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PROJECT COMPLETION REPORT FOR INTERIM REMEDIAL ACTION/SOURCE REMOVAL OF CONTAMINANTS AT ELEVEN SITES IDENTIFIED IN THE RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION NAS KEY WEST FL

11/14/1997

BECHTEL ENVIRONMENTAL INC

0113

PROJECT COMPLETION REPORT

AT THE
NAVAL AIR STATION
KEY WEST, FLORIDA

DELIVERY ORDER 0004
VOLUME I

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

BECHTEL JOB NO. 22567

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NOV 14 1997

Commanding Officer
Southern Division
Naval Facilities Engineering Command
Attention: Dudley Patrick 1858
2155 Eagle Drive
North Charleston, SC 29406

SUBJECT: Bechtel Job No. 22567
Department of the Navy Contract No. N62467-93-D-0936
DO 0004, NAS KEY WEST, DO 0004 FINAL COMPLETION REPORT
Subject Code: 3030

Dear Mr. Patrick:

Please find enclosed a copy of Volume I of the DO 0004 Final Completion Report. It includes all the sites with the exception of IR-8. IR-8 will be incorporated as Section 11. Your comments on the draft completion report have been incorporated into this document.

The only necessary change to Volume II of the report is to add two months of data for SWMU-9. A new cover sheet, updated Cross Reference Index for SWMU-9 and the new data is attached for your insertion into Volume II. Volume II contains samples of all the disposal paperwork and waste manifest and all the laboratory data.

You requested that the Key West Partnering Team be given copies of this Report. Volume I only will be send to Jorge Caspary, Martha Berry, and Ron Demes. If anyone desires a copy of Volume II, one will be provided upon request.

Volume II was already send to Phillip Williams, Chuck Bryan, Mark Ewing and yourself. A Volume II update is attached for them.

If you have any questions, please feel free to give me a call at (423) 220-2271.

Sincerely,

Roy Hoekstra
Project Engineer

REH:dcm:LR1441
Enclosure: As stated

cc: (see next page)

Bechtel Environmental, Inc.

cc: M. Ewing (ROICC) w/Vol 1 & 2
P. Williams (NASKW) w/Vol 1 & 2
C. Bryan (B&R) w/Vol 1 & 2
M. Berry (EPA) w/Vol. 1 only
J. Caspary (FDEP) w/Vol. 1 only
R. Demes (NASKW) w/Vol. 1 only

014853

BUILDING A CENTURY 1898 BECHTEL 1998

AUG 11 1998

Commanding Officer
Southern Division
Naval Facilities Engineering Command
Attention: Dudley Patrick 1858
2155 Eagle Drive
North Charleston, SC 29406

SUBJECT: Bechtel Job No. 22567
Department of the Navy Contract No. N62467-93-D-0936
DO 0004 COMPLETION REPORT, NAS KEY WEST
Subject Code: 3030

Dear Mr. Patrick:

Please find enclosed the following:

- Responses to Martha Berry's December 31, 1997 comments.
- Revised Title Page and Table of Contents.
- Revised sheet 1 of Table 1-1.
- Revised Page 9-6.
- Copy of IR-8 Section of the DO 0004 Final Completion Report. It includes all the IR-8 information, a copy of the Completion Certification, and incorporates your comments on the draft report.
- Copy of the updated Reference Section.

Please insert these pages into your existing copy of the completion report. Copies are being forwarded to the Key West Partnering Team for their review. If you have any questions, please feel free to give me a call at (423) 220-2271.

Sincerely,

Roy Hoekstra
Project Engineer

REH:crh:Lr1680
Enclosures: As stated
cc: Martha Berry (EPA) w/att
Chuck Bryan (TetraTech NUS) w/att
Jorge Caspary (FDEP) w/att
Ron Demes (NASKW) w/att
Phillip Williams (NASKW) w/att
M. Ewing (ROICC) w/att

Response to Martha Berry's Comments Dated December 31, 1997.

Comment:
General - Including a list of figures and tables in the Table of Contents would be helpful to the reader.
Response:
The Table of Contents has been revised to include a list of figures, tables and attachments.

Comment:
Table 1-1 - The amount listed on this table for contaminated soil at SWMU 1 is 7383 tons, but in Attachment 8-2, the amount is 7838. Please correct.
Response:
The correct amount is 7838. The table is corrected.

Comment:
Figure 5-1 - Is there some way to distinguish whether the results listed in the parentheses are DDT, DDD or DDE?
Response:
This results are IMU field test kits. The results given are for the total of DDT, DDD and DDE.

Comment:
Figure 6-3 - The sample locations marked with a triangle are listed as TAL samples. Are the results on this figure the lead results only?
Response:
These results are for lead only. The TAL metals results are included in Volume II.

Comment:
Section 9.6.5 - For clarification, this section should state that the ditch was excavated to caprock and not backfilled (as noted on Figure 9-4).
Response:
Agree, this section was revised.

PROJECT COMPLETION REPORT
FOR DELIVERY ORDER NO. 004

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

AUGUST 1998

Revision 1

Bechtel Job No. 22567

EXECUTIVE SUMMARY

This Delivery Order Completion Report summarizes actions taken and compiles all significant documentation related to Task 1, Delivery Order No. 0004, under Department of the Navy Contract N62467-93-D-0936. This contract is managed by the Southern Division, Naval Facilities Engineering Command (SOUTHDIV). Bechtel Environmental, Inc. (BEI) is the Response Action Contractor (RAC) responsible for performing environmental cleanup. Delivery Order No. 0004 was issued on 19 May 1994, for interim remediation/source removal of contaminants at 11 sites at the Naval Air Station (NAS) Key West, FL and associated activities. Two sites were subsequently deleted and one new site was added to the scope. This environmental cleanup was conducted pursuant to the Navy's Installation Restoration Program (IRP).

Environmental cleanup at Navy bases is typically performed by two separate contractors: Site investigation, characterization, technology selection, and design of remedial action is the responsibility of a Comprehensive Long-term Environmental Action Navy (CLEAN) contractor, while actual remediation is the responsibility of the RAC.

At Key West no CLEAN had been assigned when BEI was issued the delivery order. The sites were not fully characterized, nor had remedial design been performed. Site investigations by IT Corporation and ABB Environmental Services had identified contaminants and areas of concern and recommended interim actions to remove the major sources of contamination. The Navy directed BEI to develop the RAC scope of work from reports of these investigations. In this way the Navy hoped to expedite the cleanup.

The Navy, the Environmental Protection Agency (EPA), and Florida Department of Environmental Protection (FDEP) agreed that the RAC scope would be classified as an Interim Remedial Action (IRA) which would be followed by a comprehensive risk assessment performed by a CLEAN contractor. The Navy and regulators thought it likely that the expedited IRA would lead to a finding of "No Further Action" (NFA) required at some sites.

For this reason BEI's scope of work at NAS Key West involved more site investigation, design, and planning than would normally be performed by the RAC. Extensive delineation sampling prior to start of the remediation and confirmation sampling upon completion of the work were required.

In order to show the regulatory and technical basis for cleanup actions at Key West, a table of reference correspondence and meetings follows the main body of text as Appendix A. References to this table are provided throughout the text.

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ACRONYMS

ABB-ES	ABB Environmental Services, Inc.
AOC	Area of Concern
BEI	Bechtel Environmental, Inc.
bls	Below Land Surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
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
COE	U. S. Army Corps of Engineers
cy	cubic yard
DO	Delivery Order
EA	Economic Analysis
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
FAC	Florida Administrative Code
FDEP	Floriday Department of Environmental Protection
HW	Hazardous Waste
IMU	Imunoassay
IR	Installation Restoration
IRA	Interim Remedial Action
IRG	Interim Remedial Goal
IRP	Installation Restoration Program
JP	Jet Fuel
NAS	Naval Air Station
NAS	Naval Air Station
NFA	No Further Action
NPDES	National Pollution Discharge Elimination System
NRT	Natural Resource Trustee
NTR	Navy Technical Representative
PAH	Poly-nuclear Aromatic Hydrocarbons
PCB	Poly-Chlorinated Biphenyls
ppm	parts per million
PPR	Project Plan Revision
QC	Quality Control
QV	Quantity Verification
RAC	Response Action Contract / Response Action Contractor
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facilities Investigation
RI	Remedial Investigation
RWP	Remedial Work Plan
SAP	Sampling and Analysis Plan
SOUTHDIV	Southern Division, Naval Facilities Engineering Command
SPS	Shoreline Protection System
SVOC	Semi-Volatile Organic Compound
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TCE	Trichloroethylene
TCLP	Toxicity Characteristic Leaching Procedure
TEL	Threshold Effects Level
TRPH	Total Recoverable Petroleum Hydrocarbon
TSDF	Treatment, Storage and Disposal Facility
UXO	Unexploded Ordnance
VOC	Volatile Organic Compound

1 GENERAL

1.1 BACKGROUND

1.1.1 Scope

The scope of work at NAS Key West under Delivery Order (DO) No. 0004 was described as "interim remediation/source removal of contaminants" at 11 of the 12 sites identified in the *(Draft) RCRA*[a] *Facility Investigation / CERCLA*[b] *Remedial Investigation (RFI/RI) Report; Naval Air Station, Key West, Florida; 12 Sites; October 1993* prepared by IT Corporation, Tampa, Florida. [1, 2]

The 11 sites initially tasked to Bechtel Environmental, Inc. (BEI) were as follows:

Site	Name	Contaminant of Concern
1. SWMU[c]-1:	Boca Chica Open Disposal Area	Lead
2. SWMU-2:	Boca Chica DDT Mixing Area	Pesticides (primarily DDT)
3. SWMU-3:	Boca Chica Fire Fighting Training Area	Petroleum free product
4. SWMU-5:	Boca Chica AIMD Building A-990	Lead-based paint
5. SWMU-7:	Boca Chica Building A-824	PCB
6. IR[d] No. 1:	Truman Annex Refuse Disposal Area	Lead
7. IR No. 3:	Truman Annex DDT Mixing Area	Pesticides (primarily DDT)
8. IR No. 7:	Fleming Key North Landfill	N/A (prevent leaching)
9. IR No. 8:	Fleming Key South Landfill	N/A (protect landfill)
10. AOC[e]-A:	Demolition Key Open Disposal Area	Lead
11. AOC-B:	Big Coppit Key Abandoned Civilian Disposal Area	Lead

The Navy deleted SWMU-5 and AOC-A from the scope because NAS Key West planned to continue using the sites. A twelfth site was later assigned to BEI. It was identified by the *Contamination Assessment Report (CAR), Jet Engine Test Cell, Building A969, Boca Chica Field, Naval Air Station, Key West, Florida, June 1994*; prepared by ABB Environmental Services, Tallahassee, Florida. [3, 4, 5]

12. SWMU-9	Boca Chica Jet Engine Test Cell	Chlorinated solvents & petroleum free product

Figure 1-1 is a site location map for Key West, Boca Chica, and surrounding islands.

1.1.2 Scope Definition

As established in the Remedial Work Plan (RWP) the objectives of the Interim Remedial Action (IRA) performed by BEI were to:

- Remove waste materials and prevent further contaminant migration into the surrounding media, and
- Sample and analyze soils and groundwater after completion of the IRA to provide data for future human health and ecological risk assessments. (Confirmation sampling)

---

[a] RCRA: Resource Conservation and Recovery Act
[b] CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act
[c] SWMU: Solid Waste Management Unit
[d] IR: Installation Restoration
[e] AOC: Area of Concern

The Navy and regulatory agencies anticipated that by removing the sources of contamination, the concentrations of contaminants and risks to human health and the environment could be reduced such that a finding of No Further Action (NFA) or Monitoring Only would be possible. By performing the IRA as a follow-on to the RFI/RI, the Navy hoped to expedite the cleanup, while reducing the cost of site characterization.

Studies and site investigations following the IRA will determine whether there is any remaining risk to human health or the environment, and whether further cleanup is required. These studies will be performed by the CLEAN contractor. BEI's confirmation sampling results will be evaluated as part of the risk assessment.

The RFI/RI did not determine contamination boundaries or depth, making the actual scope of cleanup somewhat uncertain. The Navy recognized that it had only a general idea of the extent of contamination and could expect changes in site boundaries as BEI's work progressed. In developing the RWP and subcontracts, BEI and the Navy incorporated the flexibility to accommodate such changes on site.

To better identify the extent of contamination, BEI performed delineation sampling in the spring and summer of 1995 in preparation for remedial activities. BEI initially planned to set up an on-site laboratory during construction and use field tests to determine contamination boundaries. Subsequently, construction was postponed due to regulatory issues, and BEI took advantage of the delay to perform delineation sampling prior to construction. BEI used field screening methods, with 10 percent of samples sent to a laboratory for verification. [6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19]

1.2 REMEDIAL WORK PLAN DEVELOPMENT

1.2.1 Economic Analysis (EA)

Because the IRA technology had not been selected when BEI was issued the delivery order, BEI's first task was to prepare an EA of the practical, alternative technologies for the IRA at each site. An EA was prepared in July 1994, and updated in January 1995, in order to compare order of magnitude costs among the various technologies which could be used at each site. [20, 21]

The following technologies were considered for eleven sites (SWMU-5 had been eliminated from scope). Italicized type indicates technologies selected.

- *Excavate and offsite disposal:* *SWMU-1, 2, 3, 7; IR-1, 3; AOC-A[a], B*
- *Groundwater pump and treat:* *SWMU-9*
- *Fill and grade:* *IR-7*
- *Install Shoreline Protection System (SPS):* *IR-8*
- Stabilization: SWMU-1, 2; IR-1, 3
- Soil Washing: SWMU-2; IR-3
- Biological treatment/land farming: SWMU-2; IR-3
- Thermal treatment: SWMU-2; IR-3

1.2.2 Remedial Work Plan and Associated Documents

Following selection of technology, BEI prepared an RWP to guide the cleanup effort. The RWP provided the following information about each site:

- Site background, sketch, description, and contaminants of concern

[a] AOC-A was subsequently deleted from project scope.

- Objectives
- Scope of work including a description of all field procedures and technical specifications
- Sampling and Analysis Plan
- Waste Management Plan
- Regulatory requirements
- Construction schedule
- Responsibility Assignment Matrix

The following documents were incorporated into the RWP by reference or attachment:
- Site Safety and Health Plan
- Site Quality Control Plan
- Delineation Sampling Plan and Delineation Sampling Report

BEI prepared a draft RWP in September 1994, and finalized it in February 1995, incorporating comments from the Navy and regulators. The Navy and regulators approved the RWP and its associated documents. The RWP described the IRAs for SWMUs-3, 7 and 9; IRs-7 and 8, and AOCs A and B. For reasons described in paragraph 1.3.1, the remaining sites were not included, but were added later through the PPR process described below.[22, 23, 24, 25, 26, 27, 28, 29, 30]

BEI also prepared a separate Environmental Protection Plan to address protection of wetlands, endangered species habitat, turbidity control and other environmental concerns. [26]

1.2.3 Project Plan Revision (PPR) Process

The evolutionary nature of the NAS Key West project made revisions to the RWP inevitable. BEI revised the RWP in May 1995 based on continuing discussions with the Navy, EPA, and FDEP on regulatory matters discussed in paragraph 1.3.1. This revision was never approved by the Contracting Officer, and it was agreed that BEI would follow the approved (Feb 95) version of the RWP and modify it as necessary through the PPR process. [29, 30, 31]

The PPR process, developed by BEI as a Navy RAC procedure, was utilized for the first time on Key West projects. It proved to be a simple, relatively expedient process for making both major and minor changes to the approved RWP. PPRs prepared for DO-0004 are identified for each site where they were used. PPRs were approved by the Navy and sent to the regulators as necessary for concurrence. The PPR process is shown in Figure 1-2.

1.2.4 Coordination with Regulators, CLEAN Contractor, and Natural Resource Trustees (NRT)

Throughout the planning and execution of the work, close coordination among the various Navy organizations, FDEP, EPA, the NRTs, BEI, and the CLEAN contractors was maintained to insure that all organizations were kept informed. In the case of FDEP, EPA, and the NRTs, the coordination afforded them the opportunity to review the RWP and all proposed changes and to comment or approve of the plan before work actually commenced. [23, 25, 27, 29, 30, 32, 33, 34, 35, 36, 37, 38]

A Responsibility Assignment Matrix was included in the RWP to clarify responsibility among the various entities for all required project actions.

1.3 KEY REGULATORY ISSUES

The requirement to satisfy regulatory and natural resource requirements had a significant impact on project cost and schedule. There were two primary issues: 1) NAS Key West sites fell under both RCRA

and CERCLA requirements and 2) four sites required work in wetland areas. Additionally, three sites included, or were adjacent to habitat area for the lower keys marsh rabbit, an endangered species.

1.3.1 RCRA/CERCLA

On Boca Chica Island NAS Key West stores and manages hazardous waste under a RCRA permit. The RCRA permit identified several SWMUs for corrective action, including those within BEI's scope for the IRA. Therefore, remediation of these sites was performed under RCRA authority. Because the State of Florida is not authorized to implement the RCRA corrective action program, EPA Region IV had primary responsibility for oversight of the RCRA sites.

Sites on Truman Annex and Fleming Key (designated IR sites) and other islands (designated AOC sites) are outside the area included in the RCRA permit for Boca Chica Island. These sites were addressed under CERCLA regulation. NAS Key West is not on the National Priorities List, therefore, the State of Florida has primary responsibility for oversight of the CERCLA sites.

During development of the RWP and the EA, it appeared that cost savings might be obtained by combining the work for sites with similar contamination. DDT contaminated soils, HW code U061, were present at both SWMU-2 (Boca Chica) and IR-3 (Truman Annex), while at SWMU-1 (Boca Chica) and IR-1 (Truman Annex) the RFI/RI report indicated that contaminated soil would carry the HW code D008 for lead. The estimated volume at these sites and the high per ton cost to transport and dispose of their soil at a RCRA facility led BEI and the Navy to consider options such as on-site treatment and/or designation of a Corrective Action Management Unit (CAMU) in an effort to save cost. [3]

While options for these four sites were being discussed in late 1994 - early 1995, BEI submitted the RWP proposing 1) immediate action for the other sites and 2) that these four be addressed after further discussion with the regulators and a determination of whether a more cost-effective IRA could be accomplished. This became the approved RWP. [26, 28]

Ultimately, the CAMU was deemed impractical and most of the soil at the two lead sites was found to be non hazardous. As a result, excavation with off-site treatment and disposal was selected as the best option for both the lead and pesticide contaminated sites. IRAs for these four sites were proposed and approved using the PPR process. [24, 32, 33, 34]

1.3.2 Wetlands Permitting and Habitat

Recognizing that the IRA would affect natural resources, BEI and the Navy invited representatives of FDEP, U. S. Army Corps of Engineers (COE), U. S. Department of the Interior Fish and Wildlife Service, Florida Game and Freshwater Fish Commission, and National Oceanographic and Atmospheric Administration to visit NAS Key West in April 1995, for a tour of the sites and a briefing on the IRA. BEI and the Navy solicited their input on the planned work activities and considered their recommendations in the RWP and subsequent PPRs. [35, 36, 37, 38, 39]

The four wetland sites (SWMUs 1 and 2, AOC-B, and IR-8) required special permits from both the State of Florida and COE before work could proceed. Obtaining the permits required the following actions:

- Wetland delineation; i.e., a detailed mapping of wetland boundaries
- A detailed plan as to how IRA activities would minimize damage to wetlands and habitats
- A detailed plan to prevent the spread of contaminants in surface water during remediation
- A mitigation plan to encourage revegetation by native species
- Approval of the above actions by FDEP and COE through a formal permitting process.

For SWMUs 1 and 2 and AOC-B, BEI prepared the necessary plans and documents for NAS Key West to submit to FDEP. For IR-8, BEI was designated Agent for NAS Key West and prepared and submitted the application on behalf of NAS. (Wetland activities and references for IR-8 are contained in Section 11 of this report.) FDEP acted as a "clearinghouse," having the responsibility to notify the COE and all other agencies of the permit application. Obtaining approval of the permits required a significant amount of effort and affected the schedule of work. [40, 41, 42, 43, 44, 45, 46, 47, 48, 49]

The permits issued by FDEP (No. 442693985) and COE (nationwide permit No. 38) contained additional requirements which BEI and the Navy followed in executing the work. BEI prepared a binder containing the permit and all relevant correspondence for each permitted activity for use by NAS and the site managers.[50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62]

Upon completion of the work, BEI sent copies of the As-built Certification, drawings and other information required by the permit to FDEP's Submerged Lands and Environmental Resources Program. On July 30, 1996, BEI accompanied a representative from FDEP's Marathon office on an inspection of the three completed sites in order to transfer the sites to the operations phase. In September FDEP requested BEI resend the as-builts to them. BEI also prepared the FDEP form "Request for Transfer of Environmental Resource Permit from Construction Phase to Operation Phase," for NAS Key West. As of the date of this completion report, followups to FDEP have not resulted in transfer of the sites to the operations phase. Site specific comments from the inspection are contained in site sections of this report. [61, 62, 63, 64]

1.4 PROJECT SCHEDULE

BEI's budget submitted in August 1994 contained a a 22 week construction schedule. A start date was not forecast, because it was not known how long it would take the regulators to review and approve the work plans and to issue permits for work in the wetlands. The Navy and BEI wanted to start work by November, 1994, but as planning progressed through the end of 1994 and early 1995, it became clear that the review and approval process would be sequential and would take longer than planned.

BEI mobilized with its excavation/hazardous waste disposal subcontractor to NAS Key West in July 1995 to accomplish requirements for the first eight sites. These sites were completed in the following order from August 1995 to April 1996:

1. SWMU-7
2. SWMU-3
3. IR-7
4. IR-3
5. IR-1
6. AOC-B
7. SWMU-1
8. SWMU-2

A small crew returned in July/August 1996 to install a groundwater treatment system at SWMU-9. Construction activities for Shoreline Protection System at IR-8 started in February 1997 and ended in August 1997.

1.5 SITE SPECIFIC EXECUTION

The following sections describe the tools and techniques that were utililized by Bechtel to ensure regulatory compliance and proper execution of the remedial action work plan requirements. Sections 2.-11 describe the actual work at each site.

1.5.1 Planning and Coordination

Prior to conducting field activities at each site the scope of work was reviewed to insure preparations were complete. This was accomplished by the following:

- Preliminary Phase Inspection. Prior to start of construction BEI and the Navy Technical Representative (NTR) inspected each site. A pre-construction checklist was used to ensure that key requirements (e.g., permits, documentation, approvals, and notifications) were completed prior to commencing work. Any deficiencies and comments were noted on the checklist and action taken.
- Weekly Project Status Meetings. BEI conducted a weekly meeting with the NTR and subcontractor site personnel. Representatives of affected Station activities and tenant commands were often present. Discussion focused on the next three weeks' planned work and the week's work just accomplished. Bechtel informed affected activities of potential impacts of remedial activities, and they in turn informed Bechtel of any restrictions and work area rules.

1.5.2 Inspection and Quality Control (QC) of Subcontractor Work

The following procedures helped ensure compliance with regulations and the approved RWP.

- Field Inspection Reports. Conducted in accordance with the project Quality Assurance Program Plan. Checklists were developed and used for key project requirements and specifications. Deficiencies were documented and corrective actions developed and tracked.
- Bi-Weekly QC Meeting. Bi-weekly QC meetings were conducted in conjunction with the weekly status meetings. Quality compliance was documented and discussed with the NTR.
- Quantity Verification (QV) Sheets. The subcontractor submitted daily quantity verification sheets which documented all billable work. The QV sheets were reviewed and approved daily by the Bechtel Cost Engineer.
- Landfill Inspection. The BEI QC Engineer conducted an unannounced audit of the landfill that accepted waste from IR-1, SWMUs-1, -3, -7, and AOC-B. The inspector reported no deficiencies and documented the inspection in the Contractor Production Report of 6 December 1995, to the NTR.
- Daily Reports to Inspector. BEI prepared a daily report for the NTR to document its activities and findings for the day. Deviations from the approved plan were documented with reasons or for corrective action as appropriate.

1.5.3 Control of Transportation and Disposal

Transportation of hazardous and contaminated materials was controlled in the following manner:

- Characterization of Waste. Soil waste from each of the sites was characterized prior to excavation to fulfill disposal facility acceptance requirements.
- Public Works Department Observation. Representatives from NAS Public Works were present at all times to observe loading of contaminated or hazardous material.
- Department of Transportation Uniform Hazardous Waste Manifests. Manifests were completed for each load of material that left the site. The manifests were prepared by the subcontractor and signed by Public Works on behalf of the Navy as generator of the waste. They were returned to NAS Key West by the disposal facility upon receipt of the waste.
- Truck Weight Tickets. Truck weights were verified in accordance with project technical specifications by obtaining weight tickets from a public scale.

- Certificates of Disposal. Documentation of treatment/disposal was prepared by the receiving facility and returned to NAS along with the manifests.

1.6 MATERIAL QUANTITIES

Table 1-1 summarizes quantities of material excavated, transported, treated, disposed, and backfilled. Volume II provides sample waste manifests and certificates of disposal for material removed from each site.

1.7 CONFIRMATION SAMPLING

Volume II contains all confirmation sampling laboratory results.

BEI performed confirmation sampling at each site where contaminated soil was removed to determine if interim removal action goals had been reached. During preparation of the RWP and the various PPRs, BEI, the Navy and regulators determined requirements for confirmation sample locations and analysis on a site by site basis. Data Quality Level "C / III" was used. Generally, the excavations extended to caprock, so that the majority of samples were collected at the side walls of excavations. BEI used both field screening methods and fixed base laboratories. [23, 32, 65]

To avoid construction delays, sample analysis was expedited to determine if removal action goals had been met or if additional excavation were required. The results are shown on site maps in Sections 2-11 and in Volume II.

1.8 LESSIONS LEARNED

Appendix B compiles the most important lessons learned from the work on DO-004.

1.9 SUBCONTRACTS

Three principal subcontracts and several support subcontracts were used to execute the work. These are listed in Appendix C. Key lower-tier subcontractors are also identified.

1.10 SITE-SPECIFIC DESCRIPTIONS

Sections 2 - 11 of this report describe specific conditions existing at the sites prior to the start of work, work planning and execution, and conditions upon completion of work. The sites are described in the order in which they were completed.

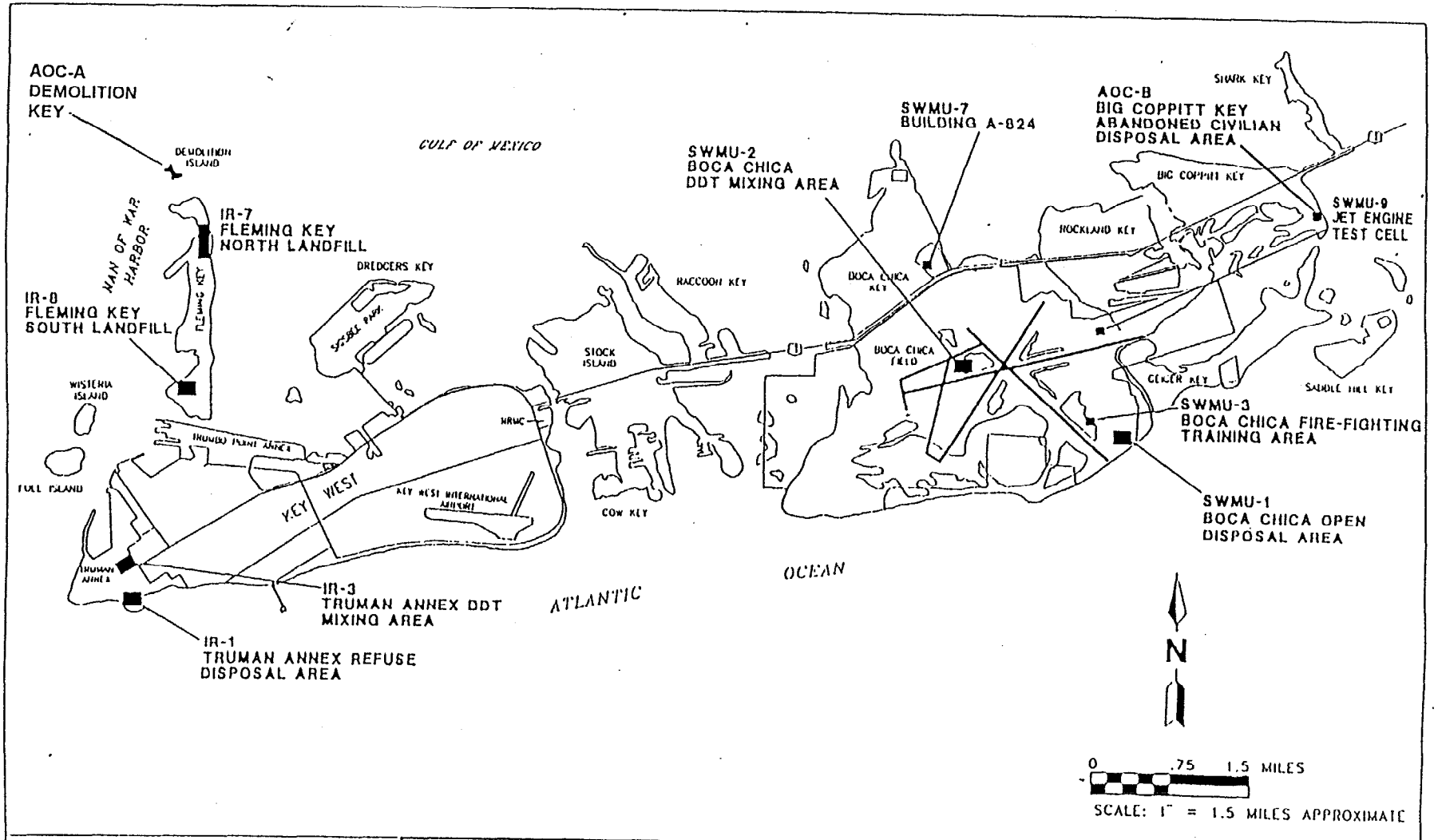
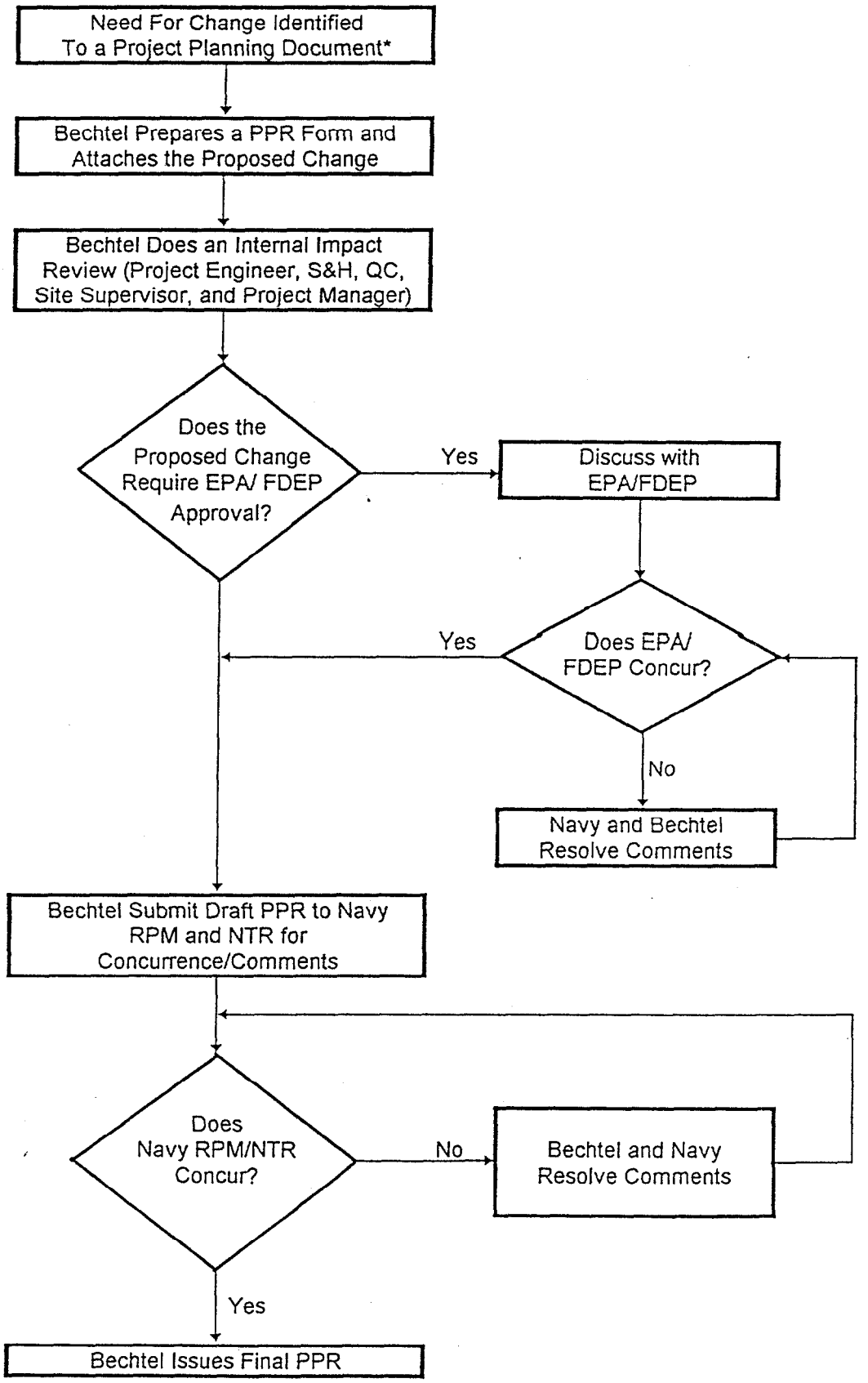


FIGURE 1-1
LOCATION OF SOLID WASTE MANAGEMENT UNITS, AREAS OF CONCERN, AND INSTALLATION RESTORATION SITES

NAS KEY WEST
KEY WEST, FLORIDA

Figure 1-2
NAS Key West
Project Plan Revision (PPR) Approval Process



*Includes Remediation Work Plan, Delineation Sampling Plan, Quality Control Plan, Health and Safety Plan and Environmental Protection Plan

Table 1.1
Summary of Quantities Excavated, Treated, and Restored

Waste Stream or Material Handled	Budget Estimated Quantity of Material to be Excav./Removed	Actual Quantity of Material Excavated and Disposed of Offsite	Disposal Manifest Numbers	Transporter	Disposal Facility or Material Source	Quantity of Soil Treated	Restoration Material Quantity
SWMU-1 - Boca Chica Open Disposal Area							
Contaminated Soil (Lead) Hazardous Waste	2500 Cubic Yards (3150 Tons)	71 Tons	96034, 96035 and 96083	Robbie D. Woods Trucking EPA ID# ALD067138891 Dolomite, AL 35061	Michigan Disposal EPA ID# MID000724831 Belleville, MI 48111 (Treatment Facility) Wayne Disposal, Inc. EPA ID# MID048090633 Belleville, MI (Landfill)	71 Tons	
Contaminated Soil (Lead) Non-Hazardous Waste	NA	7838 Tons	96036 through 96082 and 96084 through 96362	Soil Tech Distributor, Inc. Hialeah, FL 33011	Chamber Okeechobee Landfill Okeechobee, FL 32972	NA	
Backfill Placement					Sunshine Rock, Inc. Miami, FL Rinker Materials Miami, FL 33012		5797 Tons
SWMU-2 - Boca Chica DDT Mixing Area							
Contaminated Soil (Pesticides) Hazardous Waste	2400 Cubic Yards (3024 Tons)	2471 Tons	96363 through 96468	Robbie D. Woods Trucking EPA ID# ALD067138891 Dolomite, AL 35061	Michigan Disposal EPA ID# MID000724831 Belleville, MI 48111 (Treatment Facility) Wayne Disposal, Inc. EPA ID# MID048090633 Belleville, MI (Landfill)	2471 Tons	
Backfill Placement					Sunshine Rock, Inc. Miami, FL Rinker Materials Miami, FL 33012		1495 Tons

Table 1.1
Summary of Quantities Excavated, Treated, and Restored

Waste Stream or Material Handled	Budget Estimated Quantity of Material to be Excav./Removed	Actual Quantity of Material Excavated and Disposed of Offsite	Disposal Manifest Numbers	Transporter	Disposal Facility or Material Source	Quantity of Soil Treated	Restoration Material Quantity
SWMU-3 Boca Chica Fire Fighting Training Area							
Contaminated Soil (Petroleum Products)	275 Cubic Yards (347 Tons)	920 Tons	95003 through 95039	Robbie D. Woods Trucking EPA ID# ALD067138891 Dolomite, AL 35061	Chamber Okeechobee Landfill Okeechobee, FL 34972	NA	
Backfill Placement					Sunshine Rock, Inc. Miami, FL		892 Tons
SWMU-7 Building A-824							
Contaminated Soil (PCBs < 50 ppm)	3 Cubic Yards (4 Tons)	33 Tons	95001 and 95002	Soil Tech Distributor, Inc. Hialeah, FL 33011	Chamber Okeechobee Landfill Okeechobee, FL 34972	NA	
Backfill Placement					White Rock Quaries West Palm Beach, FL		39 Tons
IR-1 - Truman Annex - Refuse Disposal Area							
Contaminated Soil (Lead) Hazardous Waste	1200 Cubic Yards (1512 Tons)	428 Tons	95338 through 95355	Robbie D. Woods Trucking EPA ID# ALD067138891 Dolomite, AL 35061	Michigan Disposal EPA ID# MID000724831 Belleville, MI 48111 (Treatment Facility) Wayne Disposal, Inc. EPA ID# MID048090633 Belleville, MI (Landfill)	428 Tons	
Contaminated Soil (Lead) Non-Hazardous Waste	NA	5715 Tons	95082 through 95337 and 95356 through 95368	Soil Tech Distributor, Inc. Hialeah, FL 33011	Chamber Okeechobee Landfill Okeechobee, FL 32972		
Backfill Placement					Sunshine Rock, Inc. Miami, FL Rinker Materials Miami, FL 33012 White Rock Quaries West Palm Beach, FL Standard Sand and Silica Davenport, FL Florida Aggregate Group Labelle, FL		1021 Tons
Sod Placement					Sodmasters Summerland Key, FL		132000 Sq. Ft.

Table 1.1
Summary of Quantities Excavated, Treated, and Restored

Waste Stream or Material Handled	Budget Estimated Quantity of Material to be Excav./Removed	Actual Quantity of Material Excavated and Disposed of Offsite	Disposal Manifest Numbers	Transporter	Disposal Facility or Material Source	Quantity of Soil Treated	Restoration Material Quantity
IR-3 - Truman Annex DDT Mixing Area							
Contaminated Soil (Pesticides and Heavy Metals)	3330 Cubic Yards (4196 Tons)	926 Tons	95040 through 95079	Robbie D. Woods Trucking EPA ID# ALD067138891 Dolomite, AL 35061 Florida East Coast Railway Company EPA ID# FLD006923627 St. Augustine, FL 32804 Norfolk Southern Corp. EPA ID# GAD006920417 Atlanta, GA 30303 Grand Trunk Western Railroad EPA ID# MIT270010838 Montreal, Quebec H3C3N3	City Environmental, Inc. EPA ID# MID90991566 Detroit, MI 48211 (Treatment Facility) Wayne Disposal, Inc. EPA ID# MID048090633 Belleville, MI (Landfill)	926Tons	
Concrete Debris (Pesticides and Heavy Metals)		42 Tons	95080 and 95081	Robbie D. Woods Trucking EPA ID# ALD067138891 Dolomite, AL 35061	City Environmental, Inc. EPA ID# MID90991566 Detroit, MI 48211 (Treatment Facility) Wayne Disposal, Inc. EPA ID# MID048090633 Belleville, MI (Landfill)	42 Tons	
Backfill Placement					Sunshine Rock, Inc. Miami, FL Rockland Recycling Center Key West, FL		1021 Tons
Sod Placement					Sodmasters Summerland Key, FL 33042		15,000 Sq. Ft.

Table 1.1
Summary of Quantities Excavated, Treated, and Restored

Waste Stream or Material Handled	Budget Estimated Quantity of Material to be Excav./Removed	Actual Quantity of Material Excavated and Disposed of Offsite	Disposal Manifest Numbers	Transporter	Disposal Facility or Material Source	Quantity of Soil Treated	Restoration Material Quantity
IR-7 - Fleming Key North Landfill							
Backfill Placement					Sunshine Rock, Inc. Miami, FL		39 Tons
Sod Placement					Sodmasters Summerland Key, FL 33042		1,000 Sq. Ft.
AOC-B Big Coppit Key Abondoned Civilian Disposal Area							
Debris and Metal Contaminated Soils	1350 Cubic Yards (1890 Tons)	1251 Tons	A9601 through A9653	Soil Tech Distributor, Inc. Hialeah, FL 33011	Chamber Okeechobee Landfill Okeechobee, FL 32972	NA	
Backfill Placement					Sunshine Rock, Inc. Miami, FL		734 Tons

2 SWMU-7: BOCA CHICA BUILDING A-824

2.1 SITE DESCRIPTION

Building A-824 is located north of U.S. 1 on Boca Chica Key. It was formerly used as a 90-day accumulation point for Hazardous Waste (HW) storage, but now houses a solvent recycling operation and stores empty 55 gallon drums and old transformers. The site is shown on Figure 2-1.

The contaminant of concern, PCB[a], was located primarily by the door at the north end of the building. Additional petroleum contamination was discovered east of the building and across the road. The surface water and sediments in the ditch on the west side of the facility have been contaminated by metals, pesticides, and PCBs.

2.2 CLEANUP OBJECTIVE

2.2.1 Contaminant of Concern

The contaminant of concern was defined as PCB contaminated soil from a spill at the north end of the building. [2]

2.2.2 Cleanup Type & Criteria

The IRA objective was defined as contaminant source removal to prevent further migration of PCBs into other media. The objective was to be accomplished by removal of PCB contaminated soil at the north end of the building.

Cleanup of petroleum contaminated soil east of the building, and surface water and sediments in the ditch on the west side of the building were not within the scope of the IRA.

The IRG was to remove all soils with PCB contamination above 1 ppm[b]. This value is the residental cleanup value listed in the FDEP document *Soil Cleanup Goals for Military Sites* dated April 5, 1995. [23, 27, 66]

2.3 DELINEATION SAMPLING & RESULTS

2.3.1 Field Sampling

Delineation sampling was performed at SWMU-7 to establish limits of excavation. Fourteen samples were collected at thirteen locations. The plan was to take samples at two depths at each location, but caprock was shallower than expected and only one location permitted samples to be collected at two depths. The locations and results are shown on Figure 2-1.

2.3.2 Results

Data from delineation sampling and the RFI/RI report established the boundary for PCB contamination as shown by the dashed line on Figure 2-1. The highest concentrations of PCB were detected in samples from the edge of the concrete pad, west and southwest of the pad while concentrations dropped off sharply to the north and east of the pad. The soil sampling indicated the layer of impacted soil was thin (generally 1-10 in.) overlaying caprock.

---

[a] Poly-Chlorinated Biphenyls
[b] ppm: Parts per million

To determine whether RCRA HW was present, the sample having the highest concentration of PCB was analyzed for metals using EPA's TCLP[a] analysis. Test results indicated that no RCRA HW was present. The Delineation Sampling Report contains detailed results. [19]

Based on sampling results, the estimated quantity of soil to be removed was 15 cubic yards, as opposed to the budgetary estimate of 3 cubic yards. The actual quanity of soil removed was 26 cubic yards.

2.4 CLEANUP TECHNOLOGY

2.4.1 Technology Selection

The Economic Analysis considered only excavation and offsite disposal for remediation of SWMU-7. This option was selected as most cost effective due to the small quantity of soil estimated during the budget. The higher quantity estimated as a result of sampling did not change this decision.

2.4.2 Workplan

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

- Excavate PCB contaminated soils located near the north entrance of the building.
- Transport waste to an appropriate treatment/disposal facility.
- Perform confirmation sampling to confirm that IRGs have been met. Provide results to CLEAN contractor for risk assessment.
- Backfill with clean soil and grade.

2.5 REGULATORY AGENCY APPROVAL

2.5.1 EPA & FDEP

The following agreements were made during the planning process:

- The cleanup criteria would be 1 ppm. [23, 24, 66]
- EPA felt a No Further Action Report would be in order if confirmatory samples found nothing above 1 ppm. [34]

2.5.2 Natural Resources Permits and Protection of Natural Resources

The 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, were required.

2.6 EXECUTION OF WORK

2.6.1 Mobilization

A site survey (Figure 2-2) was performed prior to excavation to obtain elevations. The subcontractor utilized a crew with a backhoe and hand tools to excavate and load soil; a pressure washer to maintain dust control during loading operations; and a bobcat loader and walk-behind vibratory compactor to backfill and compact the site. Twenty cubic yard end dump trucks were used to transport the contaminated soil in bulk to the treatment and disposal facility.

[a] TCLP: Toxicity Characteristic Leaching Procedure

2.6.2 Dates and Significant Events

- 07 Aug 95 — Surveyed site. Obtained and ran benchmark
- 17 Aug 95 — Laid out excavation area.
- 21 Aug 95 — Mobilized equipment. Commenced excavation and transportation of PCB contaminated soil. Encountered and damaged buried ground cable. Also damaged metal siding on northwest corner of building Both incidents were documented and reported to NTR.
- 22 Aug 95 — Conducted field screening to verify cleanup objectives were met. Two "hot spots" remained, one outside fenced area in adjacent wetlands; one beneath building foundation. Completed excavation and transportation of contaminated soil. Obtained confirmation samples for laboratory analysis. Repaired cable.
- 23 Aug 95 — Obtained elevations inside excavation area. NTR approved repairs to cable. Began backfill and compaction of excavation area.
- 24 Aug 95 — Completed backfill and compaction. Reset height of site access gates.
- 23 Sep 95 — Repaired building.
- 03 Oct 95 — Closed out punchlist. NTR issued Substantial Completion Notice.

2.6.3 Work Plan vs. Actual Work

2.6.3.1 Deviations from planning and why

The RWP suggested 55 gallon drums or other containers to transport contaminated soil. An onsite estimate of the volume of soil to be removed indicated that dump trucks would be more cost effective.

2.6.3.2 Delays & Problems Encountered; Unexpected Findings/Contamination

It was anticipated that excavation to cleanup objectives would be accomplished within the lateral limits of the site. Previous investigations did not indicate that contamination existed beyond the fenced boundary of the site nor beneath the building's foundation.

Damage to the siding of the building occurred when the backhoe maneuvered past the corner of the building. The damage did not compromise structural stability. The cable that was damaged had not been identified on the utility survey conducted prior to start of work. Both the cable and building were repaired to the satisfaction of the NTR.

2.6.4 Summary of Materials Handled

Table 1-1 contains a summary of materials removed from the site and their disposition.

2.6.5 Site Restoration

The excavation was filled with crushed stone until the contours matched the existing grade. Since SWMU-7 was in a gravel area, revegetation was not required.

2.7 CONFIRMATION SAMPLING AND COMPLETION DRAWINGS

Four confirmation soil samples from the excavation side walls were collected and analyzed for PCB. Samples were collected at the approximate locations shown in Figure 2-3. No soil samples were collected from the floor of the excavation due to rock.

Interim remediation goals for PCBs were met at all but two locations, one at the fence line near the wetland and the other at the building foundation. BEI, the Navy Technical Representative, and SOUTHDIV Remedial Project Manager decided that no further excavation would be done.

Volume II contains a complete copy of the analytical results.

2.8 APPROVAL OF COMPLETED IRA

2.8.1 Regulatory Agency

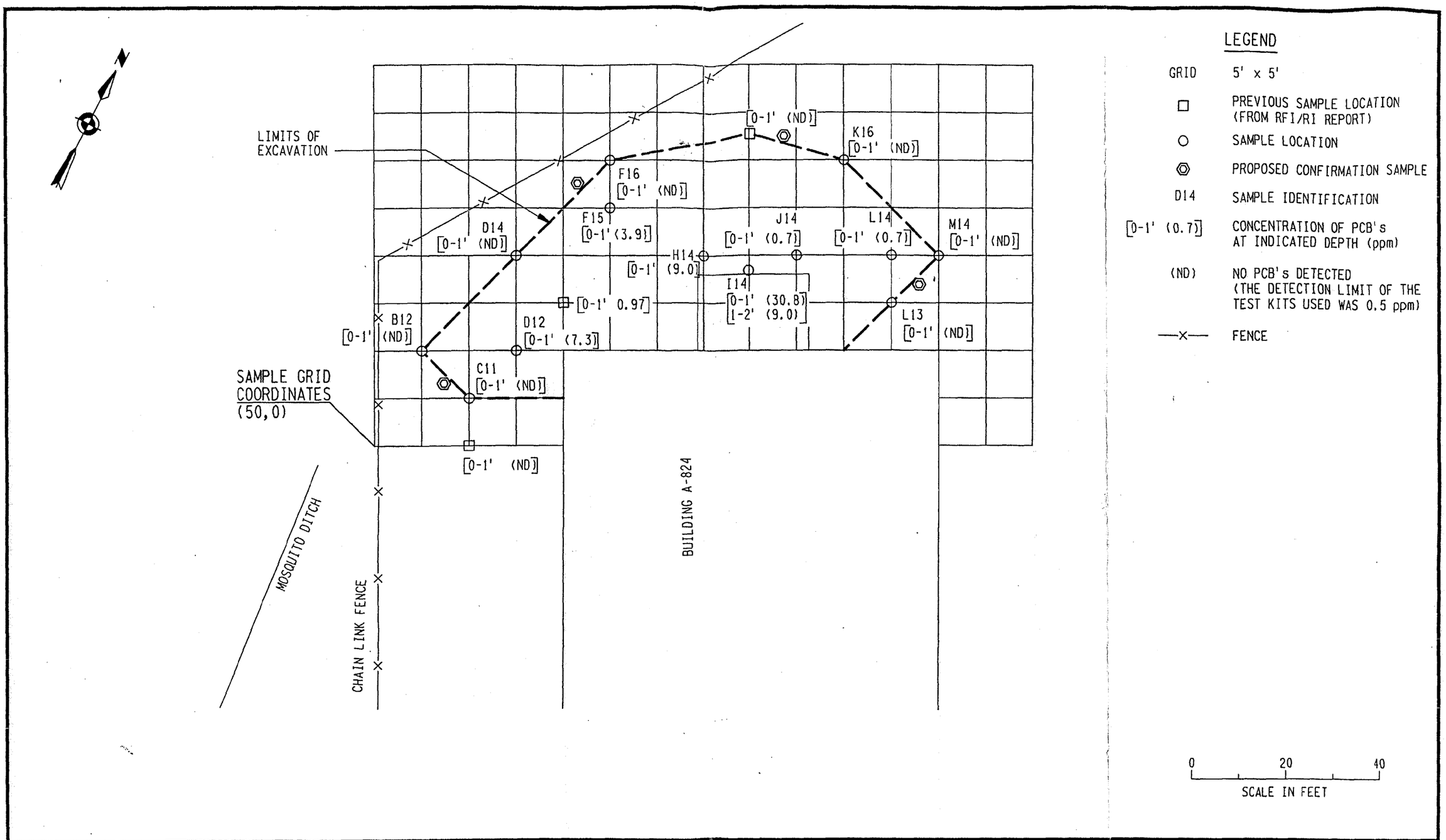
Due to the remaining PCB, a No Further Action report could not be issued.

2.8.2 Navy / NTR Approval

Copies of the Site Closeout Report and the signed Certificate of Substantial Completion are included as Attachments 2-1 and 2-2.

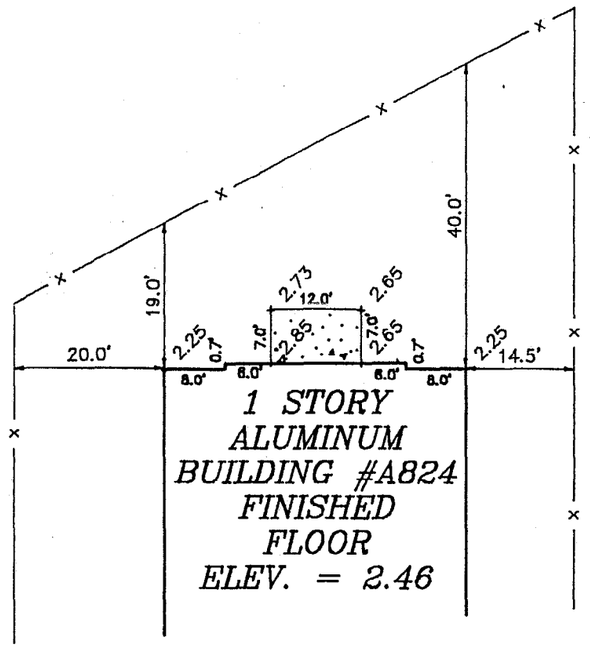
2.8.3 Photographs

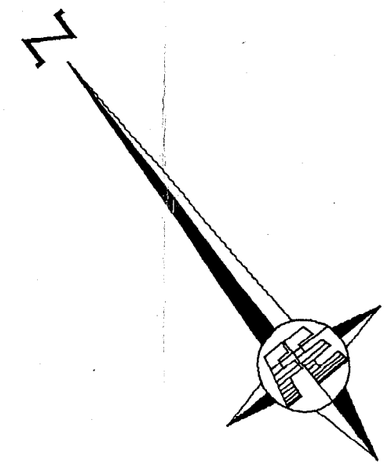
The completion poster, Attachment 2-3, provides a photographic record for this site.



22567 321 SFIG2.DGN
7/27/95

FIGURE 2-1
SAMPLE GRID FOR
SWMU NO.7 - BOCA CHICA
BUILDING A-824





GRAPHIC SCALE

(IN FEET)
1 inch = 20 ft.

FIGURE 2-2

NOTES:

1. *ELEVATIONS ARE FOR EXISTING GRADES. SITE WILL BE RESTORED TO NATURAL GRADE AFTER EXCAVATION.*

+0.00 *INDICATES SPOT WHERE ELEVATION WAS TAKEN*

ALL SHOTS WERE TAKEN AT GROUND

ABBREVIATION LEGEND:

F.I.R	FOUND IRON ROD, SIZE INDICATED	SEC.	SECTION
S.I.R.	SET IRON ROD, 1/2" L.B. No. 5408	TWP.	TOWNSHIP
F.I.P.	FOUND IRON PIPE, SIZE INDICATED	RGE.	RANGE
F.N.D.	FOUND NAIL AND DISK	(D)	DEED
S.N.D.	SET NAIL AND DISK, L.B. No. 5408	(P)	PLAT
F.C.M.	FOUND CONCRETE MONUMENT	(M)	MEASURED
P.R.M.	PERMANENT REFERENCE MONUMENT	(C)	CALCULATED
P.C.P.	PERMANENT CONTROL POINT	CONC.	CONCRETE
P.I.	POINT OF INTERSECTION	COV.	COVERED
P.C.	POINT OF CURVE	ASPH.	ASPHALT
P.O.B.	POINT OF BEGINNING	PVMT.	PAVEMENT
R/W	RIGHT-OF-WAY	ELEV.	ELEVATION
TYP.	TYPICAL	PP	POWER POLE
OHW	OVERHEAD WIRE		

FRANK & ELLIOTT
SURVEYORS • ENGINEERS LAND PLANNERS
83266 OVERSEAS HIGHWAY, SUITE 500, ISLAMORADA, FLORIDA 33036
Phone (305) 664-0764 FAX (305) 664-0818
A DIVISION OF MERMAYDON BUSINESS CORPORATION

CERTIFIED FOR SPECIAL PURPOSE SURVEY

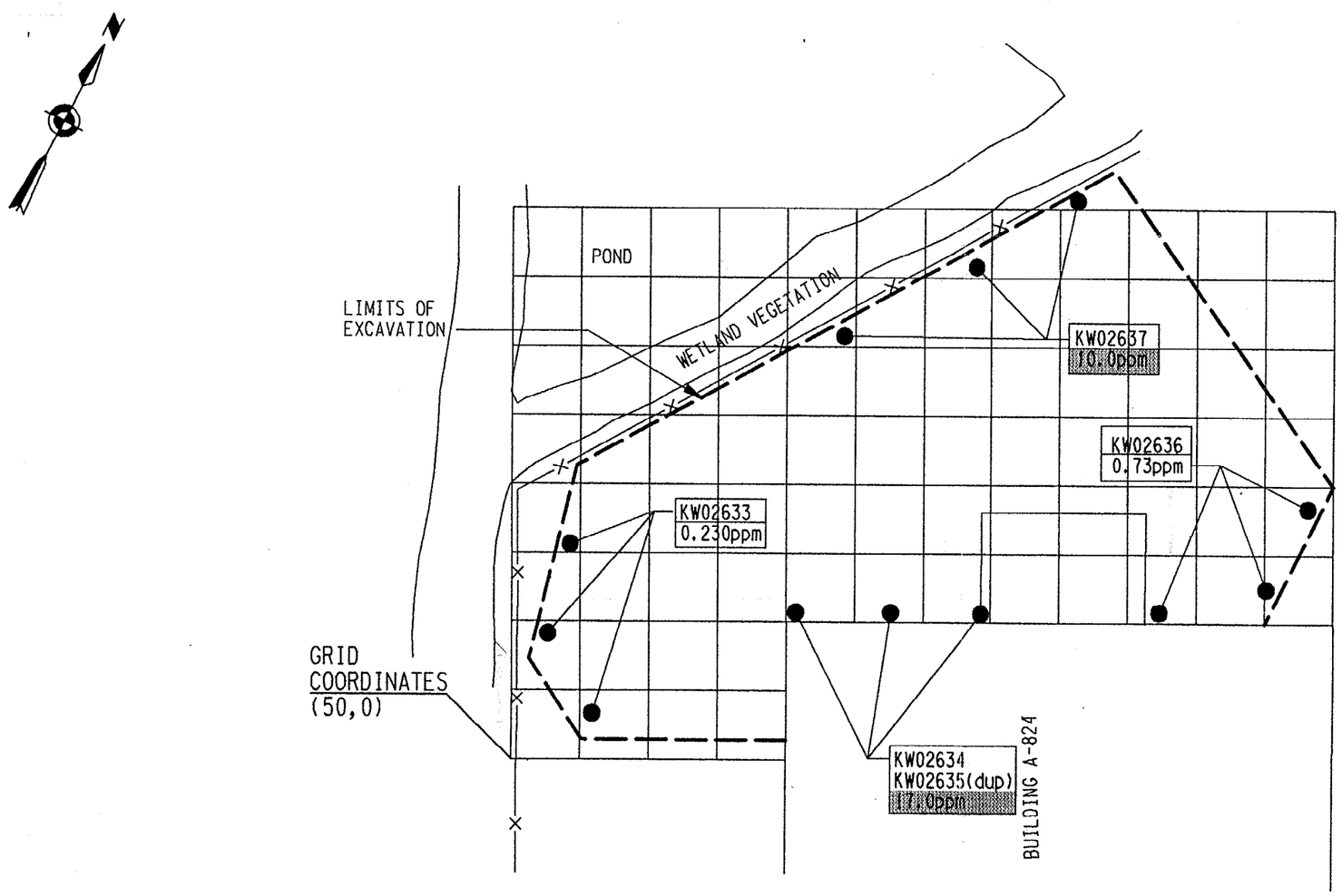
I HEREBY CERTIFY THIS SURVEY MEETS THE MINIMUM TECHNICAL STANDARDS AS SET FORTH BY THE FLORIDA BOARD OF PROFESSIONAL SURVEYORS AND MAPPERS IN CHAPTER 61G17-6 FLORIDA ADMINISTRATIVE CODE, PURSUANT TO SECTION 472.027, FLORIDA STATUTES.

SCALE: 1"=20'	Lawrence P. Frank	DRAWN BY:	G.N.B.
DATE: 08/07/95	LAWRENCE P. FRANK, P.L.S. # 4619	REVISED	

SWMU-7

CERTIFIED TO:

JOB NUMBER: 95142.SWMU-7



LEGEND

GRID	5' x 5'
●	SAMPLE LOCATION
—×—	FENCE
KW02637 / 10.0ppm	CONFIRMATION SAMPLE ID RESULTS
▒	RESULTS ABOVE 1.0ppm (CLEAN UP GOAL FOR PCB'S)

NOTES

1. THE EXCAVATION EXTENDED TO CAPROCK.
2. THE EXCAVATION WAS BACKFILLED TO THE ORIGINAL GRADE WITH CRUSHED STONE.
3. ALL EXISTING MONITORING WELLS WERE LEFT IN PLACE.

0 20 40
SCALE IN FEET

22567 321 SFIG2.DGN
10/1/96

FIGURE 2-3
SWMU NO.7 - BOCA CHICA
BUILDING A-824
AS-BUILT

Attachment 2-1

Site Closeout Report

SITE CLOSEOUT REPORT

SWMU number 7

RECEIVED
BECHTEL

OCT 2 1995

22567 - 3 2 1

On August 21, 1995 Associated Environmental Services Inc. mobilized equipment and crew to Solid Waste Management Unit (SWMU) number 7. Work consisted of site setup and security, removal of berm material, excavation, loading, transportation, and disposal of contaminated soil, personnel and equipment decontamination, backfill and site restoration.

Personnel Time on Site

Site Superintendent:	18 hrs
Forman:	18 hrs
Health & Safety:	18 hrs
Operator:	23 hrs
Labor:	18 hrs

Equipment Time on Site

Case 580D Backhoe:	23 hrs

Soil Loading, Transportation and Disposal

Final Disposition Method:	Subtitle D Landfill	
Volume Loaded:	33	Tons
Transported:	33	Tons
Disposal:	33	Tons

Site Restoration

General Fill:	39	Tons

Material Sampling and Analysis

Three samples were collected on August 4, 1995. Samples were analysized for TCLP Metals, TRPH and BTEX see attachments for results.

