N00204.AR.004481
NAS PENSACOLA
5090.3a

FINAL REMEDIAL INVESTIGATION REPORT ADDENDUM FOR SITE 2 WATERFRONT SEDIMENTS NAS PENSACOLA FL

3/26/2004

ENSAFE

32501-002
03.07.02.0002

FINAL REMEDIAL INVESTIGATION REPORT ADDENDUM

SITE 2 WATERFRONT SEDIMENTS

NAVAL AIR STATION PENSACOLA, FLORIDA

Contract No. N62467-89-D-0318

Contract Task Order 059

Prepared for:

Department of the Navy
Southern Division
Naval Facilities Engineering Command
North Charleston, South Carolina

Prepared by:

EnSafe Inc.
5724 Summer Trees Drive
Memphis, Tennessee 38134
(901) 372-7962

March 26, 2004

Filing Instructions

The instructions below should be followed carefully to ensure that your Site 2 Final Remedial Investigation Report Addendum contains accurate and up-to-date information. The boldface headings on the left (e.g., Section Column) correspond to the tab sections in the RI report. Obsolete pages in the guide are listed in the column "Take Out Old Pages." New and replacement pages are listed in the column headed "Put In New Pages."

Keep the filing instructions sheet in the front of the RI report as a record of the changes.

If you have any problems with missing pages or other question regarding the filing of these correction pages, please call Allison Harris at (901) 372-7962.

Section	Take Out Old Pages	Put In New Pages
Cover	Cover	Cover
Filing Instructions	New Addition	New Addition
Comments and Responses	New Addition	Inside Cover
Table of Contents	i-iii	i-iii
Executive Summary	vi-vii	vi-vii
Section 1	1-4	1-4
Section 2	2-1	2-1
Section 2	2-3	2-3
Section 3	3-32	3-32
Section 3	3-35	3-35
Section 3	Figure 3-21	Figure 3-21
Section 4	4-15 through 4-35	4-15 through 4-63
Section 5	5-1 and 5-2	5-1 and 5-2
Section 6	6-3	6-3
Appendix G	New Addition	New Addition

Table of Contents

1.0 INTRODUCTION 1-1
1.1 Site History and Previous Investigations 1-1
1.2 Scope of the 2000 Sediment Investigation 1-11

2.0 FIELD INVESTIGATION METHODS 2-1
2.1 Sampling Locations 2-1
2.1.1 Sample Collection 2-1
2.1.2 Chemical Analyses 2-4
2.1.3 AVS/SEM 2-5
2.2 Biological Analyses 2-6
2.2.1 Solid-Phase Toxicity Tests with the Amphipod, *Leptocheirus plumulosus* 2-7
2.2.2 Solid-Phase Toxicity Tests with the Mysid, *Mysidopsis bahia* 2-8
2.2.3 USEPA Sediment Toxicity Criteria 2-9
2.2.4 Benthic Infaunal Communities Analyses 2-9
2.2.5 Sediment Quality Triad 2-10

3.0 SAMPLING RESULTS 3-1
3.1 Results of Chemical Analyses 3-1
3.1.1 Sediment Reference Concentrations 3-1
3.1.2 Surface Sediment 3-3
3.1.3 Subsurface Sediment 3-13
3.1.4 Summary of Detections with HQs >1 3-24
3.1.5 AVS/SEM Results in Surface Sediment 3-28
3.1.6 TOC in Surface Sediment 3-29
3.1.7 Physical Composition of Sediments 3-30
3.2 Results of Biological Analyses 3-32
3.2.1 Negative Control Sediment: C-17 3-32
3.2.2 Solid-Phase Amphipod Test Results 3-32
3.2.3 Solid-Phase Mysid Test Results 3-36
3.2.4 Benthic Community Analysis Results 3-38
3.2.5 Benthic Diversity Results by Station 3-40

4.0 SEDIMENT QUALITY TRIAD INTERPRETATION 4-1
4.1 Surface Sediment Chemistry Evaluation 4-2
4.1.1 Methods 4-2
4.1.2 Application to Sediment Chemistry Results 4-3
4.2 Toxicity Test Evaluation 4-8
4.2.1 Methods 4-8
4.2.2 Application to Toxicity Test Results 4-10
4.2.3 Input into Triad Matrix 4-12
4.3 Benthic Assessment 4-12
4.4 Surface Sediment Findings 4-15
4.5 Subsurface Sediment Findings 4-26
4.6 Weight of Evidence 4-29
4.7 Protective Concentration Development 4-33

5.0 CONCLUSIONS 5-1

6.0 REFERENCES 6-1

7.0 FLORIDA PROFESSIONAL GEOLOGIST SEAL 7-1

List of Figures

Figure 1-1 Site Location and Reference Stations 1-2
Figure 1-2 Aerial View of Site 2 and Vicinity 1-3
Figure 1-3 1996 Phase IIB Sampling Locations 1-5
Figure 2-1 Decision Units for the 2000 Samples 2-2
Figure 3-1 Arsenic in Surface Sediment 3-4
Figure 3-2 Cadmium in Surface Sediment 3-5
Figure 3-3 Copper in Surface Sediment 3-6
Figure 3-4 Lead in Surface Sediment 3-7
Figure 3-5 Chromium in Surface Sediment 3-9
Figure 3-6 Mercury in Surface Sediment 3-10
Figure 3-7 Zinc in Surface Sediment 3-11
Figure 3-8 PCBs in Surface Sediment 3-12
Figure 3-9 Total PAHs in Surface Sediment 3-14
Figure 3-10 BEHP in Surface Sediment 3-15
Figure 3-11 Arsenic in Subsurface Sediment 3-16
Figure 3-12 Mercury in Subsurface Sediment 3-17
Figure 3-13 Copper in Subsurface Sediment 3-18
Figure 3-14 Lead in Subsurface Sediment 3-19
Figure 3-15 Cadmium in Subsurface Sediment 3-20
Figure 3-18 BHC in Subsurface Sediment 3-25
Figure 3-19 Total PAHs in Subsurface Sediment 3-26
Figure 3-20 *Leptocheirus* Toxicity Test Results 3-33
Figure 3-21 *Mysidopsis* Toxicity Test Results 3-37
Figure 3-22 Number of Taxa Represented by Phylum in 2000 3-41
Figure 4-1 Decision Flow for Each Decision Unit 4-39
Figure 4-2 Simplified Decision Flow for Each Decision Unit 4-40
Figure 4-3 Concentration of Arsenic in Surface Sediment by Station 4-41
Figure 4-4 Concentration of Cadmium in Surface Sediment by Station 4-42
Figure 4-5 Concentration of Chromium in Surface Sediment by Station 4-43
Figure 4-6 Concentration of Copper in Surface Sediment by Station 4-44
Figure 4-7 Concentration of Lead in Surface Sediment by Station 4-45
Figure 4-8 Concentration of Nickel in Surface Sediment by Station 4-46
Figure 4-9 Concentration of Silver in Surface Sediment by Station 4-47
Figure 4-10 Concentration of Mercury in Surface Sediment by Station 4-48
Figure 4-11 Concentration of Zinc in Surface Sediment by Station 4-49
Figure 4-12 Concentration of Total PAHs in Surface Sediment by Station 4-50
Figure 4-13 Concentration of Total PCBs in Surface Sediment by Station 4-51
Figure 4-14 Leptocheirus Survival Results and Mean ERM Quotients by Station 4-52
Figure 4-15 Leptocheirus Growth and Mean ERM Quotients by Station 4-53

Figure 4-16 Compare Mean ERM Quotients of Surface and Subsurface Sediments 4-54
Figure 4-17 Condition Summary 4-55
Figure 4-18 Leptocheirus Survival, Surface Sediment Correlations 4-56
Figure 4-19 Leptocheirus Growth, Surface Sediment Correlations 4-57
Figure 4-20 Mysid Survival, Surface Sediment Correlations 4-58
Figure 4-21 Mysid Growth, Surface Sediment Correlations 4-59
Figure 4-22 Mysid Fecundity, Surface Sediment Correlations 4-60
Figure 4-23 Benthic Diversity, Surface Sediment Correlation 4-61
Figure 4-24 Evenness, Surface Sediment Correlations 4-62
Figure 4-25 Surface Sediment Correlations 4-63

List of Tables

Table 1-1 Analytical Chemistry Results 1996 Site 2 Investigation 1-6
Table 1-2 Sediment Chronic Toxicity Effects Summary for Mysid and Sheepshead Minnow 1996 Site 2 Investigation 1-7
Table 1-3 Benthic Macroinvertebrate Community Parameters 1996 Site 2 Investigation 1-9
Table 1-4 Ecological Effects Assessment Matrix 1996 Site 2 Investigation 1-10
Table 2-1 Site 2 Field Observations 2-5
Table 3-1 Surface Sediment Chemistry 3-2
Table 3-2 Subsurface Sediment Chemistry 3-23
Table 3-3 Site 2 Detections with HQs Greater Than 1 3-27
Table 3-4 AVS/SEM Results for Sediments 3-28
Table 3-5 TOC Estimated From < 2mm Total Organic Material Content in Surface Sediment 3-29
Table 3-6 Physical Composition of Surface Sediments 3-30
Table 3-7 Physical Composition of Subsurface Sediments 3-31
Table 3-8 *Leptocheirus plumulosus* 10-Day Sediment Bioassays 3-34
Table 3-9 *Mysidopsis bahia* 7-Day Sediment Chronic Bioassays 3-35
Table 3-10 Benthic Community Data 3-39
Table 4-1 Project Decision-Making Triad Matrix 4-2
Table 4-2 Chemical Characteristics Relative to Sediment Guidelines 4-4
Table 4-3 Surface Sediment ERL Quotients 4-5
Table 4-4 Surface Sediment ERM Quotients and Mean ERM Quotients 4-6
Table 4-5 Comparison of Mean ERM Quotients and Mean PEL Quotients 4-7
Table 4-6 Toxicity Test Results Input into Matrix 4-13
Table 4-7 Benthic Assessment and Input into the Sediment Quality Triad 4-15
Table 4-8 Surface Sediment Summary as Applied to the Triad 4-16
Table 4-9 Subsurface Sediment ERL Quotients 4-27
Table 4-10 Subsurface Sediment ERM Quotients and Mean ERM Quotients 4-28
Table 4-11 Comparison of Surface and Subsurface ERL and ERM Exceedances 4-30
Table 4-12 Weight of Evidence Summary 4-31

List of Appendices

Appendix A	DQO Documents
Appendix B	Analytical Results
Appendix C	Negative Control Test Results
Appendix D	Toxicity Test Results
Appendix E	Taxonomic Results
Appendix F	TEL and PEL Comparisons and Mean PEL Quotients
Appendix G	Individual Contaminant Concentrations Compared to *Leptocheirus* Survival

LIST OF ABBREVIATIONS

ASTM	American Society for Testing and Materials
AVS/SEM	Acid Volatile Sulfides/Simultaneously Extracted Metals
BEHP	Bis(2-Ethylhexyl)phthalate
cm	Centimeter
CV	Coefficient of variance
DQO	Data Quality Objective
DU	Decision Unit
EMAP	Environmental Monitoring and Assessment Program
ERL	Effects Range Low
ERM	Effects Range Median
ESG	Equilibrium Partitioning Sediment Guideline
FDEP	Florida Department of Environmental Protection
FS	Feasibility Study
GBERL	Gulf Breeze Environmental Research Laboratory
HI	Hazard Index
HQ	Hazard Quotient
hrs	Hours
IC_{25}	Inhibition Concentration 25%
mg/kg	Milligram per kilogram
ml	Milliliter
mm	Millimeter
NADEP	Naval Aviation Depot
NAS	Naval Air Station
NOAA	National Oceanographic and Atmospheric Administration
NOEC	No Observed Effects Concentration
NS&T	National Status and Trends
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PEL	Probable Effects Level
ppt	Part per thousand
RI	Remedial Investigation
SAP	Sampling and Analysis Plan

SBV	Sediment benchmark level
SQAG	Sediment Quality Assessment Guideline
SQG	Sediment Quality Guideline
SQT	Sediment Quality Triad
SQiuRT	Screening Quick Reference Table
SSV	Sediment Screening Value
SVOC	Semivolatile Organic Compound
TAC	Test acceptability criteria
TEL	Threshold Effects Level
TOC	Total Organic Carbon
USEPA	United States Environmental Protection Agency
µg/kg	Microgram per kilogram
%	Percentage
^{o}C	Degree Celsius
>1	Greater than 1

EXECUTIVE SUMMARY

Site 2 (Operable Unit 3) at NAS Pensacola is the Waterfront Sediments Site. From 1939 to 1973, untreated industrial waste was routinely discharged into Pensacola Bay at Site 2. After 1973, the waste discharge was piped to and treated at the NAS Pensacola industrial wastewater treatment plant. Vessel operations at the pier and docking facilities in the immediate area, numerous outfalls (including storm water outfalls) lining the shore adjacent to Site 2 (Figure 2-1), and vessel traffic in the area may continue be a pathway for anthropogenic constituents.

This investigation's goal was to determine if chemical constituents at Site 2 — Waterfront Sediments — are currently creating adverse conditions for benthic communities. Three hurricanes had impacted the area since the 1996 sampling event. The investigation was designed and implemented using the Data Quality Objective Process. A total of 11 decision units (DUs), plus two offsite locations were selected for sampling. Sampling was conducted from March 7 to 10, 2000. Divers were used to increase sampling accuracy.

Sampling at each DU included composited surface sediment samples for chemistry analyses and discreet samples for toxicity and benthic diversity assessment. Discreet samples were also collected for subsurface chemistry analyses at selected DUs. Chemical analysis included metals, herbicides, organochlorine pesticides, and SVOCs. Analytical results were compared to conservative SBVs. Analyses also included AVS/SEM, and grain size. Bioassays included acute and chronic toxicity tests using *Leptocheirus plumulosus*, and *Mysidopsis bahia*. Benthic community analyses were evaluated using appropriate indices. Sediment chemistry, toxicity, and benthic diversity results were applied to the sediment quality triad (SQT) to determine site conditions.

Tools used to identify potential chemicals of concern included the SQGs (ERLs, ERMs, PELs, and TELs) and SEM/AVS. In some cases, these tools may draw attention to a particular station based on the individual scores or values. However, when evaluated under the weight of evidence approach, individual SQG scores are often considered false-positives. An example of a false-positive response during the Site 2 study occurred in the data for Stations GH-12 and GH-67. Sediment chemistry revealed no HQs > 1 for inorganics, yet SEM/AVS results indicated metals may

be bioavailable. Further evaluation confirmed that there are no biological problems at either of these stations.

Using the SQG tool at Site 2, no DUs fell into mean ERM Quotient Category 4, where acute and chronic bioassay effects would be expected and where benthic diversity would be very low, indicating impact. In addition, no DU was classified as Category 3 using the mean ERM Quotient method.

Biologically, benthic organisms are being recruited to the Site 2 area and do not appear to be impacted by the chemical constituents that were detected during the 2000 sampling event. The species diversity was greater at Site 2 than at the reference station. Evenness at Site 2 ranged from 0.75 to 0.9 which is similar to the range detected at the reference stations (0.76-0.87). Richness at the site ranged from 6.74 to 10.22 which exceeds the richness for the reference stations (4.53 to 6.84). Chemical constituents may be bound to the organic components in sediment at Site 2, which would explain their inability to affect the observed benthic community.

In applying the SQT to the eleven Site 2 DUs, surface sediments at six stations (55%) were determined to be Condition 2 (strong evidence for absence of pollution-induced degradation); three stations (27%) were assessed as Condition 3 (contaminants are not bioavailable); and two stations (18%) were ranked as Condition 6 (toxic chemicals are probably stressing the system). Though Stations EF-45 and CD-23 were determined to be Condition 6, the DUs were found to have high benthic diversity, evenness, and richness indices; a marginal response in the infaunal amphipod toxicity test for survival (73% for EF-45 and 78% for CD-23); and no observed effects with the epibenthic mysid for survival, growth, or fecundity. Both EF-45 and CD-23 outperformed the reference stations for the sublethal growth endpoint in the amphipod test.

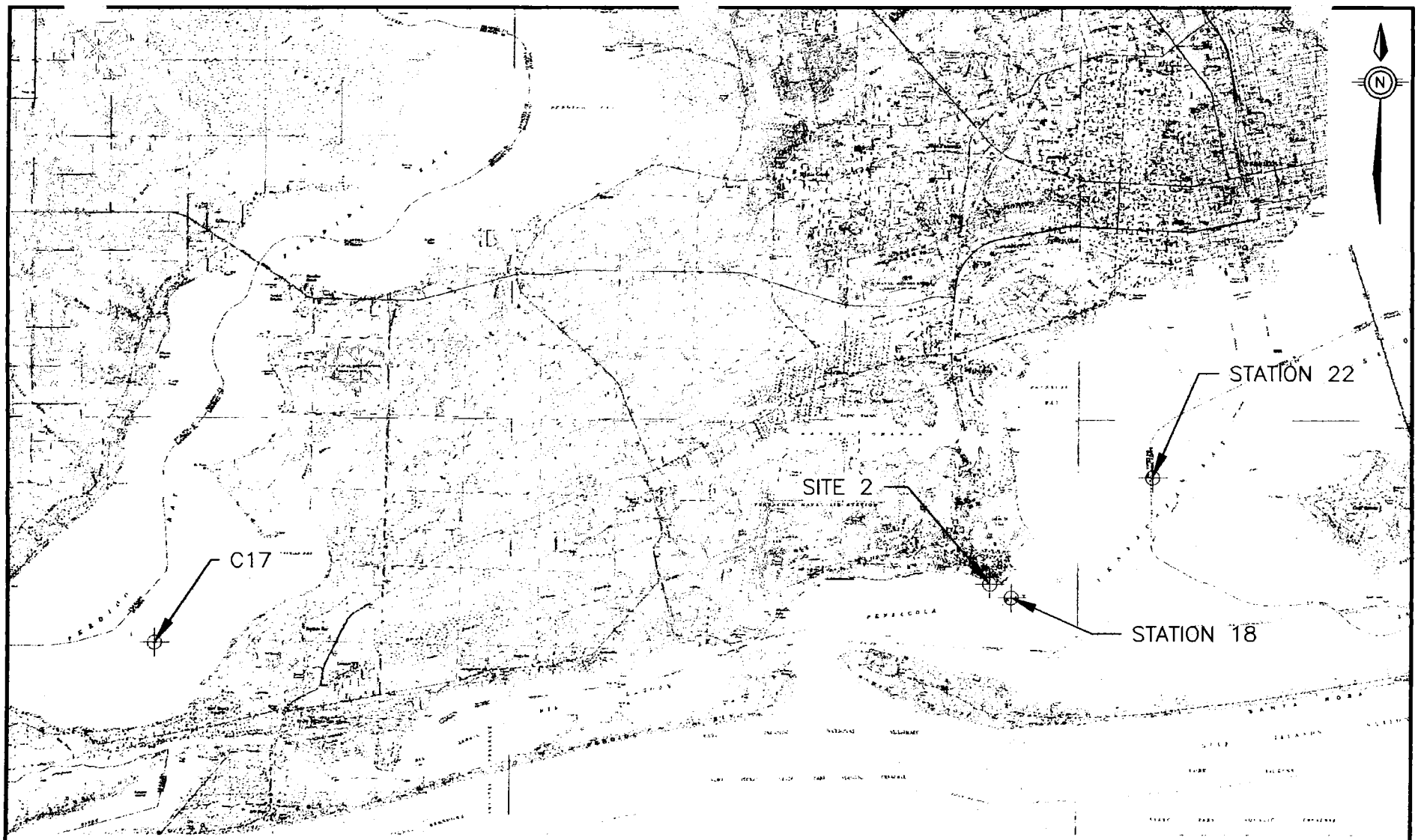
The goal of this study was to answer the following question: are chemical constituents in Site 2 sediments creating a condition adverse to benthic communities? Except for CD-23 and EF-45, sediments at Site 2 are no longer creating adverse conditions to benthic communities. Therefore, the multiple lines of evidence gathered during the investigation of Site 2 concluded that the area is recovering from past Naval Base activities.

1.0 INTRODUCTION

1.1 Site History and Previous Investigations

Site 2 (Operable Unit 3) at Naval Air Station (NAS) Pensacola is the Waterfront Sediments Site, and is associated with activities previously conducted at Buildings 71 and 604 (Site 38). Past activities at Building 71 included aircraft painting, paint stripping, and metal refinishing between 1935 and the late 1970s. From 1980 to 1989, the facility stored hazardous waste. Building 604 housed a metal plating shop for the Naval Aviation Depot (NADEP) from approximately 1960 to the spring of 1996. From 1939 to 1973, untreated industrial waste was routinely discharged into Pensacola Bay. From 1973, the waste discharge from Building 604 was piped to and treated at the NAS Pensacola industrial wastewater treatment plant. Other potential impacts may have occurred from vessel operations at the pier and docking facilities in the immediate area. Additionally, because of transport mechanisms characteristic of open bay systems such as Pensacola Bay, offsite sources may have impacted the site. Figure 1-1 is a map showing the Site 2 location relative to the major water bodies in the Pensacola area. Figure 1-2 presents a 1993 aerial photograph depicting Site 2, Site 38, and adjacent areas. Many buildings in the 1993 photograph were demolished shortly after the photograph was taken. Prior to the Site 2 remedial investigation (RI), several investigations were performed within the area of concern, including studies performed in 1983, 1984, and 1986. Results from these were generally inconclusive, though in some cases, contaminants were detected.

EnSafe's investigation began 1993, commensurate with RI activities at other sites at NAS Pensacola. The initial sampling event (Phase I) was conducted from July 28 to August 31, 1993 to determine total organic carbon (TOC) and grain-size distributions in sediments across the site. The Phase II contaminant assessment sampling event took place at Site 2 from November 31 to December 9, 1993. During this portion of the investigation, sediment and surface water chemistry samples were collected.



SOURCE:
FORT BARRANCAS, GULF BREEZE, PERDIDO BAY,
PENSACOLA, WEST PENSACOLA, AND LILLIAN QUADRANGLES
FLORIDA–ESCAMBIA CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

REFERENCE STATIONS:
STATION 18
STATION 22
C17

Naval Facilities Engineering Command • Southern Division •

REMEDIAL INVESTIGATION
REPORT ADDENDUM
SITE 2
NAS PENSACOLA

FIGURE 1–1
SITE LOCATION
AND REFERENCE STATIONS

DWG DATE: 02/25/03 | NAME: 0059001W016

250 0 250

SCALE FEET

LEGEND

PHOTO DATE: 08/25/93

71 – BUILDING NUMBER

Naval Facilities Engineering Command • Southern Division •

REMEDIAL INVESTIGATION
REPORT ADDENDUM
SITE 2
NAS PENSACOLA

FIGURE 1–2
AERIAL PHOTOGRAPH
SITE 2 AND VICINITY

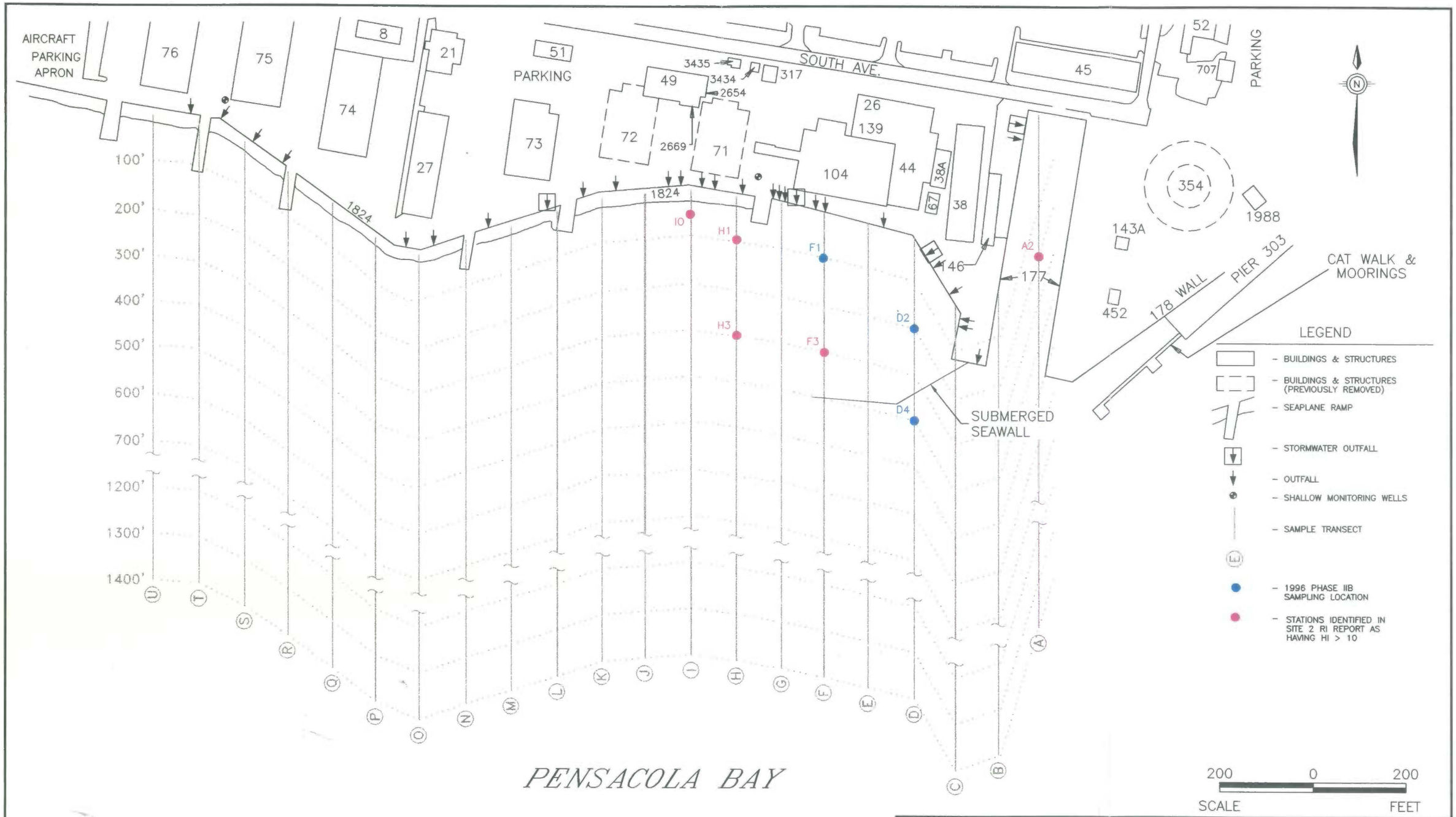
DWG DATE: 02/26/03 | NAME: 0059001G002

During Phase IIA, contaminants and locations were identified for additional investigation in Phase IIB. The areas identified during Phase IIA were resampled for chemical analysis during Phase IIB. Table 1-1 summarizes concentrations for the major constituents identified across the site during Phase IIB and Figure 1-3 presents the sampling locations.

In general, metals and semivolatile organic compounds (SVOCs) were the predominant contaminants detected. Contaminant concentrations during this phase of the investigation were similar to those identified during Phase IIA. To make a relative comparison of contamination identified at each station during the two phases of investigation, hazard quotients (HQs) were produced for constituents with USEPA Region IV Sediment Screening Values (SSV) (November 1995). HQs are produced by dividing the detected concentration by the SSV for that constituent. At each station, HQ values were summed to produce an overall hazard index (HI). Metals were the primary contaminants of concern as in Phase IIA, followed by the semivolatile organic compound, bis-2(ethyl)hexylphalate (BEHP). Polynuclear aromatic hydrocarbons (PAHs) were moderately elevated across the site, but pesticides or polychlorinated biphenyls (PCBs) did not appear to be a concern. Of the 10 stations, the highest contaminant concentrations were present at Stations A2, F3, H1, H3, and I0.

Sediment Toxicity

The Phase IIB results for the sediment chronic toxicity test results for mysid shrimp and sheepshead minnow are summarized in Table 1-2. Significant effects (95% confidence level) to mysid shrimp survival (reciprocal of mortality) were observed at Stations F1, F3, H1, H3, and I0, compared to control tests. For sheepshead minnow, survivability was significantly different from control only at Station H3. Growth effects for minnows were significantly different from control at Stations F3, H1, H3, I0, Q2, and U2.



REMEDIAL INVESTIGATION
REPORT ADDENDUM
SITE 2
NAS-PENSACOLA
PENSACOLA, FLORIDA

FIGURE 1-3
1996 SAMPLING LOCATIONS

DWG DATE:01/27/03 | NAME: 0059001W042

Table 1-1
Analytical Chemistry Results
1996 Site 2 Investigation

Compound	Range N=10	Mean	Reference Site	Screening Level (SSV or FLSQAG)	Number of Detects >SL
Arsenic	.38 - 18.9	7.74	.29	7.24	5
Cadmium	.15 - 3.2	0.70	ND	0.68	3
Chromium	2.0 - 106	34.2	.9	52.3	2
Copper	1.1 - 560	72.6	1.1	18.7	5
Lead	2.1 - 467	92.1	0.7	30.2	8
Mercury	.1 - .5	.23	ND	.13	6
Nickel	0.71 - 13.1	5.51	ND	15.9	0
Selenium	.8 - 1.4	1.1	ND	NA	NA
Vanadium	.82 - 39.1	16.2	1.4	NA	NA
Zinc	4.1 - 148	68.4	1.4	124	1
BEHP	84 - 5500	94.2	97	182	7
tDDT	3.5	3.5	ND	3.3	1
tPAHs	ND - 12,147	2198	ND	1684	3

Notes:
1 = Metals in mg/kg; organics in µg/kg.
SSV = USEPA Region IV Draft Sediment Screening Value
FLSQAG = Florida Sediment Quality Assessment Guidelines

Table 1-2
Sediment Chronic Toxicity Effects Summary for Mysid and Sheepshead Minnow
1996 Site 2 Investigation

	Site H20 Test												
Endpoint	**I**	**II**	**A2**	**D2**	**D4**	**F1**	**F3**	**H1**	**H3**	**I0**	**Q2**	**U2**	**X1**
Mysid Shrimp													
Survival						*	*	*	*	*			
Growth													
Reproduction													
Sheepshead Minnow													
Survival									*				
Growth		*	*				*	*	*	*	*	*	

Notes:
* = Significantly different from control sediment at 95% confidence level.
Water Test II was associated with Stations A2, F3, H1, H3, I0, Q2, and U2.

Benthic Community

The Phase IIB results for the benthic community indices determined for the 10 stations across Site 2 and a reference station are presented in Table 1-3. In addition, benthic community indices reported by Florida Department of Environmental Protection (FDEP) from four stations across Pensacola Bay are provided for comparison. Diversity values at Site 2 were generally lower than historical data from Pensacola Bay, but were comparable to the reference station (X1). Mean densities of individuals were higher at stations with lower evenness values. These higher densities were a result of higher numbers of polychaetes.

Risk Evaluation

To compile and evaluate the information collected from the components of this assessment, an ecological effects matrix was created (Table 1-4). This matrix evaluation presents a weight-of-evidence approach for the observable effects detected within the study results.

Results from analysis of the three components of the study indicated that sediment type was not an important criteria for observed benthic community fluctuations or contaminant concentrations observed. Instead, the level of contamination was actually a more reliable indicator of benthic species composition. Evaluation of the level at which contaminant concentrations significantly alter benthic assemblages was, in fact, one of the study's objectives. Use of the HI approach (USEPA, 1989) suggests that a moderate risk to receptors may occur when HQ values (or a cumulative HI value) exceed 1. A first attempt to correlate contamination at this level with observed benthic community changes and significant effects data from toxicological tests was unsuccessful. The next order of magnitude, 10, was selected; United States Environmental Protection Agency (USEPA) suggests that levels above 10 may indicate a moderately high potential risk in a screening assessment. At an HI of 10, changes to the benthic assemblage at Site 2 appeared distinguishable.

Table 1-3
Benthic Macroinvertebrate Community Parameters
1996 Site 2 Investigation

Stations	A2	D2	D4	F1	F3	H1	H3	I0	Q2	U2	X1	PB-1	PB-2	PB-3	PB-4
Species Diversity[a]	2.2	3.2	2.4	2.1	2.2	2.0	2.2	1.7	2.9	1.9	2.4	3.0	3.6	3.6	3.7
Evenness[b]	0.70	0.88	0.68	0.68	0.67	0.59	0.68	0.50	0.84	0.98	0.69				
Richness[c]	5.12	7.95	6.75	4.28	5.16	5.52	4.91	5.19	5.94	2.89	5.71				
Total Taxa	25	38	36	21	26	31	27	31	32	7	31	12	24	16	29
Mean Density ($\#/m^2$)	1090	700	1790	1070	2540	2290	3980	6500	3680	80	1920				
% Polychaeta	69.7	43.8	33.0	27.1	62.0	67.3	61.3	79.7	48.9	12.5	40.9	29.8	14.1	51.1	48.1
% S. *benedicti* *C. capitata* & *Mediomastus sp.*	48.6	25.7	16.2	7.5	53.5	53.5	52.7	68.5	11.4	0.1	10.4				

Notes:
a = Shannon Weiner Diversity Index (H')
b = Pielou's Evenness Index (J')
c = Margelef's Richness Index (D)
PB1-PB4 = Pensacola Bay Reference Sites from FDEP

Table 1-4
Ecological Effects Assessment Matrix
1996 Site 2 Investigation

Variable	A2	D2	D4	F1	F3	H1	H3	I0	Q2	U2
Total H1 > 10	*				*	*	*	*		
Metals H1 > 10	*						*	*		
Organics H1 > 10								*		
BEHP H1 > 10								*		
< mean Diversity Index	*			*	*	*	*	*		*
> mean % Polychaeta	*					*		*		
> 40% Indicator Species	*				*	*	*	*		
Mysid Toxicity				*	*	*	*	*		
Fish Toxicity	*				*	*	*	*	*	*

Note:
* = Indicates a positive response to selected variable.

A review of the matrix produced indicates that, stations with HIs above 10 (A2, F3, H1, H3, and I0) generally exhibited changes to the benthic assemblage relative to what might be expected (i.e, relatively higher percentage of polychaetes and/or indicator species abundance greater than 40 %). Also, at these same stations, toxicity to both shrimp and fish was indicated. Station I0 met all of the criteria provided in the matrix, suggesting that it may be the most impacted station investigated.

Based on the findings summarized above and detailed in the *Remedial Investigation Report* (EnSafe 1996), a feasibility study (FS) report was completed. The FS evaluated four alternatives (no action, monitoring, capping, and dredging with offsite disposal) for the site. Concurrence on the FS report was received on December 22, 1997, from the FDEP. The proposed plan was issued stating monitoring was the preferred alternative and a public comment period was held from

December 8, 1997, to January 22, 1998. Only one comment was submitted by a community member. The comment suggested that the Navy should do a remedial action or do nothing at the site instead of monitoring. After deliberation on the comment, the USEPA, FDEP, NOAA, and the Navy agreed to assess the current condition of Site 2 because three hurricanes (Erin, Opal, and Georges) had affected the area in the five years following the original sampling event.

1.2 Scope of the 2000 Sediment Investigation

A surface and subsurface sediment study was conducted during March 2000. This study was designed and implemented using the Data Quality Objective (DQO) process. The DQO process is a systematic planning tool based on the scientific method for establishing data quality criteria and developing data collection designs. The process uses seven steps to keep the investigation focused on identifying and implementing the correct decision(s) for reaching a program's goal(s). By using the DQO process, a strategic planning approach, data collection, study design, and designating criteria are defined early in the process. This process encourages data collection planning and highlights possible data gaps which might otherwise be overlooked until the analysis portion of the study is complete. The DQO process steps are highlighted and applied in the approved EnSafe Sampling and Analysis Plan (F) provided in Appendix A.

Since five years had passed from the time of the last data collection and three named hurricanes (Erin, Opal, and Georges) had affected the area, the following problem statement was developed: Are chemicals in the Site 2 sediments creating a condition adverse to benthic communities? If so, is remedial action warranted? A sampling approach was developed which would use multiple lines of evidence to answer the problem statement with the Site 2 surface or subsurface sediments.

Section 2 presents the field investigation methods. Section 3 presents the sampling results and Section 4 presents the data interpretation. Section 5 summarizes the conclusions. Analytical data and other information related to Site 2 are presented in the appendices of this report.

Site 2 Waterfront Sediments
Naval Air Station Pensacola, Florida

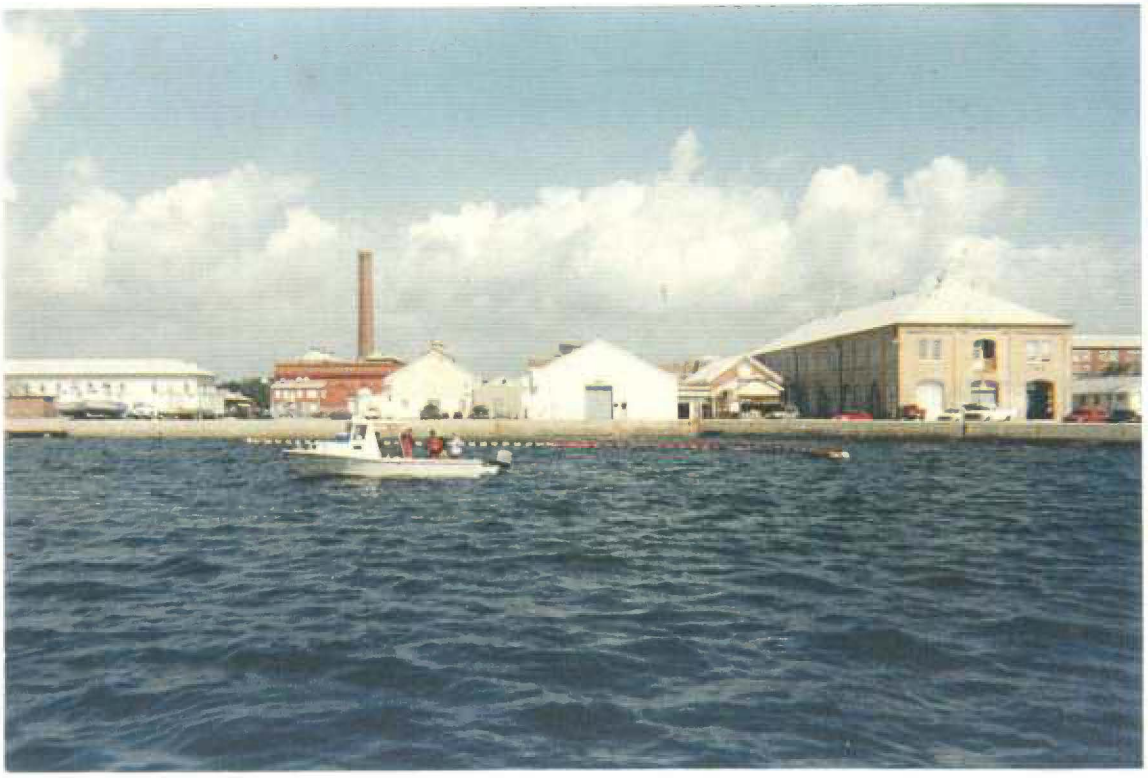


Photo 1: Looking north at the dive boat anchored in front of an oil screen.

Site 2 Waterfront Sediments
Naval Air Station Pensacola, Florida

Photo 2: EPA diver after sample collection.

Photo 3: Ejecting one of the 36" Agechi samples for the EF-23 location.

Site 2 Waterfront Sediments
Naval Air Station Pensacola, Florida

Photo 4: Stainless-steel coring tubes (w/bags tied on) used to collect the species diversity samples.

Photo 5: Sieving the species diversity sample at reference location 18.

Site 2 Waterfront Sediments
Naval Air Station Pensacola, Florida

Photo 6: An eastward view of the visible portion of the sea wall at Port Ops.

Photo 7: A southeastward view of the sea wall to include a portion of the bay where the extended sea wall is submerged.

2.0 FIELD INVESTIGATION METHODS

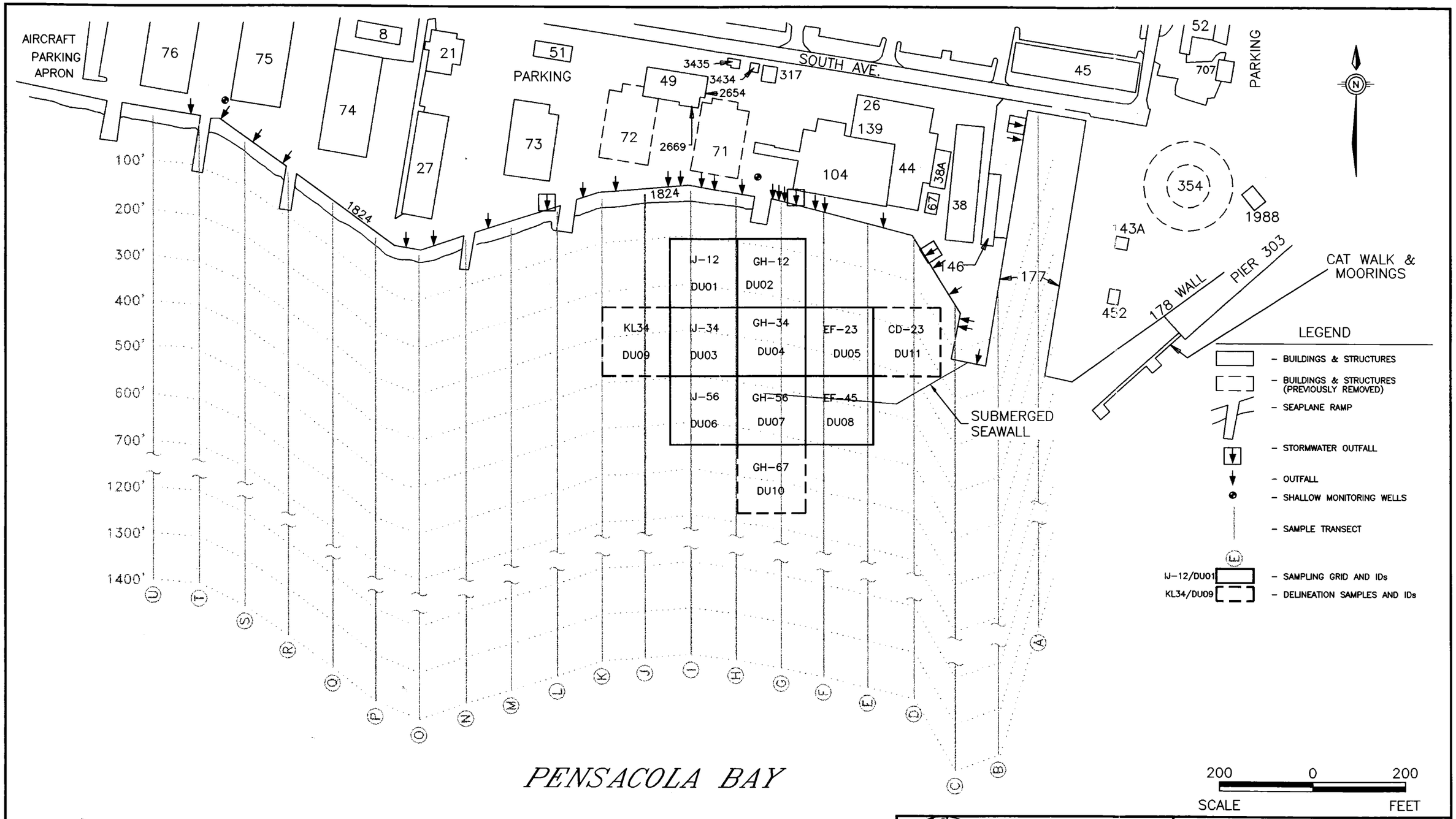
2.1 Sampling Locations

Based on the 1996 RI report, five areas with a HI greater than 10 appeared to be localized as a result of a rotational flow pattern, as evidenced by the siltation and flow patterns outlined in the report. Location A2 was excluded from this investigation using the rationale presented in Appendix A. The area is approximately bounded by grid nodes F0, F4, L4, and L0 according to the transect system established for the RI. For the current study, the area was divided into eleven decision units (DUs). Eight of these DUs were located within the area sampled during the Site 2 RI. Three were placed outside the central area (to the east, west, and south) for the delineation of extent. An additional two locations offsite, thought to contain similar physical characteristics, were identified and sampled to obtain reference information. The three DUs for delineation were placed outside the central area. Figure 2-1 depicts the DUs for the 2000 sampling effort. Photo 1, presented at the end of this section, shows the Site 2 area. The offsite reference locations were previously shown on Figure 1-1.

The offsite reference locations, USEPA Pensacola Bay Stations 18 and 22, were selected as the reference stations for Site 2 based on similar sand (%) components, high amphipod survival rates when exposed to sediments for 10 days, and healthy benthic indices in past USEPA studies (1992 and 1996). The average depth of Station 18 is twice that expected at Site 2, but fauna in a shallow bay system such as Pensacola Bay would be similar, and that sand, silt and clay content are the factors that drive habitat recruitment , not depth (Appendix A).

2.1.1 Sample Collection

As described in the SAP (Appendix A), sampling at each DU included collection of a 36" sediment core, a series of composited sediment samples from the upper 6", and three discrete 4" x 6" benthic core tubes for species diversity. The sediment collection at each DU occurred in the following order: species diversity first, sediment chemistry and sediment toxicity composites second, and the sediment core last. The intent of the sampling was to collect surface (0"- 6") and subsurface (6"-36") sediments at each location to identify the vertical and horizontal extent of contamination. Sample collection techniques are described in the *Final Report,*



REMEDIAL INVESTIGATION
REPORT ADDENDUM
SITE 2
NAS-PENSACOLA
PENSACOLA, FLORIDA

FIGURE 2-1
DECISION UNITS FOR THE
2000 SAMPLING EVENT

DWG DATE:02/28/03 | NAME: 0059001W044

Pensacola Naval Air Station, Sediment Survey, Operable Unit 3 (USEPA, 2001) and are briefly described below. Divers were used to increase the accuracy of the sample collection (Photo 2). To ensure comparability among stations between the 1996 and 2000 sampling events, all sampling stations were based on the transect system originally established for the site. Each DU is a 150' x 150' square. The eight DUs covering the central area began at the seawall adjacent to the location of former Building 71 and extended offshore to the south and east. The three DUs for extent delineation were placed outside the central area (see Figure 2-1).

Surface sediment samples for chemistry and toxicity testing were collected using decontaminated 4" x 6" stainless-steel core tubes. Cores were collected from each DU as described in the *Final Report, Pensacola Naval Air Station, Sediment Survey, Operable Unit 3* (USEPA, 2001). The samples were composited and homogenized in a stainless steel bucket with a stainless-steel spoon. Samples for chemical analyses were placed in glass containers cleaned to USEPA protocols. Samples for toxicity testing were placed in precleaned high-density polyethylene containers. All samples were thermally preserved until delivery to the laboratory.

Subsurface sediment samples for chemistry were discrete samples (Photo 3) collected as described in the *Final Report, Pensacola Naval Air Station, Sediment Survey, Operable Unit 3* (USEPA, 2001). The subsurface sample interval was not completed at five stations (Stations GH-12, IJ-56, GH-56, EF-45, and GH-67) because the core-sampler could not be advanced past the surficial hard-packed sand at these locations. In addition, pesticides/PCBs and SVOCs were not analyzed in the subsurface sediment at Station IJ-12 because of lack of sample volume. As with surface sediment samples, subsurface samples were placed in appropriate containers and thermally preserved until delivery to the laboratory.

Undisturbed samples were collected separately for benthic community structure analysis using a stainless steel 4" x 6" coring tube (Photo 4). These samples were placed into thick cotton bags and sealed to prevent losing organisms in the water column upon the diver's ascent. Three replicates were collected at each DU, from the northeast corner, center, and southwest corner of the 150' x 150' grid. Because the stations were adjacent to each other,

benthic community samples were shared between stations GH-12 and IJ-34, GH-34, and IJ-56, and CD-23 and EF-45.

The benthic samples were sieved upon receipt from the divers using a 0.5 millimeter (mm) stainless-steel sieve (Photo 5). Organisms caught on the sieve were transferred to labeled Tyvek bags which were stored in a 10 percent (%) buffered formalin solution.

All stations, except for the two reference stations (Stations 18 and 22 on Figure 1-2), were at water depths of less than 20 feet. Stations 18 and 22 were at depths of less than 30 feet. Table 2-1 presents field observations noted at each station by the divers. Of note, the divers noted the existence of an underwater seawall roughly 600 feet long with 6 to 8 feet exposed on the seaward side, and 3 to 4 feet exposed on the leeward side (Photos 6 and 7).

The difference in height is to be the result of the scouring effect which occurs daily with the incoming and outgoing tides. The sediments on the seaward side of the wall appeared to be coarser heavier sands, with finer silty materials trapped behind the wall. This submerged seawall is not visible from shore or a boat, and is roughly 6 to 8 feet underwater at the location shown in Figure 2-1.

2.1.2 Chemical Analyses

The samples for chemical analyses were analyzed by a USEPA Region IV contract laboratory. Chemical analyses included metals, acid volatile sulfide/simultaneously extracted metals (AVS/SEM), herbicides, organochlorine pesticides, SVOCs, PCBs, and ammonia. Additional analysis included grain size. The SAP outlined that the sediment samples would also be analyzed for total organic carbon. Instead, the samples were analyzed for organic and non-organic % for material greater than 2 mm in size and less than 2 mm in size. Analytical results are presented in Appendix B.

2.1.3 AVS/SEM

AVS is an important sediment property in determining the bioavailability of organic compounds and certain trace metals in sediments. The factor plays an important role in the equilibrium partitioning approach (Power, E.A., et al., 1992). The equilibrium partitioning approach assumes that the molar ratio of simultaneously extracted metals to acid volatile sulfide (SEM:AVS) can be used as a theoretical measure (a predictive model) of bioavailability for five divalent metals (cadmium, copper, nickel, lead, and zinc) which are correlated to pore water rather than to sediment concentrations (USEPA 1991a). The AVS/SEM theory predicts that at ratios less than 1.0, AVS in pore water will bind all five divalent metals (USEPA 2001).

Table 2-1
Site 2 Field Observations

Station	Sediment Observations	Diver Observations	Organisms Present
IJ-12	grainy at the surface, silty at the bottom, oil sheen visible when sediments were brought to the surface, shell fragments	white and grey paint chips present throughout the site	submerged aquatic vegetation, glass eels
GH-12	hard, rocky material present throughout the samples, wood chips present, silty and sandy sediments at this site	rocks, wood chips	glass eels, red worms
IJ-34	silty	cannon spotted	glass eels, worms
GH-34	silty	none	tube worms, tunicates observed
EF-23	silty	broken shells in the substrate	stingrays observed
IJ-56	southern samples were sandy, northern core was silty	none	lug worms, brittle stars
GH-56	silty, paint chips	paint chips present	glass eels
EF-45	dark silty sediment with shell fragments	submerged seawall noted in NE corner	hermit crabs
GH-67	grainy sand, shell fragments, little organic matter	none	amphioxis, ctenophores, and anemones
KL-34	silty, darker in color than previous stations	none	clams, glass eels
CD-23	silty on top and sandy underneath, shell and wood fragments	none	several worms with sand cone tubes
Reference Station 18	sandy, light brown in color with shell fragments	none	worms, assorted colors and sizes, jelly fish, submerged aquatic vegetation
Reference Station 22	mucky and silty, very little sand with shell fragments	none	few organisms visible at this station

sufficiently to reduce or eliminate bio-uptake and thus toxicity. At ratios greater than 1.0, insufficient AVS is present to bind all metal present in pore water, and toxicity may be expressed. Thus, AVS/SEM provides a tool to estimate bioavailability of trace metals in sediments. AVS/SEM samples were collected at each of the eleven stations in the study area and the two reference stations.

2.1.4 Application of Sediment Quality Guidelines to Site 2 Sediments

Numeric sediment quality guidelines (SQGs) have been derived for 34 of the most commonly encountered substances, including nine trace metals, 13 individual PAHs, three groups of PAHs, total PCBs, seven pesticides, and one phthalate ester (Long, E.R., 2000). For each substance, a threshold effects level (TEL) and a probable effects level (PEL) were used to define three ranges of chemical concentrations, including those that are (1) rarely, (2) occasionally, and (3) frequently associated with adverse effects.

An additional predictive tool used to assess sediment quality was developed by the National Status and Trends (NS&T) Program through data collected by National Oceanic and Atmospheric Administration (NOAA). NOAA developed SQGs to estimate concentrations below which effects were not likely for chemical constituents commonly found in coastal marine sediments. NOAA's SQGs are based on a database developed from numerous investigations in saltwater, arranged in ascending order, and focused on the 10th percentile "Effects Range-Low" (ERL) and the 50th percentile "Effects Range-Median" (ERM) values. Like the FDEP TELs, ERLs predict concentrations below which adverse effects rarely occur, and, conversely, the ERMs (like the PELs) represent concentrations above which effects frequently occur (MacDonald 1994). The ERLs and ERMs, like the PELs and TELs, are based on the same commonly encountered substances.

2.2 Biological Analyses

The samples for biological assessments included acute and chronic toxicity tests, and benthic community structure analysis. For the acute toxicity tests, the amphipod, *Leptocheirus plumulosus*, was exposed to sediments for 10 days, after which survival and growth

were noted. For the chronic toxicity tests, the opossum shrimp, *Mysidopsis bahia*, was exposed to sediments for 7 days, after which survival, growth, and fecundity were assessed.

Two types of control sediments were tested: sediment from the predetermined and agreed upon reference stations (Stations 18 and 22) and sediment from Perdido Bay. Perdido Bay has been used as a reference site for numerous toxicity studies in the local area over the past 10 years (USEPA Environmental Monitoring and Assessment Program [EMAP] 1991-2000). To ensure that test acceptability criteria (TAC) were met, Perdido Bay sediment was collected at Station C-17 (see Figure 1-2) for use as a negative control reference in the bioassay tests.

Sediments were also collected from the DUs and reference/control stations for benthic community structure analysis (i.e., biodiversity).

2.2.1 Solid-Phase Toxicity Tests with the Amphipod, *Leptocheirus plumulosus*

Test sediments were press-sieved through a 1.0 mm mesh stainless-steel sieve (to remove predators) and homogenized. A total of 200 milliliters (ml) of sediments were added to one-liter glass jars, and the jars were filled with about 800 ml of seawater (30 parts per thousand [ppt] salinity). All tests were conducted using the USEPA and American Society for Testing and Materials (ASTM) protocols for estuarine and marine amphipods as outlined in Appendix A. Five replicates of each sample were tested with the amphipod, *Leptocheirus*, for 10 days. Amphipods were not fed during the test duration. Test chambers were aerated and lighted continuously. All tests and control samples were tested simultaneously.

Twenty sub-adult amphipods were released into each jar and the jars were maintained at a constant 20 °C for the 10-day duration. Each jar was checked daily for dead or moribund animals. After 10 days, the sediments were sieved through a 0.5-mm mesh stainless-steel screen to recover the test animals. The number of survivors was recorded and the organisms were then rinsed with deionized water, placed in a weigh boat, and stored in a drying oven for 24 hours (hrs) prior to

obtaining final weights. A 96-hr reference toxicant test (positive control) with sodium dodecyl sulfate without sediment was also conducted to provide a measure of sensitivity for the amphipods.

2.2.2 Solid-Phase Toxicity Tests with the Mysid, *Mysidopsis bahia*

Subsamples of the composite sediment samples were held at 4° C until the tests commenced. Seven-day-old mysids were exposed under static conditions for 7 days in covered 400 ml vessels containing 2 centimeters (cm) (175 ml) test sediment and 150 ml overlying natural seawater adjusted to 20 ppt salinity. Eight replicate vessels were used for each sample sediment concentration. Because of the number of sediments to be tested, sediments were divided into three groups to make test initiation, sediment handling, and test termination more manageable. The tests were initiated within a 2-day interval and ran concurrently with the *Leptocheirus* tests. Each test group contained a set of negative eight control sediment replicates. Each test vessel was continuously aerated, and on a daily basis, one replicate of each treatment was chosen randomly and was monitored for salinity, pH, dissolved oxygen, and temperature. Test organisms in each vessel were fed *Artemia* nauplii twice daily.

At the termination of the 7-day test, the number of animals surviving in each replicate was recorded. The sex of the survivors from each replicate was determined by microscopic examination. When females were identified by this process, they were examined further to determine if eggs were developing in the oviducts or had been dropped into brood pouches. After sexual development was determined, the survivors from each replicate were washed with deionized water, placed in a tarred weigh boat, and then dried in an oven. Dry weights were measured and the average weight per treatment was used as a measure of growth during the test. The 7-day mysid chronic TAC indicate that an average dry weight of 0.20 mg or greater per mysid in the control exposures should be achieved when using this endpoint. The data were analyzed by variance and Dunnett's T-test or Steel's Many-one Rank test to determine significant differences ($\alpha \leq 0.05$) between the treatment and control samples for growth and survival.

2.2.3 USEPA Sediment Toxicity Criteria

USEPA criteria (1991b) for gauging sediments set the inhibition concentration 25 (IC_{25}) equal to the no observed effect concentration (NOEC). The IC_{25} is the toxicant concentration that would cause a 25% reduction in a non-quantal biological measurement such as reproduction or growth in a test population. The NOEC is the highest concentration of toxicant at which the values for the observed responses are not statistically significantly different from the controls. In other words, USEPA considers biological responses of 25% or greater in sediments to be toxic (when the endpoint is mortality), whether compared to the laboratory control or the reference station. For example, a sediment exposure resulting in 100% mortality indicates a very toxic response, while an exposure which results in only 30% mortality indicates a mildly toxic sediment.

2.2.4 Benthic Infaunal Communities Analyses

Community diversity is dependent upon both niche and sediment type. A heterogenous sediment accommodates a higher benthic diversity than a homogenous one, and environmentally stable regions demonstrate higher diversity than unstable ones (Pearson and Rosenberg, 1978).

In the laboratory, benthic community samples were stained using Rose-Bengal and sorted by hand. The organisms were identified to the lowest possible taxa (general species) and counted. Species diversity was calculated by replicate and by pooling all three replicates for each station. Total number of taxa per replicate, total number of individuals, and the two components of the Shannon Weiner Diversity, Pielou's Evenness Index and Margalef's Species Richness, were established from the samples.

The Shannon Weiner Diversity Index refers to the diversity of a community, taking into account the evenness and richness of individuals and species collected. The Shannon Weiner Diversity Index is always shown with evenness and richness (because they are components of diversity) and ranges from 1.3 to 3.5, the higher number being viewed more favorably. A low value would indicate that one or two species dominate a particular site (Power, E.A. et al., 1992).

Pielou's Evenness Index measures the abundance of species. In an ideal setting, a community of 100 individuals would be composed of 100 species. The Pielou Evenness Index ranges from 0 to 1.0, with 1.0 indicating perfect distribution of individuals (Power, E.A. et al., 1992).

Margalef's Species Richness Index refers to species abundance and distribution over a given area. An example is a community of 100 individuals composed of ten species, of which 90% of the individuals belong to a single species. The remaining 10% of the community are distributed among the other nine species, indicating low richness. Margalef's Species Richness Index ranges from 1.0 to 10.5, with 10.5 being the optimum value (Power, E.A. et al., 1992).

2.2.5 Sediment Quality Triad

Sediment quality is characterized by sediment contaminant levels, toxicity, and benthic community structure. These characteristics may be used to assess the potential effects of persistent or bioavailable sediment contamination on estuarine biota. The sediment quality triad (SQT) is a tool designed to integrate biological and ecological responses to environmental settings, as characterized by the quantity of sediment contaminants and the natural background. The SQT has been recommended for sediment quality assessments which are designed to determine: (1) the existence and extent of benthic ecosystem degradation, and (2) the cause(s) of that degradation, including specific chemical contamination (Chapman, P.M., 1997).

The SQT is used for integrated assessment of sediment quality based on three measurements: chemistry, toxicity, and benthos. The SQT approach combines measures of potential chemical impacts with laboratory measures of bioassay exposures and studies of sediment community diversity. Comparisons to reference conditions are critical as they provide the foundation for the SQT assessments (e.g., 'hit' vs 'no hit') and can account for local sediment conditions (Chapman et al., 1997). Determining reference envelopes is easiest for sediment chemistry and more difficult for benthic community assemblages (because of seasonal and temporal assemblages), with sediment toxicity intermediate in this regard (Chapman et al., 1997).

The SQT approach does not rely only on comparisons of chemistry data to SQGs; rather it uses a weight of evidence approach that relates chemistry data to available and relevant guidelines to assess chemicals of particular concern. Comparisons to multiple SQGs (e.g., ERLs, ERMs, PELs, and TELs) are appropriate. Accordingly, substances that exceed effects-based guidelines most frequently and by the greatest degree warrant the most concern (MacDonald et al., 1996). The 2000 investigation compared the chemical constituents to SQGs (see Section 4) to identify trends and translate this component into the SQT.

The SQT approach uses toxicity tests conducted with multiple species and varying endpoints. Endpoints should be complementary and include mortality and some measure of energetics (e.g., growth and/or reproduction) (Chapman et al., 1997). Analyzing the results of multiple toxicity tests with different endpoint outcomes requires both a weight of evidence approach and best professional judgement. Species differ in sensitivity and data evaluation may be difficult. A simple t-test comparison between the reference stations in Pensacola Bay and each Site 2 station was used to identify stations exceeding the reference envelope, yielding highly significant results when concordance between species sensitivities were detected.

The SQT approach also focused on evaluating resident benthic communities. Benthic assemblages were studied to define local environmental conditions and their natural variations due to salinity, sediment type, and depth. The presence of sensitive indicator species was noted to define areas of potentially contaminated sediments from potentially clean areas (Weisberg et al., 1997). Station by station comparisons to local reference stations were applied to the 2000 sediment investigation at Site 2 to reflect the local site conditions and aid in the triad analysis.

3.0 SAMPLING RESULTS

3.1 Results of Chemical Analyses

As described in Section 2, the 2000 DUs were based on the original transect system used for all previous sampling events at Site 2. Surface sediments were analyzed as specified in Section 2.1.2. The analytical results are provided in Appendix B.

Detected constituents were compared with the lower of the USEPA Region IV SSVs (USEPA, 1995) or the FDEP Sediment Quality Assessment Guidelines (SQAGs) (McDonald, 1994) to develop HQs. The SSVs/SQAGs are predictive tools developed by USEPA and FDEP for assessing the biological significance of sediment associated contaminants. Use of these conservative sediment benchmark values (SBVs) ensured that more protective HQs were derived and applied to the site.

Detected constituents were also compared to reference concentrations developed for surface sediment from data collected from the two reference stations (Stations 18 and 22). The stations provided reference values for comparison to Site 2 DU surface sediment data.

Table 3-1 summarizes the surface sediment chemistry results for TAL metals, SVOCs, pesticides, and PCBs, and compares these data to the respective SBV and surface sediment reference concentrations.

3.1.1 Sediment Reference Concentrations

Two reference stations were identified (Stations 18 and 22) for comparison to the eleven Site 2 DUs, as previously shown on Figure 1-1. The reference stations were selected based on: (1) their proximity to the study area; (2) their location in the same water body; and (3) previously collected USEPA data which indicated they had sediment characteristics similar to the site DUs. Both reference stations were located in slightly deeper water (about 30 feet deep) than the Site 2 study area.

Table 3-1
Surface Sediment Chemistry 2000

	Reference			Stations																				Reference Station			
				I3-12		GH-12		I3-34		GH-34		EF-23		I3-56		GH-56		EF-45		KL-34		GH-67		CD-23		18		22	
				USEPA 1		USEPA 2		USEPA 3		USEPA 4		USEPA 5		USEPA 6		USEPA 7		USEPA 8		USEPA 9		USEPA 10		USEPA 11		USEPA 18		USEPA 22	
	Reference Conc.	SBV	Source	Conc.	HQ	Conc.	HQ	Conc.	HQ	Conc.	HQ	Conc.	HQ	Conc.	HQ	Conc.	HQ	Conc.	HQ	Conc.	HQ	Conc.	HQ	Conc.	HQ	Conc.	HQ	Conc.	HQ
Inorganics (mg/kg)																													
Aluminum (Al)	23100	NA	NA	3500	-	990	-	8900	-	8900	-	8600	-	2100	-	2700	-	6600	-	12000	-	300	-	5000	-	4100	-	19000	-
Antimony (Sb)	0.403	12	a	0.47	0.04	0.14	0.11	0.4	0.03	0.32	0.03	0.89	0.07	0.12	0.01	0.11	0.01	0.26	0.02	0.26	0.02	-	-	1.8	0.15	0.093	0.008	0.31	0.03
Arsenic (As)	23	7.24	a/b	4.9	0.68	1.5	0.21	12	1.66	11	1.52	16	2.21	2.6	0.36	3.4	0.47	6.9	0.95	14	1.93	0.52	0.07	9.1	1.26	5	0.69	18	2.49
Barium (Ba)	31.9	NA	NA	12	-	3.2	-	16	-	17	-	150	-	4.4	-	5.8	-	13	-	24	-	1.2	-	22	-	7.9	-	24	-
Beryllium (Be)	1.36	NA	NA	0.2	-	0.063	-	0.59	-	0.54	-	0.48	-	0.16	-	0.17	-	0.38	-	0.73	-	0.021	-	0.3	-	0.26	-	1.1	-
Cadmium (Cd)	0.295	0.68	b	2.3	3.38	0.17	0.25	1.7	2.5	5.2	7.65	4.3	6.32	0.07	0.1	0.1	0.15	0.17	0.25	0.39	0.57	-	-	1.3	1.91	0.075	0.11	0.22	0.32
Calcium (Ca)	38000	NA	NA	8100	-	11000	-	20000	-	26000	-	26000	-	8400	-	14000	-	22000	-	28000	-	7600	-	23000	-	21000	-	17000	-
Chromium (Cr)	63	52.3	a/b	100	1.91	8.9	0.17	39	0.75	38	0.73	75	1.43	6.8	0.13	13	0.25	19	0.36	39	0.75	1.2	0.02	41	0.78	13	0.25	50	0.96
Cobalt (Co)	7.8	NA	NA	1.2	-	0.38	-	3.2	-	3.1	-	3.2	-	0.77	-	0.99	-	2.3	-	4.2	-	0.16	-	2.4	-	1.2	-	6.6	-
Copper (Cu)	16.7	18.7	a/b	25	1.33	11	0.59	14	0.74	27	1.44	66	3.53	3.4	0.18	4.4	0.24	8.8	0.47	23	1.23	0.56	0.03	48	2.56	3.7	0.2	13	0.7
Iron (Fe)	38800	NA	NA	6400	-	1900	-	13000	-	15000	-	19000	-	3400	-	5100	-	11000	-	20000	-	630	-	12000	-	6800	-	32000	-
Cyanide (Cn)	-	NA	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.29	-	-	-	-	-	-	-	-	-	-	-
Lead (Pb)	29.7	30.2	a/b	190	6.29	16	0.53	47	1.56	51	1.69	640	21.19	15	0.5	12	0.4	17	0.56	27	0.89	1.1	0.04	150	4.97	5.7	0.19	24	0.79
Magnesium (Mg)	13500	NA	NA	2000	-	700	-	5400	-	5100	-	5000	-	1400	-	1800	-	4100	-	7700	-	470	-	4000	-	2500	-	11000	-
Manganese (Mn)	550	NA	NA	88	-	23	-	290	-	270	-	270	-	58	-	75	-	220	-	420	-	15	-	250	-	110	-	440	-
Mercury (Hg)	0.129	0.13	a/b	0.086	0.66	0.036	0.28	0.085	0.65	0.082	0.63	0.21	1.62	0.018	0.14	0.026	0.2	0.044	0.34	0.075	0.57	-	-	0.16	1.23	0.019	0.15	0.11	0.85
Nickel (Ni)	17.7	15.9	a/b	3.3	0.21	1.1	0.07	8.7	0.55	10	0.63	7.8	0.49	2.1	0.13	2.4	0.15	6.1	0.38	9.8	0.61	0.34	0.02	5.2	0.32	3.7	0.23	14	0.88
Potassium (K)	4050	NA	NA	610	-	200	-	1700	-	1500	-	1400	-	420	-	500	-	1200	-	2200	-	120	-	780	-	650	-	3400	-
Selenium (Se)	2.67	NA	NA	0.66	-	0.31	-	1.5	-	1.5	-	1.4	-	0.48	-	0.61	-	1.3	-	2.2	-	0.25	-	0.99	-	0.87	-	1.8	-
Silver (Ag)	-	0.73	b	0.077	0.11	-	-	-	-	0.11	0.15	0.21	0.29	-	-	-	-	-	-	-	-	-	-	0.2	0.27	-	-	-	-
Sodium (Na)	34800	NA	NA	6500	-	2300	-	19000	-	15000	-	13000	-	3800	-	5200	-	12000	-	26000	-	2500	-	7100	-	7800	-	27000	-
Thallium (Tl)	0.255	NA	NA	-	-	-	-	0.13	-	0.14	-	0.14	-	-	-	-	-	0.093	-	0.17	-	-	-	0.084	-	0.065	-	0.19	-
Tin (Sn)	2.01	NA	NA	1.3	-	0.68	-	1.3	-	0.082	-	0.21	-	0.018	-	0.026	-	0.044	-	1.3	-	0.18	-	2.4	-	0.41	-	1.6	-
Vanadium (V)	53	NA	NA	9.4	-	3	-	28	-	27	-	25	-	6.6	-	9	-	23	-	37	-	1.3	-	16	-	14	-	39	-
Zinc (Zn)	83	124	a/b	75	0.61	14	0.11	55	0.44	59	0.48	670	5.4	17	0.14	19	0.15	34	0.27	52	0.41	2.5	0.02	79	0.64	13	0.1	70	0.56
Pesticides/PCBs (µg/kg)																													
Aroclor-1254	-	21.6	a/b	67	3.1	-	-	-	-	-	-	28	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aroclor-1260	-	21.6	a/b	190	8.8	-	-	-	-	33	1.53	84	3.89	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4,4'-DDD	50d	1.22	b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.5	2.05	-	-	-	-
4,4'-DDT	20d	1.19	b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.8	1.51	-	-	-	-	-	-	-	-	-	-
delta-BHC	1.1	0.32	c	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.9	12.19	-	-	-	-	1.1	3.44	-	-
Dieldrin	-	0.715	b	-	-	3.5	4.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Endosulfan Sulfate	1.1	NA	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.1	-	1.1	-	-	-
Endrin	-	3.3	a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.1	0.33	-	-	-	-
Heptachlor Epoxide	-	NA	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.95	-	-	-	-	-
Methoxychlor	-	NA	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.1	-	-	-	-	-	-	-
SVOCs (µg/kg)																													
2-Methylnaphthalene	-	20.2	b	-	-	-	-	-	-	-	-	-	-	8.6	0.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anthracene	29	46.9	b	28	0.59	18	0.38	9.8	0.21	45	0.96	59	1.26	2	0.04	11	0.23	42	0.9	22	0.47	-	-	43	0.91	-	-	29	0.62
Benzo(a)anthracene	97.7	74.8	b	100	1.33	95	1.27	49	0.66	160	2.14	310	4.14	8.4	0.11	41	0.55	210	2.81	85	1.14	0.69	0.01	240	3.2	2.7	0.04	95	1.27
Benzo(b)fluoranthene	316	NA	NA	270	-	250	-	170	-	430	-	1000	-	27	-	110	-	570	-	250	-	3.3	-	980	-	26	-	290	-
Benzo(g,h,i)perylene	124.9	NA	NA	140	-	58	-	59	-	150	-	390	-	11	-	37	-	200	-	100	-	-	-	330	-	4.9	-	120	-
Benzo(k)fluoranthene	61.6	NA	NA	110	-	78	-	48	-	120	-	280	-	7	-	28	-	140	-	60	-	1.5	-	270	-	2.6	-	59	-
Benzo(a)pyrene	123.8	88.8	b	180	1.8	86	0.96	62	0.7	180	2.03	440	4.95	9.7	0.1	45	0.51	240	2.7	110	1.24	1.1	0.01	410	4.62	3.8	0.04	120	1.35
Chrysene	216.1	108	b	280	2.59	240	2.22	93	0.86	350	3.24	1,000	9.26	20	0.19	92	0.85	380	3.52	170	1.57	1.6	0.01	630	5.8	6.1	0.06	210	1.94
Dibenz(a,h)anthracene	31	6.22	b	35	5.62	-	-	15	2.41	44	7.07	110	17.68	2.9	0.47	11	1.77	56	9	26	4.18	-	-	100	16.07	-	-	31	4.98
Fluoranthene	256.8	113	b	210	1.86	61	0.54	91	0.81	300	2.65	710	6.28	16	0.14	66	0.58	570	5.04	180	1.59	-	-	470	4.16	6.8	0.06	250	2.21
Fluorene	15.2	21.2	b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	0.613
Indeno(1,2,3-cd)pyrene	103.8	NA	NA	110	-	69	-	44	-	160	-	380	-	8.8	-	35	-	230	-	92	-	1	-	370	-	3.8	-	100	-
Naphthalene	17	34.6	b	180	5.2	-	-	71	2.1	-	-	-	-	18	0.52	62	1.79	160	4.62	110	3.18	-	-	130	3.76	17	0.49	-	-
Phenanthrene	133.2	86.7	b	97	1.12	52	0.6	39	0.45	130	1.5	230	2.65	7.8	0.09	35	0.4	140	1.61	62	0.72	-	-	160	1.85	3.2	0.04	130	1.5
Pyrene	206.7	153	b	240	1.57	99	0.64	91	0.6	270	1.77	720	4.71	21	0.14	71	0.46	560	3.66	160	1.05	1.8	0.01	440	2.88	6.7	0.04	200	1.31
Bis(2-ethylhexyl)phthalate	-	182	a/b	2,800	15.39	-	-	-	-	-	-	1,900	10.44	-	-	-	-	970	5.33	11,000	60.44	-	-	4,700	25.82	-	-	-	-
Phenol	170	NA	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	170	-	-	-
Total PAHs	1218.46	1684	a/b	1593.5	0.95	911	0.75	564.2	0.46	1860.5	1.53	4051	3.3	134.8	0.11	458.7	0.38	2710.5	2.22	982.9	0.81	32.07	0.03	2910.5	2.39	74.96	0.06	1143.5	0.94

Notes:

- = not detected

a = USEPA SSV

b = FDEP SQAG

c = The TEL of 0.32 µg/kg for gamma-BHC is used as a surrogate SBV for delta-BHC

d = The basewide level developed for BWAS Pensacola (EnSafe 1999)

SBV = Lower of EPA Region IV SSV or FDEP SQAG

HQ = Hazard Quotient, Detected Concentration/SBV

NA = no SBV available

Locations exceeding reference concentrations are shown underlined.

Locations exceeding SBV are shown in bold.

Locations exceeding SBV and reference concentrations are shown in squares.

Total PAHs were calculated summing all detected values and half the detection limit for all nondetects.

The data collected at the reference stations were used to develop reference concentrations for individual constituents for comparison to the Site 2 detections. Two times the mean concentration for each detection at Stations 18 and 22 was used as the reference concentration for a given constituent.

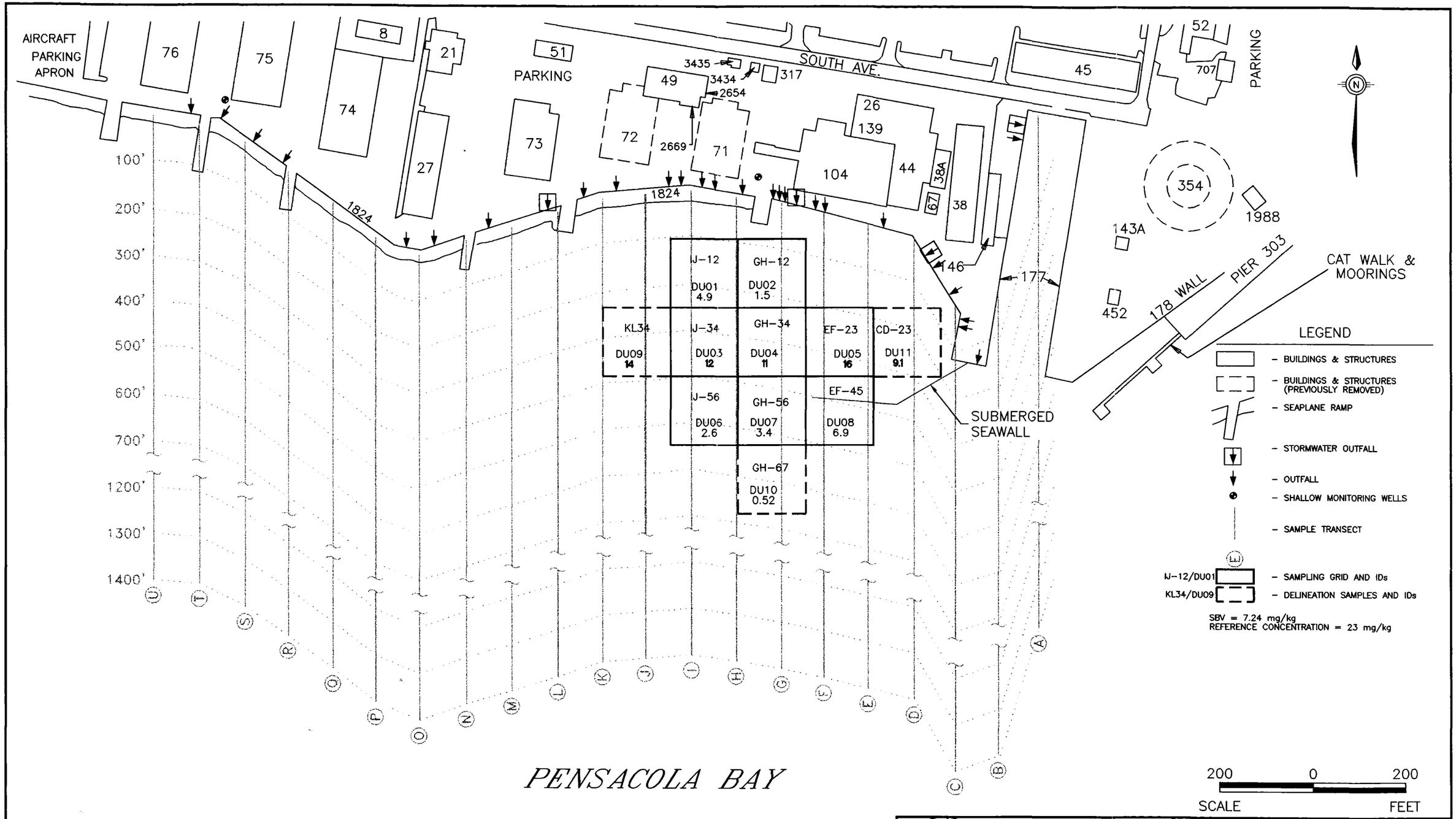
Inorganics and PAHs were detected in both reference stations. Pesticides were detected sporadically. Analytical results are presented on Table 3-1 and the calculated reference concentrations provided. Except for arsenic at Station 22, all inorganic concentrations were below SBVs. The total PAH concentration at both reference stations was also below its SBV. Delta-BHC and endosulfan sulfate were the only pesticides/PCBs detected in the reference stations, both of which occurred at Station 18. Delta-BHC exceeded its SBV, while endosulfan sulfate does not have an SBV. Phenol, which was only detected at Station 18 and does not have an SBV, was the only other SVOC detected at the reference stations.

3.1.2 Surface Sediment

Inorganics

Arsenic, cadmium, copper, and lead were each detected at five stations above their SBVs. Arsenic, which was detected at all locations, exceeded its SBV (7.24 mg/kg) at IJ-34, GH-34, EF-23, KL-34, and CD-23. However, none of the detected concentrations exceeded arsenic's reference concentration of 23 mg/kg (Figure 3-1).

Cadmium exceeded its SBV (0.68 mg/kg) and reference concentration (0.295 mg/kg) at IJ-12, IJ-34, GH-34, EF-23, and CD-23 (Figure 3-2). Copper exceeded it SBV (18.7 mg/kg) and reference concentration (16.7 mg/kg) at IJ-12, GH-34, EF-23, KL-34, and CD-23 (Figure 3-3). Lead exceeded its SBV (30.2 mg/kg) and reference concentration (29.7 mg/kg) at IJ-12, IJ-34, GH-34, EF-23, and CD-23 (Figure 3-4). Chromium, mercury, and zinc also exceeded their SBVs are selected locations. Chromium and mercury each had two exceedances of their SBVs and reference concentrations.

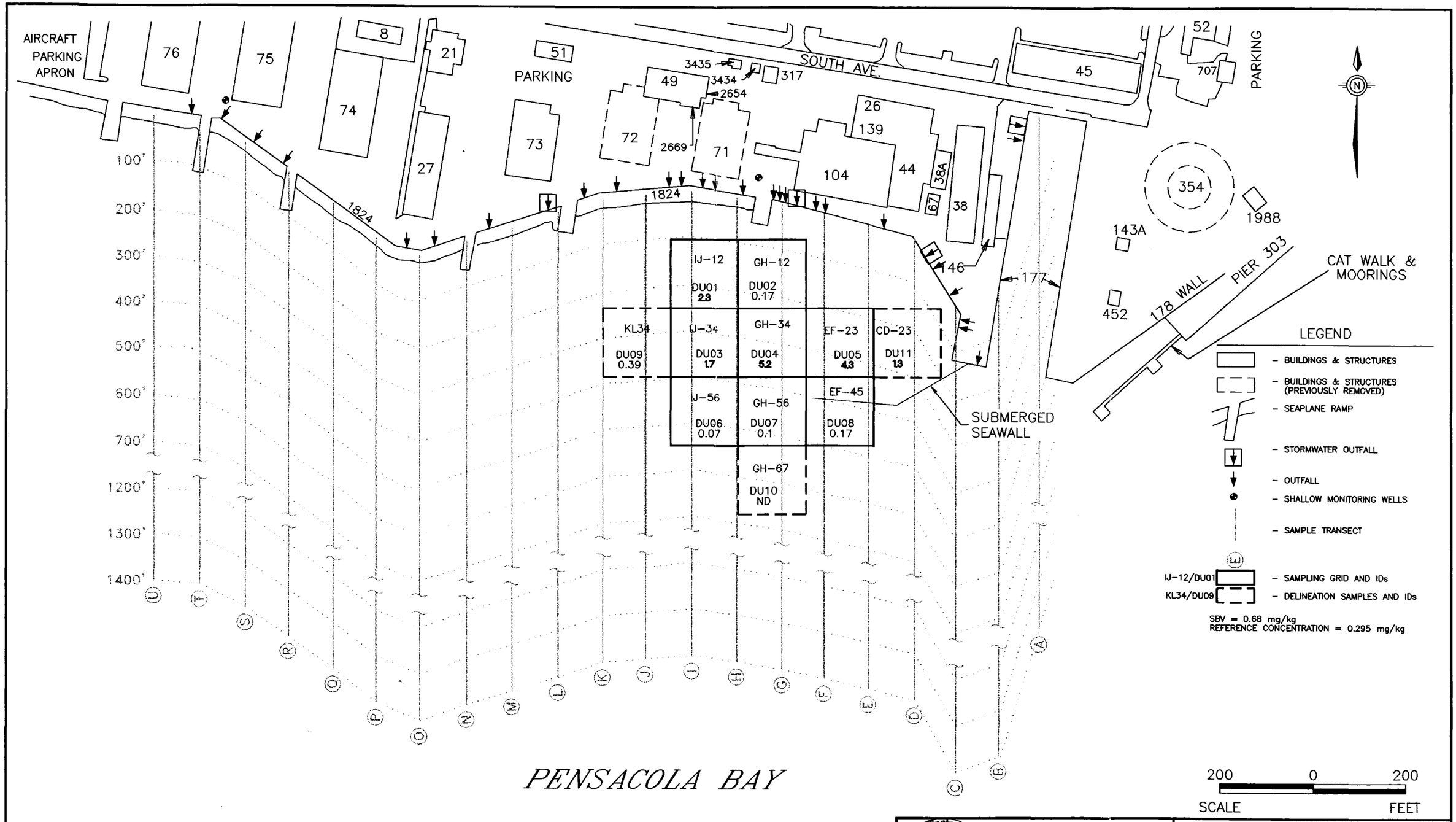


NOTE: SBV EXCEEDANCES ARE BOLD

REMEDIAL INVESTIGATION REPORT ADDENDUM
SITE 2
NAS-PENSACOLA
PENSACOLA, FLORIDA

FIGURE 3-1
ARSENIC IN SURFACE SEDIMENT

DWG DATE:02/26/03 | NAME: 0059001W022



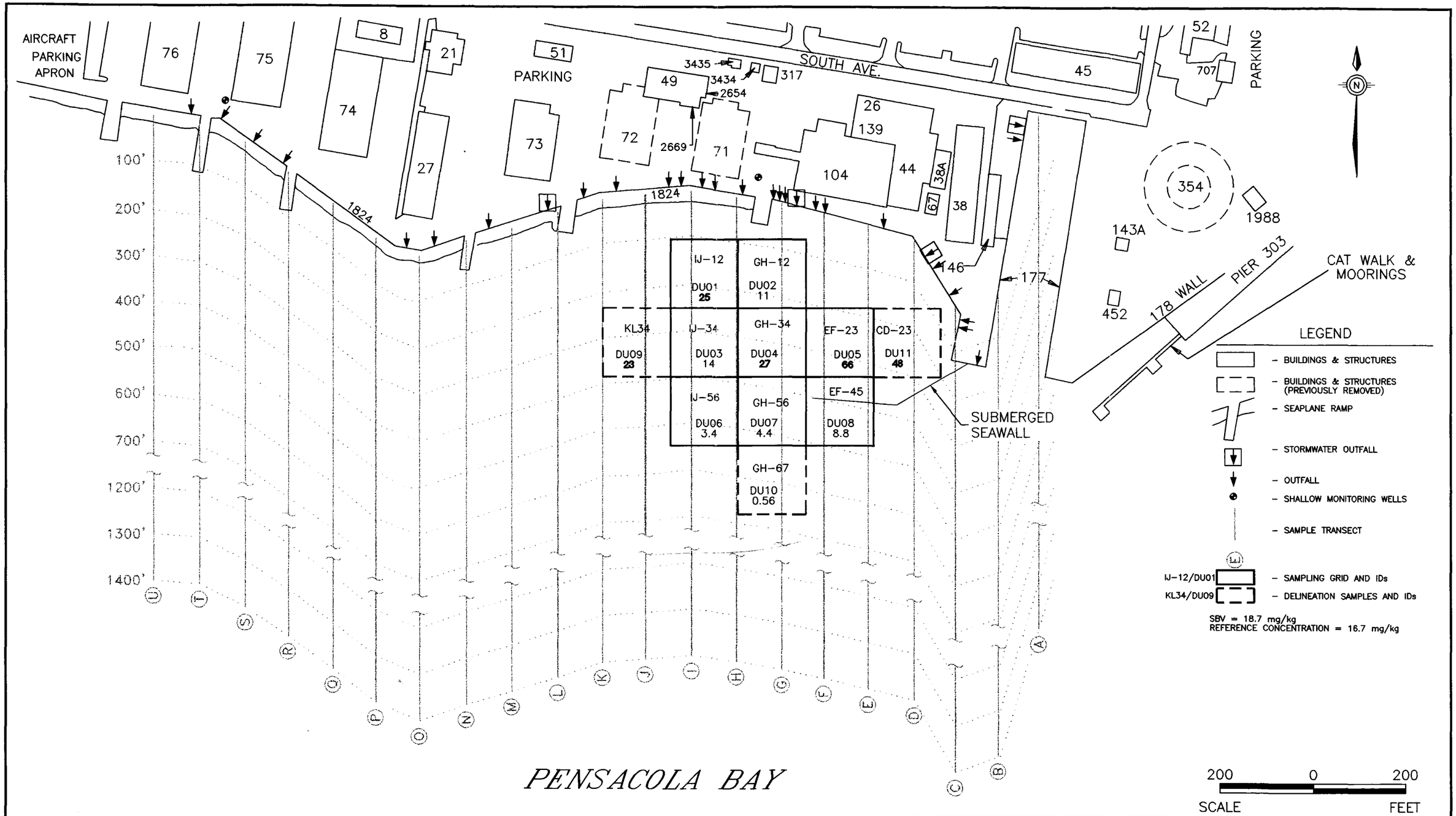
NOTE: SBV EXCEEDANCES ARE BOLD

Naval Facilities Engineering Command Southern Division

REMEDIAL INVESTIGATION REPORT ADDENDUM
SITE 2
NAS-PENSACOLA
PENSACOLA, FLORIDA

FIGURE 3-2
CADMIUM IN SURFACE SEDIMENT

DWG DATE:02/26/03 | NAME: 0059001W023



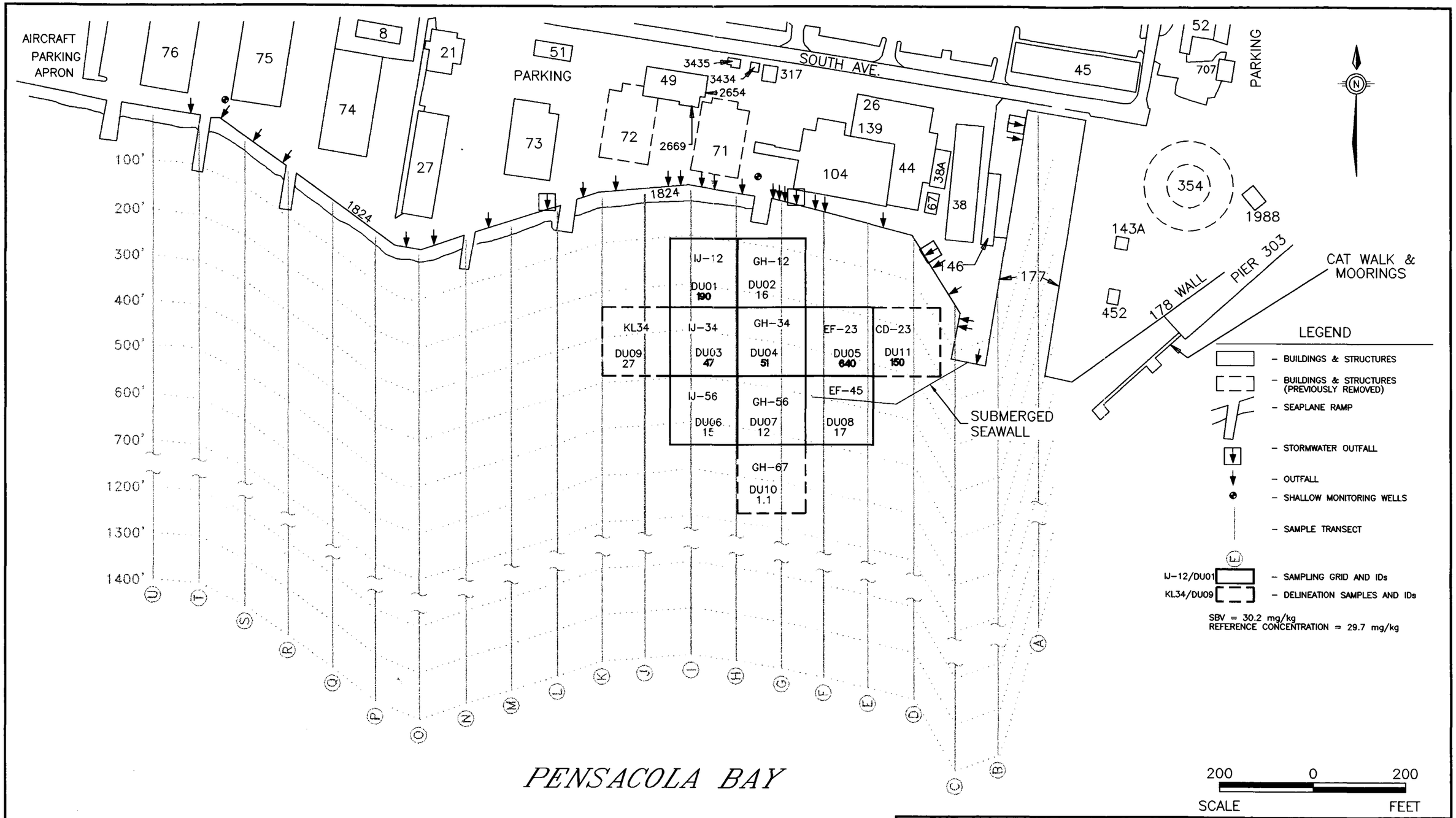
NOTE: SBV EXCEEDANCES ARE BOLD

Naval Facilities Engineering Command Southern Division

REMEDIAL INVESTIGATION REPORT ADDENDUM
SITE 2
NAS-PENSACOLA
PENSACOLA, FLORIDA

FIGURE 3-3
COPPER IN SURFACE SEDIMENT

DWG DATE:02/26/03 | NAME: 0059001W024



NOTE: SBV EXCEEDANCES ARE BOLD

Naval Facilities Engineering Command · Southern Division

REMEDIAL INVESTIGATION REPORT ADDENDUM
SITE 2
NAS-PENSACOLA
PENSACOLA, FLORIDA

FIGURE 3-4
LEAD IN SURFACE SEDIMENT

DWG DATE:02/26/03 | NAME: 0059001W025

The chromium exceedances were at IJ-12 and EF-23 (Figure 3-5), while the mercury exceedances were at EF-23 and CD-23 (Figure 3-6). One detection of zinc at EF-23 (670 mg/kg) exceeded its SBV (124 mg/kg) and reference concentration (83 mg/kg) as shown on Figure 3-7.

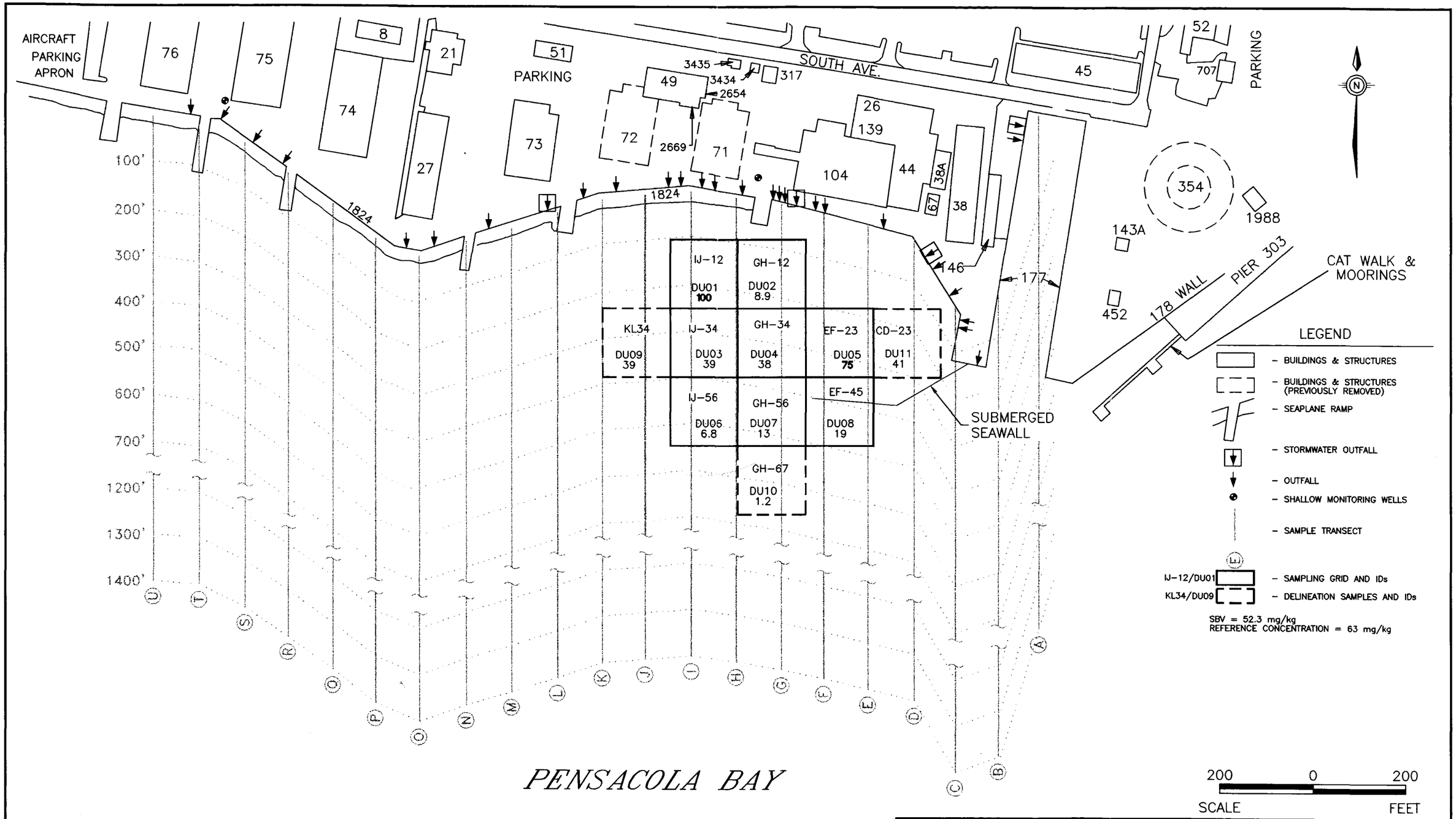
Antimony, nickel, and silver detections were all below their SBVs across Site 2. All other inorganics (barium, beryllium, calcium, cobalt, iron, magnesium, manganese, potassium, selenium, sodium, thallium, tin, and vanadium) do not have SBVs. Except for tin (2.4 mg/kg) at CD-23 and barium (150 mg/kg) at EF-23, which were above their reference concentrations of 2.01 mg/kg and 31.9 mg/kg respectively, detected concentrations of these parameters were below their reference concentrations.

Pesticides/PCBs

Aroclor-1254 exceeded its SBV of 21.6 µg/kg at both locations (IJ-12 and EF-23) where it was detected (Figure 3-8). Aroclor-1260 also exceeded its SBV of 21.6 µg/kg at the three locations (IJ-12, GH-34, and EF-23) where it was detected (Figure 3-8). 4,4-DDT , which was detected at only one location, exceeded its SBV of 1.19 µg/kg at EF-45 (1.8 µg/kg). 4,4-DDD was detected at location CD-23 above its SBV of 3.3 µg/kg. However, both of the detections are below the base-wide levels (20 µg/kg for 4,4-DDT and 50 µg/kg for 4,4-DDD) established for these constituents (EnSafe Inc., 2000). Delta-BHC was detected at one Site 2 location (KL-34) and Reference Station 18 at concentrations above its surrogate SBV (i.e., the SBV for gamma-BHC) of 0.32 µg/kg. Dieldrin was detected at one location, GH-12, above its SBV of 0.715 µg/kg. Endosulfan sulfate, heptachlor epoxide, and methoxychlor were the other pesticides detected at one location each. These three parameters do not have SBVs.

