target missile launches. As there would be increased human activity and noise during the pre-launch time period, the likelihood of a listed species being directly harmed by the launch would be remote.

Activities at Cudjoe Key during the flight test launches from Saddlebunch Keys would be limited to monitoring missile launches and flight tracking. Each of the two instrumentation sites may require the use of a generator of up to 60-kW capacity. These generators would be operating for up to 8 hours per launch. If used for instrumentation, the amount of noise at Cudjoe Key during launch from Saddlebunch Keys would not exceed current ambient levels.

The launch noise, lasting less than 60 seconds, would generally be heard within an 9-kilometer (5.6-mile) radius area and may cause nesting and foraging birds to react by either becoming alert or temporarily leaving nests (late winter, spring, and summer) or foraging areas (year-round). The nearest rookeries for colonial nesting birds are located at Snipe Key (0.9 kilometers [0.6 miles]), Johnston Key (7.0 kilometers [4.3 miles]), and



EXPLANATION

- 1 kilometer (0.6 miles)
- 2 kilometers (1.2 miles)
- 4 kilometers (2.5 miles)
- 8 kilometers (5.0 miles)
- 9 kilometers (5.6 miles)
- Indicative of where most sensitive species, and areas are located; not the entire area over which the species is known to occur.

Note: See Table 3.3.3-4 for key list of common names.

NORTH

Scale 1:100,000

0 1 2 Miles

0 1.5 3 Kilometers

Target Launch Noise Levels and Rookeries

Saddlebunch Keys, Florida

Figure 3.3.3-15

sad-100k-3bio002

Marvin Key (6.5 kilometers [4 miles]) from the site and would experience peak noise levels of approximately 121 dB, 93 dB, and 103 dB respectively from a target launch (figure 3.3.3-15).

Due to the short duration of the target launch noise (less than 60 seconds), the individuals most likely to be affected are those that have a direct line of sight to the launch pad area and nesting birds that are in the early nest initiation or egg laying and early fledgling stages. If adult birds are flushed from their nests, eggs and young could be exposed to increased predation and effects of weather. The effects of weather would be minimized by not conducting launches during the mid-day heat. Previous studies of jet aircraft noise have indicated that as long as noise levels drop to ambient levels and no other disturbance occurs, most birds will return to nests within only a few minutes (Black, et al., 1984; U.S. Fish and Wildlife Service and Florida Department of Natural Resources, 1992). Missiles will be at least 2,000 meters (6,562 feet) above rookeries downrange, except Snipe Key, which would be overflown.

Many studies have addressed noise and disturbance to various species of birds, including several Federally threatened or endangered species. The following is a summary of these studies. The USFWS and the Florida Department of Natural Resources (1992) describe the potential effects of human disturbance on avifauna and stress that there is great variation, both among and within species. The Institute for Raptor Studies (1981) found potential negative effects of disturbance on nesting raptors include temporary nest abandonment, allowing exposure of eggs or young to excess heating or cooling, reduced reproductive performance, aerie abandonment, accidental death of young due to premature fledging, and other short-term behavior responses. Female hawks left nests when they experienced shock waves, but returned to the nest within 10 minutes.

During launches occurring 1 October to 1 July, the nesting osprey located 12 and 1.25 kilometers (7.4 and 0.8 miles) from the launch pad, respectively, would experience noise levels of less than 93 dB and 121 dB, respectively. This is not likely to cause abandonment of the nests or reduced egg productivity of either species. If the birds are foraging near the launch pad at the time of launch they may show a stronger reaction.

As some testing would likely be done during night time hours, sea turtles coming on shore at night to nest at Sawyer Key, 13 kilometers (8 miles) from the site, could be affected.

Silver rice rats and marsh rabbits that occupy the immediate vicinity of the launch pad would likely be startled by the launch noise, causing them to seek cover. This could cause a short-term behavioral and possibly a physiological response such as spontaneous abortions.

Vegetation, primarily red, black, and white mangroves, and salt grass, glasswort, and saltwort within 15 meters (50 feet) may be singed. Individual joewood, geiger tree, and Porter's broom spurge may be singed. The singeing of vegetation may cause a minor loss of habitat for wading and migratory birds.

Impacts resulting from emissions would be similar to those described in section 3.3.3.4.1.

Post Launch

The post-launch activities at Saddlebunch Keys would involve personnel removing the mobile instrumentation from the site, clearing the launch pad, and securing equipment. These activities would result in increased human activity and noise in the immediate area for a period of approximately 5 days. Currently, there is no plan to collect the boosters or debris following launches. During a normal launch there should be no debris falling on or near mangroves or wetlands at the launch site, although there is a small chance of some debris washing onshore after launches. Such debris could entangle or harm wildlife.

Cumulative Impacts

Construction of the TMD test facilities on Saddlebunch Keys would take place within the Naval Air Station, Key West. This site was developed and is operated by the Naval Computer Telecommunications Area Master Station Atlantic Detachment. Current transmission and support activity will continue for the foreseeable future and there are no current plans for additional DOD projects. Residential and commercial development has continued at a moderate rate in Monroe County with some increase in population on Cudjoe Key.

Biological resources of interest in the vicinity of Saddlebunch Transmitter Site include the Lower Keys marsh rabbit and the silver rice rat, both of which are listed as endangered. The entire 242 hectares (598 acres) Navy parcel is considered to be prime habitat for both species. Construction and site preparation of options 1 and 2 would disturb 0.001 percent or 0.003 percent respectively of the parcel habitat. Construction and site preparation of options 1 and 2 would intrude onto 0.4 hectare (0.98 acre) or 0.72 hectare (1.79 acres) respectively of previously undisturbed areas. The construction of option 1 or 2 would impact 0.62 hectare (1.54 acres) or 0.89 hectare (2.2 acres) respectively of wetlands.

Human presence, lighting, or traffic during the 8 months of construction or monthly site preparation activities of either option would interrupt the activities of either the rabbits or rats. The heat and noise of launch events may cause mortality to those animals in the immediate vicinity (15 meters [50 feet]) of the launch pad that were not previously frightened away by the increased human activity. Deposition of hydrogen chloride and aluminum oxide emissions at rates of 1.64 grams per square meter (0.06 ounce per 10.8 square feet) could cause some spotting and browning of leaves within 15 meters (50 feet) of the launch pad. The long-term result would be some loss of biodiversity in the immediate vicinity (near-field) of the launch pad.

Nesting populations of wading birds are currently continuously disturbed by the increasing presence of humans. Energy that may otherwise be used for hunting, foraging, and maintenance is expended by the flushing reaction to this disturbance. The cumulative effect of these existing stresses combined with the stress from the proposed action may result in changes in reproductive behavior of nesting birds and force them to seek other potential nest sites which are becoming increasingly limited (U.S. Department of the Interior, 1997).

No other projects or programs have been identified as foreseeable future uses of the Saddlebunch Transmitter Site.

Mitigations Considered

All TMD site preparation and flight test activities would be conducted in compliance with Air Force regulations implementing compliance with the ESA and other resource protection statutes. Specific mitigation measures would be developed in continuing consultation with the appropriate agencies. In compliance with Section 7 of the Endangered Species Act, AFDTC would continue to consult with the USFWS and NMFS to ensure that program actions are not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of lands determined by the USFWS to be critical habitat. AFDTC would also, in coordination with the USFWS, NMFS, FDEP, FDCA, and other appropriate agencies, establish and implement measures to mitigate impacts to any listed species.

The 404(b)(1) permit process would be used to evaluate and minimize any potential impacts on jurisdictional or non-jurisdictional wetlands affected by the proposed or alternative actions for TMD testing. This permit, issued by the USACE in coordination with the State of Florida, would evaluate specific areas affected by the program once they are more precisely defined during the final planning and design process.

Possible mitigations would include:

- Minimize nighttime activities and lighting and use low pressure sodium where lighting is required.
- Construct blast deflectors to shield mangroves.
- Design habitat enhancement measures which occur onsite and in-kind.
- Include construction contract provisions to ensure compliance with environmental protection measures and minimize habitat destruction.
- Relocate raptor roosts offsite.
- Site personnel involved in construction activities would receive an environmental awareness orientation to make the personnel aware of their responsibilities with regard to threatened and endangered species, cultural resources, allowable activities on sensitive and protected lands, erosion control, and hazardous materials management.
- Conduct endangered species population surveys and monitor these populations within the LHA.
- Survey and monitor plants adjacent to the launch pad to assess effects of launch.
- Construct sound barriers surrounding the launch pad to reduce launch noise.

- A qualified biologist would monitor debris recovery activities following early flight termination or launch failure to reduce impacts on sensitive species or resources.
- Ensure siting layout design minimizes site disturbance.

3.3.4 CULTURAL RESOURCES

Cold War-era facilities on the alternative site on Cudjoe Key may be considered eligible for listing on the NRHP. TMD site preparation activities may affect these facilities. Saddlebunch Keys alternative launch site preparation activities have no effect on cultural resources.

3.3.4.1 Resource Description and Evaluative Methods

Refer to section 3.1.4 for a description of cultural resources as presented in this document.

3.3.4.2 Region of Influence

The cultural resources ROI for the Florida Keys is defined as that area which is encompassed by the LHA of each launch location (figures 3.3.4-1 and 3.3.4-2), the immediate vicinity of the proposed instrumentation sites, and those areas affected by ground disturbance from construction activities.

3.3.4.3 Affected Environment

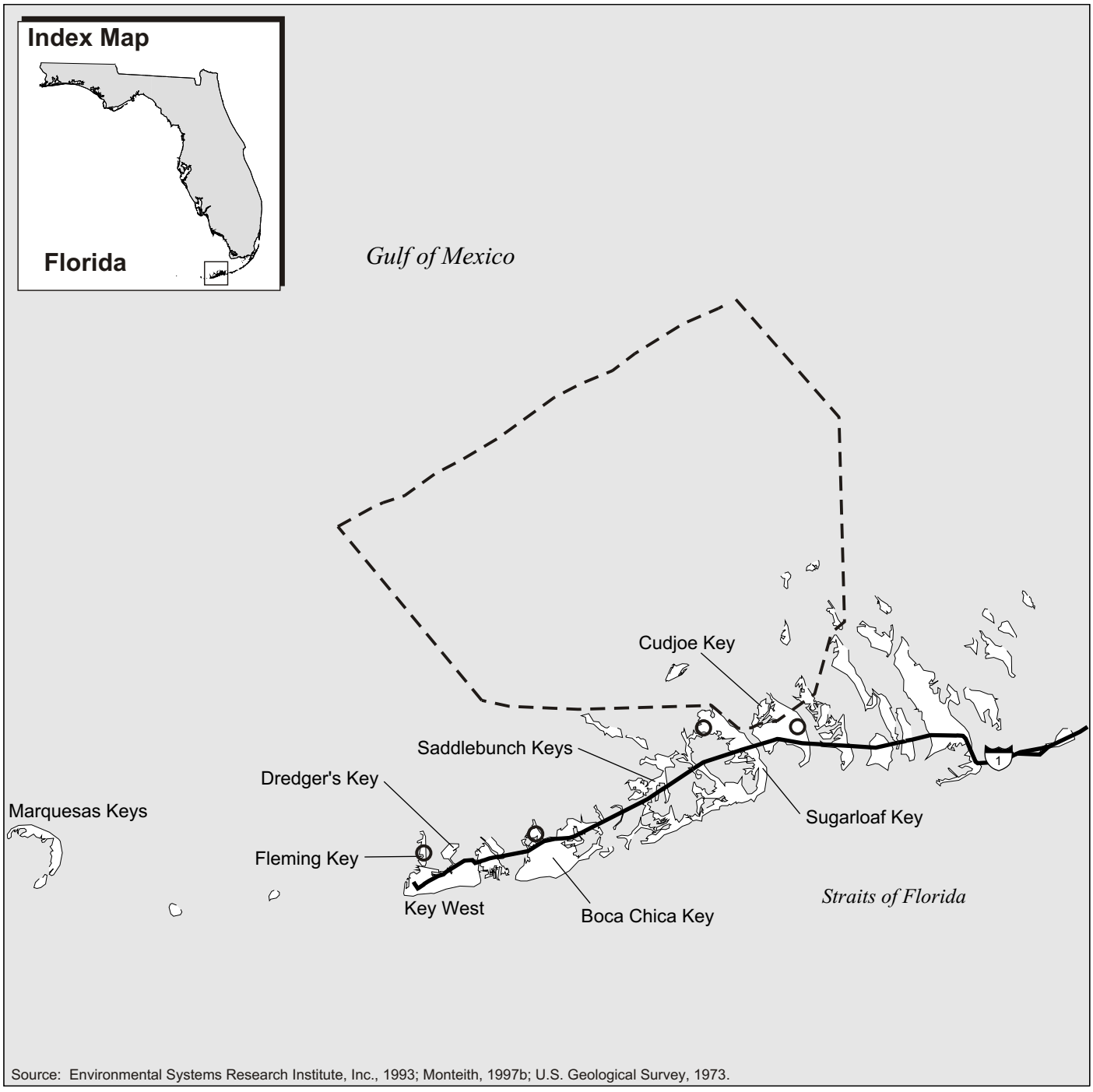
A brief prehistory and history of the Florida Keys is presented here to provide a context for the types of cultural resources known to exist or that have the potential to occur within the ROI.

The Paleo-Indian and the Archaic Periods (15,000 to 8000 B.C. and 8000 to 2000 B.C., respectively) represent the earliest periods of human occupation of South Florida. However, evidence of archaeological sites in the Florida Keys from these periods is nonexistent.

The earliest evidence of human occupation of the Florida Keys appears in the archaeological record at about 100 A.D. when the native peoples to the north migrated into the Florida Keys (Carr and Fay, 1990). This occupation of the Florida Keys is included as part of the Glades Period (500 B.C. 1600 A.D.) (Goggin, 1939).

Spanish contact with the native people of the Florida Keys began what has been termed the European Contact Period (1513 A.D.-1763 A.D.). During this period the Spanish did not settle the Florida Keys, although they did utilize the keys for timber harvest and as a center for fishing efforts where native populations were used for labor. The last descendants of the native inhabitants of the Florida Keys continued to live in the area as late as 1763 (Milanich, 1995).

In 1763 the English traded Cuba to the Spanish for Florida and held it without settlement until the English ceded it back to the Spanish in 1784. The Florida Keys then remained in Spanish possession until 1821 when Florida was ceded to the United States. United States colonization of the Florida Keys steadily increased under the economic influence of wrecking, salt manufacturing, cigar production, sponging, and the U.S. military presence.



Source: Environmental Systems Research Institute, Inc., 1993; Monteith, 1997b; U.S. Geological Survey, 1973.

EXPLANATION

- Roads
- Region of Influence
- Region of Influence (Instrumentation Sites)

Region of Influence for Cultural Resources

Scale 1:500,000

0 4 8 Miles

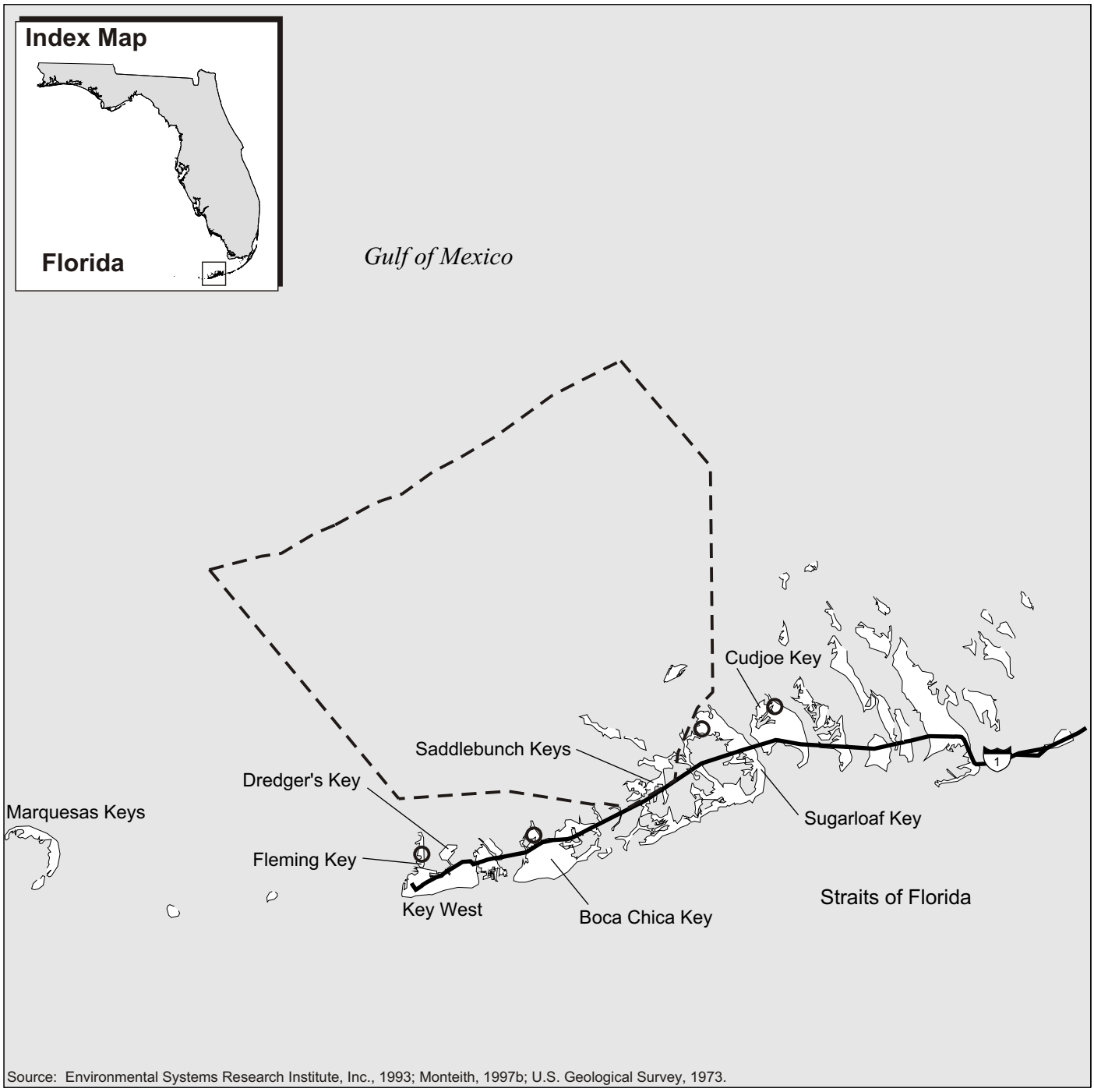
0 6.5 13 Kilometers

NORTH

Cudjoe Key, Florida

Figure 3.3.4-1

cud-500k-3cult001



Source: Environmental Systems Research Institute, Inc., 1993; Monteith, 1997b; U.S. Geological Survey, 1973.

EXPLANATION

- Roads
- Region of Influence
- Region of Influence (Instrumentation Sites)

Region of Influence for Cultural Resources

Scale 1:500,000

0 4 8 Miles

0 6.5 13 Kilometers

NORTH

Saddlebunch Keys, Florida

Figure 3.3.4-2

key-500k-3cult001

The U.S. Government established a Naval base on Key West to counter the threat of piracy in 1822. This military occupation was fortified by the construction of Fort Zachory Taylor in 1860. Key West remained in Union hands throughout the Civil War. The military presence in the Florida Keys escalated due to the proximity of the Florida Keys to Cuba during the Spanish American War (1898). During World War I Key West became a strategic defense center for shipping lanes and a sea plane training base was constructed on the north side of Key West (Nichols, 1989). The end of World War I and the advent of the depression began a decline in the military activity in the Florida Keys that lasted until World War II when the Naval base again expanded to include larger port facilities and the Naval Air Station. U.S. military operations in the Florida Keys continued throughout the Cold War era as Air Force and Naval facilities were constructed for surveillance, communications, training, and missile defense.

3.3.4.3.1 Cudjoe Key

Prehistoric Archaeological Resources

The areas of potential effect for archaeological resources on Cudjoe Key consist of fill material composed of crushed limestone or coral bedrock covered by concrete or asphalt (U.S. Department of Agriculture, Natural Resources Conservation Service, 1995a). Therefore no intact prehistoric archaeological material is likely to exist within the ROI on Cudjoe Key.

Fleming Key was created from dredged fill material as a result of the construction of a sea plane training base in 1917 (Butler, 1996). Therefore no intact prehistoric archaeological material is likely to exist within the ROI on Fleming Key.

The review of existing literature indicates that no prehistoric archaeological sites exist within the ROI for Sugarloaf Key.

No archaeological sites were discovered within the ROI on Boca Chica Key as a part of the Archeological Survey of the NASKW (Butler, 1996).

Historic Resources and Structures

The Cudjoe Key site was activated on 16 June 1959 as a missile tracking station for the Eglin test range. The site was designated Cudjoe Key AFS in February 1960. In May 1967, the installation was transferred to the Air Force Security Service. In January 1971, the station was reassigned to the Aerospace Defense Command for testing of a medium range balloon radar surveillance system designated Seek Skyhook. The site became fully operational in December 1980 to provide continuous air defense radar surveillance. On 1 October 1982, Project Seek Skyhook was redesignated the TARS. (Lockheed Martin System Support and Technical Services, undated) In 1990, the Office of Cuba Broadcasting began broadcasting Television Marti programming consisting of news, features on life in the United States, entertainment, and sports from a separate tethered aerostat on the site at Cudjoe Key (International Broadcasting Bureau, 1997). The Air Force and Television Marti operations are presently ongoing. The aerostat and TV Marti facilities could be considered potentially eligible for listing on the NRHP.

A complex of munitions storage igloos is located on Fleming Key. Constructed in 1942, it was designed to provide warehouse and storage facilities in support of the war effort during World War II. One of these structures, Igloo # F-26, is considered eligible for listing on the NRHP (U.S. Army Corps of Engineers, 1995). The review of existing literature, including the Florida Master Site File, *An Architectural Inventory of Naval Air Station Key West* and the *Archaeological Survey of Key West Naval Air Station* indicates that no other historic resources or structures are present within the ROI for Fleming Key. The seaplane training base, which was constructed in 1917 and resulted in the creation of Fleming Key, is not located within the ROI (Butler, 1996).

The literature indicates that no historic resources or structures within the ROI for Sugarloaf Key. The Florida Keys National Marine Sanctuary (NMS) Final EIS, which encompasses the ROI for cultural resources for Saddlebunch Keys, addressed shipwreck locations through analysis of four separate databases. The representative view of shipwreck locations provided in the Florida Keys NMS Final EIS indicates that no shipwrecks are present within the ROI for Saddlebunch Keys.

3.3.4.3.2 Saddlebunch Keys

Under the Saddlebunch Keys option, target launches would occur on Saddlebunch Keys; radar would be sited on Fleming Key, Saddlebunch Keys, or Cudjoe Key; optics would be sited on Saddlebunch Keys and Cudjoe Key; and RDAS would be sited on Sugarloaf Key and Saddlebunch Keys.

Refer to section 3.3.4.3.1 for the affected environment information regarding instrumentation sites for the Saddlebunch Keys option.

Prehistoric Archaeological Resources

An archaeological survey has been conducted on Saddlebunch Keys as part of the Archaeological Survey of the Naval Air Station, Key West. No archaeological sites were discovered (Butler, 1996). Therefore, there are no prehistoric archaeological sites within the ROI for Saddlebunch Keys.

Historic Resources and Structures

During World War II, Saddlebunch Keys were used by the Navy as a practice bombing range (Mickler, 1945). Some evidence of this activity was discovered on Saddlebunch Keys during the archaeological Survey of NASKW, in the form of oxidized practice bombs. These were not considered as eligible for listing on the NRHP (Butler, 1996). Saddlebunch Keys were commissioned as a Naval communications facility in 1966 and has functioned in that capacity since that time. Eight Naval communications facilities worldwide were constructed for the same purpose and are performing the same mission as that of Saddlebunch Keys (Carter, 1997). Because of the number of similar facilities in existence, all of which are currently functioning in a post-Cold War era environment, the Naval facilities at Saddlebunch Keys are not being considered Cold War era resources. Four 76.2-meter (250-foot) radio towers are located on Saddlebunch Keys. Erected in 1981, they functioned for the U.S. Army from 1984 until 1985 when they

were used for the broadcast of VOA radio programming into Cuba until 1994 (Carter, 1997).

The abandoned Boca Chica Field Hawk Missile Site complex is the location of the proposed alternate Radar site. The complex was constructed in 1963 to provide defense against a potential Cuban and Russian air assault. This site is not considered eligible for listing on the NRHP as it is in poor repair, and an alternate Hawk Missile Site complex in superior condition located outside of the ROI on Geiger Key has been considered eligible for listing on the NRHP (U.S. Army Corps of Engineers, 1995).

The Florida Keys National Marine Sanctuary Final EIS, which encompasses the ROI for cultural resources for Saddlebunch Keys, addressed shipwreck locations through analysis of four separate databases. The representative view of shipwreck locations provided in the Draft NMS EIS indicates that no shipwrecks are present within the ROI for Saddlebunch Keys.

3.3.4.4 Environmental Impacts and Mitigations

3.3.4.4.1 Cudjoe Key

Cudjoe Key Cold War-era facilities may be considered eligible for listing on the NRHP. Site preparation activities may affect these facilities.

No-action Alternative

Under the no-action alternative, TMD test activities at the Florida Keys locations, including Cudjoe, Saddlebunch, Fleming, Sugarloaf, and Boca Chica keys would not be implemented. Current operations or activities at these Florida Keys locations would continue. Continuing operation of Air Force and Navy transmission and instrumentation facilities would have negligible effects on Cold War-era eligible NRHP sites. Natural processes would continue to affect existing cultural resources.

Site Preparation Activities

Relocation of a maintenance building and a paint storage building may affect Cold War-era associated structures with the aerostat and TV Marti facilities which are determined to be National Register-eligible.

Because they would be confined to areas consisting of crushed limestone fill, site preparation activities would not affect prehistoric archaeological resources on Cudjoe Key.

The instrumentation sites at Fleming and Boca Chica keys would require no site preparation activities and, therefore, no impacts to cultural resources would be expected to occur.

A 1.5-meter (5-foot) pole would be installed on the roadside at Sugarloaf Key as part of the RDAS. The area of ground disturbance consists of fill material deposited for the installation of the road. Therefore, no impacts to cultural resources are expected.

Flight Test Activities

Radar, telemetry, and optics vehicles would drive to and park at instrumentation sites at Fleming and/or Boca Chica Keys on existing paved areas. No ground disturbing activities would be associated with their operations, therefore no impacts to the National Register-eligible Igloo F-26 at Fleming Key or the Boca Chica Hawk Missile Site would occur.

Cumulative Impacts

Construction of the TMD test facilities at Cudjoe Key would take place on a site owned by the U. S. Air Force Air Combat Command which was originally developed in 1959 for monitoring missile testing over the Gulf of Mexico. This complex was altered to accommodate balloon radar surveillance of the southern Gulf and Cuba which will continue for the foreseeable future. Residential and commercial development has continued at a moderate rate in Monroe County with some increase in population on Cudjoe Key.

Construction of facilities in support of TMD testing would disturb 0.23 hectare (0.58 acre) of previously disturbed ground at Cudjoe Key. As no Prehistoric archaeological sites or paleontological sites are located within in the ROI for Cudjoe Key, no direct or cumulative impacts are expected. No other projects have been identified at this location for the foreseeable future which, when combined with the proposed action, would result in cumulative impacts.

Construction of TMD test facilities at Cudjoe Key may affect Cold War-era structures that are associated with the operations of the TARS and TV Marti balloons. These impacts are not expected to diminish or increase when combined with reasonably foreseeable actions at Cudjoe Key. No other projects have been identified at this location for the foreseeable future which, when combined with the proposed action, would result in cumulative impacts.

Mitigations Considered

If the Cudjoe Key launch option is selected, a determination of eligibility would be conducted for site TARS and TV Marti facilities. In compliance with the NHPA Section 106 review and comment process and the ACHP's regulations implementing the Section 106 (36 CFR Part 800), BMDO would continue to consult with the ACHP and the SHPO to establish and implement measures to mitigate impacts to any properties which are determined to be eligible for listing on the NRHP.

In the event of a mishap, a professional archaeologist would participate on the debris recovery team to help determine the presence of, and to avoid impact to, cultural resources.

In accordance with the NHPA, accidental discovery of historic or pre-historic archaeological resources during ground-disturbing activities, would stop the activities until a qualified archaeologist could determine the nature and significance of the site in question. Any Native American burials or associated funerary artifacts would be treated in accordance with the NAGPRA.

3.3.4.4.2 Saddlebunch Keys

No historic resources or structures are located within the ROI for Saddlebunch Keys. Site preparation and flight test activities would have no effect on cultural resources on Saddlebunch Keys.

No-action Alternative

Under the proposed action or the no-action alternative, the proposed ground-based TMD test activities at Saddlebunch Keys would not be implemented. Current operations at Saddlebunch Keys would continue. Continuing operation of Navy and VOA transmissions from Saddlebunch Keys would have negligible effects on historical sites. Natural processes would continue to affect existing cultural resources.

Site Preparation Activities

The entire ROI for cultural resources on Saddlebunch Keys has been surveyed for the presence of archaeological sites (Butler, 1996). As no sites were identified, no impacts are expected as a result of site preparation activities on Saddlebunch Keys.

The instrumentation sites at Fleming and Boca Chica keys would require no site preparation activities; therefore, no impacts to cultural resources would be expected to occur.

A 1.5-meter (5-foot) pole would be installed on the roadside at Sugarloaf Key as part of the RDAS. The area of ground disturbance consists of fill material deposited for the installation of the road. Therefore, no impacts to cultural resources are expected.

Flight Test Activities

Radar, telemetry, and optics vehicles would drive to and park at instrumentation sites at Fleming and/or Boca Chica Keys on existing paved areas. No ground disturbing activities would be associated with their operations, therefore no impacts to the National Register-eligible Igloo F-26 at Fleming Key would occur. The Boca Chica Hawk missile site would have no impacts.

Cumulative Impacts

As no cultural resources are located within the ROI for Saddlebunch Keys no impacts, either direct or cumulative, would be expected for the Saddlebunch Keys options. No other projects have been identified at this location for the foreseeable future which, when combined with the proposed action, would result in cumulative impacts.

Mitigations Considered

In compliance with the NHPA Section 106 review and comment process and the ACHP's regulations implementing the Section 106 (36 CFR Part 800), consultations would continue with the SHPO and, if necessary the ACHP, to establish and implement measures to avoid or mitigate impacts to historic properties located within the ROI.

In the event of a mishap, a professional archaeologist would participate on the debris recovery team to help determine the presence of, and to avoid impact to, cultural resources.

In accordance with the NHPA, accidental discovery of historic or pre-historic archaeological resources during ground-disturbing activities, would stop the activities until a qualified archaeologist could determine the nature and significance of the site in question. Any Native American burials or associated funerary artifacts would be treated in accordance with the NAGPRA.

3.3.5 GEOLOGY AND SOILS

Site preparation activities at the alternative site on Cudjoe Key would be confined to previously disturbed areas. Site preparation activities at the alternative launch site on Saddlebunch Keys would have an adverse effect by disturbance of as much as 0.9 hectare (2.2 acres) of wetlands. Flight test activities would result in deposition of hydrogen chloride and aluminum oxides in the vicinity of the launch pad.

3.3.5.1 Resource Description and Evaluative Methods

The discussion of geology and soils addresses existing geology and topography, soil types and characteristics, and oil and gas exploration and extraction operations for each identified ROI. The approach for evaluating impacts relative to geology and soils involved assessing the degree to which project activities could affect soils, soil erosion, or important geologic features in the various ROIs. Impacts that could result from site preparation activities could include surface disturbance from scraping and grading, and erosion from wind or water. Impacts from flight test activities could result from deposition of launch emissions and dispersion of chemical stimulants and debris.

Refer to section 3.1.5.1 for a description of this resource area.

3.3.5.2 Region of Influence

The ROI for geology and soils on Cudjoe and Saddlebunch Keys is the area that could be affected by project activities such as construction and deposition of exhaust products. This area is defined as the island area within the proposed LHA for Cudjoe Key or Saddlebunch Keys target launch sites. The ROI for geology and soils on the remaining Florida Keys locations (Fleming, Sugarloaf, and Boca Chica keys) consists of the areas of construction for new facilities and mobile equipment locations.

3.3.5.3 Affected Environment

3.3.5.3.1 Cudjoe Key and Saddlebunch Keys

Geology and Topography

Because of its geologic nature, the islands of the Lower Keys are also referred to as the Oolite Keys. The Oolite Keys form an east-west trending chain of islands and are parallel to the Florida coastline (U.S. Department of Agriculture, Natural Resources Conservation Service, 1995a). Elevations over most of the Lower Keys are less than 3 meters (10 feet) above MSL. Surface relief is slight, seldom exceeding 0.3 or 0.6 meters (1 or 2 feet). Irregularities on the bedrock surface are the result of the heterogeneous topography of the coral reefs that created the islands, and also the result of erosion and solution of limestone rocks. The solution of exposed limestone rock within the Lower Keys area has resulted in a pitted and pinnacled surface. Sinkholes, up to several feet in diameter and several feet deep, are abundant but many are filled with peat or carbonate

sediments, which mask them from casual detection (Florida Department of Natural Resources, 1986).

The Lower Keys are underlain by an oolitic limestone bedrock referred to as Miami Limestone. Miami Limestone is white to light tan in color and is composed of tiny ooliths, lime-sand and shells. Ooliths may be up to 2.0 millimeters (0.079 inch) in diameter and are made of concentric layers of calcium carbonate. The limestone bedrock is near the surface in nearly all areas except for some areas of mangrove swamps. The Miami Limestone bedrock ranges from a few feet to as much as 10.7 meters (35 feet) in depth (Florida Department of Natural Resources, 1986).

As described in section 3.1.5.3.1, the entire state of Florida is classified as a stable geological area so the chance of an earthquake or other earthquake-related hazards (in effect, liquifaction and tsunami surge) occurring in the state are considered very remote.

Karst terrain is a generic term used to describe landforms that have been altered by the dissolution of underlying carbonate rocks. Karst terrain is common in Florida. Surface features that are characteristic of karst terrain include sinkholes, swales, springs, and caverns. Within the project area, the dissolution of sediment within the underlying aquifer system has not been extensive (Florida Department of Natural Resources, Division of Resource Management, Florida Geological Survey, 1992). Consequently, sinkholes are not considered a geologic hazard of this area.

Hydrology

On some of the larger islands of the Florida Keys, including Sugarloaf Key and Cudjoe Key, relatively thin freshwater lenses with low chloride concentrations float atop saline groundwater. The largest of these freshwater lenses occurs on Key West and Big Pine Key, but limited quantities also occur on Cudjoe and Sugarloaf keys. Chloride levels in these lenses are too high for human consumption, but are suitable for most irrigation purposes and provide the major source of drinking water for wildlife (see section 3.3.14).

Soils

Soils in the vicinity of the proposed Cudjoe Key site are of the Udorthents and Tropic Fluvaquents classification (U.S. Department of Agriculture, 1996). Much of the proposed Cudjoe Key site is mapped as Udorthents-Urban land soil complex. The Udorthent soils are typically associated with urban uses in upland areas adjacent to water. Additional, less prevalent areas are mapped as a Rock outcrop-Cudjoe series soil complex and as Cudjoe, marl, tidal phase soils (U.S. Department of Agriculture, Natural Resources Conservation Service, 1995a).

Soils in the vicinity of the proposed Saddlebunch Keys site are of the Tropic Fluvaquents classification and are described as loamy, carbonatic, isohyperthermic, and shallow (U.S. Department of Agriculture, Natural Resources Conservation Service, 1995a). Soils in this area are primarily of the Saddlebunch series and, to a lesser extent, of a rock outcrop and Cudjoe series soil complex.

The Udorthents-Urban land soil complex averages 0.9 to 3 meters (3 to 10 feet) above sea level (based on the National Geodetic Vertical Datum of 1929). This soil complex is typically associated with constructed upland areas adjacent to water. The Udorthents predominantly consist of crushed oolitic limestone or coral bedrock at maximum depths ranging from 81.3 to 152.4 centimeters (32 to 60 inches). Soil reactivity is considered mild to moderately alkaline in the upper 81.3 centimeters (32 inches) and increasingly neutral at depths below 81.3 centimeters (32 inches). In general, Udorthents are classified as having variable permeability and low shrink-swell capability.

Cudjoe series soils (including tidal and marl, tidal phases) average 0 to 4.9 meters (0 to 16 feet) in depth and areas of rock outcroppings may extend to as much as 18.3 meters (160 feet) in depth. Surfaces within the area average from 0 to 1 degree of slope with moderate to moderately rapid levels of permeability. Cudjoe series soils typically exhibit neutral to moderately alkaline pH levels and intermediate levels of predicted erosion loss.

In general, Saddlebunch series soils are described as marl underlain by bedrock and average 0 to 5.2 meters (0 to 17 feet) in depth. Cudjoe series soils are also described as marl underlain by bedrock and average 0 to 4.9 meters (0 to 16 feet) in depth. Surfaces within such areas range from 0 to 1 degree of slope with moderate to moderately rapid levels of permeability. Both soil types (Cudjoe and Saddlebunch) are classified as having neutral to moderately alkaline pH levels and low shrink-swell potential.

Udorthents are described as moderately well drained soils with a seasonal high water table depth of approximately 0.6 to 1.2 meters (2 to 4 feet) during the wet season. Individual areas are subject to rare instances of flooding from hurricanes and other tropical storms. When thoroughly wet, Udorthents exhibit moderate levels of precipitation runoff, whereas, Cudjoe series soils characteristically have high levels of precipitation runoff. As a result, flooding is rare on Udorthent soils, but is a more frequent, year-round occurrence on Cudjoe series soils (U.S. Department of Agriculture, Natural Resources Conservation Service, 1995a).

Both Cudjoe and Saddlebunch series soils are somewhat poorly drained soils and exhibit high levels of precipitation runoff (U.S. Department of Agriculture, Natural Resources Conservation Service, 1995a). During the wet periods of most years, the seasonally high water table is typically within a depth of 15 to 30 centimeters (6 to 12 inches) for Saddlebunch series soils and a depth of 15 centimeters (6 inches) for Cudjoe series soils. As a result, Cudjoe series soils are typically prone to frequent, year-round flooding. Saddlebunch series soils occasionally flood during the months of June through November (U.S. Department of Agriculture, Natural Resources Conservation Service, 1995a). See section 3.3.14 for a discussion of hydrogeology and groundwater resources.

Based on the information presented in the soil survey for Monroe County, geologic erosion occurring within the Lower Keys is predominantly sheet and rill erosion by water. The susceptibility of each soil type to erosion is expressed in rates of predicted soil loss (Factor K). Factor K is one of six factors used in the Universal Soil Loss Equation for predicting the average annual rate of soil loss by sheet and rill erosion and is expressed in values ranging from 0.02 to 0.69. The higher the K value, the more susceptible the soil is to sheet and rill erosion.

The Factor K erosion rate for both Udorthents and Cudjoe series soils is 0.32, which is slightly below the median level of 0.34 for predicted erosion loss (U.S. Department of Agriculture, Natural Resources Conservation Service, 1995a). As a result, these soils are not expected to exhibit high levels of water erosion potential.

Oil and Gas Exploration and Extraction Operations

Seven exploratory oil and gas wells were drilled in the Florida Keys area as recently as 1962. However, none of these wells were deemed productive and there are no oil or gas wells currently active within the Florida Keys area (Garrett, 1997).

3.3.5.4 Environmental Impacts and Mitigations

3.3.5.4.1 Cudjoe Key

Site preparation activities would be confined to previously disturbed areas. Flight test activities may deposit small amounts of hydrogen chloride and aluminum oxides in the vicinity of the launch pad.

No-action Alternative

Under the no-action alternative, the proposed ground-based TMD test activities at the Florida Keys locations, including Cudjoe, Fleming, Sugarloaf, and Boca Chica keys would not be implemented. Current operations at these Florida Keys locations would continue.

Site Preparation Activities

Installation activities for TMD support facilities would involve routine construction activities. Construction at the site would be short-term and would result in minor soil disturbance activities in previously disturbed areas. No wetlands would be disturbed.

If Saddlebunch Keys were to be selected as a launch site, Cudjoe Key could be used as an instrumentation site for both radar and optical tracking. No site preparation, other than the transportation of the instrumentation onto the site, would be required at Cudjoe Key. No wetlands would be disturbed.

Flight Test Activities

Impacts to surface soils within the Cudjoe Key ROI would be similar to those expected from a launch at Santa Rosa Island. Refer to section 3.1.5.4 for a discussion of impacts from flight test activities.

Cumulative Impacts

Construction of facilities in support of TMD testing would disturb 0.23 hectare (0.58 acre) of previously disturbed ground at Cudjoe Key. Of that disturbance, there would be no wetlands disturbance. No other projects have been identified at this location

for the foreseeable future which, when combined with the proposed action, would result in cumulative impacts.

