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DEMOLITION KEY RCRA MISCELLANEOUS UNIT FINAL PERMIT APPLICATION NAS KEY WEST FL

7/2/2001

ENSAFE/ALLEN AND HOSHALL

DEMOLITION KEY

RCRA MISCELLANEOUS UNIT FINAL PERMIT APPLICATION NAS KEY WEST, FLORIDA

Contract No. N62467-94-D-0888

Contract Task Order 0156

Prepared for:

Department of the Navy
Southern Division
Naval Facilities Engineering Command
North Charleston, South Carolina

Prepared by:

EnSafe Inc.
5724 Summer Trees Drive
Memphis, Tennessee 38134
(901) 372-7962

July 2, 2001

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Date July 2, 2001
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APPLICATION FOR A HAZARDOUS WASTE FACILITY PERMIT
PART I - GENERAL
TO BE COMPLETED BY ALL APPLICANTS

Please Type or Print

A. General Information

1 Type of facility:

Disposal [ ]			
landfill	[ ]	land treatment	[ ]
surface impoundment	[ ]	miscellaneous units	[ ]
Storage [ ]			
containers	[ ]	tanks	[ ]
piles	[ ]	surface impoundment	[ ]
miscellaneous units	[ ]	containment building	[ ]
Treatment [ ]			
tanks	[ ]	piles	[ ]
incineration	[ ]	surface impoundment	[ ]
miscellaneous units	[X]	boiler/industrial furnace	[ ]
type of unit Open Burn/Open Detonation		type of unit _____	
		containment building	[ ]

2. Type of application: [ ] TOP [ ] construction [ ] operation [X] closure [ ] RD&D
[ ] construction/operation

3. Revision Number: 1

4. Date current operation began (or is expected to begin): January 1, 1987

5 Facility name Demolition Key

6. EPA/DEP I D No: FL3170500000

7 Facility location or street address Demolition Key

8 Facility mailing address: NAS Key West (Street or P O. Box) Key West (City) FL (State) 33040-5000 (Zip)

9 Contact person: Patsy McNeill Telephone: (305) 293-2583

Title Hazardous Waste Manager
NAS Key West Public Works Office
Mailing Address P. O. Box 9007 Key West FL 33040-9007
Street or P O Box City State Zip

10 Operator's name: CW04 Brasko Telephone (305) 293-2839
NAS Key West, Weapons Dept.
11. Operator's address: P. O. Box 9001 Key West FL 33040-9001
Street or P.O Box City State Zip

Commanding Officer
12. Facility owner's name: Capt. L.S. Cotton Telephone: (305) 293-2107
NAS Key West
13 Facility owner's address: P. O. Box 9001 Key West FL 33040-9001
Street or P.O. Box City State Zip

14 Legal structure. [ ] Corporation [ ] Non-profit Corporation [ ] Partnership [ ] Individual
[ ] Local Government [ ] State Government [ ] Federal Government [ ] Other

15. If an individual, partnership, or business is operating under an assumed name, specify the county and state where the name is registered.

County. N/A State: N/A

16. If the legal structure is a corporation, indicate the state of incorporation.

State of incorporation: N/A

17. If the legal structure is an individual or partnership, list the owners.

Name: N/A

Address
Street or P O Box City State Zip

Name. N/A

Address
Street or P O. Box City State Zip

Name: N/A

Address: _____
Street or P.O. Box City State Zip

18. Site ownership status: [X] owned [ ] to be purchased [ ] to be leased_____years
[ ] presently leased; the expiration date of the lease is:
If leased, indicate:

Land owner's name: NAS Key West

Land owner's address: NAS Key West Key West FL 33040-5000
Street or P.O. Box City State Zip

19. Name of engineer: James N. Speakman Registration no.: 41460

Address: 5724 Summer Trees Drive Memphis, TN 38134
Street or P.O. Box City State Zip

Associated with: EnSafe Inc.

20. Facility located on Indian land: [ ] yes [X] no

21. Existing or pending environmental permits: (attach a separate sheet if necessary)

NAME OF PERMIT	AGENCY	PERMIT NUMBER	DATE ISSUED	EXPIRATION DATE
None				

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B. Site Information

1 Facility location County: Monroe Nearest Community: Key West

Latitude: 24 35', 48" N Longitude: 81 47', 45" W

Section: N/A Township: N/A Range: N/A

UTM #: / / 17/419000/2720000

2. Area of facility site (acres): 8.14

3. Attach a scale drawing and photographs of the facility showing the location of all past, present, and future treatment, storage and disposal areas. Also show the hazardous wastes traffic pattern including estimated volume and control.

4. Attach topographic map which show all the features indicated in the instruction sheet for this part.

5. Is the site located in a 100-year flood plain? [X] yes [ ] no

C. Land Use Information

1. Present zoning of the site None (Military Reservation/Federal Building)

2. If a zoning change is needed, what should the new zoning be? N/A

3. Present land use of site Military Reservation

D. Operating Information

1. Is waste generated on site? [X] yes [ ] no

List the SIC codes (4-digit)

9711 _____ _____ _____ _____ _____ _____ _____ _____

2. Attach a brief description of the facility operation, nature of the business, and activities that generate, treat, store or dispose of hazardous waste.

3. Using the following table and codes provided, specify, (1) each process used for treating, storing, or disposing of hazardous waste (including design capacities) at the facility, and (2) the hazardous waste (or wastes) listed or designated in 40 CFR Part 261, including the annual quantities, to be treated, stored, or disposed by each process at the facility. (See the instructions for the list of process codes and units).

PROCESS CODE	PROCESS DESIGN CAPACITY AND UNITS OF MEASURE	HAZARDOUS WASTE CODE	ANNUAL QUANTITY OF HAZARDOUS WASTE AND UNITS OF MEASURE
T18 (OB/OD)		D003	90 G
T18 (OB/OD)		D005	90 G
T18 (OB/OD)		D006	90 G
T18 (OB/OD)		D008	90 G
T18 (OB/OD)		D009	90 G

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P. Information Regarding Potential Releases From Solid Waste Management Units

Facility name. Demolition Key

EPA I D. Number FL3170500000

Location City Key West

State Florida

1. Are there any of the following solid waste management units (existing or closed) at your facility? A Solid Waste Management Unit (SWMU) is a discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. Such units include all areas at a facility where solid wastes have been routinely and systematically released, as described in the July 27, 1990 Federal Register (55 FR 30798).

NOTE: DO NOT INCLUDE HAZARDOUS WASTES UNITS CURRENTLY SHOWN IN YOUR PART B APPLICATION

		YES	NO
-	Landfill	___	X
-	Surface impoundment	___	X
-	Land farm	___	X
-	Waste pile	___	X
-	Incinerator	___	X
-	Storage tank	___	X
-	Container storage area	___	X
-	Injection wells	___	X
-	Wastewater treatment units	___	X
-	Transfer stations	___	X
-	Waste recycling operations	___	X
-	Land treatment facility	___	X
-	Boiler/industrial furnace	___	X
-	Other (units not listed above)	___	X

2 If there are "Yes" answers to any of the items in 1. above, please provide a description of the wastes that were stored, treated or disposed of in each unit. In particular please focus on whether or not the wastes would be considered as hazardous wastes or hazardous constituents under RCRA Also include any available data on quantities or volumes of wastes disposed of and the dates of disposal. Please also provide a description of each unit and include capacity, dimensions, and location at facility. Provide a site plan if available

N/A

NOTE: HAZARDOUS WASTES ARE THOSE IDENTIFIED IN 40 CFR PART 261. HAZARDOUS CONSTITUENTS ARE THOSE LISTED IN APPENDIX VIII OF 40 CFR PART 261.

3. For the units noted in 1. above **and also for those hazardous waste units in your Part B application**, please describe for each unit all data available on all prior or current releases of hazardous wastes or constituents to the environment that may have occurred in the past or still be occurring.

Please provide the following information:

a Date of release
b. Type of waste released
c. Quantity or volume of waste released
d. Describe nature of release (i.e., spill, overflow, ruptured pipe or tank, etc.)

See attached Closure Permit Application

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4 In regard to the prior releases described in 3 above, please provide (for each unit) all analytical data that may be available which would describe the nature and extent of environmental contamination that exists as a result of such releases. Please focus on concentrations of hazardous wastes or constituents present in contaminated soil or ground water.

See attached Closure Permit Application

Signature and Certification

The following certification must be included with the submittal of this information. The certification must be signed by a principal executive officer of at least the level of Vice President or by a duly authorized representative of that person

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments. Based on my inquiry of those individuals immediately responsible for obtaining the information, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Signature

R.A. Demes, Engineering Director
Name and Title (typed)

Demolition Key
Facility Name

Date _____ Telephone: (305) 293-2194

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APPLICATION FOR A HAZARDOUS WASTE FACILITY PERMIT
CERTIFICATION
TO BE COMPLETED BY ALL APPLICANTS

Facility Name: Demolition Key EPA ID# FL3170500000

1 Operator

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. Further, I agree to comply with the provisions of Chapter 403, Florida Statutes, and all rules and regulations of the Department of Environmental Protection. It is understood that the permit is only transferable in accordance with Chapter 62-730, F.A.C., and, if granted a permit, the Department of Environmental Protection will be notified prior to the sale or legal transfer of the permitted facility.

Signature of the Operator or Authorized Representative*

Patricia A. McNeil, Hazardous Waste Manager

Name and Title (Please type or print)

Date _____ Telephone (305) 293-2583

***Attach a letter of authorization**

2 Facility Owner

This is to certify that I understand this application is submitted for the purpose of obtaining a permit to construct, operate, or close a hazardous waste management facility on the property as described As owner of the facility, I understand fully that the facility operator and I are jointly responsible for compliance with the provisions of Chapter 403, Florida Statutes, and all rules and regulations of the Department of Environmental Protection

Signature of the Facility Owner or Authorized Representative*

L. S. Cotton, Capt., USN Commanding Officer
Name and Title (Please type or print)

Date:_____ Telephone (305) 293-2107

***Attach a letter of authorization**

3 Land Owner

This is to certify that I, as land owner, understand that this application is submitted for the purpose of obtaining a permit to construct, operate, or close a hazardous waste management facility on the property as described For hazardous waste disposal facilities, I further understand that I am responsible for providing the notice in the deed to the property required by 40 CFR §264.119 and §265.119, as adopted by reference in Chapter 62-730, F.A C

Signature of the Land Owner or Authorized Representative*

L. S. Cotton, Capt., USN Commanding Officer
Name and Title (Please type or print)

Date _____ Telephone (305) 293-2107

***Attach a letter of authorization**

4 **Professional Engineer Registered in Florida** [Complete when required by Chapter 471, F S or not exempted by Rule 62-730 220(7), F A C.]

This is to certify that the engineering features of this hazardous waste management facility have been designed/examined by me and found to conform to engineering principles applicable to such facilities. In my professional judgment, this facility, when properly constructed, maintained and operated, or closed, will comply with all applicable statutes of the State of Florida and rules of the Department of Environmental Protection.

Signature

James N. Speakman

Name (please type)

Florida Registration Number. 41460

Mailing Address 5724 Summer Trees Drive

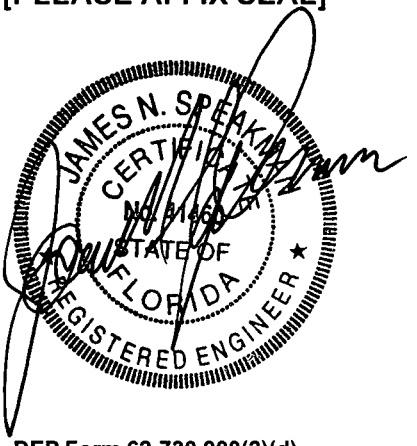
Street or P O Box

Memphis, TN 38134

City State Zip

Date 06/22/01 Telephone (901) 372-7962

[PLEASE AFFIX SEAL]



5. **Professional Geologist Registered in Florida** [Complete when required by Chapter 492, F S or not exempted by Rule 62-730 220(8), F A C]

This is to certify that the interpretations of geology at this hazardous waste management facility have been examined by me, and the interpretations conform to sound geological principles. In my professional judgement, this facility, when properly constructed, maintained and operated, or closed, will comply with all applicable statutes of the State of Florida and the rules of the Department of Environmental Protection

Signature

Steven J. Parker
Name (please type)

Florida Registration Number: 1651

Mailing Address: 313 Wingoway
Street or P O Box

Mount Pleasant, SC 29464
City State Zip

Date: 20 June 2001 Telephone (843) 884-0029

[PLEASE AFFIX SEAL]

Public Affairs Officer

- Respond immediately to emergencies at the Emergency Coordinator's request and collect information necessary to keep public and local media apprised of pertinent facts relating to the emergency.

- Keep abreast of all Navy actions during a closure incident to provide prompt and accurate information to concerned parties regarding the nature of the incident and the steps being taken to correct the problem.

- Act as the central point of contact for external information requests and clear all news releases with the Commanding Officer and the Emergency Coordinator.

Commander, Navy Region SE — Code N46EL

- Provide legal advice/assistance, at the Emergency Coordinator's request, to ensure that all necessary information, records, and samples are obtained and safeguarded for possible use in legal actions, to recover cost from or by the Navy.

- Advise the Emergency Coordinator on the legal aspects of emergency response when parties other than the Navy are responsible for the emergency.

- Assist in processing claims associated with the accident/incident.

This represents the major responsibilities by key response personnel. This section of the Contingency Plan is not all inclusive and requires the use of, by all persons, the resources available to NAS Key West and Demolition Key during a closure activity incident.

Contingency Plan Implementation Criteria

The Contingency Plan must be implemented whenever an incident results in the following:

1. Fire/Explosion
   a. Fire releases toxic fumes
   b. Fire spreads beyond area of ignition
   c. Fire threatens offsite areas
   d. Fire-fighting agents result in contaminated runoff or
   e. Threat of an uncontrolled/unplanned explosion is imminent

notification will automatically inform the Emergency Coordinator, or his/her alternate, of the situation. The Emergency Coordinator (or Alternate Contact) will be responsible for ensuring the NAS Key West Emergency Management Department representatives and all other necessary response organizations are properly notified.

For off-base incidents, the initial Emergency Coordinator may be a civilian appointee until the NAS Key West Emergency Coordinator (or Alternate Contact) arrives on scene. The NAS Key West Emergency Coordinator will then assume the responsibility of the response activity. Assigning ultimate emergency coordination responsibilities to the NAS Key West Emergency Coordinator ensures coordination by someone familiar with the contents of this permit application, capable of rallying the necessary resources, cognizant of and having the ability to apply the appropriate regulations, and familiar with the properties of military ordnance. Table II.B-3 lists the Demolition Key Emergency and Alternate Coordinators.

Table II.B-3
Emergency Coordinators

Primary Contact	Alternate Contact
Patsy McNeill RCRA Program Manager Office (305) 293-2583 Emergency (305) 797-4454	CWO4 Brasko Weapons Department Office (305) 293-2839 Emergency (305) 293-2653

Emergency Response Equipment

Emergency response to incidents involving closure of the Demolition Key hazardous waste ordnance treatment facility may require the skills of many different units. Each response unit has specific equipment it may use during such an incident. All NAS Key West and Demolition Key emergency response equipment shall be maintained in working condition at all times or immediately replaced with working equipment of identical function.

