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NAS KEY WEST  
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DELINEATION SAMPLING REPORT FOR SOLID WASTE MANAGEMENT UNITS 1, 2, 3 AND  
7, SITES 1 AND 3 AND AREAS OF CONCERN A AND B VOLUME 1 OF 2 NAS KEY WEST FL

11/1/1995

BECHTEL ENVIRONMENTAL INC

**DELINEATION SAMPLING REPORT  
FOR  
SWMU-1, SWMU-2, SWMU-3, SWMU-7,  
AOC-A, AOC-B, IR-1, and IR-3**

**AT THE  
NAVAL AIR STATION  
KEY WEST, FLORIDA  
DELIVERY ORDER 0004  
VOLUME I**

Prepared for

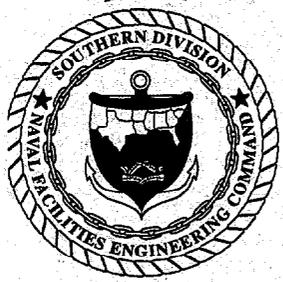
**DEPARTMENT OF THE NAVY  
SOUTHERN DIVISION  
NAVAL FACILITIES ENGINEERING COMMAND**

Under Contract No. N62467-93-D-0936



Prepared by

**BECHTEL ENVIRONMENTAL, INC.  
OAK RIDGE, TENNESSEE  
BECHTEL JOB NO. 22567**



**DELINEATION SAMPLING REPORT**

**FOR**

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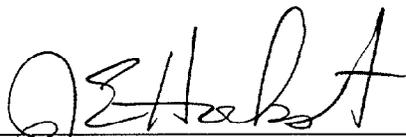
**BECHTEL ENVIRONMENTAL, INC.**

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**REVISION 1**

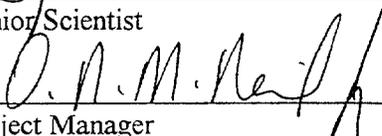
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**DELINEATION SAMPLING REPORT  
FOR SWMU-1, SWMU-2, SWMU-3, SWMU-7, AOC-A, AOC-B, IR-1, and IR-3  
AT NAS KEY WEST, FLORIDA**

**1.0 INTRODUCTION**

This document presents results from soil sampling activities conducted to support the Interim Remedial Actions (IRAs) planned for several sites at the Naval Air Station (NAS) at Key West, Florida. The IRAs include excavation and treatment/disposal of impacted soils. This report contains data needed to delineate the limits of excavation, to estimate excavation quantities, and to meet transportation and disposal requirements for the excavated material.

**1.1 BACKGROUND**

A facility characterization report *Final Report RCRA Facility Investigation Remedial Investigation Naval Air Station - Key West, 1994 (RFI/RI Report)* by IT Corporation, identified a number of sites at or near the Naval Air Station that are adversely impacted by metals and/or organic chemical constituents. The RFI/RI report recommended remedial actions to remove impacted soil at several of these sites.

IRAs were subsequently developed for several sites that include excavation and treatment/disposal of the impacted soils. Background information describing the sites, the chemicals of concern for each site, and the planned IRA activities is contained in *Remedial Work Plan Delivery Order No. 0004 Naval Air Station Key West, Florida (Remedial Work Plan)*.

Before excavation and treatment/disposal activities can commence, detailed data are needed to delineate the limits of excavation and to meet transportation and disposal requirements for the excavated material. To obtain this data, sampling was conducted at various times from February through September, 1995, at the following sites:

- Solid Waste Management Unit (SWMU) 3, Fire Fighting Training Area
- SWMU-7, Building A-824
- SWMU-1, Boca Chica Open Disposal Area
- SWMU-2, Boca Chica DDT Mixing Area
- IR-1, Truman Annex Refuse Disposal Area
- IR-3, Truman Annex DDT Mixing Area
- Area of Concern (AOC) A, Demolition Key
- AOC-B, Big Coppitt Key Abandoned Civilian Disposal Area

Sampling was conducted in accordance with Revision 1 of the *Delineation Sampling Plan for SWMU-3, SWMU-7, AOC-A, AOC-B, IR-3, SWMU-1, SWMU-2 and IR-1 at NAS Key West, Florida*.

## 2.0 GENERAL SAMPLING APPROACH

### 2.1 DELINEATION SAMPLING

Delineation sampling to support IRAs was the primary focus of this sampling effort. The purpose of delineation sampling was to establish boundaries (limits) for excavation of impacted soils. Horizontal limits are achieved when a series of sample locations below cleanup levels are established showing a clean boundary encircling the area of impacted soil (existing structures or other features may establish a portion of the boundary). Progressive sampling to determine the depth (vertical limits) of impacted soil for excavation was also conducted. Samples were collected vertically at one foot intervals (0-1 ft, 1-2 ft, etc.) to clean soil or otherwise down to the water table or caprock.

### 2.2 ANALYTICAL METHODOLOGY

Both onsite analysis by Immunoassay (IMU) methodology and offsite laboratory analysis were conducted during this study. Samples for metals analysis were analyzed by EPA Method 6010. Onsite IMU analysis was conducted following Draft EPA Method 4020 [for IMU analysis of polychlorinated biphenyls PCBs]. IMU analyses were also conducted for the pesticides and petroleum contamination, following the manufacturers instructions for these analyses. The pesticide analysis included DDT and its metabolites, DDD and DDE. To detect petroleum, IMU analysis was conducted for the volatile constituents of petroleum [benzene, toluene, ethylbenzene, and xylene (BTEX)] and semi volatile constituents of petroleum [polynuclear aromatic hydrocarbons (PAHs)]. Wherever onsite analysis was used a designated percentage of samples were sent to an offsite laboratory to verify field results. Field analytical methods and detection limits are listed in Attachment A.

Both the IMU analysis results and the offsite laboratory results for each site are included in Volume 2, Appendices 1 through 9. The offsite laboratory qualifers are included in Attachment C.

#### 2.2.1 Site Specific Analytical Methods

The *RFI/RI Report* identified specific organic and/or inorganic chemicals of concern for each site. The chemicals of concern at SWMU-3 (petroleum contaminants) and SWMU-7 (PCBs) are organic contaminants that can be analyzed in the field by IMU methodology. IMU methodology allows several rounds of samples to be collected and analyzed onsite in a relatively short period of time and is well suited for delineation sampling.

The contaminants of concern at AOC-A, AOC-B, IR-1, and SWMU-1 consist of inorganics (metals), which are not amenable for IMU analysis and require offsite laboratory analysis

The primary contaminants at IR-3 and SWMU-2 are organic (pesticides), but inorganics have also been detected. This site was delineated for pesticides by IMU methodology and samples were also sent offsite for lead and arsenic analysis for IR-3 and lead only for sediment samples for SWMU-2..

### 2.3 TOXICITY CHARACTERISTICS SAMPLING

In order to determine transportation and disposal requirements for the material to be excavated, data on the presence or absence of toxicity characteristics are needed. At least one sample from seven of the sites were collected and analyzed at an offsite laboratory using the toxicity characteristics leaching procedure (TCLP) to provide this data. These samples were selected based on locations with the highest concentrations of the chemicals of concern on a site by site basis. TCLP testing was not conducted on any samples from SWMU-2. The TCLP results are reported in Section 3.0.

## 2.4 CHARACTERIZATION SAMPLING

Characterization samples were collected at four of the sites. These sites include IR-1, IR-3, SWMU-1 and SWMU-2. The analysis required were specified in the CLEAN's *RFI/RI Workplan*. A CLEAN representative was present during the sampling and chose the location of the samples. The results from these sampling activities are included in the Appendices.

## 2.5 QUALITY CONTROL SAMPLES

Quality Control (QC) samples and frequency of collection were as follows:

- Split sample of IMU sample for offsite Laboratory Analysis 5% (1 per 20 samples)
- Duplicates 5% (1 per 20 samples for offsite analysis)  
10% (1 per 10 samples for onsite analysis)
- Equipment Rinsates 5% (1 per 20 samples)
- Decontaminated Disposable Equipment samples 5% (1 per 20 samples locations, for contaminated locations only)

## 2.6 SAMPLING APPROACH

AOC-B, IR-1, IR-3, SWMU-1 and SWMU-2 were sampled on a grid pattern that allows a known probability for detection and/or delineation of isolated hot spots (area of contamination above cleanup criteria) within the area or site of concern. For example, if an area is systematically sampled on a grid pattern, the level of confidence for detection or failure to detect an isolated hot spot can be calculated based on the size of the grid relative to the area. A complete description of hot spot detection based on grid sampling is contained in the EPA document *Methods for Evaluating the Attainment of Cleanup Standards. Volume 1: Soils and Solid Media*.

Several of the sites investigated (SWMU-3, SWMU-7, and AOC-A) are areas of known spills, releases or disposal which constitute known hot spots. The sampling approach at these sites is not based upon detection of contaminants in an unknown isolated hot spot; therefore, a statistical model is not applicable. The sampling approach for these sites was used to define the extent of the required excavation to remove the contaminants.

### 3.0 SITE-SPECIFIC SAMPLING RESULTS

#### 3.1 SWMU-3: BOCA CHICA FIRE FIGHTING TRAINING AREA

##### 3.1.1 Introduction

The site consists of a bermed area approximately 70 - 90 ft in diameter (see Figure 1). The contaminant of concern is petroleum in the soil and possible free product at the water table. The lower boundary of excavation has been determined to be no deeper than the water table or, if the water table is not encountered, soil will be removed to caprock.

A grid was established over the site and seven locations along the inner and outer boundary of the berm at SWMU-3 were sampled for discrete samples. A composite sample of berm material was also collected to determine whether the berm was impacted by petroleum contaminants. Samples were collected and analyzed in the field by IMU methodology for BTEX and PAHs. One sample was shipped to an offsite laboratory for TCLP VOA and TCLP metals analysis and one split sample was shipped to an offsite laboratory for BTEX and PAHs analysis. Sample locations and analytical data for BTEX and PAHs are presented on Figure 1. The field IMU results for SWMU-3 are included in Appendix 9 and the offsite laboratory results are included in Appendix 1.

##### 3.1.2 Description of Soil

Soil encountered was gravely, medium to coarse grain sand ranging in thickness from 20 to 35 in., overlaying Miami oolite limestone (caprock). The soil layer typically included 6 to 10 inches of weathered rock that could be broken, cut, and eventually augered and sampled with a 2-in. diameter hand auger. Caprock was encountered during sampling at depths ranging from 20 to 35 in. below grade, evident by a distinct layer of rock impenetrable by hand augers and a portable power auger. The water table was not evident at these depths, although several inches of moist soil were sometimes encountered just above the caprock.

##### 3.1.3 Analytical Results

BTEX was not detected in any of the samples above the FDEP cleanup criteria of 200 ppm. BTEX was detected in samples from two locations inside the berm (G17 and K16), ranging in concentration from 3.2 ppm to 30 ppm. Samples from all other locations had results below the detection limit of 2.5 ppm.

PAHs were detected in samples from three locations inside the berm (G17, K16 and K12). Low levels of PAHs were detected in surface and subsurface sampling intervals, ranging in concentration from 0.6 ppm to 6.3 ppm total PAHs. A petroleum odor was also evident at these locations beginning at a sampling depth of about one foot. The samples collected at all other locations had results below the detection limit of 0.6 ppm. No PAHs were detected in samples collected from locations outside the berm (E12, F17, K11, L18). Analysis of the composite sample of the berm material did not detect presence of BTEX or PAHs.

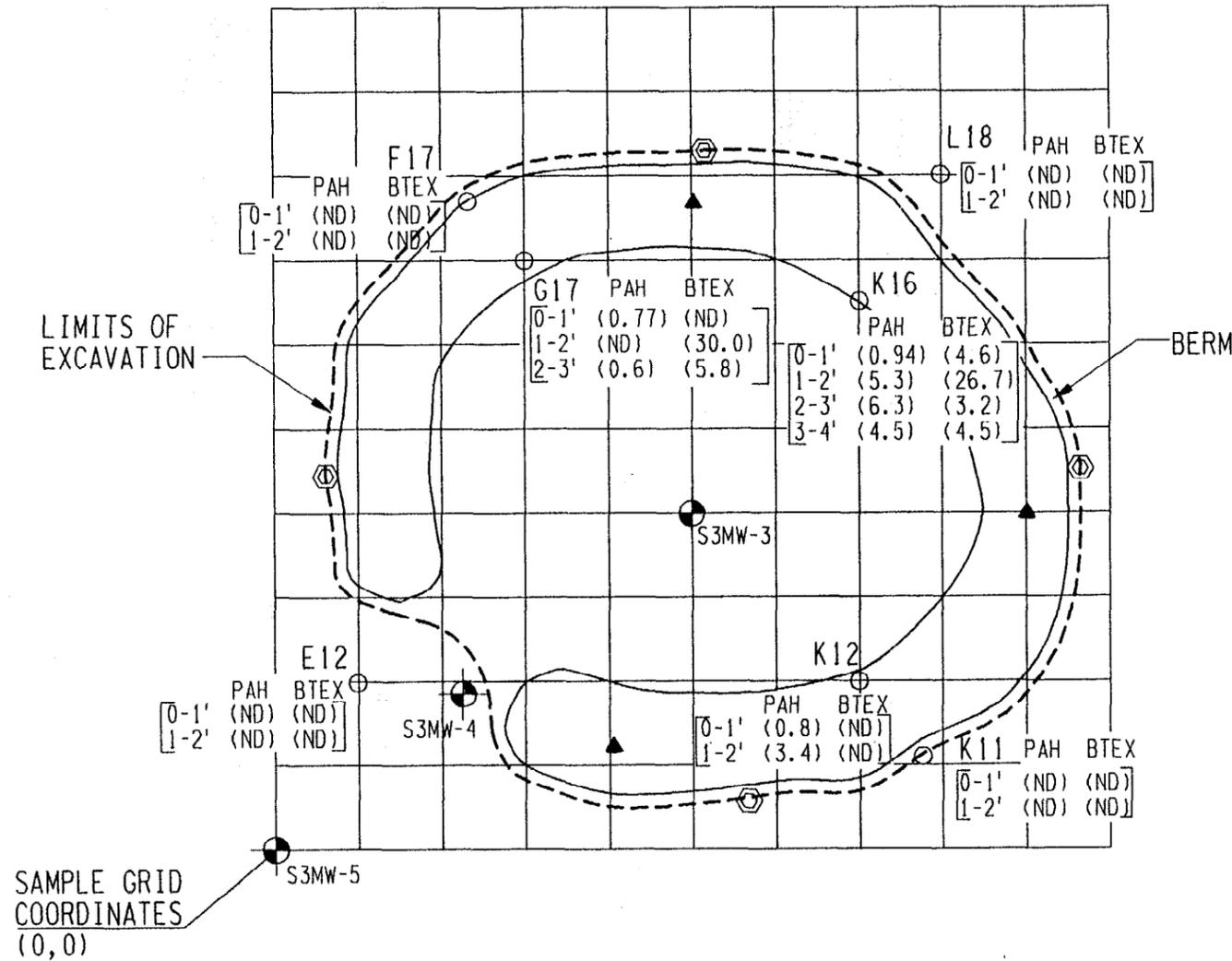
One split sample was collected at the location K16 from the 3 to 4 ft depth (Sample ID KW02042). This sample was sent to an offsite laboratory for analysis for BTEX and PAHs. The only detection was one PAH at a concentration of 30.3 ppm; there were no BTEX detections. The field analysis by IMU methodology of this sample had detections of PAHs of 4.5 ppm and BTEX of 4.5 ppm for this sample. The results of the field screening were not as precise as the lab results; however, they were able to be used to determine the extent of contamination at the SWMU-3 site.