Mitigations Considered

Because soils are predominately alkaline, only small, short-term impacts to geology or soils would result due to missile launches. Therefore, no mitigations are proposed. However, SOPs used during construction and operations would include: (1) providing site personnel involved in construction activities with an environmental awareness orientation to make the personnel aware of their responsibilities with regard to threatened and endangered species, cultural resources, allowable activities on sensitive and protected lands, erosion control, and hazardous materials management; and (2) implementing an emergency response plan (similar to appendix J) prior to launch which specifies the requirement for an onsite recovery team for debris recovery.

3.3.5.4.2 Saddlebunch Keys

Construction of Option 1 facilities in support of TMD testing would disturb 0.63 hectare (1.56 acres) of ground at the Saddlebunch Keys Transmitter Site. Of that Option 1 disturbance, 0.62 hectare (1.54 acre) would be wetlands disturbance. Construction of Option 2 facilities in support of TMD testing would disturb 0.9 hectare (2.23 acres) of ground at the Saddlebunch Keys Transmitter Site. Of that Option 2 disturbance, 0.89 hectare (2.2 acres) would be wetlands disturbance. Site preparation activities would have an adverse effect by disturbance of wetlands. Flight test activities would result in deposition of hydrogen chloride and aluminum oxides in the vicinity of the launch pad.

No-action Alternative

Under the no-action alternative, the proposed ground-based TMD test activities at Saddlebunch Keys would not be implemented. Current operations at Saddlebunch Keys would continue.

Activities at the Saddlebunch Keys transmitter site that may effect soils are primarily grounds maintenance activities. Mowing is confined to the rights of way of roads on the base. There have been no identified construction projects at the Saddlebunch Keys transmitter site.

Site Preparation Activities

TMD construction would consist of constructing a launch pad, a MAB, and a launch control building. There are two options for the site layout. The first option proposes a launch pad close to the radio antennas with a MAB at the eastern end of the site. The first option would disturb 0.63 hectare (1.56 acres) of land, 0.23 hectare (0.58 acres) of which is on previously disturbed areas, and 0.4 hectare (0.98 acre) on previously undisturbed land. The second option proposes a launch pad and MAB collocated approximately 122 meters (400 feet) west of the VOA antenna towers. The second option would disturb 0.9

hectare (2.23 acres) of land, 0.18 hectare (0.44 acre) of which is on previously disturbed areas, and 0.72 hectare (1.79 acres) on previously undisturbed land.

Installation activities for TMD support facilities would involve routine construction activities. If Cudjoe Key were to be selected as a launch site, Saddlebunch Keys could be used as an instrumentation site for both radar and optical tracking. No site preparation, other than the transportation of the instrumentation onto the site, would be required at Saddlebunch Keys for use as an instrumentation site.

Flight Test Activities

Impacts to surface soils within the Saddlebunch Keys ROI would be similar to those expected from a launch at Cudjoe Key. See section 3.1.5.4 for a discussion of impacts from flight test activities.

Cumulative Impacts

Construction of the TMD test facilities on Saddlebunch Keys would take place on land owned by Naval Air Station, Key West. This site was developed and is operated by the Naval Computer Telecommunications Area Master Station Atlantic Detachment. Current transmission and support activity will continue for the foreseeable future and there are no current plans for additional DOD projects. Residential and commercial development has continued at a moderate rate in Monroe County with some increase in population on Cudjoe Key.

No other projects have been identified at this location for the foreseeable future which, when combined with the proposed action, would result in cumulative impacts.

Mitigations Considered

Site preparation activities for either option at Saddlebunch Keys would result in disturbance to jurisdictional wetlands. Should this site be selected, specific mitigation measures will be developed in consultation with the appropriate agencies.

Because soils are predominately alkaline, only small, short-term impacts to geology or soils would result due to missile launches. Therefore, no mitigations are proposed. However, SOPs used during construction and operations would include: (1) providing site personnel involved in construction activities with an environmental awareness orientation to make the personnel aware of their responsibilities with regard to threatened and endangered species, cultural resources, allowable activities on sensitive and protected lands, erosion control, and hazardous materials management; and (2) implementing an emergency response plan (similar to appendix J) prior to launch which specifies the requirement for an onsite recovery team for debris recovery.

3.3.6 HAZARDOUS MATERIALS AND HAZARDOUS WASTES

Both of the alternative launch sites on Cudjoe Key and Saddlebunch Keys currently generate less than 100 kilograms (220 pounds) of hazardous wastes per month. They are classified under RCRA as conditionally exempt small quantity generators of hazardous waste. TMD site preparation activities and normal flight test activities would not generate sufficient quantities of hazardous materials to affect that status.

3.3.6.1 Resource Description and Evaluative Methods

Refer to section 3.1.6 for a description of this resource area.

3.3.6.2 Region of Influence

The ROI would encompass Cudjoe Key, including all geographical areas within the LHA that might be affected by a release of a hazardous substance generated by TMD activities. For the Saddlebunch Keys site, the ROI is the land area within the property boundaries, including all geographical areas within the LHA that might be affected by a release of a hazardous substance generated by TMD-related activities.

3.3.6.3 Affected Environment

3.3.6.3.1 Cudjoe Key

Hazardous Materials

The Cudjoe Key site has an Interservice Support Agreement (ISSA)/Host Tenant Support Agreement (HTSA) with NASKW. NASKW is responsible for the administration of programs for the control and disposal of hazardous materials. Also included is resource recovery programs, environmental audits and inspections, and technical guidance (Naval Air Station, Key West, 1994). The locations of hazardous materials issue points, satellite accumulation points, and ASTs are identified in figure 3.3.6-1.

Hazardous materials may be procured if they are on a distributed list made available by the maintenance supervisor. If hazardous materials not listed on the above-mentioned list, then the staff must notify the maintenance supervisor before bringing them onsite. (McClain, 1997a)

The Cudjoe Key site implemented *Standard Operating Instruction (SOI) 19-05* for its Spill Prevention Controls and Countermeasure Plan (SPCC) to prevent discharges of petroleum, oil, and lubricants (POL) in harmful quantities (Hayes, 1996) as well as Standard Operating Instruction (SOI) 19-04 for its recoverable and waste petroleum product management plan (Hayes, 1995). Table 3.3.6-1 lists the storage tanks on Cudjoe Key site. There are four ASTs on the Cudjoe site.

EXPLANATION

- Roads
- DOD Property Boundary
- Hazardous Materials Issue Point (there are none)
- Satellite Accumulation Point
- 90-Day Accumulation Site (there are none)
- Aboveground Storage Tank
- POL Building

NORTH

Scale 1:24,000

0 1,000 2,000 Feet

0 250 500 Meters

Hazardous Material and Hazardous Waste Storage Locations

Cudjoe Key, Florida

Figure 3.3.6-1

cud-24k-3hazmat001

Table 3.3.6-1: List of Storage Tanks on Cudjoe Key Aerostat Site

Tank Location	AST or UST	Size in liters (gallons)	Contents
Near Bldg #12928	AST	11,355 (3,000)	Diesel
North side of the site	AST	5,677.5 (1,500)	MUR
Near Bldg #928	AST	1,135.5 (300)	Diesel
Near Bldg #928	AST	1,135.5 (300)	Diesel

AST = Aboveground storage tank
MUR = Mogas unleaded regular
UST = Underground storage tank

Source: Hayes, 1996.

Due to the nature and volume of hazardous materials onsite, a Tier I/II inventory is not necessary in order to comply with EPCRA. (McClain, 1997b).

Hazardous Waste

SOI Hazardous Waste Management 19-01 provides the site-specific information and guidance for the proper handling, storage, transportation, and disposal of hazardous waste. It also includes instructions for the management of certain non-hazardous wastes and reclaimable products (i.e., used oil, spent absorbent). (Hayes, 1994a)

As defined under RCRA, the Cudjoe Key site is a conditionally-exempt small quantity generator (CESQG) and therefore generates less than 100 kilograms (220 pounds) of hazardous waste per month. (McClain, 1997a) Even though the Cudjoe Key site is a CESQG, they operate as though they are a small quantity generator (100 to 1,000 kilograms [220.5 to 2,204.6 pounds]) because they conduct weekly inspections, provide training, and obtained an EPA ID (FL 5570028451). Management of hazardous waste is the responsibility of the NASKW through the ISSA/HTSA agreement. NASKW has a RCRA Part B permit to operate as a treatment, storage, and disposal facility pursuant to Florida Statutes Section 403.722. Hazardous wastes may be accumulated up to 1,000 kilograms (2,204.6 pounds) at any one time until the waste is disposed of by a licensed waste hauler contracted by DRMO-NASKW. DRMO-NASKW will only accept hazardous waste for which it is permitted. Specific types of hazardous wastes which were generated on Cudjoe Key in 1996 are described in table 3.3.6-2.

To reduce the amount of hazardous waste generated, the Cudjoe Key Site has implemented *Hazardous Waste Minimization Plan SOI 19-03* (Hayes, 1994c).

A building onsite known as the POL Building was formerly used to store hazardous waste by former tenants. It does not require an environmental baseline study. (McClain, 1997b) A landfill is located 1.9 kilometers (1.2 miles) from the installation property boundary line and 2.7 kilometers (1.7 miles) from the launch pad. (Florida Marine Research Institute, undated)

Table 3.3.6-2: 1996 Hazardous Wastes or Reclaimable Products Generated on the Cudjoe Site

Chemical	Amount Generated in liters (gallons)
Regulated Used Rags	919.9 (243)
Paint-Related Material	177.9 (47)
Acid (sulfuric acid, battery acid)	132.5 (35)
Diesel	189.3 (50)
Gasoline	75.7 (20)
Fluorescent Light Bulbs	*

*Not routine
Source: McClain, 1997b.

There are no IRP, AOC, or Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites on the Cudjoe Key site (McClain, 1997a). Explosive ordnance disposal activities are not performed at the Cudjoe Key site.

3.3.6.3.2 Saddlebunch Keys

Hazardous Materials

The Saddlebunch Keys site has an ISSA with NASKW to handle hazardous material incidents (Kempshall, 1997). The Saddlebunch facility has an ISSA with NASKW utilizing the Consolidated Hazardous Material Reutilization and Inventory Management Program (CHRIMP). A fundamental element of the Navy's life cycle control and management of hazardous materials, CHRIMP mandates procedures to control, track, and reduce the variety and quantities of hazardous materials. The CHRIMP concept established Hazardous Materials Minimization Centers (HAZMINCENS) as the inventory control centers of hazardous materials. All departments, tenant commands, and work centers must order hazardous materials from HAZMINCENS. (Naval Supply Systems Command, undated) There is one 37,850 liter (10,000 gallon) diesel fuel AST on the Saddlebunch Keys facility at the northwest corner of the building.

Hazardous Waste

As defined under RCRA, the Saddlebunch Keys site is a CESQG. Management of hazardous waste is the responsibility of the NASKW because of the ISSA. NASKW has a RCRA Part B permit, to operate as a treatment, storage, and disposal facility pursuant to Florida Statutes Section 403.722. DMRO-NASKW will only accept hazardous waste for which it is permitted.

There are no IRP, AOC, or CERCLA sites on the Saddlebunch Keys site (McNeill, 1997). Explosive ordnance disposal activities are not performed at the Saddlebunch Keys site (Kempshall, 1997).

There is one FUDS located within the ROI which is eligible for more investigation based on limited historical or circumstantial information.

3.3.6.4 Environmental Impacts and Mitigations

No Action Alternative

Under the no-action alternative, the alternative ground-based TMD activities at either Cudjoe Key or Saddlebunch Keys would not be implemented. Continuing operation of Air Force facilities at Cudjoe Key generate small amounts of hazardous materials and wastes. Continuing operation of Navy and VOA transmissions from Saddlebunch Keys would also use and generate small amounts of hazardous materials and wastes.

Site Preparation and Flight Test Activities

Both Cudjoe Key and Saddlebunch Keys are classified as RCRA conditionally exempt small quantity generators of hazardous waste. TMD site preparation activities and normal flight test activities would not generate sufficient quantities of hazardous materials to affect that status.

Cumulative Impacts

Construction at either site would last approximately 8 months and would consume typical hazardous materials and generate typical hazardous wastes such as oily rags and incidental cleaning fluids, etc. This would amount to less than 100 kilograms (220.5 pounds) of hazardous wastes for the period of construction.

Flight test activities would generate less than 1 kilogram (2.2 pounds) of hazardous waste per test event, or 240 kilograms (529.2 pounds) per year for the 10-year period of the TMD program. There are no foreseeable activities for either site that would cause a cumulative impact on hazardous materials or hazardous waste at the sites.

DOD hazardous waste generation numbers have been in a downward trend reflecting the general DOD management attention to reducing the amount of hazardous materials ordered and the distribution controls within the organization through the pharmacy management approach. Hazardous materials use at Cudjoe Key and Saddlebunch Keys are also likely to continue this decreasing trend.

Mitigations Considered

Minimize refueling operations during construction.

Site personnel involved in construction activities would receive an environmental awareness orientation to make the personnel aware of their responsibilities with regard to threatened and endangered species, cultural resources, allowable activities on sensitive and protected lands, erosion control, and hazardous materials management.

Implement emergency response plan (similar to appendix J) prior to test activities which includes notification procedures and onsite recovery team for response to debris recovery.

3.3.7 LAND AND WATER USE

The Cudjoe Key LHA overlaps 30 parcels of property, 18.4 percent of which are non-Federal land. The impacts of TMD activities at either Cudjoe Key or Saddlebunch Keys to recreational use and to water based activities would be temporary. Proposed land use on Cudjoe Key or Saddlebunch Keys sites would not be compatible with the Monroe County Comprehensive Plan.

3.3.7.1 Resource Descriptions and Evaluative Methods

Refer to section 3.1.7.1 for a description of land and water use as presented in this document.

3.3.7.2 Region of Influence

The region of influence for land and water use is the proposed LHA.

3.3.7.3 Affected Environment

The Florida Keys are a series of islands that extend in a southwesterly direction off the southernmost tip of Florida in Monroe County. The Florida Keys are surrounded by water with the Gulf of Mexico located to the north and the Atlantic Ocean located to the south. Approximately 90 percent of Monroe County is located on the Mainland. (Monroe County, 1993) The Mainland portion of Monroe County includes the Everglades National Park and the Big Cypress National Preserve.

The three primary municipalities of the Florida Keys are Key West, Key Colony Beach, and Layton (Monroe County, 1993). U.S. 1 (Overseas Highway) connects the 38 main keys to each other and the mainland. The distance between Dade County and Key West is approximately 180.2 kilometers (112 miles). The Florida Keys are grouped into three main areas: the Upper Keys, the Middle Keys, and the Lower Keys. The Upper Keys consist of unincorporated Monroe County north of the Whale Harbor Bridge between Windley Key/Holiday Isle and Upper Matecumbe Key/Islamorada. The Middle Keys extend from the Whale Harbor Bridge to the Seven Mile Bridge at Bahia Honda with the exception of the cities of Layton and Key Colony Beach. The Lower Keys include the area south of the Seven Mile Bridge, with the exception of the City of Key West. The Dry Tortugas and over 200 offshore islands are also included in the unincorporated portions of the Florida Keys. The offshore islands are primarily small, mostly undisturbed islands that are only accessible by boat.

The unique geological features and location of Florida Keys are a major attraction for local residents and tourists who participate in water-related recreation activities. Some of the more popular water-based recreational activities in the Florida Keys include boating, fishing, scuba diving, and snorkeling.

In 1990, 15,595 pleasure boats were registered in Monroe County, about one for every two households. Peak recreational boating times are between November and February, around Easter, and again in the summer. Residents of neighboring counties in

South Florida often trailer boats to the Florida Keys during the summer. The Florida Keys contain 163 public and private marinas. The majority of the marinas occur in Key Largo (57), Marathon (39), Islamorada (31), and Key West (20). There are also 103 public and 22 private boat ramps (U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 1995a).

The majority of scuba diving occurs on the Atlantic side of the Florida Keys. The average depth of water on the Gulf of Mexico side is only 1.8 meters (6 feet) and is too shallow for most diving activities. Popular dive spots include the Key Largo National Marine Sanctuary and the John Pennekamp Coral Reef State Park in the Upper Keys and the Looe Key National Marine Sanctuary located in the Lower Keys (figure 3.3.7-1).

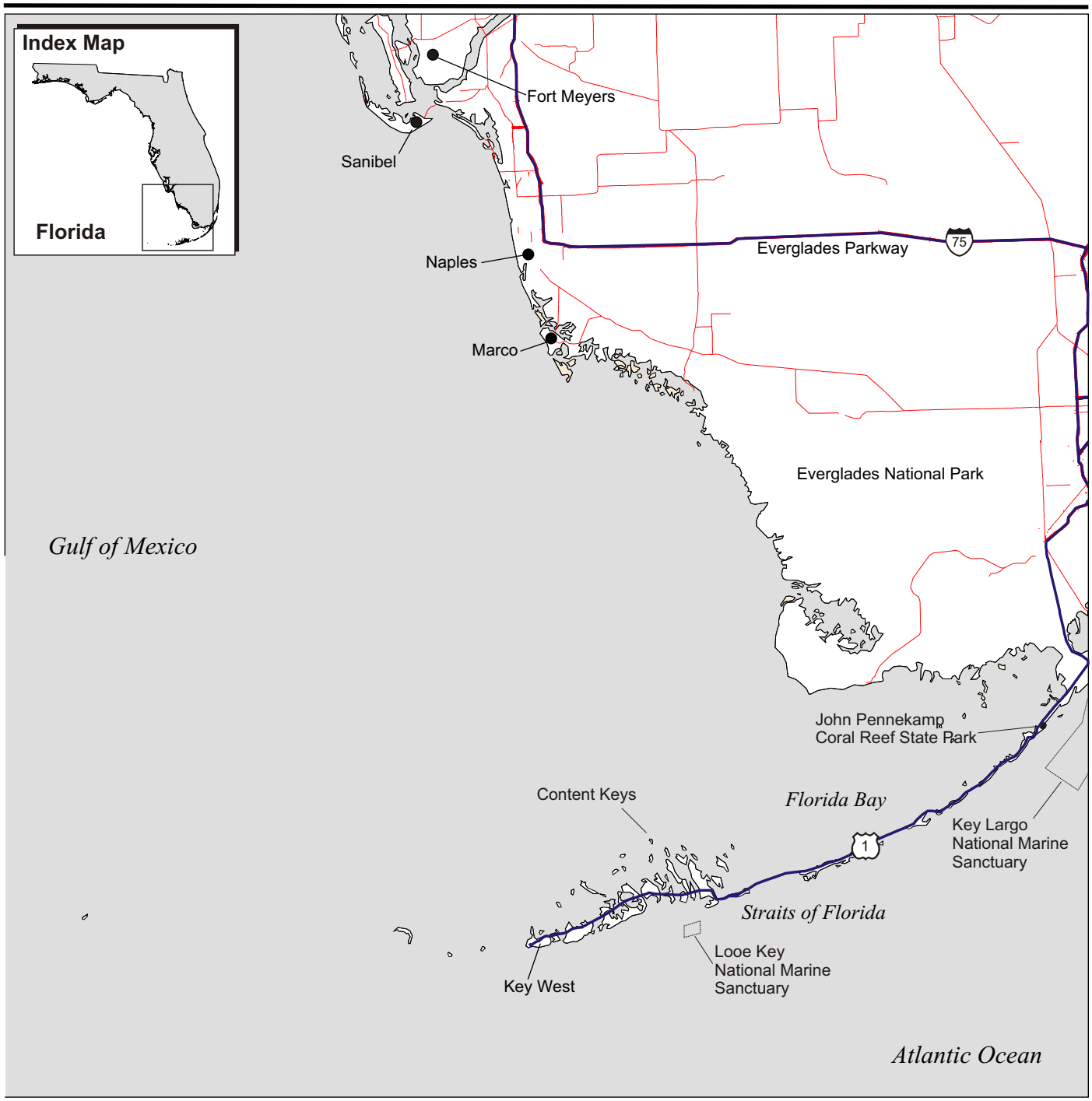
The Gulf of Mexico side of the Lower Keys includes scattered patch reefs that form a loose band approximately 7 kilometers (4.3 miles) from shore. This band of patch reefs extends from Key West northeast past Big Pine Key. One of the most commonly visited coral reef habitats on the Gulf side of the Florida Keys is called the rock-pile. It is located along the 5.5 meters (18 feet) depth contour, north to northwest of the Content Keys. The high-relief, boulder-like coral heads of the rock-pile provide habitat for a diverse mix of temperate and tropical fauna National Oceanic and Atmospheric Administration 1995).

Diving in the Gulf of Mexico is primarily limited to lobster season, a period of about 2 weeks in late July and early August. Lobster diving in the Gulf of Mexico occurs in the area from Key West to Marathon as far north as Content Keys. The largest lobstering area is Content Keys located 4.4 kilometers (2.7 miles) from Cudjoe Key and 6.9 kilometers (4.3 miles) from Saddlebunch Keys (figure 3.3.7-1).

Charter boat fishing occurs primarily in the Atlantic outside the reef. However, some charter boat fishing takes place in the back-county on the Gulf of Mexico side. The season for charter boat fishing is 15 December through the end of April. Many charter boat owners switch to commercial fishing for April to November. The season for backcountry guided fishing is February through June with fly fishing (catch and release) from March through June. Most fishing charters occur between 8:00 a.m. to 4:00 p.m. Some night fishing for Tarpon occurs in the summer.

Typical backcountry expeditions include a guide that accompanies one or two fisherman in a 5- to 6-meter (16.4- to 19.7-foot) shallow-draft boat. Boats are poled through the clear, shallow waters to fish for bonefish, permit, and tarpon. Most backcountry charter boat guides are located in the Lower Keys, and Stock Island. Charter boat companies are also operated out of Islamorada, Holiday Harbor, and Key West. The greatest concentration of backcountry fishing occurs around Islamorada (U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 1995a).

Reef fishing occurs in deeper waters, often near shipwrecks. The greatest amount of reef fishing occurs in the Middle and Lower Keys and the greatest number of reef fishing boats are located in Key West. Recreationally important fish located on the Gulf of Mexico side of the Florida Keys include spotted seatrout, red drum, bonefish, permit, tarpon, great barracuda, and various sharks. These species are found in the Gulf region. However, they are most common in the Florida Keys' nearshore habitats and tidal



EXPLANATION

Primary Roads

Secondary Roads

Vicinity Location Map

NORTH

Scale 1:1,500,000

0 10 20 Miles

0 20 40 Kilometers

key-1500k-3bio001

Florida Keys

Figure 3.3.7-1

channels. Commercially important fish found in the seagrass habitat of the Gulf of Mexico include the mangrove (gray) snapper, lane snapper, schoolmaster, and mutton snapper (National Oceanic and Atmospheric Administration, 1995).

Cudjoe Channel (1,000 meters [3,280 feet] wide and 6.4 meters [21 feet] deep) is one of the Lower Keys' major back country passes. A series of passes is located to the west of Bow Channel in the Sugarloaf and Saddlebunch keys area. Most of these channels are shallow, ranging from 70 to 380 meters (229.7 to 1,246.7 feet) wide and 0.3 to 0.6 meters (0.98 to 1.97 feet) deep (National Oceanic and Atmospheric Administration, 1995).

3.3.7.3.1 Cudjoe Key

General Land Use

Land use on Cudjoe Key is primarily "conservation" north of U.S. 1, with the exception of the military land use for operating the balloon radar site on the northern portion of the key. The conservation land includes approximately 111.2 hectares (275 acres) of land owned by the Trust for Public Land. The area north of U.S. 1 also includes the Cudjoe Key Incinerator/Transfer Station and Emergency Landfill, the Cudjoe Acres subdivision (approximately 23 houses), a day care center, and a mobile home park (approximately 25 lots). Recreational facilities on Cudjoe Key include two campgrounds, a marina, and a boat ramp. The nearest offsite building to the Cudjoe Key launch site is approximately 2,546 meters (8,353 feet) away.

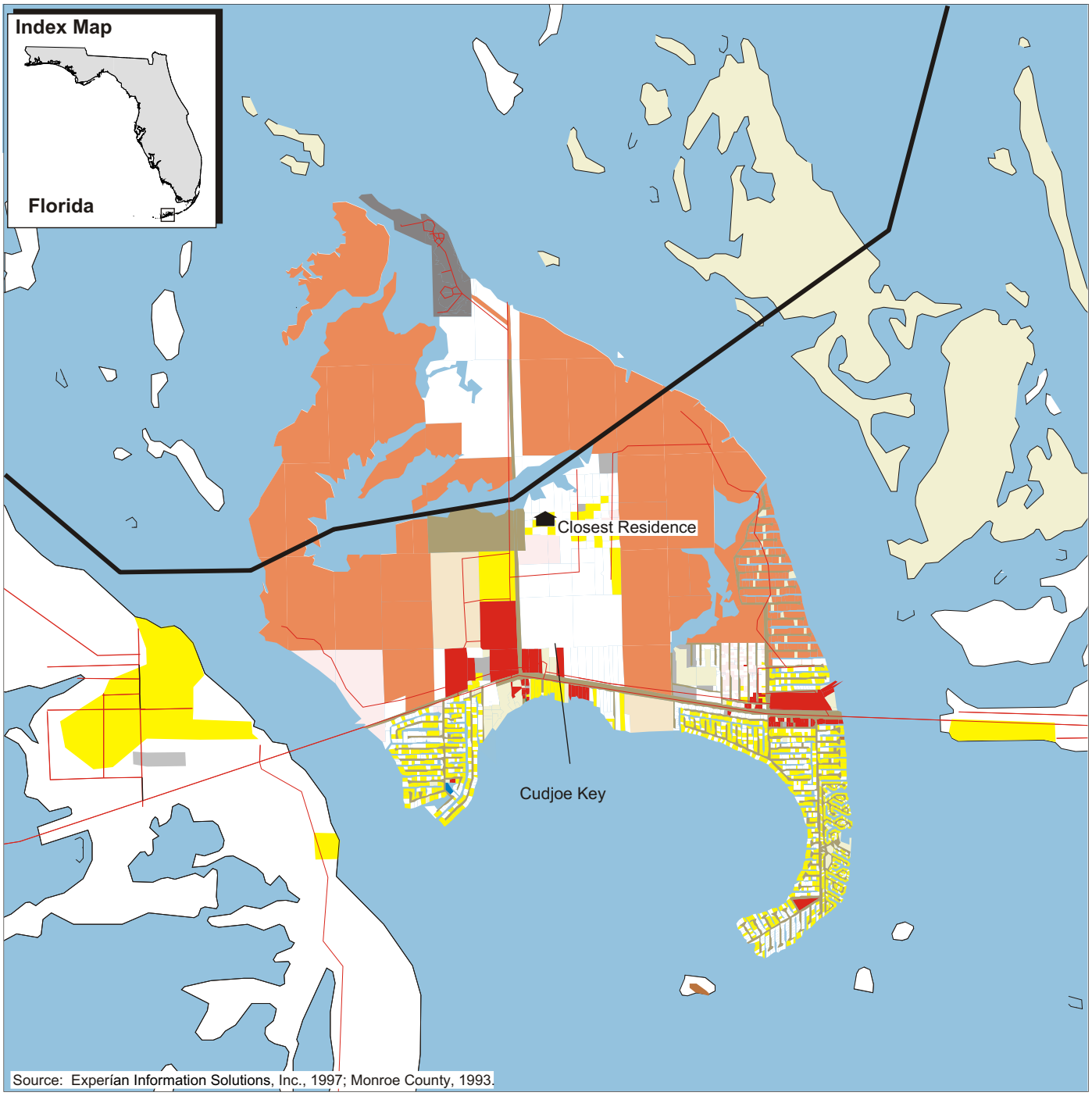
Base Land Use

The existing facility at Cudjoe Key is a balloon radar site operated by the Air Force (figure 3.3.7-2). The site is located on the north end of Cudjoe Key approximately 3.2 kilometers (2 miles) from U.S. 1. The total area at Cudjoe Key sites is 8.9 hectares (22 acres). The site is dominated by two tethering pads for the aerostats used for weather and television transmissions to Cuba. The Cudjoe Key site includes buildings 12921, 12923, 12937, and 12938. Building 12923 is used as a vehicle maintenance facility.

Other additional potential support sites include Boca Chica Key, Fleming Key, and Sugarloaf Key.

Fleming Key, located immediately north of Key West, is part of the NASKW. The existing hardstand at Fleming Key would be used for parking and operations related to the Radar 1 and Range Control. No additional site work would be required. The area immediately south of Fleming Key includes multi-family residential, single family residential, commercial, and a marina located on the water.

Sugarloaf Key would be used as an RDAS instrumentation site. Upper Sugarloaf Key is primarily conservation and vacant land use with a small residential enclave located north of U.S. 1. This residential area also includes Sugarloaf Elementary. Land uses near U.S. 1 include one public facilities site, one commercial facility, and some residential land uses. The area located south of U.S. 1 includes some tourist commercial uses and vacant



EXPLANATION

- Roads
- Launch Hazard Area
- Closest Residence
- Vacant Land
- Residential
- Retail/Commercial
- Public Facilities/Recreational
- State
- County
- Military
- Federal other than Military
- Industrial
- Roads/other
- No Data

Scale 1:50,000
0 .5 1 Miles
0 .8 1.5 Kilometers
NORTH

cud-50k-3land001c

Adjacent Land Use

Cudjoe Key, Florida

Figure 3.3.7-2

land. The primary residential area of Sugarloaf Key contains approximately 225 houses that are located on the southwestern portion of the key.

Boca Chica Key is an alternative site for radar. It lies adjacent to an empty munitions storage area and an area presently used as a small arms range. Originally built as an air defense site for launching Hawk missiles, the facility is abandoned but fenced. Access to the site is controlled through NASKW. Boca Chica Key is primarily military use. Rockland Key located immediately east of Boca Chica has several industrial uses. Big Coppit Key located northeast of Boca Chica Key is primarily single family residential.

Land Ownership

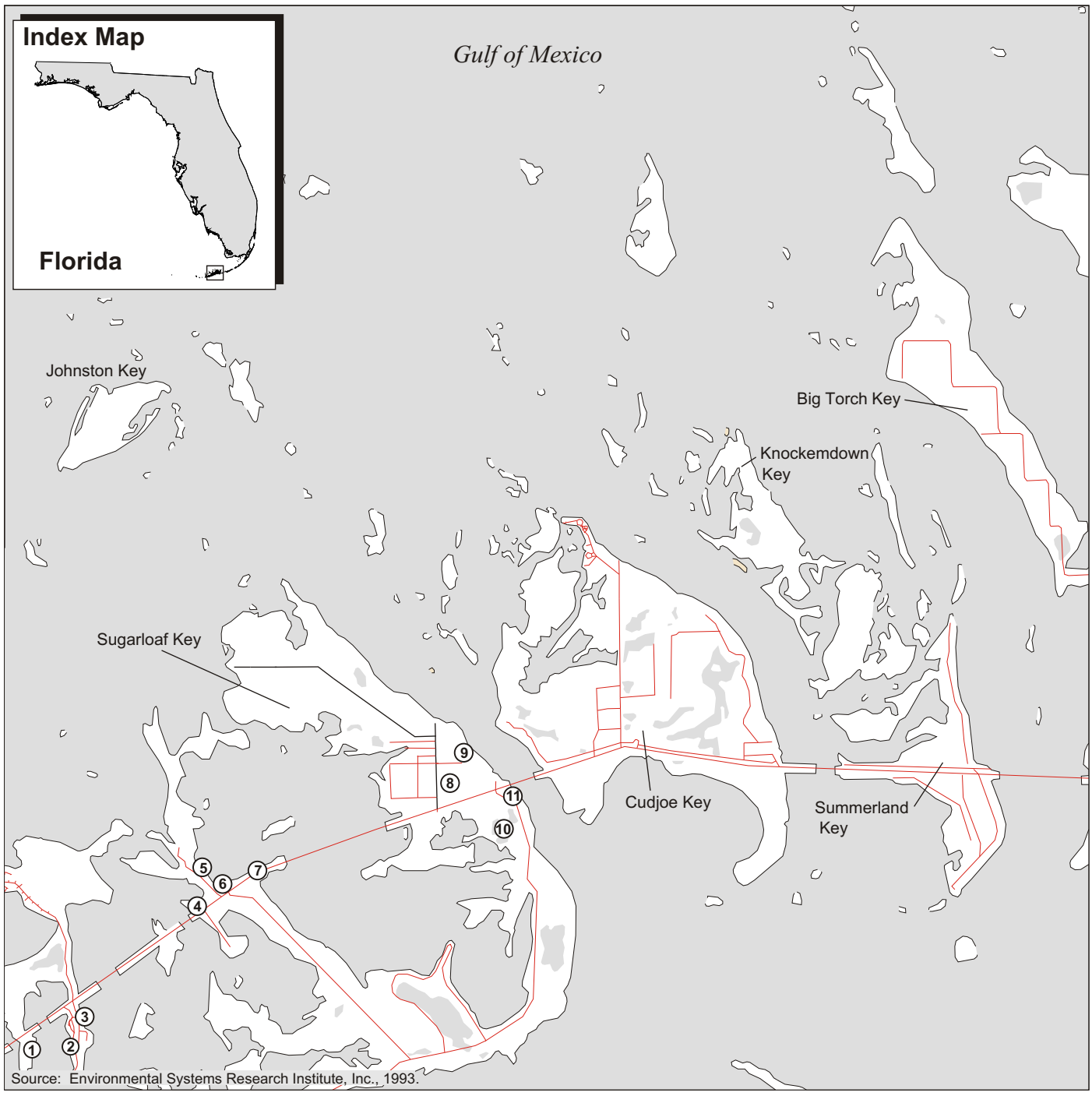
The ROI for Cudjoe Key includes 30 parcels that account for 455.4 hectares (1,125.2 acres). These 30 parcels include 21 Federally owned parcels, 7 non-Federal parcels, and 2 parcels located on uninhabited islands north of Cudjoe Key. The Federally owned property within the ROI is 366.9 hectares (906.7 acres) and includes the proposed test site on Cudjoe Key. The remaining seven non-Federal parcels account for 83.6 hectares (206.5 acres). The two island parcels account for a total of 4.9 hectares (12 acres), and the roads including Blimp Road are a total of 3.1 hectares (7.7 acres). Approximately 18.4 percent of the total 455.4 hectares (1,125.2 acres) of property within the ROI is non-Federal. These non-Federal parcels are zoned Native Area (NA).

Recreational Areas

Recreational facilities on Cudjoe Key include the Blimp Road boat ramp, Cudjoe Gardens Marina, Venture Out Campground, Cutthroat Harbor Estates Campground and the Kemp Channel Fishing Bridge (figure 3.3.7-3). The Blimp Road boat ramp is located 0.4 kilometer (0.2 mile) southeast of the test site. This facility is used on a weekly basis by kayaking tour operations.

The Cudjoe Gardens Marina is located 4.8 kilometers(3 miles) southwest of the Cudjoe Key site and includes 1 boat ramp and a marina with space for 12 boats. The Venture Out Campground is located 6.6 kilometers (4.1 miles) southeast of the test site and includes 60 sites with a boat ramp. The Cutthroat Harbor Estates Campground, located 6.8 kilometers (4.2 miles) south of the site, includes 30 sites. The Kemp Channel Fishing Bridge is located between Cudjoe and Summerland Keys approximately 5.4 kilometers (3.4 miles) southeast of the Cudjoe Key site.

Two camping facilities are located west of Cudjoe Key on Sugarloaf Key. The Lazy Lakes Resorts, located 5.3 kilometers (3.3 miles) southwest of Cudjoe Key site, includes 100 sites. The Sugarloaf Key KOA campground, located 4.8 kilometers (3.0 miles) southwest of the Cudjoe Key site, includes 200 sites. Sugarloaf Key also includes Sugarloaf Lodge and Marina located 8.6 kilometers (5.4 miles) southwest of Cudjoe Key. The Sugarloaf Lodge has 55 rooms and a marina that includes 13 boat slips and a boat ramp. The Indian Mounds boat ramp is located north of U.S. 1 on Sugarloaf Key. Boat ramps are also available at Sugarloaf Lodge (two boat ramps) and Sugarloaf Key KOA Campground.



EXPLANATION

Roads

1. Saddlebunch Key Park
2. Saddlebunch (Bay Point) Junction West Circle/East Circle Drive
3. Saddlebunch (Bay Point) Palm Drive Cul-de-sac
4. Seaplane Rides
5. Bat Tower
6. Sugarloaf Marina
7. Sugarloaf Lodge
8. Sugarloaf Elementary
9. Boat Ramp
10. Lazy Lakes Campground
11. Upper Sugarloaf KOA Campground

Scale 1:100,000

0 1 2 Miles

0 1.5 3 Kilometers

NORTH

Recreational Areas

Cudjoe Key, Florida

Figure 3.3.7-3

cud-100k-3land003

The Florida Keys National Marine Sanctuary (FKNMS), the National Key Deer Wildlife Refuge (NKDWR) and the Great White Heron National Wildlife Refuge (GWHNWR) provide opportunities for viewing a variety of wildlife in their native habitat. Several sea kayaking companies operate kayaking tours throughout these protected areas.

The Coastal Barrier Resource Act protects barrier island units from growth pressures by placing restriction on Federal program funds, such as Federally funded infrastructure and flood insurance. Unit FL-53 covers a sector of submerged land and backcountry immediately north of the Cudjoe Key Aerostat site north and west of the Cudjoe Key Boat Ramp, and extending approximately 3.2 kilometers (2 miles) north across Kemp Channel to Budd Key. The Air Force base is not included in this unit. Moreover, under section 6 (a) (4) military activities essential to national security are exempt. (Kilcollins, 1996)

Protected Areas

The National Marine Sanctuaries Act (NMSA) and the Florida Keys National Marine Sanctuary and Protection Act of 1990 (FKNMSPA) mandate the development of a comprehensive management plan that protects Sanctuary resources and facilities. Sanctuary uses are compatible with the primary objective of resource protection. The management plan was developed consistent with the planning guidelines in NEPA. The environmental and socioeconomic consequences of various alternatives were taken into consideration in developing the final comprehensive management plan for the Sanctuary.

The Final Management Plan and Environmental Impact Statement (FMP/EIS) provides a balanced approach to managing the resources of the Florida Keys by identifying ways of keeping the pulse of the health of the environment and communicating those conditions to the public, while creating ways the public can continue to use and enjoy the Keys environment with the least amount of impact.

The Act designated 2,800 square nautical miles of coastal waters off the Florida Keys as the Florida Keys National Marine Sanctuary. The Sanctuary boundary extends southward on the Atlantic Ocean side of the Keys from the north easternmost point of the Biscayne National Park along the approximate 91.4-meter (300-foot) isobath for over 370 kilometers (200 nautical miles) to the Dry Tortugas. From there it turns north and east, encompassing a large portion of the Gulf of Mexico and Florida Bay, where it adjoins the Everglades National Park. The landward boundary is the mean high water mark. The Key Largo and Looe Key National Marine Sanctuaries; the State Parks and Aquatic Preserves, and the Florida Keys Refuges of the U.S Fish and Wildlife Service are overlapped by the Sanctuary; whereas the Everglades National Park, Biscayne National Park, and Dry Tortugas National Park are excluded from the boundary of the Sanctuary.

