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FINAL TECHNICAL MEMORANDUM FOR ECOLOGICAL SAMPLING FOR SUPPLEMENTAL RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION WITH TRANSMITTAL LETTER NAS KEY WEST FL

5/8/1998

BROWN AND ROOT ENVIRONMENTAL

AIK-98-0089

ECOLOGICAL SAMPLING TECHNICAL MEMORANDUM

SUPPLEMENTAL RCRA FACILITY INVESTIGATION/REMEDIAL INVESTIGATION

FOR

NAVAL AIR STATION KEY WEST, FLORIDA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Southern Division
Naval Facilities Engineering Command
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North Charleston, South Carolina 29406

Submitted by:
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CONTRACT NUMBER N62467-94-D-0888
CONTRACT TASK ORDER 0007

May 1998

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May 8, 1998

Project Number HK 7046 *via U.S. Mail*

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

Subject: Final Technical Memorandum for IR 1 and IR 8
Naval Air Station Key West, Florida

Dear Mr. Patrick:

Brown and Root Environmental (B&R Environmental) is submitting the enclosed signature page, which is the Final Technical Memorandum for IR 1 and IR 8, NAS Key West, Florida. This page contains the B&R Environmental signatures for the preparation and approval of the technical memorandum for sediment and toxicity testing at IR 1 and IR 8. There were no changes from the previous version, which was submitted during February 1998. Please replace the unsigned signature page with enclosed signature page.

At your request, B&R Environmental is sending a copy of this signature page to the NAS Key West Partnering Team.

Please call me at (803) 649-7963, extension 345 or Scott Flickinger at extension 343, with your comments and any questions you may have regarding the enclosed document.

Sincerely,

C. M. Bryan
Task Order Manager

CMB:dsf

Enclosure

c: Ms. D. Evans-Ripley, SouthDiv (w/o enclosures)
Ms. M. Berry, U. S. EPA, Region IV (2 copies)
Mr. J. Caspary, FDEP (2 copies)
Mr. R. Demes, NAS Key West
Mr. P. Williams, NAS Key West
Mr. R. Hoekstra, Bechtel Environmental Inc.
Mr. M. Perry, B&R Environmental
Files 7046-7.11.1

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1.0 INTRODUCTION

This technical memorandum describes sediment sampling to be conducted at two Installation Restoration (IR) sites at Naval Air Station (NAS) Key West, Florida. Sediment toxicity tests have been recommended for IR 1 (Truman Annex Refuse Disposal Area) and IR 8 (Fleming Key South Landfill) as a result of an ecological risk assessment recently conducted for eight sites at NAS Key West. The ecological risk assessment was part of a Supplemental Resource Conservation and Recovery Act (RCRA) Facility Investigation and Remedial Investigation (RFI/RI) conducted on behalf of the U.S. Navy, Naval Facilities Engineering Command, Southern Division (NAVY SOUTHDIV). The Eight-Site RFI/RI Report (B&R Environmental, 1998) has been reviewed and approved by the U.S. Environmental Protection Agency (EPA) and is currently under final review by the Florida Department of Environmental Protection (FDEP). This document is provided in accordance with the RFI/RI Workplan (ABB, 1995).

The ecological risk assessment concluded that potential site-related ecological risks at both IR and IR 8 are limited to benthic organisms. Ecological contaminants of concern (COCs) at IR 1 consist of copper, lead, zinc, Aroclor-1260, and organochlorine pesticides. Ecological COCs at IR 8 consist of copper, lead, and zinc. However, the bioavailability and actual toxicity of sediment contaminants to benthos at these sites is not known. Thus, there is a need to better characterize the nature and extent of toxicity in site sediments before proceeding with a feasibility study.

On February 12, 1998, representatives of NAVY SOUTHDIV, FDEP, and Brown & Root Environmental (B&R Environmental) met to discuss sediment toxicity tests proposed for IR 1 and IR 8. The consensus of the attendees was that more information on the physical characteristics of the sediments is needed prior to making decisions regarding test species and protocols.