Tables II.B-4 and II.B-5 list emergency response equipment by equipment item and response unit, respectively, the quantity of the specific item, and phone number of the unit responsible for maintaining and replacing said equipment.

Emergency response equipment includes PPE, monitoring equipment, communication equipment, decontamination equipment, manual use equipment (shovels, rakes, brooms, etc.), absorbent/containment equipment, industrial removal/remediation equipment, and fire fighting equipment.

Table II.B-6
City of Key West's Fire Department
Emergency Equipment List

Equipment on Ladder (75 ft. Aerial)	Equipment on Pumper
Exhaust fan	One 36" bolt cutters
Two lights	One 42" hooligan
Two rescue ropes (100')	One 36" pinch bar
Bolt cutters (36")	Assorted nozzles
One 36" pinch bar	200 ft. .75" hose (booster hose)
One 42" hooligan	First-aid kit
One high-rise pack	200 lb CO_2 extinguisher
One Saws-all	20 lb. ABC dry chemical extinguisher

PREVENTIVE PROCEDURES, STRUCTURES, AND EQUIPMENT

Loading/Unloading Operations

Any environmentally impacted media will be loaded manually onto vessels for subsequent transport to Truman Annex. Forklifts will be used to unload and load said material from the vessels and onto trucks, respectively, for transport to the NAS Key West permitted hazardous waste storage facility.

Runoff

Before construction on the cover system begins, temporary erosion control devices (silt fence or straw hay bales) will be placed and staked adjacent to the waterfront downgradient of the proposed work.

Water Supplies

Emergency water supplies are not required for closure activities.

OTHER FEDERAL AND STATE LAWS

This information has been provided in accordance with the requirements of 40 CFR 270.14 (b)(20), 40 CFR 270.3, and FAC 62-730. OB/OD is a multidisciplinary issue, potentially spanning a number of federal and state regulations. In addition to the hazardous waste permitting requirements set forth under RCRA regarding miscellaneous units (40 CFR 264 Subpart X), other federal and state laws must be reviewed to determine if they are relevant to the closure permitting process, including but not limited to the Clean Water Act, the Safe Drinking Water Act, the Endangered Species Act, and the National Historic Preservation Act.

Air Issues

Closure of Demolition Key's OB/OD treatment facility involves construction of a soil cover and post closure seawater monitoring. NAS Key West does not believe these operations will have any effect on air quality. As such, no air issues exist regarding closure operations.

Coastal Zone Management Act

The Coastal Zone Management Act (16 U.S. Code [USC] 1451 et seq.) and the regulations regarding its implementation (15 CFR 930) apply to Demolition Key since the facility lies in a coastal zone as defined in Section 304(1) of 16 USC 1453. Section 307(c)(2) of 16 USC 1456 states that "any federal agency that shall undertake any development project in the coastal zone of a state shall ensure that the project is, to the maximum extent practicable, consistent with the enforcement policies of approved state management programs."

The provisions set forth in 15 CFR 930 require any federal activity to comply with the management program of the state in which the facility is located. The monitoring and modeling requirements of this permit application will assist in quantifying potential adverse effects, if any, on the coastal zone, due to the closure of Demolition Key.

According to FAC 62-380.23, when an activity requires a permit subject to federal consistency review, the issuance or renewal of the permit shall automatically constitute the state's concurrence that the permitted activity, as such, is consistent with the federally approved program. This would imply that if a permit is issued and complied with, then the provisions of the Coastal Zone Management Act are being followed. The Florida Coastal Management Act is in Florida Statue (FS) 28-380. Demolition Key shall comply with the contents of this statute.

SECTION II.D

CLOSURE AND POST-CLOSURE PLANS

CLOSURE PLAN

Introduction

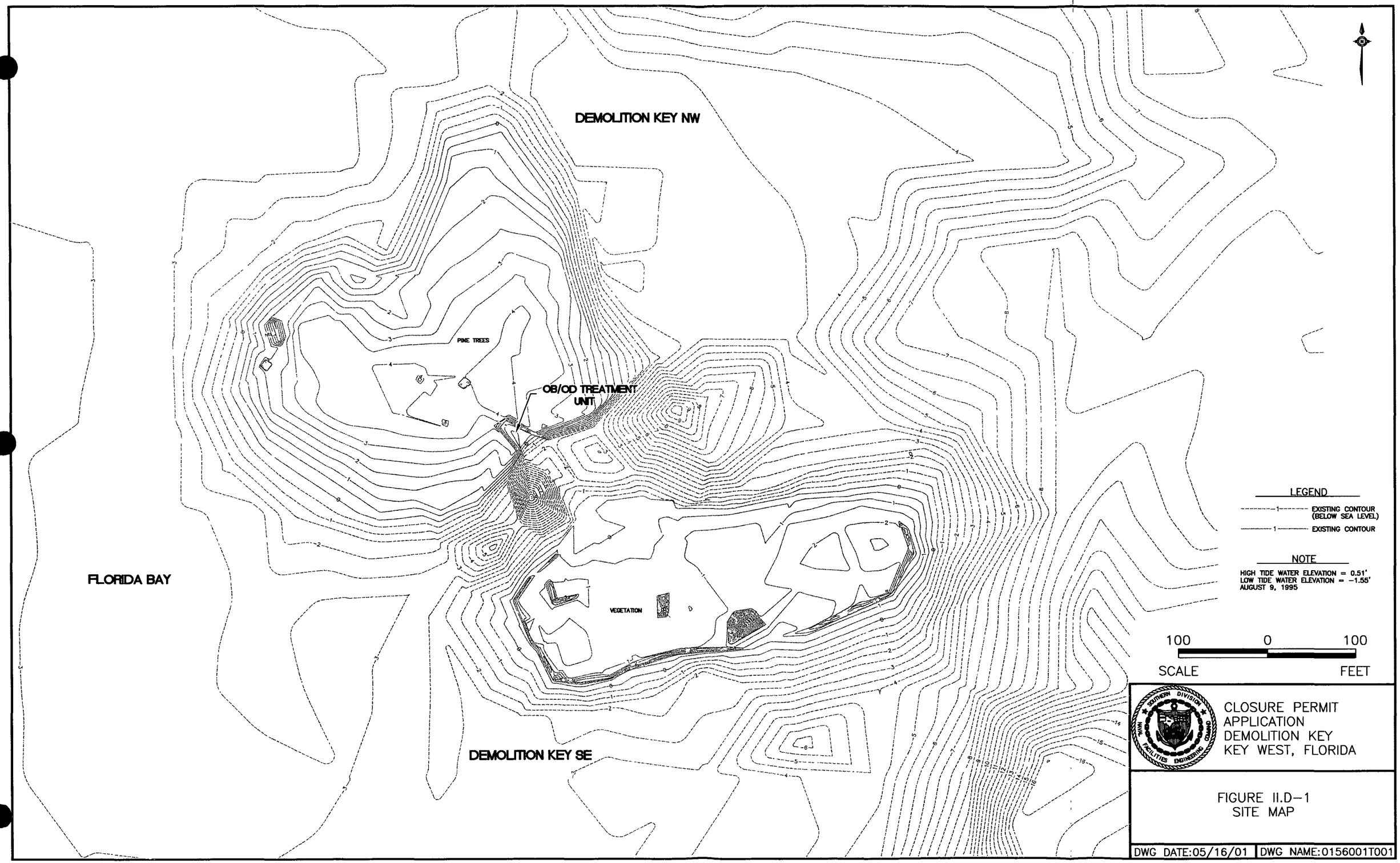
This section replaces Section II.D of the original Final Demolition Key Permit, dated June 27, 1997. It has been modified to adhere to closure requirements of Section K of the Hazardous Waste Facility Permit Application Instructions and Forms (May 15, 1996). To limit modifications to the original submittal of the Final Demolition Key Part B Permit, this section retains the numbering convention of the original submittal.

This closure plan for the former Demolition Key open burning/open detonation (OB/OD) hazardous waste ordnance treatment facility satisfies the requirements of 40 CFR 264.111 and FAC 67-730. The OB/OD unit covers approximately 940 square feet on the southeast portion of Demolition Key NW, as shown on Figure II.D-1. This facility was used for the OB/OD of waste (unserviceable) military ordnance and propellants which were classified as RCRA hazardous waste when they were declared waste products. OB/OD operations were conducted approximately one to four times per year from approximately 1965 to 1989. The unit was not used from 1990 to 1993. The site was reopened for limited use from 1994 until 1995; it has not been used since then. During the operating periods, approximately 20 pounds net explosive weight (NEW) of unserviceable ordnance were treated annually at the OB/OD unit.

During this same period, Navy SEAL and Explosive Ordnance Disposal (EOD) personnel conducted ordnance training exercises on the remainder of Demolition Key NW. These exercises involved the safe destruction of military ordnance, as required in their mission statement for annual proficiency training. Testing involved ordnance destruction configuration technique modification, developmental testing, and reaction-sequence testing. The island was also used to perform emergency response operations on unstable and/or civilian ordnance.

As part of the original Part B Closure Permit Application (June 27, 1997), excavation of contaminated site soil was proposed to provided clean closure. Soil was to be excavated to a depth of 1 foot and to a nominal 10 feet in diameter. In July, 1998, the site was over-excavated to a depth of approximately 1.5 feet or until the water table was reached and to a nominal 30 feet in diameter. The excavation was limited horizontally by mangrove roots.

Concentrations in post-removal soil samples from the excavated OB/OD pit still exceeded FDEP soil and groundwater cleanup target levels. However, they were similar to concentrations in soil samples collected at other areas on the key used for ordnance training, research, and development. Since the OB/OD treatment unit is within an active military range, this closure plan only addresses the unit and its immediate vicinity. Rather than intensively investigate one single OB/OD site, this closure plan proposes to backfill the excavated depression with compacted soil and stabilize the surface with native vegetation, thus reducing direct exposure to human and ecological receptors.



CLOSURE PERMIT
APPLICATION
DEMOLITION KEY
KEY WEST, FLORIDA

FIGURE II.D-1
SITE MAP

DWG DATE:05/16/01 | DWG NAME:0156001T001

Surface water will be monitored during the post-closure period to identify and prevent any future adverse affects to human health and the environment. If concentrations in surface water exceed background concentrations, sediment samples and sediment toxicity testing will be added to post-closure monitoring. When the entire range is no longer in use, the island will be addressed under the prevailing environmental legislation.

Facility Description and Operational Parameters

This open air facility has no protection from weather (see Figure II.D-1). The basically flat topography, which slopes slightly in all directions toward the Florida Bay, is covered with grass, pines, and mangroves. Much of the surrounding area is classified as wetlands. An area topographic map is included as Figure II.B-1. The treatment facility is discussed in Section II.C.1 of this closure permit application.

Naval Air Station (NAS) Key West generates waste explosives and munitions designated as hazardous waste (D004 to D011) due to their reactive and potential toxic characteristics. From approximately 1965 to 1995, the Demolition Key OB/OD facility, which is owned and operated by NAS Key West, was used to train Navy personnel and test ordnance and munitions. It was also used to treat various types of munitions and propellants used by the U.S. Navy through OB or OD. The item was relinquished to the NAS Key West Weapons Department for accumulation and subsequent treatment as soon as it was declared a hazardous waste based on one of five criteria.

Criteria for Declaring Ordnance Hazardous:

- The item exceeded maximum shelf life.
- The item appeared to have been damaged.
- The item showed evidence of deterioration.
- The item was declared surplus or unserviceable.
- The item could no longer be identified.

The types of ammunition and explosives shown below have been authorized for treatment through OB per *Ammunition and Explosives Ashore — Safety Regulations for Handling, Storing, Production, Renovation, and Shipping* (NAVSEA OP-5). It is assumed that they have been treated by OB and/or OD at the subject facility at some time in its operational history.

- Black Powder
- Floating Smoke Pots and Similar Ammunition
- Pyrotechnics
- Smokeless Powder
- High Explosives (Bulk) [TNT]

- Cartridge-Actuated Devices (CADs)
- Demolition Kits
- TNT Demolition Blocks
- Tracer Mix and Other Pyrotechnic Mixtures
- Primers

All OB/OD operations were performed in accordance with NAVSEA OP-5. Due to its restricted nature, NAVSEA OP-5 cannot be attached to this closure permit application. However, the procedures most recently in use are described in Section II.C.1 of this closure permit application.

Waste ordnance was burned at the facility on the ground surface. Supplemental materials such as diesel fuel may have been used during burning operations in the early stages of facility's life. "Starter" or initiating fluids have not been used at the facility since treatment operations resumed in 1994. Combustion was almost always complete. Following a burn, the area was left unaltered for 24 hours to ensure the waste had completely burned. Periodically, ash from the OB treatment process was removed and containerized for transport to the permitted storage facility at NAS Key West.

The types of ammunition and explosives classified as reactive wastes, shown below, have been authorized for treatment through OD per NAVSEA OP-5. It is also assumed that they have been treated at the facility during its initial operation. Since 1989, however, these materials have not been treated at Demolition Key.

- Mortar Ammunition
- Projectiles
- Rocket/Missile Warheads
- Detonators
- Explosive-Loaded Grenades
- High-Explosive Bombs

Although OP-5 allows miscellaneous quantities of waste to be burned based upon the waste type and the areal size of the unit, the operators restricted this unit to a 5 pounds NEW per burn limit.

Maximum One-time Waste Inventory

The operational maximum quantity of hazardous waste treated at the subject OB/OD facility is calculated to be approximately 600 pounds NEW. This amount equates to a one-time maximum quantity of 5 pounds NEW (i.e., the operational limit per NAVSEA OP-5) as was designed for the facility. The use of the term NEW allowed Navy personnel to treat a variety of ordnance items regardless of the gross weight of all items per treatment activity. As such, it is difficult to

ascertain the one-time, gross weight maximum of hazardous waste ordnance treated at Demolition Key. This quantity could be from 5 pounds to more than 100 pounds.

Environmental Setting

Physiography

Demolition Key NW is one of two twin keys created from dredge materials approximately one quarter-mile north-northwest of Fleming Key in the Florida Bay. The two keys are separated from Fleming Key by the Garrison Bight Channel. The twin keys (Demolition Key NW and SE) were formerly one larger key, which was separated by a shallow channel formed by past ordnance testing. Demolition Key NW covers approximately 8.14 generally flat acres which have a maximum elevation of 4 to 5 feet above mean sea level (msl). Its topographic features were previously detailed in Section II.C.2 of this report and Figures II.C-7 and II.C-8.

Geologic and Hydrogeologic Information

Section II.C.2 and Figures II.C-6 to II.C-8 describe regional and local geologic and hydrogeologic characteristics. Of principal interest in developing this closure plan are the results of previous surface material and shallow groundwater characterization studies. The outcome of these studies was discussed in Section II.C.2 and elements pertinent to sampling and analysis plan development are briefly summarized in this closure plan.

Surface and Vadose Materials

Surface materials across Demolition Key NW consist of dredge spoils excavated from Florida Bay during key construction in the late 1930s to early 1940s. These dredge spoils consist of a mix of white to gray gravel to cobble-sized coral/limestone rubble (60%), fine to coarse sand (10% to 30%), and brown to gray silt/mud (10% to 30%). The depth of fill ranges from 2 to -3 feet msl across the key. The permeability of the dredge spoil material was estimated to be 2.0 to 6.0 inches per hour based on measurements of tidally influenced groundwater fluctuations. Beneath the fill material, the Miami Limestone occurs at an approximate elevation of -3 feet msl.