Semivolatile Organic Compounds

PAHs are summed for evaluation of sediment quality. However, individual constituents and the total PAH concentrations are provided on Table 3-1. PAHs, which were detected at every station,



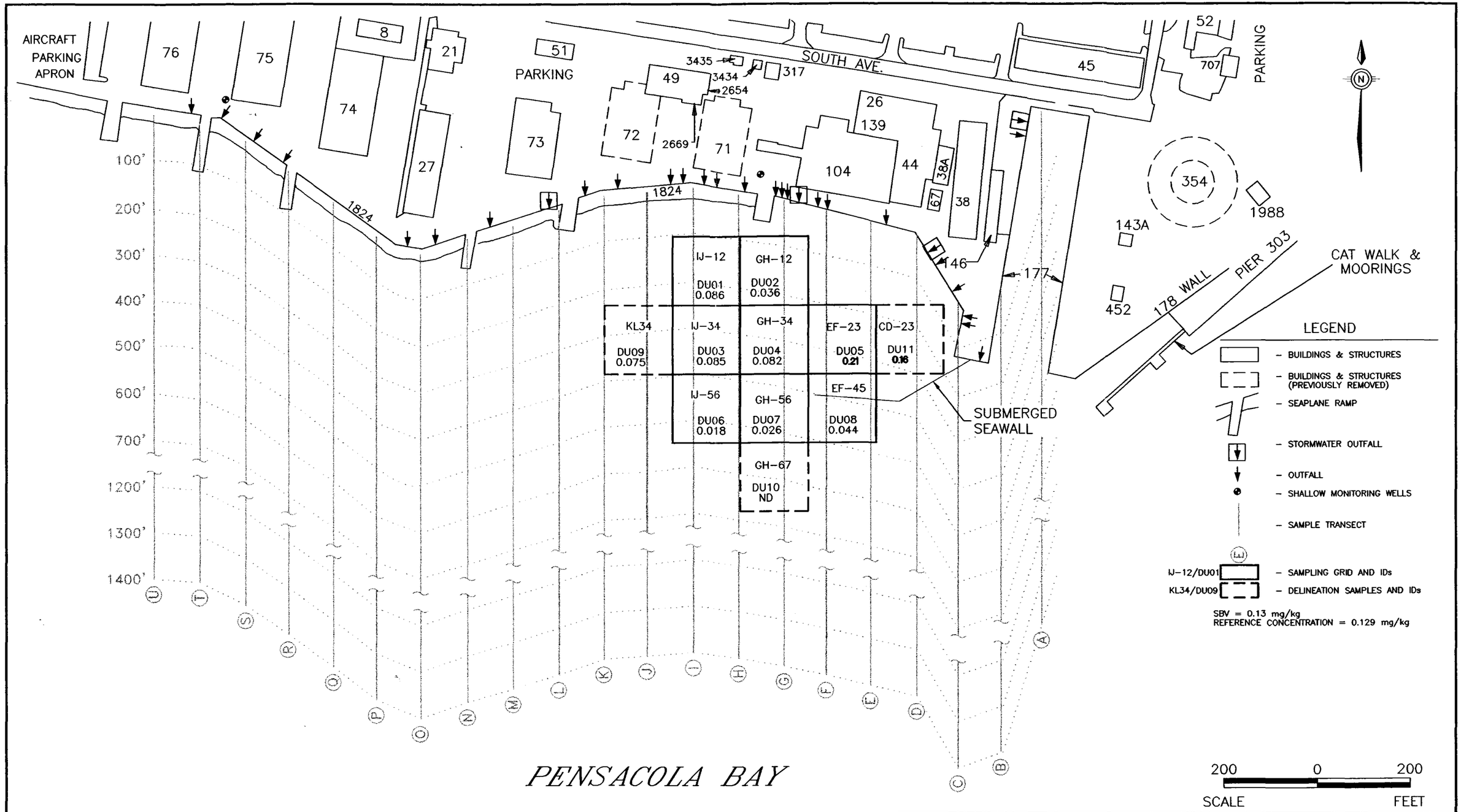
NOTE: SBV EXCEEDANCES ARE BOLD

Naval Facilities Engineering Command • Southern Division •

REMEDIAL INVESTIGATION REPORT ADDENDUM
SITE 2
NAS-PENSACOLA
PENSACOLA, FLORIDA

FIGURE 3-5
CHROMIUM IN SURFACE SEDIMENT

DWG DATE:02/26/03 | NAME: 0059001W026

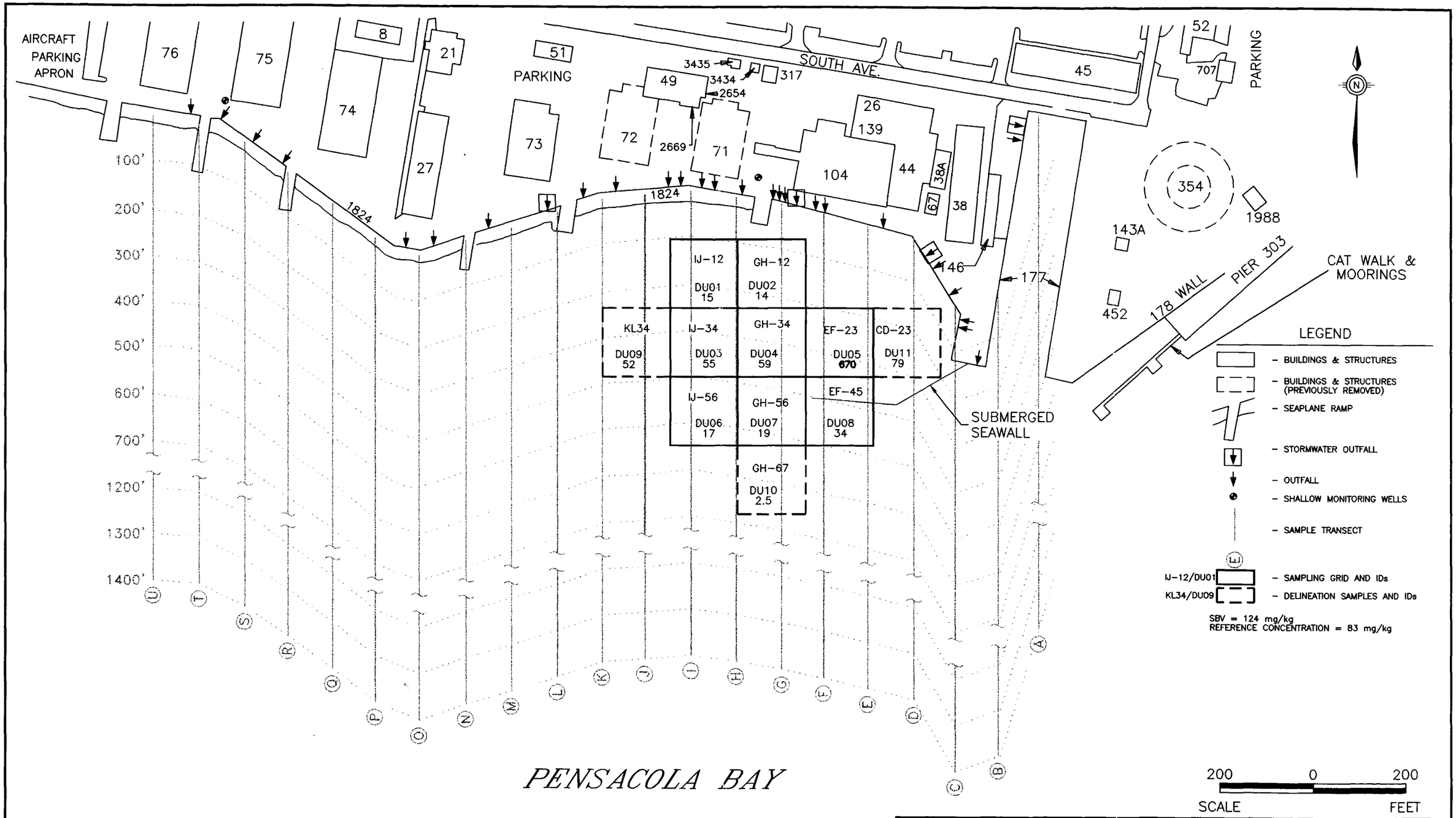


NOTE: SBV EXCEEDANCES ARE BOLD

REMEDIAL INVESTIGATION
REPORT ADDENDUM
SITE 2
NAS-PENSACOLA
PENSACOLA, FLORIDA

FIGURE 3-6
MERCURY IN SURFACE SEDIMENT

DWG DATE:02/26/03 | NAME: 0059001W027



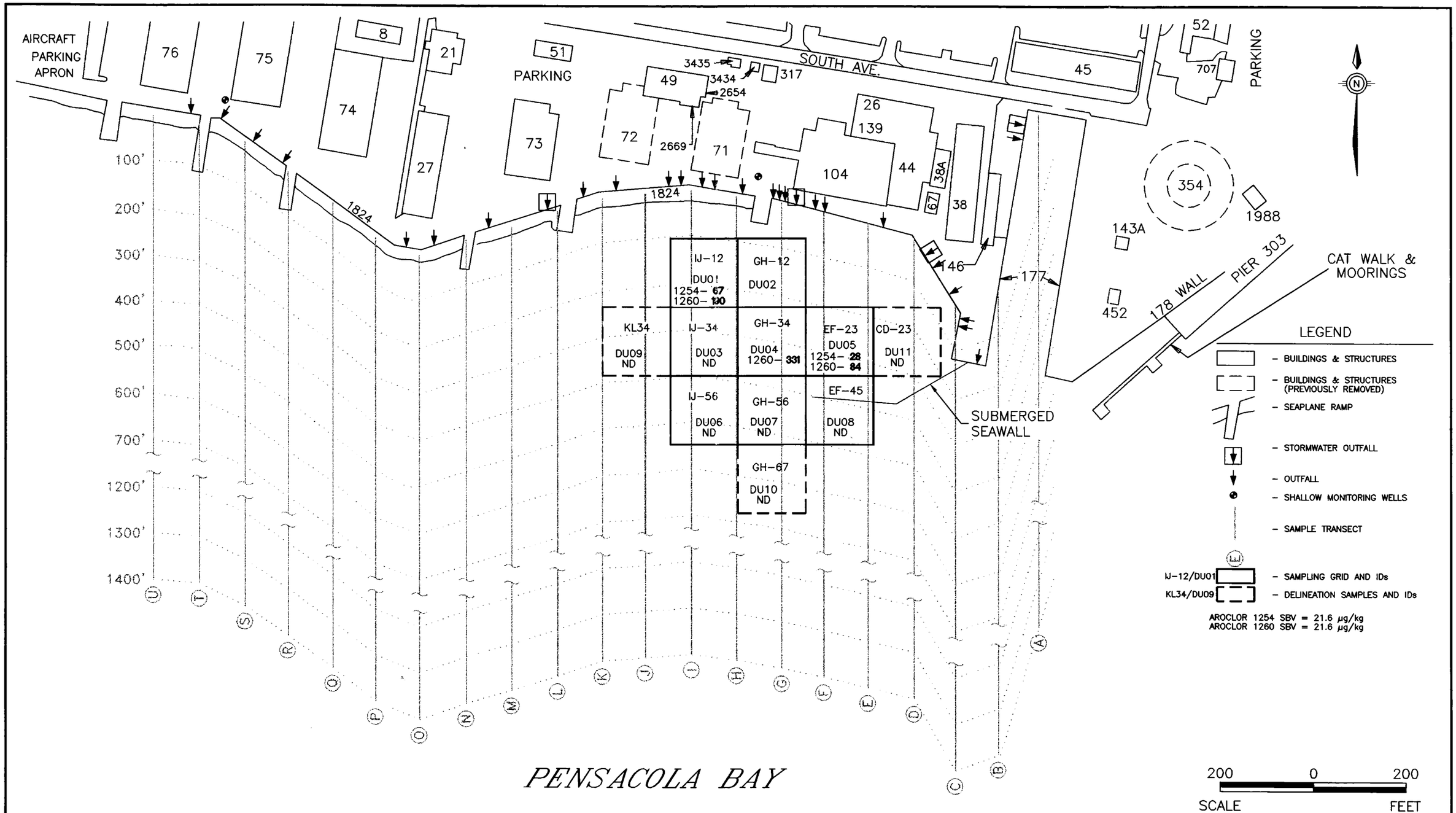
NOTE: SBV EXCEEDANCES ARE BOLD

Naval Facilities Engineering Command Southern Division

REMEDIAL INVESTIGATION REPORT ADDENDUM
SITE 2
NAS-PENSACOLA
PENSACOLA, FLORIDA

FIGURE 3-7
ZINC IN SURFACE SEDIMENT

DWG DATE:02/26/03 | NAME: 0059001W028



NOTE: SBV EXCEEDANCES ARE BOLD

Naval Facilities Engineering Command Southern Division

REMEDIAL INVESTIGATION REPORT ADDENDUM
SITE 2
NAS-PENSACOLA
PENSACOLA, FLORIDA

FIGURE 3-8
PCBs IN SURFACE SEDIMENT

DWG DATE:02/26/03 | NAME: 0059001W029

exceeded the total PAH SBV of 1,684 µg/kg at four locations (GH-34, EF-23, EF-45, and CD-23) as shown in Figure 3-9. BEHP exceeded its SBV (182 µg/kg) at the five locations (IJ-12, EF-23, EF-45, KL-34, and CD-23) where it was detected (Figure 3-10). Phenol, which does not have an SBV, was detected only at Reference Station 18 at 170 µg/kg.

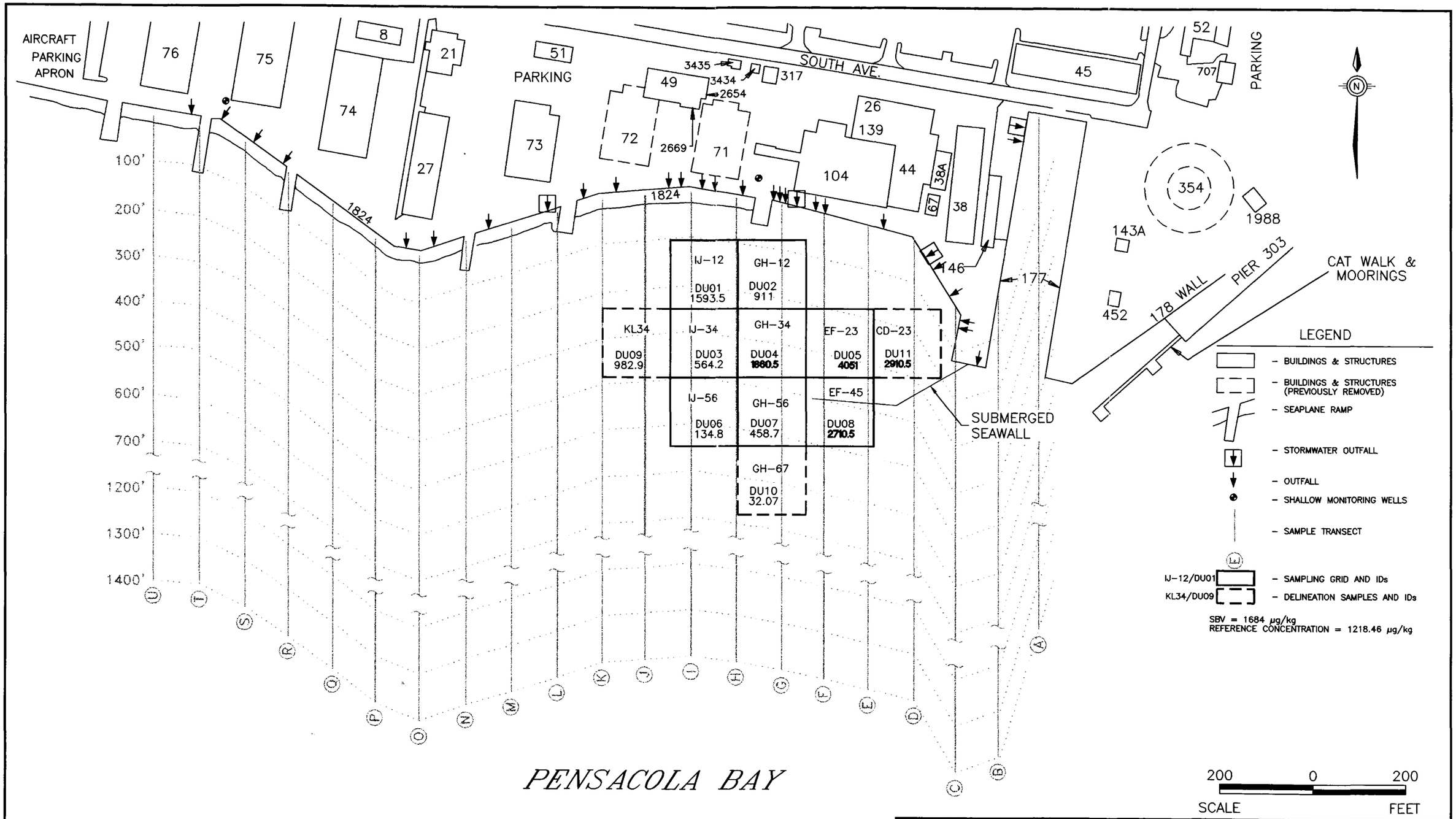
3.1.3 Subsurface Sediment

Subsurface sediment was collected at six of the eleven stations for chemical analysis. However because of lack of sample volume, Station IJ-12 was not analyzed for pesticides/PCBs or SVOCs. Subsurface sediment was not collected at five DUs (GH-12, IJ-56, GH-56, EF-45, GH-67) because of sampler refusal or compaction issues. Subsurface samples were collected at both reference locations. As with surface sediments, detected constituents were compared to the USEPA Region IV SSVs or the FDEP SQAGs (whichever was lower) to develop HQs. Detected constituents were also compared to reference concentrations developed for subsurface sediment from data collected from the two reference stations (Stations 18 and 22).

Table 3-2 summarizes the subsurface sediment chemistry results for TAL metals, extractable organics, pesticides, and PCBs, and compares these data to the respective SBV and subsurface sediment reference concentrations.

Inorganics

Arsenic exceeded its SBV (7.24 mg/kg) at all six Site 2 locations, but all the detected concentrations were below its subsurface reference concentration of 22.1 mg/kg (Figure 3-11). Mercury concentrations exceeded its SBV (0.13 mg/kg) and reference concentration (0.12 mg/kg) at all six Site 2 locations (Figure 3-12). Copper exceeded its reference concentration and SBV at five locations, while lead exceeded its reference concentration and SBV at six locations (Figures 3-13 and Figure 3-14). Cadmium exceeded its SBV and reference concentration at two locations, IJ-34 and CD-23 (Figure 3-15). Chromium, silver and zinc exceeded their reference concentrations and SBVs at location IJ-34 only. The distribution of chromium and zinc are depicted on Figures 3-16 and 3-17.



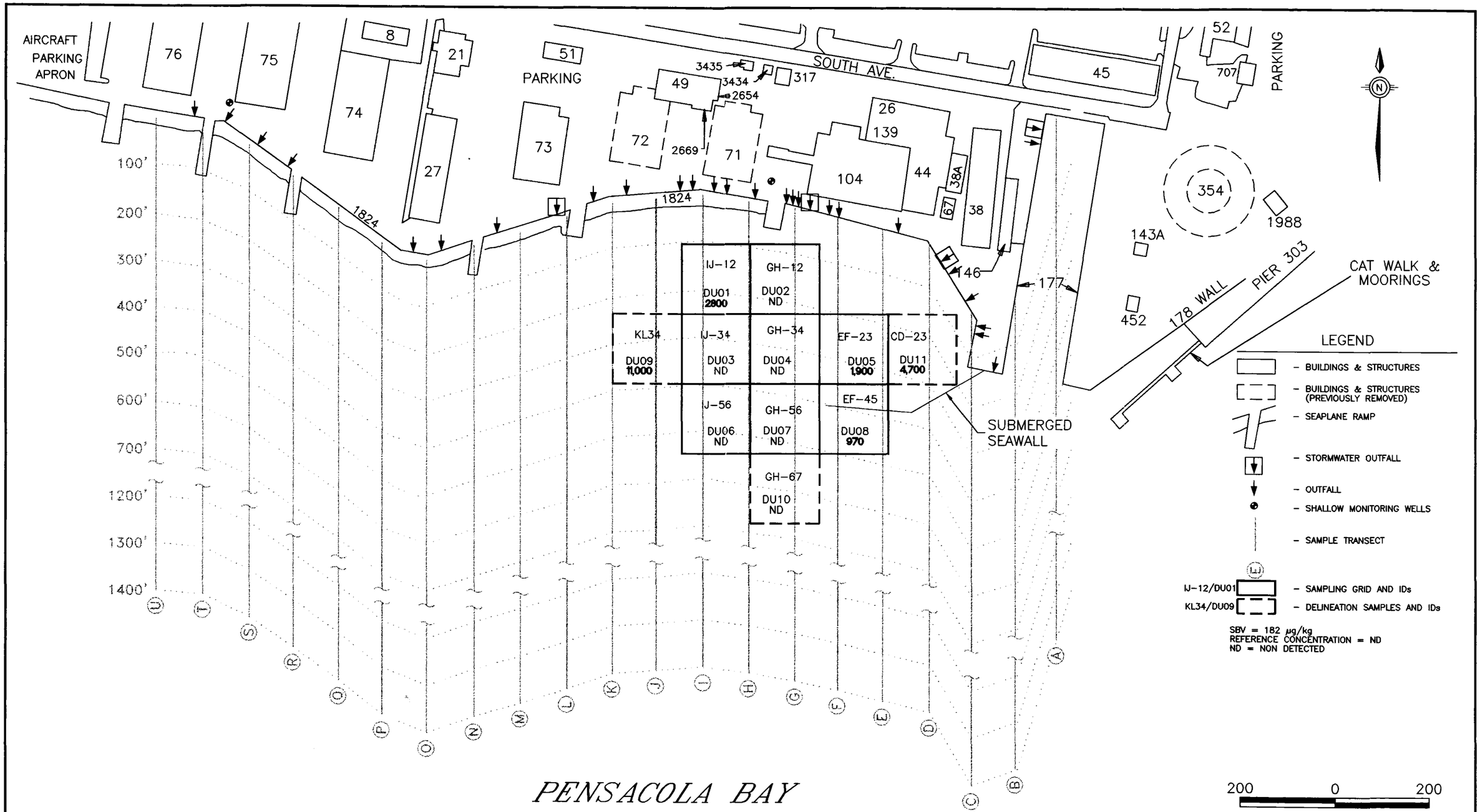
NOTE: SBV EXCEEDANCES ARE BOLD

Naval Facilities Engineering Command · Southern Division

REMEDIAL INVESTIGATION REPORT ADDENDUM
SITE 2
NAS-PENSACOLA
PENSACOLA, FLORIDA

FIGURE 3-9
TOTAL PAHs IN SURFACE SEDIMENT

DWG DATE:02/26/03 | NAME: 0059001W030

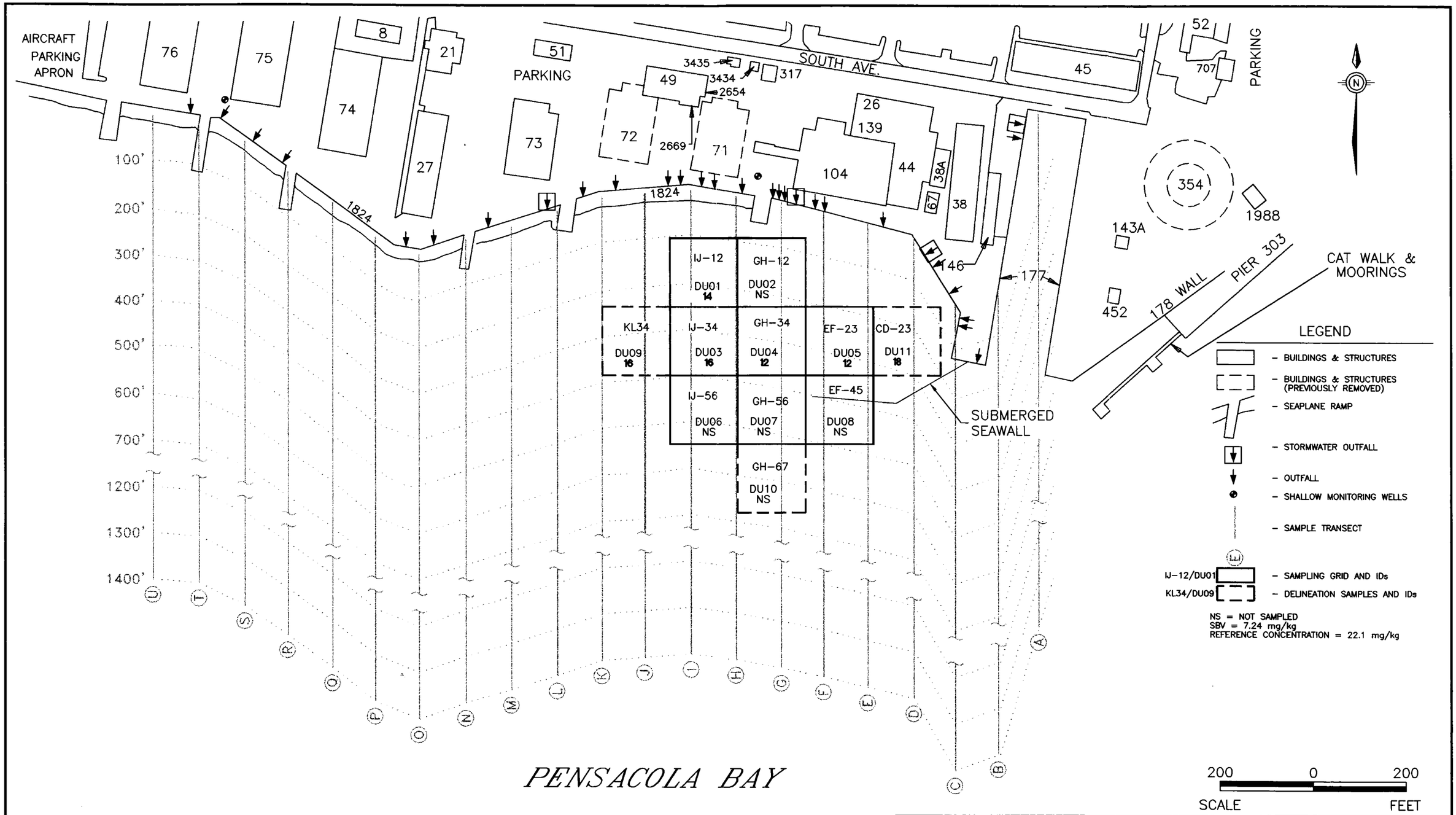


NOTE: SBV EXCEEDANCES ARE BOLD

REMEDIAL INVESTIGATION
REPORT ADDENDUM
SITE 2
NAS-PENSACOLA
PENSACOLA, FLORIDA

FIGURE 3-10
BEHP IN SURFACE SEDIMENT

DWG DATE:02/26/03 | NAME: 0059001W043

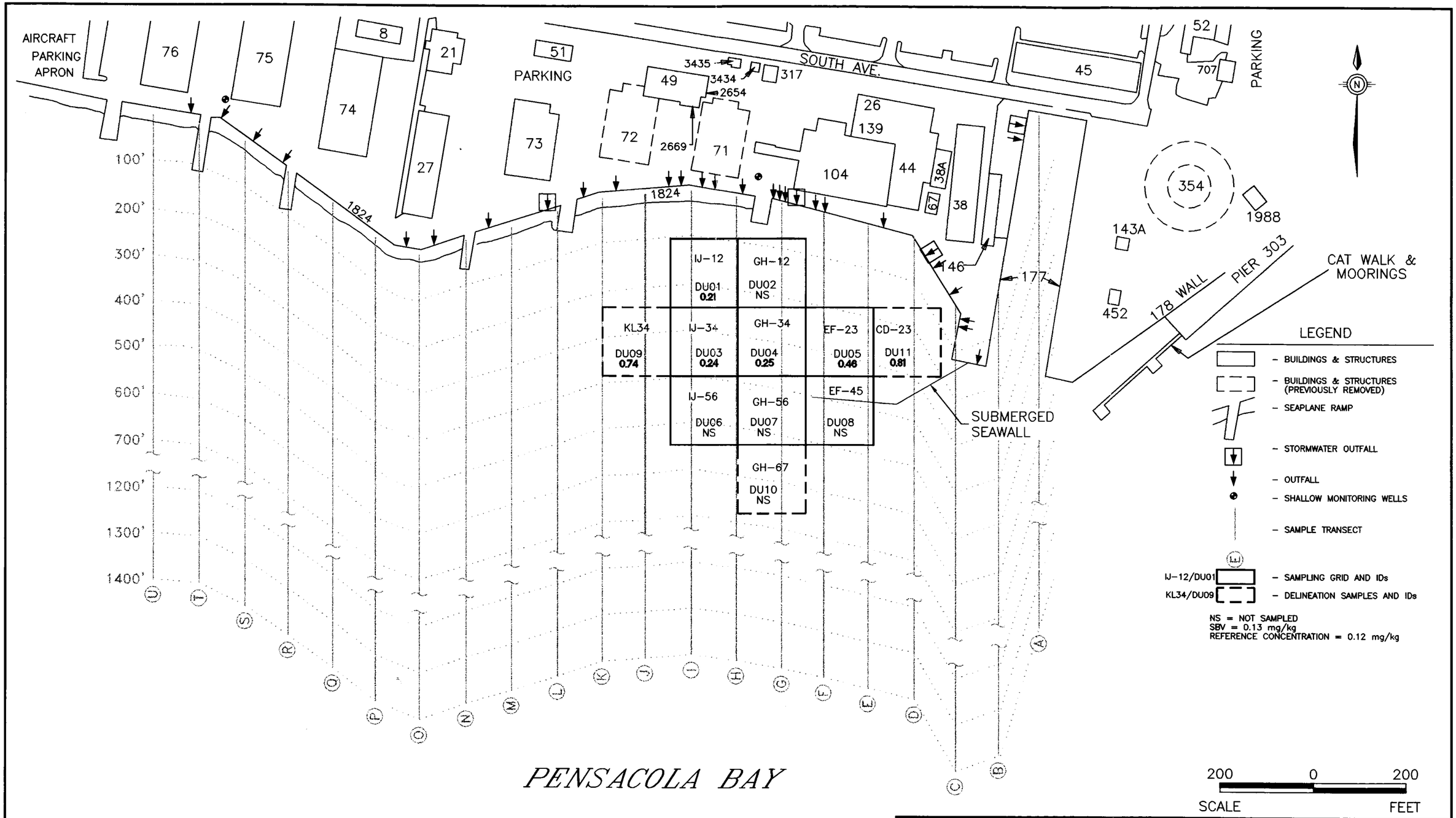


NOTE: SBV EXCEEDANCES ARE BOLD

REMEDIAL INVESTIGATION REPORT ADDENDUM
SITE 2
NAS-PENSACOLA
PENSACOLA, FLORIDA

FIGURE 3-11
ARSENIC IN SUBSURFACE SEDIMENT

DWG DATE:02/26/03 | NAME: 0059001W031



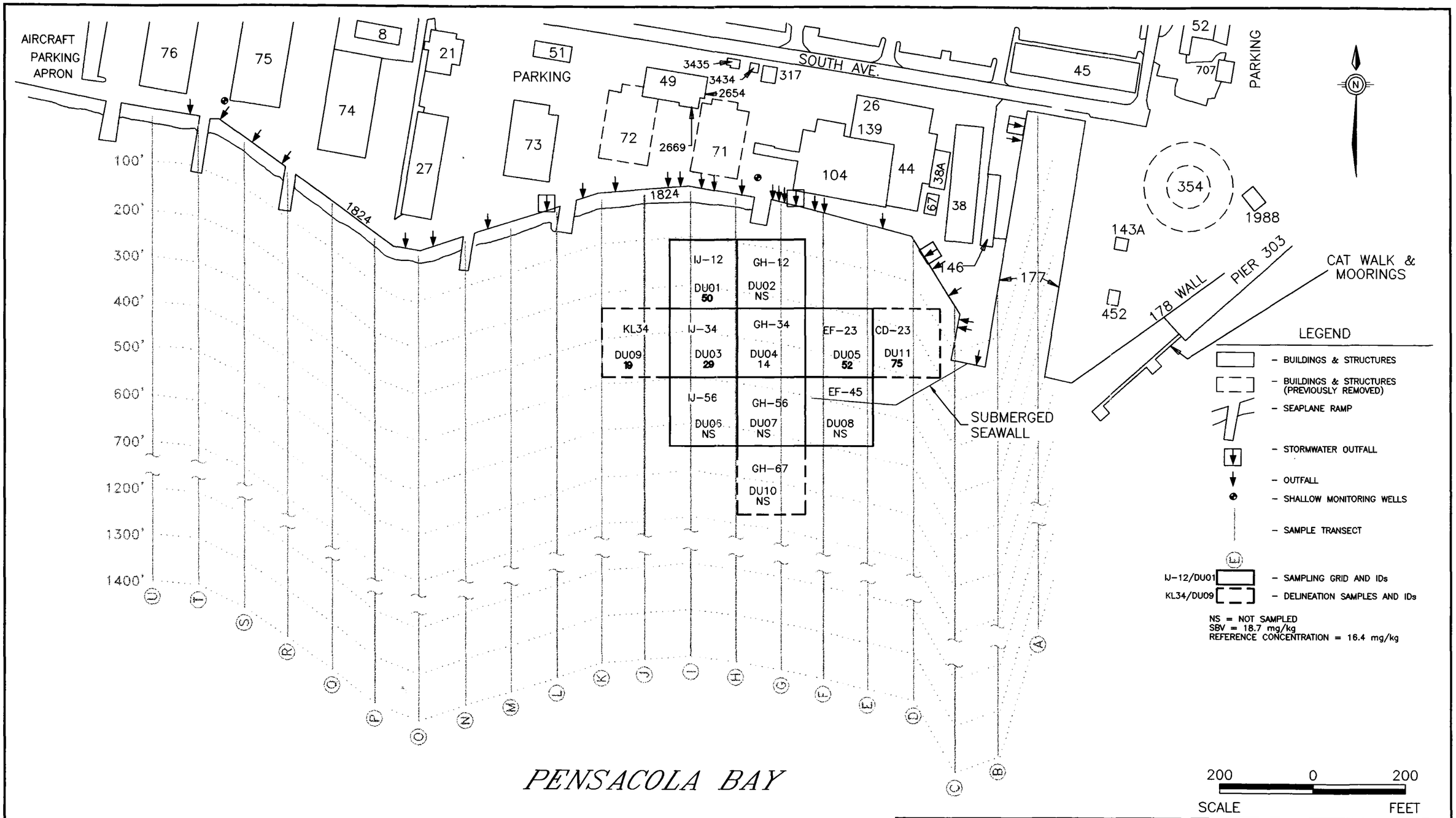
NOTE: SBV EXCEEDANCES ARE BOLD

Naval Facilities Engineering Command Southern Division

REMEDIAL INVESTIGATION REPORT ADDENDUM
SITE 2
NAS-PENSACOLA
PENSACOLA, FLORIDA

FIGURE 3-12
MERCURY IN SUBSURFACE SEDIMENT

DWG DATE:02/26/03 | NAME: 0059001W032



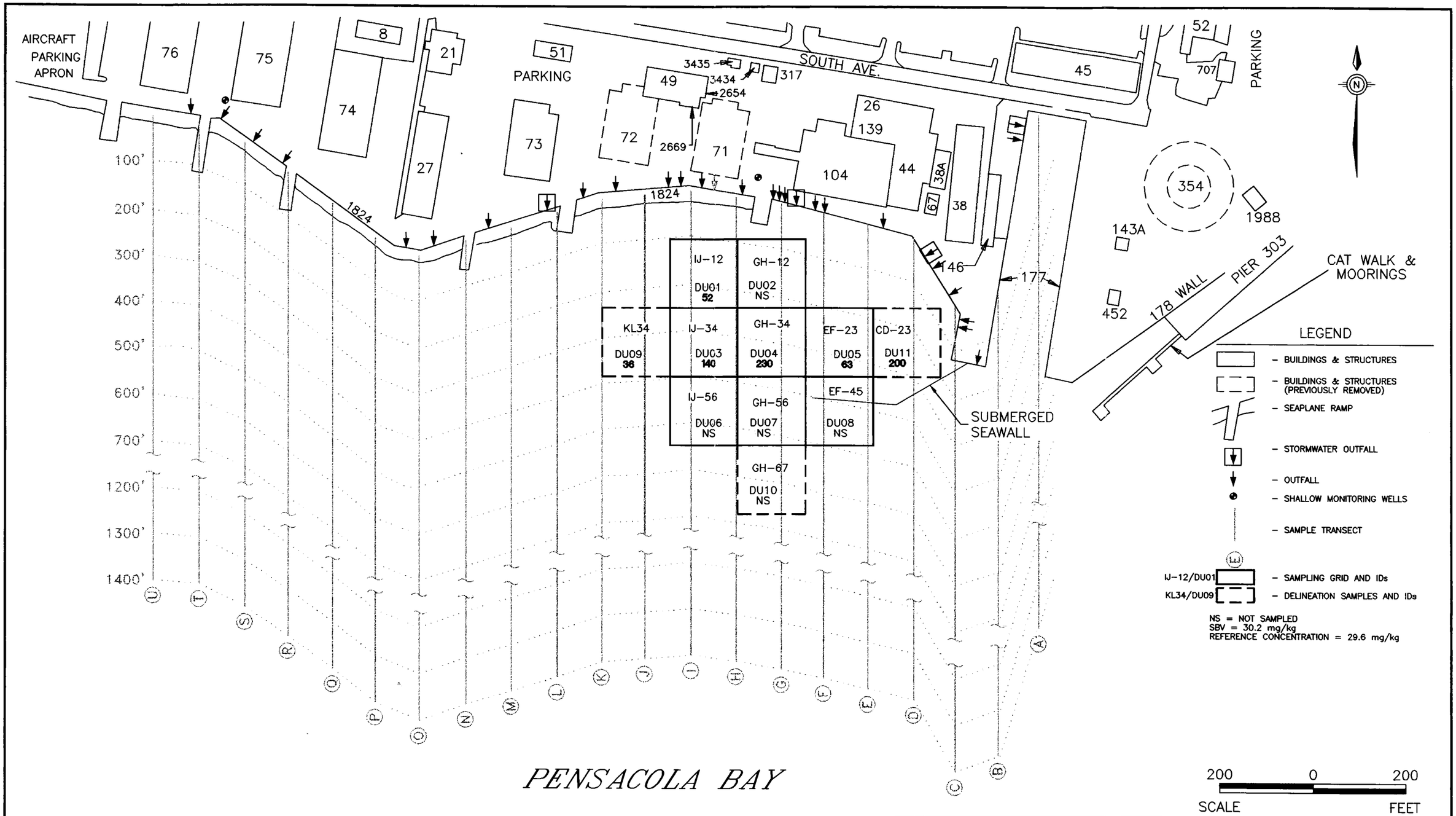
NOTE: SBV EXCEEDANCES ARE BOLD

Naval Facilities Engineering Command Southern Division

REMEDIAL INVESTIGATION REPORT ADDENDUM
SITE 2
NAS-PENSACOLA
PENSACOLA, FLORIDA

FIGURE 3-13
COPPER IN SUBSURFACE SEDIMENT

DWG DATE:02/26/03 | NAME: 0059001W033



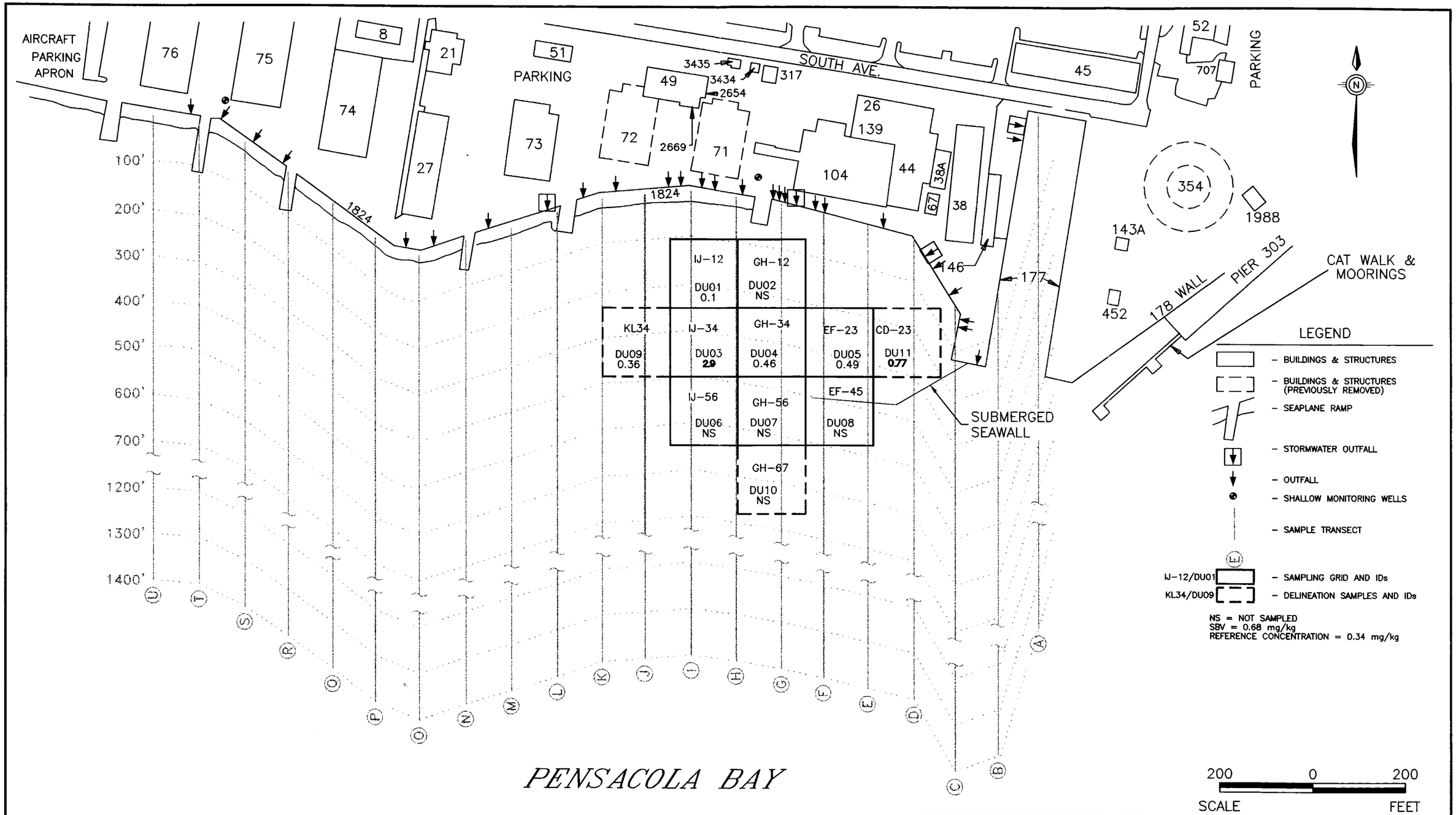
NOTE: SBV EXCEEDANCES ARE BOLD

Naval Facilities Engineering Command Southern Division

REMEDIAL INVESTIGATION REPORT ADDENDUM
SITE 2
NAS-PENSACOLA
PENSACOLA, FLORIDA

FIGURE 3-14
LEAD IN SUBSURFACE SEDIMENT

DWG DATE:02/26/03 | NAME: 0059001W034



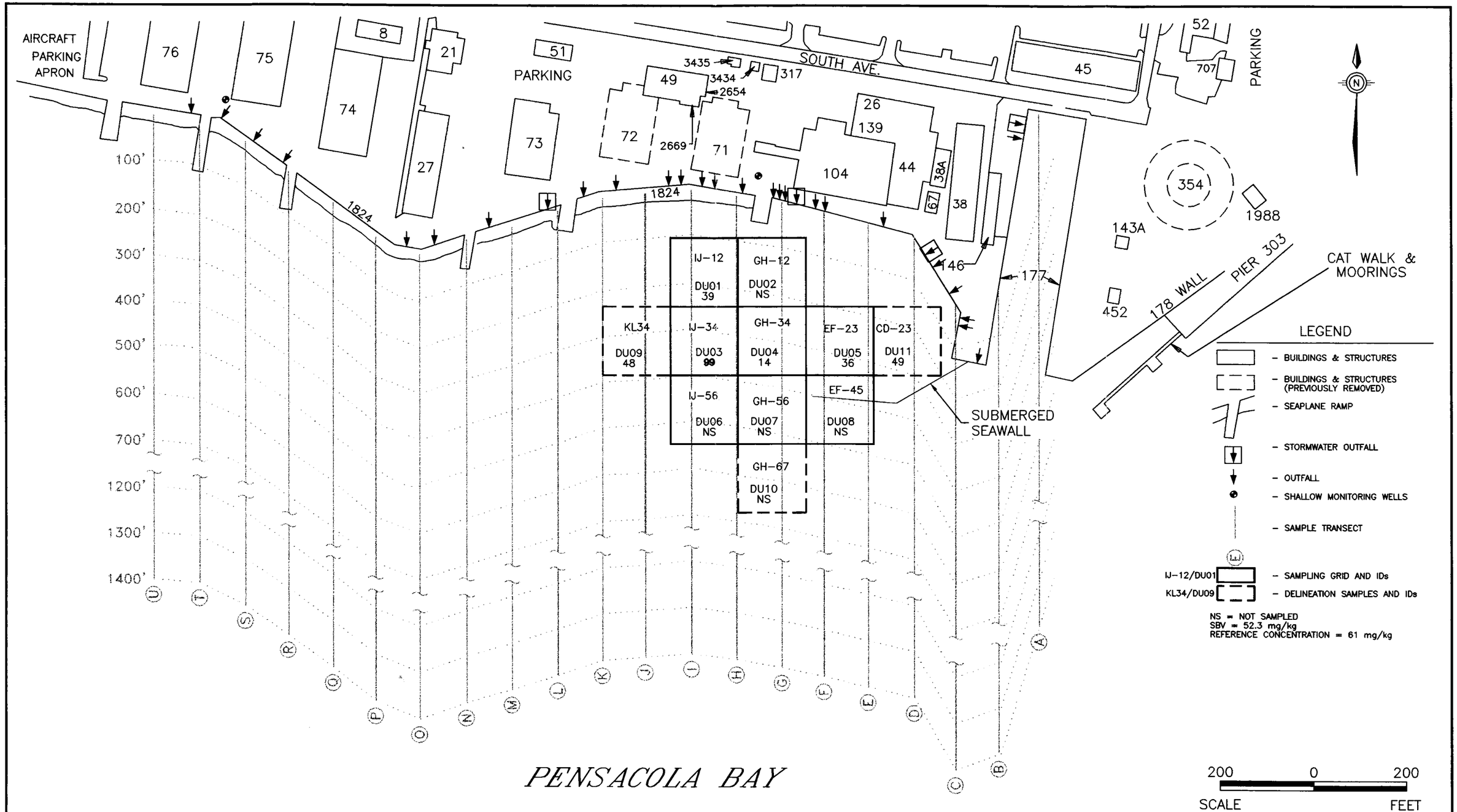
NOTE: SBV EXCEEDANCES ARE BOLD

Naval Facilities Engineering Command Southern Division

REMEDIAL INVESTIGATION REPORT ADDENDUM
SITE 2
NAS-PENSACOLA
PENSACOLA, FLORIDA

FIGURE 3-15
CADMIUM IN SUBSURFACE SEDIMENT

DWG DATE:02/26/03 | NAME: 0059001W035



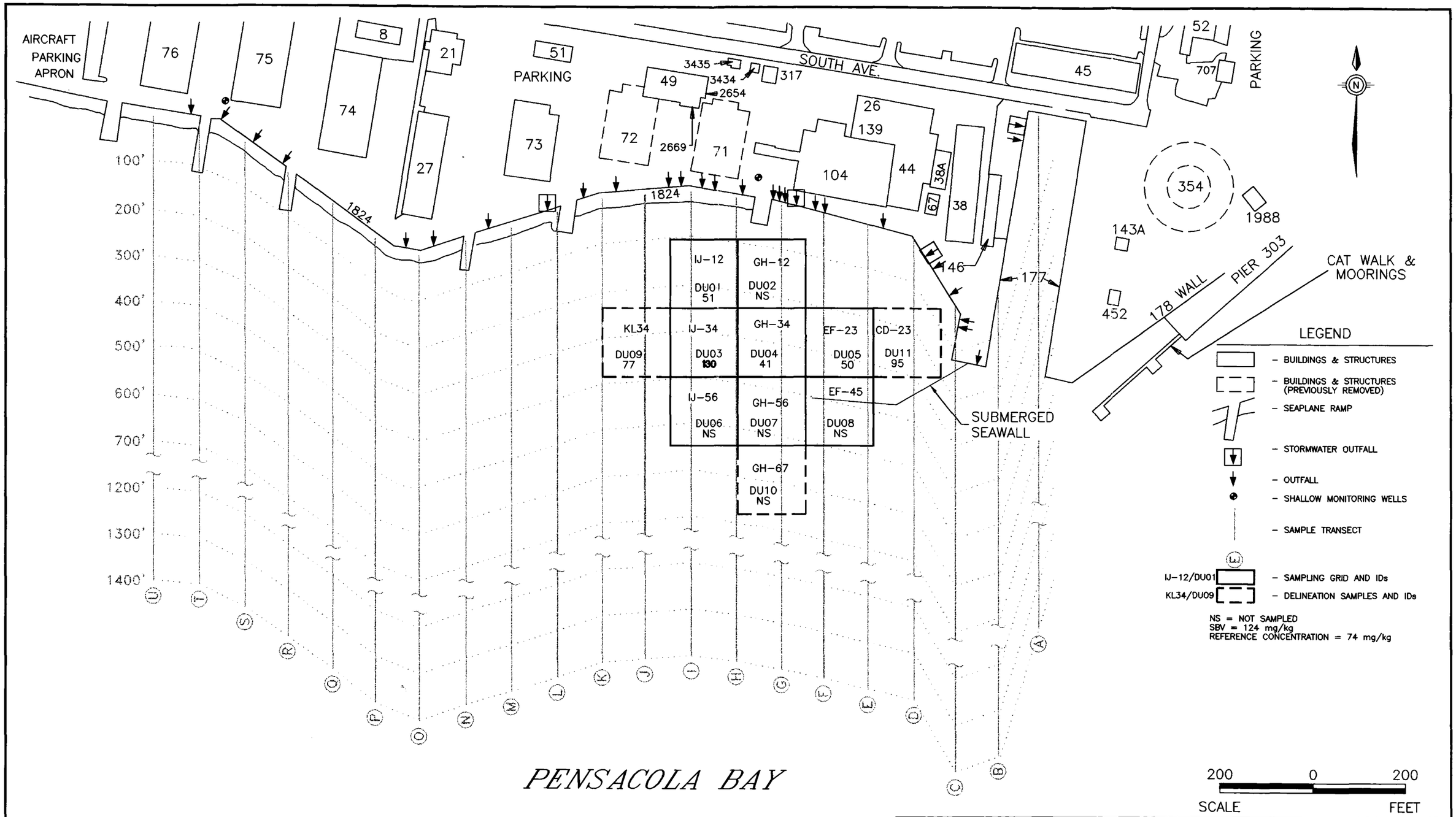
NOTE: SBV EXCEEDANCES ARE BOLD

Naval Facilities Engineering Command • Southern Division •

REMEDIAL INVESTIGATION REPORT ADDENDUM
SITE 2
NAS-PENSACOLA
PENSACOLA, FLORIDA

FIGURE 3-16
CHROMIUM IN SUBSURFACE SEDIMENT

DWG DATE:02/26/03 | NAME: 0059001W036



NOTE: SBV EXCEEDANCES ARE BOLD

Naval Facilities Engineering Command Southern Division Pensacola

REMEDIAL INVESTIGATION REPORT ADDENDUM
SITE 2
NAS-PENSACOLA
PENSACOLA, FLORIDA

FIGURE 3-17
ZINC IN SUBSURFACE SEDIMENT

DWG DATE:02/26/03 | NAME: 0059001W037

Table 3-2

Subsurface Sediment Chemistry 2000

	Reference			IJ-12 USEPA 1		IJ-34 USEPA 3		GH-34 USEPA 4		EF-23 USEPA 5		KL-34 USEPA 9		CD-23 USEPA 11		Reference Station 18 USEPA 18		22 USEPA 22	
	Conc.	SBV	Source	Conc.	HQ	Conc.	HQ	Conc.	HQ	Conc.	HQ	Conc.	HQ	Conc.	HQ	Conc.	HQ	Conc.	HQ
Inorganics (mg/kg)																			
Aluminum (Al)	19200	NA	NA	15000	-	14000	-	4000	-	10000	-	14000	-	15000	-	3200	-	16000	-
Antimony (Sb)	0.47	12	a	ND	-	2.7	0.23	0.41	0.03	0.30	0.03	0.35	0.03	0.75	0.06	0.15	0.01	0.32	0.03
Arsenic (As)	22.1	7.24	a/b	**14.00**	**1.93**	**16**	**2.2**	**12**	**1.66**	**12**	**1.66**	**16**	**2.21**	**18**	**2.49**	5.1	0.70	**17**	**2.35**
Barium (Ba)	29.7	NA	NA	25.0	-	28	-	7.7	-	22	-	24	-	36	-	5.7	-	24	-
Beryllium	1.23	NA	NA	0.78	-	0.83	-	0.21	-	0.67	-	0.91	-	0.84	-	0.23	-	1	-
Cadmium (Cd)	0.34	0.68	b	0.10	0.15	**2.9**	**4.26**	0.46	0.68	0.49	0.73	0.36	0.53	**0.77**	**1.13**	0.09	0.13	0.25	0.37
Calcium (Ca)	31000	NA	NA	41000	-	25000	-	9400	-	28000	-	33000	-	31000	-	18000	-	13000	-
Chromium (Cr)	61	52.3	a/b	39.0	0.75	**99**	**1.89**	14	0.27	36	0.69	48	0.92	49	0.94	12	0.23	49	0.94
Cobalt (Co)	7.7	NA	NA	4.10	-	5.2	-	3.1	-	3.6	-	5.1	-	5	-	1.2	-	6.5	-
Copper (Cu)	16.4	18.7	a/b	**50**	**2.67**	**29**	**1.55**	14	0.75	**52**	**2.78**	**19**	**1.02**	**75**	**4.01**	3.4	0.18	13	0.70
Iron (Fe)	28400	NA	NA	22000	-	18000	-	23000	-	14000	-	21000	-	20000	-	4400	-	24000	-
Lead (Pb)	29.6	30.2	a/b	**52.0**	**1.72**	**140**	**4.64**	**230**	**7.62**	**63**	**2.09**	**36**	**1.19**	**200**	**6.62**	5.6	0.19	24	0.79
Magnesium (Mg)	10500	NA	NA	6300	-	7300	-	3800	-	5900	-	8400	-	7300	-	2200	-	8300	-
Manganese (Mn)	388	NA	NA	220	-	420	-	150	-	210	-	540	-	330	-	68	-	320	-
Mercury (Hg)	0.12	0.13	a/b	**0.21**	**1.62**	**0.24**	**1.85**	**0.25**	**1.92**	**0.46**	**3.53**	**0.74**	**5.69**	**0.81**	**6.23**	0.02	0.16	0.1	0.77
Nickel (Ni)	16.7	15.9	a/b	12.0	0.75	13	0.82	5.4	0.34	11	0.06	13	0.82	15	0.94	3.7	0.23	13	0.82
Potassium (K)	3300	NA	NA	2800	-	2400	-	640	-	2000	-	2400	-	2200	-	600	-	2700	-
Selenium (Se)	2.55	NA	NA	2.2	-	1.9	-	0.54	-	1.9	-	2.2	-	2.3	-	0.85	-	1.7	-
Silver (Ag)	-	0.73	b	0.07	0.10	**2.2**	**3.01**	-	-	-	-	-	-	-	-	-	-	-	-
Sodium (Na)	24400	NA	NA	18000	-	20000	-	4700	-	16000	-	22000	-	19000	-	5400	-	19000	-
Thallium (Tl)	0.253	NA	NA	0.25	-	0.22	-	0.061	-	0.22	0.254	0.22	-	0.27	-	0.063	-	0.19	-
Tin (Sn)	1.81	NA	NA	0.95	-	2.9	-	1.7	-	3.1	-	1.8	-	5.5	-	0.41	-	1.4	-
Vanadiuim (V)	52	NA	NA	36	-	40	-	11	-	33	-	42	-	41	-	14	-	38	-
Zinc (Zn)	74	124	a/b	51.0	0.41	**130**	**1.05**	41	0.33	50	0.40	77	0.62	95	0.77	12	0.10	62	0.50
Pesticides/PCBs (µg/kg)																			
Aroclor-1254	-	21.6	a/b	NS	NC	**58**	**2.69**	-	-	-	-	-	-	-	-	-	-	-	-
Aroclor-1260	-	21.6	a/b	NS	NC	**98**	**4.54**	-	-	-	-	-	-	-	-	-	-	-	-
4,4'-DDT	1.2	1.19	b	NS	NC	-	-	-	-	-	-	-	-	**1.8**	**1.51**	-	-	**1.2**	**1.01**
beta-BHC	-	0.32	c	NS	NC	**1.9**	**5.94**	-	-	-	-	-	-	-	-	-	-	-	-
delta-BHC	2.6	0.32	c	NS	NC	-	-	**0.78**	**2.44**	**2.6**	**8.13**	**3.0**	**9.38**	-	-	-	-	**2.6**	**8.13**
Endosulfan Sulfate	-	NA	NA	NS	NC	-	-	1	-	1.2	-	-	-	-	-	-	-	-	-
Endrin Ketone	-	NA	NA	NS	NC	-	-	-	-	-	-	-	-	1.3	0.39	-	-	-	-
Methoxychlor	-	NA	NA	NS	NC	-	-	2.60	-	-	-	13	-	-	-	-	-	-	-
SVOCs (µg/kg)																			
Anthracene	25	46.9	b	17	0.36	**64**	**1.36**	42	0.90	35	0.75	25	0.53	**91**	**1.94**	3.0	0.06	22	0.47
Benzo(a)anthracene	113	74.8	b	**90.0**	**1.20**	**360**	**4.81**	**120**	**1.6**	**130**	**1.74**	**110**	**1.47**	**390**	**5.21**	14	0.19	**99**	**1.32**
Benzo(b)fluoranthene	322	NA	NA	-	-	1200	-	340	-	490	-	340	-	1,100	-	72	-	250	-
Benzo(g,h,i)perylene	165	NA	NA	100	-	380	-	150	-	140	-	130	-	440	-	25	-	140	-
Benzo(k)fluoranthene	91	NA	NA	48	-	290	-	97	-	88	-	85	-	250	-	14	-	77	-
Benzo(a)pyrene	142	88.8	b	**100**	**1.13**	**460**	**5.2**	**160**	**1.80**	**160**	**1.80**	**140**	**1.58**	**460**	**5.18**	22	0.25	**120**	**1.35**
Chrysene	232	108	b	**160**	**1.48**	**850**	**7.87**	**260**	**2.41**	**250**	**2.31**	**250**	**2.31**	**790**	**7.31**	32	0.3	**200**	**1.85**
Dibenz(a,h)anthracene	42.6	6.22	b	-	-	**110**	**17.68**	**41**	**6.59**	**41**	**6.59**	**36**	**5.79**	**120**	**19.29**	**6.6**	**1.06**	**36**	**5.79**
Fluorene	11	21.2	b	9.6	0.45	-	-	**26**	**1.23**	-	-	11	0.52	**48**	**2.26**	-	-	11	0.52
Fluoranthene	240	113	b	**180**	**1.59**	**530**	**4.69**	**260**	**2.3**	**260**	**2.3**	**230**	**2.04**	**800**	**7.08**	30	0.27	**210**	**1.86**
Indeno(1,2,3-cd)pyrene	141	NA	NA	91	-	360	-	140	-	110	-	120	-	390	-	21	-	120	-
Naphthalene	32	34.6	b	32	0.92	-	-	-	-	-	-	**47**	**1.36**	-	-	-	-	32	0.92
Phenanthrene	111	86.7	b	65	0.75	**210**	**2.42**	**160**	**1.85**	**130**	**1.5**	**100**	**1.15**	**390**	**4.51**	17	0.20	**94**	**1.08**
Pyrene	240	153	b	**190**	**1.24**	**890**	**5.82**	**270**	**1.76**	**290**	**1.90**	**250**	**1.63**	**1,000**	**6.54**	30	0.20	**210**	**1.37**
Total PAHs	1260.85	1684	a/b	890.7	0.53	**4053**	**2.41**	1631	0.97	**1819.5**	**1.08**	1247.5	0.74	**4659**	**2.77**	184.7	0.11	1076.15	0.64
Bis-(2-ethylhexy)phthalate	-	182	b	**NS**	**NC**	**2900**	**2.41**	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

'-' = not detected

a = USEPA SSV

b = FDEP SQAG

c = The TEL of 0.32µg/kg for gamma-BHC is used as a surrogate SBV for beta-BHC and delta-BHC

HQ = Hazard Quotient, Detected Concentration/SBV

SBV = Lower of EPA Region IV SSV or FDEP SQAG

NS = Not Sampled

NC = Not Calculated

NA = no SBV available

Locations exceeding reference concentrations are shown underlined.

Locations exceeding SBV are shown in bold.

Locations exceeding SBV and reference concentrations are shown in squares.

Total PAHs were calculated summing all detected values and half the detection limit for all nondetects.

Pesticides/PCBs

Aroclor-1254 exceeded its SBV of 21.6 µg/kg at the only location (IJ-34) where it was detected. Aroclor-1260 also exceeded its SBV of 21.6 µg/kg at location IJ-34. 4,4-DDT , which was detected at only one location, exceeded its reference concentration (1.2 µg/kg) and SBV (1.19 µg/kg) at CD-23 (1.8 µg/kg). However, the detected concentration is below the base-wide level (20 µg/kg) established for this constituent (EnSafe Inc, 2000). Beta-BHC was detected at one Site 2 location (IJ-34) above its surrogate SBV (i.e., SBV for gamma-BHC) of 0.32 µg/kg (Figure 3-18). Delta-BHC exceeded its surrogate SBV of 0.32 µg/kg at three onsite locations (GH-34, EF-23, KL-34) as shown on Figure 3-18, but also exceeded its SBV at reference location 22. Endosulfan sulfate (two locations), endrin ketone (one location) and methoxychlor (two locations) were the other pesticides detected. These three parameters do not have SBVs.

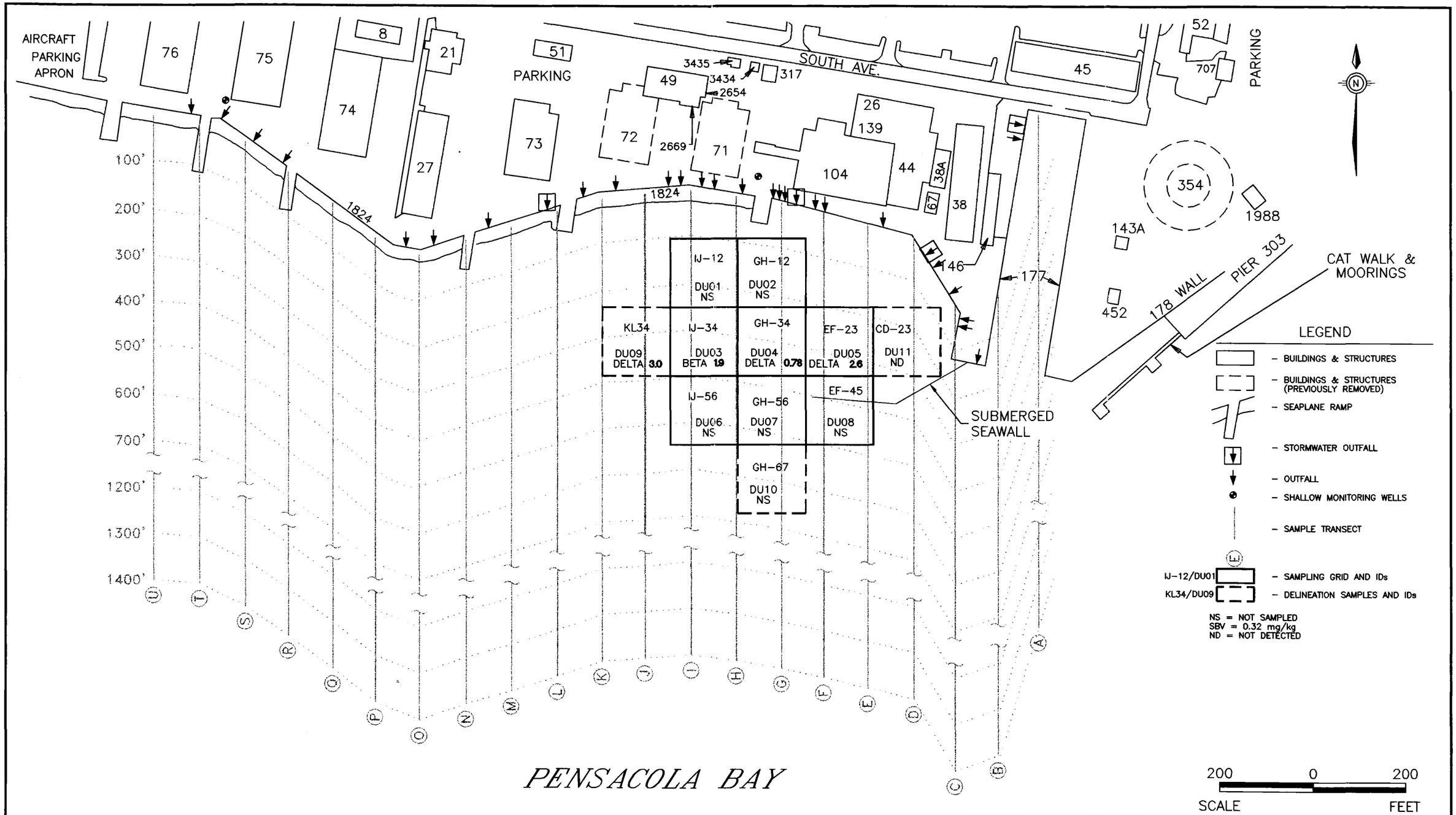
Semivolatile Organic Compounds

PAHs are summed for assessment of sediment quality. However, individual constituents and the total PAH concentrations are provided on Table 3-2. PAHs, which were detected at every station, exceeded the total PAH SBV of 1,684 µg/kg at three location s (IJ-34, EF-23, and CD-23) as shown on Figure 3-19. BEHP was detected at only one location (IJ-34). The detection (2,900 µg/kg) exceeded its SBV of 182 µg/kg.

3.1.4 Summary of Detections with HQs >1

Table 3-3 lists the constituents in surface and subsurface sediment samples which had HQs >1.

Constituents with HQs >1 were noted more often in DUs located in the eastern portion of the study area, in areas where finer sediments were observed. This may be attributed to tidal fluctuations and eddy effects caused by interactions between the shoreline and the submerged seawall.



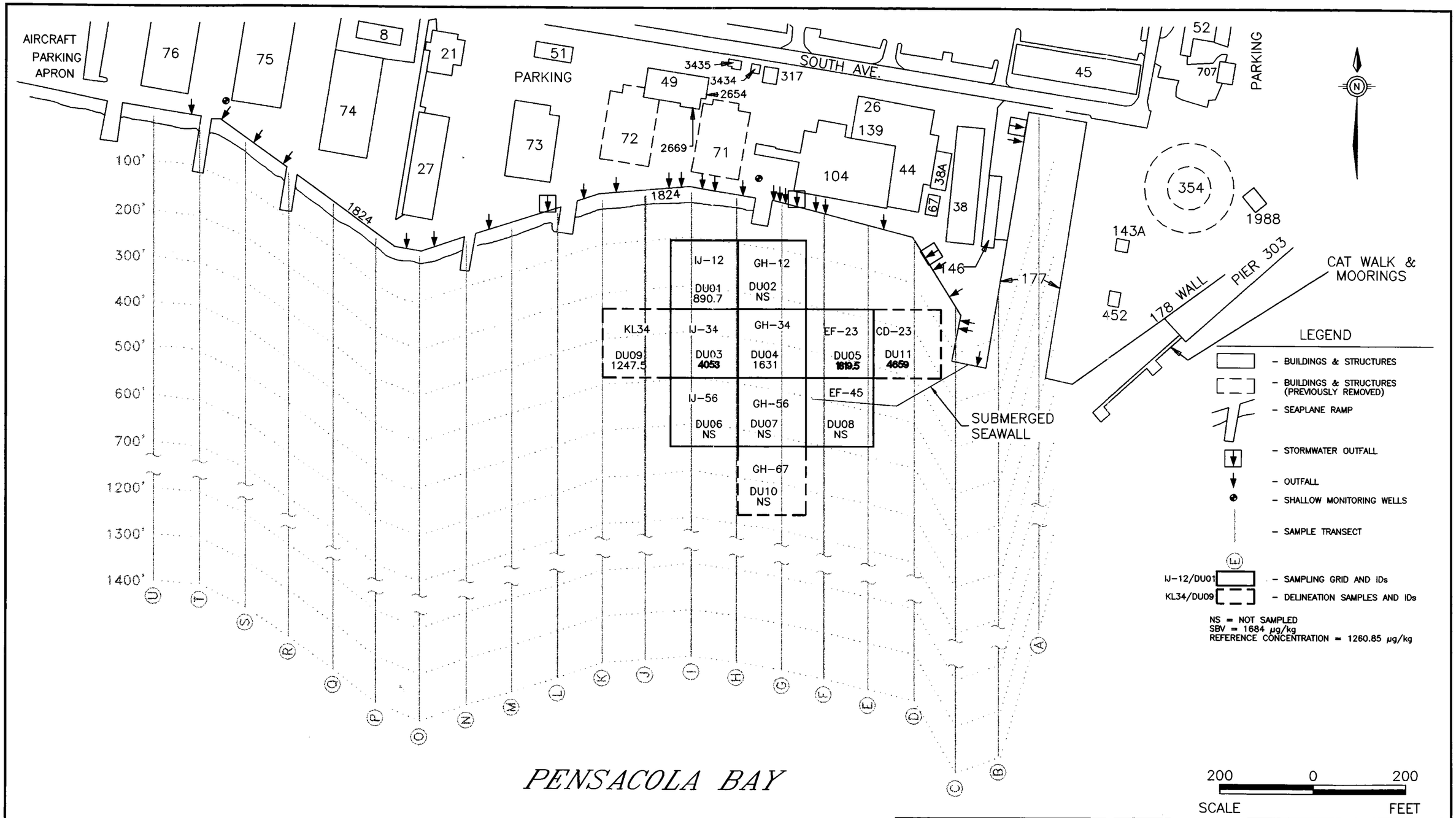
NOTE: SBV EXCEEDANCES ARE BOLD

Naval Facilities Engineering Command Southern Division

REMEDIAL INVESTIGATION REPORT ADDENDUM
SITE 2
NAS-PENSACOLA
PENSACOLA, FLORIDA

FIGURE 3-18
BHC IN SUBSURFACE SEDIMENT

DWG DATE:02/26/03 | NAME: 0059001W038



NOTE: SBV EXCEEDANCES ARE BOLD

Naval Facilities Engineering Command Southern Division

REMEDIAL INVESTIGATION REPORT ADDENDUM
SITE 2
NAS-PENSACOLA
PENSACOLA, FLORIDA

FIGURE 3-19
TOTAL PAHs IN SUBSURFACE SEDIMENT

DWG DATE:02/26/03 | NAME: 0059001W039

Table 3-3
Site 2 Detections with HQs Greater Than 1

Station	Surface	Subsurface
IJ-12 USEPA 1	Cadmium, Chromium, Copper, Lead, Aroclor-1254, Aroclor-1260, Total PAHs, and BEHP	Arsenic, Copper, Lead, and Mercury
GH-12 USEPA 2	Dieldrin	Not Sampled
IJ-34 USEPA 3	Arsenic, Cadmium, and Lead	Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Silver, Zinc, Aroclor-1254, Aroclor-1260, beta-BHC, Total PAHs and BEHP
GH-34 USEPA 4	Arsenic, Cadmium, Copper, Lead, Aroclor-1260, Total PAHs	Arsenic, Lead, Mercury, and delta-BHC
EF-23 USEPA 5	Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Zinc, Aroclor-1254, Aroclor-1260, Total PAHs and BEHP	Arsenic, Copper, Lead, Mercury, delta-BHC, and Total PAHs
IJ-56 USEPA 6	None	Not Sampled
GH-56 USEPA 7	None	Not Sampled
EF-45 USEPA 8	4,4'-DDT, Total PAHs, and BEHP	Not Sampled
KL-34 USEPA 9	Arsenic, Copper, delta-BHC, and BEHP	Arsenic, Copper, Lead, Mercury, and delta-BHC
GH-67 USEPA 10	None	Not Sampled
CD-23 USEPA 11	Arsenic, Cadmium, Copper, Lead, Mercury, 4,4-DDD, Total PAHs, and BEHP	Arsenic, Cadmium, Copper, Lead, Mercury, 4,4-DDT, and Total PAHs
Station 18 USEPA 18	delta-BHC	None
Station 22 USEPA 22	Arsenic	Arsenic, 4,4'-DDT, and delta-BHC

Notes:
All arsenic concentrations are below reference concentration.
PAHs were summed to assess sediment quality. Individual constituent exceedances are not listed in this table.

3.1.5 AVS/SEM Results in Surface Sediment

Sediments were analyzed for AVS/SEM to determine if trace metals may be bioavailable to the benthic community. As discussed in Section 2.1.3, the AVS normalization approach assumes that select trace metals (cadmium, copper, nickel, lead, and zinc) bind to sediment sulfide, thus becoming insoluble. Those metals not bound to the sediment sulfides may be bioavailable to organisms. If the concentration of SEM is less than the molar concentration of AVS, all metals should precipitate as metal sulfides and not be bioavailable. Conversely, if SEM exceeds AVS, then free metal ions may exist in pore water. The analysis assumes that when the difference between SEM and AVS (SEM-AVS) concentration is greater than 1 or the ratio of SEM/AVS is greater than 1, bioavailability from the select divalent cationic metals is probable.

The AVS/SEM results from Site 2 are presented in Table 3-4. The AVS/SEM results reveal that metal constituents are generally not bioavailable, although they may be present at Stations GH-12, GH-67, and CD-23. There was concordance at Station CD-23 between the two trace metal availability methods, but not at Stations GH-12 or GH-67.

Table 3-4
AVS/SEM Results for Sediments

Station IDs		SEM-AVS[a]	SEM/AVS[b]
IJ-12	USEPA 1	-0.07	0.97
GH-12	USEPA 2	0.095	**1.30**
IJ-34	USEPA 3	-3.28	0.24
GH-34	USEPA 4	-2.095	0.31
EF-23	USEPA 5	-0.52	0.81
IJ-56	USEPA 6	-0.701	0.28
GH-56	USEPA 7	-0.771	0.34
EF-45	USEPA 8	-9.41	0.10
KL-34	USEPA 9	-4.9	0.17
GH-67	USEPA 10	0.043	**1.60**

Table 3-4
AVS/SEM Results for Sediments

Station IDs		SEM-AVS[a]	SEM/AVS[b]
CD-23	USEPA 11	**1.67**	**2.40**
18	18	-0.088	0.74
22	22	-0.89	0.53

Notes:
a = USEPA. (2001). *Equilibrium Partitioning Sediment Guidelines (ESGs) for the Protection of Benthic Organisms: Metal Mixtures (Cadmium, Copper, Lead, Nickel, Silver, and Zinc).* Draft.
b = USEPA. (1991). *Analytical Method for the Determination of Acid Volatile Sulfide and Selected Simultaneously Extractable Metals in Sediment.*
Bold = Values above 1.0 may indicate bioavailability of select SEM metals.

3.1.6 TOC in Surface Sediment

TOC was not analyzed by the laboratory. However, a sample from each DU was analyzed for organic and non-organic % for material greater than 2 mm in size and less than 2 mm in size. The TOC content may be conservatively estimated as 50% of the organic material less than 2 mm in size (personal communication with Jack Word, MEC Analytical Systems, Inc.) Table 3-5 presents the % total organic material <2 mm in size from Appendix B and the estimated TOC.

Table 3-5
TOC Estimated From < 2mm Total Organic Material Content in Surface Sediment

Station		< 2 mm Percent Organics	Estimated TOC (%)
IJ-12	USEPA 1	2.01	1.00
GH-12*	USEPA 2	0.71	0.04
IJ-34	USEPA 3	10.09	5.04
GH-34	USEPA 4	6.26	3.13
EF-23	USEPA 5	5.41	2.71
IJ-56	USEPA 6	1.39	0.69
GH-56	USEPA 7	1.85	0.93
EF-45	USEPA 8	5.54	2.77
KL-34	USEPA 9	10.01	5.00

Table 3-5
TOC Estimated From < 2mm Total Organic Material Content in Surface Sediment

Station		< 2 mm Percent Organics	Estimated TOC (%)
GH-67*	USEPA 10	0.17	0.08
CD-23*	USEPA 11	2.71	1.36
Station 18	18	2.08	1.04
Station 22	22	6.86	3.43

Note:

* = Locations identified as a potential concern for bioavailability from AVS/SEM results.

3.1.7 Physical Composition of Sediments

Samples varied in sand, silt, and clay content, depending on the location of the sample relative to the underwater seawall. Surface sediment samples from DU stations adjacent to the shoreline (IJ-12 and GH-12) were predominantly sand, attributable to their position in a high energy zone. The sample from Station GH-67, the only station that clearly fell beyond the seawall, was largely coarse sand. Table 3-6 lists the grain size characteristics of surface sediments at Site 2, and Table 3-7 identifies the subsurface sediment make-up for Site 2.

Table 3-6
Physical Composition of Surface Sediments

Station	Sand (%)	Silt and Clay (%)	Classification
IJ-12 USEPA 1	62	38	Silty Sand
GH-12* USEPA 2	84	16	Silty Sand
IJ-34 USEPA 3	41	59	Sandy Silt
GH-34 USEPA 4	43	57	Sandy Silt
EF-23 USEPA 5	54	46	Silty Sand

Table 3-6
Physical Composition of Surface Sediments

Station	Sand (%)	Silt and Clay (%)	Classification
IJ-56 USEPA 6	76	24	Silty Sand
GH-56 USEPA 7	67	33	Silty Sand
EF-45 USEPA 8	48	52	Sandy Silt
KL-34 USEPA 9	44	56	Sandy Silt
GH-67* USEPA 10	95	5	Silty Sand
CD-23* USEPA 11	61	39	Silty Sand
Station 18 USEPA 18	58	42	Silty Sand
Station 22 USEPA 22	39.4	60.6	Sandy Silt

Notes:
Particle size for sand > 125 mm, fines < 62.5 mm and clay < 3.91 mm; as described by the Wentworth size class.
* = Locations identified as a potential concern for bioavailability from AVS/SEM results.

Table 3-7
Physical Composition of Subsurface Sediments

Station	Sand	Silt and Clay	Classification
IJ-12 USEPA 1	18	82	Sandy Silt
IJ-34 USEPA 3	13	87	Sandy Silt
GH-34 USEPA 4	57	43	Silty Sand
EF-23 USEPA 5	19	81	Sandy Silt
KL-34 USEPA 9	12	88	Sandy Silt
CD-23 USEPA 11	22	78	Sandy Silt
Station 18 USEPA 18	19	81	Sandy Silt

Table 3-7
Physical Composition of Subsurface Sediments

Station	Sand	Silt and Clay	Classification
Station 22 USEPA 22	13	87	Sandy Silt

Notes:
Particle size for sand > 125 mm, fines < 62.5 mm, and clay < 3.91 mm; as described by the Wentworth size class.

3.2 Results of Biological Analyses

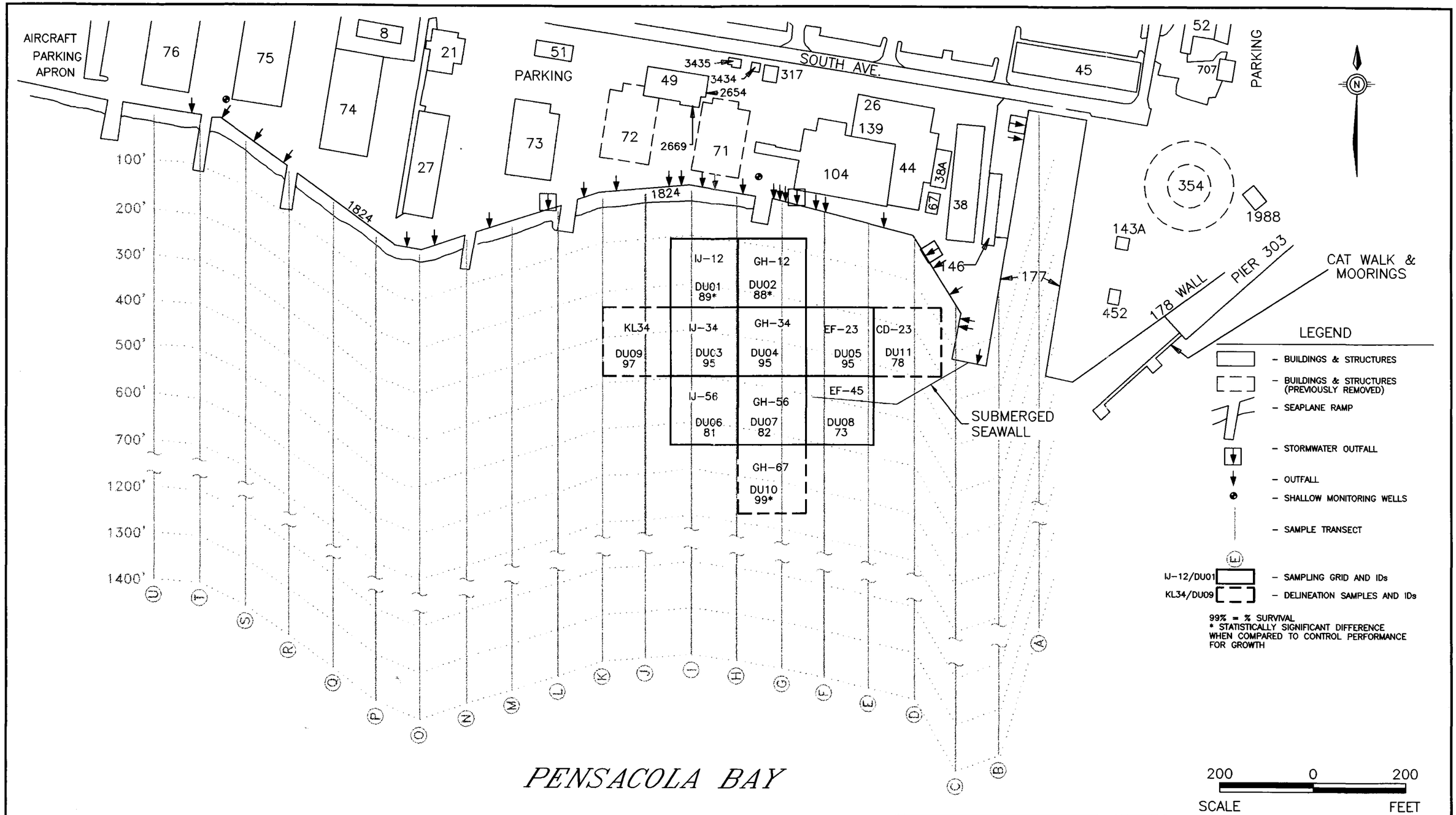
3.2.1 Negative Control Sediment: C-17

All bioassay tests had a negative control sediment (laboratory control sediment) collected from neighboring Perdido Bay (Figure 1-1). Negative controls are routinely run with all bioassay tests to ensure TAC are met. Once TAC are met, negative controls are rarely discussed.

Two reference stations were identified (Stations 18 and 22) for Site 2 sediment comparisons and evaluations. Reference Stations 18 and 22 were also tested against the negative control (see Tables 3-8 and 3-9) to evaluate their performance. Chemical analyses for C-17 are presented in Appendix C.

3.2.2 Solid-Phase Amphipod Test Results

Control performance and water quality parameters were within acceptable limits for both the initiation and termination of the 10-day solid phase test with *Leptocheirus plumulosus*. Data for each set of tests (grouped by stations with each set of laboratory controls) are summarized in Table 3-8 and presented on Figure 3-20. Toxicity data are presented in Appendix E. Sediments with statistically significant differences from the laboratory control performance are identified in Table 3-8. Control sediment performance (C-17) is provided to demonstrate that TAC for the test were met.



Naval Facilities Engineering Command Southern Division

REMEDIAL INVESTIGATION REPORT ADDENDUM
SITE 2
NAS-PENSACOLA
PENSACOLA, FLORIDA

FIGURE 3-20
LEPTOCHEIRUS TOXICITY TEST RESULTS

DWG DATE:02/26/03 | NAME: 0059001W040

Table 3-8
***Leptocheirus plumulosus* 10-Day Sediment Bioassays**

Stations	% Survival	% CV	Weight (mg/amphipod)
Lab Control Sediment C-17	93	7.2	0.22
IJ-12 USEPA 1	89	9.2	0.13[a]
GH-12 USEPA 2	88	7.6	0.14[a]
IJ-34 USEPA 3	95	3.7	0.25
GH-34 USEPA 4	95	5.2	0.21
EF-23 USEPA 5	95	4.2	0.16
Lab Control Sediment C-17	94	8.7	0.22
IJ-56 USEPA 6	81[b]	5	0.21
GH-56 USEPA 7	82	18.5	0.28
EF-45 USEPA 8	73[b]	7.8	0.24
CD-23 USEPA 11	78[b]	5.7	0.27
Lab Control Sediment C-17	100	0	0.23
KL-34 USEPA 9	97***	2.9	0.27
GH-67 USEPA 10	99***	2.5	0.13[a]
Station 18 USEPA 18	98***	2.5	0.12[a]
Station 22 USEPA 22	96***	2.5	0.14[a]

Notes:
a = T-test comparisons identified statistically significant difference when compared to the control performance.
b = Statistically significant when compared to the lab control group.
CV = Coefficient of variation between replicates
*** = Four replicates of 20 organisms were exposed to sediments giving a total of 80 animals/sediment.

Table 3-9
***Mysidopsis bahia* 7-Day Sediment Chronic Bioassays**

Stations	% Survival	% CV	Weight	Total Females/40	Females with Eggs	% Females with Eggs	Females without Eggs
Lab Control Sediment C-17	97		0.32	17	9	52.9	8
IJ-12 USEPA 1	100[b]	0	0.36	20	17	85	3
GH-12 USEPA 2	100[b]	0	0.34	12	11	92	1
IJ-34 USEPA 3	97	7.2	0.39	17	16	94	1
GH-34 USEPA 4	97	7.2	0.35	14	14	100	0
EF-23 USEPA 5	97	7.2	0.34	15	10	67	5
Lab Control Sediment C-17	100	0	0.40	15	14	93	1
IJ-56 USEPA 6	97	7.2	0.53	16	15	94	1
GH-56 USEPA 7	97	7.2	0.4	17	15	88	2
EF-45 USEPA 8	97	7.2	0.37[a]	16	12	75	4
CD-23 USEPA 11	100[b]	0	0.47	20	19	95	1
Lab Control Sediment C-17	93	16	0.32	17	9	53	8
GH-67 USEPA 10	84	16.6	0.3	13	9	69	4
KL-34 USEPA 9	95	9.7	0.34	17	15	88	2
Station 18 USEPA 18	90	20.5	0.28	14	13	93	1
Station 22 USEPA 22	92	11.1	0.32	9	2	22	7

Notes:

CV = Coefficient of variation between replicates.
Survival = 80% or greater control survival was considered acceptable.
Weights = Average dry weight 0.20 mg/mysid.
Fecundity = 50% or more females in the control were gravid, indicating a valid test.
a = T-test comparisons identified statistically significant difference when compared to growth (measured as weight) at USEPA Station 18
b = T-test comparisons identified statistically significant difference when compared to survival at USEPA Station 18

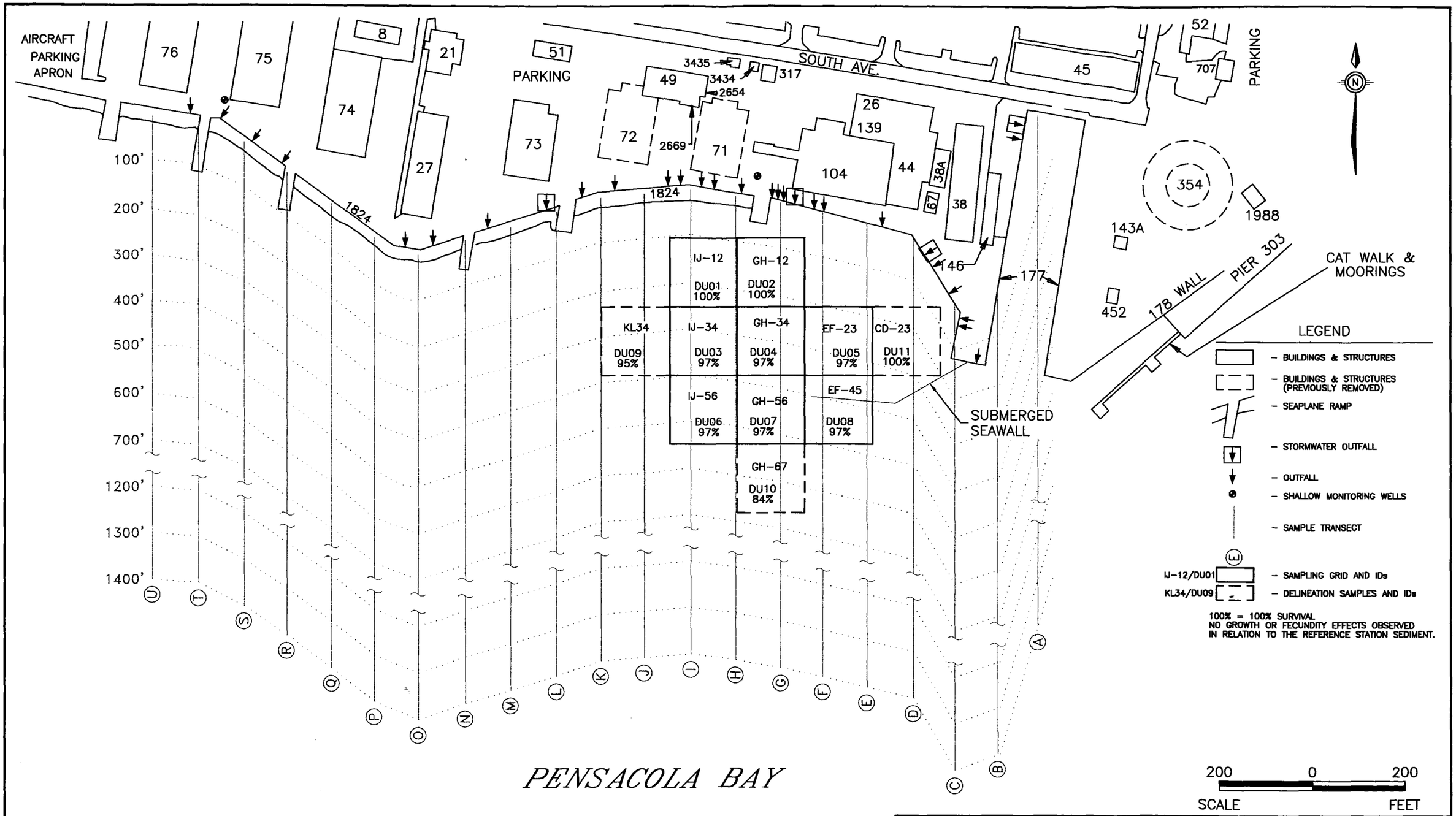
Survival rates at Stations IJ-56, EF-45, and CD-23 were found to be statistically significant when compared to the laboratory control group. However, survival rates at Stations IJ-56 (81%) and CD-23 (78%) fell within the NOEC (NOEC = IC_{25}, see Section 2.2.3) range.

Although not in the promulgated methods for this test, weight was added as an endpoint to enhance the data for this study. To determine weight, the animals were collected from the sediment replicate in which they were exposed for 10-days. After the final counts were recorded, the animals were combined with other animals from their exposure sediment, thus combining all the animals within each replicate. The amphipods were rinsed with deionized water to remove salt content, placed in a tarred weigh boat, and dried in a drying oven. Weights were statistically analyzed using a T-test and exposure sediments were compared to the laboratory control sediments. The average laboratory control weight for *Leptocheirus plumulosus* was 0.22 mg/amphipod. Statistically significant lower weights occurred at stations IJ-12, GH-12, GH-67, and Reference Stations 18 and 22.

Intra-test variability, which is measured as the coefficient of variance (CV), is considered valid if the CV is <30% (USEPA, 1991b). As shown on Table 3-9, the CV between stations was generally less than 10%, indicating that tests were valid and precise. The exception to the <10% previously cited occurred at Station GH-56, which had a CV of 18.5.

3.2.3 Solid-Phase Mysid Test Results

Water quality parameters and test conditions were within acceptable limits for the mysid tests. The mysid toxicity data are summarized in Table 3-9 and presented on Figure 3-21. The 7-Day Chronic Survival, Growth and Fecundity Tests for the mysids are presented in Appendix D. In addition to the weight endpoint, fecundity was added to determine if reproductive impairments were occurring at each station. To further enhance the study and determine if a chemical gradient could be observed through mysid responses, Site 2 sediments were serially diluted with clean sediments to establish sediment concentrations of 100%, 50%, and 25% (Appendix A). No effects were observed in tests run from the 50% and 25% dilutions, and therefore these tests are not discussed in the body of the report.



REMEDIAL INVESTIGATION
REPORT ADDENDUM
SITE 2
NAS-PENSACOLA
PENSACOLA, FLORIDA

FIGURE 3-21
MYSIDOPSIS TOXICITY TEST RESULTS

DWG DATE: 12/10/03 | NAME: 0059001W041

No effects were noted while analyzing mysid fecundity rates, except at Reference Station 22 where less than 50% of the females were carrying eggs. CV between stations was generally less that 10%, indicating a valid test. Station GH-67 exhibited slightly higher variability as did the control sediment used for that test batch, but CV values were still less than 30%, indicating a valid test (see Table 3-10). Reference Stations 18 and 22 also exhibited a slightly higher CV.

3.2.4 Benthic Community Analysis Results

Table 3-10 presents the benthic community species diversity results. The sampling plan was developed so that each DU was adjacent to the next (Figure 2-1), allowing for benthic community samples to be shared between Stations GH-12 and IJ-34; GH-34 and IJ-56; and CD-23 and EF-45 (these DUs are identified with an asterisk in Table 3-10). Benthic community samples were collected to provide additional information on the conditions at Site 2 and provide the third leg of evidence for each DU in the sediment quality triad. Results are presented in Appendix E.

Benthic Diversity at Reference Stations 18 and 22

Benthic diversity samples were collected from Reference Stations 18 and 22 for comparison to the Site 2 DU samples to determine if DU species diversity was greater or less than at the reference locations. Reference Stations 18 and 22 were located at water depths less than 30 feet, whereas the Site 2 DUs were located in less than 20 feet of water.

Reference Station 18 samples contained 40 taxa represented by annelids, molluscs, arthropods, and echinoderms. The dominant species of annelids were the polychaetes, *Mediomastus* and *Owenia fusiformis*, both found in areas where pollution influence is less apt to occur. Also collected at Station 18 were the amphipod, *Ampelisca* (a common bioassay test organism), four brittle stars representing the echinoderm family, and five molluscs. Reference Station 22 samples contained 19 taxa represented by annelids, molluscs, and arthropods. The dominant species of polychaete found at Station 22 included *Leitoscoloplos* and *Mediomastus*; the former known to occur in pollution enhanced areas and the latter found commonly in less polluted areas. As shown in Table 3-10, both reference stations had lower overall diversities (2.57 to 2.81) and richness (4.53 to 6.84) when compared to the Site 2 DU benthic diversity results. This may be attributed to the lower salinity found in the upper reaches of the Pensacola Bay system (Rakocinski, et al., 1997) or the slightly greater water depth at these stations.

Table 3-10
Benthic Community Data

Stations	Benthic Community Analysis		
	Diversity	**Evenness**	**Richness**
IJ-12 USEPA 1	3.04	0.77	9.87
GH-12 * USEPA 2	2.90	0.77	8.83
IJ-34* USEPA 3	3.25	0.85	8.83
GH-34* USEPA 4	3.17	0.82	8.30
EF-23 USEPA 5	2.87	0.76	8.28
IJ-56* USEPA 6	3.25	0.84	8.53
GH-56 USEPA 7	3.16	0.83	8.47
EF-45* USEPA 8	3.05	0.75	10.22
KL-34 USEPA 9	3.11	0.80	8.88
GH-67 USEPA 10	3.06	0.90	6.74
CD-23* USEPA 11	3.04	0.82	8.26
Station 18 USEPA 18	2.81	0.76	6.84
Station 22 USEPA 22	2.57	0.87	4.53

Notes:
Shannon Weiner Diversity range is 1.3 - 3.5 (the higher value indicates a favored response).
Pielou's Evenness Index range is 0 - 1.0 (the higher value indicates a favored response).
Margalef's Species Richness range is 1.0 - 10.5 (the higher value indicates a favored response).
* = Stations with species diversity overlap.

3.2.5 Benthic Diversity Results by Station

As shown in Table 3-10, the overall diversity for the Site 2 DUs ranged from 2.87 to 3.25, and richness ranged from 6.74 to 10.22 . Representative phyla included both pollution-indicative and pollution-sensitive organisms inhabiting the same sediments. This phenomenon is often seen when opportunistic species gain advantage of an area during times of disorder (diversity drops), followed by recovery and colonization in which the population shifts to a higher level of diversity (Gaston, 1998).

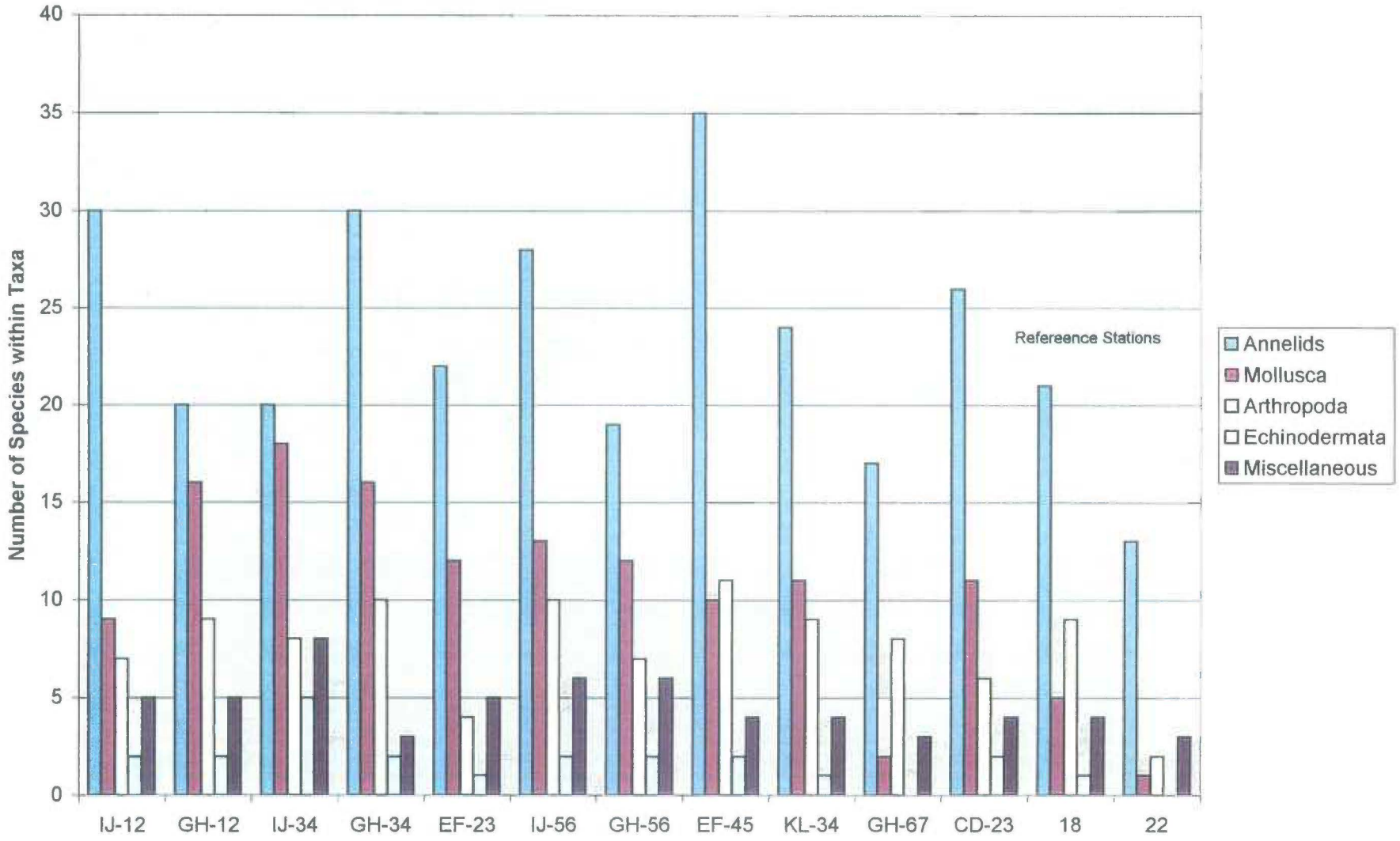
Taxonomic data are presented in Appendix E. Figure 3-22 provides a visual representation of diversity analysis results from 2000. The benthic diversity samples are detailed below by station. Samples at all stations represented a good mix of surface deposit feeders, burrowers, and filter feeders.