The objectives of the sampling described herein are to ascertain the physical characteristics of sediments at IR 1 and IR 8. Data collected as a result of the sampling will be used to determine the types of sediment toxicity tests that will ultimately be conducted on sediment samples collected from the sites. Primary issues to be resolved as a result of the initial sampling include sediment fraction to be tested (i.e., interstitial pore water vs. whole sediment), test species, number of samples, and reference sites. Decisions regarding these issues will be made with the concurrence of the NAS Key West Partnering Team. The NAS Key West Partnering Team is the decision-making body for the NAS Key West environmental restoration sites, including sites IR 1 and IR 8. The team is composed of representatives from the Navy, Navy contractor, FDEP, and EPA.

Sections 2.0 and 3.0 of this document describe existing ecological conditions at IRs 1 and 8, respectively, and summarize the results of the ecological risk assessment. Section 4.0 describes proposed reference sites. Section 5.0 describes the procedures and protocols for the sediment sampling and analyses.

2.0 IR 1 (TRUMAN ANNEX REFUSE DISPOSAL AREA)

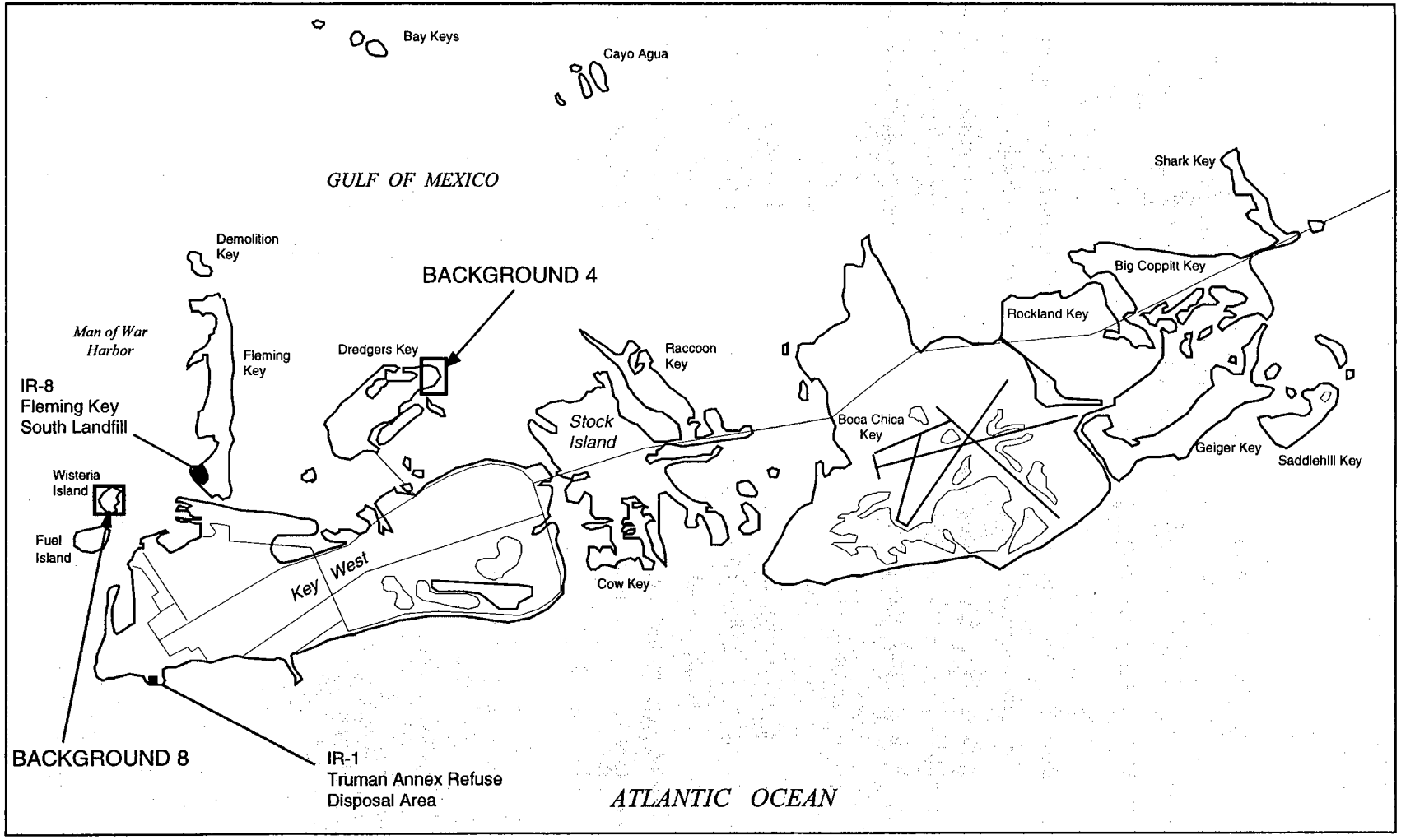
The site description, history, and the human health and ecological risk assessments are discussed in detail in Section 5 of the Eight-Site RFI/RI Report (B&R Environmental, 1998) and are summarized below.