OLD BLIMP PAD

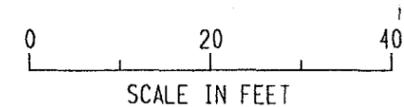
NOTES

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
- SAMPLE IDENTIFICATION
- CONCENTRATION OF PAH'S AND BTEX AT INDICATED DEPTH (ppm)
- (ND) NOT DETECTED
- LOCATION FOR COMPOSITE SAMPLE



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

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### 3.1.4 TCLP Results

One sample (K16, 2-3', Sample ID KW02041) which contained the highest levels of PAHs detected by field analysis (6.3 ppm) was selected for TCLP analysis. This sample was shipped to an offsite laboratory for TCLP VOA and TCLP metals analysis and passed these tests.

### 3.1.5 Conclusions

This study and the RFI/RI results established a boundary for the petroleum impacted soil. Data indicates petroleum impacted soil is present inside the bermed area and extends to the inner edge of the berm, but does not extend outside the outer edge of the berm. Data also indicate the depth of impacted soil extends to caprock, which is present from 20 to 35 in. below surface. Field analytical data indicate the berm material is not impacted by BTEX or PAHs. The sample containing highest level of PAHs passed the TCLP for metals and VOAs.

### 3.1.6 Limits of Excavation

Limits of excavation are shown in Figure 1. Depth of excavation is estimated to be 20-35 inches to caprock. Excavation will be in accordance with Section 4.1 of the *Remediation Work Plan*.

### 3.1.7 Confirmation Sampling

After excavation, soil samples will be collected from the excavated area to confirm removal of impacted soil. Confirmation DQO levels are described in Section 5.2 of *Remediation Work Plan*. Four confirmation soil samples will be collected from the excavation side walls and analyzed for TCL VOCs, TCL SVOCs, TAL metals and cyanide. Samples will be collected at the approximate locations shown on Figure 1. Excavation is expected to extend to caprock and remove all overlying soil. Sample locations will be adjusted, if necessary, based on actual excavation limits and presence of sample matrix. No soil samples will be collected from the floor of the excavation.

## 3.2 SWMU-7: BUILDING A-824

### 3.2.1 Introduction

The site is located at the north end of building A-824, which was used as a transformer storage building (see Figure 2). PCB, specifically, arochlor 1260, has been detected in the soil around the concrete pad located at that north end of the building. The lower boundary of soil excavation has been determined to be no deeper than the water table or, if the water table is not encountered, soil will be removed to caprock.

A grid was established over the site and samples were collected to determine extent of impacted soil. A total of 14 samples (up to one foot intervals) were collected from 13 locations. Samples were analyzed in the field by IMU methodology for PCBs. Sample locations and analytical data is shown in Figure 2. The field IMU results for SWMU-7 are included in Appendix 9 and the offsite laboratory results are included in Appendix 2.

### 3.2.2 Description of Soil

Soil encountered was a relatively thin layer of gravelly, medium to coarse grain sand generally ranging in thickness from 1 to 10 in., overlaying caprock. Portions of the site consist of exposed caprock. At exposed rock locations, samples were obtained by drilling with a portable power auger to refusal (4 - 5 in.) and obtaining the sample from the cuttings. One sample location, collected at the edge of a concrete pad (I14), extended to a depth of 17 in., possibly due to several inches of fill from excavation for placement of the pad. The water table was not encountered.

### 3.2.3 Analytical Results

PCBs were detected above the FDEP "Soil Cleanup Goals for Military Sites," dated April 5, 1995, industrial cleanup criteria of 3.5 ppm in samples from four of 13 locations. PCBs concentrations ranged from 0.7 to 30.8 ppm, with samples from seven locations indicating no detection (ND). One IMU split sample was collected for analysis by an offsite laboratory. This sample (L14, 0-1', Sample ID KW02057) was analyzed for PCBs. PCB 1260 was detected in this sample at a concentration of 0.505 ppm. The field IMU analysis of a sample from the same location detected PCBs at a concentration of 0.7 ppm showing a very good correlation between the field sampling results and the offsite laboratory results.

### 3.2.4 TCLP Results

The sample representing the highest concentrations of PCBs detected by field analysis (I14, 0-1', Sample ID KW02063) was selected for offsite TCLP metals analysis, and passed the TCLP test.

### 3.2.5 Conclusions

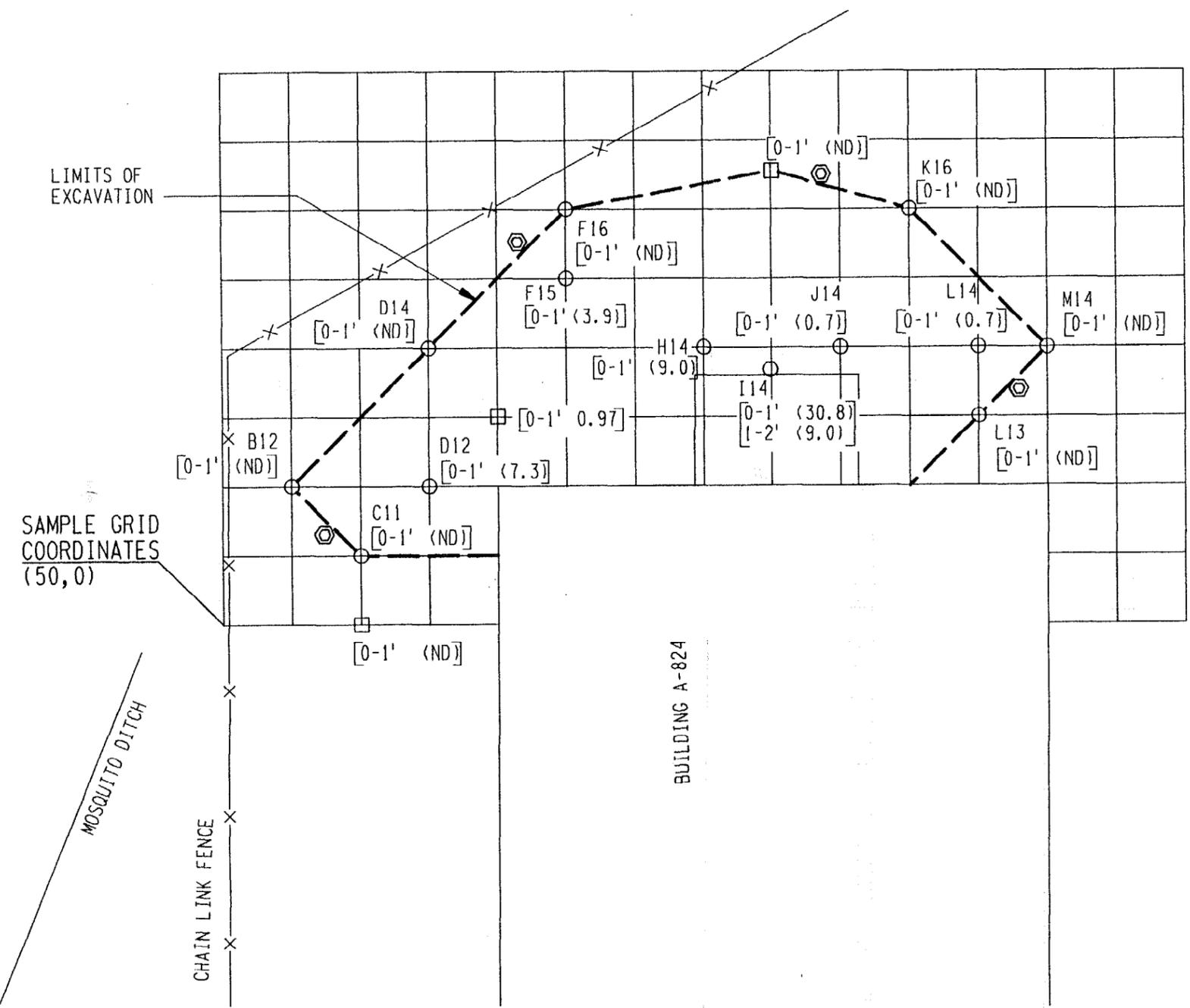
The study established the maximum horizontal extent for contamination in the surface soils (dashed line) for the PCB impacted soil as shown in Figure 2. The highest concentrations of PCB were detected in samples from the edge of the concrete pad, west and southwest of the pad while concentrations dropped off sharply to the north and east of the pad. The soil sampling investigation also indicates the layer of impacted soil to be thin (generally 1-10 in.) overlaying caprock. The sample representing the highest concentrations of PCBs passed the TCLP test for metals.

### 3.2.6 Limits of Excavation

Limits of excavation are shown in Figure 2. Depth of excavation is estimated to be 1-10 inches to caprock. Excavation will be in accordance with Section 4.2 of the *Remediation Work Plan*.

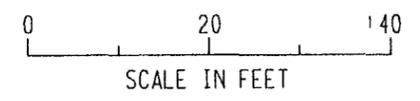
### 3.2.7 Confirmation Sampling

After excavation, samples will be collected from the excavated area to confirm removal of impacted soil. Confirmation DQO levels are described in Section 5.2 of the *Remediation Work Plan*. Four confirmation soil samples from the excavation side walls will be collected and analyzed for PCBs. Samples will be collected at the approximate locations shown in Figure 2. Excavation is expected to extend to caprock and remove all overlying soil. Sample locations and quantities will be adjusted, if necessary, based on actual excavation limits and presence of sample matrix. No soil samples will be collected from the floor of the excavation.



**LEGEND**

- GRID 5' x 5'
- PREVIOUS SAMPLE LOCATION (FROM RFI/RI REPORT)
- SAMPLE LOCATION
- ⊗ PROPOSED CONFIRMATION SAMPLE
- D14 SAMPLE IDENTIFICATION
- [0-1' (0.7)] CONCENTRATION OF PCB's AT INDICATED DEPTH (ppm)
- (ND) NO PCB's DETECTED (THE DETECTION LIMIT OF THE TEST KITS USED WAS 0.5 ppm)
- x— FENCE



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

0056D02Z

### 3.3 AOC-A: DEMOLITION KEY

#### 3.3.1 Introduction

The site is located on an island where out of date ordnance was open burned and/or open detonated for disposal. The RFI/RI investigation identified four burn pits present on the island, and established the contaminants of concern to be metals, specifically lead, arsenic, and antimony. Explosives consultants provided by the Navy accompanied the team and cleared work areas as a safety measure prior to commencing onsite activities. During this sampling event, soil samples were collected vertically at one foot intervals, except for samples collected in the side slopes of the pits, which were collected by auguring at a 45° angle into the slope (i.e., locations PUB, PAC, PEE, P1F, and P1G). Sample locations are shown in Figure 3. The offsite laboratory results for AOC-A are included in Appendix 3.

Two small pits (Pits #2 and #3) were sampled by collecting surface and subsurface samples at the center of the pits. Pits #1 and #4 were sampled at locations at the bottom and sides of the pits. Samples were sent to an offsite laboratory for analysis for lead, arsenic and antimony.

#### 3.3.2 Description of Soil

Soil at AOC-A was observed to be rocky, gravelly, medium- to coarse-grain sand. Samples were obtained by hand auguring and occasionally relocating the sample location up to two feet from the initial sampling location, as necessary, to avoid subsurface rocks. The water table was encountered during sampling at several locations. At Pit #2, moist soil and auger refusal was encountered at a depth of 3 ft. The water table was identified at Pit #4 at a depth of 28 in.. At Pit #1, the water table was identified at a depths of 16 to 18 in. at the south side of the pit (closest to the shoreline), and at 26 in. at the north end of the pit (farthest from the shoreline).

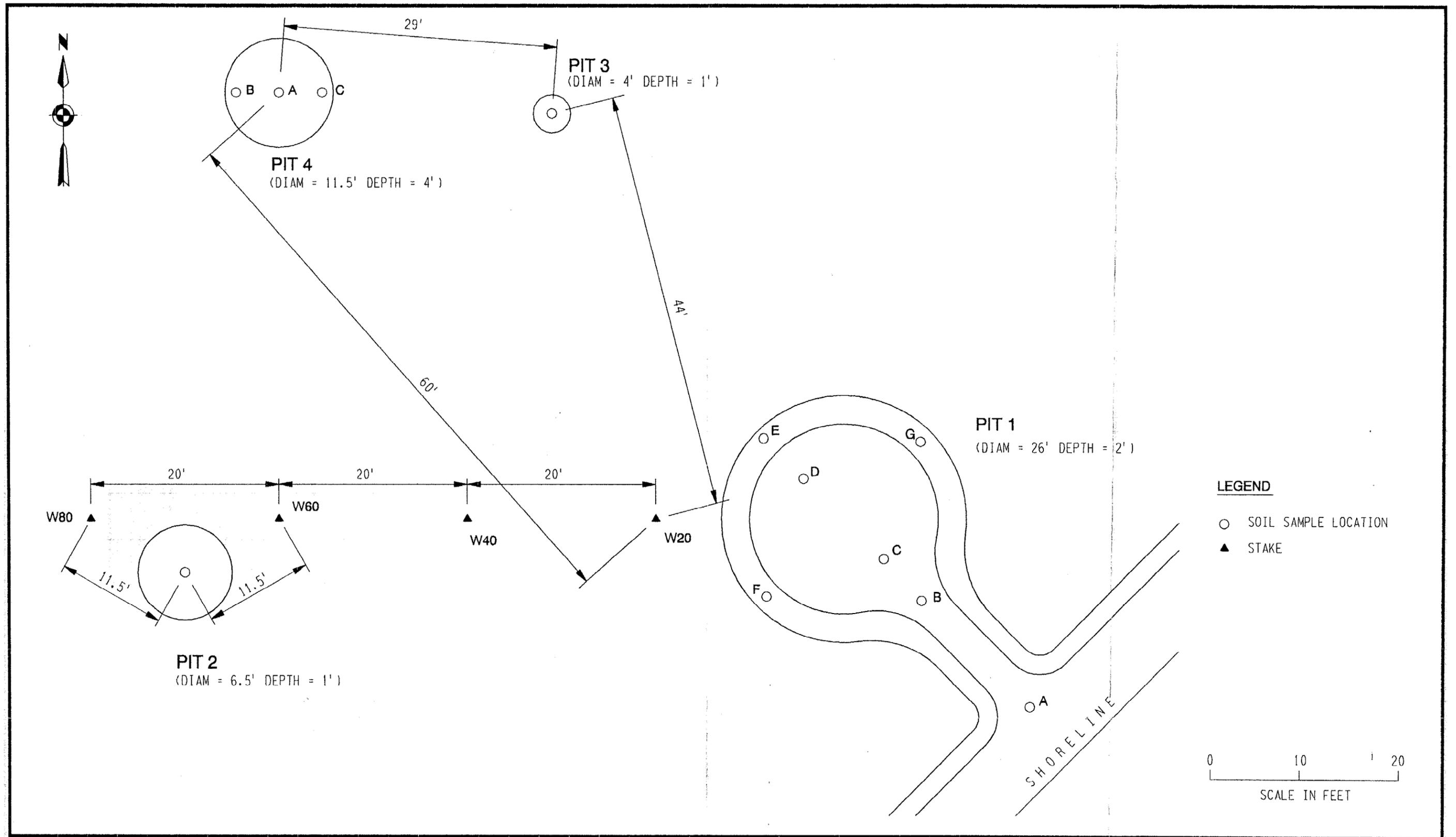
#### 3.3.3 Analytical Results

##### Pit #1

Fourteen soil samples were collected at Pit #1 at AOC-A. Six of the samples had detected concentrations of lead above the CERCLA Guidance Document cleanup criteria of 400 ppm. These concentrations of lead ranged from 672 ppm (Sample ID KW02159) to 46,800 ppm (Sample ID KW02153). Four of the samples had detected concentrations of arsenic above the cleanup criteria of 10 ppm. These concentrations of arsenic ranged from 10 ppm (Sample ID KW02153) to 73.8 ppm (Sample ID KW021161). Two of the samples had detected concentrations of antimony above the cleanup criteria of 210 ppm. These concentrations were 287 ppm (KW02152 and 512 ppm (KW02153). The samples with the highest detections were concentrated in the bottom of the pit and at sample locations E and F on the sides of the pit. Figure 3 indicates the sample locations; Table 1 contains the lead, arsenic and antimony sample results for Pit #1.