The FKNMSPA directed the Secretary of Commerce to develop a comprehensive management plan and implement regulations to protect Sanctuary resources. The Act requires that the plan:

- Facilitate all public and private uses of the Sanctuary consistent with the primary objective of resource protection

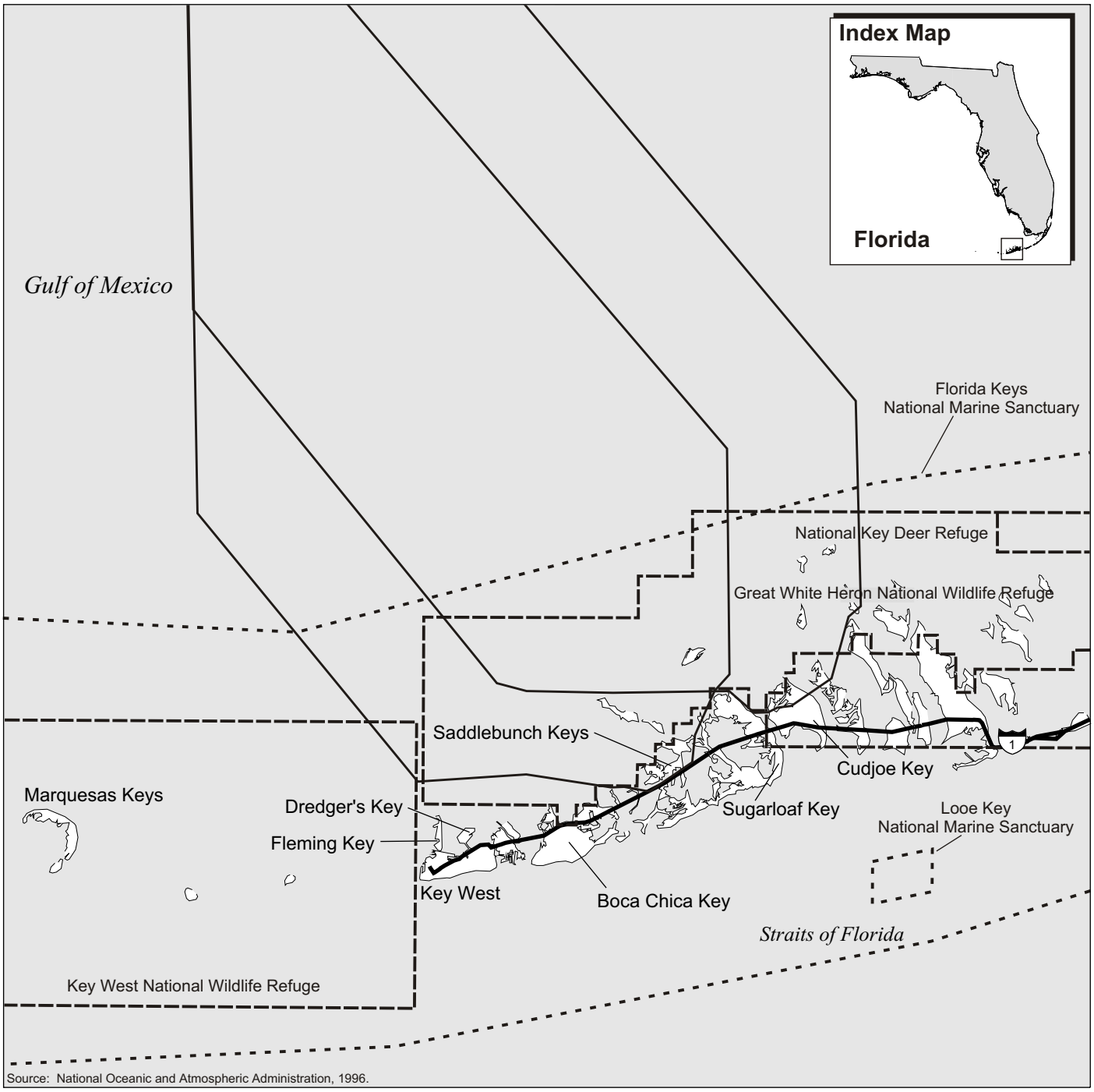
- Consider temporal and geographic zoning to ensure protection of Sanctuary resources
- Incorporate the regulations necessary to enforce the comprehensive water quality protection program developed under Section 8 of the FKNMSPA
- Identify needs for research and establish a long-term ecological monitoring program
- Identify alternative sources of funding needed to fully implement the Plan's provisions and supplement appropriations authorized under Section 10 (16 U.S.C., §1444) of the FKNMSPA and Section 313 of the NMSA
- Ensure coordination and cooperation between Sanctuary managers and other Federal, State, and local authorities with jurisdiction within or adjacent to the Sanctuary
- Promote education among users of the Sanctuary about coral reef conservation and navigation safety
- Incorporate the existing Looe Key and Key Largo National Marine Sanctuaries into the Florida Keys National Marine Sanctuary

The FKNMSPA required NOAA to develop a comprehensive management plan. To meet this mandate, NOAA addressed many problems and issues, such as water quality and land use, that are outside the "traditional" scope of Sanctuary management. The process involved unprecedented participation by the general public, user groups, and Federal, State, and local governments.

Because of the size of the Sanctuary and the variety of resources it contains, many problems never before encountered by Sanctuary management has to be addressed. For example, significant declines in water quality and habitat conditions in Florida Bay are threatening the health of Sanctuary resources. These conditions are thought to be the result of water quality and quantity management in the South Florida region. Such problems must be addressed by management to ensure adequate protection of Sanctuary resources. There is a need, therefore, to explicitly include the agencies with responsibilities in these areas in an ecosystem management approach. (U.S. Department of Commerce National Oceanic and Atmospheric Administration, 1995a)

Cudjoe Key is located within the FKNMS and the NKDWR. The northernmost tip including the test site area is located within the GWHNWR (figure 3.3.7-4). The GWHNWR was established as a refuge and breeding ground for the Great white heron (*Ardea herodias oxydentalis*), other migratory birds, and other wildlife. The refuge encompasses approximately 780 square kilometers (300 square miles) in the Lower Keys.

The National Key Deer Refuge was established to protect the Key deer (*Odocoileus virginianus clavium*) and its habitat. The refuge includes Big Pine Key and several other keys and offshore islands, including portions of No Name, Cudjoe, Ramrod, and Torch keys. National Key Deer Refuge is dedicated to protecting the Key deer, and other



EXPLANATION

- Roads
- National Wildlife Refuge Boundary
- National Marine Sanctuary Boundary
- Launch Hazard Area

Florida Keys National Wildlife Refuge and National Marine Sanctuary Areas

NORTH

Scale 1:500,000

0 4 8 Miles

0 6.5 13 Kilometers

Lower Florida Keys

Figure 3.3.7-4

key-500k-3land003

threatened and endangered species. The refuge is approximately 35 square kilometers (13 square miles). (Monroe County, 1993)

Military activities conducted prior to the adoption of the FKNMS are exempted from regulation. (National Wildlife Refuge System Administration Act of 1966) New military activities in the sanctuary are allowed and may be exempted from selected FKNMS provisions pending consultation with the Director of the FKNMS. The consultation would addresses potential conflicts relating to sanctuary-wide restrictions including prohibition of discharge or deposit of materials into the sanctuary, use of explosives or electrical charges, alteration of, or construction on, or abandoning material on the seabed of the sanctuary, and operating a vessel at more than idle speed within 91.4 meters (100 yards) of marked reefs. In the event of an untoward incident such as spills, groundings or other emergency situations, caused by the DOD, the DOD is required to promptly coordinate with the Director of the FKNMS to respond to potential threats or loss of FKNMS resources.

In addition to the sanctuary-wide restrictions, four zones have been identified to provide specific protective measures. These zones are the Ecological Preserves, the Sanctuary Preservation Areas, Special Uses Areas and Wildlife Management Areas. Four FKNMS Wildlife Management Areas are located within the ROI for Cudjoe Key. No FKNMS Ecological Reserves, Sanctuary Preservation Areas, or Special Use Areas are located within the ROI for Cudjoe Key (figure 3.3.7-4).

The four Wildlife Management Areas are Sawyer Key, East Content Key, West Content Key, and Little Crane Key. Restrictions for these Wildlife Management Areas pertain primarily to idle speed/no wake zones in tidal creeks and coves and no access buffer zones (91.4 meters [300 feet]) around specific keys.

3.3.7.3.2 Saddlebunch Keys

General Land Use

Most of Saddlebunch Keys are vacant or designated conservation land. The primary developed areas are located south of U.S. 1 approximately 1.2 kilometers (1.9 miles) south of the proposed launch site. These areas consist of a recreational vehicle park, two residential subdivisions, and a trailer park. Approximately 175 homes are located in the residential areas located south of U.S. 1 on Saddlebunch Keys.

The nearest offsite building to the Saddlebunch Keys Option 1 launch site is approximately 3,022 meters (9,915 feet). The nearest offsite building to the Saddlebunch Keys Option 2 launch site is approximately 2,950 meters (9,672 feet).

Base Land Use

The transmitter site on Saddlebunch Keys is located on the northern portion of the island (figure 3.2.7-5). The site occupies approximately 2 square kilometers (1.2 square miles) and is the responsibility of NASKW. A contractor operates the site for Naval Computer Telecommunications Area Master Station Atlantic Detachment. The site includes 18 high frequency transmitters that are managed from a single concrete block facility near

the center of the site. Four VOA antennas are located on the western end of the site. These antennas are currently idle in a backup mode. The site is a controlled access facility with an automatic gate located approximately 1.4 kilometers (0.9 mile) north of U.S. 1. (U.S. Department of Defense, Ballistic Missile Defense Organization, 1995)

There are no land use or facilities plans covering this area. There are no planned construction projects for this area.

Other additional potential support sites include Boca Chica Key, Fleming Key, and Sugarloaf Key. There are three options for operations using Saddlebunch Keys and other supporting sites. Land use for these additional sites are the same as the discussion presented above for Cudjoe Key.

Land Ownership

The ROI within the LHA for Saddlebunch Keys includes 60 parcels that account for 594.7 hectares (1,469.4 acres). These 60 parcels include 47 Federally owned parcels, 5 non-Federal parcels, and 8 parcels located in uninhabited areas south of the Saddlebunch site near U.S. 1. The 583 hectares (1,440.5 acres) of Federally-owned land include the proposed test site on Saddlebunch Keys. The remaining five non-Federal parcels account for 9.6 hectares (23.7 acres).

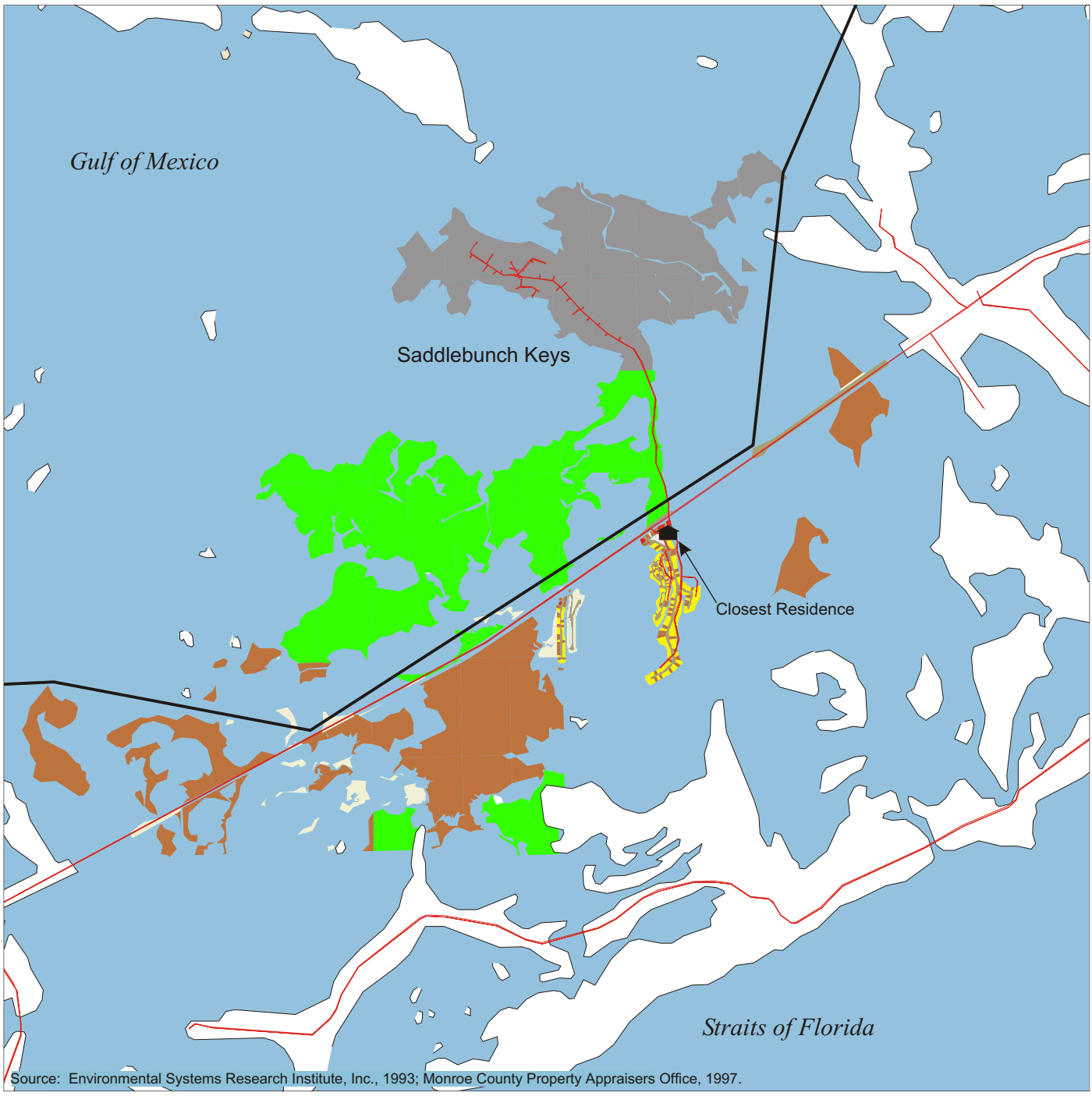
Approximately 1.6 percent of the property within the ROI is non-Federal. The non-Federal parcels within the LHA are zoned Native Area (NA) and Offshore Island (OI). Development in these areas is dependent on the ratio of developable land on these parcels. A wetlands delineation survey would need to be completed in order to determine the development suitability of any of these parcels.

Recreational Areas

Recreational areas near Saddlebunch Keys include a neighborhood park located at the junction of Circle and East Circle Drive near Baypoint (figure 3.3.7-6). This 0.5-hectare (1.2-acre) park is 3 kilometers (1.9 miles) south of the Saddlebunch Keys site and includes play equipment, a volleyball court, and tables. A second park is located on Saddlebunch Keys near Palm Drive. This 0.25-hectare (0.6-acre) park is 3 kilometers (1.9 miles) south of the Saddlebunch Keys site. The property is vacant and has no facilities. Sugarloaf Elementary, located 8 kilometers (5 miles) southeast of Saddlebunch Keys, includes a small baseball field and play area. Sugarloaf Marina has approximately 13 boat slips and 2 boat ramps.

Two campgrounds are located on Sugarloaf Key. These campgrounds include the KOA Campground (200 sites) and Lazy Lakes Campground (100 sites). The KOA campground is located 8 kilometers (5 miles) southeast of Saddlebunch Keys and also includes one boat ramp and a 23-slip marina. The Lazy Lakes Campground is located 8 kilometers (5 miles) southeast of Saddlebunch Keys.

Big Coppit Key, located 7 kilometers (4.3 miles) southwest of the Saddlebunch Keys site, includes the Gulfcrest boat ramp, Del Mar Boulevard Boat Ramp, Caribbean Village Marina, Seaside Marina Park, and an RV/trailer park and campground.



EXPLANATION

- Roads
- Launch Hazard Area
- Closest Residence
- Vacant Land
- Residential
- Retail/Commercial
- Public Facilities/Recreational
- State
- County
- Military
- Federal other than Military
- Roads/other
- No Data

NORTH

Scale 1:50,000

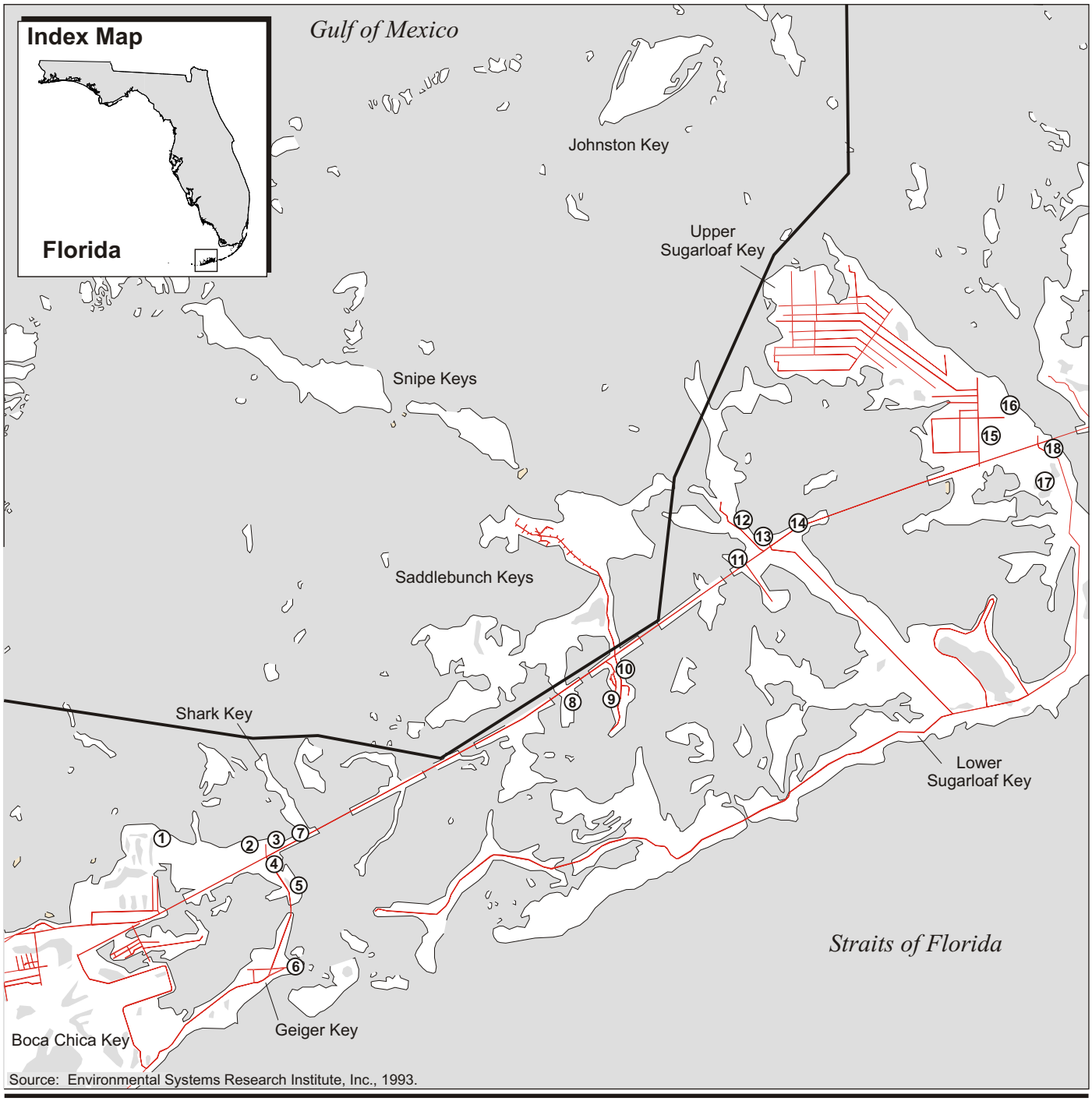
0 .5 1 Mile

0 .8 1.5 Kilometers

Adjacent Land Use

Saddlebunch Keys, Florida

Figure 3.3.7-5



Source: Environmental Systems Research Institute, Inc., 1993.

EXPLANATION

Roads

Launch Hazard Area

1. Gulfcrest Boat Ramp
2. Big Coppitt Delmar Boulevard Boat Ramp
3. Caribbean Village Marina
4. Campground
5. Seaside Park Marina
6. Geiger Key Marina and Trailer Park
7. Shark Key Boat Ramp
8. Saddlebunch Key Park
9. Saddlebunch (Bay Point) Junction West Circle/East Circle Drive
10. Saddlebunch (Bay Point) Palm Drive Cul-de-sac
11. Seaplane Rides
12. Richter C. Perky Bat Tower
13. Sugarloaf Marina
14. Sugarloaf Lodge
15. Sugarloaf Elementary
16. Boat Ramp
17. Lazy Lakes Campground
18. Upper Sugarloaf KOA Campground

Scale 1:100,000

0 1 2 Miles

0 1.5 3 Kilometers

NORTH

key-100k-3land002

Recreational Areas

Saddlebunch Keys, Florida

Figure 3.3.7-6

A boat ramp on Shark Key is located 7 kilometers (4.3 miles) southwest of Saddlebunch Keys. Geiger Key Marina and Travel Park is located 8.5 kilometers (5.3 miles) southwest of Saddlebunch Keys and includes a 20-slip marina and 30 camping sites.

An airplane sight-seeing service is operated out of the Sugarloaf Shores Airstrip located on Lower Sugarloaf Key.

Protected Areas

The Saddlebunch Keys are located within the FKNMS and the GWHNWR (figure 3.3.7-4). The marine sanctuary and the wildlife refuge provide opportunities for viewing a variety of wildlife in their native habitat. Marvin Keys, Snipe Keys, Mud Keys, Lower Harbor Keys, Cayo Aqua Key, Bay Keys, and Sawyer Key are Wildlife Management Areas within the LHA of Saddlebunch. Several sea kayaking companies operate kayaking tours throughout these protected areas.

The Coastal Barrier Resource Act protects barrier island units from growth pressures by placing restrictions on Federal program funds, such as Federally funded infrastructure and flood insurance. Unit FL-53 covers a sector of submerged land and backcountry immediately north of the Cudjoe Key aerostat site north and west of the Cudjoe Key Boat Ramp, and extending approximately 3.2 kilometers (2 miles) north across Kemp Channel to Budd Key. The Air Force base is not included in this unit. Under section 6 (a) (4) military activities essential to national security are exempt (Kilcollins, 1996).

Normal TMD site preparation and flight test activities would be confined to existing military property, not encroaching on adjacent protected land or water areas. Military activities are exempt from the Coastal Area Resource Act but require consultation with the Secretary of Interior (see appendix B).

3.3.7.4 Environmental Impacts and Mitigations

3.3.7.4.1 Cudjoe Key

Site preparation activities would result in temporary impact on land and water use for Cudjoe Key. The proposed LHA overlaps 30 parcels, including 7 non-Federal parcels which compose 8.4 percent of the property within the proposed LHA. The proposed LHA overlaps approximately 4 percent of the FKNMS, approximately 36 percent of the GWHNWR and approximately 20 percent of the NKDWR. Clearance of recreational activities from the LHA for each test event in the winter displaces 2.7 percent of the annual visitors to the Lower Keys. Clearance during the summer launches would displace 0.5 percent of the annual visitors who participated in water-based activities in the Lower Keys, causing a temporary impact.

No-action Alternative

Under the no-action alternative, the proposed ground-based TMD test activities at the Florida Keys locations, including Cudjoe, Fleming, Sugarloaf, and Boca Chica keys would not be implemented. Current operations at these Florida Keys locations would continue.

Under the no-action alternative there would be no effect on private property located in the proposed LHA. The Monroe County Comprehensive Plan shows the current land use within the proposed LHA as Military at the test site and Conservation to the east and west of Blimp Road. The area south of the site is categorized as Vacant. The Future Land use for the test site is Military with a small section south of the road that has been reclassified as Regulated Conservation Land. The Vacant land to the south of the site is also reclassified as Regulated Conservation on the Future Land Use Map. All existing Conservation areas remain designated as Conservation on the Future Land Use Map. The Regulated Conservation land use is an overlay classification established to identify and protect sensitive natural resources. Residential development in these areas is prohibited. Future development in this area will be limited.

Site Preparation Activities

Under the proposed action, site preparation activities at Cudjoe Key less than 0.23 hectare (0.58 acre) would be disturbed.

Due to the restricted size of this candidate site and the need to separate radar and optics from the launch pad at an optimum distance, not all target launch infrastructure could be placed on any one site. There are three options for operations using Cudjoe Key and the supporting sites (Fleming Key, Sugarloaf Key, Saddlebunch Keys, and Boca Chica Key). Land use impacts of Option A are described below because they show maximum use.

Under Option A, Cudjoe Key would require use of nearby sites. Land use impacts for these sites are described below.

The X RDAS on Sugarloaf Key would be located along the access road onto Sugarloaf Key. The existing area would not need clearing. No new access road or additional parking would be required. No site preparation would be required on Sugarloaf Key. The range control instrumentation and radar sites currently exist on Fleming Key and no new construction would be required. The proposed alternate radar site at Boca Chica Key would consist of one van with communications equipment that would be placed on site approximately 1 week before the launch. Site preparation activities at Boca Chica Key would not require land disturbances. Under Option A, site preparation activities at Saddlebunch Keys would not require land disturbances.

The proposed use of Cudjoe Key is consistent with existing military land use. Compatibility with radar and other tracking equipment would be ensured through an ECAC analysis. The construction of the launch pad and MAB would require construction of replacement vehicle maintenance and paint shed facilities, as illustrated on figure 2.3.2-2.

With the relocation of the vehicle maintenance and paint-shed functions, the ESQDs associated with the launch facility and the MAB would affect no occupied buildings.

Flight Test Activities

The proposed LHA for Cudjoe Key overlaps 30 parcels that account for 455.4 hectares (1,125.2 acres). These 30 parcels include 21 publicly owned parcels, 7 non-Federal parcels, and 2 parcels located on uninhabited islands north of Cudjoe Key. The publicly owned 366.9 hectares (906.7 acres) include the proposed test site on Cudjoe Key. The remaining seven non-Federal parcels account for 83.6 hectares (206.5 acres) (figure 3.3.7-7). The two island parcels account for a total of 4.9 hectares(12 acres) and the roads including Blimp Road are a total of 3.1 hectares (7.7 acres). Approximately 8.4 percent of the total 455.4 hectares (1,125.2 acres) of property within the LHA is non-Federal.

Appropriate current and future private land owners would be informed of testing activity. An MOA would be in place with private land owners prior to launch.

Recreation

Recreational facilities within the proposed LHA would be cleared for up to 4 hours during each test event. Recreational facilities within the proposed LHA would include all land based facilities as well as any water bodies that are within the proposed LHA. The proposed LHA for Cudjoe Key includes the boat ramp located at the end of Blimp Road. Access to this facility would be limited during the testing procedure. Overall, clearance of the LHA would occur for up to 4 hours on up to 12 occasions a year. Based on these figures, the maximum amount of time in which people would be cleared from recreational activity in the area would be 48 hours a year.

Recreational facilities within the 9-kilometer (5.6-miles) ROI include five boat ramps, three marinas, four campgrounds, and one fishing bridge. Cudjoe Key is also located within FKNMS, GWHNWR, and the KDNWR. Several sea kayaking companies operate kayaking tours throughout these protected areas. Economic impacts of tourism-related recreation are addressed in section 3.3.10.4.

Protected Areas

The FKNMS covers approximately 9,500 square kilometers (3,669.2 square miles) of area. Approximately 4.3 percent of this area is located within the proposed LHA for Cudjoe Key. New military activities in the National Marine Sanctuary are allowed and may be exempted from select FKNMS provisions pending consultation with the Director of the FKNMS. The GWHNWR covers approximately 500 square kilometers (193 square miles) of area. Approximately 36.4 percent of this area is located within the proposed LHA for Cudjoe Key. The NKDWR covers approximately 500 square kilometers (193 square miles) of area. Approximately 19.8 percent of this area is located within the proposed LHA. Other issues pertaining to wildlife refuges are addressed in Biological Resources (section 3.3.3), Safety (section 3.3.9), and Water Resources (section 3.3.14).

Source: Monroe County Property Appraiser's Office, 1997.

EXPLANATION

- Federal Land
- Non-Federal Land
- No Information
- Roads
- Launch Hazard Area
- Cudjoe Key Site

Scale 1:50,000

0 .5 1 Mile

0 .8 1.6 Kilometers

NORTH

cud-50k-4land001

Non-Federal Parcels

Cudjoe Key, Florida

Figure 3.3.7-7

A letter from the Florida Department of Community Affairs (DCA) dated 13 April, 1998 stated "implementation of any alternative which includes land launches from the Florida Keys would be inconsistent with the FCMP" (see appendices B and E). The alternative target launch sites on Cudjoe Key and Saddlebunch Keys are located on land owned by the Department of Defense and are designated for military use. In accordance with CEQ guidelines, this SEIS includes sufficient analysis to inform the public of potential environmental impacts resulting from the preferred action and alternatives and to assist in the decision making process. In preparing this analysis, the most recent and available data was used to characterize the existing environments and evaluate potential consequences of all alternative sites including those in the Florida Keys. Should either of the alternative sites in the Keys be selected, there would be further consultation with Federal and State agencies.

Although no longer a preferred alternative, the possibility of using a Keys launch site remains if there develops a national need. The property of either alternative Keys site is currently military land, and is recognized as such in the FKNMS management plan. The proposed site preparation and pre-flight activities, although an increase, would not affect the adjacent land uses. Flight test activities would cause increased site occupation and activity, a short-term high noise level, and a visible emissions trail. Flight test activities would include clearing land and water areas of non-mission essential personnel for periods of no more than 4 hours a month.

Cumulative Impacts

Construction of TMD test facilities at Cudjoe Key would take place in a complex of facilities that were originally constructed in 1959 for the purpose of monitoring missiles launches over the Gulf of Mexico. This complex has been altered over the years to accommodate balloon surveillance of the southern Gulf of Mexico and Cuba, but its initial purpose has been retained.

Land use in Monroe County has been changing at a moderate pace in the last 5 years. Residential development has increased the density of population south of U.S. 1 on Cudjoe Key.

Mitigations Considered

Possible mitigations include:

- Provide and distribute advance notification of closure dates and durations to the local public, FMP, Coast Guard, DEM, and marinas.
- Have easements or agreements in place with private land owners prior to launch. Inform appropriate current and future property owners of testing activity.
- Schedule launches to avoid lobster sport day (late July).
- Consider the beginning of lobster season when scheduling launch dates (early August).

3.3.7.4.2 Saddlebunch Keys

Site preparation would result in temporary impact on land and water use at Saddlebunch Keys. The proposed LHA overlaps 60 parcels, including 5 non-Federal parcels which comprise 1.6 percent of the property within the proposed LHA. The proposed LHA overlaps approximately 6 percent of the FKNMS and 41 percent of the GWHNWR. Clearance of recreational activities from the LHA for each test event in the water would displace 2.7 percent of the annual visitors to the Lower Keys. Clearance during the summer launches would displace 0.5 percent of the annual visitors who participated in water-based activities in the Lower Keys, causing a temporary impact.

No-action Alternative

Under the no-action alternative, the proposed ground-based TMD test activities at Saddlebunch Keys would not be implemented. Current operations at Saddlebunch Keys would continue.

Under the no-action alternative, there would be no effect on non-Federal property located in the proposed LHA. The Monroe County Comprehensive Plan shows the current land use within the proposed LHA as Conservation. The future land use for the test site is Military surrounded by Regulated Conservation and Conservation land uses. Regulated Conservation and Conservation land use classifications are for conservation purposes and development is prohibited. Future development in this area is expected to be limited.

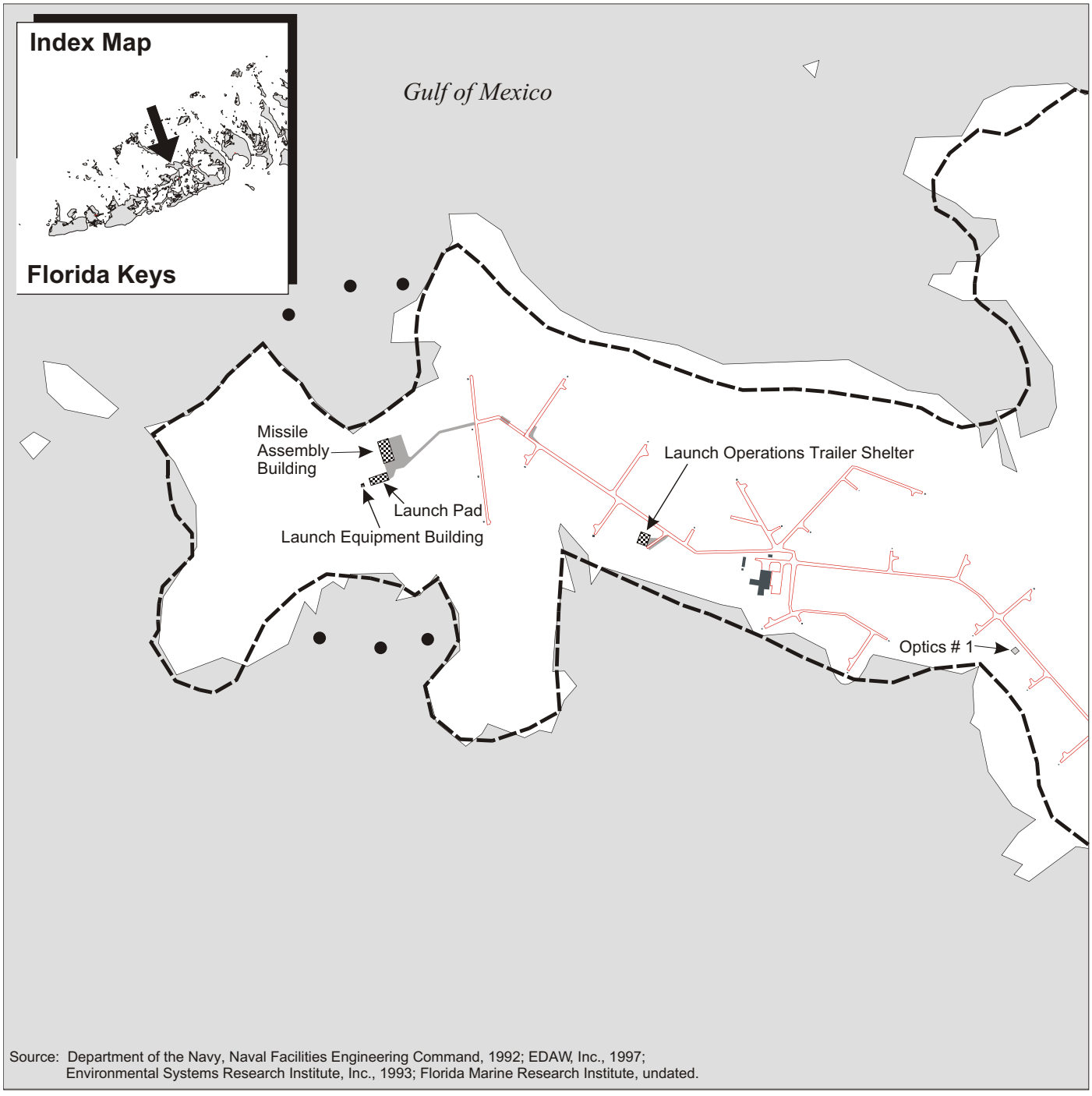
The non-Federal parcels within the proposed LHA are zoned NA and Offshore Island (OS). Development in these areas is dependent on the ratio of developable land on these parcels. Under the no-action alternative, the site would continue to be operated with the 18 high frequency transmitters on site and the four VOA antennas. No new construction is expected in the future.

Site Preparation Activities

The land disturbance for either option is displayed in table 2.2.2-4. The maximum amount of land disturbed under either option is less than 0.9 hectare (2.2 acres) of land (figure 3.3.7-8). This would be a 7.4 percent increase in disturbed land at this site. The other option (figure 3.3.7-9) disturbs less acreage.

The proposed use of Saddlebunch Keys is consistent with existing military land use. Compatibility with radar and other tracking equipment would be ensured through an ECAC analysis.

The proposed launch site is within approximately 125 meters (400 feet) of the VOA antennas. The antennas fall within the proposed 900-foot ESQD, and any future use of the antennas would likely be limited by the use of the launch pad in this location. In addition, the transmitters located at Sites J-1566 and J-1567 fall within the ESQD; investment in these facilities could be lost in the event of an accident.



Source: Department of the Navy, Naval Facilities Engineering Command, 1992; EDAW, Inc., 1997; Environmental Systems Research Institute, Inc., 1993; Florida Marine Research Institute, undated.

EXPLANATION

- Existing Building/Structure
- Proposed Building/Concrete Pad
- Gravel Fill Area
- Government Property
- Warning Buoys

Saddlebunch Keys Launch Option A-2- Alternative Target Launch Location

Saddlebunch Keys, Florida

Figure 3.3.7-8

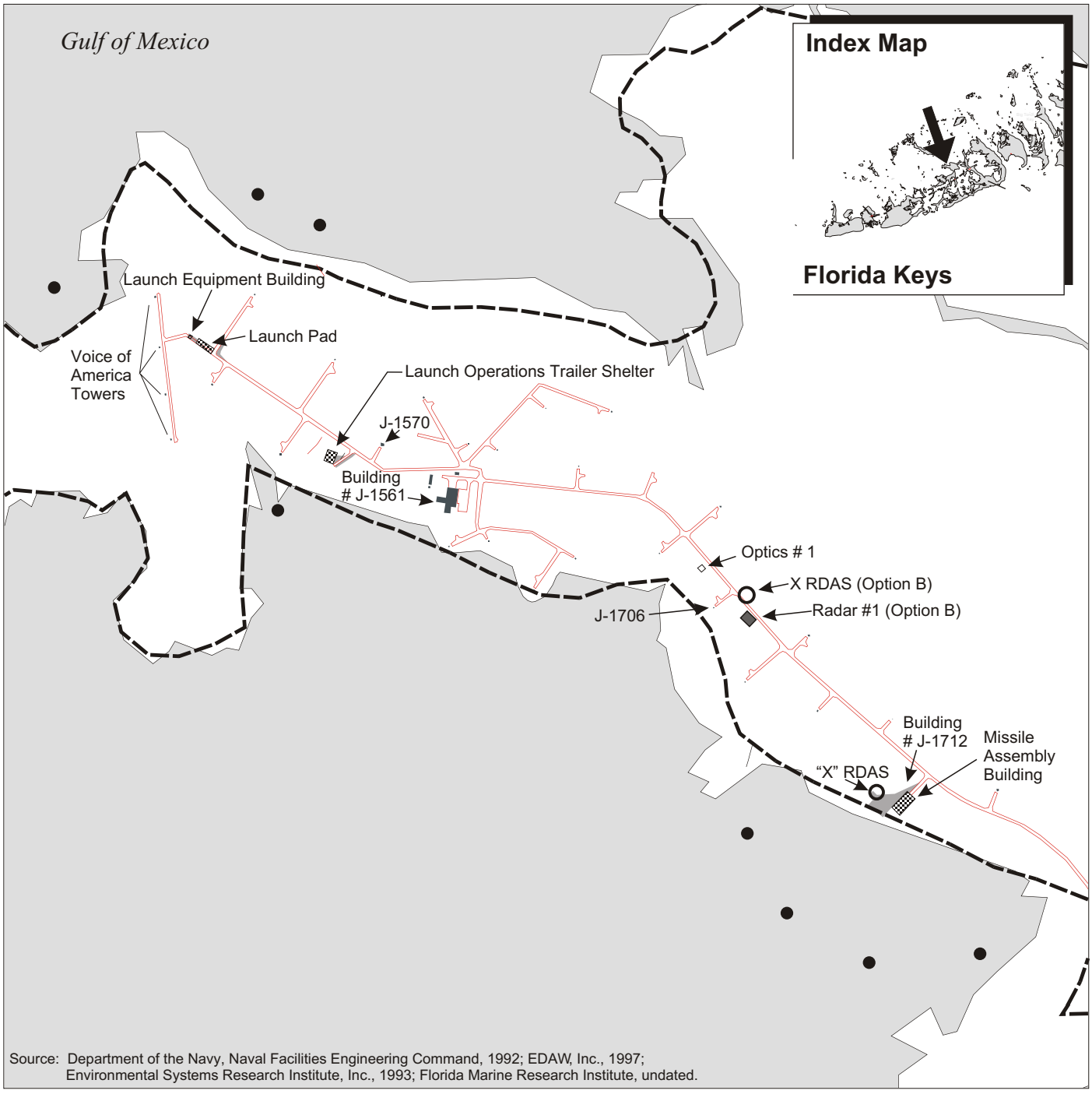
NORTH

Scale 1:9,600

0 800 1,600 Feet

0 250 500 Meters

sad-9600-4hs002



Source: Department of the Navy, Naval Facilities Engineering Command, 1992; EDAW, Inc., 1997; Environmental Systems Research Institute, Inc., 1993; Florida Marine Research Institute, undated.

EXPLANATION

- Existing Building/structure
- Proposed Building/Concrete Pad
- Gravel Fill Area
- Government Property
- Warning Buoys
- Instrumentation

Note: RDAS = Real-time data Acquisition System

NORTH

Scale 1:9,600

0 800 1,600 Feet

0 250 500 Meters

Saddlebunch Keys, Launch Option A-1

Saddlebunch Keys, Florida

Figure 3.3.7-9

Flight Test Activities

Approximately 1.6 percent of the property within the proposed LHA is non-Federal. Currently there are no non-Federal structures within the proposed LHA (figure 3.3.7-10); therefore, no clearance from private property within the LHA is anticipated.

Appropriate current and future private land owners would be informed of testing activity. An easement or agreement would be in place prior to launch.

Recreation

The 1995 National Oceanic and Atmospheric Administration (NOAA) survey found that about 137,000 visitors participated in water-based activities in the Lower Keys, during the year. This represented about 8 percent of all water-based activity by visitors to the Florida Keys in 1995. Use of the waters was highly seasonal. An average of 627 visitors per day participated in water-based activities in the Lower Keys, between December 1995 and May 1996. The average for the off-peak months of June to November 1995 was 127. These figures suggest that clearance for four hours, one day per month, of part of the Lower Keys waters will have a minimal impact on visitors to the Florida Keys. Six test events in the winter would displace 3,762 visitors, or 2.7 percent of the 137,000 visitors. Six test events in the summer would displace 726 visitors, or 0.5 percent of the visitors. (U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 1996a)

Protected Areas

The LHA for Saddlebunch Keys includes approximately 5.5 percent of the FKNMS and approximately 41 percent of GWHNWR. There are no FKNMS Ecological Reserves, Sanctuary Preservation Areas, or Special Use Areas within the LHA for Saddlebunch Keys. New military activities in the National Marine Sanctuary are allowed and may be exempted from selected FKNMS provisions pending consultation with the Director of the FKNMS. Compatibility with these protected areas is discussed in section 3.3.7.4.1.

Normal TMD site preparation and flight test activities would be confined to existing military property, not encroaching on adjacent protected land or water areas. Military activities are exempt from the Coastal Area Resource Act but require consultation with the Secretary of Interior (see appendix B).