Station IJ-12 samples contained 53 taxa represented by annelids, molluscs, arthropods, and echinoderms. The dominant species included the polychaete, *Mediomastus*, the annelid, *Armandia*, the amphipod, *Ampelisca*, the arthropod, *Callinectes*, and the bivalve, *Tellina*.

Station GH-12 samples contained 52 taxa represented by annelids, molluscs, and arthropods. The dominant species included the annelid, *Armandia*, the polychaete, *Spiophanes*, the amphipod, *Listriella*, and the bivalve, *Tellina*. No echinoderms were detected at this station.

Station IJ-34 contained a total of 49 taxa representing annelids, molluscs, arthropods, and echinoderms. The dominant species included the polychaetes, *Mediomastus*, *Cossura*, and *Prionospio* (generally found in areas with low metals and low organic levels), two amphipod species, cumaceans, three echinoderm species, several gastropods (*Bittium* and *Turbonilla*, and the bivalve, *Lucina* [typically found in areas with low metal content]).

Figure 3-22 Number of Taxa Represented by Phylum in 2000



Station GH-34 contained a total of 61 taxa representing annelids, molluscs, arthropods, and echinoderms. The dominant species included the polychaetes, *Mediomastus*, *Cossura*, and *Prionspio*, *Armandia*, *Nephtys*, *Sigambra* (a carnivore found in areas containing high levels of metals and low organics), and *Spiophanes*. The molluscs were dominated by *Lucina* and *Tellina*.

Station EF-23 contained a total of 44 taxa representing annelids, molluscs, arthropods, and echinoderms. The dominant species included the polychaetes *Mediomastus*, *Armandia*, and *Prionospio,* and the molluscs *Lucina* and *Tellina*.

Station IJ-56 contained a total of 59 taxa representing annelids, molluscs, arthropods, and echinoderms. The dominant species included the polychaetes *Mediomastus*, *Owenia*, and *Armandia;* the molluscs *Lucina*, *Nuculana* (a pollution indicative species) and *Tellina;* and the cumacean, *Leucon*.

Station GH-56 contained a total of 46 taxa representing annelids, molluscs, arthropods, and echinoderms. The dominant species included the polychaetes *Mediomastus*, *Owenia*, *Armandia*, *Spiophanes*, and *Prinospio*; the cumacean, *Leucon*; the chordate, *Molgula*; and the molluscs *Lucina* and *Tellina*.

Station EF-45 contained a total of 62 taxa representing annelids, molluscs, arthropods, and echinoderms. The dominant species included the polychaetes *Armandia, Prinospio, and Mediomastus*; the amphipod, *Corophium*; the decapod, *Paguristes*; the molluscs *Tellina* and *Lucinia*; and the gastropod, *Crepidula*.

Station KL-34 contained a total of 49 taxa representing annelids, molluscs, arthropods, and echinoderms. The dominant species included the polychaetes *Mediomastus* and *Prinospio*; the bivalves *Corbula, Lucina*, and *Tellina*; the amphipod, *Ampelisca*; and the cumacean, *Leucon*.

Station GH-67 contained a total of 30 taxa representing annelids, molluscs, and arthropods. The dominant species included the polychaetes *Travisia*, *Goniadides*, *Spiophanes*, and *Spio*; and several species of amphipods and decapods. Species within this station differed from other stations because of the seaward location of this station in relation to the submerged seawall. The sediment composition here (95% sand) supports an entirely different benthos compared to the other stations.

Station CD-23 contained a total of 49 taxa representing annelids, molluscs, arthropods, and echinoderms. The dominant species included the polychaetes *Armandia, Owenia*, *Spiophanes*, and *Mediomastus*; and the bivalves *Tellina* and *Lucina*.

4.0 SEDIMENT QUALITY TRIAD INTERPRETATION

The SQT approach combines the measures of potential impacts with laboratory measures of effects and the study of resident communities. Section 2.2.5 provides an overview of this evaluation tool.

Before beginning the latest field work, a detailed plan was established using the DQO process (Appendix A). This process encouraged data collection planning and highlighted possible data gaps which might otherwise have been overlooked until the analysis portion of the study was complete. The process uses seven steps to keep the investigation focused on identifying and implementing the correct decision(s) for reaching the program's goal (see Appendix A).

The DQO process was then used to interpret the collected data. To apply the outcome of the two different toxicity tests (acute and chronic), species diversity and chemical data, assumptions and decision rules were agreed upon and the resultant input into the triad (i.e., + or —) established. Typically, a " +" was assigned when there was a measured difference between test and control or reference conditions. Alternatively, a "—" was input into the triad when there was no measurable difference between test and control or reference conditions.

The triad matrix accommodates multiple +'s and —'s within each box representing a specific condition to reflect the continuum of chemistry, toxicity, and benthic community response normally encountered. The "interpretation" description in the triad matrix will remain unchanged, the multiple +'s will reflect the strength that should be associated with that interpretation. The evaluation tools established for each leg of the triad are described in the following sections.

Once scores are applied to each element of the triad, individual DU conditions can be determined by applying the matrix provided in Table 4-1. Figures 4-1 and 4-2 explain the decision-making process. All figures are presented at the end of this section for ease of review.

Table 4-1
Project Decision-Making Triad Matrix

Condition	Sediment Chemistry	Toxicity Tests	Benthic Assessment	Interpretation
1	+	+	+	Strong evidence for pollution-induced degradation.
2	—	—	—	Strong evidence for absence of pollution-induced degradation.
3	+	—	—	Contaminants are not bioavailable.
4	—	+	—	Unmeasured contaminants or conditions exist that have the potential to cause degradation.
5	—	—	+	Alteration of benthic community is probably not due to toxic chemical contamination.
6	+	+	—	Toxic chemicals are probably stressing the system.
7	—	+	+	Unmeasured toxic chemicals are causing degradation.
8	+	—	+	Benthic community degraded by toxic chemicals but toxicity tests not sensitive to toxic chemicals present or chemicals are not bioavailable, or alteration is not due to toxic chemicals.

Notes:
+ = Measured difference between test and control or reference conditions.
— = No measurable difference between test and control or reference conditions.

4.1 Surface Sediment Chemistry Evaluation

4.1.1 Methods

Large data sets from various programs (i.e., National Status and Trends, EMAP) have been reasonably and economically normalized using guidelines developed for sediments from various water bodies across the nation. These methods were developed and intended as informal (non-regulatory) guidelines for use in interpreting chemical data from the analyses of sediments. One set of guidelines used includes the effects range-low (ERL) and effects range-median (ERM). The values were derived by Long et al., (1995) using the biological effects database for sediment.

The ERL is the lower 10th percentile of the effects data. The ERM is the median, or 50th percentile, of the effects range. The two guidelines values delineate three concentration ranges for a particular chemical. A concentration below an ERL represents a minimal effects range where effects would rarely be observed. Concentrations equal to and above the ERL but below the ERM,

represent a possible effects range where effects occasionally occur. Finally the concentrations equal and above the ERM value represent a probable effects range where effects would frequently occur.

The mean ERM quotient method was selected to evaluate sediment chemistry because it assesses sediments with multiple chemical detections (Long, 1999). Mean ERM quotients are calculated by normalizing the detected concentrations by the developed ERM values and taking an average of the ERM quotients. ERMs have been developed for nine metals, 13 PAHs, and 3 pesticides/PCBs.

As shown in Table 4-2, sediments with no ERL exceedances **or** a mean ERM quotient of less than 0.1 are considered Category 1. Categories 2 and 3 have more uncertainty as to relationship to toxicity but are classified based on a combination of the mean ERM quotient and number of ERM exceedances. Category 4 is considered to be impacted with a mean ERM quotient above 1.5 and more than 10 ERMs exceeded. Using these guidelines, site data were compared to ERLs and ERMs, and mean ERM quotients were calculated. Figures 4-3 through 4-13 present detected concentrations comparisons to ERLs and ERMs. In addition to the ERL and ERM comparison, the detected concentrations were also compared to TELs and PELs. This comparison is presented in Appendix F. As agreed by the NAS Pensacola Partnering Team, the mean ERM quotient category was input into the decision matrix. A "—" was given to all Category 1 sediments, while a "+" was conservatively assigned to all sediments assessed as Categories 2, 3 or 4.

4.1.2 Application to Sediment Chemistry Results

Effects Range Low

Table 4-3 shows the surface sediment ERL quotients calculated for the 2000 samples. The ERL quotients were obtained by dividing each constituent detection by the ERL value. Quotients greater than 1 indicate an ERL exceendance.

Table 4-2
Chemical Characteristics Relative to Sediment Guidelines

Category 1	• Mean ERM quotient <0.1 • Mean PEL quotient <0.1 **Or** • No ERLs exceeded • No TELs exceeded
Category 2	• Mean ERM quotient 0.11- 0.5 • Mean PEL quotient 0.11 - 1.5 • 1-5 ERMs exceeded • 1-5 PELs exceeded
Category 3	• Mean ERM quotients 0.5-1.5 • Mean PEL quotient 1.51-2.3 • 6-10 ERMs exceeded • 6-20 PELs exceeded
Category 4	• Mean ERM quotients > 1.5 • Mean PEL quotient > 2.3 • > 10 ERMs exceeded • > 20 PELs exceeded

Note:
Source is Long (1999).

Values exceeding 1 are shown in bold, and the number of ERL exceedances are noted for each DU. Figures 4-3 through 4-13 compare detected concentrations to ERLs and ERMs. Arsenic exceeded its ERL at five of 11 stations, but did not exceed its reference concentration at any station. Total PCBs, calculated using 1/10 the detection limit for non-detects, exceeded its ERL at all stations (Appendix B). PCBs were only detected at IJ-12, GH-34, and EF-23, therefore the remaining exceedances are derived by the detection limits of the samples.

Effects Range-Median

ERMs were developed for nine trace metals, 13 individual PAHs,, and three classes of chlorinated hydrocarbons (i.e., pesticides/PCBs, and dioxins), which were known to persist throughout the nation in the sediments found in various water bodies. Table 4-4 summarizes the surface sediment ERM quotients and the mean ERM quotient for each location.

Six stations (GH-12, IJ-34, IJ-56, GH-56, KL-34, and GH-67) had a mean ERM quotient of less than 0.1 and were ranked as Category 1. Five stations (IJ-12, GH-34, EF-23, EF-45, and CD-23) were

Table 4-3
Surface Sediment ERL Quotients

PARAMETERS	ERLs	IJ-12 SD00101	HQ	GH-12 SD00201	HQ	IJ-34 SD00301	HQ	GH-34 SD00401	HQ	EF-23 SD00501	HQ	IJ-56 SD00601	HQ	GH-56 SD00701	HQ	EF-45 SD00801	HQ	KL-34 SD00901	HQ	GH-67 SD01001	HQ	CD-23 SD01101	HQ	Ref Conc
Metals (mg/kg)																								
ARSENIC	8.2	4.9	0.60	1.5	0.18	12	**1.46**	11	**1.34**	16	**1.95**	2.6	0.32	3.4	0.41	6.9	0.84	14	**1.71**	0.52	0.06	9.1	**1.11**	23.00
CADMIUM	1.2	2.3	**1.92**	0.17	0.14	1.7	**1.42**	5.2	**4.33**	4.3	**3.58**	0.07	0.06	0.1	0.08	0.17	0.14	0.39	0.33	0.0205	0.02	1.3	**1.08**	0.30
CHROMIUM	81	100	**1.23**	8.9	0.11	39	0.48	38	0.47	75	0.93	6.8	0.08	13	0.16	19	0.23	39	0.48	1.2	0.01	41	0.51	63.00
COPPER	34	25	0.74	11	0.32	14	0.41	27	0.79	66	**1.94**	3.4	0.10	4.4	0.13	8.8	0.26	23	0.68	0.56	0.02	48	**1.41**	16.70
LEAD	46.7	190	**4.07**	16	0.34	47	**1.01**	51	**1.09**	640	**13.70**	15	0.32	12	0.26	17	0.36	27	0.58	1.1	0.02	150	**3.21**	29.70
NICKEL	20.9	3.3	0.16	1.1	0.05	8.7	0.42	10	0.48	7.8	0.37	2.1	0.10	2.4	0.11	6.1	0.29	9.8	0.47	0.34	0.02	5.2	0.25	17.70
SILVER	1	0.077	0.08	0.0275	0.03	0.06	0.06	0.11	0.11	0.21	0.21	0.03	0.03	0.033	0.03	0.0475	0.05	0.075	0.08	0.027	0.03	0.2	0.20	0.00
TOTAL MERCURY	0.15	0.086	0.57	0.036	0.24	0.085	0.57	0.082	0.55	0.21	**1.40**	0.018	0.12	0.026	0.17	0.044	0.29	0.075	0.50	0.00375	0.03	0.16	**1.07**	0.13
ZINC	150	75	0.50	14	0.09	55	0.37	59	0.39	670	**4.47**	17	0.11	19	0.13	34	0.23	52	0.35	2.5	0.02	79	0.53	83.00
Pesticides (μg/kg)																								
4,4'-DDE (P,P'-DDE)	2.2	0.52	0.24	0.46	0.21	1.1	0.50	0.92	0.42	0.75	0.34	0.48	0.22	0.52	0.24	0.77	0.35	1.2	0.55	0.4	0.18	0.65	0.30	0.00
4,4'-DDT (P,P'-DDT)	1.58	0.52	0.33	0.46	0.29	1.1	0.70	0.92	0.58	0.75	0.47	0.48	0.30	0.52	0.33	1.8	**1.14**	1.2	0.76	0.4	0.25	0.65	0.41	0.00
Total PCBs (μg/kg)	22.7	287.8	**12.68**	36.9	**1.63**	88	**3.88**	98	**4.32**	307	**13.52**	38.5	**1.70**	41.2	**1.81**	93	**4.10**	96	**4.23**	32.2	**1.42**	52	**2.29**	0.00
PAHs (μg/kg)																								
2-METHYLNAPHTHALENE	70	28	0.40	22	0.31	4.65	0.07	43	0.61	41.5	0.59	8.6	0.12	2.65	0.04	38	0.54	6	0.09	2.15	0.03	31	0.44	0.00
ACENAPHTHENE	16	85	**5.31**	65	**4.06**	14	0.88	22.5	**1.41**	125	**7.81**	7.5	0.47	8	0.50	115	**7.19**	19	**1.19**	6.5	0.41	95	**5.94**	0.00
ACENAPHTHYLENE	44	140	3.18	110	**2.50**	23	0.52	210	**4.77**	205	**4.66**	12	0.27	13	0.30	185	**4.20**	30.5	0.69	10.5	0.24	150	**3.41**	0.00
ANTHRACENE	85.3	28	0.33	18	0.21	9.8	0.11	45	0.53	59	0.69	2	0.02	11	0.13	42	0.49	22	0.26	0.375	0.00	43	0.50	29.50
BENZO(A)ANTHRACENE	261	100	0.38	95	0.36	49	0.19	160	0.61	310	**1.19**	8.4	0.03	41	0.16	210	0.80	85	0.33	0.69	0.00	240	0.92	97.70
BENZO-A-PYRENE	430	160	0.37	86	0.20	62	0.14	180	0.42	440	**1.02**	9.7	0.02	45	0.10	240	0.56	110	0.26	1.1	0.00	410	0.95	123.80
CHRYSENE	384	280	0.73	240	0.63	93	0.24	350	0.91	1000	**2.60**	20	0.05	92	0.24	380	0.99	170	0.44	1.6	0.00	630	**1.64**	216.10
DIBENZO(A,H)ANTHRACENE	63.4	35	0.55	9	0.14	15	0.24	44	0.69	110	**1.74**	2.9	0.05	11	0.17	56	0.88	26	0.41	0.9	0.01	100	**1.58**	31.00
FLUORANTHENE	600	210	0.35	61	0.10	91	0.15	300	0.50	710	**1.18**	16	0.03	66	0.11	570	0.95	180	0.30	0.65	0.00	470	0.78	256.80
FLUORENE	19	10.5	0.55	8.5	0.45	1.75	0.09	16	0.84	15.5	0.82	0.9	0.05	1	0.05	14.5	0.76	2.35	0.12	0.8	0.04	11.5	0.61	13.00
NAPHTHALENE	160	180	**1.13**	45.5	0.28	71	0.44	90	0.56	85	0.53	18	0.11	62	0.39	160	**1.00**	110	0.69	4.5	0.03	130	0.81	17.00
PHENANTHRENE	240	97	0.40	52	0.22	39	0.16	130	0.54	230	0.96	7.8	0.03	35	0.15	140	0.58	62	0.26	0.5	0.00	160	0.67	133.20
PYRENE	665	240	0.36	99	0.15	91	0.14	270	0.41	720	**1.08**	21	0.03	71	0.11	560	0.84	160	0.24	1.8	0.00	440	0.66	206.70
Number of ERL Exceedances			5		3		4		6		15		1		1		5		3		1		10	

Notes:
One-half the detection limit has been used for parameters that were not detected, except for total PCBs and pesticides which used one-tenth the detection limit (See EPA report in Appendix B).
Concentrations exceeding the ERM are shown in **bold**.

Table 4-4
Surface Sediment ERM Quotients and Mean ERM Quotients

PARAMETERS	ERMs	IJ-12 SD00101	HQ	GH-12 SD00201	HQ	IJ-34 SD00301	HQ	GH-34 SD00401	HQ	EF-23 SD00501	HQ	IJ-56 SD00601	HQ	GH-56 SD00701	HQ	EF-45 SD00801	HQ	KL-34 SD00901	HQ	GH-67 SD01001	HQ	CD-23 SD01101	HQ	Reference SD01801	HQ	SD02201	HQ
Metals (mg/kg)																											
ARSENIC	70	4.9	0.07	1.5	0.02	12	0.17	11	0.16	16	0.23	2.6	0.04	3.4	0.05	6.9	0.10	14	0.20	0.52	0.01	9.1	0.13	5	0.07	18	0.26
CADMIUM	9.6	2.3	0.24	0.17	0.02	1.7	0.18	5.2	0.54	4.3	0.45	0.07	0.01	0.1	0.01	0.17	0.02	0.39	0.04	0.0205	0.00	1.3	0.14	0.075	0.01	0.22	0.02
CHROMIUM	370	100	0.27	8.9	0.02	39	0.11	38	0.10	75	0.20	6.8	0.02	13	0.04	19	0.05	39	0.11	1.2	0.00	41	0.11	13	0.04	50	0.14
COPPER	270	25	0.09	11	0.04	14	0.05	27	0.10	66	0.24	3.4	0.01	4.4	0.02	8.8	0.03	23	0.09	0.56	0.00	48	0.18	3.7	0.01	13	0.05
LEAD	218	190	0.87	16	0.07	47	0.22	51	0.23	640	**2.94**	15	0.07	12	0.06	17	0.08	27	0.12	1.1	0.01	150	0.69	5.7	0.03	24	0.11
NICKEL	51.6	3.3	0.06	1.1	0.02	8.7	0.17	10	0.19	7.8	0.15	2.1	0.04	2.4	0.05	6.1	0.12	9.8	0.19	0.34	0.01	5.2	0.10	3.7	0.07	14	0.27
SILVER	3.7	0.077	0.02	0.0275	0.01	0.06	0.02	0.11	0.03	0.21	0.06	0.03	0.01	0.033	0.01	0.0475	0.01	0.075	0.02	0.027	0.01	0.2	0.05	0.036	0.01	0.075	0.02
TOTAL MERCURY	0.71	0.086	0.12	0.036	0.05	0.085	0.12	0.082	0.12	0.21	0.30	0.018	0.03	0.026	0.04	0.044	0.06	0.075	0.11	0.00375	0.01	0.16	0.23	0.019	0.03	0.11	0.15
ZINC	410	75	0.18	14	0.03	55	0.13	59	0.14	670	**1.63**	17	0.04	19	0.05	34	0.08	52	0.13	2.5	0.01	79	0.19	13	0.03	70	0.17
Pesticides (μg/kg)																											
4,4'-DDE (P,P'-DDE)	27	0.52	0.02	0.46	0.02	1.1	0.04	0.92	0.03	0.75	0.03	0.48	0.02	0.52	0.02	0.77	0.03	1.2	0.04	0.4	0.01	0.65	0.02	0.57	0.02	1.1	0.04
4,4'-DDT (P,P'-DDT)	46.1	0.52	0.01	0.46	0.01	1.1	0.02	0.92	0.02	0.75	0.02	0.48	0.01	0.52	0.01	1.8	0.04	1.2	0.03	0.4	0.01	0.65	0.01	0.57	0.01	1.1	0.02
Total PCBs (μg/kg)	180	287.8	**1.60**	36.9	0.21	88	0.49	98	0.54	157	0.87	38.5	0.21	41.2	0.23	62.2	0.35	96	0.53	32.2	0.18	52	0.29	46.2	0.26	89	0.49
PAHs (μg/kg)																											
2-METHYLNAPHTHALENE	670	28	0.04	22	0.03	4.65	0.01	43	0.06	41.5	0.06	8.6	0.01	2.65	0.00	38	0.06	6	0.01	2.15	0.00	31	0.05	2.9	0.00	6	0.01
ACENAPHTHENE	500	85	0.17	65	0.13	14	0.03	22.5	0.05	125	0.25	7.5	0.02	8	0.02	115	0.23	19	0.04	6.5	0.01	95	0.19	9	0.02	18	0.04
ACENAPHTHYLENE	640	140	0.22	110	0.17	23	0.04	210	0.33	205	0.32	12	0.02	13	0.02	185	0.29	30.5	0.05	10.5	0.02	150	0.23	14	0.02	29	0.05
ANTHRACENE	1100	28	0.03	18	0.02	9.8	0.01	45	0.04	59	0.05	2	0.00	11	0.01	42	0.04	22	0.02	0.375	0.00	43	0.04	0.495	0.00	29	0.03
BENZO(A)ANTHRACENE	1600	100	0.06	95	0.06	49	0.03	160	0.10	310	0.19	8.4	0.01	41	0.03	210	0.13	85	0.05	0.69	0.00	240	0.15	2.7	0.00	95	0.06
BENZO-A-PYRENE	1600	160	0.10	86	0.05	62	0.04	180	0.11	440	0.28	9.7	0.01	45	0.03	240	0.15	110	0.07	1.1	0.00	410	0.26	3.8	0.00	120	0.08
CHRYSENE	2800	280	0.10	240	0.09	93	0.03	350	0.13	1000	0.36	20	0.01	92	0.03	380	0.14	170	0.06	1.6	0.00	630	0.23	6.1	0.00	210	0.08
DIBENZO(A,H)ANTHRACENE	260	35	0.13	9	0.03	15	0.06	44	0.17	110	0.42	2.9	0.01	11	0.04	56	0.22	26	0.10	0.9	0.00	100	0.38	1.2	0.00	31	0.12
FLUORANTHENE	5100	210	0.04	61	0.01	91	0.02	300	0.06	710	0.14	16	0.00	66	0.01	570	0.11	180	0.04	0.65	0.00	470	0.09	6.8	0.00	250	0.05
FLUORENE	540	10.5	0.02	8.5	0.02	1.75	0.00	16	0.03	15.5	0.03	0.9	0.00	1	0.00	14.5	0.03	2.35	0.00	0.8	0.00	11.5	0.02	1.1	0.00	13	0.02
NAPHTHALENE	2100	180	0.09	45.5	0.02	71	0.03	90	0.04	85	0.04	18	0.01	62	0.03	160	0.08	110	0.05	4.5	0.00	130	0.06	17	0.01	12.5	0.01
PHENANTHRENE	1500	97	0.06	52	0.03	39	0.03	130	0.09	230	0.15	7.8	0.01	35	0.02	140	0.09	62	0.04	0.5	0.00	160	0.11	3.2	0.00	130	0.09
PYRENE	2600	240	0.09	99	0.04	91	0.04	270	0.10	720	0.28	21	0.01	71	0.03	560	0.22	160	0.06	1.8	0.00	440	0.17	6.7	0.00	200	0.08
Total ERM Quotients			**4.72**		**1.23**		**2.07**		**3.52**		**9.69**		**0.61**		**0.84**		**2.74**		**2.19**		**0.29**		**4.12**		**0.66**		**2.44**
Mean ERM Quotient			**0.19**		**0.05**		**0.08**		**0.14**		**0.39**		**0.02**		**0.03**		**0.11**		**0.09**		**0.01**		**0.16**		**0.03**		**0.10**
Number of ERM Exceedances			**1**		**0**		**0**		**0**		**2**		**0**		**0**		**0**		**0**		**0**		**0**		**0**		**0**
Category			**2**		**1**		**1**		**2**		**2**		**1**		**1**		**2**		**1**		**1**		**2**		**1**		**2**
Input into Triad			+		-		-		+		+		-		-		+		-		-		+		-		+

Notes:
One-half the detection limit has been used for parameters that were not detected, except for total PCBs and pesticides which used one-tenth the detection limit (See EPA report in Appendix B).
Concentrations exceeding the ERM are shown in **bold**.

ranked as Category 2 because their mean ERM quotients were greater than 0.1. Of those ranked as Category 2, station IJ-12 had one ERM exceedance (total PCBs) and station EF-23 had three ERM exceedances (lead, zinc and total PCBs). The remaining three (GH-34, EF-45, and CD-23) had no ERM exceedances. None of the Site 2 surface sediments were ranked as Category 3 or 4. As described above, the triad matrix input for Category 1 sediment is "—" and "+" for Category 2 and above to conservatively assess the chemistry input.

Mean PEL Quotients

As shown in Table 4-5, there is concordance on the categorization at nine of the stations between the mean ERM quotient and mean PEL quotient methods. Three stations (GH-12, IJ-34, and KL-34) showed an increase from Category 1 to Category 2 using the mean PEL quotient method. Of note, EF-23 was categorized as Category 3 using the mean PEL quotient because of the number of PEL exceedances (7).

Table 4-5
Comparison of Mean ERM Quotients and Mean PEL Quotients

	ERM			PEL		
Station	**Mean ERM Quotient**	**Category**	**Number of ERM Exceedances**	**Mean PEL Quotient**	**Category**	**Number of PEL Exceedances**
IJ-12	0.19	2	1	0.38	2	4
GH-12	0.05	1	0	0.18	2	0
IJ-34	0.08	1	0	0.17	2	0
GH-34	0.14	2	0	0.31	2	2
EF-23	0.42	2	3	0.76	3	7
IJ-56	0.02	1	0	0.06	1	0
GH-56	0.03	1	0	0.08	1	0
EF-45	0.12	2	0	0.30	2	2
KL-34	0.09	1	0	0.33	2	1
GH-67	0.01	1	0	0.04	1	0
CD-23	0.16	2	0	0.42	2	4
18	0.03	1	0	0.06	1	0
22	0.1	2	0	0.26	2	0

4.2 Toxicity Test Evaluation

4.2.1 Methods

The DQO document outlined the following assumptions and rules for evaluating the acute and chronic toxicity test data.

"Hits" and "adverse effects" (terms used below) mean "statistically different" from the laboratory control using methods accompanying each test protocol. "OK" means the results were not statistically significant.

For weighting purposes, "hits" on survival are considered twice as important as "hits" on reproduction or growth because survival (i.e., mortality) is irreversible (lethal) whereas reproduction and growth endpoints (sublethal) are potentially reversible. Thus, 2 sublethal hits = 1 lethal hit.

The following possible outcomes were identified for the *Leptocheirus* test and the mysid test, and the score for each test.

Possible Outcomes from the *Leptocheirus* Test:

Survival	Growth	Scoring
OK	OK	—
OK	Hit	+
Hit	OK	++
Hit	Hit	+++

Possible Outcomes from the *Mysidopsis* Test:

Survival	Growth	Reproduction	Scoring
OK	OK	OK	—
OK	OK	Hit	+
OK	Hit	Hit	++
Hit	OK	Ok	++
Hit	OK	Hit	+++
Hit	Hit	OK	+++
Hit	Hit	Hit	++++

After the bioassays are considered individually, the results are combined for input to the triad matrix assuming additivity of cumulative adverse effects as shown below.

Combined Score		Biological Interpretation Considering both Bioassays Input to Triad Matrix		
—	No adverse effects	—	=	—
+	No survival hits in either species and/or 1 sublethal hit in one species.	—	=	—
++	1 survival hit in one species or 2 sublethal hits.	+	=	+
+++	1 survival hit in one species and/or adverse sublethal effects.	+	=	+
++++	Survival hits in 1-2 species and/or adverse sublethal endpoints.	++	=	+
+++++	Survival hits in 1-2 species and/or adverse sublethal effects.	++	=	+
++++++	Survival hits in both test species and adverse sublethal endpoints.	+++	=	+
+++++++	Survival hits in both test species and adverse sublethal endpoints.	+++	=	+

4.2.2 Application to Toxicity Test Results

The TAC were met for all the endpoints associated with Site 2 toxicity tests, and are based on the performance of the laboratory control sediment. The criteria for *Leptocheirus* were: (1) less than 10% mortality in the controls, and (2) no significant difference, via t-test, when comparisons are made to the control performance for weights. The criteria for mysids included: (1) less than 20% mortality in the controls; (2) control organisms must weigh at least 0.20 mg/mysid; and (3) 50% or more of the surviving females in the control exposure were gravid (egg development occurring in the ovaries or brood pouch, Table 3-10).

Leptocheirus Performance Versus the Reference Stations

Solid-phase tests conducted with the infaunal amphipod, *Leptocheirus plumulosus*, met the TAC (control performance for survival and weight measurements, and inter-replicate variability) as noted in Table 3-9. Leptocheirus survival results are presented with mean ERM quotients on Figure 4-14 and Leptocheirus growth results and mean ERM quotients are presented on Figure 4-15.

Survival results for three stations were significantly different from the control sediments: Stations IJ-56 (81%), EF-45 (73%), and CD-23 (78%). Only Station EF-45 (73%) was determined to be outside the IC_{25} range, indicating marginal toxicity. IJ-56 met the 80% survival criteria.

Weight is a sublethal endpoint which was added to enhance the survival data and provide additional information about the reproductive ability of infaunal organisms in Site 2 sediments. The life cycle of *Leptocheirus plumulosus* is 28 days under optimum conditions. Due to the duration of this 10-day test, reproduction/fecundity could not be established. Growth measurements were taken at test termination to determine relative size when compared between stations.

Sediments at three Site 2 stations were found to be significantly different from the control sediments for the growth endpoint. The stations and their growth endpoint results included IJ-12 (0.13 mg/amphipod), GH-12 (0.14 mg/amphipod), and GH-67 (0.13 mg/amphipod). Of note, both

reference stations were also identified as being significantly different from the control at 0.12 mg/amphipod for Station 18 and 0.14 mg/amphipod for Station 22. Reference Stations 18 and 22 were outperformed for growth by most Site 2 sediments.

Mysid Performance Versus the Reference Stations

Solid-phase tests conducted with the epibenthic opossum shrimp, *Mysidopsis bahia*, met the TAC (control performance in survival, weight, and fecundity) as noted in Table 3-10.

Survival — Survival results for the mysids ranged from 84 to 100%, all above the 80% acceptable criteria.

Growth — The sublethal endpoint growth was added to enhance the survival data and provide additional information for this investigation. None of the Site 2 Stations were found to be significantly different from control for growth. Of note, except for station GH-67, all Site 2 stations outperformed Reference Station 18 for growth. Stations IJ-34, IJ-56, GH-56, and CD-23 were found to be significantly different from Reference Station 22 for the same reason.

Fecundity — The sublethal endpoint fecundity was added to better understand the reproductive ability of these organisms when exposed to Site 2 sediments. A decline in reproduction may affect the food web associated with this area.

All Site 2 DUs had at least 67% and up to 100% gravid females in their exposures. In comparison, Reference Station 18 had 93% gravid females, and Reference Station 22 had the lowest percentage (22% gravid females or 2 females out of 9).

Summary

Comparisons between Site 2 sediments and the reference stations are important to establish what would be anticipated ecologically, based on nearby natural or background

conditions. Site 2 sediments were found to be suitable for mysid survival, growth, and reproduction.

4.2.3 Input into Triad Matrix

The solid-phase tests conducted with *Leptocheirus plumulosus* indicated three statistically significant differences in survival rates at the Site 2 DUs (IJ-56, EF-45, and CD-23) when compared to control sediments (C-17). Station IJ-56 met the 80% survival criteria. Only Station EF-45 (73%) had a survival rate outside the IC_{25}. Statistical differences in sublethal effects from control sediments were noted at three of the Site 2 stations (Table 3-9). The solid-phase tests conducted with *Mysidopsis bahia* did not indicate any statistically significant differences in the survival, growth, or fecundity endpoints (Table 3-10). Table 4-6 summarizes how the effects were translated into the SQT in accordance with the procedures agreed-upon in the DQO document. As outlined in Section 4.2.1, no adverse effects in either species or one sublethal effect in one species is input as a "—", while a lethal effect in one species or two sublethal effects is input as a "+". Therefore, only stations EF-45 and CD-23 were input as "+" in the matrix for toxicity. The remaining stations were input as "—" into the matrix for toxicity.

4.3 Benthic Assessment

Benthic diversity samples collected during March 2000 showed that diversity appears to have increased since last sampled in January 1996. This difference may be attributable to seasonal variability, since biological recruitment occurs in early spring. Pensacola Bay temperatures were recorded to average 16°C in January 1996, and 19°C during March 2000 (personal communication with Richard Greene, USEPA Gulf Breeze Environmental Research Laboratory [GBERL], November 2002).

Table 4-6
Toxicity Test Results Input into Matrix

	Stations											Reference Stations	
	IJ-12	**GH-12**	**IJ-34**	**GH-34**	**EF-23**	**IJ-56**	**GH-56**	**EF-45**	**KL-34**	**GH-67**	**CD-23**	**18**	**22**
Mysid													
Survival													
Growth													
Reproduction													
Mysid Scoring	—	—	—	—	—	—	—	—	—	—	—	—	—
Leptocheirus													
Survival						*[a]		*			*		
Growth	*	*								*		*	*
Leptocheirus Scoring	+	+	—	—	—	—	—	++	—	+	++	—	—
Score for Triad Input	—	—	—	—	—	—	—	+	—	—	+	—	—

Note:
a = Although station IJ-56 was identified as being significantly different, the station met the 80% survival criteria, therefore, a — was used for scoring since the sublethal endpoint did not show a significant difference from control.

Annelids continue to dominate the Site 2 area, but a visible shift from surface deposit feeders to subsurface deposit feeders was observed in the 2000 data. Species such as *Streblospio benedicti* are known for their tolerance to moderately high metals and organics, and noticeably declined in 2000. *Mediomastus*, another polychaete which tolerates metals at high salinities, was present at every station during the 2000 sampling event. Representatives of the Phylum Mollusca have increased, as evidenced by the presence of *Corbula barrattinia, Lucina multilineata,* and *Mysella* sp. These filter feeders are associated with sediments low in metals and organic constituents (Pearson, 1978, Rakocinski et al., 1993, 1996, 1997, 1998, 1999). A host of crustaceans, including the test species *Ampelisca, Grandidierella bonnieroides,* and the mysid, *Bowmaniella floridana,* were identified in the 2000 sampling effort. Surface deposit feeders such as the polychaetes, *Asychris* and *Capitella*, the amphipods, *Corophium* and *Grandidierella*, were more abundant in depositional areas which has been documented in the literature.

A population shift from surface deposit feeders to subsurface deposit feeders indicates that the dominating taxa have transitioned from pollution-tolerant opportunists to representatives of less tolerant taxa as environmental conditions have improved (Rakocinski et al., 1993, 1996, 1997, 1998, 1999).

The species diversity among Site 2 and Reference Stations 18 and 22 reflect both pollution indicative and pollution-sensitive species. The high diversity, evenness, and richness at these stations reflect healthy areas that are capable of supporting higher trophic level organisms through the food web. The Site 2 stations outperformed the reference stations; therefore the data input to the triad will show no negative effects. The benthic assessment and input into the triad matrix are summarized in Table 4-7.

Table 4-7
Benthic Assessment and Input into the Sediment Quality Triad

Stations	Diversity	Evenness	Richness	Benthic Community to Triad
IJ-12	3.04	0.77	9.87	—
GH-12	2.90	0.77	8.83	—
IJ-34	3.25	0.85	8.83	—
GH-34	3.17	0.82	8.30	—
EF-23	2.87	0.76	8.28	—
IJ-56	3.25	0.84	8.53	—
GH-56	3.16	0.83	8.47	—
EF-45	3.05	0.75	10.22	—
CD-23	3.04	0.82	8.26	—
GH-67	3.06	0.90	6.74	—
KL-34	3.11	0.80	8.88	—
18	2.81	0.76	6.84	—
22	2.57	0.87	4.53	—

Notes:
OK = —
Not OK = +

4.4 Surface Sediment Findings

Table 4-8 summarizes the surface sediment data applied to the sediment quality triad matrix and the conditions are presented on Figure 4-17.

DU IJ-12 (USEPA Station 1)

Station IJ-12, located closest to the seawall, was found to have several metals, PCBs, and PAHs in surface sediment with HQs > 1 (Table 3-1). There are four outfalls located due north of this station (see Figure 2-1), which may be the source for many of these exceedances. Divers noted paint chips when collecting the sediment samples, and an oily sheen was noted when sediment samples were brought to the surface (Table 2-1).

Table 4-8
Surface Sediment Summary as Applied to the Triad

Station	Sediment Chemistry	Toxicity Tests	Benthic Assessment	Condition	Interpretation
IJ-12 USEPA 1	+	—	—	3	Contaminants are not bioavailable
GH-12 USEPA 2	—	—	—	2	Strong evidence for absence of pollution-induced degradation
IJ-34 USEPA 3	—	—	—	2	Strong evidence for absence of pollution-induced degradation
GH-34 USEPA 4	+	—	—	3	Contaminants are not bioavailable
EF-23 USEPA 5	+	—	—	3	Contaminants are not bioavailable
IJ-56 USEPA 6	—	—	—	2	Strong evidence for absence of pollution-induced degradation
GH-56 USEPA 7	—	—	—	2	Strong evidence for absence of pollution-induced degradation
EF-45 USEPA 8	+	+	—	6	Toxic chemicals are probably stressing the system
KL-34 USEPA 9	—	—	—	2	Strong evidence for absence of pollution-induced degradation
GH-67 USEPA 10	—	—	—	2	Strong evidence for absence of pollution-induced degradation
CD-23 USEPA 11	+	+	—	6	Toxic chemicals are probably stressing the system
18	—	—	—	2	Strong evidence for absence of pollution-induced degradation
22	+	—	—	2	Strong evidence for absence of pollution-induced degradation

Notes:
OK = —
Not OK = +
Sediment Chemical
Mean ERM Quotient of 2 = +
Mean ERM Quotient of 1 = —

The mean ERM quotient was greater than 0.1 therefore Station IJ-12 was classified as Category 2 (Table 4-4). Neither SEM/AVS or SEM-AVS results revealed that metal constituents were bioavailable (Table 3-5), nor did any of the metals exceed their ERM values.

Surface sediments at Station IJ-12 were mainly silty sand (Table 3-7). This station is near the seawall in a high energy zone affected by the impact of waves. The estimated TOC content is 1% (Table 3-6), which may be allowing adsorption of some of the constituents detected at this site. The sediment bioassay tests revealed good survival among both the *Leptocheirus* and the mysid test organisms. Amphipod weight was noted to be significantly different than the control, but not significantly different when compared to Reference Stations 18 and 22 (Table 3-8). Mysid weights and fecundity did not show any effects (Table 3-9). Benthic diversity results showed a good trophic mix of surface deposit feeders, burrowers, and filter feeders representing 53 taxa. Translated into the triad system, these data indicate that Condition 3 exists for surface sediments, implying that contaminants are not bioavailable (Table 4-8).

DU GH-12 (USEPA Station 2)

Station GH-12, located to the east of Station IJ-12 and also adjacent to the seawall, had no surface sediment HQ exceedances for metals, but contained a pesticide and two PAHs with HQs > 1 (Table 3-1). This station is near one storm water outfall, four seawall outfalls, and a seaplane ramp. Divers noted wood chips and a rocky material (non-native to this area) while collecting sediment samples.

The mean ERM quotient was less than 0.1, therefore Station GH-12 was classified as ERM Category 1 (Table 4-4). SEM-AVS results were less than 1.0, and while SEM/AVS exceeded one indicating that some metals may be bioavailable (Table 3-5). However, none of the detected metals concentrations exceeded their ERL values, indicating that this detection may be a false positive indicator (Table 4-3).

Surface sediments at Station GH-12 were mainly silty sand (Table 3-7). This station is near the seawall, in a high energy zone affected by wave dynamics. The estimated TOC at this station is < 0.04% (Table 3-6). Sediment bioassay tests revealed good survival results among both the

Leptocheirus and the mysid test organisms. Amphipod weight was noted to be significantly different than the control, but not significantly different when compared to Reference Stations 18 and 22 (Table 3-8). Mysid weights and fecundity did not show any effects (Table 3-9). Benthic diversity results showed a good trophic mix of surface deposit feeders, burrowers, and filter feeders representing 53 taxa. Using the triad system, these data indicate Condition 2 (strong evidence for absence of pollution-induced degradation) exists.

DU IJ-34 (USEPA Station 3)

Station IJ-34, located due south of IJ-12 (Figure 2-1), had three metals and two PAHs in surface sediment with HQs > 1 (Table 3-1). Divers noted a partially submerged cannon in the silty bottom sediments (Table 2-1).

The mean ERM quotient was less than 0.1 which classified these sediments as Category 1 (Table 4-4). Neither SEM/AVS or SEM-AVS results indicated that metal constituents were bioavailable (Table 3-5).

Surface sediments at Station IJ-34 were mainly sandy silt (Table 3-7), of an almost equal ratio of sand, silt and clay. The estimated TOC at this station is 5% (Table 3-6), which may be allowing adsorption of some of the constituents detected. The sediment bioassay tests revealed good survival and sublethal endpoints among both the *Leptocheirus* and the mysid test organisms (Table 3-8 and 3-9). Benthic diversity results showed a good trophic mix of surface deposit feeders, burrowers, and filter feeders representing 49 taxa. Translated into the triad, these data indicate Condition 2 (strong evidence for the absence of pollution-induced degradation) exists.

DU GH-34 (USEPA Station 4)

Station GH-34, located due south of Station GH-12 (Figure 2-1), had several metals, PAHs, and one PCB in surface sediment with HQs > 1 (Table 3-1). Divers did not note anything unusual at this station (Table 2-1).

The mean ERM quotient was greater than 0.1 classifying the sediments as Category 2. However, no parameter exceeded its individual ERM value. Neither SEM/AVS or SEM-AVS results indicated that metal constituents were bioavailable (Table 3-5).

Surface sediments at Station GH-34 were mainly sandy silt (Table 3-7), of an almost equal ratio of sand, and silt and clay. The estimated TOC is 3.1% (Table 3-6), which may be allowing adsorption of some of the constituents detected at this station. The sediment bioassay tests revealed good survival and sublethal endpoints among both the *Leptocheirus* and the mysid test organisms (Tables 3-8 and 3-9). Benthic diversity results showed a good trophic mix of surface deposit feeders, burrowers, and filter feeders representing 61 taxa. Translated into the triad, these data indicate Condition 3 (contaminants are not bioavailable) exists.

DU EF-23 (USEPA Station 5)

Station EF-23 was found to have several metals, PCBs, and PAHs in surface sediment with HQs > 1 (Table 3-1). Lead, dibenz(a,h)anthracene, and BEHP had HQs >1. Divers noted broken shells in the substrate at this station (Table 2-1).

The mean ERM quotient exceeded 0.1 and two parameters (lead and zinc) exceeded their ERM values. Therefore, this station was classified as Category 2 (Table 4-4). However, neither SEM/AVS or SEM-AVS results indicated that metal constituents were bioavailable (Table 3-5).

Surface sediments at Station EF-23 were mainly silty sand (Table 3-7). With proximity to both the submerged seawall and the protective seawall along the shoreline (Figure 2-1), this station could encounter currents and eddies, implying that this station may be in a medium to high energy tidal zone depending on weather conditions. The estimated TOC content at this station is 2.7% (Table 3-6), which may be allowing adsorption of some of the constituents detected. The sediment bioassay tests revealed good survival and sublethal endpoints among both the *Leptocheirus* and the mysid test organisms (Tables 3-8 and 3-9). Benthic diversity results showed a good trophic mix of surface deposit feeders, burrowers, and filter feeders representing 44 taxa. Translated into the triad system, these data indicate Condition 3 (contaminants are not bioavailable) exists.

DU IJ-56 (USEPA Station 6)

Station IJ-56 had no HQ exceedances in surface sediment (Table 3-1). Divers noted conditions were sandy in the southern area of the DU and silty in the northern area (Table 2-1).

The mean ERM quotient was less than 0.1 and no ERMs were exceeded. Therefore, the sediments were classified as Category 1 (Table 4-4). Neither SEM/AVS or SEM-AVS results indicated that metal constituents were bioavailable (Table 3-5).

Surface sediments at Station IJ-56 were mainly silty sand (Table 3-7). The estimated TOC at this station is 0.7% (Table 3-6). The sediment bioassay tests showed that amphipod survival (81%) was found to be statistically significant when compared to the laboratory control, but not when compared to Reference Stations 18 and 22 (Table 3-8). Growth was not affected. The mysids performed well in this sediment (Table 3-9). Benthic diversity results showed a good trophic mix of surface deposit feeders, burrowers, and filter feeders which represented 59 taxa. Translated into the triad system, these data indicate Condition 2 (strong evidence for the absence of pollution-induced degradation) exists.

DU GH-56 (USEPA Station 7)

Only metals and PAHs were detected in surface sediment at Station GH-56, with

two PAH constituents having HQs > 1 (Table 3-1). Divers noted paint chips on the silty bottom (Table 2-1). The mean ERM quotient was less than 0.1 classifying Station GH-56 as Category 1 (Table 4-4). Neither SEM/AVS or SEM-AVS results indicated that metal constituents were bioavailable (Table 3-5).

Surface sediments at Station GH-56 were mainly silty sand (Table 3-7). The estimated TOC content at this station is 0.9 % (Table 3-6). The sediment bioassay tests revealed good survival and sublethal endpoints among both the *Leptocheirus* and the mysid test organisms (Tables 3-8 and 3-9). Benthic diversity results showed a good trophic mix of surface deposit feeders, burrowers, and filter feeders representing 46 taxa. Translated into the triad system, these data indicate Condition 2 (strong evidence of the absence of pollution-induced degradation) exists.

DU EF-45 (USEPA Station 8)

At Station EF-45 was found to have one pesticide and several PAH detections in surface sediment with HQs > 1 (Table 3-1). Divers noted that the submerged seawall was located near the northeast corner of this DU, and that this station contained dark, silty sediments (Table 2-1). Figure 2-1 shows the submerged seawall intercepting Station EF-45.

The mean ERM quotient was greater than 0.1, therefore, the sediments were classified as Category 2 (Table 4-4). None of the individual parameters exceeded their ERM values. Neither SEM/AVS or SEM-AVS results indicated that metal constituents were bioavailable (Table 3-5).

Surface sediments at Station EF-45 were mainly sandy silt (Table 3-7). The estimated TOC content at this station is 2.8 % (Table 3-6). The *Leptocheirus* test organism exhibited a survival rate of 73%, which is statistically different from the laboratory control exposures. (Table 3-8). The mysid shrimp performed very well (all endpoints) when exposed to the same sediments (Table 3-9).

Benthic diversity results showed a good trophic mix of surface-deposit feeders, burrowers, and filter feeders representing 62 taxa. Translated into the triad, these data indicate that Condition 6 implying that unmeasured contaminants or conditions exist which have the potential to cause degradation (Table 4-8).

DU KL-34 (USEPA Station 9)

One of three delineation DUs, Station KL-34 was placed to delineate the area of investigation to the west. Station KL-34 had two metals, one pesticide, and several PAHs in surface sediment with HQs > 1 (Table 3-1). Delta-BHC and BEHP had double-digit HQs. Divers noted that conditions were silty and that the sediment color was darker than at other locations (Table 2-1).

The mean ERM quotient was less than 0.1 classifying the sediments as Category 1 (Table 4-4). Neither SEM/AVS or SEM-AVS results indicated that metal constituents were bioavailable (Table 3-5).

Surface sediments at Station KL-34 were mainly sandy silt (Table 3-7). The estimated TOC content at this station is 5% (Table 3-6). The sediment bioassay tests revealed good survival and sublethal endpoints among both the *Leptocheirus* and the mysid test organisms (Tables 3-8 and 3-9). Benthic diversity results showed a good trophic mix of surface deposit feeders, burrowers, and filter feeders representing 49 taxa. Translated into the triad, these data indicate Condition 2 exists, implying there is strong evidence for the absence of pollution-induced degradation (Table 4-8).

DU GH-67 (USEPA Station 10)

One of three delineation DUs, Station GH-67 was placed to delineate the area of investigation to the south. Station GH-67, located seaward of the submerged seawall and the other DUs (Figure 2-1), did not have any HQ exceedances in surface sediment (Table 3-1). Divers noted grainy sand, little organic matter, and the presence of anemones at this site. Anemones position themselves on substrates near currents to benefit from food particles carried by those currents (Table 2-1), indicating that this DU is located in a high energy tidal area.

The mean ERM quotient was less than 0.1 placing Station GH-67 into Category 1 (Table 4-4). In addition, none of the individual ERM values were exceeded. SEM/AVS was detected above 1.0 for this station, but below 1.0 for the SEM-AVS result (Table 3-5). This discordance is explained as a false positive indicator, since there were no ERL exceedances for metals at this station.

Surface sediments at Station GH-67 were mainly silty sand (Table 3-7). The 95% sand content at this site, coupled with field observations of anemones, verifies that this is a high energy site influenced by strong tidal action. The estimated TOC content at this station is 0.08%, further evidence of a high-energy area (since organic matter [small particles] would be expected to wash away with currents). The sediment bioassay tests revealed good survival results for both species, but the amphipod weight endpoint was statistically significant when compared to the control performance (Table 3-8). Sublethal endpoints were not affected in the mysid test (Table 3-9).

Benthic diversity results showed a good trophic mix of surface deposit feeders, burrowers, and filter feeders representing 30 taxa. The species encountered at this station were more suited to the sandy conditions and continuous currents, as evidenced by the presence of anemones.

Translated into the triad, these data indicate Condition 2 exists, implying that there is strong evidence for the absence of pollution-induced degradation (Table 4-8).

DU CD-23 (USEPA Station 11)

One of three delineation DUs, Station CD-23 was placed to delineate the area of investigation to the east. Station CD-23 had several metals, PAHs, and pesticides with HQs > 1 (Table 3-1). Double-digit HQs were noted for dibenz(a,h)anthracene and BEHP. Divers noted that sediments at this station were silty on top and sandy underneath (Table 2-1). This correlates with the station location (Figure 2-1), which is closely surrounded on three sides (north, east, and south) by the shoreline seawall and submerged seawall. During normal (non-storm) tidal conditions, sediments would be expected to settle out from small eddies that occur in this confined area.

The mean ERM quotient was greater than 0.1 which placed Station CD-23 into Category 2 (Table 4-4). However, none of the individual ERM values were exceeded. Both SEM/AVS and SEM-AVS results were above 1.0 indicating the possibility that metal constituents may be bioavailable to benthic organisms (Table 3-5).

Surface sediments from CD-23 were mainly silty sand (Table 3-7). The estimated TOC content at this station is 1.4% (Table 3-6). The *Leptocheirus* test organism exhibited a survival rate of 78%, which is statistically different from the laboratory control exposures; . (Table 3-8). The mysid shrimp performed very well (100% survival, and good growth and fecundity) when exposed to the same sediments (Table 3-9). Benthic diversity results showed a good trophic mix of surface deposit feeders, burrowers, and filter feeders representing 49 taxa. Translated into the triad, these data indicate that Condition 6 exists, implying that or conditions exist which have the potential to cause degradation (Table 4-7).

Reference Station 18

Reference Station 18 had a single HQ > 1 for the pesticide delta-BHC (Table 3-1). Divers noted light brown sand with shell fragments (Table 2-1).

The mean ERM quotient was less than 0.1 placing Reference Station 18 into Category 1 (Table 4-4). None of the individual ERL or ERM values were exceeded. Neither SEM/AVS or SEM-AVS results indicated that metal constituents were bioavailable (Table 3-5).

Surface sediments at Reference Station 18 were mainly silty sand (Table 3-7). The sediment bioassay tests revealed good survival among both the *Leptocheirus* and the mysid test organisms (Tables 3-8 and 3-9). Similar to the Site 2 toxicity results, amphipod weight was significantly different than the laboratory control, whereas mysid weights and fecundity did not show any effects. Benthic diversity results showed a good trophic mix of surface deposit feeders, burrowers, and filter feeders representing 40 taxa. Applied to the triad, these data indicate Condition 2 exists, implying strong evidence for the absence of pollution-induced degradation (Table 4-8).

Reference Station 22

Reference Station 22 was found to have one metal and several PAH detections with HQs > 1 (Table 3-1). Surface sediments were mainly sandy silts (Table 3-7), which correlates with the divers' remarks that the bottom was very silty (Table 2-1). Surface sediments at this station had the highest portion of fines. The estimated TOC content at this station is 3.4% (Table 3-6).

The mean ERM quotient was 0.1 placing Reference Station 22 into Category 1 (Table 4-4). Neither SEM/AVS or SEM-AVS results indicated that metal constituents were bioavailable (Table 3-5).

The sediment bioassay tests revealed good survival among both the *Leptocheirus* and the mysid test organisms (Tables 3-8 and 3-9). Amphipod weight was noted to be significantly different than the control similar to the sediments from the subject site, whereas mysid weights

and fecundity did not appear to be statistically significant. Mysid fecundity was lowest at this station, with two out of nine females producing eggs. Benthic diversity results showed a good trophic mix of surface deposit feeders, burrowers, and filter feeders representing 19 taxa (the lowest diversity of the stations sampled). When translated into the triad, these data represent Condition 2, implying that there is strong evidence for the absence of pollution-induced degradation (Table 4-8).

4.5 Subsurface Sediment Findings

Eight subsurface sediments were collected during the 2000 sampling event to evaluate the depth of potential contamination. Similar to the surface sediments, mean ERM quotients were used to assess the data. Table 4-9 shows the subsurface ERL quotients and Table 4-10 presents the mean ERM quotients calculated for the samples. Comparisons to TELs and PELs are presented in Appendix F. Values exceeding 1.0 are reflected in the table as bold, and the number of ERL exceedances noted.

Station CD-23 had 18 ERL exceedances, four of which were inorganic, eleven of which were SVOCs, two pesticides, and total PCBs. Station IJ-34 had 17 ERL exceedances, six of which were inorganic, eight SVOCs, two pesticides, and total PCBs. Stations GH-34 and EF-23 each had nine ERL exceedances. Station KL-34 had six exceedances, Station IJ-12 had four exceedances, and the Reference Stations 18 and 22 each had three ERL exceedances.

All subsurface sediments, with the exception of Station IJ-12 which was not analyzed for pesticides or PCBs, had exceedances for total PCBs, and 4,4'-DDE. Stations Station CD-23 had the highest number of PAH ERL exceedances, whereas Stations IJ-12, 18, and 22 had no PAH ERL exceedances.

As shown in Table 4-10, three of the eight stations (IJ-12, Reference Stations 18 and 20) had mean ERM quotients below 0.1 placing them in Category 1. The remaining five stations (IJ-34, GH-34, EF-23, KL-34, and CD-23) had mean ERM quotients greater than 0.1 which placed them in Category 2. Stations IJ-34 and EF-23 had no ERM exceedances, while stations GH-34, KL-34, and

Table 4-9
Subsurface Sediment ERL Quotients

															Reference Stations			
		IJ-12		IJ-34		GH-34		EF-23		KL-34		CD-23		18		22		
Parameters	**ERLs**	**SD00102**	**HQ**	**SD00302**	**HQ**	**SD00402**	**HQ**	**SD00502**	**HQ**	**SD00902**	**HQ**	**SD01102**	**HQ**	**SD01802**	**HQ**	**SD02202**	**HQ**
Metals (mg/kg)																		
ARSENIC	8.2	14	**1.71**	16	**1.95**	12	**1.46**	12	**1.46**	16	**1.95**	18	**2.20**	5.1	0.62	17	**2.07**
CADMIUM	1.2	0.1	0.08	2.9	**2.42**	0.46	0.38	0.49	0.41	0.36	0.30	0.77	0.64	0.087	0.07	0.25	0.21
CHROMIUM	81	39	0.48	99	**1.22**	14	0.17	36	0.44	48	0.59	49	0.60	12	0.15	49	0.60
COPPER	34	50	**1.47**	29	0.85	14	0.41	52	**1.53**	19	0.56	75	**2.21**	3.4	0.10	13	0.38
LEAD	46.7	52	**1.11**	140	**3.00**	230	**4.93**	63	**1.35**	36	0.77	200	**4.28**	5.6	0.12	24	0.51
NICKEL	20.9	12	0.57	13	0.62	5.4	0.26	11	0.53	13	0.62	15	0.72	3.7	0.18	13	0.62
SILVER	1	0.07	0.07	2.2	**2.20**	0.0335	0.03	0.055	0.06	0.065	0.07	0.065	0.07	0.0325	0.03	0.06	0.06
TOTAL MERCURY	0.15	0.21	**1.40**	0.24	**1.60**	0.25	**1.67**	0.46	3.07	0.74	**4.93**	0.81	**5.40**	0.021	0.14	0.1	0.67
ZINC	150	51	0.34	130	0.87	41	0.27	50	0.33	77	0.51	95	0.63	12	0.08	62	0.41
Pesticides (µg/kg)																		
4,4'-DDE (P,P'-DDE)	2.2	NS	NC	5	**2.27**	2.4	**1.09**	4.85	**2.20**	5	**2.27**	4.85	**2.20**	2.4	**1.09**	4.45	**2.02**
4,4'-DDT (P,P'-DDT)	1.58	NS	NC	5	**3.16**	2.4	**1.52**	4.85	**3.07**	5	**3.16**	1.8	**1.14**	2.4	**1.52**	1.2	0.76
Total PCBs (µg/kg)	22.7	NS	NC	119	**5.24**	33.7	**1.48**	68.5	**3.02**	71	**3.13**	68.5	**3.02**	33.7	**1.48**	62.5	**2.75**
PAHs (µg/kg)																		
2-METHYLNAPHTHALENE	70	5	0.07	50	0.71	27	0.39	46	0.66	5.5	0.08	50	0.71	2.6	0.04	4.65	0.07
ACENAPHTHENE	16	15.5	0.97	155	**9.69**	80	**5.00**	140	**8.75**	16.5	**1.03**	160	**10.00**	8	0.50	14.5	0.91
ACENAPHTHYLENE	44	24.5	0.56	250	**5.68**	130	**2.95**	225	**5.11**	26.5	0.60	255	**5.80**	13	0.30	23	0.52
ANTHRACENE	85.3	17	0.20	64	0.75	42	0.49	35	0.41	25	0.29	91	**1.07**	3	0.04	22	0.26
BENZO(A)ANTHRACENE	261	90	0.34	360	**1.38**	120	0.46	130	0.50	110	0.42	390	**1.49**	14	0.05	99	0.38
BENZO-A-PYRENE	430	100	0.23	460	**1.07**	160	0.37	160	0.37	140	0.33	460	**1.07**	22	0.05	120	0.28
CHRYSENE	384	160	0.42	850	**2.21**	260	0.68	250	0.65	250	0.65	790	**2.06**	32	0.08	200	0.52
DIBENZO(A,H)ANTHRACENE	63.4	2.1	0.03	110	**1.74**	41	0.65	41	0.65	36	0.57	120	**1.89**	6.6	0.10	36	0.57
FLUORANTHENE	600	180	0.30	530	0.88	260	0.43	260	0.43	230	0.38	800	**1.33**	30	0.05	210	0.35
FLUORENE	19	9.6	0.51	19	**1.00**	26	**1.37**	17.5	0.92	11	0.58	48	**2.53**	1	0.05	11	0.58
NAPHTHALENE	160	32	0.20	105	0.66	55	0.34	95	0.59	47	0.29	105	0.66	5.5	0.03	32	0.20
PHENANTHRENE	240	65	0.27	210	0.88	160	0.67	130	0.54	100	0.42	390	**1.63**	17	0.07	94	0.39
PYRENE	665	190	0.29	890	**1.34**	270	0.41	290	0.44	250	0.38	1000	**1.50**	30	0.05	210	0.32
Number of ERL Exceedances			**4**		**17**		**9**		**8**		**6**		**18**		**3**		**3**

Notes:
One-half the detection limit has been used for parameters that were not detected, except for total PCBs and pesticides which used one-tenth the detection limit (See EPA report in Appendix B).
Concentrations exceeding the ERM are shown in **bold**.
NS = not sampled
NC = not calculated because of missing analytes

Table 4-10
Subsurface Sediment ERM Quotients and Mean ERM Quotients

															Reference Stations			
		IJ-12		IJ-34		GH-34		EF-23		KL-34		CD-23		18		22		
Parameters	**ERMs**	**SD00102**	**HQ**	**SD00302**	**HQ**	**SD00402**	**HQ**	**SD00502**	**HQ**	**SD00902**	**HQ**	**SD01102**	**HQ**	**SD01802**	**HQ**	**SD02202**	**HQ**
Metals (mg/kg)																		
ARSENIC	70	14	0.2	16	0.23	12	0.17	12	0.17	16	0.23	18	0.26	5.1	0.07	17	0.24
CADMIUM	9.6	0.1	0.01	2.9	0.30	0.46	0.05	0.49	0.05	0.36	0.04	0.77	0.08	0.087	0.01	0.25	0.03
CHROMIUM	370	39	0.11	99	0.27	14	0.04	36	0.10	48	0.13	49	0.13	12	0.03	49	0.13
COPPER	270	50	0.19	29	0.11	14	0.05	52	0.19	19	0.07	75	0.28	3.4	0.01	13	0.05
LEAD	218	52	0.24	140	0.64	230	**1.06**	63	0.29	36	0.17	200	0.92	5.6	0.03	24	0.11
NICKEL	51.6	12	0.23	13	0.25	5.4	0.10	11	0.21	13	0.25	15	0.29	3.7	0.07	13	0.25
SILVER	3.7	0.07	0.02	2.2	0.59	0.0335	0.01	0.055	0.01	0.065	0.02	0.065	0.02	0.0325	0.01	0.06	0.02
TOTAL MERCURY	0.71	0.21	0.30	0.24	0.34	0.25	0.35	0.46	0.65	0.74	**1.04**	0.81	**1.14**	0.021	0.03	0.1	0.14
ZINC	410	51	0.12	130	0.32	41	0.10	50	0.12	77	0.19	95	0.23	12	0.03	62	0.15
Pesticides (μg/kg)																		
4,4'-DDE (P,P'-DDE)	27	NS	NC	5	0.19	2.4	0.09	4.85	0.18	5	0.19	4.85	0.18	2.4	0.09	4.45	0.16
4,4'-DDT (P,P'-DDT)	46.1	NS	NC	5	0.11	2.4	0.05	4.85	0.11	5	0.11	1.8	0.04	2.4	0.05	1.2	0.03
Total PCBs (μg/kg)	**180**	NS	NC	119	0.66	33.7	0.19	68.5	0.38	71	0.39	68.5	0.38	33.7	0.19	62.5	0.35
PAHs (μg/kg)																		
2-METHYLNAPHTHALENE	670	5	0.01	50	0.07	27	0.04	46	0.07	5.5	0.01	50	0.07	2.6	0.00	4.65	0.01
ACENAPHTHENE	500	15.5	0.03	155	0.31	80	0.16	140	0.28	16.5	0.03	160	0.32	8	0.02	14.5	0.03
ACENAPHTHYLENE	640	24.5	0.04	250	0.39	130	0.20	225	0.35	26.5	0.04	255	0.40	13	0.02	23	0.04
ANTHRACENE	1100	17	0.02	64	0.06	42	0.04	35	0.03	25	0.02	91	0.08	3	0.00	22	0.02
BENZO(A)ANTHRACENE	1600	90	0.06	360	0.23	120	0.08	130	0.08	110	0.07	390	0.24	14	0.01	99	0.06
BENZO-A-PYRENE	1600	100	0.06	460	0.29	160	0.10	160	0.10	140	0.09	460	0.29	22	0.01	120	0.08
CHRYSENE	2800	160	0.06	850	0.30	260	0.09	250	0.09	250	0.09	790	0.28	32	0.01	200	0.07
DIBENZO(A,H)ANTHRACENE	260	2.1	0.01	110	0.42	41	0.16	41	0.16	36	0.14	120	0.46	6.6	0.03	36	0.14
FLUORANTHENE	5100	180	0.04	530	0.10	260	0.05	260	0.05	230	0.05	800	0.16	30	0.01	210	0.04
FLUORENE	540	9.6	0.02	19	0.04	26	0.05	17.5	0.03	11	0.02	48	0.09	1	0.00	11	0.02
NAPHTHALENE	2100	32	0.02	105	0.05	55	0.03	95	0.05	47	0.02	105	0.05	5.5	0.00	32	0.02
PHENANTHRENE	1500	65	0.04	210	0.14	160	0.11	130	0.09	100	0.07	390	0.26	17	0.01	94	0.06
PYRENE	2600	190	0.07	890	0.34	270	0.10	290	0.11	250	0.10	1000	0.38	30	0.01	210	0.08
Total ERM Quotients			**NC**		**6.75**		**3.46**		**3.95**		**3.56**		**7.04**		**0.76**		**2.32**
Mean ERM Quotients			**NC**		**0.27**		**0.14**		**0.16**		**0.14**		**0.28**		**0.03**		**0.09**
Number of ERM Exceedances			**0**		**0**		**1**		**0**		**1**		**1**		**0**		**0**
Category			**NC**		**2**		**2**		**2**		**2**		**2**		**1**		**1**
Input into Triad			**NC**		**+**		**+**		**-**		**+**		**+**		**-**		**-**

Notes:
One-half the detection limit has been used for parameters that were not detected, except for total PCBs and pesticides which used one-tenth the detection limit (See EPA report in Appendix B).
Concentrations exceeding the ERM are shown in **bold**.
NS = not sampled
NC = not calculated because of missing analytes

CD-23 had one ERM exceedance. None of the subsurface sediment stations were classified as Category 3 or 4.

Comparison of Surface and Subsurface Sediment Chemistry Findings

The ERL, ERM and mean ERM quotients are summarized in Table 4-11 for both surface and subsurface sediment samples. Seven of the 13 surface stations were classified as Category 1 (See Table 4-2 for a summary of the categories). Six of the eleven surface stations had mean ERM quotients of greater than 0.1 placing sediments in Category 2. No Site 2 stations were classified in Category 3 or 4 using the mean ERM quotient.

Five of the eight subsurface stations revealed mean ERM quotients of greater than 0.1 resulting in a classification of Category 2. Four of these have greater values than the surface station counterpart as shown on Figure 4-16.

4.6 Weight of Evidence

Table 4-12 is a weight of evidence summary developed to compare the performance of the DUs. The table summarizes all data pertaining to Site 2 sediments, including detected chemical constituents and their HQs (HQs >1 are shown in bold), sediment characteristics, mean ERM quotients, biological responses, and diversity findings for each DU.

Table 4-11
Comparison of Surface and Subsurface ERL and ERM Exceedances

		Surface Sediment		Subsurface Sediment	
EnSafe Station	**USEPA Station**	**ERL Exceedances**	**Category, (Mean ERM Quotient) and ERM Exceeded**	**ERL Exceedances**	**Category, (Mean ERM Quotient), and ERM Exceeded**
IJ-12	1	Cd, Cr, Pb, Acenaphthene, Naphthalene, Total PCBs	2 (0.19) Total PCBs	As, Pb, Hg	NC
GH-12	2	Total PCBs, Acenaphthene, Acenaphthylene	1 (0.05)	Not Sampled	N/A
IJ-34	3	As, Cd, Pb	1 (0.08)	As, Cd, Cr, Pb, Hg, Benzo(a)anthracene, Benzo(a)pyrene, Chrysene, Dibenz(a,h)anthracene, Pyrene, Total PCBs	2 (0.27)
GH-34	4	As, Cd, Pb, Total PCBs, Acenaphthene, Acenaphthylene	2 (0.14)	As, Pb, Hg	2 (0.14) Pb
EF-23	5	As, Cd, Cu, Pb, Hg, Zn, Acenaphthene, Acenaphthylene, Benzo(a)anthracene, Benzo(a)pyrene, Chrysene, Dibenz(a,h)anthracene, Fluoranthene, Pyrene, Total PCBs	2 (0.42) Pb, Zn, Total PCBs	As, Cu, Pb, Hg	2 (0.16)
IJ-56	6	Total PCBs	1 (0.02)	Not Sampled	N/A
GH-56	7	Total PCBs	1 (0.03)	Not Sampled	N/A
EF-45	8	Acenaphthene, Acenaphthylene, Naphthalene, 4,4'-DDT	2 (0.12)	Not Sampled	N/A
KL-34	9	As, Acenaphthene, Total PCBs	1 (0.09)	As, Hg	2 (0.14) Hg
GH-67	10	Total PCBs	1 (0.01)	Not Sampled	N/A
CD-23	11	As, Cd, Cu, Pb, Hg, Acenaphthene, Acenaphthylene, Chrysene, Dibenz(a,h)anthracene	2 (0.16)	As, Cu, Pb, Hg, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Chrysene, Dibenz(a,h)anthracene, Fluorene, 2-Methylnapthalene, Phenanthrene, Pyrene	2 (0.28) Hg
18	18	No Exceedances	1 (0.03)	No Exceedances	1 (0.03)
22	22	As	2 (0.1)	As, 4,4'-DDT	1 (0.09)

Notes:
Mean ERM Quotients are shown in parenthesis
NC = not calculated. At Station IJ-56, SVOCs and pesticides/PCBs were not analyzed.

Table 4-12
Weight of Evidence Summary

USEPA Stations	01-01		02-01		03-01		04-01		05-01		06-01		07-01		08-01		09-01		10-01		11-01		18-01		22-01	
EnSafe Stations	IJ-12		GH-12		IJ-34		GH-34		EF-23		IJ-56		GH-56		EF-45		KL-34		GH-67		CD-23		18		22	
Interval	sur	sub	sur	sub	sur	sub	sur	sub	sur	sub	sur	sub	sur	sub	sur	sub	sur	sub	sur	sub	sur	sub	sur	sub	sur	sub
Inorganics HQs																										
Antimony (Sb)	0.04	-	0.11	NS	0.03	0.23	0.03	0.03	0.07	0.03	0.01	NS	0.01	NS	0.02	NS	0.02	0.03	-	NS	0.15	0.06	0.008	0.01	0.03	0.03
Arsenic (As)	0.68	**1.93**	0.21	NS	**1.66**	**2.2**	**1.52**	**1.66**	**2.21**	**1.66**	0.36	NS	0.47	NS	0.95	NS	**1.93**	**2.21**	0.07	NS	**1.26**	**2.49**	0.69	0.70	**2.49**	**2.35**
Cadmium (Cd)	**3.38**	0.15	0.25	NS	**2.5**	**4.26**	**7.65**	0.68	**6.32**	0.73	0.10	NS	0.15	NS	0.17	NS	0.57	0.53	-	NS	**1.91**	**1.13**	0.11	0.13	0.32	0.37
Chromium (Cr)	**1.91**	0.75	0.17	NS	0.75	**1.89**	0.73	0.27	**1.43**	0.69	0.13	NS	0.25	NS	0.36	NS	0.75	0.92	0.02	NS	0.78	0.94	0.25	0.23	0.96	0.94
Copper (Cu)	**1.33**	**2.67**	0.59	NS	0.74	**1.55**	**1.44**	0.75	**3.53**	**2.78**	0.18	NS	0.24	NS	0.47	NS	**1.23**	**1.02**	0.03	NS	**2.56**	**4.01**	0.20	0.18	0.70	0.70
Lead (Pb)	**6.29**	**1.72**	0.53	NS	**1.56**	**4.64**	**1.69**	**7.62**	**21.19**	**2.09**	0.50	NS	0.40	NS	0.56	NS	0.89	**1.19**	0.04	NS	**4.97**	**6.62**	0.19	0.19	0.79	0.79
Mercury (Hg)	0.66	**1.62**	0.28	NS	0.65	**1.85**	0.63	**1.92**	**1.62**	**3.53**	0.14	NS	0.2	NS	0.34	NS	0.57	**5.69**	-	NS	**1.23**	**6.23**	0.15	0.16	0.85	0.77
Nickel (Ni)	0.21	0.75	0.07	NS	0.55	0.82	0.63	0.34	0.49	0.06	0.13	NS	0.15	NS	0.38	NS	0.61	0.82	0.02	NS	0.32	0.94	0.23	0.23	0.88	0.82
Silver (Ag)	0.11	0.10	-	NS	-	**3.01**	0.15	-	0.29	-	-	NS	-	NS	-	NS	-	-	-	NS	0.27	-	-	-	-	-
Zinc (Zn)	0.61	0.41	0.11	NS	0.44	**1.05**	0.48	0.33	**5.40**	0.40	0.14	NS	0.15	NS	0.27	NS	0.41	0.62	0.02	NS	0.64	0.77	0.10	0.10	0.56	0.50
Pesticides HQs																										
4,4'-DDD	-	NS	-	NS	-	-	-	-	-	-	-	NS	-	NS	-	NS	-	-	-	NS	**2.05**	-	-	-	-	-
4,4'-DDT	-	NS	-	NS	-	-	-	-	-	-	-	NS	-	NS	**1.51**	NS	-	-	-	NS	-	**1.51**	-	-	-	**1.01**
Dieldrin	-	NS	**4.9**	NS	-	-	-	-	-	-	-	NS	-	NS	-	NS	-	-	-	NS	-	-	-	-	-	-
Beta-BHC	-	NS	-	NS	-	**5.94**	-	-	-	-	-	NS	-	NS	-	NS	-	-	-	NS	-	-	-	-	-	-
Delta-BHC	-	NS	-	NS	-	-	-	**2.44**	-	**8.13**	-	NS	-	NS	-	NS	**12.19**	**9.38**	-	NS	-	-	**3.44**	-	-	**8.13**
Endrin	-	NS	-	NS	-	-	-	-	-	-	-	NS	-	NS	-	NS	-	-	-	NS	0.33	-	-	-	-	-
Endrin Ketone	-	NS	-	NS	-	-	-	-	-	-	-	NS	-	NS	-	NS	-	-	-	NS	-	0.33	-	-	-	-
PCBs HQs																										
Aroclor-1254	**3.1**	NS	-	NS	-	**2.69**	-	-	**1.30**	-	-	NS	-	NS	-	NS	-	-	-	NS	-	-	-	-	-	-
Aroclor-1260	**8.8**	NS	-	NS	-	**4.54**	**1.53**	-	**3.89**	-	-	NS	-	NS	-	NS	-	-	-	NS	-	-	-	-	-	-
PAHs HQs																										
2-Methylnaphthalene	-	-	-	NS	-	-	-	-	-	-	0.43	NS	-	NS	-	NS	-	-	-	NS	-	-	-	-	-	-
Anthracene	0.59	0.36	0.38	NS	0.21	**1.36**	0.96	0.90	**1.26**	0.75	0.04	NS	0.23	NS	0.90	NS	0.47	0.53	-	NS	0.91	**1.94**	-	0.06	0.62	0.47
Benzo(a)anthracene	**1.33**	**1.20**	**1.27**	NS	0.66	**4.81**	**2.14**	**1.60**	**4.14**	**1.74**	0.11	NS	0.55	NS	**2.81**	NS	**1.14**	**1.47**	0.01	NS	**3.2**	**5.21**	0.04	0.19	**1.27**	**1.32**
Benzo(a)pyrene	**1.8**	**1.13**	0.96	NS	0.70	**5.2**	**2.03**	**1.80**	**4.95**	**1.80**	0.10	NS	0.51	NS	**2.70**	NS	**1.24**	**1.58**	0.01	NS	**4.62**	**5.18**	0.04	0.25	**1.35**	**1.35**
Chrysene	**2.59**	**1.48**	**2.22**	NS	0.86	**7.87**	**3.24**	**2.41**	**9.26**	**2.31**	0.19	NS	0.85	NS	**3.52**	NS	**1.57**	**2.31**	0.01	NS	**5.8**	**7.31**	0.06	0.30	**1.94**	**1.85**
Dibenz(a,h)anthracene	**5.62**	-	-	NS	**2.41**	**17.68**	**7.07**	**6.59**	**17.68**	**6.59**	0.47	NS	**1.77**	NS	**9**	NS	**4.18**	**5.79**	-	NS	**16.07**	**19.29**	-	**1.06**	**4.98**	**5.79**
Fluoranthene	**1.86**	**1.59**	0.54	NS	0.81	**4.69**	**2.65**	**2.30**	**6.28**	**2.30**	0.14	NS	0.58	NS	**5.04**	NS	**1.59**	**2.04**	-	NS	**4.16**	**7.08**	0.06	0.27	**2.21**	**1.86**
Fluorene	-	0.45	-	NS	-	-	-	**1.23**	-	-	-	NS	-	NS	-	NS	-	0.52	-	NS	-	**2.26**	-	-	0.613	0.52
Naphthalene	**5.2**	0.92	-	NS	**2.10**	-	-	-	-	-	0.52	NS	**1.79**	NS	**4.62**	NS	**3.18**	**1.36**	-	NS	**3.76**	-	0.49	-	-	0.92
Phenanthrene	**1.12**	0.75	0.60	NS	0.45	**2.42**	**1.50**	**1.85**	**2.65**	**1.50**	0.09	NS	0.40	NS	**1.61**	NS	0.72	**1.15**	-	NS	**1.85**	**4.51**	0.04	0.20	**1.50**	**1.08**
Pyrene	**1.57**	**1.24**	0.64	NS	0.60	**5.82**	**1.77**	**1.76**	**4.71**	**1.90**	0.14	NS	0.46	NS	**3.66**	NS	**1.05**	**1.63**	0.01	NS	**2.88**	**6.54**	0.04	0.20	**1.31**	**1.37**
Total PAHs	**1.31**	0.53	0.75	NS	0.46	**2.41**	1.53	0.97	**3.3**	**1.08**	0.11	NS	0.38	NS	**2.22**	NS	0.81	0.74	0.03	NS	**2.39**	**2.77**	0.06	0.11	0.94	0.64
Semivolatile Organic Compounds HQs																										
BEHP	**15.39**	NS	-	NS	-		-	-	**10.44**	-	-	NS	-	NS	**5.33**	NS	**60.44**	-	-	NS	**25.82**	-	-	-	-	-
Other Properties																										
Grain Size, % fine	38	82	16	NS	59	87	57	43	46	81	24	NS	33	NS	52	NS	56	88	5	NS	39	78	42	81	60.6	87
Adjusted TOC %	1.004	NA	0.036	NS	5.044	NA	3.128	NA	2.706	NA	0.694	NS	0.926	NS	2.769	NS	5.004	NA	0.084	NS	1.357	NA	1.042	NA	3.432	NA
ERM Quotient	0.19	NC	0.05	NS	0.08	0.27	0.14	0.14	0.4	0.16	0.02	NS	0.03	NS	0.12	NS	0.09	0.14	0.01	NS	0.16	0.28	0.03	0.03	0.1	0.09
ERM Category	2	NC	1	NS	1	2	2	2	2	2	1	NS	1	NS	2	NS	1	2	1	NS	2	2	1	1	2	1
SEM-AVS	-0.07	NA	0.095	NA	-3.28	NA	-2.095	NA	-0.52	NA	-0.701	NA	-0.771	NA	-9.41	NA	-4.9	NA	0.043	NA	**1.67**	NA	-0.088	NA	-0.89	NA
SEM/AVS	0.97	NA	**1.3**	NA	0.24	NA	0.31	NA	0.81	NA	0.28	NA	0.34	NA	0.10	NA	0.17	NA	**1.6**	NA	**2.4**	NA	0.74	NA	0.53	NA
Leptocheirus Laboratory Toxicity																										
Survival	89		88		95		95		95		81*		82		73*		97		99		78*		98		96	
Growth	0.13*		0.14*		0.25		0.21		0.16		0.21		0.28		0.24		0.27		0.13*		0.27		0.12*		0.14*	
Mysidopsis Laboratory Toxicity																										
Survival	100		100		97		97		97		97		97		97		95		84		100		90		92	
Growth	0.36		0.34		0.39		0.35		0.34		0.53		0.4		0.37		0.34		0.3		0.47		0.28		0.32	
Fecundity (%)	85		92		94		100		67		94		88		75		88		69		95		93		22	

Table 4-12
Weight of Evidence Summary

USEPA Stations	01-01		02-01		03-01		04-01		05-01		06-01		07-01		08-01		09-01		10-01		11-01		18-01		22-01	
EnSafe Stations	IJ-12		GH-12		IJ-34		GH-34		EF-23		IJ-56		GH-56		EF-45		KL-34		GH-67		CD-23		18		22	
Interval	sur	sub	sur	sub	sur	sub	sur	sub	sur	sub	sur	sub	sur	sub	sur	sub	sur	sub	sur	sub	sur	sub	sur	sub	sur	sub
Benthic Species Diversity																										
Species Diversity	3.04		2.90		3.25		3.17		2.87		3.25		3.16		3.05		3.11		3.06		3.04		2.81		2.57	
Evenness	0.77		0.77		0.85		0.82		0.76		0.84		0.83		0.75		0.80		0.90		0.82		0.76		0.87	
Richness	9.87		8.83		8.83		8.30		8.28		8.53		8.47		10.22		8.88		6.74		8.26		6.84		4.53	

Notes:
Chemical constituent detections shown as HQ which is equal to the detected concentration divided by the lower of the EPA or FDEP sediment screening value.
HQs > 1 in bold.
Comparisons were made to the Reference Stations (18 and 22) and further validated by applying the NOEC = IC_{25}.
Su = Surface sediment interval.
Sub = Subsurface sediment interval.
HQ = Hazard quotient.
NA = Not applicable.
NS = Not Sampled.

4.7 Protective Concentration Development

The results of the sampling conducting during the RI on the Site 2 sediments were evaluated to determine if a protective level could be developed based on the data collected. The data used during this evaluation included analytical data, toxicity tests (*Leptocheirus* survival and growth and *Mysidopsis* survival, growth and fecundity), and benthic community evaluations (measuring diversity, richness, and evenness). While the data were the result of a well planned out investigation and had a clear and concise sampling and analysis plan for the toxicity testing conducted, it is important to note that several limitations apply to this data set.

1. Total organic carbon (TOC) data were not collected. TOC was supposed to be collected during this investigation; however, due to a laboratory oversight this data were not collected. Since TOC is one of the many physical parameters that can determine the bioavailability of contaminants, it can be very useful in evaluating the effects measured compared to contaminant levels.
2. While the sampling was planned to cover a contaminant gradient, the analytical results indicated that the samples collected for toxicity testing did not reproduce the original gradient shown during previous sampling events. The lack of a clear gradient makes developing protective levels more difficult because other environmental factors (other than response to contaminants) more easily over ride any contaminant – response relationship making interpretation more difficult.

Since full analytical scans were done on all the sediment samples collected at Site 2, the data were evaluated to determine if the toxic effects noted in the sampling were contaminant driven. Graphs were developed to show toxic effects against individual parameter detected concentrations. As presented in Appendix G, there was no clear relationship between the contaminant concentrations and the identified survival effects in *Leptocheirus.* Toxic effects and benthic community endpoints were also evaluated against the following:

- Metals HQ: sum of all individual metal HQs.

- Pest/PCB HQ: sum of all individual pesticide and PCB HQs.
- SVOC HQ: sum of all individual SVOC HQs.
- PAH HQ: the total PAH HQ (measured by summing the individual PAH results divided by the total PAH screening value of 1,684 µg/kg total PAHs)

These HQ categories were plotted against all the site specific biota testing to make these figures:

- *Leptocheirus* (survival and growth) (Figures 4-18 and 4-19)
- *Mysidopsis* (survival, growth, and fecundity) (Figures 4-20, 4-21, and 4-22)
- Benthic diversity (Figure 4-23)
- Benthic evenness (Figure 4-24)
- Bethnic richness (Figure 4-25)

Each graph was evaluated, both independently and collectively, to determine if the data it presented indicated any trends which would lend itself for use in developing protective levels for the benthic community at Site 2. It is important to note that none of the graphs generated showed close correlation between the effects shown and the levels of any sediment contaminants. Given the complexity of a typical marine sediment environment, correlation between contaminants and environmental effects are seldom clear and obvious. Therefore, evaluating scatter diagrams based on contaminant – biological response and developing protective levels requires professional judgment in interpreting data.

For a graph to indicate that the results support development of a protective level the following must be true:

1. The reference samples must set a level for comparison where there are few contaminants (low HQs) and a low level of effects (high survival, growth, or fecundity). This is indicated by being located in the upper left hand corner of the graph.
2. The locations that met the Condition 6 criteria (from the work plan) should be located in

the areas where HQs are the highest (meaning statistically significant effects were noted in areas with elevated concentrations of COPCs). This would put these locations in the lower right end of all the data points theoretically.

3. The other sites (not Condition 6 locations) should generally be located between the reference and Condition 6 data.

The Site 2 graphs present very few trends; and the ones identified are often contradictory (when comparing both toxicity tests or endpoints within one test) or show trends that indicate the conditions in the Site 2 sediments may present conditions that are similar to reference conditions or are actually enriched when compared to other sites or along the contaminant gradient. Most of the graphs included indicate that some other factor, other than contaminant concentrations, is the dominant force (or forces) in driving toxic responses.

A summary of the graphs generated is presented in the sections below.

Leptocheirus Survival (Figure 4-18)

Most of the graphs presenting the results of the *Leptocheirus* survival show no correlation to hazard quotients (HQ), except for *Leptocheirus* survival vs. PAH HQ in surface sediment. In this graph, there is a trend that indicates that as HQs increase survival decreases. This trend is characterized by the position of the Condition 6 samples at the far right end of the linear trend line, the reference data on the upper left hand end of the linear trend line and the rest of the site samples distributed between the two. The surficial sediment graph indicates conditions that would make selecting a protective level possible, but has several areas of uncertainty. This includes one onsite data point farther to the right on the linear trend line than the two condition 6 data. The other uncertainty is with the total PAH contaminant levels in one of the reference locations. This data point adds uncertainty to the analysis of this test, but could still possibly be used to develop a protective level. Based on the analysis of the surficial sediment total PAH *Leptocheirus* graph, a protective level of 2,372 µg/kg can be developed.

Leptocheirus Growth (Figure 4-19)

None of the graphs produced for this endpoint indicate the potential for developing protective levels with an acceptable level of certainty. The graphs show that either the trend present indicates an enriched environment as HQs increase (SVOC and PAHs), or the condition 6 data points are intermixed with the other onsite and reference data. Protective levels for *Leptocheirus* (the growth endpoint) cannot be developed with an acceptable level of uncertainty based on the current data set.

Mysidopsis Survival (Figure 4-20)

The graphs representing mysid survival indicate the results of this test are not useful in developing any protective levels for surface sediments at Site 2.

Mysidopsis Growth (Figure 4-21)

The graphs representing mysid growth indicate the results of this test are not useful in developing any protective levels for surface sediments at Site 2.

Mysidopsis Fecundity (Figure 4-22)

The graphs representing mysid fecundity indicate general trends that imply that fecundity decreases as HQs increase. However, closer evaluation of the data points indicates a great deal of uncertainty and little correlation between COPC concentrations and toxic effects (condition 6 data locations are intermixed with other data points and reference locations). One of the reference concentrations had the lowest fecundity of any sample location and most likely should not be included in any attempt to develop a protective level, and therefore is a source of uncertainty that cannot readily be explained.

The surface sediment PAH HQs graph indicate results that could be interpreted into a protective level, based on the condition 6 data locations being on the far right side of the linear trend line. However, the graph also indicates several areas of uncertainty involved in any protective levels generated with this data set. The three primary uncertainty areas include: (1) unexplained low

fecundity at one reference location; (2) high fecundity at one of the condition 6 locations; and (3) the onsite data point with the highest HQ and lowest fecundity (EF-23) was not a condition 6 location. Analysis of the graph indicates that lowest concentration that produced a condition 6 location was at an HQ of 2.22 (total PAH = 3,738.5 µg/kg) represents the lowest concentration that is not protective. Other than the exception listed in the uncertainties, the highest protective concentration (that is less than the level identified as not protective) would be 2,576.5 µg/kg (with 100% fecundity). However since that data point has no other data points close to it to help verify that result, a protective level with less uncertainty would be the highest data point in the onsite data grouped together to the left of the condition 6 location identified as the not protective level (1,599.8 µg/kg). Therefore the protective range based on mysid fecundity would range from 1,599.8 µg/kg to 2,576.5 µg/kg.

Benthic Community Evaluation Graphs (Figures 4-23, 4-24, and 4-25)

None of the benthic community analysis produced graphs that would support generating protective ranges. The community richness graphs generally indicated reduced richness as HQs increase (based on linear trend lines). However, only the data based on exposure to PAHs indicates that the statistically significant toxicity occurs in the locations with the highest HQs (condition 6 locations). This graph would indicate a protective level around 2,576 µg/kg total PAHs.

Remedial Goal Options

Based on the analysis presented above, the following remedial goal options were developed:

- 2,576 µg/kg based on Benthic Community Analysis
- 1,599.8 µg/kg to 2,576.5 µg/kg based on mysid fecunidity
- 2,372 µg/kg based on *Leptocheirus* survival

Remedial goal options could not be developed based on *Leptocheirus* growth, mysid survival or mysid growth. The developed RGOs are similar to the USEPA SSV and FDEP SQAG of 1,684 ppb.

[illegible] remedial goal options, locations EF-23 (DU 5), CD-23 (DU 11) and EF-45 (DU 8) [illegible] the identified goals. However, toxicity results from EF-23 (DU 5) indicates a 97% [illegible] for *Leptocheirus*, which is greater than the agreed upon acceptable 80% survival rate [illegible] suggest that a remedial action is not needed for that area. The remaining two stations [illegible] ously identified as Condition 6 indicating that unmeasured contamination or conditions [illegible] may have the potential to cause degradation.