Lower Tier Subcontractors

Transporter:	Soil Tech Distributor, Inc. P.O. Box 110926 Hialeah, Florida 33011-0926 (305) 828-2362
Disposal Facility:	Chamber Okeechobee Landfill 10800 NE 126th Ave. Okeechobee, FL 34972 (813) 357-0111
Laboratory:	Pace Inc. Environmental Laboratories 5460 Beaumont Center Blvd. Tampa, FL 33634 (813) 884-8268 Florida DEP CompQAP #870529G Lab Certification Florida Environmental:HRS #E84003 Florida SDWA:HRS #84125
General Fill:	White Rock Quaries P.O. Box 15065 West Palm Beach, Florida 33416 (305) 833-5322

Attachment 2-2

Certification of Substantial Completion

011203

CERTIFICATE OF SUBSTANTIAL COMPLETION

Date: 30 Oct 95

Site : SWMU-7; Boca Chica

Description of Site : PCB Storage Area

Contractor : Associated Environmental

Contract No. : 22567-321-SC-0415

Punch List Completion Date 23 Sep : Verified complete 03 Oct 95
+ CONFIRMATION SAMPLE TEST RESULTS, TO BE SUBMITTED 10/25/95 RECD

This is to certifiy the work described above has been substantially completed in accordance with the contract and associated documents. The site designated above has been inspected by representatives of the customer, contractor, and Bechtel, and is compete with the exception of the attached punch list (if applicable) which the contractor agrees to complete by the date designated.

The warranty period commences on the date the contractor completes the remedial work as described in the punch list or from the date of execution of the Certificate of Substantial Completion, whichever is later.

INSPECTION CERTIFICATE

CONTRACTOR: Randall L. Veal DATE: 04-Oct-95

ACCEPTED BY

BECHTEL: [signature] DATE: 04 Oct 95

CUSTOMER REPRESENTATIVE: [signature] DATE: 15 Nov 95

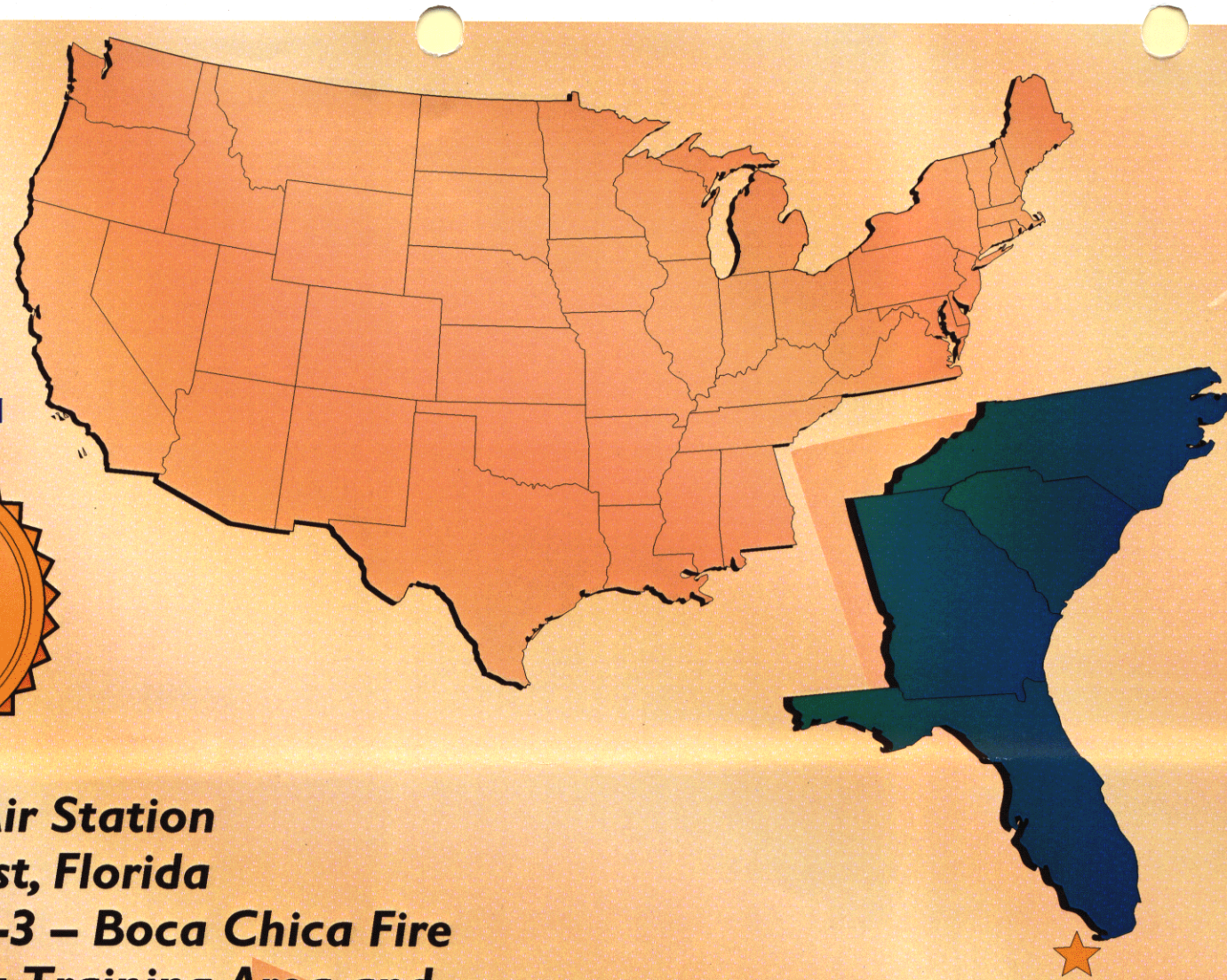
Attachment 2-3

Completion Poster

Southern Division
Naval Facilities Engineering Command

11th & 12th Completed Sites

Navy RGC Completed Sites



Naval Air Station Key West, Florida SWMU-3 – Boca Chica Fire Fighting Training Area and SWMU-7 Building A-824

Remediation activities at SWMU-3 and SWMU-7 included excavation of petroleum-contaminated soil (SWMU-3) and PCB-contaminated soil (SWMU-7), transportation to a landfill for disposal and backfill with clean soil. To determine the limits of excavation, screening methods were used followed by confirmation sampling and laboratory analysis.

The site before remediation activities began (SWMU-7)

Excavation and stockpiling of the petroleum-contaminated soils (SWMU-3)

Dust suppression during loading activities (SWMU-7)

Backfilling with clean crushed stone to match existing grade (SWMU-3)

Loading of the PCB-contaminated soils for disposal. Note the use of plastic on the side of the truck to keep the truck from becoming contaminated (SWMU-7)

The site after all site restoration activities are complete (SWMU-3)

The site after all site restoration activities are complete (SWMU-7)

BECHTEL

Z10.2 8735

0113D02X

3 SWMU-3: BOCA CHICA FIRE FIGHTING TRAINING AREA

3.1 SITE DESCRIPTION

The Fire Fighting Training Area is located adjacent to the southern blimp pad on Boca Chica Key in the southeastern portion of NAS Key West. This area consisted of two unlined circular pits approximately 50 ft in diameter with a 2 to 3 ft berm around each. Figure 3-1 is a site map showing the southeast pit where remediation activities were conducted.

Fire-fighting training was conducted in the pits using diesel fuel, aviation gas, or oil. The soils and groundwater in the two burn areas were 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 contain pesticides and metals.

3.2 CLEANUP OBJECTIVE

3.2.1 Contaminant of Concern

The contaminant of concern was defined as floating free product. [2]

3.2.2 Cleanup Type & Criteria

The IRA objective was contaminant source removal from the southernmost of the two circular pits to prevent further migration of petroleum contamination into groundwater. This objective was to be accomplished by removal of floating product that had been found in monitoring well S3MW-3 and removal of any petroleum contaminated soils. [2]

The Interim Remedial Goal (IRG) for the site was defined as removal of floating product. [67]

This IRA was conducted in accordance with Florida Administrative Code (FAC) 62-770, "Petroleum Contamination Site Cleanup Criteria." The criteria used to determine the extent of soil removal was visual discoloration of the soil or, alternatively, headspace readings which exceeded 10 ppm. [23]

3.3 DELINEATION SAMPLING & RESULTS

3.3.1 Field Sampling

Delineation sampling established limits of excavation. Samples were taken as follows:

- Seven different locations at varying depths.
- One composite sample of the berm was prepared using soil from four different locations

Sample locations, depths, results, and limits of excavation are shown on Figure 3-1.

3.3.2 Results

Data from the delineation sampling and the RFI/RI report established the boundary for petroleum impacted soil as the area inside the berm. The data indicated that impacted soil extended down to caprock, 20 to 35 inches below the ground surface. Field analytical data indicated the berm material was not impacted by BTEX[a] or PAHs[b]. Immunoassay test kits were used for the field analysis.

[a] BTEX: Benzene, Toluene, Ethylene, Xylene

To determine whether RCRA HW was present, the sample containing the highest level of PAH was analyzed for metals and VOCs[a] using EPA's TCLP analysis. Test results indicated that no RCRA HW was present. The results of testing and limits of excavation are also shown on Figure 3-1, and detailed findings are contained in BEI's delineation sampling report of August 1995. [19]

Based on delineation sampling results, the estimated quantity of soil to be removed was increased from the budgeted 275 cubic yards (cy) to 525 cy. The actual quanity of soil removed was 726 cy.

3.4 CLEANUP TECHNOLOGY

3.4.1 Technology Selection

Excavation and offsite disposal was selected as the most cost effective option due to the small quantity of soil estimated during the budget. The higher quantity estimated as a result of sampling did not change this selection.

3.4.2 Workplan

The scope of work for SWMU-3 consisted of the following elements:

- Close two monitoring wells (S3MW-3 and S3MW-4).
- Excavate soil above floating product down to the watertable or caprock; the excavation was to remain within the bermed area.
- Use absorbent material to recover all floating product in the excavation.
- Transport solid waste to a disposal facility.
- Perform confirmation sampling to confirm that IRGs have been met. Provide results to CLEAN contractor for risk assessment.
- Backfill with clean fill and grade. The workplan allowed use of berm material or excavated soils provided headspace readings of the material were below 10 ppm.

The extent of the excavation was based on the extent of floating product and the extent of discolored soil encountered. In areas where soil color was not distinctive enough to determine the extent of excavation an alternative method was to take headspace readings and remove soil where the reading exceeded 10 ppm. Upon completion of excavation and/or removal of free product, confirmatory samples would be taken at four locations in the sidewalls and analyzed for SVOC[b]s and VOCs.

PPR-321-01 was written to better define the IRGs and to specify the use of headspace readings as the field screening method. [67]

3.5 REGULATORY AGENCY APPROVAL

3.5.1 EPA & FDEP

The following agreements were made during the planning process:

- Conferees at the August 1994 Regulatory meeting agreed to excavate the petroleum contaminated soil and haul it to a soil burning facility in Miami [23, 32]
- Conferees at the NRT meeting in April 1995, agreed that the site is an upland area and that the primary natural resources concern would be nesting least terns. [37]

---

[a] VOC: Volatile Organic Compounds
[b] Semi-Volatile Organic Compounds

- In a January 4, 1995 letter to EPA, BEI agreed that the RWP would use cleanup criteria of 10 ppm TRPH[a] for the site. [23]

3.5.2 Natural Resources Permits and Protection of Natural Resources

SWMU-3 was not in a wetland, but was a potential nesting area for the endangered Least Tern. The NAS Key West Natural Resources Manager inspected the site prior to start of work and found no nesting terns.

3.6 EXECUTION OF WORK

3.6.1 Mobilization

SWMU-3 is located inside the airfield. Access procedures were jointly developed by BEI, the NTR and NAS Key West Air Operations personnel. A backhoe and front end loader were used for excavation. End dump trucks (20 cubic yard capacity) were used to transport contaminated soil to the disposal facility. A bulldozer was used to spread backfill.

3.6.2 Dates and Significant Events

• 27 Jul 95	Mobilized drill rig to site and abandoned wells S3MW3 and S3MW4..
• 03 Aug 95	Surveyed site. Obtained and ran benchmark. Layout excavation area.
• 23 Aug 95	Received SOUTHDIV approval of PPR 321-001.
• 24 Aug 95	Performed preliminary phase inspection with NTR. (Attachment 3-1) Mobilized backhoe and crew to site. Began removal of berm material.
• 23 Aug 95	Received SOUTHDIV approval of PPR 321-001.
• 29 Aug 95	Commenced loading and transporting contaminated material.
• 31 Aug 95	Completed excavation of petroleum contaminated soil to delineated lateral limits. Conducted headspace analysis of screening samples. Found one "hot spot" at edge of excavation. NTR approved additional excavation.
• 01 Sep 95	Excavated "hot spot." Collected confirmation samples.
• 06 Sep 95	Completed transportation of petroleum contaminated soil. Mobilized dozer and began backfill.
• 27 Sep 95	Completed backfill and grading. Demobilized all equipment.
• 5 Oct 95	NTR issued Certificate of Substantial Completion.

3.6.3 Work Plan vs. Actual Work

3.6.3.1 Deviations from Planning and Why

BEI had planned to use berm material as backfill; however, the berm contained trash and debris which was not suitable for fill material. At the direction of the NTR, the spoils were moved into a pile adjacent to the site and no further action was taken with the berm material.

Project procedures required that after departure for the disposal facility each truck transporting contaminated materials be weighed at a certified scale within 30 miles of the Naval Air Station. Due to the remote location of the site, turnaround times often resulted in trucks arriving at the site after 1400. The only scale within the 30 mile radius closed at 1600 each weekday so that late arriving trucks could not be loaded and weighed before the scales closed. To avoid holding trucks overnight and incurring demurrage charges BEI and the NTR agreed that these trucks would be lightly loaded and weights obtained at the first available certified scales en route to the disposal facility.

[a] TRPH: Total Recoverable Petroleum Hydrocarbon

3.6.3.2 Delays & Problems Encountered; Unexpected Findings/Contamination

Delays were encountered initially when Public Works personnel were not available to provide oversight of truck loading and manifest signing due to schedule conflicts during normal work hours. In addition, because of the long turnaround times, trucks often arrived at the site after normal work hours. In order to avoid truck demurrage charges Public Works personnel were given approval to work extended hours to support loading and manifesting.

Substantially less free product than expected (about one quart total) was found on the surface of the groundwater.

3.6.4 Summary of Materials Handled

Table 1-1 contains the summary of materials removed from the site and their disposition.

3.6.5 Site Restoration

The excavation was filled with crushed stone until the contours matched the existing grade. Since SWMU-3 was in a gravel area next to the taxiway, revegetation was not required.

3.7 CONFIRMATION SAMPLING AND COMPLETION DRAWINGS

Four sidewall confirmation samples were collected at the edge of the excavation. The locations of these samples are shown on Figure 3-2. This figure also indicates boundaries of the actual excavation. The results from the sampling indicated that all volatile and semi-volatile organic compounds including BTEX and PAHs were removed to below criteria limits. A copy of the complete analytical results is contained in Volume II.

3.8 APPROVAL OF COMPLETED IRA

3.8.1 Regulatory Agency

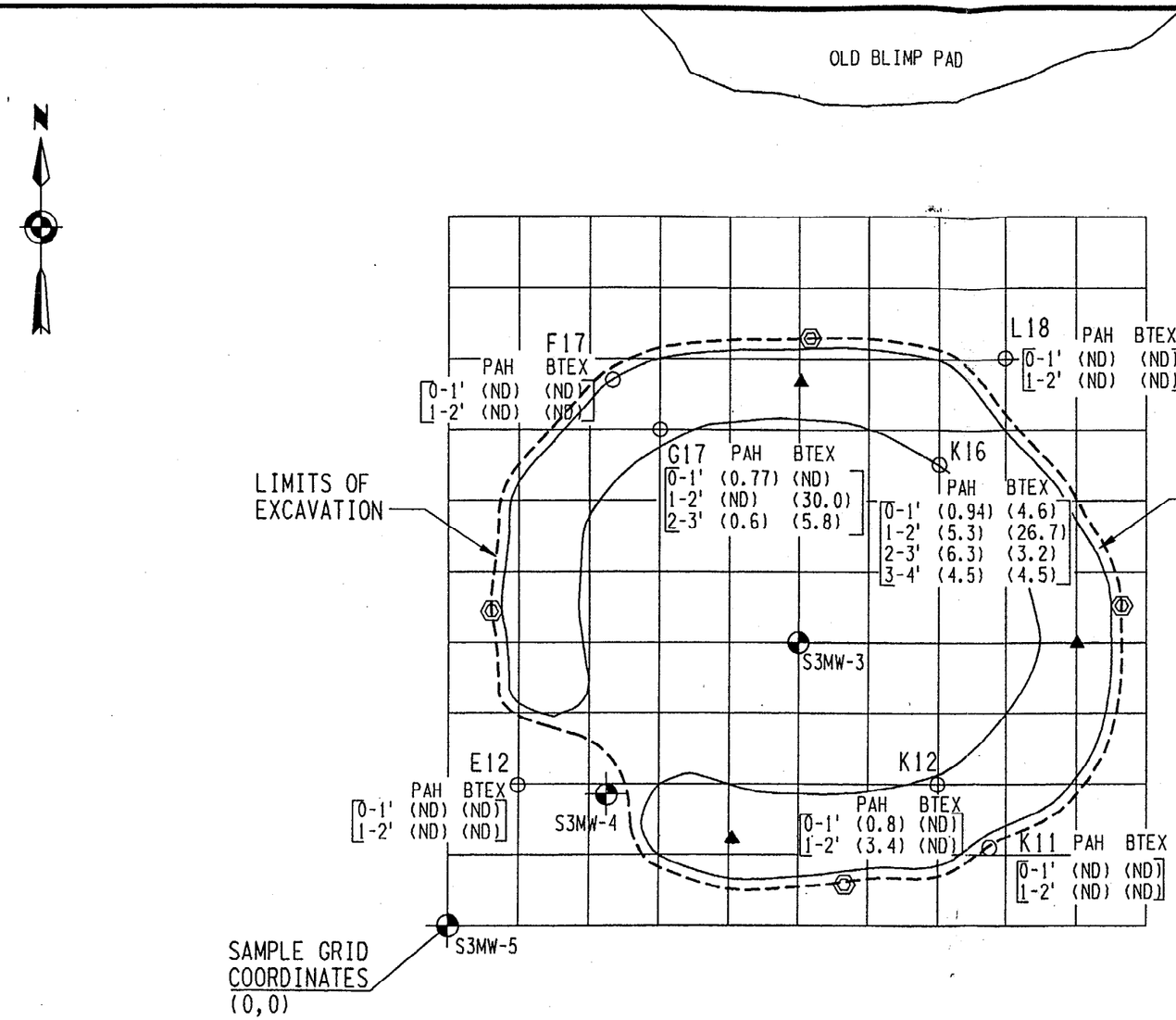
There is no required regulatory action on the completed IRA, since the IRA goals were met.

3.8.2 Navy / NTR Approval

Copies of the Site Closeout Report and signed Certificate of Substantial Completion are included as Attachments 3-2 and 3-3.

3.9 PHOTOGRAPHS

The completion poster, Attachment 3-4, provides a photographic record of the site.



NOTES

1. NO PAH's OR BTEX DETECTED IN COMPOSITE SAMPLE OF BERM MATERIAL.
2. THE DETECTION LIMIT FOR THE PAH TEST KIT WAS 0.6 PPM AND FOR THE BTEX KIT WAS 2.5 PPM.

LEGEND

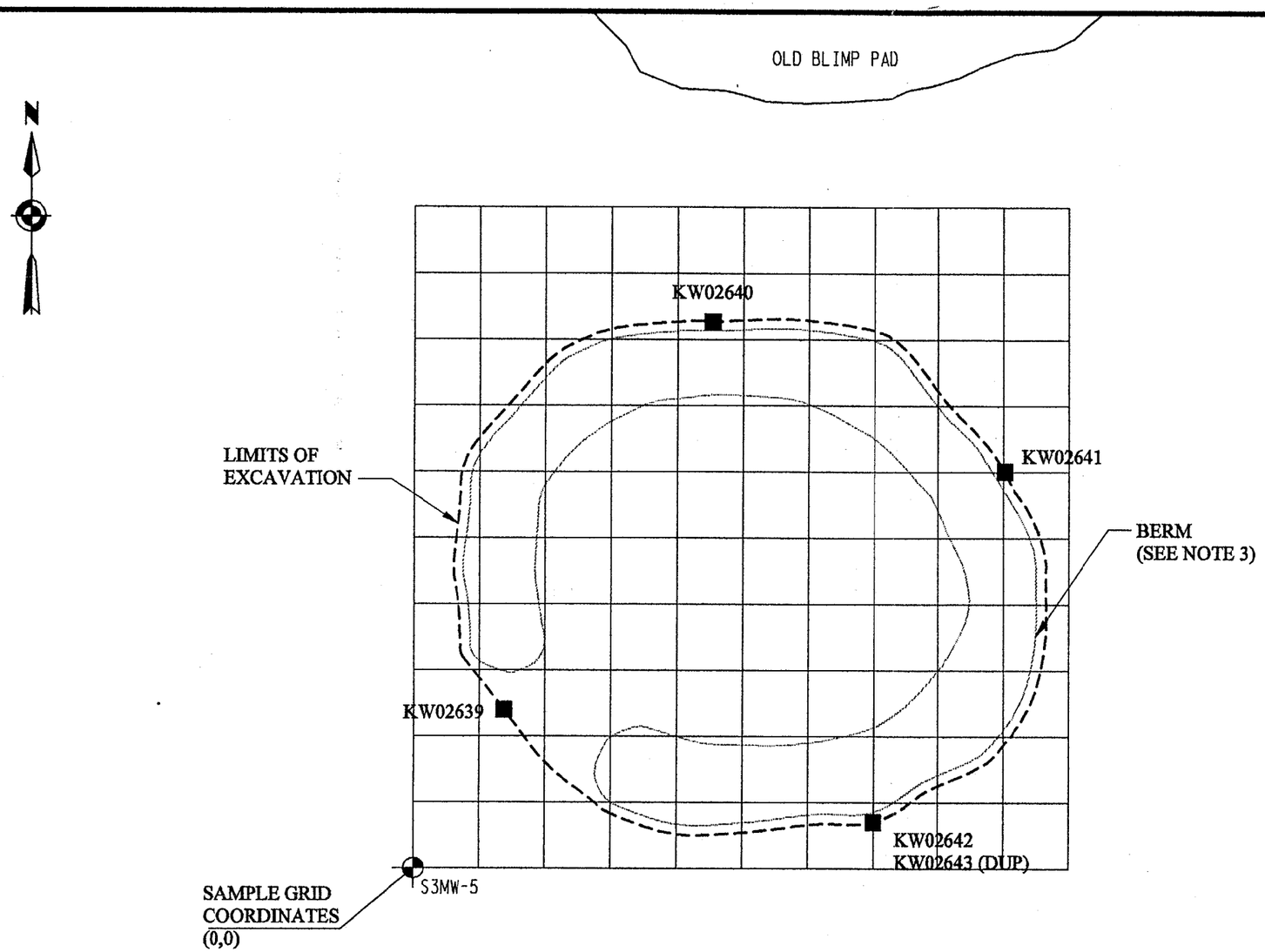
GRID	10' x 10'
⊕	MONITORING WELL
○	SAMPLE LOCATION
⬡	PROPOSED CONFIRMATION SAMPLE
K11	SAMPLE IDENTIFICATION
PAH BTEX 0-1' (0.8) (3.0) 1-2' (3.4) (8.5)	CONCENTRATION OF PAH's AND BTEX AT INDICATED DEPTH (ppm)
(ND)	NOT DETECTED
▲	LOCATION FOR COMPOSITE SAMPLE

0 20 40
SCALE IN FEET

22567 321 SFIG4.DGN
7/27/95

FIGURE 3-1
SAMPLE RESULTS FOR SWMU NO.3 - BOCA CHICA FIRE FIGHTING TRAINING AREA

0113D832



NOTES

1. The excavation depth was to the water table. The excavation was backfilled with crushed limerock to match the adjacent grade.
2. The limits of the excavation extended to the outside of the existing berm.
3. The berm was removed prior to the start of the excavation.
4. Monitoring Wells S3MW-4 and S3MW-4 were abandoned prior to the start of the excavation.
5. Confirmation Sampling results indicate that all of the volatile and semi-volatile organic compounds were removed to below criteria limits.

LEGEND

GRID	10' x 10'
⊕	MONITORING WELL
■	CONFIRMATION SAMPLE ID

0 20 40
SCALE IN FEET

22567 321 SFIG4.DGN
7/27/95

FIGURE 3-2
SWMU NO.3 - BOCA CHICA FIRE FIGHTING TRAINING AREA AS-BUILT

Attachment 3-1

Pre-Activity Site Checklist

CHECKLIST ITEMS FOR SWMU-3

NO.	DESCRIPTION	YES	NO	N/A	Comments
1	Natural Resource Representive OK	X			Verbal verification by NTR on 8/21/95
2	Excavation Permit in place	X			Verbal verification by A. Saltzman
3	Approved Work Plan/Criteria/Delineation of Excavation	X			RPM approved Project Plan Revision 8/23/95
4	Original Survey Results		X		Proceed with work
5	Utility Survey Performed/Documented/Ok to proceed	X			On file
6	Southern Bell Telephone Survey/Documented/OK to proceed	X			On file
7	Profile Sampling Analytical Results	X			AES has, will copy BEI prior to loading trucks.
8	Disposal facility letter of material acceptance	X			AES has, will copy BEI prior to loading trucks.
9	Backfill Material Certification of Cleanliness		X		AES to verify requirements with project engineer prior to backfill
10	ROICC Notification	X			
11	Are any potential subsurface hazards identified and addressed	X			Free product, no others identified
12	Are any archaeological items present		X		None present to our knowledge
13	Potential UXO identified and addressed	X			None present to our knowledge. Contingency plan in place
14	Backfill/Compaction requirements identified	X			
15	Compaction testing requirements identified/scheduled	X			
16	Field Screening/Confirmatory sampling scheduled	X			Headspace screening.
17	Loading observation by PWD Environmental scheduled		X		Call NTR at time of excavation
18	OK to backfill based on field screening results			X	Will be determined at time of backfill
19	Absorbent Material for removing free product on-site	X			Round absorbent booms
20	Drums for used absorbent material on-site	X			5 on-site
21	Disposal of Drums w/ absorbent material scheduled		X		Need analytical and profile of material prior to disposal
22	Truck routing and loading location discussed with ROICC	X			NTR OK with routing and loading locations
23	Removal of conrete rubble from well abandonment addressed	X			AES will remove rubble along with soil removal

Notes:

Discussion between AES, BEI and NTR regarding use of berm material as backfill material. Agreement was reached that the berm material was probably not suitable and that it would be placed in a clear area northwest of the excavation area. NTR was asked whether there were any requirements on size, height or lining for placing the berm material and the NTR indicated that there were not.

NTR indicated that the Florida Administrative Code precluded staging contaminated material on potentially uncontaminated areas, including withing the excavation area, unless the stockpile was placed on a liner and surrounded by a berm to contain runoff. Later agreement was reached between the NTR and the BEI field engineer that if a determination was made by visual inspection or headspace samples that an area within the excavation zone was contaminated that disturbed material could be staged for loading on this contaminated area without using liners.

Attachment 3-2

Site Closeout Report

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BECHTEL
OCT 2 1995
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Site Closeout Report

SWMU number 3

On August 23, 1995 Associated Environmental Services Inc. mobilized equipment and crew to Solid Waste Management Unit (SWMU) number 3. Work consisted of site setup and security, removal of berm material, excavation, loading, transportation, and disposal of contaminated soil, personnel and equipment decontamination, backfill and site restoration.

Personnel Time on Site

Site Superintendent:	89 hrs
Forman:	66.5 hrs
Health & Safety:	89 hrs
Operator:	94 hrs
Labor:	89 hrs

Equipment Time on Site

Case 580D Backhoe:	89 hrs
D4 Dozer:	5 hrs

Soil Loading, Transportation and Disposal

Final Disposition Method:	Subtitle D Landfill
Volume Loaded:	920 Tons
Transported:	920 Tons
Disposal:	920 Tons

Site Restoration

General Fill:	892 Tons

Material Sampling and Analysis

Three samples were collected on August 4, 1995. Samples were analysized for TCLP Metals, TRPH and BTEX see attachments for results.

Lower Tier Subcontractors

Transporter:	Robbie D. Wood Trucking P.O. Box 125 Dolomite, AL 35061 (205) 744-8440 EPA ID# ALD067138891
Disposal Facility:	Chamber Okeechobee Landfill 10800 NE 126th Ave. Okeechobee, FL 34972
Laboratory:	Pace Inc. Environmental Laboratories 5460 Beaumont Center Blvd. Tampa, FL 33634 (813) 884-8268 Florida DEP CompQAP #870529G Lab Certification Florida Environmental:HRS #E84003 Florida SDWA:HRS #84125
General Fill:	Sunshine Rock, Inc. Plant Address: NW 129th Ave. & 202nd St. Miami, FL (305) 821-8660

Attachment 3-3

Certification of Substantial Completion

011203

CERTIFICATE OF SUBSTANTIAL COMPLETION

Date: 03 Oct 95

Site : SWMU-3

Description of Site : Fire Fighting Test Cell

Contractor : Associated Environmental

Contract No. : 22567-321-SC-0415

Punch List Completion Date ____ : N/A [CONFIRMATION SAMPLE TEST RESULTS - TO BE SUBMITTED - A.S.A.P.] Rec'd 23 Oct 9 SMPE

This is to certifiy the work described above has been substantially completed in accordance with the contract and associated documents. The site designated above has been inspected by representatives of the customer, contractor, and Bechtel, and is compete with the exception of the attached punch list (if applicable) which the contractor agrees to complete by the date designated.

The warranty period commences on the date the contractor completes the remedial work as described in the punch list or from the date of execution of the Certificate of Substantial Completion, whichever is later.

INSPECTION CERTIFICATE

CONTRACTOR: Landall R. Karl DATE: Oct 04, 1995

ACCEPTED BY

BECHTEL: [signature] DATE: 04 Oct 95

CUSTOMER REPRESENTATIVE: [signature] DATE: 05 OCT 95

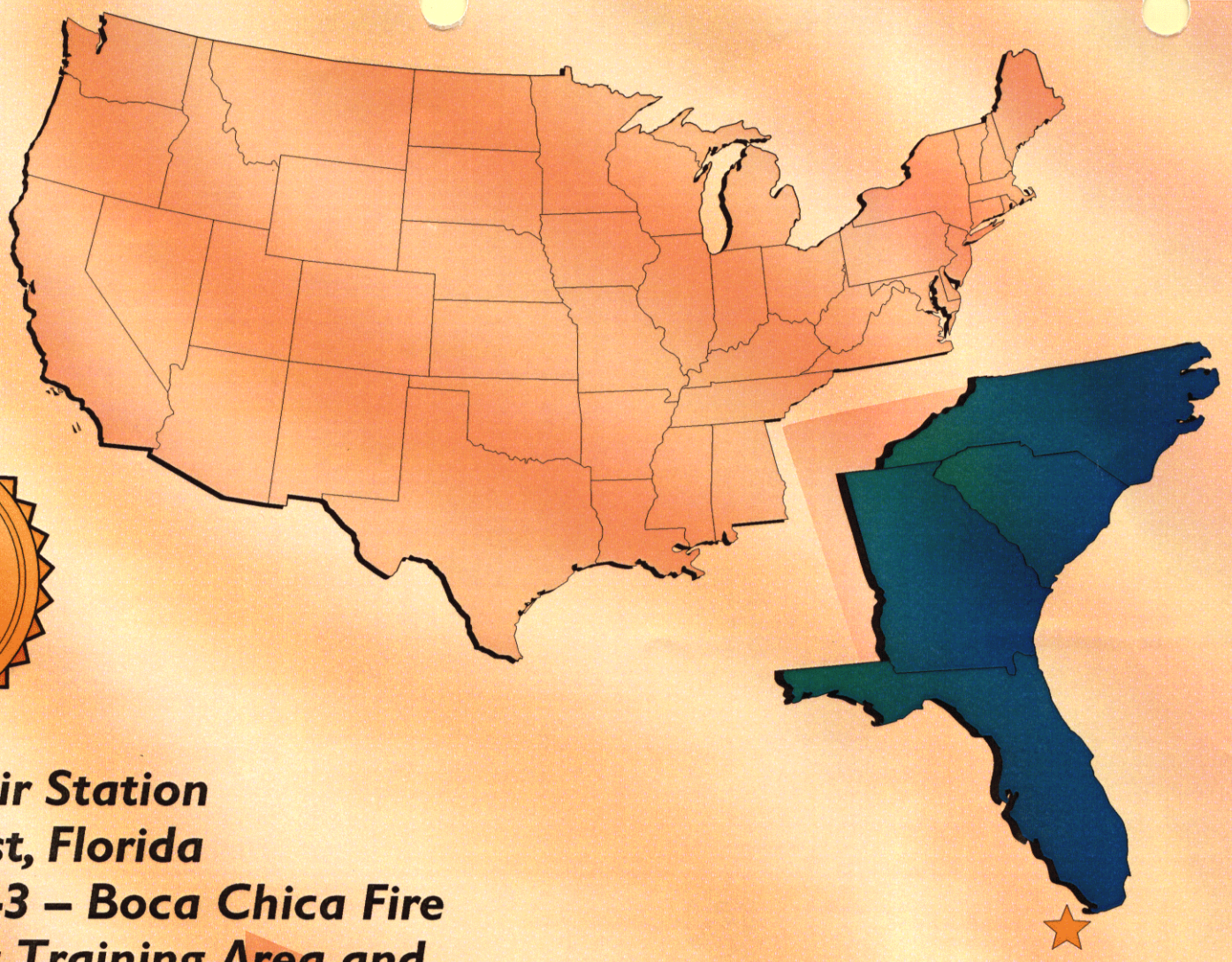
Attachment 3-4

Completion Poster

Southern Division
Naval Facilities Engineering Command

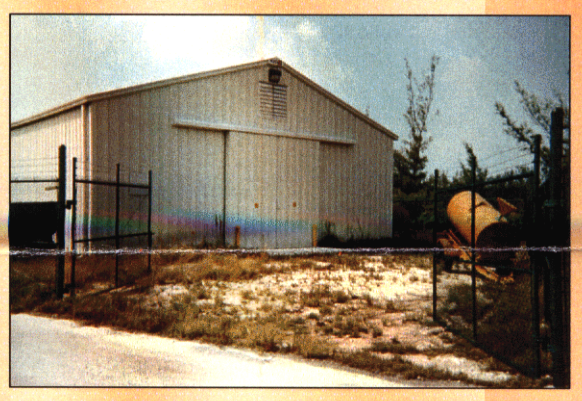
Navy RAC Completed Sites

11th & 12th Completed Sites



Naval Air Station Key West, Florida SWMU-3 – Boca Chica Fire Fighting Training Area and SWMU-7 Building A-824

Remediation activities at SWMU-3 and SWMU-7 included excavation of petroleum-contaminated soil (SWMU-3) and PCB-contaminated soil (SWMU-7), transportation to a landfill for disposal and backfill with clean soil. To determine the limits of excavation, screening methods were used followed by confirmation sampling and laboratory analysis.

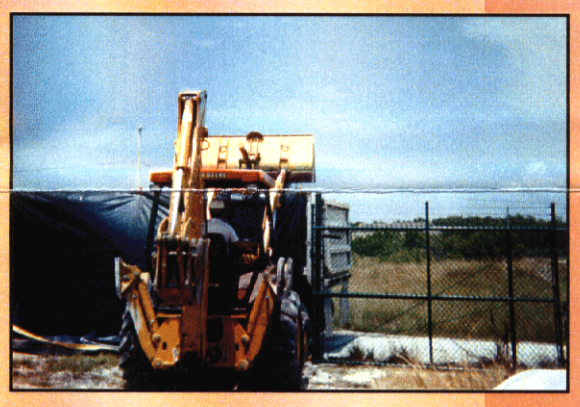


The site before remediation activities began (SWMU-7)

Excavation and stockpiling of the petroleum-contaminated soils (SWMU-3)

Dust suppression during loading activities (SWMU-7)

Backfilling with clean crushed stone to match existing grade (SWMU-3)



Loading of the PCB-contaminated soils for disposal. Note the use of plastic on the side of the truck to keep the truck from becoming contaminated (SWMU-7)

The site after all site restoration activities are complete (SWMU-3)

The site after all site restoration activities are complete (SWMU-7)

BECHTEL

Z10.2 8735

0113D044

4 IR-7: FLEMING KEY NORTH LANDFILL

4.1 SITE DESCRIPTION

The Fleming Key North Landfill covers approximately 30 acres on the northern end of Fleming Key. The site, which houses the U.S. Department of Agriculture Animal Import Center, is generally flat, open and covered with grass. Trees, brush and mangroves grow along the western shoreline. On the southern end, the ground drops down and drains toward the southwest. Figure 4-1 is a site map.

From 1952 to 1962 the site was a landfill for NAS Key West and the City of Key West. Four to five thousand tons of unknown wastes reportedly were disposed of annually. In 1977, the Animal Import Center was constructed over a portion of the landfill. During construction, wastes were excavated and transferred to an area immediately west of the construction site and buried under a soil/rock cover.

Stormwater was reported to collect in low areas that resulted from irregular grading of the landfill. The State was concerned that water might be seeping through the wastes, leaching contaminants to the soil and groundwater in the process.

4.2 CLEANUP OBJECTIVE

4.2.1 Contaminant of Concern

No specific contaminants were identified for this site for purposes of the IRA. [2]

4.2.2 Cleanup Type & Criteria

The Navy defined the IRA objective at IR-7 as preventing ponding of rainwater in order to minimize infiltration through the waste and eliminate the surface water pathway.

4.3 DELINEATION SAMPLING & RESULTS

No delineation sampling was necessary for this site.

4.4 CLEANUP TECHNOLOGY

4.4.1 Technology Selection

The technology selected was to fill low spots on the high ground and grade to direct drainage to the south. [24]

4.4.2 Workplan

The scope of work consisted of the following elements:

- Import clean topsoil
- Fill and grade low areas to promote runoff of surface water and eliminate ponding.
- Establish soil and vegetative cover over the site to prevent erosion.

4.5 REGULATORY AGENCY APPROVAL

4.5.1 EPA & FDEP

There was no significant involvement by EPA or FDEP.

4.5.2 Natural Resources Permits and Protection of Natural Resources

No permits were required, and the work did not impact wetlands or endangered species habitat.

4.6 EXECUTION OF WORK

4.6.1 Mobilization

A civil survey crew established baseline elevations and identified low spots prior to construction. Most of the work was accomplished with a front-end loader.

4.6.2 Chronology of Construction Actions

- 24 Jul 95 — Set up survey grid and shot elevations.
- 28 Jul 95 — Obtained and ran benchmark elevation.
- 25 Sep 95 — Mowed grass to identify low spots. Applied markings to low spots.
- 26 Sep 95 — Placed approximately 40 cubic yards of clean fill in low spots. Rough graded.
- 27 Sep 95 — Completed finish grading of backfilled areas.
- 28 Sep 95 — Completed sodding of affected areas.
- 04 Oct 95 — NTR issued Notice of Substantial Completion.

Clean backfill material was spread and graded, and two pallets of sod were placed upon completion of grading. Backfill elevations were surveyed after construction.

4.6.3 Work Plan vs. Actual Work

4.6.3.1 Deviations from Planning

There were no deviations from the work plan.

4.6.3.2 Delays & Problems Encountered;Uunexpected Findings/Contamination

Areas identified as low spots by the civil survey were less than anticipated. Low spots filled were confined to the southern end of the higher area covering the landfill. The Natural Resource Trustees had stated that the low areas southwest of the site were wetlands and should not be filled. The result was a significant decrease in the actual scope of work.

4.6.4 Summary of Materials Handled

Table 1-1 provides the quantity of material imported to the site. No material was removed.

4.6.5 Site Restoration

Upon completion of fill and grading, the work area was sodded.

4.7 CONFIRMATION SAMPLING AND COMPLETION DRAWINGS

No confirmation sampling was necessary at IR-7.

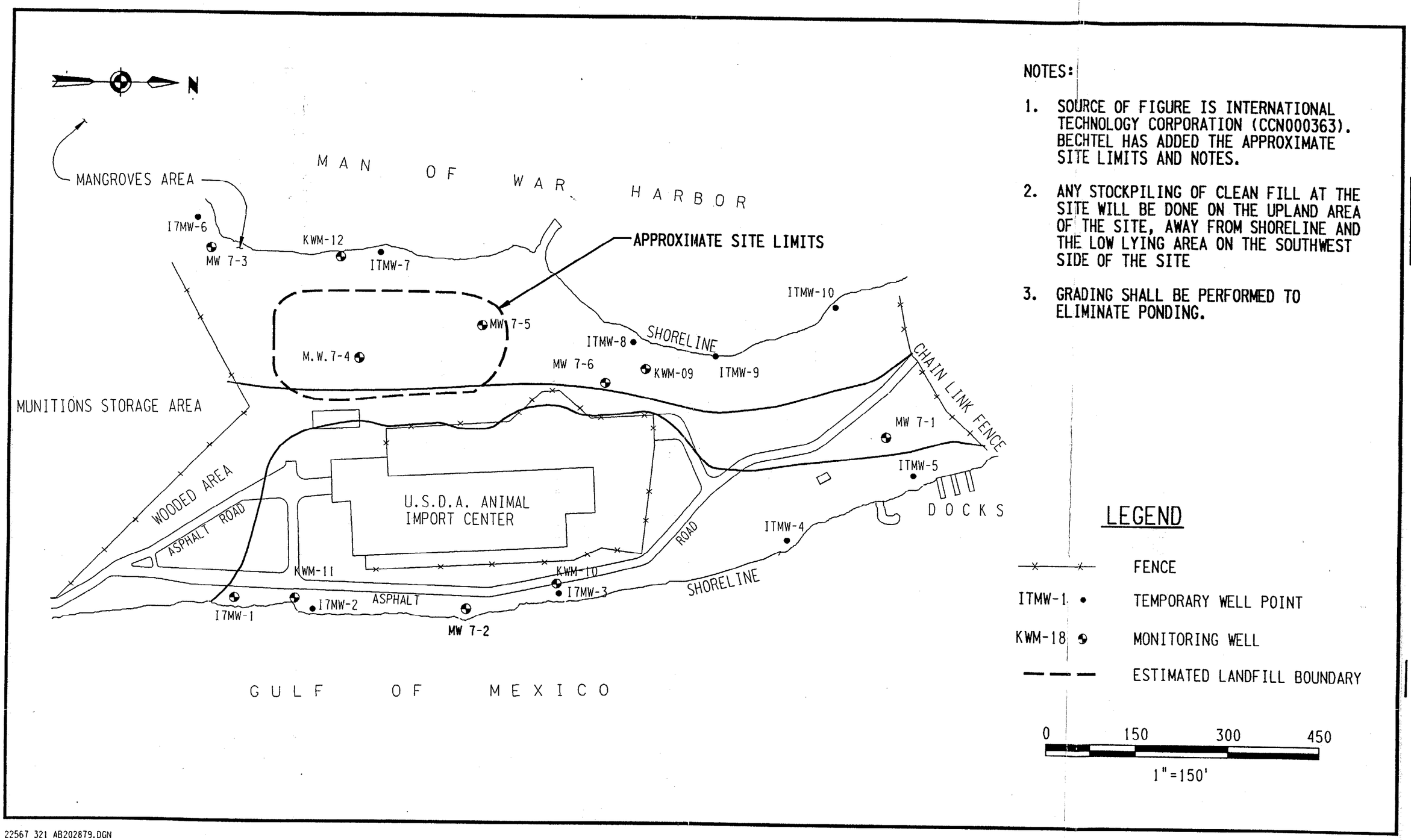
4.8 APPROVAL OF COMPLETED IRA

4.8.1 Regulatory Agency

There is no required regulatory action on the completed IRA, since the IRA goals were met.

4.8.2 Navy / NTR Approval

A copy of the Site Closeout Report and signed Certificate of Substantial Completion are included as Attachments 4-1 and 4-2.



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.

22567 321 AB202879.DGN

Figure 4-1
IR-7 - Fleming Key
North Landfill

FIGURE 4-2

NOTES:

1. *THE GRID AS SHOWN IS ~~50'~~ 25' BY ~~50'~~ 25' rah 8-24-95*
2. *ELEVATIONS ARE FOR EXISTING GRADES. SITE WILL BE RESTORED TO NATURAL GRADE AFTER EXCAVATION.*

INDICATES SPOT WHERE ELEVATION WAS TAKEN

ABBREVIATION LEGEND:

F.I.R	FOUND IRON ROD, SIZE INDICATED	SEC.	SECTION
S.I.R.	SET IRON ROD, 1/2" L.B. No. 5408	TWP.	TOWNSHIP
F.I.P.	FOUND IRON PIPE, SIZE INDICATED	RGE.	RANGE
F.N.D.	FOUND NAIL AND DISK	(D)	DEED
S.N.D.	SET NAIL AND DISK, L.B. No. 5408	(P)	PLAT
F.C.M.	FOUND CONCRETE MONUMENT	(M)	MEASURED
P.R.M.	PERMANENT REFERENCE MONUMENT	(C)	CALCULATED
P.C.P.	PERMANENT CONTROL POINT	CONC.	CONCRETE
P.I.	POINT OF INTERSECTION	COV.	COVERED
P.C.	POINT OF CURVE	ASPH.	ASPHALT
P.O.B.	POINT OF BEGINNING	PVMT.	PAVEMENT
R/W	RIGHT-OF-WAY	ELEV.	ELEVATION
TYP.	TYPICAL	PP	POWER POLE
OHW	OVERHEAD WIRE		

FRANK & ELLIOTT
SURVEYORS • ENGINEERS • LAND PLANNERS
8326 OLD KATS BRIDGE, NW 5th, GAINSVILLE, FLORIDA 32606
Phone (904) 664-0764 FAX (904) 664-0816
A DIVISION OF STOCKTON BENEDETTO CORPORATION

CERTIFIED FOR: SPECIAL PURPOSE SURVEY

I HEREBY CERTIFY THIS SURVEY MEETS THE MINIMUM TECHNICAL STANDARDS AS SET FORTH BY THE FLORIDA BOARD OF PROFESSIONAL SURVEYORS AND MAPPERS IN CHAPTER 61G17-6 FLORIDA ADMINISTRATIVE CODE, PURSUANT TO SECTION 472.027, FLORIDA STATUTES.

SCALE: 1"=20'

DATE: 07/24/95

LAWRENCE R. FRANK, P.L.S. # 4619

DRAWN BY: G.N.B.

BY: VICKI D.

IR-7 -- NORTH LAND FILL

CERTIFIED TO:

JOB NUMBER: 95142.IR-7

Attachment 4-1

Site Closeout Report

SITE CLOSEOUT REPORT

IR Number 7

On September 27, 1995 Associated Environmental Services Inc. mobilized equipment and crew to IR number 7. Work consisted of site setup, backfill, and site restoration.

Personnel Time on Site

Site Superintendent:	8 hrs

Equipment Time on Site

Case 580D Backhoe:	8 hrs

Site Restoration

General Fill:	39	Tons

Lower Tier Subcontractors

Transporter:	Robbie D. Wood Trucking P.O. Box 125 Dolomite, AL 35061 (205) 744-8440 EPA ID# ALD067138891
General Fill:	Sunshine Rock, Inc. Plant Address: NW 129th Ave. & 202nd St. Miami, FL (305) 821-8660
Site Restoration:	Sod Master P.O. Box 420184 Summerland Key, Florida 33042 (305) 745-8727

Attachment 4-2

Certification of Substantial Completion

CERTIFICATE OF SUBSTANTIAL COMPLETION

Date: 03 Oct 95

Site : IR-7

Description of Site : Flemming Key Landfill (North)

Contractor : Associated Environmental

Contract No. : 22567-321-SC-0415

Punch List Completion Date : 03-Oct-95

This is to certifiy the work described above has been substantially completed in accordance with the contract and associated documents. The site designated above has been inspected by representatives of the customer, contractor, and Bechtel, and is compete with the exception of the attached punch list (if applicable) which the contractor agrees to complete by the date designated.

The warranty period commences on the date the contractor completes the remedial work as described in the punch list or from the date of execution of the Certificate of Substantial Completion, whichever is later.

INSPECTION CERTIFICATE

CONTRACTOR: Randall K. Veal DATE: Oct 04, 1995

ACCEPTED BY

BECHTEL: DATE: 04-Oct-95

CUSTOMER REPRESENTATIVE: DATE: 15 NOV 95

5 IR-3: TRUMAN ANNEX DDT MIXING AREA

5.1 SITE DESCRIPTION

IR-3 is located at the former site of Building 265. Approximately 1/4 acre in size, IR-3 is located on the eastern property (fence) line adjacent to Fort Street in the city of Key West. The site was given a high priority because a residential community is located across Fort Street, and there were unconfirmed reports of residential wells in the area. The site is flat with no surface drainage features and is underlain by highly permeable soils. Cap rock is found about 1.5 feet below land surface (bls) and the water table occurs at approximately 5 feet bls.

From the early 1940s to 1970s the site was used to mix and store pesticides, primarily DDT. Fifty-five gallon drums were used for this purpose, and it is believed that pesticides were spilled during mixing operations. Soil and groundwater contamination exceeded action levels and has potential to adversely affect human health and the environment. Figure 5-1 is a site map.

5.2 CLEANUP OBJECTIVE

5.2.1 Contaminant of Concern

The contaminant of concern was identified as DDT (including its metabolites, DDD and DDE). Lead and arsenic were also detected at concentrations above regulatory limits, but were not as wide spread as the pesticides. [2]

IR-3 was a high priority site because the Navy and FDEP were concerned that the groundwater could transport contamination to the residential community. It was therefore agreed to designate the interim action as a Time Critical Removal Action under the National Oil and Hazardous Substances Pollution Contingency Plan. The Navy and BEI followed the prescribed procedures under 40 CFR[a] 300.415 in conducting the interim action. [24, 68, 69, 70]

5.2.2 Cleanup Type & Criteria

The IRA objective was contaminant source removal to prevent migration of contaminants off site or to other media.

Cleanup required removing soil to limits established by BEI's delineation sampling. Excavation extended vertically to competent caprock, which was encountered before the water table. Contaminated soil was classified as a RCRA Hazardous Waste and taken to a RCRA treatment and disposal facility for final disposal.

The IRG was defined as removal of pesticide, lead, and arsenic contaminated soils above CERCLA and FDEP established guidelines. [71]

- DDT: 3.1 ppm based on FDEP Soil Cleanup Goals for Military Sites dated April 5, 1995.
- DDE: 2.9 ppm based on FDEP Soil Cleanup Goals for Military Sites dated April 5, 1995.
- DDD: 4.4 ppm based on FDEP Soil Cleanup Goals for Military Sites dated April 5, 1995.
- Lead: 400 ppm based on revised CERCLA Guidance Document dated July, 1994.
- Arsenic: 10 ppm proposed by FDEP and EPA in May 1995.

[a] CFR: Code of Federal Regulations

5.3 DELINEATION SAMPLING & RESULTS

5.3.1 Field Sampling

IR-3 includes an area approximately 150-ft long by 100-ft wide. Delineation sampling was performed to establish horizontal and vertical limits of excavation using a 25 foot grid pattern. A total of 50 surface and subsurface samples were collected from 27 locations at depths of 0-1 ft. and 1-2 ft. Sampling depth was limited by caprock.

Samples were analyzed in the field by immunoassay (IMU) methodology for pesticides (DDT and its metabolites). Two pesticide samples were sent offsite for laboratory verification. All 50 samples were analyzed for lead and arsenic in the laboratory. The plan was to take samples at shallow depths first, and if these yielded contamination, progressively increase depth until encountering clean soil, caprock, or groundwater. Caprock was generally encountered at 1 - 2 feet bls.

5.3.2 Results

Pesticides were detected above cleanup criteria at 21 of 27 locations, and in subsurface soil at 10 of 27 locations. Pesticide concentrations ranged from not detected to greater than 10 ppm. (IMU field test kits did not indicate actual values if concentrations were greater than 10 ppm.)

Lead concentrations ranged from 21.4 to 1,050 ppm, exceeding criteria at 4 of 27 locations. Arsenic concentrations ranged from 0.43 to 191 ppm.. The arsenic criteria was exceeded at seven of the 27 sampling locations.

Two samples were shipped to an offsite laboratory for TCLP pesticides and TCLP metals analysis; one sample was sent for TCLP metals only. Samples were selected from the area on the western side of the site which appeared to be the area of highest contamination. All three samples passed the TCLP test.

After the above samples were taken, additional samples were taken several weeks later across Fort Street. These samples were taken to assist the CLEAN contractor in developing the risk assessment, but they also served to show that contamination had not migrated to the residential community. No concentrations were found that exceeded cleanup goals.

The first round of sample locations, depths, and limits of excavation is shown on Figure 5-1. Figure 5-2 shows the results of sampling across Fort Street. [19]

Based on the delineation sampling results, the estimated quantity of soil to be removed was 800 cubic yards, as opposed to the budgetary estimate of 3330 cubic yards. The actual quantity of soil removed was 735 cubic yards.

5.4 CLEANUP TECHNOLOGY

5.4.1 Technology Selection

Excavation and offsite disposal was selected as the most cost effective option. The excavated soil was classified as RCRA listed HW (U060 and U061) and required disposal in a RCRA landfill even after treatment. Options for onsite treatment were considered, but were found to be not cost-effective because of the RCRA requirement.

5.4.2 Workplan

The scope of work consisted of the following elements:

- Excavate soil within the area where contamination was found down to caprock.
- Remove soil from caprock to the extent practicable.
- Transport waste soil to a RCRA permitted treatment and disposal facility.
- Sample sides of the excavation to verify that the excavation had removed all soil above criteria. Provide results to CLEAN contractor for risk assessment.
- Backfill with clean fill, topsoil, and sod. An option to pave the site as a parking lot was considered (but not selected) by the Naval Air Station.

As noted in Section 1, the approved RWP did not address IR-3. PPR 321-002 provided the detailed scope of work. [71]

5.5 REGULATORY AGENCY APPROVAL

5.5.1 EPA & FDEP

The initial delineation sampling found contamination adjacent to Fort Street. The Navy, regulators,and BEI noted that pesticides are generally not very mobile, and considered it unlikely that they would migrated under the sidewalk or pavement. Even if the pesticides had migrated, the public was protected by the pavement. It was agreed that BEI would excavate to the fence line and sample the sides of the excavation as far as possible. FDEP said this would satisfy the State's requirement, but left open the possibility of further monitoring. The later sampling indicated that IR-3 had not impacted the residential community. [19, 72, 73]

It was also agreed that removal of soil down to rock would remove the source of contamination while the backfilling would add further protection by effectively capping any remaining contamination in the rock. Removal of rock was not considered necessary nor practical. [72]

An Area of Concern was designated by agreement with EPA and FDEP to facilitate work activities at this site. Because of the small size of the site and limited access, additional area was needed to load and turn the trucks that would haul the soil offsite. [71]

5.5.2 Natural Resources Permits and Protection of Natural Resources

The site is located in a cleared, fenced area, and does not impact any wetland or habitat; therefore, there were no natural resources issues or permits associated with this site.

5.6 EXECUTION OF WORK

5.6.1 Mobilization

A site survey (Figure 5-3) was performed prior to excavation to obtain elevations. A mobile auger type drill rig and crew were used to close the existing wells. Excavation was accomplished using a backhoe and front-end loader, and end dump trucks (20 cy capacity) were used to haul the contaminated soil to a railhead facility for further transport to the treatment and disposal facility.

5.6.2 Dates and Significant Events

- 28 Jul 95 — Abandoned monitoring wells.
- 31 Jul 95 — Surveyed site.

- 04 Aug 95 — Completed delineation sampling of proposed excavation area and background samples obtained at Fort St. location.
- 23 Aug 95 — Received approval of Project Plan Revision (PPR) 321-002.
- 07 Sep 95 — Conducted preparatory phase inspection with NTR. Attachment 5-1.
- 08 Sep 95 — Reviewed utility as-builts for potential underground interference.
- 11 Sep 95 — Setup site exclusion zone area. Located underground utilities with hand tools.
- 12 Sep 95 — Installed dust monitors at perimeter of site. Commenced excavation. Front loader broke underground 4" fresh water line. Work stopped, and Public Works assumed responsibility for the pipe and shutting off water.
- 18 Sep 95 — Resumed excavation and transportation of contaminated soil.
- 20 Sep 95 — Bechtel inspected truck-to-rail transfer operations at Miami rail head and noted several safety deficiencies.
- 21 Sep 95 — Safety deficiencies corrected by shipper. Actions verified by Bechtel.
- 25 Sep 95 — Completed field screening analysis at lateral limits of excavation. Obtained confirmation samples for offsite analysis.
- 26 Sep 95 — Completed transportation of contaminated soil.
- 27 Sep 95 — Commenced backfilling the excavation with clean soil.
- 04 Oct 95 — Completed backfilling and sodding of site.
- 05 Oct 95 — Notice of Substantial Completion issued.

5.6.3 Work Plan vs. Actual Work

5.6.3.1 Deviations from planning and why

There were no significant deviations from the workplan as defined by PPR 321-002.

5.6.3.2 Delays & Problems Encountered; Unexpected Findings/Contamination

On 12 September, a loader broke a water line which was not shown on site drawings and which had not been located during the utility survey. Public Works decided not to shut off the line immediately due to concerns that contaminated water might be siphoned into the water system, and as a result the site quickly flooded.

BEI built a 2-3 foot high soil berm around the leak and took other actions to contain the water and prevent spread of contamination. Public Works shut off the water before runoff occurred.

Ten trucks that were onsite to transport soil on 12 September were held over due to the work stoppage. Excavation and loading was suspended until 18 September due to standing water within the excavation area. On 18 September the NTR directed Bechtel to remove the damaged 4" line and any other laterals associated with it.

Large pieces of concrete and pipe debris were unexpectedly found in the excavation. The debris was not acceptable for processing through the truck-to-rail car conveyor system in Miami, and this material was transported directly to the treatment and disposal facility by truck.

5.6.4 Summary of Materials Handled

Table 1-1 contains a summary of materials removed from the site and their disposition.

5.6.5 Site Restoration

The excavation was filled with an underlayment of crushed stone, followed by a top layer of screened sand until the contours matched existing grade. Sodding established a final vegetative cover.

5.7 CONFIRMATION SAMPLING AND COMPLETION DRAWINGS

Confirmatory samples were collected from 10 locations on the excavation floor and 20 locations along the sidewall. These samples were sent to a laboratory for analysis for pesticides and TAL[a] metals. The locations of these samples and boundaries of excavation are depicted on Figure 5-4.

The results from sampling indicate that cleanup goals were achieved at all but four locations. These samples detected pesticides above cleanup levels. These locations are also shown on Figure 5-4. A copy of the complete analytical results is contained in Volume II.

5.8 APPROVAL OF COMPLETED IRA

5.8.1 Regulatory Agency

BEI informed FDEP and EPA of this finding, but both agencies agreed the intent of the interim action had been met, and that no further excavation was needed. Any future action would be based on results of the risk assessment. [74, 75, 76]

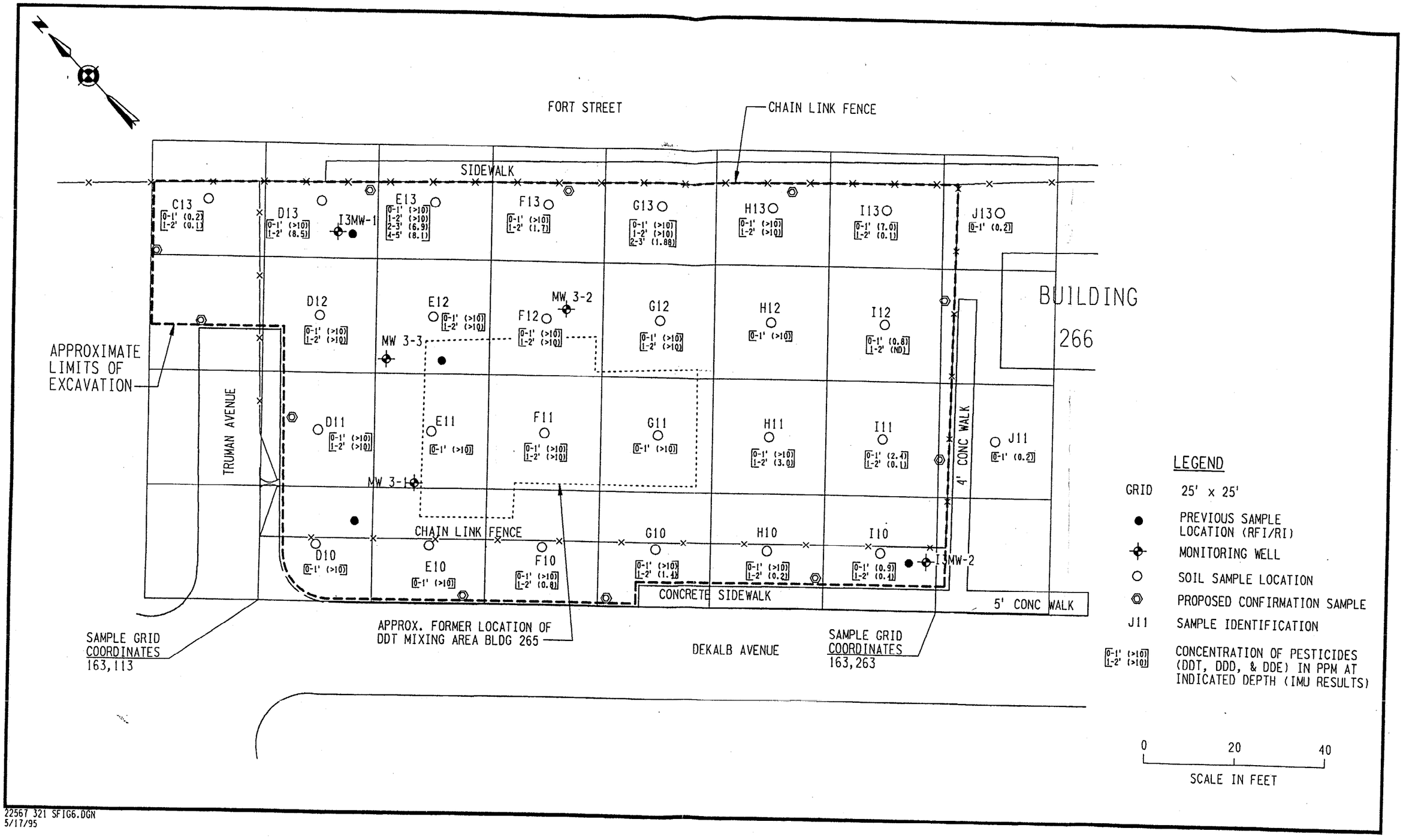
5.8.2 Navy / NTR Approval

Copies of the Site Closeout Report and the signed Certificate of Substantial Completion are included as Attachments 5-2 and 5-3.

