SAMPLING EVENT REPORT FOR POTENTIAL SOURCE OF CONTAMINATION 9 OLD DISPOSAL AREA EAST OF THE FUEL FARM NAS JACKSONVILLE FL

8/1/1999

HARDING LAWSON ASSOCIATES

SAMPLING EVENT REPORT

POTENTIAL SOURCE OF CONTAMINATION 9
OLD DISPOSAL AREA EAST OF THE FUEL FARM

NAVAL AIR STATION JACKSONVILLE
JACKSONVILLE, FLORIDA

Unit Identification Code: N00207

Contract No.: N62467-89-D-0317/040

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August 1999

CERTIFICATION OF TECHNICAL
DATA CONFORMITY (MAY 1987)

The Contractor, Harding Lawson Associates, hereby certifies that, to the best of its knowledge and belief, the technical data delivered herewith under Contract No. N62467-89-D-0317/040 are complete and accurate and comply with all requirements of this contract.

DATE: August 27, 1999

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(DFAR 252.227-7036)

TABLE OF CONTENTS

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

TABLE OF CONTENTS (Continued)

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

LIST OF FIGURES

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

LIST OF TABLES

GLOSSARY

ABB-ES	ABB Environmental Services, Inc.
AWQC	ambient water quality criteria
BAF	bioaccumulation factor
BEI	Bechtel Environmental, Inc.
BHC	benzene hexachloride
bls	below land surface
CLP	Contract Laboratory Program
CompuChem	CompuChem Environmental Corporation
COPC	chemical of potential concern
EDS	Environmental Data Services
ERA	ecological risk assessment
FDEP	Florida Department of Environmental Protection
GGC	groundwater guidance concentration
HI	hazard index
HLA	Harding Lawson Associates
HQ	hazard quotient
IAS	Initial Assessment Study
LOAEL	lowest observed adverse effects level
LUC	land-use control
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
µg/kg	micrograms per kilogram
µg/ℓ	micrograms per liter
NAS	Naval Air Station
NFESC	Naval Facilities Engineering Service Center
NOAEL	no observable adverse effects level
OU	Operable Unit
PAH	polynuclear aromatic hydrocarbon
PARCC	precision, accuracy, representativeness, completeness, and comparability
PCB	polychlorinated biphenyl
pCi/g	picocuries per gram
pCi/ℓ	picocuries per liter
PDE	potential dietary exposure
PEL	probable effect level
ppb	parts per billion
PSC	potential source of contamination
QA/QC	quality assurance and quality control

GLOSSARY (Continued)

RBC	risk-based concentration
RI	remedial investigation
RTV	reference toxicity value
SCG	soil cleanup goal
SER	sampling event report
SFF	site foraging frequency
SQAG	sediment quality assessment guideline
SSW	Site Screening Workplan
SVOC	semivolatile organic compound
TAL	target analyte list
TCL	target compound list
TEL	threshold effects limit
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound
yds^3	cubic yards

1.0 INTRODUCTION

Harding Lawson Associates (HLA), under contract to the Department of Navy (Contract No. N62467-89-D-0317, Task Order No. 040) is submitting this Sampling Event Report (SER) for Potential Source of Contamination (PSC) 9, Old Disposal Area East of the Fuel Farm at Naval Air Station (NAS) Jacksonville, Jacksonville, Florida. PSC 9 is located east of the Fuel Farm between Catapult Road and the St. Johns River (Figures 1-1 and 1-2). The Old Disposal Area was identified as a PSC during the Initial Assessment Study (IAS) (Fred C. Hart Associates, Inc., 1983). According to the IAS report, the site contained garbage, construction debris, and a few 55-gallon drums that were disposed of from 1977 to 1978. The IAS report stated that high chromium concentrations in soil samples previously collected and analyzed indicated that industrial waste such as chromium sludge could have been disposed of in this area.

This SER summarizes the methods and the results of the field investigation and transmits the field and analytical data.

1.1 PURPOSE AND SCOPE. The purpose of the sampling event at PSC 9 was to gather sufficient information to support the next phase of the Remedial Response Decision System process. The scope of the sampling event at PSC 9, detailed in the Site Screening Workplan (SSW) (ABB Environmental Services, Inc. [ABB-ES], 1997), included the following:

- Collection of up to nine soil samples. Five surface soil samples will be collected from 0 to 1 foot, and the remaining four samples will be collected during downgradient monitoring well installation.
- Installation of three "micro" monitoring wells to collect groundwater. Two wells will be downgradient, and the remaining well will be located upgradient to observe what may be introduced from other sources not related to PSC 9.
- Collection of one surface water and one sediment sample from the unlined drainage ditch along the south side of site.
- Laboratory analysis of the soil, groundwater, surface water and sediment samples for U.S. Environmental Protection Agency (USEPA) target compound list (TCL) volatile organic compounds (VOCs), TCL semivolatile organic compounds (SVOCs), TCL pesticides and polychlorinated biphenyls (PCBs), target analyte list (TAL) inorganics, and radiological parameters (gross alpha and beta).

Fieldwork for the above sampling event was completed between June 5, 1997 and August 21, 1997.

Based on the analytical results of the sampling, further sampling of PSC 9 was recommended to gather supplemental data necessary for ecological risk screening. Field work for the second sampling event was completed on March 30, 1999. The scope of the additional sampling included the following:

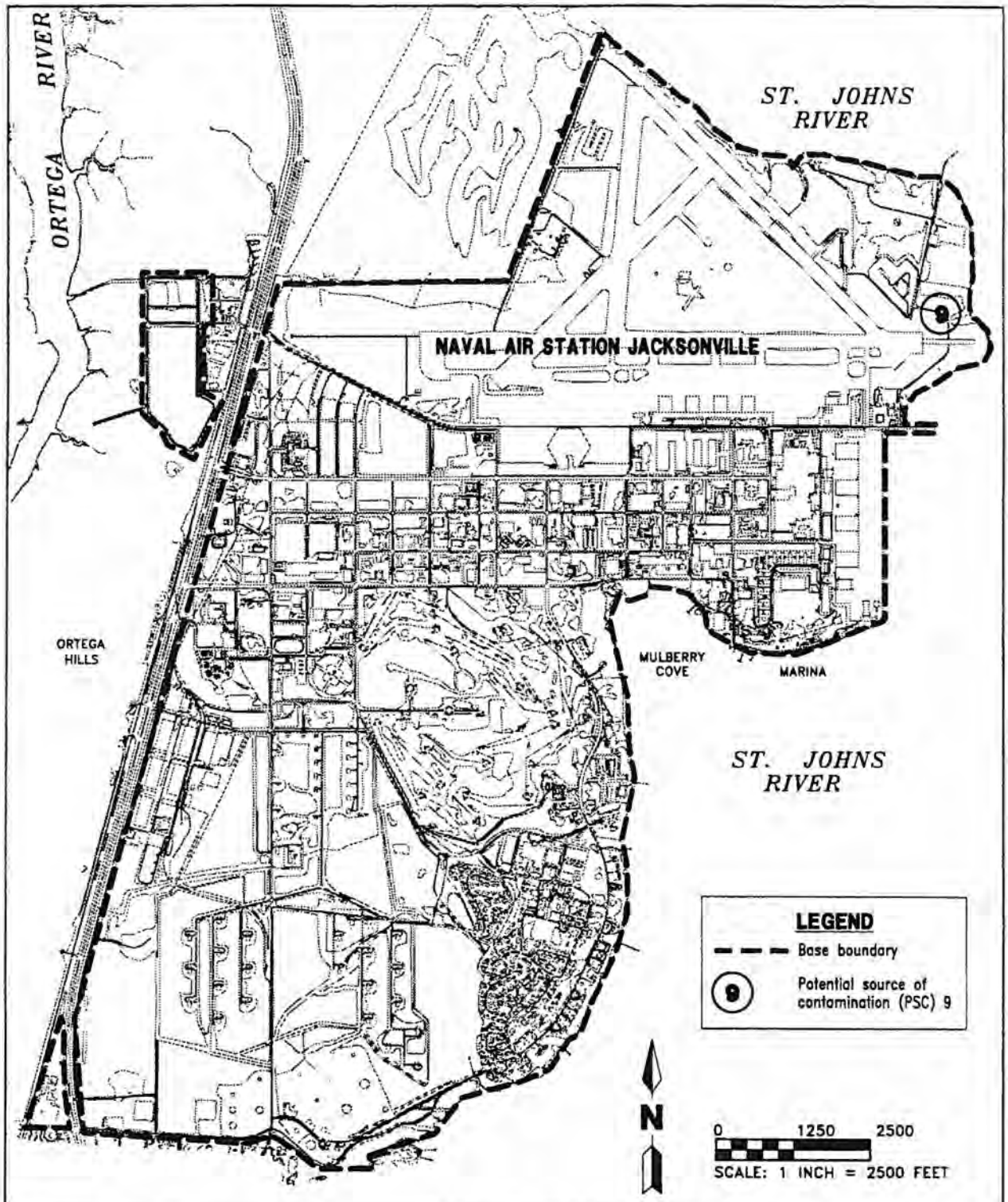

FIGURE 1-1
LOCATION OF PSC 9 AT
NAVAL AIR STATION JACKSONVILLE

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SAMPLING EVENT REPORT
PSC 9

NAVAL AIR STATION JACKSONVILLE
JACKSONVILLE, FLORIDA

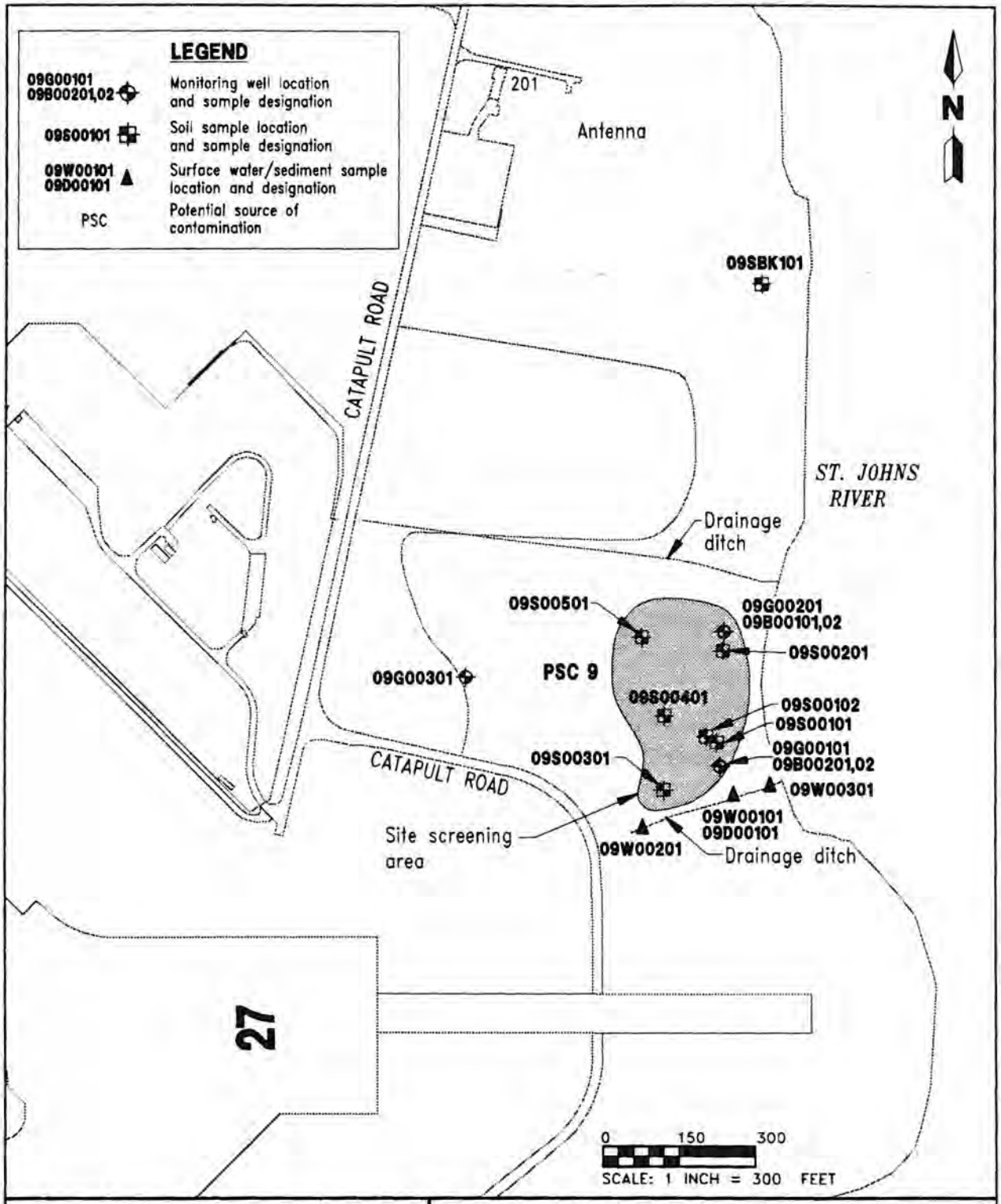

FIGURE 1-2
SAMPLING LOCATIONS AT PSC 9
OLD DISPOSAL AREA EAST OF FUEL FARM

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SAMPLING EVENT REPORT
PSC 9

NAVAL AIR STATION JACKSONVILLE
JACKSONVILLE, FLORIDA

- Resampling of one surface soil location (09S001), and collection of one background surface soil sample. Analysis of the surface soil samples for polynuclear aromatic hydrocarbons (PAHs), TCL PCBs, and mercury, and toxicity testing using the earthworm (*Eisenia fostida*) 14-day survival test with an additional 16 days of exposure, and the 120-hour lettuce seed (*Sativa latuca*) germination test.

- Collection of two surface water samples from the unlined drainage ditch (one sample upgradient and one downgradient of surface water sample 09W00101 collected in 1997). Analysis of the surface water samples for TCL PCBs.

A tracking log showing sample and sample delivery group identifiers, relevant dates, sample depths, and parameters analyzed is included in Appendix A.

1.2 SITE DESCRIPTION AND HISTORY. PSC 9 is located near the shoreline of the St. Johns River, just north and east of the main east-west runway (Figure 1-2). The site is approximately 200 feet wide by 400 feet long and is accessible from Catapult Road. The proximity of PSC 9 to the flight line makes it inaccessible to most people. Northern portions of PSC 9 have dense ground cover and shrubs, which also limit access to the site. The shoreline near PSC 9 is built up with concrete rubble and bricks.

During HLA's PSC reconnaissance on April 21 and 27, 1994, large pieces of concrete rubble were observed in the central part of the site. A large berm of rubble runs in a north-south direction in this area. Rusted scrap metal and pieces of polyvinyl chloride pipe were also observed.

PSC 9 is located between two drainage ditches that flow east to the St. Johns River. The site is mostly flat and gently slopes north and south toward the two drainage ditches. Groundwater flow is generally east toward the St. Johns River. The Verification Study report concluded that the St. Johns River is the discharge point for groundwater (Geraghty & Miller, Inc., 1985).

Interviews with NAS Jacksonville personnel and examination of aerial photographs revealed additional information regarding the PSC history. In a 1959 aerial photograph, PSC 9 was devoid of vegetation; a small roadway led to the site. This photograph indicates that disposal at this site could have occurred prior to 1977. According to an engineer on station, unauthorized disposal occurred at PSC 9 for an undetermined period after 1978 (Wadel, 1994a). Between 1985 and 1988, organic and possibly other materials were disposed of at PSC 9.

Concrete runway debris was placed over the entire disposal area at PSC 9 and pushed underground by bulldozers (Wadel, 1994b). According to *History of the Public Works Department and Office of the Officer in Charge of Construction*, runways on the landing field were constructed of a limerock base with a triple-surface asphalt treatment (NAS Jacksonville, 1945). The roadways were constructed with a double-surface treatment. No asbestos is known to have been disposed of at PSC 9 (Wadel, 1994a). In 1990, soil from the Wright Street project and concrete rubble were disposed of at PSC 9 (Geraghty & Miller, Inc., 1990).

An October 1951 aerial photograph shows dredge spoils being collected and drained in the area between PSC 5 and Gas Hill. The photographic evidence also suggests that this material was being transported to and used as fill at PSC 9 and the west end of the runway.

In 1997, Bechtel Environmental, Inc. (BEI) conducted a radiological survey at PSC 9 to define and remediate areas of elevated radiological contamination (BEI, 1998). A total of 540 cubic yards (yd^3) of soil were removed from 10 hot spots/area locations totalling approximately 17,000 square feet. The excavated soil was transported to PSC 26 for disposal. Radiological measurements performed after the excavated areas were backfilled indicated that residual activities are within stationwide background levels. The BEI radiological survey report is included in Appendix B.

2.0 SAMPLING APPROACH AND FIELD CHANGES

The work described herein was performed as presented in the SSW (ABB-ES, 1997). Additional sampling performed to more fully characterize the environmental conditions at PSC 9 is also described in this section.

Three micro monitoring wells, two downgradient and one upgradient, were installed at the site. Each of the wells, installed using TerraProbe℠ technology, were set at 10 feet below land surface (bls) and with 9 feet of well screen. Groundwater samples 09G00101, 09G00201, and 09G00301 were collected from the monitoring wells for laboratory analysis. One surface (09B00101) and three subsurface soil samples (09B00102, 09B00201, and 09B00202) were collected during the installation of the downgradient wells. Five additional surface soil samples (09S00101 through 09S00501) were collected from 0 to 1 foot bls.

One surface water sample (09W00101) and one sediment sample (09D00101) were collected from the same location in the drainage ditch directly south of the site.

The soil, surface water, sediment, and groundwater samples collected for laboratory analysis were sent by overnight carrier to the subcontract laboratory, CompuChem Environmental Corp. (CompuChem), Cary, North Carolina. The samples were analyzed for TCL VOCs, SVOCs, pesticides and PCBs, TAL inorganic analytes, and radiological parameters (gross alpha and gross beta).

Elevated concentrations of PAHs, cadmium, lead, and mercury were detected at sampling locations 09B00101, 09S00101, and 09S00201. Based on information presented in BEI's report (Appendix B), soil areas in and around sampling locations 09B00101 and 09S00201 were excavated, thereby removing the contamination found at these locations. BEI removed a total of 540 yd^3 of soil from PSC 9. Aldrin, Aroclor-1254, and alpha-BHC were detected in the surface water sample (09W00101).

HLA recommended additional sampling at PSC 9 to gather supplemental data necessary for ecological risk screening. Field work for the second sampling event was completed on March 30, 1999, and included surface soil and surface water sampling.

A surface soil sample at the approximate location of 09S00101 and a background surface soil sample at an upgradient location were collected. Site sample 09S00102 and background sample 09SBK101 were collected on March 30, 1999 and analyzed for PAHs, PCBs, and mercury. In addition, toxicity tests were performed including the earthworm (*Eisenia fostida*) 14-day survival test with an additional 16 days of exposure, and the 120-hour lettuce seed (*Sativa latuca*) germination test. Surface water samples were collected from the drainage ditch at locations upgradient (09W00201) and downgradient (09W00301) of sample location 09W00101 to confirm the presence of Aroclor-1254 in surface water.

Toxicity tests were performed by Aquatec Biological Sciences, South Burlington, Vermont. The results of the toxicity tests are presented in Appendix C. The surface soil and surface water samples collected for laboratory analysis were sent to the subcontract laboratory, Quanterra, Inc., North Canton, Ohio.

Following the laboratory analysis all data were validated in accordance with the Naval Facilities Engineering Service Center (NFESC) Level D protocol. A summary of the detections in the soil, surface water, sediment, and groundwater analytical results is presented in Appendix C. The validated analytical results are included in Appendix D.

3.0 QUALITY ASSURANCE AND QUALITY CONTROL

3.1 JULY AND AUGUST 1997 SAMPLING ACTIVITY. Field samples and associated quality assurance and quality control (QA/QC) samples were collected and analyzed according to USEPA Contract Laboratory Program (CLP) and NFESC requirements by a NFESC-certified laboratory, CompuChem Laboratories, following CLP analytical and deliverable requirements. The analytical data packages, submitted by sample delivery groups, were independently validated by a subcontract data validation company, Environmental Data Services (EDS), Concord, New Hampshire, in accordance with validation requirements contained in NFESC document *Navy Installation Restoration Laboratory Quality Assurance Guide* (NFESC, 1996). Other documents used in the data validation and review include the *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review* (USEPA, 1994a), and the *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (USEPA, 1994b).

A detailed QA/QC evaluation can be found in the EDS report (EDS, 1997), which summarizes the results of the data quality assessment according to the precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters for the entire site screening activity. The EDS report was issued as Appendix B of the SSW. The generated analytical data were found to be acceptable according to the PARCC criteria, with less than 5 percent of the data requiring qualification (primarily estimated "J" qualifier).

3.2 MARCH 1999 SAMPLING ACTIVITY. Field samples and an associated rinsate blank were collected and analyzed according to USEPA CLP and NFESC requirements by an NFESC certified laboratory, Quanterra, Inc. (North Canton, Ohio), following CLP analytical and deliverable requirements. PAH analysis was performed using USEPA SW846 Method 8310. Toxicity tests were performed based on methods described in Method 600/R-94/025 (USEPA, 1994c).

The analytical data package was independently validated by a subcontract data validation company, EDS, in accordance with validation requirements contained in the documents cited in Section 3.1. The EDS validation report for the March 1999 samples is included in Appendix F.

4.0 ANALYTICAL RESULTS

The analytical results in each sampled media are discussed in the following sections. As mentioned in Chapter 1.0, the IAS report indicated possible sludge disposal at PSC 9 based on the high chromium concentrations found in soil samples. Since PSC 9 was identified as a PSC because of the suspected sludge disposal in the area, this discussion also includes a comparison of analytical results in surface soil and subsurface soil at PSC 9 to the sludge sample collected at PSC 50, the former East Side Wastewater Treatment Plant Sludge Disposal Area.

4.1 ANALYTICAL RESULTS FOR SURFACE SOIL SAMPLES. Seven surface soil samples and one background surface soil sample were collected. Appendix C presents a summary of the parameters detected in surface soil samples. The complete validated analytical data are included in Appendix D.

Based on information presented in BEI's report (Appendix B), several soil areas, including the two surface soil sampling locations 09B00101 and 09S00201 were excavated and remediated, at depths ranging from one to three feet below land surface. The excavated material was transported to PSC 26 for disposal. Since the contamination found at these locations has been effectively remediated, the following discussion of analytical results are limited to the remaining five surface soil samples collected at PSC 9 (surface soil samples 09S00101, 09S00102, 09S00301, 09S00401, and 09S00501).

4.1.1 Volatile Organic Compounds The only VOC detected was acetone which was detected in two surface soil samples, at concentrations of 30 and 33 micrograms per kilogram (µg/kg). These detections, however are considered artifacts of laboratory or decontamination procedures.

4.1.2 Semivolatile Organic Compounds Fourteen SVOCs, primarily consisting of PAHs, were detected in the five surface soil samples analyzed. Benzo(a)pyrene was detected in three samples at concentrations ranging from 85 to 860 µg/kg versus the FIorida Department of Environmental Protection (FDEP) residential soil cleanup goal (SCG) of 100 µg/kg. Based on the visual findings, the detected PAHs are directly related to the disposal of asphalt-containing rubble at PSC 9.

4.1.3 Pesticides and Polychlorinated Biphenyls Twelve pesticides and a PCB compound (Aroclor-1254) were detected in surface soil samples. Detected concentrations did not exceed their respective FDEP residential SCGs.

4.1.4 Inorganic Parameters Eighteen inorganic parameters were identified in surface soil. Detected concentrations did not exceed their respective FDEP residential SCGs.

4.1.5 Radiological Parameters Gross alpha measurements ranged from -0.57 picocuries per gram (pCi/g) to 4.06 pCi/g and gross beta ranged from 6.07 pCi/g to 12.87 pCi/g.

4.2 ANALYTICAL RESULTS FOR SUBSURFACE SOIL SAMPLES. Appendix C presents a summary of the parameters detected in the three subsurface soil samples collected at PSC 9. The complete validated analytical data are included in Appendix D.

4.2.1 Volatile Organic Compounds Acetone was detected in one subsurface soil sample at 15 µg/kg. This detection is considered an artifact of laboratory or decontamination procedures.

4.2.2 Semivolatile Organic Compounds Four PAH compounds, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, and benzo(k)fluoranthene, were detected in one subsurface soil sample (09B00201).

4.2.3 Pesticides and Polychlorinated Biphenyls Eight pesticide compounds and one PCB compound (Aroclor-1254) were detected in subsurface soil samples. The pesticide detections are all below 1 µg/kg, except for endosulfan sulfate at 1.5 µg/kg in sample 09B00201. Aroclor-1254 was detected in two subsurface samples at 11 and 36 µg/kg.

4.2.4 Inorganic Parameters Nineteen inorganic parameters were identified in the three subsurface soil samples analyzed. Antimony and cadmium were detected in only one sample (09B00201), and beryllium was detected only in sample 09B00102. All other inorganic detections were found in all three samples analyzed.

4.2.5 Radiological Parameters Gross alpha measurements ranged from -2.94 to 18.79 pCi/g and gross beta ranged from 5.04 to 15.31 pCi/g.

4.3 ANALYTICAL RESULTS FOR GROUNDWATER SAMPLES. Appendix C presents a summary of the parameters detected in groundwater samples collected at PSC 9. The complete validated analytical data are included in Appendix D.

4.3.1 Volatile Organic Compounds Methylene chloride was detected in one groundwater sample at 21 micrograms per liter (µg/ℓ). This detection is considered an artifact of laboratory or decontamination procedures.

4.3.2 Semivolatile Organic Compounds No SVOCs were detected in the groundwater samples analyzed.

4.3.3 Pesticides and Polychlorinated Biphenyls One pesticide compound, dieldrin, was detected in the two downgradient groundwater samples (09G00101 and 09G00201) at 0.005 µg/ℓ and 0.09 µg/ℓ. However, the detections are below the FDEP groundwater guidance concentrations (GGC) of 0.1 µg/ℓ.

4.3.4 Inorganic Parameters Eighteen inorganic parameters were detected in the groundwater samples analyzed. Aluminum, iron, and manganese were detected at concentrations exceeding both their FDEP GGCs and Federal maximum contaminant level (MCL) secondary standards. Exceedances of secondary standards were observed in the three groundwater samples analyzed and may be related to the suspended solids naturally present in groundwater. Antimony and lead were detected at concentrations exceeding both their FDEP GGC and Federal MCL primary standards. Exceedances of the primary standards were detected in only one sample (09G00301), the upgradient sample.

4.3.5 Radiological Parameters Gross alpha, ranging from 2.79 picocuries per liter (pCi/ℓ) to 7.41 pCi/ℓ, and gross beta, ranging from 8.79 pCi/ℓ to 19.53 pCi/ℓ, were detected in all three groundwater samples.

4.4 ANALYTICAL RESULTS FOR SURFACE WATER SAMPLES. Appendix C presents a summary of the parameters detected in three surface water samples collected at PSC 9. Only one surface water sample (09W00101) was analyzed for the full suite of TCL and TAL parameters. The remaining two surface water samples were analyzed for TCL pesticides and PCBs only. The complete validated analytical data are included in Appendix D.

4.4.1 Volatile Organic Compounds No VOCs were detected in surface water sample 09W00101.

4.4.2 Semivolatile Organic Compounds One SVOC, di-n-butylphthalate at 2 μg/ℓ, was detected in surface water sample 09W00101 at a concentration slightly below the Florida surface water standard of 3 μg/ℓ. This detection is considered a laboratory artifact.

4.4.3 Pesticides and Polychlorinated Biphenyls One pesticide (Aldrin) and one PCB compound (Aroclor-1254) were detected in surface water sample 09W00101. The Aroclor-1254 detection at 1.6 μg/ℓ exceeded the Florida surface water standard of 0.014 μg/ℓ, and may be related to the suspended solids naturally present in the surface water. However, these compounds were not detected in two surface water samples collected upgradient (sample 09W00201) and downgradient (sample 09W00301) of this initial sample. Three other pesticide compounds (alpha-benzene hexachloride [BHC], beta-BHC, and Heptachlor) were detected in the downgradient sample at low concentrations (2 to 6 parts per billion [ppb]). All detections may be related to the suspended sediments present in the surface water.

4.4.4 Inorganic Parameters Thirteen inorganic parameters were detected in surface water sample 09W00101. Only iron, detected at 2,610 μg/ℓ, exceeded the Florida surface water standard of 1,000 μg/ℓ.

4.4.5 Radiological Parameters Gross alpha at 2.01 pCi/ℓ and gross beta at 5.13 pCi/ℓ were detected in surface water sample 09W00101.

4.5 ANALYTICAL RESULTS FOR SEDIMENT SAMPLES. Appendix C presents a summary of the parameters detected in one sediment sample collected at PSC 9. The complete validated analytical data are included in Appendix D.

4.5.1 Volatile Organic Compounds No VOCs were detected in the sediment sample analyzed.

4.5.2 Semivolatile Organic Compounds No SVOCs were detected in the sediment sample analyzed.

4.5.3 Pesticides and Polychlorinated Biphenyls Three pesticide compounds, dieldrin, endrin, and heptachlor, were detected below 1 ppb in the sediment sample. FDEP sediment quality assessment guidelines (SQAGs) have not been determined for these compounds.

4.5.4 Inorganic Parameters Sixteen inorganic parameters were detected in the sediment sample analyzed; however, none were detected at concentrations exceeding their respective FDEP SQAGs.

4.5.5 Radiological Parameters Gross alpha at 14.26 pCi/g and gross beta at 11.04 pCi/g were detected in the sediment sample.

4.6 COMPARISON OF PSC 9 ANALYTES TO COMPONENTS OF INDUSTRIAL SLUDGE. The IAS (Fred C. Hart Associates, Inc., 1983) reported that the chromium content of the soils indicated that chromium sludge "could have been disposed of in this area." However, no documented disposal of industrial waste is known to have occurred. As discussed in Subsection 4.1.4 and as shown in Appendix C, no inorganic parameters in surface soil exceeded the FDEP residential SCG. These results would not be expected at an area contaminated with industrial sludge.

Further evidence that PSC 9 was not used for disposal of industrial sludge is presented in Table 4-1. As shown in Table 4-1, the analytes detected in surface and subsurface soil at PSC 9 are not similar to the known sludge that was disposed of at PSC 50. The PSC 50 sludge contained a different "fingerprint" of PAHs than at PSC 9. At PSC 50, the PAHs contained significant levels of bis(2-ethylhexyl)phthalate, 1,4-dichlorobenzene, 2-methylnaphthalene, and naphthalene. Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and fluoranthene were not detected. PSC 9 contained detectable levels of Aroclor-1254 but nondetectable levels of Aroclor-1260, results that are opposite of those from the PSC 50 sludge. Pesticides detected in the sludge at PSC 50 included dichlorodiphenyltrichloroethane, dichlorodiphenyldichloroethene, and dichlorodiphenyldichloroethane, and were at levels indicating disposal, whereas the levels detected at PSC 9 indicated normal application of pesticides for insect control. Finally, the soils at PSC 9 contained significantly less silver, manganese, mercury, zinc, and cadmium (which would be expected in industrial waste) and significantly more calcium, magnesium, and potassium, which would be expected in local soils. The levels of radioactivity present at PSC 9 are consistent with those found at PSC 5, an area also known to contain dredge material from the St. Johns River. These levels may be indicative of naturally occurring radioactivity in the materials from the river bottom.

The analytical results, therefore, suggest that the material disposed of at PSC 9 is not consistent with industrial sludge at PSC 50 and is more like the reported construction debris, which included asphalt, and dredge spoils. The asphalt would account for the PAH compounds found in the soil samples.

Table 4-1
Comparison of Detected Analytes in Soils at PSC 9 and Sludge at PSC 50

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Analytes	Surface Soil PSC 9	Subsurface Soil PSC 9	Sludge PSC 50
Volatile Organic Compounds (µg/kg)			
Acetone	35	15	450
2-Butanone	ND	ND	250
Chlorobenzene	ND	ND	190
Ethylbenzene	ND	ND	20
Toluene	ND	ND	10
Xylene (total)	ND	ND	65
Semivolatile Organic Compounds (µg/kg)			
Acenaphthene	49	ND	ND
Acenaphthylene	46	ND	ND
Anthracene	120	ND	ND
Benzo(a)anthracene	1,400	77	ND
Benzo(a)pyrene	1,400	140	ND
Benzo(b)fluoranthene	2,300	150	ND
Benzo(g,h,i)perylene	860	ND	ND
Benzo(k)fluoranthene	1,100	59	ND
bis(2-Ethylhexyl)phthalate	250	ND	2,600
Carbazole	82	ND	ND
Chrysene	1,600	99	ND
Di-*n*-butylphthalate	180	ND	ND
Dibenz(a,h)anthracene	120	ND	ND
1,4-Dichlorobenzene	ND	ND	2,500
Fluoranthene	3,200	ND	610
Fluorene	39	ND	ND
Indeno(1,2,3-cd)pyrene	750	ND	ND
2-Methylnaphthalene	ND	ND	1,800
Naphthalene	ND	ND	6,300
Phenanthrene	680	ND	840
Pyrene	2,600	ND	500

See notes at end of table.

Table 4-1 (Continued)
Comparison of Detected Analytes in Soils
at PSC 9 and Sludge at PSC 50

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Analytes	Surface Soil PSC 9	Subsurface Soil PSC 9	Sludge PSC 50
Pesticides and PCBs (µg/kg)			
4,4'-DDD	51	0.71	100
4,4'-DDE	41	ND	760
4,4'-DDT	41	0.58	1,600
Aldrin	ND	0.26	ND
alpha-Chlordane	7.9	ND	87
Aroclor-1254	74	36	ND
Aroclor-1260	ND	ND	5,800
delta-BHC	0.47	ND	2.6
Dieldrin	11	0.94	180
Endosulfan I	1.5	ND	42
Endosulfan sulfate	2.2	1.5	ND
Endrin	1.5	0.67	ND
Endrin aldehyde	1.6	ND	ND
Endrin ketone	7.4	ND	ND
gamma-BHC (Lindane)	ND	0.19	ND
gamma-Chlordane	6.8	ND	2.7
Heptachlor	0.3	0.45	ND
Heptachlor epoxide	0.35	ND	ND
Methoxychlor	ND	ND	14

See notes at end of table.

Table 4-1 (Continued)
Comparison of Detected Analytes in Soils at PSC 9 and Sludge at PSC 50

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Analytes	Surface Soil PSC 9	Subsurface Soil PSC 9	Sludge PSC 50
Inorganic Analytes (mg/kg)			
Aluminum	4,030	4,110	3,090
Antimony	0.76	1.2	18.3
Arsenic	2.6	3.2	1.8
Barium	124	21.9	165
Beryllium	0.33	0.7	0.05
Cadmium	7.1	0.56	67.3
Calcium	35,500	58,000	10,700
Chromium	38.8	366	595
Cobalt	2.4	2.6	1.8
Copper	42.4	9.4	280
Iron	12,900	12,800	10.200
Lead	182	18.3	420
Magnesium	1,350	1,400	67.8
Manganese	73.9	107	1,100
Mercury	1.6	ND	9.1
Nickel	45.8	17.2	329
Potassium	547	814	231
Selenium	1.2	ND	1.5
Silver	6.9	ND	470
Sodium	194	593	ND
Vanadium	14.6	30.5	11.2
Zinc	151	19	940

Notes: Values presented for surface soil and subsurface soil are the maximum detected concentrations. For surface soil, the data set includes all seven surface soil samples, including the two excavated soil areas 09B00101 and 09S00201.

PSC = potential source of contamination.
µg/kg = micrograms per kilogram.
ND = compound or analyte was not detected at the reporting limit.
PCB = polychlorinated biphenyl.
DDD = dichlorodiphenyldichloroethane.
DDE = dichlorodiphenyldichloroethene.
DDT = dichlorodiphenyltrichloroethane.
BHC = benzene hexachloride.
mg/kg = milligrams per kilogram.

