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NAS KEY WEST
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LETTER OF TRANSMITTAL FOR DRAFT STATEMENT OF BASIS FACT SHEETS FOR SOLID WASTE MANAGEMENT UNITS 3 AND 4 WITH ATTACHMENTS NAS KEY WEST FL
3/12/1998
BROWN AND ROOT ENVIRONMENTAL

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AIK-98-0113

REC'D MAR 13 1998

March 12, 1998

Project Number HK 7046

via FedEx

Mr. Dudley Patrick - Code 1858
Southern Division
NAVFACENGCOM
P.O. Box 190010
North Charleston, South Carolina 29419-9010

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order No. 0007

Subject: U.S. Navy Statement of Basis Fact Sheet for the Former Fire-Fighting Training Area (SWMU 3) and U.S. Navy Statement of Basis Fact Sheet for the Boca Chica Aircraft Intermediate Maintenance Building (AIMD) Building A-980 (SWMU 4)

Dear Mr. Patrick:

Brown and Root Environmental (B&R Environmental) is pleased to submit for your review the enclosed Draft Statement of Basis Fact Sheets for SWMU 3 and SWMU 4, NAS Key West, Florida. I would like to discuss both of these fact sheets with the NAS Key West Partnering Team during our upcoming Partnering Team meeting, currently scheduled for 31 March 1998 to 2 April 1998. I plan to discuss this on-board review of the two fact sheets as a potential agenda item for the Partnering Team meeting during our teleconference scheduled for 23 March 1998 at 1000 hours.

Please call me at (803) 649-7963, extension 345, with your comments and any questions you may have regarding the enclosed documents.

Sincerely,

C. M. Bryan
Project Manager
NAS Key West (CTO 007)

CMB:spd

Enclosure

c: Ms. D. Evans-Ripley, SouthDiv (w/o enclosures)
Ms. M. Berry, U. S. EPA, Region IV
Mr. J. Caspary, FDEP
Mr. R. Demes, NAS Key West
Mr. P. Williams, NAS Key West
Mr. R. Hoekstra, Bechtel Environmental Inc.
Mr. M. Perry, B&R Environmental
File 7046-3.2

NAVAL AIR STATION KEY WEST
U.S. Navy Statement of Basis Fact Sheet for the Former Fire-Fighting Training Area (SWMU 3)

DRAFT

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This fact sheet is one in a series informing interested citizens of the Installation Restoration (IR) program being conducted at Naval Air Station (NAS) Key West. The IR program is the Department of Defense plan for environmental investigation and cleanup of military installations nationwide. The program is designed to address areas of contamination from past spills and waste disposal practices. Fact sheets will be produced at milestones and in response to other items of public interest. Community relations activities associated with the IR program, including distribution of fact sheets, are coordinated through the NAS Key West Public Affairs Office, (305) 293-2425.

Introduction

This fact sheet is issued by the U.S. Navy, the lead agency for Naval Air Station (NAS) Key West remedial activities, with concurrence by the U.S. Environmental Protection Agency (EPA) and the Florida Department of Environmental Protection (FDEP). The purpose of the fact sheet is to describe the preferred alternative for addressing environmental contamination at the former Fire-Fighting Training Area and to ask for public comment on the preferred alternative. The area is in the eastern portion of Boca Chica Key. The fact sheet meets the EPA Resource Conservation and Recovery Act (RCRA) guidance recommending the preparation of a statement of basis.

NAS Key West manages certain waste materials regulated under RCRA, a comprehensive law requiring responsible management of hazardous waste. RCRA 3004(u) requires that releases from solid waste management units (SWMUs) be investigated and remediated as necessary. The former Fire-Fighting Training Area is a SWMU regulated under RCRA 3004(u) and designated SWMU 3 at NAS Key West.

RCRA requires that the public be given the opportunity to review and comment on the draft permit modification and proposed remedial alternative. FDEP requirements for public participation in Florida are listed in Chapter 62-004 Florida Administrative Code (F.A.C.). These requirements include establishing an Information Repository that documents the selection of remedial alternatives and allows for review and comment by the public regarding those alternatives. The NAS Key West Community Relations Plan (1996) facilitates public involvement in the decision making process for permitting, closure, and selection of remedial alternatives. FDEP requires the Navy to advertise the draft permit modifications and proposed remedial action so that the public can participate in the selection of a remedial action (Chapter 62-004 F.A.C.).

Background

This fact sheet summarizes the contents of the Information Repository leading to selection of the preferred alternative. The fact sheet presents the preferred alternative and the reasons for its selection. Community involvement during the evaluation of remedial alternatives for SWMU 3 is sought.

FDEP requires that a brief description and response to all significant comments be made available to the public as part of the public record (Chapter 62-004 F.A.C.). All submitted comments will be reviewed and considered. Following the public comment period, a Responsiveness Summary will be prepared to address significant issues raised during the comment period. The Responsiveness Summary will be available with the final RCRA permit. In order to better understand RCRA activities as they pertain to SWMU 3, the public is encouraged to consult the Information Repository for this unit. The Community Involvement section of this fact sheet has information on access to the Information Repository.

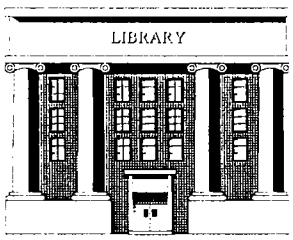
RCRA also provides opportunities for the public to comment on draft permit modifications. The preferred alternative proposed in this Fact Sheet is also being proposed in the draft permit modification under RCRA. Therefore, comments received on this Fact Sheet will apply to the draft RCRA permit modification, proposing the same remedy for this waste unit.

The final selection of the remedial alternative under RCRA will coincide with the final permit modification decisions made by EPA and FDEP. It is important to note that the final action may be different from the preferred alternative discussed in this fact sheet, depending on new information or public comments. The alternative chosen will be protective of human health and the environment and will comply with Federal and state environmental laws.

Community Involvement

This fact sheet summarizes information from the documents listed in the Reference section. The reference documents are part of the Information Repository, which is available to the public.

Information Repository: An Information Repository has been set up in the Local and State History Department at the Monroe County Library.



700 Fleming Street
Key West, Florida
(305) 292 3595

Public Meeting and Comment Period: The public will be notified of the public comment period through a mailing sent to approximately 100 citizens and through *The Citizen* newspaper that serves the southern Keys. Local radio stations will also announce the public comment period.

With significant public interest, the Navy will hold a public meeting during the comment period. The public will be notified of the date, time, and location. At the meeting, the proposed action will be discussed and questions about the proposed action answered. To request a public hearing during the comment period, to obtain more information concerning this fact sheet, or to submit written comments contact:

Public Affairs Officer
Code 01J, Naval Air Station
Key West, Florida 33040-9001
305-293-2425 or Fax 305-293-2230

Following the public comment period, the FDEP or Navy will issue a final decision for the RCRA permit modification. The RCRA permit modification will detail the remedial alternative chosen for the site and will include responses to oral and written comments received during the public comment period in the Responsiveness Summary. FDEP will issue a permit modification incorporating this remedy into the NAS Key West permit.

The following is excerpted from the RFI/RI Report for the High Priority Sites (July 1997). It summarizes the results of that report in language that is more technical than is usually included in a fact sheet. If you have questions or would like further explanation of these results, call Phillip Williams, Installation Restoration Coordinator, Environmental Branch, NAS Key West, at 305-293-2061.

Scope and Role of Response Action within the Facility Strategy

NAS Key West is in southern Monroe County, Florida, primarily on Boca Chica Key and Key West (Figure 1). Several Navy bases in the lower Florida Keys comprise the Naval Complex. The entire complex encompasses approximately 5,000 acres.

Boca Chica Key is approximately 3 miles wide and 3 miles long, and the air station encompasses 3,250 acres. The elevations of Boca Chica Key are less than 5 feet above mean sea level (msl) except for fill that underlies the U.S. Highway 1. SWMU 3 is on the eastern portion of Boca Chica Key, west of the closed taxiway, approximately 700 feet southwest of Building A1005 (Figure 2).

There are several SWMUs on the Key that are currently being evaluated to determine the impacts of contamination, if any, to associated groundwater, surface water, soil, and sediment. The proposed ac-

tion for SWMU 3 is a final action. Upon disposition of all the SWMUs on Boca Chica Key, a final comprehensive RCRA permit modification will be pursued.

Media Specific Investigation for the Former Fire-Fighting Training Area SWMU 3

Unit Description, History, and Media Assessment

Unit Description and Location

The terrain of SMWU 3 is flat with little vegetation and is comprised of concrete, gravel, and crushed shell. The unit is in the southeastern portion of Boca Chica Key (Figure 2). The unit contains aircraft and vehicles that were ignited with JP-5 fuel, waste oil, or hydraulic fluid for use in fire-fighting training. Until recently, two unlined circular pits approximately 20 feet in diameter and 2 to 3 feet deep surrounded by gravel aprons existed at SWMU 3. These pits also received combustible liquids, which were ignited. In 1995, soil and berms in the southern burn pit were excavated to bedrock and replaced with clean fill material as part of an Interim Remedial Action (IRA) (described below). Approximately 200 feet to the south and west of the former pits is a 16-acre shallow lagoon that is fringed by red and black mangroves. Water depth in the lagoon ranges from approximately 16 to 26 inches. The lagoon is landlocked; therefore, no surface water connections to the ocean water exist.

In October 1995, an IRA for soil was conducted at the southern pit of SWMU 3. The action was performed in parallel with the remedial investigation in an effort to expedite the remediation of the unit. The IRA included the delineation of the soil for benzene, toluene, ethylbenzene and xylene (BTEX), and polycyclic aromatic hydrocarbon (PAH) contamination associated with the southern pit through the use of immunoassay kits followed by laboratory confirmation sampling. Post excavation soil sampling was also performed and analyzed by a laboratory. Approximately 900 tons (726 cubic yards) of contaminated soil were removed from the pit to a depth of between 20 to 35 inches and properly disposed offsite. The excavation was backfilled with crushed limerock to match the surrounding grade.

Media Assessment

A Conceptual Site Model (Figure 3) was developed to characterize the sources, potential exposure pathways, and exposure media relevant to SWMU 3. The model shows the primary sources of contamination including material from past training activities. The potential contaminants of concern are hazardous substances within the oils and other fuels that were applied to the pit and burned, and the media used to extinguish the fire. Volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), metals, pesticides, and polychlorinated biphenyls (PCBs) were the contaminants investigated in surface and subsurface soils, sediment, surface water, and groundwater. The SWMU 3 environmental media impacted by the release of source contamination could include surface soil, subsurface soil, and sediment and surface water in a nearby lagoon. The State of Florida classified the groundwater as a Class G-III nonpotable aquifer that has not been accessed by public or domestic wells at NAS Key West. Although groundwater was sampled and analyzed, it has not been considered a pathway of concern. Further, the Monroe County Health Department recognizes the public water supply obtained from the mainland to be the only potable water supply available to Key West. Therefore, this pathway was not further evaluated. However, a preliminary comparison was performed between the chemical concentrations of the groundwater samples and both EPA Tap Water Risk Based Concentrations (RBCs) and EPA Maximum Contaminant Levels (MCLs) as part of the Baseline Risk Assessment (BRA). In addition, groundwater chemical concentrations were compared to surface water threshold concentrations that are considered to be protective of ecological receptors. A summary of the comparison is found in the BRA section. The comparison can also be found in the 1997 Supplemental RFI/RI Report for High-Priority Sites.

Nature and Extent of Contamination

The media sampling activities conducted at SWMU 3 provide data on the type and extent of constituents present in the unit. Sampling was performed in 1986, 1990, 1993, 1995, and 1996 as part of a series of remedial investigations. The sampling activities in each investigation were tailored to the unit based on known unit activities and existing data. In 1995, the delineation and post excavation sampling performed during the soil IRA was an additional source of soil data for SWMU 3.