5.8.3 Photographs

The completion poster, Attachment 5-4, provides a photographic record for this site.

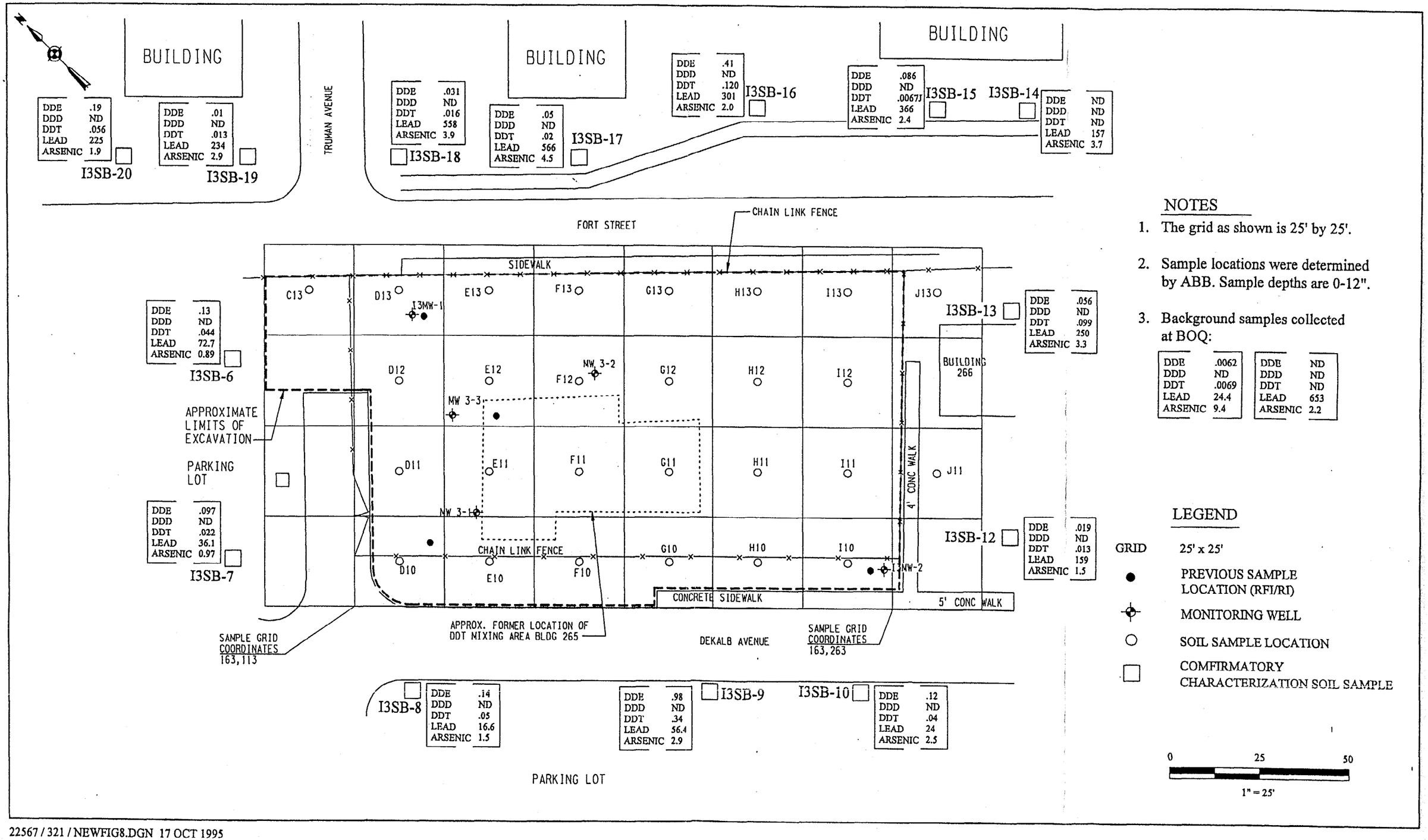
[a] TAL: Target Analyte List



22567 321 SFIG6.DGN
5/17/95

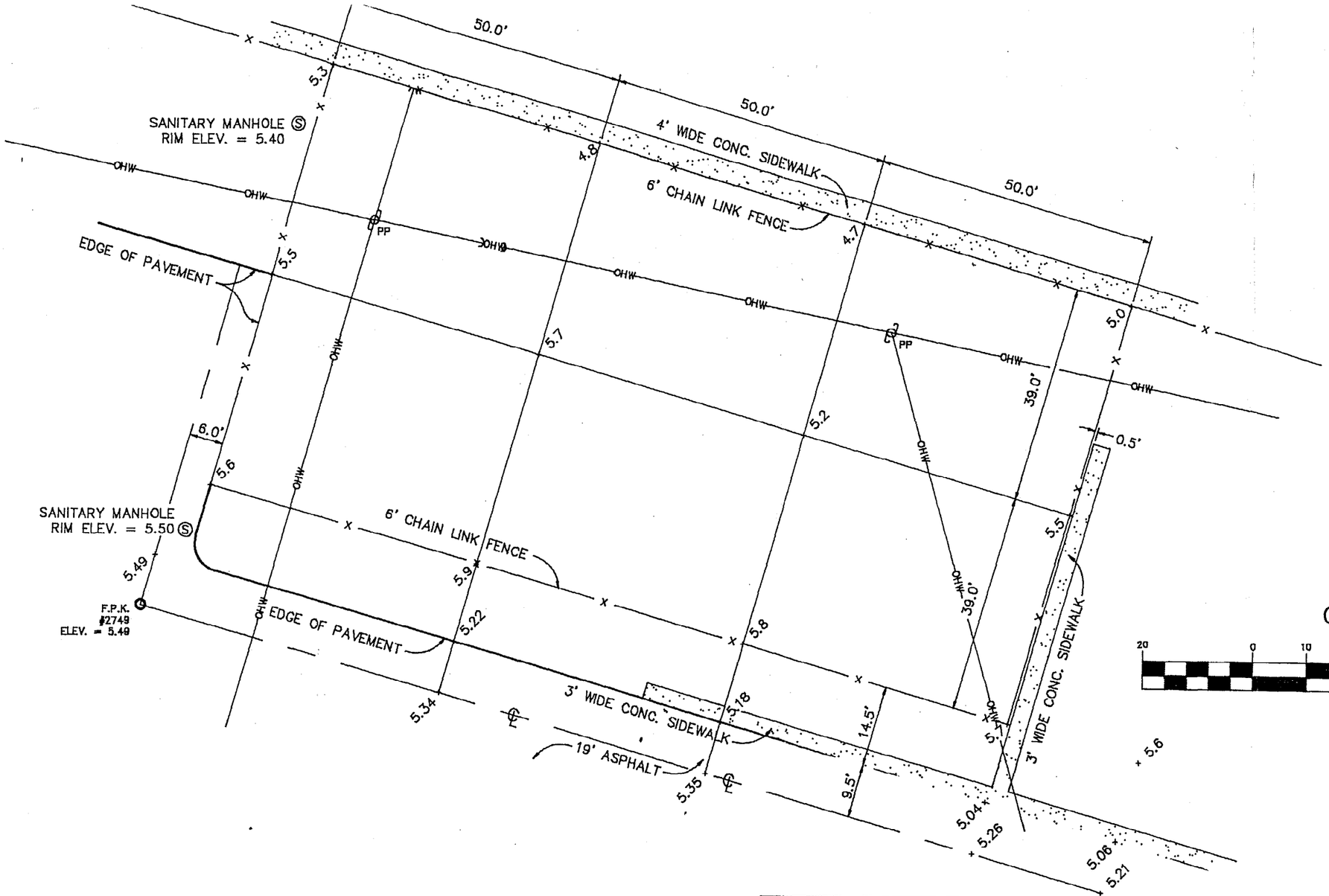
FIGURE 5-1

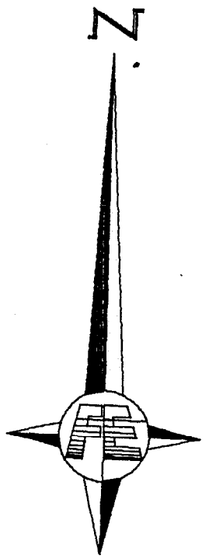
IR NO.3 - TRUMAN ANNEX (KEYWEST)
DDT MIXING AREA - PESTICIDE RESULTS



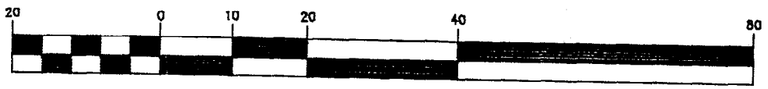
22567 / 321 / NEWFIG8.DGN 17 OCT 1995

FIGURE 5-2
ADDITIONAL IR-3
CHARACTERIZATION SAMPLING





GRAPHIC SCALE



(IN FEET)
1 inch = 20 ft.

FIGURE 5-3

NOTES:

1. *ELEVATIONS ARE FOR EXISTING GRADES. SITE WILL BE RESTORED TO NATURAL GRADE AFTER EXCAVATION.*

+0.00 *INDICATES SPOT WHERE ELEVATION WAS TAKEN*

ABBREVIATION LEGEND:

F.I.R	FOUND IRON ROD, SIZE INDICATED	SEC.	SECTION
S.I.R.	SET IRON ROD, 1/2" L.B. No. 5408	TWP.	TOWNSHIP
F.I.P.	FOUND IRON PIPE, SIZE INDICATED	RGE.	RANGE
F.N.D.	FOUND NAIL AND DISK	(D)	DEED
S.N.D.	SET NAIL AND DISK, L.B. No. 5408	(P)	PLAT
F.C.M.	FOUND CONCRETE MONUMENT	(M)	MEASURED
P.R.M.	PERMANENT REFERENCE MONUMENT	(C)	CALCULATED
P.C.P.	PERMANENT CONTROL POINT	CONC.	CONCRETE
P.I.	POINT OF INTERSECTION	COV.	COVERED
P.C.	POINT OF CURVE	ASPH.	ASPHALT
P.O.B.	POINT OF BEGINNING	PVMT.	PAVEMENT
R/W	RIGHT-OF-WAY	ELEV.	ELEVATION
TYP.	TYPICAL	PP	POWER POLE
OHW	OVERHEAD WIRE		

FRANK & ELLIOTT
SURVEYORS • ENGINEERS LAND PLANNERS
83266 OVERSEAS HIGHWAY, SUITE 500, ISLAMORADA, FLORIDA 33036
Phone (305) 664-0764 FAX (305) 664-0616
A DIVISION OF MEDAVISION BUSINESS CORPORATION

CERTIFIED FOR SPECIAL PURPOSE SURVEY

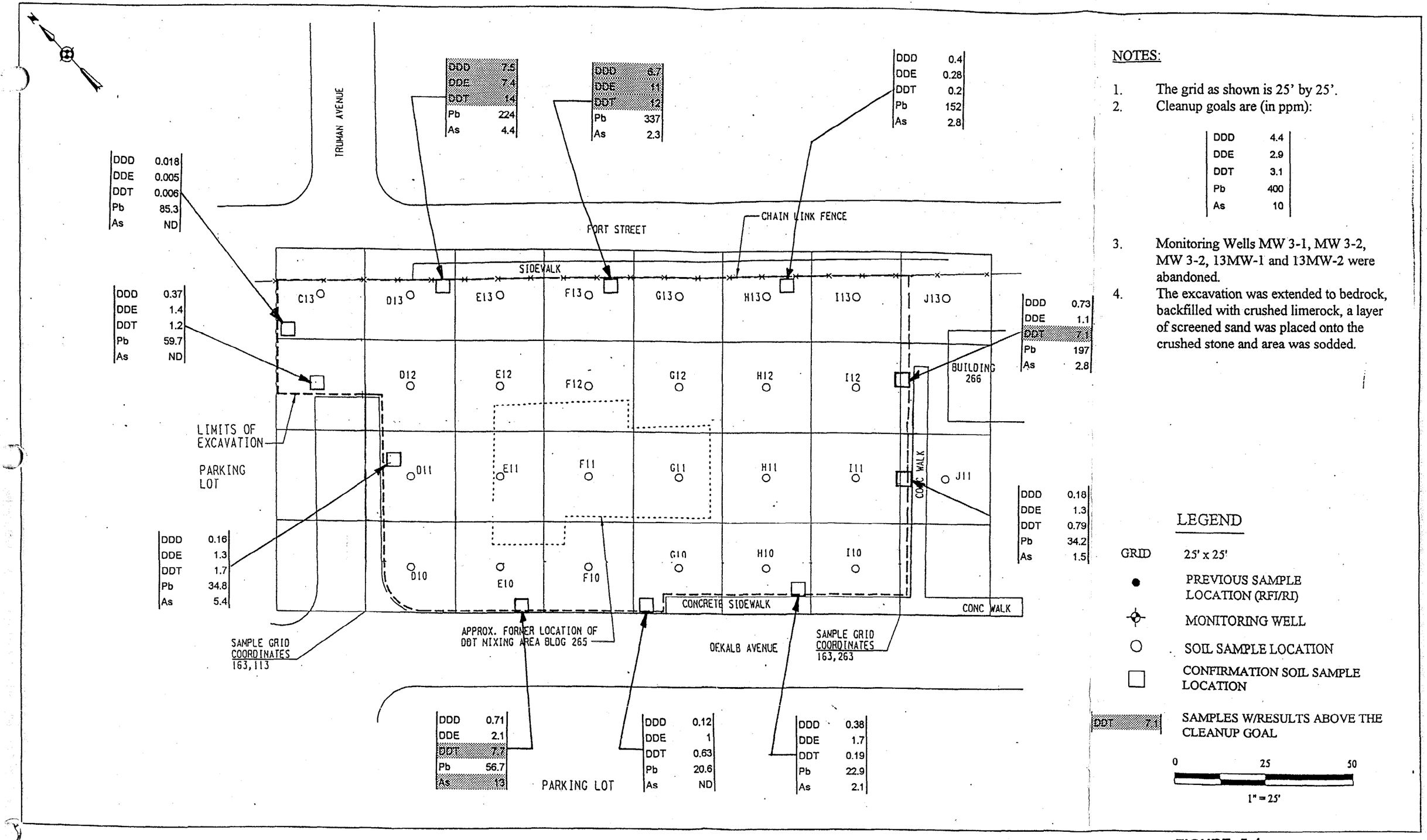
I HEREBY CERTIFY THIS SURVEY MEETS THE MINIMUM TECHNICAL STANDARDS AS SET FORTH BY THE FLORIDA BOARD OF PROFESSIONAL SURVEYORS AND MAPPERS IN CHAPTER 61G17-6 FLORIDA ADMINISTRATIVE CODE, PURSUANT TO SECTION 472.027, FLORIDA STATUTES.

SCALE: 1"=20'	Lawrence P. Frank	DRAWN BY: G.N.B.
DATE: 07/31/95	LAWRENCE P. FRANK, P.L.S. # 4619	REVISED

IR-3

CERTIFIED TO:

JOB NUMBER: 95142.IR-3



NOTES:

1. The grid as shown is 25' by 25'.
2. Cleanup goals are (in ppm):

DDD	4.4
DDE	2.9
DDT	3.1
Pb	400
As	10

3. Monitoring Wells MW 3-1, MW 3-2, MW 3-2, 13MW-1 and 13MW-2 were abandoned.
4. The excavation was extended to bedrock, backfilled with crushed limerock, a layer of screened sand was placed onto the crushed stone and area was sodded.

FIGURE 5-4

IR-3 - TRUMAN ANNEX (KEY WEST)
DDT MIXING AREA - AS BUILT

Attachment 5-1

Pre-Activity Checklist

PREPARATORY PHASE INSPECTION
TRUMAN ANNEX DDT MIXING AREA
7 September 1995
MEETING MINUTES

ATTENDEES:

Rick Summers - BEI
Allen Saltzman - BEI (part time)
Gaines Smith - BEI
Mark Ewing - NAS Key West
Rick Akers - BEI
Ed Frost - AES

CHECK LIST

NO.	DESCRIPTION	YES	NO	N/A	Comments
1	Excavation Permit in place	X			See Note 1
2	Approved Work Plan/Criteria/Delineation of Excavation	X			
3	Pre-Construction Survey Results	X			
4	Utility Survey Performed/Documented/OK to proceed	X			
5	Southern Bell Telephone Survey/Documented/OK to proceed	X			See Note 2
6	Profile Sampling Analytical Results	X			
7	Disposal facility letter of material acceptance		X		See Note 3
8	Backfill Material Certified Clean	X			
	ROICC Notification	X			
10	Are any potential subsurface hazards identified and addressed	X			See Note 4
11	Are any potential overhead hazards identified and addressed	X			See Note 5
12	Archaeological potential discussed	X			None to our knowledge
13	Potential UXO identified and addressed	X			None to our knowledge
14	Backfill/Compaction requirements identified	X			85% RC - Mod. Proctor
15	Compaction testing requirements identified/scheduled	X			Later if necessary - FCR in process to revise requirements
16	Field Screening/Confirmatory sampling scheduled	X			Concurrent with excavation
17	Loading observation by PWD Environmental scheduled	X			Start 12 Sept.
18	Truck routing and loading location discussed with ROICC	X			See Note 6
19	Potential of Bracing Power Pole discussed	X			See Note 7
20	Salvage or Dispose of Fence Material?	X			Dispose at DRMO
21	Water line rupture contingency plan	X			See Note 8
22	Truck staging area and procedures discussed	X			See Note 9
3	Truck weight procedures discussed	X			See Note 10
24	Truck to Gondola transfer process discussed	X			See Note 11

PREPARATORY PHASE INSPECTION
TRUMAN ANNEX DDT MIXING AREA
7 September 1995
MEETING MINUTES

25	Witnessing of transfer process discussed	X			See Note 11
26	Manifest signatures: 1) PWD Support 2) BEI coordination with NTR	X			Scheduled for start on 12 Sept
27	Discuss extended work hours procedures, impacts and contingencies	X			Standard work hours unless emergency
28	Discuss availability of NAS Key West Emergency Response contact for Emergency Response Plan	X			See Note 12
29	Review each paragraph of applicable specification sections - SP000-005 & SP000-011	X			
30	Review Testing Plan	X			
31	Examine work area to ensure that required preliminary work has been completed	X			
32	Examine req'd mat'ls and equip, and sample work to ensure that matl's and equip are on hand and conform to the approved shop drawings and submitted data			X	No materials or equipment at work site.
33	Review safety plan and appropriate activity hazard analysis to ensure that applicable safety requirements are met, and that required MSDS's are submitted		X		To be discussed with Site Safety and Health representative.

PREPARATORY PHASE INSPECTION
TRUMAN ANNEX DDT MIXING AREA
7 September 1995
MEETING MINUTES

NOTES

1. Water line not indicated on permit. BEI/AES will locate utilities by hand digging and visibly mark locations.
2. Telephone lines are all overhead. No underground lines.
3. Have disposal facility permit. Letter of acceptance from facilty coming.
4. Underground utilties include water line, power lines and sewer line. Indicated on drawing in BEI's possession. Will hand dig to locate underground utilities, based on locations marked on drawings.
5. Overhead power lines and guy wires.
6. Construction work at United Street gate and on United Street may prevent using planned route. Will look at alternate routes.
7. AES has contacted power company and they will provide bracing of poles if necessary.
8. NTR directed BEI to contact Al Hillman at the Truman Annex Utility Dept.
9. All arriving trucks will stage at Building 112 and go to the work site at IR-3 as needed.
10. Inspected scales at DRMO on Truman Annex and found it unacceptable. AES will investigate providing portable scale at work site. Alternative is the scale at Tarmac.
11. Discussed possibility of BEI and NAS Key West inspecting the transfer process as well as the operations at the disposal facility. Mr. Frost indicated that the disposal facility was permitted to accept government waste and Mr. Smith indicated that this might mean that an inspection was unnecessary.
12. Mr. Ewing to locate phone number and provide to BEI

ACTION ITEMS

No.	Action	Responsibility	Complete?
1.	Photo document existing site conditions prior to work start	Akers	
2.	Start site setup 10 September	BEI/AES	
3.	Provide AES with utility drawing	BEI	
4.	Visibily mark (paint) locations of underground utilities prior to excavation	BEI/AES	
5.	Determine if palm tree near west fence will be removed	Akers	
6.	Prepare/Submit RFI for type of turf establishment after backfill	Akers	
7.	Prepare/Submit FCR for revision to compaction testing requirements in spec	Akers	
8.	Look for alternate truck routes due to construction on United Street	Akers/Frost	
9.	Provide address of truck to rail transfer location to NTR	AES	
10.			
11.			
12.			

Attachment 5-2

Site Closeout Report

Site Closeout Report

IR Number 3

On September 11, 1995 Associated Environmental Services Inc. mobilized equipment and crew to Interim Removal (IR) number3. Work consisted of site setup and security, excavation, loading, transportation, and disposal of contaminated soil, removal of fence around the work site, personnel and equipment decontamination, backfill and site restoration.

Personnel Time on Site

Site Superintendent:	112 hrs
Forman:	80 hrs
Health & Safety:	184 hrs
Operator:	112 hrs
Labor:	144 hrs

Equipment Time on Site

Case 580D Backhoe:	80 hrs
Deere 624 Endloader:	112 hrs

Soil Loading, Transportation and Disposal

Final Disposition Method:	Chemical Oxidation
Volume Loaded:	968 Tons
Transported:	968 Tons
Disposal:	968 Tons

Site Restoration

General Fill:	1021 Tons

Material Sampling and Analysis

Two samples were collected on August 4, 1995. A treatability study and fingerprint analysis was performed for disposal approval, see attachments for results.

Lower Tier Subcontractors

Transporter:

Robbie D. Wood Trucking
P.O. Box 125
Dolomite, AL 35061
(205) 744-8440
EPA ID# ALD067138891

Rail:

Florida East Coast Railway Company
1 Malaga Street
St. Augustine, FL 32084
EPA ID Number FLD006923627

Norfolk Southern Corporation
Southern Railway Company and System Lines
185 Spring Street
Atlanta, GA 30303
EPA ID Number GAD006920417

Grand Trunk Western Railroad
Box 8106
Montreal, Quebec H3C3N3
EPA ID Number MIT270010838

TSDF

City Environmental, Inc.
1923 Frederick Street
Detroit, MI 48211
Phone (313) 923-0080
EPA ID Number MID90991566

Waste Description: Hazardous waste, solid, n.o.s., 9, NA3082, PG III (soil c/w Pesticides) (U060 U061)

Wayne Disposal, Inc.
49350 North I-94, Service Drive
Belleville, MI
Phone (313) 699-6287
EPA ID Number MID048090633

Chemical Waste Management of Indiana, Inc.
4636 Adams Center Road
Fort Wayne, IN 46806
EPA ID Number IND078911146

Laboratory:	Pace Inc. Environmental Laboratories 5460 Beaumont Center Blvd. Tampa, FL 33634 (813) 884-8268 Florida DEP CompQAP #870529G Lab Certification Florida Environmental:HRS #E84003 Florida SDWA:HRS #84125
General Fill:	Sunshine Rock, Inc. Plant Address: NW 129th Ave. & 202nd St. Miami, FL (305) 821-8660

Attachment 5-3

Certification of Substantial Completion

CERTIFICATE OF SUBSTANTIAL COMPLETION

Date: 05-Oct-95

Site : IR-3

Description of Site : DOT Mixing Area - Truman Annex

Contractor : Associated Environmental

Contract No. : 22567-321-SC-0415

Punch List Completion Date _____ : _____

13 NOV 95 REC'D CONFIRMATION RESULTS

This is to certifiy the work described above has been substantially completed in accordance with the contract and associated documents. The site designated above has been inspected by representatives of the customer, contractor, and Bechtel, and is compete with the exception of the attached punch list (if applicable) which the contractor agrees to complete by the date designated.

The warranty period commences on the date the contractor completes the remedial work as described in the punch list or from the date of execution of the Certificate of Substantial Completion, whichever is later.

INSPECTION CERTIFICATE

CONTRACTOR: Randall L. Veal DATE: Oct 5, 1995

ACCEPTED BY

BECHTEL: _____ DATE: 05-Oct-95

CUSTOMER REPRESENTATIVE: _____ DATE: 15 NOV 95

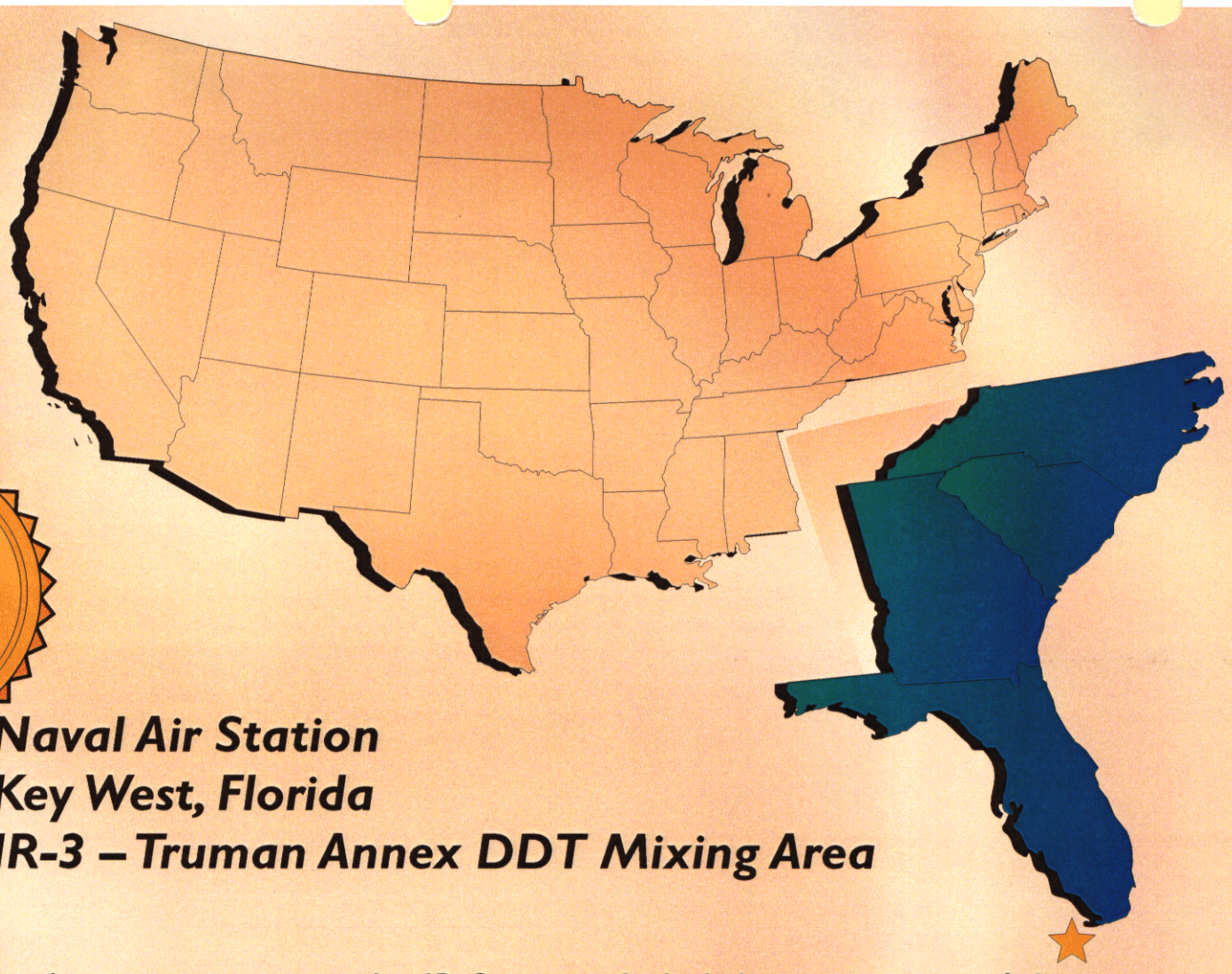
Attachment 5-4

Completion Poster

Southern Division
Naval Facilities Engineering Command

Navy RAC Completed Sites

13th Completed Site



Naval Air Station Key West, Florida IR-3 – Truman Annex DDT Mixing Area

Remediation activities at the IR-3 site included the excavation of the pesticide-contaminated soils, transportation of the soils to a RCRA permitted treatment disposal facility, backfilling with clean backfill and restoration with sod. An innovative and cost saving chemical treatment technology was used for treatment of the pesticide-contaminated soils. Chemical treatment costs were approximately half of estimated incineration costs.

Before remediation, the site was fenced to limit access.

The decontamination area was set up adjacent to the site to prevent the spread of pesticides.

The site after all restoration activities were completed.

The site was excavated to caprock to remove the pesticide-contaminated soils. Dust suppression measures prevented the spread of contaminated soils to adjacent residences.

The site was backfilled with clean crushed stone after removal of the contaminated soils. Then, a layer of graded sand was placed in preparation for the sod.

The contaminated soils were transferred at Miami from trucks to rail cars for the trip to the RCRA treatment and disposal facility in Detroit, Michigan.

BECHTEL

Z10.2 8735

6 IR-1: TRUMAN ANNEX REFUSE DISPOSAL AREA

6.1 SITE DESCRIPTION

The Truman Annex Refuse Disposal Area is approximately seven acres of filled land located along the southern shore of Truman Annex. The site contained several large antennas and antenna arrays. A fence surrounds the site and access is controlled. The shoreline has erosion protection consisting of large concrete rubble and debris. The main sewer outfall line for the City of Key West runs through the property. Figure 6-1 is a site map.

From 1952 until the mid-1960s the site was used for general refuse disposal and open burning. As a result of these activities, soil, groundwater, and sediment were contaminated with metals, PCBs, and some pesticides at concentrations greater than action levels. Although the shoreline is protected with concrete rubble, contamination has migrated into the surrounding sediments. In addition, the contaminated groundwater may have affected surface water and sediments.

6.2 CLEANUP OBJECTIVE

6.2.1 Contaminant of Concern

The contaminant of concern was lead. [2]

6.2.2 Cleanup Type & Criteria

The IRA objective at the Truman Annex Refuse Disposal Area was contaminant source removal to:

- Reduce the likelihood of exposure to the workers at this site.
- Reduce the likelihood of further migration of waste into other media.

The IRG was to remove and dispose of the top one foot layer of contaminated soil. Although deeper soils may also be contaminated by lead and other metals, removal of the top foot and replacement with clean backfill was considered adequate to protect site workers from exposure.

The cleanup guideline for lead contaminated soil was set at 400 ppm based on the revised CERCLA Guidance Document dated July, 1994. [32]

6.3 DELINEATION SAMPLING & RESULTS

6.3.1 Field Sampling

Delineation sampling was initially performed in the area indicated by the Navy to be of most concern. Samples were collected on a staggered 25 foot grid. A total of 112 samples were collected from 56 locations at depths of 0"-6" and 12"-18" and analyzed for TAL metals. The 5 samples with the highest total lead concentrations were analyzed for metals using EPA's TCLP analysis.

The initial phase of sampling found lead at the outer edges of the sampled area, indicating more widespread contamination than previously thought. Arsenic above cleanup levels was also detected. PPR 321-003 was written to extend the boundaries of sampling and to focus on lead and arsenic. Additional samples were collected on a 50 foot grid as follows: [14]

- At 16 locations a sample was taken at a depth of 0"-6" and analyzed for TAL metals
- At 69 locations a sample was taken from 0-6" and analyzed for arsenic and lead.

The two samples with the highest total lead concentrations were analyzed using EPA's TCLP analysis.

6.3.2 Results

Data from delineation sampling and the RFI/RI report indicated that contaminated surface soil existed over a large area of the IR-1 Site. [2, 19]

Two of the seven samples analyzed for metals using EPA's TCLP analysis failed the test for lead. As a conservative measure, the soil in the area of the failed samples (grids H23 and AB20) was considered to be RCRA HW (waste code D008). [17, 18]

The proposed excavation boundaries, based on delineation sampling results, along with results of testing are shown on Figure 6-1. Detailed findings are contained in Bechtel's delineation sampling report of August 1995. [19]

Based on the delineation sampling results the estimated quantity of soil to be removed was increased from the budgeted 1200 cy to 5100 cy. The actual quantity of soil removed was 4875 cy.

6.4 CLEANUP TECHNOLOGY

6.4.1 Technology Selection

Excavation and offsite disposal was selected as the most cost effective option. The higher quantity of soil estimated as a result of sampling did not change this selection.

6.4.2 Workplan

The scope of work consisted of the following elements:

- Excavation of the top one foot of lead contaminated soils.
- Offsite disposal of the excavated soils.
- Perform confirmation sampling to confirm that IRGs have been met. Provide results to CLEAN contractor for risk assessment.
- Backfill with clean fill.
- Perform turf establishment.

The soil which was considered to be a RCRA hazardous waste was to be segregated and handled separately from the non-hazardous material. The hazardous waste was to be taken to a licensed Treatment, Storage and Disposal Facility, while the non-hazardous soil was disposed of in a licensed municipal landfill.

Confirmatory samples would be used to verify removal of impacted soil. Samples were to be collected from the excavation sidewalls and analyzed for TAL metals. No soil samples were to be collected from the floor of the excavation.

As noted in Section 1, the approved RWP did not address IR-1. PPR-321-004 provided the detailed scope of work based on the two phases of delineation sampling. As noted in paragraph 6.7 below, confirmation sampling determined that additional excavation was required beyond the limits shown in PPR 321-004. PPR-321-009 identified the areas of additional excavation. [7468, 8319] [77, 78] 77, 78]

6.5 REGULATORY AGENCY APPROVAL

6.5.1 EPA & FDEP

The IRG was to remove and dispose of the top one foot layer of contaminated soil to protect site workers from exposure. This goal was agreed to by EPA and FDEP at a meeting in Atlanta on August 14-15, 1995. [34]

The boundaries of excavation, based on the two phases of delineation sampling and the results of the initial confirmation sampling, were coordinated with EPA and FDEP by letter and during several meetings and telephone calls. [74, 75, 76, 79]

6.5.2 Natural Resources Permits and Protection of Natural Resources

The IRA area for IR-1 is within a cleared, fenced area. Although the site is along the shoreline, the work did not impact any wetland or endangered species habitat. No permits, other than for excavation, were required.

6.6 EXECUTION OF WORK

6.6.1 Mobilization

A site survey (Figure 6-2) was performed prior to excavation to obtain elevations. The large size of the site dictated more pieces of equipment than at other sites. Excavation was accomplished using a front end loader, an excavator, a bobcat and dump trucks. End dump trucks (20 cy capacity) were used to transport the soil to the landfill.

6.6.2 Dates and Significant Events

- 27 Jul 95 — Completed civil survey of site. Established grid and benchmark elevation.
- 10 Aug 95 — Received sample analytical data indicating that further delineation sampling was required.
- 01 Sep 95 — Received approval of PPR 321-003 to conduct additional sampling.
- 07 Sep 95 — Collected 85 additional samples.
- 03 Oct 95 — Conducted preparatory phase inspection with NTR. Attachment 6-1.
- 09 Oct 95 — Identified and marked locations of physical hazards (e.g., antennae, guy wires, etc.) with high visibility tape.
- 11 Oct 95 — Renewed excavation permit. Conducted utility survey with Public Works.
- 12 Oct 95 — Commenced excavation of contaminated soil. Placed sheets of plywood over buried historic seawall to prevent damage from site vehicle traffic.
- 24 Oct 95 — Received approval of PPR 321-004, scope definition for remedial work. Commenced transportation of contaminated soil to landfill.
- 30 Oct 95 — Encountered UXO[a] in excavation area. Monroe County Sheriff bomb squad removed pre-civil war cannonball.
- 16 Nov 95 — Encountered second UXO. Monroe County removed cannonball.
- 17 Nov 95 — Intrusive work halted for safety reasons pending arrival of UXO specialist. Began clearing and grubbing of trees/bushes located outside fenced area.
- 20 Nov 95 — EOD[b] Technologies representative onsite. Following training by EODT in recognition and response to potential UXO, work resumed. Obtained confirmation samples at horizontal limits of excavation.

---

[a] UXO: Unexploded Ordnance

- 05 Dec 95 — Conducted QC inspection of disposal facility in Okeechobee that accepted the non-hazardous portion of the IR-1 soil.
- 07 Dec 95 — Commenced transportation of hazardous soil from site. Commenced spreading backfill in excavated areas.
- 08 Dec 95 — Completed transportation of hazardous soil.
- 12 Dec 95 — Confirmation sample results indicated that cleanup objectives were not realized at several locations (primarily along north side of excavation area).
- 08 Jan 96 — Delineated additional hot spots to be excavated.
- 10 Jan 96 — Received approval of PPR-009 and excavated additional area.
- 11 Jan 96 — Completed transportation of contaminated soil.
- 15 Jan 96 — Obtained two additional confirmation samples outside excavation area pursuant to regulator's request.
- 27 Jan 96 — Commenced placing sod in backfilled areas.
- 05 Feb 96 — Completed installation of sod.
- 08 Feb 96 — Installed erosion control mats along areas excavated outside facility fence.
- 19 Mar 96 — Notice of Substantial Completion issued.

6.6.3 Work Plan vs. Actual Work

6.6.3.1 Deviations from planning and why

Scope definition for IR-1 was not developed when the work plan was submitted for approval. Two PPRs describing how the objectives of the source removal action would be accomplished were issued to revise the work plan. There were no significant deviations from the PPRs.

6.6.3.2 Delays & Problems Encountered; Unexpected Findings/Contamination

Encountered unexploded ordnance (UXO) on two occasions. Both were Civil War era cannonballs. One had a fuse boss (no fuse material present). The Monroe County bomb experts attempted to detonate the second device in-place. The device remained intact and was disposed of by the Sheriff's department.

Quantities of soil deemed as hazardous were greater than expected. Delineation and confirmation sampling showed that the area of contamination extended well beyond the earliest estimates.

Excavation was extremely difficult and time consuming due to physical obstructions (e.g., the antennae, guy wires, and cable chaseways) on the site. Because trucks could not be easily or safely maneuvered and positioned among the wires and antennae, most of the contaminated soil had to be excavated, stock piled, and then transferred to a loading area. This extra handling significantly increased the duration of work activities at IR-1.

6.6.4 Summary of Materials Handled

Table 1-1 contains a summary of materials removed from the site and their disposition.

6.6.5 Site Restoration

The excavation was filled with an underlayment of crushed stone, followed by a layer of screened sand until the contours matched the existing grade. Sodding established a final vegetative cover. Areas excavated along the shore outside the fenced facility were backfilled with clean screened sand and covered with erosion matting to stabilize the soil until natural revegetation occurs.

---

[b] EOD: Explosives Ordnance Disposal

6.7 CONFIRMATION SAMPLING AND COMPLETION DRAWINGS

Confirmatory samples were collected from the excavated area to verify removal of impacted soil. Samples were collected from the excavation sidewalls and analyzed for TAL metals. Confirmation sampling at the boundaries established by PPR-004 showed that contamination extended beyond the excavated area, and additional excavation was required. A second round of confirmation samples were taken upon completion of the additional excavation.

Sample locations and quantities are indicated on Figure 6-3. No soil samples were collected from the floor of the excavation, as the objective of the IRA was to remove only the top layer of contaminated soil. [74, 80]

6.8 APPROVAL OF COMPLETED IRA

6.8.1 Regulatory Agency

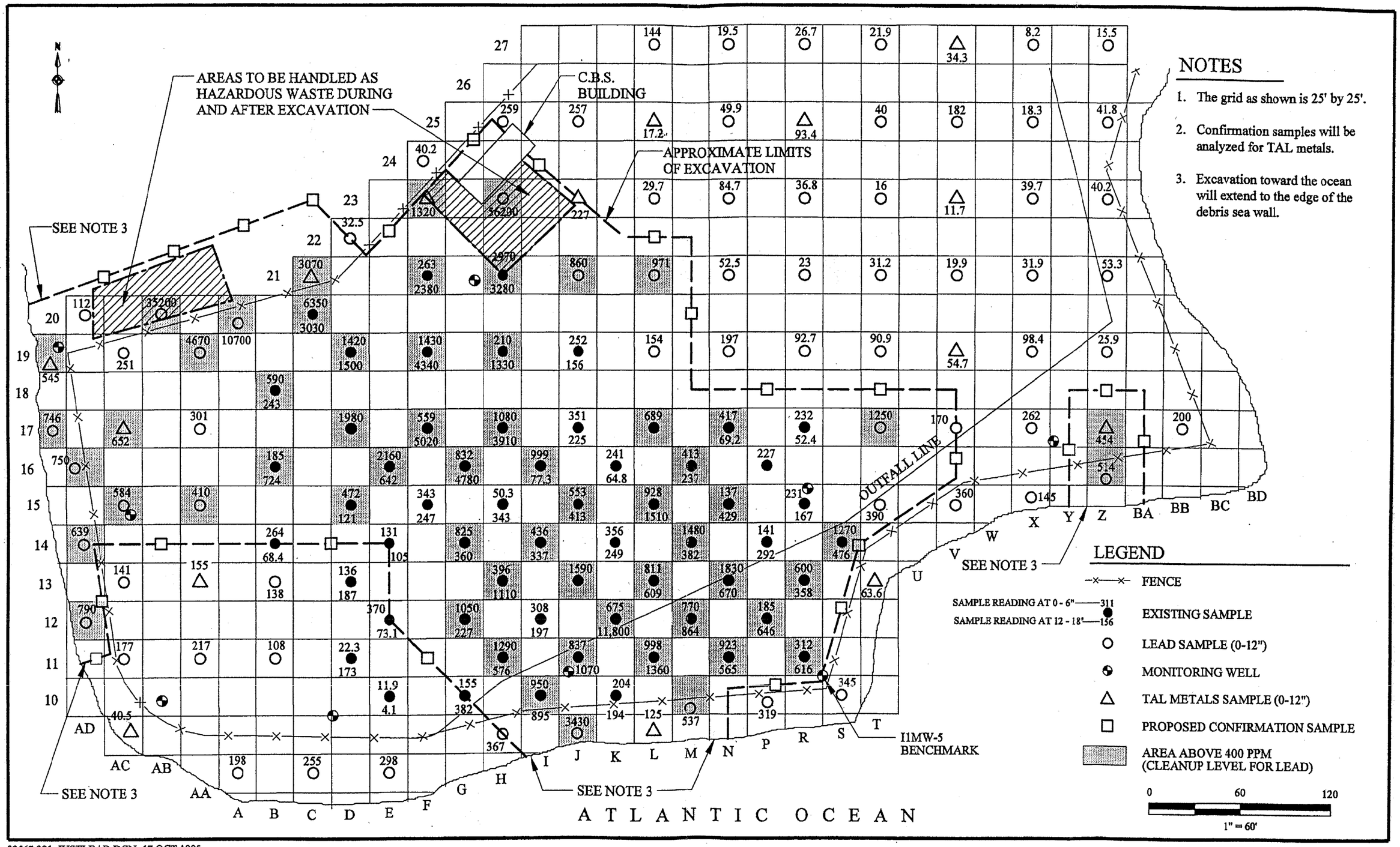
Both EPA and FDEP agreed to the actual limits of excavation and the confirmation sampling results. Seven of the confirmation samples had results slightly above the IRG for lead; however, the regulators agreed that these exceedances were not substantial enough to warrant additional soil removal. [75, 76]

6.8.2 Navy / NTR Approval

Copies of the Site Closeout Report and the signed Certificate of Substantial Completion are included as Attachments 6-2 and 6-3.

6.8.3 Photographs

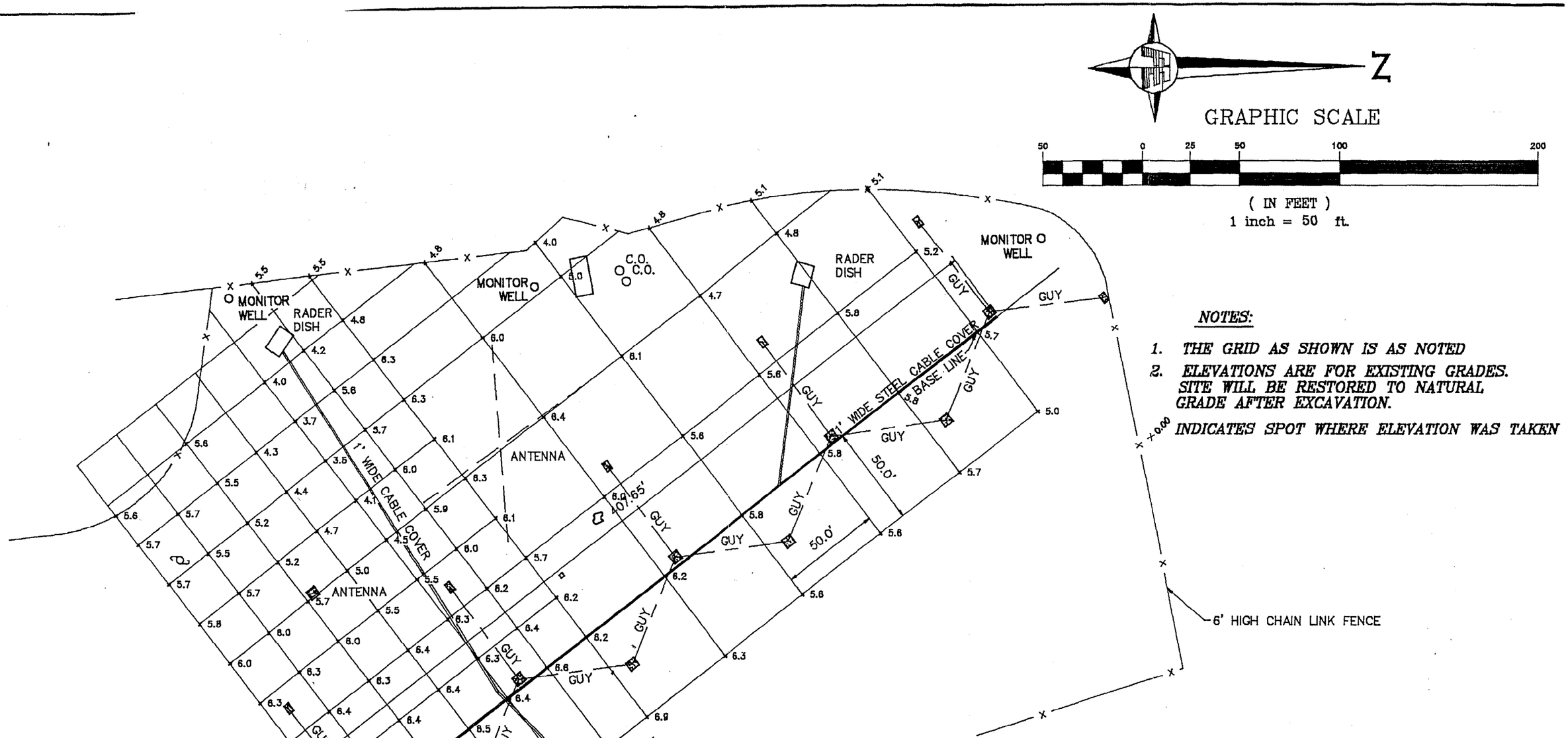
The completion poster, Attachment 6-4, provides a photographic record for this site.



22567 321 JUSTLEAD.DGN 17 OCT 1995

FIGURE 6-1

IR NO.1 - TRUMAN ANNEX (KEYWEST)
REFUSE DISPOSAL AREA - LEAD RESULTS



NOTES:

1. *THE GRID AS SHOWN IS AS NOTED*
2. *ELEVATIONS ARE FOR EXISTING GRADES. SITE WILL BE RESTORED TO NATURAL GRADE AFTER EXCAVATION.*

INDICATES SPOT WHERE ELEVATION WAS TAKEN

FIGURE 6-2

ABBREVIATION LEGEND:

F.I.R	FOUND IRON ROD, SIZE INDICATED	SEC.	SECTION
S.I.R.	SET IRON ROD, 1/2" L.B. No. 5408	TWP.	TOWNSHIP
F.I.P.	FOUND IRON PIPE, SIZE INDICATED	RGE.	RANGE
F.N.D.	FOUND NAIL AND DISK	(D)	DEED
S.N.D.	SET NAIL AND DISK, L.B. No. 5408	(P)	PLAT
F.C.M.	FOUND CONCRETE MONUMENT	(M)	MEASURED
P.R.M.	PERMANENT REFERENCE MONUMENT	(C)	CALCULATED
P.C.P.	PERMANENT CONTROL POINT	CONC.	CONCRETE
P.I.	POINT OF INTERSECTION	COV.	COVERED
P.C.	POINT OF CURVE	ASPH.	ASPHALT
P.O.B.	POINT OF BEGINNING	PVMT.	PAVEMENT
R/W	RIGHT-OF-WAY	ELEV.	ELEVATION
TYP.	TYPICAL		
OHW	OVERHEAD WIRE		

FRANK & ELLIOTT
SURVEYORS • ENGINEERS LAND PLANNERS
83286 OVERSEAS HIGHWAY, SUITE 500, ISLAMORADA, FLORIDA 33036
Phone (305) 664-0784 FAX (305) 664-0818
A DIVISION OF SEBASTIAN MARINE CONSTRUCTION

CERTIFIED FOR _____

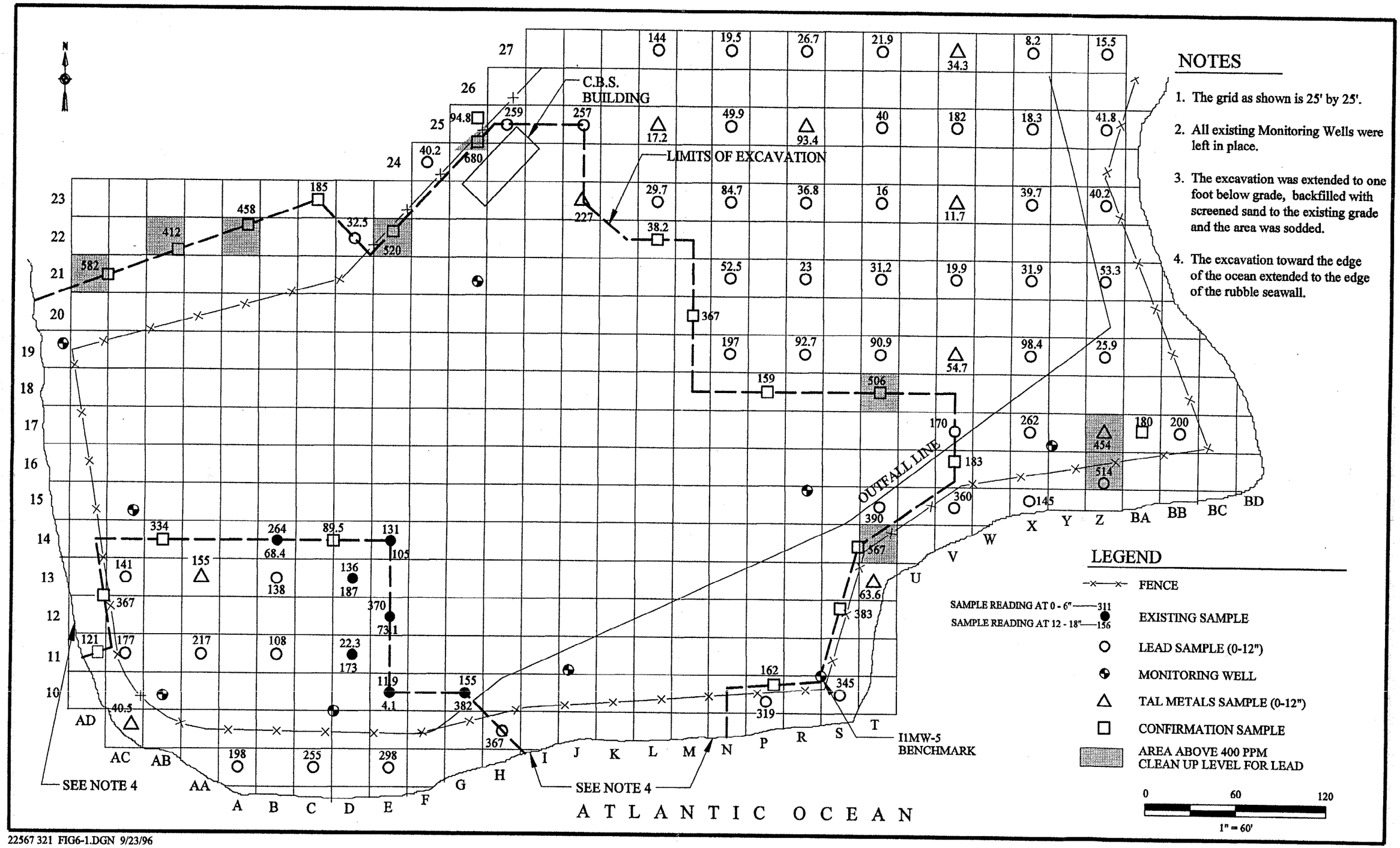
I HEREBY CERTIFY THIS SURVEY MEETS THE MINIMUM TECHNICAL STANDARDS AS SET FORTH BY THE FLORIDA BOARD OF PROFESSIONAL SURVEYORS AND MAPPERS IN CHAPTER 61G17-6 FLORIDA ADMINISTRATIVE CODE, PURSUANT TO SECTION 472.027, FLORIDA STATUTES.

SCALE: 1"=50'	Lawrence P. Frank	DRAWN BY: G.N.B.
DATE: 07/24/95	LAWRENCE P. FRANK, P.E.S. # 4819	REVISED

IR-1

CERTIFIED TO:

JOB NUMBER: 95142.IR-1



22567 321 FIG6-1.DGN 9/23/96

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

Attachment 6-1

Site Closeout Report

Site Closeout Report

IR Number 1

RECEIVED
JUN 1 8 1996
BECHTEL 22567

On October 10, 1995 Associated Environmental Services Inc. mobilized equipment and crew to Interim Removal (IR) number 1. Work consisted of site setup and security, excavation, loading, transportation, and disposal of contaminated soil, personnel and equipment decontamination, backfill and site restoration.

Personnel Time on Site

Site Superintendent:	360 hrs
Forman:	240 hrs
Health & Safety:	360 hrs
Operator:	760 hrs
Labor:	760 hrs

Equipment Time on Site

Deere 690 Trackhoe:	328 hrs
Deere 624 Endloader:	568 hrs
Rubber Tired Bobcat:	112 hrs
Dump Truck:	308 hrs
Backhoe:	24 hrs

Soil Loading, Transportation and Disposal

Final Disposition Method:	Chemical Stabilization
Volume Loaded:	428 Tons
Transported:	428 Tons
Disposal:	428 Tons

Final Disposition Method:	Class 1 Landfill
Volume Loaded:	5715 Tons
Transported:	5715 Tons
Disposal:	5715 Tons

22567-321-0415-0033-005-01

Site Restoration

General Fill: 6714 Tons

Material Sampling and Analysis

Five samples were collected on August 4, 1995. A profile analysis was performed for disposal approval, see attachments for results.

Lower Tier Subcontractors

Transporters:

Robbie D. Wood Trucking
P.O. Box 125
Dolomite, AL 35061
(205) 744-8440
EPA ID# ALD067138891

Soil Tech Distributor, Inc.
P.O. Box 110926
Hialeah, FL 33011
(305) 828-2362

Disposal Facilitys:

Wayne Disposal, Inc.
49350 North I-94, Service Drive
Belleville, MI 48111
(313) 699-6287
EPA ID Number MID048090633

Chamber Okeechobee Landfill
10800 NE 126th Ave
Okeechobee, FL 32972
(813) 357-0772

22567-321-0415-0033-005-01

Laboratory:	Pace Inc. Environmental Laboratories 5460 Beaumont Center Blvd. Tampa, FL 33634 (813) 884-8268 Florida DEP CompQAP #870529G Lab Certification Florida Environmental:HRS #E84003 Florida SDWA:HRS #84125
General Fill:	Sunshine Rock, Inc. Plant Address: NW 129th Ave. & 202nd St. Miami, FL (305) 821-8660
	Rinker Materials Corporation Plant Address: 13292 NW 118th Ave Miami, FL 33012 (305) 558-5830

Attachment 6-2

Certification of Substantial Completion

321-F00257

CERTIFICATE OF SUBSTANTIAL COMPLETION

Date: 19 March 1996

Site: IR-1

Description of Site: Former Open Disposal Area

Contractor: Associated Environmental Services

Contract No.: 22567-321-SC-0415

Punch List Completion Date: N/A

This is to certifiy the work described above has been substantially completed in accordance with the contract and associated documents. The site designated above has been inspected by representatives of the customer, contractor, and Bechtel, and is compete with the exception of the attached punch list (if applicable) which the contractor agrees to complete by the date designated.

The warranty period commences on the date the contractor completes the remedial work as described in the punch list or from the date of execution of the Certificate of Substantial Completion, whichever is later.

INSPECTION CERTIFICATE

CONTRACTOR: _____ DATE: 19 MAR 96

ACCEPTED BY

BECHTEL: _____ DATE: 19 Mar 96

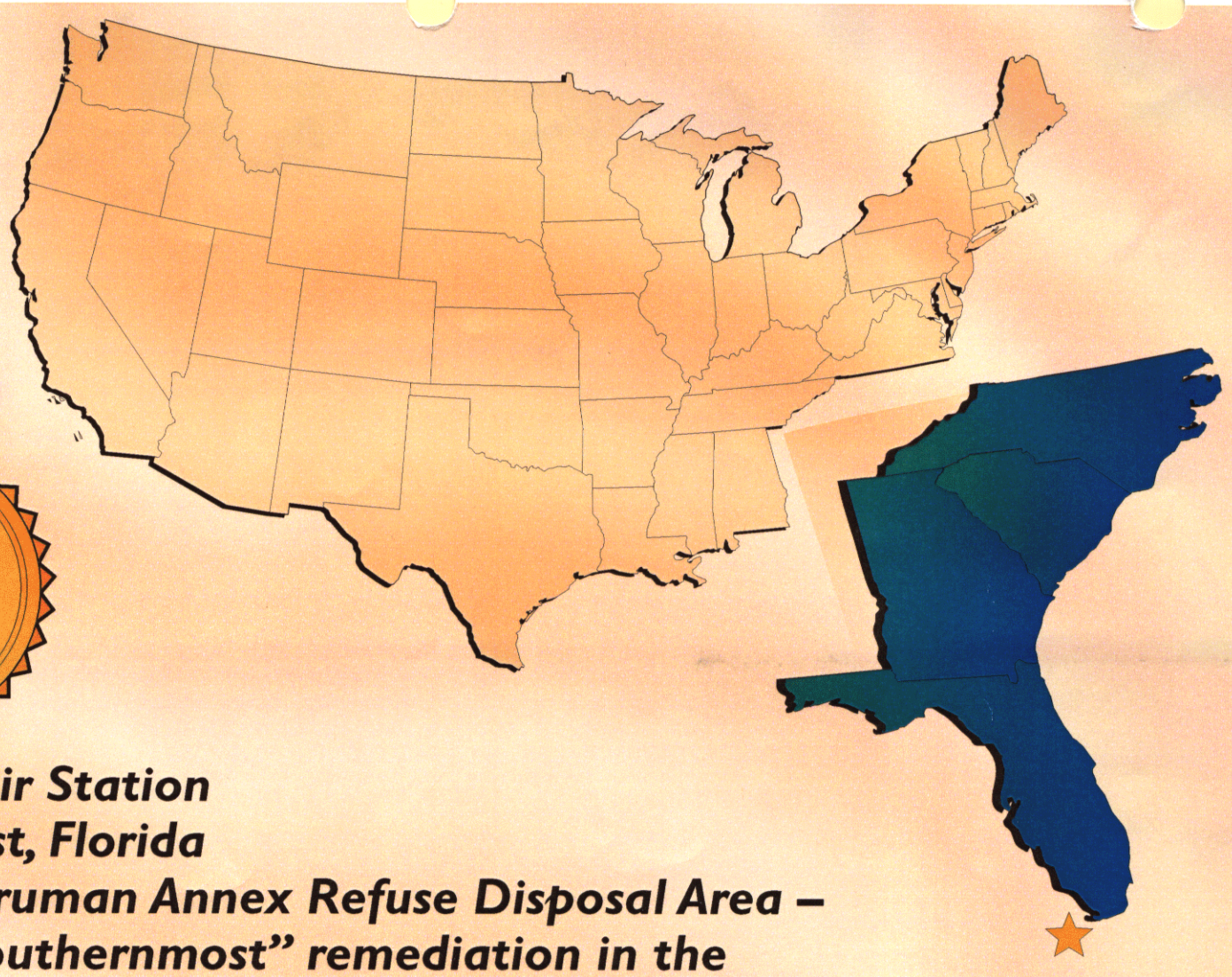
CUSTOMER REPRESENTATIVE: _____ DATE: 20 MAR 96

Attachment 6-3

Completion Poster

Southern Division
Naval Facilities Engineering Command

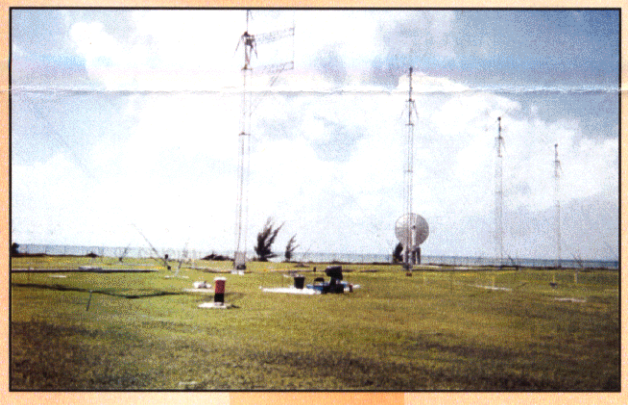
Navy RAC Completed Sites



20th Completed Site

Naval Air Station Key West, Florida IR-1 – Truman Annex Refuse Disposal Area – The "Southernmost" remediation in the United States.