##### Pit #2

Three soil samples were collected at varying depths from one auger hole at the center of Pit #2 at AOC-A. None of the samples had detected levels of arsenic, lead, or antimony above the cleanup criteria of 10 ppm for arsenic, 400 ppm for lead or 820 ppm for antimony. Table 2 contains the lead, arsenic and antimony sample results for Pit #2.



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FIGURE 3  
PIT SAMPLING LOCATIONS AT AOC-A

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**Table 1**  
**AOC-A Pit 1**  
**Laboratory Analysis Results in ppm**

PARAMETER	STANDARD mg/kg	Sample ID						
		Location, Depth(ft)						
		KW02152 P1D 0-1*	KW02153 P1D 1-2	KW02154 P1E 0-1	KW02155 P1E 1-2	KW02157 P1G 0-1	KW02158 P1G 1-2	KW02159 P1F 0-1
ARSENIC	10 <sup>1</sup>	48.2	10	2.59	1.26	1.14	1.05	3.31
LEAD	400 <sup>2</sup>	28900	46800	1140	144	18.8J	ND	672
ANTIMONY	210 <sup>3</sup>	287	612	ND	ND	ND	ND	ND

PARAMETER	STANDARD mg/kg	Sample ID						
		Location, Depth(ft)						
		KW02160 P1F 1-2	KW02161 P1C 0-1	KW02162 P1C 1-2	KW02163 P1B 0-1	KW02164 P1B1-2	KW02165 P1A 0-1	KW02166 P1A1-2
ARSENIC	10 <sup>1</sup>	3.4	73.8	12.1	7.54	0.791	0.318	0.781
LEAD	400 <sup>2</sup>	66.1	2290	1570	2260	274	11.3J	10.9J
ANTIMONY	210 <sup>3</sup>	ND	ND	12.7J	16.6J	ND	ND	ND

<sup>1</sup>The 10 ppm limit for arsenic was proposed by FDEP and Region IV EPA on May 2, 1995.

<sup>2</sup>The 400 ppm limit for lead is based on the revised CERCLA Guidance Document dated July, 1994.

<sup>3</sup>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 standard.

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

ppm=parts per million

### **Pit #3**

Three soil samples were collected at varying depths from one auger hole at the center of Pit #3 at AOC-A. None of the samples had detected levels of arsenic, lead, or antimony above the cleanup criteria of 10 ppm for arsenic, 400 ppm for lead or 820 ppm for antimony. Table 3 contains the lead, arsenic and antimony sample results for Pit #3.

### **Pit #4**

Six soil samples were collected at Pit #4 at AOC-A. One of the samples had detected concentrations of lead above the cleanup criteria of 400 ppm, this concentrations of lead was 914 ppm. The sample with the only detection of lead above the cleanup criteria was on the east side of the pit at sample location C, 0-1 ft (Sample ID KW02144). The only sample with the detection of arsenic above the cleanup level of 10 ppm was on the bottom of the pit at sample location A, 0-1 ft (Sample ID KW02138). The concentration for this sample was 13 ppm. Figure 3 indicates the sample locations; Table 4 contains the lead, arsenic and antimony sample results for Pit #4.

#### **3.3.4 TCLP Results**

One sample from each pit was shipped to an offsite laboratory for TCLP metals analysis. The sample selected from Pit #1 was from the bottom of pit at location D, 0-1 ft (Sample ID KW02152). This sample had lead concentrations detected at 28,900 ppm from the metals analysis. The TCLP analysis for this sample passed the TCLP test with a value for lead of 4.08 ppm (TCLP limit = 5.0 ppm). The rest of the samples results from the other pits also passed the TCLP testing (Sample IDs KW02138, KW02146, and KW02149).

#### **3.3.5 Conclusions**

Two of the four pits tested had values of lead detected in excess of CERCLA Guidance Document cleanup criteria of 400 ppm.. The results from Pits #2 and #3 indicate the detected concentrations for lead are below the 400 ppm action levels.

### **3.4 AOC-B: BIG COPPITT KEY ABANDONED CIVILIAN DISPOSAL AREA**

#### **3.4.1 Introduction**

The AOC-B disposal area consists of a peninsula shaped area of bare ground (resembling a roadbed) that extends about 250 ft into a surrounding mangrove swamp (Figure 4). The area is about 2 ft higher in elevation than the surrounding mangrove swamp. Remains of rusted car and truck bodies were observed along the edge of the high ground. The contaminants of concern are metals, possibly originating from the decaying car and truck parts. Sampling during the RFI/RI did not detect contaminants in soil at levels that would cause the excavated soils to be a hazardous waste. Sediment samples at the edge of the disposal area did however exceed sediment quality guidelines for metals.

Samples were collected and analyzed for TAL metals along the center of the AOC-B, along the edge of AOC-B, and at locations extending about 50 ft into the mangrove swamp. Sample locations are shown in Figure 4. The offsite laboratory results for AOC-B are included in Appendix 4.

**Table 2**  
**AOC-A Pit 2 - Laboratory Analysis Results in ppm**

PARAMETER	STANDARD mg/kg	Sample ID Location, Depth(ft)		
		KW02149 P2A 0-1*	KW02150 P2A 1-2	KW02151 P2A 2-3
ARSENIC	10 <sup>1</sup>	1.34	0.703	1.18
LEAD	400 <sup>2</sup>	249	149	31.1
ANTIMONY	210 <sup>3</sup>	ND	ND	ND

**Table 3**  
**AOC-A Pit 3 - Laboratory Analysis Results in ppm**

PARAMETER	STANDARD mg/kg	Sample ID Location, Depth(ft)		
		KW02146 P3A 0-1*	KW02147 P3A 1-2	KW02148 P3A 2-3
ARSENIC	10 <sup>1</sup>	6.63	6.14	5.82
LEAD	400 <sup>2</sup>	83.3	52	59.7
ANTIMONY	210 <sup>3</sup>	ND	ND	ND

**Table 4**  
**AOC-A Pit 4 - Laboratory Analysis Results in ppm**

PARAMETER	STANDARD mg/kg	Sample ID Location, Depth(ft)					
		KW02138 P4A 0-1*	KW02139 P4A 1-2	KW02140 P4B 0-1	KW02142 P4B 1-2	KW02144 P4C 0-1	KW02145 P4C 1-2
ARSENIC	10 <sup>1</sup>	13	8.73	4.29	2.23	7.37	1.68
LEAD	400 <sup>2</sup>	371	114	171	ND	914	12.0J
ANTIMONY	210 <sup>3</sup>	ND	ND	ND	ND	ND	ND

<sup>1</sup>The 10 ppm limit for arsenic was proposed by FDEP and Region IV EPA on May 2, 1995.

<sup>2</sup>The 400 ppm limit for lead is based on the revised CERCLA Guidance Document dated July, 1994.

<sup>3</sup>FDEP Soil Cleanup goals for Military Bases, April 15, 1995

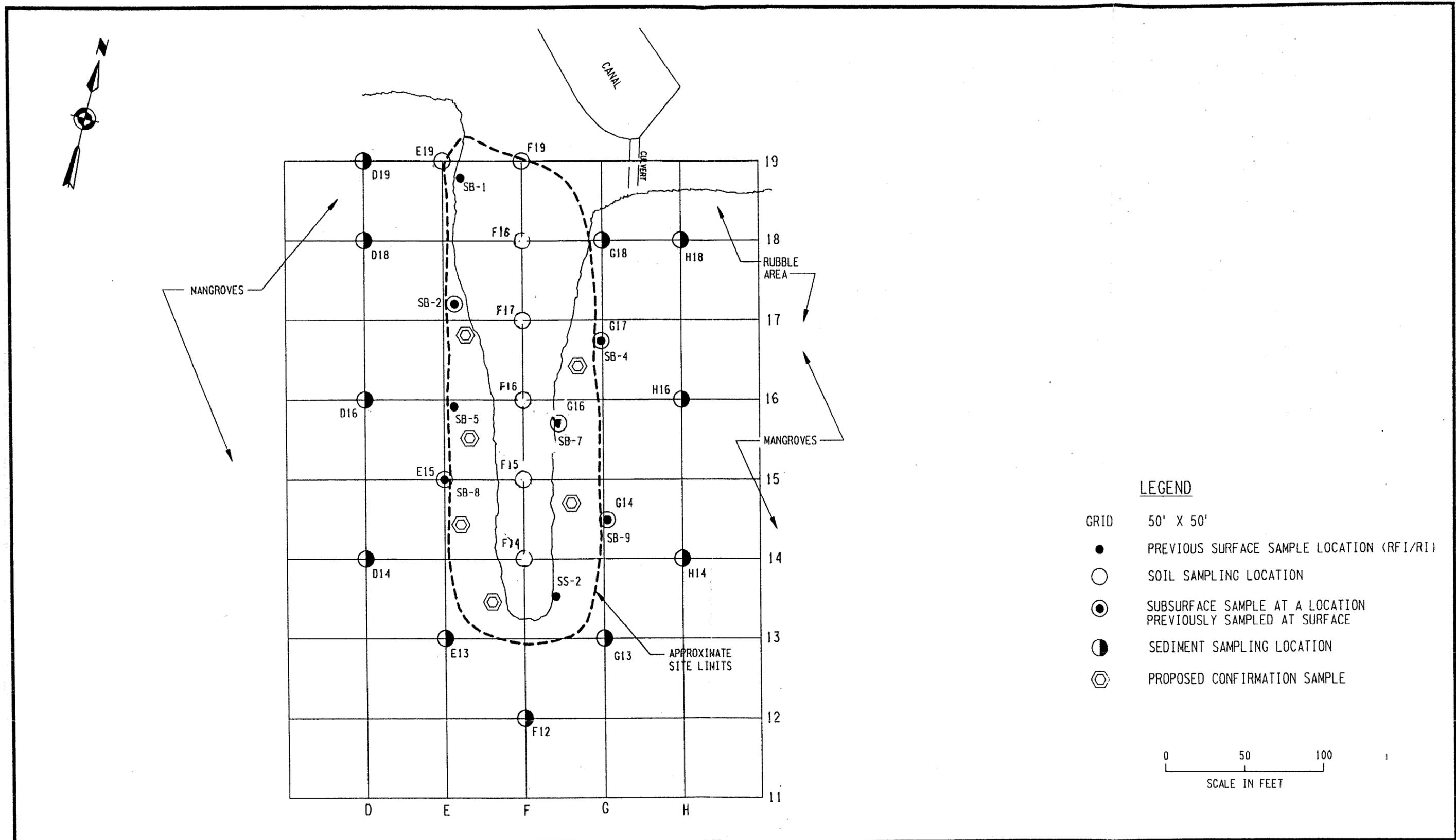
ND - Not Detected

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 standard.

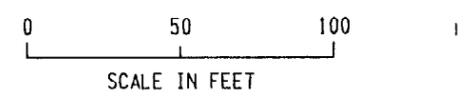
\*TCLP analysis included. Results were below TCLP limits for all metals.

ppm=parts per million



**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
- ⬡ PROPOSED CONFIRMATION SAMPLE



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**FIGURE 4**  
**AOC SITE B - BIG COPPITT KEY**  
**ABANDONED CIVILIAN - DISPOSAL AREA**

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### 3.4.2 Description of Soil

Soil sampling along the center portion of the peninsula indicated soil there is relatively shallow, rocky and gravely, medium to coarse grain sand. Soil generally ranged in thickness from 4 to 12 in., overlaying caprock.

Along the edge of disposal area, between the higher ground and the mangrove swamp, is a transitional area about 15 to 20 ft wide consisting of rusted and deteriorated metal, tires and car parts that is partially overgrown or encroached upon with mangroves. The rusted metal parts range in thickness from about 6 to 20 in.. A shallow layer of soil, about 6 in. thick and intermingled with the metal parts, was encountered overlaying the caprock.

Soil in the surrounding mangrove swamp, at locations about 50 ft out from the edge of the disposal area, consists of a relatively shallow layer of peat and silt ranging in thickness from 10 to 24 in., overlaying caprock. No surface water was present at sample locations in the mangrove wetland during the study period.

An area of rubble was also identified at the northeast corner of the area. This area contained boulder size pieces of rock and coral fill overgrown with brush. No metal or other refuse was observed in this area.

### 3.4.3 Sample Analysis

#### Sediment

Twenty-three sediment samples were collected. Analytical results indicate that seven of these samples exceeded sediment quality standards for one or more metals. The laboratory results for the sediment samples are included in Table 5.

- The arsenic sediment criteria of 7.24 ppm was exceeded at location D14, 0-1 ft, Sample ID KW02005 (8.1 ppm); E13, 0-1 ft, Sample ID KW02007 (10.2 ppm); D19, 0-1 ft, Sample ID KW02002 (7.68 ppm); and G16, 1-2 ft, Sample ID KW02020 (7.96 ppm).
- The nickel sediment criteria of 15.9 ppm was exceeded at location D19, 0-1 ft, Sample ID KW02002 (38.1 ppm).
- The copper sediment criteria of 18.7 ppm was exceeded at location D19, 0-1 ft, Sample ID KW02002.
- The lead sediment criteria of 30.2 ppm was exceeded at location D19, 0-1 ft, Sample ID KW02002 (44.7 ppm).
- The zinc sediment criteria of 68 ppm was exceeded at locations D19, 0-1 ft, Sample ID KW02002 (450 ppm); D14, 0-1 ft, Sample ID KW02005 (480 ppm); and E13, 0-1 ft, Sample ID KW02007 (442 ppm).

#### Soils

Analytical results indicate that samples from three of the nine soil samples exceeded the cleanup goals for arsenic of 10 ppm with concentrations ranging from 10.3 ppm (Sample ID KW02027) to 17.4 ppm (Sample ID KW02034).

The laboratory results for the soil samples are included in Table 6.

**Table 5**  
**AOC-B Sediment**  
**Laboratory Analysis Results in ppm**

PARAMETER	STANDARD <sup>1</sup> 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									
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

<sup>1</sup>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 5 (con't)**  
**AOC-B Sediment**  
**Laboratory Analysis Results in ppm**

PARAMETER	STANDARD <sup>1</sup> 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
ALUMINIUM	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									
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

<sup>1</sup>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

#### **3.4.4 TCLP Results**

Two samples were shipped to an offsite laboratory for TCLP metals analysis (Sample IDs KW02027 and KW02035). Soil samples believed to represent relatively high concentrations of the contaminants present at the site were selected for this analysis. Both of the samples passed the TCLP test.

