N00213.AR.000117
NAS KEY WEST
5090.3a

REMEDIATION WORK PLAN FOR SOLID WASTE MANAGEMENT UNITS 1, 2, 3, AND 7, JET ENGINE TEST CELL, SITES 1, 3, 7 AND 8 AND AREAS OF CONCERN SITES A AND B WITH TRANSMITTAL LETTER NAS KEY WEST FL

5/16/1995

BECHTEL ENVIRONMENTAL INC

Bechtel

Oak Ridge Corporate Center
151 Lafayette Drive
P.O. Box 350
Oak Ridge, Tennessee 37831-0350

Facsimile: (615) 220-2100

MAY 16 1995

Commanding Officer
Department of the Navy, Southern Division
Naval Facilities Engineering Command
Attention: Mr. Robert Meddick ((0232RM)
2155 Eagle Drive, P.O. Box 190010
North Charleston, SC 29419-9010

SUBJECT: Bechtel Job No. 22567
Department of the Navy Contract No. N62467-93-D-0936
DO 0004, TASK 1, PHASE 3 REMEDIATION WORK PLAN FOR INTERIM REMEDIAL ACTIONS AT THE NAVAL AIR STATION KEY WEST, FLORIDA, REVISION 1
Subject Code: 5320

Dear Mr. Meddick:

Enclosed for your approval is Revision 1 to the Remediation Work Plan (RWP) for Delivery Order 4, Task 1 at NAS Key West Florida. The major changes from Revision 0 include resolution of comments from FDEP, the addition of interim actions for Site IR-3, and other changes as agreed with Mr. Dudley Patrick. Enclosed is a complete RWP and revised specifications for well drilling and closure and shoreline protection structure. All other portions of Revision 0, the QA/QC plan, Environmental Protection Plan, and Health and Safety Plan are unchanged. Changes are marked with a vertical bar in the margin.

We will forward copies to EPA and FDEP as soon as we have your concurrence. Please call me at (615) 220-2745 if you wish to discuss this submittal.

Sincerely,

O. N. McNeil, Jr.
Project Manager

ONM:sc:LR0129

Enclosure: As stated

cc: Dudley Patrick (w/encl)
Mark Ewing (w/encl)
Bill Carley (w/encl)

ACTION REQ'D	[ ] YES	[ ] NO	DUE DATE _____
RESPONSE TO CHRON NO. _____			

REMEDIATION WORK PLAN

DELIVERY ORDER NO. 004 AT

NAVAL AIR STATION, KEY WEST, FLORIDA

Prepared for

DEPARTMENT OF THE NAVY
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND

Under Contract No. N62467-93-D-0936

Prepared by

BECHTEL ENVIRONMENTAL, INC.
OAK RIDGE, TENNESSEE

MAY 1995

REVISION 1

Bechtel Job No. 22567

Prepared: _____ 5-16-95
Senior Scientist — Date

Approved: _____ 5/16/95
Project Manager — Date

Approved: _____
Navy Contracting Officer — Date

FOREWORD

This Remediation Work Plan (RWP) has been prepared to document the plans prepared for the U.S. Navy for interim remedial actions/source removal of contaminants at the Key West Naval Air Station, located on Boca Chica; the Truman Annex and the Trumbo Point facility, located on Key West; and sites on other nearby keys.

Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), International Technology Corporation (IT) conducted a remedial investigation (RI) to support the decision-making process for evaluating interim remedial action alternatives for a number of the sites off the main base. The RI/FS study recommended that a number of interim remedial actions be taken to remove the major sources of contamination at the Installation Restoration (IR) sites.

For those sites on the main base for which the Resource Conservation and Recovery Act (RCRA) applies, a RCRA Feasibility Investigation (RFI) was conducted simultaneously with the RI work. The results of that work were recorded in the same RFI/RI report prepared by IT. The report recommended that a number of interim remedial actions be taken on each of the Solid Waste Management Units (SWMUs) to remove the major sources of contamination.

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CONTENTS (cont.)

CONTENTS (cont.)

FIGURES

TABLES

ACRONYMS AND ABBREVIATIONS

ABB-ES	ABB Environmental Services, Inc.
AOC-A	Area of Concern A
AOC-B	Area of Concern B
BEI	Bechtel Environmental, Inc.
bls	below land surface
CAMU	Corrective Action Management Unit
CAR	Contamination Assessment Report
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-Term Environmental Action Navy
DCE	Dichloroethene
DOT	Department of Transportation
DQO	Data Quality Objective
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FGFFC	Florida Game and Freshwater Fish Commission
HW	hazardous waste
HSWA	Hazardous and Solid Waste Amendments
IR	Installation Restoration
IRG	Interim Remediation Goal
IRA	Interim Remedial Action
IT	International Technology Corporation
JETC	Jet Engine Test Cell
NAS	Naval Air Station
PCB	polychlorinated biphenyls
PPE	personnel protective equipment
PSHP	Program Safety and Health Plan
QA	quality assurance
QC	quality control
QCPA	Quality Control Plan Addendum
QCPP	Quality Control Program Plan
RCRA	Resources Conservation and Recovery Act
RI	Remedial Investigation
RFI	RCRA Facilities Investigation
ROICC	Resident Officer in Charge of Construction
RPE	Remedial Project Engineer
RPM	Remedial Project Manager
RWP	Remediation Work Plan
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure
SOUTHDIV	Naval Facilities Engineering Command, Southern Division
SSHP	Site Safety and Health Plan
SWMU	Solid Waste Management Unit
SSHR	Site Safety and Health Representative
TCE	Trichloroethene

ACRONYMS AND ABBREVIATIONS
(continued)

TCLP	Toxic Characteristic Leaching Procedure
TRPH	Total Recoverable Petroleum Hydrocarbons
TSCA	Toxic Substances Control Act
TSDF	Treatment, Storage, Disposal Facility
USDA	United States Department of Agriculture
US EPA	United States Environmental Protection Agency
VOC	volatile organic compounds

1.0 INTRODUCTION

Under contract to the Naval Facilities Engineering Command, Southern Division (SOUTHDIV), International Technology Corporation (IT) performed a Resource Conservation and Recovery Act (RCRA) Facilities Investigation (RFI) and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Remedial Investigation (RI) at the Naval Air Station (NAS) Key West and its supporting facilities. The RFI was conducted for six Solid Waste Management Units (SWMUs) as required by the Hazardous and Solid Waste Amendments (HSWA) permit. The RI was conducted at six other sites under the Navy's Installation Restoration (IR) program.

A Preliminary RI was conducted by IT at several IR sites in May of 1990. After the Preliminary RI was conducted, NAS Key West was issued a HSWA permit. Some of the IR sites were reclassified as SWMUs. After completion of the Preliminary RI, each of the sites were grouped into the following two categories:

- RCRA Sites

  SWMU No. 1 - Boca Chica Open Disposal Area
  SWMU No. 2 - Boca Chica DDT Mixing Area
  SWMU No. 3 - Boca Chica Fire Fighting Training Area
  SWMU No. 4 - AIMD Building A-980
  SWMU No. 5 - AIMD Building A-990
  SWMU No. 7 - Building A-824

- Non-RCRA Sites

  IR No. 1 - Truman Annex Refuse Disposal Area
  IR No. 3 - Truman Annex DDT Mixing Area
  IR No. 7 - Fleming Key North Landfill
  IR No. 8 - Fleming Key South Landfill
  Area of Concern (AOC) A - Demolition Key Open Disposal Area
  Area of Concern (AOC) B - Big Coppitt Key Abandoned Civilian Disposal Area

ABB Environmental Services, Inc. (ABB-ES) was contracted by SOUTHDIV to perform a contamination assessment (CA) and submit a Contamination Assessment Report (CAR) for a fuel spill that occurred at the SWMU-9 the Jet Engine Test Cell (Building A-969) located on Boca Chica. Both petroleum-related and chlorinated compounds were detected in the groundwater at levels exceeding Florida target levels. Since NAS Key West has a RCRA Part B and HSWA permit for Boca Chica and because the detected chlorinated compounds are regulated under RCRA, this facility has been designated SWMU-9.

This Remediation Work Plan (RWP) documents the scope of work and identifies the procedures to be used by Bechtel Environmental, Inc. (BEI) for an interim remedial action (IRA)/source removal of contaminants at the sites described above, excepting SWMU Nos. 4 and 5 which were excluded from the scope of this RWP by SOUTHDIV. BEI has submitted a Notice of Intent and CompQAP to the Florida DEP, Quality Assurance Section on February 2, 1995 for approval.

It should be noted that the regulatory effect of SWMU Nos. 1 and 2 falling under RCRA and IR No. 1 falling under CERCLA is that no straightforward IRA approach, such as consolidation of similar contaminated soil for treatment, has been found acceptable by FDEP and EPA. The only assuredly acceptable IRA is to excavate the soil and transport it to an off-site RCRA permitted

facility for disposal. Off-site disposal is generally a more costly alternative and does not satisfy the statutory preference for reduction of mobility, toxicity, and volume. For this reason the selection of an IRA for these three sites is still under consideration and will be addressed in a future revision of this IRA.

The proposed IRA activities described in this Plan are based on the following references:

- Final RFI/RI Report, IT, June 7, 1994
- CAR, Jet Engine Test Cell, ABB-ES, June, 1994
- Letters from ABB-ES to Southern Division, December 21, 1993 and March 22, 1994
- Site meetings and other discussions between BEI, SOUTHDIV, the Naval Air Station, and representatives of the Environmental Protection Agency (EPA) Region IV and Florida Department of Environmental (FDEP)
- BEI Economic Analysis, dated July 15, 1994 and updated January 8, 1995
- Cost Proposal Assumptions, letter from BEI to SOUTHDIV, August 9, 1994
- Comments on the first draft of this RWP received from SOUTHDIV, ROICC, and FDEP
- BEI Program Wide Plans

In implementing this RWP, BEI will supply qualified personnel and equipment to the project; coordinate, manage, and supervise construction activities on site; perform sampling and analysis; provide follow-on operations and maintenance services; assist the Navy in obtaining permits, determine regulatory requirements, and assure compliance with these requirements as well as the contract; and lastly, provide documentation to the Navy that will include a summary of services provided and project completion for each of the remedial sites where work is performed. BEI's approach to complete these tasks is presented in the following sections of this RWP.

The remainder of Section 1.0 provides general site information and the justification and objectives for the proposed remediation. Section 2.0 presents the BEI organization and responsibilities for completing the work. Section 3.0 provides a site history and a detailed description of the SWMUs, IR sites, and AOCs that have been identified by the Navy as requiring remediation. Section 4.0 provides the scope of work, the approach BEI will take to achieve the remedial objectives, and a description of the remedial action components and field activities. Section 5.0 presents BEI's sampling and analysis plan and includes details on the remediation activities planned. Sections 6.0, 7.0, and 8.0 address the Waste Management Plan, Safety and Health Plan, and Quality Control Plan, respectively. Section 9.0 addresses regulatory requirements for performance of work activities.

1.1 GENERAL SITE INFORMATION

NAS Key West is approximately 150 miles southwest of Miami on the western-most two major islands of the Florida Keys (Boca Chica and Key West). It is connected to the mainland by the

Overseas Highway (US Highway No. 1). A regional map showing the Florida Keys is presented in Figure 1-1.

Key West is about 4 miles long and 1.5 miles wide; Boca Chica Key is approximately 3 miles long and 3 miles wide. Navy activities on Key West are adjacent to civilian housing and commercial property; whereas virtually all property on Boca Chica is owned by the Navy. Locations of the CERCLA and RCRA sites are provided in Figure 1-2.

1.2 JUSTIFICATION AND OBJECTIVES FOR THE INTERIM REMEDIAL ACTIONS

The waste disposal practices and operations associated with the above identified sites have adversely impacted the soils and groundwater with organic and inorganic chemicals. In some instances, the contamination has spread to the surface water and sediments. A baseline human health risk assessment and preliminary ecological risk assessment were performed for some of the sites by IT. Results of this study indicate that several of the contaminants have the potential for bioaccumulation and could result in unacceptable current or future ecological risk. There appear to be no current human health risks above a level of concern; however, future human health risks above a level of concern could occur if the groundwater were used as a potable water source.

The objectives of the interim remedial actions (IRAs) described in this RWP are to (1) remove waste materials and prevent further contaminant migration into the surrounding media, and (2) sample and analyze soils and groundwater after completion of the IRAs to provide data for future human health and ecological risk assessments.

1.3 SUMMARY OF INTERIM REMOVAL ACTIONS ADDRESSED BY THIS RWP

The following summarizes the IRAs that will be included in the scope of work for this RWP:

SWMU No. 1 - Boca Chica Open Disposal Area

The scope of work for this site will be determined at a later date.

SWMU No. 2 - Boca Chica DDT Mixing Area

The scope of work for this site will be determined at a later date.

SWMU No. 3 - Boca Chica Fire Fighting Training Area

The scope of work for the Boca Chica Fire Fighting Training Area will consist of the following elements:

- closing of two monitoring wells (S3MW-3 and S3MW-4)
- excavation of petroleum contaminated soil from the pit, down to the water table
- spreading of absorbent media to collect any free product that collects in the pit
- transporting of solid waste to a disposal facility
- backfilling with clean soil and grading

The estimated volume of excavation and disposal at this site is 275 cubic yards.

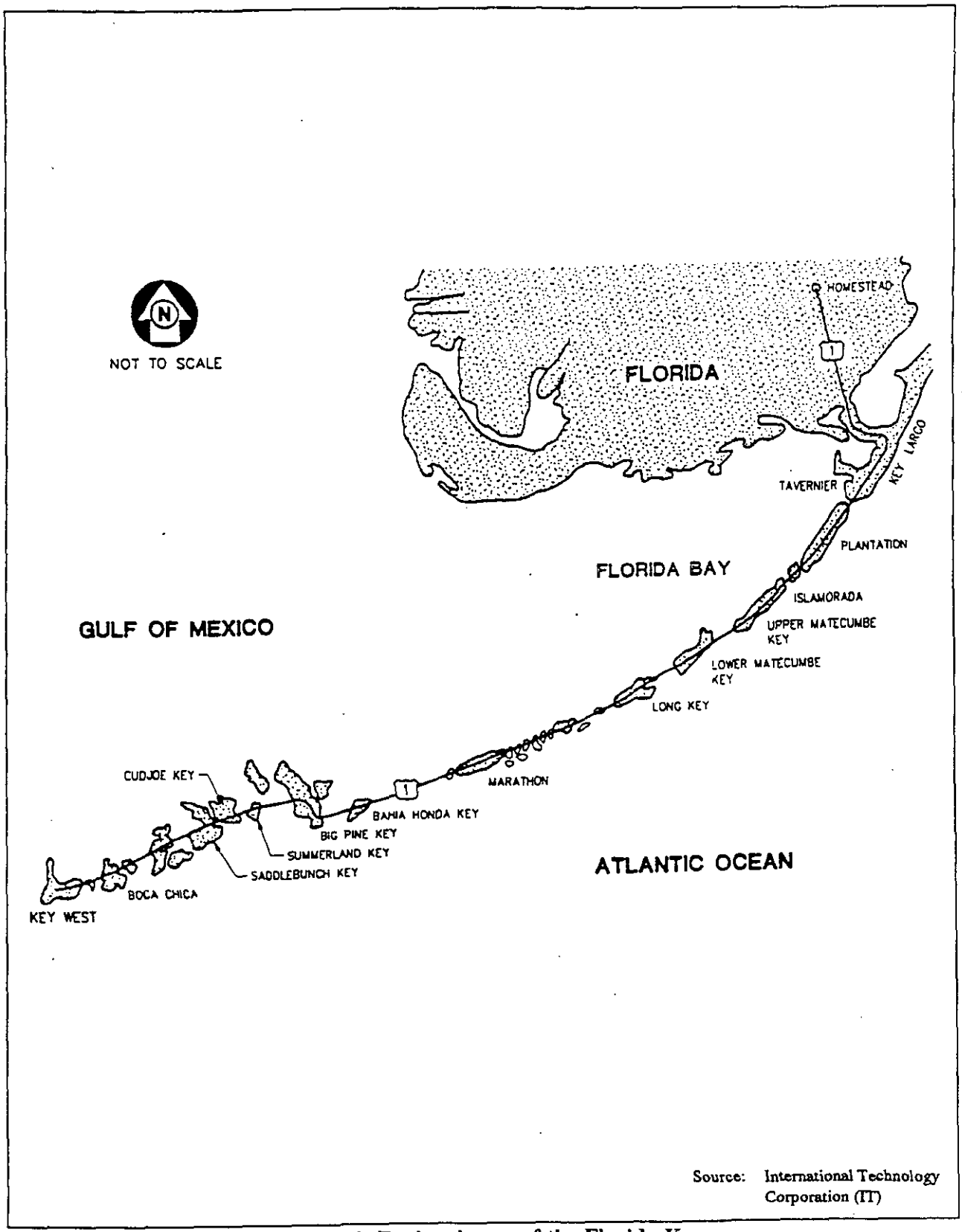


Figure 1-1 Regional map of the Florida Keys

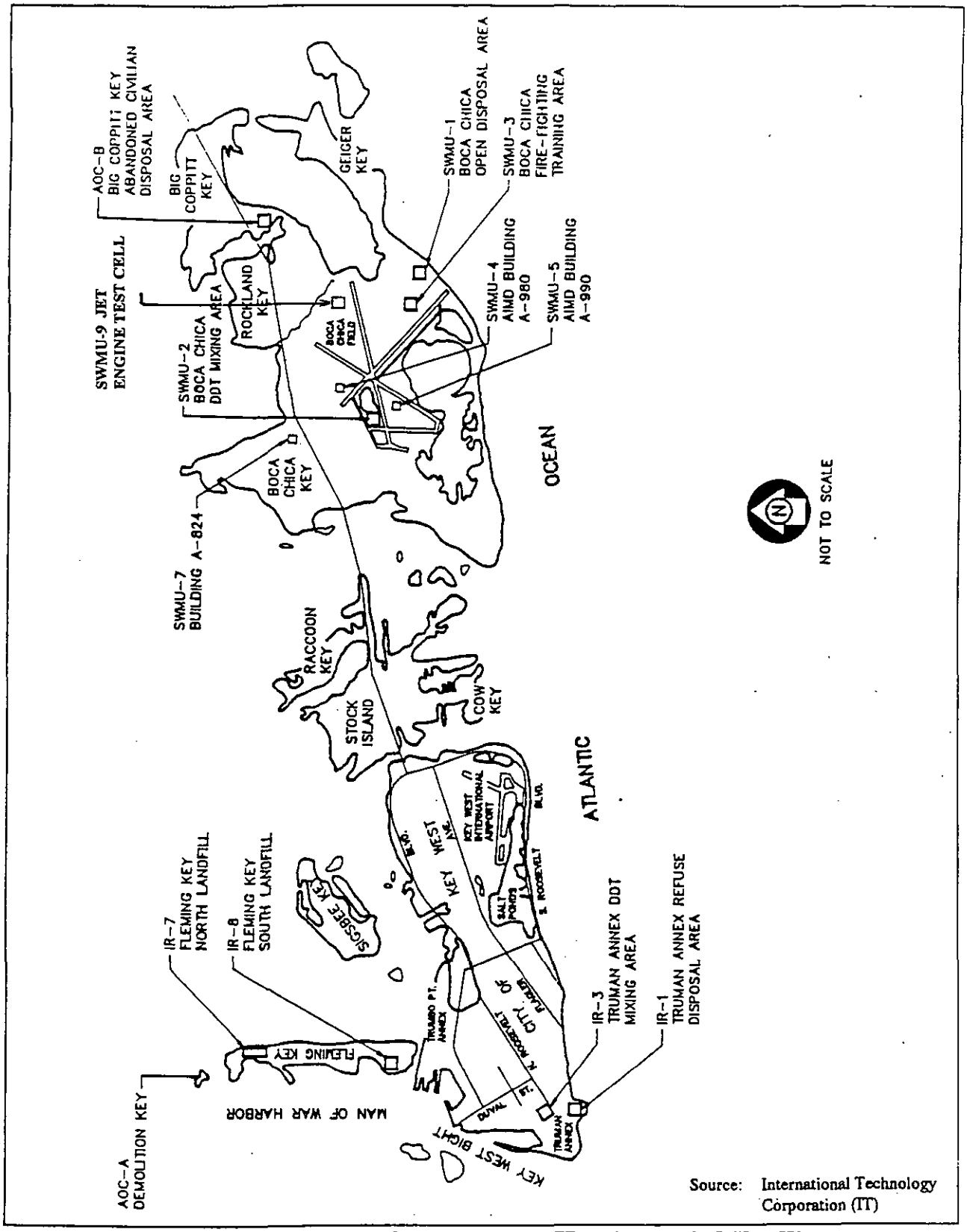


Figure 1-2 Locations of CERCLA and RCRA sites at NAS Key West

SWMU No. 7 - Building A-824

The scope of work at Building A-824 will consist of the following elements:

- excavation of PCB contaminated soils located near the north entrance of the building
- transportation of waste to an appropriate treatment/disposal facility
- backfilling with clean soil and grading

The estimated volume of excavation and disposal at this site is 3 cubic yards.

SWMU-9 - Jet Engine Test Cell (JETC)

The scope of work for the JETC will consist of the following elements:

- initial field work, including groundwater sampling using Hydropunch or similar technology, analysis to delineate the extent of contamination, and aquifer testing

- designing a groundwater pump-and-treat system including treatment system, extraction system, and discharge system

- installation of the system as designed

- operation and maintenance (O&M) of the pump-and-treat system by BEI for one year (responsibility for O&M thereafter is to be determined later)

IR No. 1 - Truman Annex Refuse Disposal Area

The scope of work for this site will be determined at a later date.

IR No. 3 - Truman Annex DDT Mixing Area

The scope of work for the Truman Annex DDT Mixing Area will consist of the following elements:

- excavation of pesticide contaminated soils
- transportation of waste to a RCRA-permitted treatment/disposal facility
- backfilling with clean fill
- stabilizing with topsoil and sod (alternatively the site may be paved over for additional parking)

The estimated volume of excavation and disposal at this site is 1,000 cubic yards.

IR No. 7 - Fleming Key North Landfill

The scope of work for the Fleming Key North Landfill will consist of the following elements:

- importing clean topsoil

- regrading the west side of the site to provide drainage and prevent ponding of water over waste material

- establishing soil and vegetative cover over the entire site to prevent erosion

IR No. 8 - Fleming Key South Landfill

The scope of work for the Fleming Key South Landfill will consist of the following elements:

- removing visible rubble and debris from the shoreline
- cutting back or modifying the shoreline as necessary
- install shore protection structure to prevent further erosion of the banks

AOC-A - Demolition Key Open Disposal Area

The scope of work for the Demolition Key Open Disposal Area will consist of the following elements:

- excavation of contaminated soils from demolition craters

- transportation of any identified hazardous waste to RCRA-permitted treatment/disposal facility or the waste will be treated and disposed of in an appropriate facility

The estimated volume of excavation and disposal at this site is 30 cubic yards.

AOC-B - Big Coppitt Key Abandoned Civilian Disposal Area

The scope of work for the Big Coppitt Key Abandoned Civilian Disposal Area will consist of the following elements:

- excavation and removal of trash and metal debris from decomposed car bodies
- transportation of solid waste to a municipal landfill for disposal
- transportation of hazardous waste (if any) to a RCRA-permitted treatment/disposal facility or the waste will be treated and disposed of in a appropriate facility
- backfilling and grading with organic substrate
- use of natural recolonization and succession to replace any wetland areas disturbed during excavation

The estimated volume of excavation and disposal at this site is 1000 cubic yards.

2.0 ORGANIZATION AND RESPONSIBILITIES

2.1 PROJECT ORGANIZATION

As the Environmental Response Action Contractor for Navy installations at Key West, Florida, BEI is responsible for developing and implementing remedial actions at assigned sites. BEI's responsibilities include: collection and review of data; sampling and analysis; development of RWPs and related documents; procurement of subcontracts, labor, materials, and equipment; management and execution of field work; preparation of reports; compliance with environmental regulations; control of quality, cost, schedule; and safety and health.

2.2 PROJECT ORGANIZATION

BEI will carry out its responsibilities using a team of professional managers, environmental specialists, engineers, and other support personnel. BEI's organization, including names of key personnel, for executing the work at NAS Key West is shown in Figure 2-1. The following text briefly describes the responsibilities assigned to the various team members.

2.2.1 Senior Project Manager

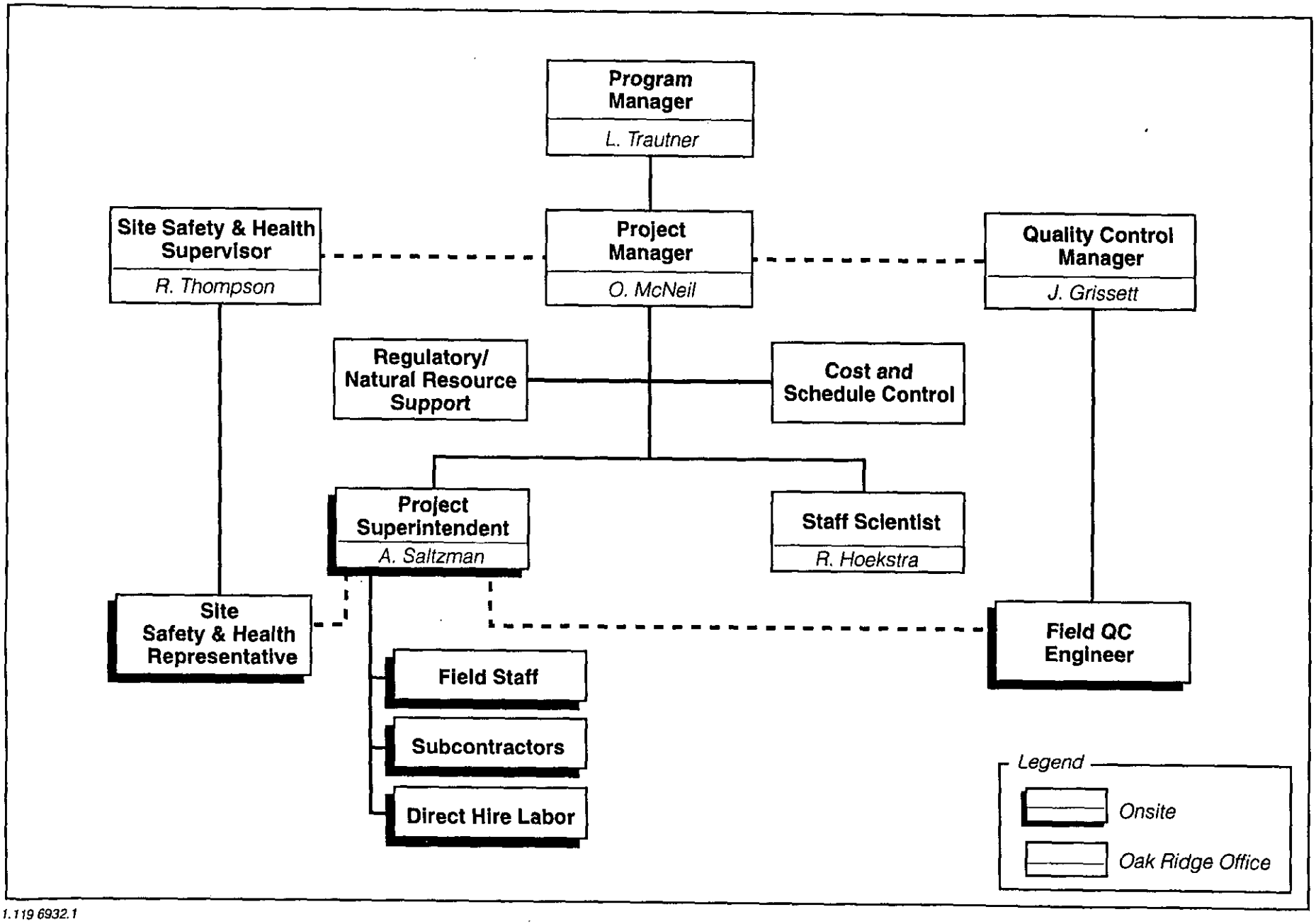
- Responsible for accomplishing all aspects of the work, including the requirements of budget, schedule, and quality.
- Interfaces directly with the Navy RPM/RPE to achieve Navy objectives for the site.
- Manages the BEI project team.
- Implements overall guidance provided by the BEI program manager.

2.2.2 Senior Engineering Scientist

- Responsible for developing all technical and regulatory requirements and ensuring regulatory compliance.
- Develops work plans, technical specifications, drawings, and scopes of work and prepares required reports.
- Develops information required for technology selection.
- Responsible for onsite sampling, evaluation and management of data, and waste management procedures.

2.2.3 Project Superintendent

- Responsible for successful execution of onsite work, including safety and health, quality control, and environmental compliance.
- Manages BEI field staff, subcontractors, and/or direct hire labor.



1.119 6932.1

Figure 2-1
Organizational Chart

- Serves as primary point of contact with Station and ROICC during onsite work.
- Reviews all work plans for constructibility.

2.2.4 Certified Industrial Hygienist

- Develops all safety and health requirements and plans.
- Advises the Project Manager concerning safety and health matters.
- Provides site-specific safety and health training.
- Audits site activities to ensure compliance and assess effectiveness of the safety and health program.

2.2.5 Site Safety and Health Representative

- Insures the requirements of the safety and health plans are followed in the field.
- Advises the Project Superintendent concerning safety and health matters.
- Ensures compliance with all applicable federal, state, local, and BEI safety and health requirements during on-site work.
- Provides site-specific safety and health training.

2.2.6 Quality Control Manager

- Develops all quality control (QC) plans and requirements.
- Advises the Project Manager concerning QC matters.
- Provides quality assurance (QA) as required by regulation and BEI procedures, including the handling of samples and management of data.
- Reviews and audits site activities to ensure QC/QA compliance and consistency.

2.2.7 Field Quality Control Engineer

- Insures the requirements of the quality control plans are followed in the field.
- Advises the Project Superintendent concerning QC matters.
- Prepares field quality control reports.

2.2.6 Other Field Staff (Assigned as Mutually Agreed)

- Staff Scientist (Environmental)
  - Advises Project Superintendent on environmental technical matters

- Oversees treatment operations and installation of treatment systems
- Develops sampling plan and leads/performs sampling activity
- Performs field screening tests and prepares/ships samples for laboratory analysis
- Determines whether IRA criteria have been met

- Field Engineer (Civil)
  - Assists Project Superintendent on all civil engineering and construction matters
  - Leads or provides oversight during surveying, civil, excavation, and shore protection system site work.
  - Assists Staff Scientist (Environmental) with sampling activity.

- Field Engineer (Geotechnical)
  - Provides oversight during well drilling, closure, and other groundwater operations.
  - Assists Staff Scientist (Environmental) with sampling activity.
  - Samples monitoring wells.
  - Performs aquifer testing.