A letter from the Florida Department of Community Affairs (DCA) dated 13 April, 1998 stated "implementation of any alternative which includes land launches from the Florida Keys would be inconsistent with the FCMP" (see appendices B and E). The alternative target launch sites on Cudjoe Key and Saddlebunch Keys are located on land owned by the Department of Defense and are designated for military use. In accordance with CEQ guidelines, this SEIS includes sufficient analysis to inform the public of potential environmental impacts resulting from the preferred action and alternatives and to assist in the decision making process. In preparing this analysis, the most recent and available data was used to characterize the existing environments and evaluate potential consequences of all alternative sites including those in the Florida Keys. Should either of

EXPLANATION

- Federal Land
- Non-Federal Land
- No Information
- Launch Hazard Area
- Saddlebunch Keys Site

Scale 1:50,000
0 .5 1 Mile
0 .8 1.6 Kilometers
NORTH

Non-Federal Parcels

Saddlebunch Keys, Florida

Figure 3.3.7-10

the alternative sites in the Keys be selected, there would be further consultation with Federal and State agencies.

Although no longer a preferred alternative, the possibility of using a Keys launch site remains if there develops a national need. The property of either alternative Keys site is currently military land, and is recognized as such in the FKNMS management plan. The proposed site preparation and pre-flight activities, although an increase, would not affect the adjacent land uses. Flight test activities would cause increased site occupation and activity, a short-term high noise level, and a visible emissions trail. Flight test activities would include clearing land and water areas of non-mission essential personnel for periods of no more than 4 hours a month.

Cumulative Impacts

Construction of the TMD project facilities on Saddlebunch Keys would take place within the Naval Air Station property, Key West. This site was developed and is operated by the Naval Computer Telecommunications Area Master Station Atlantic Detachment. Current transmission and support activity will continue for the foreseeable future and there are no current plans for additional DOD projects. Residential and commercial development has continued at a moderate rate in Monroe County with some increase in population on Cudjoe Key.

The land use discussion in section 3.3.7.4.1 pertains to Saddlebunch Keys as well.

Mitigations Considered

Possible mitigations would include:

- Provide and distribute advance notification of closure dates and durations to the local public, FMP, Coast Guard, DEM, and marinas.
- Inform appropriate current and future property owners of test activity.
- Have an easement or agreement in place with private land owners prior to launch.
- Schedule launches to avoid lobster sport day (late July).
- Consider the beginning of lobster season when scheduling launch dates (early August).

3.3.8 NOISE

There would be no health-related sound exposures beyond the LHA. The noise associated with the proposed activities would have a temporary impact on either Keys location.

3.3.8.1 Resource Description and Evaluative Methods

Refer to section 3.1.8.1 for a description of this resource area.

3.3.8.2 Region of Influence

As described in section 3.1.8.2, the ROI for launch noise is a circle with a radius of 9 kilometers (5.6 miles) about each of the proposed launch sites (see figure 3.3.8-1). The ROI for noise generated by construction and by portable diesel fueled power generators is that area which could be exposed to eight hour time weighted average SPLs equal to or greater than 85 dBA.

3.3.8.3 Affected Environment

3.3.8.3.1 Cudjoe Key

Sources of ambient noise at the proposed Cudjoe Key launch site include aircraft traffic from the NASKW airfield and the Key West International Airport, vehicular traffic on local roads, commercial and private motor boats, and wind- and surf-generated noise.

Noise contours from the 1989 NASKW AICUZ (Naval Facilities Engineering Command, Commander, 1989) study show that the L_{dn} = 60 dBA contour, which is the smallest contour calculated in the study, does not overlay the Cudjoe Key noise ROI (figure 3.3.8-2). This study is sufficient to conservatively analyze current conditions at NASKW given that the annual flight operations for NASKW in FY87 was 133,052 and for FY97 was 69,368 (Schaeffner, 1997).

The proposed TMD activities for Cudjoe Key would involve noise confined to Monroe County, Florida. The noise control ordinance of Monroe County regulate noise levels in residential and industrial situations (Monroe County Code, 1978).

The acoustical environment at the proposed Cudjoe Key launch site, as calculated by the methodology of *Guidelines for Preparing Environmental Impact Statements on Noise* (National Academy of Sciences, 1977), is characterized by an LWP of 407 and an NII of 0.109. The background noise levels of the noise ROI for the proposed Cudjoe Key launch site is depicted in figure 3.3.8-3. Details of the land area and population within each 5 dBA YDNL increment are given in table 3.3.8-1.

Source: EDAW, Inc., 1997; Environmental Systems Research Institute, Inc., 1993.

EXPLANATION

- Roads
- ROI - 9 kilometer(5.6 miles) radius
- Potential Launch Site

Region of Influence for Noise

Scale 1:250,000

0 2 4 Miles

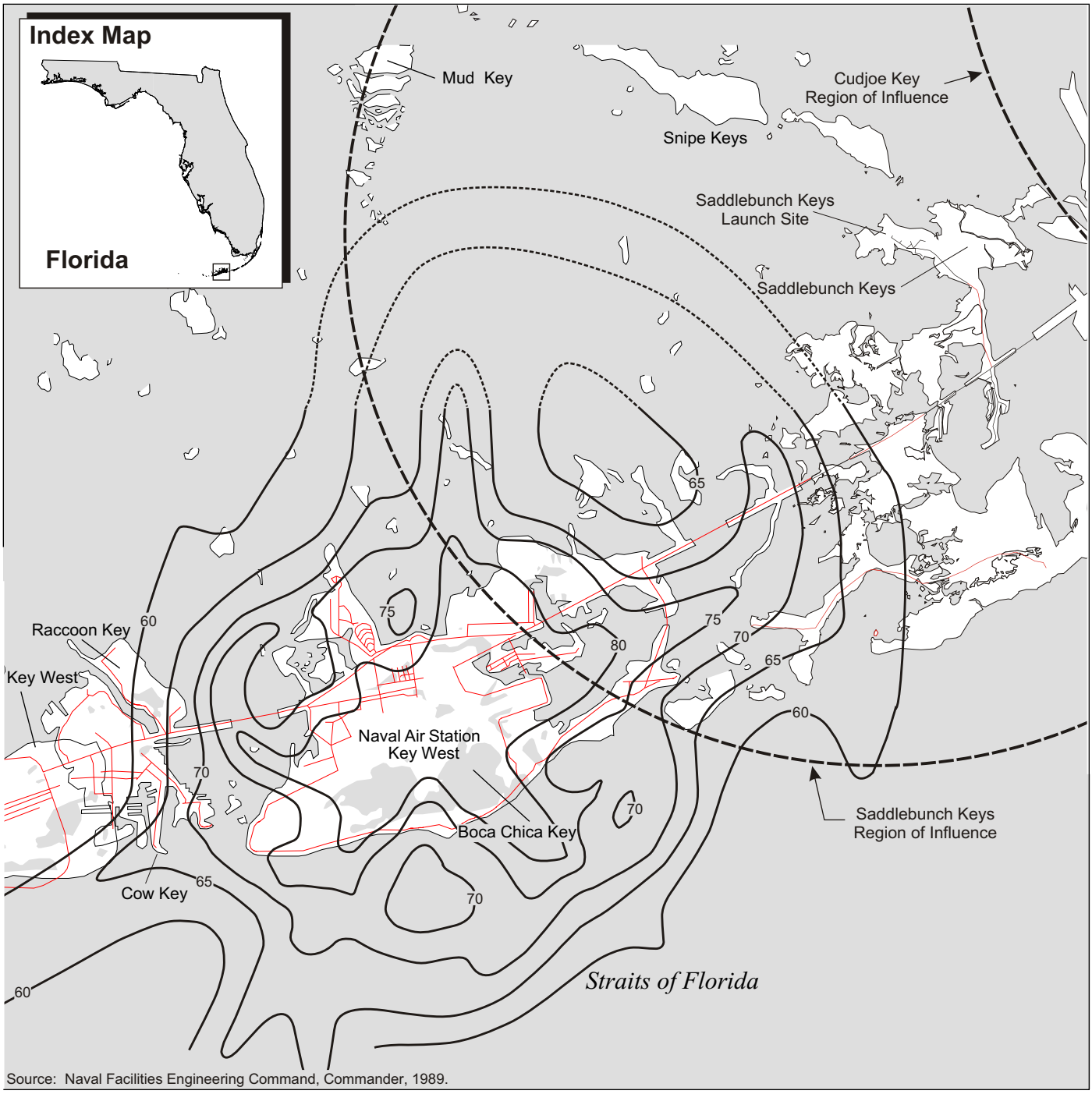
0 3 6 Kilometers

NORTH

key-250k-3noise004

Lower Keys, Florida

Figure 3.3.8-1



EXPLANATION

- Roads
- Noise L_{dn} Contours (dBA)
- Contours Extrapolated for Closure
- Noise ROI

NORTH

Scale 1:100,000

0 1 2 Miles

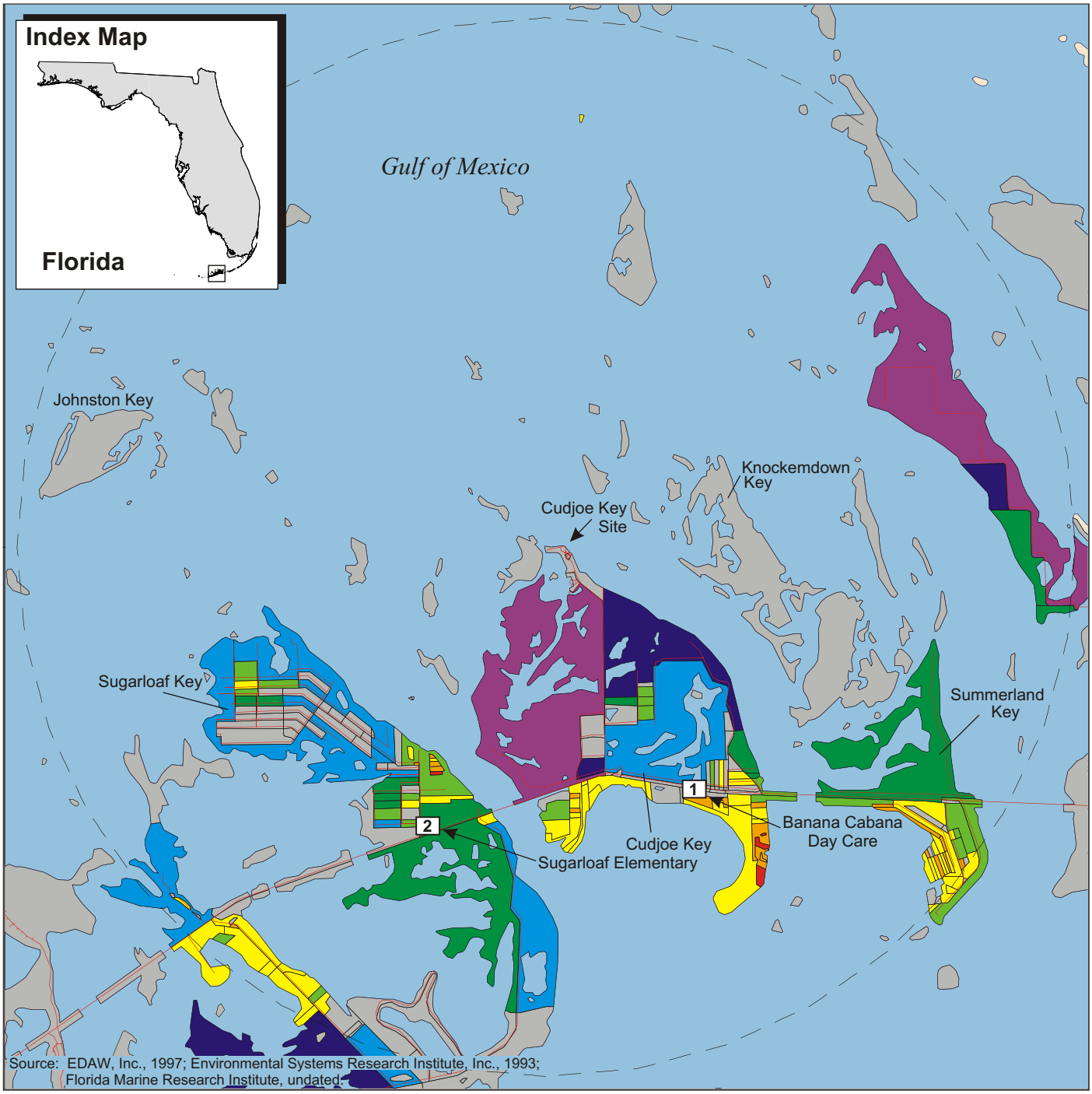
0 1.5 3 Kilometers

boc-100k-3noise001

1989 NASKW AICUZ L_{dn} Contours

Boca Chica Key, Florida

Figure 3.3.8-2



EXPLANATION

- Roads
- Noise Sensitive Receptor
- Noise ROI

L_{dny} for Event in dBA

Excluded from Analysis	40-45
<25	45-50
25-30	50-55
30-35	55-60
35-40	60-65

Note: Sound Level Weighted Population = 408
Noise Impact Index = 0.1095

NORTH

Scale 1:100,000
0 1 2 Miles
0 1.5 3 Kilometers

Cudjoe Key Site Yearly Average Day-Night Sound Level (dBA) - Background

Cudjoe Key, Florida

Figure 3.3.8-3

cud-100k-3noise001

Table 3.3.8-1: Background Noise Environment for Cudjoe Key

YDNL (dBA)	Total Land Area (Square miles)	Population	Noise Sensitive Receptors†	Percent Highly Annoyed*	Number Highly Annoyed
< 25	19.45	0	-	0.05	0
25-30	3.73	15	-	0.10	0
30-35	2.35	26	-	0.20	0
35-40	3.25	137	1	0.41	1
40-45	2.65	237	2	0.83	2
45-50	0.92	414	-	1.66	7
50-55	1.60	2,061	-	3.31	68
55-60	0.17	586	-	6.48	38
60-65	0.03	248	-	12.29	30
TOTAL	-	3,724	-	3.92	146

*Reference: Finegold, Harris, and VonGierke, 1992. +Noise receptor numbers from table 3.3.8-3.

Level Weighted Population (LWP) =408
Noise Impact Index = 0.109

The number and percent of persons highly annoyed by the current noise environment, as calculated by the Method of Finegold et al. (1992), are also given in table 3.3.8-1. Table 3.3.8-2 shows the noise sensitive receptors associated with the Cudjoe Keys site. Of the approximately 3,700 population in the Cudjoe Key ROI, nearly 4 percent are estimated to be highly annoyed by existing background noise.

Table 3.3.8-2: Noise Sensitive Receptors within the Noise ROIs for Cudjoe Keys Sites

Receptor Number	Site	Facility	Population	Location	Distance From Site
1	Banana Cabana Academy (day care facility)	Cudjoe Key	30 students	22290 Overseas Highway (mile marker 22.5) Cudjoe Key	4.8 kilometers (3.0 miles)
2	Sugarloaf Elementary School	Cudjoe Key Saddlebunch Keys	900 Students	255 Crane Boulevard Sugarloaf Key	5.1 kilometers (3.2 miles) from Cudjoe Key

3.3.8.3.2 Saddlebunch Keys

Sources of ambient noise at the proposed Saddlebunch Keys launch site include aircraft traffic from the NASKW, airfield and the Key West International Airport, vehicular traffic on local roads, commercial and private motor boats, and wind- and surf-generated noise.

Noise contours from the 1989 NASKW AICUZ (Naval Facilities Engineering Command, Commander, 1989) study show that the L_{dn} = 60 dBA contour, which is the smallest contour calculated in the study, do overlay the Saddlebunch Keys noise ROI. As discussed in section 3.3.8.3-1, the current flight activity at NASKW is less than the level analyzed in the 1989 AICUZ.

The proposed TMD activities for Saddlebunch Key would involve noise confined to Monroe County, Florida. The noise control ordinance of Monroe County regulate noise levels in residential and industrial situations (Monroe County Code, 1978).

The noise environment at the proposed Saddlebunch Keys launch site, as calculated by the methodology of *Guidelines for Preparing Environmental Impact Statements on Noise* (National Academy of Sciences, 1977), is characterized by an LWP of 724 and an NII of 0.172. Details of the land area and population within each 5 dBA YDNL increment are given in table 3.3.8-3. The background noise level of the ROI for the proposed Saddlebunch Keys launch site is depicted in figure 3.3.8-4.

Table 3.3.8-3: Background Noise Environment for Saddlebunch Keys

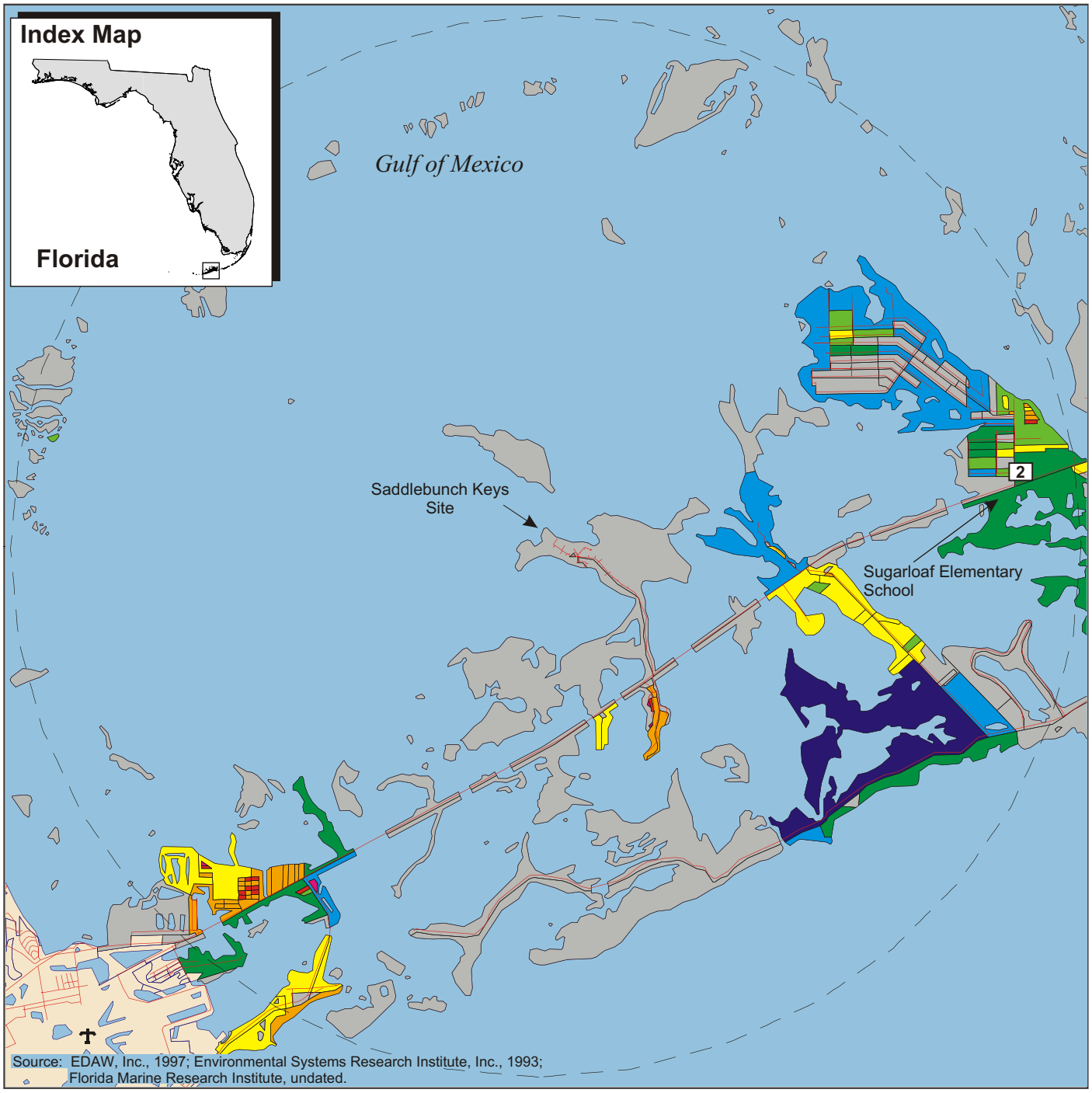
YDNL (dBA)	Total Land Area (Square miles)	Population	Noise Sensitive Receptors+	Percent Highly Annoyed*	Number Highly Annoyed
< 25	18.43	0	-	0.05	0
30-35	1.42	18	-	0.20	0
35-40	2.01	67	-	0.41	0
40-45	1.97	213	2	0.83	2
45-50	0.40	190	-	1.66	3
50-55	1.34	1,513	-	3.31	50
55-60	0.43	1,500	-	6.48	97
60-65	0.04	387	-	12.29	48
65-70	0.01	324	-	22.10	72
TOTAL	-	4212	-	6.46	272

*Reference: Finegold, Harris, and VonGierke, 1992.
+Noise sensitive receptor number from table 3.3.8-2.

Level Weighted Population (LWP) =724
Noise Impact Index = 0.172

The number and percent of persons highly annoyed by the current noise environment, as calculated by the Method of Finegold et al. (1992), are also given in table 3.3.8-3.

The only noise sensitive receptor identified within the Saddlebunch Key launch noise ROI is the Sugarloaf Elementary School. The school is currently attended by approximately 900 students and is located 8 kilometers (5 miles) from the proposed launch site. The baseline annual noise (YDNL) at the school is estimated to be in the range of 40 to 45 dBA. If a Hera missile were launched from the proposed launch site, the school would be expected to experience an equivalent noise level of approximately 68 dBA for 84 seconds. For 24 such launches per year, the background annual noise level at the school would remain at a YDNL in the range of 40 to 45 dBA.



EXPLANATION

- Roads
- Noise Sensitive Receptor
- Noise ROI
- Airfield

L_{dny} for Event in dBA

Excluded from Analysis	40-45
<25	45-50
25-30	50-55
30-35	55-60
35-40	60-65

Note: Sound Level Weighted Population = 724
Noise Impact Index = 0.1719

NORTH

Scale 1:100,000
0 1 2 Miles
0 1.5 3 Kilometers

Saddlebunch Keys Site Yearly Average Day-Night Sound Level (dBA) - Background

Saddlebunch Keys, Florida

Figure 3.3.8-4

Sad-100k-3noise001

3.3.8.4 Environmental Impacts and Mitigations

3.3.8.4.1 Cudjoe Key

The construction-related noise at Cudjoe Key would cause a short-term temporary increase in noise levels. There would be no health-related sound exposures beyond the LHA. Flight test activities would not increase the percentage of the population within the ROI that are highly annoyed.

No-action Alternative

Under the no-action alternative, aerostat missions would continue at their current planned levels. There would be no TMD project-related changes to activities at the potential instrumentation sites. No project-related construction or activities would take place. As such, noise would remain at current levels.

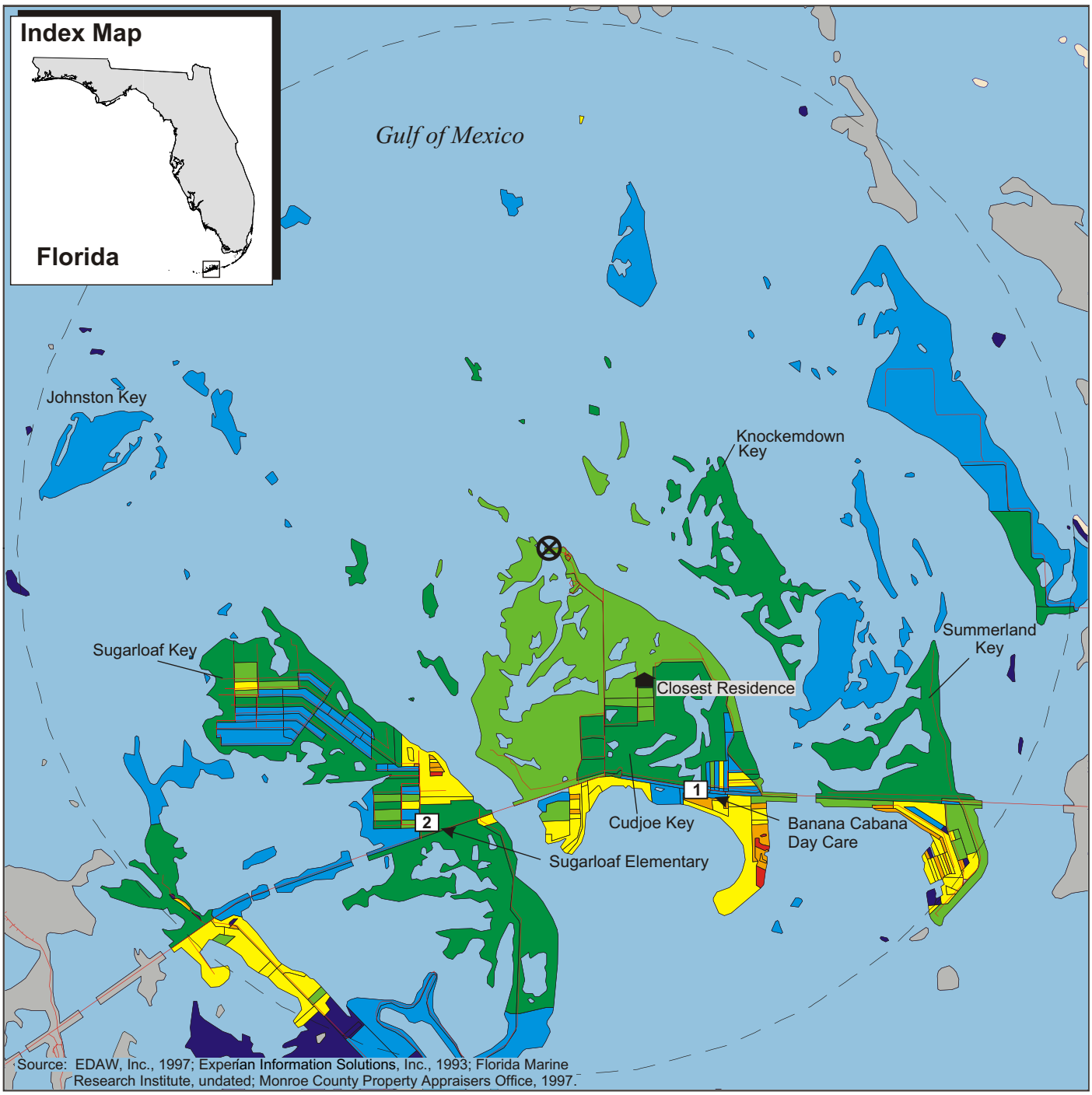
The noise environment at the Cudjoe Key site could be described as moderately quiet. Approximately 40 people commute to the site each day. Raising and lowering the aerostat involves periodic use of some loud equipment for periods as long as an hour. At other times, there are very few human noise sources on the site.

Site Preparation Activities

Site preparation activities would involve routine construction activities. These operations are routinely accomplished in both military and civilian construction operations, and present only occupation-related effects on noise exposure for the workers. Such exposures would occur only for the duration of the construction activities. The proposed work locations on Cudjoe Key do not present any unique construction-related noise exposures to personnel or the public.

Flight Test Activities

In order to estimate the maximum possible impact, a scenario of 12 Hera launches per year, all occurring during the DNL penalty period (between 10:00 p.m. and 7:00 a.m.) was used for the analysis. Using these assumptions, the acoustical environment at the proposed Cudjoe Key launch site, as calculated by the methodology of *Guidelines for Preparing Environmental Impact Statements on Noise* (National Academy of Sciences, 1977), is characterized by an LWP of 416 and an NII of 0.112 (figure 3.3.8-5). The noise level of the noise ROI for the proposed Cudjoe Key launch site for these conditions is also depicted in figure 3.3.8-5. Details of the results for the proposed launch of 12 Hera missiles per year are given in table 3.3.8-4. Table 3.3.8-5 displays the baseline LWP and launch LWP and the baseline NII and launch NII.



EXPLANATION

- Roads
- Sensitive Noise Receptor
- Cudjoe Key Site
- Noise ROI
- Closest Residence

L_{dny} for Event in dBA

Excluded from Analysis	40-45
<25	45-50
25-30	50-55
30-35	55-60
35-40	60-65

Note: Sound Level Weighted Population = 416
Noise Impact Index = 0.1116

NORTH

Scale 1:100,000
0 1 2 Miles
0 1.5 3 Kilometers

Cudjoe Key Launch Site Yearly Average Day-Night Sound Level (dBA) - 12 Hera Launches Per Year Between 10 PM and 7 AM

Cudjoe Key, Florida

Figure 3.3.8-5

Cud-100k-4noise004

Table 3.3.8-4: Noise Environment for Cudjoe Key Proposed Hera Launches

YDNL (dBA)	Total Land Area (Square miles)	Population	Noise Sensitive Receptors+	Percent Highly Annoyed*	Number Highly Annoyed
25-30	12.58	0	-	0.10	0
30-35	1.86	18	-	0.20	0
35-40	6.95	12	-	0.41	0
40-45	7.08	359	1, 2	0.83	3
45-50	3.71	323	-	1.66	5
50-55	1.76	2,119	-	3.31	70
55-60	0.20	645	-	6.48	42
60-65	0.03	248	-	12.29	30
TOTAL	-	3,724	-	4.03	150

*reference: Finegold, Harris, and VonGierke, 1992.
+Noise sensitive receptor numbers from table 3.3.8-2

Level Weighted Population (LWP) =416
Noise Impact Index = 0.112

Table 3.3.8-5: Summary of Sound Level Weighted Population and Noise Impact Index Results

			Cudjoe Key	Saddlebunch Keys
Total Population in ROI			3,724	4,212
Sound Level Weighted Population	Baseline	Value	408	724
	Night	Value	416	733
Noise Impact Index	Baseline	Value	0.109	0.172
	Night	Value	0.112	0.174
Percent Highly Annoyed	Baseline	Value	4	6
	Night	Value	4	7

As discussed in section 3.1.8.4, the OSHA limits exposure to noise of 115 dBA to 15 minutes per day. Levels of 112.4 dBA are expected to occur at a distance of 0.5 kilometer (0.3 mile) from the launch site. Therefore, no potential short-term hearing loss exists at 0.5 kilometer (0.3 mile) or greater from the launch site.

For a loud noise that occurs over a short time interval, such as the noise from a rocket launch, the difference between the peak noise level of the event and the background noise level gives a qualitative indication of the obtrusiveness of the noise. For distances that correspond to locations outside the LHA (2 kilometers [1.2 miles]), monitored peak noise levels from the launch of a Hera missile were 98 dBA (see table 3.1.8-6).

In the Cudjoe Key area, background noise levels range from 25 dBA to 65 dBA. Thus the launch of a Hera missile would cause peak noise levels that would be from 12

dBA to 73 dBA above background noise levels. This would be perceived as a noise that lasts for less than a minute and is twice to 128 times as loud as the background noise.

At Cudjoe Key the nearest residence is approximately 2,546 meters (8,353 feet) from the proposed launch site. Therefore, during a launch a person standing outside at this residence would experience a peak noise level of approximately 94 dBA and an average noise level of approximately 80 dBA for about 50 seconds.

The instrumentation sites associated with a Cudjoe Key missile launch are shown in figures 2.3.2-1 through 2.3.2-5. The noise levels created at these sites by generators are not expected to exceed 85 dBA at a distance of 9.8 meters (32 feet). A launcher generator will be located near the launch pad with noise levels no greater than 85 dBA at 6.1 meters (20 feet) (figure 3.1.8-3).

Outdoor recreational facilities within the 55 DNL noise contour (9-kilometer [5.6-mile] radius of the test site) would be subject to a louder than average noise associated with the missile testing procedure. This noise event would be short in duration and would occur up to 12 times a year.

Figure 3.3.8-6 shows the potential peak and equivalent noise levels at 0.5, 1.0, 2.0, 4.0, and 8.0 kilometers (0.3, .06, 1.2, 2.5, and 5.0 miles), based on table 3.1.8-6, that could occur for a single Hera launch at the Cudjoe Key launch site.

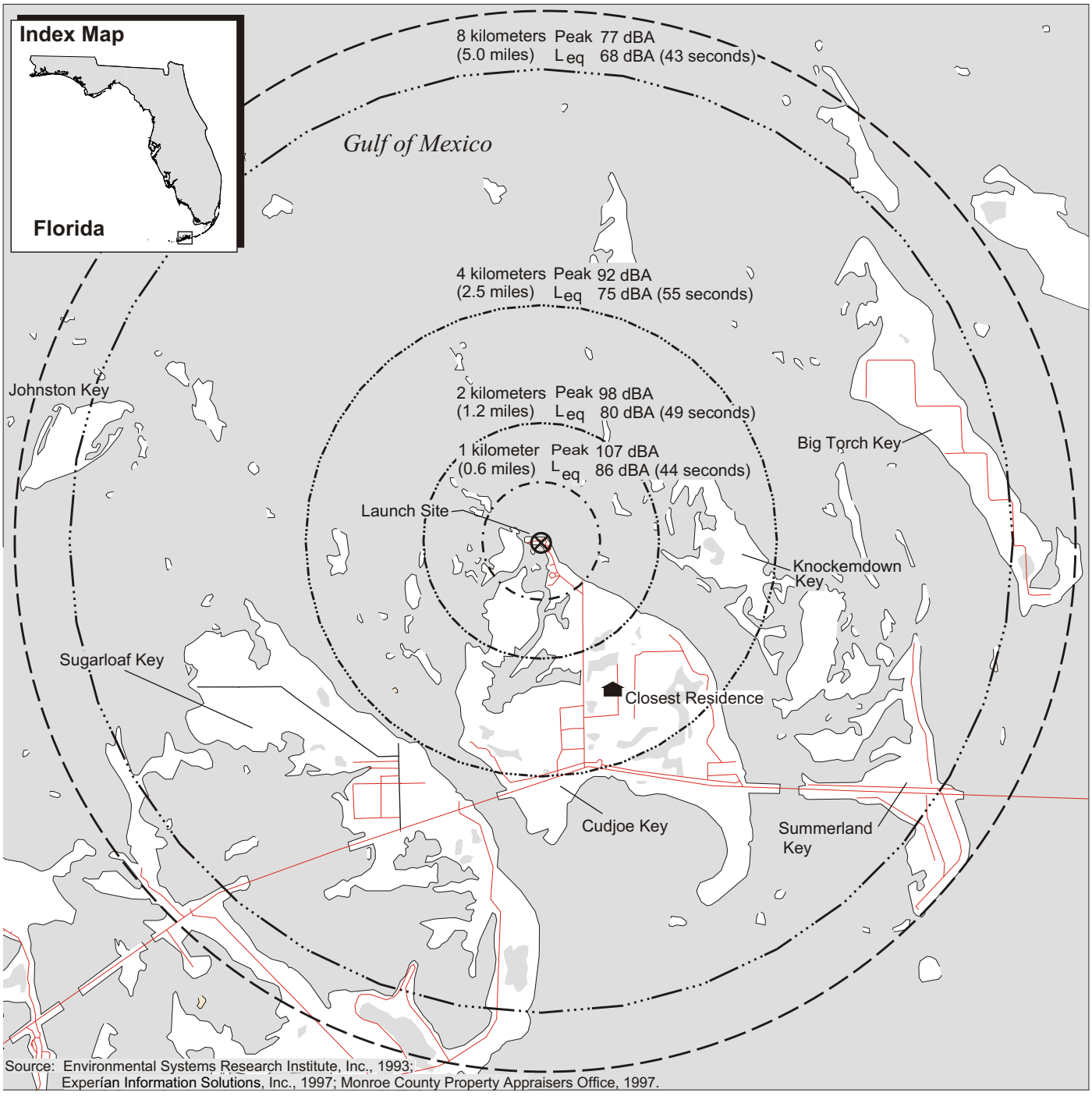
The noise affected area for recreational activity near Cudjoe Key includes five boat ramps, three marinas, four campgrounds, and one fishing bridge. Cudjoe Key is also located within FKNMS, GWHNWR, and the KDNWR. Several sea kayaking companies operate kayaking tours throughout these protected areas. Economic impacts of tourism-related recreation are addressed in section 3.3.10.

Cumulative Impacts

Construction of the TMD test facilities at Cudjoe Key would take place within the U.S. Air Force Air Combat Command which was originally developed in 1959 for monitoring missile testing over the Gulf of Mexico. This complex was altered to accommodate balloon radar surveillance of the southern Gulf and Cuba which will continue for the foreseeable future. Residential and commercial development has continued at a moderate rate in Monroe County with some increase in population on Cudjoe Key.

Construction of TMD test facilities at Cudjoe Key would cause a short-term temporary increase in the noise levels in the immediate vicinity of the construction work. This effect would be localized and is not anticipated to cause noise levels to exceed health-based guidance levels. Other than vehicular traffic, no major sources of noise are known to be in this area. Since no exceedances are anticipated, cumulative impacts would be negligible.

Flight testing at Cudjoe Key may include up to 12 Hera target missile launches per year. The launch of 12 Hera missiles per year would not cause the annual average noise



EXPLANATION

- Roads
- Cudjoe Key Launch Site
- Closest Residence
- 1 kilometer (0.6 miles)
- 2 kilometers (1.2 miles)
- 4 kilometers (2.5 miles)
- 8 kilometers (5.0 miles)
- 9 kilometers (5.6 miles)

Noise Contours

NORTH

Scale 1:100,000

0 1 2 Miles

0 1.5 3 Kilometers

Cudjoe Key, Florida

Figure 3.3.8-6

cud-100k-4noise002

level to exceed the established guidelines for residential land use. No cumulative impact is expected.

Mitigations Considered

Possible mitigations would include:

- Minimize nighttime construction activities.
- Notify noise sensitive receptors of scheduled launch events.
- Construct sound barriers surrounding the launch pad to reduce launch noise.

3.3.8.4.2 Saddlebunch Keys

The construction-related noise impacts at Saddlebunch Keys would cause a short-term temporary increase in the noise levels. There would be no health-related sound exposures beyond the LHA. Flight test activities would increase the percentage of the population within the ROI that are highly annoyed from the current 3 to 7 percent, a temporary impact.

No-action Alternative

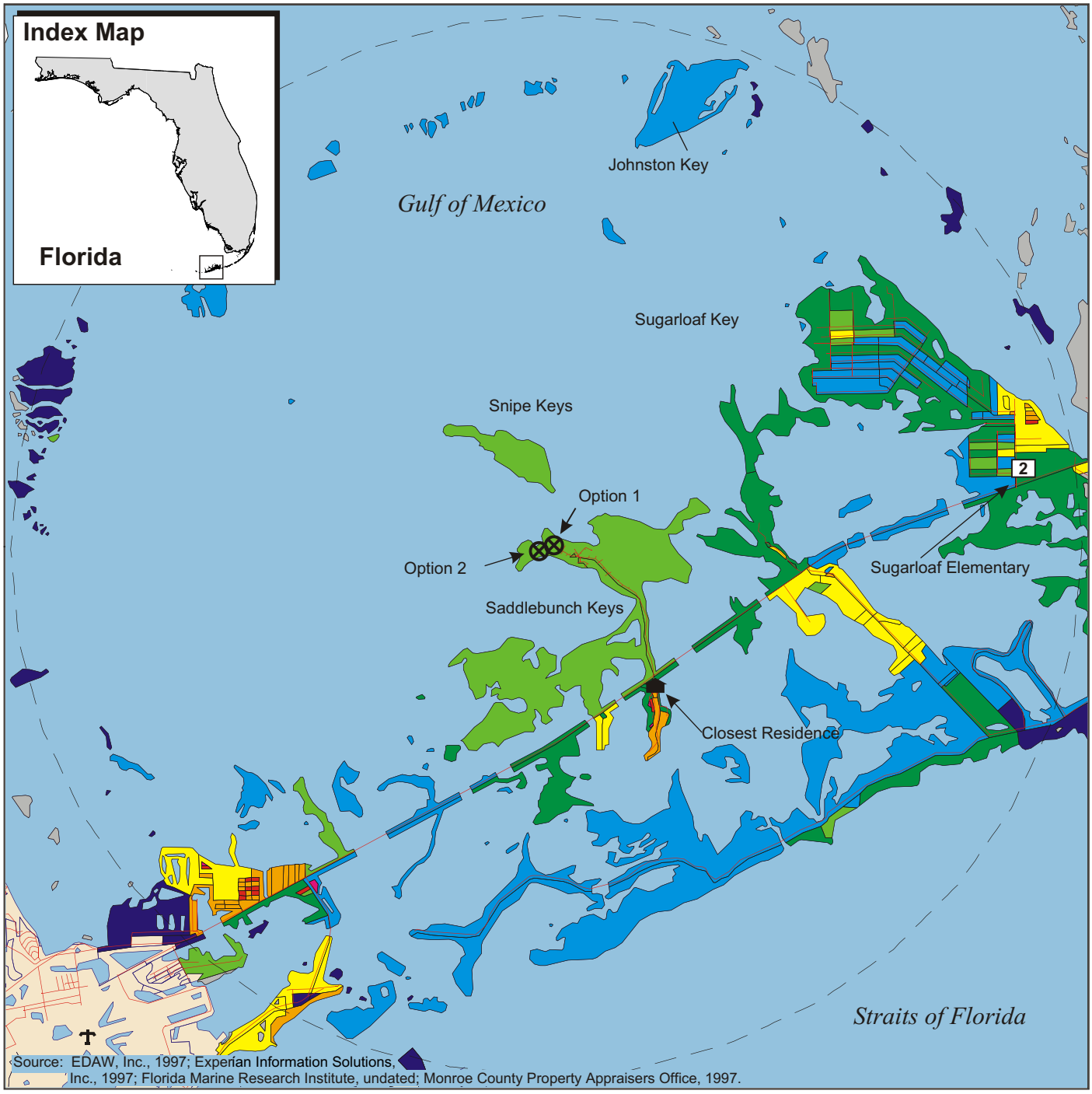
Under the proposed action or the no-action alternative, the operations of the Saddlebunch Keys facility would continue at the current planned levels. There would be no project-related changes to activities at the potential instrumentation sites. As such, noise would remain at its current levels.