Interim remediation at IR-1 required excavation of the top one foot of lead contaminated soil, transportation of non-hazardous waste to a licensed municipal landfill, transportation of hazardous waste to a RCRA permitted treatment facility, backfilling and restoration with sod. The 3.3-acre excavation was complicated by numerous antennas, cable trays, and guy wires which required protection and avoidance during equipment operations. One cost saving measure was the segregation of hazardous soil from non-hazardous soil to reduce disposal costs.



The site before excavation begins. The personnel decontamination area is in the center of the picture.

Excavation of contaminated soils around the cable trenches and guy wire foundations. Clean fill is stockpiled in the background.

Excavation of contaminated soil. A spotter was used at all times to ensure the excavator avoided guy wires and antennas.

Backfilling with clean fill. The contaminated soils are stockpiled and covered in the background awaiting loading and disposal.

Removal of a Civil War cannonball, one of two discovered on the site. The Key West Bomb Squad attempted to detonate the cannonball with plastic explosives, but it was not a "live" round.

The site after all restoration activities were completed, including laying the new sod.

BECHTEL

Z10.3 9077.1

0113D10X

7 AOC-B: BIG COPPIT KEY ABANDONED CIVILIAN DISPOSAL AREA

7.1 SITE DESCRIPTION

The site encompasses approximately 10 acres located east of the Naval Air Station along Boca Chica Road. A dead end canal occupies the northern end. The waste disposal area is located in a wetland south of the canal and is surrounded by mature mangroves. Ground elevations vary from sea level to approximately 2 ft above sea level. A culvert connects the south end of the canal with the wetland. Figure 7-1 is a site map.

The site is accessible from Boca Chica Road, and was used by local civilians to dispose of automobile parts and other material. Most of the debris lay in a horseshoe shaped area approximately 150 ft by 300 ft. This area is elevated slightly above the surrounding wetland. Caprock is exposed along the centerline, and a light soil cover, approximately 6 in. to 1 ft, covers the rock and is mixed with the debris. Mangroves were growing among the exposed waste. Most of the waste disposal is believed to have occurred prior to Navy ownership.

7.2 CLEANUP OBJECTIVE

7.2.1 Contaminant of Concern

The primary contaminant of concern was identified as lead thought to come from automobile batteries. Sampling prior to the IRA indicated that soil, sediment, surface water, and groundwater had been adversely impacted by metals. [2]

7.2.2 Cleanup Type & Criteria

The IRA objective was contaminant source removal to prevent further migration of waste into other media and to comply with regulatory requirements. This objective was to be accomplished by removing the solid waste debris and transporting it to a municipal landfill. [26, 81]

The IRG was defined as removal of trash and metal debris up to the edge of the mature mangroves. The cleanup criteria for sediment contaminated with metals are the Threshold Effect Level (TEL) values from Table 4 of FDEP's "Approach to the Assessment of Sediment Quality in Florida Coastal Waters", dated November, 1994. For lead, the criteria is 30.2 ppm. [38]

7.3 DELINEATION SAMPLING & RESULTS

7.3.1 Field Sampling

Delineation sampling was performed to establish the extent of contamination. Sampling covered the open area where debris was visible and extended approximately 50 feet into the mangroves. Samples were taken as follows:

- 23 sediment samples at 14 locations covering an area of approximately 200 ft by 300 ft.
- 9 subsurface soil samples were collected from 6 locations along the center of the site

All of the collected samples were analyzed for for TAL metals. Additionally, 3 of the subsurface soil samples were analyzed for TCLP metals.

7.3.2 Results

The sampling results indicated that soil and sediment in the adjacent wetlands had been impacted by the disposal area. Seven of the 23 sediment samples exceeded criteria for metals other than lead; however, the levels of contamination were not excessive and the interim goal did not include excavating these areas, which would have destroyed many mangroves.

None of the samples subjected to TCLP testing exceeded the regulatory criteria, indicating that there was no RCRA hazardous waste present. The locations of the samples are shown on Figure 7-1. Tables 7-1 and 7-2 contain the sampling results for the surface soil sampling and the sediment sampling. [19, 81].

Based on the delineation sampling results, the estimated quantity of soil to be removed was 1100 cubic yards, as opposed to the budgetary estimate of 1350 cubic yards. The actual quantity of soil removed was 1251 cubic yards.

7.4 CLEANUP TECHNOLOGY

7.4.1 Technology Selection

Excavation and offsite disposal was the only alternative considered for remediation of AOC-B.

7.4.2 Workplan

The scope of work consisted of the following elements:

- Excavate and remove trash and debris. Excavate to caprock or until soils were visibly free of debris.
- Transport solid waste to a municipal landfill for disposal.
- Transport hazardous waste (if any) to a RCRA-permitted treatment/disposal facility.
- Perform confirmation sampling. Provide results to CLEAN contractor for risk assessment.
- Backfill and grade with organic substrate.
- Natural recolonization and succession of wetland species.

PPR 321-008 was written to make the work plan consistent with the wetlands permit and to reflect the results of delineation sampling. [81]

7.5 REGULATORY AGENCY APPROVAL

7.5.1 EPA & FDEP

The following agreements were made during the planning process:

- Conferees at the August, 1994 Regulatory meeting agreed that the draft work plan was acceptable for AOC-B. [32]
- Conferees at the NRT meeting in April, 1995, agreed that the site is a wetland, that permits would be required, and that natural recolonization and succession would be the means of revegetation after excavation was complete. [37]

7.5.2 Natural Resources Permits and Protection of Natural Resources

AOC-B encompasses a wetland and required permits from the State of Florida and the U.S. Army Corps of Engineers.

- FDEP issued permit Number 442693985 on December 18, 1995. [50]
- The Army Corps of Engineers determined that the work could be performed under the nationwide permit Number 38 and that an individual permit would not be required. [55]

Key concerns expressed by the permitting authorities were as follows:

- Minimize damage to mature mangroves during excavation.
- Sediment control in the excavation area and control of runoff from stockpiled material.
- Stockpiling should take place on higher ground.
- Establishment of correct elevations for site restoration to a natural wetland.
- Site access should be blocked after completion of the work to prevent a recurrence of dumping.

These concerns were addressed as follows: [37, 48, 53, 82]]

- Civil survey to establish elevations for site restoration and confirming survey upon completion.
- Straw bale barrier was used for sediment and runoff control.
- Stockpiling and loading occurred on high ground north of the excavation.
- Horizontal extent of excavation ended at edge of mature mangroves.
- Barriers placed at entrance.

AOC-B does not encompass any endangered species habitat. The NAS Natural Resources Manager was notified by BEI before excavation was performed at the outer edge of the site adjacent to the larger mangroves. [81]

7.6 EXECUTION OF WORK

7.6.1 Mobilization

A civil survey of the site (Figure 7-2) prior to start of work established elevations of the surrounding wetlands. These elevations were later used to establish final elevations upon completion of the work. Work was accomplished using an excavator, front loader, and bulldozer.

7.6.2 Dates and Significant Events

- 09 Aug 95 — Surveyed elevation of surface debris.
- 22 Jan 96 — Received SouthDiv approval of PPR 321-008.
- 01 Feb 96 — Received renewed excavation permit from Public Works.
- 02 Feb 96 — Conducted preparatory phase inspection with NTR. Attachment 7-1.
- 06 Feb 96 — Commenced excavation of solid waste.
- 09 Feb 96 — Completed excavation of solid waste material.
- 12 Feb 96 — Commenced hauling solid waste to sanitary landfill.
- 13 Feb 96 — Commenced placing clean fill in excavated areas.
- 14 Feb 96 — Collected confirmation samples from horizontal excavation limits.
- 15 Feb 96 — Completed transportation of solid waste.
- 04 Mar 96 — Completed spreading of backfill.
- 05 Mar 96 — Obtained elevations of backfill and surrounding wetlands.
- 22 Apr 96 — NTR issued Certificate of Substantial Completion.

7.6.3 Work Plan vs. Actual Work

7.6.3.1 Deviations from planning and why

There were no significant deviations from the work plan.

7.6.3.2 Delays & Problems Encountered; Unexpected Findings/Contamination

In attempting to spread backfill material to the same elevation as surrounding wetlands the excavation was always saturated with tidally influenced water, creating a quagmire that made it especially difficult to operate equipment.

Representatives from the U. S. Army Corps of Engineers and U. S. Fish and Wildlife Service visited the site on 13 and 16 February 1996 and indicated some disagreement with the approved work plan as stipulated by the FDEP permit. These comments were referred to FDEP. [59, 60]

7.6.4 Summary of Materials Handled

Table 1-1 contains a summary of materials removed from the site and their disposition.

7.6.5 Site Restoration

The excavation was filled with organic substrate material (at least 6 inches thick) until the contours matched the existing wetlands elevations. A survey was performed to confirm that the final elevations were correct. This survey is included as Figure 7-3.

Due to the abundance of mature "seed" (propagule) producing mangroves located adjacent to the site it was determined that the site would be revegetated by natural colonization. The long term objective was to establish a persistent wetland species density of at least 50 percent of the aerial canopy in three years. [81]

7.7 CONFIRMATION SAMPLING AND COMPLETION DRAWINGS

Confirmatory samples were collected from the excavated area to verify the removal of the impacted soil. Samples were collected form the sidewall of the excavation and analyzed For TAL metals. Sample locations and limits of excavation are shown on Figure 7-4. Table 7-3 contains the sampling results for the confirmation sampling. No samples were collected from the bottom of the excavation.

A copy of the complete analytical results is contained in Volume II.

7.8 APPROVAL OF COMPLETED IRA

7.8.1 Regulatory Agency

An FDEP representative from the Marathon office inspected the the site in late July 1996, and was pleased with the remedial activities. The notification form for transfer of the site from the construction phase to operations phase was prepared by BEI and sent to NAS Key West in September, 1996. NAS Key West forwarded this form to FDEP. [62, 64]

As required by the wetland permit, BEI sent the Environmental Resource As-built Certification with excavation and backfill quantities, and copies of the as-built survey and confirmation sampling results to FDEP in May 1995 and again in September. [61, 63]

7.8.2 Navy / NTR Approval

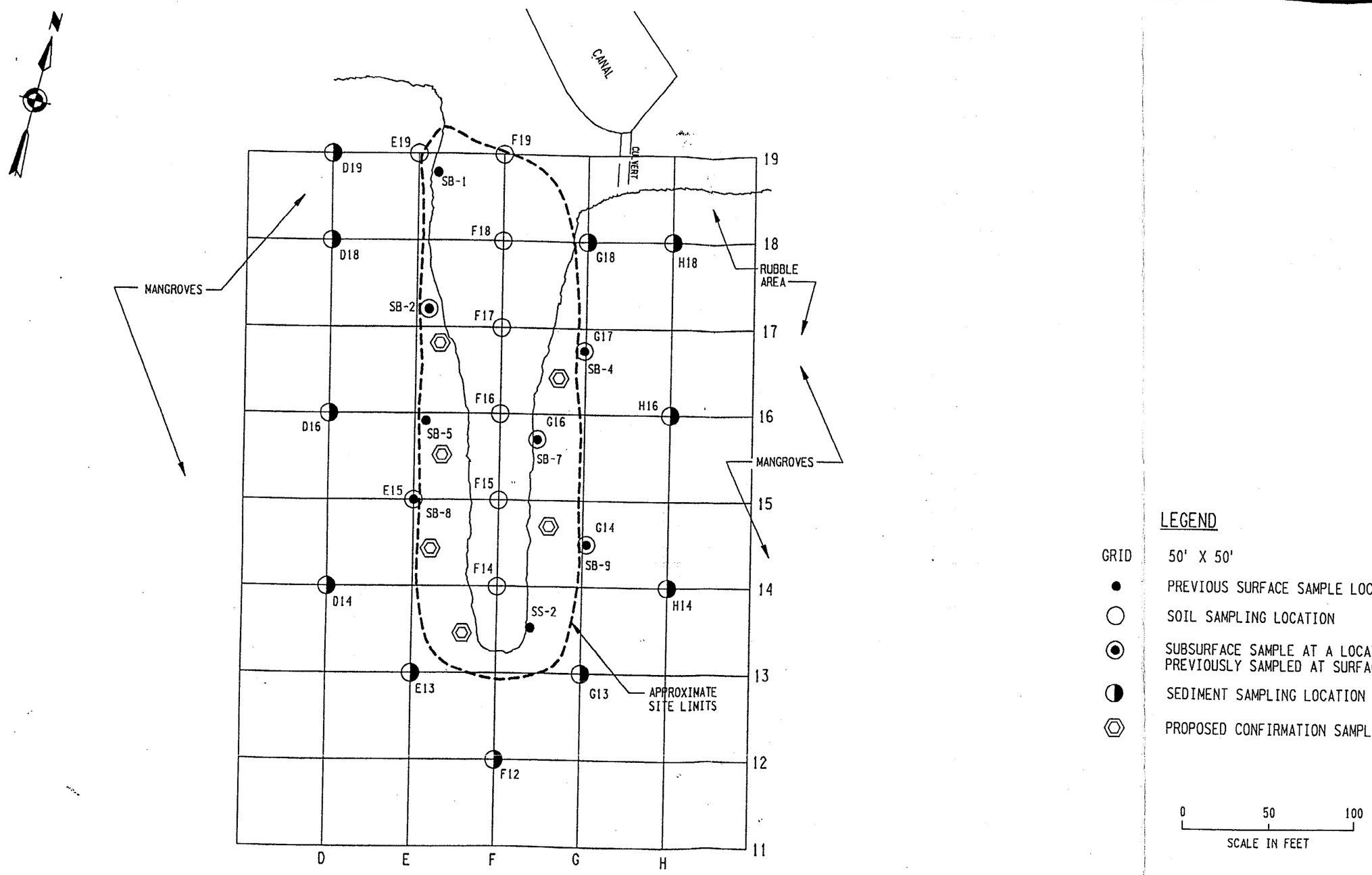
Copies of the Site Closeout Report and the signed Certificate of Substantial Completion are included as Attachments 7-2 and 7-3.

7.8.3 Photographs

The completion poster, Attachment 7-4, provides a photographic record for this site.

7.9 FOLLOW-ON

Visits to the site a year after completion reveal that mangroves are establishing themselves throughout the excavated area.



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7/31/95

FIGURE 7-1
AOC SITE B - BIG COPPITT KEY
ABANDONED CIVILIAN - DISPOSAL AREA

AUZ DIV

Table 7-1
AOC-B Soil
Delineation Sampling Results in ppm

PARAMETER	STANDARD[3] mg/kg	Sample ID Location, Depth(ft)								
		KW02026 F19, 0-1	KW02027 F14, 0-1*	KW02028 F14, 1-2	KW02029 F14, 2-3	KW02030 F15, 0-1	KW02031 F16, 0-1*	KW02033 F17, 0-1	KW02034 F17, 1-2	KW02035 F18, 0-1*
ALUMINUM	NA	677	1490	2100	3910	1310	2310	1100	1770	232
ARSENIC	10[1]	0.73 J	10.3	12.3	3.04	4.07	2.52	3.87	17.4	0.86 J
BARIUM	74000	16.8	214	108	19.3	118	63.3	81	155	17.1
CADMIUM	600	ND	7.71	12.6	ND	1.45 J	1.25 J	2.69	7.56	ND
CALCIUM	NA	388000	267000	216000	294000	319000	332000	304000	180000	385000
CHROMIUM	220	4.12 J	111	53.5	13.6 J	20.8	15.9	31.9	49.5	3.47 J
COBALT	110000	1.32 J	11.4 J	8.97 J	3.14 J	4.65 J	3.7 J	6.12 J	16.5 J	1.33 J
COPPER	72000	11.9	146	191	18	132	54.6 J	78.8	263	18.6
IRON	NA	2000	144000	113000	13900	78000	25800	84200	289000	4000
LEAD	400[2]	ND	226	146	ND	78.7	68.1	70.7	97	ND
MAGNESIUM	NA	2880	5970	8350	14300	5730	6380	3860	7430	1470
MANGANESE	170000	11.7	1220	474	54.5	276	121	410	653	18.9
NICKEL	NA	2.18 J	116	107	19.0 J	33.5	21	44	148	4.11 J
POTASSIUM	NA	265 J	ND	453 J	871 J	170 J	229 J	138 J	142 J	ND
SILVER	8000	ND	ND	ND	ND	ND	ND	ND	11.9	ND
SODIUM	NA	4870	2540	7000	16800	2800	2120	1200	4950	2630
ZINC	550000	61.8	2460	3240	674	1250	612	833	2210	51.1

[1]The 10 ppm limit for arsenic proposed by FDEP and Region IV EPA on May 2, 1995.

[2]The 400 ppm limit for lead is based on the revised CERCLA Guidance Document dated July, 1994.

[3]FDEP Cleanup Goals for Military Sites in Florida, April 15, 1995.

ND - Not Detected

J - A "J" indicates that the value is estimated, the detected concentration is above the detection limit, but below the reporting limit

The Shaded boxes indicate detected concentrations above the stand

*TCLP analysis included. Results were below TCLP limits for all metals.

ppm=parts per million

Table 7-2
AOC-B Sediment
Delineation Sampling Results in ppm

PARAMETER	STANDARD[1] mg/kg	Sample ID Location, Depth(ft)											
		KW02001 D18, 0-1	KW02002 D19, 0-1	KW02003 E19, 0-1	KW02004 D16, 0-1	KW02005 D14, 0-1	KW02006 D14, 1-2	KW02007 E13, 0-1	KW02008 E13, 1-2	KW02009 F12, 0-1	KW02010 F12, 1-2	KW02011 H14, 0-1	KW02012 H14, 1-2
ALUMINUM	NA	5470	4750	3250	3980	3220	2470	4830	2060	3760	3030	2840	5000
ARSENIC	7.24	2.59	7.68	1.53 J	5.05	8.1	5.44	10.2	2.34 J	6.3	1.95 J	1.33 J	3.11
BARIUM	NA	11.6 J	32.4	10.1 J	11.6 J	7.41 J	10.5 J	9.43	9.19 J	8.75	10.8 J	8.61 J	9.66 J
CADMIUM	0.676	ND	ND	ND	ND	1.19 J	ND	1.91 J	ND	ND	ND	ND	ND
CALCIUM	NA	262000	295000	311000	244000	135000	318000	67900	284000	128000	324000	253000	250000
CHROMIUM	52.3	9.57 J	35.4	4.69 J	9.33 J	9.7	ND	13	5.7 J	11.2	3.85 J	2.71 J	9.45 J
COBALT	NA	4.06 J	3.57 J	2.43 J	7.34	1.74 J	ND	2.39 J	3.04 J	2.45 J	2.06 J	6.62 J	4.06 J
COPPER	18.7	3.21 J	25.9	ND	ND	11.4	ND	16.1	ND	2.08 J	ND	ND	ND
IRON	NA	2420	12700	1620	1800	2730	2610	3350	1120	1540	1490	1200	2420
LEAD	30.2	ND	44.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MAGNESIUM	NA	20000	16600	12700	19900	10200	14700	14700	13100	12000	17200	15300	20000
MANGANESE	NA	25.8	55.7	15.5	18.4	11.2	20.2	11.4	13.9	8.75	18.4	16.5	25.7
NICKEL	15.9	5.83 J	38.1	ND	ND	5.87 J	ND	13.1	ND	5.08 J	ND	ND	4.81 J
POTASSIUM	NA	1340	936	875	1690	1690	1310 J	3720	973 J	2940	1090 J	936	1160
SODIUM	NA	13800	10900	11400	21300	30000	31000	65700	20000	49300	18700	14200	16400
VANADIUM	NA	ND	ND	ND	ND	11.6	ND	40.5	ND	14.5	ND	ND	ND
ZINC	124	54.1	450	24.1	41	480	90.1	442	7.21 J	19.8	2.19 J	6.43 J	3.04 J

[1]Sediment Criteria based on FDEP's "Approach to the Assessment of Sediment Quality in Florida Coastal Waters" November, 1994

ND - Not Detected

J - A "J" indicates that the value is estimated, the detected concentration is above the detection limit, but below the reporting limit

The Shaded boxes indicate detected concentrations above the standard.

ppm=parts per million

Table 7-2 (con't)
AOC-B Sediment
Delineation Sampling Results in ppm

PARAMETER	STANDARD[1] mg/kg	Sample ID Location, Depths										
		KW02013 G13, 0-1	KW02015 G13, 1-2	KW02016 H16, 0-1	KW02017 H16, 1-2	KW02018 G14, 1-2	KW02020 G16, 1-2	KW02021 G17, 1-2	KW02022 G18, 0-1	KW02023 G18, 1-2	KW02024 H18, 0-1	KW02025 H18, 1-2
ALUMINUM	NA	3990	4040	3670	3760	3590	6170	5320	1350	1300	3380	3500
ARSENIC	7.24	4.8	2.48 J	2.96	2.31 J	1.36 J	7.96	2.0 J	0.85 J	0.86 J	1.43	1.32
BARIUM	NA	8.95 J	11.3 J	9.89 J	9.88 J	10.1 J	21.4	13.8	9.13	9.94	11.1 J	10.5 J
CADMIUM	0.676	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CALCIUM	NA	208000	292000	241000	258000	230000	276000	310000	362000	346000	325000	322000
CHROMIUM	52.3	8.95 J	6.25 J	4.84 J	6.81 J	8.34 J	12.5 J	11.7 J	3.25 J	3.76 J	9.79 J	8.94 J
COBALT	NA	5.19 J	2.95 J	2.74 J	2.02 J	3.5 J	3.25 J	3.17 J	4.54 J	1.9 J	3.26 J	2.93 J
COPPER	18.7	ND	ND	ND	ND	ND	9.44 J	ND	ND	1.99 J	3.86 J	2.55 J
IRON	NA	1840	2590	1710	1830	2070	9150	3230	1310	824	1810	1680
LEAD	30.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MAGNESIUM	NA	13800	20400	20400	20400	22700	18500	20400	6690	7740	20800	20300
MANGANESE	NA	14.8	24.1	19	21.2	22.5	58.3	28.4	11.4	16.9	22.3	22.3
NICKEL	15.9	5.99 J	4.89 J	ND	5.21 J	ND	7.69 J	5.04 J	ND	2.64 J	5.45 J	6.9 J
POTASSIUM	NA	1830	850 J	1540	1120	1030	1160	1340	317 J	401 J	1120	761 J
SODIUM	NA	30800	16600	23100	17400	20500	16700	16200	2860	3880	12400	11800
VANADIUM	NA	2.01 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ZINC	124	69.7	3.57 J	72.1	8.03 J	29.8	123	31.7	5.63 J	4.08 J	26.1	22.5

[1]Sediment Criteria based on FDEP's "Approach to the Assessment of Sediment Quality in Florida Coastal Waters" November, 1994

ND - Not Detected

J - A "J" indicates that the value is estimated, the detected concentration is above the detection limit, but below the reporting limit

The Shaded boxes indicate detected concentrations above the standard.

ppm=parts per million

SUPPLIER DOCUMENT STATUS STAMP

1 ☑ WORK MAY PROCEED.
2 ☐ REVISE AND RESUBMIT. WORK MAY PROCEED SUBJECT TO RESOLUTION OF INDICATED COMMENTS.
3 ☐ REVISE AND RESUBMIT. WORK MAY NOT PROCEED.
4 ☐ REVIEW NOT REQUIRED. WORK MAY PROCEED.

PERMISSION TO PROCEED DOES NOT CONSTITUTE ACCEPTANCE OR APPROVAL OF DESIGN DETAILS, CALCULATIONS, ANALYSES, TEST METHODS, OR MATERIAL DEVELOPED OR SELECTED BY THE SUPPLIER AND DOES NOT RELIEVE SUPPLIER FROM FULL COMPLIANCE WITH CONTRACTUAL OBLIGATIONS.

REVIEWED

SSRS ITEM # ☐ PARTIAL ☐ COMPLETE
REVIEWED BY DATE 9/2/95

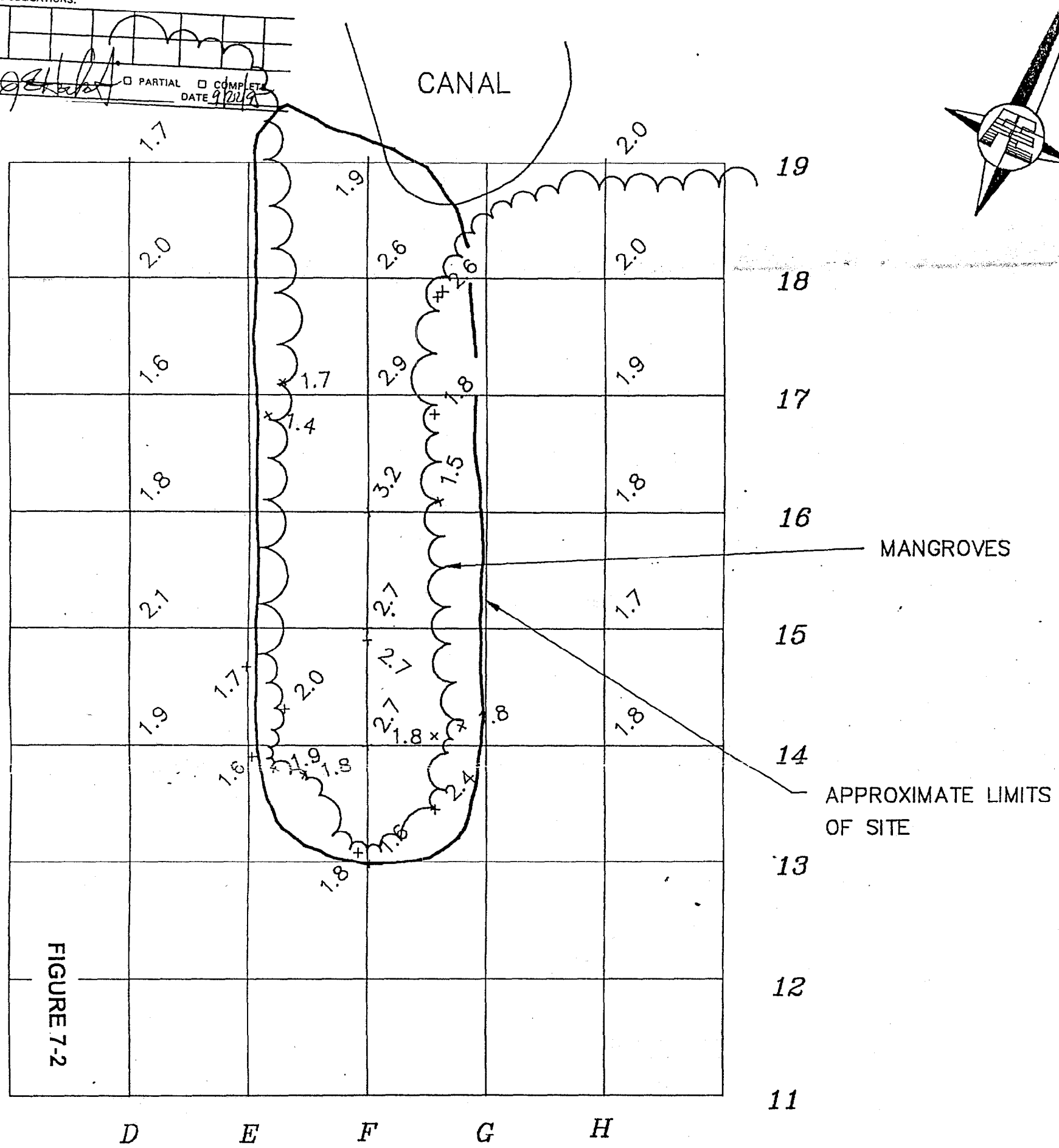


FIGURE 7-2

NOTES:

1. *THE GRID AS SHOWN IS 50' BY 50'*
2. *ELEVATIONS ARE FOR EXISTING GRADES. SITE WILL BE RESTORED TO NATURAL GRADE AFTER EXCAVATION.*

+ 0.9 *INDICATES SPOT WHERE ELEVATION WAS TAKEN*

GRAPHIC SCALE

50 0 25 50 100 200

(IN FEET)
•1 inch = 50 ft.

22567-321-0120-0012-002-01

ABBREVIATION LEGEND:

F.I.R	FOUND IRON ROD, SIZE INDICATED	SEC.	SECTION
S.I.R.	SET IRON ROD, 1/2" L.B. No. 5408	TWP.	TOWNSHIP
F.I.P.	FOUND IRON PIPE, SIZE INDICATED	RGE.	RANGE
F.N.D.	FOUND NAIL AND DISK	(D)	DEED
S.N.D.	SET NAIL AND DISK, L.B. No. 5408	(P)	PLAT
F.C.M.	FOUND CONCRETE MONUMENT	(M)	MEASURED
P.R.M.	PERMANENT REFERENCE MONUMENT	(C)	CALCULATED
P.C.P.	PERMANENT CONTROL POINT	CONC.	CONCRETE
P.I.	POINT OF INTERSECTION	COV.	COVERED
P.C.	POINT OF CURVE	ASPH.	ASPHALT
P.O.B.	POINT OF BEGINNING	PVMT.	PAVEMENT
R/W	RIGHT-OF-WAY	ELEV.	ELEVATION
TYP.	TYPICAL		
OHW	OVERHEAD WIRE		

FRANK & ELLIOTT
SURVEYORS • ENGINEERS • LAND PLANNERS
83266 OVERSEAS HIGHWAY, SUITE 500, ISLAMORADA, FLORIDA 33036
Phone (305) 664-0764 FAX (305) 664-0816
A DIVISION OF MEGAVISION BUSINESS CORPORATION

CERTIFIED FOR SPECIAL PURPOSE SURVEY

I HEREBY CERTIFY THIS SURVEY MEETS THE MINIMUM TECHNICAL STANDARDS AS SET FORTH BY THE FLORIDA BOARD OF PROFESSIONAL SURVEYORS AND MAPPERS IN CHAPTER 61G17-6 FLORIDA ADMINISTRATIVE CODE, PURSUANT TO SECTION 472.027, FLORIDA STATUTES.

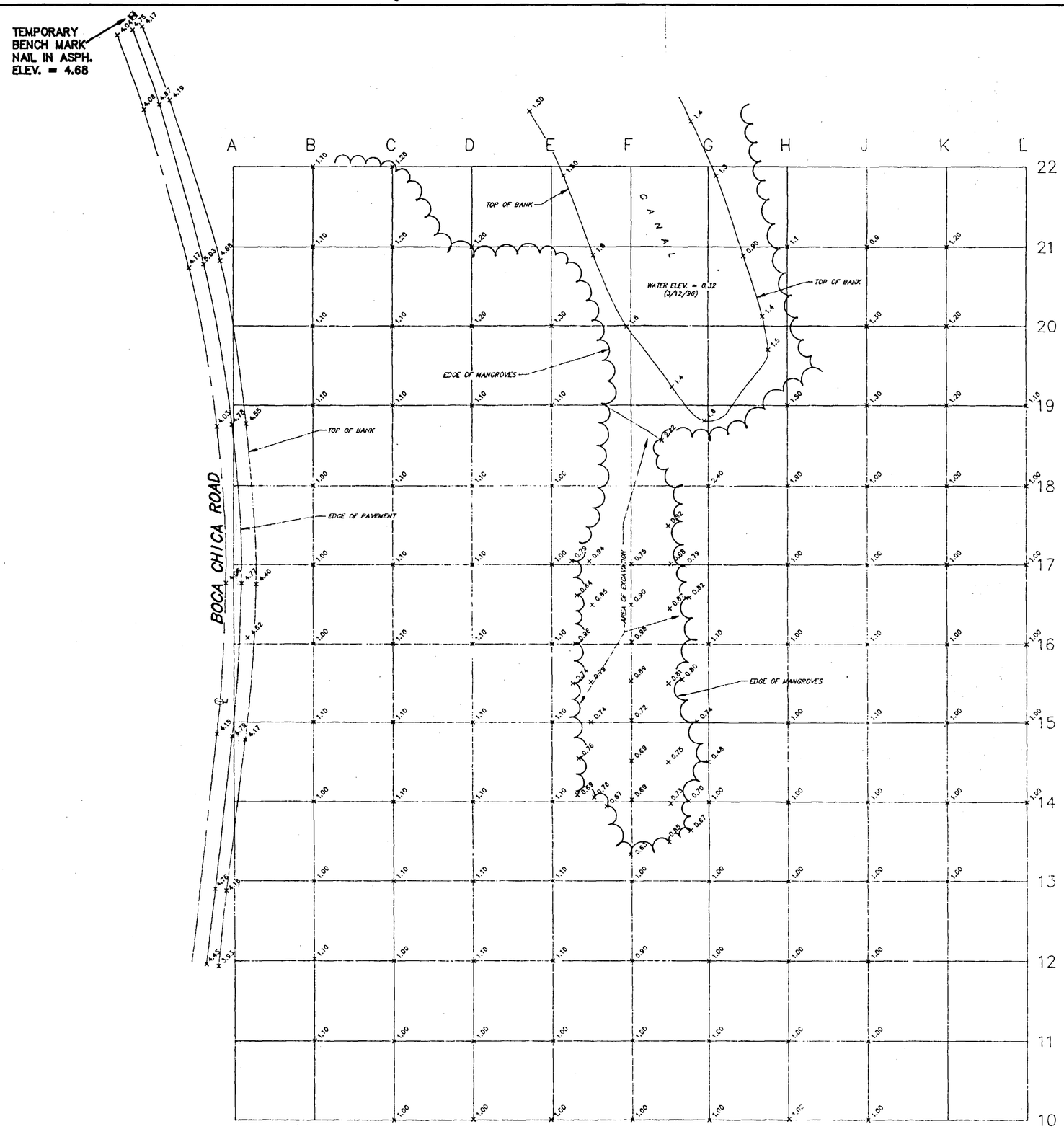
SCALE: 1"=50'	Lawrence P. Frank	DRAWN BY: G.N.B.
DATE: 07/12/95	LAWRENCE P. FRANK, P.L.S. # 4619	REVISED 09/07/95

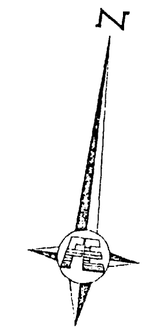
AOC SITE B – BIG COPPITT KEY
ABANDONED CIVILIAN – DISPOSAL AREA

CERTIFIED TO:

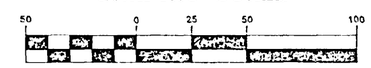
JOB NUMBER: 95142 AOC-B

0113D12Z





GRAPHIC SCALE



(IN FEET)
1 inch = 50 ft.

NOTES:
1. THE GRID AS SHOWN IS 50' BY 50'.
2. ELEVATIONS ARE FOR EXISTING GRADES.

$+^{1.00}$ INDICATES SPOT WHERE ELEVATION WAS TAKEN.

NAVY RAC PROJECT 22567-321

BECHTEL ID NUMBER: 120-0018-001-01			
SC/PO	SEQ	SHT	SUBMTL

FIGURE 7-3

ABBREVIATION LEGEND:

F.I.R	FOUND IRON ROD, SIZE INDICATED	SEC.	SECTION
S.I.R.	SET IRON ROD, 1/2" L.B. No. 5408	TWP.	TOWNSHIP
F.I.P.	FOUND IRON PIPE, SIZE INDICATED	RGE.	RANGE
F.N.D.	FOUND NAIL AND DISK	(D)	DEED
S.N.D.	SET NAIL AND DISK, L.B. No. 5408	(P)	PLAT
F.C.M.	FOUND CONCRETE MONUMENT	(M)	MEASURED
P.R.M.	PERMANENT REFERENCE MONUMENT	(C)	CALCULATED
P.C.P.	PERMANENT CONTROL POINT	CONC.	CONCRETE
P.I.	POINT OF INTERSECTION	COV.	COVERED
P.C.	POINT OF CURVE	ASPH.	ASPHALT
P.O.B.	POINT OF BEGINNING	PVMT.	PAVEMENT
R/W	RIGHT-OF-WAY	ELEV.	ELEVATION
TYP.	TYPICAL		
OHW	OVERHEAD WIRE		

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Phone (305) 664-0764 FAX (305) 664-0816
A DIVISION OF MERMAISON BUSINESS CORPORATION

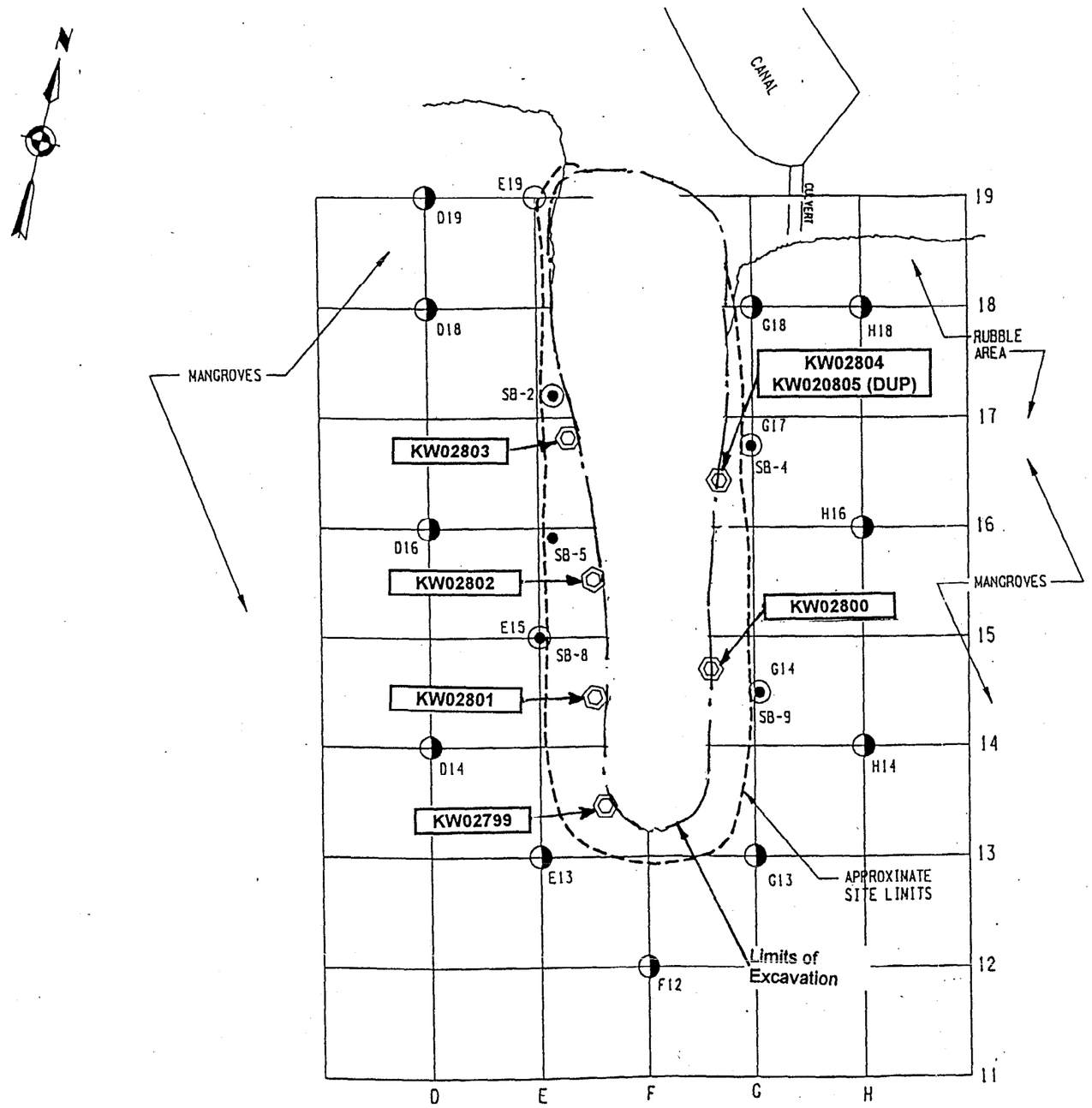
CERTIFIED FOR SPECIAL PURPOSE SURVEY

I HEREBY CERTIFY THIS SURVEY MEETS THE MINIMUM TECHNICAL STANDARDS AS SET FORTH BY THE FLORIDA BOARD OF PROFESSIONAL SURVEYORS AND MAPPERS IN CHAPTER 61G17-6 FLORIDA ADMINISTRATIVE CODE, PURSUANT TO SECTION 472.027, FLORIDA STATUTES.

SCALE: 1" = 50'	EDWARD C. ELLIOTT, P.L.S. # 3983	DRAWN BY: JVE
DATE: 4/22/96		REVISED

AOC SITE B – BIG COPPITT KEY
ABANDONED CIVILIAN – DISPOSAL AREA

CERTIFIED TO:	JOB NUMBER:
BECHTEL	95142.AOC-B



NOTES:

1. The excavation was extended to the edge of the mature mangroves. Debris that was past the edge was left in place.
2. The excavation was extended to caprock and backfilled with a mixture of topsoil and sand. The backfill elevation matched the adjacent wetland areas.
3. The adjacent mangroves will be allowed to revegetate the site.

LEGEND

GRID	50' X 50'
●	PREVIOUS SURFACE SAMPLE LOCATION (RFI/RI)
○	SOIL SAMPLING LOCATION
◉	SUBSURFACE SAMPLE AT A LOCATION PREVIOUSLY SAMPLED AT SURFACE
◑	SEDIMENT SAMPLING LOCATION
⬡ ← KW02800	CONFIRMATION SAMPLE ID

0 50 100
SCALE IN FEET

22567 321 TABLE.DGN
7/31/95

FIGURE 7-4
AOC-B BIG COPPITT KEY
ABANDONED CIVILIAN DISPOSAL AREA
AS BUILT

TABLE 7-3
AOC-B Sediment Confirmation Samples
Laboratory Analysis Results in ppm

PARAMETER	STANDARD[1] mg/kg	Sample ID Location, Depth(ft)						
		KW02799	KW02800	KW02801	KW02802	KW02803	KW02804	KW02805
ALUMINUM	NA	2770	4230	3920	2880	3340	3480	2990
ANTIMONY	NA	3.1	11.2	1.2	0.71	2.5	0.56	0.43
ARSENIC	7.24	4.8	22.9	6.6	7.6	10.1	2.3	2.6
BARIUM	NA	25.9	131	19.7	22.9	213	13.6	13.4
BERYLLIUM	NA	0.09	0.13	0.07	0.07	0.08	0.08	0.07
CADMIUM	0.68	0.74	8.8	1.5	3.6	3.3	0.82	1
CALCIUM	NA	260000	126000	182000	278000	195000	311000	287000
CHROMIUM	52.3	56.9	121	18.6	21.9	79.6	25.6	9.1
COBALT	NA	1.1	9.7	7.8	3.4	3.1	0.86	0.97
COPPER	18.7	40.5	420	415	49.2	107	22.2	29.4
IRON	NA	16800	116000	18900	50300	49400	6500	9310
LEAD	30.2	165	302	33.8	12.4	37.9	9.6	12.9
MAGNESIUM	NA	14300	10800	6970	12700	13300	16100	13900
MANGANESE	NA	65	388	69.7	129	168	46.8	45.4
MECURY	0.13	0.11	1.2	0.04	0.04	0.09	0.03	0.03
NICKEL	15.9	23.6	151	37.6	123	57.7	13.6	7.9
POTASSIUM	NA	1690	2260	1240	1360	1650	1300	1210
SELENIUM	NA	ND	ND	ND	1.7	ND	ND	ND
SILVER	0.73	ND	ND	ND	ND	ND	ND	ND
SODIUM	NA	29800	43300	21700	24900	29500	19300	18200
THALLIUM	NA	ND	0.33	0.24	ND	ND	0.21	ND
VANADIUM	NA	9.3	19.4	8.9	8.9	12.6	8.1	7.7
ZINC	124	258	3680	1140	2380	2280	210	241

[1]Sediment Criteria based on FDEP's "Approach to the Assessment of Sediment Quality in FLorida's Costal Waters"

ND - Not Detected

J - A "J" indicates that the value is estimated, the detected concentration is above the detection limit, but below the reporting limit

The Shaded boxes indicate detected concentrations above the standard.

ppm=parts per million

Attachment 7-1

Pre-Activity Checklist

CHECKLIST ITEMS FOR AOC-B

NO.	DESCRIPTION	YES	NO	N/A	Comments
1	Natural Resource Representive OK	X			
2	Excavation Permit in place	X			
3	Approved Work Plan/Criteria/Delineation of Excavation	X			
4	Original Survey Results	X			Tie to original grid
5	PWD Utility Survey Performed/Documented/Ok to proceed	X			Cut old phone line, per PWD
6	Southern Bell Telephone Survey/Documented/OK to proceed	X			
7	Profile Sampling Analytical Results	X			
8	Disposal facility letter of material acceptance	X			Chambers
9	Backfill Material Certification	X			
10	ROICC Notification Provided	X			
11	FDEP/COE Notification Provided	X			
12	Organic Substrate Material Approved	X			50/50 top soil mix
13	Wetlands Vegetation Photo-Documented Prior to Disturbance		X		Pending, Lt Hupp (PAO) to conduct
14	Silt Fences/Surface Flow Barriers Installation Scheduled	X			
15	Removal of Access Road Barriers Scheduled	X			
16	Overhead Utility Clearance at Site Access Point	X			Phone line will be cut by AES
17	Mature Mangrove Species Identified/Excavation Delineated	X			Observe during excavation
18	PWD Natural Resources Specialist Inspect Site Prior to Work	X			
19	Are any potential subsurface hazards identified and addressed	X			PWD cleared for excavation
20	Are any archaeological items present		X		None expected
21	Potential UXO identified and addressed	X			None expected
22	Backfill/Compaction requirements identified	X			Backfill to existing grade in wetlands
23	Compaction testing requirements identified/scheduled			X	
24	Field Screening/Confirmatory sampling scheduled			X	Solid waste
25	Loading observation by PWD Environmental scheduled			X	Per Patsy Watson
26	OK to backfill based on field screening results			X	Backfill based on field observation
27	Absorbent Material for removing free product on-site	X			
28	Drums for used absorbent material on-site	X			
29	Disposal of Drums w/ absorbent material scheduled			X	As required
30	Truck routing and loading location discussed with ROICC	X			AES to provide routing/staging plan

Attachment 7-2

Site Closeout Report

Site Closeout Report

AOC-B

RECEIVED
JUN 1 8 1996
BECHTEL 22567

On February 5, 1996 Associated Environmental Services Inc. mobilized equipment and crew to AOC-B. Work consisted of site setup and security, excavation, loading, transportation, and disposal of non\contaminated soil, personnel and equipment decontamination, backfill and site restoration.

Personnel Time on Site

Site Superintendent:	64 hrs
Forman:	hrs
Health & Safety:	34 hrs
Operator:	70 hrs
Labor:	60 hrs

Equipment Time on Site

Deere 690 Trackhoe:	32 hrs
Deere 624 Endloader:	64 hrs
Dozier:	16 hrs

Soil Loading, Transportation and Disposal

Final Disposition Method:	Class 1 Landfill
Volume Loaded:	1251 Tons
Transported:	1251 Tons
Disposal:	1251 Tons

Site Restoration

General Fill:	734 Tons

22567-321-0415-0033-006-01

Material Sampling and Analysis

Three samples were collected on August 4, 1995. A profile analysis was performed for disposal approval, see attachments for results.

Lower Tier Subcontractors

Transporter:	Soil Tech Distributor, Inc. P.O. Box 110926 Hialeah, FL 33011 (305) 828-2362
Disposal Facility:	Chamber Okeechobee Landfill 10800 NE 126th Ave Okeechobee, FL 32972 (813) 357-0772
Laboratory:	Pace Inc. Environmental Laboratories 5460 Beaumont Center Blvd. Tampa, FL 33634 (813) 884-8268 Florida DEP CompQAP #870529G Lab Certification Florida Environmental:HRS #E84003 Florida SDWA:HRS #84125
General Fill:	Sunshine Rock, Inc. Plant Address: NW 129th Ave. & 202nd St. Miami, FL (305) 821-8660

22567-321-0415-0033-006-01

Attachment 7-3

Certification of Substantial Completion

~~000834~~

CERTIFICATE OF SUBSTANTIAL COMPLETION

011203

Date: 22 April 1996

Site : AOC-B

Description of Site : Civilian Disposal Area

Contractor : Associated Environmental Services

Contract No. : 22567-321-SC- 0415

Punch List Completion Date : N/A

This is to certifiy the work described above has been substantially completed in accordance with the contract and associated documents. The site designated above has been inspected by representatives of the customer, contractor, and Bechtel, and is compete with the exception of the attached punch list (if applicable) which the contractor agrees to complete by the date designated.

The warranty period commences on the date the contractor completes the remedial work as described in the punch list or from the date of execution of the Certificate of Substantial Completion, whichever is later.

INSPECTION CERTIFICATE

CONTRACTOR: _____ DATE: 5-7-96

ACCEPTED BY

BECHTEL: _____ DATE: 10 May 96

CUSTOMER REPRESENTATIVE: _____ DATE: 21 MAY 96

PUNCHLIST: 1) SUBMIT COMPLETION SURVEY TOPO
2) PREPARE NOTICE OF COMPLETION PER WETLANDS PERMIT

REC'D 03 JUN 96

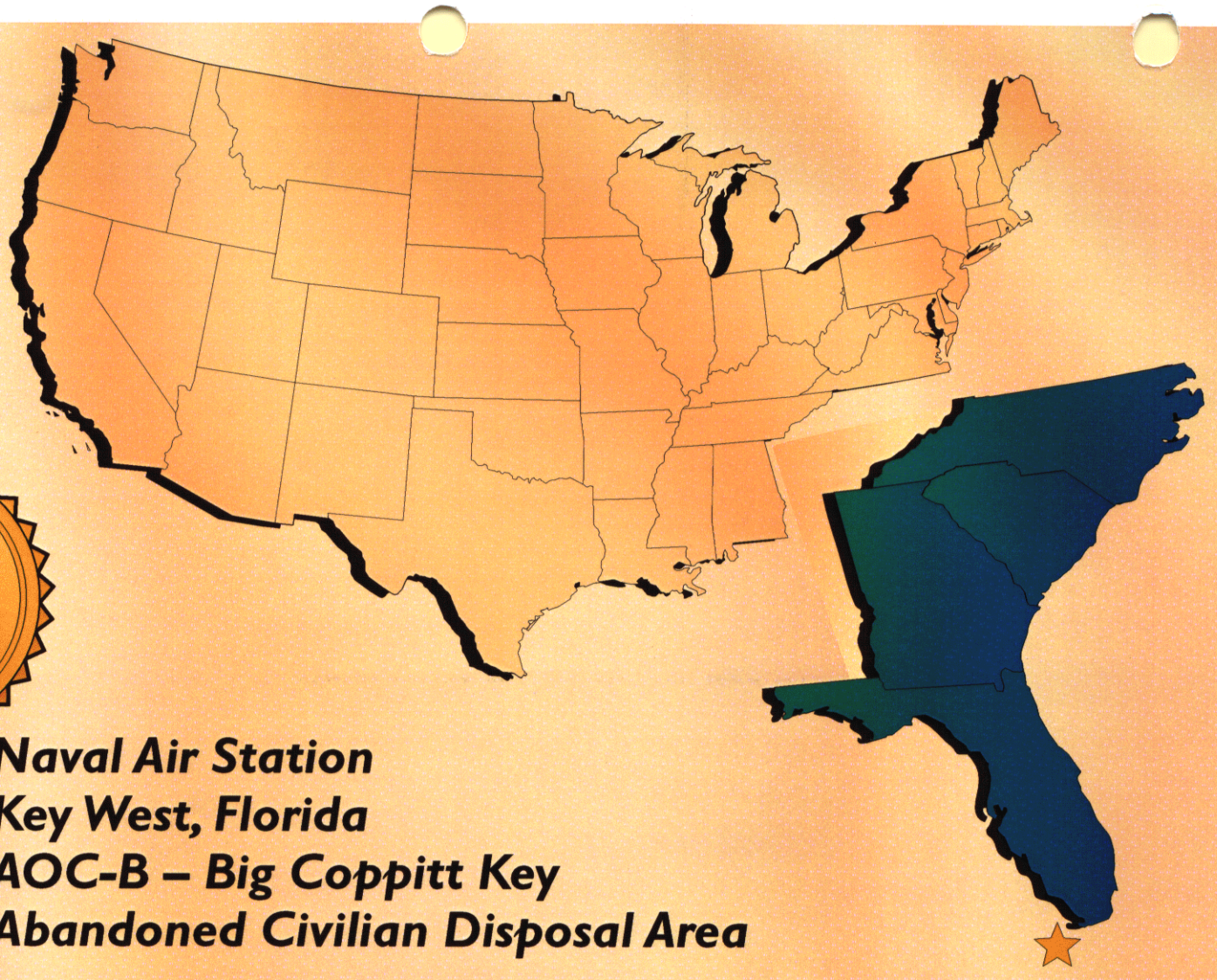
Attachment 7-4

Completion Poster

Southern Division
Naval Facilities Engineering Command

Navy RAC Completed Sites

21st Completed Site



Naval Air Station Key West, Florida AOC-B – Big Coppitt Key Abandoned Civilian Disposal Area

AOC-B is a two-acre wetland acquired by the Navy to prevent development adjacent to the NAS airfield. The site had been used for many years as a junkyard for automobiles and appliances which had rusted down to shards. Bechtel excavated the debris to the edge of mature mangroves and down to underlying caprock. Debris was hauled to a landfill and the site was backfilled with organic topsoil graded to match adjacent wetland. Mangroves can now revegetate the site naturally.

Typical debris at the site before the start of remedial activites.

Trucks awaiting loading on the access road next to canal. Canal was lined with a straw bale sediment barrier. Orange fence prevented truck drivers from encroaching on an environmentally sensitive area.

AOC-B after excavation and before backfilling operations began.

Backfilling operations – backfill was added to the site until final grade matched adjacent wetland elevations.

Stockpiled debris awaiting loading and disposal.

Site at high tide after backfilling is complete. Mangroves are expected to revegetate the site naturally.

BECHTEL

Z10.5 9548.1

0113D15Y

8 SWMU-1: BOCA CHICA OPEN DISPOSAL AREA

8.1 SITE DESCRIPTION

The Boca Chica Open Disposal Area is located in the southeastern part of Boca Chica, between Perimeter Road and Geiger Creek. The site is a relatively flat wetland area with brush and mangroves around the perimeter. Figure 8-1 is a site map.

The site was operated 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 2,600 tons of waste were disposed and burned each year at this site. This activity contaminated the groundwater and soils with organic and inorganic chemicals. Debris was visible on site before start of the IRA.

8.2 CLEANUP OBJECTIVE

8.2.1 Contaminant of Concern

The contaminant of concern was defined as lead. [2]

8.2.2 Cleanup Type & Criteria

The IRA objective was contaminant source removal of lead contaminated soil and sediment to prevent further migration of waste into other media. The RFI/RI report led Bechtel and the Navy to anticipate that most of the soil and sediment at SWMU-1 would be classified as RCRA HW; however, Bechtel's delineation sampling (see paragraph 8.3.2) found no indications of HW. [2]

The Interim Remediation Goal for SWMU-1 was to remove and dispose of the contaminated soil and sediment. Cleanup guidelines depended on whether a particular area contained upland soil or wetland sediment. [83]

Upland. The cleanup guideline for lead contaminated soil was set at 400 ppm during a site meeting with regulators and was based on a CERCLA Guidance Document dated July 1994. [32]

Wetland. The cleanup guideline for lead contaminated sediment was 30.2 ppm. This cleanup goal was based on the TEL values from Table 4 of FDEP's "Approach to the Assessment of Sediment Quality in Florida Coastal Waters," dated November 1994. [38]

8.3 DELINEATION SAMPLING & RESULTS

8.3.1 Sampling

Delineation sampling established a basis for excavation limits. Samples were taken as follows:

- 86 soil and sediment samples were collected on a 50 by 50 foot grid and analyzed for lead.
- Two composite samples were collected from existing soil berms and analyzed for lead.
- Seven background sediment samples were collected and analyzed for VOCs, SVOCs, TAL[a] metals, cyanide, tin, pesticides, and PCBs.
- Five background surface water samples were collected and analyzed for VOCs, SVOCs, TAL metals, cyanide, tin, pesticides, and PCBs.

[a] TAL: Target Analyte List

8.3.2 Results

Data from delineation sampling and the RFI/RI report indicated that contaminated soil and sediment extended down to caprock. Lead contaminated sediment extended to the western edge of the site into an area populated with mature mangroves. [2, 19]

To determine whether RCRA HW was present, the three samples containing the highest level of lead were analyzed for metals using EPA's TCLP analysis. Although none of these failed, one sample taken for the earlier RFI/RI report had failed the TCLP test for lead. As a conservative measure, the soil and sediment in the area of the failed sample (grid J20) were considered to be RCRA HW (waste code D008) and were excavated, transported and disposed of as such. [18, 79, 83]

The proposed excavation boundaries, based on delineation sampling results, were coordinated with EPA and FDEP during discussions from October 24-30, 1995. These boundaries, along with results of testing are shown on Figure 8-1. Detailed findings are contained in Bechtel's delineation sampling report of August 1995. [19, 79]

Based on the delineation sampling results the estimated quantity of soil to be removed was increased from the budgeted 2500 cy to 5740 cy. The actual quantity of soil removed was 5916 cy.

8.4 CLEANUP TECHNOLOGY

8.4.1 Technology Selection

Excavation and offsite disposal was selected as the most cost effective option for this site. The higher quantity estimated as a result of the delineation sampling did not change this selection. Because the amount of HW was small, the per yard cost of disposal was substantially lower than originally estimated.

8.4.2 Workplan

The scope of work consisted of the following elements:

- Pre-construction survey to determine elevations necessary for wetland restoration.
- Install silt control barriers to prevent the spread of contamination during excavation.
- Excavate contaminated soils and sediments.
- Offsite disposal of excavated material as hazardous or non-hazardous waste as appropriate.
- Perform confirmation sampling to confirm that IRGs have been met. Provide results to CLEAN contractor for risk assessment.
- Backfill with clean fill to surveyed elevations.
- Revegetation through natural recolonization.

As noted in Section 1, the approved RWP did not address SWMU-1. PPR-321-007 provided the detailed scope of work. So that the PPR would be consistent with the wetlands permit as well as with FDEP/EPA cleanup guidance, the PPR was not finalized until after the permit was issued. [83]

8.5 REGULATORY AGENCY APPROVAL

8.5.1 EPA & FDEP

The following agreements were made during the planning process:

- Conferees at the August 1994 Regulatory meeting agreed to search the site for hot spots and remediate those by excavation and disposal to a RCRA landfill. [23, 32]

- Conferees at the NRT meeting in April 1995, agreed that the site is a wetland, that permits would be required and that natural recolonization and succession would be the means of revegetation after the excavation was complete. [37]
- A telecon was held with the Navy and FDEP on 24 October 1995, to discuss the delineation sampling results and proposed limits of excavation at SWMU-1. The proposed limits (approximately to row 16 at the west side of stockpile #3) were approved by FDEP. It was understood that this would leave some lead contamination to be evaluated by the risk assessment. EPA did not participate, but received a copy of the discussion minutes. [79]
- BEI confirmed that no modifications to NAS Key West's RCRA permit were required to implement the removal action. [84]
- BEI called the EPA Regional Coordinator in October 1995 to comply with the CERCLA Off-Site Notification Rule for the waste stream being removed from SWMU-1. [85]

8.5.2 Natural Resources Permits and Protection of Natural Resources

SWMU-1 encompasses a wetland and required permits from the State and the Army Corps of Engineers.

- FDEP issued permit Number 442693985 on December 18, 1995. [50]
- The Army Corps of Engineers determined that the work could be performed under the nationwide permit Number 38 and that an individual permit would not be required. [55]

FDEP permitting authorities had three primary concerns:

- Preventing silt from spreading contamination beyond the boundaries of the excavation.
- Protection of mature mangroves surrounding the site.
- Restoring site elevations to support wetland development.

These concerns were addressed as follows:

- A straw bale barrier backed by an impermeable plastic barrier was used for silt control
- The Navy and regulators decided not to extend the IRA into the mature mangroves because of concern that the removal might do more harm than good. This area will be included in the risk assessment to determine whether additional removal should be accomplished. [79]
- Backfill elevations were surveyed to insure they were within the range for wetlands.

The site is adjacent to known Lower Keys Marsh Rabbit habitat and parts of the site may serve as a corridor for rabbits. The NAS Key West Natural Resources Manager provided guidance to avoid rabbits during construction.

8.6 EXECUTION OF WORK

8.6.1 Mobilization

A civil survey of the site prior to the start of work established elevations of the surrounding wetlands. These elevations were later used to establish final elevations upon completion of the work. As requested by the NTR, the survey also established locations of the monitoring wells as a permanent basis for the sampling grids. The survey is shown as Figure 8-2.

An excavator and front end loader were used for excavation; a bulldozer was used to spread backfill.

8.6.2 Chronology

- 06 Feb 96 — Conducted civil survey.
- 07 Feb 96 — Conducted preliminary phase inspection with NTR. Attachment 8-1.
- 12 Feb 96 — Commenced clearing of vegetation.

- 15 Feb 96 Commenced installation of silt control barrier.
- 16 Feb 96 Commenced excavation of contaminated soil.
- 28 Feb 96 Found and sampled unknown tar-like material.
- 29 Feb 96 Commenced transportation of contaminated soil.
- 01 Mar 96 Completed excavation.
- 02 Mar 96 Commenced placing clean fill to surveyed elevations.
- 28 Mar 96 Collected confirmation samples from horizontal excavation limits. Completed transportation of contaminated soil.
- 11 Apr 96 Completed spreading of backfill.
- 18 Apr 96 Completed final civil survey of site.
- 22 Apr 96 NTR issued Certificate of Substantial Completion.

8.6.3 Work Plan vs. Actual Work

8.6.3.1 Deviations from Planning

There were no significant deviations from the work plan as provided in PPR-321-007.