5.0 RISK EVALUATION

The purpose of performing risk screening as part of the site-screening evaluation is to assist in determining whether or not the existing risk at PSC 9 (1) supports a no further action decision (with or without the implementation of land-use controls [LUCs]), (2) indicates the need for an interim remedial action, or (3) requires additional investigation to make a decision.

Risk screening involves comparing concentrations of detected inorganic analytes to background screening levels and then comparing the concentrations of those inorganic analytes present above background screening levels and all detected organic analytes to risk-based screening concentrations (RBCs) developed by the USEPA Region III (USEPA, 1998a). USEPA developed RBCs using conservative pathway-specific models. Contaminants present below the RBCs are considered to pose no or only insignificant risk. Analytes detected both above the background screening concentrations and the RBCs are considered chemicals of potential concern (COPCs). If any COPCs are identified, a more detailed risk analysis may be appropriate.

5.1 HUMAN HEALTH RISK SCREENING. Analytes were excluded as COPCs if they met the following criteria:

- the detected concentration of a contaminant did not exceed two times the arithmetic mean (with one-half the reported quantitation limit averaged for non-detections) of background concentrations;
- the detected concentration did not exceed USEPA Region III RBCs (USEPA, 1998); or
- the analyte was an essential nutrient that did not have a Region III RBC but was detected below calculated screening concentrations based on the recommended dietary allowances.

5.1.1 Surface Soil Table 5-1 presents a comparison of the maximum detected analytes in surface soil to Region III RBCs and background levels. As discussed in Section 4.1, the surface soil data set is limited to the remaining five surface soil samples since sampling locations 09B00101 and 09S00201 have been excavated. Stationwide background screening concentrations for NAS Jacksonville were established during the Operable Unit (OU) 1 remedial investigation (RI) (ABB-ES, 1996). This background data set is used for comparison because the one upgradient background soil sample (09SBK101) was only analyzed for mercury.

Only dibenz(a,h)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno-(1,2,3-cd)pyrene exceeded the USEPA Region III RBCs for residential exposure to surface soil. Because all carcinogenic PAHs are essentially formed as part of the same process, benzo(a)anthracene, benzo(k)fluoranthene, and chrysene were also selected as COPCs.

While the carcinogenic PAHs exceeded residential RBCs, only benzo(a)pyrene slightly exceeded its industrial RBCs of 780 µg/kg (Table 5-2). The exceedance of benzo(a)pyrene (860 µg/kg) was found in the location resampled as 09S00102. The earlier sample taken near 09S00102 and identified as 09S00101 contained benzo(a)pyrene at a concentration of 590 µg/kg, below the industrial RBC of 780 µg/kg.

Table 5-1
Comparison of Detected Compounds to Background and Risk Screening Levels in Surface Soil

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detects	Maximum Detected Concentration	Background Screening Level	USEPA Region III Risk-Based Concentration (Residential)	Analyte COPC? (Yes/No)
Volatile Organic Compounds (µg/kg)					
Acetone	2/4	33	NA	7,800,000	No
Semivolatile Organic Compounds (µg/kg)					
Acenaphthylene	1/5	46	NA	ND	No
Benzo(a)anthracene	3/5	600	NA	870	Yes[1]
Benzo(a)pyrene	3/5	860	NA	87	Yes
Benzo(b)fluoranthene	3/5	890	NA	870	Yes
Benzo(g,h,i)perylene	3/5	520	NA	[2]2,300,000	No
Benzo(k)fluoranthene	3/5	780	NA	8,700	Yes[1]
bis(2-Ethylhexyl)phthalate	3/4	130	NA	46,000	No
Chrysene	3/5	590	NA	87,000	Yes[1]
Dibenz(a,h)anthracene	1/5	120	NA	87	Yes
Fluoranthene	3/5	1,100	NA	3,100,000	No
Indeno(1,2,3-cd)pyrene	3/5	940	NA	870	Yes
Phenanthrene	1/5	81	NA	[2]2,300,000	No
Pyrene	3/5	1,300	NA	2,300,000	No
Pesticides and PCBs (µg/kg)					
4,4'-DDD	2/5	51	NA	2,700	No
4,4'-DDE	5/5	41	NA	1,900	No
4,4'-DDT	3/5	41	NA	1,900	No
alpha-Chlordane	3/5	7.9	NA	1,800	No
Aroclor-1254	3/5	74	NA	320	No
delta-BHC	1/5	0.31	NA	[3]100	No
Dieldrin	2/5	5.3	NA	40	No
Endosulfan I	2/5	1.5	NA	470,000	No
Endrin	1/5	1.5	NA	23,000	No
Endrin aldehyde	2/5	1.6	NA	[4]23,000	No
Endrin ketone	1/5	0.39	NA	[4]23,000	No
gamma-Chlordane	4/5	6.8	NA	1,800	No
Heptachlor	1/5	0.3	NA	140	No

See notes at end of table.

Table 5-1 (Continued)
Comparison of Detected Compounds to Background and Risk Screening Levels in Surface Soil

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detects	Maximum Detected Concentration	Background Screening Level	USEPA Region III Risk-Based Concentration (Residential)	Analyte COPC? (Yes/No)
Inorganic Analytes (mg/kg)					
Aluminum	4/4	4,030	1,340	78,000	No
Barium	4/4	14.1	11.2	5,500	No
Beryllium	4/4	0.31	ND	160	No
Cadmium	4/4	0.71	ND	78	No
Calcium	4/4	20,600	2,360	[5]1,000,000	No
Chromium	4/4	9.9	6.6	390	No
Cobalt	4/4	1.3	ND	4,700	No
Copper	4/4	6	5.8	3,100	No
Iron	4/4	6,080	852	23,000	No
Lead	4/4	88.4	24.4	400	No
Magnesium	4/4	1,230	99.8	[5]460,468	No
Manganese	4/4	50	18	1,600	No
Mercury	4/5	0.54	ND	610	No
Nickel	4/4	3.4	11	1,600	No
Potassium	4/4	547	ND	[5]1,000,000	No
Silver	2/4	2	ND	390	No
Vanadium	4/4	10.5	3.8	550	No
Zinc	4/4	24.1	15.2	23,000	No

[1] All carcinogenic polynuclear aromatic hydrocarbons were selected as COPCs because members of the class were selected.
[2] The Region III RBC for pyrene was used to screen those noncarcinogenic COPCs without RBCs.
[3] The RBC for alpha-BHC was used to screen delta-BHC.
[4] The RBC for endrin was used to screen endrin aldehyde and endrin ketone.
[5] The RBCs for essential nutrients are calculated based on recommended daily allowances.

Notes: USEPA = U.S. Environmental Protection Agency.
COPC = chemical of potential concern.
µg/kg = micrograms per kilogram.
NA = not applicable.
PCB = polychlorinated biphenyl.
DDD = dichlorodiphenyldichloroethane.
DDE = dichlorodiphenyldichloroethene.
DDT = dichlorodiphenyltrichloroethane.
BHC = benzene hexachloride.
mg/kg = milligrams per kilogram.
ND = not detected.

Table 5-2
Comparison of Selected Compounds to Industrial Risk Screening Levels in Surface Soil

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Maximum Detected Concentration	USEPA Region III Risk-Based Concentration (Industrial)	Analyte > RBC? (Yes/No)
Semivolatile Organic Compounds (µg/kg)			
Benzo(a)anthracene	600	7,800	No
Benzo(a)pyrene	860	780	Yes
Benzo(b)fluoranthene	890	7,800	No
Benzo(k)fluoranthene	780	78,000	No
Dibenz(a,h)anthracene	120	780	No
Chrysene	590	780,000	No
Indeno(1,2,3-cd)pyrene	940	7,800	No

Notes: USEPA = U.S. Environmental Protection Agency.
RBC = risk-based concentration.
µg/kg = micrograms per kilogram.
mg/kg = milligrams per kilogram.

An industrial exposure scenario would be appropriate for PSC 9 considering its location. The proximity of PSC 9 to the flight line makes it inaccessible to most people. Implementation of LUCs would further prevent exposure to residents who are currently prohibited access to PSC 9.

5.1.2 Subsurface Soil According to FDEP and USEPA guidance, subsurface soil is screened against an industrial exposure scenario even if a residential exposure would be appropriate for surface soil in the same location because it is assumed that residents would not be regularly exposed to subsurface soils (Table 5-3). Stationwide background screening concentrations for NAS Jacksonville were established during the OU 1 RI (ABB-ES, 1996).

No analytes in subsurface soil exceeded RBCs for industrial exposure (Table 5-3).

5.1.3 Surface Water There is no surface water within the area defined as PSC 9. However, a drainage ditch to the south of PSC 9 appears to contain flowing water only during rainfall events and normally has ankle-deep turbid water. Surface water samples were conservatively screened against the residential tap water exposure scenario, which assumes a consumption of two liters of water per day (see Table 5-4). This assumption grossly overestimates a reasonable consumption of surface water at PSC 9. The background screening concentrations were the data set used to support the OU 1 RI (ABB-ES, 1996).

Aldrin, Aroclor-1254, and alpha-BHC, detected in the initial surface water sample (09W00101), were the only compounds that slightly exceeded their respective tap water RBCs. These compounds, however, were not detected in surface water samples taken at locations upgradient and downgradient of 09W00101. There is currently no human exposure to surface water at PSC 9 because of its location. Future

Table 5-3
Comparison of Detected Compounds to Background and Risk Screening Levels in Subsurface Soil

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detects	Maximum Detected	Background Screening Concentration	USEPA Region III Risk-Based Concentration (Industrial)	Analyte COPC? (Yes/No)
Volatile Organic Compounds (µg/kg)					
Acetone	1/3	15	NA	7,800,000	No
Semivolatile Organic Compounds (µg/kg)					
Benzo(a)anthracene	1/3	77	NA	7,800	No
Benzo(a)pyrene	1/3	140	NA	780	No
Benzo(b)fluoranthene	1/3	150	NA	7,800	No
Benzo(k)fluoranthene	1/3	59	NA	78,000	No
Chrysene	1/3	99	NA	780,000	No
Pesticides and PCBs (µg/kg)					
4,4'-DDD	1/3	0.71	NA	24,000	No
4,4'-DDT	1/3	0.58	NA	17,000	No
Aldrin	1/3	0.26	NA	340	No
Aroclor-1254	2/3	36	NA	2,900	No
Dieldrin	1/3	0.94	NA	360	No
Endosulfan sulfate	1/3	1.5	NA	[1]12,000,000	No
Endrin	1/3	0.67	NA	61,000	No
gamma-BHC (Lindane)	1/3	0.19	NA	4,400	No
Heptachlor	2/3	0.45	NA	1,300	No
Inorganic Analytes (mg/kg)					
Aluminum	3/3	4,110	6,823	2,000,000	No
Antimony	1/3	1.2	ND	31	No
Arsenic	3/3	3.2	1.48	3.8	No
Barium	3/3	21.9	20.8	140,000	No
Beryllium	1/3	0.7	0.49	4,100	No
Cadmium	1/3	0.56	ND	78	No
Calcium	3/3	58,000	668	NA	No
Chromium	3/3	366	14.1	10,000	No
Cobalt	3/3	2.6	ND	120,000	No
Copper	3/3	9.4	ND	NA	No
Iron	3/3	12,800	5,818	610,000	No
Lead	3/3	18.3	6.46	1,000	No
Magnesium	3/3	1,400	500	NA	No
Manganese	3/3	107	6.9	41,000	No

See notes at end of table

Table 5-3 (Continued)
Comparison of Detected Compounds to Background and Risk Screening Levels in Subsurface Soil

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detects	Maximum Detected	Background Screening Concentration	USEPA Region III Risk-Based Concentration (Industrial)	Analyte COPC? (Yes/No)
Nickel	3/3	17.2	ND	41,000	No
Potassium	3/3	814	343	NA	No
Sodium	3/3	593	ND	NA	No
Vanadium	3/3	30.5	ND	14,000	No
Zinc	3/3	19	14.5	610,000	No

[1] The risk-based concentration for endosulfan was used to screen endosulfan sulfate.

Notes: USEPA = U.S. Environmental Protection Agency.
COPC = chemical of potential concern.
µg/kg = micrograms per kilogram.
NA = not available.
PCB = polychlorinated biphenyl.
DDD = dichlorodiphenyldichloroethane.
DDT = dichlorodiphenyltrichloroethane.
BHC = benzene hexachloride.
mg/kg = milligrams per kilogram.
ND = not detected.

Table 5-4
Comparison of Detected Compounds to Background and Risk Screening Levels in Surface Water

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detects	Maximum Detected	Background Screening Concentration	USEPA Region III Risk-Based Concentration (Tap Water)	Analyte COPC? (Yes/No)
Semivolatile Organic Compounds (µg/ℓ)					
Di-n-butylphthalate	1/1	2	NA	3,700	No
Pesticides and PCBs (µg/ℓ)					
Aldrin	1/3	.01	NA	.0039	Yes
Aroclor-1254	1/3	1.6	NA	.033	Yes
alpha-BHC	1/3	.0022	NA	0.011	Yes
beta-BHC	1/3	.0061	NA	.037	No
Heptachlor	1/3	.0019	NA	.0023	No
Inorganic Analytes (µg/ℓ)					
Aluminum	1/1	2,820	ND	NA	No
Barium	1/1	19	83	2,600	No
Calcium	1/1	31,700	39,110	NA	No
Chromium	1/1	9.6	ND	180	No
Cobalt	1/1	1.1	ND	2,200	No
Iron	1/1	2,610	2,436	11,000	No
Magnesium	1/1	14,500	6,126	NA	No
Manganese	1/1	54.1	39.6	730	No
Nickel	1/1	2.8	ND	730	No
Potassium	1/1	4,590	1,792	NA	No
Sodium	1/1	85,400	20,870	NA	No
Vanadium	1/1	7.9	5.6	260	No
Zinc	1/1	20	46.4	11,000	No

Notes: The risk-based concentration indicated for chromium is from hexavalent chromium.

USEPA = U.S. Environmental Protection Agency.
COPC = chemical of potential concern.
µg/ℓ = micrograms per liter.
NA = not available.
PCB = polychlorinated biphenyl.
BHC = benzene hexachloride.
ND = not detected.

exposure to surface water at PSC 9 is unlikely unless land use changed to allow for residential use. Therefore, implementation of LUCs further prevents exposure to potential future residents who might use surface water for recreation.

5.1.4 Sediment Results from one sediment sample collected at PSC 9 were conservatively screened against residential RBCs and the stationwide background sediment screening concentrations. The background screening concentrations were the data set used to support the OU 1 RI (ABB-ES, 1996). No analytes in sediment exceeded RBCs for residential exposure (Table 5-5). There is little potential for human exposure to contaminated sediments under the recreational or wading scenario because the area is currently off-limits to human activities.

5.1.5 Radiological Parameters A detailed radiological investigation was performed on surface soil by BEI (BEI, 1998). Those areas containing hot spots (defined as 5 pCi/g above background) were remediated. Based on the BEI report which documented the location of hot spots and their removal, risk from radiation in surface soil at PSC 9 is considered acceptable. In groundwater, the highest detected gross alpha and gross beta readings are within the range of stationwide background detections from the OU 1 RI (ABB-ES, 1996). The maximum gross alpha level at PSC 9 was 7.41 pCi/ℓ, which is below the Federal MCL of 15 pCi/ℓ.

5.1.6 Conclusions Human health risk screening at PSC 9 indicates that contaminants found in soil, sediment, and surface water pose insignificant risks to human health under the industrial exposure scenario, which is appropriate for PSC 9 considering its location. The proximity of PSC 9 to the flight line makes it inaccessible to most people. Implementation of LUCs would further prevent exposure to residents who are currently prohibited access to PSC 9.

5.2 ECOLOGICAL RISK SCREENING. This screening-level evaluation is intended to provide an assessment of potential ecological risks associated with exposure of ecological receptors to surface soil, sediment, and surface water at PSC 9. The evaluation consists of an exposure pathway analysis (Subsection 5.2.1), a summary of the analytical results and section of COPCs (Subsection 5.2.2), an exposure and effects evaluation (Subsection 5.2.3), a risk characterization (Subsection 5.2.4), and conclusions and recommendations (Subsection 5.2.5).

5.2.1 Exposure Pathway Analysis PSC 9 is relatively flat and approximately 2 acres in size. As previously mentioned, PSC 9 is located in proximity to the flight line at NAS Jacksonville. A major portion of the site was subjected to earth-moving operations during BEI's radiological remediation activities. The site is in the process of becoming revegetated with various ruderal annual and perennial herbaceous plants and small shrubs. The northern, eastern, and southern areas are vegetated by dense shrubs. As shown in Figure 1-2, the site is located between two drainage ditches that flow east to the St. Johns River. Off-site migration of site-related surface soil constituents to the southernmost ditch is possible because the topography of PSC 9 gently slopes toward the south. Standing water is usually present in the drainage ditch; however, the presence of surface water during periods of drought is intermittent.

Exposure pathways are identified for the following four groups of ecological receptors: terrestrial wildlife (Paragraph 5.2.1.1), terrestrial plants and soil invertebrates (Paragraph 5.2.1.2), and aquatic receptors (Paragraph 5.2.1.3).

Table 5-5
Comparison of Detected Compounds to Background and Risk Screening Levels in Sediment

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Sample 09D00101	Background Screening Level	USEPA Region III Risk-Based Concentration (Residential)	Analyte COPC? (Yes/No)
Pesticides µg/kg				
Dieldrin	0.83	NA	40	No
Endrin	0.66	NA	23,000	No
Heptachlor	0.46	NA	140	No
Inorganic Analytes (mg/kg)				
Aluminum	6,810	1,190	78,000	No
Barium	19.2	9.8	5,500	No
Beryllium	0.54	0.48	160	No
Cadmium	0.35	0.6	78	No
Calcium	3,780	6,468	[1]1,000,000	No
Chromium	16.6	3.8	390	No
Cobalt	2.2	3.8	4,700	No
Copper	5.5	0.16	3,100	No
Iron	10,300	2,300	23,000	No
Lead	11.9	14.4	400	No
Magnesium	2,090	131	[1]460,468	No
Manganese	58.6	6.8	1,600	No
Nickel	4.6	6.2	1,600	No
Potassium	923	218	[1]1,000,000	No
Vanadium	17.8	5.2	550	No
Zinc	23	18.4	23,000	No

[1] The RBCs for essential nutrients are calculated based on recommended daily allowances.

Notes: USEPA = U.S. Environmental Protection Agency.
COPC = chemical of potential concern.
µg/kg = micrograms per kilogram.
NA = not available.
mg/kg = milligrams per kilogram.

5.2.1.1 **Terrestrial Wildlife** Terrestrial wildlife may be exposed to contaminants in surface soil, surface water, and contaminated food items as a result of ingestion, dermal adsorption, and inhalation of fugitive dust and volatile emissions. Because PSC 9 is located in proximity to the flight line, it is expected that only small mammals and birds would frequent the site.

There are no inhalation concerns at the site because only one VOC (acetone) was detected in the surface soil. Inhalation of fugitive dust is also not likely to be a significant exposure pathway because the vegetation at PSC 9 would limit the release of fugitive dust. Dermal adsorption is considered to be a negligible exposure pathway because the presence of fur, feathers, or chitinous exoskeleton is likely to prevent contamination from coming into direct contact with the skin (personal communication with Ted Simon, USEPA Region IV, September 1997). In addition, soil trapped in the fur or feathers is likely to be ingested during grooming or preening activities, which are evaluated as part of the indirect ingestion exposure pathway.

Although ingestion of surface water by terrestrial wildlife is a potential route of exposure, this pathway is not considered as significant due to the ephemeral nature of the ditch system.

5.2.1.2 **Terrestrial Plants and Invertebrates** Terrestrial plants and soil invertebrates may be exposed to contamination in surface soil by direct contact with and root uptake (for plants) or ingestion of soil (for invertebrates). The ingestion exposure routes include the ingestion of soil and food items containing chemicals accumulated from PSC 9 surface soil.

5.2.1.3 **Aquatic Receptors** Because surface water runoff of site-related surface soil constituents into the southernmost drainage ditch is possible, exposure pathways for aquatic receptors in the drainage ditch include direct contact with surface water and sediment. Off-site migration of site-related surface soil constituents to the southernmost ditch is possible because the topography of PSC 9 gently slopes toward the south. It should be noted that evaluation of this exposure pathway for aquatic receptors is considered as conservative given the ephemeral nature of the ditch system and potential lack of aquatic habitat during periods of drought.

5.2.2 Summary of the Analytical Results and Selection of Contaminants of Potential Concern This section includes a review of the analytical data and selection of COPCs. COPCs represent analytes detected in environmental media (surface soil, surface water, and sediment) that are considered in the screening-level ecological risk evaluation. Calcium, iron, magnesium, potassium, and sodium are excluded as COPCs because they are considered to be essential nutrients and not toxic (National Academy of Sciences, 1977; National Research Council, 1982; 1984). Selection of COPCs in surface soil, surface water, and sediment are discussed separately in Paragraphs 5.2.2.1, 5.2.2.2, and 5.2.2.3, respectively.

5.2.2.1 **Surface Soil** Table 5-6 presents a summary of the analytical data for surface soil including the frequency of detection, range of detected concentrations, average of detected concentrations, the background screening levels, analytical data from site-specific background location 09SBK101, the USEPA Region IV Surface Soil Screening Value (USEPA, 1998b), and the selected COPCs.

Table 5-6
Comparison of Detected Compounds to Background and Ecological Screening Values for Surface Soil

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detects	Range of Detected Concentrations	Average of Detected Concentrations	Background Screening Level[1]	09BK101[2]	USEPA Region IV Surface Soil Screening Value[3]	Analyte COPC? (Yes/No)
Volatile Organic Compounds (µg/kg)							
Acetone	2/4	30 to 33	31.5	NA	NA	NA	Yes
Semivolatile Organic Compounds (µg/kg)							
Acenaphthylene	1/5	46 to 46	46	NA	ND	NA	Yes
Benzo(a)anthracene	3/5	76 to 600	292	NA	ND	NA	Yes
Benzo(a)pyrene	3/5	85 to 860	512	NA	ND	100	Yes
Benzo(b)fluoranthene	3/5	160 to 890	640	NA	ND	NA	Yes
Benzo(g,h,i)perylene	3/5	89 to 520	340	NA	ND	NA	Yes
Benzo(k)fluoranthene	3/5	140 to 780	433	NA	ND	NA	Yes
bis(2-Ethylhexyl)phthalate	3/4	53 to 130	91	NA	ND	NA	Yes
Chrysene	3/5	75 to 590	308	NA	ND	NA	Yes
Di-n-butylphthalate	1/4	180 to 180	180	NA	ND	200	No[4]
Dibenz(a,h)anthracene	1/5	120 to 120	120	NA	ND	NA	Yes
Fluoranthene	3/5	68 to 1,100	449	NA	ND	100	Yes
Indeno(1,2,3-cd)pyrene	3/5	54 to 940	478	NA	ND	NA	Yes
Phenanthrene	1/5	81 to 81	81	NA	ND	100	No[4]
Pyrene	3/5	130 to 1,300	587	NA	ND	100	Yes
Pesticides and PCBs (µg/kg)							
4,4'-DDD	2/5	1.4 to 51	26.2	NA	1.2	2.5	Yes
4,4'-DDE	5/5	0.71 to 41	11.2	NA	3.7	2.5	Yes
4,4'-DDT	3/5	7.7 to 41	19.6	NA	1.5	2.5	Yes
alpha-Chlordane	3/5	2 to 7.9	5	NA	ND	100	No[4]
Aroclor-1254	3/5	16 to 74	38.7	NA	ND	20	Yes

See notes at end of table.

Table 5-6 (Continued)
Comparison of Detected Compounds to Background and Ecological Screening Values for Surface Soil

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detects	Range of Detected Concentrations	Average of Detected Concentrations	Background Screening Level[1]	09BK101[2]	USEPA Region IV Surface Soil Screening Value[3]	Analyte COPC? (Yes/No)
Pesticides and PCBs (µg/kg) (Continued)							
delta-BHC	1/5	0.31 to 0.31	0.31	NA	ND	100	No[4]
Dieldrin	2/5	2.7 to 5.3	4	NA	0.37	0.5	Yes
Endosulfan I	2/5	1.1 to 1.5	1.3	NA	4.7	100	No[4]
Endrin	1/5	1.5 to 1.5	1.5	NA	ND	1.0	Yes
Endrin aldehyde	2/5	0.4 -1.6	1.0	NA	ND	100	No[4]
Endrin ketone	1/5	0.39 to 0.39	0.39	NA	ND	100	No[4]
gamma-Chlordane	4/5	0.72 to 6.8	3.8	NA	2.4	100	No[4]
Heptachlor	1/5	0.3 to 0.3	0.3	NA	0.27	100	No[4]
Inorganic Analytes (mg/kg)							
Aluminum	4/4	1,660 to 4,030	2,430	1,340	NA	50	Yes
Barium	4/4	11.4 to 14.1	12.3	11.2	NA	165	No[4]
Beryllium	4/4	0.08 to 0.31	0.17	ND	NA	1.1	No[4]
Cadmium	4/4	0.21 to 0.71	0.38	ND	NA	1.6	No[4]
Calcium	4/4	2,250 to 20,600	13,063	2,360	NA	NA	No[5]
Chromium	4/4	5.9 to 9.9	7.9	6.6	NA	0.4	Yes
Cobalt	4/4	0.46 to 1.3	1.79	ND	NA	20	No[4]
Copper	4/4	3.3 to 6	4.5	5.8	NA	40	No[4]
Iron	4/4	1,580 to 6,080	3,283	852	NA	200	No[5]
Lead	4/4	7.1 to 88.4	35.9	24.4	NA	50	Yes
Magnesium	4/4	281 to 1,230	718	99.8	NA	NA	No[5]
Manganese	4/4	29.7 to 50	37.2	18	NA	100	No[4]

See notes at end of table.

Table 5-6 (Continued)
Comparison of Detected Compounds to Background and Ecological Screening Values for Surface Soil

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detects	Range of Detected Concentrations	Average of Detected Concentrations	Background Screening Level[1]	09BK101[2]	USEPA Region IV Surface Soil Screening Value[3]	Analyte COPC? (Yes/No)
Inorganic Analytes (mg/kg) (Continued)							
Mercury	4/5	0.07 to 0.54	0.24	ND	ND	0.1	Yes
Nickel	4/4	2 to 3.4	2.6	11	NA	30	No[4]
Potassium	4/4	102 to 547	268	ND	NA	NA	No[5]
Silver	2/4	0.68 to 2	1.3	ND	NA	2.0	Yes
Vanadium	4/4	3.9 to 10.5	6.3	3.8	NA	2.0	Yes
Zinc	4/4	14.3 to 24.1	17.8	15.2	NA	50	No[4]

[1] The background screening levels are taken from the NAS Jacksonville Remedial Investigation and Feasibility Study for Operable Unit 1.
[2] Analytical data collected from location 09BK101, which is located upgradient of Potential Source of Contamination 9.
[3] USEPA Region IV Surface Soil Screening Values (USEPA, 1998).
[4] The maximum detected concentration is less than the USEPA Region IV Surface Soil Screening Value.
[5] The analyte is an essential nutrient and is not considered toxic.

Notes: USEPA = U.S. Environmental Protection Agency.
COPC = chemical of potential concern.
µg/kg = micrograms per kilogram.
NA = not analyzed.
ND = not detected.
PCB = polychlorinated biphenyl.
DDD = dichlorodiphenyldichloroethane.
DDE = dichlorodiphenyldichloroethene.
DDT = dichlorodiphenyltrichloroethane.
BHC = benzene hexachloride.
mg/kg = milligrams per kilogram.

The background screening values are taken from the OU 1 remedial investigation (ABB-ES, 1996). Those analytes selected as COPCs include constituents in which the maximum detected surface soil concentration exceeds its respective USEPA Region IV Surface Soil Screening Value (USEPA, 1998).

Surface soil constituents selected as COPCs include 1 VOC (acetone), 12 SVOCs, 5 pesticides and 1 PCB, and 6 inorganic analytes.

5.2.2.2 **Surface Water** Analytical results for the three surface water samples were compared to the USEPA Region IV Freshwater Screening Values (USEPA, 1998) in Table 5-7. Stationwide background screening values are taken from the OU 1 remedial investigation (ABB-ES, 1996). Those analytes selected as COPCs include constituents in which the maximum detected surface water concentration exceeds its respective USEPA Region IV Surface Water Screening Value. (USEPA, 1998).

Surface water constituents selected as COPCs include one PCB (Aroclor-1254) and five inorganic constituents (aluminum, cobalt, iron, manganese, and vanadium).

5.2.2.3 **Sediment** Analytical results for the one sediment sample collected from the southernmost drainage ditch were compared to the USEPA Region IV Sediment Screening Values (USEPA, 1998) in Table 5-8. Stationwide background screening values are taken from the OU 1 remedial investigation (ABB-ES, 1996). Those analytes selected as COPCs include constituents in which the maximum detected surface water concentration exceeds its respective USEPA Region IV Sediment Screening Value (USEPA, 1998).

Sediment constituents selected as COPCs include one pesticide (heptachlor) and five inorganic constituents (aluminum, barium, beryllium, manganese, and vanadium).

5.2.3 Ecological Exposure and Effects Evaluation The ecological exposure and effects evaluations are discussed separately in Paragraphs 5.2.3.1 and 5.2.3.2, respectively.

5.2.3.1 **Ecological Exposure Assessment** The following sections briefly describe how contaminant exposures are estimated or measured for wildlife, terrestrial plants, and invertebrates at PSC 9 and aquatic receptors in the drainage ditch south of PSC 9.

Terrestrial Wildlife. Exposure routes for wildlife receptors include direct and indirect ingestion of soil and ingestion of food containing site-related chemicals. The actual amount of a COPC taken by a wildlife species (i.e., ingestion dose in mg/kg/day) depends on a number of factors that can be obtained from the literature to estimate a potential dietary exposure (PDE). In calculating the PDE, wildlife species considered representative of the trophic guilds at the site are identified, quantitative exposure parameters are developed, and bioaccumulation through the food chain is considered.

Wildlife species from different trophic guilds that may be present at the site were selected for the PDE model. The model uses species-specific feeding and habitat characteristics to estimate chemical exposures to wildlife species relative to their position in the food chain. As previously discussed, PSC 9 is located in proximity to the flightline; therefore it is expected that only

Table 5-7
Comparison of Detected Compounds in Surface Water to Background and Florida Surface Water Standards

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detects	Maximum Detected Concentration	Background Screening Concentration[1]	USEPA Region IV Freshwater Screening Values[2]	Analyte COPC? (Yes/No)
Semivolatile Organic Compounds (µg/ℓ)					
Di-n-butylphthalate	1/1	2	NA	9.4	No[3]
Pesticides and PCBs (µg/ℓ)					
Aldrin	1/3	.01	NA	0.3	No[3]
Aroclor-1254	1/3	1.6	NA	0.014	Yes
alpha-BHC	1/3	.0022	NA	500	No[3]
beta-BHC	1/3	.0061	NA	5,000	No[3]
Heptachlor	1/3	.0019	NA	0.0038	No[3]
Inorganic Analytes (µg/ℓ)					
Aluminum	1/1	2,820	ND	87	Yes
Barium	1/1	19	83	NA	No[4]
Calcium	1/1	31,700	39,110	NA	No[5]
Chromium	1/1	9.6	ND	117	No[3]
Cobalt	1/1	1.1	ND	NA	Yes
Iron	1/1	2,610	2,436	1,000	Yes
Magnesium	1/1	14,500	6,126	NA	No[5]
Manganese	1/1	54.1	39.6	NA	Yes
Nickel	1/1	2.8	ND	88	No[3]
Potassium	1/1	4,590	1,792	NA	No[5]
Sodium	1/1	85,400	20,870	NA	No[5]
Vanadium	1/1	7.9	5.6	NA	Yes
Zinc	1/1	20	46.4	59	No[3]

[1] The background screening concentrations are taken from the NAS Jacksonville Remedial Investigation and Feasibility Study for Operable Unit 1.
[2] USEPA Region IV Freshwater Screening Value (USEPA, 1998).
[3] The maximum detected concentration is less than the USEPA Region IV Freshwater Screening Value.
[4] The maximum detected concentration is less than the background screening concentration.
[5] The analyte is an essential nutrient and is not considered toxic.

Notes: USEPA = U.S. Environmental Protection Agency.
COPC = chemical of potential concern.
µg/ℓ = micrograms per liter.
NA = not available.
PCB = polychlorinated biphenyl.
BHC = benzene hexachloride.
ND = not detected.

Table 5-8
Comparison of Detected Compounds to Background and Sediment Screening Values

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Sample 09D00101	Background Screening Level[1]	USEPA Region IV Sediment Screening Values[2]	Analyte COPC? (Yes/No)
Pesticides (µg/kg)				
Dieldrin	0.83	NA	3.3	No[3]
Endrin	0.66	NA	3.3	No[3]
Heptachlor	0.46	NA	NA	Yes
Inorganic Analytes (mg/kg)				
Aluminum	6,810	1,190	NA	Yes
Barium	19.2	9.8	NA	Yes
Beryllium	0.54	0.48	NA	Yes
Cadmium	0.35	0.6	1	No[3]
Calcium	3,780	6,468	NA	No[4]
Chromium	16.6	3.8	52.3	No[3]
Cobalt	2.2	3.8	NA	No[5]
Copper	5.5	0.16	18.7	No[3]
Iron	10,300	2,300	NA	No[4]
Lead	11.9	14.4	30.2	No[3]
Magnesium	2,090	131	NA	No[4]
Manganese	58.6	6.8	NA	Yes
Nickel	4.6	6.2	42.8	No[3]
Potassium	923	218	NA	No[4]
Vanadium	17.8	5.2	NA	Yes
Zinc	23	18.4	124	No[3]

[1] The background screening levels are taken from the NAS Jacksonville Remedial Investigation and Feasibility Study for Operable Unit 1.
[2] USEPA Region IV Sediment Screening Values (USEPA, 1998).
[3] The maximum detected concentration is less than the USEPA Region IV Sediment Screening Value.
[4] The analyte is an essential nutrient and is not considered toxic.
[5] The maximum detected concentration is less than the background screening level.

Notes: USEPA = U.S. Environmental Protection Agency.
COPC = chemical of potential concern.
µg/kg = micrograms per kilogram.
NA = not available.
mg/kg = milligrams per kilogram.

small mammals and birds would occur at the site. The representative wildlife species considered in the ecological risk assessment are discussed below:

- **Cotton mouse** (*Peromyscus gossypinus*). The cotton mouse represents a small mammalian herbivore that could potentially be exposed to contamination in soil and plant tissue (accumulated from the soil). The cotton mouse home range is estimated at 0.147 acres; therefore, this species could reside entirely on the site. The cotton mouse represents the small mammal herbivore community at PSC 9.

- **Short-tailed shrew** (*Blarina brevicauda*). The short-tailed shrew finds suitable habitat in forests, fields, marshes, and brush. It primarily feeds on earthworms, snails, centipedes, insects, small vertebrates, and slugs (DeGraaf and Rudis, 1986). Insectivorous species may receive relatively high chemical doses of bioaccumulating compounds as a result of their voracious appetites. The shrew represents small omnivorous mammals that may be found in the old field present at PSC 9.

- **Mourning dove** (*Zenaida macroura*). The mourning dove forages by ground-gleaning in roadsides and open fields with scattered shrubs and trees. It feeds almost entirely on seeds; however, it is also known to eat occasional insects, snails, and gravel to facilitate seed digestion (Terres, 1991). The mourning dove will nest in a variety of man-made or natural structures, and its estimated home range is 5 acres. The dove represents herbivorous avian receptors at PSC 9.