2.1 HABITATS AND ECOLOGICAL RECEPTORS

IR 1 is located adjacent to the open ocean along the southern shore of Truman Annex on Key West (Figures 2-1 and 2-2). The site covers an area of approximately 7 acres, and consists primarily of a Navy antenna field. A chain-link fence surrounds the site, and access to IR 1 is strictly controlled. The main sewer outfall line for Key West runs through the property. Treated sewage is pumped to the outfall point 3,600 feet southwest of IR 1. From 1952 until the mid-1960s the Truman Annex Refuse Disposal Area was used for general refuse disposal and open burning (ABB 1995).

Terrestrial habitat at IR 1 consists largely of mowed turf grass enclosed by a chain link fence. Outside the chain link fence is a narrow 15-foot strip of weeds and a few Australian pines (*Casuarina equisetifolia*). Large concrete rubble and boulders have been placed along the shoreline for erosion protection. Due to the overall lack of vegetation (other than turf grass) the site is probably utilized by few terrestrial receptors. Birds, however, forage occasionally in grassy areas on the site. There are no freshwater resources at IR 1.

A diverse assemblage of marine life was observed within the near shore vicinity of IR 1 during sampling activities of September 1996. Common aquatic plants included turtle grass (*Thalassia testudinum*), sea fan (*Gorgonia* spp.), sea plume (*Pseudopterogorgia* spp.), and sea whip (*Leptogorgia* spp.). Observed animal life included spiny lobster (*Panulirus argus*), queen conch (*Strombus gigas*), hawkwing conch (*Strombus raninus*), Caribbean vase conch (*Vasum muricatum*), green moray eel (*Gymnothorax funebris*), hermit crab (*Petrochirus diogenes*), tarpon (*Megalops atlanticus*), barracuda (*Sphyraena barracuda*), and several other fish.



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Scale in Miles (Approximate)

FIGURE 2-1.