8.6.3.2 Delays & Problems Encountered; Unexpected Findings/Contamination

Encountered black tar-like substance that exhibited strong hydrocarbon odor. After receiving concurrence from the NTR and SOUTHDIV, the material was sampled and analyzed. Results indicated that the material was non-hazardous. Analytical results were sent to the landfill receiving the lead contaminated soil and the landfill accepted this waste. Analytical results are contained in Volume II.

Two incidents delayed work. 1) Loading and transportation activities were delayed on 1 March while NAS Security responded to reports of an armed individual near the work site. 2) Smoke from brush fires in the Everglades obscured the highway and delayed transportation of soil to the landfill. Productivity was impacted for two to three weeks as a result.

8.6.4 Summary of Materials Handled

Table 1-1 contains a summary of the materials removed from the site and their disposition.

8.6.5 Site Restoration

To promote natural recolonization by the abundant, propagule producing mangroves adjacent to the site, the excavation was backfilled with gravel, overlain with six inches of organic substrate material, and graded to elevations within the required range for wetlands revegetation. BEI surveyed the site and confirmed that final elevations are correct. This survey is shown as Figure 8-3.

8.7 CONFIRMATION SAMPLING AND COMPLETION DRAWINGS

Confirmatory samples were collected around the edge of the excavation at approximately 100 foot intervals. The locations of these samples are shown on Figure 8-4. This figure also indicates the actual limits of the excavation.

Sampling results indicated that all "hot spots" were removed. Some areas, however, exceeded the sediment criteria for lead and will be evaluated for further action by the CLEAN contractor. A copy of the complete analytical results is contained in Volume II.

8.8 APPROVAL OF COMPLETED IRA

8.8.1 Regulatory Agency

The notification form for transfer of the site from the construction phase to operations phase was prepared by BEI and sent to NAS Key West in September, 1996. NAS Key West forwarded this form to FDEP. [62, 64]

As required by the wetland permit, BEI sent the Environmental Resource As-built Certification with excavation and backfill quantities, and copies of the as-built survey and confirmation sampling results to FDEP in May 1995 and again in September. [61, 63]

An FDEP representative from the Marathon office inspected the the site in late July 1996 and made the following comments: [62]

- Remove plastic turbidity barriers. This was done August 28.
- Regrade high spots to below the water level. BEI pointed out that the as-built survey found no elevations above the surrounding wetlands. FDEP promised to review the as-builts and determine whether the final grade is acceptable.

The FDEP Remedial Project Manager requested that the straw bales be removed to promote propagation of mangroves.

8.8.2 Navy / NTR Approval

Copies of the Site Closeout Report and the signed Certificate of Substantial Completion are included as Attachments 8-2 and 8-3.

8.9 PHOTOGRAPHS

The completion poster, Attachment 8-4, provides a photographic record for this site.

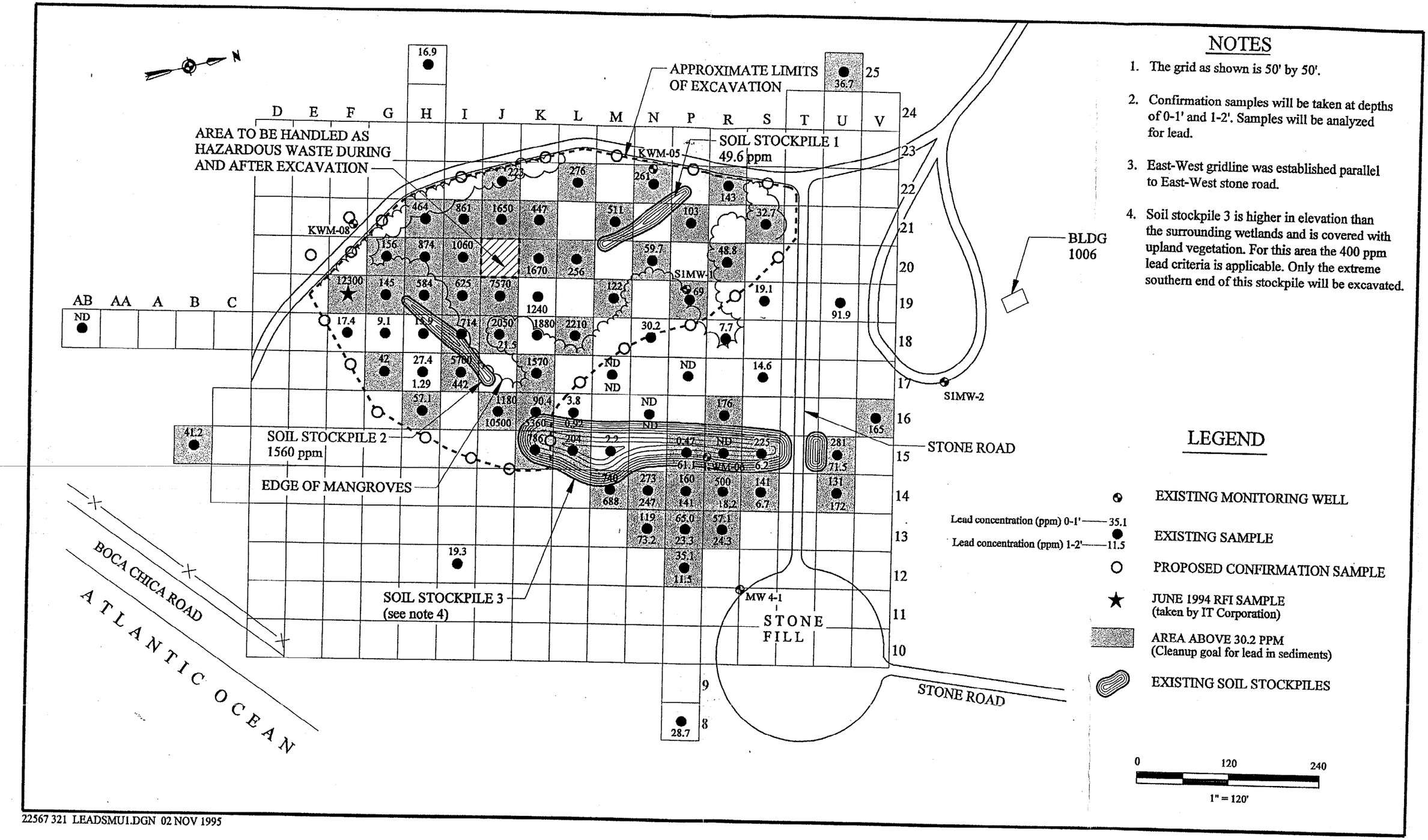
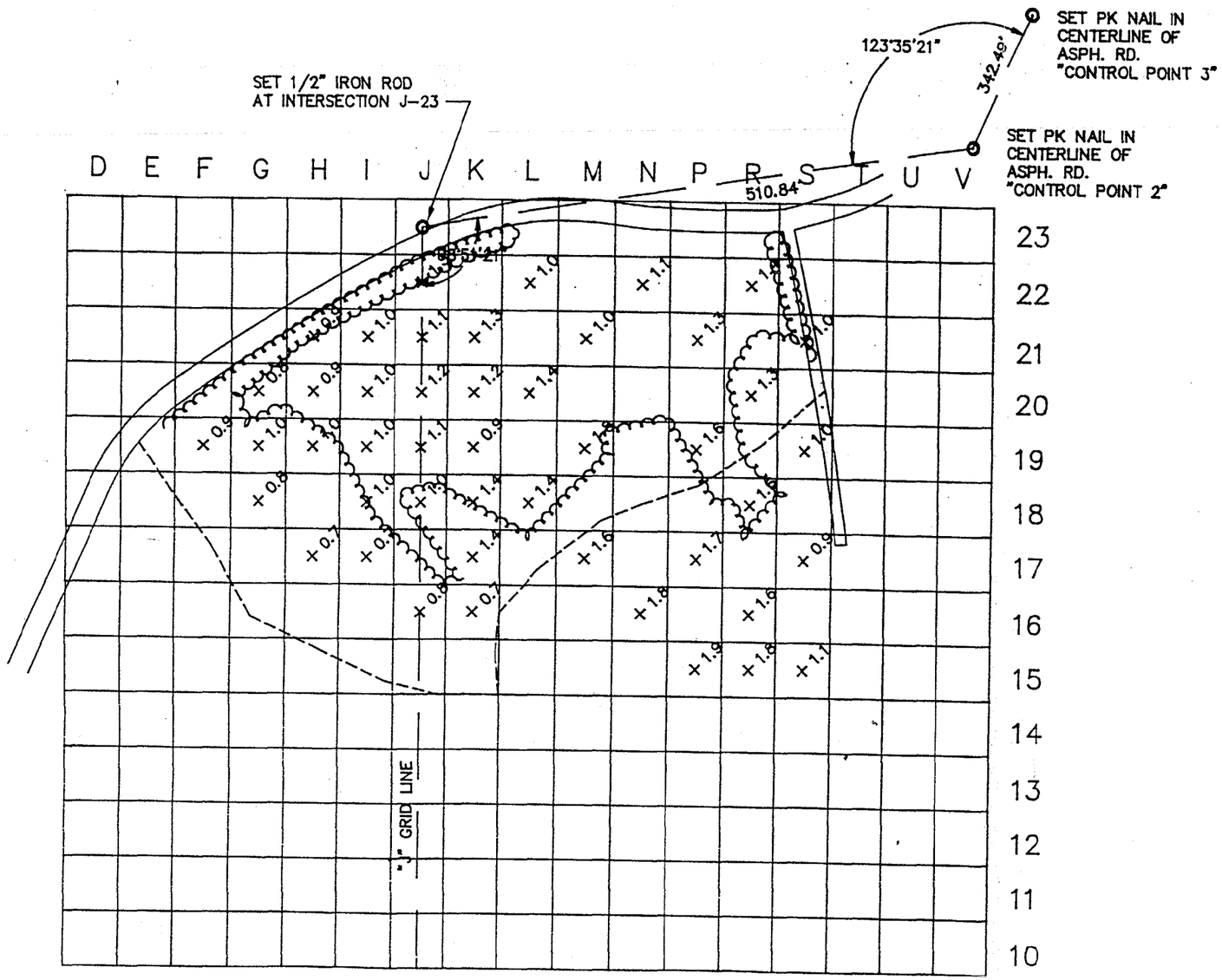


FIGURE 8-1
SWMU NO.1 - BOCA CHICA OPEN DISPOSAL AREA



BECHTEL ENVIRONMENTAL, INC.	JOB NO. 22567

SUPPLIER DOCUMENT STATUS STAMP

1 ☑ WORK MAY PROCEED.
2 ☐ REVISE AND RESUBMIT. WORK MAY PROCEED SUBJECT TO RESOLUTION OF INDICATED COMMENTS.
3 ☐ REVISE AND RESUBMIT. WORK MAY NOT PROCEED.
4 ☐ REVIEW NOT REQUIRED. WORK MAY PROCEED.

PERMISSION TO PROCEED DOES NOT CONSTITUTE ACCEPTANCE OR APPROVAL OF DESIGN DETAILS, CALCULATIONS, ANALYSES, TEST METHODS, OR MATERIAL DEVELOPED OR SELECTED BY THE SUPPLIER AND DOES NOT RELIEVE SUPPLIER FROM FULL COMPLIANCE WITH CONTRACTUAL OBLIGATIONS.

REVIEWED

SSRS ITEM # 546 ☐ PARTIAL ☐ COMPLETE
REVIEWED BY [signature] DATE 2-12-96
S:\FORMS\STATUS

N

GRAPHIC SCALE

120 0 60 120 240 480

(IN FEET)
1 inch = 120 ft.

×1.1 DENOTES EXISTING SPOT ELEVATION

-------- DENOTES NEW LIMITS OF EXCAVATION

DENOTES EXISTING MANGROVE LINE

THE GRID SHOWN IS 50' X 50'

FIGURE 8-2

22567-321-0120-0012-004-02

FRANK & ELLIOTT
SURVEYORS • ENGINEERS • LAND PLANNERS
[illegible]

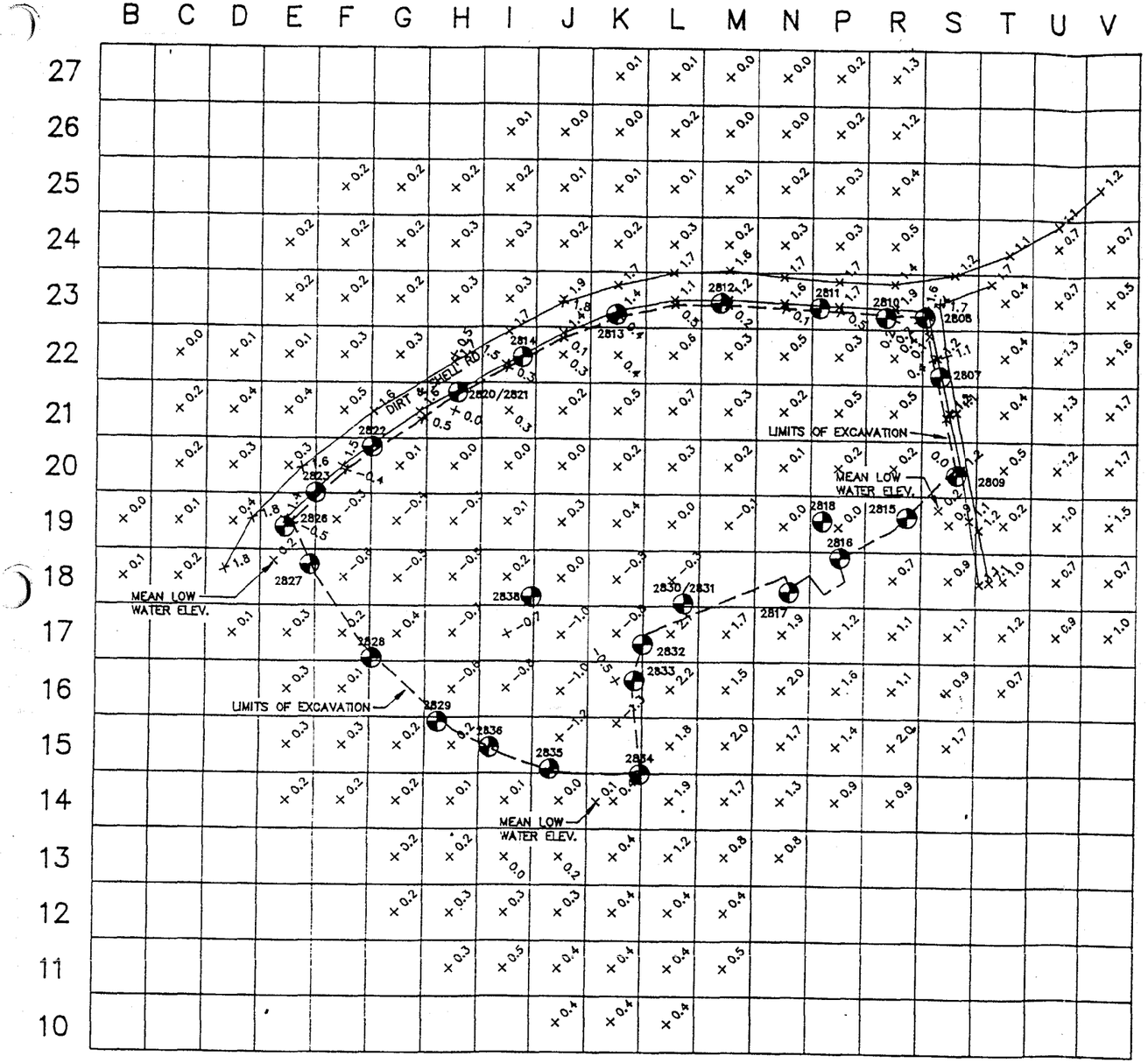
CERTIFIED FOR SPECIFIC PURPOSE SURVEY
I HEREBY CERTIFY THIS SURVEY MEETS THE MINIMUM TECHNICAL STANDARDS AS SET FORTH BY THE FLORIDA BOARD OF PROFESSIONAL SURVEYORS AND MAPPERS IN CHAPTER 61G17-6 FLORIDA ADMINISTRATIVE CODE, PURSUANT TO SECTION 472.027, FLORIDA STATUTES.

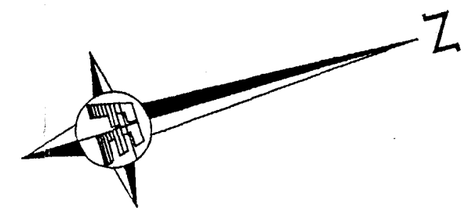
SCALE 1' = 120'	EDWARD C. ELLIOTT, P.L.S. # 3963	DRAWN BY ECE
DATE 7/12/95		REVISED 2/7/96

SWMU NO. 1 – BOCA CHICA OPEN DISPOSAL AREA

CERTIFIED TO:

JOB NUMBER: 95142.SWMU1





GRAPHIC SCALE

(IN FEET)
1 inch = 120 ft.

NOTES

+1.0 DENOTES EXISTING SPOT ELEVATION

2850 DENOTES SAMPLING POINT

THE GRID SHOWN IS 50'x 50'

FIGURE 8-3

FINAL AS BUILT SURVEY 4/17/96

NAVY RAC PROJECT 22567-321

BECHTEL ID NUMBER:
120-0018-002-01

SC/PO SEQ SHT SUBMTL

FRANK & ELLIOTT
SURVEYORS • ENGINEERS • LAND PLANNERS
83286 OVERSEAS HIGHWAY, SUITE 200, ISLAMORADA, FLORIDA 33036
Phone (305) 664-0764 FAX (305) 664-0816

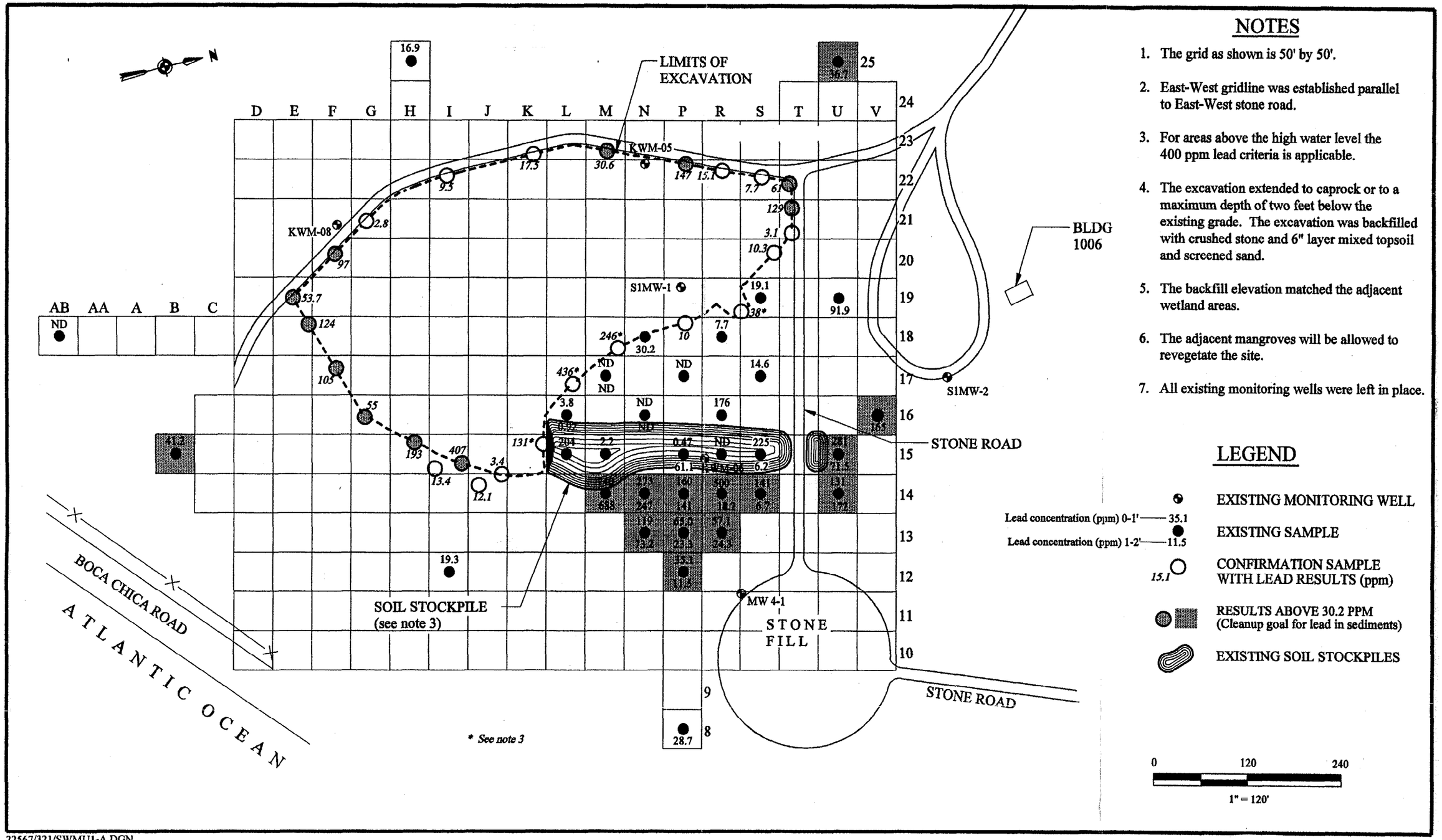
CERTIFIED FOR SPECIFIC PURPOSE SURVEY

I HEREBY CERTIFY THIS SURVEY MEETS THE MINIMUM TECHNICAL STANDARDS AS SET FORTH BY THE FLORIDA BOARD OF PROFESSIONAL SURVEYORS AND MAPPERS IN CHAPTER 61G17-6 FLORIDA ADMINISTRATIVE CODE, PURSUANT TO SECTION 472.027, FLORIDA STATUTES.

SCALE 1' = 120'	EDWARD C. ELLIOTT, P.L.S. # 3983	DRAWN BY ECE
DATE 7/12/95		REVISED 2/7/96

SWMU NO. 1 — BOCA CHICA OPEN DISPOSAL AREA

CERTIFIED TO: BECHTEL	JOB NUMBER: 95142.SWMU1

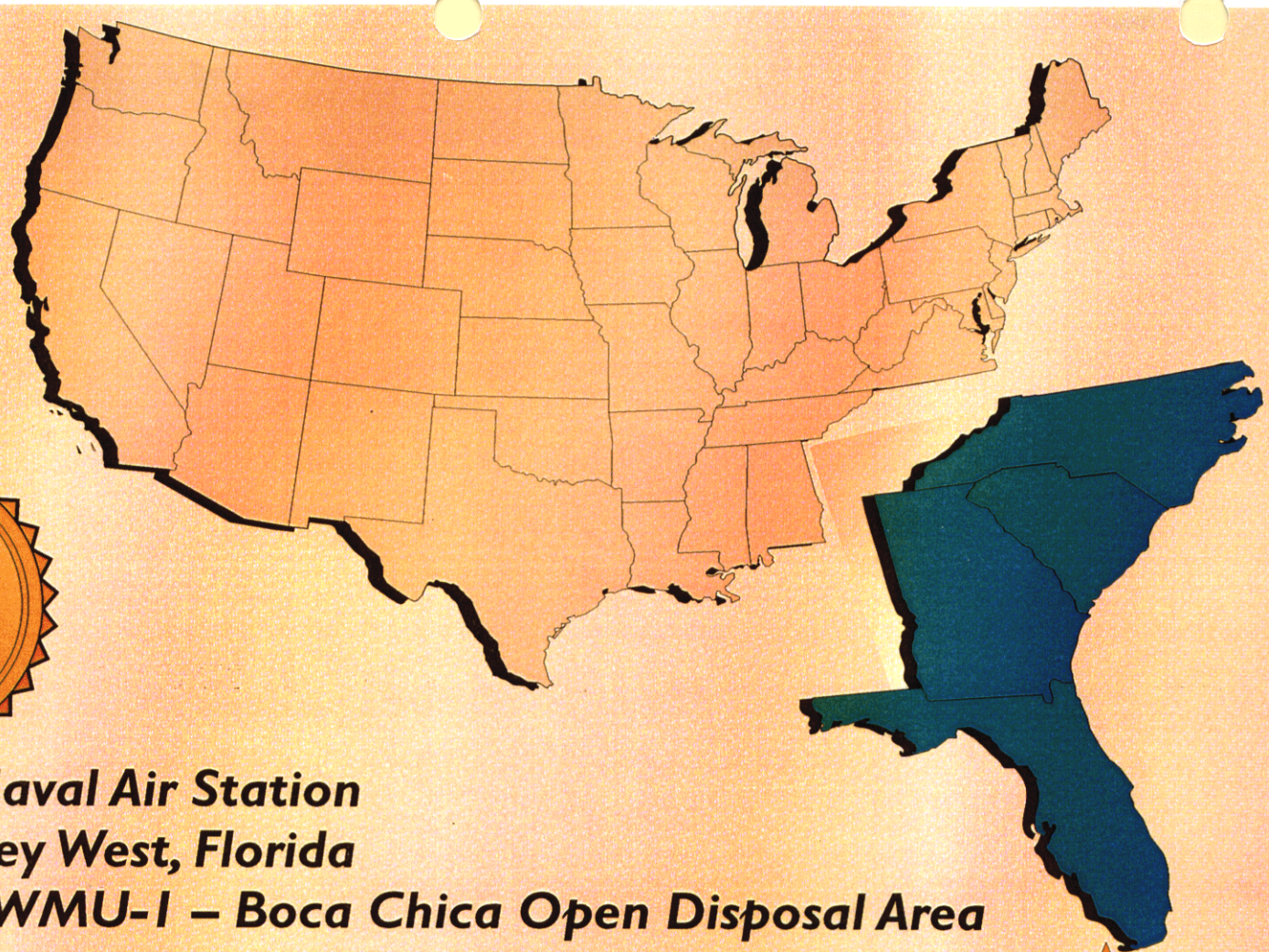


22567/321/SWMU1-A.DGN

FIGURE 8-4
SWMU NO.1 - BOCA CHICA OPEN DISPOSAL AREA AS-BUILTS

Southern Division
Naval Facilities Engineering Command

Navy RAC Completed Sites



22nd Completed Site

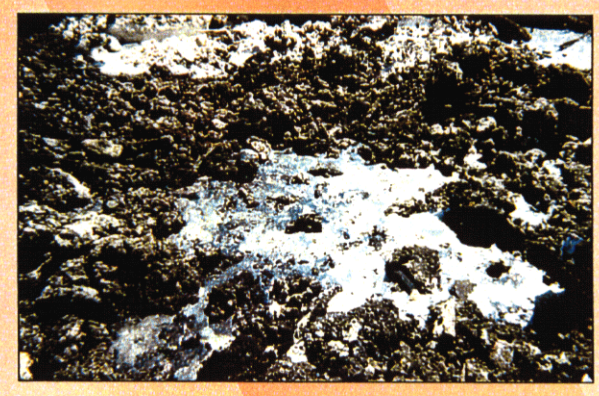
Naval Air Station
Key West, Florida
SWMU-1 – Boca Chica Open Disposal Area

The 3.5-acre SWMU-1 is a former open disposal and burn site contaminated primarily by lead in the soil. Bechtel removed and disposed of soil and debris down to underlying caprock and replaced it with organic topsoil graded to match adjacent wetlands. Because most of the soil was not hazardous, Bechtel segregated hazardous from nonhazardous material to reduce transportation and disposal costs. Confirmation sampling indicates site remediation objectives were achieved.

Debris amid wetlands before the start of remedial activities

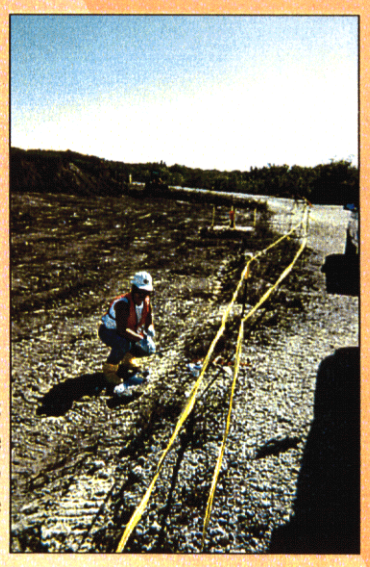
SWMU-1 site after clearing and grubbing and before excavation. The sediment barrier was used to prevent the spread of contamination.

Excavation and stockpiling of contaminated soils.



An unexpected tar-like substance was discovered in the excavation. It was left in place until laboratory sample results showed that the substance was not a hazardous waste.

Aerial photo of the site showing surrounding wetland and sediment barrier was taken from the Met Life Blimp.



Confirmation samples collected at the edge of the excavation were used to assess whether the removal was successful.

The site after backfilling activities are completed. Nearby mangroves are expected to revegetate the site naturally.

BECHTEL

Z10.5 9536.2

Attachment 8-1

Pre-Activity Site Checklist

CHECKLIST ITEMS FOR SWMU-1

NO.	DESCRIPTION	YES	NO	N/A	Comments
1	Natural Resource Representative OK		X		Arnim Schuetz to inspect site prior to excavation
2	Excavation Permit in place	X			
3	Approved Work Plan/Criteria/Delineation of Excavation	X			E-Mail approval from Southdiv. BEI to delineate soil piles.
4	Site Surveyed	X			
5	PWD Utility Survey Performed/Documented/Ok to proceed	X			
6	Southern Bell Telephone Survey/Documented/OK to proceed	X			
7	Profile Sampling Analytical Results (non-hazardous)	X			
8	Profile Sampling Analytical Results (Hazardous)	X			
9	Disposal facility letter of material acceptance (Non-Hazardous)		X		Chambers. PWD to approve profile. AES has waste number.
10	Disposal facility letter of material acceptance (Hazardous)	X			EQ, Detroit, MI
11	Backfill Material Certification	X			
12	ROICC Notification Provided	X			
13	PWD Manifesting Support Scheduled	X			Tentatively scheduled for 22 Feb.
14	FDEP/COE Notification Provided	X			
15	Organic Substrate Material Approved	X			50/50 top soil mix
16	Wetlands Vegetation Photo-Documented Prior to Disturbance				Pending, Lt. Hupp (PAO) to conduct 13 Feb
17	Silt Fences/Surface Flow Barriers Installation Scheduled	X			Hay bales arrive on-site 10 Feb
18	PWD Natural Resources Specialist Inspect Site Prior to Work		X		See #1
19	Are any potential subsurface hazards identified and addressed	X			PWD cleared for excavation
20	Are any archaeological items present			X	None expected
21	Potential UXO identified and addressed			X	None expected
22	Backfill/Compaction requirements identified	X			Backfill to existing grade in wetlands/minimum 6 inches
23	Compaction testing requirements identified/scheduled			X	
24	Confirmatory sampling scheduled	X			
25	Loading observation by PWD Environmental scheduled	X			See #13
26	OK to backfill after confirmation sampling?	X			Pending receipt of results.
27	Truck routing and staging area discussed with ROICC	X			AES to provide routing/staging plan
28	Truck access through Old Boca Chica Rd. Gate?				NTR to determine if available for use.
29	PWD remove drill cutting drums left on site by Brown & Root	X			NTR to request.
30	Truck weight restrictions on any bridges, Old Boca Chica Road?		X		BEI inpected route.

Attachment 8-2

Site Closeout Report

Site Closeout Report

SWMU-1

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JUN 1 8 1996
BECHTEL 22567

On February 9, 1996 Associated Environmental Services Inc. mobilized equipment and crew to Solid Waste Management Unit (SWMU) 1. Work consisted of site setup and security, installation of sediment barriers, excavation, loading, transportation, and disposal of contaminated soil, personnel and equipment decontamination, backfill and site restoration.

Personnel Time on Site

Site Superintendent:	280 hrs
Forman:	hrs
Health & Safety:	320 hrs
Operator:	600 hrs
Labor:	640 hrs

Equipment Time on Site

Deere 690 Trackhoe:	208 hrs
Deere 624 Endloader:	272 hrs
Dozier:	160 hrs

Soil Loading, Transportation and Disposal

Final Disposition Method:	Class 1 Landfill
Volume Loaded:	7838 Tons
Transported:	7838 Tons
Disposal:	7838 Tons

Final Disposition Method:	Chemical Stabilization
Volume Loaded:	71 Tons
Transported:	71 Tons
Disposal:	71 Tons

22567-321-0415-0033-008-01

Site Restoration

General Fill: 5797 Tons

Material Sampling and Analysis

Four samples were collected on August 4, 1995. A profile analysis was performed for disposal approval, see attachments for results.

Lower Tier Subcontractors

Transporters:

Soil Tech Distributor, Inc.
P.O. Box 110926
Hialeah, FL 33011
(305) 828-2362

Robbie D. Wood Trucking
P.O. Box 125
Dolomite, AL 35061
(205) 744-8440
EPA ID# ALD067138891

Disposal Facilitys:

Chamber Okeechobee Landfill
10800 NE 126th Ave
Okeechobee, FL 32972
(813) 357-0772

Wayne Disposal, Inc.
49350 North I-94, Service Drive
Belleville, MI 48111
(313) 699-6287
EPA ID# MID048090633

22567-321-0415-0033-008-01

Laboratory:	Pace Inc. Environmental Laboratories 5460 Beaumont Center Blvd. Tampa, FL 33634 (813) 884-8268 Florida DEP CompQAP #870529G Lab Certification Florida Environmental:HRS #E84003 Florida SDWA:HRS #84125
General Fill:	Sunshine Rock, Inc. Plant Address: NW 129th Ave. & 202nd St. Miami, FL (305) 821-8660
	Rinker Materials Corporation Plant Address: 13292 NW 118th Ave Miami, FL 33012 (305) 558-5830

22567-321-0415-0033-008-01

Attachment 8-3

Certification of Substantial Completion

011203

~~009835~~

CERTIFICATE OF SUBSTANTIAL COMPLETION

Date: 22 April 1996

Site : SWMU-1

Description of Site : Former Open Disposal Area

Contractor : Associated Environmental Services

Contract No. : 22567-321-SC- 0415

Punch List Completion Date : N/A

This is to certifiy the work described above has been substantially completed in accordance with the contract and associated documents. The site designated above has been inspected by representatives of the customer, contractor, and Bechtel, and is compete with the exception of the attached punch list (if applicable) which the contractor agrees to complete by the date designated.

The warranty period commences on the date the contractor completes the remedial work as described in the punch list or from the date of execution of the Certificate of Substantial Completion, whichever is later.

INSPECTION CERTIFICATE

CONTRACTOR: _____ DATE: 5-7-96

ACCEPTED BY

BECHTEL: _____ DATE: 10-May 96

CUSTOMER REPRESENTATIVE: _____ DATE: 21 MAY 96

PUNCHLIST: 1) CONFIRMATION SAMPLE RESULTS
2) FINAL SURVEY
3) PREPARE NOTICE OF COMPLETION PER WETLANDS PERMIT

Attachment 8-4

Completion Poster

9 SWMU-2: BOCA CHICA DDT MIXING AREA

9.1 SITE DESCRIPTION

SWMU-2 is located near the center of the Boca Chica airfield, southeast of Taxiway "A," and surrounds a man-made ditch that drains runoff from the airfield. The ditch is 3 - 4 feet deep, 10 - 12 feet wide and runs east/west. The water table occurs at depths from 1.5 to 6 ft below land surface, varying with season. Prior to start of the IRA, the ditch had medium size mangroves around its banks, sparse grass on the north side and heavier grass on the south. The ditch discharges toward the Atlantic Ocean through a culvert at the west end. The site is shown in detail in Figure 9-1.

DDT mixing operations were conducted from the 1940s to the early 1970s in a building (demolished in 1982) located approximately 30 ft north of the drainage ditch. Pesticides spilled during mixing operations contaminated the soil and sediment with pesticides, organic chemicals, and metals.

9.2 CLEANUP OBJECTIVE

9.2.1 Contaminant of Concern

The primary contaminants of concern were identified as DDT, DDE and DDD. A secondary concern was lead in sediments. The RFI/RI report identified levels of lead above the 30.2 ppm TEL established in FDEP's sediment quality guidelines. Although lead was not initially identified as a contaminant of concern, this guideline by FDEP generated a requirement to determine its extent. [2, 38]

DDT and its metabolites, DDD and DDE, are listed RCRA wastes when these products have been spilled and have contaminated soil or debris. Soil contaminated with these chemicals is classified as a hazardous waste (RCRA waste codes U060 and U061).

9.2.2 Cleanup Type & Criteria

The IRA objective was contaminant source removal from soil and sediment to prevent further migration of pesticides into other areas and media.

The IRG was to remove and dispose of contaminated soil and sediment. Cleanup guidelines depended on whether a particular area contained upland soil or wetland sediment. [86]

Upland Soil. Cleanup criteria for pesticide contaminated soil was based on the industrial guidelines from FDEP's "Soil Cleanup Goals for Military Sites" dated April 5, 1995. The guideline for lead was based on revised CERCLA guidance of July 1994. [29, 32]

- DDD 17 ppm
- DDE 9.9 ppm
- DDT 12 ppm
- Lead 400 ppm

Wetland Sediment. Cleanup criteria for sediment was based on TEL values in Table 4 of FDEP's "Approach to the Assessment of Sediment Quality in Florida Coastal Waters," November 1994.

- DDD 0.00122 ppm
- DDE 0.00207 ppm
- DDT 0.00119 ppm
- Lead 30.2 ppm

Surface Water. The initial scope did not require surface water treatment; however, it was a condition of the FDEP wetlands permit that where sediments were disturbed, the surface water would have to be treated. The permit stipulated attainment of Florida water quality standards (FAC 62-302.530) for DDT, a maximum level of only 0.00059 ppb. This criteria would have been impossible to achieve and was well below detection limits. BEI negotiated a more achievable standard with the permitting authorities as shown below. [50,87, 88]

- DDD 1.0 ppb
- DDE 1.0 ppb
- DDT 1.0 ppb

9.3 DELINEATION SAMPLING & RESULTS

9.3.1 Sampling

Delineation sampling was performed to establish limits of excavation. During initial site visits with the Navy in 1994, the area of concern was thought to be the north side of the ditch where the mixing building had been located as well as sediments in the ditch. The delineation sampling revealed pesticide contamination in those locations and also in the ditch bank on the south side. In order to find the southern boundary of contamination, the sampling team took additional samples on the uplands south of the ditch. Samples taken alongside the ditch and in the sediments were also analyzed for lead.

Samples were taken as follows:

- 87 surface soil samples were analyzed for pesticides using field IMU test kits. These samples determined the lateral extent of contamination in the upland area.
- 15 surface soil samples were analyzed for lead at an offsite laboratory. They were collected alongside the ditch.
- Nine sediment samples were analyzed for pesticides and lead at an offsite laboratory. Three were taken inside the area to be excavated and six were outside.
- Five sediment samples were additionally analyzed for VOCs, TAL metals, cyanide, tin, and PCBs.
- Four surface water samples were analyzed for VOCs, TAL metals, cyanide, tin, pesticides, and PCBs. Three were collected inside the area to be excavated and one outside.

9.3.2 Results

Data from the delineation sampling report established the extent of pesticide and lead contamination. All sediment samples had pesticide detections above sediment criteria values. The center of the ditch had especially high concentrations, and surface soil on both sides of the ditch was highly contaminated. Lead exceeded cleanup criteria in five sediment samples; however, no soil samples exceeded the criteria for lead. The excavation boundaries were therefore based on the extent of pesticide contamination. Sample locations, depths, results, and limits of excavation are shown on Figure 9-1. [19]

The area of contaminated soil was nearly double the size estimated in the budget due to discovery of contamination south of the ditch. The depth of soil to caprock (and thus depth of excavation) was less than estimated, however, and the estimated quantity of soil to be removed decreased from the budgeted 2400 cy to 1736 cy. The actual quantity of soil removed was 1958 cy.

The past history of extensive pesticide application made it difficult to determine cleanup boundaries. Pesticides were found in sediments outside the area of excavation at levels greater than cleanup goals, probably due to flowing water carrying contaminated particles. A follow-on Risk Assessment and

Corrective Measures Study by the CLEAN will assess outlying contamination to determine whether further remediation is required.

9.4 CLEANUP TECHNOLOGY

9.4.1 Technology Selection

Excavation and offsite disposal was selected as the most cost effective option. The location of the site, between an active runway and a taxiway also influenced the decision to remove the soil to an offsite treatment and disposal facility. Because the excavated soil and sediment were classified as RCRA listed HW, it required disposal in a RCRA landfill even after treatment. This requirement made the onsite treatment option not cost-effective.

9.4.2 Workplan

The scope of work consisted of the following elements:

- Pre-construction survey to determine elevations necessary to restore the upland habitat and wetlands areas to their natural states.
- Install barriers to prevent spread of contaminants from the work area.
- Excavate and dredge pesticide contaminated soil and sediment.
- On-site treatment of pesticide contaminated surface water.
- Offsite treatment/disposal of excavated soil and sediment.
- Perform confirmation sampling to confirm that IRGs have been met. Provide results to CLEAN contractor for risk assessment.
- Backfill of the upland area with clean fill.
- Erosion control of the upland area to prevent erosion of backfill into the ditch.
- Natural revegetation by native species

As noted in Section 1, the approved RWP did not address SWMU-2. PPR-321-006 provided the detailed scope of work. So that the PPR would be consistent with the wetlands permit as well as with FDEP/EPA guidelines, the PPR was not finalized until after the permit and a modification were issued. [86]

9.5 REGULATORY AGENCY APPROVAL

9.5.1 EPA & FDEP

The following agreements were made during the planning process:

- Conferees at the August 1994, regulatory meeting agreed that there were no alternatives to offsite disposal at a RCRA landfill for the contaminated soils. [32]
- Conferees at the NRT meeting in April 1995, agreed that the site contains a wetland area and that permits would be required. It was agreed that natural recolonization and succession would be used as a means of revegetation of both the upland and wetland areas of the site. [37]
- A telecon was held with the Navy and FDEP on 24 October 1995 to discuss the delineation sampling results and proposed excavation limits. FDEP agreed to limit excavation of sediments in the ditch to the area adjacent to the upland contamination, and also agreed to the proposed upland excavation limits. FDEP understood that these limits would leave some contaminated sediment for later evaluation. EPA did not participate, but received a copy of the discussion minutes. [79]
- BEI confirmed that no modifications to NAS Key West's RCRA permit were required to implement the removal action. [84]
- BEI called the EPA Regional Coordinator in October 1995, to comply with the CERCLA Off-Site Notification Rule for the waste stream being removed from SWMU-2. [85]

9.5.2 Natural Resources Permits and Protection of Natural Resources

SWMU-2 encompasses a wetland and required permits from the State and the Army Corps of Engineers.

- FDEP issued permit 442693985 on 18 December 1995. [50, 52]
- FDEP issued a permit modification on 13 March 1996. [88]
- The Army Corps of Engineers determined that the work could be performed under the nationwide permit Number 38 and that an individual permit would not be required. [55]

FDEP permitting authorities had three primary concerns:

- Preventing silt in the ditch from spreading beyond the boundaries of the excavation.
- The water in the ditch where sediments were to be dredged must be treated to remove contamination.
- Erosion of upland backfill into the ditch must be prevented.

The permit issued in December, imposed costly, if not impossible, requirements to satisfy these concerns. To find acceptable solutions, BEI conducted extensive discussions with FDEP and among its own construction and environmental personnel. Research of products available that would meet FDEP requirements was also necessary. BEI proposed new methods and revised water cleanup criteria (1 ppb) to FDEP by letter in February 1996, and FDEP thereupon modified the permit. [87, 88, 89]

Additionally, the NAS Key West Natural Resources Manager identified the area south of the ditch as Marsh Rabbit habitat. As required by the U.S. Fish and Wildlife Service and Florida Fish and Game Commission, BEI took the following precautions:

- Prior to start of work, the area was surveyed under direction of the NAS Key West Natural Resources Manager to ensure that no rabbits were in the work area.
- When the area was declared clear, the vegetation was scraped away to prevent rabbits from returning to the site until the remediation activities were complete.
- During the remediation, the construction crew avoided driving equipment into grassy areas outside the work area.

9.6 EXECUTION OF WORK

9.6.1 Mobilization

A civil survey of the site prior to start of work established elevations of wetland areas and upland Marsh Rabbit habitat. These elevations would be used to establish final elevations upon completion of the work. The survey is shown as Figure 9-2.

Excavation of contaminated soil was accomplished using a front end loader and excavator. A sand plate bucket attachment was used for excavation of sediment in the ditch. End dump trucks (20 cy capacity) were used to transport the soil to the treatment and disposal facility.

SWMU-2 required purchase or fabrication of several items unique to this project.

- Water-filled bladders to use as cofferdams to close off the ends of the ditch and prevent spread of contamination beyond the construction boundary.
- Fabrication of hand-operated dredge system.
- Carbon treatment unit for removing pesticide contamination from water in the ditch.

9.6.2 Chronology of Construction Actions

- 08 Mar 96 Conducted preparatory phase inspection with NTR. Attachment 9-1
- 14 Mar 96 Survey of Marsh Rabbit habitat with NAS Natural Resources Manager.

- 15 Mar 96 Commenced clearing and grubbing.
- 19 Mar 96 Completed clearing of vegetation. Removed and accumulated contaminated soil from along banks of ditch. Installed temporary sediment control barriers.
- 21 Mar 96 Installed water filled cofferdams in ditch. Commenced removal of sediment.
- 25 Mar 96 Commenced excavation and accumulation of soil.
- 26 Mar 96 Installed water filtration system.
- 27 Mar 96 Completed removal of sediment. Began continuous filtration of water in ditch .
- 29 Mar 96 Collected water sample.
- 01 Apr 96 Commenced transportation of contaminated soil.
- 03 Apr 96 Water sample results showed criteria had not been met. Collected second sample.
- 04 Apr 96 Collected soil confirmation samples at boundaries of construction area.
- 08 Apr 96 Major thunderstorm flooded ditch area and washed out cofferdams.
- 09 Apr 96 Results of second water sample were within criteria. Terminated water treatment.
- 11 Apr 96 Removed temporary sediment barriers. Collected additional confirmation samples.
- 15 Apr 96 Completed transportation of contaminated soil. Began backfilling excavation and installation of final sediment barrier and erosion prevention matting.
- 18 Apr 96 Surveyed elevations of backfill and surrounding wetlands. Received soil confirmation sampling analytical data.
- 19 Apr 96 Completed backfill of excavation and installation of erosion prevention matting.
- 22 Apr 96 Completed site cleanup. NTR issued Certificate of Substantial Completion.

9.6.3 Work plan vs. actual work

9.6.3.1 Deviations from Planning

There were no significant deviations from the work plan provided in PPR-006.

9.6.3.2 Delays & Problems Encountered; Unexpected Findings/Contamination

Delineation sampling revealed that the areal extent of soil contamination was about twice as large as the area identified in previous investigations. Past efforts to define the limits of contamination had only identified areas north of the ditch, where the mixing building had been located, and sediment in the ditch. High levels of pesticide were also found south of the ditch, probably the result of past dredging, in Marsh Rabbit habitat. High levels of pesticides were found in sediments beyond limits of construction.

After vegetation was removed near the headwall of the ditch a concrete vault was encountered which contained electrical lines that did not appear on as-built drawings. Public Works determined that the lines were abandoned. The NTR approved removal of the lines.

The work plan for sediment removal called for a dredge pump suspended from the bucket of the trackhoe. The pump inlet appeared too small, and the crew substituted a trash pump and three-inch inlet hose with a fabricated PVC nozzle, and vacuumed the sediments by hand.

A concrete drainage culvert at the headwall of the ditch was damaged when an excavator crossed the culvert. A replacement section was located and repairs were made. A front end loader backed into a monitoring well, damaging the casing. The wellhead, casing, and grout were replaced.

A sudden, torrential rain caused a surge of runoff from the airfield. Rising water and heavy flow in the ditch washed out the cofferdams. Treatment of water between the cofferdams was ongoing at the time, but results received the day after the storm indicated that cleanup objectives had been met before the

storm. In planning for use of the cofferdams, provision had been made for a storm; however, the magnitude of this event completely overwhelmed any capability to divert the water.

9.6.4 Summary of Materials Handled

Table 1-1 contains a summary of materials removed from the site and their disposition.

9.6.5 Site Restoration

The uplands excavation area was filled with organic substrate material until the contours matched the existing adjacent elevations, so that the site would be revegetated by natural colonization. The ditch was excavated to caprock and not backfilled. The completion survey confirmed that final elevations are correct. The survey is shown on Figure 9-3.

Erosion control mats and straw bales covered with geotexile were placed on both sides of the ditch to prevent erosion of topsoil into the ditch. These were left in place upon completion of construction.

9.7 CONFIRMATION SAMPLING AND COMPLETION DRAWINGS

Confirmation soil samples were collected around the edges of the excavation and sediment samples were collected from each end of the ditch. The locations of these samples and excavation boundaries are shown on Figure 9-4.

Confirmation sampling indicated that the IRA achieved the goal of removing the source of pesticide contamination in the upland areas; however, the sediment analysis indicated that contamination remains at levels above sediment criteria. These will be evaluated for further action by the CLEAN contractor. A copy of the complete analytical results is contained in Volume II.

9.8 APPROVAL OF COMPLETED IRA

9.8.1 Regulatory Approval

The notification form for transfer of the site from the construction phase to operations phase was prepared by BEI and sent to NAS Key West in September, 1996. NAS Key West forwarded this form to FDEP. [62, 64,]

As required by the wetland permit, BEI sent the Environmental Resource As-built Certification with excavation and backfill quantities, and copies of the as-built survey and confirmation sampling results to FDEP in May 1995 and again in September. [61, 63]

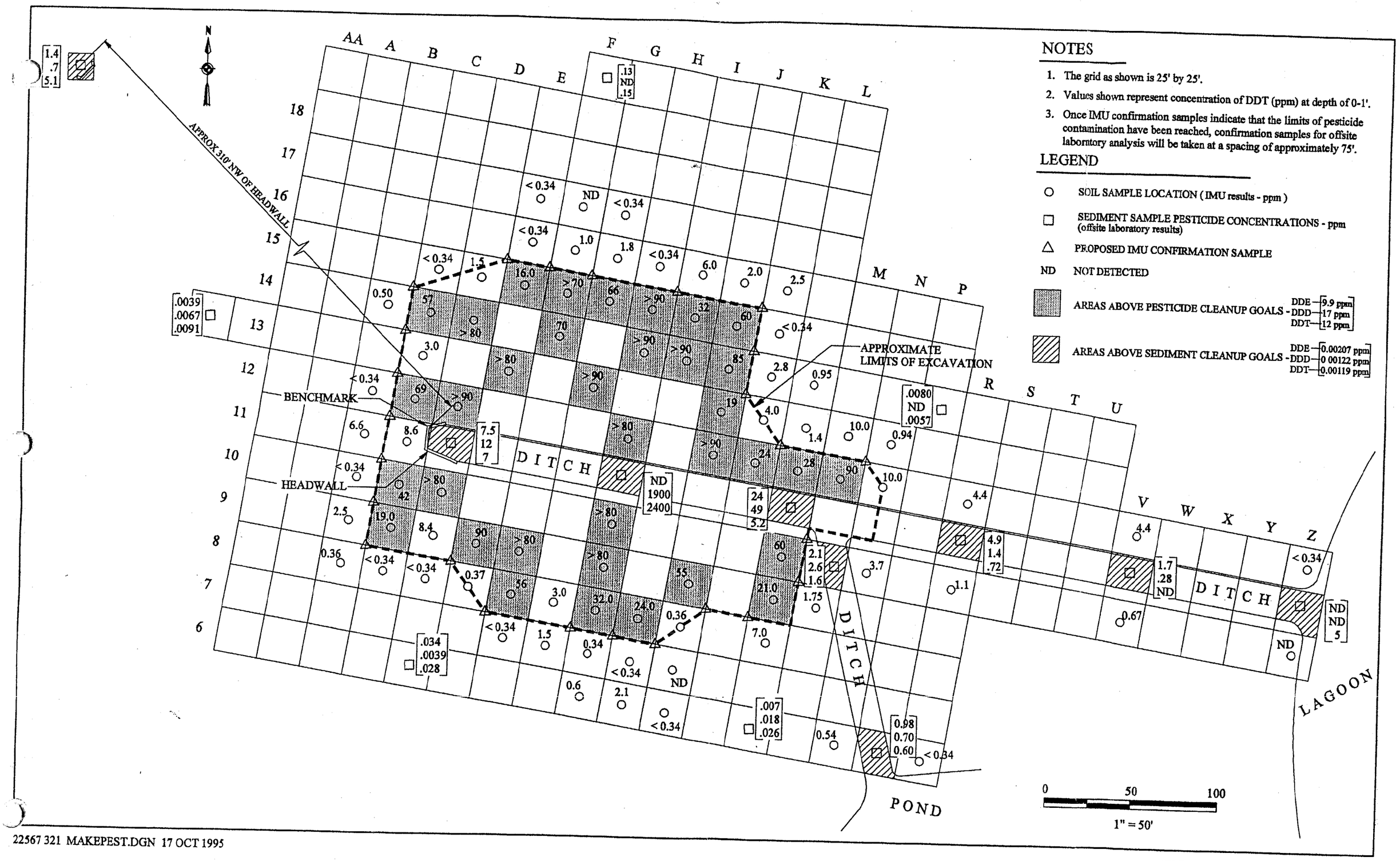
An FDEP representative from the Marathon office inspected the the site on 30 July 1996. He noted that there was some growth of exotic grasses, probably brought in with the fill material, but otherwise considered the site had been properly restored. The NAS Natural Resource Manager, who was present, said he would take care of the grasses.

9.8.2 Navy / NTR Approval

Copies of the Site Completion Report and signed Certificate of Substantial Completion are included as Attachments 9-2 and 9-3.

9.9 PHOTOGRAPHS

The completion poster, Attachment 9-4, provides a photographic record for this site.



22567 321 MAKEPEST.DGN 17 OCT 1995

FIGURE 9-1
SWMU-2 - BOCA CHICA
DDT MIXING AREA PESTICIDE RESULTS

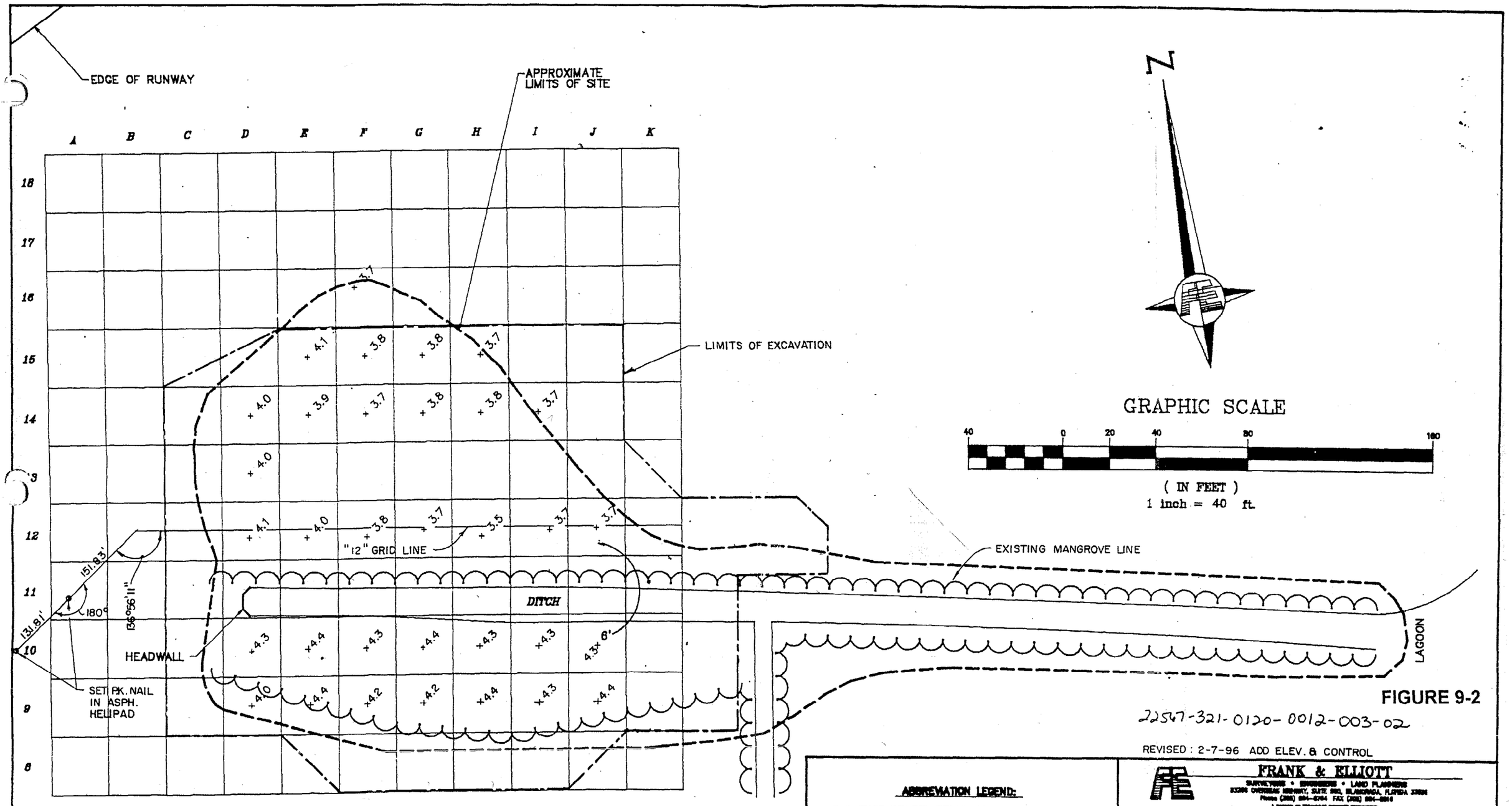


FIGURE 9-2

22567-321-0120-0012-003-02

REVISED : 2-7-96 ADD ELEV. & CONTROL

NOTES:

1. *THE GRID AS SHOWN IS 25' BY 25'*
2. *ELEVATIONS ARE FOR EXISTING GRADES. SITE WILL BE RESTORED TO A NATURAL GRADE AFTER EXCAVATION.*

+0.00 *DENOTES EXISTING SPOT ELEVATION.*

ABBREVIATION LEGEND:

F.I.R	FOUND IRON ROD, SIZE INDICATED	SEC.	SECTION
S.I.R.	SET IRON ROD, 1/2" L.B. No. 5406	TWP.	TOWNSHIP
F.I.P.	FOUND IRON PIPE, SIZE INDICATED	RGE.	RANGE
F.N.D.	FOUND NAIL AND DISK	(D)	DEED
S.N.D.	SET NAIL AND DISK, L.B. No. 5406	(P)	PLAT
F.C.M.	FOUND CONCRETE MONUMENT	(M)	MEASURED
P.R.M.	PERMANENT REFERENCE MONUMENT	(C)	CALCULATED
P.C.P.	PERMANENT CONTROL POINT	CONC.	CONCRETE
P.I.	POINT OF INTERSECTION	COV.	COVERED
P.C.	POINT OF CURVE	ASPH.	ASPHALT
P.O.B.	POINT OF BEGINNING	PVMT.	PAVEMENT
R/W	RIGHT-OF-WAY	ELEV.	ELEVATION
TYP.	TYPICAL		
OHW	OVERHEAD WIRE		

FRANK & ELLIOTT

SURVEYORS • ENGINEERS • LAND PLANNERS

CERTIFIED FOR: SPECIAL PURPOSE SURVEY

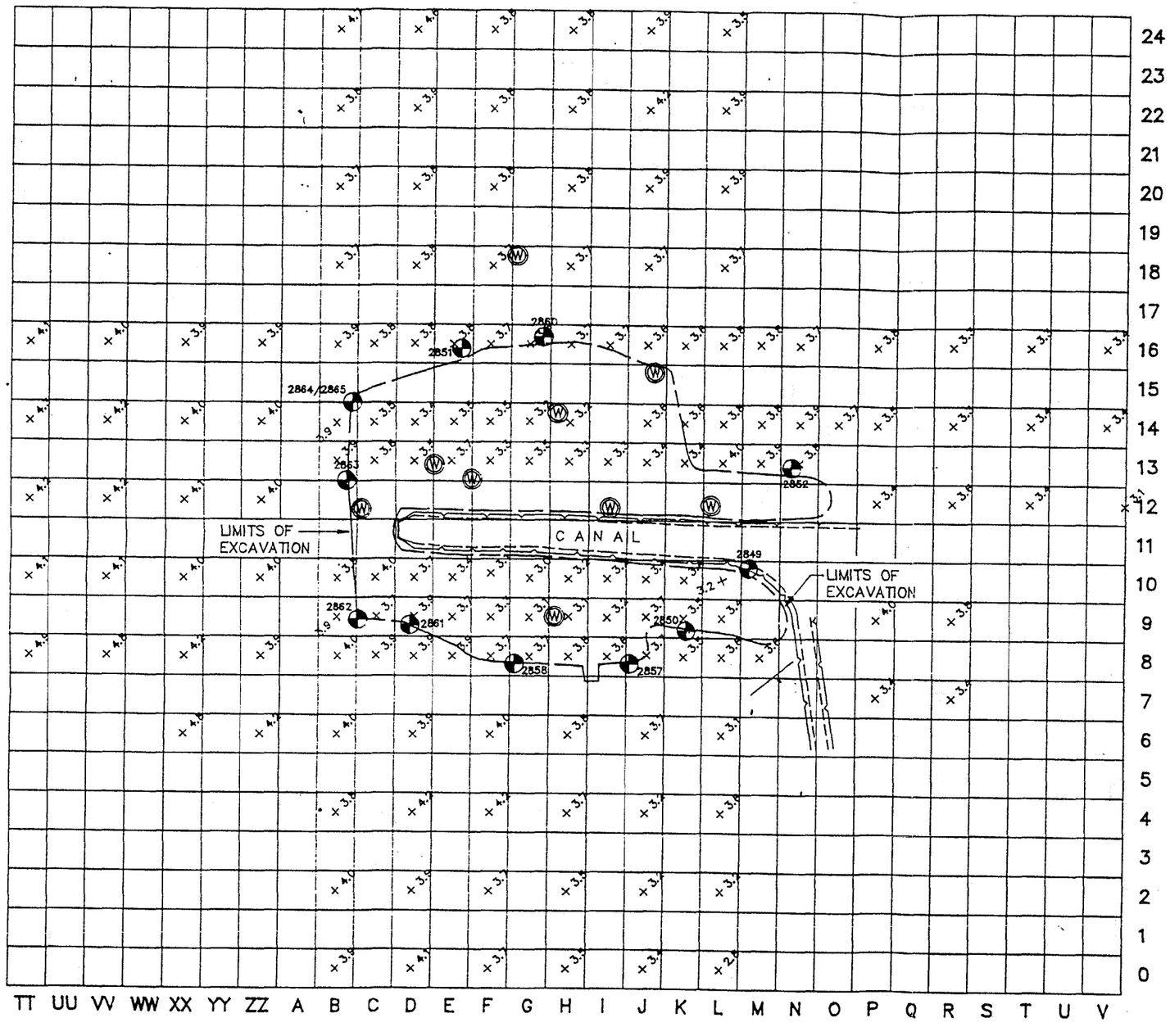
I HEREBY CERTIFY THIS SURVEY MEETS THE MINIMUM TECHNICAL STANDARDS AS SET FORTH BY THE FLORIDA BOARD OF PROFESSIONAL SURVEYORS AND MAPPERS IN CHAPTER 61G17-6 FLORIDA ADMINISTRATIVE CODE, PURSUANT TO SECTION 472.027, FLORIDA STATUTES.

