

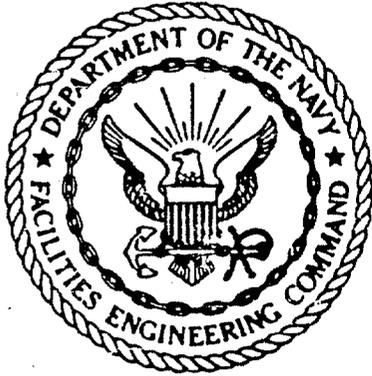
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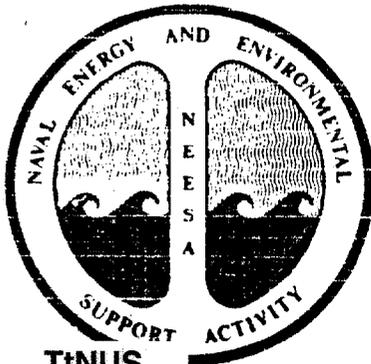
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**MAY, 1985**

**INITIAL ASSESSMENT STUDY OF  
NAVAL AIR STATION,  
KEY WEST, FLORIDA**

**NEESA 13-071**



**NAVAL ENERGY AND ENVIRONMENTAL  
SUPPORT ACTIVITY**

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SONNY

INITIAL ASSESSMENT STUDY  
NAVAL AIR STATION, KEY WEST, FLORIDA

UIC: N00213

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May 1985

## EXECUTIVE SUMMARY

This report presents the results of an Initial Assessment Study (IAS) conducted at the Naval Air Station (NAS), Key West, Florida. The purpose of an IAS is to identify and assess sites posing a potential threat to human health or the environment due to contamination from past hazardous materials disposal operations.

Based on historical data, aerial photographs, field inspections, and personnel interviews, eight potentially contaminated sites were identified at NAS Key West. Each of the sites were evaluated with regard to contamination characteristics, migration pathways, and pollutant receptors.

There is potential for contamination migration from the sites to surface waters in the Key West area due to the porous nature of Miami Oolite and the underlying Key West limestone geologic formations. Seawaters under tidal influence move freely in and out of the limestone creating a flushing action for contaminant dispersal into the large volume of tidal waters. The Atlantic Ocean and Gulf of Mexico and the significant tidal flushing involved might tend to limit the potential impacts to these areas.

The study concludes that six of the sites warrant further investigation under the Naval Assessment and Control of Installation Pollutants (NACIP) Program, to assess potential long-term impacts. A Confirmation Study, including actual sampling and monitoring of the sites, is recommended to confirm or deny the existence of the suspected contamination and to quantify the extent of any problems which may exist. The six sites recommended for confirmation are listed below in order of priority.

- 1) Site 2: Transformer Oil Disposal Area
- 2) Site 8: South Fleming Key Landfill
- 3) Site 4: Boca Chica Open Disposal Area
- 4) Site 3: Truman Annex DDT Mixing Area
- 5) Site 1: Truman Annex Refuse Disposal Area
- 6) Site 5: Boca Chica DDT Mixing Area

The results of the Confirmation Study will be used to evaluate the necessity of conducting mitigating actions or cleanup operations.



Naval  
Environmental  
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## FOREWORD

The Department of the Navy developed the Navy Assessment and Control of Installation Pollutants (NACIP) Program to identify and control environmental contamination from past use and disposal of hazardous substances at Navy and Marine Corps installations. The NACIP Program is part of the Department of Defense Installation Restoration Program, and is similar to the Environmental Protection Agency's "Superfund" Program authorized by the Comprehensive Environmental Response, Compensation and Liability Act of 1980.

In the first phase of the NACIP Program, a team of engineers and scientists conducts an Initial Assessment Study (IAS). The IAS team collects and evaluates evidence of contamination that may pose a potential threat to human health or the environment. The IAS includes a review of archival and activity records, interviews with activity personnel, and an on-site survey of the activity. This report documents the findings of an IAS at the Naval Air Station (NAS), Key West, Florida.

A Confirmation Study, Phase II of the NACIP Program, is recommended for six sites identified during the IAS. Southern Division of the Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) will assist NAS Key West in implementing the recommendations.

Questions regarding this report should be referred to the Naval Energy and Environmental Support Activity, Code 112N at AUTOVON 360-3351, FTS 799-3351, or commercial 805-982-3351. Questions concerning confirmation work or other follow-on efforts should be referred to SOUTHNAVFACENGCOM, 114, at AUTOVON 794-5510, FTS 679-5510, or commercial 803-743-5510.

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## ACKNOWLEDGEMENTS

The Initial Assessment Study Team expresses its thanks for the support, assistance and cooperation provided by personnel at Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM); Naval Energy and Environmental Support Activity (NAVENENVSA); and Naval Air Station (NAS), Key West, Florida. Without their support, the Initial Assessment Study at the NAS Key West could not have been successfully completed. In particular, the team acknowledges the effort provided by the following people:

ENS Joe Avolis, Environmental Coordinator, NAS Key West

Bob Young, Civil Engineer, NAS Key West

A.L. "Sonny" Chestnut, Southern Division, NAVFACENGCOM

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## CHAPTER 1. INTRODUCTION

1.1 PROGRAM BACKGROUND. Past hazardous waste disposal methods, although acceptable at the time, have often caused unexpected long-term problems through release of hazardous pollutants into the soil and ground water. In response to a growing recognition of these problems, the U.S. Congress directed the U.S. Environmental Protection Agency (EPA) to develop a comprehensive national program to manage past disposal sites. The program is outlined in the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of December 1980.

1.1.1 Department of Defense (DOD) Program. DOD efforts in this area preceded the nationwide CERCLA program. In 1975, the U.S. Army developed for DOD a pilot program to investigate past disposal sites at military installations. In 1980, DOD named this program the Installation Restoration Program and instructed the services to comply with program guidelines.

1.1.2 Navy Program. The Navy manages its part of the program, the Navy Assessment and Control of Installation Pollutants (NACIP) Program, in three phases. Phase one, the Initial Assessment Study (IAS), identifies disposal sites and contaminated areas caused by past hazardous substance storage, handling or disposal practiced at Naval activities. These sites are then individually evaluated with respect to their potential threat to human health or to the environment. Phase two, the Confirmation Study, verifies or characterizes the extent of contamination present and provides additional information regarding migration pathways. Phase three, Remedial Action, provides the required corrective measure to mitigate or eliminate confirmed problems.

1.2 AUTHORITY. The Chief of Naval Operations (CNO) initiated the NACIP program in OPNAVNOTE 6240 of 11 September 1980, superseded by OPNAVINST 5090.1 of 26 May 1983. Naval Facilities Engineering Command (NAVFACENGCOM) manages the program within the existing structure of the Naval Environmental Protection Support Service (NEPSS), which is administered by the Naval Energy and Environmental Support Activity (NAVENENVSA). NAVENENVSA conducts the program's first phase, the IAS, in coordination with NAVFACENGCOM Engineering Field Divisions (EFDs). Activities are selected for an IAS by CNO, based on recommendations by NAVFACENGCOM, the EFDs, and NAVENENVSA. Approval of the Naval Air Station (NAS) Key West, Florida, for an IAS is contained in CNO letter ser 451/3U392444 of July 1983.

### 1.3 SCOPE.

1.3.1 Past Operations. The NACIP program focuses attention on past hazardous substance storage, use and disposal practices on Navy property. Current practices are regularly surveyed for conformity to state and federal regulations and, therefore, are not included in the scope of the NACIP program. The IAS addresses operational non-hazardous disposal and storage areas only if they were hazardous waste disposal or storage areas in the past. Current operations are investigated solely to determine what types and quantities of chemicals or other materials were used and what disposal methods were practiced.

1.3.2 Results. If necessary, an IAS recommends mitigating actions to be performed by the activity or EFD, or recommends Confirmation Studies to be

administered by the EFD under the NACIP program. Based on these recommendations, NAVFACENGCOCOM schedules Confirmation Studies for those sites which have been determined by scientific and engineering judgment to be potential hazards to human health or to the environment.

#### 1.4 INITIAL ASSESSMENT STUDY.

1.4.1 Records Search. The IAS begins with an investigation of activity records followed by a records search at various government agencies including EFDs, national and regional archives and records centers, and U.S. Geological Survey offices. In this integral step, study team members review records to assimilate information about the activity's past missions, industrial processes, waste disposal records, and known environmental contamination. Examples of records include activity master plans and histories, environmental impact statements, cadastral records, and aerial photographs. Appendix A lists the agencies contacted during this study.

1.4.2 On-Site Survey. After the records search, the study team conducts an on-site survey to complete documentation of past operations and disposal practices and to identify potentially-contaminated areas. With the assistance of an activity point-of-contact, the team inspects the activity during ground and aerial tours, and interviews long-term employees and retirees. The on-site survey for NAS Key West was conducted from 30 July to 3 August, 1984; information in this report is current as of those dates.

Information obtained from interviews is verified by data from other sources or from corroborating interviews before inclusion in the report. If information for certain sites is conflicting or inadequate, the team may collect samples for clarification.

1.4.3 Confirmation Study Ranking System. With information collected during the study, team members evaluate each site for its potential hazard to human health or to the environment. A two-step Confirmation Study Ranking System (CSRS) developed at NAVENENVSA is used to systematically evaluate the relative severity of potential problems. The two steps of the CSRS are a flowchart and a numerical ranking model. The first step is a flowchart based on type of waste, containment, and hydrogeology. This step eliminates innocuous sites from further consideration. If the flowchart indicates a site poses a potential threat to human health or to the environment, the second step, the model, is applied. This model assigns a numerical score from 0 to 100 to each site. The score reflects the characteristics of the waste, the potential migration pathways from the site, and possible contaminant receptors on and off the activity.

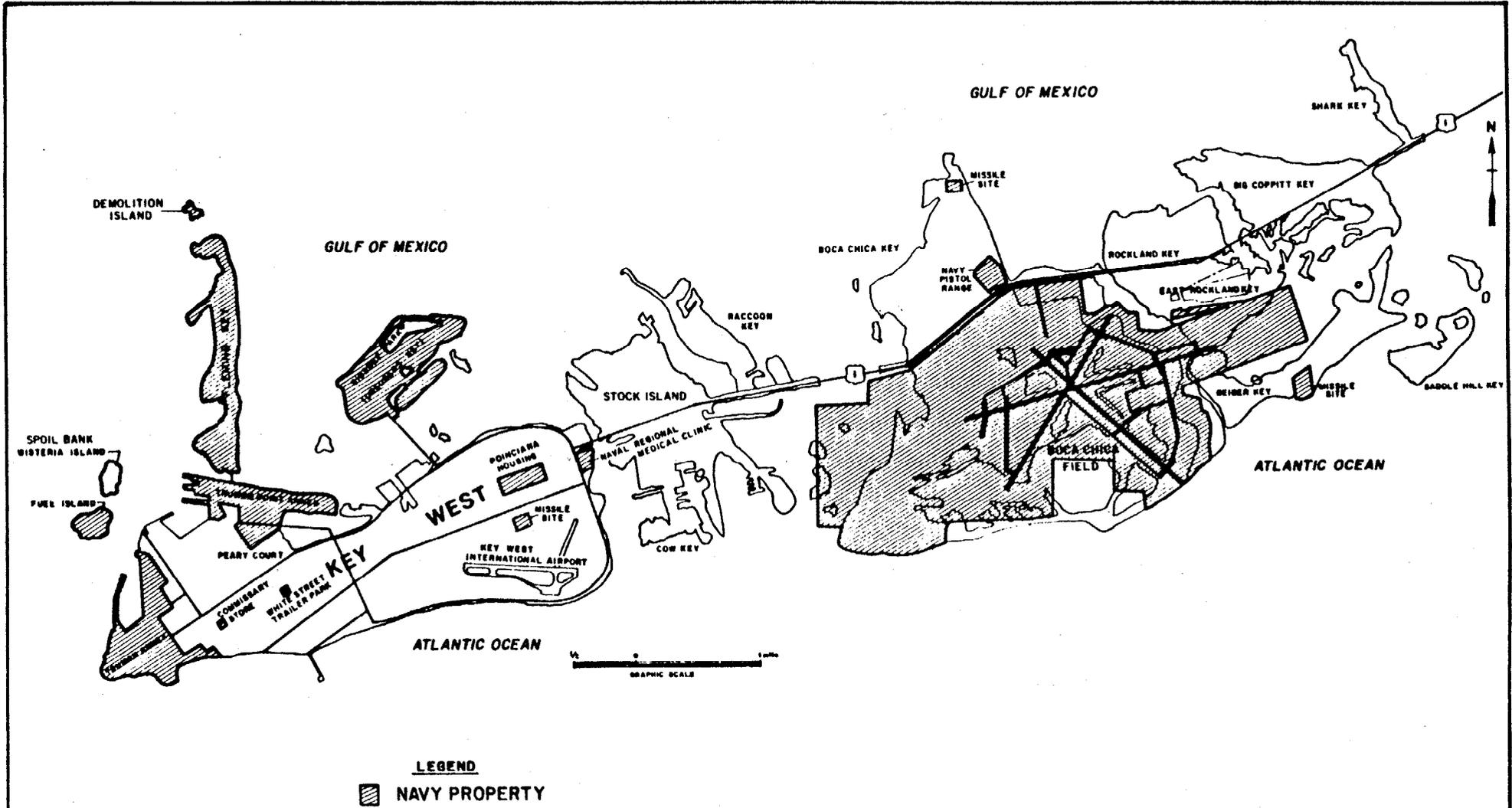
1.4.4 Site Ranking. After scoring a site, engineering judgment is applied to determine the need for a Confirmation Study or for immediate mitigating action. At sites recommended for further work, CSRS scores are used to rank the sites in a prioritized list for scheduling projects. For a more detailed description, refer to NEESA 20.2-042, Confirmation Study Ranking System.

1.4.5 Confirmation Study Criteria. A Confirmation Study is recommended for sites at which: 1) sufficient evidence exists to indicate the presence of contamination, and 2) the contamination poses a potential threat to human health or to the environment.

1.5 CONFIRMATION STUDY. Generally, the EFD conducts the Confirmation Study in two phases - verification and characterization. In the verification

phase, short-term analytical testing and monitoring determines whether specific toxic and hazardous materials, identified in the IAS, are present in concentrations considered to be hazardous. Normally, the IAS recommends verification phase sampling and monitoring. The design of the characterization phase usually depends on results from the verification phase. If required, a characterization phase, using longer-term testing and monitoring, provides more detailed information concerning the horizontal and vertical distribution of contamination migrating from sites, as well as site hydrogeology. If sites require remedial actions or additional monitoring programs, the Confirmation Study recommendations include the necessary planning information for the work, such as design parameters.

1.6 IAS REPORT CONTENTS. In this report, the significant findings and conclusions from the IAS are presented in Chapter 2. Recommendations are presented in Chapter 3. Chapter 4 describes general activity information, history, biology and physical features. Chapters 5 through 8 trace the use of chemicals and hazardous materials from storage and transfer, through manufacturing and operations, to waste processing and disposal. The latter chapters provide detailed documentation to support the findings, conclusions and recommendations in Chapters 2 and 3. An overall location map indicating the extent of Navy property managed by NAS Key West is shown in Figure 1-1.



**INITIAL ASSESSMENT STUDY**  
**NAVAL AIR STATION**  
**KEY WEST, FLORIDA**

1-4

## CHAPTER 2. SIGNIFICANT FINDINGS AND CONCLUSIONS

2.1 INTRODUCTION. This chapter summarizes significant findings concerning the physical setting, geology, hydrogeology and biology, as well as evidence of past contamination that may represent a threat to human health or a potential impact to the environment. Information is generated from extensive review of available data, the results of the on-site survey, and interviews with current and retired key employees, military personnel and contractors. Conclusions are made using professional judgment in the determination that a past disposal area warranted further action. Of the eight sites identified during the on-site survey at the Naval Air Station (NAS) Key West, Florida, six are recommended for further study under the Naval Assessment and Control of Installation Pollutants (NACIP) program. Specific recommendations for these sites are presented in Chapter 3. Complete descriptions of each site can be found in Chapter 8.

2.1.1 Location. NAS Key West is located approximately 150 miles southwest of Miami on the last major island of the Florida Keys. It is connected to the mainland by the Overseas Highway (U. S. Highway No. 1). Tourism is the primary industry in the Key West area. Visitors are attracted by the tropical climate and the beautiful island setting. Fishing is the second most important industry with shrimping accounting for half the total catch.

2.1.2 Climate. Key West has a mild, tropical-maritime climate with a winter temperature average of only 14°F lower than in summer. The average annual rainfall is 40 inches with numerous, heavy showers and thunderstorms during the wet season months of June through October. The area is typically flat and low with ground elevations ranging from 0 to 15 feet mean sea level.

2.1.3 Biological Factors. The Key West Naval Complex includes areas such as Truman Annex and Trumbo Point that are completely developed. Other areas such as portions of Boca Chica, Saddlebunch and Demolition Island are mostly cleared land. These lands do not contain tropical hammock-type habitat. Around the periphery of these islands are mangrove swamps and salt marshes at intertidal areas, grading into marine grass flats in subtidal areas. Areas cleared and left fallow have come back with an Australian Pine monoculture or thick cover of other early successional. It is unlikely native vegetation will re-establish in these areas without human encouragement.

In Florida there are 68 animal species considered endangered or threatened by either the U. S. Fish and Wildlife Service (USFWS) or the Florida Game and Freshwater Fish Commission (FGFFC). Eleven of these species have ranges that potentially overlap NAS Key West. The list includes: the Key silverside fish, American crocodile, leatherback and Key mud turtles, eastern brown pelican, bald eagle, least tern, white-crowned pigeons, West Indian manatee, and the Stock Island tree snail.

There are 325 plants listed as either endangered or threatened by the Florida Department of Agriculture. Of these, only seven now occur in the Key West area. The list includes: the golden leather fern, tree cactus, silver thatch and coconut palms, manchineel tree, Florida thatch palm, and the brittle thatch palm. The tree cactus was recently designated an endangered species by the United States Fish and Wild Life Service.

2.1.4 Geology. The Florida Keys were created through eustatic elevation of limestone rock units. All of the Lower Keys are composed of Miami Oolite, which consists of calcium carbonate and tiny oolids or spherical calcareous grains. Key Largo limestone underlies the Miami Oolite on all the Lower Keys. It consists of cemented remains of ancient coral reefs, fossils and shells. The Miami Oolite is approximately 20 feet thick at Key West. It is a porous formation and of little use as a ground water aquifer because of the poor quality. The underlying Key Largo formation is permeable and yields water but the quality is poor, being close to that of seawater. The Key Largo Limestone is approximately 180 feet thick at Key West.

The original soils in the area are shallow marl over limerocks. However, many areas at NAS Key West have been filled and graded. In fact, Fleming and Dredgers Keys are essentially spoil islands created from material dredged from the Seaplane Basin.

2.1.5 Hydrology. The surface water regime in the Florida Keys is dominated by the surrounding saltwater bodies, the Atlantic Ocean and the Gulf of Mexico. The Florida Department of Environmental Regulation (DER) classifies surface waters in the Keys as Class III Waters - Recreational - Propagation and Management of Fish and Wildlife. Also in the immediate area of NAS Key West are the Great Heron Wildlife Refuge and the Key West National Wildlife Refuge, which are classified by DER as outstanding Florida waters and are afforded the highest protection by the State. These waters are considered to be of exceptional recreational and ecological significance.

Although the Keys are underlain by highly transmissive limestone aquifers, most ground water is brackish, saline or hypersaline. In the Key West area, freshwater wells of consequence do not exist and potable water is obtained by rainwater catchment, a three million gallon per day desalination plant or imported by pipeline from the Florida Keys Aquaduct Authority via a 130-mile pipeline from the mainland. There are no freshwater wells at NAS Key West.

2.1.6 Migration Potential. There is potential for contamination migration to surface waters in the Key West area due to the porous nature of Miami Oolite and the underlying Key Largo limestone. Seawaters under tidal influence move freely in and out of the limestone, creating a flushing action for contaminant dispersal into the large volume of tidal waters. The Atlantic Ocean and Gulf of Mexico and the significant tidal flushing involved might tend to limit the potential impacts to these areas.

2.1.7 Potential Contaminant Receptors. Surface waters in the Keys are classified as Class III Waters-Recreation-Propagation and Management of Fish and Wildlife. Common activities in the Key West area waters include commercial and recreational shell fishing, boating and swimming. These waters support the richest coral reefs in the continental United States.

2.1.8 Waste Disposal Sites. Eight waste disposal sites were identified at NAS Key West during the on-site survey. Figures 2-1 and 2-2 show the location of these sites. The significant findings and conclusions concerning these sites are outlined below.

2.2 SITES RECOMMENDED FOR CONFIRMATION STUDY. Of the eight disposal and spill sites identified at NAS Key West, six are recommended for Confirmation Studies. Table 2-1 summarizes the findings of the disposal and spill sites.

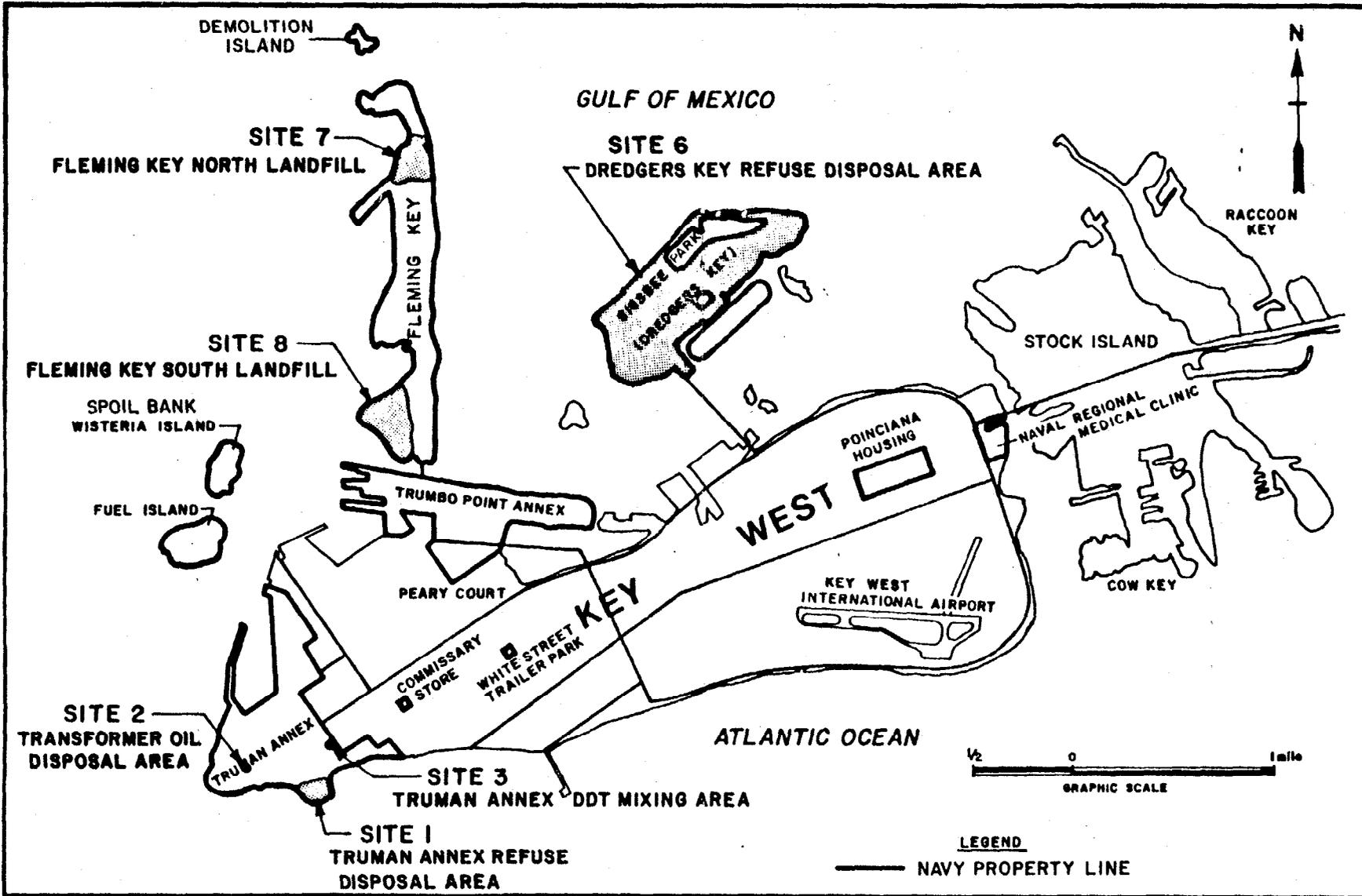
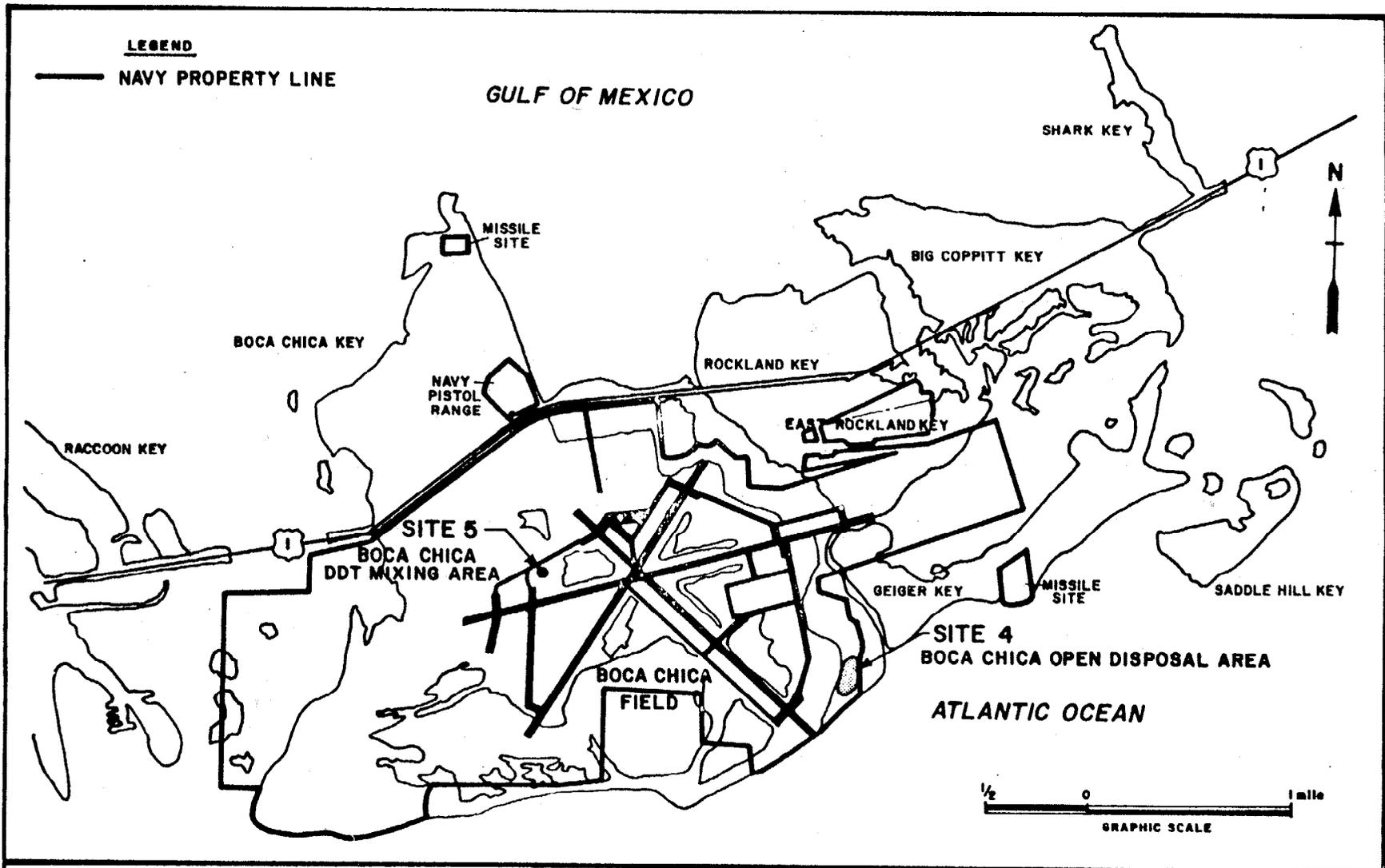


FIGURE 2-1  
 KEY WEST  
 Waste Disposal Sites



INITIAL ASSESSMENT STUDY  
 NAVAL AIR STATION  
 KEY WEST, FLORIDA



**FIGURE 2-2  
BOCA CHICA  
WASTE DISPOSAL SITES**



**INITIAL ASSESSMENT STUDY  
NAVAL AIR STATION  
KEY WEST, FLORIDA**

Table 2-1

Summary of Disposal and Spill Sites  
at NAS Key West

Site No.	Site Name	Location	Period of Operation	Types of Material Disposed	Comments
Sites Recommended for Confirmation Studies:					
IR1 1	Truman Annex Refuse	Truman Annex	1952 to mid-1960s	Combustibles, waste paints, paint thinners, solvents	Received Naval Station combustibles, open burning area
2	Transformer Oil Disposal Area	Truman Annex	mid-1950s to 1970	Dielectric fluid, PCBs	Dielectric fluid used to control dust and weeds
IR3 3	Truman Annex DDT Mixing Area	Truman Annex	1940s to early 1970	DDT	Spillage of solutions and concentrates
SWMU 1 4	Boca Chica Open Disposal Area	Boca Chica	1942 to mid-1960s	Refuse, waste oil, waste paints and thinners, solvents (toluene, xylene, MEK, TMIK, PD-680)	Primary landfill for Air Station
SWMU 2 5	Boca Chica DDT Mixing Area	Boca Chica	1940s to early 1970	DDT	Spillage of solutions and concentrates
IR8 8	South Fleming Key Landfill	Fleming Key	1962-1980	Refuse, waste oil, waste paints and thinners, solvents (toluene, xylene, MEK, TMIK, PD-680)	Primary landfill for Naval Station from 1962 to 1980; Primary landfill for Air Station from 1966 to 1980
Sites Not Recommended for Confirmation Studies:					
6	Dredgers Key Refuse Disposal Area	Dredgers Key	early 1940s to 1952	Refuse	Primary disposal for Naval Station refuse
IR7 7	North Fleming Key Landfill	Fleming Key	1952-1962	Refuse	Primary landfill for Naval Station refuse

IR 1

IR 1

2.2.1 Site 1: Truman Annex Refuse Disposal Area. This site is located along the shore of Truman Annex on Key West, in the general proximity of the current antenna field. It was used from 1952 until the mid-1960s as a general refuse disposal and open burning area. Combustible wastes such as telephone poles, tree clippings, paper, etc., were taken to Site 1 and burned. Waste liquids including waste oil and hydraulic fluids, were used to help ignite the wastes. It is probable that Site 1 received general refuse from the Naval Station which potentially could have included shop wastes such as waste paints, thinners and solvents. This site is covered and supports a lush growth of vines, weeds and wildflowers.

Since the burning operation was not a controlled process, it can be assumed that not all the wastes were completely destroyed. There is high potential for migration from the site. The southern portion of the site borders the Atlantic Ocean and ground water in the area is only two to three feet below the surface. The permeability of the soils at the site are expected to be high since this fill area extends beyond the natural shoreline. Contaminants entering surface waters could impact humans involved in water contact recreation as well as commercial and recreational shell fishing.

Avells

EPA  
Priority  
Pollutants  
TDS

Based on the types of wastes possibly disposed at Site 1, the high potential for migration and the presence of receptors, this site is recommended for a Confirmation Study.