- Field Engineer (Transportation Specialist)
  - Insures compliance with all Department of Transportation (DOT) packaging, labeling, handling, and shipment requirements.
  - Assists the Naval Air Station in preparation of shipping manifests.
  - Insures transportation subcontractors meet all applicable DOT requirements.
  - Insures that all hazardous waste (HW) handling personnel are properly trained.

- Field Technician
  - Supports Staff Scientist (Environmental) and Staff Engineer (Geotechnical) with sampling and analysis.
  - Assists Project Superintendent as necessary.

- Project Controls Engineer
  - Performs cost and schedule control in field
  - Assists Project Superintendent with quantity verification.
  - Receives and tracks subcontractor submittals in field.
  - Manages field office.

- Field Clerk
  - Performs field office clerical functions.

2.3 RESPONSIBILITY ASSIGNMENT MATRIX (RAM)

Accomplishment of the interim remedial actions/source removal of contaminants at NAS Key West in the most cost-effective and environmentally sound manner requires a cooperative approach and coordinated activities among all interested and affected parties. To facilitate this process, the Navy, regulators from EPA and FDEP, and BEI developed tables depicting the responsibilities of the various parties for each of the most significant actions required at the sites. These RAMs are included as Tables 2-1 through 2-3 for SWMUs 3, 7 and 9, IRs 3, 7 and 8, AOCs A and B. RAMs for the other sites will be provided as revisions to this RWP.

TABLE 2-1
RESPONSIBILITY ASSIGNMENT MATRIX (RAM)
RCRA SITES: SWMU-3, SWMU-7
NON-RCRA SITES: IR-3, AOC-A, AOC-B

No.	ACTION	BEI	SDIV	ROICC	NAS	EPA	FDEP	CLEAN	OTHER	NOTES
Preparatory Phase										
1	Evaluate Existing Data	L	S		S					
2	Site Visits / Gather Data	L	S	S	S					
3	Select Technologies for Consideration	S	L	I	I					
4	Perform Economic Analysis	L	S	S	S					
5	Select Technology	S	L	I	I	I	I			
6	Determine Regulatory Requirements	L	S	I	S	A	A			
7	Develop Cleanup Criteria	L	A	I	I	A	A			1
8	Prepare Work Plans	L	A	R	R	A	A	I	R	2
9	Prepare Sampling & Analysis Plan	L	A	R	I	I	I		I	2
10	Prepare Health & Safety Plan	L	A	R	I	I	I			
11	Prepare Quality Control Plan	L	A	R	I	I	I			
12	Prepare Environmental Protection Plan	L	A	I	A	I	I	I	I	2
13	Coord w/Natural Resource Trustees	S	S		L	I	S	I	S	2,3
14	Prep Wetland Delineation, Permit Apps	L	I	I	A					4
15	Obtain Necessary Permits/Agreements	S	S	S	L		A		A	2,3,4
16	Prepare Cost Estimate and Schedule	L	A	I	I					
Construction Phase										
1	Provide Plans for Public Comment	S	S		L	S	S	S		
2	Evaluate Bids / Award Subcontracts	L	A	I						
3	Provide Construction Drawings	L	A	R	I	R	R		R	2
4	Perform Site Survey	L		S						
5	Close Existing Monitoring Wells	L	I	O	I	I	I		R	2,5,6
6	Pre-Construction Sampling/Analysis	L	I	O	I	I	I			
7	Field Screening	L	I	O	I	I	I			
8	Determine Excavation/Construction Limits	L	A	I	I					
9	Excavation/Removal/Construction	L		O	S					
10	Post-Construction Sampling (DQL IV)	L	I	O	I	I	I	I		7
11	Prepare Manifests & Waste Accept Forms	L	I	I	I					
12	Sign Manifests & Waste Accept Forms	S			L					
13	Coordinate Shipment of Contaminated Soil	L			S				A	2
14	Install New Monitoring Wells									
15	Obtain/Install Treatment Equipment									
16	Start Up & Treat									
17	Monitoring (first year)									
18	Operations & Maintenance (first year)									
19	Analyze/Evaluate Treatment Data									
20	Restore Site	L	S	O			A		R	2
21	Remediation Report	L	A	I	I	I	I		I	2

Legend **EMPTY CELLS ARE NOT APPLICABLE**

- L Lead
- A Approve
- S Support
- R Review & Comment
- I Information
- O Oversight Inspection

Notes

1. BEI will develop, recommend, and defend criteria
2. Others may include Natural Resources Trustees, City of Key West, Monroe County, Transportation Authorities, etc.
3. NAS will sign permit applications and letters to trustees.
4. Includes Excavation Permits, Wetland Delineation, & Wetland Permit for AOC-B
5. Monitoring well closure is required only for SWMU-3
6. Closure report to Trustees for Review & Comment
7. DQL IV (Appendix 9) required for 5%-10% of samples. EPA may split samples.

At Atlanta mtg, EPA's Bassett indicated DQL III, correct?

TABLE 2-2
RESPONSIBILITY ASSIGNMENT MATRIX (RAM)
RCRA: SWMU-9, JET ENGINE TEST CELL

No.	ACTION	BEI	SDIV	ROICC	NAS	EPA	FDEP	CLEAN	OTHER	NOTES
Preparatory Phase										
1	Evaluate Existing Data	L	S		S					
2	Site Visits / Gather Data	L	S	S	S					
3	Select Technologies for Consideration	S	L	I	I					
4	Perform Economic Analysis	L	S	S	S					
5	Select Technology	S	L	I	I	I	I			
6	Determine Regulatory Requirements	L	S	I	S	A	A			
7	Develop Cleanup Criteria	L	A	I	I	A	A			1
8	Prepare Work Plans	L	A	R	R	A	A	I	R	2
9	Prepare Sampling & Analysis Plan	L	A	R	I	I	I		I	2
10	Prepare Health & Safety Plan	L	A	R	I	I	I			
11	Prepare Quality Control Plan	L	A	R	I	I	I			
12	Prepare Environmental Protection Plan	L	A	I	A	I	I	I	I	2
13	Coord w/Natural Resource Trustees	S	S		L	I	S	I	S	
14	Prep Wetland Delineation, Permit Apps	L	I	I	A					3
15	Obtain Necessary Permits/Agreements	S	S	S	L		A		A	2,3,4
16	Prepare Cost Estimate and Schedule	L	A	I	I					
Construction Phase										
1	Provide for Public Comment	S	S		L	S	S	S		
2	Evaluate Bids / Award Subcontracts	L	A	I						
3	Provide Construction Drawings	L	A	R	I	R	R			
4	Perform Site Survey	L		S						
5	Close Existing Monitoring Wells									
6	Pre-Construction Sampling/Analysis	L	I	O	I	I	I			
7	Field Screening									
8	Determine Excavation/Construction Limits									
9	Excavation/Removal/Construction									
10	Post-Construction Sampling (DQL IV)	L	A	O	I	A	A	I		5
11	Prepare Manifests & Waste Accept Forms									
12	Sign Manifests & Waste Accept Forms									
13	Coordinate Shipment of Contaminated Soil									
14	Install New Wells	L		O						
15	Obtain/Install Treatment Equipment	L		O						
16	Start Up & Treat	L		O					A	2
17	Monitoring (first year)	L		O	I	I	I			
18	Operations & Maintenance (first year)	L		O	I					
19	Analyze/Evaluate Treatment Data	L		O	I	I	I	I		
20	Restore Site									6
21	Remediation Report	L	A	I	I	I	I		I	2

Legend **EMPTY CELLS ARE NOT APPLICABLE**

- L Lead
- A Approve
- S Support
- R Review & Comment
- I Information
- O Oversight Inspection

Notes

1. BEI will develop, recommend, and defend criteria
2. Others may include Natural Resources Trustees, City of Key West, Monroe County, Transportation Authorities, etc.
3. Includes Excavation Permit + Possible Air Quality District Permit, Others TBD
4. NAS will sign permit applications and letters to trustees.
5. DQL IV (Appendix 9) required for 5%-10% of samples. EPA may split samples. See p. 2-5 comment
6. Site restoration is undefined due to uncertain time required for treatment operation

TABLE 2-3
RESPONSIBILITY ASSIGNMENT MATRIX (RAM)
NON RCRA SITES: IR-7, IR-8

No.	ACTION	BEI	SDIV	ROICC	NAS	EPA	FDEP	CLEAN	OTHER	NOTES
Preparatory Phase										
1	Evaluate Existing Data	L	S		S					
2	Site Visits / Gather Data	L	S	S	S					
3	Select Technologies for Consideration	S	L	I	I					
4	Perform Economic Analysis	L	S	S	S					
5	Select Technology	S	L	I	I		I			
6	Determine Regulatory Requirements	L	S	I	S		A			
7	Develop Cleanup Criteria									
8	Prepare Work Plans	L	A	R	R		A	I	R	1
9	Prepare Sampling & Analysis Plan									
10	Prepare Health & Safety Plan	L	A	R	I		I			
11	Prepare Quality Control Plan	L	A	R	I		I			
12	Prepare Environmental Protection Plan	L	A	I	A		I	I	I	1
13	Coord w/Nat'l Resource Trustees	S	S		L		S	I	S	1
14	Prep Wetland Delineation, Permit Apps	L	I	I	A					2
15	Obtain Necessary Permits/Agreements	S	S	S	L		A		A	1,2,3
16	Prepare Cost Estimate and Schedule	L	A	I	I					
Construction Phase										
1	Provide for Public Comment	S	S		L		S			
2	Evaluate Bids / Award Subcontracts	L	A	I						
3	Provide Construction Drawings	L	A	R	I		R		R	1
4	Perform Site Survey	L		S						
5	Close Existing Monitoring Wells									
6	Pre-Construction Sampling/Analysis									
7	Field Screening									
8	Determine Excavation/Construction Limits	L	A	I	I					
9	Excavation/Removal/Construction	L		O						
10	Post-Construction Sampling (DQL IV)									
11	Prepare Manifests & Waste Accept Forms									
12	Sign Manifests & Waste Accept Forms									
13	Coordinate Shipment of Contaminated Soil									
14	Install New Monitoring Wells									
15	Obtain/Install Treatment Equipment									
16	Start Up & Treat									
17	Monitoring (first year)									
18	Operations & Maintenance (first year)									
19	Analyze/Evaluate Treatment Data									
20	Restore Site									
21	Remediation Report	L	A	I	I		I		A	1

Legend **EMPTY CELLS ARE NOT APPLICABLE**

- L Lead
- A Approve
- S Support
- R Review & Comment
- I Information
- O Oversight Inspection

Notes

1. Others may include Natural Resources Trustees, City of Key West, Monroe County, Transportation Authorities, etc.
2. Wetland Delineation, Dredge & Fill Permit, Shoreline Protection System Permit: IR-8
3. NAS will sign permit applications and letters to trustees.

3.0 SITE BACKGROUND AND SETTING

The following background discussion entails all contaminated areas which BEI has the responsibility to remediate under Delivery Order No. 0004.

3.1 SWMU NO. 1 - BOCA CHICA OPEN DISPOSAL AREA

The Boca Chica Open Disposal Area is located in the southeastern part of Boca Chica, between Perimeter Road and Geiger Creek (see Figure 1-2), and is shown in detail in Figure 3-1. The site consists of a burn and open disposal area with miscellaneous debris deposited into the mangroves and brush. The site was operated originally as an open disposal and burning area from 1942 to the mid 1960s, and received general refuse and waste associated with the operation and maintenance of aircraft. These wastes may have included waste oils, hydraulic fluids, paint thinners, and solvents. It has been estimated that approximately 2,600 tons of waste were disposed and burned each year. Sampling indicates that debris is confined to the eastern perimeter of the site.

The site is relatively flat with brush and mangroves around the perimeter. The site is adjacent to a communications center. Roads in the area were built to access remote antenna sites that are no longer in use. The water table occurs just below ground surface. This area has been identified by NAS Public Works as a wetland.

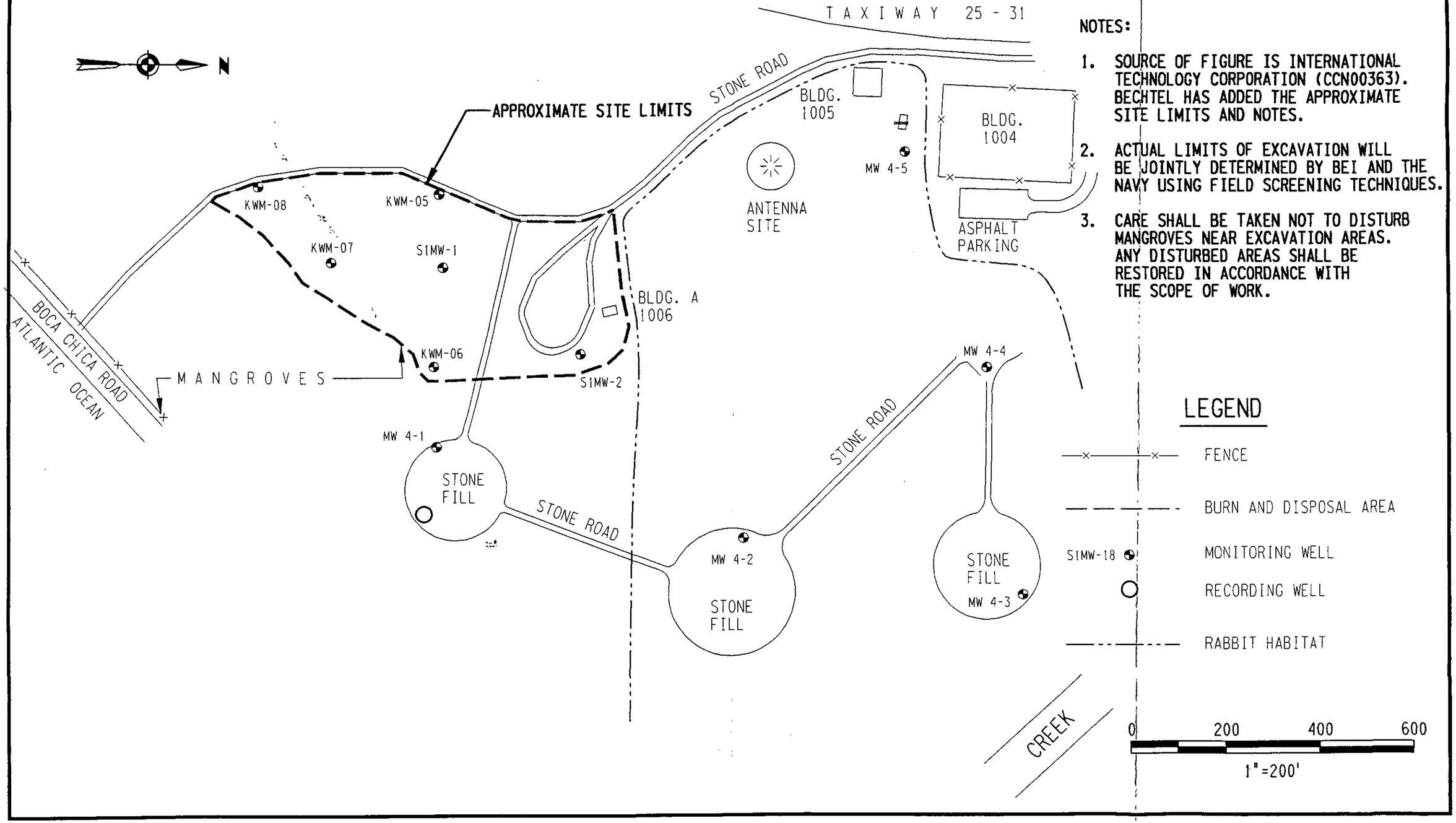
The waste disposal efforts at this site have left the groundwater and soils adversely impacted with organic and inorganic chemicals. The contamination has migrated into the surrounding sediments and appears to have migrated into the nearby, shallow ditch that drains to the Atlantic Ocean. Because surface water is in constant contact with waste material, surface water flows have the potential to transport contaminants off site.

3.2 SWMU NO. 2 - BOCA CHICA DDT MIXING AREA

The site is adjacent to the north side of a man-made drainage ditch that is connected to a large borrow pit and is along the southeast side of a taxiway on Boca Chica. The water table occurs at depths ranging from 1.5 to 6 ft below land surface (bls), varying with the season. The site is approximately 0.18 acres and is shown in detail in Figure 3-2.

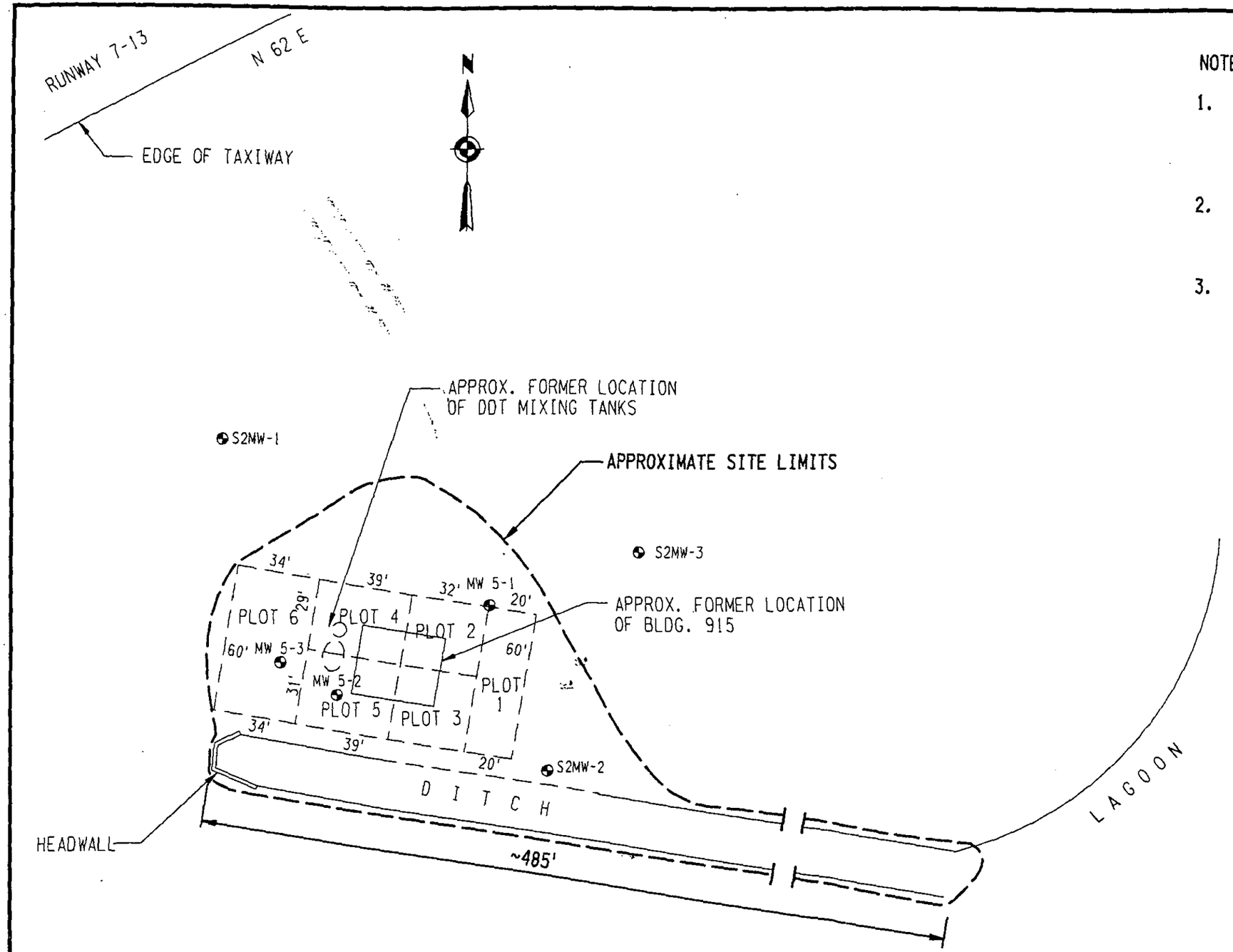
DDT mixing operations were conducted from the 1940s to the early 1970s in a building (demolished in 1982) located approximately 30 ft from the drainage ditch. The area near the demolished building is now partly covered with sparse grass. The ditch has medium size mangroves around its banks and discharges towards the Atlantic Ocean through a culvert at the west end. During the site investigation, numerous fish were observed in the ditch.

During operations and demolition some pesticides were spilled at the site. The soils, groundwater, and sediments in the area have been adversely impacted with pesticides, organic chemicals, and metals. The extent of the impacts has not been fully delineated.



22567 321 FIG3-1.DGN

FIGURE 3-1
SWMU NO. 1 - BOCA CHICA
OPEN DISPOSAL AREA



NOTES:

1. SOURCE OF FIGURE IS INTERNATIONAL TECHNOLOGY CORPORATION (CCN000363). BECHTEL HAS ADDED THE APPROXIMATE SITE LIMITS AND NOTES.
2. ACTUAL LIMITS OF EXCAVATION WILL BE JOINTLY DETERMINED BY BEI AND THE NAVY USING FIELD SCREENING TECHNIQUES.
3. VEHICLE AND PERSONNEL ACCESS TO THE WORK AREA WILL BE COORDINATED WITH NAVY AIR OPERATIONS BY BEI.

LEGEND

S2MW-1 ● MONITORING WELL

PLOT BOUNDARY & NUMBER

0 50 100 150

1"=50'

22567 321 AB202896.DGN

FIGURE 3-2
SWMU NO.2 - BOCA CHICA
DDT MIXING AREA

3.3 SWMU NO. 3 - BOCA CHICA FIRE FIGHTING TRAINING AREA

The Fire Fighting Training Area is located adjacent to the southern blimp pad (Figure 3-3) on Boca Chica Key in the southeastern portion of NAS Key West. This area consists of two unlined circular pits approximately 50 ft in diameter with a 2 to 3 ft berm around each. The pits are surrounded by a gravel apron. The area is open and flat. The water table occurs within a few feet of the ground surface. Mangroves and brush grow along the shoreline that borders the study site to the southwest. This area has been identified by NAS Public Works as being adjacent to, but not within a wetland.

Fire-fighting training was conducted in the pits in which old planes and tanks were set on fire using diesel fuel, aviation gas, or oil. The soils and groundwater in the two burn areas have been adversely impacted with petroleum products. Some free product (primarily diesel fuel) was found in the groundwater in the southernmost burn area. Surface water and sediments adjacent to the site contained pesticides and metals. Because the petroleum contamination was found in the burn areas, and metals and pesticides were found in the sediments upgradient and downgradient from the sites, the surface water and sediment contamination is probably not a result of site activities.

3.4 SWMU NO. 7 - BUILDING A-824

Building A-824 is located north of U.S. 1 on Boca Chica Key (see Figure 1-2). The building was used formerly as a 90-day accumulation point for hazardous waste storage, but was decontaminated and is no longer used for hazardous waste storage. Currently, the building houses a solvent recycling operation and is used for storage of empty 55 gallon drums and old transformers. The depth to the water table ranges from 1 to 3 ft bls. The building is shown in detail in Figure 3-4.

The soils around the building have been impacted with organic and inorganic compounds. The soil contamination is located primarily by the doors at the south and north ends of the building. Additional soil contamination was discovered east of the building and across the road. The primary contamination in this area is petroleum related. The groundwater at the site has been impacted by metals, but at levels below Florida drinking water standards. The surface water and sediments in the ditch on the west side of the facility have been impacted adversely with metals, pesticides, and PCBs. The extent of the surface water and sediment contamination has not been fully delineated.

3.5 SWMU-9 JET ENGINE TEST CELL

SWMU-9 lies on the northwest perimeter of Boca Chica Field between a taxiway and inlet as shown on Figure 3-5. This facility includes a cradle for securing jet engines, a concrete pad, jet blast deflectors, above ground storage tanks (jet fuel), and a storage shed. The shed, present at the northeast edge of the area, is used to store recyclables, including fuel oil, hydraulic oil, turbo oil, engine oil, jet fuel, and a variety of jet engine cleaners. The facility is still in an operational status.

The water table occurs at depths of 1 to 3 ft bls. The general groundwater flow direction is north toward the inlet that borders the site.

ABB-ES sampled soil and groundwater at SWMU-9 in October, 1993, and February 1994 to assess the contamination resulting from a JP-5 fuel spill that occurred in January, 1989. Benzene, ethylbenzene, xylenes, naphthalenes, total recoverable petroleum hydrocarbons (TRPH), and several

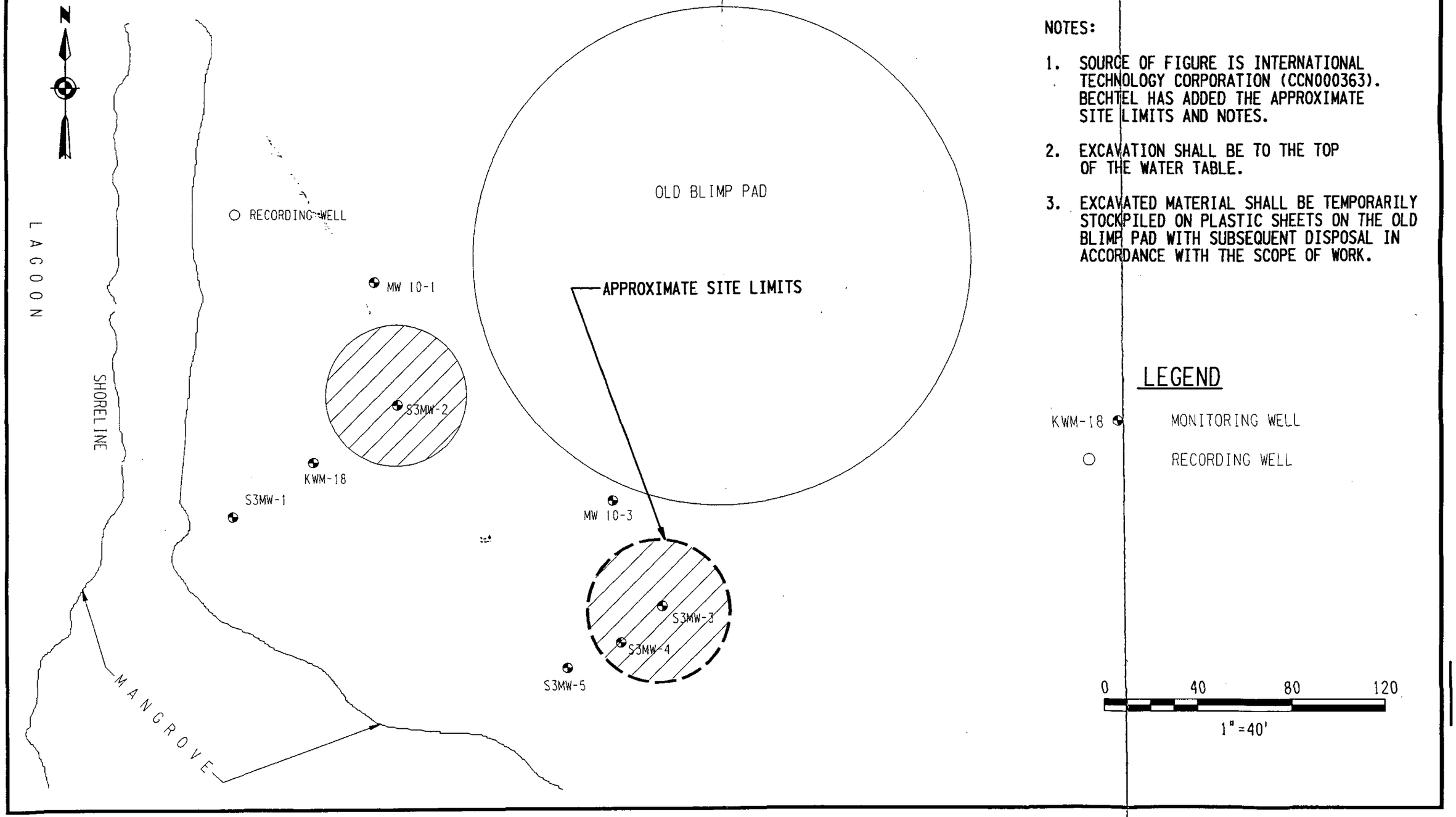


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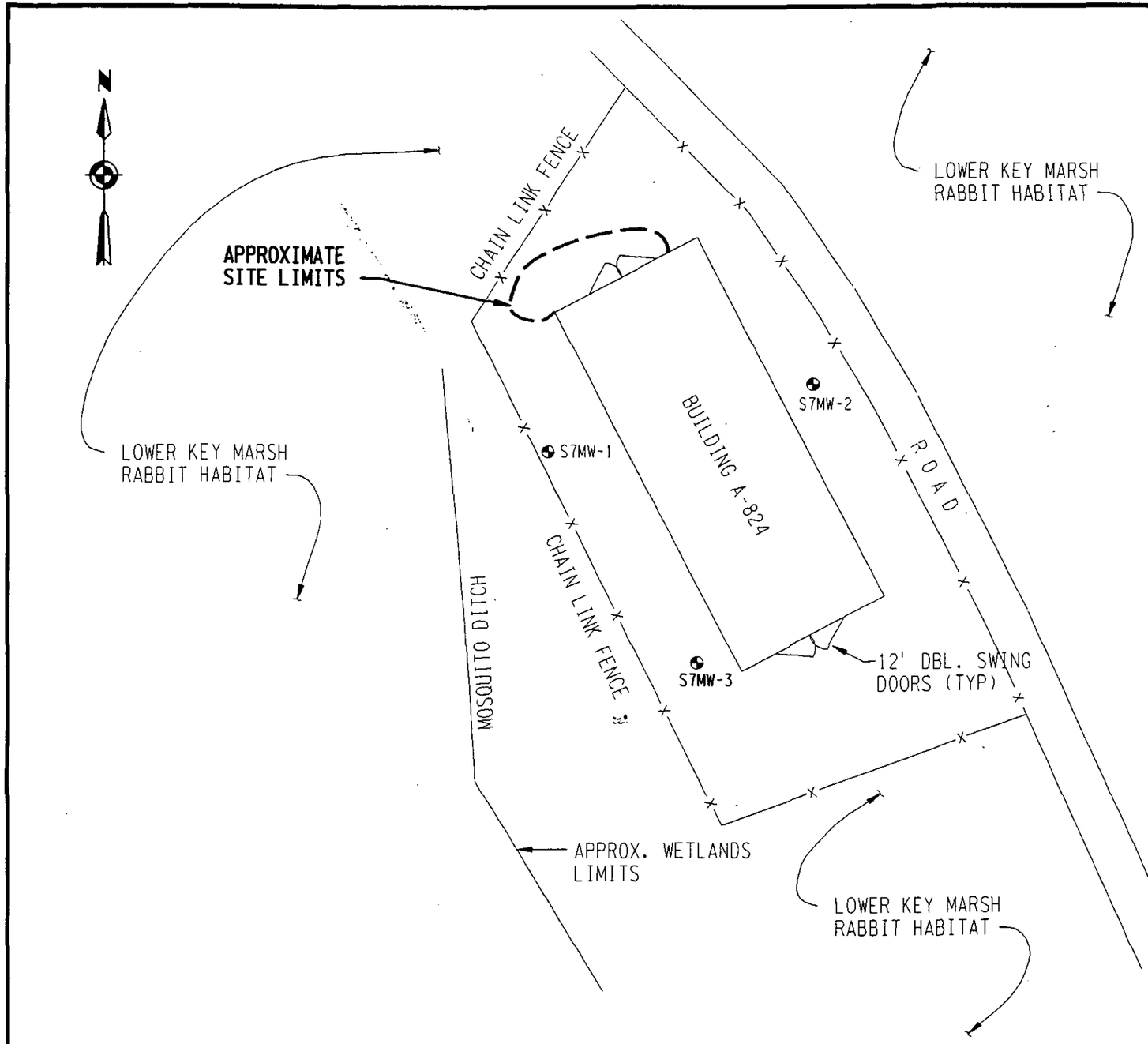
FIGURE 3-3
SWMU NO. 3 - BOCA CHICA
FIRE FIGHTING TRAINING AREA



NOTES:

1. SOURCE OF FIGURE IS INTERNATIONAL TECHNOLOGY CORPORATION (CCN000363). BECHTEL HAS ADDED THE APPROXIMATE SITE LIMITS AND NOTES.
2. ACTUAL LIMITS OF EXCAVATION WILL BE JOINTLY DETERMINED BY BEI AND THE NAVY USING FIELD SCREENING TECHNIQUES.
3. CARE SHALL BE TAKEN TO MINIMIZE DAMAGE TO EXISTING WETLANDS AREA, AND RABBIT HABITAT.