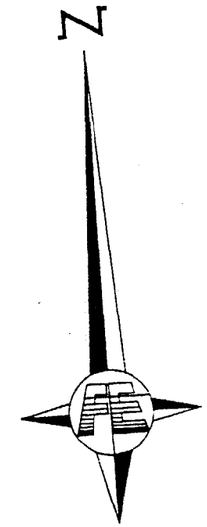
SCALE: 1"=40'	Lawrence P. Frank	DRAWN BY: G.K.B.
DATE: 07/12/95	LAWRENCE P. FRANK, P.L.S. # 4819	REVISED: 08/18/95

SWMU NO. 2 – BOCA CHICA DDT MIXING AREA

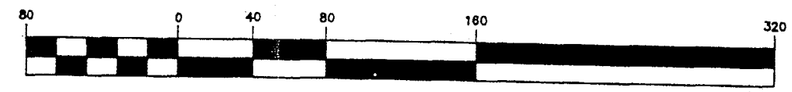
CERTIFIED TO:

JOB NUMBER: 95142.SWMU2





GRAPHIC SCALE



(IN FEET)
1 inch = 80 ft.

NOTES

x 3.4 DENOTES EXISTING SPOT ELEVATION

(W) DENOTES MONITOR WELL

2850 DENOTES SAMPLING POINT

THE GRID SHOWN IS 25'x 25'

FIGURE 9-3

FINAL AS BUILT SURVEY 4/18/96

NAVY RAC PROJECT 22567-321

BECHTEL ID NUMBER:
120-0018-002-01

SC/PO	SEQ	SHT	SUBMTL

FRANK & ELLIOTT
SURVEYORS • ENGINEERS • LAND PLANNERS
83294 OVERSEAS HIGHWAY, SUITE 202, ISLAMORADA, FLORIDA 33036
Phone (305) 664-0784 FAX (305) 664-0816

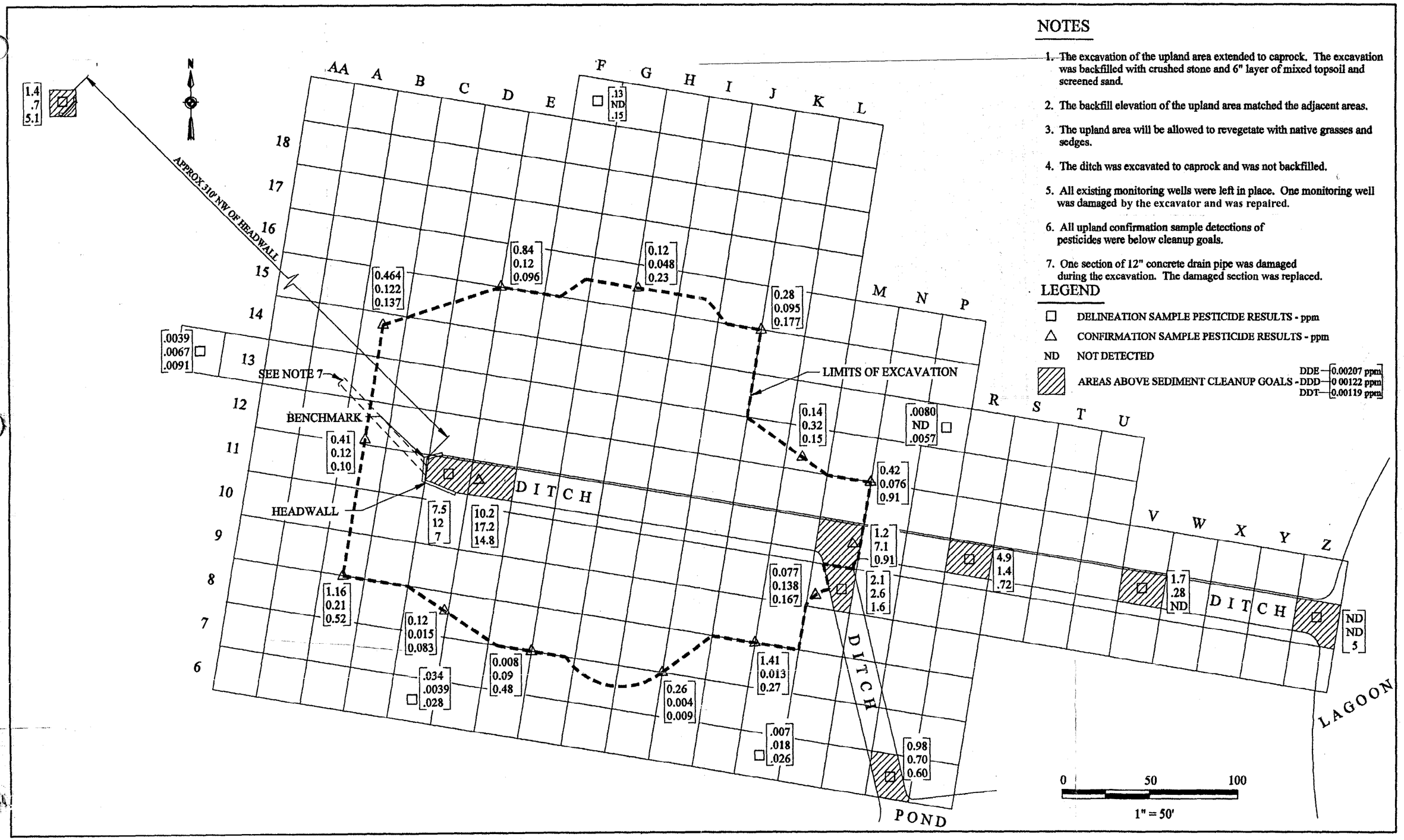
CERTIFIED FOR SPECIFIC PURPOSE SURVEY
I HEREBY CERTIFY THIS SURVEY MEETS THE MINIMUM TECHNICAL STANDARDS AS SET FORTH BY THE FLORIDA BOARD OF PROFESSIONAL SURVEYORS AND MAPPERS IN CHAPTER 61G17-6 FLORIDA ADMINISTRATIVE CODE, PURSUANT TO SECTION 472.027, FLORIDA STATUTES.

SCALE: 1' = 80'	EDWARD C. ELLIOTT, P.L.S. # 3683	DRAWN BY: ECE
DATE: 7/12/95		REVISED 2/7/96

SWMU NO. 2 – BOCA CHICA DDT MIXING AREA

CERTIFIED TO: BECHTEL

JOB NUMBER: 95142.SWMU2



NOTES

1. The excavation of the upland area extended to caprock. The excavation was backfilled with crushed stone and 6" layer of mixed topsoil and screened sand.
2. The backfill elevation of the upland area matched the adjacent areas.
3. The upland area will be allowed to revegetate with native grasses and sedges.
4. The ditch was excavated to caprock and was not backfilled.
5. All existing monitoring wells were left in place. One monitoring well was damaged by the excavator and was repaired.
6. All upland confirmation sample detections of pesticides were below cleanup goals.
7. One section of 12" concrete drain pipe was damaged during the excavation. The damaged section was replaced.

LEGEND

- □ DELINEATION SAMPLE PESTICIDE RESULTS - ppm
- △ CONFIRMATION SAMPLE PESTICIDE RESULTS - ppm
- ND NOT DETECTED
- AREAS ABOVE SEDIMENT CLEANUP GOALS - DDE 0.00207 ppm, DDD 0.00122 ppm, DDT 0.00119 ppm

22567/321/SWMU2-A/.DGN

FIGURE 9-4

SWMU-2 BOCA CHICA DDT MIXING AREA AS-BUILTS

Attachment 9-1

Pre-Activity Site Checklist

CHECKLIST ITEMS FOR SWMU-2
Preparatory Meeting 8 March, 1996

NO.	DESCRIPTION	YES	NO	N/A	Comments
1	Natural Resource Representative OK		X		Arnim Schuetz to inspect site prior to excavation 13 March
2	Excavation Permit in place	X			Check w/ J. Lamberson if OK to use existing permit
3	Approved Work Plan/Criteria/Delineation of Excavation		X		Will issue signed copy to NAVY for approval
4	Site Surveyed	X			Benchmark elevation not shown on drawing, need to revise
5	PWD Utility Survey Performed/Documented/Ok to proceed	X			
6	Southern Bell Telephone Survey/Documented/OK to proceed	X			
7	Profile Sampling Analytical Results	X			
8	Disposal facility letter of material acceptance	X			EQ, Detroit, MI
9	Backfill Material Certification	X			
10	ROICC Notification Provided	X			
11	PWD Manifesting Support Scheduled	X			
12	FDEP/COE Notification Provided	X			
13	Organic Substrate Material Approved	X			top soil
14	Wetlands Vegetation Photo-Documented Prior to Disturbance	X			PWD conducted
15	Silt Fences/Sediment Barriers Installation Scheduled	X			Hay bales arrived on-site 27 Feb
16	Cofferdams received		X		Scheduled for 11 March
17	Charcoal filter drums received		X		Scheduled for 11 March
18	Stormwater pumps received		X		Scheduled for 11 March
19	Dredge pump received		X		Scheduled for week of 11 March
20	Geotextile fabric material received	X			Received 8 March
21	Are any potential subsurface hazards identified and addressed	X			None expected - need to verify that excavation permit covers revised excavation area
22	Are any archaeological items present	X			None expected
23	Potential UXO identified and addressed	X			None expected
24	Backfill/Compaction requirements identified	X			Backfill to existing grade in wetlands/minimum 6 inches - No compaction requirement
25	Wetlands permit revisions approved by FDEP		X		Verbal OK from FDEP for revised water standard
26	Confirmatory sample locations identified	X			
27	Loading observation by PWD Environmental scheduled	X			Support available following loading at SWMU-1
28	OK to backfill after confirmation sampling?	X			
29	Truck routing and staging area discussed with ROICC	X			AES to provide routing/staging plan
30	Taxiway crossing procedures developed		X		AES to provide before transport begins
31	Taxiway crossing training for drivers/employees scheduled	X			Will provide before transport begins
32	PWD remove drill cutting drums left on site by Brown & Root		X		NTR to request. Will affect schedule if not removed prior to excavation start.

Notes:

Attachment 9-2

Site Closeout Report

Site Closeout Report

SWMU-2

RECEIVED
JUN 18 1996
BECHTEL 22567

On March 14, 1996 Associated Environmental Services Inc. mobilized equipment and crew to Solid Waste Management Unit (SWMU) 2. Work consisted of site setup and security, installation of sediment barriers and coffer dams, excavation and dredging of ditch, treatment of water in ditch, excavation, loading, transportation, and disposal of contaminated soil, personnel and equipment decontamination, backfill and site restoration.

Personnel Time on Site

Site Superintendent:	216 hrs
Forman:	hrs
Health & Safety:	96 hrs
Operator:	296 hrs
Labor:	288 hrs

Equipment Time on Site

Deere 690 Trackhoe:	176 hrs
Deere 624 Endloader:	104 hrs
Dozier:	48 hrs

Soil Loading, Transportation and Disposal

Final Disposition Method:	Chemical Oxidation
Volume Loaded:	2471 Tons
Transported:	2471 Tons
Disposal:	2471 Tons

Site Restoration

General Fill:	1495 Tons

22567-321-0415-0033-007-01

Material Sampling and Analysis

Two samples were collected on August 7, 1995. A profile analysis was performed for disposal approval, see attachments for results.

Lower Tier Subcontractors

Transporter:	Robbie D. Wood Trucking P.O. Box 125 Dolomite, AL 35061 (205) 744-8440 EPA ID# ALD067138891
Disposal Facility:	Wayne Disposal, Inc. 49350 North I-94, Service Drive Belleville, MI 48111 (313) 699-6287 EPA ID# MID048090633
Laboratory:	Pace Inc. Environmental Laboratories 5460 Beaumont Center Blvd. Tampa, FL 33634 (813) 884-8268 Florida DEP CompQAP #870529G Lab Certification Florida Environmental:HRS #E84003 Florida SDWA:HRS #84125
General Fill:	Sunshine Rock, Inc. Plant Address: NW 129th Ave. & 202nd St. Miami, FL (305) 821-8660
	Rinker Materials Corporation Plant Address: 13292 NW 118th Ave Miami, FL 33012 (305) 558-5830

22567-321-0415-0033-007-01

Attachment 9-3

Certification of Substantial Completion

CERTIFICATE OF SUBSTANTIAL COMPLETION

Date: 22 April 1996

Site : SWMU-2

Description of Site : Former DDT Mixing Area

Contractor : Associated Environmental Services

Contract No. : 22567-321-SC- 0415

Punch List Completion Date : N/A

This is to certifiy the work described above has been substantially completed in accordance with the contract and associated documents. The site designated above has been inspected by representatives of the customer, contractor, and Bechtel, and is compete with the exception of the attached punch list (if applicable) which the contractor agrees to complete by the date designated.

The warranty period commences on the date the contractor completes the remedial work as described in the punch list or from the date of execution of the Certificate of Substantial Completion, whichever is later.

INSPECTION CERTIFICATE

CONTRACTOR: _____ DATE: 5-7-96

ACCEPTED BY

BECHTEL: _____ DATE: 10 May 96

CUSTOMER REPRESENTATIVE: _____ DATE: 21 MAY 96

PUNCHLIST: 1) FINAL SURVEY RESULTS
2) CONFIRMATION SAMPLE RESULTS
3) WATER QUALITY SAMPLE RESULTS
4) NOTICE OF COMPLETION PER WETLANDS PERMIT

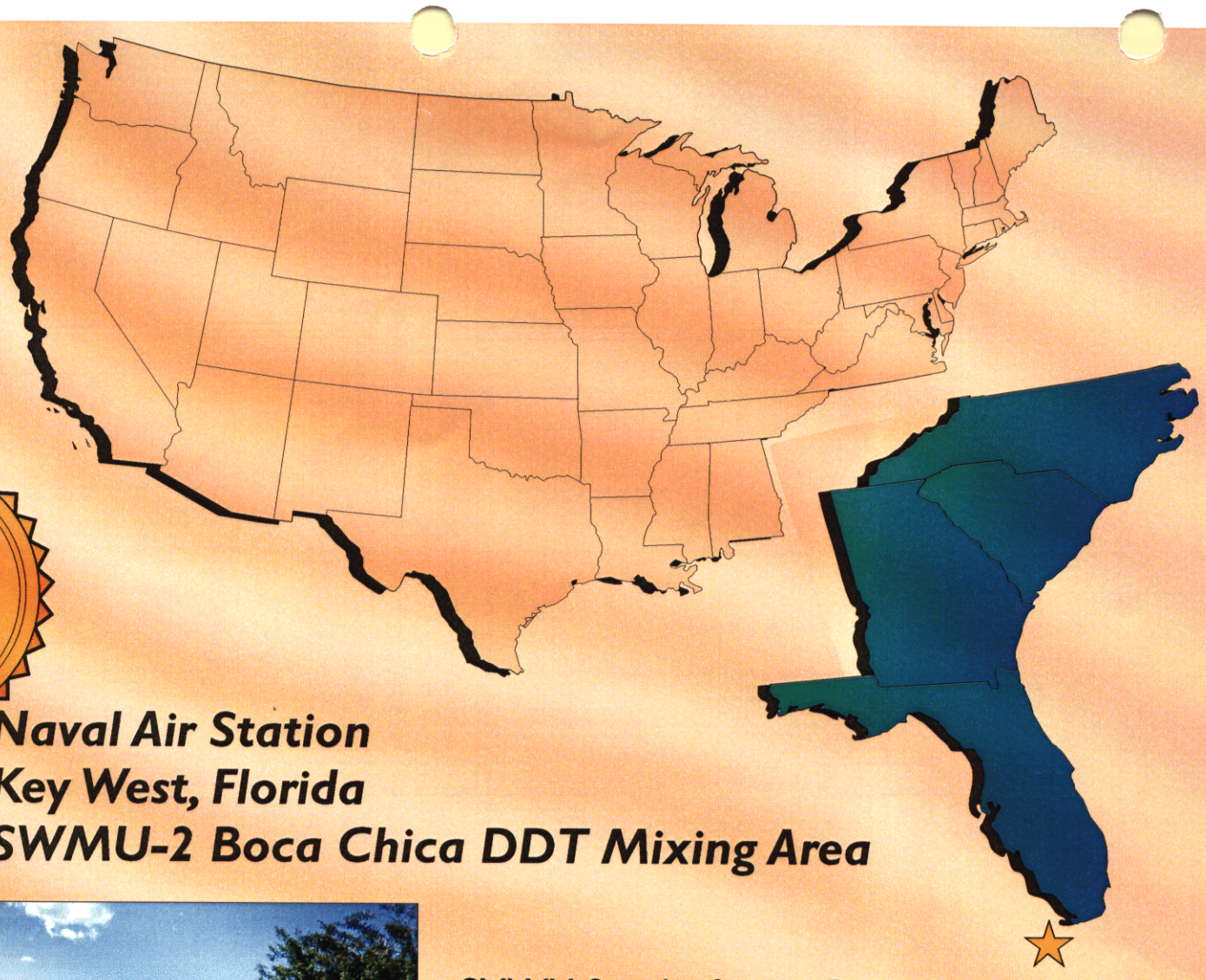
Attachment 9-4

Completion Poster

Southern Division
Naval Facilities Engineering Command

Navy RAC Completed Sites

23rd Completed Site



Naval Air Station
Key West, Florida
SWMU-2 Boca Chica DDT Mixing Area

The site before excavation began. The area south of the drainage was identified as habitat for the endangered Lower Keys Marsh Rabbit *(Sylvilagus palustris hefneri)*. The workers are conducting a rabbit sweep prior to excavation.

SMWU-2 is the former Boca Chica pesticide mixing area. High levels of DDT had been detected in the sediment of a drainage ditch bisecting the site and in soil on both sides of the ditch. Probably the most difficult Navy RAC site at NAS Key West, SWMU-2 contains a wetland surrounding the ditch, endangered species habitat, and hazardous waste. Compliance with wetlands permits issued for the work required innovative remediation methods such as water-filled cofferdams to seal off the ditch, dredging of sediment, onsite water treatment, and use of field pesticide test kits. Contaminated soils and sediments were hauled away for chemical treatment at a RCRA disposal facility.

The site after completion of clearing and grubbing.

Water filled cofferdams were used to prevent the spread of contaminated water.

Contaminated sediments were first removed with an excavator. The remaining sediments were vacuumed out of the ditch with a 3" diaphragm pump and pumped to a drying bed.

The site after all remedial activities were completed. The black and white material is the permanent erosion control system. The site will be allowed to revegetate naturally.

After removing the sediments, the contaminated water in the ditch was treated with a carbon adsorption system. The system reduced DDT in the water from 17 ppb to 0.9 ppb. The cleanup goal was 1.0 ppb.

Soil around the ditch was excavated to caprock. Here, stockpiled soil is being loaded for transportation to a RCRA permitted treatment and disposal facility.

BECHTEL

Z10.5 9548

10 SWMU-9: BOCA CHICA JET ENGINE TEST CELL

10.1 SITE DESCRIPTION

SWMU-9 lies on the northwest perimeter of Boca Chica Field between a taxiway and inlet. The facility was used to perform static tests on jet engines. When it was in use, this facility included a cradle for securing jet engines, a concrete pad, jet blast deflectors, above ground storage tanks (jet fuel), and a storage shed (formerly an approved hazardous waste storage site). After the facility was closed the cradle and above ground storage tanks were removed. Figure 10-1 is a site map.

The shed, located at the northeast edge of the area, was used to store recyclable items, including fuel oil, hydraulic oil, turbo oil, engine oil, jet fuel (JP), and a variety of jet engine cleaners. A JP-5 spill occurred in January 1989. During the site investigation of the fuel spill, the groundwater was found to be contaminated by chlorinated solvents. [5]

The water table occurs at depths of 1 to 2 ft below grade. The general groundwater flow direction is north toward the inlet that borders the site.

10.2 CLEANUP OBJECTIVE

10.2.1 Contaminant of Concern

The contaminants of concern at SWMU-9 were naphthalenes; Total Recoverable Petroleum Hydrocarbon (TRPH), floating product; cis 1,2-dichloroethylene (DCE); trans 1,2-DCE; and trichloroethylene (TCE). [5]

10.2.2 Cleanup Type & Criteria

The IRA objective at SWMU-9 was hydraulic containment to prevent contaminants from reaching the inlet. Other objectives included: [23, 32, 66, 90]

- Treatment of groundwater contaminated with chlorinated solvents and floating product.
- Free petroleum product recovery.

Groundwater extraction wells would be used to prevent the migration of contaminants to the inlet. Groundwater extracted from the wells required onsite treatment prior to discharge on site. The cleanup criteria for the treatment system are the FDEP standards listed in Table 10-1.

10.3 SAMPLING & RESULTS

10.3.1 Sampling

ABB-ES sampled soil and groundwater at SWMU-9 in October 1993, and February 1994, to assess the contamination resulting from the JP-5 fuel spill that had occurred in January 1989. [5]

BEI sampled groundwater from existing wells in June 1995, and installed 10 temporary well points in July 1995, to delineate the extent of the solvent plume on the northeast corner of the site. [91]

10.3.2 Results

The results from both sampling events are summarized in Table 10-2. Only those compounds that exceeded Florida Groundwater Standards are listed in the table. BTEX, naphthalenes, TRPH, and several chlorinated VOCs were detected in the groundwater samples. TRPH and total naphthalenes concentrations exceeded Florida Groundwater Standards in the vicinity of the jet engine testing pad, while concentrations of 1,2-DCE and TCE exceeded their respective maximum contaminant levels in the vicinity of the storage shed.

Floating product was detected in two wells during the June 1995, sampling event. Floating product had not been detected previously. Figures 10-2, 10-3 and 10-4 illustrate the extent of groundwater contamination at SWMU-9.

10.4 CLEANUP TECHNOLOGY

10.4.1 Technology Selection

The Economic Analysis considered only pump and treat technologies. Both air stripping and carbon adsorption of groundwater prior to discharge were also considered. After site hydrology was better understood, natural attenuation was recommended, but was not accepted by the regulators.

SOUTHDIV proposed bioslurping wells followed by air stripping in lieu of pump and treat; however, BEI expressed concern that low soil permeability and shallow depth to groundwater would hinder system effectiveness. EPA had previously stated that air sparging would probably not contain the plume. The technology selection remained as pump and treat. [32, 90, 91, 92]

The Naval Air Station did not approve a request to discharge effluent to the Station's wastewater treatment system because of limitations at the treatment plant. This decision led to construction of a recharge gallery adjacent to the treatment system. [93, 94]

10.4.2 Workplan

The scope of work consisted of the following elements:

- Delineation to determine the horizontal extent of contamination by sampling groundwater in the existing monitoring wells and sampling new Hydropunch wells. Figure 10-2 shows the locations of these wells.
- Pump test to determine aquifer properties.
- Design of a groundwater pump-and-treat system including an extraction system, a treatment system and a recharge system.
- Installation of the system as designed.
- Installation and sampling of a deep monitoring well in the area of the solvent plume.
- Operation and maintenance (O&M) of the pump-and-treat system by BEI for one year.

PPR 321-010 was written to implement this scope of work. [95]

10.5 REGULATORY AGENCY APPROVAL

10.5.1 EPA & FDEP

The following agreements were made during the planning process:

- Conferees at the August 1994 Regulatory meeting agreed to incorporate the remediation of the JP-5 spill into the BEI Work Plan. [32]
- Conferees at the NRT meeting in April 1995 agreed that Bechtel would determine if wetlands would be impacted by extraction well placement . [37]
- BEI contacted EPA Region IV to determine if a nationwide NPDES permit was available for discharge of treated water into the inlet next to SWMU-9. A nationwide permit was not available, and obtaining an individual permit was deemed not feasible. [96]
- BEI contacted FDEP about using a recharge gallery for disposal of treated groundwater. This was an acceptable alternative as long as the treated groundwater met surface water standards. [97]
- BEI contacted South Florida Water Management District about the need for a consumptive use permit. A consumptive use permit was required and obtained. [98, 99, 100, 101]
- BEI recommended a "natural attenuation" approach be used at this site. [91]
- FDEP rejected BEI's "natural attenuation" proposal for SWMU-9. [90]
- BEI contacted FDEP, South District, Air Quality to determine if emissions from the airstripper needed to be permitted. An air permit was not required for these emissions. [102]
- EPA and FDEP approved PPR 321-010. [103, 104, 105, 106, 107]

10.5.2 Natural Resources Permits and Protection of Natural Resources

Work at SWMU-9 did not impact any wetland or endangered species habitat, although the workers were cautioned that there could be habitat nearby.

10.6 EXECUTION OF WORK

10.6.1 Mobilization

Bechtel used construction personnel from the NAS Jacksonville Navy RAC team to install the system. Subcontractors installed the wells, performed electrical installation and final grading of the site. A backhoe was used to excavate the trenches for the recharge gallery.

10.6.2 Dates and any significant events

- 05 Jul 96 — Surveyed site, laid out recharge gallery and well locations. Received pump and treat equipment package.
- 08 Jul 96 — Installed monitoring well MW-25D.
- 09 Jul 96 — Installed recovery wells RW-1, RW-2 and RW-3.
- 10 Jul 96 — Developed wells, completed trenching for recovery piping and commenced trenching for the recharge gallery.
- 12 Jul 96 — Completed recharge gallery trenching and trenching for conduit installation.
- 20 Jul 96 — Completed backfill and rough grading, completed air and water influent line and manifold installation.
- 22 Jul 96 — Completed all plumbing, well pump installation.
- 23 Jul 96 — Completed electrical installation.
- 24 Jul 96 — Completed system startup testing.
- 25 Jul 96 — Installed sequestrant system.
- 29 Jul 96 — Performed system startup and initial system sampling.

10.6.3 Work plan vs. actual work

10.6.3.1 Deviations from planning and why

Groundwater testing performed prior to startup revealed that the calcium and magnesium concentrations of the groundwater were high. If left untreated, the calcium could have caused scaling in the piping and in the air stripper. A block type sequestrant system was selected and installed in the treatment system.

10.6.3.2 Delays & Problems Encountered

The installation of the system was completed within a very tight schedule. The only major problems occurred after start of the system. These problem areas are detailed below:

The Sequesterant System. Just prior to installation, groundwater testing revealed that calcium and magnesium concentrations were high enough to cause scaling. Preventive systems ranged from $500 to $10,000. The $500 option, a dissolving block system, was selected but the vendor did not provide a compatible system. After two false starts, the vendor resolved the problem and provided the correct block system.

The Pneumatic Transfer Pump. The vendor for the treatment system provided a pneumatic pump that required lubrication but did not provide a method to lubricate it. When the pump quit, it was replaced. When the second pump quit, BEI consulted the pump manufacturer and the vendor for the treatment system and diagnosed the lack of lubrication. A lubrication system was added and the problem was corrected.

Power Surges. A power surge hit the system during an electrical storm and damaged the motor for the air stripper transfer pump and the float controller for the air stripper. The specifications required that a surge protector be provided, but the vendor had omitted it. The vendor provided a surge protector and replaced the damaged motor and float assembly under warranty.

Extraction Well Biofouling

After approximately two months of operation, a black slime began growing in the wells and covered the pumps and equipment. The concern was that if the growth of this biomass continued, it could reduce the flowrates of groundwater into the wells and also clog the treatment system. The solution was to add hydrogen peroxide to the wells once a month to control the biofouling.

10.6.4 Site Restoration

The site was graded with the backhoe and the excavated material (rock) from the trenches was spread on top of the recharge gallery area. The NTR expressed concern that the rocks would be a problem for mowing operations. The area was regraded and the rocks removed and stockpiled behind the jet blast deflector.

10.7 TREATMENT SYSTEM SAMPLING AND AS-BUILT DRAWINGS

Samples were collected of the influent and effluent of the SWMU-9 system weekly for the first month of operations and monthly thereafter. Figures 10-5, 10-6, 10-7 and 10-8 illustrate the changes in concentrations during system operation. A copy of the complete analytical results is contained in Volume II.

One objective of the SWMU-9 system was to capture the free product that is present. The system maintained hydraulic control of the site during operation, but did not recover any free product.

As-Built Drawings are included in Attachment 10-1.

10.8 APPROVAL OF COMPLETED IRA

10.8.1 Regulatory Agency

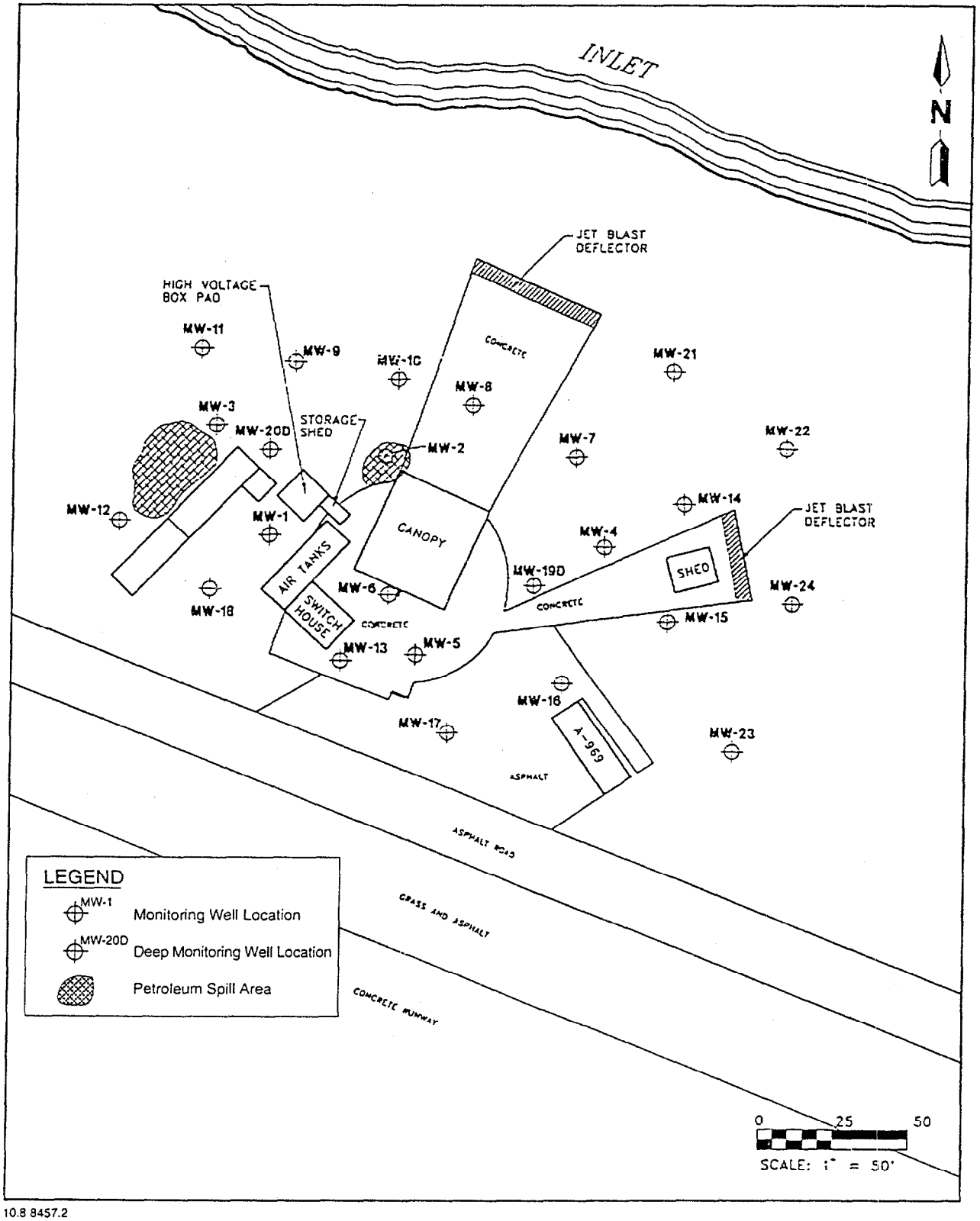
On June 16, 1997 the Key West Tier I Partnering Team which includes representatives from EPA and FDEP reviewed the results to date for the performance of the SWMU-9 Treatment System. Consensus was reached that the treatment system had successfully met its interim action goals and its operation should cease. The site will now proceed into the Corrective Measures Study phase. [108]

10.8.2 Navy / NTR Approval

The Certificate of Substantial Completion was not obtained.

10.9 PHOTOGRAPHS

The completion poster, Attachment 10-2, provides a photographic record of the site.



10.8 8457.2

FIGURE 10-1
SWMU-9 Site Plan

TABLE 10-1. SWMU-9 GROUNDWATER CLEANUP GOALS

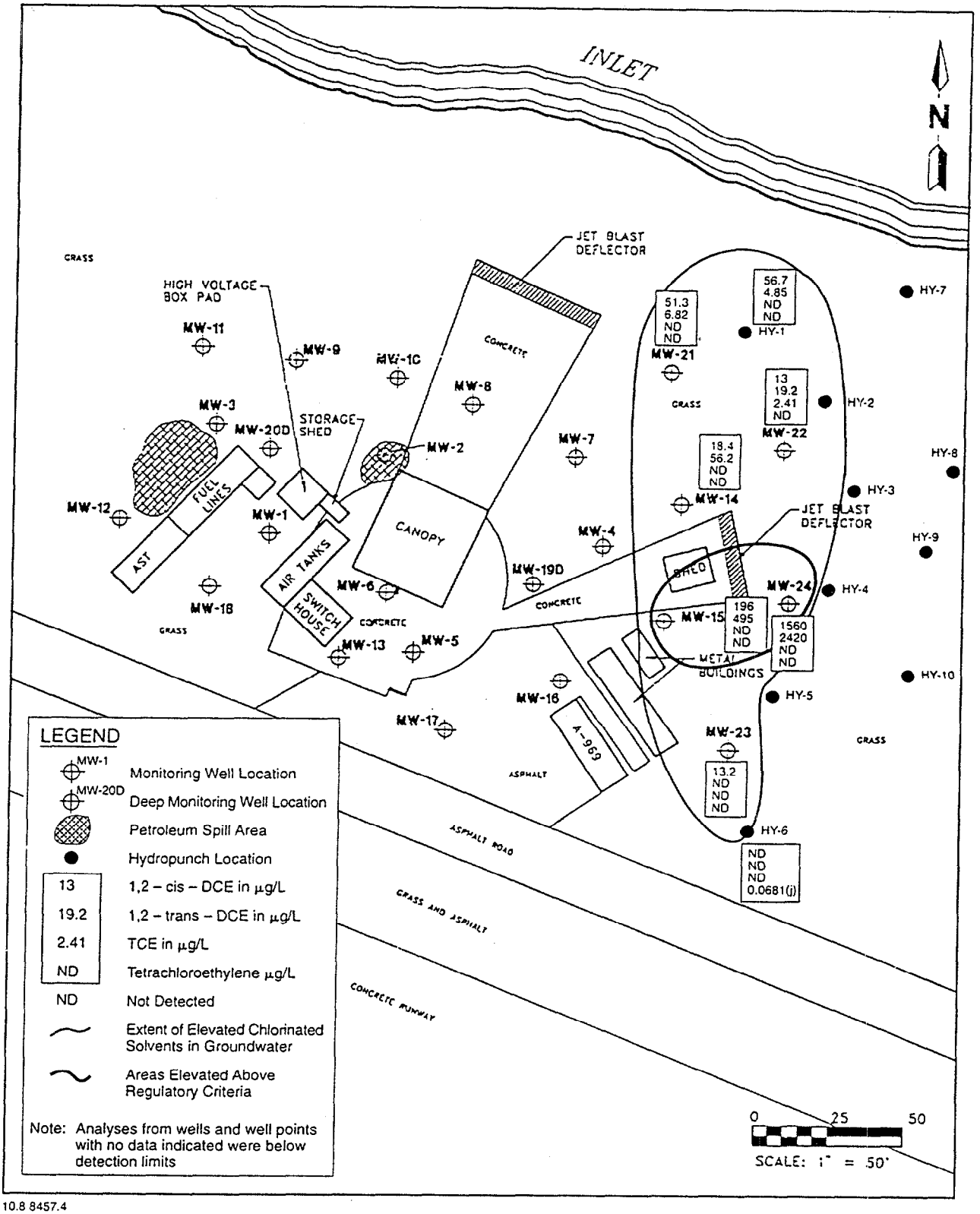
Contaminant	Cleanup Standard	Reference
Total Naphthalenes	100 ppb	Petroleum Contaminated Site Cleanup Levels for G-II Groundwater 62.770.310 FAC
TRPH	5000 ppb	Petroleum Contaminated Site Cleanup Levels for G-II Groundwater 62.770.310 FAC
cis 1,2-DCE	70 ppb	Maximum Contaminant Level - Primary Drinking Water Standard 62.550.520 FAC
trans 1,2-DCE	100 ppb	Maximum Contaminant Level - Primary Drinking Water Standard 62.550.520 FAC
TCE	3 ppb	Maximum Contaminant Level - Primary Drinking Water Standard 62.550.520 FAC

Table 10-2 - SWMU-9 SUMMARY OF GROUNDWATER ANALYTICAL RESULTS

		MW-2		MW-3		MW-4		MW-5	
		DATES		DATES		DATES		DATES	
COMPOUND	APPLIED STANDARD	OCT. 1993	JUN. 1995	OCT. 1993	JUN. 1995	OCT. 1993	JUN. 1995	FEB. 1994	JUN. 1995
Total Napthalenes	100 ppb	226	69	19	ND	198	Floating Product	340	Floating Product
TRPH	5000 ppm	1000	ND	2000	1120	8000		46000	
cis 1,2-DCE	70 ppb	ND	ND	ND	ND	ND		ND	
trans 1,2-DCE	100 ppb	ND	ND	ND	ND	ND		ND	
TCE	3 ppb	ND	ND	ND	ND	ND		ND	

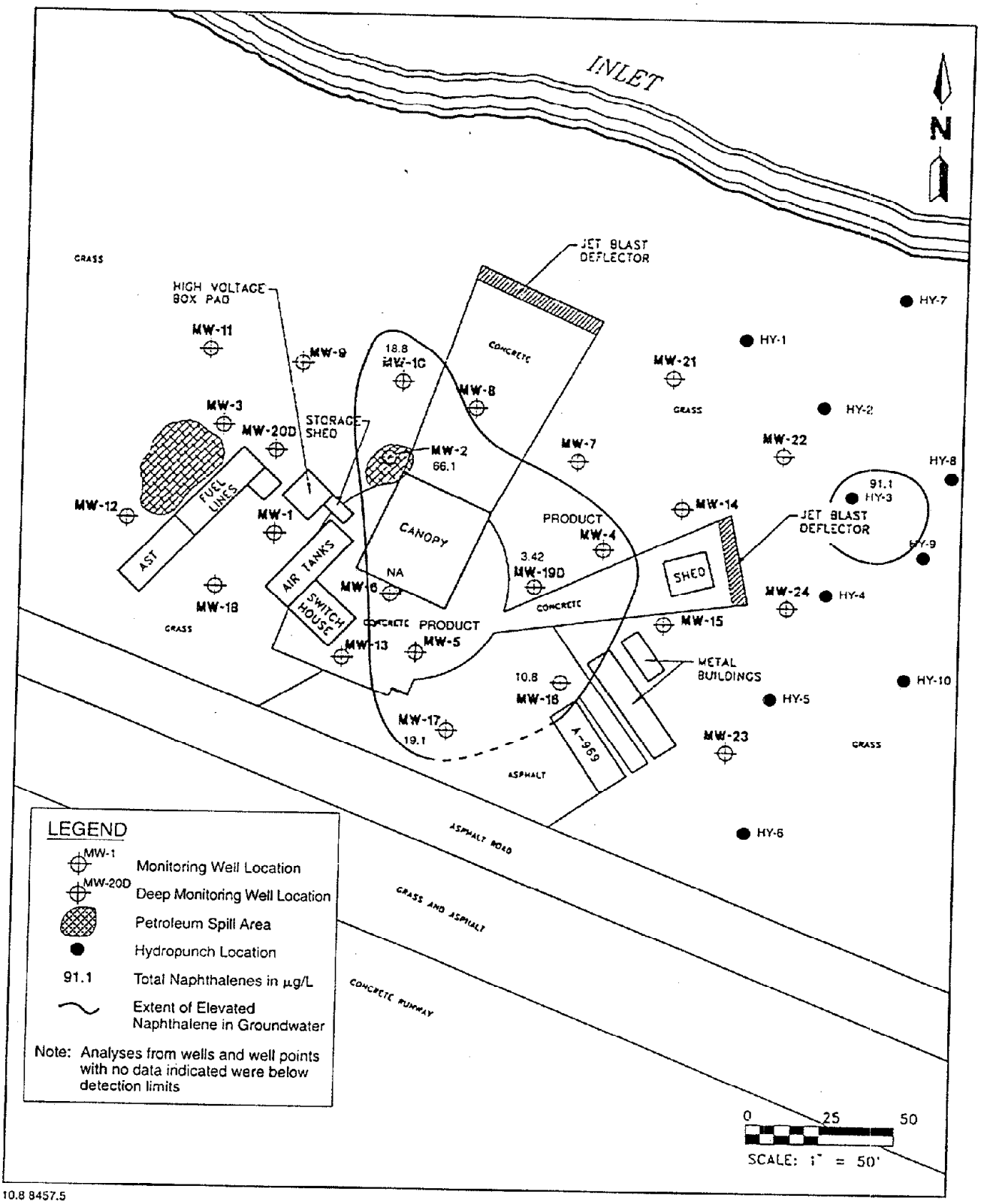
		MW-14					MW-15				
		DATES					DATES				
COMPOUND	APPLIED STANDARD	OCT. 1993	DEC. 1993	JAN. 1994	FEB. 1994	JUN. 1995	OCT. 1993	DEC. 1993	JAN. 1994	FEB. 1994	JUN. 1995
Total Napthalenes	100 ppb	ND	NA	NA	NA	ND	ND	NA	NA	NA	ND
TRPH	5000 ppm	ND	NA	NA	NA	ND	ND	NA	NA	NA	ND
cis 1,2-DCE	70 ppb	11	480	54	74	18.4	9	980	160	120	196
trans 1,2-DCE	100 ppb	24	1400	76	190	56.2	17	2800	170	280	495
TCE	3 ppb	ND	ND	ND	ND	ND	ND	41	2	1.8	ND

		MW-21		MW-22		MW-23		MW-24		HY-1	HY-3
		DATES		DATES		DATES		DATES		DATE	DATE
COMPOUND	APPLIED STANDARD	FEB. 1994	JUN. 1995	FEB. 1994	JUN. 1995	FEB. 1994	JUN. 1995	FEB. 1994	JUN. 1995	JUL. 1995	JUL. 1995
Total Napthalenes	100 ppb	NA	ND	NA	ND	NA	ND	NA	ND	ND	91.1
TRPH	5000 ppm	NA	ND	NA	ND	NA	ND	NA	ND	ND	ND
cis 1,2-DCE	70 ppb	73	51.3	4.2	13	ND	13.2	770	1560	56.7	ND
trans 1,2-DCE	100 ppb	6.6	6.8	4.6	19.2	ND	ND	890	2420	4.6	ND
TCE	3 ppb	ND	ND	ND	2.4	ND	ND	2.4	ND	ND	ND



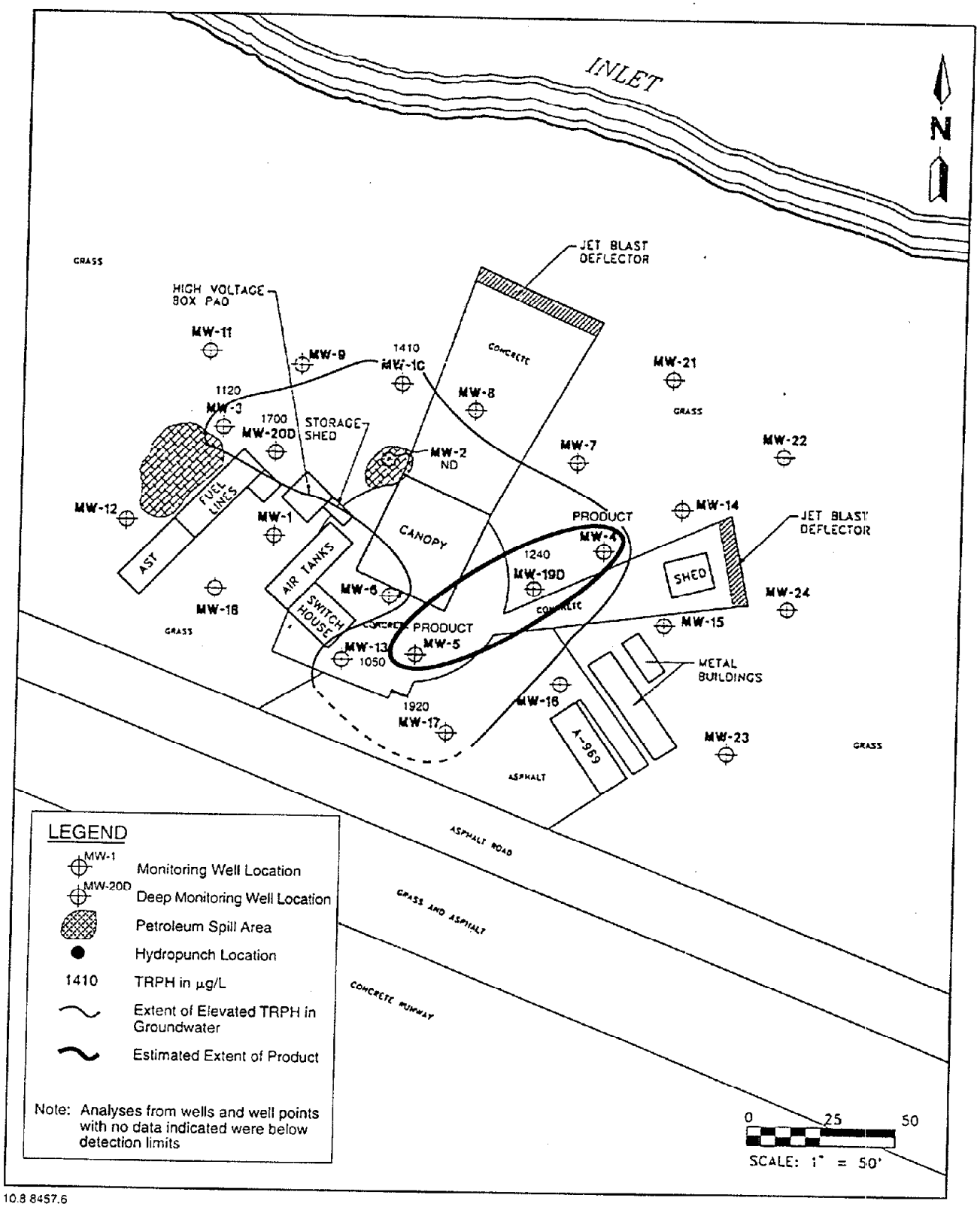
10.8 8457.4

FIGURE 10-2
Extent of Chlorinated Solvents in Groundwater



10.8 8457.5

FIGURE 10-3
Extent of Elevated Naphthalene in Groundwater



10.8 8457.6

FIGURE 10-4
Extent of TRPH in Groundwater

Figure 10-5 SWMU-9 Groundwater Treatment Results cis 1,2-DCE

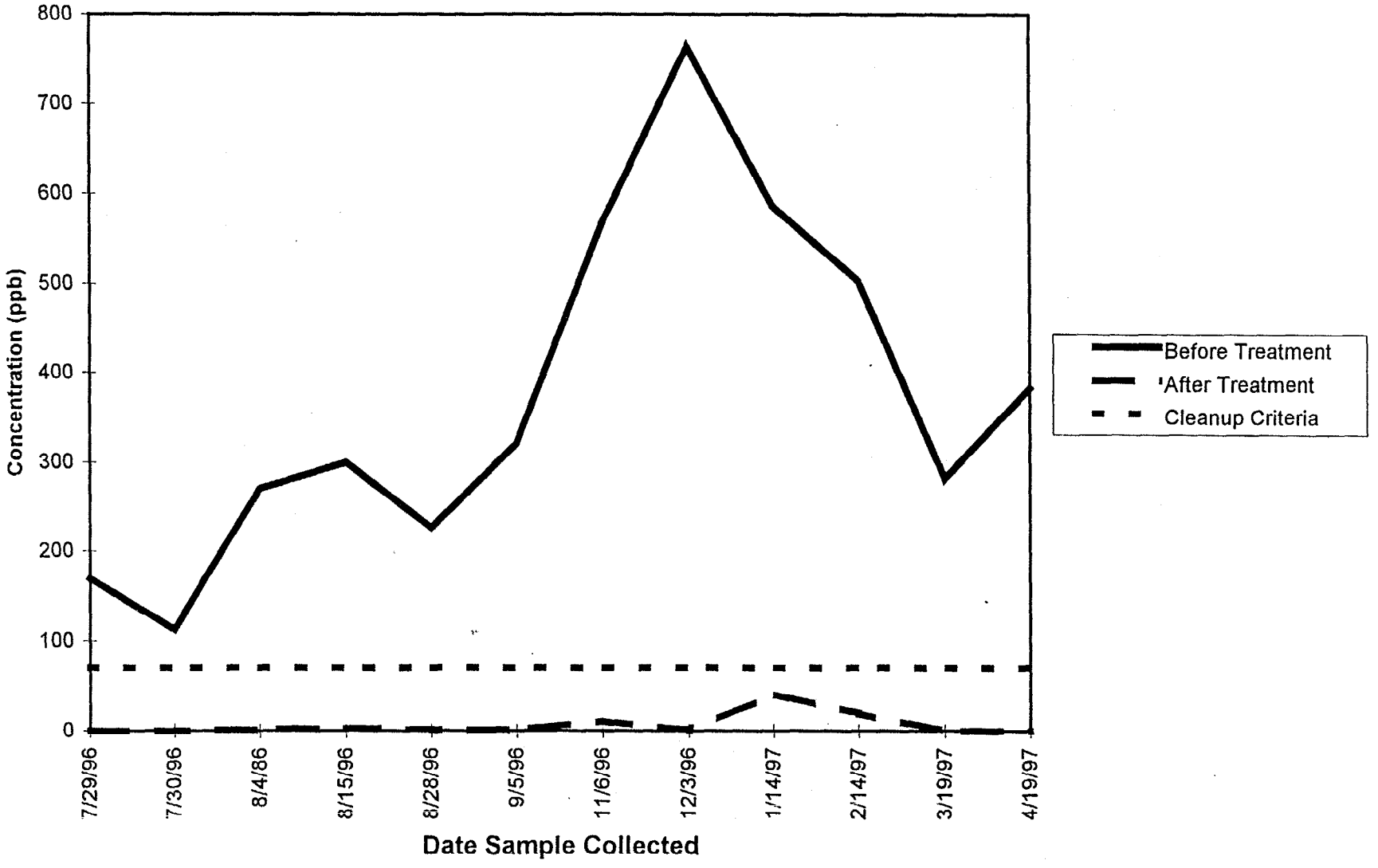


Figure 10-6 SWMU-9 Groundwater Treatment Results - trans 1,2-DCE

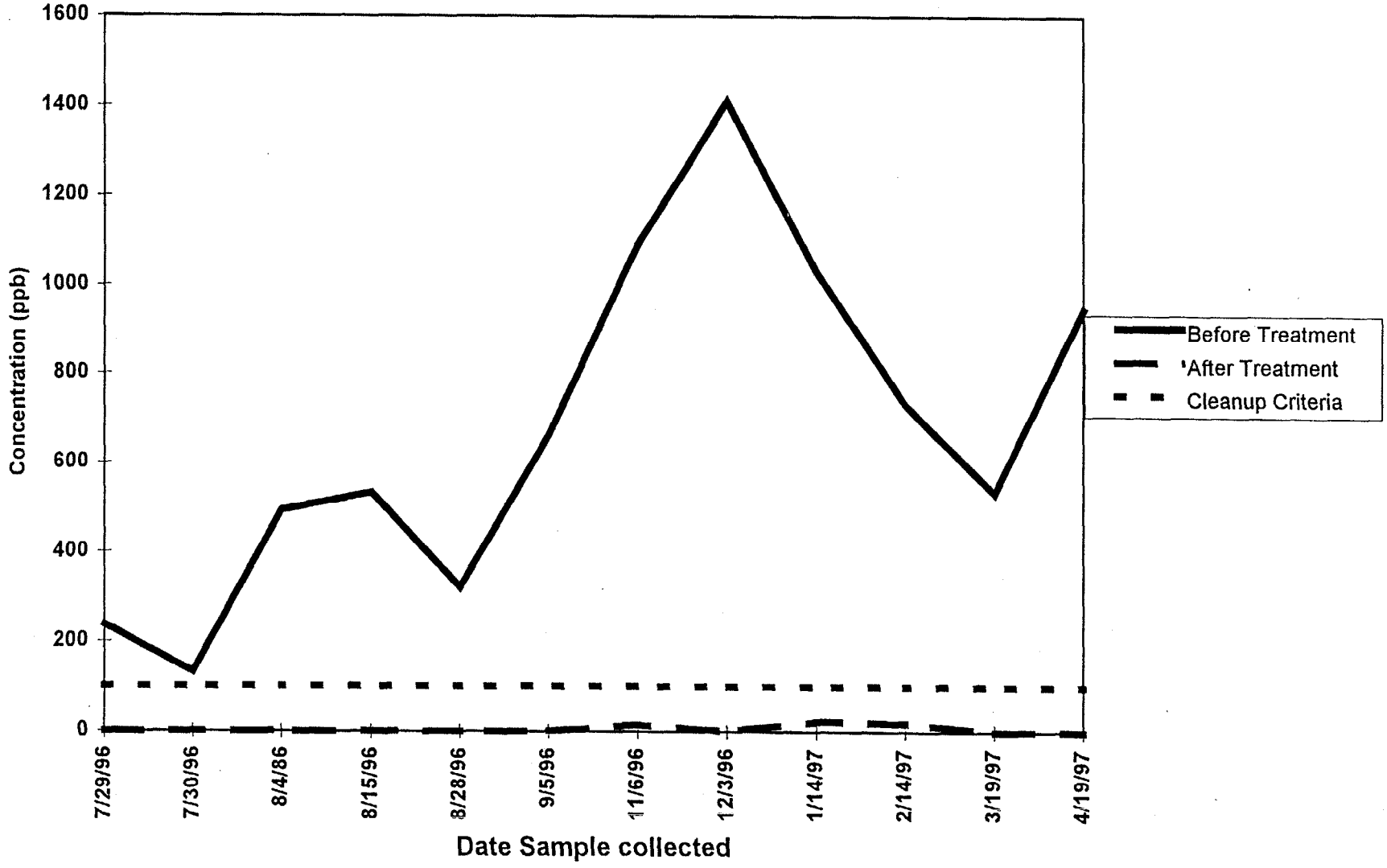


Figure 10-7 SWMU-9 Groundwater Treatment Results - TCE

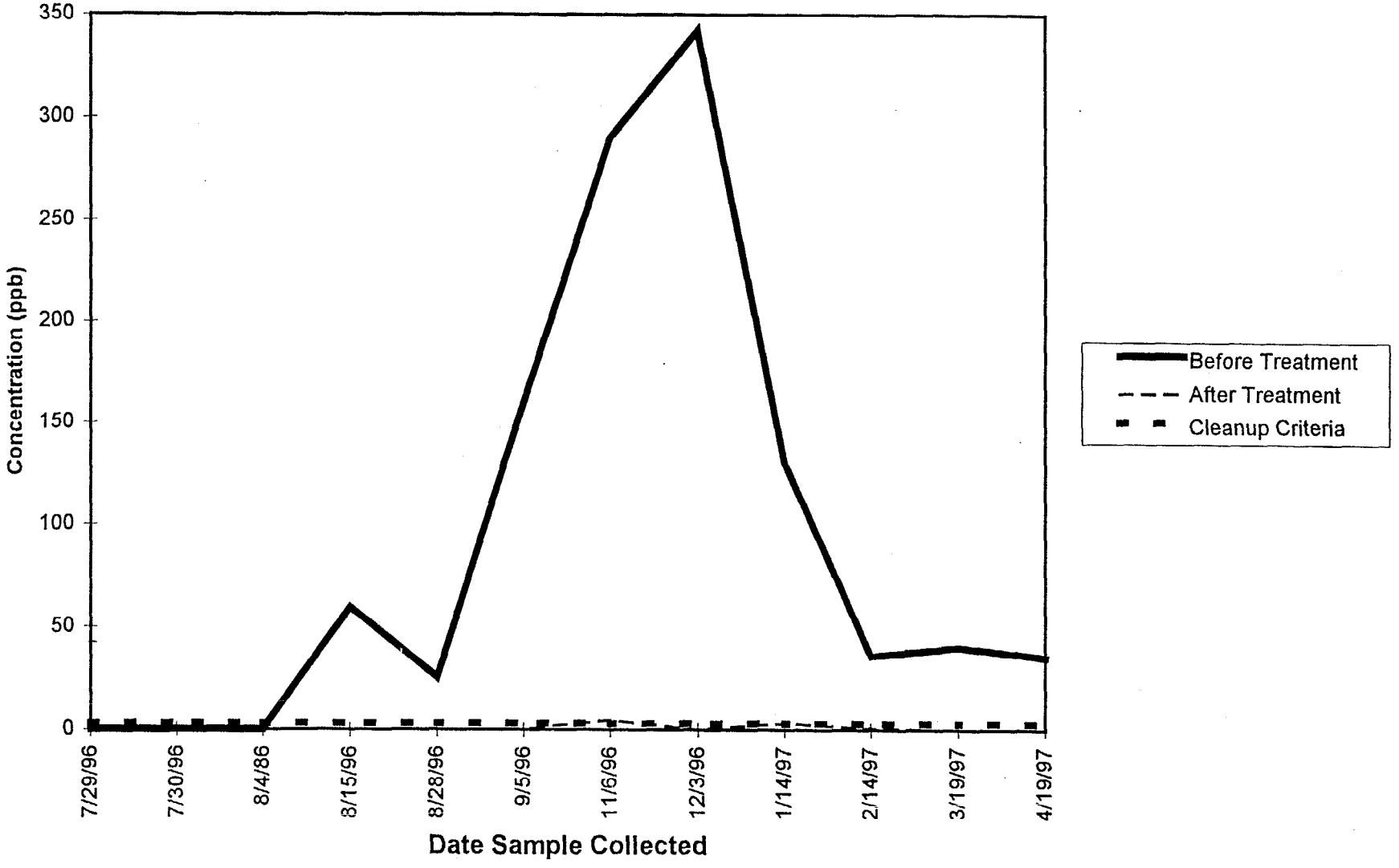
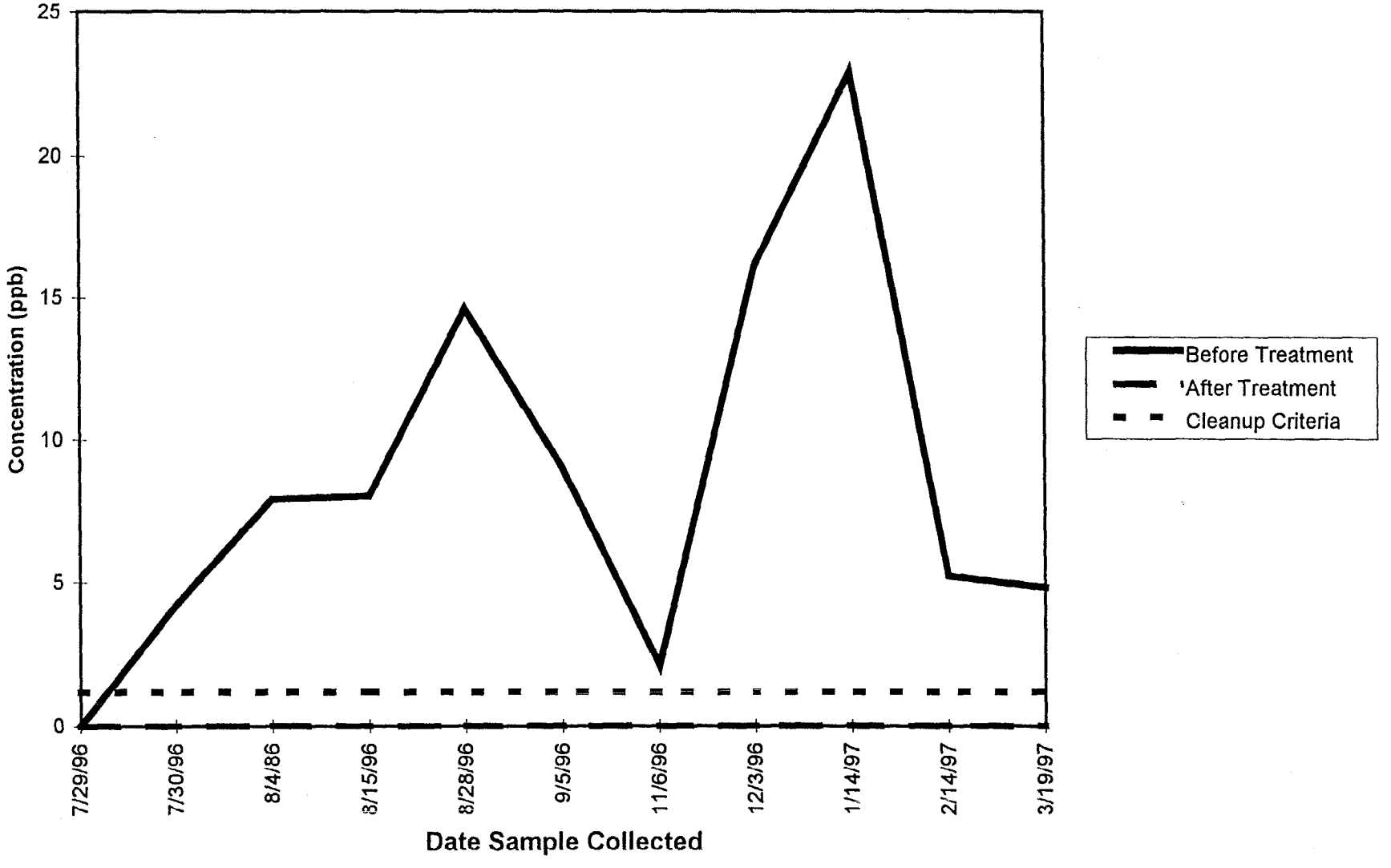
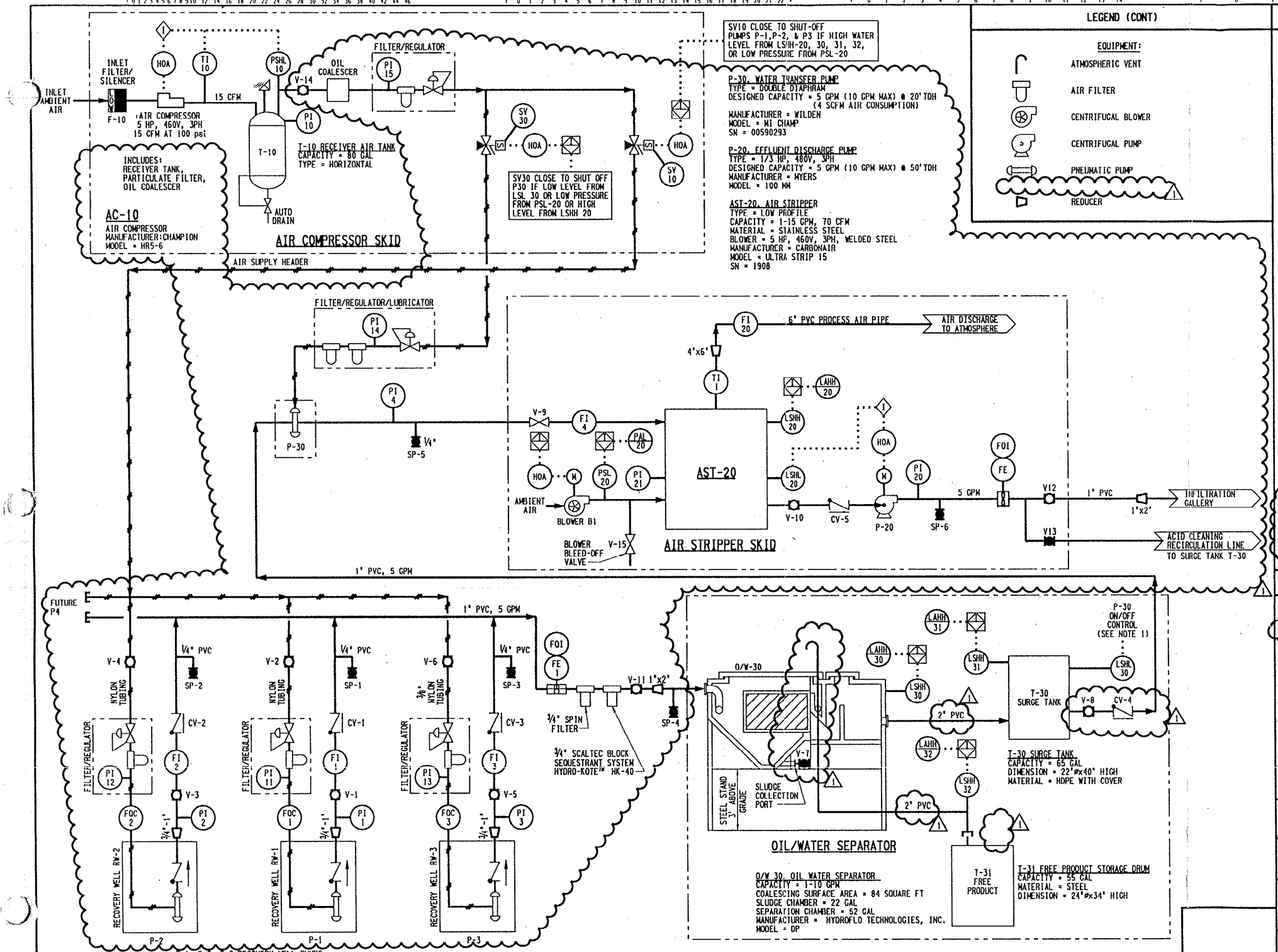


Figure 10-8 SWMU-9 Groundwater Treatment Results - Benzene



Attachment 10-1

As-Built Drawings



LEGEND (CONT)

EQUIPMENT:

- ATMOSPHERIC VENT
- AIR FILTER
- CENTRIFUGAL BLOWER
- CENTRIFUGAL PUMP
- PNEUMATIC PUMP
- REDUCER

LEGEND

INSTRUMENTATION:

- INSTRUMENT FOR SIGNAL MEASURED VARIABLE (LOCALLY MOUNTED)
- INSTRUMENT FOR SIGNAL MEASURED VARIABLE (PANEL MOUNTED)
- FE — FLOW ELEMENT, POSITIVE DISPLACEMENT

SIGNALS AND LINES:

- PRIMARY LIQUID PROCESS OR MECHANICAL LINK
- PNEUMATIC LINE
- ELECTRICAL SIGNAL
- VENDOR PACKAGED EQUIPMENT
- PLC ELECTRICAL INTERLOCK/INPUT
- ELECTRICAL INTERLOCK

VALVES AND ACTUATORS:

- BALL VALVE, NORMALLY OPEN
- BALL VALVE, NORMALLY CLOSED
- CHECK VALVE
- PRESSURE RELIEF VALVE
- GATE VALVE
- HAND RESET, 3-WAY SOLENOID VALVE
- PRESSURE CONTROL VALVE, DIAPHRAM ACTIVATED

CV - CHECK VALVE
FI - FLOW INDICATOR
FQC - FLOW COUNTER
FQI - TOTALIZING FLOW METER
HOA - HAND/OFF/AUTO
LA - LOCAL ALARM (HIGH/LOW)
LSL - LEVEL SWITCH LOW
PI - PRESSURE INDICATOR
PSL - PRESSURE SWITCH LOW
SP - SAMPLING PORT
TI - TEMPERATURE INDICATOR
V - VALVE
SV - SOLENOID VALVE

NOTES

1. ALL INTERLOCKS ARE FIELD WIRED EXCEPT AIR COMPRESSOR AND AIR STRIPPER BLOWER.
2. ALL FILTER/REGULATOR ASSEMBLIES HAVE AUTO DRAINS.