Groundwater

Groundwater has been studied on Demolition Key NW relative to tidally influenced fluctuations and general water quality parameters. Tide-cycle-based measurements indicate direct communication between the surficial aquifer and Florida Bay. Groundwater levels fluctuated consistently with the rise and fall of the tide, although a time lag was noted. Shallow groundwater tidal response was estimated to average approximately 6 inches compared with a 2-foot response

in adjacent open water. These measurements indicate that significant shallow aquifer flushing may occur with each tide cycle. Because the unit is close to the shore, it is reasonable to expect that the tidal flushing action would be more pronounced at this location.

Based on salinity measured during the groundwater study, no identifiable freshwater lens is present on Demolition Key NW. Groundwater salinity near the facility is comparable to salinity recorded in the channel separating Demolition Key NW from SE (33.5 parts per thousand [ppt]). Figure II.C-9 provided groundwater salinity contours at high tide for Demolition Key NW. Salinity readings for both keys at high and low tide are provided in Section II.C.2.

Based on surface material characteristics and groundwater tidal fluctuations, it was estimated that nearly 399,000 gallons of water moves into and out of the shallow aquifer at Demolition Key NW during each tide cycle (approximately 800,000 gallons/day). The daily tidal influences were estimated to result in flushing and/or displacement of approximately 35% of the shallow aquifer volume. Groundwater flow is expected to be radial as influenced by tidal conditions. During high tide, water from surrounding Florida Bay moves into the shallow aquifer toward the center of the key; at low tide, the flow reverses with shallow groundwater moving toward Florida Bay. Figure II.C-11 (presented in Section C) shows the potentiometric surface of the shallow aquifer during high tide.

It is widely recognized that the surficial aquifer system in the Florida Keys does not contain water of sufficient quality and quantity to be considered a viable freshwater supply. Desalination would be required if water from this aquifer were to be used for potable purposes. Demolition Key NW has no potable water supply or need for one, and drinking water for the surrounding area (Key West, Fleming Key, etc.) is provided via an aqueduct system originating in Dade County, Florida.

Climate

The general area climate may be characterized as tropical. Refer to Section II.C.2 for details on average rainfall, temperature, wind patterns, atmospheric stability class, and hurricane frequency.

Potential Human Receptors

Demolition Key is an uninhabited island with restricted access. Potential human receptors include NAS Key West personnel engaged in range operations and infrequent trespassers gaining access by watercraft.

Potential Ecological Receptors

General Site Ecology

Demolition Key NW is generally flat and supports the invasive/exotic species of Australian pine (*Casuarina* spp.) and Brazilian pepper (*Schinus terebinthifolius*). The bay cedar (*Suriana maritima*), a plant species protected by Monroe County, and sea-purslane (*Sesuvium portulacastrum*) are abundant. The key was inspected in April 2001 by EnSafe Inc. of Memphis, Tennessee. The results are discussed in the following sections. No mammalian, migratory bird, or reptile species appear to be using the key as permanent habitat. However, local personnel report that it may be used during part of the year as nesting habitat for migratory birds. Native bird species appear to use the key year-round.

The key is thickly vegetated with the entire perimeter lined in a dense cover of mangroves except for a short portion of the shoreline section, which is used for island access. This landing supports several mature Australian pines, while dense populations dominated the interior portion of the island. The thick layer of pine needles inhibit all but sparse understory vegetation.

The OB/OD unit is near the southeastern approach to the island, about 15 feet from the shoreline. The original OB/OD unit was a 10-foot diameter pit, which was expanded to 30 feet by excavation activities in 1998. The site is surrounded and marked with orange plastic fencing placed and maintained by Navy personnel. The excavation's extent was restricted by the water table and the location of mangrove roots encountered along the channel end. Cobble-sized coral/limestone rubble unearthed during the excavation process are still visible throughout the site. In the excavated area, a small population of juvenile mangroves, *Avicennia germinans*, and one 8-foot Australian pine have taken root and appear to be flourishing. In addition, hundreds of 3- to 4-inch black mangrove roots have established themselves in their typical upward nature among the juvenile mangroves.

The area adjacent to the site is relatively barren toward the channel and blanketed with pine needles to the interior. The small (2- to 3-foot) berm, an artifact of the excavation process, is rigid, vegetated with mangroves, and thus stable. During storm events or exceptionally high tides, it is likely that sea water from the channel inundates the excavated depression and may explain its ability to support the juvenile mangroves.

Wetlands on Demolition Key

According to Chapter 62-340 of the Florida Regulations, Delineation of the Landward Extent of Wetlands and Surface Waters, site topography and the presence of four vegetative species have determined that Demolition Key NW supports wetland habitat. The four species are the white

mangrove (*Laguncularia racemosa*), red mangrove (*Rhizophora mangle*), black mangrove, and sea-purslane. High tides flood much of the area delineated as wetland and all three of the mangrove species are identified as obligate wetland plant species and sea-purslane is a succulent herbaceous facultative wetland species. The boundary where wetland hydrology begins and ends at the key is undefinable because rocky conditions prevent intrusive investigations. A copy of the wetland map is included as Figure II.C-18. Demolition Key SE is not as elevated as the Key NW, and sea-purslane is prevalent throughout the entire key and all three mangrove species have been noted along its edges. During high tide, this key is almost completely inundated. Thus, the smaller key is considered entirely wetland (Section II.C.2).

Channel

The channel between the twin keys was formed by ordnance detonation not associated with hazardous waste treatment, and has been maintained by storm and sea erosion. Prior to the keys being divided, demolition and testing were generally conducted in the center of the island, on the seaward parts. As demolition occurred, the Florida Bay encroached, aided by waters filling craters, storms, etc. Demolition continued inland as the Florida Bay encroached; eventually the key was bisected.

As described in Section II.C.2-5, large craters were seen throughout the channel. These craters, 20 to 50 feet in diameter and up to 10 feet deep, are reported to be the result of World War II-era sea mines being towed into the area and detonated in the water. Depths in some areas of the channel ranged from 1 to 3 feet and 4 to 10 feet in others. Today the narrow channel still harbors several craters, but the swift and vigorous current has likely diminished their dimensions by scouring and redepositing bottom sediments.

The current channel, which is approximately 150 feet long and only 15 to 20 feet wide, carries a swift current from the deeper Garrison Bight Channel (to the east) through the narrow cut dividing the island, and then disperses into a shallow (1 to 3 feet) flat to the west. This flat area extends from the northern portion of Demolition Key NW to the southern portion of Demolition Key SE.

The shallow flats adjacent to Demolition Key's west end are a habitat for mangrove establishment. As the mangroves mature, their branches overhang the waters, eventually creating a habitat for juvenile fish and crustaceans. The shallow waters limit the size of predators that can be supported in the area.

The high flow rate in the channel limits any submerged aquatic vegetation from the middle (deepest) portion of the channel; however, submerged vegetation has established in areas of low-energy flow across the flats. The northwest, windward side of the key had quiet waters

bordering mangroves. Several patches of turtle grass (*Thallasia testudinum*) were observed when approaching the island. This habitat would harbor the following invertebrate species: spiny lobster (*Panulirus argus*), queen conch (*Strombus gigas*), hawkwing conch (*S. Raninus*), Caribbean vase conch (*Vasum muicatum*), and hermit crabs (*Petrochirus diogenes*). The waters surrounding Demolition Key would be expected to support nursery inhabitants from the following species: red snapper, yellow-tail snapper, and mutton snapper (all members of the *Lutjanus* genus.) The quieter waters also support the larger predatory fish representatives such as barracuda (*Sphyraena barracuda*) and tarpon (*Megalops atlanticus*).

Florida Bay

The bay surrounding Demolition Key consists of relatively deep waters within the Garrison Bight Channel to the south and east and shallow waters to the northwest. The Garrison Bight Channel trends northeast-southwest and extends from Demolition Key to Fleming Key. The channel is approximately 12 feet deep. Waters on the opposite side of Demolition Key (from Garrison Bight Channel) are relatively shallow, ranging from 1 to 3 feet with relatively low relief. Demolition Key is tidally influenced. During high tide, the smaller of the two keys was almost completely inundated. However, the larger key is higher in elevation and does not appear to be as inundated by tides.

The shallow waters west of Demolition Key support patches of turtle grass (*Thallassia testudinum*) a common food and habitat for the queen conch (*Strombus gigas*). The water surrounding Demolition Key also supports abundant marine grass beds at shallow depths. These grass beds provide habitat for fish and other marine organisms and are a vital component of the benthic food web. Healthy communities of marine grass beds are reported to be present near Demolition Key. Many commercially and recreationally important fish species are reported to live and feed in the area of Demolition Key (Monroe County Comprehensive Plan).

The nearby surface waters are used for recreation and transportation. The navigable Garrison Bight Channel runs adjacent to the key, but was closed during OB/OD (see Section II.C.2).

Regional Fisheries

Seagrass beds are transitional habitats between the coral reef and mangrove habitats. As such, they are important to many species of both ecosystems. They provide abundant food and shelter for many species of fish, sea turtles, and invertebrates. They represent the richest nursery and feeding grounds in South Florida's coastal waterways. In addition to representing a primary resource for grazers, seagrasses provide vast amounts of energy via detritus that may cycle internally or be expected in mangrove or coral reef communities.

Many species of fish complete their life cycle within the mangrove community. Others depend on mangroves during juvenile life stages and migrate to grassbeds and/or coral reefs when mature. Others are seasonally or locally abundant. Many of the invertebrates and fishes are important to the region's recreational and commercial fisheries (Monroe County Comprehensive Plan).

Threatened and Endangered Species

Four governmental organizations (US Fish and Wildlife Service, Florida Game and Freshwater Fish Commission [FGFFC], NAS Key West Natural Resources Department, and Monroe County) which have knowledge of the area were contacted to determine whether threatened or endangered species may live on Demolition Key. None of these groups had any evidence that threatened or endangered species live on the key. According to the FGFFC, the least tern (a listed threatened/endangered species) may nest on Demolition Key from March to June, although there have been no records of nesting colonies. To protect the nesting and survival of the least tern, no testing or training operations are conducted at the Demolition Keys during these months. Monroe County has published a map showing threatened and endangered species known to live in the area. None of these species' habitat was noted on Demolition Key or within approximately 3 miles of it.

At least one plant species listed for protection by Monroe County, the bay cedar (*S. maritima*), is common on Demolition Key. Since this species is listed by Monroe County, it has no legal status in relation to Demolition Key.

Demolition Key is also between the Key West National Wildlife Refuge, approximately 2.5 miles west of Truman Annex, and the Great White Heron National Wildlife Refuge, approximately one half-mile north-northeast of Demolition Key. No endangered or threatened species habitat or other sensitive environments are known to be on these preserves (See Section II.C.2).

No white sandy beaches were noted on the island, removing the chance that sea turtles would nest there.

Migratory Bird Habitat

The red and black mangroves along the shore of Demolition Key NW have reached heights of 30 feet and provide habitat and nesting sites for wading birds, perching birds, and other migratory species. Large migratory species such as the great white heron (*Ardea occidentalis*) and the great blue heron (*A. herodias*) are common in the area, as are the smaller species such as the little blue heron (*Florida caerulea*) and the night heron (*Nyctanassa* sp).

According to the NAS Key West Natural Resources Management Department, September and October are the only months when any of three common migratory bird species would not be considered to possibly nest on Demolition Key. This conclusion is based on a review of species that live in the area and known characteristics about their breeding behavior. FGFCC also concurred with the NAS Key West natural resource manager concerning when migratory birds may nest on Demolition Key (See Section II.C.2).

Previous Investigation and Removal Action

IT Corporation, 1993

In May 1990, IT Corporation (IT) conducted a preliminary remedial investigation (RI) at several of the Navy's Installation Restoration program sites at NAS Key West. After the preliminary RI, the EPA issued a Hazardous and Solid Waste Amendments permit for NAS Key West. During this process, each site was grouped into one of the following categories: (1) sites requiring additional RCRA Facility Investigation (RFI) work, (2) sites requiring an RFI, (3) sites requiring additional RI work, or (4) sites requiring preliminary RI work. Demolition Key NW was grouped into the fourth category. Therefore, from March to May 1993, IT conducted a preliminary study on Demolition Key NW. These sampling and analysis efforts chiefly focused on metals and semivolatile compounds in environmental media (*Final Report, RCRA Facility Investigation/Remedial Investigation*, IT, 1994). From the preliminary data, IT recommended a more comprehensive investigation to determine the nature and extent of contamination.

EnSafe Inc., 1999

In 1998, EnSafe Inc. of Memphis, Tennessee, provided third-party monitoring of Bechtel Environmental, Inc. as soil and other materials were removed from the OB/OD unit under contract to Southern Division Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) in Charleston, South Carolina. American Technologies, Inc. of Oak Ridge, Tennessee, performed the direct removal under subcontract to Bechtel, Inc. This excavation was performed in accordance with EnSafe's 1997 FDEP-approved closure plan. Its primary objectives were to assess the nature and extent of surface material and potential groundwater/surface water impacts associated with former units operations, and provide a means of closure protective of human health and the environment. The sampling and analysis plan for these closure activities is in Appendix F. The project quality assurance plan is in Appendix E.

Excavated material was screened to remove large metal pieces. No live unexploded ordnance was encountered during the project. Of the approximately 98 drums of excavated material, 18 contained scrap metal. The drummed material was removed under a hazardous waste manifest

and shipped to the Chemical Waste Management, Inc. hazardous waste disposal facility in Emelle, Alabama. As previously described, the original 10-foot-diameter OB/OD unit was over-excavated to a nominal 30 feet in diameter and down as far as 18 inches or until the water table was reached. The actual depth of soil excavated from the bottom of the pit ranged from a few inches on the end nearest the channel to 18 inches on the end opposite the channel. Eighteen inches of soil were also excavated on all sidewalls, except on the channel end of the OB/OD unit where approximately 12 inches of soil were removed. Excavation on the channel end was terminated when mangrove roots were encountered. The sides of the unit were excavated to follow the original contours of the unit as much as possible. Confirmation samples from the OB/OD pit contained residual contaminant concentrations exceeding FDEP's soil and groundwater cleanup target levels (EnSafe, 1999).

Sampling Locations/Results

During the IT study of Demolition Key NW, soil, sediment and groundwater samples were collected to determine the impact of site activities. Nine soil samples (SB-1 to SB-9) were collected at the top of the water table, which varied from 0 to 2 feet below ground surface (bgs). Sediment and surface water samples were also collected in the channel between Demolition Key NW and SE. The sampling scenario is summarized below. Sampling locations are shown on Figure II.D-2; exceedances are shown in red.

Matrix	No. of Samples	Analytical Parameters
Soil	3	Toxicity Characteristic Leaching Procedure (TCLP) for metals
	4	Volatile Organic Compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and Appendix IX metals
	1	Total Organic Carbon (TOC), grain size, ion-exchange capacity, pH, density and moisture content
	1	Target Analyte List/Target Compound List (TAL/TCL) parameters
Sediment	2	VOCs, PAHs, PCBs, and metals
Groundwater	1	VOCs, PAHs, pesticides/PCBs and Appendix IX metals

Numerous metals were detected in surface soil samples. Antimony, arsenic, cadmium, copper and lead exceeded current FDEP soil cleanup target levels (SCTLs). Of three samples analyzed for TCLP metals, lead concentrations exceeded SCTLs in one. Arsenic exceeded its groundwater protection soil cleanup goal at three locations in the surface interval only. A water sample collected from SB-9 also contained several metals above groundwater protection-based cleanup goals.