LEGEND

FENCE

I8MW-18 MONITORING WELL

0 20 40 60

1"=20'

22567 321 AB202878.DGN

FIGURE 3-4
SWMU NO.7 - BOCA CHICA
BUILDING A-824

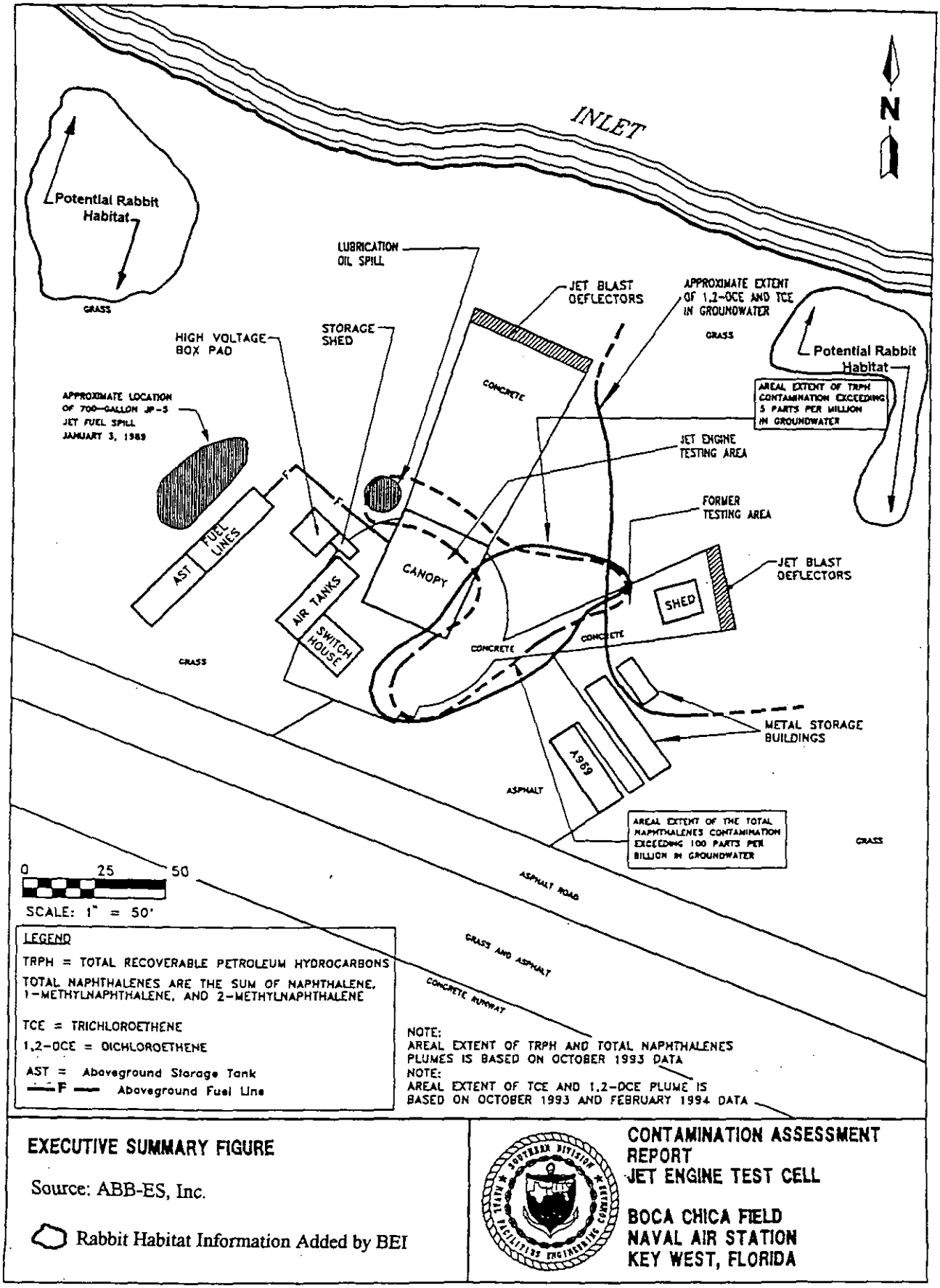


Figure 3-5 SWMU-9 Jet Engine Test Cell

chlorinated volatile organic compounds (VOCs) were identified in the groundwater samples. TRPH and total naphthalenes concentrations exceeded Florida target levels in the vicinity of

SWMU-9, while concentrations of 1,2-dichloroethene (1,2-DCE) and trichloroethene (TCE) exceeded their respective maximum contaminant levels in the vicinity of the storage shed.

The areal extent of the TRPH and total naphthalenes in groundwater appears to be restricted to the vicinity of the jet engine testing area. The vertical extent of TRPH and total naphthalenes in groundwater does not appear to exceed 20 ft bls. The horizontal and vertical extent of 1,2-DCE and TCE in groundwater does not appear to be delineated in the northeast part of the site. The presence of 1,2-DCE and TCE in groundwater does not appear to be associated with petroleum contamination, and may be associated with cleaning and maintenance activities in the vicinity of the former test area. Given the groundwater flow direction to the north, chlorinated VOCs are likely migrating to the inlet (surface water) north of the site.

3.6 IR SITE NO. 1 - TRUMAN ANNEX REFUSE DISPOSAL AREA

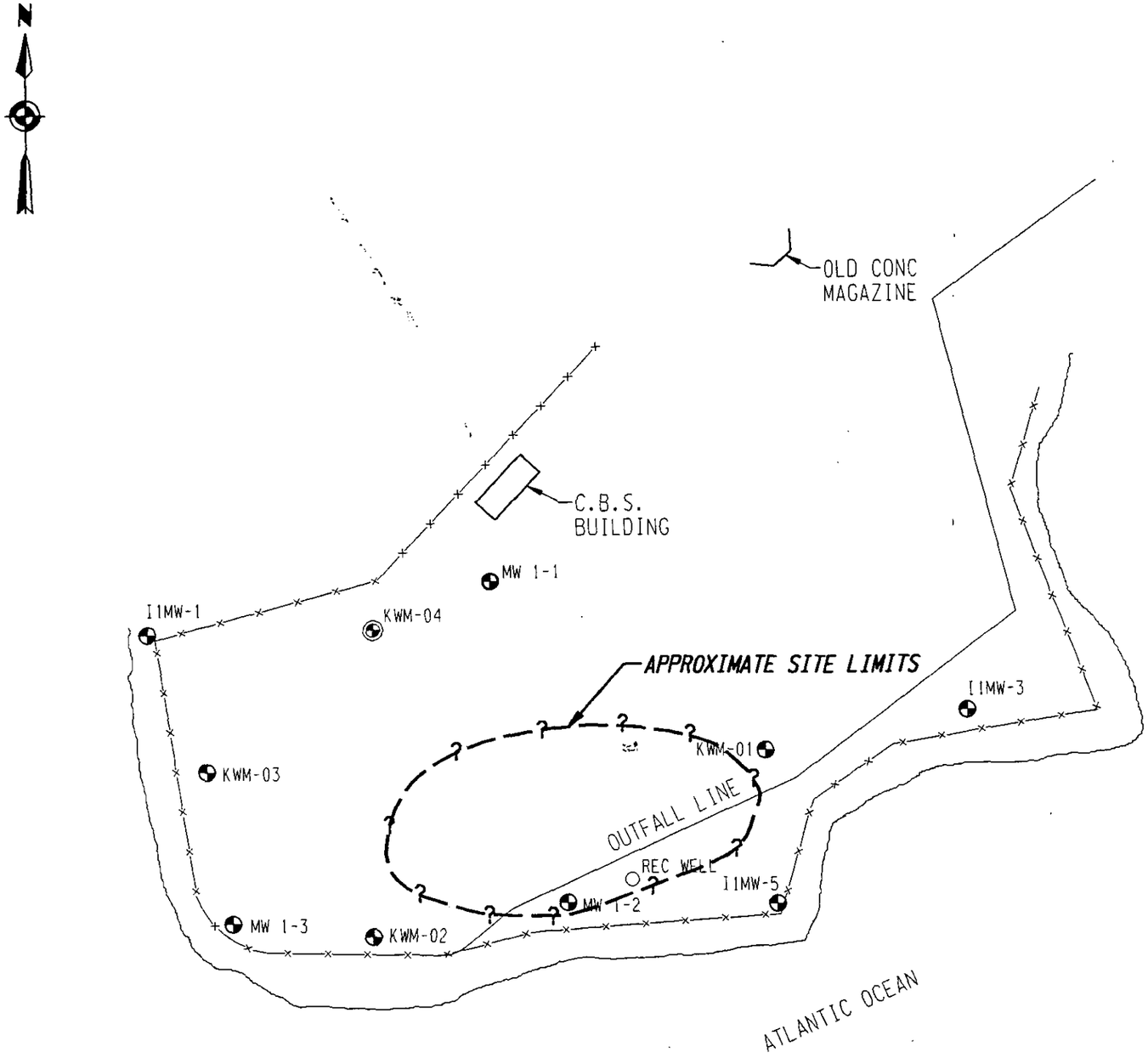
The Truman Annex Refuse Disposal Area is located along the southern shore of Truman Annex on Key West. The site covers an area of approximately seven acres of filled land, including the antenna field. Figure 3-6 depicts pertinent features and the layout of the site. A fence surrounds the site and access is strictly controlled. The shoreline has erosion protection consisting of large concrete rubble and debris. The main sewer outfall line for Key West runs through the property.

From 1952 until the mid 1960s the Truman Annex Refuse Disposal Area was used for general refuse disposal and open burning. As a result of these activities, the soils, groundwater and sediment at the site have been contaminated with metals, PCBs and some pesticides at concentrations greater than action levels. Although the shoreline is protected with concrete rubble, the contaminated soils have migrated into the surrounding sediments. In addition, the contaminated groundwater also may be impacting the surface water and sediments. The extent of the soil and groundwater contamination has not been fully delineated to the north or east.

3.7 IR SITE NO. 3 - TRUMAN ANNEX DDT MIXING AREA

The Truman Annex DDT Mixing Area is located at the former site of NAS Building 265 and is depicted in detail in Figure 3-7. The site covers an area of about 0.25 acres and is located approximately 1,100 ft inland from the coastline in an area that is subject to restricted vehicular and pedestrian traffic. Fort Street, which is the western-most street of a residential area, is located to the northeast of the site. There are unconfirmed reports that some of the nearby residents have potable water wells in their homes. The site is underlain by highly permeable soils with no surface water drainage or holding features present. The water table occurs at approximately 5 ft bls. The surface of the site is flat with tall grass and weeds.

From the 1940s to the early 1970s, the location was used as a DDT mixing area. Powdered DDT concentrate was mixed with water and temporarily stored in 55-gallon drums both inside and outside the former building. The mixed solution was then transferred to trucks for disposal.



NOTES:

1. SOURCE OF FIGURE IS INTERNATIONAL TECHNOLOGY CORPORATION (CCN000363). BECHTEL HAS ADDED THE APPROXIMATE SITE LIMITS AND NOTES.
2. ACTUAL LIMIT OF EXCAVATION WILL BE JOINTLY DETERMINED BY BEI AND THE NAVY USING FIELD SCREENING TECHNIQUES.
3. EXCAVATED AREAS SHALL BE BACKFILLED WITH CLEAN SOIL AND TURF ESTABLISHED.
4. NO EXCAVATION SHALL BE UNDERTAKEN IN ANY AREA IN WHICH EXISTING CABLE TRAYS AND ANTENNAS OR THEIR FOUNDATIONS OR SUPPORTS COULD BE DISTURBED. NOISE SHALL BE MINIMIZED NEAR THE ANTENNAS.

LEGEND

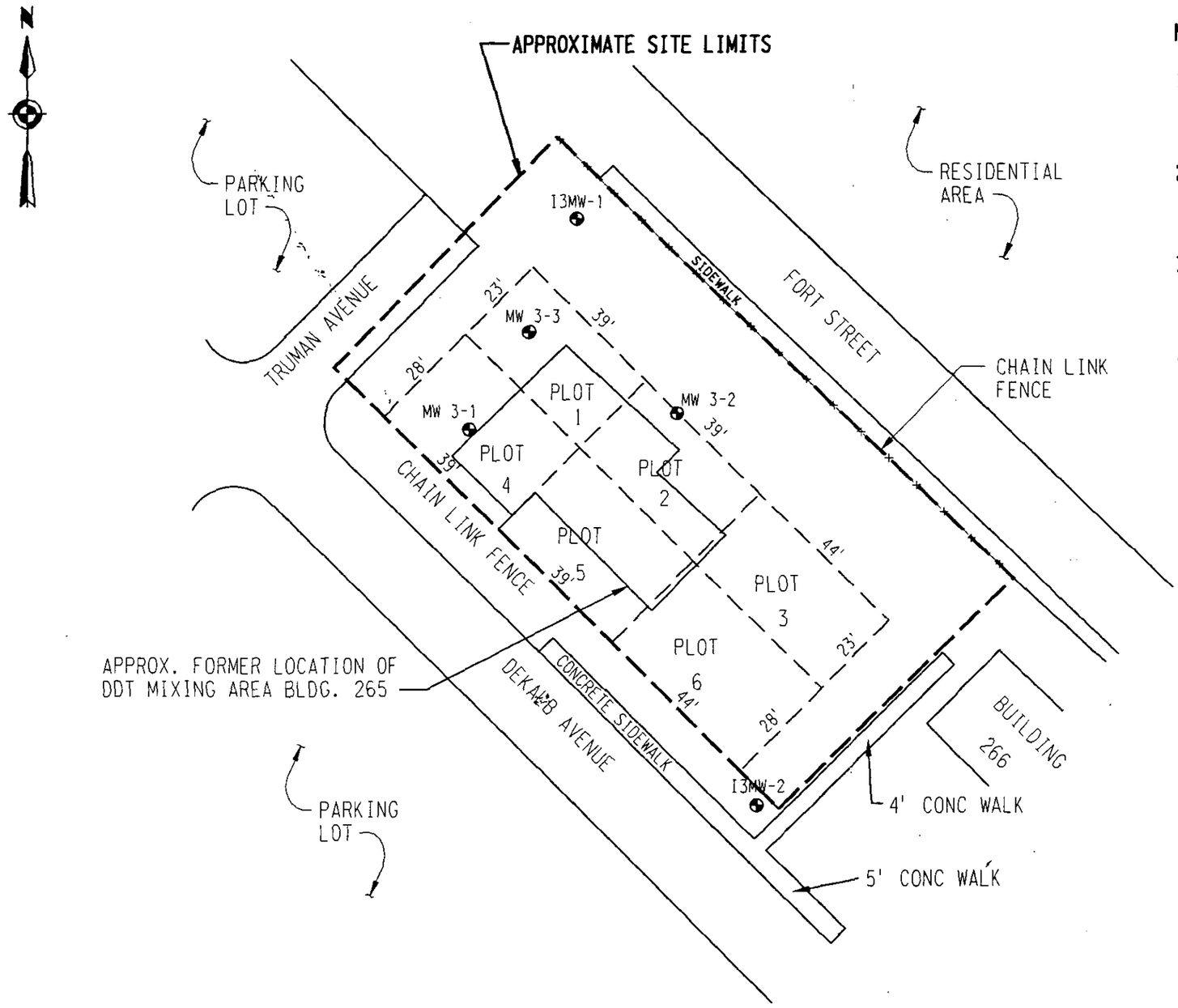
- FENCE
- KMW-04 — ABANDONED WELL
- KWM-18 — MONITORING WELL
- ITMW-1 — TEMPORARY WELL POINT
- RECORDING WELL

0 150 300 450

1"=150'

22567 321 AB202884.DGN

FIGURE 3-6
IR NO.1 - TRUMAN ANNEX (KEYWEST)
REFUSE DISPOSAL AREA



NOTES:

1. SOURCE OF FIGURE IS INTERNATIONAL TECHNOLOGY CORPORATION (CCN000363). BECHTEL HAS ADDED THE APPROXIMATE SITE LIMITS AND NOTES.
2. ACTUAL LIMIT OF EXCAVATION WILL BE JOINTLY DETERMINED BY BEI AND THE NAVY USING FIELD SCREENING TECHNIQUES.
3. SHORING SHALL BE INSTALLED AS NECESSARY IN ACCORDANCE WITH OSHA REGULATIONS AND THE SCOPE OF WORK.
4. MONITORING WELLS WILL BE REMOVED PRIOR TO THE START OF WORK ACTIVITIES.

LEGEND

KWM-18 ⊕ MONITORING WELL

PLOT BOUNDARY & NUMBER

0 30 90 120

1"=30'

22567 321 AB202886.DGN

FIGURE 3-7
IR NO. 3 - TRUMAN ANNEX (KEYWEST)
DDT MIXING AREA

The soils and groundwater at the site have been impacted with pesticides, primarily DDT, DDE, and DDD from spills. The contamination exceeds action levels and has potential for adverse human health and environmental impacts. The extent of groundwater contamination has not been determined.

3.8 IR SITE NO. 7 - FLEMING KEY NORTH LANDFILL

The Fleming Key North Landfill covers approximately 30 acres on the northern end of Fleming Key and is shown in detail in Figure 3-8. The site currently houses the US Department of Agriculture (USDA) Animal Import Center. South of the site is a munitions storage area for NAS Key West. North of the site is a small U.S. Army base. Docks are present on the northeast corner and on the west side of the island for launching and docking Navy boats.

The site is generally flat with trees, brush and mangroves along the west shoreline. The east shoreline has grass cover and concrete rubble riprap for erosion protection. The northwest portion of the site is wooded. The remainder of the site is open area covered with grass. Stormwater is reported to collect in low-lying areas that resulted from irregular grading of the landfill.

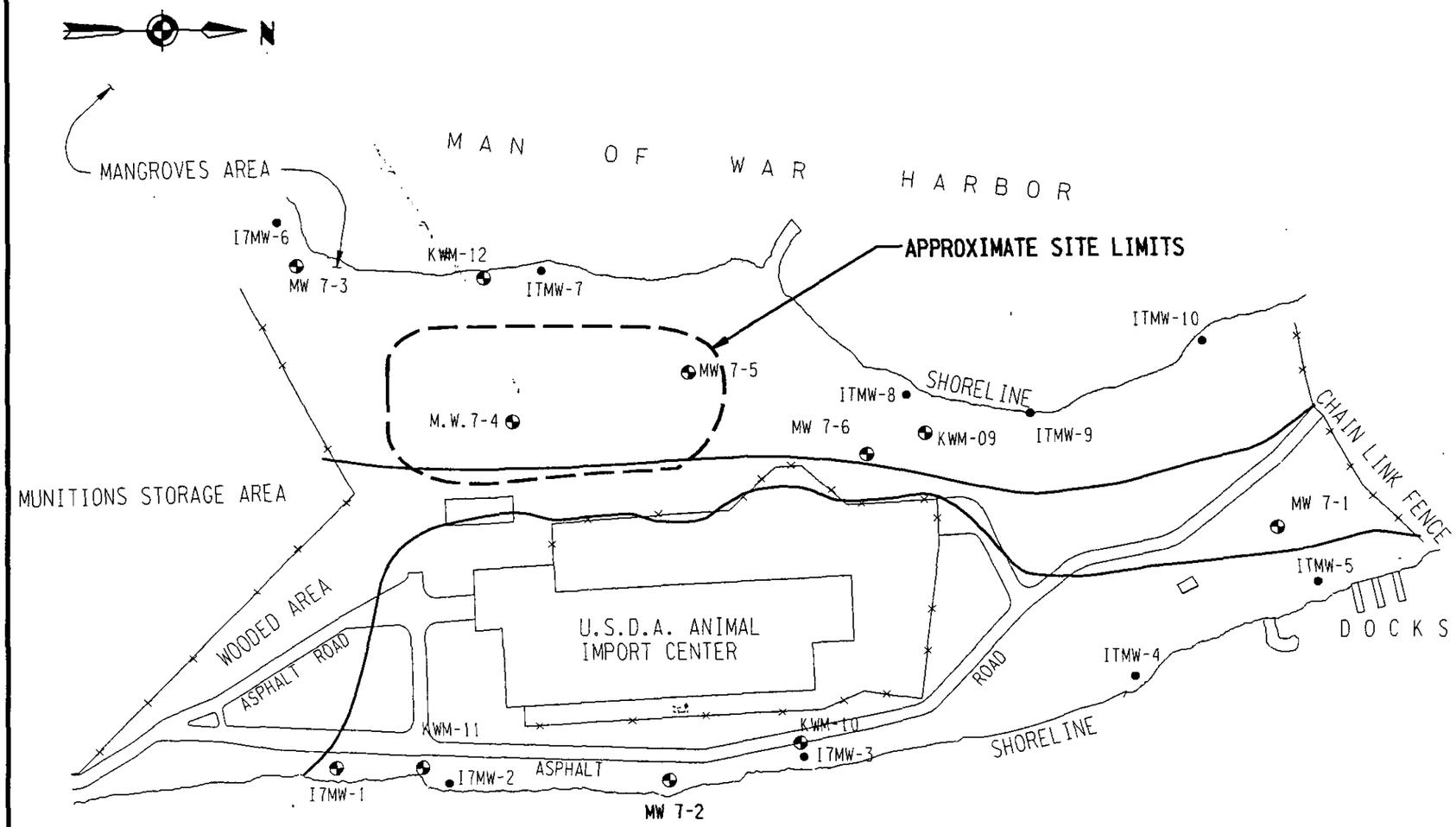
From 1952 to 1962 the site was used as the landfill for NAS Key West and the City of Key West. Four to five thousand tons of unknown wastes reportedly were disposed of annually. The wastes were placed in trenches typically 25 ft wide, 10 ft deep and 500 to 1,000 ft long. In 1977, a building housing the USDA Animal Import Center was constructed over a portion of the landfill. During the construction phase, wastes were excavated and transferred to an area immediately to the west of the construction site and buried under a soil/rock cover.

The subsurface soils and groundwater have been impacted with organic and inorganic contaminants at concentrations that exceed action levels. The surrounding surface water and sediments have been impacted in two small areas. There is some contamination located along the shore on the northwest side of the site. This contamination may be the result of surface water runoff into the mangroves in this area. Some high lead levels are also in the sediments by the dock at the northeast end of the site. The contamination is delineated to the south. The current site conditions pose no human health impacts. However, there is potential for contaminants to migrate off site and cause future ecological or human health risk.

3.9 IR SITE NO. 8 - FLEMING KEY SOUTH LANDFILL

The Fleming Key South Landfill covers approximately 45 acres on the southern end of Fleming Key and is shown in detail in Figure 3-9. The southeastern portion of the site area 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. Dense vegetation covers most of the site with Australian pine being located around the borders. The southwestern area of the site contains piles of metal debris (heavy equipment, desks, marine equipment, etc.) as well as construction debris. There are buses, buoys, trailers, etc. along the northwest portion of the landfill. There is visible erosion of the beach areas, and waste material (primarily concrete construction debris) is exposed to surface waters along all shorelines.

As much as 8,000 tons of unknown wastes reportedly were disposed at the landfill annually between 1962 and 1982. The waste disposal activities of the City of Key West were combined with those of the Navy from 1968 to 1982 at this site. Waste materials and fill from Sigsbee Key (Dredgers Key)



NOTES:

1. SOURCE OF FIGURE IS INTERNATIONAL TECHNOLOGY CORPORATION (CCN000363). BECHTEL HAS ADDED THE APPROXIMATE SITE LIMITS AND NOTES.
2. ANY STOCKPILING OF CLEAN FILL AT THE SITE WILL BE DONE ON THE UPLAND AREA OF THE SITE, AWAY FROM SHORELINE AND THE LOW LYING AREA ON THE SOUTHWEST SIDE OF THE SITE
3. GRADING SHALL BE PERFORMED TO ELIMINATE PONDING.

LEGEND

- FENCE
- ITMW-1 • TEMPORARY WELL POINT
- KWM-18 MONITORING WELL
- ESTIMATED LANDFILL BOUNDARY

0 150 300 450

1"=150'

22567 321 AB202879.DGN

FIGURE 3-8
IR NO. 7 - FLEMING KEY
NORTH LANDFILL

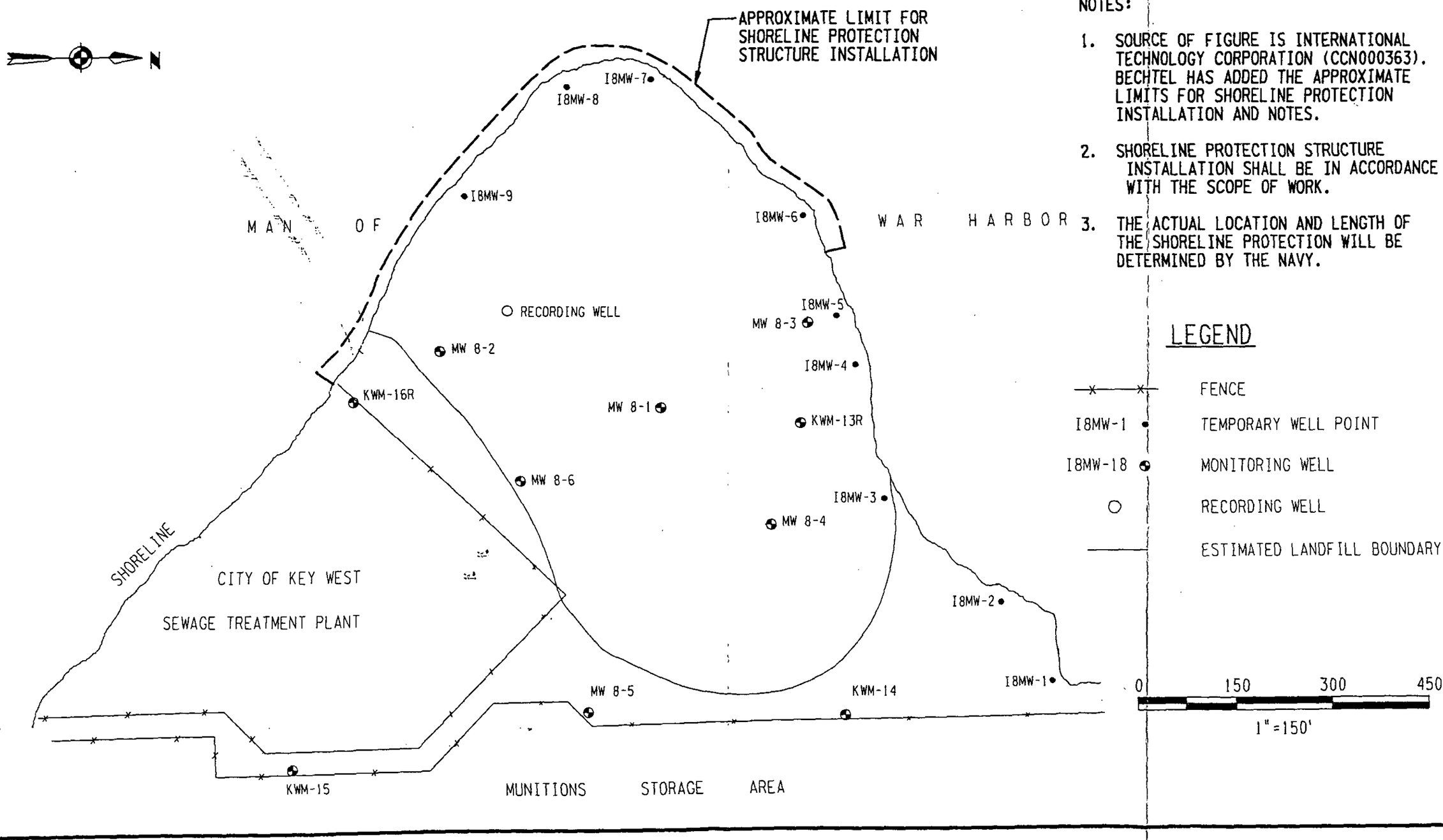


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FIGURE 3-9
IR NO. 8 - FLEMING
SOUTH LANDFILL

were also disposed of at the site between 1948 and 1951. The open trench disposal method was practiced at this site, with the trenches being constructed in a manner similar to that at Fleming Key North Landfill. The trenches were partially full of sea water when the wastes were disposed. Combustible wastes were taken to the western portion of the site and burned. The ash and unburned wastes were then deposited in the western portion of the landfill.

The groundwater, soils, and sediments have been adversely impacted by waste disposal practices at the site. The groundwater and soil contamination has been delineated. The primary contaminants of concern in the groundwater and other media are metals. There is potential for adverse environmental impacts to aquatic and terrestrial receptors.

3.10 AOC SITE A - DEMOLITION KEY OPEN DISPOSAL AREA

The Demolition Key Open Disposal Area, as shown in Figure 3-10, is on the northern half of Demolition Key, a man-made dredge spoil island used historically for explosives disposal and (reportedly) target practice. Demolition Key is approximately 6 ft above mean sea level at its highest point. The Key is accessible only by water transportation and is an off limits restricted area; however, there is evidence of continued usage by campers or picnickers. The Key consists of two land masses; however, this IRA addresses only the northern land mass where historically disposal of explosives took place. No permanent surface water features are present on the Key. The shoreline currently is supporting a mangrove community that does not appear to be affected by the disposal activities.

