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STUDY AREA 39 AND 40 SAMPLING AND ANALYSIS PLAN VERTICAL EXTENT OF
CONTAMINATION IN SURFACE SOIL NTC ORLANDO FL
8/27/1997
ABB ENVIRONMENTAL



03.04.39.0003

00186

August 27, 1997

Document No., 8454.253

Commanding Officer
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ATTN: Mr. Wayne J. Hansel, P.E., Code 18B7
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Subject: Study Areas 39 and 40 Sampling and Analysis Plan
Vertical Extent of Contamination in Surface Soil
NTC, Orlando
Contract: N62467-89-D-0317/CTO 107

Dear Mr. Hansel:

In response to a request from the Orlando Partnering Team (OPT), ABB Environmental Services, Inc. (ABB-ES) has prepared this letter report presenting a sampling and analysis plan for Study Areas (SAs) 39 and 40 at the Naval Training Center (NTC), Orlando, Florida. The results of this investigation will be used to evaluate the vertical distribution of arsenic and polynuclear aromatic hydrocarbon (PAH) contamination in surface soil at the SAs.

I. BACKGROUND. Environmental investigations were initiated at SAs 39 and 40 in January 1996. At this time, the SAs were being investigated as a part of the site screening effort for former Air Force Sites (refer to the *Site Screening Plan, Former Air Force Sites, Addendum 2, NTC, Orlando, ABB-ES, December 1995*). Site screening investigation activities for the SAs were focused on evaluating the former use of the site as a coal storage yard and landfill, as well as the current use of the SAs as the solid and hazardous waste storage and handling area. The results of this site screening effort were summarized in the *Technical Memorandum, Site Survey Investigations, SAs 39, 40, and 45 (ABB-ES, June 1996)*.

Based on the results of this initial site screening effort, and because of exceedances of Federal and State regulatory and guidance criteria for both soil and groundwater, an additional site screening was performed to determine the nature and extent of such contamination. This supplemental site screening work was completed in May 1997. The results of this site screening effort were summarized by ABB-ES in a letter report, referenced as *Additional Site Screening Results and Recommendations* and dated January 22, 1997.

Focused Risk Assessment for Surface Soils. Based on the results of both screening efforts, risks to human health based on exposure to surface soil at the SAs were predicted. The results of this assessment were reported by ABB-ES in a letter memorandum referenced as the *Focused Risk Assessment (FRA), Surface Soil, SAs 39 and 40*, the draft was dated April 11, 1997 and the final was dated August 13, 1997. The FRA did not evaluate groundwater, subsurface soil, or other media associated with the SAs; hence, the term "focused" indicates an analysis of risks based on exposure to surface soil, only.

The FRA was conducted to assess whether or not contamination in the surface soil at SAs 39 and 40 pose potential health risks to individuals under the proposed reuse scenario (i.e., mixed office and residential use) and in the absence of remediation. The assessment indicated the following:



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- The potential future reasonable *maximum* exposure (RME) for residential use of the SAs resulted in a slightly elevated cancer risk of 1×10^{-5} . The potential future *average* residential risk posed by exposure to surface soil was at an acceptable cancer risk level 1×10^{-6} . The cancer risk range, 1×10^{-5} to 1×10^{-6} , presented by these scenarios presents information for the risk manager to use as perspective into the risks presented by the SAs as a whole.
- The RME residential cancer risk is based on exposure to arsenic and two carcinogenic PAHs (benzo(a)pyrene and dibenz(a,h)anthracene), which were detected in surface soil.
- Concentrations of arsenic and the two PAHs detected in surface soil exceeded the Florida residential Soil Cleanup Goals (SCGs).

Based on these findings, the reduction of the risk based on exposure to arsenic- or PAH-contaminated soil via remedial action and its affect on lowering the overall surface soil pathway cancer risk estimate was evaluated. First, Remedial Goal Options (RGOs) were identified. The RGOs established for surface soil at SAs 39 & 40 are the Florida residential SCGs for the two PAHs and the NTC, Orlando background screening concentration for arsenic (see Table below).