2.2.2 Site 2: Transformer Oil Disposal Area. Site 2 is the gravel parking area surrounding Building 795, which is the Defense Property Disposal Office (DPDO). It covers an area of approximately 0.5 acre. During the time period from the mid-1950s to approximately 1970, off-line transformers were sent to the Key West Naval Station DPDO at Truman Annex for ultimate disposal. Reportedly, transformers were lifted by a forklift truck and punctured near the bottom to allow the dielectric fluid to drain. The truck drove back and forth over the gravel parking area surrounding Building 795, spreading the oil to control dust and weeds. During this time, polychlorinated biphenyl (PCB) oil was in common use. It is probable that some of the dielectric fluid drained on the parking lot contained PCBs. The probability that PCB-containing dielectric fluid was disposed at this site is very likely. PCBs could still remain at this site due to the fact that PCBs are relatively insoluble in water and migrate slowly through the soil. This area is subjected to vehicle and pedestrian traffic.

IR  
Soil samples  
PCB's

Since this site has the potential for PCB contamination and may represent a hazard to human health or a potential impact to the environment, a Confirmation Study is recommended.

IR 3

2.2.3 Site 3: Truman Annex Dichlorodiphenyl Trichloroethane (DDT) Mixing Area. Site 3 is located at the former site of Building 265, which has been demolished. It was used as a DDT mixing area from the 1940s to the early 1970s. Powdered DDT concentrate was mixed with water in 55-gallon drums and stored until it was sprayed by a small tank truck. Reportedly, disposal at this site was not intentional but instead was due to accidental spillage during mixing and filling operations. This area is currently a non-posted, vacant lot. DDT is non-degradable and very persistent in the environment.

IR  
Soil samples  
postulated  
sampling  
technique?

Since this site has the potential to be contaminated with DDT and could represent a hazard to human health or a potential impact to the environment, a Confirmation Study is recommended.

2.2.4 Site 4: Boca Chica Open Disposal Area. The southeastern portion of Boca Chica Key, between the perimeter road and Geiger Creek, was operated as an open disposal area from 1942 when the NAS was first established on Boca Chica, until it was closed in the mid-1960s. This site received all the wastes generated at NAS. Typical wastes disposed at the site consisted primarily of general refuse and wastes associated with the operation and maintenance of aircraft operated by the squadrons and Aircraft Intermediate Maintenance Department (AIMD), possibly including waste oils, hydraulic fluids, paint thinners and solvents. During the period of operation, approximately 2,600 tons of waste from the NAS were disposed at the site annually. The site was operated as an open disposal and burning area. Wastes were disposed on the ground and burned daily if wind conditions permitted. Since the burning operation was not a controlled process, it can be assumed that not all wastes were completely destroyed.

SWMU 1

Fuels

EPA  
Priority  
Pollutant Screen  
TDS

Also located in the northwest area of the site are three large, empty, rusted, abandoned, aboveground tanks. The sides, foundations and ground around the tanks were covered with an unknown black tar-like substance.

Site 4 is located in a low area subject to frequent tidal inundation. Ground water in the area is at or near the ground surface and flows into nearby Geiger Creek to the east, and the Atlantic Ocean to the south. There is high potential for migration from the site. Contaminants entering the surface waters could impact humans involved with water contact recreation as well as commercial and recreational shell fishing.

Based on the types of wastes potentially disposed at Site 4, the high potential for migration and the presence of receptors, this site is recommended for a Confirmation Study.

2.2.5 Site 5: Boca Chica DDT Mixing Area. Site 5 is located at the former site of Building 915. This site is approximately 0.25 acre in size. DDT mixing operations were conducted at Building 915 from the 1940s to the early 1970s. Reportedly, disposal at this site was not intentional but instead was due to accidental spillage during mixing and filling operations. The building was demolished and the tanks removed in 1982. During removal of the tanks, some spillage occurred. A slight odor of pesticide was detectable at the site during the on-site survey. DDT is non-degradable and very persistent in the environment.

SWMU 2

IF  
Soil  
Samples  
Pesticidal  
Sampling  
Technique?

Since this site has the potential to be contaminated with DDT and could represent a hazard to human health, a Confirmation Study is recommended.

2.2.6 Site 8: South Fleming Key Landfill. Site 8 is located on the southern end of Fleming Key and covers approximately 45 acres. This landfill was started in 1962 and operated until 1980. The site received approximately 4,000 to 5,000 tons of waste from the Naval Station annually from 1962 to 1966. Beginning 1966, wastes from the Air Station were also disposed at the site. By the late 1970s, annual waste disposal had increased to approximately 8,600 tons. Wastes typically disposed at this site included general refuse from the Naval and Air Stations, sewage sludge, and other items such as waste oil, hydraulic fluid, paint, thinner and solvents from the Air Station shops. The site was operated as trench and fill and covered daily. Wet garbage was placed at one end of the trench and combustible wastes were taken to the western area of the site and burned. Since the burning operation was

IR 8

5/2/75

not a controlled process, it can be assumed that not all wastes were completely destroyed. The ashes were pushed into a mound along the shoreline at the west edge of the landfill area.

EPA  
Permit  
Pollution  
TDS

Ground water is approximately two to three feet below grade and flows toward nearby Gulf waters surrounding the Key. Fleming Key was created from limestone dredge spoil and permeability is expected to be relatively high. There is high potential for migration from the site. Contaminants entering the surface waters could impact humans involved with water contact recreation as well as commercial and recreational shell fishing.

Based on the types of wastes possibly disposed at Site 8, the high potential for migration and the presence of receptors, this site is recommended for a Confirmation Study.

2.3 SITES NOT RECOMMENDED FOR CONFIRMATION STUDY. Two of the eight potentially contaminated sites are not recommended for Confirmation Studies. Significant findings on these sites are summarized in Table 2-1.

nothing  
to date

2.3.1 Site 6: Dredgers Key Refuse Disposal Area. Dredgers Key is located on a man-made island just north of Key West. The site covers an area of approximately 250 acres. Dredgers Key, formed from dredge material during construction of the Seaplane Base, was used from the early 1940s until 1952 as an open disposal and burning ground for wastes generated at the Naval Station. Approximately 1,000 to 2,000 tons of waste from the Naval Station were disposed at this site annually. Typically, wastes disposed at this site consisted of bulky refuse items. Prior to 1952, Naval Station garbage was disposed of by barging to open ocean disposal areas. The City of Key West was also using the site to dispose of some refuse. Wastes were burned at the site for volume reduction.

Due to the non-hazardous nature of the wastes reportedly disposed here, this site is judged not to pose a potential threat to human health or the environment, and a Confirmation Study is not recommended.

IR 7

2.3.2 Site 7: North Fleming Key Landfill. Site 7 is located on the northern end of Fleming Key and covers approximately 30 acres. It was developed as a landfill for Naval Station wastes. This site was used from 1952 until 1962 and received approximately 4,000 to 5,000 tons of waste annually. Typically, wastes disposed at this landfill consisted of general refuse. The method of landfill operation was trench and fill with daily cover. Wastes were placed directly into about three feet of seawater. DDT, malathion and diesel oil were sprayed at the landfill to control pests and insects. However, it is the judgement of the IAS team that this practice does not represent a threat to human health or a potential impact on the environment.

In 1977, the U.S. Department of Agriculture Animal Import Center was constructed over a portion of the site. Wastes excavated during construction were relocated immediately west of the structure and covered.

Due to the non-hazardous nature of the wastes reportedly disposed here, this site is judged not to pose a potential threat to human health or the environment, and a Confirmation Study is not recommended.

## CHAPTER 3. RECOMMENDATIONS

3.1 INTRODUCTION. This chapter presents the recommended actions for the potentially contaminated sites at Naval Air Station (NAS) Key West. Based on the significant findings and conclusions developed in Chapter 2, six sites are recommended for Confirmation Studies under Phase two of the Navy Assessment and Control of Installation Pollutants (NACIP) program. The two-step Confirmation Study Ranking System (CSRS), developed at Naval Energy and Environmental Support Activity (NAVENENVSA), was used to systematically evaluate the relative severity of potential problems.

The results of the CSRS and a summary of the recommended actions for the sites recommended for Confirmation Studies are listed in Table 3-1. These sampling recommendations are designed to first verify the presence of contamination. Depending on the results of the recommended actions for verification, a characterization of the extent of contamination at the sites may be required. The design of the characterization phase will depend on the results from the verification phase.

All recommendations for drilling, sampling and analyses should be conducted in accordance with applicable federal and state regulations and requirements. Additional sampling and analysis may be required at these sites to fully locate and define the extent of contamination migration.

### 3.2 CONFIRMATION STUDY RECOMMENDATIONS.

#### 3.2.1 Site 1, Truman Annex Refuse Disposal Area.

Type of Sample:	Ground water
Number of Ground Water Monitoring Wells:	Four
Frequency of Sampling:	Quarterly for one year
Number of Samples:	16
Testing Parameter:	Cadmium, chromium, lead, zinc, toluene, 1,1,1-trichloroethane, xylene, pH, oil and grease

Remarks: A total of four monitoring wells, three downgradient and one upgradient of the site, should be installed. These shallow monitoring wells should be installed in the water table and the screen positioned to allow capture of possible floating contaminants. Recommended locations are shown in Figure 3-1.

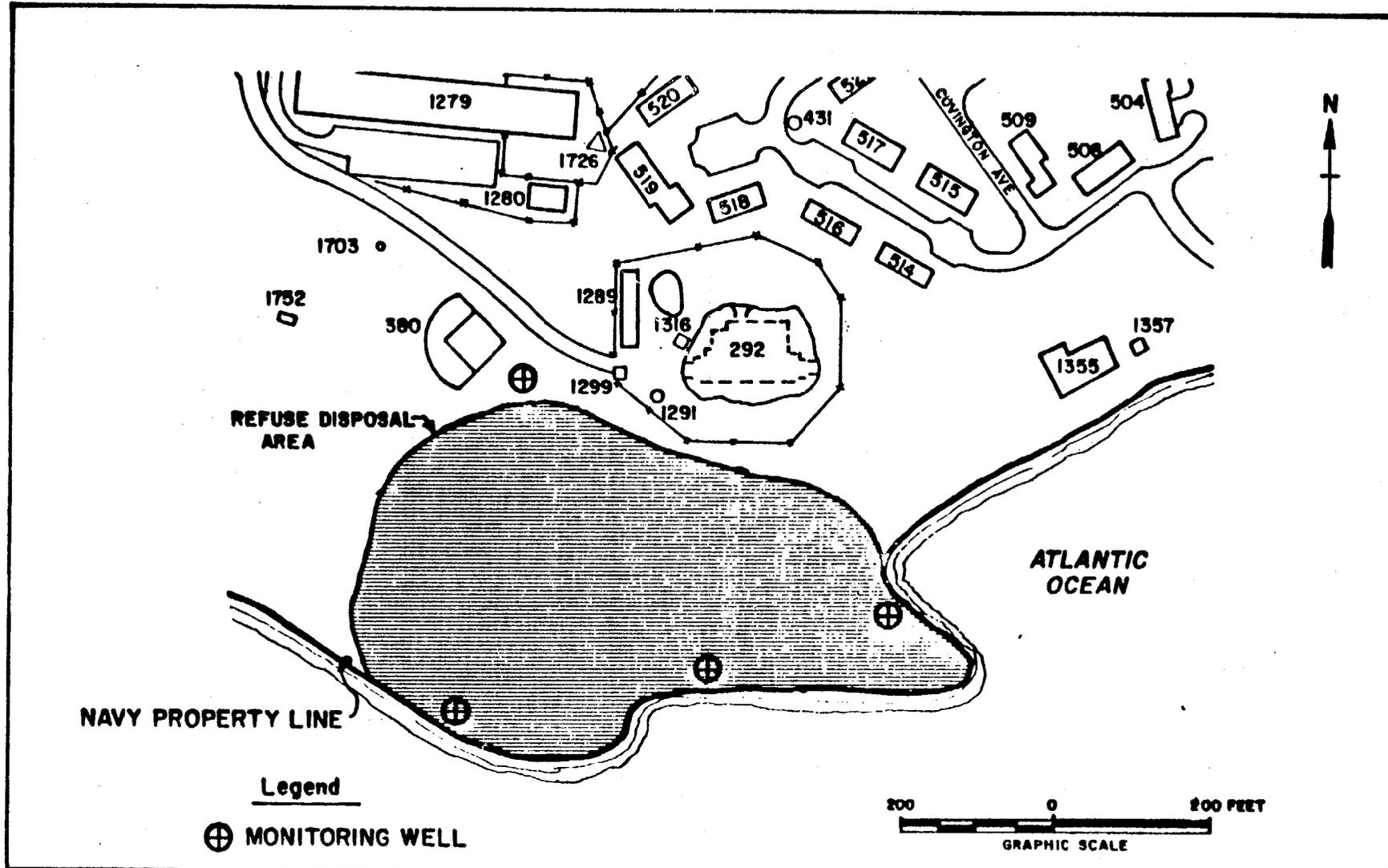
#### 3.2.2 Site 2, Transformer Oil Disposal Area.

Type of Sample:	Soil
Frequency of Sampling:	One time only
Number of Samples:	18

Table 3-1

Summary of Confirmation Study Recommendations - NAS Key West  
Study Number 71

Site No.	Site Name	CSRS Score	No. of Wells	No. and Type of Samples	Frequency	Testing Parameters
71-1	Truman Annex Disposal Area	6	4	16-ground water	Quarterly for 1 year	Cadmium, chromium, lead, zinc, trichloroethylene, 1,1,1-trichloroethane, toluene, xylene, oil and grease, pH
71-2	Transformer Oil Disposal Area	13	-	18-soil	Once	PCBs, Oil and Grease
71-3	Truman Annex DDT Mixing Area	7	-	18-soil	Once	First Round: Priority pollutant pesticide scan Second Round (if required): Other potential pesticides as listed in Table 6.3
71-4	Boca Chica Open Disposal Area	9	4	16-ground water	Quarterly for 1 year	Cadmium, chromium, lead, zinc, pH, trichloroethylene, 1,1,1-trichloroethane, toluene, xylene, methyl ethyl ketone, oil and grease
				3-tanks	Once	GC/MS Scan
71-5	Boca Chica DDT Mixing Area	6		18-soil	Once	First Round: Priority pollutant pesticide scan Second Round (if required): Other potential pesticides as listed in Table 6.4
71-8	South Fleming Key Landfill	12	6	24-ground water	Quarterly for 1 year	Cadmium, chromium, lead, zinc, pH, trichloroethylene, 1,1,1-trichloroethane, toluene, xylene, methyl ethyl ketone, oil and grease



**FIGURE 3-1**  
**Site 1**  
**Recommended Monitoring Well Locations**



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**NAVAL AIR STATION**  
**KEY WEST, FLORIDA**

Testing Parameter: Polychlorinated biphenyls (PCBs), oil and grease

Remarks: Soil sampling should be performed throughout the parking lot area on a grid pattern, similar to that shown in Figure 3-2. Soil core samples should be taken at depth intervals of six inches, one foot and three feet. For each depth interval, combine four of the individual grid samples into a composite sample to isolate six sub-areas for initial screening.

3.2.3 Site 3, Truman Annex Dichlorodiphenyl Trichloroethane (DDT) Mixing Area.

Type of Sample: Soil

Frequency of Sampling: One time only

Number of Samples: 18

Testing Parameter: First Round: Priority Pollutant Pesticide Scan  
Second Round (if required): Other potential pesticides or listed in Table 6.3

Remarks: Soil sampling should be performed throughout the vacant lot where Building 265 was located. A grid pattern similar to the one shown in Figure 3-3 should be used. Soil core samples should be taken at depth intervals of six inches, one foot and three feet. For each depth interval, composite samples into six samples for initial screening for priority pollutant pesticides prior to doing complete analysis. If priority pollutant pesticides are not present, analyze for other pesticides as listed above.

3.2.4 Site 4, Boca Chica Open Disposal Area.

Type of Sample: Ground water, tank contents

Number of Ground Water Monitoring Wells: Four

Frequency of Sampling: Ground water: Quarterly for one year  
Tanks: Once

Number of Samples: Ground water: 16  
Tanks: Three

Testing Parameter: Ground water: Cadmium, chromium, lead, zinc, trichloroethylene, toluene, xylene, 1,1,1-trichloroethylene, methyl ethyl ketone (MEK), oil and grease, pH  
Tanks: Gas chromatography/mass spectrometry (GC/MS) scan

Remarks: A total of four monitoring wells, three downgradient and one upgradient of the site, should be installed. These shallow monitoring wells should be installed in the water table and the screen should be positioned to

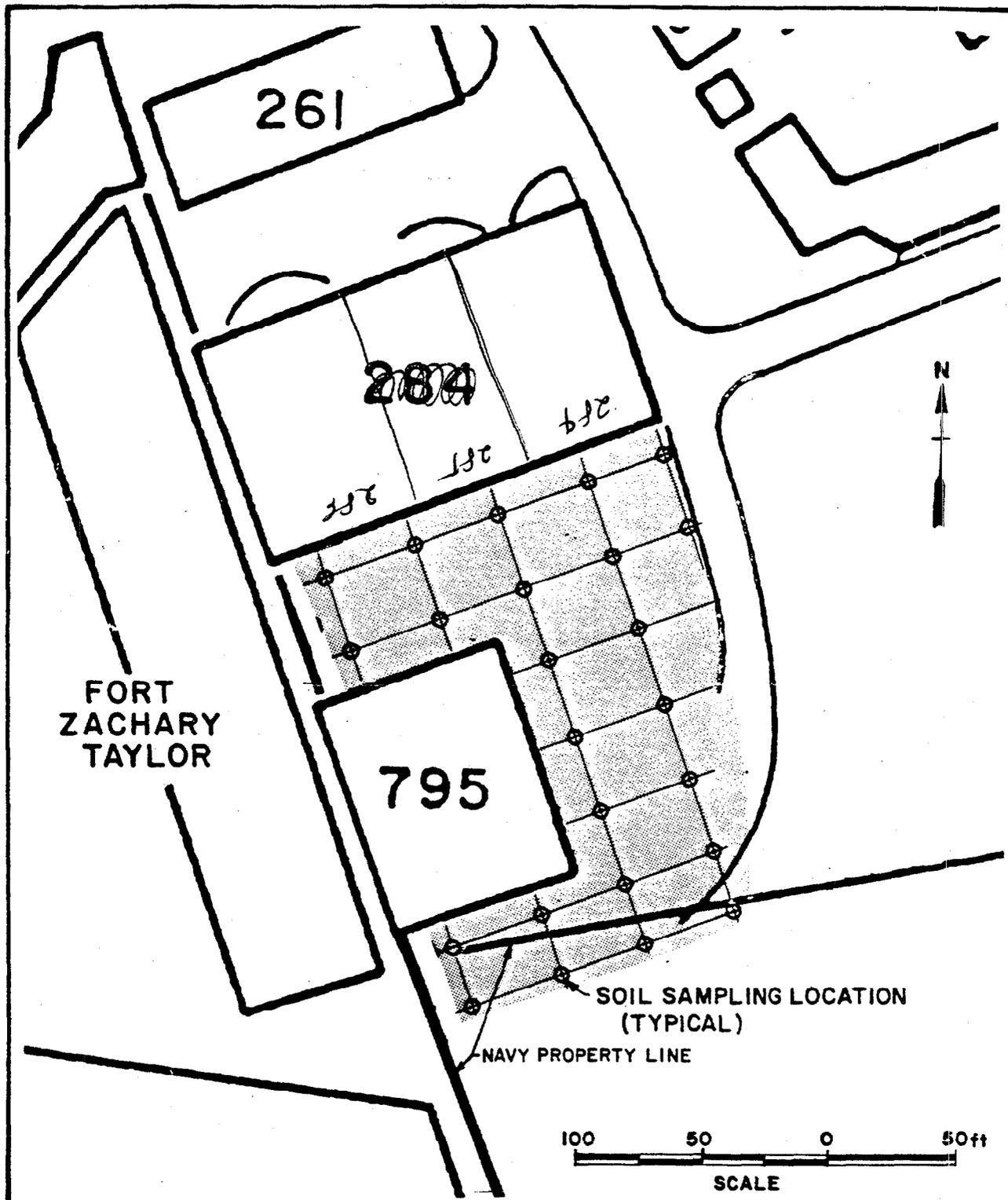


FIGURE 3-2

Site 2 Recommended  
Soil Sampling Locations



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NAVAL AIR STATION  
KEY WEST, FLORIDA

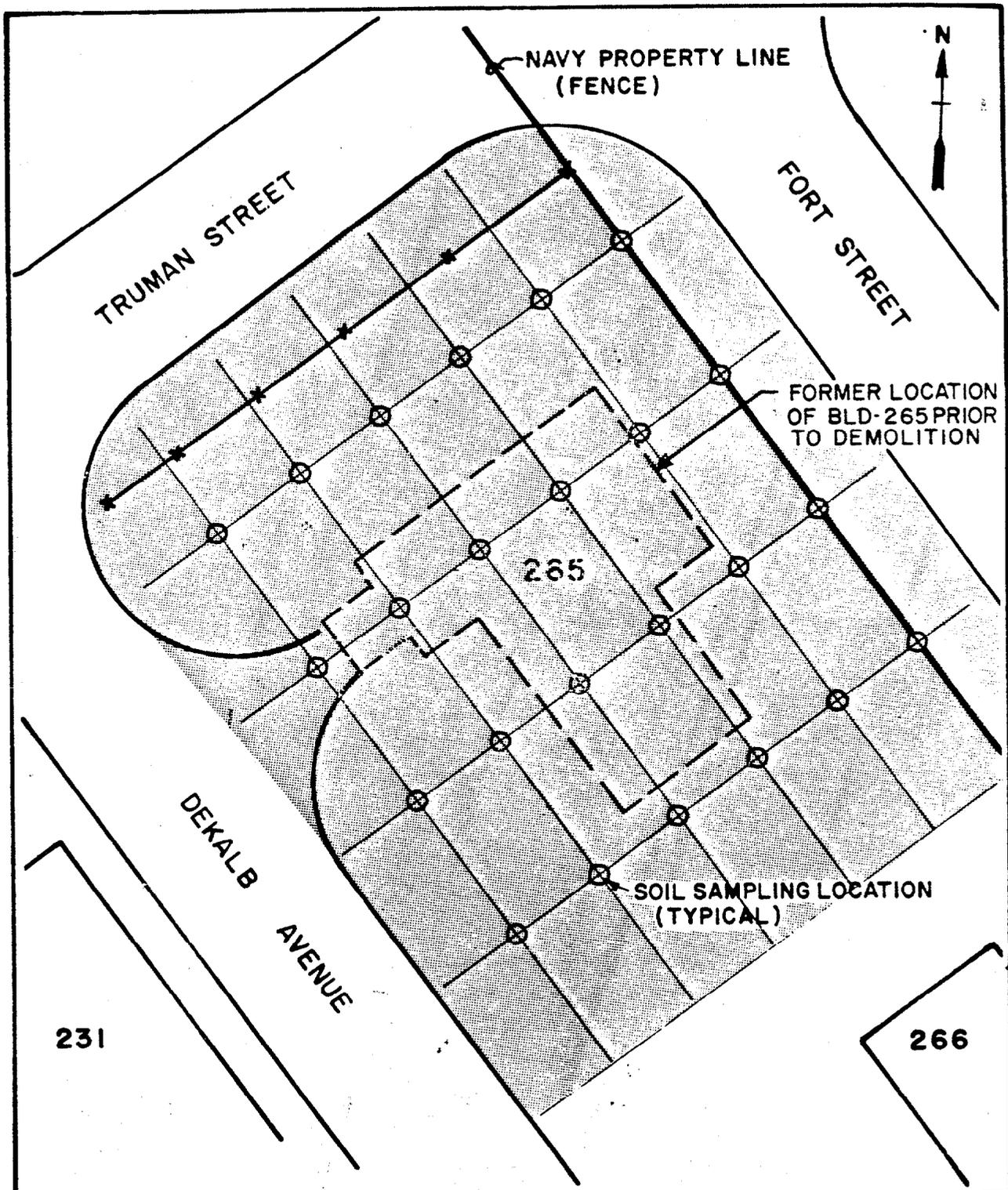


FIGURE 3-3

Site 3 Recommended  
Soil Sampling Locations



INITIAL ASSESSMENT STUDY  
NAVAL AIR STATION  
KEY WEST, FLORIDA

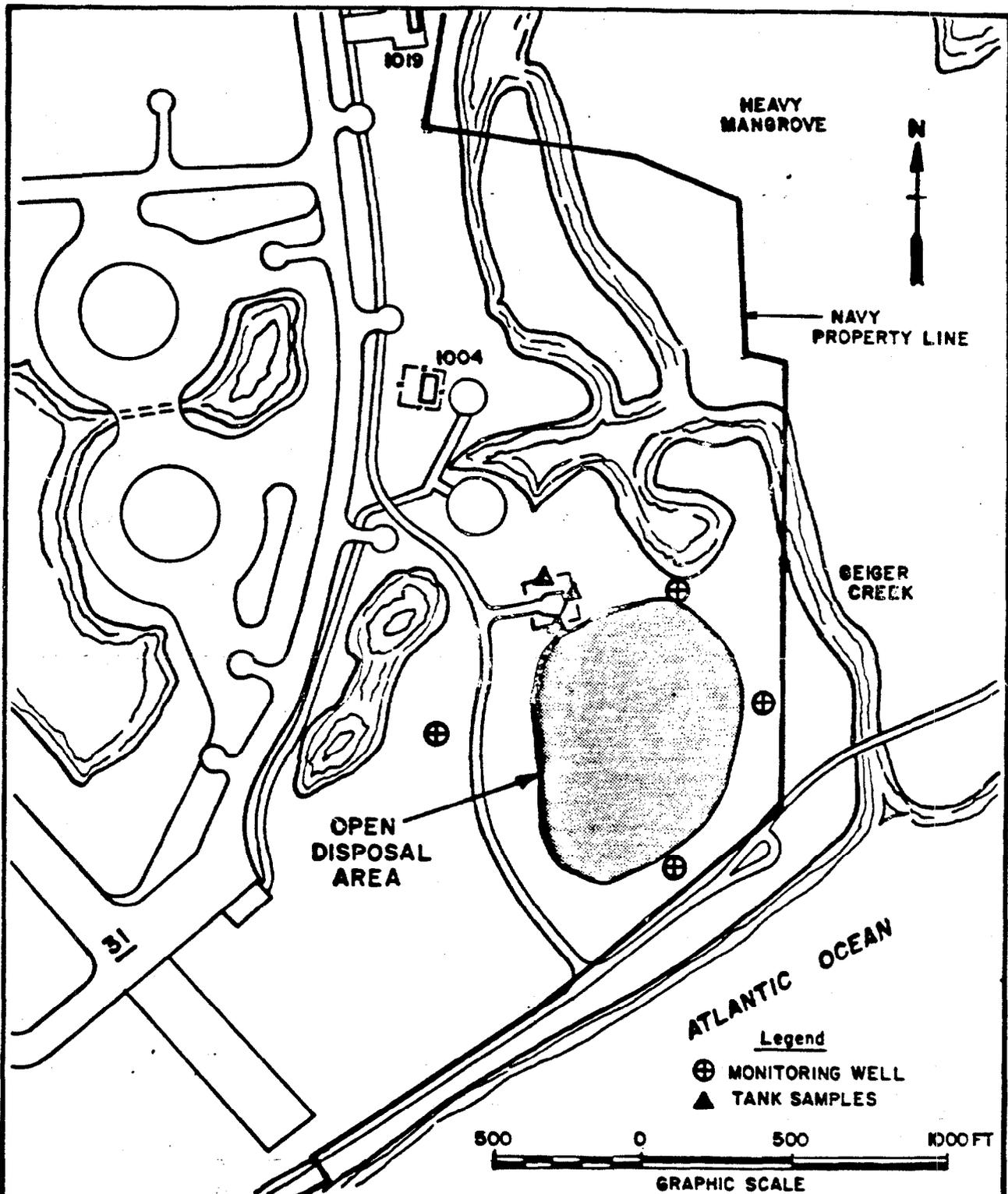


FIGURE 3-4

**Site 4**  
**Recommended Monitoring**  
**Well and Tank Sample**  
**Locations**



INITIAL ASSESSMENT STUDY  
 NAVAL AIR STATION  
 KEY WEST, FLORIDA

allow capture of possible floating contaminants. Recommended locations are shown in Figure 3-4.

In addition, take one sample from each of the three tanks on the site. Analyze using GC/MS scan to identify sample. It is recommended that these tanks be dismantled, removed and properly disposed.

### 3.2.5 Site 5, Boca Chica DDT Mixing Area.

Type of Sample:	Soil
Frequency of Sampling:	One time only
Number of Samples:	18
Testing Parameter:	First Round: Priority Pollutant Pesticide Scan Second Round (if required): Other potential pesticides are listed in Table 6.4.

Remarks: Soil sampling should be performed throughout the area where Building 915 was located. A grid pattern similar to the one shown in Figure 3-5 should be used. Soil core samples should be taken at depth intervals of six inches, one foot and three feet. For each depth interval, composite samples into six samples for initial screening for priority pollutant pesticides prior to doing complete analysis. If the priority pollutant pesticides are not present, analyze for other pesticides used at Boca Chica as listed above.

### 3.2.6 Site 8, South Fleming Key Landfill.

Type of Sample:	Ground water
Number of Ground Water Monitoring Wells:	Six
Frequency of Sampling:	Quarterly for one year
Number of Samples:	24
Testing Parameter:	Cadmium, chromium, lead, zinc, toluene, trichloroethylene, 1,1,1-trichloroethane, xylene, MEK, pH, oil and grease

Remarks: A total of six monitoring wells, five downgradient and one upgradient of the site should be installed. These shallow monitoring wells should be installed in the water table and the screen should be positioned to allow capture of possible floating contaminants. Recommended locations are shown in Figure 3-6.

3.3 OTHER RECOMMENDATIONS. All eight of the sites identified in this study should be documented and it is recommended that activity maps and NAS Key West master plan be annotated with the locations of the sites. Additional precautions should be taken to prevent accidental contamination exposure at the sites once the results from the Confirmation Study area available.