IR 1, IR 8, AND POTENTIAL BACKGROUND SITES

NAS KEY WEST KEY WEST, FLORIDA

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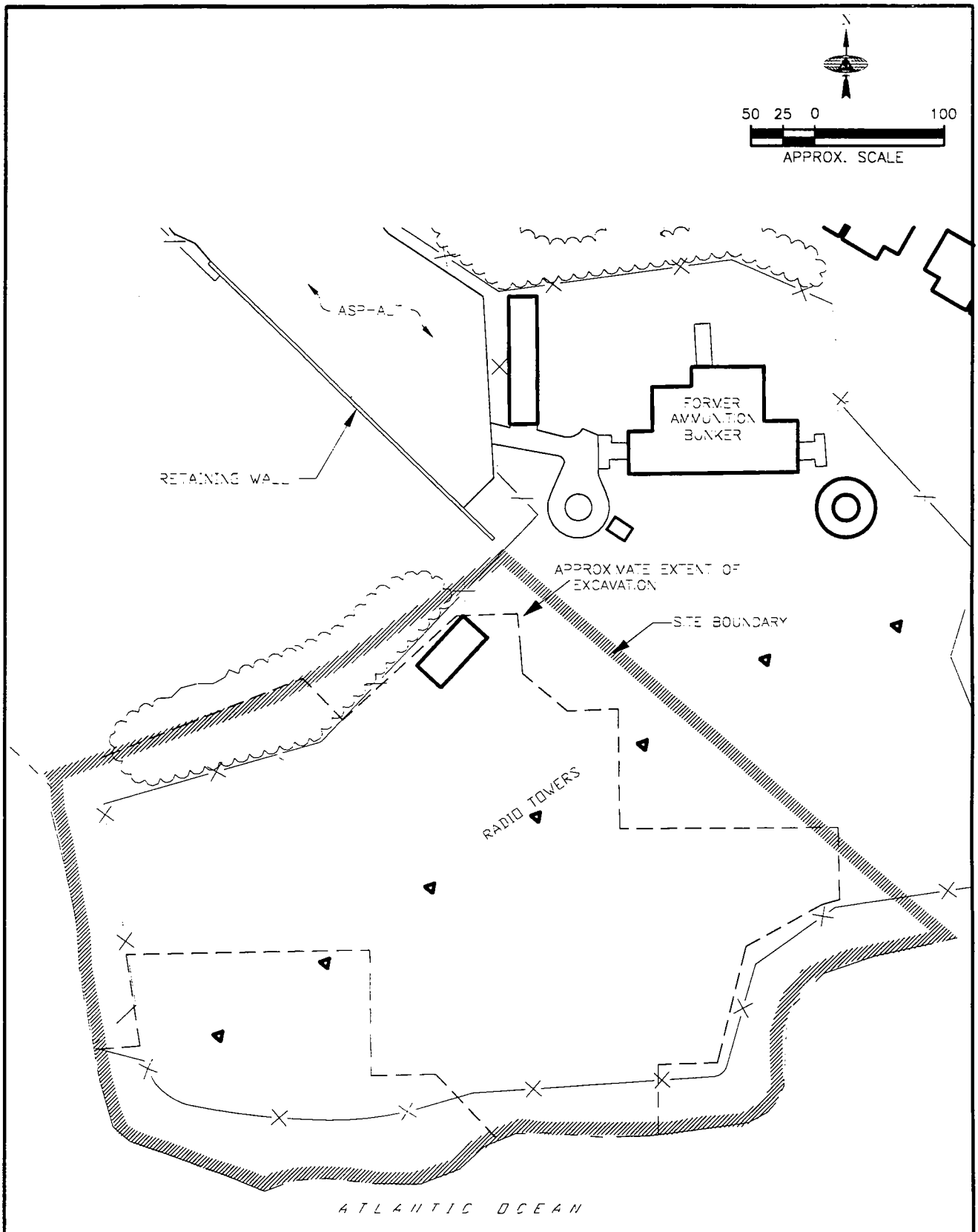

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FIGURE 2-2
SITE LOCATION MAP
IR 1
NAVAL AIR STATION
KEY WEST, FLORIDA

2.2 ECOLOGICAL RISK SUMMARY

The ecological risk assessment was based on the analyses of groundwater and soil samples collected from IR 1, and the analyses of surface water, sediment, and tissue samples (spiny lobster, Caribbean vase conch, giant hermit crab, and turtle grass) collected from the near shore vicinity of the site. Runoff and groundwater discharge to the ocean are potential contaminant migration pathways from IR 1.

Ecological contaminants of concern (COCs) in groundwater consist of endosulfan I, dieldrin, and gamma-BHC. Sediment COCs consist of Aroclor-1260, 4,4'-DDT, dieldrin, endrin, endosulfan, gamma-BHC, some daughter products of these pesticides, as well as copper, lead, and zinc. COCs in soil consist of copper, lead, and zinc. The use of the site by terrestrial receptors is minimal, and thus, these metals do not pose a potential risk to terrestrial receptors; however, they are considered soil COCs due to their potential for migration to aquatic habitats near IR 1. Copper and zinc were elevated (relative to background tissue samples) in some crab and lobster samples from the vicinity of IR 1, but most concentrations were not significantly elevated in comparison to concentrations of these metals reported in the literature for similar organisms from other background areas. Overall, potential ecological risks from metals and organic compounds appear to be limited to benthic organisms. However, the bioavailability and toxicity of sediment contaminants to benthic organisms is not known. Thus, there is a need to better characterize the nature and extent of toxicity in IR 1 sediments before proceeding with a feasibility study.