#### **3.4.5 Statistical Approach**

AOC-B was sampled within the area consisting of car/truck remains to determine the presence or absence of concentrations of metals indicating the presence of hazardous waste. A 50-ft grid pattern which includes previously collected sample data was used to determine sampling locations. This grid size provides an 80 percent level of confidence for detection of isolated hotspots with a 25-ft radius, and a 100 percent level of confidence for detecting isolated hotspots with a 35-ft radius and greater.

The perimeter of the area was sampled to determine the aerial extent of metals detected at levels that exceed sediment quality guidelines. This portion of the sampling effort is not based upon detection of isolated hotspots. However, since the perimeter samples were collected based on a 100-ft grid, this gives an 80 percent level of confidence for detection of isolated hotspots with a 50-ft radius, and a 100 percent level of confidence for detecting isolated hotspots with a 70-ft radius and greater.

#### **3.4.6 Conclusions**

##### **Sediment**

The sediment testing was conducted in two phases. IT collected samples at the edge of the trash within the mangroves; the IT sampling data is included in Attachment B. The samples collected for this effort included sampling to supplement the sampling activities previously performed by IT. Additionally, samples were collected 50 ft from the edge of the trash into the mangrove wetland to determine if any contaminants had spread from the disposal area.

At perimeter locations, 4 of 10 sediment sampling locations had detected concentrations exceeding one or more sediment quality criteria. Detected concentrations of arsenic and cadmium at locations D14 and E13, arsenic at locations D19 and G16, and nickel at location D19 only slightly exceeded sediment criteria. Zinc was most widely detected and most elevated compared to criteria. Lead was detected at one location exceeding sediment criteria.

The IT data indicated that detected concentrations in the sediment samples exceeded the FDEP standards for antimony, arsenic, cadmium, chromium, copper, lead, mercury and zinc. The supplemental sampling performed by BEI had only one detection of zinc for the six samples collected at the edge of the trash.

**Table 6**  
**AOC-B Soil**  
**Laboratory Analysis Results in ppm**

PARAMETER	STANDARD <sup>3</sup> 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 <sup>1</sup>	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 <sup>2</sup>	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

<sup>1</sup>The 10 ppm limit for arsenic proposed by FDEP and Region IV EPA on May 2, 1995.

<sup>2</sup>The 400 ppm limit for lead is based on the revised CERCLA Guidance Document dated July, 1994.

<sup>3</sup>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 standard.

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

ppm=parts per million

## Soil

The soil samples showed only slightly elevated levels of arsenic. The soils tested will be removed as part of the remedial actions at this site since they overlay the debris disposed at this site. The soil samples passed TCLP testing and any excavated soils may be disposed of in a municipal landfill.

### 3.4.7 Limits of Excavation

This site will be excavated to remove rusted car parts, debris, and associated soil mixed with the debris. The approximate limits of excavation are shown in Figure 4. The excavation will extend to the edge of the mature mangroves, but not into them. Some of the rusted car parts and other debris that have been overgrown with mangroves will be left at the site. Depth of excavation is estimated to be 6-24 inches to caprock. Excavation will be in accordance with Section 4.7 of the *Remediation Work Plan*.

### 3.4.8 Confirmation Sampling

The removal of rusted car parts, debris, and associated soil will be removed up to the edge of the mature mangroves be confirmed through visual inspection. Six confirmatory samples will be collected and analyzed for TAL metals. Samples will be collected at the approximate locations shown in Figure 4.

## 3.5 IR-3: TRUMAN ANNEX DDT MIXING AREA

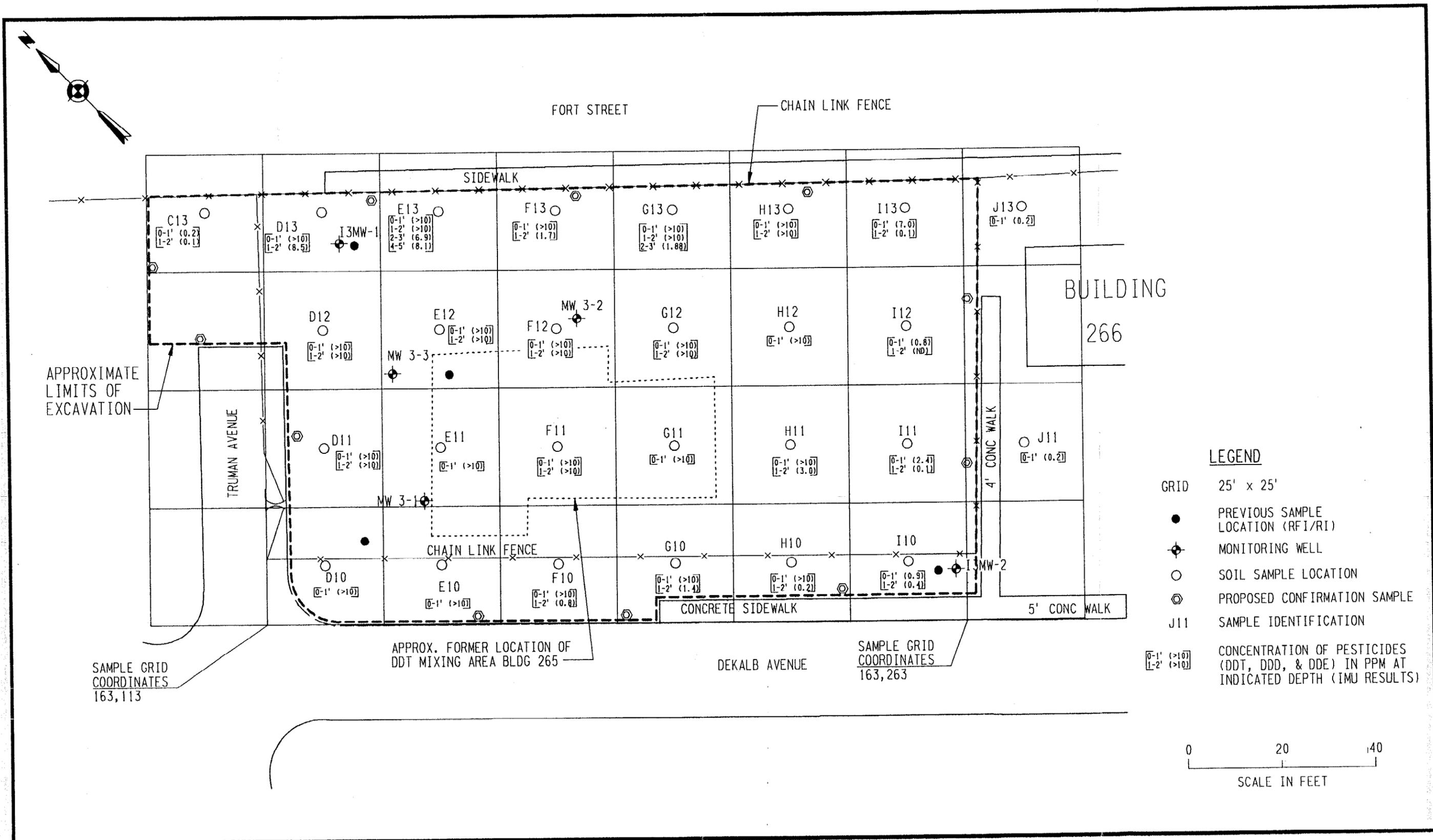
### 3.5.1 Introduction

The Truman Annex DDT Mixing Area is located at the former site of NAS Key West Building 265. DDT (including its metabolites DDD & DDE) has been detected above regulatory limits in surface and subsurface soil at this site. The Residential Cleanup Goals for DDT is 3.1 ppm, for DDE is 2.9 ppm and for DDD is 4.4 ppm. Lead and arsenic were also detected above regulatory limits (400 ppm for lead and 10 ppm for arsenic), but were not as wide spread as the DDT. The lower boundary of soil excavation has been determined to be no deeper than the water table or, if the water table is not encountered, soil will be removed to caprock.

A 25-ft grid was established over the site and samples were collected to determine the extent of impacted soil. A total of 50 surface and subsurface samples were collected from 27 locations. Samples were analyzed in the field by IMU methodology for pesticides (DDT and its metabolites DDD & DDE) and sent offsite for analysis for lead and arsenic. Sample locations are shown in Figure 5. The IMU sample results for IR-3 are included in Appendix 9 and the offsite laboratory results are included in Appendix 5.

### 3.5.2 Description of Soil

Soil encountered was a relatively shallow layer of gravely, medium- to coarse-grain sand ranging in thickness from 5 to 32 in., overlaying caprock. The soil layer typically included 4 to 8 in. of weathered rock that could be broken, cut, and eventually augured and sampled with a 2-in. diameter hand auger. Caprock was indicated by a distinct layer of rock impenetrable by hand augers and portable power auger. The water table was not encountered during soil sampling activities, but was measured at monitoring well I3MW-1 to be 5 ft below grade.



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**FIGURE 5**  
**IR NO.3 - TRUMAN ANNEX (KEYWEST)**  
**DDT MIXING AREA - PESTICIDE RESULTS**

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### 3.5.3 Analytical Results

#### Pesticides:

Pesticides were detected above the cleanup criteria of 3.1 ppm for DDT in surface soil at 21 of 27 locations, and in subsurface soil at 10 of 27 locations. The pesticide concentrations ranged from not detected to >10 ppm. The sample results are shown on Figure 5.

Analysis by an offsite laboratory was conducted on two IMU split samples, one from location F12, 0-1 ft (Sample ID KW02089) and one from E13, 2-3 ft (Sample ID KW02121). The results of the first sample indicated a total detected concentration of pesticides (DDT, DDE and DDD) of 43.6 ppm whereas the field analysis indicated a concentration of pesticides of >10 ppm. The results of the second sample indicated a total detected concentration of pesticides (DDT, DDE and DDD) of 3.2 ppm whereas the field analysis indicated a concentration of pesticides of 6.9 ppm. The split sampling analysis indicated that the field analysis was accurate, and could be used to delineate the required excavation.

#### Lead:

Lead soil concentrations ranged from 21.4 to 1,050 ppm. The lead soil criteria of 400 ppm was exceeded at 4 of 27 locations (E12, E11, G13 & C13). Lead concentrations exceeding 400 ppm ranged in concentration from 401 ppm to 1050 ppm. The laboratory results are summarized in Table 7 and indicated on Figure 6.

#### Arsenic:

Arsenic concentrations ranged from 0.43 to 191 ppm.. The arsenic soil criteria of 10 ppm was exceeded at seven of the 27 sampling locations. Samples at two locations exceeded RCRA Corrective Action Level of 80 ppm. The laboratory results are summarized in Table 7 and included on Figure 7.

### 3.5.4 TCLP Results

Two samples were shipped to an offsite laboratory for TCLP pesticides and TCLP metals analysis. One sample was sent for TCLP metals only (Sample ID KW02110). Samples were selected from the area on the western side of the former DDT Mixing area (Bldg. 265) which appears, based on elevated levels of pesticides, to be the area of highest contamination. All three samples (locations E12-Sample ID KW02073, E11-Sample ID KW02105, and E10-Sample ID KW02110) passed the TCLP test.

### 3.5.5 Statistical Approach

IR-3 consists of an area approximately 150-ft long and 100-ft wide. IR-3 was systematically sampled on a 25-ft grid pattern. This grid size gives an 80 percent level of confidence for detecting isolated hotspots with a 12.5 ft radius, and a 100 percent level of confidence for detecting isolated hotspots with a 17.5 ft radius and greater.

### 3.5.6 Conclusions

Surface soil sampling data established a boundary for the DDT impacted soil as shown in Figure 5. IMU data indicated highest concentrations of DDT was detected in samples from locations E10, E11, E12, and G12. DDT concentrations dropped below the cleanup criteria (3.1 ppm) to the north, south, and southeast sides of the site (grid blocks C13, I10, J11, I12 and J12). The site is further bounded to the southwest and northwest

**Table 7**  
**IR-3 Truman Annex DDT Mixing Site**  
**Laboratory Analysis Results in ppm**

PARAMETER	STANDARD mg/kg	Sample ID Location, Depth(ft)									
		KW02071 D12, 0-1	KW02072 D12, 1-2	KW02073 E12, 0-1*	KW02074 E12, 1-2	KW02075 E13, 0-1	KW02076 E13, 1-2	KW02077 D13, 0-1	KW02078 D13, 1-2	KW02079 F13, 0-1	KW02080 F13, 1-2
ARSENIC	10 <sup>1</sup>	13.1	8.82	191	98.4	11.6	8.25	3.82	2.6	1.52	4.58
LEAD	400 <sup>2</sup>	52.8	51.7	1050	441	263	271	102	106	296	307

PARAMETER	STANDARD mg/kg	Sample ID Location, Depth(ft)									
		KW02081 G13, 0-1	KW02082 G13, 1-2	KW02083 G12, 0-1	KW02089 F12, 0-1	KW02090 F12, 1-2	KW02091 H13, 0-1	KW02092 H13, 1-2	KW02093 I13, 0-1	KW02094 I13, 1-2	KW02095 I12, 0-1
ARSENIC	10 <sup>1</sup>	2.06	4.18	8.42	7.94	3.5	2.2	1.1	1.9	1.6	1.7
LEAD	400 <sup>2</sup>	520	868	189	163	92.1	132	94.4	107	60.5	53.7

PARAMETER	STANDARD mg/kg	Sample ID Location, Depth(ft)									
		KW02096 I12, 1-2	KW02097 I11, 0-1	KW02098 I11, 1-2	KW02099 H11, 0-1	KW02100 H11, 1-2	KW02101 G11, 0-1	KW02103 F11, 0-1	KW02104 F11, 1-2	KW02105 E11, 0-1*	KW02106 D11, 0-1
ARSENIC	10 <sup>1</sup>	0.49	2.2	0.8	2.2	1.3	17.7	17.4	3.6	98.3	20.2
LEAD	400 <sup>2</sup>	22.8J	48.2	24.7J	73.3	21.4J	214	83.8	56.7	401	46.7

<sup>1</sup>The 10 ppm limit for arsenic in soil was proposed by FDEP and Region IV EPA on May 2, 1995

<sup>2</sup>The 400 ppm limit for lead is based on the revised CERCLA Guidance Document dated July, 1994

The shaded boxes indicate detected concentrations above the standard.

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

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

ppm=parts per million

Table 7 (Con't)

PARAMETER	STANDARD mg/kg	Sample ID Location, Depth(ft)									
		KW02107 D11, 1-2	KW02108 H12, 0-1	KW02109 D10, 0-1	KW02110 E10, 0-1*	KW02112 F10,0-1	KW02113 F10,1-2	KW02114 G10,0-1	KW02115 G10,1-2	KW02116 H10,0-1	KW02117 H10,1-2
ARSENIC	10 <sup>1</sup>	23.0	9.6	1.7	2.56	0.75	0.43J	1.4	0.75	2.4	2.3
LEAD	400 <sup>2</sup>	116	378	83.5	58.6	26.2J	76.8	46.6	27.5J	34	24.5J

PARAMETER	STANDARD mg/kg	Sample ID Location, Depth(ft)									
		KW02118 I10,0-1	KW02119 I10,1-2	KW02121 E13, 2-3	KW02123 E13,4-5	KW02124 J13,0-1	KW02126 J11,0-1	KW02127 C13,0-1	KW02128 C13,1-2	KW02129 G13,2-3	
ARSENIC	10 <sup>1</sup>	3.6	1.3	7.18	2.5	2.1	0.97	1.3	2.4	0.99	
LEAD	400 <sup>2</sup>	54.9J	40.4	261	55.7	156	51.9	76.2	921	82	

<sup>1</sup>The 10 ppm limit for arsenic was proposed by FDEP and Region IV EPA on May 2, 1995.