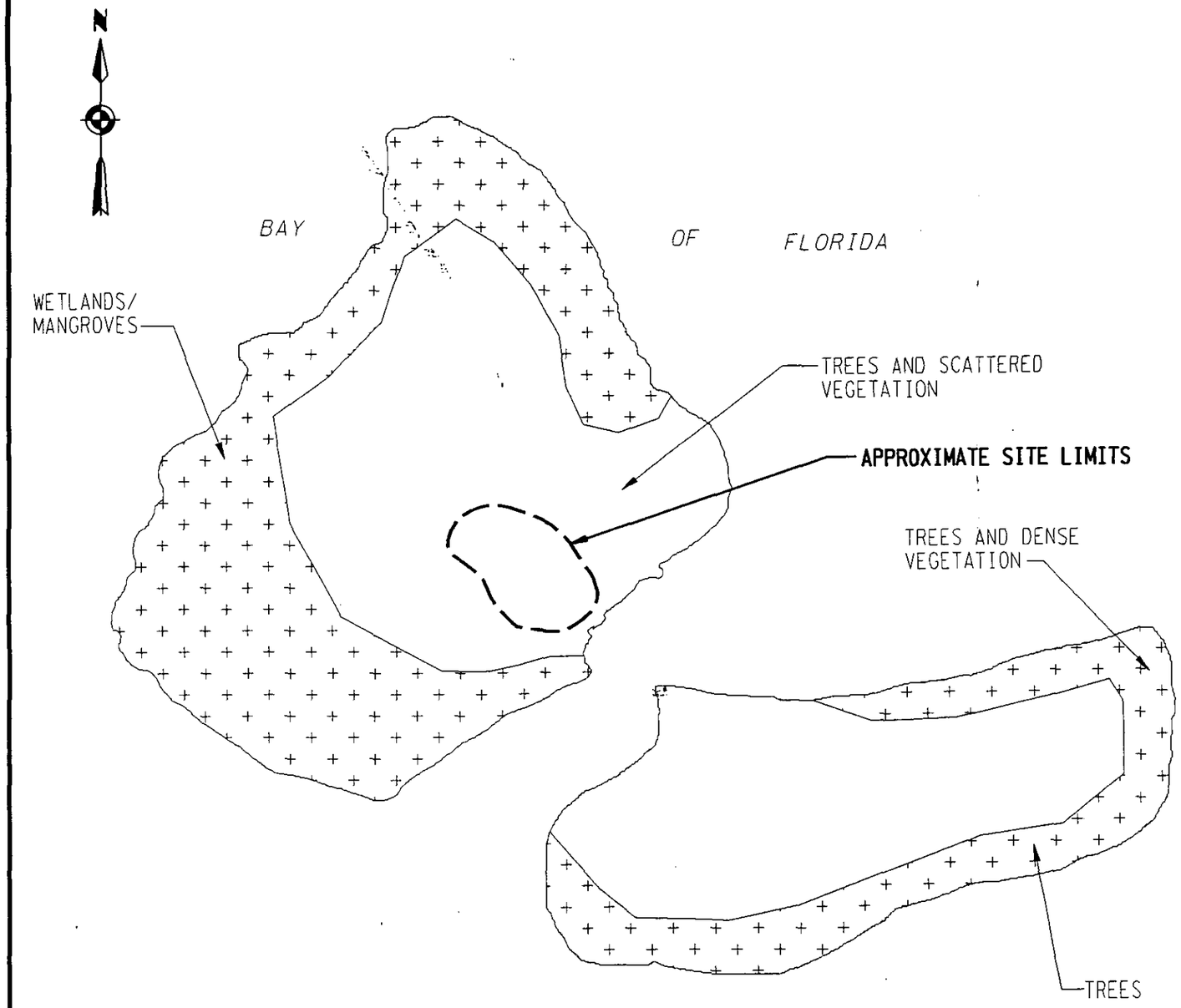
Demolition Key has been used by the Navy as a secure area for the disposal of out-of-date ordnance. The Navy typically utilizes open burning and/or open detonation as the means to ensure the explosives will be burned to completion. The Key contains several craters approximately 5 to 15 ft in diameter and 4 to 5 ft deep. The area presently is not being used for burning or demolition.

Soil and groundwater samples from the craters indicate contamination by metals, which may pose a threat to the environment. One of the soil samples exceeded the regulatory requirement for toxicity (lead) and would be classified as hazardous if removed.

3.11 AOC SITE B - BIG COPPITT KEY ABANDONED CIVILIAN DISPOSAL AREA

The Big Coppitt Key Abandoned Civilian Disposal Area is located to the east of the NAS airfield on Big Coppitt Key. Figure 3-11 shows the pertinent aspects of the Big Coppitt Key area. The site encompasses approximately 10 acres, of which approximately 0.7 acres are cleared and approximately 1.6 acres are occupied by a dead end canal. Mangroves surround the waste disposal area, which has been identified by NAS Public Works as being within a wetland. The ground elevations at the site vary from sea level up to approximately 2 ft above sea level. Surface water exists in the mangrove wetlands. All runoff from precipitation appears to drain directly into the canal and into the mangrove wetlands. There is a culvert that appears to connect the south end of the canal with the mangroves.

The area of concern is an old abandoned civilian disposal area used for disposal of discarded car/truck body and frame parts. The fill area is horseshoe shaped, approximately 150 ft by 300 ft in horizontal extent and apparently 1 to 2 ft thick. A light soil cover approximately 6 in. to 1 ft overlies the crushed car bodies/debris. The mangroves encompassing the site have started to grow in among the exposed waste. The exact time and method of waste placement is unknown.



NOTES:

1. SOURCE OF FIGURE IS INTERNATIONAL TECHNOLOGY CORPORATION (CCN000363). BECHTEL HAS ADDED THE APPROXIMATE SITE LIMITS AND NOTES.
2. ACTUAL LIMITS OF EXCAVATION WILL BE JOINTLY DETERMINED BY BEI AND THE NAVY.
3. EXCAVATED MATERIAL WILL BE PLACED IN DRUMS AND TRANSPORTED OFF DEMOLITION KEY.
4. EXCAVATION WILL NOT BE PERFORMED UNTIL BEI VERIFIES THE EXCAVATION AREA WITH AN UNEXPLODED ORDNANCE SPECIALIST.

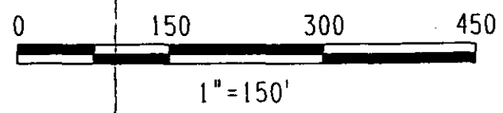


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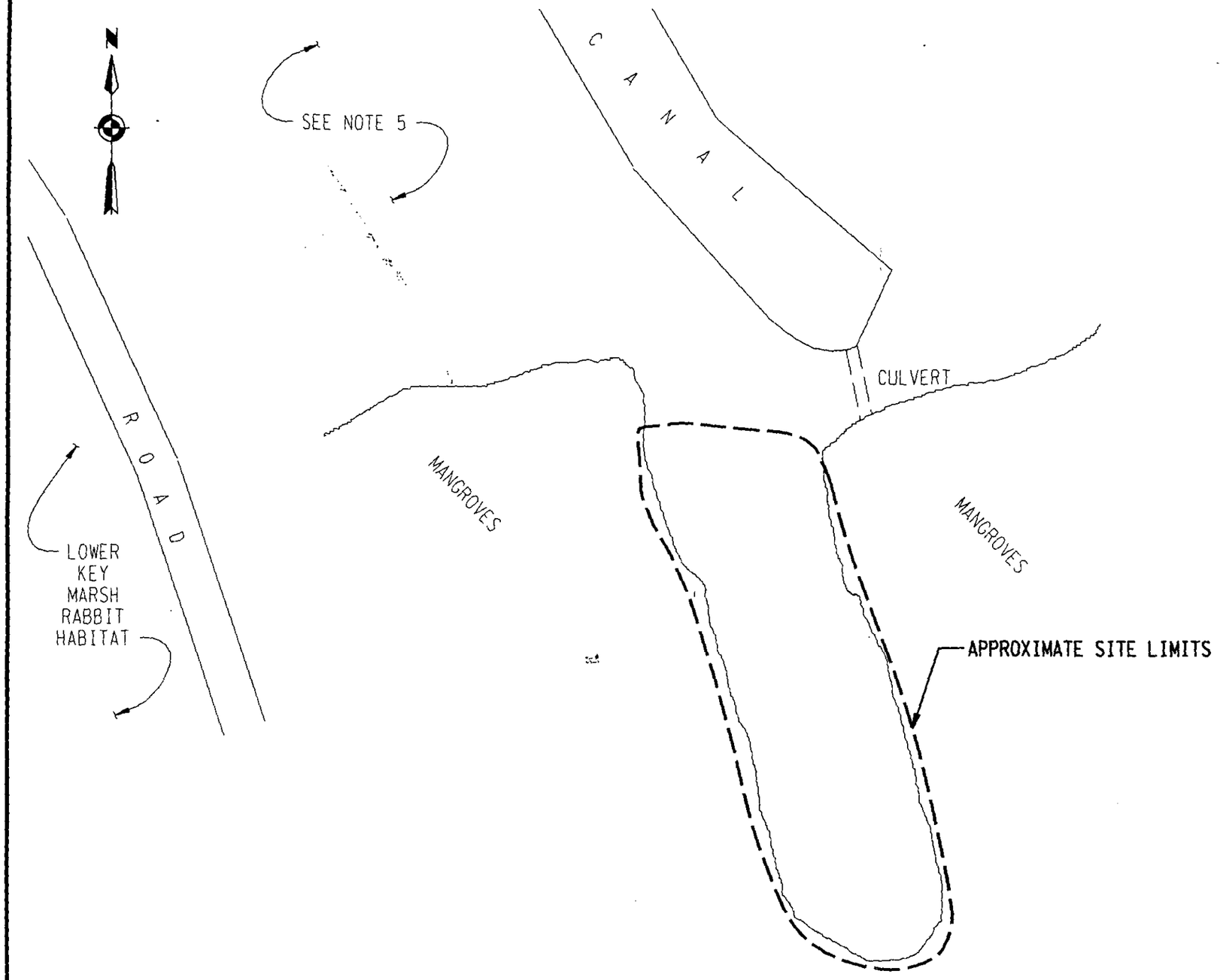
FIGURE 3-10
AOC SITE A - DEMOLITION KEY
OPEN DISPOSAL AREA



NOTES:

1. SOURCE OF FIGURE IS INTERNATIONAL TECHNOLOGY CORPORATION (CCN000363). BECHTEL HAS ADDED THE APPROXIMATE SITE LIMITS AND NOTES.

2. ACTUAL LIMITS OF EXCAVATION WILL BE JOINTLY DETERMINED BY BEI AND THE NAVY USING FIELD SCREENING TECHNIQUES. ONLY THE TOP LAYER (APPROX. 1 TO 2 FEET) SHALL BE EXCAVATED.

3. CARE SHALL BE TAKEN TO MINIMIZE DISTURBANCE OF THE EXISTING MANGROVES.

4. THE SITE SHALL BE RESTORED AS A WETLANDS IN ACCORDANCE WITH THE SCOPE OF WORK FOLLOWING EXCAVATION OPERATIONS.

5. ANY REQUIRED STOCKPILES WILL BE LOCATED ON THE UNVEGETATED UPLAND AREA NORTHWEST OF THE SITE.

0 80 160 240

1"=80'

22567 321 AB202891.DGN

FIGURE 3-11
AOC SITE B - BIG COPPITT KEY
ABANDONED CIVILIAN - DISPOSAL AREA

Sampling indicates that the soils, sediments, surface water and groundwater have been adversely impacted by metals. However, none of the soil samples subjected to TCLP testing exceeded the regulatory requirements for toxicity, and would therefore not be classified as hazardous if removed.

4.0 SCOPE OF WORK

this revision

NOTE: The scopes of work for SWMU 1, Boca Chica Open Disposal Area; SWMU 2, Boca Chica DDT Mixing Area; IR-1, and Truman Annex Refuse Disposal Area remain undetermined as of May, 1995, and thus will not be discussed in ~~the initial submittal~~ of the work plan. The scope of work for these sites will be provided in future revisions of this work plan in Sections 4.8 - 4.10.

4.1 SWMU NO. 3 - BOCA CHICA FIRE FIGHTING TRAINING AREA

4.1.1 Interim Remedial Action

SOUTHDIV has designated the IRA objective at the Boca Chica Fire Fighting Training Area as contaminant source removal from the southernmost of the two circular pits to prevent further migration of waste into the groundwater. To accomplish this objective, the scope of work for the Boca Chica Fire Fighting Training Area will consist of the following elements:

- close two monitoring wells (S3MW-3, S3MW-4);
- excavate petroleum contaminated soil from the pit, down to the water table;
- spread absorbent media to collect any free product that collects in the pit;
- transport solid waste to a disposal facility; and
- backfill with clean soil and grade.

4.1.2 Regulatory Requirements

RCRA Waste Analysis

SWMU-3 was used as a fire fighting training area where diesel, JP-5, gas and oil were burned at the site. Analysis of available sample data indicates no hazardous waste is present in the designated area to be remediated.

Interim Remediation Goals (IRG)

The IRGs are the more stringent of the "Commercial Industrial Preliminary Remediation Goals" or the "FDEP General Worker Soil Cleanup Goals" as specified in Table 1-12 of the RFI/FI Report (Attachment 2).

Permits and Protection of Natural Resources

BEI will follow requirements specified in the Environmental Protection Plan which accompanies this work plan. SWMU-3 is adjacent to but not a part of a wetland. Other than possible use by Least Terns as a nesting area during the spring and summer, no other natural resources are impacted. BEI will facilitate Navy interaction with the cognizant agencies and Natural Resources Trustees in order to provide notification of proposed remedial actions and site restoration.

Water Management Requirements

Erosion and runoff control will be practiced throughout the duration of excavation activities. Silt fences, surface flow barriers, and stabilization of disturbed areas will be used to control the erosion of loose silt or soil. Excavation will be performed such that stormwater runoff will not create a pathway for spread of contamination from the site.

4.1.3 Excavation of Contaminated Soil

Approximate excavation limits have been determined in the RFI/RI Report as shown in Figure 3-3. Actual limits of excavation will be determined based on additional sampling performed by Bechtel before and during excavation of soil. Bechtel will support Southdiv in the determination of the boundaries of the excavation, based upon the IRG cleanup criteria.

Sampling points will be determined prior to excavation by establishing a horizontal grid system and sampling each point of the grid at vertical intervals. The grid size and vertical sampling interval will be determined based on field conditions. Samples will be analyzed for BETX and PAHs, indicators of petroleum contamination, onsite using field screening methods outlined in Section 5.0. Analytical results will be compared with the IRGs to define the horizontal and vertical extent of contaminated soil requiring excavation.

It is assumed that soil will be excavated down to, but not below the water table. Excavated soil will be stockpiled on plastic liners which will be draped over berms around the perimeter of the stockpile to prevent runoff of liquid from the soil. Stockpiles will be covered with plastic sheeting to prevent infiltration from precipitation and blowing of fugitive dust from the stockpiles. Any free product observed in the excavation will be removed with absorbent material. The absorbent material will be packaged into 55-gal. drums or other suitable containers for disposal.

After the excavation limits are achieved, final confirmatory samples will be collected from the excavation and sent for offsite analysis. Analytical results will be used to confirm that IRGs have been met prior to backfilling the excavation. Results will also be provided to the Comprehensive Long-Term Action Navy (CLEAN) contractor for NAS Key West for use in preparing human health and ecological risk assessments. Section 5.0 describes the approach for collecting confirmatory samples and prescribes the analytical methods to be used to confirm the cleanup and risk assessment.

Waste classification samples will be taken from the soil stockpile. Analytical results will be used to prepare manifests and other documents required for offsite transport and disposal of the waste. The procedure for sampling the stockpile and the analytical methods required for waste classification are described in Section 5.0.

When the analytical results are returned from the offsite laboratory and confirm that the IRGs have been achieved, the excavation will be backfilled in 1 ft lifts and compacted as detailed in section 4.15.7.

4.1.4 Transportation of Contaminated Soil

The stockpiled soil will be loaded into dump trucks or roll-off containers for shipment and processing through cement kilns located offsite, probably in the Miami area. Contaminated soil, containerized free product, and other containerized waste will be handled in accordance with

Section 6.0. Contaminated materials will be transported in accordance with the regulations specified in Section 4.17.

4.2 SWMU NO. 7 - BUILDING A-824

4.2.1 Interim Remedial Action

The Navy has designated the IRA objective at Building A-824 as contaminant source removal to prevent further migration of waste into other media. To accomplish this objective, the scope of work at Building A-824 will consist of the following elements:

- excavate PCB contaminated soils located near the north entrance of the building;
- transport waste to an appropriate treatment/disposal facility; and
- backfill with clean soil and grade.

The cleanups of petroleum contaminated soil east of the building and across the road, and surface water and sediments in the ditch on the west side of the building are not within the designated scope of this RWP.

4.2.2 Regulatory Requirements

RCRA Waste Analysis

SWMU-7 was formerly used to store hazardous waste. The building currently houses a solvent recycling operation and is used for storage of empty 55-gal. drums and old transformers. Soil samples taken from this area do not indicate the presence of RCRA hazardous waste. One soil sample contained Aroclor-1260 at 19 ppm. However, this level of PCBs is not regulated by the Toxic Substance Control Act (TSCA), nor is it regulated by the State of Florida. For this reason, we anticipate that any soil removed from the site can be disposed of as solid waste. Should PCBs be detected in concentrations above 50 ppm the soil will be disposed in a TSCA permitted landfill.

Interim Remediation Goals

The IRG is the more stringent of the "Commercial Industrial Preliminary Remediation Goals" or the "FDEP General Worker Soil Cleanup Goals" specified in Table 1-12 of the RFI/RI Report (Attachment 2).

Permits and Protection of Natural Resources

BEI will follow requirements specified in the Environmental Protection Plan which accompanies this work plan. The designated IRA area for SWMU-7 is within a cleared, fenced area and does not impact any wetland or endangered species habitat. No permits, other than for excavation, are required in order to perform the IRA. BEI will facilitate Navy interaction with the cognizant agencies and Natural Resources Trustees in order to provide notification of proposed remedial actions and site restoration.

Water Management Requirements

Erosion and runoff control will be practiced throughout the duration of excavation activities. Silt fences, surface flow barriers, and stabilization of disturbed areas will be used to control the erosion of loose silt or soil. Excavation will be performed such that stormwater runoff will not create a pathway for spread of contamination from the site.

4.2.3 Excavation of Contaminated Soil

Approximate excavation limits have been determined from the RFI/RI Report and are shown in Figure 3-4. BEI will take samples before and during excavation in order to delineate actual excavation limits, both horizontal and vertical. These limits will be jointly determined and agreed to by both BEI and the Navy.

Sampling points will be determined prior to excavation by establishing a horizontal grid system and sampling each point of the grid at vertical intervals. The grid size and vertical sampling interval will be determined based on field conditions. Samples will be analyzed for PCBs (Aroclor-1260) onsite using the field screening methods outlined in Section 5.0. Analytical results will be compared with the IRG to define the horizontal and vertical extent of contaminated soil requiring excavation.

A backhoe (or laborers with shovels if the quantity is small) will be used to excavate and place PCB contaminated soils into 55-gallon drums or other suitable containers meeting the requirements for the storage and transport of hazardous waste.

After the excavation limits are achieved, Bechtel will collect final confirmatory samples from the excavation for offsite PCB analysis. Analytical results will be used to confirm that the IRG has been met prior to backfilling of excavation. Excavation will continue as required until the IRG levels have been achieved. Analytical results will also be provided to the CLEAN contractor for NAS Key West for use in preparing human health and ecological risk assessments. Section 5.0 describes the approach for collecting confirmatory samples and the analytical methods to be used.

Waste classification samples will be collected from the bins containing excavated soil. Analytical results will be used for preparation of manifests and other documents required for offsite transport and disposal of the waste. The procedure for sampling the containers and the analytical methods required for waste classification are described in Section 5.0.

After confirmation that the IRG has been achieved and upon concurrence of SOUTHDIV, the excavation will be backfilled in 1 ft lifts and compacted as described in Section 4.15.7. Any necessary turf establishment will be performed as described in Section 4.18.

4.2.4 Disposal of Contaminated Soil

Contaminated soil will be handled and transported in accordance with Section 6.0.

4.3 SWMU-9 JET ENGINE TEST CELL

4.3.1 Interim Remedial Action

The Navy has designated the IRA objective at SWMU-9 is to provide hydraulic containment, recovery, and treatment of groundwater contaminated with petroleum related compounds from the JP-5 fuel spill plus the chlorinated VOCs associated with cleaning and maintenance activities in the vicinity of the test area. To accomplish this objective, BEI's scope of work for SWMU-9 will consist of the following elements:

- initial field work, including groundwater sampling using Hydropunch or similar technology, analysis to delineate the extent of contamination, and aquifer testing;
- design a groundwater pump-and-treat system including treatment system, extraction system and recharge system;
- install the system as designed; and
- operation and maintenance (O&M) of the pump-and-treat system by BEI for one year (responsibility for O&M thereafter is to be determined.

4.3.2 Regulatory Requirements

Permits and Protection of Natural Resources

BEI will follow the requirements specified in the Environmental Protection Plan which accompanies this work plan. SWMU-9 does not impact any wetland or endangered species habitat; however, it is located adjacent to an inlet connected to the ocean. Excavation permits are required to install the wells and a worksheet is required to determine whether an air quality permit is needed. BEI will assist the Navy to obtain these permits and will facilitate Navy interaction with the cognizant agencies and Natural Resources Trustees in order to provide notification of proposed remedial actions and site restoration.

Water Management Requirements

At SWMU-9, extraction wells will be installed to contain the plume and pump groundwater for treatment and disposal. The groundwater will be treated with an onsite treatment system to meet FDEP drinking water standards that are protective of the receiving surface water body and recharged to the aquifer using an infiltration gallery. Treatment will be monitored by use of the analytical methods listed in Table 5-1. Monitoring, testing, and reporting will meet the requirements of the FDEP.

4.3.3 Initial Fieldwork

Groundwater Sampling and Analyses

Groundwater samples will be collected at up to sixteen locations using Hydropunch or similar technology. Field measurements to be made at each well include water level, pH, redox potential, dissolved oxygen, and specific conductance. Groundwater samples from each well will be submitted

for offsite analyses of the parameters documented in Section 5.0. Wells to be measured and sampled include the existing wells described in the CAR and all wells installed as part of this IRA. Information derived from this task will be used to define the horizontal extent of the plume of chlorinated VOC contamination, determine and establish a baseline water quality prior to implementing the IRA, and provide up to date information necessary to locate the recovery wells.

Aquifer Testing

One 4-in. diameter extraction well and 5-in. diameter piezometers will be installed for the aquifer testing. The testing will be performed to determine the hydraulic characteristics of the uppermost aquifer. The test will include a minimum 48-hour pumping and recovery test. Groundwater generated during the pump test will be stored in portable storage tanks for later treatment in the treatment system. Information derived from aquifer testing will be used to determine optimum pumping rates for the extraction wells, estimate the radius of influence of the extraction system, and determine the VOC contaminant loading rate to the treatment facility.

Drill spoils will be containerized and disposed of as specified in Section 6.0.

Site Surveying

The horizontal and vertical locations of each newly installed well will be surveyed by a surveyor licensed in the State of Florida. Horizontal locations will be referenced to state plane coordinates, the US Geological Survey and/or US Geodetic Survey bench marks. The vertical location of the ground surface and a measuring point on the top of each well casing will also be determined. Technical specifications for surveying are provided in Appendix B.

Reports

A brief report on the results of the field work will be produced. The report will include a description of field activities, geologic logs, aquifer testing results, and groundwater analysis results.

4.3.4 Groundwater Pump-and-Treat System Design

The groundwater pump-and-treat system design will include designs for extraction wells, pumps, a collection or header system to convey extracted groundwater from the wells to the treatment unit, a groundwater treatment unit, and a recharge system. The system design will be based on information provided by the CAR and obtained during the initial fieldwork described in Section 4.3.3. Groundwater modeling will be conducted to demonstrate that the extraction wells contain the plumes and to ensure that the recharge system does not result in excessive groundwater mounding. Technical specifications, design drawings for the installation of the system, and operation manuals will be produced during the design phase of this IRA. Included in the design phase will be an estimate for treatment duration and a groundwater monitoring plan to be implemented after system startup. A brief, preliminary description of system components are given below and will be finalized during the design phase of the work for this IRA.

Extraction system components will include: wells, well vaults; submersible pumps; hoses; well head valves, flow meters and sampling ports; water level indicators; and pump controllers. Well locations, and depths will be determined during the design phase.

The collection system will consist of 2-in. diameter Schedule 40 PVC piping used to convey extracted groundwater to the treatment system. The piping will be buried approximately 1 to 2 ft below grade.

The treatment facility will minimally consist of a portable air stripping and carbon unit. The unit will mounted on a 4-in. thick concrete pad with a lip or sump for spill containment. Sizing of the unit and the addition of any other treatment methodologies that may be found to be necessary after the completion of field work will be determined during design.

The discharge system will consist of an infiltration gallery installed upgradient of the extraction system. Location of the gallery will be determined during the design phase of this IRA. The piping from the treatment unit to the infiltration gallery will be buried approximately 1 to 2 ft below grade and consist of 2-in. diameter Schedule 40 PVC pipe.

Utilities for the pump-and-treat system will include electrical connections to extraction wells and treatment unit, tying in to nearest potable water, and installing an estimated 100 ft of 2-in. PVC piping for potable water. Trenching for utilities will be accordance with standard specifications for uncontaminated earthwork construction which is provided in Appendix E.

Note that treatment by air stripping will aerate the groundwater prior to its recharge upgradient of the contaminated areas. This will result in increased oxygen concentrations that will likely enhance the biodegradation of hydrocarbons derived from the JP-5 fuel spill in-situ, complementing the ex-situ treatment and facilitating the remediation (destruction in this case) of the hydrocarbons. The chlorinated VOCs will not undergo aerobic biodegradation without supplying additional nutrients to the groundwater. Treatment of these constituents will be entirely ex-situ.

4.3.5 Groundwater Pump-and-Treat System Installation

The groundwater pump-and-treat system will be installed according to the specifications developed during the design phase of this IRA. Included in the installation phase is system startup and system testing (including influent and effluent sampling and analysis as described in Section 5.0) to insure that design requirements are met.

4.3.6 Operations and Maintenance

BEI will provide operation and maintenance (O&M) of the treatment system for a period of one year following installation. Written O&M procedures and checklists will be provided to BEI by the equipment manufacturers. Field system maintenance personnel will be trained prior to long term O&M of the treatment system. The Navy will determine how the O&M will be provided after the one-year period.

The influent and effluent from the treatment system will be sampled at the commencement of operations and periodically during operation. Sampling requirements are contained in Section 5.0. Flow rates will be monitored as well. If effluent analyses results are above discharge requirements, then the system will be shut down to determine and implement the necessary measures to attain the discharge requirements.

BEI's plan is based on a subcontractor performing the O&M and monitoring/sampling; however, should the Navy desire to perform this function in-house, BEI will assist the NAS to take over the O&M of the system.

4.4 IR NO. 7 - FLEMING KEY NORTH LANDFILL

4.4.1 *Interim Remedial Action*

The Navy has designated the IRA objective at the Fleming Key North Landfill as preventing ponding of rainwater in order to minimize infiltration through the waste and eliminate the surface water pathway. To accomplish this objective, the scope of work for the Fleming Key North Landfill will consist of the following elements:

- import clean topsoil
- regrade the west side of the site to provide drainage and prevent ponding of water over waste material
- establish soil and vegetative cover over the entire site to prevent erosion.

4.4.2 Regulatory Requirements

Permits and Protection of Natural Resources

BEI will follow requirements in the Environmental Protection Plan which accompanies this work plan. The designated area for the IRA does not impact wetlands or habitat. No permits are required. BEI will facilitate Navy interaction with the cognizant agencies and Natural Resources Trustees in order to provide notification of proposed remedial actions and site restoration.

4.4.3 Regrading for Surface Water Drainage and Erosion Protection

Regrading of the Fleming Key North Landfill site shall consist of filling and grading low areas to promote the runoff of surface water and eliminate ponding. Regrading will be performed in accordance with the applicable sections of the Technical Specification for Uncontaminated Earthwork, which is included as Appendix E.

Clean backfill for the Fleming Key North Landfill shall be brought in from an offsite borrow source. Grading shall be performed within the area shown in Figure 3-8 to fill in low areas of the landfill to be located by BEI field personnel using civil survey information. The fill shall be graded to slope toward the shoreline for runoff.

At the completion of grading activities, revegetation of the work areas shall be performed in accordance with Section 4.18 and the Technical Specification for Turf Establishment, which is included as Appendix I.

4.5 IR NO. 8 - FLEMING KEY SOUTH LANDFILL

4.5.1 Interim Remedial Action

The Navy has designated the IRA objective at the Fleming Key South Landfill as establishing a stable shoreline along the landfill perimeter. This objective will be attained by performing the following tasks:

- remove visible rubble and debris from the shoreline;
- cut back or modify the shoreline as necessary; and
- install shore structure protection to prevent further erosion of the banks.

4.5.2 Regulatory Requirements

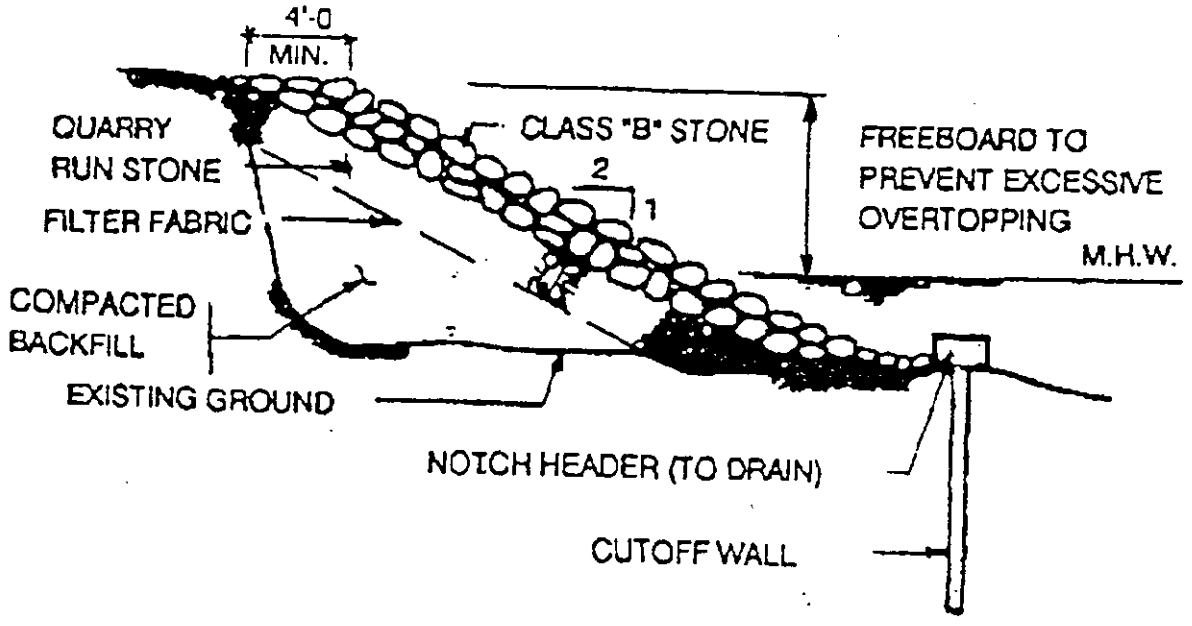
Permits and Protection of Natural Resources

BEI will follow requirements specified in the Environmental Protection Plan which accompanies this work plan. The State of Florida requires permits for shoreline stabilization, installation of riprap, and certain piers and associated structures (Florida Administrative Code, Chapter 17-312). Although the work at IR-8 does not impact wetlands or endangered species habitat, BEI will assist the Navy to obtain all necessary permits under Florida Code prior to construction. It is noted that Monroe County normally requires permits for shore protection systems as well; however, federal facilities are exempt from this requirement. BEI will facilitate Navy interaction with the cognizant agencies and Natural Resources Trustees in order to provide notification of proposed remedial actions and site restoration.