- **American woodcock** (*Scolopax minor*). The woodcock is a vermivorous (feeding primarily on earthworms) bird that inhabits areas of fertile, moist soil where earthworms are plentiful. These areas include open pastures, cultivated fields, and stream banks (DeGraaf and Rudis, 1986). The woodcock represents avian receptors found in the open field community of PSC 9.

Parameters for quantitatively evaluating exposures to wildlife include body weight, food ingestion rate, home range, and relative consumption of food items. Exposure assumptions for each of the representative wildlife species for PSC 9 are provided in Table 5-9. In addition to these parameters, the species foraging habits and bioaccumulation in food items are also considered.

The Site Foraging Frequency (SFF) is an adjustment term that accounts for the frequency a receptor feeds within the site area. The SFF is based on both the acreage of the site relative to the receptor's home range and the fraction of the year the receptor would be exposed to site-related chemicals (i.e., the exposure duration). By definition the SFF cannot exceed 1. The area of PSC 9 (approximately 2 acres) is larger than the home range for the cotton mouse and the short-tailed shrew and smaller than the home range for the mourning dove and the woodcock. Because all representative wildlife species are expected to actively forage at the site year round, it is assumed that the exposure duration for these receptors is 1.

Wildlife species may be exposed to COPCs in surface soil via incidental ingestion of soil or by ingesting prey items that have bioaccumulated these COPCs. To estimate this exposure, a PDE is estimated for all representative wildlife species for each COPC according to the equations in Table 5-10.

Table 5-9
Exposure Parameters for Representative Wildlife Species

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Representative Wildlife Species	Body Weight (kg)	Reported Diet	Assumed Diet for Exposure Assessment (% of diet)	Food Ingestion Rate (kg/day)	Water Intake Rate (ℓ/day)	Home Range (acres)
Short-tailed shrew (*Blarina brevicauda*)	0.017 [a]	Earthworms, slugs, snails, fungi, insects, and vegetation [b]	78% Invertebrates 12% Plants 10% Soil [c]	0.0024 [d]	0.0025 [e]	0.96 ± 0.09 [b]
Cotton Mouse [f] (*Peromyscus gossypinus*)	0.040 [g]	Seeds and some insects [b]	88% Plants 10% Invertebrates 2% Soils [h]	0.0049 [d]	0.0055 [e]	0.147 [i]
Mourning Dove (*Zenaida macroura*)	0.13 [j]	Seeds, some insects, weed seeds, waste grain of agriculture, occasionally takes small snails [k]	94% Plants 1% Invertebrates 5% Soil [c]	0.015 [l]	0.015 [m]	5 [k]
American woodcock (*Scolopax minor*)	0.197 [n]	Primarily earthworms and insects with some plants [b]	80% Invertebrates 10% Plants 10% Soil [h]	0.02 [l]	0.020 [m]	80.1 ± 68.2 [b]

References:
[a] Mean of means reported for male and female shrews in summer and fall (USEPA, 1993).
[b] Wildlife Exposure Factors Handbook (USEPA, 1993).
[c] Estimated soil ingestion.
[d] Calculated using the mammal equation based on body weight (Wt.) in kg. Food ingestion (kg/day) = $0.0687 \times Wt^{0.822}$ (kg) (USEPA, 1993).
[e] Calculated using the mammal equation based on body weight (Wt.) in kg. Water ingestion (ℓ/day) = $0.099 \times Wt^{0.90}$ (kg) (USEPA, 1993).
[f] Values for the deer mouse are used for the cotton mouse when not available (USEPA, 1993).
[g] Average of values for cotton mice in the southeastern U.S. (USEPA, 1993).
[h] The value for the cotton mouse was estimated from the white-footed mouse (USEPA 1993).
[i] Average for male and female deer mice, Virginia/mixed deciduous forest (USEPA, 1993).
[j] Terres (1980).
[k] DeGraaf & Rudis (1986).
[l] Calculated using the bird equation based on body weight (Wt.) in kg. Food ingestion (kg/day) = $0.0582 \times Wt^{0.651}$ (kg) (USEPA, 1993a).
[m] Calculated using the bird equation based on body weight (Wt.) in kg. Water ingestion (ℓ/day) = $0.059 \times Wt^{0.67}$ (kg) (USEPA, 1993a).
[n] Median of mean weights reported for adult male and female American woodcocks (USEPA, 1993a).

Notes: kg = kilograms.
% = percent.
kg/day = kilograms per day.
ℓ/day = liters per day
± = plus or minus.

Table 5-10
Estimation of Potential Chemical Exposures for Representative Wildlife Species

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Estimation of Chemical Exposures Related to Surface Soil

Scope: Estimates the amount (dose) of a chemical ingested and accumulated by a species via incidental ingestion of surface soil and food items containing site related chemicals.

Soil Chemical Concentration: The maximum detected concentration of the chemicals of potential concern.

Soil Exposure Concentration:

$$\underset{(mg/kg)}{Soil\ Exposure} = \left(\underset{as\ Soil}{\%\ of\ Diet} \times \underset{(mg/kg)}{Soil\ Concentration} \right)$$

Primary Prey Item Concentration (T_N)

$$\underset{(mg/kg)}{Primary\ Prey\ Item\ Concentration} = \left(BAF_{inv\ or\ plant} \times \underset{(mg/kg)}{Soil\ Concentration} \right)$$

Secondary Prey Item Concentration (T_N):

$$\underset{(mg/kg)}{Secondary\ Prey\ Item\ Concentration} = \left(BAF_{mam\ or\ bird} \times \underset{(mg/kg)}{Tissue\ Concentration\ of\ Primary\ Prey\ Items^{*}} \right)$$

where: BAF = Bioaccumulation Factor or mg/kg fresh weight tissue over mg/kg dry weight soil for invertebrates and plants, and mg/kg fresh weight tissue over mg/kg fresh weight food for small mammals and small birds.

* For a discussion of the weighted chemical concentration in prey items, see explanation of the PDE term below.

Total Exposure Related to Surface Soil:

$$\underset{(mg/kgBW\text{-}day)}{PDE} = \frac{[P_1 \times T_1 + \ldots + P_N \times T_N + \underset{exposure}{soil}] \times IR_{Diet} \times SFF \times ED}{BW}$$

where:
- PDE = potential dietary exposure (mg/kgBW-day),
- P_N = percent of diet composed of food item N,
- T_N = tissue concentration in food item N (mg/kg),
- IR_{Diet} = food ingestion rate of receptor (kg of food or dietary item per day),
- BW = body weight (kg) of receptor,
- SFF = site foraging frequency (site area [acres] divided by home range [acres]), assumed to be equal to 1 for lethal exposure scenario, and
- ED = exposure duration (fraction of year species is expected to occur onsite)

Notes: % = percent.
mg/kg = milligrams per kilogram.
mg/kg BW-day = milligrams per kilograms of body weight per day.
inv = invertebrate.
mam = mammal species.

Bioaccumulation factors (BAFs) are used in the wildlife exposure model to estimate the transfer of chemicals between soil and plants or soil invertebrates, and between these organisms and primary consumer species. To estimate the PDE, tissue concentrations of COPCs in prey items are estimated using BAFs for surface soil. BAFs for most receptors are extrapolated from literature values or estimated using regression equations from scientific literature.

BAFs for invertebrate and plant food items are defined as the ratio of the COPC concentration in plant or invertebrate tissue (mg chemical/kg tissue wet-weight) to the COPC concentration in surface soil (mg chemical/kg dry-weight soil). BAFs reported in the scientific literature for avian and mammalian receptors are the reported ratios of COPC concentrations in the tissues of these receptors (mg chemical/kg tissue wet-weight) to the concentrations of COPCs in their food items (mg chemical/kg tissue wet-weight). BAFs for each of the surface soil COPCs evaluated at PSC 9 are included in Table G-1 of Appendix G.

Terrestrial Plants and Invertebrates. Terrestrial plants and invertebrates may be exposed to COPCs via direct contact with and root uptake (for plants) or ingestion of COPCs (for invertebrates) measured in PSC 9 surface soil. For the purposes of the screening-level ERA for PSC 9, exposures to terrestrial plants are assumed to occur within the top one foot interval of surface soil.

Aquatic Receptors. Aquatic organisms may be exposed to COPCs in the surface water and sediment of the drainage ditch; therefore, aquatic organism exposures to COPCs in the surface water and sediment of the drainage ditch are evaluated in the screening-level ERA. As previously discussed, evaluation of this exposure pathway is considered conservative due to the intermittent nature of the ditch system. During periods of drought, it is likely that the ditch is dry and unable to provide adequate habitat for aquatic receptors.

5.2.3.2 **Ecological Effects Evaluation** The methods used for identifying and characterizing ecological effects for COPCs in surface soil, surface water, and sediment are discussed separately below.

Surface Soil. Ecological effects are evaluated for three groups of ecological receptors that may be potentially exposed to the surface soil at PSC 9. These receptors include terrestrial wildlife, terrestrial plants, and soil invertebrates.

Terrestrial Wildlife. The assessment endpoint selected for terrestrial wildlife is the survival and maintenance of small mammal and bird wildlife populations present within the area of PSC 9. Because no long-term wildlife population data are available at NAS Jacksonville, a direct measurement of this assessment endpoint is not possible. The literature-derived results of laboratory toxicity studies that relate the dose of a chemical in an oral exposure with an adverse response to growth, reproduction, or survival of a test population (avian or mammalian species) are used as a measure of the assessment endpoint. Wildlife ingestion toxicity data are presented in Appendix G, Table G-2.

Reference toxicity values (RTVs) are derived for each COPC and representative wildlife species according to the data hierarchy presented in *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments*, Interim Final (USEPA, 1997). The RTV represents the highest exposure level (e.g., concentration in the diet) not shown or estimated

to produce adverse effects (e.g., reduced growth, impaired reproduction, increased mortality). For each COPC, two RTVs representing lethal and sublethal effects are selected for each representative wildlife species. Lethal effects are those that result in mortality while sublethal effects include those that impair or prevent reproduction or growth. The RTVs are assumed to be a measure of the assessment endpoints for the protection of the survival, growth, and reproduction of terrestrial wildlife populations. Lethal RTVs are developed using the following data hierarchy discussed in items 1, 2, and 3, while sublethal RTVs are derived using the methodology discussed in items 1 and 2:

1) For contaminants with well-documented adverse effects, the highest reported exposure level not resulting in significant adverse effects (i.e., a no observed adverse effect level [NOAEL]) was selected as the RTV.

2) Generally, one-tenth of the lowest observed adverse effect level (LOAEL) was selected as the RTV for analytes lacking NOAEL values. However, application of the 10-fold uncertainty factor was based on consideration of the exposure duration and the type of toxicity test. Deviations from application of the 10-fold uncertainty factor are footnoted in Table G-2 of Appendix G.

3) The lowest reported oral LD_{50} (oral dose [in mg/kg body weight-day] lethal to 50 percent of a test population) was used to derive the lethal RTV if NOAEL or LOAEL values (based on lethal effects) were not available. The lethal RTV is one-fifth of the lowest reported LD_{50} value for the species most closely related to the representative wildlife receptor. One-fifth of an oral LD_{50} value is considered to be protective against lethal effects for 99.9 percent of individuals in a test population (USEPA, 1986).

A summary of lethal and sublethal RTVs selected from the ingestion toxicity data is provided in Table G-3 of Appendix G.

Terrestrial Plants and Invertebrates. The assessment endpoints selected for terrestrial plants and soil invertebrates are survival of invertebrates and growth of terrestrial plants at PSC 9. One surface soil sample at the approximate location of 09S00101 and one background surface soil sample at an upgradient location were collected and submitted for toxicity testing. Toxicity tests were performed using the earthworm (*Eisenia fostida*) 14 and 30-day survival test, and the 120-hour lettuce seed (*Sativa latuca*) germination test. The results of the toxicity tests are summarized in Table 5-11; the full laboratory report is presented in Appendix E.

As shown in Table 5-11, survival of earthworms in the site-related sample, 09S00102 was not significantly different from the laboratory control; therefore, no adverse impacts are expected for terrestrial invertebrates.

Lettuce seed germination rates for both the site-related sample 09S00102 (50 percent) and the site background sample 09SBK101 (11 percent) were significantly different from the laboratory control sample (91 percent). It should be noted, however, that the results reported in Table 5-11 are from a retest of the experiment. The test was rerun because the percent germination in the laboratory control did not meet the acceptability criteria. The initial toxicity tests

Table 5-11
Summary of Surface Soil Toxicity Testing Results

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Sample Location	Earthworm Toxicity Test		Lettuce Seed Mean Germination (percent)
	Mean Survival on Day 14 (percent)	Mean Survival on Day 30 (percent)	
Laboratory Control	100	98	91
09S00102	100	98	50*
09SBK101 (Site Background)	98	95	11*

Note: * = Statistically significant differences from the laboratory control soil (p=0.05).

resulted in germination rates of 82 and 55 percent for samples 09S00102 and 09SBK101, respectively, while the laboratory control had only 22 percent germination. It is unclear why the site-related soils supported higher germination rates in the first round of testing as compared to the repeated tests or why the laboratory control did poorly in the initial testing. The same packet of seeds was used for both the initial and repeated toxicity tests. Germination in the site background sample 09SBK101 was consistently low for both testing events. Soil pH values for 09S00102 and 09SBK101 were reported at 8.0 and 5.8 units, respectively; therefore, differences in pH could partially account for the differences in germination rates. Vegetation at both the site-related and background locations appears to be growing normally with no evidence of stressed growth patterns. The background sample was collected near the edge of a maintained grassy field from soil that is geologically similar to that collected at PSC 9.

Aquatic Receptors. Literature values that relate the concentration of a contaminant with an effect level (derived from data for adverse growth, reproduction, or survival effects of a test population) were used to measure adverse effects to aquatic receptors. Aquatic organism effects from exposure to surface water and sediment of the drainage ditch were evaluated as described below.

Surface water RTVs selected for comparison to surface water exposure concentrations include the State of Florida Class III Freshwater Quality Standards (Florida Legislature, 1996), and Federal Chronic Ambient Water Quality Criteria (AWQC) (USEPA, 1991).

Sediment benchmarks selected for comparison to detected sediment concentrations include the State of Florida SQAGs Threshold Effects Limit (TEL) and Probable Effect Limit (PEL) values (MacDonald, 1994).

5.2.4 **Risk Characterization** This subsection discusses how risks are characterized for ecological receptors exposed to contamination in surface soil, surface water, and sediment. A comparison of exposure information with the appropriate concentration-response toxicity data is the basis for the risk characterization.

5.2.4.1 **Surface Soil** Potential risks associated with exposure to COPCs in surface soil at PSC 9 are discussed separately for wildlife, terrestrial plants, and soil invertebrates. Risks to wildlife are characterized by comparing PDE

concentrations (based on maximum exposure concentrations) for each surface soil COPC with its respective RTV (estimated threshold dose for toxicity). Risks for terrestrial plants and soil invertebrates are evaluated based on the surface soil toxicity testing results.

Terrestrial Wildlife. Risks for the representative wildlife species associated with ingestion and bioaccumulation of COPCs in surface soil and prey items are quantitatively evaluated using Hazard Quotients (HQs). HQs are calculated for each COPC by dividing the PDE concentration by the selected lethal and sublethal RTV. Hazard Indices (HIs) are determined for each receptor by summing the HQs for all COPCs. When the estimated PDE is less than the RTV (i.e., the HQ less than 1), it is assumed that chemical exposures are not associated with adverse effects to receptors and risks to wildlife populations are unlikely to be significant. For instance, if the PDE calculated using the maximum detected concentration is less than the lethal RTV, then it is assumed that adverse effects to the survival of wildlife populations (e.g., reduction in population size) are unlikely to occur. Similarly, if the maximum PDE is less than the sublethal RTV, then it is assumed that adverse effects to wildlife populations related to growth and reproduction are unlikely to occur. When an HI is greater than 1, a discussion of the ecological significance of the HQs comprising the HI is completed and risks from exposure to the average concentration of COPCs are evaluated.

This hazard ranking scheme evaluates potential ecological effects to individual organisms and does not evaluate potential population-wide effects. Contaminants may cause population reductions by affecting birth and mortality rates, immigration, and emigration (USEPA, 1989). In many circumstances, lethal or sublethal effects may occur to individual organisms with little population- or community-level impacts; however, as the number of individual organisms experiencing toxic effects increases, the probability that population effects will occur also increases. The number of affected individuals in a population presumably increases with increasing HQ or HI values; therefore, the likelihood of population-level effects occurring is generally expected to increase with higher HQ or HI values.

HQs and HIs based on lethal and sublethal RTVs are calculated for each COPC and each representative wildlife species. Tables G-4 through G-9 of Appendix G present the HQ and HI calculations for PSC 9. A summary of risks to representative wildlife receptors is provided in Table 5-12.

Summary HIs for representative wildlife species exposed to maximum detected concentrations of COPCs for lethal effects are less than 1; therefore risks are not predicted for these receptors (i.e., bioaccumulating chemicals are not sufficiently high to reduce survivability in small mammal and bird wildlife populations at PSC 9).

The sublethal HIs for the short-tailed shrew exceed 1 based on the maximum (HI = 12) and average (HI = 6.6) exposure concentrations. Aluminum is the primary risk driver. Aluminum was detected in all four surface soil samples at concentrations ranging from 1,660 to 4,030 mg/kg. The distribution of aluminum in the soil at PSC 9 indicates that a localized area of elevated concentrations may be present. Aluminum was detected at a maximum concentration of 4,030 mg/kg at sample location 09S00101 as compared to detected concentrations ranging from

Table 5-12
Summary of HIs for Terrestrial Wildlife at PSC 9[1]

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Ecological Receptor	Lethal Effects HIs (maximum exposure)	Sublethal Effects HIs (maximum exposure)	Sublethal Effects HIs (average exposure)	Primary Risk Contributors
Cotton mouse	0.003	1.3	0.76	aluminum
Short-tailed shrew	0.23	12	6.6	aluminum
Mourning dove	0.0075	0.95	0.43	NA
American woodcock	0.0004	0.027	0.013	NA

[1] The information is a summary of the HIs presented in Tables G-4 through G-9 of Appendix G.

Notes: HI = hazard index.
NA = not applicable.

1,660 to 2,480 mg/kg at the other three sampling locations. As previously discussed in Section 1.2, the surface soil at PSC 9 originates from dredged spoils or sediment from the St. Johns River. Sediment from coastal areas in Florida contains an abundance of naturally-occurring aluminum, due to the presence of aluminosilicate clay minerals in the earth's crust (Schropp, 1988). Therefore, the presence of aluminum in the surface soil of PSC 9 may be the result of naturally-occurring aluminum that is present in the sediment of the St. Johns River. Aluminum was detected at concentrations ranging from 407 to 14,100 mg/kg in sediment samples collected from the St. Johns River east of OU 3 (HLA, 1998). Given the high concentrations of naturally-occurring aluminum in the sediment of the St. Johns River, it is likely that concentrations detected in the PSC 9 surface soil are not site-related.

The sublethal HI for the cotton mouse slightly exceeds one (HI = 1.3) based on exposure to maximum detected concentrations; however, the HI value is less than one based on exposure to the average concentration of COPCs in the surface soil. Because the maximum exposure HI value for the cotton mouse only slightly exceeds 1, population-level sublethal impacts to the mouse and other herbivorous small mammals are expected to be unlikely. Sublethal risks are also not predicted for small birds because the HI values for the mourning dove and woodcock are well below 1, based on maximum exposure concentrations.

In summary, exposure of small insectivorous mammals to aluminum in the surface soil at PSC 9 may cause a reduction in the growth and reproduction of these receptors. It is likely, however, that the presence of aluminum in the surface soil at PSC 9 is not site-related, but related to naturally-occurring aluminum present in dredged spoils that have been transferred to the site.

Terrestrial Plants and Soil Invertebrates. Based on the results of the soil toxicity testing, risks are not predicted for soil invertebrates exposed to the surface soil at PSC 9.

The results of the lettuce seed germination toxicity test show that germination rates for both the site-related sample 09S00102 (50 percent) and the background

sample 09SBK101 (11 percent) were significantly different from the laboratory control sample (91 percent). As previously discussed in Paragraph 5.2.3.2, this test was rerun because the laboratory control sample in the initial toxicity test did not meet the acceptability criteria. In the initial test, germination rates in samples 09S00102 and 09SBK101 were 82 and 55 percent, respectively, while the laboratory control had only 22 percent germination. It is unclear why the site-related sample supported higher germination rates in the first round of testing as compared to the second round or why the laboratory control did poorly in the initial testing. The results of the lettuce seed germination toxicity tests are inconclusive due to the variability in test results for the site-related and laboratory control samples. However, vegetation at PSC 9 appears to be growing normally with no evidence of stressed growth patterns. Given the lack of stressed vegetation at PSC 9, risks are not predicted for terrestrial plants exposed to the surface soil at PSC 9.

5.2.4.2 **Surface Water** Risks for aquatic receptors from exposure to surface water in the drainage ditch south of PSC 9 were characterized based on a comparison of concentrations of surface water COPCs with aquatic toxicity benchmarks including chronic Federal freshwater AWQC (USEPA, 1991) and the State of Florida Class III Fresh Surface Water Quality Standards (Florida Legislature, 1996). The comparison of detected concentrations of COPCs to aquatic toxicity benchmark values at the three surface water sampling locations 09W00101, 09W00201, and 09W00301 is provided in Table 5-13.

Aquatic toxicity benchmarks are unavailable for several of the surface water COPCs at PSC 9 including aluminum, cobalt, manganese, and vanadium. Aroclor-1254 and iron were detected above their respective aquatic toxicity benchmark values. The Aroclor-1254 detection at location 09W00101 of 1.6 $\mu g/\ell$, however, was not confirmed by surface water samples taken at the upgradient and downgradient locations. Due to its low solubility in water, it is likely that the detection was related to suspended particulates present in the shallow turbid surface water of the ditch system at PSC 9. The iron detection is only slightly higher than the stationwide background screening concentration and may also be related to suspended particulates in surface water. Given the ephemeral nature of the ditch system and the distribution of COPCs in the surface water, risks for aquatic receptors are not predicted.

5.2.4.3 **Sediment** Risks for aquatic receptors exposed to COPCs in the sediment of the drainage ditch were characterized based on comparison of concentrations of COPCs in sediment relative to FDEP coastal sediment assessment PEL and TEL values (MacDonald, 1994). FDEP PEL and TEL values are not available for any of the sediment COCPs, which include heptachlor, aluminum, barium, beryllium, manganese, and vanadium. Given the lack of aquatic toxicity information for these constituents, it is not possible to evaluate risks associated with exposure to these constituents in the sediment. However, as previously stated, the ditch system south of PSC 9 is intermittent, unable to provide adequate habitat for aquatic receptors during periods of drought. Therefore, the presence of aquatic receptors in the ditch system is questionable and potential impacts associated with exposure to COPCs in the sediment is unlikely.

5.2.4 Conclusions Potential risks for ecological receptors were evaluated for COPCs in surface soil, surface water, and sediment at PSC 9.

Table 5-13
Comparison of Surface Water COPCs with Aquatic Toxicity Benchmarks[1]

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

COPC	Detected Concentration			FDEP Class III Fresh Water Quality Standards ($\mu g/\ell$)[2]	AWQC ($\mu g/\ell$)[3]
	09W00101	09W00201	09W00301		
Pesticides and PCBs ($\mu g/\ell$)					
Aroclor-1254	1.6	ND	ND	0.014	0.014
Inorganic Analytes ($\mu g/\ell$)					
Aluminum	2,820	NA	NA	NSC	NSC
Cobalt	1.1	NA	NA	NSC	NSC
Iron	2,610	NA	NA	1,000	1,000
Manganese	54.1	NA	NA	NSC	NSC
Vanadium	7.9	NA	NA	NSC	NSC

[1] Only those analytes selected as COPCs in Table 5-7 are presented.
[2] FDEP, Chapter 63-302, Florida Administrative Code, Freshwater Surface Water Quality Standards (Florida Legislature, 1996).
[3] Chronic Freshwater Federal AWQC (USEPA, 1991).

Notes: FDEP = Florida Department of Environmental Protection.
$\mu g/\ell$ = micrograms per liter.
AWQC = Ambient Water Quality Criteria.
ND = not detected.
NA = not available.
NSC = no screening concentration.

Risks associated with exposures to COPCs in surface soil were evaluated for small mammals and birds based on a model that estimates the amount of contaminant exposure obtained via diet and incidental ingestion of surface soil.

Comparison of estimated doses for wildlife species with reference toxicity doses representing thresholds for lethal and sublethal effects is the basis of the wildlife risk evaluation.

Exposure of small insectivorous mammals to aluminum in the surface soil at PSC 9 may cause a reduction in the growth and reproduction of these receptors. It is likely, however, that the presence of aluminum in the surface soil at PSC 9 is not site-related, but related to naturally-occurring aluminum present in dredge spoils from the St. Johns River that have been transferred to the site. No other lethal or sublethal risks were predicted for small herbivorous mammals or birds at PSC 9.

Risks for terrestrial plants and soil invertebrates were evaluated based on the results of site-specific toxicity testing of the PSC 9 surface soil. The results of the lettuce seed germination toxicity tests are inconclusive due to the variability in test results for the site-related and laboratory control samples. However, vegetation at PSC 9 appears to be growing normally with no evidence of stressed growth patterns. Given the lack of stressed vegetation at PSC 9, risks are not predicted for terrestrial plants exposed to the surface soil at PSC 9. Risks are also not predicted for soil invertebrates because the results of the toxicity test indicate high survival rates for earthworms exposed to surface soil from PSC 9.

Risks for aquatic receptors in the drainage ditch south of PSC 9 were characterized based on a comparison of COPC exposure concentrations with aquatic toxicity benchmarks. Benchmark values were not available for many of the surface water and sediment COPCs; therefore qualitative evaluations of the ditch system as well as the distribution of COPCs in surface water and sediment were used to characterize risks. Given the distribution of contaminants and the ephemeral nature of the ditch system, risks are not predicted for aquatic receptors that may be present in the ditch south of PSC 9.

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APPENDIX A

OFF-SITE SAMPLE TRACKING LOG

Appendix A

PSC 9
OFFSITE SAMPLE TRACKING LOG
SITE SCREENING, NAS JACKSONVILLE

SDG	SAMPLE ID	SAMP DATE	UDEPTH (ft bls)	LDEPTH (ft bls)	MATRIX	TAL MET	TCL VOC	TCL SVOC	TCL PEST/PCB	RAD	TOXT	DRFL	TAT	DSTV	DRFV
0018S	09B00101	8/7/97	0	1	soil	X	X	X	X	X		10/6/97	48	10/6/97	10/17/97
0018S	09B00102	8/7/97	6	8	soil	X	X	X	X	X		10/6/97	48	10/6/97	10/17/97
0018S	09B00201	8/7/97	3	5	soil	X	X	X	X	X		10/6/97	48	10/6/97	10/17/97
0018S	09B00202	8/7/97	9	11	soil	X	X	X	X	X		10/6/97	48	10/6/97	10/17/97
00016	09G00101	7/10/97	1	10	groundwater	X	X	X	X	X		8/13/97	33	8/13/97	8/15/97
00016	09G00201	7/10/97	1	10	groundwater	X	X	X	X	X		8/13/97	33	8/13/97	8/15/97
00016	09G00301	7/10/97	1	10	groundwater	X	X	X	X	X		8/13/97	33	8/13/97	8/15/97
0019S	09S00101	8/20/97	0	0.8	soil	X	X	X	X	X		10/7/97	48	10/7/97	10/21/97
0019S	09S00201	8/20/97	0	0.5	soil	X	X	X	X	X		10/7/97	48	10/7/97	10/21/97
0019S	09S00301	8/20/97	0	1	soil	X	X	X	X	X		10/7/97	48	10/7/97	10/21/97
0019S	09S00401	8/20/97	0	1	soil	X	X	X	X	X		10/7/97	48	10/7/97	10/21/97
0019S	09S00501	8/20/97	0	0.9	soil	X	X	X	X	X		10/7/97	48	10/7/97	10/21/97
0019S	09D00101	8/21/97	NA	NA	sediment	X	X	X	X	X		10/7/97	47	10/7/97	10/21/97
0019W	09W00101	8/21/97	NA	NA	surface water	X	X	X	X	X		10/7/97	47	10/7/97	10/21/97
JAX05	09W00201	3/29/99	NA	NA	surface water				X			5/3/99	35	5/5/99	5/15/99
JAX05	09W00301	3/29/99	NA	NA	surface water				X			5/3/99	35	5/5/99	5/15/99
JAX05	09S00102	3/30/99	0	1	soil	X (Hg)		X (PAH)	X		X	5/3/99	35	5/5/99	5/15/99
JAX05	09SBK101	3/30/99	0	1	soil	X (Hg)		X (PAH)	X		X	5/3/99	35	5/5/99	5/15/99

NOTES:

SDG	Sample Delivery Group (defined group of 20 samples or less collected not more than 14 days of each other.
SAMPLE ID	Sample Identifier
SAMP DATE	Date of Sample Collection
UDEPTH, LDEPT	Depths, upper (UDEPTH) and lower (LDEPTH)
MATRIX	Media Sampled
TAL MET	Target Analyte List Metals
TCL VOC	Target Compound List Volatile Organics
TCL SVOC	Target Compound List Semivolatile Organics
TCL PEST/PCB	Target Compound List Pesticides and Polychlorinated Biphenyls
RAD	Radiological parameters (gross alpha and beta)
TOXT	Toxicity tests (earthworm toxicity and lettuce germination tests)
DRFL	Date Package Received from Laboratory
TAT	Turnaround Time (days)
DSTV	Date Package Sent to Validators
DRFV	Date Package Received from Validators

ft bls = feet below land surface
Hg = mercury analysis only
PAH = Polynuclear aromatic hydrocarbons only

APPENDIX B

BECHTEL ENVIRONMENTAL INC. RADIOLOGICAL SURVEY REPORT

14183-1

PSC-9

FINAL RADIOLOGICAL SURVEY REPORT

FOR

COMPLETION OF REMEDIATION ACTIVITIES

AT

THE NAVAL AIR STATION, JACKSONVILLE, FLORIDA

Under Contract No. N62467-93-D-0936

Prepared by

BECHTEL ENVIRONMENTAL, INC.

OAK RIDGE, TENNESSEE

JANUARY 1998

REVISION 0

Bechtel Job. No. 22567

Prepared: E/Walker — Senior Scientist — 1-27-98 — Date

Approved: M. F. Barker — Project Manager — 2/9/98 — Date

CONTENTS

FIGURES

TABLES

1.0 INTRODUCTION

In response to results of a planned radiological characterization of PSC-9 (Ref. 1) at the Naval Air Station Jacksonville, Florida, Bechtel Environmental, Inc. performed remediation activities to remove materials that contained radioactive contamination at concentrations in excess of regulatory standards (Ref. 2).

PSC-9 is an approximate 2-acre area located east of Catapult Road along the shoreline of the St. Johns River (Figure 1-1). This PSC contained construction debris and a few 55-gal drums. The area of potential radiological contamination was estimated to be contained inside north-south grid lines E to S and east-west grid lines 0 to 8 (an area approximately 200 ft wide by 400 ft long).

The radiological characterization survey consisted of a 33 ft (10 m) by 33 ft (10 m) grid line gamma scan to locate elevated activity in excess of twice the background. This grid pattern resulted in approximately 10 percent of the total area being scanned. When a scan reading exceeded twice background along the particular grid line, the scanning continued around the grid line until the location of the highest reading was found. The "hot spot" area was then defined by the four compass points at which the gamma reading fell to 20 percent above background. Hot spot characterization then consisted of gross beta, gamma, and alpha readings; a dose rate measurement; and a surface soil sample.

This characterization identified a total of 20 hot spots (isolated and multi-hit areas) over the 2-acrea site that exceeded the twice-background designation criteria. These hot spots were found to vary in size from several feet in diameter to areas as large as a total grid (33 ft by 33 ft). Levels of activity were as high as 40 μR/h. The average background at the grid intersections onsite is approximately 7 μR/h. Radioisotope concentrations in the soil samples ranged from approximately 0.6 pCi/g to 25.0 pCi/g, with an average of 7.4 pCi/g. Due to the extent of activity encountered using a survey protocol that involved only 10 percent of the site area, this site was considered as contaminated above release criteria. The areas of potential contamination defined from this survey are shown on Figure 1-2.

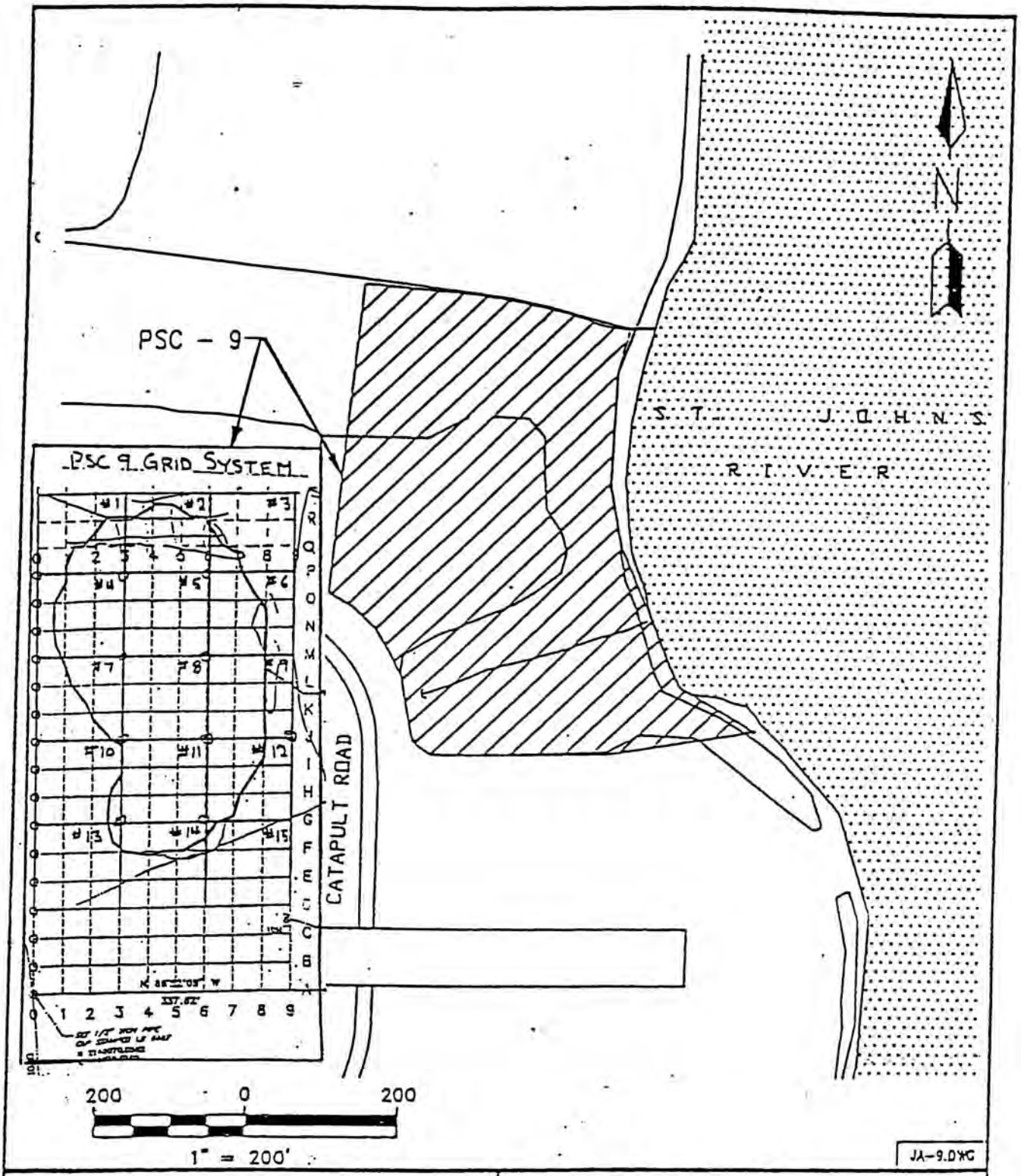
Based on these results, additional gamma measurements were made to confirm that additional hot spots had not been missed by the grid survey. No additional hot spots were encountered. Note that the original characterization identified an area of elevated activity between grids E–G and 0–1 that was outside the original boundary defined for PSC-9.