3.0 IR 8 (FLEMING KEY SOUTH LANDFILL)

The site description, history, and the human health and ecological risk assessments are discussed in detail in Section 8 of the Eight-Site RFI/RI Report (B&R Environmental, 1998) and are summarized below.

3.1 HABITATS AND RECEPTORS

IR 8 covers approximately 45 acres in the southwestern portion of Fleming Key (Figures 2-1 and 3-1). The southeastern portion of the site is bordered by the City of Key West Sewage Treatment Plant. A munitions storage area is located along the east boundary of the site. The remainder of the site is bordered by ocean water (Man of War Harbor). As much as 8,000 tons of unknown wastes reportedly were disposed at the landfill annually between 1962 and 1982.

A closed canopy of Australian pines exists throughout most of the site, and ground cover is generally sparse. Brazilian pepper (*Schinus terebinthifolius*) and weedy species such as sandbur (*Cenchrus tribuloides*) and *Cyperus* spp. occur in areas where sufficient sunlight can reach the ground. These areas are limited primarily to narrow dirt access roads within the site. Approximately 1,800 mangrove trees have been planted along the shoreline of IR 8 in order to provide shoreline stabilization as part of recent Interim Remedial Action activities. There are no surface freshwater resources at IR 8.

Since most of the site is a monoculture of Australian pines, the site provides poor habitat for terrestrial species. Nevertheless, a few species of mammals, reptiles, arboreal birds, and avian raptors utilize the site. Turtle grass is abundant and is the dominant aquatic vegetation in nearshore waters of IR 8. Aquatic marine life observed during sampling activities conducted in 1996 included queen conch, milk conch (*Strombus costatus*), stone crab (*Menippe mercenaria*), spiny spider crab (*Mithrax spinosissimus*), true tulip snails (*Fasciolaria tulipa*), spiny lobsters, and several fish species.

3.2 ECOLOGICAL RISK SUMMARY

The ecological risk assessment was based on the analyses of groundwater and soil samples collected from IR 8, and the analyses of surface water, sediment, and tissue samples (spiny lobster, stone crab, spiny spider crab, true tulip, milk conch, and turtle grass) collected from the near shore vicinity of the site. Ecological COCs at IR 8 consist of copper, lead, and zinc in sediment. Groundwater discharge of these