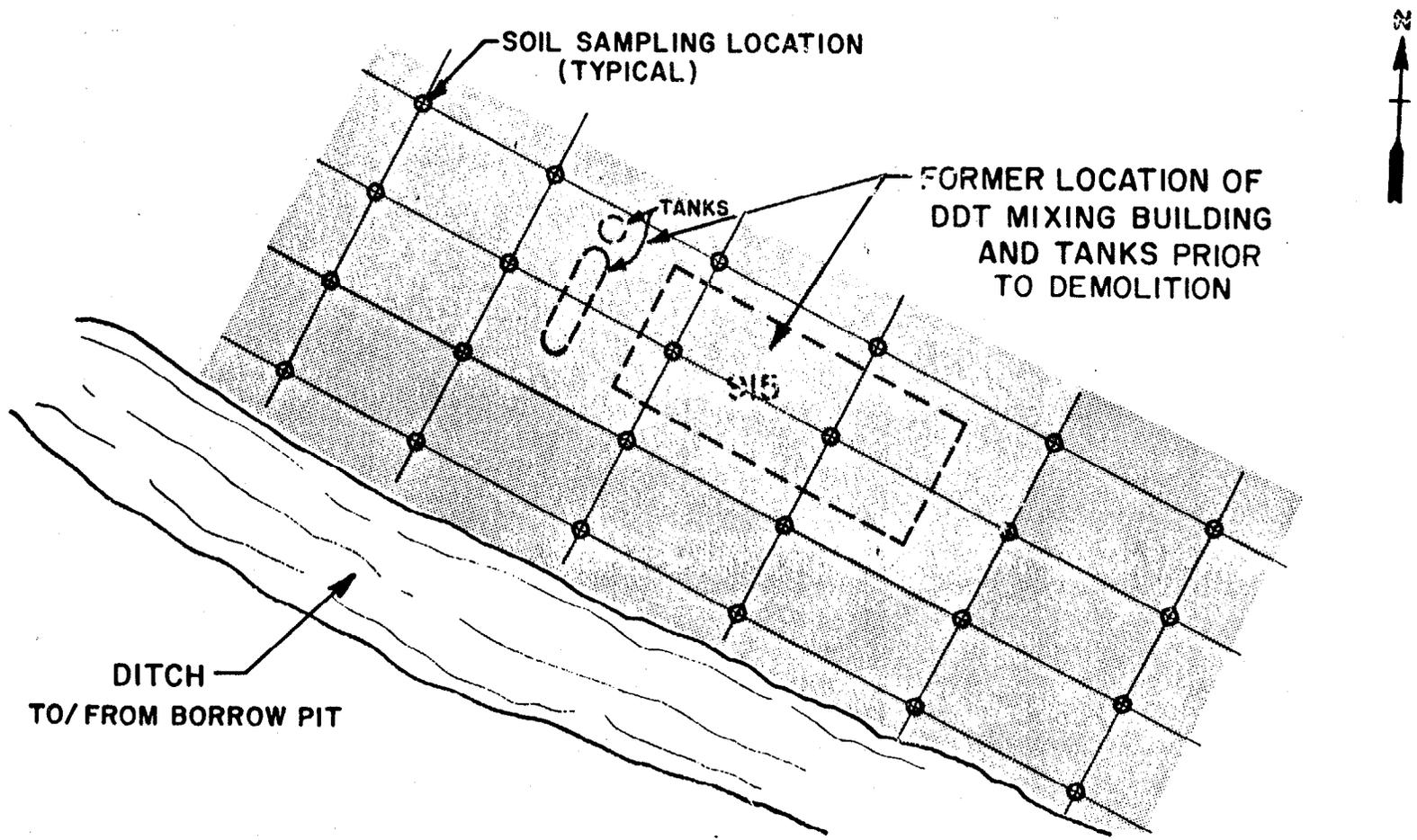
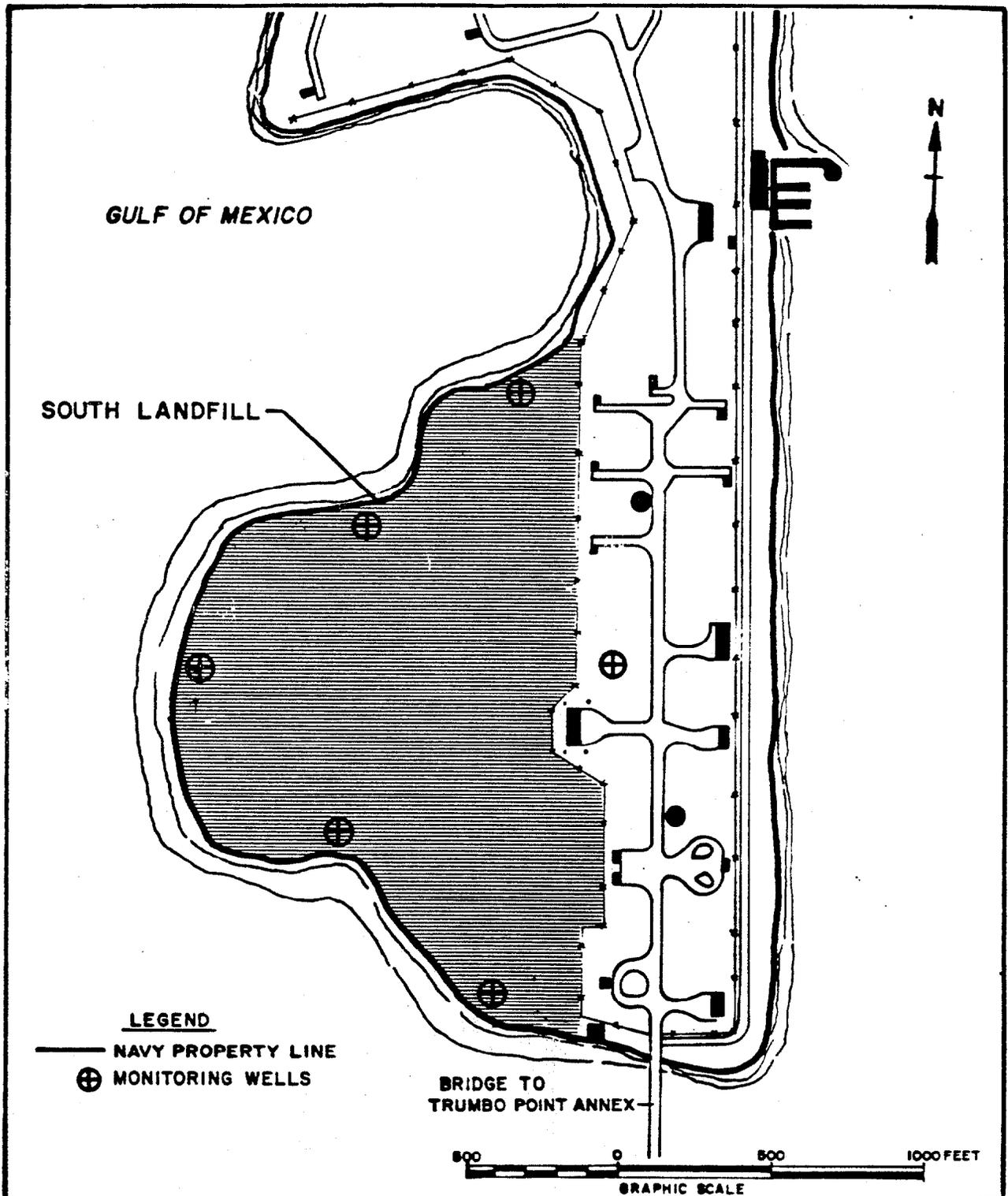


FIGURE 3-5  
**Site 5 Recommended  
Soil Sampling Locations**



**INITIAL ASSESSMENT STUDY  
NAVAL AIR STATION  
KEY WEST, FLORIDA**



**FIGURE 3-6**  
**Site 8 Recommended**  
**Monitoring Well Locations**



**INITIAL ASSESSMENT STUDY**  
**NAVAL AIR STATION**  
**KEY WEST, FLORIDA**

3.3.1 Site 6, Dredgers Key Refuse Disposal Area. No Confirmation Study is recommended.

3.3.2 Site 7, North Fleming Key Landfill. No Confirmation Study is recommended.

## CHAPTER 4. BACKGROUND

4.1 GENERAL. Naval Air Station (NAS) Key West is located in Monroe County approximately 150 miles southwest of Miami and 90 miles north of Havana, Cuba. Key West's location is of significance in that it is the closest point in the United States to Cuba, Central and South America, and the Caribbean Sea. A general vicinity map is shown in Figure 4-1.

The Naval Complex at Key West is spread throughout numerous areas of the lower Florida Keys and encompasses approximately 5,000 acres. Most of these areas are concentrated around Key West and Boca Chica Key, as depicted in Figures 4-2 and 4-3. NAS Key West, which is the host activity, is located on Boca Chica Key and encompasses 3,250 acres. The remainder of the real estate owned by the Navy is summarized below (SOUTHNAVFACENCOM, 1981a):

- Trumbo Point Annex (138.79 acres)
- Truman Annex (121 acres)
- Fleming Key (256.67 acres)
- Sigsbee Park (351.5 acres)
- Naval Regional Medical Clinic (15.23 acres)
- Poinciana Housing (35.4 acres)
- Peary Court (28.65 acres)
- Commissary Store (1.82 acres)
- White Street Trailer Park (1.9 acres)
- Fuel Island (58.2 acres)
- Demolition Island (24 acres)
- Saddlebunch Key (614.96 acres)
- Geiger Key (38.05 acres)
- International Airport Missile Site (87.2 acres)

4.1.1 Tenant/Host Relationships. NAS Key West's mission is "to maintain and operate facilities and provide services and material to support operations of aviation activities and units of the operating forces of the Navy and other activities and units as designated by the Chief of Naval Operations (CNO)." The complete list of other activities and units at NAS Key West is as follows:

- Caribbean Contingency Joint Task Force (CCJTF)
- Tactical Electronic Warfare Squadron 33 (VAQ-33)
- Attack Squadron 45 (VA-45)
- Hydrofoil Guided Missile Patrol Ships/Mobile Logistic Support Group (PHM/MLSG)
- Naval Aviation Maintenance Training Detachment (VAQ-33)
- Naval Research Laboratory (NRL)
- Resident Office in Charge of Construction (ROICC)
- Naval Air Development Center Detachment (NAVAIRDEVCEN)
- Explosive Ordnance Disposal Detachment (EOD)
- Naval Weather Service Environmental Detachment (NWSER)
- Fleet Aviation Specialized Operation Training Group Atlantic Detachment Key West (FASOTRAGRULANT)
- Naval Investigative Service Resident Agency (NIS)
- Naval Aviation Engineering Services Unit (NAESU)
- Fleet Audio Visual Detachment Key West (FLACTR)
- Naval Intelligence Processing System Training Facility (NIPSTRAFAC)
- Naval Communications Unit (NAVCOMMU)

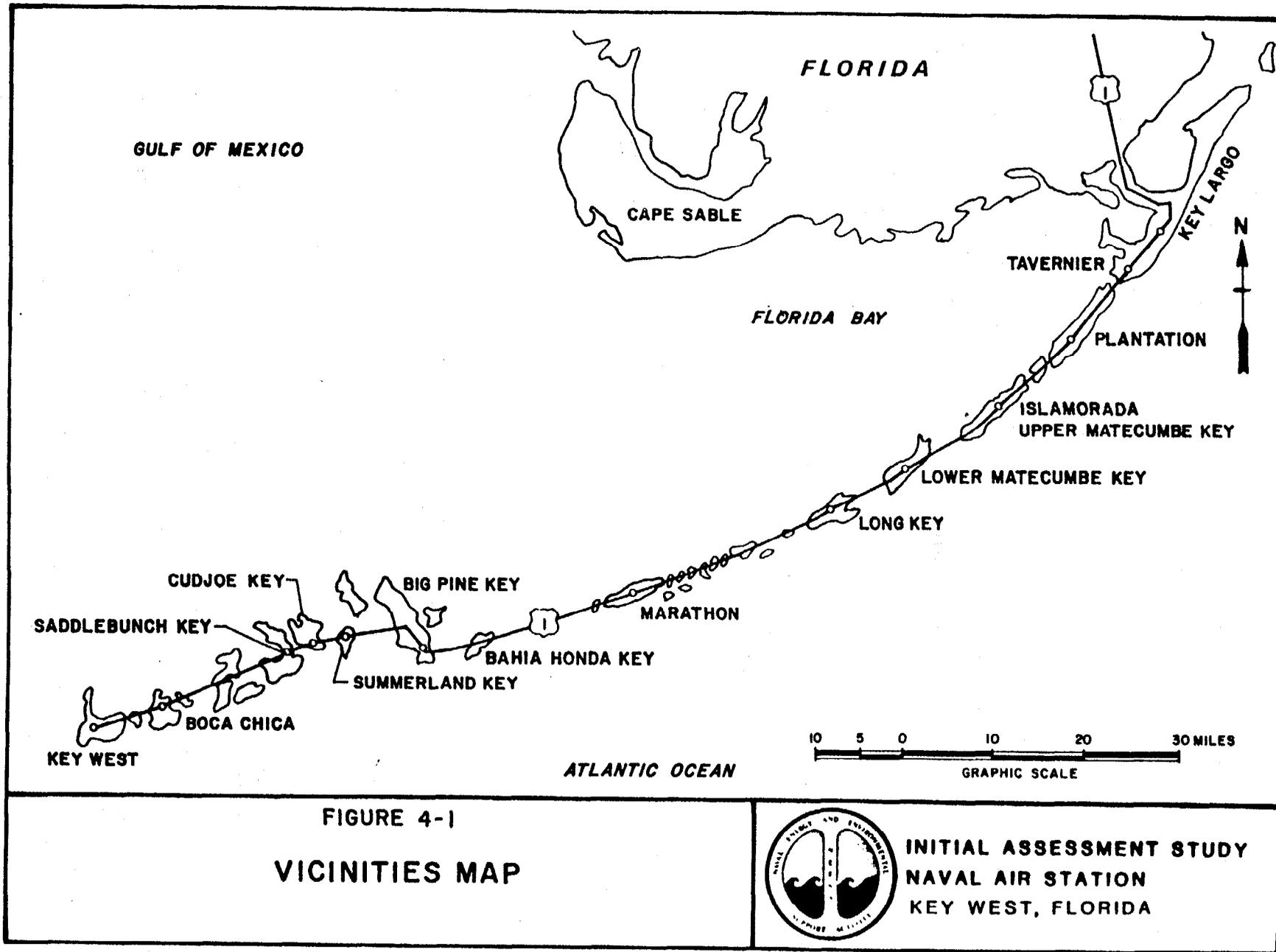


FIGURE 4-1  
VICINITIES MAP



INITIAL ASSESSMENT STUDY  
NAVAL AIR STATION  
KEY WEST, FLORIDA

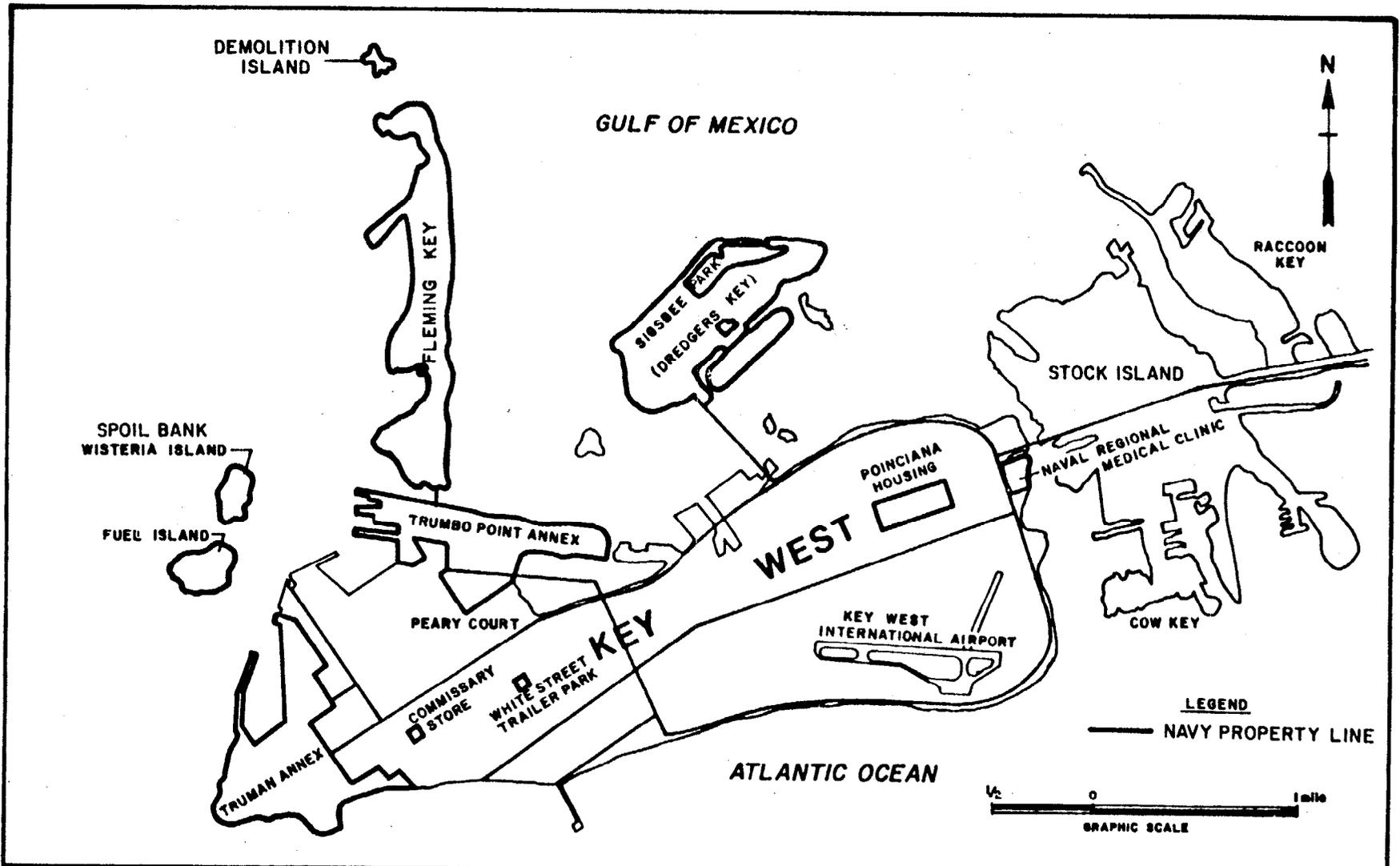


FIGURE 4-2

# KEY WEST INSTALLATION MAP



**INITIAL ASSESSMENT STUDY  
NAVAL AIR STATION  
KEY WEST, FLORIDA**

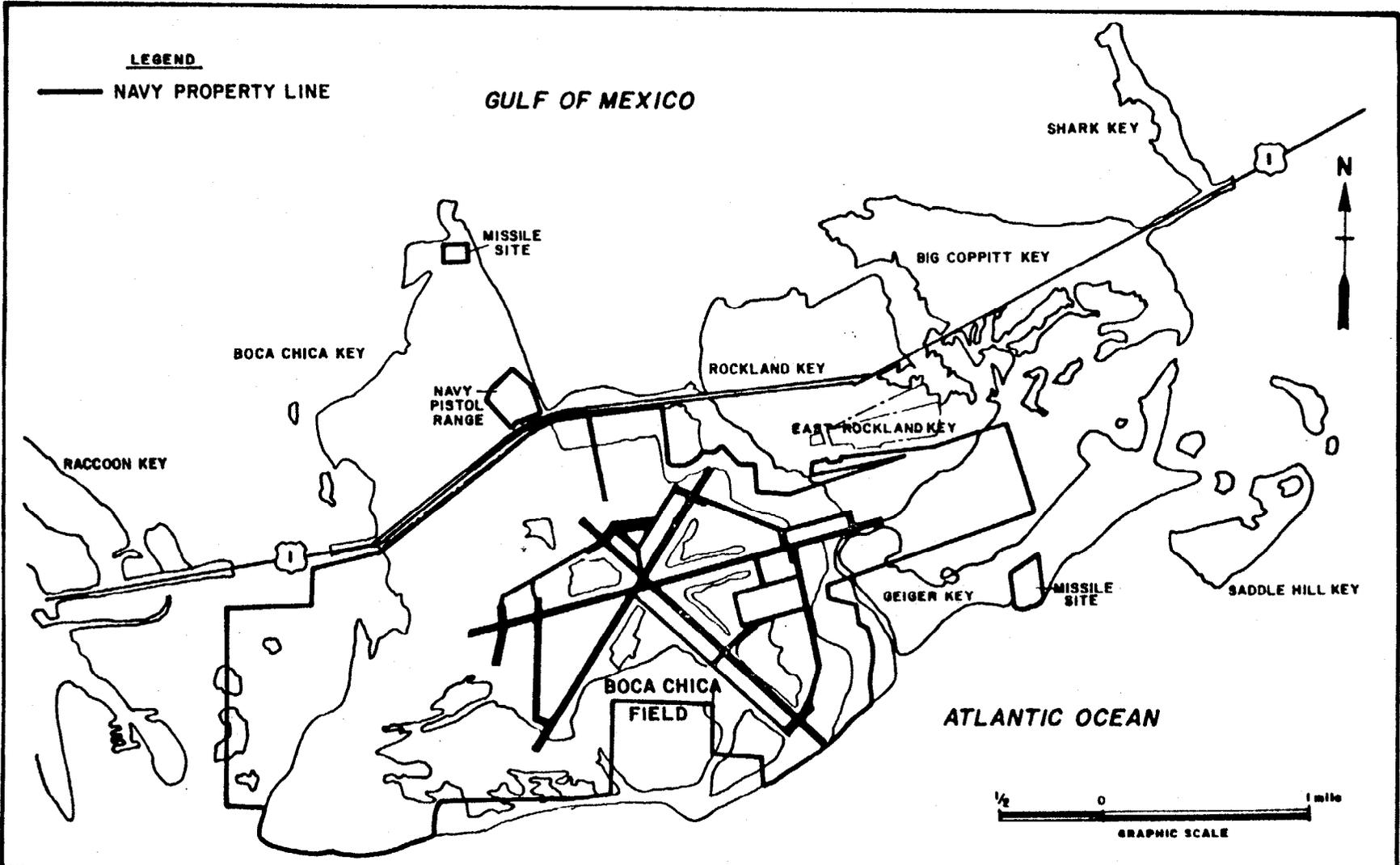


FIGURE 4-3

**BOCA CHICA INSTALLATION MAP**



**INITIAL ASSESSMENT STUDY  
 NAVAL AIR STATION  
 KEY WEST, FLORIDA**

Naval Legal Service Branch Office (NLSBO)  
Navy Branch Commissary Store (NAVBRCOMSTO)  
Naval Regional Medical Clinic (NAVREGMEDCLINIC)  
Naval Regional Dental Clinic (NAVREGDENCLINIC)  
Navy Exchange (BREXCH Store)

In addition to the Naval activities and units, there are also other Department of Defense and federal activities/agencies located at NAS Key West.

Joint Air Reconnaissance Control Center (JARCC)  
U. S. Air Force (671st Radar Squadron, 6947th Security Squadron,  
Detachment One Space and Missile Test Center)  
U. S. Army Special Forces Division  
Federal Aviation Authority (FAA)  
Foreign Broadcast Information Service (FBIS)  
Defense Property Disposal Office (DPDO)  
Defense Investigative Service  
U. S. Coast Guard  
Department of Agriculture, Quarantine Station

4.1.2 Leases and Agreements. The 28.65-acre tract of land referred to as Peary Court is licensed to the City of Key West for recreational use. This facility is located adjacent to and south of Trumbo Point Annex (Figure 4-2).

The City of Key West leases 41 acres of land at Truman Annex, and 58.2 acres of land on Fuel Island under a protection and maintenance agreement with the Navy. Included within the Fuel Island area are two 40,000 barrel fuel storage tanks. These properties have been reported as excess by the Navy. The City of Key West is currently negotiating for the purchase of both areas.

4.1.3 Adjacent Land Use. NAS Key West consists of numerous areas in the lower Florida Keys, comprising a total area of approximately 5,000 acres (Figures 4-1 and 4-2). Major land areas adjacent to the Navy lands include Stock Island and Raccoon Key, which are located between Key West and Boca Chica Key, and the non-military areas of Key West.

Facilities located on Stock Island include two marinas, a municipal golf course, the City's solid waste landfill and electric power plant, a reverse osmosis water desalinization plant, a boat building facility, Florida Keys Memorial Hospital, Florida Keys Community College and residential areas consisting primarily of mobile homes. Raccoon Key is approximately 70 percent developed and is primarily a residential area.

The City of Key West's solid waste landfill on Stock Island has been in operation since the 1920s. It is unlined and the Florida Department of Environmental Regulation has required that test wells be installed around the landfill.

The primary land use in Key West is residential, representing approximately 63 percent of the developed acreage. This residential acreage is composed of approximately 70 percent single family units, 17 percent mobile homes and 13 percent multifamily units. Military facilities and other federal lands compose approximately 20 percent of the total area of Key West, while commercial and industrial facilities account for 10 percent of the developed acreage. The remaining area of Key West consists of recreational facilities, the Key West International Airport and public buildings (SOUTHNAVFACENGCOM, 1981a).

In the 1930s, an area along the southern shore of Key West just east of White Street Pier was used by the City of Key West as a dump. Today, condominiums occupy the site.

4.2 HISTORY. The Florida Keys were believed to have been inhabited as early as 500 BC. At the time of the Spanish discovery in the early 1500s, the Keys were occupied by the Calusas, Teguestas, Matecumbeses and lower Key Indians. By 1763, the Indians had disappeared from the Keys.

While under Spanish control, a small settlement was inhabited on Key West by pirates and fishermen. In 1763, the area came under English control for a short period of time. In 1783, Florida once again became a Spanish possession. The first recorded permanent settlement south of St. Augustine was established at Key West in 1822. The early inhabitants of Key West were transients and ship wreck survivors. Latter inhabitants were immigrants from England, Spain, the Carolinas, the Bahamas and Cuba.

In 1822, Florida became a territory of the United States. A Naval expeditionary force was sent to the Florida Keys to drive pirates from the area. This force established the first U. S. Naval Base on Key West in 1823. The Navy has been linked to the Key West area since this date. The U. S. Naval Station was expanded with construction for Fort Taylor during the Mexican War of 1846 to 1848. Construction of the first permanent Naval buildings on Key West was begun in the 1850s and was a buttressed, brick storehouse and depot for Naval supplies. This building remained unfinished until the Civil War years. When finished, it was known as "Number 1 Building."

Throughout its history, Key West has played a vital role in U. S. Naval activities. During the Civil War from 1861 to 1865, the Naval Station played a strategic role in the blockade of the Confederacy shipping lanes. The Key West Citizens were Confederate Sympathizers, but the City was held by federal forces throughout the war. Key West was used as a base to block Gulf Coast and East Florida shipping lanes. Nearly 300 Confederate blockade runners were captured by U. S. Naval Station forces during the war. While the Civil War was in progress, there were more vessels stationed in the port of Key West than any other port in the United States.

Following the Civil War, the Naval Station lay dormant until the Spanish American War of 1898. During the Spanish-American War, Key West was geographically the nation's most important Naval Base. During one stage of the conflict, the entire Atlantic Fleet was based at Key West. The battleship Maine made its ill-fated voyage to Havanna Harbor from Key West in January 1898. It was the sinking of the Maine on 15 February 1898 which started the Spanish-American War. Many of the Maine's dead were brought to Key West and buried in the Key West cemetery.

After the Spanish-American War, the Naval Station once again became dormant, except for the construction of the Naval radio station towers in 1907, and remained that way until the outbreak of World War I. World War I led to increased activity and expansion on the Key West Naval Station, and establishment of the Seventh Naval District Headquarters at the Naval Station. During the War, the Naval Station was involved in supporting and maintaining forces afloat, accomplishing minor repairs and keeping German submarines out of the Gulf and away from Mexican oil. Numerous buildings and ships were constructed and renovated to enable the Naval Station to support the destroyers, submarines, converted yachts and other vessels based here during the

War. In 1916, a marine railway having a capacity of 700 tons was completed. The railway was used to perform sandblasting and painting along with other dry dock repair operations. In 1917, pile drivers started work on the first of nine "finger" piers at what was later called Truman Annex. The piers were completed in 1920.

Naval Air Base Key West was commissioned on 18 December 1917. It was located on land leased from the Florida East Coast Railroad Company at Trumbo Point. Construction of the base involved a considerable dredging project and the erection of station buildings, three seaplane ramps, a dirigible hangar, a hydrogen generating plant, and assorted temporary barracks. By the beginning of 1918, a seaplane training center and blimp facility were established. The Airbase was used primarily for anti-submarine patrol operations and flight training center. Planes using this facility during the war included small-type twin cockpit training planes, with about 20 to 30 planes operating from the base at one time. During the War, more than 500 aviators were trained at the Station. At the end of World War I, use of the Naval Air Station was discontinued. The Air Station was decommissioned, its personnel released, and most of the buildings destroyed or dismantled.

The Naval Base also became dormant following World War I. On 30 June 1932, the Naval Station was reduced to a bare maintenance status and the headquarters of the Seventh Naval District moved to Charleston, SC to be combined with the Sixth Naval District.

From 1932 to 1939, the Naval Radio Station was the only activity still operating on the Naval Station. Maintenance and upkeep on the Naval Station was done by WPA Workers throughout these years.

With the outbreak of World War II, a state of National Emergency was declared. This led to the reopening of the Naval Station on 1 November 1939. The Naval Station expanded tremendously during the war years of 1941 to 1945. The Naval Station's primary function was the support of other Naval activities in the Key West area and the repair and overhaul of numerous escort vessels that convoyed merchant shipping in the Caribbean area. The seaplane base was formally re-established as a NAS on 15 December 1940, and served as an operating and training base for fleet aircraft squadrons.

Shortly after the outbreak of World War II, the Army leased Boca Chica Field, which is approximately eight miles to the northeast of Key West, from Monroe County. Boca Chica was originally a small civilian airport with three short runways. On 9 December 1942, the Navy assumed jurisdiction of Boca Chica Field. In February 1943, the field was established as a Naval Auxiliary Air Facility. On 8 February 1945, the Naval Auxiliary Air Station, Boca Chica was designated a full-fledged Naval Air Station. The following month it was disestablished and the Naval Air Facilities at Key West and Boca Chica were combined into one activity under the designation of U. S. Naval Air Station, Key West.

In 1942, a pipeline was constructed by the Navy to bring water from mainland Florida. This pipeline is still the main source of water for the Keys. The Navy has turned over jurisdiction of the pipeline to the Florida Keys Aqueduct Authority (FKAA).

At the conclusion of World War II, the Naval complex at Key West did not undergo a severe cutback as did many other installations. Anti-submarine

warfare training and testing operations continued. Rapid access to the open sea lanes for surface ships and submarines, and ideal flying conditions made Key West an ideal around-the-clock, around-the-year training and experimental area.

During the Cuban missile crisis of 1962, the Naval complex at Key West, being only 90 miles from Cuba, played a pivotal role. Reconnaissance and operational flights were conducted from Key West in support of the blockade around Cuba. The defense of the United States and the control of reconnaissance flights was administered by a joint military command situated at Key West.

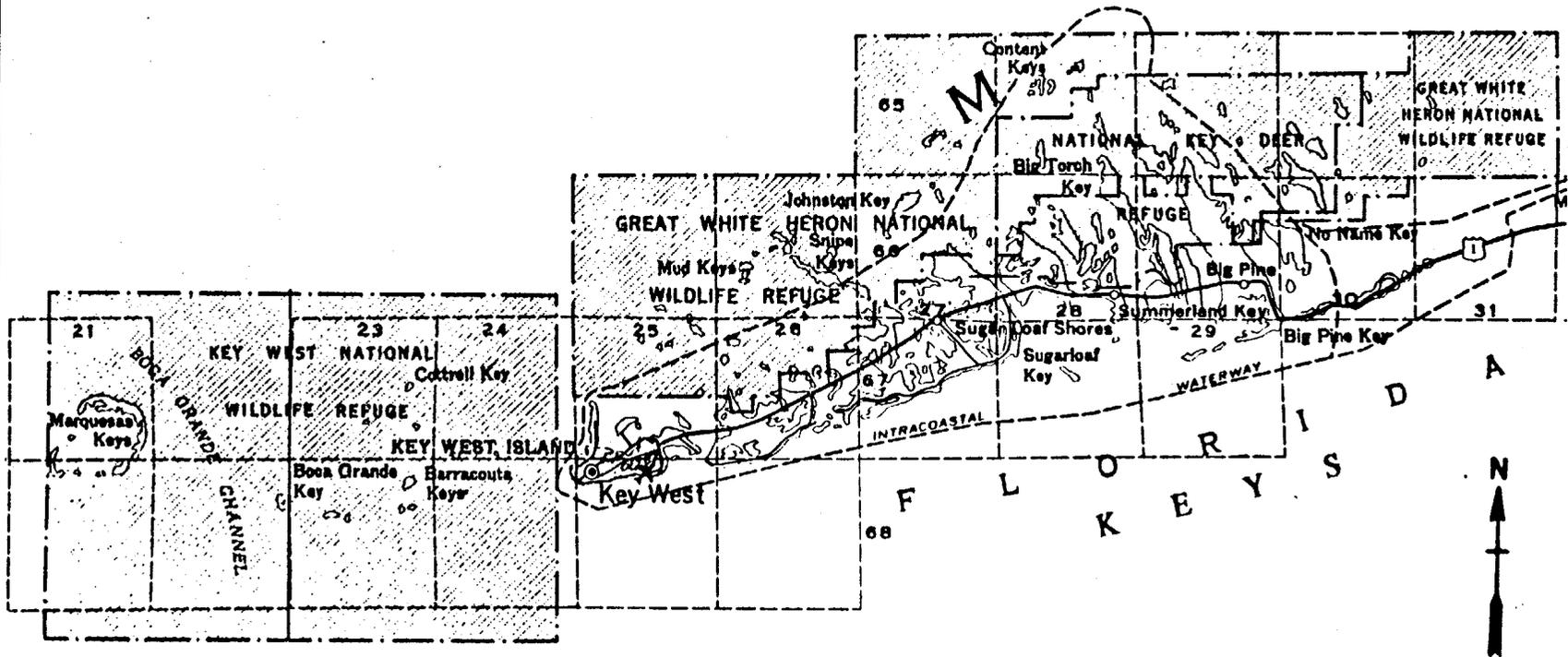
The Naval Station at Key West was disestablished in 1974 resulting in the relocation of the Fleet Sonar School, Undersea Divers School, and the Navy Submarine Units. This resulted in the relocation of some 16 submarines, 8 destroyers, and various other units. The lack of a clear mission at NAS Key West during 1978 and 1979 resulted in the transfer or decommissioning of additional commands and the disestablishment of some activities. The reconnaissance wing and squadrons RVAH-3 and RVAH-12 were decommissioned, VF-101 Fighter Squadron was transferred as was the Army Hawk Battalion, and the Naval Hospital downgraded to a Regional Medical Clinic. In January 1980, the Tactical Electronic Warfare Squadron 33 was relocated to Key West from Norfolk and in April of the same year, Attack Squadron 45 arrived at Boca Chica. Operations at Trumbo were increased with the arrival of the patrol hydrofoil missile ships of PHMRON II.

