SAMPLING EVENT REPORT POTENTIAL SOURCE OF CONTAMINATION 44 DRAINAGE DITCH WEST OF AJAX STREET NAS JACKSONVILLE FL

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HARDING LAWSON ASSOCIATES

SAMPLING EVENT REPORT

POTENTIAL SOURCE OF CONTAMINATION 44
DRAINAGE DITCH WEST OF AJAX STREET

NAVAL AIR STATION JACKSONVILLE
JACKSONVILLE, FLORIDA

UNIT IDENTIFICATION CODE: N00207
CONTRACT NO.: N62467-89-D-0317/040

MARCH 1999

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NORTH CHARLESTON, SOUTH CAROLINA
29418

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

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March 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: March 19, 1999

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(DFAR 252.227-7036)

JX-PSC44 SER
PMW 03 99

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GLOSSARY

ABB-ES	ABB Environmental Services, Inc.
B&R	Brown & Root Environmental, Inc.
CompuChem	Compuchem Environmental Corporation
COPC	chemical of potential concern
EA	Engineering, Science, and Technology, Inc.
EDS	Environmental Data Services
FDEP	Florida Department of Environmental Protection
FERE	focused ecological risk evaluation
HLA	Harding Lawson Associates
mg/kg	milligrams per kilogram
mg/organism	milligrams per organism
NAS	Naval Air Station
NFESC	Naval Facilities Engineering Service Center
PAH	polynuclear aromatic hydrocarbon
PARCC	precision, accuracy, representativeness, completeness, and comparability
PEL	probable effects level
PSC	potential source of contamination
QA/QC	quality assurance and quality control
RBC	risk-based concentration
RRDS	Remedial Response Decision System
SCG	soil cleanup goal
SER	sampling event report
SVOC	semivolatile organic compound
TAL	target analyte list
TCL	target compound list
TEL	threshold effects level
USEPA	U.S. Environmental Protection Agency

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) 44, the drainage ditch west of Ajax Street at Naval Air Station (NAS) Jacksonville, Jacksonville, Florida. PSC 44 is an approximately one-half mile long segment of drainage ditch located in the north-central region of the station (Figures 1-1 and 1-2).

This SER summarizes the methods and 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 44 was to gather sufficient information to support the next phase of the Remedial Response Decision System (RRDS) process. The original scope of the sampling event was summarized in the Naval Installation Restoration Program Plan, Volume 2, RRDS, Appendix D (ABB Environmental Services, Inc. [ABB-ES], 1995) and included the following:

- collection of sediment, surface soil, and surface water samples along the length of the ditch;
- collection of sediment and surface water samples near the outfall in Mulberry Cove;
- collection of liquid samples from the 20-inch drain line and the storm sewer north of Yorktown Avenue; and
- laboratory analysis of the sediment, surface soil, surface water, and liquid samples for U.S. Environmental Protection Agency (USEPA) target compound list (TCL) semivolatile organic compounds (SVOCs), TCL pesticides (only), and target analyte list (TAL) inorganic constituents.

Fieldwork for this sampling event was completed between December 17, 1997, and April 17, 1998.

1.2 SITE DESCRIPTION. PSC 44 is an approximately one-half-mile long segment of drainage ditch located between Yorktown Avenue on the north and the St. Johns River, south of Birmingham Avenue, to the south.

The sides of the drainage ditch are constructed of brick and concrete, much of which is in a state of disrepair. Several culverts from other smaller drainage areas next to the ditch drain into PSC 44 along its course. Dense grasses, reeds, and other vegetation grow in the ditch. Small fish were present in the north section of the ditch (south of Yorktown Avenue to Saratoga Avenue) during HLA's PSC reconnaissance in April 1994. In addition, several birds and insects were observed in the vegetated areas of the ditch. Rust-colored sediment was noted in the north section, and the submerged parts of vegetation in this section appeared rust colored. Sediment south of Saratoga Avenue was less rusty. Water in several parts of the ditch appeared to have an oily sheen.

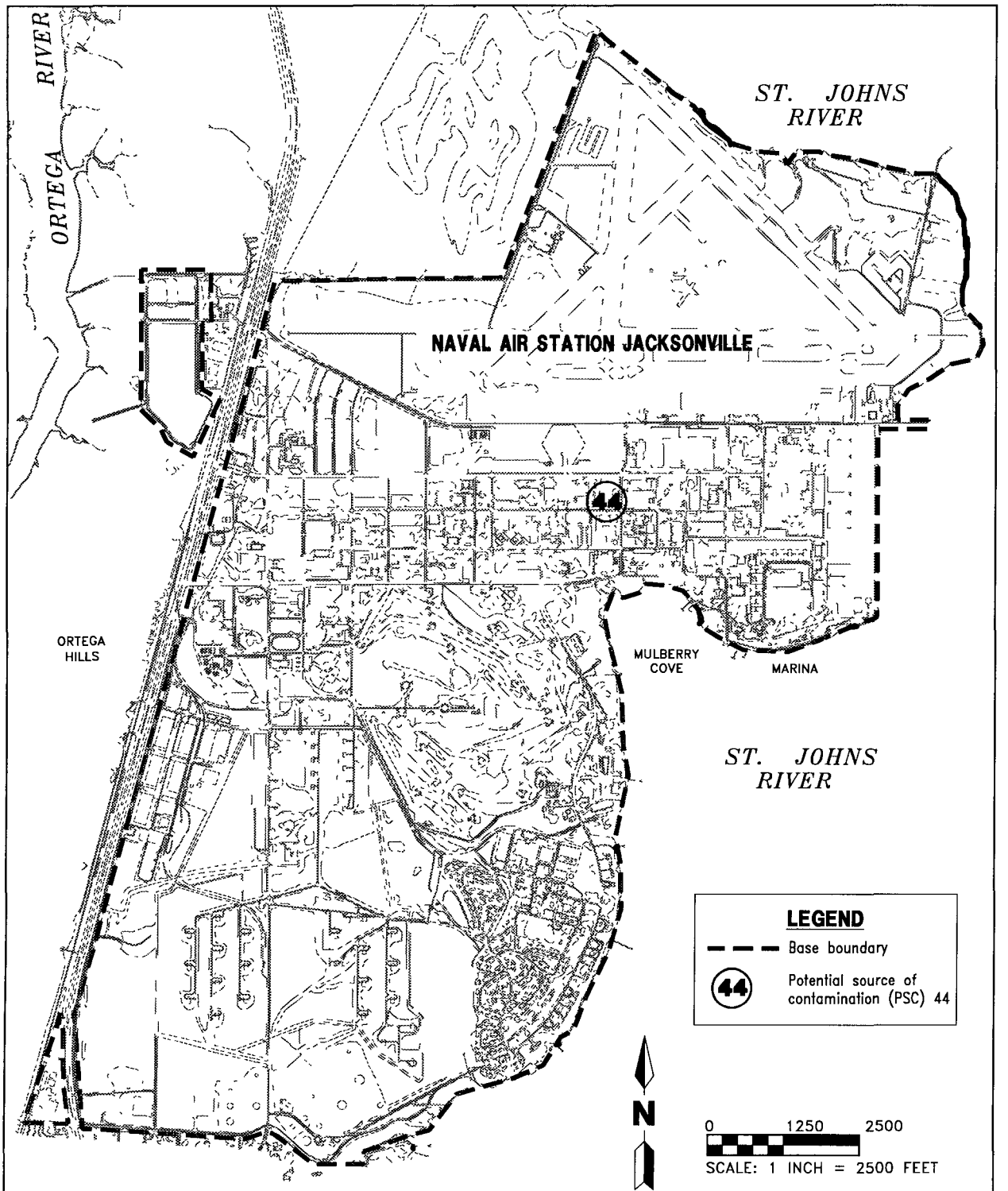

FIGURE 1-1
LOCATION OF PSC 44
AT NAVAL AIR STATION JACKSONVILLE

K \02508\02508-59\SER\02508534.DWG KMH-VC 12/16/98 11 02 53, AutoCAD R14

SAMPLING EVENT REPORT
PSC 44

NAVAL AIR STATION JACKSONVILLE
JACKSONVILLE, FLORIDA

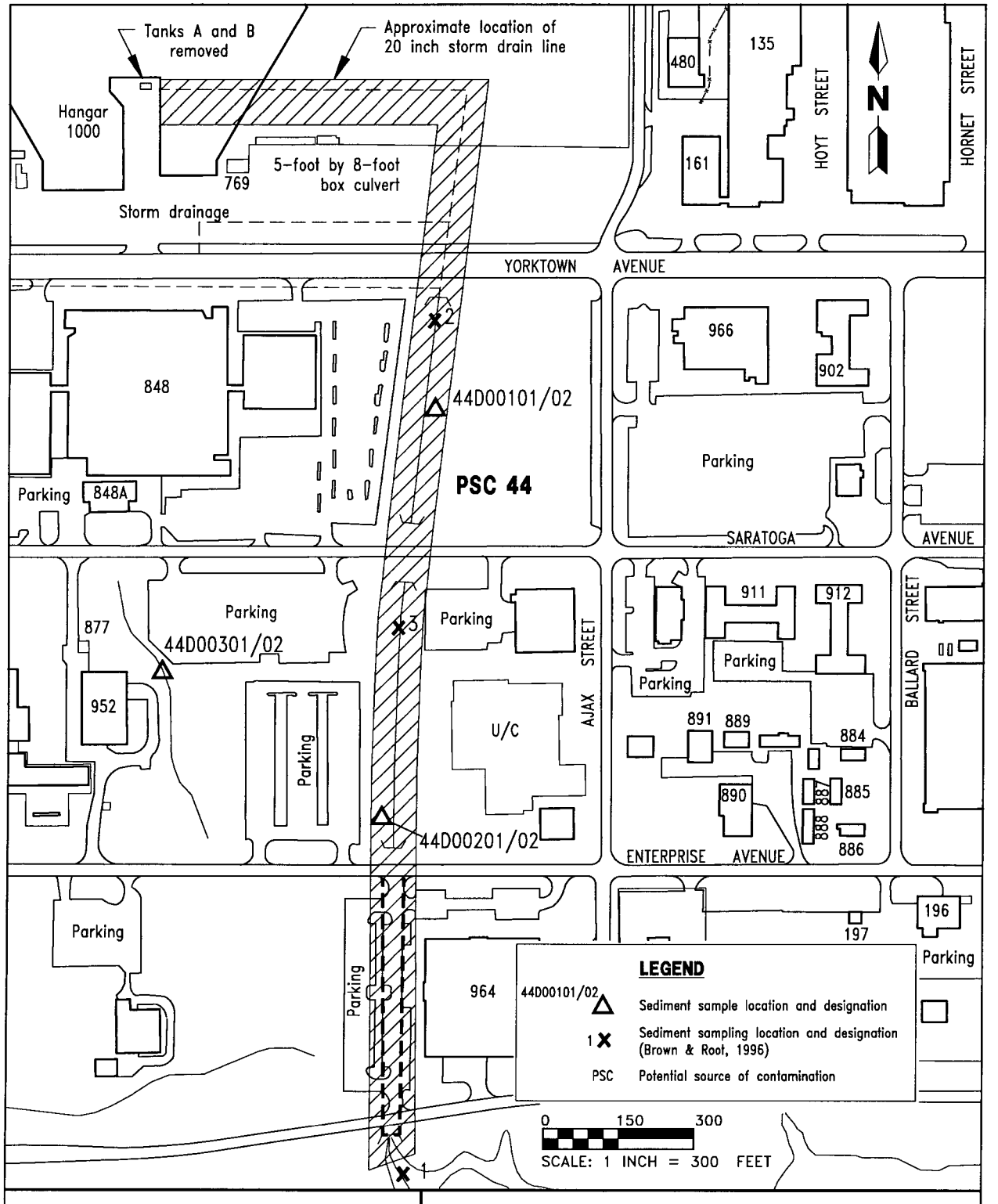

FIGURE 1-2
SAMPLING LOCATIONS AT PSC 44
DRAINAGE DITCH WEST OF AJAX STREET

K \02508\02508-59\SER\02508542.DWG BB-VC 12/16/98 14 21 23, AutoCAD R14

SAMPLING EVENT REPORT
PSC 44

NAVAL AIR STATION JACKSONVILLE
JACKSONVILLE, FLORIDA

In 1991, NAS Jacksonville proposed to add PSC 44 to the hazardous and solid waste amendment permit as a PSC after testing of the sediment in the ditch revealed potential metal and organic contamination (NAS Jacksonville, 1991). Based on the results of three sediment samples collected by Brown & Root Environmental, Inc. (B&R), in 1995, it was unclear whether the detected contaminants were the result of a release from tanks at Hangar 1000 (located north of Yorktown Avenue) or due to storm water runoff from the adjacent parking lots and/or roads (B&R, 1996). Therefore, the NAS Jacksonville Partnering Team recommended that further analytical testing and concurrent toxicity testing of the ditch sediment be completed in order to facilitate the RRDS process.

2.0 SAMPLING APPROACH AND FIELD CHANGES.

The actual sampling program conducted at PSC 44 is significantly different from the sampling plan recommended in the RRDS report (ABB-ES, 1995). In December of 1995, B&R sampled sediment at the upper end of the ditch near the storm sewer discharge south of Yorktown Avenue and at the outfall area in the St. Johns River. A third sediment sample was collected along the ditch between these two samples. The results of the B&R sediment sampling showed that detected concentrations of polynuclear aromatic hydrocarbons (PAHs), pesticides, and several metals exceeded the Florida Sediment Quality Assessment Guidelines (MacDonald, 1994). The NAS Jacksonville Partnering Team concurred with recommendations to not collect surface water as part of the sampling program. Due to the dynamic nature of surface water movement in the PSC 44 drainage ditch, site-related constituents are more likely to be detected in the sediment. The actual field sampling program conducted by HLA at PSC 44 is summarized below.

A total of six sediment samples were collected by HLA at three locations in the drainage ditch during two separate rounds of sampling. The first round of sampling was completed on December 17 and 18, 1997. Sediment was collected from two locations in the PSC 44 drainage ditch (44D001 and 44D002) and one background location (44D003) from a drainage ditch located approximately 400 feet west of PSC 44. The samples were analyzed for the TCL and TAL analyses described in Section 1.1 and were also submitted for toxicity testing using the saltwater amphipod *Ampelisca abdita*. This saltwater amphipod was chosen as the test organism for toxicity testing because a portion of the ditch is tidally influenced by the brackish St. Johns River, and previous HLA investigations during 1993 had indicated that the river water was marine in nature. However, upon receipt of the sediment samples by the toxicity testing laboratory, the salinity of the samples was measured and classified as freshwater. Although natural seawater with a salinity of approximately 32 parts per thousand was added to the sediment prior to the initiation of the toxicity test, the results from the testing was inconclusive and it was determined that the freshwater amphipod *Hyalella azteca* should have been used as the appropriate test organism. Based on recommendations from the NAS Jacksonville Partnering Team, sediment from the same three locations (44D001, 44D002, and 44D003) was resampled on April 17, 1998, and analyzed for cadmium and concurrent toxicity testing using the freshwater amphipod *Hyalella azteca*.

The six sediment samples were sent by overnight carrier to the subcontracting analytical and toxicity testing laboratories. CompuChem Environmental Corporation (CompuChem) (Cary, North Carolina) analyzed the first set of sediment samples for TCL SVOCs, pesticides, and TAL inorganic constituents, and QST Environmental (Newberry, Florida) conducted the toxicity tests. The second round of sediment samples was sent to EA Engineering, Science, and Technology, Inc. (EA) (Sparks, Maryland), who performed the toxicity tests and analyzed the sediment for cadmium. A sample tracking log, including the sample identifier and parameters analyzed, is included in Appendix A. The validated laboratory analytical results are presented in Appendix B. A summary of sediment analytical results is presented in Appendix C. The results of the sediment toxicity testing using *Ampelisca abdita* are shown in Appendix D, and results using *Hyalella azteca* are presented in Appendix E.

3.0 QUALITY ASSURANCE AND QUALITY CONTROL

Field samples and associated quality assurance and quality control (QA/QC) samples were collected and analyzed according to USEPA Contract Laboratory Program and Naval Facilities Engineering Service Center (NFESC) requirements by an NFESC certified laboratory, CompuChem. 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 utilized 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 Site Screening Workplan (ABB-ES, 1997). 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).

EA performed reference toxicant tests (EA, 1998) on cultured test species. The *Hyalella azteca* were exposed to the reference toxicant, copper sulfate, in a graded concentration series to determine the 96-hour LC_{50} value. The results of the reference toxicant test were compared to control chart limits established by EA according to USEPA methodology (USEPA, 1993).

4.0 ANALYTICAL RESULTS

4.1 ANALYTICAL RESULTS FOR SEDIMENT. A summary of the sediment analytical data from the two sampling events is summarized in Appendix B. As shown in Figure 1-2, three samples were collected during each of the two sampling events. Two sediment samples were collected in the PSC 44 drainage ditch and one background sample was collected in a nearby drainage ditch located approximately 400 feet west of the PSC 44 ditch. Samples collected during the first round of sampling contain a -01 suffix in the sample identification, while those collected during the second round of sampling contain a -02 suffix.

4.1.1 Semivolatile Organic Compounds Twenty SVOCs were detected in the sediment samples collected during the first round of sampling. Maximum concentrations of SVOCs were detected at sampling location 44D001. Based on concurrence from the NAS Jacksonville Partnering Team, the samples collected during the second phase of sediment sampling were not analyzed for SVOCs.

4.1.2 Pesticides Thirteen pesticides were identified in sediment samples collected during the first round of sampling. The presence of pesticides in the PSC 44 drainage ditch is likely the result of stationwide pesticide use. Based on concurrence from the NAS Jacksonville Partnering Team, the samples collected during the second phase of sediment sampling were not analyzed for pesticides.

4.1.3 Inorganic Parameters Nineteen inorganic constituents were detected in sediment samples collected during the first round of sampling. Based on concurrence from the NAS Jacksonville Partnering Team, the samples collected during the second phase of sediment sampling were only analyzed for cadmium. The results of the second phase of sampling show that concentrations of cadmium in the PSC 44 drainage ditch have decreased over time.

5.0 RISK EVALUATION

The purpose of performing risk evaluations as part of the site screening evaluation is to assist in determining whether or not the existing risk at PSC 44

1. supports a no further action decision,
2. indicates the need for an interim remedial action, or
3. requires additional investigation to make a decision.

5.1 HUMAN HEALTH RISK SCREENING. Human health risk screening involves comparing concentrations of detected analytes to background screening levels (inorganic analytes only) and then comparing the concentrations of those analytes present above background screening levels to risk-based concentrations (RBCs) developed by the USEPA and soil cleanup goals (SCGs) developed by the Florida Department of Environmental Protection (FDEP). The USEPA and FDEP have not developed human health RBCs and SCGs for sediment. The maximum detected concentrations in sediment were, therefore, compared to RBCs and SCGs developed for soils. Because exposure to soil is considerably more likely than exposure to sediment, the screening is very conservative. Contaminants present below the RBCs are considered to pose no or only insignificant risk. Analytes that are detected above both the background screening concentrations and the RBCs are considered chemicals of potential concern (COPCs).

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 nondetections) of background concentrations. (For PSC 44, the background screening concentrations presented in Appendix F were the data set used to support the Operable Unit 3 remedial investigation.)

- The detected concentration did not exceed USEPA Region 3 RBCs (USEPA, 1998).

The maximum detected concentration of an analyte in sediment was first screened against the background screening levels presented in Appendix F. Those chemicals present below background were dropped from further consideration. Appendix C presents a comparison of all detected analytes and the USEPA Region 3 RBCs and FDEP SCGs. Table 5-1 presents those chemicals present above background screening levels, if appropriate, and their respective RBCs and SCGs. Benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene had maximum detected concentrations above both the residential and industrial screening values. The maximum detected concentration of indeno(1,2,3-cd)pyrene and arsenic were above the residential screening values.

These compounds were selected as COPCs and a more detailed risk evaluation was performed. Under current conditions, it is unlikely that anyone would be exposed to sediment at PSC 44. The drainage ditch is not maintained, and grasses and other plants are allowed to grow in the ditch. Workers entering the ditch will most likely be wearing shoes. Potential future exposure could involve residents

Table 5-1
Contaminants of Potential Concern

Sampling Event Report
Potential Source of Contamination 44
Naval Air Station
Jacksonville, Florida

Analyte	Maximum Detected Concentration	FDEP Soil Cleanup Goals		Region 3 Risk-Based Concentrations		Background Screening Levels
		Residential	Industrial	Residential	Industrial	
Semivolatile Organic Compounds (µg/kg)						
Benzo(a)anthracene	10,000	1,400	4,900	870	7,800	NA
Benzo(a)pyrene	8,500	100	500	87	780	NA
Benzo(b)fluoranthene	14,000	1,400	500	870	7,800	NA
Indeno(1,2,3-cd)pyrene	2,800	1,400	5,000	870	7,800	NA
Inorganic Analytes (mg/kg)						
Arsenic	17	0.7	3.1	0.43	3.8	1.26

Notes: FDEP = Florida Department of Environmental Protection.
µg/kg = micrograms per kilogram.
NA = not available
mg/kg = milligrams per kilogram

or trespassers if the station were closed and land use were changed to residential or recreational. A residential exposure was evaluated because it is the most conservative.

Risk to child and adult residents were evaluated assuming exposure to sediment due to wading in the drainage ditch. Because the depth of water at the northern end of the ditch (where the maximum detected concentration of contaminants is located) is shallow, it was assumed that the water would be from the knees down (which is a conservative estimate of water depth). Adults were assumed to wade approximately 1 day per week (50 times per year) and children were assumed to wade approximately 2 days per week (100 times per year). A separate calculation was performed for children 6 years and under. It was assumed that children within this group and between the ages of 4 and 6 would play in the ditch, and that children less than 4 years old would not be allowed to play in the drainage ditch because of the danger of drowning. Because the sediment is always covered with water, it has been assumed that ingestion of sediment would be an unlikely pathway. (See Appendix G for risk calculations.)

Using the above assumptions, risks were calculated as shown in the following table:

Scenario	Cancer Risk	Hazard Index
Future Adult Resident	5×10^{-6}	0.00003
Future Child Resident	3×10^{-6}	0.0002

The cancer risk for potential future adult and child residents are within the USEPA acceptable range of 10^{-4} to 10^{-6}. The hazard index for both adult and child are well below the pathway-acceptable limit of 1. Even so, it is likely that these risk calculations overestimate the risk at PSC 44 if the site were to become residential. Most of the risk at PSC 44 is due to the presence of PAHs in the sediment. The most likely source of PAHs in the sediment are runoff from

the tarmac, roads, and parking lots that drain into the drainage ditch. If NAS Jacksonville were to close and the land use converted from industrial to residential, most of these sources would be eliminated or reduced significantly. In addition, if the area were to be converted to residential use, it is likely that the drainage ditch would be enclosed in a culvert as a mosquito control measure. In that case, there would be no exposure to sediment.

Based on these calculations, human health risk is acceptable at PSC 44 based on current land use and potential future residential land use.

5.2 FOCUSED ECOLOGICAL RISK EVALUATION. A focused ecological risk evaluation (FERE) has been prepared for PSC 44 in response to the initial findings from the RRDS for PSC 44 at NAS Jacksonville (B&R, 1996).

As previously discussed, B&R collected three sediment samples in the PSC 44 drainage ditch in December 1995. Detected concentrations of pesticides, PAHs, and several metals exceeded the Florida Sediment Quality Assessment Guidelines (MacDonald, 1994). Based on the results of the B&R data, it was unclear whether the detected contaminants were the result of a release from tanks at Hangar 1000 (located upgradient of PSC 44) or due to storm water runoff from adjacent parking lots and roads surrounding the ditch. Therefore, further evaluation of the potential ecological impacts associated with exposure to the sediment is required before making a remedial decision about PSC 44. As part of the FERE, HLA completed the following tasks, which are described in further detail in Chapter 2.0:

- collection of additional sediment analytical data, and
- evaluation of sediment toxicity testing results.

The results of the chemical analyses and concurrent toxicity testing results were used to determine if chemical concentrations in the sediment of the PSC 44 drainage ditch are associated with adverse effects to aquatic receptors including benthic invertebrates.

The FERE is presented in the following sections:

- 5.2.1 Identification of Exposure Pathways
- 5.2.2 Sediment Analytical Data
- 5.2.3 Sediment Toxicity Testing Results
- 5.2.4 Summary of Focused Ecological Risk Evaluation

5.2.1 Identification of Exposure Pathways Exposure pathways were considered for two groups of ecological receptors including terrestrial wildlife and aquatic receptors. Because the area surrounding PSC 44 is industrialized and little, if any, ecological habitat exists, the presence of terrestrial wildlife at the PSC 44 drainage ditch is unlikely. It is anticipated that only small birds may occasionally drink surface water from the ditch. However, given the low water solubility of the major contaminants, it is unlikely that birds would be adversely affected from drinking surface water out of the PSC 44 drainage ditch.

The ecological exposure route believed to contribute the highest potential contaminant exposures is direct contact of aquatic receptors with the sediment in the drainage ditch. Because the drainage ditch is very shallow, it is

that aquatic receptors would primarily include sediment-dwelling benthic macroinvertebrates and small fish.

5.2.2 Sediment Analytical Data As recommended by the NAS Jacksonville Partnering Team, additional sediment samples were collected to evaluate potential ecological exposures to aquatic receptors. As previously discussed in Chapter 2.0, two sets of three sediment samples (two site-related and one background) were collected during December 1997 and April 1998. During the December 1997 sampling event, sediment was analyzed for TCL SVOCs, pesticides, and TAL inorganic constituents. During the April 1998 sampling event, sediment was analyzed for cadmium only.

A summary of the sediment analytical data for both sampling events is provided in Table 5-2. This table includes the frequency of detection, range of detected concentrations, average of all concentrations, and the applicable sediment quality guidelines from USEPA Region IV (USEPA, 1995) and the FDEP (MacDonald, 1994). Maximum and average concentrations of analytes detected in the sediment are compared to the USEPA Region IV and FDEP threshold effects level (TEL) and probable effects level (PEL) sediment quality criteria. The USEPA Region IV values are derived from literature as reported in publications from the State of Florida and the National Oceanic and Atmospheric Administration (Long and Morgan, 1991). The FDEP TEL value represents concentrations of sediment-associated contaminants that are not considered to represent significant hazards to aquatic organisms. Within the range of concentrations between the TEL and PEL, adverse biological effects are possible; above the PEL range, concentrations of sediment-associated contaminants are considered to represent significant hazards to aquatic organisms.

As shown in Table 5-2, maximum detected concentrations of 11 PAHs in the sediment of the PSC 44 drainage ditch are elevated above the USEPA Region IV and FDEP PEL sediment screening values. The distribution of total PAHs in the sediment of the PSC 44 drainage ditch shows that a localized area of elevated PAHs occurs in the vicinity of sampling station 44D001. Total PAHs were detected at a concentration of 139 milligrams per kilogram (mg/kg) at station 44D001 as compared to concentrations ranging from 0 to 12.1 mg/kg at the other PSC 44 sampling locations. Concentrations of PAHs detected in the B&R sediment sampling location 2 (located directly upstream of 44D001) and 3 (located directly downstream of 44D001) were 3.7 mg/kg and 0 mg/kg, respectively. Therefore, it appears that the source of the PAHs is not from Hangar 1000, but rather is the result of storm water runoff from adjacent parking lots and roads.

Detected concentrations of several pesticides including 4,4'-dichlorodiphenyl-dichloroethene (DDE), 4,4'-dichlorodiphenyltrichloroethane (DDT), alpha-chlordane, and endrin are elevated above their respective screening values. However, the presence of these pesticides in the PSC 44 drainage ditch is likely the result of basewide pesticide use, rather than site-related.

With the exception of cadmium and lead, detected concentrations of all metals in sediment of the PSC 44 drainage ditch were less than the available sediment screening values. Both cadmium and lead were detected during the first round of sampling at concentrations that exceeded their respective FDEP PEL values. Maximum concentrations of cadmium (6.2 mg/kg) and lead (130 mg/kg) were both detected from sampling station 44D001. Based on recommendations from the NAS Jacksonville Partnering Team, it was decided that the sediment would be resampled

Table 5-2
Summary of Analytes Detected in Sediment[1]

Sampling Event Report
Potential Source of Contamination 44
Naval Air Station
Jacksonville, Florida

Chemical Name	Frequency of Detection[2]	Range of Detects	Average of all Concentrations[3]	Background Concentrations[4]	USEPA Region IV Sediment Guidelines[5]	FDEP Sediment TEL/PEL Guidelines[6]
Semivolatile Organic Compounds (µg/kg)						
2-Methylnaphthalene	1/2	600	413	ND	330	20.2/201
Acenaphthene	2/2	86 to 1,500	118	ND	330	6 71/88.9
Acenaphthylene	1/2	82	154	ND	330	5 87/128
Anthracene	2/2	140 to 2,400	190	ND	330	46.9/245
Benzo(a)anthracene	2/2	890 to 10,000	5,445	390	330	74.8/693
Benzo(a)pyrene	2/2	1,100 to 8,500	4,800	460	330	88.8/763
Benzo(b)fluoranthene	2/2	1,800 to 14,000	7,900	930	330	NA/NA
Benzo(g,h,i)perylene	2/2	460 to 2,400	1,430	290	330	NA/NA
Benzo(k)fluoranthene	2/2	650 to 16,000	8,325	330	330	NA/NA
bis(2-Ethylhexyl)phthalate	2/2	570 to 1,900	1,235	560	182	182/2647
Butylbenzylphthalate	2/2	73 to 350	212	72	NA	NA/NA
Carbazole	2/2	140 to 5,300	2,720	ND	330	NA/NA
Chrysene	2/2	960 to 11,000	5,980	640	330	108/846
Dibenzofuran	1/2	1400	813	ND	NA	NA/NA
Fluoranthene	2/2	2,100 to 21,000	11,550	890	330	113/1494
Fluorene	2/2	66 to 1,800	933	ND	330	21.2/144
Indeno(1,2,3-cd)pyrene	2/2	580 to 2,800	1,690	300	330	NA/NA
Naphthalene	1/2	1300	763	ND	330	34.6/391
Phenanthrene	2/2	940 to 17,000	8,970	180	330	86 7/544
Pyrene	2/2	1,600 to 20,000	10,800	650	330	153/1398

See notes at end of table.

Table 5-2 (Continued)
Summary of Analytes Detected in Sediment[1]

Sampling Event Report
Potential Source of Contamination 44
Naval Air Station
Jacksonville, Florida

Chemical Name	Frequency of Detection[2]	Range of Detects	Average of all Concentrations[3]	Background Concentrations[4]	USEPA Region IV Sediment Guidelines[5]	FDEP Sediment TEL/PEL Guidelines[6]
Pesticides and PCBs (µg/kg)						
4,4'-DDE	2/2	4.6 to 7	5.8	1.9	3.3	2.07/3.74
4,4'-DDT	2/2	1.2 to 22	11.6	ND	3 3	1.19/4.77
Aldrin	1/2	5 6	3.4	0.26	NA	NA/NA
alpha-BHC	1/2	0 55	0 88	0.3	[7]3.3	NA/NA
alpha-Chlordane	2/2	1 to 3.8	2 4	2 4	1.7	2.26/4.79
delta-BHC	1/2	1.6	1.4	ND	[7]3.3	[7]0.32/[7]0.99
Endosulfan II	1/2	1.5	2.3	1.2	NA	NA/NA
Endosulfan sulfate	1/2	0.87	1.9	1.4	NA	NA/NA
Endrin	1/2	23	12.7	ND	3.3	NA/NA
Endrin ketone	1/2	5.4	4.2	ND	NA	NA/NA
gamma-Chlordane	1/2	1.1	1.3	3.3	1 7	2.26/4.79
Heptachlor epoxide	1/2	1.3	1.4	ND	NA	NA/NA
Methoxychlor	1/2	10	11	ND	NA	NA/NA
Inorganic Analytes (mg/kg)						
Aluminum	2/2	525 to 1100	813	1,700	NA	NA/NA
Arsenic	1/2	1.7	1	0.73	7.24	7.24/41.6
Barium	2/2	7.3 to 25.6	16.5	21.5	NA	NA/NA
Beryllium	1/2	0.11	0.06	0.1	NA	NA/NA
Cadmium (1997 sampling)	2/2	1.9 to 6.2	4 1	2.2	1	0.676/4 21
Cadmium (1998 sampling)	2/2	0.22 to 1.6	0.91	0.31	1	0.676/4.21
Calcium	2/2	805 to 4,240	2,523	16,000	NA	NA/NA

See notes at end of table.

Table 5-2 (Continued)
Summary of Analytes Detected in Sediment[1]

Sampling Event Report
Potential Source of Contamination 44
Naval Air Station
Jacksonville, Florida

Chemical Name	Frequency of Detection[2]	Range of Detects	Average of all Concentrations[3]	Background Concentrations[4]	USEPA Region IV Sediment Guidelines[5]	FDEP Sediment TEL/PEL Guidelines[6]
Inorganic Analytes (mg/kg) (continued)						
Chromium	2/2	7.4 to 33 3	20.4	9	52.3	52.3/160
Cobalt	2/2	1.3 to 2	1 7	0.81	NA	NA/NA
Copper	2/2	5 8 to 17.5	11.7	13	18.7	18.7/108
Iron	2/2	1,330 to 2,280	1,805	6,090	NA	NA/NA
Lead	2/2	42 to 130	86	46.6	30.2	30 2/112
Magnesium	2/2	148 to 639	394	701	NA	NA/NA
Manganese	2/2	5.9 to 18.8	12.4	34	NA	NA/NA
Mercury	2/2	0.11 to 0.12	0.12	0 13	0.13	0.13/0.696
Nickel	2/2	1.4 to 3 3	2 4	3.3	15.9	15.9/42 8
Potassium	2/2	19 to 59	39	40.4	NA	NA/NA
Sodium	2/2	172 to 227	100	203	NA	NA/NA
Vanadium	2/2	3 1 to 7.6	5 4	8.5	NA	NA/NA
Zinc	2/2	38.6 to 137	87.8	159	124	124/271

[1] Sample locations include 44D001 and 44D002.
[2] Frequency of detection is equal to the number of samples in which the analyte is detected in relation to the total number of samples analyzed (excluding rejected data).
[3] The average of all concentrations assigns a value of 1/2 the detection limit to non-detects
[4] Data from background location 44D003.
[5] USEPA Region IV Waste Management Division Sediment Screening Values for Hazardous Waste Sites (USEPA, 1995).
[6] TEL and PEL Sediment Quality Assessment Guidelines (MacDonald, 1994).
[7] Value for gamma-BHC used as a surrogate.