Table 1
Remedial Goal Objectives (RGOs) for Surface Soil
SAs 39 & 40, NTC, Orlando

Analyte	Maximum Detected Concentration	RGO
Arsenic	6.7 mg/kg (ppm)	1.0 mg/kg (ppm)
Benzo(a)pyrene	520 ug/kg (ppb)	100 ug/kg (ppb)
Dibenz(a,h)anthracene	110 ug/kg (ppb)	100 ug/kg (ppb)

Based on the RGOs established, the following statements regarding the reduction in the predicted cancer risks were made:

- Remediation of arsenic-contaminated soil to background levels (1 mg/kg) would result in a predicted RME residential cancer risk of 2.5×10^{-6} . This risk level is greater than the Florida Department of Environmental Protection's (FDEP) acceptable cancer risk target of 1×10^{-6} .
- Remediation of benzo(a)pyrene- and dibenz(a,h)anthracene-contaminated soils to the residential Florida SCGs would result in a predicted RME residential cancer risk of 1.6×10^{-6} ; this risk level is greater than the Florida DEP's acceptable cancer risk target of 1×10^{-6} .

Conclusions and Recommendations of the FRA. The FRA predicted that the presence of arsenic and two carcinogenic PAHs in surface soil at the SAs may be presenting an unacceptable cancer risk of 1×10^{-5} based on exposure of a future resident to surface soil. Although remediation of surface soil to RGOs would reduce the total predicted cancer risk, the remaining risk upon completion of the remedial action would still present an unacceptable predicted cancer risk of 4.1×10^{-6} .

Remedial Options for Contaminated Surface Soil. In order to gain perspective for the risk managers on the viability of remediating surface soil at the SAs in lieu of the minimal reduction in risk that would be gained, the Navy requested ABB-ES to develop cost estimates for various remedial options addressing contaminated surface soil at the SA. A letter memorandum was prepared by ABB-ES presenting three cost options to address contaminated surface soil at the SAs. This memorandum is referenced as *Cost Estimates for Surface Soil Remedial Options* and was dated July 15, 1997.

The cost options discussed in the letter included:

- treatment (In-situ Stabilization)
- containment (Soil Cover/Capping)
- disposal (Excavation and Offsite Disposal)

Estimated Volume of Contaminated Surface Soil. To prepare the cost estimates, the volume of surface soil contamination was estimated. This volume was based on the surface area of surface soil contamination (based on the RGOs listed in Table 1), which is shown in Figure 1. In general, arsenic- and PAH-contaminated soils are not co-located. Based on this figure, the approximate surface area of contamination includes 4 areas (approximately 25 feet wide by 25 feet long) located north of Nautilus Street, and one area (approximately 200 feet wide by 700 feet long) located south of Nautilus Street and west of Grace Hopper Avenue. The depth of contaminated soil was assumed to be 2 feet. This depth was assumed based on a comment received from the FDEP regarding guidance that surface soil should be remediated to 2 feet bls. Based on this surface area and depth of contamination, the volume of contaminated surface soil at the SAs was estimated to be approximately 11,000 cubic yards (cy).

Cost Estimates for Remedial Options. The cost estimates developed for the three remedial options based on the calculated volume estimated are summarized in Table 2.

Table 2
Cost Estimates for Various Surface Soil Remedial Options
SAs 39 & 40, NTC, Orlando

Remedial Option	Cost Estimate (two significant figures)
In-situ Stabilization	\$620,000
Soil Cover/Capping	\$450,000
Excavation and Offsite Disposal	\$1,300,000

II. ADDITIONAL SAMPLING FOR SURFACE SOIL AT SAs 39 AND 40. The cost estimates developed for the three remedial options were presented to the OPT in the July partnering meeting. At that time, the Navy requested additional information regarding the vertical extent of surface soil contamination at the SAs. This is because the cost estimates prepared assumed a depth of contamination of 2 feet, and, if the depth of contamination were less, then the volume of contamination and, hence, the cost of remediation would be less. As such, ABB-ES was tasked with preparing a sampling and analysis plan for SAs 39 and 40 to evaluate the vertical distribution of arsenic and PAHs in surface soil.