Based on the results of the characterization and the supplemental measurements to better locate and define the hot spot boundaries, an estimate of 540 yd^3 of material for removal was used for remedial action planning.

2.0 REMEDIATION OF PSC-9

The remediation plan was based on completing the excavation with a minimum of waste volume generated. Excavation was started at the hot spot "center." and soil was removed in depth increments of 6–12 in. The excavation was expanded in the areal directions until gamma measurements, using a 2"×2" NaI detector, fell below approximately 15,000 cpm. This value was selected to approximate a subsurface radium-226 contamination level of ≤ 15 pCi/g, the regulatory limit for activity at subsurface depths ≥ 15 cm (6 in.) (Ref. 2). Excavation proceeded to depths ranging from 1–3 ft. The actual areas of excavation are shown

Figure 1-1 PSC 9 Grid System



PSC – 9

OLD DISPOSAL AREA (EAST OF FUEL FARM)

PROGRAM ORGANIZATION AND PLANNING

NAS JACKSONVILLE
SEPTEMBER 1991

on Figure 2-1. These areas of excavation resulted in a total of 540 yd^3 of soil removal. A total of 10 hot spot/area locations were excavated totaling as area of approximately 1,600 m^2 (~ 17,000 ft^2). The total excavated volume for PSC-9 was equal to the estimated volume. The excavated material was transported to PSC-26 for disposal.

3.0 RADIOLOGICAL CHARACTERIZATION

Excavation was continued until all surfaces inside the excavation were less than 15,000 cpm as measured with a 2"×2" NaI detector. The following protocol was followed for characterizing the excavation surfaces, based on the detector responses (R_D).

(1) Complete a 100 percent scan of the excavated area.

   (a) If $R_D > 15{,}000$ cpm, continue excavation

   (b) If $12{,}000 \text{ cpm} \leq R_D \leq 15{,}000$ cpm, collect one soil sample within the area where R_D is greater than 12,000 cpm

   (c) If $R_D \leq 12{,}000$ cpm, and

   - Excavation area > 10 m^2 (3 m × 3 m), collect one composite soil sample consisting of five random plugs
   - Excavation area < 10 m^2 (3 m × 3 m), collect one sample plug from each area and combine up to five plugs to obtain one composite soil sample

(2) If $R_D < 15{,}000$ cpm, backfill with at least 2 ft of clean soil

(3) Obtain dose rate readings using a Reuter-Stokes pressurized ion chamber (PIC). Obtain readings over each backfilled area. Take one reading for each ~ 3 m radius area (1/9 of a grid)

3.1 GAMMA MEASUREMENTS

At the completion of the soil removal activities, each excavated area was surveyed for gamma activity using the 2"×2" NaI detector. The results of this survey are shown on Figure 3-1, with the maximum measurements (in cpm) shown for each area. The maximum reading at the completion of excavation is noted in the small area to the northeast. This value is 11,300 cpm. All other readings were less then or equal to 11,000 cpm (less than twice local background). The field measurements are included in Attachment A. Based on these results, the excavation was terminated and a detailed radiological characterization of the area was completed.

The grids around each of the excavation grids of PSC-9 were measured, using fixed-point gamma measurements, to ensure that the hot spot/areas had been identified. The results of that survey are summarized in Table 3-1 and shown on Figure 3-2. The field measurements are included in Attachment A.

3.2 SOIL SAMPLE ANALYSIS

At the completion of the hot spot/area excavation, soil samples were obtained to analyze for residual radioactivity content. Single samples were obtained from the larger excavation areas (> 10 m^2). For the smaller excavations (< 10 m^2), composite samples were prepared by combining aliquots from several areas. The locations for the samples are shown on Figure 3-3. A summary of the radioisotopic analysis of the samples is shown in Table 3-2.

FIGURE 1-2: PSC-9

FIGURE 2-1 PSC-9

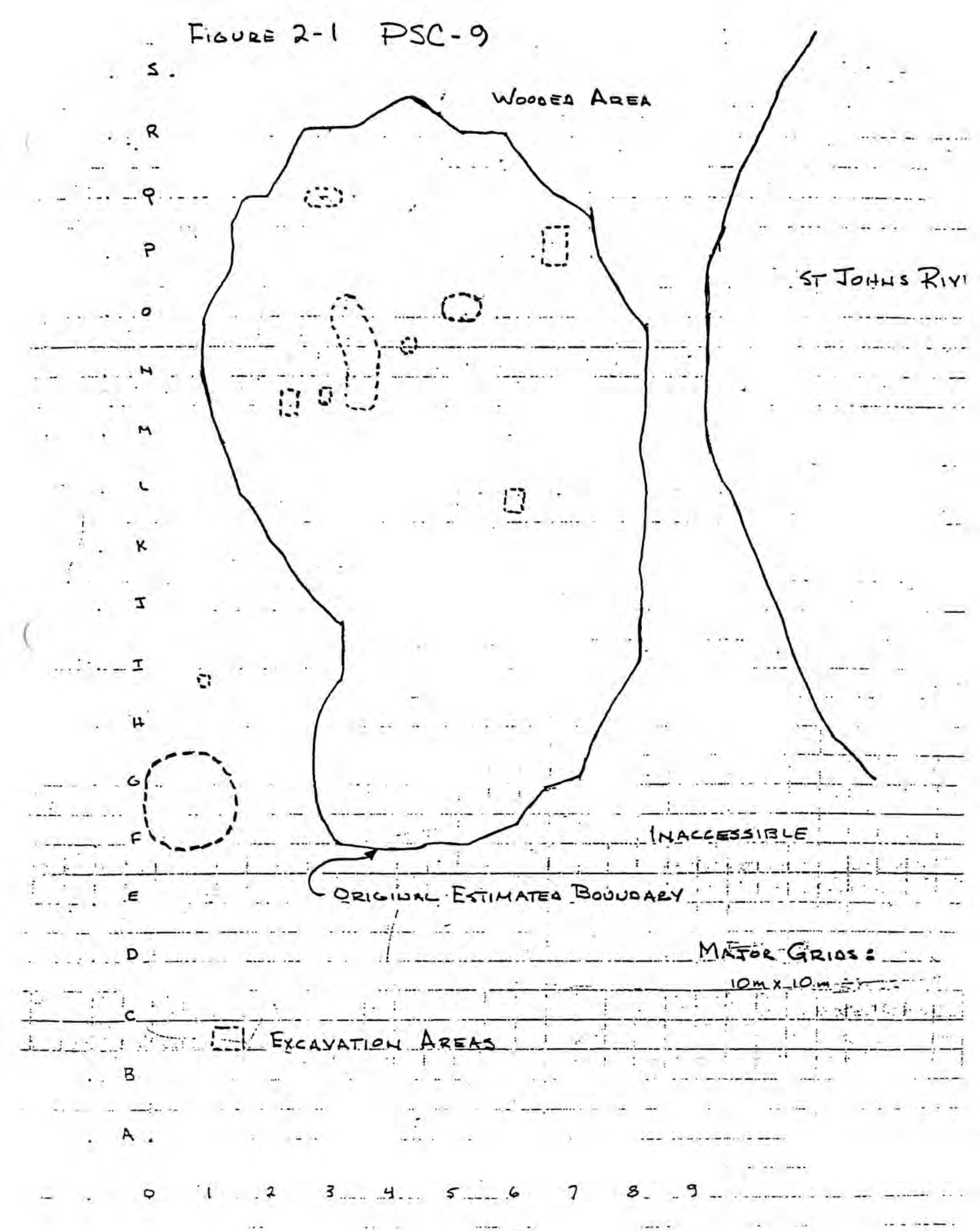


FIGURE 3-1 PSC-9

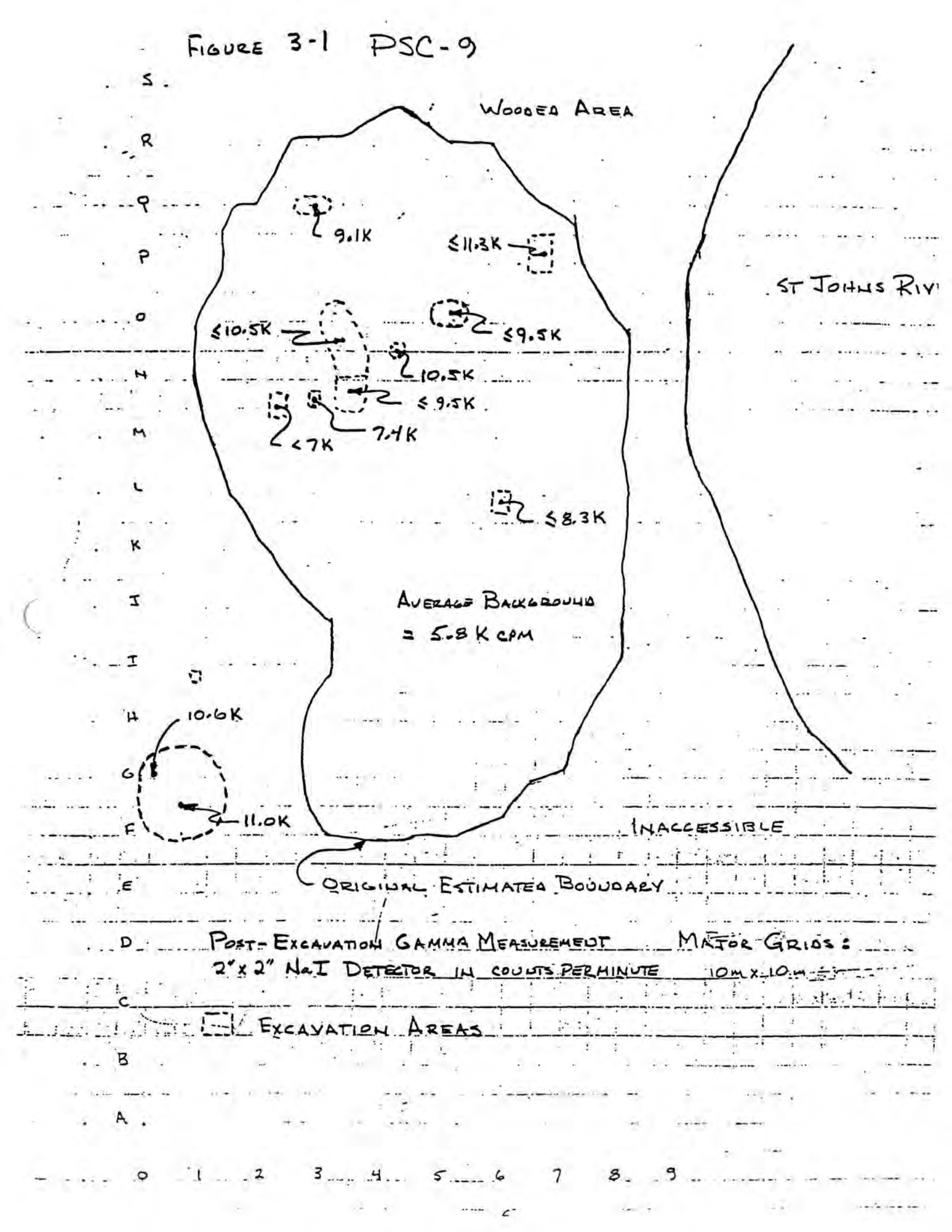
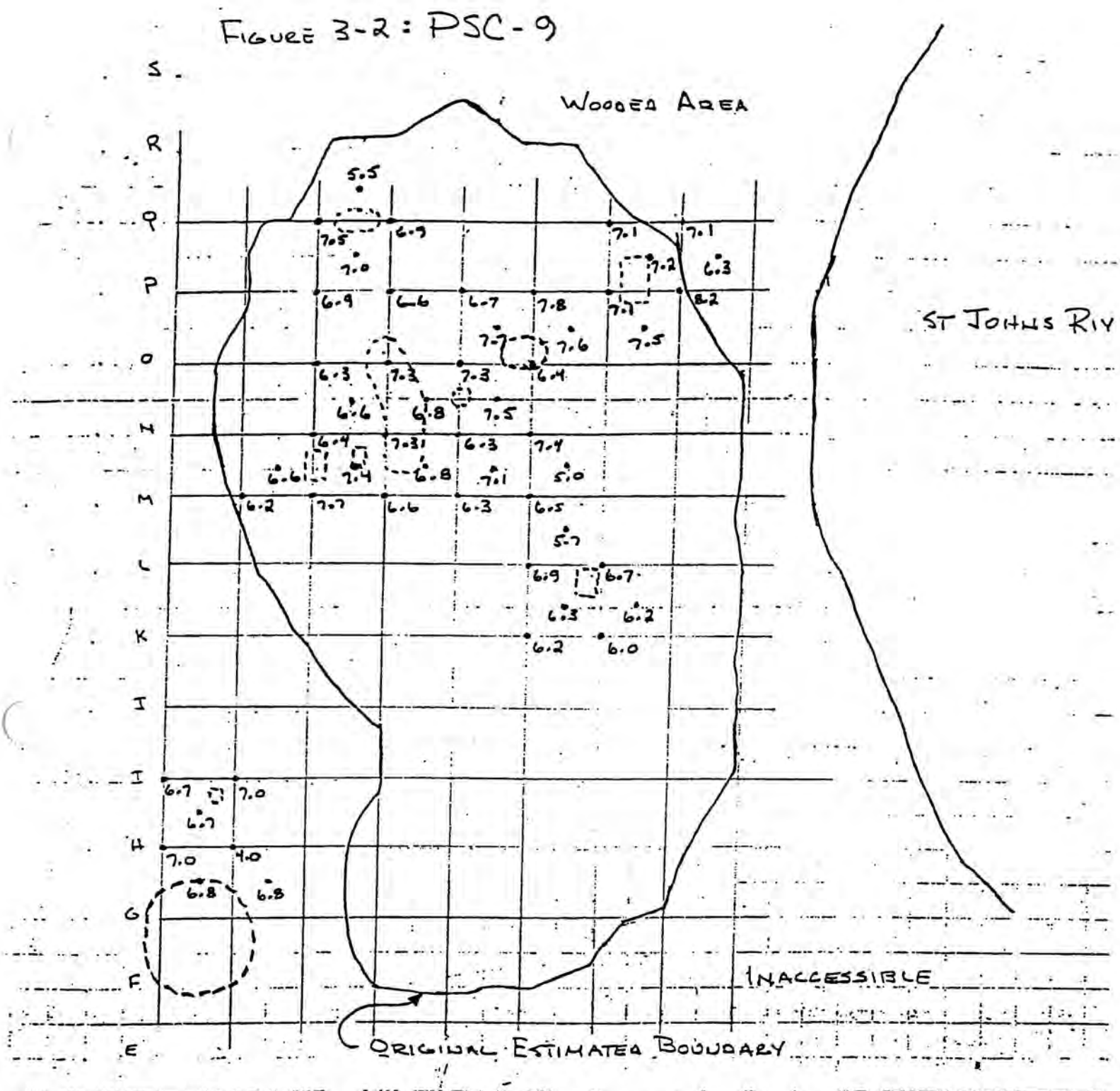


FIGURE 3-2 : PSC-9



POST EXCAVATION GAMMA MEASUREMENTS MAJOR GRIDS:
2"x2" N-I DETECTOR (CPM x 1000) 10m x 10m

EXCAVATION AREAS

AVERAGE BACKGROUND = 5.8K CPM

FIGURE 3-3: PSC-9

Table 3-1
Gamma Fixed Point Measurements
2"×2" NaI Detector (cpm)

Grid Point	Date	Background (offsite)	Surface	1 Ft	3 Ft
H-1	11/18/97	5,825 ± 968	3,998 ± 45	4,513 ± 72	4,856 ± 29
G-H/1-2			6,757 ± 84	6,698 ± 67	6,395 ± 192
G-H/0-1			6,770 ± 72	6,779 ± 168	6,622 ± 63
H-0			7,013 ± 108	6,597 ± 100	6,437 ± 42
H-I/0-1			6,657 ± 27	6,238 ± 14	6,229 ± 91
J-0			6,664 ± 113	6,478 ± 73	6,155 ± 139
I-J/0-1			6,502 ± 86	6,494 ± 98	6,235 ± 59
I-1			7,038 ± 123	6,940 ± 93	6,555 ± 131
L-5			6,887 ± 26	6,553 ± 63	6,170 ± 74
L-M/5-6			5,698 ± 104	5,809 ± 19	5,666 ± 269
L-6			6,699 ± 63	6,118 ± 120	6,023 ± 41
K-L/6-7			6,202 ± 61	6,085 ± 81	5,823 ± 47
K-L/5-6			6,295 ± 165	6,163 ± 106	5,941 ± 60
K-6			5,991 ± 70	5,768 ± 49	5,774 ± 51
K-5			6,216 ± 68	6,166 ± 13	6,003 ± 38
P-6			7,078 ± 57	6,681 ± 109	6,452 ± 38
P-7			8,176 ± 25	6,673 ± 90	6,429 ± 79
Q-6			7,102 ± 82	7,087 ± 65	7,041 ± 102
Q-7			7,127 ± 90	6,902 ± 68	6,540 ± 101
P-Q/6-7			7,220 ± 134	7,386 ± 85	7,257 ± 81
P-Q/7-8			6,306 ± 107	5,989 ± 27	5,955 ± 93
O-P/6-7			7,515 ± 79	6,887 ± 21	6,285 ± 95
P-5	11/19/97		7,812 ± 61	7,505 ± 63	7,352 ± 123
O-5			6,441 ± 188	6,303 ± 62	6,513 ± 116
P-O/5-6			7,452 ± 97	7,222 ± 152	7,038 ± 81
P-O/4-5			7,706 ± 222	7,423 ± 17	7,321 ± 151
Q-2			7,545 ± 94	7,345 ± 86	6,964 ± 80
Q-3			6,938 ± 86	6,890 ± 50	6,854 ± 81
P-Q/2-3			6,966 ± 169	6,897 ± 67	6,489 ± 161
Q-R/2-3			5,527 ± 68	6,020 ± 14	5,919 ± 28
P-4			6,664 ± 58	6,826 ± 53	6,693 ± 92
P-3			6,566 ± 54	6,692 ± 96	6,345 ± 68
P-2			6,919 ± 35	6,588 ± 139	6,049 ± 102
O-4			7,317 ± 72	7,136 ± 65	7,060 ± 102
O-3			7,328 ± 208	7,178 ± 157	6,965 ± 116
O-2			6,306 ± 41	6,461 ± 81	6,373 ± 116
N-5			7,413 ± 133	6,990 ± 71	6,907 ± 90
N-4			6,382 ± 83	6,279 ± 39	6,253 ± 42
N-3			7,264 ± 46	6,787 ± 30	6,799 ± 6
N-2			6,396 ± 133	6,209 ± 68	6,257 ± 237

Table 3-1 (continued)

Grid Point	Date	Background (offsite)	Surface	1 Ft	3 Ft
M-5	11/24/97		6,524 ± 30	6,235 ± 71	5,720 ± 71
M-4			6,339 ± 85	6,311 ± 122	6,275 ± 53
M-3			6,557 ± 131	6,460 ± 40	6,290 ± 43
M-2			7,714 ± 81	7,634 ± 112	7,270 ± 31
M-1			6,178 ± 84	6,310 ± 27	6,338 ± 181
M-N/5-6			4,991 ± 126	6,047 ± 58	6,418 ± 138
M-N/4-5			7,053 ± 64	6,860 ± 105	6,784 ± 81
M-N/3-4			6,815 ± 97	6,745 ± 37	6,561 ± 59
M-N/2-3			7,368 ± 76	7,264 ± 72	7,003 ± 82
M-N/1-2			6,578 ± 84	6,543 ± 53	6,344 ± 130
N-O/2-3			6,637 ± 44	6,832 ± 108	6,822 ± 127
N-O/3-4			6,759 ± 135	6,746 ± 101	6,604 ± 92
N-O/4-5			7,488 ± 86	7,085 ± 58	6,685 ± 32

Table 3-2
Isotopic Concentration in Soil (pCi/g)

Location	Sample ID	Ra-226	Th-232	K-40	Cs-137
9-1	JX00742	1.4 ± 0.21	1.5 ± 0.19	10.6 ± 1.27	0 ± 0.02
9-2/1, 2, 3, 4	JX00743	1.2 ± 0.18	1.0 ± 0.14	3.8 ± 0.63	0.12 ± 0.04
9-3	JX00744	1.1 ± 0.15	0.98 ± 0.13	3.7 ± 0.62	0.13 ± 0.03
9-4/1, 2, 3, 4, 5	JX00745	1.0 ± 0.16	0.88 ± 0.12	4.2 ± 0.70	0.08 ± 0.04
9-5	JX00746	1.2 ± 0.20	1.5 ± 0.19	12.0 ± 1.54	–
NAS-JAX average background (Ref. 3)		0.59 ± 0.16	0.72 ± 0.19	2.52 ± 1.25	0.17 ± 0.13

3.3 DOSE RATE MEASUREMENTS

At the completion of the excavation, a series of dose rate measurements was obtained using a pressurized ion chamber (PIC) in and around the excavated areas. These measurements are shown on Figure 3-4. These measurements were made before the areas were backfilled. The range of dose rates observed around the open excavations was 6.9–7.6 μR/h. This compares to the background measured around the entire PSC during characterization of 6.2–7.6 μR/h, and the NAS-JAX area background of 5.7–7.8 μR/h.

After backfilling of the excavated areas was completed, dose rates were again measured with the PIC. The locations of these measurements are shown on Figure 3-5. The range of dose rates observed after backfilling was 7.0–7.6 μR/h. Backfilling had essentially no effect on dose rate reduction, which indicates that the excavation areas had been reduced to levels comparable to the surrounding areas.

4.0 CONCLUSIONS

Based on the radiological measurements performed at the completion of excavation, this site may be used with no further radiological restrictions. The measurements indicate that residual activity that may be present is very near the background levels determined for the NAS-JAX site (Ref. 3). These residual levels may be summarized as follows:

Activity	PSC-9	NAS-JAX Background
Dose Rate (before backfill)	6.9–7.6 μR/h	5.7–7.8 μR/h
Dose Rate (after backfill)	6.2–7.6 μR/h	5.7–7.8 μR/h
Uranium-238 decay chain	1.0–1.4 pCi/g	0.37–0.99 pCi/g
Thorium-232 decay chain	0.88–1.5 pCi/g	0.37–1.08 pCi/g
Potassium-40	3.7–12.0 pCi/g	0.82–5.22 pCi/g
Cesium-137	0–0.13 pCi/g	0.01–0.49 pCi/g

The radium-226, as indicated by the uranium-238 chain, is well within the cleanup criteria used for this project of 5.0 pCi/g above background.

5.0 REFERENCES

1. M. H. Haghighi and E. Walker, "PSC-9 Radiological Survey Report for the Naval Air Station Jacksonville, Florida," prepared by Bechtel Environmental, Inc., Oak Ridge, Tennessee, October 26, 1995.

2. U.S. Environmental Protection Agency, 40 CFR 192, "Health and Environmental Standards for Uranium and Thorium Mill Tailings," January 5. 1983.

3. Bauer, V. Hermann (Bechtel Environmental, Inc.), "Radiological Background Determination for the NAS Jacksonville Site," to B. K. Moring (Southern Division - Naval Facilities Engineering Command) dated January 11, 1995.