Notes: USEPA = U.S Environmental Protection Agency.
FDEP = Florida Department of Environmental Protection
TEL = threshold effects limit.
PEL = probable effects limit.
µg/kg = micrograms per kilogram.
ND = not detected.
NA = not analyzed.
PCB = polychlorinated biphenyl.
DDE = dichlorodiphenyldichloroethene
DDT = dichlorodiphenyltrichloroethane.
BHC = benzene hexachloride.
mg/kg = milligrams per kilogram.

and analyzed for cadmium only. Analytical results from the second round of sampling show that detected concentrations of cadmium in the PSC 44 drainage ditch have decreased over time. The range of detected cadmium concentrations in the April 1998 sampling was 0.22 to 1.6 mg/kg, as compared to a range of 1.9 to 6.2 mg/kg detected during the December 1997 sampling event.

Because detected concentrations of PAHs, several pesticides, and two metals exceeded the available sediment screening criteria, sediment from the PSC 44 drainage ditch was also submitted for sediment toxicity testing. The results of the sediment toxicity tests are described in Subsection 5.2.3.

5.2.3 Sediment Toxicity Testing Results As previously discussed in Chapter 2.0, sediment from the PSC 44 drainage ditch and sediment from a background drainage ditch were submitted for toxicity testing. These toxicity tests represent exposure of test organisms to the actual mixture of contamination in the sediment and provide a measurement of contaminant bioavailability from the sediment to the receptor.

During the first round of sediment sampling, sediment was submitted for toxicity testing using the saltwater amphipod *Ampelisca abdita*. As discussed in Chapter 2.0, the toxicity test should have been completed using the freshwater amphipod *Hyalella azteca* because the salinity of the sample was classified as freshwater by the toxicity testing laboratory. The results of the sediment toxicity tests using the saltwater amphipod *Ampelisca abdita* are attached as Appendix C. Based on input from the NAS Jacksonville Partnering Team, the sediment was resampled in April 1998 and resubmitted for sediment toxicity testing using the freshwater amphipod *Hyalella azteca.*

The results of the 10-day *Hyalella azteca* sediment toxicity tests are summarized in Table 5-3; the full laboratory report is attached as Appendix E. At the completion of the toxicity tests, the site background sample location 44D003 had 96 percent survival with a mean dry weight of 0.112 milligrams per organism (mg/organism). Survival in the sample location 44D002 sediment was 99 percent, while survival in the sample location 44D001 sediment was 93 percent. Statistical analyses showed no significant ($P = 0.05$) decrease in survival of the sample location 44D001 organisms when compared to the site background sample location 44D003. Mean dry weights of the organisms exposed to sample locations 44D001 and 44D002 sediments were higher than the site background sediment. The sample location 44D001 sediment had a mean dry weight of 0.124 mg/organism, while the 44D002 sediment had a mean dry weight of 0.12 mg/organism. No statistical comparisons were made to the formulated laboratory sediment because all survival and growth values for the three field-collected samples were higher than the formulated laboratory sediment. The formulated laboratory sediment had an acceptable mean survival of 81 percent with a mean dry weight of 0.079 mg/organism.

In summary, neither the sample location 44D001 nor the 44D002 sediments were toxic to *Hyalella azteca* with respect to survival or growth when compared to the site background sample location 44D003 sediment. These results suggest that although concentrations of PAHs, pesticides, cadmium, and lead exceeded the available sediment screening criteria, benthic invertebrates are not adversely affected from exposure to sediment in the PSC 44 drainage ditch.

Table 5-3
Summary of Sediment Toxicity Testing Results

Sampling Event Report
Potential Source of Contamination 44
Naval Air Station
Jacksonville, Florida

Sample Location	Survival (percent)	Mean Dry Weight (mg)[1]
Formulated laboratory control sediment	81	0 079
44D001	93	0.124
44D002	99	0.12
44D003	96	0.112

[1] Growth was measured as dry weight in milligrams.

Note: mg = milligram.

5.2.4 Summary of the Focused Ecological Risk Evaluation Based on a comparison of maximum detected concentrations of analytes in the sediment of the PSC 44 drainage ditch with sediment screening criteria, detected concentrations of PAHs, several pesticides, and cadmium and lead exceeded the available criteria. The maximum concentrations of these contaminants were generally detected at sampling location 44D001, which is located approximately 200 feet south of Yorktown Avenue. Based on the distribution of contaminants along the PSC 44 drainage ditch, it is likely that the source of these contaminants is storm water runoff from adjacent parking lots and roads. In addition, the results of the sediment toxicity tests confirm that aquatic receptors in the PSC 44 drainage ditch are not adversely affected from exposure to sediment. Therefore, risks to aquatic receptors in the PSC 44 drainage ditch are not predicted.

6.0 REFERENCES

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APPENDIX A

OFF-SITE SAMPLE TRACKING LOG

Appendix A

PSC 44
OFFSITE SAMPLE TRACKING LOG
SITE SCREENING, NAS JACKSONVILLE

SAMPLE ID	LAB	SAMP DATE	MATRIX	TAL MET	Cadmium	TCL SVOC	TCL PEST	TOXICITY	DRFL	TAT	DSTV	DRFV
44D00101	COMPU/QST	12/17/97	S	X		X	X	X	1/16/98	30	NDV	NDV
44D00201	COMPU/QST	12/18/97	S	X		X	X	X	1/16/98	29	NDV	NDV
44D00301	COMPU/QST	12/17/97	S	X		X	X	X	1/16/98	30	NDV	NDV
44D00102	QST	4/17/98	S		X			X	5/15/98	28	NDV	NDV
44D00202	QST	4/17/98	S		X			X	5/15/98	28	NDV	NDV
44D00302	QST	4/17/98	S		X			X	5/15/98	28	NDV	NDV

NOTES:

SAMPLE ID	Sample Identifier
SAMP DATE	Date of Sample Collection
UDEPTH, LDEPTH	Depths, upper (UDEPTH) and lower (LDEPTH), feet below land surface
MATRIX	Media Sampled
TAL_MET	Target Analyte List Metals
TCL SVOC	Target Compound List Semivolatile Organics
TCL PEST	Target Compound List Pesticides
DRFL	Date Package Received from Laboratory
TAT	Turnaround Time (days)
DSTV	Date Package Sent to Validators
DRFV	Date Package Received from Validators
NDV	Internal review only, not subjected to full independent data validation

APPENDIX B

VALIDATED LABORATORY ANALYTICAL RESULTS

Appendix B

Validated Laboratory Analytical Results
TAL Metals, TCL Semivolatile Organics and Pesticides
Sediment
PSC 44

Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	44D00101		44D00102		44D00201		44D00202		44D00301		44D00302	
Sampling Date	12/17/97		4/17/98		12/17/97		4/17/98		12/17/97		4/17/98	
Semivolatile organics, ug/kg												
1,2,4-Trichlorobenzene	570	U	NA		450	U	NA		470	U	NA	
1,2-Dichlorobenzene	570	U	NA		450	U	NA		470	U	NA	
1,3-Dichlorobenzene	570	U	NA		450	U	NA		470	U	NA	
1,4-Dichlorobenzene	570	U	NA		450	U	NA		470	U	NA	
2,2'-oxybis(1-Chloropropane)	570	U	NA		450	U	NA		470	U	NA	
2,4,5-Trichlorophenol	1400	U	NA		1100	U	NA		1200	U	NA	
2,4,6-Trichlorophenol	570	U	NA		450	U	NA		470	U	NA	
2,4-Dichlorophenol	570	U	NA		450	U	NA		470	U	NA	
2,4-Dimethylphenol	570	U	NA		450	U	NA		470	U	NA	
2,4-Dinitrophenol	1400	U	NA		1100	U	NA		1200	U	NA	
2,4-Dinitrotoluene	570	U	NA		450	U	NA		470	U	NA	
2,6-Dinitrotoluene	570	U	NA		450	U	NA		470	U	NA	
2-Chloronaphthalene	570	U	NA		450	U	NA		470	U	NA	
2-Chlorophenol	570	U	NA		450	U	NA		470	U	NA	
2-Methylnaphthalene	600		NA		450	U	NA		470	U	NA	
2-Methylphenol	570	U	NA		450	U	NA		470	U	NA	
2-Nitroaniline	1400	U	NA		1100	U	NA		1200	U	NA	
2-Nitrophenol	570	U	NA		450	U	NA		470	U	NA	
3,3'-Dichlorobenzidine	570	U	NA		450	U	NA		470	U	NA	
3-Nitroaniline	1400	U	NA		1100	U	NA		1200	U	NA	
4,6-Dinitro-2-methylphenol	1400	U	NA		1100	U	NA		1200	U	NA	
4-Bromophenyl-phenylether	570	U	NA		450	U	NA		470	U	NA	
4-Chloro-3-methylphenol	570	U	NA		450	U	NA		470	U	NA	
4-Chloroaniline	570	U	NA		450	U	NA		470	U	NA	
4-Chlorophenyl-phenylether	570	U	NA		450	U	NA		470	U	NA	
4-Methylphenol	570	U	NA		450	U	NA		470	U	NA	
4-Nitroaniline	1400	U	NA		1100	U	NA		1200	U	NA	
4-Nitrophenol	1400	U	NA		1100	U	NA		1200	U	NA	
Acenaphthene	1500		NA		86	J	NA		470	U	NA	
Acenaphthylene	82	J	NA		450	U	NA		470	U	NA	
Anthracene	2400		NA		140	J	NA		470	U	NA	
Benzo(a)anthracene	10000	D	NA		890		NA		390	J	NA	
Benzo(a)pyrene	8500	D	NA		1100		NA		460	J	NA	
Benzo(b)fluoranthene	14000	DJ	NA		1800		NA		930		NA	
Benzo(g,h,i)perylene	2400		NA		460		NA		290	J	NA	
Benzo(k)fluoranthene	16000	DJ	NA		650		NA		330	J	NA	
bis(2-Chloroethoxy)methane	570	U	NA		450	U	NA		470	U	NA	
bis(2-Chloroethyl)ether	570	U	NA		450	U	NA		470	U	NA	
bis(2-Ethylhexyl)phthalate	1900		NA		570		NA		560		NA	
Butylbenzylphthalate	350	J	NA		73	J	NA		72	J	NA	
Carbazole	5300	DJ	NA		140	J	NA		470	U	NA	
Chrysene	11000	D	NA		960		NA		640		NA	
Di-n-butylphthalate	570	U	NA		450	U	NA		470	U	NA	
Di-n-octylphthalate	570	U	NA		450	U	NA		470	U	NA	
Dibenz(a,h)anthracene	570	U	NA		450	U	NA		470	U	NA	
Dibenzofuran	1400		NA		450	U	NA		470	U	NA	
Diethylphthalate	570	U	NA		450	U	NA		470	U	NA	
Dimethylphthalate	570	U	NA		450	U	NA		470	U	NA	
Fluoranthene	21000	D	NA		2100		NA		890		NA	
Fluorene	1800		NA		66	J	NA		470	U	NA	
Hexachlorobenzene	570	U	NA		450	U	NA		470	U	NA	

Appendix B

Validated Laboratory Analytical Results
TAL Metals, TCL Semivolatile Organics and Pesticides
Sediment
PSC 44

Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	44D00101		44D00102		44D00201		44D00202		44D00301		44D00302	
Sampling Date	12/17/97		4/17/98		12/17/97		4/17/98		12/17/97		4/17/98	
Hexachlorobutadiene	570	U	NA		450	U	NA		470	U	NA	
Hexachlorocyclopentadiene	570	U	NA		450	U	NA		470	U	NA	
Hexachloroethane	570	U	NA		450	U	NA		470	U	NA	
Indeno(1,2,3-cd)pyrene	2800		NA		580		NA		300	J	NA	
Isophorone	570	U	NA		450	U	NA		470	U	NA	
N-Nitroso-di-n-propylamine	570	U	NA		450	U	NA		470	U	NA	
N-Nitrosodiphenylamine (1)	570	U	NA		450	U	NA		470	U	NA	
Naphthalene	1300		NA		450	U	NA		470	U	NA	
Nitrobenzene	570	U	NA		450	U	NA		470	U	NA	
Pentachlorophenol	1400	U	NA		1100	U	NA		1200	U	NA	
Phenanthrene	17000	D	NA		940		NA		180	J	NA	
Phenol	570	U	NA		450	U	NA		470	U	NA	
Pyrene	20000	D	NA		1600		NA		650		NA	
Pesticides/PCBs, ug/kg												
4,4'-DDD	6	U	NA		4 6	U	NA		4 7	U	NA	
4,4'-DDE	7	J	NA		4 6	J	NA		1 9	J	NA	
4,4'-DDT	22	J	NA		1 2	J	NA		4 7	U	NA	
Aldrin	5 6	J	NA		2 4	U	NA		0 26	J	NA	
alpha-BHC	0 55	J	NA		2 4	U	NA		0 3	J	NA	
alpha-Chlordane	1	J	NA		3 8		NA		2 4	J	NA	
beta-BHC	3 1	U	NA		2 4	U	NA		2 4	U	NA	
delta-BHC	1 6	J	NA		2 4	U	NA		2 4	U	NA	
Dieldrin	6	U	NA		4 6	U	NA		4 7	U	NA	
Endosulfan I	3 1	U	NA		2 4	U	NA		2 4	U	NA	
Endosulfan II	6	U	NA		1 5	J	NA		1 2	J	NA	
Endosulfan sulfate	6	U	NA		0 87	J	NA		1 4	J	NA	
Endrin	23	J	NA		4 6	U	NA		4 7	U	NA	
Endrin aldehyde	6	U	NA		4 6	U	NA		4 7	U	NA	
Endrin ketone	6	U	NA		5 4	J	NA		4 7	U	NA	
gamma-BHC (Lindane)	3 1	U	NA		2 4	U	NA		2 4	U	NA	
gamma-Chlordane	3 1	U	NA		1 1	J	NA		3 3		NA	
Heptachlor	3 1	U	NA		2 4	U	NA		2 4	U	NA	
Heptachlor epoxide	3 1	U	NA		1 3	J	NA		2 4	U	NA	
Methoxychlor	10	J	NA		24	U	NA		24	U	NA	
Inorganics, mg/kg												
Aluminum	1100		NA		525		NA		1700		NA	
Antimony	0 74	U	NA		0 56	U	NA		0 58	U	NA	
Arsenic	1 7	J	NA		0 62	U	NA		0 73	J	NA	
Barium	25 6	J	NA		7 3	J	NA		21 5	J	NA	
Beryllium	0 11	J	NA		0 03	U	NA		0 1	J	NA	
Cadmium	6 2	J	0 22		1 9	J	1 6		2 2	J	0 31	
Calcium	4240		NA		805	J	NA		16000		NA	
Chromium	33 3		NA		7 4		NA		9		NA	
Cobalt	2	J	NA		1 3	J	NA		0 81	J	NA	
Copper	17 5		NA		5 8	J	NA		13		NA	
Iron	2280	J	NA		1330	J	NA		6090	J	NA	
Lead	130	J	NA		42	J	NA		46 6	J	NA	
Magnesium	639	J	NA		148	J	NA		701	J	NA	
Manganese	18 8		NA		5 9		NA		34		NA	
Mercury	0 12	J	NA		0 11	J	NA		0 13	J	NA	
Nickel	3 3	J	NA		1 4	J	NA		3 3	J	NA	
Potassium	59	J	NA		19	J	NA		40 4	J	NA	

Appendix B

Validated Laboratory Analytical Results
TAL Metals, TCL Semivolatile Organics and Pesticides
Sediment
PSC 44

Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	44D00101		44D00102		44D00201		44D00202		44D00301		44D00302	
Sampling Date	12/17/97		4/17/98		12/17/97		4/17/98		12/17/97		4/17/98	
Selenium	1 5	U	NA		1 1	U	NA		1 2	U	NA	
Silver	0 26	U	NA		0 2	U	NA		0 2	U	NA	
Sodium	227	J	NA		172	J	NA		203	J	NA	
Thallium	1 4	U	NA		1	U	NA		1 1	U	NA	
Vanadium	7 6	J	NA		3 1	J	NA		8 5	J	NA	
Zinc	137	J	NA		38 6	J	NA		159	J	NA	

Appendix B

Notes to Appendix B
Sediment
PSC 44

Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID = Sample Identifier
Lab ID = Laboratory identifier
NA = Analyte/compound not analyzed

Units

mg/kg	milligram per kilogram
ug/kg	microgram per kilogram

The following standard 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
D	The reported concentration is from a dilution/reanalysis of the sample

APPENDIX C

SUMMARY OF SEDIMENT ANALYTICAL RESULTS

APPENDIX C

Summary of Sediment Analytical Results
Detections Only
PSC 44

Naval Air Station, Jacksonville
Jacksonville, FL

Analyte	FDEP Soil Cleanup Goals		Region 3 Risk-Based Concentrations		Background Screening Levels	44D00101		44D00102		44D00201		44D00202		44D00301		44D00302	
	Residential	Industrial	Residential	Industrial		12/17/97		4/17/98		12/17/97		4/17/98		12/17/97		4/17/98	
Semivolatile Organics, ug/kg																	
2-Methylnaphthalene	960,000	8,800,000	3,100,000	82,000,000		600		NA				NA				NA	
Acenaphthene	2,800,000	30,000,000	4,700,000	120,000,000		1,500		NA		86	J	NA				NA	
Acenaphthylene	670,000	5,600,000				82	J	NA				NA				NA	
Anthracene	20,000,000	300,000,000	23,000,000	610,000,000		2,400		NA		140	J	NA				NA	
Benzo(a)anthracene	~~1,400~~	~~4,900~~	~~870~~	~~7,800~~		~~10,000~~	D	NA		~~890~~		NA		390	J	NA	
Benzo(a)pyrene	~~100~~	~~500~~	~~87~~	~~780~~		~~8,500~~	D	NA		~~1100~~		NA		~~460~~	J	NA	
Benzo(b)fluoranthene	~~1,400~~	~~500~~	~~870~~	~~7,800~~		~~14,000~~	DJ	NA		~~1800~~		NA		~~930~~		NA	
Benzo(g,h,i)perylene	14,000	50,000				2,400		NA		460		NA		290	J	NA	
Benzo(k)fluoranthene	14,000	48,000	8,700	78,000		16,000	DJ	NA		650		NA		330	J	NA	
bis(2-Ethylhexyl)phthalate	48,000	110,000	46,000	410,000		1,900		NA		570		NA		560		NA	
Butylbenzylphthalate	15,000,000	310,000,000	16,000,000	410,000,000		350	J	NA		73	J	NA		72	J	NA	
Carbazole	42,000	120,000	32,000	290,000		5,300	DJ	NA		140	J	NA				NA	
Chrysene	140,000	500,000	87,000	780,000		11,000	D	NA		960		NA		640		NA	
Dibenzofuran	240,000	3,500,000	310,000	8,200,000		1,400		NA				NA				NA	
Fluoranthene	2,900,000	48,000,000	3,100,000	82,000,000		21,000	D	NA		2100		NA		890		NA	
Fluorene	2,400,000	30,000,000	3,100,000	82,000,000		1,800		NA		66	J	NA				NA	
Indeno(1,2,3-cd)pyrene	~~1,400~~	5,000	~~870~~	7,800		~~2,800~~		NA		580		NA		300	J	NA	
Naphthalene	1,300,000	12,000,000	3,100,000	82,000,000		1,300		NA				NA				NA	
Phenanthrene	1,700,000	21,000,000				17,000	D	NA		940		NA		180	J	NA	
Pyrene	2,200,000	41,000,000	2,300,000	61,000,000		20,000	D	NA		1600		NA		650		NA	
Pesticides, ug/kg																	
4,4'-DDE	3,000	11,000	1,900	17,000		7	J	NA		4 6	J	NA		1 9	J	NA	
4,4'-DDT	3,100	12,000	1,900	17,000		22	J	NA		1 2	J	NA				NA	
Aldrin	60	200	38	340		5 6	J	NA				NA		0 26	J	NA	
alpha-BHC	200	600	100	910		0 55	J	NA				NA		0 3	J	NA	
alpha-Chlordane	800	3,000	1,800	16,000		1	J	NA		3 8		NA		2 4	J	NA	
delta-BHC	23,000	470,000				1 6	J	NA				NA				NA	
Endosulfan II	390,000	5,900,000	470,000	12,000,000				NA		1 5	J	NA		1 2	J	NA	
Endosulfan sulfate	390,000	5,900,000	470,000	12,000,000				NA		0 87	J	NA		1 4	J	NA	
Endrin	230,000	470,000	23,000	610,000		23	J	NA				NA				NA	
Endrin ketone	23,000	470,000	23,000	610,000				NA		5 4	J	NA				NA	
gamma-Chlordane	800	3,000	1,800	16,000				NA		1 1	J	NA		3 3		NA	
Heptachlor epoxide	100	1,600	70	630				NA		1 3	J	NA				NA	
Methoxychlor	380,000	7,800,000	390,000	10,000,000		10	J	NA				NA				NA	

APPENDIX C

Summary of Sediment Analytical Results
Detections Only
PSC 44

Naval Air Station, Jacksonville
Jacksonville, FL

Analyte	FDEP Soil Cleanup Goals		Region 3 Risk-Based Concentrations		Background Screening Levels	44D00101		44D00102		44D00201		44D00202		44D00301		44D00302	
	Residential	Industrial	Residential	Industrial		12/17/97		4/17/98		12/17/97		4/17/98		12/17/97		4/17/98	
Inorganics, mg/kg																	
Aluminum	75,000	>1,000,000	78,000	2,000,000	1,190	1,100		NA		525		NA		1,700		NA	
Arsenic	**0.7**	3 1	**0.43**	3 8	1 26	**1.7**	J	NA				NA		**0.73**	J	NA	
Barium	5,200	84,000	5,500	140,000	9 80	25 6	J	NA		7 3	J	NA		21 5	J	NA	
Beryllium	0 2	1	160	4,100	0 48	0 11	J	NA				NA		0 1	J	NA	
Cadmium	37	600	39	1,000	0 6	6 2	J	0 22		1 9	J	1 6		2 2	J	0 31	
Calcium					6,468	4,240		NA		805	J	NA		16,000		NA	
Chromium	290	430	390	10,000	3 8	33 3		NA		7 4		NA		9		NA	
Cobalt	4,700	110,000	4,700	120,000	3 8	2	J	NA		1 3	J	NA		0 81	J	NA	
Copper			3,100	82,000	7	17 5		NA		5 8	J	NA		13		NA	
Iron			23,000	610,000		2,280	J	NA		1,330	J	NA		6,090	J	NA	
Lead	500	1,000			2,300	130	J	NA		42	J	NA		46 6	J	NA	
Magnesium					131	639	J	NA		148	J	NA		701	J	NA	
Manganese	370	5,500	1,600	41,000	6 8	18 8		NA		5 9		NA		34		NA	
Mercury	23	480	23	610	0 1	0 12	J	NA		0 11	J	NA		0 13	J	NA	
Nickel	1,500	26,000	1,600	41,000	6 2	3 3	J	NA		1 4	J	NA		3 3	J	NA	
Potassium					218	59	J	NA		19	J	NA		40 4	J	NA	
Sodium					498	227	J	NA		172	J	NA		203	J	NA	
Vanadium	490	4,800	550	14,000	5 2	7 6	J	NA		3 1	J	NA		8 5	J	NA	
Zinc	23,000	560,000	23,000	610,000	18 4	137	J	NA		38 6	J	NA		159	J	NA	

APPENDIX C

Notes to Summary of Sediment Analytical Results
Detections Only
PSC 44

Naval Air Station, Jacksonville
Jacksonville, FL

NOTES:

NA = Not analyzed

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

D The reported concentration is from a dilution/reanalysis of the sample

mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram
PCB = polychlorinated biphenyl
J = Reported concentration is an estimated quantity
Bold/shaded values indicate exceedance of sediment screening value
Blank space indicates analyte/compound was not detected at the reporting limit

APPENDIX D

RESULTS OF SEDIMENT TOXICITY TESTING WITH *AMPELISCA ABDITA*

QST ENVIRONMENTAL

January 27, 1998

ABB Environmental Services, Inc
(ATTN: Fred Bragdon)
1536 Kingsley Avenue
Orange Park, FL 32703

Dear Fred:

RE: Toxicity Test Report for the PSC 44 Drainage Ditch, NAS JAX

Please find enclosed, the final report for the above-referenced toxicity test conducted by QST. The tests went well without any major problems. After reviewing the reports, if you desire any changes, I will be happy to make them for you.

Please contact me at (352) 333-2626, if you have any questions.

Sincerely,
QST ENVIRONMENTAL

Joe Owusu-Yaw

Joe Owusu-Yaw, Ph.D.
Toxicology Lab Manager

Enclosures:

P.O. Box 1703, Gainesville, FL 32602-1703, Phone 352•332•3318, FAX 352•333•6622
A CILCORP COMPANY
Formerly Environmental Science & Engineering, Inc.

FINAL REPORT:

SUB-CHRONIC TOXICITY OF SEDIMENTS FROM THE PSC 44 DRAINAGE DITCH, NAS JACKSONVILLE, FLORIDA, WITH THE AMPHIPOD, *AMPELISCA ABDITA*

TEST GUIDE:

ASTM E 1367-92

SUBMITTED TO:

ABB Environmental Services, Inc.
1536 Kingsley Avenue
Orange Park, Florida 32703
Phone: (904) 269-7012

PREPARED BY:

QST Environmental
404 SW 140th Terrace
Newberry, Florida 32669-3000
Phone: (352) 332-3318
Fax: (352) 333-6622

STUDY ID:

ABB-ES Project No: 0855548
QST Project No: 3197250G-0100-3100

January 1998

EXECUTIVE SUMMARY

Whole sediment toxicity tests were conducted at QST Environmental with the saltwater amphipod, *Ampelisca abdita*, on samples collected from the PSC 44 Drainage Ditch, Naval Air Station (NAS), Jacksonville, Florida. The effect criteria for the tests were survival and growth. A total of three site sediments and one laboratory control sediment were used in the toxicity tests. After 10 days of exposure, survival of *Ampelisca abdita* in the laboratory control sediment was 91 percent. Survival of *Ampelisca abdita* in the site sediments ranged from 4 percent (44D00101) to 64 percent (44D00301). Survival of *Ampelisca abdita* in the laboratory control sediment was significantly different ($P=0.05$) from survival in sediments from all of the sample stations tested, 44D00101, 44D00201 and 44D00301. Growth, measured as mean length, of *Ampelisca abdita* in the laboratory control sediment was also significantly different ($P=0.05$) from growth in all of the site sediments.

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1.0 INTRODUCTION

Whole sediment toxicity tests were conducted at QST Environmental on samples collected from the PSC 44 Drainage Ditch, Naval Air Station (NAS) Jacksonville, Florida, to determine the potential toxicity of the test samples. The test organism used for the static, non-renewal sediment toxicity tests was the saltwater amphipod, *Ampelisca abdita*. The effect criteria for the sub-chronic toxicity tests were survival and growth, measured as mean length.

The tests were conducted following ASTM Guideline E 1367-92 entitled *Standard Guide for Conducting 10-Day Sediment Toxicity Tests with Marine and Estuarine Amphipods* (ASTM 1995). All of the original raw data pertaining to this study are maintained at QST, 404 SW 140th Terrace, Newberry, Florida 32669-3000.

2.0 MATERIALS AND METHODS

2.1 TEST SAMPLES

Test sediments were collected on December 17 and 18, 1997 by ABB Environmental Services, Inc. (ABB-ES) personnel and were received on ice at the QST Gainesville laboratory on December 19, 1997. The test samples, identified as 44D00101, 44D00201, and 44D00301, were received in quantities of approximately 3.75 Liters (1 gallon jars) each. Upon receipt, the coolers were opened and the contents checked against the chain-of-custody to ensure that all the recorded samples were present. The temperature of the cooler was then measured using the temperature blank provided in the cooler. Any observations made were recorded in the sample receipt logbook.

Laboratory control sediment was collected by a commercial test organism supplier from a marsh in Dillon Beach, California, where the test organisms were field collected. The site from which the control sediment was collected has been proven to be uncontaminated in previous tests. Prior to use in testing, the laboratory control sediment was sifted to remove any indigenous organisms present. Chain-of-custody records and other traffic information pertaining to the sediment samples are presented in Appendix A. All samples were stored in a refrigerator at 4 $\pm$ 2 °C during the testing period.

2.2 OVERLYING WATER

The water used as dilution or overlying water for the *A. abdita* tests was filtered natural seawater with a salinity of approximately 32 parts-per-thousand (ppt). The seawater was obtained from the Atlantic Ocean, near Marineland, Florida. The site was selected because it is relatively free of human activity, and has been shown to be uncontaminated in previous tests. Prior to use the water was diluted to a salinity of 28 ppt with deionized water.

2.3 TEST ORGANISMS

The whole sediment bioassays were conducted using juvenile (second or third instar) *A. abdita* (3-5 mm in length, with no mature males or females). The test organisms were obtained from Brezina & Associates, Dillon Beach, CA. The supplier's holding conditions, such as temperature and water salinity, were similar to those of the testing conditions, therefore, organisms were held for less than 24 hours prior to test initiation.

2.4 TEST DESIGN

The whole sediment toxicity tests were initiated on January 5, 1998, within 17 days of receiving the test samples. Prior to use in the toxicity tests, the sediment samples were allowed to equilibrate to room temperature and individually homogenized. Sediments were then hand-sorted to remove small stones and sticks, plant debris, and sieved to remove any indigenous organisms. The test vessels used for the bioassays were 2 L glass jars (23 cm height and 13 cm diameter). On day minus one, approximately 200 grams of site, reference, or control sediment were introduced into the test chambers and uniformly leveled. Eight-hundred milliliters (800 mL) of overlying seawater were added to each test chamber to provide a ratio of 1 part sediment to 4 parts overlying water. The test chambers were then allowed to settle overnight with aeration provided to maintain dissolved oxygen levels above 90 percent saturation. On day zero, the initial water quality measurements were taken and the test organisms were introduced into the test chambers. The test organisms were randomly added to the test chambers, loading one replicate at a time until loading was complete. The test vessels were examined one hour after loading to identify and replace any floaters and to ensure that the organisms had burrowed into the sediments.

The whole sediment tests were conducted using four replicates of 20 organisms per replicate for a total of 80 *A. abdita* per sample. The test vessels were labeled with the site I.D. number and replicate number (A through D), and the test area was identified by the QST project number, test type and schedule, and the name of the project manager.

The duration of the static non-renewal whole sediment toxicity tests was 10-days during which the test organisms received no supplemental feeding. The tests were conducted in a waterbath adjusted to maintain a temperature of 20 ± 1 °C under fluorescent lighting with a daily photoperiod of 24 hours continuous light (ambient laboratory illumination, 700 Lux). All test chambers were aerated at approximately 80 bubbles per minute throughout the testing period. Temperature, pH and dissolved oxygen (DO) concentrations, were measured daily. Ammonia and conductivity levels were measured at the beginning of the tests. The salinity of the overlying water was measured three times during the test. Water quality measurements were taken with the following instruments: temperature--Fisher Scientific digital thermocouple; pH--SA 290A Orion pH meter equipped with an Orion 91-57 triode; dissolved oxygen--YSI, Model 57 DO meter; salinity--Aquatic Biosystems refractometer, ammonia--SA 290A electrode with Orion Model 95-12 ammonia probe, and conductivity--YSI, Model 33 SCT conductivity meter. All instruments were calibrated daily during the testing period.

The test chambers were observed daily for organism mortality, entrapment at the surface of overlying water, and sediment avoidance. At test termination, the sediments were sieved through a 0.5 mm mesh Nytex screen to collect, observe, and enumerate test organisms. *A. abdita* were considered dead if they remained immobile, possessed no pigmentation, and did not respond to a gentle stimulus. Growth, as mean length in millimeters was measured with the aid of a dissecting microscope equipped with a micrometer.

2.5 REFERENCE TOXICANT TEST

A 96-hour reference toxicant test was conducted concurrently with the whole sediment toxicity tests to determine the general health of the test organisms. The reference toxicant used was sodium dodecyl sulfate (SDS) at concentrations of 0, 0.62, 1.25, 2.5, 5.0 and 10.0 mg/L. The reference toxicant test was conducted in complete darkness and under similar conditions of temperature and salinity as the whole

sediment tests. Only 10 organisms were exposed per reference toxicant concentration without any replication.

3.0 STATISTICAL ANALYSIS

All toxicity data were evaluated by a statistical comparison of mean survival and growth of *A. abdita* in the site samples with mean survival and growth in the reference and laboratory control samples using appropriate statistical procedures. Analysis of variance and Dunnett's t-test (EPA/600/4-89/001) were used to determine statistical significance. The survival data were arc-sine square root transformed prior to performing the statistics. The 96-hour median lethal concentration (LC_{50}) for the reference toxicant test, the concentration of the reference toxicant causing 50 percent mortality of the test organisms under the specified conditions of exposure, was determined using the Trimmed Spearman-Karber Statistical Method (Hamilton et. al., 1977).

4.0 RESULTS AND DISCUSSION

4.1 SEDIMENT TOXICITY TESTS

Test conditions, including lighting, salinity, DO, conductivity, temperature, and pH levels remained at acceptable levels throughout the testing period. Test temperature remained in the range of 19.9 to 21.0 °C, pH ranged from 7.8 to 8.0 standard units, and dissolved oxygen remained above 90 percent saturation (ranged from 6.9 to 7.3 mg/L) for the duration of the tests (Table 1). Salinity of the overlying water remained in the range of 26-30 ppt, solution conductivities ranged from 39,000 to 45,000 μmhos/cm, and ammonia levels were all below the reporting limit of 0.10 (Table 1). There were no deviations from the test protocols in the ASTM Guidelines used to conduct this test (ASTM E1367-92; ASTM, 1995).