Objective of Additional Surface Soil Sampling. The objective of this sampling plan at SAs 39 and 40 is to obtain sampling data, evaluate the collected data, and identify the depth of surface soil contamination at the SAs. This depth will be used to calculate the volume of contaminated soil at the SAs.

Approach to Additional Surface Soil Sampling. For this additional sampling, ABB-ES proposes to collect soil samples at various sample locations at three depth intervals:

- 0 to 0.5 feet bls,
- 0.5 to 1 foot bls, and
- 1 to 2 feet bls.

ABB-ES will collect soil samples at these depth intervals from 18 locations at SAs 39 and 40, including (see Figure 2):

- one at each of the 4 hot spot areas located north of Nautilus Street, and
- one each at 14 locations within the hot spot area located south of Nautilus Street.

Based on this suggested approach, a total of 54 soil samples would be collected for analysis (i.e., 18 sample locations x 3 depth intervals per location = 54 total samples). *The Project Operations Plan for Field Investigations at NTC, Orlando* (August 1997), describes the procedures for collecting surface soil samples.

As previously stated, arsenic- and PAH-contaminated soils are generally not co-located (see Figure 1). Therefore, soil samples from each location will be analyzed for one of the following:

- arsenic using EPA Method 3050/7060
- PAHs using EPA Method 8310
- both arsenic (EPA Method 3050/7060) and PAHs (EPA Method 8310)

Figure 2 presents the proposed sample locations and Table 3 summarizes the analyses for location. Data quality level D will be used for all surface soil samples.

Table 3
Summary of Sampling and Analysis Plan for Surface Soil
SAs 39 & 40, NTC, Orlando

Sample Location	# sample locations for arsenic analysis	# sample locations for PAHs analysis	# sample locations for both arsenic and PAHs analyses	total # sample locations
hot spots located north of Nautilus Street	2	1	1	4
hot spot area located south of Nautilus Street	4	6	4	14

Evaluation of Results of Additional Surface Soil Sampling. The results of the additional surface soil sampling at SAs 39 and 40 will be used to identify the depth of contamination at the SAs. This estimate will then be used to determine the volume of contaminated soil at the SAs. Based on this identified depth, the cost estimates of the remedial options will be recalculated.