FIGURE 3-4: PSC-9

FIGURE 3-5: PSC-9

APPENDIX A

GAMMA SURVEYS

PSC-9

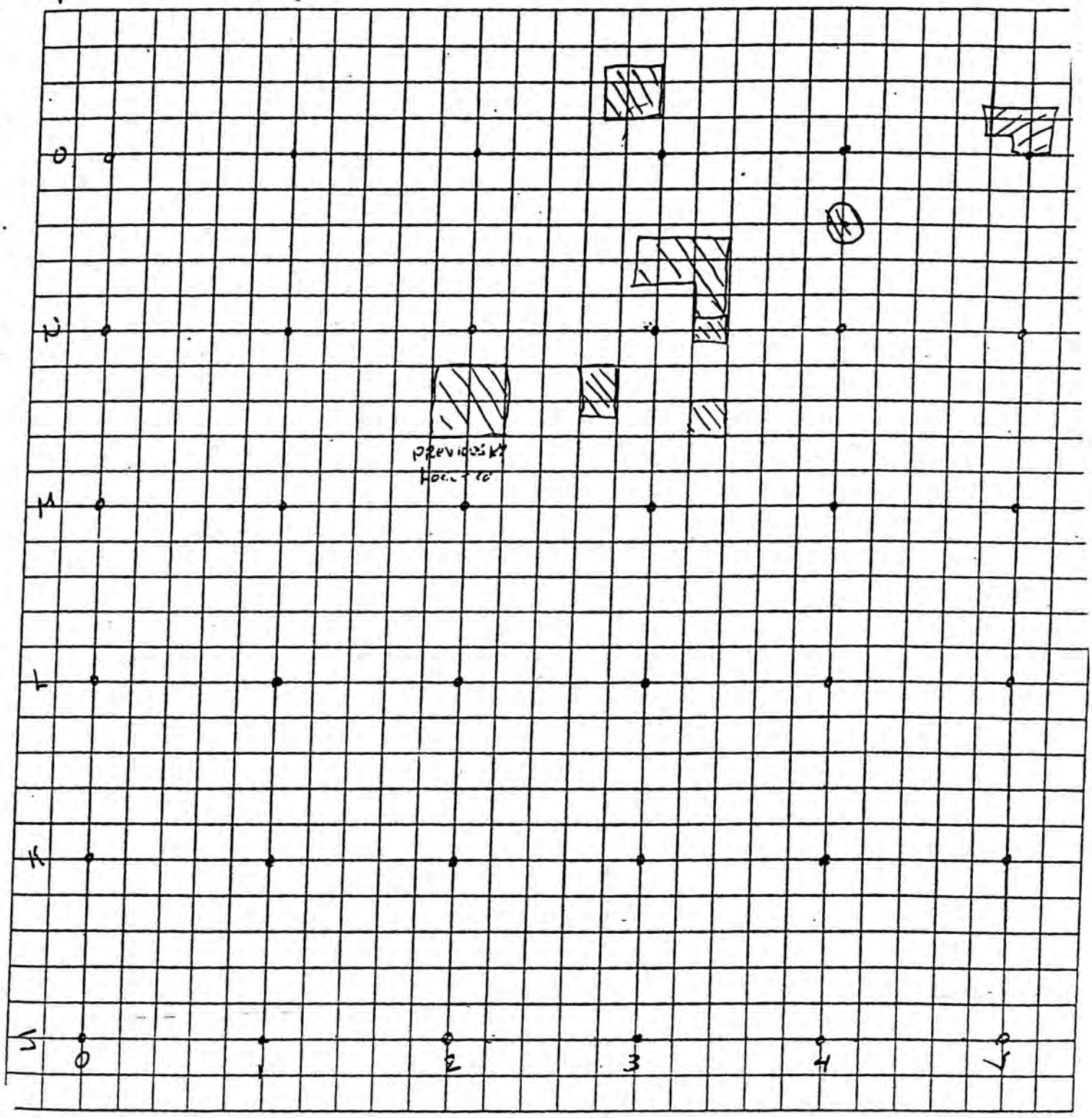
Walkover Gamma Scan Sheet

Q - Top of Rise - C - Tree

Grid: _____ Detector: 44-10 SN Technician: T. Ramirez

Scaler: _____ BKG: _____ FER 10-22-97

Conv: _____ S/N: _____



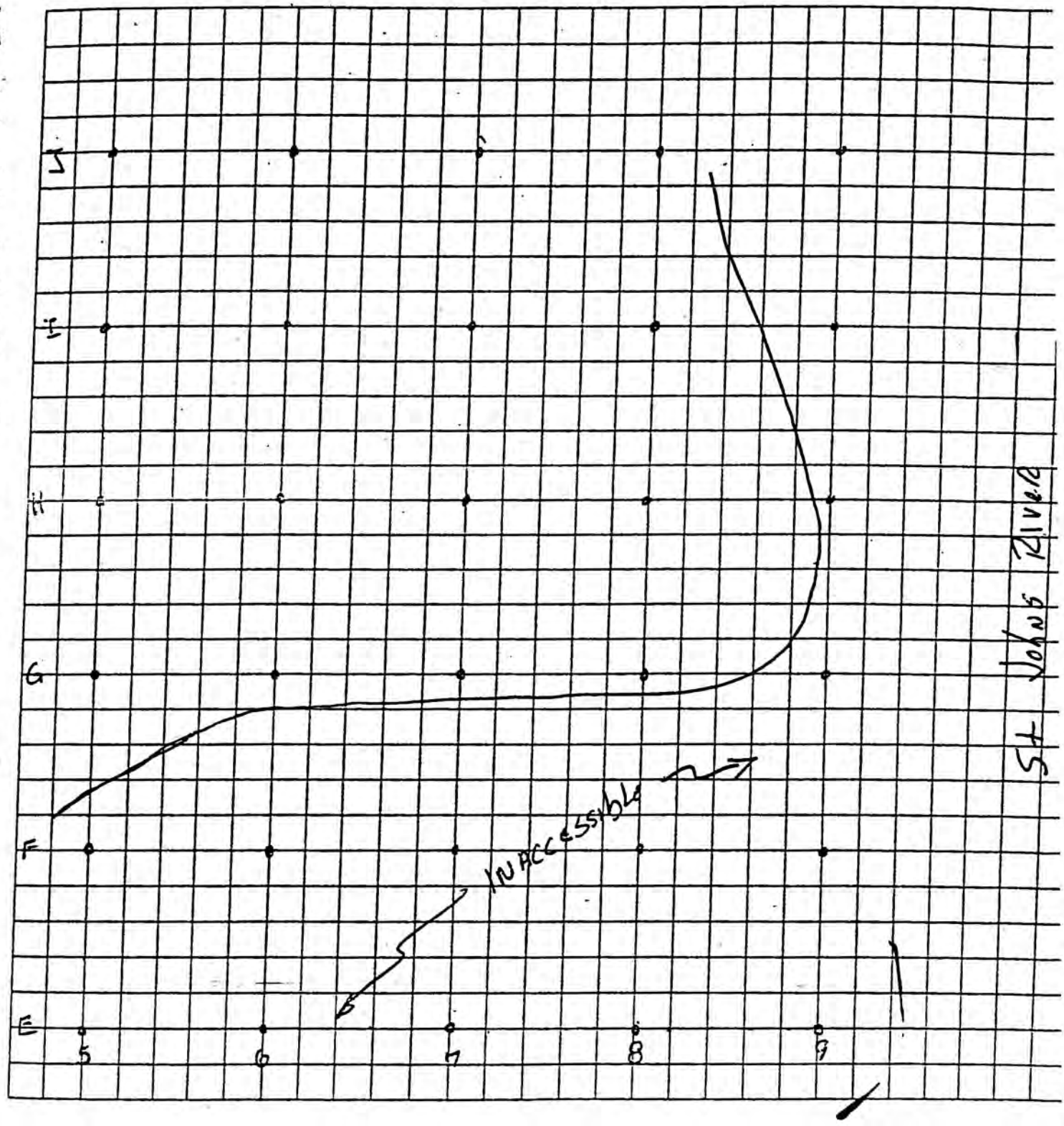
Remark _____

Walkover Gamma Scan Sheet

Grid: _____ Detector: _____ Technician: T. Rountree

Scaler: _____ BKG: _____ 10-22-99

Conv: _____ S/N: _____



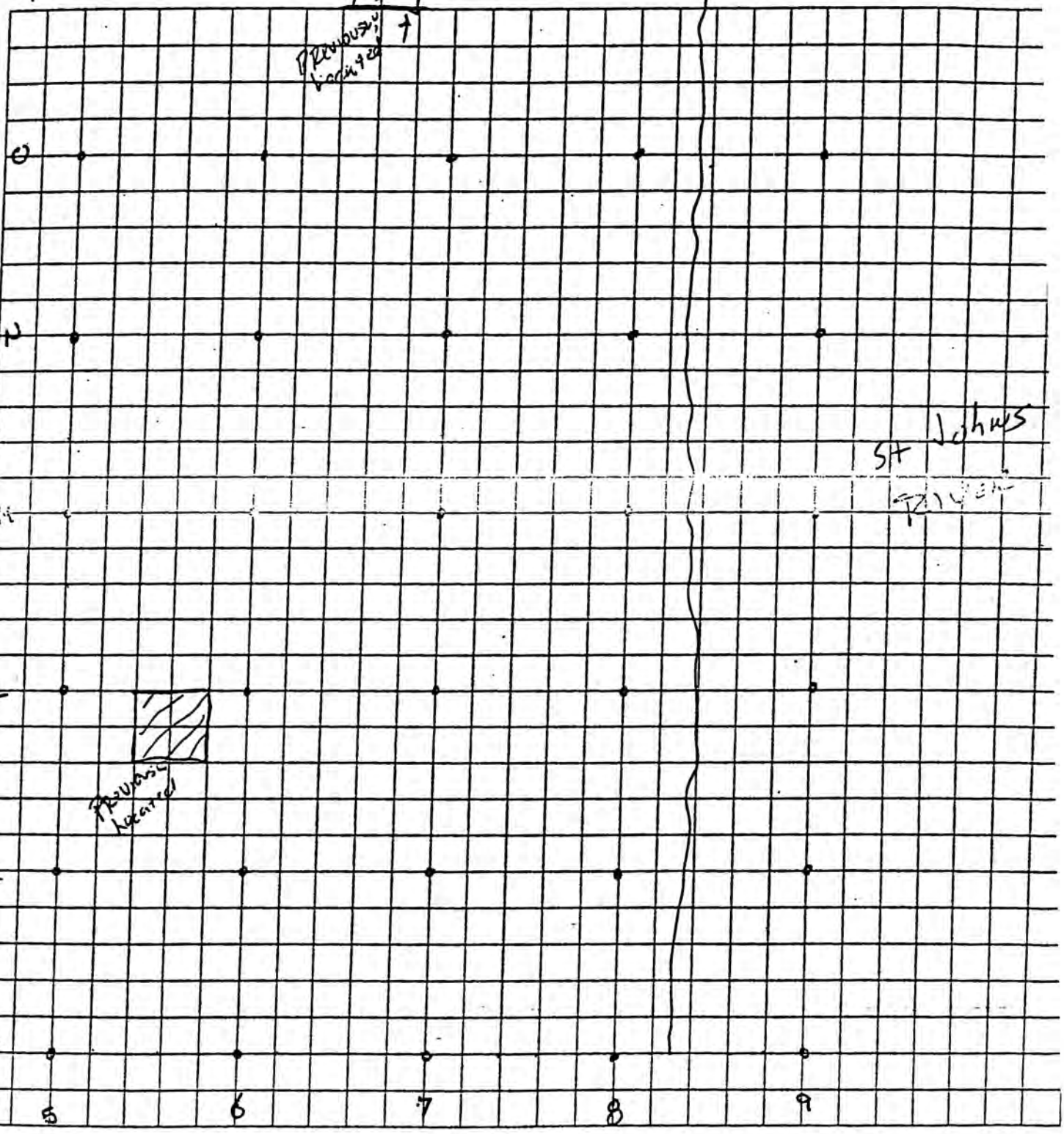
Remark _____

Walkover Gamma Scan Sheet

Grid: _____ Detector: _____ Technician: J. Rountree

Scaler: _____ BKG: _____ 10-22-9

Conv: _____ S/N: _____



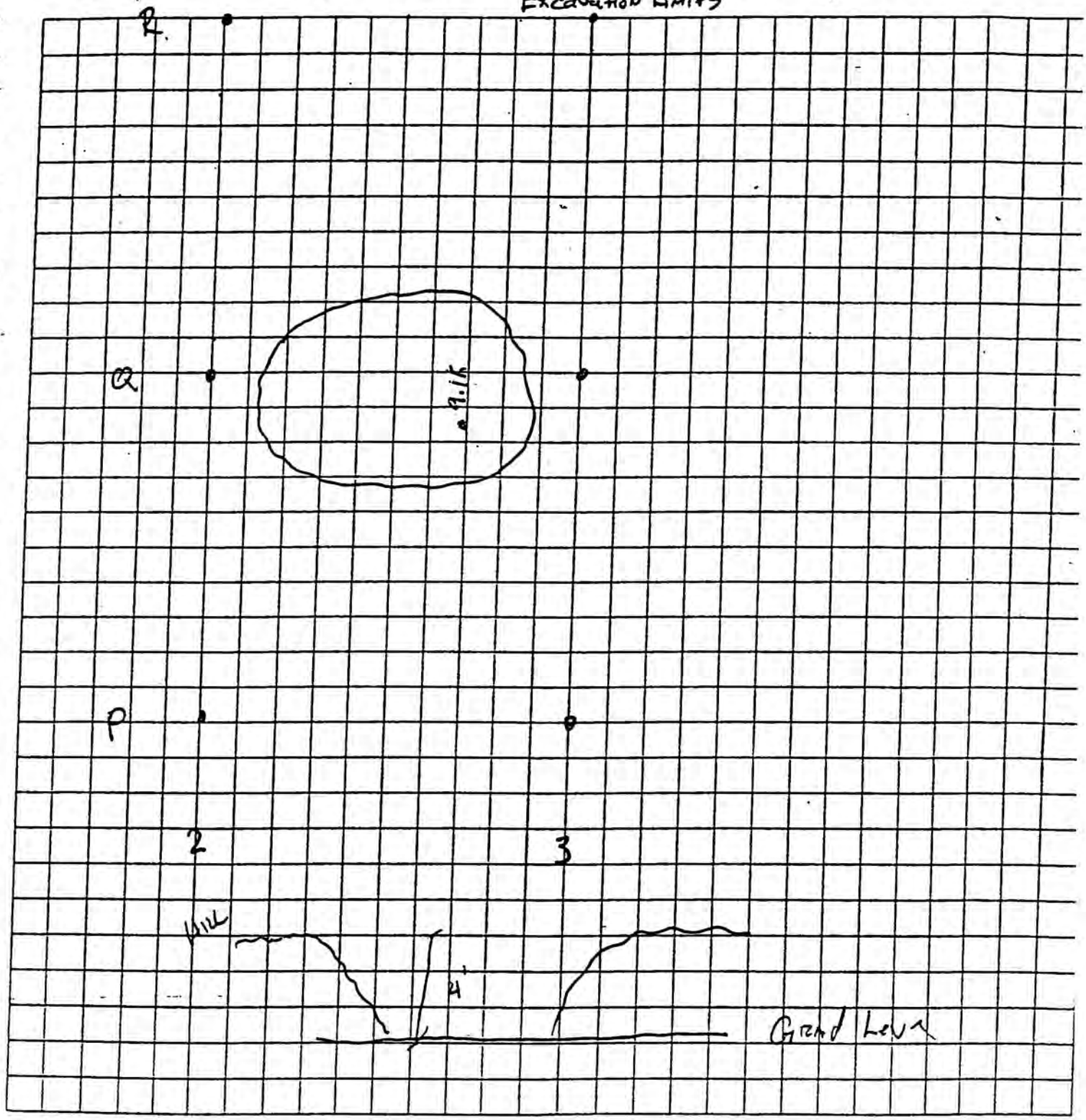
Remark _____

Walkover Gamma Scan Sheet

Grid: PSC 9 Detector: 44-10 S/N 386 Technician: T. Rowntree

Scaler: 2221 S/N 117651 BKG: 4839.6 cpm TJR 10-23-94

Conv: — S/N: —



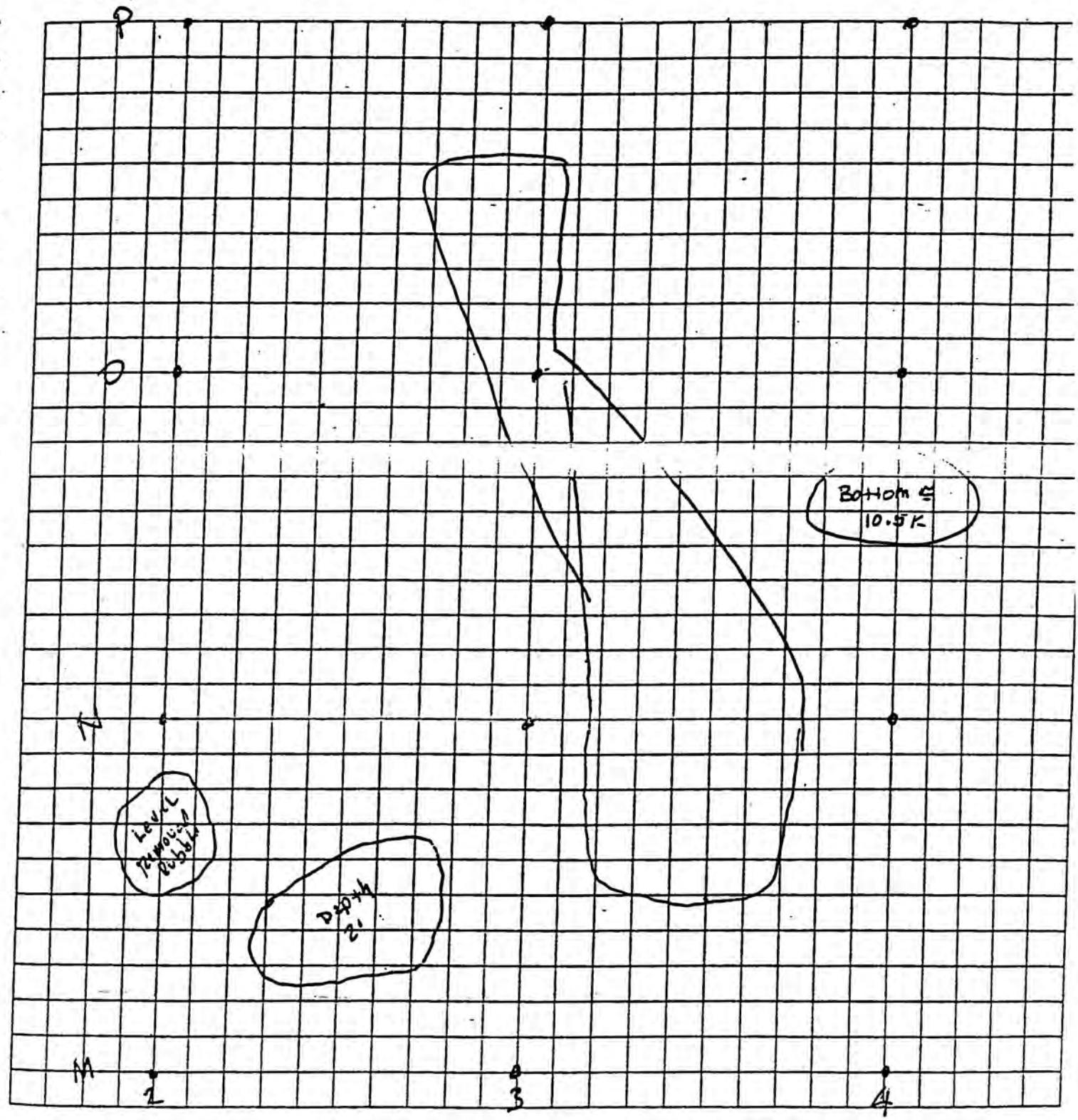
Remark

Walkover Gamma Scan Sheet

Grid: PSC 9 Detector: 4410 Technician: T. Dountsa

Scaler: 2221 BKG: 4 839.6 MGR 10-23-9

Conv: — S/N: 386



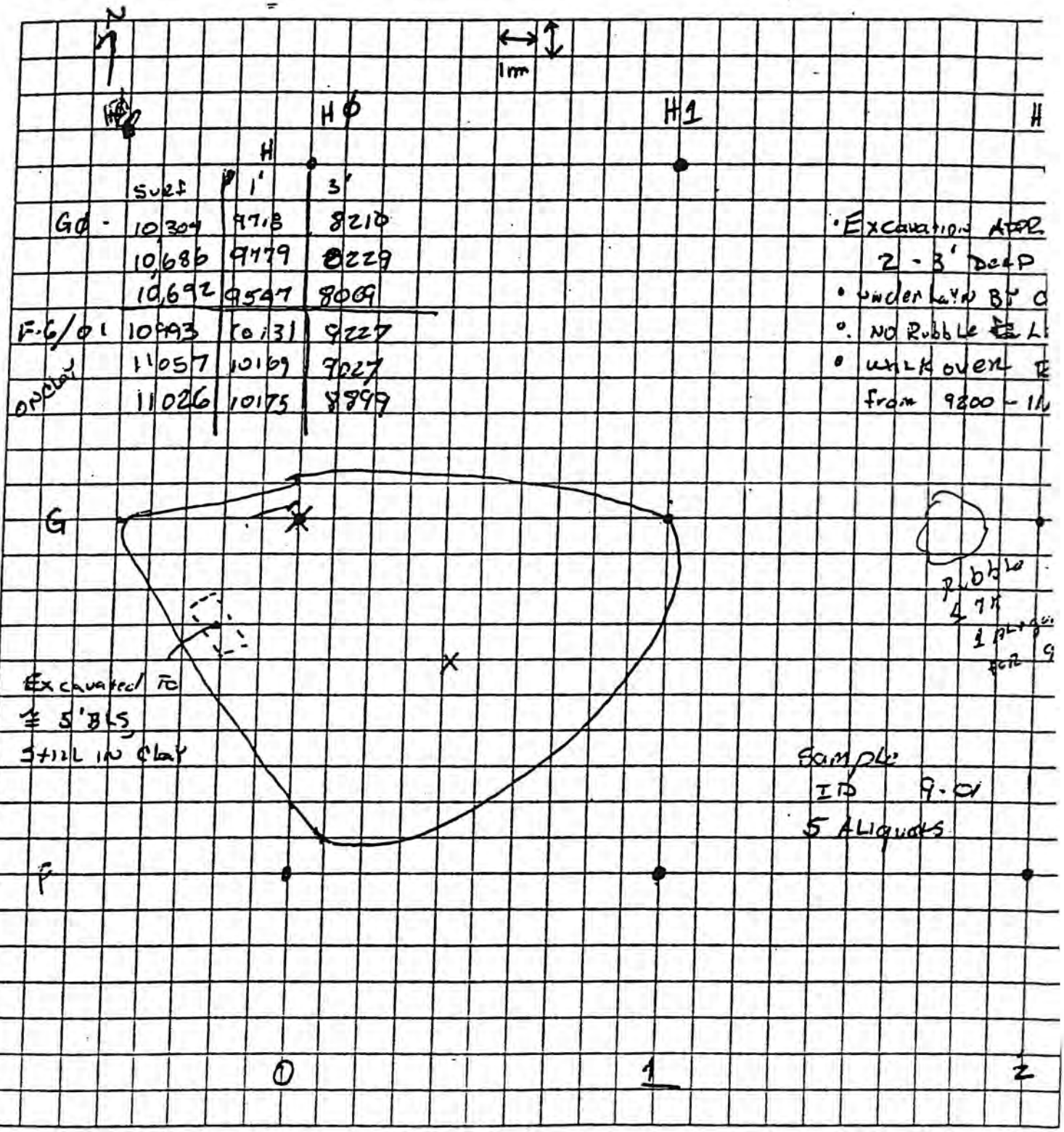
Remark

Walkover Gamma Scan Sheet

Grid: _____ Detector: _____ Technician: _____

Scaler: _____ BKG: _____

Conv: _____ S/N: _____



	Surf	1'	3'
G0 -	10,304	9718	8210
	10,686	9479	8229
	10,692	9547	8069
F-6/01	10493	10131	9227
	11057	10169	9027
Opcon	11026	10175	8899

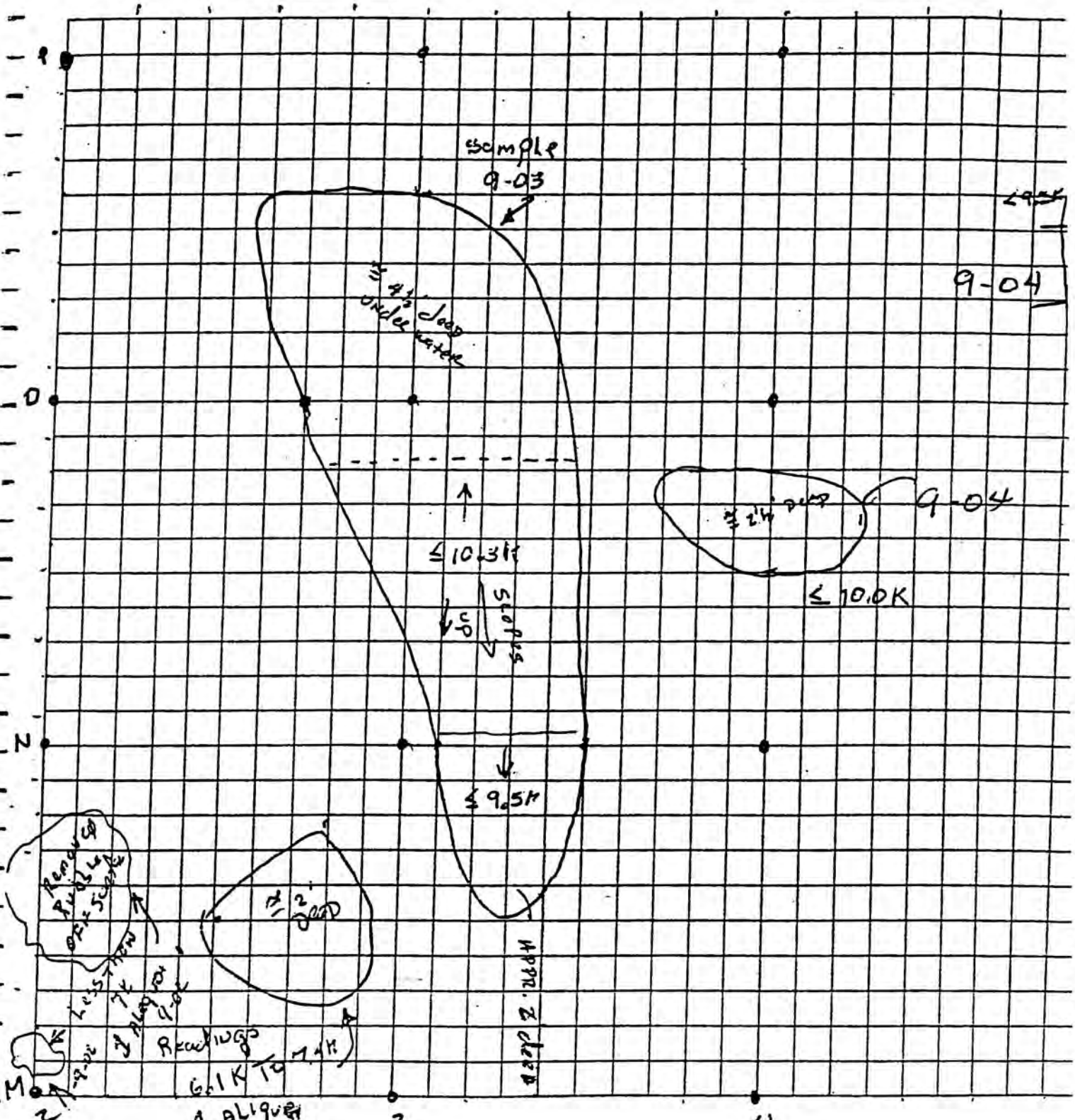
Remark JEF 11-12-97

Walkover Gamma Scan Sheet

Grid: _____ Detector: _____ Technician: _____

Scaler: _____ BKG: _____

Conv: _____ S/N: _____



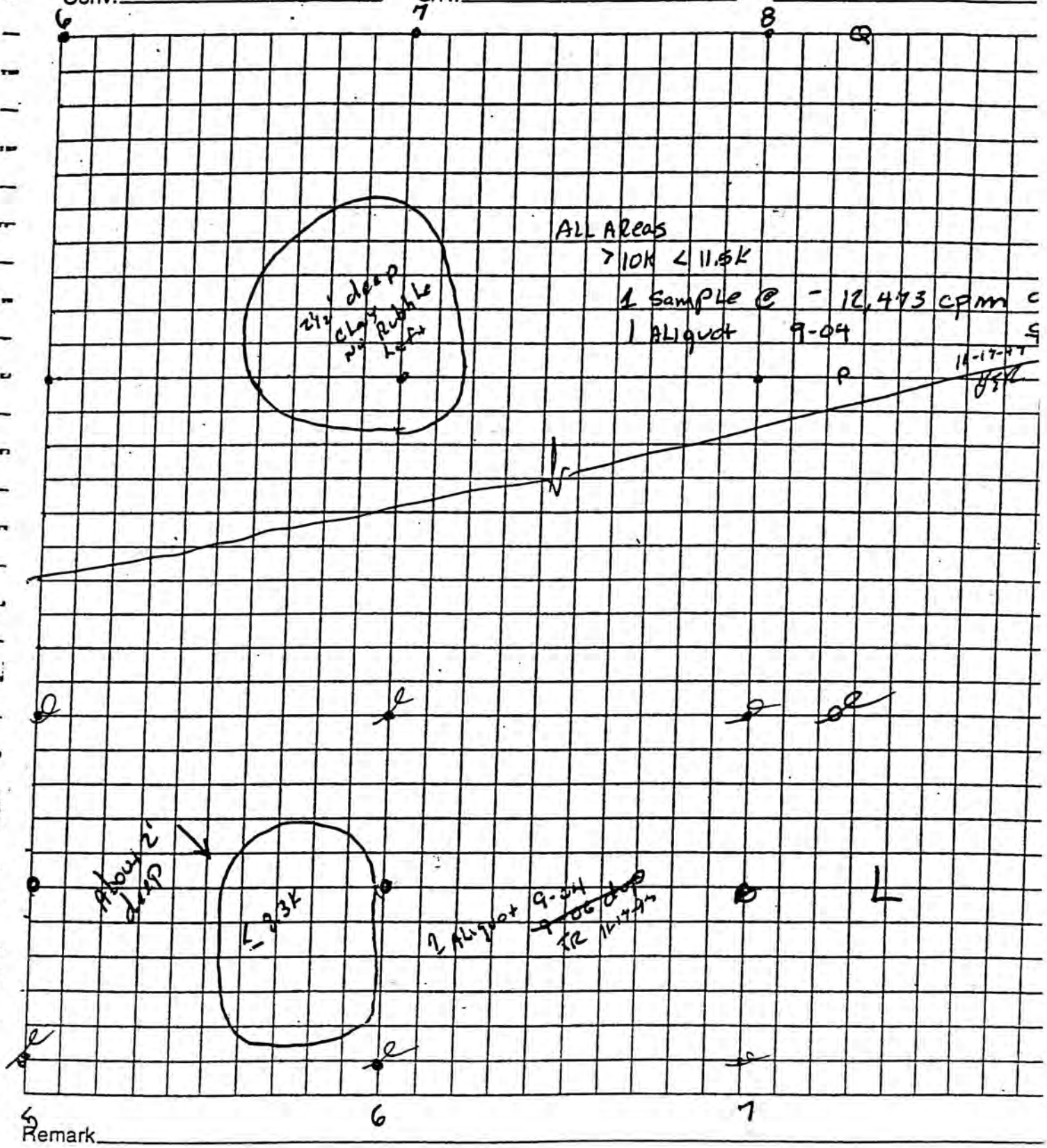
Remark _____

Walkover Gamma Scan Sheet

Grid: _____ Detector: _____ Technician: _____

Scaler: _____ BKG: _____

Conv: _____ S/N: _____



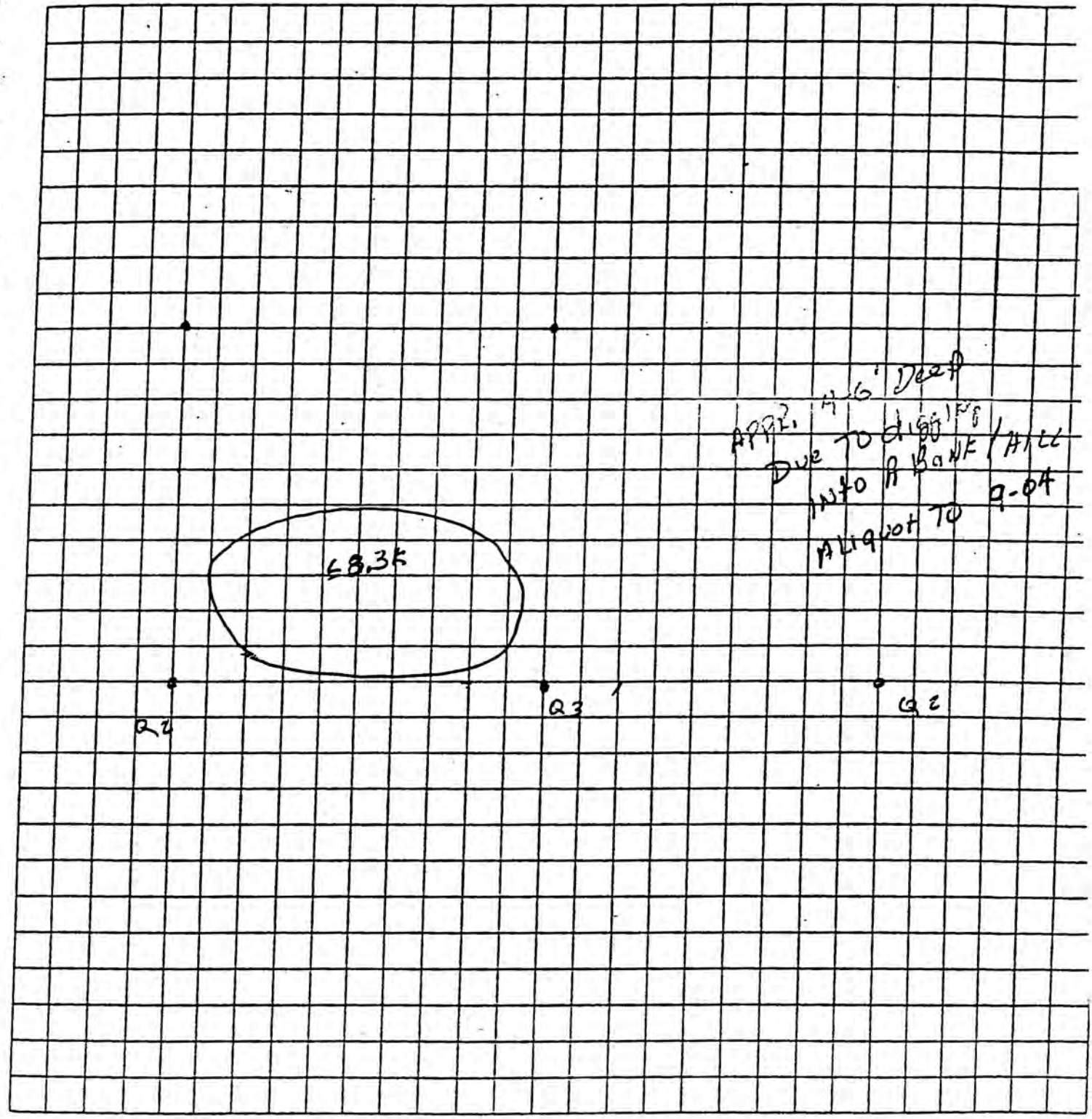
Remark _____

Walkover Gamma Scan Sheet

Grid: _____ Detector: _____ Technician: _____

Scaler: _____ BKG: _____ _____

Conv: _____ S/N: _____ _____



Remark _____

_____

10-21-97

This w/ R. Halsey, we need a written Request (! signed) from William Requesting this info Due To Confidential Nature of Documents.

J E Ro
10-22-97

10-22-97

0615 Start ON INSTRUMENTS

0700 MORNING meeting.

0745 @ Post S. Made To go & get H. Johnson & Becon On a "List". NOT Required as Pol Sully @ Bldg 9.

0900 @ PSC9.

3Kg

1 -	5231	TOTAL -	
2 -	7504		
3 -	6765	AVg -	6749.57
4 -	6914		
5 -	6535	AVg +4750 -	11499.57
6 -	7890	use	11.57K
7 -	6405		

1115 digging IN lot area.

J E Ro
10-22-97

Truck #	Gross #	
6200	Ø	#1
Bloc Red	Ø	No Smear Taken
Red	Ø	#2
6200	Ø	#3
Red	Ø	#4
6200	Ø	#5
Red	Ø	#6
Red	—	—
Blue	—	—
Red	—	—
Red	6	7
6200	0	8
Red	Ø	9
6200	Ø	10

1630 Cut of work for day TO Read Smears. Talked TO Howard Johnsos Reg Lr. Trucks will Sit tonight @ Yard & Not be used. will Release Trucks Tomorrow for un Restricted Use.

1800 Outdoor

JER 10-23-94

10-23-94

0630 arrive

0700 morning meeting

0800 hauling

0930 Brs

1 - 5365

2 - 7424

3 - 6882

4 - 7023

5 - 6483

6 - 7801

7 - 6394

Total : 47372

Avg : 6767

Avg + 475 : 11517

Use 11.6K

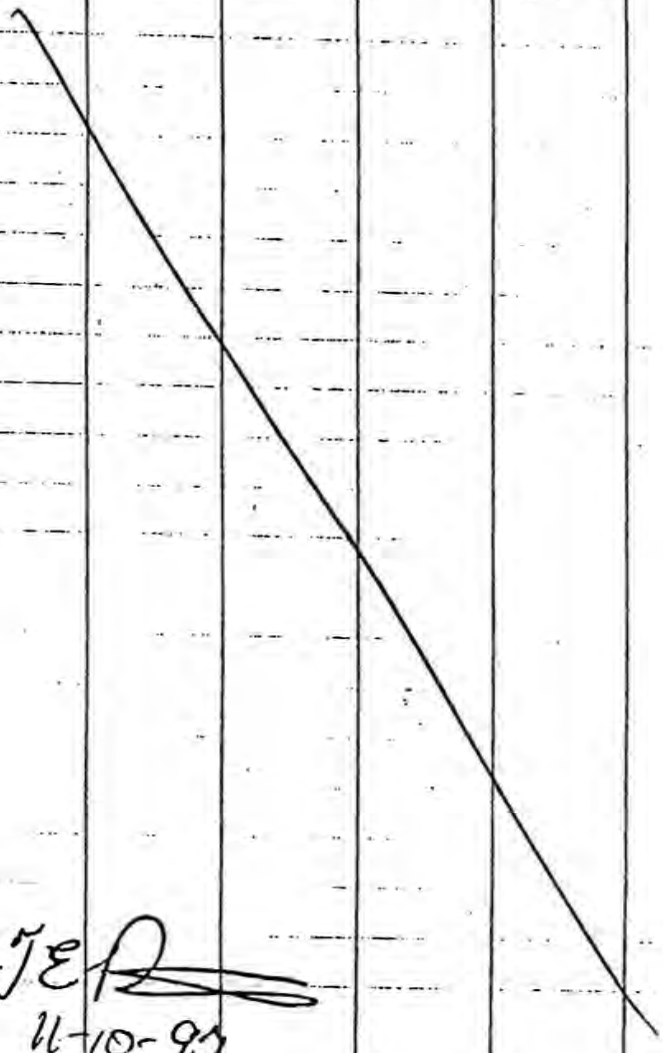
1510 finished work & Scanning out machinery. Released Howard Johnsons Trucks. No Problem

1615 : Sunshine for Area 8. NOV 12, 724096

JER

10-23-94

11-10-97
0700 morning meeting
working on CF Logbooks for Rad Characterization OU 1 (Logbooks arrived Friday)



JE Powers
11-10-97

11-11-97

0700 MORNING meeting
0830 @ PSC 9 w/ G. Walker
- use 15K or 8K + 8K for cut-off
- 1 sample per Big Area & Aliquot for smaller Areas
- IF 12-15K (Grey Area) a single Grab sample.

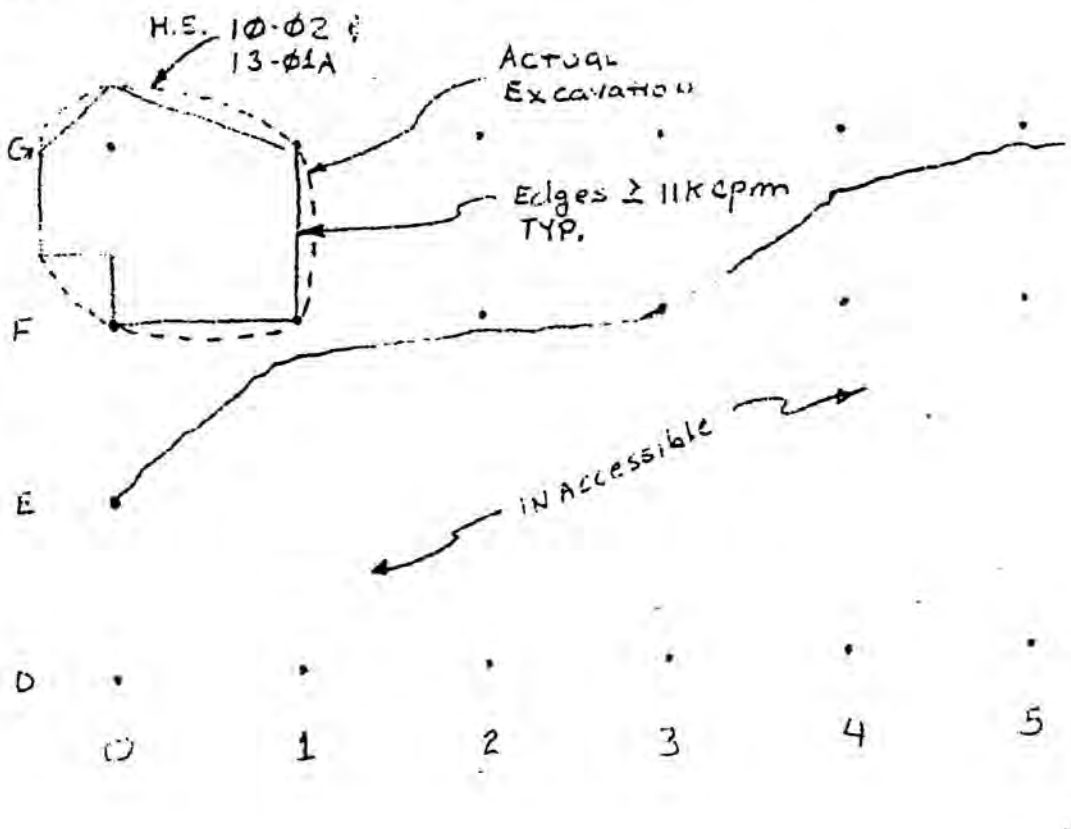
Bkg
1 - 7658
2 - 6127
3 - 6230
4 - 6668
5 - 6484
6 - 6790
7 - 5088
42035