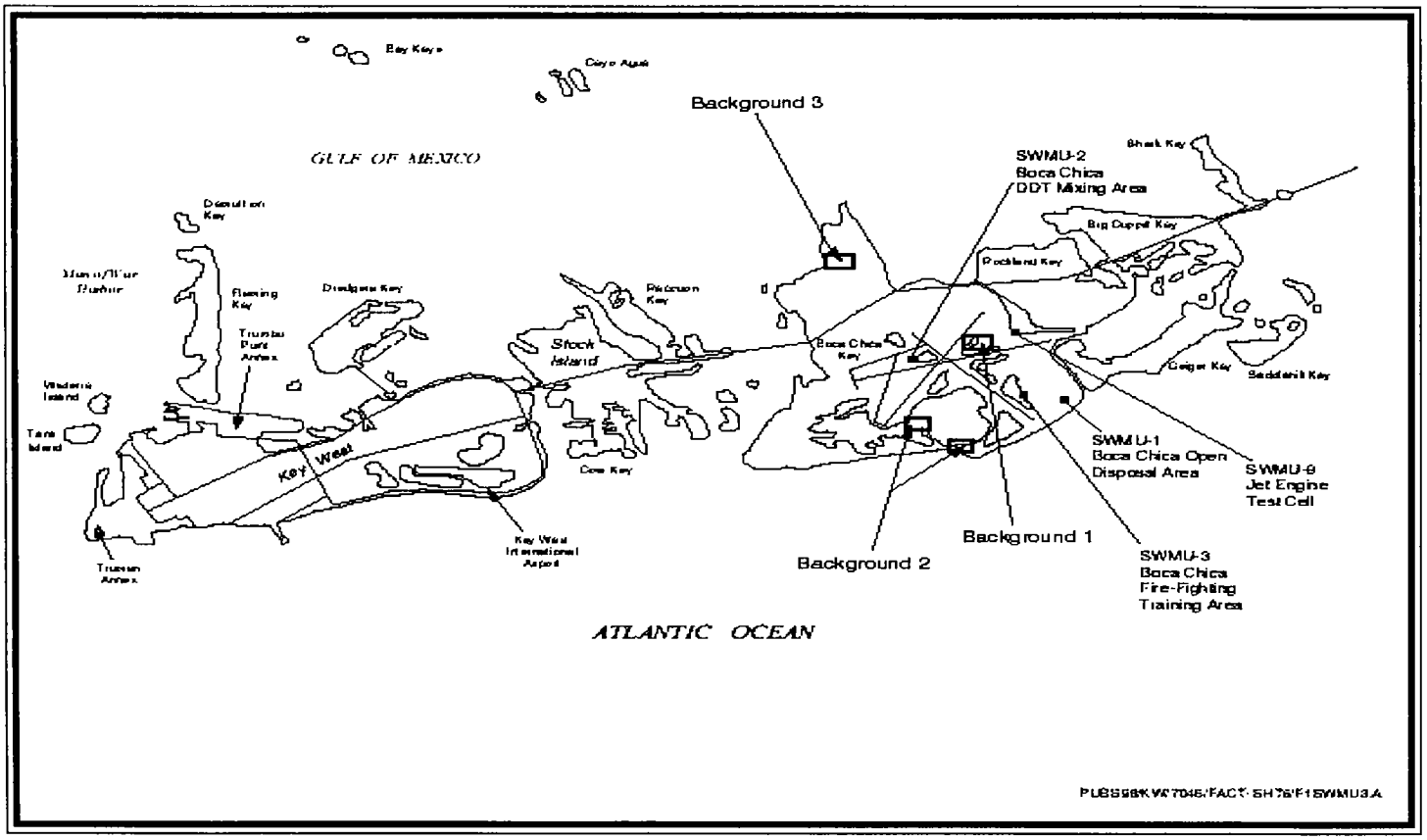


Figure 1. NAS Key West High Priority Installation Restoration Sites.

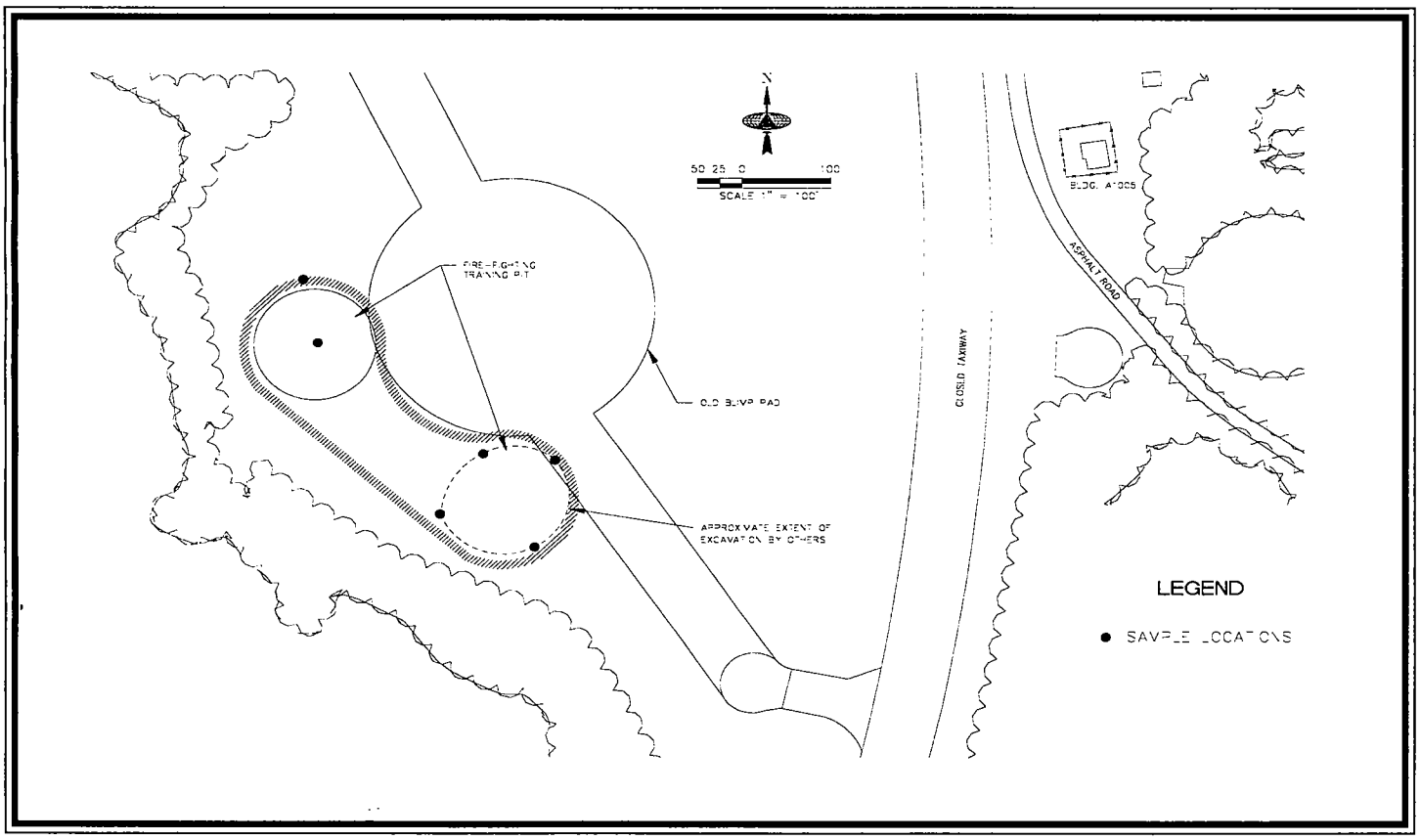


Figure 2. Site Location Map of SWMU 3.

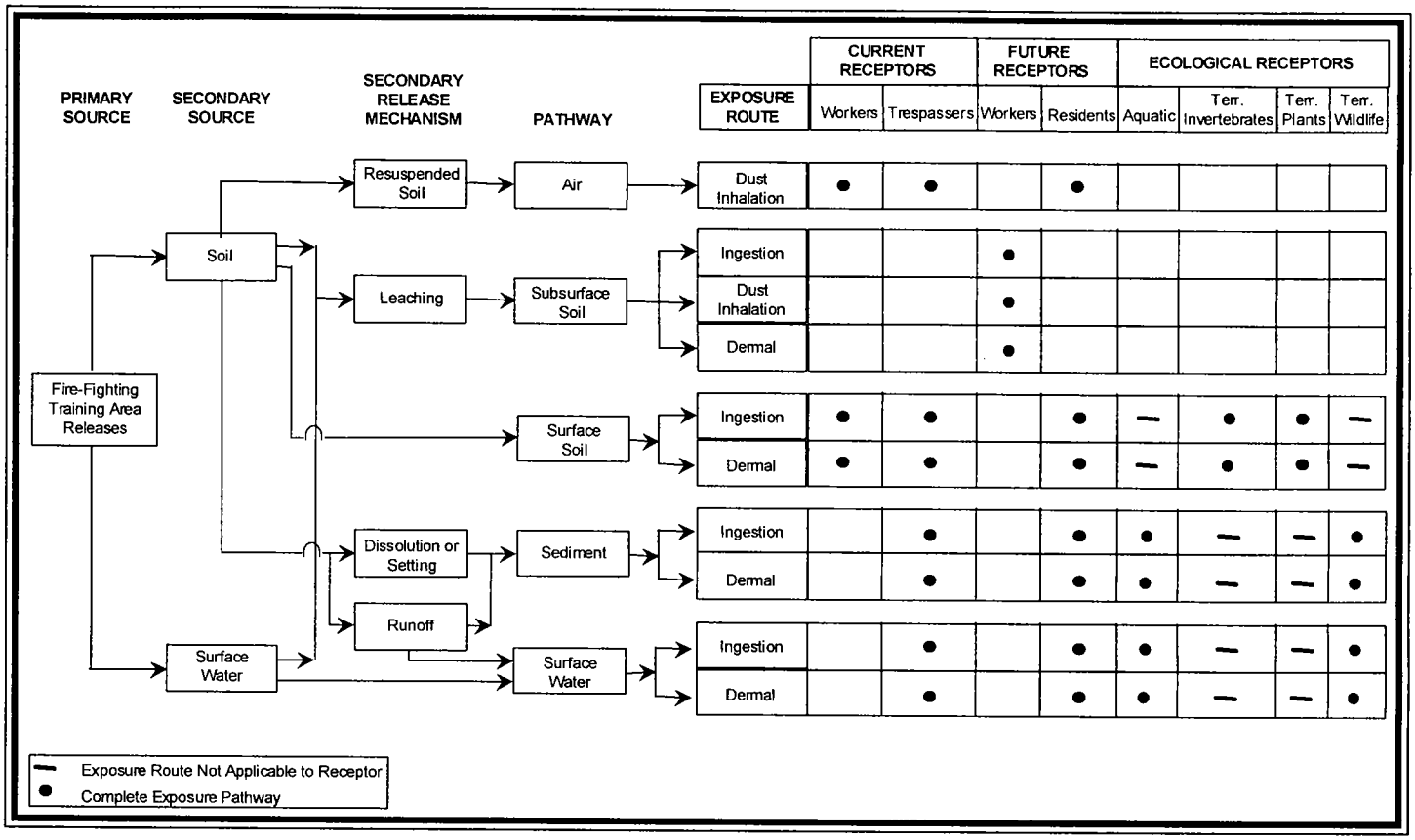


Figure 3. Conceptual Site Model for NAS Key West SWMU 3.