4.5.3 Shore Protection Installation/Construction

Shore protection installation at the Fleming Key South Landfill site shall consist of debris removal, excavation, installation of a cutoff wall, backfilling, compacting, geotextile installation, and placing stone to control shoreline erosion. Shore protection installation will be performed in accordance with the applicable sections of the Performance Specification for Shore Protection which is included as Appendix G. A cross-section of a typical shore-protection scheme is shown in Figure 4-1; other schemes meeting the shore protection performance criteria specified in Appendix G, including pre-fabricated protection, may be used instead.

Debris shall be removed from the shoreline in the work area shown in Figure 3-9. Debris shall be disposed of as directed by the ROICC or his designee. Clean backfill shall be brought in from an offsite borrow source, placed, and compacted along the bank. Shore protection will be placed in accordance with the design meeting the requirements of the performance specification. Silt curtains will be used to control the migration of sediments during construction.



Source: Military Handbook – Seawalls, Bulkheads, and Quaywalls (MIL–HDBK–1025/4)

Figure 4-1 Cross-Section of an Example Shoreline Protection Scheme at IR-8

4.6 AOC A - DEMOLITION KEY OPEN DISPOSAL AREA

4.6.1 Interim Remedial Action

The Navy has designated the IRA objective at the Demolition Key Open Disposal Area as contaminant source removal to prevent further migration of waste into other media. To accomplish this objective, the scope of work for the Demolition Key Open Disposal Area will consist of the following elements:

- excavate contaminated soils from the demolition craters
- transport hazardous waste to RCRA-permitted treatment/disposal facility or the waste will be treated and disposed of in a appropriate facility

4.6.2 Regulatory Requirements

RCRA Waste Analysis

AOC-A, the Demolition Key Open Disposal Area, was used by the Navy as a secure area for the disposal of out-of-date ordnance. One soil sample taken from this area exceeded the toxicity characteristic level for lead (5 mg/L). Contaminated soil excavated from this area will be managed, transported, and disposed of as hazardous waste (RCRA Waste Code D008).

Interim Remediation Goals

The IRG for lead will be 400 ppm (Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, US EPA OSWER Directive No. 9355.4-12, July 14, 1994). For all other contaminants, the IRGs are the more stringent of the "Residential Preliminary Remediation Goals" or the "FDEP Residential Soil Cleanup Goals" as specified in Table 1-12 of the RFI/RI Report (Attachment 2). These residential IRGs were adopted because the site appears to be regularly used by campers and picnickers.

Permits and Protection of Natural Resources

BEI will follow the requirements specified in the Environmental Protection Plan which accompanies this work plan. The IRA at AOC-A will not affect any wetland or endangered species habitat, and no permits, other than for excavation, are required. BEI will facilitate Navy interaction with the cognizant agencies and Natural Resources Trustees in order to provide notification of proposed remedial actions and site restoration.

Water Management Requirements

Erosion and runoff control will be practiced throughout the duration of excavation activities. Silt fences, surface flow barriers, and stabilization of disturbed areas will be used to control the erosion of loose silt or soil. Excavation will be performed such that stormwater runoff will not create a pathway for spread of contamination from the site.

4.6.3 Excavation of Contaminated Soil

BEI will take samples before and during excavation in order to delineate excavation limits, both horizontal and vertical, and these limits will be jointly agreed to by both BEI and the SOUTHDIV. The grid size and vertical sampling interval will be determined based on field conditions. Samples will be analyzed for metals at an offsite laboratory using the methods outlined in Section 5.0. Analytical results will be compared with the IRGs to define the horizontal and vertical extent of contaminated soil requiring excavation.

An electric-powered jackhammer or clay spade will be used to excavate the contaminated soil. The excavated material will be placed in 55-gallon drums or other suitable containers meeting the requirements for storage and transport of hazardous waste. A Navy or subcontracted ordnance specialist will test for any buried ordnance before excavation and will act as safety observer. Should any unexploded ordnance be encountered, the Navy will be responsible to remove it.

After the excavation limits are achieved, final confirmatory samples will be collected from the excavation and sent for offsite analysis. Analytical results will be used to confirm that IRGs have been met prior to backfilling the excavation. Results will also be provided to the CLEAN contractor for NAS Key West for use in preparing human health and ecological risk assessments. Section 5.0 describes the approach for collecting confirmatory samples, and prescribes the analytical methods to be used to confirm the cleanup and risk assessment.

Waste classification samples will be taken from the containers filled with the excavated soil. Analytical results will be used for preparation of manifests and other documents required for off-site transport and disposal of the waste. The procedure for sampling the containers and the analytical methods required for waste classification are described in Section 5.0.

Backfilling of the excavated craters is not in the scope of work for this site.

4.6.4 Disposal of Contaminated Soil

Material will be handled and transported in accordance with Section 6.0.

4.7 AOC B - BIG COPPITT KEY ABANDONED CIVILIAN DISPOSAL AREA

4.7.1 Interim Remedial Action

The Navy has designated the IRA objective at the Big Coppitt Key Abandoned Civilian Disposal Area as contaminant source removal to prevent further migration of waste into other media. To accomplish this objective, the scope of work for the Big Coppitt Key Abandoned Civilian Disposal Area will consist of the following elements:

- excavate and remove trash and metal debris from decomposed car bodies;
- transport solid waste to a municipal landfill for disposal;
- transport hazardous waste (if any) to a RCRA-permitted treatment/disposal facility or the waste will be treated and disposed of in an appropriate facility;
- backfill and grade with organic substrate; and
- use natural recolonization and succession to replace any wetland areas disturbed during excavation.

4.7.2 Regulatory Requirements

RCRA Waste Analysis

The land around AOC-B was purchased by the Navy to prevent development of the area under the Boca Chica flight pattern. Sampling data suggests that no hazardous waste is present in soils on site. However, one sediment sample taken from this area may the toxicity characteristic level for lead (5 mg/L) based on the assumptions from totals anaylsis. Contaminated sediment excavated from this area that exceeds the TCLP limit for lead may require management, transportation, and disposal as hazardous waste (RCRA Waste Code D008).

Permits and Protection of Natural Resources

BEI will follow the specified requirements in the Environmental Protection Plan which accompanies this work plan. AOC-B is located in a mangrove wetland, but does not encompass any endangered species habitat areas of concern. A dredge and fill permit is required from FDEP, in addition to the excavation permit. BEI will assist the Navy to obtain the appropriate permits and will facilitate Navy interaction with the cognizant agencies and Natural Resources Trustees in order to provide notification of proposed remedial actions and site restoration.

Water Management Requirements

Erosion and runoff control will be practiced throughout the duration of excavation activities. Silt fences, surface flow barriers, and stabilization of disturbed areas will be used to control the erosion of loose silt or soil. Excavation will be performed such that stormwater runoff will not create a pathway for spread of contamination from the site.

4.7.3 Excavation of Car Bodies and Debris

Excavation limits will be determined prior to excavation by establishing a horizontal grid system and sampling each point of the grid at vertical intervals. The grid size and vertical sampling interval will be determined based on field conditions. Samples will be analyzed for metals by an offsite laboratory using the methods outlined in Section 5.0. Analytical results will be compared with the IRGs to define the horizontal and vertical extent of contaminated soil requiring excavation.

Excavation will begin at the south end of the disposal area and progress north (see Figure 3-11). The excavation will likely extend below the water table. Any material excavated from below the water table will be placed above grade on the leading edge of the excavation and allowed to drain back into the excavation. Intact car body parts will be segregated from the soil to the extent practicable and stockpiled separately from the soil in the open area between the road and canal. Any batteries or other lead-containing debris will be further segregated for shipment to a specifically licensed disposal facility. Any required stockpiling of material will be located at the upland, unvegetated areas northwest of the site.

After the excavation limits are achieved, final confirmatory samples will be collected from the excavation and sent for offsite analysis. Analytical results will be used to confirm that IRGs have been met prior to backfilling the excavation. Results will also be provided to the CLEAN contractor for NAS Key West for use in preparing human health and ecological risk assessments. Section 5.0

describes the approach for collecting confirmatory samples, and prescribes the analytical method to be used to confirm the cleanup and risk assessment.

Waste classification samples will be taken from the soil stockpile. Analytical results will be used to prepare manifests and other documents required for offsite transport and disposal of the waste. The procedure for sampling the stockpile and the analytical methods required for waste classification are described in Section 5.0.

Because the excavation will extend into the mangrove populated wetlands, care will be taken to minimize damage to the mangroves. Any necessary wetlands restoration and/or turf establishment will be performed as detailed in Section 4.18.

The excavation will be backfilled in 1 ft lifts and compacted as detailed in Section 4.15. Uncontaminated soil from the site will be used as backfill to the extent practicable.

4.7.4 Disposal of Excavated Car Bodies and Contaminated Soil

The crushed car bodies and metal debris will be loaded into dump trucks and transported to a local municipal disposal transfer station. Disposal of the excavated car bodies and debris will not require any specific sampling or handling.

Contaminated soil, if encountered, will be handled and transported in accordance with Section 6.0.

4.7.5 Site Access Control

The access to the site will be through the existing driveway entrance in the upland area north of the site. The use of this area will allow access to the site with a minimum of disturbance to the site. Minor grading and clearing will be required to utilize this means of access.

Once the IRA at the AOC-B site is complete, it will be necessary to restrict access to the site, especially from motor vehicles. The area used for the access road will be restored to the original grade. The access will be blocked with fencing or "Jersey" type concrete barriers until vegetation has grown enough to restrict access to the site.

4.8 RESERVED FOR SWMU NO. 1 - BOCA CHICA OPEN DISPOSAL AREA

4.9 RESERVED FOR SWMU NO. 2 - BOCA CHICA DDT MIXING AREA

4.10 RESERVED FOR IR NO. 1 - TRUMAN ANNEX REFUSE DISPOSAL AREA

4.11 IR NO. 3 - TRUMAN ANNEX DDT MIXING AREA

4.11.1 Interim Remedial Action

The Navy has designated the IRA objective at the Truman DDT Mixing Area as contaminant source removal to prevent further migration of waste into other media. To accomplish this objective, the scope of work for the Truman Annex DDT Mixing Area will consist of the following elements:

- excavation of pesticide, lead, and arsenic contaminated soils;
- transportation of waste to a RCRA-permitted treatment/disposal facility;
- backfill with clean fill; and
- stabilize with topsoil and sod. (alternatively, the site may be paved over for additional parking)

4.11.2 Regulatory Requirements

RCRA Waste Analysis

The IR-3 site was formerly the location of DDT Mixing Building 265. Sampling data has confirmed that DDT is present in the soil at this site. DDT is a listed RCRA waste when this commercial product has been spilled and contaminated soil or debris (see 40 CFR 261.33). Therefore, the soil that is contaminated with DDT will be classified as a hazardous waste with a RCRA waste code of U061. The excavated soil will be managed, transported, and disposed of in accordance with Federal and FDEP RCRA requirements.

Interim Remediation Goals

The IRG is the more stringent of the "Residential Preliminary Remediation Goals" or the "FDEP Residential Soil Cleanup Goals" as specified in Table 1-12 of the RFI\RI Report; or alternate values specified by SOUTHDIV.

Permits and Protection of Natural Resources

BEI will follow the requirements specified in the Environmental Protection Plan that accompanies this work plan. The designated IRA area for IR-3 is within a cleared and fenced area and does not impact any wetlands or endangered species habitat. No permits, other that required for excavation are needed in order to perform the IRA. BEI will facilitate Navy interaction with the cognizant agencies in order to provide notification of proposed remedial actions and site restoration.

Waste Management Requirements

Erosion and runoff control will be practiced throughout the duration of excavation activities. Silt fences, surface flow barriers, and stabilization of disturbed areas will be used to control the erosion of loose silt or soil. The excavation will be performed such that stormwater runoff will not create a pathway for migration of contamination. Some equipment on the site will come into contract with hazardous waste. Any waste water generated as a result of decontamination activities will be collected and sampled. If the testing determines that the water is contaminated, it will be disposed of accordingly.

Area of Concern (AOC) Designation

To facilitate implementation of the response action at this site, an AOC has been designated. The AOC concept was developed to clarify the definition of "onsite" in CERCLA. The regulatory definition of "onsite" in Section 300.400(e)(1), Title 40, Code of Federal Regulations, includes the "areal extent of contamination and all suitable area in very close proximity to the contamination necessary for implementation of the response action."

Remediation of the IR-3 site will be accomplished by excavating and transporting the contaminated soil to a licensed treatment and disposal facility. Due to the small size of the site, all the necessary heavy equipment and trucks cannot be mobilized inside the existing fenceline of the site. Additional area is required to implement the remedial action. Therefore, an AOC has been designated to allow this action to be performed in accordance with applicable regulatory requirements.

The location of the areas for excavation and mobilization of equipment are indicated in Figure 4-2 and are bounded by the area designated as the AOC. The entire AOC is on Navy property, and access to all these areas is restricted.

4.11.3 Excavation of Contaminated Soils

Primary excavation limits have been determined from the RFI/RI report and the additional field sampling performed by BEI. Additionally BEI will collect samples for the city property across Fort Street to determine if the contamination is present at that location as directed by the Navy. The horizontal limits of the excavation will include the entire area bounded by Fort Street, Truman Avenue, DeKalb Avenue and the sidewalk on the southeast side of the site. The vertical extent of the excavation will extend until soil contamination is below the prescribed limits, competent caprock is encountered, or the excavation reaches the water table. The excavation will not extend below water table. The extent of the excavation has be determined by the limits of the DDT contamination. The areas of high lead and arsenic contamination are contained within the same area and will be excavated with the DDT contaminated soils. The soils will be excavated, stockpiled if necessary, and then loaded into rolloff containers or directly into trucks for transportation to a RCRA-permitted treatment/disposal facility.

Two power poles are within ~~ghe~~ the area to be excavated to remove the contaminated soils. If the excavation affects the stability of the power poles, the Navy is to be consulted.

Additional sampling will be taken during and after excavation to confirm the removal of all the contaminated soils. These samples will be taken in the walls of the excavation at points determined prior to excavation. Additionally samples will be taken on the floor on the excavation where the IRGs were achieved before caprock or the water table is encountered. These samples will be analyzed for DDT onsite using the field screening methods outlined in Section 5.0.

After the excavation limits are achieved, Bechtel will collect final confirmatory samples from the excavation for offsite DDT and TAL metals analysis. Analytical results will be provided to the CLEAN contractor for NAS Key West for use in preparing human health and ecological risk assessments. Section 5.0 describes the approach for collecting confirmatory samples and the analytical methods to be used.

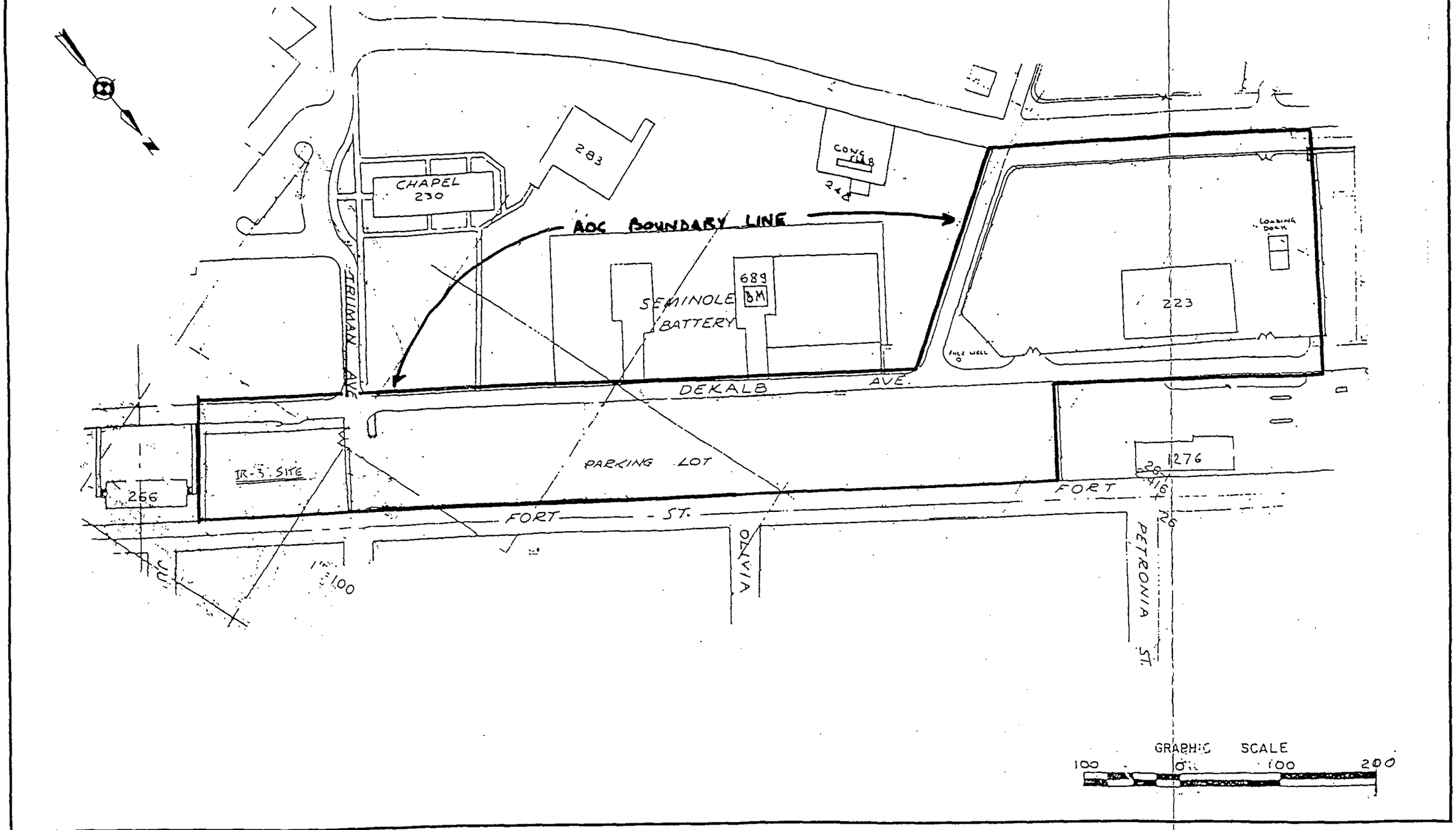


FIGURE 4-2.
IR NO. 3 - TRUMAN ANNEX (KEY WEST)
DDT MIXING AREA
AREA OF CONCERN BOUNDARY DESIGNATION

When the field screening sampling has shown that the IRGs have been achieved and upon concurrence of SOUTHDIV, the excavation will be backfilled in 1 ft. lifts and compacted as described in Section 4.15.7. Any necessary turf establishment will be performed as described in Section 4.18.

4.11.4 Disposal of Contaminated Soil

Contaminated soils will be handled and transported in accordance with Section 6.0.

4.12 MOBILIZATION

Mobilization will include delivering to the jobsite and work areas all construction equipment, tools, materials, supplies, and miscellaneous articles and establishing a work force sufficient to commence and sustain construction activities as required.

BEI will establish an onsite office in a building approved by NAS, or in trailers in an area designated by the Navy. Setup of any trailers will include electrical, sewer, and water connections.

4.13 CLEARING AND GRUBBING

Areas where IRAs are to be performed shall be cleared of all debris and vegetation as necessary in order to provide access for the work. Clearing shall consist of removing all designated vegetation and debris within the limits of areas designated for site remediation. Grass within the limits of clearing shall be mowed to a maximum height of 1 in. Clearing shall include the removal of trees and shrubs with a trunk diameter less than 2 in. with the exception of mangroves or other protected species which shall be removed only as directed by BEI and the NAS Key West environmental coordinator or his designee. Trees and shrubs with trunk diameter greater than 2 in. and vegetation along shorelines shall not be removed until BEI has coordinated removal with the NAS Key West environmental coordinator or his designee.

Grubbing shall include the removal of all plant, woody, and metallic debris not suitable for foundation purposes to a depth of not less than 18 in. All removed materials shall be suitably reduced in size for safe transport and storage. All materials generated as a result of clearing and grubbing operations shall be stockpiled in areas as directed by Public Works. The disposition of all materials generated as a result of clearing and grubbing operations shall be determined by the Public Works Office. The Technical Specification for Clearing and Grubbing is provided as Appendix A.

4.14 CIVIL SURVEYING

Surveying services will consist of performing necessary surveys, such as construction, boundary, contour, planimetric and/or grid and preparing associated drawings and documentation as agreed upon with SOUTHDIV. Surveying services will also include establishing the mean high water line at sites SWMU-1, AOC-A, AOC-B, and IR-8 before and after construction. Civil surveying will be performed in accordance with the Technical Specification for Surveying Services, included as Appendix B.

4.15 EARTHWORK CONSTRUCTION

4.15.1 Excavation Interferences

Prior to beginning excavation, the designated areas will be checked for existing utilities and other potential interferences. The BEI Project Superintendent will obtain excavation permits from the Naval Air Station, Southern Bell and Key Aqueduct. He will also perform a walkdown of the areas to be excavated to visually observe locations of manholes, hydrants, valves, open cuts, overhead obstructions, curbs, buildings, etc., and other unusual conditions. For the Truman Annex sites, the City of Key West Public Works Office will be consulted as well. In addition, the BEI Project Superintendent will perform location surveys using standard field utility detection equipment. No excavation will be initiated until the subgrade interference survey is complete.

4.15.2 Sampling Prior to Excavation

Prior to excavation, the contaminated soil areas designated for removal will be characterized in situ. No soil will be excavated until this sampling is complete. For additional information regarding in situ sampling prior to excavation, see Section 5.0.

4.15.3 Limits of Excavation

The estimated limits of excavation are indicated on the individual site figures in Section 3.0 of this RWP. The actual limits of excavation will be determined in the field based on sampling results or other methods as directed by BEI and jointly determined with the RPE or designee.

Once all material has been excavated and the extent of contaminated material requiring removal has been confirmed by an offsite laboratory, a registered land surveyor shall provide the necessary survey information (coordinates, cross-sections, elevations, etc.) to prepare as-built drawings for the excavation and backfill.

4.15.4 Method of Excavation

All excavation will be by backhoe and/or excavator where practical. In areas where interferences are present and preclude use of mechanized equipment, excavation will be by hand. All interferences such as existing utilities will be properly maintained while the excavation is in progress and remain protected until the excavation is backfilled.

4.15.5 Free Product Removal

Any free product encountered as a result of excavation and observed floating within the excavation will be removed to the extent practicable using an absorbent media. Expended absorbent media containing the recovered free product will be containerized and dispositioned in accordance with Section 6.0.

4.15.6 Contaminated Material Transport and Storage

As contaminated soil is excavated, the material will be temporarily stockpiled onsite or loaded into containers for temporary storage. All material will be stored, loaded, and transported in accordance with Section 6.0.

Temporary contaminated soil stockpiles shall be stored on a plastic liner draped over a perimeter berm to control runoff. A cover of plastic sheeting shall be in place at all times that material is not being added to or removed from the pile. The cover shall be suitably anchored to prevent wind erosion.

4.15.7 Backfill

Backfill of excavated areas will be performed after confirmatory sampling of the excavation is complete. In the interim, the area of excavation remaining open will be protected using temporary fencing to avoid inadvertent intrusion until the areas are backfilled. Backfill material will be from approved, offsite borrow areas. All material placed within the excavations will be field compacted with the tracks of earth moving equipment or roller compactors to a minimum of 85 percent Proctor (ASTM D1557) or no less than 4 passes of the earth moving equipment. Material shall be compacted in lifts of approximately 1 ft.

Prior to backfilling, an appropriate amount of crushed stone may be provided as a bottom layer in order to stabilize saturated material resulting from groundwater intrusion within the open excavation. If required, this layer of crushed stone will provide the means to achieve the desired compaction. Backfilling with a layer of gravel will be at the discretion of the Site Superintendent.

4.16 FENCING

Temporary fencing shall be installed in accordance with the Technical Specification for Fencing, included as Appendix H. Temporary fencing will be installed around IR-3 only as a safety precaution while the excavation is open. The existing fence on the north west, and south sides of IR-3 will be removed and will not be replaced.

4.17 TRANSPORTATION

4.17.1 DOT Classification

The DOT classification of the material is provided and can be found in the hazardous materials table (HMT) (49 CFR 172.101). The table will be reviewed for the contaminated material deemed present on the site by BEI. After review of the table, the waste management coordinator will determine the appropriate classification. After the classification has been made, it will be necessary to contain the material.

4.17.2 Containment

The material will be contained based on the requirements provided in the HMT (49 CFR 172.101 and 49 CFR 173). At NAS Key West the current selected containment includes: "sift-proof containers," "strong tight containers," and 1A1 or 1A2 drums. Additional packages may be required as other contaminated materials are identified.

4.17.3 Control

The material will be controlled onsite by staging in an appropriate area that will maintain the integrity of the container and the segregation of the contaminated materials in accordance with 49 CFR 176.83. Controls will be applied during transport to ensure that the load is blocked/braced sufficiently for transport on public highways, the material is segregated appropriately, and the material will be transported "exclusive use" when reasonably achievable.

4.17.3 Communication

The hazard of the contaminated material will be communicated to the public using shipping papers (Bills of Lading or Hazardous Waste Manifest), placarding the load, and labeling the container. The completion of the shipping papers will be accomplished in accordance with 49 CFR 172.200. The load will be placarded in accordance with 49 CFR 172.500, and the container will be labeled in accordance with 49 CFR 172.400.

4.18 TURF ESTABLISHMENT

After all disturbed areas of excavation and/or grading have been successfully completed, the sites shall be restored as directed by BEI field personnel. In areas where turf is to be established, seeding or sodding shall be performed as directed by BEI in accordance with the Technical Specification for Turf Establishment, which is included as Appendix I.

Sod shall be used for turf establishment for relatively small areas requiring revegetation. St. Augustine grass sod shall be used, with the variety (e.g., Floritam, Roselawn, etc.) to be designated by BEI in the field based on conditions and availability.

Seeding shall be used for establishing vegetation on larger disturbed areas. A mixture of Hulled Common Bermudagrass and Scarified Pensacola Bahiagrass shall be used as directed by BEI. BEI may specify other seed if necessary due to local conditions.

Fertilizer shall be 10-10-10, spread at the rate directed by BEI field personnel.

Any wetland or mangrove areas disturbed during the implementation of an IRA will be allowed to revegetate by means of natural recolonization and succession. The disturbed sites would be backfilled with an organic substrate to the natural elevation. Then the site would be allowed to naturally revegetate. The required success criteria will be defined by the wetlands permit.

4.19 SCHEDULE

The proposed schedule of construction and operations is included in Attachment 3. The schedule is subject to change because of uncertainties related to the resolution of regulatory issues, approvals, permits, and final decisions on remedial actions.

5.0 SAMPLING AND ANALYSIS PLAN

This section presents the Sampling and Analysis Plan (SAP) for the following activities: (1) sampling and analysis to define the horizontal and vertical limits of excavation; (2) confirmatory sampling and analysis to ensure IRGs have been attained; (3) sampling and analysis to profile the waste for the purpose of handling, transportation, and disposal; and (4) sampling and analysis of groundwater to define the extent of contamination and to monitor the influent and effluent streams of a treatment system. Sampling methodologies and procedures described in this SAP are based on FDEP's *Standard Operating Procedures for Laboratory Operations and Sample Collection Activities* (DER QA-001/92).

5.1 SAMPLING PROTOCOL

5.1.1 Decontamination

Sampling equipment will be decontaminated prior to collection of each sample. Decontamination will be completed in accordance with Section 4.1, "Decontamination," of FDEP's *Standard Operating Procedures for Laboratory Operations and Sample Collection Activities*. Used decontamination fluids will be containerized, stored and disposed of in accordance with Section 6.0 of this RWP.

5.1.2 Sample Collection

Sampling, with the exception of field screening, will be performed in accordance with Section 4.0, "Sampling Procedures," of FDEP's *Standard Operating Procedures for Laboratory Operations and Sample Collection Activities*.

5.1.3 Sample Identification

Sample identification will be in accordance with Navy RAC Project Procedure 6003, Sample Identification and Data Encoding.

5.1.4 Data Entry Verification

All data will be loaded into the project database and will be subject to a 100% verification. This includes data generated by field activities or as a result of laboratory analysis. The verification process begins with manual entry or electronic loading of the data. Printouts of this information from the project database will be compared to the original hard copy of the data and discrepancies resolved.

Documentation of all verification activities will be performed by the individual performing the verification. This documentation will consist of a signature of the person who performed the verification in the hard copy printouts from the project database. These signed verification printouts will be forwarded to the database manager or designee for review.

5.1.5 Data Review

All data packages will be contract compliance screened upon receipt. This screen will evaluate technical holding times, contractual turn around times, appropriate analytical methodology, and completeness of the analytical data package. A cursory technical review will also be performed.

This review is not a full validation but will evaluate spike recoveries (matrix and surrogate), method blanks, duplicates and laboratory control sample recoveries.

5.2 FIELD SAMPLING AND ANALYSIS

Sampling protocol for identified samples will follow the FDEP's SOPs as outlined in Section 5.1.2. Analyses of these samples will be in accordance with FDEP's *Standard Operating Procedures for Laboratory Operations and Sample Collection Activities*. The requirements for the various phases of soil and groundwater sampling and analysis are described below.

5.2.1 Excavation Limit Sampling/Initial Waste Profiling

Sampling and analysis will be conducted to define the horizontal and vertical extent of soil with contamination exceeding the IRGs as described for each site in Section 4.0. This activity will be completed in advance of excavation. Analyses will be performed both onsite and offsite. Analysis for PCBs, PAHs, and BETX will be conducted onsite using field-screening (immunoassay) methods. The Data Quality Objectives (DQOs) for onsite analysis will be at Level II. Five percent of the samples will be analyzed in an offsite laboratory with a DQO Level III to validate the onsite analysis. Analysis for metals will be conducted in an offsite laboratory at DQO Level III. Attachment 1 provides a detailed description of the Delineation Sampling Plan.

In order to determine handling requirements for the material to be excavated, data on the presence or absence of toxicity characteristics are needed. Samples will be collected in accordance with the Delineation Sampling Plan and analyzed at an offsite laboratory using the toxicity characteristics leaching procedure (TCLP) to provide this data.