Sediment samples were collected in the channel areas between Demolition Key NW and SW that would most likely receive surface water runoff from the OB/OD unit. However, no inorganics exceeded their criteria in these sediment samples.

PAH compounds were not detected in samples collected near the OB/OD unit, although low concentrations (<1 mg/kg) were detected in surface soil samples from other ordnance testing/training areas on Demolition Key NW.

During the 1998 removal action, soil samples were collected from the bottom of the OB/OD pit in accordance with the SAP and the QAPP, with two exceptions. Based on the FDEP project manager's preference, the soil samples were leached using TCLP in lieu of the proposed synthetic precipitate leaching procedure, and the total metals analyses were performed for the full list of TAL metals in lieu of the abridged list of arsenic, barium, chromium, cadmium, lead, and nickel.

As shown on Figure II.D-2, five sampling points were chosen, with soil from sample no. 5 submitted for duplicate quality assurance/quality control analyses. All samples were analyzed for total and TCLP VOCs, SVOCs, explosives, metals, FL-petroleum recoverable organics, ammonia, nitrate, and sulfate (EnSafe, 1999). 2,4-dinitrotoluene was detected in three samples, two of which exceeded the FDEP criteria for total explosives. Sixteen metals were detected in five of the six (five primary and one duplicate) samples analyzed for total metals; antimony, arsenic, barium, copper, lead and manganese exceeded criteria in some of these samples. Total metals were compared with FDEP direct exposure residential and commercial/industrial criteria to determine exceedances. Fourteen metals were detected in the samples analyzed for TCLP metals; antimony, arsenic, cadmium, copper, lead, manganese, strontium, and zinc exceeded residential criteria for some of these samples. TCLP metals were compared with FDEP groundwater criteria to determine exceedances.

Soil, TCLP, and groundwater exceedances are shown in Tables II D-1 to II D-3. The FDEP has updated its soil cleanup target levels since the OB/OD unit closure; the more recent 1999 criteria were used to develop the tables.

N

SB-2
SB-3
SB-1
SB-4
SB-5
Pine Trees
SB-9 / 2
SB-6
Fire Place
3
5 & D
OD/OB Treatment Unit
4
1
SS-1
SB-8
SB-7
SS-2

75 0 75 Feet

Soil Samples (mg/kg)

Parameter	1	2	3	4	SB-3	SB-4	SB-5	SB-9
Antimony	114	46						44
Arsenic	6	9	3.7	7.5	1	0.96	1.4	19
Barium		187	129					
Copper								1540
Lead	7530	1990	875	610				2100
Manganese		4040						

TCLP Samples (µg/l)

Parameter	1	2	3	4	5	D	SB-6
Antimony	1900	15	32	42	7		
Arsenic	130						
Cadmium	52		115	48	40	22.9	
Copper			1790				
Lead	16400	745	1420	2470	92	74	22,900
Manganese	2480	14700	8010	7440	2690	1,660	

Groundwater Samples (µg/l)

Parameter	SB-9
Antimony	249
Cadmium	52
Copper	4070
Lead	1610
Nickel	116
Zinc	23500

Approximate Sample Locations
- IT Detect Below Clean-up
- IT Detect Above Clean-Up
- EnSafe Detect Above Clean-Up

Approximate Outline
Wetlands

SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND

FIGURE II.D-2
DEMOLITION KEY NW

SAMPLING LOCATIONS

KEY WEST, FL

DATE: 3/7/2000

//GIS1/WORK_DIR/NAS_KEYWEST

Table II D-1
NAS Key West Demolition Key NW Soil Criteria Exceedances (mg/kg)

Sample ID	Location	Parameter	Soil Result	Residential FDEP Soil Criteria[1]	Industrial FDEP Soil Criteria
1	OB/OD Pit	Antimony	114	26	240
		Arsenic	**6.4**	0.8	3.7
		Lead	**7,530**	400	920
2	OB/OD Pit	Antimony	45.5	26	240
		Arsenic	9	0.8	3.7
		Barium	187	110	87,000
		Lead	**1,990**	400	920
		Manganese	4,040	1,600	22,000
3	OB/OD Pit	Arsenic	3.7	0.8	3.7
		Barium	129	110	87,000
		Lead	875	400	920
4	OB/OD Pit	Arsenic	**7.5**	0.8	3.7
		Lead	610	400	920
SB-3	Ordnance Testing/Training	Arsenic	1	0.8	3.7
SB-4	Ordnance Testing/Training	Arsenic	0.96	0.8	3.7
SB-5	Ordnance Testing/Training	Arsenic	1.4	0.8	3.7
SB-9	OB/OD Pit	Antimony	43.5	26	240
		Arsenic	**19.3**	0.8	3.7
		Copper	1,540	110	76,000
		Lead	2,100	400	920

Notes:
[1]FDEP (1999). *Technical Report: Development of Soil Cleanup Target Levels (SCTLs) for Chapter 62-777, F.A.C.*, May 26.
Bold denotes concentration exceeds both residential and industrial FDEP Soil Criteria.

Table II D-2
NAS Key West Demolition Key NW TCLP Criteria Exceedances (μg/L)

Sample ID	Location	Parameter	TCLP Result	FDEP TCLP Criteria[1]
1	OB/OD Pit	Antimony	1,900	6
		Arsenic	130	50
		Cadmium	52.4	5
		Lead	16,400	15
		Manganese	2,480	50
		Strontium	14,500	4,200
2	OB/OD Pit	Antimony	14.9	6
		Lead	745	15
		Manganese	14,700	50
		Strontium	17,100	4,200
		Zinc	22,500	5,000
3	OB/OD Pit	Antimony	32.3	6
		Cadmium	115	5
		Copper	1,790	1,000
		Lead	1,420	15
		Manganese	8,010	50
		Strontium	20,600	4,200
		Zinc	37,600	5,000
4	OB/OD Pit	Antimony	42.2	6
		Cadmium	48	5
		Lead	2,470	15
		Manganese	7,440	50
		Strontium	17,700	4,200
		Zinc	25,000	5,000
5	OB/OD Pit	Antimony	7	6
		Cadmium	40.2	5
		Lead	92.3	15
		Manganese	2,690	50
		Strontium	17,900	4,200
		Zinc	8,000	5,000
D	OB/OD Pit	Cadmium	22.9	5
		Lead	73.7	15
		Manganese	1,660	50
		Strontium	16,500	4,200
SB-6	Ordnance Testing/Training	Lead	22,900	15

Note:
[1]FDEP (1999). *Technical Report: Development of Soil Cleanup Target Levels (SCTLs) for Chapter 62-777, F.A.C.*, May 26.

Table II D-3
NAS Key West Demolition Key NW Groundwater Criteria Exceedances (μg/L)

Sample ID	Location	Parameter	Groundwater Result	FDEP Groundwater Criteria[1]
SB-9	OB/OD Pit	Antimony	249	6
		Cadmium	52.2	5
		Copper	4,070	1,000
		Lead	1,610	15
		Nickel	116	100
		Zinc	23,500	5,000

Note:
[1]FDEP (1999). *Technical Report: Development of Soil Cleanup Target Levels (SCTLs) for Chapter 62-777, F.A.C.*, May .

Summary

In all, 15 soil samples, two sediment samples, and one groundwater sample have been collected on Demolition Key NW. Seven of the soil samples, including one duplicate, were collected in the OB/OD unit area — one during the 1993 preliminary RFI/RI study, and the rest following the 1998 soil excavation. The single groundwater sample was collected in 1993 at the OB/OD unit. The remaining eight soil samples were collected at other sites (i.e., training and research and development areas) over the 8-acre island.

All of the samples from the OB/OD unit exceeded current FDEP residential criteria; four exceeded commercial/industrial criteria. Numerous metals were detected in surface soil samples from the OB/OD unit area; antimony, arsenic, barium, copper, lead, and manganese exceeded current FDEP SCTLs. In the samples analyzed for TCLP metals, antimony, arsenic, cadmium, copper, lead, manganese, strontium, and zinc exceeded groundwater protection-based cleanup goals. In the groundwater sample collected from the OB/OD unit in 1993, antimony, cadmium, copper, lead, nickel, and zinc exceeded FDEP groundwater criteria.

Four of the eight soil samples collected from the other sites on Demolition Key NW exceeded FDEP residential criteria for arsenic and lead; two of exceedances were in the OB/OD unit area. That is not surprising since the same ordnance was likely detonated at all sites. The highest measured lead concentration on Demolition Key NW occurred at sampling location SB-6, near the center of the island. SVOCs were not detected in samples collected near the OB/OD unit, although low concentrations (< 1 mg/kg) were detected in surface soil samples from training and research and development areas.

Human Health Considerations

As discussed above, groundwater is not a drinking water source. Therefore, the primary pathway of exposure is incidental ingestion and dermal contact with contaminated soil from site trespassers and site workers. To reduce this risk, this closure plan proposes to cover the site with clean soil, place warning signs, and restrict disturbance of the former treatment unit. These measures are intended to eliminate the soil to human receptor pathway.

Ecological Considerations

To evaluate ecological risk, residual soil concentrations from the 1998 removal action are compared with USEPA recommended ecological screening values (ESVs) for soil (see Table II.D-4). Concentrations in samples from the pit exceed numerous ESVs. As shown in Table II.D-4, some parameters only slightly exceeded their ESVs (barium, nickel, and tin), but several parameters' maximum concentrations were orders of magnitude above their ESVs, including aluminum, cadmium, chromium, copper, lead, manganese, and zinc. For these parameters, even the lowest detected concentration exceeded the ESV, suggesting potential risk to ecological receptors.

Nearly all the maximum concentrations were detected in the sample from the center of the pit (Sample No. 2). Aluminum, antimony, lead and 2-butanone were highest in the soil sample from between the pit and the channel (Sample No. 1), which may signify a migration pathway. The single SVOC, hexachlorobenzene, was detected in soil on the southwest side of the excavation (Sample No. 4) and the highest strontium concentration was in Sample No. 5 on the northeast side of the excavation.

Table II.D-4
Comparison to Ecological Screening Values for Soil

Parameter	No. of Detections	Range of Concentrations	ESVs[1]	Sample with Maximum Concentration
VOCs (μg/kg)				
2-Butanone (MEK)	1/6	15	NA	1
SVOCs (μg/kg)				
Hexachlorobenzene	1/6	150	2500	4

Table II.D-4
Comparison to Ecological Screening Values for Soil

Parameter	No. of Detections	Range of Concentrations	ESVs[1]	Sample with Maximum Concentration
Metals (mg/kg)				
Aluminum	6/6	1090 - 36100	**50**	1
Antimony	6/6	1.6 - 114	**3.5**	1
Arsenic	6/6	0.67 - 9.0	10	2
Barium	6/6	32.5 - 187	**165**	2
Beryllium	6/6	0.18 - 0.28	1.1	2
Cadmium	6/6	3.9 - 34.1	**1.6**	2
Chromium	6/6	4.9 - 55.1	**0.4**	2
Copper	6/6	88.4 - 3700	**40**	2
Lead	6/6	57.7 - 7530	**50**	1
Manganese	6/6	88.8 - 4040	**100**	2
Mercury	5/6	0.05 - 0.1	0.1	2
Nickel	6/6	2.5 - 40.3	**30**	2
Strontium	6/6	1090 - 3600	NA	5
Tin	6/6	7.2 - 72.9	**53**	2
Vanadium	6/6	2.0 - 7.9	**2.0**	2
Zinc	6/6	417 - 8420	**50**	2
Other Parameters (mg/kg)				
Sulfate	6/6	680 - 2100	NA	1
Nitrate-Nitrite-N	1/6	2.1	NA	5
2,4-Dinitrotoluene	3/6	273 - 3230	NA	4
TPH (8015)	3/6	11 - 1600	NA	1

Notes:
[1] Ecological Screening Values from USEPA's 1998 *Ecological Screening Values*, Table of Recommended ESVs for Soil, WSRC-TR-98-00110, Region 4.
Bold = ESV exceeded by maximum concentration.
Box = ESV exceeded by the minimum concentration

As indicated by the exceedances of USEPA's ESVs, it is anticipated that ecological receptors exposed to the residual soil concentrations at the OB/OD site would be at risk for adverse effects. To reduce this risk, the closure plan proposes to cover the OB/OD site with clean soil, thus eliminating the soil-to-receptor exposure pathway.

The remaining ecological concern would then be residual subsurface soil contaminants below the water table which was beyond the vertical extent of the original excavation. Residual soil contaminants could leach to groundwater, then migrate offsite to the adjacent channel and make direct contact with aquatic receptors. Because Demolition Key NW is an active range with similar contaminants across the island from past training activities, additional removal of soils below the water table at the OB/OD disposal site is not considered practical. This closure plan proposes to instead monitor surface water from the channel and compare detected concentrations with those from samples collected from FDEP-approved background locations. If the maximum detected background concentration for each metal is exceeded, sediment and aquatic biota near the OB/OD site will also be monitored. When OB/OD training exercises cease and the range closes, the entire island will be addressed under prevailing environmental legislation.

Comparative Studies of Similar Sites

To provide further rationale for post-closure monitoring of the Demolition Key NW OB/OD site, the investigations of two similar sites in the same general area were compared with the OB/OD site. Installation Restoration (IR) 1, the Truman Annex Refuse Disposal Area, and IR 8, the Fleming Key South Landfill. As with Demolition Key NW, both IR 1 and IR 8 are adjacent to the Gulf of Mexico. Both sites underwent a preliminary investigation, an RFI/RI, which included a Phase I ERA, and a Supplemental RFI/RI with a Phase II ERA. The primary contaminants at both sites were inorganics (Tetra Tech NUS. Sept. 2000. *Decision Document for IR 1 and IR 8, Naval Air Station, Key West, Florida.* AIK-00-0288, Rev. 1.)

Truman Annex Refuse Disposal Area: IR 1 is a 7-acre disposal area at the southwest end of Key West used as a general refuse disposal and open burning area from 1952 to the mid-1960s. No restrictions were placed on the types of waste disposed of at the site; therefore it may have received waste paint thinners and solvents in addition to general refuse.

Numerous metals in soil exceeded FDEP action levels: aluminum, antimony, arsenic, barium, beryllium, cadmium, copper, iron, lead, manganese, mercury, nickel, tin, and vanadium. Based on the resulting analytical data, an immediate removal action was performed at IR 1; nearly 5,000 cubic yards of contaminated soil were removed. This soil removal eliminated the need for additional remedial action. However, elevated concentrations of some contaminants, primarily metals, remain in soil, sediment, surface water, and groundwater at IR 1.

Due to the highly compacted soils, sparse vegetation, and other restrictive site features, the Phase I ERA concluded that surface soil at IR 1 posed minimal risk to terrestrial receptors. The greatest potential risk (from metals) was to aquatic organisms through direct contact via groundwater discharges and, to a much lesser extent, contact with contaminated sediment. The overall conclusion of the ERA was that moderate-to-high potential risks were present from several constituents in various media, primarily aquatic, and that further ecological evaluation was warranted to more fully characterize ecological risk. The IR 1 disposal site then underwent a supplemental RFI/RI, which included a Phase II ERA.