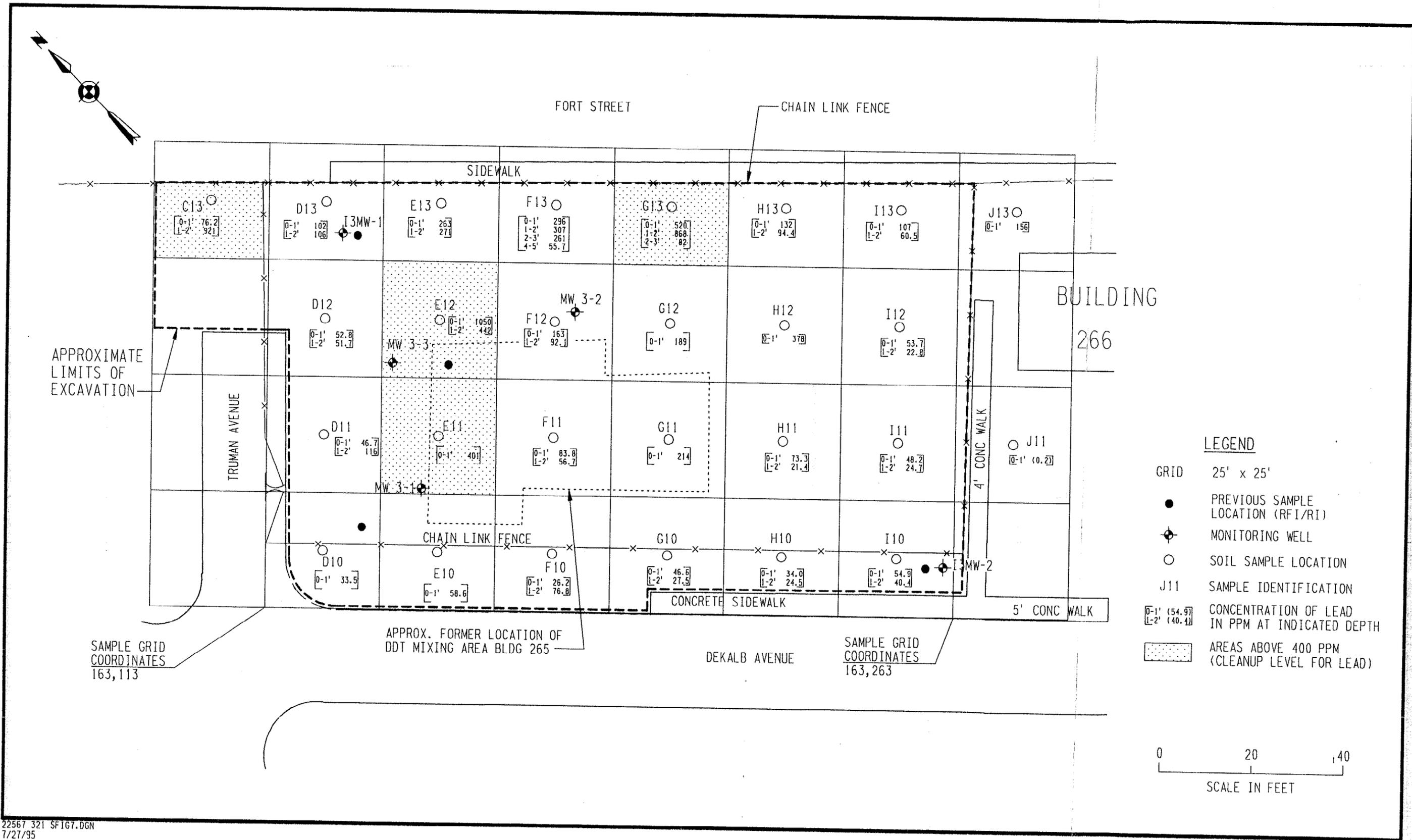
<sup>2</sup>The 400 ppm limit for lead is based on the revised CERCLA Guidance Document dated July, 1994

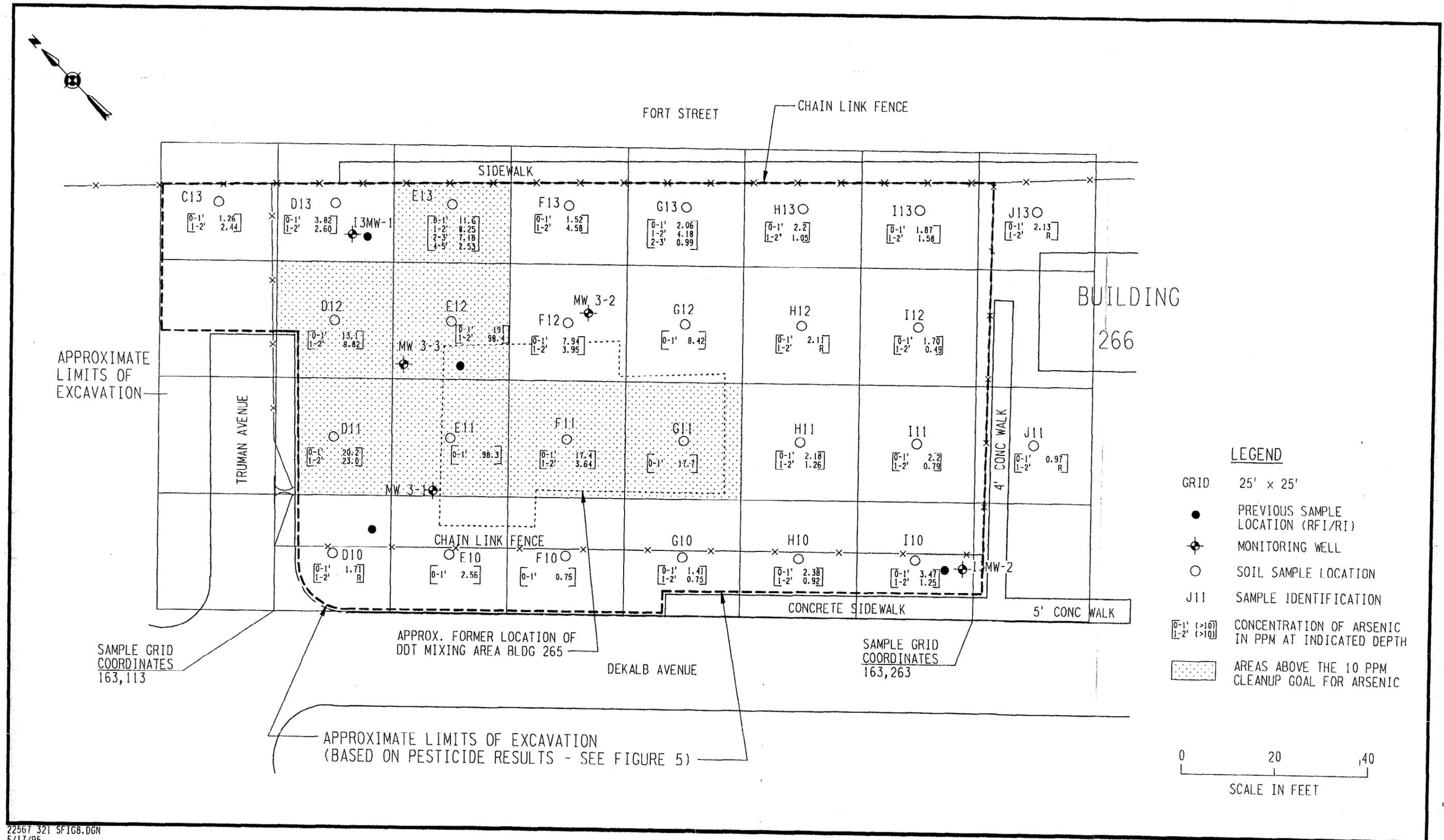
The shaded boxes indicate detected concentrations above the standard.

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

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

ppm=parts per million





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

by paved streets and parking lots, and to the northeast by a concrete sidewalk followed by a paved street (Fort Street). The proposed excavation limits are shown on Figure 5.

The lead soil criteria of 400 ppm was exceeded at four of 27 locations. The arsenic soil criteria of 10 ppm was exceeded at seven of the 27 sampling locations. The removal of the DDT contaminated soils will remove all of the lead and arsenic contaminated soils with the exception of the lead detected at sample location C13, 1-2 ft (Sample ID KW02128). The proposed excavation limits has included this area.

Of 21 locations where DDT was detected, the depth of impacted soil extends to "clean" subsurface soil at six locations, and to shallow caprock in 15 locations. Data indicate DDT concentrations drop with depth, and the layer of impacted soil ranges in thickness from 4 to 32 in., with an average thickness of 15 in. over a 13,550 ft<sup>2</sup> area.

### 3.5.7 Limits of Excavation

Limits of excavation are shown in Figure 5. Depth of excavation is estimated to be 5-32 inches to caprock. Excavation will be in accordance with Section 4.11 of the *Remediation Work Plan*.

### 3.5.8 Confirmation Sampling

After excavation, samples will be collected from the excavated area to confirm removal of impacted soil. Confirmation sample numbers, analyses, and DQO levels are described in Section 5.2 of the *Remediation Work Plan*. Eleven confirmation soil samples from the excavation side walls will be collected and analyzed for pesticides and TAL metals. Samples will be collected at the approximate locations shown in Figure 5. Excavation is expected to extend to caprock and remove all overlying soil. Sample locations will be adjusted, if necessary, based on actual excavation limits and presence of sample matrix. No soil samples will be collected from the floor of the excavation.

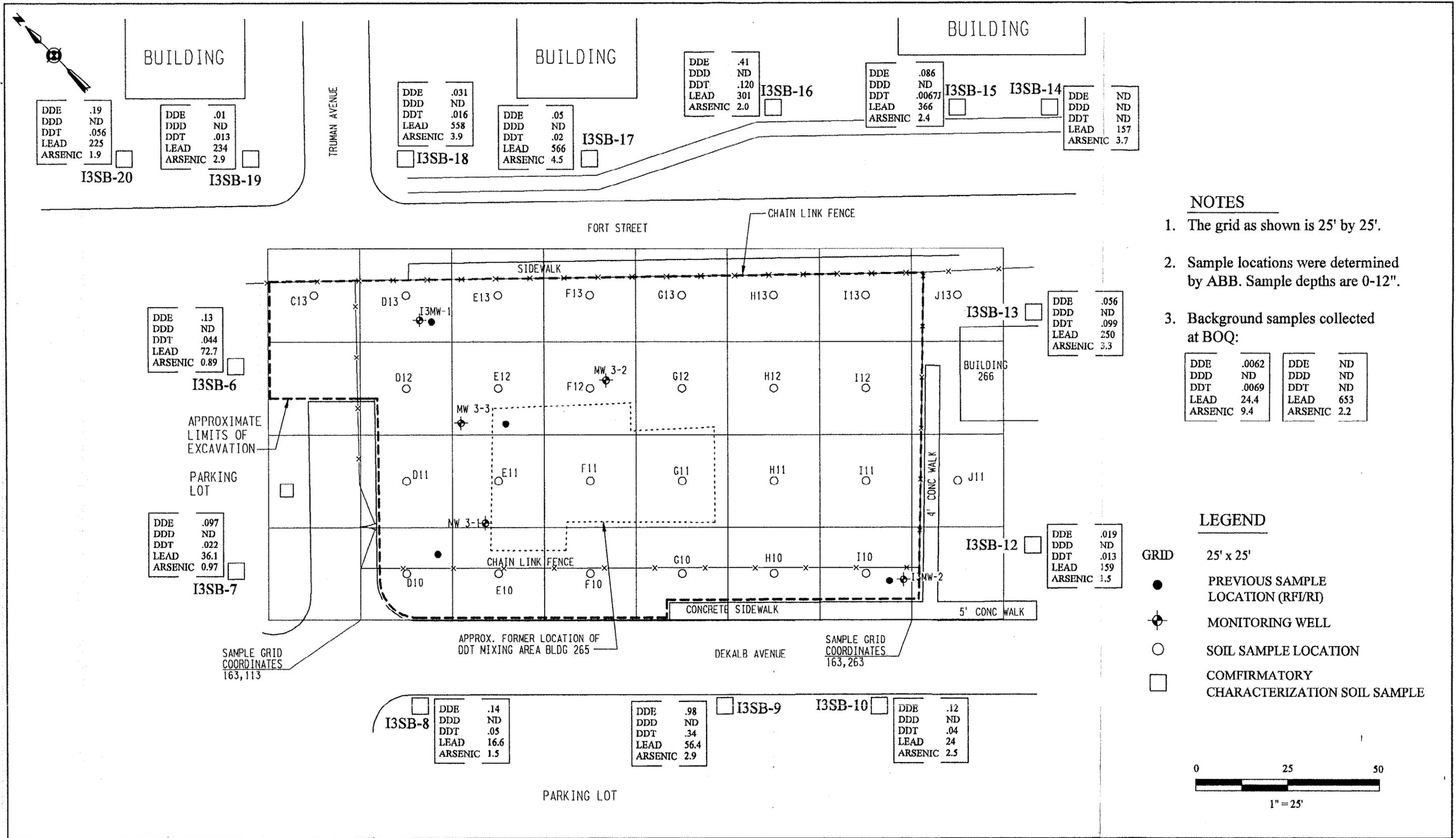
### 3.5.9 Characterization Sampling

Characterization samples were collected adjacent to the site along all four sides and at two background locations at Trumbo Point. The pesticide, lead and arsenic results are recorded on Figure 8. Appendix 5 contains the complete laboratory analysis results.

**Pesticides:** All of the samples analyzed for pesticides had detections below the goals established in FDEP's "Soil Cleanup Goals for Military Sites" dated April 5, 1995

**Lead:** Three of the sixteen samples analyzed for lead had detections above the 400 ppm limit established in the CERCLA Guidance Document dated July, 1994. Two of the samples were across Fort Street and one was one of the two background samples collected at the BOQ at Trumbo Point.

**Arsenic:** All of the samples analyzed for arsenic had detections below the 10 ppm limit. This limit was agreed to by FDEP and Region IV EPA on May 2, 1995.



- NOTES**
- The grid as shown is 25' by 25'.
  - Sample locations were determined by ABB. Sample depths are 0-12".
  - Background samples collected at BOQ:

**FIGURE 8  
ADDITIONAL IR-3  
CHARACTERIZATION SAMPLING**

0056 D077

## **3.6 IR-1: TRUMAN ANNEX REFUSE DISPOSAL AREA**

### **3.6.1 Introduction**

IR-1 covers an area of approximately seven acres including an antenna field. From 1952 to the mid 1960s this site was used for general refuse disposal. The main sewer outfall line for Key West runs through the property (along with other underground utilities associated with the antenna field). Lead has been detected in surface soil above regulatory limits along the southern portion of the site. Planned remedial action includes excavation of the upper 1 ft soil in this area and covering the area with clean fill.