Site specific requirements for the excavation limit and the initial waste profiling are summarized in Table 5-1.

5.2.2 Confirmatory Sampling and Analysis

Once the excavation limits are achieved for any given site, confirmatory samples will be taken from the excavation. A biased statistical approach, based on the source areas and preferential pathways of contamination will be used to select the sample locations (*Michigan Department of Natural Resources, Guidance Document for Verification of Soil Remediation*, April 1994). Using this approach minimizes the number of samples needed to verify that the IRGs have been achieved. The site specific sampling and analysis requirements and estimated number of confirmatory samples are summarized in Tables 5-1 and 5-2, respectively.

All confirmatory samples will be analyzed in an offsite laboratory at DQO Level III for the site-specific potential contaminants of concern. Five percent (3 minimum) of the confirmatory samples will also be analyzed at DQO Level IV (CLP protocol) for the full target analyte list (TAL) and target compound (TCL). Table 5-3 describes the TAL/TCL analyses to be performed on these samples. Results from this task will be used to confirm that IRGs have been achieved. These DQOs will allow the results to be used in baseline human health and ecological risk assessments of a site in its post-interim measure (altered) state. These risk assessments will be prepared by the CLEAN contractor.

See comment p. 2-5

Table 5-1
Site Specific Sampling and Analysis Requirements

SWMU 3: FIRE FIGHTING TRAINING AREA

Sample Event	Analytical Method	DQO Level	Volume	Sample Container	Preservative	Holding Time	QC Samples Required
Excavation Limit							
PAH	Immunoassay	II	100 g	4 oz jar	None	Analyze immediately	Dup: 1/20 RB: 1/10
BETX	Immunoassay	II	100 g	4 oz jar	None	Analyze immediately	Dup: 1/10 RB: 1/20
5% to lab	PAH by 8270	III	300 g	8 oz widemouth glass w/ Teflon septum	Cool 4°C	14 days until extraction 40 days until analysis	
5% to lab	BTEX by 8020	III	300 g	8 oz widemouth glass w/ Teflon septum	Cool 4°C	14 days until analysis	
Initial Waste Profile							
TCLP BNAs	EPA 1311 extraction EPA 8270 analysis	III	300 g	8 oz widemouth glass w/ Teflon lined cap	Cool 4°C	14 days until extraction 40 days until analysis	RB: 1/20 or 1 weekly Dup: 1/20
TCLP VOCs	EPA 1311 extraction EPA 8240 analysis	III	100 g	4 oz jar w/Teflon septum no headspace	Cool 4°C	14 days until extraction 14 days until analysis	RB: 1/20 or 1 weekly Dup: 1/20
Confirmatory							
PAH	EPA 8270	III	300 g	8 oz widemouth glass w/ Teflon septum	Cool 4°C	14 days until extraction 40 days after extraction	RB: 1/20 or 1 weekly Dup: 1/20
BETX	EPA 8020	III	300 g	8 oz widemouth glass w/ Teflon septum	Cool 4°C	14 days until analysis	RB: 1/20 or 1 weekly Dup: 1/20

Table 5-1
Site Specific Sampling and Analysis Requirements

SWMU 7: BUILDING A-824

Sample Event	Analytical Method	DQO Level	Volume	Sample Container	Preservative	Holding Time	QC Samples Required
Excavation Limit							
PCB	Immunoassay	II	100 g	4 oz jar	None	Analyze Immediately	Dup: 1/10 RB: 1/20
5% to the lab	EPA 8080	III	300 g	8 oz widemouth glass w/ Teflon septum	Cool 4°C	14 days until extraction 40 days until analysis	
Initial Waste Profile							
TCLP metals	EPA 1311 extraction EPA 6000/7000 analysis	III	300 g	8 oz widemouth glass w/Teflon lined cap	Cool 4°C	14 days until extraction 180 days until analysis	RB: 1/20 or 1 weekly Dup: 1/20
Confirmatory							
PCB	EPA 8080	III	300 g	8 oz widemouth glass w/ Teflon septum	Cool 4°C	14 days until extraction 40 days until analysis	RB: 1/20 or 1 weekly Dup: 1/20

Table 5-1
Site Specific Sampling and Analysis Requirements

SWMU-9: JET ENGINE TEST CELL

Sample Event	Analytical Method	DQO Level	Volume	Sample Container	Preservative	Holding Time	QC Samples Required
Groundwater/Treatment System Monitoring							
TRPH	EPA 418.1	III	1 L	1 L glass bottle w/ Teflon lined cap	HCL to pH<2 Cool 4°C	14 days	TB: 1/cooler per shipment RB: 1/20 or 1 weekly Dup: 1/20
VOCs	EPA 8240	III	40 mL	2-40 mL glass vials w/Teflon septum	HCL to pH<2 Cool 4°C	14 days	TB: 1/cooler per shipment RB: 1/20 or 1 weekly Dup: 1/20
Total Naphthalenes	EPA 8270	III	1 L	1 L glass bottle w/ Teflon septum	HCL to pH<2 Cool 4°C	14 days until extraction 40 days until analysis	TB: 1/cooler per shipment RB: 1/20 or 1 weekly Dup: 1/20

Table 5-1
Site Specific Sampling and Analysis Requirements

IR 3: TRUMAN ANNEX DDT

Sample Event	Analytical Method	DQO Level	Volume	Sample Container	Preservative	Holding Time	QC Samples Required
Excavation Limit							
DDT	Immunoassay	II	100 g	4 oz jar	None	Analyze immediately	Dup: 1/10 RB: 1/10
5% to lab	DDT by 8080	III	300 g	8 oz widemouth glass w/Teflon lined cap	Cool 4°C	14 days	
100% to lab	Pb, As by 7000	III	300 g	8 oz widemouth glass w/Teflon lined cap	Cool 4°C	14 days	RB: 1/20 or 1 weekly Dup: 1/20
Confirmatory							
Pesticides	EPA 8080	III	300 g	8 oz widemouth glass w/ Teflon lined cap	Cool 4°C	14 days until extraction 40 days after extraction	RB: 1/20 or 1 weekly Dup: 1/20
TAL Metals	EPA 6010	III	300 g	8 oz widemouth glass or plastic	Cool 4°C	6 months	RB: 1/20 or 1 weekly Dup: 1/20
Waste Profile							
TCLP pesticides	EPA 1311 extraction EPA 8080	III	300 g	8 oz widemouth glass w/Teflon septum	Cool 4°C	14 days	RB: 1/20 or 1 weekly Dup: 1/20
TCLP metals	EPA 1311 extraction EPA 7000 analysis	III	300 g	8 oz widemouth glass w/Teflon lined cap	Cool 4°C	14 days	RB: 1/20 or 1 weekly Dup: 1/20

Table 5-1
Site Specific Sampling and Analysis Requirements

AOC A: DEMOLITION KEY

Sample Event	Analytical Method	DQO Level	Volume	Sample Container	Preservative	Holding Time	QC Samples Required
Excavation Limit							
100% to lab	Sb, Pb, As by 7000	III	300 g	8 oz widemouth glass or plastic	Cool 4°C	6 months	RB: 1/20 or 1 weekly Dup: 1/20
Intitial Waste Profile							
TCLP metals	EPA 1311 extraction EPA 7000 analysis	III	300 g	8 oz widemouth glass w/Teflon lined cap	Cool 4°C	14 days until extraction 180 days until analysis	RB: 1/20 or 1 weekly Dup: 1/20
Confirmatory							
TAL metals	EPA 6010/7000	IV ?	300 g	8 oz widemouth glass or plastic	Cool 4°C	6 months	RB: 1/20 or 1 weekly Dup: 1/20

Table 5-1
Site Specific Sampling and Analysis Requirements

AOC B: BIG COPPITT KEY

Sample Event	Analytical Method	DQO Level	Volume	Sample Container	Preservative	Holding Time	QC Samples Required
Excavation Limit							
TAL Metals	EPA 6010	III	300 g	8 oz widemouth glass w/Teflon lined cap	Cool 4°C	6 months	RB: 1/20 or 1 weekly Dup: 1/20
Waste Profile							
TCLP metals	EPA 1311 extraction EPA 7000 analysis	III	300 g	8 oz widemouth glass w/Teflon lined cap	Cool 4°C	14 days until extraction 180 days until analysis	RB: 1/20 or 1 weekly Dup: 1/20
Confirmatory							
TAL Metals	EPA 6010/7000	IV ?	300 g	8 oz widemouth glass or plastic	Cool 4°C	6 months	RB: 1/20 or 1 weekly Dup: 1/20

Table 5-2
Estimated Number of Confirmatory Samples

Location	Number of samples from excavation floor	Number of samples from excavation wall	Total number of samples (including QC samples)
SWMU-1	TBD	TBD	TBD
SWMU-2	TBD	TBD	TBD
SWMU-3	2	4	9
SWMU-7	2	4	8
IR-1	TBD	TBD	TBD
IR-3	10	20	36
AOC-A	4	4	10
AOC-B	14	8	26

Table 5-3
Confirmatory Sampling and Analysis Requirements

Confirmatory Analysis	Analytical Method	DQO Level	Volume	Sample Container	Preservative	Holding Time	QC Samples Required
TCL VOCs	CLP SOW	IV	100 g	4 oz widemouth glass w/Teflon septum no headspace	Cool 4°C	14 days	RB: 1/20 or 1 weekly Dup: 1/20 TB: 1/cooler/shipment
TCL BNAs	CLP SOW	IV	300 g	8 oz widemouth glass w/Teflon septum	Cool 4°C	14 days until extraction 40 days until analysis	RB: 1/20 or 1 weekly Dup: 1/20
TAL Metals	CLP SOW	IV	300 g	8 oz widemouth glass w/Teflon lined cap	Cool 4°C	6 months	RB: 1/20 or 1 weekly Dup: 1/20
TCL Pesticides/PCBs	CLP SOW	IV	300 g	8 oz widemouth glass w/Teflon septum	Cool 4°C	14 days until extraction 40 days until analysis	RB: 1/20 or 1 weekly Dup: 1/20

5.2.3 Final Waste Profile Sampling and Analysis

Excavated soils that failed the initial TCLP tests will be either stockpiled or containerized (in 55-gal drums) depending on the soil volume and other logistical considerations as is described in Section 4.0. Samples of the excavated soils will be taken and analyzed to determine the complete waste profile. Drill spoils from the Jet Engine Test Cell will be containerized in 55-gal drums. Samples of the drill spoils will be taken and analyzed to determine if the waste is hazardous. The results will appear on the waste profile sheets and the manifest.

For stockpiled soils, a grid will be established in approximately 2,500 ft^2 (50 ft by 50 ft) sections. A composite sample will be collected from each section of the grid, with subsamples from each corner and the center of the section, and from the top, middle and bottom of each location (a total of 15 subsamples per section). For soils or drill spoils containerized in 55-gal. drums, a composite sample will be collected by subsampling ten drums. Composite samples will be thoroughly mixed prior to shipment to an offsite laboratory for analysis. Sufficient sample volumes will be collected to ensure that all waste profiling analyses can be completed as described below.

Table 5-4 summarizes the additional analytical requirements. All waste profile analyses will be completed at DQO Level III.

5.2.4 Groundwater Sampling and Analysis

Prior to the installation of the groundwater containment system at the Jet Engine Test Cell, baseline sampling will be conducted to define the extent of the chlorinated VOC plume and confirm the extent of the JP-5 plume. Samples will be obtained from the monitoring wells specified in Section 4.3.3. Following the installation of the hydraulic containment system, these monitoring wells will continue to be sampled, along with the influent and effluent streams of the groundwater treatment system, to monitor the performance of the system. All groundwater samples will be analyzed for the constituents specified in Table 5-1 at DQO Level III. The frequency of the sampling will be weekly for the first month of operation, monthly thereafter for the first quarter of operation, and quarterly thereafter.

5.3 SAMPLE HANDLING/CHAIN-OF-CUSTODY

5.3.1 Logbooks

Field logbooks will be used for recording all field activities. Entries will include sufficient detail to reconstruct all significant activities. Logbook entries will be completed in accordance with Section 5.0, "Sample Custody and Documentation," of the FDEP's *Standard Operating Procedures for Laboratory Operations and Sample Collection Activities*. This Standard Operating Procedure (SOP) includes the minimum requirements for recordkeeping.

5.3.2 Chain-of-Custody Records

In order to maintain sample traceability, each sample for offsite analysis will be properly documented on a chain of custody record. Chain-of-custody documentation will be completed in accordance with Section 5.0, "Sample Custody and Documentation," of the FDEP's *Standard Operating Procedures for Laboratory Operations and Sample Collection Activities*. This SOP includes the minimum requirements for recordkeeping.

Table 5-4
Final Waste Profile Sampling and Analysis Requirements

Waste Profile Analysis	Analytical Method	DQO Level	Volume	Sample Container	Preservative	Holding Time	QC Samples Required
TCLP Metals	EPA 1311 extraction EPA 7000 analysis	III	300 g	8 oz widemouth glass w/Teflon lined cap	Cool 4°C	14 days until extraction 180 days until analysis	RB: 1/20 or 1 weekly Dup: 1/20
TCLP VOCs	EPA 1311 extraction EPA 8240 analysis	III	100 g	4 oz jar w/Teflon septum no headspace	Cool 4°C	14 days until extraction 14 days until analysis	RB: 1/20 or 1 weekly Dup: 1/20
TCLP Pesticides	EPA 1311 extraction EPA 8080 analysis	III	300 g	8 oz widemouth glass w/Teflon septum	Cool 4°C	14 days until extraction 14 days until analysis	RB: 1/20 or 1 weekly Dup: 1/20
TOX	EPA 9020 modified	III	300 g	4 oz clear widemouth	Cool 4°C	28 days	RB: 1/20 or 1 weekly Dup: 1/20
Reactivity	EPA 9010	III					
Corrosivity	EPA 9045	III	600 g total	16 oz widemouth glass w/Teflon lined cap	None	None	
Flashpoint	D-56 modified	III					
DOT Test	ASTM D4359-84	III	100 g	8 oz widemouth glass w/Teflon lined cap	None	None	
Gradation	ASTM D2487	II					
Optimum Moisture Content	ASTM D2216	II	4 kg total	5 gal bucket	None	None	
Density	ASTM D2487	II					

5.3.3 Packaging and Holding Times

Sample volume requirements, preservation techniques, minimum holding times, and container material requirements for samples are given in Table 5-1, 5-3, and 5-4 for each SWMU and IR. The Staff Engineer is responsible for ensuring that a sufficient volume of each sample is collected and placed in the appropriate container with proper preservation.

The preparation of all sampling containers and the container types, preservatives, and holding times are specified in the FDEP's *Standard Operating Procedures for Laboratory Operations and Sample Collection Activities*. Section 4.4 of the FDEP SOP contains the recommended container, preservation, and holding times for water, wastewater, soil, and sediment samples. Sample containers will meet all specifications outlined in the above-mentioned procedures.

6.0 WASTE MANAGEMENT

BEI's Program Hazardous Waste Management Plan and Project Procedure 9001 will be used as guidance and appropriately followed for this work. Waste management activities will be coordinated with the NAS and ROICC.

6.1 HAZARDOUS WASTE

Hazardous waste will be identified and managed in accordance with RCRA (40 CFR Parts 260, 261, 262, 264, 265, 268, 270, and 271) and TSCA (40 CFR Part 761). In the event that hazardous waste is generated, an EPA identification number will be obtained by the Navy before treatment, storage, disposal, or transportation of hazardous waste. Hazardous waste will not be offered to any transporters or treatment, storage or disposal facilities (TSDFs) that do not have an EPA identification number.

6.2 WASTE MINIMIZATION

To minimize the amount of materials that must be disposed, waste minimization practices will be implemented during operations. These practices include, but are not limited to:

- no extraneous materials taken into contamination control areas;
- decontamination and free release of equipment used to support onsite activities, to the extent practicable;
- use of consumables that can be compacted or otherwise volume reduced, to the extent practicable; and
- soil removed during sampling returned to the hole from which it was removed.

Personal protective equipment (PPE) that is not visibly soiled will be disposed of as conventional waste. Contaminated portions of PPE will be managed as hazardous waste.

6.3 CONTAMINATED SOIL TEMPORARY STORAGE

Excavated soil will be stockpiled or containerized until it has been sampled and analyzed for parameters identified by the TSDF. The soil excavated from the small volume sites (SWMU 7, AOC A) will be placed in 55-gal drums or other suitable containers; drill spoils from the Jet Engine Test Cell will be handled similarly. The soil will then be transported to the TSDF.

6.4 CONTAMINATED WATER

Water generated during well development and aquifer testing at the Jet Engine Test Cell will be containerized in portable tanks and treated, if necessary, by the treatment system that will be installed at the Jet Engine Test Cell. The influent and effluent from the treatment system will be sampled and analyzed for parameters to ensure compliance with all federal, state, and local requirements.

Decontamination water will be containerized and sampled. Contaminated water will be treated and disposed of in accordance with applicable state and federal regulations. Contaminated water that meets the acceptance criteria for the NAS Key West POTW will be disposed of on a case by case basis depending on the availability of POTW capacity at the time of disposal; when the POTW is not available the next least expensive method of offsite disposal will be selected.

6.5 FREE PRODUCT REMOVAL

Floating non-aqueous phase liquids (i.e. free product) encountered in excavations will either be collected with absorbent materials or removed with a skimmer or vacuum system designed for the purpose, depending upon the volume of the floating contaminant.

Expended absorbent media used to recover free product from excavated soil will be containerized in lined 55-gal drums. A representative sample will be collected from each container and analyzed for parameters identified in the TSDF's waste acceptance criteria to determine if the waste is hazardous or nonhazardous.

6.6 NONHAZARDOUS SOLID WASTE DISPOSAL

Any nonhazardous solid waste that is generated as a result of mobilization will be properly disposed of onsite, if directed by the Navy, or offsite to a municipal or industrial landfill.

6.7 HAZARDOUS WASTE TRANSPORTATION

The Technical Specification for Transportation of Contaminated Materials (Appendix F) provides guidance for loading transporting and manifesting of hazardous wastes and other contaminated materials.

Hazardous waste will be packaged, labeled, marked and transported offsite in accordance with applicable DOT hazardous material regulations (49 CFR Parts 171 through 179). In addition, all TSDF waste acceptance criteria will be adhered to, and the applicable manifests will be completed by BEI for signature by the Navy.

Contaminated materials transported from NAS Key West sites will be transported in accordance with the Department of Transportation (DOT) regulations Sections 100-177. After contaminated materials have been identified by BEI, these sections provide the information necessary to classify, contain, control, and communicate the material. BEI will prepare shipment manifests for signature by the NAS.

7.0 SAFETY AND HEALTH

A Program Safety and Health Plan (PSHP) defines policies for work on the Navy RAC Project. A Site Safety and Health Plan (SSHP) has been prepared to provide guidance on all sites under the contract for the Navy RAC Bases. Addendum No. 8, which is submitted along with this work plan, to the SSHP for Navy RAC Bases will be followed during remediation activities at NAS Key West.

8.0 QUALITY CONTROL PLAN

A Quality Control Program Plan (QCPP) defines policies for work on the Navy RAC Project. A Quality Control Plan Addendum (QCPA) has been prepared for NAS Key West, Florida and is submitted along with this work plan. The QCPA defines site-specific requirements for the remediation at NAS Key West.

The QCPP and QCPA will be administered as directed by the QC Manager. The purpose of the QCPP/QCPA is to provide adequate confidence that the IRAs defined in DO No. 0004 have been satisfied. This objective is accomplished by oversight, the QC system, performance assessments, and review of compliance with program plans and work guidance documents.

9.0 REGULATORY REQUIREMENTS

The scope of work for this RWP is being conducted under authority of the Navy's IR program and in conjunction with the Navy's RCRA program. As such, there are a variety of regulations that apply or should be considered during the response action. This section briefly summarizes some of the major regulatory drivers and discusses their impacts on the proposed work.

9.1 CERCLA AND RCRA

NAS Key West and supporting facilities are located on several islands in the Florida Keys, including Boca Chica Key and Key West. Boca Chica Airfield has a HSWA Part B permit (jointly issued by EPA Region IV and the State of Florida), with the jurisdictional boundaries of the permit drawn at the edges of the island. The island of Key West is being remediated under the Navy IR program and therefore may utilize CERCLA authority to implement cleanup actions.

A RFI has been performed for the six SWMUs on the site, and concurrently, a RI has been performed for six sites identified for investigation under the IR program.

9.2 FLORIDA PETROLEUM CLEANUP REGULATIONS

Cleanup of the Jet Engine Test Cell will be conducted under the Florida petroleum cleanup regulations. When it has been determined that a site has been contaminated with petroleum (including aviation fuel), as defined in the cleanup regulations, then the provisions of the Petroleum Contamination Cleanup Criteria, Florida Administrative Code (FAC), Chapter 17-770 must be met. In addition, should thermal treatment be selected as the cleanup alternative, then the procedures and cleanup goals in the soil thermal treatment guidelines (FAC 17-775, Soil Thermal Treatment Facilities) must be met.

(**NOTE**: Regulations contained in FAC Chapter 17, including 17-761, 17-770, and 17-775 are being recodified by FDEP into Title 62.)

9.3 AIR EMISSIONS REQUIREMENTS

Operation of an air stripper for remediation of petroleum contaminated groundwater requires compliance with limits and procedures dictated by the local Air Quality District. Some areas of Florida are designated as non-attainment zones for various air pollutants. Local Air Quality District offices, in conjunction with county authorities, will establish emission limitations and/or control technology requirements for such areas.

The Southeast Air Quality District, located in Miami, is the local FDEP Air Quality District office for Monroe County. Monroe County is an attainment zone for ozone (FAC 17-274.410); therefore, it is not anticipated that FDEP provisions relating to VOCs will be triggered. An Air Quality District Worksheet will be prepared to determine whether any air quality permit is required.

9.4 WATER MANAGEMENT REQUIREMENTS

Water Management Districts have been delegated the authority to regulate surface and groundwater projects and uses. Procedures and requirements for permitting of consumptive uses of water and water well regulations for the South Florida Water Management District are contained in FAC 40E-1 et. seq. The Water Management District may have specific requirements for monitoring and extraction wells.

A potential remedy for one of the sites on Boca Chica is a groundwater pump-and-treat system. This system will require that treated groundwater be discharged to either a surface water body or the NAS POTW or be reinjected to the aquifer. A preliminary review of the three options indicates that reinjection may be the most viable alternative. Florida Underground Injection Control Regulations (FAC 17-28) will provide the performance criteria and permitting requirements for this alternative.

9.5 NATURAL RESOURCE LAWS AND REGULATIONS

BEI, in conjunction with NAS Key West, has determined the sites where boundaries of excavation or contamination impact regulated wetland areas, endangered species habitat (marsh rabbit), or require alteration of mangroves. In those instance where remedial action activities impact regulated natural resources, appropriate permitting and mitigation measures will be taken. The Environmental Protection Plan for Key West addresses in detail the applicable natural resource regulations for Key West, coordination with Natural Resource Trustees, and plans for maintaining compliance with these regulations.

The Environmental Protection Plan is being submitted to the Navy in conjunction with this RWP.

ATTACHMENT 1

DELINEATION SAMPLING PLAN

FOR

SWMU 3, SWMU 7, AOC-A, AOC-B, AND IR-3

AT THE

NAVAL AIR STATION, KEY WEST, FLORIDA

ATTACHMENT 2

TABLE 1-12 OF FINAL REPORT

RCRA FACILITY INVESTIGATION REMEDIAL INVESTIGATION

NAVAL AIR STATION, KEY WEST

AS PREPARED BY IT CORPORATION

JUNE 7, 1994

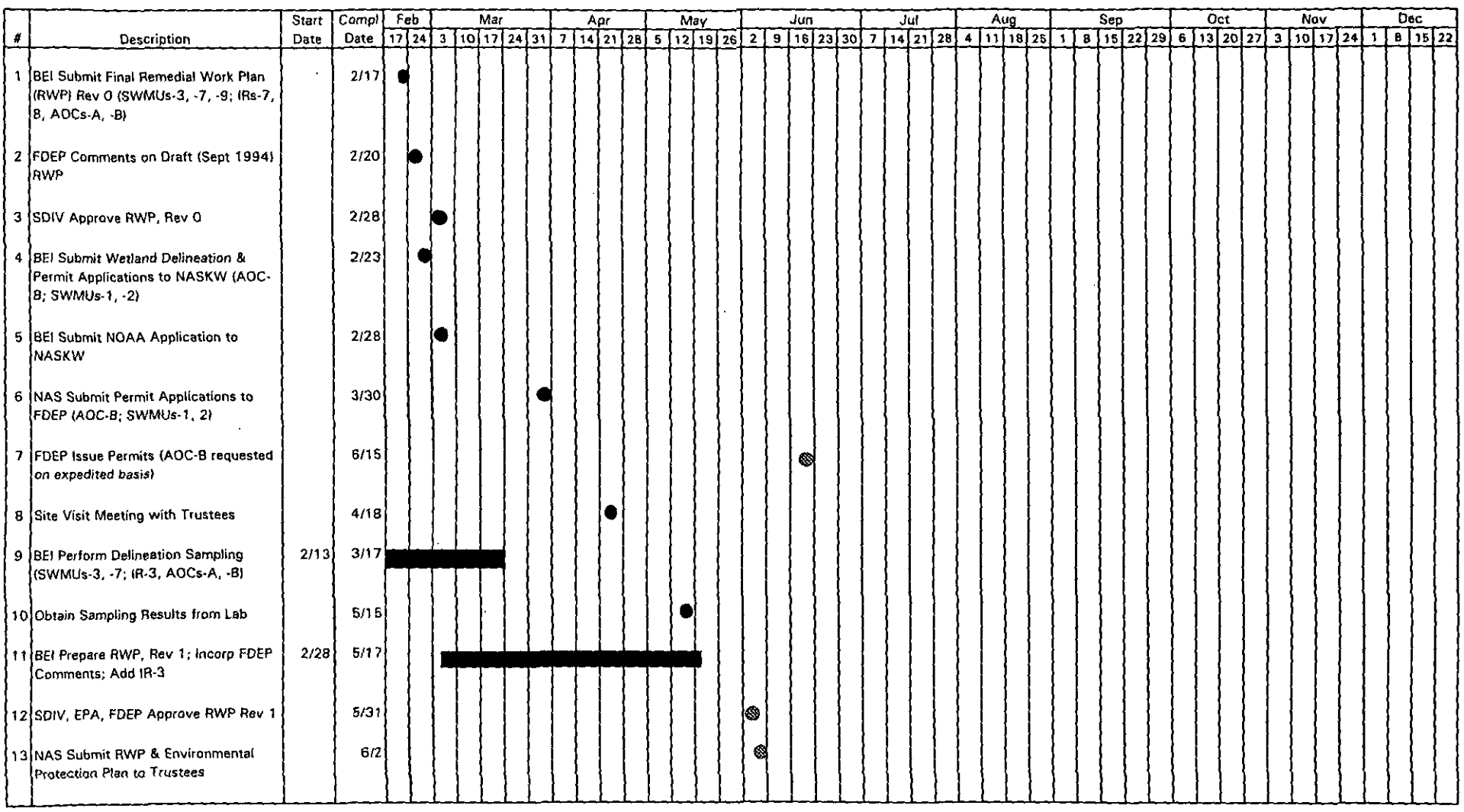
ATTACHMENT 3

CONSTRUCTION SCHEDULE

NAS KEY WEST
SWMU-3, 7, 9; IR-3, 7, 8; AOC-A, B

15 May 1995

#	Description	Start Date	Compl Date
1	BEI Submit Final Remedial Work Plan (RWP) Rev 0 (SWMUs-3, -7, -9; IRs-7, 8, AOCs-A, -B)		2/17
2	FDEP Comments on Draft (Sept 1994) RWP		2/20
3	SDIV Approve RWP, Rev 0		2/28
4	BEI Submit Wetland Delineation & Permit Applications to NASKW (AOC-B; SWMUs-1, -2)		2/23
5	BEI Submit NOAA Application to NASKW		2/28
6	NAS Submit Permit Applications to FDEP (AOC-B; SWMUs-1, 2)		3/30
7	FDEP Issue Permits (AOC-B requested *on expedited basis*)		6/15
8	Site Visit Meeting with Trustees		4/18
9	BEI Perform Delineation Sampling (SWMUs-3, -7; IR-3, AOCs-A, -B)	2/13	3/17
10	Obtain Sampling Results from Lab		5/15
11	BEI Prepare RWP, Rev 1; Incorp FDEP Comments; Add IR-3	2/28	5/17
12	SDIV, EPA, FDEP Approve RWP Rev 1		5/31
13	NAS Submit RWP & Environmental Protection Plan to Trustees		6/2



Action Complete

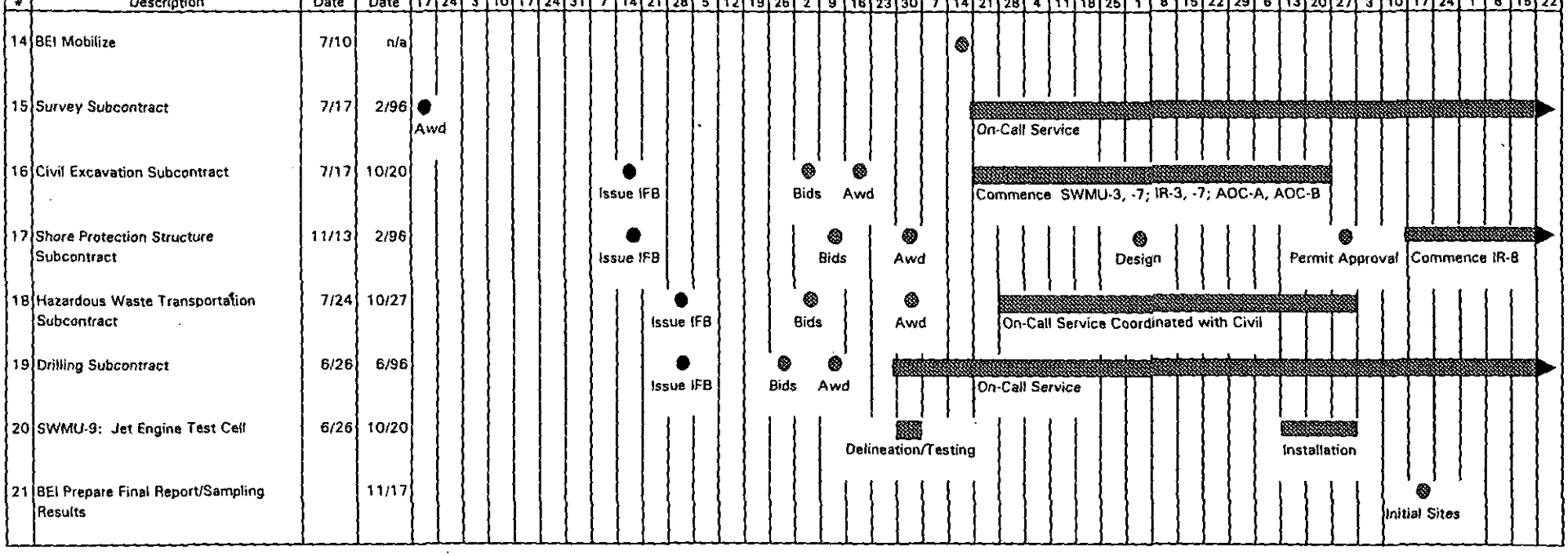
Action Scheduled

Attachment 3

NAS KEY WEST
SWMU-3, 7, 9; IR-3, 7, 8; AOC-A, B

15 May 1995

#	Description	Start Date	Compl Date
14	BEI Mobilize	7/10	n/a
15	Survey Subcontract	7/17	2/96
16	Civil Excavation Subcontract	7/17	10/20
17	Shore Protection Structure Subcontract	11/13	2/96
18	Hazardous Waste Transportation Subcontract	7/24	10/27
19	Drilling Subcontract	6/26	6/96
20	SWMU-9: Jet Engine Test Cell	6/26	10/20
21	BEI Prepare Final Report/Sampling Results		11/17



Action Complete

Action Scheduled

Note: Civil and Haz Waste subcontractors have optional scope for SWMU-1, -2, and IR-1 at later date TBD.
Note: Drilling and Survey subcontractors have one year contract to support all NASKW requirements.