Soil

In 1990, 1993, and 1995, soil was sampled in the two pits. During the 1996 supplemental sampling effort, the Navy did not sample soil because sufficient data had already been collected for decision-making purposes.

The soil sampling was conducted at the surface (0 to 1 ft below ground surface) and at subsurface (3 to 5 feet below ground surface). Five surface soil samples and one subsurface soil sample were taken during the investigations. These samples were analyzed for VOCs, SVOCs, metals/inorganics, and pesticides/PCBs. In addition, 17 samples were taken and analyzed in the field for BTEXs and PAHs. VOCs and SVOCs were not detected in excess of applicable or relevant and appropriate requirements and screening action levels (ARAR/SALs). Metals and inorganics were the most common class of contaminants detected in soil. Specifically, arsenic and chromium were detected consistently in surface soil from the perimeter of the southern training pit during the 1995 IRA confirmation sampling. Chromium was also detected in both surface and subsurface soil samples from the unexcavated northern pit. Pesticides and PCBs were not detected in soil during the investigations.

Sediment

In 1993 and 1996, sediment was sampled at the lagoon to the west and south of the two pits. VOCs and SVOCs were detected in excess of ARAR/SAL levels in two of the four samples collected in 1993. These contaminants included cis-1,2-dichloroethene, bis(2-ethylhexyl)phalate and carbon disulfide. As in soil, metals and inorganics were the most common class of contaminants detected in sediment. In both 1993 and 1996, arsenic was found at levels much higher than those observed in soil with a maximum value to the west of the north pit. Copper and lead were consistently detected and cyanide exceeded the SAL at only two of the nine sample locations. In 1993, mercury was detected in excess of its SAL in one sample. In 1996, cadium exceeded SAL in two of four samples.

Surface Water

In 1993 and 1996, surface water was sampled in the lagoon to the west and south of the two pits. VOCs and SVOCs, analyzed in 1993 only, were not detected in excess of ARAR/SALs in the nine samples. As in soil and sediment, metals and inorganics were the most common class of contaminants detected in surface water. Antimony and thallium were consistently

detected in 1993 and 1996, respectively. They are assumed to be common surface water contaminants based on results from the previous investigations. Copper was detected in excess of its ARAR/SALs in isolated samples during the 1993 and 1996 sampling events. No pattern of copper as a surface water contaminant is apparent from the investigation results. In 1993, lead and tin were each detected above their ARAR/SAL. In addition cyanide was twice detected above its SAL.

Groundwater

Groundwater was sampled in 1986, 1990, 1993, and 1996. Fourteen wells have been installed and sampled in and around the two pits. The 1990 and 1993 sample results indicate levels of VOCs and SVOCs above ARAR/SAL levels. These contaminants included benzene, ethylbenzene, methyl chloride, trans-1,2-dichloroethene, vinyl chloride, and naphthalene that were consistently detected in groundwater underlying the unexcavated training pit during previous investigations. In 1996, however, ethylbenzene was the only VOC detected in excess of ARAR/SAL criteria. The SVOC naphthalene was detected in groundwater in increasing concentrations from 1990 to 1996. No other SVOCs were detected in excess of available ARAR/SAL criteria. In 1990, a single sample revealed pesticide results in excess of ARAR/SAL levels. PCBs were not detected in the groundwater during the investigations. In 1990, only chromium and manganese were both found to exceed ARAR/SALs but were not identified as significant contaminants in subsequent investigations. In 1993, antimony was the only inorganic detected above ARAR/SALs. Antimony appeared to be a common groundwater contaminant in the RFI/RI but was not detected at the site in the other investigations.

Contaminant Fate and Transport

The major contaminant source at SWMU 3 is the soil from the former burn pits. The potential contaminant release pathways at the site include volatilization, wind erosion, overland runoff, and infiltration of contaminants. Constituents in the site soil can volatilize from surficial material or become airborne via resuspension. Contaminated fugitive dust can also be generated during ground-disturbing activities such as construction or excavation. These contaminants are dispersed in the surrounding environment and transported to downwind locations where they can repartition to surface soil, surface water, or sediment through gravitational settling, precipitation, and deposition. However, the burn pit areas are relatively small, precluding extensive fugitive dust or gaseous emissions.

Precipitation runoff can carry constituents to nearby surface waters, sediments, and surface soils but primarily to surface water and sediments in the lagoon. Infiltrating precipitation can cause the contamination of subsurface soil and groundwater. Contaminants with a stronger tendency to adsorb to organic matter in soil, such as PAHs and pesticides, are likely to migrate at a slower rate. On infiltrating the soil column and reaching the water table, a contaminant can be carried with the flow of groundwater to downgradient locations. Groundwater at the site is shallow and probably is hydrologically connected to surface water in the lagoon; contaminants can be deposited in sediment or they can accumulate in the tissues of aquatic organisms.

Former Fire-Fighting Training Area Risks

Human Health Risk Assessment

A BRA for human health was conducted in order to evaluate the significance of contamination at SWMU 3. The assessment for the RFI/RI activities at NAS Key West was conducted according to Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) risk assessment guidance. EPA indicated that evaluation of risk for the RCRA sites be performed according to the CERCLA risk assessment methods.

Soil, sediment, and surface water data for SWMU 3 were aggregated into exposure groups. Soil data was further divided into surface and subsurface exposure groups. Summary statistics, including identification of chemicals of potential concern (COPCs) and an estimate of the exposure point concentration based on the reasonable maximum exposure (RME), were prepared. The COPCs were selected based on the summary statistics and their toxicity. Chemicals were selected as COPCs to represent the SWMU 3 contamination and provide a framework for the quantitative risk assessment. The RME is intended to provide a conservative yet realistic estimate of potential exposure.

In the BRA, the human health risk associated with the exposure to contaminants in soil, sediments, and surface water were assessed for the exposed receptors. The exposed receptors were based on current and future land uses. The current receptors are iden-

tified as the adolescent/adult trespasser, occupational worker, and site maintenance worker. In the future, the most likely receptor is believed to be the excavation worker. Also considered for the future are the resident child and adult, although residential development of SWMU 3 is not considered likely. Under the master plan for land use on NAS Key West, the area where the unit is located is designated with a future use as a restricted access military base or future zoning to limit access at the site because it is near an active airstrip. The full study is in the Final Supplemental RFI/RI Report (July 1997). The incremental lifetime cancer risk (ILCR) and the Hazard Index (HI) values for the various pathways and receptors are discussed in the following sections.

ILCR refers to the cancer risk over and above the background cancer risk in unexposed individuals. ILCRs are determined by multiplying the intake level with the cancer potency factor. Future child and adult resident exposure to potential carcinogens is combined for a lifetime-weighted average (LWA) to calculate ILCR. The calculated risk probability is typically expressed in scientific notation (e.g., 1×10^{-6}). For example, ILCR of 1×10^{-4} means that one additional person out of ten thousand may be at risk of developing cancer due to excessive exposure at a site if no actions are conducted. The EPA acceptable target risk range is 1×10^{-4} to 1×10^{-6}. Florida's acceptable risk is 1×10^{-6}. Potential concern for noncarcinogenic effects of a single contaminant in a single medium is expressed in a hazard quotient (HQ). By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the HI can be generated. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media. The HI refers to the noncarcinogenic effect and is the ratio for the level of exposure to an acceptable level for a noncarcinogenic health effects. An HI value of less than 1.0 is an acceptable level for noncarcinogenic health effects as reviewed by EPA and FDEP. Table 1 summarizes the total ILCRs and HIs calculated for SWMU 3.

Neither the current/future site trespasser nor future site worker exceed the 1×10^{-6} point of departure for the ILCR or 1.0 for the HI. The future child and adult resident did have an ILCR that exceeded 1×10^{-6} and HI equal to 1.0. An explanation follows to explain the significance of these values for the future resident.

Human Health: Soil

The BRA did not identify any COPCs in soil; therefore, no further action is required to protect human health.

Human Health: Groundwater

Groundwater was not fully evaluated as part of the BRA because of its designation and use in the Keys. Groundwater is classified by FDEP as a nonpotable aquifer (Class G-III) and no potable water sources

Table 1

Total Incremental Lifetime Cancer Risk and Hazard Indices[1]

	Adolescent/Adult Resident	Trespasser Adult	Trespasser Child
All Pathways Cumulative Total Risk/Hazard with Sediment			
HI	0.2	0.04	0.05
ILCR	1×10^{-5}	3×10^{-6}	2×10^{-6}
All Pathways Cumulative Total Risk/Hazard with Surface Water			
HI	1.0	0.01	0.02
ILCR	1×10^{-5}	3×10^{-6}	2×10^{-6}

[1] The estimated carcinogenic risks for the current maintenance worker, occupational worker, and future excavation worker were not estimated in the BRA because no COPCs were selected in soils.

from groundwater exist on NAS Key West. The local water authority regulates the installation of potable water wells and; the Monroe County Health Department recognizes the only potable water source for the keys as the source from the mainland.

A preliminary comparison was performed between the of the chemical concentrations from the groundwater samples and both EPA Tap Water RBCs and EPA MCLs
as part of the 1997 Supplemental RFI/RI Report for High-Priority Sites.

The maximum values of heptachlor and benzene exceeded both MCLs and RBC screening criteria. Heptachlor was detected in one out of eight samples at levels above the MCL and above the tap water RBC. Benzene was detected in 2 out of 18 samples at levels above the MCL and above the tap water RBC. One sample was slightly lower than the MCL value, yet still exceeded the tap water RBC.

The maximum values of aldrin, alpha-BHC, beta-BHC, gamma-BHC, 1,1-dichloroethene, methylene chloride, vinyl chloride, antimony, and arsenic exceeded only their maximum RBC values. Aldrin, alpha-BHC, beta-BHC, and gamma-BHC were all detected in one out of eight samples at a level above their respective RBCs. All of their levels were slightly above the maximum RBC values. 1,1-dichloroethene was detected in only 1 out of 18 samples, but at a level that is over 300-fold the value of its tap water RBC value. Methylene chloride was detected in 6 out of 18 samples. The maximum range of the samples was only slightly above the RBC value. Vinyl chloride was detected in 7 out of 17 samples at levels far exceeding the tap water RBC value. Antimony and arsenic were detected in seven and eight out of nine samples, respectively. Both were at levels that were at very high magnitudes exceeding their respective RBCs.

Human Health: Surface Water/Sediment

The COPCs identified are antimony and lead for surface water, and iron and lead for sediment in the current adolescent and adult trespasser and future residential pathway.

Uncertainties

An uncertainty analysis was performed on the risk data with the BRA. The uncertainty analysis allows for professional judgment to be used to exclude constituents that may not be clearly site-related for which risks may be overstated. As a result of the uncertainty analysis process, no human health remediation goal options were developed for iron, arsenic, or lead in sediment or for antimony or lead in surface water. Most important in this regard are the following findings:

- The uncertainty associated with the human dermal exposure is high because of the derivation of the dermal reference dose. Dermal exposure is a primary contributor to the cumulative cancer risk (via sediment) for the hypothetical future residential receptor. The uncertainty associated with the dermal exposure route may overestimate the risk at SWMU 3.
- Iron was selected as a COPC in sediment, but it was detected at levels in SWMU 3 that slightly exceed background levels. The inclusion of iron as a site-related sediment COPC could overestimate the quantitative risk at SWMU 3 for the hypothetical future residential receptor. Additionally, there is high uncertainty associated with the oral reference dose for iron.
- Use of residential RBCs for sediment and tap water RBCs for surface water probably results in the selection of COPCs that do not contribute significantly to the quantitative risk at SWMU 3 (i.e., iron and arsenic in sediment and antimony in surface water). This bias is based on the fact that sediment exposure is generally well below the intakes a receptor would be exposed to under a realistic residential soil exposure pathway.
- Lead was determined to be a COPC in sediment and surface water at SWMU 3. Lead exposure to sediment and surface water cannot be estimated under the Integrated Exposure and Uptake Biokinetic (IEUBK) Lead Model for the BRA at SWMU 3. Therefore, lead exposure could not be modeled. This probably underestimates the risks to potential human receptors exposed to lead in sediment and surface water, especially residential children.