4.3 LEGAL ACTIONS. There have been no legal actions concerning contamination incidents at NAS Key West.

4.4 BIOLOGICAL FEATURES. The Key West Naval complex covers some 5,000 acres of land surface (SOUTHNAVFACENCOM, 1981a). Sigsbee Park, Poinciana Housing, Peary Court, Trumbo Point Annex, Truman Annex, the commissary, White Street trailer park site, and the Naval Regional Medical Clinic comprise 694 acres of completely developed land. These areas are considered suburban habitat.

Saddlebunch Key, Geiger Key, Boca Chica Key, Demolition Island, Fleming Key, Spoil Bank and Fuel Island total 4,240 acres. All of these areas are very low in elevation and close to saltwater. They have some facilities but for the most part are simply cleared land. No tropical hammock-type habitat was found. Around the periphery of these islands there are many acres of mangrove swamp and salt marsh at intertidal areas, grading into marine grass flats in subtidal areas. Most of the land that has been cleared consists of mowed open grassy fields; Boca Chica runway areas and the Fleming Key Ordnance Magazine areas are primary examples. Those areas, such as the Fleming Key landfill, that have been left fallow have come back with an Australian Pine (*Casuarina* spp.) monoculture or a thick cover of other early successional. It is unlikely that native vegetation will ever re-establish in these areas without human encouragement.

In the immediate area of the NAS Key West are the Great White Heron Wildlife Refuge and the Key West National Wildlife Refuge (Figure 4-4). The surface waters within these areas are classified by the Florida Department of Environmental Regulation as Outstanding Florida Waters and are afforded the highest protection by the State. These waters are considered to have exceptional recreational and ecological significance, providing nursery areas for the great white heron (*Ardea herodias occidentalis*) and a number of fish and invertebrate species.



SOURCE: U.S. Department of Interior, Geologic Survey  
USGS, State of Florida Map, 1967

**FIGURE 4-4**  
**Wildlife Refuge Areas**



**INITIAL ASSESSMENT STUDY**  
**NAVAL AIR STATION**  
**KEY WEST, FLORIDA**

#### 4.4.1 Habitats, Flora and Fauna.

4.4.1.1 Mangrove Swamp and Salt Marsh Habitats. These habitats are represented on much of Boca Chica and parts of Saddlebunch. Black mangrove (Avicennia germinans), saltwort (Batis maritima), grasswort (Salicornia virginica) and other halophytes grow in the upper least tidal parts of these areas. Moving toward the saltwater, very small to medium size red mangroves (Rhizophora mangle) grow. The mangrove roots are nearly always in water. Sea grass and marine algae grow in the open spaces between the trees.

4.4.1.2 Grass Flat Habitats. The NAS is on several small islands and has many miles of shoreline. Most of this shoreline borders on grass flats. These areas are typically very shallow and principally covered by species of vascular marine plants including turtle grass (Thalassia testudinum), shoal weed (Halodule beaudettei) and manatee-grass (Cymodocea filiformis). Growing on and among these plants are many species of marine algae.

The shallow clear water over these flats is biologically among the worlds most productive. The grass flats support a rich variety of invertebrate life. The grass and its associated invertebrates in turn support a variety of commercial, game and shell fish.

#### 4.4.2 Threatened, Rare and Endangered Species.

4.4.2.1 Fauna. There are 37 species of animals in Florida that are on the U. S. Fish and Wildlife Service (USFWS) list of endangered and threatened species. There are an additional 31 species that are listed as endangered or threatened by the Florida Game and Freshwaters Fish Commission (FGFWFC). Of these 68 animal species, 11 have ranges that potentially overlap NAS Key West. These will be discussed below.

The Key silverside (Menidia conchorum) was found from Big Pine Key to Key West (Gilbert, 1978). It normally lives in shallow, open bays, but it may enter completely fresh water. It feeds on planktonic animal life, such as copepods. The Key silverside is listed as endangered by the FGFWFC.

The American crocodile (Crocodylus acutus) occurs primarily in coastal swamp and rivers in extreme southern Florida, and is widely distributed elsewhere in the American tropics. Known populations occur in the vicinity of Big Pine Key and in numerous locations in the upper Keys (McDiarmid, 1978), but apparently not in the vicinity of the Naval complex. This species is listed as endangered by both USFWS and FGFWFC.

The leatherback turtle (Dermochelys coriacea), the Atlantic green turtle (Chelonia mydas mydas), the Atlantic hawksbill (Eretmochelys imbricata imbricata), and the Atlantic Ridley turtle (Lepidochelys kempii), are all listed as endangered by the USFWS and the FGFWFC. The Atlantic loggerhead turtle (Caretta caretta caretta) is listed as threatened by the USFWS and the FGFWFC. All of these turtles may be found in the waters of the Keys but none of them are likely to nest in the Keys or NAS Key West due to the general lack of beaches.

The Key mud turtle (Kinosternon bauri bauri) is a subspecies of the three striped mud turtle, common throughout the Florida mainland. It is primarily aquatic, but it will enter brackish water, mangrove swamps, and will even forage on land. This subspecies is found only on Pig Pine Key, Key West and Stock Island, but is most abundant on Big Pine (McDiarmid, 1978). The Key mud turtle is classified as endangered by the FGFWFC.

The eastern brown pelican (Pelecanus occidentalis carlinensis) nest primarily in mangrove trees. They breed from North Carolina through the Gulf states, Mexico and the West Indies. The brown pelican is classified as endangered by the USFWS and as threatened by the FGFWFC.

Two to four pairs of bald eagles (Haliaeetus leucocephalus) are known to nest in the lower Keys. They usually nest in tall pine trees that have no nearby obstructions. Eagles have been known to nest in mangroves as low as 20 feet off the ground. If nothing else is available, they will even nest in Australian Pine. NAS Key West has very few pine trees. There are plenty of mangroves and Australian pines, but most of these are too small to support an eagles nest. Bald eagles are classified as threatened by FGFWFC and endangered by the USFWS.

The Roseate terns (Sterna dougallii) nest in scattered coastal colonies from Nova Scotia to Virginia and in the Florida Keys, Bahamas, eastern West Indies and southern Caribbean. As of 1973, a colony of 100 to 400 have been reported to nest on spoil islands in Key West harbor such as Fuel Island, Spoil Bank or Wisteria Island. Roseate terns are listed as threatened by the FGFWFC.

The least tern (Sterna antillarum) has a wide distribution in this hemisphere. It ranges from Argentina to Maine. The least tern breeds from the Dry Tortugas to Key West to Southern Maine. It will nest on beaches or spoil seaward of vegetation and even gravel roofs, miles inland from the sea shore. Least terns are listed as threatened by FGFWFC.

Breeding populations of the white-crowned pigeon (Columba leucocephala) are found in the Keys and the extreme southern fringes of mainland Florida. They seasonally inhabit mangrove shorelines or islands and tropical forests inland of the mangroves. The white-crowned pigeon is listed as threatened by FGFWFC. USFWS currently has this species under review. This species was sighted at NAS Key West.

The West Indian manatee (Trichechus manatus latirostris) ranges along both coasts of Florida, Cuba, Puerto Rico, the Atlantic coast of Mexico down to northern Brazil. They feed on vascular aquatic plants and require a source of fresh water. Manatees are not found on NAS Key West. Manatees are listed as endangered by both the USFWS and the FGFWFC.

The Stock Island tree snail (Orthalicus reses reses) is now found only on Stock Island. It was formerly on Key West. The Stock Island tree snail is listed as threatened by the USFWS and the FGFWFC.

4.4.2.2 Flora. The USFWS lists four plants in Florida as endangered. One of these plants is found in the Florida Keys. There are 325 plants in Florida that are listed as either endangered or threatened by the Florida Department of Agriculture (FDA). Of these, only six now occur on or near NAS Key West. These plants are described below.

The golden leather fern (Acrostichum aureum) is found throughout the Florida Keys north to Marco Island. In the American tropics, it is a characteristic plant of low energy shores south to Venezuela and Belize. The golden leather fern is listed as threatened by the FDA.

The tree cactus (Cereus robinii) is now known to occur at only five areas in the Florida Keys; this species is also known to occur in Cuba. The tree cactus can be found in rocky, tropical hammocks. However, due to the destruction of tropical hardwood hammocks and collecting pressure from botany enthusiasts, this species has suffered a major decline in number. The tree cactus is listed as endangered by the FDA, and just recently, by the USFWS.

The silver thatch palm (Coccothrinax argentata) once occurred along the southeast coast of Florida and on the Florida Keys to the Marquesas Keys. The silver thatch palm also occurs on some of the Bahama Islands. It grows in rock pinelands and on coastal dunes. The silver thatch palm is listed as endangered by the FDA.

The coconut palm (Cocos nucifera) occurs throughout the world. In Florida it is threatened by a mycoplasma disease, lethal yellowing. The coconut palm is listed as threatened by the FDA.

The manchineel tree (Hippomane mancinella) has a wide distribution, ranging from Florida to Mexico, Venezuela and Columbia. In Florida, it occurs from Key West to Key Largo, and on the mainland from Cape Sable eastward. The largest remaining stands are near Flamingo. The Manchineel prefers the brackish swamps behind a fringe of mangroves. Manchineel can grow to a height of 15 meters. The specimens still found in the Keys are much smaller than this. The manchineel is considered threatened by FDA.

The Florida thatch palm (Thrinax floridana) is found in Jamaica, Cuba, Haiti, Central America and southern Florida. In the Keys, it is found from Elliot Key to Stock Island. This palm always occurs near the seashore. It grows in the shallow calcareous soils overlying the coral bedrock of the Keys. The Florida thatch palm is listed as endangered by the FDA.

The brittle thatch palm (Thrinax microcarpa) is found on Cuba, Hispaniola, Puerto Rico, the southern Bahamas, Barbados and Anguilla of the Lesser Antilles. In Florida, it is only found from Key Largo to the Marquesas. The brittle thatch palm is listed as threatened by the FDA.

#### 4.5 PHYSICAL FEATURES.

4.5.1 Climatology. The Key West area has a mild, tropical-maritime climate with average winter temperatures about 14°F lower in the winter than in the summer. The extreme recorded temperatures in Key West range from a low of 46°F to a high of 95°F.

The average annual rainfall in Key West is 40 inches with approximately 53 percent of the total yearly rainfall occurring in the wet season months of June through October. Rainfall during the wet season results from numerous showers and thunderstorms. The period December through April accounts for approximately 25 percent of the annual rainfall, with the rainfall occurring typically in a few heavy showers in advance of cold fronts, or occasionally five to eight light showers a month (National Oceanic and Atmospheric Administration, 1980).

The relative humidity in the Florida Keys is high year round and generally about 75 percent. The average evapotranspiration rate in south Florida is approximately 70 percent of the rainfall. There is no record of frost, sleet, ice or snow in Key West (Hanson, 1980).

The Key West area is periodically subject to hurricane activity. Typically, these hurricanes are formed in the warm moist air over the tropical sea areas around the Lesser Antilles. The majority of the hurricanes which reach Key West approach from the south and east. Hurricanes bring high winds, greater than 75 miles per hour, and tidal flooding to the area.

**4.5.2 Topography.** The land is typically flat and low with ground elevations ranging from 0 to 15 feet mean sea level (MSL). The average elevation in the area is four to five feet MSL (SOUTHNAVFACENCOM, 1981b). Thus, much of the area is below the 100-year flood elevation of eight feet MSL. Commonly, intertidal flats border the islands and represent areas which are covered at low tide and gradually slope into deeper water (Black, 1977).

The highest point of the runway system at Boca Chica is six feet MSL. Building floor elevations at Sigsbee Key range from approximately six to nine feet MSL.

Approximately 50 percent of the Key West area is served by storm sewer systems. Stormwater runoff, including overland and storm sewer flow, discharges to nearby tidal waters (General Service Administration, 1979).

#### **4.5.3 Geology.**

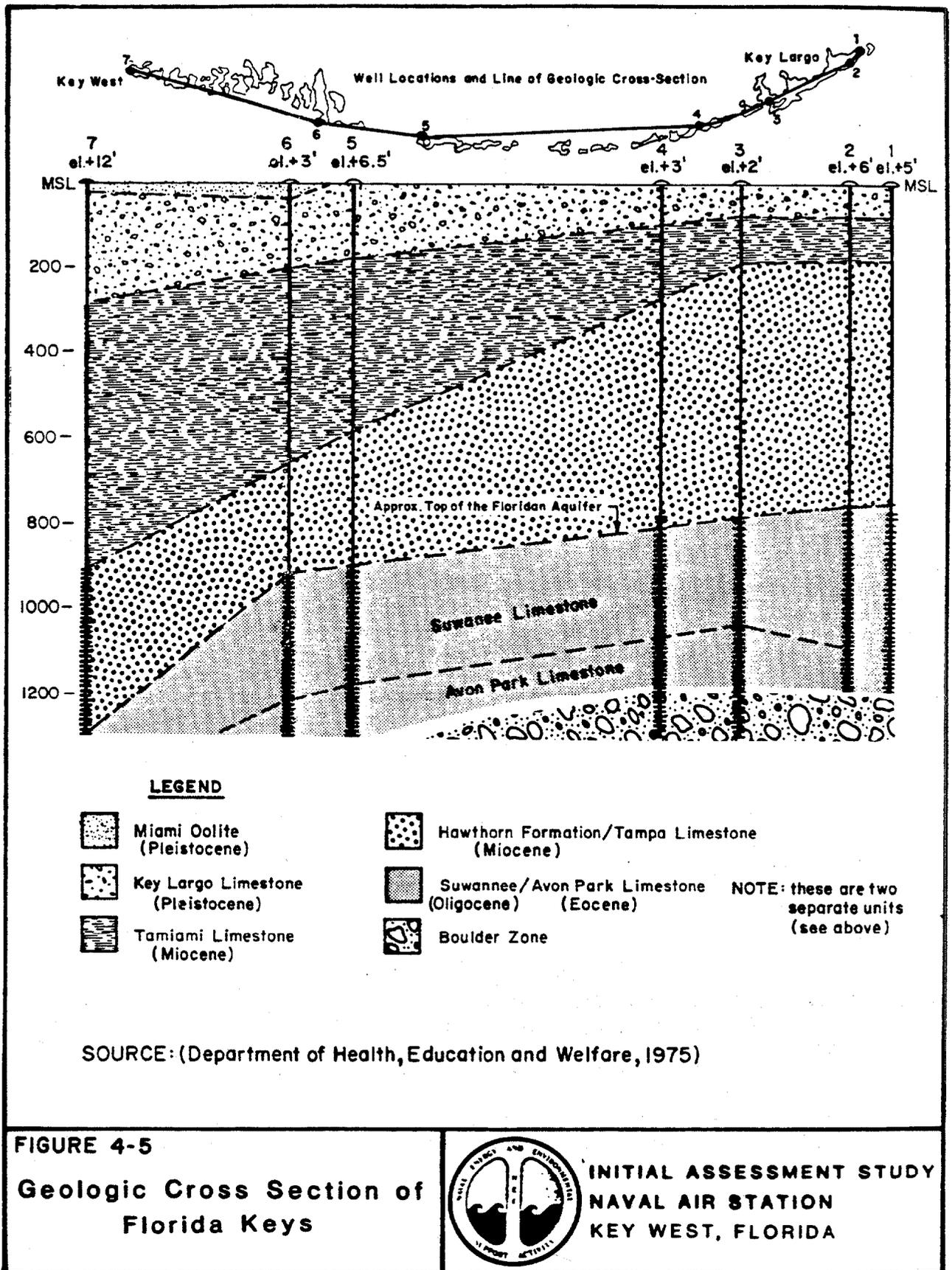
**4.5.3.1 Stratigraphy.** A detailed description of the various geologic strata in the Florida Keys follows. The stratigraphic sequences are illustrated in Figure 4-5.

The Pleistocene Miami Oolite rests upon the Key Largo limestone in what appears to be a transitional contact, covering all of the Lower Keys from Big Pine Key to Key West (Black, 1977). The formation is soft, white to yellow, stratified to massive and is constituted of pure calcium carbonate (limestone) which may contain shell fragments and minor quartz sand. Its major constituents are tiny oolids which are spherical calcareous grains with concentric structure, cemented to form Oolite rock (SOUTHNAVFACENCOM, 1981a). The formation thickens in a northward direction and its greatest known thickness is 35 feet in the northern part of Stock Island (Black, 1977).

The Pleistocene Key Largo limestone underlies Miami Oolite on all the Lower Keys. Its major constituents are the cemented remains of ancient coral reefs and a subsidiary amount of fossils or coral, shell, algae and echinoids (SOUTHNAVFACENCOM, 1981a). The formation varies from 75 feet in thickness at Key Largo to 180 feet under Key West (Department of Health Education and Welfare, 1975).

The Miocene Tamiami Formation is extremely complex, consisting of many different facies in south Florida. The Tamiami Formation consists of a gray to green, fine-grained sand, clayey sand and clay. Coarse gravel lenses have been located within the Tamiami Formation. Thicknesses of greater than 100 feet have been reported from wells penetrating this strata (Black, 1977).

The Miocene Hawthorn Formation is composed primarily of greenish sediments of marine origin, laid down by a transgressing sea. The Hawthorn consists of blue-green clay, gray-green marl with varying amounts of quartz sand. Occasionally, a lens of porous limestone may occur in the basal section of this formation. Thicknesses range up to 400 to 600 feet, however, in the study area thicknesses probably average 200 feet (Black, 1977).



The Tampa Formation is a Lower Miocene sandy limestone. The sand is primarily quartz and occurs in pockets or lenses, or is disseminated in the limestone matrix. Well cuttings reveal the limestone as a dirty bluff color to a very light color with some phosphatic material associated (Black, 1977). In the study area, thicknesses probably average 120 feet (Department of Health, Education and Welfare, 1975).

The Oligocene Suwannee limestone consists of nodular, granular, chalky limestone, some Oolite, usually very fossiliferous. The color is cream to white and occasionally may contain some clear quartz grains. The formation ranges in thickness from 100 to 250 feet in south Florida; however, well cuttings indicate thicknesses of approximately 400 feet below the Florida Keys (Black, 1977).

The Avon Park Formation consists of chalky, nodular, Oolitic, fragmental limestone with some inter-granular anhydrite and gypsum in the upper unit. This section of the formation is very fossiliferous, usually a cream white and buff color. Commonly, dense to finely crystalline dolomite occurs in the middle sections. The lower unit consists of a massive, dense to finely crystalline or sucrosic dolomite. Thicknesses of greater than 500 feet have been reported from wells in south Florida (Black, 1977).

4.5.3.2 Water-bearing Characteristics. A detailed description of the water-bearing characteristics of the various geologic formations in the Florida Keys follows (Black, 1977).

The Miami limestone, exposed at the surface in the Lower Keys, is a porous, solution riddled formation. Much of the total volume of this formation is occupied by voids, producing a very high vertical permeability; however, since many of the solution pipes are not connected, a lower horizontal permeability is observed. In the Key West area, a freshwater lens has developed above a saltwater interface in this formation. There are no freshwater wells of consequence in this formation in the Key West area (SOUTHNAVFACENGCOM, 1980a).

The Key Largo limestone, a remnant reef structure, is extremely permeable. Solution holes and caverns are common throughout this formation. This permeability allows sea water, under tidal influence, to move freely in and out of the rock structure. Rain falling on the surface quickly permeates the rock and escapes to the sea. Although the Key Largo limestone will yield water freely to a well, the quality is poor, being close to that of sea water.

The Tamiami Formation represents a major water producing zone in south Florida. Permeability is variable and depends on the amount of clay and sand occurring in a section. The gravel lenses represent areas of high permeability and it is within these zones that groundwater yields are highest. Below the Florida Keys, the Tamiami Formation contains mineralized water and does not represent a source of fresh groundwater; however, the formation may contain water of a quality suitable for desalination or reverse osmosis feed water.

The Hawthorn Formation consists of very low permeability clays and sands and, as such, acts as an aquiclude confining the underlying limestones under artesian pressure. The intermittent limestone lenses occurring in the basal section of the Hawthorn are permeable enough to yield water; however, in the Keys, the water is mineralized and of poor quality.

The Tampa Formation, consisting of sandy limestones, represents a source of water supply in parts of southwest Florida. In that part of the state, it is considered part of the upper Floridan aquifer. In the Keys, the permeability is lower and it, together with the underlying Hawthorn Formation, acts as an aquiclude for the underlying Suwanne and Avon Park Formation.

The Suwanne limestone, a fossiliferous limestone, represents the top of the water-producing zone in the Keys. The water is mineralized; however, it is of high enough quality to be treated for use. The transmissivity of the Suwanne limestone is much lower than the prolific Avon Park; however, the quality is much better.

The Avon Park Formation, a very high permeable limestone and dolomitized limestone, represents the deepest formation from which water supply is obtained in the Keys. In certain areas of Florida, particularly central Florida, DeSoto, Hardee and Polk counties, it is the Avon Park Formation which supplies great quantities of water from large diameter wells. Transmissivities as high as  $2 \times 10^6$  gallons per day per foot have been recorded. In the Keys, water quality of the Avon Park is poor, containing water high in chlorides and high in total dissolved solids and becoming worse with depth. The high transmissivities associated with this formation are also common in the Keys.

4.5.4 Soils. The original soils in the area are shallow marl over limerock with the substrata rock appearing at the surface in numerous outcroppings. Many areas at the Key West Naval Station have been filled and graded. In particular, areas such as Fleming Key and Dredgers Key are essentially spoil islands created from material dredged from the Seaplane Basin in the Key West Naval Station.

Figures 4-6 and 4-7 provide a general soils map of Key West and Boca Chica, respectively. A detailed description of the various soil types identified in these maps follows (SOUTHNAVFACENGCOM, 1982a).

4.5.4.1 Rockland. This mapping unit is composed of areas of rockland with sufficient elevation above sea level to be only slightly affected by salt. Typically, it consists of rocky areas in which small pockets of dark grayish-brown loamy marl with varying amounts of organic matter abound. These pockets are seldom more than six to eight inches thick. Only a few, small areas of this unit remain undisturbed. They have a dense, brushy vegetation; a thin cover over the rock of loose leaf mold; and potholes filled with peat or loamy marl.

4.5.4.2 Rockland, Salt Affected. This mapping unit is very similar to the rockland unit described above except for one major difference. It occurs at a lower elevation and is affected by salt accumulation for occasional high tidal action.

4.5.4.3 Rockland, Tidal Flats. This unit consists of rockland that occurs at approximately sea level and is subject to daily tidal inundation. Parts of the unit are covered by water most of the time and have a thin covering of fine marly sediments. Other areas have scattered small mangroves. Ditches have been cut into the rock in some areas for mosquito control and the loose rock scattered over the surface.

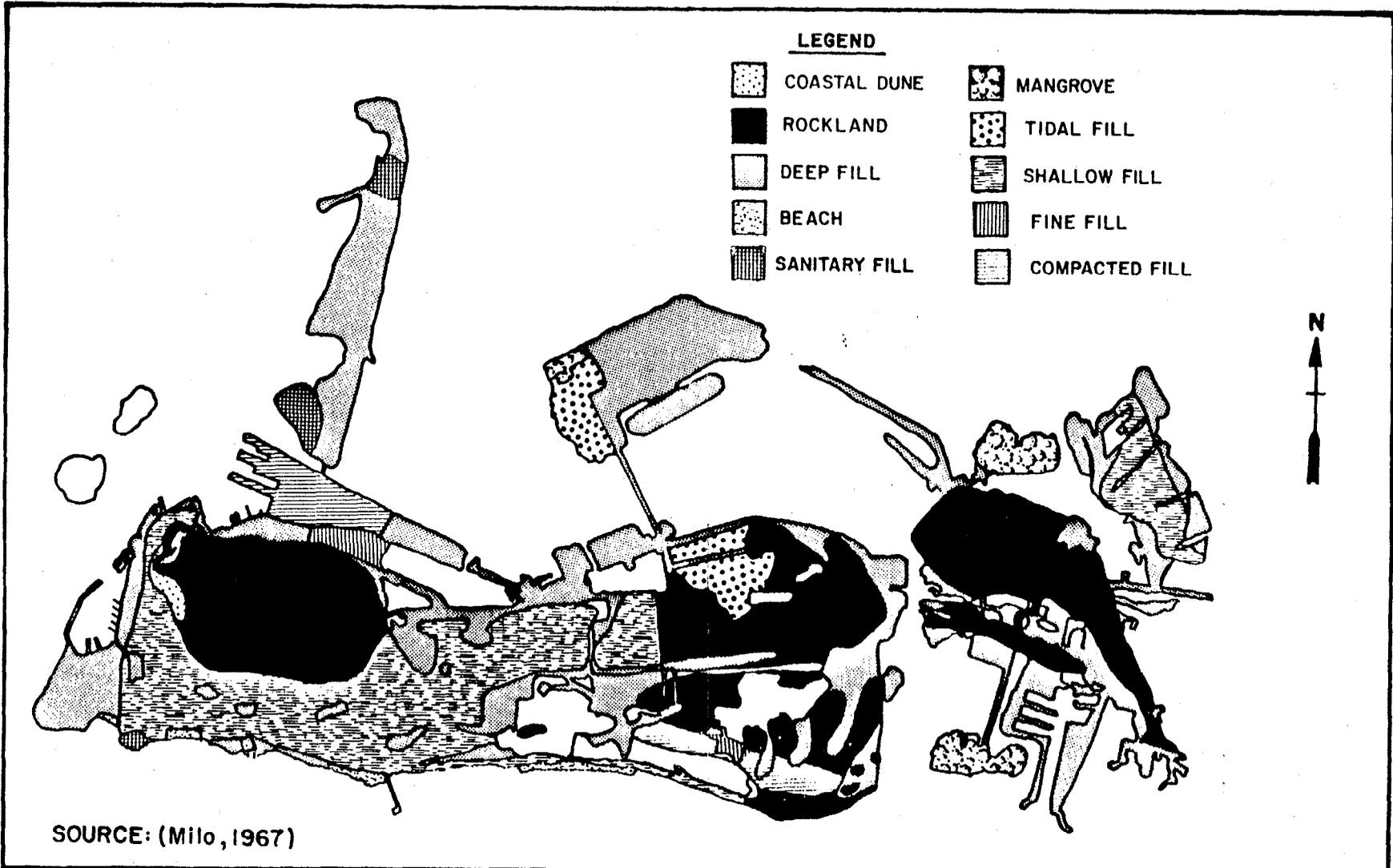


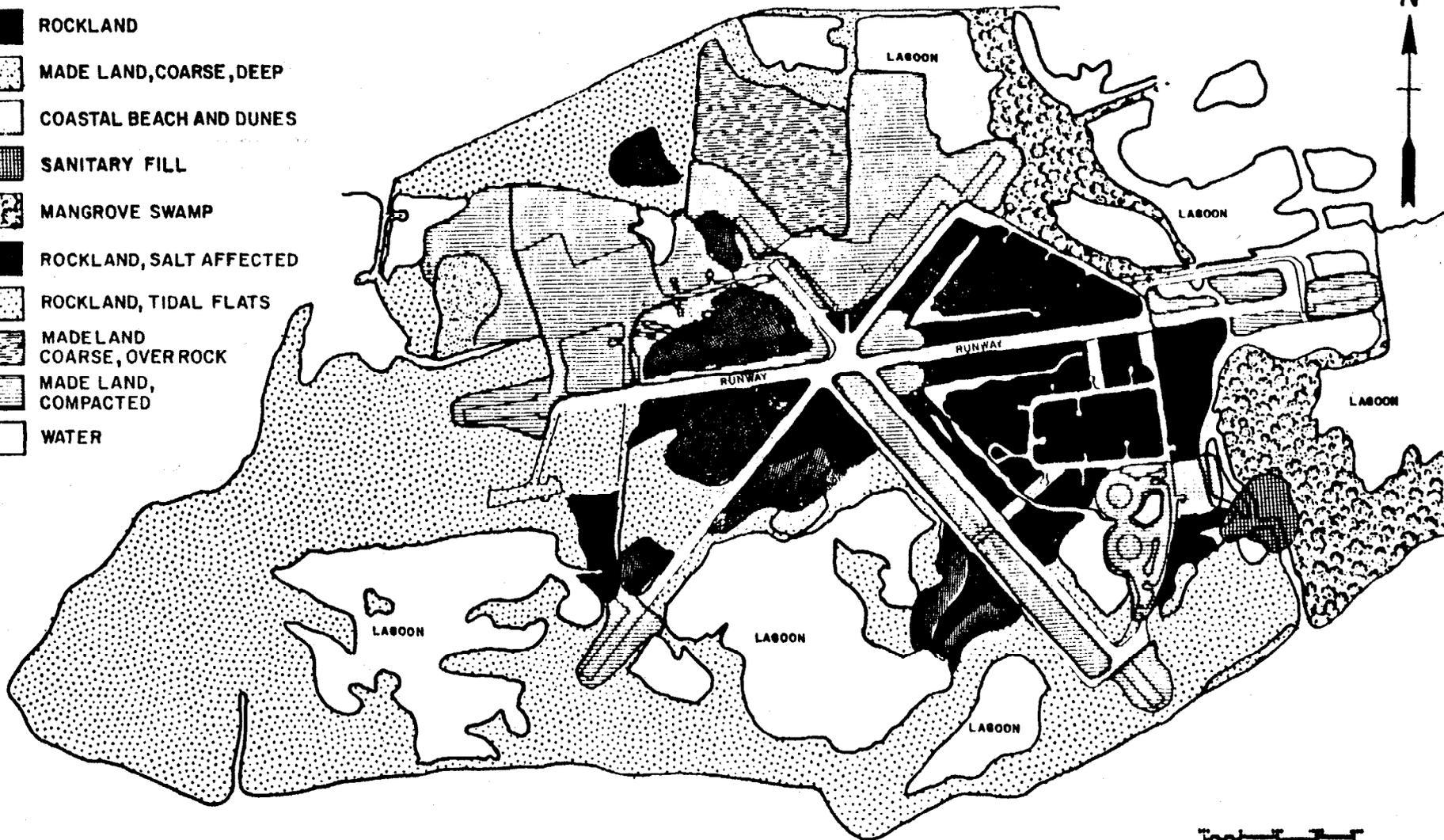
FIGURE 4-6  
General Soils Map of Key West  
and Vicinity



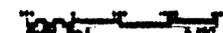
INITIAL ASSESSMENT STUDY  
NAVAL AIR STATION  
KEY WEST, FLORIDA

**LEGEND**

-  ROCKLAND
-  MADE LAND, COARSE, DEEP
-  COASTAL BEACH AND DUNES
-  SANITARY FILL
-  MANGROVE SWAMP
-  ROCKLAND, SALT AFFECTED
-  ROCKLAND, TIDAL FLATS
-  MADE LAND COARSE, OVER ROCK
-  MADE LAND, COMPACTED
-  WATER



SOURCE: (SOUTH DIV, 1982)



**FIGURE 4-7**  
**General Soils Map Boca Chica**



**INITIAL ASSESSMENT STUDY**  
**NAVAL AIR STATION**  
**KEY WEST, FLORIDA**

4.5.4.4 Made Land, Coarse, Deep. This mapping consists primarily of dredge spoil ranged from 2.5 to 6 feet thick. This material is composed of crushed limestone ranging from three to four inches in diameter, interfilled with finer particles of some marl. Developed areas of this unit include compacted fill for streets, houses, buildings, parking lots, etc. Also included are lawns or other vegetated areas that have received a thin top-dressing of mixed fine marl and organic materials. Undeveloped areas have not been vegetated or smoothed and remain in a rough, rocky condition.