The Phase II ERA indicated elevated concentrations of copper, lead, and zinc in sediment, suggesting potential risk to benthic receptors. Runoff appeared to be the primary migration pathway. Because the Supplemental RFI/RI soil sampling did not include inorganic analyses, the ERA could not determine if IR 1 soils were the source of these compounds in sediment, but they were retained as ecological contaminants of concern for both soil and sediment due to their potential for migration (via runoff) to aquatic habitats near IR 1. For this reason, sediment toxicity testing was performed; based on the results, risks to ecological receptors may exist at a single location. Sediment in this area will be monitored to ensure that the remedy is protective of the environment.

Fleming Key South Landfill: IR 8 is a 45-acre landfill at which approximately 8,000 tons of unknown waste were disposed of annually from 1962 to 1982. The waste disposal activities of the City of Key West and Sigsbee Key (Dredgers Key) were combined with those of the Navy. The open trench disposal method was used, with trenches typically 25 feet wide, 10 feet deep, and 500 to 1,000 feet long and often full of sea water when filled. Combustible wastes were also burned here.

At IR 8, metals and pesticides were the most widespread contaminants detected; all exceeded FDEP action levels. The metals were antimony, arsenic, cadmium, chromium, copper, cyanide, lead, mercury, nickel, thallium, tin, and zinc. Ecological risks from contamination were calculated during the supplemental RFI/RI; based on sediment toxicity testing, potential ecological risks from site-related contaminants at IR 8 appeared to be negligible.

Selected Remedies: The selected remedies for each site (IR 1 and IR 8) were: (1) to implement land-use controls, which would restrict site access and (2) conduct periodic performance sampling of sediment and groundwater at both sites and biota at IR 1 to ensure the selected remedies are protective of the environment.

Conclusions

Although metals in residual soils at the Demolition Key NW OB/OD site exceeded soil criteria, the impact of exceedances on terrestrial receptors will be minimal if the site is covered with clean soil and re-vegetated. A vegetated buffer between the site and the channel will also minimize the potential of cross-media transport of surface soils. To monitor the migration of potentially contaminated groundwater to the nearby channel, surface water samples will be collected at the shoreline. It is anticipated that the rapid flow in the channel would quickly dilute and disperse any residual contaminants washed in by the surface water or leached via groundwater transport due to the velocity of current in the immediate area.

Based on the performance monitoring remedies proposed for the two similar sites at Key West (IR 1 disposal site and IR 8 landfill), it would be reasonable to expect similar remedies to be effective at Demolition Key NW. When range operations at Demolition Key NW cease, the entire island can be addressed under the prevailing legislation.

Closure Performance Standard

The facility will be closed in a manner that:

- Minimizes the need for further maintenance.
- Controls, minimizes, or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous waste constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground, surface waters, or the atmosphere.
- Complies with the closure requirements of 40 CFR 264.111 and FAC 67-730.

The general steps required to accomplish this closure standard are:

- Placement of temporary erosion controls
- Placement and compaction of a soil cover in the former OB/OD excavation
- Planting of native vegetation to stabilize the cover and reduce erosion
- Certification of closure

- Implementation of post-closure care, which includes surface water (seawater) monitoring and restricting site access.

A professional engineer registered in Florida will certify that all closure activities are conducted in accordance with this closure permit.

Final Closure

This action will constitute the final closure of the RCRA OB/OD unit at Demolition Key. However, when the active range is closed, the entire island will be addressed under the prevailing environmental legislation.

Corrective Action

The Navy's final closure of the OB/OD unit includes backfilling the excavation and compacting to grade with "clean" soil from offsite (Miami oolitic limestone). The cover soil will be placed in 6-inch loose lifts and compacted to 95% density. The top lift will consist of soil that can support native vegetation (see Figures II.D-3 and II. D-4). The area will be planted with a native vegetation (lantana) to stabilize the soil, but naturally occurring island vegetation will be allowed to migrate into the area. Since the first removal action in 1998, juvenile mangroves have sprouted inside the excavated pit. To properly place and compact the cover soil, the juvenile mangroves will be covered or displaced.

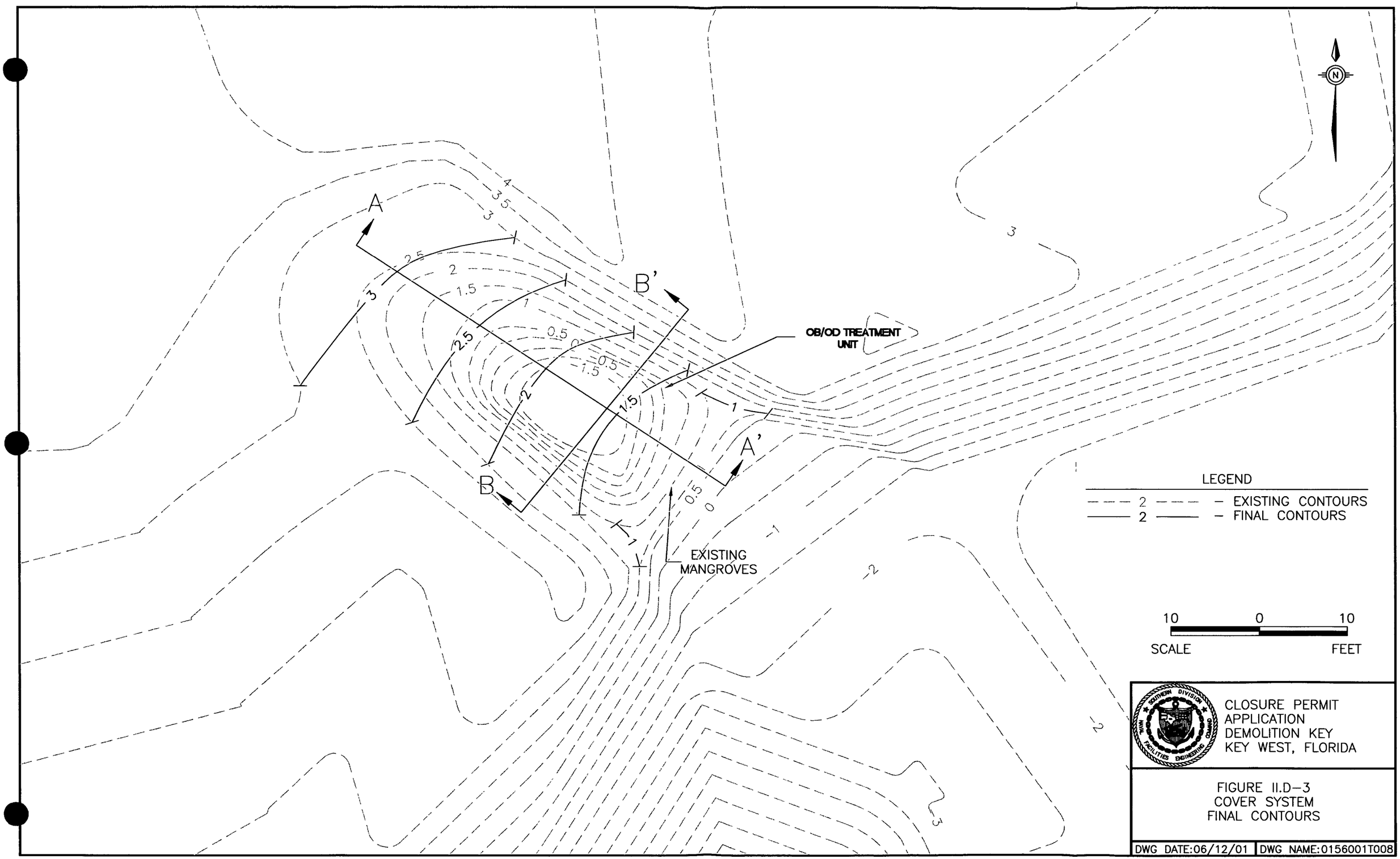
Temporary Sediment Controls

Before construction of the cover system begins, temporary erosion control devices (silt fence or straw hay bales) will be placed and staked adjacent to the waterfront downgradient of the proposed work.

Cover Soil

The cover soil will consist of Miami oolitic limestone with particle size no larger than one half-inch, with 50 % passing no. 200 sieve and 90% passing no. 4 sieve. It will be placed in a maximum 6-inch loose lifts and compacted to 95% density. During placement and compaction, the soil moisture content will be at optimum to +4% wet of optimum.

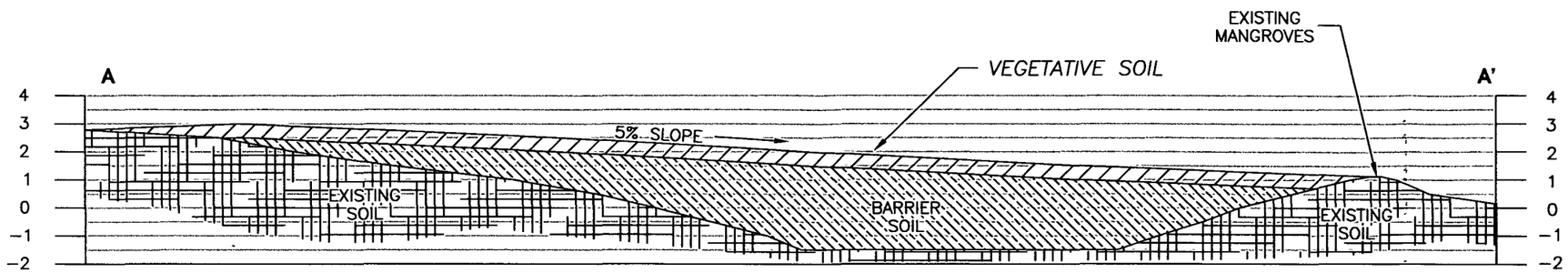
A fixing agent will not be added to the cover soil since it will not help prevent contaminants leaching from the underlying soil, which is being infiltrated with tidally influenced groundwater.



CLOSURE PERMIT APPLICATION
DEMOLITION KEY
KEY WEST, FLORIDA

FIGURE II.D–3
COVER SYSTEM
FINAL CONTOURS

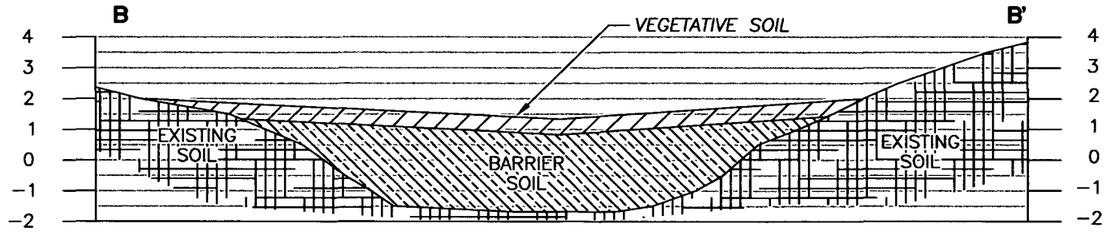
DWG DATE:06/12/01 | DWG NAME:0156001T008



5 0 5

SCALE FEET

VERTICAL SCALE 1" = 5'



5 0 5

SCALE FEET

VERTICAL SCALE 1" = 5'

CLOSURE PERMIT
APPLICATION
DEMOLITION KEY
KEY WEST, FLORIDA

FIGURE II.D−4
CROSS SECTIONS

DWG DATE:06/12/01 | DWG NAME:0156001T003

Vegetative Soil

The top 6 inches of the cover system will be soil that can sustain the native vegetation (lantana). The soil will be a mixture of uncompacted Miami oolitic limestone, topsoil, and a hydrating gel. The mix ratio will be 65% oolite, 30% topsoil, and 5% hydrating gel. The gel will promote growth in the early vegetation stages.

Finish Grade

After the vegetative soil is placed, the surface will have positive sheet drainage flow to the waterfront, without pools, ruts, or depressions. Any surface depression will be filled to surrounding elevations and graded to maintain positive drainage.

Vegetation

Lantana, a native Keys vegetation, will be plugged/planted on all disturbed areas above the high tide watermark. The lantana will be viable plants between six and 18 months old. At a minimum, the plants will be plugged 6 inches into the surface and spaced 4 feet center-to-center. If conditions or time of year warrant a different plant, a natural vegetation species similar to lantana will be substituted.

Fertilization

Fertilizer will be applied before planting to all areas requiring vegetation at a rate of 300 pounds per acre (lbs/acre). The fertilizer will contain 17% nitrogen, 17% phosphorus, and 17% potash.

Mulching

Mulch will be placed over all disturbed areas to prevent erosion at a rate of 2,000 lbs/acre. It will be made up of straw and applied at a thickness of approximately one-half inch.

Groundwater

Due to site hydrogeology and the absence of a freshwater source/aquifer, no groundwater monitoring is proposed. The primary way in which contaminants are transported from this site is by saltwater to the channel between Demolition Key NW and SE. Therefore, as outlined in the following post-closure plan, the water column in the channel will be monitored for metals contamination.

Decontamination

All equipment will be inspected before being brought onsite to ensure cleanliness and to prevent contaminants from being transported onto the site. All equipment will be left onsite during field activities. When field activities are complete, all equipment will be decontaminated to prevent contaminants from being transported offsite. Decontamination solids and liquids will be collected and analyzed for site contaminants. If analysis indicate the materials are hazardous, they will be disposed of in a hazardous waste facility.

Because Demolition Key NW is an active range, no further decontamination or contamination removal will take place. Future remedial actions for the remainder of the island will be discussed as part of the final closure of the range.

Soil Removal

As stated above, the OB/OD unit was over-excavated laterally and to groundwater/seawater vertically. Additionally, the surrounding soils are part of the active range and contain the same contaminants identified in the unit. Therefore, the Navy considers further excavation to be unwarranted.

Clean-up Criteria

Because no further excavation is proposed, a clean-up criteria does not apply.

Closure Schedule

Final closure activities will be completed per the schedule shown in Figure II.D-5. Closure will begin when the FDEP approves the closure plan. Final closure will be witnessed and certified by an independent Florida-registered professional engineer, in addition to the owner/operator.

In case of a delay or potential delay, FDEP will be notified orally within 24 hours or by the next working day and in writing within seven calendar days of oral notification. The written notification will outline the anticipated length and cause of delay, the measures taken, or to be taken, to prevent or lessen the delay, and the timetable for implementing these measures. If FDEP concurs that the delay or anticipated delay have been caused by circumstances beyond the Navy's reasonable control, the time for performance will be extended to a time equal to the agreed-upon delay resulting from such circumstances.

Task	Original Duration	Months 1	2	3	4	5	6	7
00001	0	FDEP Approval of Technical Memorandum						
00002	0	Funding Obligation						
00011	90	Contractor Selection/Contract Award						
00021	60			Installation of Cover System				
00031	30						Completion Report	
00041	30							FDEP Approval of Site Work/Cover

Run Date 25JUN01 15 46 JNS1

Figure II.D-5

NAS Key West FL

Schedule

ENSAFE

Notification of Closure

NAS Key West shall notify the State of Florida's Regional Office Director in writing at least 45 days prior to the date on which it expects to begin final closure operations.

Closure Time Allowed

NAS Key West will complete closure of the Demolition Key treatment within 180 days of receiving FDEP approval of the closure plan. This includes contract award, installation of the cover, as well as a closure report.