Ecological Risk Assessment

An ecological risk assessment (ERA) was conducted in order to evaluate the possibility that aquatic and terrestrial ecological receptors may be at risk from site-related contaminants. The ERA was based on laboratory analyses of groundwater, surface water, sediment, and soil samples; sediment and surface water toxicity tests; and laboratory analyses of fish collected from the nearby lagoon.

Ecologically based benchmarks, which are concentrations of contaminants in various media protective of ecological receptors, were selected to compare SWMU 3 concentrations of analytes in surface water, groundwater, sediment, and soil to determine if they qualify as COPCs at SWMU 3. The samples used in this portion of the ERA were the same as those

used in the human health risk assessment.

Toxicity tests were performed using five surface water and five sediment samples collected in 1996 from the edge of the lagoon at SWMU 3. Surface water was evaluated using the silverside minnow, and sediment was evaluated using the amphipod. *Hyallela azteca*. Results of the toxicity tests were compared to results in concurrently tested laboratory control samples.

Fish were collected from the lagoon immediately west of the site and analyzed for VOCs, SVOCs, pesticides, PCBs, and metals. Concentrations of contaminants detected in the fish were compared to concentrations in fish collected at background sites and to benchmark concentrations considered to be protective of fish and piscivorous (i.e., fish-eating) receptors.

Ecological Risk: Soil

Results of the ERA indicate that no metals or organic compounds in site soils exceeded ecological benchmark values. Thus, contaminants in soils at SWMU 3 do not appear to pose significant ecological risks to terrestrial plants or animals.

Ecological Risk: Groundwater

Groundwater is not available to ecological receptors, but groundwater could become available to ecological receptors by discharging to surface water or sediment. Groundwater contaminants at SWMU 3 did not match surface-water and sediment COPCs. Hence, the groundwater-to-surface-water/sediment migration pathway does not appear to represent significant ecological risks.

Ecological Risk: Surface Water

Four metals (copper, cyanide, lead, and tin) in some surface water samples exceeded ecological benchmark values, but were present in only a few samples. The survival of silverside minnows in the surface water toxicity tests was similar to the survival of laboratory controls, indicating no site-related toxic effects. No VOCs or SVOCs were detected in fish tissue samples collected from the lagoon. Concentrations of metals and pesticides in fish tissues were generally less than in fish collected from background locations and less than concentrations considered hazardous to piscivorous receptors. Concentrations of Aroclor-1260 (the only PCB detected in fish tissue from SWMU 3) were generally higher than in background fish. However, all Aroclor-1260 concentrations were less than mean values in fish collected nationwide and analyzed by the U.S. Fish and Wildlife Service as part of the National Pesticide Monitoring Program. Because PCBs were not detected in site groundwater, surface water, soil, or sediment, and because the concentrations of PCBs in fish were low in relation to available benchmarks, the presence of Aroclor-1260 in fish from SWMU 3 is not believed to pose a significant risk to aquatic receptors. In addition, the disposal of PCBs at or near SWMU 3 is not known to have occurred, and the source of contamination at SWMU 3 (primarily waste jet fuel) would not be expected to be a source of PCBs.

Ecological Risk: Sediment

Concentrations of sediment analytes were generally less than benchmark values. Survival of amphipods in one of five sediment samples from SWMU 3 was significantly less than in the laboratory controls, and survival in the other four samples was similar to survival in the laboratory controls. Growth of the amphipods in all five samples from this site was greater than in laboratory controls. Based on the generally low levels of chemicals found in fish tissue and sediment, the reduced survival in a single sediment sample does not appear to have been a SWMU-related effect. Overall, the potential risks to aquatic receptors from sediment contaminants appear to be negligible.

Conclusions

The primary objectives of the investigation at SWMU 3 were to identify the existing nature and extent of contamination (after a previous interim remedial action at the SWMU) in the on-site media to provide a BRA of COPCs identified in those media, and to perform an ecological risk assessment. COPCs in SWMU 3 media were not present at sufficient concentrations to cause adverse noncarcinogenic health effects to any current or future potential receptor. The estimated cancer risks for the future resident (1×10^{-5}), current adolescent trespasser (2×10^{-6}), and adult trespasser (3×10^{-6}) were within the 1×10^{-4} to 1×10^{-6} target risk range often used by EPA in setting standards and criteria to evaluate the need for environmental remediation. These estimated cancer risks do exceed the 1×10^{-6} target risk range used by FDEP. However, the future land uses planned for this site do not include residential land use for the foreseeable future. Those include uses as a military base with restricted access, or future zoning to limit access at the site because it is near an active airstrip.

The ecological risk assessment concluded thatpotential risks to terrestrial and aquatic receptors are negligible. This is largely because of the lack of terrestrial habitat and low level of contaminants present. In addition, it was concluded that the low levels of contamination present in surface water and sediment at the site are negligible and do not pose a significant risk to aquatic receptors. The results of the BRA for all media evaluated at SWMU 3 support a decision for no further action.

Preferred Alternative

The preferred alternative for SWMU 3 is No Action. The previous soil removal activities at SWMU 3 have eliminated the need to perform additional remedial action. The SWMU 3 BRA identified three risks exceeding the one in one million (1×10^{-6}) cancer threshold. For the hypothetical future resident (1×10^{-5}), current hypothetical adult trespasser (3×10^{-6}), and adolescent trespasser (2×10^{-6}), the principal constituent contributing to the cancer risk is arsenic in sediment. However, the uncertainty analysis produced findings that address the estimate of the cancer risk associated with arsenic for the three receptors.
The calculated noncarcinogenic risk for the hypothetical future resident slightly exceeds 1.0, a benchmark below which adverse noncarcinogenic health effects are not anticipated. The primary chemicals contributing to the calculated noncarcinogenic risk (antimony in surface water and arsenic in sediment) are not believed to be indicators of contamination, but rather they are indicative of the wide variability inherent in the analytical results.

For the BRA, the carcinogenic and noncarcinogenic risks associated with antimony and arsenic are considered negligible. Further, both types of risk are calculated for receptors who in all probability will never be present at the unit. The land use for that part of NAS Key West does not include residential use for the foreseeable future, and access is restricted because it is part of a military installation and adjacent to the airstrip. Lastly, the ecological risk assessment concluded thatpotential risks to terrestrial and aquatic receptors at SWMU 3 are negligible. No Action will therefore provide protection to human health and the environment at SWMU 3. There are no costs associated with the No Action alternative.

This proposal is consistent with EPA guidance and is an effective use of risk management principles. This fact sheet provides for involvement with the community through a document review process and a public comment period. Public input will be documented in the responsiveness summary, as previously discussed. To submit written or oral comments, please refer to the Community Involvement Section of this fact sheet.

REFERENCES

BEI (Bechtel Environmental, Inc.), 1995, Delineation Sampling Report for SWMU 1, SWMU 2, SWMU 3, SWMU 7, AOC-A, AOC-B, IR-1, and IR-2 at the Naval Air Station Key West, Florida, prepared for Department of the Navy, Southern Division, Naval Facilities Engineering Command, Oak Ridge, Tennessee.

IT (IT Corporation), 1991, Remedial Investigation Report, Naval Air Station, Key West, Florida, Final Draft, prepared for Southern Division, Tampa, Florida.

IT (IT Corporation), 1994, RCRA Facility Investigation/Remedial Investigation, Final Report, NAS Key West, Florida, prepared for SOUTHNAVFACENGCOM, Tampa, Florida, June.

BRE (Brown & Root Environmental), 1997, Supplemental RCRA Facility Investigation/Remedial Investigation, Final Report, NAS Key West, Florida, prepared for SOUTHNAVFACENGCOM, Aiken, South Carolina, July.

BEI (Bechtel Environmental, Inc.), 1997 Project Completion Report for SWMU 1, SWMU 2, SWMU 3, SWMU 7, AOC-A, AOC-B, IR-1, and IR-2 at the Naval Air Station Key West, Florida, prepared for Department of the Navy, Southern Division, Naval Facilities Engineering Command, Oak Ridge, Tennessee.

GLOSSARY

Applicable or Relevant and Appropriate Requirements (ARARs): Refers to the Federal and state requirements that a selected remedy will attain. These requirements may vary from site to site.

Baseline Risk Assessment (BRA): Analysis of the potential adverse health effects (current or future) caused by hazardous substance release from a site in the absence of any actions to control or mitigate these releases.

Characterization: The compilation of all available data about the waste units to determine the fate and extent of contaminant migration resulting from the waste site, and the concentration of any contaminants that may be present.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) 1980: A Federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act. The Acts created a special tax that goes into a Trust Fund, commonly known as Superfund, to investigate and clean up abandoned or uncontrolled hazardous waste sites.

Exposure: Contact of an organism with a chemical or physical agent. Exposure is quantified as the amount of the agent available at the exchange boundaries of the organism (e.g., skin, lungs, digestive tract, etc.) and available for absorption.

Hazard Quotient/Hazard Index (HQ/HI): The hazard quotient (HQ) is used to express the risk of adverse noncarcinogenic effects from constituent exposure. The HQ is the ratio of the estimated chronic daily intake of a constituent to the reference dose (RfD). RfDs are reported as chemical intakes (mg/kg-day) and are the toxicity values used most often in evaluating noncarcinogenic effects on human health. The RfDs are developed by the EPA and are defined as estimates of a daily exposure level for the human population, including sensitive subpopulations, likely to be without an appreciable risk of deleterious effects during a lifetime. The constituent-specific HQs are summed for each environmental medium and exposure pathway to obtain the hazard index (HI). After individual pathway risks are calculated, HIs may be combined across pathways to estimate total unit risk for each receptor. An HI greater than 1.0 has been defined by the EPA as the level of potential concern for adverse noncarcinogenic health effects.

Information Repository: The collection of documents from the Installation Restoration Program at NAS Key West. Refer to the Community Involvement section for its location in Key West, Florida.

Media: A pathway through which contaminants are transferred. Five media by which contaminants may be transferred are groundwater, soil, surface water, sediment, and air.

Reasonable Maximum Exposure (RME): This is the value that the average concentration will fall below 95 percent of the time.

Resource Conservation and Recovery Act (RCRA) of 1976: A Federal law that established a regulatory means to track hazardous substances from their generation to disposal. The law requires safe and secure procedures to be used in treating, transporting, storing, and disposing of hazardous substances. RCRA is designed to prevent the creation of new, uncontrolled hazardous waste sites.

Responsiveness Summary: A summary of oral and/or written comments and Navy responses received during the proposed comment period. The responsiveness summary is a key part of the Record of Decision (ROD) highlighting community concerns.

Screening Action Levels (SAL): Refers to Federal and State recommendations that a selected remedy should attain. These recommendations vary from site to site.

Statement of Basis: A report describing the corrective measures/remedial actions being conducted pursuant to Florida Department of Environmental Protection (FDEP) regulations, as amended.

Target Risk Range: EPA guidance for carcinogenic risk due to exposure to a known or suspected carcinogen between one excess cancer in an exposed population of 10,000 (1×10^{-4}) and one excess cancer in an exposed population of 1 million (1×10^{-6}). Risks within this range require risk management evaluation of remedial action alternatives to determine if risks can be reduced below one excess cancer in a million (1×10^{-6}). Risks greater than 1×10^{-4} indicate that remedial action is generally warranted.