Survival and growth data of the whole sediment bioassays are presented in Table 2. After 10 days of exposure, survival of *A. abdita* in the laboratory control sediment was 91 percent. Survival of *A. abdita* in the PSC 44 Drainage Ditch sediments ranged from 4 percent (44D00101) to 64 percent (44D00301). Survival of *A. abdita* in the laboratory control sediment was significantly different (P=0.05) from survival in all of the site sediments tested.

Growth, measured as mean length in millimeters of surviving *A. abdita*, averaged 3.7 mm/organism in the laboratory control sediment (Table 2). The mean length of *A. abdita* in the site sediments ranged from 3.1 mm/organism (44D00101) to 3.6 mm/organism (44D00201). Growth of *A. abdita* in the laboratory control sediment was significantly different (P=0.05) from growth in all of the site sediments.

The recommended holding time of 14 days (ASTM, 1995) was exceeded by 3 days due to problems encountered in obtaining the test organisms. This deviation was not deemed serious enough to affect the outcome of the results. This is because different researchers have shown that sediments can be stored for up to 8 weeks or longer without any changes in their toxicity (USEPA-USCOE, 1994). No indigenous organisms were detected in the site sediments during the sieving and cleaning processes. Sample 44D00101 exhibited a strong petroleum odor. No adverse behavioral observations were recorded during the 10-day exposures. All of the exposed *A. abdita* were observed to burrow into the sediments and make tubes during the first hour of loading. At the end of the 10-day exposure period, all surviving *A. abdita* appeared to be normal and healthy.

4.2 REFERENCE TOXICANT TESTS

The 96-hour LC_{50} of the reference toxicant for *A. abdita* was determined to be 2.63 mg SDS/L with 95 percent confidence limits of 1.99 and 3.47 mg SDS/L. The LC_{50} value falls within the normal sensitivity ranges of test species used for testing at QST. The raw data pertaining to the reference toxicant test are provided in Appendix C.

5.0 CONCLUSION

The toxicity test results indicated that after 10 days of exposure to whole sediments from the PSC 44 Drainage Ditch, NAS Jacksonville, Florida, survival of *A. abdita* in the laboratory control sediment was significantly different (P=0.05) from survival in all of the site sediments tested. Growth of *A. abdita* in the laboratory control sediment was also significantly different (P=0.05) from growth of *A. abdita* in all of the site sediments.

6.0 REFERENCES

American Society for Testing and Materials. ASTM E 1367-92. *Standard Guide for Conducting 10-Day Sediment Toxicity Tests with Marine and Estuarine Amphipods*. Annual Book of ASTM Standards Vol. 11.05, 1995.

Gulley, D., and WEST, Inc. 1994. *Toxstat Version 3.4*. Department of Zoology and Physiology, University of Wyoming.

Hamilton, M.A., R.C. Russo, and R.V. Thurston. 1977. *Trimmed Spearman-Karber Method for Estimating Median Lethal Concentrations in Toxicity Bioassays*. Environmental Science and Technology. 11(7):714-719; Correction 12(4):417 (1978).

U.S. Environmental Protection Agency (EPA). 1994. *Methods for Assessing the Toxicity of Sediment-Associated Contaminants with Estuarine and Marine Amphipods*. EPA/600/R-94/025. June 1994.

USEPA-USCOE (U.S. Army Corps of Engineers). 1994. Evaluation of Dredged Material Proposed for Ocean Discharge in Inland and Near Coastal Waters. EPA-000/0-93/000.

U.S. Environmental Protection Agency (EPA). 1988. *Computer Program and Users Guide for Probit and Dunnett's Analysis of Data from Acute and Short Term Chronic Toxicity Tests with Aquatic Organisms*. Prepared by Statistical Support Staff, Computer Sciences Corporation. Prepared for the Biological Methods Branch, Environmental Monitoring and Support Laboratory, Cincinnati, OH, 1988.

Table 1. Water Quality Measurement Ranges[a] of Overlying Water During a 10-Day Toxicity Test of Whole Sediment From the PSC 44 Drainage Ditch, NAS Jacksonville, Florida, With the Amphipod, *Ampelisca abdita*

Site ID	Ammonia (ppm)	Salinity (ppt)	Temp (°C)	pH (s.u.)[b]	DO (mg/L)	Cond[c] (μmhos/cm)
Control	<0.10	27 - 29	19.9 - 21.0	7.9 - 8.0	7.0 - 7.3	43,000
44D00101	<0.10	26 - 30	20.0 - 21.0	7.7 - 7.9	6.9 - 7.3	45,000
44D00201	<0.10	27 - 29	19.9 - 21.0	7.8 - 7.9	7.0 - 7.3	39,000
44D00301	<0.10	27 - 30	20.0 - 21.0	7.8 - 8.0	7.0 - 7.3	44,000

[a]Range of 11 measurements for temperature, pH and DO.
[b]pH measured in standard units (s.u.).
[c]Conductivity.

Source: QST, 1998

Table 2. Survival and Growth of *Ampelisca abdita* After 10 Days of Exposure to Whole Sediments From the PSC 44 Drainage Ditch, NAS Jacksonville, Florida

Sample ID	Replicate[a]	Survival (Percent)	Mean Length (mm)[b]
Control	A	18	3.7
	B	19	3.7
	C	19	3.6
	D	17	3.7
		73 (91)	3.7
44D00101	A	0	NM[c]
	B	1	3.6
	C	1	NM
	D	1	3.5
		3 (4)[d]	3.6[d]
44D00201	A	11	3.2
	B	13	3.1
	C	13	3.0
	D	12	3.1
		49 (62)[d]	3.1[d]
44D00301	A	12	4.4
	B	14	3.3
	C	9	3.4
	D	16	3.4
		51 (64)[d]	3.4[d]

[a]Twenty organisms exposed per replicate (80 organisms/sample). Percent survival in parentheses.
[b]Growth was measured as length in millimeters.
[c]Not measured due to 100 percent mortality.
[d]Significantly different (P=0.05) from the laboratory control.

Source: QST 1998

Appendix A: Chain-of-Custody and Traffic Information

COMPUCHEM ENVIRONMENTAL
a division of Liberty Analytical Corp.
4600 Silicon Drive
Durham, NC 27703
1-800-833-5097

ABB-ES

CHAIN-OF-CUSTODY RECORD

No. 01021

Ship to: QST	Project Name: NASJAX PSC-44	Field Point-of-Contact:
	Sampler Name: F. Brogdon	Telephone No.:
		Sampling for project complete? Y or N (See Note 1)
Carrier: Airbill No.:	Sampler Signature: Fred Brogdon	Project-specific (PS) or Batch (B) QC: ____

BOX #1 1. Surface Water; 2 Ground Water; 3 Leachate; 4. Rinsate; 5. Soil / Sediment / Sludge; 6 Trip Blank; 7 Oil; 8 Waste; 9 Other ____

Box #2: A HCl; B HNO_3; C. $NaHSO_4$; D $Na_2S_2O_3$; E. Ice Only; O Other ____; N Not Preserved

Box #3: F Filtered; U. Unfiltered

Box #4: C. CLP 3/90; S SW-846; W CWA 600-series; L Low Conc CLP; R Radiological; T. TCLP; O. Other ____

Box #5: H. - High; M. - Medium; L. - Low

Sample ID (Organics 9 characters max, Inorganics 6 characters, See Note 2)	Date: Year: 1992	Time	Box #1 Matrix	Box #2 Preservative	Box #3 Filtered/Unfiltered	Box #4 Method	Box #5 Expect. Conc.	No. of Bottles	Use for Lab QC (MS or DUP)	Organic Analysis: VOA-GC / MS	SV-GC / MS	Pest / PCB-GC	Herb-GC	VOA-GC	Inorganics Other: Metals	Mercury	Cyanides	Radiologicals	TOC / TOX	O&G / TPH	Phenols	Other	Remarks / Comments
44D001O1	12/17	2:15	Sed	None				1 gal															Toxicity Test
44D002O1	12/18	10:30	Sed	"				1 gal															" "
44D003O1	12/17	1:40	Sed	"				1 gal															" "
	/	:																					
	/	:																					
	/	:																					
	/	:																					
	/	:																					
	/	:																					
	/	:																					

Client's Special Instructions:

Lab: Received In Good Condition? Y or N **Describe Problems, If Any:**

#1 Relinquished By (Sig) Fred Brogdon	Date 12-18	#2 Relinquished By (Sig)	Date	#3 Relinquished By (Sig)	Date:	Sample storage time requested? ____ (In days, see Note 3)
Company Name	Time.	Company Name	Time	Company Name	Time	
#1 Received By. (Sig) Jill Owens-Yan	Date 12/19/92	#2 Received By. (Sig)	Date	#3 Received By (Sig)	Date	DESTROY or RETURN data after five years of archival? (Circle choice; see Note 4)
Company Name QST	Time 1415	Company Name	Time	Company Name	Time	

Note (1): If "N" lab will hold samples to await remainder of project-maximizing batch size and minimizing QC ratio; if "Y" lab will begin processing batches now. Note (2): If CLP Inorganics diskette required, ID limited to maximum of six characters.

Note (3): Samples stored 60 days after date report mailed at no extra charge Note (4): All lab copies of data de d after five years unless client requests and pays for return of copies; annual storage fee billed in January of year

Appendix B: *Ampelisca abdita* Sediment Test Raw Data

Project: 3197250-0100-3100

DAILY LOG

1/05/98 mo - The three sediment samples were stored in a refrigerator at 4±2°C prior to use. For each sediment, the sample was placed in a glass pan, homogenized, + sifted by hand. Samples 101 and no 301 contained plant debris; sample 201 was sandy with no debris. No indigenous organisms were observed. 200 mL of sediment was placed into each replicate, and 800 mL of overlying water was added. Overlying water will be aerated using Tygon tubing + glass pipette tips; aeration was set at about 80 bubbles per minute. Test vessels were placed in waterbath 8. Control sediment was washed with DI water prior to use. Overlying water is filtered seawater collected near Marineland, FL, diluted with deionized water to a salinity of 28 ppt.

1/06/98 CR - water quality measured Organisms received & acclimated to test conditions. 20 organisms loaded per replicate. Organisms in normal condition. Airlines checked.

A. abdita in normal condition at test initiation. Ammonia was measured in overlying water using SA290A meter and probe 95-12 Ammonia electrode.

1/07/98 water quality measured. Observations made Airlines checked. Tube made by organisms in all samples.

1/08/98 mo - observed + monitored test. Checked airlines.

Project: 3197250-0100-3100

DAILY LOG

1/09/98 CR Test monitored + observed. Checked airlines
1/10/98 MD- Test monitored + observed - checked airlines.
1/11/98 MD- Test monitored + observed, checked airlines.
1/12/98 MD - Test monitored + observed, checked airlines.
1:3/98 CR Test monitered + observed. Checked airlines
1/14/98 CR Test monitered + observed. Checked airlines
1/15/98 CR Test monitcredit observed. Airlines checked
1/16/98 CR Test monitered. Test ended by paning overlying water + sediment into sieve; rinsing + displacing the sediment in sieve by placing into Sorting pan. Organisms enumerated + preserved with 10% formalin to await measurement. Strong petroleum odor in Sample 101

Environmental Science & Engineering, Inc.
Aquatic Toxicology Laboratory
Gainesville, Florida

Page: _____
ESE QA Form: 097A
Effective: August 1994

SUBJECT: TOXICITY TEST DATA SHEET

Client: ABB-ES

Project Number: 3197250-0100-3100

Test Material

See Page 216 of Sample Receipt Log
Test Material Information

Test Conditions

[ ] Preliminary
[ ] Definitive
[X] Screening

[X] Static [ ] Flow-through

Duration : 10 Days

Test Animal History

Species : A. abdita
Batch Number : 98-01
Age / Life Stage : Adults
Date Acclimation / Maintenance Began : 1/06/98
See Page 204 of Invertebrate Holding Log for raw data.
Mortality (%) 48 Hrs prior to testing: 0 %

Dilution Water: Natural, Filtered seawater

Lighting : [X] Fluorescent [ ] Incandescent
Photoperiod : 24 16 hr Light : 8 0 hr Dark
mo 1/6/98

Test Container Dimensions: 23 (10,5) L x — W x 10,5 (23) H
Test Solution Height : 10,5 cm
Test Containers : [X]Open [ ]Covered
Test Container Volume : 2.0 Liters
Diluent Volume : 0.8 Liters

Test Area Used	Temperature (C)	Salinity (ppt)
waterbath 8	20 +/- 1	28 +/- 2

Reps / Concentration : 4
Animals / Replicate : 20

Protocol Followed:

Concentrations Based on: [ ] A.I. [X] W.M.

Container Composition: [X] Glass [ ] Plastic

Test Concentrations: (Units = %):	Control	44D00101	44D00201	44D00301				
Amount ~~Reference Soil~~ Overlying water Added (mL): mo 1/6/98	800	800	800	800				
Amount Test ~~Soil~~ Sediment Added (mL): mo 1/6/98	200 N/A	200	200	200				

Additional Observations: _____

Data By: mo Date: 1/06/98

FORM: Soil94

QST ENVIRONMENTAL
TOXICOLOGY LAB: GAINESVILLE, FL

QA FORM NO: 108C
EFFECTIVE: AUGUST 1997

SUBJECT: SEDIMENT TOXICITY DATA SHEET

SPONSOR: ABB ENVIRONMENTAL SERVICES
SAMPLE ID: CONTROL

PROJECT NUMBER: 3197250-1011-3100
TEST SPECIES: *Ampleisca abdita*

DATE-DAY	REP	TEMP (°C)	SALIN	NH_3 (ppm)	pH (s.u.)	DO (mg/L)	COND (µmhos/cm)	FEEDING	INITIAL/TIME
1-6-98 0	A	20.8	27	<0.1	8.0	7.3	43000	none	CR 1500
1-7-98 1	B	21.0	—	—	7.9	7.2	—	—	CR 0800
1-8-98 2	C	20.9	—	—	7.9	7.3	—	—	MO 1100
1-9-98 3	D	20.9	—	—	7.9	7.3	—	—	CR 0900
1-10-98 4	A	20.7	—	—	7.9	7.1	—	—	MO 1145
1-11-98 5	B	19.9	27	—	7.9	7.3	—	—	MO 1018
1-12-98 6	C	20.5	—	—	8.0	7.2	—	—	MO 1600
1-13-98 7	D	21.0	—	—	7.9	7.0	—	—	CR 0915
1-14-98 8	A	21.0	—	—	7.9	7.1	—	—	CR 0915
1-15-98 9	B	20.9	—	—	7.9	7.2	—	—	CR 1000
1-16-98 10	C	20.9	29	—	7.9	7.1	—	—	CR 1500

OBSERV	REPLICATE				
DATE-DAY	A	B	C	D	Initial
1-6-98 0	20A	20A	20A	20A	CR
1-7-98 1	〃	〃	〃	〃	CR
1-8-98 2	N	N	N	N	MO
1-9-98 3	〃	〃	〃	〃	CR
1-10-98 4	N	N	N	N	MO
1-11-98 5	N	N	N	N	MO
1-12-98 6	N	N	N	N	MO
1-13-98 7	〃	〃	〃	〃	CR
1-14-98 8	〃	AS	〃	〃	CR
1-15-98 9	〃	〃	〃	〃	CR
1-16-98 10	18A 2NF	19A INF	19A INF	17A 3NF	CR

Comments:

KEY: AS = AT SURFACE N= NONE EMR = EMERGENCE A = ALIVE D = DEAD NF = NOT FOUND
REP = REPLICATE COND = CONDUCTIVITY ALK = ALKALINITY AMP = AMPLEXUS
TEMP = TEMPERATURE HARD = HARDNESS YTC = YEAST/ TROUT CHOW/CEROPHYLL

QST ENVIRONMENTAL
TOXICOLOGY LAB: GAINESVILLE, FL

QA FORM NO: 108C
EFFECTIVE: AUGUST 1997

SUBJECT: SEDIMENT TOXICITY DATA SHEET

SPONSOR: ABB ENVIRONMENTAL SERVICES
SAMPLE ID: 44D00101

PROJECT NUMBER: 3197250-1011-3100
TEST SPECIES: *Ampleisca abdita*

DATE-DAY	REP	TEMP (°C)	SALIN	NH_3 (ppm)	pH (s.u.)	DO (mg/L)	COND (µmhos/cm)	FEEDING	INITIAL/TIME
1-6-98 0	A	20.9	27	<0.1	7.8	7.3	45000	none	CR 1500
1-7-98 1	B	21.0	—	—	7.8	7.1	—	—	CR 0800
1-8-98 2	C	20.8	—	—	7.7	6.9	—	—	MO 1100
1-9-98 3	D	20.9	—	—	7.9	7.2	—	—	CR 0900
1-10-98 4	A	20.7	—	—	7.8	7.1	—	—	MO 1145
1-11-98 5	B	20.0	26	—	7.9	7.2	—	—	MO 1045
1-12-98 6	C	20.6	—	—	7.8	7.1	—	—	MO 1600
1-13-98 7	D	21.0	—	—	7.9	7.2	—	—	CR 0915
1-14-98 8	A	20.9	—	—	7.8	7.0	—	—	CR 0915
1-15-98 9	B	21.0	—	—	7.7	7.1	—	—	CR 1000
1-16-98 10	C	21.0	30	—	7.8	7.1	—	—	CR 1500

OBSERV	REPLICATE				
DATE-DAY	A	B	C	D	Initial
1-6-98 0	20 A	20A	20A	20A	CR
1-7-98 1	∩	∩	∩	∩	CR
1-8-98 2	N	N	N	N	MO
1-9-98 3	∩	∩	∩	∩	MO
1-10-98 4	N	N	N	N	MO
1-11-98 5	N	N	N	N	MO
1-12-98 6	N	N	N	N	MO
1-13-98 7	∩	∩	∩	∩	CR
1-14-98 8	∩	∩	∩	∩	CR
1-15-98 9	∩	∩	∩	∩	CR
1-16-98 10	20 ∩ F	1A 19 ∩ F	1A 19 ∩ F	1A 19 ∩ F	CR

Comments:

KEY: AS = AT SURFACE N= NONE EMR = EMERGENCE A = ALIVE D = DEAD NF = NOT FOUND
REP = REPLICATE COND = CONDUCTIVITY ALK = ALKALINITY AMP = AMPLEXUS
TEMP = TEMPERATURE HARD = HARDNESS YTC = YEAST/ TROUT CHOW/CEROPHYLL

QST ENVIRONMENTAL
TOXICOLOGY LAB: GAINESVILLE, FL

QA FORM NO: 108C
EFFECTIVE: AUGUST 1997

SUBJECT: SEDIMENT TOXICITY DATA SHEET

SPONSOR: ABB ENVIRONMENTAL SERVICES
SAMPLE ID: 44D00201

PROJECT NUMBER: 3197250-1011-3100
TEST SPECIES: *Ampleisca abdita*

DATE-DAY	REP	TEMP (°C)	SALIN	NH_3 (ppm)	pH (s.u.)	DO (mg/L)	COND (µmhos/cm)	FEEDING	INITIAL/TIME
1-6-98 0	A	20.9	27	<0.1	7.8	7.3	39000	none	CR 1500
1-7-98 1	B	21.0	—	—	7.8	7.0	—	—	CR 0800
1-8-98 2	C	20.8	—	—	7.9	7.1	—	—	MO 1100
1-9-98 3	D	20.8	—	—	7.9	7.2	—	—	CR 0900
1-10-98 4	A	20.6	—	—	7.8	7.2	—	—	MO 1148
1-11-98 5	B	19.9	27	—	7.8	7.1	—	—	MO 1015
1-12-98 6	C	20.6	—	—	7.9	7.0	—	—	MO 1600
1-13-98 7	D	20.9	—	—	7.9	7.0	—	—	CR 0915
1-14-98 8	A	21.0	—	—	7.9	7.0	—	—	CR 0915
1-15-98 9	B	21.0	—	—	7.9	7.1	—	—	CR 1000
1-16-98 10	C	21.0	29	—	7.8	7.1	—	—	CR 1500

OBSERV	REPLICATE				
DATE-DAY	A	B	C	D	Initial
1-6-98 0	20 A	20A	20A	20A	CR
1-7-98 1	"	"	"	"	CR
1-8-98 2	N	N	N	N	MO
1-9-98 3	"	"	"	"	CR
1-10-98 4	N	N	N	N	MO
1-11-98 5	N	N	N	N	MO
1-12-98 6	N	N	N	N	MO
1-13-98 7	"	"	"	"	CR
1-14-98 8	1 DEAD	"	2 DEAD	1 DEAD	CR
1-15-98 9	"	"	"	"	CR
1-16-98 10	11A, 8 NF	13A, 7 NF	13A, 5 NF	12A, 7 NF	

Comments:

KEY: AS = AT SURFACE N= NONE EMR = EMERGENCE A = ALIVE D = DEAD NF = NOT FOUND
REP = REPLICATE COND = CONDUCTIVITY ALK = ALKALINITY AMP = AMPLEXUS
TEMP = TEMPERATURE HARD = HARDNESS YTC = YEAST/ TROUT CHOW/CEROPHYLL

QST ENVIRONMENTAL
TOXICOLOGY LAB: GAINESVILLE, FL

QA FORM NO: 108C
EFFECTIVE: AUGUST 1997

SUBJECT: SEDIMENT TOXICITY DATA SHEET

SPONSOR: ABB ENVIRONMENTAL SERVICES
SAMPLE ID: 44D00301

PROJECT NUMBER: 3197250-1011-3100
TEST SPECIES: *Ampleisca abdita*

DATE-DAY	REP	TEMP (°C)	SALIN	NH_3 (ppm)	pH (s.u.)	DO (mg/L)	COND (µmhos/cm)	FEEDING	INITIAL/TIME
1-6-98 0	A	20.8	27	<0.1	7.8	7.3	44000	none	CR 1500
1-7-98 1	B	21.0	—	—	7.9	7.0	—	—	CR 0800
1-8-98 2	C	20.9	—	—	7.9	7.0	—	—	MD 1100
1-9-98 3	D	20.8	—	—	8.0	7.2	—	—	CR 0900
1-10-98 4	A	20.6	—	—	7.9	7.2	—	—	MD 1145
1-11-98 5	B	20.0	27	—	7.9	7.2	—	—	MD 1015
1-12-98 6	C	20.7	—	—	7.9	7.1	—	—	MD 1600
1-13-98 7	D	20.9	—	—	7.9	7.0	—	—	CR 0915
1-14-98 8	A	20.9	—	—	7.9	7.1	—	—	CR 0915
1-15-98 9	B	21.0	—	—	7.9	7.2	—	—	CR 1000
1-16-98 10	C	21.0	30	—	7.9	7.1	—	—	CR 1500

WE CR 1-7-98

OBSERV	REPLICATE				
DATE-DAY	A	B	C	D	Initial
1-6-98 0	20 A	20 A	20 A	20 A	CR
1-7-98 1	〃	〃	〃	〃	CR
1-8-98 2	〃	〃	〃	〃	MD
1-9-98 3	〃	〃	〃	〃	CR
1-10-98 4	〃	〃	〃	〃	MD
1-11-98 5	〃	〃	〃	〃	MD
1-12-98 6	〃	〃	〃	〃	MD
1-13-98 7	〃	〃	〃	〃	CR
1-14-98 8	1 DEAD	〃	〃	〃	CR
1-15-98 9	〃	〃	〃	〃	CR
1-16-98 10	12A, 7NF	14A, 6NF	9A, 11NF	16A, 4NF	

Comments:

KEY: AS = AT SURFACE N= NONE EMR = EMERGENCE A = ALIVE D = DEAD NF = NOT FOUND
REP = REPLICATE COND = CONDUCTIVITY ALK = ALKALINITY AMP = AMPLEXUS
TEMP = TEMPERATURE HARD = HARDNESS YTC = YEAST/ TROUT CHOW/CEROPHYLL

QST Environmental
Toxicology Department
Gainesville, Florida

QA FORM: 017D
EFFECTIVE: MAY 1997

SUBJECT: TEST ORGANISM GROWTH											
SPONSOR: ABB ENVIRONMENTAL						SAMPLE ID: CONTROL					
PROJECT NUMBER:						TEST SPECIES: *Ampelisca abdita*					
Boat	**REP**	**Length (mm)**	**Boat**	**REP**	**Length (mm)**	**Boat**	**REP**	**Length (mm)**	**Boat**	**REP**	**Length (mm)**
1	A	3.1	2	B	4.0	3	C	3.3	4	D	3.3
		4.4			3.7			3.5			3.2
		3.2			3.3			3.3			3.9
		4.3			3.4			4.1			3.8
		4.2			3.3			3.8			3.9
		3.2			3.6			3.2			3.4
		3.3			3.8			3.6			3.7
		4.0			3.9			3.5			3.3
		3.8			3.6			3.3			3.2
		3.9			4.1			4.1			4.1
		4.0			3.4			4.2			3.8
		3.4			3.7			3.4			4.3
		3.5			3.6			3.5			4.0
		3.3			3.6			3.5			3.8
		3.8			4.0			3.8			3.9
		4.0			3.7			3.6			3.2
		3.9			3.5			3.2			3.4
		3.6			3.2			3.9			
					4.0			3.8			
AVERAGE STD. DEV. RANGE		3.7 0.40 3.1-4.4	AVERAGE STD. DEV. RANGE		3.7 0.27 3.2-4.1	AVERAGE STD. DEV. RANGE		3.6 0.31 3.2-4.2	AVERAGE STD. DEV. RANGE		3.7 0.33 3.2-4.3
NET WT (g) GROSS WT (g) MEAN (mg)			NET WT (g) GROSS WT (g) MEAN (mg)			NET WT (g) GROSS WT (g) MEAN (mg)			NET WT (g) GROSS WT (g) MEAN (mg)		
Measuring Device: micrometer slide						Calculator: RS-SAE					
Data By: MAO			Date: 1/23/98			Reviewed By: JEY			Date: 1/23/98		

QST Environmental
Toxicology Department
Gainesville, Florida

QA FORM: 017D
EFFECTIVE: MAY 1997

SUBJECT: TEST ORGANISM GROWTH											
SPONSOR: ABB ENVIRONMENTAL						SAMPLE ID: 44D00101					
PROJECT NUMBER:						TEST SPECIES: *Ampelisca abdita*					
Boat	**REP**	**Length (mm)**	**Boat**	**REP**	**Length (mm)**	**Boat**	**REP**	**Length (mm)**	**Boat**	**REP**	**Length (mm)**
—	A	3.no	5	B	3.6	—	C		6	D	3.5
AVERAGE STD. DEV. RANGE		/	AVERAGE STD. DEV. RANGE		3.6 /	AVERAGE STD. DEV. RANGE		/	AVERAGE STD. DEV. RANGE		3.5 /
NET WT (g) GROSS WT (g) MEAN (mg)			NET WT (g) GROSS WT (g) MEAN (mg)			NET WT (g) GROSS WT (g) MEAN (mg)			NET WT (g) GROSS WT (g) MEAN (mg)		
Measuring Device: Micrometer						Calculator: T1-60					
Data By: MAD			Date: 1/23/98			Reviewed By: JRY			Date: 1/23/98		

QST Environmental
Toxicology Department
Gainesville, Florida

QA FORM: 017D
EFFECTIVE: MAY 1997

SUBJECT: TEST ORGANISM GROWTH											
SPONSOR: ABB ENVIRONMENTAL						SAMPLE ID: 44D00201					
PROJECT NUMBER:						TEST SPECIES: *Ampelisca abdita*					
Boat	**REP**	**Length (mm)**	**Boat**	**REP**	**Length (mm)**	**Boat**	**REP**	**Length (mm)**	**Boat**	**REP**	**Length (mm)**
7	A	2.6	8	B	3.0	9	C	2.7	10	D	2.7
		3.5			3.1			2.8			3.1
		3.4			2.8			3.2			3.0
		2.7			2.7			3.0			2.8
		3.3			3.0			3.3			2.7
		2.8			3.2			3.0			3.0
		2.7			3.6			3.3			3.7
		3.2			2.8			3.0			3.1
		3.6			2.9			3.1			3.4
		3.4			3.3			3.1			3.5
		3.8			3.4			2.9			2.9
					3.1			2.8			2.7
					3.2			3.1			
AVERAGE STD. DEV. RANGE		3.2 0.41 2.6-3.8	AVERAGE STD. DEV. RANGE		3.1 0.26 2.7-3.4	AVERAGE STD. DEV. RANGE		3.0 0.19 2.7-3.3	AVERAGE STD. DEV. RANGE		3.1 0.33 2.7-3.7
NET WT (g) GROSS WT (g) MEAN (mg)			NET WT (g) GROSS WT (g) MEAN (mg)			NET WT (g) GROSS WT (g) MEAN (mg)			NET WT (g) GROSS WT (g) MEAN (mg)		
Measuring Device: Micrometer						Calculator: TI-60					
Data By: MAO			Date: 1/23/98			Reviewed By: JOY			Date: 1/23/98		

QST Environmental
Toxicology Department
Gainesville, Florida

QA FORM: 017D
EFFECTIVE: MAY 1997

SUBJECT: TEST ORGANISM GROWTH											
SPONSOR: ABB ENVIRONMENTAL						SAMPLE ID: 44D00301					
PROJECT NUMBER:						TEST SPECIES: *Ampelisca abdita*					
Boat	**REP**	**Length (mm)**	**Boat**	**REP**	**Length (mm)**	**Boat**	**REP**	**Length (mm)**	**Boat**	**REP**	**Length (mm)**
7	A	3.1	8	B	3.0	9	C	3.2	10	D	3.5
		3.8			3.2			3.2			3.6
		3.2			3.2			3.5			3.5
		3.7			3.4			3.4			3.7
		3.5			3.3			3.3			3.2
		3.5			3.7			3.7			3.4
		3.2			3.7			3.2			3.5
		3.3			3.1			3.3			3.1
		3.6			3.2			3.5			3.6
		3.5			3.5						3.5
		3.1			3.3						3.4
		3.0			3.4						3.7
					3.3						3.2
					3.2						3.3
											3.1
											3.3
AVERAGE STD. DEV. RANGE		3.4 0.26 3.0-3.8	AVERAGE STD. DEV. RANGE		3.3 0.20 3.0-3.7	AVERAGE STD. DEV. RANGE		3.4 0.17 3.2-3.7	AVERAGE STD. DEV. RANGE		3.4 0.20 3.1-3.7
NET WT (g) GROSS WT (g) MEAN (mg)			NET WT (g) GROSS WT (g) MEAN (mg)			NET WT (g) GROSS WT (g) MEAN (mg)			NET WT (g) GROSS WT (g) MEAN (mg)		
Measuring Device: Micrometer						Calculator: TI-60					
Data By: MAD			Date: 1/27/98			Reviewed By: JDY			Date: 1/23/98		

NAS JAX Toxicity Tests-Ampelisca Survival
File: a:amp2 Transform: NO TRANSFORM

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	3	0.745	0.248	66.222
Within (Error)	12	0.045	0.004	
Total	15	0.790		

Critical F value = 3.49 (0.05,3,12)
Since F > Critical F REJECT Ho: All equal

NAS JAX Toxicity Tests-Ampelisca Survival
File: a:amp2 Transform: NO TRANSFORM

DUNNETT'S TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	Control	3.675	3.675		
2	001	3.550	3.550	2.887	*
3	002	3.100	3.100	13.279	*
4	003	3.375	3.375	6.928	*

Dunnett table value = 2.29 (1 Tailed Value, P=0.05, df=12,3)

NAS JAX Toxicity Tests-Ampelisca Survival
File: a:amp2 Transform: NO TRANSFORM

DUNNETT'S TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	Control	4			
2	001	4	0.099	2.7	0.125
3	002	4	0.099	2.7	0.575
4	003	4	0.099	2.7	0.300

NAS JAX Toxicity Tests-Ampelisca Survival
File: a:amp1 Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	3	2.450	0.817	103.882
Within (Error)	12	0.094	0.008	
Total	15	2.544		

Critical F value = 3.49 (0.05,3,12)
Since F > Critical F REJECT Ho: All equal

NAS JAX Toxicity Tests-Ampelisca Survival
File: a:amp1 Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	Control	1.278	1.278		
2	001	0.198	0.198	17.234	*
3	002	0.899	0.899	6.041	*
4	003	0.915	0.915	5.794	*

Dunnett table value = 2.29 (1 Tailed Value, P=0.05, df=12,3)

NAS JAX Toxicity Tests-Ampelisca Survival
File: a:amp1 Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	Control	4			
2	001	4	0.144	11.2	1.081
3	002	4	0.144	11.2	0.379
4	003	4	0.144	11.2	0.363

Appendix C: Reference Toxicant Test Raw Data

TRIMMED SPEARMAN-KARBER METHOD. VERSION 1.5

DATE: 1/26/98 TEST NUMBER: 1 DURATION: 96 h
TOXICANT : SDS
SPECIES: A. abdita

RAW DATA: Concentration (mg/L)	Number Exposed	Mortalities
.00	10	0
.62	10	1
1.25	10	1
2.50	10	4
5.00	10	10
10.00	10	10

SPEARMAN-KARBER TRIM: 10.00%

SPEARMAN-KARBER ESTIMATES: LC50: 2.63
95% LOWER CONFIDENCE: 1.99
95% UPPER CONFIDENCE: 3.47

QST ENVIRONMENTAL INC.
TOXICOLOGY LABORATORY
GAINESVILLE, FLORIDA

PAGE:_____
QST QA FORM NO: 097A REFTOX
EFFECTIVE: AUGUST 1997

REFERENCE TOXICANT TEST DATA SHEET

Client: Misc.	Project Number: Ref Tox
Test Material	**Test Conditions**
Amount of SDS : 0.1001 (g)	[X] Definitive [X] Static
Volume of Milli-Q Water: 100 (mL)	
Date Prepared: 1/06/98	[ ] Screening Duration: 96 Hours
Test Organism History	Dilution Water: natural Filtered Seawater
Species: A. abdita	Lighting: [X] Fluorescent [ ] Incandescent
Batch Number: 98-01	Photoperiod: 0 Hr Light 24 Hr Dark
Age/Life Stage: Adult	Test Vessel Dimensions: 100 (mm) L X — W 50 H
Date of Acclimation/Maintenance: 1/06/98	Test Solution Height: 4 (cm)
See Page 204 of Invert Holding Log	Test Vessel Volume: 0.34 (L)
Mortality 48 hours prior to test: 0 (%)	Test Solution Volume: 0.20 (L)
Replicates/Concentration: 1	Test Temperature: 20 ± 1 °C
No. Of Organisms/Replicate: 10	Test Salinity: 28 ± 2 ppt
Test Area Used: waterbath 9	Test Vessel Composition: [X] Glass [ ] Plastic
Test Concentrations Based on: [X] Whole Material [ ] Active Ingredient	Test Protocol/Guideline Followed: SOP A-004

Test Concentrations: (Units: mg/L)	Control	0.62	1.25	2.5	5	10	
Amount Dilution Water Added (mL)	200	199.875	199.75	199.5	199	198	
Amount of Reftox Stock Added (mL)	—	0.125	0.25	0.5	1	2	

Additional Observations:_____

Data By: MO Date: 1/06/98

QST ENVIRONMENTAL INC.
TOXICOLOGY LABORATORY
GAINESVILLE, FLORIDA

PAGE:_____
QST QA FORM NO: 097 REFTOX
EFFECTIVE: AUGUST 1997

REFERENCE TOXICANT TEST DATA: DAY 0 - 2

Client: MISC	Project Number: Ref Tox	Species: A. abdita

DAY 0

Nominal Concentration (mg/L)	Date: 1/06/98		Time: 1430		Analyst: MO	
	# Alive	Observ.	Temp. (°C)	Sal (ppt)	DO (mg/L)	pH
Control	10	2	20.1	27	7.4	8.0
0.62	10	2	—	—	—	—
1.25	10	2	—	—	—	—
2.5	10	2	—	—	—	—
5	10	2	—	—	—	—
10	10	2	—	—	—	—

DAY 1	Date: 1/07/98		Time: 1700		Analyst: MO	
Nominal Concentration	# Alive	Observ.	Temp. (°C)	Sal (ppt)	DO (mg/L)	pH
Control	10	2	20.9	27	7.3	8.0
0.62	10	2	—	—	—	—
1.25	10	2	—	—	—	—
2.5	10	2	—	—	—	—
5	6	4 Dead	—	—	—	—
10	0	10 Dead	—	—	7.0	8.0

DAY 2	Date: 1/08/98		Time: 1100		Analyst: MO	
Nominal Concentration	# Alive	Observ.	Temp. (°C)	Sal (ppt)	DO (mg/L)	pH
Control	10	2	20.8	27	7.2	8.0
0.62	10	2	—	—	—	—
1.25	10	2	—	—	—	—
2.5	10	2	—	—	—	—
5	2	4 Dead	—	—	—	—
10	0	—	—	—	—	—

QST ENVIRONMENTAL INC.
TOXICOLOGY LABORATORY
GAINESVILLE, FLORIDA

PAGE:_____
QST QA FORM NO: 097 REFTOX
EFFECTIVE: AUGUST 1997

REFERENCE TOXICANT TEST DATA: DAY 3 AND 4

Client: MISC | Project Number: | Species: A. abdita

DAY 3

Nominal Concentration	Date: 1-9-98		Time: 0900		Analyst: MD	
	# Alive	Observ.	Temp. (°C)	Sal (ppt)	DO (mg/L)	pH
Control	10	N	21.8	27	7.2	8.6
0.62	10	N	—	—	—	—
1.25	10	N	—	—	—	—
2.5	8	2 DEAD	—	—	—	—
5	0	2 DEAD	21.7	27	7.1	7.9

DAY 4	Date: 1-10-98		Time: 1200		Analyst: MD	
Nominal Concentration	# Alive	Observ.	Temp. (°C)	Sal (ppt)	DO (mg/L)	pH
Control	10	N	20.9	26	7.1	7.9
0.62	9	1 Dead	—	—	—	—
1.25	9	1 Dead	—	—	—	—
2.5	6	2 Dead	—	—	—	—
5	—	—	—	—	—	—
—	—	—	—	—	—	—

SUMMARY

Nominal Concentration	Number Dead
Control	0
0.62	1
1.25	1
2.5	4
5	10
10	10

COMMENTS:

APPENDIX E

RESULTS OF SEDIMENT TOXICITY TESTING WITH *HYALELLA AZTECA*

EA Engineering, Science, and Technology

15 Loveton Circle
Sparks, MD 21152
Telephone: 410-771-4950
Fax 410-771-4204

18 June 1998

Ms. Anita Pease
Harding Lawson Associates
2120 Washington Boulevard, Suite 300
Arlington, Virginia 22204

Dear Ms. Pease:

Enclosed please find one copy of EA Engineering, Science, and Technology's final report titled "Results of Toxicity Testing with *Hyalella azteca* on Sediment Samples from Harding Lawson Associates" (EA Report #2810). Should you have any questions or comments regarding this report, please do not hesitate to contact me at (410) 771-4950. On behalf of EA, I would like to thank you for the opportunity to perform this work for you.