Certification of Closure

As required by 40 CFR 265.115 and FAC 67-730, the certification of closure will be submitted to the FDEP director within 60 days of completing final closure. As part of closure certification, NAS Key West will submit a survey plat to the local zoning authority and the FDEP. The plat will be prepared and certified by a professional land surveyor and prominently note NAS Key West's obligation to restrict disturbance of the former treatment unit. It will also show the location and dimensions of the Demolition Key treatment unit.

Closure Cost Estimate

Demolition Key is owned and operated by the federal Department of Defense. As such, a closure cost estimate is not required.

POST-CLOSURE PLAN

This section describes the activities that the Navy will perform during the post-closure care period; as such, it satisfies the requirements of 40 CFR 264.118 and FAC 67-730. The Navy will implement a five-year post-closure period for the Dèmolition Key OB/OD unit.

Administrative Requirements

Plat Notation

NAS Key West will submit a survey plat to the local zoning authority and the FDEP. The plat will be prepared and certified by a professional land surveyor and prominently note NAS Key West's obligation to restrict disturbance of the former treatment unit. It will also show the location and dimensions of the Demolition Key treatment unit.

Security Controls

Demolition Key NW is an uninhabited island and restricted to authorized Navy personnel. However, signs will be posted and maintained to discourage trespassers.

Oversight and Record-Keeping

The Navy will maintain a budget and personnel to address closure issues associated with oversight and record-keeping for environmental activities. The Navy has named Ms. Patsy McNeill as the NAS Key West project manager, and she has the primary responsibility for ensuring that all closure/post-closure activities are budgeted and completed in accordance with FDEP requirements. She may be reached at NAS Key West, Public Works Office, P.O. Box 9007, Key West, Florida, (33040-9001). Her regular phone number is 305-293-2583 and her emergency number is 305-797-4454.

Monitoring

Monitoring to be performed by the Navy during the post-closure care is discussed below.

Seawater Monitoring

Groundwater (mainly seawater) is directly influenced by tidal conditions. Due to these conditions, groundwater sampling is impractical. The primary way in which contaminants would be transported from the OB/OD unit would be by soil contamination leaching to groundwater, which would be discharged to the channel between Demolition Key NW and SE. Therefore, the Navy

will monitor seawater in the channel by collecting three discrete samples during ebb tide in the top 6 inches of the water along the shoreline (See Figure II.D-6). The water samples will be analyzed for residual metals associated with the OB/OD unit's past activities: aluminum, antimony, arsenic, barium, beryllium, cadmium, copper, lead, manganese, strontium, and zinc. In addition, during each post closure sampling event, samples will be collected from three background locations (BG4, BG5, and BG7, as presented in the *Background Report for Naval Air Station Key West*) and analyzed for the same list of metals. Detected concentrations from the Demolition Key channel samples will be compared to the maximum concentration for each metal found in samples collected from the three background locations.

Location BG4 is between the eastern tip of Dredgers Key and the small island to the south. The area consists of an east-west channel, approximately 100 feet wide and 15 feet deep, bounded by shallow areas on both its north and south sides. Previous measurements were characteristic of near-shore marine habitats in the Gulf of Mexico with small-to-insignificant freshwater inflows (Brown & Root, 1997).

Location BG5 is approximately five miles north of Key West. The area consists of open water in the Gulf of Mexico. Previous measurements were characteristic of open water/offshore habitats in the Gulf of Mexico (Brown & Root, 1997).

Location BG7 is in a lagoon and mangrove swamp near Cow Key Channel. The sample location is hydrologically connected by narrow, shallow channels to Cow Key Channel; the water depth in the lagoon fluctuates with the tides, and salinities approximate those found in open ocean waters. Previous measurements were characteristic of near-shore marine habitats in the Gulf of Mexico with small-to-insignificant freshwater inflows (Brown & Root, 1997).

Initially, seawater will be sampled quarterly for the first year. If concentrations from the Demolition Key channel are below the maximum concentration for each metal in the background sample results, monitoring will continue annually for the next four years. If surface water samples exceed screening values, sediment samples will be collected biennially for metals analysis and toxicity testing. Sample collection methods and analytical protocols are detailed in the attached quality assurance plan.

Cover Monitoring

The cover will be visually inspected periodically to ensure it is not compromised by exposure to wind and rain. The site will be inspected every six months for the first year of the five-year post-closure period, and annually for the final four years. Required maintenance will be performed after each inspection during the five-year post-closure period. Table II.D-5 provides a checklist for monitoring and repairs.

OB/OD TREATMENT UNIT

LEGEND

- 2 – EXISTING CONTOURS
- 2 – FINAL CONTOURS
- SEAWATER SAMPLING LOCATION
- WATER FRONT

10 0 10

SCALE FEET

CLOSURE PERMIT APPLICATION
DEMOLITION KEY
KEY WEST, FLORIDA

FIGURE II.D–6
PROPOSED SAMPLE LOCATIONS

DWG DATE:06/12/01 | DWG NAME:0156001T004

Maintenance

The vegetative cover will be maintained as required to preserve its integrity. Fresh water will be transported to the island quarterly for the first year to promote vegetative growth. Also, any damaged areas noted during monitoring will be repaired as outlined in Table II.D-5.

Table II.D-5
Post-Closure Monitoring and Repair Procedures

Inspection Item	Identifying Features	Repair Procedures
Vegetation	Large barren areas	Fertilize, plant, and mulch the area.
Surface Erosion	Rills and gullies in the surface soil	Replace topsoil; grade to match existing contours, replant, and mulch. If the area persistently needs repair, consider diverting surface water away from the area, or installing a permanent geosynthetic erosion control mat.
Subsidence	Depressions in the cover that appear to hold water. These are easily identified shortly after a rain event, when standing water can be observed.	To repair areas undergoing subsidence, place and compact a vegetative soil in the depression(s) to match the surrounding area. Fertilize, replant, and mulch the area.
Unauthorized Access	Debris or evidence that trespassers have been on the site.	Check the integrity of security and access controls. If missing, replace signs around the perimeter prohibiting access.

Reporting

Annual Reporting

An annual post-closure report will be developed for the Demolition Key OB/OD unit, after approval of the final closure certification. The approval date of closure certification will be the anniversary for submittal of the annual reports. These reports will describe inspections, maintenance, and analytical data for the previous year.

Post-Closure Certification

After completion of post-closure monitoring , the Navy will develop a signed certification report stating that the site was monitored and maintained in accordance with the approved post-closure plan and applicable regulations. At a minimum, this certification report will include all information required for the annual report, plus information about any contamination detected during surface water monitoring. If warranted, corrective actions will also be described.

Post-Closure Cost Estimate

Demolition Key is owned and operated by the federal Department of Defense. Therefore, a post-closure cost estimate is not required.

QUALITY ASSURANCE PLAN

Introduction

This quality assurance plan (QAP) presents policies, project organization, objectives, functional activities, and quality assurance/quality control (QA/QC) measures intended to achieve a cover soil system and post-closure sampling for the Demolition Key OB/OD unit for NAS Key West, Florida. This document is intended to fulfill QA/QC requirements for cover construction and environmental monitoring protocols.

Site History

The Demolition Key OB/OD facility has historically been used to treat hazardous waste ordnance. It has had RCRA Part B Interim Status since 1980 to conduct these operations. The OB/OD facility is currently subject to closure. Preceding sections of the closure plan provide additional background information regarding Demolition Key.

Summary of Historical Data

Numerous metals have been detected in soil samples; antimony, arsenic, barium, copper, lead, and manganese exceeded current FDEP soil cleanup target levels. Antimony, cadmium, copper, lead, nickel, and zinc detected in groundwater exceeded groundwater criteria.

Project Scope and Purpose

The cover soil system will be constructed to limit human and ecological exposure to underlying contaminated soils at the OB/OD unit. To ensure the system will prevent such contact throughout post-closure or until the entire range is closed, the cover system will be compacted and vegetated in accordance with the closure permit application. Additionally, the seawater adjacent to the OB/OD unit will be monitored during post-closure care to determine if known site contaminants are migrating from the OB/OD unit. Sample results will be compared to those collected from three background locations. If samples from the Demolition Key channel exceed the maximum concentration of each metal from the three background locations, sediment will be collected biennially for metals analysis and toxicity testing. Results will be used for RCRA closure permit compliance. A copy of the project schedule is included as Figure II.D-5.

Construction Management and Quality Assurance

Project Organization and Responsibility

As owner of the facility, the Navy has the primary responsibility for the quality of all work performed during closure activities. The Navy has retained EnSafe as owner's representative on the project to provide construction management and quality assurance services. The construction quality assurance (CQA) officer for closure activities will be an EnSafe employee (identified below). The Navy's remedial action contractor (RAC) will be responsible for performing all work in accordance with the construction performance specifications. The key personnel responsible for implementing the QA/QC program and their responsibilities are outlined below.

- **SOUTHNAVFACENGCOM's Project Manager — Bryan Kizer:** SOUTHNAVFACENGCOM's Project Manager will be responsible for overall project management. He will be responsible for monitoring project progress and addressing unforeseen quality issues requiring resolution. He will communicate those issues with FDEP as appropriate. He will coordinate between the RAC and EnSafe personnel. As the overall project manager, he has the authority to stop any portion of the project found defective.

- **NAS Key West Project Manager — Patsy McNeill:** NAS Key West's project manager will coordinate and manage site activities and verify that closure activities are conducted in accordance with the closure/post-closure care plan. She will communicate the results of her observations of construction activities to SOUTHNAVFACENGCOM's project manager.

- **EnSafe Project Manager — Dr. James Speakman:** Dr. Speakman is a registered professional engineer in the State of Florida independent of the RAC. He will be responsible for ensuring that qualified personnel and resources are available to oversee the quality of construction activities of the project. He will have overall responsibility for implementing the QA/QC program and ensuring the work is performed in accordance with the performance specifications and this QAP. Dr. Speakman will work closely with the SOUTHNAVFACENGCOM and NAS Key West project managers and EnSafe's CQA officer to see that work is conducted and documented properly. Dr. Speakman's duties will include the following: identifying quality deficiencies, overseeing all EnSafe personnel, scheduling, invoicing, and client liaison.

- **EnSafe's Construction Quality Assurance Officer:** As EnSafe's CQA officer, Mr. Chris Triplett will be onsite during the work at the OB/OD unit to observe and document elements of construction, under the direction of EnSafe's project manager. Mr. Triplett is independent of the RAC and not responsible to the RAC.

- **RAC's Project Manager — TBD:** The RAC's Project Manager will have primary responsibility for managing the construction activities of the project and for the quality of the work performed. He will work closely with his site supervisor and foremen to see that work is conducted properly. He shall have the authority to stop any portion of the job found defective. His duties will include the following: managing subcontractors, overseeing all contractor personnel, contract management of subcontractors, scheduling, invoicing, and client liaison.

- **RAC's Site Supervisor — TBD:** The RAC's site supervisor will be responsible for the day-to-day performance of the project. His duties will include coordination and onsite supervision of subcontractors to ensure that quality work is done safely and in a timely manner. He will coordinate the efficient use of equipment and personnel and provide supervision and guidance to foremen. This person will serve as the RAC's full-time onsite QC officer for the project and as the daily point-of-contact with the RAC's project manager and Navy personnel.

- **Florida Department of Environmental Protection:** As administrators of the RCRA program, FDEP will serve in an oversight capacity for all closure and post-closure activities.

Project Meetings

- **Preconstruction Meeting:** Before construction begins, the NAS Key West project manager, the RAC's site supervisor, and the CQA officer will review the proposed plans and specifications for completeness. If necessary, a preconstruction meeting will be held to resolve any remaining uncertainties with the project. Topics of the meeting may include establishing lines of communication and reviewing responsibilities, duties and monitoring/oversight procedures.

- **Progress Meetings:** Progress meetings will be held weekly at the work area. Meetings will be documented by the CQA and copies compiled for submission to the SOUTHNAVFACENGCOM project manager. These meetings are held to review the activities and accomplishments since the last meeting, determine the activities for upcoming work, identify personnel and equipment assignments for that work, and discuss

any potential construction problems or deficiencies and corrective actions implemented, or to be implemented.

- **Problem or Work Deficiency Meeting**: A special meeting may be held if a problem or deficiency is present or likely to occur. The meeting will be attended by the NAS Key West project manager, the RAC's site supervisor, and the CQA officer. These meetings, which will be documented by the CQA, are held to define and resolve a problem, or recurring work deficiency.

Cover Soil Selection

Miami oolitic limestone will be used as the cover soil. The soil will be clean-fill transported onto the site from a Navy-approved borrow source. The RAC will test the borrow source materials for particle size before material placement, and moisture content and density parameters after compaction as outlined in Table II.D-6. Soil that does not meet the established criteria will not be used.

Table II.D-6
Measurements for Cover Soil

Property	ASTM Standard	Frequency	Requirement
Particle Size	D422	1 per borrow source	50 % passing no. 200 sieve, 90% passing no. 4 sieve, one half-inch maximum
Moisture Content	D3017	1 per lift	optimum +4%
Density	D2922	1 per lift	95%

Placement of Compacted Cover

The placement of the compacted cover soil will adhere to the approved performance specifications. All lifts will compacted to a density at least 95% maximum dry density with a moisture content from optimum to +4% above optimum, as determined by ASTM D698. Testing activities necessary to observe in-place moisture and density are detailed in Table II D-6.

Field Observation and Testing

Field observation and documentation of fill placement will include the following activities:

- Visual classification of proposed material before placement.

- Verification that the material is placed in lifts no more than 6 inches thick.
- Verification that lifts are uniform and continuous across the fill area.
- Verification that the number of compaction equipment passes is adequate.
- Monitoring the addition of water to ensure that it is applied uniformly and in the amounts required.

Following completion of the compacted cover soil layer, surface elevations of the fill will be surveyed on 5-foot by 5-foot grid spacing and at points of change in slope to confirm the cover soil has been placed and compacted to 6 inches below final ground surface. Ground-shot elevations will be measured to the nearest 0.1 foot.

Vegetative Layer Construction

Following placement of the compacted cover layer, a 6-inch vegetative soil cover that can support the growth of native vegetation (lantana) will be placed across the compacted cover soil. Quantities and quality of lantana plants, fertilizer, lime, and mulch applied to the cover will be documented by the CQA officer based on packaging labels and/or weigh bills, as appropriate.

Following placement of the vegetative layer, the surface elevation of the cover area will again be surveyed on a 5-foot by 5-foot grid and at changes in slope to verify that a 6-inch-thick vegetative soil layer is in place. This survey will also be used to generate a final as-built surface contour map of the cover. CQA officer will review this survey to verify accuracy of the generated drawing. Ground-shot elevations will be measured to the nearest 0.1 foot.

Documentation

Standard daily reporting procedures will include preparation of a summary report with supporting observation data sheets. When appropriate, problem identification and corrective measure reports will be appended.

- **Daily Summary Report:** A log of daily activities will be kept by the RAC in a hard bound field notebook used specifically to track construction progress. Pages in the notebook will be numbered consecutively and dated. From the notes recorded in the notebook, a standard report will be prepared daily to summarize that day's construction activities and the chronological framework for identifying and recording all other reports. The field notebook and the daily summary reports will include the following information:

  — Unique identifying sheet number for document control.
  — Date, project name, location, and weather conditions.
  — Reports of any additional meetings held.