A 25-ft grid was established over the site and samples collected to determine the extent of impacted soil surface. The majority of the samples were sent to an offsite laboratory for TAL metals analysis the remaining samples were analyzed for lead and arsenic only. Sample locations are shown on Figures 9 and 10. The offsite laboratory results for IR-1 are included in Appendix 6.

### **3.6.2 Description of Soil**

Surface soil at sample locations was observed to be rocky, gravelly, medium- to course-grain sand.

### **3.6.3 Analytical Results**

The analytical data are included in Attachment 1 and summarized in Figures 9 and 10. Both lead and arsenic were detected above the soil cleanup criteria of 400 ppm and 10 ppm, respectively.

### **3.6.4 TCLP Results**

Seven soil samples which were high in lead were selected for TCLP analysis. Five samples passed the TCLP test, however two did not as shown in Table 8.

### **3.6.5 Statistical Approach**

A staggered 25 ft grid pattern was used during the first round of sampling. This grid size provides an 80% level of confidence for detecting isolated hotspots of 17.5 ft radius, and a 100% level of confidence for detecting isolated hotspots of 25 ft radius and greater. Data from the first round of samples indicated the area of impacted soil is larger than initially anticipated. The grid was then expanded using a 50 ft grid pattern, to provide an 80% level of confidence for detecting isolated hotspots of 25 ft radius, and a 100% level of confidence for detecting isolated hotspots of 35 ft radius and greater.

### **3.6.6 Limits of Excavation**

Limits of excavation are shown in Figures 9 and 10. Depth of excavation has been determined to be 1 ft. Excavation will be in accordance with Section 4.10 of the *Remediation Work Plan*.

**Table 8**  
**IR-1 Refuse Disposal Area**  
**TCLP Results**

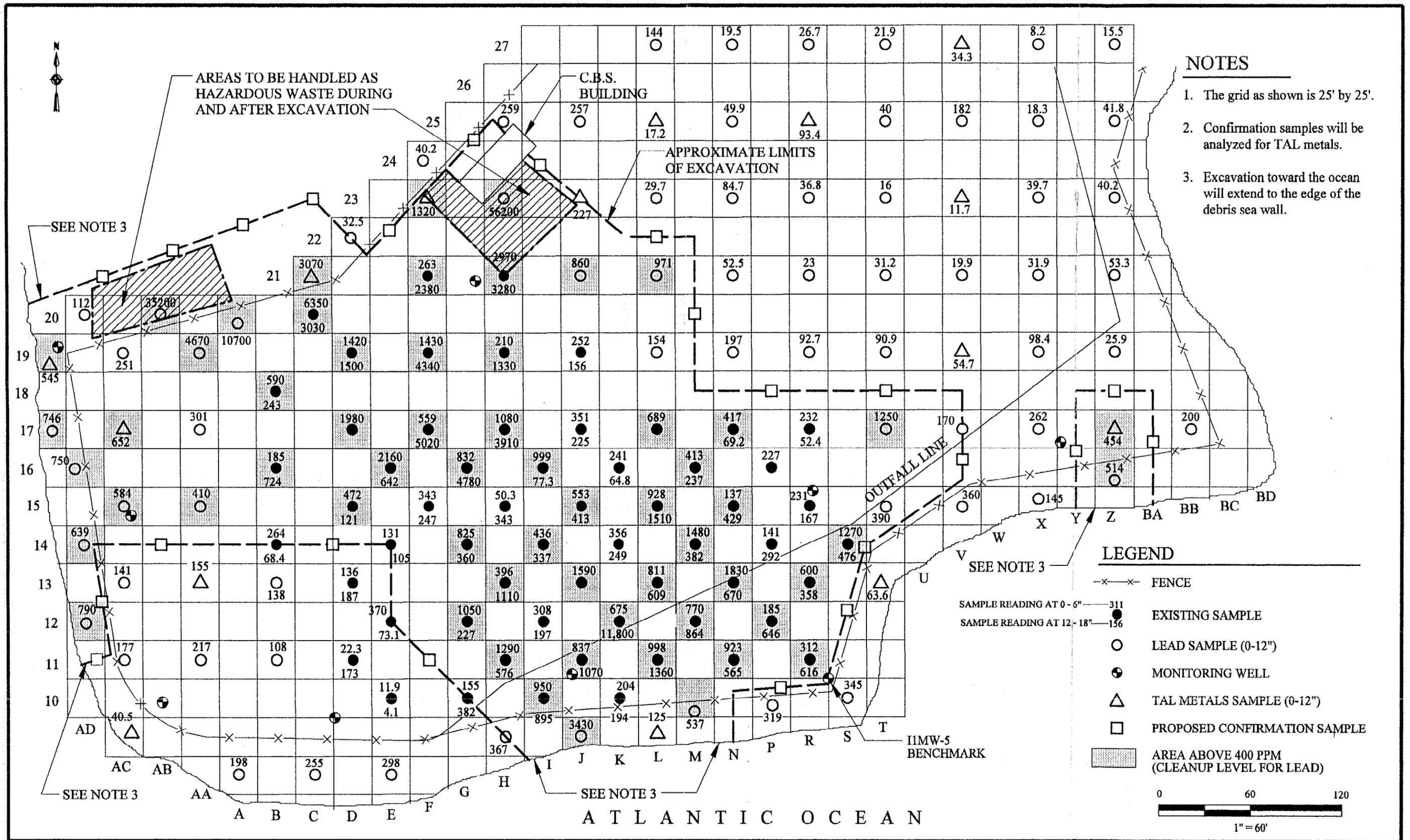
Analyte	TCLP Limits ug/L	Sample ID						
		KW02237 <sup>1</sup> ug/L	KW02327 <sup>1</sup> ug/L	KW02553 <sup>2</sup> ug/L	KW02559 <sup>2</sup> ug/L	KW02614 <sup>2</sup> ug/L	KW02669 <sup>1</sup> ug/L	KW02724 <sup>1</sup> ug/L
Arsenic	5000	ND	ND	5.7	7.2	14.3	ND	ND
Barium	100,000	1090	485	3430	3240	4370	1790	1580
Cadmium	1000	31.3	12.9	68.4	119	216	93.4	143
Chromium	5000	25.9	9.5	14.7	10.9	12.4	7.3	ND
Lead	5000	2940	3120	2680	3050	2730	10800	20100
Mercury	200	ND						
Selenium	1000	ND	ND	8.9	21.2	22.2	ND	124
Silver	5000	ND						
Total Lead mg/L <sup>3</sup>	Cleanup Goal 400 mg/L	Total Lead Concentrations						
		5020 mg/L	4190 mg/L	4340 mg/L	3280 mg/L	6350 mg/L	56200 mg/L	35200 mg/L

<sup>1</sup> GEL

<sup>2</sup> Inchscape

<sup>3</sup> The 400 ppm limit for lead is based on the revised CERCLA Guidance Document dated July, 1994

The shaded boxes indicate detected concentrations above the standard.



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**FIGURE 9**  
**IR NO.1 - TRUMAN ANNEX (KEYWEST)**  
**REFUSE DISPOSAL AREA - LEAD RESULTS**

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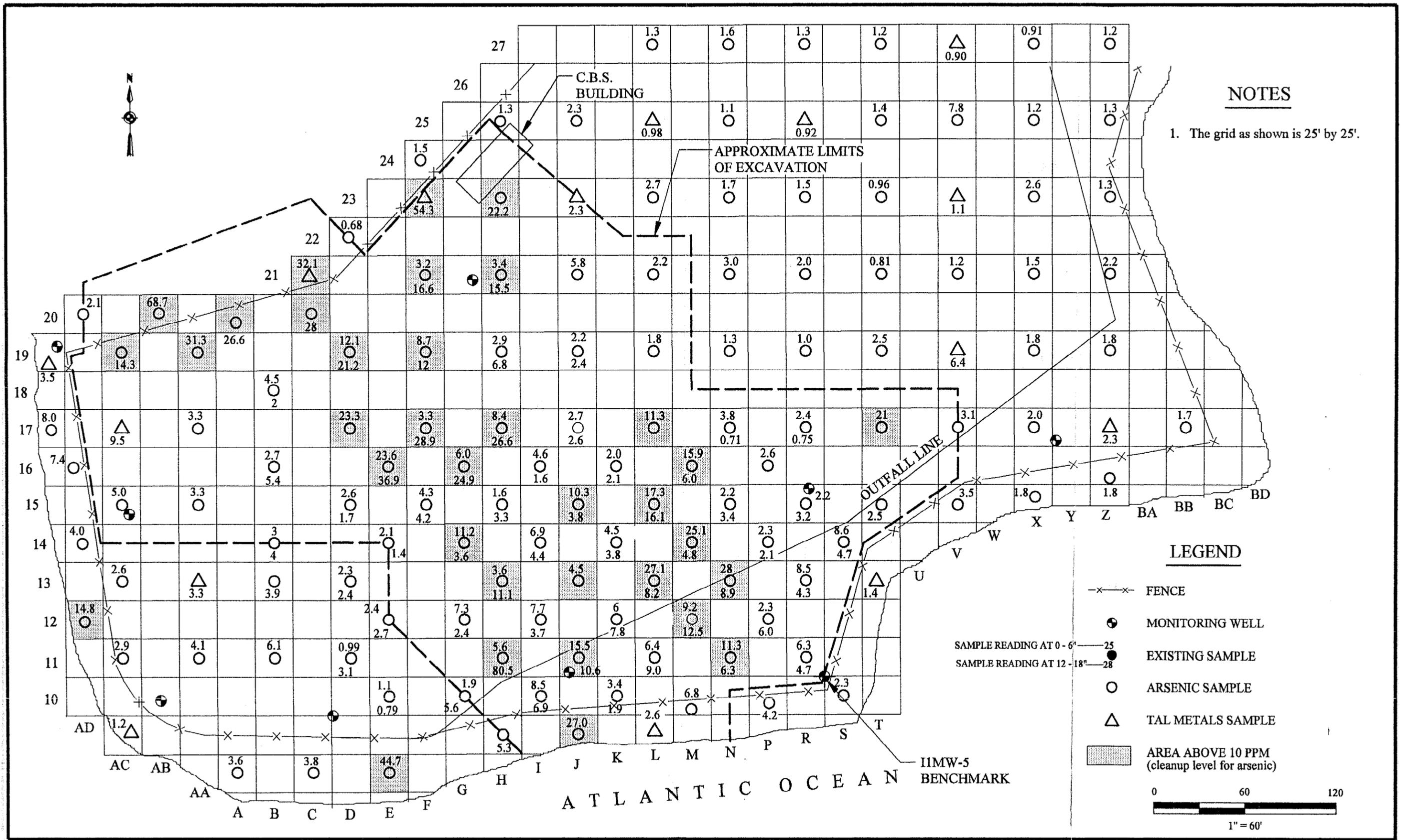


FIGURE 10  
 IR NO.1 - TRUMAN ANNEX (KEYWEST)  
 REFUSE DISPOSAL AREA - ARSENIC RESULTS

### 3.6.7 Confirmation Sampling

After excavation, soil samples will be collected from the excavated area to confirm removal of impacted soil. Confirmation DQO levels are described in Section 5.2 of the *Remediation Work Plan*. Confirmation soil samples will be collected from the excavation side walls and analyzed for TAL metals. Samples will be collected at the approximate locations shown on Figure 9. Sample locations will be adjusted, if necessary, based on actual excavation limits and availability of sample matrix. No soil samples will be collected from the floor of the excavation.

### 3.6.8 Conclusions

Analytical data from the first round of samples collected indicated that lead was the primary contaminant of concern at IR-1. After additional sampling, the extent of lead impacted surface soil and the limits of excavation were determined as shown in Figures 9 and 10. Five samples with high lead concentrations passed the TCLP test for metals, while two did not. The areas around the samples that did not pass the TCLP testing will be handling as a hazardous waste during the remediation of the site.

## 3.7 SWMU-1: BOCA CHICA OPEN DISPOSAL AREA

### 3.7.1 Introduction

The site was used as an open disposal and burning area from 1942 to the mid-1960s, with miscellaneous debris deposited into adjacent mangroves and brush. The site received general waste and refuse associated with the operation and maintenance of aircraft. The site is mostly bare ground or rock bounded to the north, west, and southwest by gravel roads and southeast by mangroves. Two shallow windrows of burned derbies extends across the open ground. The east side of the site contains overgrown piles of dirt, 4-7 feet high, between the open ground and the mangroves. Previous sampling detected lead above the sediment cleanup criteria of 30.2 ppm.

A 50-ft grid was established over the site and samples collected to determine the extent of lead impacted soil. Samples were sent to an off-site laboratory for lead analysis. Sample locations are shown in Figure 11. The sampling results are included in Appendix 7.

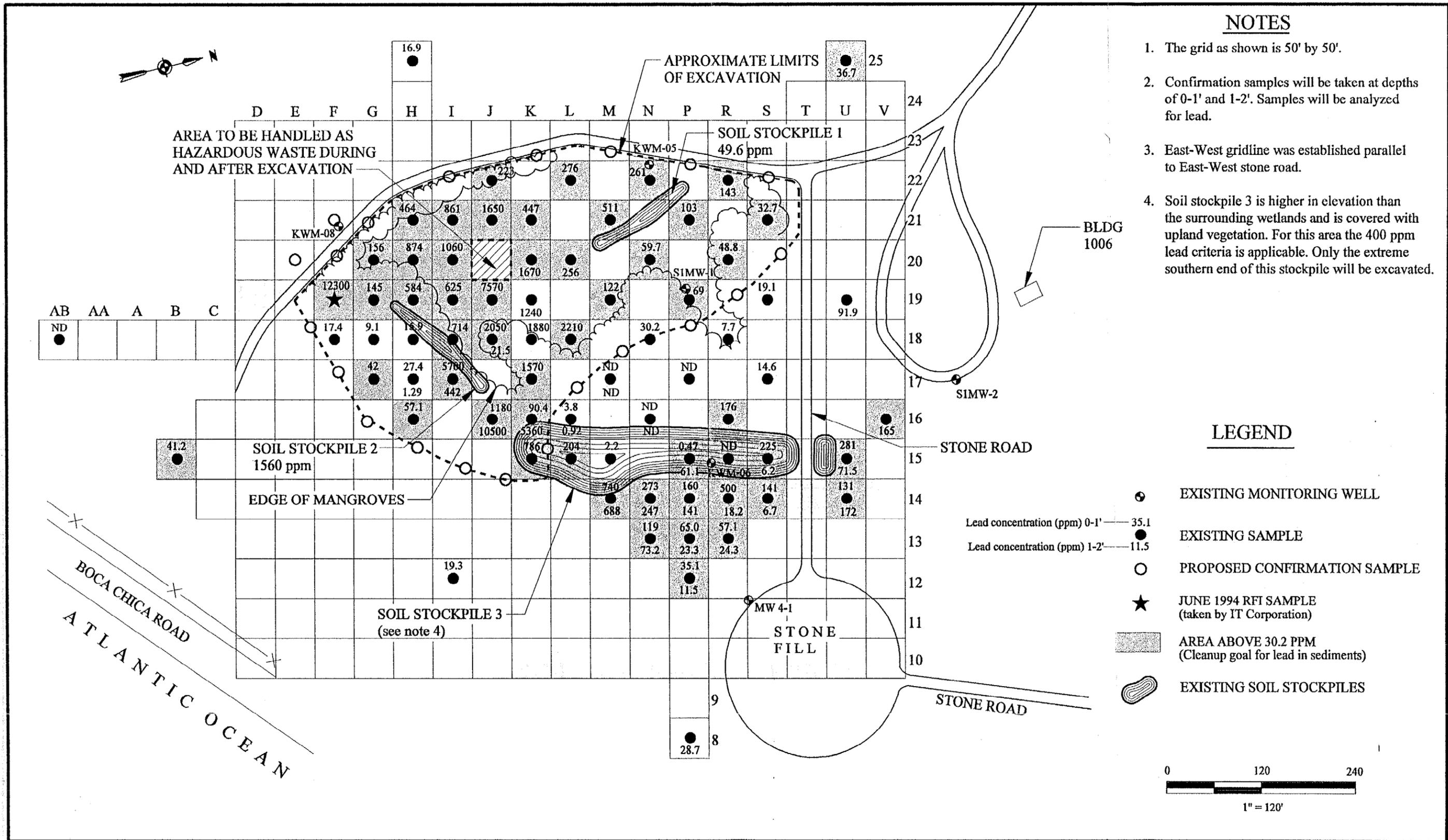
Characterization sampling for the RFI/RI was also conducted for SWMU-1. These results are included in Appendix 7.