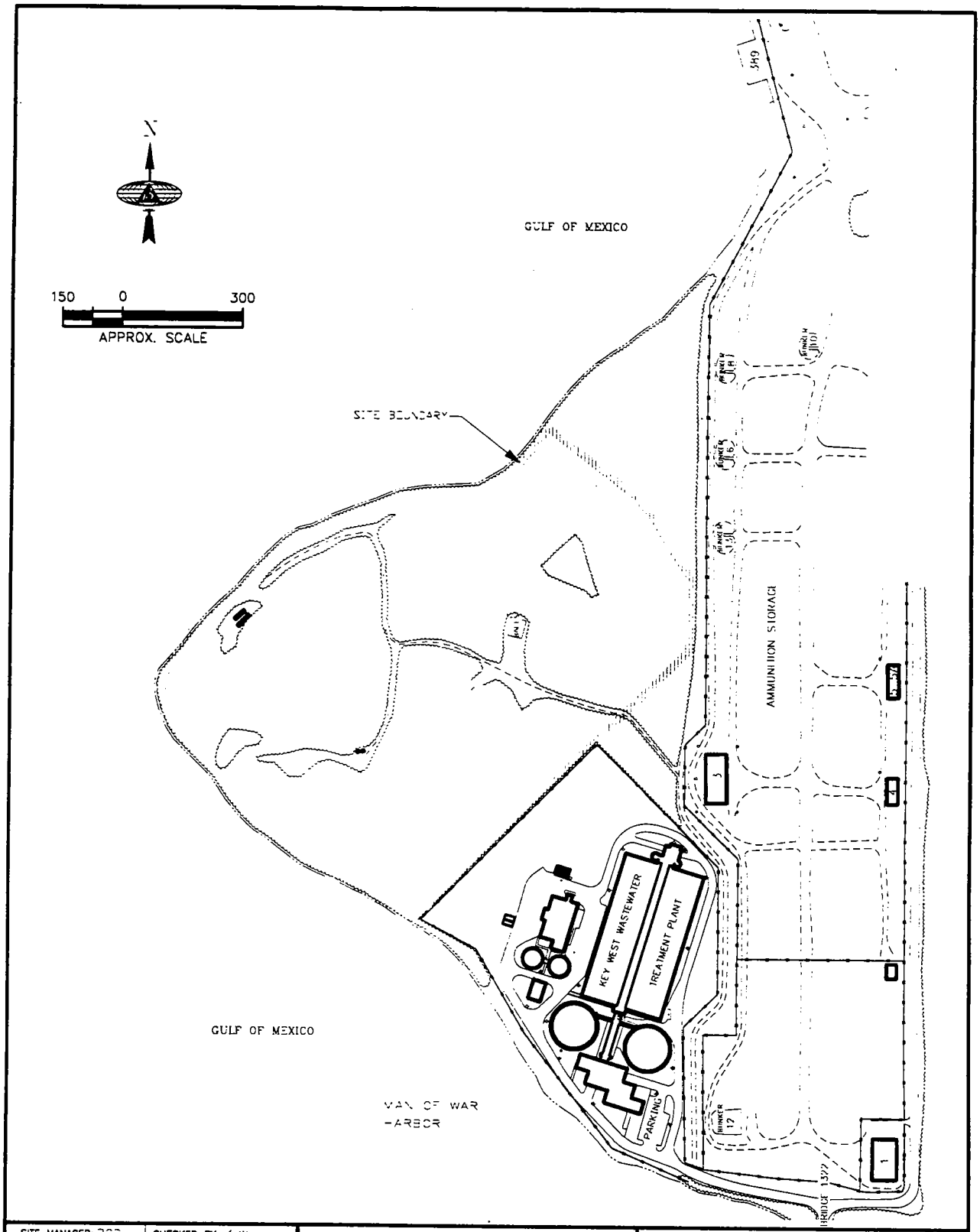

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FIGURE 3-1
SITE LOCATION MAP
IR 8
NAVAL AIR STATION
KEY WEST, FLORIDA

metals appears to be the dominant migration pathway. These metals were also elevated (relative to background tissue samples) in some crab, lobster, and conch samples from the vicinity of IR 8, but most concentrations were not significantly elevated in comparison to concentrations of these metals reported in the literature for similar organisms from other background areas. The impact of recent Interim Remedial Action activities on sediments is not known. However, sediment concentrations of site-related contaminants are expected to gradually decrease as a result of the Interim Remedial Action activities.

Overall, potential ecological risks at IR 8 are primarily confined to risks to benthic organisms from copper, lead, and zinc in sediments. However, the bioavailability and toxicity of these metals to benthic organisms is not known. Thus, there is a need to better characterize the nature and extent of toxicity in IR 8 sediments before proceeding with a feasibility study.

4.0 REFERENCE SAMPLING LOCATIONS

The assessment of in situ sediment toxicity is aided by the collection and testing of reference samples when whole sediments are tested. The inclusion of uncontaminated reference sediments allows an assessment of the potentially interfering effects of geochemical and geophysical properties of the sediment. Therefore, sediment samples will be collected from at least two locations in the Key West area. Ideally, at least one location will be found where sediments resemble the IR 1 and IR 8 sediments in characteristics such as grain size, water content, redox potential, pH, interstitial water salinity, and total organic carbon. The objective in collecting reference sediments during this initial sampling is to prepare for the possibility that whole sediments will ultimately be the sediment fraction of choice for toxicity testing.

Two reference locations that were utilized as background reference sites in the Eight-Site RFI/RI Report will be preferentially sampled, and are briefly described below. Other locations may be sampled depending on available resources and field conditions. The designations used in the Eight-Site RFI/RI Report (i.e., Background 4 and Background 8) will be retained when referring to these sites.