Figure 4-1 Decision Flow for Each Decision Unit

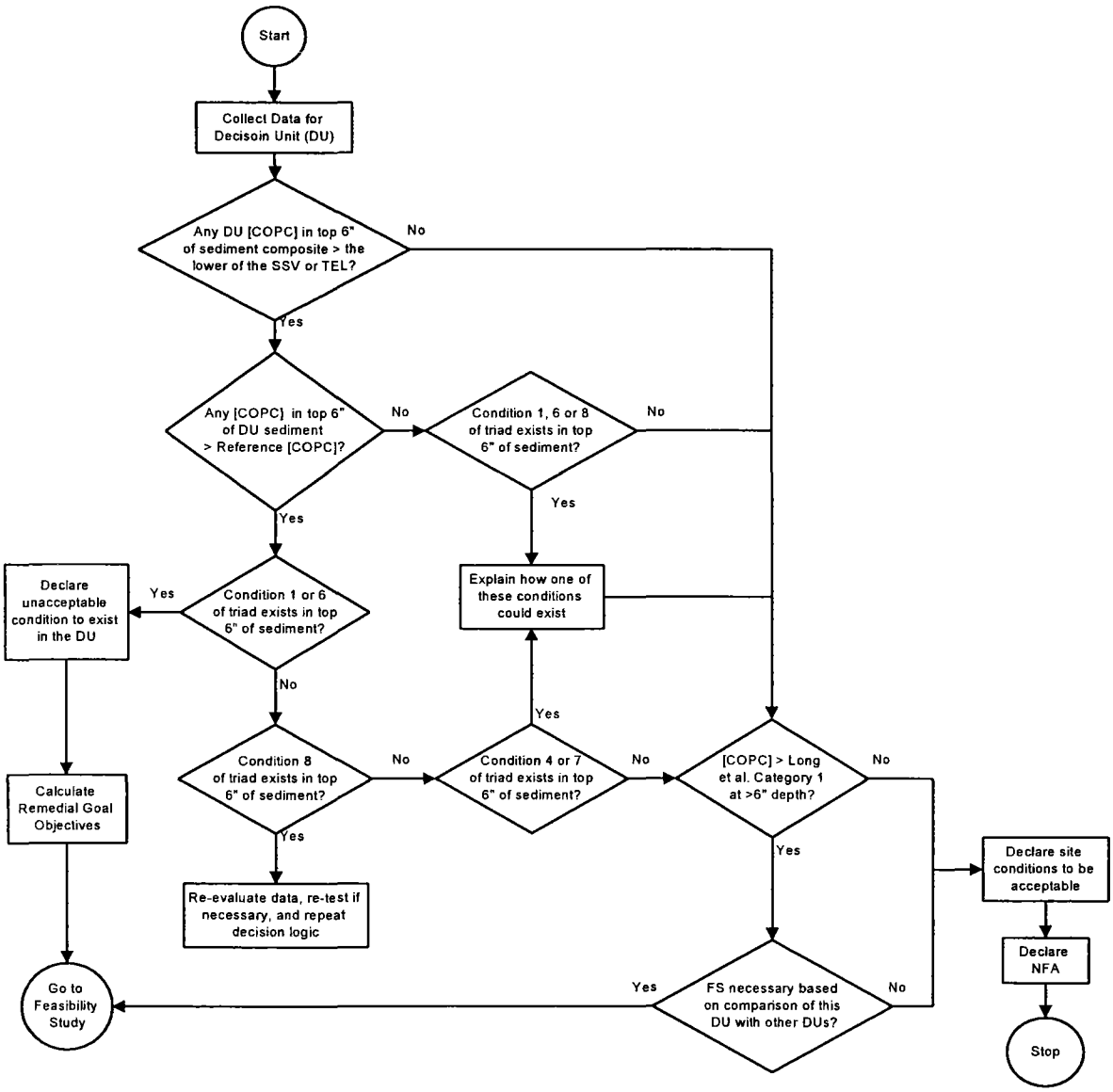


Figure 4-2 Simplified Decision Flow for Each Decision Unit

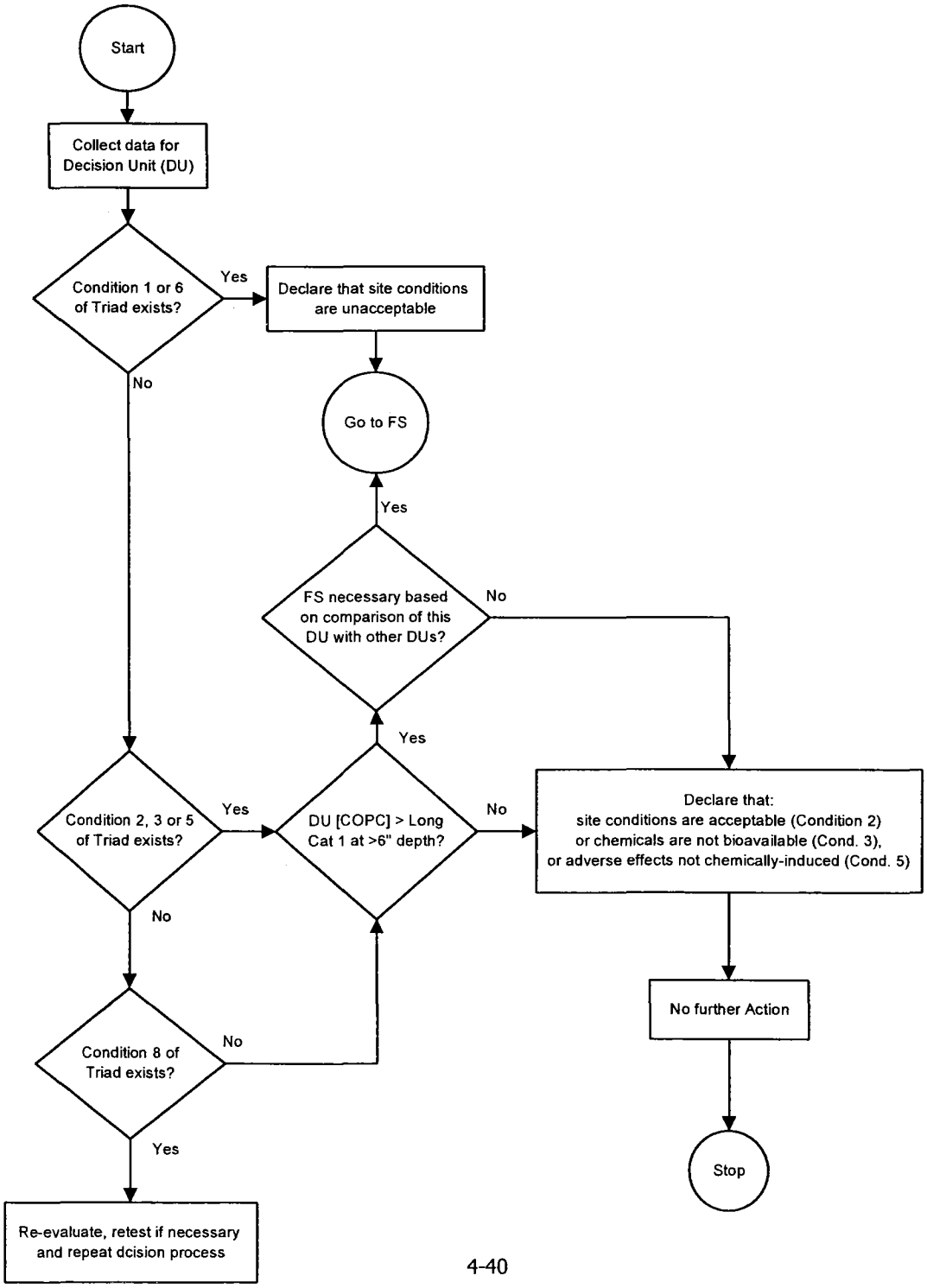


Figure 4-3 Concentration of Arsenic in Surface Sediment by Station

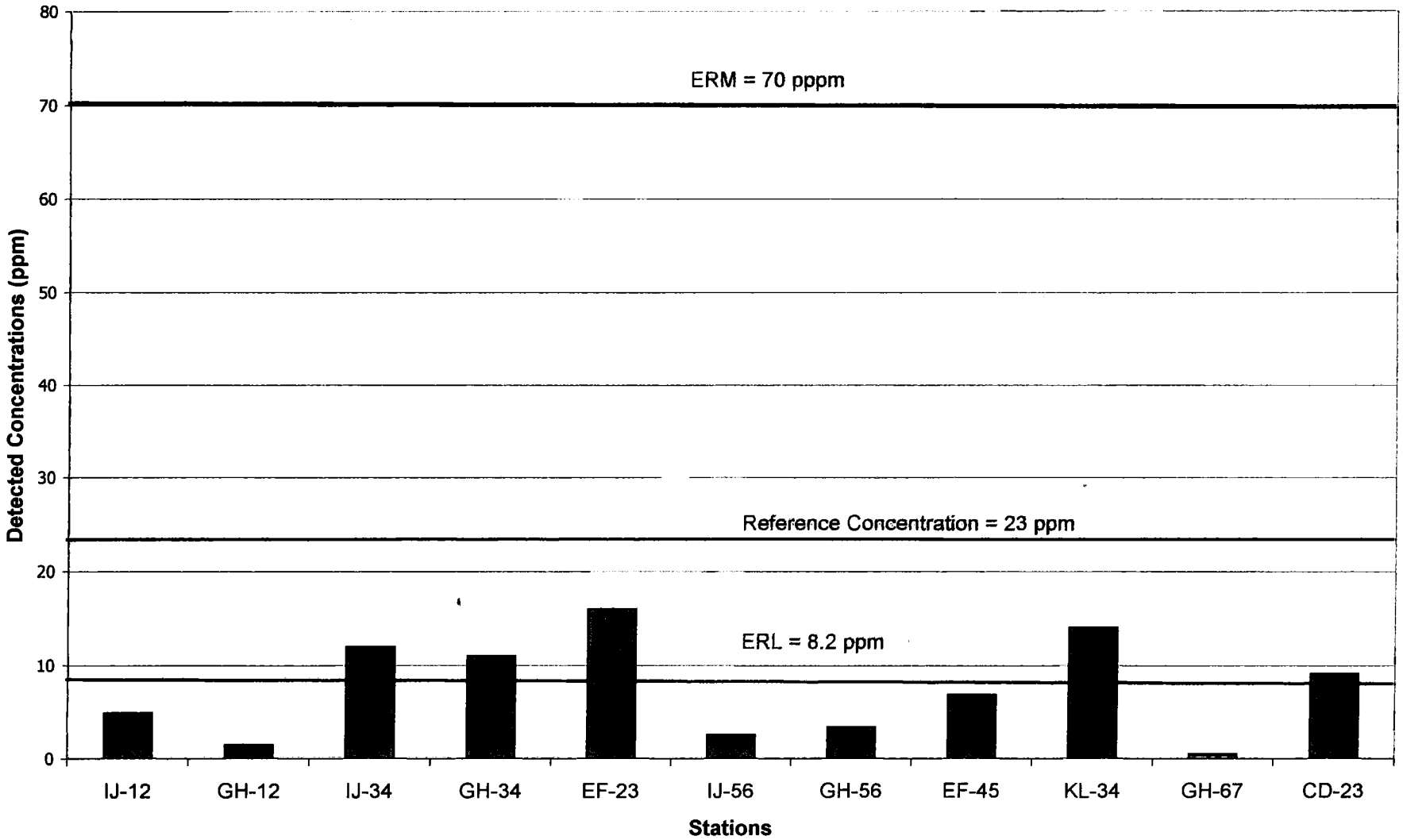


Figure 4-4 Concentration of Cadmium in Surface Sediment by Station

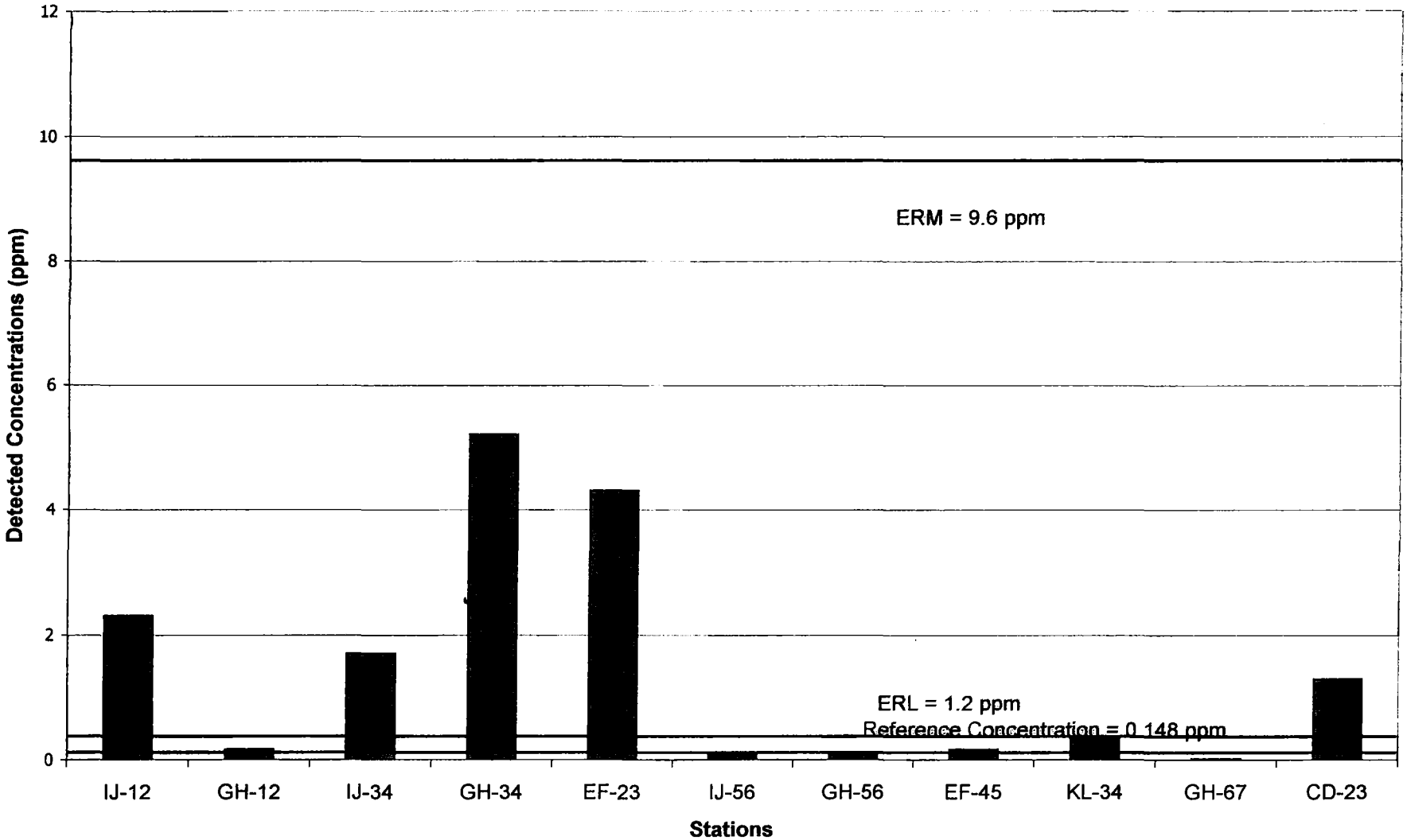


Figure 4-5 Concentration of Chromium in Surface Sediment by Station

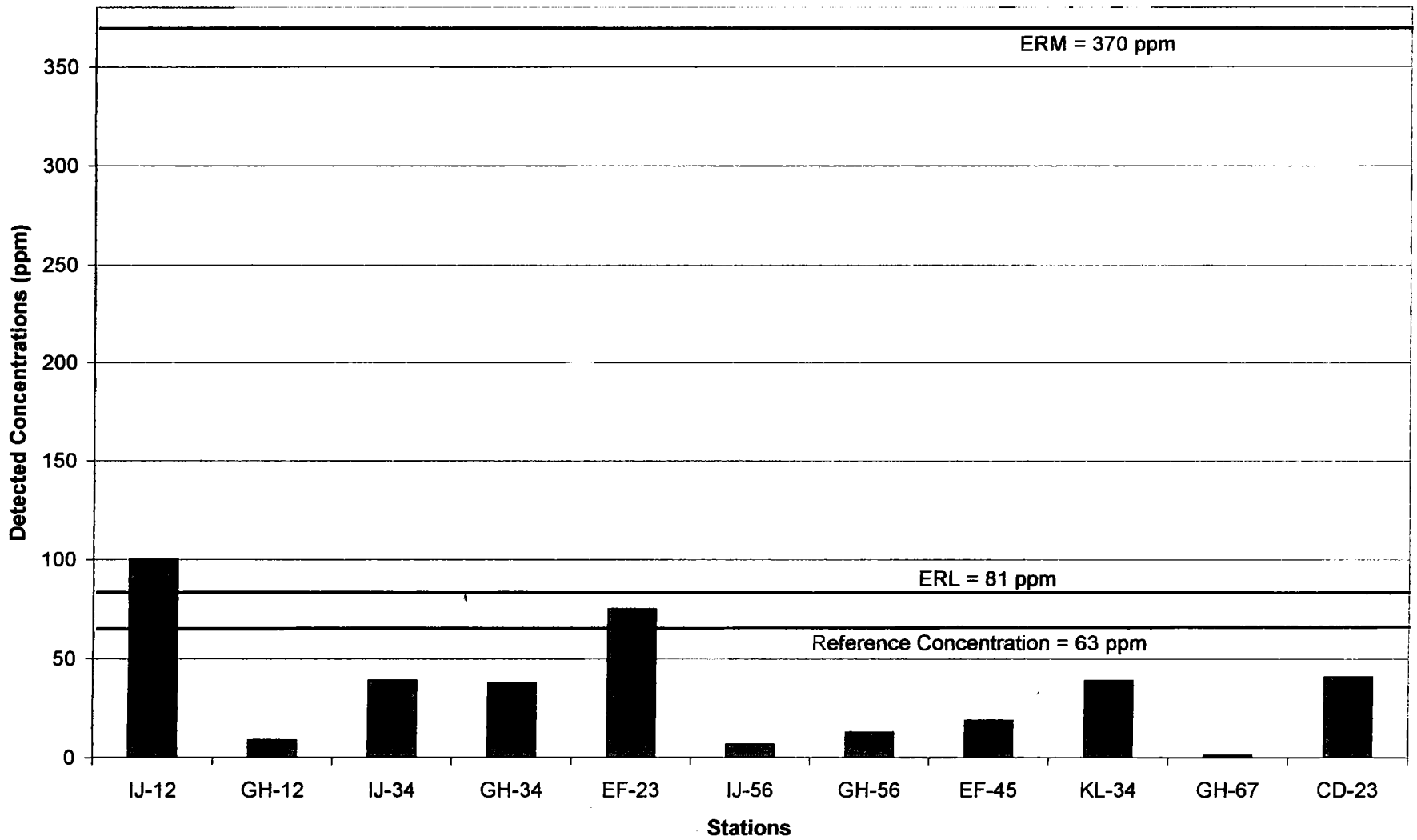


Figure 4-6 Concentration of Copper in Surface Sediment By Station

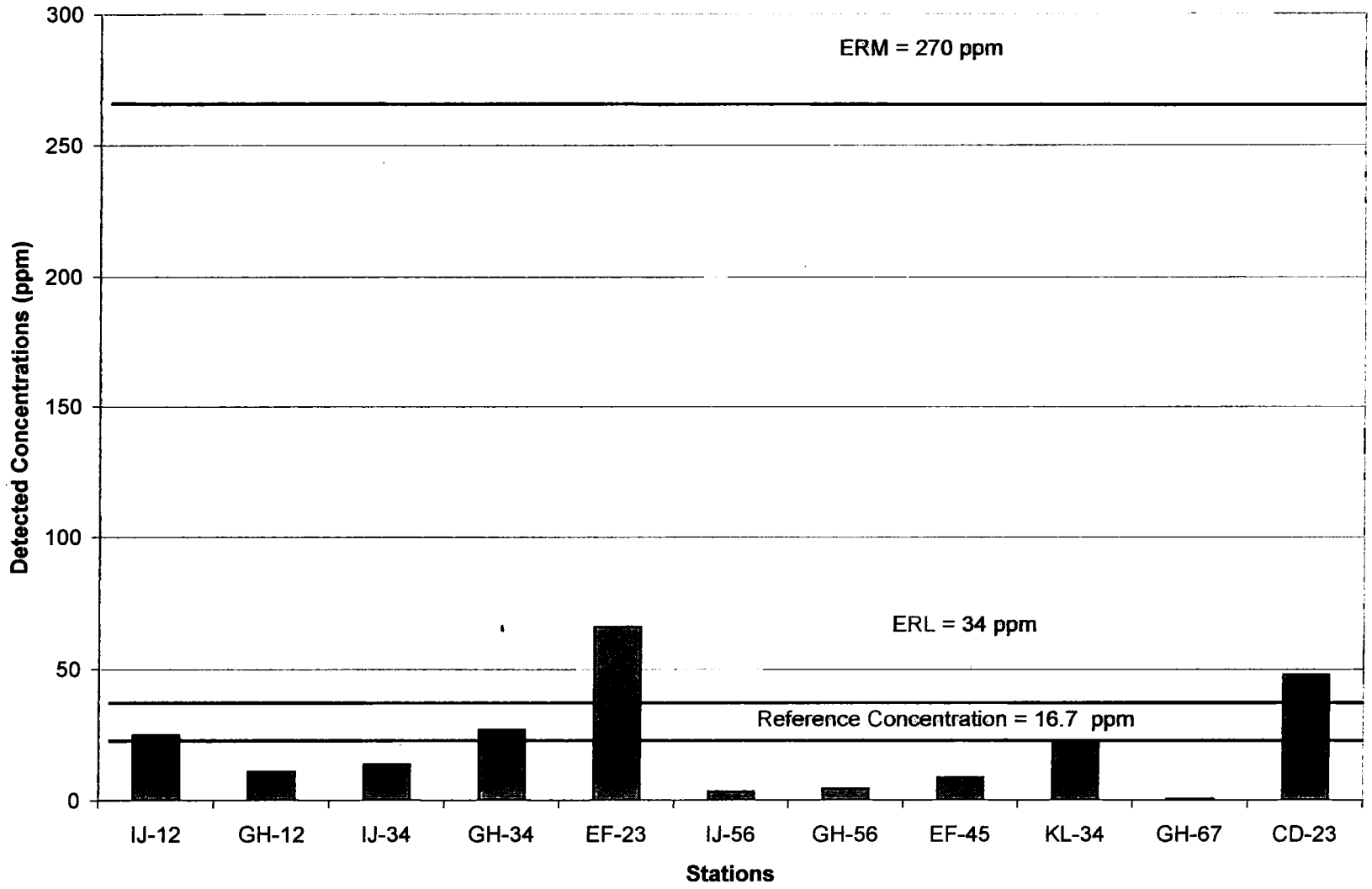


Figure 4-7 Concentration of Lead in Surface Sediment by Station

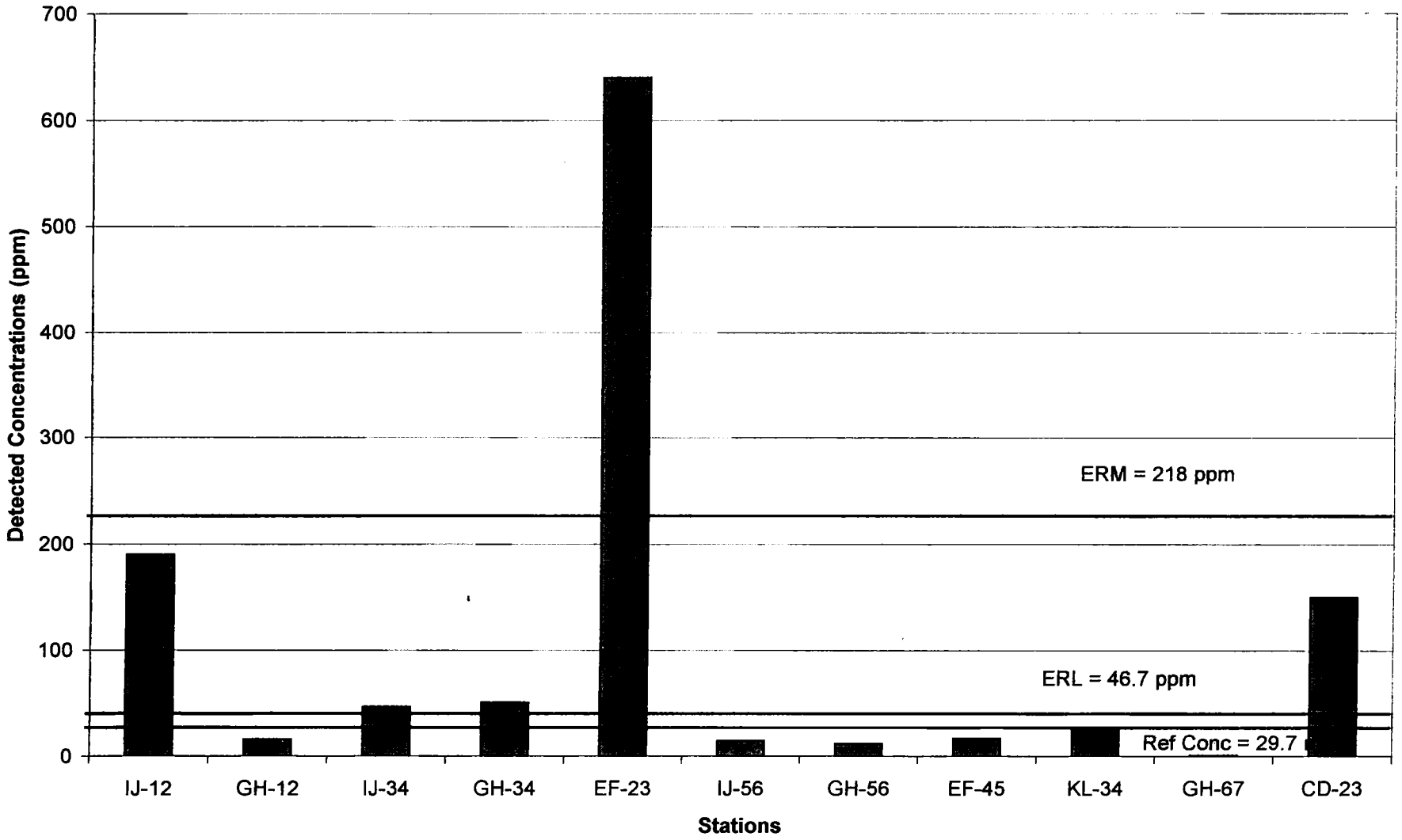


Figure 4-8 Concentration of Nickel in Surface Sediment by Station

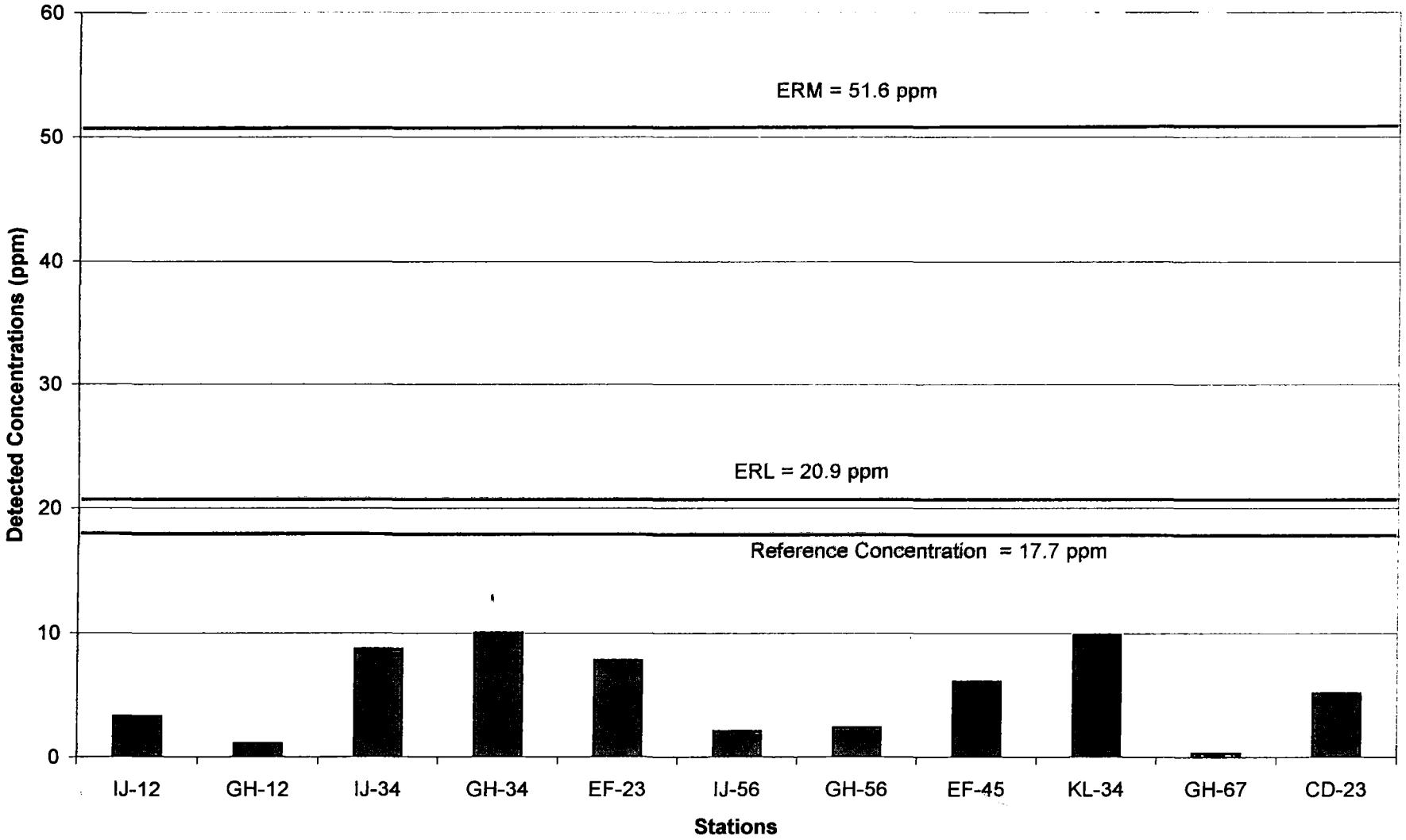


Figure 4-9 Concentration of Silver in Surface Sediment by Station

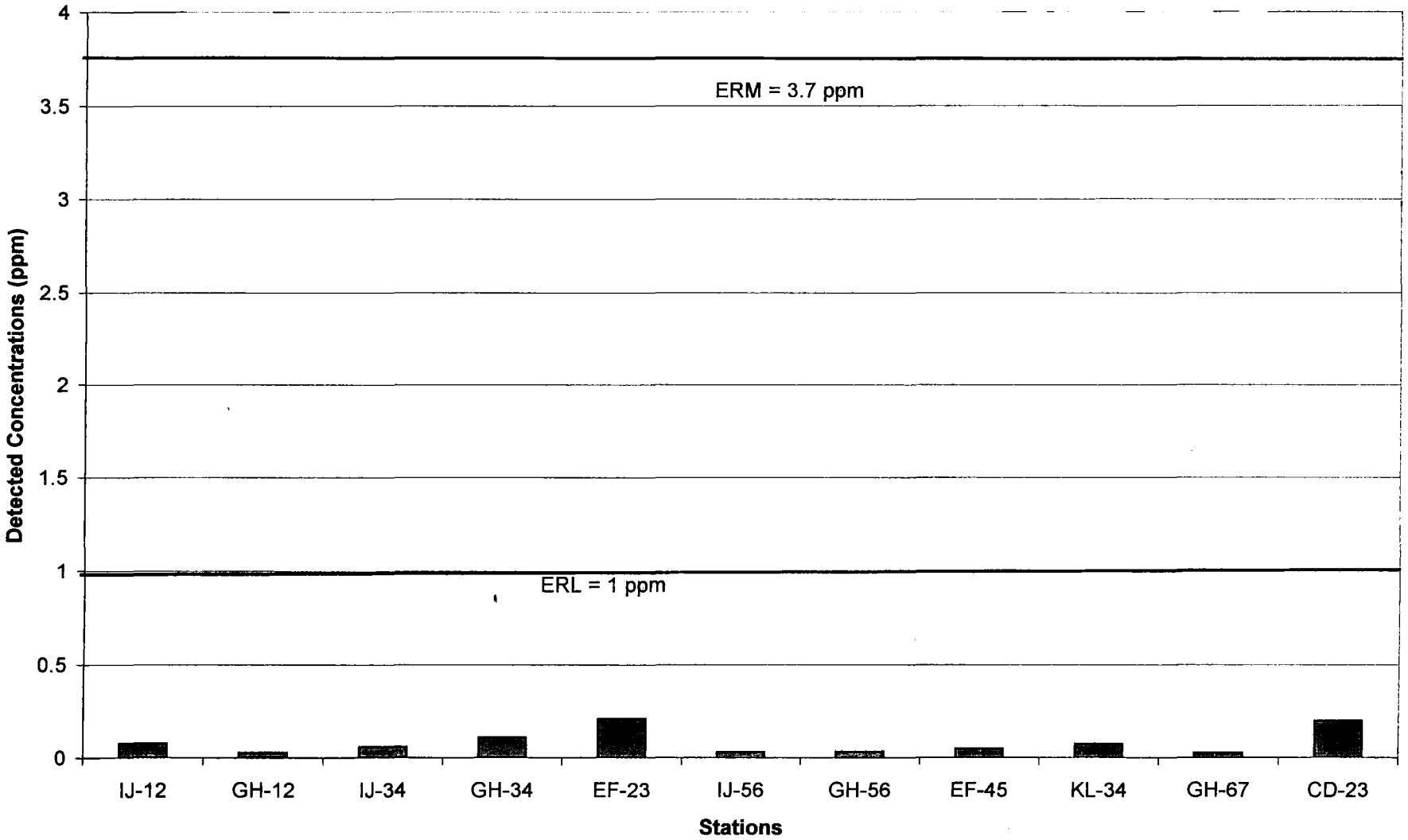


Figure 4-10 Concentration of Mercury in Surface Sediment by Station

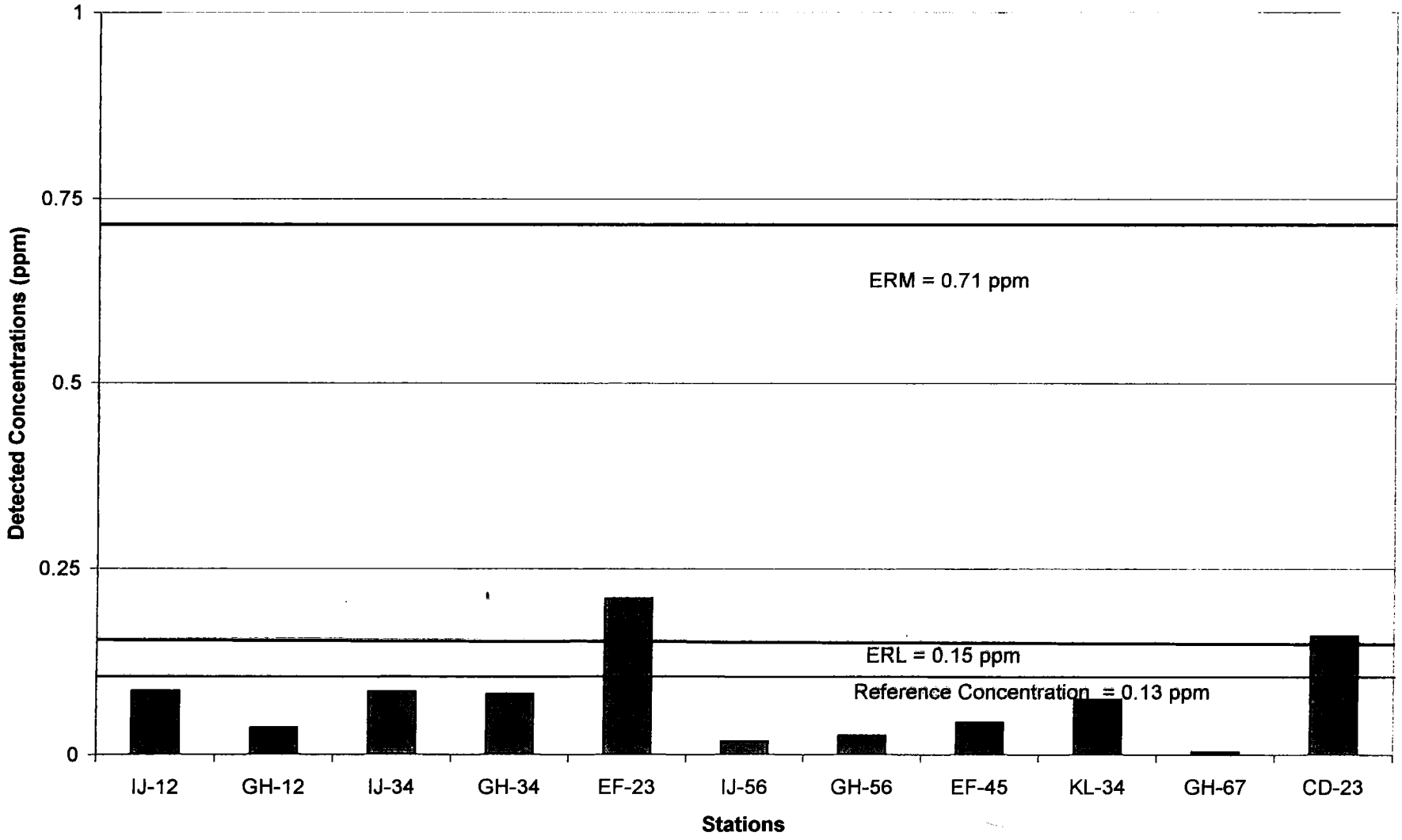


Figure 4-11 Concentration of Zinc in Surface Sediment by Station

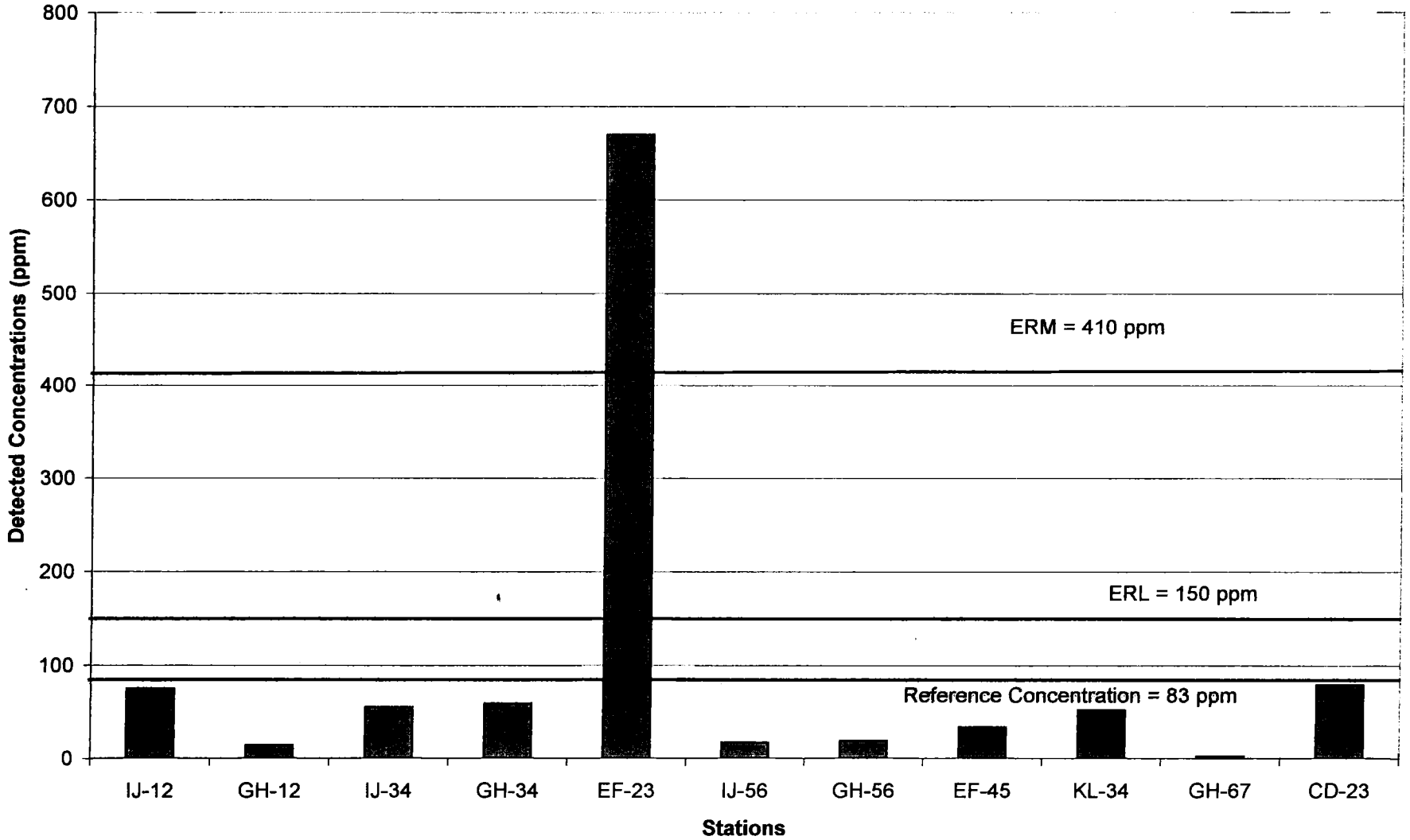


Figure 4-12 Concentration of Total PAHs in Surface Sediment by Station

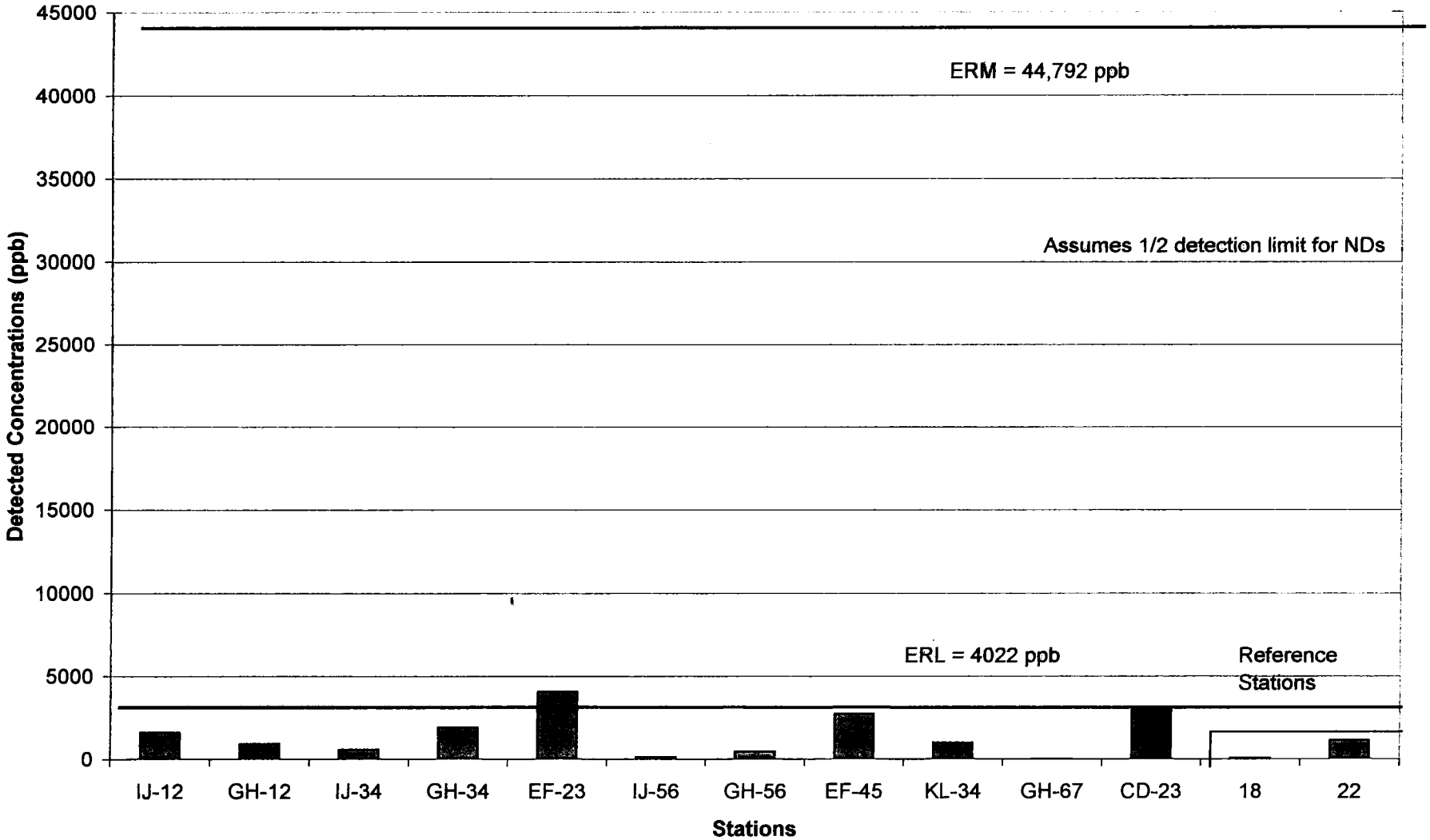


Figure 4-13 Concentration of Total PCBs in Surface Sediment by Station

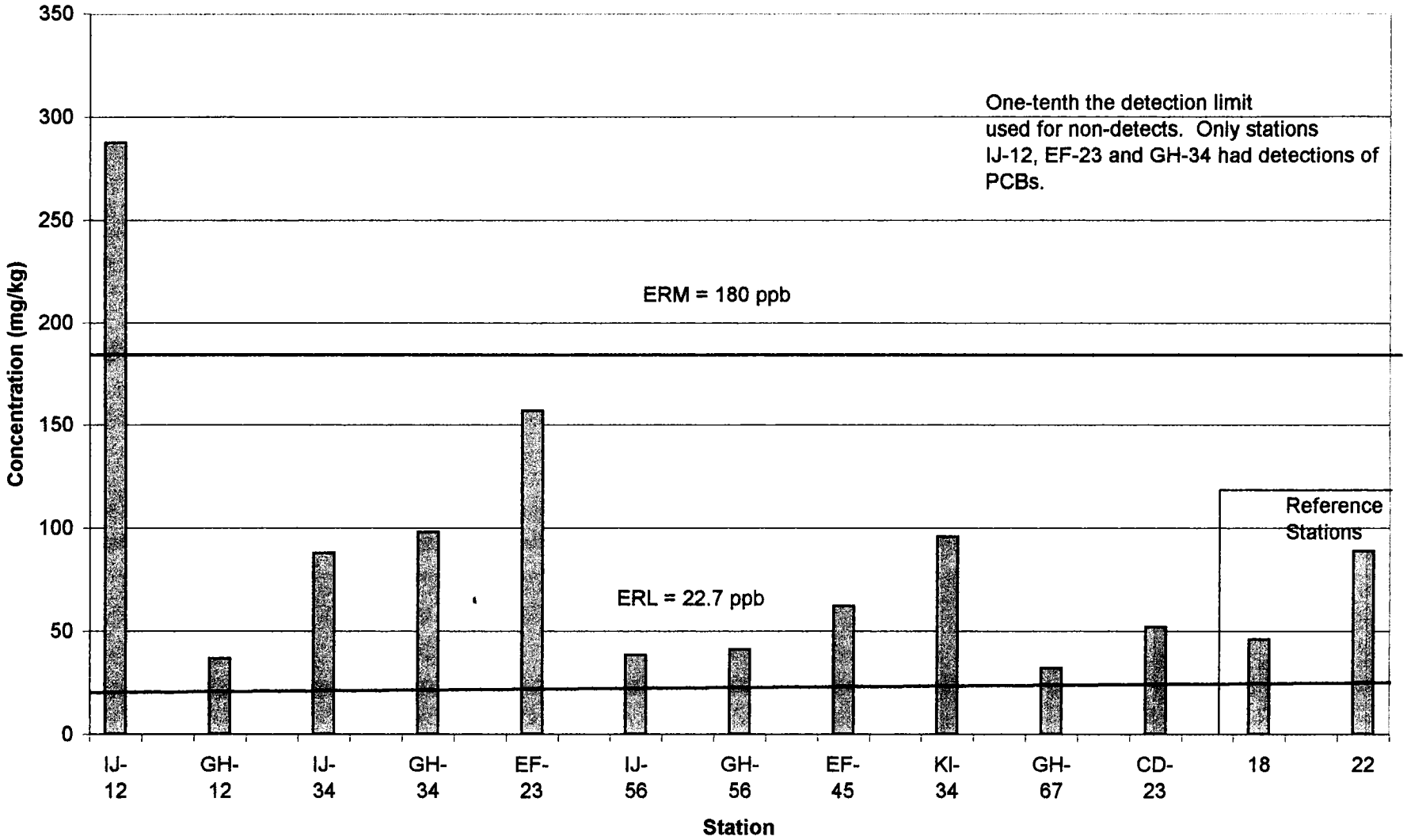
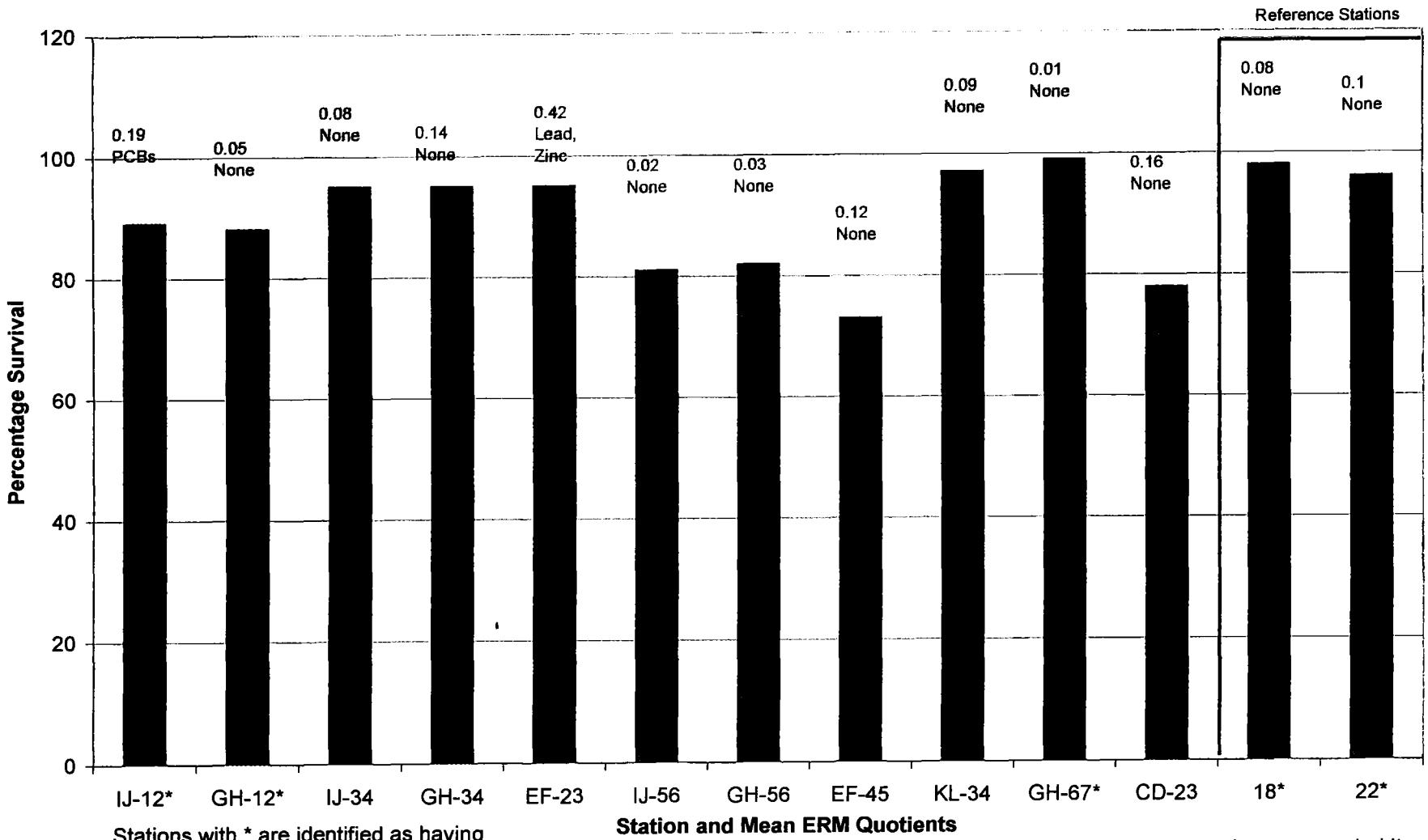


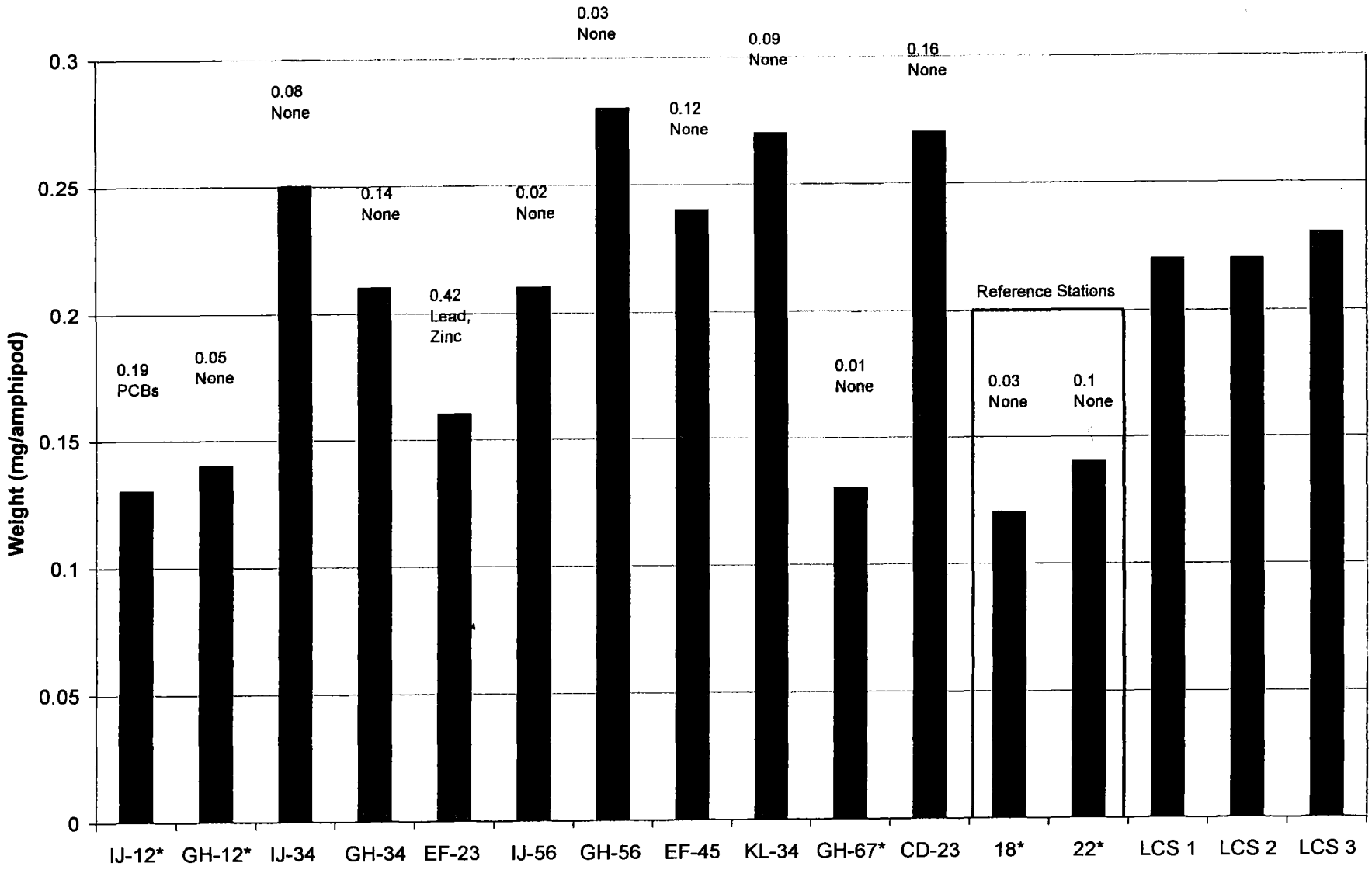
Figure 4-14 Leptocheirus Survival Results and Mean ERM Quotients by Station



Stations with * are identified as having growth significantly different from the control

Parameter shown exceeded its ERM value.

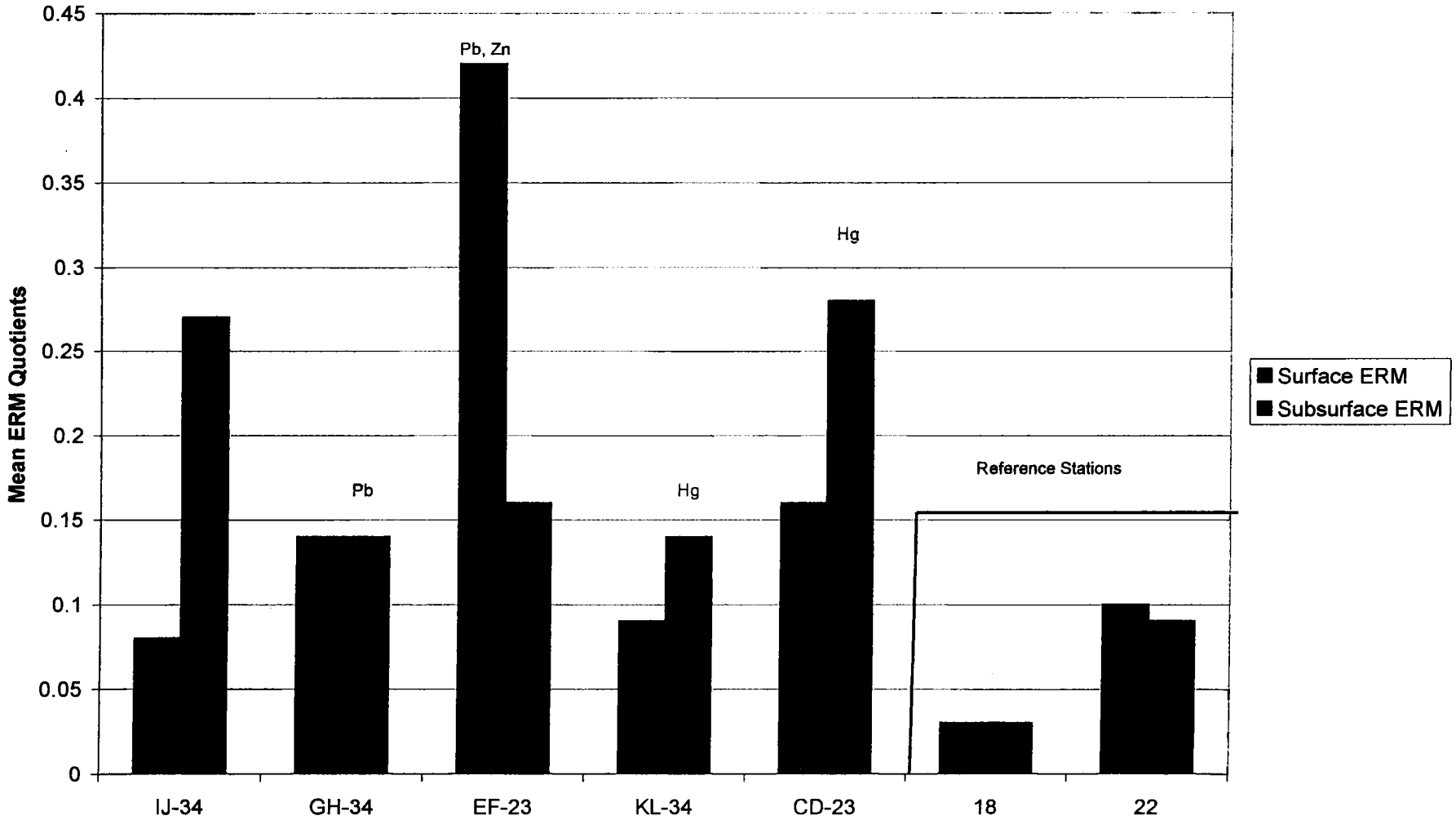
Figure 4-15 Leptocheirus Growth and Mean ERM Quotients by Station



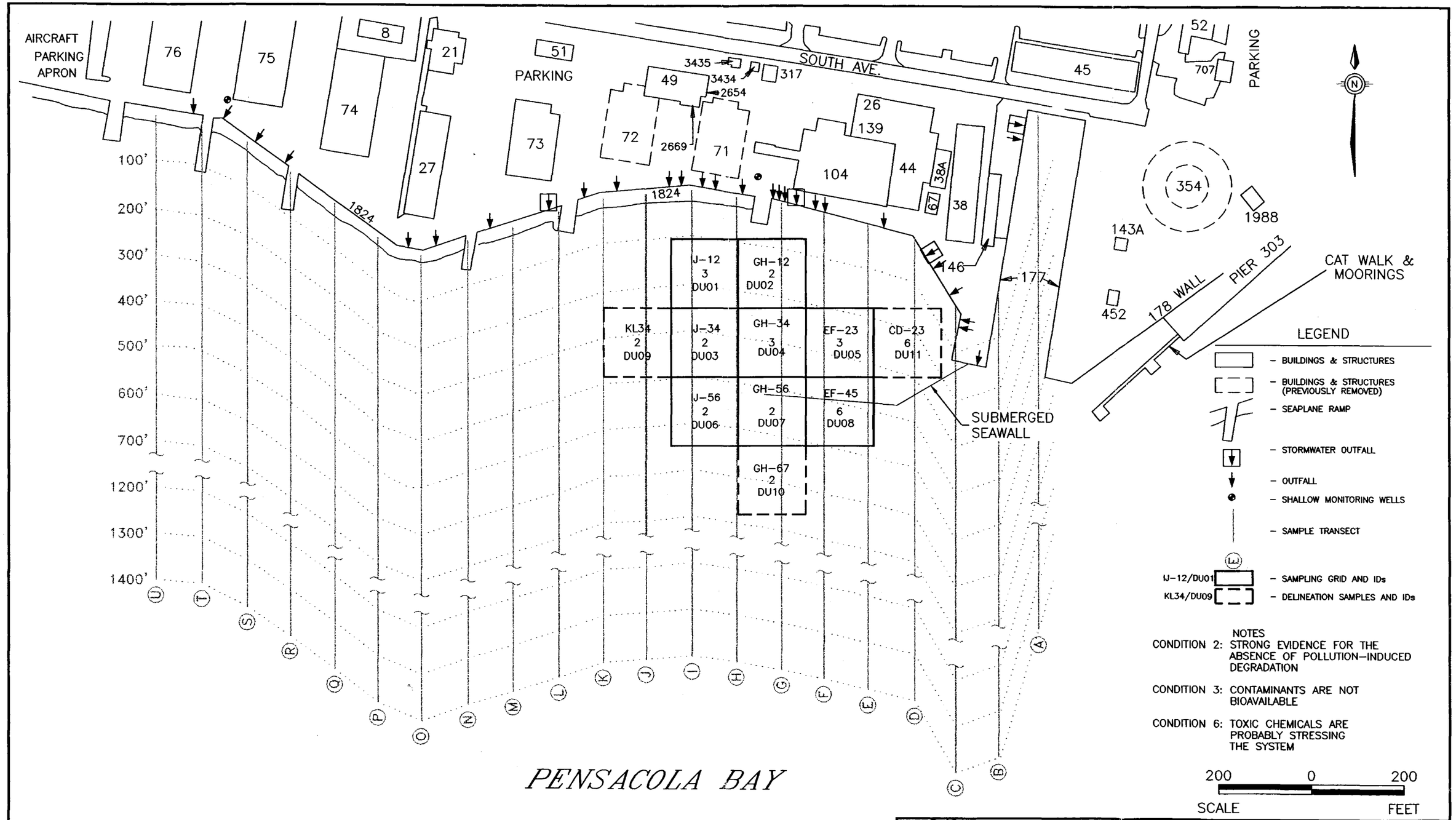
Mean ERM Quotient and parameters exceeding ERM values are shown above.

* = Statistically Significant Difference from Control
LCS = Laboratory Control Sediment

Figure 4-16 Compare Mean ERM Quotients of Surface and Subsurface Sediments



Parameters listed exceeded their ERMs at that location and interval.

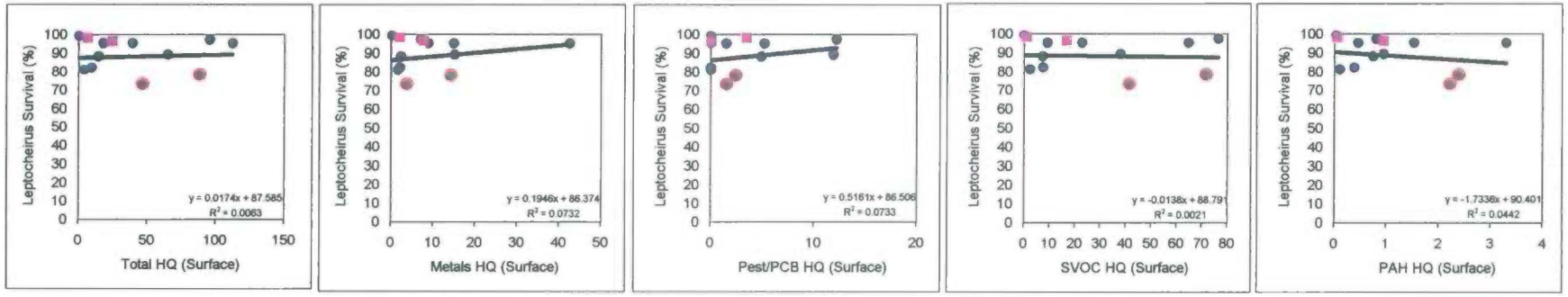


REMEDIAL INVESTIGATION REPORT ADDENDUM
SITE 2
NAS-PENSACOLA
PENSACOLA, FLORIDA

FIGURE 4-17
CONDITION SUMMARY

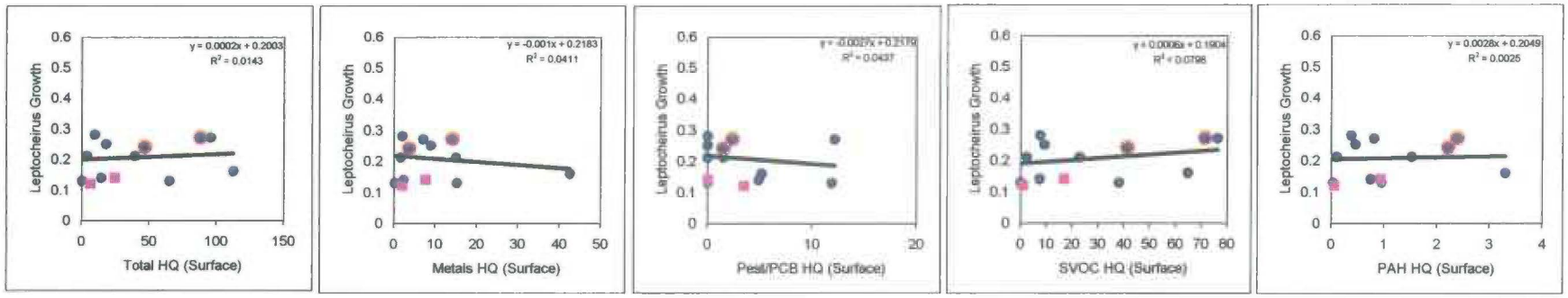
DWG DATE:02/28/03 | NAME: 0059001W045

Figure 4-18
Leptocheirus Survival, Surface Sediment Correlations
Site 2 (Operable Unit 3), Waterfront Sediments



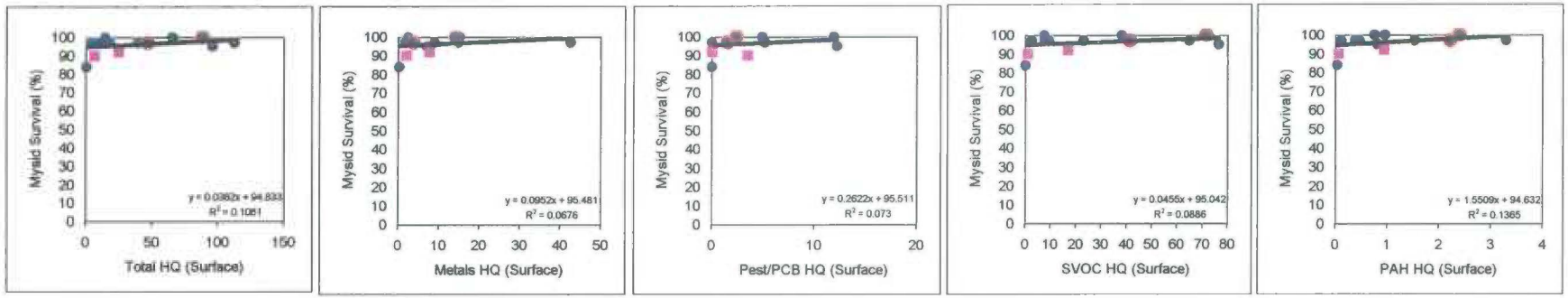
Notes:
Dark blue diamonds are data (fitted by linear regression)
Red circles are condition 6 data (CD-23 & EF-45)
Magenta squares are control data (REF-18, REF-22)

Figure 4-19
Leptocheirus Growth, Surfare Sediment Correlations
Site 2 (Operable Unit 3), Waterfront Sediments, NAS Pensacola



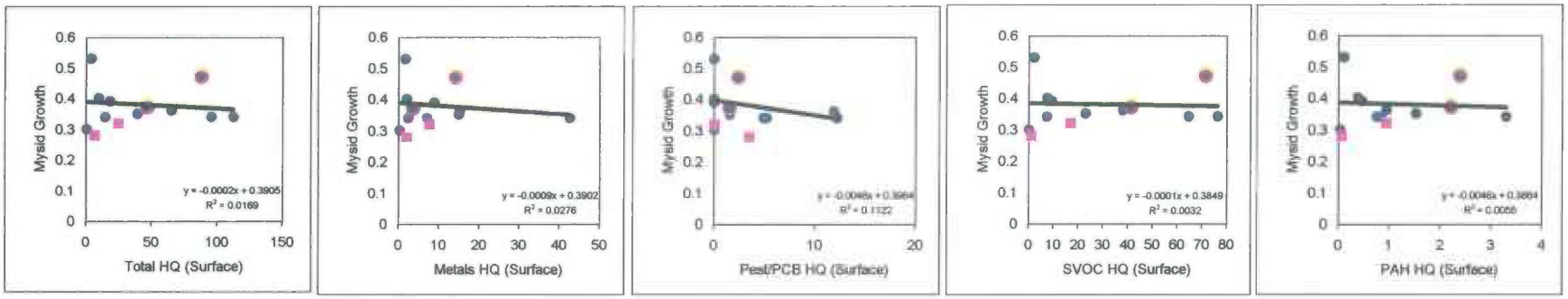
Notes:
Dark blue diamonds are data (fitted by linear regression)
Red circles are condition 6 data (CD-23 & EF-45)
Magenta squares are control data (REF-18, REF-22)
Growth in mg/anthropod

Figure 4-20
Mysid Survival, Surface Sediment Correlations
Site 2 (Operable Unit 3), Waterfront Sediments, NAS Pensacola



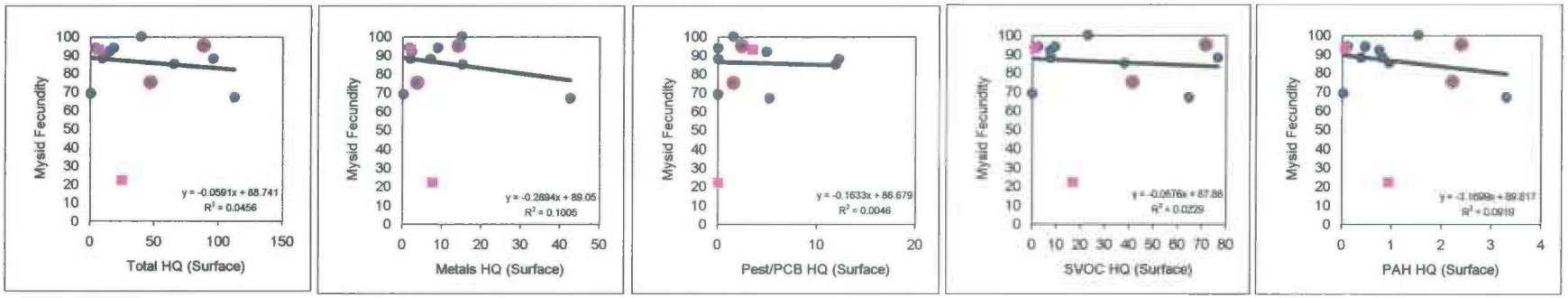
Notes:
Dark blue diamonds are data (fitted by linear regression)
Red circles are condition 6 data (CD-23 & EF-45)
Magenta squares are control data (REF-18, REF-22)

Figure 4-21
Mysid Growth, Surface Sediment Correlations
Site 2 (Operable Unit 3), Waterfront Sediments, NAS Pensacola



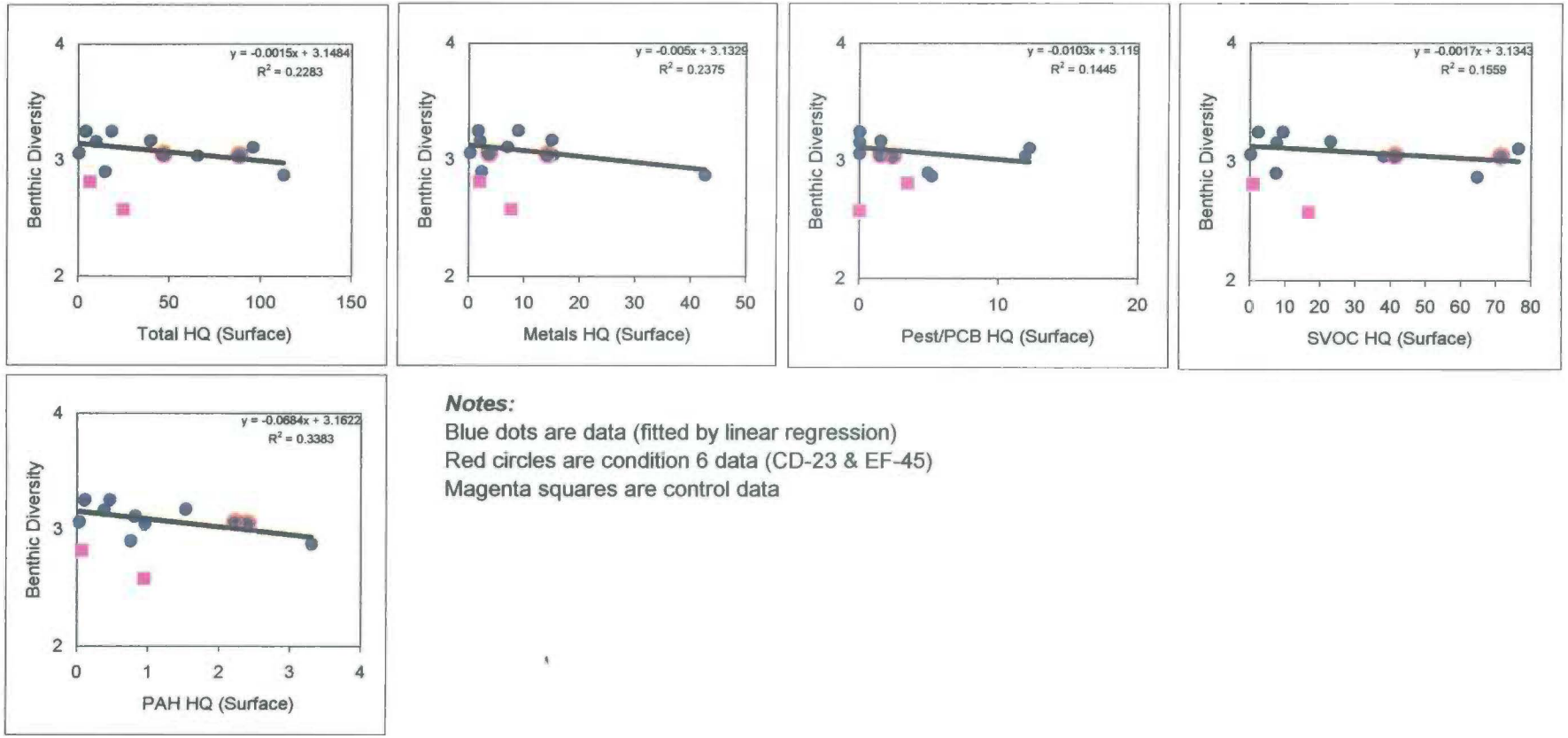
Notes:
Dark blue diamonds are data (fitted by linear regression)
Red circles are condition 6 data (CD-23 & EF-45)
Magenta squares are control data (REF-18, REF-22)
Growth in mg/anthropod

Figure 4-22
Mysid Fecundity, Surface Sediment Correlations
Site 2 (Operable Unit 3), Waterfront Sediments, NAS Pensacola



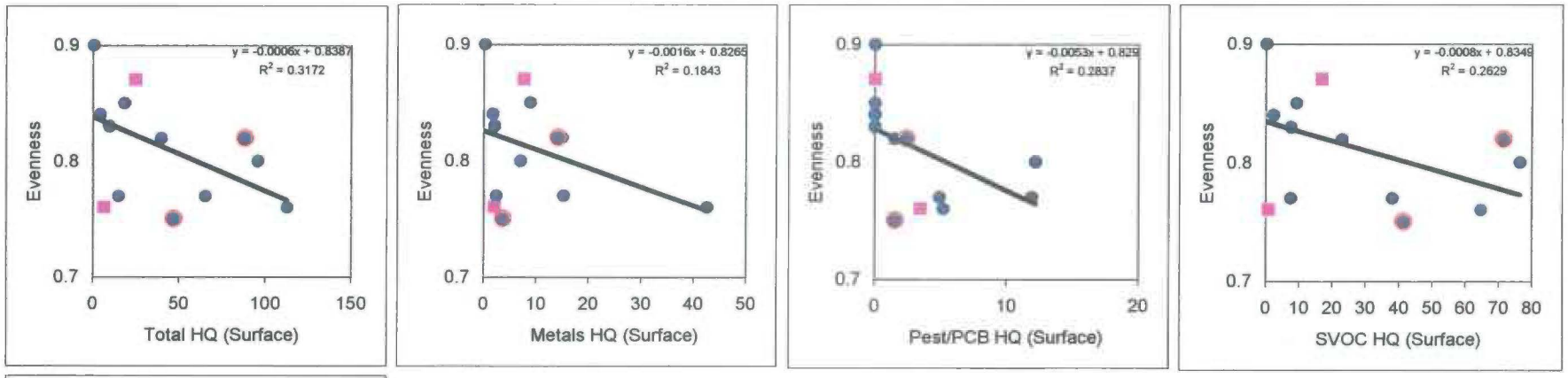
Notes:
Dark blue diamonds are data (fitted by linear regression)
Red circles are condition 6 data (CD-23 & EF-45)
Magenta squares are control data (REF-18, REF-22)

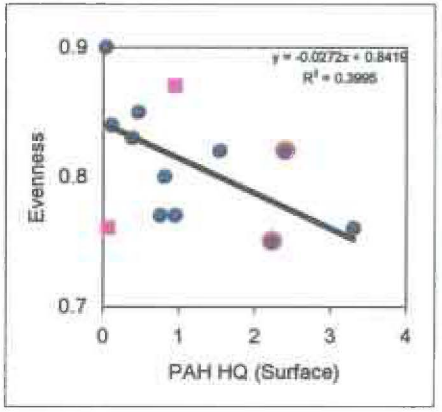
Figure 4-23
Benthic Diversity, Surface Sediment Correlations
Site 2 (Operable Unit 3), Waterfont Sediments, NAS Pensacola



Notes:
Blue dots are data (fitted by linear regression)
Red circles are condition 6 data (CD-23 & EF-45)
Magenta squares are control data

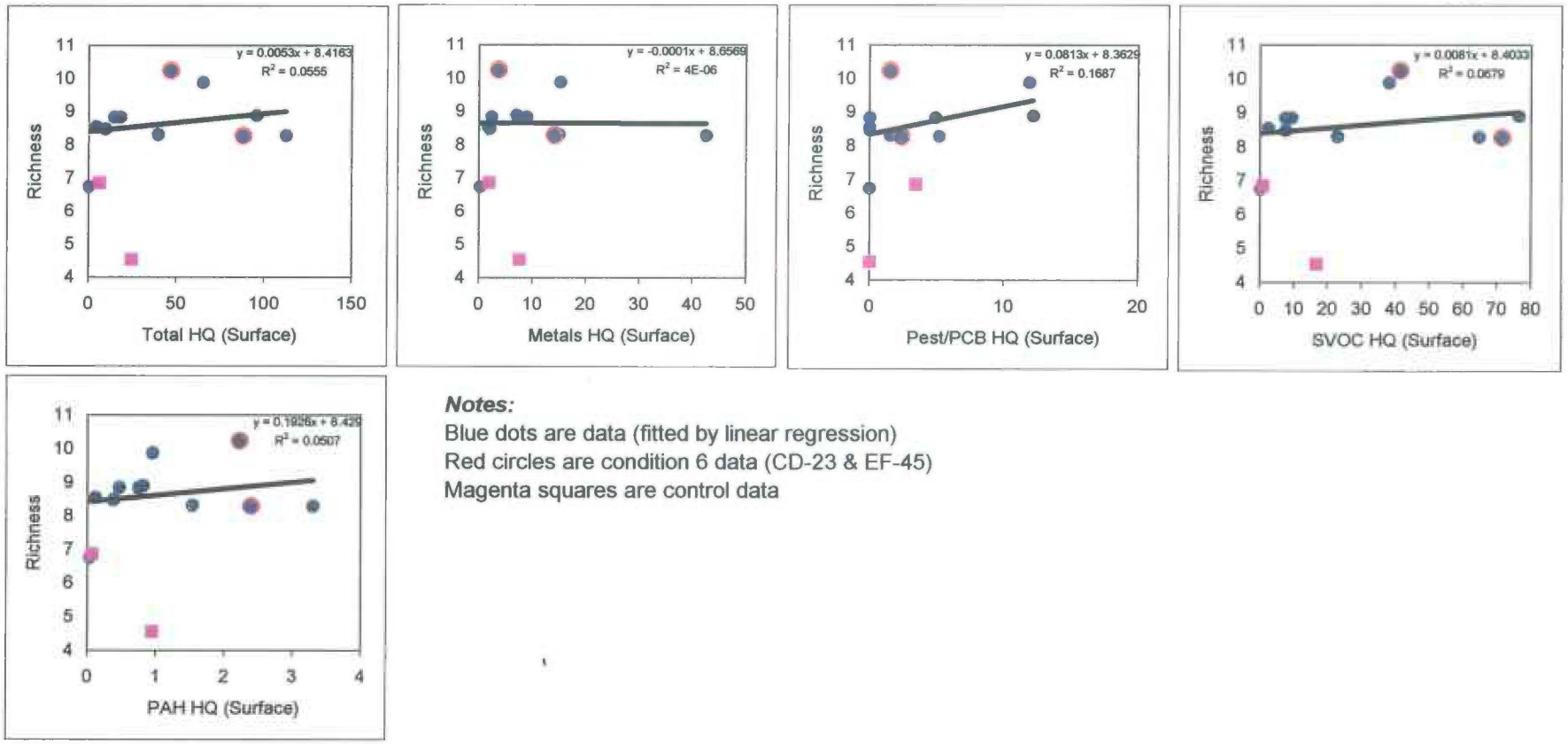
Figure 4-24
Evenness, Surface Sediment Correlations
Site 2 (Operable Unit 3), Waterfront Sediments, NAS Pensacola





Notes:
Blue dots are data (fitted by linear regression)
Red circles are condition 6 data (CD-23 & EF-45)
Magenta squares are control data

Figure 4-25
Richness, Surface Sediment Correlations
Site 2 (Operable Unit 3), Waterfront Sediments, NAS Pensacola



Notes:
Blue dots are data (fitted by linear regression)
Red circles are condition 6 data (CD-23 & EF-45)
Magenta squares are control data

5.0 CONCLUSIONS

Site 2 (Operable Unit 3) at NAS Pensacola is the Waterfront Sediments Site. From 1939 to 1973, untreated industrial waste was routinely discharged into Pensacola Bay at Site 2. After 1973, the waste discharge was piped to and treated at the NAS Pensacola industrial wastewater treatment plant. Vessel operations at the pier and docking facilities in the immediate area, numerous outfalls (including storm water outfalls) lining the shore adjacent to Site 2 (Figure 2-1), and vessel traffic in the area may continue be a pathway for anthropogenic constituents. The submerged seawall (Figure 2-1) appears to deflect high energy waves and currents near Station EF-45, simultaneously creating a depositional zone leeward of this DU.

Tools used to identify potential chemicals of concern included the SQGs (ERLs, ERMs, PELs, and TELs) and SEM/AVS. In some cases, these tools may draw attention to a particular station based on the individual scores or values. However, when evaluated under the weight of evidence approach, individual SQG scores are often considered false-positives. An example of a false-positive response during the Site 2 study occurred in the data for Stations GH-12 and GH-67. Sediment chemistry revealed no HQs > 1 for inorganics, yet SEM/AVS results indicated metals may be bioavailable. Further evaluation confirmed that there are no biological problems at either of these stations.

Using the SQG tool at Site 2, no DUs fell into mean ERM Quotient Category 4, where acute and chronic bioassay effects would be expected and where benthic diversity would be very low, indicating impact. In addition, no DU was classified as Category 3 using the mean ERM Quotient method.

Biologically, benthic organisms are being recruited to the Site 2 area. The species diversity was greater at Site 2 than at the reference station. Evenness at Site 2 ranged from 0.75 to 0.9 which is similar to the range detected at the reference stations (0.76-0.87). Richness at the site ranged from 6.74 to 10.22 which exceeds the richness for the reference stations (4.53 to 6.84). Chemical

constituents may be bound to the organic components in sediment at Site 2, which would explain their inability to affect the observed benthic community.

In applying the SQT to the eleven Site 2 DUs, surface sediments at six stations (55%) were determined to be Condition 2 (strong evidence for absence of pollution-induced degradation); three stations (27%) were assessed as Condition 3 (contaminants are not bioavailable); and two stations (18%) were ranked as Condition 6 (toxic chemicals are probably stressing the system). Though Stations EF-45 and CD-23 were determined to be Condition 6, the DUs were found to have good benthic diversity, evenness, and richness indices and no observed effects with the epibenthic mysid for survival, growth, or fecundity. The survival responses in the infaunal amphipod toxicity tests were only 7% (EF-45) and 2% (CD-23) less than the established acceptable rate of 80%. Both EF-45 and CD-23 outperformed the reference stations for the sublethal growth endpoint in the amphipod test. Remedial goal options for site were developed in accordance with the DQO process.

The goal of this study was to answer the following question: are chemical constituents in Site 2 sediments creating a condition adverse to benthic communities? Except for CD-23 and EF-45, sediments at Site 2 are no longer creating adverse conditions to benthic communities. Therefore, the multiple lines of evidence gathered during the investigation of Site 2 concluded that the area is recovering from past Naval Base activities. However, possible remedial alternatives for CD-23 and EF-45 will be evaluated in a feasibility study report.

6.0 REFERENCES

Chapman, P.M., B. Anderson, S. Carr, V. Engles, R. Green, J. HameedI, M. Harmon, P. Haverland, J. Hyland, C. Ingersoll, E. Long, J. Rodgers Jr., M. Salazar, P.K. Sibley, P.J. Smith, R.C. Swartz, B. Thompson, and H. Windom. (1997). *General Guidelines for Using the Sediment Quality Triad.* Mar. Poll. Bull., 34(6):368-372.

EnSafe Inc. (1999). *Final Remedial Investigation Report NAS Pensacola Site 40.* EnSafe Inc.: Memphis, Tennessee.

EnSafe Inc. (1996). *Final Remedial Investigation Report NAS Pensacola Site 2.* EnSafe Inc.: Memphis, Tennessee.

Gaston, G.R., C.F. Rakocinski, S.S. Brown, and C.M. Cleveland. (1998). *Trophic Function in Estuaries: Response of Macrobenthos to Natural and Contaminant Gradients.* Mar. Freshwater Res., 49(8):833-846.

Greene, Richard, USEPA GBERL. (November, 2002). Personal communication.

Long, E.R. (2000). *Degraded Sediment Quality in U.S. Estuaries: A Review of Magnitude and Ecological Implications.* Ecol. Appl. 10:338-349

MacDonald, D.D. (1994). *Approach to the Assessment of Sediment Quality in Florida Coastal Waters; Volume 1 — Development and Evaluation of Sediment Quality Assessment Guidelines.* Florida Department of Environmental Protection, Office of Water Policy. Tallahassee, FL.

Macdonald, D.D.R., S. Carr, F.D. Calder, E.R. Long, and C.G. Ingersoll. (1996). *Development and Evaluation of Sediment Quality Guidelines for Florida Coastal Waters.* Ecotoxicol. 5:253-278.

Pearson, T.H. and R. Rosenberg. (1978). *Macrobenthic Succession in Relation to Organic Enrichment and Pollution of the Marine Environment.* Oceanogr. Mar. Biol. Ann. Rev. 16: 229-311.

Power, E.A. and P.M. Chapman (1992). *Assessing Sediment Quality* in Sediment Toxicity Assessment, Lewis Publishers.

Rakocinski, C.F., R.W. Heard, S.E. LeCroy, J.A. McLelland and T. Simons. (1993). *Seaward Change and Zonation of the Sandy-Shore Macrofauna at Perdido Key, Florida, U.S.A.* Estuar. Coast. Shel. Sci. 36:81-104.

Rakocinski, C.F., R.W. Heard, S.E. LeCroy, J.A. McLelland, and T. Simons. (1996). *Responses by Macrobenthic Assemblages to Extensive Beach Restoration at Perdido Key, Florida, U.S.A.* J. Coast. Res. 12(1):326-353.

Rakocinski, C.F., S.S. Brown, G.R. Gaston, R.W. Heard, W.W. Walker, and J.K. Summers. (1997). *Macrobenthic Responses To Natural and Contaminant-Related Gradients In Northern Gulf Of Mexico Estuaries.* Ecol. Appl. 7(4):1278-1298.

Rakocinski, C.F., S.E. LeCroy, J.A. McLelland, and R.W. Heard. (1998). *Nested Spatiotemporal Scales of Variation in Sandy-Shore Macrobenthic Community Structure.* B. Mar. Sci., 62(2):343-362.

Rakocinski, C.F., S.S. Brown, G.R. Gaston, R.W. Heard, W.W. Walker, and J.K. Summers. (1999). *D Volatile Sulfide and Selected Simultaneously Extractable Metals in Sediment.*

USEPA. (1991b). *Technical Support Document for Water Quality-based Toxics Control;* U.S. Environmental Protection Agency, Office of Water, Washington, D.C., 1991; EPA-505/2-90-001

USEPA. (1995). *Supplemental Guidance to RAGS: Region IV Bulletins — Ecological Screening Values,* Ecological Risk Assessment Bulletin No. 2. USEPA Region IV. Atlanta, GA.

USEPA. (2001). *Equilibrium Partitioning Sediment Guidelines (ESGs) for the Protection of Benthic Organisms: Metal Mixtures (Cadmium, Copper, Lead, Nickel, Silver, and Zinc).* Draft.

Weisberg, S.B., L.C. Schaffner, D.M. Dauer, and J.B. Frithsen. (March 1997). *An Esurarine Benthic Index of Biotic Integrity (B-IBI) for Chesapeake Bay.* Estuaries 20:149-158.

Word, Jack. MEC Analytical Systems, Inc. Personal communication.

7.0 FLORIDA PROFESSIONAL GEOLOGIST SEAL

I have read and approve of this Final Remedial Investigation Report Addendum, Site 2 Waterfront Sediments, Naval Air Station Pensacola, Florida and seal it in accordance with Chapter 492 of the Florida Statutes. In sealing this document, I certify the geological information contained in it is true to the best of my knowledge and the geological methods and procedures included herein are consistent with currently accepted geological practices.

Name:	Brian Caldwell
License Number:	#1330
State:	Florida
Expiration Date:	July 31, 2004

B Caldwell

Brian Caldwell

7/26/03

Date

Appendix A
DQO Documents

DATA QUALITY OBJECTIVES SUMMARY, WORK PLAN, AND SAMPLING AND ANALYSIS PLAN

NAS PENSACOLA
SITE 2 (OPERABLE UNIT 3)
WATERFRONT SEDIMENTS

Prepared by:

NAS PENSCOLA
TIER 1 PARTNERING TEAM

January 3, 2001

Table of Contents

Volume 1	Pensacola Site 2 Data Quality Objectives Summary
Volume 2	Final Work Plan for Pensacola Naval Air Station Sediment Survey Operable Unit
Volume 3	Post-RI Sampling and Analysis Plan — Site 2 NAS Pensacola

Volume 1

Pensacola Site 2
Data Quality Objectives Summary

Table of Contents

DQO Step 0. Establish an Effective Planning Team 1
DQO Step 1. State the Problem 1
DQO Step 2. State the Decision 4
DQO Step 3. Identify Inputs to the Decision 6
DQO Step 4. Establish Decision Unit Boundaries 9
DQO Step 5. State the Decision Rule 12
DQO Step 6. Establish Quantitative Tolerances for Decision Errors 15
DQO Step 7. Optimize the Design 21

List of Attachments

Attachment 1. TAL Metals Plus Cyanide Analyte List
Attachment 2. SVOC Analyte List (EPA CLP OLM 3.2)
Attachment 3. Organochlorine Pesticide Analyte List
Attachment 4. Toxicity Testing Background and Specifications
Attachment 5. Statistical Specifications for Toxicity Testing

Pensacola Site 2 Data Quality Objectives Summary

(2-14-00)

DQO Step 0. Establish an Effective Planning Team

Allison Harris (EnSafe, geologist)

Amy Twitty (CH2MHill, geologist)

Ann Marie Lyddy (Center for Leadership Development, facilitator)

Barbara Albrecht (EnSafe, biologist, ecologist, toxicologist)

Bill Hill (EFD South, EIC, environmental engineer)

Brian Caldwell (EnSafe, Hydrogeologist)

Gena Townsend (EPA Region IV, RPM, environmental engineer)

Joe Fugitt (FDEP,RPM geologist)

Jon Williams (CH2MHill, geologist)

Ken Seely (Fish and Wildlife Service)

Lynn Wellman (USEPA Region IV, ecological risk assessor)

Paul Stoddard (Tier II, EnSafe, geologist)

Robbie Darby (Tier II liaison, EFD South, IR Branch manager)

Ron Joyner (PWCPENS, RPM)

Terry Hansen (TtNUS, geologist)

Tom Dillon (NOAA, Coastal Resource Coordinator)

Tom Johnston (TtNUS, DQO facilitator, chemist)

DQO Step 1. State the Problem

Assumptions:

- Cost is a significant factor in this investigation.

Background and Initial Conceptual Site Model:

Untreated plating shop (Bldg. 71) liquid discharges have entered the Pensacola Bay Site 2 area through outfalls. The bay sediments along the shoreline that may have been affected by these discharges have been sampled previously on a rectangular grid oriented along the shoreline. Some of the sediments within a few hundred feet of the shore have generated a hazard index (HI) greater than 10 for the benthic communities, presumably a consequence of accumulated chemicals from the discharges. Despite the observed HI values for the benthic communities, the U.S. EPA Region IV, FDEP and the Navy agree a human health risk does not exist in the Site 2 area. The HI values were computed across all chemicals of concern because such an approach simplifies the hazard assessment involving multiple samples and/or locations. The hazard quotients (HQs) are summed across all chemicals to yield an HI for comparative purposes, which could be viewed as a programmatic HI. This approach, which normalizes chemical concentrations to common consensus toxicity benchmarks, is not specifically prohibited by EPA guidance. The HI > 10 cut point was used because the chemical concentrations generally fell into two classes — one with HI < 1 and one with HI > 10, although some exceptions to this condition do exist. A reduction in the HI values > 10 is viewed as an earnest attempt at risk reduction that is protective of the environment.

The five areas with HI > 10 appear to be relatively localized as a result of rotational flow in the bay. This is evident from siltation patterns, flow patterns and chemistry data themselves that are documented in the latest RI report. This oval region is approximately bounded by grid nodes F0, F4, L4 and L0. There also appears to be a general westward flow. However, Site A2 to the east of Site 2 does not appear to be a source term for Site 2 because of flow patterns and the fact that the contaminant distributions at the two sites are significantly different. At Site 2, metals and the SVOC bis(2-ethylhexyl)pthalate drive the elevated HI values; at site A2 PAHs drive the elevated HI values. Copper detected at elevated levels at Site A2 may be associated with boat traffic and is not expected to be associated with Site 2 operations.

Two hurricanes (Erin and Opal) were experienced in the bay in 1995 (the same time frame as past data collection activities), and the hurricanes were observed to have relocated some of the sediment. The relocation amounted to about a 200-foot movement to the west (note: R. Joyner can provide documentation to support this 200-foot estimate). In September 1998, a third hurricane (Georges) was experienced and there is some uncertainty concerning its effect on sediments. In addition, past data collection efforts focused on the top six inches of sediment where the benthic community lives, and there is now concern about the chemical concentrations at greater depths. This concern derives in part from recognition that dredging has the potential to uncover contaminated sediments. The top six inches of sediment is effectively viewed as a cap on deeper sediments, even though knowledge about chemical concentrations at greater depths is of interest for establishing the extent of contamination. Although some sediment transport is possible or even likely, any major transport phenomena (i.e., to depths greater than 6") are expected to be rare and do not warrant protection against at this time. If such an event should occur, the bay area will likely have other, more acute problems with which to deal.

Note:

The short video (filmed within the past year but after Hurricane Georges) which was shown 16 Dec 99 during the Partnering meeting was apparently taped at Site 2, in the immediate area within which this group is concerned. The video showed a silty bottom devoid of any flora or habitat. Pock marks and fecal matter dotted the area, indicating burrowing organisms. The area is affected by tidal influence as was evident when the diver disturbed the bottom and the current carried away the disturbed water column rather quickly. The diver handled the bottom in several areas in which clay and silt were evident components but sand dominated, as was clear when it was observed falling through the water column (despite the current) to the seafloor.

At one location, the diver handled a darker sediment which may have contained less sand, and more organic matter (difficult to ascertain from video). Although the viewer has no way of orienting the divers' position to the specific sites in question, by looking at the data, a

small eddie (current) appears to have developed in the area of F3 and H3 which has concentrated organic matter. Site F3 and H3 resulted in 49% mortality in the exposed *Mysid* sediment toxicity test and had some of the highest TOC levels in this area.

The lack of flora (seagrasses) and habitat (whole or fragmented shells) are indications that this area may not support a "grand" diversity composed of crustaceans (i.e., shrimp, crabs, amphipods, etc.), or bivalves (oysters) and snails. This being the case, a reference station similar in composition may be a bit more difficult to locate.

Problem Statement:

It has been five years since the last data collection and a hurricane has been experienced at Pensacola during that time period. Past data indicate localized areas of adverse or potential adverse effects on benthic communities (HI > 10). If conditions adverse to benthic communities in the Pensacola Bay Site 2 area exist today, the conditions will need to be rendered acceptable. In addition, information about chemical nature and extent is desired to support any feasibility study (FS) that might follow this investigation. The criteria for establishing extent of contamination are to be determined.

DQO Step 2. State the Decision

Primary Study Question:

Are chemicals in Pensacola Bay Site 2 sediments creating a condition adverse to benthic communities and, if so, do they warrant remedial action?

Primary Potential Remedial Actions:

- Monitored natural attenuation (MNA)
- Dredging only

- Dredging with possible recapping of the sediments with clean sediment (this would include extending the sea wall and back-filling the landward area)

- In-situ remediation

- Cap as is (recommendation from Barbara Albrecht)

Note: Dredging to only 6" depth is not practical. However, dredging to greater than 6" with recapping with clean sediment, or simply dredging deep enough to encounter acceptable chemical concentrations would be feasible. The fluidity of the sediments will have to be considered when evaluating remedial options. The depth resolution of dredging is likely to only be approximately one foot.

Alternate Potential Remedial Actions:

- No further action (no remediation)

Secondary Study Questions:

1. To support any follow-on FS, what is the nature and extent of chemical concentrations in the vertical and horizontal directions over the yet to be determined decision unit areas?

2. To identify concentration gradients to support the development of site-specific chemical concentrations protective of the environment, what is the relationship between chemical concentration and toxicity for each COPEC?

Decision Statement:

Based on measured chemical concentrations, toxicity testing and benthic assessments in the Site 2 sediments as compared to established acceptance levels, determine whether remediation is required. If site conditions are acceptable, no remediation is required; if they are unacceptable, proceed to an FS (i.e., evaluate remedial options and implement the option that is the most cost-effective and protective of human health and the environment).

DQO Step 3. Identify Inputs to the Decision

Assumptions:

- The assessment end point is maintaining a viable benthic community typical of the lower Pensacola Bay. (*"An Inventory of the Estuarine Fauna in the Vicinity of Pensacola, Florida" by Nelson Cooley, 1978; data from 1960-1968. This was the most comprehensive study conducted in this area).*

- Chemical/physical testing methodologies should be consistent with past testing to maintain comparability. The methodologies will be selected to support the objectives of this investigation. The selected chemical/physical test methods will exhibit detection limits and other analytical figures of merit consistent with project needs. For example, the detection limits of chemical analysis methods will be low enough to measure chemical at concentrations at least as low as action levels.

- A minimum of three samples from each sampling area in an AOC are needed for benthic community assessment. The actual numbers of samples/organisms for benthic community assessment will be addressed by the test methodology.

- In-situ toxicity testing is not practical.

Acceptance Criteria:

Refer to Attachments 4 and 5.

Biological Test Species:

Leptocheirus plumulosus will be used for toxicity evaluations; *Mysid* shrimp will be used for toxicity, fecundity and growth evaluations/endpoints. Methodology consistent with past toxicity testing methodology will be used to maintain comparisons of results with past evaluations. The 10-day toxicity test will be used on *Leptocheirus plumulosus* and the 7-day toxicity test will be used on the shrimp, *Mysidopsis bahia.*

Toxicity Testing Inputs:

Refer to Attachments 4 and 5; see toxicity acceptance criteria. The two bioassays will be evaluated independently and results treated with equal weight.

Chemistry Inputs:

- Acid volatile sulfides (AVS)
- Simultaneously extracted metals
- Total metals (hot HNO_3/HCl leach)
- Herbicides
- Organochlorine Pesticides
- SVOCs

- Sediment chemistry Quality criteria: defined in the SQAGs and EPA's action levels (SSVs)

- TOC

- Inorganic and organic tin

- Grain size

Biology Inputs:

- Toxicty (pH, NH3, salinity, etc., to be controlled as per the test methodology)
- Fecundity
- Growth
- Biodiversity

Attachments 1 through 3 list the target analytes.

Physical Inputs:

While sediment core lithology will not be used for determining risk, it will provide additional valuable information for understanding deposition at the site.

Note: *Important information concerning the purpose of toxicity testing and toxicity testing parameter specifications is provided in Attachment 4.*

DQO Step 4. Establish Decision Unit Boundaries

Assumptions:

- Upper trophic levels are not exposed in a significant way to the benthic community sediments. Bioaccumulators were not measured at unacceptable concentrations in the top 6" of sediment, thus posing no threat to upper trophic levels. Therefore, higher trophic levels are not of interest.

- Habitats span only the top 6" in sediment (that's where the benthic communities are). Thus, contaminants in this region exhibit a pathway to benthic communities.

- Acceptable sediment chemistry in the top 6" would effectively constitute a cap on the deeper sediments.

- Based on calculations of sedimentation rates (maximum estimate = 12 mm/yr), up to 24" of sediment have accumulated in the past 50 years. A 36" depth should provide at least a 50% margin of error in sediment depth estimates and appears to be a reasonable maximum depth to which chemical concentrations should be measured. This depth also coincides with the length of a core sampling tube. Any chemicals deeper than 36" in sediment are not likely to generate unacceptable environmental risks because they are much deeper than the typical benthic communities. Even dredging to remove any chemicals is not likely to expose sediments at depths of ≥36" to the benthic communities.

- Site A2 (east of Site 2) is not part of this problem for the following reasons. The bottom of Site A2 is rocky with limited sediment accumulation and significant sediment migration from site A2 to Site 2 is not likely, based on water flow patterns. Furthermore, mortality rates at Site A2 *(to Mysids)* were approximately 20% and any sediment causing this level of mortality would be

reduced significantly in lethality via dilution associated with migration. Finally, chemistry at Site A2 is significantly different from that at Site 2.

- Depths greater than 6" will be used to evaluate sedimentation rates and potential remedial actions, and will be useful for the FS, but they are not directly related to establishing a problem condition at Site 2.

The five locations exhibiting HI > 10 five years ago may not exist today because sediment has likely been redistributed within this general region. Therefore, the five hot spots simply represent a general area of contamination bounded by grid nodes F0, F4, L4 and L0. For various reasons, it is useful to subdivide this area into smaller subunits called decision units. One reason is to facilitate the generation of concentration gradients to establish effects levels. Another reason is that it could facilitate the initial evaluation of remedial alternatives.

Combining depth boundaries with chemistry inputs from Step 3 yields the following associations:

— Top 6" of sediment:
  - TAL metals
  - Cyanide
  - Inorganic tin
  - Organic tin
  - Grain size
  - TOC
  - AVS
  - SEM
  - Herbicides
  - Organochlorine Pesticides
  - SVOCs
  - Toxicity

- Biodiversity
- Fecundity
- Growth

— Sediment depths >6"
- TAL metals
- Cyanide
- Inorganic tin
- Organic tin
- Grain size
- Herbicides
- Organochlorine Pesticides
- SVOCs

Sediment concentrations of interest below 6" will be the remainder of the core length (i.e., 30") divided equally to yield two 15-inch core intervals below 6" depth. However, some sediment may be lost from the bottom of the coring tube during sampling so the bottom interval will be from 21" to the bottom of the sediment in the coring tube.

Reference stations should emulate the decision units of the site with regard to grain size, chemistry and toxicity. Therefore, it is desirable to select two reference stations, one with approximately 20% sand content and one with approximately 80% sand content, as sand content is a common denominator. Lower Pensacola Bay areas might be suitable back-up reference stations if no others can be identified.

U.S. EPA Pensacola Bay Stations 18 and 22 were selected as the reference stations for Site 2 based on similar sand (%) components, high amphipod survival rates when exposed to sediments for 10 days, and healthy benthic indices in past studies (1992 & 1996). The average depth of Station 18 is twice that expected at Site 2, but phone conversations with several benthic ecologists (Gary Gaston (University of Mississippi), Richard Heard (Gulf Coast Research Laboratory), Tony Martin (Barry Vittor and Associates), and Virgina Engle

(U.S. EPA Environmental Monitoring and Assessment Program Coordinator) indicated that the fauna in this shallow bay system would be similar, and that sand, silt, and clay are the factors that drive habitat recruitment and not depth.

DQO Step 5. State the Decision Rule

See flow chart. Mean COC concentrations ([COC]), toxicity and benthic assessments identified as "Condition *x*" in the flow chart refer to conditions within the top 6" of sediment in each 150 sq. ft. decision unit, validation area and the reference area, as appropriate. Eight decision units will be sampled and the decisions will be made about these eight areas. Three additional validation areas will be used to validate the notion that the area of contamination is localized within the area of eddy flow. These validation regions may provide additional information on extent of contamination if perimeter decision units are contaminated at unacceptable levels. Two reference areas will be sampled as a benchmark against which to evaluate decision unit conditions. Decision units and reference areas that will be compared for decision-making will exhibit similar physical characteristics that validate their comparability. Chemistry data will be needed at depths greater than 6" for evaluating remedial options during the FS.