Who Do I Call?	*Where Can I Find Them?*
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Mr. Jorge R. Caspary, P.G. Florida Department of Environmental Protection (FDEP)	FL Department of Environmental Protection 2600 Blair Stone Road Tallahassee, FL 32399-2400 Phone: (904) 488-3935 Fax: (904) 922-4939

Public Affairs Office
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Key West, Florida 33040-9001

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NAVAL AIR STATION KEY WEST
U.S. Navy Statement of Basis Fact Sheet for the Boca Chica Aircraft Intermediate Maintenance Building (AIMD) Building A-980 (SWMU 4)

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This fact sheet is one in a series informing interested citizens of the Installation Restoration (IR) program being conducted at Naval Air Station (NAS) Key West. The IR program is the Department of Defense plan for environmental investigation and cleanup of military installations nationwide. The program is designed to address areas of contamination from past spills and waste disposal practices. Fact sheets will be produced at milestones and in response to other items of public interest. Community relations activities associated with the IR program, including distribution of fact sheets, are coordinated through the NAS Key West Public Affairs Office, (305) 293-2425.

Introduction

This fact sheet is issued by the U.S. Navy, the lead agency for Naval Air Station (NAS) Key West remedial activities, with concurrence by the U.S. Environmental Protection Agency (EPA) and the Florida Department of Environmental Protection (FDEP). The purpose of the fact sheet is to describe the preferred alternative for addressing environmental contamination at the Boca Chica Aircraft Intermediate Maintenance Building (AIMD) Building A-980 located on Boca Chica Key and to ask for public comment on the preferred alternative. The fact sheet meets the guidance for the preparation of a statement of basis under the Resource Conservation and Recovery Act (RCRA).

NAS Key West manages certain waste materials regulated under RCRA, a comprehensive law requiring responsible management of hazardous waste. RCRA 3004(u) requires that releases from solid waste management units (SWMUs) be investigated and remediated as necessary. The AIMD Building A-980 is a SWMU regulated under RCRA 3004(u) and designated SWMU 4 at NAS Key West.

RCRA requires that the public be given the opportunity to review and comment on the draft permit modification and proposed remedial alternative. FDEP requirements for public participation in Florida are listed in Chapter 62-004 Florida Administrative Code (F.A.C.). These requirements include establishing an Information Repository that documents the selection of remedial alternatives and allows for review and comment by the public regarding those alternatives. The NAS Key West Community Relations Plan (1996) facilitates public involvement in the decisionmaking process for permitting, closure, and selection of remedial alternatives. FDEP requires the Navy to advertise the draft permit modifications and proposed remedial action so that the public can participate in the selection of a remedial action (Chapter 62-004 F.A.C.).

Background

This fact sheet summarizes the contents of the Information Repository leading to selection of the preferred alternative. The fact sheet presents the preferred alternative and the reasons for its selection. Community involvement during the evaluation of remedial alternatives for SWMU 4 is sought.

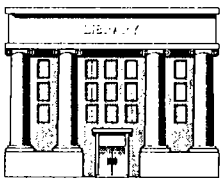
FDEP requires that a brief description of and response to all significant comments be made available to the public as part of the public record (Chapter 62-004 F.A.C.). All submitted comments will be reviewed and considered. Following the public comment period, a Responsiveness Summary will be prepared to address significant issues raised during the comment period. The Responsiveness Summary will be available with the final RCRA permit. In order to better understand RCRA activities as they pertain to SWMU 4, the public is encouraged to consult the Information Repository for this unit. The Community Involvement section of this fact sheet has information on access to the Information Repository.

RCRA also provides opportunities for the public to comment on draft permit modifications. The preferred alternative proposed in this fact sheet is also being proposed in the draft permit modification under RCRA. Therefore, comments received on this fact sheet will apply to the draft RCRA permit modification, proposing the same remedy for this waste unit.

The final selection of the remedial alternative under RCRA will coincide with the final permit modification decisions made by EPA and FDEP. It is important to note that the final action may be different from the preferred alternative discussed in this fact sheet, depending on new information or public comments. In any case, the alternative chosen will be protective of human health and the environment and will comply with Federal and state environmental laws.

Community Involvement

This fact sheet summarizes information from the documents listed in the Reference section. The reference documents are part of the Information Repository, which is available to the public at the following location:



Local and State History
Department Monroe Co.
700 Fleming Street
Key West, Florida
(305) 292 3595

The public will be notified of the public comment period through a mailing sent to approximately 100 citizens and through *The Citizen* newspaper that serves the southern Keys. Local radio stations will also announce the public comment period.

With significant public interest, the Navy will hold a public meeting during the comment period. The public will be notified of the date, time, and location. At the meeting, the proposed action will be discussed and questions about the proposed action answered. To request a public hearing during the comment period, to obtain more information concerning this fact sheet, or to submit written comments contact:

Public Affairs Officer
Code 01J, Naval Air Station
Key West, Florida 33040-9001
305-293-2425 or Fax 305-293-2230

Following the public comment period, the FDEP will issue a final decision for the RCRA permit modification. The RCRA permit modification will detail the remedial alternative chosen for the site and will include responses to oral and written comments received during the public comment period in the Responsiveness Summary. FDEP will issue a permit modification incorporating this remedy into the NAS Key West permit.

The following is excerpted from the RFI/RI Report for the High Priority Sites (July 1997). It summarizes the results of that report in language that is more technical than is usually included in a fact sheet. If you have questions or would like further explanation of these results, call Phillip Williams, Installation Restoration Coordinator, Environmental Branch, NAS Key West, at 305-293-2061.

Scope and Role of Response Action within the Facility Strategy

NAS Key West is in southern Monroe County, Florida. Several Navy bases in the lower Florida Keys make up the Naval Complex at Key West (Figure 1). Most of these are on Key West and Boca Chica Key. Other parts of the complex include Trumbo Point, Sigsbee Key (formerly Dredgers Key), Fleming Key, Demolition Key, Truman Annex on Key West, and Big Coppitt Key. The entire complex encompasses approximately 5,000 acres.

Boca Chica Key is approximately 3 miles wide and 3 miles long, and the air station encompasses 3,250 acres. The elevations of Boca Chica Key are less than 5 feet above mean sea level (msl) except for fill that underlies U.S. Highway 1. SWMU 4 is on the northwestern portion of Boca Chica Key, adjacent to Midway Avenue (Figure 2). There are several SWMUs on the Key that are currently being evaluated to determine the impacts of contamination, if any, to associated groundwater, surface water, soil, and sediment. The proposed action for SWMU 4 is a final action. Upon disposition of all the SWMUs on Boca Chica Key, a final comprehensive RCRA permit modification will be pursued.

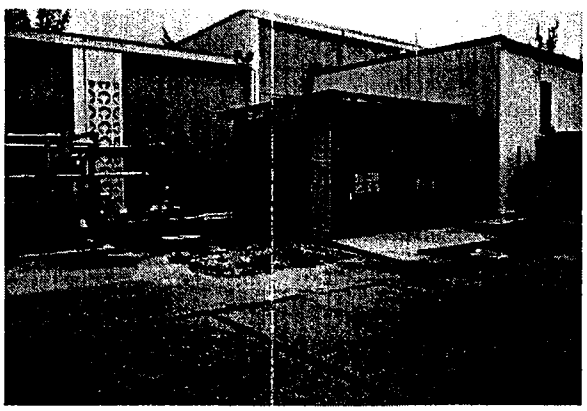


Photo of SWMU 4

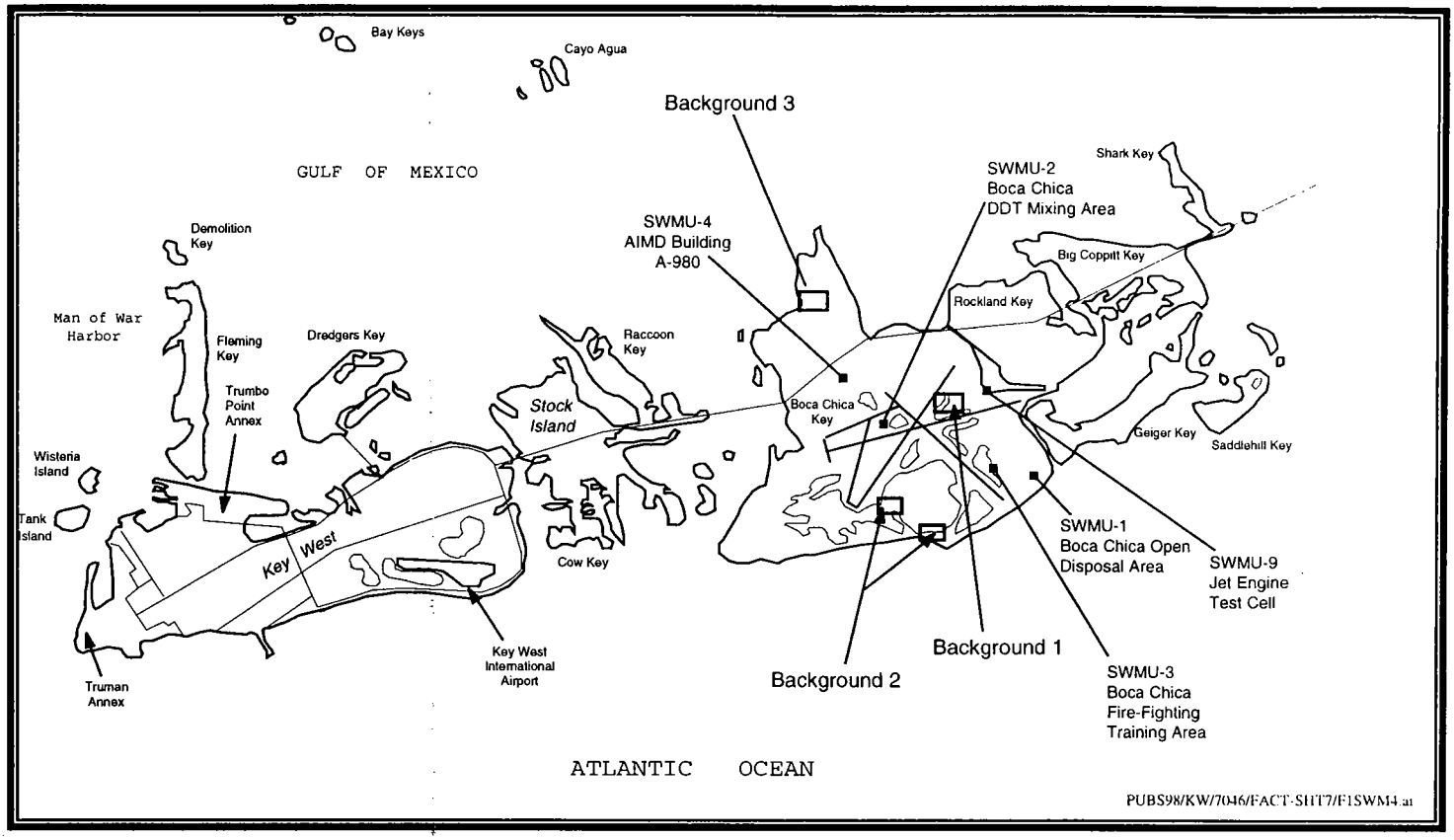


Figure 1. NAS Key West High Priority Installation Restoration Sites..