Site Preparation Activities

Site preparation activities for TMD support facilities would involve routine construction activities. The proposed work at Saddlebunch Keys would not present any unique construction-related noise exposure to personnel.

Flight Test Activities

In order to estimate the maximum possible impact, a scenario of 12 Hera launches per year, all occurring during the DNL penalty period (between 10:00 p.m. and 7:00 a.m.) was used for the analysis. Using these assumptions, the acoustical environment at the proposed Saddlebunch Keys launch site, as calculated by the methodology of *Guidelines for Preparing Environmental Impact Statements on Noise* (National Academy of Sciences, 1977), is characterized by an LWP of 733 and an NII of 0.174 (figure 3.3.8-7). The noise level of the noise ROI for the proposed Saddlebunch Keys launch site for these conditions is also depicted in figure 3.3.8-7. Details of the results for the proposed launch of 12 Hera missiles per year are given in table 3.3.8-6. Table 3.3.8-7 displays the baseline LWP and launch LWP and the baseline NII and launch NII.



EXPLANATION

- Roads
- Sensitive Noise Receptor
- Saddlebunch Keys Site
- Noise ROI
- Airfield
- Closest Residence

L_{dny} for Event in dBA

Excluded from Analysis	40-45
<25	45-50
25-30	50-55
30-35	55-60
35-40	60-65

Note: Sound Level Weighted Population = 733
Noise Impact Index = 0.1739

NORTH

Scale 1:100,000
0 2 Miles
0 1.5 3 Kilometers

Saddlebunch Keys Launch Site Yearly Average Day-Night Sound Level (dBA) - 12 Hera Launches Per Year Between 10 PM and 7 AM

Saddlebunch Keys, Florida

Figure 3.3.8-7

Sad-100k-4noise003

Table 3.3.8-6: Noise Environment for Saddlebunch Keys for Proposed Hera Launches

YDNL (dBA)	Total Land Area (Square miles)	Population	Noise Sensitive Receptors[+]	Percent Highly Annoyed[*]	Number Highly Annoyed
25-30	8.04	0	-	0.10	0
30-35	1.44	0	-	0.20	0
35-40	7.17	20	-	0.41	0
40-45	4.46	215	2	0.83	2
45-50	2.92	126	-	1.66	2
50-55	1.55	1,640	-	3.31	54
55-60	0.43	1,500	-	6.48	97
60-65	0.04	387	-	12.29	48
65-70	0.01	324	-	22.10	72
TOTAL	-	4,212	-	6.53	275

Source: Finegold, Harris, and VonGierke, 1992.
[+]Noise sensitive receptor number from table 3.3.8-2

Level Weighted Population (LWP) = 733
Noise Impact Index = 0.174

Table 3.3.8-7: Summary of Sound Level Weighted Population and Noise Impact Index Results

			Cudjoe Key	Saddlebunch Keys
Total Population in ROI			3,724	4,212
Sound Level Weighted Population	Baseline	Value	408	724
	Penalty	Value	416	733
Noise Impact Index	Baseline	Value	0.109	0.172
	Penalty	Value	0.112	0.174
Percent Highly Annoyed	Baseline	Value	4	6
	Penalty	Value	4	7

As discussed in section 3.1.8.4, OSHA limits exposure to noise of 115 dBA to 15 minutes per day. Levels of 112.4 dBA are expected to occur at a distance of 0.5 kilometer (0.3 mile) from the launch site. Therefore, no potential short-term hearing loss exists at 0.5 kilometer (0.3 mile) or greater from the launch site.

For a loud noise that occurs over a short time interval, such as the noise from a rocket launch, the difference between the peak noise level of the event and the background noise level gives a qualitative indication of the obtrusiveness of the noise. For distances that correspond to locations outside the LHA (2 kilometers [1.2 miles]), monitored peak noise levels from the launch of a Hera missile were 98 dBA (see table 3.1.8-6).

In the Saddlebunch Key area, background noise levels range from 30 dBA to 70 dBA. Thus the launch of a Hera missile would cause peak noise levels that would be from 7 dBA to 73 dBA above background noise levels. This would be perceived as a noise that lasts for less than a minute and is twice to 128 times as loud as the background noise.

At Saddlebunch Key, the nearest residence is approximately 2,950 meters (9,672 feet) from the proposed launch site. Therefore, during a launch a person standing outside at this residence would experience a peak noise level of approximately 94 dBA and an average noise level of approximately 80 dBA for about 50 seconds.

The instrumentation sites associated with a Saddlebunch Key missile launch are shown in figures 2.3.2-3, 2.3.2-5, 2.3.2-8, and 2.3.2-9. The noise levels created at these sites by generators are not expected to exceed 85 dBA at a distance of 9.8 meters (32 feet). A launcher generator will be located near the launch pad with noise levels no greater than 85 dBA at 6.1 meters (20 feet) (figure 3.1.8-3).

If a Hera missile were launched from the proposed launch site, the school would be expected to experience an equivalent noise level of approximately 68 dBA for 43 seconds. For 24 such launches per year, the background annual noise level at the school would remain at a YDNL in the range of 40 to 45 dBA.

Figure 3.3.8-8 shows potential peak and equivalent noise levels, based on table 3.1.8-6, that could occur for a single Hera launch at the Saddlebunch Keys launch site.

Cumulative Impacts

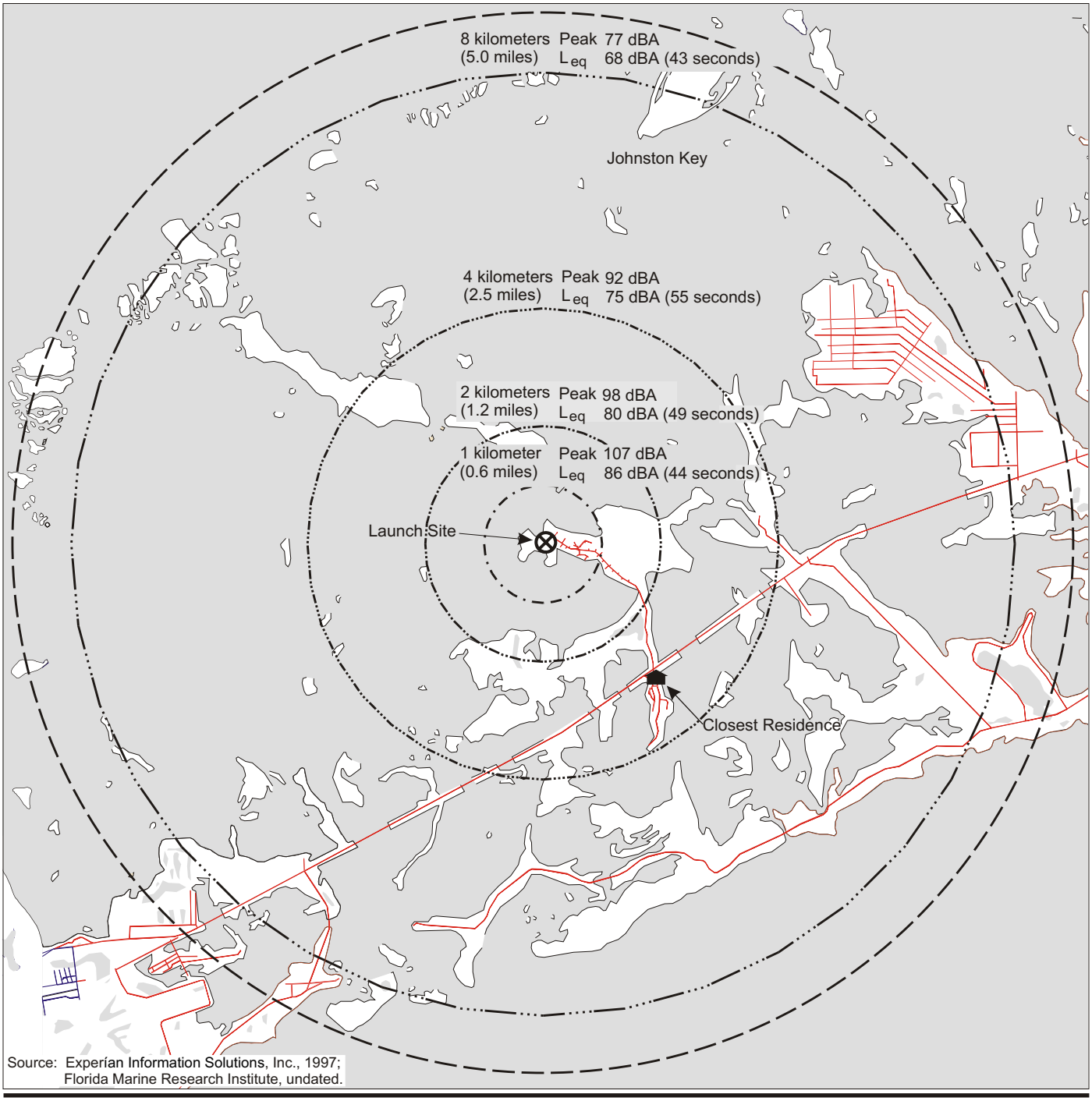
Construction of the TMD test facilities on Saddlebunch Keys would take place on land owned by Naval Air Station, Key West. This site was developed and is operated by the Naval Computer Telecommunications Area Master Station Atlantic Detachment. Current transmission and support activity will continue for the foreseeable future and there are no current plans for additional DOD projects. Residential and commercial development has continued at a moderate rate in Monroe County with some increase in population on Cudjoe Key.

Site preparation and flight testing activities would have noise impacts equivalent to the Cudjoe Key proposal discussed above.

Mitigations Considered

Possible mitigations would include:

- Minimize nighttime construction activities.
- Notify noise sensitive receptors of scheduled launch events.
- Construct sound barriers surrounding the launch pad to reduce launch noise.



EXPLANATION

- Roads
- Saddlebunch Keys Launch Site
- Closest Residence
- 1 kilometer (0.6 miles)
- 2 kilometers (1.2 miles)
- 4 kilometers (2.5 miles)
- 8 kilometers (5.0 miles)
- 9 kilometers (5.6 miles)

Peak and Equivalent Noise Levels From Single Hera Launch

Scale 1:100,000

0 1 2 Miles

0 1.5 3 Kilometers

NORTH

Saddlebunch Keys, Florida

Figure 3.3.8-8

Key-100k-4noise003

3.3.9 SAFETY

Air Force safety and health regulations and procedures are designed and enforced to minimize the potential impacts to service members and the public.

3.3.9.1 Resource Description and Evaluative Methods

Refer to section 3.1.9 for a description of this resource.

3.3.9.2 Region of Influence

The ROI for safety-related impacts varies by the type of hazard (occupational vs. non-occupational), and type of work activity (launch vehicle transport, launch vehicle component handling and assembly, launch vehicle operation, etc.). The occupational hazard ROI is the ESQD and the non-occupational (public) hazard ROI is the LHA.

Construction Operations

As use of Florida Keys operating locations will require prior construction of some missile launch support facilities (launch pad complex, LOT, and MAB) at either Cudjoe Key or Saddlebunch Keys, there is the potential for safety impacts at these locations. Impacts would be limited to normal occupational safety and health issues only, and the ROI at both locations would be limited to the immediate construction site(s).

Launch Vehicle Transport

Safety issues associated with transportation activities are limited to consideration of non-occupational impacts. Proposed TMD Target vehicles include various components and rocket motors which are considered to be explosive materials.

For overland shipping activities, the ROI which could be impacted in the event of a significant mishap would include all locations within approximately 304.8 meters (1,000 feet) of the shipping route. This can include U.S. 1 and any secondary connecting roads, bridges, and adjacent locations along selected shipping routes.

For air transport the ROI which could be impacted in the event of a significant mishap would include all airfields used for the proposed action and locations beneath the flight path of any transport aircraft. In the Florida Keys this would be limited to military airstrips and military flight routes between the various operating locations.

Launch Vehicle and Component Handling and Assembly

Launch vehicle handling and assembly operations include unloading of vehicles or vehicle components from transport vehicles, onsite movement of vehicles or components, use of a storage location for vehicle components, and final assembly of each target at a MAB. As some components present explosive hazards, this work presents the potential for both occupational and non-occupational safety and health impacts.

For public safety impacts, the ROI is limited to the facilities actually used for target vehicle processing operations. Military or contractor personnel located elsewhere in the vicinity of these facilities, who have no direct connection to target operations but who could be affected in the event of explosion, are considered non-mission-essential personnel for this assessment and are treated the same as members of the general public.

For public safety impacts, the ROI is limited to areas which might be directly or indirectly affected by explosion in the event of a mishap at any target facility. The exact distance will vary by facility, but would in all cases be contained within government-controlled areas.

Under the alternative actions, handling operations could occur at either Cudjoe Key or Saddlebunch Keys (for all other facilities), and the ROIs described above would be limited to those locations only.

Launch Operations

Normal target launch operations may result in the release of airborne exhaust products which may adversely affect the health of persons located in the immediate vicinity of a launch site. Also, during target launch operations there is the potential for a mishap which results in explosion, whole-body impact, or debris impact. These effects are limited to the alternative launch locations (Cudjoe Key and Saddlebunch Keys). Launch operations present both occupational and non-occupational safety and health issues.

For occupational safety and health impacts the ROI includes those locations in the vicinity of a launch site where personnel would be present in support of launch operations. This includes personnel controlling the launch at the LOT shelter.

For public safety impacts, the ROI encompasses the areas which might be affected by target explosion, whole-body impact, or debris impact. Around the launch site this area is specifically determined for each launch, and is referred to as the LHA. A specific discussion of how LHAs are developed is provided in appendix G. In addition to the LHA, additional areas immediately downwind of the launch site may be impacted by airborne vehicle exhaust products or fuel vapors. These areas are also included in the ROI.

In the event of a mishap, the on-scene commander would work with local disaster control groups to follow established disaster preparedness plans and operations in accordance with AFI 32-4001. An evacuation plan and emergency response plan (similar to appendices I and J, respectively) would be established.

Sensor Systems

Active sensor systems (radar units) will emit EMR at various frequencies and powers. Safety and health impacts associated with the EMR would be limited to non-occupational issues. The ROI would include any areas within the path of any radar beam where exposure could exceed the maximum permissible exposure (MPE) level established by the U.S. Air Force. As radar sites may be located on the locations under evaluation

(depending on the alternative action selected), the ROI includes areas in the vicinity of all proposed locations.

3.3.9.3 Affected Environment

3.3.9.3.1 Cudjoe Key

Cudjoe Key is the location of a TARS. Aerostats are launched for use in air interdiction and transmission of television signals to Cuba (U.S. Department of Defense, Ballistic Missile Defense Organization, 1995). The aerostat balloons are helium-filled.

Operation of the balloons presents some minor occupational safety hazards for operating personnel, which are addressed through existing operating procedure documentation and training efforts. There are no significant public safety hazards associated with balloon operations. Helium is non-explosive and non-toxic, and thus presents no significant hazard to areas offsite. In the event of a significant problem, a balloon has the potential to become entangled with local power utility or other services. However, the launch sites are located well away from any entanglement hazards (Flinn, 1997).

3.3.9.3.2 Saddlebunch Keys

Saddlebunch Keys is controlled by NASKW, and is the site of a Navy communication center. This center includes a complex of 18 high-frequency antenna towers and associated communication/radio equipment, used by the U.S. Navy for communication with vessels and assets throughout the Caribbean. There is also an inactive site used for support of VOA radio broadcasts to Cuba.

The primary hazard is related to exposure to EMR produced by the transmitters, which is considered to be a non-occupational issue. However, the frequencies, antenna configurations, and output powers used by the transmitter systems are unlikely to result in a significant hazard to personnel or members of the public.

Navy support operations at the communication site also result in minor occupational safety and health hazards, which are addressed through existing operating procedure documentation and training efforts.

3.3.9.4 Environmental Impacts and Mitigations

3.3.9.4.1 Cudjoe Key

Air Force safety procedures designed and enforced to minimize the potential impacts to the public.

No-action Alternative

Under the no-action alternative no TMD ETR test activities would occur at Cudjoe Key. The current aerostat launching activities (with their associated minimal safety and

health hazards) presented in section 3.1.9.3.2 will continue. Selection of the no-action alternative would have no effect on safety or health hazards at Cudjoe Key.

Approximately 40 people work at the Cudjoe Key TARS site each day. Their activities involve the operations and maintenance of the two tethered aerostats, including the daily raising and lowering of these aerostats to an altitude of approximately 3,048 meters (10,000 feet). The work involves maintenance of heavy winch equipment, aerostats, and electronics.

These activities may expose these workers to occupational and health hazards typical of this type of work. The work is done in compliance with OSHA and U.S. Air Force regulations and procedures.

Site Preparation Activities

Installation activities for TMD support facilities would involve routine construction activities. These operations are routinely accomplished in both military and civilian construction operations, and present only occupationally-related effects on safety and health for the workers involved in the performance of construction activities. Such hazards would occur only for the duration of the construction activities, and are a routine part of normal construction activities. The proposed work locations at Cudjoe Key do not present any unique construction-related hazards to personnel.

Flight Test Activities

Flight test activities for Cudjoe Key would be similar to those for Santa Rosa Island. described in section 3.1.9.4.1.

Although transport of hazardous materials is considered routine, one aspect of using Cudjoe Key or Saddlebunch Keys alternative requires specific consideration. Primary access to the Florida Keys is provided by U.S. 1. Accidents involving hazardous materials could have the potential to cause a prolonged shut-down of this route. Shipments associated with proposed operations are small in both volume and number in comparison with existing shipments of hazardous materials into Monroe County. As reported in the *Monroe County Comprehensive Emergency Management Plan* (Monroe County Emergency Management, 1997), at least 30 facilities actively store and use hazardous materials, all of which must be transported into the county via U.S. 1. Included in the hazardous materials so transported are gaseous chlorine, ammonia, sulfuric acid, and sulfur dioxide. All of these materials are transported in bulk quantities via commercial truck shipments, and each pose more significant inhalation hazards than the combustion products associated with a fire involving proposed rocket motors.

In response to this concern, Monroe County has developed a hazardous materials emergency response plan to allow for recovery in the event of an accident involving hazardous materials.

Standard operational procedures would be developed to enable the host mission and the proposed TMD mission to coexist efficiently and effectively. Special attention

would be paid to safety procedures for aerostat operations during target launch operations that would minimize exposure to risk by both missions.

Cumulative Impacts

Construction of the TMD test facilities at Cudjoe Key would take place on a site owned by the U. S. Air Force Air Combat Command which was originally developed in 1959 for monitoring missile testing over the Gulf of Mexico. This complex was altered to accommodate balloon radar surveillance of the southern Gulf and Cuba which will continue for the foreseeable future. Residential and commercial development has continued at a moderate rate in Monroe County with some increase in population on Cudjoe Key.

No cumulative safety impacts have been identified.

Mitigations Considered

TMD activities would have no impacts on safety because of the standard safety and health regulations and procedures (SOPs) in place. Therefore, no mitigations are proposed. The SOPs would include establishment of adequate water clearance areas and clearance of non-mission essential vessels, implementation of a worker safety training and inspection program, publication of notice to mariners and clearance of non-mission essential vessels, clearance of non-mission essential aircraft from appropriate airspace.

In the event of a mishap, the appropriate Federal, state, and local authorities would be consulted to determine the proper procedures to recover biological and cultural resources.

If this alternative were selected, cooperative agreements with local law enforcement and safety departments would be made to provide the necessary resources to accommodate potential service requirements.

3.3.9.4.2 Saddlebunch Keys

Air Force safety and health regulations and procedures are designed and enforced to minimize the potential impacts to the public.

No-action Alternative

Under the no-action alternative, no TMD test activities would occur at Saddlebunch Keys. The current communication and radio transmitting activities presented in section 3.1.9.3.4 would continue. However, selection of this alternative would have no additional effect on safety or health hazards at Saddlebunch Keys.

Approximately 10 people work at the Saddlebunch Keys transmitter site each day. Their activities involve operations and maintenance of the radio transmitters, antennas, and backup generators. These activities expose these workers to the normal occupational

and health hazards of this type of work. The work is done in compliance with standard OSHA requirements.

Site Preparation Activities

Installation activities for TMD support facilities at Saddlebunch Keys would be similar to those described for Cudjoe Key (section 3.3.9.4.1).

Flight Test Activities

The procedures and considerations of safety and health are addressed in the Cudjoe Key section 3.3.9.4.1.

Cumulative Impacts

Construction of the TMD test facilities on Saddlebunch Keys would take place on land owned by Naval Air Station, Key West. This site was developed and is operated by the Naval Computer Telecommunications Area Master Station Atlantic Detachment. Current transmission and support activity will continue for the foreseeable future and there are no current plans for additional DOD projects. Residential and commercial development has continued at a moderate rate in Monroe County with some increase in population on Cudjoe Key.

No cumulative safety impacts have been identified.

Mitigation Measures

TMD activities would have no impacts on safety because of the standard safety and health regulations and procedures in place. Therefore, no mitigations are proposed. However, SOPs would include establishment of adequate water clearance areas and clearance of non-mission essential vessels, implementation of a worker safety training and inspection program, publication of notice to mariners and clearance of non-mission essential vessels, clearance of non-mission essential aircraft from appropriate airspace.

In the event of a mishap, the appropriate Federal, state, and local authorities would be consulted to determine the proper procedures to recover biological and cultural resources.

If this alternative were selected, cooperative agreements with local law enforcement and fire departments would be made to provide the necessary resources to accommodate the new requirements.

3.3.10 SOCIOECONOMICS

The siting and operation of proposed launch sites on Cudjoe and Saddlebunch Keys may effect the Florida Keys economy. Program-related expenditure on labor and materials during site preparation and local spending by personnel during flight-test activities would generate small beneficial increases in income and employment in the Keys.

3.3.10.1 Resource Description and Evaluative Methods

Refer to section 3.1.10 for a description of this resource.

3.3.10.2 Region of Influence

For the purposes of this socioeconomic impact analysis, the ROI for the Florida Keys coincides with the boundaries of Monroe County (figure 3.3.10-1). The Lower Keys represents the ROI.

3.3.10.3 Affected Environment

3.3.10.3.1 Florida Keys Area

Population and Income

In 1990, the total population of Monroe County was 134,667. This figure comprises 78,024 residents—25,040 people in seasonal households, 21,026 people in tourist facilities, 2,498 people on live-aboard vessels, and 8,079 people staying with friends or relatives. The 1995 total population estimate for Monroe County was 145,900 people including an estimated 83,400 residential population and a peak seasonal population of 61,300. For the year 2010, the total population is estimated to be 175,800 including a residential population of 99,600 and a peak seasonal population of 76,200.

Population statistics for Monroe County have been aggregated into subcounty areas referred to as Planning Analysis Area/Enumeration Districts (PAED). Saddlebunch Keys is located in PAED # 3, which also includes the Upper and Lower Sugarloaf Keys. Cudjoe Key is located in PAED #4, which also includes Summerland, Ramrod, Little, Middle, Big Torch, and No Name keys. (Monroe County, 1993)

Population estimates including both seasonal and resident population are 6,100 (1990), 7,561 (2000), and 9,212 (2010). The 1995 estimated total population of Monroe County is 83,400 (University of Florida, Bureau of Economic and Business Research, College of Business Administration, 1996).

Total personal income, measured at the place of residence, grew in Monroe County by 109 percent between 1985 and 1994, compared to a growth of 87 percent in Florida as a whole. When income is measured on a per capita basis, income in Monroe County grew by 100 percent over the same time period, compared to 63 percent statewide. Retirees are an important group within the Monroe County economy. Transfer payments

Source: Environmental Systems Research Institute, Inc., 1993; Florida Marine Research Institute, undated.

EXPLANATION

---- Region of Influence

Socioeconomic Region of Influence, Monroe County

Scale 1:6,000,000

0 50 100 Miles

0 100 200 Kilometers

NORTH

Eastern Gulf of Mexico

Figure 3.3.10-1

are a disproportionately large component of income in Monroe County; in 1994 retirement payments, dividends, and rental receipts made up 24 percent of the United States per capita income while 34 percent of Florida's per capita income fell into the same categories. In Monroe County 44 percent of per capita income in 1994 was classified as retirement, dividend, and rental income.

Employment and Unemployment

Monroe County jobs are concentrated in the retail and service sectors and, reflecting the dominance of the tourist industry, specifically in food service and lodging. In 1994, over 27,000 full- and part-time jobs, or 57 percent of all such jobs in Monroe County, were in the retailing and service sectors. The equivalent proportion for the State of Florida, in the same year, was 53 percent. Over 40 percent of Monroe County retail sector jobs were provided by restaurants, and a similar proportion of service jobs was provided by hotels.

Unemployment patterns in Monroe County reflect the seasonal nature of an economy dominated by tourism. The average annual unemployment rate between 1980 and 1995 ranged from a low of 2.6 percent, in 1988, to a high of 6.5 percent in 1982. As the peak tourist season closes in May, unemployment rises. With the opening of a new season in October, unemployment falls (figure 3.3.10-2).

Housing

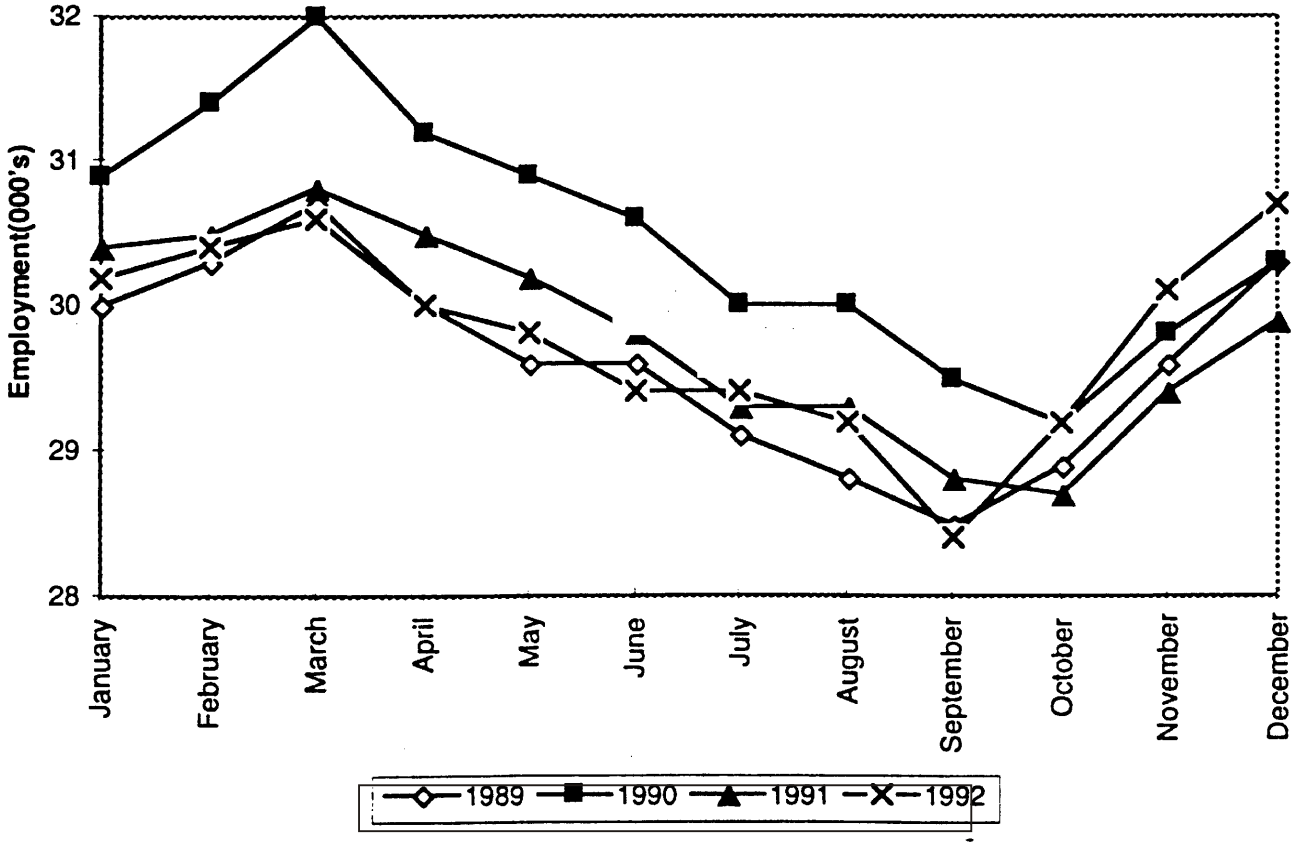
Approximately 8,999 transient housing units between Key West and Marathon (table 3.3.10-1) may be used for supporting temporary military personnel. However, due to high rates of tourism during the winter months, availability may be limited.

Table 3.3.10-1: Saddlebunch Keys Transient Housing Supply

	Condominiums	Hotel	Total
N.Cudjoe/Saddlebunch	570	1,383	1,953
S.Cudjoe/Saddlebunch	300	6,598	6,898
Middle (Sugarloaf and Cudjoe)	115	33	148
Total	985	8,014	8,999

Source: Florida Department of Business and Professionalism Regulation, 1996.

Military personnel on official orders to Saddlebunch Keys, Cudjoe Key, or NASKW may be able to use the Navy's Bachelor Officer's Quarters (BOQ) or Bachelor Enlisted Quarters (BEQ) at Trumbo Point, Boca Chica, and Truman Annex. The BOQ consists of 280 private rooms, and the BEQ consists of 951 rooms. This housing is most often committed for training missions at NASKW, which peak between January and March and typically last 2 weeks. Personnel not housed in military housing would seek housing in motels or other seasonally available accommodations. The tourist season peaks between the months of November and April.



Source: Mulkey, Gran, and Adams, 1995.

Monthly Non-proprietor Employment in Monroe County: 1989 -1992

Figure 3.3.10-2

On a county-by-county comparison, Monroe County has the costliest housing in the State of Florida. In 1995, the average cost of a home in Monroe County was $141,640, compared to $87,900 for the state as a whole. The high cost of housing in Monroe County is a function of scarcity. The growth ordinance enacted in 1992 made worse an already chronic shortage of housing. The ordinance reflected a safety guideline which stated that only 2,552 should be constructed in the decade 1993-2002.

The scarcity of affordable housing is critical in an economy that depends on a ready supply of relatively cheap seasonal labor. For Key West to remain a leading tourist destination, it must compete with destinations throughout the region. Historically, there has been a shortage of affordable housing for sale or rent in and near Key West. Affordable housing away from Key West, on the surrounding keys, is also scarce. Trailers and live-aboard boats have provided cheap accommodation in areas where sufficient land and moorings are available. Increasing statutory demands for higher standards of sanitation, however, are making these alternative forms of accommodation less viable.

Tourism

The tourism industry dominates the economic base of Monroe County, contributing, between June 1995 and May 1996, 60 percent of the county's output, 45 percent of its income, and 46 percent of its employment (U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 1996b). The impact of tourism is measured in terms of visitor spending in the county and how this translates into output (goods and services) and income as a result of jobs. A multiplier effect occurs when the income generated by visitor spending is expended on further goods and services. Visitor expenditure is estimated to generate 13,655 direct jobs. An additional 8,193 jobs are estimated to arise from the secondary spending which this primary output has created.

The survey work carried out by NOAA in 1995 and 1996 concluded that the Florida Keys received 2,540,488 visits by tourists in a 12-month period, and each visit lasted on average a little over 5 days (U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 1996b).

Commercial and Recreational Fishing

Monroe County numbered first among counties in the State of Florida in 1995 for seafood landings, second for seafood fishing trips, and first for commercial boats registered. Over million kilograms (15 million pounds) of shellfish were landed in Monroe County in 1995, almost two times more than any other county in Florida. There were 138 retail seafood dealers and 103 wholesale dealers in Monroe County in 1993, as well as 3,052 Saltwater Products License holders. Almost 39,000 recreational resident saltwater licenses were issued in Monroe County in 1993.

Retirees

The importance of retirees to the economy of Monroe County is illustrated by the demography of the region and the disproportionately high share of the county's income that is generated in the form of transfer payments. Retirees, historically, have been attracted to the Florida Keys by the environment and microclimate combining to offer a quality of life

unavailable elsewhere in the United States. Unlike those in paid employment, retirees are not dependent on Key West as their economic base. They are able to purchase homes in relatively less expensive locations.

3.3.10.3.2 Cudjoe Key

Table 3.3.10-2 shows the population residing, and those in work, within 8 kilometers (5 miles), 16 kilometers (10 miles) and 32.2 kilometers (20 miles) of Cudjoe Key.

Table 3.3.10-2: Cudjoe Key Population

Distance from Cudjoe Key	Resident Population
8 kilometers (5 miles)	2,584
16 kilometers (9.9 miles)	8,799
32.2 kilometers (20 miles)	30,947

Source: Environmental Systems Research Institute, Inc., 1992.

Tourism

Regional visitation statistics compiled by NOAA in 1996 show that on average, approximately 11 percent of the annual visitors to the Florida Keys visited the Lower Keys. The top rated activity in the Lower Keys was the viewing of wildlife and nature study; during the 1995 June to November period, 68,700 visitors to the Lower Keys cited this activity and this figure rose to 79,000 December 1995 to May 1996. Cudjoe Key is one of a number of locations in the Lower Keys where visitors may participate in this activity mostly by gaining access to the area by water. The Lower Keys have 8,014 hotel rooms and 985 condominiums.

Retirees

The Lower Keys, like the Middle and Upper Keys, has attracted retiree house purchasers who have relocated to Monroe County and who are bringing regular, guaranteed transfer payments into the region.

3.3.10.3.3 Saddlebunch Keys

Saddlebunch Keys is one of the Lower Keys and as such falls into the same affected environment, for socioeconomic purposes, as Cudjoe Key. Table 3.3.10-3 shows the population residing, and in work, within 8 kilometers (5 miles), 16 kilometers (10 miles), and 32.2 kilometers (20 miles) of Saddlebunch Keys.

Table 3.3.10-3: Saddlebunch Keys Population

Distance from Saddlebunch Keys	Resident Population
8 kilometers (5 miles)	14,906
16 kilometers (10 miles)	29,638
32.2 kilometers (20 miles)	112,180

Source: Environmental Systems Research Institute, 1992.

The activities that are planned to be carried out on Boca Chica Key, Fleming Key, and Sugarloaf Key have little or no socioeconomic impacts.

3.3.10.4 Environmental Impacts and Mitigations

The analytical approach adopted by the socioeconomic resource for the Florida Keys begins by recognizing that the action can be broken down into a series of well defined activities. Each of these activities has the potential to generate three broad areas of socioeconomic impact. First, general economic impacts, as a result of the action, can be defined as personal economic gain or loss and/or economic gain or loss to the community as a whole. Second, there may be an impact, as a result of the action, on the quality of life of individuals in the community, defined particularly as the economic impact on retirees and the economic impact of an altered ecology. Third, there may be impacts of displacement or exclusion on residents, tourists, and commercial fishermen because of the clearance of launch hazard areas for periods of time.

This framework recognizes that the local economy of the Florida Keys lacks diversity and that it comprises the key drivers of tourism, commercial fishing, and the retiree population. Impacts on any or all of these drivers are likely to result in disproportionate impacts on the economy as a whole. Furthermore, the framework addresses the concerns raised during the scoping process.

3.3.10.4.1 Cudjoe Key and Saddlebunch Keys

No-action Alternative

Under the no-action alternative, aerostat missions would continue at their current planned levels at Cudjoe Key. The naval communications mission would continue at Saddlebunch Keys. There would be no TMD project-related changes to activities at the potential instrumentation sites. No project-related construction or activities would take place.

Under the no-action alternative, the proposed ground-based TMD test activities at the Florida Keys locations, including Cudjoe, Fleming, Sugarloaf, and Boca Chica keys would not be implemented. Current operations at these Florida Keys locations would continue. Continuing Air Force and Navy operations would result in negligible changes to local or regional socioeconomic factors.

Site Preparation Activities

Site preparation would involve labor and materials being brought to Cudjoe Key or Saddlebunch Keys for a limited period while the preparation program is implemented. Table 3.3.10-4 illustrates the financial impact of site preparation. A multiplier of 1.75 has been applied in order to arrive at these figures.

Construction activity would result in personal economic gain for some individuals, including construction workers and retailers. The community would also gain financially due to the transfer of money that would not otherwise have been in circulation in Monroe County. Annual total personal income in Monroe County was $2.068 billion in 1994 and annual gross sales for the same year amounted to a little over $2.031 billion. These figures include the personal income generated by the cities of Key West and Marathon. They provide a context within which to assess the economic benefits of the construction work.

Site preparation would have minimal impacts on the local environment of Cudjoe Key or Saddlebunch Keys (see biological resources, noise, air quality, transport). Given that the impacts identified are imperceptible, it is assumed that they would have little or no effect on the quality of life of Florida Keys residents and visitors to the area. The increase in money circulating throughout the local economy, as a result of site preparation, would have a small, but nevertheless positive, impact on the quality of life of some local residents.

Quality of life impacts, for the individual, are highly subjective and often complex. Such impacts may be negative but can also be positive. An individual's perception of a degradation (or improvement) in the quality of his or her life is assumed to be associated with changes to their surrounding economic and natural environment and freedom of access to particular areas, such as the backcountry and its creeks.

Flight Test Activities

Flight test activities would involve personnel being brought to Cudjoe Key or Saddlebunch Keys for specific periods throughout the year. Table 3.3.10-5 illustrates the economic impact of flight test activities. In order to arrive at these figures, it was assumed that each person/day would have an average expense budget of $189 and that the multiplier for the total effect is 1.75.

The demand for lodging, generated by flight test activities, represents about 1 percent of the total stock of hotel rooms and condominiums in Lower Keys. At peak times of the year, demand for hotel and condominium space in the Lower Keys may exceed supply. In such an event, a tourist "displaced" by a member of the launch team would result in a net economic gain for the community because the launch team member's per diem of $189 compares favorably with the average daily tourist expenditure of $108 (U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 1995b).

Table 3.3.10-4: Personnel-related Impacts of Site Preparation Activities for Cudjoe Key

Launch Preparation Personnel			Population		Hotel/motel/condominium Accommodation, Lower Keys		Economic Impact	
Month (28 days)	Average Number of Personnel	Person/days (Cumulative)	Within Sensitive Receptor Area	Within 8 kilometers (4.9 miles)	Hotels/motels	Condominiums	Cumulative Direct Dollar Expenditure	Cumulative Total Dollar Expenditure (including multiplied effects)
1	10	200	930	5,485	8,014	985	$125,000.00	$218,750.00
2	10	400	930	5,485	8,014	985	$250,000.00	$473,500.00
3	10	600	930	5,485	8,014	985	$375,000.00	$656,250.00
4	10	800	930	5,485	8,014	985	$500,000.00	$875,000.00
5	10	1,000	930	5,485	8,014	985	$625,000.00	$1,093,750.00
6	10	1,200	930	5,485	8,014	985	$750,000.00	$1,312,500.00
7	10	1,400	930	5,485	8,014	985	$875,000.00	$1,531,250.00
8	10	1,600	930	5,485	8,014	985	$1,000,000.00	$1,750,000.00
Total (32 weeks)	10	1,600	930	5,485	8,014	985	$1,000,000.00	$1,750,000.00

Table 3.3.10-5: Personnel-related Impacts of Flight Test Activities for Cudjoe Key

Flight Test Personnel			Local Population		Hotel/motel/condominium Accommodation, Lower Keys		Economic Impact	
Day	Average Number of Personnel	Person/days (Cumulative)	Within Sensitive Receptor Area	Within 8 kilometers (4.9 miles)	Hotels/motels	Condominiums	Cumulative Direct Dollar Expenditure at $189 Per Day	Cumulative Total Dollar Expenditure (including multiplied effects)
1-7	10	70	930	5,485	8,014	985	$13,230.00	$23,152.00
8-14	20	210	930	5,485	8,014	985	$36,690.00	$64,207.00
15-21	35	455	930	5,485	8,014	985	$85,995.00	$150,491.00
22-28	40	735	930	5,485	8,014	985	$138,915.00	$243,101.00
2-30	90	1,365	930	5,485	8,014	985	$257,985.00	$451,474.00
31	90	1,455	930	5,485	8,014	985	$274,995.00	$481,241.00
Total For One Complete Action	**90**	**1,455**	**930**	**5,485**	**8,014**	**985**	**$274,995.00**	**$481,241.00**
Total For 12 Compete Actions	**1,080**	**17,460**	**930**	**5,485**	**8,014**	**985**	**$3,299,940.00**	**$5,774,895.00**

Flight testing would have a small negative economic effect on businesses (including some canoe tours and fishing charters) which operate exclusively in the waters encompassed by the LHA (figure 3.3.10-3 and 3.3.10-4). This assumes that, during the 48 hours of clearance from the LHA each year, these businesses are unable to use waters elsewhere in the region. Given the short period of exclusion and the availability of alternative waters, this impact would be temporary.