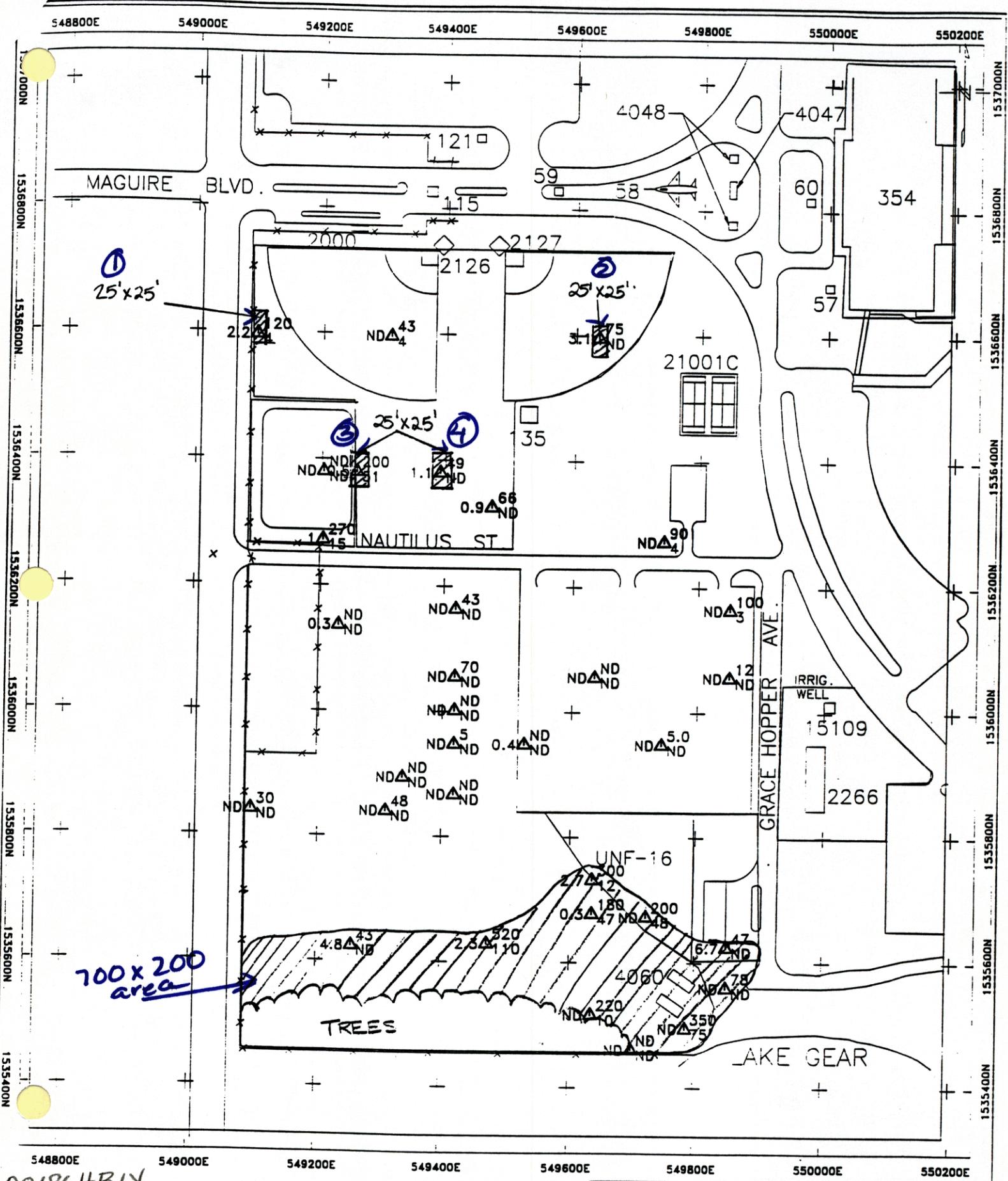
The OPT discussed a draft of this memorandum at the August OPT meeting. Our intent is to schedule and perform this sampling plan as soon as possible. If you have any questions or comments regarding this letter or our direction at SA 39 and 40, please call me at (407) 895-8845 or Shannon Gleason at (703) 769-8145.

Very Truly Yours,
ABB ENVIRONMENTAL SERVICES, INC.


John Kaiser
Installation Manager

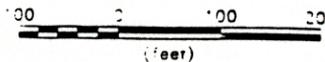
cc: B. Nwokike (SDIV)
J. Mitchell (FDEP)
N. Rodriguez (EPA)
Lt. G. Whipple (NTC, ORL)
O. McNeil (Bechtel)
S. McCoy (Brown & Root)
S. Gleason (ABB-ES)
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Figure 1