### 3.7.2 Description of Soil

Samples collected at the open area of the site indicate this area contains a relatively thin layer of silty sediment, typically 0-6 inches thick, overlaying weathered caprock.

Soil encountered at sample locations in the mangrove swamp consists of a relatively shallow layer of peat and silt ranging in thickness from 8 to 24 in., overlaying caprock. Surface water in the mangrove area typically ranges from 4-6 inch deep.

Piles of dirt overgrown with brush were observed at the east side of the site. The dirt appeared to be gravelly, medium to coarse grain sand and/or silt. An area of rubble was identified north of and adjacent to the gravel road at grid square T15 and U15 on Figure 11. This area contains boulder size pieces of rock overgrown with brush.



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FIGURE 11  
SWMU NO.1 - BOCA CHICA  
OPEN DISPOSAL AREA

0056D09Z

### **3.7.3 Analytical Results**

The analytical data are included in Attachment 1 and summarized in Figure 11. Lead was detected above the sediment quality cleanup criteria of 30.2 ppm at locations shown in Figure 11.

### **3.7.4 TCLP Results**

Three soil samples with the highest lead concentrations were selected for TCLP analysis. All three samples tested passed the TCLP test.

### **3.7.5 Statistical Approach**

A staggered 50 ft grid pattern was used as a basis for sampling the north west portion of the site which consists of bare ground/rock. This grid size provides an 80% level of confidence for detecting isolated hotspots of 35 ft radius, and a 100% level of confidence for detecting isolated hotspots of 50 ft radius and greater. The remainder of the site was sampled on a 50 ft grid pattern to an 80% level of confidence for detecting isolated hotspots of 25 ft radius, and a 100% level of confidence for detecting isolated hotspots of 35 ft radius and greater.

### **3.7.6 Limits of Excavation**

Limits of excavation are shown in Figure 11. Depth of excavation is estimated to vary from 3 to 18 inches. Excavation will be in accordance with Section 4.8 of the *Remediation Work Plan*.

### **3.7.7 Confirmation Sampling**

After excavation, soil samples will be collected from the excavated area to confirm removal of impacted soil. Confirmation sample numbers, analyses, and DQO levels are described in Section 5.2 of the *Remediation Work Plan*. Samples will be collected at the approximate location shown in Figure 11 and analyzed for total lead. Sample locations will be adjusted, if necessary, based on actual excavation limits and availability of sample matrix. No soil samples will be collected from the floor of the excavation.

### **3.7.8 Conclusions**

Analytical data was used to determine the extent of lead impacted soil /sediment and to delineate the limits of excavation for SWMU-1, as shown in Figure 11. Three samples with the highest concentrations of lead passed the TCLP test for metals.

## **3.8 SWMU-2: BOCA CHICA DDT MIXING AREA**

### **3.8.1 Introduction**

SWMU-2 is located along the southeast side of a taxiway at Boca Chica Island. DDT operations were conducted from the 1940s to early 1970s in a former building (demolished in 1982) located approximately 30 ft from an adjacent manmade ditch. The adjacent ditch is connected to a large borrow pit approximately 400 feet east of the site. The ditch also forks to the southeast and connects to a second, smaller borrow pit south of the site. Previous investigations detected DDT in surface and subsurface soil above cleanup goals. DDT and lead were also detected in sediment in the adjacent ditch above sediment quality criteria.

A 25 by 25 ft grid was established over the site and soil samples were collected to determine extent of impacted soil. Soil samples were analyzed in the field by IMU methodology for DDT. The adjacent ditch and banks of the ditch were sampled for DDT and lead at 100 ft intervals. Sample locations and analytical data are shown in Figures 12 and 13. The IMU sample results for SWMU-2 are included in Appendix 9 and the offsite laboratory results are included in Appendix 8.

### **3.8.2 Description of Soil**

Soil encountered at sampling locations north of the ditch indicated soil generally consists of a relatively thin layer of gravely, medium to coarse grain sand ranging in thickness from 1 to 12 inches, overlaying weathered caprock. Portions of the site consist of exposed weathered caprock. At exposed rock locations, samples were obtained by breaking the weathered rock with a pick and cutting into the rock with a hand auger to refusal (4 - 5 inch) and obtaining the sample from the cuttings.

Soil south of the ditch consists primarily of a relatively thin layer of gravely, medium to coarse grain sand and/or silt ranging in thickness from 8 to 24 inches, overlaying weathered caprock. The water table was not encountered.

Sediment samples from the ditch indicated a layer of loose silty sediment 1-2 ft thick overlaying apparent solid bottom.

### **3.8.3 Analytical Results**

The analytical data are included in Attachment 1 and summarized in Figures 12 and 13. Pesticides were detected above the soil criteria at locations around the former DDT mixing building and at several locations south of the ditch. Lead was analyzed for but not detected above criteria in samples collected along the banks of the ditch.

Samples collected from the adjacent ditch exceeded the sediment quality criteria for pesticides in sediments. Results from lead analysis did not exceed the sediment quality criteria of 30.1 ppm lead.

### **3.8.4 TCLP Results**

TCLP analysis was not done on any samples from SWMU-2 since the entire area is being treated as hazardous waste.

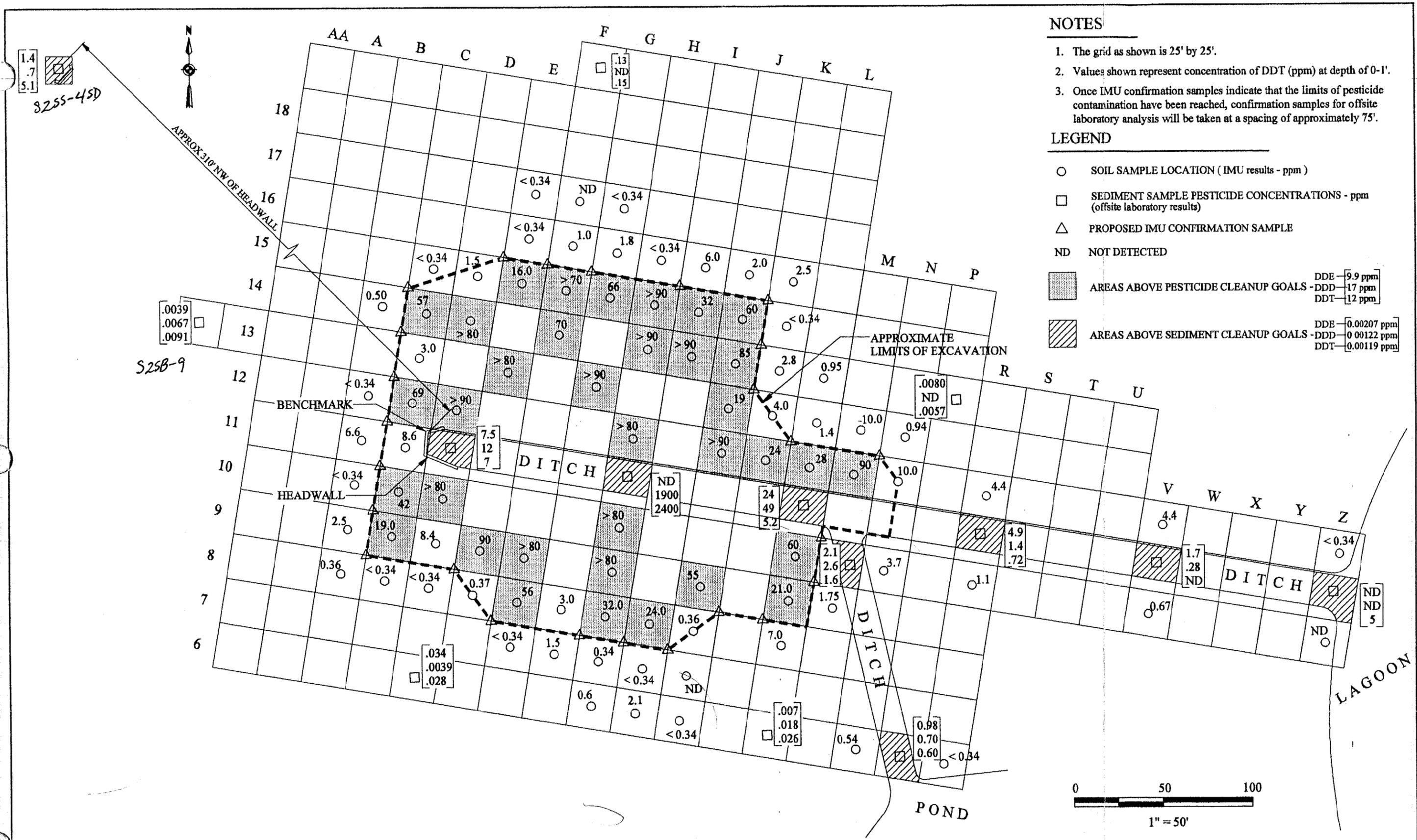
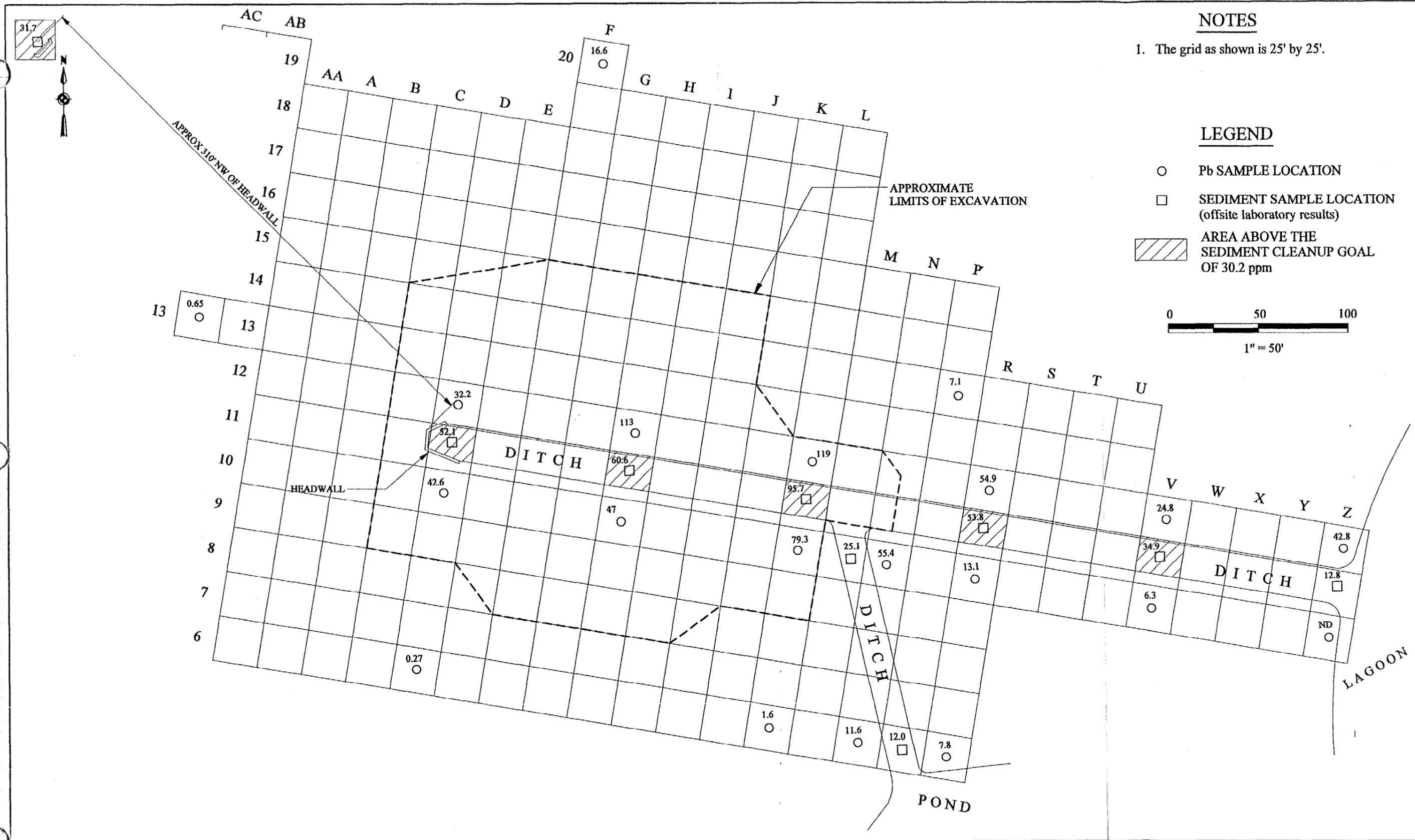


FIGURE 12  
SWMU-2 - BOCA CHICA  
DDT MIXING AREA PESTICIDE RESULTS

0056 DB10Z

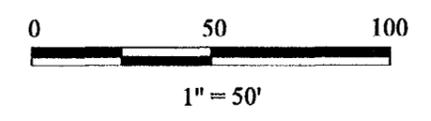


**NOTES**

1. The grid as shown is 25' by 25'.

**LEGEND**

- Pb SAMPLE LOCATION
- SEDIMENT SAMPLE LOCATION (offsite laboratory results)
- ▨ AREA ABOVE THE SEDIMENT CLEANUP GOAL OF 30.2 ppm



**FIGURE 13**  
**SWMU-2 - BOCA CHICA**  
**LEAD RESULTS**

### 3.8.5 Statistical Approach

A 25 ft grid pattern was used as a basis for sampling the site. This grid size provides an 80% level of confidence for detecting isolated hotspots of 12 ft radius, and a 100% level of confidence for detecting isolated hotspots of 17.5 ft radius and greater.

### 3.8.6 Limits of Excavation

Limits of excavation are shown in Figures 12 and 13. Depth of excavation is estimated to vary from 1 to 2.5 feet. Excavation will be in accordance with Section 4.9 of the *Remediation Work Plan*.