Attachment 3

APPENDIX A

TECHNICAL SPECIFICATION FOR CLEARING AND GRUBBING

APPENDIX B

TECHNICAL SPECIFICATION FOR SURVEYING SERVICES

APPENDIX C

STANDARD SPECIFICATION FOR WELL DRILLING, INSTALLATION, AND ABANDONMENT

DEPARTMENT OF THE NAVY

SOUTHERN DIVISION

STANDARD SPECIFICATION

FOR

WELL DRILLING, INSTALLATION

and

ABANDONMENT

0	4/14/95	ISSUED FOR USE	[signature]	[signature]	[signature]	[signature]
NO.	DATE	REVISION	BY	CHECK	SUPV	PE

ORIGIN	WELL DRILLING, INSTALLATION AND ABANDONMENT	JOB NO. 22567	
		STANDARD SPECIFICATION	REV
		001-SP000-022	0
BEI		SHEET 1 OF 29	

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STANDARD SPECIFICATIONS
FOR
WELL DRILLING, INSTALLATION, AND ABANDONMENT

PART 1 GENERAL

1.01 SCOPE OF WORK

The subcontractor shall furnish all labor, equipment, materials, and incidentals required for drilling boreholes; installing monitoring and production wells and piezometers; air sparging wells; soil venting wells; and the abandonment of existing monitoring wells. The types of wells include, but are not limited to, monitoring, air sparging, vapor extraction, soil venting, and production wells. Not all activities defined herein may be required. Only those activities required in the applicable Subcontract Scope of Work, Technical Specifications, and Engineering Drawings for specific services shall apply.

1.02 ABBREVIATIONS

The abbreviations listed below, where used in this specification, shall have the following meanings:

ASTM American Society for Testing and Materials
Bechtel Bechtel Environmental Inc.
CFR Code of Federal Regulations
CME Central Mine Equipment
EPA U.S. Environmental Protection Agency
GC/MS Gas Chromatograph/Mass Spectrometer
MSDS Material Safety Data Sheet
OSHA U.S. Occupational Safety and Health Administration
psi pounds per square inch
PVC polyvinyl chloride
SSRS Subcontractors Submittal Requirements Summary
SDR Standard Dimension Ratios

1.03 QUALITY STANDARDS

Subcontractor shall control the quality of items and services to meet the requirements of the subcontract documents. Unless otherwise specified or shown, the following codes and standards of the latest issue at the time of bid shall apply to the extent indicated herein.

ASTM C 150 Portland Cement

ASTM A 312 Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipe

ASTM A 53	Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless
ASTM C 136	Standard Method for Sieve Analysis of Fine and Coarse Aggregates of Soils
ASTM D 1587	Standard Practice for Thin-Walled Tube Sampling of Soils
ASTM D 1586	Standard Method for Penetration Test and Split-Barrel Sampling of Soils
ASTM D 2113	Practice for Diamond Core Drilling for Site Investigation
ASTM D 5299	Decommissioning of Groundwater Wells, Vadose Zone Monitoring Devices, Boreholes and other Devices for Environmental Activities
ASTM F 480	Thermoplastic Water Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDRs), Schedules 40 and 80

1.04 SUBMITTALS

Refer to Subcontract Exhibit F, Subcontractor Submittal Requirements Summary (SSRS) for submittal requirements. Bechtel will determine if documentation is complete as submitted by the Subcontractor, and reserves the right to reject and require resubmittal of any submittal that does not meet the Subcontract requirements.

Unless noted otherwise, all Subcontractor submittals shall be made to Bechtel at least one (1) week prior to use, fabrication, or implementation. For those submittals required within the two (2) weeks following Subcontract award, submittals shall be made no later than mobilization to the site. Bechtel will notify the Subcontractor by telephone of any submittal which must be revised and resubmitted.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. Drilling Equipment

Each drilling rig and support equipment shall be provided with all necessary protection measures to operate safely in accordance with the OSHA requirements set forth in 29 CFR 1910 and 29 CFR 1926. Equipment should be adaptable to work in conditions associated with hazardous waste and environmental investigations and remedial activities. All drilling equipment shall be clean and free of contamination prior to arrival onsite and in good working order (i.e., no leaking or damaged equipment will be allowed onsite). No downhole equipment will be allowed onsite that is deemed unacceptable per the initial Bechtel equipment inspection. No paint or rust inhibitor coating will be allowed on any downhole equipment.

Bechtel may collect equipment rinsate samples to confirm that the drilling equipment is free of contamination. The Subcontractor shall be required to decontaminate the drilling rig(s), and all

associated equipment required during drilling operation, immediately upon arrival to the site and between each successive boring location.

Drilling equipment required to install boreholes shall be capable of performing all work specified in the applicable Subcontractor Scope of Work, Technical Specifications, and Engineering Drawings and in good working condition. Drill rig(s) shall be equipped to minimize disturbance in the areas in which they are drilling. Drilling equipment shall be of sufficient capacity to ream the boreholes to the specified diameter and depth in accordance with the subcontract documents.

Air rotary drilling rigs, when allowed by Bechtel, shall have in-line air filter systems to prevent the introduction of compressor oil into the downhole air stream. Dust collection system(s) shall include borehole containment skirt and cyclone particle separator. All cuttings collected will be funneled to one location in a controlled manner. The system output shall be directed into a suitable containment system and then transferred to 55-gallon UN1A1 or UN1A2 steel drums (49 CFR 173) or other suitable container for storage, transportation, and disposal. At no time shall oil or other additives be introduced into the borehole without prior written approval from Bechtel.

Portable mud tubs shall be required for mud rotary drilling and/or the containment of drilling spoils where applicable.

Materials for drilling shall include, but not limited to, all augers, temporary casings, casing shoes, tools, bits suitable for penetrating the materials being drilled, drill rods, pipe, pumps, potable water, compressors, and other incidentals necessary to perform the work in accordance with the Subcontract documents. Drilling fluid shall be not be used without prior written approval from Bechtel.

2.02 MATERIALS

A. Water Supply

The Bechtel-approved potable water supply will be used for dust control, large equipment decontamination, and for the installing of wells, where applicable. The Subcontractor shall install a meter and backflow preventer to monitor potable water consumption. The equipment required may include, but not limited to, pumps, water trucks or trailers, hoses, meters, and all other items necessary to meter and transfer the water supply to the work area. A potable water supply may not be available onsite.

B. Temporary Casings

All temporary casings used for temporary piezometers or monitoring wells during investigation activities shall be provided by the Subcontractor as necessary to complete the work required. All temporary casing shall be clean, straight, and free of obstructions. Temporary casing will not be

grouted in place, but a filter pack could be required per direction from Bechtel. All temporary casing will be capable of being removed from the borehole upon completion of investigation activities.

C. Protective Casing

Protective casing shall be of a diameter appropriate for the type well installation as specified by the lithologic environment in which boring activities are conducted. Protective casing shall be carbon steel or PVC pipe, unless otherwise specified by Bechtel. Pipe gauge or thickness shall be sufficient to support specific well requirements. Protective casing shall be used when boring activities must continue through flowing sands, unstable lithological units, shallow or multiple aquifers, or contamination zones. All protective casing shall be provided by the Subcontractor as required. All protective casing shall be clean, straight, and free of obstructions.

D. Conductor Casing for Double Walled Wells

Conductor casing shall be of a diameter appropriate for the type well installation as specified in the Scope of Work or as shown on the engineering drawings. Conductor casing shall be carbon steel or PVC pipe, unless otherwise specified, with open ends, or equivalent material submitted to Bechtel for review before use. Pipe gauge or thickness shall be sufficient to support specific drilling requirements. All conductor casing shall be provided by the Subcontractor as required by the Scope of Work and/or site specific drilling conditions. All conductor casing shall be clean, straight, and free of obstructions. Grouting of the conductor casing shall be in accordance with guidelines for backfilling materials set forth in Section 2.02 (J) of this specification.

E. Riser Pipe

Riser pipe shall be of a diameter appropriate for the type well installation as specified in the Scope of Work or as shown on the engineering drawings. Riser pipe shall be clean, straight, and free of obstructions. Riser shall be inspected by Bechtel personnel in the field, at the discretion and direction of Bechtel personnel all riser pipes will be cleaned in accordance with guidelines for small equipment set forth in Section 3.09 of this specification.

1) **Stainless Steel**: Riser pipe shall conform to ASTM A 312 and shall be flush threaded joint, Schedule 40 or 80, Type 316 or 316L stainless steel pipe as indicated in the Subcontractors Scope of Work, or as shown on the engineering drawings.

2.) **PVC**: Riser pipe shall conform to ASTM F 480 and shall be flush threaded joint, Schedule 40 or 80 PVC pipe as indicated in the Scope of Work or the engineering drawings.

F. Screen

Well screen shall be compatible for use with the specified riser pipe. The screen length, diameter, and width of the slots shall be as specified in the Scope of Work, or as shown on the engineering drawings, or as determined by Bechtel in the field. The bottom of the screen shall be fitted with flush threaded joint blank casing (riser pipe) at least 1 foot in length to serve as a sump, or as shown on the engineering drawings, or as described in the Scope of Work. Some wells may not require a sump and will only require the bottom of the screen to be capped. The bottom of the blank casing shall be capped.

1) **Stainless Steel**: Screens shall be flush threaded joint, Type 316 or 316L stainless steel, continuously slotted, wire wrapped as indicated in the Scope of Work, or as shown on the engineering drawings. Screen shall be inspected by Bechtel personnel in the field, at the discretion and direction of Bechtel personnel all screens will be cleaned in accordance with guidelines for small equipment set forth in Section 3.09 of this specification.

2) **PVC**: PVC screens shall be flush threaded joint, Schedule 40 or 80 PVC either factory slotted or continuously slotted, wire wrapped, as indicated in the Scope of Work or the engineering drawings. Screen shall be inspected by Bechtel personnel in the field, at the discretion and direction of Bechtel personnel all screens will be cleaned in accordance with cleaning guidelines for small equipment set forth in Section 3.09 of this specification.

G. Filter Pack

Filter pack material shall be clean, well-graded silica sand, free from deleterious material, conforming to ASTM C 136 Fine Aggregate. Filter pack material size shall be specified in the Subcontract Scope of Work, or as shown in engineering drawings, or as determined by Bechtel in the field.

If required in the Scope of Work the Subcontractor shall submit a certified sieve analysis of the filter pack material to Bechtel for review prior to use.

H. Gravel Filter Pack

Gravel filter pack material shall be clean stone suitable for use as drain fill material. The gravel will be graded from 3/8-in. to No. 8 sieve size or as specified in the Subcontract Scope of Work.

I. Annular Seal

The annular seal above the filter pack shall consist of bentonite pellets placed to the thickness specified in the Subcontract Scope of Work, or as shown on the engineering drawings. The actual bentonite pellet size shall be as specified in the Scope of Work or as shown on engineering drawings.

Bentonite granules are not acceptable for use in the annular seal. Bentonite pellets shall be high-swelling and sodium- based material. Bechtel reserves the right to check the bentonite sample to determine if the bentonite meets the requirement of this specification.

Alternatively, Bechtel may require the Subcontractor to use Pure Gold (trade name) grout or equivalent material, a high solids bentonite clay grout manufactured by American Colloid Company.

Bentonite hydration requirements will be as specified in the specific Subcontract Scope of Work.

J. Backfill Materials

The following materials shall be used as backfill only to the extent allowed in the Scope of Work or engineering drawings.

1) **Cement/Bentonite Grout**: Cement/bentonite grout shall be mixed approximately in the following proportions: 7.8 gallons of water and 4.0 pounds of powdered bentonite per 94 pound sack of Portland cement. Water shall be potable and source approved by Bechtel. Sand may be added to the cement/bentonite grout mixture at the discretion of Bechtel. The Subcontractor will not add sand to any backfill material without prior approval from Bechtel.

   Bentonite shall be free flowing, high-swelling, sodium-based bentonite meeting the following dry screen analysis:

U.S. Standard Sieve	Percent Passing
#16	100%

   Bechtel may check the bentonite sample to determine if the bentonite meets the requirement of this specification. Portland cement shall be Type I or Type II in accordance with ASTM C 150.

2) **Bentonite Grout** Bentonite grout shall be pure Bentonite, (Volclay) used to backfill the borehole/well casing annulus to the surface. Bentonite shall be free flowing, high-swelling, sodium-based bentonite meeting the above referenced specifications or as stated in the specific Subcontract Scope of Work or as shown in the specific engineering drawings.

K. Surface Casing

This section applies to the outer protective surface casing for standard and hardened surface seals only. Surface casing shall be steel pipe in accordance with ASTM A 53 or square steel covers (e.g. B-K TC-200) of an appropriate diameter and schedule for the type well. The installation shall be stated in the Subcontract Scope of Work or as shown on the engineering drawings. Surface casing shall be vented and fitted with a lockable steel protective cap. The minimum thickness of the steel used in cap shall be 3/16 in. Casing shall be installed into the borehole after the annular grout has set-up for at least 24 hours. The casing shall be plumb and centered around the riser pipe. The protective casing shall be placed so that the cap of the inner well casing is exposed when the outer casing is opened.

L. Flush Mount

For well installations in areas where an above grade casing would present a hazard or is otherwise undesirable, Bechtel will require the Subcontractor to install a flush mount water tight surface completion and of the specification stated in the Subcontract Scope of Work or as shown in the specific engineering drawings. The cover for this seal must have a pentagon lock nut or other intrusion deterrent device approved by Bechtel. The well cap for this type installation must be lockable with a Bechtel provided padlock.

M. Well Cap and Surface Pad

1) **Well Cap** Each well cap shall consist of a slip-on or threaded, vented cap fitable to and of the same material as the specified riser casing or a plastic gasket cap unless otherwise authorized by Bechtel. Well cap for flush mount surface seal shall be padlockable and not vented.

2) **Surface Pad** Surface pad shall be concrete Type I or II Portland cement with a minimum 28-day compressive strength of 3000 psi. The surface pad shall have the dimensions of 4 ft by 4 ft with a minimum thickness of 4 in. The surface pack shall also be "belled" toward the well casing at a minimum depth of 18-in. (unless otherwise directed by Bechtel) or below the frost line, whichever is greater or as stated in the Subcontract Scope of Work or as shown in the specific engineering drawings.

N. Centering Devices

For any wells 50-ft or greater in depth centering devices, (centralizers), shall be installed and consist of stainless steel. The centralizers shall maintain the screen and riser casings in the center of the drill holes.

O. Drill Spoils Handling Equipment

The Subcontractor shall containerize all generated spoils in 55-gal UN1A2 steel drums (49 CFR 173) or other suitable containers, load, haul, unload and place them at location(s) onsite as designated by Bechtel. Equipment used for this purpose and hauling practices shall prevent the spread of contamination.

P. Sampling Equipment

Samplers and sample retainers for obtaining soil samples for chemical analysis shall be made of ASTM A 312, Grade TP304 or TP316 stainless steel. Samplers and sample retainers constructed of other materials may be substituted only when specifically approved in writing by Bechtel prior to use. A sufficient number of samplers shall be provided to avoid delays in sample collection due to sampler decontamination.

Q. Cleaning Material For Chemical Sampling

1) **Deionized Water.** Material shall meet ASTM D 3375 for deionized water.

2) **Organic-Free Water.** Organic-free water is defined as water that contains no pesticides, herbicides, extractable organic compounds and less than 5 mg/L of purgeable organic compounds as measured by a low-level GC/MS scan. In addition, no metals or organic compounds should be detected at routine detection limits.

3) **Phosphate-Free Detergent.** Detergent shall be a biodegradable, laboratory grade, phosphate free soap such as Liquinox (TM), or equivalent material.

4) **Solvent.** Solvent shall be pesticide-grade isopropanol. Additional solvents may be required per specific tasks outlined in the Subcontractor Scope of Work. A MSDS of the specified solvents shall be submitted to Bechtel for review prior to using on-site.

R. Lubricants

Tool joint lubricants other than Teflon tape, graphite powder, vegetable oil, and/or apiezon™ grease (i.e., Dow Corning High Vacuum grease or equal) shall not be used unless approved by Bechtel. For the threaded connections on the riser pipe assembly, no lubricant is allowed unless approved in writing by Bechtel.

S. Surface Patching Materials

1) **Concrete Patch.** Concrete patching material shall be standard "redi-mix" or as specified in the Subcontract Scope of Work or as shown on the specific engineering drawings.

2) **Asphalt Patch.** Asphalt patching compound shall be a All-Temp Cold-Mix Road Patch or as specified in the Subcontract Scope of Work or as shown on the specific engineering drawings.

T. Protective Barriers

1) **Temporary Perimeter Barricades.** Perimeter barricades around each borehole location shall consist a suitable material to preclude inadvertent entry into work areas.

2) **Permanent Perimeter Barricades.** Guard posts shall be installed around all above-ground wells. Specification for the guard posts shall be stated in the Subcontract Scope of Work or as shown on specific engineering drawings. Typical guard post construction consists of steel pipe four inches in diameter with a minimum length of 6 ft. The guard posts are usually installed to a minimum depth of 3 ft below ground level in a concrete footing and extend a maximum of three feet above ground surface. Concrete shall also be poured into the steel pipe for additional strength. Steel rails and/or other steel materials can be used in place of steel pipe with prior approval from Bechtel. Additionally, the posts shall be plumb and painted as directed by Bechtel.

U. Surface Protection Materials

1) **Plastic Sheeting.** Plastic sheeting shall be minimum 6-mil thick plastic with woven nylon or stronger reinforcement. Sheeting shall be of a minimum size to place under any drill rig in use for any specific boring task and extend at least 6 ft in each direction from the drill hole to prevent drill cuttings and spoils from contact with surrounding surfaces.

2) **Plywood Sheeting.** Plywood sheeting for surface protection shall be a minimum of 1/2 in. thick. The plywood sheeting shall be at least 6 ft wide in each direction from the borehole to prevent drill cuttings and spoils from contact with surrounding surfaces.

V. Borehole Covers

Borehole covers shall be placed over open boreholes, regardless of depth, to minimize hazardous conditions and the accidental introduction of objects into the borehole. Covers shall remain in place until boreholes are completed as wells or are permanently closed. Borehole covers shall consist of steel plate or other suitable material to preclude inadvertent access to boreholes. Covers shall also be equipped to prevent surface water runoff from entering the borehole.

W. Drive Hammer

Drive hammer for sample collection, casing installation or removal shall have the impact head of the rod completely enclosed. It shall be a safety drive hammer, part No. 006981

(AW rod connection) of Mobile Drill manufacture or equal. Hammers of other design may be used only when specifically approved in writing by Bechtel prior to use.

PART 3 EXECUTION

3.01 PREDRILLING

Prior to drilling operations, the Subcontractor shall meet with Bechtel and base personnel to obtain access, security, and make other arrangements (i.e., location of exploration areas, decontamination areas, etc.); and Bechtel shall brief Subcontractor personnel on site history, health and safety requirements and Scope of Work field procedures.

The Subcontractor shall verify that there are no interference's with existing underground and/or above ground process/industrial and other utility lines and tanks at indoor and outdoor drilling locations prior to drilling. Subcontractor verification shall be performed with the support of information and data obtained by the Subcontractor from the property owners/users Subcontractor-verified drilling locations shall be reviewed by Bechtel prior to drilling. Property and utilities damaged or destroyed during Subcontractor operations shall be immediately repaired or replaced, at the expense of the Subcontractor, as directed by Bechtel.

3.02 GENERAL DRILLING INSTRUCTIONS

Boreholes shall be drilled per the Scope of Work or as shown on the engineering drawings as applicable and in the sequence directed by Bechtel.

Prior to drilling, surface protection material shall be placed over and around the borehole location in a manner that will prevent the drill spoils from contacting the surrounding surfaces or prevent leaks developed from the drill rig during operations contacting the ground.

All boreholes shall be drilled straight, plumb, and free of obstructions to permit free and easy installation of the any specified casing. Faulty alignment of the boreholes shall be corrected at the expense of the Subcontractor.

Where necessary to keep the borehole open and enable the boring to be advanced, protective casing may be required.

Approval to drill through obstructions shall be obtained from Bechtel prior to advancing the borehole. In the event that the decision is made to drill through an obstruction, Bechtel will determine whether to abandon the hole or change to a different type of bit. This decision will be made after a maximum of 10 minutes of drilling with minimal or no advancement of the bit.

Drilling shall not be interrupted before reaching the required depth without prior approval from Bechtel.

The exact location of a supplementary borehole to replace an abandoned borehole will be determined in the field by Bechtel. Abandoned boreholes shall be backfilled as specified herein.

Drilling shall be performed in a manner to permit continuous soil sampling, when soil sampling is required by the scope of work.

Boreholes advanced through concrete slabs and asphalt surfaces shall be completed by coring using clean potable water unless otherwise authorized by Bechtel. All water from the coring operations shall be contained, collected, and disposed of as specified herein.

Subcontractor shall not drill through slab expansion or construction joints unless so directed in writing by Bechtel.

Advancement of boreholes below the concrete/asphalt slab, following coring of the slab, shall not use water or any other drilling fluids unless permitted by Bechtel.

Unless noted otherwise, all drill spoils and cleaning debris shall be confined to the surface protection material around each borehole and shall be collected in 55 gallon UN1A2 drums (49 CFR 173). The drums shall be supplied by the Subcontractor and loaded, hauled and unloaded at locations onsite as identified by Bechtel.

Unless otherwise noted on the engineering drawings or the Scope of Work as applicable, all outdoor areas (except areas of pavement, concrete, gravel, etc.) damaged or disturbed by the Subcontractor shall be returned to original condition, as directed by Bechtel.

3.03 WATER USAGE AND CONTROL

Subcontractor shall notify Bechtel of the requirement to use water prior to its use. The water usage and discharge shall be subject to Bechtel review and acceptance before initiating usage or discharge and shall be controlled to prevent the spread of contamination, erosion, and other damage. All water usage for drilling operations shall be metered and recorded.

Surface water shall be controlled and prevented from entering the boreholes by the Subcontractor.

All water discharged from the boreholes during drilling and backfill operations shall, at Bechtel's direction, either be discharged to the ground surface or be collected in 55-gallon UN1A1 drums (49 CFR 173) supplied by the Subcontractor or other suitable container approved by Bechtel (i.e. polytank, frac tank). All drummed water shall be loaded, hauled, unloaded, and placed at an on-site location identified by Bechtel.

3.04 MATERIAL INTRUSION INTO BOREHOLES

No drilling additives, drilling mud, organic solvents, or cleaning solutions shall be introduced into boreholes without prior written approval from Bechtel. Foreign matter, excluding necessary downhole equipment, shall be prevented from entering boreholes.

3.05 TEMPORARY PROTECTIVE BARRIERS

Temporary perimeter barricades shall be provided around borehole work areas during all work operations. Barricades shall be placed to provide sufficient mobility for work operations within the barricaded area and shall not interfere with activities of occupants of the work areas. Barricades shall remain in place until all work within that barricaded area is completed, at which time barricades shall be removed.

A. Borehole Covers And Markers

Borehole covers and markers shall be placed over open boreholes, regardless of depth, to indicate and mark the location of an open borehole and minimize hazardous conditions. Covers and markers shall remain in place until boreholes are properly backfilled and, if required, patched.

3.06 INSTALLATION OF CASINGS

A. Temporary Casing

Temporary casings (wells) shall be installed in boreholes where groundwater sampling is required. Before installation of temporary casings, the borehole shall be cleaned of drill spoils and loose material. The Subcontractor shall not install temporary casings until so directed by Bechtel. Temporary casing shall be removed, upon direction from Bechtel.

B. Protective Casing

Protective Casing shall be installed in boreholes where required. Where shallow aquifers exist, flowing sands, or contaminated zones occur, Bechtel may require the installation of protective casing to isolated specific zones. Before installation of any protective casing, the borehole shall be cleaned of drill spoils and loose material. In areas of flowing sands the protective casing may have to be driven inplace using a drive shoe. The Subcontractor shall not install protector casing until so directed by Bechtel.

C. Conductor Casing for double walled wells

Conductor casing shall be installed in boreholes where double walled wells are required..

3.07 SAMPLES

A. Disturbed Soil Samples

Disturbed soil samples shall be obtained by the standard penetration test and shall be collected with a standard 2-in. outside diameter (O.D.) stainless steel split-barrel sampler in accordance with ASTM D 1586, or 5-ft CME type sampler, or other technique as approved by Bechtel prior to sampling. Soil samples shall be collected at intervals directed by Bechtel, at changes in subsurface lithology, or continuously until bedrock is contacted, or as directed by Bechtel. All sampling equipment shall be fabricated from materials as specified in the Subcontractor Scope of Work. All samples shall be submitted to Bechtel at the point and time of recovery.

B. Undisturbed Soil Samples

Undisturbed soil samples shall be collected with thin-walled metal tubes at five foot intervals, and/or at changes in soil lithology or as directed by Bechtel. Continuous sampling may be required at specific locations identified in the field by Bechtel. The outside diameter of the tubes shall be 2 or 3 in., the minimum length shall be 30 in., and the wall thickness shall be 16 gauge unless otherwise specified by Bechtel. Samples shall be obtained in accordance with ASTM D 1587. The tubes shall be pushed into the bottom of the boreholes by a continuous and rapid motion, without impact or twisting, using open tube or piston samplers. When subsurface materials are too dense or hard that satisfactory samples are not recovered by these methods, rotary samplers shall be used. Rotary samplers shall be Pitcher samplers or approved equivalent and shall utilize a minimum 30-in. long tube.

Undisturbed samples shall be sealed within the tubes. Disturbed materials shall be removed from the upper end of the tube and the lower end shall be trimmed square removing enough material to make an effective seal. Both ends of the samples shall be sealed with hot microcrystalline wax and shall be protected with plastic end caps secured to the tube with tape, all of which shall be provided by the Subcontractor as necessary. Tubes shall be labeled with job name, boring number, sample number, depth, length sampled, length recovered, and date.

All undisturbed samples shall be protected against freezing, exposure and damage. Undisturbed samples shall be treated with extreme care and shall not be dropped, jarred, or vibrated.

C. Rock Core Samples

Core drilling shall be in accordance with ASTM D 2113 and shall be performed to allow the maximum amount of core recovery. Grinding of the core after a core barrel has become blocked will not be permitted. A blocked core barrel shall be pulled regardless of the interval drilled, as directed by Bechtel.

Subcontractor shall supply boxes for the storage of cores. Cores shall be placed in Bechtel-approved core boxes and marked as to orientation (i.e. top and bottom), boring number, date, depth, and any other information requested by Bechtel..

3.08 BACKFILLING BOREHOLES

Unless noted otherwise, all boreholes shall be backfilled as directed by Bechtel. Boreholes that are to be converted to wells shall not be backfilled.

Unless noted otherwise, boreholes shall be secured with borehole covers during all temporary stoppage of drilling operations to minimize hazardous conditions and the accidental introduction of objects and surface water runoff into the borehole.

Boreholes drilled through surface asphalt or concrete shall be backfilled with cement/bentonite grout or volclay using the tremie method and shall allow for placement of an asphalt or concrete patch as set forth herein. Boreholes not drilled through surface asphalt or concrete shall be backfilled using either the dry pack method or the tremie method as defined in Section A "Backfill Method" or as defined in the specific Subcontract Scope of Work and/or as shown in the specific engineering drawings.

A. Backfilling Method

1) **Dry Pack Method.** The dry-packing method shall be performed, using granular bentonite, in maximum 1 ft lifts and thoroughly rodded using a solid bar or suspended weight. Bentonite shall be placed such that there are no voids in the filled borehole. The dry pack method shall not be used when the borehole contains water, unless approved in advance by Bechtel.

2) **Tremie Method.** The tremie method shall use cement/bentonite grout or volclay starting at the bottom of the borehole. Grout shall be placed in one continuous operation. The tremie pipe shall be placed at the bottom of the borehole and the grout pumped until it reaches the ground surface. If loss of grout occurs, the borehole shall be filled as to "cake" off the wall of the borehole and allowed to cure prior to placing additional grout in the borehole. Should loss or shrinkage of grout occur, holes shall be refilled with grout until grout is within 1/2 in. of the required elevation as shown on the engineering drawings or as directed by Bechtel.

3.09 DECONTAMINATION AND CLEANING

The work areas shall be kept in a neat and orderly condition at all times. Items shall not be brought onto the site nor removed from the site until so authorized by Bechtel.

A. Drill Site Cleaning

Deposits of mud and other materials adhering to drilling equipment and vehicles shall be removed while at the drill site. This material shall be broadcast in the vicinity of the hole or containerized in 55-gal UN1A2 steel drums (49 CFR 173), or other suitable container as directed by Bechtel.

B. Decontamination Pad

Decontamination of all equipment shall occur at a decontamination pad or area, either excavated or built above grade by the Subcontractor. The pad and surrounding area will be lined with heavy duty plastic film of sufficient width to provide a seamless, lapless liner for the decontamination area. All cleaning of drill rod, auger flights, well screen and casing, etc., will be conducted above the plastic film using non-wood saw horses or other appropriate means. The decontamination pad shall be equipped with a containment sump for the easy removal of the decontamination fluids.