Sincerely,

Lynda Hartzell

Lynda Hartzell
Associate Scientist
Environmental Toxicology

cc: Lissa Miller

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RESULTS OF TOXICITY TESTING WITH *Hyalella azteca* ON SEDIMENT SAMPLES FROM HARDING LAWSON ASSOCIATES

Prepared for:

Harding Lawson Associates
1536 Kingsley Avenue, Suite 127
Orange Park, Florida 32073

Prepared by:

EA Engineering, Science, and Technology, Inc.
15 Loveton Circle
Sparks, Maryland 21152

June 1998

EA Project 70003.10

Report Number 2810

RESULTS OF TOXICITY TESTING WITH *Hyalella azteca* ON SEDIMENT SAMPLES FROM HARDING LAWSON ASSOCIATES

Prepared for:

Harding Lawson Associates
1536 Kingsley Avenue, Suite 127
Orange Park, Florida 32073

Prepared by:

EA Engineering, Science, and Technology, Inc.
15 Loveton Circle
Sparks, Maryland 21152

Wayne L. McCulloch — Date
Project Manager

Virginia A. Sohn — Date
Scientist

June 1998

Report Number 2810

1. INTRODUCTION

At the request of Harding Lawson Associates (formerly ABB Environmental Services, Inc.), EA Engineering, Science and Technology performed 10-day sediment toxicity tests using the freshwater amphipod *Hyalella azteca* as the test species. The tests were conducted on three site sediment samples, one of which was a reference location sediment, and a laboratory-prepared formulated sediment. The objective of the testing was to assess the toxicity of the sediment samples to the test organisms by determining the effects upon survival and growth of the organisms exposed to the two test sediments, as compared to the organisms exposed to the reference sediment and the formulated laboratory sediment. This testing was performed as part of a field investigation conducted by ABB Environmental Services to evaluate potential risks to benthic macroinvertebrates associated with contaminants in the PSC 44 drainage ditch sediment located at a screening site at Naval Air Station Jacksonville, Florida.

2. METHODS AND MATERIALS

2.1 SAMPLE DESCRIPTION

Sediment from an upgradient (reference) site and two sites in the PSC drainage ditch at Naval Air Station Jacksonville, Florida were collected on 17 April 1998 by ABB Environmental Services personnel. The sediments were collected in 1-gallon buckets and were shipped on wet ice via Federal Express courier to EA's Ecotoxicology Laboratory in Sparks, Maryland. An additional 40-oz of each sediment was collected in glass jars for cadmium analysis and was shipped with the 1-gallon buckets to EA. The sediment samples were identified as 44D00302 (reference site), 44D00202, and 44D00102. Upon receipt at EA, the sediments were logged in and assigned EA Ecotoxicology Laboratory accession numbers. Table 1 summarizes the sample collection and receipt data. The 40-oz jars of sediment were relinquished to EA's analytical chemistry laboratory for cadmium analysis. All samples were stored in the dark at 4°C when not is use. Prior to use in toxicity testing, each sediment sample was sieved to remove large particles and debris and was then homogenized.

An artificial laboratory sediment was prepared following the formulation by Suedel and Rodgers (1994) as presented in Table 2.

2.2 TEST ORGANISMS

Hyalella azteca (freshwater amphipods) were obtained from EA's Ecotoxicology culture facility in Sparks, Maryland. The amphipods were cultured at 20°C in 10-gallon glass aquaria with a substrate of hardwood leaves and overlying water of dechlorinated municipal tap water. Prior to introduction into the aquaria, the leaves were pre-soaked or boiled to remove tannins. The cultures were fed Tetramin-B flake food weekly in addition to the hardwood leaves. For use in testing, 7-14 day old organisms were collected from the cultures and gradually acclimated to the proper test temperature (23°C).

2.3 OVERLYING WATER

Dechlorinated municipal tap water was used as the overlying water for culturing and testing the *H. azteca*. The source of tap water was the City of Baltimore municipal water system. Upon entering the laboratory, the water was passed through a high-capacity, activated-carbon filtration system to remove any possible contaminants such as chlorine, detergents, and other possible trace organic contaminants. This water source has proven safe for aquatic organism toxicity testing at EA as evidenced by maintenance of multigeneration *Daphnia magna, D. pulex,* and fathead minnow cultures with no evident loss of fecundity.

2.4 TOXICITY TEST OPERATIONS AND PERFORMANCE

The sediment toxicity tests were conducted in accordance with US EPA guidance (US EPA 1994) and methodology followed EA's standard toxicity testing protocols (EA 1996) which are included as Attachment I of this report. The *H. azteca* sediment toxicity tests were initiated on 24 April 1998 and were completed on 4 May 1998. The tests were performed with eight replicates per sediment sample and formulated laboratory sediment. Each replicate consisted of 100 ml of sediment with 175 ml of overlying water in a lipless 300-ml glass beaker. The sediment and overlying water were placed into the beakers 24-hours prior to introduction of the test organisms. The beakers were left undisturbed overnight so as to allow any suspended sediment particles in the water column to settle.

Ten *H. azteca* (7-14 days old) were randomly introduced to each replicate test chamber. The introduction of the test organisms to the test chambers marked the initiation of the toxicity tests. The test chambers were placed in a water bath and maintained at 23 ± 1°C with a 16-hour light/8-hour dark photoperiod. The *H. azteca* were fed 1.5 ml/replicate of YCT (a suspension of yeast, ground cereal leaves, and trout chow) daily.

The overlying dechlorinated tap water in the exposure chambers was renewed twice daily (morning and late afternoon) using a water delivery system (Zumwalt et al. 1994). Fresh overlying water was slowly added to each replicate, allowing the water already in the beaker to flow out through a notch cut into the top of the beaker. The notch was sealed with fine mesh screen to prevent any organisms from being flushed out of the test chamber. Temperature and dissolved oxygen measurements were recorded daily on the overlying water in one replicate of each test sediment and formulated laboratory sediment. At test initiation and Day 9, conductivity and pH were measured in one replicate of each sediment, while alkalinity, hardness and ammonia were measured on composited aliquots taken from each of the replicates of each sediment. Water quality parameters were measured using methods described in US EPA (1979) and APHA et al. (1995). A summary of the water quality measurements recorded during testing is provided in Table 3.

At the end of the 10-day exposure period, the surviving organisms from each replicate were retrieved by screening through a 250 μm sieve. The number of surviving *H. azteca* from each replicate was recorded, and the organisms were placed in a dried, pre-weighed tin and placed in a drying oven at 100°C. After approximately 16 hours, the tins were removed from the oven, placed in a desiccator to cool, and each pan was weighed to the nearest 0.01 mg. The dry weight of the surviving organisms in each replicate was determined by subtracting the weight of the empty tin from the weight of the tin plus dried organisms. Copies of the original data sheets, which include all observations and water quality measurements, are provided in Attachment II. Table 4 contains the survival and dry weight results from the *H. azteca* toxicity testing.

2.5 DATA ANALYSIS

The survival and dry weight data were statistically analyzed to determine if either of the two test sediments were significantly (P=0.05) different from the reference sediment and formulated laboratory sediment. If the data from each individual comparison were normally

distributed, then an ANOVA followed by a t-Test were performed to detect statistically significant differences between one sediment and another at $\alpha=0.05$. If the data distribution from a comparison was non-normal, then a Steel's Many One Rank Test (for equal replicate numbers) or a Wilcoxon's Rank Sum Test with Bonferroni Adjustment (for unequal replicate numbers) was used to compare the group means. Attachment III contains copies of the statistical analyses.

2.6 REFERENCE TOXICANT TESTS

In conformance with EA's quality assurance/quality control program, reference toxicant tests were performed with the EA-cultured test species. The *H. azteca* were exposed to the reference toxicant copper sulfate ($CuSO_4$) in a graded concentration series to determine the 96-hour LC50 value. The results of the reference toxicant test were compared to control chart limits established by EA according to US EPA methodology (US EPA 1993). Reference toxicant test data is contained in Table 5.

2.7 ARCHIVES

Original data sheets, records, memoranda, notes, and computer printouts are archived at EA's Baltimore Office in Sparks, Maryland. These data will be retained for a period of 5 years unless a longer period of time is requested by Harding Lawson Associates.

3. RESULTS AND DISCUSSION

A summary of collection and receipt information for the field collected sediments is presented in Table 1, and the constituents of the formulated laboratory sediment are listed in Table 2.

Table 3 summarizes the water quality measurements recorded during the *H. azteca* toxicity tests. The temperatures of the overlying waters were within the proper testing range ($23 \pm 1°C$) for the duration of the exposure period. In addition, alkalinity, hardness, pH, and conductivity values of the overlying waters did not differ by more than 50 percent during testing; however, there was an increase in ammonia levels of the overlying waters in all sediments except the reference sediment 44D00302 (AT8-302). On Day 1 of the exposure period (24 hours after introduction of the test organisms), the dissolved oxygen level in the 44D00202 test sediment (AT8-202) was at 34 percent saturation (3.4 mg/L) which was below the aeration trigger level of 40 percent saturation. The dissolved oxygen level in the other test sediments and formulated laboratory sediment ranged 4.4-4.6 mg/L (slightly above 40 percent saturation). In order to maintain dissolved oxygen levels above 40 percent saturation, all replicates of the three test sediments and the formulated laboratory sediment were placed under gently aeration for the remainder of the exposure period. Mean dissolved oxygen levels in the overlying waters ranged 7.2-7.6 mg/L during testing.

The results of the 10-day *H. azteca* sediment toxicity tests are summarized in Table 4. The *H. azteca* toxicity tests were initiated on 24 April within seven days of collection of the sediment samples. At the completion of the toxicity tests on 4 May, the reference sediment 44D00302 (AT8-203) had 96 percent survival with a mean dry weight of 0.112 mg/organism. Survival in the 44D00202 sediment (AT8-202) was 99 percent, while survival in the 44D00102 sediment (AT8-204) was 93 percent. Statistical analyses showed no significant ($P=0.05$) decrease in survival of the 44D00102 organisms when compared to the reference sediment 44D00302. Mean dry weights of the organisms exposed to the 44D00102 and 44D00202 sediments were higher than the reference sediment. The 44D00102 sediment had a mean dry weight of 0.124 mg/organism, while the 44D00202 sediment had a mean dry weight

of 0.120 mg/organism. No statistical comparisons were made to the formulated laboratory sediment, because all survival and growth values for the three field collected sediments were higher than the formulated laboratory sediment. The formulated laboratory sediment had an acceptable mean survival of 81 percent with a mean dry weight of 0.079 mg/organism. Replicate E of the laboratory sediment had 50 percent survival and was considered by EA's best professional judgement as an anomalous value when compared to the other seven replicates of the laboratory sediment; consequently, replicate E was excluded from the results.

The results of the reference toxicant testing conducted on the EA-cultured *H. azteca* are presented in Table 5. The 96-hour LC50 from the reference toxicant test using copper sulfate ($CuSO_4$) was 297 μg/L Cu which fell within the acceptable control chart limits of 214-317 μg/L Cu. These reference toxicant test results indicate that the *H. azteca* cultures were of acceptable quality.

The results of the cadmium analyses conducted on the three field collected sediments are summarized in Table 6. The complete data report for the cadmium analyses is presented in Attachment IV.

In summary, neither the 44D00102 nor the 44D00202 sediments were toxic to *H. azteca* with respect to survival or growth when compared to the reference sediment 44D00302. The Report Quality Assurance Record is presented in Attachment V.

4. REFERENCES

American Public Health Association (APHA), American Water Works Association, Water Environment Federation. 1995. Standard Methods for the Examination of Water and Wastewater. 19th edition. APHA, Washington, D.C.

EA. 1996. Quality Control and Standard Operating Procedures Manual for the EA Ecotoxicology Laboratory. Revision No.5. EA Manual ATS-102. Internal document prepared by EA's Ecotoxicology Laboratory, EA Engineering, Science, and Technology, Inc., Sparks, Maryland.

US EPA. 1979. Methods for Chemical Analysis of Water and Wastes. EPA/600/4-79/020. U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Cincinnati, Ohio.

US EPA. 1993. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms. Fourth Edition. EPA/600/4-90/027F. U.S. Environmental Protection Agency, Environmental Monitoring Systems Laboratory, Cincinnati, Ohio.

US EPA. 1994. Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates. EPA/600/R-94/024. U.S. Environmental Protection Agency, Office of Research and Development, Washington, DC.

Zumwalt, D.C., F.J. Dwyer, I.E. Greer, and C.G. Ingersoll. 1994. A water-renewal system that accurately delivers small volumes of water to exposure chamber. Environ. Toxicol. Chem. 13:1311-1314.

TABLE 1 SUMMARY OF COLLECTION AND RECEIPT INFORMATION FOR SEDIMENT SAMPLES FROM HARDING LAWSON ASSOCIATES

Sample Identification	EA Accession Number	Sample Collection	Sample Receipt
44D00302 (reference)	AT8-203	1010, 17 APR 98	1102, 18 APR 98
44D00202	AT8-202	0910, 17 APR 98	1102, 18 APR 98
44D00102	AT8-204	1100, 17 APR 98	1102, 18 APR 98

TABLE 2 FORMULATED LABORATORY SEDIMENT CONSTITUENTS AND CORRESPONDING SOURCES[a]

Constituent	Source	Percent of Total Dry Weight
Ca-Montmorillonite ("Cheto" clay) #SAz-1	University of Missouri - Columbia, Source Clays Columbia, Missouri	1.0
ASP 400 (kaolinite clay)	Engelhard Corporation Edison, New Jersey	43.5
ASP 600 (clay)	Engelhard Corporation Edison, New Jersey	4.0
Mystic White #18, #45, and #90 (silica sands)	New England Silica, Inc. South Windsor, Connecticut	Coarse Sand: 9.7% Medium Sand: 19.5% Fine Sand: 19.5%
Peat Moss (organic matter)	Hoffman's Peat Moss	2.4
Dolomite (buffer) ("Dixie Brand Dolomite")	Southern Agri-Minerals Corporation Hartford, Alabama	0.4

(a) Suedel, B.C. and J.H. Rodgers, Jr. 1994. Development of formulated reference sediments for freshwater and estuarine sediment toxicity testing. Environ. Toxicol. Chem. 13:1165-1175.

TABLE 3 MEAN (±STANDARD DEVIATION) WATER QUALITY VALUES MEASURED DURING *Hyalella azteca* TOXICITY TESTING FOR HARDING LAWSON ASSOCIATES

Sample Identification	EA Accession Number	Temperature[a] (°C)	Dissolved Oxygen[a] (mg/L)	Conductivity[b] µS/cm	pH[b]	Alkalinity[c] (mg/L as $CaCO_3$)	Hardness[c] (mg/L as $CaCO_3$)	Ammonia[c] (mg/L N-NH_3)
44D00302	AT8-203	22.8 (±0.6)	7.2 (±0.9)	273 (±5)	7.7 (±0.1)	51 (±1)	88 (±6)	0.13 (±0.01)
44D00202	AT8-202	22.7 (±0.5)	7.4 (±1.3)	263 (±11)	7.7 (±0.1)	44 (±3)	86 (±8)	0.16 (±0.17)
44D00102	AT8-204	22.9 (±0.5)	7.3 (±1.0)	269 (±8)	7.7 (±0.1)	50 (±0)	86 (±3)	0.11 (±0.08)
Formulated Laboratory Sediment	--	22.6 (±0.4)	7.6 (±1.1)	299 (±33)	7.6 (±0.4)	49 (±1)	92 (±11)	0.50 (±0.57)

(a) Temperature and dissolved oxygen were measured in one replicate of each sediment once daily, between renewals of the overlying water.
(b) Conductivity and pH were measured in one replicate of each sediment at test initiation and Day 9.
(c) Alkalinity, hardness, and ammonia were measured at test initiation and Day 9 on each sediment by compositing an aliquot of the overlying water from each replicate of the sediment.

TABLE 4 SUMMARY OF RESULTS OF 10-DAY *Hyalella azteca* SEDIMENT TOXICITY TESTS FOR HARDING LAWSON ASSOCIATES

Test Organism: *Hyalella azteca*

QC Test Number: TN-98-130

Test Initiation: 24 April 1998

Test Termination: 4 May 1998

Sample Identification	EA Accession Number	10-Day Percent Survival	10-Day Mean Dry Weight[a] as mg/organism (+S.D.)
44D00302 (reference)	AT8-203	96	0.112 (±0.022)
44D00202	AT8-202	99	0.120 (±0.021)
44D00102	AT8-204	93	0.124 (±0.029)
Formulated Laboratory Sediment	--	81	0.079 (±0.014)

(a) Mean dry weight of organisms at test initiation was 0.023 mg/organism.

TABLE 5 REFERENCE TOXICANT TEST DATA FOR *Hyalella azteca*

QC Test Number	Reference Toxicant	96-Hour LC50	Acceptable Control Chart Limits
RT-98-081	Copper sulfate ($CuSO_4$)	297 μg/L Cu	214-317 μg/L Cu

TABLE 6 RESULTS OF CADMIUM ANALYSES ON SEDIMENT SAMPLES FROM HARDING LAWSON ASSOCIATES

Sample Identification	Cadmium (mg/kg)
44D00302	0.31
44D00202	1.60
44D00102	0.22

ATTACHMENT I

Protocols

SEDIMENT TOXICITY TEST (DAILY RENEWAL) WITH *Hyalella azteca*

1. TEST OBJECTIVE

To assess the toxicity of a whole sediment sample to *Hyalella azteca* and determine the effects on survival (growth optional) of the test organisms compared to controls.

2. TEST ARTICLE

2.1 Description/Identification

Unless otherwise specified, the test material is supplied by the client. Adequate chemical specifications with special reference to hazardous properties and storage conditions are also supplied by the client.

2.2 Methods of Synthesis

Test article is a whole sediment sample. Information on the methods of synthesis, stability, and composition or other characteristics which define the test article are on the file with the client.

2.3 Sample Preparation

Depending upon the project, the sediment may be screened through a suitably sized sieve to remove large particles and indigenous organisms, and homogenized before being placed in the test chambers. Sediment and overlying water should be added to test vessels 24 hours prior to introduction of test organisms in order to allow suspended sediments to settle.

3. EXPERIMENTAL DESIGN

3.1 Test Organisms

3.1.1 Species

The test species is the amphipod, *Hyalella azteca*.

3.1.2 Source

H. azteca used for toxicity tests are obtained from EA cultures or from a scientific organism vendor as specified in the report.

3.1.3 Culturing and Holding Conditions

Stocks obtained from a scientific vendor are transferred into recirculating holding tanks containing hardwood leaves which have been presoaked or boiled to remove tannins. The organisms are gradually acclimated to testing conditions and to the overlying water used in testing. During the holding period, the *H. azteca* are fed Tetramin-B flake food weekly in addition to the hardwood leaves. Dead organisms or these displaying abnormal behavior, discoloration, or pronounced lethargy are removed as observed, and recorded on appropriate log sheets as part of the quality control program. Certain regulatory or project specific objectives may require organism acclimation to the dilution water when it is different from the holding/culture water.

3.1.4 Age of Test Organisms at Test Initiation

Juvenile organisms, 7-14 days old at test initiaion, are used for the toxicity testing. Length or weight should be measured on a subset of at least 20 organisms from the population used to start the test.

3.2 Test Concentration Series

H. azteca are exposed in replicate chambers to whole sediment samples and to a laboratory or reference sediment control.

3.3 Overlying Water

The overlying water is typically dechlorinated tap water. The source of dechlorinated tap water is the City of Baltimore municipal water system. Upon entry to the laboratory, the water passes through a high-capacity, activated-carbon filtration system to remove chlorine and other possible organic contaminants. This water source has proven safe for aquatic organism toxicity testing at EA, as evidenced by maintenance of the multigeneration *Daphnia* and *Pimephales promelas* cultures, with no evident loss of fecundity. Reconstituted fresh water or other dilution water (e.g. site water) may be used depending on study requirements.

3.4 Test Vessels and Test Volume

Test vessels are typically 300-ml high-form lipless beakers, each containing 100 ml volume of sediment and 175 ml volume of overlying water. The size of the test vessels, and the volume of sediment and overlying water may be changed depending upon the study requirements.

3.5 Test Organism Number

The number of replicate chambers per treatment depends on the test objective. Eight replicates are recommended for routine testing. Each replicate test chamber has 10 organisms. To introduce the test organisms into the test chambers, ten *H. azteca* are randomly assigned to 30-ml portion cups. One cup of 10 organisms is then randomly added to each replicate. Prior to organism transfer, the volume of each transfer portion cup is reduced.

3.6 Test Environment

The test vessels are maintained in an environmentally controlled laboratory with a 16-hour light, 8-hour dark photoperiod. Temperature within the environmental room is monitored continuously using temperature recorders and is maintained at 23 ± 1°C (unless a different project-specific temperature is required). The instantaneous temperature must always be within ± 3°C of the desired temperature, and the daily mean temperature must be within ± 1°C of the desired temperature.

3.7 Test Observations

The overlying water is renewed daily, either continuously or intermittently, at a rate of at least 2 volume additions/day.

Test organisms are fed a suspension of yeast/cereal leaves/trout chow (YCT) during the exposure period. However, the amount of food added to the test chambers is kept to a minimum to avoid fungal or bacterial growth on the sediment surface. A typical feeding rate is 1.5 ml YCT daily per replicate. If the dissolved oxygen concentration drops below 40 percent of saturation in the overlying water of a replicate, then feeding should be suspended in all replicates until the dissolved oxygen concentration increases to $\geq$40 percent.

Samples of overlying water from the test sediment and control or reference sediment are analyzed for conductivity, alkalinity, hardness, pH, and ammonia at test initiation and termination. Water samples from the replicates of a treatment may be pooled for analysis. Measurements of water quality are taken daily thereafter for dissolved oxygen and temperature

from a minimum of one replicate of each sediment, reference, and control treatment. During testing, the alkalinity, hardness, conductivity, pH, and ammonia of the overlying water within a treatment should not vary by more than 50 percent. Aliquots of overlying water may be gently aerated, if necessary, to maintain dissolved oxygen levels at or above 40 percent of saturation. Analytical determinations are conducted according to APHA et al. (1995) and US EPA (1979).

The study terminates after 10 days of exposure to the sediment sample. At test termination, test organisms are observed to record the number of surviving *H. azteca* in each replicate. If growth is used as an endpoint, surviving *H. azteca* at the end of the test period may be placed into pre-weighed, oven-dried aluminum pans (one replicate per pan). Organisms are oven dried for a minimum of six hours at 100°C after which each pan is weighed. Mean dry weight of the *H. azteca* (weight of pan and organisms minus weight of pan/number of organisms) is calculated.

3.8 Data Analysis

Statistical analyses are performed on percent survival and mean dry weight data. Analysis of variance (ANOVA) and either Bonferroni's T-Test or Dunnett's Mean Comparison Test can be used to analyze significance of effects. Depending on the distributional characteristics of the data generated, it may be necessary to use Steel's Many-One Rank Test or the Wilcoxon Rank Sum Test instead (US EPA 1994). For single treatment comparisons, a t-Test can be performed. The statistical methods used are specified in the final report.

4. FINAL REPORT

The final report is prepared to contain, at a minimum, the following information:

- Objectives and procedures stated in the approved protocol, including any changes made to the original protocol
- Identity of the test article(s) by name or code number and their strength (i.e., quality/purity), and a description of any pretreatment
- Source of the overlying water, its chemical characteristics, and a description of any pretreatment
- Test concentration series used and duration of the assay

- Mean dry weights of test organisms with the respective standard deviations
- Water quality characteristics (pH, dissolved oxygen, temperature, etc.) of overlying water from reference, control, and test sediment treatments
- Any unforeseen circumstances that may have affected the quality or integrity of the study
- Signature of the project manager, senior technical reviewer, and quality control officer authorizing release of the report
- Location of all archived data and the original copy of the final report at EA

Items of data to be included in the report consist of experimental design and test performance, effects on general appearance of test organisms (if applicable), morbidity and mortality, presentation of water quality characteristics, and survival and weight data.

5. QUALITY ASSURANCE

5.1 Amendments to Protocol

Amendments to the authorized protocol established by EA or by the client are made only after proper authorization. Such authorization is achieved by completion of the Protocol Amendment Form by EA after consultation with the client.

5.2 Standard Operating Procedures

Unless otherwise specified, all procedures given in the protocol are subject to detailed Standard Operating Procedures (SOPs) which are contained in the SOP manuals of the participating departments. These SOPs and protocols generally follow the type of requirements in the U.S. EPA's Good Laboratory Practice Standards (GLPs) (US EPA 1989).

5.3 Reference Toxicant

A reference toxicant test, utilizing potassium chloride (KCl), copper sulfate, or another appropriate chemical, is used as an internal quality check of the sensitivity of the test organisms. Testing is conducted at least once monthly on organisms which are cultured in-house, and on each population of organisms purchased for testing from an outside source if reference toxicant data are not available from the supplier on the acquired lot. The results of

each test are compared with historical, species-specific toxicological information from reference toxicant tests performed at EA, to determine if the results are within acceptable limits. Limits are established using the control charts outlined in US EPA (1993).

5.4 Quality Assurance Evaluation

Studies conducted under this protocol may be subject to internal audit by EA's Quality Assurance Unit. A quality control officer is responsible for monitoring each study to assure the client that the facilities, equipment, personnel, methods, practices, records, and controls are in conformance with EA's QC program and, if applicable, EPA's GLPs.

5.5 Inspection by Regulatory Authorities

In the event of an inspection of EA by an outside authority during the course of the study, the client whose study is being inspected will be consulted before examiners are permitted access to any of the project records or the experimental areas.

5.6 Archives

Copies of project-specific records shall be transferred to the client promptly after the project is completed or as negotiated and budgeted. Original primary data are retained at EA for 5 years. Primary data include chain-of-custody records, laboratory data sheets, records, memoranda, notes, photographs, microfilm, and computer printouts that are a result of the original observations and activities of the study and which are necessary for the reconstruction and evaluation of the study report.

5.7 Location

Studies are conducted at the Ecotoxicology Laboratory of EA Engineering, Science, and Technology, Inc. at the Loveton Office in Sparks, Maryland.

6. SPECIFICATIONS OF THE *Hyalella azteca* SEDIMENT TOXICITY TEST

6.1 Basic References

American Public Health Association (APHA) American Water Works Association, Water Envrionment Federation. 1995. Standard Methods for Examination of Water and Wastewater, 19th or most recent version. APHA, Washington, D.C.

American Society for Testing and Materials (ASTM). 1991. Standard Practice for Conducting Acute Tests with Fishes, Macroinvertebrates, and Amphibians. ASTM Designation: E729-80, Philadelphia, Pennsylvania.

American Socity for Testing and Materials (ASTM). 1991. Standard Guide for Conducting Sediment Toxicity Tests with Freshwater Invertebrates. ASTM Designation: E1383-90, Philadelphia, Pennsylvania

American Society for Testing and Materials (ASTM). 1995. Standard Test Methods for Measuring the Toxicity of Sediment-Associated Contaminants with Freshwater Invertebrates. ASTM Designation: E1706-95, Philadelphia, Pennsylvania.

EA. 1996. Quality Control and Standard Operating Procedures Manual for EA's Ecotoxicology Laboratory. Fifth Revision. EA Manual ATS-102. Internal document prepared by EA's Ecotoxicology Laboratory, EA Engineering, Science, and Technology, Inc., Sparks, Maryland.

US EPA. 1979. Methods for Chemical Analysis of Water and Wastes. EPA/600/4-79/020. U.S. Environmental Protection Agency, Washington, D.C.

US EPA. 1989. Toxic Substances Control Act (TSCA); Good Laboratory Practice Standards. Title 40 CFR Part 792. Fed. Regist. 54(158): 34034-34074.

US EPA. 1989. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms. Second Edition. EPA/600/4-89/001. U.S. Environmental Protection Agency, Environmental Monitoring Systems Laboratory, Cincinnati, Ohio.

US EPA. 1991. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms. Fourth Edition. EPA/600/4-90/027. U.S. Environmental Protection Agency, Environmental Monitoring Systems Laboratory, Cincinnati, Ohio.

US EPA. 1993. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms. Fourth Edition. EPA/600/4-90/027F. U.S. Environmental Protection Agency, Environmental Monitoring Systems Laboratory, Cincinnati, Ohio.

US EPA. 1994. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms. Third Edition. EPA/600/4-91/002. U.S. Environmental Protection Agency, Environmental Monitoring Systems Laboratory, Cincinnati, Ohio.

US EPA. 1994. Methods for Measuring the Toxicity and Bioaccumulation of Sediment-Associated Contaminants with Freshwater Invertebrates. EPA/600/R-94/024. U.S. Environmental Protection Agency, Office of Research and Development, Duluth, Minnesota.