6005
7 | 42035
42
003

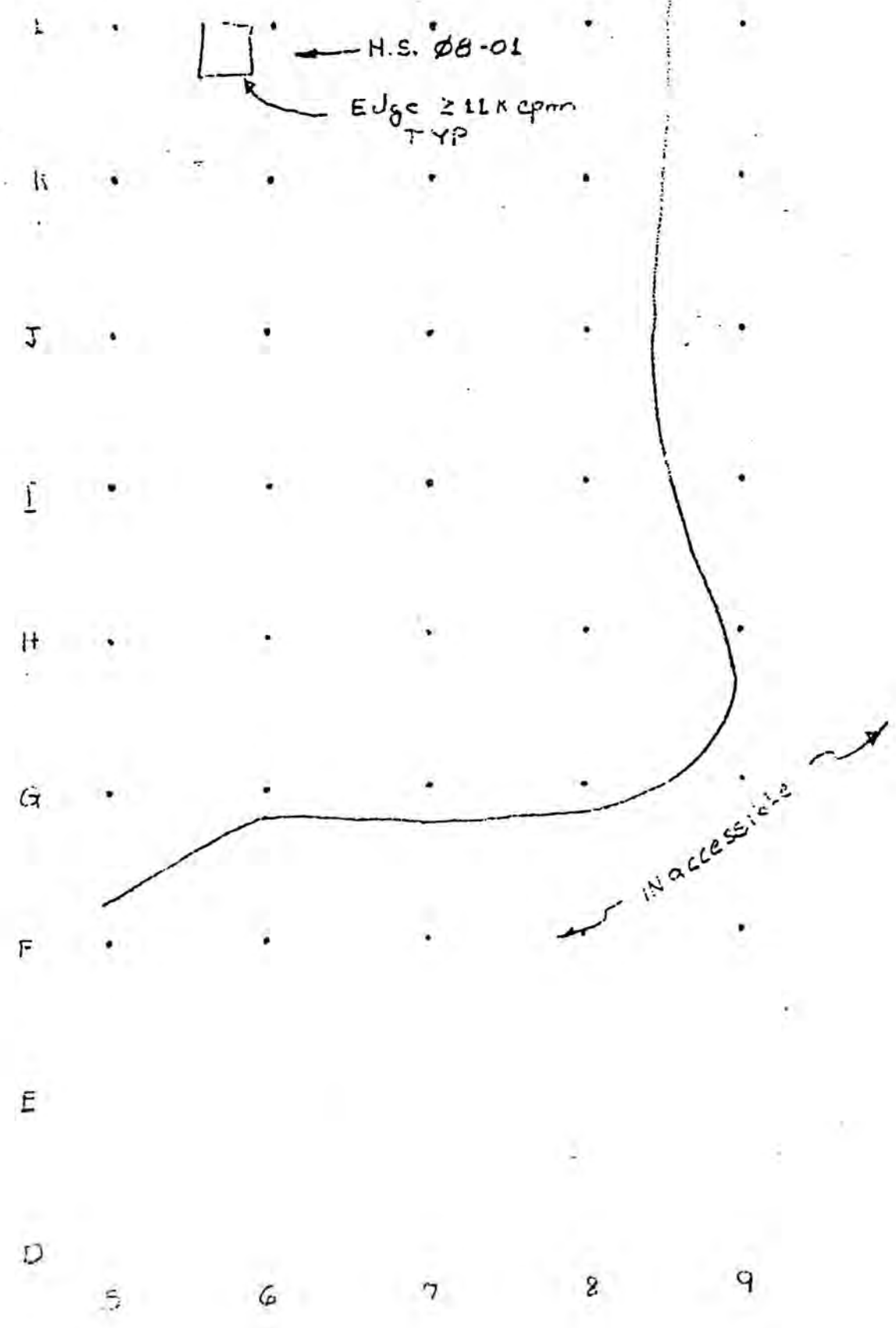
6005
8000
14,005

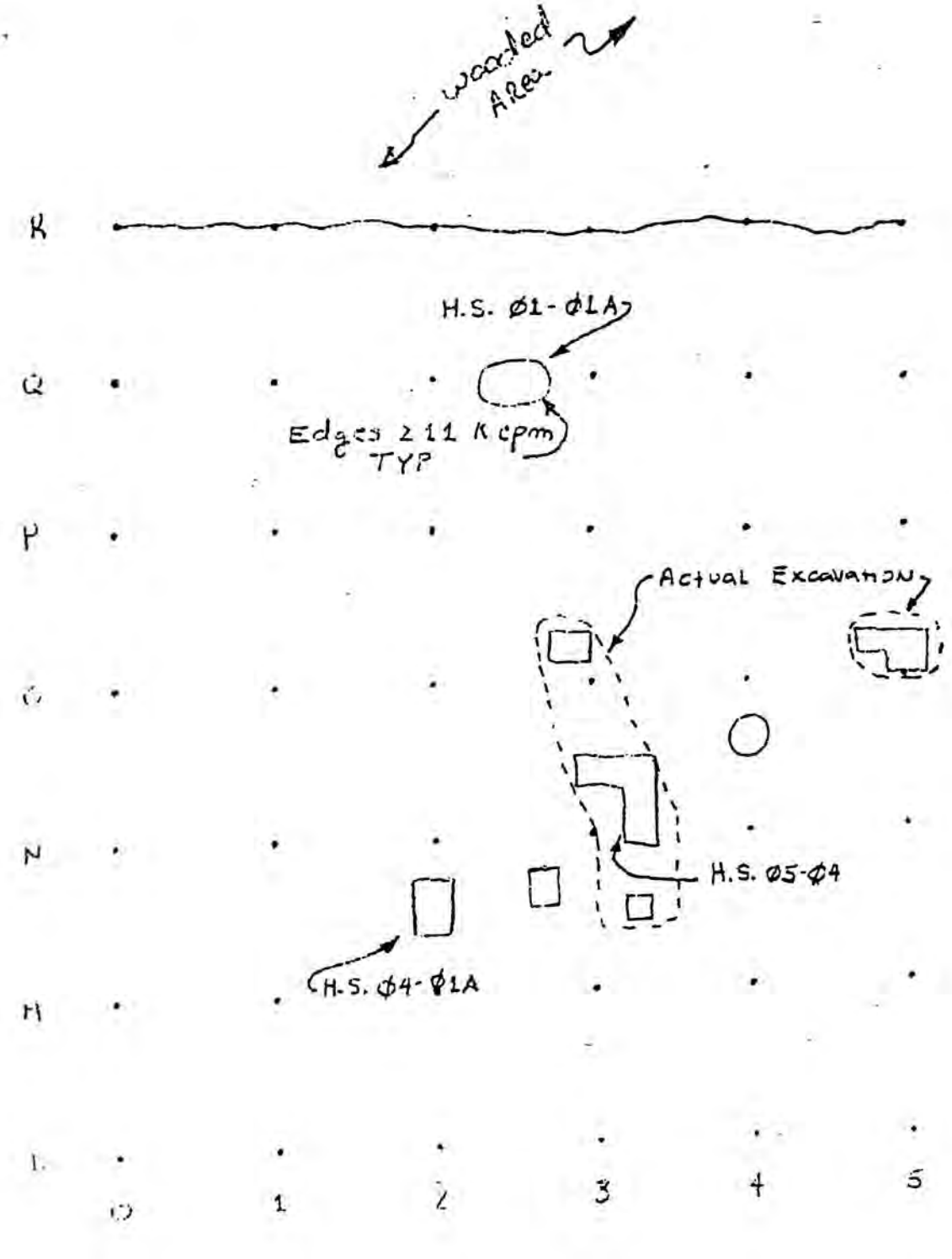
JE Powers
11-11-97

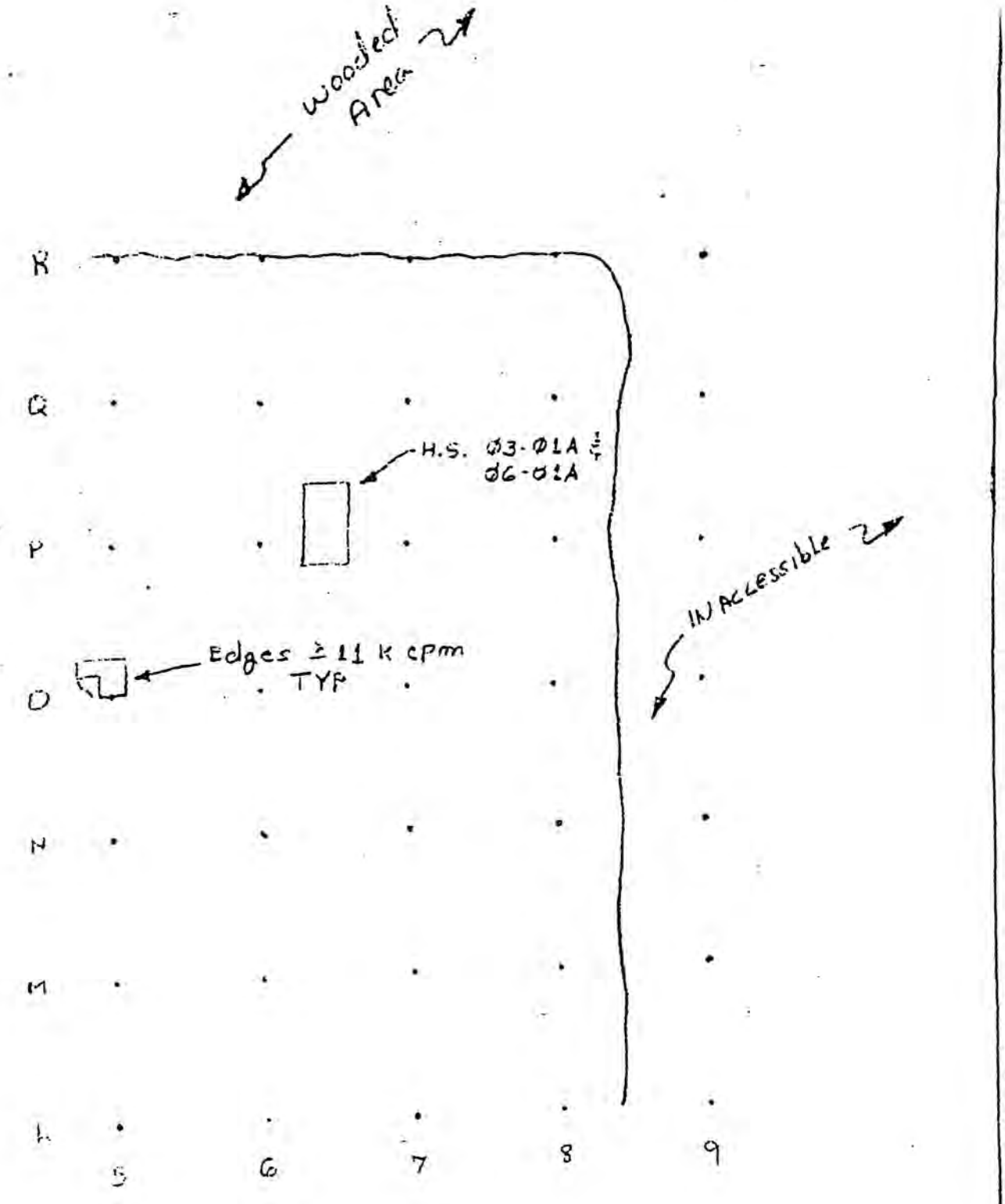
- Actual Excavation followed the 11 Kcpm lines unless otherwise noted.
- If Area not noted as a Previously Located Hot Spot H.S., found during walkover on 10-21-97.



1 of 4


H.S. Ø8-01
Edge ≥ 11K cpm
TYP
INaccessible
K
J
I
H
G
F
E
D
5
6
7
8
9


Wooded Area
R
H.S. Ø1-Ø1A
Q
Edges ≥ 11 Kcpm TYP
P
Actual Excavation
O
N
H.S. Ø5-Ø4
H.S. Ø4-Ø1A
M
L
0
1
2
3
4
5


Wooded Area
R
Q
P
O
N
M
L
H.S. Ø3-Ø1A
Ø6-Ø1A
Edges ± 11 K cpm
TYP
Inaccessible
5
6
7
8
9

11-17-97

0700 morning meeting.
0830 - 1200 Sampling Area 8 + Associated documentation
1250 @ Psc 9.

Bkg	1	4468
	2	5255
	3	5786
	4	5588
	5	7645
	6	6109
	7	5926
Total		40,777
Avg		5,825.3 cpm

Recap 8 Sampled Psc 9, Rak from Psc 15.
GTI @ 880.

JER
11-17-97

11-18-97

(111)

0700 morning meeting.
0715 Response checking 44-10,

Grid Point	Grnd	1'	3'
H1	4010	4590	4889
—	3948	4448	4846
—	4036	4502	4834
GH/1-2	6714	6624	6324
—	6704	6714	6249
—	6864	6755	6617
GH/0-1	6715	6586	6605
—	6743	6889	6692
—	6851	6843	6570
H Φ	6895	6663	6448
—	7107	6647	6423
—	7036	6482	6391
HI/Φ-1	6680	6227	6207
—	6665	6234	6329
—	6627	6254	6150
I Φ	6711	6490	6177
—	6746	6544	6007
—	6535	6399	6282
IJ/Φ-1	6421	6537	6201
—	6592	6563	6303
—	6492	6381	6200

JER 11-18-97

GRID Point	GRND	1'	3'
I 1	6977	6928	6894
–	6958	6854	6408
–	7180	7038	6662
~~GH/1-3 6ft~~	—	—	—
MH L 5	6904	6554	6117
0 LM ~~/5-6~~ –	6857	6616	6139
11-18-97 –	6900	6490	6255
LM/5-6	5760	5788	5476
–	5578	5813	5548
–	5755	5826	5975 ~~6ft~~ 5984
LG	6675	6177	~~5980~~ 5984
–	6771	6197	~~6113~~ 6020
–	6652	5980	6066
KL/6-7	6208	6170	~~6075~~ 5828
–	6139	6009	5774
–	6260	6075	5868
KL/5-6	6476	6099	6008
–	6254	6285	5895
–	6154	6105	5919
KG	5939	5815	5826
–	5963	5718	5725
–	6071	5772	5770
K5	6217	6179	6009
–	6283	6164	6037
–	6147	6154	5962

JE Rowe 11-18-97

GRID Point	GRND	1'	3'
P6	7141	6788	6413
–	7030	6604	6453
–	7064	6571	6489
P7	8182	6583	6519
–	8197	6762	6395
–	8149	6675	6372
Q6	7123	7094	6989
–	7011	7148	7158
–	7171	7019	6976
Q7	7085	6872	6510
–	7231	6854	6653
–	7066	6980	6458
PQ/6-7	7373	7301	7165
–	7124	7387	7298
–	7162	7471	7319
PQ/7-8	7040	6466	6396
–	6948	6523	6344
–	6987	6291	6482
OP/7-8	6329	5956	5920
–	6189	6007	6000
–	6399	5998	5885
OP/6-7	7599	6826	6381
–	7502	6868	6284
–	7443	6853	6191

JE Rowe 11-18-97

GRND POINT	REPEAT	GRND	1'	3'
M6 L6		6730	6156	5752
REPEAT		6450	6084	5829
LM		6555	6044	5814
M/5-6		5698	5578	5327
—		5591	5526	5488
REPEAT—		5643	5612	5593
L5		6754	6587	6039
REPEAT		6702	6430	6195
ML/5-6		6813	6461	6134
ML/5-6		6876	6331	5931
—		6828	6382	5911
—		6705	6321	5776

JE Rood 11-18-97

11-19-97

0700 morning meeting.
0830 @ PSO, hauling soils

GRID POINT	GRND	1'	3'
P5	7766	7516	7431
—	7788	7561	7210
—	7881	7437	7414
O5	6619	6325	6447
—	6459	6351	6647
—	6245	6233	6446
PO/5-6	7414	7398	6944
—	7380	7136	7086
—	7562	7132	7083
PO/4-5	7459	7423	7326
—	7768	7440	7469
—	7890	7407	7167
Q2	7444	7428	6872
—	7560	7257	7013
—	7630	7551	7007
Q3	7033	6876	6745
—	6866	6849	6821
—	6915	6946	6946
QP/23	6947	6968	6443
—	7143	6834	6068
—	6807	6890	6357

JE Rood 11-19-97

GRID Point	Grnd	1'	3'
QR/2-0	5589	6011	5888
–	5454	6013	5940
–	5538	6037	5930
P4	6666	6837	6647
–	6720	6873	6799
–	6605	6768	6634
P3	6581	6753	6274
–	6611	6582	6409
–	6506	6742	6352
P2	6955	6658	6153
IN Rubble	6917	6428	5950
–	6886	6679	6045
O4	7301	7140	7211
–	7254	7069	7069
–	7396	7199	6400
O3	7376	7190	6906
–	7100	7015	6883
–	7507	7329	7107
O2	6264	6520	6276
–	6346	6494	6341
–	6308	6368	6502
N5	7565	6913	6897
–	7351	7059	6822
–	7322	6998	7002

JER 11-19-97

GRID Point	GRND	1'	3'
N4	6470	6223	6284
–	6372	6321	6206
–	6305	6244	6270
N3	7235	6753	6802
–	7241	6798	6792
–	7317	6810	6805
N2	6323	6132	6530
–	6549	6234	6129
–	6315	6261	6111

JER 11-19-97

(119)

RS-112 S/N G023

PIC Readings

Location	Start Time	END Time	Inter.	Averg	MAX	min	S.D.
L 5-6	08:22	08:40	2.0	6.9	8.3	5.6	0.4
P 6-7	09:38	0956	2.0	6.9	8.2	5.7	0.4
OP/5-6 (2m N of O)	0958	1016	2.1	7.1	8.2	6.1	0.4
O/2-3	1018	1036	2.2	7.3	9.0	6.1	0.4
O 4	1038	1056	2.2	7.4	8.6	6.2	0.4
O3	1058	1116	2.3	7.6	9.0	6.5	0.4
O2	1316	1334	2.1	7.1	8.8	6.1	0.4
OP/2-3	1335	1353	2.3	7.3	9.8	6.1	0.4

11-24-97 [signature] 11-24-97

11-24-97

0700 morning meeting. Cold!

0815 @ PSC 4. PIC Readings

GRID POINT	GRND	1'	3'
M-5	6497	6259	5769
–	6518	6156	5639
–	6557	6291	5754
M-4	6300	6431/6292	6332
–	6437	6314/6246	6205
–	6281	6187/6331	6227
M-3	6699	6493	6267
–	6440	6471	6264
–	6531	6416	6340
M 2	7701	7732	7247
–	7801	7512	7306
–	7641	7658	7258
M 1	6254	6341	6288/6216
–	6087	6300	6188/6455
–	6192	6290	6537/6239
MN/5-6	5085	5981	6370
–	5039	6088	6573
–	4848	6072	6310
MN/4-5	7002	6942	6850
–	7031	6762	6807
–	7125	6997	6694

[signature] 11-24-97

(121)

Location	Start Time	END Time	Integer	Average	MAX	MIN	SD
OP/3-4	1533	1551	2.5	7.4	9.0	6.1	0.5
OP/4-5	1355	1613	2.2	7.5	8.7	6.5	0.4
OP/5-6	1615	1633	2.3	7.6	9.1	6.2	0.4
~~NP/5-6~~							
NP/4-5							

JE Root 11-24-97

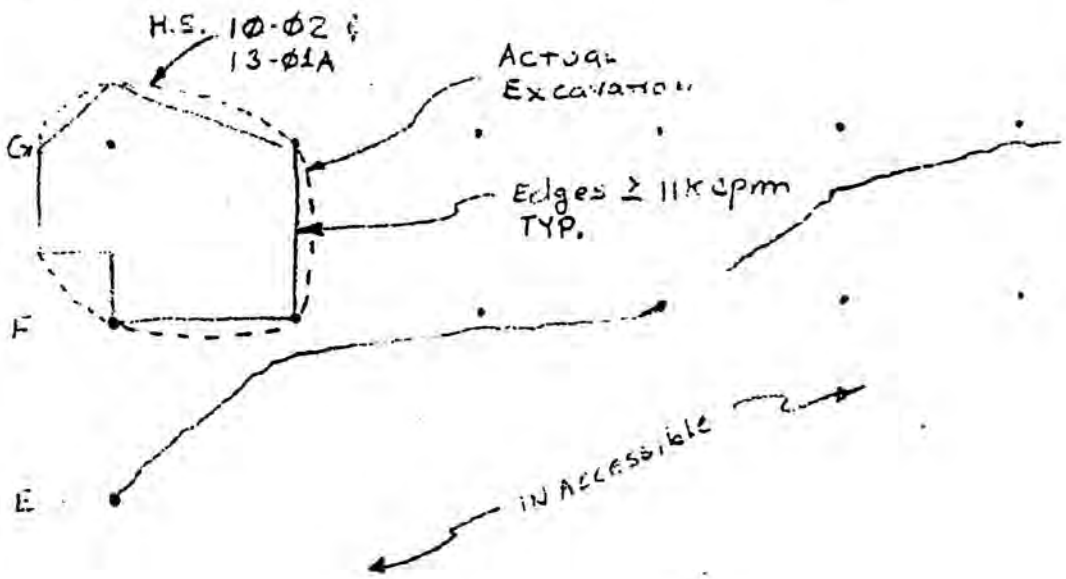
Grid Point	Grnd	1'	3'
MN/3-4	6775	6769	6600
-	6767	6764	6493
-	6903	6702	6591
MN/2-3	7287	7303	7023
-	7341	7181	6913
-	7476	7308	7073
MN/1-2	6514	6486	6462
-	6673	6550	6200
o -	6547	6592	6379
NP/2-3	6595	6896	6916
-	6683	6893	6873
o -	6632	6707	6878
NP/3-4	6603	6736	6694
-	6836	6851	6511
o -	6837	6650	6608
NP/4-5	7391	7145	6954
-	7521	7030	6718
-	7553	7080	6682
NP/5-6			
-			
-			

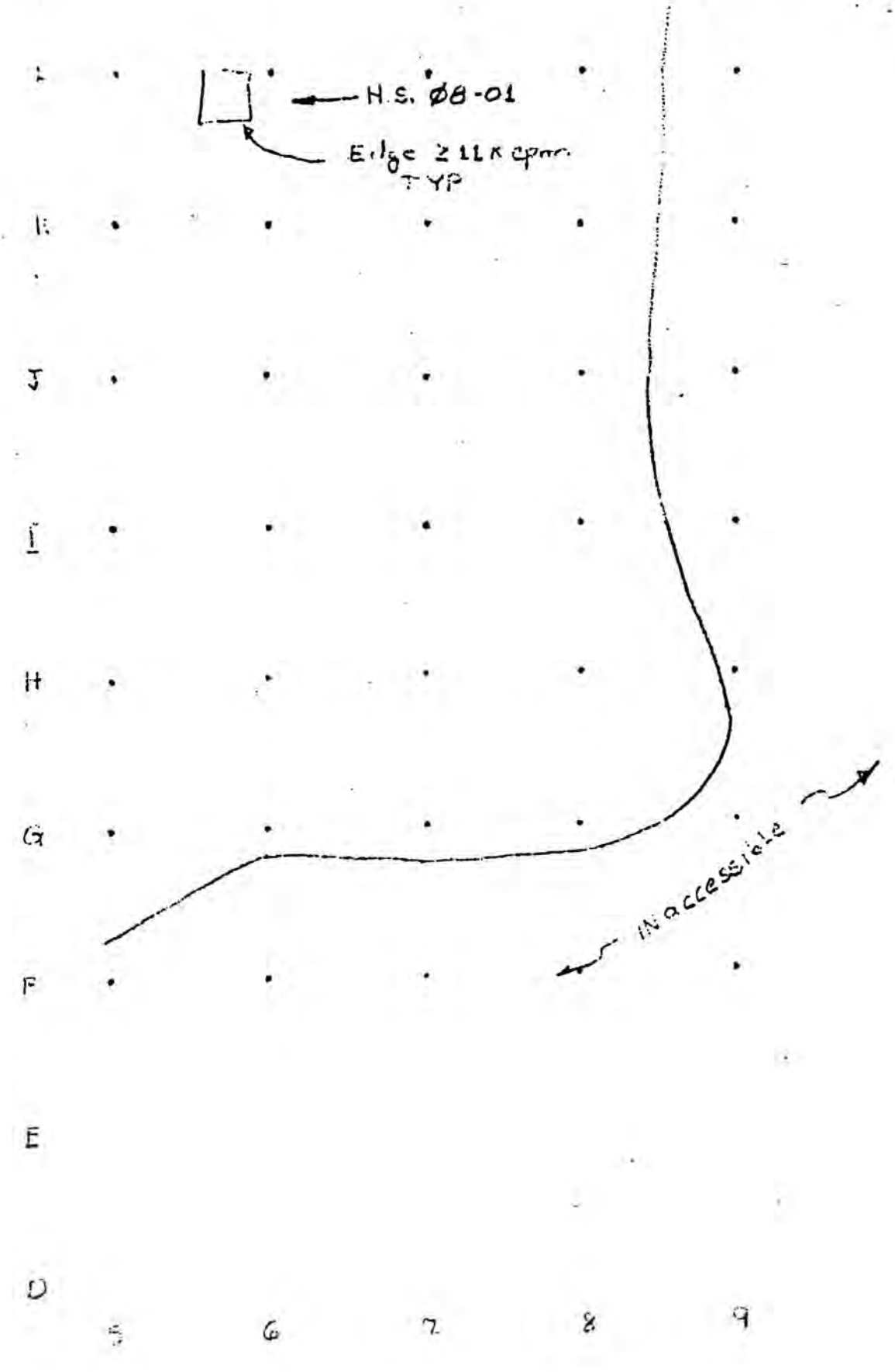
JE Root 11-24-97

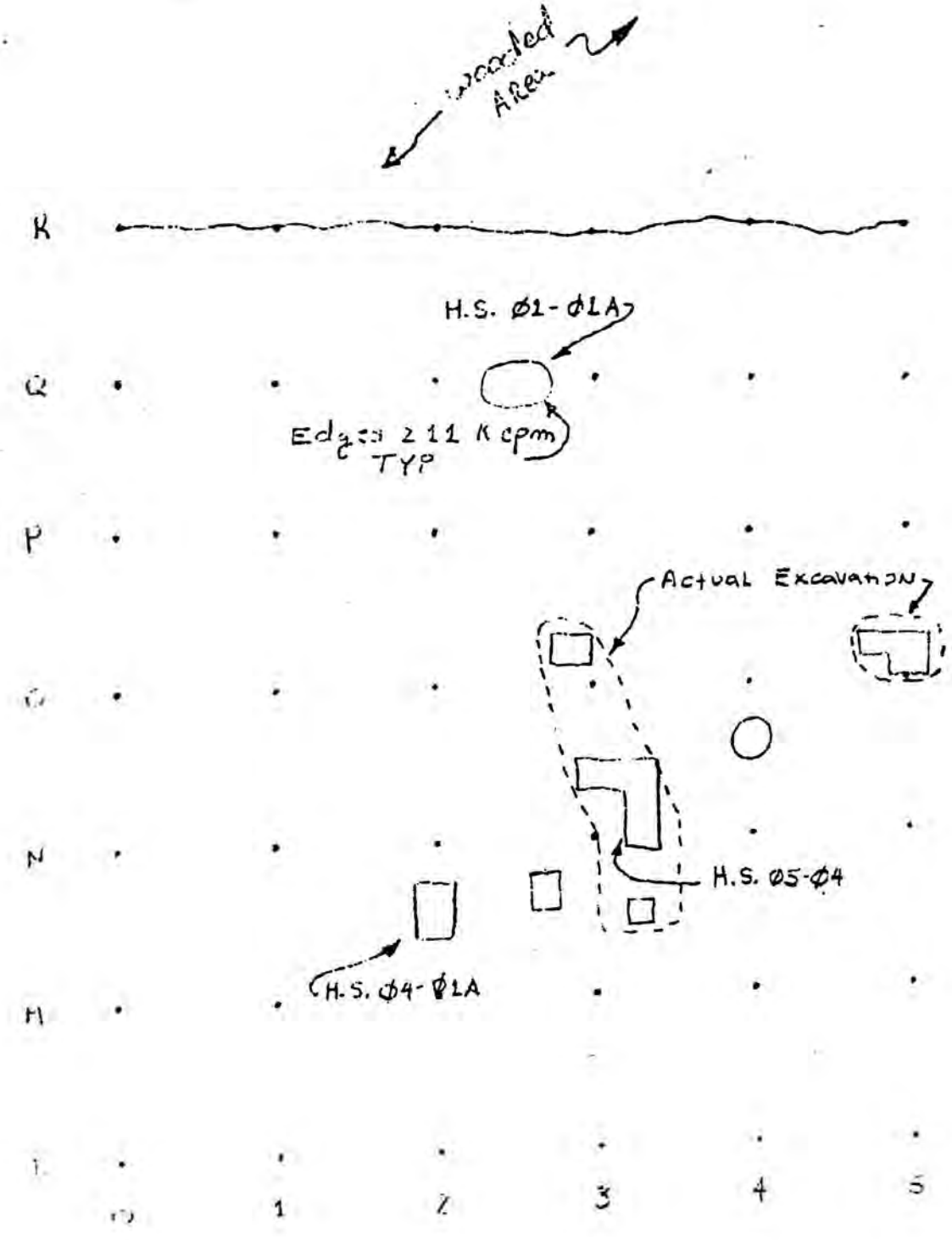
APPENDIX B

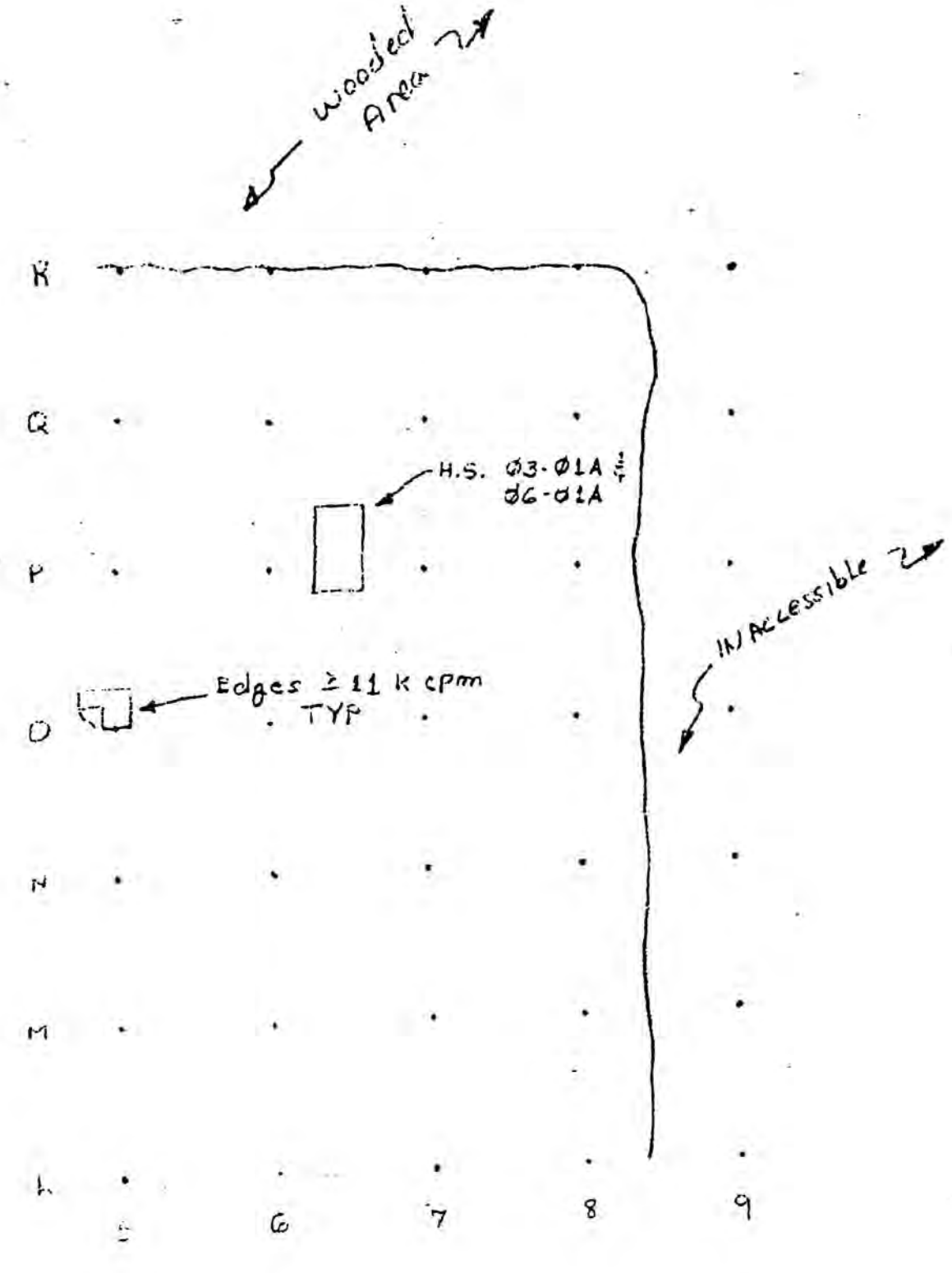
DOSE RATE MEASUREMENTS

- Actual Excavation followed the 11 Kcpm lines unless otherwise noted.
- If Area not noted as a Previously Located Hot Spot H.S., found during walkover on 10-21-97.




H.S. Ø8-01
Edge 211K cpm
TYP
INaccessible
I
H
G
F
E
D
5
6
7
8
9


Wooded Area
R
H.S. Ø1-Ø1A
Q
Edges ≥ 11 K cpm TYP
P
Actual Excavation
N
H.S. Ø5-Ø4
H.S. Ø4-Ø1A
M
L
1
2
3
4
5


Wooded Area
K
Q
H.S. Ø3-Ø1A
Ø6-Ø1A
P
Inaccessible
Edges ≥ 11 k cpm
TYP
O
N
M
L
6
7
8
9

(119)

11-24-97 PIC Readings

RS-112 S/N G023

Location	Start Time	END Time	Inter.	Averg	MAX	MIN	S.D.
L 5-6	08:22	08:40	2.0	6.9	8.3	5.6	0.4
P 6-7	09 38	0956	2.0	6.9	8.2	5.7	0.4
OP/5 [illegible] (2m N of O)	0958	1016	2.1	7.1	8.2	6.1	0.4
Q/2-3	1018	1036	2.2	7.3	9.0	6.1	0.4
O 4	1038	1056	2.2	7.4	8.6	6.2	0.4
O3	1058	1116	2.3	7.6	9.0	6.5	0.4
O2	1316	1334	2.1	7.1	8.8	6.1	0.4
OP/2-3	1335	1353	2.3	7.3	9.8	6.1	0.4

JER 11-24-97

BEFORE BACKFILL

11-24-97

0700 morning meeting, Cold!

0815 @ PSC 4. PIC Readings

GRID POINT	GRND	1'	3'
M-5	6497	6259	5769
–	6518	6156	5639
–	6557	6291	5754
M-4	6300	6431/6292	6332
–	6437	6314/6246	6205
–	6281	6187/6331	6227
M-3	6699	6493	6267
–	6440	6471	6264
–	6531	6416	6340
M 2	7701	7732	7247
–	7801	7512	7306
–	7641	7658	7258
M 1	6254	6341	6288/6216
–	6087	6300	6188/6455
–	6192	6290	6537/6239
MN/5-6	5085	5981	6370
–	5039	6088	6573
–	4840	6072	6310
MN/4-5	7002	6942	6850
–	7031	6762	6807
–	7125	6997	6694

JER 11-24-97

GRND POINT	GRND	1'	3'
MN/3-4	6445	6769	6600
–	6767	6764	6493
–	6903	6702	6591
MN/2-3	7287	7303	7023
–	7341	7181	6913
–	7476	7308	7073
MN/1-2	6514	6486	6462
–	6673	6550	6200
–	6547	6592	6379
NP/2-3	6595	6896	6916
–	6683	6893	6873
–	6632	6707	6878
NP/3-4	6603	6736	6694
–	6836	6851	6511
–	6837	6650	6608
NP/4-5	7391	7145	6654
–	7521	7030	6718
–	7553	7080	6682
NP/5-6			
–			
–			

JE Root 11-24-97

BEFORE BACKFILL

Location	Start Time	END Time	Integer	Average	MAX	MIN	SD
OP/3-4	1533	1551	2.5	7.4	9.0	6.1	0.5
OP/4-5	1355	1613	2.2	7.5	8.7	6.5	0.4
OP/5-6	1615	1633	2.3	7.6	9.1	6.2	0.4
~~NP/5-6~~							
NP/4-5							

JE Root 11-24-97

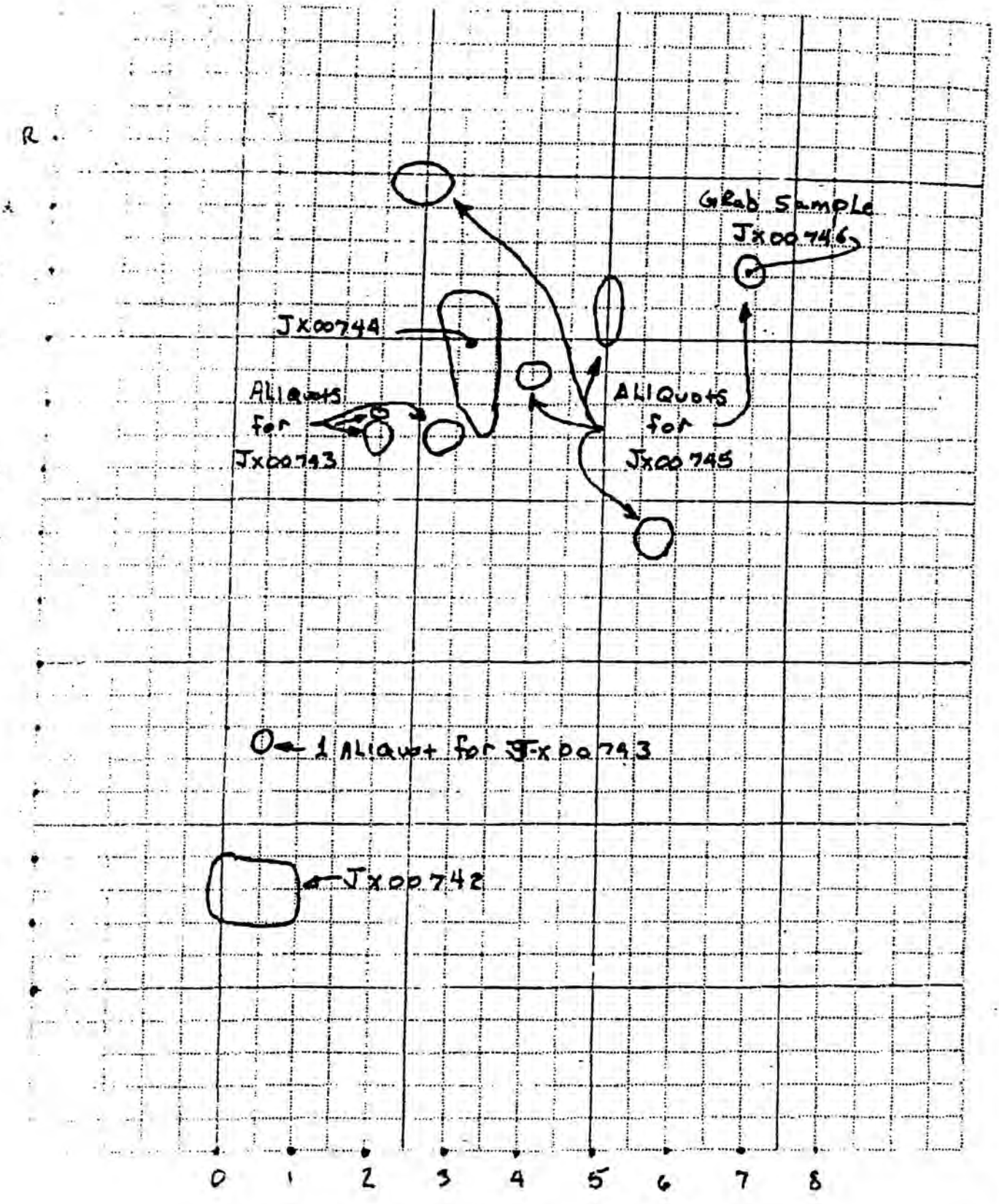
After Backfill

(11) Location	Start Time	END Time	Integer	Average	max	min	STD DEV
F-G/0-1	09:05	09:23	2.1	7.1	8.5	5.7	0.4
G/0-1	09:24	09:42	2.2	7.0	8.7	6.0	0.4
G Ø	09:44	1002	2.1	7.1	8.7	5.8	0.5
5'sof H, 15'wof 1	10:04	10:22	2.1	7.0	9.6	5.7	0.5
L/5-6	10:24	1042	2.1	7.0	10.3	5.8	0.4
P/15'wofP	10:44	1102	2.1	7.1	8.6	5.8	0.4
OP/15	11:05	11:23	2.1	7.1	8.5	5.8	0.4
3'NofQ/12'E of 2	11:25	11:43	2.2	7.4	9.2	6.3	0.4
OP/3	11:44	1202	2.3	7.6	9.1	6.5	0.4
NO/3-4	12:03	12:21	2.2	7.5	9.0	6.5	0.4
MN/3-4	12:22	12:40	2.2	7.4	9.1	6.3	0.4
MN/2-3	12:41	12:59	2.2	7.5	8.7	6.6	0.4

12-4-97

ATTACHMENT C

SAMPLE RESULTS


R
Grab Sample
JX00746
JX00744
Aliquots
for
JX00743
Aliquots
for
JX00745
0 ← 1 Aliquot for JX00743
JX00742
0
1
2
3
4
5
6
7
8

GENERAL ENGINEERING LABORATORIES

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Client: Bechtel
PO Box 350
Oak Ridge, Tennessee 37831-0350
Contact: Ms. Lori Davenport
Project Description: Cecil Field/JX

cc: BECH00394 Report Date: January 08, 1998 SAMPLE 9-1

Sample ID	: 9-01 JX00 742
Lab ID	: 9712128-01
Matrix	: Soil
Date Collected	: 11/17/97
Date Received	: 12/04/97
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result		DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Radiological												
Evaporative Loss @ 105 C		28.2		1.0	1	wt%	1.0	PCW	12/16/97	1200	112553	1
Gamma PHA - 20 items												
CESIUM-137	U	0	+/- 0.0164	0.03	0.10	pCi/g	1.0	EJB	12/22/97	2345	112998	2
POTASSIUM-40		10.6	+/- 1.27	0.30	5	pCi/g	1.0					
RADIUM-226		1.4	+/- 0.209	0.05	1	pCi/g	1.0					
RADIUM-228		1.5	+/- 0.256	0.10	1	pCi/g	1.0					
THORIUM-228	J	1.5	+/- 0.201	0.04	5	pCi/g	1.0					
THORIUM-230	J	1.4	+/- 0.209	0.05	5	pCi/g	1.0					
THORIUM-232	J	1.5	+/- 0.194	0.04	5	pCi/g	1.0					
THORIUM-234	J	1.4	+/- 0.528	0.40	15	pCi/g	1.0					
URANIUM-235	U	0.20	+/- 0.0771	0.20	5	pCi/g	1.0					
URANIUM-238	J	1.4	+/- 0.528	0.40	15	pCi/g	1.0					

M = Method	Method-Description
M 1	GL-OA-E-020
M 2	HASL 300

Notes:
The qualifiers in this report are defined as follows:
J indicates presence of analyte between DL (Detect Limit) and RL (Report Limit)
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.