- Construction activity occurring that day.
- Description of areas and/or activities being inspected or tested.
- Description of offsite materials received, including any manufacturer's certifications received.
- Decisions made regarding approval or rejection of materials or construction activity, and any corrective actions taken.
- Reference to pertinent data sheets or corrective measures reports prepared.
- Signature of the person preparing the reports.

- **Problem Identification and Corrective Measures Reports:** If the results of observations or testing indicate that a material or work does not meet the approved design, a problem identification, and corrective measures report will be prepared by the RAC and cross-referenced to the specific data sheets where the problem was identified. The report will include the following information:

  - Unique identifying sheet number for document control.
  - Detailed description of the problem.
  - Location of the problem.
  - Presumed cause or source of the problem.
  - How and when the problem was identified (reference to data sheets).
  - Suggested corrective measure.
  - Documentation of corrective actions taken (reference to data sheets).
  - Recommendations for preventing similar problems.
  - Signature.

- **Acceptance Reports:** All field notebook pages, daily summary reports, data sheets, project meeting summaries, problem identification reports, and corrective measures reports will be reviewed by both the NAS Key West project manager and EnSafe's CQA officer. This information will be summarized into acceptance reports for submittal to the SOUTHNAVFACENGCOM project manager. These reports will indicate that the materials and construction processes comply with the approved plans or note any unresolved deficiencies.

Upon completion of construction, EnSafe's project manager will prepare a final closure certification report which compiles the documents developed throughout the project, along with as-built construction drawings depicting any modifications made to the original plans and describing the completed cover.

Storage of Records

During construction activities, the CQA officer will be responsible for all QCA documents. This includes the CQA officer's copy of the performance specifications, this QAP, and all original data sheets and reports. Duplicate records will be maintained by the Navy to avoid loss of this information if the originals are destroyed. Originals will be turned over to the Navy upon completion of construction.

Post-Closure Sampling

Project Organization and Responsibilities

Overall responsibility for post-closure monitoring will be vested in the commanding officer, NAS Key West or his approved representative. The FDEP, as administrators of the RCRA program, will serve in an oversight capacity for all closure and post-closure activities.

Post-Closure Sampling QA Objectives

The seawater adjacent to the OB/OD unit will be monitored during post-closure care to determine if known site contaminants are migrating into it from the OB/OD unit. Sample results will be compared to those collected from three background locations. If samples from the Demolition Key channel exceed the maximum concentration of each metal from the three background locations (as presented in *Background Report for Naval Air Station Key West*), sediment will be collected biennially for metals analysis and toxicity testing. (See Figure II.D-6 for Demolition Key sample locations). Definitive data as described in *Data Quality Objectives for Superfund, Interim Final Guidance*, USEPA/540/G-93/071, will be of sufficient quality to support decision making. An FDEP-approved laboratory will be used for this project. All samples will be collected in accordance with FDEP Standard Operating Procedures (SOPs) for Laboratory Operations and Sample Collection Activities (September 30, 1992) or most recent guidance. Sampling and analysis activities and anticipated general QA goals for these methods are summarized in Table II.D-7. Bottle, preservation, and holding time requirements are summarized in Table II.D-8.

Table II.D-7
Laboratory Measurements

Frequency	Matrix	Measurement Parameter	Reference	Precision[1] (%)	Accuracy[1] % Recovery	Completeness (%)
6 /event	Surface Water	Metals[2]	SW846 - 6010B	±20	±25	95
Depends on surface water results	Sediment	Metals[2]	SW846 - 6010B	±20	±25	95
Depends on surface water results	Sediment	Toxicity[3]	EPA 600/R-94/025	N/A	N/A	N/A

Notes:

[1] = Precision and accuracy goals are subject to change based on specific method data quality history from the analytical laboratory chosen.

[2] = aluminum, antimony, arsenic, barium, beryllium, cadmium, copper, lead, manganese, strontium, and zinc

[3] = If there are background exceedances of surface water samples, biennial toxicity testing will also be conducted as part of post-closure monitoring. Monitoring will include 10-day whole sediment toxicity tests using *Leptocheirus plumulosus*. Protocols provided in EPA 600/R-94/025, *Methods for Assessing the Toxicity of Sediment-associated Contaminants with Estuarine and Marine Amphipods* (EPA, 1994) will serve as the basis for the test methodology. Survival will be measured.

SW-846 = Analytical Method Reference: *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846), Third Edition, USEPA, Office of Solid Waste and Emergency Response (OSWER), Third Edition, revised December 1996

Table II.D-8
Bottle, Preservation, and Holding Time Requirements

Matrix	Method	Bottles	Preservation	Holding Time
Surface Water	SW846 - 6010B	1 liter plastic or glass	HNO_3, pH < 2, 4° C	6 months
Sediment	SW846 - 6010B	1 liter plastic or glass	4° C	6 months
Sediment	toxicity	1 liter plastic or glass	4° C	36 hours

The following subsections discuss the methods of assessing quantitative QA objectives.

Precision: Precision measures the reproducibility of measurements and methods, and is defined for qualitative data as a group of values' variability compared with its average value. To assess the precision of the measurement systems used in this project, field duplicates will be obtained and analyzed with the samples collected. A duplicate is an identical sample collected from the same location, at the same time under the same conditions. Duplicate samples are analyzed, along with the original sample to obtain sampling procedure precision and inherent sample source variability. One duplicate will be collected per sampling event. Precision of laboratory analysis will be assessed by comparing the analytical results between matrix spike/matrix spike duplicates (MS/MSDs). The relative percent difference (%RPD) will be calculated for each pair of duplicate analysis using the following equation:

$$\% \ RPD = \frac{S - D}{(S + D)/2} \ x \ 100$$

where:

S	=	sample result
D	=	duplicate result

Accuracy: Accuracy is the degree to which a given result agrees with the true value. Spiked sample results provide information needed to assess the accuracy of analyses. Specifically, MS/MSD and laboratory control sample percent recoveries are used to assess accuracy. Five percent of all samples analyzed are spiked with target chemicals for the MS/MSD. If the calculated percent recoveries (%Rs) for the known spike concentrations are within defined control limits set by each method, the reported sample concentrations are considered accurate.

$$\% \ R = \frac{(SSR - SR)}{SA} \ x \ 100$$

where:

SSR	=	spike sample recovery
SR	=	sample recovery
SA	=	concentration of spike added

Completeness: Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount expected to be obtained under correct normal conditions. The completeness goal for field measurements will be greater than 90%. Laboratory analysis for this project will have a completeness goal greater than 95%. Completeness will be calculated by dividing the number of valid results by the number of possible

individual analyte results, expressed as a percentage. The formula for calculating completeness is presented below:

$$\% \text{ completeness} = \frac{\text{Number of valid (i.e., non-rejected) results}}{\text{Number of possible results}} \times 100$$

Representativeness: Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Representativeness depends on the proper design of the sampling program and will be satisfied by ensuring that the post-closure monitoring requirements are followed and that proper sampling techniques are used. Representativeness in the laboratory is ensured by using the proper analytical procedures, meeting sample holding times, and analyzing and assessing field duplicated samples. The sampling network is designed to provide data representative of site conditions.

Comparability: Comparability expresses the confidence with which one data set can be compared to another. Comparability also depends on similar QA objectives, including the proper design of the sampling program, and will be satisfied by ensuring that the post-closure monitoring requirements are followed and proper sampling techniques are used.

Field Procedures and Quality Control

This section specifies the protocols and procedures to be used when conducting sampling activities for post-closure monitoring. Surface water samples will be collected from three locations in the Demolition Key channel (Figure II.D-6) and three background locations using a laboratory bottle submerged in 6 inches of water adjacent to the OB/OD unit. If the results exceed the maximum background concentration for each metal, sediment samples will be collected biennially using scoops from the top 6 inches of sediment for chemical and toxicity analysis. Surface water and sediment sampling protocols will conform to Sections 4.2.3 and 4.3.5 of the FDEP SOP. The selected samples will be cooled in an ice chest to 4°C ($\pm$ 2° C) and shipped under chain-of-custody via overnight courier to the selected laboratory for analysis.

General Surface Water Sampling Concerns:

- Collect samples downstream to upstream.
- In tidal areas, collect samples at slack tide, preferably low slack.
- Collect samples in a way that will reduce agitation of underlying sediments.
- If surface water and sediment are sampled at the same location, collect surface water sample first.

Surface Water Sampling Procedures:

1. Find the sample collection location on a site map and describe it in the field logbook.
2. Don disposal latex gloves.
3. Slowly submerge unpreserved bottle, neck first, into the surface water.
4. Invert the bottle so that the neck is upright.
5. Return the filled container quickly to the surface.
6. Seal with Teflon-lined cap.
7. Collect additional surface water in the sample collection device.
8. Use second sample for field measurement of pH, temperature, conductivity, and salinity using an Horiba meter.
9. Place bottles in cooler and preserve to 4°C.
10. Note pertinent sampling information, including the tidal phase, in the field logbook.

Sediment Sampling Procedures:

1. Find the sample collection location on the site map and reference it in the field logbook.
2. Don disposable latex gloves.
3. Approach the location from the downstream location.
4. Scoop the sediment with a decontaminated stainless-steel spoon or spatula.
5. For metals analysis, thoroughly homogenize the sample prior to containerization.
6. For toxicity samples, directly empty the contents into an appropriate sample container.
7. Secure container with Teflon-lined cap.
8. Label each sample container with appropriate information.

9. Place the samples in a cooler and preserve to 4°C.

10. Record pertinent information in the field logbook.

Equipment Decontamination: All equipment will be decontaminated in accordance with Section 4.1 of the FDEP SOP.

Investigation-Derived Waste: No investigative-derived waste is anticipated during these sampling activities.

Sample Management

This section describes SOPs for sample identification and chain-of-custody procedures to be used for all field activities. These procedures will ensure that the quality of the samples is maintained during their collection, transportation, and storage through analysis. All chain-of-custody requirements comply the FDEP sample handling protocol.

Sample identification documents must be carefully prepared so that sample tracking and disposition may be maintained and controlled. Sample identification documents include field notebooks, sample labels, custody seals, and chain-of-custody records.

Chain-of-Custody: The primary objective of the chain-of-custody procedures is to provide an accurate record that can be used to trace the possession and handling of a sample from collection to completion of all required analyses.

When A Sample Is In Custody:

- It is in someone's physical possession.
- It is in someone's view.
- It is locked up.
- It is kept in a secured area restricted to authorized personnel.

Sample Designation and Labeling System: Tracking a sample and maintaining certain information about the sample from the time of collection to delivery of the final analytical data package will be achieved through the sample identification, which includes site name, sample matrix, and sample interval/depth (when applicable).

Field Custody Procedures:

- As few persons as possible should handle samples.

- Sample bottles must be obtained precleaned from an approved source. Coolers or boxes containing cleaned bottles should be sealed with a custody tape seal during transport to the field or while in storage prior to use. Sample bottles from unsealed coolers or boxes, or those which appear to have been tampered with, will not be used.

- The sample collector is personally responsible for the care and custody of samples collected until they are transferred to another person or dispatched properly under chain-of-custody protocol.

- The sample collector will record sample data in the field notebook.

Sample Tags: Sample tags attached to, or affixed around, the sample container should be used to properly identify all samples collected in the field. The sample tags are to be placed on the bottles in a way that will not obscure any QA/QC lot numbers on the bottles; sample information must be printed in a legible manner using waterproof black ink.

Chain-of-Custody Record: The chain-of-custody record must be fully completed at least in triplicate by the field technician who is responsible for sample shipment to the appropriate laboratory for analysis. In addition, if samples are known to require rapid turnaround in the laboratory because of project time constraints or analytical concerns (e.g., extraction time or sample retention period limitations), the person completing the chain-of-custody record should note these constraints in the "Remarks" section of the form.

Custody Seals: Custody seals are preprinted adhesive-backed seals designed to indicate whether seals were tampered with. A custody seal is placed across the cap of individual sample bottles by the sampling technician. Sample shipping containers (coolers, cardboard boxes, etc.) are sealed in as many places as necessary to ensure security. Seals must be signed and dated before use. When the sample is received at the laboratory, the sample custodian must check and record if seals on shipping coolers and/or bottles are not intact.

Transfer of Custody and Shipment:

- The shipping coolers in which the samples are packed must be sealed and accompanied by a chain-of-custody form. When transferring samples, the individuals relinquishing, and receiving them must sign, date, and note the time on the chain-of-custody record. This record documents the sample custody transfer.

- Samples must be dispatched to the analytical laboratory for analysis with a separate chain-of-custody record accompanying each shipment. Shipping containers must be sealed with custody seals for shipment to the laboratory. The method of shipment,

name of courier, and other pertinent information can be entered in the "Remarks" section of the chain-of-custody form.

- All shipments must be accompanied by the chain-of-custody form identifying their contents. The original record accompanies the shipment.

- If sent by mail, the package is registered with return receipt requested. If sent by common carrier, a bill of lading is used. Freight bills, Postal Service receipts, and bills of lading are retained as part of the permanent documentation.

Laboratory Custody Procedures: A sample custodian accepts custody of the shipped samples from the carrier and enters preliminary information about the package into a receipt log, including the initials of the person delivering the package and the status of the custody seals on the coolers (i.e., broken vs. unbroken). The laboratory sample custodian is responsible for sample log-in and will open the shipping coolers, check the contents, and verify that the information on the chain-of-custody agrees with samples received. Pertinent information such as shipment, pickup, and courier name must be entered into the "Remarks" section of the chain-of-custody record. The custodian will also document the temperature of the cooler (by checking the temperature blank) and the general condition of the sample containers. Sample preservation shall be verified by the analyst prior to extraction, digestion or analysis and the pH recorded. If samples are improperly preserved, the laboratory QA coordinator will document the improper preservation, along with the sample identification and other pertinent information. All other QA/QC discrepancies are followed in a similar manner and must be documented as an out-of-control event with the corrective action taken.

Field Records and Document Control

Sampling personnel shall use only bound notebooks to maintain field records. Bound logbooks such as surveyors' logbooks are acceptable, as long as pages cannot be removed without tearing them out. Waterproof paper is preferred. All aspects of sample collection and handling, as well as visual observations, shall be documented in the logs. Sample collection equipment will identified in the logs.

All entries shall be dated, legible, and contain accurate and inclusive documentation of an individual's project activities. Because field records are the basis for later written reports, language should be objective, factual, and free of personal feelings. Once completed, these facility operating logs become accountable documents and must be maintained as part of the Demolition operating file. Operating files shall be maintained by NAS Key West or their designee.

Demolition Key Operating File Contents:

- Original chain-of-custody records and bound field logbooks.
- A copy of the receipt for sample forms.
- All records obtained during sampling activities.
- A complete copy of the analytical data and memoranda transmitting analytical data.
- All official correspondence received by Demolition Key relating to sampling or monitoring activities.

Under no circumstances are any personal observations or irrelevant information to be filed. The file will be reviewed at the conclusion of each sampling activity to ensure that it is complete.

Laboratory Procedures and Quality Control

Laboratory analyses will be conducted by an FDEP-approved laboratory. The laboratory will following the procedures outlined in the specific analytical methods and the laboratory's QAP and SOPs.

Quality Assurance Management

It is understood that field personnel and subcontract laboratories are subject to FDEP quality assurance audits. The Navy will incorporate the results of regulatory QA/QC evaluation, and may consider action based solely on those results. During the sampling, field personnel are responsible for seeing that field instruments are functioning properly and that work progresses satisfactorily. Field personnel are also responsible for performing routine preventive maintenance and quality control procedures, thereby helping ensure collection of valid field data.