4.5.4.5 Made Land, Over Rock. This unit consists of areas of rockland that have been covered with dredge spoil, 6 to 30 inches thick. This covering consists of materials similar in all respects to that of made land, coarse soils. This unit differs primarily by having limestone bedrock within depths of 30 inches. Areas of this unit were built up to provide suitable land for buildings, houses, lawns and recreational areas. The areas that are vegetated have had a mixture of fine marl and organic matter incorporated into the top few inches. There are compacted areas for streets and parking lots included in the unit.

4.5.4.6 Made Land, Fine. This unit occurs only in the vicinity of the Seaplane Base. It is composed of materials dipped from the bay bottom by a clam shell digger and deposited as fill for the old Flagler rail yards. This fill material is much finer than fill materials elsewhere. It consists of mixed fine marl and shell stratified with thin to thick layers of soft, light gray marl that has a silt loam texture. The thickness of the fill is more than 30 inches. This fine material is firm when dry, but below depths of two feet remains wet and very unstable. A few, small areas have up to 12 inches of coarse spoil overlying the finer marl material.

4.5.4.7 Made Land, Compacted. This mapping unit consists of coarse fill material of any depth up to six feet, which has been well compacted to give semi-paved properties for roadways, parking aprons, buildings, storage tanks, shoulders of runways and taxi ways.

4.5.4.8 Old Coastal Dune. This mapping unit is an old stabilized coastal dune. It occurs slightly higher than adjacent lands and consists of deep deposits of sand size marl and fine shell fragments overlying limestone. The surface soil is approximately six inches thick with organic matter intermixed. It is dark grayish-brown speckled with light colored marl and shell fragments. The rest of the profile is a very pale brown mixture of loose marl and shell. Limestone occurs at depths greater than three feet. There is a bit of rocky material mixed into the surface in places due to the scattering of coarse fill from adjacent areas.

4.5.4.9 Coastal Beach and Dune. This unit is composed of existing narrow strips of beach and adjacent low dunes. The soil consists of a mixture of light colored, sand sized marl and shell. Limerock underlies the beaches at shallow depths and outcrops frequently. The dunes are underlain by limerock at depths of more than three feet. They are very rapidly permeable, droughty and subject to wind erosion.

4.5.4.10 Sanitary Fill. This unit consists of deep, coarse fill material that is used as a disposal area. When trenches dug in the areas are full, they are covered over with more coarse fill material. As settling takes place, the strips are periodically re-leveled.

4.5.4.11 Mangrove Swamp. This unit consists of existing mangrove swamp that is either flooded with each tide, or if cut off from tidal action, remains permanently wet. These areas may have a thin layer (6 to 10 inches) of peat or soft marl sediments overlying limestone. This limestone occurs at very shallow depths and outcrops frequently in all areas.

#### 4.5.5 Hydrology.

4.5.5.1 Surface Water. The surface water regime in the Florida Keys is dominated by the surrounding saltwater bodies. Southeast of the island chain, the Atlantic Ocean, particularly the Gulf Stream, is the dominant influence, while on the northwest side of the Keys, it is the Gulf of Mexico and Florida Bay. These two water bodies intermix between the islands through the many tidal channels that occur along the length of the Florida Keys (Black, 1977).

The tides in the Lower Keys result from the phasing together of the Atlantic Ocean and Gulf of Mexico. Tides from the Atlantic are a predictable two-cycle (diurnal) tidal movement, while the tides of the Gulf are normally one-cycle daily. The phasing together of these tide systems results in mixed tides. Varying amounts of this phasing cause large differences in the amplitudes and times of the tides in the Lower Keys (Hanson, 1980).

The mean tidal range for Key West is 1.3 feet with a spring range of 1.6 feet. The tidal current is toward the Gulf of Mexico during the flood and toward the Atlantic Ocean during the ebb (General Services Administration, 1979).

In general, drainage from the developed areas (buildings, streets, parking lots, runway) of the Naval complex is characterized by inlets, culverts, and ditches which direct surface runoff to nearby lagoons, borrow pits, and tidal waters. Due to the generally flat nature of the Keys and their porous Miami Oolite soils, open and undeveloped areas tend to produce little surface runoff. Drainage from these areas is characterized by percolation and some ponding, with any surface runoff flowing by overland flow to nearby surface or tidal waters. Low lying wetland areas which are found within the Naval complex are subject to frequent tidal inundation and flooding.

4.5.6 Water Quality. Surface waters in the Keys are classified by the Florida Department of Environmental Regulation as Class III Waters, Recreation, Propagation and Management of Fish and Wildlife. Common activities in area waters include commercial, recreational and shell fishing, boating and swimming. These waters support the richest coral reefs in the Continental United States.

Currently two treatment plants at Boca Chica and Sigsbee Park, respectively, provide sewage service to portions of NAS Key West. These plants discharge secondarily treated effluent to the Gulf Mexico. Certain areas of Boca Chica use septic tanks, while the Medical Clinic, Trumbo Point, Truman Annex, the Commissary Store, White Street Trailer Park, and Poinciana Housing areas all discharge into the City of Key West collection system. The City's sanitary sewer system serves 99 percent of Key West residents. The sewers collect and discharge raw sewage via a 24-inch cast iron pipe to an Atlantic Ocean outfall approximately 4,700 feet from the shore in 33 feet of water (General Services Administration, 1979).

During periods of rain, excessive amounts of infiltration occurs in all the sewer lines; however, the worst known conditions exist at Sigsbee Park housing and NAS Boca Chica where the Navy treats its sewage. At these locations, excessive infiltration is continuous (SOUTHNAVFACENGCOM, 1981a).

Currently, there is insufficient water quality data available to support firm conclusions regarding the quality of the surface waters in the Key West area (Black, 1977 and General Services Administration, 1979).

**4.5.7 Ground Water.** Although the Keys are underlain by highly transmissive limestone aquifers, most contain brackish, saline or hypersaline water. Only the larger Keys (Key West, Big Pine Key and Key Largo) have any fresh ground water at all (Black, 1977).

Due to the generally low ground elevations in the Key West area, the water table is close to the surface. The water table aquifer, in the lower Keys, is developed within the Miami Oolite and Key Largo limestone. In most areas, the limestone occurs at the surface. The recharge to this aquifer is directly from precipitation and discharge is via ground water flow to surrounding surface and tidal waters. In the Key Largo limestone, the infiltration is extremely rapid, discharging almost immediately to the surrounding saltwater bodies. In Key West, where there is a larger land mass and the Miami limestone occurs, a freshwater lens has developed above the saltwater interface (Black, 1977). This freshwater lens is subject to saltwater intrusion through the porous Key Largo Formation which underlies the less porous Miami Oolite (SOUTHNAVFACENGCOM, 1981a). In the Key West area, freshwater wells of consequence do not exist and potable water is obtained by rainwater catchment, reverse osmosis desalination, or imported from the mainland (SOUTHNAVFACENGCOM, 1980a). There are no freshwater wells at NAS Key West. All potable water comes from the mainland.

Ground water flow directions, in general, are to the nearest surface or tidal water in the area. Water table elevations are primarily influenced by local rainfall and tides. No ground water quality data for the area is available.

Information regarding the hydraulic conductivity of the water table aquifer in the Key West area is limited. However, it can be expected that the hydraulic conductivity of the water table aquifer in Key West is similar to the Biscayne aquifer in South Florida, composed of Miami Oolite and Key Largo Limestone, among other formations. Based on reported hydraulic conductivities in the Biscayne aquifer ranging from approximately 1,300 to 13,000 gallons per day per square foot (Wedderburn, 1982), the rate of ground water movement in the Key West area can be predicted. Assuming a one foot head difference between the water table and surface waters, and a distance to surface waters of 200 feet, the ground water velocity would vary from 0.9 to 9.0 feet per day. Based on the assumed 200 foot travel distance, any contaminants migrating with the ground water would enter surface waters within 22 to 220 days. This time range is probably low since many areas of NAS Key West are immediately adjacent to surface waters and tidal fluctuations alone would easily account for a head differential of one foot.

**4.5.8 Water Supply.** Water is supplied to NAS Key West Complex and surrounding areas by the FKAA. This water is pumped from deep wells at Florida City, Florida and is transported via a 130-mile pipeline, which terminates at Key West. Water is distributed along the aquaduct at various points along the Florida Keys (SOUTHNAVFACENGCOM, 1981a).

A three million gallon per day reverse osmosis desalination plant, located just north of Key West on Stock Island, is used as a supplemental source of water to the Key West Area (General Services Administration, 1979). FKAA has storage facilities at Stock Island with a capacity of 22 million gallons, which can be used when the aquaduct pressure is low or flow is disrupted. This storage capacity equates to a seven-day supply for the Key West area (SOUTHNAVFACENGCOM, 1981a).

4.6 MIGRATION POTENTIAL. The major migration pathways from sites of potential contamination at NAS Key West include surface runoff (both storm sewer and overland flow) and shallow ground water movement. In either case, discharges would flow to nearby surface waters, which may include lagoons, borrow pits, or tidal waters such as the Atlantic Ocean or the Gulf of Mexico. Contamination via the surface runoff route could occur in areas where the source of contamination is at or near the ground surface.

Contaminants may easily enter the ground water system due to its close proximity to the land surface and the porous nature of Miami Oolite and underlying Key West limestone. The highly porous and permeable Key West limestone, with its common solution hole and cavernous structure, would provide a highly effective pathway for contaminant migration to nearby surface waters. In addition, head differentials associated with tidal variations in near-shore waters can further accelerate ground water movement in the area. Seawaters, under tidal influence, move freely in and out of the Key Largo limestone, thus creating a flushing action for contaminant dispersal.

Vertical movement of contaminants in the ground water would not forseebly reach beyond the Tamiami Formation, which directly underlies the Key Largo limestone. This is due to the fact that the Hawthorne Formation, underlying the Tamiami Formation, is relatively impermeable and acts as a confining layer or aquiclude preventing further downward migration.

It is possible that potential contaminant migration in the area may travel to nearby surface waters as pathways for contaminant migration exist. However, the large volume of the tidal waters in the area (Atlantic Ocean and Gulf of Mexico) and the significant tidal flushing involved, would tend to limit the potential impacts to receptors in these areas.

## CHAPTER 5. WASTE GENERATION

5.1 INDUSTRIAL OPERATIONS. The Naval Air Station (NAS) Key West Complex has been involved with various types of operations since the mid-1800s. These operating functions of NAS Key West are accomplished by a number of shops organized into departments. This section provides an overview of the principal industrial related operations conducted by the Naval Complex shops which generated hazardous waste materials. In addition to the brief discussion of the operations, types and quantities of wastes are provided in as much detail as possible. Almost all of the documentable information on waste generation and disposal for activities at NAS Key West was developed since the late 1970s. Many of the activities at the Naval Station have not been active since the early 1970s. Likewise, the Seaplane Base has not operated since the 1940s. Almost all of the personnel who worked in these areas have been assigned other jobs or have relocated. Very few long-term personnel were available who could provide detailed information on disposal practices prior to the last 5 to 10 years. It can be reasonably assumed that prior to the establishment of hazardous waste management and recycle of waste oils programs, most of the wastes of concern were disposed either in dumpsters which found their way to one of the four operating disposal areas, the wastes went into waste oil bowlers which may have been used for fire fighting training, stored at the Trumbo Point Tank Farm, or sent to Defense Property Disposal Office (DPDO) for disposal off Navy property. In general, where a lack of historical information existed, more recent records were used to provide an indication of past practices.

The main departments of NAS Key West and its tenant activities to be discussed in this section include:

- Aircraft Intermediate Maintenance Department (AIMD)
- Air Operations Department
- Public Works Department (PWD)
- Atlantic Fleet Audio-Visual Detachment
- Attack Squadron 45 (VA-45)
- Dental Clinic
- Naval Communications Unit (NCU)
- Naval Intelligence Processing System Training Facilities (NIPSTRAFAC)
- Naval Regional Medical Clinic (NRMC)
- Patrol Hydrofoil Missile Squadron 2 (PHMRON II)
- Tactical Electronic Warfare Squadron 33 (VAQ-33)

5.1.1 Aircraft Intermediate Maintenance Department. The AIMD shops or Work Centers (WC) were responsible for the maintenance and repairs of various aircraft components. These operations were primarily located in Hangar Building 936 on Boca Chica from the 1950s until 1970 when most of the shops were consolidated into Building 980. The shops generating hazardous wastes such as oils, cleaning solvents, waste paints and hydraulic fluids are discussed below. Table 5-1 summarizes waste generation from AIMD.

5.1.1.1 Airframes Shop (WC 510). The shop performed minor repairs to damaged structural components of the airframes. The shop used approximately ten gallons/year of freon (which evaporated) to wipe off parts.

5.1.1.2 Machine Shop (WC 520). The shop provided typical machine shop services and used drill presses, metal turning lathes etc., which generated water soluble cooling oils. Until 1983, the estimated 60 gallons/year were

Table 5-1

## Waste Generation from AIMD

Source	Waste Type	Quantity (gallons/year)	Date	Disposal Method/ Location*
Machine Shop	Machine oil	60	1973 to 1983 Since 1983	TPTF/FFTA ONP
Hydraulic Shop	1,1,1-trichloroethane	50	1973 to 1983	TPTF/FFTA
	Hydraulic Oil	60	Since 1983	ONP
Tire Shop	PD-680	-	1972 TO 1982	TPTF/FFTA
	Turco	-	Since 1982	ONP
Non-Destructive Inspection Laboratory	Fixer & Developer	60	Since 1980	Sanitary Sewer
	Waste oil	<60	Since 1980	TPTF/FFTA
Corrosion Control	MEK	100	Since 1970	ONP
	Toluene	-	Since 1970	ONP
	Xylene	200	Since 1970	ONP
	TMIK	-	Since 1970	ONP
	Paints/solvents	200	Since 1970	ONP
Electric Shop	Nicad electrolyte	2	Since 1970	ONP
Fire Control	Hydraulic oil	60	Since 1970	ONP
Defensive & Passive Electronic Countermeasure	Waste oil	500	Since 1980	ONP
PME	Hydraulic oil	20	Since 1970	ONP
Aviation Ordnance Shop	PD-680	60	Since 1970	ONP
Ground Support Equipment Division	PD-680	200	Since 1973	TPTF/FFTA
	Waste oil	200	Since 1973	TPTF/FFTA
Power Plants Shop	Waste oil	300	Since 1973	TPTF/FFTA
	PD-680	60	Since 1973	TPTF/FFTA

\*TPTF/FFTA = Trumbo Point Tank Farm/Fire Fighting Training Area

ONP Off Navy Property

poured into a waste oil bowser and transported to the Trumbo Point Tank from storage. (Refer to Chapter 6 for the discussion of the disposition of these wastes.) After 1983, this waste was collected in a drum by Building 980 and taken to the Base Hazardous Waste Storage Facility prior to disposal off Navy property.

5.1.1.3 Hydraulic Shop (WC 540). The shop performed hydraulic test and repairs to lines and filters used in the pressurized aircraft systems. The shop used a vapor degreaser to clean filters and miscellaneous parts. The degreasing unit used for filter cleaning generated about 50 gallons/year of waste 1,1,1-trichloroethane. Approximately 60 gallons/year of waste hydraulic oil was generated by the shop. Approximately 10 gallons/year of freon was used in cleaning and degreasing parts. Until 1983, the combined mixture was poured into one of the squadron waste oil bowzers and transported to the Trumbo Point Tank Farm for storage. Following 1983, these wastes were segregated for disposal as hazardous wastes off Navy property.

5.1.1.4 Tire Shop (WC 550). This shop conducted cleaning and inspection of aircraft tires. Tires were first dismounted from the wheels. The wheels were then placed into a two-stage cleaning bath and rinsed. The cleaning compounds utilized in this operation were PD-680 (a flammable, petroleum-based cleaning solvent) and Turco (a phenolic-based aircraft cleaner). Rinse water from this operation drained outside Building 980 into a buried plastic 55-gallon drum. The wastewater was pumped out on a weekly basis and transferred to a drum for temporary storage behind Building 980. Since about 1982, this material was handled and disposed off Navy property. It was reported that before this, the material was probably poured into a waste oil bowser.

5.1.1.5 Weld Shop (WC 560). This shop, first located in Building 143, was involved in various aircraft welding operations but did not generate any potentially hazardous wastes. These operations were more recently housed in Building 992.

5.1.1.6 Non-Destructive Inspection (NDI) Laboratory (WC 570). The NDI lab shared facilities with the welding operation in Building 992. The laboratory performed inspections and X-ray examinations of various aircraft parts and in so doing, generated approximately 60 gallons/year of photographic fixer and developer wastes. These wastes were discharged to the sanitary sewer system. Proprietary inspection penetrants such as Farco Magna Flux compounds, and some acids (acetic and sulfuric) were also used for testing. Additionally, alcohol and freon were used periodically to clean parts prior to examination, but this material evaporated during use. Less than 60 gallons of waste oil was collected during the evaluations and was turned over to AIMD for storage with other department wastes at the Trumbo Point Tank Farm.

5.1.1.7 Corrosion Control (WC 51-B). Aircraft corrosion control functions were carried out in Building 989 at Boca Chica from the early 1970s. Shop activities primarily consisted of paint stripping of component parts, some manual sanding along with sandblasting, corrosion coating, sealing and spot painting. The solvents, methyl ethyl ketone (MEK) (approximately 100 gallons/year), toluene methyl isobutyl ketone (TMIK), xylene (approximately 200 gallons/year) and toluene, are used in these operations. The painting activities used enamel and epoxy paints and generated some 200 gallons/year of waste paints and solvents, which were handled by the PWD for disposal off Navy property.

5.1.1.8 Communication and Navigational Instrumentation (CNI) Shop (WC 610). The communication and navigational equipment items were repaired in the CNI shop located in Building 980. Less than 60 gallons/year of alcohol and freon were used to clean the electronic equipment during such repairs. No waste was generated by this operation because it evaporated.

5.1.1.9 Electric Shop (WC 620). The shop was involved with the repair and maintenance of electrical equipment and printed circuit boards. Less than 50 gallons/year of alcohol and freon were consumed in the cleaning of these items. These solvents quickly evaporated during use. The shop also was responsible for the maintenance of nickel cadmium (nicad) battery packs. These batteries were used from about 1970. Old batteries were handled by the Supply Department and sold by DPDO. Waste nicad electrolyte, about two gallons/year, was handled by the PWD for disposal off Navy property.

5.1.1.10 Fire Control (WC 630). The shop provided maintenance of the weapons directing radar systems onboard aircraft. When the F-4 and F-4J aircraft were stationed at Key West the repair of the fire control antennas generated about 50 gallons/year of waste hydraulic oil mixed with freon. These wastes were sent to the Hydraulic Shop (WC 540) for disposal with their wastes. The newer fire control system antenna units were sealed and did not generate waste oil, only about 60 gallons/year of cleaning solvents were used in their repair. The solvents evaporated during use.

5.1.1.11 Defensive and Passive Electronic Counter Measure (DECM/PECM) (WC 640). The DECM/PECM shop began repair and maintenance operations from radar jamming units in 1980. The shop generated waste cleaning solvents during the course of repairs. The jamming units contained approximately 3 gallons of insulating oil which was cleaned and reused. Repair of these units generated about 500 gallons/year of waste freon mixed with some residual oil. The area dedicated to the repair of the jamming units contained a floor drain which lead to a buried 55-gallon drum behind Building 980. The waste freon was routinely pumped out by the PWD and disposed off Navy property.

5.1.1.12 Performance Measuring Equipment (PME) (WC 670). The calibration of a wide variety of pressure gauges was performed by the personnel of this shop. Freon was routinely used to dry out the gauges which generated a mixture of waste hydraulic oil and the freon. The operation generated about 20 gallons/year of this waste which was poured into a waste drum behind Building 980 and subsequently disposed off Navy property.

5.1.1.13 Module Repair (WC 690). The small quantities of alcohol used by the shop to clean the printed circuit boards did not generate wastes because it evaporated.

5.1.1.14 Aviation Ordnance Shop (WC 710). The shop performed maintenance of aircraft ordnance mechanisms. The solvent, PD-680, was generally used to clean parts during the course of the repairs. The operation generated about 60 gallons/year of waste solvent. This waste was taken to the Tire Shop (WC 550) for storage in the 55-gallon drum located outside Building 980 and subsequently disposed off Navy property.

5.1.1.15 Ground Support Equipment Division (WC 900-940). The GSE operations were housed in Buildings 986, 987 and 988 on Boca Chica from the 1960s. The shops of this division provided maintenance and repairs of aircraft support equipment such as tow tractors, aircraft stands and jacks. Activities such

as wheel and tire cleaning conducted in Building 986 generated about 200 gallons/year of oily PD-680 wastes. This waste was poured into the waste oil bowser located outside the building. Batteries handled in Buildings 986 and 987 were sent to DPDO for resale. Repairs performed in Building 988 involved the cleaning of wheel bearing and other similar tractor parts. This operation generated about 200 gallons/year of oily waste PD-680 which was poured into the bowser beside Building 986 and taken to the Trumbo Point Tank Farm for storage. Freon was used at a rate of about 10 gallons per month for parts cleaning, but this material evaporated.

5.1.1.16 Power Plants Shop. The repair of aircraft jet engines was conducted in Building 134 on Boca Chica from the 1960s. Waste engine oil was generated at the rate of 300 gallons/year and poured into a waste oil bowser and taken to Trumbo Point Tank Farm for storage. The shop also generated about 60 gallons/year of the cleaning solvent PD-680 which was dumped into the bowser. A test cell located at Building 969 was used for testing of overhauled engines. A bowser was located by the test cells to collect the residual material generated during testing operations.

#### 5.1.2 Air Operations Department.

5.1.2.1 Crash/Fire Division. The division was responsible for all crash and structural fire protection including fire fighter training activities. The fire station was located in Building 132 from the 1950s. The air crash rescue fire fighter training area was located at the abandoned dirigible parking ramp between Runway 31 and the antenna station (Building 1004) in the south-east corner of the NAS. The training facility consisted of four fuel containment pits approximately 60 to 80 feet in diameter. Waste oil and fuels were poured into the unlined pits for the training sessions. About 300 gallons of material was routinely ignited so that fire fighters could extinguish the blaze. Fire training was generally performed every two weeks so the operation consumed approximately 8,000 gallons of waste fuels monthly from the 1950s. Table 5-2 summarizes waste generation for air operations.

5.1.2.2 Operations Maintenance Division. OMD maintained four SH-3D "Sea King" type helicopters used extensively for search and rescue operations. The operation was located in Building 131 and routinely generated engine and hydraulic oil, paints, thinners, cleaning solvents and freon used during repairs. Prior to 1983, this material was poured into the waste oil bowser located outside the building and transported to the Trumbo Point Tank Farm for storage. Since 1983, the operation generated about 50 gallons/year of petroleum wastes, 50 gallons/year of mixed paints, and 25 gallons/year of both chlorinated and unchlorinated solvents. These materials were poured into segregated, color-coded drums outside the building and routinely hauled by the PWD to the Base Hazardous Waste Storage Area prior to disposal off Navy property.

5.1.3 Public Works Department. The PWD provided station service functions through an organization of divisions, branches and shops. The services performed by the PWD included: administration, engineering, maintenance, transportation and housing. The Maintenance Division specifically contained the Building Trades Branch, Electrical Branch, Metal Trades Branch, and the Utilities Branch. Prior to the mid-1960s, the Key West Naval Complex had two PWDs operating as separate entities, one for the NAS on Boca Chica and another for the Naval Station at Truman Annex and Trumbo Point. After the merger, the PWD operations were consolidated into the PW facilities of the

Table 5-2

**Waste Generation from Air Operations, Public Works Department,  
Engineering and Repair Department, and Fleet Audio Visual Detachment**

Source	Waste Type	Quantity (gallons/year)	Date	Disposal Method/ Location
<b>Air Operations:</b> Crash/Fire Division Operations Maintenance Division	Waste oils, fuels	8,000*	Since 1950	Ignited
	Waste oils	50	Since 1982	ONP
	Waste paints	50	Since 1982	ONP
	Chlorinated and unchlorinated solvents	30	Since 1982	ONP
<b>Public Works Department:</b> Utilities Branch Pest Control Operations	PCBs	-	1950s to 1970s	Site 2
	DDT	-	1940s to 1970s	Sites 3 and 5
<b>Engineering and Repair Department:</b> Machine Division	Waste oil	3,000	1940s to 1970s	ONP
	Solvent	300	1940s to 1970s	ONP
Hull Division	Scrap	-	1940s	DPDO
	Waste paints, thinners, solvents	-	1940s to 1970s	Site 1
Fleet Audio Visual Detachment	Waste fixer and development	50	1940s to 1980s	Sanitary Sewer

\*Waste liquids were burned for fire fighting training practice. This quantity estimate is larger than the sum of the estimated wastes generated from the various shops. This difference may be due to over estimating the amount of fuel used for fire fighting or it may be that when fuels were cheaper, they were used to a larger extent.

NAS on Boca Chica. No specific information was available concerning the operation of the Naval Station's PWD. Table 5-2 summarizes waste generation for the Public Works Department.

5.1.3.1 Transportation Division. This division was responsible for the maintenance of all transportation, construction, material handling, and material moving equipment and also provided motor vehicles and heavy equipment operators. Until about 1980, the Division handled the wastes generated by the various industrial operations and transported the material to the on-station disposal area operating at the time. After 1980, wastes collected in the dumpster were hauled off Navy property by contractor to the City landfill. Reportedly, the operating personnel working at the on-station landfills commonly used sprayers containing diesel fuel, DDT or malathion for pest control purposes. The disposal operations are covered in more detail in Chapter 8 of this report.

5.1.3.2 Utilities Branch. The shop was located in Building A-437 on Boca Chica. The primary responsibilities of this shop were to repair and maintain power distribution lines, street lighting, boilers, water and wastewater systems, the facility power plants, a number of compressors and generators along with ship service functions (water and temporary power). The inventory, handling, storage and ultimate disposition of polychlorinated biphenyls (PCB) transformers and fluid at the activity was also the responsibility of the Utilities Branch. A PCB Audit and Survey of the NAS was conducted in 1982 for the Southern Division (SOUTHNAVFACENCOM, 1982b). The report provided a very thorough inventory of existing transformers and their condition which is presented in Table 6-5. From the mid-1950s until approximately 1970, out-of-service transformers were transported to salvage (DPDO) for disposal. Transformer disposal procedures (Site 2) are discussed in Section 8.3.

5.1.3.3 Pest Control Operations. The main pest control services performed at NAS Key West included: structural pests, disease vectors, household nuisance pests, ornamental and turf pests, weed control, stored products pests, vertebrate pests, and miscellaneous organisms. Prior to the consolidation of the two PWDs in the mid-1960s, pest control operations were performed from two locations at the Naval Complex. The Pest Control Shop, Building 265 on Truman Annex (Site 3), provided services to the Naval Station, while the NAS pest control operations were conducted in Building 915 (Site 5) on Boca Chica. Both shops provided DDT-mixing areas for mosquito control until the early 1970s when the pesticide was banned. The mixing area at Truman Annex used a 55-gallon drum for mixing the powdered DDT with water. An estimated 50 gallons/month of a five percent solution was applied. Reportedly, occasional spills occurred in the mixing area when the solution was transferred from the drum to the spray tank. DDT applications were performed using a Bean Model 1010 Hydraulic Sprayer with a 200-gallon tank mounted on a trailer. Mixing facilities at Building 915 on Boca Chica incorporated a 500-gallon aboveground agitated tank for the mixing of powdered DDT which was then transferred to a 1,000-gallon tank for short-term storage. A trailer-mounted tank sprayer unit was also used for this operation to apply approximately 250 gallons/month.

Structural pests such as termites were typically controlled with chlordane. Fly control was accomplished with a low concentration of Malathion solution. Control of adult mosquitoes was performed using concentrated oil (diesel fuel). Applications were conducted based on need rather than a fixed schedule. Insecticide treatments were also accomplished through the use of an

ultra low volume (ULV) aerosol generator. A mosquito growth regulator, Altocil, was also used to control mosquito larvae. Of the common household and nuisance pests which required control at the activity, cockroaches were by far the worst problem. They were controlled through the application of a Baygon emulsion.

The pest control operations were primarily handled by Station personnel until the early 1970s when all pest control services were awarded to contractors. The five separate contracts awarded for pest control services included: Interior Pest Control, Grounds Maintenance which covers herbicide work for military housing, Chinch Bug Control for sodded area having turf pests, Mosquito Control by fogging trucks and aerial spraying, and Fumigation Treatment of Various buildings (tent fumigation).

Due to the loss of the in-house pest control function, a variety of materials from the Pest Shop, Building 265, were disposed in 1979. The items transferred off Navy property for final disposition are given in Table 6-3. Before the Pest Control Shop on Boca Chica, Building 915, was demolished in the early 1980s, miscellaneous pesticides were removed. A list of the types and quantities of materials removed from the shop are presented in Table 6-4. Of these materials listed, DDT and Mirex formulations were no longer authorized for use. The remaining materials were deteriorated and were not effective for use. These materials were disposed off Navy property.

5.1.4 Engineer and Repair Department. This department was composed of five different divisions: Planning, Machinery, Electrical, Hull and Electronics. The departments' Production Shops primary responsibilities at the Naval Station at Truman Annex consisted of the organization of maintenance, repair and overhaul operations for vessels homeported at Key West. The facilities operated from the 1940s until the mid-1970s. This shop area was decommissioned in March 1974 leaving the buildings vacant for later demolition. Table 5-2 summarizes waste generation for the Engineering and Repair Department.

5.1.4.1 Machine Division. The Machine Division was composed of the Machine Shop (Inside), Marine-Outside Machinist, and the Optical Shop. The division, housed in Building 7, was located on the waterfront. The Inside Machine Shop, being one of the larger operations, was principally involved with the disassembly, reassembly, fabrication, tooling, repair, maintenance and testing of mechanical equipment removed from the ships requiring overhaul. A major portion of the work performed by the Marine machinist was conducted on board vessels requiring some type of overhaul, primarily engine repair. The shop generated some 3,000 gallons/year of waste oil which was collected in drums at the building. Waste material was routinely taken to the salvage area for disposal off Navy property by DPDO personnel. Additionally, about 300 gallons/year of waste cleaning solvent was generated. This waste was also collected and sold by DPDO.