C. Cleaning Equipment

Cleaning shall utilize brushes, scrapers, rags, and other items as necessary to remove surface dirt. Equipment shall be decontaminated at the exclusion zone of the intrusive activities. Field equipment, which includes but not limited to, augers, drilling bits, large tools, drill rigs, monitoring well supplies and other large items shall be cleaned at this zone. All equipment and materials required for decontamination including potable water required for this purpose shall be provided by the Subcontractor. Potable water (tap water from any municipal water supply system) shall be used as designated by Bechtel. Organic-free water and organic-free water systems shall be stored separately from gasoline and/or fuel containers and gasoline powered equipment to prevent cross-contamination. Steam cleaning and/or high pressure hot water washing shall be used to decontaminate all drilling equipment. Hollow-stem augers, drill rods, shelby tubes, etc., that are hollow or have holes that transmit water or drilling fluids, shall be cleaned on the inside and outside. The steam cleaner and/or high pressure hot water washer shall be capable of generating a pressure of at least 2,500 PSI and producing hot water and/or steam at a temperature of at least 200°F. Bechtel shall check the temperature of the steam cleaner to confirm the minimum temperature requirement. If the steam cleaner does not attain the minimum temperature the Subcontractor shall be required to replace the steam cleaner with equipment capable of generating the minimum temperature.

D. Large Equipment Decontamination

Large equipment shall be decontaminated using the following procedure:

1) Remove heavy accumulation of mud/spoils at drill site.

2) Move equipment to the decontamination pad at the exclusion zone of intrusive activities after sampling/field activities are complete.

3) Decontaminate equipment with a high pressure steam cleaner which utilizes a soap and water cycle. Scraping and scrubbing may be necessary to remove encrusted material. Items shall be placed on nonwooden sawhorses, pallets, or the equivalent to prevent contact with the ground.

4) Place equipment on polyethylene sheeting, saw horses, or clean pallets and allow to air dry. Saw horses and pallets shall not be constructed of wood.

5) Sampling and field equipment shall not be allowed to contact the ground surface before their use at the next sampling location. Wrap appropriate equipment (i.e., monitoring well installation supplies, augers, drill rods, etc.) in polyethylene sheeting and secure with duct tape. Specific sampling equipment will be wrapped in aluminum foil in accordance with guidelines for equipment storage set forth in Section 3.09 (F) of this specification. The Subcontractor shall store decontamination fluids in 55-gal UN1A1 steel drums (49 CFR 173) or other suitable containers approved by Bechtel, load the drums, haul, unload and place them at the locations designated by Bechtel.

E. Small Equipment Decontamination

Small equipment, including all sampling equipment, shall be decontaminated as follows:

1) Wash thoroughly with phosphate-free laboratory detergent and tap water using a brush to remove all particulate matter and surface film.

2) Rinse thoroughly with tap water.

3) Rinse thoroughly with deionized water.

4) Rinse twice with isopropanol using only teflon-squeeze bottles.

5) Rinse thoroughly with organic-free water, using stainless steel, glass, or teflon lined applicators, and allow to air dry.

6) If organic-free water is not available, allow equipment to air dry until the isopropanol has evaporated.

F. Equipment Storage

Decontaminated equipment shall be stored on clean tables with polyethylene sheeting and wrapped in aluminum foil between uses. Following decontamination, the sampling equipment shall not be allowed to touch the ground prior to use. All decontamination fluids shall be contained and care shall be taken to ensure that the isopropanol and other fluids do not contact the ground surface. Isopropanol and any other solvent rinsates shall be segregated from other decontamination fluids and containerized

3.10 WELL INSTALLATION

Wells shall be installed in boreholes at the locations shown on the engineering drawings or designated by Bechtel. All wells shall be installed immediately after completion of drilling activities and before moving to a new borehole location.

A. Annular Space

The borehole shall be of sufficient diameter so that well installation and construction can proceed without difficulties. To ensure adequate size, a minimum 2-in. annular space is required between the well casing and the borehole wall (or the hollow stem auger wall). The work shall be scoped as to allow the Subcontractor to know which boreholes will potentially be used for well construction in order to allow the Subcontractor to initially drill the appropriate sized borehole.

B. Installing Conductor Casing for Double Cased Wells

Double cased wells shall be constructed when there is reason to believe that interconnection of two aquifers by well construction may cause cross contamination. They can also be installed when flowing sands make it difficult or impossible to install a monitoring well using conventional methods. This will be determined by Bechtel prior to well installation in the field during drilling operations.

1) A borehole shall be drilled through the overburden and/or the contaminated zone into a clay confining layer, 5 ft below the known elevation of contamination or bedrock as determined in the field by Bechtel and dependent on the specific lithology encountered at the borehole location.

2) A conductor casing shall then be placed into the borehole and sealed with grout. The borehole and conductor casing shall extend into tight clay a minimum of 5 ft or into competent bedrock a minimum of 2 ft, dependent on the specific lithological conditions at the borehole location. The total depths into the clay or bedrock will vary, depending on the plasticity of the clay and the extent of weathering and/or fracturing of the bedrock. The size of the conductor casing shall be of sufficient inside diameter (ID) to contain the inner casing, and allow 2-in. minimum annular space for the inner casing. In addition, the borehole shall be of sufficient size to contain the conductor casing and a 2-in. minimum annular space.

3) The conductor casing shall be grouted by either the tremie method or by pressure grouting to within 2 ft of the ground surface. The grout shall be pumped into the annular space between the conductor casing and the borehole wall. This can be accomplished by:

- placing the tremie pipe in the annular space and pumping the grout from the bottom of the borehole to the surface,
- placing a grout shoe or plug inside the casing at the bottom of the borehole and pumping the grout through the bottom grout plug and up the annular space on the outside of the casing.

If the conductor casing is set into tight clay, both of the above methods might have to be used, because the clay usually forms a tight seal in the bottom and around the outside of the casing preventing grout from flowing freely during grout injection. Bridging is not anticipated in bedrock thus, conductor casing set into bedrock normally will have space enough to allow grout to flow freely during injection. A minimum of 24 hours shall be allowed for the grout plug (seal) to "set" or cure before attempting to drill through it. The grout mixture used to seal the outer annular space can be either a cement/bentonite, cement/sand/bentonite, or a pure bentonite grout. However, the seal or plug at the bottom of the borehole and conductor casing shall consist of a Type I Portland cement/bentonite or cement/sand mixture. The use of a pure bentonite grout for a bottom plug or seal is not acceptable.

4) When drilling through the plug, care shall be taken to avoid cracking, shattering, and/or washing out of the annular seal. If caving conditions exist so that the conductor casing cannot be sufficiently sealed by grouting, the conductor casing shall be fitted with a drive shoe and driven into place with a grout seal placed in the bottom of the casing.

C. Installing Screen and Riser Casing

Before installation of the riser pipe assembly (e.g., riser pipe, screen, sump, and bottom cap), the final depth of the hole shall be measured with a weighted tape to $\pm$ 0.1 feet, and the assembly and appurtenances cleaned in accordance with Section 3.09. All cuttings shall be removed from the borehole prior to the installation of the monitoring well.

1) If the hollow-stem auger method is used to construct the well, equilibrium or excess water pressure inside the hollow-stem auger relative to the observed groundwater level shall be maintained at all times during the screen and riser installation (if necessary by adding potable water to the hollow stem) to prevent a "heaving" condition at the bottom of the borehole. This is particularly applicable when the bottom consists of loose, sandy soils.

2) The riser pipe assembly shall then be lowered into the borehole. In boreholes greater than 50 ft deep, centering devices shall be used to maintain the entire riser pipe assembly in the center of the borehole at intervals designated in the field by Bechtel. Centering of riser pipe assembly through the hollow stem of an auger shall be provided by suspending the assembly using the

cable/hoist method such that the riser pipe assembly is located in the center of the borehole upon completion.

D. Installing Filter Pack

As soon as the riser pipe and screen assembly is in place, the filter pack shall then be placed into the annular space between the well screen and borehole wall by tremie method or free fall through the hollow-stem augers as designated by Bechtel in the field. If the hollow-stem auger method is used the augers shall be slowly withdrawn as the filter pack is placed to allow the annular space between the screen and the borehole to be properly filled. The filter pack shall extend from the bottom of the borehole to at least two feet but not more than five feet above the top of the screen. The protective casing, if applicable, shall be removed upon direction from Bechtel.

All water discharged from the boreholes during well installation shall be collected in 55-gal UN1A1 steel drums (49CFR173) or other suitable containers as directed by Bechtel. Drums or other containers shall be loaded, hauled, and unloaded to a staging area specified by Bechtel. Water shall be controlled by the Subcontractor to prevent erosion and other damages.

E. Installing Gravel Filter Pack

When the riser pipe and screen assembly is in place in the borehole, the gravel pack shall then be placed into the annular space between the well screen and borehole wall by carefully pouring the pea gravel into the annular space. If the hollow-stem auger method is used the augers shall be slowly withdrawn as the gravel pack is placed to allow the annular space between the screen and the borehole wall to be properly filled. The gravel pack will be poured until it is 2 ft but not more than 5 ft above the top of the screen.

F. Installing Seal and Backfill

An annular seal of bentonite pellets shall be installed in the borehole after the filter or gravel pack is placed. The minimum thickness of this bentonite seal, after tamping, shall be 2 ft. The completed bentonite seal shall be allowed to hydrate for a minimum of eight hours or the manufacturer's recommended hydration time, whichever is greater, before proceeding with the grouting operation. Following placement of the annular seal, the remainder of the annular space between the riser casing and borehole wall shall be filled with cement/bentonite grout or volclay as specified in the Subcontractor Scope of Work or as shown on the engineering drawings. The annular space shall be filled to 2 ft below ground surface or as shown on the engineering drawings. The cement/bentonite or volclay grout shall be installed through a tremie by placing a rod, pipe, or hose to a point immediately above the seal and pumping the grout into the hole. The tremie pipe will be equipped with a side discharge port to preclude disruption of the seal. Should loss or shrinkage of grout occur, boreholes shall be refilled until they remain full as outlined in Section 3.08 A2 "Tremie Method." The grout shall be allowed to set-up for a minimum of 24 hours before the concrete surface pad is installed, or as directed by Bechtel..

G. Well Testing

The alignment of the well screen and riser will not be considered acceptable unless a decontaminated, clean, straight pipe of appropriate diameter can be passed freely down the length of the well. This test shall be performed approximately 24 hours after completion of grouting by the Subcontractor. Upon completion, each well shall be tested after the annular seal and grout have set to confirm the well is operative. This shall be accomplished by bailing water from the riser casing and measuring recovery of the water level. An alternate testing method that may be requested by Bechtel is the slug method whereby the decay of the water level induced by the slug will be monitored.

H. Well Development

Installed wells shall be developed to maximize the yield of water per foot of drawdown. The development shall also extract from the water-bearing formation the maximum practical quantity of fines as may be drawn through the screen when the well is pumped under maximum conditions of drawdown. Well development shall not commence until the cement/bentonite or volclay grout has been in place for at least 24 hours, or as directed by Bechtel. Development shall proceed by surge block, jetting, pumping and/or bailing (using stainless steel or teflon bailers) techniques. Development will continue along the length of the well screen until the well produces clear sediment free water, and/or the parameters of water temperature, pH, and conductivity have stabilized as indicated by three consecutive measurements within 10 percent of each other or a minimum of five bore-volumes has been removed. In the event wells are bailed dry, the wells must be developed to dryness a minimum of three times to be considered complete, or as directed by Bechtel.

I. Surface Casing, Cap and Pad

As directed by Bechtel the surface pad, surface casing or flush mount surface completion, and locking cap shall be installed at each monitoring well as shown on the engineering drawings or described in the Scope of Work.

3.11 WELL ABANDONMENT

A. General

The specific well removal method used to abandon wells shall be determined by the Subcontractor Scope of Work or Bechtel field personnel dependent on specific site conditions. Several different types of wells may be abandoned at the Facility. Abandonment procedures are presented below:

1.) **Singled Cased Overburden Screened Well.** Single cased wells that are screened in the overburden will be abandoned by first removing the protective surface casing. Once the surface casing is removed, the well can be abandoned by one of two methods. The well casing will be left inplace and grouted, or alternatively, the casing will be removed and then overdrilled to remove the well construction materials and then backfilled with grout. The method to be used for the abandonment of these wells will be as specified in the Scope of Work or on the engineering drawings.

2) **Double Cased Overburden Screened Well.** Double cased wells that are screened in the overburden will have the protective surface casing and the riser casing removed. The outer (protective) casing will not be removed unless specified. If the outer casing is not removed, the borehole from the riser casing will be overdrilled inside of the outer casing to remove as much of the well construction materials as possible. The borehole will then be backfilled with grout. If the outer casing is suspect and specified to be removed, the outer casing zone will be overdrilled. After overdrilling and all cuttings are removed from the bottom of the hole, the borehole will be backfilled with grout.

3) **Single Cased Overburden Temporary Wells/Piezometers.** These wells are not installed with any seals, grout or filterpack. These wells will be abandoned by pulling the casing and backfilling with grout. Overdrilling will not be required for these wells.

4) **Shallow Bedrock Wells.** Shallow bedrock wells have construction details similar to the single and double cased overburden wells. Abandonment of these wells will be similar to the overburden wells. In the case of where outer or intermediate (protective) casings are present they will not be removed unless specified. If these casings are to be removed the outer casing zone will be overdrilled before backfilling with grout.

5) **Deep Bedrock Wells.** Deep bedrock wells are completed as open-hole wells and have no well casing, sand pack, or bentonite seal installed inside the bedrock borehole and the overlying unconsolidated deposits are cased. First, the borehole in the bedrock will be sealed with grout before beginning to overdrill the cased portion of the borehole. (If bedrock occurs at the land surface, no overdrilling is required.). After the bedrock portion of the hole is grouted, overdrill the cased portion of the well, and backfilled the remaining borehole with grout.

6) **Hybrid Wells.** Hybrid wells are those wells that are screened in more than one water-bearing unit. Most of these wells are screened at the bedrock-overburden interface. Hybrid wells will be abandoned by removing the protective surface casing and then removing the riser and screen casing. The borehole will then be overdrilled and backfilled with grout.

B. Decontamination Procedures for Well Abandonment

Prior to abandoning any well, the drilling rig and any other associated downhole equipment will be decontaminated at an approved decontamination area per the requirement of Section 3.09. The drill rig and associated equipment need not be decontaminated between well abandonment locations if

the wells to be abandoned are located on an area considered to be uncontaminated, or if the order of abandonment is scheduled such that it progresses from clean to successively more contaminated wells. However, if any contamination is observed during abandonment of a well, either through visual observation or instrument readings, all equipment will be decontaminated upon completion of that well abandonment.

C. Overdrilling Procedure

The overdrilling operation shall: follow the original wellbore, create a borehole of a slightly larger diameter than the original boring, and remove all well construction materials. Acceptable methods for overdrilling include:

1) Using an overreaming tool with a pilot bit that is nearly the same size as the inside diameter of the casing and a reaming bit that has a slightly larger diameter than the original borehole diameter (this method can be used for wells with steel casings)

2) Using a hollow-stem auger equipped with outward-facing, carbide cutting teeth with a minimum diameter of 4 in. larger than the casing. Use outward-facing cutting teeth so that the cutting tool does not sever the casing and drift off-center. Install a steel guide pipe inside the casing as required to ensure that the augers remain centered. When the full diameter and length of the well have been penetrated, retrieve the casing and screen from the center of the auger in accordance with ASTM D 5299.

3) After overdrilling is completed, grout the borehole.

D. Casing Pulling

Remove the abandoned well casing by the following procedure:

1) Puncture the bottom of the casing

2) Fill the casing with grout tremied from the bottom of the well

3) Use jacks to free casing from the hole

4) Lift the casing out by using a drill rig, backhoe, crane, or other suitable equipment of sufficient capacity. Place additional grout as required as the casing is withdrawn.

5) PVC casings may not be able to be removed by pulling in certain conditions. Excessive deformation or breakage of the well casing may preclude removal by pulling deep wells in cohesive soils. Pulling of PVC casings by this procedure shall be reviewed and approved by Bechtel before the pulling operation begins.

E. Grouting the Casing In-Place

Fill the casing with grout to a level of approximately 3 ft below the land surface. Cut the well casing at a depth of 3 ft below the land surface, and remove the casing and associated well materials from the ground.

F. Removing the Protective Surface Casing

1) **Before Sealing the Well** When overdrilling or casing pulling is required, the protective surface casing shall be removed first, unless the drilling tools used to overdrill the well have an inside diameter larger than the surface casing. The removal of the surface casing shall not break the well casing off below ground or allow foreign material to enter the well casing. To remove the surface casing, break up the concrete surface pad surrounding the surface casing, and jack or hoist the casing out of the ground. Verify that the inner well casing is not being pulled up with the protective surface casing. If this occurs, cut off the well casing above ground after the base of the protective casing is lifted above the land surface and note the amount of casing pulled to assure true total depth for overdrilling activities, if warranted.

2) **After Sealing the Well** When grouting the well casing in-place is required, the protective surface casing may be removed after the well has been filled with grout to a depth of 3 ft below the land surface. The upper 2 ft of well casing and the surface casing may be removed in one operation if a casing cutter is used

G. Selecting, Mixing, and Placing Grout

1) **Standard Mixture.** Unless a special mixture is required, as stated in the mixing procedure below, the following standard mixture shall be used for all boreholes:

   a) One 94-pound bag of type I or type II Portland cement
   b) 4.0 pounds of powdered bentonite
   c) 7.8 gal of potable water

2) **Pure Sodium Bentonite Plug.** For special conditions below the water table, a pure sodium bentonite plug will be used to seal a well that is screened across a confining unit. When this method of sealing is required it will be specified in the Scope of Work or on the engineering drawings. A bentonite slurry, composed of granular bentonite made pumpable by adding a minimal amount of water, will be tremied into the borehole. The bentonite slurry will be mixed as thick as possible, while maintaining its capacity to flow. Because of the rapid setup time of the bentonite, approximately fifteen minutes, the slurry needs to be placed quickly and evenly to ensure that no gaps are created in the seal. The slurry will be placed to an elevation of 3 feet above the top of the confining layer. The rest of the borehole will be filled with grout or as specified in the Scope of Work or shown on the engineering drawings.

3) **Mixing Procedure.** Calculate the volume of grout required to fill the borehole before beginning to mix the grout. Mix the grout until a smooth, homogeneous mixture is achieved. No lumps or dry clots should be present. Grout can be mixed manually or with a mechanized mixer such as a vertical paddle grout mixer. Colloidal mixers shall not be used.

4) **Placement.** Grout shall be placed in the borehole from the bottom to the top by using a tremie pipe of not less than 1-in. diameter. Grout shall then be pumped into the borehole at a rate of 5 to 10 gpm until the grout appears at the land surface or to 3 ft below land surface when grouting casing in place. When grouting an open hole in bedrock, the grout level must reach above the bedrock surface. In wells where screen and casing are pulled from the borehole, the casing to be removed shall be removed from the hole after the grout level stabilizes. As each section is removed, grout shall be added to keep the level just below the land surface. If the grout level cannot be maintained near the land surface, ie. loss of grout occurs, the borehole shall be filled as to "cake" off the wall of the borehole and allowed to cure prior to placing additional grout, and/or grout in stages, such that the first batch of grout is allowed to partially cure before a second batch of grout is added, at the specific direction of Bechtel.

   If hole collapse or problems with flowing sands are encountered, the augers or casing will be left in place as the grout is pumped into the boring. The augers or casing flights will be removed as the grout level rises. The grout will then be topped off after removal of the augers or casing.

H. Aboveground Completion

Surface completions of abandoned wells will depend upon the methodology selected for well abandonment.

1) For wells in which the well casing has been removed, the remaining borehole must be backfilled to grade with grout. The grout will be allowed to cure for a minimum of 24 hours, and the location checked for subsidence after that period. If any subsidence occurs, the borehole will be topped with grout to grade. To complete the abandonment of the well, a permanent marking plate containing the former well identification number will be installed flush with the ground surface.

2) For wells abandoned by grouting in place or if one of more of the casings remain above or near the ground surface, the casing will be cut off below grade before surface completion can be completed. These wells will first be backfilled with grout to a depth of approximately 3 ft below grade. Once the grout has cured for 24 hours the grout will be checked for subsidence. If the grout has subsided, the well will again be back filled to 3 ft below grade. After the grout has cured, the remaining casing will be cut off at a minimum of 2 ft below grade and will be removed. The remaining hole will be topped off with grout to grade and a permanent marking plate containing the former well identification number will be installed flush with the ground surface.

3.13 REPAIR OF SURFACE SLABS

A. Concrete Slab

The surface surrounding the drill hole shall be free of water, oil, dirt, and loose rust at the time of repair. The sidewalls of boreholes through concrete shall be roughened and brushed with a steel wire brush before the concrete patch is placed. The concrete patch shall be mixed, placed, and cured according to manufacturer's instructions only after the cement/bentonite grout has cured for a minimum of 24 hours, or as directed by Bechtel. Patch shall be flush with and finished to match surrounding surfaces.

B. Asphalt Surfaces

The surface surrounding the drill hole shall be free of water, oil, dirt, and loose rust at the time of patching. The asphalt patch shall be mixed, placed, and cured according to the manufacturer's instructions only after the cement/bentonite grout has cured for a minimum of 24 hours, or as directed by Bechtel. Patch shall be flush with and finished to match surrounding surfaces.

3.13 WASTE DISPOSAL

Soil cuttings generated from each borehole, shall be containerized by the Subcontractor by placing onto plastic sheeting or other material approved by Bechtel. The soil cuttings will then be placed into 55-gal UN1A2 steel drums (49 CFR 173) or other suitable containers provided by the Subcontractor and approved by Bechtel. The lids of the containers will be tightly secured by the Subcontractor. The Subcontractor shall mark each container as to its contents, borehole identification number, depth interval represented by the spoils, and the date. Discharge water shall be conveyed to UN1A1 steel drums (49 CFR 173) or other suitable Bechtel approved container, labeled and identified as described above. Used plastic sheeting and contaminated personal protective equipment shall be containerized and compacted by the Subcontractor in 55-gal UN1A2 steel drums (49 CFR 173) labeled and identified as described above. Different wastes (soil, water, and plastic sheeting and personal protective equipment) shall not be mixed. Containers shall be filled with all waste generated by these operations and loaded, hauled, unloaded and placed at locations onsite as designated by Bechtel.

3.14 SITE CLEANUP

The drilling locations and work areas shall be kept in a neat and orderly condition at all times. Cleanup includes but is not limited to the following:

A. Removal of Uncontaminated Items from Site

Removal from the site of all uncontaminated equipment, trash, waste, and materials used in connection with the work

B. Decontamination of Contaminated Items

Decontamination of contaminated equipment and materials. These shall not be removed from the site until certified for release by Bechtel.

C. Contaminated Items

Items which cannot be decontaminated, as determined by Bechtel, shall be placed at locations onsite as designated by Bechtel.

D. Site Restoration

The work site locations(s) shall be restored to a condition(s) similar to that found before the work commenced.

E. Verification

Verification that all areas damaged or disturbed by the Subcontractor and associated work activities have been, as nearly as possible, returned to their original conditions.

APPENDIX D

TECHNICAL SPECIFICATION FOR CONTAMINATED EARTHWORK AND MISCELLANEOUS DEMOLITION

APPENDIX E

STANDARD SPECIFICATION FOR UNCONTAMINATED EARTHWORK

APPENDIX F

TECHNICAL SPECIFICATION FOR TRANSPORTATION OF CONTAMINATED MATERIALS

APPENDIX G

PERFORMANCE SPECIFICATION FOR SHORELINE PROTECTION STRUCTURE

DEPARTMENT OF THE NAVY

SOUTHERN DIVISION

PERFORMANCE SPECIFICATION

FOR

SHORELINE PROTECTION STRUCTURE

1	5/15/95	MINOR REVISION	REH	JRM	[signature]	REH
0	2/8/95	ISSUED FOR USE	GAC/RKA	RKA/NJA	FBC	JRM
REV.	DATE	REASON FOR REVISION	BY	CHECK	EGS	PE

ORIGIN	SHORELINE PROTECTION STRUCTURE	JOB NO. 22567	
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PERFORMANCE SPECIFICATION
FOR
SHORELINE PROTECTION STRUCTURE

1.0 GENERAL

1.1 SCOPE

A shoreline protection structure is required at the Fleming Key South Landfill to control wave erosion of the shoreline. The Subcontractor shall design and construct a shoreline protection structure meeting the performance requirements outlined in this specification. The configuration and type of protection shall be determined by the Subcontractor, subject to approval by BEI, based on the Subcontractor's experience and parameters listed below. The Subcontractor may recommend a pre-engineered structure (e.g., articulated concrete mat) provided it meets the requirements herein.

The design shall consider the following parameters:

- Cost effectiveness
- Longevity of the shoreline protection structure
- Damage limitation
- Overtopping
- Scour and flank protection
- Permeability
- Wave reflection
- Appearance
- Environmental criteria
- Federal, state and local codes and regulations

Design and performance criteria for each of the above items is discussed below.

1.2 REFERENCED CODES AND STANDARDS

U.S. Army Corps of Engineers, "Shore Protection Manual" (USACE SPM); Coastal Engineering Research Center; Vicksburg, Mississippi

Navy Facilities Engineering Command, Department of the Navy, "Coastal Protection Design Manual 26.2" (NAVFAC DM-26.2); Alexandria, Virginia

Construction Industry Research and Information Association (CIRIA), "Manual on the Use of Rock in Coastal and Shoreline Engineering;" CIRIA Special Publication 83, published by A.A. Balkema, Rotterdam

In addition, the design and construction of the structure shall meet, in all respects, the applicable federal, state, and local codes and regulations.

1.3 SUBMITTALS

Submittals are summarized on Exhibit F (Attachment A), "Subcontract Submittal Requirements Summary."

1.3.1 Preliminary Design Report

The preliminary design report shall include all calculations, assumptions, references (including applicable building codes), sketches, material specifications, and drawings relevant to the design of shoreline protection. The preliminary design shall be submitted for Bechtel and Government comment for 14 working days.

1.3.2 Final Design Report

The final design shall include all calculations, assumptions, references, sketches, material specifications, and drawings relevant to the design of shoreline protection. The final design shall be sealed by the responsible Professional Engineer licensed in the State of Florida. In addition, a summary of Bechtel and Government comments with their resolution shall be submitted.

1.3.3 Construction Method

The Subcontractor shall submit the proposed construction method for installation of the shoreline protection structure. This method shall identify all personnel (e.g., craft, supervision, quality control inspectors, etc.) and equipment that will be used during the construction, as well as permit and inspection requirements by federal, state, and local governments. A summary of quality control (e.g., testing requirements, incremental measurements, etc.) shall be included in this submittal.

1.3.4 Permits

The Subcontractor shall obtain all applicable federal, state, and local permits required to perform the work. For those permits requiring Navy signature, the Subcontractor shall prepare the permit applications and submit them to the Bechtel Project Superintendent, who will coordinate obtaining any required Navy signatures. The Bechtel Project Superintendent will return the signed permit applications to the Subcontractor, who shall then obtain those permits. The Subcontractor shall submit copies of each issued permit to Bechtel.

2.0 PRODUCTS

2.1 SPECIFICATIONS

The Subcontractor shall provide specifications for the materials to be used in construction of the shoreline protection structure. Materials shall be suitable for the exposure conditions existing at the jobsite.

Catalog cuts of materials or pre-engineered structures may be submitted as specifications.

3.0 EXECUTION

The following sections provide information for development of the final design report. These sections should, at minimum, be discussed in the design report.

3.1 GENERAL

The following requirements shall be incorporated into the shoreline protection structure design:

- No vertical seawalls, unless it can be shown that the wave reflection requirements in Section 3.7 can be met.
- Toe of riprap cannot be located more than 10 ft offshore from the existing mean high water mark.
- Construction of structure must not damage or destroy federally protected vegetation (i.e., mangroves), or alternately if protected vegetation will be affected, appropriate mitigation measures must be incorporated.
- Erosion due to local ship traffic shall be considered in the design

3.2 COST EFFECTIVENESS

The baseline for cost comparison shall be shoreline stabilization using stone fill over a geotextile liner (both appropriately keyed into the shoreline). The Subcontractor shall consider longterm maintenance (100-yr period) as well as initial construction costs.

3.3 LONGEVITY OF SHORELINE PROTECTION

The shoreline protection shall be designed using durable materials that will withstand the saltwater environment over a design life of 100 yr. The structure shall be designed and constructed in accordance with the current issue of the USACE SPM, or NAVFAC DM 26.2. The design shall consider the simultaneous occurrence of the 100-yr wave, the 100-yr storm

surge, and the 10 percent exceedance astronomical tide level. Groundwater levels during the design storm shall be consistent with the 100-yr rainfall event.

3.4 DAMAGE LIMITATION

Estimated damage during the 100-yr wave and storm surge event shall be less than 10 percent as defined by the USACE SPM for multiple-layer armor stone protection. A risk analysis may be performed to justify a lesser design, and hence higher damage allowance.

3.5 OVERTOPPING

The crest height and the materials for the shoreline protection shall be selected such that the average overtopping rate during the annual storm (including the 1-yr storm surge and 10 percent exceedance tide level) shall not exceed 50 liters/sec/meter. This value can be exceeded if the area immediately behind the crest is protected against scour from overtopping and incorporates a drainage system to return the overtopping flow to the ocean. The 100-yr wave and storm surge value shall not exceed 200 liters/sec/meter unless a scouring protection and drainage system is included and is based upon the 100 yr values. Average overtopping rates shall be calculated using the approaches outlined in the CIRIA Special Publication No. 83. Other methods may be used only upon written consent from Bechtel.

A risk analysis may be performed to demonstrate that higher overtopping values are acceptable when a drainage system is incorporated into the area immediately behind the crest of the shoreline protection.

The crest height may be vary along the shoreline if it can be shown that there is a significant variation in the design wave height along the structure.

3.6 SCOUR/FLANK PROTECTION

The shoreline protection shall have a properly designed toe in the form of a cutoff wall or a stone apron, such that it will be stable under the design 100-yr wave and storm surge conditions.

The ends of the shoreline protection shall be carried far enough inland that the erosion in the vicinity of the ends of the seawall, under the design conditions, will not impact the landfill.

3.7 WAVE REFLECTION

The wave reflection coefficient for the shoreline protection shall be less than 0.25 for the 100-yr design wave and associated water level conditions. The increase in wave height due to reflection from the structure shall be less than 3 percent in the vicinity of the berths to the immediate south of the landfill.

3.8 APPEARANCE

The structure shall be constructed such that its appearance is in harmony with the surrounding environment, and that it meets applicable local codes.

3.9 ENVIRONMENTAL CRITERIA

The design and construction of the shoreline protection shall meet applicable environmental criteria, including limitations on sediment disturbance during construction, alterations to the local littoral drift during the life of the shoreline protection, and re-vegetation requirements.

3.10 OTHER CRITERIA

The design criteria presented in this specification is not intended to be all inclusive of criteria required in applicable federal, state, and local codes and regulations. A design basis shall be submitted along with the Preliminary and Final Design Reports and shall include but not be limited to the following items:

- A list of reference/guidance documents used for design.
- Design parameters (e.g., Sections 3.1 - 3.8 of this Technical Specification and any additional criteria required by applicable codes and regulations).
- A list of all applicable permits required to perform the work.

APPENDIX H

TECHNICAL SPECIFICATION FOR CHAINLINK FENCING

APPENDIX I

TECHNICAL SPECIFICATION FOR TURF ESTABLISHMENT