### 3.8.7 Confirmation Sampling

After excavation, samples will be collected from the excavated area to confirm removal of impacted soil. Confirmation sample numbers, analyses, and DQO levels are described in Section 5.2 of the *Remediation Work Plan*. Four confirmation soil samples from the excavation side walls will be collected. Samples will be collected at the approximate locations shown in Figures 12 and 13. Excavation is expected to extend to ccaprock and remove all overlying soil. Sample locations will be adjusted, if necessary, based on actual excavation limits and presence of sample matrix. No soil samples will be collected from the floor of the excavation.

### 3.8.8 Conclusions

Analytical data was used to determine the extent of pesticide impacted soil and sediment and to delineate the limits of excavation for SWMU-2, as shown in Figures 12 and 13. All material excavated from the site will be treated and disposed of as hazardous waste.

## 4.0 FIELD SAMPLING PROCEDURES AND DOCUMENTATION

Field sampling activities, including equipment decontamination and documentation, were conducted in accordance with *State of Florida Department of Environmental Regulation Standard Operating Procedures for Laboratory Operations and Sample Collection Activities, DER-QA-001/92* (FDER SOPs).

**ATTACHMENT A**

**TABLE A-1**

**FIELD ANALYTICAL METHOD, DETECTION LIMITS, AND MANUFACTURER**

ATTACHMENT A

TABLE A-1

Field Analytical Method, Detection Limits, and Manufacturer

<u>Analytical Area</u>	<u>Analyte</u>	<u>Method</u>	<u>Quantitation Limit</u>	<u>IMU kit Brand Name</u>
SWMU-3	BTEX	Immunoassay	2.5 ppm	D-Tech BTEX Test Kit <sup>1</sup>
	PAH	Immunoassay	0.6 ppm	D-Tech PAH Test Kit <sup>1</sup>
SWMU-7	PCB	Immunoassay	0.5 ppm	D-Tech PCB Test Kit <sup>1</sup>
IR-3	Pesticides	Immunoassay	0.2 ppm	EnviroGuard Pesticides in soil Test Kit <sup>2</sup>

<sup>1</sup> D-Tech test kits manufactured by EM Science, Gibbstown, NJ.

<sup>2</sup> EnviroGuard test kits manufactured by Millipore Corporation, Bedford, MA.

**ATTACHMENT B**

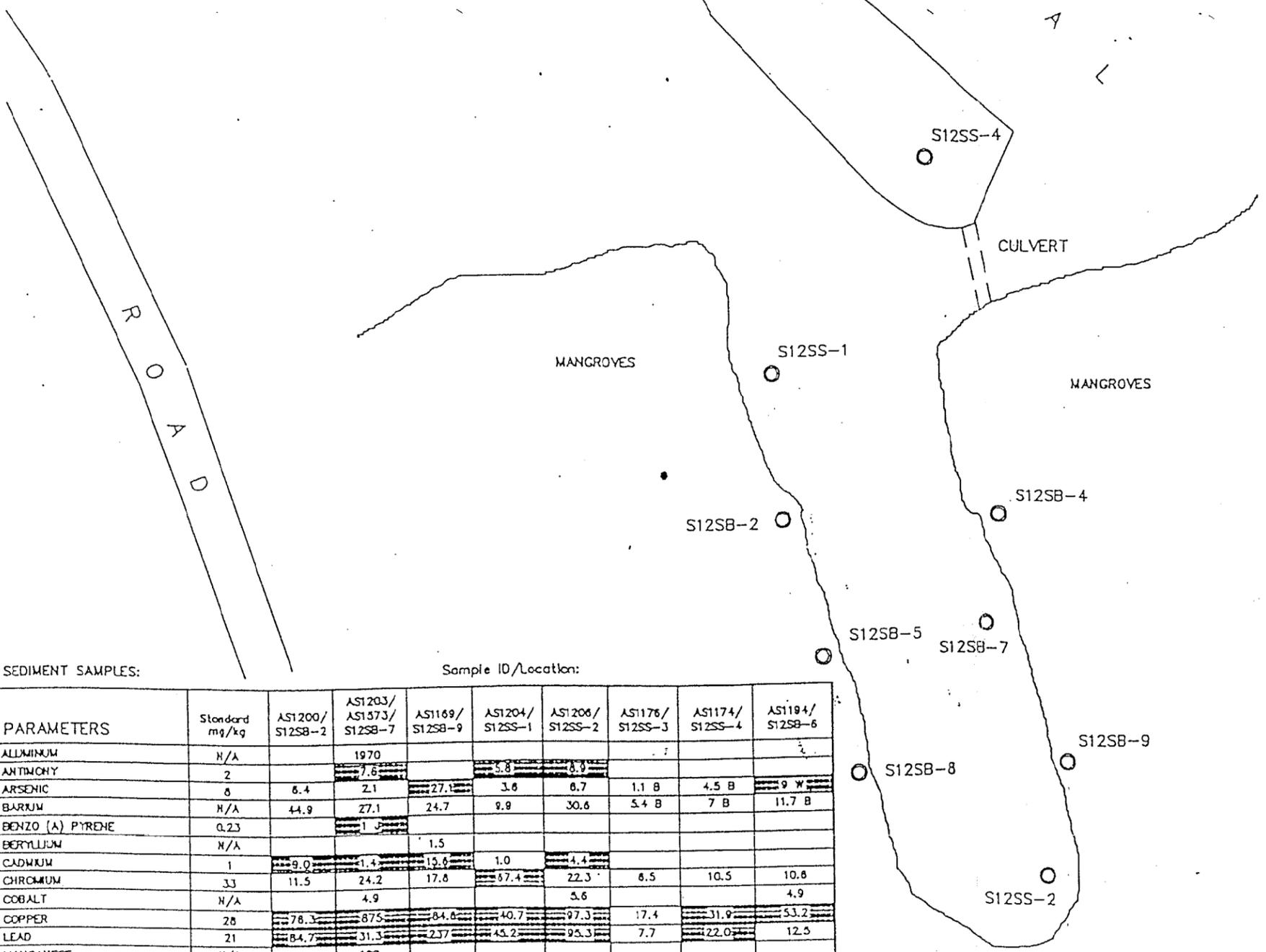
**IT RFI/RI**

**SEDIMENT SAMPLE RESULTS FOR AOC-B  
(June 1994)**

CAD FILE: 2028835.DWG  
 DRAWING NO.: 2028835  
 PROJ. NO.: 422028  
 CR: E. RAY  
 PROJ. MGR.: M. JONES  
 CHECKED BY:  
 APPROVED BY:  
 LAST REV DATE: 8/3/04  
 DRAWN BY: SOUF  
 STARTING DATE: 11/7/03  
 DRAWN BY: L. PLANZ

TCLP SAMPLES: Sample ID/Location:

PARAMETERS	Standard mg/l	S12SB-4	S12SB-5	S12SB-8
BARIIUM	100	0.002	0.094	0.004
CADMIUM	1.0			
CHROMIUM	5.0	0.01	0.01	0.02



SURFACE WATER SAMPLES: Sample ID/Location:

PARAMETERS	Standard ug/l	AS1207/ S12SS-1	AS1172/ S12SS-4	AS1175/ S12SS-3
ANTIMONY	4,300	268	202	181
AROCOLOR-1016	N/A	2.0		
AROCOLOR-1232	N/A	2.0		
AROCOLOR-1242	N/A	2.0		
AROCOLOR-1248	N/A	2.0		
ARSENIC	36	70.3		
BARIIUM	N/A	118	7 B	6.7 B
BERYLLIUM	0.13	1.6		
CHROMIUM	50	115		
COPPER	2.9	72.6		
LEAD	5.6	71		
MERCURY	0.025	0.24		
NICKEL	8.3	19.6		
TIN	N/A	98.7		
YANADIUM	N/A	66.1		
ZINC	86	1290		

- NOTES:
- STANDARD REFERS TO FLORIDA SURFACE WATER QUALITY STANDARDS OR FEDERAL MARINE PROTECTION CRITERIA, WHICHEVER IS MORE RESTRICTIVE (SEE TABLE 1-14).
  - ALL VALUES EXCEED BACKGROUND CONCENTRATION.
  - SHADED AREAS EXCEED STANDARD.
  - J INDICATES AN ESTIMATED VALUE.
  - B INDICATES THAT COMPOUND WAS ALSO DETECTED IN BLANK.

SEDIMENT SAMPLES: Sample ID/Location:

PARAMETERS	Standard mg/kg	AS1200/ S12SB-2	AS1203/ AS1573/ S12SB-7	AS1169/ S12SB-9	AS1204/ S12SS-1	AS1206/ S12SS-2	AS1176/ S12SS-3	AS1174/ S12SS-4	AS1194/ S12SB-6
ALLUMINIUM	N/A		1970						
ANTIMONY	2		7.6		5.8	8.9			
ARSENIC	8	6.4	2.1	27.1	3.6	6.7	1.1 B	4.5 B	9.9
BARIIUM	N/A	44.9	27.1	24.7	9.9	30.6	5.4 B	7 B	11.7 B
BENZO (A) PYRENE	0.23		1.1						
BERYLLIUM	N/A			1.5					
CADMIUM	1	9.0	1.4	15.6	1.0	4.4			
CHROMIUM	33	11.5	24.2	17.8	67.4	22.3	6.5	10.5	10.8
COBALT	N/A		4.9			5.6			4.9
COPPER	28	78.3	875	84.6	40.7	97.3	17.4	31.9	53.2
LEAD	21	84.7	31.3	237	45.2	95.3	7.7	22.0	12.5
MANGANESE	N/A		102						
MERCURY	0.1		0.04	0.22					
NICKEL	30	16.2	26.2	15.3	11.3	26.6			24.3
PHENANTHRENE	0.014	0.055							
TIN	N/A	12.2	32.4		20.1	31.3			14.7 B
YANADIUM	N/A		7.0	17.5	6.0	7.1	2.4		7.1 B
ZINC	68	1280	1050	2590	383	1030	146	145	324

- NOTES:
- STANDARD REFERS TO TBC VALUES PROVIDED IN TABLE 1-13.
  - ALL VALUES EXCEED BACKGROUND CONCENTRATION.
  - SEE TABLE 1-13 FOR STANDARDS.
  - J INDICATES AN ESTIMATED VALUE.

REVISION BY BEI

- LEGEND:
- S12SS-1 ○ SEDIMENT/SURFACE WATER SAMPLE
  - AS1207/S12SS-1 SAMPLE ID/ SAMPLE LOCATION
  - ===== CHEMICAL OF CONCERN

FIGURE 13-4  
 CHEMICAL CONCENTRATIONS IN  
 SEDIMENT/SURFACE WATER  
 SAMPLES  
 AOC SITE B - BIG COPPITT KEY  
 ABANDONED CIVILIAN DISPOSAL  
 AREA  
 Prepared for:  
 NAS - KEY WEST  
 KEY WEST, FLORIDA

SOURCE: FREDERICK H. HILDBRANDT, INC.  
 ENGINEERS-SURVEYORS-PLANNERS  
 15321 S. DOXE HWY., SUITE 202  
 MIAMI, FLORIDA 33157



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**ATTACHMENT C**  
**LABORATORY QUALIFIERS**

General Engineering Laboratories, Inc.

Qualifiers

Results Qualifiers of the Certificate of Analysis follow the specifications from the technical specification of the contract and are as follows:

Section	Explanation	Location
Inorganics		
*	Duplicate analysis is not within control limit	C of A, Form 1, and EDD
+	Correlation Coefficient for the MSA is < 0.995	C of A, Form 2, EDD
B	Reported value is >DL and < RL	C of A, Form 1, and EDD
M	Duplicate Injection precision not met	C of A, Form 1, EDD
S	Reported Method was determined by MSA	C of A, Form 1, EDD
U	Parameter analyzed but < DL	C of A, Form 1 and EDD
W	Post-Dig spike for GFAA out of control limit (85% - 115%) and sample absorb is < 50% spike absb	C of A, EDD, Form 5 part 2
X	Other Flag	C of A, Form 1, and EDD
**	Control Sample outside of acceptance limit	QC Summary Report

Section	Explanation	Location
Organics		
A	TIC is suspected Aldol Condensation Product	C of A, Form 1, and EDD
C	PEST/PCB ID has been confirmed by GC/MS	C of A, Form 1, and EDD
D	Value derived by dilution	C of A, Form 1, and EDD
E	Out of Calibration Range	C of A, Form 1, and EDD
J	Value is non-zero detect and <RL	C of A, Form 1, and EDD
N	Presumptive evidence to make a tentative identification of the analyte	C of A, Form 1, and EDD
NJ	Analyte has been tentatively identified and the associated numerical value is estimated	C of A, Form 1, and EDD
P	PEST/PCB target analyte with > 25% difference between the two GC columns	C of A, EDD, Form 1, Form 10
U	Compound analyzed but not detected	C of A, Form 1, and EDD
X	Other Flag	C of A, Form 1, and EDD
B	Compound was also detected in the method blank	C of A, Form 1, and EDD
**	Control Sample outside of acceptance limit	QC Summary Report

All surrogate recoveries and acceptance ranges are reported at the bottom of the certificate. Any recoveries falling outside the acceptance range will be flagged with a \*\*.



Note: TCLP extracts are routinely diluted 1:10 for the initial analysis as specified in GEL Standard Operating Procedures. These dilutions leave the reporting levels well below the regulatory Maximum Contamination Levels for TCLP.

QUALIFIERS FOR METALS ANALYSIS

- E (Fur) - Analytical cup spike recovery is less than 40%. An explanatory note is included on the specific form to which this applies.
- E (ICP) - The reported value is estimated because of the presence of interference.
- M - Duplicate injection precision not met.
- N - Matrix spiked sample recovery not within control limits.
- S - The reported value was determined by the Method of Standard Additions.
- + - Correlation coefficient for the MSA is less than 0.995.
- W - Post digestion spike for Furnace AA analysis is out of control limits (85-115%), while sample concentration is less than 50% of spike concentration.
- \* - Duplicate analysis not within control limits.

Concentration Qualifiers

- B - Entered if the reported value is less than the Contract Required Detection Limit (CRDL) but greater than the Instrument Detection Limit (IDL).
- U - Entered if the analyte was analyzed for but not detected, less than IDL.

Method Qualifiers

- P - for ICP
- F - for Furnace AA
- CV - for Manual Cold Vapor AA
- AS - for Semi-automated Spectrophotometric
- NR - if the analyte is not required to be analyzed

Sample Calculations

$$\begin{array}{l}
 \text{waters digestate} \quad (\text{ug}) \times \frac{\text{final}}{\text{volume (L)}} \times \frac{\text{density* (1 g)}}{(1 \text{ mL})} \times \frac{\text{dilution}}{\text{factor}} \times \frac{1000 \text{ ml}}{1 \text{ L}} = \text{ug/L} \\
 \text{concentration (L)} \quad \text{amount of} \\
 \text{sample} \\
 \text{digested (g)}
 \end{array}$$

$$\begin{array}{l}
 \text{soils digestate} \quad (\text{ug}) \times \frac{\text{final}}{\text{volume (L)}} \times \frac{100}{\% \text{ solids}} \times \frac{\text{dilution}}{\text{factor}} = \text{mg/Kg dry weight} \\
 \text{concentration (L)} \quad \text{amount of} \\
 \text{sample} \\
 \text{digested (g)}
 \end{array}$$

\* For the purposes of calculation, water samples are assumed to have a density of 1 g/mL.