Decision-making will be staged and will apply to each decision unit. The first test to perform is an evaluation of chemistry in the top 6" of sediment. If surface chemistry is acceptable, an evaluation of deeper sediments will be conducted, with a possibility of NFA if chemistry to depth is acceptable. If chemistry is unacceptable in either the surface or at greater depths, additional evaluations will ensue. If surface chemistry is acceptable but the subsurface chemistry is unacceptable, the need for an FS will be evaluated by comparing the detected concentrations at depth to the site-specific remedial goals. If the surface chemistry is unacceptable, the benthic assessment and toxicity will be evaluated according to the decision matrices below with incorporation of sub-evaluations of fecundity, etc. In all cases, even if a decision unit is declared not to pose a problem based on chemistry alone, evaluation of toxicity and benthic diversity will occur. This evaluation may be used to explain any cases in which adverse biological effects are observed when chemistry appears to be acceptable.

Decision-Making Triads

Decision-making will proceed based on the triads or assessment results presented in the matrices below. First, biological decision making triads will be used to assess biological test results. These will be fed into the Project Decision Making Triad to establish decisions at the project level.

"Hits" and "Adverse effects" (terms used below) mean "statistically different" using methods accompanying each test protocol. "OK" = results were not statistically significant.

For weighting purposes, "Hits" on survival are considered twice as important as "Hits" on reproduction or growth because survival (i.e., mortality) is irreversible whereas reproduction and growth endpoints are potentially reversible; 2 sublethal hits = 1 lethal hit.

After the bioassays are considered individually, their results will be combined for input to the triad matrix assuming additivity of cumulative adverse effects.

The triad matrix accommodates multiple +'s and -'s within each box to reflect the continuum of chemistry, toxicity, and benthic community response one normally encounters. The "interpretation" description currently in the triad matrix will remain unchanged. The multiple +'s will better reflect the strength one should associate with that interpretation.

Possible Outcomes from the *Leptocheirus* Test:

Survival	Growth	Scoring
OK	OK	-
OK	Hit	+
Hit	OK	++
Hit	Hit	+++

Possible Outcomes from the *Mysidopsis* Test:

Survival	Growth	Reproduction	Scoring
OK	OK	OK	-
OK	OK	Hit	+
OK	Hit	Hit	++
Hit	OK	OK	++
Hit	OK	Hit	+++
Hit	Hit	OK	+++
Hit	Hit	Hit	++++

Biological Decision-Making Triad

Integrate results from each test by combining scores in an additive fashion.

Combined Score	Biological Interpretation Considering both Bioassays	Input to Triad Matrix			
-	No adverse effects		-	=	-
+	No survival hits in either species. 1 sublethal hit in one species.	-	=	-	
++	1 survival hit in one species or 2 sublethal hits.	+	=	+	
+++	1 survival hit in one species and/or adverse sublethal effects.	+	=	+	
++++	Survival hits in 1-2 species and/or adverse sublethal endpoints.		++	=	+
+++++	Survival hits in 1-2 species and/or adverse sublethal effects.	++	=	+	
++++++	Survival hits in both test species and adverse sublethal endpoints.		+++	=	+
+++++++	Survival hits in both test species and adverse sublethal endpoints.		+++	=	+

Project Decision Making Triad Matrix				
Condition	**Sediment Chemistry**	**Toxicity Tests**	**Benthic Assessment**	**Interpretation**
1	+	+	+	Strong evidence for pollution-induced degradation.
2	-	-	-	Strong evidence for absence of pollution-induced degradation.
3	+	-	-	Contaminants are not bioavailable.

Project Decision Making Triad Matrix				
Condition	Sediment Chemistry	Toxicity Tests	Benthic Assessment	Interpretation
4	-	+	-	Unmeasured contaminants or conditions exist that have the potential to cause degradation.
5	-	-	+	Alteration of benthic community is probably not due to toxic chemical contamination.
6	+	+	-	Toxic chemicals are probably stressing the system.
7	-	+	+	Unmeasured toxic chemicals are causing degradation.
8	+	-	+	Benthic community degraded by toxic chemicals but toxicity tests not sensitive to toxic chemicals present or chemicals are not bioavailable or alteration is not due to toxic chemicals.

Notes:
+ = Measured difference between test and control or reference conditions.
- = No measurable difference between test and control or reference conditions.

DQO Step 6. Establish Quantitative Tolerances for Decision Errors

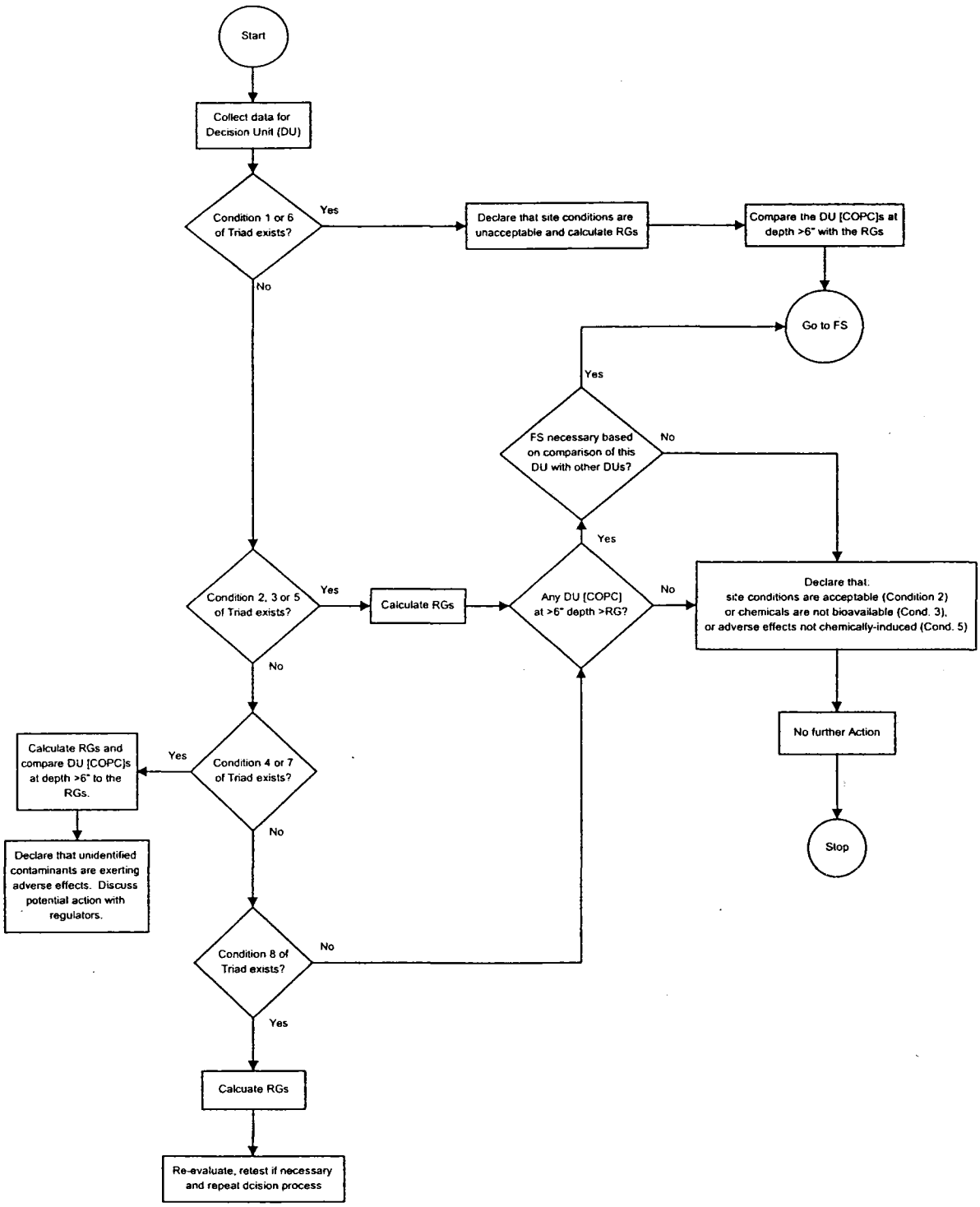
Given the advanced status of the project prior to initiating these DQOs, this step of the DQO process was used primarily as a means of introducing and reinforcing the concept of quantified error tolerances to the planning team. The outputs from this DQO step were used only as a rough guide to establish numbers of samples to be collected.

There are two types of decision error — rejecting the null hypothesis when it is true; and failing to reject the null hypothesis when it is false. Establishment of the null hypothesis rests on establishing the severity of consequences for making each type of error.

Site-Specific Errors and Consequences:

Walk away from a dirty site ⇒ more severe consequence.

Clean up a clean site ⇒ less severe consequence.


Start
Collect data for Decision Unit (DU)
Condition 1 or 6 of Triad exists?
Yes
No
Declare that site conditions are unacceptable and calculate RGs
Compare the DU [COPC]s at depth >6" with the RGs
Go to FS
Yes
FS necessary based on comparison of this DU with other DUs?
No
Yes
Condition 2, 3 or 5 of Triad exists?
Yes
Calculate RGs
Any DU [COPC] at >6" depth >RG?
No
Declare that, site conditions are acceptable (Condition 2) or chemicals are not bioavailable (Cond. 3), or adverse effects not chemically-induced (Cond. 5)
No
No further Action
Stop
Calculate RGs and compare DU [COPC]s at depth >6" to the RGs.
Yes
Condition 4 or 7 of Triad exists?
No
Declare that unidentified contaminants are exerting adverse effects. Discuss potential action with regulators.
Condition 8 of Triad exists?
No
Yes
Calcuate RGs
Re-evaluate, retest if necessary and repeat dcision process

Establish the Null Hypothesis:

The null hypothesis is the true state of nature that exists when the error having the more severe consequence is made. The error with the more severe consequence is to walk away from a dirty site, so the null hypothesis is that the site is dirty:

H_0 = site is dirty.

Then the alternative hypothesis is:

H_a = site is clean.

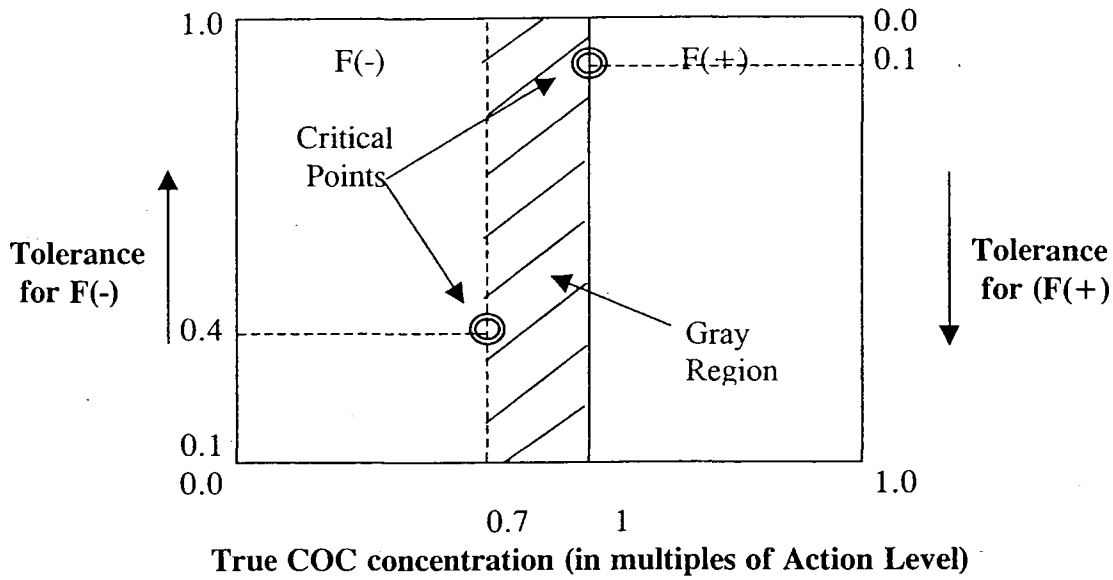
The Type I error (false positive) is rejecting H_0 when it is true. Therefore, the type I error is: Walk away from a dirty site.

Then the Type II error (false negative) is: Clean up a clean site.

Quantitative Tolerances for Decision Errors		
True Concentration	**Error Type**	**Tolerance**
0.7* Action Level	II: False Negative [F(-)]	0.4 (40% probability)
Action Level	I: False Positive [F(+)]	0.1 (10% probability)

Note:
These specifications are contrary to the proclaimed tolerances for decision errors because they indicate a greater tolerance for making the Type II Error. Generate the performance goal diagram, anyway, to indicate this decision performance

Decision Performance Goal Diagram



Based on the above specifications, the following numbers of samples were computed:

DQO Specifications:	
H_0	Site is Dirty
H_a	Site is Clean
Action Level	SSV
Gray Region Boundary	0.7SSV
Probability of F(+)	0.1 (walk away from dirty site)
Probability of F(–)	0.4 (clean up clean site)

Numbers of Samples				
		Screening	Null Condition: Site is Dirty	
Metal	Standard Dev.	Value	Gray Region	No. Samples
Arsenic	8.35	7.24	5.1	36
Cadmium	7.67	0.68	0.48	>1000
Chromium	68.1	52.3	36.6	46
Zinc	59.3	124	86.8	6

These calculations assume normally distributed data, independent samples, and random sample collection. We do not expect the data to be normally distributed, and the standard deviations used in the calculations are only estimates based on approximately nine samples. The actual variances are likely to be greater than those used in these computations, which would cause the number of samples to increase for each metal.

The numbers of samples required is greater than can be afforded. So, compute the numbers of samples required when the tolerance for both decision error types is equal and more liberal (i.e., 45%). Also consider both possibilities for the null hypothesis:

DQO Specifications		
	Case 1	**Case 2**
H_0	Site is Dirty	Site is Clean
H_a	Site is Clean	Site is Dirty
Action Level	SSV	SSV
Gray Region Boundary	0.7SSV	(1/0.7)SSV
Probability of F(+)	0.45 (walk away from dirty site)	0.45 (clean up clean site)
Probability of F(–)	0.45 (clean up clean site)	0.45 (walk away from dirty site)

Numbers of Samples						
		Screening	**Case 1 (Assume site is dirty)**		**Case 2 (Assume site is clean)**	
Metal	**Standard Dev.**	**Value**	**Gray Region**	**No. Samples**	**Gray Region**	**No. Samples**
Arsenic	8.35	7.24	5.1	2	10.5	2
Cadmium	7.67	0.68	0.48	93	1	37
Chromium	68.1	52.3	36.6	2	75	2
Zinc	59.3	124	86.8	2	180	2

Still, in the case of cadmium, the number of samples is prohibitively large. That's because the smallest detectable difference is small relative to the standard deviation of the data.

If only the areas with HI > 10 are used in the calculations, the standard deviations generally increase and the means and action levels become a little more different. These factors offset each other and the required numbers of samples using these new means and standard deviations with the 45% tolerance for F(+) and F(–) above are: As= 2, Cd = 201, Cr = 3, and Zn = 2. Using the same factors with an error tolerance of F(+) = F(–) =35% yields: As= 10, Cd = 872, Cr = 21, and Zn = 2.

In the above calculations the number of samples required is computed using the difference between the gray region boundary and the action level as the minimum detectable concentration difference. This causes the number of samples required to achieve the specified decision performance to be limited by cadmium.

If the actual mean concentration computed from the 1997 Site 2 data is used for each analyte, the situation changes because the mean cadmium concentration is significantly greater than the computed gray region boundary. Using these mean concentrations, we can ask the question, "What statistical power is achieved if we wish to detect a difference between the observed mean analyte concentration and the action level?" To determine this, the problem is reversed to yield the probability of making a F(–) error when we specify a given number of samples (n) and fixed values of mean concentration (mean), standard deviation (std. dev.), Screening Value, and the Probability of false positive error, F(+). The results of these calculations are shown in the tables below.

Probability of F(–) with n = 9.

Metal (mean)	Std Dev.	Screening Value	Mean Concentration	Δx	n	Prob. of F(+)	Prob. of F(–)
Arsenic	8.37	7.24	9.98	2.74	9	50%	16%
						35%	31%
						20%	54
Cadmium	8.10	0.68	4.11	3.43	9	50%	10%
						35%	21%
						20%	40%
Chromium	70.7	52.3	58.9	6.6	9	50%	39%
						35%	UD
						20%	UD
Zinc	59.6	124	68.1	55.9	9	50%	0.2%
						35%	0.8%
						20%	2.9%

Note:
UD = undefined

Probability of F(–) with n = 15.							
Metal (mean)	**Std Dev.**	**Screening Value**	**Mean Concentration**	**Δx**	**n**	**Prob. of F(+)**	**Prob. of F(–)**
Arsenic	8.37	7.24	9.98	2.74	15	50%	10%
						35%	21%
						20%	40%
Cadmium	8.10	0.68	4.11	3.43	15	50%	5.0%
						35%	12%
						20%	25%
Chromium	70.7	52.3	58.9	6.6	15	50%	36%
						35%	UD
						20%	UD
Zinc	59.6	124	68.1	55.9	15	50%	0.0%
						35%	0.1%
						20%	0.3%

Note:
UD = undefined

Conclusion:

Using the above information, it appears that about 15 samples should provide acceptable statistical power for decision making (false positive and negative rates near 35% or better). Chromium stands out as an exception, however, a review of chromium date reveals that a single concentration of 220 ppm is contributing to this exception. Removing that single value from the data set renders the decision performance between that for cadmium and zinc, a significant improvement. This conclusion is caveated because analyte distributions are likely not Gaussian and the statistical calculations assume Gaussian distributions and because sediments are relatively mobile. Mobile sediments imply that concentration hot spots may move and be redistributed over time. Therefore, standard deviations observed for past data could be considerably different than current standard deviations, so it does not pay to invest much more time into power calculations.

DQO Step 7. Optimize the Design

The site will be subdivided into eight decision units (DUs), 150' x 150' square. Each DU will be sampled in an identical manner, as follows:

- One core sample at the center of the DU. The top 6" will be removed and the remaining 30" will be divided equally into two samples, yielding a total of three samples. The top 6" will be used as a point of reference for sediment depth profiling only. Its concentration relative to the composite samples described below will not affect decision making. That is, a surface core sample that is of greater or lesser concentration than the composite samples will have no bearing on decisions. This approach should limit "knee-jerk" reactions to hot spots which may arise as a consequence of statistical fluctuations or heterogeneity of the surface sediment.

- Eight grab samples from the top 6" of sediment will be composited into a single sample that will be split for toxicity testing and chemical analysis. One grab sample will be collected from each corner of the DU and four grab samples arranged in a diamond pattern will be collected closer to the center of the DU. The samples will be arranged to provide relatively even coverage of the DU area.

- Three sediment diversity samples will be collected along the water flow direction: one sample in the NE corner of the DU, one near the center of the DU, and one from the SW corner of the DU.

It will be important to collect sediment samples such that any sediment lost from coring tubes does not contaminate nearby sediment that is yet to be sampled. Therefore, the following sampling sequence will be used for each DU:

1. Mark the coring location with a buoy
2. Collect sediment diversity samples
3. Collect grabs for compositing
4. Collect the core sample

A map identifying the Site 2 area and the 150' x 150' areas of concern is included in the appendix. Reference stations and validation units will be sampled and analyzed in a manner identical to that of the DUs. A Map of these stations is also included in the appendix of this document.

Attachment 1. TAL Metals Plus Cyanide Analyte List

ANALYTE	CAS No.	CRQL, WATER (μg/L)
Aluminum	7429-90-5	200
Antimony	7440-36-0	60
Arsenic	7440-38-2	10
Barium	7440-39-3	200
Beryllium	7440-41-7	5
Cadmium	7440-43-9	5
Calcium	7440-70-2	5000
Chromium	7440-47-3	10
Cobalt	7440-48-4	50
Copper	7440-50-8	25
Iron	7439-89-6	100
Lead	7439-92-1	3
Magnesium	7439-95-4	5000
Manganese	7439-96-5	15
Mercury	7439-97-6	0.2
Nickel	7440-02-0	40
Potassium	7440-09-7	5000
Selenium	7782-49-2	5
Silver	7440-22-4	10
Sodium	7440-23-5	5000
Thallium	7440-28-0	10
Vanadium	7440-62-2	50
Zinc	7440-66-6	20
Cyanide	57-12-5	10

Attachment 2. SVOC Analyte List (EPA CLP OLM 3.2)

COMPOUND	CAS No.	Water, (μg/L)	Soil, (μg/kg)	Med. Soil, μg/kg	On Column (ng)
1,2,4-Trichlorobenzene	120-82-1	10	330	10000	(20)
1,2-Dichlorobenzene	95-50-1	10	330	10000	(20)
1,3-Dichlorobenzene	541-73-1	10	330	10000	(20)
1,4-Dichlorobenzene	106-46-7	10	330	10000	(20)
2,2'-oxybis(1-Chloropropane)	108-60-1	10	330	10000	(20)
2,4,5-Trichlorophenol	95-95-4	25	830	25000	(50)
2,4,6-Trichlorophenol	88-06-2	10	330	10000	(20)
2,4-Dichlorophenol	120-83-2	10	330	10000	(20)
2,4-Dimethylphenol	105-67-9	10	330	10000	(20)
2,4-Dinitrophenol	51-28-5	25	830	25000	(50)
2,4-Dinitrotoluene	121-14-2	10	330	10000	(20)
2,6-Dinitrotoluene	606-20-2	10	330	10000	(20)
2-Chloronapthalene	91-58-7	10	330	10000	(20)
2-Chlorophenol	95-57-8	10	330	10000	(20)
2-Methylnaphthalene	91-57-6	10	330	10000	(20)
2-Methylphenol	95-48-7	10	330	10000	(20)
2-Nitroaniline	88-74-4	25	830	25000	(50)
2-Nitrophenol	88-75-5	10	330	10000	(20)
3,3'-Dichlorobenzidine	91-94-1	10	330	10000	(20)
3-Nitroaniline	99-09-2	25	830	25000	(50)
4,6-Dinitro-2-methylphenol	534-52-1	25	830	25000	(50)
4-Bromophenyl-phenyl ether	101-55-3	10	330	10000	(20)
4-Chloro-3-methylphenol	59-50-7	10	330	10000	(20)
4-Chloroaniline	106-47-8	10	330	10000	(20)
4-Chlorophenyl-phenyl ether	7005-72-3	10	330	10000	(20)
4-Methylphenol	106-44-5	10	330	10000	(20)
4-Nitroaniline	100-01-6	25	830	25000	(50)
4-Nitrophenol	100-02-7	25	830	25000	(50)
Acenaphthene	83-32-9	10	330	10000	(20)
Acenaphthylene	208-96-8	10	330	10000	(20)
Anthracene	120-12-7	10	330	10000	(20)
Benzo(a)anthracene	56-55-3	10	330	10000	(20)
Benzo(a)pyrene	50-32-8	10	330	10000	(20)
Benzo(b)fluoranthene	205-99-2	10	330	10000	(20)
Benzo(g,h,i)perylene	191-24-2	10	330	10000	(20)
Benzo(k)fluoranthene	207-08-9	10	330	10000	(20)
bis(2-Chloroethoxy) methane	111-91-1	10	330	10000	(20)
bis(2-Chloroethyl) ether	111-44-4	10	330	10000	(20)
bis-(2-Ethylhexyl)phthalate	117-81-7	10	330	10000	(20)
Butylbenzylphthalate	85-68-7	10	330	10000	(20)
Carbazole	86-74-8	10	330	10000	(20)
Chrysene	218-01-9	10	330	10000	(20)
Dibenz(a,h)anthracene	53-70-3	10	330	10000	(20)
Dibenzofuran	132-64-9	10	330	10000	(20)
Diethylphthalate	84-66-2	10	330	10000	(20)

COMPOUND	CAS No.	Water, (μg/L)	Soil, (μg/kg)	Med. Soil, μg/kg	On Column (ng)
Dimethylphthlate	131-11-3	10	330	10000	(20)
Di-n-butylphthalate	84-74-2	10	330	10000	(20)
Di-n-octylphthalate	117-84-0	10	330	10000	(20)
Fluoranthene	206-44-0	10	330	10000	(20)
Fluorene	86-73-7	10	330	10000	(20)
Hexachlorobenzene	118-74-1	10	330	10000	(20)
Hexachlorobutadiene	87-68-3	10	330	10000	(20)
Hexachlorocyclopentadiene	77-47-4	10	330	10000	(20)
Hexachloroethane	67-72-1	10	330	10000	(20)
Indeno(1,2,3-cd)pyrene	193-39-5	10	330	10000	(20)
Isophorone	78-59-1	10	330	10000	(20)
Naphthalene	91-20-3	10	330	10000	(20)
Nitrobenzene	98-95-3	10	330	10000	(20)
N-Nitroso-di-n-propylamine	621-64-7	10	330	10000	(20)
N-Nitrosodiphenylamine	86-30-6	10	330	10000	(20)
Pentachlorophenol	87-86-5	25	830	25000	(50)
Phenanthrene	85-01-8	10	330	10000	(20)
Phenol	108-95-2	10	330	10000	(20)
Pyrene	129-00-0	10	330	10000	(20)

Attachment 3. Organochlorine Pesticide Analyte List

COMPOUND	CAS No.	Water, (μg/L)	Soil, (μg/kg)	On Column, (pg)
4,4'-DDD	72-54-8	0.1	3.3	10
4,4'-DDE	72-55-9	0.1	3.3	10
4,4'-DDT	50-29-3	0.1	3.3	10
Aldrin	309-00-2	0.05	1.7	5
alpha-BHC	319-84-6	0.05	1.7	5
alpha-Chlordane	5103-71-9	0.05	1.7	5
beta-BHC	319-85-7	0.05	1.7	5
delta-BHC	319-86-8	0.05	1.7	5
Dieldrin	60-57-1	0.1	3.3	10
Endosulfan I	959-98-8	0.05	1.7	5
Endosulfan II	33213-65-9	0.1	3.3	10
Endosulfan sulfate	1031-07-8	0.1	3.3	10
Endrin	72-20-8	0.1	3.3	10
Endrin aldehyde	7421-93-4	0.1	3.3	10
Endrin ketone	53494-70-5	0.1	3.3	10
gamma-BHC (Lindane)	58-89-9	0.05	1.7	5
gamma-Chlordane	5103-74-2	0.05	1.7	5
Heptachlor	76-44-8	0.05	1.7	5
Heptachlor epoxide	1024-57-3	0.05	1.7	5
Methoxychlor	72-43-5	0.5	17	50
Toxaphene	8001-35-2	5	170	500

Attachment 4. Toxicity Testing Background and Specifications

Toxicity tests are designed to determine whether toxic chemicals are present in toxic amounts. Toxicity tests are not designed to be quantitative predictors of ecosystem responses — though many studies have demonstrated significant associations between toxicity test results and ecosystem impacts.

V. deVlaming and T. Norberg-King (draft) identified 10 studies from the literature in which marine sediment toxicity tests were compared to ecological effects on marine benthos. In all ten of these studies, laboratory sediment tests were reliable qualitative predictors of benthic community effects, although the laboratory tests tended to underestimate the extent of the benthic community impacts.

Each toxicity test is designed with test acceptability criteria (TAC), which determine the validity and acceptability of the test based on control survival and other test endpoints. In addition to control criteria, a toxicity test may set limits on minimum growth requirements in weight or length, reproduction, fertilization, etc.

Another acceptance criterion is based on the performance of a specific batch of animals. Stressed organisms will not be suitable predictors of what is actually occurring within a toxicity test, so to insure that the population of organisms is sensitive (but not stressed) to toxicants reference toxicant tests are preformed.

Reference toxicant tests are multi-dilution tests with a known chemical that gauges the sensitivity of a pool of organisms. Reference toxicant tests are set up prior to the test or concurrent with the compliance test and utilize organisms from the same brood (when cultured in-house) or same batch when organisms are purchased. The reference toxicant is tested using the same concentrations from test to test under the same conditions (i.e., the same test duration, type of dilution water, age of test organisms, and feeding regime) and the same statistical analysis as the effluent test.

Reference toxicant tests indicate the relative sensitivity of the test organisms being used and demonstrate a laboratory's ability to obtain consistent test results with the test method. It is the laboratory's responsibility to demonstrate its ability to obtain consistent, precise results with reference toxicants before the laboratory performs toxicity tests with effluents for permit compliance purposes. Reference toxicants should be verified analytically and stock solutions should be replaced when concentrations show signs of degradation.

The frequency of reference toxicant testing depends on whether the organisms are cultured in-house or obtained from an outside source. If the laboratory obtains the test organisms from an outside source, the reference toxicant test must be conducted concurrently with the effluent test. If the laboratory facility maintains in-house cultures, a reference toxicant test must be conducted at least once a month. It is preferred that this reference toxicant test be performed concurrently with an effluent toxicity test.

Toxicity test conditions are outlined in Tables 1 and 2 for the mysid shrimp and the amphipod *Leptochinos plumulosus*. Both test methods have been tailored to address the concerns unique to sediments at Site 2.

Traditionally, scientists have set the nominal error rate for biological studies at 0.01 to 0.1 (1% to 10%). The 0.01 level, at one extreme, provides a conservative error rate for false positives and the 0.10, at the other extreme, provides a more liberal rate for false positives. The WET test method manuals recommend a nominal error rate of 0.05 for hypothesis testing, striking a balance between the two extremes. A nominal error rate of 0.05 means a 5% probability of making a Type I error and is associated with a 95% level of significance.

Toxicity tests will be statistically analyzed at test termination. Figure 1 provides a glimpse of the statistical programs utilized when analyzing data with multiple endpoints. Figure 2 illustrates the steps which one takes to analyze data from a screening type test. (Single exposure).

Figure 1. Flowchart for statistical analysis of test data for *Mysidopsis bahia*.

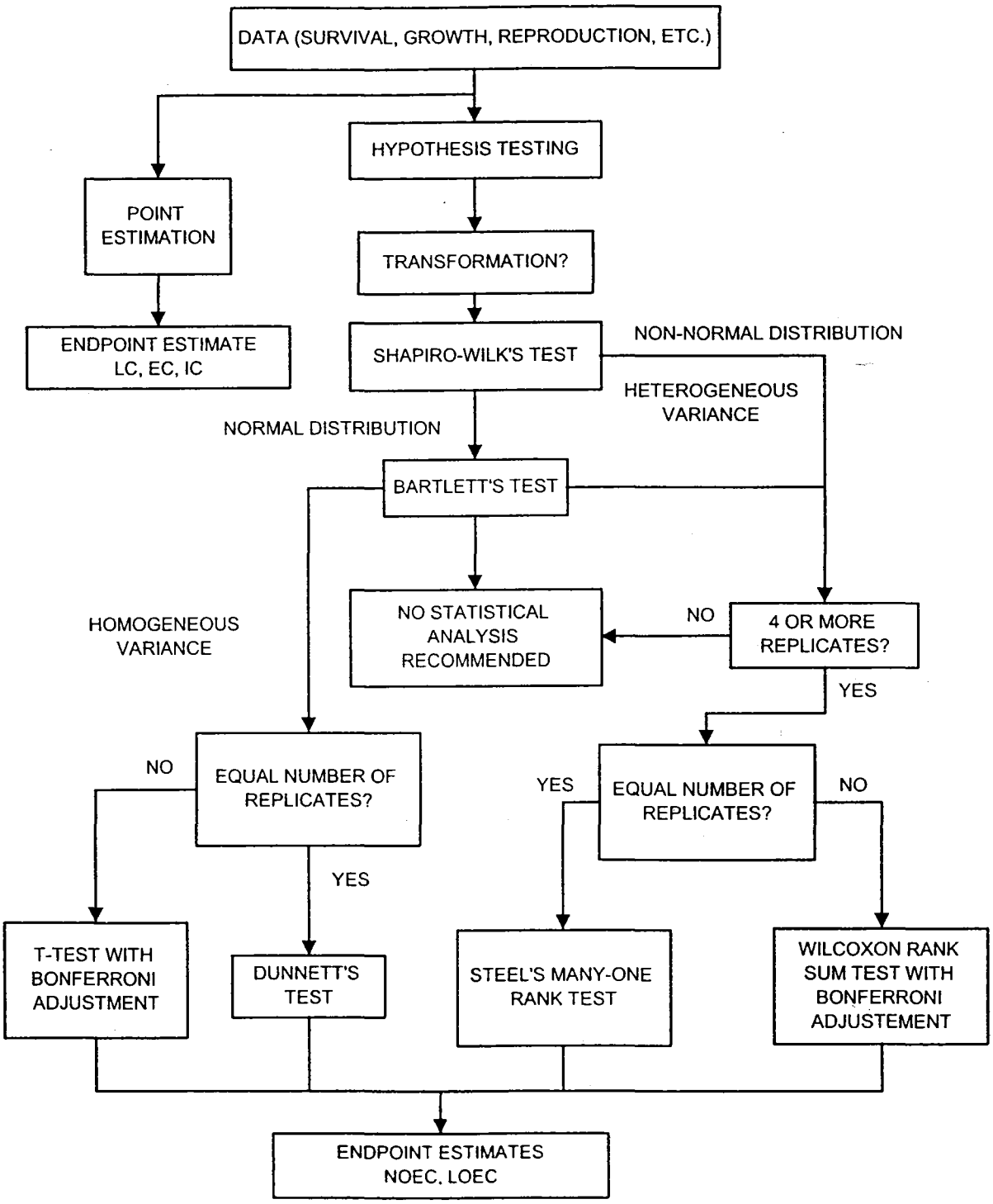


Figure 2. Determination of pass or fail from a single sediment exposure with *Leptocheirus plumulosus*.

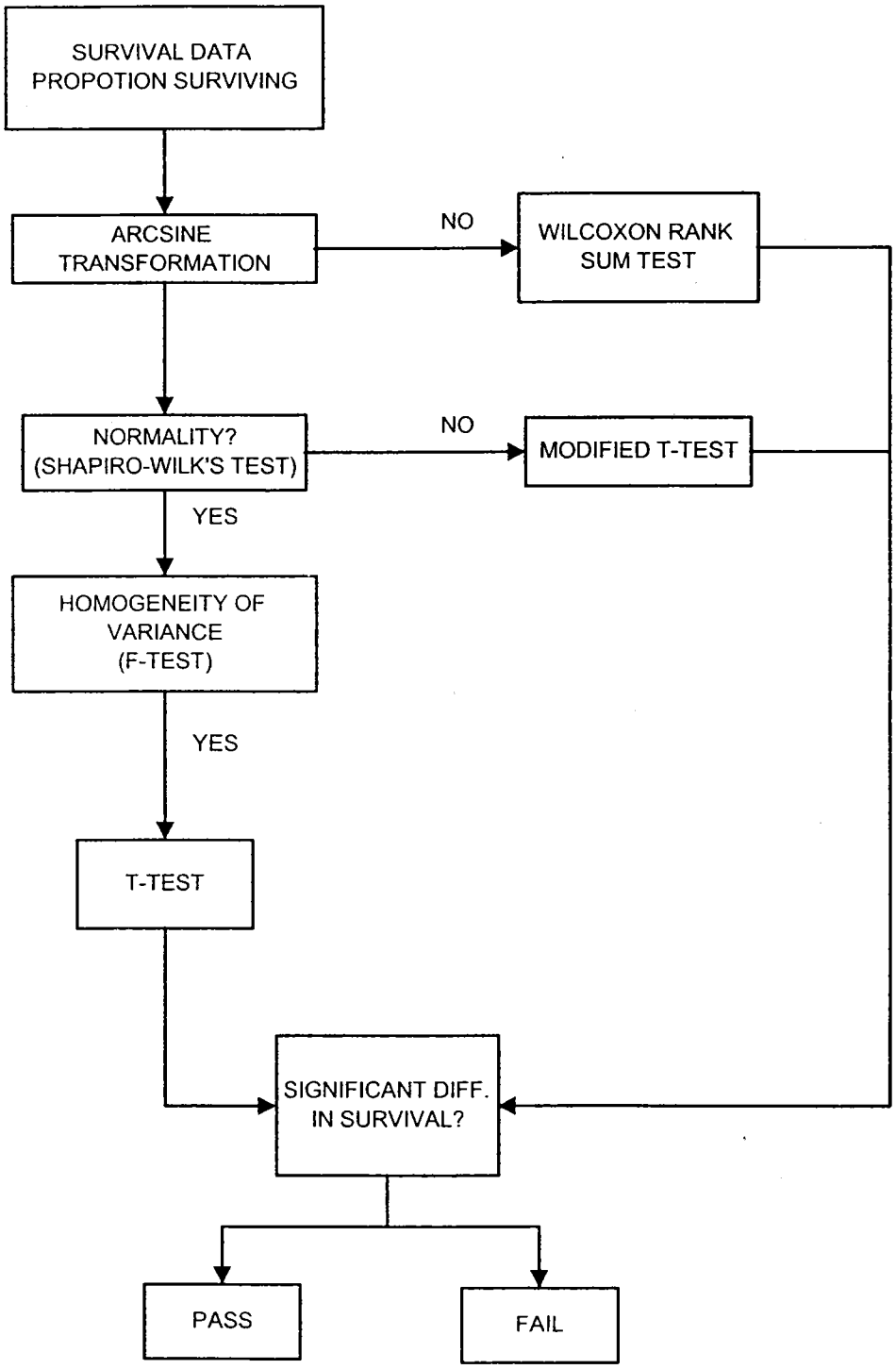


TABLE 1 SUMMARY OF TEST CONDITIONS AND T EST ACCEPTABILITY CRITERIA FOR THE MYSID, *MYSIDOPSIS BAHIA*, SEVEN DAY SURVIVAL, GROWTH, AND FECUNDITY TEST WITH SEDIMENTS	
1. Test type:	Static renewal
2. Salinity:	20% to 30% (± 2% of the selected test salinity).
3. Temperature:	26 ± 1 C
4. Light quality:	Ambient laboratory illumination.
5. Light intensity:	10-20 $E/m^2/s$ (50-100 ft-c.)(ambient laboratory levels).
6. Photoperiod:	16 h light, 8 h darkness, with phase in/out period.
7. Test chamber:	8-oz plastic disposable cups, or 400-mL glass beakers.
8. Sediment volume:	2 cm
9. Overlying water volume:	150 mL per replicate.
10. Renewal of overlying water:	Daily
11. Age of test organisms:	7 days
12. No. organisms per test chamber:	5 (minimum)
13. No. replicate chambers per concentration:	8 (minimum)
14. No. larvae per concentration:	40 (minimum)
15. Source of food:	Newly hatched *Artemia* nauplii (less than 24 h old).
16. Feeding regime:	Feed 150 24 h old nauplii per mysid daily, half after test solution renewal and half after 8-12 h.
17. Cleaning:	Pipette excess food from cups daily immediately before test solution renewal and feeding.
18. Aeration:	None unless DO falls below 4.0 mg/L, then gently aerate in all cups.
19. Overlying water:	Clean sea water, natural or reconstituted water.
20. Test concentrations:	Sediments: Minimum of 3 and a control sediment.
21. Sediment concentrations:	Sediments to be serially diluted with clean sediment. Sediment concentrations will be 100, 50, and 25%.
22. Test duration:	7 days
23. Endpoints:	Survival, growth, and egg development.
24. Test acceptability criteria:	80% or greater survival, average dry weight 0.20 mg or greater in controls; fecundity may be used if 50% or more of females in controls produce eggs.

Note:
Modified from: U.S. EPA. 1991. Short-term methods for estimating the chronic toxicity of effluents and receiving waters to marine and estuarine organisms. Environmental Monitoring and Support Laboratory, Cincinnati, OH. EPA/600/4-91/028.

TABLE 2 TEST CONDITIONS FOR CONDUCTING A 10-D SEDIMENT TOXICITY TEST WITH THE AMPHIPOD, *LEPTOCHEIRUS PLUMULOSUS*	
1. Test type:	Whole sediment toxicity test, static.
2. Temperature:	25% C
3. Salinity:	20%
4. Light quality:	Wide-spectrum fluorescent lights
5. Illuminance:	500 - 1000 lux
6. Photoperiod:	24L:0D
7. Test chamber:	1-L glass beaker or jar with - 10 cm I.D.
8. Sediment volume:	175 mL (2 cm)
9. Overlying water volume:	800 mL
10. Renewal of overlying water:	None
11. Size and life stage of amphipods:	2 - 4 mm (no mature males or females).
12. No. of organisms/chamber:	20 per test chamber.
13. No. of replicate chambers/treatment:	Depends on objective of test. At a minimum, four replicates must be used.
14. Source of food:	GORP - U.S. EPA recipe.
15. Feeding:	Twice during test duration; day 2 and day 6.
16. Aeration:	Water in each test chamber should be aerated overnight before start of test, and throughout the test; aeration at rate that maintains 90% saturation of dissolved oxygen concentration.
17. Overlying water:	Clean sea water, natural or reconstituted water.
18. Overlying water quality:	Temperature daily. pH, ammonia, salinity, and DO of overlying water at least at test start and end. Salinity, ammonia, and pH of pore water.
19. Test duration:	10 days
20. Endpoints:	Survival and growth.
21. Test acceptability criteria:	Minimum mean control survival of 90% in the control exposure. Growth endpoint will be determined by subsampling the population at test initiation to establish a baseline weight. Organism weight at test termination will be compared to the control exposures and calculated using a T-test.

Note:
Modified from: U.S. EPA. Methods for assessing the toxicity of sediment-associated contaminants with estuarine and marine amphipods. EPA/600/R-94/025.

Attachment 5. Statistical Specifications for Toxicity Testing

Data Acceptance Criteria:

- Toxicity, fecundity, growth: Survival rates will be dictated by the test methodology; an *alpha* = 5% significance level (95% confidence level) will be used. The *Mysid* test will use 40 organisms per replicate; the *Leptocheirus* test will use 100 organism per replicate.

- Biodiversity: Species diversity will be assessed utilizing the triad matrix (overall) and comparisons between reference stations and site locations (individually). Site 2 diversity data will be compared to the US EPA Stations 18 and 22 (reference location) data.

Note: Much of the acceptance criteria for toxicity and biodiversity may be incorporated into the decision matrix.

- Sediment Chemistry: Threshold Effects Levels (TELs) and Sediment Screening Values (SSVs)

Volume 2

Final Work Plan for Pensacola Naval Air Station Sediment Survey Operable Unit

FINAL WORK PLAN FOR PENSACOLA NAVAL AIR STATION SEDIMENT SURVEY OPERABLE UNIT 3

PENSACOLA NAVAL AIR STATION
PENSACOLA, FLORIDA

Prepared By:

Robert J. Lewis
Life Scientist

U.S. EPA Region IV
Science and Ecosystem Support Division
Enforcement and Investigations Branch
Hazardous Waste Section

OCTOBER 2000

WORK PLAN
USEPA REGION 4

Title and Approval Sheet

FINAL WORK PLAN FOR PENSACOLA NAVAL AIR STATION SEDIMENT SURVEY OPERABLE UNIT 3

EPA PROJECT # 00-0026

Prepared By: _____ Date: _____
Robert J. Lewis
Project Leader
USEPA SESD

Reviewed By: _____ Date: _____
Archie Lee
Section Chief, Hazardous Waste Section
USEPA SESD

Approved By: _____ Date: _____
Gena Townsend
Remedial Project Manager
USEPA Region IV

Table Of Contents

SECTION 1.0 INTRODUCTION 1
1.1 Background 1
1.2 Problem 2
1.3 Technical Approach 2

SECTION 2.0 QUALITY ASSURANCE PROJECT PLAN 4
2.1 Project Management 4
2.1.1 Project/Task Organization 4
2.1.2 Problem Definition/Background 5
2.1.3 Project/Task Description 5
2.1.4 Quality Objectives and Criteria for Measurement Data . 5
2.1.5 Project Narrative 6
2.1.6 Special Training Requirements/Certification 6
2.1.7 Documentation and Records 6
2.2 Measurement/Data Acquisition 6
2.2.1 Sampling Process Design/Sampling Methods Requirements 7
2.2.2 Sample Handling and Custody Requirements 7
2.2.3 Sample Preservation, Containers and Holding Times ... 7
2.2.4 Analytical Method Requirements 7
2.2.5 Quality Control Requirements 11
2.2.5.1 Field Quality Control 11
2.2.5.2 Onsite Measurements Quality Control 11
2.2.5.3 Laboratory QC 11
2.2.6 Instrument Calibration 12
2.2.7 Data Acquisition Requirements 12
2.2.8 Sample Management 12
2.3 Data Validation and Usability 12

SECTION 3.0 SAMPLING AND ANALYSIS PLAN 14
3.1 Project Schedule and Deliverables 14
3.2 Field Investigation 14
3.2.1 Sampling Locations 14
3.2.2 Sampling Approach 14
3.2.3 Sediment Sampling 15
3.2.4 Surface Water Sampling 16
3.3 Sample Identification 17
3.4 Sample Collection and Handling Procedures 18
3.4.1 Field Equipment Decontamination Procedures 18
3.4.2 Instrument Calibration 19
3.4.3 Management of Investigation-Derived Wastes 19

SECTION 4.0 REFERENCES 20

List of Tables

Table 2.1 Holding Times and Sample Containers for All Analyses..... 8
Table 2.2 Region IV Ecological Screening Values for TCL and TAL Sediment 8
Table 2.3 FDEP Threshold Effects Level for TCL and TAL Sediment 10
Table 3.1 Summary of Analyses to be Performed on Sediment Samples.....15
Table 3.2 Sample Identification.....17
Table 3.3 QA/QC Sample Designations.....18

List of Figures

Figure 1.1 Map Showing The Area Of Concern, OU3, Site 2, Waterfront Sediments
Figure 3.1 Map Showing The Sampling Locations Of The Initial RI
Figure 3.2 Map Showing The 150'x150' Sampling Grids For This Investigation
Figure 3.3 Map Showing Background Locations In Relation To The Study Area And Recognizable Landmarks

SECTION 1.0 INTRODUCTION

This sampling and analysis plan (SAP) for completing a Remedial Investigation of Operable Unit 3 (Site 2, Waterfront Sediments) at the Pensacola Naval Air Station, Superfund site was developed by the United States Environmental Protection Agency (EPA), Region IV, in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, amended by the Superfund Amendments and Reauthorization Act (SARA), of 1986 (Ref.1). The plan generally follows a detailed scope of work and technical approach outlined in the AGuidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final.

This Work Plan is design to support the completion of the Record of Decision for Site 2 (Operable Unit 3), Waterfront Sediments. This study will conduct an assessment of the vertical nature and extent of sediment contamination in the Waterfront area. The sediment Quality ATriad approach will be utilized to assess sediment contamination at Site 2 (OU3). The triad uses three different methods of characterizing sediment; sediment chemistry, sediment toxicity, and benthic community structure. All three lines of evidence will be used to assess sediment contamination of Site 2 and will be used by the risk manager for decision-making. This Sampling and Analysis (Volume 2) focuses on the sediment chemistry part for the triad. The other two legs of the triad, benthic community surveys, and sediment toxicity, will be addressed in the SAP/QAPP provided by the Navy (Volume 3). Both of these documents will fulfill the requirements of the Data Quality Objective document contained in Volume 1.

1.1 Background

The Pensacola Naval Air Station (NAS) was placed on U.S. EPA's National Priority List 1989. Operable Unit 3 (OU3), or Site 2, is located on the southeastern shoreline of the NAS along Pensacola Bay (Figure 1.1). From 1939-1973 untreated industrial wastes from base facilities were routinely discharged into Pensacola Bay, near Site 2. An estimated 83 million gallons of industrial waste was disposed of in the Bay. The waste consisted of: waste containing paint, paint solvents, thinners, ketones, trichloroethylene, alodine, mercury, and concentrated plating waste (primarily chromium, cadmium, lead, nickel, and cyanide).

The Remedial Investigation (EnSafe, 1996) of the site showed the presence of metals, PAHs, pesticides, and polychlorinated biphenyls (PCBs) in the sediments. The results of the RI and baseline ecological risk assessment also described five areas where contaminated sediment posed unacceptable risk to the environment and remedial alternatives should be developed for these areas.

1.2 Problem

The initial RI (EnSafe, 1996) did not adequately describe the vertical extent of contamination in the sediments. If a remedial alternative that requires removal is selected, it is unclear how much sediment needs to be removed to achieve cleanup goals. In addition, there may have been a significant change in site conditions since last investigated. There have been two hurricanes and a few tropical storms that have passed through the area in recent years. This storm activity may have caused some sediment redistribution. It is unclear what the current nature and extent of contaminated sediment is in the Waterfront area (OU3). Before any remedial action is selected and implemented, sediment contamination in OU3 needs to be reevaluated and vertical extent defined. The additional sediment characterization is necessary to complete the ROD and selection of a remedial alternative.

1.3 Technical Approach

Based on the results of the initial RI (EnSafe, 1996) five locations where the Hazard Index (HI) was greater than 10 were identified and targeted for remedial action. These five locations and the surrounding area will be the focus of this investigation. A total of 11 grids will be sampled in the vicinity of the previous investigations. Five of these locations had HI > 10 in the previous investigation. Two background locations will also be sampled. At each location surface and subsurface sediment will be collected to assess the vertical and horizontal extent of contamination. Analytical results will be compared to the lower of the USEPA Region IV's ecological benchmark values or the Florida Department of Environmental Protection Sediment Quality Assessment Guidelines.

The sediment Quality Atriad approach will be utilized to assess sediment contamination at Site 2 (OU3). The triad uses three different methods of characterizing sediment; sediment chemistry, sediment toxicity and benthic community surveys. All three lines of evidence will be used to assess sediment contamination of Site 2 and will be used by the risk manager for decision-making. This SAP focuses on the sediment chemistry part for the triad. The data will be compared to ecological benchmark screening values and effects values, discussed in the Analytical section of this document. The other two legs of the triad, benthic community surveys and sediment toxicity, will be addressed in another QAPP and SAP provided the Pensacola Naval Air Station. The Navy will provide the appropriate Data Quality Objectives for all three legs of the triad.

SECTION 2.0 QUALITY ASSURANCE PROJECT PLAN

The following sections identify the individuals or organizations participating in the project and discuss specific roles and responsibilities of personnel. This section also discusses the quality objectives for measurement data and discusses the special training requirements for the staff.

2.1 Project Management

This section addresses the basic area of project management and ensures that the project has a defined goal, that the participants understand the goal and the approach to be used and that the planned outputs have been appropriately documented.

2.1.1 Project/Task Organization

The overall field investigation/sampling phase of the project and any field decisions will be the responsibility of the Field Project Leader. The Field Project Leader will be responsible for the following field activities:

- Insuring that all field activities are communicated and coordinated with the Project Manager (Gena Townsend).
- Monitoring overall field project quality control.
- Coordinating field scheduling of work with other section activities.
- Overseeing and managing field technical resources including non-sampling field activities.
- Monitoring health and safety of the sampling/investigative personnel.
- Coordinating sample analyses with the laboratory.

The following is a partial listing of the personnel that will be involved in the field operations for the Pensacola OU3 investigation and their responsibilities:

- Gena Townsend — Project Manager
- Bobby Lewis — Field Project Leader
- Philip Murphy — USEPA Lead Diver
- Peter Kalla — USEPA Diver
- Candace Halbrook — USEPA Diver
- Bruce Pruitt — USEPA Diver

This list of personnel will be supplemented by other resources, including RESAT contract personnel, that may be provided on an as-needed basis. In addition, the Project Manager will arrange for additional personnel (EPA contractors and/or Waste Management Division staff) to be on site to participate in the data collection activities. Contract personnel may be dedicated solely to this investigation for the duration of field activities.

2.1.2 Problem Definition/Background

Background information about the site and a definition of the problem are provided in Section 1.

2.1.3 Project/Task Description

A detailed description of the sampling strategy is provided in Section 3 of this document.

2.1.4 Quality Objectives and Criteria for Measurement Data

Data quality requirements were derived as part of the DQO process provided by the Pensacola Naval Air Station. All samples will be analyzed in accordance with the USEPA, Region IV, SESD, Analytical Support Branch Laboratory Operations and Quality Control Manual (1997b) or as specified by the USEPA Region IV, SESD Quality Assurance Program Statement of Work for Contract Laboratory Program (CLP).

2.1.5 Project Narrative

EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations is provided in the following sections. Section 1.3 provides a description of the hypothesis and attended use of the data. Requirements related to analytical methods, quality control, and sample handling and custody are discussed in Section 2.2.

2.1.6 Special Training Requirements/Certification

All sediment samples will be collected by the USEPA SESD Dive Team. All divers must be certified by the USEPA dive program. In addition, all divers and sample handlers must have completed the Occupational Safety and Health Administration 40-hour Hazardous Waste Worker training.

2.1.7 Documentation and Records

Sample collection, handling, documentation and custody procedures will be done in accordance with the USEPA Region IV, SESD, Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (EISOPQAM, May, 1996).

2.2 Measurement/Data Acquisition

The following section provides discussion on the sampling process design and the requirements for:

- sampling methods,
- sampling handling and custody,
- analytical methods,
- field and laboratory quality control,
- instrument calibration, and
- data acquisition and management.

2.2.1 Sampling Process Design/Sampling Methods Requirements

The sampling strategy, number and type of samples to be collected, and sample locations are presented in Section 3.0 of this document.

2.2.2 Sample Handling and Custody Requirements

All samples will be collected, handled and documented in accordance with Sections 11.0 and 3.0, respectively, of the USEPA, Region IV, SESD, EISOPQAM (1996). A copy of the appropriate sections of the manual, in addition to the project Work Plan and Field Health and Safety Plan, will be maintained in each sampling vessel and onshore command post for reference during all phases of the field sampling activities. If any deviations in sampling procedures are used, these deviations will be recorded in the field logbooks.

2.2.3 Sample Preservation, Containers and Holding Times

All samples will be preserved in accordance with Appendix A of the EISOPQAM (1996) or as determined by the USEPA, SESD Quality Assurance Program Statement of Work (SOW). Holding times and containers are presented in Table 2.1. The containers required for analyses are subject to change depending on the selection of the appropriate laboratory.

2.2.4 Analytical Method Requirements

Detection limits or quantitation limits for metals and extractable organics must be below the lower of the EPA Region IV's ecological screening values or effects values (Table 2.2) or the FDEP threshold effects values (Table 2.3). To meet these limits samples will be analyzed by methods specified in the SOW provided by The USEPA Region IV, SESD, Quality Assurance Program. The SOW will determine and describe the methods needed to achieve required detection limits for all analyses.

Table 2.1 Holding Times and Sample containers for all Analyses			
Parameter	**Container**	**Preservation**	**Holding Times**
Organic Compounds	8 oz. glass with Teflon lid	Cool, 4 C	7 days to extraction 40 days after ext.
Metals	8-oz. glass with Teflon lid	Cool, 4 C	6 months
Cyanide	8-oz. glass with Teflon lid	Cool, 4 C	14 days
Organotins	8-oz. glass with Teflon lid	Cool, 4 C	7 days to extraction 40 days after ext.
AVS SEM	1-quart glass with Teflon lid	Cool, 4 C	Not specified
TOC/Particle Size Analysis	8-oz. glass with Teflon lid	Cool, 4 C	28 days
Grain Size	8-oz. glass with Teflon lid	Cool, 4 C	Not specified

Table 2.2 Region 4 Ecological Screening Values for TCL and TAL Sediment					
Semi-Volatiles and Pesticides	**Effects Value (μg/kg)**	**Screening Values (μg/kg)**	**Target Analyte List**	**Effects Value (mg/kg)**	**Screening Value (mg/kg**
Naphthalene	34.60	330.0	ANTIMONY	2	12
alpha-Chlordane	0.50	1.7	ARSENIC	7.24	7.24
Gamma-Chlordane	0.50	1.7	CADMIUM	0.68	1
4,4'-DDD	1.22	3.3	CHROMIUM	52.3	52.3
4,4'-DDE	2.00	3.3	COPPER	18.7	18.7
4,4'-DDT	1.58	3.3	LEAD	30.2	30.2
Dieldrin	0.02	3.3	MERCURY	0.13	0.13
Endrin	0.02	3.3	NICKEL	15.9	15.9
Gamma-BHC (Lindane)	0.32	3.3	SILVER	0.733	2
Aroclor-1221		21.6	ZINC	124	124
Aroclor-1232		21.6			
Aroclor-1242		21.6			

Table 2.2 Region 4 Ecological Screening Values for TCL and TAL Sediment					
Semi-Volatiles and Pesticides	**Effects Value (μg/kg)**	**Screening Values (μg/kg)**	**Target Analyte List**	**Effects Value (mg/kg)**	**Screening Value (mg/kg**
Aroclor-1248		21.6			
Aroclor-1254		21.6			
Aroclor-1260		21.6			
Aroclor-1016	21.60	33.0			
bis(2-Ethylhexyl) phthalate	182.0	182.0			
Acenaphthene	6.71	330.0			
Acenaphthylene	5.87	330.0			
Anthracene	46.90	330.0			
Benzo(a)anthracene	74.8	330.0			
Benzo(a)pyrene	88.80	330.0			
Chrysene	108.00	330.0			
Dibenzo(a,h)-anthracene	6.2	330.0			
Fluoranthene	113.00	330.0			
Fluorene	21.20	330.0			
1,1'-Biphenyl		1100.0			
4-Bromophenyl-phenylether	1300.0	1300.00			

Table 2.3 FDEP Threshold Effects Level for TCL and TAL Sediment	
Parameters	**TEL**
Inorganics (mg/kg)	
Arsenic	7.24
Cadmium	0.676
Chromium	52.3
Copper	18.7
Lead	30.2
Mercury	0.13
Nickel	15.9
Silver	0.733
Zinc	124
Organics (μg/kg)	
PCBs	21.6
Acenaphthene	6.71
Acenaphthylene	5.87
Anthracene	46.9
Fluorene	21.2
2-methynapthalene	20.2
Naphthalene	34.6
Phenanthrene	86.7
Benzo(a)anthracene	74.8
Benzo(a)pyrene	88.8
Chrysene	108
Dibenzo(a,h)anthracene	6.22
Fluroanthene	113
Pyrene	153
Chlordane	2.26
DDD	1.22
DDE	2.07
DDT	1.19
Dieldrin	0.715
Lindane	0.32
Bis(2-ethylhexyl)phthalate	182

Notes:

TEL = threshold effects level
mg/kg = milligrams per kilogram or parts per million (ppm)
μg/kg = micrograms per kilogram or parts per billion (ppb)

2.2.5 Quality Control Requirements

Quality control (QC) measures will be made in the field and laboratory to ensure that reliable data are obtained.

2.2.5.1 Field Quality Control

Field QC samples to be collected as part of the investigation include a pre-determined background location and duplicate samples as described below:

- Local background samples will be collected from an area already established from previous investigations and determined suitable for providing necessary background information.

- Field splits will be collected to provide information on analytical precision. There will be 1 split collected for every 20 analytical samples. The location of samples will be determined by the field team leader while in the field.

- Equipment rinse blanks will be collected from all sampling equipment to evaluate field decontamination procedures.

2.2.5.2 Onsite Measurements Quality Control

The QC samples prepared and analyzed of onsite measurements include split samples. Splits samples are used for indication of precision associated with the analytical process by calculating the relative percent difference (RPD between two results). As indicated above 1 split will be collected for every 20 laboratory samples collected.

2.2.5.3 Laboratory QC

Laboratory QC will be conducted in accordance with the USEPA Region IV, SESD, Analytical Support Branch Laboratory Operations and Quality Control Manual (1997b), USEPA Quality Assurance Management Plan (1998), or as is specified in the SOW for the CLP provided by the USEPA Region IV, SESD, Office of Quality Assurance.

2.2.6 Instrument Calibration

A Hydrolab multiprobe in-situ water quality measuring device will be used in the field to evaluate water quality conditions (DO, conductivity/salinity, pH and temperature). All field instruments shall be calibrated and maintained in accordance with the EISOPQAM (1996) and the manufacturer's instructions. Results from all instrument calibration procedures will be recorded in a field logbook.

2.2.7 Data Acquisition Requirements

All data acquisition requirements, including sample collection, onsite measurements, and laboratory analysis are presented in Section 3 of this document.

2.2.8 Sample Management

Data resulting from the implementation of the following Sampling and Analysis Plan (SAP) shall be managed and stored in USEPA Region IV, R4LIMS database.

2.3 Data Validation and Usability

All sampling and analytical data will be reviewed to ensure that analyses were performed and reported as required. All CLP data will be validated by OQA, in accordance with the following guidance documents:

- USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, EPA-540/R-94-012 (PB94-963501), February 1994;

- USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, EPA-540/R-94-013 (PB94-963502), February 1994; and

- Data Validation Standard Operating Procedures for Contract Laboratory Program Routine Analytical Services, Revision 2.1, July 1999, Office of Quality Assurance, SESD, USEPA, Region IV.

The Region 4 Office of Quality Assurance provides a data qualifier report for each set of CLP data that is validated. The project leader will review the data qualifier report to determine any data limitations and may consult with Office of Quality Assurance staff to determine the impact of any qualified data on overall data usability for this project.

SECTION 3.0 SAMPLING AND ANALYSIS PLAN

This SAP was developed to address and implement the design developed in Section 1.3. This study will conduct an assessment of the vertical nature and extent of sediment contamination in the Waterfront area. The data generated in this investigation will be used to support the completion of the Record of Decision for Site 2 (Operable Unit 3), Waterfront Sediments.

3.1 Project Schedule and Deliverables

The field investigation described in this document is scheduled for the week of March 7, 2000. Deliverables for this project will be a report consisting of text, tables, and graphs explaining analytical results. A draft report will be submitted within 30 days after receipt of all validated analytical data. Anticipated schedule is as follows:

- Field Study March 6-10, 2000.
- Receive validated analytical results April 20, 2000
- Draft Report will be delivered by May 30, 2000.

3.2 Field Investigation

All sediment samples will be collected by USEPA certified divers. Sampling vessels will be provided by USEPA, SESD.

3.2.1 Sampling Locations

The sampling locations for this investigation are based on the initial RI (Figure 3.1). Figure 3.2 shows the sampling locations for this investigation. Eleven different locations (150' x 150' grids) will be sampled in the area of concern. Two background locations will be selected during the investigation. Sampling locations will be located using real time global positioning system (GPS) equipment and marked with anchored buoys.

3.2.2 Sampling Approach

At each sampling location the vertical extent of sediment contamination will be profiled. Vertical extent will be defined by sampling sediment at three different depth intervals up to 36 inches at the

center point of each grid. The sampling intervals may change depending on field conditions. At all sampling locations the surface interval will be 0-6". The remaining two intervals will depend on the recovered core length of sediment. For example if core penetration is only to 30 inches, then the sampling intervals would be 0-6", 6"-21" and 21"-remaining.

At all the surface sediment (0-6") locations, samples will be analyzed for TAL, extractable organics, pesticides, PCBs, TOC, grain size, acid volatile sulfides with simultaneously extracted metals (AVS SEM), inorganic tin and organic tin (monobutyl, dibutyl, tributyl, and tetrabutyl tin), and ammonia. At the two subsurface intervals samples will be analyzed for TAL, inorganic tin and organic tin (monobutyl, dibutyl, tributyl, and tetrabutyl tin), and ammonia. At the subsurface sediments depths all samples will be analyzed for parameters listed above except for AVS SEM. A summary of samples to be collected is presented in Table 3.1.

Table 3.1
Summary of Analyses to be Performed on Sediment Samples.

Analyses	Surface Sediments	Subsurface B	Subsurface C
Metal Scan/Cyanide	13	13	13
AVS SEM	13	—	—
Extractable organics/pesticides/PCBs	13	13	13
Low Level PAHs (SW)	13	13	13
Organotins	13	13	13
TOC	13	13	13
Grain Size	13	13	13

3.2.3 Sediment Sampling

Sediment samples will be collected, using three different coring devices, by U.S. EPA-certified divers. Minimal compaction of sediment while sampling the top six inches is critical in evaluating data results. Using divers will allow for more control of sediment penetration. For 0-6" surface sediment, samples will be collected using a stainless steel core tube (~ 4" O.D. x 12"). The diver will carefully insert the core tube 6" into the sediment while minimizing compaction. The core tube will carefully be capped on top and bottom and brought

the to the surface for processing. Nine core tubes will be required at each location to produce enough sample volume for analytical and toxicological requirements. The nine core tubes will be brought to the surface and composited and homogenized in a clean stainless-steel bucket. Aliquots will then be collected from the homogenate and placed in the appropriate containers for chemical analysis and toxicity.

Benthic diversity samples will be collected using a 4" x 6" stainless steel benthic core tube. Three benthic cores grabs will be collected at each location (Figure 3). Each grab will be placed in a mesh bag and brought to the surface for processing.

For the two subsurface sediment intervals a decontaminated thin walled stainless steel 36" core tube will be carefully pushed into the sediment to minimize compaction. The SS core tube will be removed from the sediment and capped at both ends and brought to the surface. The sediment will then be extruded from the core tube onto an appropriate length of aluminum foil and the two sediment intervals will be extracted and placed into glass pans for processing. The top 6 inches of each core will be discarded. Samples will be homogenized and placed into the appropriate sampling containers. It is anticipated that 2-3 core tubes will be needed at each location to produce enough sample volume for analytical requirements.

3.2.4 Surface Water Sampling

No surface water samples will be collected for analysis. However, in-situ water quality measurements will be collected. Dissolved oxygen, pH, salinity, and temperature will be measured using a Hydolab Minisonde, a multi-probe in-situ water quality-measuring device. This data will be used to assess the condition of surface water overlying the sediment. Measurements will be collected at the surface and the bottom of the water column at the surface water sediment interface.

3.3 Sample Identification

Samples collected during this investigation will be identified using a unique eight-character format such as: **YY - XXX - ZZZ** indicating media code - sample number - sample or station designator. All sample identification will start with two characters (media code) i.e., sediment (SD), surface soil (SF), etc. The middle three characters will be numeric (sample number) followed by the last three characters that will consist of three letters and/or numbers (sample or station designator).

For example, sediment samples will be identified using the sediment media code "SD". Sample location will be given an numeric number A001" and sediment depth will be indicated using a numeric number; 001 will indicate 0-6", 002 will indicate 6-21" and 003 will indicate 18-30 21-remaining" (Table 3.2).

Table 3.2
Sample Identification

Media Code	Sample Media YY	Sample Location XXX	Sediment Depth Code ZZZ	Sediment Depth
SW	Surface Water	001-020	001	0-6"
SD	Sediment	001-020	002	6"-21"
OT	Other (Unknown)	001-020	003	21" -?
	Split Samples	100-120		
QA	All QA Samples	200-220	—	—

The identification of samples collected for field QA/QC purposes will follow the same general format as the other samples. However, field QA/QC samples will be identified using the following format: **QA - XXX - ZZZ** indicating field QA/QC material - sample number - QA/QC sample designator. All QA/QC sample identification will start with the letters AQA for the sample to be properly identified. The middle three characters will be numeric (sample location), from Table 3.2, followed by the last three characters which will consist of three letters (QA/QC sample designator). The following three character scheme, if applicable, in Table 3.3, will be used for the QA/QC sample designators.

Table 3.3 QA/QC Sample Designations	
QA/QC DESIGNATOR ZZZ	DESCRIPTION
TBW	TRIP BLANK — WATER
OFW	ORGANIC FREE WATER BLANK
ERB	EQUIPMENT RINSE BLANK
PRE	PRESERVATIVE BLANK

A copy of the chain-of-custody form will remain at the project leader to insure the continuation of the proper numbering sequence throughout the project is maintained. The account number that will be used by the field personnel throughout the field sampling portion of the investigation will be 50102D 04EG. Laboratory project numbers will be assigned at a later date.

3.4 Sample Collection and Handling Procedures

All samples will be collected, preserved, handled and documented in accordance with the EISOPQAM. A copy of the manual, in addition to the SAP and Field Health and Safety Plan, will be maintained with the project officer for reference during all phases of the field sampling activities. If any deviations in sampling procedures are used, these deviations will be recorded in the field logbooks.

3.4.1 Field Equipment Decontamination Procedures

All field equipment will be pre-cleaned in accordance with the USEPA Region IV, SESD, EISOPQAM (May, 1996). All field decontamination procedures will be in accordance with the EISOPQAM. It is anticipated that a small-scale decontamination area will be set up on the sampling boats to clean the SS core tubes and buckets between sampling locations.

All decontamination liquids will be collected and containerized. These wastes will be handled in accordance with a typical Investigation Derived Waste (IDW) management plan. The following identifies the types of IDW anticipated to be generated during the investigation and their disposition.

- Waste solvents generated during the cleaning of equipment will be re-contained in the original four-liter jugs, conspicuously labeled as IDW, placed in the factory shipping boxes and returned to the SESD laboratory. This material will be entered into the laboratory's hazardous waste tracking system for appropriate disposal.

- Clothing and miscellaneous trash generated during the investigation will be bagged and placed in a commercial Dumpster for appropriate disposal.

3.4.2 Instrument Calibration

All field instrumentation will be calibrated in accordance with the EISOPQAM (May 1996).

3.4.3 Management of Investigation-Derived Wastes

The SESD project leader will ensure that all investigation-derived wastes (IDW) are handled in accordance with Section 5.15 of the USEPA Region IV, SESD, EISOPQAM (May, 1996) (Appendix A).

SECTION 4.0 REFERENCES

EISOPQAM, 1996. USEPA Region IV, SESD, Environmental Investigations Standard Operating Procedures and Quality Assurance Manual. 1996.

EnSafe, 1996. Remedial Investigation, Site 2, Naval Air Station, Pensacola, Florida. EnSafe/Allen & Hoshall, Memphis, Tennessee.

Appendix

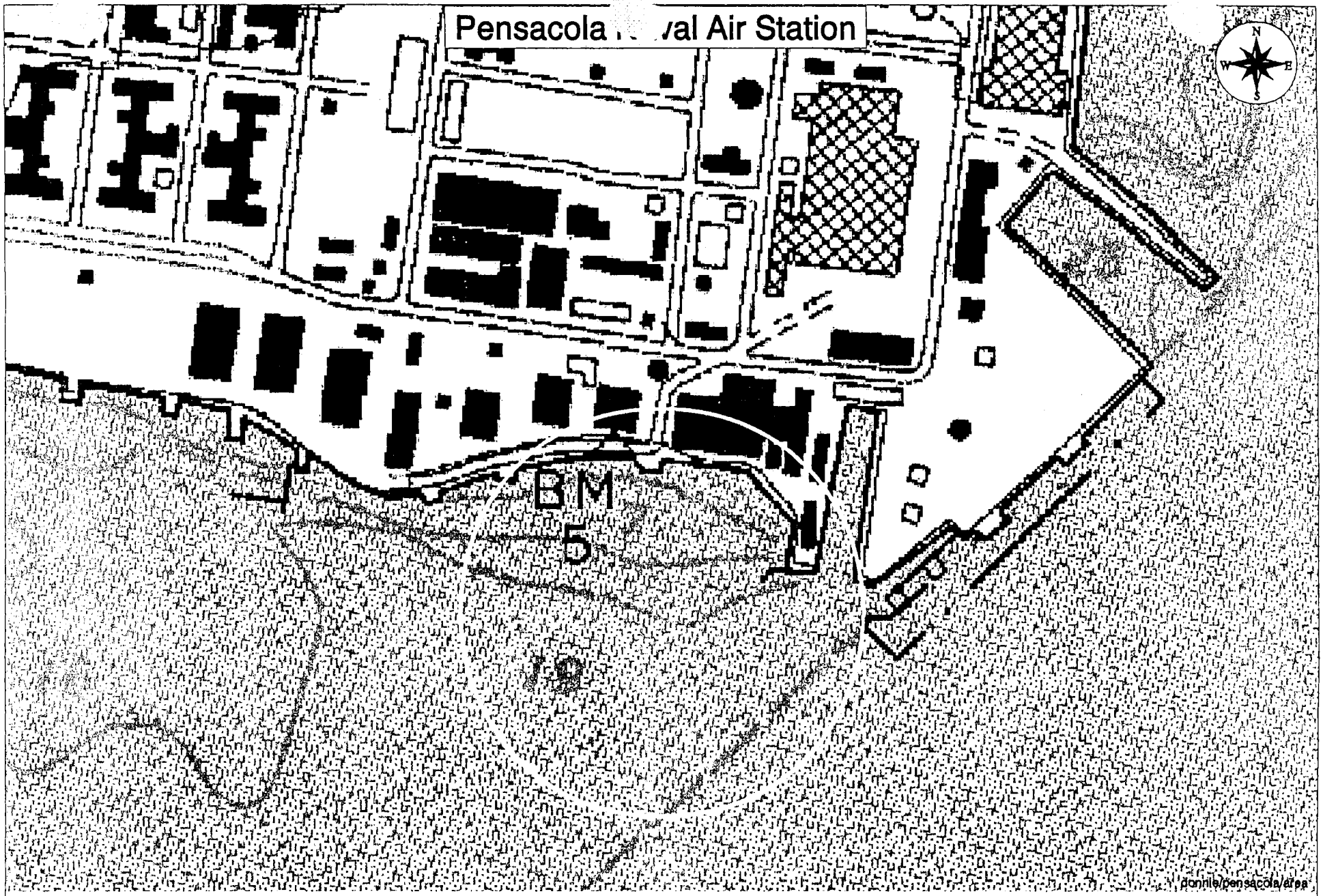


Figure 1.1 Map showing the area of concern, OU3, Site 2, waterfront sediments

LEGEND Area of concern

0 500 1000 1500 Feet

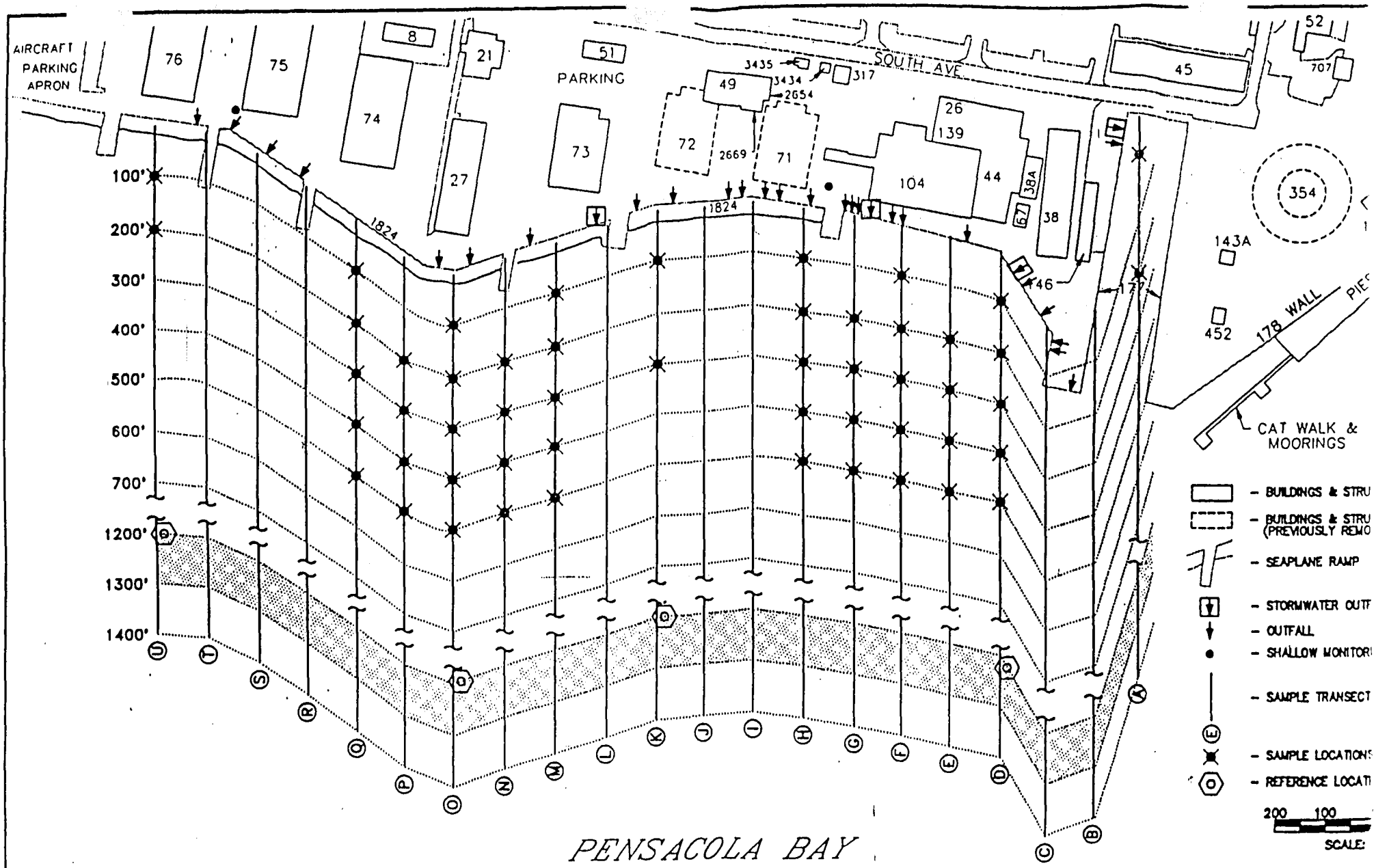


Figure 3.1 Map showing the sampling locations of the initial RI.

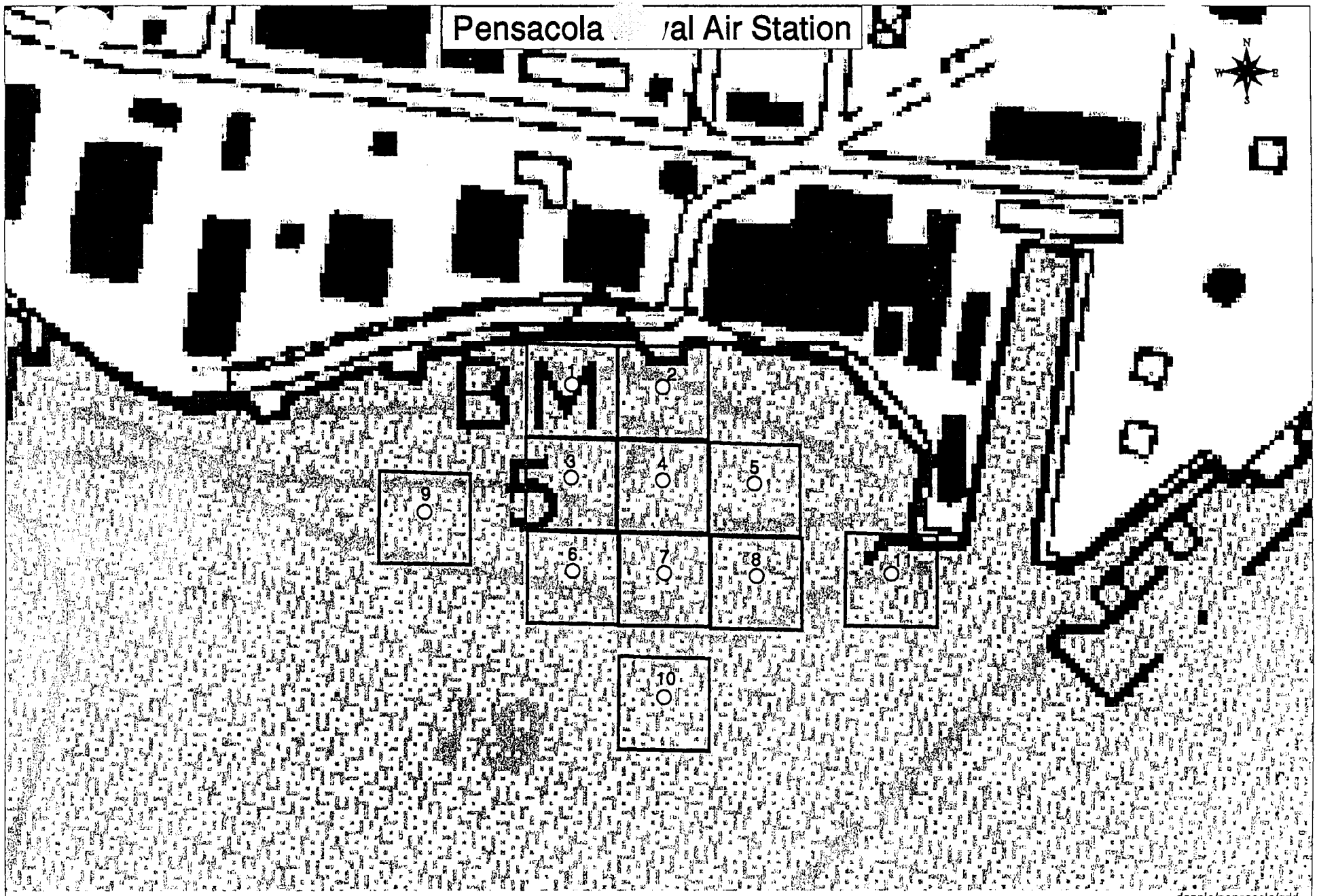


Figure 3.2 Map showing the 150' x 150' sampling grids for this investigation.

LEGEND Sampling grids

0 100 200 300 400 500 Feet

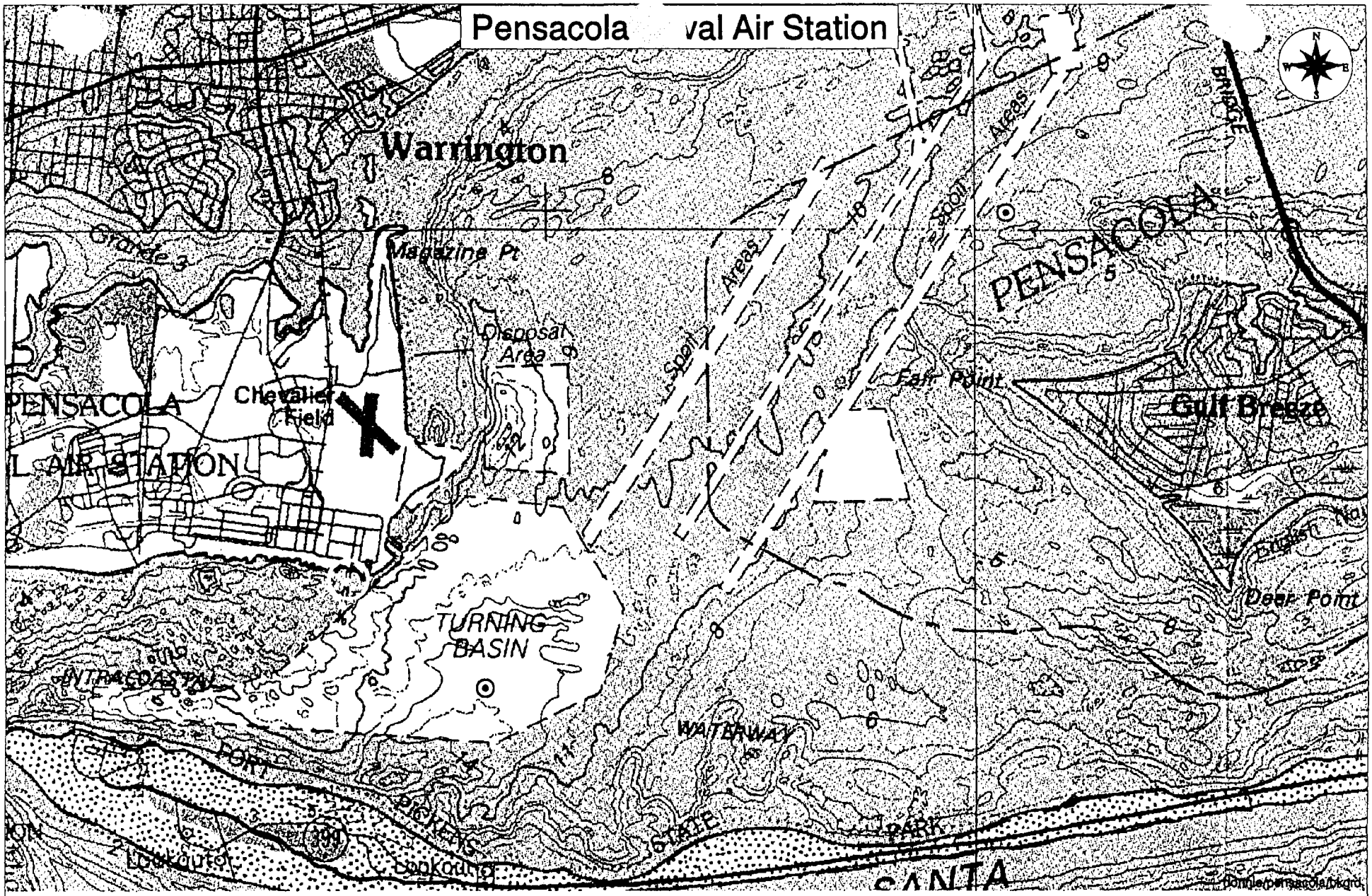


Figure 3.3 Map showing background locations in relation to the study area and recognizable landmarks.

LEGEND

Area of concern

Background locations

0 1 2 3 Miles

Volume 3

Post-RI Sampling and Analysis Plan Site 2 NAS Pensacola

Table of Contents

INTRODUCTION 1

SAMPLING 2

Locations 2

Methodology 2

Additional Considerations 5

List of Figures

Figure 1 Post-RI Sampling Locations 3

List of Tables

Table 1 Test Conditions and Test Acceptability Criteria for the Mysid, Mysidopsis Bahia, Seven-Day Survival, Growth, and Fertility Test with Sediments 6

Table 2 Test Conditions for Conducting a 10 Dat Sediment Toxicity Test with the Amphipod, Leptocheirus, Plumulosus 7

MEMORANDUM

To: Pensacola Tier 1 Team

From: Allison Harris, EnSafe Inc.

Date: March 3, 2000

RE: POST-RI SAMPLING AND ANALYSIS PLAN
SITE 2 NAS PENSACOLA

INTRODUCTION

This Sampling and Analysis Plan has been developed to support the completion of a Record of Decision for Site 2 — Waterfront Sediments — NAS Pensacola. Specifically, this plan is designed to complete the assessment of the nature and extent of contamination at this site, and to provide the data needed to execute a removal of contaminated sediment from the site, if necessary. The required work will entail the collection and analysis of subaqueous sediment cores, toxicity and species diversity sample collection and analysis, and the preparation of a report detailing the work conducted and the data analyses. The additional data are required to refine the contamination at the site because of a) a significant change in site conditions since the initial RI sampling (i.e., Hurricane Georges) and b) a data gap in the initial RI. Since the RI sampling, the site has experienced a hurricane and a number of tropical storms, which would suggest that sediment redistribution may have occurred. Additionally, in accordance with the approved SAP, the initial RI data assessed the upper 6 inches of sediment only; data regarding deeper intervals was not collected. The following text describes the work to be conducted during this sampling effort.

A complete history of the site, and a detailing of the RI sampling locations and methodologies, is included in the RI report (EnSafe, 1997). The overall goal of this sampling effort is "to conduct a one-time sampling event that will delineate the vertical/horizontal extent of contamination such that a removal may be planned and executed based on the sampling results. Confirmatory sampling after the dredging (if necessary) will provide the evidence for site closure."

This Sampling and Analysis Plan (Volume 3) focuses on the benthic community surveys and sediment toxicity testing. The other leg of the triad, sediment chemistry, is addressed in the Sampling and Analysis Plan presented in Volume 2. Both of these documents will fulfill the requirements of the Data Quality Objective document contained in Volume 1.

SAMPLING

The brevity of this plan reflects the anticipation that USEPA's Environmental Services Division (ESD) will conduct the sampling and will complete a separate Sampling and Analysis Plan. Sampling will be conducted in accordance with the SOPQAM.

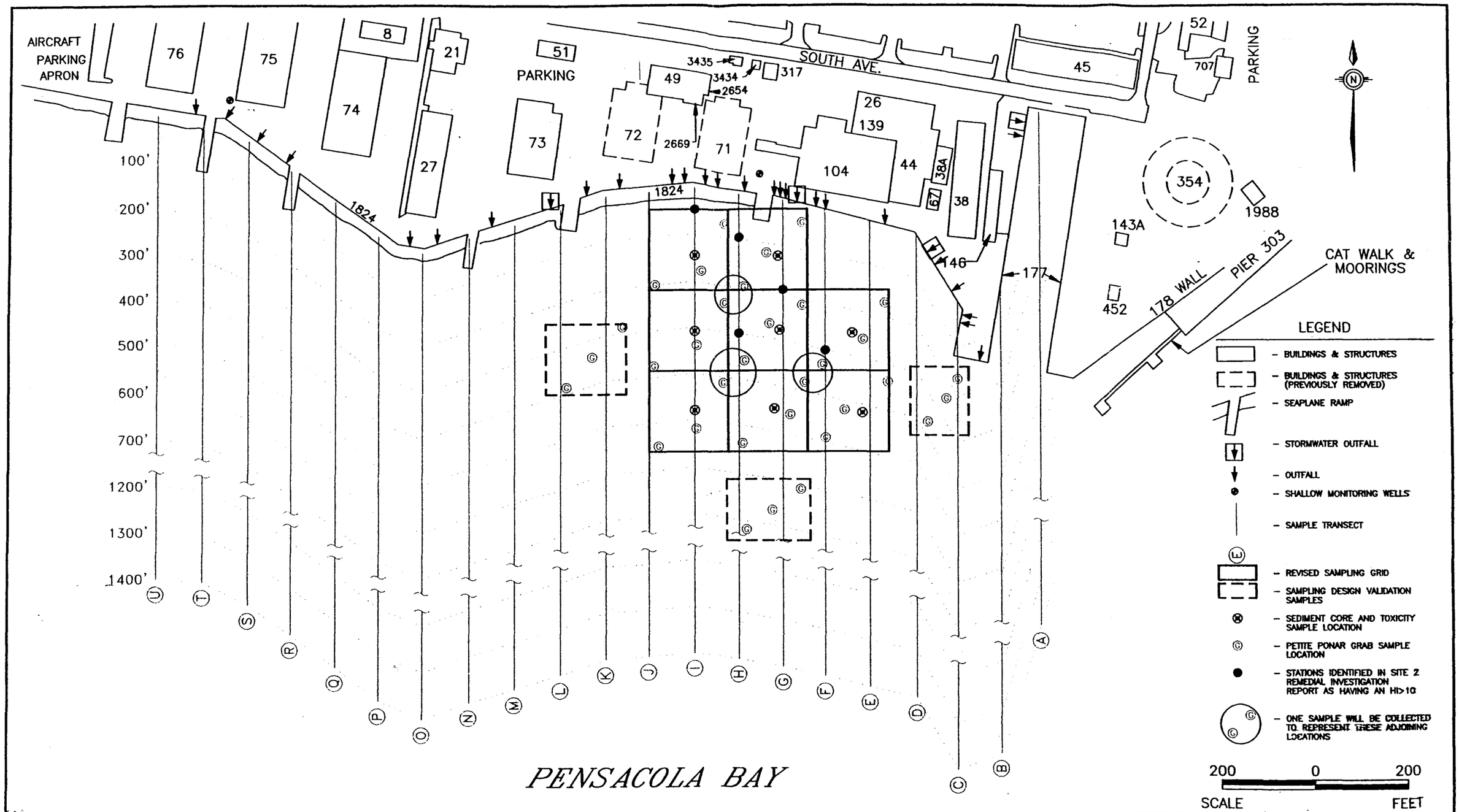
Locations:

Figure 1 presents the proposed sampling locations for this effort. In the initial RI, contamination was defined using the calculation of a Hazard Index, or HI, for the various sampling locations. The RI identified an area of HIs greater than 10 located in the eastern portion of the site. This area provides the focus for this additional sampling.

This plan calls for the collection of sediment at 13 decision units within and outside of the HI > 10 area for chemical, diversity and toxicity analyses. The assumption has been made that if a removal is to occur, it will encompass all sediment up to the seawall on the northern boundary of Site 2. Eight decision units are in the area identified as being impacted in the RI report. Three decision units are identified outside the impacted area to validate the sampling scheme. Two other decision units are background locations. The decision units are defined in the DQO document provided in Volume 1.

Methodology:

General — Sampling at each decision unit will encompass a 36" sediment core, a series of sediments collected from the upper 6 inches of the sediment using a decontaminated 6" long, 4" diameter stainless-steel core tube, which will be composited for sediment chemistry characterization and sediment toxicity tests, and three discreet decontaminated 6" long, 4" diameter stainless-steel benthic core tubes for the species diversity.



SAMPLING AND ANALYSIS PLAN
SITE 2
NAS-PENSACOLA
PENSACOLA, FLORIDA

FIGURE 1
POST-RI SAMPLING LOCATIONS

DWG DATE:02/11/00 | DWG NAME:0083G012

Sample collection should occur in the following order at each decision unit: species diversity first, sediment chemistry and sediment toxicity composites second, and sediment core last.

Sediment samples will be collected downstream first and then proceed upstream for the next sample, and then upstream for the next (last) sample at that location. Samples will be discreet, that is each labeled, handled, and collected separate from each other for each location. There will be no compositing of samples for the species diversity study.

Sediments for the diversity study will be collected using decontaminated 6" long, 4" diameter stainless-steel benthic core tubes and emptied into a clean stainless-steel bowl. The diversity samples will be collected at three locations along a gradient in each decision unit as shown in Figure 1. Each grab will be sieved through a U.S. Standard No. 30 sieve (0.595 mm opening) to remove sediments and their components (sand, silt, and clay). Organisms retained on the sieve will be washed into a labeled sample jar and preserved with a solution of 10% buffered formalin or 70% ethanol.

Sediment intended for sediment chemistry and sediment toxicity will be collected at eight locations within the decision unit. At each of the eight locations, the samples will be collected from the upper 6 inches of the sediment using a decontaminated 6" long 4" diameter stainless-steel core tube (to be supplied by personnel from USEPA Region IV). The sediment will be composited and placed into the containers provided by the testing facility. The volume for the sediment toxicity tests should be 1 gallon (3.75 liters) composited sediment per decision unit. Core sampling is described in the Sampling and Analysis Plan provided in Volume 2. Chemistry samples will be collected in accordance with the SAP completed by USEPA in Volume 2.

Analysis — In addition to the chemical analysis performed by USEPA, toxicity (mysid and Leptocheirus) and diversity tests will be conducted by EnSafe. Toxicity test criteria are presented in Tables 1 and 2. Diversity analysis will include the following summary statistics:

- Number of each taxon per replicate/station
- Total individuals per replicate/station
- Number of taxa per replicate/station
- Individual density (#/m^2) per station
- Standard deviation of individual density per station
- Species diversity
- Species evenness
- Species equitability
- Species richness
- Phylogenetic listing

Additional Considerations:

This plan has been developed with the intent of delineating contamination quickly at Site 2 for the purposes of scoping a potential removal action. Some screening techniques for inorganics can and may be strategically employed to further refine the sampling effort, but if used, these techniques need to be identified and their use described for prior approval of their use by the Tier 1 Team.

Table 1 Test Conditions and Test Acceptability Criteria for the Mysid, *Mysidopsis Bahia*, Seven-Day Survival, Growth, and Fecundity Test with Sediments	
1. Test type:	Static renewal
2. Salinity:	20 ppt (± 2 ppt of the selected test salinity).
3. Temperature:	26° ± 1° C
4. Light quality:	Ambient laboratory illumination.
5. Light intensity:	10-20 $E/m^2/s$ (50-100 ft-c.)(ambient laboratory levels).
6. Photoperiod:	16 h light, 8 h darkness, with phase in/out period.
7. Test chamber:	8 oz plastic disposable cups, or 400 ml glass beakers.
8. Sediment volume:	2 cm
9. Overlying water volume:	150 ml per replicate.
10. Renewal of overlying water:	Daily
11. Age of test organisms:	7 days
12. No. organisms per test chamber:	5 (minimum)
13. No. replicate chambers per concentration:	8 (minimum)
14. No. larvae per concentration:	40 (minimum)
15. Source of food:	Newly hatched *Artemia* nauplii (less than 24 h old).
16. Feeding regime:	Feed 150 24 h old nauplii per mysid daily, half after test solution renewal and half after 8-12 h.
17. Cleaning:	Pipette excess food from cups daily immediately before test solution renewal and feeding.
18. Aeration:	None unless DO falls below 4.0 mg/L, then gently aerate in all cups.
19. Overlying water:	Clean sea water, natural or reconstituted water.
20. Test concentrations:	Sediments: Minimum of 3 and a control sediment.
21. Sediment concentrations:	Sediments to be serially diluted with clean sediment. Sediment concentrations will be 100, 50, and 25%.
22. Test duration:	7 days
23. Endpoints:	Survival, growth, and egg development.
24. Test acceptability criteria:	80% or greater survival, average dry weight 0.20 mg or greater in controls; fecundity may be used if 50% or more of females in controls produce eggs.

Note:
Modified from: U.S. Environmental Protection Agency. (1991). *Short-term methods for estimating the chronic toxicity of effluents and receiving waters to marine and estuarine organisms.* Environmental Monitoring and Support Laboratory, Cincinnati, OH. EPA/600/4-91/028.

Table 2 **Test Conditions for Conducting a 10 Day Sediment Toxicity Test with the Amphipod, *Leptocheirus Plumulosus***	
1. Test type:	Whole sediment toxicity test, static.
2. Temperature:	25° C
3. Salinity:	20 ppt (± 2 ppt of the selected test salinity)
4. Light quality:	Wide-spectrum fluorescent lights
5. Illuminance:	500 - 1000 lux
6. Photoperiod:	24L:0D
7. Test chamber:	1-L glass beaker or jar with - 10 cm I.D.
8. Sediment volume:	175 ml (2 cm)
9. Overlying water volume:	800 ml
10. Renewal of overlying water:	None
11. Size and life stage of amphipods:	2 - 4 mm (no mature males or females).
12. No. of organisms/chamber:	20 per test chamber.
13. No. of replicate chambers/treatment:	Depends on objective of test. At a minimum, four replicates must be used.
14. Source of food:	GORP - US EPA recipe.
15. Feeding:	Twice during test duration; day 2 and day 6.
16. Aeration:	Water in each test chamber should be aerated overnight before start of test, and throughout the test; aeration at rate that maintains 90% saturation of dissolved oxygen concentration.
17. Overlying water:	Clean sea water, natural or reconstituted water.
18. Overlying water quality:	Temperature daily. pH, ammonia, salinity, and DO of overlying water at least at test start and end. Salinity, ammonia, and pH of pore water.
19. Test duration:	10 days
20. Endpoints:	Survival and growth.
21. Test acceptability criteria:	Minimum mean control survival of 90% in the control exposure. Growth endpoint will be determined by subsampling the population at test initiation to establish a baseline weight. Organism weight at test termination will be compared to the control exposures and calculated using a T-test.

Note:
Modified from: U.S. Environmental Protection Agency. *Methods for assessing the toxicity of sediment-associated contaminants with estuarine and marine amphipods*. EPA/600/R-94/025.

Appendix B
Analytical Results

FINAL REPORT
PENSACOLA NAVAL AIR STATION
SEDIMENT SURVEY OPERABLE UNIT 3

PENSACOLA NAVAL AIR STATION
PENSACOLA, FLORIDA

AUGUST, 2001

PREPARED BY:

Robert J. Lewis
Life Scientist

U.S. EPA Region IV
Science and Ecosystem Support Division
Enforcement and Investigations Branch
Hazardous Waste Section

DRAFT REPORT
USEPA REGION 4

Title and Approval Sheet

FINAL REPORT
PENSACOLA NAVAL AIR STATION
SEDIMENT SURVEY OPERABLE UNIT 3

EPA PROJECT # 00-0026

Prepared By: _____ Date: 8/1/01
Robert J. Lewis
Project Leader
USEPA SESD

Reviewed By: _____ Date: _____

Issued By: _____ Date: _____

Approved By: _____ Date: 8/6/01
Gena Townsend
Remedial Project Manager
USEPA Region IV

TABLE OF CONTENTS

1.0 INTRODUCTION 1
Background 2
1.2 Objectives 2

2.0 METHODS 2
2.1 Sampling Locations 2
2.2 Sediment Sampling 3

3.0 RESULTS 6
3.1 Sediment Chemistry Results 6
3.1.1 Metals Analysis 6
3.1.2 Acid Volatile Sulfides - Simultaneously Extracted Metals (AVS_SEM) Analysis 10
3.1.3 PAH Analysis 11
3.1.3.1 PAH Hazard Quotient Analysis 13
3.1.3.2 Total PAH's 15
3.1.4 Pesticides/PCB Analysis 17
3.1.5 Organic Tin 18
3.1.6 Semi-volatiles Analysis 18
3.1.7 Percent Orgainc Matter and Particle Size Distribution Analysis 19
3.1.8 Surface Water 22

List of Tables

Table 2.1. Sampling Coordinates 3
Table 2.2 Summary of sediment collection efforts. 5
Table 3.1 Summary of Maximum Metals Concentrations Compared to 2 x Background. 7
Table 3.2 Summary of all Metals with BV HQ's greater than 1 using Region 4's benchmark values. 9
Table 3.3 Summary of SEM/AVs data. 10
Table 3.5 Screening values used for the PAH hazard quotient analysis 13
Table 3.8 Total PAH Hazard Quotient Using USEPA Region 4's Screening Value of 1684 ug/kg. 15
Table 3.6. Summary of PAH analysis in surface sediments. 16
Table 3.7 Summary of PAH analysis in subsurface sediments. 17
Table 3.10 Summary of detected SVOC's and their HQ's. 19
Table 3.11 Summary of percent organics and inorganics for all sediment samples. 20
Table 3.9 . Summary of the HQ analysis for all detectable Pesticides/PCBs 21
Table 3.12 . Summary of In-situ water quality measurements recorded during the investigation 22
Appendix A Analytical Data
Appendix B Results of the Hazard Quotient Analysis

1.0 INTRODUCTION

This draft report summarizes the sediment chemistry data for completing a Remedial Investigation of the Pensacola Naval Air Station , Superfund site, Site- 2 (Operable Unit 3), Waterfront Sediments.