5.1.4.2 Hull Division. The two largest shops of this division were the Riggers/Labors Shop and the Joiner/Pattern Shop. The latter shop was fairly large because of the number of wooden craft assigned for overhaul in the late 1940s. The Shipfitting Shop provided major repair services to the metal hulls which included forging, fabricating and erecting large pieces of metal during ship repairs. Waste generated by these facilities consisted mainly of scrap wood and metal. Salvageable metal scrap was collected by DPDO for resale. The Paint Shop conducted some painting and sandblasting at a shed

near Fort Taylor until the early 1970s. A floating drydock, ARD-11, was also utilized for a period of time for vessel sandblasting. Waste typically generated by this operation included waste paints, thinners, cleaning solvents and residue from sandblasting. These wastes probably would have been taken to the Truman Annex Refuse Disposal Area (Site 1).

5.1.4.3 Battery Repair Shop. The operations in the Submarine Battery Shop (Building 104) included disassembly, reassembly, draining, rinsing, recharging, cleaning and plate removal which generated, in addition to the concentrated sulfuric acid-bearing rinse waters, potassium hydroxide electrolyte and lead. Two large acid vats were used for this operation. Non-serviceable batteries were taken to DPDO for resale.

5.1.4.4 Foundry. The foundry was located in Building 11 on the waterfront and operated in this area until the 1970s. The foundry produced small casting such as bearings and other miscellaneous parts required for ship repair. The majority of the wastes generated included materials such as waste sand, core butts, and casting cement.

5.1.5 Fleet Audio Visual Detachment. This facility was located at Trumbo Point, adjacent to Pier D-1. The Detachment operated and maintained a photo lab in support of NAS Key West. Less than five gallons/year of fixers and developers were disposed by the department into the sanitary sewer. Silver recovery unit sludge was sent to DPDO for resale. Table 5-2 summarizes waste generation for the Fleet Audio Visual Detachment.

5.1.6 Attack Squadron 45 (VA-45). VA-45 was located in Hangar 936 and had a two-fold mission. It provided both instrument flight and defensive air combat maneuvering training for operational fleet units. The squadron served as an instrument training standardization and examining unit, conducting ground and in-flight training for light attack and air anti-submarine wings. It also provided ground and in-flight training in defensive air combat maneuvering. Routine maintenance activities for the squadron's 14 planes generated waste engine oil, hydraulic fluids, contaminated fuel, cleaning solvent from parts cleaning, waste paint and some thinners from spot painting operations. These wastes were poured into the waste bowser located outside the hangar.

Wastes placed in the bowser were routinely picked up by base personnel and transported to the Trumbo Point Tank Farms for storage prior to disposal. Engine oil changes were performed approximately once each year and consumed about five gallons of oil. Therefore, the operation typically generated some 80 gallons/year of waste engine oil. All of these materials were reportedly poured into a waste bowser and transported to the Trumbo Point Tank Farm for storage prior to disposal. Table 5-3 summarizes the waste generation from VA-45.

Aircraft washing was performed on a regular basis at the wash rack next to Hangar 936. Approximately seven planes were washed weekly. Wastewater containing aircraft surface cleaners were discharged to the sanitary sewer since 1980. Prior to that time, the wastewater drained into the storm sewer.

5.1.7 Fighter Squadron 171 Detachment (VF-171). The mission of the Key West Detachment was to train pilots in fighter tactics using F-4J Phantoms and A-4 Skyhawks. The Fighter Detachment was responsible for teaching replacement pilots and Radar Intercept Officers (RIOs) how to win in air-to-air combat against enemy fighter aircraft. The squadron shared maintenance hangar space

Table 5-3

**Waste Generation from Attack Squadron 45, Fighter Squadron 171,  
Naval Air Development Center Detachment and Naval Communications Unit  
and Naval Intelligence Processing System Training Facilities**

Source	Waste Type	Quantities*	Date	Disposal Method/ Location
Attack Squadron 45	Waste oil	80	Since 1980	TPTF/FFTA**
	Waste fuel	100	Since 1980	TPTF/FFTA
	PD-680	50	Since 1980	TPTF/FFTA
	Waste paint	50	Since 1980	TPTF/FFTA
	Paint thinners, solvents	100	Since 1980	TPTF/FFTA
Fighter Squadron 171 Detachment	Waste fuel	300	Since 1980	TPTF/FFTA
	Naptha	100	Since 1980	TPTF/FFTA
	Toluene	60	Since 1980	TPTF/FFTA
	1,1,1-Trichloroethane	200	Since 1980	TPTF/FFTA
	MEK	200	Since 1980	TPTF/FFTA
	Waste paint	10	Since 1980	TPTF/FFTA
Naval Air Development Center Detachment	Mixed acids	5	Since 1980	Sanitary Sewer
	Waste thinners, paints	30	Since 1980	Sanitary Sewer
	Chlorinated solvents	5	Since 1980	Sanitary Sewer
Naval Communications Unit	1,1,1-Trichloroethane	50	Since 1973	TPTF/FFTA
Naval Intelligence Processing System Training Facilities	Waste fixer/developer	500	Since 1970	ONP
	Spent fixer/developer	100	Since 1970	Sanitary Sewer

\*Quantities in gallons/year, except Waste Fixer/Developer in pounds.

\*\*TPTF/FFTA = Trumbo Point Tank Farm/Fire Fighting Training Area

ONP = Off Navy Property

with VA-45 in Building A-936 at Boca Chica Field until 1983 when the unit was decommissioned. Squadron aircraft maintenance operations generated wastes similar to the activities of VA-45. In addition to the waste oil poured into the bowser, aircraft repairs generated cleaning solvents, thinners and paint wastes which were also placed into the bowser prior to storage at the Trumbo Point Tank Farms. Table 5-3 summarizes waste generation from VF-171.

**5.1.8 Naval Air Development Center Detachment (NADC).** This facility, located at Trumbo Point on the west end of Pier D-1, accomplished research and development efforts concerning anti-submarine and underwater warfare systems. Wastes typically generated in conjunction with these activities included: mixed acids (five gallons/year), mixed paint thinners and waste paint (30 gallons/year), and chlorinated solvents (five gallons/year). These wastes were poured into the sanitary sewer system. Table 5-3 summarizes waste generation for NADC.

**5.1.9 Naval Communications Unit (NCU).** This unit, established in 1905, was located in Building A-1019 on Boca Chica Field along with its receiver facilities. The unit's transmitter operations were located at Saddlebunch Key. The services they provided included routine general message delivery/distribution, all high frequency command and control communications, air-to-ground communications, message circuits, preventative and demand maintenance for various teletype and electronic systems along with area frequency coordination. Building 1019 contained the Electronic Maintenance Facility, TTY Repair Shop, CMS Vault, Supply/Fiscal Department and Facilities Maintenance. The maintenance and repair of electronic equipment generated roughly 50 gallons/year of waste (1,1,1-trichloroethane) which was sent to the Trumbo Point Tank Farms for storage. Table 5-3 summarizes waste generation from NCU.

**5.1.10 Naval Intelligence Processing System Training Facilities (NIPSTRAFAC).** The mission of this unit was to train officers and enlisted personnel for specialized intelligence billets for duty in or associated with the Naval Intelligence Processing System (NIPS) and to conduct test and evaluation of NIPS software/hardware programs. The facility was located on the NAS in Building 994. In January 1974 when NAS Albany, Georgia, was closed, NIPSTRAFAC was officially moved to NAS Key West. The facility's photo lab generated around five pounds of film per year which was sent to DPDO for resale. The waste film/fixer amounted to about 500 pounds annually and was also handled by DPDO for disposal off Navy property. Other chemicals used in the photo lab for film processing included: bleach fix, developer, fixing bath, neutralizers, replenisher, stabilizer, starter and stop bath. These chemicals were consumed at a rate of roughly 100 gallons annually and were discharged to the sanitary sewer along with photo processing rinse waters. Table 5-3 summarizes waste generation for NIPSTRAFAC.

**5.1.11 Naval Regional Medical Clinic (NRMC).** This facility, located at the east end of the City of Key West, and the Branch Clinic located at the NAS, provided general/specialized outpatient clinic services primarily for active duty Navy and Marine Corps personnel. When built in the early 1940s, the facility operated as an active Naval Hospital. However, due to the lack of an ongoing mission in the late 1970s, the hospital was downgraded to a regional clinic. No radioactive medicine was reportedly conducted at the clinic except X-rays. Waste X-ray film, about 2,200 pounds per year, was sold by DPDO. An average of about 60 gallons/year of fixer was processed through a silver recovery unit prior to discharge to the sanitary sewer. The

silver recovery unit sludge was, in turn, sent to DPDO for resale. Waste acids and paints were sent to DPDO for disposal off Navy property. General laboratory reagents used for various medical tests were discharged to the sanitary sewer with copious quantities of water. About one gallon per week of waste reagents was generated by the NRMCL laboratory. Table 5-4 summarizes waste generation from NRMCL.

5.1.12 Naval Regional Dental Clinic (NAVREGDENCLINIC). This clinic was located at the NAS, Building 640, with branch services in the City of Key West, Building A-4011. Its mission was to provide dental care for personnel of the station and fleet detachments and to such other personnel as may be authorized to receive dental treatment. The clinic generated about 25 gallons/year of X-ray fixer which was sent off Navy property for disposal. Table 5-4 summarizes waste generation from NAVREGDENCLINIC.

5.1.13 Patrol Hydrofoil Guided Missile Squadron/Mobile Logistics Support Groups (PHM/MLSG). The U. S. Navy's only hydrofoil squadron (six ships) was homeported at the Trumbo Point Annex, Pier D-1, from the early 1980s. The PHM's primary mission was to augment surface forces, particularly in coastal areas and narrow seas where surveillance was impractical for conventional ships. The MLSG supports the ships by performing preventive and corrective maintenance. Materials typically used during the course of repair activities included PD-680, paint thinners, acids, carbon removing compounds, and alcohol. The mixed waste paint and thinners were generated at a rate of some 50 gallons/year. About 30 gallons of freon was consumed annually for parts cleaning. Disposal of these wastes was performed through a hook-up to the pier holding tank. Small amounts of carbon removing compound, 12 gallons/year, were also disposed in this manner. Table 5-4 summarizes waste generation from PHM/MLSG.

5.1.14 Tactical Electronic Warfare Squadron 33 (VAQ-33). The squadron, Firebirds, moved to Hangar A-981 NAS Key West in 1980 from NAS Norfolk, Virginia. The primary mission of the squadron was to provide electronic warfare training for the Atlantic and Pacific fleet forces by interfering with and degrading (jamming) radar and communications systems. It was also tasked with furnishing a realistic jamming environment designed to meet the needs of modern warfare and flew several different types of aircraft with a total of 19 planes. These were the TA-3B, ERA-3B Sky Warrior, EA-4F Sky Hawk, and EA-6A Intruder. Maintenance operations required to support the activities of the squadron generated wastes such as engine oil, hydraulic fluids, paint and thinners, cleaning solvents along with small amounts of contaminated fuel. Corrosion control activities typically generated about 25 gallons/month of mixed paint and thinners. Waste paint was placed in five gallon cans and disposed off Navy property. Table 5-4 summarizes waste generation from VAQ-33.

The waste solvents were poured into 55-gallon drums and disposed off Navy property. Waste oil and contaminated fuel was placed in a bowser located outside the hangar. This material was routinely delivered to the Fire Fighter Training Area or Trumbo Point Tank Farm for storage.

The Naval Aviation Maintenance Detachment (NAMTD) of VAQ-33 provided technical training for officers and enlisted personnel in the maintenance and repair of assigned air weapons systems and associated equipment. This operation was located at Trumbo Point Annex (B-48) adjacent to Pier D-1. The maintenance training activities generated small quantities, less than ten

Table 5-4

Waste Generation from Naval Regional Medical Clinic, Naval Regional Dental Clinic,  
 Patrol Hydrofoil Guided Missile Squadron/Mobil Logistics Support Group,  
 and Tactical Electronic Warfare Squadron 33

Source	Waste Type	Quantities*	Date	Disposal Method/ Location
Naval Regional Medical Clinic	Waste X-ray film	2,000	1940s to 1970	DPDO
	Waste fixer	60	1940s to 1970	Sanitary Sewer
	Waste acid/paints	-	1940s to 1970	DPDO
	Reagents	50	1940s to 1970	Sanitary Sewer
Naval Regional Dental Clinic	Waste X-ray fixer	25	Since 1970	ONP**
Patrol Hydrofoil Guided Missile Squadron/ Mobil Logistics Support Group	PD-680, paint thinners	50	Since 1980	ONP
Tactical Electronic Warfare Squadron 33	MEK	100	Since 1980	ONP
	TMIK	60	Since 1980	ONP
	Toluene	40	Since 1980	ONP
	Laquer thinner	60	Since 1980	ONP
	Xylene	70	Since 1980	ONP
	Waste fuel	400	Since 1980	TPTF/FFTA

\*Quantities in gallons/year, except Waste X-ray Film in pounds.

\*\*TPTF/FFTA = Trumbo Point Tank Farm/Fire Fighting Training Area

ONP = Off Navy Property

gallons/year, of MEK, TMIK, laquer thinner, xylene and toluene. Wastes were generally poured into a temporary storage tank outside the building prior to disposal off Navy property.

5.2 ORDNANCE OPERATIONS. The NAS Key West mission was to maintain and operate facilities and provide services and materials to support operations of aviation activities. Consequently, the use of live ordnance for training operations was limited. Ordnance loading, manufacturing or rework were not conducted at NAS Key West. However, handling and storage of various kinds of ordnance items did occur over the years.

An Explosive Ordnance Disposal (EOD) detachment was located at Trumbo Point adjacent to Pier D-1. This detachment provided support to NRL and NADC in addition to the Air Station. Their mission was to detect, identify, evaluate, render safe, recover and dispose of all explosive ordnance. Ordnance materials were stored in magazines at Fleming Key prior to final disposal at Demolition Key. Typically, the materials (explosive, cads, munitions) were brought to Demolition Key via boat and placed on wooden pallets. The pallets were doused with diesel fuel or kerosene and time fuses were used for ignition purposes. The materials would generally burn for two to three hours. Old mines, found in waters surrounding the Keys, were disposed by EOD. Mines greater than 25 pounds were detonated approximately 10 to 15 feet under water in the small channel which ran through the middle of Demolition Key. Maximum single detonations of 25 pounds were allowed on land.

Major demolitions took place at Demolition Key about twice a year. The amount of ordnance disposed was highly variable. Currently, approximately 150 to 200 pounds a year of explosive materials are disposed by EOD.

Until the 1960s, ocean disposal was utilized as a method of ordnance disposal. Typically, 50-gallon drums were filled with ordnance and concrete, and then disposed off shore. The extent to which this method of disposal was used at NAS Key West was not reported.

## CHAPTER 6. MATERIAL HANDLING: STORAGE AND TRANSPORTATION

6.1 INTRODUCTION. Numerous materials were stored and transported at Naval Air Station (NAS) Key West. This chapter provides a summary of the main storage areas and the types and quantities of materials which were handled. Present operations are discussed only as an indication of past practices. Past records on materials and quantities are not available. Key long-term employees, familiar with daily operations of the past, have since relocated or transferred. Most of the information presented is taken from recent reports on materials handling.

### 6.2 INDUSTRIAL.

6.2.1 Materials Storage: Defense Property Disposal Office (DPDO). Prior to 1953, a fenced area near the water tower (Building 298) at Truman Annex was used for the storage of DPDO materials. In 1953 or 1954, when the DPDO facility was moved to the current location in Building 795, additional storage area was provided at the northwest corner of the building. From the mid-1950s to the mid-1970s, Fort Taylor was also used as a storage area by DPDO.

Various materials were handled by DPDO including empty batteries, transformers, waste oils and cleaning solvents, waste paints and acids, silver sludges, X-ray film and metal scraps. The stored transformers were emptied in the parking lot at the east side of Building 795 (Site 2).

6.2.2 Supply Storage. The supply storage facility at Boca Chica was located in Building A931. At Truman Annex, several buildings in the immediate vicinity of Fort Taylor were used for storage purposes. At Trumbo Point, a large warehouse (Building S-72) was used for storage. Materials were primarily transported by truck along U.S. Highway 1. Table 6-1 provides an inventory of the materials which have been stored at Boca Chica in the past.

6.2.3 Petroleum, Oil, Lubricants (POL). Beginning in 1942, fuel was brought in by tanker and pumped to the tank farm at Trumbo Point. Seven large concrete tanks (Tanks D1 through D7) ranging in size from 567,000 to 1,156,000 gallons were installed at Trumbo Point in 1942. Tanks D1 through D3 were used for diesel storage and Tanks D4 through D7 were used for Bunker C storage. Tank D4 was later converted to a diesel storage tank. All of these tanks were primarily used for ship refueling purposes. Currently, Tanks D1 through D4 are used for the storage of diesel fuel, while Tank D5 has been used for the storage of waste oils generated at NAS Key West since 1982, as described in Section 6.2.4. Tanks D6 through D7 were pumped out and abandoned in place.

A 10,500 gallon tank (D-21) was installed in 1942 at Trumbo Point as a ballast sludge tanks and later used for the storage of hazardous wastes, as described in Section 6.2.4.

Eleven aviation gasoline (AVGAS) tanks, originally installed in 1942 at Trumbo Point, were used for fueling seaplanes at the Seaplane Base located at Trumbo Point. The AVGAS tanks were emptied and abandoned in the late 1940s.

In 1966, three jet fuel storage tanks (total capacity 5.25 million gallons) which were fueled by tanker, were installed at Trumbo Point. JP-4 fuel was transferred as needed, via a four inch pipeline owned and operated by Key West Pipeline Company, from these tanks to the Boca Chica fuel pier. From

Table 6-1

Supply Storage Materials Inventory

Xylene, Technical	Propane Torch Kit
Acetone	Walkway Compound
Tetrachloroethylene	Dry Battery
Toluene-Methyl	Naptha Auphatic
Toluene-Methyl-Isobutyl	Methyl Ethyl Ketone
Toluene-Technical	1,1,1-Trichloroethane
Potassium Hydroxide	1,1,1-Trichloroethane Spray
Denatured Alcohol	Trichlorofluoromethane
Tetrachloroethylene	Propane
Dichlorodifluoromethane	Insect Repellent
Monochlorodifluoromethane	Lubricated Cleaning Compound
Nitrogen	Electric Parts
Aviator Breathing Oxygen	Aircraft Cleaning Compound
Butane	Solvent Cleaning Compound
Ammonia, Technical	Water Dispenser Compound
Helium, Technical	Dry Cleaning Solvent
General Purpose Deodorant	Penetrating Fluid
Trichlorotrifluoromethane	Duplicator Correction Fluid
PD-680, Type I	Duplicator Fluid
Carbon Removing Compound	Floor Polish Remover
Plastic Trash Can	Plastic Polish
Ink Eradicator	Primer Coating
Liquid Furniture Polish	Tacky Paint Remover Solvent
Enamel	Laquer Thinner (Dope)
Paint Remover	Oil Varnish
Polyurethane Paint Thinner	Epoxy Primer Coating
Polyurethane Coatings	Traffic Paint
Laquer Base (Dope)	Adhesive Paste
Red Lead Paint	Adhesive Asphalt
Laquer	Adhesive Epoxy Paste
Paint Thinner (Mineral Petroleum)	Rubber Adhesive
Oil Paint	Aircraft Lubricating Oil
Acetate Laquer Thinner (Dope)	Paint Thinner (Mineral Spirits)

Source: Adapted from NAS Key West Supply Office Inventory Sheet  
(August 1984)

there, a pipeline owned and operated by the Navy, transferred the fuel to the Boca Chica tank farm. The fuel was then piped, as needed, to a fueling station on Boca Chica, for dispersal to trucks which would transfer the fuel to various points at the NAS. In 1975, JP-4 was no longer used at NAS Key West, having been replaced by JP-5. A current list of the various tanks used for POL storage at NAS Key West is provided in Table 6-2.

Several fuel spill incidents have been reported at NAS Key West. A summary of each spill event follows (SOUTHNAVFACENGCOM, 1984).

On 6 February 1974, Tank A-958, located at Boca Chica, was overfilled due to operator error. Several thousand gallons of JP-5 spilled into the berm where it was collected and removed. There was no overflow of the berm and no JP-5 was discharged to surface waters.

On 2 May 1974, a pump to pipe connection failed and spilled 332 gallons of JP-4 which the pumphouse contained. No JP-4 was discharged to surface waters. The fitting failed due to slippage from vibration.

On 5 May 1980, a valve gasket failure at Boca Chica resulted in a spill of 800 to 900 gallons of JP-5. All except 50 gallons of this was captured in the valve pit berm area. The 50 gallons were boomed and recovered.

In June 1981, a pipe failed at Tank D-4, located at the Trumbo Point tank farm, and spilled 5,000 to 6,000 gallons of diesel into the berm. All of the diesel was captured and recovered with no discharge to surface waters.

On 5 October 1981, a pipeline leak on Pier D-2 spilled 300 gallons of diesel into the harbor where it was boomed and recovered.

**6.2.4 Chemical and Hazardous Materials Storage.** Tank D-21, located at Trumbo Point Tank Farm, was originally installed in 1942 as a ship ballast sludge tank. Between 1973 (beginning of oil embargo) and the late 1970s, the tank was used for the temporary storage of hazardous wastes (waste oil, hydraulic fluids). During this period, the tank contents were sold as waste oil to contractors who hauled the material off Navy property. This practice of selling waste oils was discontinued in the late 1970s and the hazardous wastes were allowed to accumulate in Tank D-21 until 1982 when the tank became full. After that time, waste oils (approximately 200 to 300 gallons/month) were placed in a 1,156,000 gallon concrete tank (D-5) at Trumbo Point. Contracts will be awarded by the Navy for the removal of the wastes from both tanks.

**6.2.5 Pesticide Storage.** Pest control operations were carried out at two sites at NAS Key West Field. The Pest Control Shop, Building 265 (Site 3) at Truman Annex, provided pest control to the Naval Station while the NAS was served by Building 915 (Site 5) at Boca Chica.

In the early 1970s, all pest control services were awarded to contractors. In 1979, a variety of materials were transferred from Building 265 to the Naval Security Group Activity, Homestead, Florida for disposition. Table 6-3 provides a list of these materials. Before Building 915 was demolished in the early 1980s, miscellaneous pesticides (Table 6-4) were removed. The materials were disposed off Navy property.

Table 6-2

## Petroleum, Oil, Lubricant (POL) Storage Tank Inventory

Location	Tank No.	Type*	Product	Size (kGal)
Naval Medical Clinic	L-41	UGS	Fuel Oil 2	2.7
	L-39	UGS	Diesel	2.0
Navy Communications Unit (Saddlebunch Key)	J-1563	AGS	Diesel	10.0
Sigsbee Park Housing	V-3005	UGS	MOGAS	4.0
	V-4022-1	UGS	MOGAS	10.0
	V-4022-2	UGS	MOGAS	10.0
	V-4022-3	UGS	MOGAS	10.0
	V-4022-4	UGS	Diesel	6.0
Fleming Key	F-2074	UGS	MOGAS	1.5
Trumbo Point Annex	D-1292	ES	MOGAS	15.0
	D-1293	ES	MOGAS	15.0
	D-1	ECC	Diesel	567.0
	D-2	ECC	Diesel	586.0
	D-3	ECC	Diesel	586.0
	D-4	ECC	Diesel	1156.0
	D-5	ECC	Waste Oil	1156.0
	C-2076	AGS	Diesel	1.0
	D-21	ECC	Hazardous Waste	1.05
Boca Chica	A-938	AGS	JP-5	240.0
	A-944	AGS	JP-5	239.0
	A-945	AGS	JP-5	213.0
	A-958	AGS	JP-5	298.0
	A-959	AGS	JP-5	293.0
	A-1005	AGS	Diesel	2.0
	A-1025	AGS	Diesel	1.0
	A-231	AGS	Diesel	2.0
	A-317-1	UGS	MOGAS	6.0
	A-313-2	UGS	MOGAS	6.0
	A-317-3	UGS	MOGAS	6.0
	A-944	AGS	Diesel	3.5
	A-322-1	UGS	MOGAS	10.0
	A-322-2	UGS	MOGAS	6.0
	A-322-3	UGS	MOGAS	6.0
	A-322-4	UGS	Waste Oil	4.0
	A-419-1	AGS	Diesel	5.0
	A-419-2	AGS	Diesel	5.0
	A-419-3	AGS	Diesel	5.0
	A-522-1	UGS	Fuel Oil 2	1.0
	A-522-2	UGS	Fuel Oil 2	1.0
	A-1332	AGS	Diesel	0.84
	A-515-1	UGS	Fuel Oil 2	1.0
	A-515-2	UGS	Fuel Oil 2	1.0
	A-727	AGS	Fuel Oil 2	0.75
	A-924	AGS	AVGAS	25.0
	A-925	AGS	AVGAS	25.0
	A-1107	AGS	Diesel	4.0
	A-150	AGS	AVGAS	4.0
	A-150	AGS	AVGAS	0.8
A-1042	AGS	JP-5	7.0	

\*UGS - Underground Steel  
 AGS - Aboveground Steel  
 ES - Elevated Steel  
 ECC - Earth Covered Concrete

Source: SOUTHNAVFACENGCOCM 1984

Table 6-3

## Truman Annex Pest Control Materials - 1979

<b>1) <u>Insecticides</u></b>	
Aluminum phosphide (phostoxin), 55% pellets	2 flasks
Carbaryl (Sevin), 10% dust	200 pounds
Carbaryl (Sevin), 80% WP	60 pounds
Chlordane, 45.3% EC	1 gallon
Chlordane, 5% dust	50 pounds
Chloropicrin, 99% Conc	5 pounds
Chlorpyrifos (Dursban), 22.4% EC	6 gallons
Chlorpyrifos (Dursban), 12.1% OS	30 gallons
Chlorpyrifos (Dursban), 5% Granules	50 pounds
Diazinon, 48% EC	6 gallons
Diazinon, 2% dust	50 pounds
Dichlorvos (Vapona), 44.1% EC	5 gallons
Dimethoate (Cygon), 30.5% EC	15 gallons
Isotox, 15% OS	3 pints
Malathion, 57% EC	10 gallons
Propoxur (Baygon), 1% OS	20 gallons
Propoxur (Baygon), 13.9% EC	23 gallons
Pyrethrum, 3% OS	8 gallons
<b>2) <u>Herbicides</u></b>	
Bromacil, 80% WP	129 pounds
Copper liquid	1 gallon
<b>3) <u>Rodenticides</u></b>	
Anticoagulant (Warfarin), 0.025% Bait	25 pounds
Anticoagulant (Warfarin), 0.005% Bait	40 pounds
Diphacinone, 0.1% Conc	4 pounds
Pivalyn, 15% Bait (14 ounce packets)	28 ounces
Rozol, 0.3% Tracking Powder	9 pounds
<b>4) <u>Miscellaneous</u></b>	
Bird repellent (For-The-Birds)	11 tubes
Metaldehyde (snail and slug pellets)	5 pounds
Repellent (Deet, 71.2% Conc (2 ounce bottles)	12 each
Silica Aerogel	30 pounds
<b>5) <u>Equipment</u></b>	
Aerosol Generator, ULV Root-Lowell, Model HCS1-2A	1 each
Aerosol Generator, Challenger	1 each
Aerosol Generator, Micro Gen, ULV	1 each
Dyna Fog, back pac duster	1 each
LECO, ULV Conversion Kit	1 each
Apron, rubber	1 each
Bait Station, rodent	7 each
Duster, bulb	1 each
Duster, hand, plunger	4 each
Gloves, rubber	4 pair
Goggles	5 each
Mosquito Light Trap	2 each
Respirator, half mask, A06058	4 each
Respirator, cartridge, AOR58	48 each
Sprayer, hand compression, 1 gallon	1 each
Sprayer, hand compression, 2 gallon	2 each
Scoops	2 each
Scales	1 each
Traps, mouse	3 dozen
Traps, rat	8 dozen
Trays, bait	25 each

Source: (SOUTHNAVPACENCOM 1980b)

Table 6-4

## Boca Chica Pesticide Disposal - 1980

<p>1) <u>Insecticides</u></p> <p>Baytex, 1% granules  Carbaryl (Sevin), 80% WP  Calcium cyanide, 42% dust (1 pound can)  DDT, 5% OS  DDT, 75% WP  Dieldrin, 0.5% OS  Dursban, 0.05% Briquets  Lindane, 1% dust  Malathion, 3% OS  Mirex, 0.150% bait</p>	<p>300 pounds  35 pounds  1 pound  4 gallons  300 pounds  2 gallons  10 pounds  14 pounds  15 gallons  50 pounds</p>
<p>2) <u>Miscellaneous</u></p> <p>Anticoagulant (Warfarin), 0.005% bait  Anticoagulant (Warfarin), 0.025% bait  Promar, 0.005% bait  Ortho Additive  Thiosperse Additive</p>	<p>15 pounds  15 pounds  65 pounds  55 gallons  55 gallons</p>

Source: (SOUTHNAVFACENGCOM 1980b)

6.2.6 Polychlorinated Biphenyls (PCB) Storage. From the mid-1950s until approximately 1970, out-of-service transformers were routinely taken to salvage (DPDO) for disposal at Truman Annex (Building 795). For further information regarding past dielectric fluid draining and disposal operations, see Section 8.3. Table 6-5 lists NAS Key West PCB transformers as of 1982.

6.2.7 Pier Materials Handling. Materials were brought in by truck via U.S. Highway 1 to Key West. Ships at the piers on Truman Annex and Trumbo Point were loaded by crews and work parties or by cargo net and crane. The ships were fueled via pipeline from Trumbo Point. The tank farm was resupplied by tanker ships. In the 1960s, there was 16 submarines stationed at Truman Annex and 8 destroyers at Trumbo Point Annex.

6.3 ORDNANCE. Ordnance was stored at various sites at Boca Chica and at the southern end of Fleming Key. Tables 6-6 and 6-7 provide a summary of ordnance storage facilities at Boca Chica and Fleming Key, respectively. Some of the facilities, as indicated in the tables, are no longer used for ordnance storage. Ordnance was primarily transported to NAS Key West by truck along U.S. Highway 1.

Table 6-5

## PCB Transformer Inventory - 1982

Location	Manufacture	Serial No.	Size KVA	Gallons	PCB
Boca Chica: Transformers Stored for Reuse at Old Auto Hobby Shop	Marcus	87043	75	48	Askarel
	ESCO	5127515	75	Estimated	Askarel
	Standard	18653	37.5	45	Pyranol
	GE	C861949	112.5	92	Pyranol
	GE	F-956769	300	74	Pyranol
	GE	H259825-69P	225	94	Pyranol
	Niagara	35597	500	152	Askarel N-3
	GE	B345406	45	41	Pyranol
	Central	2250-1	150	150	Askarel
	Wagner	F968116	150	135	No Flamol
	Niagara	31426	500	152	Askarel
	GE	7103127	333	180	PCB contaminated
	GE	7103123	333	180	PCB contaminated
	Allis-Chalmers	1841769	75	63	Chlorentol
	Wagner	B9G2281	75	-	No Flamol
	GE	H309438-72P	15	-	Pyranol
	GE	F497223-64P	15	-	Pyranol
	GE	6897075	100	42	Pyranol
	GE	F497222-64P	15	-	Pyranol
	Standard	114574	150	132	Pyranol
Capacitors	(4) EUC	70523	-	4.4	Yes
	(3) GE	-	37.5	33	Yes
	(1) GE	-	100	42	Yes
Trumbo Point: BEQ	Niagara	31378	333	70	Askarel N-3
	Niagara	31379	333	70	Askarel N-3
	Niagara	31377	333	70	Askarel N-3
Fuel Farm Next to Coast Guard: Building D24	GE	7095746	37.5	40	Pyranol
	GE	7095742	37.5	40	Pyranol
	GE	7095741	37.5	40	Pyranol
	GE	7095744	37.5	40	Pyranol
	GE	7095743	37.5	40	Pyranol
	GE	7095745	37.5	40	Pyranol
Drain in floor Building D24 Building 29	GE	7095746	37.5	40	Pyranol
	GE	7095742	37.5	40	Pyranol
	GE	7095741	37.5	40	Pyranol
	GE	7095744	37.5	40	Pyranol
	GE	7095743	37.5	40	Pyranol
Truman Annex: Building 1315 & 1350 437, 438, 439 BEQ in Building 438 Caribbean Command Forces Hdqt.	Niagara	31427	750	221	Askarel N-3
	Standard	148902	300	161	Pyranol
	Marcus	86729	250	149	Askarel
	Marcus	86730	250	149	Askarel
	Marcus	86728	250	149	Askarel

Source: (SOUTHNAVPACENGCOM 1982b)

Table 6-6

## Ordnance Storage Facilities - Boca Chica (1981)

Description	Facility No.	Storage Capacity (ft <sup>2</sup> )
Fuse and Detonation Magazine	A814, A1119, A1120	434
High Explosive Magazine	A805, A806, A996, A1121, A1122, A1123, A1124	5,373
Inert Storehouse	A811, A1068, A1108, A1114, A1166	13,222
Ready Magazine	A921	221
Small Arms/Pyrotechnic Magazine	A803, A807, A808, A817, A1117	2,627
Smokeless Powder/Pyrotechnic Magazine	A1118	1,377
Special Weapons Magazine Depot	A915	4,640
Missile Magazine	A965	<u>741</u>
Total		28,635

Facility Nos. A814, A805, A806, A811, A921, A803, A807, A808 and A817 are designated vacant/substandard.