4.1 BACKGROUND 4 (DREDGERS KEY)

Dredgers Key is ½ mile north of Key West and 1 mile east of Fleming Key (Figure 2-1). Various U.S. Navy facilities exist on the western and central portions of Dredgers Key. The northeastern portion of the island is relatively undeveloped. The northeastern shoreline is covered by Australian pines and red mangroves (*Rhizophora mangle*). Sea grass communities exist in nearshore waters. At least one sediment sample will be collected from a location near the northeastern shoreline.

4.2 BACKGROUND 8 (WISTERIA ISLAND)

Wisteria Island is located approximately ½ mile northwest of Key West (Figure 2-1). No development exists on the island, which is covered with a dense canopy of Australian pines. The shoreline consists of crushed limestone and coral. Submerged aquatic vegetation surrounding the island is dominated by turtle grass. At least one sediment sample will be collected from a location near the western shoreline.

5.0 SAMPLING PROCEDURES AND PROTOCOLS

This section describes how the sediment samples will be collected, processed, and analyzed.

5.1 COLLECTION METHODS

Sediment will be collected using a ponar grab sampler. The upper two centimeters of sediment will be targeted for collection. Extreme care will be taken to obtain the sediment samples with as little disruption as possible and to retain the fine-grained portion of each sediment grab. At least one sample will be collected from each sediment type observed during sampling activities, and each sample will be a composite of several grabs collected from the within the same general area and sediment type. It is anticipated that four samples from IRs 1 and 8 will probably be sufficient for adequate characterization. It is further anticipated that approximately 500 mL of whole sediment will be a sufficient amount to constitute a sample.

5.2 SAMPLE PROCESSING AND SHIPPING

Samples will be stored on ice at 4°C and shipped via overnight delivery to the testing laboratory. Samples will be processed and shipped in accordance with FDEP standard operating procedures (FDEP 1992) and Section 4.4 of the RFI/RI Sampling and Analysis Plan (ABB, 1995). Any deviation from these procedures will be discussed and resolved with the NAS Key West Partnering Team.

5.3 GENERAL AQUATIC SURVEY

General field observations of habitat conditions (water depth, bottom type, cover type and extent, channel/basin morphology) and field measurements of physical/chemical water quality parameters (pH, conductivity, salinity, dissolved oxygen, and water temperature) will be made using portable field instrumentation at each site. A formal field notebook will be maintained to document field activities and observations, including any problems and deviations from plans and procedures, for all field sample collection and processing activities.

5.4 LABORATORY ANALYSES

Parameters to be measured in all whole sediment samples will consist of water content, grain size, total organic carbon, pH, salinity, redox potential, and acid volatile sulfides/simultaneously extracted metals (AVS/SEM). Dissolved oxygen, pH, ammonia, and salinity will be measured in the pore water. The preferred method of pore water extraction from whole sediment will be the centrifuge method, since this method has less effect on the ammonia concentration in the pore water than the vacuum method. The vacuum method is preferable to the compression method.

The selection of test species and protocols will be determined after a review of the parameters measured in the whole sediments compared to the pore water extractions. For example, the decision of whether to use interstitial pore water or whole sediment in toxicity tests will partially depend on the pH measured in these two fractions. Decisions regarding test species and protocols will be made with the concurrence of FDEP.

6.0 REFERENCES

ABB Environmental Services, Inc. 1995. Supplemental Resource Conservation and Recovery Act Facility and Remedial Investigation Workplan - Volume I; Sampling and Analysis Plan - Volume II, NAS Key West. ABB Environmental Services, Inc., Tallahassee, Florida.

B&R Environmental (Brown & Root Environmental), 1998. Supplemental RCRA Facility Investigation and Remedial Investigation Report for Eight Sites, Naval Air Station Key West, Florida. Prepared for Department of the Navy, Southern Division, Naval Facilities Engineering Command, Aiken, South Carolina, Revision 2, January 1998.

Florida Department of Environmental Protection (FDEP). 1992. Standard Operating Procedures for Laboratory Operations and Sample Collection Activities, DEP - QA-001/92. Florida Department of Environmental Protection, Tallahassee.