This study was conducted to assess the vertical nature and extent of sediment contamination in the Waterfront area. The sediment Quality "Triad" approach will be utilized to assess sediment contamination at Site 2 (OU3). The triad uses three different methods of characterizing sediment; sediment chemistry, sediment toxicity and benthic community structure. All three lines of evidence will be used to assess sediment contamination of Site 2 and will be used by the risk manager for decision making. This report focuses on the sediment chemistry part for the triad. The other two legs of the triad, benthic community surveys and sediment toxicity, will be addressed in another Report provided by the Navy.

1.1 Background

The Pensacola Naval Air Station (NAS) was placed on U.S. EPA's National Priority List 1989. Operable Unit 3 (OU3), or Site 2, is located on the southeastern shoreline of the NAS along Pensacola Bay. From 1939-1973 untreated industrial wastes from base facilities were routinely discharged into Pensacola Bay, near Site-2. An estimated 83 million gallons of industrial waste was disposed of in the Bay. The waste consisted of : waste containing paint, paint solvents, thinners, ketones, trichloroethylene, alodine, mercury, and concentrated plating waste (primarily chromium, cadmium, lead, nickel, and cyanide). The Remedial Investigation of the site showed the presence of metals, PAH's, pesticides and polychlorinated biphenyls (PCBs) in the sediments. The results of the RI and baseline ecological risk assessment also described five areas where contaminated sediment posed unacceptable risk to the environment.

The results of the RI report was based on data collected before hurricanes (Erin and Opal) which passed through this area in 1995. The hurricanes raised concerns that the unacceptable sediment contaminants detected may have been redistributed since the last data collection was preformed. Before any remedial action is selected and implemented, sediment contamination in OU 03 needs to be reevaluated and vertical extent defined. At the November 1998 NAS Pensacola Partnering meeting, EPA agreed to assist the Navy in collecting the additional data required at this site. The NAS Pensacola Partnering team then developed a Data Quality Objective Summary (dated 2/14/00), which satisfied each Agency's concerns and identified required fieldwork. This report focuses on the sediment chemistry data.

The initial RI did not describe the vertical extent of contamination in the sediments. Only surface sediments were collected and analyzed. If the selected remedial alternative requires removal of contaminated sediment, it is unclear how much sediment would need to be removed. Only horizontal extent has been defined.

1.2 Objectives

The objective of this report is to document field activities conducted at OU03 during the collection of sediment samples and summarize the sediment chemistry data as outlined in the DQO Summary Document dated 2/14/00.

2.0 METHODS

2.1 Sampling Locations

The sampling locations for this investigation were based on the initial RI 0f OU3. Eleven different locations (150' x 150' Decision Units (DU)) were sampled in the area of concern, DUs 1 - 11, as described in the Work Plan. Only one location was moved during the investigation. DUs DUs 9, 10, and 11 were perimeter locations to assess if the contamination had redistributed outside the area of concern (DUs 1-8) DU 11 was originally placed too far into the main channel of the Navy's port operations. It was determined that this would be logistically too difficult to sample by diving because of the amount of boat traffic moving through the channel are during the day. In addition the location may not be representative of a depositional area based on the fact it was the main channel coming out of the Navy's boat and ship docks. Therefore, DU 11 was moved father north inside the old submerged seawall which would be more representative of a depositional area. Two background locations were selected based on other investigations, locations 18 and 22. Sampling locations were located using real time G.P.S. equipment and temporarily marked with anchored buoys. All sampling location coordinates are presented in Table 2.1. Figures 1 and 2 show the sampling locations for this investigation.

Table 2.1. Sampling Coordinates

	UTM Coordinates	
DU #	X	Y
1	474091.8	3356813.0
2	474137.7	3356812.0
3	474091.3	3356766.0
4	474137.7	3356765.0
5	474184.0	3356763.0
6	474092.2	3356720.0
7	474138.4	3356718.0
8	474184.8	3356717.0
9	474017.8	3356749.0
10	474138.1	3356656.0
11	474252.1	3356718.0
18	475421.7	3355668.7
22	480320.6	3360126.0

2.2 Sediment Sampling

Sediment samples were collected using two different coring devices by U.S. EPA certified divers. Minimal compaction of sediment while sampling the top six inches was critical for evaluating data results. Using divers allowed for more control of sediment penetration. For 0-6" surface sediments, samples were collected using a decontaminated stainless steel core tube (~ 4" O.D. x 12"). The diver inserts the core tube 6" into the sediment while minimizing compaction. The core tube was then capped on top and bottom and brought the to the surface for processing. The core tubes were brought to the surface and composited and homogenized in a clean stainless steel bucket. Aliquots were then collected from the homogenate and placed in the appropriate containers for chemical analysis and toxicity.

The predetermined number of replicates (8) for each DU was based on the estimated sample volume needed to produce enough sample for analytical and toxicological requirements. Between 6 and 10 core tubes were collected at each location. It was determined in the field that six cores would satisfy sample volume requirements. Locations where splits were collected required an additional 2 cores, a total of 10, to satisfy sample volume requirements.

Benthic diversity samples were collected using a 4" x 12" stainless steel benthic core tube. Three benthic cores grabs were collected at each location from 0"-6". Each grab was placed in a mesh bag and brought to the surface and processed by Ensafe biologists for the US Navy.

For the two subsurface sediment intervals a decontaminated thin walled stainless steel 2" x 36" core tube was carefully pushed into the sediment to minimize compaction. The SS core tube was removed from the sediment and capped at both ends and brought to the surface. The sediment cores were then extruded from the core tube onto an appropriate length of aluminum foil for extracting the subsurface sample.

The Sampling and Analysis Plan indicated that three intervals would be sampled from the 36"core, 0-6", 6"-21" and 21"-remaining". In the field, however, only one interval was collected from the 36" core tube. The divers were able to insert the core tubes into the sediment the appropriate depth (>30"). However, a 30" core was not recovered due to compaction and or spreading of sediment during the core tube insertion. It was difficult to distinguish between the 3 sampling intervals, so it was determined that the top 4"-6" of the core would be removed and the remaining lower core length was used as a subsurface sample >6". The exact number of subsurface samples collected and the amount of compaction for each core is presented in Table 2.2. The subsurface sample was then homogenized and placed into the appropriate sampling containers.

Subsurface sediment cores were not collected at 5 of the DUs (2,6,7,8, and 10). In general, the substrate at these locations were sandy to hard packed sand. There was little to no soft organic deposits. Therefore, the divers were unable to penetrate greater than 6 inches with the core tubes to retrieve a subsurface sample for analysis. Compaction of the subsurface cores was determined by calculating the percent recovery from a 36" core tube. For example, the core tube penetrated

the surface 36", but only 18 inches was recovered, therefore the compaction would be 50 percent.

At all the surface sediment (0-6") locations, samples were analyzed for TAL metals and cyanide, extractable organics, pesticides, PCBs, TOC, grain size, acid volatile sulfides with simultaneously extracted metals (AVS SEM), inorganic tin and organic tin (monobutyl, dibutyl, tributyl, and tetrabutyl tin) and ammonia. The subsurface samples were analyzed for , extractable organics, pesticides, PCBs, TOC, grain size, TAL, inorganic tin and organic tin (monobutyl, dibutyl, tributyl, and tetrabutyl tin). AVS SEM was not analyzed in subsurface samples.

Table 2.2 Summary of sediment collection efforts.

Surface Sediments			Subsurface Sediments			
DU #	Sample ID	Surface Samples Number of Cores Collected	DU #	Subsurface Samples Number of 30" Cores Collected	Core Length Recovered (inches)	% Compaction
1	SD001	9	1	2	6"-15"	50
2	SD002	9	--	--	--	--
3	SD003	9	3	2	6"-16"	47
4	SD004	7	4	2	6"-15"	50
5	SD005	7	5	2	6"-16	47
6	SD006	10*	--	--	--	--
7	SD007	7	--	--	--	--
8	SD008	7	--	--	--	--
9	SD009	10*	9	2	6"-15"	50
10	SD010	7	--	--	--	--
11	SD011	7	11	2	6"-17"	43
18	SD018	6	18	2	6"-24"	20
22	SD022	7	22	2	6"-24"	20

3.0 RESULTS

Sediment was collected from thirteen locations, 11 DUs representing OU3 and two background locations. Surface sediment samples were collected from all 13 locations, but subsurface samples were collected from only eight locations. At five of the locations divers could not penetrate the sediment greater than a few inches due to the bottom substrate being hard packed sand.

Initially nine random cores were collected from the DUs to ensure plenty of sample volume was available for all analytical and toxicity requirements. After the first three locations, it was determined that 7 cores provided the required sample volume. At two DU locations additional cores were collected to provide sufficient volume for QA/QC split samples. Table 2.2 presents a summary of the sediment collection efforts.

3.1 Sediment Chemistry Results

The following sections describe the analytical results by the different analyses. USEPA Region IV, Office of Technical Services Supplemental Guidance to RAGS (1996) provides ecological benchmark values to be used in Region 4 for many organic and inorganic compounds as well as effects values (EV) associated with these compounds. Analytical results from this investigation were compared to USEPA Region 4 ecological benchmark values (1996). Hazard quotients (HQ) were calculated for each inorganic and organic compound that had a benchmark value. If USEPA Region 4 did not have a benchmark value for a particular compound then an alternative value was taken from G.P. Friday (1998). This is considered appropriate as part of the COPC refinement process of an ecological risk assessment. Results of the hazard quotient analysis is presented in Appendix B.

3.1.1 Metals Analysis

Analytical results for the metals scan is presented in Appendix A. Table 3.1 compares the maximum metals concentration in OU3, DUs 1-11, to the background locations. Shaded rows in Table 3.1 indicate those metals whose concentrations were greater than two times background. In surface sediments, nine metals are considered elevated based on Table 3.1, antimony, barium cadmium, chromium, copper, lead, tin, total mercury and zinc. In subsurface sediments 13 metals are elevated greater than background including antimony, barium, cadmium, calcium, chromium, copper, lead, manganese, silver, thallium, tin, total mercury and zinc.

Table 3.1 Summary of Maximum Metals Concentrations Compared to 2 x Background.

	Surface Sediments									Subsurface Sediments								
	Backgrounds				Mean	DU		DU Max >		Backgrounds				Mean	DU		DU Max>	
METALS (MG/KG)	SD01801		SD02201		2 x Bkg	Max	DU #	2 x Bkg?		SD01802		SD02202		2 x Bkg	Max	DU #	2 x Bkg?	
ALUMINUM	4100		19000		23100	12000	9			3200		16000		19200	15000	11		
ANTIMONY	0.093	J	0.31		0.403	1.8	11	Yes		0.15		0.32		0.47	2.7	3	Yes	
ARSENIC	5		18		23	16	5			5.1		17		22.1	18	11		
BARIUM	7.9		24		31.9	150	5	Yes		5.7		24		29.7	36	11	Yes	
BERYLLIUM	0.26		1.1	J	1.36	0.73	9			0.23	J	1	J	1.23	0.91	11		
CADMIUM	0.075		0.22		0.295	5.2	4	Yes		0.087		0.25		0.337	2.9	3	Yes	
CALCIUM	21000		17000		38000	28000	9			18000		13000		31000	41000	1	Yes	
CHROMIUM	13		50		63	100	1	Yes		12		49		61	99	3	Yes	
COBALT	1.2		6.6		7.8	4.2	9			1.2		6.5		7.7	5.2	3		
COPPER	3.7		13		16.7	66	5	Yes		3.4		13		16.4	75	11	Yes	
CYANIDE	0.22	UR	0.45	UJ	0.67	0.48	ND			0.2	UJ	0.36	UJ	0.56	ND	ND	ND	
IRON	6800		32000		38800	20000	9			4400		24000		28400	23000	4		
LEAD	5.7	J	24		29.7	640	5	Yes		5.6		24		29.6	230	4	Yes	
MAGNESIUM	2500		11000	J	13500	7700	9			2200	J	8300	J	10500	8400	9		
MANGANESE	110	J	440		550	420	9			68		320		388	540	9	Yes	
NICKEL	3.7		14		17.7	10	4			3.7		13		16.7	15	11		
POTASSIUM	650		3400		4050	2200	9			600		2700		3300	2800	1		
SELENIUM	0.87		1.8		2.67	2.2	9			0.85		1.7		2.55	2.3	11		
SILVER	0.072	U	0.15	U	0.222	0.21	5			0.065	U	0.12	U	0.185	2.2	3	Yes	
SODIUM	7800		27000		34800	26000	9			5400		19000		24400	22000	9		
THALLIUM	0.065		0.19		0.255	0.17	9			0.063		0.19		0.253	0.27	11	Yes	
TIN	0.41		1.6		2.01	83	5	Yes		0.41		1.4		1.81	5.5	11	Yes	
TOTAL MERCURY	0.019		0.11		0.129	0.21	5	Yes		0.021		0.1		0.121	0.81	11	Yes	
VANADIUM	14		39		53	37	9			14		38		52	42	9		
ZINC	13		70		83	670	9	Yes		12		62		74	130	130	Yes	

ND = Non detect

Metals Hazard Quotient Analysis

Hazard quotients were calculated for all metals data. Appendix B presents the results of the HQ analysis for metals. The metals HQ data presented in Table 3.2 shows the metals and sampling locations (DUs) where the HQ's were greater than 1, indicating potential ecological risk. All other metals and /or DUs not listed in this table had HQ's less than 1 or screening values were unavailable. The benchmark values used for the HQ analysis are also presented in Appendix B.

Hazard quotients, using USEPA Region 4's benchmark values (BV), for all metals ranged from 1 to ~22. Only one location had an BV HQ greater than 10. Surface sediments in DU # 5 had 640 mg/kg of lead resulting with an BV HQ of 21.2. One of the background locations (DU 22) had arsenic levels of 18 and 17 mg/kg in the surface and subsurface sediments, respectively, resulting in HQ's 2.49 and 2.39 respectively. The metals that had HQ's greater than one were primarily arsenic, cadmium, chromium, copper, lead, and mercury. Only one location had an HQ > 1 for silver, DU # 3, in the subsurface sediments. Zinc had HQ's > 1 at two locations, DUs 3 and 4 both in the subsurface sediments. No metals had HQs greater than 1 at DUs 1 and 18.

Comparison to effects levels (EV) resulted in EV HQs from 1 to 5.2. Only one location had an EV HQ greater than 5. Surface sediment in DU 4 had 5.2 mg/kg of cadmium resulting in an EV HQ of 5.2.

Table 3.2 Summary of all Metals with BV HQ's greater than 1 using Region 4's benchmark values.

SAMPLE_ID	DU #	Depth	COMPOUND	UNITS	AMOUNT	FNT	HQ BV	HQ EV	HQ EV >1
SD00101	1	Surface	CADMIUM	MG/KG	2.3		2.30	3.38	Yes
SD00101	1	Surface	CHROMIUM	MG/KG	100		1.91		
SD00101	1	Surface	COPPER	MG/KG	25		1.34		
SD00101	1	Surface	LEAD	MG/KG	190	J	6.29		
SD00301	3	Surface	ARSENIC	MG/KG	12		1.66	1.66	Yes
SD00301	3	Surface	CADMIUM	MG/KG	1.7		1.70	2.50	Yes
SD00301	3	Surface	LEAD	MG/KG	47		1.56		
SD00302	3	Subsurface	ANTIMONY	MG/KG	2.7		0.28	1.35	
SD00302	3	Subsurface	ARSENIC	MG/KG	16		2.21	2.21	Yes
SD00302	3	Subsurface	CADMIUM	MG/KG	2.9		2.90	4.26	Yes
SD00302	3	Subsurface	CHROMIUM	MG/KG	99		1.89		
SD00302	3	Subsurface	COPPER	MG/KG	29		1.55		
SD00302	3	Subsurface	LEAD	MG/KG	140		4.64		
SD00302	3	Subsurface	SILVER	MG/KG	2.2		1.10	3.0	Yes
SD00302	3	Subsurface	TOTAL MERCURY	MG/KG	0.24		1.85		
SD00302	3	Subsurface	ZINC	MG/KG	130		1.05		
SD00401	4	Surface	ARSENIC	MG/KG	11		1.52	1.52	Yes
SD00401	4	Surface	CADMIUM	MG/KG	5.2		5.20	7.65	Yes
SD00401	4	Surface	COPPER	MG/KG	27		1.44		
SD00401	4	Surface	LEAD	MG/KG	51	J	1.69		
SD00402	4	Subsurface	ARSENIC	MG/KG	12		1.66	1.66	Yes
SD00402	4	Subsurface	LEAD	MG/KG	230		7.62		
SD00402	4	Subsurface	TOTAL MERCURY	MG/KG	0.25		1.92		
SD00501	5	Surface	ARSENIC	MG/KG	16		2.21	2.21	Yes
SD00501	5	Surface	CADMIUM	MG/KG	4.3		4.30	6.32	Yes
SD00501	5	Surface	CHROMIUM	MG/KG	75		1.43		
SD00501	5	Surface	COPPER	MG/KG	66		3.53		
SD00501	5	Surface	LEAD	MG/KG	640	J	21.19		
SD00501	5	Surface	TOTAL MERCURY	MG/KG	0.21		1.62		
SD00501	5	Surface	ZINC	MG/KG	670		5.40		
SD00502	5	Subsurface	ARSENIC	MG/KG	12		1.66	1.66	Yes
SD00502	5	Subsurface	COPPER	MG/KG	52		2.78		
SD00502	5	Subsurface	LEAD	MG/KG	63		2.09		
SD00502	5	Subsurface	TOTAL MERCURY	MG/KG	0.46		3.54		
SD00901	9	Surface	ARSENIC	MG/KG	14		1.93	1.93	Yes
SD00901	9	Surface	COPPER	MG/KG	23		1.23		
SD00902	9	Subsurface	ARSENIC	MG/KG	16		2.21	2.21	Yes
SD00902	9	Subsurface	COPPER	MG/KG	19		1.02		
SD00902	9	Subsurface	LEAD	MG/KG	36		1.19		
SD00902	9	Subsurface	TOTAL MERCURY	MG/KG	0.74		5.69		
SD01101	11	Surface	ARSENIC	MG/KG	9.1	J	1.26	1.26	Yes
SD01101	11	Surface	CADMIUM	MG/KG	1.3		1.30	1.91	Yes
SD01101	11	Surface	COPPER	MG/KG	48		2.57		
SD01101	11	Surface	LEAD	MG/KG	150	J	4.97		
SD01101	11	Surface	TOTAL MERCURY	MG/KG	0.16		1.23		
SD01102	11	Subsurface	ARSENIC	MG/KG	18		2.49	2.49	Yes
SD01102	11	Subsurface	CADMIUM	MG/KG	0.77		0.77	1.13	
SD01102	11	Subsurface	COPPER	MG/KG	75		4.01		
SD01102	11	Subsurface	LEAD	MG/KG	200		6.62		
SD01102	11	Subsurface	TOTAL MERCURY	MG/KG	0.81		6.23		
SD02201	22	Surface	ARSENIC	MG/KG	18		2.49	2.49	Yes
SD02202	22	Subsurface	ARSENIC	MG/KG	17		2.35	2.35	Yes

Shaded rows are background locations.

3.1.2 Acid Volatile Sulfides - Simultaneously Extracted Metals (AVS_SEM) Analysis

Results of the AVS-SEM analysis are presented in Appendix A. The AVS-SEM data will be used to evaluating the toxicity studies conducted by the Naval Air Station. The method for determining AVA-SEM is based on the draft document *Analytical Method for Determination of Acid Volatile Sulfide and Selected Simultaneously Extractable Metals in Sediment* (December 1991), developed by the USEPA Office of Science and Technology. It has been established that relative amounts of SEM and AVS are important in predicting the bioavailability of bivalent metals. These bivalent metals include Cadmium, Copper, Lead, Mercury, Nickel and Zinc. If the molar SEM/AVS ratio exceeds one the bivalent metals in the sample are potentially toxic. If the ratio is below one then the bivalent metals are predicted to be not bioavailable and therefore not toxic. The SEM/ AVS ratio must be calculated using the molar concentrations (μmoles/g). The results of the SEM/AVS are presented in Table 3.3.

Table 3.3 Summary of SEM/AVs data.

Field Sample ID	DU #	Acid Volatile Sulfide (umole/g)		SEM (umole/g)	SEM/AVS Ratio	
SD-001-01	1	2.110		2.040	0.97	
SD-002-01	2	0.278		0.373	1.34	
SD-003-01	3	4.330		1.050	0.24	
SD-004-01	4	3.040	UR	0.945	0.31	U
SD-005-01	5	2.690		2.170	0.81	
SD-006-01	6	0.978		0.277	0.28	
SD-106-01	6 dup	0.695		0.225	0.32	
SD-007-01	7	1.170		0.399	0.34	
SD-008-01	8	10.500		1.090	0.10	
SD-009-01	9	5.900		1.000	0.17	
SD-109-01	9 dup	9.250		0.917	0.10	
SD-010-01	10	0.070		0.113	1.61	
SD-011-01	11	1.230		2.900	2.36	
SD-018-01	18	0.340	UR	0.252	0.74	U
SD-022-01	22	1.890		1.000	0.53	

Three out of the 13 sampling locations had SEM/AVS ratios greater than one, DUs 2, 10 and 11. This indicates that any of the bivalent metals (discussed above) present in these locations could potentially be toxic. Bivalent metals in the remaining DUs are predicted to be not bioavailable, meaning, that any toxicity found the remaining DUs is probably not being caused by the bivalent metals.

3.1.3 PAH Analysis

Results of the PAH analysis are presented in Appendix A. Sediments samples were analyzed for PAH's using Method 8310 (HPLC) to achieve lower detection limits. The PAH's reported out using this method are presented below:

1-methylnaphthalene	Benzo-a-pyrene
2-methylnaphthalene	Chrysene
Acenaphthene	Dibenzo(a,h)anthracene
Acenaphthylene	Fluoranthene
Anthracene	Fluorene
Benzo(a)anthracene	Indeno (1,2,3-cd) Pyrene
Benzo(b)fluoranthene	Naphthalene
Benzo(ghi)perylene	Phenanthrene
Benzo(k)fluoranthene	Pyrene

The majority of PAH compounds from OU3 were higher than the background locations, DUs 18 and 22. Table 3.4 compares the maximum concentration of each PAH compound to the reference locations.

Table 3.4 Comparison of Maximum PAH Concentrations of OU3 to 2 x Background.

	Surface Sediments								Subsurface Sediments							
	SD01801		SD02201		Mean			DU Max>	SD01802		SD02202		Mean			DU Max>
COMPOUND (MG/KG)	Result	Fnt	Result	Fnt	2 x Bkg	DU Max	DU #	2 x Bkg?	Result	Fnt	Result	Fnt	2 x Bkg	DU Max	DU #	2 x Bkg?
2-METHYLNAPHTHALENE	5.8	UJ	12	U	17.8	8.6	4		5.2	U	9.3	U	14.5	ND		
ACENAPHTHENE	18	UJ	36	U	54	ND			16	U	29	U	45	ND		
ACENAPHTHYLENE	28	UJ	58	U	86	ND			26	U	46	U	72	ND		
ANTHRACENE	0.99	UJ	29		29.99	59	5	Yes	3		22		25	91	11	Yes
BENZO(A)ANTHRACENE	2.7	J	95		97.7	310	5	Yes	14		99		113	390	11	Yes
BENZO(B)FLUORANTHENE	26	J	290		316	1000	5	Yes	72		250		322	1200	3	Yes
BENZO(GHI)PERYLENE	4.9	J	120		124.9	390	5	Yes	25		140		165	440	11	Yes
BENZO(K)FLUORANTHENE	2.6	J	59		61.6	280	5	Yes	14		77		91	290	3	Yes
BENZO-A-PYRENE	3.8	J	120		123.8	440	5	Yes	22		120		142	460	11	Yes
CHRYSENE	6.1	J	210		216.1	1000	5	Yes	32		200		232	850	3	Yes
DIBENZO(A,H)ANTHRACENE	2.4	UJ	31		33.4	110	5	Yes	6.6		36		42.6	120	11	Yes
FLUORANTHENE	6.8	J	250	J	256.8	710	5	Yes	30		210		240	800	11	Yes
FLUORENE	2.2	UJ	13		15.2	ND			2	U	11		13	48	11	Yes
INDENO (1,2,3-CD) PYRENE	3.8	J	100	J	103.8	380	5	Yes	21		120		141	390	11	Yes
NAPHTHALENE	17	J	25	U	42	180	1	Yes	11	U	32		43	47	9	Yes
PHENANTHRENE	3.2	J	130		133.2	230	5	Yes	17		94		111	390	11	Yes
PYRENE	6.7	J	200	J	206.7	720	5	Yes	30		210		240	1000	11	Yes
1-METHYLNAPHTHALENE	4.9	UJ	10	U	14.9	ND			4.4	U	7.9	U	12.3	ND		

ND = Nondetect

3.1.3.1 PAH Hazard Quotient Analysis

Hazard Quotients were calculated for all PAH's that had EPA ecological benchmark and/or effects values. The ecological benchmark values and effects values used for the HQ calculations are presented in Table 3.5. Some detection limits were greater than the BV's and EV's and some were lower. If detection limits were greater than the BV's and EV's then and accurate HQ could not be calculated. Appendix B presents all calculated PAH HQ data. A summary of sediment PAH HQ's is present in Table 3.6 for surface sediments and Table 3.7 for subsurface sediments.

HQ's using Region 4's Benchmark Values

Table 3.5 Screening values used for the PAH hazard quotient analysis

COMPOUND	Effect Values (ug/kg)	Screening Values (ug/kg)
1-METHYLNAPHTHALENE		330
2-METHYLNAPHTHALENE	20.23	330
ACENAPHTHENE	6.71	330
ACENAPHTHYLENE	5.87	330
ANTHRACENE	46.9	330
BENZO(A)ANTHRACENE	74.8	330
BENZO(B)FLUORANTHENE		330
BENZO(GHI)PERYLENE		330
BENZO(K)FLUORANTHENE		330
BENZO-A-PYRENE	88.8	330
CHRYSENE	108	330
DIBENZO(A,H)ANTHRACENE	74.8	330
FLUORANTHENE	113	330
FLUORENE	21.2	330
INDENO (1,2,3-CD) PYRENE		330
NAPHTHALENE	34.6	330
PHENANTHRENE	86.7	330
PYRENE	153	330

Detection limits for the PAH analysis were below EPA's ecological benchmark values. Therefore, HQ's using the benchmark values were calculated for all PAH compounds. Surface sediment samples for DUs 4,5,8, and 11 had PAH BV HQs > 1 (Table 3.6), and subsurface sediment samples had PAH BV HQs's >1 for DUs 3 and 11 (Table 3.7). All calculated BV HQS, for both surface and subsurface sediments samples, were less than 10. (see, Appendix B).

HQ's using Region 4's Effects Values

Hazard quotients were also calculated using EV's listed in Table 3.5. Detection limits for the PAH analysis varied by sample, depending on the compound, method limits, percent moisture and other interferences. Although detection limits were low enough for calculating HQ's using benchmark values, some were greater than the effects values. Hazard quotients were calculated for all samples whose detection limits were below the EV's.

Table 3.6 is a summary table listing all the PAHs in the surface sediment who had EV HQs greater than 1. PAH compounds that had EV HQs less than one are not listed. For surface sediment samples , DUs 1, 2, 3, 4, 5, 7, 8, 9, 11, and 22 had PAH EV HQs greater than one, but less than 10 (Table 3.6). All EV HQ's calculated for DUs 6, 10, and 18 were less than one.

Table 3.7 is formatted similar to Table 3.6, but lists the subsurface PAH HQs. Subsurface sediment samples had PAH EV HQs greater than 1 at all DUs except for one, DU 18, a background location (Table 3.7). All of the calculated EV HQs for the subsurface sediment samples were less than 10.

3.1.3.2 Total PAH's

Hazard Quotients were also calculated for total PAH's for each DU.. Total PAH's were calculated by summing all detected values and half of the detection limit value for all nondetects. An HQ was then calculated using USEPA Region 4's benchmark value of 1684 ug/kg for total PAH's. Results are presented in Table 3.8.

Table 3.8 Total PAH Hazard Quotient Using USEPA Region 4's Screening Value of 1684 ug/kg.

SAMPLE_ID	DU #	Sediment Depth	Amount (ug/kg)	HQ
SD00102	1	SB	1135.4	0.67
SD00302	3	SB	6326.0	3.76
SD00402	4	SB	2381.0	1.41
SD00502	5	SB	2686.5	1.60
SD00902	9	SB	1927.1	1.14
SD01102	11	SB	6883.0	4.09
SD01802	18	SB	318.9	0.19
SD02202	22	SB	1667.1	0.99
SD00101	1	SF	2247.5	1.33
SD00201	2	SF	1384.5	0.82
SD00301	3	SF	889.2	0.53
SD00401	4	SF	2757.0	1.64
SD00501	5	SF	6136.5	3.64
SD00601	6	SF	190.7	0.11
SD00701	7	SF	670.9	0.40
SD00801	8	SF	3883.0	2.31
SD00901	9	SF	1490.4	0.89
SD01001	10	SF	40.3	0.02
SD01101	11	SF	4886.5	2.90
SD01801	18	SF	114.7	0.07
SD02201	22	SF	1717.5	1.02

Table 3.6. Summary of PAH analysis in surface sediments.

SAMPLE_ID	DU #	Depth	COMPOUND	Amount (mg/kg)	FNT	HQ EV	HQ BV	HQ EV > 1	HQ BV >1
SD00101	1	SF	NAPHTHALENE	180	J	5.20	0.55	Yes	
SD00101	1	SF	CHRYSENE	280	J	2.59	0.85	Yes	
SD00101	1	SF	FLUORANTHENE	210	J	1.86	0.64	Yes	
SD00101	1	SF	BENZO-A-PYRENE	160	J	1.80	0.48	Yes	
SD00101	1	SF	PYRENE	240	J	1.57	0.73	Yes	
SD00101	1	SF	BENZO(A)ANTHRACENE	100	J	1.34	0.30	Yes	
SD00101	1	SF	PHENANTHRENE	97	J	1.12	0.29	Yes	
SD00201	2	SF	CHRYSENE	240	J	2.22	0.73	Yes	
SD00201	2	SF	BENZO(A)ANTHRACENE	95	J	1.27	0.29	Yes	
SD00301	3	SF	NAPHTHALENE	71		2.05	0.22	Yes	
SD00401	4	SF	CHRYSENE	350	J	3.24	1.06	Yes	Yes
SD00401	4	SF	FLUORANTHENE	300	J	2.65	0.91	Yes	
SD00401	4	SF	BENZO(A)ANTHRACENE	160	J	2.14	0.48	Yes	
SD00401	4	SF	BENZO-A-PYRENE	180	J	2.03	0.55	Yes	
SD00401	4	SF	PYRENE	270	J	1.76	0.82	Yes	
SD00401	4	SF	PHENANTHRENE	130	J	1.50	0.39	Yes	
SD00501	5	SF	CHRYSENE	1000	J	9.26	3.03	Yes	Yes
SD00501	5	SF	FLUORANTHENE	710	J	6.28	2.15	Yes	Yes
SD00501	5	SF	BENZO-A-PYRENE	440	J	4.95	1.33	Yes	Yes
SD00501	5	SF	PYRENE	720	J	4.71	2.18	Yes	Yes
SD00501	5	SF	BENZO(A)ANTHRACENE	310	J	4.14	0.94	Yes	
SD00501	5	SF	PHENANTHRENE	230	J	2.65	0.70	Yes	
SD00501	5	SF	DIBENZO(A,H)ANTHRACENE	110	J	1.47	0.33	Yes	
SD00501	5	SF	ANTHRACENE	59	J	1.26	0.18	Yes	
SD00701	7	SF	NAPHTHALENE	62	J	1.79	0.19	Yes	
SD00801	8	SF	FLUORANTHENE	570	J	5.04	1.73	Yes	Yes
SD00801	8	SF	NAPHTHALENE	160	J	4.62	0.48	Yes	
SD00801	8	SF	PYRENE	560	J	3.66	1.70	Yes	Yes
SD00801	8	SF	CHRYSENE	380	J	3.52	1.15	Yes	Yes
SD00801	8	SF	BENZO(A)ANTHRACENE	210	J	2.81	0.64	Yes	
SD00801	8	SF	BENZO-A-PYRENE	240	J	2.70	0.73	Yes	
SD00801	8	SF	PHENANTHRENE	140	J	1.61	0.42	Yes	
SD00901	9	SF	NAPHTHALENE	110	J	3.18	0.33	Yes	
SD00901	9	SF	FLUORANTHENE	180	J	1.59	0.55	Yes	
SD00901	9	SF	CHRYSENE	170	J	1.57	0.52	Yes	
SD00901	9	SF	BENZO-A-PYRENE	110	J	1.24	0.33	Yes	
SD00901	9	SF	BENZO(A)ANTHRACENE	85	J	1.14	0.26	Yes	
SD00901	9	SF	PYRENE	160	J	1.05	0.48	Yes	
SD01101	11	SF	CHRYSENE	630	J	5.83	1.91	Yes	Yes
SD01101	11	SF	BENZO-A-PYRENE	410	J	4.62	1.24	Yes	Yes
SD01101	11	SF	FLUORANTHENE	470	J	4.16	1.42	Yes	Yes
SD01101	11	SF	NAPHTHALENE	130	J	3.76	0.39	Yes	
SD01101	11	SF	BENZO(A)ANTHRACENE	240	J	3.21	0.73	Yes	
SD01101	11	SF	PYRENE	440	J	2.88	1.33	Yes	Yes
SD01101	11	SF	PHENANTHRENE	160	J	1.85	0.48	Yes	
SD01101	11	SF	DIBENZO(A,H)ANTHRACENE	100	J	1.34	0.30	Yes	
SD02201	22	SF	FLUORANTHENE	250	J	2.21	0.76	Yes	
SD02201	22	SF	CHRYSENE	210		1.94	0.64	Yes	
SD02201	22	SF	PHENANTHRENE	130		1.50	0.39	Yes	
SD02201	22	SF	BENZO-A-PYRENE	120		1.35	0.36	Yes	
SD02201	22	SF	PYRENE	200	J	1.31	0.61	Yes	
SD02201	22	SF	BENZO(A)ANTHRACENE	95		1.27	0.29	Yes	

Table 3.7 Summary of PAH analysis in subsurface sediments.

SAMPLE_ID	DU #	Sediment Depth	COMPOUND	Amount (ug/kg)	HQ EV	HQ SV	HQ EV > 1	HQ SV >1
SD00102	1	SB	FLUORANTHENE	180	1.59	0.55	Yes	
SD00102	1	SB	CHRYSENE	160	1.48	0.48	Yes	
SD00102	1	SB	PYRENE	190	1.24	0.58	Yes	
SD00102	1	SB	BENZO(A)ANTHRACENE	90	1.20	0.27	Yes	
SD00102	1	SB	BENZO-A-PYRENE	100	1.13	0.30	Yes	
SD00302	3	SB	CHRYSENE	850	7.87	2.58	Yes	Yes
SD00302	3	SB	PYRENE	890	5.82	2.70	Yes	Yes
SD00302	3	SB	BENZO-A-PYRENE	460	5.18	1.39	Yes	Yes
SD00302	3	SB	BENZO(A)ANTHRACENE	360	4.81	1.09	Yes	Yes
SD00302	3	SB	FLUORANTHENE	530	4.69	1.61	Yes	Yes
SD00302	3	SB	PHENANTHRENE	210	2.42	0.64	Yes	
SD00302	3	SB	DIBENZO(A,H)ANTHRACENE	110	1.47	0.33	Yes	
SD00302	3	SB	ANTHRACENE	64	1.36	0.19	Yes	
SD00402	4	SB	CHRYSENE	260	2.41	0.79	Yes	
SD00402	4	SB	FLUORANTHENE	260	2.30	0.79	Yes	
SD00402	4	SB	PHENANTHRENE	160	1.85	0.48	Yes	
SD00402	4	SB	BENZO-A-PYRENE	160	1.80	0.48	Yes	
SD00402	4	SB	PYRENE	270	1.76	0.82	Yes	
SD00402	4	SB	BENZO(A)ANTHRACENE	120	1.60	0.36	Yes	
SD00402	4	SB	FLUORENE	26	1.23	0.08	Yes	
SD00502	5	SB	CHRYSENE	250	2.31	0.76	Yes	
SD00502	5	SB	FLUORANTHENE	260	2.30	0.79	Yes	
SD00502	5	SB	PYRENE	290	1.90	0.88	Yes	
SD00502	5	SB	BENZO-A-PYRENE	160	1.80	0.48	Yes	
SD00502	5	SB	BENZO(A)ANTHRACENE	130	1.74	0.39	Yes	
SD00502	5	SB	PHENANTHRENE	130	1.50	0.39	Yes	
SD00902	9	SB	CHRYSENE	250	2.31	0.76	Yes	
SD00902	9	SB	FLUORANTHENE	230	2.04	0.70	Yes	
SD00902	9	SB	PYRENE	250	1.63	0.76	Yes	
SD00902	9	SB	BENZO-A-PYRENE	140	1.58	0.42	Yes	
SD00902	9	SB	BENZO(A)ANTHRACENE	110	1.47	0.33	Yes	
SD00902	9	SB	NAPHTHALENE	47	1.36	0.14	Yes	
SD00902	9	SB	PHENANTHRENE	100	1.15	0.30	Yes	
SD01102	11	SB	CHRYSENE	790	7.31	2.39	Yes	Yes
SD01102	11	SB	FLUORANTHENE	800	7.08	2.42	Yes	Yes
SD01102	11	SB	PYRENE	1000	6.54	3.03	Yes	Yes
SD01102	11	SB	BENZO(A)ANTHRACENE	390	5.21	1.18	Yes	Yes
SD01102	11	SB	BENZO-A-PYRENE	460	5.18	1.39	Yes	Yes
SD01102	11	SB	PHENANTHRENE	390	4.50	1.18	Yes	Yes
SD01102	11	SB	FLUORENE	48	2.26	0.15	Yes	
SD01102	11	SB	ANTHRACENE	91	1.94	0.28	Yes	
SD01102	11	SB	DIBENZO(A,H)ANTHRACENE	120	1.60	0.36	Yes	
SD02202	22	SB	FLUORANTHENE	210	1.86	0.64	Yes	
SD02202	22	SB	CHRYSENE	200	1.85	0.61	Yes	
SD02202	22	SB	PYRENE	210	1.37	0.64	Yes	
SD02202	22	SB	BENZO-A-PYRENE	120	1.35	0.36	Yes	
SD02202	22	SB	BENZO(A)ANTHRACENE	99	1.32	0.30	Yes	
SD02202	22	SB	PHENANTHRENE	94	1.08	0.28	Yes	

3.1.4 Pesticides/PCB Analysis

Results of the pesticide/PCB analysis are presented in Appendix A. The minimum quatitation limit (MQL) for the pesticide /PCB analysis were higher than the benchmark and effects values to be used for the HQ analysis. The method detection limit is approximately 0.1 of the MQL. If the compounds were present below the MQL they would have been detected and an estimated value (J flag) would have been reported.

The results of the hazard quotient analysis is presented in Appendix B. A summary of the HQ's for all detected pesticides and PCB's is presented in Table 3.9. Those pesticides and PCBs that did not have benchmark values include alpha-BHC, delta-BHC, Endrin Aldehyde, Endrin Ketone, and Heptachlor. Of all detected pesticides only Dieldrin and Heptachlor Epoxide had BV HQs>1 (DU 2, BV HQ = 1.06 and DU 11, BV HQ = 1.58, respectively) in the surface sediments. Of all detected pesticides, no BV HQs were greater than 1 in the subsurface sediments. When using EV's for calculating HQ's two pesticides had relatively elevated EV HQs's, Dieldrin had an EV HQS of 175 in DU # 2 and Endrin had an EV HQ of 55 in DU # 11.

3.1.5 Organic Tin

The results of the organic tin analysis is presented in Appendix A. USEPA Region 4 does not have any benchmark values for Orgainc tins. However, the Puget Sound Dredge Disposal Analysis (PSDDA) has extensive documentation on tri-butyltin (TBT) one of the most widely used form of organic tins. The PSDDA (1989) established a screening value for TBT in sediment of 30 ug/kg (as Sn). This screening level was found to be protective of acute and most chronic effects (PSDDA, 1996). For the purposes of this investigation this screening level was used for evaluating the TBT concentrations in sediment. All TBT concentrations reported here are well below the screening level of 30ug/kg TBT (as Sn). No HQ's were calculated for TBT because of the low levels detected.

3.1.6 Semi-volatiles Analysis

In general, SVOC detection limits were relatively high. Probably due to high moisture content of the samples and other matrix interferences. These elevated detection limits were higher than the ecological benchmark values used for the assessment. The only detected SVOC in all sediments was Bis(2-ethylhexyl) Phthalate and Phenol. Table 3.10 summarizes the detected SVOC's and their HQ's.

Table 3.10 Summary of detected SVOC's and their HQ's.

Location	DU #	Depth	Compound	Amount ug/kg	BV	HQ
SD00302	3	SB	Bis(2-ethylhexyl) Phthalate	2900	182	15.93
SD00501	5	SF	Bis(2-ethylhexyl) Phthalate	1900	182	10.44
SD00801	8	SF	Bis(2-ethylhexyl) Phthalate	970	182	5.33
SD00901	9	SF	Bis(2-ethylhexyl) Phthalate	11000	182	60.44
SD01101	11	SF	Bis(2-ethylhexyl) Phthalate	4700	182	25.82
SD00101	1	SF	Bis(2-ethylhexyl) Phthalate	2800 J	182	15.38
SD00302	3	SB	Phenol	210 J		
SD01801	18	SF	Phenol	170 J		

There is no USEPA Region 4 Benchmark Value for Phenol.

3.1.7 Percent Orgainc Matter and Particle Size Distribution Analysis

The results of the percent organic matter and particle size distribution analysis is presented in Appendix A. Percent organic matter was analyzed using Standard Methods 2540-G, analysis for volatile solids. Particle size was analyzed using a Coulter LS200 Particle Size Analyzer. Table 3.11 presents a summary of the percent organics and inorganics for each sediment sample.

It is understood that contaminants are generally associated with the finer grain sizes and that the higher the organic matter content the lower the toxicity potential. Therefore, the sediment samples were separated into two size classes for organic matter analysis, > 2mm and < 2mm. Analyzing the whole sediment sample, including the coarse material, may result in her organic matter values, thus underestimating the toxicity potential of the sediment. Analyzing the organic matter content of the < 2mm fraction separately, where the contamination is found, will provide a more representative picture of the actual toxicity potential.

Table 3.11 Summary of percent organics and inorganics for all sediment samples.

			Particles <2 mm in size			Particles >2 mm in size		
Sample ID	DU #	Sediment Depth	Percent Inorganic	Percent Organics	Sample Description	Percent Inorganic	Percent Organics	Sample Description
SD-001-01	1	Surface	97.99	2.01	<2MM	78.21	21.79	>2MM-shells
SD-001-02	1	subsurface	92.63	7.37	<2MM	76.25	23.75	>2MM-shells
SD-002-01	2	Surface	99.29	0.71	<2MM	89.96	10.04	>2MM-shells
SD-003-01	3	Surface	89.91	10.09	<2MM	89.97	10.03	>2MM-shells
SD-003-02	3	subsurface	91.36	8.64	<2MM	79.44	20.56	>2MM- shells
SD-004-01	4	Surface	93.74	6.26	<2MM	82.37	17.63	>2MM- shells
SD-004-02	4	subsurface	98.40	1.60	<2MM	95.80	4.20	>2MM-shells
SD-005-01	5	Surface	94.59	5.41	<2MM	85.70	14.30	>2MM- bones
SD-005-02	5	subsurface	91.56	8.44	<2MM	95.67	4.33	>2MM- shells
SD-006-01	6	Surface	98.61	1.39	<2MM	97.66	2.34	>2MM- shells
SD-007-01	7	Surface	98.15	1.85	<2MM	95.70	4.30	>2MM-shells
SD-008-01	8	Surface	94.46	5.54	<2MM	97.16	2.84	>2MM-plastic/shells
SD-009-01	9	Surface	89.99	10.01	<2MM	87.05	12.95	>2MM- shells
SD-009-02	9	subsurface	91.86	8.14	<2MM	84.49	15.51	>2MM- shells
SD-010-01	10	Surface	99.83	0.17	<2MM	98.67	1.33	>2MM- shells
SD-011-01	11	Surface	97.29	2.71	<2MM	79.73	20.27	>2MM-shells
SD-011-02	11	subsurface	90.79	9.21	<2MM	63.34	36.66	>2MM-shells
SD-018-01	18	Surface	97.92	2.08	<2MM	90.15	9.85	>2MM-shells
SD-018-02	18	subsurface	98.12	1.88	<2MM	97.55	2.45	>2MM-shells
SD-022-01	22	Surface	93.14	6.86	<2MM	89.60	10.40	>2MM-shells
SD-022-02	22	subsurface	94.80	5.20	<2MM	92.94	7.06	>2MM-shells
SD-106-01	106	Surface	99.27	0.73	<2MM	81.49	18.51	>2MM-roofing material
SD-109-01	109	Surface	89.99	10.01	<2MM	76.94	23.06	>2MM-grass

Table 3.9 Summary of the HQ analysis for all detectable Pesticides/PCBs

Sample ID	DU	Depth	Compound	Units	Amount	FNT	Effects Value	Benchmark Value	HQ EV	HQ BV	BV HQ>1	EV HQ>1
SD00101	1	SF	PCB-1254 (AROCLOR 1254)	UG/KG	67.00	A		21.6		3.10	Yes	
SD00101	1	SF	PCB-1260 (AROCLOR 1260)	UG/KG	190.00	A		21.6		8.80	Yes	
SD00201	2	SF	DIELDRIN	UG/KG	3.50	J	0.02	3.3	175.00	1.06	Yes	Yes
SD00302	3	SB	PCB-1254 (AROCLOR 1254)	UG/KG	58.00	J		21.6		2.69	Yes	
SD00302	3	SB	PCB-1260 (AROCLOR 1260)	UG/KG	98.00	J		21.6		4.54	Yes	
SD00401	4	SF	PCB-1260 (AROCLOR 1260)	UG/KG	33.00	J		21.6		1.53	Yes	
SD00402	4	SB	ENDOSULFAN SULFATE	UG/KG	1.00	J		5.4		0.19		
SD00402	4	SB	METHOXYCHLOR	UG/KG	2.60	J		19		0.14		
SD00501	5	SF	PCB-1254 (AROCLOR 1254)	UG/KG	28.00	J		21.6		1.30	Yes	
SD00501	5	SF	PCB-1260 (AROCLOR 1260)	UG/KG	84.00	A		21.6		3.89	Yes	
SD00502	5	SB	ENDOSULFAN SULFATE	UG/KG	1.20	JN		5.4		0.22		
SD00801	8	SF	4,4'-DDT (P,P'-DDT)	UG/KG	1.80	J	1.2	3.3	1.50	0.55		Yes
SD00902	9	SB	METHOXYCHLOR	UG/KG	13.00	J		19		0.68		
SD01001	10	SF	METHOXYCHLOR	UG/KG	6.10	J		19		0.32		
SD01101	11	SF	4,4'-DDD (P,P'-DDD)	UG/KG	2.50	JN	1.22	3.3	2.05	0.76		Yes
SD01101	11	SF	ENDOSULFAN SULFATE	UG/KG	1.10	J		5.4		0.20		
SD01101	11	SF	ENDRIN	UG/KG	1.10	J	0.02	3.3	55.00	0.33		Yes
SD01101	11	SF	HEPTACHLOR EPOXIDE	UG/KG	0.95	J		0.6		1.58	Yes	
SD01102	11	SB	4,4'-DDT (P,P'-DDT)	UG/KG	1.80	J	1.2	3.3	1.50	0.55		Yes
SD01801	18	SF	ENDOSULFAN SULFATE	UG/KG	1.10	J		5.4		0.20		
SD02202	22	SB	4,4'-DDT (P,P'-DDT)	UG/KG	1.20	J	1.2	3.3	1.00	0.36		
SD10901	109	SF	METHOXYCHLOR	UG/KG	10.00	JN		19		0.53		

3.1.8 Surface Water

No surface water samples were collected for analysis. However, in-situ water quality measurements were collected from one DU location each sampling day and from the two background locations (018 and 022). Dissolved oxygen, pH, salinity, and temperature were measured using a YSI Minisonde, a multi-probe in-situ water quality measuring device. This data will be used to assess the condition of surface water overlying the sediment. Measurements were at one to four foot intervals, depending on depth and location, from the surface to the bottom of the water column. A summary of results are presented in Table 3.12 and all of the results are presented in Appendix A.

Table 3.12 . Summary of In-situ water quality measurements recorded during the investigation.

Location	DEPTH (feet)	TEMP Range (C)	COND Range	Salinity Range (ppt)	p H Range	DO Range (mg/l)
1	8	19.4 - 19.07	36222 - 37317	26 -27.06	8.13 - 8.15	8.05 - 7.89
4	10	19.81 - 19.65	40116 - 42887	28.83 - 31.18	8.09 - 8.10	8.26 - 8.24
8	22	19.99 - 18.61	40439 - 53921	29.95 - 41.35	8.12 - 8.03	8.63 - 6.96
18	36	21.16 - 19.08	43080 - 55040	30.26 - 41.83	8.11 - 8.02	8.73 - 7.73
22	22	21.94 - 19.42	43845 - 51177	30.04 - 40.46	8.10 - 8.03	8.57 - 7.91

4.0 QA/QC

All QA/QC data is presented in Appendix A. Analysis of QA/QC data will be discussed by the Penascola NAS in another document that describes the overall assessment of OU3.

References

Friday, 1996. Friday, G.P., Ecological Screening Values for Surface Water, Sediment and Soil. Westinghouse Savannah Company, Savannah River Site. WSRC-TR-98-00110.

PSDDA, 1996. Puget Sound Dredge Disposal Analysis program. Issue Paper, October 1996.

USEPA 1996. United State Environmental Protection Agency, Region 4, Office of Technical Services Supplemental Guidance RAGS, Bulletins October, 1996.

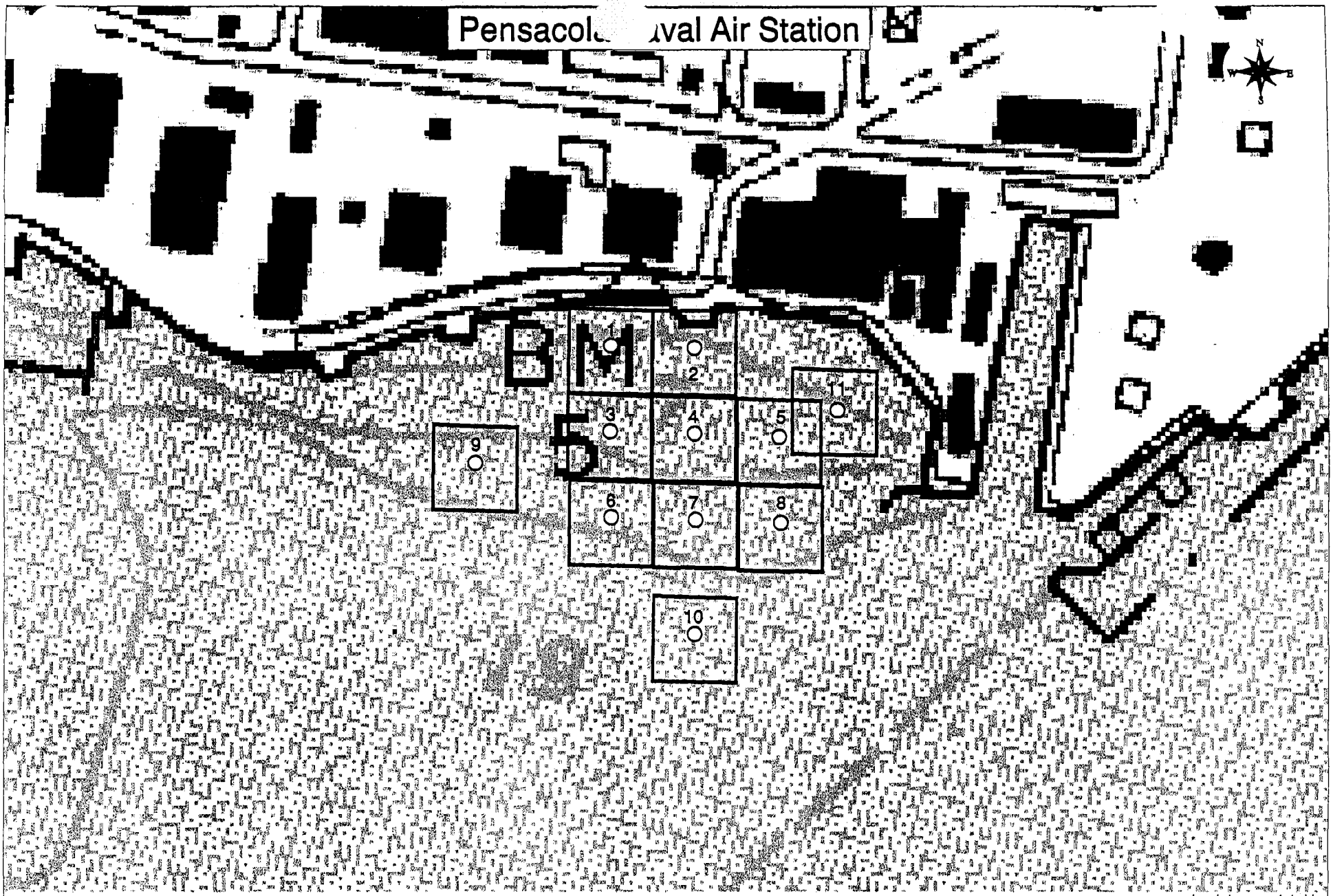


Figure 1. Map showing the 150' x 150' sampling grids for this investigation.

LEGEND ☐ Sampling grids

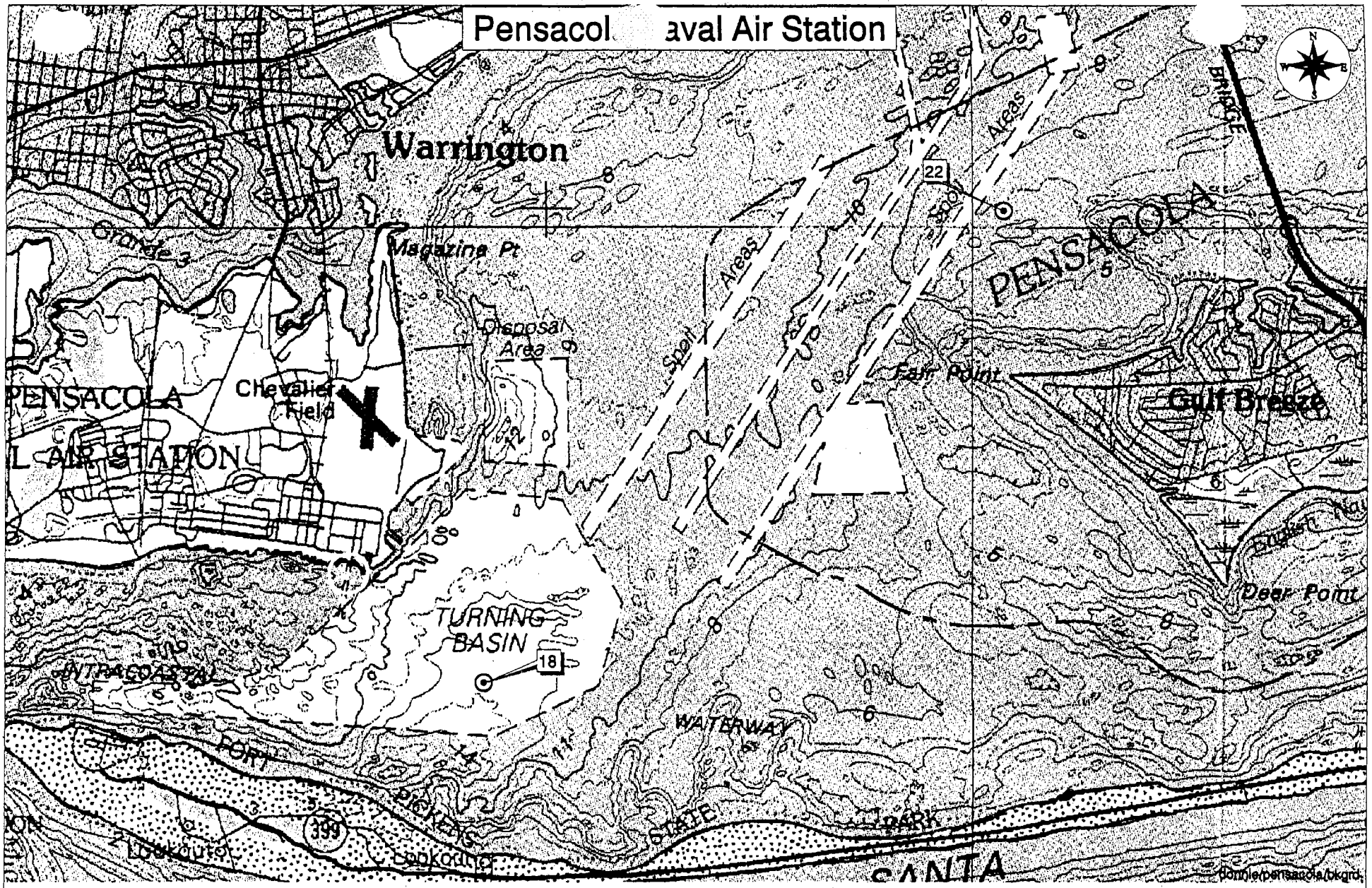


Figure 2. Map showing background locations in relation to the study area and recognizable landmarks.

LEGEND

OU3 Area of concern

⊙ Background locations

0 1 2 3 Miles

APPENDIX A
Analytical Data

Metals Analysis

Pe. ɔla NAS Metals Analytical Data

METALS (MG/KG)	SD00101	SD00102	SD00201	SD00301	SD00302	SD00401	SD00402	SD00501	SD00502	SD00601	SD00701	SD00801
% MOISTURE	37	65	19	32	65	59	34	58	62	27	34	54
ALUMINUM	3500	15000 NA	990	8900	14000	8900	4000	8600	10000	2100	2700	6600
ANTIMONY	0.47 J	0.16 U	0.14 J	0.4	2.7	0.32 J	0.41	0.89 J	0.3	0.12	0.11 J	0.26 J
ARSENIC	4.9	14	1.5	12	16	11	12	16	12	2.6	3.4	6.9
BARIUM	12	25	3.2	16	28	17	7.7	150	22	4.4	5.8	13
BERYLLIUM	0.2	0.78 J	0.063	0.59 J	0.83 J	0.54	0.21 J	0.48	0.67 J	0.16 J	0.17	0.38
CADMIUM	2.3	0.1	0.17	1.7	2.9	5.2	0.46	4.3	0.49	0.07	0.1	0.17
CALCIUM	8100	41000	11000	20000	25000	26000	9400	26000	28000	8400	14000	22000
CHROMIUM	100	39	8.9	39	99	38	14	75	36	6.8	13	19
COBALT	1.2	4.1	0.38	3.2	5.2	3.1	3.1	3.2	3.6	0.77	0.99	2.3
COPPER	25	50	11	14	29	27	14	66	52	3.4	4.4	8.8
CYANIDE	0.22 UR	0.38 UJ	0.17 UR	0.36 UJ	0.39 UJ	0.33 UR	0.21 UJ	0.32 UR	0.35 UJ	0.19 UJ	0.2 UR	0.29 UR
IRON	6400	22000	1900	13000	18000	15000	23000	19000	14000	3400	5100	11000
LEAD	190 J	52	16 J	47	140	51 J	230	640 J	63	15	12 J	17 J
MAGNESIUM	2000	6300 J	700	5400 J	7300 J	5100	3800 J	5000	5900 J	1400 J	1800	4100
MANGANESE	88 J	220 J	23 J	290	420	270 J	150	270 J	210	58	75 J	220 J
NICKEL	3.3	12	1.1	8.7	13	10	5.4	7.8	11	2.1	2.4	6.1
POTASSIUM	610	2800	200	1700	2400	1500	640	1400	2000	420	500	1200
SELENIUM	0.66	2.2	0.31	1.5	1.9	1.5	0.54	1.4	1.9	0.48	0.61	1.3
SILVER	0.077	0.07	0.055 U	0.12 U	2.2	0.11	0.067 U	0.21	0.11 U	0.06 U	0.066 U	0.095 U
SODIUM	6500	18000	2300	19000	20000	15000	4700	13000	16000	3800	5200	12000
THALLIUM	0.064 U	0.25	0.05 U	0.13	0.22	0.14	0.061	0.14	0.22	0.055 U	0.06 U	0.093
TIN	1.3	0.95	0.68	1.3	2.9	2.8	1.7	83	3.1	0.41	0.46	0.76
TOTAL MERCURY	0.086	0.21 J	0.036	0.085	0.24	0.082	0.25	0.21	0.46	0.018	0.026	0.044
VANADIUM	9.4	36	3	28	40	27	11	25	33	6.6	9	23
ZINC	75	51 J	14	55	130	59	41	670	50	17	19	34

Data Qualifiers

A-Average value. NA-Not analyzed. NAI-Interferences. J-Estimated value.
N-Presumptive evidence of presence of material.
NR-Not Reported
K-Actual value is known to be less than value given.
L-Actual value is known to be greater than value given.
U-Material was analyzed for but not detected. The number is the minimum quantitation limit.
R-QC indicates that data unusable. Compound may or may not be present. Resampling and reanalysis is necessary for verification.
C-Confirmed by GCMS.
1.When no value is reported, see chlordane constituents.
2.Constituents or metabolites of technical chlordane.

F ɔla NAS Metals Analytical Data

METALS (MG/KG)	SD00901	SD00902	SD01001	SD01101	SD01102
% MOISTURE	72	67	19	43	66
ALUMINUM	12000	14000	300	5000	15000
ANTIMONY	0.26 J	0.35	0.039 UJ	1.8	0.75
ARSENIC	14	16	0.52	9.1 J	18
BARIUM	24	24	1.2	22	36
BERYLLIUM	0.73	0.91 J	0.021	0.3	0.84 J
CADMIUM	0.39	0.36	0.041 U	1.3	0.77
CALCIUM	28000	33000	7600	23000	31000
CHROMIUM	39	48	1.2	41	49
COBALT	4.2	5.1	0.16	2.4	5
COPPER	23	19	0.56	48	75
CYANIDE	0.48 UR	0.41 UJ	0.17 UR	0.24 UR	0.39 UJ
IRON	20000	21000	630	12000	20000
LEAD	27 J	36	1.1 J	150 J	200
MAGNESIUM	7700	8400 J	470	4000	7300 J
MANGANESE	420 J	540	15 J	250 J	330
NICKEL	9.8	13	0.34	5.2	15
POTASSIUM	2200	2400	120	780	2200
SELENIUM	2.2	2.2	0.25	0.99	2.3
SILVER	0.15 U	0.13 U	0.054 U	0.2	0.13 U
SODIUM	26000	22000	2500	7100	19000
THALLIUM	0.17	0.22	0.049 U	0.084	0.27
TIN	1.3	1.8	0.18	2.4	5.5
TOTAL MERCURY	0.075	0.74	0.0075 U	0.16	0.81
VANADIUM	37	42	1.3	16	41
ZINC	52	77	2.5	79	95

Data Qualifiers

A-Average value. NA-
N-Presumptive eviden
NR-Not Reported
K-Actual value is know
L-Actual value is know
U-Material was analyz
R-QC indicates that da
C-Confirmed by GCM
1.When no value is re
2.Constituents or meta

F ›la NAS Metals Analytical Data

METALS (MG/KG)	Backgrounds SD01801	SD01802	SD02201	SD02202	Duplicates SD10601	SD10901
% MOISTURE	39	32	70	62	26	71
ALUMINUM	4100	3200	19000	16000	2200	14000
ANTIMONY	0.093 J	0.15	0.31	0.32	0.077 J	0.3 J
ARSENIC	5	5.1	18	17	2.5	15
BARIUM	7.9	5.7	24	24	4	23
BERYLLIUM	0.20	0.23 J	1.1 J	1 J	0.14	0.77
CADMIUM	0.075	0.087	0.22	0.25	0.12	0.43
CALCIUM	21000	18000	17000	13000	8400	30000
CHROMIUM	13	12	50	49	7.2	43
COBALT	1.2	1.2	6.6	6.5	0.77	4.7
COPPER	3.7	3.4	13	13	4.1	15
CYANIDE	0.22 UR	0.2 UJ	0.45 UJ	0.36 UJ	0.18 UR	0.46 UR
IRON	6800	4400	32000	24000	3800	22000
LEAD	5.7 J	5.6	24	24	7.4 J	31 J
MAGNESIUM	2500	2200 J	11000 J	8300 J	1400	7700
MANGANESE	110 J	68	440	320	58 J	420 J
NICKEL	3.7	3.7	14	13	1.9	11
POTASSIUM	650	600	3400	2700	380	2400
SELENIUM	0.87	0.85	1.8	1.7	0.44	2.2
SILVER	0.072 U	0.065 U	0.15 U	0.12 U	0.06 U	0.15 U
SODIUM	7800	5400	27000	19000	4000	25000
THALLIUM	0.065	0.063	0.19	0.19	0.054 U	0.18
TIN	0.41	0.41	1.6	1.4	0.38	1.5
TOTAL MERCURY	0.019	0.021	0.11	0.1	0.017	0.082
VANADIUM	14	14	39	38	6.9	41
ZINC	13	12	70	62	15	61

Data Qualifiers

A-Average value. NA-
N-Presumptive eviden
NR-Not Reported
K-Actual value is know
L-Actual value is know
U-Material was analyz
R-QC indicates that da
C-Confirmed by GCM
1.When no value is re
2.Constituents or meta

Acid Volatile Sulfides
Simultaneously Extracted Metals

Pen. ola NAS Simultaeously Extracted Metals

Sample ID No.:		SD-008-01		SD-001-01		SD-002-01		SD-003-01		SD-004-01		SD-005-01		SD-007-01		SD-109-01	
Element	Units	Results	Qualifier	Results	Qualifier	Results	Qualifier	Results	Qualifier	Results	Qualifier	Results	Qualifier	Results	Qualifier	Results	Qualifier
Cadmium	mg/kg	0.16		1.1		0.18		0.31		0.44		1.8		0.05		0.24	
Copper	mg/kg	6.9		4.6		3		9.8		7.5		9.1		2.8		9	
Lead	mg/kg	11		220		20		33		30		82		7		23	
Mercury	mg/kg	0.011	U	0.008	U	0.002	U	0.016	U	0.016		0.012	U	0.008	U	0.017	U
Nickel	mg/kg	1.5		0.69		0.36		2.2		1.88		2		1		2.7	
Zinc	mg/kg	27	J	59	J	14	J	45	J	42	J	100	J	20	J	40	J

Data Qualifiers

A-Average value. NA-Not analyzed. NAI-Interferences. J-Estimated value.

N-Presumptive evidence of presence of material.

NR-Not Reported

K-Actual value is known to be less than value given.

L-Actual value is known to be greater than value given.

U-Material was analyzed for but not detected.

R-QC indicates that data unusable. Compound may or may not be present. Resampling and reanalysis is necessary for verification.

C-Confirmed by GCMS.

1.When no value is reported, see chlordane constituents.

2.Constituents or metabolites of technical chlordane.

Pen. ola NAS Simultaeously Extracted Metals

Sample ID No.:		SD-009-01		SD-010-01		SD-011-01		SD-106-01		SD-018-01		SD-022-01		SD006-01	
Element	Units	Results	Qualifier	Results	Qualifier	Results	Qualifier	Results	Qualifier	Results	Qualifier	Results	Qualifier	Results	Qualifier
Cadmium	mg/kg	0.15		0.02	U	1.4		0.04		0.05	U	0.1		0.1	
Copper	mg/kg	10		1.8		10		2		3.7		8.4		2.9	
Lead	mg/kg	25		2.3		61		5.5		4.6		20		5.6	
Mercury	mg/kg	0.018	U	0.002	U	0.009	U	0.004	U	0.008	U	0.017	U	0.014	U
Nickel	mg/kg	2.8		0.2		1.4		0.58		1.3		3.6		0.83	
Zinc	mg/kg	44	J	4.6	J	160	J	10	J	9.8	J	46		12	

Pensacola Naval Air Station Acid Volatile Sulfide Data

Case: NAS Pensacola
Project N 00-0041
Laborator En Chem, Madison, WI

SAD No.	Field Sample ID	Grid #	Acid Volatile Sulfide (umole/g)		SEM (umole/g)	SEM/AVS Ratio	
4492	SD-001-01	1	2.110		2.040	0.97	
4493	SD-002-01	2	0.278		0.373	1.30	
4494	SD-003-01	3	4.330		1.050	0.24	
4495	SD-004-01	4	3.040	UR	0.945	0.31	U
4496	SD-005-01	5	2.690		2.170	0.81	
4505	SD-006-01	6	0.978		0.277	0.28	
4502	SD-106-01	6 dup	0.695		0.225	0.32	
4497	SD-007-01	7	1.170		0.399	0.34	
4491	SD-008-01	8	10.500		1.090	0.10	
4499	SD-009-01	9	5.900		1.000	0.17	
4498	SD-109-01	9 dup	9.250		0.917	0.10	
4500	SD-010-01	10	0.070		0.113	1.60	
4501	SD-011-01	11	1.230		2.900	2.40	
4503	SD-018-01	18	0.340	UR	0.252	0.74	U
4504	SD-022-01	22	1.890		1.000	0.53	

Data Qualifiers

A-Average value. NA-Not analyzed. NAI-Interferences. J-Estimated value.

N-Presumptive evidence of presence of material.

NR-Not Reported

K-Actual value is known to be less than value given.

L-Actual value is known to be greater than value given.

U-Material was analyzed for but not detected.

R-QC indicates that data unusable. Compound may or may not be present. Resampling and reanalysis is necessary for verification.

C-Confirmed by GCMS.

1.When no value is reported, see chlordane constituents.

2.Constituents or metabolites of technical chlordane.

PAH and Organic Tin Analysis

Pens..ola NAS PAH and Organic Tin Analytical Results

COMPOUND		SD00101 Result	Fnt	SD00102 Result	Fnt	SD00201 Result	Fnt	SD00301 Result	Fnt	SD00301 Result	Fnt	SD00302 Result	Fnt	SD00401 Result	Fnt
% MOISTURE	%	37		65		19		62		NR		65		59	
2-METHYLNAPHTHALENE	UG/KG	56	UJ	10	U	44	UJ	9.3	U	NR		100	U	86	UJ
ACENAPHTHENE	UG/KG	170	UJ	31	U	130	UJ	28	U	NR		310	U	45	UJ
ACENAPHTHYLENE	UG/KG	280	UJ	49	U	220	UJ	46	U	NR		500	U	420	UJ
ANTHRACENE	UG/KG	28	J	17		18	J	9.8		NR		64		45	J
BENZO(A)ANTHRACENE	UG/KG	100	J	90		95	J	49		NR		360		160	J
BENZO(B)FLUORANTHENE	UG/KG	270	J	2.8	U	250	J	170		NR		1200		430	J
BENZO(GHI)PERYLENE	UG/KG	140	J	100		58	J	59		NR		380		150	J
BENZO(K)FLUORANTHENE	UG/KG	110	J	48		78	J	48		NR		290		120	J
BENZO-A-PYRENE	UG/KG	160	J	100		86	J	62		NR		460		180	J
CHRYSENE	UG/KG	280	J	160		240	J	93		NR		850		350	J
DIBENZO(A,H)ANTHRACENE	UG/KG	35	J	4.2	U	18	UJ	15		NR		110		44	J
FLUORANTHENE	UG/KG	210	J	180		61	J	91		NR		530		300	J
FLUORENE	UG/KG	21	UJ	9.6		17	UJ	3.5	U	NR		38	U	32	UJ
INDENO (1,2,3-CD) PYRENE	UG/KG	110	J	91		69	J	44		NR		360		160	J
NAPHTHALENE	UG/KG	180	J	32		91	UJ	71		NR		210	U	180	UJ
PHENANTHRENE	UG/KG	97	J	65		52	J	39		NR		210		130	J
PYRENE	UG/KG	240	J	190		99	J	91		NR		890		270	J
1-METHYLNAPHTHALENE	UG/KG	48	UJ	8.5	U	37	UJ	7.9	U	NR		86	U	73	UJ

ORGANIC TINS		SD00101		SD00102		SD00201		SD00301		SD00301		SD00302		SD00401	
DIBUTYL TIN	UG/KG	0.66	J	NR		0.15	J	NR		0.66	J	0.47	J	0.52	J
MONOBUTYL TIN	UG/KG	0.39	J	NR		0.1	UJ	NR		0.29	J	0.04	J	0.74	J
TETRABUTYL TIN	UG/KG	0.23	U	NR		0.2	U	NR		0.23	U	0.22	U	0.22	U
TRIBUTYL TIN	UG/KG	0.45		NR		0.12	J	NR		0.6		1		0.7	

. Data Qualifiers

A-Average value. NA-Not analyzed. NAI-Interferences. J-Estimated value.

N-Presumptive evidence of presence of material.

NR-Not Reported

K-Actual value is known to be less than value given.

L-Actual value is known to be greater than value given.

U-Material was analyzed for but not detected. The number is the minimum quantitation limit.

R-QC indicates that data unusable. Compound may or may not be present. Resampling and reanalysis is necessary for verification.

C-Confirmed by GCMS.

1.When no value is reported, see chlordane constituents.

2.Constituents or metabolites of technical chlordane.

Pensacola NAS PAH and Organic Tin Analytical Results

COMPOUND		SD00402 Result	SD00402 Fnt	SD00501 Result	SD00501 Fnt	SD00502 Result	SD00502 Fnt	SD00601 Result	SD00601 Fnt	SD00701 Result	SD00701 Fnt	SD00801 Result	SD00801 Fnt	SD00901 Result	SD00901 Fnt
% MOISTURE	%	34		58		62		27		34		54		72	
2-METHYLNAPHTHALENE	UG/KG	54	U	83	UJ	92	U	8.6		5.3	UJ	76	UJ	12	UJ
ACENAPHTHENE	UG/KG	160	U	250	UJ	280	U	15	U	16	UJ	230	UJ	38	UJ
ACENAPHTHYLENE	UG/KG	260	U	410	UJ	450	U	24	U	26	UJ	370	UJ	61	UJ
ANTHRACENE	UG/KG	42		59	J	35		2		11	J	42	J	22	J
BENZO(A)ANTHRACENE	UG/KG	120		310	J	130		8.4		41	J	210	J	85	J
BENZO(B)FLUORANTHENE	UG/KG	340		1000	J	490		27		110	J	570	J	250	J
BENZO(GHI)PERYLENE	UG/KG	150		390	J	140		11		37	J	200	J	100	J
BENZO(K)FLUORANTHENE	UG/KG	97		280	J	88		7		28	J	140	J	60	J
BENZO-A-PYRENE	UG/KG	160		440	J	160		9.7		45	J	240	J	110	J
CHRYSENE	UG/KG	260		1000	J	250		20		92	J	380	J	170	J
DIBENZO(A,H)ANTHRACENE	UG/KG	41		110	J	41		2.9		11	J	56	J	26	J
FLUORANTHENE	UG/KG	260		710	J	260		16		66	J	570	J	180	J
FLUORENE	UG/KG	26		31	UJ	35	U	1.8	U	2	UJ	29	U	4.7	UJ
INDENO (1,2,3-CD) PYRENE	UG/KG	140		380	J	110		8.8		35	J	230	J	92	J
NAPHTHALENE	UG/KG	110	U	170	UJ	190	U	18		62	J	160	J	110	J
PHENANTHRENE	UG/KG	160		230	J	130		7.8		35	J	140	J	62	J
PYRENE	UG/KG	270		720	J	290		21		71	J	560	J	160	J
1-METHYLNAPHTHALENE	UG/KG	46	U	71	UJ	78	U	4.1	U	4.5	UJ	65	UJ	11	UJ

ORGANIC TINS		SD00402	SD00501	SD00502	SD00601	SD00701	SD00801	SD00901
DIBUTYL TIN	UG/KG	0.34 UJ	0.45 J	0.36 UJ	0.35 UJ	0.2 J	0.36 J	0.83 J
MONOBUTYL TIN	UG/KG	0.1 UJ	0.3 J	0.1 UJ	0.1 UJ	0.1 UJ	0.22 J	0.87 J
TETRABUTYL TIN	UG/KG	0.2 U	0.22 U	0.22 U	0.21 U	0.21 U	0.21 U	0.23 U
TRIBUTYL TIN	UG/KG	0.21 U	0.8	0.23 U	0.19 J	0.28	0.57	1

. Data Qualifiers

A-Average value. NA-Not analyzed. NAI-Interferences. J-E
N-Presumptive evidence of presence of material.
NR-Not Reported
K-Actual value is known to be less than value given.
L-Actual value is known to be greater than value given.
U-Material was analyzed for but not detected. The number i
R-QC indicates that data unusable. Compound may or may
C-Confirmed by GCMS.
1.When no value is reported, see chlordane constituents.
2.Constituents or metabolites of technical chlordane.

Pe..ola NAS PAH and Organic Tin Analytical Results

COMPOUND		SD00902 Result	Fnt	SD01001 Result	Fnt	SD01101 Result	Fnt	SD01102 Result	Fnt	SD01801 Result	Fnt	SD01802 Result	Fnt	SD02201 Result	Fnt
% MOISTURE	%	67		19		43		66		39		32		70	
2-METHYLNAPHTHALENE	UG/KG	11	U	4.3	UJ	62	UJ	100	U	5.8	UJ	5.2	U	12	U
ACENAPHTHENE	UG/KG	33	U	13	UJ	190	UJ	320	U	18	UJ	16	U	36	U
ACENAPHTHYLENE	UG/KG	53	U	21	UJ	300	UJ	510	U	28	UJ	26	U	58	U
ANTHRACENE	UG/KG	25		0.75	UJ	43	J	91		0.99	UJ	3		29	
BENZO(A)ANTHRACENE	UG/KG	110		0.69	J	240	J	390		2.7	J	14		95	
BENZO(B)FLUORANTHENE	UG/KG	340		3.3	J	980	J	1100		26	J	72		290	
BENZO(GHI)PERYLENE	UG/KG	130		1.2	UJ	330	J	440		4.9	J	25		120	
BENZO(K)FLUORANTHENE	UG/KG	85		1.5	J	270	J	250		2.6	J	14		59	
BENZO-A-PYRENE	UG/KG	140		1.1	J	410	J	460		3.8	J	22		120	
CHRYSENE	UG/KG	250		1.6	J	630	J	790		6.1	J	32		210	
DIBENZO(A,H)ANTHRACENE	UG/KG	36		1.8	UJ	100	J	120		2.4	UJ	6.6		31	
FLUORANTHENE	UG/KG	230		1.3	UJ	470	J	800		6.8	J	30		250	J
FLUORENE	UG/KG	11		1.6	UJ	23	UJ	48		2.2	UJ	2	U	13	
INDENO (1,2,3-CD) PYRENE	UG/KG	120		1	J	370	J	390		3.8	J	21		100	J
NAPHTHALENE	UG/KG	47		9	UJ	130	J	210	U	17	J	11	U	25	U
PHENANTHRENE	UG/KG	100		1	UJ	160	J	390		3.2	J	17		130	
PYRENE	UG/KG	250		1.8	J	440	J	1000		6.7	J	30		200	J
1-METHYLNAPHTHALENE	UG/KG	9.1	U	3.7	UJ	52	UJ	88	U	4.9	UJ	4.4	U	10	U

ORGANIC TINS		SD00902		SD01001		SD01101		SD01102		SD01801		SD01802		SD02201	
DIBUTYL TIN	UG/KG	0.7	J	0.17	J	0.42	J	0.36	U	0.83	J	0.37	UJ	0.46	J
MONOBUTYL TIN	UG/KG	0.18	J	0.1	UJ	0.12	J	0.1	U	0.1	UJ	0.11	UJ	0.21	J
TETRABUTYL TIN	UG/KG	0.22	U	0.21	U	0.2	U	0.22	U	0.21	U	0.22	U	0.42	U
TRIBUTYL TIN	UG/KG	3.6		0.14	J	0.33		0.23	U	0.33		0.13	J	0.24	J

Data Qualifiers

A-Average value. NA-Not analyzed. NAI-Interferences. J-E
N-Presumptive evidence of presence of material.
NR-Not Reported
K-Actual value is known to be less than value given.
L-Actual value is known to be greater than value given.
U-Material was analyzed for but not detected. The number i
R-QC indicates that data unusable. Compound may or may
C-Confirmed by GCMS.
1.When no value is reported, see chlordane constituents.
2.Constituents or metabolites of technical chlordane.

Pensacola NAS PAH and Organic Tin Analytical Results

COMPOUND		SD02202 Result	SD02202 Fnt	SD10601 Result	SD10601 Fnt	SD10901
% MOISTURE	%	62		26		71
2-METHYLNAPHTHALENE	UG/KG	9.3	U	4.8	UJ	12 UJ
ACENAPHTHENE	UG/KG	29	U	15	UJ	37 UJ
ACENAPHTHYLENE	UG/KG	46	U	24	UJ	59 UJ
ANTHRACENE	UG/KG	22		3	J	6.1 J
BENZO(A)ANTHRACENE	UG/KG	99		10	J	29 J
BENZO(B)FLUORANTHENE	UG/KG	250		39	J	120 J
BENZO(GHI)PERYLENE	UG/KG	140		11	J	41 J
BENZO(K)FLUORANTHENE	UG/KG	77		9.1	J	29 J
BENZO-A-PYRENE	UG/KG	120		12	J	47 J
CHRYSENE	UG/KG	200		28	J	86 J
DIBENZO(A,H)ANTHRACENE	UG/KG	36		3.1	J	12 J
FLUORANTHENE	UG/KG	210		22	J	48 J
FLUORENE	UG/KG	11		1.8	UJ	4.6 UJ
INDENO (1,2,3-CD) PYRENE	UG/KG	120		11	J	38 J
NAPHTHALENE	UG/KG	32		18	J	25 UJ
PHENANTHRENE	UG/KG	94		10	J	17 J
PYRENE	UG/KG	210		23	J	57 J
1-METHYLNAPHTHALENE	UG/KG	7.9	U	4.1	UJ	10 UJ

ORGANIC TINS		SD02202	SD10601	SD10901
DIBUTYL TIN	UG/KG	0.17 J	0.2 J	0.38 J
MONOBUTYL TIN	UG/KG	0.12 UJ	0.09 UJ	0.8 J
TETRABUTYL TIN	UG/KG	0.26 U	0.2 U	0.22 U
TRIBUTYL TIN	UG/KG	0.07 J	0.2 J	0.7

Data Qualifiers

A-Average value. NA-Not analyzed. NAI-Interferences. J-E
N-Presumptive evidence of presence of material.
NR-Not Reported
K-Actual value is known to be less than value given.
L-Actual value is known to be greater than value given.
U-Material was analyzed for but not detected. The number I
R-QC indicates that data unusable. Compound may or may
C-Confirmed by GCMS.
1.When no value is reported, see chlordane constituents.
2.Constituents or metabolites of technical chlordane.

Pesticides and PCB Analysis

Pensacola NAS Pesticide/PCB Analytical Results

PESTICIDES SCAN		SD00101	SD00201	SD00301	SD00302	SD00401	SD00402	SD00501	SD00502
% MOISTURE	%	36	28	70	68	64	31	56	66
4,4'-DDD (P,P'-DDD)	UG/KG	5.2 U	4.6 U	11 U	10 U	9.2 UJ	4.8 UJ	7.5 U	9.7 UJ
4,4'-DDE (P,P'-DDE)	UG/KG	5.2 U	4.6 U	11 U	10 U	9.2 UJ	4.8 UJ	7.5 U	9.7 UJ
4,4'-DDT (P,P'-DDT)	UG/KG	5.2 U	4.6 U	11 U	10 U	9.2 UJ	4.8 UJ	7.5 U	9.7 UJ
ALDRIN	UG/KG	2.7 U	2.4 U	5.7 U	5.3 U	4.7 UJ	2.5 UJ	3.9 U	5 UJ
ALPHA-BHC	UG/KG	2.7 U	2.4 U	5.7 U	5.3 U	4.7 UJ	2.5 UJ	3.9 U	5 UJ
ALPHA-CHLORDANE /2	UG/KG	2.7 U	2.4 U	5.7 U	5.3 U	4.7 UJ	2.5 UJ	3.9 U	5 UJ
BETA-BHC	UG/KG	2.7 U	2.4 U	5.7 U	1.9 JN	4.7 UJ	2.5 UJ	3.9 U	5 UJ
DELTA-BHC	UG/KG	2.7 U	2.4 U	5.7 U	5.3 U	4.7 UJ	0.78 J	3.9 U	2.6 J
DIELDRIN	UG/KG	5.2 U	3.5 J	11 U	10 U	9.2 UJ	4.8 UJ	7.5 U	9.7 UJ
ENDOSULFAN I (ALPHA)	UG/KG	2.7 U	2.4 U	5.7 U	5.3 U	4.7 UJ	2.5 UJ	3.9 U	5 UJ
ENDOSULFAN II (BETA)	UG/KG	5.2 U	4.6 U	11 U	10 U	9.2 UJ	4.8 UJ	7.5 U	9.7 UJ
ENDOSULFAN SULFATE	UG/KG	5.2 U	4.6 U	11 U	10 U	9.2 UJ	1 J	7.5 U	1.2 JN
ENDRIN	UG/KG	5.2 U	4.6 U	11 U	10 U	9.2 UJ	4.8 UJ	7.5 U	9.7 UJ
ENDRIN ALDEHYDE	UG/KG	5.2 U	4.6 U	11 U	10 U	9.2 UJ	4.8 UJ	7.5 U	9.7 UJ
ENDRIN KETONE	UG/KG	5.2 U	4.6 U	11 U	10 U	9.2 UJ	4.8 UJ	7.5 U	9.7 UJ
GAMMA-BHC (LINDANE)	UG/KG	2.7 U	2.4 U	5.7 U	5.3 U	4.7 UJ	2.5 UJ	3.9 U	5 UJ
GAMMA-CHLORDANE /2	UG/KG	2.7 U	2.4 U	5.7 U	5.3 U	4.7 UJ	2.5 UJ	3.9 U	5 UJ
HEPTACHLOR	UG/KG	2.7 U	2.4 U	5.7 U	5.3 U	4.7 UJ	2.5 UJ	3.9 U	5 UJ
HEPTACHLOR EPOXIDE	UG/KG	2.7 U	2.4 U	5.7 U	5.3 U	4.7 UJ	2.5 UJ	3.9 U	5 UJ
METHOXYCHLOR	UG/KG	27 U	24 U	57 U	53 U	47 UJ	2.6 J	39 U	50 UJ
PCB-1016 (AROCLOR 1016)	UG/KG	52 U	46 U	110 U	100 U	92 UJ	48 UJ	75 U	97 UJ
PCB-1221 (AROCLOR 1221)	UG/KG	100 U	93 U	220 U	210 U	190 UJ	97 UJ	150 U	200 UJ
PCB-1232 (AROCLOR 1232)	UG/KG	52 U	46 U	110 U	100 U	92 UJ	48 UJ	75 U	97 UJ
PCB-1242 (AROCLOR 1242)	UG/KG	52 U	46 U	110 U	100 U	92 UJ	48 UJ	75 U	97 UJ
PCB-1248 (AROCLOR 1248)	UG/KG	52 U	46 U	110 U	100 U	92 UJ	48 UJ	75 U	97 UJ
PCB-1254 (AROCLOR 1254)	UG/KG	67	46 U	110 U	58 J	92 UJ	48 UJ	28 J	97 UJ
PCB-1260 (AROCLOR 1260)	UG/KG	190	46 U	110 U	98 J	33 J	48 UJ	84	97 UJ
TOXAPHENE	UG/KG	270 U	240 U	570 U	530 U	470 UJ	250 UJ	390 U	500 UJ

Data Qualifiers

A-Average value. NA-Not analyzed. NAI-Interferences. J-Estimated value.

N-Presumptive evidence of presence of material.

NR-Not Reported

K-Actual value is known to be less than value given.

L-Actual value is known to be greater than value given.

U-Material was analyzed for but not detected. The number is the minimum quantitation limit.

R-QC indicates that data unusable. Compound may or may not be present. Resampling and reanalysis is necessary for verification.

C-Confirmed by GCMS.

1.When no value is reported, see chlordane constituents.

2.Constituents or metabolites of technical chlordane.