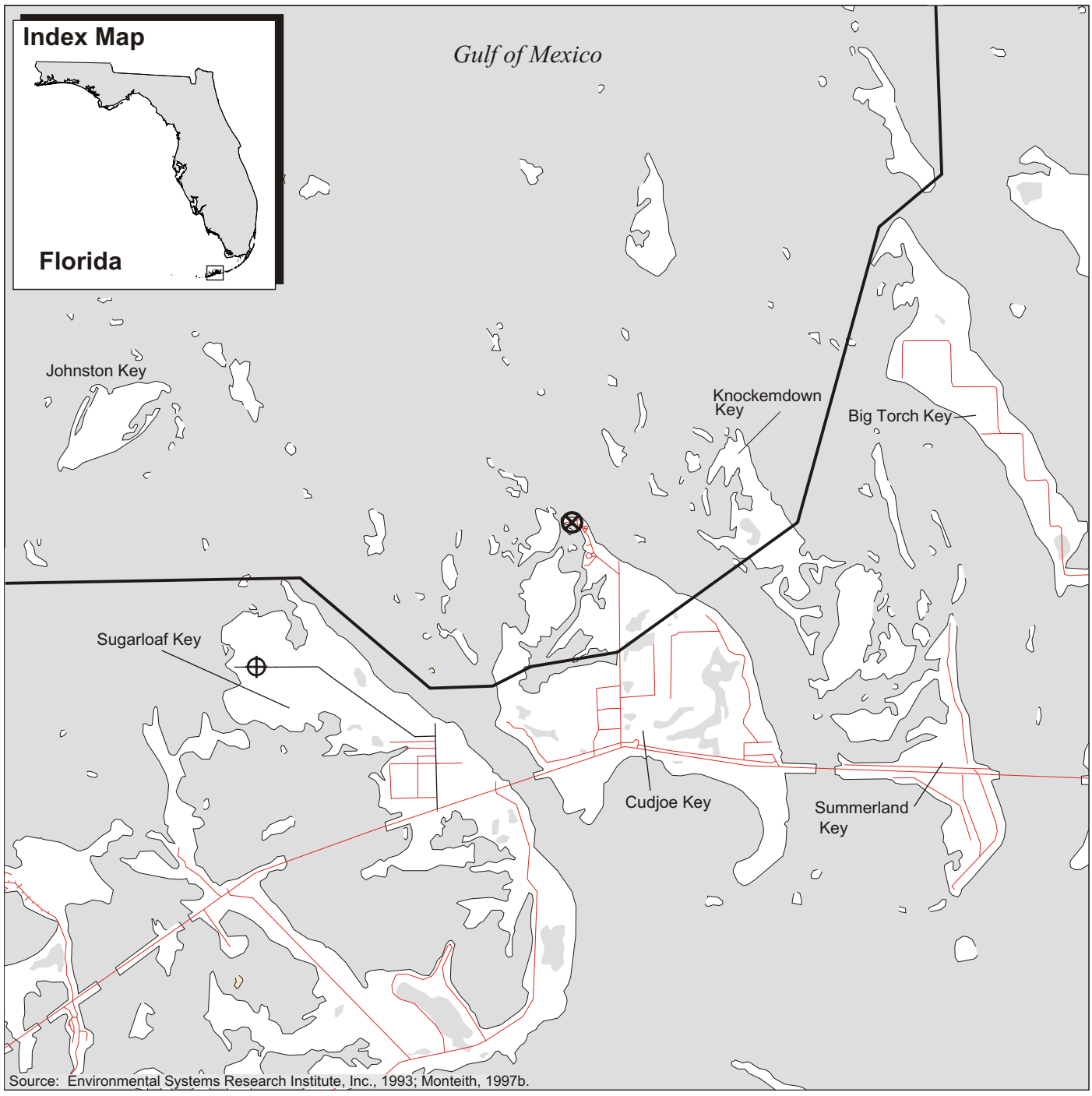
Flight testing would have a temporary impact on the local environment of either Cudjoe Key or Saddlebunch Keys (see biological resources, noise, air quality, land use, transportation). The marginal increase in money circulating throughout the local economy, as a result of flight testing, would have a minimal positive impact on the quality of life of some local residents.

Given the capacity of the area to absorb a large number of resident and tourist boating trips, it is unlikely that clearance from either the Cudjoe Key LHA or Saddlebunch Keys LHA would have any significant economic impact. Flight testing would exclude certain individuals and groups within the community from the areas surrounding Cudjoe Key or Saddlebunch Keys (figures 3.3.10-3 and 3.3.10-4). Some public activities that would be otherwise carried out near Cudjoe Key would be displaced to other locations. The land and water use resource discusses the physical boundaries of the clearance area in detail (see section 3.3.7.4). The economic impacts are discussed below.

For the purposes of this analysis, it is assumed that three main groups would be cleared from the area adjacent to Cudjoe Key or Saddlebunch Keys as a result of flight testing. These groups are Florida Keys residents, tourists (including leisure boaters), and commercial fishermen.

At present, the use of the land that comprises Cudjoe Key and Saddlebunch Keys by residents and tourists of the Florida Keys is limited. Use of the waters of the Lower Keys was surveyed in 1995.

Clearance up to 4 hours, 1 day per month, of part of the Lower Keys waters will have a temporary impact on visitors to the Florida Keys. Use of the waters of the Lower Keys by visitors to Monroe County was surveyed by NOAA and several other agencies in 1995 and 1996 (U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 1995b; 1996a; 1996b; 1996c). The 1995 NOAA survey found that about 137,000 visitors participated in water-based activities in the Lower Keys, during the year. This represented about 8 percent of all water-based activity by visitors to the Florida Keys in 1995. Use of the waters was highly seasonal. An average of 627 visitors per day participated in water-based activities in the Lower Keys, between December 1995 and May 1996. The average for the off-peak months of June to November 1995 was 127. These figures suggest that clearance for four hours, one day per month, of part of the Lower Keys waters will have a minimal impact on visitors to the Florida Keys. Six test events in the winter would displace 3,762 visitors, or 2.7 percent of the 137,000 visitors, conservatively assuming that all those visitors used the waters around Cudjoe or Saddlebunch Keys. Six test events in the summer would displace 726 visitors, or 0.5 percent of the visitors. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 1996a)



EXPLANATION

- Roads
- RDAS Site
- Alternative Launch Site
- Launch Hazard Area

Note: RDAS = Real-time Data Acquisition System

Scale 1:100,000

0 1 2 Miles

0 1.5 3 Kilometers

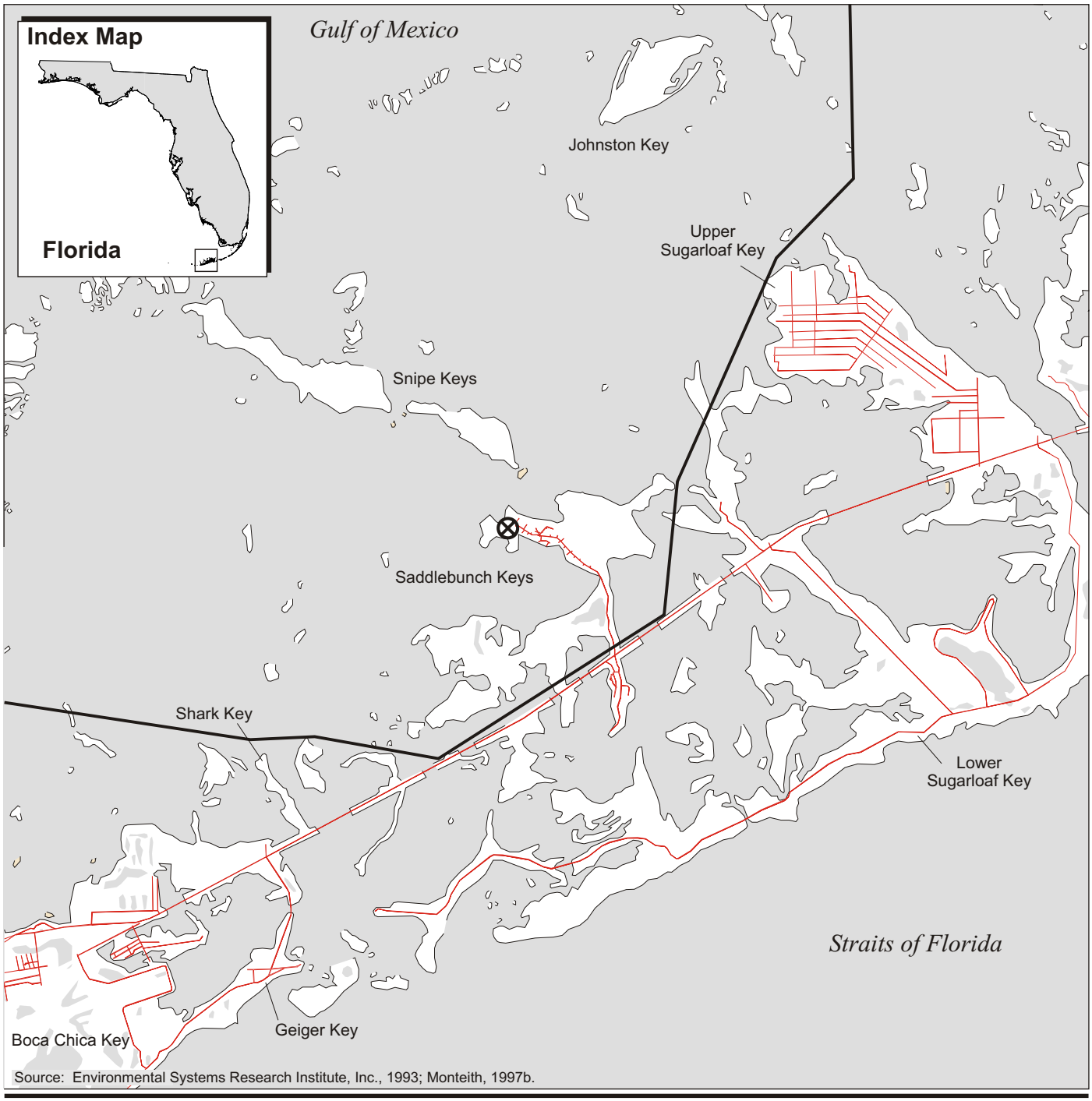
NORTH

cud-100k-4gen002

Recreation Clearance Areas

Cudjoe Key, Florida

Figure 3.3.10-3



EXPLANATION

- Roads
- Proposed Launch Site
- Launch Hazard Area

Recreation Clearance Areas

NORTH

Scale 1:100,000

0 1.5 3 Kilometers

0 1 2 Miles

Saddlebunch Keys, Florida

Figure 3.3.10-4

sad-100k-4land004

In addition to Florida Keys visitors, residents of Monroe County also use the waters of the Lower Keys for leisure purposes. Four hours of being cleared from part of the Lower Keys, one day per month would have a minimal impact on the leisure patterns of Monroe County residents. As part of the wider NOAA study, Leeworthy and Wiley completed a socioeconomic analysis in August 1997 of the recreation activities of Monroe County residents. The study concluded that 77 percent of residents—or over 60,000 people—participated in an outdoor recreation activity in the 12 months leading up to the summer and fall of 1996. About 8,600—or 10 percent—of residents stated that they fished the waters of the Lower Keys (which include Atlantic as well as Gulf of Mexico waters) and about 8,000 said they had viewed wildlife or studied nature from a boat in the Lower Keys (these numbers are not exclusive; people who said they both fished and viewed wildlife from a boat are included in both groups). The average number of days that respondents said they had carried out these activities in a year was between 19 and 23 days. This level of participation suggests that a 4-hour clearance from part of the Lower Keys, one day per month would have a temporary impact on the leisure patterns of Monroe County residents.

Given the capacity of the area to absorb a large number of resident and tourist boating trips, and the availability of readily accessible state parks, it is unlikely that clearance from Cudjoe Key or Saddlebunch Keys as a result of flight testing would have any significant economic impact. The Florida Keys include eight state parks and one national park which would not be affected by the action and which provide alternative locations for visitors interested in the Florida Keys environment. These parks received almost 4 million visits in 1994-1995.

There is no evidence that the area of clearance includes any species that could not be caught by commercial fishermen in the non-clearance zones nearby or in the periods it is not cleared. The availability of similar fishing grounds nearby to which commercial fishing vessels could be displaced suggests that there would be no economic effect as a result of exclusion.

Following the destruction wrought by Hurricane Andrew in 1992, and the resulting refusal by many insurance companies to cover Florida homeowners, the State Legislature instituted the Joint Underwriting Association (JUA), an insurer of last resort.

The Insurance News Network for Florida produces an insurance rate guide of sample annual premiums for every county in the State. A typical baseline homeowners policy is priced for each county by the top 18 insurance companies operating in Florida.

The 1997 Sample for Monroe County showed wide variations between the premiums charged for the baseline homeowner's policy. These ranged from a low annual premium of $662 to a high of $2,424 for identical policies. The 1997 JUA sample premium for Monroe County was $1,754.

Okaloosa County includes Eglin AFB. The 1997 sample annual premiums for identical policies in Okaloosa County ranged from $407 to $977. The 1997 JUA sample premium for Okaloosa County was $943.

The substantial variance between premiums for identical policies in Monroe County and Okaloosa County is mainly the result of the greater historic cost of hurricane and flood damage in the former.

A representative of the Florida Insurance News Network confirmed that insurance premiums are a function of each insurer's past experience in fulfilling claims for particular events (such as damage arising from hurricanes) and do not reflect subjective assumptions about future risks. There have been no notified claims in Monroe or Okaloosa counties arising from military testing programs and insurance company premiums reflect this experience. It is not anticipated that selection of the Florida Keys for TMD testing would affect insurance rates. Even a mishap would not likely change rates because of the small scale isolated nature of such an event. (Insurance News Network, 1998).

Environmental Justice

One census tract in Monroe County having disproportionately high low-income or minority populations is located close to or adjacent to the proposed launch site on Saddlebuch Keys. As a result, environmental justice concerns may arise on Saddlebunch Keys but would not affect Cudjoe Key. An evaluation of potential environmental justice impacts is presented in appendix C.

Cumulative Impacts

Construction of the TMD test facilities at Cudjoe Key would take place within the U.S. Air Force Air Combat Command property which was originally developed in 1959 for monitoring missile testing over the Gulf of Mexico. This complex was altered to accommodate balloon radar surveillance of the southern Gulf and Cuba which will continue for the foreseeable future. Residential and commercial development has continued at a moderate rate in Monroe County with some increase in population on Cudjoe Key.

Construction of the TMD test facilities on Saddlebunch Keys would take place on land owned by Naval Air Station, Key West. This site was developed and is operated by the Naval Computer Telecommunications Area Master Station Atlantic Detachment. Current transmission and support activity will continue for the foreseeable future and there are no current plans for additional DOD projects. Residential and commercial development has continued at a moderate rate in Monroe County with some increase in population on Cudjoe Key.

The construction program of TMD test facilities at either Cudjoe Key or Saddlebunch Keys is relatively small when compared to other construction activities in the area, particularly Key West. The employment of local construction workers will, nonetheless, help reduce the impact of seasonality on the local construction industry. No other projects have been identified at this location for the foreseeable future which, when combined with the proposed action, would result in cumulative impacts.

Flight test activities will lead to an small influx of personnel from time to time. Their cumulative contribution to the local economy will be negligible, when compared to the revenues and other impacts that tourists generate in the Keys, particularly between

October and May. Flight test activity during the off-peak months will help reduce the impact of local unemployment in the tourist industry.

Flight testing will, from time to time, clear residents and visitors from the waters surrounding the launch facilities. This clearance, though relatively minimal, will augment the limitations imposed by the Florida Keys Marine Sanctuary. A recent survey, carried out by NOAA and various partner organizations, tested visitor satisfaction in the Keys. Among other things, the survey found that shoreline access was perceived to have declined significantly in the last 5 years (1991 to 1996). There is a possibility that the TMD proposal could contribute further to the perceived decline in shoreline access. No other projects have been identified at this location for the foreseeable future which, when combined with the proposed action, would result in cumulative impacts.

Mitigations Considered

Possible mitigations would include:

- Provide and distribute advance notification of closure dates and durations to the local public, FMP, Coast Guard DEM, and marinas.
- Schedule launched to avoid lobster sport day (late July).
- Consider the beginning of lobster season when scheduling launch dates (early August).

3.3.11 TRANSPORTATION

TMD flight test activities would add approximately 290 daily trips at either site. For Cudjoe Key, this would be a 0.5 percent increase. For Saddlebunch Keys, this would be a 1.5 percent increase in the AADT.

3.3.11.1 Resource Description and Evaluative Methods

The purpose of the transportation resource section is to address the road and water transport system and its use within the ROI defined for each of the alternative launch sites. For the purposes of this document, there are two primary categories encompassed under the term transportation:

- The system of public streets and highways within the ROI and their use by vehicles
- The waterways of the Intracoastal Waterway and the Gulf of Mexico

Discussion of marine shipping in the Intracoastal Waterway and in shipping channels in the open Gulf of Mexico is in the transportation resource section 3.2.11 related to the Gulf Flight Test Range.

3.3.11.2 Region of Influence

For the Florida Keys sites, the ROI will be equivalent for all of the Keys that are included in the alternative action. The Overseas Highway, U.S. 1, is the principal artery upon which transportation between all the Florida Keys mutually depend. The ROI extends along U.S. 1 and Highway A1A south of its intersection with U.S. 1 in Key West and north along U.S. 1, a distance of about 56.3 kilometers (35 miles) to MM 33. This region is intended to include the majority of the local travel area for personnel making trips between the test sites to provide for their lodging and commercial activities while assigned to project activities.

3.3.11.3 Affected Environment

Monroe County's roadway system depends on U.S. 1 to connect 100,000 residents and tourists on a chain of islands 181 kilometers (112.5 miles) long, including 42 bridges (figure 3.3.11-1). U.S. 1 is therefore the economic lifeline of the residents and visitors of the Florida Keys for food and supplies needed from the mainland of Florida. Further, in event of a hurricane, U.S. 1 northbound is the only available evacuation route.

Within Monroe County, U.S. 1 is predominantly a two-lane road with no major roads intersecting it. Of its 180.2 kilometers (112 total miles), 120.7 kilometers (75 miles) have only two lanes with additional turn lanes at intersections. Only 9 of 340 intersections are fully signalized. Four-lane sections are limited to 25.7 kilometers (16 miles) on Key Largo, 9.7 kilometers (6 miles) on Marathon Key, 3.2 kilometers (2 miles) on Bahia Honda Key, and 11.3 kilometers (7 miles) from Boca Chica Key to Key West.

EXPLANATION

- Roads
- U.S. Highway
- Mile Marker

Major Roadway System

Scale 1:250,000

0 2 4 Miles

0 3 6 Kilometers

NORTH

key-250k-3trans001

Lower Florida Keys

Figure 3.3.11-1

U.S. 1 ends on Key West and joins U.S. A1A, Roosevelt Highway. Roosevelt Highway is a four-lane state-maintained loop system that collects traffic from local streets on Key West and channels it to U.S. 1. For convenience, locations along the 173.8-kilometer (108-mile) length of U.S. 1 are keyed to mile markers beginning with MM 0 at the extreme western end of Key West to MM 108 along the bridge from Key Largo to Homestead.

Under Monroe County's growth management process, the overall LOS for U.S. 1 is based on analysis of average travel speeds. Based on an analysis done by the Monroe County Planning Department in 1996, the *U.S. 1 Arterial Travel Time and Delay Study*, the median overall travel speed in the Keys is 61.7 kilometers (47.1 miles) per hour compared with the LOS C standard of 61.7 kilometers (41.7 miles) per hour. The only one of the 24 segments in the speed study that did not have the minimum median speed was the Big Pine Key segment, located between MM 29.5 and MM 33.0.

In the vicinity of Cudjoe and Saddlebunch Keys, U.S. 1 consists of a two-lane road. In 1995, the annual volume of traffic on U.S. 1 in this stretch ranged from a minimum of 15,000 vehicles per day between MM 16.5 and MM 23 opposite Sugarloaf and Cudjoe Keys to a maximum of 25,000 vehicles per day between MM 7 and MM 9 near Boca Chica Key. All of these segments had levels of service of C or better, in 1995, as shown in table 3.3.11-1. According to FDOT at MM 15.7, approximately 4.3 percent of all vehicles (521 vehicles per day) on U.S. 1 in 1996 were heavy trucks.

Table 3.3.11-1: Traffic Data for Florida Keys ROI, MM 0 - MM 33

Segment FDOT Count Station #	Approximate Kilometers (Miles)	1996 ADT	Lanes	1996 LOS	Capacity LOS C	Remaining Trips 1996
# 105 - N. Roosevelt Blvd	3.2 (2.0)	32,500	4	B	34,900	2,400
# 5004 – Fleming Key: MM 0.0 - 2.0	3.2 (2.0)	25,000	4	A	34,900	9,900
# 5034 – Dredger's Key: MM 2.0 - 4.0	3.2 (2.0)	31,500	4	B	34,900	3,400
# 165 - Stock Island: MM 4.0 - 5.0	1.8 (1.1)	32,600	4	B	34,900	1,658
# 9 - Boca Chica : MM 5.0 - 9.0	6.3 (3.9)	25,000	4	A	34,900	4,694
# 10 - Big Coppitt: MM 9 - 10.5	2.4 (1.5)	21,000	2	A	16,300	1,949
# 106 – Saddlebunch: MM 10.5-16.5	9.3 (5.8)	16,000	2	C	16,300	2,713
# 107 – Sugarloaf: MM 16.5 - 20.5	6.4 (4.0)	15,000	2	B	16,300	3,464
# 107 - Cudjoe: MM 20.5 - 23.0	4.0 (2.5)	15,000	2	A	16,300	3,118
# 108 – Summerland: MM 23.0 - 25.0	3.5 (2.2)	15,400	2	B	16,300	1,715
# 109 – Ramrod: MM 25.0 - 27.5	3.7 (2.3)	18,000	2	A	16,300	3,307
# 109 - Torch: MM 27.5 - 29.5	3.4 (2.1)	18,000	2	A	16,300	2,266
# 16 - Big Pine: MM 29.5 – 33.0	5.5 (3.4)	24,541	2	E	16,300	0
# 110 – Marathon Key: MM 50.5	4.8 (3)	28,500	4	A	31,900	21,369
# 65 - Craig Key: MM 72	13.3 (8.2)	11,000	2	B	16,300	3,430
#102 Plantation Key: MM 91	5.2 (3.2)	25,500	4	C	36,700	4,320
# R-164 - Key Largo: MM 106	3.2 (2)	19,500	4	B	36,700	5,769

Source: Florida Department of Transportation, Office of Planning, 1996.

There is seasonal variation in this traffic volume on U.S. 1. In 1995, according to the FDOT, the maximum traffic month for this portion of U.S. 1 (measured at Big Pine Key) is February when the average monthly traffic is 110 percent of the annual average and the minimum month is September, when the average monthly traffic is 94 percent of the annual average.

Cudjoe Key

Blimp Road extends north from U.S. 1 at MM 21.5 a distance of approximately 3.1 kilometers (2 miles) to its end at a public boat ramp. The entrance road to the TARS facility is located along this route approximately 3 kilometers (1.9 miles) north of U.S. 1. Blimp Road is a two-lane paved road that also provides access to a City of Key West incinerator and a former landfill that has been closed and is used as a solid waste transfer station. There are also two intersecting residential streets along this stretch of Blimp Road, with approximately 23 single-family homes on 0.4-hectare (1-acre) lots. Neither the state or county has any records of traffic volume on Blimp Road. However, judging from its length and current land use, it likely ranges between 500 and 1,500 vehicles per day.

Fleming Key

Fleming Key is a munitions storage facility adjacent to Key West and is part of NASKW. Its access depends on a short connection along Truman Road to Route A1A in Key West.

Saddlebunch Keys

The transmitter site on Saddlebunch Keys is accessed along a two-lane road that intersects directly with U.S. 1. There are currently no other uses or traffic on this road except for very light traffic in and out of the military base.

Sugarloaf Key

The most important internal road on Sugarloaf Key is Crane Road, a county-maintained, two-lane collector road on Sugarloaf Key from the proposed instrumentation site to its intersection with U.S. 1. Crane Road is closed to through traffic about 1.6 kilometers (1 mile) north of U.S. 1. Neither the county nor the state maintains records of traffic volumes on Crane Road, but based on its current land use, it is likely to serve less than 2,000 vehicles per day from local homes and the Sugarloaf Elementary School.

Boca Chica Key

The entrance to the NASKW military property on Boca Chica Key is accessed through a gate from U.S. 1. There is currently very little activity at this location because there are no permanent personnel assigned to this area.

3.3.11.4 Environmental Impacts and Mitigations

3.3.11.4.1 Cudjoe Key

TMD flight test activities would add approximately 290 daily trips to the projected 18,000 AADT at Cudjoe Key in 2005; this would be an increase of 0.5 percent of the predicted AADT.

No-action Alternative

Under the no-action alternative action, there would be no additional traffic on local roads on Cudjoe Key, Saddlebunch Keys, Sugarloaf Key, Fleming Key, and Boca Chica Key associated with the proposed action. However, as shown in table 3.3.11-2, daily traffic on U.S. 1 is expected to increase slowly as a result of continued growth related to tourism and the construction of the permitted number of housing units and commercial development consistent with the growth management policies of Monroe County and the City of Key West.

Table 3.3.11-2: Baseline Increase in Traffic on U.S. 1 in Florida Keys ROI, MM 0 - MM 33

Segment FDOT Count Station #	APX. MILES	1995 ADT	2005 ADT*	%Change (1995-2005)	Year 2005 Capacity**
# 5004 - Fleming Key: MM 0.0 - 2.0	2.0	25,000	26,130	4.5%	14,700
# 5034 - Dredger's Key: MM 2.0 - 4.0	2.0	31,500	38,020	20.7%	31,900
# 165 - Stock Island: MM 4.0 - 5.0	1.1	32,600	46,130	41.5%	36,700
# 9 - Boca Chica : MM 5.0 - 9.0	3.9	25,000	30,880	23.5%	36,700
# 10 - Big Coppitt: MM 9 - 10.5	1.5	21,000	23,770	13.2%	16,300
# 106 - Saddlebunch: MM 10.5-16.5	5.8	16,000	18,510	15.7%	16,300
# 107 - Sugarloaf: MM 16.5 - 20.5	4.0	15,000	17,700	18.0%	16,300
# 107 - Cudjoe: MM 20.5 - 23.0	2.5	15,000	17,700	18.0%	16,300
# 108 - Summerland: MM 23.0 - 25.0	2.2	15,400	18,180	18.0%	16,300
# 109 - Ramrod: MM 25.0 - 27.5	2.3	18,000	19,350	7.5%	16,300
# 109 - Torch: MM 27.5 - 29.5	2.1	18,000	19,350	7.5%	16,300
# 16 - Big Pine: MM 29.5 – 33.0	3.4	24,541	26,380	7.5%	16,300

*2005 forecast based on extrapolation of growth factors used in 2000 Monroe County Long Range Transportation Plan
**Based on 2,000 capacity on Table 24 of the Monroe County Long Range Transportation Plan
MM = Mile Marker
Source: Monroe County, 1994.

Continuing Air Force and Navy operations would have a negligible effect on local land or water transportation.

Site Preparation Activities

Under the Cudjoe Launch alternative, the TARS site on Cudjoe Key would be a target launch site. Construction activity is expected to extend over an 8-month period with approximately 6 personnel, increasing to 15 personnel during the middle of the project. This will likely increase vehicle traffic on U.S. 1 and Blimp Road by approximately 16 to 50 vehicles per day, assuming 5 trips per day, per person, and a vehicle occupancy rate of 1.5 persons per vehicle, for a period of up to 8 months.

No site modifications are anticipated at Sugarloaf Key, Saddlebunch Keys, Fleming Key, or Boca Chica Key in connection with their proposed use as instrumentation sites to support target missile launches from Cudjoe Key. Therefore, there would not be any effects on traffic at those locations associated with construction.

The safety aspects of transport and handling of missiles and missile components related to the proposed action is discussed in section 3.1.9. When necessary to transport missiles and missile components over public highways, it would be done in accordance with Federal safety regulations of the USDOT concerning transportation of hazardous materials. Routes would be almost entirely on state and Federal highways regularly used for the transportation of similarly classified materials by commercial and military carriers and would be coordinated with appropriate Federal, state, and local officials to minimize risk to people and property.

The Minuteman Stage II booster motor is shipped with the FTS attached. The initiator of this FTS assembly is not part of the shipped motor. The FTS is a linear shaped charge designed to split the rocket motor case. The FTS would not detonate without an initiator. Should a vehicle accident damage the booster, it is more likely to burn than explode. The booster motors are shipped with both ends open, so any fire would not result in sufficient compression for an explosion or propulsion. The designation as a DOD Class 1.1 does not mean that the propellant is explosive. In fact, the propellant has less equivalent energy per mass than gasoline.

Flight Test Activities

There would be a maximum of 12 launch events per year operated from Cudjoe Key. Each target launch event could require as many as 90 personnel with varied lengths of assignment to the site.

Table 3.3.11-3 presents the daily fluctuation in personnel and the associated number of trips generated each day during a typical 34-day target missile launch test cycle. The vehicle trip generation rate of 4.18 one-way trips per person is based on the weekday rate per employee for Military Bases, Land Use 501 (Institute of Transportation Engineers, 1991). The mean traffic effect during the entire launch cycle would be 150 daily trips. The minimum would be 42 daily trips. The maximum traffic level of 376 daily trips would only take place for 2 days per launch event.

Table 3.3.11-3 presents the amount of daily traffic generated by the proposed action alternative during the 2 maximum activity days of a launch event, assuming a maximum of 90 personnel assigned to Cudjoe Key for a target launch. These trips would

be distributed by direction on U.S. 1 in proportion to the distribution of transient lodging available in the ROI north and south of Cudjoe Key, as discussed in section 3.3.10. Approximately 78 percent, or 293 vehicle trips, would be to and from the south, principally towards Key West. Approximately 22 percent, or 83 vehicle trips would be to and from the north, principally towards Marathon Key. Blimp Road would receive all 376 trips on the 2 maximum activity days, for up to 12 times per year. Although there are no available data concerning the current volume of traffic on Blimp Road, based on the current land uses, remaining capacity on Blimp Road would be more than adequate to accommodate the anticipated increase in traffic resulting from the proposed action alternative. A forecast of traffic volume is presented in table 3.3.11-3.

Table 3.3.11-3: Forecast Traffic Data for Florida Keys ROI, MM 0 - MM 33

Segment FDOT Count Station #	2005 ADT (1)	2005 Remaining Capacity (2)	Project Traffic (3)	% of 2005 ADT (4)	% of Remaining Capacity (5)
#5004 - Fleming Key: MM 0.0 - 2.0	26,130 (LOS F)	0*	293	1.1%	NA
#5034 - Dredger's Key: MM 2.0 - 4.0	38,020 (LOS F)	0	293	0.8%	NA
#165 – Stock Island: MM 4.0 - 5.0	46,130 (LOS F)	0	293	0.6%	NA
#9 – Boca Chica : MM 5.0 - 9.0	30,880 (LOS D)	5,800	293	0.9%	5.0
#10 – Big Coppitt: MM 9 - 10.5	23,770 (LOS C)	12,900	293	1.2%	2.2
#106 – Saddlebunch: MM 10.5-16.5	**18,510 (LOS F)**	**0**	**293**	**1.6%**	**NA**
#107 – Sugarloaf: MM 16.5 - 20.5	17,700 (LOS F)	0	293	1.7%	NA
#107 – Cudjoe: MM 20.5 - 23.0	**17,700 (LOS F)**	**0**	**293**	**1.7%**	**NA**
#108 – Summerland: MM 23.0 - 25.0	18,180 (LOS F)	0	83	0.5%	NA
#109 – Ramrod: MM 25.0 - 27.5	19,350 (LOS F)	0	83	0.4%	NA
#109 – Torch: MM 27.5 - 29.5	19,350	0	83	0.4%	NA
#16 – Big Pine: MM 29.5 – 33.0	26,380	0	83	0.3%	NA

1. Projected volume by EDAW based on change forecast for 1995 - 2000 in Monroe County Long Range Transportation Plan.
2. Extrapolated by EDAW from report of U.S. 1 Level of Service Task Force for Monroe County, except where noted (*FDOT Standard Capacity Tables)
3. Project Traffic distributed in proportion to distribution of transient housing in ROI.
4. Column 3 divided by column 1.
5. Column 3 divided by column 2, when value in column 2 is greater than 0.

Source: Monroe County, 1994.

Overall, the analysis shows that the additional traffic from the alternative action would increase forecast traffic on U.S. 1 in 2005 by 0.3 to 1.6 percent on a peak day of activity. The traffic impacts are a function of the distribution of transient lodging in the ROI. Project traffic south of Cudjoe Key would be increased by about 293 vehicles per day because most of the available lodging is towards the south (Key West). Traffic north of Cudjoe Key would be increased by only about 83 vehicles per day because there are fewer destinations in that direction.

Most segments on U.S. would already be above their design capacities in 2005, and the small increase in traffic from the alternative action for a limited amount of time is expected to slightly worsen the level of service on U.S. 1. On an annual average basis, the program would increase traffic on U.S. 1 by less than 1 percent.

The Cudjoe Key launch alternative would require closure of Blimp Road from Asturius Road to the boat ramp for up to 4 hours for each launch event (up to 12 times per year). This would be a minor traffic disruption for people using the boat ramp.

Other keys would have lesser program impacts, as discussed below.

Boca Chica Key, Fleming Key, Saddlebunch Keys, and Sugarloaf Key

If the Cudjoe Key target launch alternative was selected, these sites would be used as alternative locations for radar equipment consisting of three trucks with a total crew of six. There would be no oversize vehicles or loads over those normally permitted on state routes.

Trucks and equipment would be set up once for each of 12 annual launches, and return to offsite storage sites following each launch event. The radar crew would generate a total of 30 daily trips in and out of base roads and on U.S. 1. They would remain on the site for up to 2 weeks per launch. These additional vehicle trips would have a temporary effect on vehicle trips on the total vehicle volumes on U.S. 1.

Cumulative Impacts

Construction of the TMD test facilities at Cudjoe Key would take place within the U.S. Air Force Air Combat Command property which was originally developed in 1959 for monitoring missile testing over the Gulf of Mexico. This complex was altered to accommodate balloon radar surveillance of the southern Gulf and Cuba, which will continue for the foreseeable future. Residential and commercial development has continued at a moderate rate in Monroe County with some increase in population on Cudjoe Key.

One of the main transportation issues in the Florida Keys is the peak hour congestion on U.S. 1, the only arterial connecting the Keys to the mainland. A related issue is the manner in which the time required to evacuate residents and tourists in the event of a hurricane. This issue is not only as a safety concern, but also has become a constraint to further growth in Monroe County. Although there have been numerous proposals to widen U.S. 1 in order to improve safety and to reduce evacuation time, no improvements have been approved. Although the TMD program would add less than 500

daily vehicles to the traffic on U.S. 1, this increase would be added to other traffic demand and could be considered to have a cumulative effect on the remaining capacity of the highway.

In addition, due to the sustained presence of program personnel, there may be cumulative effects arising from this program due to its local economic activity (as a result of construction, lodging, retail and associated indirect consumer expenditures) in the ROI. Over the 10-year program life, this economic activity may lead to small amounts of additional construction of housing and commercial space. The additional traffic resulting from the indirect and cumulative economic activity is expected to increase average annual and peak hour traffic in the ROI by less than 1 percent of the future levels of traffic otherwise forecast on U.S. 1.

Mitigations Considered

By ensuring compliance with DOT hazardous materials transportation regulations, additional mitigations are not required. However, SOPs would include separation and coordination of emergency response plans and emergency access procedures with appropriate state and local authorities.

The small increase in traffic due to TMD activities would contribute marginally to the exceedance of road capabilities in the ROI. Traffic management strategies may be proposed to minimize program impact on these roadways, such as the utilization of low density traffic hours for construction and missile components traffic.

3.3.11.4.2 Saddlebunch Keys

TMD flight test activities would add approximately 290 daily trips to the projected 18,500 ADT at Saddlebunch Keys in 2005; this would be an increase of 1.5 percent of the projected ADT.

No-action Alternative

Under the no-action alternative, the operations of the Saddlebunch Keys facility would continue at the current planned levels. As such, traffic would remain at its current levels. If the proposed action does not take place, there would be no additional traffic anticipated on Saddlebunch Keys, Boca Chica Key, Cudjoe Key, Fleming Key, or Sugarloaf Key associated with program activities (see table 3.3.11-2).

Continuing Navy and VOA transmission activities would have a negligible effect on local land or water transportation.

Site Preparation Activities

Under Saddlebunch Keys Launch Options A and B, the transmitter site on Saddlebunch Keys would be a target launch site. Site preparation consists of construction of facilities as required. Maximum use would be made of existing facilities and infrastructure, and no road improvements are expected to be needed off military property.

Altogether, construction activity is expected to increase vehicle traffic on U.S. 1 by less than 67 vehicles per day for a period of up to 8 months.

No site modifications are anticipated at Cudjoe Key, Saddlebunch Keys, Fleming Key, or Boca Chica Key in connection with their proposed use as instrumentation sites to support target missile launches from Saddlebunch Keys. Therefore, there would not be any effects on traffic at those locations associated with construction.

Flight Test Activities

The safety aspects of transport and handling of missiles and missile components related to the proposed action is discussed in section 3.1.9.

Overall, the analysis shows that the additional traffic from the proposed action alternative would increase forecast traffic on U.S. 1 in 2005 by 0.03 to 1.5 percent. Most segments on U.S. 1 would already be above their design capacities in 2005, and the small increase in traffic from the proposed action alternative for a limited amount of time is not expected to significantly increase the LOS on U.S. 1 or have a measurable effect on the maintenance of roads and bridges in the ROI.

Other keys would have lesser program impacts, as discussed below.

Boca Chica Key, Cudjoe Key, Fleming Key, and Sugarloaf Key

If the proposed action takes place, these sites would be used as alternative locations for radar equipment consisting of three trucks with a total crew of six. There would be no oversize vehicles or loads over those normally permitted on state routes.

Trucks and equipment would be set up once for each of 12 annual launches, and return to offsite storage sites following each launch event. The radar crew would generate a total of 25 daily trips in and out of base roads and on U.S. 1. They would remain on the site for up to 2 weeks per launch. These additional vehicle trips would have a negligible effect on vehicle trips on the total vehicle volumes on U.S. 1.

Cumulative Impacts

Construction of the TMD test facilities on Saddlebunch Keys would take place on land owned by NASKW. This site was developed and is operated by the Naval Computer Telecommunications Area Master Station Atlantic Detachment. Current transmission and support activity will continue for the foreseeable future and there are no current plans for additional DOD projects. Residential and commercial development has continued at a moderate rate in Monroe County with some increase in population on Cudjoe Key.

Cumulative Impacts are discussed in 3.3.11.4.1.

Mitigations Considered

By ensuring compliance with DOT hazardous materials transportation regulations, additional mitigations are not required. However, SOPs would include separation and

coordination of emergency response plans and emergency access procedures with appropriate state and local authorities.

The small increase in traffic due to TMD activities would contribute marginally to the exceedance of road capabilities in the ROI. Traffic management strategies may be proposed to minimize program impact on these roadways, such as the utilization of low density traffic hours for construction and missile components traffic.

3.3.12 UTILITIES

TMD activities would cause an increased demand for utilities at either site. The baseline consumption is so small that the increased demand would have a temporary impact on utilities.

3.3.12.1 Resource Description and Evaluative Methods

Refer to section 3.1.12 for a description of the resource and evaluative methods.

3.3.12.2 Region of Influence

The ROIs for utilities are the service areas of the agencies that provide the utility services. The ROI is the entire city or county that provides the service. As a consequence, the ROI for site alternatives in the Florida Keys is Monroe County for all the Florida Keys.

Potable Water

The Florida Keys Aqueduct Authority (FKAA) jurisdiction includes all of Monroe County. The FKAA has the authority to obtain potable water outside of its boundaries.

The FKAA also supplies potable water to the bases on Cudjoe and Saddlebunch keys. Individual wells on Cudjoe Key are used for fire suppression.

Wastewater Treatment

The residents of Cudjoe and Saddlebunch keys dispose of wastewater by onsite septic tanks and cesspits. Monroe County is currently studying the feasibility of a central public wastewater treatment system.

Stormwater Management

The State of Florida has designated the South Florida Water Management District (SFWMD) to regulate surface waters within the district that included all of Monroe County. Much of Florida Bay and the reef track have been classified by FDEP as Outstanding Florida Waters, affording these areas state protection.