6.2 Test Specifications

Test organism:	*Hyalella azteca*
Organism age:	Juvenile (7-14 days old at start of test)
Aeration:	None, unless dissolved oxygen falls below 40 % saturation; gentle aeration should be provided through a 1-ml glass pipet, placed no closer than 2 cm above the sediment surface.
Temperature:	23±1°C
Light quality:	Wide-spectrum fluorescent light
Light intensity:	50-100 f.c.
Photoperiod:	16-hour light, 8-hour dark
Overlying water:	Dechlorinated municipal tap water, reconstituted fresh water, or appropriate receiving water
Test container:	300-ml beaker
Test volume:	100 ml sediment with 175 ml overlying water
No. of replicates:	8
No. organisms per replicate:	10

Feeding regime:	1.5 ml YCT daily per replicate
Test duration:	10 days
Endpoints:	Survival (growth optional)
Test acceptability:	80 percent or greater survival in the control sediment

ATTACHMENT II

Data Sheets

Chain-of-Custody Record

EA Engineering, Science, and Technology

EA Ecotoxicology Laboratory
15 Loveton Circle
Sparks (Baltimore), Maryland 21152
Telephone (410) 771-4950
Fax (410) 771-4204

FOR OFFICE USE ONLY
Species to be tested

____	*D magna*	____	*Menidia* sp
____	*D pulex*	____	*P pugio*
____	*C dubia*	____	*C variegatus*
____	*P promelas*	____	*M bahia*
X	(Other) *H. azteca*	____	Other

A = Acute C = Chronic B = Bioaccumulation

Client ABB-ES Project No NAS Jacksonville PSC 44

NPDES Number NA Client Purchase Order Number SE849059G

State/City/County Collected Jacksonville, FL

LATE 14-day 10

PLEASE READ SAMPLING INSTRUCTIONS ON BACK OF FORM

Accession Number (office use only)	Grab	Composite	Collection Start Date/Time	Collection End Date/Time	Sample Description (including Site, Station Number, and Outfall Number)	Number/Volume of Container
ATS-202		X	4.17.98/0840	- 0910	44D00202 - toxicity testing	1/1gallon plastic
		X	"	"	44D00202 - cadmium analysis	1/40oz glass
ATS-203		X	" /0930	- 1010	44D00302 - toxicity testing	1/1gallon plastic
		X	"	"	44D00302 - cadmium analysis	1/40 oz glass
ATS-204		X	" /1030	1100	44D00102 - toxicity testing	1/1gallon plastic
		X	"	"	44D00102 - cadmium analysis	1/40 oz glass

Sampled By	Date/Time	Received By	Date/Time
Anita Reese	4/17/98 1400		
Sampler's Printed Name	Title	Relinquished By	Date/Time
Relinquished By	Date/Time	Received By Laboratory	Date/Time
			4/18/98 1102

Was Sample Chilled During Collection? (Yes) No

Sample Shipped By (circle)

(Fed Ex) Puro UPS Airborne

Other _____

Comments

40 oz glass jars contain sediment to be tested for cadmium.

ON ice when received!

PO 4/18/98 1102

White—Report Production Yellow—Laboratory Pink—Client/Sampler

EA0534 F&B 8/6/96 TOXCOC cdr

SEDIMENT TOXICITY TEST DATA SHEET

Project No.: 70023.10
Client: ABB
QC Test No.: IN98-130
Test Article: Sediments
Sample No.: ATS-202, 203, 204

Overlying Water: Dechlor.
Sample No.: N/A

Test Organism: H. azteca
Lot No.:

Beginning Date: 4/24/98 Time: 1407
Ending Date: 5/4/98 Time: 1500

Acclimation: N/A Age: 7-14 days
Source: EA

Treatment	Replicate No.	No. Organisms Alive										
		0 Date 4/24	1 Date 4/25	2 Date 4/26	3 Date 4/27	4 Date 4/28	5 Date 4/29	6 Date 4/30	7 Date 5/1	8 Date 5/2	9 Date 5/3	10 Date 5/4
Lab	A	10										8
Control	B	10										8
	C	10										7
	D	10										7
	E	10										5 (a)
	F	10										10
	G	10										9
	H	10										8
ATS-	A	10										10
202	B	10										10
	C	10										9
	D	10										10
	E	10										10
	F	10										10
	G	10										10
	H	10										10
Initials/Time		KV/1407										

(a) Rep E excluded from analysis as an outlier

SEDIMENT TOXICITY TEST DATA SHEET

Project No.: 7000310
Client: ABB
QC Test No.: TN#98-130
Test Article: Sediments
Sample No.: ATS-202, 203, 204

Overlying Water: Dechlor
Sample No.: N/A
Test Organism: H. azteca
Lot No.:

Beginning Date: 4/24/98 Time: 1407
Ending Date: 5/4/98 Time: 1500
Acclimation: N/A Age: 7-14 days
Source: LA

Treatment	Replicate No.	No. Organisms Alive										
		0 Date 4/24	1 Date 4/25	2 Date 4/26	3 Date 4/27	4 Date 4/28	5 Date 4/29	6 Date 4/30	7 Date 5/1	8 Date 5/2	9 Date 5/3	10 Date 5/4
ATS-203	A	10										10
	B	10										10
	C	10										10
	D	10										10
	E	10										9
	F	10										9
	G	10										10
	H	10										9
ATS-204	A	10										9
	B	10									Lost Rep PSH	—
	C	10										9
	D	10										10
	E	10										10
	F	10										10
	G	10										7
	H	10										10
Initials/Time		1107/KO										

EA

WEIGHT DATA (Test Species: H. azteca)

Project No.: 70003.10 Client: AFB QC Test Number: TN 98-130

Sample Number: N/A Balance Calibration: 0403 Oven Temp. (°C): 100.4°C.

Tin Lot Number: #6 Red Tins Placed in Oven (date/time/initials): 1512, 4/24/98, RO

Tins Removed from Oven (date/time/initials): 4/25/98, 1630, RO Tins Weighed (date/time/initials): RSH 5/5/98 0930

Test Concentration	Rep No.	Pan No.	A Weight of Oven-Dried Pans (mg)	B Weight of Pan and Organisms (mg)	B-A Total Dry Organism Weight (mg)	C Number of Organisms Weighed	(B-A)/C Average Dry Organism Weight (mg)	Observations
Initial Weights	A	4	29.58	29.79	0.21	10	0.021	
	B	3	34.26	34.51	0.25	10	0.025	
							$\bar{x}$ = 0.023	

General Remarks: calculations checked 5/7/98 LAH.

WEIGHT DATA (Test Species: H. azteca)

Project No.: 7000310 Client: ABB QC Test Number: TW-130

Sample Number: Lab Control Balance Calibration: 0/50 g Oven Temp. (°C): 160°C

Tin Lot Number: Green #10 Tins Placed in Oven (date/time/initials): 5/4/98 1700 NSH

Tins Removed from Oven (date/time/initials): 5/5/98 NSH 0900 Tins Weighed (date/time/initials): SSD 5/5/98 0930

Test Concentration	Rep. No.	Pan No.	A Weight of Oven-Dried Pans (mg)	B Weight of Pan and Organisms (mg)	B-A Total Dry Organism Weight (mg)	C Number of Organisms Weighed	(B-A)/C Average Dry Organism Weight (mg)	Observations
Lab Control	A	25	28.88	29.36	0.48	8	0.060	
	B	37	30.30	30.87	0.57	8	0.071	
	C	3	28.89	29.61	0.72	7	0.103	
	D	24	29.13	29.63	0.50	7	0.071	
	E	~~34~~ 5	28.46	SSD 28.~~88~~ 87	0.41	5 ~~9~~ 7SH	0.082	
	F	34	27.16	27.86	0.70	9	0.078	(1) lost all to alive
	G	21	29.46	30.26	0.80	9	0.089	
	H	31	29.39	30.03	0.64	8	0.080	

General Remarks: calculations checked 5/7/98 LATH.

WEIGHT DATA (Test Species: H. azteca)

Project No.: 7000310 Client: ABB QC Test Number: TN-130

Sample Number: ATS-202 Balance Calibration: 0/50 g Oven Temp. (°C): 100°C

Tin Lot Number: Green #10 Tins Placed in Oven (date/time/initials): 5/4/98 1700 RSH

Tins Removed from Oven (date/time/initials): 5/5/98 RSH 0900 Tins Weighed (date/time/initials): SSD 5/5/98 0930

Test Concentration	Rep No.	Pan No.	A Weight of Oven-Dried Pans (mg)	B Weight of Pan and Organisms (mg)	B-A Total Dry Organism Weight (mg)	C Number of Organisms Weighed	(B-A)/C Average Dry Organism Weight (mg)	Observations
ATS-202	A	4	29.96	SSD ~~31~~ 31.50	1.54	10	0.154	
	B	36	28.93	29.81	0.88	10	0.088	
	C	TSH ~~15~~	27.91	SSD 28.42 91	1.00	TSD ~~10~~ 9	0.111	
	D	17	28.88	29.99	1.11	10	0.111	
	E	27	27.82	28.95	1.13	10	0.113	
	F	40	29.50	30.72	1.22	10	0.122	
	G	28	28.64	29.78	1.14	10	0.114	
	H	42	28.27	29.75	1.48	~~9~~ 10 JL	0.148	

General Remarks: calculations checked 5/7/98 LAH.

WEIGHT DATA (Test Species: H azteca)

Project No.: 70003.10 Client: ABB QC Test Number: TIV-130

Sample Number: ATS-203 Balance Calibration: 0/50g Oven Temp. (°C): 100°C

Tin Lot Number: Green #10 Tins Placed in Oven (date/time/initials): 5/4/98 1700 RSH

Tins Removed from Oven (date/time/initials): 5/5/98 MSH 0900 Tins Weighed (date/time/initials): SSD 5/5/98 0930

Test Concentration	Rep No.	Pan No.	A Weight of Oven-Dried Pans (mg)	B Weight of Pan and Organisms (mg)	B-A Total Dry Organism Weight (mg)	C Number of Organisms Weighed	(B-A)/C Average Dry Organism Weight (mg)	Observations
ATS-203	A	18	TIV + 29.65	SSD 30.~~77~~91	1.26	10	0.126	
	B	23	28.30	29.43	1.13	10	0.113	
	C	8	29.81	31.36	1.55	10	0.155	
	D	1	29.92	30.97	1.05	10	0.105	
	E	26	28.39	29.16	0.77	9	0.086	
	F	22	29.33	30.45	1.12	9	0.124	
	G	20	28.12	29.05	0.93	10	0.093	
	H	2	29.56	30.42	0.86	9	0.096	

General Remarks: calculations checked 5/7/98 LAH.

WEIGHT DATA (Test Species: H. azteca)

Project No.: 70003.10 Client: ABB QC Test Number: TW-130

Sample Number: 1918-204 Balance Calibration: 0/50 g Oven Temp. (°C): 100°C

Tin Lot Number: Green #10 Tins Placed in Oven (date/time/initials): 5/4/98 1700 RSH

Tins Removed from Oven (date/time/initials): 5/5/98 RSH 0900 Tins Weighed (date/time/initials): SSD 5/5/98 0930

Test Concentration	Rep No.	Pan No.	A Weight of Oven-Dried Pans (mg)	B Weight of Pan and Organisms (mg)	B-A Total Dry Organism Weight (mg)	C Number of Organisms Weighed	(B-A)/C Average Dry Organism Weight (mg)	Observations
ATS 204	A	30	27.81	29.43	1.62	9	0.180	
	B	—				—		Rep lost at test termination RH
	C	9	27.99	28.95	0.96	9	0.107	
	D	14	28.40	29.76	1.36	10	0.136	
	E	7	28.26	29.24	LAH ~~1.28~~ 0.98	10	LAH ~~0.128~~	0.098
	F	6	30.57	31.57	1.00	10	0.100	
	G	41	28.58	29.52	0.94	7	0.134	
	H	32	29.06	30.17	1.11	10	0.111	

General Remarks. Calculations checked 5/7/98 LAH.

AQUATIC TOXICOLOGY BENCH SHEET

Project No: 10003 10
Client: ABB
QC Test No.: IN98-130

Date/Time | Activity | Investigator

Test Treatment: Lab Control

Water Quality Monitoring (1X/Day):

composite of all reps

Test Day	Replicate Sampled	Initials / TIME Meter #s	Temp (°C)	D.O. (mg/L)	pH	Cond (µS/cm)	Hardness (mg/L)	Alkalinity (mg/L)	Ammonia (mg/L)
0	A	73/100 7H/17 RO 1122	22.8	7.2	7.3	322	100	48	0.09
1	B	74/100 RO 1410	23.3	4.5	—	—	—	—	—
2	C	74/18 1545 RSH	22.4	7.8	—	—	—	—	—
3	D	74/100 1730 RSH	22.0	7.9	—	—	—	—	—
4	E	74/100 1419 RO	22.1	8.0	—	—	—	—	—
5	F	92/100 1614 RO	22.2	7.9	—	—	—	—	—
6	G	74/100 1718 RSH	22.8	87	—	—	—	—	—
7	H	94/100 1530 RSH	23.1	7.6	—	—	—	—	—
8	A	74/100 1345 KAH	22.4	7.6	—	—	—	—	—
9	B	99/100 7H/918 1600 TSH	22.5	8.2	7.8	276	84	50	0.9
10	C	94/100 1343 RL	23.1	8.0	—	—	—	—	—

AQUATIC TOXICOLOGY BENCH SHEET

Project No: 70003.10
Client: ABB
QC Test No.: TN-95-130

Date/Time | Activity | Investigator

Test Treatment: AT8-202

Water Quality Monitoring (1X/Day):

COMPOSITE of all reps.

Test Day	Replicate Sampled	Initials / TIME Meter #s	Temp (°C)	D O. (mg/L)	pH	Cond (µS/cm)	Hardness (mg/L)	Alkalinity (mg/L)	Ammonia (mg/L)
0	A	PB/100 741917 56 RO 1125	22.9	7.6	7.6	270	92	46	0.04
1	B	99/100 56 1410 RO	23.4	3.4	—	—	—	—	—
2	C	741/5 56 1545 RSH	22.3	7.8	—	—	—	—	—
3	D	741100 55 1730 RSH	22.1	8.0	—	—	—	—	—
4	E	991/100 55 1419 RO	22.0	8.1	—	—	—	—	—
5	F	92/100 56 1614 RO	22.5	7.8	—	—	—	—	—
6	G	991/100 56 1718 RSH	22.8	7.9	—	—	—	—	—
7	H	44/100 56 1530 KRS	23.1	7.3	—	—	—	—	—
8	A	74/100 56 1345 KAH	22.4	8.0	—	—	—	—	—
9	B	991100 741918 55 1601 SH	22.7	7.8	7.8	255	80	42	0.28
10	C	99/ 55 1345 DL	23.2	7.8	—	—	—	—	—

AQUATIC TOXICOLOGY BENCH SHEET

Project No: 70003 10
Client: ABB
QC Test No.: TN-98-130

Date/Time | Activity | Investigator

Test Treatment: ATS-203

COMPOSITE OF ALL REPS

Water Quality Monitoring (1X/Day):

Test Day	Replicate Sampled	Initials / TIME Meter #s	Temp (°C)	D.O. (mg/L)	pH	Cond (µS/cm)	Hardness (mg/L)	Alkalinity (mg/L)	Ammonia (mg/L)
0	A	TB 1100 74/917 56 1129 RO	22.7	7.1	7.6	276	92	50	0.13
1	B	99/100 56 1410 RO	23.8	4.6	—	—	—	—	—
2	C	74/18 56 1545 RSH	22.2	7.5	—	—	—	—	—
3	D	74/100 55 1730 RSH	22.3	7.9	—	—	—	—	—
4	E	99/100 55 1419 RO	22.3	7.5	—	—	—	—	—
5	F	92/100 56 1614 RO	22.2	7.6	—	—	—	—	—
6	G	99/100 56 1718 RSH	22.8	7.3	—	—	—	—	—
7	H	99/100 56 1530 RSH	23.3	7.2	—	—	—	—	—
8	A	74/100 56 1345 KAH	22.7	7.7	—	—	—	—	—
9	B	99/100 741918 55 1600 RSH	23.3	7.2	7.7	269	84	52	0.12
10	C	99/100 55 1343 GL	23.4	7.6	—	—	—	—	—

AQUATIC TOXICOLOGY BENCH SHEET

Project No: 7000310
Client: ABB
QC Test No.: IN48-B0

Date/Time | Activity | Investigator

Test Treatment: AT8-204

COMPOSITE OF ALL REPS.

Water Quality Monitoring (1X/Day):

Test Day	Replicate Sampled	Initials / TIME Meter #s	Temp (°C)	D.O. (mg/L)	pH	Cond (µS/cm)	Hardness (mg/L)	Alkalinity (mg/L)	Ammonia (mg/L)
0	A	RB/100 74/917 56 1131 RO	22.7	7.2	7.6	274	88	50	0.05
1	B	99/100 56 1410 RO	23.7	4.4	—	—	—	—	—
2	C	74/18 56 1545 RSH	22.4	7.8	—	—	—	—	—
3	D	74/100 55 1730 RSH	22.3	7.8	—	—	—	—	—
4	E	74/100 55 1449 RO	22.3	7.7	—	—	—	—	—
5	F	92/100 56 1614 RO	22.5	7.6	—	—	—	—	—
6	G	99/100 56 1715 RSH	22.9	7.8	—	—	—	—	—
7	H	99/100 56 1530 RSH	23.3	7.1	—	—	—	—	—
8	A	74/100 56 1345 KAH	22.7	7.3	—	—	—	—	—
9	B	99/100 74/918 55 1625 TSH	23.4	7.8	7.7	263	84	52	0.16
10	C	99/100 55 1343 GL	23.4	7.9	—	—	—	—	—

AQUATIC TOXICOLOGY BENCH SHEET

Project No: 70003.10
Client: ARB
QC Test No.: TN-98-130

Date/Time	Activity	Investigator

Renewal Record (2X/Day):

Day 0 — 4/24/98 — AM - 1100 — Initials - RO
PM - 1640 — Initials - RO

Day	Date		Time	Initials
1	4125198	AM	0910	RO
		PM	1615	RO
2	4126198	AM	0930	RSL
		PM	1600	RSH
3	4127198	AM	0945	RCL
		PM	1740	RSH
4	4128198	AM	0906	RO
		PM	1630	RSL
5	4129198	AM	0910	RO
		PM	1629	RO
6	4130198	AM	0907	RO
		PM	1725	RSH
7	5/1/98	AM	0945	RO
		PM	1545	KAH
8	5/2/98	AM	1030	RO/KAH
		PM	1555	KAH
9	5/3/98	AM	1000	ᗡ
		PM	1630	ᗡ
10	N/A	AM	—	—
		PM	—	—

24 Chambers 175 mls/each 4.2 L/Renewal

AQUATIC TOXICOLOGY BENCH SHEET

Project No: 70003.10
Client: ABB
QC Test No.: TN-98-130

Date/Time | Activity | Investigator

Feeding Record (1X/Day, between renewals): 1½ mls YCT / rep.

INITIAL FEED. Day 0 — 4/24/98 — 1445 — RO

Day	Date	Time	Initials
1	4/25/98	0925	RO
2	4/26/98	1000	RSH
3	4/27/98	1005	RSH
4	4/28/98	0919	RO
5	4/29/98	0917	RO
6	4/30/98	0912	RO
7	5/1/98	0945	RO
8	5/2/98	1042	RO
9	5/3/98	1020	RO
10	N/A	—	—

Comments:

AQUATIC TOXICOLOGY BENCH SHEET

Project No.: 70003.10
Client: ABB
QC Test No.: IN-98-130

Date/Time		Activity	Investigator
4/23/98	1500	Sediment Added to Chambers	RSH
↓	1600	Overlying Water Added to Chambers	RSH
4/24/98	1407	Organisms Transferred	RO

Sample Nos.: ATS-202, 203, 204
Overlying Water: DECHLOR

Test Concentration	Volume Test Sediment (ml)	Volume Overlying Water (ml)
Control (formulated sediment)	100ml	175 ml
ATS-202	100ml	175 ml
ATS-203	100 ml	175 ml
ATS-204	100 ml	175 ml

AQUATIC TOXICOLOGY BENCH SHEET

Project No: 70003.10
Client: ABB
QC Test No.: JN-98-130

Date/Time	Activity	Investigator
4/25/98 1615	Entire test aerated due to low D.O. levels. (D.O. ATS-202 Rep B = 34%.)	RO
4/25/98 - 4/26/98 5/3/98	Zumwalt diluter used for renewals 4.2 L dechlor dumped in to diluter for each renewal (175 mls of dechlor water to be replaced. 24 seringes on Zumwalt diluter) 175 x 24 = 4200 mls	RSJ

ATTACHMENT III

Statistical Analyses

TN-98-130 ABB H.AZTECA SURVIVAL
File: f:\ls\130hasur.abb Transform: NO TRANSFORM

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	AT8-203 (REF)	0.003	0.052	0.018	5.38
2	AT8-202	0.001	0.035	0.013	3.58
3	AT8-204	0.012	0.111	0.042	11.98
4	LAB CONTROL	0.011	0.107	0.040	13.13

TITLE: TN-98-130 ABB H.AZTECA SURVIVAL
FILE: f:\ls\130hasur.abb
TRANSFORM: NO TRANSFORM NUMBER OF GROUPS: 4

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	AT8-203 (REF)	1	1.0000	1.0000
1	AT8-203 (REF)	2	1.0000	1.0000
1	AT8-203 (REF)	3	1.0000	1.0000
1	AT8-203 (REF)	4	1.0000	1.0000
1	AT8-203 (REF)	5	0.9000	0.9000
1	AT8-203 (REF)	6	0.9000	0.9000
1	AT8-203 (REF)	7	1.0000	1.0000
1	AT8-203 (REF)	8	0.9000	0.9000
2	AT8-202	1	1.0000	1.0000
2	AT8-202	2	1.0000	1.0000
2	AT8-202	3	0.9000	0.9000
2	AT8-202	4	1.0000	1.0000
2	AT8-202	5	1.0000	1.0000
2	AT8-202	6	1.0000	1.0000
2	AT8-202	7	1.0000	1.0000
2	AT8-202	8	1.0000	1.0000
3	AT8-204	1	0.9000	0.9000
3	AT8-204	2	0.9000	0.9000
3	AT8-204	3	1.0000	1.0000
3	AT8-204	4	1.0000	1.0000
3	AT8-204	5	1.0000	1.0000
3	AT8-204	6	0.7000	0.7000
3	AT8-204	7	1.0000	1.0000
4	LAB CONTROL	1	0.8000	0.8000
4	LAB CONTROL	2	0.8000	0.8000
4	LAB CONTROL	3	0.7000	0.7000
4	LAB CONTROL	4	0.7000	0.7000
4	LAB CONTROL	5	1.0000	1.0000
4	LAB CONTROL	6	0.9000	0.9000
4	LAB CONTROL	7	0.8000	0.8000

TN-98-130 ABB H.AZTECA SURVIVAL
File: f:\ls\130hasur.abb Transform: NO TRANSFORM

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	AT8-203 (REF)	8	0.900	1.000	0.963
2	AT8-202	8	0.900	1.000	0.988
3	AT8-204	7	0.700	1.000	0.929
4	LAB CONTROL	7	0.700	1.000	0.814

TITLE: TN-98-130 ABB H.AZTECA SURVIVAL
FILE: F:\LS\130HASUA.ABB
TRANSFORM: NO TRANSFORM NUMBER OF GROUPS: 2

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	AT8-203 (REF)	1	1.0000	1.0000
1	AT8-203 (REF)	2	1.0000	1.0000
1	AT8-203 (REF)	3	1.0000	1.0000
1	AT8-203 (REF)	4	1.0000	1.0000
1	AT8-203 (REF)	5	0.9000	0.9000
1	AT8-203 (REF)	6	0.9000	0.9000
1	AT8-203 (REF)	7	1.0000	1.0000
1	AT8-203 (REF)	8	0.9000	0.9000
2	AT8-204	1	0.9000	0.9000
2	AT8-204	2	0.9000	0.9000
2	AT8-204	3	1.0000	1.0000
2	AT8-204	4	1.0000	1.0000
2	AT8-204	5	1.0000	1.0000
2	AT8-204	6	0.7000	0.7000
2	AT8-204	7	1.0000	1.0000

TN-98-130 ABB H.AZTECA SURVIVAL
File: F:\LS\130HASUA.ABB Transform: NO TRANSFORM

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	AT8-203 (REF)	8	0.900	1.000	0.963
2	AT8-204	7	0.700	1.000	0.929

TN-98-130 ABB H.AZTECA SURVIVAL
File: F:\LS\130HASUA.ABB Transform: NO TRANSFORM

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	AT8-203 (REF)	0.003	0.052	0.018	5.38
2	AT8-204	0.012	0.111	0.042	11.98

TN-98-130 ABB H.AZTECA SURVIVAL
File: F:\LS\130HASUA.ABB Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.200

W = 0.811

Critical W (P = 0.05) (n = 15) = 0.881
Critical W (P = 0.01) (n = 15) = 0.835

Data FAIL normality test. Try another transformation.

Warning - The F-test of homogeneity is sensitive to non-normal data and should not be performed.

TN-98-130 ABB H.AZTECA SURVIVAL
File: F:\LS\130HASUA.ABB Transform: ARC SINE(SQUARE ROOT(Y))

F-Test for equality of two variances

GROUP	IDENTIFICATION	VARIANCE	F
1	AT8-203 (REF)	0.007	
2	AT8-204	0.025	3.527

Critical F = 9.16 (P=0.01, 6, 7)

Since F <= Critical F, FAIL TO REJECT Ho: Equal Variances.

TN-98-130 ABB H.AZTECA SURVIVAL
File: F:\LS\130HASUA.ABB Transform: ARC SINE(SQUARE ROOT(Y))

WILCOXON'S RANK SUM TEST W/ BONFERRONI ADJUSTMENT - Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	REPS	SIG
1	AT8-203 (REF)	1.351				
2	AT8-204	1.305	53.00	41.00	7	

Critical values use k = 1, are 1 tailed, and alpha = 0.05

TITLE: TN-98-130 ABB H.AZTECA GROWTH
FILE: F:\LS\130HAGRO.ABB
TRANSFORM: NO TRANSFORM NUMBER OF GROUPS: 4

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	AT8-203 (REF)	1	0.1260	0.1260
1	AT8-203 (REF)	2	0.1130	0.1130
1	AT8-203 (REF)	3	0.1550	0.1550
1	AT8-203 (REF)	4	0.1050	0.1050
1	AT8-203 (REF)	5	0.0860	0.0860
1	AT8-203 (REF)	6	0.1240	0.1240
1	AT8-203 (REF)	7	0.0930	0.0930
1	AT8-203 (REF)	8	0.0960	0.0960
2	AT8-202	1	0.1540	0.1540
2	AT8-202	2	0.0880	0.0880
2	AT8-202	3	0.1110	0.1110
2	AT8-202	4	0.1110	0.1110
2	AT8-202	5	0.1130	0.1130
2	AT8-202	6	0.1220	0.1220
2	AT8-202	7	0.1140	0.1140
2	AT8-202	8	0.1480	0.1480
3	AT8-204	1	0.1800	0.1800
3	AT8-204	2	0.1070	0.1070
3	AT8-204	3	0.1360	0.1360
3	AT8-204	4	0.0980	0.0980
3	AT8-204	5	0.1000	0.1000
3	AT8-204	6	0.1340	0.1340
3	AT8-204	7	0.1110	0.1110
4	LAB CONTROL	1	0.0600	0.0600
4	LAB CONTROL	2	0.0710	0.0710
4	LAB CONTROL	3	0.1030	0.1030
4	LAB CONTROL	4	0.0710	0.0710
4	LAB CONTROL	5	0.0780	0.0780
4	LAB CONTROL	6	0.0890	0.0890
4	LAB CONTROL	7	0.0800	0.0800

TN-98-130 ABB H.AZTECA GROWTH
File: F:\LS\130HAGRO.ABB Transform: NO TRANSFORM

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	AT8-203 (REF)	8	0.086	0.155	0.112
2	AT8-202	8	0.088	0.154	0.120
3	AT8-204	7	0.098	0.180	0.124
4	LAB CONTROL	7	0.060	0.103	0.079

TN-98-130 ABB H.AZTECA GROWTH
File: F:\LS\130HAGRO.ABB Transform: NO TRANSFORM

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	AT8-203 (REF)	0.001	0.022	0.008	20.01
2	AT8-202	0.000	0.021	0.008	17.84
3	AT8-204	0.001	0.029	0.011	23.54
4	LAB CONTROL	0.000	0.014	0.005	17.68

ATTACHMENT IV

Chemical Analyses

LABORATORY DATA REPORT

Prepared for:

NAS Jacksonville

Prepared by:

EA Laboratories
19 Loveton Circle
Sparks, MD 21152

Report 980617

May 1998

TABLE OF CONTENT
Jacksonville
EA Laboratories Report 980617

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1. NARRATIVE

EA Laboratories
ANALYTICAL NARRATIVE

Client: **EA Eng., Sci., and Tech. Inc.**
Site: **NAS Jacksonville**
Project number: **70003.10**

EA Laboratories Report: **980617**
Laboratory Project Manager: **Mary E. Asper**
Report Date: **8 May 1998**

This report contains the results of the analysis of three soil samples collected on 17 April 1998 in support of the referenced project.

SAMPLE RECEIPT

The samples arrived intact by hand at EA Laboratories on 15 April 1998. Upon receipt, the samples were inspected and compared with the chain-of-custody record. The samples were then logged into the laboratory computer system with assigned laboratory accession numbers and released for analysis.

Client Sample Designation	EA Lab Number
44D00202	9804680
44D00302	9804681
44D00102	9804682

Following this narrative section are a glossary of data qualifiers (Table 1) and the original chain-of-custody record. Analytical results and quality control information are summarized in the appended data package which has been formatted to be consistent with the deliverable requirements of this project.

QUALITY CONTROL

The following sections are ordered as the data appears in this report. They contain observations made during sample analysis, summarize the results of quality control measurements, and address the impact on data usability based upon project Data Quality Objectives. For each fractional analysis the narrative includes:

- Sample chronology: This section summarizes the sample history by fraction including the sample preparation method and date, analytical method, and analysis date. Anything unusual about the samples, digestates, or extracts is identified. Holding time compliance is evaluated in this section.

- Laboratory method performance: All quality control criteria for method performance must be met for all target analytes for data to be reported. These criteria generally apply to instrument tune, calibration, method blanks, and Laboratory Control Samples (LCS). In some instances where method criteria fail, useable data can be obtained and are reported with client approval. The narrative will then include a thorough discussion of the impact on data quality.

EA Laboratories
ANALYTICAL NARRATIVE

Client: **EA Eng., Sci., and Tech. Inc.**
Site: **NAS Jacksonville**
Project number: **70003.10**

EA Laboratories Report: **980617**
Laboratory Project Manager: **Mary E. Asper**
Report Date: **8 May 1998**

- Sample performance: Quality control field samples are analyzed to determine any measurement bias due to the sample matrix based on evaluation of matrix spikes (MS), matrix spike duplicates (MSD), and laboratory duplicates (D). If acceptance criteria are not met, matrix interferences are confirmed either by reanalysis or by inspection of the LCS results to verify that laboratory method performance is in control. Data are reported with appropriate qualifiers or discussion.

METALS - WATER (EA9804680-EA9804682)

Sample Chronology: Three samples were prepared on 1 May 1998 (SW846 3050) and analyzed for total cadmium according to SW846 methods 6010 on 5 May 1998.

Laboratory Method Performance: All laboratory method performance criteria were met for the reported samples.

Sample Performance: All quality control criteria were met for the reported samples with the following exceptions:

The RPD of the cadmium (34.4%) duplicates is above the upper control limit (20%).

CERTIFICATION OF RESULTS

The Laboratory certifies that this report meets the project requirements for analytical data as stated in the Analytical Task Order (ATO) and the chain-of-custody. In addition, the Laboratory certifies that the data as reported meet the Data Quality Objectives for precision, accuracy, and completeness specified for this project or as stated in EA Laboratories Quality Assurance program for other than the conditions detailed above. It is recommended by the Laboratory that this analytical report should only be reproduced in its entirety. EA Laboratories is not responsible for any assumptions of data quality if partial packages are used to interpret data. Release of the data contained in this report has been authorized by the appropriate Laboratory Manager as verified by the following signature.

May 8, 1998
Mary E. Asper, Laboratory Project Manager

TABLE 1. LABORATORY ORGANIC ANALYSIS DATA QUALIFIERS [1]

Qualifiers other than those listed below may be required to properly define the results. If used, they are given an alphabetic designation not already specified in this table or in a project/program document. such as a Quality Assurance Project Plan or a contract Statement of Work. Each additional qualifier is fully described in the Analytical Narrative section of the laboratory report.

U Indicates a target compound was analyzed for but not detected. The sample Reporting Limit (RL) is corrected for dilution and, if a soil sample, for percent moisture, if reported on a dry weight basis.

J Indicates an estimated value. This qualifier is used under the following circumstances:

1) when estimating a concentration for tentatively identified compounds (TICs) in GC/MS analyses, where a 1:1 response is assumed,
2) when the mass spectral and retention time data indicate the presence of a compound that meets the volatile and semivolatile GC/MS identification criteria, and the result is less than the RL but greater than the method detection limit (MDL).

B This qualifier is used when the analyte is found in the associated method blank as well as in the sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action. For GC/MS analyses, this qualifier is used for a TIC, as well as, for a positively identified target compound.

E This qualifier identifies compounds whose concentrations exceed the calibration range of the instrument for that specific analysis.

D When applied, this qualifier identifies all compound concentrations reported from a secondary dilution analysis.

A This qualifier indicates that a TIC is a suspected aldol-condensation product.

N Indicates presumptive evidence of a compound. This qualifier is only used for GC/MS TICs, where the identification is based on a mass spectral library search. For generic characterization of a TIC, such as chlorinated hydrocarbon, the N qualifier is not used.

P When applied, this qualifier indicates a reported value from a GC analysis when there is greater than 25% difference for det cted concentrations between the two GC columns.