NO.	DATE	REVISIONS	BY	CHKR	DESIGN APP	ENGR	PROJ ENGR	MFG REP
1	3/10/97	AS-BUILT	JEB	EMB	JRM	ADJ	RLH	
0	4/12/96	ISSUED FOR CONSTRUCTION	JEB	WRZ	JMC	ADJ	RLH	

SCALE NONE — 22567/321/DD576001.DGN

BECHTEL ENVIRONMENTAL INC.
OAK RIDGE, TENNESSEE

DEPARTMENT OF THE NAVY
SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND
CHARLESTON, SOUTH CAROLINA

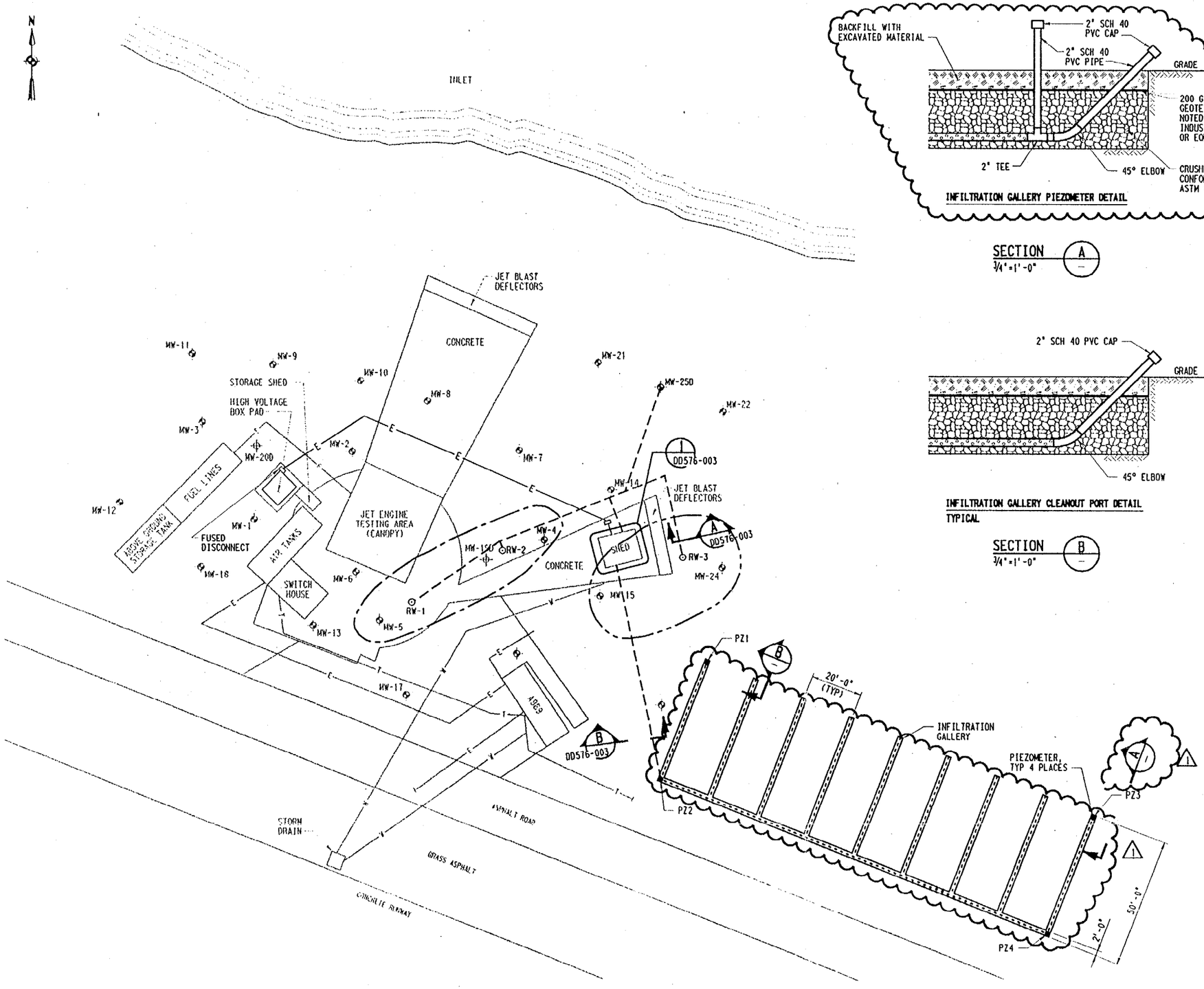
SWMU-9 GROUNDWATER TREATMENT SYSTEM
PIPING AND INSTRUMENTATION DIAGRAM

JOB NO.	DRAWING NO.	REV
22567	321-DD576-001	1

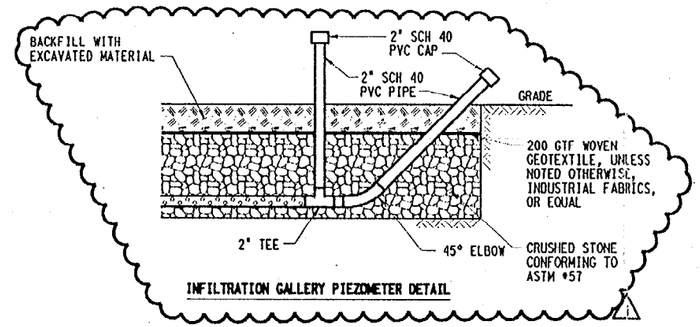
ROY E. HOEKSTRA
FLORIDA PE # 49690
EXPIRES FEBRUARY 28, 1997

SEAL

22 x 34



SITE PLAN
1"=20'



INFILTRATION GALLERY PIEZOMETER DETAIL

SECTION A
3/4"=1'-0"

INFILTRATION GALLERY CLEANOUT PORT DETAIL
TYPICAL

SECTION B
3/4"=1'-0"

NOTES

1. PHYSICAL VERIFICATION OF EXISTING UNDERGROUND UTILITIES SHALL BE DONE PRIOR TO ANY EXCAVATION.

REFERENCE DRAWINGS

SWMU-9 GROUNDWATER TREATMENT SYSTEM PIPING AND INSTRUMENTATION DIAGRAM	321-DD576-001
SWMU-9 GROUNDWATER TREATMENT SYSTEM SECTIONS AND DETAILS	321-DD576-003

LEGEND

- EXISTING MONITORING WELL
- EXISTING DEEP MONITORING WELL
- RECOVERY WELL
- DEEP MONITORING/RECOVERY WELL
- EXTENT OF ELEVATED CHLORINATED SOLVENTS IN GROUNDWATER
- EXTENT OF FREE PRODUCT
- EXISTING ABOVE GROUND FUEL LINE
- EXISTING UNDERGROUND WATER LINE
- EXISTING UNDERGROUND ELECTRIC LINE
- EXISTING UNDERGROUND TELEPHONE
- UNDERGROUND GROUNDWATER LINE
- UNDERGROUND ELECTRICAL LINE
- UNDERGROUND PERFORATED LINE
- PZ — PIEZOMETER WELL

0 20 40 60
1"=20'

NO.	DATE	REVISIONS	BY	CHKD	PROJ ENGR	ENGR	PROJ ENGR	MECH ENGR
1	3/10/97	AS-BUILT	JED	FMB	JRM	ABJ	RLH	
0	2/12/96	ISSUED FOR CONSTRUCTION	JED	WRZ	TMC	ABJ	RLH	

SCALE NOTED — 22567/321/DD576002.DGN

BECHTEL ENVIRONMENTAL INC.
OAK RIDGE, TENNESSEE

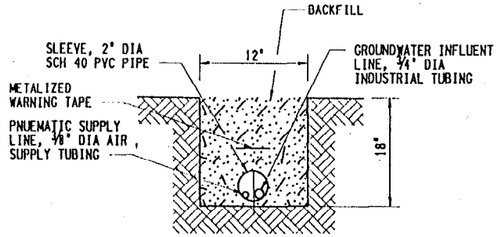
DEPARTMENT OF THE NAVY
SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND
CHARLESTON, SOUTH CAROLINA

SWMU-9 GROUNDWATER TREATMENT SYSTEM
SITE LAYOUT PLAN

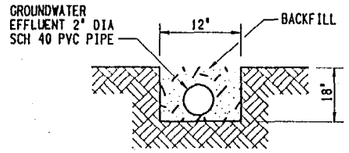
JOB NO.	DRAWING NO.	REV
22567	321-DD576-002	1

R. E. HOEKSTRA
FLORIDA PE #49690
EXPIRES FEBRUARY 28, 1997

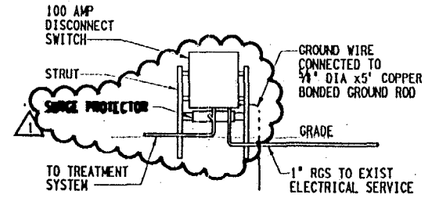
SEAL



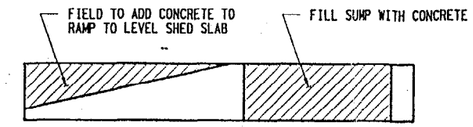
SECTION A
NTS
DD576-002



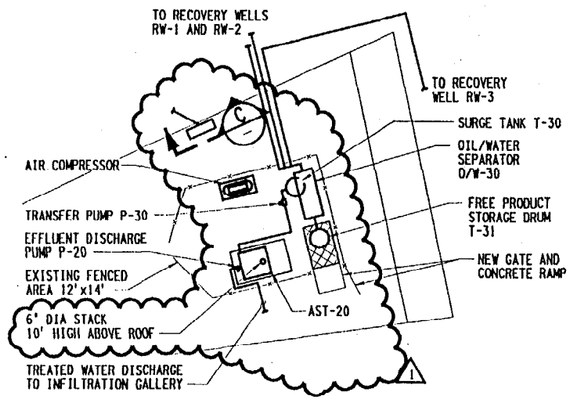
SECTION B
NTS
DD576-002



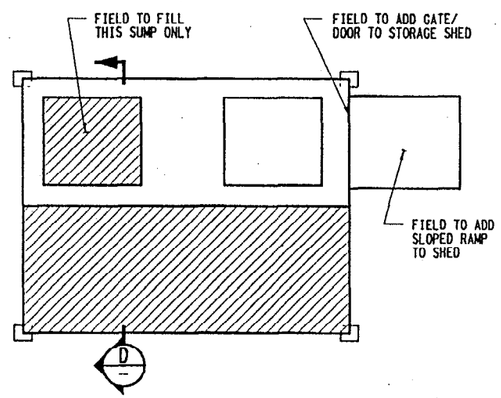
SECTION C
NTS



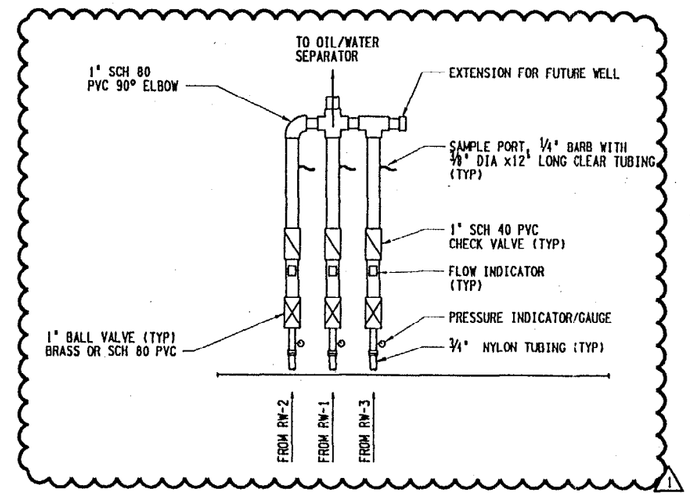
SECTION D
NTS



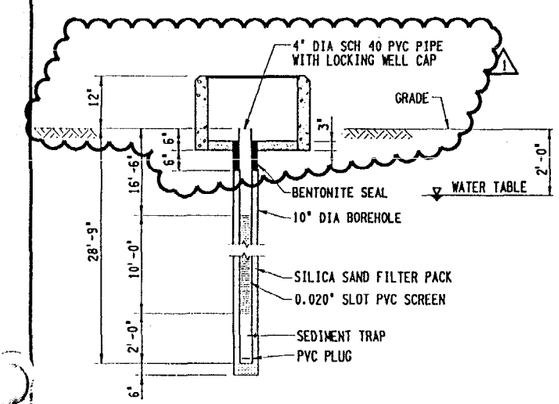
DETAIL 1
⅛"=1'-0"
DD576-002



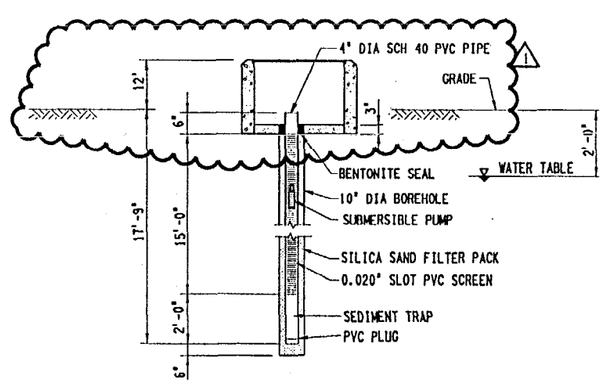
SHED SLAB MODIFICATION DETAIL
NTS



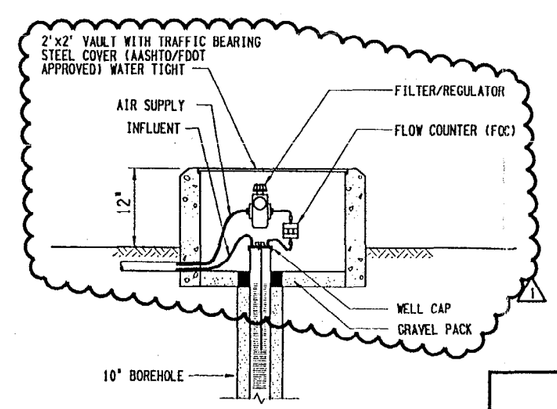
INFLUENT HEADER DETAIL
NTS



MW-25D MONITORING WELL DETAIL
NTS



RECOVERY WELL DETAIL
NTS



RECOVERY WELL VAULT DETAIL
NTS

R. E. HOEKSTRA
FLORIDA PE #49690
EXPIRES FEBRUARY 28, 1997

SEAL

NOTES

1. PHYSICAL VERIFICATION OF EXISTING UNDERGROUND UTILITIES SHALL BE DONE PRIOR TO ANY EXCAVATION.
2. METALIZED POLYETHYLENE PLASTIC DETECTABLE WARNING TAPE SHALL BE INSTALLED IN TRENCHING OVER PIPING.
3. TRENCHES SHALL BE BACKFILLED WITH EXCAVATED SOIL. MATERIAL ADJACENT TO PIPING SHALL NOT HAVE ANY STONES OR OBJECTS GREATER THAN ½" DIAMETER.
4. ALL ELECTRICAL WORK SHALL BE IN ACCORDANCE WITH THE LATEST REVISION OF THE NATIONAL ELECTRICAL CODE.

REFERENCE DRAWINGS

SWMU-9 GROUNDWATER TREATMENT SYSTEM PIPING AND INSTRUMENTATION DIAGRAM	321-00576-001
SWMU-9 GROUNDWATER TREATMENT SYSTEM SITE LAYOUT PLAN	321-00576-002

LEGEND

NO.	DATE	REVISIONS	BY	CHKR	DESIGN MGR	ENGR	PROJ ENGR	METHOD ENGR
1	3/10/97	AS BUILT	JFD	FMB	JRM	ABJ	RFH	
0	4/12/96	ISSUED FOR CONSTRUCTION	JFD	WRZ	TMC	ABJ	RFH	

SCALE NOTED — 22567/321/00576003.DGN

BECHTEL ENVIRONMENTAL INC.
OAK RIDGE, TENNESSEE

DEPARTMENT OF THE NAVY
SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND
CHARLESTON, SOUTH CAROLINA

SWMU-9 GROUNDWATER TREATMENT SYSTEM
SECTIONS AND DETAILS

JOB NO.	DRAWING NO.	REV
22567	321-DD576-003	1

Attachment 10-2

Completion Poster

Remedial Action Update

NAS Key West

Naval Facilities Engineering Command, Southern Division

At Naval Air Station (NAS) Key West, Florida, an Interim Remedial Action (IRA) is underway at the Jet Engine Test Cell. This IRA is being conducted as part of the Navy's Installation Restoration Program. A pump and treat system was installed to prevent groundwater contamination from spreading to an adjacent lagoon.

Description of the Problem

A contamination assessment, performed to investigate a known fuel spill, identified areas of JP-5 free product and a dissolved plume of chlorinated solvent. More recent sampling at the site confirmed the presence of these contaminants, and an IRA was proposed to prevent them from spreading to the adjacent lagoon.

How the Problem Was Addressed

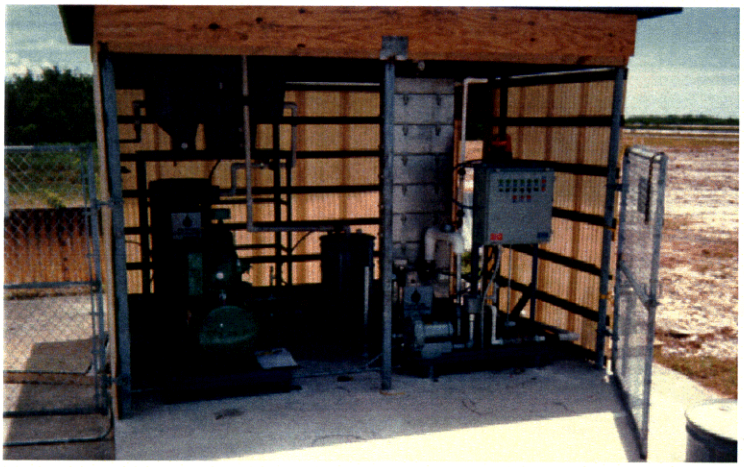
Natural attenuation was considered, but rejected because it could not assure protection of the lagoon. In July 1996, a pump and treat system was installed to address both contaminants. Two extraction wells were placed in the JP-5 plume and one in the solvent plume. An oil water separator and air stripper were installed to treat extracted groundwater and a recharge gallery was developed to return treated water to the ground. Pumping rates were designed to contain the plumes and prevent spreading. The system is expected to be operational at least through 1997. Close coordination with EPA and state regulators occurred throughout the planning process.

Treatment Results

This system has been operational since August 1996. System maintenance and testing of the extracted groundwater was performed weekly for the first month and monthly thereafter. Following start-up adjustments, test results show that the system is consistently reducing solvent concentrations to below cleanup goals; however, the amount of free product recovered has been less than anticipated. Tests of groundwater elevations indicate the pumping has achieved hydraulic containment.

Savings Realized

- Use of local contractors and direct hire personnel to install the system was faster and less expensive, as compared to a specialty installation contractor. Savings estimated at $5,000.
- Use of BOQ facilities, discount airfares, and combined trips saved more than $7,500.
- The number of sampling analytes has been reduced based on favorable test results, saving $500 per month in lab cost.



Participants (ABB Environmental Services, Inc.; Bechtel Environmental, Inc.; Florida Department of Environmental Protection; Environmental Protection Agency; Naval Facilities Engineering Command, Southern Division)

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11 IR-8: FLEMING KEY SOUTH LANDFILL

11.1 SITE DESCRIPTION

The Fleming Key South Landfill covers approximately 45 acres of the southern end of Fleming Key and is shown in Figure 11-1. The City of Key West Sewage Treatment Plant borders the southeastern portion of the site. A munitions storage area is located along the east boundary. Man of War Harbor borders the remainder of the site. Dense vegetation covers most of the site with Australian pine being the most prevalent species. The southwestern area of the site contained piles of metal debris (heavy equipment, marine equipment, etc.) as well as construction debris. There was a bus, buoys, trailers etc. along the northwestern portion of the landfill. There was visible erosion of the beach areas and waste material (primary concrete construction debris, corroded scrap iron and ashes from past waste disposal activities) was exposed to the surface waters along all shorelines.

As much as 8000 tons of wastes were reportedly disposed of at the landfill annually between 1962 and 1982. The open trench disposal method was practiced at this site, with the trenches typically being 25 feet long, 10 feet deep and 500 to 1000 feet long. Combustible wastes were taken to the western portion of the site and burned. The groundwater, soils and sediments have been adversely impacted by waste disposal practices at this site.

11.2 CLEANUP OBJECTIVE

11.2.1 Contaminant of Concern

The primary contaminant of concern at the site was identified as metals. Other contaminants such as pesticides, PCBs, and SVOCs were detected in soil and sediment samples. Sampling prior to the IRA indicated that the groundwater has been impacted primary by metals. [2]

11.2.2 Cleanup Type & Criteria

The IRA objective at the IR-8 Fleming Key South Landfill was to establish a stable shoreline along the landfill perimeter to prevent debris from being washed into the harbor by erosion. A secondary objective was to improve the appearance of the shoreline, which is visible from the City of Key West. [26, 109] This objective was accomplished by completing the following tasks:

- removal of visible rubble and debris from shoreline.
- cut back and modify shoreline as necessary.
- installation of shoreline protection to prevent further erosion of the banks.

11.3 CLEANUP TECHNOLOGY

11.3.1 Technology Selection

Removal of debris and the installation of a shoreline protection system were the only alternatives considered for this IRA for IR-8.

11.3.2 Workplan

The scope of work consisted of the following elements:

- Design of a shoreline structure that can withstand a saltwater environment for a period of 50 years. The structure was also designed for a 50-yr wave and 50-yr storm surge.
- Installation of temporary erosion and sediment control barriers around the work area.
- Removal of debris along the shoreline.
- Excavation and backfill of the shoreline slope (as required).
- Installation of the shoreline protection structure.
- Removal of temporary erosion and sediment control structures.
- Revegetation with native species.

PPR 321-011 was written to corporate the final design of the shoreline protection system into the workplan. [109] The final design also incorporated all wetland permit requirements.

11.4 REGULATORY AGENCY APPROVAL

11.4.1 EPA & FDEP

The following agreements were made during the planning process:

- Conferees at the August, 1994, Regulatory meeting agreed to the remedial action of installing a seawall. [32]
- Conferees at the NRT meeting in April, 1995, agreed with the proposed remedial action as detailed in the workplan. [37]

11.4.2 Natural Resources Permits and Protection of Natural Resources

Installation of the shoreline protection system at IR-8 involved excavation in wetland areas. Permits were required from the State of Florida and U. S. Army Corps of Engineers (USACE). The Bechtel Project Manager was designated as agent for the Naval Air Station for purposes of obtaining the necessary permits.

Upon issuance of the permits, a binder [110] was prepared for use by the construction team on site that contained the permit application, permits and correspondence relating to the permits. The following is a chronology of the permitting process for the IR-8 shoreline protection system:

1. Bechtel conducted an onsite orientation meeting with the permitting agencies on July 30, 1996. [111] Representatives of FDEP, Florida Department of Community Affairs (FDCA), the Navy and Bechtel met at Key West to provide the permitting agencies an opportunity to review the preliminary design, identify potential problems and provide input to the Navy and Bechtel. The USACE was invited to the meeting, but did not attend.
2. USACE notified NAS Key West, on August 27, 1996, that Department of the Army authorization was required prior to the installation of the shoreline protection system. [112]
3. Bechtel sent the Permit Application and proposed design to FDEP for their review and approval on October 3, 1996. [113] FDEP forwarded the Permit Application to the USACE.
4. Comments were received by FDEP from FDCA on November 22, 1996. These comments expressed FDCA's desire to have more native species planted than proposed in the permit application. [114] The request for additional plantings were discussed with FDEP. FDEP

accepted the proposed number of native species planting and did not require more to be planted.

5. FDEP issued Permit Number 442959285 on December 3, 1996. [115]
6. The approved FDEP Permit Number 442959285 was forwarded to the USACE on December 9, 1996. [116]
7. USACE issued public notice for Permit Application 199604865 (IP-EJ) on January 7, 1997. [117]
8. USACE received a request from the National Marine Fisheries Service (NMFS) on January 29, 1997 that red mangroves be planted along the entire 1800 feet length of the shoreline protection system instead of the 300 feet that were included in the permit application. [118]
9. Bechtel responded to USACE about the NMFS concerns and request for additional plantings on February 4, 1997. [119] Bechtel's response detailed the existing conditions at the site and planned improvements to the site with the installation of the shoreline protection system.
10. Bechtel requested on February 4, 1997 that FDEP modify its permit to allow the slope to change from 2:1 to 3:1 for slope stability. [120] A copy of this request was also forwarded to the USACE.
11. FDEP approves permit modification for the slope change on February 7, 1997. [121]
12. A draft USACE permit dated February 11, 1997 is received. [122] This draft required the planting of mangroves along the entire length of the shoreline. The estimated cost of planting the additional mangroves was $25,000. [123]
13. The USACE issued Permit Number 199604865 on March 5, 1997. [124] The additional mangrove plantings were not included in the issued permit. As a result of extensive discussion and negotiation with the USACE the requirement to plant mangroves along the entire length of the Shoreline Protection System was removed. The USACE agreed that the revegetation plan, as proposed in the design, was a significant improvement over existing conditions and that additional mitigation was not required.
14. Bechtel submitted documentation required by the permits as follows:
    - The Construction Commencement Notice was sent to FDEP on March 5, 1997 [125] and to USACE on March 10, 1997. [126]
    - Construction complete notification was sent on September 2, 1997 to FDEP [127] and to USACE. [128]
    - "As Built" Certification [Form No. 62-343.900(5). F.A.C.] was forwarded to FDEP on September 11, 1997. [129]
    - FDEP's *Request for transfer of Environmental Resource Permit Construction Phase to Operation Phase* was forwarded to FDEP on February 23, 1998. [130]

The key concerns expressed by the permitting authorities were as follows:

- Remove all exotic plants (e. g.) Brazilian pepper, punk, Australian pine, and leatherwood within the area of construction.
- Turbidity barriers shall remain in place until any generated turbidity subsides.
- Spoil materials shall be stockpiled on uplands to prevent runoff into waters of the State.
- Provide a filter cloth underlining the riprap and block.
- All work must be done landward of existing seagrass communities.
- The seaward toe of the shoreline could extent no more than 10 feet seaward of the mean high water line.

- Provide sea purslane and red mangroves for revegetation.

These concerns were addressed in the workplan and subsequent PPR 31-011 [26, 109].

11.5 EXECUTION OF WORK

11.5.1 Site Mobilization

In order to expedite start of work and avoid delay cost, Bechtel authorized its subcontractor to mobilize to the site on February 25, 1997. However, work was limited to areas above the Mean High Water Level until issuance of the USACE permit.

11.5.2 Dates and Significant Events

- 25 Feb 97 — Mobilized equipment to the site. Site orientation meetings held.
- 26 Feb 97 — Started clearing, grubbing and upgrading access roads.
- 05 Mar 97 — Started lay out of baseline for the shoreline system. Received USACE permit authorizing work in the wetland and along the shore.
- 12 Mar 97 — Started installation of turbidity barriers.
- 13 Mar 97 — Started clearing the shoreline and removal of debris from shoreline.
- 17 Mar 97 — Delivery of offsite backfill starts.
- 20 Mar 97 — Start of cutting slope of the berm. Turbidity was a severe problem.
- 21 Mar 97 — Started placing offsite fill on berm.
- 25 Mar 97 — Started hauling fill material from Trumbo Point. Use of fill from Trumbo Point was a cost-saving initiative.
- 3 Apr 97 — Completed all removal of vegetation, grubbing and debris removal along the entire shoreline. Started cutting slope to 3:1 at STA 1+00 to 2+00.
- 11 Apr 97 — The first shipment of Armorflex blocks arrived.
- 18 Apr 97 — Two practice bombs were uncovered during excavation activities. The proper authorities were notified and their inspection revealed that the objects were inert. Excavation work continues.
- 22 Apr 97 — Began Armorflex mat fabrication.
- 21 May 97 — Crane arrived on site and mat installation began. Three mats installed.
- 16 May 97 — Finished mat fabrication. Placed rip rap along the toe of the slope on 100 feet of shoreline. Started backfilling Armorflex block with #89 stone.
- 23 Jun 97 — Continued mat installation to Station 11+00. Poured mat anchor at the top of the berm from Station 0+00 to 3+00. Started installation of Pyromat on the top of the berm.
- 24 Jul 97 — Started topsoil placement and seeding of top and landward side of the berm.
- 31 Jul 97 — Started planting sea purslane along seaward side of the berm.
- 1 Aug 97 — Started planting mangroves along the last 300 feet of shoreline.
- 5 Aug 97 — Finished installation of Armorflex mats. Continued with rip rap installation and mangrove plantings.
- 7 Aug 97 — Finished anchor trench installation.

- 8 Aug 97 Finished the following: installation of riprap, berm construction, placing of topsoil, planting mangroves and sea purslane, and
- 11 Aug 97 Site clean up completed and finished work on rip rap.
- 13 Aug 97 Final site walkdown. Site Demobilization.

11.5.3 Work Plan vs. Actual Work

11.5.3.1 Deviations from planning and why

These deviations were changes from Revision 0 of the RWP. These changes were documented in PPR 321-11. [109].

Increase in length of shoreline protection system:
When the delivery order was tasked to Bechtel, the length of shoreline protection was unspecified. Bechtel therefore based its proposal on an assumed length of 1,000 feet. Subsequently, Bechtel and the Navy determined that to provide full protection from all exposed portions of shoreline, the length should be extended to 1,800 feet. The completed structure was actually 1,830 feet.

Selection of Armorflex as the shoreline protection system to be used at IR-8:
The original work plan was submitted on a compressed schedule which did not allow time for an engineered analysis of the project requirements. Bechtel initially assumed the design would use boulders from local sources as suggested by the Navy, and proposed a rip rap structure with a sheet piling cutoff wall.

Bechtel's coastal protection specialists subsequently assisted the project team to define more appropriate requirements for the site and to develop a performance specification that could be put out for bids. The successful subcontractor would be required to provide a detailed design based on the performance specification and to install the shoreline protection system.

The bidders offered several types of systems. These included rip rap structures, but these proposals were very expensive and their ability to meet the performance requirements for a 50-year period was questionable. Two bidders offered mat type structures using the proprietary systems of Armorform and Armorflex.

Armorform is installed using a two layered fabric on the slope and filling the void between the two layers with grout. The resulting structure resembles pillows. Bechtel visited two Armorform installations, one at Key West and one in San Francisco to determine long term performance of this type of shore. The results were mixed. The fabric tends to breakdown over time and there was no redundancy in this type of application.

Armorflex uses mats made of concrete blocks laced together into mats and laid on a prepared slope. The system has been extensively tested using full scale waves at the Delft Laboratory in the Netherlands. Bechtel selected this system because it performed well in the Delft tests, is well-known to Bechtel's coastal protection specialists, and meets all criteria for this installation.

Slope Change:
The successful bidder proposed a 2:1 slope for the shoreline structure. Bechtel reviewed the design and concluded that stability of the 2:1 slope during wave attack was not assured. Also the full scale testing at the Delft laboratory was performed at a 3:1 slope and no data was available for a steeper slope. The slope was revised to 3:1 to provide a safer and more durable structure, and the subcontractor's proposed price was revised to reflect the longer slope length.

Cables:
The blocks of Armorflex are assembled into mats by lacing polyester cables through them. They are lifted into place on the berm using these cables. The cables also tie the blocks together and allow the mat to function as a unit. Bechtel questioned the longevity of the cable in a marine environment. Although the manufacturer showed that the material is suitable for such use, Bechtel required a thicker cable than was originally proposed by the successful bidder.

11.5.3.2 Delays & Problems Encountered; Unexpected Findings/Contamination

Turbidity Barriers
Turbidity barriers were required by the permits to protect seagrass in shallow water near the construction. The installation and upkeep of the barriers was a continuing problem throughout construction. Storms, tides and boat wakes were constantly pulling on the barriers or washing them up on the bank. It was necessary to check barriers on a daily basis and more labor than planned was used in keeping them in place. The toe of the excavation was moved landward 5 to 6 feet and a double barrier was installed to help reduce turbidity.

Settlement
In one area of the site, from Station 500 to 600, excessive settlement was experienced during construction. This settlement was most probably due to unconsolidated debris and rubble under the construction area. This area was backfilled until the settlement ceased.

Torpedoes and Practice Bombs
When excavating in a existing landfill, sometimes unexpected items are uncovered. The work at IR-8 was no exception with workers uncovering both practice bombs and torpedoes in shipping crates. The proper authorities were notified after each discovery and in each case the discovery was handled without incident.

Worker Complaints
Early in the job, workers complained of feeling sick and questioned whether they were being exposed to something at the jobsite. Bechtel quickly dispatched a Health and Safety Specialist to interview the workers, collect samples, and observe work practices to determine if these symptoms were job related. The investigation did not find any job-related cause for the complaints.[131]

Local Labor
The subcontractor for this project used local hires as labors for mat assembly. This was a cost saving measure, since he did not need to provide per diem for these workers. The use of local hires did, however, result in high turnover and absenteeism.

11.5.4 Summary of Materials Handled

This project involved a large effort in material handling. The following quantities of materials were installed at the IR-8 site:

- 9,806 tons of offsite borrow material
- 2,940 tons of Navy owned fill material from Trumbo Point
- 81,572 square feet of Armorflex block

11.5.5 Site Restoration

The site was revegetated by the following activities:

- Sea purslane was planted along the entire length of the shoreline in the top three rows of blocks.
- Red Mangroves were planted along 300 feet on the northern end of the site.
- The top and landward side of the berm were hydroseeded and mulched.

In addition to the revegetation of the site, all visible debris, rubbish, trees, and stumps uncovered or disturbed at the site were buried in the landfill out of public view during site cleanup prior to demobilization.

11.6 COMPLETION DRAWINGS

A copy of the final survey drawing is included in Attachment 11-1.

11.7 APPROVAL OF COMPLETED IRA

11.7.1 Regulatory Agency

FDEP accepted the completion documentation and the transfer of the site from construction status to operational status. [129, 130]

11.7.2 Navy / NTR Approval

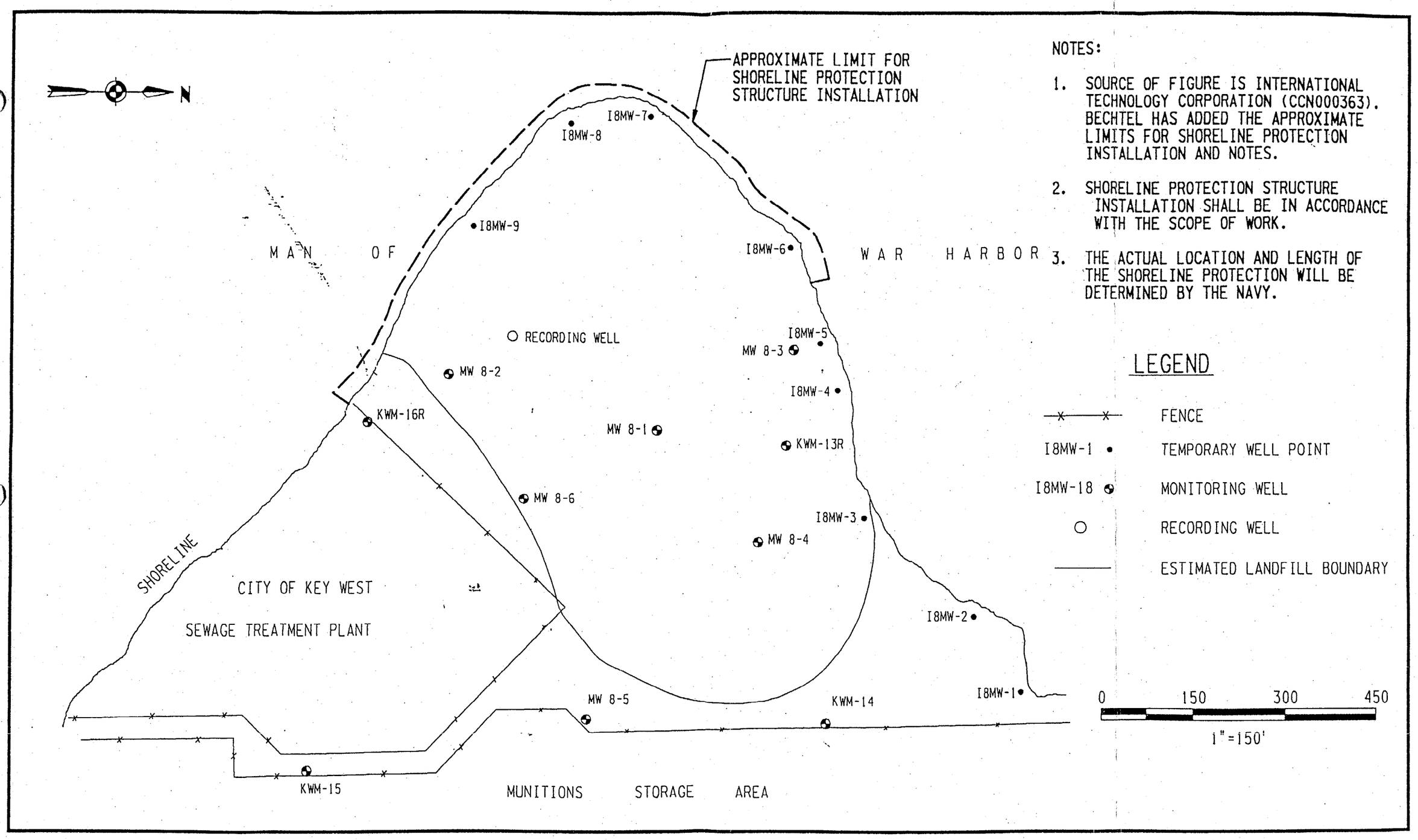
A Certificate of Substantial Completion is included in Attachment 11-2.

11.8 PHOTOGRAPHS

A copy of the Completion Poster for this site is included as a photographic record in Attachment 11-3.

11.9 TECHNICAL PAPER PRESENTATION

Bechtel's Subcontractor for the project, Ocean Breeze, prepared a paper that was presented at the 1998 International Erosion Control Association (IECA) annual conference. This project was awarded the Excellence in Technology Award under the IECA Awards for Environmental Excellence Program. A copy of the paper is included in Attachment 11-4.



22567 321 AB202876.DGN

FIGURE 11-1
IR-8 -- FLEMING KEY
SOUTH LANDFILL

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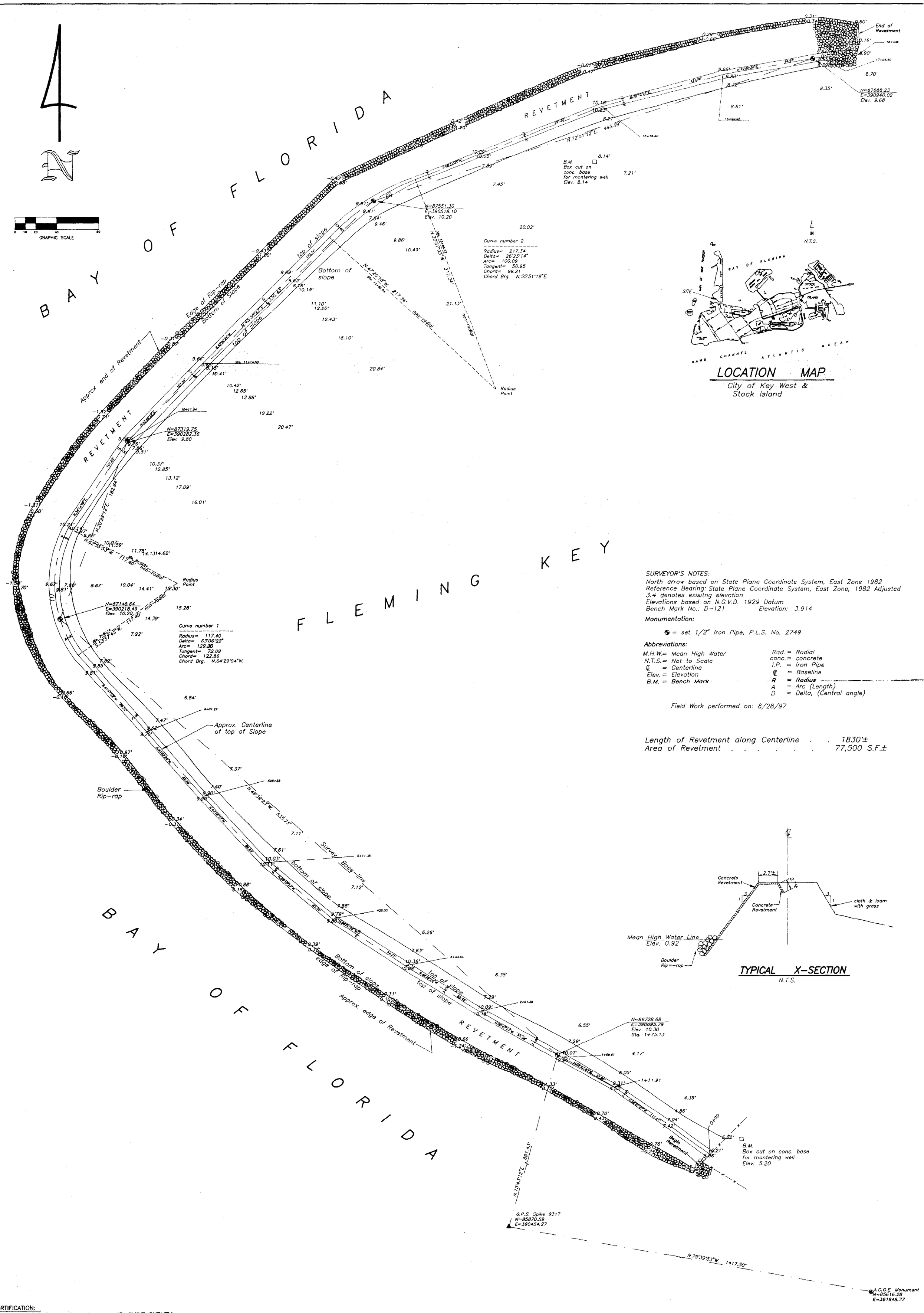
Attachment 11-1.

As-built Survey



SURVEYOR'S NOTES:
North arrow based on State Plane Coordinate System, East Zone 1982
Reference Bearing: State Plane Coordinate System, East Zone, 1982 Adjusted
3.4 denotes exisitng elevation
Elevations based on N.G.V.D. 1929 Datum
Bench Mark No.: D-121 Elevation: 3.914

Monumentation:

● = set 1/2" Iron Pipe, P.L.S. No. 2749

Abbreviations:

M.H.W.= Mean High Water
N.T.S.= Not to Scale
℄ = Centerline
Elev. = Elevation
B.M. = Bench Mark
Rad. = Radial
conc. = concrete
I.P. = Iron Pipe
℄ = Baseline
R = Radius
A = Arc (Length)
D = Delta, (Central angle)

Field Work performed on: 8/28/97

Length of Revetment along Centerline . . 1830'±
Area of Revetment . . . . . 77,500 S.F.±

CERTIFICATION:
I HEREBY CERTIFY that the attached *AS-BUILT SURVEY* is true and correct to the best of my knowledge and beleif; that it meets the minimum technical standards adopted by the Florida Board of Land Surveyors, Chapter 61G17-6, Florida Statute Section 472.027, and the American Land Title Association, and that there are no visible encroachments unless shown hereon.

FREDERICK H. HILDEBRANDT
Professional Land Surveyor No. 2749
Professional Engineer No. 36810
State of Florida

NOT VALID UNLESS EMBOSSED WITH RAISED SEAL & SIGNATURE

Ocean Breeze Construction Co., Inc. U.S.N., Fleming Key, Key West, Fl. 33040			
AS-BUILT SURVEY			Dwn No.: 97-327
Scale: 1"=40'	Ref. 125-43 127-11	Flood panel No.	Dwn. By: F.H.H.
Date: 8/31/97		Flood Zone:	Flood Elev.
REVISIONS AND/OR ADDITIONS			
File:Flemkey			

FREDERICK H. HILDEBRANDT
ENGINEER PLANNER SURVEYOR

3150 Northside Drive
Suite 101
Key West, Fl. 33040
(305) 293-0466
Fax. (305) 293-0237

Attachment 11-2.

Completion Certification

CERTIFICATION OF SUBSTANTIAL COMPLETION

Date: 22 JUN 98

Site : IR-8 Fleming Key

Description of Site : South Landfill - Shoreline Protection System

Contractor : Ocean Breeze

Contract No. : 22567-321-SC-0248

This is to certify the work described above has been substantially completed in accordance with the contract and associated documents. Representatives of the customer, contractor and Bechtel have inspected the site designated above and the work is complete.

ACCEPTED BY

BECHTEL: [signature] DATE: 22-JUN 98

CUSTOMER REPRESENTATIVE: [signature] DATE: 23 JUN 98

FINAL INSPECTION 8·13·97

PUNCHLIST COMPLETED 2·10·98

CONTRACT N62467-93-D-0936/004

Attachment 11-3.

Completion Poster

Remedial Action Update

NAS Key West

Naval Facilities Engineering Command, Southern Division

At Naval Air Station (NAS) Key West, Florida, an Interim Remedial Action (IRA) has been completed at the Fleming Key South Landfill. This IRA is part of the Navy's Installation Restoration Program. An articulated concrete block shoreline protection system was installed to prevent further erosion of the shoreline at the edge of the abandoned landfill.

Description of the Problem

The Fleming Key South Landfill consists of 45 acres covered with ash and metal wastes, building demolition rubble, and obsolete naval equipment. Along the entire length of the shoreline (approximately 1800 feet) severe erosion from tidal fluctuations and wave action had caused debris to be washed into the pristine Key West waters.

How the Problem was Addressed

The solution to the problem was to remove the visible rubble and debris from the shoreline and to install a shoreline protection system to prevent further erosion of the banks. Several types of shoreline protection systems were considered. The ARMORFLEX articulated concrete block mattress system was selected because of longevity of the system, appearance, and stability of the system even under hurricane wave attack. Other considerations were cost effectiveness and environmental criteria.

Designed to 50-year storm-criteria, the system consists of a berm constructed on a 3 to 1 slope covered with the block mattresses. The top of the berm is 10 feet above sea level. Rip rap at the base of the berm provides toe support and scour protection. The site was revegetated with sea purslane along the top four feet of the block and mangroves along the northwestern face. These indigenous plant species will provide a seed base for further propagation. The landward side of the berm was hydroseeded.

Savings Realized

Using fill from a nearby Navy tank demolition project instead of trucking in fill material from off site resulted in a $60,000 savings.

Use of BOQ facilities, discount airfares and combined trips saved more than $19,000.

AWARD

This installation has been selected for the 1998 Excellence in Technology Award by the International Erosion Control Association under the Awards for Environmental Excellence program.

Participants: Bechtel Environmental, Inc.; Florida Department of Environmental Protection; NAS Key West PWD and ROICC offices; Naval Facilities Engineering Command, Southern Division; U.S. EPA Region IV

1 1485.1

Attachment 11-4.

Technical Paper

COASTAL SHORELINE PROTECTION FOR THE NAVAL AIR STATION - KEY WEST LANDFILL

Stephen W. Murray, P.E., CPESC

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Ocean Breeze Construction Co., Inc.
10276 Riverside Drive
Palm Beach Gardens, Florida 33410

ABSTRACT

Key West, Florida has been a haven to sun-worshipers for decades. The relaxed attitude of its residents, as well as its beautiful waters, is known around the world. The U.S. Navy determined that the abandoned landfill on Fleming Key, which was undergoing extensive shoreline erosion, needed repairs and protection. Accordingly, Bechtel Environmental, Inc., the Navy's Environmental Response Action Contractor, solicited bids for a Design & Build Shoreline Protection System.

The original shoreline protection concept was a layer of granite rip rap that must be hauled from distant quarries and placed along the shoreline. Ocean Breeze Construction Co., Inc., in association with Delon Hampton & Associates, Chartered, proposed a more cost-effective method to protect the eroding shoreline of the landfill. This method considered the design and construction of an articulated concrete block mattress system, instead of rip rap, for the entire 549-meter (1800-foot) length of the project.

The articulated concrete block (ACB) system was placed on a newly constructed 3(H): 1(V) slope of granular bedding material and woven monofilament geotextile. Rip rap was provided for toe support and scour protection at the base of the ACB system. A three meter (10-foot) wide berm was constructed at the top of the slope for access. The berm is protected from wave over-topping by a permanent erosion reinforcement matrix extending across the top and down the backside of the berm. A small swale was constructed where necessary to divert all wave over-topping to natural areas for infiltration.

All disturbed areas landward of the ACB system were vegetated. In addition to the hard-armoring shoreline protection system, sea purslane was planted on the upper 1.22 meters (four feet) of the slope. Red mangroves were also planted along the last 91 meters (300 feet) of the project to provide the area with a substantial seed base from which both of these indigenous plant species can propagate. Thus, an engineered revetment system, incorporating both hard and soft erosion control techniques and the latest in non-corrosive materials, was designed and constructed to meet the fifty-year minimum performance specification requirement.

INTRODUCTION

The Naval Air Station (NAS) Key West and the City of Key West used the southern portion of Fleming Key as a solid waste landfill for decades. Prior to construction, the site had obsolete naval equipment, buoys, channel markers, and other debris directly adjacent to the shoreline. Tidal fluctuations and wave action along this shoreline have caused significant erosion compromising the integrity of the solid waste landfill. The purpose of this project is to establish a shoreline protection system along a 549 meter (1800-foot) section of the southwest portion of Fleming Key to protect the abandoned solid waste landfill shoreline from further degradation.

The U.S. Navy's Environmental Response Action Contractor, Bechtel Environmental, Inc., solicited a design and build shoreline protection system. The following were the design criteria factors used to evaluate the different proposals.

1. Stability
2. Permeability
3. Overtopping
4. Scour and Flank Protection
5. Damage Limitation
6. Longevity of the System
7. Appearance
8. Cost Effectiveness
9. Environmental Criteria

DESIGN PARAMETERS

Stability

The revetment design used on the Key West project incorporated a precast articulating block 19.05 – centimeter (7.5 –inches) with open cells placed on top of a 30.5-centimeter (12-inch) thick layer of Florida Department of Transportation (FDOT) No. 4 bedding stone as shown in Figure 1. The FDOT No. 4 stone has a maximum size of 5.08-centimeters (2-inches). The bedding stone layer serves two purposes. First, the layer provides drainage for water exiting from the subgrade. Secondly, the layer provides a stable, uniform foundation for the blocks.

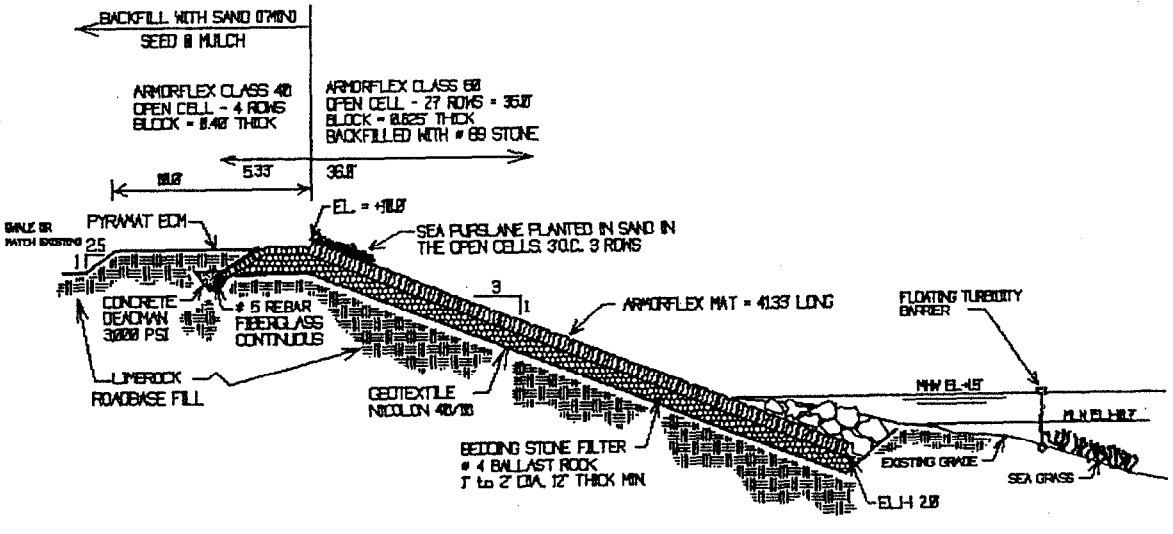

Figure 1. Typical Revetment Cross Section

During the review process of the design for this project, plane slippage was the failure mode of most concern. The methods of plane slip failure evaluated were geotextile slippage along the embankment soil, bedding stone sliding along the

geotextile surface, and sliding of the mat on the bedding stone. Geotextile slippage along the embankment soil was discounted since the geotextile is embedded in a concrete anchor trench at the top of the slope. Additional, sliding of the mat on the bedding stone, although not evaluated, was considered unlikely since in all past research conducted on ACB systems, mat sliding has never been a mode of failure.

The only practical form of sliding failure in this case, therefore, is between the bedding stone and the geotextile surface. The analysis considered two situations, 1) stability during construction of the slope (infinite slope analysis), and 2) stability immediately after construction of the slope (finite slope analysis). Analyzing the stability of the bedding stone along the geotextile interface during construction (infinite slope analysis) determined a factor of safety against failure of

$$FS = \frac{\tan\alpha}{\tan\beta} = \frac{\tan 32^\circ}{\tan 18.4^\circ} = 1.88$$

According to McKelvey and Deutsch, 1991, the stability of the bedding stone along the geotextile surface after construction was analyzed using a finite method of analysis. The weight of the buttressing, W_1, and driving, W_2, wedges were calculated based upon Figure 2.