The region's surface waters are affected by stormwater runoff that flows overland following the topography of the area. Natural drainage systems are defined by the topography of an area. The largest feature of a natural drainage system is the drainage basin, or watershed. The boundary of the basin is called the basin divide. This is a line where the natural elevation directs runoff from the basin toward a receiving water body. Each Florida Key contains its own watershed and receiving water body.

Solid Waste Disposal

The Department of Environment Management (DEM) has divided solid waste collection into three geographic subdistricts. Solid waste collectors temporarily dispose of solid waste at county owned transfer sites leased to Waste Management Inc. (WMI). At these facilities the solid waste is transferred to WMI trucks for hauling out of Monroe County. Cudjoe Key and Saddlebunch Keys are within subdistrict III and are served by Bland Disposal Service Inc.

Construction debris can also be recycled in the County by a private company. Hazardous material disposal is separated into large and small quantity generators, household wastes, and contaminated sites. The DEM has two temporary storage facilities, at Cudjoe and Long Key, to store small quantities of primarily household hazardous wastes. The DEM goes out to bid for the transportation and disposal of this waste.

Electricity

The City Electric System City of Key West provides electrical service from Key West up to, but not including, Marathon Key. Primary power is supplied to both Keys via overhead lines. The Department of the Navy is responsible for continuation of these lines within military property. The primary load supplied to Saddlebunch is 350 kVA and 275 kVA to Cudjoe. (U.S. Army Space and Strategic Defense Command, 1997)

3.3.12.3 Affected Environment

3.3.12.3.1 Cudjoe Key and Saddlebunch Keys

Potable Water

There are three sources of potable water for the Florida Keys area. The primary source of potable water is the Biscayne Aquifer located on the mainland in Florida City in southeast Dade County. The Biscayne Aquifer is an approximately 22.9-meter (75-foot) thick permeable limestone recharged by direct rainfall. The secondary source is the Floridan Aquifer System, a confined artesian aquifer found beneath Monroe County. Water pumped from this aquifer requires desalination treatment before it is suitable for either potable or irrigation use. The third source is water drawn directly from the Biscayne Aquifer in the Florida Keys. Water drawn from this aquifer also requires desalination for potable use. The Biscayne Aquifer in the Florida Keys is a limited freshwater lens that occurs beneath several keys including Cudjoe Key. This lens serves as a secondary source for fire suppression and is an important source of water for wildlife.

The Biscayne Aquifer in southeast Dade County offers water more efficiently than the other two and is therefore the major source of potable water for the Florida Keys. The FKAA distributes potable water from the treatment plant (Florida City) to the Florida Keys via a 209.2-kilometer (130-mile) large diameter main running the length of U.S. 1 that is connected to a series of storage and pumping facilities (Monroe County, 1993). In-line booster pumping stations are used as necessary to increase and sustain an operating pressure of 250 psi in the transmission main.

Cudjoe Key is serviced by a 15.2-centimeter (6-inch) water line. The line serves the TARS Site as well as surrounding residents. The line was originally installed and operated by the Air Force, but has since been given to the FKAA. This line is operational and available for use. The monthly average usage at the Cudjoe aerostat site for July 1996 through June 1997 was 78,767.9 liters (20,808.3) gallons (Cates, 1997). Inside Federal property the water lines are maintained by the military.

Saddlebunch Keys is served by a 6.4-centimeter (2.5 inch) PVC main located along the site entrance road from U.S. 1. A water line serves the main communication building (J-1561) and the maintenance building (J-1700). The monthly average usage at the Saddlebunch Keys site is 17,381.4 liters (4,591.7 gallons) (Cates, 1997). Inside Federal property the water lines are maintained by the military.

The FKAA does not have sufficient water pressure to provide fire protection throughout the Florida Keys. In most instances the water distribution systems connected to the transmission mains are 5.1 centimeters (2 inches) in size and will not support fire flows. Non-potable dry wells are located at the Cudjoe Key site. There are four wells with one located at the launch site. The volunteer fire department at Sugarloaf Key monitors these dry wells.

Wastewater Treatment

Monroe County has a particularly high percentage of soils unsuited to conventional OSDS septic tank and absorption bed systems. If OSDS are to function properly in such soils, alternative systems which are designed to overcome the specific limitations, improve effluent treatment, and reduce the potential for groundwater contamination must be used.

There are currently six wastewater treatment facilities discharging effluent via outfall to surface waters in unincorporated Monroe County. Effluent is the treated wastewater that flows out of the treatment plant. One such facility, Venture Out, is located on Cudjoe Key. The sludge is transported to a landfill in Broward County.

The Cudjoe aerostat site has five on site disposal systems consisting of septic tanks and drainfields. These septic tanks are pumped annually. (Morrow, 1997)

The Saddlebunch Keys site has one onsite disposal system consisting of a septic tank and drainfield. This system serves the transmitter building and the maintenance building.

Florida legislature has recognized the Florida Keys as an Area of Critical State Concern. State statutes were adopted to ensure a water management system that will reverse the deterioration of water quality and provide optimum utilization of these limited aquatic resources, facilitate orderly and well planned development, and protect the residents of this state. (Monroe County, 1993)

Stormwater Management

Florida Bay and the coral reefs have been classified by the FDEP as "Outstanding Florida Waters," affording these areas state protection.

The Cudjoe Key site does not have a planned stormwater management system. Stormwater from impervious surface areas sheet flow to pervious areas where the water either percolates into the soil or runs to the nearest body of water.

Saddlebunch Keys site does not have a planned stormwater management system. Stormwater from impervious surface areas sheet flow to pervious areas where the water either percolates into the soil or runs to the nearest body of water.

Solid Waste Disposal

Monroe County contracts to have its solid waste hauled out of the county. In 1990 a contract was signed with WMI to transport solid waste to WMI landfill in Broward County. The collected solid waste is taken to the transfer site on Cudjoe Key. At these facilities the solid waste is transferred to WMI trucks for hauling out of Monroe County. A previously used landfill on Cudjoe Key acts as a transfer site for solid waste. Bland Disposal Service Inc. administers collection of solid waste on Cudjoe Key and Saddlebunch Keys.

Hazardous material disposal is separated into large and small quantity generators, household wastes, and contaminated sites. The DEM has two temporary storage facilities, at Cudjoe and Long keys, to store small quantities of primarily household hazardous wastes. The DEM contracts for the transportation and disposal of this waste.

Electricity

City Electric System has a firm allocation of 100 megawatts. Peak high use to date has been 115 megawatts. In peak situations City Electric could either purchase more or generate additional capacity through their local generator. In case of emergency or peak demands the City Electric System can generate locally 60 percent of their capacity through fuel generated diesel engines.

The existing electrical system for Cudjoe Key is as follows. Incoming power to this site is rated 13.8 kV and is overhead construction to the transformer Building 12921. The transformer building contains three 333-kVA single-phase transformers, 13.8-kV—480-V, and a switchboard with a 1,600-ampere main bus. The 480-volt distribution lines from Building 12921 to the using facilities are direct buried. The location of the launch complex in this area will require that the substation in Building 12921 and the underground electrical lines be upgraded. (Medlate, 1997)

Saddlebunch Keys. Existing power distribution lines are rated 13.8 kV and are overhead lines from the highway to the outer gate of the Saddlebunch Keys site. From the outer gate to the transformer yard adjacent to Building 1561, the 13.8-kV lines are direct buried. The transformer yard contains one 500 kVA, 13.8-kV–120/208-V, 3-phase transformer and one 225-kVA, 13.8-kV–480/277-V 3-phase transformer. The location of the launch complex in this area will require that a new 13.8-kV–480-V transformer be located in the transformer yard and new underground distribution lines be installed. There are three emergency generators, two of which are new 500-kW generators. (Medlate, 1997)

3.3.12.4 Environmental Impacts and Mitigations

3.3.12.4.1 Cudjoe Key

TMD activities would cause a large relative increase in demand for utilities at Cudjoe Key. The baseline consumption is so small that the increased demand would have a temporary impact on utilities.

No-action Alternative

Potable Water. Under the no-action alternative, TMD testing does not take place and the Cudjoe Key aerostat site would continue its current level of potable water consumption (table 4.2.12-1). The total annual usage was 945,114 liters (249,700 gallons). Average daily usage was 2,588 liters (684 gallons).

Wastewater Treatment. Under the the no-action alternative, TMD testing does not take place, and the Cudjoe Key aerostat site would maintain its existing level of wastewater treatment needs. Daily wastewater treatment demand would be 2,589 liters (684 gallons).

The 1995 wastewater treatment demand in Monroe County is assumed to equal the potable water sales, 17.07 billion liters (4.51 billion gallons) per year. The increase in Monroe County population over a 10-year period, 1995 to 2005, projected to be 10,900 persons, or 13.1 percent, would lead to annual disposal of 19.31 billion liters (5.10 billion gallons) of wastewater in the year 2005.

Solid Waste. Under the no-action alternative, TMD testing does not take place, and the Cudjoe Key Aerostat site would maintain its existing level of generating solid waste. The Cudjoe Key site generates 235 cubic meters (8,400 cubic feet) of waste annually. This number was generated by multiplying the size of the onsite dumpster by the number of times it is hauled off per year.

The FY 1994 level of solid waste for Monroe County is 206,500 cubic meters (7,290,500 cubic feet) per year. The increase in Monroe County population over a 10-year period, 1995 to 2005, is projected to be 10,900 persons. Multiplied by the per capita of 0.0028 cubic meters (1 cubic feet) per day would equal 13,360 cubic meters (471,786 cubic feet) per year increase in solid waste by the year 2005. This would represent an increase of 6.5 percent of the existing level of solid waste without the proposed action.

Electricity. Under the no-action alternative, TMD testing does not take place at the Cudjoe Key site, and the current activities would continue. The electricity required in peak periods would not change from existing conditions.

Site Preparation Activities

Construction of a launch pad, launch equipment building, MAB, LOT shelter, optics #1, replacement vehicle maintenance building, and replacement paint shed would generate

442 cubic meters (15,800 cubic feet) of waste. No permanent facilities would be required at Boca Chica, Fleming, or Sugarloaf keys. There would be no modification to those sites.

Flight Test Activities

Potable Water Demand. Potable water demand resulting from the TMD Flight Test Activities at either the Cudjoe Key or Saddlebunch Keys site would be approximately 340 liters (90 gallons) per person per day. This figure was selected from the USGS Resources Division *Estimated Commercial and Industrial Water Use by Employment, 1995*. As the Florida Keys Aqueduct Authority is the source of potable water for the base and the community, no effort is made to divide consumption into onsite and transient housing components. The estimate of potable water demand for both the Cudjoe Key site and the Saddlebunch Keys site are based on a maximum of 12 target launch events per year, yielding an annual total of 13,680 person days on site. The corresponding potable water demand at 340 liters (90 gallons) per person-day would be 4.66 million liters (1.23 million gallons) per year.

Table 3.3.12-1 shows how this demand compares with the total annual potable water demand projected for Monroe County in the year 2005. The TMD Program adds approximately 0.02 percent to the total water needs of Monroe County.

Table 3.3.12-1: Potable Water Demand for Cudjoe or Saddlebunch Keys

Cudjoe Key or Saddlebunch Keys	Annual Amounts liters (gallons)	Percent Change Due to TMD Activities
Consumptive Use Permit for Military		
Usage at Cudjoe Key	0.94 million (0.25 million)	
TMD Flight	4.66 million (1.23 million)	395% increase over baseline at Cudjoe Key
County 1995	17.07 billion (4.51 billion)	
County Project Increase	2.24 billion (0.59 billion)	13.1% increase without TMD
County 2005	19.31 billion (5.10 billion)	0.02% of projected county demand

Source: Monroe County, 1993.

Wastewater Treatment Demand. The increase in wastewater treatment and disposal resulting from the TMD flight test activities at either Cudjoe Key or Saddlebunch Keys site is assumed to be the same quantity as potable water consumption: 4.66 million liters (1.23 million gallons) per year. The proportionate increase with respect to total wastewater treatment and disposal in Monroe County is 0.02 percent. The disposal method is assumed to be on site septic drainfields until Monroe County creates a central public wastewater treatment facility.

Stormwater Management. Florida Bay and the coral reefs have been classified by the FDEP as "Outstanding Florida Waters," affording these areas state protection.

The Cudjoe Key site does not have a planned stormwater management system. Stormwater from impervious surface areas sheet flow to pervious areas where the water either percolates into the soil or runs to the nearest body of water.

The increase in stormwater flows from the construction of additional facilities related to the TMD program is assumed to be proportionate to the increased area of land

disturbed. At Cudjoe Key all construction is planned to take place within existing disturbed area. Therefore, the small amount of additional stormwater generated by new construction on the site would be managed with the existing facilities.

Saddlebunch Keys site does not have a planned stormwater management system. Stormwater form impervious surface areas sheet flow to pervious areas where the water either percolates into the soil or runs to the nearest body of water.

Municipal Solid Waste Generated By Project. Approximately 398.4 cubic meters (14,064 cubic feet) of municipal solid waste would be generated by the project at the site. This figure was calculated by using the per capita per day amount of 0.0029 cubic meters (0.1024 cubic feet) applied to the total number of 13,680 person days of launch personnel needed for 12 target launches (Boca Chica, Fleming, and Sugarloaf keys are included in the Cudjoe Key figure). This would increase total waste disposal in Monroe County in the year 2005 by 0.18 percent as shown in table 3.3.12-2.

Table 3.3.12-2: Municipal Solid Waste for Cudjoe Key

Cudjoe Key	Annual Cubic Meters (cubic feet)	Percent Change Due to the Proposed Action
Usage at Cudjoe Key	240 (8,400)	
TMD Flight	400 (14,100)	66% increase over baseline at Cudjoe Key
Country Current	206,500 (7,290,500)	
County Project Increase	13,360 (471,800)	
County 2005	219,860 (7,762,300)	0.18% of projected county demand

Source: Monroe County, 1993.

Electricity Used By Project In Peak Period. Support/instrumentation units stationed on Boca Chica, Fleming, and Sugarloaf keys would use portable generators for electrical supply.

Cumulative Impacts

Construction of the TMD test facilities at Cudjoe Key would take place on a site owned by the U. S. Air Force Air Combat Command which was originally developed in 1959 for monitoring missile testing over the Gulf of Mexico. This complex was altered to accommodate balloon radar surveillance of the southern Gulf and Cuba, which will continue for the foreseeable future. Residential and commercial development has continued at a moderate rate in Monroe County with some increase in population on Cudjoe Key.

The total impact of the proposed action on water usage at Cudjoe Key would be to increase Monroe County's potable water consumption in the year 2005 by approximately 4.66 million liters (1.23 million gallons), or 0.02 percent.

An ongoing issue in the Florida Keys is the need to replace aging cesspits and septic tanks with a central wastewater treatment plant. The current system is considered to be contributing to the degradation of water quality, especially in inlets which do not have adequate natural currents for flushing accumulated leachate. The county is currently

investigating methods for constructing a central wastewater treatment facility and eliminating as many onsite septic systems as possible.

The TMD program could use portable toilets in order to minimize its wasteload and associated impact on water quality. However, if not approved, it would be necessary to use onsite septic systems or make arrangements to tie into a central system when it becomes available. In either case, the addition of wastewater treatment demand that would result from the TMD program would have a very small cumulative impact on the total wastewater treatment load that would need to be accommodated by an improved wastewater treatment system.

Over the 10-year time frame of the TMD program it is anticipated that there would be an impact on the local economy due to local program expenditures. It is possible that this economic stimulus would generate some additional employment and associated demand for permanent housing in Monroe County. Should these impacts occur, there may result additional demand for utility services, that would not be expected to increase total county-level demand by more than 1 percent.

Mitigations Considered

Bottled water supplies could be used to fulfill peak program requirements for drinking water. Contractual provisions could be incorporated to minimize utilities consumption by construction practices. Portable toilets could be used.

3.3.12.4.2 Saddlebunch Keys

TMD activities would cause a large increased demand for utilities at Saddlebunch Keys. The baseline consumption is so small that the increased demand would have a temporary impact on utilities.

No-action Alternative

Potable Water Demand. Under the no-action alternative, the Naval facility on Saddlebunch Keys would maintain its existing level of potable water consumption. The total annual consumption is 208,553 liters (55,100 gallons). The average daily consumption is 568 liters (150 gallons).

Stormwater. Saddlebunch Keys site does not have a planned stormwater management system. Stormwater from impervious surface areas sheet flow to pervious areas where the water either percolates into the soil or runs to the nearest body of water.

The increase in stormwater flows at Saddlebunch Keys from the construction of additional facilities related to the TMD program is assumed to be proportionate to the increased area of land disturbed. The existing site has disturbed 12.14 hectares (30 acres).

The approximate increase in disturbed area resulting from Saddlebunch Alternative 1 is 0.4 hectares (0.98 acres), resulting in an increase of 3.3 percent. The approximate

increase in stormwater generated on the site from Alternative 1 is therefore assumed to be approximately 3.3 percent.

The approximate increase in disturbed area resulting from Saddlebunch Alternative 2 is 0.72 hectares (1.79 acres), resulting in an increase of 6.0 percent. The approximate increase in stormwater generated on the site from Alternative 2 is therefore assumed to be approximately 6.0 percent.

Wastewater Treatment Demand. Under the no-action alternative, Saddlebunch Keys would maintain its existing level of wastewater treatment demand. Total wastewater demand is assumed to be the same as the potable water demand. Wastewater treatment demand for the facility would therefore be 207,300 liters (54,750 gallons) per year.

See section 3.3.12.4.1 for the increase in wastewater and water requirements over a 10-year period associated with population increase.

Municipal Solid Waste. The current solid waste load of 79 annual cubic meters (2,808 cubic feet) would continue to be generated at the Saddlebunch Keys site without the proposed action.

Electricity. The primary power supplied to the base by City Electrical Systems is 350 kVA.

Site Preparation Activities

Construction And Demolition Waste. Construction of a launch pad, wider road, launch equipment building, environmental shelter, launch operations trailer shelter, upgrade access road, five new parking spaces, and a missile assembly building would generate 442 cubic meters (15,800 cubic feet) of waste.

Flight Test Activities

The impacts on utilities would be similar to those predicted for Cudjoe Key (section 3.3.12.4.1).

Cumulative Impacts

Construction of the TMD test facilities on Saddlebunch Keys would take place on land owned by NASKW. This site was developed and is operated by the Naval Computer Telecommunications Area Master Station Atlantic Detachment. Current transmission and support activity will continue for the foreseeable future and there are no current plans for additional DOD projects.

Mitigations Considered

The TMD program could use portable toilets in order to minimize its wasteload and associated impact on water quality. Bottled water supplies could be used to fulfill peak program requirements for drinking water. Contractual provisions could be incorporated to minimize utilities consumption by construction practices.

3.3.13 VISUAL AESTHETICS

TMD activities would cause visual impacts to the visual environment. The impacts are consistent with the current military context.

3.3.13.1 Resource Description and Evaluative Methods

See section 3.1.13.1 for a description of the evaluation methods.

Visual simulations were prepared of each vantage point at each launch location. These simulations were prepared by projecting computer perspectives using the computerized GIS site plans and using known vertical reference measurements. These simulations were superimposed on the same photographs. The new photograph displays what would be visible of a 15-meter-tall (50-foot-tall) Hera missile in the proposed launch site.

In some cases this simulation revealed that the original photograph did not have the right vantage point to see the missile. This was noted on the appropriate photographs.

3.3.13.2 Region of Influence

The ROI for visual and aesthetic resources for proposed launch sites at Saddlebunch Keys and Cudjoe Key includes the range of vantage points on land and water from which residents and tourists may view facilities and activities related to the proposed action. The instrumentation sites at Fleming, Boca Chica, and Sugarloaf keys are not included in the visual assessment because these sites are proposed to have only portable facilities with a relatively low-profile appearance, little or disturbance of land or vegetation and short-term duration.

3.3.13.3 Affected Environment

The dominant character-defining and distinctive visual and aesthetic resources of the Florida Keys were assessed from field trips, photography, and telephone interviews with individuals and representatives of local Chambers of Commerce in the Lower Keys. (Brown, 1997; Craddick 1997; Fisher, 1997; Kitchner, 1997; McMinn 1997; Penico, 1997). They include the following:

- Sky—clear and bright; dramatic sunsets
- Water—shimmering, translucent appearance
- Landform—long horizontal lines, distant horizon, backcountry islands, secluded coves, stony beaches
- Vegetation—red and white mangroves, upland hammocks
- Habitat—coral reef, key deer, osprey, white and blue heron, frigate bird, double-crested cormorant, sea turtles, tropical fish, lobster, shrimp

- Culture—fishing boats, sunken treasure, lighthouses
- Architecture—Seven Mile bridge, historic district

Several of these character defining features are shown in figures 3.3.13-1 and 3.3.13-2.

The Florida Keys is a popular tourist destination because of its relatively remote location, cultural diversity, and unique scenery. However, national and state-level attention has been drawn to the impacts of heavy tourism on the ecosystem and infrastructure of the Keys, and particularly the degradation of water quality in Florida Bay and its attendant impact on the declining vitality of the coral reef. A recent study has shown that some tourists experience disappointment in the declining aesthetic quality of the environment and the scenery of the Florida Keys. (U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 1996c)

From a regional standpoint, the Lower Keys has an environment that is distinct from that of the Upper Keys or Middle Keys. The Lower Keys is dominated by Key West, the major center for colorful restaurants, night life, tourist shopping, and culture. Key West is also a transportation terminal for air travel and cruise ships.

The Lower Keys also has the role of host for the major utility and government uses of the Florida Keys—the port, landfill, incinerator, as well as military installations of the Navy and Air Force. The DOD has sizable land holdings and visual impact on the landscapes of six of the Lower Keys: Key West, Dredger Key, Fleming Key, Boca Chica Key, Saddlebunch Keys, and Cudjoe Key.

The specific areas considered for launch and instrumentation sites, namely the northern sides of Cudjoe and Saddlebunch Keys, are on the opposite side of the islands from the main attraction, coral reef, and well removed from the habitat of the Key Deer and the tourist attractions in Key West. The primary natural attraction in this area is the backcountry that attracts boaters and birdwatchers to its secluded coves, water fowl, and mangrove islands. Among the most prominent visual features in this area are the low, white, industrial buildings, the two 53.3-meter-long (175-foot-long) "Fat Albert" balloons tethered from Cudjoe Key and the "antenna farm" on Saddlebunch Keys. See figures 3.3.13-3 and 3.3.13-4.

Cudjoe Key

The assessment of the visual and aesthetic environment affected by the proposed action and its alternatives was performed from vantage points on land and water from which residents and tourists may view facilities and activities related to the proposed action. Several representative sites were investigated within the ROI and documented with photography. The locations of these vantage points and their viewsheds are shown in figures 3.3.13-5 through 3.3.13-11.

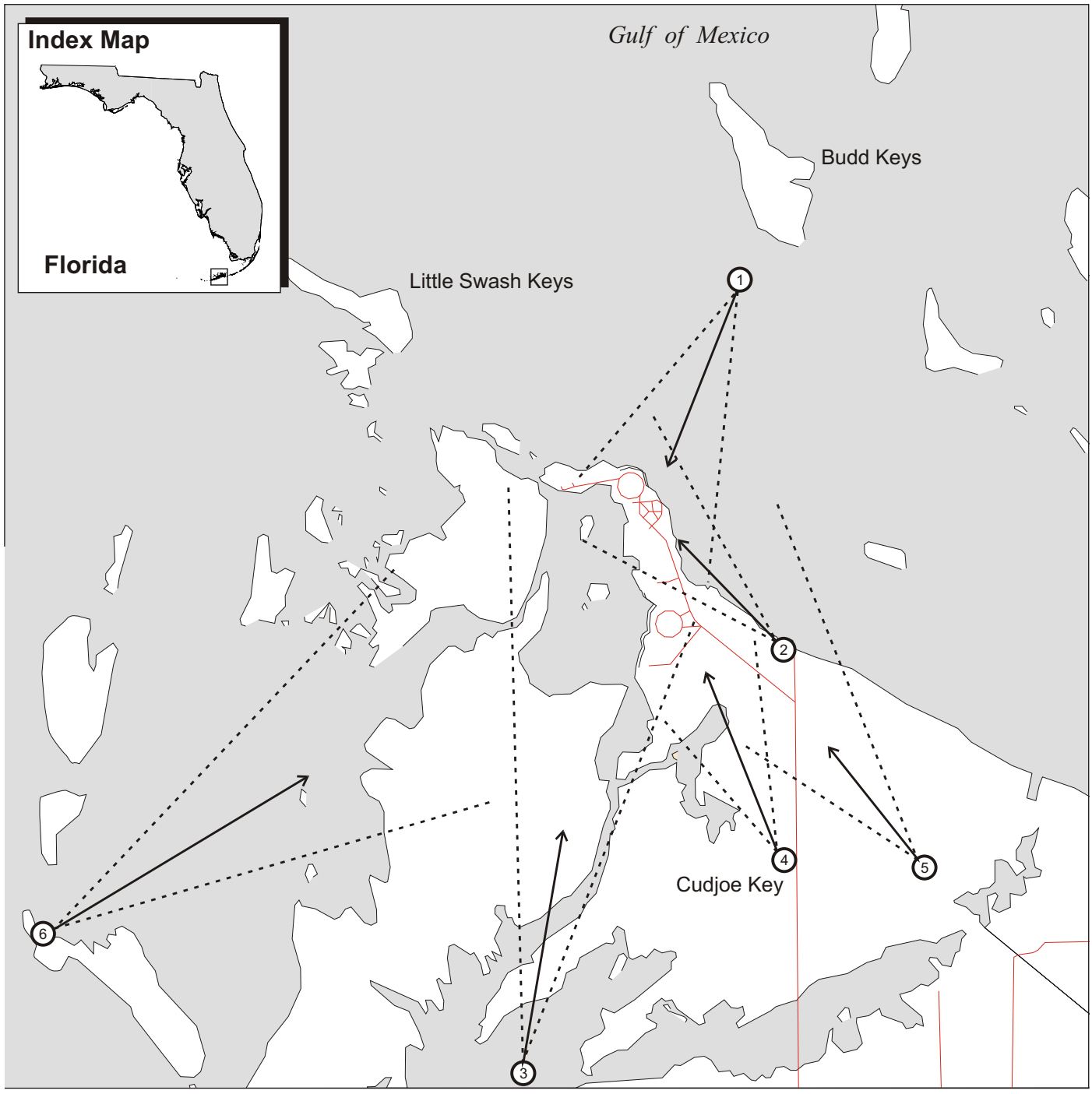
Table 3.3.13-1 rates the scenic attractiveness of each of these views using a procedure derived from the Visual Resource Management System of the USDA Forest Service (U.S. Department of Agriculture, Forest Service, 1995).

Figure 3.3.13-1: Florida Keys - Seven Mile Bridge

Figure 3.3.13-2: Florida Keys Mangroves and Rocky Beach

Figure 3.3.13-3: Aerostat Balloon, "Fat Albert", at Cudjoe Key

Figure 3.3.13-4: Communications Center on Saddlebunch Keys



EXPLANATION

- Roads
- 1 Vantage Point
- Cone of Vision

Vantage Points for Visual Assessment

Scale 1:24,000

0 1,000 2,000 Feet

0 250 500 Meters

NORTH

Cudjoe Key, Florida

Figure 3.3.13-5

cud-24k-3vis001

Figure 3.3.13-6: Vantage Point #1: Aerostat Facility on Cudjoe Key from Budd Key

Figure 3.3.13-7: Vantage Point #2: Aerostat Facility on Cudjoe Key from Blimp Road Boat Ramp

Figure 3.3.13-8: Vantage Point #3: Aerostat Facility on Cudjoe Key from U.S. 1 at Bow Channel

Figure 3.3.13-9: Vantage Point #4: Aerostat Facility from Blimp Road on Cudjoe Key

Figure 3.3.13-10: Vantage Point #5: Aerostat Facility from Cudjoe Acres Subdivision

Figure 3.3.13-11: Vantage Point #6: Aerostat Facility from Indian Mound Drive on Sugarloaf Key

Table 3.3.13-1: Rating of Views of Cudjoe Key

Vantage Point		Dominant Landscape Feature	Scenic attractiveness	Concern level
1	from Dug Key	Sky, water, mangroves, horizon, horizontal landforms	Minimal	Medium
2	from Boat Ramp	Sky, water, mangroves, horizon, horizontal landforms	Minimal	Medium
3	from U.S. 1	Sky, water, mangroves, horizon, horizontal landforms	Common	High
4	from Blimp Road	Sky, water, mangroves, horizon, horizontal landforms	Minimal	Low
5	from Asturius Road	Sky, water, mangroves, horizon, horizontal landforms	Minimal	Low
6	from Indian Mound Road	Sky, water, mangroves, horizon, horizontal landforms	Common	Medium

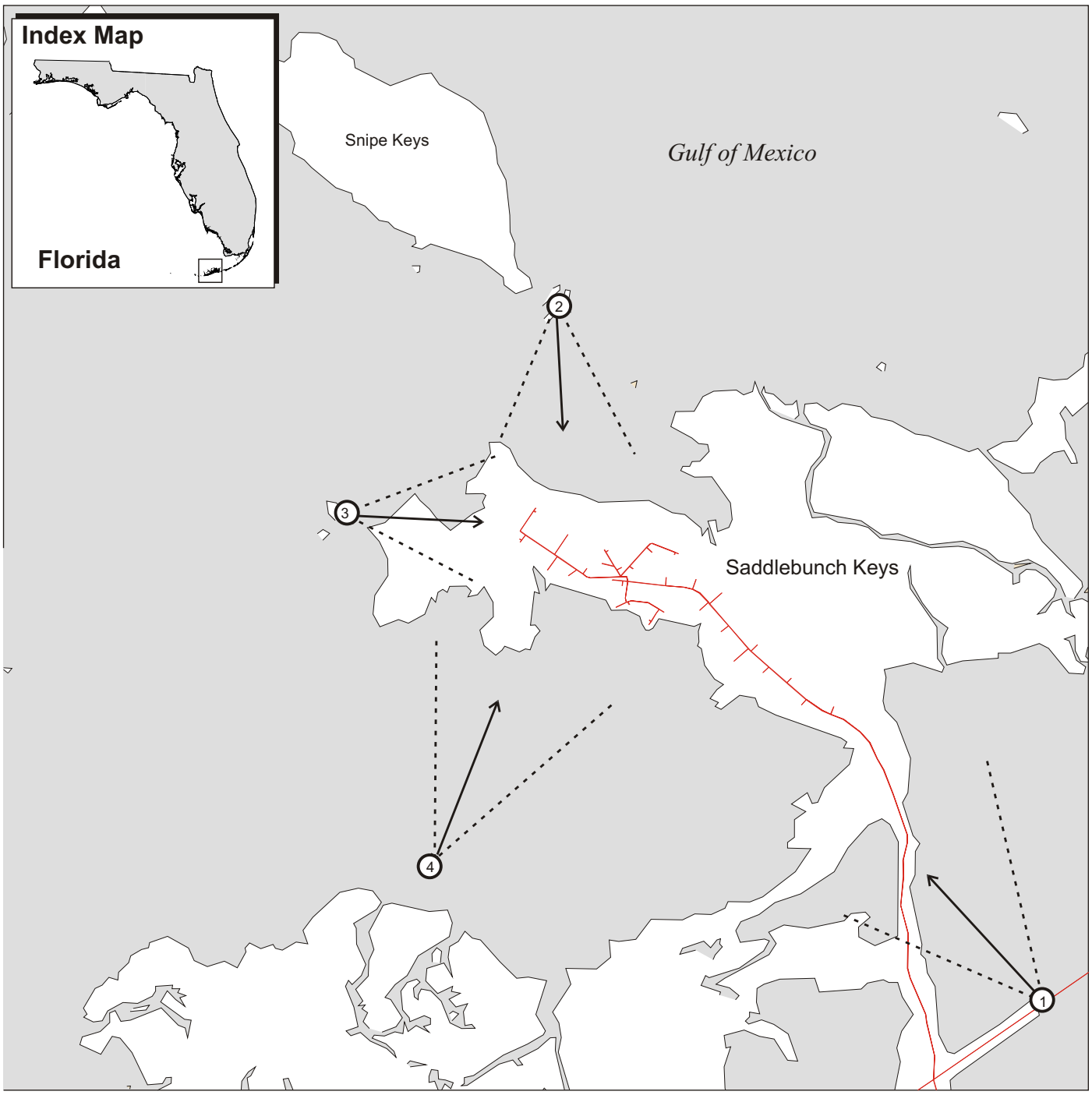
All of the views of Cudjoe Key include the common elements of the Florida Keys' bright sky, translucent water, distant horizon, and horizontal landforms covered with mangroves. Vantage points #1 and #2 are views that have degraded levels of scenic attractiveness because of the noticeable intrusion of the aerostat and related military facilities that exist on the site.

Vantage point #3 could be rated higher because the aerostat is less noticeable, and the view contains a more varied land and water interface. The concern level of vantage point #3 is relatively high because it is seen by about 20,000 motorists each day.

Vantage points #4 and #5 are rated relatively low in scenic value because of the visual intrusion of the unkept roadway and desolate roadside. These views have low concern level because they are in relatively remote, low density areas with little outside traffic. Vantage point #6 provides a view that is dominated by the water, sky, horizon, and mangrove profile, with minor alteration from the balloon. Its concern level is rated "medium" because it is seen from a picnic area on the edge of a fully-developed subdivision.

Saddlebunch Keys

The assessment of the environment affected by the proposed action and its alternatives was performed from vantage points on land and water from which residents and tourists may view facilities and activities related to the proposed action. Several representative sites were investigated within the ROI and documented with photography. The locations of these vantage points and their viewsheds are shown in figures 3.3.13-12 through 3.3.13-16.



EXPLANATION

- Roads
- (1) Vantage Point
- Cone of Vision

Vantage Points for Visual Assessment

Scale 1:24,000

0 1,000 2,000 Feet

0 250 500 Meters

NORTH

Saddlebunch Keys, Florida

Figure 3.3.13-12

sad-24k-3vis001

Figure 3.3.13-13: Vantage Point #1: Saddlebunch Keys Communication Facility from U.S. 1 at Lower Sugarloaf Channel

Figure 3.3.13-14: Vantage Point #2: Saddlebunch Keys Communication Facility from Dug Key

Figure 3.3.13-15: Vantage Point #3: Saddlebunch Keys Communication Facility from Whiting Key

Figure 3.3.13-16: Vantage Point #4: Saddlebunch Communication Facility from Simross Key

Table 3.3.13-2 rates the scenic attractiveness of each of these views using a procedure based on the Visual Resource Management System of the USDA Forest Service (U.S. Department of Agriculture, Forest Service, 1995).

Table 3.3.13-2: Comparison of Scenic Attractiveness of Saddlebunch Keys Views

Vantage Point		Dominant Landscape Feature	Scenic attractiveness	Concern level
1	from U.S. 1 at Lower Sugarloaf Channel	Sky, water, mangroves, horizon, horizontal landforms	Common	High
2	from Dug Key	Sky, water, mangroves, horizon, horizontal landforms	Minimal	Medium
3	from Whiting Key	Sky, water, mangroves, horizon, horizontal landforms	Minimal	Low
4	from Simross Key	Sky, water, mangroves, horizon, horizontal landforms	Minimal	Low

All the vantage points associated with the Saddlebunch Keys site include the common elements of the Florida Keys' bright sky, translucent water, distant horizon, and horizontal landforms covered with mangroves. The scenic attractiveness of the view from vantage point #1 was rated "common" because the antennas are not very noticeable on the distant horizon. Concern level was rated High because it is exposed to almost 20,000 motorists per day.

Vantage points #2, #3, and #4 are views that have relatively low scenic attractiveness because of the noticeable intrusion of the communication antennas against the horizon. The concern level of the view from vantage point #2 was rated "medium" because Dug Key is a relatively active boating area, providing a narrow navigation channel that funnels boat traffic crossing the area. However, vantage points #3 and #4 are in relatively remote areas, so the concern level of views from those locations was rated "low."

3.3.13.4 Environmental Impacts and Mitigations

3.3.13.4.1 Cudjoe Key

TMD activities would cause impacts to the visual environment around Cudjoe Key. These impacts are consistent within the context of the built environment and the tethered balloons on the site.

No-action Alternative

Under the no-action alternative, TMD test activities would not be implemented and current activities such as the aerostat and TV Marti would continue at Cudjoe Key. Changes in the visual character of the existing site would depend on other, unknown activities that may otherwise be conducted on the site in the future.

Site Preparation Activities

Figure 2.1.2-3 illustrates the three major structures that would be constructed at a typical launch site of the target missile. Not shown is a one-story Launch Equipment Building of about 256 square feet, to be constructed of reinforced concrete and located next to the launch pad. Figure 2.3.2-2 shows the proposed site layout at Cudjoe Key. It would not be necessary to construct a new MAB at Cudjoe Key because the existing vehicle maintenance building would be modified for that purpose. However, it would be necessary to construct a new vehicle maintenance building and paint shed near aerostat site 12938.

During site preparation, the disruption to the visual and aesthetic environment would be temporary. This activity would be visible from the water for boaters using the boat ramp and passing along Kemp Channel. Because of the temporary nature of construction impacts and the low level of public visibility of these activities, site preparation activities are considered to have a negative, but not substantial, impact on visual and aesthetic resources of the Cudjoe Key ROI.

Flight Test Activities

The permanent effect of the program on the visual and aesthetic environment would be a function of the visibility of the structures illustrated in figure 2.1.2-3 and the temporary visibility of the launch and assembly vehicles.

Figure 3.1.13-15 shows the proposed target missile in its upright position, ready for launch. The launch pad would be located on the northwest corner of Cudjoe Key, facing the Gulf of Mexico. Its height would be about the same as the existing tower to which the nose of the aerostat balloon is tethered.

The assessment of the effects of the launch activities from the vantage points shown in figure 3.3.13-5 recognizes that the proposed facilities represent significant modifications to the dominant features of the natural landscape viewed from many of the representative vantage points. The dominant natural features include the views of the water and rocky beach in the foreground, views of the sky and flat, distant horizon in the background, and stands of mangroves in the middleground. The location of the relatively bulky industrial buildings proposed at the launch site, and the tall vertical element of the erected launch missile, present potentially dominant alterations of this natural landscape if appearing in the middle ground or foreground of the landscape scene.

Table 3.3.13-3 summarizes the assessment of scenic integrity for each vantage point selected in the Cudjoe Key ROI viewshed as a result of the proposed action. The existing landscape already has dominant human alterations when seen from locations which place the large human-made forms, such as the aerostat balloon and tower, and the large industrial type buildings in the middle ground. In other cases, such as vantage points #5 and #6, the viewing distance is great enough that additional numbers of human alterations would barely be noticeable in the background.

Table 3.3.13-3: Rating of Scenic Integrity of Cudjoe Key ROI for Proposed Action Alternative

Vantage Point	Dominant Feature	Degree of Alteration	Intactness of Landscape Character	Scenic Integrity Rating
1. View from Budd Key	Human Alterations	Dominant	Altered, and Low Expression of Character	Low
2. View from Boat Ramp on Blimp Road	Landscape Character	Evident, but not Dominant	Slightly Altered and Character Expression Moderate	Moderate
3. View from U.S. 1 at Bow Channel	Landscape Character	Evident, but not Dominant	Slightly Altered and Character Expression Moderate	Moderate
4. View from Blimp Road	Landscape Character	Evident, but not Dominant	Slightly Altered and Character Expression Moderate	Moderate
5. View from Asturius Road	Human Alterations	Dominant	Altered and Low Expression of Character	Low
6. View from Indian Mound Road	Landscape Character	Evident, but not Dominant	Slightly Altered and Character Expression Moderate	Moderate

The scenic integrity of views from vantage point #1, in Kemp Channel between Cudjoe Key and Budd Key, is the most affected because the environmental shelter and LOT shelter would be located on that side in areas near the shore. However, these alterations are comparable to those already present in those locations and, by themselves, would not warrant a lower rating than that of the current scene.

Figures 3.3.13-17 through 3.3.13-20 display the results of imposing the Hera missile on the same views of Cudjoe Key shown previously. The Hera missile is within view of all figures but 3.3.13-17, where it is outside the view to the right. For the others, the missile is superimposed, but not visibly apparent.

Cumulative Impacts

The construction and operation of the TMD program will take place in an area which has historically been used for military operations and occupied by structures that are of a similar aesthetic appearance and nature to those proposed by the TMD program. It is unlikely that the addition of the proposed structures will pose a cumulative impact to the established alterations of the landscape and visual character of Santa Rosa Island.

Mitigations Considered

Possible mitigations would include:

- Design facilities to be compatible with local military architecture.
- Design facilities to minimize reflective surfaces and bright colors.

Figure 3.3.13-17: Vantage Point #1: Aerostat Facility on Cudjoe Key from Budd Key

Figure 3.3.13-18: Vantage Point #2: Aerostat Facility on Cudjoe Key from Blimp Road Boat Ramp

Figure 3.3.13-19: Vantage Point #5: Aerostat Facility from Cudjoe Acres Subdivision

Figure 3.3.13-20: Vantage Point #6: Aerostat Facility from Indian Mound Drive on Sugarloaf Key

3.3.13.4.2 Saddlebunch Keys

TMD activities would cause some impacts to the visual environment around Saddlebunch Keys. These impacts are consistent within the context of the built environment and the many tall antennas on the site.