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9712128-01 1052-A

GENERAL ENGINEERING LABORATORIES
Meeting today's needs with a vision for tomorrow.

Client: Bechtel
PO Box 350
Oak Ridge, Tennessee 37831-0350
Contact: Ms. Lori Davenport
Project Description: Cecil Field/JX

cc: BECH00394 Report Date: January 08, 1998

Sample ID : 9-01 JX00 742

M = Method	Method-Description

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Valerie Davis at (803) 769-7391.

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9712128-01

0003-B

GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

Client: Bechtel
PO Box 350
Oak Ridge, Tennessee 37831-0350
Contact: Ms. Lori Davenport
Project Description: Cecil Field/JX

cc: BECH00394 Report Date: January 08, 1998

Sample ID	: 9-02 JX00 743
Lab ID	: 9712128-02
Matrix	: Soil
Date Collected	: 11/17/97
Date Received	: 12/04/97
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result		DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Radiological												
Evaporative Loss @ 105 C		24.9		1.0	1	wt%	1.0	PCW	12/16/97	1200	112553	1
Gamma PHA - 20 items												
CESIUM-137		0.12	+/- 0.0379	0.04	0.10	pCi/g	1.0	EJB	12/23/97	0826	112998	2
POTASSIUM-40	J	3.8	+/- 0.628	0.30	5	pCi/g	1.0					
RADIUM-226		1.2	+/- 0.175	0.07	1	pCi/g	1.0					
RADIUM-228		1.1	+/- 0.230	0.20	1	pCi/g	1.0					
THORIUM-228	J	1.1	+/- 0.141	0.06	5	pCi/g	1.0					
THORIUM-230	J	1.2	+/- 0.175	0.07	5	pCi/g	1.0					
THORIUM-232	J	1.0	+/- 0.136	0.06	5	pCi/g	1.0					
THORIUM-234	J	1.4	+/- 1.05	1.1	15	pCi/g	1.0					
URANIUM-235	U	0.20	+/- 0.124	0.30	5	pCi/g	1.0					
URANIUM-238	J	1.4	+/- 1.05	1.1	15	pCi/g	1.0					

M = Method	Method-Description
M 1	GL-OA-E-020
M 2	HASL 300

Notes:
The qualifiers in this report are defined as follows:
J indicates presence of analyte between DL (Detect Limit) and RL (Report Limit)
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.

Client: Bechtel
PO Box 350
Oak Ridge, Tennessee 37831-0350
Contact: Ms. Lori Davenport
Project Description: Cecil Field/JX

cc: BECH00394 Report Date: January 08, 1998

Sample ID : 9-02 JX00 743

M = Method	Method-Description

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Client: Bechtel
PO Box 350
Oak Ridge, Tennessee 37831-0350
Contact: Ms. Lori Davenport
Project Description: Cecil Field/JX

cc: BECH00394 Report Date: January 08, 1998

Sample ID	: 9-03 JX00 744
Lab ID	: 9712128-03
Matrix	: Soil
Date Collected	: 11/17/97
Date Received	: 12/04/97
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result		DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Radiological												
Evaporative Loss @ 105 C		25.8		1.0	1	wt%	1.0	PCW	12/16/97	1200	112553	1
Gamma PHA - 20 items												
CESIUM-137		0.13	+/- 0.0326	0.04	0.10	pCi/g	1.0	EJB	12/23/97	0828	112998	2
POTASSIUM-40	J	3.7	+/- 0.619	0.40	5	pCi/g	1.0					
RADIUM-226		1.1	+/- 0.151	0.06	1	pCi/g	1.0					
RADIUM-228	J	0.90	+/- 0.185	0.20	1	pCi/g	1.0					
THORIUM-228	J	1.0	+/- 0.136	0.06	5	pCi/g	1.0					
THORIUM-230	J	1.1	+/- 0.151	0.06	5	pCi/g	1.0					
THORIUM-232	J	0.98	+/- 0.131	0.06	5	pCi/g	1.0					
THORIUM-234	J	1.8	+/- 1.40	1.8	15	pCi/g	1.0					
URANIUM-235	U	0.02	+/- 0.157	0.30	5	pCi/g	1.0					
URANIUM-238	J	1.8	+/- 1.40	1.8	15	pCi/g	1.0					

M = Method	Method-Description
M 1	GL-OA-E-020
M 2	HASL 300

Notes:
The qualifiers in this report are defined as follows:
J indicates presence of analyte between DL (Detect Limit) and RL (Report Limit)
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

reported in mass/mass units is reported as 'dry weight'.

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Client:	Bechtel
	PO Box 350
	Oak Ridge, Tennessee 37831-0350
Contact:	Ms. Lori Davenport
Project Description:	Cecil Field/JX

cc: BECH00394 Report Date: January 08, 1998

Sample ID : 9-03 JX00 744

M = Method	Method-Description

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Client: Bechtel
PO Box 350
Oak Ridge, Tennessee 37831-0350
Contact: Ms. Lori Davenport
Project Description: Cecil Field/JX

cc: BECH00394 Report Date: January 08, 1998

Sample ID	: 9-04 JX00 745
Lab ID	: 9712128-04
Matrix	: Soil
Date Collected	: 11/17/97
Date Received	: 12/04/97
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result		DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Radiological												
Evaporative Loss @ 105 C		21.7		1.0	1	wt%	1.0	PCW	12/16/97	1200	112553	1
Gamma PHA - 20 items												
CESIUM-137	J	0.08	+/- 0.0403	0.04	0.10	pCi/g	1.0	EJB	12/23/97	0854	112998	2
OTASSIUM-40	J	4.2	+/- 0.701	0.40	5	pCi/g	1.0					
RADIUM-226		1.0	+/- 0.155	0.07	1	pCi/g	1.0					
RADIUM-228	J	0.83	+/- 0.213	0.20	1	pCi/g	1.0					
THORIUM-228	J	0.92	+/- 0.126	0.07	5	pCi/g	1.0					
THORIUM-230	J	1.0	+/- 0.155	0.07	5	pCi/g	1.0					
THORIUM-232	J	0.88	+/- 0.121	0.06	5	pCi/g	1.0					
THORIUM-234	U	1.1	+/- 1.17	1.3	15	pCi/g	1.0					
URANIUM-235	U	-.02	+/- 0.120	0.20	5	pCi/g	1.0					
URANIUM-238	U	1.1	+/- 1.17	1.3	15	pCi/g	1.0					

M = Method	Method-Description
M 1	GL-OA-E-020
M 2	HASL 300

Notes:
The qualifiers in this report are defined as follows:
J indicates presence of analyte between DL (Detect Limit) and RL (Report Limit)
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

a orted in mass/mass units is reported as 'dry weight'.

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9712128-04

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Meeting today's needs with a vision for tomorrow.

Client:	Bechtel
	PO Box 350
	Oak Ridge, Tennessee 37831-0350
Contact:	Ms. Lori Davenport
Project Description:	Cecil Field/JX

cc: BECH00394 Report Date: January 08, 1998

Sample ID : 9-04 JX00.745

M = Method	Method-Description

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GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

Client: Bechtel
PO Box 350
Oak Ridge, Tennessee 37831-0350
Contact: Ms. Lori Davenport
Project Description: Cecil Field/JX

cc: BECH00394 Report Date: January 08, 1998

Sample ID	: 9-05 JX00 746
Lab ID	: 9712128-05
Matrix	: Soil
Date Collected	: 11/17/97
Date Received	: 12/04/97
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result		DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Radiological												
Evaporative Loss @ 105 C		36.6		1.0	1	wt%	1.0	PCW	12/16/97	1200	112553	1
Gamma PHA - 20 items												
CESIUM-137	U	-.02	+/- 0.0225	0.04	0.10	pCi/g	1.0	EJB	12/23/97	1104	112998	2
POTASSIUM-40		12.0	+/- 1.54	0.40	5	pCi/g	1.0					
RADIUM-226		1.2	+/- 0.196	0.08	1	pCi/g	1.0					
RADIUM-228		1.2	+/- 0.282	0.20	1	pCi/g	1.0					
THORIUM-228	J	1.6	+/- 0.197	0.07	5	pCi/g	1.0					
THORIUM-230	J	1.2	+/- 0.196	0.08	5	pCi/g	1.0					
THORIUM-232	J	1.5	+/- 0.190	0.07	5	pCi/g	1.0					
THORIUM-234	J	2.6	+/- 1.57	1.2	15	pCi/g	1.0					
URANIUM-235	U	0.09	+/- 0.144	0.30	5	pCi/g	1.0					
URANIUM-238	J	2.6	+/- 1.57	1.2	15	pCi/g	1.0					

M = Method	Method-Description
M 1	GL-OA-E-020
M 2	HASL 300

Notes:
The qualifiers in this report are defined as follows:
J indicates presence of analyte between DL (Detect Limit) and RL (Report Limit)
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

Analyte reported in mass/mass units is reported as 'dry weight'.

GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

Client: Bechtel
PO Box 350
Oak Ridge, Tennessee 37831-0350
Contact: Ms. Lori Davenport
Project Description: Cecil Field/JX

cc: BECH00394 Report Date: January 08, 1998

Sample ID : 9-05 JX00 746

M = Method	Method-Description

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APPENDIX C

SUMMARY OF DETECTIONS IN ANALYTICAL RESULTS

Appendix C-1

Summary of Detections in Surface Soil Analytical Results
TCL Organics and TAL Metals
PSC 9

Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	09B00101		09S00101		09S00102		09S00201		09S00301		09S00401		09S00501		09SBK101	
Sampling Date	7-Aug-97		20-Aug-97		3/30/99		20-Aug-97		20-Aug-97		20-Aug-97		20-Aug-97		3/30/99	
Volatile Organics, ug/kg																
Acetone					NA		35	J	33	J	30	J			NA	
Semivolatile Organics, ug/kg																
Acenaphthene							49	J								
Acenaphthylene			46	J												
Anthracene							120	J								
Benzo(a)anthracene	1400		200	J	600		810		76	J						
Benzo(a)pyrene	1400		590		860		560		85	J						
Benzo(b)fluoranthene	2300		870	J	890		1300		160	J						
Benzo(g,h,i)perylene	860		520		410	J	320	J	89	J						
Benzo(k)fluoranthene	900		780	J	380		1100		140	J						
bis(2-Ethylhexyl)phthalate			130	J	NA		250	J	53	J			90	J		
Carbazole	80	J					82	J								
Chrysene	1600		260	J	590		710		75	J						
Di-n-butylphthalate							82	J					180	J		
Dibenz(a,h)anthracene			120	J			71	J								
Fluoranthene	3200		180	J	1100		1700		68	J						
Fluorene							39	J								
Indeno(1,2,3-cd)pyrene	750	J	440		940		310	J	54	J						
Phenanthrene			81	J			680									
Pyrene	2600	J	330	J	1300	J	1100		130	J						
Pesticides/PCBs, ug/kg																
4,4'-DDD									1.4	J	51				1.2	J
4,4'-DDE	0.71	J	4.6	J	6	J	1.9	J	3.4	J	41		0.77	J	3.7	J
4,4'-DDT			10	J	7.7	J	4.9				41				1.5	J
alpha-Chlordane	0.9	J	5		7.9	J	1.5	J			2					
Aroclor-1254			74	J					26	J			16	J		
Aroclor-1260															4.7	J
delta-BHC							0.47	J			0.31	J				
Dieldrin	11	J			5.3	J					2.7	J			0.37	J
Endosulfan I									1.1	J	1.5	J			4.7	J
Endosulfan sulfate	2.2	J													0.3	J
Endrin											1.5	J				
Endrin aldehyde			1.6	J							0.4	J				
Endrin ketone	7.4		0.39	J			1.3	J								
gamma-Chlordane			5.1		6.8	J	2.4		0.72	J	2.7				2.4	J
Heptachlor			0.3	J											0.27	J
Heptachlor epoxide	0.35	J													0.96	J

Summary of Detections in Surface Soil Analytical Results
TCL Organics and TAL Metals
PSC 9

Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	09B00101	09S00101	09S00102	09S00201	09S00301	09S00401	09S00501	09SBK101
Sampling Date	7-Aug-97	20-Aug-97	3/30/99	20-Aug-97	20-Aug-97	20-Aug-97	20-Aug-97	3/30/99
Inorganics, mg/kg								
Aluminum	2480 J	4030 J	NA	2480 J	2140 J	1890 J	1660 J	NA
Antimony	0.76 J		NA					NA
Arsenic	1.2 J		NA	2.6				NA
Barium	28.4 J	11.4 J	NA	124 J	11.8 J	11.9 J	14.1 J	NA
Beryllium	0.33 J	0.31 J	NA	0.12 J	0.21 J	0.09 J	0.08 J	NA
Cadmium	7.1	0.21 J	NA	2.9	0.3 J	0.71 J	0.29 J	NA
Calcium	35500	2250 J	NA	22000 J	19100 J	20600 J	10300 J	NA
Chromium	35.3	9.9	NA	38.8	8.8	6.8	5.9	NA
Cobalt	2.4 J	1.3 J	NA	1.1 J	0.73 J	0.65 J	0.46 J	NA
Copper	42.4	3.4 J	NA	24.8	3.3 J	5.2 J	6 J	NA
Iron	3830 J	6080 J	NA	12900 J	3610 J	1580 J	1860 J	NA
Lead	182	7.1	NA	181	14.9	33.1	88.4	NA
Magnesium	1350	1230	NA	582 J	597 J	763 J	281 J	NA
Manganese	73.9	34.7	NA	51.3	34.2	29.7	50	NA
Mercury	1.3	0.54		1.6 J	0.17	0.19	0.07 J	
Nickel	45.8	2.8 J	NA	6.6 J	2 J	3.4 J	2 J	NA
Potassium	215 J	547 J	NA	192 J	299 J	123 J	102 J	NA
Selenium			NA	1.2				NA
Silver	1.3 J		NA	6.9	0.68 J	2 J		NA
Sodium	194 J		NA					NA
Vanadium	6.4 J	10.5	NA	14.6	6.2 J	4.7 J	3.9 J	NA
Zinc	151	14.3 J	NA	83.8 J	14.9 J	17.8 J	24.1 J	NA
Radiological, pCi/g								
Gross Alpha	2.49	-0.57	NA	7.44	-0.48	4.06	2.58	NA
Gross Beta	10.97	6.07	NA	12.86	10.11	12.87	10.51	NA

NOTES:

Sample ID = Sample identifier

Sample 09SBK101 is a background surface soil sample taken upgradient of PSC 9.

PCB = Polychlorinated biphenyls

mg/kg = milligrams per kilogram.

ug/kg = micrograms per kilogram.

pCi/g = picocuries per gram

J = Reported concentration is an estimated quantity.

NA = Not analyzed.

Blank space indicates analyte/compound was not detected at the reporting limit.

Appendix C-2

Summary of Detections in Subsurface Soil Analytical Results
TAL Metals and TCL Organics
PSC 9

Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	09B00102	09B00201	09B00202
Sampling Date	8/7/97	8/7/97	8/7/97
Volatile organics, ug/kg			
Acetone			15 J
Semivolatile Organics, ug/kg			
Benzo(a)anthracene		77 J	
Benzo(a)pyrene		140 J	
Benzo(b)fluoranthene		150 J	
Benzo(k)fluoranthene		59 J	
Chrysene		99 J	
Pesticides/PCBs, ug/kg			
4,4'-DDD		0.71 J	
4,4'-DDT			0.58 J
Aldrin			0.26 J
Aroclor-1254	11 J	36 J	
Dieldrin			0.94 J
Endosulfan sulfate		1.5 J	
Endrin			0.67 J
gamma-BHC (Lindane)			0.19 J
Heptachlor		0.45 J	0.3 J
Inorganics, mg/kg			
Aluminum	4110 J	1810 J	1120 J
Antimony		1.2 J	
Arsenic	3.2	1.7 J	1.5 J
Barium	21.9 J	16.1 J	6.5 J
Beryllium	0.7 J		
Cadmium		0.56 J	
Calcium	5570	58000	1840
Chromium	9.9	366	5.3
Cobalt	2.6 J	1 J	0.41 J
Copper	3.5 J	9.4	1.5 J
Iron	7620 J	12800 J	2420 J
Lead	11.6	18.3	3.4
Magnesium	1400	878 J	326 J
Manganese	75.7	107	20.4
Nickel	4.5 J	15.5	17.2
Potassium	814 J	163 J	132 J
Sodium	593 J	165 J	185 J
Vanadium	9.7 J	30.5	3.3 J
Zinc	19	14.9	8.8
Radiological, pCi/g			
Gross Alpha	18.79	2.45	-2.94
Gross Beta	15.31	5.76	5.04

NOTES:

Sample ID = Sample identifier

PCB = Polychlorinated biphenyls

mg/kg = milligrams per kilogram.

ug/kg = micrograms per kilogram.

pCi/g = picocuries per gram

J = Reported concentration is an estimated quantity.

Blank space indicates analyte/compound was not detected at the reporting limit.

Appendix C-3

Summary of Detections in Groundwater Analytical Results
TAL Metals and TCL Organics
PSC 9

Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	09G00101	09G00201	09G00301
Sampling Date	7/10/97	7/10/97	7/10/97
Volatile organics, ug/L			
Methylene chloride			21
Pesticides/PCBs, ug/L			
Dieldrin	0.09 J	0.005 J	
Inorganics, ug/L			
Aluminum	80.1 J	448	152 J
Antimony	8.2 J		49.7 J
Arsenic	7.3 J	5.2 J	6.2 J
Barium	49.3 J	82.9 J	57.8 J
Cadmium	0.4 J		2.1 J
Calcium	118000	194000	146000
Chromium	1.5 J	4.2 J	23.1
Cobalt	1.3 J		
Copper	11.2 J	7 J	49.4
Iron	247	12400	132
Lead	1.7 J	1.8 J	22.8
Magnesium	7140	13800	9270
Manganese	92.2	229	6.5 J
Nickel	5.1 J	3.7 J	32 J
Potassium	12500 J	4890 J	6510 J
Sodium	10700	12200	20000
Vanadium	4.8 J	2.4 J	8.4 J
Zinc	29.7 J	49.5 J	220 J
Radiological, pCi/L			
Gross Alpha	7.41	2.79	3.39
Gross Beta	19.53	8.79	10.04

NOTES:

Sample ID = Sample identifier
PCB = Polychlorinated biphenyls
J = Reported concentration is an estimated quantity.
ug/L = micrograms per liter.
pCi/l = picocuries per liter.
Blank space indicates analyte/compound was not detected at the reporting limit.

Appendix C-4

Summary of Detections in Surface Water Analytical Results
TAL Metals and TCL Organics
PSC 9

Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	09W00101		09W00301	
Sampling Date	8/21/97		3/29/99	
Semivolatile Organics, ug/L				
Di-n-butylphthalate	2	J	NA	
Pesticides/PCBs, ug/L				
Aldrin	0.01	J		
Aroclor-1254	1.6			
alpha-BHC			0.0022	J
beta-BHC			0.0061	J
Heptachlor			0.0019	J
Inorganics, ug/L				
Aluminum	2820		NA	
Barium	19	J	NA	
Calcium	31700		NA	
Chromium	9.6	J	NA	
Cobalt	1.1	J	NA	
Iron	2610		NA	
Magnesium	14500		NA	
Manganese	54.1		NA	
Nickel	2.8	J	NA	
Potassium	4590	J	NA	
Sodium	85400		NA	
Vanadium	7.9	J	NA	
Zinc	20	J	NA	
Radiological, pCi/L				
Gross Alpha	2.01		NA	
Gross Beta	5.13		NA	

NOTES:

Sample ID = Sample identifier
PCB = Polychlorinated biphenyls
J = Reported concentration is an estimated quantity.
ug/L = micrograms per liter.
pCi/L = picocuries per liter.
NA = Not analyzed.
Blank space indicates analyte/compound was not detected at the reporting limit.

Appendix C-5

Summary of Detections in Sediment Analytical Results
TAL Metals and TCL Organics
PSC 9

Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	09D00101	
Sampling Date	8/21/97	
Pesticides, ug/kg		
Dieldrin	0.83	J
Endrin	0.66	J
Heptachlor	0.46	J
Inorganics, mg/kg		
Aluminum	6810	J
Barium	19.2	J
Beryllium	0.54	J
Cadmium	0.35	J
Calcium	3780	J
Chromium	16.6	
Cobalt	2.2	J
Copper	5.5	J
Iron	10300	J
Lead	11.9	
Magnesium	2090	
Manganese	58.6	
Nickel	4.6	J
Potassium	923	J
Vanadium	17.8	
Zinc	23	J
Radiological, pCi/g		
Gross Alpha	14.26	
Gross Beta	11.04	

NOTES:

Sample ID = Sample identifier

mg/kg = milligrams per kilogram.

ug/kg = micrograms per kilogram.

pCi/g = picocuries per gram

J = Reported concentration is an estimated quantity.

Blank space indicates analyte/compound was not detected at the reporting limit.

APPENDIX D

VALIDATED ANALYTICAL DATA SHEETS

Appendix D-1

Summary of Surface Soil Analytical Results
TAL Metals and TCL Organics
PSC 9

Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	09B00101	09S00101	09S00102	09S00201	09S00301	09S00401	09S00501	09SBK101
Sampling Date	8/7/97	8/20/97	3/30/99	8/20/97	8/20/97	8/20/97	8/20/97	3/30/99
Volatile organics, ug/kg								
1,1,1-Trichloroethane	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
1,1,2,2-Tetrachloroethane	11 UJ	11 U	NA	11 U	11 U	12 U	12 U	NA
1,1,2-Trichloroethane	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
1,1-Dichloroethane	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
1,1-Dichloroethene	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
1,2-Dichloroethane	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
1,2-Dichloroethene (total)	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
1,2-Dichloropropane	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
2-Butanone	11 UJ	11 UJ	NA	11 UJ	11 UJ	12 UJ	12 UJ	NA
2-Hexanone	11 UJ	11 UJ	NA	11 UJ	11 UJ	12 UJ	12 UJ	NA
4-Methyl-2-pentanone	11 U	11 UJ	NA	11 UJ	11 UJ	12 UJ	12 UJ	NA
Acetone	11 UJ	11 UJ	NA	35 J	33 J	30 J	12 UJ	NA
Benzene	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
Bromodichloromethane	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
Bromoform	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
Bromomethane	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
Carbon disulfide	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
Carbon tetrachloride	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
Chlorobenzene	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
Chloroethane	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
Chloroform	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
Chloromethane	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
cis-1,3-Dichloropropene	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
Dibromochloromethane	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
Ethylbenzene	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
Methylene chloride	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
Styrene	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
Tetrachloroethene	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
Toluene	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
trans-1,3-Dichloropropene	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
Trichloroethene	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
Vinyl chloride	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
Xylene (total)	11 U	11 U	NA	11 U	11 U	12 U	12 U	NA
Semivolatile organics, ug/kg								
1-Methylnaphthalene	NA	NA	710 U	NA	NA	NA	NA	390 U

Appendix D-1

Summary of Surface Soil Analytical Results
TAL Metals and TCL Organics
PSC 9

Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	09B00101	09S00101	09S00102	09S00201	09S00301	09S00401	09S00501	09SBK101
Sampling Date	8/7/97	8/20/97	3/30/99	8/20/97	8/20/97	8/20/97	8/20/97	3/30/99
2-Methylnaphthalene	NA	NA	710 U	NA	NA	NA	NA	390 U
1,2,4-Trichlorobenzene	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
1,2-Dichlorobenzene	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
1,3-Dichlorobenzene	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
1,4-Dichlorobenzene	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
2,2'-oxybis(1-Chloropropane)	760 UJ	360 U	NA	350 U	380 U	390 U	410 U	NA
2,4,5-Trichlorophenol	1900 U	900 U	NA	880 U	950 U	980 U	1000 U	NA
2,4,6-Trichlorophenol	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
2,4-Dichlorophenol	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
2,4-Dimethylphenol	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
2,4-Dinitrophenol	1900 UJ	900 U	NA	880 U	950 U	980 U	1000 U	NA
2,4-Dinitrotoluene	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
2,6-Dinitrotoluene	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
2-Chloronaphthalene	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
2-Chlorophenol	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
2-Methylnaphthalene	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
2-Methylphenol	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
2-Nitroaniline	1900 U	900 U	NA	880 U	950 U	980 U	1000 U	NA
2-Nitrophenol	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
3,3'-Dichlorobenzidine	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
3-Nitroaniline	1900 U	900 U	NA	880 U	950 U	980 U	1000 U	NA
4,6-Dinitro-2-methylphenol	1900 U	900 U	NA	880 U	950 U	980 U	1000 U	NA
4-Bromophenyl-phenylether	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
4-Chloro-3-methylphenol	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
4-Chloroaniline	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
4-Chlorophenyl-phenylether	760 U	360 UJ	NA	350 UJ	380 UJ	390 UJ	410 UJ	NA
4-Methylphenol	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
4-Nitroaniline	1900 UJ	900 U	NA	880 U	950 U	980 U	1000 U	NA
4-Nitrophenol	1900 UJ	900 U	NA	880 U	950 U	980 U	1000 U	NA
Acenaphthene	760 U	360 U	710 U	49 J	380 U	390 U	410 U	390 U
Acenaphthylene	760 U	46 J	710 U	350 U	380 U	390 U	410 U	390 U
Anthracene	760 U	360 U	110 U	120 J	380 U	390 U	410 U	60 U
Benzo(a)anthracene	1400	200 J	600	810	76 J	390 U	410 U	60 U
Benzo(a)pyrene	1400	590	860	560	85 J	390 U	410 U	60 U
Benzo(b)fluoranthene	2300	870	890	1300	160 J	390 U	410 U	60 U
Benzo(g,h,i)perylene	860	520	410 J	320 J	89 J	390 U	410 U	60 U

Appendix D-1

Summary of Surface Soil Analytical Results
TAL Metals and TCL Organics
PSC 9

Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	09B00101	09S00101	09S00102	09S00201	09S00301	09S00401	09S00501	09SBK101
Sampling Date	8/7/97	8/20/97	3/30/99	8/20/97	8/20/97	8/20/97	8/20/97	3/30/99
Benzo(k)fluoranthene	900	780	380	1100	140 J	390 U	410 U	60 U
bis(2-Chloroethoxy)methane	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
bis(2-Chloroethyl)ether	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
bis(2-Ethylhexyl)phthalate	760 U	130 J	NA	250 J	53 J	390 U	90 J	NA
Butylbenzylphthalate	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
Carbazole	80 J	360 U	NA	82 J	380 U	390 U	410 U	NA
Chrysene	1600	260 J	590	710	75 J	390 U	410 U	60 U
Di-n-butylphthalate	760 UJ	360 U	NA	82 J	380 U	390 U	180 J	NA
Di-n-octylphthalate	760 UJ	360 U	NA	350 U	380 U	390 U	410 U	NA
Dibenz(a,h)anthracene	760 U	120 J	110 U	71 J	380 U	390 U	410 U	60 U
Dibenzofuran	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
Diethylphthalate	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
Dimethylphthalate	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
Fluoranthene	3200	180 J	1100	1700	68 J	390 U	410 U	60 U
Fluorene	760 UJ	360 U	110 UJ	39 J	380 U	390 U	410 U	60 UJ
Hexachlorobenzene	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
Hexachlorobutadiene	760 UJ	360 U	NA	350 U	380 U	390 U	410 U	NA
Hexachlorocyclopentadiene	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
Hexachloroethane	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
Indeno(1,2,3-cd)pyrene	750 J	440	940	310 J	54 J	390 U	410 U	60 U
Isophorone	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
N-Nitroso-di-n-propylamine	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
N-Nitrosodiphenylamine (1)	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
Naphthalene	760 U	360 U	710 U	350 U	380 U	390 U	410 U	390 U
Nitrobenzene	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
Pentachlorophenol	1900 U	900 UJ	NA	880 UJ	950 UJ	980 UJ	1000 UJ	NA
Phenanthrene	760 U	81 J	110 U	680	380 U	390 U	410 U	60 U
Phenol	760 U	360 U	NA	350 U	380 U	390 U	410 U	NA
Pyrene	2600 J	330 J	1300 J	1100	130 J	390 U	410 U	60 UJ
Pesticides/PCBs, ug/kg								
4,4'-DDD	3.8 U	3.6 U	36 U	3.5 U	1.4 J	51	4.1 U	1.2 J
4,4'-DDE	0.71 J	4.6 J	6 J	1.9 J	3.4 J	41	0.77 J	3.7 J
4,4'-DDT	3.8 U	10 J	7.7 J	4.9	3.8 U	41	4.1 U	1.5 J
Aldrin	1.9 U	1.8 U	18 U	1.8 U	2 U	2 U	2.1 U	2 U
alpha-BHC	1.9 U	1.8 U	18 U	1.8 U	2 U	2 U	2.1 U	2 U
alpha-Chlordane	0.9 J	5	7.9 J	1.5 J	2 U	2	2.1 U	2 U

Appendix D-1

Summary of Surface Soil Analytical Results
TAL Metals and TCL Organics
PSC 9

Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	09B00101	09S00101	09S00102	09S00201	09S00301	09S00401	09S00501	09SBK101
Sampling Date	8/7/97	8/20/97	3/30/99	8/20/97	8/20/97	8/20/97	8/20/97	3/30/99
Aroclor-1016	38 U	36 U	360 U	35 U	38 U	39 U	41 U	40 U
Aroclor-1221	76 U	73 U	710 U	71 U	77 U	79 U	83 U	79 U
Aroclor-1232	38 U	36 U	360 U	35 U	38 U	39 U	41 U	40 U
Aroclor-1242	38 U	36 U	360 U	35 U	38 U	39 U	41 U	40 U
Aroclor-1248	38 U	36 U	360 U	35 U	38 U	39 U	41 U	40 U
Aroclor-1254	38 U	74 J	360 U	35 U	26 J	39 U	16 J	40 U
Aroclor-1260	38 U	36 U	360 U	35 U	38 U	39 U	41 U	4.7 J
Aroclor-1262	NA	NA	360 U	NA	NA	NA	NA	40 U
Aroclor-1268	NA	NA	360 U	NA	NA	NA	NA	40 U
beta-BHC	1.9 U	1.8 U	18 U	1.8 U	2 U	2 U	2.1 U	2 U
delta-BHC	1.9 U	1.8 U	18 U	0.47 J	2 U	0.31 J	2.1 U	2 U
Dieldrin	11 J	3.6 U	5.3 J	3.5 U	3.8 U	2.7 J	4.1 U	0.37 J
Endosulfan I	1.9 U	1.8 U	18 U	1.8 U	1.1 J	1.5 J	2.1 U	4.7 J
Endosulfan II	3.8 U	3.6 U	36 U	3.5 U	3.8 U	3.9 U	4.1 U	4 U
Endosulfan sulfate	2.2 J	3.6 U	36 U	3.5 U	3.8 U	3.9 U	4.1 U	0.3 J
Endrin	3.8 U	3.6 U	36 U	3.5 U	3.8 U	1.5 J	4.1 U	4 U
Endrin aldehyde	3.8 U	1.6 J	36 U	3.5 U	3.8 U	0.4 J	4.1 U	4 U
Endrin ketone	7.4	0.39 J	36 U	1.3 J	3.8 U	3.9 U	4.1 U	4 U
gamma-BHC (Lindane)	1.9 UR	1.8 U	18 U	1.8 U	2 U	2 U	2.1 U	2 U
gamma-Chlordane	1.9 U	5.1	6.8 J	2.4	0.72 J	2.7	2.1 U	2.4 J
Heptachlor	1.9 U	0.3 J	18 U	1.8 U	2 U	2 U	2.1 U	0.27 J
Heptachlor epoxide	0.35 J	1.8 U	18 U	1.8 U	2 U	2 U	2.1 U	0.96 J
Methoxychlor	19 U	18 U	180 U	18 U	20 U	20 U	21 U	20 U
Toxaphene	190 U	180 U	1800 U	180 U	200 U	200 U	210 U	200 U
Inorganics, mg/kg								
Aluminum	2480 J	4030 J	NA	2480 J	2140 J	1890 J	1660 J	NA
Antimony	0.76 J	0.61 UJ	NA	0.61 UJ	0.66 UJ	0.67 UJ	0.71 UJ	NA
Arsenic	1.2 J	1.2 U	NA	2.6	1.4 U	1.4 U	1.4 U	NA
Barium	28.4 J	11.4 J	NA	124 J	11.8 J	11.9 J	14.1 J	NA
Beryllium	0.33 J	0.31 J	NA	0.12 J	0.21 J	0.09 J	0.08 J	NA
Cadmium	7.1	0.21 J	NA	2.9	0.3 J	0.71 J	0.29 J	NA
Calcium	35500	2250 J	NA	22000 J	19100 J	20600 J	10300 J	NA
Chromium	35.3	9.9	NA	38.8	8.8	6.8	5.9	NA
Cobalt	2.4 J	1.3 J	NA	1.1 J	0.73 J	0.65 J	0.46 J	NA
Copper	42.4	3.4 J	NA	24.8	3.3 J	5.2 J	6 J	NA
Iron	3830 J	6080 J	NA	12900 J	3610 J	1580 J	1860 J	NA