Facility Nos. A1068 and A1108 are used by NAVCOMMU for storage.

Facility Nos. A1114 and A951 are used by Supply Department for storage.

Source: (SOUTHNAVFACENGCOM 1981b)

Table 6-7

## Ordnance Storage Facilities - Fleming Key (1981)

Description	Facility No.	Storage Capacity (ft <sup>2</sup> )
Fuse and Detonation Magazine	F6, F7, F9, F10, F13, F25	2,482
High Explosive Magazine	F8, F21, F22, F23, F24, F26, F27, F31, F32, F33, F34, F35, F36, F37, F1329, F1330, F1331	26,139
Inert Storehouse	F1, F16	7,311
Smokedrum Storehouse	F221	1,053
Small Arms/Pyrotechnic Magazine	F5, F5A, F12, F17, F18	5,184
Smokeless Powder/Pyrotechnic Magazine	F3, F4	<u>8,155</u>
Total		50,635

Facility Nos. F2, F16, F17 and F18 are not used and designated as vacant/substandard.

Source: (SOUTHNAVFACENGCOM 1981a)

## CHAPTER 7. WASTE PROCESSING

7.1 INTRODUCTION. Naval Air Station (NAS) Key West generated both solid and liquid waste materials. Processing and disposal techniques, and disposal sites typically varied with time. This chapter summarizes the major waste processing and disposal operations at NAS Key West and provides estimates of the quantities and types of disposed materials.

### 7.2 INDUSTRIAL.

7.2.1 Sanitary Sewer Systems. Two sewage treatment plants (Boca Chica and Sigsbee Park) served portions of NAS Key West. Sewer service at Boca Chica was provided by secondary treatment and also by septic tanks. The sewage treatment plant originally provided primary treatment but was upgraded in 1970 to a contact stabilization plant with a design capacity of 400,000 gallons per day. From 1952 to approximately 1979, the sewage sludge was disposed in the Fleming Key landfills (Sites 7 and 8). Since 1979, the sludge has been taken off Navy property. Chlorinated effluent from the chlorine contact basins was discharged via gravity outfall to the Gulf of Mexico (Black, 1977).

The treatment plant received other wastes in addition to sanitary sewage. Beginning in 1980, detergent (Turco) wastewater from aircraft washdown operations, conducted at the washrack next to Hangar 936, was discharged into the sanitary sewer system. Because these discharges created upsets of the Boca Chica treatment plant, and a new wastewater detergent was employed, which seemed to have eliminated the problem.

The Sigsbee Park sewage treatment plant was constructed as a primary treatment plant in 1952 and upgraded in 1970 to a contact stabilization plant with a design capacity of 600,000 gallons per day. The treatment system now consists of a comminutor, two mixing tanks, two clarifiers, a reaeration tank, two aerobic digesters, a chlorine contact chamber and sludge drying beds (SOUTHNAVFACENCOM, 1981a). The plant provided service to the Naval housing areas of Sigsbee Park and treated effluent was discharged to the Gulf of Mexico. From 1952 to 1982 dewatered sludge was disposed at the Fleming Key landfills (Sites 7 and 8). Since 1982, the dewatered sludge has been trucked off Navy property.

The Medical Clinic, the Commissary, White Street Trailer Park, and the Poinciana housing area all discharge to the City of Key West collection system, which directly discharges into the Atlantic Ocean.

7.2.2 Incinerators. The Naval Hospital, which was completed in 1941, regularly used an on-site incinerator for the disposal of pathological wastes. The incinerator has since been replaced by a smaller propane incinerator which is used primarily for the disposal of laboratory cultures and used syringes. This incinerator processes approximately 300 pounds of waste per year. The old, abandoned incinerator probably handled a significantly greater volume of waste since the medical facility was an operational hospital at the time. The incinerator ash was probably disposed of at the Fleming Key landfills.

7.3 ORDNANCE. An Explosive Ordnance Disposal (EOD) detachment was located at Trumbo Point adjacent to Pier D-1. Ordnance materials were stored in magazines at Fleming Key prior to final disposal at Demolition Key. Typically, the materials (explosive, cads, munitions) were brought to Demolition

Key via boat and placed on wooden pallets. The pallets were doused with diesel fuel or kerosene and time fuses were used for ignition purposes. The materials would generally burn for two to three hours. Old mines, found in waters surrounding the Keys, were disposed by EOD. Mines greater than 25 pounds were detonated approximately 10 to 15 feet under water in the small channel which ran through the middle of Demolition Key. Maximum single detonations of 25 pounds were allowed on land.

Major demolitions took place at Demolition Key about twice a year. The amount of ordnance disposed was highly variable. Currently, approximately 150 to 200 pounds a year of explosive materials are disposed by EOD.

Up until the 1960s, ocean disposal was utilized as a method of ordnance disposal. Typically, 50-gallon drums were filled with ordnance and concrete, and then disposed off shore. The extent to which this method of disposal was used at NAS Key West was not reported.

## CHAPTER 8. DISPOSAL SITES AND POTENTIALLY CONTAMINATED AREAS

8.1 GENERAL. This chapter presents findings on past waste disposal sites that may be potentially contaminated. As a results of extensive records searches, interviews and on-site examination, eight potentially contaminated areas were identified at Naval Air Station (NAS) Key West by the initial assessment study (IAS) team. These are sites where waste disposal occurred in the past. The locations of these eight waste disposal sites are shown on Figures 8-1 and 8-2. A detailed discussion of each of the identified disposal sites is contained in the remainder of this chapter. Each of the sites is discussed in terms of its location, operational history, types of wastes disposed at the site, and potential contaminant migration pathways and receptors. Table 8-1 summarizes the information collected on these sites.

8.2 SITE 1, TRUMAN ANNEX REFUSE DISPOSAL AREA. Site 1 is located at Truman Annex in the general proximity of the current antenna field. The site covers an area of approximately seven acres, including the antenna field and the area to the immediate south. The location of this site is shown in Figure 8-3. From 1952 until approximately the mid-1960s, this site was used as a general refuse disposal and open burning area.

Combustible wastes for the Naval Station such as telephone poles, tree clippings, paper, etc., were taken to Site 1 and burned. Waste liquids, such as oils and hydraulic fluids were used to ignite fires. It is also probable that Site 1 received wastes from the Naval Station, which would have included primarily general refuse. Because no restrictions were placed on the types of wastes disposed at Site 1, it is likely waste paint, paint thinner and solvents from the Naval Station shops were also disposed here.

The south and southeastern portion of Site 1 are bordered by the Atlantic Ocean. The ground water in the area is approximately two to three feet below the surface and flows in a southerly direction to the Atlantic Ocean. The site is relatively flat with no signs of surface erosion due to runoff from the site. The permeability of the Miami Oolite soils at the site depends in part on the degree of compaction of the material.

Except for a few large articles lying on the ground and some scrap materials evident in the shore riprap, the site has little or no evidence that it was used as an open disposal and burning area. There is no apparent evidence of any biological stress to indicate past contamination. Since disposal operations were discontinued at the site in the mid-1960s, a lush rank growth of vines, weeds and wildflowers have appeared on the site. Some Australian pines and Brazilian peppers are beginning to appear.

8.3 SITE 2, TRANSFORMER OIL DISPOSAL AREA. Site 2 is the gravel parking area surrounding Building 795, which is the current Defense Property Disposal Office (DPDO). It covers an area of approximately 0.5 acre. During the time period from the mid-1950s to approximately 1970, off-line transformers were sent to the Key West DPDO at Truman Annex for ultimate disposal. The dielectric fluid contained in the transformers was routinely spread along a gravel parking area surrounding Building 795 for dust and weed control purposes. The location of this site is shown in Figure 8-4. Transformers were loaded onto a forklift truck, and then a hole was poked into the transformer bottom. The transformer was then driven back and forth over the gravel parking area while the dielectric fluid drained out.

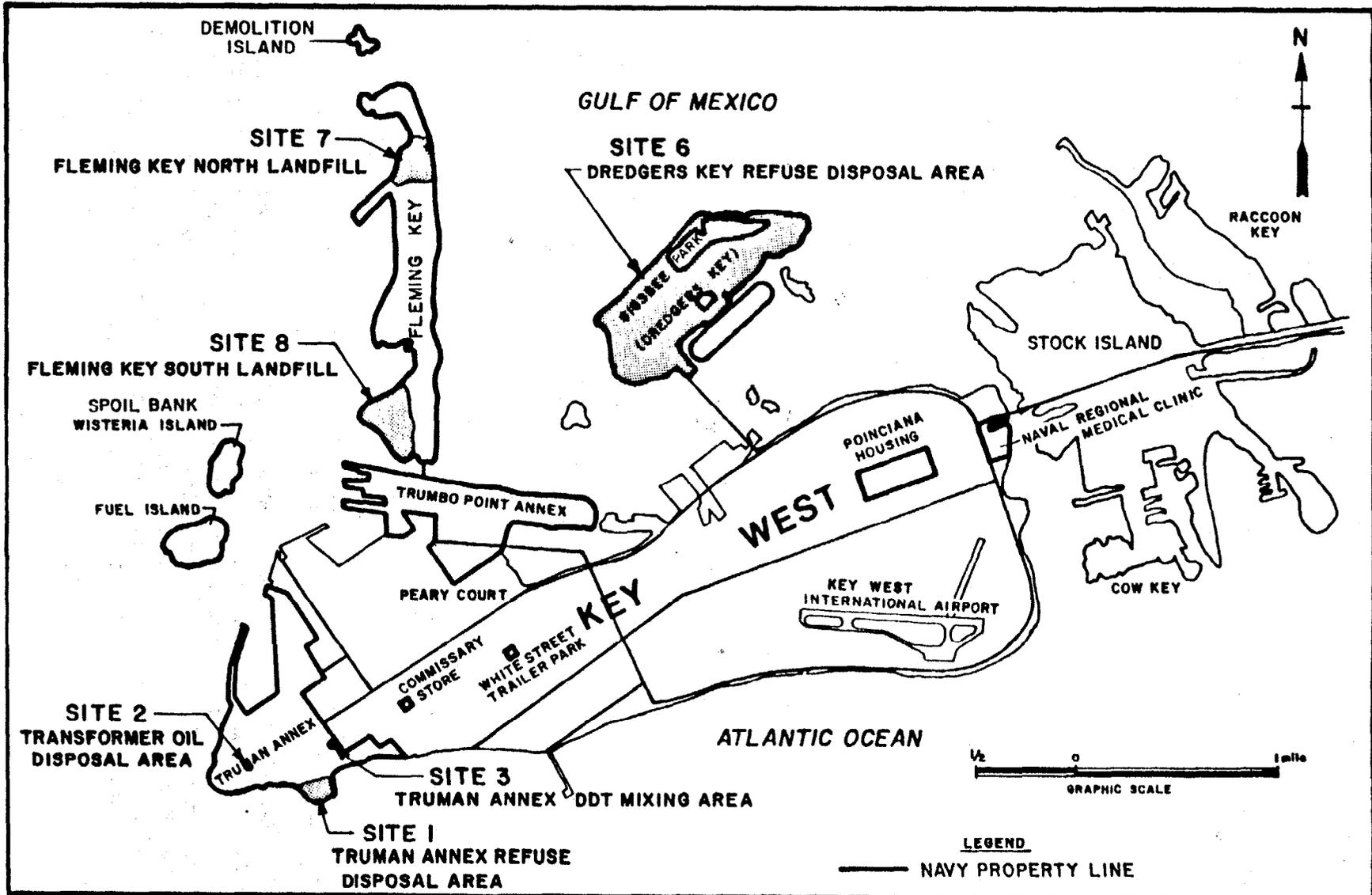


FIGURE 8-1  
KEY WEST  
Waste Disposal Sites

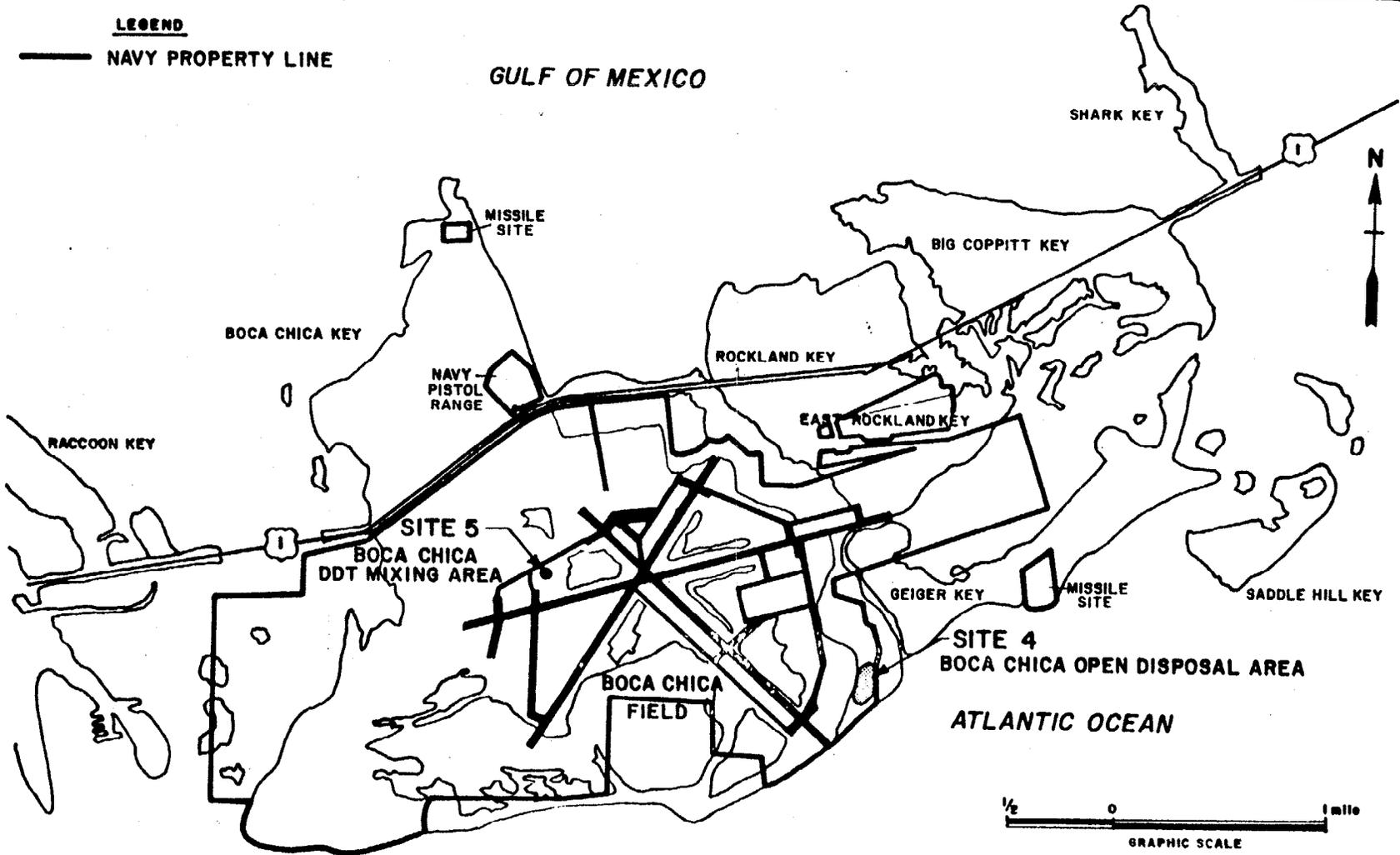


INITIAL ASSESSMENT STUDY  
NAVAL AIR STATION  
KEY WEST, FLORIDA

**LEGEND**

— NAVY PROPERTY LINE

GULF OF MEXICO



**FIGURE 8-2  
BOCA CHICA  
WASTE DISPOSAL SITES**

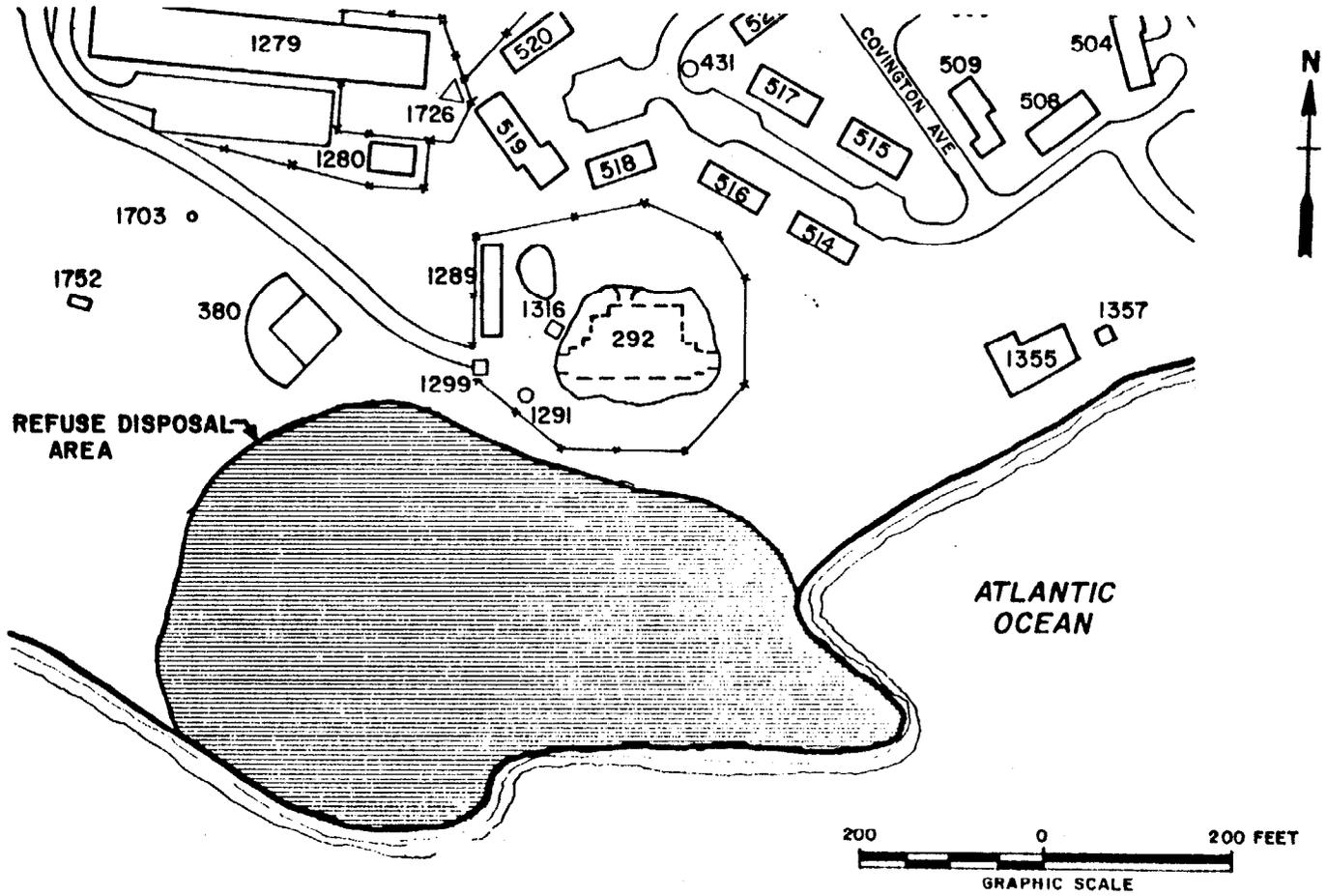


**INITIAL ASSESSMENT STUDY  
NAVAL AIR STATION  
KEY WEST, FLORIDA**

Table 8-1

## Potentially Contaminated Sites at NAS Key West

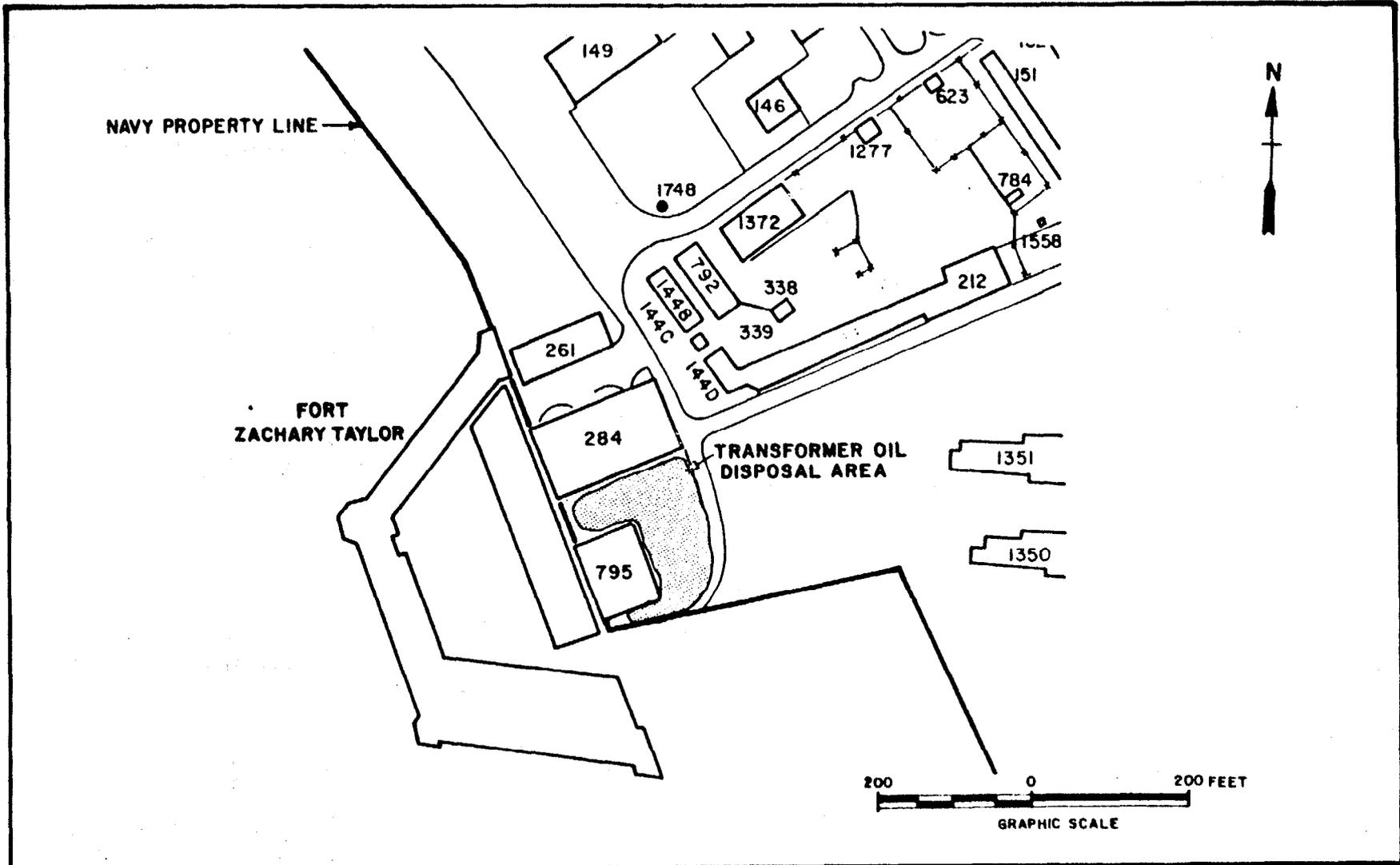
Site No.	Site Name	Location	Period of Operation	Types of Material Disposed	Comments
1	Truman Annex Refuse	Truman Annex	1952 to mid-1960s	Combustibles, waste paints, paint thinners, solvents	Received Naval Station combustibles, open burning area
2	Transformer Oil Disposal Area	Truman Annex	mid-1950s to 1970	Dielectric fluid, PCBs	Dielectric fluid used to control dust and weeds
3	Truman Annex DDT Mixing Area	Truman Annex	1940s to early 1970	DDT	Spillage of solutions and concentrates
4	Boca Chica Open Disposal Area	Boca Chica	1942 to mid-1960s	Refuse, waste oil, waste paints and thinners, solvents (toluene, xylene, MEK, TMIK, PD-680)	Primary landfill for Air Station
5	Boca Chica DDT Mixing Area	Boca Chica	1940s to early 1970	DDT	Spillage of solutions and concentrates
6	Dredgers Key Refuse Disposal Area	Dredgers Key	early 1940s to 1952	Refuse	Primary disposal for Naval Station refuse
7	North Fleming Key Landfill	Fleming Key	1952-1962	Refuse	Primary landfill for Naval Station refuse
8	South Fleming Key Landfill	Fleming Key	1962-1980	Refuse, waste oil, waste paints and thinners, solvents (toluene, xylene, MEK, TMIK, PD-680)	Primary landfill for Naval Station from 1962 to 1980; Primary landfill for Air Station from 1966 to 1980



**FIGURE 8-3**  
**Site 1**  
**Truman Annex Refuse Disposal Area**



**INITIAL ASSESSMENT STUDY**  
**NAVAL AIR STATION**  
**KEY WEST, FLORIDA**



**FIGURE 8-4**  
**Site 2**  
**Transformer Oil Disposal Area**



**INITIAL ASSESSMENT STUDY**  
**NAVAL AIR STATION**  
**KEY WEST, FLORIDA**

During the time period that the transformer oil was being drained onto the parking area, many of the Key West Naval Complex transformers contained polychlorinated biphenyls (PCB) dielectric fluid. It is probable that some of the transformers drained at the site contained PCB dielectric fluid. Since the transformers were not tested prior to being drained, it is not known whether they were PCB contaminated.

PCB contaminated soil is the major threat to human health posed by this site. PCBs are relatively insoluble in water and migrate slowly through soil. The transformer oil disposal area is currently gravel covered and devoid of vegetation. The area is subjected to vehicle and pedestrian traffic. The ground water at the site is approximately three to four feet below ground surface. Available topographic information indicates that ground water flows are predominantly in a southerly direction. There are surface waters within 1,500 feet of the site to the south, west and north. There are no surface drainage systems at the site. Ground water movement represents a potential pathway for contaminant migration to nearby surface waters. The surface waters to the south of the site serve as swimming areas for tourists and residents.

8.4 SITE 3, TRUMAN ANNEX DICHLORODIPHENYL TRICHLOROETHANE (DDT) MIXING AREA. Site 3 is located at the former site of Building 265, which has been demolished. The yard is approximately 0.25 acre in size. The location of the former DDT mixing area is shown on Figure 8-5. It was used as a DDT mixing area from the 1940s to the early 1970s. Disposal at this site was not intentional but instead would have been the result of accidental spillage of the mixed solution and concentrates.

The powdered DDT concentrate was mixed with water in 55-gallon drums. The drums were then stored both inside and outside of Building 265. The actual spraying of the DDT solution was done by a small tank truck. The 55-gallon drums of the mixed DDT solution were used to fill the tank on the truck. During the filling operation, small amounts of spillage reportedly did occur on occasion.

The area where the DDT mixing was done is currently a vacant lot covered with sparse grass and weeds. There is no indication that a building once stood at the site. There is no apparent evidence of any biological stress to indicate past contamination. The ground water in the area is approximately two to three feet below the ground and flows in a southerly direction to the Atlantic Ocean which is approximately 1,100 feet away. The site is relatively flat with no signs of surface erosion due to runoff from the site.

8.5 SITE 4, BOCA CHICA OPEN DISPOSAL AREA. The open disposal area is located between the perimeter road and Geiger Creek, as shown on Figure 8-6. Site 4 covers an area of approximately ten acres. From 1942 until the mid-1960s, the southeastern most portion of Boca Chica Key was used as an open disposal area. The use of this site for disposal purposes dates back to 1942 when the NAS was first established on Boca Chica Key. Site 4 received all the waste generated at the Air Station. This included wastes associated with the operation and maintenance of aircraft that were generated by the squadrons and Aircraft Intermediate Maintenance Department (AIMD). Typical wastes disposed at the site included primarily general refuse, and possibly waste oils, hydraulic fluid, paint, paint thinner and solvents not taken to fire fighting training. During the period the site was operated, approximately 2,600 tons of waste from the Air Station was disposed at the site annually.