No-action Alternative

Under the no-action alternative, TMD test activities would not be implemented and current activities would continue. Changes in the visual character of the existing site would depend on other, unknown activities that may otherwise be conducted on the site.

Site Preparation Activities

Figures 2.1.2-3 illustrates the three major structures that would be constructed at a typical launch site of the target missile. Not shown is a one-story launch equipment building of about 23.8 square meters (256 square feet), which would be constructed of reinforced concrete and located next to the launch pad. Two alternative site layouts at Saddlebunch Keys are shown in figures 2.3.2-7 and 2.3.2-9.

Option A-1

See figure 2.3.2-7 for layout. In this option, the launch pad, environmental shelter, and launch equipment building would be constructed at the north end of the existing gravel road just east of the VOA towers at the western end of Saddlebunch Keys. The LOT shelter would be across the road and west of antenna site J-1570. The MAB would be located on the abandoned antenna site J-1712. Clearing would be required for the building at this location, and it would be in a location that is relatively closer to U.S. 1 than structures that are visible now. Other new structures would require little disturbance of existing vegetation.

Option A-2

See figure 2.3.2-9 for layout. In this option, the launch pad, environmental shelter, MAB and launch equipment building would be constructed about 137 meters (450 feet) west of the VOA towers. This would increase their visibility from locations such as vantage points #4 and #5 at Whiting and Simross keys. The LOT shelter would be across the road and west of antenna site J-1570, in the same location as in Option A-1.

Most of the construction would take place on previously disturbed or unvegetated areas on the northwest end of Saddlebunch Keys where they would be partly screened from noise and view from popular boating routes to backcountry destinations such as Snipe Key. These sites are unlikely to be visible from residential areas which are across U.S. 1 and on adjacent keys. During site preparation, the disruption to the visual and aesthetic environment would be temporary and would consist of low-levels of noise, smoke, and dust as well as the view of equipment coming and going on U.S. 1. Because of the temporary nature of construction impacts and the low level of public visibility of

these activities, site preparation activities are considered to have a negative, but not substantial, impact on visual and aesthetic resources of the Saddlebunch Keys ROI.

Flight Test Activities

The permanent effect of the program on the visual and aesthetic environment would be a function of the visibility of the structures illustrated in figure 2.1.2-3 and the temporary visibility of the launch and assembly vehicles.

Figure 3.1.13-15 shows the proposed target missile in its upright position, ready for launch. Typically, the missile would be out of view. Except for a brief period immediately prior to launch, the missile would be housed out of sight either in storage areas offsite or cradled horizontally in the environmental shelter.

The assessment of the effects of the launch activities from the vantage points shown in figure 3.3.13-12 recognizes that the proposed facilities represent significant modifications to the dominant features of the natural landscape viewed from many of the representative vantage points. The dominant natural features include the views of the water and rocky beach in the foreground, views of the sky and flat, distant horizon in the background, and stands of mangroves in the middleground. The location of the relatively bulky industrial buildings proposed at the launch site, and the tall vertical element of the erected launch missile present potentially dominant alterations of this natural landscape if appearing in the middle ground or foreground of the landscape scene.

Option A-1

Table 3.3.13-4 summarizes the assessment of scenic integrity for each vantage point selected in the Saddlebunch Keys ROI viewshed as a result of Option A-1 of the proposed action alternatives. The existing landscape already has dominant human alterations when seen from locations which place the vertical forms, such as the numerous antennas, and the large industrial type building in the middle ground. However, there is expected to be degradation of scenic integrity at vantage point #1, where the construction of the relatively large MAB would be twice as close to U.S. 1 as the bulk of the antennas are now. This moves the human alterations from the background to the middleground where they stand to become more dominant.

Option A-2

Table 3.3.13-5 summarizes the assessment of scenic integrity for each vantage point selected in the Saddlebunch Keys ROI viewshed as a result of Option A-2 of the proposed action alternatives. It has much in common with the rating applied to the no-action alternative because it has comparable sized, shaped, and colored forms with similar landscape characteristics. For instance, the existing landscape already has dominant human alterations when seen from locations which place the vertical forms, such as the numerous antennas, and the large industrial type building in the middle ground. However, there is expected to be degradation of scenic integrity at vantage points #3 and #4, where the construction of the relatively large MAB, launch equipment building, erect missile, and environmental shelter would be much closer to the viewer, standing in front of the VOA

towers. This moves the human alterations from the background to the middleground where they stand to become more dominant.

Table 3.3.13-4: Rating of Scenic Integrity of Saddlebunch Keys, Option A-1, Proposed Action Alternative

Vantage Point	Criteria for Scenic Integrity			
	Dominant Feature	Degree of Alteration	Intactness of Landscape Character	Scenic Integrity Rating
1. View from U.S. 1 at Lower Sugarloaf Channel	Human Alterations	Dominant	Altered and Character Expression Low	Low
2. View from Dug Key	Landscape Character	Evident, but not Dominant	Slightly Altered and Character Expression Moderate	Moderate
3. View from Whiting Key	Human Alterations	Dominant	Altered and Character Expression Low	Low
4. View from Simross Key	Human Alterations	Dominant	Altered and Character Expression Low	Low

Table 3.3.13-5: Rating of Scenic Integrity of Saddlebunch Keys Option A-2, Proposed Action Alternative

Vantage Point	Criteria for Scenic Integrity			
	Dominant Feature	Degree of Alteration	Intactness of Landscape Character	Scenic Integrity Rating
1. View from U.S. 1 at Lower Sugarloaf Channel	Landscape Character	Evident, but not Dominant	Slightly Altered and Character Expression Moderate	Moderate
2. View from Dug Key	Landscape Character	Evident, but not Dominant	Slightly Altered and Character Expression Moderate	Moderate
3. View from Whiting Key	Human Alterations	Extremely Dominant	Extremely Altered	Very Low
4. View from Simross Key	Human Alterations	Extremely Dominant	Extremely Altered	Very Low

Figures 3.3.13-21 through 3.3.13-24 display the results of imposing the Hera missile on the same views of Saddlebunch Keys shown previously. The Hera missile is within view of figures 3.3.13-21 and 3.3.13-23, but not visibly apparent in figures 3.3.13-22 and 3.3.13-24.

Cumulative Impacts

The construction and operation of the TMD Program will take place in an area which has historically been used for military operations and occupied by structures that are of a similar aesthetic appearance and nature to those proposed by the TMD program.

Figure 3.3.13-21: Vantage Point #1: Saddlebunch Keys Communication Facility from U.S. 1 at Lower Sugarloaf Channel

Figure 3.3.13-22: Vantage Point #2: Saddlebunch Keys Communication Facility from Dug Key

Figure 3.3.13-23: Vantage Point #3: Saddlebunch Keys Communication Facility from Whiting Key

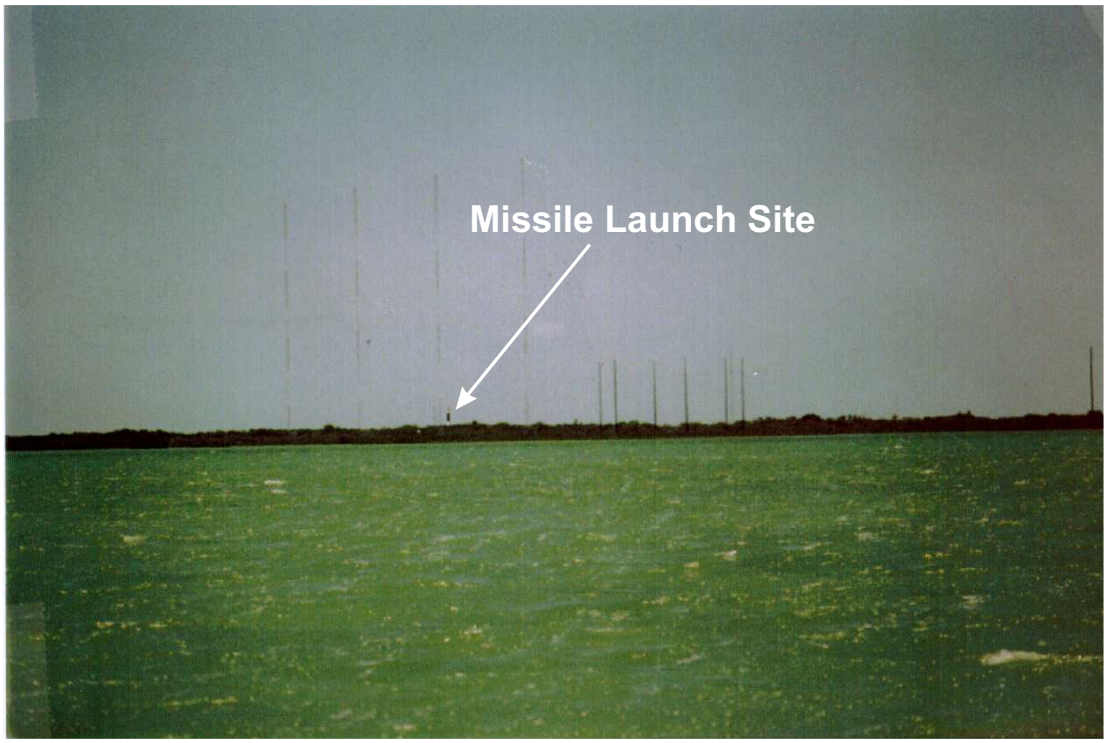
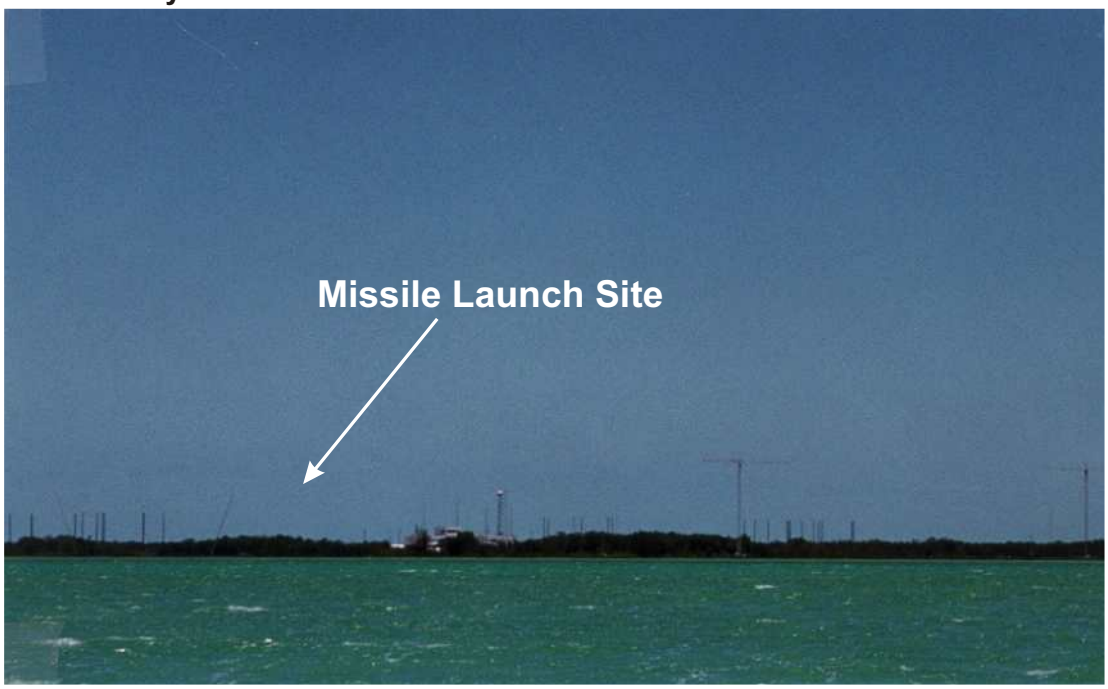


Figure 3.3.13-24: Vantage Point #4: Saddlebunch Communication Facility from Simross Key



It is unlikely that the addition of the proposed structures will pose a cumulative impact to the established alterations of the landscape and visual character of Saddlebunch Keys.

Mitigations Considered

Possible mitigations would include:

- Design facilities to be compatible with local military architecture.
- Design facilities to minimize reflective surfaces and bright colors.

3.3.14 WATER RESOURCES

TMD flight test activities may result in the deposition of hydrogen chloride on surface waters. The increase in water acidity would be temporary.

3.3.14.1 Resource Description and Evaluative Methods

The Florida Keys have been designated a National Marine Sanctuary, Outstanding Florida Waters, and an Area of Critical State Concern. In addition, the Nature Conservancy has designated the Keys one of the ten most significant ecological communities in the world (Monroe County, 1993). This section presents a discussion of existing surface water, groundwater, and marine resources within the Lower Keys. See section 3.2.14 for a discussion of open marine waters and section 3.3.12 for a discussion of water-related facilities.

3.3.14.2 Region of Influence

The ROI for water resources at the Florida Keys sites can be divided into three categories: surface water, groundwater, and coastal marine waters. The ROI for surface water resources at the proposed launch sites (Cudjoe and Saddlebunch Keys) includes the launch pad and the LHA. The surface water resource ROI for the remaining instrumentation support sites (Fleming, Sugarloaf, and Boca Chica keys) is restricted to the footprints of new construction and surface waters located down gradient of new construction and mobile equipment sites. The ROI for groundwater is similar to the ROI for surface waters and includes the groundwater between the site where infiltration occurs and the aquifer from this point along the groundwater flow to the ocean. The ROI for coastal marine water includes the ocean area within the LHAs.

3.3.14.3 Affected Environment

3.3.14.3.1 Cudjoe Key

Surface Water

Because of the high permeability of the soils, stormwater runoff readily infiltrates the undifferentiated sands that comprise the soils of the Florida Keys. As a result, there are virtually no freshwater rivers, lakes, or streams located within the Florida Keys.

Groundwater

The Biscayne and Floridan aquifers are the primary groundwater sources underlying the Lower Keys. However, both aquifers contain significant chloride concentrations and require desalination prior to potable use. (South Florida Water Management District, 1995) Some Monroe County residents meet their individual potable water demands using home reverse osmosis plants to desalinate Biscayne Aquifer water, or by collecting rain water in cisterns. However, due to the limited availability of fresh groundwater, its vulnerability to saltwater intrusion, and its importance to wildlife, no additional wells have been permitted in the Biscayne aquifer since February 1986. The Ocean Reef Club is the

only consumer currently using enough Floridan Aquifer water to require an individual permit from the SFWMD (Monroe County, 1993).

On some of the larger islands of the Florida Keys, including Sugarloaf Key and Cudjoe Key, relatively thin freshwater lenses with low chloride concentrations float atop saline ground water. The largest of these freshwater lenses occurs on Key West and Big Pine Key, but limited quantities also occur on Cudjoe and Sugarloaf Keys. Chloride levels in these lenses are too high for human consumption, but are suitable for most irrigation purposes, and provide the major source of drinking water for wildlife.

The fresh and saline ground waters beneath the Florida Keys are known to be contaminated by effluent from domestic sewage-disposal systems. The natural flow mechanisms and pathways that enable this contaminated water to reach the Florida Bay and coastal waters, however, is not fully understood. The U.S. Geological Service is currently quantifying groundwater flow through the use of water-level data from observation wells and results of tracer studies to better determine seepage rates and impacts to marine and bay water quality (U.S. Department of the Interior, U.S. Geological Survey, 1997).

Coastal Marine Water

The coastal marsh ecosystem of the Florida Keys is a valuable and protected resource of the Florida Keys. The coastal marshes are a complex system of shallow-water bays and basins surrounded by hundreds of mangrove-fringed keys and developed shorelines. They are broad and extremely flat, are separated by a long, narrow channel, and their long axis is perpendicular to the axis of the chain. Water exchange between the Gulf of Mexico and the Atlantic Ocean occurs through these tidal passes on the north side of the Florida Keys. Although these tidal passes allow for water exchange, the cluster of islands protects the reef tract from the outflow of seasonally variable Gulf of Mexico water (National Oceanic and Atmospheric Administration, 1996). In addition to providing habitat for many marine animals, these coastal marsh areas serve as buffers during hurricanes and tropical storms protecting the shorelines from erosion (Florida Department of Natural Resources, 1986).

The Lower Keys' major tidal passes include Rocky Channel (2,035 meters wide/5.8 meters deep [6,677 feet wide/19 feet deep]), Big Spanish Channel (2,340 meters wide/8.8 meters deep [7,677 feet wide/29 feet deep]), Harbor Channel (700 meters wide/7.9 meters deep [2,297 feet wide/26 feet deep]), Cudjoe Channel (1,000 meters wide/6.4 meters deep [3,281 feet wide/21 feet deep]), Johnston Key Channel (700 meters wide/6.1 meters deep [2,297 feet wide/20 feet deep]), and numerous smaller channels. After flowing through the Keys, the water exits to the Atlantic through several major ocean-side passes including Bahia Honda Channel (1,560 meters wide/8.2 meters deep [5,118 feet wide/27 feet deep]), Bogie Channel (595 meters wide/5.2 meters deep [1,952 feet wide/17 feet deep]), Pine Channel (1,000 meters wide/6.4 meters deep [3,281 feet wide/21 feet deep]), Niles Channel (1,250 meters wide/2.7 meters deep [4,101 feet wide/8.9 feet deep), Kemp Channel (965 meters wide/3.1 meters deep [3,166 feet wide/10 feet deep), and Bow Channel (400 meters wide/2.7 meters deep [1,312 feet wide/8.9 feet deep]) (National Oceanic and Atmospheric Administration, 1996).

To the west of Bow Channel is a series of passes in the Sugarloaf and Saddlebunch Keys area. Most of these channels range from 70 to 380 meters wide (230 to 1,247 feet wide) and are shallow, ranging from 0.3 to 0.6 meters deep (1 to 2 feet deep). The last wide channel in the Lower Keys (before Key West) is the Boca Chica Channel, which is approximately 790 meters wide and 3.1 meters deep (2,592 feet wide and 10 feet deep) (National Oceanic and Atmospheric Administration, 1996). Because of the area's low population density, low level of industrial development, and lack of major rivers, concentrations of chemical contaminants are generally low. However, water chemistry problems have been identified, including nutrient enrichment of groundwater and nearshore waters due to sewage disposal via septic systems. The nutrient problem is of special concern because excessive nutrients could alter the ecological balance of nearshore communities such as coral reefs and seagrass beds (U.S. Department of the Interior, Minerals Management Service, 1990). A 1988 water quality assessment by the Florida Department of Environmental Regulation indicated some degradation of nearshore water quality within the urbanized areas of the Florida Keys. Although no comprehensive water quality monitoring program has been undertaken in the Keys, preliminary results of some studies have confirmed that groundwater flushing of septic tank effluent is the primary pollution mechanism contributing to a general degradation of nearshore water quality (South Florida Water Management District, 1995).

Special Flood Hazard Zones

The primary stormwater concern in the Florida Keys is the threat of inundation by hurricane-driven storm surges within low-lying areas. The Lower Keys, including Cudjoe Key, are located within areas identified by FEMA as SFHAs. SFHAs are defined as areas with a 1 percent or greater chance of equaling or exceeding the established 100-year flood levels in any given year. SFHAs are subdivided into flood hazard zones according to specific criteria. The flood hazard zones commonly associated with the Lower Keys include Zone VE, Zone AE, and Zone X (Federal Emergency Management Agency, 1997). See section 3.1.14.3.1 for zone definitions.

The proposed project site on Cudjoe Key is located within 100-year flood hazard zones (Zones VE and AE). Base flood elevations at the site range from approximately 3.3 meters (11 feet) within Zone AE to 4 meters (13 feet) within Zone VE (Federal Emergency Management Agency, 1997).

Target missile launch support facilities may include the location of an "X" RDAS facility on Sugarloaf Key, and radar facilities on Fleming and Boca Chica Keys. The proposed facility locations on Sugarloaf, Fleming, and Boca Chica Keys are all located within 100-year flood hazard zones. Base flood elevations at these sites range from approximately 3.3 to 4 meters (11 to 13 feet) (Federal Emergency Management Agency, 1997).

3.3.14.3.2 Saddlebunch Keys

Saddlebunch Keys share similar hydrologic structure and characteristics with Cudjoe Key.

Special Flood Hazard Zones

The proposed target launch site location on Saddlebunch Keys is located predominantly within the "VE" flood hazard zone and, to a lesser extent, within the "AE" flood hazard zone. Base flood elevations at the site range from approximately 3.3 meters (11 feet) within Zone AE to 4 meters (13 feet) within Zone VE (Federal Emergency Management Agency, 1997). Refer to section 3.1.14.3.1 for a description of FEMA flood zones.

3.3.14.4 Environmental Impacts and Mitigations

A general description of water resources impact analysis is presented in section 3.1.14. See section 3.1.3 for a discussion of wetland impacts and section 3.1.14 for a discussion of impacts to water-related facilities.

3.3.14.4.1 Cudjoe Key

TMD flight test activities may result in the deposition of hydrogen chloride on surface waters. The increase in water acidity would be temporary.

No-action Alternative

Under the no-action alternative, the ground-based TMD test activities at the Florida Keys locations, including Cudjoe, Saddlebunch, Fleming, Sugarloaf, and Boca Chica keys would not be implemented. Current operations at these Florida Keys locations would continue.

Continuing Air Force and Navy activities would result in negligible effects on surface and ground water resources.

Site Preparation Activities

Construction activities at Cudjoe Key would result in the disturbance of approximately 0.24 hectare (0.6 acre) of land, none of which would be considered a wetland resource.

Section 402 of the 1987 Federal Clean Water Act requires the USEPA to establish an NPDES stormwater permitting program. In accordance with NPDES program requirements, a General NPDES Permit would be required for construction activities which result in the disturbance of 2 or more hectares (5 or more acres) of land. Construction activities at Cudjoe Key would result in the disturbance of approximately 0.24 hectare (0.6 acre) of land, and would not be subject to Federal NPDES stormwater permitting requirements.

Within the State of Florida, stormwater management activities are also governed by the Florida ERP program. The ERP program applies to alterations of the landscape, including the creation or alteration of wetlands and other surface waters, and alterations of uplands that affect flooding, and all stormwater management activities. Under the ERP

program, the permit application serves as a joint application to initiate review by the FDEP and the USACE. The FDEP utilizes the ERP application for the concurrent review of State of Florida stormwater management requirements, application for use of state-owned submerged lands, and for ensuring compliance with state water quality standards. The ERP also serves as an application to the USACE for Federal dredge and fill permitting review. Construction activities will be required to comply with the State of Florida stormwater management requirements.

If Saddlebunch Keys is selected as a launch site, Cudjoe Key could be used as an instrumentation site for both radar and optical tracking. No site preparation, other than the actual transportation of the instrumentation onto the site, would be required at Cudjoe Key for use as an instrumentation site. Installation activities for TMD support facilities would involve routine construction activities. The proposed work locations at Cudjoe Key do not present any unique construction-related demands on water resources.

No construction would be required at the proposed instrumentation sites located on Sugarloaf and Boca Chica keys. Construction activities at the proposed instrumentation site located on Fleming Key would result in the disturbance of approximately 0.08 hectare (0.2 acre) of land. Because the area of disturbance is less than 2 hectares (5 acres), construction activities at the Fleming Key location would not be subject to NPDES permitting requirements. However, submittal of an ERP application for the determination of applicable State of Florida stormwater management requirements may be required.

Flight Test Activities

Implementation of the proposed action would result in deposition of combustion emission products into surface waters within the ROI. Combustion emissions would be composed primarily of hydrogen chloride, aluminum oxide, and water. In general, the effects associated with hydrogen chloride deposition are primarily related to increased water acidity, whereas, effects associated with the deposition of aluminum oxide are related to mineral uptake by plants.

The most significant environmental impact of acidity involves synergistic effects on water-dependent biological resources. Synergism is the combination of two or more conditions or factors which produce effects greater than their sum individually. Synergism is most important in surface waters receiving agricultural or urban runoff, which may contain elevated amounts of nutrients or minerals. A high water acidity can result in an increased solubility of some substances and may contribute to toxic levels of these substances.

Although hydrogen chloride is very soluble in water, it does not deposit readily as a dry aerosol or onto dry surfaces. Therefore, direct dry deposition of hydrogen chloride gas onto the ground and vegetation would not be significant. Similarly, the deposition of aluminum oxide would be very low. Thus, no impacts to surface water, including coastal marine waters, are anticipated for normal launches during dry weather. Because launch activities would not be conducted at Fleming, Sugarloaf, and Boca Chica keys, no impacts to surface waters at these locations are anticipated.

If it were to rain shortly after a missile launch, the hydrogen chloride present in the exhaust plume would be dissolved in the rain droplets, which would result in a temporary reduction in rainfall pH. Depending on the buffering capacity of the receiving water, rainfall may result in an increase in surface water acidity. Surface water acidity ranging from approximately pH 4.0 to 6.0 is generally believed to result in stress to marine life and possibly death (National Aeronautics and Space Administration, 1990). The degree and duration of any increased acidity in surface waters would depend on several variables, including surface water volume and alkalinity, as well as the amount and pH level of rainfall.

The pH of shallow marine waters in the Florida Keys ranges from a low of 7.3 near Saddlebunch and Cudjoe Keys to a high of 8.2 near Plantation Key. Average alkalinity measurements range from a low of 119 mg/L calcium carbonate near Plantation Key to a high of 137 mg/L calcium carbonate near Harrison Canal (Florida Department of Environmental Protection, 1996).

Project-related changes in pH of shallow marine waters near Cudjoe Key were estimated for purposes of impact analysis. Calculations were conservative in that 100 percent of the hydrogen chloride present in the exhaust plume was assumed to be dissolved in rain droplets (as opposed to approximately 20 percent under normal conditions). Existing surface water pH and alkalinity levels were assumed to be 7.3 and 119 mg/L calcium carbonate, respectively. Due to the high buffering capacity of the shallow marine waters, this would not result in a decrease in the pH levels.

Shallow, fresh water in the Florida Keys is limited to nonexistent. Measurable groundwater contamination as a result of launch activities is highly unlikely because of the standard spill prevention, containment, and transportation safety plans that are implemented for any launch program. For these reasons, impacts on groundwater quality are expected to be negligible. In addition, refer to section 3.2.14.4 for a discussion of impacts to the Gulf of Mexico marine water environment.

Cumulative Impacts

Construction of the TMD test facilities at Cudjoe Key would take place within the U.S. Air Force Air Combat Command property which was originally developed in 1959 for monitoring missile testing over the Gulf of Mexico. This complex was altered to accommodate balloon radar surveillance of the southern Gulf and Cuba which will continue for the foreseeable future. Residential and commercial development has continued at a moderate rate in Monroe County with some increase in population on Cudjoe Key.

There are no other projects in the foreseeable future at Cudjoe Key; therefore, no cumulative water quality impacts are foreseen.

Mitigations Considered

Standard operating procedures would include the implementation of an emergency response plan prior to test which specifies the requirement for an onsite recovery team for debris recovery and advanced notification procedures.

Possible mitigations would include:

- Use of bottled water and portable toilets to reduce demand for onsite water and sanitation facilities and possible contamination from septic tanks.
- Design planning and engineering that would minimize the amount of new impervious surfaces and establish procedures or systems to minimize untreated surface runoff from program-related sites.
- Monitoring water quality in the vicinity during and after initial launches.
- Scheduling TMD launch activities to avoid rain prior, during, or for 24 hours after a launch.

3.3.14.4.2 Saddlebunch Keys

TMD flight test activities may result in the deposition of hydrogen chloride on surface waters. The increase in water acidity would be temporary.

No-action Alternative

Under the no-action alternative, the operations of the Saddlebunch Keys facility would continue at the current planned levels. As such, water quality would remain at its current levels. Under the no-action alternative, the proposed ground-based TMD test activities at Saddlebunch Keys would not be implemented. Current operations at Saddlebunch Keys would continue, and would result in negligible effects on surface and ground water resources.

Site Preparation Activities

Installation activities for TMD support facilities would involve routine construction activities. The proposed work locations at Saddlebunch Keys do not present any unique construction-related water quality impacts. In accordance with NPDES program requirements, a general NPDES permit would be required for construction activities which result in the disturbance of 2 or more hectares (5 or more acres). Construction activities at Saddlebunch Keys would result in a disturbance of approximately 0.9 hectare (2.2 acres) of land, and would not be subject to Federal NPDES permitting requirements.

Within the State of Florida, stormwater management activities are also governed by the Florida ERP program. The ERP program applies to alterations of the landscape, including the creation or alteration of wetlands and other surface waters, and alterations of uplands that affect flooding and all stormwater management activities. Under the ERP program, the permit application serves as a joint application to initiate review by the FDEP and the USACE. The FDEP utilizes the ERP application for the concurrent review of State of Florida stormwater management requirements, application for use of state-owned submerged lands, and for ensuring compliance with state water quality standards. Construction activities will be required to comply with the State of Florida stormwater management requirements. As previously mentioned, the ERP also serves as an

application to the USACE for Federal dredge and fill permitting review. Disturbance of wetland areas resulting from construction activities will require submittal of an ERP application to the USACE for determination of dredge and fill permitting requirements.

No construction would be required at the proposed instrumentation sites located on Sugarloaf and Boca Chica keys. Construction activities at the proposed instrumentation site located on Fleming Key would result in the disturbance of approximately 0.08 hectare (0.2 acre) of land. Because the area of disturbance is less than 2 hectares (5 acres), construction activities at the Fleming Key location would not be subject to NPDES permitting requirements.

Flight Test Activities

Refer to section 3.3.14.4.1 for a description of impacts.

Cumulative Impacts

Construction of the TMD test facilities on Saddlebunch Keys would take place on land owned by NASKW. This site was developed and is operated by the Naval Computer Telecommunications Area Master Station Atlantic Detachment. Current transmission and support activity will continue for the foreseeable future and there are no current plans for additional DOD projects. Residential and commercial development has continued at a moderate rate in Monroe County with some increase in population on Cudjoe Key.

There are no other projects in the foreseeable future at Saddlebunch Keys; therefore, no cumulative water quality impacts are foreseen.

Mitigation Measures

Disturbance of wetlands will require development of mitigations in consultation with the appropriate agencies. Standard operating procedures would include the implementation of an emergency response plan to test which specifies the requirement for an onsite recovery team for spill response and debris recovery and advanced notification procedures.

Possible mitigations would include:

- Use of bottled water and portable toilets to reduce demand for onsite water and sanitation facilities and possible contamination from septic tanks.
- Design planning and engineering that would minimize the amount of new impervious surfaces and establish procedures or systems to minimize untreated surface runoff from program-related sites.
- Monitoring water quality in the vicinity during and after initial launch.

3.4 RELATIONSHIP BETWEEN USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The proposed TMD Extended Test Range Program has been planned and designed to test defensive missile systems that would deter or prevent the use of theater missiles against deployed U.S. military forces, allied military forces, and civilians; to protect deployed U.S. military forces, allied military forces, and civilians from theater missiles launched against them; and, to reduce the probability of and to minimize the effects of damage caused by a theater missile attack. The proposed target and interceptor launch modes and locations in the EGTR would offer a unique combination of existing range instrumentation and sparsely occupied intercept areas (in the Gulf of Mexico) for TMD missile testing. TMD program testing is needed to validate the system design and operational effectiveness of TMD missile and sensor systems. Testing with target and launch facilities in the United States provides the most cost effective, long-term method of meeting this requirement. Once operational, DOD would have the ability to train personnel using realistic systems with representative targets. The EGTR offers a unique capability for effectively and economically testing and training with these new TMD systems.

3.4.1 AIR QUALITY

The proposed TMD program and alternatives would cause small quantities of criteria air pollutants to be generated during site preparation activities. During flight test activities emissions from missile propellants and from support equipment would be generated and normally dispersed within the designated Launch Hazard Area (LHA). Both of these activities would cause short-term local impacts, with no long-term effects on the environment. The program would not affect the attainment of Federal or state air quality standards for any single test event or cumulatively for all events over the projected 10-year testing and training period.

3.4.2 AIRSPACE USE

The proposed TMD program and alternatives would require temporary, scheduled CFA procedures within the LHA during flight test and training activities. The existing warning areas would be cleared up to 4 hours to support flight test activities. These clearance periods would be episodic throughout the year with a maximum of 24 test or training events. The airspace in the vicinity of Eglin AFB has been designated and charted to accommodate this type of weapon system testing and training. The TMD program would result in short-term effects on airspace use during any single test event or cumulatively for all events over the projected 10-year testing and training period.

3.4.3 BIOLOGICAL RESOURCES

The proposed TMD program and alternatives would result in minor levels of temporary and permanent disturbance to vegetation and wildlife habitats during site preparation activities. At some proposed launch sites, protected species and habitats could be affected. During flight test activities, some temporary disturbance to vegetation and wildlife could occur. These combined short- and long-term impacts would be

considered adverse with potential long-term effects. The preservation and enhancement of biological habitat areas outside of the project areas would contribute to the long-term productivity of affected habitats and species. Program-related short-term and long-term local effects on the biological environment would remain relatively constant over the projected 10-year testing and training period. Following this period, appropriate restoration could result in partial or full recovery of the habitats. The potential loss of specific species would be considered negative with respect to long-term productivity.

3.4.4 CULTURAL RESOURCES

Effects of the proposed TMD program and its alternatives may increase the loss of cultural resources beyond the conditions which could be expected without the project. Any project-related field studies and analyses would, however, contribute to the present level of knowledge about resources on Santa Rosa Island and Cape San Blas or in the Florida Keys if alternative sites are selected.

3.4.5 GEOLOGY AND SOILS

Short-term effects may occur on geology and soils. Short-duration demands for construction materials would be related to site preparation of facilities and roads and would not appreciably affect regional supplies or availability. Short-duration effects to soils by erosion during construction are also predicted. These effects would be mitigated by re-vegetation of exposed areas. During flight test activities, there could be some deposition of propellant residuals on the soil in the immediate areas around the launch pad. The effects of these deposits would be short-term and would not affect the long-term productivity of the soil or any oil and gas resources.

3.4.6 HAZARDOUS MATERIALS AND WASTE

The proposed TMD program and alternatives would utilize some hazardous materials and would consequently generate some hazardous wastes. The handling, transportation, storage and disposal of hazardous materials and waste would be strictly controlled by the application of Federal and Air Force regulations and procedures. The LHA is designed to contain all hazardous wastes generated by flight test activities, and specific post-launch procedures ensure that effects would be short-term within the designated areas. The program would not cause and long-term effects for any single test event or cumulatively for all events during the projected 10-year testing and training period.

3.4.7 LAND AND WATER USE

Development of some currently vacant lands could be precluded by the determination of the general LHA for each launch site. However, these lands are currently designated Native Area, which minimizes their development potential. As a result, the long-term productivity of the use of the land for other purposes could be reduced over the projected 10-year testing and training period.

The proposed TMD program and alternatives would require temporary clearance of portions of the Gulf of Mexico within the LHA during flight test and training activities.

This would cause private, commercial and other water activity to be delayed, re-routed or canceled during a clearance period of up to 4 hours. These clearance periods would be episodic throughout the year with a maximum of 24 test or training events. The TMD program would result in short-term effects on water use during any single test event or cumulatively for all events during the projected 10-year testing and training period.

3.4.8 NOISE

Implementation of the proposed project would result in short-term noise impacts during site preparation and flight test activities. Missile launch (propulsion) and reentry (sonic boom) would have a brief but startling effect on human and wildlife populations. Since interception would occur over the Gulf of Mexico, high-intensity sound pressure would particularly disturb marine mammals. No long-term noise effects on the environment are anticipated as a result of TMD testing and training.

3.4.9 SAFETY

Safety is defined as the consideration of those events which could result in adverse effects to human health, the environment, and/or property. The preparation, transport and flight testing of TMD interceptor and target missiles could potentially pose a safety risk, particularly to mission essential personnel who provide direct support to TMD operations. The minimization of this risk would be accomplished through a comprehensive management process hat includes highly trained technical personnel, specially designed facilities, stringent health and safety regulations, delineated safety stand-off zones and established range protocols. Potential safety impacts for all environmental resources were evaluated for both normal interceptor and target flight tests and for a series of defined mishaps. For normal flight test activity, there would be no safety impacts, with no appreciable ecological or human health risks. Air Force safety and health regulations and procedures are designed and enforced to minimize safety hazards to service members and the public. These regulations and procedures would be strictly followed. Potential hazards would be anticipated and mitigated in advance by imposition of safety clearance zones to minimize public exposure to any possible mishap scenario. As a result, no short- or long-term effects on productivity are expected to result.

3.4.10 SOCIOECONOMICS

The proposed TMD program and alternatives would require the employment of human resources during both site preparation and flight-test activities. The short-term utilization of these resources is projected to be from existing available labor in the region and is not expected to be in conflict with any other productive activity. During flight test activities, temporary clearance of the Gulf of Mexico within the LHA would be required. As a result, some commercial and industrial activities (shipping, fishing, recreation) would be temporarily interrupted during a clearance period of up to 4 hours. These clearance periods would be episodic throughout the year with a maximum of 24 test or training events. The TMD program would result in short-term effects on socioeconomics during any single test event but would not cause any long-term effects on productivity within the region.

3.4.11 TRANSPORTATION

The proposed TMD program and alternatives would cause some short-term increases in road traffic during site preparation and flight test activities. These increases would not appreciably affect traffic movement at any of the proposed sites. During flight test activities some roads would be temporarily closed for a period of up to 4 hours. In addition, temporary clearance of the Gulf of Mexico within the LHA would be required. As a result, some commercial and industrial activities would be temporarily interrupted. Air traffic intending to transit the Gulf of Mexico would be rerouted over land, increasing the traffic on those routes. The TMD program would result in short-term effects on transportation during any single test event but would not cause any long-term effects on productivity within the region.

3.4.12 UTILITIES

The proposed TMD program and alternatives would require a relatively small increase in demand for utility services including water, wastewater treatment, solid waste disposal, electricity, and storm drainage. Since these services would can be provided by existing capacities within these utility systems, no short- or long-term effects on productivity are expected to result.

3.4.13 VISUAL AESTHETICS

The proposed TMD program and alternatives would cause some visual changes to the landscape of proposed launch sites. Proposed structures and activities at Santa Rosa Island and Cape San Blas would not provide a noticeable contrast with existing structures and would not result in short- or long-term effects. The alternative target launch sites in the Florida Keys would require structures and activities that would be more visible although compatible with existing military facilities. The TMD program would result in short-term effects on visual aesthetics, but would not cause any long-term effects on productivity within the region.

3.4.14 WATER RESOURCES

The proposed TMD program and alternatives would not appreciably affect the availability or quality of surface, ground, or marine water resources as a result of site preparation and flight test activities in the proposed project areas. Some short-term water quality effects on surface water could result from the deposition of propellant residuals, but these effects would be temporary. and no long-term effects on productivity would occur within the region.

3.5 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The current planning horizon for the operation of the proposed TMD Extended Test Range is 10 years, from 1999 through 2009. Although it is possible that TMD testing and training activities could continue beyond this period, the evaluation of irreversible and irretrievable commitments of resources was generally based on the assumption that the program would include all projected test events. With this assumption, it is possible that some of the natural resources required for the operation of the program may restored to their pre-project conditions.

The TMD Extended Test Range Program would not generally involve the use of resources to such an extent that they would become fully consumed or destroyed. As a result, potential irreversible and irretrievable commitments of resources would be very limited, and would occur only for certain biological and cultural resources.

3.5.1 BIOLOGICAL RESOURCES

The removal of very small areas of vegetation and wildlife habitats, including wetlands on Cape San Blas and in the Saddlebunch Keys, represents a potential irretrievable and irreversible commitment of these resources. The preservation and enhancement of adjacent areas containing habitat of similar, equal or greater biological value would ensure that these important resources are permanently protected on a local and regional basis. Some biological habitats would be temporarily disturbed during initial site preparation and over the projected 10-year testing and training period. Upon conclusion of the TMD flight test and training programs, appropriate restoration could result in partial or full recovery of the habitats. Given sufficient time, adequate conditions, and an appropriate mitigation program, these areas would be expected to recover to a state approximating predisturbance conditions.

In addition to general habitat loss, site preparation and flight test activities may also result in direct losses of certain sensitive plants and wildlife, including marine mammals. These losses, while initially small, would be minimized through implementation of appropriate mitigation measures.

3.5.2 CULTURAL RESOURCES

The cultural resource base on Santa Rosa Island and Cape San Blas, and at the alternate sites in the Florida Keys is fragile, finite, and non-renewable. Although surveys have identified no potentially-eligible NRHP archaeological sites within the proposed areas of construction, there is the potential for cultural material to be present. Physical disturbances during flight test activities could result in the loss of these resources.

4.0 Environmental Impacts and Mitigations

4.0 ENVIRONMENTAL IMPACTS AND MITIGATIONS

In this SEIS, the presentation of the Affected Environment and Environmental Consequences has been combined into a single section identified as section 3-4. In this unified section, the presentation of existing and future environmental baseline conditions for each of the 14 environmental resource areas is directly followed by a discussion of the potential impacts of the proposed project and alternatives, including appropriate mitigations.

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