Appendix D-1

Summary of Surface Soil Analytical Results
TAL Metals and TCL Organics
PSC 9

Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	09B00101	09S00101	09S00102	09S00201	09S00301	09S00401	09S00501	09SBK101
Sampling Date	8/7/97	8/20/97	3/30/99	8/20/97	8/20/97	8/20/97	8/20/97	3/30/99
Lead	182	7.1	NA	181	14.9	33.1	88.4	NA
Magnesium	1350	1230	NA	582 J	597 J	763 J	281 J	NA
Manganese	73.9	34.7	NA	51.3	34.2	29.7	50	NA
Mercury	1.3	0.54	0.16 UJ	1.6 J	0.17	0.19	0.07 J	0.22 UJ
Nickel	45.8	2.8 J	NA	6.6 J	2 J	3.4 J	2 J	NA
Potassium	215 J	547 J	NA	192 J	299 J	123 J	102 J	NA
Selenium	0.64 U	0.92 U	NA	1.2	1 U	1 U	1.1 U	NA
Silver	1.3 J	0.17 U	NA	6.9	0.68 J	2 J	0.2 U	NA
Sodium	194 J	326 U	NA	153 U	133 U	160 U	165 U	NA
Thallium	1.1 U	1.1 U	NA	1.1 U	1.1 U	1.2 U	1.2 U	NA
Vanadium	6.4 J	10.5	NA	14.6	6.2 J	4.7 J	3.9 J	NA
Zinc	151	14.3 J	NA	83.8 J	14.9 J	17.8 J	24.1 J	NA
Radiological, pCi/g								
Gross alpha	2.49	-0.57	NA	7.44	-0.48	4.06	2.58	NA
Gross beta	10.97	6.07	NA	12.86	10.11	12.87	10.51	NA

Appendix D-2

Summary of Subsurface Soil Analytical Results
TAL Metals and TCL Organics
PSC 09

Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	09B00102		09B00201		09B00202	
Sampling Date	8/7/97		8/7/97		8/7/97	
Volatile organics, ug/kg						
1,1,1-Trichloroethane	14	U	12	U	13	U
1,1,2,2-Tetrachloroethane	14	UJ	12	UJ	13	U
1,1,2-Trichloroethane	14	U	12	U	13	U
1,1-Dichloroethane	14	U	12	U	13	U
1,1-Dichloroethene	14	U	12	U	13	U
1,2-Dichloroethane	14	U	12	U	13	U
1,2-Dichloroethene (total)	14	U	12	U	13	U
1,2-Dichloropropane	14	U	12	U	13	U
2-Butanone	14	UJ	12	UJ	13	UJ
2-Hexanone	14	UJ	12	U	13	UJ
4-Methyl-2-pentanone	14	U	12	U	13	U
Acetone	15	UJ	12	UJ	15	J
Benzene	14	U	12	U	13	U
Bromodichloromethane	14	U	12	U	13	U
Bromoform	14	U	12	U	13	U
Bromomethane	14	U	12	U	13	U
Carbon disulfide	14	U	12	UJ	13	U
Carbon tetrachloride	14	U	12	U	13	U
Chlorobenzene	14	U	12	U	13	U
Chloroethane	14	U	12	U	13	U
Chloroform	14	U	12	U	13	U
Chloromethane	14	U	12	U	13	U
cis-1,3-Dichloropropene	14	U	12	U	13	U
Dibromochloromethane	14	U	12	U	13	U
Ethylbenzene	14	U	12	U	13	U
Methylene chloride	14	U	12	U	13	U
Styrene	14	U	12	U	13	U
Tetrachloroethene	14	U	12	U	13	UJ
Toluene	14	U	12	U	13	U
trans-1,3-Dichloropropene	14	U	12	U	13	U
Trichloroethene	14	U	12	U	13	U
Vinyl chloride	14	U	12	U	13	U
Xylene (total)	14	U	12	U	13	U
Semivolatile organics, ug/kg						
1,2,4-Trichlorobenzene	460	U	390	U	420	U
1,2-Dichlorobenzene	460	U	390	U	420	U
1,3-Dichlorobenzene	460	U	390	U	420	U
1,4-Dichlorobenzene	460	U	390	U	420	U
2,2'-oxybis(1-Chloropropane)	460	UJ	390	UJ	420	UJ
2,4,5-Trichlorophenol	1200	U	970	U	1100	U
2,4,6-Trichlorophenol	460	U	390	U	420	U
2,4-Dichlorophenol	460	U	390	U	420	U
2,4-Dimethylphenol	460	U	390	U	420	U
2,4-Dinitrophenol	1200	UJ	970	UJ	1100	UJ
2,4-Dinitrotoluene	460	U	390	U	420	U
2,6-Dinitrotoluene	460	U	390	U	420	U
2-Chloronaphthalene	460	U	390	U	420	U
2-Chlorophenol	460	U	390	U	420	U
2-Methylnaphthalene	460	U	390	U	420	U
2-Methylphenol	460	U	390	U	420	U
2-Nitroaniline	1200	U	970	U	1100	U

Appendix D-2

Summary of Subsurface Soil Analytical Results
TAL Metals and TCL Organics
PSC 09

Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	09B00102	09B00201	09B00202
Sampling Date	8/7/97	8/7/97	8/7/97
2-Nitrophenol	460 U	390 U	420 U
3,3'-Dichlorobenzidine	460 U	390 U	420 U
3-Nitroaniline	1200 U	970 U	1100 U
4,6-Dinitro-2-methylphenol	1200 U	970 U	1100 U
4-Bromophenyl-phenylether	460 U	390 U	420 U
4-Chloro-3-methylphenol	460 U	390 U	420 U
4-Chloroaniline	460 U	390 U	420 U
4-Chlorophenyl-phenylether	460 U	390 U	420 U
4-Methylphenol	460 U	390 U	420 U
4-Nitroaniline	1200 UJ	970 UJ	1100 UJ
4-Nitrophenol	1200 UJ	970 UJ	1100 UJ
Acenaphthene	460 U	390 U	420 U
Acenaphthylene	460 U	390 U	420 U
Anthracene	460 U	390 U	420 U
Benzo(a)anthracene	460 U	77 J	420 U
Benzo(a)pyrene	460 U	140 J	420 U
Benzo(b)fluoranthene	460 U	150 J	420 U
Benzo(g,h,i)perylene	460 U	390 U	420 U
Benzo(k)fluoranthene	460 U	59 J	420 U
bis(2-Chloroethoxy)methane	460 U	390 U	420 U
bis(2-Chloroethyl)ether	460 U	390 U	420 U
bis(2-Ethylhexyl)phthalate	460 U	380 U	420 U
Butylbenzylphthalate	460 U	390 U	420 U
Carbazole	460 U	390 U	420 U
Chrysene	460 U	99 J	420 U
Di-n-butylphthalate	460 UJ	390 U	420 UJ
Di-n-octylphthalate	460 UJ	390 U	420 UJ
Dibenz(a,h)anthracene	460 U	390 U	420 U
Dibenzofuran	460 U	390 U	420 U
Diethylphthalate	460 U	390 U	420 U
Dimethylphthalate	460 U	390 U	420 U
Fluoranthene	460 U	380 U	420 U
Fluorene	460 UJ	390 UJ	420 UJ
Hexachlorobenzene	460 U	390 U	420 U
Hexachlorobutadiene	460 UJ	390 UJ	420 UJ
Hexachlorocyclopentadiene	460 U	390 U	420 U
Hexachloroethane	460 U	390 U	420 U
Indeno(1,2,3-cd)pyrene	460 U	390 U	420 U
Isophorone	460 U	390 U	420 U
N-Nitroso-di-n-propylamine	460 U	390 U	420 U
N-Nitrosodiphenylamine (1)	460 U	390 U	420 U
Naphthalene	460 U	390 U	420 U
Nitrobenzene	460 U	390 U	420 U
Pentachlorophenol	1200 U	970 U	1100 U
Phenanthrene	460 U	380 U	420 U
Phenol	460 U	390 U	420 U
Pyrene	460 U	380 U	420 U
Pesticides/PCBs, ug/kg			
4,4'-DDD	4.6 U	0.71 J	4.2 U
4,4'-DDE	4.6 U	3.9 U	4.2 U
4,4'-DDT	4.6 U	3.9 U	0.58 J
Aldrin	2.3 U	2 U	0.26 J

Appendix D-2

Summary of Subsurface Soil Analytical Results
TAL Metals and TCL Organics
PSC 09

Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	09B00102	09B00201	09B00202
Sampling Date	8/7/97	8/7/97	8/7/97
alpha-BHC	2.3 U	2 U	2.1 U
alpha-Chlordane	2.3 U	2 U	2.1 U
Aroclor-1016	46 U	39 U	42 U
Aroclor-1221	92 U	78 U	84 U
Aroclor-1232	46 U	39 U	42 U
Aroclor-1242	46 U	39 U	42 U
Aroclor-1248	46 U	39 U	42 U
Aroclor-1254	11 J	36 J	42 U
Aroclor-1260	46 U	39 U	42 U
beta-BHC	2.3 U	2 U	2.1 U
delta-BHC	2.3 U	2 U	2.1 U
Dieldrin	4.6 U	3.9 U	0.94 J
Endosulfan I	2.3 U	2 U	2.1 U
Endosulfan II	4.6 U	3.9 U	4.2 U
Endosulfan sulfate	4.6 U	1.5 J	4.2 U
Endrin	4.6 U	3.9 U	0.67 J
Endrin aldehyde	4.6 U	3.9 U	4.2 U
Endrin ketone	4.6 U	3.9 U	4.2 U
gamma-BHC (Lindane)	2.3 U	2 U	0.19 J
gamma-Chlordane	2.3 U	2 U	2.1 U
Heptachlor	2.3 U	0.45 J	0.3 J
Heptachlor epoxide	2.3 U	2 U	2.1 U
Methoxychlor	23 U	20 U	21 U
Toxaphene	230 U	200 U	210 U
Inorganics, mg/kg			
Aluminum	4110 J	1810 J	1120 J
Antimony	0.46 UJ	1.2 J	0.43 UJ
Arsenic	3.2	1.7 J	1.5 J
Barium	21.9 J	16.1 J	6.5 J
Beryllium	0.7 J	0.2 U	0.15 U
Cadmium	0.08 U	0.56 J	0.08 U
Calcium	5570	58000	1840
Chromium	9.9	366	5.3
Cobalt	2.6 J	1 J	0.41 J
Copper	3.5 J	9.4	1.5 J
Iron	7620 J	12800 J	2420 J
Lead	11.6	18.3	3.4
Magnesium	1400	878 J	326 J
Manganese	75.7	107	20.4
Mercury	0.06 U	0.05 U	0.06 U
Nickel	4.5 J	15.5	17.2
Potassium	814 J	163 J	132 J
Selenium	0.75 U	0.65 U	0.72 U
Silver	0.11 U	0.09 U	0.1 U
Sodium	593 J	165 J	185 J
Thallium	1.3 U	1.1 U	1.2 U
Vanadium	9.7 J	30.5	3.3 J
Zinc	19	14.9	8.8
Radiological, pCi/g			
Gross Alpha	18.79	2.45	-2.94
Gross Beta	15.31	5.76	5.04

Appendix D-3

Summary of Groundwater Analytical Results
TAL Metals and TCL Organics
PSC 09

Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	09G00101	09G00201	09G00301
Sampling Date	7/10/97	7/10/97	7/10/97
Volatile organics, ug/L			
1,1,1-Trichloroethane	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10 U	10 U	10 U
1,1,2-Trichloroethane	10 U	10 U	10 U
1,1-Dichloroethane	10 U	10 U	10 U
1,1-Dichloroethene	10 U	10 U	10 U
1,2-Dichloroethane	10 U	10 U	10 U
1,2-Dichloroethene (total)	10 U	10 U	10 U
1,2-Dichloropropane	10 U	10 U	10 U
2-Butanone	10 UJ	10 UJ	10 UJ
2-Hexanone	10 UJ	10 UJ	10 UJ
4-Methyl-2-pentanone	10 U	10 U	10 U
Acetone	10 UJ	10 UJ	10 UJ
Benzene	10 U	10 U	10 U
Bromodichloromethane	10 U	10 U	10 U
Bromoform	10 U	10 U	10 U
Bromomethane	10 U	10 U	10 U
Carbon disulfide	10 U	10 U	10 U
Carbon tetrachloride	10 U	10 U	10 U
Chlorobenzene	10 U	10 U	10 U
Chloroethane	10 U	10 U	10 U
Chloroform	10 U	10 U	10 U
Chloromethane	10 UJ	10 UJ	10 UJ
cis-1,3-Dichloropropene	10 U	10 U	10 U
Dibromochloromethane	10 U	10 U	10 U
Ethylbenzene	10 U	10 U	10 U
Methylene chloride	13 UJ	10 UJ	21
Styrene	10 U	10 U	10 U
Tetrachloroethene	10 U	10 U	10 U
Toluene	10 U	10 U	10 U
trans-1,3-Dichloropropene	10 U	10 U	10 U
Trichloroethene	10 U	10 U	10 U
Vinyl chloride	10 U	10 U	10 U
Xylene (total)	10 U	10 U	10 U
Semivolatile organics, ug/L			
1,2,4-Trichlorobenzene	10 U	10 U	10 U
1,2-Dichlorobenzene	10 U	10 U	10 U
1,3-Dichlorobenzene	10 U	10 U	10 U
1,4-Dichlorobenzene	10 U	10 U	10 U
2,2'-oxybis(1-Chloropropane)	10 UJ	10 UJ	10 U
2,4,5-Trichlorophenol	25 U	25 U	25 U
2,4,6-Trichlorophenol	10 U	10 U	10 U
2,4-Dichlorophenol	10 U	10 U	10 U
2,4-Dimethylphenol	10 U	10 U	10 U
2,4-Dinitrophenol	25 U	25 U	25 U
2,4-Dinitrotoluene	10 U	10 U	10 U
2,6-Dinitrotoluene	10 U	10 U	10 U
2-Chloronaphthalene	10 U	10 U	10 U
2-Chlorophenol	10 U	10 U	10 U
2-Methylnaphthalene	10 U	10 U	10 U
2-Methylphenol	10 U	10 U	10 U
2-Nitroaniline	25 U	25 U	25 U
2-Nitrophenol	10 U	10 U	10 U

Appendix D-3

Summary of Groundwater Analytical Results
TAL Metals and TCL Organics
PSC 09

Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	09G00101	09G00201	09G00301
Sampling Date	7/10/97	7/10/97	7/10/97
3,3'-Dichlorobenzidine	10 U	10 U	10 U
3-Nitroaniline	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25 U	25 U	25 U
4-Bromophenyl-phenylether	10 U	10 U	10 U
4-Chloro-3-methylphenol	10 U	10 U	10 U
4-Chloroaniline	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10 U	10 U	10 U
4-Methylphenol	10 U	10 U	10 U
4-Nitroaniline	25 U	25 U	25 U
4-Nitrophenol	25 UJ	25 UJ	25 U
Acenaphthene	10 U	10 U	10 U
Acenaphthylene	10 U	10 U	10 U
Anthracene	10 U	10 U	10 U
Benzo(a)anthracene	10 U	10 U	10 U
Benzo(a)pyrene	10 U	10 U	10 U
Benzo(b)fluoranthene	10 U	10 U	10 U
Benzo(g,h,i)perylene	10 U	10 U	10 U
Benzo(k)fluoranthene	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10 U	10 U	10 U
bis(2-Chloroethyl)ether	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10 U	10 U	10 U
Butylbenzylphthalate	10 U	10 U	10 U
Carbazole	10 U	10 U	10 U
Chrysene	10 U	10 U	10 U
Di-n-butylphthalate	10 U	10 U	10 U
Di-n-octylphthalate	10 U	10 U	10 U
Dibenz(a,h)anthracene	10 U	10 U	10 U
Dibenzofuran	10 U	10 U	10 U
Diethylphthalate	10 U	10 U	10 U
Dimethylphthalate	10 U	10 U	10 U
Fluoranthene	10 U	10 U	10 U
Fluorene	10 U	10 U	10 U
Hexachlorobenzene	10 U	10 U	10 U
Hexachlorobutadiene	10 U	10 U	10 U
Hexachlorocyclopentadiene	10 U	10 U	10 U
Hexachloroethane	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10 U	10 U	10 U
Isophorone	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10 U	10 U	10 U
N-Nitrosodiphenylamine (1)	10 U	10 U	10 U
Naphthalene	10 U	10 U	10 U
Nitrobenzene	10 U	10 U	10 U
Pentachlorophenol	25 UJ	25 UJ	25 U
Phenanthrene	10 U	10 U	10 U
Phenol	10 U	10 U	10 U
Pyrene	10 UJ	10 UJ	10 U
Pesticides/PCBs, ug/L			
4,4'-DDD	0.1 U	0.1 U	0.1 U
4,4'-DDE	0.1 U	0.1 U	0.1 U
4,4'-DDT	0.1 U	0.1 U	0.1 U
Aldrin	0.05 U	0.05 U	0.05 U
alpha-BHC	0.05 U	0.05 U	0.05 U
alpha-Chlordane	0.05 U	0.05 U	0.05 U

Appendix D-3

Summary of Groundwater Analytical Results
TAL Metals and TCL Organics
PSC 09

Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	09G00101	09G00201	09G00301
Sampling Date	7/10/97	7/10/97	7/10/97
Aroclor-1016	1 U	1 U	1 U
Aroclor-1221	2 U	2 U	2 U
Aroclor-1232	1 U	1 U	1 U
Aroclor-1242	1 U	1 U	1 U
Aroclor-1248	1 U	1 U	1 U
Aroclor-1254	1 U	1 U	1 U
Aroclor-1260	1 U	1 U	1 U
beta-BHC	0.05 U	0.05 U	0.05 U
delta-BHC	0.05 U	0.05 U	0.05 U
Dieldrin	0.09 J	0.005 J	0.1 U
Endosulfan I	0.05 U	0.05 U	0.05 U
Endosulfan II	0.1 U	0.1 U	0.1 U
Endosulfan sulfate	0.1 U	0.1 U	0.1 U
Endrin	0.1 U	0.1 U	0.1 U
Endrin aldehyde	0.1 U	0.1 U	0.1 U
Endrin ketone	0.1 U	0.1 U	0.1 U
gamma-BHC (Lindane)	0.05 U	0.05 U	0.05 U
gamma-Chlordane	0.05 U	0.05 U	0.05 U
Heptachlor	0.05 U	0.05 U	0.05 U
Heptachlor epoxide	0.05 U	0.05 U	0.05 U
Methoxychlor	0.5 U	0.5 U	0.5 U
Toxaphene	5 U	5 U	5 U
Inorganics, ug/L			
Aluminum	80.1 J	448	152 J
Antimony	8.2 J	1.7 U	49.7 J
Arsenic	7.3 J	5.2 J	6.2 J
Barium	49.3 J	82.9 J	57.8 J
Beryllium	0.1 U	0.1 U	0.1 U
Cadmium	0.4 J	0.3 U	2.1 J
Calcium	118000	194000	146000
Chromium	1.5 J	4.2 J	23.1
Cobalt	1.3 J	0.6 U	0.6 U
Copper	11.2 J	7 J	49.4
Iron	247	12400	132
Lead	1.7 J	1.8 J	22.8
Magnesium	7140	13800	9270
Manganese	92.2	229	6.5 J
Mercury	0.1 U	0.1 U	0.1 U
Nickel	5.1 J	3.7 J	32 J
Potassium	12500 J	4890 J	6510 J
Selenium	2.8 U	2.8 U	2.8 U
Silver	0.4 U	0.4 U	0.4 U
Sodium	10700	12200	20000
Thallium	4.7 U	4.7 U	4.7 U
Vanadium	4.8 J	2.4 J	8.4 J
Zinc	29.7 J	49.5 J	220 J
Radiological, pCi/L			
Gross Alpha	7.41	2.79	3.39
Gross Beta	19.53	8.79	10.04

Appendix D-4

Summary of Sediment Analytical Results
TAL Metals and TCL Organics
PSC 9

Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	09D00101	
Sampling Date	8/21/97	
Volatile Organic Compounds, ug/kg		
1,1,1-Trichloroethane	18	U
1,1,2,2-Tetrachloroethane	18	U
1,1,2-Trichloroethane	18	U
1,1-Dichloroethane	18	U
1,1-Dichloroethene	18	U
1,2-Dichloroethane	18	U
1,2-Dichloroethene (total)	18	U
1,2-Dichloropropane	18	U
2-Butanone	18	UJ
2-Hexanone	18	UJ
4-Methyl-2-pentanone	18	U
Acetone	18	UJ
Benzene	18	U
Bromodichloromethane	18	U
Bromoform	18	U
Bromomethane	18	U
Carbon disulfide	18	U
Carbon tetrachloride	18	U
Chlorobenzene	18	U
Chloroethane	18	U
Chloroform	18	U
Chloromethane	18	U
cis-1,3-Dichloropropene	18	U
Dibromochloromethane	18	U
Ethylbenzene	18	U
Methylene chloride	18	U
Styrene	18	U
Tetrachloroethene	18	UJ
Toluene	18	U
trans-1,3-Dichloropropene	18	U
Trichloroethene	18	U
Vinyl chloride	18	U
Xylene (total)	18	U
Semivolatile Organics, ug/kg		
1,2,4-Trichlorobenzene	590	U
1,2-Dichlorobenzene	590	U
1,3-Dichlorobenzene	590	U
1,4-Dichlorobenzene	590	U
2,2'-oxybis(1-Chloropropane)	590	U
2,4,5-Trichlorophenol	1500	U
2,4,6-Trichlorophenol	590	U
2,4-Dichlorophenol	590	U
2,4-Dimethylphenol	590	U
2,4-Dinitrophenol	1500	U
2,4-Dinitrotoluene	590	U
2,6-Dinitrotoluene	590	U
2-Chloronaphthalene	590	U
2-Chlorophenol	590	U
2-Methylnaphthalene	590	U
2-Methylphenol	590	U
2-Nitroaniline	1500	U

Appendix D-4

Summary of Sediment Analytical Results
TAL Metals and TCL Organics
PSC 9

Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	09D00101
Sampling Date	8/21/97
2-Nitrophenol	590 U
3,3'-Dichlorobenzidine	590 U
3-Nitroaniline	1500 U
4,6-Dinitro-2-methylphenol	1500 U
4-Bromophenyl-phenylether	590 U
4-Chloro-3-methylphenol	590 U
4-Chloroaniline	590 U
4-Chlorophenyl-phenylether	590 UJ
4-Methylphenol	590 U
4-Nitroaniline	1500 U
4-Nitrophenol	1500 U
Acenaphthene	590 U
Acenaphthylene	590 U
Anthracene	590 U
Benzo(a)anthracene	590 U
Benzo(a)pyrene	590 U
Benzo(b)fluoranthene	590 U
Benzo(g,h,i)perylene	590 U
Benzo(k)fluoranthene	590 U
bis(2-Chloroethoxy)methane	590 U
bis(2-Chloroethyl)ether	590 U
bis(2-Ethylhexyl)phthalate	590 U
Butylbenzylphthalate	590 U
Carbazole	590 U
Chrysene	590 U
Di-n-butylphthalate	590 U
Di-n-octylphthalate	590 U
Dibenz(a,h)anthracene	590 U
Dibenzofuran	590 U
Diethylphthalate	590 U
Dimethylphthalate	590 U
Fluoranthene	590 U
Fluorene	590 U
Hexachlorobenzene	590 U
Hexachlorobutadiene	590 U
Hexachlorocyclopentadiene	590 U
Hexachloroethane	590 U
Indeno(1,2,3-cd)pyrene	590 U
Isophorone	590 U
N-Nitroso-di-n-propylamine	590 U
N-Nitrosodiphenylamine (1)	590 U
Naphthalene	590 U
Nitrobenzene	590 U
Pentachlorophenol	1500 UJ
Phenanthrene	590 U
Phenol	590 U
Pyrene	590 U
Pesticides/PCB, ug/kg	
4,4'-DDD	5.9 U
4,4'-DDE	5.9 U
4,4'-DDT	5.9 U
Aldrin	3 U

Appendix D-4

Summary of Sediment Analytical Results
TAL Metals and TCL Organics
PSC 9

Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	09D00101
Sampling Date	8/21/97
alpha-BHC	3 U
alpha-Chlordane	3 U
Aroclor-1016	59 U
Aroclor-1221	120 U
Aroclor-1232	59 U
Aroclor-1242	59 U
Aroclor-1248	59 U
Aroclor-1254	59 U
Aroclor-1260	59 U
beta-BHC	3 U
delta-BHC	3 U
Dieldrin	0.83 J
Endosulfan I	3 U
Endosulfan II	5.9 U
Endosulfan sulfate	5.9 U
Endrin	0.66 J
Endrin aldehyde	5.9 U
Endrin ketone	5.9 U
gamma-BHC (Lindane)	3 U
gamma-Chlordane	3 U
Heptachlor	0.46 J
Heptachlor epoxide	3 U
Methoxychlor	30 U
Toxaphene	300 U
Inorganics, mg/kg	
Aluminum	6810 J
Antimony	1 UJ
Arsenic	2.1 U
Barium	19.2 J
Beryllium	0.54 J
Cadmium	0.35 J
Calcium	3780 J
Chromium	16.6
Cobalt	2.2 J
Copper	5.5 J
Iron	10300 J
Lead	11.9
Magnesium	2090
Manganese	58.6
Mercury	0.09 UJ
Nickel	4.6 J
Potassium	923 J
Selenium	1.5 U
Silver	0.28 U
Sodium	548 U
Thallium	1.8 U
Vanadium	17.8
Zinc	23 J
Radiological, pCi/g	
Gross Alpha	14.26
Gross Beta	11.04

Appendix D-5

Summary of Surface Water Analytical Results
TAL Metals and TCL Organics
PSC 9

Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	09W00101		09W00201		09W00301	
Sampling Date	8/21/97		3/29/99		3/29/99	
Volatile Organic Compounds, ug/L						
1,1,1-Trichloroethane	10	U	NA		NA	
1,1,2,2-Tetrachloroethane	10	U	NA		NA	
1,1,2-Trichloroethane	10	U	NA		NA	
1,1-Dichloroethane	10	U	NA		NA	
1,1-Dichloroethene	10	U	NA		NA	
1,2-Dichloroethane	10	U	NA		NA	
1,2-Dichloroethene (total)	10	U	NA		NA	
1,2-Dichloropropane	10	U	NA		NA	
2-Butanone	10	U	NA		NA	
2-Hexanone	10	U	NA		NA	
4-Methyl-2-pentanone	10	U	NA		NA	
Acetone	10	U	NA		NA	
Benzene	10	U	NA		NA	
Bromodichloromethane	10	U	NA		NA	
Bromoform	10	U	NA		NA	
Bromomethane	10	U	NA		NA	
Carbon disulfide	10	U	NA		NA	
Carbon tetrachloride	10	U	NA		NA	
Chlorobenzene	10	U	NA		NA	
Chloroethane	10	U	NA		NA	
Chloroform	10	U	NA		NA	
Chloromethane	10	U	NA		NA	
cis-1,3-Dichloropropene	10	U	NA		NA	
Dibromochloromethane	10	U	NA		NA	
Ethylbenzene	10	U	NA		NA	
Methylene chloride	10	U	NA		NA	
Styrene	10	U	NA		NA	
Tetrachloroethene	10	U	NA		NA	
Toluene	10	U	NA		NA	
trans-1,3-Dichloropropene	10	U	NA		NA	
Trichloroethene	10	U	NA		NA	
Vinyl chloride	10	U	NA		NA	
Xylene (total)	10	U	NA		NA	
Semivolatile Organics, ug/L						
1,2,4-Trichlorobenzene	10	U	NA		NA	
1,2-Dichlorobenzene	10	U	NA		NA	
1,3-Dichlorobenzene	10	U	NA		NA	
1,4-Dichlorobenzene	10	U	NA		NA	
2,2'-oxybis(1-Chloropropane)	10	U	NA		NA	
2,4,5-Trichlorophenol	25	U	NA		NA	
2,4,6-Trichlorophenol	10	U	NA		NA	
2,4-Dichlorophenol	10	U	NA		NA	
2,4-Dimethylphenol	10	U	NA		NA	
2,4-Dinitrophenol	25	U	NA		NA	
2,4-Dinitrotoluene	10	U	NA		NA	
2,6-Dinitrotoluene	10	U	NA		NA	
2-Chloronaphthalene	10	U	NA		NA	
2-Chlorophenol	10	U	NA		NA	
2-Methylnaphthalene	10	U	NA		NA	
2-Methylphenol	10	U	NA		NA	
2-Nitroaniline	25	U	NA		NA	
2-Nitrophenol	10	U	NA		NA	

Appendix D-5

Summary of Surface Water Analytical Results
TAL Metals and TCL Organics
PSC 9

Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	09W00101	09W00201	09W00301
Sampling Date	8/21/97	3/29/99	3/29/99
3,3'-Dichlorobenzidine	10 U	NA	NA
3-Nitroaniline	25 U	NA	NA
4,6-Dinitro-2-methylphenol	25 U	NA	NA
4-Bromophenyl-phenylether	10 U	NA	NA
4-Chloro-3-methylphenol	10 U	NA	NA
4-Chloroaniline	10 U	NA	NA
4-Chlorophenyl-phenylether	10 U	NA	NA
4-Methylphenol	10 U	NA	NA
4-Nitroaniline	25 U	NA	NA
4-Nitrophenol	25 U	NA	NA
Acenaphthene	10 U	NA	NA
Acenaphthylene	10 U	NA	NA
Anthracene	10 U	NA	NA
Benzo(a)anthracene	10 U	NA	NA
Benzo(a)pyrene	10 U	NA	NA
Benzo(b)fluoranthene	10 U	NA	NA
Benzo(g,h,i)perylene	10 U	NA	NA
Benzo(k)fluoranthene	10 U	NA	NA
bis(2-Chloroethoxy)methane	10 U	NA	NA
bis(2-Chloroethyl)ether	10 U	NA	NA
bis(2-Ethylhexyl)phthalate	10 U	NA	NA
Butylbenzylphthalate	10 U	NA	NA
Carbazole	10 U	NA	NA
Chrysene	10 U	NA	NA
Di-n-butylphthalate	2 J	NA	NA
Di-n-octylphthalate	10 U	NA	NA
Dibenz(a,h)anthracene	10 U	NA	NA
Dibenzofuran	10 U	NA	NA
Diethylphthalate	10 U	NA	NA
Dimethylphthalate	10 U	NA	NA
Fluoranthene	10 U	NA	NA
Fluorene	10 U	NA	NA
Hexachlorobenzene	10 U	NA	NA
Hexachlorobutadiene	10 U	NA	NA
Hexachlorocyclopentadiene	10 U	NA	NA
Hexachloroethane	10 U	NA	NA
Indeno(1,2,3-cd)pyrene	10 U	NA	NA
Isophorone	10 U	NA	NA
N-Nitroso-di-n-propylamine	10 U	NA	NA
N-Nitrosodiphenylamine (1)	10 U	NA	NA
Naphthalene	10 U	NA	NA
Nitrobenzene	10 U	NA	NA
Pentachlorophenol	25 U	NA	NA
Phenanthrene	10 U	NA	NA
Phenol	10 U	NA	NA
Pyrene	10 U		
Pesticides/PCB, ug/L			
4,4'-DDD	0.1 U	0.1 U	0.1 U
4,4'-DDE	0.1 U	0.1 U	0.1 U
4,4'-DDT	0.1 U	0.1 U	0.1 U
Aldrin	0.01 J	0.05 U	0.05 U
alpha-BHC	0.05 U	0.05 U	0.0022 J
alpha-Chlordane	0.05 U	0.05 U	0.05 U

Appendix D-5

Summary of Surface Water Analytical Results
TAL Metals and TCL Organics
PSC 9

Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	09W00101	09W00201	09W00301
Sampling Date	8/21/97	3/29/99	3/29/99
Aroclor-1016	1 U	1 U	1 U
Aroclor-1221	2 U	2 U	2 U
Aroclor-1232	1 U	1 U	1 U
Aroclor-1242	1 U	1 U	1 U
Aroclor-1248	1 U	1 U	1 U
Aroclor-1254	1.6	1 U	1 U
Aroclor-1260	1 U	1 U	1 U
Aroclor-1262	NA	1 U	1 U
Aroclor-1268	NA	1 U	1 U
beta-BHC	0.05 U	0.05 U	0.0061 J
delta-BHC	0.05 U	0.05 U	0.05 U
Dieldrin	0.1 U	0.1 U	0.1 U
Endosulfan I	0.05 U	0.05 U	0.05 U
Endosulfan II	0.1 U	0.1 U	0.1 U
Endosulfan sulfate	0.1 U	0.1 U	0.1 U
Endrin	0.1 U	0.1 U	0.1 U
Endrin aldehyde	0.1 U	0.1 U	0.1 U
Endrin ketone	0.1 U	0.1 U	0.1 U
gamma-BHC (Lindane)	0.05 U	0.05 U	0.05 U
gamma-Chlordane	0.05 U	0.05 U	0.05 U
Heptachlor	0.05 U	0.05 U	0.0019 J
Heptachlor epoxide	0.05 U	0.05 U	0.05 U
Methoxychlor	0.5 U	0.5 U	0.5 U
Toxaphene	5 U	5 U	5 U
Inorganics, ug/L			
Aluminum	2820	NA	NA
Antimony	2.9 U	NA	NA
Arsenic	5.9 U	NA	NA
Barium	19 J	NA	NA
Beryllium	0.14 U	NA	NA
Cadmium	0.3 U	NA	NA
Calcium	31700	NA	NA
Chromium	9.6 J	NA	NA
Cobalt	1.1 J	NA	NA
Copper	5.3 U	NA	NA
Iron	2610	NA	NA
Lead	4.5 U	NA	NA
Magnesium	14500	NA	NA
Manganese	54.1	NA	NA
Mercury	0.1 UJ	NA	NA
Nickel	2.8 J	NA	NA
Potassium	4590 J	NA	NA
Selenium	4.4 U	NA	NA
Silver	0.8 U	NA	NA
Sodium	85400	NA	NA
Thallium	5 U	NA	NA
Vanadium	7.9 J	NA	NA
Zinc	20 J	NA	NA
Radiological, pCi/L			
Gross Alpha	2.01	NA	NA
Gross Beta	5.13	NA	NA

Appendix D-1 to D-5

Notes to Full Analytical Results Tables
PSC 9

Naval Air Station Jacksonville
Jacksonville, Florida

TAL = Target Analyte List
TCL = Target Compound List
Sample ID = Sample Identifier
NA = Not analyzed.
Units:

mg/kg	milligram per kilogram
ug/kg	microgram per kilogram
ug/L	microgram per liter
pCi/L	picocuries per liter
pCi/g	picocuries per gram

The following standard validation qualifiers have the following definitions:

U	The analyte/compound was analyzed for but was not detected above the reported sample quantitation limit The number preceding the U qualifier is the reported sample quantitation limit.
J	The analyte/compound was positively identified and the associated numerical value is an estimated concentration of the analyte/compound in the sample. For most detected analytes and compounds, the J qualifier is also used to indicate that the reported concentration is below the contract required detection or quantitation limit.
UJ	The analyte/compound was not detected above the reported sample quantitation limit. The reported quantitation limit, however, is approximate and may or may not represent the actual limit of quantitation necessary to accurately measure the analyte/compound in the sample.
R	The analytical result is rejected upon data validation.