Corrective Actions: If a problem is detected by field personnel, the NAS Key West project manager shall be notified immediately, at which time corrective action will begin. Similarly, if a problem is identified during an audit by the regulatory agency, an immediate investigation will be undertaken and whatever corrective action deemed necessary will be taken as early as possible. Samples or analyses that do not meet quality control or quality assurance criteria may be resampled, re-analyzed, or the analysis reviewed by the Navy or its designee. Cases of noncompliance will be documented to assure that the corrective action is implemented and recorded.

If corrective action is required by the analytical laboratory, the action should be conducted in accordance with the laboratory's quality assurance program and the corrective action process outlined in the laboratory's QAP, following the guidelines provided in the laboratory's analytical methods. The necessity for corrective action is determined after the data have been evaluated.

Performance and System Audits: No specific field or laboratory audits are planned. However, FDEP audits or oversight may be expected during the post-closure period.

Quality Assurance Reports: No specific quality assurance reports are planned; however, post-closure reports will be submitted to FDEP for the duration of the post-closure period. These reports will discuss any significant QA/QC problems.

SECTION II.F

SOLID WASTE MANAGEMENT UNITS AND POTENTIAL RELEASES

SOLID WASTE MANAGEMENT UNITS AND POTENTIAL RELEASES

This section of the permit application satisfies the requirements of 40 CFR 270.14(d) and FAC 62-730 and Section Q of the 1996 Hazardous Waste Facility Permit Application Instructions and Forms. However, in order to limit modifications to the original submittal of the Final Demolition Key Part B Permit, this sections retains the numbering convention of the original submittal.

No solid waste management units (SWMUs) are on Demolition Key. However, in 1994, the entire northwest island was designated Area of Concern (AOC) A in the RCRA Facility Investigation/Remedial Investigation Report for Naval Air Station Key West, prepared for the Naval Facilities Engineering Command, Southern Division by IT Corporation. Details of this investigation are presented below.

Background

Demolition Key, just north of Key West, Florida, is two land masses separated by a narrow channel and surrounded by both the Atlantic Ocean and the Gulf of Mexico. Originally, it consisted of approximately 24 acres of dredge spoil from the clearing of navigable waterways around Key West. Demolition Key, an off-limits area restricted by the Navy, is approximately 6 feet above mean sea level at its highest point, assessable only by water. No permanent surface water features are present on the Key, which is marked by several small craters. Rainfall is distributed through percolation to the groundwater and runoff to the surrounding waters. The shoreline supports a mangrove community. The approximately 80-square-foot open burning/open detonation (OB/OD) unit addressed in this permit application is on the northwest land mass adjacent to the water channel.

Historically, the island of Demolition Key Northwest has been used to train military personnel and develop and test experimental naval ordnance. OB/OD operations have been conducted here approximately one to four times per year from 1960 to 1989 (from 1980 to 1989 under RCRA interim status). It was not used from 1990 to 1993, but OB/OD operations resumed in 1994 and 1995, then ceased. During the operating periods, approximately 20 pounds net explosive weight (NEW) of unserviceable ordnance were treated annually at the OB/OD unit.

During this same period, Navy SEAL and Explosive Ordnance Disposal (EOD) personnel conducted ordnance training exercises on other areas of Demolition Key NE. These exercises involved the safe destruction of military ordnance, as required in the mission statement for annual proficiency training. Testing involved ordnance destruction configuration technique modification, development testing, and reaction-sequence testing. These areas were also used to perform emergency response operations on unstable and/or civilian explosives.

No other potential sources of contamination have been identified at Demolition Key.

Previous Investigations

IT Corporation, 1993

In May 1990, IT Corporation conducted a preliminary remedial investigation (RI) at several of the Navy's Installation Restoration Program sites at Naval Air Station (NAS) Key West. After the preliminary RI, the EPA issued a Hazardous and Solid Waste Amendments permit for NAS Key West. During this process, each site was classified as one of the following : (1) sites requiring additional RCRA facility investigation (RFI) work, (2) sites requiring an RFI, (3) sites requiring additional RI work, or (4) sites requiring preliminary RI work. Demolition Key NW was classified as a "site requiring preliminary RI work." Therefore, in March to May of 1993, IT conducted a preliminary study on Demolition Key NW. These sampling and analysis efforts chiefly focused on metals and semivolatile compounds in environmental media. From the preliminary data, IT recommended a more comprehensive investigation to determine nature and extent of contamination.

EnSafe Inc., 1999

In 1998, Bechtel Environmental, Inc. removed soil and other materials from the OB/OD unit under contract to Southern Division Naval Facilities Engineering Command in Charleston, South Carolina. American Technologies, Inc. of Oak Ridge, Tennessee, performed the direct removal under subcontract to Bechtel, Inc. EnSafe Inc. of Memphis, Tennessee provided third-party monitoring of these activities. This excavation was performed in accordance with the closure plan, prepared by EnSafe in 1997. Its primary objectives were to assess the nature and extent of surface material and potential groundwater/surface water impacts associated with former facility operations, and provide a means of closure protective of human health and the environment.

Excavated material was screened to remove large metal pieces. No live unexploded ordnance was encountered during the project. Of the approximately 98 drums of excavated material, 18 contained scrap metal. The drummed material was removed under hazardous waste manifest and shipped to the Chemical Waste Management, Inc. hazardous waste disposal facility in Emelle, Alabama.

Excavation and waste management were conducted in accordance with the FDEP-approved closure plan. The original OB/OD unit, which had a nominal 10-foot diameter, was a nominal 30 feet in diameter after excavation. The unit was excavated to 18 inches or until the water table was reached. The actual depth of soil excavated from the bottom of the pit ranged from a few

inches on the unit end nearest the channel (since this portion was already at the water table) to 18 inches on the unit end opposite the channel. Eighteen inches of soil was also excavated on all sidewalls, except on the channel end of the OB/OD unit where approximately 12 inches of soil was removed. Excavation on the channel end was terminated when mangrove roots were encountered. As much as possible, the sides of the unit were excavated to follow the original contours of the unit. Contaminant concentrations remaining in the OB/OD pit exceeded FDEP soil and groundwater cleanup target levels (EnSafe, 1999).

Sampling Locations and Results

During the IT Corporation study of Demolition Key NW, soil, sediment, and groundwater samples were collected to determine the impact of site activities on these media. Nine soil samples were collected at the top of the water table, which varied from zero to two feet below ground surface (bgs). The soil samples were analyzed as follows: three using toxicity characteristic leaching procedures (TCLP) for metals; four for volatile organic compounds (VOCs), polyaromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and Appendix IX metals; one for total organic carbon (TOC), grain size, ion exchange capacity, pH, density and moisture content; and one for target analyte list/target compound list (TAL/TCL) parameters. Two sediment samples were collected in the channel between Demolition Key NW and SE and analyzed for VOCs, PAHs, PCBs, and metals. There are no monitoring wells on the key. However, one groundwater grab sample was analyzed for VOCs, PAHs, pesticides/PCBs and Appendix IX metals. No air sampling was conducted. Sampling locations are shown on Figure II.D-2 in Section II.D; exceedances are shown in red.

Numerous metals were detected in surface soil samples. Antimony, arsenic, cadmium, copper, and lead exceeded current FDEP soil cleanup target levels (SCTLs). One of three samples analyzed for TCLP metals had elevated levels of lead. The groundwater sample from boring SB-9 also contained several metals exceeding groundwater protection-based cleanup goals. However, this was a grab sample in which surface and near-surface sediment were probably entrained, resulting in higher metals concentrations.

The sediment samples were collected in the channel between Demolition Key NW and SW. Although these locations were the ones most likely to receive surface water runoff from the OB/OD unit, samples did not exceed any inorganic constituent criteria.

Semivolatile organic compounds (SVOCs) were not detected in samples collected near the OB/OD unit, although low concentrations (< 1 mg/kg) were detected in surface soil samples from other ordnance testing/training areas on Demolition Key NW.

During the 1998 removal action, the soil at the bottom of the OB/OD pit was sampled in accordance with the approved sampling and analysis plan and the quality assurance project plan, with two exceptions. Based on FDEP Project Manager's preference, soil samples were leached using TCLP in lieu of the synthetic precipitate leaching procedure, and the total metals analyses were performed for the full list of TAL metals in lieu of the abridged list (arsenic, barium, chromium, cadmium, lead, and nickel) as presented in the approved closure plan.

As shown on Figure II.D-2, five sampling points were chosen, with sampling point 5 the duplicate. All samples were analyzed for total and TCLP VOCs, SVOCs, explosives, metals, FL-petroleum recoverable organics, ammonia, nitrate, and sulfate (EnSafe, 1999). 2,4-dinitrotoluene was detected in three samples; two exceeded the FDEP criteria for total explosives. Sixteen metals were detected in five of the six samples analyzed for total metals; antimony, arsenic, barium, copper, lead, and manganese exceeded criteria in some of these samples. Total metals were compared with FDEP direct exposure residential and commercial/industrial criteria to determine exceedances. Fourteen metals were detected in the samples analyzed for TCLP metals; eight exceeded residential criteria in some of these samples: antimony, arsenic, cadmium, copper, lead, manganese, strontium, and zinc. TCLP metals were compared with FDEP groundwater criteria to determine exceedances.

Soil, TCLP, and groundwater exceedances are shown in Tables II.F-1 to II.F-3, respectively. Subsequent to the OB/OD unit closure, the FDEP updated its soil cleanup target levels; these criteria were used to develop the tables.

Table II.F-1
NAS Key West Demolition Key NW Soil Criteria Exceedances (mg/kg)

Sample ID	Location	Parameter	Soil Result	Residential FDEP Soil Criteria[1]	Industrial FDEP Soil Criteria
1	OB/OD Pit	Antimony	114	26	240
		Arsenic	**6.4**	0.8	3.7
		Lead	**7,530**	400	920
2	OB/OD Pit	Antimony	45 5	26	240
		Arsenic	9	0.8	3.7
		Barium	187	110	87,000
		Lead	**1,990**	400	920
		Manganese	4,040	1,600	22,000
3	OB/OD Pit	Arsenic	3.7	0.8	3.7
		Barium	129	110	87,000
		Lead	875	400	920
4	OB/OD Pit	Arsenic	**7.5**	0.8	3.7
		Lead	610	400	920
SB-3	Ordnance Testing/Training	Arsenic	1	0.8	3.7

Table II.F-1
NAS Key West Demolition Key NW Soil Criteria Exceedances (mg/kg)

Sample ID	Location	Parameter	Soil Result	Residential FDEP Soil Criteria[1]	Industrial FDEP Soil Criteria
SB-4	Ordnance Testing/Training	Arsenic	0.96	0.8	3.7
SB-5	Ordnance Testing/Training	Arsenic	1.4	0.8	3.7
SB-9	OB/OD Pit	Antimony	43.5	26	240
		Arsenic	**19.3**	0.8	3.7
		Copper	1,540	110	76,000
		Lead	**2,100**	400	920

Notes:
[1]FDEP (1999). *Technical Report: Development of Soil Cleanup Target Levels (SCTLs) for Chapter 62-777, F.A.C.*
Bold denotes concentration exceeds both residential and industrial FDEP Soil Criteria

Table II.F-2
NAS Key West Demolition Key NW TCLP Criteria Exceedances (μg/L)

Sample ID	Location	Parameter	TCLP Result	FDEP TCLP Criteria[1]
1	OB/OD Pit	Antimony	1,900	6
		Arsenic	130	50
		Cadmium	52.4	5
		Lead	16,400	15
		Manganese	2,480	50
		Strontium	14,500	4,200
2	OB/OD Pit	Antimony	14.9	6
		Lead	745	15
		Manganese	14,700	50
		Strontium	17,100	4,200
		Zinc	22,500	5,000
3	OB/OD Pit	Antimony	32.3	6
		Cadmium	115	5
		Copper	1,790	1,000
		Lead	1,420	15
		Manganese	8,010	50
		Strontium	20,600	4,200
		Zinc	37,600	5,000
4	OB/OD Pit	Antimony	42.2	6
		Cadmium	48	5
		Lead	2,470	15
		Manganese	7,440	50
		Strontium	17,700	4,200
		Zinc	25,000	5,000

Table II.F-2
NAS Key West Demolition Key NW TCLP Criteria Exceedances (μg/L)

Sample ID	Location	Parameter	TCLP Result	FDEP TCLP Criteria[1]
5	OB/OD Pit	Antimony	7	6
		Cadmium	40.2	5
		Lead	92.3	15
		Manganese	2,690	50
		Strontium	17,900	4,200
		Zinc	8,000	5,000
D	OB/OD Pit	Cadmium	22.9	5
		Lead	73.7	15
		Manganese	1,660	50
		Strontium	16,500	4,200
SB-6	Ordnance Testing/Training	Lead	22,900	15

Note:
[1]FDEP (1999). *Technical Report: Development of Soil Cleanup Target Levels (SCTLs) for Chapter 62-777, F.A.C.*, May 26

Table II.F-3
NAS Key West Demolition Key NW Groundwater Criteria Exceedances (μg/L)

Sample ID	Location	Parameter	Groundwater Result	FDEP Groundwater Criteria[1]
SB-9	OB/OD Pit	Antimony	249	6
		Cadmium	52.2	5
		Copper	4,070	1,000
		Lead	1,610	15
		Nickel	116	100
		Zinc	23,500	5,000

Note:
[1]FDEP (1999). *Technical Report: Development of Soil Cleanup Target Levels (SCTLs) for Chapter 62-777, F.A.C.*, May

Summary

In all, 15 soil samples, two sediment samples, and one groundwater sample have been collected on Demolition Key NW. Seven of the soil samples, including one duplicate, were collected in the OB/OD unit area — one during the 1993 preliminary RFI/RI study, and the rest following the 1998 soil excavation. The single groundwater sample was collected in 1993 at the OB/OD unit. The remaining eight soil samples were collected at other sites (i.e., training and research and development areas) over the 8-acre island. Figure II.D-2 shows the distribution of those samples on the island.

All of the samples from the OB/OD unit exceeded current FDEP residential criteria; four exceeded commercial/industrial criteria. Numerous metals were detected in surface soil samples from the OB/OD unit area; antimony, arsenic, barium, copper, lead and manganese exceeded current FDEP SCTLs. In the samples analyzed for TCLP metals, antimony, arsenic, cadmium, copper, lead, manganese, strontium, and zinc exceeded groundwater protection-based cleanup goals. In the groundwater sample collected from the OB/OD unit in 1993, antimony, cadmium, copper, lead, nickel, and zinc exceeded FDEP groundwater criteria.

Four of the eight soil samples collected from the other sites on Demolition Key NW exceeded FDEP residential criteria for arsenic and lead; two of exceedances were in the OB/OD unit area. That is not surprising since the same ordnance was likely detonated at all sites. The highest measured lead concentration on Demolition Key NW occurred at sampling location SB-6, near the center of the island. SVOCs were not detected in samples collected near the OB/OD unit, although low concentrations (< 1 mg/kg) were detected in surface soil samples from training and research and development areas.

Although the OB/OD unit is being closed, the remainder of the key will continue to be used as a range; the entire island will be addressed under the prevailing environmental regulation when the range is no longer in use.

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