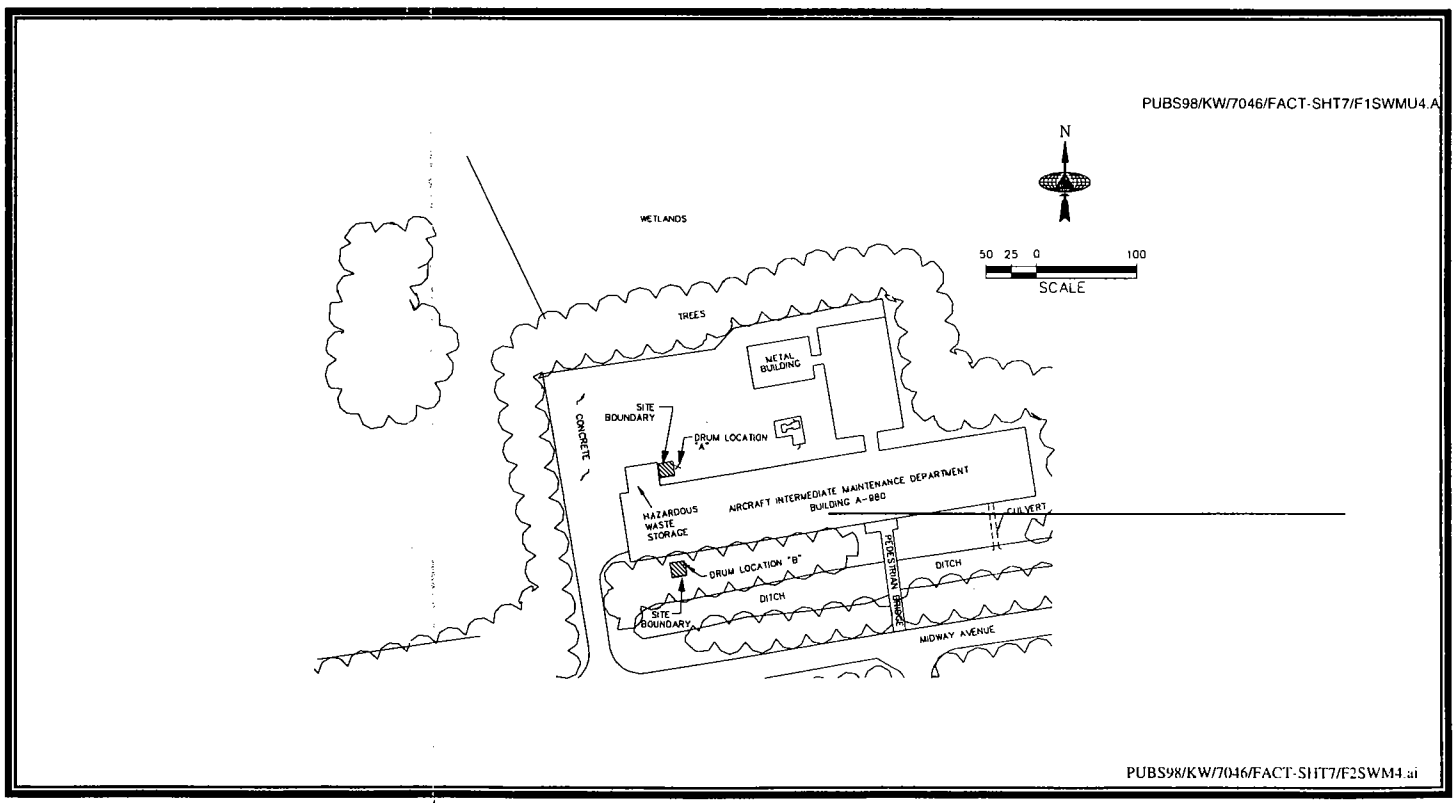


Figure 2. Site Location Map at SWMU 4.

Media-Specific Investigation for the Aircraft Intermediate Maintenance (AIMD) Building A-980

Unit Description, History, and Media Assessment

Unit Description and Location

AIMD Building A-980 provides electronics maintenance support to aircraft utilizing the NAS Key West airfield. The building was constructed in the late 1960s on Midway Avenue south of Highway 1 at a location that had been filled with 6 feet of crushed limerock (Figure 2). The site consists primarily of Building A-980, a paved parking area, and turf grass. A small stormwater drainage ditch lies to the south of the site. A shallow brackish marsh is located north of the site. A narrow strip of red mangroves exists along the edge of the marsh. The site is flat, except where it slopes down approximately 4 feet to the marsh and ditch. In August 1981, two plastic 55-gallon drums were installed in-ground on the north (Location "A") and south (Location "B") sides of the building to capture and store waste liquids generated by maintenance activities within the building. Those liquids included 70 percent freon 113 and 30 percent electrical insulating oil mixture. The Navy ceased using the drums in 1987.

In December 1989, the two drums and a 6-inch layer of soil from around and under each drum were removed from the ground. The removal included post excavation samples of the soil. The samples were analyzed for a variety of hazardous waste parameters including ignitability, corrosivity, reactivity, and toxicity; metals; polychlorinated biphenyls (PCBs); oil/grease; and total organic carbon. Elevated cadmium, chromium, lead, and mercury were reported in samples from both excavations. The analytical results for these samples were not used in the remedial investigations of the site because of the type of analyses and their associated level of data quality. The excavated soil and drums were removed from the former locations and properly disposed. The excavation was backfilled with crushed limerock to match the surrounding grade.

Media Assessment

A Conceptual Site Model (Figure 3) was developed to characterize the sources, potential exposure pathways, and exposure media relevant to SWMU 4. The model shows the primary sources of contamination including material from past storage activities. The potential contaminants of concern are hazardous substances within oil mixtures and solvents stored in the drums. Volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), metals, pesticides, and PCBs were the contaminants investigated in surface and subsurface soils, sediment, surface water, and groundwater. The SWMU 4 environmental media impacted by the release of source contamination could include surface soil, subsurface soil, and sediment and surface water in the nearby marsh. The State of Florida classified the groundwater as Class G-III nonpotable that has not been accessed by public or domestic wells at NAS Key West. In addition, the Monroe County Health Department recognizes the public water supply obtained from the mainland to be the only potable water supply available to Key West. Therefore, this pathway was not further evaluated in the human health risk assessment. However, a preliminary comparison was performed between the chemical concentrations of the groundwater samples and both EPA Tap Water Risk Based Concentrations (RBCs) and EPA Maximum Contaminant Levels (MCLs) as part of the Baseline Risk Assessment (BRA). In addition, groundwater chemical concentrations were compared to surface water threshold concentrations that are considered to be protective of ecological receptors. These comparisons are found in the 1998 Supplemental RFI/RI Report for Eight Sites.

Nature and Extent of Contamination

The media sampling activities conducted at SWMU 4 provide data on the type and extent of constituents present in the unit. Sampling was performed in 1993 and 1996 as part of the remedial investigation.

Soil

The soil samples from 1989 were not utilized to determine the nature and extent of site contamination because of the type of analytical methods and a lack of quality assurance documentation. In 1993, soil was sampled in the immediate vicinity of the former in-ground drum locations. Soil samples collected in 1996 were from south and southwest of the AIMD building. The soil sampling was conducted at the surface [0 to 1 feet below ground surface (bgs)] and at subsurface (2 to 4 feet bgs). During both investigations, a total of six surface soil samples were taken from the south side of the AIMD building. Seventeen subsurface soil samples were taken during the 1993 investigation. All SWMU 4 soil samples were analyzed for VOCs, SVOCs, pesticides, PCBs, metals, and other inorganics.

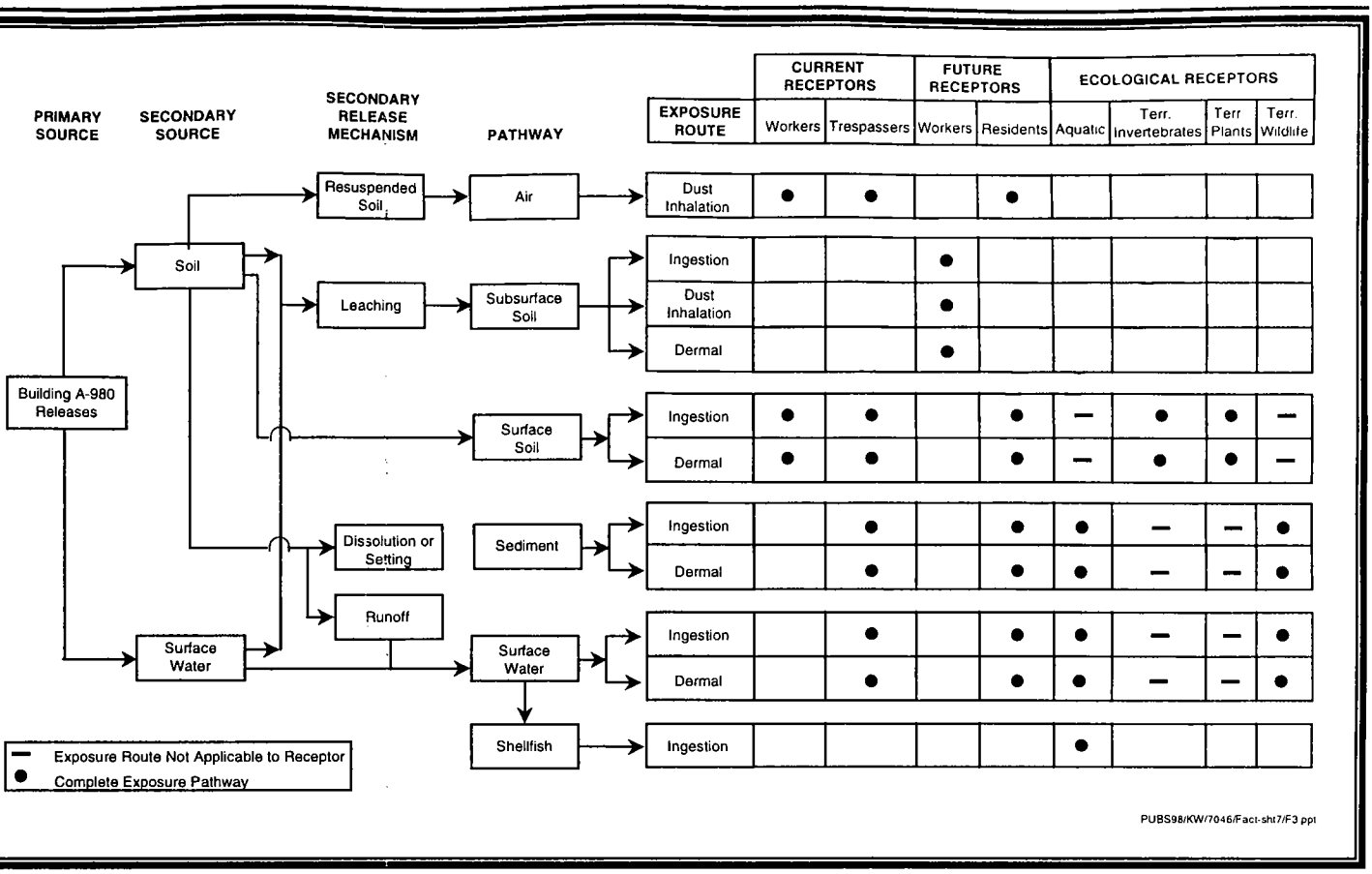


Figure 3. Site Conceptual Model for NAS Key West SWMU 4.

Only one SVOC, napthalene, exceeded the applicable or relevant and appropriate requirements (ARARs) and screening action levels (SALs) in subsurface soils in two of the samples collected near the former location of in-ground Drum B. No pesticides were detected above ARARs/SALs, and no PCBs were detected in subsurface soils at SWMU 4. Metals and inorganics were the most common class of contaminants detected in subsurface soil. Specifically, antimony, beryllium, cyanide, tin, and sulfide were detected in excess of ARARs/SALs near the former location of Drum B (south of the building). Antimony, beryllium, mercury, silver, tin, and zinc were detected in excess of ARARs/SALs near the former location of Drum A (north of the building).