Pensacola NAS Pesticide/PCB Analytical Results

PESTICIDES SCAN		SD00601	SD00701	SD00801	SD00901	SD00902	SD01001	SD01101	SD01102
% MOISTURE	%	31	36	57	72	68	18	49	66
4,4'-DDD (P,P'-DDD)	UG/KG	4.8 U	5.2 U	7.7 U	12 UJ	10 UJ	4 UJ	2.5 JN	9.7 UJ
4,4'-DDE (P,P'-DDE)	UG/KG	4.8 U	5.2 U	7.7 U	12 UJ	10 UJ	4 UJ	6.5 UJ	9.7 UJ
4,4'-DDT (P,P'-DDT)	UG/KG	4.8 U	5.2 U	1.8 J	12 UJ	10 UJ	4 UJ	6.5 UJ	1.8 J
ALDRIN	UG/KG	2.5 U	2.7 U	4 U	6.1 UJ	5.3 UJ	2.1 UJ	3.3 UJ	5 UJ
ALPHA-BHC	UG/KG	2.5 U	2.7 U	4 U	6.1 UJ	5.3 UJ	2.1 UJ	3.3 UJ	5 UJ
ALPHA-CHLORDANE /2	UG/KG	2.5 U	2.7 U	4 U	6.1 UJ	5.3 UJ	2.1 UJ	3.3 UJ	5 UJ
BETA-BHC	UG/KG	2.5 U	2.7 U	4 U	6.1 UJ	5.3 UJ	2.1 UJ	3.3 UJ	5 UJ
DELTA-BHC	UG/KG	2.5 U	2.7 U	4 U	3.9 JN	3 JN	2.1 UJ	3.3 UJ	5 UJ
DIELDRIN	UG/KG	4.8 U	5.2 U	7.7 U	12 UJ	10 UJ	4 UJ	6.5 UJ	9.7 UJ
ENDOSULFAN I (ALPHA)	UG/KG	2.5 U	2.7 U	4 U	6.1 UJ	5.3 UJ	2.1 UJ	3.3 UJ	5 UJ
ENDOSULFAN II (BETA)	UG/KG	4.8 U	5.2 U	7.7 U	12 UJ	10 UJ	4 UJ	6.5 UJ	9.7 UJ
ENDOSULFAN SULFATE	UG/KG	4.8 U	5.2 U	7.7 U	12 UJ	10 UJ	4 UJ	1.1 J	9.7 UJ
ENDRIN	UG/KG	4.8 U	5.2 U	7.7 U	12 UJ	10 UJ	4 UJ	1.1 J	9.7 UJ
ENDRIN ALDEHYDE	UG/KG	4.8 U	5.2 U	7.7 U	12 UJ	10 UJ	4 UJ	6.5 UJ	9.7 UJ
ENDRIN KETONE	UG/KG	4.8 U	5.2 U	7.7 U	12 UJ	10 UJ	4 UJ	6.5 UJ	1.3 JN
GAMMA-BHC (LINDANE)	UG/KG	2.5 U	2.7 U	4 U	6.1 UJ	5.3 UJ	2.1 UJ	3.3 UJ	5 UJ
GAMMA-CHLORDANE /2	UG/KG	2.5 U	2.7 U	4 U	6.1 UJ	5.3 UJ	2.1 UJ	3.3 UJ	5 UJ
HEPTACHLOR	UG/KG	2.5 U	2.7 U	4 U	6.1 UJ	5.3 UJ	2.1 UJ	3.3 UJ	5 UJ
HEPTACHLOR EPOXIDE	UG/KG	2.5 U	2.7 U	4 U	6.1 UJ	5.3 UJ	2.1 UJ	0.95 J	5 UJ
METHOXYCHLOR	UG/KG	25 U	27 U	40 U	61 UJ	13 J	6.1 J	33 UJ	50 UJ
PCB-1016 (AROCLOR 1016)	UG/KG	48 U	52 U	77 U	120 UJ	100 UJ	40 UJ	65 UJ	97 UJ
PCB-1221 (AROCLOR 1221)	UG/KG	97 U	100 U	160 U	240 UJ	210 UJ	82 UJ	130 UJ	200 UJ
PCB-1232 (AROCLOR 1232)	UG/KG	48 U	52 U	77 U	120 UJ	100 UJ	40 UJ	65 UJ	97 UJ
PCB-1242 (AROCLOR 1242)	UG/KG	48 U	52 U	77 U	120 UJ	100 UJ	40 UJ	65 UJ	97 UJ
PCB-1248 (AROCLOR 1248)	UG/KG	48 U	52 U	77 U	120 UJ	100 UJ	40 UJ	65 UJ	97 UJ
PCB-1254 (AROCLOR 1254)	UG/KG	48 U	52 U	77 U	120 UJ	100 UJ	40 UJ	65 UJ	97 UJ
PCB-1260 (AROCLOR 1260)	UG/KG	48 U	52 U	77 U	120 UJ	100 UJ	40 UJ	65 UJ	97 UJ
TOXAPHENE	UG/KG	250 U	270 U	400 U	610 UJ	530 UJ	210 UJ	330 UJ	500 UJ

Pens..ola NAS Pesticide/PCB Analytical Results

PESTICIDES SCAN		SD01801	SD01802	SD02201	SD02202	SD10601	SD10901
% MOISTURE	%	42	31	71	63	29	72
4,4'-DDD (P,P'-DDD)	UG/KG	5.7 UJ	4.8 U	11 U	8.9 UJ	4.6 UJ	12 UJ
4,4'-DDE (P,P'-DDE)	UG/KG	5.7 UJ	4.8 U	11 U	8.9 UJ	4.6 UJ	12 UJ
4,4'-DDT (P,P'-DDT)	UG/KG	5.7 UJ	4.8 U	11 U	1.2 J	4.6 UJ	12 UJ
ALDRIN	UG/KG	2.9 UJ	2.5 U	5.9 U	4.6 UJ	2.4 UJ	6.1 UJ
ALPHA-BHC	UG/KG	2.9 UJ	2.5 U	5.9 U	4.6 UJ	2.4 UJ	6.1 UJ
ALPHA-CHLORDANE /2	UG/KG	2.9 UJ	2.5 U	5.9 U	4.6 UJ	2.4 UJ	6.1 UJ
BETA-BHC	UG/KG	2.9 UJ	2.5 U	5.9 U	4.6 UJ	2.4 UJ	6.1 UJ
DELTA-BHC	UG/KG	1.1 JN	2.5 U	5.9 U	2.6 J	0.91 J	5.2 J
DIELDRIN	UG/KG	5.7 UJ	4.8 U	11 U	8.9 UJ	4.6 UJ	12 UJ
ENDOSULFAN I (ALPHA)	UG/KG	2.9 UJ	2.5 U	5.9 U	4.6 UJ	2.4 UJ	6.1 UJ
ENDOSULFAN II (BETA)	UG/KG	5.7 UJ	4.8 U	11 U	8.9 UJ	4.6 UJ	12 UJ
ENDOSULFAN SULFATE	UG/KG	1.1 J	4.8 U	11 U	8.9 UJ	4.6 UJ	12 UJ
ENDRIN	UG/KG	5.7 UJ	4.8 U	11 U	8.9 UJ	4.6 UJ	12 UJ
ENDRIN ALDEHYDE	UG/KG	5.7 UJ	4.8 U	11 U	8.9 UJ	4.6 UJ	12 UJ
ENDRIN KETONE	UG/KG	5.7 UJ	4.8 U	11 U	8.9 UJ	4.6 UJ	12 UJ
GAMMA-BHC (LINDANE)	UG/KG	2.9 UJ	2.5 U	5.9 U	4.6 UJ	2.4 UJ	6.1 UJ
GAMMA-CHLORDANE /2	UG/KG	2.9 UJ	2.5 U	5.9 U	4.6 UJ	2.4 UJ	6.1 UJ
HEPTACHLOR	UG/KG	2.9 UJ	2.5 U	5.9 U	4.6 UJ	2.4 UJ	6.1 UJ
HEPTACHLOR EPOXIDE	UG/KG	2.9 UJ	2.5 U	5.9 U	4.6 UJ	2.4 UJ	6.1 UJ
METHOXYCHLOR	UG/KG	29 UJ	25 U	59 U	46 UJ	24 UJ	10 JN
PCB-1016 (AROCLOR 1016)	UG/KG	57 UJ	48 U	110 U	89 UJ	46 UJ	120 UJ
PCB-1221 (AROCLOR 1221)	UG/KG	120 UJ	97 U	230 U	180 UJ	94 UJ	240 UJ
PCB-1232 (AROCLOR 1232)	UG/KG	57 UJ	48 U	110 U	89 UJ	46 UJ	120 UJ
PCB-1242 (AROCLOR 1242)	UG/KG	57 UJ	48 U	110 U	89 UJ	46 UJ	120 UJ
PCB-1248 (AROCLOR 1248)	UG/KG	57 UJ	48 U	110 U	89 UJ	46 UJ	120 UJ
PCB-1254 (AROCLOR 1254)	UG/KG	57 UJ	48 U	110 U	89 UJ	46 UJ	120 UJ
PCB-1260 (AROCLOR 1260)	UG/KG	57 UJ	48 U	110 U	89 UJ	46 UJ	120 UJ
TOXAPHENE	UG/KG	290 UJ	250 U	590 U	460 UJ	240 UJ	610 UJ

Extractable (SVOC) Data

EXTRACTABLES SCAN		SD00101	SD00201	SD00301	SD00302
% MOISTURE	%	36	28	70	68
(3-AND/OR 4-)METHYLPHENOL	UG/KG	520 UJ	460 UJ	1100 U	1000 U
1,1-BIPHENYL	UG/KG	520 UJ	460 UJ	1100 U	1000 U
2,4,5-TRICHLOROPHENOL	UG/KG	1300 UJ	1200 UJ	2800 U	2600 U
2,4,6-TRICHLOROPHENOL	UG/KG	520 UJ	460 UJ	1100 U	1000 U
2,4-DICHLOROPHENOL	UG/KG	520 UJ	460 UJ	1100 U	1000 U
2,4-DIMETHYLPHENOL	UG/KG	53 J	460 UJ	1100 U	1000 U
2,4-DINITROPHENOL	UG/KG	1300 UJ	1200 UJ	2800 U	2600 U
2,4-DINITROTOLUENE	UG/KG	520 UJ	460 UJ	1100 U	1000 U
2,6-DINITROTOLUENE	UG/KG	520 UJ	460 UJ	1100 U	1000 U
2-CHLORONAPHTHALENE	UG/KG	520 UJ	460 UJ	1100 U	1000 U
2-CHLOROPHENOL	UG/KG	520 UJ	460 UJ	1100 U	1000 U
2-METHYL-4,6-DINITROPHENOL	UG/KG	1300 UJ	1200 UJ	2800 U	2600 U
2-METHYLNAPHTHALENE	UG/KG	520 UJ	460 UJ	1100 U	1000 U
2-METHYLPHENOL	UG/KG	520 UJ	460 UJ	1100 U	1000 U
2-NITROANILINE	UG/KG	1300 UJ	1200 UJ	2800 U	2600 U
2-NITROPHENOL	UG/KG	520 UJ	460 UJ	1100 U	1000 U
3,3'-DICHLOROBENZIDINE	UG/KG	520 UJ	460 UJ	1100 U	1000 U
3-NITROANILINE	UG/KG	1300 UJ	1200 UJ	2800 U	2600 U
4-BROMOPHENYL PHENYL ETHER	UG/KG	520 UJ	460 UJ	1100 U	1000 U
4-CHLORO-3-METHYLPHENOL	UG/KG	520 UJ	460 UJ	1100 U	1000 U
4-CHLOROANILINE	UG/KG	520 UJ	460 UJ	1100 U	1000 U
4-CHLOROPHENYL PHENYL ETHER	UG/KG	520 UJ	460 UJ	1100 U	1000 U
4-NITROANILINE	UG/KG	1300 UJ	1200 UJ	2800 UJ	2600 UJ
4-NITROPHENOL	UG/KG	1300 UJ	1200 UJ	2800 U	2600 U
ACENAPHTHENE	UG/KG	520 UJ	460 UJ	1100 U	1000 U
ACENAPHTHYLENE	UG/KG	520 UJ	460 UJ	1100 U	1000 U
ACETOPHENONE	UG/KG	520 UJ	460 UJ	1100 U	1000 U
ANTHRACENE	UG/KG	520 UJ	460 UJ	1100 U	1000 U
ATRAZINE	UG/KG	520 UJ	460 UJ	1100 U	1000 U
BENZALDEHYDE	UG/KG	520 UJ	460 UJ	1100 UJ	1000 UJ
BENZO(A)ANTHRACENE	UG/KG	230 J	460 UJ	1100 U	470 J
BENZO(B)FLUORANTHENE	UG/KG	500 J	62 J	190 J	730 J
BENZO(GHI)PERYLENE	UG/KG	54 J	460 UJ	1100 U	1000 U
BENZO(K)FLUORANTHENE	UG/KG	410 J	59 J	140 J	540 J
BENZO-A-PYRENE	UG/KG	410 J	62 J	140 J	490 J
BENZYL BUTYL PHTHALATE	UG/KG	520 UJ	460 UJ	1100 U	1000 U
BIS(2-CHLOROETHOXY)METHANE	UG/KG	520 UJ	460 UJ	1100 U	1000 U
BIS(2-CHLOROETHYL) ETHER	UG/KG	520 UJ	460 UJ	1100 U	1000 U
BIS(2-CHLOROISOPROPYL) ETHER	UG/KG	520 UJ	460 UJ	1100 U	1000 U
BIS(2-ETHYLHEXYL) PHTHALATE	UG/KG	2800 J	460 UJ	1100 U	2900
CAPROLACTAM	UG/KG	520 UJ	460 UJ	1100 U	1000 U
CARBAZOLE	UG/KG	520 UJ	460 UJ	1100 U	1000 U
CHRYSENE	UG/KG	260 J	50 J	130 J	550 J
DIBENZO(A,H)ANTHRACENE	UG/KG	120 J	460 UJ	1100 U	1000 U
DIBENZOFURAN	UG/KG	520 UJ	460 UJ	1100 U	1000 U
DIETHYL PHTHALATE	UG/KG	520 UJ	460 UJ	1100 U	1000 U
DIMETHYL PHTHALATE	UG/KG	520 UJ	460 UJ	1100 U	1000 U
DI-N-BUTYLPHTHALATE	UG/KG	520 UJ	460 UJ	1100 U	1000 U
DI-N-OCTYLPHTHALATE	UG/KG	520 UJ	460 UJ	1100 U	1000 U

EXTRACTABLES SCAN		SD00101	SD00201	SD00301	SD00302
FLUORANTHENE	UG/KG	320 J	77 J	170 J	400 J
FLUORENE	UG/KG	520 UJ	460 UJ	1100 U	1000 U
HEXACHLOROBENZENE (HCB)	UG/KG	520 UJ	460 UJ	1100 U	1000 U
HEXACHLOROBUTADIENE	UG/KG	520 UJ	460 UJ	1100 U	1000 U
HEXACHLOROCYCLOPENTADIENE (HCCP)	UG/KG	520 UJ	460 UJ	1100 U	1000 U
HEXACHLOROETHANE	UG/KG	520 UJ	460 UJ	1100 U	1000 U
INDENO (1,2,3-CD) PYRENE	UG/KG	220 J	460 UJ	1100 U	260 J
ISOPHORONE	UG/KG	520 UJ	460 UJ	1100 U	1000 U
NAPHTHALENE	UG/KG	520 UJ	460 UJ	1100 U	1000 U
NITROBENZENE	UG/KG	520 UJ	460 UJ	1100 U	1000 U
N-NITROSODI-N-PROPYLAMINE	UG/KG	520 UJ	460 UJ	1100 U	1000 U
N-NITROSODIPHENYLAMINE/DIPHENYLAMINE	UG/KG	520 UJ	460 UJ	1100 U	1000 U
PENTACHLOROPHENOL	UG/KG	1300 UJ	1200 UJ	2800 U	2600 U
PHENANTHRENE	UG/KG	520 UJ	460 UJ	1100 U	120 J
PHENOL	UG/KG	520 UJ	460 UJ	1100 U	210 J
PYRENE	UG/KG	340 J	80 J	170 J	800 J
MISCELLANEOUS EXTRACTABLES					
10 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
11 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
11H-BENZO[A]FLUORENE	UG/KG	180 JN	NR	NR	270 JN
14 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
14-PENTADECENOIC ACID	UG/KG	180 JN	NR	NR	NR
15-OCTADECENOIC ACID, METHYL	UG/KG	NR	NR	NR	NR
16 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
17 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	8300 J	NR
1-EICOSANOL	UG/KG	NR	150 JN	NR	NR
1-NONADECANOL	UG/KG	NR	NR	NR	NR
1-NONADECENE	UG/KG	NR	NR	NR	NR
1-OCTADECANOL	UG/KG	NR	NR	NR	NR
1-OCTADECENE	UG/KG	NR	NR	410 JN	NR
22 UNIDENTIFIED COMPOUNDS	UG/KG	7400 J	NR	NR	NR
23 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
25 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
26 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	13000 J
27 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
2H-INDOL-2-ONE, 1,3-DIHYDRO-	UG/KG	NR	NR	NR	NR
30 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
3-OCTADECENE, (E)-	UG/KG	NR	NR	NR	NR
4H-1,2,4-TRIAZOLE, 4-ETHYL-	UG/KG	NR	NR	NR	NR
4-HYDROXY-5-OXOHEXANOIC ACID	UG/KG	NR	NR	NR	NR
6 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
7-HEPTADECENE, 17-CHLORO-	UG/KG	NR	NR	NR	NR
8 UNIDENTIFIED COMPOUNDS	UG/KG	NR	4200 J	NR	NR
9 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
9-HEXADECENOIC ACID	UG/KG	NR	330 JN	NR	NR
BENZO[B]NAPHTHO[2,1-D]THIOPH	UG/KG	NR	NR	NR	NR
BENZO[B]NAPHTHO[2,3-D]THIOPH	UG/KG	200 JN	NR	NR	NR
BENZO[E]PYRENE	UG/KG	220 JN	NR	NR	490 JN
BIS(TRIMETHYLSILYL)-1,4-DIBR	UG/KG	NR	NR	NR	NR

EXTRACTABLES SCAN		SD00101	SD00201	SD00301	SD00302
CHOLESTEROL	UG/KG	NR	NR	1100 JN	NR
CYCLOPROPANENONANOIC ACID, 2	UG/KG	NR	NR	NR	NR
ERGOSTA-5,22-DIEN-3-OL, (3.B	UG/KG	NR	NR	630 JN	NR
ETHANOL, 2-(HEXADECYLOXY)-	UG/KG	NR	NR	NR	NR
HEXADECANOIC ACID	UG/KG	630 JN	280 JN	NR	570 JN
HEXADECENOIC ACID (2 ISOMERS)	UG/KG	NR	NR	2400 JN	NR
HYDROXYLAMINE, O-DECYL-	UG/KG	NR	NR	NR	NR
OLEIC ACID	UG/KG	460 JN	NR	550 JN	NR
OXACYCLOHEPTADECAN-2-ONE	UG/KG	460 JN	NR	NR	NR
OXACYCLOHEXADECAN-2-ONE	UG/KG	NR	NR	NR	NR
OXACYCLOHEXADECAN-2-ONE, 16-	UG/KG	NR	NR	NR	NR
OXACYCLOTETRADECANE-2,11-DIO	UG/KG	NR	NR	NR	NR
PENTADECANOIC ACID	UG/KG	NR	NR	NR	NR
PERYLENE	UG/KG	270 JN	NR	NR	NR
PHENANTHRENE, 2,4,5,7-TETRAM	UG/KG	NR	NR	NR	NR
PHOSPHONOUS DICHLORIDE, (1,7	UG/KG	NR	NR	NR	NR
PIPERIDINE, 4-METHYL-	UG/KG	NR	NR	NR	NR
PYRENE, 1-METHYL-	UG/KG	NR	NR	NR	620 JN
TETRADECANOIC ACID	UG/KG	NR	NR	250 JN	NR
UNKNOWN ORGANIC ACID	UG/KG	NR	NR	380 J	NR

Data Qualifiers

A-Average value. NA-Not analyzed. NAI-Interferences. J-Estimated value.

N-Presumptive evidence of presence of material.

NR-Not Reported

K-Actual value is known to be less than value given.

L-Actual value is known to be greater than value given.

U-Material was analyzed for but not detected. The number is the minimum quantitation limit.

R-QC indicates that data unusable. Compound may or may not be present. Resampling and reanalysis is necessary for verification.

C-Confirmed by GCMS.

1.When no value is reported, see chlordane constituents.

2.Constituents or metabolites of technical chlordane.

EXTRACTABLES SCAN		SD00401	SD00402	SD00501	SD00502
% MOISTURE	%	64	31	56	66
(3-AND/OR 4-)METHYLPHENOL	UG/KG	920 U	480 U	750 U	970 UJ
1,1-BIPHENYL	UG/KG	920 U	480 U	750 U	970 U
2,4,5-TRICHLOROPHENOL	UG/KG	2300 U	1200 U	1900 U	2400 U
2,4,6-TRICHLOROPHENOL	UG/KG	920 U	480 U	750 U	970 U
2,4-DICHLOROPHENOL	UG/KG	920 U	480 U	750 U	970 U
2,4-DIMETHYLPHENOL	UG/KG	920 U	480 U	750 U	970 U
2,4-DINITROPHENOL	UG/KG	2300 U	1200 U	1900 U	2400 U
2,4-DINITROTOLUENE	UG/KG	920 U	480 U	750 U	970 U
2,6-DINITROTOLUENE	UG/KG	920 U	480 U	750 U	970 U
2-CHLORONAPHTHALENE	UG/KG	920 U	480 U	750 U	970 U
2-CHLOROPHENOL	UG/KG	920 U	480 U	750 U	970 U
2-METHYL-4,6-DINITROPHENOL	UG/KG	2300 U	1200 U	1900 U	2400 U
2-METHYLNAPHTHALENE	UG/KG	920 U	480 U	750 U	970 U
2-METHYLPHENOL	UG/KG	920 U	480 U	750 U	970 UJ
2-NITROANILINE	UG/KG	2300 U	1200 U	1900 U	2400 U
2-NITROPHENOL	UG/KG	920 U	480 U	750 U	970 U
3,3'-DICHLOROBENZIDINE	UG/KG	920 U	480 U	750 U	970 UJ
3-NITROANILINE	UG/KG	2300 U	1200 U	1900 U	2400 U
4-BROMOPHENYL PHENYL ETHER	UG/KG	920 U	480 U	750 U	970 U
4-CHLORO-3-METHYLPHENOL	UG/KG	920 U	480 U	750 U	970 U
4-CHLOROANILINE	UG/KG	920 U	480 U	750 U	970 U
4-CHLOROPHENYL PHENYL ETHER	UG/KG	920 U	480 U	750 U	970 U
4-NITROANILINE	UG/KG	2300 UJ	1200 UJ	1900 UJ	2400 U
4-NITROPHENOL	UG/KG	2300 U	1200 U	1900 U	2400 U
ACENAPHTHENE	UG/KG	920 U	480 U	750 U	970 U
ACENAPHTHYLENE	UG/KG	920 U	480 U	750 U	970 U
ACETOPHENONE	UG/KG	920 U	480 U	750 U	970 U
ANTHRACENE	UG/KG	920 U	480 U	750 U	970 U
ATRAZINE	UG/KG	920 U	480 U	750 U	970 U
BENZALDEHYDE	UG/KG	920 UJ	480 UJ	750 UJ	970 U
BENZO(A)ANTHRACENE	UG/KG	130 J	100 J	310 J	970 UJ
BENZO(B)FLUORANTHENE	UG/KG	210 J	170 J	450 J	970 UJ
BENZO(GHI)PERYLENE	UG/KG	920 U	480 U	750 U	970 UJ
BENZO(K)FLUORANTHENE	UG/KG	400 J	120 J	550 J	970 UJ
BENZO-A-PYRENE	UG/KG	170 J	130 J	420 J	970 UJ
BENZYL BUTYL PHTHALATE	UG/KG	920 U	480 U	750 U	970 UJ
BIS(2-CHLOROETHOXY)METHANE	UG/KG	920 U	480 U	750 U	970 U
BIS(2-CHLOROETHYL) ETHER	UG/KG	920 U	480 U	750 U	970 U
BIS(2-CHLOROISOPROPYL) ETHER	UG/KG	920 U	480 U	750 U	970 U
BIS(2-ETHYLHEXYL) PHTHALATE	UG/KG	920 U	480 U	1900	970 UJ
CAPROLACTAM	UG/KG	920 U	480 U	750 U	970 UR
CARBAZOLE	UG/KG	920 U	480 U	750 U	970 U
CHRYSENE	UG/KG	160 J	120 J	360 J	970 UJ
DIBENZO(A,H)ANTHRACENE	UG/KG	920 U	480 U	91 J	970 UJ
DIBENZOFURAN	UG/KG	920 U	480 U	750 U	970 U
DIETHYL PHTHALATE	UG/KG	920 U	480 U	750 U	970 U
DIMETHYL PHTHALATE	UG/KG	920 U	480 U	750 U	970 U
DI-N-BUTYLPHTHALATE	UG/KG	920 U	480 U	750 U	970 U
DI-N-OCTYLPHTHALATE	UG/KG	920 U	480 U	750 U	970 UJ

EXTRACTABLES SCAN		SD00401	SD00402	SD00501	SD00502
FLUORANTHENE	UG/KG	200 J	160 J	510 J	230 J
FLUORENE	UG/KG	920 U	480 U	750 U	970 U
HEXACHLOROBENZENE (HCB)	UG/KG	920 U	480 U	750 U	970 U
HEXACHLOROBUTADIENE	UG/KG	920 U	480 U	750 U	970 U
HEXACHLOROCYCLOPENTADIENE (HCCP)	UG/KG	920 U	480 U	750 U	970 U
HEXACHLOROETHANE	UG/KG	920 U	480 U	750 U	970 U
INDENO (1,2,3-CD) PYRENE	UG/KG	110 J	87 J	220 J	970 UJ
ISOPHORONE	UG/KG	920 U	480 U	750 U	970 U
NAPHTHALENE	UG/KG	920 U	480 U	750 U	970 U
NITROBENZENE	UG/KG	920 U	480 U	750 U	970 U
N-NITROSODI-N-PROPYLAMINE	UG/KG	920 U	480 U	750 U	970 UJ
N-NITROSODIPHENYLAMINE/DIPHENYLAMINE	UG/KG	920 U	480 U	750 U	970 U
PENTACHLOROPHENOL	UG/KG	2300 U	1200 U	1900 U	2400 U
PHENANTHRENE	UG/KG	150 J	480 U	200 J	970 U
PHENOL	UG/KG	920 U	480 U	750 U	970 U
PYRENE	UG/KG	240 J	170 J	580 J	200 J
MISCELLANEOUS EXTRACTABLES					
10 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
11 UNIDENTIFIED COMPOUNDS	UG/KG	NR	2300 J	NR	NR
11H-BENZO[A]FLUORENE	UG/KG	NR	NR	NR	NR
14 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
14-PENTADECENOIC ACID	UG/KG	NR	NR	NR	NR
15-OCTADECENOIC ACID, METHYL	UG/KG	NR	NR	NR	NR
16 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
17 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
1-EICOSANOL	UG/KG	NR	NR	NR	NR
1-NONADECANOL	UG/KG	NR	NR	NR	NR
1-NONADECENE	UG/KG	NR	NR	NR	NR
1-OCTADECANOL	UG/KG	600 JN	NR	NR	NR
1-OCTADECENE	UG/KG	NR	NR	NR	NR
22 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	9500 J	NR
23 UNIDENTIFIED COMPOUNDS	UG/KG	10000 J	NR	NR	NR
25 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
26 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
27 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
2H-INDOL-2-ONE, 1,3-DIHYDRO-	UG/KG	NR	NR	NR	NR
30 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	17000 J
3-OCTADECENE, (E)-	UG/KG	NR	180 JN	NR	NR
4H-1,2,4-TRIAZOLE, 4-ETHYL-	UG/KG	NR	NR	NR	NR
4-HYDROXY-5-OXOHEXANOIC ACID	UG/KG	NR	NR	NR	NR
6 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
7-HEPTADECENE, 17-CHLORO-	UG/KG	NR	NR	260 JN	NR
8 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
9 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
9-HEXADECENOIC ACID	UG/KG	1500 JN	NR	NR	NR
BENZO[B]NAPHTHO[2,1-D]THIOPH	UG/KG	NR	NR	220 JN	NR
BENZO[B]NAPHTHO[2,3-D]THIOPH	UG/KG	NR	NR	NR	NR
BENZO[E]PYRENE	UG/KG	NR	NR	230 JN	NR
BIS(TRIMETHYLSILYL)-1,4-DIBR	UG/KG	NR	NR	NR	NR

EXTRACTABLES SCAN		SD00401	SD00402	SD00501	SD00502
CHOLESTEROL	UG/KG	880 JN	NR	850 JN	NR
CYCLOPROPANENONANOIC ACID, 2	UG/KG	NR	NR	NR	NR
ERGOSTA-5,22-DIEN-3-OL, (3.B	UG/KG	NR	NR	NR	NR
ETHANOL, 2-(HEXADECYLOXY)-	UG/KG	NR	NR	NR	NR
HEXADECANOIC ACID	UG/KG	1700 JN	190 JN	850 JN	NR
HEXADECENOIC ACID (2 ISOMERS)	UG/KG	NR	NR	NR	NR
HYDROXYLAMINE, O-DECYL-	UG/KG	NR	NR	NR	NR
OLEIC ACID	UG/KG	500 JN	NR	300 JN	NR
OXACYCLOHEPTADECAN-2-ONE	UG/KG	NR	NR	760 JN	NR
OXACYCLOHEXADECAN-2-ONE	UG/KG	NR	NR	NR	NR
OXACYCLOHEXADECAN-2-ONE, 16-	UG/KG	NR	NR	NR	NR
OXACYCLOTETRADECANE-2,11-DIO	UG/KG	NR	NR	NR	NR
PENTADECANOIC ACID	UG/KG	200 JN	NR	NR	NR
PERYLENE	UG/KG	NR	NR	NR	NR
PHENANTHRENE, 2,4,5,7-TETRAM	UG/KG	NR	NR	NR	NR
PHOSPHONOUS DICHLORIDE, (1,7	UG/KG	NR	NR	370 JN	NR
PIPERIDINE, 4-METHYL-	UG/KG	NR	NR	NR	NR
PYRENE, 1-METHYL-	UG/KG	NR	NR	NR	NR
TETRADECANOIC ACID	UG/KG	360 JN	NR	NR	NR
UNKNOWN ORGANIC ACID	UG/KG	NR	NR	NR	NR

Data Qualifiers

A-Average value. NA-Not analyzed. NAI-Interferences. J-Esti
N-Presumptive evidence of presence of material.
NR-Not Reported
K-Actual value is known to be less than value given.
L-Actual value is known to be greater than value given.
U-Material was analyzed for but not detected. The number is th
R-QC indicates that data unusable. Compound may or may not
C-Confirmed by GCMS.
1.When no value is reported, see chlordane constituents.
2.Constituents or metabolites of technical chlordane.

EXTRACTABLES SCAN		SD00601	SD00701	SD00801	SD00901
% MOISTURE	%	31	36	57	72
(3-AND/OR 4-)METHYLPHENOL	UG/KG	480 U	520 U	770 U	1200 UJ
1,1-BIPHENYL	UG/KG	480 U	520 U	770 U	1200 U
2,4,5-TRICHLOROPHENOL	UG/KG	1200 U	1300 U	1900 U	3000 U
2,4,6-TRICHLOROPHENOL	UG/KG	480 U	520 U	770 U	1200 U
2,4-DICHLOROPHENOL	UG/KG	480 U	520 U	770 U	1200 U
2,4-DIMETHYLPHENOL	UG/KG	480 U	520 U	770 U	1200 U
2,4-DINITROPHENOL	UG/KG	1200 U	1300 U	1900 U	3000 U
2,4-DINITROTOLUENE	UG/KG	480 U	520 U	770 U	1200 U
2,6-DINITROTOLUENE	UG/KG	480 U	520 U	770 U	1200 U
2-CHLORONAPHTHALENE	UG/KG	480 U	520 U	770 U	1200 U
2-CHLOROPHENOL	UG/KG	480 U	520 U	770 U	1200 U
2-METHYL-4,6-DINITROPHENOL	UG/KG	1200 U	1300 U	1900 U	3000 U
2-METHYLNAPHTHALENE	UG/KG	480 U	520 U	770 U	1200 U
2-METHYLPHENOL	UG/KG	480 U	520 U	770 U	1200 UJ
2-NITROANILINE	UG/KG	1200 U	1300 U	1900 U	3000 U
2-NITROPHENOL	UG/KG	480 U	520 U	770 U	1200 U
3,3'-DICHLOROBENZIDINE	UG/KG	480 U	520 U	770 U	1200 U
3-NITROANILINE	UG/KG	1200 U	1300 U	1900 U	3000 U
4-BROMOPHENYL PHENYL ETHER	UG/KG	480 U	520 U	770 U	1200 U
4-CHLORO-3-METHYLPHENOL	UG/KG	480 U	520 U	770 U	1200 U
4-CHLOROANILINE	UG/KG	480 U	520 U	770 U	1200 U
4-CHLOROPHENYL PHENYL ETHER	UG/KG	480 U	520 U	770 U	1200 U
4-NITROANILINE	UG/KG	1200 UJ	1300 UJ	1900 UJ	3000 U
4-NITROPHENOL	UG/KG	1200 U	1300 U	1900 U	3000 U
ACENAPHTHENE	UG/KG	480 U	520 U	770 U	1200 U
ACENAPHTHYLENE	UG/KG	480 U	520 U	770 U	1200 U
ACETOPHENONE	UG/KG	480 U	520 U	770 U	1200 U
ANTHRACENE	UG/KG	480 U	520 U	770 U	1200 U
ATRAZINE	UG/KG	480 U	520 U	770 U	1200 U
BENZALDEHYDE	UG/KG	480 UJ	520 UJ	770 UJ	1200 U
BENZO(A)ANTHRACENE	UG/KG	54 J	520 U	770 U	140 J
BENZO(B)FLUORANTHENE	UG/KG	66 J	53 J	120 J	170 J
BENZO(GHI)PERYLENE	UG/KG	480 U	520 U	770 U	1200 U
BENZO(K)FLUORANTHENE	UG/KG	79 J	110 J	130 J	150 J
BENZO-A-PYRENE	UG/KG	59 J	520 U	110 J	150 J
BENZYL BUTYL PHTHALATE	UG/KG	480 U	520 U	770 U	1200 U
BIS(2-CHLOROETHOXY)METHANE	UG/KG	480 U	520 U	770 U	1200 U
BIS(2-CHLOROETHYL) ETHER	UG/KG	480 U	520 U	770 U	1200 U
BIS(2-CHLOROISOPROPYL) ETHER	UG/KG	480 U	520 U	770 U	1200 U
BIS(2-ETHYLHEXYL) PHTHALATE	UG/KG	480 U	520 U	970	11000
CAPROLACTAM	UG/KG	480 U	520 U	770 U	1200 UR
CARBAZOLE	UG/KG	480 U	520 U	770 U	1200 U
CHRYSENE	UG/KG	56 J	520 U	78 J	220 J
DIBENZO(A,H)ANTHRACENE	UG/KG	480 U	520 U	770 U	1200 U
DIBENZOFURAN	UG/KG	480 U	520 U	770 U	1200 U
DIETHYL PHTHALATE	UG/KG	480 U	520 U	770 U	1200 U
DIMETHYL PHTHALATE	UG/KG	480 U	520 U	770 U	1200 U
DI-N-BUTYLPHTHALATE	UG/KG	480 U	520 U	770 U	1200 U
DI-N-OCTYLPHTHALATE	UG/KG	480 U	520 U	770 U	1200 U

EXTRACTABLES SCAN		SD00601	SD00701	SD00801	SD00901
FLUORANTHENE	UG/KG	76 J	77 J	100 J	250 J
FLUORENE	UG/KG	480 U	520 U	770 U	1200 U
HEXACHLOROBENZENE (HCB)	UG/KG	480 U	520 U	770 U	1200 U
HEXACHLOROBUTADIENE	UG/KG	480 U	520 U	770 U	1200 U
HEXACHLOROCYCLOPENTADIENE (HCCP)	UG/KG	480 U	520 U	770 U	1200 U
HEXACHLOROETHANE	UG/KG	480 U	520 U	770 U	1200 U
INDENO (1,2,3-CD) PYRENE	UG/KG	480 U	520 U	770 U	1200 U
ISOPHORONE	UG/KG	480 U	520 U	770 U	1200 U
NAPHTHALENE	UG/KG	480 U	520 U	770 U	1200 U
NITROBENZENE	UG/KG	480 U	520 U	770 U	1200 U
N-NITROSODI-N-PROPYLAMINE	UG/KG	480 U	520 U	770 U	1200 UJ
N-NITROSODIPHENYLAMINE/DIPHENYLAMINE	UG/KG	480 U	520 U	770 U	1200 U
PENTACHLOROPHENOL	UG/KG	1200 U	1300 U	1900 U	3000 U
PHENANTHRENE	UG/KG	480 U	520 U	770 U	1200 U
PHENOL	UG/KG	480 U	520 U	770 U	1200 U
PYRENE	UG/KG	95 J	73 J	150 J	740 J
MISCELLANEOUS EXTRACTABLES					
10 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
11 UNIDENTIFIED COMPOUNDS	UG/KG	NR	2800 J	NR	NR
11H-BENZO[A]FLUORENE	UG/KG	NR	NR	NR	NR
14 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
14-PENTADECENOIC ACID	UG/KG	NR	NR	NR	NR
15-OCTADECENOIC ACID, METHYL	UG/KG	NR	170 JN	NR	NR
16 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
17 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
1-EICOSANOL	UG/KG	NR	NR	NR	NR
1-NONADECANOL	UG/KG	NR	NR	NR	NR
1-NONADECENE	UG/KG	NR	190 JN	NR	NR
1-OCTADECANOL	UG/KG	170 JN	NR	NR	NR
1-OCTADECENE	UG/KG	NR	NR	NR	NR
22 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	9100 J	NR
23 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
25 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
26 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
27 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	17000 J
2H-INDOL-2-ONE, 1,3-DIHYDRO-	UG/KG	NR	NR	NR	NR
30 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
3-OCTADECENE, (E)-	UG/KG	NR	NR	NR	NR
4H-1,2,4-TRIAZOLE, 4-ETHYL-	UG/KG	580 JN	NR	NR	NR
4-HYDROXY-5-OXOHEXANOIC ACID	UG/KG	NR	430 JN	NR	NR
6 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
7-HEPTADECENE, 17-CHLORO-	UG/KG	NR	NR	NR	NR
8 UNIDENTIFIED COMPOUNDS	UG/KG	1600 J	NR	NR	NR
9 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
9-HEXADECENOIC ACID	UG/KG	NR	470 JN	NR	NR
BENZO[B]NAPHTHO[2,1-D]THIOPH	UG/KG	NR	NR	NR	NR
BENZO[B]NAPHTHO[2,3-D]THIOPH	UG/KG	NR	NR	NR	NR
BENZO[E]PYRENE	UG/KG	NR	NR	NR	NR
BIS(TRIMETHYLSILYL)-1,4-DIBR	UG/KG	NR	NR	NR	NR

EXTRACTABLES SCAN		SD00601	SD00701	SD00801	SD00901
CHOLESTEROL	UG/KG	NR	NR	NR	NR
CYCLOPROPANENONANOIC ACID, 2	UG/KG	NR	NR	NR	NR
ERGOSTA-5,22-DIEN-3-OL, (3.B	UG/KG	NR	NR	NR	NR
ETHANOL, 2-(HEXADECYLOXY)-	UG/KG	NR	NR	NR	NR
HEXADECANOIC ACID	UG/KG	370 JN	540 JN	1100 JN	1800 JN
HEXADECENOIC ACID (2 ISOMERS)	UG/KG	NR	NR	NR	NR
HYDROXYLAMINE, O-DECYL-	UG/KG	NR	NR	NR	310 JN
OLEIC ACID	UG/KG	100 JN	NR	NR	NR
OXACYCLOHEPTADECAN-2-ONE	UG/KG	NR	NR	NR	NR
OXACYCLOHEXADECAN-2-ONE	UG/KG	NR	NR	NR	NR
OXACYCLOHEXADECAN-2-ONE, 16-	UG/KG	280 JN	NR	NR	NR
OXACYCLOTETRADECANE-2,11-DIO	UG/KG	NR	NR	NR	2800 JN
PENTADECANOIC ACID	UG/KG	NR	NR	NR	NR
PERYLENE	UG/KG	NR	NR	NR	NR
PHENANTHRENE, 2,4,5,7-TETRAM	UG/KG	NR	NR	NR	NR
PHOSPHONOUS DICHLORIDE, (1,7	UG/KG	NR	NR	NR	NR
PIPERIDINE, 4-METHYL-	UG/KG	NR	NR	NR	NR
PYRENE, 1-METHYL-	UG/KG	NR	NR	NR	NR
TETRADECANOIC ACID	UG/KG	NR	NR	180 JN	NR
UNKNOWN ORGANIC ACID	UG/KG	NR	NR	NR	NR

Data Qualifiers

A-Average value. NA-Not analyzed. NAI-Interferences. J-Esti
N-Presumptive evidence of presence of material.
NR-Not Reported
K-Actual value is known to be less than value given.
L-Actual value is known to be greater than value given.
U-Material was analyzed for but not detected. The number is th
R-QC indicates that data unusable. Compound may or may not
C-Confirmed by GCMS.
1.When no value is reported, see chlordane constituents.
2.Constituents or metabolites of technical chlordane.

EXTRACTABLES SCAN		SD00902	SD01001	SD01101	SD01102
% MOISTURE	%	68	18	49	66
(3-AND/OR 4-)METHYLPHENOL	UG/KG	1000 U	400 U	650 U	970 U
1,1-BIPHENYL	UG/KG	1000 U	400 U	650 U	970 U
2,4,5-TRICHLOROPHENOL	UG/KG	2600 U	1000 U	1600 U	2400 U
2,4,6-TRICHLOROPHENOL	UG/KG	1000 U	400 U	650 U	970 U
2,4-DICHLOROPHENOL	UG/KG	1000 U	400 U	650 U	970 U
2,4-DIMETHYLPHENOL	UG/KG	1000 U	400 U	650 U	970 U
2,4-DINITROPHENOL	UG/KG	2600 UJ	1000 UJ	1600 U	2400 U
2,4-DINITROTOLUENE	UG/KG	1000 U	400 U	650 U	970 U
2,6-DINITROTOLUENE	UG/KG	1000 U	400 U	650 U	970 U
2-CHLORONAPHTHALENE	UG/KG	1000 U	400 U	650 U	970 U
2-CHLOROPHENOL	UG/KG	1000 U	400 U	650 U	970 U
2-METHYL-4,6-DINITROPHENOL	UG/KG	2600 U	1000 U	1600 U	2400 U
2-METHYLNAPHTHALENE	UG/KG	1000 U	400 U	650 U	970 U
2-METHYLPHENOL	UG/KG	1000 U	400 U	650 U	970 U
2-NITROANILINE	UG/KG	2600 U	1000 U	1600 U	2400 U
2-NITROPHENOL	UG/KG	1000 U	400 U	650 U	970 U
3,3'-DICHLOROBENZIDINE	UG/KG	1000 U	400 U	650 U	970 U
3-NITROANILINE	UG/KG	2600 U	1000 U	1600 U	2400 U
4-BROMOPHENYL PHENYL ETHER	UG/KG	1000 U	400 U	650 U	970 U
4-CHLORO-3-METHYLPHENOL	UG/KG	1000 U	400 U	650 U	970 U
4-CHLOROANILINE	UG/KG	1000 UJ	400 UJ	650 U	970 U
4-CHLOROPHENYL PHENYL ETHER	UG/KG	1000 U	400 U	650 U	970 U
4-NITROANILINE	UG/KG	2600 UJ	1000 UJ	1600 U	2400 U
4-NITROPHENOL	UG/KG	2600 U	1000 U	1600 UJ	2400 UJ
ACENAPHTHENE	UG/KG	1000 U	400 U	76 J	970 U
ACENAPHTHYLENE	UG/KG	1000 U	400 U	650 U	970 U
ACETOPHENONE	UG/KG	1000 U	400 U	650 U	970 U
ANTHRACENE	UG/KG	1000 U	400 U	110 J	970 U
ATRAZINE	UG/KG	1000 U	400 U	650 U	970 U
BENZALDEHYDE	UG/KG	1000 UJ	400 UJ	650 U	970 U
BENZO(A)ANTHRACENE	UG/KG	140 J	400 U	380 J	560 J
BENZO(B)FLUORANTHENE	UG/KG	190 J	400 U	470 J	560 J
BENZO(GHI)PERYLENE	UG/KG	1000 U	400 U	650 U	970 U
BENZO(K)FLUORANTHENE	UG/KG	160 J	400 U	380 J	550 J
BENZO-A-PYRENE	UG/KG	160 J	400 U	380 J	510 J
BENZYL BUTYL PHTHALATE	UG/KG	1000 U	400 U	650 U	970 U
BIS(2-CHLOROETHOXY)METHANE	UG/KG	1000 U	400 U	650 U	970 U
BIS(2-CHLOROETHYL) ETHER	UG/KG	1000 U	400 U	650 U	970 U
BIS(2-CHLOROISOPROPYL) ETHER	UG/KG	1000 U	400 U	650 UJ	970 UJ
BIS(2-ETHYLHEXYL) PHTHALATE	UG/KG	1000 U	400 U	4700	970 U
CAPROLACTAM	UG/KG	1000 U	400 U	650 UR	970 UR
CARBAZOLE	UG/KG	1000 U	400 U	650 U	970 U
CHRYSENE	UG/KG	150 J	400 U	390 J	560 J
DIBENZO(A,H)ANTHRACENE	UG/KG	1000 U	400 U	650 U	970 U
DIBENZOFURAN	UG/KG	1000 U	400 U	650 U	970 U
DIETHYL PHTHALATE	UG/KG	1000 U	400 U	650 U	970 U
DIMETHYL PHTHALATE	UG/KG	1000 U	400 U	650 U	970 U
DI-N-BUTYLPHTHALATE	UG/KG	1000 U	400 U	650 U	970 U
DI-N-OCTYLPHTHALATE	UG/KG	1000 U	400 U	650 U	970 U

EXTRACTABLES SCAN		SD00902	SD01001	SD01101	SD01102
FLUORANTHENE	UG/KG	200 J	400 U	760	950 J
FLUORENE	UG/KG	1000 U	400 U	650 U	970 U
HEXACHLOROBENZENE (HCB)	UG/KG	1000 U	400 U	650 U	970 U
HEXACHLOROBUTADIENE	UG/KG	1000 U	400 U	650 U	970 U
HEXACHLOROCYCLOPENTADIENE (HCCP)	UG/KG	1000 U	400 U	650 U	970 U
HEXACHLOROETHANE	UG/KG	1000 U	400 U	650 U	970 U
INDENO (1,2,3-CD) PYRENE	UG/KG	1000 U	400 U	190 J	970 U
ISOPHORONE	UG/KG	1000 U	400 U	650 U	970 U
NAPHTHALENE	UG/KG	1000 U	400 U	650 U	970 U
NITROBENZENE	UG/KG	1000 U	400 U	650 U	970 U
N-NITROSODI-N-PROPYLAMINE	UG/KG	1000 U	400 U	650 U	970 U
N-NITROSODIPHENYLAMINE/DIPHENYLAMINE	UG/KG	1000 U	400 U	650 U	970 U
PENTACHLOROPHENOL	UG/KG	2600 U	1000 U	1600 U	2400 U
PHENANTHRENE	UG/KG	1000 U	400 U	370 J	280 J
PHENOL	UG/KG	1000 U	400 U	650 U	970 U
PYRENE	UG/KG	240 J	400 U	590 J	1000
MISCELLANEOUS EXTRACTABLES					
10 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
11 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
11H-BENZO[A]FLUORENE	UG/KG	NR	NR	NR	NR
14 UNIDENTIFIED COMPOUNDS	UG/KG	7100 J	NR	NR	NR
14-PENTADECENOIC ACID	UG/KG	NR	100 JN	NR	NR
15-OCTADECENOIC ACID, METHYL	UG/KG	NR	NR	NR	NR
16 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
17 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
1-EICOSANOL	UG/KG	NR	NR	NR	NR
1-NONADECANOL	UG/KG	NR	120 JN	NR	NR
1-NONADECENE	UG/KG	NR	NR	NR	NR
1-OCTADECANOL	UG/KG	NR	NR	NR	NR
1-OCTADECENE	UG/KG	NR	NR	NR	NR
22 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	10000 J
23 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
25 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	7900 J	NR
26 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
27 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
2H-INDOL-2-ONE, 1,3-DIHYDRO-	UG/KG	NR	NR	NR	NR
30 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
3-OCTADECENE, (E)-	UG/KG	NR	NR	NR	NR
4H-1,2,4-TRIAZOLE, 4-ETHYL-	UG/KG	NR	NR	NR	NR
4-HYDROXY-5-OXOHEXANOIC ACID	UG/KG	NR	NR	NR	NR
6 UNIDENTIFIED COMPOUNDS	UG/KG	NR	1400 J	NR	NR
7-HEPTADECENE, 17-CHLORO-	UG/KG	NR	NR	NR	NR
8 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
9 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
9-HEXADECENOIC ACID	UG/KG	300 JN	200 JN	NR	NR
BENZO[B]NAPHTHO[2,1-D]THIOPH	UG/KG	NR	NR	NR	NR
BENZO[B]NAPHTHO[2,3-D]THIOPH	UG/KG	NR	NR	NR	NR
BENZO[E]PYRENE	UG/KG	NR	NR	NR	NR
BIS(TRIMETHYLSILYL)-1,4-DIBR	UG/KG	NR	NR	NR	210 JN

EXTRACTABLES SCAN		SD00902	SD01001	SD01101	SD01102
CHOLESTEROL	UG/KG	NR	260 JN	NR	NR
CYCLOPROPANENONANOIC ACID, 2	UG/KG	240 JN	NR	NR	NR
ERGOSTA-5,22-DIEN-3-OL, (3.B	UG/KG	NR	NR	NR	NR
ETHANOL, 2-(HEXADECYLOXY)-	UG/KG	NR	NR	NR	NR
HEXADECANOIC ACID	UG/KG	580 JN	460 JN	560 JN	NR
HEXADECENOIC ACID (2 ISOMERS)	UG/KG	NR	NR	NR	NR
HYDROXYLAMINE, O-DECYL-	UG/KG	NR	NR	NR	NR
OLEIC ACID	UG/KG	NR	NR	NR	NR
OXACYCLOHEPTADECAN-2-ONE	UG/KG	NR	NR	NR	NR
OXACYCLOHEXADECAN-2-ONE	UG/KG	NR	NR	NR	NR
OXACYCLOHEXADECAN-2-ONE, 16-	UG/KG	NR	NR	NR	NR
OXACYCLOTETRADECANE-2,11-DIO	UG/KG	NR	NR	NR	NR
PENTADECANOIC ACID	UG/KG	NR	NR	NR	NR
PERYLENE	UG/KG	NR	NR	NR	NR
PHENANTHRENE, 2,4,5,7-TETRAM	UG/KG	NR	NR	280 JN	280 JN
PHOSPHONOUS DICHLORIDE, (1,7	UG/KG	NR	NR	NR	NR
PIPERIDINE, 4-METHYL-	UG/KG	NR	NR	NR	200 JN
PYRENE, 1-METHYL-	UG/KG	NR	NR	NR	NR
TETRADECANOIC ACID	UG/KG	NR	NR	NR	NR
UNKNOWN ORGANIC ACID	UG/KG	NR	NR	NR	NR

Data Qualifiers

A-Average value. NA-Not analyzed. NAI-Interferences. J-Esti
N-Presumptive evidence of presence of material.
NR-Not Reported
K-Actual value is known to be less than value given.
L-Actual value is known to be greater than value given.
U-Material was analyzed for but not detected. The number is th
R-QC indicates that data unusable. Compound may or may not
C-Confirmed by GCMS.
1.When no value is reported, see chlordane constituents.
2.Constituents or metabolites of technical chlordane.

EXTRACTABLES SCAN		SD01801	SD01802	SD02201	SD02202
% MOISTURE	%	42	31	71	63
(3-AND/OR 4-)METHYLPHENOL	UG/KG	570 U	480 U	1100 U	890 UJ
1,1-BIPHENYL	UG/KG	570 U	480 U	1100 U	890 U
2,4,5-TRICHLOROPHENOL	UG/KG	1400 U	1200 U	2900 U	2200 U
2,4,6-TRICHLOROPHENOL	UG/KG	570 U	480 U	1100 U	890 U
2,4-DICHLOROPHENOL	UG/KG	570 U	480 U	1100 U	890 U
2,4-DIMETHYLPHENOL	UG/KG	570 U	480 U	1100 U	890 U
2,4-DINITROPHENOL	UG/KG	1400 U	1200 U	2900 U	2200 U
2,4-DINITROTOLUENE	UG/KG	570 U	480 U	1100 U	890 U
2,6-DINITROTOLUENE	UG/KG	570 U	480 U	1100 U	890 U
2-CHLORONAPHTHALENE	UG/KG	570 U	480 U	1100 U	890 U
2-CHLOROPHENOL	UG/KG	570 U	480 U	1100 U	890 U
2-METHYL-4,6-DINITROPHENOL	UG/KG	1400 U	1200 U	2900 U	2200 U
2-METHYLNAPHTHALENE	UG/KG	570 U	480 U	1100 U	890 U
2-METHYLPHENOL	UG/KG	570 U	480 U	1100 U	890 UJ
2-NITROANILINE	UG/KG	1400 U	1200 U	2900 U	2200 U
2-NITROPHENOL	UG/KG	570 U	480 U	1100 U	890 U
3,3'-DICHLOROBENZIDINE	UG/KG	570 U	480 U	1100 U	890 U
3-NITROANILINE	UG/KG	1400 U	1200 U	2900 U	2200 U
4-BROMOPHENYL PHENYL ETHER	UG/KG	570 U	480 U	1100 U	890 U
4-CHLORO-3-METHYLPHENOL	UG/KG	570 U	480 U	1100 U	890 U
4-CHLOROANILINE	UG/KG	570 U	480 U	1100 U	890 U
4-CHLOROPHENYL PHENYL ETHER	UG/KG	570 U	480 U	1100 U	890 U
4-NITROANILINE	UG/KG	1400 U	1200 UJ	2900 UJ	2200 U
4-NITROPHENOL	UG/KG	1400 UJ	1200 U	2900 U	2200 U
ACENAPHTHENE	UG/KG	570 U	480 U	1100 U	890 U
ACENAPHTHYLENE	UG/KG	570 U	480 U	1100 U	890 U
ACETOPHENONE	UG/KG	570 U	480 U	170 J	890 U
ANTHRACENE	UG/KG	570 U	480 U	1100 U	890 U
ATRAZINE	UG/KG	570 U	480 U	1100 U	890 U
BENZALDEHYDE	UG/KG	570 U	480 UJ	1100 UJ	890 U
BENZO(A)ANTHRACENE	UG/KG	570 U	480 U	210 J	110 J
BENZO(B)FLUORANTHENE	UG/KG	570 U	480 U	220 J	890 U
BENZO(GHI)PERYLENE	UG/KG	570 U	480 U	1100 U	890 U
BENZO(K)FLUORANTHENE	UG/KG	570 U	480 U	230 J	890 U
BENZO-A-PYRENE	UG/KG	570 U	480 U	190 J	130 J
BENZYL BUTYL PHTHALATE	UG/KG	570 U	480 U	1100 U	890 U
BIS(2-CHLOROETHOXY)METHANE	UG/KG	570 U	480 U	1100 U	890 U
BIS(2-CHLOROETHYL) ETHER	UG/KG	570 U	480 U	1100 U	890 U
BIS(2-CHLOROISOPROPYL) ETHER	UG/KG	570 UJ	480 U	1100 U	890 U
BIS(2-ETHYLHEXYL) PHTHALATE	UG/KG	570 U	480 U	1100 U	890 U
CAPROLACTAM	UG/KG	570 UR	480 U	1100 U	890 UR
CARBAZOLE	UG/KG	570 U	480 U	1100 U	890 U
CHRYSENE	UG/KG	570 U	480 U	220 J	120 J
DIBENZO(A,H)ANTHRACENE	UG/KG	570 U	480 U	1100 U	890 U
DIBENZOFURAN	UG/KG	570 U	480 U	1100 U	890 U
DIETHYL PHTHALATE	UG/KG	570 U	480 U	1100 U	890 U
DIMETHYL PHTHALATE	UG/KG	570 U	480 U	1100 U	890 U
DI-N-BUTYLPHTHALATE	UG/KG	570 U	480 U	1100 U	890 U
DI-N-OCTYLPHTHALATE	UG/KG	570 U	480 U	1100 U	890 U

EXTRACTABLES SCAN		SD01801	SD01802	SD02201	SD02202
FLUORANTHENE	UG/KG	570 U	480 U	470 J	180 J
FLUORENE	UG/KG	570 U	480 U	1100 U	890 U
HEXACHLOROBENZENE (HCB)	UG/KG	570 U	480 U	1100 U	890 U
HEXACHLOROBUTADIENE	UG/KG	570 U	480 U	1100 U	890 U
HEXACHLOROCYCLOPENTADIENE (HCCP)	UG/KG	570 U	480 U	1100 U	890 U
HEXACHLOROETHANE	UG/KG	570 U	480 U	1100 U	890 U
INDENO (1,2,3-CD) PYRENE	UG/KG	570 U	480 U	110 J	890 U
ISOPHORONE	UG/KG	570 U	480 U	1100 U	890 U
NAPHTHALENE	UG/KG	570 U	480 U	1100 U	890 U
NITROBENZENE	UG/KG	570 U	480 U	1100 U	890 U
N-NITROSODI-N-PROPYLAMINE	UG/KG	570 U	480 U	1100 U	890 UJ
N-NITROSODIPHENYLAMINE/DIPHENYLAMINE	UG/KG	570 U	480 U	1100 U	890 U
PENTACHLOROPHENOL	UG/KG	1400 U	1200 U	2900 U	2200 U
PHENANTHRENE	UG/KG	570 U	480 U	250 J	890 U
PHENOL	UG/KG	170 J	480 U	1100 U	890 U
PYRENE	UG/KG	570 U	480 U	320 J	170 J
MISCELLANEOUS EXTRACTABLES					
10 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
11 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
11H-BENZO[A]FLUORENE	UG/KG	NR	NR	NR	NR
14 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
14-PENTADECENOIC ACID	UG/KG	NR	NR	NR	NR
15-OCTADECENOIC ACID, METHYL	UG/KG	NR	NR	NR	NR
16 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	9800 J	NR
17 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
1-EICOSANOL	UG/KG	NR	NR	NR	NR
1-NONADECANOL	UG/KG	NR	140 JN	NR	NR
1-NONADECENE	UG/KG	NR	NR	NR	NR
1-OCTADECANOL	UG/KG	NR	NR	NR	NR
1-OCTADECENE	UG/KG	NR	NR	NR	NR
22 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
23 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
25 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
26 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
27 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
2H-INDOL-2-ONE, 1,3-DIHYDRO-	UG/KG	140 JN	NR	NR	NR
30 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
3-OCTADECENE, (E)-	UG/KG	NR	NR	NR	NR
4H-1,2,4-TRIAZOLE, 4-ETHYL-	UG/KG	NR	NR	NR	NR
4-HYDROXY-5-OXOHEXANOIC ACID	UG/KG	NR	NR	NR	NR
6 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR	NR	NR
7-HEPTADECENE, 17-CHLORO-	UG/KG	NR	NR	NR	NR
8 UNIDENTIFIED COMPOUNDS	UG/KG	NR	2100 J	NR	NR
9 UNIDENTIFIED COMPOUNDS	UG/KG	3400 J	NR	NR	6400 J
9-HEXADECENOIC ACID	UG/KG	NR	NR	620 JN	NR
BENZO[B]NAPHTHO[2,1-D]THIOPH	UG/KG	NR	NR	NR	NR
BENZO[B]NAPHTHO[2,3-D]THIOPH	UG/KG	NR	NR	NR	NR
BENZO[E]PYRENE	UG/KG	NR	NR	NR	NR
BIS(TRIMETHYLSILYL)-1,4-DIBR	UG/KG	NR	NR	NR	NR

EXTRACTABLES SCAN		SD01801	SD01802	SD02201	SD02202
CHOLESTEROL	UG/KG	NR	NR	NR	NR
CYCLOPROPANENONANOIC ACID, 2	UG/KG	NR	NR	NR	NR
ERGOSTA-5,22-DIEN-3-OL, (3.B	UG/KG	NR	NR	NR	NR
ETHANOL, 2-(HEXADECYLOXY)-	UG/KG	NR	NR	NR	250 JN
HEXADECANOIC ACID	UG/KG	370 JN	190 JN	1300 JN	NR
HEXADECENOIC ACID (2 ISOMERS)	UG/KG	NR	NR	NR	NR
HYDROXYLAMINE, O-DECYL-	UG/KG	NR	NR	NR	NR
OLEIC ACID	UG/KG	NR	NR	NR	NR
OXACYCLOHEPTADECAN-2-ONE	UG/KG	NR	NR	NR	NR
OXACYCLOHEXADECAN-2-ONE	UG/KG	NR	NR	NR	NR
OXACYCLOHEXADECAN-2-ONE, 16-	UG/KG	NR	NR	NR	NR
OXACYCLOTETRADECANE-2,11-DIO	UG/KG	NR	NR	NR	NR
PENTADECANOIC ACID	UG/KG	NR	NR	NR	NR
PERYLENE	UG/KG	NR	NR	NR	NR
PHENANTHRENE, 2,4,5,7-TETRAM	UG/KG	NR	NR	NR	NR
PHOSPHONOUS DICHLORIDE, (1,7	UG/KG	NR	NR	NR	NR
PIPERIDINE, 4-METHYL-	UG/KG	NR	NR	NR	NR
PYRENE, 1-METHYL-	UG/KG	NR	NR	NR	NR
TETRADECANOIC ACID	UG/KG	NR	NR	NR	NR
UNKNOWN ORGANIC ACID	UG/KG	NR	NR	NR	NR

Data Qualifiers

A-Average value. NA-Not analyzed. NAI-Interferences. J-Esti
N-Presumptive evidence of presence of material.
NR-Not Reported
K-Actual value is known to be less than value given.
L-Actual value is known to be greater than value given.
U-Material was analyzed for but not detected. The number is th
R-QC indicates that data unusable. Compound may or may not
C-Confirmed by GCMS.
1.When no value is reported, see chlordane constituents.
2.Constituents or metabolites of technical chlordane.

EXTRACTABLES SCAN		SD10601	SD10901
% MOISTURE	%	29	72
(3-AND/OR 4-)METHYLPHENOL	UG/KG	460 UJ	1200 U
1,1-BIPHENYL	UG/KG	460 U	1200 U
2,4,5-TRICHLOROPHENOL	UG/KG	1200 U	3000 U
2,4,6-TRICHLOROPHENOL	UG/KG	460 U	1200 U
2,4-DICHLOROPHENOL	UG/KG	460 U	1200 U
2,4-DIMETHYLPHENOL	UG/KG	460 U	1200 U
2,4-DINITROPHENOL	UG/KG	1200 U	3000 U
2,4-DINITROTOLUENE	UG/KG	460 U	1200 U
2,6-DINITROTOLUENE	UG/KG	460 U	1200 U
2-CHLORONAPHTHALENE	UG/KG	460 U	1200 U
2-CHLOROPHENOL	UG/KG	460 U	1200 U
2-METHYL-4,6-DINITROPHENOL	UG/KG	1200 U	3000 U
2-METHYLNAPHTHALENE	UG/KG	460 U	1200 U
2-METHYLPHENOL	UG/KG	460 UJ	1200 U
2-NITROANILINE	UG/KG	1200 U	3000 U
2-NITROPHENOL	UG/KG	460 U	1200 U
3,3'-DICHLOROBENZIDINE	UG/KG	460 U	1200 U
3-NITROANILINE	UG/KG	1200 U	3000 U
4-BROMOPHENYL PHENYL ETHER	UG/KG	460 U	1200 U
4-CHLORO-3-METHYLPHENOL	UG/KG	460 U	1200 U
4-CHLOROANILINE	UG/KG	460 U	1200 U
4-CHLOROPHENYL PHENYL ETHER	UG/KG	460 U	1200 U
4-NITROANILINE	UG/KG	1200 U	3000 U
4-NITROPHENOL	UG/KG	1200 U	3000 UJ
ACENAPHTHENE	UG/KG	460 U	1200 U
ACENAPHTHYLENE	UG/KG	460 U	1200 U
ACETOPHENONE	UG/KG	460 U	1200 U
ANTHRACENE	UG/KG	460 U	1200 U
ATRAZINE	UG/KG	460 U	1200 U
BENZALDEHYDE	UG/KG	460 U	1200 U
BENZO(A)ANTHRACENE	UG/KG	460 U	190 J
BENZO(B)FLUORANTHENE	UG/KG	460 U	220 J
BENZO(GHI)PERYLENE	UG/KG	460 U	1200 U
BENZO(K)FLUORANTHENE	UG/KG	460 U	160 J
BENZO-A-PYRENE	UG/KG	460 U	140 J
BENZYL BUTYL PHTHALATE	UG/KG	460 U	1200 U
BIS(2-CHLOROETHOXY)METHANE	UG/KG	460 U	1200 U
BIS(2-CHLOROETHYL) ETHER	UG/KG	460 U	1200 U
BIS(2-CHLOROISOPROPYL) ETHER	UG/KG	460 U	1200 UJ
BIS(2-ETHYLHEXYL) PHTHALATE	UG/KG	460 U	1200 U
CAPROLACTAM	UG/KG	460 UR	1200 UR
CARBAZOLE	UG/KG	460 U	1200 U
CHRYSENE	UG/KG	460 U	270 J
DIBENZO(A,H)ANTHRACENE	UG/KG	460 U	1200 U
DIBENZOFURAN	UG/KG	460 U	1200 U
DIETHYL PHTHALATE	UG/KG	460 U	1200 U
DIMETHYL PHTHALATE	UG/KG	460 U	1200 U
DI-N-BUTYLPHTHALATE	UG/KG	460 U	1200 U
DI-N-OCTYLPHTHALATE	UG/KG	460 U	1200 U

EXTRACTABLES SCAN		SD10601	SD10901
FLUORANTHENE	UG/KG	460 U	330 J
FLUORENE	UG/KG	460 U	1200 U
HEXACHLOROBENZENE (HCB)	UG/KG	460 U	1200 U
HEXACHLOROBUTADIENE	UG/KG	460 U	1200 U
HEXACHLOROCYCLOPENTADIENE (HCCP)	UG/KG	460 U	1200 U
HEXACHLOROETHANE	UG/KG	460 U	1200 U
INDENO (1,2,3-CD) PYRENE	UG/KG	460 U	1200 U
ISOPHORONE	UG/KG	460 U	1200 U
NAPHTHALENE	UG/KG	460 U	1200 U
NITROBENZENE	UG/KG	460 U	1200 U
N-NITROSODI-N-PROPYLAMINE	UG/KG	460 UJ	1200 U
N-NITROSODIPHENYLAMINE/DIPHENYLAMINE	UG/KG	460 U	1200 U
PENTACHLOROPHENOL	UG/KG	1200 U	3000 U
PHENANTHRENE	UG/KG	460 U	1200 U
PHENOL	UG/KG	460 U	1200 U
PYRENE	UG/KG	460 U	240 J
MISCELLANEOUS EXTRACTABLES			
10 UNIDENTIFIED COMPOUNDS	UG/KG	2800 J	NR
11 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR
11H-BENZO[A]FLUORENE	UG/KG	NR	NR
14 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR
14-PENTADECENOIC ACID	UG/KG	NR	NR
15-OCTADECENOIC ACID, METHYL	UG/KG	NR	NR
16 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR
17 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR
1-EICOSANOL	UG/KG	NR	NR
1-NONADECANOL	UG/KG	NR	NR
1-NONADECENE	UG/KG	NR	NR
1-OCTADECANOL	UG/KG	NR	NR
1-OCTADECENE	UG/KG	NR	NR
22 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR
23 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR
25 UNIDENTIFIED COMPOUNDS	UG/KG	NR	15000 J
26 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR
27 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR
2H-INDOL-2-ONE, 1,3-DIHYDRO-	UG/KG	NR	NR
30 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR
3-OCTADECENE, (E)-	UG/KG	NR	NR
4H-1,2,4-TRIAZOLE, 4-ETHYL-	UG/KG	NR	NR
4-HYDROXY-5-OXOHEXANOIC ACID	UG/KG	NR	NR
6 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR
7-HEPTADECENE, 17-CHLORO-	UG/KG	NR	NR
8 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR
9 UNIDENTIFIED COMPOUNDS	UG/KG	NR	NR
9-HEXADECENOIC ACID	UG/KG	NR	3000 JN
BENZO[B]NAPHTHO[2,1-D]THIOPH	UG/KG	NR	NR
BENZO[B]NAPHTHO[2,3-D]THIOPH	UG/KG	NR	NR
BENZO[E]PYRENE	UG/KG	NR	NR
BIS(TRIMETHYLSILYL)-1,4-DIBR	UG/KG	NR	NR

EXTRACTABLES SCAN		SD10601	SD10901
CHOLESTEROL	UG/KG	NR	NR
CYCLOPROPANENONANOIC ACID, 2	UG/KG	NR	NR
ERGOSTA-5,22-DIEN-3-OL, (3.B	UG/KG	NR	NR
ETHANOL, 2-(HEXADECYLOXY)-	UG/KG	NR	NR
HEXADECANOIC ACID	UG/KG	280 JN	3200 JN
HEXADECENOIC ACID (2 ISOMERS)	UG/KG	NR	NR
HYDROXYLAMINE, O-DECYL-	UG/KG	NR	NR
OLEIC ACID	UG/KG	NR	NR
OXACYCLOHEPTADECAN-2-ONE	UG/KG	NR	NR
OXACYCLOHEXADECAN-2-ONE	UG/KG	NR	1300 JN
OXACYCLOHEXADECAN-2-ONE, 16-	UG/KG	NR	NR
OXACYCLOTETRADECANE-2,11-DIO	UG/KG	NR	NR
PENTADECANOIC ACID	UG/KG	NR	1900 JN
PERYLENE	UG/KG	NR	NR
PHENANTHRENE, 2,4,5,7-TETRAM	UG/KG	NR	NR
PHOSPHONOUS DICHLORIDE, (1,7	UG/KG	NR	NR
PIPERIDINE, 4-METHYL-	UG/KG	NR	NR
PYRENE, 1-METHYL-	UG/KG	NR	NR
TETRADECANOIC ACID	UG/KG	NR	690 JN
UNKNOWN ORGANIC ACID	UG/KG	NR	NR

Data Qualifiers

A-Average value. NA-Not analyzed. NAI-Interferences. J-Esti
N-Presumptive evidence of presence of material.
NR-Not Reported
K-Actual value is known to be less than value given.
L-Actual value is known to be greater than value given.
U-Material was analyzed for but not detected. The number is th
R-QC indicates that data unusable. Compound may or may not
C-Confirmed by GCMS.
1.When no value is reported, see chlordane constituents.
2.Constituents or metabolites of technical chlordane.

Grain Size Analysis
Total Organic Matter

Sediment Evaluation Laboratory, EPA Athens, GA

SEDIMENT ANALYSIS- ORGANIC / INORGANIC %

Date Received in Lab: 36605.00 Project Lead Bobby Lewis

alyst: WFS/LT Project: Pensacola,NAS

Analysis Date:

Sample ID	Grid #	Sediment Depth	Particles <2 mm in size: Percent Inorganic	Percent Organics	Sample Description	Particles >2 mm in size: Percent Inorganic	Percent Organics	Sample Description
SD-001-01	1	Surface	97.99	2.01	<2MM	78.21	21.79	>2MM-shells
SD-001-02	1	subsurface	92.63	7.37	<2MM	76.25	23.75	>2MM-shells
SD-002-01	2	Surface	99.29	0.71	<2MM	89.96	10.04	>2MM-shells
SD-003-01	3	Surface	89.91	10.09	<2MM	89.97	10.03	>2MM-shells
SD-003-02	3	subsurface	91.36	8.64	<2MM	79.44	20.56	>2MM- shells
SD-004-01	4	Surface	93.74	6.26	<2MM	82.37	17.63	>2MM- shells
SD-004-02	4	subsurface	98.40	1.60	<2MM	95.80	4.20	>2MM-shells
SD-005-01	5	Surface	94.59	5.41	<2MM	85.70	14.30	>2MM- bones
SD-005-02	5	subsurface	91.56	8.44	<2MM	95.67	4.33	>2MM- shells
SD-006-01	6	Surface	98.61	1.39	<2MM	97.66	2.34	>2MM- shells
SD-007-01	7	Surface	98.15	1.85	<2MM	95.70	4.30	>2MM-shells
SD-008-01	8	Surface	94.46	5.54	<2MM	97.16	2.84	>2MM-plastic/shells
SD-009-01	9	Surface	89.99	10.01	<2MM	87.05	12.95	>2MM- shells
SD-009-02	9	subsurface	91.86	8.14	<2MM	84.49	15.51	>2MM- shells
SD-010-01	10	Surface	99.83	0.17	<2MM	98.67	1.33	>2MM- shells
-011-01	11	Surface	97.29	2.71	<2MM	79.73	20.27	>2MM-shells
SD-011-02	11	subsurface	90.79	9.21	<2MM	63.34	36.66	>2MM-shells
SD-018-01	18	Surface	97.92	2.08	<2MM	90.15	9.85	>2MM-shells
SD-018-02	18	subsurface	98.12	1.88	<2MM	97.55	2.45	>2MM-shells
SD-022-01	22	Surface	93.14	6.86	<2MM	89.60	10.40	>2MM-shells
SD-022-02	22	subsurface	94.80	5.20	<2MM	92.94	7.06	>2MM-shells
SD-106-01	106	Surface	99.27	0.73	<2MM	81.49	18.51	>2MM-roofing material
SD-109-01	109	Surface	89.99	10.01	<2MM	76.94	23.06	>2MM-grass

COULTER LS	04/03/2000 13:07
File name:	sd-001-0.$01

Group ID:	D-001-01-Pensacola,NAS
Sample ID:	D-001-01-Pensacola,NAS
Operator:	WFS
Comments:	3/7/200 @ 1319
Comments:	

From	0.375
To	2000
Volume	100
Mean:	92.36
Median:	172.7
Mode:	471.1
S.D.:	5.99
Skewness:	-0.632
Kurtosis:	-0.778

Particle Diameter µm	Volume % <
3.91	5.2
62.5	37.9
125	46.2
250	56.5
500	81.7
1000	99.5
2000	100

SD-001-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
1	0.375	0.011	0
2	0.412	0.019	0.011
3	0.452	0.029	0.03
4	0.496	0.041	0.059
5	0.545	0.052	0.1
6	0.598	0.063	0.15
7	0.657	0.074	0.22
8	0.721	0.086	0.29
9	0.791	0.097	0.38
10	0.869	0.11	0.47
11	0.953	0.12	0.58
12	1.047	0.14	0.7
13	1.149	0.15	0.84
14	1.261	0.17	0.99
15	1.385	0.19	1.16
16	1.52	0.21	1.34
17	1.669	0.24	1.55

SD-001-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
18	1.832	0.27	1.79
19	2.01	0.3	2.06
20	2.207	0.34	2.36
21	2.423	0.38	2.69
22	2.66	0.43	3.07
23	2.92	0.48	3.5
24	3.206	0.54	3.98
25	3.519	0.6	4.52
26	3.862	0.67	5.12
27	4.241	0.73	5.78
28	4.656	0.81	6.52
29	5.111	0.88	7.32
30	5.611	0.95	8.2
31	6.158	1.02	9.15
32	6.761	1.08	10.2
33	7.421	1.15	11.2
34	8.147	1.2	12.4
35	8.944	1.25	13.6
36	9.819	1.3	14.9
37	10.78	1.33	16.2
38	11.83	1.35	17.5
39	12.99	1.35	18.8
40	14.26	1.35	20.2
41	15.65	1.33	21.5
42	17.18	1.3	22.9
43	18.86	1.26	24.2
44	20.7	1.22	25.4
45	22.73	1.17	26.6
46	24.95	1.13	27.8
47	27.38	1.09	28.9
48	30.07	1.06	30
49	33	1.03	31.1
50	36.24	1.01	32.1
51	39.77	0.99	33.1
52	43.66	0.98	34.1
53	47.93	0.98	35.1
54	52.63	0.98	36.1
55	57.77	1	37.1
56	63.41	1.03	38.1
57	69.62	1.08	39.1
58	76.43	1.12	40.2
59	83.9	1.16	41.3
60	92.09	1.17	42.5
61	101.1	1.17	43.6
62	111	1.14	44.8
63	121.8	1.09	45.9
64	133.7	1.07	47

SD-001-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
65	146.8	1.07	48.1
66	161.2	1.14	49.2
67	176.8	1.29	50.3
68	194.2	1.52	51.6
69	213.2	1.84	53.1
70	234.1	2.2	54.9
71	256.8	2.59	57.1
72	282.1	2.95	59.7
73	309.6	3.28	62.7
74	339.8	3.55	66
75	373.1	3.76	69.5
76	409.6	3.91	73.3
77	449.7	3.96	77.2
78	493.6	3.9	81.1
79	541.9	3.68	85
80	594.9	3.29	88.7
81	653	2.76	92
82	716.9	2.12	94.8
83	786.9	1.47	96.9
84	863.9	0.9	98.4
85	948.2	0.47	99.3
86	1041	0.2	99.7
87	1143	0.063	99.9
88	1255	0.014	100
89	1377	0.0016	100
90	1512	0.000075	100
91	1660	0	100
92	1822	0	100
	2000		100

COULTER LS 04/03/2000 13:08
File name: sd-001-0.$02

Group ID: SD-001-02-Pensacola,NAS
Sample ID: SD-001-02-Pensacola,NAS
Operator: WFS
Comments: 3/8/2000 @ 1319
Comments:

From 0.375
To 2000
Volume 100
Mean: 29.56
Median: 28.2
Mode: 14.94
S.D.: 4.707
Skewness: 0.0674
Kurtosis: -0.332

Particle Diameter µm	Volume % <
3.91	8.82
62.5	68.1
125	82.3
250	90.4
500	95.5
1000	99.2
2000	100

SD-001-02

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
1	0.375	0.028	0
2	0.412	0.049	0.028
3	0.452	0.072	0.077
4	0.496	0.1	0.15
5	0.545	0.13	0.25
6	0.598	0.15	0.38
7	0.657	0.17	0.53
8	0.721	0.19	0.7
9	0.791	0.2	0.88
10	0.869	0.22	1.09
11	0.953	0.23	1.3
12	1.047	0.24	1.53
13	1.149	0.26	1.78
14	1.261	0.28	2.04
15	1.385	0.3	2.32
16	1.52	0.33	2.62
17	1.669	0.37	2.95

SD-001-02

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
18	1.832	0.41	3.32
19	2.01	0.47	3.73
20	2.207	0.53	4.2
21	2.423	0.6	4.73
22	2.66	0.69	5.33
23	2.92	0.78	6.02
24	3.206	0.88	6.8
25	3.519	0.99	7.69
26	3.862	1.1	8.68
27	4.241	1.22	9.78
28	4.656	1.34	11
29	5.111	1.46	12.3
30	5.611	1.58	13.8
31	6.158	1.69	15.4
32	6.761	1.81	17.1
33	7.421	1.91	18.9
34	8.147	2.01	20.8
35	8.944	2.1	22.8
36	9.819	2.17	24.9
37	10.78	2.23	27.1
38	11.83	2.28	29.3
39	12.99	2.3	31.6
40	14.26	2.31	33.9
41	15.65	2.3	36.2
42	17.18	2.26	38.5
43	18.86	2.22	40.8
44	20.7	2.17	43
45	22.73	2.12	45.1
46	24.95	2.1	47.3
47	27.38	2.09	49.4
48	30.07	2.09	51.5
49	33	2.11	53.5
50	36.24	2.12	55.7
51	39.77	2.13	57.8
52	43.66	2.13	59.9
53	47.93	2.13	62
54	52.63	2.12	64.2
55	57.77	2.12	66.3
56	63.41	2.11	68.4
57	69.62	2.09	70.5
58	76.43	2.05	72.6
59	83.9	1.98	74.6
60	92.09	1.88	76.6
61	101.1	1.76	78.5
62	111	1.63	80.3
63	121.8	1.51	81.9
64	133.7	1.38	83.4

SD-001-02

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
65	146.8	1.26	84.8
66	161.2	1.14	86
67	176.8	1.02	87.2
68	194.2	0.9	88.2
69	213.2	0.8	89.1
70	234.1	0.72	89.9
71	256.8	0.67	90.6
72	282.1	0.64	91.3
73	309.6	0.64	91.9
74	339.8	0.66	92.6
75	373.1	0.7	93.2
76	409.6	0.74	93.9
77	449.7	0.77	94.7
78	493.6	0.77	95.4
79	541.9	0.73	96.2
80	594.9	0.65	96.9
81	653	0.53	97.6
82	716.9	0.4	98.1
83	786.9	0.3	98.5
84	863.9	0.25	98.8
85	948.2	0.24	99.1
86	1041	0.27	99.3
87	1143	0.24	99.6
88	1255	0.15	99.8
89	1377	0.039	100
90	1512	0.0046	100
91	1660	0	100
92	1822	0	100
	2000		100

COULTER LS	04/03/2000 13:08
File name:	sd-002-0.$01

Group ID:	SD-002-01-Pensacola,NAS
Sample ID:	SD-002-01-Pensacola,NAS
Operator:	WFS
Comments:	3/7/2000 @ 1555
Comments:	

From	0.375
To	2000
Volume	100
Mean:	255.9
Median:	450.4
Mode:	567.8
S.D.:	4.681
Skewness:	-1.761
Kurtosis:	2.08

Particle Diameter µm	Volume % <
3.91	2.82
62.5	16.2
125	18.3
250	23.8
500	57.2
1000	96.5
2000	100

SD-002-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
1	0.375	0.0024	0
2	0.412	0.0041	0.0024
3	0.452	0.0062	0.0065
4	0.496	0.0093	0.013
5	0.545	0.013	0.022
6	0.598	0.017	0.035
7	0.657	0.021	0.051
8	0.721	0.026	0.072
9	0.791	0.033	0.098
10	0.869	0.04	0.13
11	0.953	0.049	0.17
12	1.047	0.06	0.22
13	1.149	0.072	0.28
14	1.261	0.086	0.35
15	1.385	0.1	0.44
16	1.52	0.12	0.54
17	1.669	0.14	0.66

SD-002-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
18	1.832	0.16	0.8
19	2.01	0.18	0.96
20	2.207	0.21	1.14
21	2.423	0.23	1.34
22	2.66	0.26	1.57
23	2.92	0.28	1.83
24	3.206	0.31	2.12
25	3.519	0.34	2.43
26	3.862	0.37	2.77
27	4.241	0.4	3.14
28	4.656	0.43	3.54
29	5.111	0.45	3.96
30	5.611	0.48	4.41
31	6.158	0.5	4.89
32	6.761	0.52	5.39
33	7.421	0.54	5.92
34	8.147	0.56	6.46
35	8.944	0.57	7.02
36	9.819	0.58	7.59
37	10.78	0.58	8.17
38	11.83	0.58	8.75
39	12.99	0.57	9.33
40	14.26	0.55	9.9
41	15.65	0.53	10.5
42	17.18	0.51	11
43	18.86	0.48	11.5
44	20.7	0.46	12
45	22.73	0.43	12.4
46	24.95	0.41	12.9
47	27.38	0.39	13.3
48	30.07	0.37	13.7
49	33	0.36	14
50	36.24	0.34	14.4
51	39.77	0.33	14.7
52	43.66	0.32	15.1
53	47.93	0.31	15.4
54	52.63	0.3	15.7
55	57.77	0.29	16
56	63.41	0.29	16.3
57	69.62	0.29	16.6
58	76.43	0.29	16.9
59	83.9	0.29	17.2
60	92.09	0.29	17.5
61	101.1	0.28	17.7
62	111	0.26	18
63	121.8	0.25	18.3
64	133.7	0.26	18.5

SD-002-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
65	146.8	0.31	18.8
66	161.2	0.42	19.1
67	176.8	0.62	19.5
68	194.2	0.94	20.1
69	213.2	1.39	21.1
70	234.1	1.93	22.5
71	256.8	2.55	24.4
72	282.1	3.22	27
73	309.6	3.91	30.2
74	339.8	4.61	34.1
75	373.1	5.29	38.7
76	409.6	5.91	44
77	449.7	6.42	49.9
78	493.6	6.75	56.3
79	541.9	6.83	63.1
80	594.9	6.6	69.9
81	653	6.06	76.5
82	716.9	5.25	82.5
83	786.9	4.26	87.8
84	863.9	3.2	92.1
85	948.2	2.21	95.3
86	1041	1.39	97.5
87	1143	0.74	98.9
88	1255	0.31	99.6
89	1377	0.083	99.9
90	1512	0.011	100
91	1660	0.00044	100
92	1822	0	100
	2000		100

COULTER LS	04/03/2000 13:09
File name:	sd-003-0.$02

Group ID:	SD-003-01-Pensacola,NAS
Sample ID:	SD-003-01-Pensacola,NAS
Operator:	WFS
Comments:	3/8/2000 @ 0935
Comments:	

From	0.375
To	2000
Volume	100
Mean:	38.6
Median:	41.71
Mode:	87.9
S.D.:	4.146
Skewness:	-0.189
Kurtosis:	-0.37

Particle Diameter µm	Volume % <
3.91	5.29
62.5	59.3
125	78.9
250	90.5
500	96.8
1000	100
2000	100

SD-003-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
1	0.375	0.015	0
2	0.412	0.026	0.015
3	0.452	0.039	0.041
4	0.496	0.055	0.079
5	0.545	0.069	0.13
6	0.598	0.081	0.2
7	0.657	0.092	0.28
8	0.721	0.1	0.38
9	0.791	0.11	0.48
10	0.869	0.12	0.59
11	0.953	0.13	0.71
12	1.047	0.14	0.84
13	1.149	0.15	0.98
14	1.261	0.16	1.13
15	1.385	0.18	1.29
16	1.52	0.19	1.47

SD-003-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
17	1.669	0.21	1.66
18	1.832	0.24	1.88
19	2.01	0.28	2.12
20	2.207	0.32	2.39
21	2.423	0.36	2.71
22	2.66	0.42	3.07
23	2.92	0.49	3.5
24	3.206	0.56	3.98
25	3.519	0.65	4.55
26	3.862	0.74	5.19
27	4.241	0.84	5.93
28	4.656	0.95	6.77
29	5.111	1.06	7.72
30	5.611	1.18	8.78
31	6.158	1.3	9.96
32	6.761	1.43	11.3
33	7.421	1.55	12.7
34	8.147	1.68	14.2
35	8.944	1.8	15.9
36	9.819	1.91	17.7
37	10.78	2.02	19.6
38	11.83	2.11	21.6
39	12.99	2.18	23.8
40	14.26	2.23	25.9
41	15.65	2.25	28.2
42	17.18	2.25	30.4
43	18.86	2.22	32.7
44	20.7	2.18	34.9
45	22.73	2.12	37.1
46	24.95	2.05	39.2
47	27.38	1.99	41.2
48	30.07	1.95	43.2
49	33	1.92	45.2
50	36.24	1.92	47.1
51	39.77	1.95	49
52	43.66	2.01	51
53	47.93	2.1	53
54	52.63	2.22	55.1
55	57.77	2.36	57.3
56	63.41	2.51	59.7
57	69.62	2.65	62.2
58	76.43	2.75	64.8
59	83.9	2.79	67.6
60	92.09	2.76	70.4
61	101.1	2.66	73.1
62	111	2.5	75.8
63	121.8	2.3	78.3

SD-003-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
64	133.7	2.08	80.6
65	146.8	1.84	82.7
66	161.2	1.61	84.5
67	176.8	1.4	86.1
68	194.2	1.22	87.5
69	213.2	1.07	88.7
70	234.1	0.97	89.8
71	256.8	0.9	90.8
72	282.1	0.85	91.7
73	309.6	0.82	92.5
74	339.8	0.81	93.3
75	373.1	0.82	94.1
76	409.6	0.85	95
77	449.7	0.88	95.8
78	493.6	0.89	96.7
79	541.9	0.83	97.6
80	594.9	0.7	98.4
81	653	0.5	99.1
82	716.9	0.27	99.6
83	786.9	0.1	99.9
84	863.9	0.019	100
85	948.2	0.0014	100
86	1041	0	100
87	1143	0	100
88	1255	0	100
89	1377	0	100
90	1512	0	100
91	1660	0	100
92	1822	0	100
	2000		100

COULTER LS	04/03/2000 13:09
File name:	sd-003-0.$01
Group ID:	SD-003-02-Pensacola,NAS
Sample ID:	SD-003-02-Pensacola,NAS
Operator:	WFS
Comments:	3/8/2000 @0935
Comments:	
From	0.375
To	2000
Volume	100
Mean:	26.45
Median:	26.09
Mode:	14.94
S.D.:	4.009
Skewness:	-0.0914
Kurtosis:	-0.225

Particle Diameter µm	Volume % <
3.91	8.01
62.5	70.1
125	87.5
250	95.5
500	97.9
1000	100
2000	100

SD-003-02

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
1	0.375	0.026	0
2	0.412	0.047	0.026
3	0.452	0.069	0.074
4	0.496	0.098	0.14
5	0.545	0.12	0.24
6	0.598	0.14	0.36
7	0.657	0.16	0.5
8	0.721	0.17	0.65
9	0.791	0.18	0.83
10	0.869	0.19	1.01
11	0.953	0.2	1.2
12	1.047	0.21	1.41
13	1.149	0.22	1.62
14	1.261	0.24	1.84
15	1.385	0.26	2.08
16	1.52	0.28	2.34
17	1.669	0.32	2.62

SD-003-02

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
18	1.832	0.36	2.93
19	2.01	0.41	3.29
20	2.207	0.47	3.7
21	2.423	0.55	4.18
22	2.66	0.63	4.72
23	2.92	0.73	5.36
24	3.206	0.84	6.09
25	3.519	0.95	6.92
26	3.862	1.07	7.87
27	4.241	1.2	8.94
28	4.656	1.33	10.1
29	5.111	1.47	11.5
30	5.611	1.61	13
31	6.158	1.74	14.6
32	6.761	1.87	16.3
33	7.421	2	18.2
34	8.147	2.12	20.2
35	8.944	2.23	22.3
36	9.819	2.33	24.5
37	10.78	2.41	26.9
38	11.83	2.48	29.3
39	12.99	2.52	31.8
40	14.26	2.53	34.3
41	15.65	2.53	36.8
42	17.18	2.49	39.3
43	18.86	2.44	41.8
44	20.7	2.38	44.3
45	22.73	2.31	46.6
46	24.95	2.24	49
47	27.38	2.18	51.2
48	30.07	2.13	53.4
49	33	2.1	55.5
50	36.24	2.08	57.6
51	39.77	2.07	59.7
52	43.66	2.09	61.8
53	47.93	2.13	63.8
54	52.63	2.2	66
55	57.77	2.29	68.2
56	63.41	2.38	70.5
57	69.62	2.46	72.9
58	76.43	2.5	75.3
59	83.9	2.48	77.8
60	92.09	2.4	80.3
61	101.1	2.26	82.7
62	111	2.07	85
63	121.8	1.85	87
64	133.7	1.61	88.9

SD-003-02

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
65	146.8	1.37	90.5
66	161.2	1.14	91.9
67	176.8	0.93	93
68	194.2	0.74	93.9
69	213.2	0.57	94.7
70	234.1	0.43	95.2
71	256.8	0.32	95.7
72	282.1	0.24	96
73	309.6	0.21	96.2
74	339.8	0.22	96.4
75	373.1	0.28	96.7
76	409.6	0.37	96.9
77	449.7	0.48	97.3
78	493.6	0.55	97.8
79	541.9	0.56	98.3
80	594.9	0.49	98.9
81	653	0.35	99.4
82	716.9	0.19	99.7
83	786.9	0.066	99.9
84	863.9	0.012	100
85	948.2	0.00078	100
86	1041	0	100
87	1143	0	100
88	1255	0	100
89	1377	0	100
90	1512	0	100
91	1660	0	100
92	1822	0	100
	2000		100

COULTER LS	04/03/2000 13:10
File name:	sd-004-0.$02

Group ID:	SD-004-01-Pensacola,NAS
Sample ID:	SD-004-01-Pensacola,NAS
Operator:	WFS
Comments:	3/8/200 @ 1035
Comments:	

From	0.375
To	2000
Volume	100
Mean:	42.3
Median:	45.47
Mode:	87.9
S.D.:	4.51
Skewness:	-0.156
Kurtosis:	-0.527

Particle Diameter µm	Volume % <
3.91	5.49
62.5	56.9
125	75
250	86.3
500	95.3
1000	99.9
2000	100

SD-004-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
1	0.375	0.014	0
2	0.412	0.025	0.014
3	0.452	0.037	0.039
4	0.496	0.053	0.077
5	0.545	0.067	0.13
6	0.598	0.079	0.2
7	0.657	0.09	0.28
8	0.721	0.1	0.37
9	0.791	0.11	0.47
10	0.869	0.12	0.58
11	0.953	0.13	0.7
12	1.047	0.14	0.83
13	1.149	0.15	0.97
14	1.261	0.17	1.13
15	1.385	0.18	1.29
16	1.52	0.2	1.48
17	1.669	0.23	1.68

SD-004-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
18	1.832	0.26	1.91
19	2.01	0.29	2.16
20	2.207	0.34	2.46
21	2.423	0.39	2.79
22	2.66	0.44	3.18
23	2.92	0.51	3.62
24	3.206	0.59	4.13
25	3.519	0.67	4.72
26	3.862	0.76	5.39
27	4.241	0.86	6.15
28	4.656	0.97	7.01
29	5.111	1.07	7.98
30	5.611	1.19	9.05
31	6.158	1.3	10.2
32	6.761	1.42	11.5
33	7.421	1.53	13
34	8.147	1.65	14.5
35	8.944	1.75	16.1
36	9.819	1.85	17.9
37	10.78	1.94	19.7
38	11.83	2.02	21.7
39	12.99	2.08	23.7
40	14.26	2.11	25.8
41	15.65	2.12	27.9
42	17.18	2.11	30
43	18.86	2.08	32.1
44	20.7	2.03	34.2
45	22.73	1.98	36.2
46	24.95	1.92	38.2
47	27.38	1.86	40.1
48	30.07	1.82	42
49	33	1.79	43.8
50	36.24	1.79	45.6
51	39.77	1.81	47.4
52	43.66	1.86	49.2
53	47.93	1.94	51.1
54	52.63	2.05	53
55	57.77	2.18	55.1
56	63.41	2.32	57.2
57	69.62	2.45	59.6
58	76.43	2.54	62
59	83.9	2.58	64.6
60	92.09	2.55	67.1
61	101.1	2.46	69.7
62	111	2.31	72.1
63	121.8	2.13	74.4
64	133.7	1.92	76.6

SD-004-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
65	146.8	1.72	78.5
66	161.2	1.52	80.2
67	176.8	1.35	81.7
68	194.2	1.23	83.1
69	213.2	1.16	84.3
70	234.1	1.14	85.5
71	256.8	1.16	86.6
72	282.1	1.19	87.8
73	309.6	1.23	89
74	339.8	1.25	90.2
75	373.1	1.26	91.4
76	409.6	1.24	92.7
77	449.7	1.21	93.9
78	493.6	1.15	95.2
79	541.9	1.04	96.3
80	594.9	0.89	97.3
81	653	0.69	98.2
82	716.9	0.48	98.9
83	786.9	0.29	99.4
84	863.9	0.15	99.7
85	948.2	0.067	99.8
86	1041	0.037	99.9
87	1143	0.025	100
88	1255	0.017	100
89	1377	0.0051	100
90	1512	0.00071	100
91	1660	0	100
92	1822	0	100
	2000		100

COULTER LS	04/03/2000 13:10
File name:	sd-004-0.$01

Group ID:	SD-004-02-Pensacola,NAS
Sample ID:	SD-004-02-Pensacola,NAS
Operator:	WFS
Comments:	3/8/2000 @1035
Comments:	

From	0.375
To	2000
Volume	100
Mean:	111.1
Median:	266.9
Mode:	390.9
S.D.:	6.481
Skewness:	-0.651
Kurtosis:	-0.786

Particle Diameter µm	Volume % <
3.91	4.88
62.5	35.8
125	40
250	48
500	79.2
1000	94.8
2000	100

SD-004-02

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
1	0.375	0.0087	0
2	0.412	0.015	0.0087
3	0.452	0.023	0.024
4	0.496	0.033	0.047
5	0.545	0.042	0.08
6	0.598	0.051	0.12
7	0.657	0.06	0.17
8	0.721	0.07	0.23
9	0.791	0.08	0.3
10	0.869	0.091	0.38
11	0.953	0.1	0.48
12	1.047	0.12	0.58
13	1.149	0.13	0.69
14	1.261	0.15	0.82
15	1.385	0.17	0.97
16	1.52	0.19	1.14
17	1.669	0.22	1.33

SD-004-02

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
18	1.832	0.25	1.55
19	2.01	0.28	1.8
20	2.207	0.32	2.08
21	2.423	0.37	2.41
22	2.66	0.42	2.77
23	2.92	0.47	3.19
24	3.206	0.53	3.66
25	3.519	0.6	4.2
26	3.862	0.67	4.79
27	4.241	0.74	5.46
28	4.656	0.81	6.2
29	5.111	0.88	7.01
30	5.611	0.96	7.89
31	6.158	1.03	8.85
32	6.761	1.09	9.87
33	7.421	1.16	11
34	8.147	1.21	12.1
35	8.944	1.26	13.3
36	9.819	1.3	14.6
37	10.78	1.33	15.9
38	11.83	1.35	17.2
39	12.99	1.35	18.6
40	14.26	1.34	19.9
41	15.65	1.32	21.3
42	17.18	1.28	22.6
43	18.86	1.24	23.9
44	20.7	1.19	25.1
45	22.73	1.13	26.3
46	24.95	1.08	27.4
47	27.38	1.02	28.5
48	30.07	0.97	29.5
49	33	0.92	30.5
50	36.24	0.87	31.4
51	39.77	0.82	32.3
52	43.66	0.77	33.1
53	47.93	0.72	33.9
54	52.63	0.67	34.6
55	57.77	0.63	35.3
56	63.41	0.6	35.9
57	69.62	0.58	36.5
58	76.43	0.57	37.1
59	83.9	0.56	37.7
60	92.09	0.55	38.2
61	101.1	0.54	38.8
62	111	0.52	39.3
63	121.8	0.51	39.8
64	133.7	0.51	40.3

SD-004-02

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
65	146.8	0.56	40.9
66	161.2	0.69	41.4
67	176.8	0.93	42.1
68	194.2	1.32	43
69	213.2	1.86	44.3
70	234.1	2.52	46.2
71	256.8	3.22	48.7
72	282.1	3.87	51.9
73	309.6	4.37	55.8
74	339.8	4.68	60.2
75	373.1	4.77	64.9
76	409.6	4.66	69.6
77	449.7	4.37	74.3
78	493.6	3.95	78.7
79	541.9	3.44	82.6
80	594.9	2.85	86
81	653	2.24	88.9
82	716.9	1.63	91.1
83	786.9	1.1	92.8
84	863.9	0.71	93.9
85	948.2	0.48	94.6
86	1041	0.37	95
87	1143	0.38	95.4
88	1255	0.46	95.8
89	1377	0.61	96.3
90	1512	0.81	96.9
91	1660	1.01	97.7
92	1822	1.31	98.7
	2000		100

COULTER LS	04/03/2000 13:10
File name:	sd-004-0.$03
Group ID:	SD-004-01- D Pensacola,NAS
Sample ID:	SD-004-01 -D Pensacola,NAS
Operator:	WFS
Comments:	3/8/2000 @1035
Comments:	This is a Lab Duplicate of SD-004-01
From	0.375
To	2000
Volume	100
Mean:	44.29
Median:	48.03
Mode:	87.9
S.D.:	4.656
Skewness:	-0.0956
Kurtosis:	-0.41

Particle Diameter µm	Volume % <
3.91	5.39
62.5	55.7
125	74.1
250	86.1
500	94.4
1000	98.6
2000	100

SD-004-01-D

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
1	0.375	0.014	0
2	0.412	0.026	0.014
3	0.452	0.038	0.04
4	0.496	0.054	0.078
5	0.545	0.068	0.13
6	0.598	0.08	0.2
7	0.657	0.091	0.28
8	0.721	0.1	0.37
9	0.791	0.11	0.47
10	0.869	0.12	0.59
11	0.953	0.13	0.71
12	1.047	0.14	0.84
13	1.149	0.15	0.98
14	1.261	0.17	1.14
15	1.385	0.18	1.3
16	1.52	0.2	1.48
17	1.669	0.22	1.68

SD-004-01-D

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
18	1.832	0.25	1.9
19	2.01	0.28	2.15
20	2.207	0.33	2.44
21	2.423	0.37	2.76
22	2.66	0.43	3.14
23	2.92	0.5	3.57
24	3.206	0.57	4.07
25	3.519	0.65	4.64
26	3.862	0.74	5.29
27	4.241	0.84	6.04
28	4.656	0.94	6.87
29	5.111	1.05	7.82
30	5.611	1.16	8.87
31	6.158	1.27	10
32	6.761	1.39	11.3
33	7.421	1.5	12.7
34	8.147	1.61	14.2
35	8.944	1.72	15.8
36	9.819	1.81	17.5
37	10.78	1.9	19.3
38	11.83	1.97	21.2
39	12.99	2.03	23.2
40	14.26	2.06	25.2
41	15.65	2.07	27.3
42	17.18	2.06	29.4
43	18.86	2.03	31.4
44	20.7	1.99	33.5
45	22.73	1.93	35.4
46	24.95	1.88	37.4
47	27.38	1.82	39.3
48	30.07	1.78	41.1
49	33	1.76	42.9
50	36.24	1.75	44.6
51	39.77	1.77	46.4
52	43.66	1.82	48.1
53	47.93	1.9	50
54	52.63	2.02	51.9
55	57.77	2.16	53.9
56	63.41	2.31	56
57	69.62	2.45	58.4
58	76.43	2.56	60.8
59	83.9	2.62	63.4
60	92.09	2.6	66
61	101.1	2.52	68.6
62	111	2.37	71.1
63	121.8	2.19	73.5
64	133.7	1.99	75.7

SD-004-01-D

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
65	146.8	1.79	77.7
66	161.2	1.61	79.5
67	176.8	1.46	81.1
68	194.2	1.36	82.5
69	213.2	1.3	83.9
70	234.1	1.27	85.2
71	256.8	1.24	86.4
72	282.1	1.21	87.7
73	309.6	1.15	88.9
74	339.8	1.09	90.1
75	373.1	1.05	91.1
76	409.6	1.02	92.2
77	449.7	1.01	93.2
78	493.6	0.99	94.2
79	541.9	0.93	95.2
80	594.9	0.82	96.1
81	653	0.65	97
82	716.9	0.46	97.6
83	786.9	0.28	98.1
84	863.9	0.17	98.4
85	948.2	0.12	98.5
86	1041	0.11	98.6
87	1143	0.14	98.8
88	1255	0.19	98.9
89	1377	0.23	99.1
90	1512	0.25	99.3
91	1660	0.24	99.6
92	1822	0.2	99.8
	2000		100

COULTER LS 04/03/2000 13:11

Group ID:	SD-005-01-Pensacola,NAS
Sample ID:	SD-005-01-Pensacola,NAS
Operator:	WFS
Comments:	3/8/2000 @1153
Comments:	

From	0.375
To	2000
Volume	100
Mean:	61.18
Median:	74.33
Mode:	96.49
S.D.:	5.01
Skewness:	-0.28
Kurtosis:	-0.473

Particle Diameter µm	Volume % <
3.91	4.81
62.5	46.1
125	63.2
250	78.5
500	92.3
1000	97.2
2000	100

SD-005-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
1	0.375	0.012	0
2	0.412	0.021	0.012
3	0.452	0.031	0.033
4	0.496	0.045	0.064
5	0.545	0.056	0.11
6	0.598	0.066	0.16
7	0.657	0.077	0.23
8	0.721	0.087	0.31
9	0.791	0.097	0.39
10	0.869	0.11	0.49
11	0.953	0.12	0.6
12	1.047	0.13	0.71
13	1.149	0.14	0.84
14	1.261	0.15	0.98
15	1.385	0.17	1.13
16	1.52	0.18	1.3
17	1.669	0.21	1.48

SD-005-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
18	1.832	0.23	1.69
19	2.01	0.26	1.92
20	2.207	0.3	2.18
21	2.423	0.34	2.48
22	2.66	0.39	2.82
23	2.92	0.44	3.21
24	3.206	0.5	3.65
25	3.519	0.57	4.15
26	3.862	0.64	4.72
27	4.241	0.72	5.37
28	4.656	0.8	6.09
29	5.111	0.89	6.89
30	5.611	0.97	7.78
31	6.158	1.06	8.75
32	6.761	1.14	9.81
33	7.421	1.23	11
34	8.147	1.31	12.2
35	8.944	1.39	13.5
36	9.819	1.46	14.9
37	10.78	1.52	16.3
38	11.83	1.56	17.8
39	12.99	1.6	19.4
40	14.26	1.62	21
41	15.65	1.63	22.6
42	17.18	1.62	24.3
43	18.86	1.6	25.9
44	20.7	1.58	27.5
45	22.73	1.54	29.1
46	24.95	1.51	30.6
47	27.38	1.49	32.1
48	30.07	1.47	33.6
49	33	1.47	35.1
50	36.24	1.48	36.6
51	39.77	1.51	38
52	43.66	1.56	39.6
53	47.93	1.64	41.1
54	52.63	1.76	42.8
55	57.77	1.9	44.5
56	63.41	2.06	46.4
57	69.62	2.21	48.5
58	76.43	2.34	50.7
59	83.9	2.42	53
60	92.09	2.44	55.4
61	101.1	2.4	57.9
62	111	2.32	60.3
63	121.8	2.2	62.6
64	133.7	2.08	64.8

SD-005-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
65	146.8	1.98	66.9
66	161.2	1.94	68.9
67	176.8	1.96	70.8
68	194.2	2.04	72.8
69	213.2	2.16	74.8
70	234.1	2.27	77
71	256.8	2.31	79.2
72	282.1	2.26	81.5
73	309.6	2.1	83.8
74	339.8	1.89	85.9
75	373.1	1.65	87.8
76	409.6	1.45	89.4
77	449.7	1.3	90.9
78	493.6	1.19	92.2
79	541.9	1.08	93.4
80	594.9	0.93	94.5
81	653	0.74	95.4
82	716.9	0.52	96.1
83	786.9	0.32	96.7
84	863.9	0.19	97
85	948.2	0.13	97.2
86	1041	0.14	97.3
87	1143	0.2	97.4
88	1255	0.3	97.6
89	1377	0.42	98
90	1512	0.51	98.4
91	1660	0.56	98.9
92	1822	0.56	99.4
	2000		100

COULTER LS 04/03/2000 13:11

Group ID:	SD-005-02-Pensacola,NAS
Sample ID:	SD-005-02-Pensacola,NAS
Operator:	WFS
Comments:	3/8/2000 @1153
Comments:	

From	0.375
To	2000
Volume	100
Mean:	31.23
Median:	28.46
Mode:	14.94
S.D.:	4.832
Skewness:	0.157
Kurtosis:	-0.254

Particle Diameter µm	Volume % <
3.91	8.06
62.5	67.4
125	81.6
250	89.4
500	94.1
1000	98.1
2000	100

SD-005-02

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
1	0.375	0.026	0
2	0.412	0.046	0.026
3	0.452	0.068	0.072
4	0.496	0.096	0.14
5	0.545	0.12	0.24
6	0.598	0.14	0.35
7	0.657	0.16	0.49
8	0.721	0.17	0.65
9	0.791	0.19	0.82
10	0.869	0.2	1.01
11	0.953	0.21	1.22
12	1.047	0.23	1.43
13	1.149	0.24	1.66
14	1.261	0.26	1.9
15	1.385	0.28	2.15
16	1.52	0.3	2.43
17	1.669	0.33	2.73

SD-005-02

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
18	1.832	0.37	3.06
19	2.01	0.42	3.43
20	2.207	0.48	3.85
21	2.423	0.54	4.33
22	2.66	0.62	4.87
23	2.92	0.71	5.49
24	3.206	0.81	6.21
25	3.519	0.92	7.02
26	3.862	1.03	7.93
27	4.241	1.15	8.96
28	4.656	1.28	10.1
29	5.111	1.4	11.4
30	5.611	1.53	12.8
31	6.158	1.66	14.3
32	6.761	1.78	16
33	7.421	1.9	17.8
34	8.147	2.02	19.7
35	8.944	2.12	21.7
36	9.819	2.22	23.8
37	10.78	2.29	26
38	11.83	2.35	28.3
39	12.99	2.39	30.7
40	14.26	2.41	33.1
41	15.65	2.4	35.5
42	17.18	2.37	37.9
43	18.86	2.32	40.2
44	20.7	2.26	42.6
45	22.73	2.2	44.8
46	24.95	2.14	47
47	27.38	2.09	49.2
48	30.07	2.06	51.3
49	33	2.05	53.3
50	36.24	2.05	55.4
51	39.77	2.05	57.4
52	43.66	2.06	59.5
53	47.93	2.06	61.5
54	52.63	2.07	63.6
55	57.77	2.07	65.7
56	63.41	2.08	67.7
57	69.62	2.07	69.8
58	76.43	2.04	71.9
59	83.9	1.99	73.9
60	92.09	1.9	75.9
61	101.1	1.77	77.8
62	111	1.63	79.6
63	121.8	1.47	81.2
64	133.7	1.32	82.7