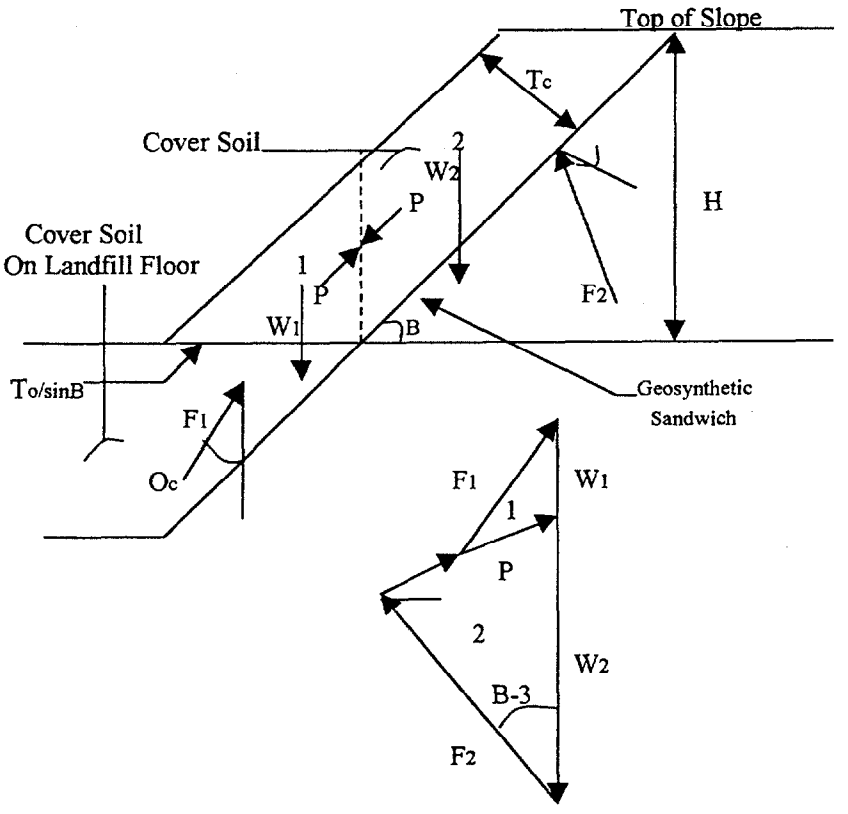

Figure 2. Geometry of Buttressing Wedge W1 and Driving Wedge W2 in Giroud and Beech Model.

$$W_1 = \frac{\gamma_c T_c^2}{\sin 2\beta} = 323 \text{ kilograms/meter (217 pounds/foot)}$$

$$W_2 = \frac{\gamma_c T_c^2}{\sin 2\beta}\left[\frac{2H\cos\beta}{T_c} - 1\right] + W_a = 9483 \text{ kilograms/meter (6372 pounds/foot)}$$

Where, W_1 = weight of the buttressing wedge, kilograms/meter (pounds/foot)
W_2 = weight of driving wedge, kilograms/meter (pounds/foot)

γ_c = unit weight of bedding stone = 20 kilonewtons/meter^3 (130 pounds/foot^3)
T_c = bedding stone layer thickness = .30 meters (1-foot)
β = slope angle of bedding stone, 18.4 degrees
H = slope height = 4.88 meters (16 feet)
W_a = equipment loading (assumed to be zero)

The critical parameter in this analysis is the interface friction angle, γ, between the bedding stone and the geotextile. The value assumed was 32 degrees based on a coefficient of interaction of 0.80 and assuming that the bedding stone has an internal friction angle, ϕ_c, greater than the embankment fill itself, 38 degrees. This value is a reasonable assumption as a result of the coarseness and angularity of the chosen bedding material. The factor of safety was then determined based upon,

FS = Resisting Forces/ Driving Forces

$$FS = \left(W_2 \cos\beta \tan\gamma + W_1 \sin\phi_c \Big/ \cos(\beta + \phi_c) \right) \Big/ W_2 \sin\beta = 2.0$$

Permeability

The ACB system was then placed on a 0.30-meter (1-foot) layer of FDOT No. 4 bedding stone over the woven monofilament geotextile fabric with an apparent opening size (AOS) of 0.420 mm (40) and a percent open area of 10%. The permeability of this fabric in association with the aggregate bedding material relieves the system of hydrostatic pressure. At the same time, the fabric also prevents migration of soil particles through the ACB. The soil grain size distribution for this site allowed the design to use a large open weave fabric. The simple rule that each successive layer must be more permeable than the layer below, applied from the subgrade, to the geotextile, to the bedding stone, to the ACB.

Overtopping

The specified deign parameter of the maximum overtopping rate for the 50-year storm surge significant wave for this project was 200 liters/sec/meter (4.83 feet^3/second) unless a scouring protection and drainage system is included.

The overtopping rate per unit length of structure can be expressed by the following equation:

$$Q = \left(g Q_0 H^3\right)^{1/2} e^{-\left[\frac{0.217}{\alpha} \tanh^{-1}\left(\frac{h-d}{R}\right)\right]}$$

Where Q = overtopping rate, liters/sec/meter
g = gravitational acceleration, 9.81 meters/second^2
H = deepwater wave height, 0.72 meters
h = height of the structure crest above the bottom, 3.05 meters
d = depth at the structure toe, 1.69 meters
R = runup on the structure, 2.13 meters
α and Q_0 = empirically determined coefficients

Utilizing charts developed from small-scale laboratory models of structures from the *Shore Protection Manual*, values for α and Q_0 are estimated to be 0.07 and 0.05, respectively.

The estimated overtopping rate of 39 liters/second/meter is well below the maximum allowable rate for overtopping. As an extra safety measure, the top and backslope of the berm was overlaid with a three-dimensional permanent erosion and reinforcement matrix (PERM). The PERM further reduces the potential for erosion along the backside of the berm.

As a result of the varied topography in this landfill, a small swale was added for approximately 152 meters (500 feet) to capture wave overtopping and release it onto the natural grade behind the berm. The water then infiltrates into the ground as in the site's present condition

At each end of the swale, erosion protection of the sandy soils is provided in the form of rip rap with a d_{50} of 0.12 meters (0.40 feet). Each apron was calculated to be 1.8 meters (6 feet) wide at the end of the swale, 3.6 meters (12 feet) long, and 4.3 meters (14 feet) wide at the end of the apron. The size of the rip rap and the dimensions of the apron allow for sufficient energy dissipation of the flow and protect the ends of the swales from erosion.

Scour and Flank Protection

Scour and flank protection for the ACB system is one of the most important aspects of the design and was accomplished through the use of rip rap along the toe and edges of the revetment. The buttressing effect created at the toe of the slope is critical in the stability of the system. Therefore, embedment of this toe is of paramount importance.

Using the Technical Report CERC-93-8, *Coastal Scour Problems and Methods for Prediction of Maximum Scour,* the maximum scour depth below the natural bed is roughly less than or equal to the height of the unbroken deepwater wave. Since the deepwater wave height calculated was 0.72 meters (2.36 feet), the maximum depth of scour at the toe of the structure is no greater than 0.72 meters (2.36 feet) below the bottom.

A cost consideration decision was made to embed the ACB system 0.61 meters below the existing bottom. The remaining 0.11 meters of potential scour was protected with rip rap. This rip rap was sized according to the *Shore Protection Manual* equation for armor stone,

$$W = \frac{W_r H^3}{K_0 (S_r - 1)^3 \cot\theta}$$

Where W = weight in newtons of an individual stone
W_r = unit weight of stone = 22, 763 Newtons/meter^3 (145 pounds/foot^3)
H = design wave height = 0.72 meters (2.36 feet)
K_D = stability coefficient = 3.5
S_r = specific gravity of stone = W_r/W_w = 2.27
W_w = unit weight of sea water = 10,047 Newtons/meter^3 (64 pounds/foot^3)
θ = angle of structure slope = 6(H): 1(V) = 9.46 degrees

The embedded toe of the system was covered with 200 Newton (45 pound) stone to prevent potential scouring.

It was assumed that the flank protection at each end of the revetment would encounter no more wave action attack than the toe of the revetment. Therefore, the flank was imbedded the same amount as the toe. The flank was then backfilled with 400-Newton (90-pound) riprap to further prevent the effects of scouring along each end of the system.

Damage Limitation

The specified design parameter for estimated damage on this project was to be less than 10 percent as defined by the U.S. Army Corps of Engineers *Shore Protection Manual* for multiple-layer Armor Stone Protection during a 50-year wave.

The computer design program developed by Armortec, Inc., and used for this project considers failure of the system as the loss of "intimate contact" between the most vulnerable individual block in the system and the subgrade. Therefore, the design parameter was met since the design procedure allows for zero damage.

Longevity of the System

The performance specification required that the structure use durable materials that will withstand the saltwater environment over a 50-year design life. This ACB system is comprised of a series of individual precast concrete blocks tied together with cables to form a continuous embankment overlay. All of the materials used in this ACB system are capable of a 50-year life span or more. Concrete is an extremely durable material used extensively in saltwater environments and will last for at least the design life. The material used in the cables to tie the blocks together for easier mat placement is high-tenacity polyester. These polyester cables have been tested and shown to withstand the effects of hydrolysis without significant loss of strength. Although the polyester cables may be susceptible to damage from UV radiation, the short period of time that they are exposed to sunlight has insignificant effect on their strength.

Appearance

The performance specification required that the structure be constructed such that its appearance is in harmony with the surrounding environment, and that it meets applicable local codes. The ACB system accomplishes this task quite well. Once the ACB system is placed and the voids are backfilled, it provides a uniform, pleasing finish on the slope compared to the finish provided by conventional hard-armored protection such as rip rap.

Another positive aesthetic benefit of the ACB system is ease of planting vegetation. The Key West project used a 19.05 centimeter (7.5-inch) thick open-cell block. This block configuration allowed for the installation of red mangroves along a 91-meter (300-foot) section to provide a seed base for future red mangrove habitats. In addition to red mangroves, sea purslane was planted on the upper 1.22 meters (four feet) of the slope and will eventually cover this portion of the surface of the system.

Cost Effectiveness

The baseline for cost comparison is the second lowest design & build proposal for a revetment of stone rip rap over a geotextile liner keyed into the shoreline for approximately $2.1 million. The articulated concrete block (ACB) system chosen is a proven economically feasible option to conventional protection materials. The final cost including all design, environmental permitting, clearing, surveying, construction materials, equipment, labor, and re-vegetation of the ACB system was $1.1 million. This is equivalent to an in-place cost of approximately $119 per square meter ($11 per square foot) of ACB.

Environmental Criteria

The environmental design criteria for this project included limitations on sediment disturbance during construction, revegetation requirements, and meeting all environmental requirements for the State of Florida.

The pristine waters surrounding Key West invite water enthusiasts of many varieties to enjoy its benefits. As a result, erosion and sediment control on this project was of paramount importance. Sediment control was accomplished through the use of regularly maintained floating turbidity barriers. Best management practices for erosion control were accomplished by minimizing the construction disturbance area to practical working areas, and revegetating disturbed areas as early as practical.

In addition to the erosion and sediment control measures taken, every effort was made to avoid working below the mean low water level. Minimal disturbance of the soil below this mark was important to protect the abundant seagrass which is a habitat for several endangered species.

Above the water line, exotic plant species such as Brazilian pepper, punk tree, Australian pine and latherleaf were deemed extremely undesirable. These plants were removed within the construction area to allow native species to fill in this space.

CONSTRUCTION CONSIDERATIONS

Site Preparation

The project site was a landfill that has been abandoned for about twenty-five years. The area was densely covered with exotic trees and shrubs. The eroding slopes had a mixture of concrete, steel and other types of materials exposed along the shoreline as shown in Figure 3. Access roads were also overgrown and in one area, the road was eroded and terminated at the shoreline embankment.

Figure 3. Existing eroded shoreline and debris.

The first order of business was to provide for the sediment containment with a floating turbidity barrier at the upper limits of the seagrass. Due to the higher winter winds, a second row of floating turbidity barrier had to be placed along the shoreline because of the wave energy disturbance on the bare soil of the embankment. Clearing of the existing slopes, approximately 23-meters (75-feet) landward along the whole shoreline and approximately 915-meters (3,000-feet) of access roads was accomplished with a dozer, excavators, and a large loader with a rake attachment. Most of the debris was piled within the interior of the site and covered over with available soils. Many of the smaller trees and shrubs were run through a chipper to provide mulch for temporary sediment control at the entrance and exit road to eliminate off-site tracking and other areas as needed.

The existing embankment was excavated back to a minimum of 0.6-meter (2-feet) below the line of the proposed ACB revetment. The existing top of bank elevation varied from an elevation of +1.5-meter (5-feet) to an elevation of +3.75 meters (13-feet). The mean low waterline was the base elevation of 0.0 meter. The existing embankment soils consisted of mixed limestone, landfill ash, broken glass, steel, and concrete which was unsuitable to use directly under the revetment face. This unsuitable material was excavated approximately 3-meters (10-feet) landward and laid back on a 3:1 slope.

Transportation

The project is on a small island, Fleming Key, on the north side of Key West. The bridge, which accesses the site, was limited to 32 tons gross weight. This caused numerous logistical limitations for the delivery of equipment and materials. The best source of the fill materials was from west of Miami, over 99 Km (160-miles) away. All of the fill material and the ACB components were brought to a staging area and shuttled to the site in smaller truck loads.

Base Preparation

The project required the importing of over 9,740 metric tons of base material, which was placed in lifts and compacted with a seven-ton roller. The single drum roller was able to compact the 3 (H) to 1 (V) slope down to the low waterline. Compaction testing was done with a minimum standard for the slope face of 90% and the horizontal lifts were at 95% standard proctor (ASTM D698). Once the base subgrade was compacted and graded to the desired lines and grades, a woven monofilament geotextile was sewn into large panels and placed to provide both separation and filtration as shown in Figure 4.

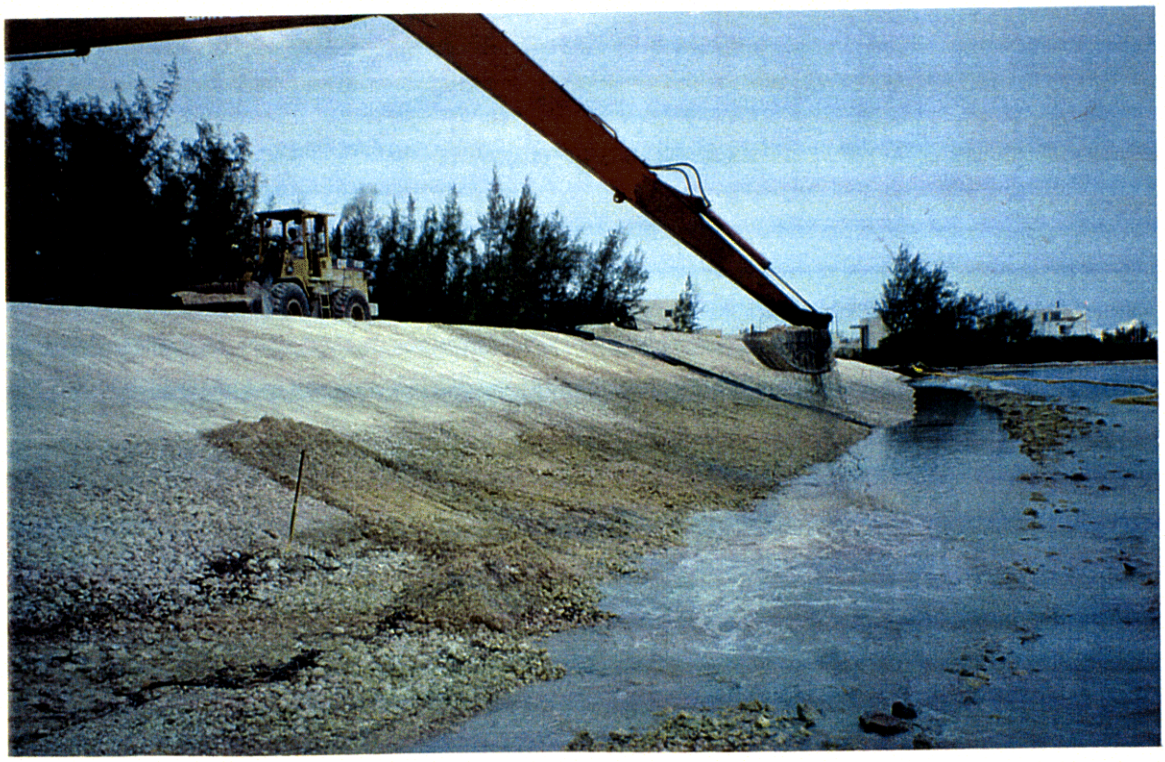

Figure 4. Filled, compacted and graded sub-base in foreground. Geotextile and bedding stone in background.

Above the geotextile, 3,371 tons of No. 4 bedding stone, 37.5 to 19.0 mm (1.5 to ¾ inches) was placed for an average thickness of 0.30-meter (1-foot) for additional wave run-up drainage and energy absorption. A special excavator with an 18.3-meter (60-feet) reach was used to grade the long slope length.

ACB Mat Fabrication

Because of the weight restriction of the Access Bridge, it was decided to fabricate the ACB's into mats on the jobsite, adjacent to the embankment. The mats were assembled into 2.4-meter (8-feet) wide and 12.6-meter (41.3-feet) long mats. The components consisted of the concrete blocks, polyester cable, and aluminum sleeves. The mats were made into piles of six and all sleeves were hydraulically swaged as shown in Figure 5.

Figure 5. A Fabricated mat being lifted from the stockpile to be placed on the slope.

Revetment Installation

Once the bedding stone layer was graded on the 3:1 slope from an elevation of –0.6-meter (-2.0-feet) to the slope crest at +2.9-meter (9.6-feet), the pre-assembled mats were lifted with a horizontal spreader bar by a 75-ton crane and placed on the slope. The mats had staggered blocks on the edges to allow the seams to be fully interlocked in a "zipper" fashion. When a radius in the shoreline alignment was encountered, the mats were overlapped and the blocks were custom cut into a triangular shape to accommodate the turn. The top of the mats were anchored by placing a fiberglass reinforcement bar, threaded through the cables loops, at the top and placed in a soil formed trench. Then, concrete was poured in the trench to form a continuous concrete "deadman". Any seams were grouted; thus a complete integrally connected revetment was constructed for the full 549-meter (1,800-feet) long revetment which made an overall curve of over 270 degrees.

To insure against any undermining from overtopping during an extreme storm event, a synthetic PERM blanket was placed into the concrete anchor trench and folded back over the berm and down the back slope to the existing contours. A drainage swale was also lined with blanket. The blanket was pinned with wire staples, 2.5 each per square meter, then a grass seed mix of "brown top" Millet, Argentine Bahia, and Common Bermuda was broadcast over the blanket depositing in the pyramid shape depressions. The whole berm, backslopes and swales were backfilled with a veneer of topsoil.

Backfilling

The toe trench was filled with native limestone riprap with an average weight if 275-kilograms (125-pounds) and an average diameter of 0.61-meter (2-feet). The riprap was placed with the long reach excavator and positioned with the top of the rocks approximately equal to the high waterline. The rip rap added scour protection, wave energy dissipation, and void space for marine organisms. Larger pieces of limestone were used for the flank end treatments to transition into the existing shoreline.

The open cells of the ACB system were backfilled with a No. 4 course aggregate in the wave run-up zone. A finer No. 89 aggregate, 9.5 to 1.18-mm (3/8-inch to No. 16), was used to backfill the middle and upper areas of the block system as shown in Figure 6. The aggregate was imported from quarries west of Miami.

Figure 6. Revetment in-place with Riprap on the "toe" and the No. 4 & No. 89 stone backfilled. The top of the ACB and the PERM are ready for topsoil.

The top 1.2-meters (4-feet) of the slope, top berm area, back slope and the swale were covered with 1,210-tons topsoil. Good topsoil is nearly non-existent in the Keys and had to be imported from the Everglades region in the southern Florida peninsula.

Planting

Now that the exotic species of plants were removed from the shoreline area, the re-establishment of native vegetation was possible. At the toe of slope, along the most sheltered area of the revetment shoreline, 330 red mangroves were planted to provide a seed base for the future establishment of the critical mangrove ecosystem. The open cells of the ACB system allows for the spreading of mangroves with their "prop roots" and "risers" as proven over the years in other ACB coastal installations. The ACB and geotextile hold the soils against boat and wind generated waves, and the open cells provide protective little "pots" to hold the seedlings until they mature, spread, and the roots penetrate into the subgrade as shown in Figure 7.

The upper 1.2-meters (4-feet) of the slope was planted with over 2,000, liner size, sea purslane within the open cells of the ACB system. The sea purslane will spread over the entire slope down to the wave run-up zone. The native sea purslane will also help reduce the re-establishment of exotic plant species.

The flat berm, backslopes, swale and all other disturbed areas were treated with soil enhancing fertilizers, seeded with Bahia and Millet, covered with mechanically blown straw, and rolled-in to provide a complete vegetative cover through out the whole construction site as shown in Figure 8.

Maintenance

The ACB system will require little if any maintenance over the design performance period of 50 years. The flank end treatment rip rap may migrate down slope. Some exotic plant species may become naturally re-introduced to the site and will be removed on an annual basis by the U.S. Navy, Base personnel.

During a major storm event, when the sea level rises significantly and the wind direction is from a western approach, the high energy waves may dislodge the backfilled material and wash away the plantings. After such a storm the Base personnel will re-backfill and provide for the additional plantings as necessary.

SUMMARY

The design and construction of the ACB shoreline protection system has provided a unique solution to the ever-present problem of shoreline erosion in a paradise setting. The proven stability of the articulated concrete block system is capable of effectively handling the savage effects of storms in this area. The blending of a "hard armor" ACB system with a "soft armor" matrix blanket and vegetation, shows how the pleasing uniformity of the ACB, performs as a natural looking shoreline embankment. This system provides an excellent aesthetic backdrop for the numerous watercraft that anchor nearby.

The cost effectiveness of this ACB system has given the client, the U.S. Navy, a shoreline protection system that cost them about one-half of the other conventional designs. Can we really ask any more of a shoreline protection system than that?

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BIOGRAPHICAL SKETCH

Stephen W. Murray is the Group Manager for Civil Engineering in the Atlanta office of Delon Hampton and Associates, Chartered. He is a registered professional engineer in Georgia and Florida and a CPESC specialist. He graduated from Texas A & M University in 1983 with a Bachelor of Science in Civil Engineering degree. For the last 11 years in Atlanta area, he has tried to educate fellow-engineers, developers, and reviewing agencies to the need for erosion control measures beyond the minimum requirements. He is the past-president and is currently the Vice-President of the Southeastern Chapter of the IECA.

Andrew K. Hackett is the President and Owner of Ocean Breeze Construction Co., Inc., a specialty erosion and sediment control contractor since 1981. He is a licensed marine contractor and a CPESC specialist. He attended Ohio State University and Florida Atlantic University with studies in Natural Resources, Business, and Ocean Engineering. For the last 16 years he has specialized in the installation of articulating concrete blocks, fabric-formed concrete, cellular confinement grids, gabions and other erosion control systems for slope stabilization, revetments, bridge and port scour protection, landfills, road, and water control structures projects throughout the southeastern United States and the Caribbean. He is currently a board member of the IECA and is the Treasurer of the Southeastern Chapter of the IECA.

APPENDIX A

REFERENCE CORRESPONDENCE AND MEETINGS

No.	Date	Doc No.	From	To	Site	Subject
1.	19 May 94	134	SDIV (Clement)	BEI (Trautner)	All	Delivery Order No. 0004 and Statement of Work
2.	7 Jun 94	363			All	IT Corporation Draft RFI/RI Report, Oct 93 IT Corporation Final RFI/RI Report, May 94, SWMU 1-7; IR 1,3,7,8; AOC A,B
3.	8 Dec 94	2025	SDIV (Patrick)	FDEP (Caspary) EPA (Bassett)	All	SWMU-5 dropped from scope; possible use of CAMU for SWMU-1, & 2, IR-1, & 3. Request review RWPfor remaining 7 sites only.
4.	2 Jun 95	5368	BEI (McNeil)	SDIV (Patrick)	AOC-A, B, IR-3	AOC-A deleted from scope. Discussed high zinc levels in mangroves at AOC-B. At IR-3, BEI is to sample across Fort Street as recommended by Bassett.
5.	12 Aug 94	809	SDIV (Patrick)	BEI (McNeil)	S-9	ABB-ES Contamination Assessment Report (CAR) Jet Engine Test Cell (June 1994)
6.	12 Jul 94	387	BEI (McNeil)	SDIV (Patrick)	All	Conference notes 26 Jun 94. Agreed to use field screen methods for delineation. Pupose of IRA is removal of primary contaminant source.
7.	8 Feb 95	2888	BEI (McNeil)	SDIV (Meddick)	S-3, 7 IR-3 AOC-A, B	Delineation Sampling and Analysis Plan, Rev 0 for approval.
8.	2 Feb 95	2812	SDIV (Meddick)	BEI	S-3, 7 IR-3 AOC-A, B	Approval of Sampling and Analysis Plan (ref Doc 2888). Notice to Proceed with sampling only. Dates of Doc 2812 and 2888 appear out of order, but this approval was based on a draft document which preceded Doc 2888 above.
9.	6 Jul 95	5839	BEI (McNeil)	SDIV (Patrick) EPA (Bassett) FDEP (Caspary)	S-1, 2 IR-1 S-3, 7 IR-3 AOC-A, B	Draft Delineation Sampling Plan, Rev 1 (ref doc 2888). This added SAP for the remaining 3 sites. Delineation Sampling Report (Draft) for the initial sites sampled.
10.	18 Jul 95	6104	BEI (Hoekstra)	SDIV (Patrick) EPA (Bassett)	S-1, 2 IR-1	Telcon memo. EPA agreed with Delineation Sampling Plan (ref doc 5839)
11.	26 Jul 95	6108	BEI (McNeil)	SDIV (Patrick)	S-1, 2 IR-1, 3	Final Delineation Sampling Plan, Rev 1. (ref doc 5839). Revision incorporates indicated sites and additional RFI sampling into overall SAP.

No.	Date	Doc No.	From	To	Site	Subject
12.	9 Aug 95	6389	SDIV (Meddick)	BEI (McNeil)	S-1,2,3,7 IR-1,3 AOC-A,B	Approval of Delineation Sampling Plan, Rev 1. (ref docs 6108 & 2888)
13.	24 Aug 95	6564	BEI (McNeil)	SDIV (Patrick) EPA (Berry) FDEP (Caspary)	S-3, 7 IR-3 AOC-A,B	Delineation Sampling Report, Final. Limits of excavation established. Includes guidelines from regulatory conference (ref 8/15/95) & FDEP Soil Cleanup Goals for military sites 4/5/95.
14.	5 Sep 95	6810	BEI (Hoekstra)	SDIV (Patrick)	IR-1	PPR-003. For taking additional delineation samples at perimeter of site where high concentrations of lead were found during initial delineation sampling.
15.	28 Sep 95	7274	FDEP (Caspary)	SDIV (Patrick)	S-1, 2 IR-1	Approval of Delineation Sampling Plan (REF DOC 5839)
16.	28 Sep 95	7275	FDEP (Caspary)	SDIV (Patrick)	S-3, 7 IR-3 AOC-A, B	Approval of Delineation Sampling Report (ref doc 6564)
17.	3 Oct 95	7151	BEI (McNeil)	SDIV (Patrick) EPA (Berry) FDEP (Caspary)	IR-1	Delineation Sampling results. Recommend limit of excavation. Samples from two locations failed TCLP. Remainder of site can be handled as non-hazardous waste.
18.	17 Oct 95	7322	BEI (McNeil)	SDIV (Patrick) EPA (Berry) EPA (Bassett) FDEP (Caspary)	S-1, 2, IR-1	Delineation Sampling results and limits of soil excavation (IR-1 limits revised from doc 7151). No hazardous waste found at SWMU-1.
19.	8 Nov 95	7619	BEI (McNeil)	SDIV (Patrick) EPA (Berry) FDEP (Caspary)	S-1,2,3,7 IR-1,3 AOC-A,B	Delineation Sampling Report, Rev 1, final (ref doc 6564). This consolidates all sites in a single report.
20.	15 Jul 94	438	BEI (McNeil)	SDIV (Patrick)	All	Economic Analysis for selection of interim remediation technology
21.	6 Jan 95	2433	BEI (McNeil)	SDIV (Patrick)	All	Revised Economic Analysis (ref doc 438).
22.	1 Sep 94	893	BEI (McNeil)	SDIV (Patrick)	All	Draft RWP, Addendum 8 to SSHP[a], Addendum to QCP[b], and EPP[c]
23.	4 Jan 95	2386	BEI (McNeil)	EPA (Bassett)	All	Response to EPA comments at 24 Aug conf. Established DQO[d] Levels & cleanup criteria. Bassett said this letter was acceptable to EPA for purposes of approving the RWP. EPA would not issue a letter approving the RWP.

[a] SSHP: Site Safety and Health Plan
[b]QCP: Quality Control Plan
[c]EPP: Environmental Protection Plan
[d]DQO: Data Quality Objective

No.	Date	Doc No.	From	To	Site	Subject
24.	2 Feb 95	2794	BEI (McNeil)	SDIV (Patrick)	All	Conference notes 18 Jan 95. Resolved comments on RWP. Pursue Time-Critical Removal Action for IR-3. Consider thermal treatment IR-3. Discuss pre-construction sampling plan.
25.	6 Feb 95	2840	BEI (McNeil)	FDEP (Brown)	All	Draft RWP, SSHP, and SAP[a] for review
26.	17 Feb 95	2994 3021	BEI (McNeil)	SDIV (Meddick)	All	RWP Rev 0, EPP, and Addendum to QCP. Comments on draft RWP of 1 Sep 94 (ref Doc 893) incorporated.
27.	20 Feb 95	3287	FDEP (Caspary)	SDIV (Reed)	All	FDEP review comments on draft RWP (ref doc 2840).
28.	28 Feb 95	3295	SDIV (Meddick)	BEI	All	Notice to Proceed; Approval of RWP Rev O; Addendum to QCP and EPP (ref Doc 2994)
29.	14 Apr 95	4430	BEI (McNeil)	SDIV (Patrick) FDEP (Caspary)	All	Response to FDEP comments on draft RWP (ref. Doc 3287 & 2840).
30.	3 May 95	4985	FDEP (Caspary)	SDIV (Patrick)	All	FDEP approval of RWP. BEI 14 April responses to FDEP comments are acceptable (ref Doc 4430 & 2840).
31.	16 May 95	5106	BEI (McNeil)	SDIV (Meddick)	All	RWP, Rev 1
32.	1 Sep 94	894	BEI (McNeil)	SDIV (Patrick)	All	Minutes, Reg Rvw Conf on site 24-25 Aug 94. Attendees: FDEP, EPA, SDIV, NAS PWD, ROICC, BEI. Established cleanup criteria. Discussed RCRA & CERCLA issues and DQL for confirmatory sampling
33.	9 Jan 95	5324	Georgariou (ABB)	Reed (SDIV)	All	Minutes, Regulatory Conference in Atlanta 9 Jan 95: Discussed feasibility of CAMU concept, and likely difficulty in establishing a CAMU
34.	12 Sep 95	7276	ABB (Futch)	SDIV (Patrick)	All	Conference notes 14 Aug 95 regulatory meeting. EPA/FDEP reps agreed BEI RWP satisfies requirements of EE/CA. BEI prepare Action Memo for IRA at IR-1, 7, 8. IR-3 is Time critical removal action.
35.	9 Feb 95	2897	BEI (McNeil)	NAS (Carley)	All	Draft letters informing NRT of planned IRA and invitation to public meeting.
36.	22 Mar 95 3 Apr 95	3998 4249	BEI (McNeil)	NRTs	All	Notifications to FDEP (Mitchell/Caspary); USCOE (Anderson); NOAA (Johnson); FL Game & Freshwater Fish Comm; USDOI, F&W Svc; EPA (Bassett/Finley). Invitation to site meeting in April.
37.	15 May 95	5090	BEI (McNeil)	Attendees	All	Minutes of NRT meeting 18 April 95.

[a]SAP: Sampling and Analysis Plan

No.	Date	Doc No.	From	To	Site	Subject
38.	8 May 95	5114	FDEP (Mitchell)	SDIV (Patrick)	All	NRT comments on RWP Rev. 0 (ref doc 2840). Comments resolved during mtg 18-19 April and no further response necessary. Cleanup goal for lead in sediment should be 30.2 ppm. MHW[a] survey required to delineate wetland sites.
39.	11 Jul 95	5889	BEI (McNeil)	USFWS[b] (Yanno)	All	Methods of protecting Lower Keys Marsh Rabbit.
40.	17 Jan 95	2598	BEI (McNeil)	SDIV (Patrick) NAS (Carley)	Wetlands	Draft Wetland Delineation for submittal by NAS.
41.	23 Feb 95	3134	BEI (McNeil)	NAS (Carley)	Wetlands	Draft wetland permit applications and suggested text of cover letter to FDEP.
42.	28 Feb 95	3297	BEI (McNeil)	NAS (Carley)	All	NOAA Notification Package, revised, for NAS submittal to NOAA.
43.	4 May 95	4670	USACOE (Diaz)	CO NASKW	Wetlands	Assigned project number for consideration under nationwide permit and gave 30 days to respond to several questions and submittal requirements.
44.	9 May 95	4672	FDEP (Traudt)	CO NAS KW	Wetlands	Acknowledge receipt of permit application on 10 Apr. Enclosed comments and questions for further submittal.
45.	9 May 95	7339	BEI (McNeil)	SDIV (Patrick) NAS (Carley)	Wetlands	Response to Corps of Engineers comments on wetland pemit applications (ref doc 5/4/95)
46.	3 Aug 95	7366	USACOE (Studt)	CO NASKW	Wetlands	Reference COE letter 4 May. COE did not receive response and gave NAS 15 days to respond or application would be dropped
47.	31 Oct 95	7546	BEI (McNeil)	FDEP (Traudt)	Wetlands	Description of methods BEI will use to contain the spread of contamination. Request permit issue by 3 Nov 95.
48.	13 Nov 95	7673	FDEP (Traudt)	BEI (Hoekstra)	Wetlands	Summary for the record of telcons and discussions and agreements reached.
49.	30 Oct 95	7700	NAS (Demes)	FDEP (Traudt)	Wetlands	Responses to FDEP questions on permit application.
50.	18 Dec 95	8140	FDEP (Romeis)		Wetlands	Notice of Permit Issuance. File No. 442693985
51.	20 Dec 95	8149	FDEP (Romeis)	CO NASKW	Wetlands	Approval of authority sought under Section 253.77 to proceed with project.
52.	26 Dec 95	8178	FDEP (Romeis)	CO NASKW	Wetlands	Correction of errors in original permit document.
53.	21 Dec 95	8213	BEI (McNeil)	SDIV (Patrick)	Wetlands	Telcon memo. Forwarded Responsibility Assignment Matrix for wetlands.
54.	20 Dec 95	8217	BEI (Hoekstra)	FDEP (Traudt)	Wetlands	Questions regarding permit.

[a]MHW: Mean High Water
[b]USFWS: Department of the Interior, U. S. Fish and Wildlife Service

No.	Date	Doc No.	From	To	Site	Subject
55.	29 Dec 95	8220	BEI (McNeil)	NAS (Demes)	Wetlands	Forward Dept. of Army project authorization for SWMU 1 & 2 and AOC-B. Noted permit is based on outdated site excavation boundaries.
56.	9 Jan 96	8291	BEI (McNeil)	USACOE (Diaz)	Wetlands	Forward revised figures detailing extent of planned excavation (ref doc 8220).
57.	10 Jan 96	8320	BEI (McNeil)	FDEP (Romeis)	Wetlands	30-day notification required by General Condition No. 4 of wetland permit. Submitted on behalf of NASKW.
58.	29 Jan 96	8761	NAS (Demes)	FDEP	Wetlands	Environmental Resource Permit Construction Commencement Notice. Construction expected to commence 6 Feb 96. (48-hour notice)
59.	23 Feb 96	8853	ROICC (Ewing)	SDIV (Patrick)	Wetlands	Discussion of COE and USFWS visit to sites on 13 Feb, and their comments on restoration of sites.
60.	26 Feb 96	8947	SDIV (Patrick)	FDEP (Romeis) COE (Studt)	Wetlands	Discussion of site visits by COE and USFWS (ref doc 8853). SDIV referred these agencies to FDEP and will continue to work under terms of permit unless modified by FDEP.
61.	29 May 96	10004	BEI (McNeil)	FDEP (Romeis)	Wetlands	As-built certification; As-built survey; Excavation and backfill quantities; Delineation and sampling results
62.	5 Aug 96	10614	BEI (McNeil)	SDIV (Patrick)	Wetlands	Discussion of site inspection visit of 31 Jul 96 by Ed Barham of FDEP Marathon Office.
63.	17 Sep 96	10992	BEI (McNeil)	FDEP (Traudt)	Wetland	Resend as-built survey.
64.	30 Sep 96	11121	BEI (McNeil)	NAS (Demes)	Wetland	Prepared FDEP form for *Request for Transfer of Environmental Resource Permit Construction Phase to Operation Phase.*
65.	31 May 95	5307	BEI (McNeil)	SDIV (Patrick)	All	Confirmation Sampling: Revised requirements from DQL IV to DQL III (ref doc 2386 and as coordinated with ABB for use in risk analysis). Submitted revised pages for RWP, Rev 1.
66.	29 Jun 95	5885	BEI (McNeil)	EPA (Bassett)	All	Telcon memo discussion of RWP Rev 1. EPA recommended IRG[a] for SWMU-7 be set at 1 ppm. Various other requirements. (ref doc 5610)
67.	23 Aug 95	6543	BEI (Hoekstra)	SDIV (Patrick)	S-3	PPR-001. Better definition of scope and change of IRG to "remove free product."
68.	26 Sep 95	7040	BEI (Atwood)	FDEP (Caspary)	IR-3	Telcon memo. Mobilization of IR-3 occurred more than 6 months after NAS letter 28 Feb notified FDEP of intent to perform time-critical removal action. FDEP said intent of NCP had been met; acceptable to continue.
69.	27 Sep 95	7050	BEI (McNeil)	SDIV (Patrick)	IR-3	Forward Action Memorandum for concurrence and inclusion in Administrative Record per Section 300.820 National Contingency Plan. (ref doc 7040)

[a]IRG: Interim Remediation Goal

No.	Date	Doc No.	From	To	Site	Subject
70.	6 Oct 95	7229	SDIV (Patrick)	CO NAS	IR-3	Action Memorandum (ref doc 7050) for signature and inclusion in Navy Administrative Record and publication of availability for public review.
71.	24 Aug 95	6545	BEI (Hoekstra)	SDIV (Patrick)	IR-3	PPR-002. Changes to scope definition.
72.	17 Mar 95	3907	BEI (McNeil) BEI (Taylor) BEI (Atwood)	SDIV (Patrick) FDEP (Caspary)	IR-3	Telcon memo. Agreements: BEI excavate to fence line; sample sides of excavation, but not outside fence on city property. Removal of soil down to rock removes source and satisfies intent of IRA. Cleanup criteria should be FDEP Residential/Preliminary Remediation Goal for DDT 1.8 ppm
73.	17 Apr 95	5002	FDEP (Caspary)	SDIV (Patrick)	IR 3	Horizontal core wall samples should be taken under Fort Street. Letter is review of IR site portion of RI/RFI report June 94.
74.	18 Dec 95	8107 8108	BEI (McNeil)	FDEP (Caspary) EPA (Berry)	IR-1& 3	Forward results of confirmation sampling and noted exceedances of cleanup goals.
75.	20 Dec 95	8155	BEI (Hoekstra)	SDIV (Patrick) EPA (Berry)	IR-1, 3	Telcon memo. IR-1: Discuss confirmation sampling results (ref doc 8108). EPA agreed to extend excavation to only those sample locations where exceedances were substantial (2 of 9) and not excavate area Z-16 and Z-17. IR-3: EPA agreed that intent of IRA had been met and no further excavation was required, despite 4 exceedances of IRG
76.	8 Jan 96	8295	SDIV (Patrick)	BEI (Hoekstra)	IR-1, 3	Telcon memo. FDEP (Caspary) has approved the proposed revised limits of excavation for IR-1 and agreed with no further excavation at IR-3 (ref Doc. No. 8107, 8155).
77.	25 Oct 95	7468	BEI (McNeil)	SDIV (Patrick)	IR-1	PPR-004. Added Section 4.10 to RWP to define scope.
78.	10 Jan 96	8319	BEI (McNeil)	SDIV (Patrick)	IR-1	PPR-009. Additional excavation at areas where confirmation sampling found highest concentrations of lead. Areas Z-15 and 16 are slightly above 400 ppm, but will not be excavated. (ref docs 8155 & 8295)
79.	24 Oct 95	7429	BEI (Hoekstra)	SDIV (Patrick) FDEP (Caspary)	S-1, 2 IR-1	Telcon memo discussion/agreement of Delineation Sampling maps and proposed limits of excavation (ref doc 7274)
80.	7 Mar 96	8981	BEI (McNeil)	SDIV (Patrick) FDEP (Caspary) EPA (Berry) B&R (Walters)	IR-1	Map showing final confirmation sampling results and results of additional samples requested by EPA (ref doc 8155)
81.	19 Jan 96	8464	BEI (McNeil)	SDIV (Patrick)	AOC-B	PPR-008. Added Section 4.7 to RWP to define scope and methods to comply with wetland permit.
82.	2 Feb 96	8695	NAS (Demes)	FDEP (Romeis)	Wetlands	Forward telcon memo of 20 Dec 95 to FDEP to document conclusions and understandings reached with FDEP.

No.	Date	Doc No.	From	To	Site	Subject
83.	6 Feb 96	8637	BEI (McNeil)	SDIV (Patrick)	S-1	PPR-007. Added Section 4.8 to RWP to define scope and methods to comply with wetland permit.
84.	24 Jan 96	8475 8493	BEI (Atwood)	FDEP (Gordon) EPA (Berry)	Wetland	Telcon memo. BEI asked if any mods to NAS RCRA permit were needed for BEI to perform removals at these sites. EPA agreed none were needed.
85.	28 Dec 95	8216	BEI (Atwood)	EPA Reg Coord	S 1, 2	Telcon memo. Compliance with CERCLA OFF-Site Rule. (ref doc 7430)
86.	13 Mar 96	9055	BEI (McNeil)	SDIV (Patrick)	S-2	PPR-006. Added Section 4.9 to RWP to define scope and methods to comply with wetland permit.
87.	26 Feb 96	8839	BEI (McNeil)	FDEP (Romeis)	S-2	Proposed revisions to wetland permit for excavation methods and surface water cleanup goals for IRA.
88.	13 Mar 96	9047	FDEP (Romeis)	CO NASKW	S-2	Approval of request to modify permit for SWMU-2 (Doc No. 8839).
89.	20 Nov 95	7827	BEI (Hoekstra)	FDEP (Traudt)	S-2	Sketch and description of construction plan.
90.	27 Nov 95	7896	FDEP (Caspary)	SDIV (Patrick)	S-9	Natural Attenuation proposed in BEI Technical Memo (ref doc 7569) is not appropriate. Navy should start free product recovery efforts.
91.	2 Nov 95	7569	BEI (McNeil)	SDIV (Patrick) EPA (Berry) FDEP (Caspary)	S-9	Tech memo TM-321-001. Results of groundwater sampling and pump test. Recommend Natural Attenuation.
92.	12 Feb 96	8852	BEI (Hoekstra)	SDIV (Patrick)	S-9	E-mail request from SDIV to evaluate bioslurping in lieu of pump and treat and BEI response. Based on conditions, pump and treat appears more favorable and less costly.
93.	7 Oct 94	1286	BEI (Taylor)	NAS (Carley)	S-9	Table summaries of contaminants; request to know whether effluent from treatment system can be discharged to NAS wastewater treatment system.
94.	undated	1578	NAS (Demes)	BEI (Taylor)	S-9	NAS cannot approve request to discharge to wastewater treatment system.
95.	10 Apr 96	9464	BEI (McNeil)	SDIV (Patrick)	S-9	PPR-010. Defined scope based on several reviews with EPA and FDEP.
96.	10 Nov 94	1826	BEI (Atwood)	FDEP (Cole)	S-9	Telcon. Solvents in GW[a] preclude using Gen'l NPDES[b] to enable discharge of treated GW to nearby inlet.
97.	25 Jan 95	4282	BEI (Taylor)	FDEP (Caspary)	S-9	Telcon memo, subj: Infiltration gallery. FDEP said infiltration gallery to discharge effluent posed no regulatory issues, but treatment to surface water standards is required

[a]GW: Groundwater
[b]NPDES: National Pollutant Discharge Elimination System

No.	Date	Doc No.	From	To	Site	Subject
98.	10 Apr 95	5005	BEI (Atwood)	SFWMD[a] (Superchi)	S-9	Telcon memo. Verified that any size extraction well needs a Consumptive Use permit issued. Less than 6" qualifies for gen'l permit ($350) but avoids need for well construction permit.
99.	19 Mar 96	9146	BEI (McNeil)	NAS (Demes)	S-9	Draft Consumptive Use Permit Application to SFWMD (ref doc 5005 & 9009).
100.	10 Apr 96	9509	NAS (Demes)	SFWMD	S-9	Application for General Water Use Permit. (ref docs 9009 & 9146)
101.	9 May 96	9929 10062	SFWMD[b] (Rosenfeld)	CO NASKW	S-9	Issuance of General Water Use Permit No. 44-00206-W. (Doc 10062 forwarded page change)
102.	12 Mar 96	9039	BEI (Atwood)	FDEP (Lyle)	S-9	Telcon memo. Subject: Req't for Air Permit for Air Stripper. FDEP South District, Air Quality confirmed no permit required for < 15 lb/day VOC emission. System calculated at 3.05 lb/day. Also confirmed that CAA[c] Amdt threshold 1000 lb/yr hazardous air pollutant is not applicable.
103.	15 Apr 96	9513	BEI (McNeil)	FDEP (Caspary) EPA (Berry)	S-9	Final Project Plan Revision 321-010.
104.	14 May 96	10061	FDEP (Caspary)	SDIV (Patrick)	S-9	Review and comments on Remedial Action Work Plan (Doc No. 9513)
105.	3 Jun 96	10046	BEI (McNeil)	FDEP (Caspary)	S-9	Responses to FDEP comments (Doc No. 10061)
106.	26 Jun 96	10440	FDEP (Caspary)	SDIV (Patrick)	S-9	Review and approval of responses to comments (Doc No. 10046) and approval of Remedial Action Work Plan.
107.	4 Jun 96	10550	EPA (Berry)	SDIV (Patrick)	S-9	Review and approval of Project Plan Revision (ref Doc No. 9513).
108.	24 Jun 97	13829	BEI (Hoekstra)	File	S-9	Meeting Summary - NAS Key West Tier I Partnering Team, Atlanta, Ga. June 16-17, 1997
109.	18 Feb 97	12200	BEI (McNeil)	SDIV (Patrick)	IR-8	Final Project Plan Revision 321-011. This PPR incorporated the final design report and the final drawings into the RWP.
110.	20 Feb 97	12216	BEI (McNeil)	SDIV (Patrick)	IR-8	IR-8 Wetlands Permit Binder
111.	6 Aug 96	10652	BEI (McNeil)	SDIV (Patrick)	IR-8	Minutes of July 30, 1996 meeting with wetlands permitting agencies
112.	27 Aug 96	10873	USACE (Studt)	BEI (McNeil)	IR-8	USACE Wetlands jurisdictional determination for shoreline revetment installation along the SW edge of Fleming Key
113.	3 Oct 96	11154	BEI (McNeil)	FDEP (Romeis)	IR-8	Joint application for Environmental Resources Permit / Authorization to use State Owned Submerged Lands

[a]SFWMD: South Florida Water Management District
[b]SFWMD: South Florida Water Management District
[c]CAA: Clean Air Act

No.	Date	Doc No.	From	To	Site	Subject
114.	3 Dec 96	11621	BEI (McNeil)	SDIV (Patrick)	IR-8	Comments from the FDCA on Shoreline Protection at Fleming Key
115.	9 Dec 96	11633	BEI (McNeil)	SDIV (Patrick)	IR-8	Wetlands Permit approved by FDEP
116.	9 Dec 96	11628	BEI (McNeil)	USACE (Jimenez)	IR-8	Letter forwarding Wetlands Permit approved by FDEP to USACE
117.	14 Jan 97	11874	BEI (McNeil)	SDIV (Patrick)	IR-8	USACE public notice for IR-8 Shoreline Protection Wetlands Permit
118.	3 Feb 97	12105	USACE (Jimenez)	BEI (McNeil)	IR-8	NMFS review comments on USACE's IR-8 Shoreline Protection Wetlands Permit Public Notice
119.	4 Feb 97	12116	BEI (McNeil)	USACE (Jimenez)	IR-8	BEI's response to NMFS's request that mangroves be planted the entire length of the shoreline protection system
120.	4 Feb 97	12114	BEI (McNeil)	FDEP (Grau)	IR-8	Revision to the Wetlands Permit application to change the slope from 2:1 to 3:1
121.	7 Feb 97	12191	FDEP (Grau)	NASKW (Demes)	IR-8	FDEP approval of slope change
122.	11 Feb 97	12159	BEI (McNeil)	SDIV (Patrick)	IR-8	USACE Draft Permit. This draft contained the requirement to plant 1500 linear feet of additional mangrove plantings.
123.	18 Feb 97	12201	Ocean Breeze (Hackett)	BEI (McNeil)	IR-8	Cost Estimate for additional mangrove plantings.
124.	5 Mar 97	12490	USACE (Hall)	BEI (McNeil)	IR-8	Wetlands Permit approved by USACE
125.	5 Mar 97	12329	BEI (McNeil)	FDEP (Grau)	IR-8	FDEP's Environmental Resource Permit Construction Commencement Notice
126.	10 Mar 97	12382	BEI (McNeil)	USACE (Collazo)	IR-8	Notification to USACE of the start of construction
127.	2 Sep 97	13600	BEI (McNeil)	FDEP (Grau)	IR-8	Notification to FDEP of Construction Completion
128.	2 Sep 97	13601	BEI (McNeil)	USACE (Hall)	IR-8	Notification to USACE of Construction Completion
129.	11 Sep 97	13651	BEI (McNeil)	FDEP (Grau)	IR-8	"Environmental Resource Permit As-Built Certification by a Registered Professional" was forwarded to FDEP
130.	23 Feb 98	14337	NASKW (Demes)	FDEP (Grau)	IR-8	"Request to Transfer of Environmental Resource Permit from Construction Phase to Operational Phase" was forwarded to FDEP
131.	22 Jun 98	14669-1	BEI (Cohose)	SDIV (Patrick)	IR-8	Investigation of worker symptoms – possible exposure IR-8

APPENDIX B

LESSONS LEARNED

(+) **The RAC contact vehicle is very flexible for unknown scopes of work.** The scope of work for the majority of these sites was based on limited information. Limits of excavation, types of waste, and remedial technology were not known when the project was assigned; however, the flexibility of the RAC contract permitted successful implementation of the IRA despite the limited amount of information and the variety of site conditions.

(+) **Weekly status meetings with the customer were highly productive and served as a communication conduit.** At first these weekly meetings drew little interest from the Navy, but Public Works and the NTR quickly saw their value as tools to coordinate and plan the work. Navy activities affected by the work attended regularly to stay abreast of the project.

(+) **The Critical Item Action tracking process kept important issues focused and facilitated a systematic approach to problem solving.** Bechtel's Critical Item Action Report was reviewed during a weekly telecon between the Construction Superintendent, the Project Manager, the Project Engineer, and project controls. This method of communicating needs and problem areas was very successful and helped to keep the project on track and avoided delays.

(+) **The use of preparatory phase checklists was extremely valuable in ensuring that work was conducted in accordance with approved the work plan and regulatory and Station requirements.** A site specific checklist (special conditions, permit requirements, approvals, inspections, procurement items, etc.) was prepared for each job site. Prior to beginning work Bechtel and the NTR visited the site and reviewed checklist items one by one. This process achieved NTR and Public Works agreement that Bechtel had properly prepared for the work and had identified potential obstacles and enhanced the working relationship.

(-) **The work plan approved prior to mobilization did not encompass all sites.** Three sites were not included in the initial work plan because the RAC and Navy were attempting to work out regulatory issues that would determine the type of remeidal action. This was a source of consternation to the Navy Technical Representative (NTR). Although both Bechtel and the RPM had agreed that it was more cost-effective to mobilize while the plans for those sites were in progress, it would have been better to involve the NTR in the decision-making.

(+) **The project plan revision (PPR) process was a success.** The PPR process was developed as an expedited means to modify an approved work plan. It proved to be simple, fast, and cost-effective. Modifications to the approved site work plans were developed, reviewed, and approved by the RPM in a matter of days rather than weeks. Costly delays in the field were avoided in this manner.

(-) **Mobilization of the remediation team occurred prior to conducting characterization and delineation of some sites.** The delineation of waste constituents for three sites was not obtained prior to mobilization. Although delineation was completed prior to commencing work on these sites, there were delays, notably delays in receiving analytical results needed to determine the extent of remedial actions. It would have been more efficient to conduct delineation sampling immediately after Phase 1; however, the requirement to meet funding deadlines for Phase 3 did not permit such an orderly progression of work preparation.

(-) **Overly optimistic schedules were utilized early in the project.** Because the sites were not delineated prior to publishing the initial schedules, the assumptions of waste quantities and productivity proved too optimistic. Teams working with undefined scopes should anticipate potential setbacks in scheduling, and the schedules should be updated and discussed with the Navy/NTR on a regular basis.

(-) **The approved work schedule (5 days/40 hours per week) was not as productive or efficient as the proposed 10 hour, 4 day week.** A substantial portion of the cost of working at Key West is the cost of equipment rental and per diem for field personnel. Longer work days are more efficient and help shorten the duration. An opportunity to reduce costs was lost due to the station's disapproval of the modified work week.

(+) **Use of the Christmas break to plan the remaining work was instrumental in the success of the project.** Upon receipt of the wetlands permit for SWMUs 1 and 2, and AOC-B, the project team conducted extensive planning with the subcontractor to determine the most efficient and environmentally benign methods to remove contaminated soil and surface water from the wetlands. Innovative approaches were developed that facilitated completion of the work on schedule and under budget.

(-) **The time required to obtain wetlands permits was underestimated.** Neither Bechtel nor the Navy anticipated the difficulty and slowness of processing permits through the regulatory system. Numerous unanticipated requirements were added and it was necessary to negotiate away some requirements that would have been impossible to meet. To enhance the process, wetlands permit actions should begin early and the contractor should be assigned to act as agent for the Government, as was done for the shoreline protection system permit. Developing trust with the permitting authorities is critical.

(+) **The wetlands permit field manual was beneficial in clarifying responsibilities and ensuring critical tasks were completed in a timely manner.** Bechtel prepared a field manual containing the permit and all pertinent documents and correspondence for each of the wetlands permits issued during the job. An integral part of the manual was the responsibility assignment matrix which clearly identified responsibilities and due dates. Site managers used the manuals to insure that work was in compliance with permit requirements.

(+) **Close coordination with the transportation subcontractor minimized demurrage costs.** The remote location of Key West made transportation scheduling difficult and expensive. On average, it took the lower tier hazardous waste hauler two to three days to arrive at the site from their Alabama location. The costs associated with demurrage of trucks held over at the site was high. Uncertain waste quantities remaining at the end of work at a site made scheduling trucks difficult and risky. The Bechtel/NAS field team planned and executed the work to minimize scheduling problems. Bechtel and its subcontractors coordinated their requirements effectively.

(- > +) **The station's requirements for truck loading and manifesting oversight were not fully understood at the beginning of the project.** It was learned after work began that NAS Public Works wanted to oversee all aspects of loading and manifesting waste hauling trucks. Inconsistent support on the first two sites resulted in trucks ordered several days in advance being held overnight because oversight was not available. Bechtel and the Navy recognized the problem and teamed to resolve it on all later sites; thereafter, Public Works oversight worked well.

(-) **Adequate staffing and equipping of subcontractor crews is critical in remote areas such as Key West.** The use of small business subcontractors performing work on a fixed price subcontract basis sometimes results in firms that are not fully experienced in local conditions and project specific requirements. A combination of mentoring, insistence on meeting project goals, and good contract administration is often necessary to stay on track. Pre-bid meetings are essential to show potential subcontractors the conditions of their work.

(-) **Local, qualified labor was almost non-existent.** Remedial action teams working in Key West should not expect to find a supply of qualified, efficient labor. The special training and experience required for remediation generally means that labor must be brought in from elsewhere. The cost of per diem can be significant.

(-) **Productivity is generally lower in Key West than in most mainland areas.** The small island, crowded with tourists, is often congested and movement is slow. Heat and sun, especially in summer, means workers must pace themselves and take frequent breaks. There are frequent heavy thunderstorms.

(-) **One key subcontractor was not fully responsive to Bechtel's safety and health requirements.** It is sometimes necessary to overemphasize safety and health, especially during the early phases of a project. In this case the Bechtel Safety and Health Representative assumed a more hands-on role than normal. Limitation of funds is sometimes cited as reason to forego the site health and safety specialist, but the risk is high. Project superintendents generally cannot provide day-to-day health and safety oversight and need the assistance of an on-site specialist.

(-) **Engineered controls are important on the job site to prevent damage to property and delays to the schedule.** Similar to enforcement of safety and health awareness and procedures, working with subcontractors demands constant vigilance. Despite Bechtel efforts to point out physical hazards and to enforce engineered control processes, lower tier subcontractors caused minor damage to Navy property on three occasions.

(-) **Equipment repairs caused delays.** It often took two full days to get equipment serviced due to the travel time from the equipment vendor in Miami. Planning for critical equipment should consider the need for redundancy or nearby alternate resources such as other contractors.

(-) **Hurricane evacuation must be considered in work planning during the season.** Key West is not well prepared for hurricanes and the low-lying islands are subject to flooding. Emergency travel arrangements should be made in advance for all site personnel.

(+) **Coffer dams utilized at NAS Key West were salvaged for reuse at the Jacksonville Navy RAC site.** After being used successfully at SWMU-2, these water filled bladders were shared with the Jacksonville Navy RAC team which had a similar requirement, thereby creating cost savings for the Navy.

The Following Lessons Learned Are Specific to SWMU-9, Jet Engine Test Cell

(-) **Water Chemistry: Design did not determine a need to treat water for hardness.** The treatment system design did not include a means to prevent precipitation of minerals. Manganese and calcium concentrations were determined, but tests should have included total hardness as well. This would have alerted designers to the need for water treatment prior to stripping.

(-) **Manufacturer's literature is often inadequate to predict compatibility of system components.** The sequesterant proved unsuited for the system as installed. The literature from which it was selected described the device in terms of total gallons treated, but did not indicate sensitivity to flow rate. Neither the distributor nor the vendor mentioned flow rate--they probably didn't know the limitations either. Only the manufacturer's representative finally identified the problem. Asking the right questions is important when trying to integrate components. Equipment compatibility is a critical check item in system design.

(-) **Consider using the equipment supplier for O&M support.** When the O&M phase of this project was bid, the goal was to find a qualified small business in the South Florida area, specifically the Keys. The successful bidder had to go through a learning curve, whereas the equipment supplier would probably have been more knowledgeable of system requirements.

(- > +) **Operating system signage should be visible and understandable to base duty personnel.** The system properly shut itself down due to a malfunction which occurred during the night. The alarm light illuminated and caught the attention of base duty personnel who did not understand the condition, and did not have correct contact information. A large, visible sign was placed on the system to better inform security personnel on future patrols.

APPENDIX C

KEY SUBCONTRACTORS

Subcontractor	Scope	Prime or Lower Tier
Associated Environmental Services, Inc. 411 West 25th St. Chattanooga, TN 37408 (423) 265-3108	Civil construction and hazardous and non-hazardous waste transportation, treatment & disposal.	Prime
Ocean Breeze Construction Co., Inc. 10276 Riverside Dr. Palm Beach Gardens, FL 33410 (407) 627-4407	Design and construction of shoreline protection system at IR-8.	Prime
J. J. Sosa & Associates, Inc. 9010 SW 137th Ave, Suite 211 Miami, FL 33186-1438 (305) 385-9333	Operations & maintenance of SWMU-9 treatment system	Prime
EODT Services 10511 Hardin Valley Road Knoxville, TN 37932 (423)690-6061	Unexploded ordnance / ordnance explosive waste consultant	Prime
General Engineering Laboratories P. O. Box 30712 Charleston, SC 29417 (803) 556-8171	Testing of soil and water samples.	Prime
Inchcape Testing Services 55 South Park Drive Colchester, VT 05446 (802) 655-1203	Testing of soil and water samples.	Prime
Environmental Drilling, Inc. 2301 NW 33rd Court, Suite 115 Pompano Beach, FL 33069 (305) 979-8172	Drilling	Prime
Frank & Elliott Surveyors 83266 Overseas Highway Islamorada, FL 33036	Survey Survey for shoreline protection system.	Prime Lower-tier
Sod Master P. O. Box 420184 Summerland Key, FL (305) 745-8727	Provide and install sod for site restoration at IR-1, IR-3, IR-7	Prime & Lower-tier
City Environmental Detroit, MI EPA ID No. MID90991566	Receive, treat, dispose of pesticide contaminated soil from SWMU-2 and IR-3	Lower-tier

Subcontractor	Scope	Prime or Lower Tier
Chambers Okeechobee Landfill 10800 NE 126th Ave Okeechobee, FL 34972 aka: Berman Road Landfill	Receive and dispose of waste from IR-1	Lower-tier
Environmental Quality Company 4930 North I-94 Service Drive Belleville, MI 48111 (800) 592-5489 EPA ID No. MID000724831	Receive and dispose of waste from IR-1	Lower-tier
Robbie D. Wood Trucking P. O. Box 125 Dolomite, AL 35061 (205) 744-8440 EPA ID: ALD067138891	Transportation of solid and hazardous waste	Lower-tier
Sunshine Rock, Inc. NW 129th Ave & 202nd St. Miami, FL (305) 821-8660	General fill	Lower-tier
Pace Environmental Laboratories, Inc. 5600 Beaumont Center Blvd Tampa, FL 33634 (813) 884-8268 FDEP CompQAP 870529G Lab Certification Florida Environmental: HRS E84003 FL SDWA: HRS 84125	Laboratory analysis for disposal profiles and personnel monitoring	Lower-tier
Rinker Materials Miami, FL 33012	Backfill material	Lower-tier
Soil Tech Distributors, Inc. Hialeah, FL 33011	Transporter of non-hazardous waste	Lower-tier
White Rock Quarries West Palm Beach, FL	Backfill material	Lower-tier
Standard Sand & Silica Davenport, FL	Backfill material	Lower-tier
Florida Aggregate Group Labelle, FL	Backfill material	Lower-tier