No VOCs, SVOCs, pesticides, or PCBs were detected at concentrations in excess of ARAR/SAL criteria in surface soil samples at SWMU 4. As in subsurface soils, metals and other inorganics were the most common class of contaminants detected in surface soil. In 1993, antimony, beryllium, chromium, copper, cyanide, lead, and tin were detected in excess of ARAR/SAL criteria at one location each. Sulfide, silver, and zinc were detected in excess of ARAR/SAL at two of the four 1993 sampling locations. Mercury was detected in excess of ARAR/SAL criteria at four 1993 sampling locations. In 1996, cadmium was detected in excess of screening criteria although it was not previously detected. Chromium, mercury, silver, vanadium, and zinc were each detected in excess of screening criteria at only one of the two 1996 surface soil samples. Copper and lead were detected in excess at both sampling locations.

Sediment

In 1993 and 1996, sediment was sampled at the ditch to the south of the building and at the marsh north of the building. In 1993, only one VOC, acetone, and one SVOC, bis(2-ethylhexyl)phthalate, were detected in excess of ARAR/SAL criteria in a single sample located at the ditch. Lead was the only metal detected in excess of ARAR/SAL criteria. This exceedance was detected at the same sample location as the VOC and SVOC exceedances. No pesticides or PCBs were detected in sediment at SWMU 4.

Surface Water

In 1993 and 1996, surface water was sampled in the ditch to the south of the building and in the marsh north of the building. A single SVOC, N-nitroso-di-n-propylamine, was detected in excess of ARAR/SAL criteria in a 1996 surface water sample. No other SVOCs and no pesticides or PCBs were detected in surface water at SWMU 4. No VOCs were detected in excess of ARAR/

SAL criteria. Antimony, lead, and tin were detected in excess of screening criteria in 1993 surface-water samples. In 1996, no metals were detected in excess of ARAR/SAL criteria.

Groundwater

In 1993, groundwater was sampled at the former location of the two in-ground drums. In 1996, groundwater was sampled from these locations as well as additional locations farther from the building on both the north and south sides. Analysis of these samples indicated levels of VOCs and SVOCs above ARAR/SAL criteria. These contaminants include 1,4-dioxane, bis(2-ethylhexyl)phthalate, and chloroform detected in the 1996 samples and vinyl chloride detected in the 1993 and 1996 samples. No pesticides or PCBs were detected in groundwater at SWMU 4. No metals were detected in excess of screening criteria in 1996, although antimony, arsenic, and cyanide were detected in excess of ARAR/SAL criteria at one of the two 1993 sample locations.

Contaminant Fate and Transport

The major contaminant source at SWMU 4 is the soil from the vicinity of the former buried drums. The potential contaminant release pathways at the site include volatilization, wind erosion, overland runoff, and infiltration of contaminants. Constituents in the site soil can volatilize from surficial material or become airborne via resuspension. Contaminated fugitive dust can also be generated during ground-disturbing activities, such as construction or excavation. These contaminants are dispersed in the surrounding environment and transported to downwind locations where they can repartition to surface soil, surface water, or sediment through gravitational settling, precipitation, and deposition. However, the areas surrounding each of the two former buried storage drums are relatively small, precluding extensive fugitive dust or gaseous emissions.

Precipitation runoff can carry constituents to nearby surface waters, sediments, and surface soils but primarily to surface water and sediments in the marsh and the stormwater ditch. Infiltrating precipitation can cause the contamination of subsurface soil and groundwater. Contaminants with a stronger tendency to adsorb to organic matter in soil, such as oils and solvents, are likely to migrate at a slower rate. On infiltrating the soil column and reaching the water table, contaminants can be carried with the flow of groundwater to downgradient locations. Groundwater at the site is shallow and probably is hydrologically connected to surface water in the marsh; contaminants can be deposited in sediment or they can accumulate in the tissues of aquatic organisms.

AIMD Building A-980 Risks

Human Health Risk Assessment

A BRA for human health was conducted in order to evaluate the significance of contamination at SWMU 4. The assessment for the RFI/RI activities at NAS Key West was conducted according to Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) risk assessment guidance. EPA indicated that evaluation of risk for the RCRA sites will be performed according to CERCLA risk assessment methods.

Soil, sediment, and surface water data for SWMU 4 were aggregated into exposure groups. Soil data was further divided into surface and subsurface exposure groups. Summary statistics, including identification of chemicals of potential concern (COPCs), an estimate of the exposure point concentration based on the reasonable maximum exposure (RME), and an estimate of the exposure point concentration based on the central tendency exposure (CTE) were prepared. The COPCs were selected based on comparison to screening criteria. Chemicals were selected as COPCs to represent the SWMU 4 contamination and provide a framework for the quantitative risk assessment. The RME is intended to provide a conservative yet reasonable estimate of potential exposure. The CTE is intended to provide a realistic estimate of potential exposure. The CTE is only used when the carcinogenic risk for an exposure pathway exceeds 1×10^{-6} or if a hazard index (HI) (noncarcinogenic risk) for an exposure pathway exceeds 1.0.

In the BRA, the human health risk associated with the exposure to contaminants in soil, sediment, and surface water was assessed for exposed receptors. The exposed receptors were based on current and potential future land uses. The current receptors are identified as the adolescent/adult trespasser, occupational worker, and site maintenance worker. In the future, the most likely receptor is believed to be the excavation worker. Also considered for the future are the resident child and adult, although residential development of SWMU 4 is not considered likely. Under the master plan for land use on NAS Key West, the area where the unit is located is designated with a future use as a restricted access military base. The full BRA is in the Final Supplemental RFI/RI Report (January 1998). The incremental lifetime cancer risk (ILCR) and the Hazard Index (HI) values for

the various pathways and receptors are discussed in the following sections.

ILCR refers to the cancer risk over and above the background cancer risk in unexposed individuals. ILCRs are determined by multiplying the intake level by the cancer potency factor. Future child and adult resident exposure to potential carcinogens is combined for a lifetime weighted average (LWA) to calculate the ILCR. The calculated risk probability is typically expressed in scientific notation (e.g., 1×10^{-6}). For example, an ILCR of 1×10^{-4} means that one additional person out of ten thousand may be at risk of developing cancer due to excessive exposure at a site if no actions are conducted. The EPA acceptable target risk range is 1×10^{-4} to 1×10^{-6}. Florida's acceptable risk is 1×10^{-6}. Potential concern for noncarcinogenic effects of a single contaminant in a single medium is expressed in a hazard quotient (HQ). The HQ is the ratio of the estimated intake and the reference dose for a selected chemical. By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the HI can be generated. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media. The HI refers to noncarcinogenic effect and is the ratio for the level of exposure to an acceptable level for noncarcinogenic health effects. An HI value of less than 1.0 is an acceptable level for noncarcinogenic health effects as reviewed by EPA and FDEP. Table 1 summarizes the total ILCRs and HIs calculated for SWMU 4.

An ILCR and HI were not calculated for the future excavation worker because the pathways were not applicable for the respective media, no COPCs were selected, or COPCs did not have applicable toxicity values. Neither the current site trespasser nor future maintenance and occupational worker exceed the 1×10^{-6} threshold for the ILCR or 1.0 for the HI. The future child and adult resident did have an ILCR that slightly exceeded 1×10^{-6} and the HI was slightly above 1.0. An explanation follows to explain the significance of these values for the future resident.

Human Health: Soil

There were no COPCs identified in subsurface soils at SWMU 4 because they were detected at concentrations below the RBC developed for industrial land use scenarios. The BRA identified antimony, beryllium, and cadmium as COPCs in surface soils. Beryllium is the main contributor to the carcinogenic risk, and antimony is the main contributor to noncarcinogenic risk at SWMU 4. Beryllium and antimony are present at concentrations within or slightly above background concentrations. These metals might not be associated with past site-related activity and could represent non-anthropogenic levels for SWMU 4.

Human Health: Sediment and Surface Water

Antimony and phenanthrene were identified as COPCs in sediment. Antimony and N-nitroso-di-n-propylamine were identified as COPCs in surface water. Dibromomethane, barium, iron, manganese, tin, and zinc were also identified as COPCs for surface water at SWMU 4. These chemicals do not have listed water quality standards, but they do have available quantitative toxicity values. Therefore, to be conservative regarding protection of human health, these chemicals were included as COPCs and evaluated quantitatively under the surface water exposure pathway scenario.

Human Health: Groundwater

Groundwater was not evaluated as part of the BRA. Groundwater is classified by FDEP as a nonpotable aquifer (Class G-III) and no potable water sources from groundwater exist on NAS Key West. The local water authority regulates the installation of potable water wells and the Monroe County Health Department recognizes the only potable water source for the Keys as the source from the mainland.

However, a preliminary comparison was performed between the chemical concentrations from the groundwater samples and both EPA Tap Water RBCs and EPA MCLs as part of the 1998 Supplemental RFI/RI Report for Eight Sites. The maximum values of antimony, cyanide, bis(2-ethylhexyl)phthalate, and vinyl chloride exceeded both their respective MCL and RBC values. Arsenic and chromium concentrations exceeded tap water RBCs; however, this is not uncommon for unfiltered groundwater. Arsenic concentrations were detected at concentrations significantly higher than RBC values, while only the maximum detected chromium concentration exceeded the RBC value. Two organic chemicals, 1,4-dioxane and chloroform, were each detected in excess of RBC values in one sample. Other VOCs and SVOCs were detected at concentrations that did not exceed either MCLs or RBCs.

Uncertainties

An uncertainty analysis was performed on the risk data with the BRA. The uncertainty analysis allows for professional judgment to be used to exclude constituents that may not be clearly site-related for which risks may

Table 1. Total Incremental Lifetime Cancer Risk and Hazard Indices[1]

	Child/Adult Resident[a]	Trespasser Adult	Trespasser Adolescent	Maintenance Worker	Occupational Worker
All Pathways Cumulative Total Risk/Hazard With Surface Soil					
HI	0.1	0.003	0.006	0.002	0.01
ILCR	1×10^{-6}	2×10^{-8}	3×10^{-8}	2×10^{-8}	1×10^{-7}
All Pathways Cumulative Total Risk/Hazard With Sediment					
HI	0.08	0.003	0.005	NA	NA
ILCR	**	**	**	NA	NA
All Pathways Cumulative Total Risk/Hazard With Surface Water					
HI	0.9	0.04	0.09	NA	NA
ILCR	**	**	**	NA	NA
Cumulative Total Risk/Hazard					
HI	1.0	0.04	0.01	0.002	0.01
ILCR	1×10^{-6}	2×10^{-8}	3×10^{-8}	2×10^{-8}	1×10^{-7}

a = The ILCR is slightly above 1×10^{-6} and the HI is slightly above 1.0 when totaled across the three media.
** = Either no COPCs were selected or the COPCs selected for this pathway did not have applicable toxicity values.
NA= Not applicable; pathway is not applicable for the respective media.

be overstated. Most important in this regard are the following findings:

- Antimony is a major contributor to the noncarcinogenic risks in surface soil and surface water, but antimony was detected only sporadically in all media. Furthermore, antimony was detected at concentrations in surface water that may be associated with background conditions. Antimony might not be associated with past site activities which include receiving and storing solvents and oils. The inclusion of antimony as a site-related surface soil COPC could overestimate the quantitative risk at SWMU 4 for the future residential receptor.

- Beryllium is a major contributor to the cumulative carcinogenic risks in surface soil, but beryllium was detected at levels in SWMU 4 that only slightly exceed background levels. Beryllium might not be associated with past site activities, which include receiving and storage of solvents and oils. The inclusion of beryllium as a site-related surface soil COPC could overestimate the quantitative risk at SWMU 4 for the future residential receptor.