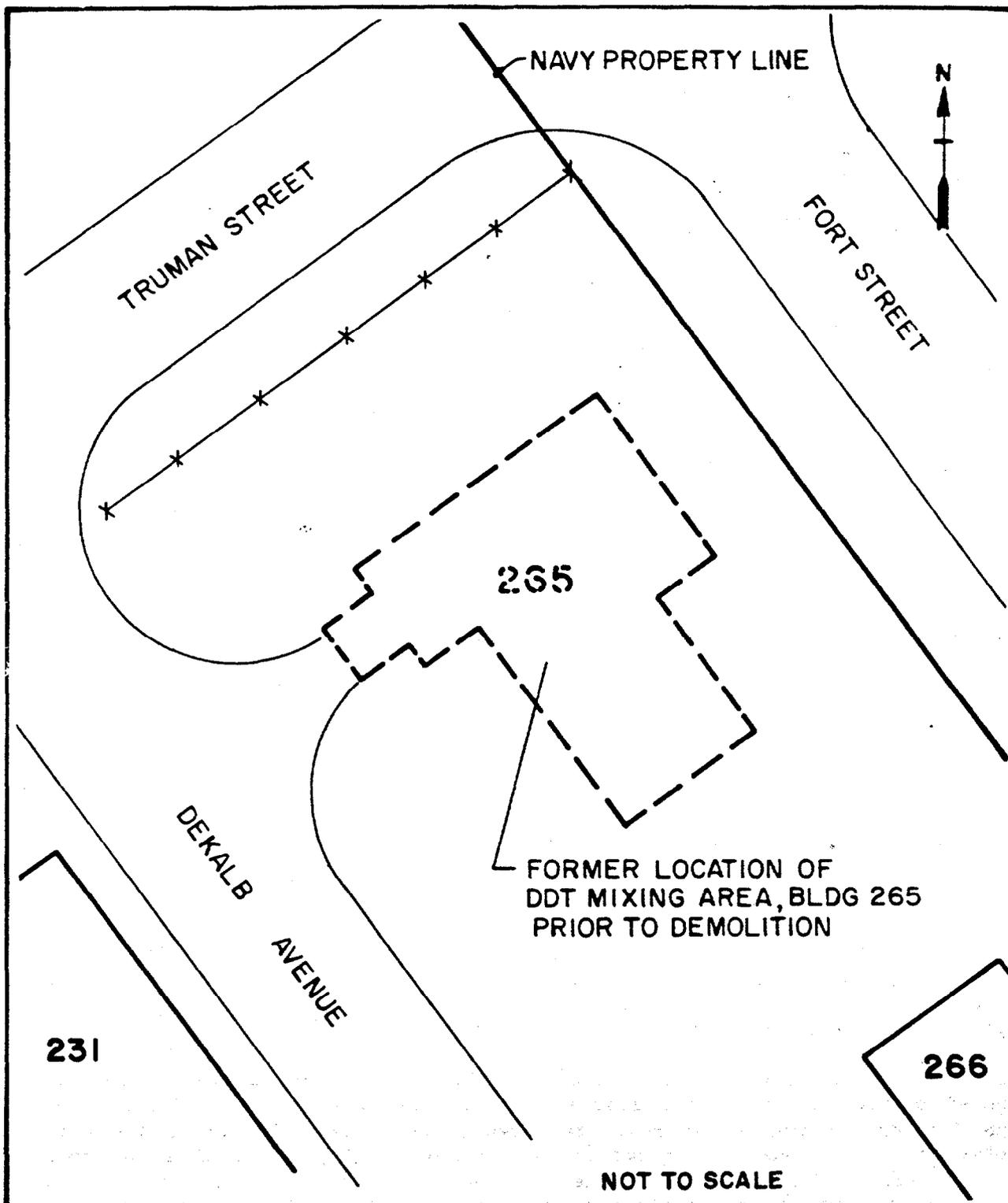
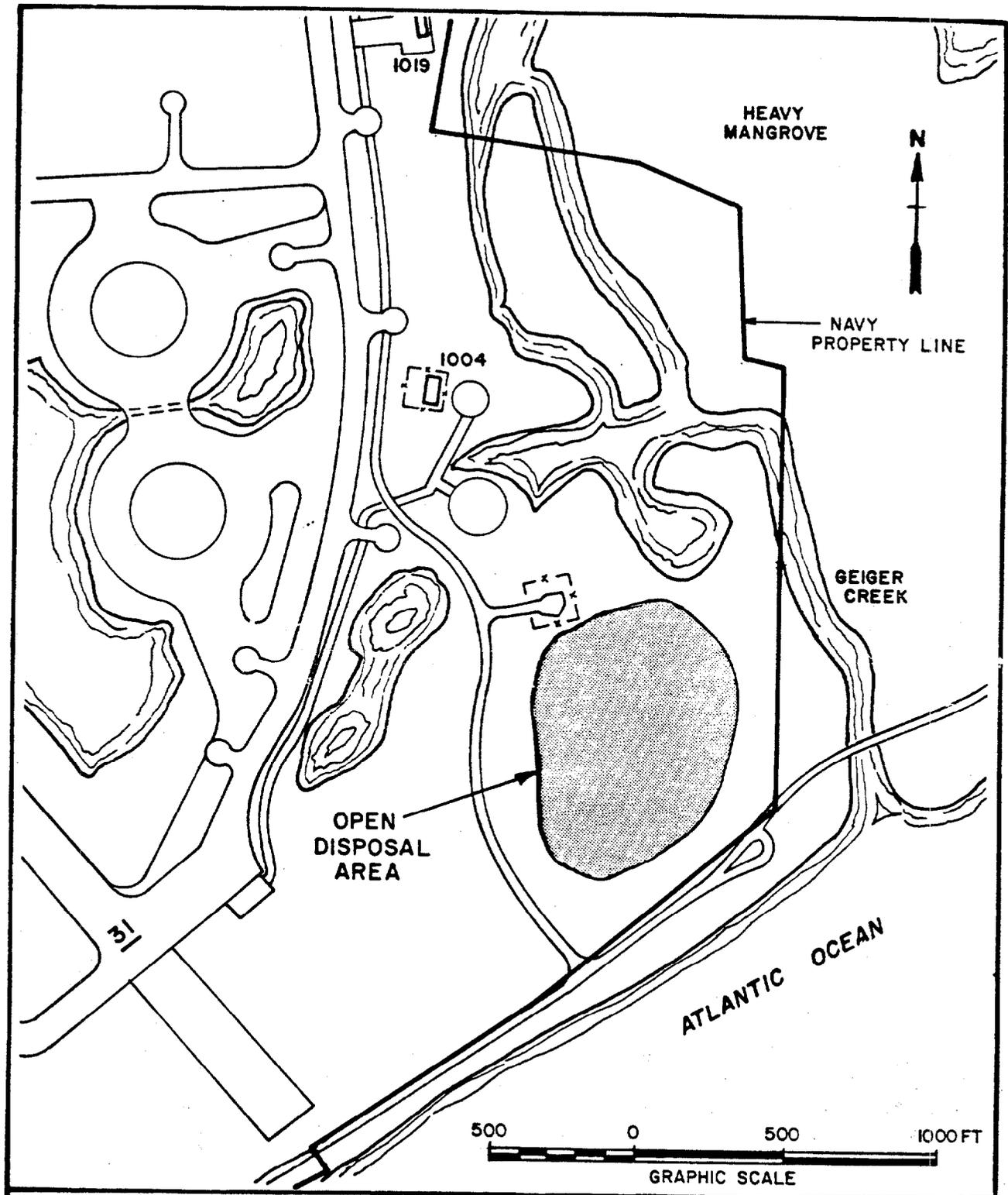


FIGURE 8-5

**Site 3**  
**Truman Annex**  
**DDT Mixing Area**



**INITIAL ASSESSMENT STUDY**  
**NAVAL AIR STATION**  
**KEY WEST, FLORIDA**



**FIGURE 8-6**

**Site 4  
Boca Chica  
Open Disposal Area**



**INITIAL ASSESSMENT STUDY  
NAVAL AIR STATION  
KEY WEST, FLORIDA**

Table 8-2 summarizes the types and quantities of wastes assumed to have been disposed at Site 4. The site was operated as an open disposal and burning area and intended to fill low-lying areas. Wastes were deposited on the ground and burned daily if wind conditions permitted. Wastes were burned at the site for volume reduction.

Site 4 contains numerous weed-covered mounds approximately five feet high and ten feet in diameter. These mounds seemed relatively stable with no signs of exposed waste. A trench located just east of the mounds may have provided the cover material for the mounds. Located at the northwest corner of the site are three large, empty, rusted and abandoned, aboveground tanks. The ground and foundations around the tanks were covered with a black tar-like substance. A scrubby growth of weeds occurs throughout the area. East of the disposal area are tall mangroves in shallow standing saltwater. Geiger Creek lies approximately 200 feet east of the area.

The disposal site as a whole is located in a low area which is subject to frequent tidal inundation. The presence of blue green algae around the base of the mounds indicates that the area was recently flooded. Ground water in the area, which is at or near the ground surface, flows east and south toward Geiger Creek and the Atlantic Ocean, respectively. There is a pathway for potential contaminant migration from the area via tidal flushing and ground water movement.

8.6 SITE 5, BOCA CHICA DDT MIXING AREA. Site 5 is located at the former site of Building 915. The site is approximately 0.25 acre in size. The location of the site is shown on Figure 8-7. This site was used to mix DDT insecticide from the 1940s to the early 1970s. Disposal at this site was not intentional, but instead would have been the result of accidental spillage of the mixed solution and concentrates. Located just outside and to the west of the building were two aboveground tanks on concrete foundations. One was a 500-gallon mixing tank and the other a 1,000-gallon storage tank. Building 915 was demolished around 1982. During removal of the tanks, some spillage occurred. A small amount of building demolition debris (such as pieces of wood, scrap metal and concrete chunks) is all that remains at the site.

A slight odor of pesticide was detectable at the site during the on-site survey. A drainage ditch is located just south of the site. Drainage from the ditch is to a large borrow pit to the east. The area near the demolition debris is partly covered with sparse grass, while the ditch has medium size mangroves around the banks. During the on-site survey, numerous small fish were observed in the ditch.

The site is in a low-lying area with ground water elevations approximately one to two feet below the ground. Ground water in the area flows south to the ditch, which leads to a borrow pit (Figure 8-7). During periods of rainfall, surface runoff from the site drains directly into the ditch. Thus, both ground water movement and surface runoff represent pathways for potential contaminant migration.

8.7 SITE 6, DREDGERS KEY REFUSE DISPOSAL AREA. Site 6 is located on a man-made island just north of Key West. It covers an area of approximately 250 acres as depicted on Figure 8-8. Dredgers Key, which was formed from dredge material during construction of the Seaplane Base, was used from the early 1940s until 1952 as an open disposal and burning ground for wastes generated at the Naval Station. Approximately 1,000 to 2,000 tons of waste

Table 3-2

Wastes Disposed at Site 4, Boca Chica Open Disposal Area

Waste	Source of Waste	Time Period	Estimated Total Quantity	Comments
General Refuse	Naval Air Station	1942 to mid-1960s	60,000 tons	Open disposal and burning
Waste oils, fuels	AIMD, air operations and squadrons	1942 to mid-1960s	50,000 gallons	Maximum quantity estimated disposed at this site and/or Fire Fighting Training Area
Solvents (MEK, toluene, xylene, PD-680)	AIMD, air operations and squadrons	1942 to mid-1960s	40,000 gallons	Maximum quantity estimated disposed at this site and/or Fire Fighting Training Area
Waste paints	AIMD, air operations and squadrons	1942 to mid-1960s	1,000 gallons	Maximum quantity estimated disposed at this site and/or Fire Fighting Training Area
Waste thinners	AIMD and squadrons	1942 to mid-1960s	3,000 gallons	Maximum quantity estimated disposed at this site and/or Fire Fighting Training Area

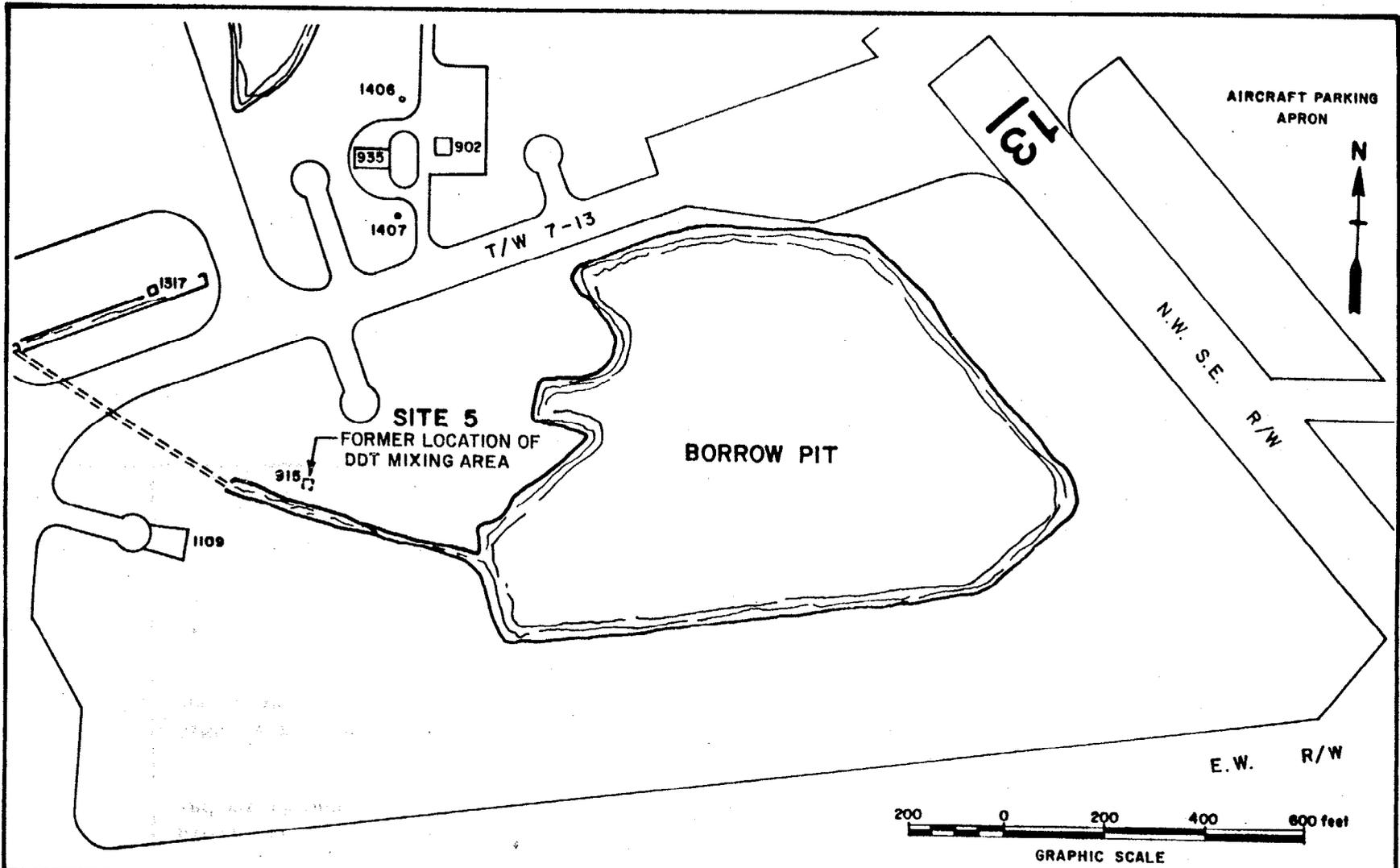


FIGURE 8-7  
**Site 5**  
Boca Chica DDT Mixing Area



**INITIAL ASSESSMENT STUDY**  
**NAVAL AIR STATION**  
**KEY WEST, FLORIDA**

from the Naval Station were disposed at Site 6 annually. Wastes typically consisted of bulky refuse items. Prior to 1952, Naval Station garbage was disposed of by barging to open ocean disposal areas. The City of Key West was also using the site to dispose of some refuse. Wastes were burned at the site for volume reduction.

Waste disposal operations were discontinued at the site in 1952. At this time construction began on the Sigsbee Park Navy housing project. Ground elevations ranged from approximately five to eight feet mean sea level (MSL) before the housing area was constructed. Additional fill material was added to obtain the existing elevations of from six to nine feet MSL. With the exception of the eastern portion of Dredgers Key, the entire area is covered by Navy housing.

The depth to ground water at the site is approximately five to eight feet below ground level. However, the waste materials are likely to be within three to five feet of the ground water. Ground water in the area flows to the Gulf waters which surround the Key. Due to the permeable nature of the limestone spoil material and the tidal flushing action, ground water movement is a pathway for potential contaminant migration.

8.8 SITE 7, NORTH FLEMING KEY LANDFILL. Site 7 is located on the northern end of Fleming Key. The location of the landfill, which covers an area of approximately 30 acres, is shown on Figure 8-9. The northern portion of Fleming Key was used as a landfill for Naval Station wastes for a ten year period from 1952 to 1962. It is estimated that during the period that the landfill was operated, approximately 4,000 to 5,000 tons of waste from the Naval Station was disposed at the landfill annually. Typical wastes disposed at the landfill probably consisted of general refuse.

The open trench method was used for the landfill operation. The trenches were approximately 25 feet wide, 10 feet deep and 500 to 1,000 feet in length. Burning was not done at the site. The wastes were placed directly into the trenches. There was typically about three feet of sea water in the bottom of each trench. Thus, the wastes were in direct contact with the sea water upon disposal. The trench was covered at the end of each working day. Typically, the loose material from the next trench was used to cover the completed trench. DDT, malathion and diesel oil were sprayed at the landfill to control pests and insects.

In 1977, the U. S. Department of Agriculture Animal Import Center was constructed over a portion of the landfill. During construction of the Animal Import Center, wastes were excavated and transferred to an area to the immediate west. This created a mounded area which is approximately four feet above the surrounding ground. In constructing the Animal Import Center an impermeable clay and synthetic liner was installed under the building and gas vents put in to prevent the buildup of methane gas in the building.

Based on visual observations from the on-site survey, there are no well-defined surface drainage patterns from the site. Except for some empty drums, bottles, metal caps and a submarine battery, the wastes are covered and overgrown with vegetation. Most of the area is cleared and mowed. The parts left fallow have produced a dense growth of understory and brush. Australian pines are evident inland, with mangrove along the shoreline. There is no obvious evidence of pollution or biological stress at the landfill site.

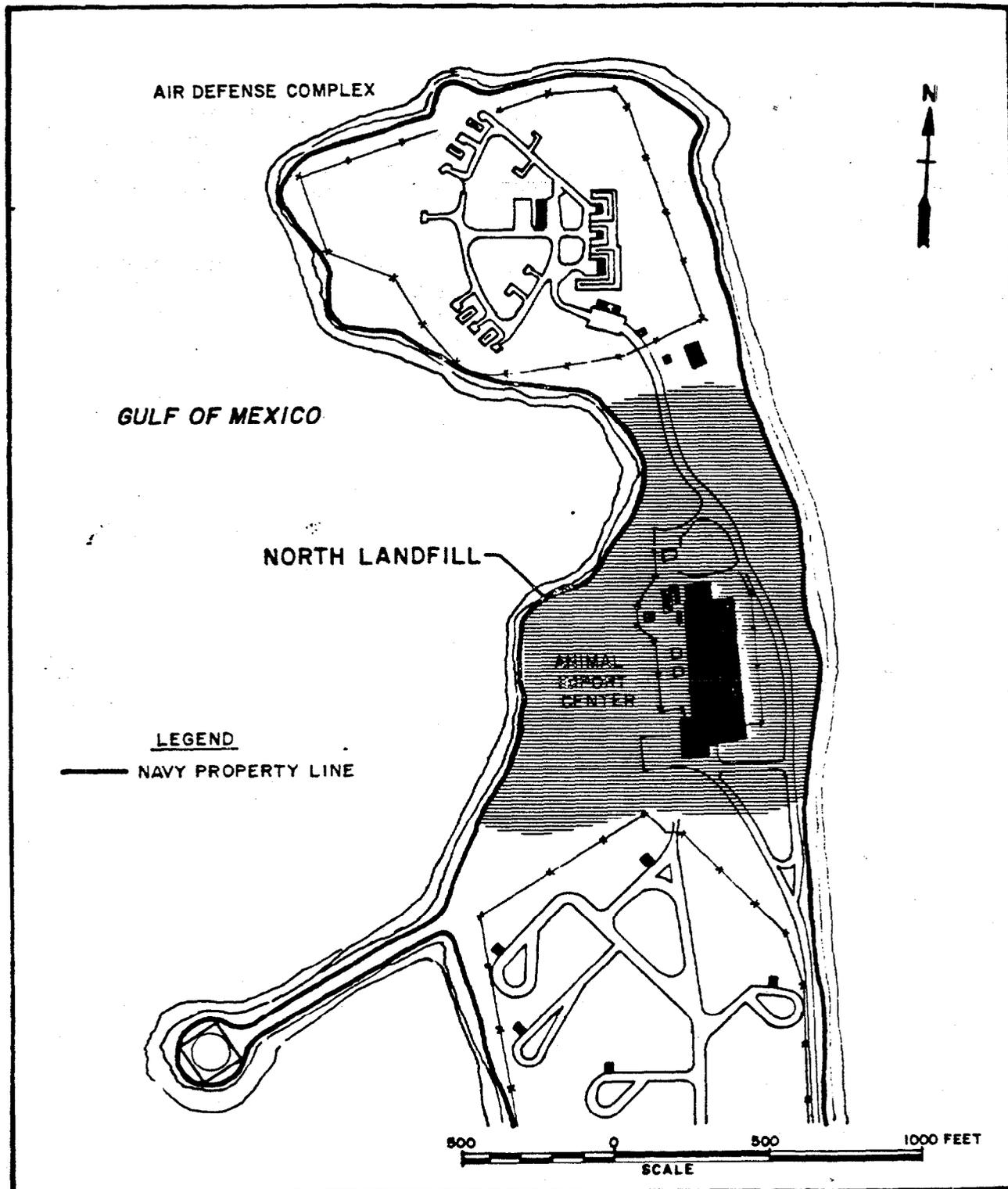


FIGURE 8-9

Site 7  
North Fleming Key Landfill



INITIAL ASSESSMENT STUDY  
NAVAL AIR STATION  
KEY WEST, FLORIDA

The ground water in the area is approximately two to three feet below ground allowing direct contact with the buried waste. The general ground water flow in the area is toward open waters surrounding the Key. Due to the permeable nature of the limestone spoil material of Fleming Key and tidal flushing action, ground water movement is a pathway for potential contaminant migration.

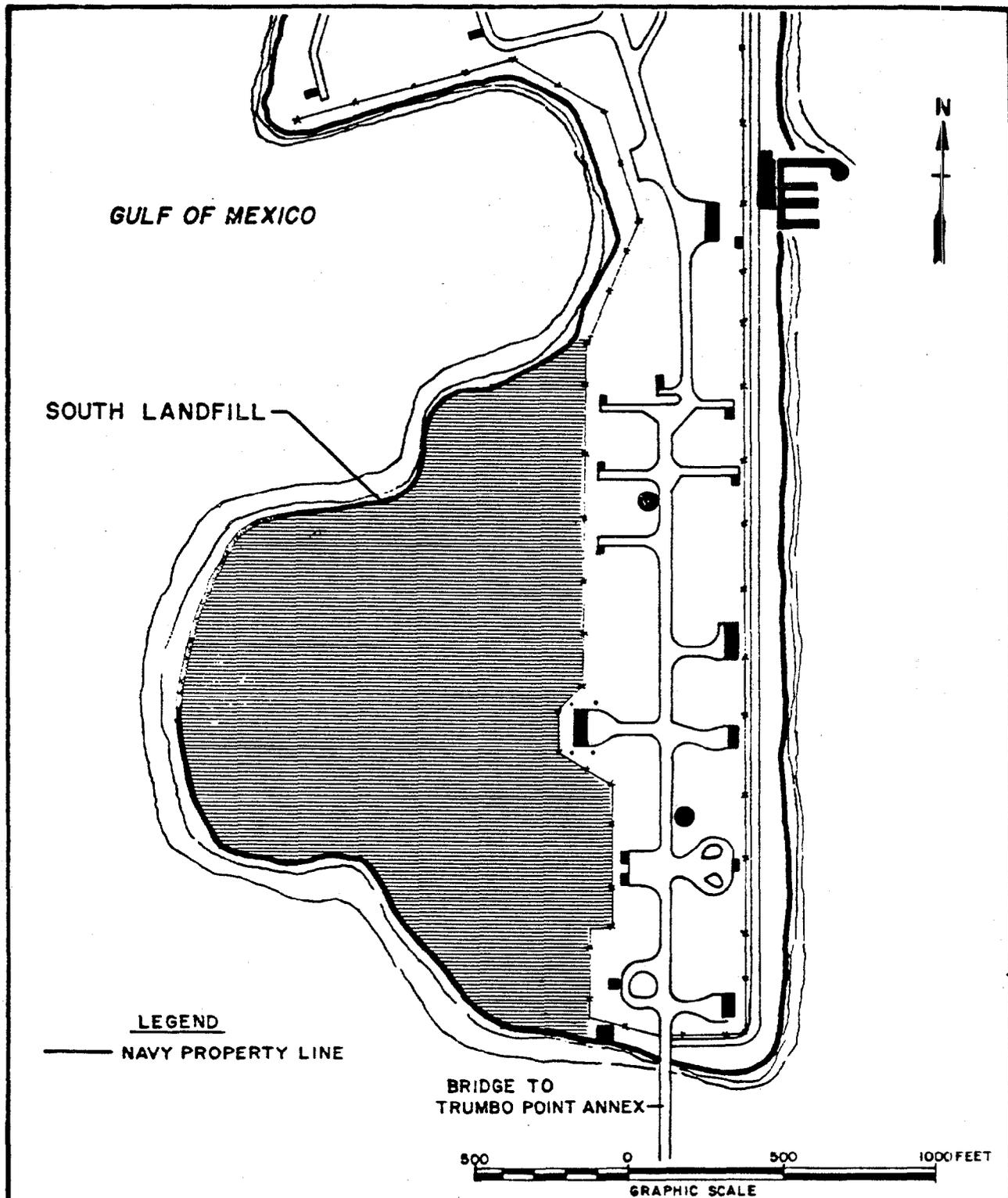
8.9 SITE 8, SOUTH FLEMING KEY LANDFILL. Site 8 is located on the southern portion of Fleming Key. It covers an area of approximately 45 acres and was operated as a landfill from 1962 until 1980. Figure 8-10 shows the location of the landfill. From 1962 to 1966, it is estimated that approximately 4,000 to 5,000 tons of waste from the Naval Station were disposed at the landfill annually.

Beginning in 1966, the public works activities of NAS Key West were combined with the Naval Station. At this time, the wastes from the Air Station at Boca Chica also began being disposed at this site. This increased the annual amount of waste disposed at the site to approximately 8,000 tons. Typical wastes disposed at the site included primarily general refuse from the Naval and Air Stations, although sewage sludge, waste oil, hydraulic fluid, paint, paint thinner and solvents from the Air Station shops were probably disposed at Site 8 also. Table 8-3 summarizes the types and quantities of wastes assumed to have been disposed at Site 8.

The open trench disposal method was practiced at the landfill. The trenches were approximately 20 to 30 feet wide, 10 feet deep, and 500 to 1,000 feet long. The trenches were partially filled with sea water when the wastes were disposed. Wet garbage was placed directly into one end of the trench. The other wastes were taken to the western portion of the site and burned. The ashes and unburned portions of the wastes were then placed into the remainder of the trench. Typically, three-quarters of a trench contained burned waste and one-quarter wet garbage. DDT, malathion and diesel oil were sprayed at the landfill to control pests and insects.

During the on-site survey, it was observed that the eastern area of the site where the trenches are located is distinctive in that the trenches are mounded four to five feet higher than the surrounding ground. The oldest portion of the trenches is covered with a monoculture of 40-foot Australian pines. The western portion of the site has construction debris, metal pipes, scrap metal, and furniture scattered about on the ground surface. This material has all been placed at the site since 1980 when landfill operations ceased. There is also an open ponded area filled with rust colored stagnant water. The pond is approximately 25 feet in diameter and is surrounded by rusted scrap metal which leaches into the pond. There is no surface connection between the pond and the nearby Gulf waters. The location of the landfill, which covers an area of approximately 30 acres, is shown on Figure 8-9.

The ground water at the site is approximately two to three feet below undisturbed ground and flows toward the nearby Gulf waters surrounding the Key. Since the buried wastes were disposed in wet trenches, there is a direct contact with the ground water. Ground water flow represents the major pathway for contaminant migration at the site. Fleming Key was created from limestone dredge spoil and thus the permeability of the site can be expected to be relatively high. This high permeability in association with the close proximity to tidal surface waters enhances the potential for contaminant migration from the site.



**FIGURE 8-10**

**Site 8  
South Fleming Key Landfill**



**INITIAL ASSESSMENT STUDY  
NAVAL AIR STATION  
KEY WEST, FLORIDA**

Table 8-3

## Wastes Disposed at Site 8, South Fleming Key Landfill

Waste	Source of Waste	Time Period	Estimated Total Quantity	Comments
General Refuse	Naval Station Naval Air Station	1962 to 1980 1966 to 1980	80,000 tons 40,000 tons	Open burning and landfill operation
Waste oils, fuels	AIMD, air operations and squadrons	1966 to 1980	30,000 gallons	Maximum quantity estimated disposed at this site and/or Fire Fighting Training Area
Solvents (MEK, toluene, xylene, PD-680)	AIMD, air operations and squadrons	1966 to 1980	30,000 gallons	Maximum quantity estimated disposed at this site and/or Fire Fighting Training Area
Waste paints	AIMD, air operations and squadrons	1966 to 1980	1,000 gallons	Maximum quantity estimated disposed at this site and/or Fire Fighting Training Area
Waste thinners	AIMD and squadrons	1966 to 1980	2,000 gallons	Maximum quantity estimated disposed at this site and/or Fire Fighting Training Area

## REFERENCE

Black, Crow and Eidness, Inc., October 1977. Monroe County 201 Wastewater Facility Plan, Draft Copy No. 11.

General Services Administration, Region 4, December 1979. Real Property Division, Final Environmental Impact Statement, Disposal of Surplus Federal Military Properties.

Gilbert, Carter R., 1978. "Fishes," Volume 4 in Rare and Endangered Biota of Florida, Peter C. H. Pritchard, series editor, University Presses of Florida, Gainesville.

Hanson, C. E., 1980. "Freshwater Resources of Big Pine Key, Florida," U. S. Geological Survey, Open-File Report 80-44.

Department of Health, Education and Welfare, June 1975. Draft Environmental Impact Statement for the Conveyance and Expansion of a Portion of the U.S. Navy Aquaduct Serving the Florida Keys.

McDiarmid, Roy W., 1978. "Amphibians and Reptiles," Volume 3 in Rare and Endangered Biota of Florida, Peter C. H. Pritchard, series editor. University Presses of Florida, Gainesville.

Milo, Smith and Associates, Inc., April 1967. Key West Comprehensive Plan, Volume 1.

National Oceanic and Atmospheric Administration, 1980. Local Climatological Data, Annual Summary, Key West, FL.

Naval Facilities Engineering Command, Southern Division (SOUTHNAVFACENGCOM), January 1980a. Environmental Engineering Survey, Naval Air Station Key West, FL.

Naval Facilities Engineering Command, Southern Division (SOUTHNAVFACENGCOM), January 1980b. Pest Management Plan, Naval Air Station Key West, FL.

Naval Facilities Engineering Command, Southern Division (SOUTHNAVFACENGCOM), September 1981a. Master Plan, Naval Complex, Key West, FL.

Naval Facilities Engineering Command, Southern Division (SOUTHNAVFACENGCOM), 1981b. Environmental Engineering Survey, Naval Air Station Key West, FL.

Naval Facilities Engineering Command, Southern Division (SOUTHNAVFACENGCOM), October 1982a. Long Range Land Management Plan for Naval Air Station Key West, FL.

Naval Facilities Engineering Command, Southern Division (SOUTHNAVFACENGCOM), September 1982b. PCB Audit and Survey, Naval Air Station Key West, FL.

Naval Facilities Engineering Command, Southern Division (SOUTHNAVFACENGCOM), January 1983. Hazardous Waste Management Plan, Naval Air Station Key West, FL.

REFERENCES  
(Continued)

Naval Facilities Engineering Command, Southern Division (SOUTHNAVFACENGCOM), February 1984. Oil Spill Prevention, Control and Countermeasure (SPCC) Plan, Naval Air Station Key West, FL.

Wedderburn, Leslie A., May 1982. "Hydrology of the South Florida Water Management District," Proceedings of the First Annual Symposium on Florida Hydrogeology, Northwest Florida Water Management District.

BIBLIOGRAPHY

Browder, Joan, Energy Flow Unit Model and Vegetation Survey of a Tropical Hammock of the Florida Keys.

Connell, Metcalf and Eddy, November 1979. Environmental Impact Assessment for Extended Runway Safety Areas, Key West International Airport.

APPENDIX A

AGENCIES CONTACTED DURING INITIAL ASSESSMENT STUDY

Naval Energy and Environmental Support Activity (NAVENENVSA),  
Port Hueneme, California

NAVFAC Command Historian, Naval Construction Battalion Center,  
Port Hueneme, California

Southern Division, Naval Facilities Engineering Command Headquarters  
(SOUTHNAVFACENGCOM), Charleston, South Carolina

Ordnance Environmental Support Office (OESO), Indian Head, Maryland

National Archives, Navy and Old Army Branch, Washington, DC

Navy Historical Center, Operational Archives, Washington Navy Yard,  
Washington DC

Marine Corps Historical Center, Washington Navy Yard, Washington, DC

National Records Center, General Archives, Suitland, Maryland

DOD Explosive Safety Board, Alexandria, Virginia

Naval Sea Systems Command, Crystal City, Alexandria, Virginia

Naval Facilities Engineering Command Headquarters, Alexandria, Virginia

Naval Air Systems Command, Alexandria, Virginia

U. S. Geological Survey, Reston, Virginia