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(1) These Data Qualifiers are added by the laboratory to provide additional information for the reported results. ***They should not be confused with the qualifiers applied to the reported data as a result of a data validation process performed independently of the laboratory reporting procedure.***

2. CHAIN-OF-CUSTODY

Company Name:	Project Manager or Contact:
ABB - ES	Linda Hartzell
Project No. 700310.	Phone:
Dept.: Task:	Project Name: NAS Jacksonville
Sample Storage Location: B9	ATO Number: 4
Page of	Report #. 980617

Chain of Custody Record

EA Laboratories
19 Loveton Circle
Sparks, MD 21152
Telephone: (410) 771-4920
Fax: (410) 771-4407

Report Deliverables: 1 2 3 (4) (D) E

EDD: Yes/(No)

DUE TO CLIENT: 5-11-98

Date	Time	Water	Soil	Sample Identification 19 Characters	No. of Containers	CADMIUM by 6010	EA Labs Accession Number	Remarks
4/17/98	0840-0910		X	44D002702	1	X	980680	LPM: MARY ASPER
								Project Summary No.: EAL PS-0910
4/17/98	0930-1010		X	44D003002	1	X	980681	
4/17/98	1030-1100		X	44D003102	1	X	980682	
								SEND Report Next Door.
								L13702
								0000281

Sampled by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time
A. Reese	4/17/98 1400			R. Olzewski - Tox Lab	4/18/98 1102
Relinquished by: (Signature)	**Date/Time**	**Received by Laboratory: (Signature)**	**Date/Time**	**Airbill Number:**	**Sample Shipped by: (Circle)**
L. Hartzell - Tox Lab	4/17/98 1721		4/18/98 09:30		Fed Ex Puro. UPS Hand Carried Other:

Cooler Temp. N/AC pH: ☐ Yes ☑ No Comments: Custody Seals Intact ☑ Yes ☐ No

NOTE: Please indicate method number for analyses requested. This will help clarify any questions with laboratory techniques.

WHITE—EA Laboratories YELLOW—EA Laboratories PINK—Project Manager *Shaded Areas for Lab Use Only*

C2681

3. METALS DATA

A. Sample Data

EPA SW846

COVER PAGE - METALS ANALYSES DATA PACKAGE

Laboratory EA LABORATORIES

Client: ABB-ES
Project: NAS JACKSONVILLE

Lab Sample No.	Client ID.
T04680	44D00202
T04680D	44D00202D
T04680S	44D00202S
T04681	44D00302
T04682	44D00102

Comments:

NAS JACKSONVILLE

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package and in the computer-readable data submitted on floppy diskette has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature.

Signature: _____ Name: Phyllis Christopher

Date: 5/18/98 Title: QC Chemist

EPA SW846

FORM 1
METALS ANALYSIS DATA SHEET

LAB SAMPLE NUMBER: T04680

Laboratory: EA LABORATORIES

SDG No.: T04680

Matrix: SOIL Client ID: 44D00202

Percent Solids: 75.7 Date Received: 04/20/98

Results for: TOTAL CADMIUM metals

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-43-9	Cadmium	1.6		*	P

M = "P" ICP SW6010
M = "F" Graphite Furnace AA As by SW7060, Pb by SW7421, Se by SW7740, Tl by SW7841, Sb by 7041
M = "CV" Cold Vapor AA - waters by SW7470, soils by SW7471

EPA SW846

FORM 1
METALS ANALYSIS DATA SHEET

LAB SAMPLE NUMBER: T04681

Laboratory: EA LABORATORIES

SDG No.: T04680

Matrix: SOIL Client ID: 44D00302

Percent Solids: 76.9 Date Received: 04/20/98

Results for: TOTAL CADMIUM metals

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-43-9	Cadmium	0.31	B	*	P

M = "P" ICP SW6010
M = "F" Graphite Furnace AA As by SW7060, Pb by SW7421, Se by SW7740, Tl by SW7841, Sb by 7041
M = "CV" Cold Vapor AA - waters by SW7470, soils by SW7471

EPA SW846

FORM 1
METALS ANALYSIS DATA SHEET

LAB SAMPLE NUMBER T04682

Laboratory: EA LABORATORIES

SDG No.: T04680

Matrix: SOIL Client ID: 44D00102

Percent Solids: 76.2 Date Received: 04/20/98

Results for: TOTAL CADMIUM metals

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-43-9	Cadmium	0.22	B	*	P

M = "P" ICP SW6010
M = "F" Graphite Furnace AA As by SW7060, Pb by SW7421, Se by SW7740, Tl by SW7841, Sb by 7041
M = "CV" Cold Vapor AA - waters by SW7470, soils by SW7471

B. QC Summary

EPA SW846

FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

Laboratory: EA LABORATORIES

SDG No.:T04680

Initial Calibration Source: IV RICCA

Continuing Calibration Source: IV RICCA

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					M
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Cadmium	250.0	249.41	99.8	250.0	248.53	99.4	250.25	100.1	P

EPA SW846

FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

Laboratory: EA LABORATORIES

SDG No.:T04680

Initial Calibration Source: IV RICCA

Continuing Calibration Source: IV RICCA

Concentration Units: ug/L

Analyte	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(1)	Found	%R(1)	M
Cadmium				250.0	252.92	101.2	254.30	101.7	P

EPA SW846

FORM 2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

Laboratory: EA LABORATORIES

SDG No.:T04680

Initial Calibration Source: IV RICCA

Continuing Calibration Source: IV RICCA

Concentration Units: ug/L

Analyte	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(1)	Found	%R(1)	M
Cadmium				250.0	252.05	100.8			P

EPA SW846

FORM 3
BLANKS

Laboratory: EA LABORATORIES

SDG No.: T04680

Preparation Blank Matrix (soil/water): SOIL

Preparation Blank Concentration Units (ug/L or mg/kg): MG/KG

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Cadmium	0.6	U	0.6	U	0.6	U	0.6	U	0.060	U	P

EPA SW846

FORM 3
BLANKS

Laboratory: EA LABORATORIES

SDG No.: T04680

Preparation Blank Matrix (soil/water): SOIL

Preparation Blank Concentration Units (ug/L or mg/kg): MG/KG

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Cadmium			0.6	U	0.6	U					P

EPA SW846

FORM 4
ICP INTERFERENCE CHECK SAMPLE

Laboratory: EA LABORATORIES

SDG No.: T04680

ICP ID Number: 7P ICS Source: IV

Concentration Units: ug/L

Analyte	True Sol. A	True Sol. AB	Initial Found Sol. A	Initial Found Sol. AB	Initial Found %R	Final Found Sol. A	Final Found Sol. AB	Final Found %R
Cadmium	0	500	-2	421.7	84.3	-1	436.0	87.2

EPA SW846

FORM 5
SPIKE SAMPLE RECOVERY

LAB SAMPLE NUMBER: T04680S

Laboratory: EA LABORATORIES

SDG No.: T04680

Matrix (soil/water): SOIL
% Solids for Sample: 75.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Cadmium	75-125	7.2460		1.5742		6.26	90.6		P

Comments:

EPA SW846

FORM 6
DUPLICATES

LAB SAMPLE NUMBER T04680D

Laboratory: EA LABORATORIES

SDG No.: T04680

Matrix (soil/water): SOIL

% Solids for Sample: 75.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Cadmium	0.6	1.5742		2.2284		34.4	*	P

EPA SW846

FORM 7
LABORATORY CONTROL SAMPLE

Laboratory: EA LABORATORIES

SDG No.: T04680

Solid LCS Source: ERA Lot 233

Aqueous LCS Source: IV

Analyte	Aqueous (ug/L) True	Found	%R	Solid (mg/kg) True	Found	C	Limits		%R
Cadmium				114.0	91.4		68.6	159.0	80.2

EPA SW846

FORM 9
ICP SERIAL DILUTIONS

LAB SAMPLE NUMBER T04682L

Laboratory: EA LABORATORIES

SDG No.: T04680

Matrix (soil/water): SOIL

Concentration Units: ug/L

Analyte	Initial Sample Result (I)	C	Serial Dilution Result (S)	C	% Difference	Q	M
Cadmium	1.79	B	3.00	U	100.0		P

EPA SW846

FORM 10
METHOD DETECTION LIMITS

Laboratory: EA LABORATORIES

SDG No.: T04680

ICP ID Number: 7P Date: 07/11/97

Furnace AA ID Number:

Analyte	Wave-length (nm)	Back-ground	Reporting Limit (ug/L)	MDL (ug/L)	M
Cadmium	226.50		5.0	0.6	P

Comments:

EPA SW846

FROM 11A
ICP INTERELEMENT CORRECTION FACTORS (Annually)

Laboratory: EA LABORATORIES

SDG No.: T04680

ICP ID Number: 4P Date: 07/22/96

Analyte	Wave-length (nm)	Interelement Correction Factors for: Al	Ca	Fe	Mg	
Aluminum	308.22	1.0000000	0.0000000	-0.0040644	0.0001044	
Antimony	206.83	0.0000000	0.0000000	0.0000264	0.0000000	
Arsenic	189.98	0.0000000	0.0000000	0.0000000	0.0000000	
Barium	455.40	0.0000000	0.0000000	0.0000000	0.0000000	
Beryllium	313.04	0.0000000	0.0000000	0.0000000	0.0000000	
Cadmium	214.44	-0.0000039	10.0000000	0.0000847	0.0000000	
Calcium	317.93	-0.0000643	1.0000000	-0.0003590	-0.0000590	
Chromium	267.72	0.0000000	0.0000000	0.0000145	0.0000000	
Cobalt	228.62	0.0000000	0.0000000	0.0000741	0.0000000	
Copper	324.75	0.0000000	0.0000000	0.0000172	0.0000000	
Iron	259.94	0.0000000	0.0000299	1.0000000	0.0000122	
Lead	220.35	-0.0001766	-0.0000102	0.0001413	0.0000000	
Magnesium	279.55	0.0000000	0.0000000	0.0000297	1.0000000	
Manganese	257.61	0.0000000	0.0000000	0.0000031	0.0000114	
Mercury						
Nickel	231.60	0.0000000	0.0000000	0.0000023	0.0000000	
Potassium	766.49	0.0000000	0.0000000	0.0000000	0.0002721	
Selenium	196.03	-0.0000739	-0.0000630	0.0000000	0.0000000	
Silver	328.07	0.0000000	0.0000000	0.0000000	0.0000000	
Sodium	589.00	0.0000000	-0.0002161	-0.0002148	-0.0001237	
Thallium	190.80	0.0000000	0.0000000	0.0005080	0.0000000	
Vanadium	292.40	0.0000000	0.0000000	0.0000000	0.0000000	
Zinc	213.86	0.0000000	0.0000000	0.0000766	0.0000940	

Comments:

EPA SW846

FROM 11A
ICP INTERELEMENT CORRECTION FACTORS (Annually)

Laboratory: EA LABORATORIES

SDG No.: T04680

ICP ID Number: 5P Date: 07/22/96

Analyte	Wave-length (nm)	Interelement Correction Factors for: Al	Ca	Fe	Mg	
Aluminum	396.15	1.0000000	0.0007339	0.0000000	0.0000000	
Antimony	206.83	0.0002009	0.0000000	0.0004064	0.0000000	
Arsenic	193.70	0.1728820	0.0000985	0.0017849	0.0002449	
Barium	233.53	0.0000000	0.0000000	0.0001768	0.0000000	
Beryllium	313.04	0.0000000	0.0000000	0.0000000	0.0000000	
Cadmium	226.50	0.0000085	0.0000000	0.0002273	0.0000000	
Calcium	317.93	0.0000000	1.0000000	0.0001666	0.0000000	
Chromium	267.72	0.0000000	0.0000000	0.0000175	0.0000071	
Cobalt	228.62	0.0000000	0.0000000	0.0000832	0.0000000	
Copper	324.75	0.0000000	0.0000000	0.0000508	0.0000000	
Iron	259.94	0.0000000	0.0000000	0.9751200	0.0000000	
Lead	220.35	0.0003837	0.0000000	0.0000000	0.0000000	
Magnesium	279.08	0.0000000	0.0000000	0.0023530	1.0000000	
Manganese	257.61	0.0000000	0.0000000	0.0001029	0.0000131	
Mercury						
Nickel	231.60	0.0000000	0.0000000	0.0000533	0.0000000	
Potassium						
Selenium	196.03	0.0039390	0.0001205	0.0072656	0.0003362	
Silver	328.07	0.0000000	0.0000226	-0.0000229	0.0000000	
Sodium	589.59	0.0000000	0.0000000	0.0000000	0.0000000	
Thallium	190.80	0.0022766	0.0001289	0.0018188	0.0001762	
Vanadium	292.40	0.0000000	0.0000000	-0.0000297	0.0000000	
Zinc	213.86	0.0000000	0.0000000	0.0001086	0.0000507	

Comments:

EPA SW846

FROM 11A
ICP INTERELEMENT CORRECTION FACTORS (Annually)

Laboratory: EA LABORATORIES

SDG No.: T04680

ICP ID Number: 7PA Date: 03/13/97

Analyte	Wave-length (nm)	Interelement Correction Factors for: Al	Ca	Fe	Mg	MN
Aluminum						
Antimony	206.83	-0.0000100	-0.0000065	-0.0000100	0.0000000	
Arsenic	189.04	0.0000030	0.0000000	-0.0000400	0.0000000	
Barium						
Beryllium						
Cadmium	226.50	0.0000000	0.0000000	0.0000800		0.0004700
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead	220.35	0.0004500	-0.0000027	0.0000600	0.0000000	
Magnesium						
Manganese						
Mercury						
Nickel						
Potassium						
Selenium	196.02	0.0000700	0.0000000	-0.0000020	0.0000000	0.0005000
Silver						
Sodium						
Thallium						
Vanadium						
Zinc						

Comments:

EPA SW846

FROM 11A
ICP INTERELEMENT CORRECTION FACTORS (Annually)

Laboratory: EA LABORATORIES

SDG No.: T04680

ICP ID Number: 7PB Date: 03/13/97

Analyte	Wave-length (nm)	Interelement Correction Factors for: Al	Ca	Fe	Mg	MN
Aluminum						
Antimony	206.80	0.0000150	0.0000000	0.0000258	-0.0000077	
Arsenic						
Barium						
Beryllium						
Cadmium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead	220.35	-0.0003000	0.0000600	0.0000300	0.0000000	-0.0000300
Magnesium						
Manganese						
Mercury						
Nickel						
Potassium						
Selenium	196.02	0.0000025	0.0000000	-0.0002550	0.0000000	0.0002391
Silver						
Sodium						
Thallium						
Vanadium						
Zinc						

Comments:

EPA SW846

FORM 11B
ICP INTERELEMENT CORRECTION FACTORS (Annually)

Laboratory: EA LABORATORIES

SDG No.: T04680

ICP ID Number: 7PA Date: 03/13/97

Analyte	Wave-length (nm)	Interelement Correction Factors for: V				
Aluminum						
Antimony	206.83	-0.0110000				
Arsenic						
Barium						
Beryllium						
Cadmium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Magnesium						
Manganese						
Mercury						
Nickel						
Potassium						
Selenium	196.02	0.0001985				
Silver						
Sodium						
Thallium						
Vanadium						
Zinc						

Comments:

EPA SW846

FORM 11B
ICP INTERELEMENT CORRECTION FACTORS (Annually)

Laboratory: EA LABORATORIES

SDG No.: T04680

ICP ID Number: 7PB Date: 03/13/97

Analyte	Wave-length (nm)	Interelement Correction Factors for: V				
Aluminum						
Antimony						
Arsenic						
Barium						
Beryllium						
Cadmium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead	220.35	-0.0003248				
Magnesium						
Manganese						
Mercury						
Nickel						
Potassium						
Selenium						
Silver						
Sodium						
Thallium						
Vanadium						
Zinc						

Comments:

EPA SW846

FORM 12
ICP LINEAR RANGES

Laboratory: EA LABORATORIES

SDG No.: T04680

ICP ID Number: 4P Date: 02/25/97

Analyte	Integ. Time (Sec.)	Concentration (ug/L)	M
Aluminum	0.50	100000.0	P
Antimony	0.50	50000.0	P
Arsenic	0.50	20000.0	P
Barium	0.50	60000.0	P
Beryllium	0.50	2500.0	P
Cadmium	0.50	15000.0	P
Calcium	0.50	250000.0	P
Chromium	0.50	6000.0	P
Cobalt	0.50	15000.0	P
Copper	0.50	12500.0	P
Iron	0.50	30000.0	P
Lead	0.50	30000.0	P
Magnesium	0.50	50000.0	P
Manganese	0.50	25000.0	P
Mercury			
Nickel	0.50	15000.0	P
Potassium	0.50	250000.0	P
Selenium	0.50	10000.0	P
Silver	0.50	2500.0	P
Sodium	0.50	250000.0	P
Thallium	0.50	30000.0	P
Vanadium	0.50	15000.0	P
Zinc	0.50	25000.0	P

Comments:

EPA SW846

FORM 12
ICP LINEAR RANGES

Laboratory: EA LABORATORIES

SDG No.: T04680

ICP ID Number: 5P Date: 02/18/97

Analyte	Integ. Time (Sec.)	Concentration (ug/L)	M
Aluminum	10.00	100000.0	P
Antimony	10.00	10000.0	P
Arsenic	10.00	10000.0	P
Barium	10.00	20000.0	P
Beryllium	10.00	500.0	P
Cadmium	10.00	5000.0	P
Calcium	10.00	125000.0	P
Chromium	10.00	2000.0	P
Cobalt	10.00	12500.0	P
Copper	10.00	2500.0	P
Iron	10.00	10000.0	P
Lead	10.00	10000.0	P
Magnesium	10.00	250000.0	P
Manganese	10.00	5000.0	P
Mercury			
Nickel	10.00	5000.0	P
Potassium	10.00	50000.0	P
Selenium	10.00	30000.0	P
Silver	10.00	2500.0	P
Sodium	10.00		P
Thallium	10.00	10000.0	P
Vanadium	10.00	5000.0	P
Zinc	10.00	12500.0	P

Comments:

EPA SW846

FORM 12
ICP LINEAR RANGES

Laboratory: EA LABORATORIES

SDG No.: T04680

ICP ID Number: 7P Date: 05/01/97

Analyte	Integ. Time (Sec.)	Concentration (ug/L)	M
Aluminum			
Antimony	10.00	20000.0	P
Arsenic	10.00	20000.0	P
Barium	10.00	2000.0	P
Beryllium			
Cadmium	10.00	1000.0	P
Calcium			
Chromium	10.00	4000.0	P
Cobalt			
Copper	10.00	5000.0	P
Iron			
Lead	10.00	8000.0	P
Magnesium			
Manganese			
Mercury			
Nickel	10.00	1000.0	P
Potassium	10.00	50000.0	P
Selenium	10.00	20000.0	P
Silver	10.00	1000.0	P
Sodium	10.00	50000.0	P
Thallium	10.00	10000.0	P
Vanadium			
Zinc			

Comments:

EPA SW846

FORM 13
Preparation Log

Laboratory: EA LABORATORIES

SDG No.: T04680

Method: P

LAB Sample No.	Preparation Date	Weight (gram)	Volume (ml)
LCSS	05/01/98	1.05	100
PBS	05/01/98	1.00	100
T04680	05/01/98	1.03	100
T04680D	05/01/98	1.01	100
T04680S	05/01/98	1.06	100
T04680SD	05/01/98	1.03	100
T04681	05/01/98	1.09	100
T04682	05/01/98	1.04	100

EPA SW846

FORM 14
Analysis Run Log

Lab Name: EA LABORATORIES
SDG No.: T04680
Instrument ID Number: 7P
Method: P
Start Date: 05/05/98
End Date: 05/05/98

Sample No.	D/F	Time	%R	Analytes																										
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
S0	1.00	1211		-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S20	1.00	1214		-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S100	1.00	1216		-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S1000	1.00	1219		-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CKS	1.00	1225		-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ICV	1.00	1228		-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ICB	1.00	1230		-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IEC1	1.00	1233		-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IEC2	1.00	1236		-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ICSAI	1.00	1239		-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ICSABI	1.00	1241		-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CCV1	1.00	1244		-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CCB1	1.00	1246		-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ZZZZZZ	1.00	1249		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ZZZZZZ	1.00	1252		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ZZZZZZ	1.00	1254		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ZZZZZZ	1.00	1257		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ZZZZZZ	1.00	1300		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ZZZZZZ	1.00	1302		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ZZZZZZ	1.00	1305		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ZZZZZZ	1.00	1308		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ZZZZZZ	1.00	1310		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CCV2	1.00	1313		-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CCB2	1.00	1316		-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ZZZZZZ	1.00	1318		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ZZZZZZ	1.00	1321		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ZZZZZZ	1.00	1324		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ZZZZZZ	1.00	1326		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ZZZZZZ	1.00	1329		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ZZZZZZ	1.00	1332		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ZZZZZZ	1.00	1334		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ZZZZZZ	1.00	1337		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

EPA SW846

FORM 14
Analysis Run Log

Lab Name: EA LABORATORIES
SDG No.: T04680
Instrument ID Number: 7P
Method: P
Start Date: 05/05/98
End Date: 05/05/98

Sample No.	D/F	Time	%R	Analytes																										
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
PBS	1.00	1340							X																	
ZZZZZZ	1.00	1343																								
CCV3	1.00	1345							X																	
CCB3	1.00	1348							X																	
LCSS	1.00	1350							X																	
T04680	1.00	1353							X																	
T04680D	1.00	1356							X																	
T04680S	1.00	1359							X																	
T04680SD	1.00	1401							X																	
T04680A	1.00	1404							X																	
T04681	1.00	1407							X																	
T04682	1.00	1409							X																	
T04682L	5.00	1412							X																	
CCV4	1.00	1415							X																	
CCB4	1.00	1417							X																	
IEC1	1.00	1420							X																	
IEC2	1.00	1423							X																	
ICSAF	1.00	1426							X																	
ICSABF	1.00	1428							X																	
CCV5	1.00	1431							X																	
CCB5	1.00	1443							X																	

C. QC Raw Data

Method: 3PBCD Standard: STD1-BLANK
Run Time: 05/05/98 12:11:24

Elem	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576	V_2924
Avge	2.5079	-.13399	5.554	6.727	4.252	1.061	.9430
SDev	.2178	.14707	.001	.008	.015	.001	.0000
%RSD	8.6838	109.76	.0255	.1261	.3492	.0666	.0000
#1	2.6619	-.23799	5.555	6.721	4.263	1.062	.9430
#2	2.3539	-.03000	5.553	6.733	4.242	1.061	.9430

Elem	Ca3179	Cd2265
Avge	.3965	.03150
SDev	.0021	.00778
%RSD	.5350	24.693
#1	.3950	.02600
#2	.3980	.03700

7P2875 T04099
SAW T05113
TRACE ICP-7P T04680

(CKS) STD HIGH: M04433
STD 1: M04434
STD 2: M04435
(ICV\CCV) MQC: M04438

Method: 3PBCD Standard: 20PPB
Run Time: 05/05/98 12:14:13

Elem	2203/1	Cd2265
Avge	12.156	4.2113
SDev	.250	.0233
%RSD	2.0533	.55406
#1	12.332	4.1948
#2	11.979	4.2278

Method: 3PBCD Standard: 100PPB
Run Time: 05/05/98 12:16:51

Elem	2203/1	Cd2265
Avge	52.782	21.213
SDev	.893	.046
%RSD	1.6919	.21665
#1	53.413	21.181
#2	52.150	21.246

Method: 3PBCD Standard: 1000PPB
Run Time: 05/05/98 12:19:38

Elem	2203/1	2203/2	Cd2265
Avge	515.52	316.32	215.33
SDev	.30	.88	.66
%RSD	.05788	.27919	.30703
#1	515.73	315.70	214.86
#2	515.31	316.95	215.79

Method: 3PBCD Standard: STDICSA
Run Time: 05/05/98 12:22:15

Elem	Mg2790	Al3082	Fe2714	Ca3179
Avge	3535.	2916.	442.6	778.2
SDev	9.	1.	.6	.2
%RSD	.2440	.0358	.1291	.0260
#1	3529.	2916.	442.2	778.0
#2	3541.	2917.	443.0	778.3

Method: 3PBCD Standard: STDMNV
Run Time: 05/05/98 12:23:53

Elem	Mn2576	V_2924
Avge	797.8	112.0
SDev	1.0	.1
%RSD	.1294	.1332
#1	797.0	111.9
#2	798.5	112.1

Method: 3PBCD Slope = Conc(SIR)/IR

Element	Wavelen	High std	Low std	Slope	Y-intercept	Date Standardized
Pb2203	220.353	NONE	NONE	.000000	.000000	*NOT STANDARDIZED
2203/1	220.351	Multiple	Standards	2.00221	-5.01491	05/05/98 12:19:38
2203/2	220.352	1000PPB	STD1-BLANK	3.16001	.423420	05/05/98 12:23:53
Mg2790	279.078	STDICSA	STD1-BLANK	.141662	-.786750	05/05/98 12:23:53
Al3082	308.215	STDICSA	STD1-BLANK	.171840	-1.15591	05/05/98 12:23:53
Fe2714	271.441	STDICSA	STD1-BLANK	.456278	-1.94022	05/05/98 12:23:53
Mn2576	257.610	STDMNV	STD1-BLANK	.012552	-.013323	05/05/98 12:23:53
V_2924	292.402	STDMNV	STD1-BLANK	.090031	-.084895	05/05/98 12:23:53
Ca3179	317.933	STDICSA	STD1-BLANK	.642854	-.254879	05/05/98 12:23:53
Cd2265	226.502	Multiple	Standards	4.71594	-.145709	05/05/98 12:19:38

Method: 3PBCD Sample Name: CKS Operator:
Run Time: 05/05/98 12:25:31
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	994.73	1029.8	977.23	.0159	.0228	.0110	.0027
SDev	20.43	1.8	31.53	.0192	.0244	.0113	.0015
%RSD	2.0534	.17736	3.2270	121.2	107.3	103.1	54.57
#1	980.28	1031.1	954.93	.0295	.0400	.0189	.0037
#2	1009.2	1028.5	999.53	.0023	.0055	.0030	.0016

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.0054	-.0016	1012.7
SDev	.0024	.0209	1.2
%RSD	43.24	1301.	.11668
#1	.0071	.0132	1011.9
#2	.0038	-.0164	1013.6

Method: 3PBCD Sample Name: CCV Operator:
Run Time: 05/05/98 12:28:18
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	495.82	505.48	491.00	2.624	1.055	.6260	.2432
SDev	.68	.03	1.00	.007	.005	.0074	.0004
%RSD	.13614	.00636	.20285	.2787	.4377	1.185	.1679
#1	495.34	505.46	490.29	2.619	1.052	.6207	.2429
#2	496.30	505.51	491.70	2.629	1.058	.6312	.2435

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.2482	2.780	249.41
SDev	.0007	.004	.51
%RSD	.2822	.1472	.20433
#1	.2477	2.777	249.05
#2	.2487	2.782	249.77

Method: 3PBCD Sample Name: Blank Operator:
Run Time: 05/05/98 12:30:55
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	-.48713	-2.9281	.73153	-.0302	-.0313	-.0244	-.0006
SDev	.33057	.0952	.54313	.0006	.0005	.0006	.0000
%RSD	67.861	3.2510	74.246	1.992	1.554	2.643	.0000
#1	-.25338	-2.9954	1.1156	-.0306	-.0309	-.0240	-.0006
#2	-.72088	-2.8608	.34748	-.0297	-.0316	-.0249	-.0006

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.0016	-.0521	.04912
SDev	.0000	.0005	.05999
%RSD	.0000	.8730	122.12
#1	.0016	-.0517	.09154
#2	.0016	-.0524	.00671

Method: 3PBCD Sample Name: IEC1 Operator:
Run Time: 05/05/98 12:33:32
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	-.78241	-18.975	8.3003	245.3	247.2	100.4	.0086
SDev	.30685	.968	.0234	.2	.2	.1	.0000
%RSD	39.218	5.1033	.28208	.0857	.0624	.0646	.0000
#1	-.99939	-19.660	8.3168	245.2	247.1	100.4	.0086
#2	-.56544	-18.290	8.2837	245.5	247.3	100.5	.0086

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.0068	251.2	-1.1888
SDev	.0001	.0	.0601
%RSD	.9365	.0072	5.0565
#1	.0068	251.2	-1.2313
#2	.0068	251.2	-1.1463

Method: 3PBCD Sample Name: IEC2 Operator:
Run Time: 05/05/98 12:36:19
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	-.93219	-3.6958	.44753	.0203	.1549	.1013	4.821
SDev	.64663	2.0007	1.9683	.0092	.0118	.0106	.018
%RSD	69.366	54.135	439.82	45.49	7.608	10.51	.3746
#1	-1.3894	-2.2811	-.94427	.0268	.1632	.1088	4.834
#2	-.47496	-5.1105	1.8393	.0137	.1466	.0938	4.808

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	4.750	-.0029	-2.4095
SDev	.019	.0118	.0257
%RSD	.3940	408.6	1.0663
#1	4.764	.0055	-2.4277
#2	4.737	-.0112	-2.3913

Method: 3PBCD Sample Name: ICSA Operator:
Run Time: 05/05/98 12:39:06
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	-.91560	-34.953	16.077	473.9	476.8	189.4	.0185
SDev	.39115	1.225	.025	.8	.2	.2	.0002
%RSD	42.721	3.5034	.15489	.1644	.0428	.0806	.8614
#1	-.63902	-34.087	16.060	473.4	476.7	189.3	.0187
#2	-1.1922	-35.818	16.095	474.5	477.0	189.5	.0184

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.0140	468.5	-1.5755
SDev	.0000	.2	.0958
%RSD	.0000	.0337	6.0815
#1	.0140	468.4	-1.6433
#2	.0140	468.6	-1.5078

Method: 3PBCD Sample Name: ICSAB Operator:
Run Time: 05/05/98 12:41:44
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	427.67	402.43	440.27	481.0	482.3	190.7	.0177
SDev	2.23	.55	3.07	1.1	.7	.4	.0001
%RSD	.52132	.13709	.69666	.2242	.1475	.1871	.5027
#1	426.09	402.04	438.10	480.2	481.8	190.5	.0176
#2	429.24	402.82	442.44	481.8	482.8	191.0	.0177

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.0130	470.2	421.70
SDev	.0001	.7	1.20
%RSD	.4893	.1441	.28359
#1	.0130	469.7	420.85
#2	.0131	470.6	422.54

Method: 3PBCD Sample Name: CCV Operator:
Run Time: 05/05/98 12:44:22
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	494.97	503.92	490.51	2.667	1.090	.6506	.2421
SDev	.59	1.02	.37	.030	.027	.0145	.0003
%RSD	.11842	.20200	.07555	1.130	2.451	2.231	.1393
#1	495.39	504.64	490.77	2.688	1.109	.6609	.2423
#2	494.56	503.20	490.24	2.646	1.072	.6404	.2418

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.2474	2.772	248.53
SDev	.0006	.030	.33
%RSD	.2315	1.098	.13113
#1	.2478	2.794	248.76
#2	.2470	2.751	248.30

Method: 3PBCD Sample Name: Blank Operator:
Run Time: 05/05/98 12:46:59
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	-.60896	-.38325	-.72165	-.0203	-.0259	-.0137	-.0004
SDev	.37419	.99728	.06311	.0002	.0012	.0016	.0000
%RSD	61.447	260.22	8.7456	.9889	4.683	11.78	.0000
#1	-.34437	.32193	-.67702	-.0201	-.0251	-.0148	-.0004
#2	-.87356	-1.0884	-.76628	-.0204	-.0268	-.0125	-.0004

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.0023	-.0456	.02491
SDev	.0001	.0005	.05343
%RSD	2.773	.9959	214.46
#1	.0023	-.0453	.06270
#2	.0023	-.0460	-.01287

Method: 3PBCD Sample Name: T04099 2X Operator:
Run Time: 05/05/98 12:49:37
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	2873.9	2954.2	2833.7	22.27	26.56	1008.	14.09
SDev	10.0	5.1	17.6	.02	.02	.	.01
%RSD	.34908	.17432	.62149	.1075	.0823	.0101	.0975
#1	2866.8	2957.9	2821.3	22.26	26.55	1008.	14.08
#2	2881.0	2950.6	2846.2	22.29	26.58	1008.	14.09

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.2966	70.58	-14.152
SDev	.0006	.10	.078
%RSD	.1932	.1423	.55299
#1	.2962	70.51	-14.097
#2	.2970	70.65	-14.207

Method: 3PBCD Sample Name: T04099D 2X Operator:
Run Time: 05/05/98 12:52:15
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	2272.0	2339.2	2238.4	24.70	22.83	912.8	17.27
SDev	11.9	9.6	13.0	.11	.10	3.2	.06
%RSD	.52219	.41154	.57992	.4282	.4220	.3538	.3758
#1	2263.6	2332.4	2229.3	24.63	22.77	910.5	17.22
#2	2280.4	2346.0	2247.6	24.78	22.90	915.1	17.31

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.3488	89.16	-14.743
SDev	.0016	.36	.061
%RSD	.4563	.4089	.41672
#1	.3477	88.90	-14.786
#2	.3499	89.41	-14.699

Method: 3PBCD Sample Name: T04099S 2X Operator:
Run Time: 05/05/98 12:54:54
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	3092.0	3183.3	3046.3	41.40	28.94	960.4	24.34
SDev	11.8	4.8	15.4	.15	.11	3.0	.08
%RSD	.38321	.15105	.50433	.3549	.3770	.3170	.3161
#1	3083.6	3179.9	3035.5	41.30	28.87	958.2	24.28
#2	3100.3	3186.7	3057.2	41.50	29.02	962.5	24.39

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.7392	123.4	3.7181
SDev	.0025	.4	.2751
%RSD	.3359	.3624	7.3997
#1	.7374	123.1	3.5235
#2	.7409	123.7	3.9126

Method: 3PBCD Sample Name: T04099SD 2X Operator:
Run Time: 05/05/98 12:57:33
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	2541.5	2616.3	2504.2	51.33	31.94	971.8	18.51
SDev	10.8	6.4	12.9	.18	.15	2.7	.05
%RSD	.42350	.24496	.51662	.3536	.4717	.2730	.2525
#1	2533.9	2611.7	2495.0	51.20	31.83	969.9	18.47
#2	2549.1	2620.8	2513.3	51.46	32.04	973.7	18.54

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.6148	140.1	5.7120
SDev	.0020	.4	.0955
%RSD	.3210	.3210	1.6716
#1	.6134	139.7	5.6445
#2	.6162	140.4	5.7795