- The uncertainty associated with the dermal exposure is high because of the derivation of the dermal slope factor and reference dose. The dermal toxicity factors are based on default oral absorption factors. This can result in an overestimation of the toxicity factors. It eventually causes dermal exposure to be a primary contributor to the cumulative cancer risk and HI (via surface soils and sediment) for the future residential receptors and occupational workers. The uncertainty associated with the dermal exposure route may overestimate the risk at SWMU 4.

- Use of residential RBCs (sediment) and water quality standards (WQSs) (surface water) probably influences the selection of COPCs at the site by potentially designating chemicals as COPCs that do not contribute significantly to the quantitative risk at SWMU 4 (i.e., certain metals in sediment and surface water). This selection bias is based on sediment and surface-water exposure that is generally well above intakes to which a receptor would be typically exposed under a true residential soil and groundwater exposure pathway.

- In order to be conservative, chemicals without WQSs, but with toxicity values, were included as COPCs. Risks were evaluated for these COPCs for the surface-water exposure pathway. The inclusion of these COPCs would tend to overestimate the cumulative risks for the surface-water exposure pathway.

- Two chemicals, phenanthrene in sediment and dibromomethane in surface water, did not have listed toxicity values for use in the quantitative risk assessment; therefore, no risks were estimated for exposure to the COPCs. However, these chemicals were detected in only one sample. This could possibly underestimate the carcinogenic and noncarcinogenic risk at SWMU 4, but without additional toxicity information, this uncertainty remains unknown.

Ecological Risk Assessment

An ecological risk assessment (ERA) was conducted in order to evaluate the possibility that aquatic and terrestrial ecological receptors may be at risk from site-related contaminants. The ERA was based on the laboratory analyses of groundwater, surface water, sediment, and soil samples collected on and near SWMU 4, and on laboratory analyses of fish and vegetation. The fish consisted of minnows collected from the nearby marsh, which has a water depth of approximately 12 inches. Vegetation samples consisted of red mangrove foliage collected from the edge of the marsh.

Ecologically based benchmark values, which are concentrations of contaminants in various media protective of ecological receptors, were selected to compare SWMU 4 concentrations of analytes in surface water, groundwater, sediment, and soil to determine if they qualify as COPCs at SWMU 4. The samples used in this portion of the ERA were the same as those used in the human health risk assessment.

Fish and red mangrove foliage were analyzed for VOCs, SVOCs, pesticides, PCBs, and metals. Concentrations of contaminants detected in the fish and vegetative tissue were compared to concentrations in tissues collected at background sites, and fish tissue concentrations were also compared to benchmark concentrations considered to be protective of fish and piscivorous (i.e., fish-eating) receptors.

Ecological Risk: Soil

The ERA indicated that risks to terrestrial receptors from site-related soil contaminants were negligible. In addition, migration of contaminants to nearby surface water or sediments does not appear to have occurred.

Ecological Risk: Groundwater

Groundwater is not available to ecological receptors, but groundwater could become available to ecological receptors by discharging to surface water or sediment. Groundwater contaminants at SWMU 4 were infrequently detected and none exceeded available ecological benchmark values. Hence, the groundwater-to-surface-water/sediment migration pathway does not appear to represent significant ecological risks.

Ecological Risk: Surface Water

No analytes in surface water samples exceeded ecological benchmark values. Concentrations of metals and organic compounds in fish and vegetation were similar to concentrations in tissue collected from background locations and fish tissue concentrations were less than values considered to be hazardous to piscivorous receptors. Thus, contaminants in surface water at SWMU 4 do not appear to pose significant ecological risks.

Ecological Risk: Sediment

Concentrations of sediment analytes collected from the marsh north of the site indicate negligible ecological risk. Sediment concentrations of lead, tin, acetone, 2-butanone, and bis(2-ethylhexyl)phthalate) were elevated only in a single sample collected from the ditch adjacent to Midway Avenue, although the concentrations were indicative of relatively low potential risks. The sediment sample collected immediately downstream did not contain elevated concentrations of COPCs. Therefore, migration from this sample location does not appear to have occurred. In summary, potential ecological risks from sediment contaminants appear to be negligible. The results of analyses of fish and vegetation tissue support this conclusion.

Conclusions

The primary objectives of investigation at SWMU 4 were to identify the existing nature and extent of contamination (after removal of the drums) in the on-site media, to provide a BRA of COPCs identified in those media, and to perform an ecological risk assessment.

Although metal contaminants (i.e., antimony, and beryllium) are present at concentrations that might contribute to the risk for the hypothetical future resident, these metals might not be associated with past site-related activity. Antimony and beryllium are present at concentrations within or slightly above background.

COPCs in SWMU 4 media were not present at sufficient concentrations to cause adverse noncarcinogenic or carcinogenic human health effects to any current potential receptors; however, adverse noncarcinogenic health effects might occur under conditions evaluated for the future resident exposure scenario. The risk for the future resident exposure scenario is estimated at the

lower end of EPA's $1x10^{-4}$ to $1x10^{-6}$ target risk range for carcinogenic risk, slightly exceeds the FDEP target cancer risk of $1x10^{-6}$, and only slightly exceeds the 1.0 hazard index for noncarcinogenic risk. However, the future land uses planned for this site do not include residential land use for the foreseeable future. Those include uses as a military base with restricted access, or future zoning to limit access at the site because it is near an active airstrip.

The ecological risk assessment concluded that potential risks to terrestrial receptors at SWMU 4 appear to be low. Soil, surface water, and sediment contaminants do not appear to have bioaccumulated in vegetation or fish to any significant extent. In addition, terrestrial habitat at the site is of minimal areal extent and quality, resulting in minimal use of the site and vicinity by terrestrial receptors. The marsh north of the site provides excellent aquatic habitat, but contaminants do not appear to have migrated there to any significant extent. The results of the BRA for all media evaluated at SWMU 4 support a decision for no further action.

Preferred Alternative

The preferred alternative for SWMU 4 is No Action. The previous source and soil removal activities at SWMU 4 have eliminated the need to perform additional remedial action. The SWMU 4 BRA identified one risk exceeding the one in one million ($1x10^{-6}$) cancer threshold for the hypothetical future residents ($1x10^{-6}$). The principal constituent contributing to the cancer risk is beryllium in soil. However, as discussed in the uncertainty analysis, beryllium in SWMU 4 soil was infrequently detected and only slightly exceeded background values.

The calculated noncarcinogenic risk for the hypothetical future resident slightly exceeds 1.0, a benchmark below which adverse noncarcinogenic health effects are not anticipated. The primary chemical contributing to the calculated noncarcinogenic risk is antimony in soil and surface water. Antimony is not believed to be an indicator of contamination since it is probably not associated with past site activities and was detected at levels near background concentrations.

For the BRA, the carcinogenic and noncarcinogenic risks associated with antimony and arsenic are considered negligible. Furthermore, both types of risk are calculated for receptors who most likely will never be present at the unit. The future land for that part of NAS Key West does not include residential use for the foreseeable future, and access is restricted because it is part of a military installation. Finally, the ecological risk assessment concluded that potential risks to terrestrial and aquatic receptors at SWMU 4 are negligible. No Action will therefore still be protective to human health and the environment at SWMU 4. There are no costs associated with the No Action alternative.

This proposal is consistent with EPA guidance and is an effective use of risk management principles. This fact sheet provides for involvement with the community through a document review process and a public comment period. Public input will be documented in the Responsiveness Summary, as previously discussed. To submit written or oral comments, please refer to the Community Involvement Section of this fact sheet.

REFERENCES

BEI (Bechtel Environmental, Inc.), 1995, Delineation Sampling Report for SWMU 1, SWMU 2, SWMU 3, SWMU 7, AOC-A, AOC-B, IR-1, and IR-2 at the Naval Air Station Key West, Florida, prepared for Department of the Navy, Southern Division, Naval Facilities Engineering Command, Oak Ridge, Tennessee.

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BRE (Brown & Root Environmental), 1997, Supplemental RCRA Facility Investigation/Remedial Investigation, Final Report, NAS Key West, Florida, prepared for SOUTHNAVFACENGCOM, Aiken, South Carolina, July.

BEI (Bechtel Environmental, Inc.), 1997, Project Completion Report for SWMU 1, SWMU 2, SWMU 3, SWMU 7, AOC-A, AOC-B, IR-1, and IR-2 at the Naval Air Station Key West, Florida, prepared for Department of the Navy, Southern Division, Naval Facilities Engineering Command, Oak Ridge, Tennessee.

GLOSSARY

Applicable or Relevant and Appropriate Requirements (ARARs): Refers to the Federal and state requirements that a selected remedy will attain. These requirements may vary from site to site.

Baseline Risk Assessment (BRA): Analysis of the potential adverse health effects (current or future) caused by hazardous substance release from a site in the absence of any actions to control or mitigate these releases.

Characterization: The compilation of all available data about the waste units to determine the fate and extent of contaminant migration resulting from the waste site, and the concentration of any contaminants that may be present.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) 1980: A Federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act. The Acts created a special tax that goes into a Trust Fund, commonly known as Superfund, to investigate and clean up abandoned or uncontrolled hazardous waste sites.

Exposure: Contact of an organism with a chemical or physical agent. Exposure is quantified as the amount of the agent available at the exchange boundaries of the organism (e.g., skin, lungs, digestive tract, etc.) and available for absorption.

Hazard Quotient/Hazard Index (HQ/HI): The hazard quotient (HQ) is used to express the risk of adverse noncarcinogenic effects from constituent exposure. The HQ is the ratio of the estimated chronic daily intake of a constituent to the reference dose (RfD). RfDs are reported as chemical intakes (mg/kg-day) and are the toxicity values used most often in evaluating noncarcinogenic effects on human health. The RfDs are developed by the EPA and are defined as estimates of a daily exposure level for the human population, including sensitive subpopulations likely to be without an appreciable risk of deleterious effects during a lifetime. The constituent-specific HQs are summed for each environmental medium and exposure pathway to obtain the hazard index (HI). After individual pathway risks are calculated, HIs may be combined across pathways to estimate total unit risk for each receptor. An HI greater than 1.0 has been defined by the EPA as the level of potential concern for adverse noncarcinogenic health effects.

Information Repository: The collection of documents from the Installation Restoration Program at NAS Key West. Refer to the Community Involvement section for its location in Key West, Florida.

Media: A pathway through which contaminants are transferred. Five media by which contaminants may be transferred are groundwater, soil, surface water, sediment, and air.

Reasonable Maximum Exposure (RME): This is the value that the average concentration will fall below 95 percent of the time.

Resource Conservation and Recovery Act (RCRA) of 1976: A Federal law that established a regulatory means to track hazardous substances from their generation to disposal. The law requires safe and secure procedures to be used in treating, transporting, storing, and disposing of hazardous substances. RCRA is designed to prevent the creation of new, uncontrolled hazardous waste sites.

Responsiveness Summary: A summary of oral and/or written comments and Navy responses received during the proposed comment period. The responsiveness summary is a key part of the Record of Decision (ROD) highlighting community concerns.

Screening Action Levels (SAL): Refers to Federal and State recommendations that a selected remedy should attain. These recommendations vary from site to site.

Statement of Basis: A report describing the corrective measures/remedial actions being conducted pursuant to Florida Department of Environmental Protection (FDEP) regulations, as amended.

Target Risk Range: EPA guidance for carcinogenic risk due to exposure to a known or suspected carcinogen between one excess cancer in an exposed population of 10,000 (1×10^{-4}) and one excess cancer in an exposed population of 1 million (1×10^{-6}). Risks within this range require risk management evaluation of remedial action alternatives to determine if risks can be reduced below one excess cancer in a million (1×10^{-6}). Risks greater than 1×10^{-4} indicate that remedial action is generally warranted.

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