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Scale 1:2400

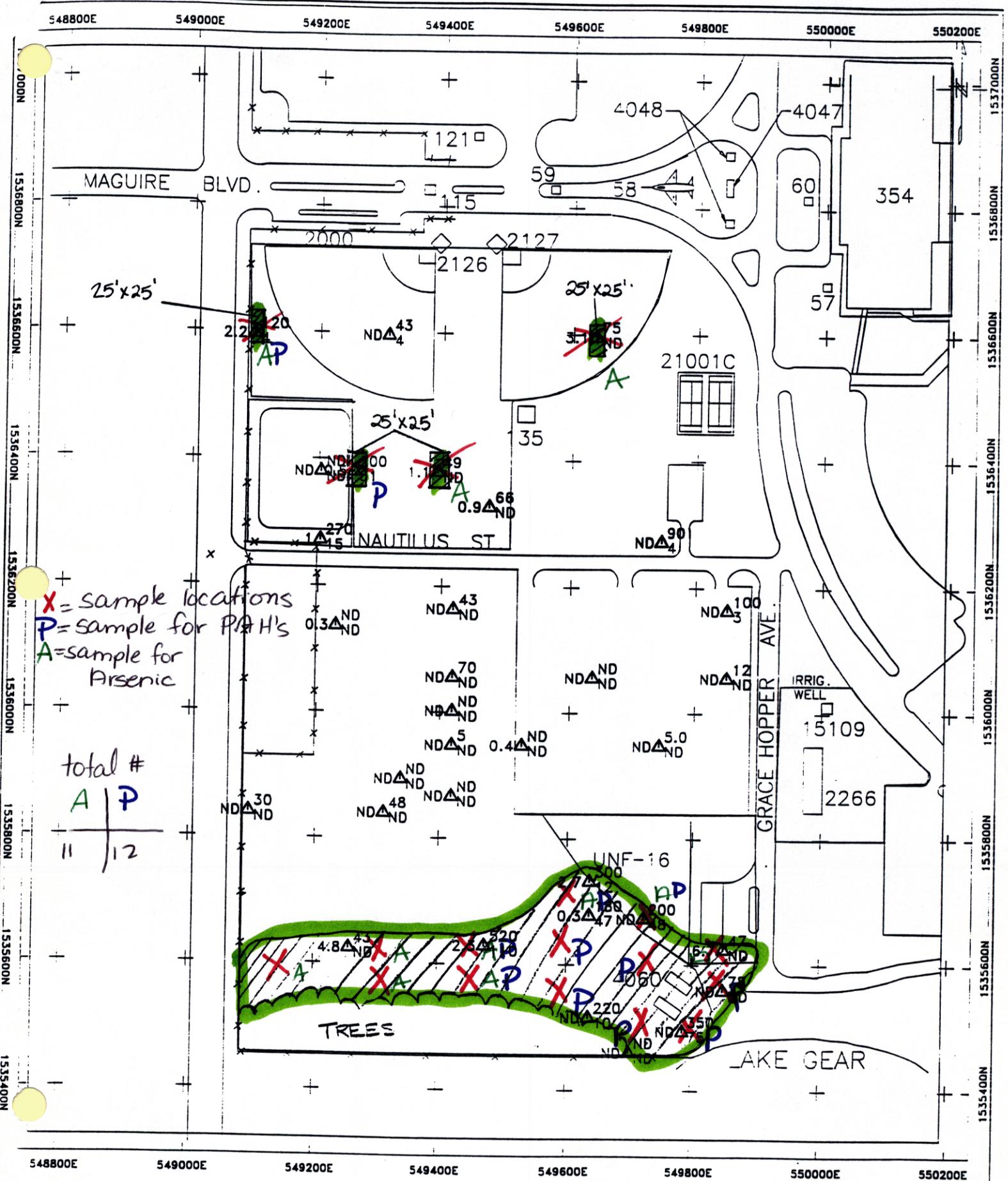


NOTE: ARSENIC IS PLOTTED TO LEFT OF SYMBOL.
 BENZO(A)PYRENE TO UPPER RIGHT, AND DIBENZ-
 (A,H)ANTHRACENE TO LOWER RIGHT

REMEDIATION AREA

SOUTHERN DIVISION
 STUDY AREAS 39 AND 40
 ARSENIC, BENZO(A)PYRENE AND
 DIBENZ(A,H)ANTHRACENE CONCENTRATIONS

FIGURE 2



X = sample locations
 P = sample for PAH's
 A = sample for Arsenic

total #

A	P
11	12

Scale 1:2400

NOTE: ARSENIC IS PLOTTED TO LEFT OF SYMBOL. BENZO(A)PYRENE TO UPPER RIGHT, AND DIBENZ-(A,H)ANTHRACENE TO LOWER RIGHT

SOUTHERN DIVISION
 STUDY AREAS 39 AND 40
 ARSENIC, BENZO(A)PYRENE AND
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