Method: 3PBCD Sample Name: T04104 2X Operator:
Run Time: 05/05/98 13:00:12
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	109.28	114.40	106.72	15.44	45.76	245.9	4.692
SDev	.26	.45	.62	.07	.31	.9	.017
%RSD	.24175	.39239	.58111	.4651	.6744	.3724	.3647
#1	109.09	114.71	106.29	15.39	45.54	245.3	4.680
#2	109.47	114.08	107.16	15.49	45.98	246.6	4.704

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.1255	13.53	-4.9413
SDev	.0007	.05	.0895
%RSD	.5582	.3930	1.8122
#1	.1250	13.49	-5.0046
#2	.1259	13.57	-4.8780

Method: 3PBCD Sample Name: T04108 5X Operator:
Run Time: 05/05/98 13:02:51
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	159.45	167.10	155.63	43.86	21.52	243.7	22.25
SDev	.17	.21	.15	.00	.01	.1	.01
%RSD	.10700	.12635	.09663	.0025	.0559	.0339	.0271
#1	159.57	167.25	155.73	43.86	21.51	243.6	22.25
#2	159.33	166.95	155.52	43.86	21.53	243.8	22.26

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.6103	227.2	-13.360
SDev	.0002	.1	.017
%RSD	.0313	.0396	.12702
#1	.6105	227.2	-13.348
#2	.6102	227.1	-13.372

Method: 3PBCD Sample Name: PB0682 Operator:
Run Time: 05/05/98 13:05:31
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	.73518	-.70121	1.4523	-.0666	-.0657	-.0331	.0016
SDev	.82813	.78824	1.6351	.0031	.0021	.0181	.0015
%RSD	112.64	112.41	112.59	4.659	3.143	54.62	91.15
#1	.14960	-.14384	.29610	-.0645	-.0643	-.0203	.0026
#2	1.3208	-1.2586	2.6085	-.0688	-.0672	-.0459	.0006

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.0010	-.0566	-.03871
SDev	.0001	.0141	.07162
%RSD	12.86	24.91	185.02
#1	.0011	-.0466	-.08935
#2	.0009	-.0665	.01193

Method: 3PBCD Sample Name: LCSW0682 Operator:
Run Time: 05/05/98 13:08:11
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	479.55	490.01	474.34	10.14	1.991	1.211	.4713
SDev	2.47	1.25	3.08	.05	.018	.006	.0021
%RSD	.51551	.25603	.64933	.4533	.9215	.5060	.4519
#1	477.81	489.12	472.16	10.11	1.978	1.207	.4698
#2	481.30	490.90	476.51	10.17	2.004	1.216	.4728

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.4840	10.46	47.863
SDev	.0019	.04	.275
%RSD	.3814	.4083	.57550
#1	.4827	10.43	47.669
#2	.4853	10.49	48.058

Method: 3PBCD Sample Name: T05113 Operator:
Run Time: 05/05/98 13:10:50
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	16.118	16.621	15.866	13.14	10.00	20.19	.3982
SDev	.282	1.693	1.269	.02	.01	.01	.0002
%RSD	1.7512	10.187	7.9951	.1212	.0838	.0511	.0490
#1	15.918	17.819	14.969	13.13	9.995	20.19	.3981
#2	16.317	15.424	16.763	13.15	10.01	20.20	.3984

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.0173	72.45	-.39948
SDev	.0001	.07	.00606
%RSD	.3673	.1023	1.5172
#1	.0173	72.40	-.40377
#2	.0174	72.50	-.39520

Method: 3PBCD Sample Name: CCV Operator:
Run Time: 05/05/98 13:13:29
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	498.98	506.97	494.99	2.763	1.164	.7063	.2440
SDev	.22	.62	.01	.003	.000	.0048	.0001
%RSD	.04323	.12262	.00264	.0979	.0313	.6852	.0327
#1	499.13	507.41	495.00	2.761	1.164	.7097	.2441
#2	498.82	506.53	494.98	2.765	1.164	.7029	.2440

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.2504	2.868	250.25
SDev	.0001	.005	.32
%RSD	.0254	.1902	.12780
#1	.2505	2.864	250.48
#2	.2504	2.872	250.03

Method: 3PBCD Sample Name: Blank Operator:
Run Time: 05/05/98 13:16:06
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	-.33353	-1.6555	.32646	.0053	-.0002	.0087	-.0002
SDev	.15783	1.2946	.88296	.0011	.0010	.0003	.0001
%RSD	47.321	78.202	270.46	20.74	565.7	3.723	45.46
#1	-.44513	-.74005	-.29789	.0061	-.0009	.0084	-.0001
#2	-.22193	-2.5709	.95081	.0045	.0005	.0089	-.0002

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.0032	-.0251	.07086
SDev	.0001	.0005	.03999
%RSD	4.041	1.813	56.437
#1	.0032	-.0254	.09914
#2	.0031	-.0247	.04258

Method: 3PBCD Sample Name: T05113D Operator:
Run Time: 05/05/98 13:18:45
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	14.938	17.534	13.642	12.88	7.947	19.20	.3936
SDev	.447	1.010	1.174	.02	.002	.04	.0004
%RSD	2.9898	5.7588	8.6039	.1851	.0229	.2319	.0947
#1	14.622	18.248	12.812	12.86	7.945	19.17	.3933
#2	15.254	16.820	14.472	12.89	7.948	19.23	.3939

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.0147	71.99	-.39460
SDev	.0004	.13	.06429
%RSD	2.603	.1749	16.292
#1	.0144	71.91	-.44005
#2	.0149	72.08	-.34914

Method: 3PBCD Sample Name: T05113S Operator:
Run Time: 05/05/98 13:21:26
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	456.14	467.78	450.34	22.61	11.35	21.38	.8367
SDev	2.36	1.36	2.85	.09	.07	.08	.0035
%RSD	.51673	.29130	.63364	.3917	.6062	.3743	.4190
#1	454.48	466.81	448.32	22.54	11.30	21.32	.8343
#2	457.81	468.74	452.35	22.67	11.39	21.44	.8392

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.4638	82.68	43.597
SDev	.0019	.35	.048
%RSD	.3981	.4195	.10943
#1	.4625	82.43	43.563
#2	.4651	82.92	43.631

Method: 3PBCD Sample Name: T05113SD Operator:
Run Time: 05/05/98 13:24:07
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	438.38	448.84	433.16	21.62	9.354	20.12	.8037
SDev	1.20	.75	1.42	.06	.016	.06	.0022
%RSD	.27289	.16804	.32713	.2728	.1740	.3030	.2772
#1	437.54	448.31	432.16	21.58	9.343	20.08	.8021
#2	439.23	449.37	434.16	21.67	9.366	20.17	.8053

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.4414	79.78	41.791
SDev	.0017	.23	.013
%RSD	.3894	.2843	.03009
#1	.4402	79.62	41.782
#2	.4427	79.94	41.800

Method: 3PBCD Sample Name: T05113P Operator:
Run Time: 05/05/98 13:26:48
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	480.88	492.77	474.94	12.99	11.87	21.07	.8540
SDev	.85	2.02	.26	.00	.00	.01	.0001
%RSD	.17574	.41004	.05438	.0255	.0297	.0475	.0062
#1	480.28	491.34	474.76	12.98	11.87	21.06	.8539
#2	481.48	494.20	475.13	12.99	11.87	21.08	.8540

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.4879	71.46	45.917
SDev	.0005	.02	.003
%RSD	.1044	.0274	.00612
#1	.4876	71.45	45.915
#2	.4883	71.48	45.919

Method: 3PBCD Sample Name: T05119 Operator:
Run Time: 05/05/98 13:29:29
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	23.119	22.826	23.265	5.549	-.0304	.1380	.0130
SDev	.255	.068	.416	.027	.0002	.0013	.0000
%RSD	1.1023	.29895	1.7887	.4874	.7990	.9350	.2739
#1	23.299	22.778	23.559	5.530	-.0306	.1389	.0129
#2	22.939	22.875	22.970	5.568	-.0302	.1371	.0130

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.0014	38.03	.45670
SDev	.0000	.15	.03673
%RSD	.0000	.4064	8.0419
#1	.0014	37.92	.43073
#2	.0014	38.14	.48267

Method: 3PBCD Sample Name: T05120 Operator:
Run Time: 05/05/98 13:32:11
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	33.404	33.784	33.215	5.736	-.0564	.2318	.0276
SDev	.453	1.457	.048	.021	.0017	.0023	.0001
%RSD	1.3564	4.3113	.14416	.3650	3.018	.9744	.4176
#1	33.725	34.814	33.181	5.721	-.0552	.2334	.0275
#2	33.084	32.754	33.249	5.751	-.0576	.2302	.0277

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.0016	39.67	.48284
SDev	.0002	.16	.04329
%RSD	12.12	.4011	8.9656
#1	.0017	39.55	.51345
#2	.0014	39.78	.45223

Method: 3PBCD Sample Name: T05121 Operator:
Run Time: 05/05/98 13:34:53
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	36.697	36.948	36.571	3.509	-.0402	.6757	.1008
SDev	.697	1.065	1.576	.010	.0007	.0036	.0003
%RSD	1.8990	2.8821	4.3106	.2826	1.813	.5252	.2730
#1	36.204	37.701	35.456	3.502	-.0407	.6732	.1006
#2	37.190	36.195	37.686	3.516	-.0397	.6782	.1010

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.0024	34.07	.36732
SDev	.0000	.10	.12640
%RSD	.0000	.2962	34.413
#1	.0024	34.00	.27794
#2	.0024	34.14	.45670

Method: 3PBCD Sample Name: T05121L Operator:
Run Time: 05/05/98 13:37:36
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	7.3449	6.0968	7.9680	.6501	-.0660	.1074	.0196
SDev	.2938	.9817	.0497	.0008	.0010	.0013	.0000
%RSD	3.9997	16.102	.62337	.1233	1.473	1.201	.0452
#1	7.1372	5.4027	8.0031	.6506	-.0653	.1065	.0196
#2	7.5527	6.7910	7.9329	.6495	-.0667	.1084	.0196

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.0023	6.707	.06133
SDev	.0001	.008	.05341
%RSD	2.773	.1152	87.089
#1	.0023	6.713	.09910
#2	.0023	6.702	.02356

Method: 3PBCD Sample Name: PB0677 Operator:
Run Time: 05/05/98 13:40:17
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	1.6076	3.6068	.60946	-.0739	-.0891	-.0632	-.0006
SDev	.3253	1.9957	1.4840	.0008	.0013	.0045	.0001
%RSD	20.233	55.332	243.50	1.084	1.500	7.147	10.53
#1	1.3776	5.0180	-.43991	-.0745	-.0900	-.0664	-.0006
#2	1.8376	2.1956	1.6588	-.0734	-.0881	-.0600	-.0005

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	-.0008	-.0521	-.12812
SDev	.0010	.0005	.00692
%RSD	124.8	.8730	5.4041
#1	-.0014	-.0524	-.12323
#2	-.0001	-.0517	-.13302

Method: 3PBCD Sample Name: LCSW0677 Operator:
Run Time: 05/05/98 13:43:00
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	457.12	482.87	444.26	9.606	1.831	1.137	.4508
SDev	4.52	22.05	4.24	.041	.011	.007	.0016
%RSD	.98820	4.5674	.95404	.4317	.5905	.5961	.3465
#1	453.93	467.28	447.26	9.577	1.824	1.132	.4497
#2	460.32	498.47	441.27	9.635	1.839	1.141	.4519

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.4625	10.11	44.901
SDev	.0010	.04	.365
%RSD	.2202	.3868	.81186
#1	.4617	10.08	45.159
#2	.4632	10.13	44.643

Method: 3PBCD Sample Name: CCV Operator:
Run Time: 05/05/98 13:45:39
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	503.72	506.53	502.32	2.811	1.183	.7503	.2468
SDev	4.86	3.23	5.68	.039	.014	.0290	.0022
%RSD	.96555	.63804	1.1304	1.390	1.202	3.870	.8701
#1	507.16	508.81	506.33	2.838	1.193	.7708	.2484
#2	500.28	504.24	498.30	2.783	1.173	.7298	.2453

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.2532	2.926	252.92
SDev	.0036	.036	2.15
%RSD	1.408	1.243	.85070
#1	.2557	2.952	254.45
#2	.2506	2.901	251.40

Method: 3PBCD Sample Name: Blank Operator:
Run Time: 05/05/98 13:48:16
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	.20923	-3.7628	2.1922	.0096	-.0034	.0230	.0001
SDev	1.1354	2.4575	.4754	.0008	.0017	.0052	.0000
%RSD	542.68	65.311	21.684	8.319	49.50	22.40	35.36
#1	-.59364	-5.5005	1.8561	.0102	-.0022	.0267	.0001
#2	1.0121	-2.0250	2.5284	.0091	-.0046	.0194	.0001

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.0038	-.0177	.11718
SDev	.0001	.0000	.01358
%RSD	1.664	.0000	11.592
#1	.0038	-.0177	.10758
#2	.0039	-.0177	.12679

Method: 3PBCD Sample Name: LCSS0677 Operator:
Run Time: 05/05/98 13:50:59
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	387.73	394.63	384.29	15.87	30.08	79.17	1.117
SDev	.33	4.44	1.72	.01	.03	.02	.000
%RSD	.08436	1.1239	.44859	.0858	.1030	.0265	.0405
#1	387.50	391.50	385.50	15.86	30.05	79.16	1.117
#2	387.96	397.77	383.07	15.88	30.10	79.19	1.118

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.5486	15.74	959.51
SDev	.0001	.02	.67
%RSD	.0116	.1040	.06963
#1	.5485	15.73	959.98
#2	.5486	15.75	959.04

Method: 3PBCD Sample Name: T04680 Operator:
Run Time: 05/05/98 13:53:44
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	339.73	350.91	334.15	.6521	3.171	6.983	.0294
SDev	1.04	1.45	2.28	.0039	.014	.029	.0001
%RSD	.30589	.41308	.68285	.5991	.4292	.4205	.4826
#1	339.00	351.94	332.54	.6493	3.161	6.962	.0293
#2	340.47	349.89	335.76	.6549	3.180	7.003	.0295

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.0158	4.706	12.294
SDev	.0000	.025	.025
%RSD	.0000	.5216	.20450
#1	.0158	4.688	12.277
#2	.0158	4.723	12.312

Method: 3PBCD Sample Name: T04680D Operator:
Run Time: 05/05/98 13:56:29
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	187.50	192.75	184.88	1.019	3.777	7.611	.0315
SDev	.38	1.12	1.13	.007	.018	.028	.0001
%RSD	.20175	.58300	.61021	.6780	.4632	.3645	.3948
#1	187.23	193.54	184.08	1.015	3.765	7.592	.0314
#2	187.77	191.96	185.68	1.024	3.790	7.631	.0316

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.0165	5.613	17.117
SDev	.0009	.017	.115
%RSD	5.780	.3077	.67339
#1	.0158	5.601	17.035
#2	.0172	5.625	17.198

Method: 3PBCD Sample Name: T04680S Operator:
Run Time: 05/05/98 13:59:14
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	665.32	683.80	656.09	10.65	6.304	9.323	.4892
SDev	3.79	1.54	4.92	.03	.021	.033	.0014
%RSD	.56993	.22496	.74944	.2783	.3315	.3530	.2921
#1	662.63	682.71	652.61	10.63	6.289	9.300	.4882
#2	668.00	684.89	659.56	10.68	6.319	9.346	.4902

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.4793	16.10	57.869
SDev	.0012	.05	.198
%RSD	.2524	.3162	.34172
#1	.4784	16.06	57.729
#2	.4801	16.13	58.009

Method: 3PBCD Sample Name: T04680SD Operator:
Run Time: 05/05/98 14:01:55
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	646.55	663.87	637.90	10.36	6.064	9.029	.4724
SDev	1.96	1.60	3.74	.03	.025	.024	.0011
%RSD	.30347	.24127	.58651	.2631	.4168	.2644	.2349
#1	645.16	665.00	635.25	10.34	6.046	9.012	.4716
#2	647.93	662.74	640.54	10.38	6.082	9.045	.4731

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.4676	15.39	55.880
SDev	.0009	.03	.068
%RSD	.1906	.2038	.12225
#1	.4670	15.37	55.832
#2	.4682	15.41	55.928

Method: 3PBCD Sample Name: T04680P Operator:
Run Time: 05/05/98 14:04:36
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	807.49	830.11	796.19	.6505	5.139	8.091	.4973
SDev	2.82	.05	4.25	.0041	.020	.035	.0018
%RSD	.34874	.00584	.53331	.6313	.3972	.4266	.3605
#1	805.50	830.15	793.19	.6476	5.124	8.067	.4960
#2	809.48	830.08	799.19	.6535	5.153	8.116	.4986

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.4920	4.695	59.143
SDev	.0019	.021	.097
%RSD	.3752	.4454	.16480
#1	.4907	4.680	59.074
#2	.4933	4.710	59.212

Method: 3PBCD Sample Name: T04681 Operator:
Run Time: 05/05/98 14:07:16
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	80.257	85.099	77.839	2.301	3.432	10.79	.0401
SDev	.123	.841	.235	.008	.004	.02	.0000
%RSD	.15368	.98816	.30179	.3657	.1204	.1854	.0663
#1	80.344	85.694	77.673	2.295	3.429	10.77	.0402
#2	80.169	84.504	78.005	2.307	3.435	10.80	.0401

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.0149	61.91	2.5970
SDev	.0004	.14	.0324
%RSD	2.556	.2335	1.2459
#1	.0147	61.81	2.5742
#2	.0152	62.01	2.6199

Method: 3PBCD Sample Name: T04682 Operator:
Run Time: 05/05/98 14:09:57
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	48.882	52.014	47.318	2.278	4.639	10.86	.0957
SDev	.277	1.337	1.083	.014	.033	.07	.0005
%RSD	.56647	2.5708	2.2882	.6332	.7071	.6356	.5473
#1	48.686	52.960	46.552	2.268	4.616	10.81	.0953
#2	49.077	51.069	48.083	2.288	4.662	10.91	.0960

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.0123	18.74	1.7868
SDev	.0003	.11	.0463
%RSD	2.065	.5798	2.5924
#1	.0122	18.66	1.7540
#2	.0125	18.81	1.8195

Method: 3PBCD Sample Name: T04682L Operator:
Run Time: 05/05/98 14:12:39
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	9.9358	6.8622	11.470	.4239	.9019	2.207	.0190
SDev	.1341	2.2986	1.349	.0021	.0027	.005	.0000
%RSD	1.3496	33.497	11.757	.4962	.2964	.2485	.1873
#1	10.031	5.2368	12.424	.4254	.9001	2.203	.0190
#2	9.8410	8.4875	10.517	.4224	.9038	2.211	.0189

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.0043	3.772	.40231
SDev	.0000	.000	.16365
%RSD	.0000	.0121	40.677
#1	.0043	3.772	.51802
#2	.0043	3.772	.28659

Method: 3PBCD Sample Name: CCV Operator:
Run Time: 05/05/98 14:15:17
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	505.10	515.57	499.87	2.799	1.196	.6983	.2487
SDev	.05	.54	.20	.007	.002	.0039	.0004
%RSD	.00948	.10543	.03993	.2613	.1625	.5544	.1713
#1	505.14	515.96	499.73	2.794	1.195	.6956	.2484
#2	505.07	515.19	500.02	2.804	1.197	.7010	.2490

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.2542	2.932	254.30
SDev	.0006	.003	.61
%RSD	.2504	.0930	.24111
#1	.2538	2.930	253.86
#2	.2547	2.934	254.73

Method: 3PBCD Sample Name: Blank Operator:
Run Time: 05/05/98 14:17:56
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	-.79259	-1.0524	-.66289	.0098	.0076	.0230	.0001
SDev	.32912	1.7895	.39995	.0021	.0000	.0000	.0000
%RSD	41.524	170.04	60.334	21.37	.0000	.0000	23.57
#1	-.55987	.21297	-.94570	.0084	.0076	.0230	.0001
#2	-1.0253	-2.3177	-.38008	.0113	.0076	.0230	.0001

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.0035	-.0154	.14310
SDev	.0003	.0005	.01666
%RSD	7.252	2.946	11.642
#1	.0033	-.0157	.15488
#2	.0037	-.0151	.13132

Method: 3PBCD Sample Name: IEC1 Operator:
Run Time: 05/05/98 14:20:33
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	.08626	-21.173	10.700	250.8	255.1	101.8	.0088
SDev	.06851	1.010	.402	.2	.4	.1	.0000
%RSD	79.426	4.7705	3.7529	.0933	.1576	.1420	.1013
#1	.13470	-20.459	10.416	251.0	255.4	101.9	.0088
#2	.03781	-21.887	10.984	250.6	254.8	101.7	.0088

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.0070	253.3	-.88141
SDev	.0002	.3	.20063
%RSD	2.737	.1276	22.762
#1	.0068	253.5	-1.0233
#2	.0071	253.1	-.73955

Method: 3PBCD Sample Name: IEC2 Operator:
Run Time: 05/05/98 14:23:20
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	-.98231	-2.2539	-.34746	.0541	.1937	.1230	4.965
SDev	.68887	1.7996	1.93122	.0004	.0022	.0065	.023
%RSD	70.127	79.841	555.81	.7404	1.129	5.248	.4626
#1	-.49521	-3.5264	1.0181	.0544	.1952	.1275	4.949
#2	-1.4694	-.98145	-1.7130	.0538	.1921	.1184	4.982

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	4.891	.0251	-2.4408
SDev	.022	.0032	.0872
%RSD	.4568	12.69	3.5711
#1	4.875	.0273	-2.3792
#2	4.907	.0228	-2.5025

Method: 3PBCD Sample Name: ICSA Operator:
Run Time: 05/05/98 14:26:07
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	.45158	-35.781	18.541	493.2	495.0	195.1	.0201
SDev	1.1758	.890	2.207	1.1	.6	.3	.0001
%RSD	260.38	2.4870	11.904	.2264	.1219	.1741	.5288
#1	-.37985	-35.152	16.980	492.4	494.6	194.8	.0202
#2	1.2830	-36.410	20.101	494.0	495.4	195.3	.0201

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.0158	480.5	-1.2579
SDev	.0000	.6	.0731
%RSD	.0000	.1219	5.8108
#1	.0158	480.1	-1.3096
#2	.0158	480.9	-1.2062

Method: 3PBCD Sample Name: ICSAB Operator:
Run Time: 05/05/98 14:28:49
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	440.13	413.85	453.25	499.4	500.1	196.2	.0186
SDev	2.21	2.80	4.71	.9	.5	.2	.0000
%RSD	.50163	.67751	1.0392	.1711	.1097	.1029	.0955
#1	438.57	415.83	449.92	498.8	499.7	196.0	.0186
#2	441.69	411.87	456.58	500.0	500.5	196.3	.0186

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.0146	482.4	436.01
SDev	.0001	.4	.50
%RSD	.4351	.0915	.11469
#1	.0146	482.1	435.66
#2	.0147	482.7	436.37

Method: 3PBCD Sample Name: CCV Operator:
Run Time: 05/05/98 14:31:29
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	499.43	509.58	494.36	2.698	1.103	.6575	.2430
SDev	.82	1.97	.25	.023	.024	.0203	.0003
%RSD	.16413	.38623	.04984	.8575	2.181	3.091	.1023
#1	500.01	510.97	494.54	2.715	1.120	.6718	.2432
#2	498.85	508.19	494.19	2.682	1.086	.6431	.2428

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.2470	2.768	252.05
SDev	.0005	.023	.36
%RSD	.2062	.8212	.14243
#1	.2474	2.784	252.30
#2	.2467	2.752	251.80

Method: 3PBCD Sample Name: Blank Operator:
Run Time: 05/05/98 14:43:02
Comment:
Mode: CONC Corr. Factor: 1

Elem	Pb2203	2203/1	2203/2	Mg2790	Al3082	Fe2714	Mn2576
Units	ppb	ppb	ppb	ppm	ppm	ppm	ppm
Avge	-.47198	-3.0956	.83786	-.0351	-.0327	-.0110	-.0005
SDev	.72448	1.7415	.21675	.0000	.0013	.0177	.0000
%RSD	153.50	56.256	25.869	.0000	4.083	162.0	1.861
#1	.04030	-1.8642	.99113	-.0351	-.0318	.0016	-.0005
#2	-.98427	-4.3270	.68460	-.0351	-.0337	-.0235	-.0005

Elem	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppb
Avge	.0023	-.0627	.07199
SDev	.0000	.0000	.10760
%RSD	.0000	.0000	149.47
#1	.0023	-.0627	-.00410
#2	.0023	-.0627	.14807

Method: 3PBCD Sample Name: T04099 10X Operator:
Run Time: 05/05/98 14:47:36
Comment:
Mode: CONC Corr. Factor: 1

Elem	Mg2790	Al3082	Fe2714	Mn2576	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppb
Avge	4.830	5.526	217.8	3.120	.0645	15.10	-3.3992
SDev	.011	.009	.7	.010	.0002	.04	.2074
%RSD	.2178	.1627	.3295	.3291	.2961	.2949	6.1023
#1	4.822	5.520	217.3	3.112	.0644	15.07	-3.2525
#2	4.837	5.533	218.3	3.127	.0646	15.13	-3.5459

Method: 3PBCD Sample Name: T04099D 10X Operator:
Run Time: 05/05/98 14:49:50
Comment:
Mode: CONC Corr. Factor: 1

Elem	Mg2790	Al3082	Fe2714	Mn2576	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppb
Avge	5.299	4.696	196.2	3.819	.0735	18.91	-3.3876
SDev	.008	.008	.3	.007	.0011	.02	.0514
%RSD	.1550	.1630	.1572	.1771	1.472	.1153	1.5181
#1	5.294	4.701	196.0	3.814	.0727	18.90	-3.4239
#2	5.305	4.690	196.4	3.823	.0743	18.93	-3.3512

Method: 3PBCD Sample Name: T04099S 10X Operator:
Run Time: 05/05/98 14:52:03
Comment:
Mode: CONC Corr. Factor: 1

Elem	Mg2790	Al3082	Fe2714	Mn2576	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppb
Avge	9.046	6.028	210.4	5.588	.1587	26.72	.47379
SDev	.002	.007	.3	.009	.0001	.03	.04166
%RSD	.0244	.1109	.1337	.1636	.0802	.0953	8.7926
#1	9.045	6.023	210.2	5.581	.1586	26.70	.44433
#2	9.048	6.033	210.6	5.594	.1588	26.74	.50324

Method: 3PBCD Sample Name: T04099SD 10X Operator:
Run Time: 05/05/98 14:54:18
Comment:
Mode: CONC Corr. Factor: 1

Elem	Mg2790	Al3082	Fe2714	Mn2576	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppb
Avge	11.22	6.628	213.3	4.190	.1331	30.38	.72020
SDev	.02	.015	.3	.005	.0005	.05	.00490
%RSD	.1562	.2310	.1493	.1176	.3827	.1571	.68025
#1	11.21	6.617	213.1	4.186	.1327	30.35	.72367
#2	11.24	6.639	213.5	4.193	.1334	30.42	.71674

Method: 3PBCD Sample Name: T04108 20X Operator:
Run Time: 05/05/98 14:56:33
Comment:
Mode: CONC Corr. Factor: 1

Elem	Mg2790	Al3082	Fe2714	Mn2576	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppb
Avge	11.37	5.403	64.10	6.110	.1577	59.19	-3.7939
SDev	.01	.013	.06	.007	.0000	.04	.0274
%RSD	.1269	.2406	.0901	.1068	.0000	.0684	.72200
#1	11.36	5.394	64.06	6.105	.1577	59.16	-3.8132
#2	11.38	5.413	64.14	6.115	.1577	59.22	-3.7745

Method: 3PBCD Sample Name: IEC1 Operator:
Run Time: 05/05/98 14:58:41
Comment:
Mode: CONC Corr. Factor: 1

Elem	Mg2790	Al3082	Fe2714	Mn2576	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppb
Avge	253.0	255.6	102.2	.0096	.0076	253.6	-.96148
SDev	.3	.0	.1	.0004	.0002	.2	.18900
%RSD	.1167	.0139	.0902	4.601	2.510	.0622	19.657
#1	252.8	255.6	102.2	.0100	.0075	253.5	-1.0951
#2	253.2	255.6	102.3	.0093	.0077	253.7	-.82784

Method: 3PBCD Sample Name: IEC2 Operator:
Run Time: 05/05/98 15:00:58
Comment:
Mode: CONC Corr. Factor: 1

Elem	Mg2790	Al3082	Fe2714	Mn2576	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppb
Avge	.1278	.2741	.1743	4.977	4.895	.0993	-2.4864
SDev	.0188	.0204	.0307	.004	.005	.0182	.0429
%RSD	14.74	7.448	17.59	.0851	.1027	18.31	1.7250
#1	.1411	.2885	.1960	4.974	4.892	.1122	-2.5167
#2	.1145	.2596	.1526	4.980	4.899	.0865	-2.4560

Method: 3PBCD Sample Name: ICSA Operator:
Run Time: 05/05/98 15:03:18
Comment:
Mode: CONC Corr. Factor: 1

Elem	Mg2790	Al3082	Fe2714	Mn2576	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppb
Avge	492.4	493.1	194.3	.0216	.0180	477.3	-1.4195
SDev	1.0	.2	.1	.0003	.0002	.7	.0372
%RSD	.1940	.0494	.0759	1.521	1.063	.1380	2.6227
#1	491.8	493.3	194.2	.0218	.0181	476.9	-1.3932
#2	493.1	492.9	194.4	.0214	.0178	477.8	-1.4458

Method: 3PBCD Sample Name: ICSAB Operator:
Run Time: 05/05/98 15:05:31
Comment:
Mode: CONC Corr. Factor: 1

Elem	Mg2790	Al3082	Fe2714	Mn2576	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppb
Avge	500.8	498.9	196.4	.0192	.0153	481.7	436.71
SDev	1.8	.9	.6	.0000	.0003	1.4	1.33
%RSD	.3550	.1865	.3046	.1387	2.086	.2969	.30545
#1	499.6	498.2	195.9	.0192	.0150	480.7	435.76
#2	502.1	499.5	196.8	.0192	.0155	482.7	437.65

Method: 3PBCD Sample Name: CCV Operator:
Run Time: 05/05/98 15:07:41
Comment:
Mode: CONC Corr. Factor: 1

Elem	Mg2790	Al3082	Fe2714	Mn2576	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppb
Avge	2.820	1.238	.7311	.2423	.2448	2.887	251.16
SDev	.031	.036	.0342	.0000	.0001	.032	.21
%RSD	1.087	2.895	4.677	.0146	.0260	1.118	.08299
#1	2.842	1.263	.7553	.2423	.2448	2.910	251.02
#2	2.799	1.213	.7070	.2423	.2449	2.864	251.31

Method: 3PBCD Sample Name: Blank Operator:
Run Time: 05/05/98 15:09:49
Comment:
Mode: CONC Corr. Factor: 1

Elem	Mg2790	Al3082	Fe2714	Mn2576	V_2924	Ca3179	Cd2265
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppb
Avge	.0052	.0089	.0050	-.0003	.0028	-.0254	.09939
SDev	.0006	.0005	.0023	.0000	.0001	.0009	.00010
%RSD	11.47	5.439	45.00	9.223	2.245	3.580	.10102
#1	.0057	.0093	.0066	-.0003	.0028	-.0247	.09932
#2	.0048	.0086	.0034	-.0003	.0029	-.0260	.09946

D. Laboratory Logs

EA LABORATORIES
METALS DIGESTION LOG-SOIL(Solid)

805014

Analyst: JAM Date: 5·01 98

Method No: (EAL-M-) 3050ICP Final Volume: 100ml

Reagents Added: 10ml 1:1 HNO_3, 10ml CON HNO_3, 10ml 30% H_2O_2, 5ml CON HCl

Reagent Lot Numbers: I28542 M07545 KVNA M04543

Matrix spike:
Standard Stock Id: M04387
Volume of stock added: 10ml

LCS:
Stock Source: M04387 NIST SOLID LOT
Volume of stock: 10ml ERA LOT#233

Sample No. TB805014	Weight G	Color Before	Color After	Texture	Artifacts	Hotplate ID	Hotplate Setting	Comments
PB	10ml	Colorless	Colorless	—	none	#1(4A)	2	
IL 805014 LCSW	10ml	"	↓	—				
ID 805014 LCSS	1.0503	brown	light Yellow	fine, soft				
T041080	1.0317		colorless					
T041080 DUP	1.0147							
T04680 STK	1.0550							
T04680 STK DUP	1.0307				↓			
T041081	1.0992	↓			twigs			
T041082	1.0423	brown	↓	↓	none	↓	↓	

RECEIVED
MAY 04 1998
By

Samples measured by: LAM
Samples prepared by: LAM
Samples filtered and batched by: CD

#677

EA LABORATORIES PRE-DIGESTION SPIKE LOG

FURNACE/ICP

DATE 5/1/98 ANALYST LAM FINAL VOLUME: ICP 50/100 mL
FN 50/100 mL

CLIENT Abb Nas

SAMPLE RANGE TO4680-88

ICP SPIKE STOCK USED M04387 VOLUME OF STOCK USED (ICP) 10 mL

FURNACE STOCK USED _____ VOLUME OF STOCK USED (FN)_____

METHOD SW846

ELEMENT	SUBSTOCK A CONC. (PPM)	FINAL CONC. (PPB)
Ag SW846 Ag CLP/200	50 5.0	500 50.0
Al. As. Ba. Se	200	2000
Ca, K, Mg. Na	1000	10000
Cd. Be	5.0	50.0
Co, Mn, Ni, Pb, Sb, V, Zn	50.0	500
Cr	20.0	200
Cu	25.0	250
Fe	100	1000
B, Si, Ti, Sn	100	1000
Mo, Sr	50.0	500

TRACE ICP / FURNACE LEVELS		
As SW846	2.5	25.0
As CLP/ 200	4.0	40.0
Se SW846	5.0	50.0
Se CLP/200	1.0	10.0
Pb SW846	2.5	25.0
Pb CLP/200	2.0	20.0
Tl SW846	2.5	25.0
Tl CLP/200	5.0	50.0
Ag SW846	5.0	50.0
Ag CLP/ 200	2.5	25.0
Cd SW846	0.5	5.0
Cd CLP/ 200	0.5	5.0
Ni SW846	2.5	25.0
Ni CLP/ 200	5.0	50.0
Cr SW846	2.5	25.0
Cr CLP/ 200	2.5	25.0
Cu SW846	2.5	25.0
Cu CLP/200	2.5	25.0
Be SW846	0.5	5.0

METAL'S STANDARD PREP LOGBOOK #3

Std. number	Date	Analyst	Std Name	Metal	Stock Source	Lot Number	Conc.	Vol. of Stock	Final Vol.	Final Conc.	Acid Lot #	Exp. Date
M03269	5/9/97	BLS	TRACE STD High	Ni	RICCA	D171	1000ppm	1 mL	1000mL	1ppm	VO77 KMP VO77 KMKP	8/9/97
(cont)	↓	↓	↓	Sb	↓	F061	↓	↓	↓	↓	↓	↓
				Se		A101						
				Tl		C101		↓		↓		
				Na		J172		5mL		5ppm		
↓	↓	↓	↓	K	↓	E231	↓	↓	↓	↓	↓	↓
M03270	5/9/97	BLS	TRACE STD 1	TRACE STD High	M03269	Prep Date: 5/9/97	See Sheets	4mL	200mL	See Sheets	VO77-ICMKP VO77 KMKP	8/9/97
M03271	↓	↓	TRACE STD 2	↓	↓	↓	↓	20mL	↓	↓	↓	↓
M03272	5-12-97	MAM	Std	Hg	Mall	Prep 5-8-97	10 ppm	1.0 ml	100 ml	100 ppb	VO77 KTP48-P	5-12-97
M03273	↓	↓	MAC	↓	Ricca	↓	↓	↓	↓	↓	↓	↓
M03274	5/12/97	JH	STOCK STD High	See Sheets	H.P	71272	See Sheets	250ml	NA	NA	NA	6/98
M03275	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
M03276												
M03277												
M03278												
M03279												
M03280												
M03281												
M03282												
M03283												
M03284				↓	↓	↓	↓	↓	↓	↓	↓	↓

030102

METAL'S STANDARD PREP LOGBOOK #3

Std. number	Date	Analyst	Std Name	Metal	Stock Source	Lot Number	Conc.	Vol. of Stock	Final Vol.	Final Conc.	Acid Lot #	Exp. Date
MO3387	6/5/97	SAW	Mg STOCK	Mg	RICCA	D171	1000PPM	100ML	—	—	—	6/98
MO3388			Fe STOCK	Fe	RICCA	B052			—	—	—	10/98
MO3389			Mn STOCK	Mn	RICCA	A282			—	—	—	10/98
MO3390	↓	↓	B STOCK	B	RICCA	F072	↓	↓	—	—	—	7/98
MO3391	6/5/97	SAW	STD HIGH	MIX 1	HP	MO3276	SEE SHEETS	100.0ML	1000ML	SEE SHEETS	V077KARV-P V078KTKB-P	9/5/97
↓	↓	↓	↓	MIX 1*	HP	MO2937	↓	50.0ML	↓	↓	↓	↓
MO3392	6/5/97	SAW	Co STOCK	Co	RICCA	D251	1000PPM	100ML	—	—	—	6/98
MO3393			Cd STOCK	Cd	RICCA	B142						11/98
MO3394			Ag STOCK	Ag	RICCA	M242						9/98
MO3395			Sb STOCK	Sb	RICCA	A082						9/98
MO3396			V STOCK	V	RICCA	B132		↓				10/98
MO3397			Se STOCK	Se	RICCA	A212		500ML				10/98
MO3398			Pb STOCK	Pb	RICCA	B212						11/98
MO3399			As STOCK	As	RICCA	B162		↓				11/98
MO3400			Cu STOCK	Cu	MALL	KTNJ-P		100ML				8/98
MO3401			Ni STOCK	Ni	MALL	KTNA-P						8/98
MO3402			Ba STOCK	Ba	MALL	KTTA-P						10/98
MO3403			Cr STOCK	Cr	MALL	KVCJ-P						2/99
MO3404			B STOCK	B	MALL	KTCM-P						2/98
MO3405	↓	↓	K STOCK	K	MALL	KVEG-P	↓	↓	↓	↓	↓	3/99
MO3406	6/6/97	KJH	FNSTD	Cd	Mall	MO3214 2/98	1000ppm	50ul	50ml	1ppm	KTKB-P	6/13/97
MO3407	↓	↓	FNMDL	↓	Ricca	MO2778 4/98	↓	↓	↓	↓	↓	↓

030103

Std. number	Date	Analyst	Std Name	Metal	Stock Source	Lot Number	Conc.	Vol. of Stock	Final Vol.	Final Conc.	Acid Lot #	Exp. Date
m03418	6-9-97	V.Rn	Int. Std	Hg	Mall	exp 12-97 H548-KPKS-P	1000ppm	1 ml	100ml	10ppm	KTKB-P	7-9-97
m03419	↓	↓	↓	↓	Ricca	F301 exp 8-97	↓	↓	↓	↓	↓	↓
m03420	6-9-97	MRM	Std	Hg	Mall	m03418 exp 7-9-97	10ppm	1.0ml	100ml	100ppb	KTKBP	6-9-97
m03421	↓	↓	MQC	↓	Ricca	m03419 exp 7-9-97	↓	↓	↓	↓	↓	↓
M03422	6/9/97	JH	Ricca	Pb	—	B307	1000ppm	473ml	—			6/9/98
M03423				V	Ricca	B132		118ml	—			↓
M03424			CLPP-ICS-B	see sheets	I.V.	LMEB5843	see sheets	100ml	—			6/1/98
M03425			CLPP ICSA	see sheets	I.V.	M-MEB58043	↓	500ml	—			↓
M03426			Mn	—	Ricca	A2B	1000ppm	118ml	—			6/9/98
M03427	6/9/97	BAW	TRACE MQC	As	Mall	M02084	1000PPM	500uL	1L	500Ppb	V077 KPKS-P V078 KTKB-P	9/9/97
↓	↓	↓	↓	Pb	↓	M03215	↓	↓	↓	↓	↓	↓
				Sb		M02788						
				Cd		M03244						
				Se	JTBaker	M02808						
m03428	6-10-97	MRM	Std	Hg	Mall	m03418	10ppm	1.0ml	100ml	100ppb	KTKB-P	6-10-97
m03429	6-10-97	↓	MQC	↓	Ricca	m03419	↓	↓	↓	↓	↓	↓
M03430	6/11/97	SAW	Ca, Mg CRI 30Ppb	Ca	Inorg Vent	M03381	25 PPM	120uL	100mL	30Ppb	V079 KPKS-P V078 KTKB-P	6/18/97
↓	↓	↓	↓	Mg	↓	↓	↓	↓	↓	↓	↓	↓
m03431	6-11-97	MRM	Std	Hg	Mall	m03418	10ppm	1 ml	100ml	100ppb	KTKB-P	6-11-97
m03432	↓	↓	MQC	↓	Ricca	m03419	↓	↓	↓	↓	↓	↓

KJH 6/12/97

METAL'S STANDARD PREP LOGBOOK #3

Std. number	Date	Analyst	Std Name	Metal	Stock Source	Lot Number	Conc.	Vol. of Stock	Final Vol.	Final Conc.	Acid Lot #	Exp. Date
M03738	9/23/97	SAW	MIX 2A	SOLN A	HP	724713	SEE SHEETS	250 mL	—	—	—	10/98
M03739	9/23/97	SAW	MIX 2A	SOLN A	HP	724713	SEE SHEETS	250 mL	—	—	—	10/98
M03740	9/23/97	SAW	MIX 3	SEE SHEETS	HP	724805	SEE SHEETS	250 mL	—	—	—	10/98
M03741	9/23/97	SAW	MIX 3	SEE SHEETS	HP	724805	SEE SHEETS	250 mL	—	—	—	10/98
M03742	9/23/97	SAW	MIX 4	SOLN A	HP	725811	SEE SHEETS	500 mL	—	—	—	10/98
M03743	9/23/97	SAW	MIX 4	SOLN B	HP	725811	SEE SHEETS	500 mL	—	—	—	10/98
M03744	9/23/97	SAW	ICSAB	CLPP ICSA	INORG VENT	M03595	SEE SHEETS	200 mL	2000 mL 200 mL 9/23/97	SEE SHEETS	V079 KTKB-P V078 KVCN	12/23/97
↓	↓	↓	↓	CLPP ICSB	INORG VENT	M03365	SEE SHEETS	20 mL	↓	↓	↓	↓
M03745	9/23/97	SAW	STD 1	MIX 2A	HP	M03738	SEE SHEETS	1.0 mL	1000 mL	SEE SHEETS	V077 KTKB-P V078 KVCN	12/23/97
↓	↓	↓	↓	MIX 2A*	HP	M03737	SEE SHEETS	1.0 mL	↓	↓	↓	↓
M03746	9/23/97	SAW	STD 2	MIX 3	HP	M03740	SEE SHEETS	10.0 mL	1000 mL	SEE SHEETS	V077 KTKB-P V077 KVCN	12/23/97
↓	↓	↓	↓	MIX 1A*	HP	M03284	SEE SHEETS	5.0 mL	↓	↓	↓	↓
M03747	9/23/97	SAW	TRACE STD HIGH	MIX 4	HP	M03742	SEE SHEETS	10.0 mL	1000 mL	SEE SHEETS	V077 KTKB-P V078 KVCN	12/23/97
↓	↓	↓	↓	MIX 4*	HP	M03743	SEE SHEETS	10.0 mL	↓	↓	↓	↓
M03748	9/23/97	SAW	TRACE STD 1 - 20 PPB	M03747 PREP'D	HP	M03747	SEE SHEETS	2.0 mL	100 mL	SEE SHEETS	V077 KTKB-P V078 KVCN	10/23/97
M03749	9/23/97	SAW	TRACE STD 2 - 100 PPB	PREP'D 9/23/97	HP	M03747	SEE SHEETS	10.0 mL	100 mL	SEE SHEETS	V077 KTKB-P V078 KVCN	10/23/97
M03750	9/23/97	AFS	Std	Hg	M03689	Prep 9/9/97	10 ppm	500 uL	50 mL	100 ppb	V077 KTKB-P	9/24/97
M03751	↓	↓	MQC	↓	M03690	↓	↓	↓	↓	↓	↓	↓

METAL'S STANDARD PREP LOGBOOK #3

Std. number	Date	Analyst	Std Name	Metal	Stock Source	Lot Number	Conc.	Vol. of Stock	Final Vol.	Final Conc.	Acid Lot #	Exp. Date
M04185	2/20/98	JH	FN STD	Cu	H.P.	M03770	10,000ppm	10ml	100ml	1000ppb	KVD L39539	2/27/98
				Cd	↓	M03779	↓	↓	↓	↓	↓	↓
				Ag	↓	M03761	↓	↓	↓	↓	↓	↓
M04186	2/20/98	JH	2XCCBL Sub	Ni	Ricca	M02883	1000ppm	800.ul	100ml	8000ppb	KVD L39539	5/20/98
				Zn	Mall	M04012	↓	400ul	↓	4000ppb	↓	↓
M04187	2/20/98	JH	2XCCBL	Be	Prep'd 1/28/98	M04072	800ppb	2ml	200ml	8.0ppb		4/20/98
				Mo	↓	↓	1000ppb			10ppb		
				Ni	Prep'd 2/20/98	M04186	8000ppb			80ppb		
				Zn	↓	↓	4000ppb	↓	↓	40ppb	↓	↓
M04188	2/20/98	JH	QCP ICV-2	Stock Solution	I.V.	L-MEB58032	—	100ml	—	—	—	3/99
M04189			QCP ICV-3			M-MEB58063	—	↓	—	—	—	↓
M04190			QCP ICV-3			M-MEB58063	—	↓	—	—	—	↓
M04191			QCP ICV-2			L-MEB58032	—	↓	—	—	—	↓
M04192			QCP ICV-1			N-MEB58076	—	↓	—	—	—	↓
M04193			CLPP Cal-3			M-MEB58073	—	↓	—	—	—	↓
M04194			CLPP Cal-2			M-SB02047	—	↓	—	—	—	↓
M04195			CLPP ICS-A			N-MEB58074	—	600ml	—	—	—	↓
M04196			CLPP ICS-A			N-MEB58074	—	↓	—	—	—	↓
M04197			CLPP Cal-1			N-MEB58075	—	100ml	—	—	—	3/99
M04198			QCP ICV-1			N-MEB58076	—	↓	—	—	—	↓

030106

METAL'S STANDARD PREP LOGBOOK #4

Std. number	Date	Analyst	Std Name	Metal	Stock Source	Lot Number	Conc.	Vol. of Stock	Final Vol.	Final Conc.	Acid Lot #	Exp. Date
M04431	5/2/98	JH	STD1	MIX 2A	A&B H.P	M03738	see Sheets	1ml	1000ml	see Sheets	L28542 L37650	8/2/98
↓			Std ↓	MIX 2A #	↓	M03737	↓	↓	↓	↓	↓	↓
~~M04432~~			~~STD2~~	~~MIX1~~		~~M04136~~		~~5.0ml~~				
↓ see below			↓	~~MIX 3~~		~~M03740~~		~~10ml~~	↓			
M04433	5/2/98	JH	TRACE STD High	MIX4A	H.P	M03742		10ml	1000ml			8/2/98
				MIX4B	↓	M03743	↓	↓	↓	↓	↓	↓
M04434	5/2/98	JH	Trace STD1	PWP	H.P	M04433		4ml	200ml	20ppb		7/2/98
M04435	5/2/98	JH	Trace STD2	5/2/98	↓	↓	↓	20ml	↓	100ppb	↓	↓
M04436	5/2/98	JH	STD2	MIX 1	H.P	M03276	see Sheets	5.0ml	1000ml	see Sheets		8/2/98
				MIX 3	↓	M03740	↓	10ml	↓	↓		↓
M04437	5/4/98	JH	IEC2	Mn	Reeca	M03389	1000ppm	5ml	1000ml	6ppm	L28542 L37650	8/4/98
				V	↓	M03423	↓	↓	↓	↓	↓	↓
M04438	5/4/98	JH	TRACE Cal	QCP CICV1	IV	~~M04198~~ M04188	see Sheets	2.0ml	2000ml	see Sheets		
				QCP CICV2		M04191						
				QCP CICV3	↓	M04189	↓	↓	↓	↓	↓	↓
M04439	5/4/98	AS	FN Std	Ag	Mall	M03619	1000ppm	50ml	50ml	1ppm	L28542	5/11/98
				As		M02084		50ml				
				Cd		M03825		50ml				
				Cr		M02781		50ml				
				Cu		M03815		50ml				
				Pb	↓	M04314	↓	50ml	↓	↓	↓	↓

030107

ENVIRONMENTAL
RESOURCE ASSOCIATES
ARVADA, COLORADO 1-800-372-0122

Certification

PriorityPollutnT™/CLP Inorganic Soils Quality Control Standards

Catalog Nº PPS-46 Lot Nº 233

Parameter	Certified Value	Performance Acceptance Limits™
TRACE METALS PriorityPollutnT™ (Catalog No 540)	**mg/Kg**	**mg/Kg**
aluminum	3980	2100 - 5860
antimony	54 3	5 10 - 103
arsenic	108	80 1 - 136
barium	59 7	45.2 - 74.2
beryllium	47.6	33 7 - 61 4
boron	75 4	53 4 - 97.3
cadmium	114	68.6 - 159
calcium	1770	1290 - 2250
chromium	42 2	32 4 - 52 1
cobalt	123	97 5 - 148
copper	68.9	56 4 - 81.3
iron	7300	2920 - 11700
lead	44 3	33.7 - 54.9
magnesium	1880	1360 - 2400
manganese	128	93 7 - 162
mercury	1 71	1.16 - 2.26
molybdenum	61.1	44.1 - 78 1
nickel	71.8	55.7 - 88 0
potassium	2400	1830 - 2970
selenium	70 6	44.6 - 96 6
silver	59.7	30 6 - 88.8
sodium	280	168 - 391
strontium	122	88 4 - 155
thallium	77 8	44 5 - 111
tin	79 0	59.2 - 98.9
titanium	196	89.8 - 301
vanadium	64 3	43 9 - 84 7
zinc	85.6	66.2 - 105
CYANIDE PriorityPollutnT™ (Catalog No 541)	**mg/Kg**	**mg/Kg**
total cyanide	51 1	27.0 - 75.2

The ***Trace Metals Certified Values*** are equal to the mean recoveries for each parameter as determined in an interlaboratory round robin study The standard was digested using various EPA methods such as Method 3050, 3051, etc and the digest analyzed by ICP and atomic absorption spectroscopy

The ***Cyanide Certified Value*** is equal to the mean recovery as determined in an interlaboratory round robin study. The standard was distilled and analyzed following the procedure outlined in Method 9010, SW-846.

The ***Performance Acceptance Limits (PALs™)*** are listed as guidelines for acceptable analytical results given the limitations of the USEPA methodologies commonly used to determine these parameters and closely approximate the 95% confidence interval The PALs™ are based on data generated by your peer laboratories in ERA's InterLaB™ programs. If your result falls outside of the PALs™, ERA recommends that you investigate potential sources of error in your preparation and/or analytical procedures For further technical assistance, call ERA at 1-800-372-0122

For users of internal standards, ERA has determined that scandium is present in this soil at 2.2 mg/Kg and that yttrium is present at 17 mg/Kg

PriorityPollutnT™/CLP Inorganic Soils Lot No. 233

030108

% Solid/Moisture Report
Samples: 9804680 through 9804682
Blanks Included? N Other QC Included? N

Sample#	% Solid	% Moisture	Date of Analysis	Analyst
9804680	75.68	24.32	04-MAY-98	KLL
9804681	76.87	23.13	04-MAY-98	KLL
9804682	76.20	23.80	04-MAY-98	KLL

030103

E. Technical Review Checklist and Other Analysis Documentation

9804680 - 4682
3 Soils

EA LABORATORIES
QUALITY ASSURANCE SUMMARY
FOR SW-846 ANALYSES

Project: TX Lab ABB Jackson **Analysis:** Metals **Analyst(s):** SAW

EA Laboratories Report No. 98061 7 **Method:** U.S. EPA SW846

Reviewed by: [signature] **Date:** 5/8/98 **Data Generator:** ULF

1 Samples were analyzed within six months of sample collection. Mercury was analyzed within 28 days.
✓ Yes ____ No ____ NCR#

2. ICP Initial Calibration: A calibration blank and at least three standards were analyzed daily, and the initial calibration verification standard recovery was within 90-110%. The check standard recovery was within ±5%.
✓ Yes ____ No

3 AA Calibration. A calibration blank and at least three standards were used to establish the curve, and the initial calibration verification standard recovery was within 90-110%.
NA Yes ____ No

4 Continuing Calibration Verification (CCV): A CCV standard prepared from a source other than that of the initial calibration was used, and the result was 90-110% of the true value for both ICP and GFAA (80-120% for Mercury) The CCV was run at a frequency of 10% or every two hours and at the end of the run.
✓ Yes ____ No

5. A preparation blank was analyzed with each batch and all analytes are less than three times the MDL or below the reporting limit for the project.
____ Yes ____ No ____ NCR#

6. Matrix spikes, matrix spike duplicates and matrix duplicates were analyzed for each batch. Accuracy and precision criteria were met for all analytes. If no specify analyte and recovery or RPD.
____ Yes ____ No

Analyte	MS recovery	MSD recovery	Dup RPD
Cd			34.4

EA LABORATORIES
QUALITY ASSURANCE SUMMARY
FOR SW-846 ANALYSES

Project: TOX Lab ABB

Analysis: Metals

EA Laboratories Report No. 98017

Method: U.S. EPA SW846

Reviewed by: QC

Date: 5/8/98

7. LCS criteria were met for all analytes.
✓ Yes _____ No _____ NCR#

Preparation Date: 5/1/98

Analysis Date: 5/5/98

Comments:

ATTACHMENT V

Report Quality Assurance Record

REPORT QUALITY ASSURANCE RECORD

Client: Harding Lawson Associates
Project Number: 70003.1C
Author: L. Hartzell

EA Report No.: 2810
Type Analysis: 10-day sediment test
Test Organisms: Hyalella azteca

REPORT CHECKLIST

QA/QC ITEM	REVIEWER	DATE
1. Samples collected, transported, and received according to study plan requirements.	Lynda A. Hartzell	5/13/98
2. Samples prepared and processed according to study plan requirements.	Lynda A. Hartzell	5/13/98
3. Data collected using calibrated equipment.	Lynda A. Hartzell	5/13/98
4. Calculations checked:		
- Hand calculations checked	Richard A. Connelly	5/13/98
- Documented and verified statistical procedure used.	Lynda A. Hartzell	5/13/98
5. Data input/statistical analyses complete and correct.	Richard A. Connelly	5/13/98
6. Reported results and facts checked against original sources.	Richard A. Connelly	5/13/98
7. Data presented in figures and tables correct and in agreement with text.	Richard A. Connelly	5/13/98
8. Results reviewed for compliance with study plan requirements.	Wayne McCulloch	5/18/98

	AUTHOR	DATE
9. Commentary reviewed and resolved.	Lynda A. Hartzell	6/17/98

10. All study plan and quality assurance/control requirements have been met and the report is approved:

Wayne McCulloch PROJECT MANAGER	5/18/98 DATE
Richard A. Connelly QUALITY CONTROL OFFICER	5/13/98 DATE
Virginia A. Lohr SENIOR TECHNICAL REVIEWER	6/16/98 DATE

APPENDIX F

BACKGROUND SCREENING CONCENTRATIONS FOR OPERABLE UNIT 3 REMEDIAL INVESTIGATION

Table F-1
Background Screening Concentrations for Operable Unit 3 Remedial Investigation

Sampling Event Report
Potential Source of Contamination 44
Naval Air Station
Jacksonville, Florida

Parameter	St Johns' Sediment (mg/kg)
Aluminum	1,239 5
Antimony	ND
Arsenic	ND
Barium	4.8
Beryllium	ND
Cadmium	ND
Calcium	1,914
Chromium	4.65
Cobalt	0 6
Cooper	1.8
Iron	1,644
Lead	6.7
Magnesium	353.8
Manganese	19.95
Mercury	ND
Nickel	ND
Potassium	122.8
Selenium	1.48
Silver	ND
Sodium	ND
Thallium	ND
Vanadium	3.65
Zinc	ND

Analytical data for the specific metal in the sampled media are all below the reporting limits.

Notes. mg/kg = milligrams per kilogram.
ND = not detected

APPENDIX G

CALCULATIONS OF RISK FROM CONTAMINATED SEDIMENT FOR POSSIBLE FUTURE RESIDENTS

TABLE G-1

DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SEDIMENT
ADULT RESIDENT
NAVAL AIR STATION JACKSONVILLE
PSC 44

08-Dec-98

Aug 1996

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
CONCENTRATION SEDIMENT	CS	chemical-specific	chemical-specific	
INGESTION RATE	IR	100	mg/day	USEPA, 1995
FRACTION INGESTED	FI	100%	unitless	Assumption
ADHERENCE FACTOR	AF	1	mg/cm²-event	USEPA, 1995
ABSORPTION FRACTION	ABS	chemical-specific	unitless	USEPA, 1992b
SURFACE AREA EXPOSED	SA	2,500	cm²	USEPA, 1992a (below knees)
DOSE ABSORBED PER EVENT	DA_{event}	chemical-specific	mg/cm²-event	USEPA, 1992a
CONVERSION FACTOR	CF	1.00E-09	kg/ug	Organic conversion
CONVERSION FACTOR	CF	1.00E-06	kg/mg	Inorganic conversion
BODY WEIGHT	BW	70	kg	USEPA, 1991
EXPOSURE FREQUENCY	EF	50	days/year [1]	Assumption
EXPOSURE DURATION	ED	24	years	USEPA, 1991
AVERAGING TIME				
CANCER	AT	70	years	USEPA, 1991
NONCANCER	AT	24	years	USEPA, 1991

[1] Units for exposure frequency are events/year in the calculation of the dermally absorbed dose.

USEPA, 1991 Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors", OSWER Directive 9285.6-03.

USEPA, 1992a. Dermal Exposure Assessment: Principles and Applications; EPA/600/8-91/011B; January 1992.

USEPA, 1992b. USEPA Region IV Guidance Memorandum; February 10, 1992.

USEPA, 1995. Supplemental Guidance to RAGS : Region IV, Human Health Risk Assessment Bulletin No. 3.

EQUATIONS

CANCER RISK = INTAKE (mg/kg-day) x CANCER SLOPE FACTOR $(mg/kg\text{-}day)^{-1}$

HAZARD QUOTIENT = INTAKE (mg/kg-day) / REFERENCE DOSE (mg/kg-day)

$$\text{INTAKE-INGESTION} = \frac{CS \times IR \times FI \times CF \times EF \times ED}{BW \times AT \times 365\ days/yr}$$

$$\text{INTAKE-DERMAL} = \frac{(DA_{event} \times EF \times ED \times SA)}{BW \times AT \times 365\ days/yr}$$

Where:

$DA_{event} = CS \times AF \times ABS \times CF$

Note: For noncarcinogenic effects, AT = ED.

TABLE G-1

DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SEDIMENT
ADULT RESIDENT
NAVAL AIR STATION JACKSONVILLE
PSC 44

CARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SEDIMENT CONCENTRATION	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL CSF [1] (mg/kg-day)$^{-1}$	CANCER RISK INGESTION	DERMAL ABS [2]	INTAKE DERMAL (mg/kg-day)	DERMAL CSF [1, 3] (mg/kg-day)$^{-1}$	CANCER RISK DERMAL	TOTAL CANCER RISK
benzo(a)anthracene	o	10000	ug/kg	0 0E+00	7.3	0.0E+00	0.01	1.7E-07	8	1.3E-06	1.3E-06
benzo(a)pyrene	o	8500	ug/kg	0.0E+00	7 3	0.0E+00	0.01	1 4E-07	8	1.1E-06	1.1E-06
benzo(b)fluoranthene	o	14000	ug/kg	0.0E+00	7.3	0.0E+00	0.01	2 3E-07	8	1.9E-06	1.9E-06
indeno(1,2,3-cd)pyrene	o	2800	ug/kg	0.0E+00	7.3	0.0E+00	0.01	4 7E-08	8	3.8E-07	3.8E-07
arsenic	I	1.7	mg/kg	0.0E+00	1.5	0.0E+00	0.001	2 9E-09	1.5	4.3E-09	4.3E-09
					SUMMARY CANCER RISK	0E+00				5E-06	5E-06

[1] Relative potency factors have been applied to the CSFs for carcinogenic PAHs. Relative potency factors are derived in "Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons," USEPA, 1993
[2] USEPA Region IV guidance specifies absorption factors of 1% for organics and 0 1% for inorganics (February 10, 1992)
[3] Calculated from oral CSFs
NE = not evaluated

NONCARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SEDIMENT CONCENTRATION	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL RfD (mg/kg-day)	HAZARD QUOTIENT INGESTION	DERMAL ABS [1]	INTAKE DERMAL (mg/kg-day)	DERMAL RfD [2] (mg/kg-day)	HAZARD QUOTIENT DERMAL	TOTAL HAZARD QUOTIENT
benzo(a)anthracene	o	10000	ug/kg	0.0E+00	ND		0.01	4 9E-07	ND		
benzo(a)pyrene	o	8500	ug/kg	0.0E+00	ND		0.01	4 2E-07	ND		
benzo(b)fluoranthene	o	14000	ug/kg	0.0E+00	ND		0.01	6 8E-07	ND		
indeno(1,2,3-cd)pyrene	o	2800	ug/kg	0 0E+00	ND		0.01	1 4E-07	ND		
arsenic	I	1.7	mg/kg	0 0E+00	0.0003	0.0E+00	0.001	8 3E-09	0.00029	2.9E-05	2.9E-05
					SUMMARY HAZARD INDEX	0E+00				3E-05	3E-05

[1] USEPA Region IV guidance specifies absorption factors of 1% for organics and 0 1% for inorganics (February 10, 1992)
[2] Calculated from oral RfDs
ND = no data available

TABLE G-2

DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SEDIMENT
CHILD RESIDENT
NAVAL AIR STATION JACKSONVILLE
PSC 44

08-Dec-98

Aug 1996

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
CONCENTRATION SEDIMENT	CS	chemical-specific	chemical-specific	
INGESTION RATE	IR	20	mg/day	USEPA, 1995
FRACTION INGESTED	FI	100%	unitless	Assumption
ADHERENCE FACTOR	AF	1	mg/cm^2-event	USEPA, 1995
ABSORPTION FRACTION	ABS	chemical-specific	unitless	USEPA, 1992b
AGE-WEIGHTED SURFACE AREA	$SA_{soil/adj}$	300	cm^2	[1] (below knees)
DOSE ABSORBED PER EVENT	DA_{event}	chemical-specific	mg/cm^2-event	USEPA, 1992a
CONVERSION FACTOR	CF	1 00E-09	kg/ug	Organic conversion
CONVERSION FACTOR	CF	1 00E-06	kg/mg	Inorganic conversion
BODY WEIGHT	BW	15	kg	USEPA, 1991
EXPOSURE FREQUENCY	EF	100	days/year [2]	Assumption
EXPOSURE DURATION	ED	2	years	USEPA, 1995
AVERAGING TIME				
CANCER	AT	70	years	USEPA, 1991
NONCANCER	AT	2	years	USEPA, 1995

[1] In estimating the dermally absorbed dose for children age 4 through 6, the time-weighted, bodyweight normalized surface area exposed is calculated from surface area, exposure duration, and body weight for each of 6 age periods, age 1 through 6, per USEPA, 1992

[2] Units for exposure frequency are events/year in the calculation of the dermally absorbed dose

USEPA, 1991 Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors", OSWER Directive 9285 6-03

USEPA, 1992a Dermal Exposure Assessment Principles and Applications, EPA/600/8-91/011B, January 1992

USEPA, 1992b USEPA Region IV Guidance Memorandum, February 10, 1992

USEPA, 1995 Supplemental Guidance to RAGS Region IV, Human Health Risk Assessment Bulletin No 3

EQUATIONS

CANCER RISK = INTAKE (mg/kg-day) x CANCER SLOPE FACTOR (mg/kg-day)$^{-1}$

HAZARD QUOTIENT = INTAKE (mg/kg-day) / REFERENCE DOSE (mg/kg-day)

$$\textbf{INTAKE-INGESTION} = \frac{\textbf{CS x IR x FI x CF x EF x ED}}{\textbf{BW x AT x 365 days/yr}}$$

INTAKE-DERMAL = (DAevent x EF/ AT x 365 days/year) x SAsoil/adj

Where:

$SA_{soil/adj}$ = SUM(SAi x EDi/BWi)

DA_{event} = CS x AF x ABS x CF

Note. For noncarcinogenic effects, AT = ED.

TABLE G-2

DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SEDIMENT
CHILD RESIDENT
NAVAL AIR STATION JACKSONVILLE
PSC 44

CARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC I/O	SEDIMENT CONCENTRATION	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL CSF [1] $(mg/kg\text{-}day)^{-1}$	CANCER RISK INGESTION	DERMAL ABS [2]	INTAKE DERMAL (mg/kg-day)	DERMAL CSF [1,3] $(mg/kg\text{-}day)^{-1}$	CANCER RISK DERMAL	TOTAL CANCER RISK
benzo(a)anthracene	o	10000	ug/kg	0.0E+00	7.3	0.0E+00	0.01	1.2E-07	8	9 4E-07	9.4E-07
benzo(a)pyrene	o	8500	ug/kg	0.0E+00	7.3	0.0E+00	0.01	1.0E-07	8	8 0E-07	8.0E-07
benzo(b)fluoranthene	o	14000	ug/kg	0.0E+00	7.3	0 0E+00	0.01	1 6E-07	8	1.3E-06	1.3E-06
indeno(1,2,3-cd)pyrene	o	2800	ug/kg	0.0E+00	7.3	0 0E+00	0.01	3 3E-08	8	2.6E-07	2 6E-07
arsenic	I	1.7	mg/kg	0 0E+00	1.5	0 0E+00	0.001	2 0E-09	1.5	3.0E-09	3.0E-09
					SUMMARY CANCER RISK	0E+00				3E-06	3E-06

[1] Relative potency factors were applied to the CSFs for carcinogenic PAHs Relative potency factors are derived in "Provisional Guidance for Quantitative Risk Assessment for Polycyclic Aromatic Hydrocarbons," USEPA, 1993
[2] USEPA Region IV guidance specifies absorption factors of 1% for organics and 0 1% for inorganics (February 10, 1992)
[3] Calculated from oral CSFs
NE = not evaluated

NONCARCINOGENIC EFFECTS

COMPOUND	INORGANIC OR ORGANIC	SEDIMENT CONCENTRATION	UNITS	INTAKE INGESTION (mg/kg-day)	ORAL RfD (mg/kg-day)	HAZARD QUOTIENT INGESTION	DERMAL ABS [1]	INTAKE DERMAL (mg/kg-day)	DERMAL RfD [2] (mg/kg-day)	HAZARD QUOTIENT DERMAL	TOTAL HAZARD QUOTIENT
benzo(a)anthracene	o	10000	ug/kg	0.0E+00	ND		0.01	4 1E-06	ND		
benzo(a)pyrene	o	8500	ug/kg	0.0E+00	ND		0.01	3.5E-06	ND		
benzo(b)fluoranthene	o	14000	ug/kg	0.0E+00	ND		0.01	5.8E-06	ND		
indeno(1,2,3-cd)pyrene	o	2800	ug/kg	0.0E+00	ND		0.01	1.2E-06	ND		
arsenic	I	1 7	mg/kg	0.0E+00	0.0003	0.0E+00	0 001	7.0E-08	0 00029	2.4E-04	2.4E-04
					SUMMARY HAZARD INDEX	0E+00				2E-04	2E-04

[1] USEPA Region IV guidance specifies absorption factors of 1% for organics and 0 1% for inorganics (February 10, 1992)
[2] Calculated from oral RfDs
ND = no data available