SD-005-02

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
65	146.8	1.19	84
66	161.2	1.08	85.2
67	176.8	0.97	86.3
68	194.2	0.88	87.2
69	213.2	0.79	88.1
70	234.1	0.7	88.9
71	256.8	0.64	89.6
72	282.1	0.59	90.2
73	309.6	0.56	90.8
74	339.8	0.57	91.4
75	373.1	0.61	92
76	409.6	0.67	92.6
77	449.7	0.73	93.2
78	493.6	0.78	94
79	541.9	0.78	94.8
80	594.9	0.72	95.5
81	653	0.6	96.3
82	716.9	0.43	96.9
83	786.9	0.31	97.3
84	863.9	0.27	97.6
85	948.2	0.38	97.9
86	1041	0.57	98.3
87	1143	0.62	98.8
88	1255	0.43	99.4
89	1377	0.12	99.9
90	1512	0.015	100
91	1660	0	100
92	1822	0	100
	2000		100

COULTER LS	04/03/2000 13:12
File name:	sd-006-0.$01

Group ID:	SD-006-01-Pensacola,NAS
Sample ID:	SD-006-01-Pensacola,NAS
Operator:	WFS
Comments:	3/8/2000 @1304
Comments:	

From	0.375
To	2000
Volume	100
Mean:	165.1
Median:	344.2
Mode:	471.1
S.D.:	5.018
Skewness:	-1.259
Kurtosis:	0.458

Particle Diameter µm	Volume % <
3.91	3.09
62.5	24.1
125	29.1
250	37.2
500	74.8
1000	99.8
2000	100

SD-006-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
1	0.375	0.0055	0
2	0.412	0.0099	0.0055
3	0.452	0.015	0.015
4	0.496	0.021	0.03
5	0.545	0.027	0.051
6	0.598	0.033	0.079
7	0.657	0.039	0.11
8	0.721	0.046	0.15
9	0.791	0.053	0.2
10	0.869	0.061	0.25
11	0.953	0.069	0.31
12	1.047	0.078	0.38
13	1.149	0.088	0.46
14	1.261	0.099	0.55
15	1.385	0.11	0.64
16	1.52	0.13	0.76
17	1.669	0.14	0.88

SD-006-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
18	1.832	0.16	1.03
19	2.01	0.18	1.19
20	2.207	0.2	1.37
21	2.423	0.23	1.57
22	2.66	0.26	1.8
23	2.92	0.29	2.06
24	3.206	0.32	2.35
25	3.519	0.36	2.68
26	3.862	0.4	3.04
27	4.241	0.44	3.44
28	4.656	0.49	3.88
29	5.111	0.53	4.37
30	5.611	0.58	4.9
31	6.158	0.63	5.48
32	6.761	0.67	6.11
33	7.421	0.72	6.78
34	8.147	0.76	7.5
35	8.944	0.8	8.27
36	9.819	0.84	9.07
37	10.78	0.87	9.91
38	11.83	0.89	10.8
39	12.99	0.9	11.7
40	14.26	0.91	12.6
41	15.65	0.9	13.5
42	17.18	0.88	14.4
43	18.86	0.86	15.3
44	20.7	0.83	16.1
45	22.73	0.79	17
46	24.95	0.75	17.7
47	27.38	0.71	18.5
48	30.07	0.68	19.2
49	33	0.66	19.9
50	36.24	0.63	20.5
51	39.77	0.62	21.2
52	43.66	0.6	21.8
53	47.93	0.59	22.4
54	52.63	0.59	23
55	57.77	0.6	23.6
56	63.41	0.61	24.2
57	69.62	0.64	24.8
58	76.43	0.66	25.4
59	83.9	0.69	26.1
60	92.09	0.7	26.8
61	101.1	0.71	27.5
62	111	0.71	28.2
63	121.8	0.71	28.9
64	133.7	0.71	29.6

SD-006-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
65	146.8	0.75	30.3
66	161.2	0.82	31.1
67	176.8	0.96	31.9
68	194.2	1.22	32.8
69	213.2	1.62	34.1
70	234.1	2.19	35.7
71	256.8	2.93	37.9
72	282.1	3.79	40.8
73	309.6	4.68	44.6
74	339.8	5.51	49.3
75	373.1	6.14	54.8
76	409.6	6.5	60.9
77	449.7	6.53	67.4
78	493.6	6.22	74
79	541.9	5.61	80.2
80	594.9	4.76	85.8
81	653	3.76	90.5
82	716.9	2.71	94.3
83	786.9	1.73	97
84	863.9	0.88	98.7
85	948.2	0.31	99.6
86	1041	0.058	99.9
87	1143	0.0044	100
88	1255	0	100
89	1377	0	100
90	1512	0	100
91	1660	0	100
92	1822	0	100
	2000		100

COULTER LS	04/03/2000 13:12
File name:	sd-007-0.$01

Group ID:	SD-007-01-Pensacola,NAS
Sample ID:	SD-007-01-Pensacola,NAS
Operator:	WFS
Comments:	3/8/2000 @ 1415
Comments:	

From	0.375
To	2000
Volume	100
Mean:	123.8
Median:	259.8
Mode:	429.2
S.D.:	5.723
Skewness:	-0.745
Kurtosis:	-0.526

Particle Diameter µm	Volume % <
3.91	3.58
62.5	32.4
125	39.8
250	49
500	77.3
1000	96.2
2000	100

SD-007-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
1	0.375	0.0066	0
2	0.412	0.012	0.0066
3	0.452	0.018	0.018
4	0.496	0.025	0.036
5	0.545	0.032	0.061
6	0.598	0.039	0.094
7	0.657	0.046	0.13
8	0.721	0.053	0.18
9	0.791	0.061	0.23
10	0.869	0.068	0.29
11	0.953	0.077	0.36
12	1.047	0.086	0.44
13	1.149	0.097	0.52
14	1.261	0.11	0.62
15	1.385	0.12	0.73
16	1.52	0.14	0.85
17	1.669	0.16	0.99

SD-007-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
18	1.832	0.18	1.15
19	2.01	0.21	1.33
20	2.207	0.23	1.54
21	2.423	0.27	1.77
22	2.66	0.3	2.04
23	2.92	0.34	2.34
24	3.206	0.39	2.69
25	3.519	0.44	3.08
26	3.862	0.49	3.52
27	4.241	0.55	4.02
28	4.656	0.61	4.57
29	5.111	0.68	5.18
30	5.611	0.74	5.86
31	6.158	0.81	6.61
32	6.761	0.88	7.42
33	7.421	0.94	8.29
34	8.147	1	9.23
35	8.944	1.06	10.2
36	9.819	1.12	11.3
37	10.78	1.16	12.4
38	11.83	1.2	13.6
39	12.99	1.22	14.8
40	14.26	1.24	16
41	15.65	1.24	17.2
42	17.18	1.22	18.5
43	18.86	1.19	19.7
44	20.7	1.15	20.9
45	22.73	1.11	22
46	24.95	1.06	23.2
47	27.38	1.02	24.2
48	30.07	0.97	25.2
49	33	0.94	26.2
50	36.24	0.91	27.1
51	39.77	0.9	28.1
52	43.66	0.89	29
53	47.93	0.89	29.8
54	52.63	0.9	30.7
55	57.77	0.92	31.6
56	63.41	0.95	32.6
57	69.62	0.98	33.5
58	76.43	1.01	34.5
59	83.9	1.03	35.5
60	92.09	1.03	36.5
61	101.1	1.01	37.6
62	111	0.98	38.6
63	121.8	0.93	39.5
64	133.7	0.9	40.5

SD-007-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
65	146.8	0.9	41.4
66	161.2	0.96	42.3
67	176.8	1.1	43.2
68	194.2	1.37	44.3
69	213.2	1.75	45.7
70	234.1	2.23	47.4
71	256.8	2.76	49.7
72	282.1	3.3	52.4
73	309.6	3.76	55.7
74	339.8	4.12	59.5
75	373.1	4.34	63.6
76	409.6	4.42	68
77	449.7	4.36	72.4
78	493.6	4.16	76.7
79	541.9	3.83	80.9
80	594.9	3.38	84.7
81	653	2.82	88.1
82	716.9	2.2	90.9
83	786.9	1.6	93.1
84	863.9	1.07	94.7
85	948.2	0.69	95.8
86	1041	0.47	96.5
87	1143	0.38	97
88	1255	0.39	97.4
89	1377	0.45	97.8
90	1512	0.53	98.2
91	1660	0.6	98.7
92	1822	0.67	99.3
	2000		100

COULTER LS	04/03/2000 13:13
File name:	sd-008-0.$01
Group ID:	SD-008-01-Pensacola,NAS
Sample ID:	SD-008-01-Pensacola,NAS
Operator:	WFS
Comments:	3/8/2000 @ 1606
Comments:	
From	0.375
To	2000
Volume	100
Mean:	57.65
Median:	59.17
Mode:	429.2
S.D.:	5.09
Skewness:	-0.198
Kurtosis:	-0.855

Particle Diameter µm	Volume % <
3.91	4.51
62.5	51
125	64.1
250	74.4
500	90.6
1000	99.9
2000	100

SD-008-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
1	0.375	0.0094	0
2	0.412	0.017	0.0094
3	0.452	0.025	0.026
4	0.496	0.036	0.051
5	0.545	0.045	0.087
6	0.598	0.054	0.13
7	0.657	0.063	0.19
8	0.721	0.072	0.25
9	0.791	0.081	0.32
10	0.869	0.09	0.4
11	0.953	0.099	0.49
12	1.047	0.11	0.59
13	1.149	0.12	0.7
14	1.261	0.14	0.82
15	1.385	0.15	0.96
16	1.52	0.17	1.11
17	1.669	0.19	1.28

SD-008-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
18	1.832	0.22	1.47
19	2.01	0.25	1.69
20	2.207	0.29	1.94
21	2.423	0.33	2.23
22	2.66	0.38	2.56
23	2.92	0.43	2.94
24	3.206	0.5	3.37
25	3.519	0.57	3.87
26	3.862	0.64	4.43
27	4.241	0.73	5.08
28	4.656	0.82	5.8
29	5.111	0.91	6.62
30	5.611	1.01	7.53
31	6.158	1.12	8.55
32	6.761	1.23	9.67
33	7.421	1.34	10.9
34	8.147	1.45	12.2
35	8.944	1.56	13.7
36	9.819	1.66	15.2
37	10.78	1.77	16.9
38	11.83	1.86	18.7
39	12.99	1.94	20.5
40	14.26	2	22.5
41	15.65	2.04	24.5
42	17.18	2.05	26.5
43	18.86	2.04	28.5
44	20.7	2	30.6
45	22.73	1.94	32.6
46	24.95	1.86	34.5
47	27.38	1.78	36.4
48	30.07	1.71	38.2
49	33	1.65	39.9
50	36.24	1.61	41.5
51	39.77	1.59	43.1
52	43.66	1.59	44.7
53	47.93	1.61	46.3
54	52.63	1.65	47.9
55	57.77	1.7	49.6
56	63.41	1.76	51.3
57	69.62	1.8	53
58	76.43	1.84	54.8
59	83.9	1.84	56.7
60	92.09	1.81	58.5
61	101.1	1.74	60.3
62	111	1.65	62.1
63	121.8	1.54	63.7
64	133.7	1.42	65.2

SD-008-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
65	146.8	1.32	66.7
66	161.2	1.26	68
67	176.8	1.25	69.3
68	194.2	1.31	70.5
69	213.2	1.43	71.8
70	234.1	1.6	73.2
71	256.8	1.8	74.8
72	282.1	2	76.6
73	309.6	2.17	78.6
74	339.8	2.31	80.8
75	373.1	2.38	83.1
76	409.6	2.4	85.5
77	449.7	2.35	87.9
78	493.6	2.23	90.3
79	541.9	2.02	92.5
80	594.9	1.74	94.5
81	653	1.4	96.2
82	716.9	1.04	97.7
83	786.9	0.69	98.7
84	863.9	0.39	99.4
85	948.2	0.17	99.8
86	1041	0.054	99.9
87	1143	0.0087	100
88	1255	0.00055	100
89	1377	0	100
90	1512	0	100
91	1660	0	100
92	1822	0	100
	2000		100

COULTER LS 04/03/2000 13:13

Group ID:	SD-009-01-Pensacola,NAS
Sample ID:	SD-009-01-Pensacola,NAS
Operator:	WFS
Comments:	3/9/2000 @ 1008
Comments:	

From	0.375
To	2000
Volume	100
Mean:	35.15
Median:	35.92
Mode:	96.49
S.D.:	3.919
Skewness:	-0.133
Kurtosis:	-0.288

Particle Diameter µm	Volume % <
3.91	5.07
62.5	62.4
125	82
250	93.5
500	97.2
1000	100
2000	100

SD-009-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
1	0.375	0.013	0
2	0.412	0.024	0.013
3	0.452	0.035	0.038
4	0.496	0.051	0.073
5	0.545	0.063	0.12
6	0.598	0.074	0.19
7	0.657	0.083	0.26
8	0.721	0.093	0.34
9	0.791	0.1	0.44
10	0.869	0.11	0.54
11	0.953	0.12	0.65
12	1.047	0.12	0.77
13	1.149	0.13	0.89
14	1.261	0.15	1.02
15	1.385	0.16	1.17
16	1.52	0.18	1.33
17	1.669	0.2	1.5

SD-009-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
18	1.832	0.23	1.7
19	2.01	0.26	1.93
20	2.207	0.3	2.19
21	2.423	0.35	2.49
22	2.66	0.42	2.85
23	2.92	0.49	3.26
24	3.206	0.57	3.75
25	3.519	0.66	4.32
26	3.862	0.76	4.97
27	4.241	0.87	5.73
28	4.656	0.98	6.59
29	5.111	1.11	7.58
30	5.611	1.24	8.68
31	6.158	1.37	9.92
32	6.761	1.51	11.3
33	7.421	1.65	12.8
34	8.147	1.79	14.5
35	8.944	1.93	16.3
36	9.819	2.06	18.2
37	10.78	2.19	20.3
38	11.83	2.29	22.4
39	12.99	2.38	24.7
40	14.26	2.45	27.1
41	15.65	2.48	29.6
42	17.18	2.48	32
43	18.86	2.46	34.5
44	20.7	2.4	37
45	22.73	2.32	39.4
46	24.95	2.24	41.7
47	27.38	2.15	43.9
48	30.07	2.08	46.1
49	33	2.03	48.2
50	36.24	2	50.2
51	39.77	2	52.2
52	43.66	2.03	54.2
53	47.93	2.09	56.2
54	52.63	2.17	58.3
55	57.77	2.29	60.5
56	63.41	2.42	62.8
57	69.62	2.56	65.2
58	76.43	2.68	67.7
59	83.9	2.76	70.4
60	92.09	2.78	73.2
61	101.1	2.73	76
62	111	2.61	78.7
63	121.8	2.43	81.3
64	133.7	2.2	83.7

SD-009-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
65	146.8	1.94	85.9
66	161.2	1.66	87.9
67	176.8	1.39	89.5
68	194.2	1.14	90.9
69	213.2	0.92	92
70	234.1	0.74	93
71	256.8	0.6	93.7
72	282.1	0.49	94.3
73	309.6	0.42	94.8
74	339.8	0.4	95.2
75	373.1	0.42	95.6
76	409.6	0.48	96
77	449.7	0.56	96.5
78	493.6	0.63	97.1
79	541.9	0.66	97.7
80	594.9	0.61	98.4
81	653	0.49	99
82	716.9	0.32	99.5
83	786.9	0.16	99.8
84	863.9	0.05	99.9
85	948.2	0.008	100
86	1041	0.00047	100
87	1143	0	100
88	1255	0	100
89	1377	0	100
90	1512	0	100
91	1660	0	100
92	1822	0	100
	2000		100

COULTER LS 04/03/2000 13:13

Group ID:	SD-009-02-Pensacola,NAS
Sample ID:	SD-009-02-Pensacola,NAS
Operator:	WFS
Comments:	3/9/2000 @1008
Comments:	

From	0.375
To	2000
Volume	100
Mean:	33.11
Median:	37.24
Mode:	87.9
S.D.:	4
Skewness:	-0.293
Kurtosis:	-0.315

Particle Diameter µm	Volume % <
3.91	6.53
62.5	61.3
125	83.3
250	95.1
500	98
1000	100
2000	100

SD-009-02

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
1	0.375	0.02	0
2	0.412	0.035	0.02
3	0.452	0.051	0.054
4	0.496	0.073	0.11
5	0.545	0.09	0.18
6	0.598	0.11	0.27
7	0.657	0.12	0.37
8	0.721	0.13	0.49
9	0.791	0.15	0.63
10	0.869	0.16	0.77
11	0.953	0.17	0.93
12	1.047	0.18	1.1
13	1.149	0.19	1.27
14	1.261	0.2	1.46
15	1.385	0.22	1.66
16	1.52	0.24	1.88
17	1.669	0.27	2.12

SD-009-02

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
18	1.832	0.3	2.39
19	2.01	0.34	2.69
20	2.207	0.39	3.03
21	2.423	0.45	3.42
22	2.66	0.51	3.86
23	2.92	0.59	4.38
24	3.206	0.68	4.97
25	3.519	0.77	5.65
26	3.862	0.87	6.42
27	4.241	0.98	7.29
28	4.656	1.09	8.27
29	5.111	1.21	9.37
30	5.611	1.33	10.6
31	6.158	1.45	11.9
32	6.761	1.57	13.4
33	7.421	1.69	14.9
34	8.147	1.81	16.6
35	8.944	1.92	18.4
36	9.819	2.01	20.4
37	10.78	2.1	22.4
38	11.83	2.17	24.5
39	12.99	2.22	26.6
40	14.26	2.24	28.9
41	15.65	2.24	31.1
42	17.18	2.22	33.3
43	18.86	2.17	35.6
44	20.7	2.11	37.7
45	22.73	2.05	39.8
46	24.95	1.98	41.9
47	27.38	1.92	43.9
48	30.07	1.87	45.8
49	33	1.83	47.6
50	36.24	1.83	49.5
51	39.77	1.85	51.3
52	43.66	1.91	53.2
53	47.93	2.03	55.1
54	52.63	2.2	57.1
55	57.77	2.42	59.3
56	63.41	2.66	61.7
57	69.62	2.89	64.4
58	76.43	3.07	67.3
59	83.9	3.17	70.3
60	92.09	3.17	73.5
61	101.1	3.06	76.7
62	111	2.88	79.7
63	121.8	2.63	82.6
64	133.7	2.35	85.2

SD-009-02

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
65	146.8	2.04	87.6
66	161.2	1.72	89.6
67	176.8	1.41	91.4
68	194.2	1.11	92.8
69	213.2	0.84	93.9
70	234.1	0.61	94.7
71	256.8	0.44	95.3
72	282.1	0.34	95.8
73	309.6	0.29	96.1
74	339.8	0.29	96.4
75	373.1	0.34	96.7
76	409.6	0.42	97
77	449.7	0.52	97.4
78	493.6	0.58	97.9
79	541.9	0.57	98.5
80	594.9	0.47	99.1
81	653	0.29	99.6
82	716.9	0.12	99.8
83	786.9	0.027	100
84	863.9	0.0026	100
85	948.2	0.000007	100
86	1041	0	100
87	1143	0	100
88	1255	0	100
89	1377	0	100
90	1512	0	100
91	1660	0	100
92	1822	0	100
	2000		100

COULTER LS	04/03/2000 13:14
File name:	sd-010-0.$01

Group ID:	SD-010-01-Pensacola,NAS
Sample ID:	SD-010-01-Pensacola,NAS
Operator:	WFS
Comments:	3/9/2000 @ 0855
Comments:	

From	0.375
To	2000
Volume	100
Mean:	402.1
Median:	465.5
Mode:	471.1
S.D.:	2.52
Skewness:	-3.283
Kurtosis:	13.28

Particle Diameter µm	Volume % <
3.91	0.79
62.5	4.46
125	5.08
250	9.62
500	56.8
1000	96.2
2000	100

SD-010-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
1	0.375	0	0
2	0.412	0	0
3	0.452	0	0
4	0.496	0	0
5	0.545	0	0
6	0.598	0	0
7	0.657	0	0
8	0.721	0.00016	0
9	0.791	0.0022	0.00016
10	0.869	0.0067	0.0023
11	0.953	0.012	0.0091
12	1.047	0.016	0.021
13	1.149	0.021	0.037
14	1.261	0.026	0.058
15	1.385	0.032	0.084
16	1.52	0.037	0.12
17	1.669	0.043	0.15

SD-010-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
18	1.832	0.049	0.2
19	2.01	0.055	0.25
20	2.207	0.062	0.3
21	2.423	0.069	0.36
22	2.66	0.076	0.43
23	2.92	0.083	0.51
24	3.206	0.09	0.59
25	3.519	0.097	0.68
26	3.862	0.1	0.78
27	4.241	0.11	0.88
28	4.656	0.12	0.99
29	5.111	0.13	1.11
30	5.611	0.13	1.24
31	6.158	0.14	1.37
32	6.761	0.14	1.5
33	7.421	0.15	1.65
34	8.147	0.15	1.8
35	8.944	0.16	1.95
36	9.819	0.16	2.1
37	10.78	0.16	2.26
38	11.83	0.16	2.42
39	12.99	0.16	2.58
40	14.26	0.16	2.74
41	15.65	0.16	2.9
42	17.18	0.15	3.06
43	18.86	0.15	3.22
44	20.7	0.14	3.36
45	22.73	0.12	3.5
46	24.95	0.11	3.63
47	27.38	0.092	3.73
48	30.07	0.084	3.83
49	33	0.084	3.91
50	36.24	0.09	4
51	39.77	0.093	4.08
52	43.66	0.087	4.18
53	47.93	0.074	4.26
54	52.63	0.065	4.34
55	57.77	0.065	4.4
56	63.41	0.07	4.47
57	69.62	0.071	4.54
58	76.43	0.069	4.61
59	83.9	0.075	4.68
60	92.09	0.088	4.75
61	101.1	0.099	4.84
62	111	0.1	4.94
63	121.8	0.12	5.05
64	133.7	0.15	5.16

SD-010-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
65	146.8	0.2	5.31
66	161.2	0.28	5.52
67	176.8	0.44	5.8
68	194.2	0.73	6.24
69	213.2	1.24	6.97
70	234.1	2.01	8.21
71	256.8	3.06	10.2
72	282.1	4.34	13.3
73	309.6	5.69	17.6
74	339.8	6.96	23.3
75	373.1	7.97	30.3
76	409.6	8.6	38.3
77	449.7	8.78	46.9
78	493.6	8.54	55.6
79	541.9	7.96	64.2
80	594.9	7.1	72.1
81	653	6.01	79.2
82	716.9	4.73	85.2
83	786.9	3.39	90
84	863.9	2.16	93.4
85	948.2	1.26	95.5
86	1041	0.74	96.8
87	1143	0.47	97.5
88	1255	0.35	98
89	1377	0.36	98.3
90	1512	0.44	98.7
91	1660	0.45	99.1
92	1822	0.4	99.6
	2000		100

COULTER LS 04/03/2000 13:14

Group ID:	SD-011-02-Pensacola,NAS
Sample ID:	SD-011-02-Pensacola,NAS
Operator:	WFS
Comments:	3/9/2000 @1123
Comments:	

From	0.375
To	2000
Volume	100
Mean:	34.08
Median:	32.09
Mode:	13.61
S.D.:	5.138
Skewness:	-0.00593
Kurtosis:	-0.645

Particle Diameter µm	Volume % <
3.91	8.71
62.5	62.9
125	76.7
250	86.2
500	93.9
1000	99.9
2000	100

SD-011-02

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
1	0.375	0.027	0
2	0.412	0.048	0.027
3	0.452	0.07	0.075
4	0.496	0.1	0.14
5	0.545	0.12	0.24
6	0.598	0.14	0.37
7	0.657	0.16	0.51
8	0.721	0.18	0.68
9	0.791	0.2	0.86
10	0.869	0.21	1.06
11	0.953	0.22	1.27
12	1.047	0.24	1.49
13	1.149	0.25	1.73
14	1.261	0.27	1.98
15	1.385	0.3	2.26
16	1.52	0.33	2.55
17	1.669	0.36	2.88

SD-011-02

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
18	1.832	0.41	3.24
19	2.01	0.46	3.65
20	2.207	0.53	4.11
21	2.423	0.6	4.64
22	2.66	0.69	5.24
23	2.92	0.78	5.93
24	3.206	0.88	6.71
25	3.519	0.99	7.59
26	3.862	1.1	8.57
27	4.241	1.21	9.67
28	4.656	1.33	10.9
29	5.111	1.44	12.2
30	5.611	1.55	13.6
31	6.158	1.65	15.2
32	6.761	1.75	16.9
33	7.421	1.85	18.6
34	8.147	1.93	20.5
35	8.944	2	22.4
36	9.819	2.06	24.4
37	10.78	2.1	26.4
38	11.83	2.12	28.5
39	12.99	2.13	30.7
40	14.26	2.13	32.8
41	15.65	2.1	34.9
42	17.18	2.07	37
43	18.86	2.02	39.1
44	20.7	1.97	41.1
45	22.73	1.92	43.1
46	24.95	1.88	45
47	27.38	1.85	46.9
48	30.07	1.82	48.7
49	33	1.8	50.6
50	36.24	1.79	52.4
51	39.77	1.78	54.2
52	43.66	1.78	55.9
53	47.93	1.79	57.7
54	52.63	1.82	59.5
55	57.77	1.86	61.3
56	63.41	1.91	63.2
57	69.62	1.96	65.1
58	76.43	1.97	67.1
59	83.9	1.95	69
60	92.09	1.88	71
61	101.1	1.78	72.9
62	111	1.66	74.6
63	121.8	1.54	76.3
64	133.7	1.44	77.8

SD-011-02

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
65	146.8	1.35	79.3
66	161.2	1.28	80.6
67	176.8	1.22	81.9
68	194.2	1.18	83.1
69	213.2	1.15	84.3
70	234.1	1.11	85.5
71	256.8	1.08	86.6
72	282.1	1.04	87.7
73	309.6	1.01	88.7
74	339.8	0.99	89.7
75	373.1	0.99	90.7
76	409.6	1.02	91.7
77	449.7	1.07	92.7
78	493.6	1.12	93.8
79	541.9	1.14	94.9
80	594.9	1.1	96
81	653	0.98	97.1
82	716.9	0.79	98.1
83	786.9	0.57	98.9
84	863.9	0.33	99.5
85	948.2	0.14	99.8
86	1041	0.04	100
87	1143	0.0054	100
88	1255	0.00021	100
89	1377	0	100
90	1512	0	100
91	1660	0	100
92	1822	0	100
	2000		100

COULTER LS 04/03/2000 13:15

Group ID:	SD-011-01-Pensacola,NAS
Sample ID:	SD-011-01-Pensacola,NAS
Operator:	WFS
Comments:	3/9/2000 @1123
Comments:	

From	0.375
To	2000
Volume	100
Mean:	76.39
Median:	93.28
Mode:	567.8
S.D.:	6.14
Skewness:	-0.337
Kurtosis:	-0.967

Particle Diameter µm	Volume % <
3.91	5.27
62.5	44
125	54.5
250	64.6
500	81
1000	97.4
2000	100

SD-011-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
1	0.375	0.011	0
2	0.412	0.019	0.011
3	0.452	0.028	0.03
4	0.496	0.041	0.058
5	0.545	0.052	0.099
6	0.598	0.062	0.15
7	0.657	0.072	0.21
8	0.721	0.083	0.29
9	0.791	0.094	0.37
10	0.869	0.1	0.46
11	0.953	0.12	0.57
12	1.047	0.13	0.68
13	1.149	0.14	0.81
14	1.261	0.16	0.96
15	1.385	0.18	1.12
16	1.52	0.2	1.3
17	1.669	0.23	1.5

SD-011-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
18	1.832	0.26	1.73
19	2.01	0.3	2
20	2.207	0.34	2.3
21	2.423	0.39	2.64
22	2.66	0.44	3.02
23	2.92	0.5	3.47
24	3.206	0.57	3.97
25	3.519	0.64	4.54
26	3.862	0.72	5.18
27	4.241	0.8	5.9
28	4.656	0.89	6.7
29	5.111	0.97	7.59
30	5.611	1.06	8.56
31	6.158	1.14	9.62
32	6.761	1.23	10.8
33	7.421	1.31	12
34	8.147	1.38	13.3
35	8.944	1.45	14.7
36	9.819	1.5	16.1
37	10.78	1.55	17.6
38	11.83	1.58	19.2
39	12.99	1.6	20.7
40	14.26	1.6	22.3
41	15.65	1.59	23.9
42	17.18	1.56	25.5
43	18.86	1.53	27.1
44	20.7	1.48	28.6
45	22.73	1.44	30.1
46	24.95	1.39	31.5
47	27.38	1.35	32.9
48	30.07	1.32	34.3
49	33	1.28	35.6
50	36.24	1.25	36.9
51	39.77	1.23	38.1
52	43.66	1.21	39.4
53	47.93	1.2	40.6
54	52.63	1.22	41.8
55	57.77	1.25	43
56	63.41	1.3	44.2
57	69.62	1.37	45.5
58	76.43	1.43	46.9
59	83.9	1.47	48.3
60	92.09	1.48	49.8
61	101.1	1.46	51.3
62	111	1.42	52.8
63	121.8	1.36	54.2
64	133.7	1.29	55.5

SD-011-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
65	146.8	1.25	56.8
66	161.2	1.23	58.1
67	176.8	1.27	59.3
68	194.2	1.36	60.6
69	213.2	1.5	61.9
70	234.1	1.67	63.4
71	256.8	1.84	65.1
72	282.1	1.99	66.9
73	309.6	2.12	68.9
74	339.8	2.23	71
75	373.1	2.34	73.3
76	409.6	2.47	75.6
77	449.7	2.61	78.1
78	493.6	2.72	80.7
79	541.9	2.77	83.4
80	594.9	2.72	86.2
81	653	2.52	88.9
82	716.9	2.2	91.4
83	786.9	1.8	93.6
84	863.9	1.39	95.4
85	948.2	1.01	96.8
86	1041	0.72	97.8
87	1143	0.51	98.5
88	1255	0.37	99.1
89	1377	0.26	99.4
90	1512	0.17	99.7
91	1660	0.11	99.9
92	1822	0.038	100
	2000		100

COULTER LS 04/03/2000 13:15

Group ID:	SD-018-02-Pensacola,NAS
Sample ID:	SD-018-02-Pensacola,NAS
Operator:	WFS
Comments:	3/9/2000 @1312
Comments:	

From	0.375
To	2000
Volume	100
Mean:	56.33
Median:	106.4
Mode:	168.8
S.D.:	4.9
Skewness:	-0.663
Kurtosis:	-0.502

Particle Diameter µm	Volume % <
3.91	6.53
62.5	41.7
125	55.2
250	87.5
500	95.8
1000	100
2000	100

SD-018-02

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
1	0.375	0.018	0
2	0.412	0.032	0.018
3	0.452	0.048	0.051
4	0.496	0.069	0.099
5	0.545	0.086	0.17
6	0.598	0.1	0.25
7	0.657	0.12	0.36
8	0.721	0.13	0.47
9	0.791	0.15	0.6
10	0.869	0.16	0.75
11	0.953	0.17	0.91
12	1.047	0.19	1.08
13	1.149	0.2	1.27
14	1.261	0.22	1.47
15	1.385	0.24	1.69
16	1.52	0.26	1.93
17	1.669	0.29	2.19

SD-018-02

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
18	1.832	0.32	2.47
19	2.01	0.36	2.79
20	2.207	0.4	3.15
21	2.423	0.45	3.55
22	2.66	0.51	4
23	2.92	0.57	4.51
24	3.206	0.64	5.08
25	3.519	0.71	5.72
26	3.862	0.79	6.43
27	4.241	0.87	7.22
28	4.656	0.95	8.09
29	5.111	1.03	9.05
30	5.611	1.11	10.1
31	6.158	1.19	11.2
32	6.761	1.26	12.4
33	7.421	1.32	13.6
34	8.147	1.38	15
35	8.944	1.43	16.3
36	9.819	1.47	17.8
37	10.78	1.49	19.2
38	11.83	1.5	20.7
39	12.99	1.5	22.2
40	14.26	1.48	23.7
41	15.65	1.45	25.2
42	17.18	1.4	26.7
43	18.86	1.35	28.1
44	20.7	1.29	29.4
45	22.73	1.23	30.7
46	24.95	1.17	31.9
47	27.38	1.12	33.1
48	30.07	1.07	34.2
49	33	1.03	35.3
50	36.24	0.99	36.3
51	39.77	0.95	37.3
52	43.66	0.92	38.3
53	47.93	0.89	39.2
54	52.63	0.88	40.1
55	57.77	0.89	40.9
56	63.41	0.95	41.8
57	69.62	1.07	42.8
58	76.43	1.27	43.9
59	83.9	1.56	45.1
60	92.09	1.97	46.7
61	101.1	2.49	48.7
62	111	3.08	51.2
63	121.8	3.71	54.2
64	133.7	4.28	57.9

SD-018-02

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
65	146.8	4.73	62.2
66	161.2	4.96	67
67	176.8	4.91	71.9
68	194.2	4.56	76.8
69	213.2	3.95	81.4
70	234.1	3.17	85.3
71	256.8	2.32	88.5
72	282.1	1.55	90.8
73	309.6	0.97	92.4
74	339.8	0.62	93.3
75	373.1	0.5	94
76	409.6	0.54	94.5
77	449.7	0.69	95
78	493.6	0.86	95.7
79	541.9	0.97	96.6
80	594.9	0.93	97.5
81	653	0.75	98.4
82	716.9	0.49	99.2
83	786.9	0.23	99.7
84	863.9	0.068	99.9
85	948.2	0.0099	100
86	1041	0.00047	100
87	1143	0	100
88	1255	0	100
89	1377	0	100
90	1512	0	100
91	1660	0	100
92	1822	0	100
	2000		100

COULTER LS 04/03/2000 13:15

Group ID: SD-018-01-Pensacola,NAS
Sample ID: SD-018-01-Pensacola,NAS
Operator: WFS
Comments: 3/9/2000 @1312
Comments:

From 0.375
To 2000
Volume 100
Mean: 54.6
Median: 98.24
Mode: 153.8
S.D.: 4.52
Skewness: -0.663
Kurtosis: -0.423

Particle Diameter µm	Volume % <
3.91	5.58
62.5	42.7
125	58.6
250	90.2
500	97
1000	100
2000	100

SD-018-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
1	0.375	0.015	0
2	0.412	0.027	0.015
3	0.452	0.04	0.042
4	0.496	0.057	0.081
5	0.545	0.071	0.14
6	0.598	0.084	0.21
7	0.657	0.096	0.29
8	0.721	0.11	0.39
9	0.791	0.12	0.5
10	0.869	0.13	0.62
11	0.953	0.14	0.75
12	1.047	0.15	0.89
13	1.149	0.17	1.05
14	1.261	0.18	1.22
15	1.385	0.2	1.4
16	1.52	0.22	1.6
17	1.669	0.24	1.81

SD-018-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
18	1.832	0.27	2.05
19	2.01	0.3	2.32
20	2.207	0.34	2.62
21	2.423	0.39	2.97
22	2.66	0.44	3.35
23	2.92	0.5	3.79
24	3.206	0.56	4.29
25	3.519	0.64	4.85
26	3.862	0.71	5.49
27	4.241	0.8	6.2
28	4.656	0.88	7
29	5.111	0.97	7.88
30	5.611	1.05	8.85
31	6.158	1.14	9.9
32	6.761	1.23	11
33	7.421	1.31	12.3
34	8.147	1.38	13.6
35	8.944	1.45	15
36	9.819	1.51	16.4
37	10.78	1.56	17.9
38	11.83	1.59	19.5
39	12.99	1.61	21.1
40	14.26	1.61	22.7
41	15.65	1.59	24.3
42	17.18	1.56	25.9
43	18.86	1.51	27.4
44	20.7	1.45	28.9
45	22.73	1.38	30.4
46	24.95	1.31	31.8
47	27.38	1.24	33.1
48	30.07	1.18	34.3
49	33	1.13	35.5
50	36.24	1.09	36.6
51	39.77	1.06	37.7
52	43.66	1.04	38.8
53	47.93	1.03	39.8
54	52.63	1.02	40.9
55	57.77	1.02	41.9
56	63.41	1.07	42.9
57	69.62	1.2	44
58	76.43	1.43	45.2
59	83.9	1.81	46.6
60	92.09	2.33	48.4
61	101.1	2.98	50.7
62	111	3.69	53.7
63	121.8	4.34	57.4
64	133.7	4.83	61.8

SD-018-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
65	146.8	5.07	66.6
66	161.2	4.98	71.7
67	176.8	4.6	76.6
68	194.2	3.99	81.2
69	213.2	3.24	85.2
70	234.1	2.45	88.5
71	256.8	1.74	90.9
72	282.1	1.16	92.7
73	309.6	0.77	93.8
74	339.8	0.56	94.6
75	373.1	0.5	95.1
76	409.6	0.55	95.6
77	449.7	0.66	96.2
78	493.6	0.77	96.9
79	541.9	0.79	97.6
80	594.9	0.7	98.4
81	653	0.51	99.1
82	716.9	0.27	99.6
83	786.9	0.097	99.9
84	863.9	0.017	100
85	948.2	0.0011	100
86	1041	0	100
87	1143	0	100
88	1255	0	100
89	1377	0	100
90	1512	0	100
91	1660	0	100
92	1822	0	100
	2000		100

COULTER LS 04/03/2000 13:16

Group ID: SD-022-02-Pensacola,NAS
Sample ID: SD-022-02-Pensacola,NAS
Operator: WFS
Comments: 3/9/2000 @1440
Comments:

From 0.375
To 2000
Volume 100
Mean: 26.28
Median: 27.61
Mode: 87.9
S.D.: 4.023
Skewness: -0.19
Kurtosis: -0.275

Particle Diameter µm	Volume % <
3.91	8.61
62.5	68.2
125	88.7
250	96.7
500	97.9
1000	100
2000	100

SD-022-02

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
1	0.375	0.03	0
2	0.412	0.053	0.03
3	0.452	0.078	0.083
4	0.496	0.11	0.16
5	0.545	0.13	0.27
6	0.598	0.15	0.4
7	0.657	0.17	0.56
8	0.721	0.19	0.73
9	0.791	0.2	0.92
10	0.869	0.21	1.12
11	0.953	0.22	1.33
12	1.047	0.23	1.54
13	1.149	0.24	1.77
14	1.261	0.25	2
15	1.385	0.27	2.26
16	1.52	0.3	2.53
17	1.669	0.33	2.82

SD-022-02

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
18	1.832	0.38	3.16
19	2.01	0.44	3.54
20	2.207	0.51	3.98
21	2.423	0.59	4.49
22	2.66	0.68	5.08
23	2.92	0.79	5.76
24	3.206	0.9	6.55
25	3.519	1.02	7.45
26	3.862	1.14	8.46
27	4.241	1.27	9.61
28	4.656	1.4	10.9
29	5.111	1.53	12.3
30	5.611	1.65	13.8
31	6.158	1.78	15.5
32	6.761	1.89	17.2
33	7.421	2	19.1
34	8.147	2.09	21.1
35	8.944	2.17	23.2
36	9.819	2.24	25.4
37	10.78	2.29	27.6
38	11.83	2.32	29.9
39	12.99	2.33	32.2
40	14.26	2.32	34.6
41	15.65	2.29	36.9
42	17.18	2.24	39.2
43	18.86	2.19	41.4
44	20.7	2.13	43.6
45	22.73	2.07	45.7
46	24.95	2.03	47.8
47	27.38	2.01	49.8
48	30.07	1.99	51.8
49	33	1.99	53.8
50	36.24	1.98	55.8
51	39.77	1.99	57.8
52	43.66	2.02	59.8
53	47.93	2.1	61.8
54	52.63	2.24	63.9
55	57.77	2.43	66.2
56	63.41	2.66	68.6
57	69.62	2.88	71.3
58	76.43	3.03	74.1
59	83.9	3.05	77.2
60	92.09	2.93	80.2
61	101.1	2.68	83.1
62	111	2.36	85.8
63	121.8	2	88.2
64	133.7	1.67	90.2

SD-022-02

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
65	146.8	1.37	91.9
66	161.2	1.11	93.2
67	176.8	0.89	94.3
68	194.2	0.68	95.2
69	213.2	0.5	95.9
70	234.1	0.34	96.4
71	256.8	0.22	96.8
72	282.1	0.13	97
73	309.6	0.081	97.1
74	339.8	0.074	97.2
75	373.1	0.11	97.3
76	409.6	0.2	97.4
77	449.7	0.32	97.6
78	493.6	0.44	97.9
79	541.9	0.51	98.3
80	594.9	0.48	98.8
81	653	0.38	99.3
82	716.9	0.22	99.7
83	786.9	0.082	99.9
84	863.9	0.015	100
85	948.2	0.0011	100
86	1041	0	100
87	1143	0	100
88	1255	0	100
89	1377	0	100
90	1512	0	100
91	1660	0	100
92	1822	0	100
	2000		100

COULTER LS 04/03/2000 13:16

Group ID:	SD-022-01-Pensacola,NAS
Sample ID:	SD-022-01-Pensacola,NAS
Operator:	WFS
Comments:	3/9/2000 @ 1440
Comments:	

From	0.375
To	2000
Volume	100
Mean:	34.72
Median:	42.15
Mode:	87.9
S.D.:	3.621
Skewness:	-0.415
Kurtosis:	-0.112

Particle Diameter µm	Volume % <
3.91	5.25
62.5	60.6
125	85.9
250	96.7
500	98.6
1000	100
2000	100

SD-022-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
1	0.375	0.015	0
2	0.412	0.026	0.015
3	0.452	0.038	0.041
4	0.496	0.055	0.079
5	0.545	0.068	0.13
6	0.598	0.079	0.2
7	0.657	0.089	0.28
8	0.721	0.1	0.37
9	0.791	0.11	0.47
10	0.869	0.12	0.58
11	0.953	0.12	0.69
12	1.047	0.13	0.82
13	1.149	0.14	0.95
14	1.261	0.15	1.09
15	1.385	0.16	1.24
16	1.52	0.18	1.4
17	1.669	0.21	1.58

SD-022-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
18	1.832	0.24	1.79
19	2.01	0.27	2.03
20	2.207	0.32	2.3
21	2.423	0.37	2.61
22	2.66	0.43	2.98
23	2.92	0.5	3.41
24	3.206	0.58	3.91
25	3.519	0.67	4.49
26	3.862	0.76	5.15
27	4.241	0.86	5.91
28	4.656	0.97	6.78
29	5.111	1.08	7.75
30	5.611	1.2	8.83
31	6.158	1.32	10
32	6.761	1.43	11.3
33	7.421	1.55	12.8
34	8.147	1.66	14.3
35	8.944	1.77	16
36	9.819	1.87	17.8
37	10.78	1.96	19.6
38	11.83	2.03	21.6
39	12.99	2.09	23.6
40	14.26	2.13	25.7
41	15.65	2.15	27.8
42	17.18	2.15	30
43	18.86	2.14	32.2
44	20.7	2.11	34.3
45	22.73	2.07	36.4
46	24.95	2.05	38.5
47	27.38	2.03	40.5
48	30.07	2.03	42.5
49	33	2.04	44.6
50	36.24	2.08	46.6
51	39.77	2.15	48.7
52	43.66	2.26	50.8
53	47.93	2.42	53.1
54	52.63	2.64	55.5
55	57.77	2.9	58.1
56	63.41	3.19	61
57	69.62	3.45	64.2
58	76.43	3.63	67.7
59	83.9	3.7	71.3
60	92.09	3.62	75
61	101.1	3.41	78.6
62	111	3.1	82.1
63	121.8	2.73	85.2
64	133.7	2.33	87.9

SD-022-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
65	146.8	1.93	90.2
66	161.2	1.55	92.1
67	176.8	1.2	93.7
68	194.2	0.89	94.9
69	213.2	0.64	95.8
70	234.1	0.44	96.4
71	256.8	0.3	96.9
72	282.1	0.21	97.2
73	309.6	0.17	97.4
74	339.8	0.16	97.6
75	373.1	0.2	97.7
76	409.6	0.26	97.9
77	449.7	0.35	98.2
78	493.6	0.41	98.5
79	541.9	0.41	98.9
80	594.9	0.34	99.3
81	653	0.21	99.7
82	716.9	0.085	99.9
83	786.9	0.017	100
84	863.9	0.0014	100
85	948.2	0	100
86	1041	0	100
87	1143	0	100
88	1255	0	100
89	1377	0	100
90	1512	0	100
91	1660	0	100
92	1822	0	100
	2000		100

COULTER LS	04/03/2000 13:17
File name:	sd-106-0.$01
Group ID:	SD-106-01-Pensacola,NAS
Sample ID:	SD-106-01-Pensacola,NAS
Operator:	WFS
Comments:	3/8/2000 @ 1304
Comments:	
From	0.375
To	2000
Volume	100
Mean:	220.8
Median:	400.8
Mode:	471.1
S.D.:	4.706
Skewness:	-1.582
Kurtosis:	1.481

Particle Diameter µm	Volume % <
3.91	2.67
62.5	18.5
125	21.7
250	27.9
500	65.5
1000	97.8
2000	100

SD-106-01 Duplicate of SD-006-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
1	0.375	0.0036	0
2	0.412	0.0063	0.0036
3	0.452	0.0095	0.0099
4	0.496	0.014	0.019
5	0.545	0.018	0.033
6	0.598	0.023	0.051
7	0.657	0.027	0.074
8	0.721	0.033	0.1
9	0.791	0.039	0.13
10	0.869	0.046	0.17
11	0.953	0.053	0.22
12	1.047	0.062	0.27
13	1.149	0.072	0.33
14	1.261	0.084	0.41
15	1.385	0.097	0.49
16	1.52	0.11	0.59
17	1.669	0.13	0.7

SD-106-01 Duplicate of SD-006-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
18	1.832	0.14	0.82
19	2.01	0.16	0.97
20	2.207	0.19	1.13
21	2.423	0.21	1.32
22	2.66	0.23	1.53
23	2.92	0.26	1.76
24	3.206	0.29	2.02
25	3.519	0.32	2.31
26	3.862	0.35	2.63
27	4.241	0.38	2.98
28	4.656	0.42	3.37
29	5.111	0.45	3.78
30	5.611	0.49	4.24
31	6.158	0.52	4.72
32	6.761	0.55	5.24
33	7.421	0.59	5.8
34	8.147	0.62	6.39
35	8.944	0.64	7
36	9.819	0.67	7.65
37	10.78	0.68	8.31
38	11.83	0.69	8.99
39	12.99	0.69	9.68
40	14.26	0.69	10.4
41	15.65	0.67	11.1
42	17.18	0.65	11.7
43	18.86	0.62	12.4
44	20.7	0.59	13
45	22.73	0.56	13.6
46	24.95	0.52	14.2
47	27.38	0.49	14.7
48	30.07	0.47	15.2
49	33	0.45	15.6
50	36.24	0.43	16.1
51	39.77	0.42	16.5
52	43.66	0.41	16.9
53	47.93	0.4	17.3
54	52.63	0.39	17.7
55	57.77	0.39	18.1
56	63.41	0.4	18.5
57	69.62	0.41	18.9
58	76.43	0.43	19.3
59	83.9	0.45	19.8
60	92.09	0.46	20.2
61	101.1	0.46	20.7
62	111	0.45	21.1
63	121.8	0.44	21.6
64	133.7	0.43	22

SD-106-01 Duplicate of SD-006-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
65	146.8	0.45	22.5
66	161.2	0.51	22.9
67	176.8	0.67	23.4
68	194.2	0.96	24.1
69	213.2	1.43	25
70	234.1	2.08	26.5
71	256.8	2.89	28.6
72	282.1	3.78	31.4
73	309.6	4.68	35.2
74	339.8	5.47	39.9
75	373.1	6.1	45.4
76	409.6	6.5	51.5
77	449.7	6.65	58
78	493.6	6.55	64.6
79	541.9	6.2	71.2
80	594.9	5.63	77.4
81	653	4.86	83
82	716.9	3.97	87.9
83	786.9	3.03	91.8
84	863.9	2.14	94.9
85	948.2	1.4	97
86	1041	0.84	98.4
87	1143	0.46	99.2
88	1255	0.21	99.7
89	1377	0.074	99.9
90	1512	0.016	100
91	1660	0.0015	100
92	1822	0.000025	100
	2000		100

COULTER LS 04/03/2000 13:19
File name: sd-109-0.$01

Group ID: SD-109-01-Pensacola,NAS
Sample ID: SD-109-01-Pensacola,NAS
Operator: WFS
Comments: 3/9/2000 @ 1008
Comments:

From 0.375
To 2000
Volume 100
Mean: 35.01
Median: 36.21
Mode: 96.49
S.D.: 3.913
Skewness: -0.171
Kurtosis: -0.327

Particle Diameter µm	Volume % <
3.91	5.22
62.5	62.2
125	81.9
250	93.4
500	97.7
1000	100
2000	100

SD-109-01 Duplicate of SD-009-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
1	0.375	0.014	0
2	0.412	0.024	0.014
3	0.452	0.036	0.038
4	0.496	0.051	0.074
5	0.545	0.064	0.13
6	0.598	0.075	0.19
7	0.657	0.085	0.26
8	0.721	0.096	0.35
9	0.791	0.1	0.44
10	0.869	0.11	0.55
11	0.953	0.12	0.66
12	1.047	0.13	0.78
13	1.149	0.14	0.91
14	1.261	0.15	1.05
15	1.385	0.17	1.2
16	1.52	0.18	1.37
17	1.669	0.21	1.55

SD-109-01 Duplicate of SD-009-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
18	1.832	0.24	1.76
19	2.01	0.27	2
20	2.207	0.31	2.27
21	2.423	0.37	2.59
22	2.66	0.43	2.95
23	2.92	0.5	3.38
24	3.206	0.58	3.88
25	3.519	0.67	4.45
26	3.862	0.77	5.12
27	4.241	0.87	5.89
28	4.656	0.99	6.76
29	5.111	1.11	7.75
30	5.611	1.24	8.86
31	6.158	1.37	10.1
32	6.761	1.51	11.5
33	7.421	1.65	13
34	8.147	1.79	14.6
35	8.944	1.92	16.4
36	9.819	2.05	18.3
37	10.78	2.17	20.4
38	11.83	2.28	22.6
39	12.99	2.36	24.8
40	14.26	2.42	27.2
41	15.65	2.46	29.6
42	17.18	2.46	32.1
43	18.86	2.43	34.5
44	20.7	2.37	37
45	22.73	2.29	39.3
46	24.95	2.21	41.6
47	27.38	2.12	43.8
48	30.07	2.05	46
49	33	2.01	48
50	36.24	1.98	50
51	39.77	1.99	52
52	43.66	2.02	54
53	47.93	2.09	56
54	52.63	2.18	58.1
55	57.77	2.3	60.3
56	63.41	2.44	62.6
57	69.62	2.59	65
58	76.43	2.71	67.6
59	83.9	2.78	70.3
60	92.09	2.79	73.1
61	101.1	2.73	75.9
62	111	2.61	78.6
63	121.8	2.42	81.2
64	133.7	2.19	83.7

SD-109-01 Duplicate of SD-009-01

Channel Number	Channel Diameter (Lower) µm	Difference Volume %	Cumulative < Volume %
65	146.8	1.93	85.8
66	161.2	1.65	87.8
67	176.8	1.38	89.4
68	194.2	1.14	90.8
69	213.2	0.93	91.9
70	234.1	0.77	92.9
71	256.8	0.64	93.6
72	282.1	0.56	94.3
73	309.6	0.52	94.8
74	339.8	0.51	95.4
75	373.1	0.54	95.9
76	409.6	0.59	96.4
77	449.7	0.65	97
78	493.6	0.68	97.7
79	541.9	0.63	98.3
80	594.9	0.51	99
81	653	0.33	99.5
82	716.9	0.15	99.8
83	786.9	0.041	100
84	863.9	0.0056	100
85	948.2	0.00019	100
86	1041	0	100
87	1143	0	100
88	1255	0	100
89	1377	0	100
90	1512	0	100
91	1660	0	100
92	1822	0	100
	2000		100

In-situ Water Quality Measurements

DU #1 3/7/00

DEPTH (ft)	TEMP (C)	COND (μ	SAL (ppt)	p H	DO (mg/l)	DO SAT (%)	BATT (volts)
0.5	19.4	36,222	26.00	8.13	8.05	102.1	11.6
1.0	19.4	36,245	26.01	8.13	8.02	101.7	11.6
2.0	19.4	36,247	26.02	8.14	8.00	101.4	11.6
3.0	19.39	36,306	26.12	8.14	8.00	101.2	11.6
4.0	19.21	36,304	26.07	8.14	8.00	101.3	11.6
5.0	19.5	36,773	26.68	8.14	8.00	101.3	11.6
6.0	19.07	37,027	26.82	8.14	7.99	101.2	11.6
7.0	19.04	37,130	26.96	8.13	7.96	100.8	11.6
Bottom	19.07	37,317	27.06	8.15	7.89	100.0	11.6

DU #4 3/8/00 @ 1125

DEPTH	TEMP	COND	SAL	p H	DO	DO SAT	BATT
0.5	19.81	40,116	28.83	8.09	8.26	107.2	10.4
1.0	19.80	40,250	29.00	8.09	8.24	107.2	10.4
2.0	19.67	41,385	29.81	8.10	8.23	107.5	10.5
3.0	19.65	41,694	30.15	8.09	8.22	107.2	10.4
4.0	19.65	42,520	30.92	8.09	8.21	107.7	10.4
5.0	19.62	42,755	31.07	8.09	8.24	108.1	10.5
6.0	19.63	42,711	31.05	8.09	8.23	107.9	10.5
7.0	19.62	42,698	31.04	8.10	8.201	107.6	10.5
8.0	19.63	42,725	31.06	8.10	8.22	107.8	10.5
9.0	19.64	42,845	31.13	8.10	8.22	107.9	10.5
Bottom	19.65	42,887	31.18	8.10	8.24	108.1	10.5

DU #8 3/8/00 @ 1634

DEPTH	TEMP	COND	SAL	p H	DO	DO SAT	BATT
1.249 Surf	19.99	40,439	29.45	8.12	8.63	112.8	10.6
1.728	19.83	41,339	29.79	8.11	8.61	112.4	10.6
2.207	19.72	41,410	29.93	8.12	8.60	112.3	10.6
4.339	19.78	41,614	30.15	8.11	8.53	111.4	10.6
6.092	19.52	42,942	31.68	8.10	8.35	109.6	10.6
8.111	19.02	48,954	36.94	8.06	7.76	104.1	10.6
10.295	18.73	53,081	40.53	8.03	7.31	99.5	10.6
12.118	18.72	53,154	40.56	8.03	7.22	98.5	10.6
14.105	18.66	53,614	41.03	8.03	7.13	97.4	10.6
16.097	18.65	53,663	41.09	8.03	7.10	97.1	10.6
18.038	18.61	53,891	41.33	8.03	6.98	95.5	10.6
20	18.62	53,890	41.30	8.03	6.98	95.4	10.5
22 Bottom	18.61	53,921	41.35	8.03	6.96	95.2	10.5

Location 18, 1st Reference 3/9/00

DEPTH	TEMP	COND	SAL	p H	DO	DO SAT	BATT
1	21.16	43080	30.26	8.11	8.73	117.2	- -
6	20.33	44385	31.86	8.08	8.89	118.7	10.5
11	19.27	48478	35.94	8.06	8.32	112.4	10.5
16	18.99	54171	41.14	8.02	7.85	107.8	10.5
21	19.05	54908	41.77	8.02	7.78	107.6	10.5
26	19.06	54982	41.80	8.02	7.77	107.5	10.5
31	19.07	55010	41.81	8.02	7.76	107.4	10.5
36 Bottom	19.08	55040	41.83	8.02	7.73	107.1	10.5

Location 22, Reference 3/9/00 @ 1520

DEPTH	TEMP	COND	SAL	p H	DO	DO SAT	BATT
2 Surf	21.84	43,845	30.94	8.10	8.57	115.3	10.6
7	20.50	44,980	32.32	8.09	8.44	113.9	10.6
12	19.59	52,426	39.74	8.04	7.95	108.9	10.6
17	19.11	52,737	39.76	8.04	7.95	108.3	10.5
22	19.42	51,177	40.46	8.03	7.91	108.8	10.5

QA/QC DATA

PAH and Organic Tin QA/QC Sample Results

Compound	Equipment Rinse Blank QA001ERB	Sediment Split Samples (ug/kg) Sample SD00601	Split SD10601	Sample SD00901	Split SD10901
Percent Moisture	NA	27	26	72	71
1-METHYLNAPHTHALENE	0.044 U	4.1 U	4.1 UJ	11 UJ	10 UJ
2-METHYLNAPHTHALENE	0.049 U	8.6	4.8 UJ	12 UJ	12 UJ
ACENAPHTHENE	0.2 U	15 U	15 UJ	38 UJ	37 UJ
ACENAPHTHYLENE	0.18 U	24 U	24 UJ	61 UJ	59 UJ
ANTHRACENE	0.0089 U	2	3 J	22 J	6.1 J
BENZO(A)ANTHRACENE	0.0087 U	8.4	10 J	85 J	29 J
BENZO(B)FLUORANTHENE	0.016 U	27	39 J	250 J	120 J
BENZO(GHI)PERYLENE	0.018 U	11	11 J	100 J	41 J
BENZO(K)FLUORANTHENE	0.0079 U	7	9.1 J	60 J	29 J
BENZO-A-PYRENE	0.012 U	9.7	12 J	110 J	47 J
CHRYSENE	0.0089 U	20	28 J	170 J	86 J
DIBENZO(A,H)ANTHRACENE	0.018 U	2.9	3.1 J	26 J	12 J
FLUORANTHENE	0.019 U	16	22 J	180 J	48 J
FLUORENE	0.02 U	1.8 U	1.8 UJ	4.7 UJ	4.6 UJ
INDENO (1,2,3-CD) PYRENE	0.0083 U	8.8	11 J	92 J	38 J
NAPHTHALENE	0.12 U	18	18 J	110 J	25 UJ
PHENANTHRENE	0.011 U	7.8	10 J	62 J	17 J
PYRENE	0.013 U	21	23 J	160 J	57 J
ORGANIC TINS					
DIBUTYL TIN	4.9 UJ	0.35 UJ	0.2 J	0.83 J	0.38 J
MONOBUTYL TIN	4.9 UJ	0.1 UJ	0.09 UJ	0.87 J	0.8 J
TETRABUTYL TIN	4.9 U	0.21 U	0.2 U	0.23 U	0.22 U
TRIBUTYL TIN	0.14 J	0.19 J	0.2 J	1	0.7

Data Qualifiers

A-Average value. NA-Not analyzed. NAI-Interferences. J-Estimated value.

N-Presumptive evidence of presence of material.

NR-Not Reported

K-Actual value is known to be less than value given.

L-Actual value is known to be greater than value given.

U-Material was analyzed for but not detected. The number is the minimum quantitation limit.

R-QC indicates that data unusable. Compound may or may not be present. Resampling and reanalysis is necessary for verification.

C-Confirmed by GCMS.

1.When no value is reported, see chlordane constituents.

2.Constituents or metabolites of technical chlordane.

EXTRACTABLES SCAN SPLIT SAMPLES

		SD00601	SD10601	SD00901	SD10901
% MOISTURE	%	31	29	72	72
(3-AND/OR 4-)M	UG/KG	480 U	460 UJ	1200 UJ	1200 U
1,1-BIPHENYL	UG/KG	480 U	460 U	1200 U	1200 U
2,4,5-TRICHLOR	UG/KG	1200 U	1200 U	3000 U	3000 U
2,4,6-TRICHLOR	UG/KG	480 U	460 U	1200 U	1200 U
2,4-DICHLOROP	UG/KG	480 U	460 U	1200 U	1200 U
2,4-DIMETHYLP	UG/KG	480 U	460 U	1200 U	1200 U
2,4-DINITROPH	UG/KG	1200 U	1200 U	3000 U	3000 U
2,4-DINITROTO	UG/KG	480 U	460 U	1200 U	1200 U
2,6-DINITROTO	UG/KG	480 U	460 U	1200 U	1200 U
2-CHLORONAP	UG/KG	480 U	460 U	1200 U	1200 U
2-CHLOROPHE	UG/KG	480 U	460 U	1200 U	1200 U
2-METHYL-4,6-D	UG/KG	1200 U	1200 U	3000 U	3000 U
2-METHYLNAPH	UG/KG	480 U	460 U	1200 U	1200 U
2-METHYLPHEN	UG/KG	480 U	460 UJ	1200 UJ	1200 U
2-NITROANILIN	UG/KG	1200 U	1200 U	3000 U	3000 U
2-NITROPHENO	UG/KG	480 U	460 U	1200 U	1200 U
3,3'-DICHLORO	UG/KG	480 U	460 U	1200 U	1200 U
3-NITROANILIN	UG/KG	1200 U	1200 U	3000 U	3000 U
4-BROMOPHEN	UG/KG	480 U	460 U	1200 U	1200 U
4-CHLORO-3-M	UG/KG	480 U	460 U	1200 U	1200 U
4-CHLOROANILI	UG/KG	480 U	460 U	1200 U	1200 U
4-CHLOROPHE	UG/KG	480 U	460 U	1200 U	1200 U
4-NITROANILIN	UG/KG	1200 UJ	1200 U	3000 U	3000 U
4-NITROPHENO	UG/KG	1200 U	1200 U	3000 U	3000 UJ
ACENAPHTHEN	UG/KG	480 U	460 U	1200 U	1200 U
ACENAPHTHYL	UG/KG	480 U	460 U	1200 U	1200 U
ACETOPHENON	UG/KG	480 U	460 U	1200 U	1200 U
ANTHRACENE	UG/KG	480 U	460 U	1200 U	1200 U
ATRAZINE	UG/KG	480 U	460 U	1200 U	1200 U
BENZALDEHYD	UG/KG	480 UJ	460 U	1200 U	1200 U
BENZO(A)ANTH	UG/KG	54 J	460 U	140 J	190 J
BENZO(B)FLUO	UG/KG	66 J	460 U	170 J	220 J
BENZO(GHI)PE	UG/KG	480 U	460 U	1200 U	1200 U
BENZO(K)FLUO	UG/KG	79 J	460 U	150 J	160 J
BENZO-A-PYRE	UG/KG	59 J	460 U	150 J	140 J
BENZYL BUTYL	UG/KG	480 U	460 U	1200 U	1200 U
BIS(2-CHLORO	UG/KG	480 U	460 U	1200 U	1200 U
BIS(2-CHLORO	UG/KG	480 U	460 U	1200 U	1200 U
BIS(2-CHLOROI	UG/KG	480 U	460 U	1200 U	1200 UJ
BIS(2-ETHYLHE	UG/KG	480 U	460 U	11000	1200 U
CAPROLACTAM	UG/KG	480 U	460 UR	1200 UR	1200 UR
CARBAZOLE	UG/KG	480 U	460 U	1200 U	1200 U
CHRYSENE	UG/KG	56 J	460 U	220 J	270 J
DIBENZO(A,H)A	UG/KG	480 U	460 U	1200 U	1200 U
DIBENZOFURA	UG/KG	480 U	460 U	1200 U	1200 U
DIETHYL PHTH	UG/KG	480 U	460 U	1200 U	1200 U

EXTRACTABLES SCAN SPLIT SAMPLES

		SD00601	SD10601	SD00901	SD10901
DIMETHYL PHT	UG/KG	480 U	460 U	1200 U	1200 U
DI-N-BUTYLPHT	UG/KG	480 U	460 U	1200 U	1200 U
DI-N-OCTYLPHT	UG/KG	480 U	460 U	1200 U	1200 U
FLUORANTHEN	UG/KG	76 J	460 U	250 J	330 J
FLUORENE	UG/KG	480 U	460 U	1200 U	1200 U
HEXACHLOROB	UG/KG	480 U	460 U	1200 U	1200 U
HEXACHLOROB	UG/KG	480 U	460 U	1200 U	1200 U
HEXACHLOROC	UG/KG	480 U	460 U	1200 U	1200 U
HEXACHLOROE	UG/KG	480 U	460 U	1200 U	1200 U
INDENO (1,2,3-	UG/KG	480 U	460 U	1200 U	1200 U
ISOPHORONE	UG/KG	480 U	460 U	1200 U	1200 U
NAPHTHALENE	UG/KG	480 U	460 U	1200 U	1200 U
NITROBENZEN	UG/KG	480 U	460 U	1200 U	1200 U
N-NITROSODI-N	UG/KG	480 U	460 UJ	1200 UJ	1200 U
N-NITROSODIP	UG/KG	480 U	460 U	1200 U	1200 U
PENTACHLORO	UG/KG	1200 U	1200 U	3000 U	3000 U
PHENANTHREN	UG/KG	480 U	460 U	1200 U	1200 U
PHENOL	UG/KG	480 U	460 U	1200 U	1200 U
PYRENE	UG/KG	95 J	460 U	740 J	240 J
MISCELLANEOUS EXTRACTABLES					
10 UNIDENTIFIE	UG/KG	N	2800 J	NR	NR
11 UNIDENTIFIE	UG/KG	NR	NR	NR	NR
11H-BENZO[A]F	UG/KG	NR	NR	NR	NR
14 UNIDENTIFIE	UG/KG	NR	NR	NR	NR
14-PENTADECE	UG/KG	NR	NR	NR	NR
15-OCTADECEN	UG/KG	NR	NR	NR	NR
16 UNIDENTIFIE	UG/KG	NR	NR	NR	NR
17 UNIDENTIFIE	UG/KG	NR	NR	NR	NR
1-EICOSANOL	UG/KG	NR	NR	NR	NR
1-NONADECAN	UG/KG	NR	NR	NR	NR
1-NONADECEN	UG/KG	NR	NR	NR	NR
1-OCTADECAN	UG/KG	170 JN	NR	NR	NR
1-OCTADECEN	UG/KG	NR	NR	NR	NR
22 UNIDENTIFIE	UG/KG	NR	NR	NR	NR
23 UNIDENTIFIE	UG/KG	NR	NR	NR	NR
25 UNIDENTIFIE	UG/KG	NR	NR	NR	15000 J
26 UNIDENTIFIE	UG/KG	NR	NR	NR	NR
27 UNIDENTIFIE	UG/KG	NR	NR	17000 J	NR
2H-INDOL-2-ON	UG/KG	NR	NR	NR	NR
30 UNIDENTIFIE	UG/KG	NR	NR	NR	NR
3-OCTADECEN	UG/KG	NR	NR	NR	NR
4H-1,2,4-TRIAZ	UG/KG	580 JN	NR	NR	NR
4-HYDROXY-5-	UG/KG	NR	NR	NR	NR
6 UNIDENTIFIE	UG/KG	NR	NR	NR	NR
7-HEPTADECEN	UG/KG	NR	NR	NR	NR
8 UNIDENTIFIE	UG/KG	1600 J	NR	NR	NR
9 UNIDENTIFIE	UG/KG	NR	NR	NR	NR

EXTRACTABLES SCAN SPLIT SAMPLES

		SD00601	SD10601	SD00901	SD10901
9-HEXADECEN	UG/KG	NR	NR	NR	3000 JN
BENZO[B]NAPH	UG/KG	NR	NR	NR	NR
BENZO[B]NAPH	UG/KG	NR	NR	NR	NR
BENZO[E]PYRE	UG/KG	NR	NR	NR	NR
BIS(TRIMETHYL	UG/KG	NR	NR	NR	NR
CHOLESTEROL	UG/KG	NR	NR	NR	NR
CYCLOPROPAN	UG/KG	NR	NR	NR	NR
ERGOSTA-5,22-	UG/KG	NR	NR	NR	NR
ETHANOL, 2-(H	UG/KG	NR	NR	NR	NR
HEXADECANOI	UG/KG	370 JN	280 JN	1800 JN	3200 JN
HEXADECENOI	UG/KG	NR	NR	NR	NR
HYDROXYLAMI	UG/KG	NR	NR	310 JN	NR
OLEIC ACID	UG/KG	100 JN	NR	NR	NR
OXACYCLOHEP	UG/KG	NR	NR	NR	NR
OXACYCLOHEX	UG/KG	NR	NR	NR	1300 JN
OXACYCLOHEX	UG/KG	280 JN	NR	NR	NR
OXACYCLOTET	UG/KG	NR	NR	2800 JN	NR
PENTADECANO	UG/KG	NR	NR	NR	1900 JN
PERYLENE	UG/KG	NR	NR	NR	NR
PHENANTHREN	UG/KG	NR	NR	NR	NR
PHOSPHONOU	UG/KG	NR	NR	NR	NR
PIPERIDINE, 4-	UG/KG	NR	NR	NR	NR
PYRENE, 1-MET	UG/KG	NR	NR	NR	NR
TETRADECANO	UG/KG	NR	NR	NR	690 JN
UNKNOWN OR	UG/KG	NR	NR	NR	NR

Data Qualifiers

A-Average value. NA-Not analyzed. NAI-Interferences. J-Estimated value.

N-Presumptive evidence of presence of material.

NR-Not Reported

K-Actual value is known to be less than value given.

L-Actual value is known to be greater than value given.

U-Material was analyzed for but not detected. The number is the minimum quantitation limit.

R-QC indicates that data unusable. Compound may or may not be present. Resampling and reanalysis is necessary for verification

C-Confirmed by GCMS.

1.When no value is reported, see chlordane constituents.

2.Constituents or metabolites of technical chlordane.

Extractable Scan Performance Evaluation and Equipment Rinse Blank Samples

QA Samples EXTRACTABLES		Equipment Rinse Blank QA001ERB	Performance Evaluation QA003PES
(3-AND/OR 4-)METHYLPHENOL	UG/L	10 U	10 U
1,1-BIPHENYL	UG/L	10 U	10 U
2,4,5-TRICHLOROPHENOL	UG/L	25 U	25 U
2,4,6-TRICHLOROPHENOL	UG/L	10 U	31
2,4-DICHLOROPHENOL	UG/L	10 U	10 U
2,4-DIMETHYLPHENOL	UG/L	10 U	33
2,4-DINITROPHENOL	UG/L	25 U	25 U
2,4-DINITROTOLUENE	UG/L	10 U	10 U
2,6-DINITROTOLUENE	UG/L	10 U	10 U
2-CHLORONAPHTHALENE	UG/L	10 U	10 U
2-CHLOROPHENOL	UG/L	10 U	10 U
2-METHYL-4,6-DINITROPHENOL	UG/L	25 U	25 U
2-METHYLNAPHTHALENE	UG/L	10 U	10 U
2-METHYLPHENOL	UG/L	10 U	10 U
2-NITROANILINE	UG/L	25 U	25 U
2-NITROPHENOL	UG/L	10 U	10 U
3,3'-DICHLOROBENZIDINE	UG/L	10 U	10 U
3-NITROANILINE	UG/L	25 U	25 U
4-BROMOPHENYL PHENYL ETHER	UG/L	10 U	10 U
4-CHLORO-3-METHYLPHENOL	UG/L	10 U	10 U
4-CHLOROANILINE	UG/L	10 U	10 U
4-CHLOROPHENYL PHENYL ETHER	UG/L	10 U	10 U
4-NITROANILINE	UG/L	25 U	25 U
4-NITROPHENOL	UG/L	25 U	25 U
ACENAPHTHENE	UG/L	10 U	10 U
ACENAPHTHYLENE	UG/L	10 U	10 U
ACETOPHENONE	UG/L	10 U	10 U
ANTHRACENE	UG/L	10 U	2 J
ATRAZINE	UG/L	10 U	10 U
BENZALDEHYDE	UG/L	10 U	10 U
BENZO(A)ANTHRACENE	UG/L	10 U	10 U
BENZO(B)FLUORANTHENE	UG/L	10 U	10 U
BENZO(GHI)PERYLENE	UG/L	10 U	10 U
BENZO(K)FLUORANTHENE	UG/L	10 U	10 U
BENZO-A-PYRENE	UG/L	10 U	10 U
BENZYL BUTYL PHTHALATE	UG/L	10 U	10 U
BIS(2-CHLOROETHOXY)METHANE	UG/L	10 U	15
BIS(2-CHLOROETHYL) ETHER	UG/L	10 U	10 U
BIS(2-CHLOROISOPROPYL) ETHER	UG/L	10 U	10 U
BIS(2-ETHYLHEXYL) PHTHALATE	UG/L	10 U	10 U
CAPROLACTAM	UG/L	10 U	10 U
CARBAZOLE	UG/L	10 U	10 U
CHRYSENE	UG/L	10 U	10 U
DIBENZO(A,H)ANTHRACENE	UG/L	10 U	10 U
DIBENZOFURAN	UG/L	10 U	10 U
DIETHYL PHTHALATE	UG/L	10 U	10 U
DIMETHYL PHTHALATE	UG/L	10 U	10 U

Extractable Scan Performance Evaluation and Equipment Rinse Blank Samples

QA Samples EXTRACTABLES		Equipment Rinse Blank QA001ERB	Performance Evaluation QA003PES
DI-N-BUTYLPHTHALATE	UG/L	10 U	10 U
DI-N-OCTYLPHTHALATE	UG/L	10 U	10 U
FLUORANTHENE	UG/L	10 U	10 U
FLUORENE	UG/L	10 U	10 U
HEXACHLOROBENZENE (HCB)	UG/L	10 U	10 U
HEXACHLOROBUTADIENE	UG/L	10 U	10 U
HEXACHLOROCYCLOPENTADIENE (	UG/L	10 U	70
HEXACHLOROETHANE	UG/L	10 U	33
INDENO (1,2,3-CD) PYRENE	UG/L	10 U	10 U
ISOPHORONE	UG/L	10 U	10 U
NAPHTHALENE	UG/L	10 U	10 U
NITROBENZENE	UG/L	10 U	10 U
N-NITROSODI-N-PROPYLAMINE	UG/L	10 U	10 U
N-NITROSODIPHENYLAMINE/DIPHEN	UG/L	10 U	10 U
PENTACHLOROPHENOL	UG/L	25 U	25 U
PHENANTHRENE	UG/L	10 U	10 U
PHENOL	UG/L	10 U	43
PYRENE	UG/L	10 U	77

MISCELLANEOUS EXTRACTABLES

		QA001ERB	QA003PES
1 UNIDENTIFIED COMPOUND	UG/L	2 J	NR

Data Qualifiers

A-Average value. NA-Not analyzed. NAI-Interferences. J-Estimated value.
N-Presumptive evidence of presence of material.
NR-Not Reported
K-Actual value is known to be less than value given.
L-Actual value is known to be greater than value given.
U-Material was analyzed for but not detected. The number is the minimum quantit
R-QC indicates that data unusable. Compound may or may not be present. Resa
C-Confirmed by GCMS.
1.When no value is reported, see chlordane constituents.
2.Constituents or metabolites of technical chlordane.

Metals QA/QC Data

METALS	Equipment Rinse Blank QA001ERB ug/l	Preservative Blank QA002PRE ug/l	Sediment Split Samples: Sample SD00601 mg/kg	Split SD10601 mg/kg	Sample SD00901 mg/kg	Split SD10901 mg/kg
ALUMINUM	14 U	6.5 U	2100	2200	12000	14000
ANTIMONY	0.26 U	0.26 U	0.12	0.077 J	0.26 J	0.3 J
ARSENIC	0.47 U	0.27 U	2.6	2.5	14	15
BARIUM	0.097 U	0.1	4.4	4	24	23
BERYLLIUM	0.11 U	0.11 U	0.16 J	0.14	0.73	0.77
CADMIUM	0.051 U	0.051 U	0.07	0.12	0.39	0.43
CALCIUM	30 U	25 U	8400	8400	28000	30000
CHROMIUM	0.13 U	0.13 U	6.8	7.2	39	43
COBALT	0.062 U	0.062 U	0.77	0.77	4.2	4.7
COPPER	1.1 U	1.1 U	3.4	4.1	23	15
CYANIDE	8.9 U	8.9 U				
IRON	25 U	47 U	3400	3800	20000	22000
LEAD	0.089 U	0.089 U	15	7.4 J	27 J	31 J
MAGNESIUM	7.2 U	2.8 U	1400 J	1400	7700	7700
MANGANESE	0.38 U	0.38 U	58	58 J	420 J	420 J
NICKEL	0.33	0.44	2.1	1.9	9.8	11
POTASSIUM	18 U	18 U	420	380	2200	2400
SELENIUM	0.43 U	0.43 U	0.48	0.44	2.2	2.2
SILVER	0.25 U	0.25 U	U	U	U	U
SODIUM	73 U	56 U	3800	4000	26000	25000
THALLIUM	0.058 U	0.058 U	U	U	0.17	0.18
TOTAL MERCURY	0.042 U	0.042 U	0.018	0.017	0.075	0.082
VANADIUM	0.15 U	0.15 U	6.6	6.9	37	41
ZINC	3.2 U	4.2	17	15	52	61
PERCENT MOISTURE			27	26	72	71

Data Qualifiers

A-Average value. NA-Not analyzed. NAI-Interferences. J-Estimated value.

N-Presumptive evidence of presence of material.

NR-Not Reported

K-Actual value is known to be less than value given.

L-Actual value is known to be greater than value given.

U-Material was analyzed for but not detected. The number is the minimum quantitation limit.

R-QC indicates that data unusable. Compound may or may not be present. Resampling and reanalysis is necessary for verification.

C-Confirmed by GCMS.

1.When no value is reported, see chlordane constituents.

2.Constituents or metabolites of technical chlordane.

APPENDIX
B

Hazard Quotients for Metals

SAMPLE_ID	Grid #	COMPOUND (MG/KG	AMOUNT	FNT	HQ EV	HQ BV	HQ EV >1	HQ BV >1
SD00101	1	ANTIMONY	0.47	J	0.24	0.04		
SD00102	1	ANTIMONY	0.16	U	0.00	0.00		
SD00201	2	ANTIMONY	0.14	J	0.07	0.01		
SD00301	3	ANTIMONY	0.40		0.20	0.03		
SD00301	3	ANTIMONY		NA	0.00	0.00		
SD00302	3	ANTIMONY	2.7		1.35	0.23		Yes
SD00401	4	ANTIMONY	0.32	J	0.16	0.03		
SD00402	4	ANTIMONY	0.41		0.21	0.03		
SD00501	5	ANTIMONY	0.89	J	0.45	0.07		
SD00502	5	ANTIMONY	0.30		0.15	0.03		
SD00601	6	ANTIMONY	0.12		0.06	0.01		
SD00701	7	ANTIMONY	0.11	J	0.06	0.01		
SD00801	8	ANTIMONY	0.26	J	0.13	0.02		
SD00901	9	ANTIMONY	0.26	J	0.13	0.02		
SD00902	9	ANTIMONY	0.35		0.18	0.03		
SD01001	10	ANTIMONY	0.039	UJ	0.02	0.00		
SD01101	11	ANTIMONY	1.8		0.90	0.15		
SD01102	11	ANTIMONY	0.75		0.38	0.06		
SD01801	18	ANTIMONY	0.093	J	0.05	0.01		
SD01802	18	ANTIMONY	0.15		0.08	0.01		
SD02201	22	ANTIMONY	0.31		0.16	0.03		
SD02202	22	ANTIMONY	0.32		0.16	0.03		
SD10601	106	ANTIMONY	0.077	J	0.04	0.01		
SD10901	109	ANTIMONY	0.30	J	0.15	0.03		
SD00101	1	ARSENIC	4.9		0.68	0.68		
SD00102	1	ARSENIC	14.00		0.00	1.90		Yes
SD00201	2	ARSENIC	1.5		0.21	0.21		
SD00301	3	ARSENIC		NA	0.00	0.00		
SD00301	3	ARSENIC	12		1.66	1.66	Yes	Yes
SD00302	3	ARSENIC	16		2.21	2.21	Yes	Yes
SD00401	4	ARSENIC	11		1.52	1.52	Yes	Yes
SD00402	4	ARSENIC	12		1.66	1.66	Yes	Yes
SD00501	5	ARSENIC	16		2.21	2.21	Yes	Yes
SD00502	5	ARSENIC	12		1.66	1.66	Yes	Yes
SD00601	6	ARSENIC	2.6		0.36	0.36		
SD00701	7	ARSENIC	3.4		0.47	0.47		

COMPOUND	Effects Value (mg/kg)	Benchmark Value (mg/kg)
ANTIMONY	2	12
ARSENIC	7.24	7.24
BARIUM		200
CADMIUM	0.68	1
CHROMIUM	52.3	52.3
COBALT		20
COPPER	18.7	18.7
LEAD	30.2	30.2
TOTAL HG	0.02	0.13
NICKEL	15.9	15.9
SILVER	0.733	2

SAMPLE_ID	Grid #	COMPOUND (MG/KG	AMOUNT	FNT	HQ EV	HQ BV	HQ EV >1	HQ BV >1
SD00801	8	ARSENIC	6.9		0.95	0.95		
SD00901	9	ARSENIC	14		1.93	1.93	Yes	Yes
SD00902	9	ARSENIC	16		2.21	2.21	Yes	Yes
SD01001	10	ARSENIC	0.52		0.07	0.07		
SD01101	11	ARSENIC	9.1	J	1.26	1.26	Yes	Yes
SD01102	11	ARSENIC	18		2.49	2.49	Yes	Yes
SD01801	18	ARSENIC	5.0		0.69	0.69		
SD01802	18	ARSENIC	5.1		0.70	0.70		
SD02201	22	ARSENIC	18		2.49	2.49	Yes	Yes
SD02202	22	ARSENIC	17		2.35	2.35	Yes	Yes
SD10601	106	ARSENIC	2.5		0.35	0.35		
SD10901	109	ARSENIC	15		2.07	2.07	Yes	Yes
SD00101	1	BARIUM	12			0.06		
SD00102	1	BARIUM	25.00			0.12		
SD00201	2	BARIUM	3.2			0.02		
SD00301	3	BARIUM		NA		0.00		
SD00301	3	BARIUM	16			0.08		
SD00302	3	BARIUM	28			0.14		
SD00401	4	BARIUM	17			0.09		
SD00402	4	BARIUM	7.7			0.04		
SD00501	5	BARIUM	150			0.75		
SD00502	5	BARIUM	22			0.11		
SD00601	6	BARIUM	4.4			0.02		
SD00701	7	BARIUM	5.8			0.03		
SD00801	8	BARIUM	13			0.07		
SD00901	9	BARIUM	24			0.12		
SD00902	9	BARIUM	24			0.12		
SD01001	10	BARIUM	1.2			0.01		
SD01101	11	BARIUM	22			0.11		
SD01102	11	BARIUM	36			0.18		
SD01801	18	BARIUM	7.9			0.04		
SD01802	18	BARIUM	5.7			0.03		
SD02201	22	BARIUM	24			0.12		
SD02202	22	BARIUM	24			0.12		
SD10601	106	BARIUM	4.0			0.02		
SD10901	109	BARIUM	23			0.12		

SAMPLE_ID	Grid #	COMPOUND (MG/KG	AMOUNT	FNT	HQ EV	HQ BV	HQ EV >1	HQ BV >1
SD00101	1	CADMIUM	2.3		3.38	2.30	Yes	Yes
SD00102	1	CADMIUM	0.10		0.10	0.00		
SD00201	2	CADMIUM	0.17		0.25	0.17		
SD00301	3	CADMIUM	1.7		2.50	1.70	Yes	Yes
SD00301	3	CADMIUM		NA	0.00	0.00		
SD00302	3	CADMIUM	2.9		4.26	2.90	Yes	Yes
SD00401	4	CADMIUM	5.2		7.65	5.20	Yes	Yes
SD00402	4	CADMIUM	0.46		0.68	0.46		
SD00501	5	CADMIUM	4.3		6.32	4.30	Yes	Yes
SD00502	5	CADMIUM	0.49		0.72	0.49		
SD00601	6	CADMIUM	0.070		0.10	0.07		
SD00701	7	CADMIUM	0.10		0.15	0.10		
SD00801	8	CADMIUM	0.17		0.25	0.17		
SD00901	9	CADMIUM	0.39		0.57	0.39		
SD00902	9	CADMIUM	0.36		0.53	0.36		
SD01001	10	CADMIUM	0.041	U	0.06	0.04		
SD01101	11	CADMIUM	1.3		1.91	1.30	Yes	Yes
SD01102	11	CADMIUM	0.77		1.13	0.77		Yes
SD01801	18	CADMIUM	0.075		0.11	0.08		
SD01802	18	CADMIUM	0.087		0.13	0.09		
SD02201	22	CADMIUM	0.22		0.32	0.22		
SD02202	22	CADMIUM	0.25		0.37	0.25		
SD10601	106	CADMIUM	0.12		0.18	0.12		
SD10901	109	CADMIUM	0.43		0.63	0.43		
SD00101	1	CHROMIUM	100			1.91		Yes
SD00102	1	CHROMIUM	39.00			0.75		
SD00201	2	CHROMIUM	8.9			0.17		
SD00301	3	CHROMIUM	39			0.75		
SD00301	3	CHROMIUM		NA		0.00		
SD00302	3	CHROMIUM	99			1.89		Yes
SD00401	4	CHROMIUM	38			0.73		
SD00402	4	CHROMIUM	14			0.27		
SD00501	5	CHROMIUM	75			1.43		Yes
SD00502	5	CHROMIUM	36			0.69		
SD00601	6	CHROMIUM	6.8			0.13		
SD00701	7	CHROMIUM	13			0.25		

SAMPLE_ID	Grid #	COMPOUND (MG/KG	AMOUNT	FNT	HQ EV	HQ BV	HQ EV >1	HQ BV >1
SD00801	8	CHROMIUM	19			0.36		
SD00901	9	CHROMIUM	39			0.75		
SD00902	9	CHROMIUM	48			0.92		
SD01001	10	CHROMIUM	1.2			0.02		
SD01101	11	CHROMIUM	41			0.78		
SD01102	11	CHROMIUM	49			0.94		
SD01801	18	CHROMIUM	13			0.25		
SD01802	18	CHROMIUM	12			0.23		
SD02201	22	CHROMIUM	50			0.96		
SD02202	22	CHROMIUM	49			0.94		
SD10601	106	CHROMIUM	7.2			0.14		
SD10901	109	CHROMIUM	43			0.82		
SD00101	1	COBALT	1.2			0.06		
SD00102	1	COBALT		4.10		0.20		
SD00201	2	COBALT	0.38			0.02		
SD00301	3	COBALT			NA	0.00		
SD00301	3	COBALT	3.2			0.16		
SD00302	3	COBALT	5.2			0.26		
SD00401	4	COBALT	3.1			0.16		
SD00402	4	COBALT	3.1			0.16		
SD00501	5	COBALT	3.2			0.16		
SD00502	5	COBALT	3.6			0.18		
SD00601	6	COBALT	0.77			0.04		
SD00701	7	COBALT	0.99			0.05		
SD00801	8	COBALT	2.3			0.12		
SD00901	9	COBALT	4.2			0.21		
SD00902	9	COBALT	5.1			0.26		
SD01001	10	COBALT	0.16			0.01		
SD01101	11	COBALT	2.4			0.12		
SD01102	11	COBALT	5.0			0.25		
SD01801	18	COBALT	1.2			0.06		
SD01802	18	COBALT	1.2			0.06		
SD02201	22	COBALT	6.6			0.33		
SD02202	22	COBALT	6.5			0.33		
SD10601	106	COBALT	0.77			0.04		
SD10901	109	COBALT	4.7			0.24		

SAMPLE_ID	Grid #	COMPOUND (MG/KG	AMOUNT	FNT	HQ EV	HQ BV	HQ EV >1	HQ BV >1
SD00101	1	COPPER	25			1.34		Yes
SD00102	1	COPPER	50.00			2.70		Yes
SD00201	2	COPPER	11			0.59		
SD00301	3	COPPER	14			0.75		
SD00301	3	COPPER		NA		0.00		
SD00302	3	COPPER	29			1.55		Yes
SD00401	4	COPPER	27			1.44		Yes
SD00402	4	COPPER	14			0.75		
SD00501	5	COPPER	66			3.53		Yes
SD00502	5	COPPER	52			2.78		Yes
SD00601	6	COPPER	3.4			0.18		
SD00701	7	COPPER	4.4			0.24		
SD00801	8	COPPER	8.8			0.47		
SD00901	9	COPPER	23			1.23		Yes
SD00902	9	COPPER	19			1.02		Yes
SD01001	10	COPPER	0.56			0.03		
SD01101	11	COPPER	48			2.57		Yes
SD01102	11	COPPER	75			4.01		Yes
SD01801	18	COPPER	3.7			0.20		
SD01802	18	COPPER	3.4			0.18		
SD02201	22	COPPER	13			0.70		
SD02202	22	COPPER	13			0.70		
SD10601	106	COPPER	4.1			0.22		
SD10901	109	COPPER	15			0.80		
SD00101	1	CYANIDE	0.22			0.22		
SD00102	1	CYANIDE	0.38	UJ		0.38		
SD00201	2	CYANIDE	0.17	UR		0.17		
SD00301	3	CYANIDE	0.36	UJ		0.36		
SD00301	3	CYANIDE		NA		0.00		
SD00302	3	CYANIDE	0.39	UJ		0.39		
SD00401	4	CYANIDE	0.33	UR		0.33		
SD00402	4	CYANIDE	0.21	UJ		0.21		
SD00501	5	CYANIDE	0.32	UR		0.32		
SD00502	5	CYANIDE	0.35	UJ		0.35		
SD00601	6	CYANIDE	0.19	UJ		0.19		
SD00701	7	CYANIDE	0.20	UR		0.20		

SAMPLE_ID	Grid #	COMPOUND (MG/KG	AMOUNT	FNT	HQ EV	HQ BV	HQ EV >1	HQ BV >1
SD00801	8	CYANIDE	0.29	UR		0.29		
SD00901	9	CYANIDE	0.48	UR		0.48		
SD00902	9	CYANIDE	0.41	UJ		0.41		
SD01001	10	CYANIDE	0.17	UR		0.17		
SD01101	11	CYANIDE	0.24	UR		0.24		
SD01102	11	CYANIDE	0.39	UJ		0.39		
SD01801	18	CYANIDE	0.22	UR		0.22		
SD01802	18	CYANIDE	0.20	UJ		0.20		
SD02201	22	CYANIDE	0.45	UJ		0.45		
SD02202	22	CYANIDE	0.36	UJ		0.36		
SD10601	106	CYANIDE	0.18	UR		0.18		
SD10901	109	CYANIDE	0.46	UR		0.46		
SD00101	1	LEAD	190	J		6.29		Yes
SD00102	1	LEAD	52.00			1.70		Yes
SD00201	2	LEAD	16	J		0.53		
SD00301	3	LEAD	47			1.56		Yes
SD00301	3	LEAD		NA		0.00		
SD00302	3	LEAD	140			4.64		Yes
SD00401	4	LEAD	51	J		1.69		Yes
SD00402	4	LEAD	230			7.62		Yes
SD00501	5	LEAD	640	J		21.19		Yes
SD00502	5	LEAD	63			2.09		Yes
SD00601	6	LEAD	15			0.50		
SD00701	7	LEAD	12	J		0.40		
SD00801	8	LEAD	17	J		0.56		
SD00901	9	LEAD	27	J		0.89		
SD00902	9	LEAD	36			1.19		Yes
SD01001	10	LEAD	1.1	J		0.04		
SD01101	11	LEAD	150	J		4.97		Yes
SD01102	11	LEAD	200			6.62		Yes
SD01801	18	LEAD	5.7	J		0.19		
SD01802	18	LEAD	5.6			0.19		
SD02201	22	LEAD	24			0.79		
SD02202	22	LEAD	24			0.79		
SD10601	106	LEAD	7.4	J		0.25		
SD10901	109	LEAD	31	J		1.03		Yes

SAMPLE_ID	Grid #	COMPOUND (MG/KG	AMOUNT	FNT	HQ EV	HQ BV	HQ EV >1	HQ BV >1
SD00101	1	NICKEL	3.3			0.21		
SD00102	1	NICKEL	12.00			0.75		
SD00201	2	NICKEL	1.1			0.07		
SD00301	3	NICKEL	8.7			0.55		
SD00301	3	NICKEL		NA		0.00		
SD00302	3	NICKEL	13			0.82		
SD00401	4	NICKEL	10			0.63		
SD00402	4	NICKEL	5.4			0.34		
SD00501	5	NICKEL	7.8			0.49		
SD00502	5	NICKEL	11			0.69		
SD00601	6	NICKEL	2.1			0.13		
SD00701	7	NICKEL	2.4			0.15		
SD00801	8	NICKEL	6.1			0.38		
SD00901	9	NICKEL	9.8			0.62		
SD00902	9	NICKEL	13			0.82		
SD01001	10	NICKEL	0.34			0.02		
SD01101	11	NICKEL	5.2			0.33		
SD01102	11	NICKEL	15			0.94		
SD01801	18	NICKEL	3.7			0.23		
SD01802	18	NICKEL	3.7			0.23		
SD02201	22	NICKEL	14			0.88		
SD02202	22	NICKEL	13			0.82		
SD10601	106	NICKEL	1.9			0.12		
SD10901	109	NICKEL	11			0.69		
SD00101	1	SILVER	0.077		0.11	0.04		
SD00102	1	SILVER	0.07		0.03	0.00		
SD00201	2	SILVER	0.055	U	0.08	0.03		
SD00301	3	SILVER	0.12	U	0.16	0.06		
SD00301	3	SILVER		NA	0.00	0.00		
SD00302	3	SILVER	2.2		3.00	1.10	Yes	Yes
SD00401	4	SILVER	0.11		0.15	0.06		
SD00402	4	SILVER	0.067	U	0.09	0.03		
SD00501	5	SILVER	0.21		0.29	0.11		
SD00502	5	SILVER	0.11	U	0.15	0.06		
SD00601	6	SILVER	0.060	U	0.08	0.03		
SD00701	7	SILVER	0.066	U	0.09	0.03		

SAMPLE_ID	Grid #	COMPOUND (MG/KG	AMOUNT	FNT	HQ EV	HQ BV	HQ EV >1	HQ BV >1
SD00801	8	SILVER	0.095	U	0.13	0.05		
SD00901	9	SILVER	0.15	U	0.20	0.08		
SD00902	9	SILVER	0.13	U	0.18	0.07		
SD01001	10	SILVER	0.054	U	0.07	0.03		
SD01101	11	SILVER	0.20		0.27	0.10		
SD01102	11	SILVER	0.13	U	0.18	0.07		
SD01801	18	SILVER	0.072	U	0.10	0.04		
SD01802	18	SILVER	0.065	U	0.09	0.03		
SD02201	22	SILVER	0.15	U	0.20	0.08		
SD02202	22	SILVER	0.12	U	0.16	0.06		
SD10601	106	SILVER	0.060	U	0.08	0.03		
SD10901	109	SILVER	0.15	U	0.20	0.08		
SD00101	1	TOTAL MERCURY	0.086			0.66		
SD00102	1	TOTAL MERCURY	0.21	J		1.60		Yes
SD00201	2	TOTAL MERCURY	0.036			0.28		
SD00301	3	TOTAL MERCURY		NA		0.00		
SD00301	3	TOTAL MERCURY	0.085			0.65		
SD00302	3	TOTAL MERCURY	0.24			1.85		Yes
SD00401	4	TOTAL MERCURY	0.082			0.63		
SD00402	4	TOTAL MERCURY	0.25			1.92		Yes
SD00501	5	TOTAL MERCURY	0.21			1.62		Yes
SD00502	5	TOTAL MERCURY	0.46			3.54		Yes
SD00601	6	TOTAL MERCURY	0.018			0.14		
SD00701	7	TOTAL MERCURY	0.026			0.20		
SD00801	8	TOTAL MERCURY	0.044			0.34		
SD00901	9	TOTAL MERCURY	0.075			0.58		
SD00902	9	TOTAL MERCURY	0.74			5.69		Yes
SD01001	10	TOTAL MERCURY	0.0075	U		0.06		
SD01101	11	TOTAL MERCURY	0.16			1.23		Yes
SD01102	11	TOTAL MERCURY	0.81			6.23		Yes
SD01801	18	TOTAL MERCURY	0.019			0.15		
SD01802	18	TOTAL MERCURY	0.021			0.16		
SD02201	22	TOTAL MERCURY	0.11			0.85		
SD02202	22	TOTAL MERCURY	0.10			0.77		
SD10601	106	TOTAL MERCURY	0.017			0.13		
SD10901	109	TOTAL MERCURY	0.082			0.63		

SAMPLE_ID	Grid #	COMPOUND (MG/KG	AMOUNT	FNT	HQ EV	HQ BV	HQ EV >1	HQ BV >1
SD00101	1	ZINC	75			0.60		
SD00102	1	ZINC	51.00	J		0.41		
SD00201	2	ZINC	14			0.11		
SD00301	3	ZINC		NA		0.00		
SD00301	3	ZINC	55			0.44		
SD00302	3	ZINC	130			1.05		Yes
SD00401	4	ZINC	59			0.48		
SD00402	4	ZINC	41			0.33		
SD00501	5	ZINC	670			5.40		Yes
SD00502	5	ZINC	50			0.40		
SD00601	6	ZINC	17			0.14		
SD00701	7	ZINC	19			0.15		
SD00801	8	ZINC	34			0.27		
SD00901	9	ZINC	52			0.42		
SD00902	9	ZINC	77			0.62		
SD01001	10	ZINC	2.5			0.02		
SD01101	11	ZINC	79			0.64		
SD01102	11	ZINC	95			0.77		
SD01801	18	ZINC	13			0.10		
SD01802	18	ZINC	12			0.10		
SD02201	22	ZINC	70			0.56		
SD02202	22	ZINC	62			0.50		
SD10601	106	ZINC	15			0.12		
SD10901	109	ZINC	61			0.49		

Hazard Quotients for PAH's

Pensacola NAS PAH HQ Analysis

SAMPLE	DU	Depth	COMPOUND (ug/kg)	AMOUNT	FNT	Effects Value	Benchmark Value	HQ EV	HQ BV	Effects HQs>1	Benchmark HQs>1
SD00101	1	Surface	ANTHRACENE	28	J	46.9	330	0.60	0.08		
SD00101	1	Surface	BENZO(A)ANTHRACENE	100	J	74.8	330	1.34	0.30	Yes	
SD00101	1	Surface	BENZO(B)FLUORANTHENE	270	J		330		0.82		
SD00101	1	Surface	BENZO(GHI)PERYLENE	140	J		330		0.42		
SD00101	1	Surface	BENZO(K)FLUORANTHENE	110	J		330		0.33		
SD00101	1	Surface	BENZO-A-PYRENE	160	J	88.8	330	1.80	0.48	Yes	
SD00101	1	Surface	CHRYSENE	280	J	108	330	2.59	0.85	Yes	
SD00101	1	Surface	DIBENZO(A,H)ANTHRACENE	35	J	74.8	330	0.47	0.11		
SD00101	1	Surface	FLUORANTHENE	210	J	113	330	1.86	0.64	Yes	
SD00101	1	Surface	INDENO (1,2,3-CD) PYRENE	110	J		330		0.33		
SD00101	1	Surface	NAPHTHALENE	180	J	34.6	330	5.20	0.55	Yes	
SD00101	1	Surface	PHENANTHRENE	97	J	86.7	330	1.12	0.29	Yes	
SD00101	1	Surface	PYRENE	240	J	153	330	1.57	0.73	Yes	
SD00102	1	Subsurfac	ANTHRACENE	17		46.9	330	0.36	0.05		
SD00102	1	Subsurfac	BENZO(A)ANTHRACENE	90		74.8	330	1.20	0.27	Yes	
SD00102	1	Subsurfac	BENZO(GHI)PERYLENE	100			330		0.30		
SD00102	1	Subsurfac	BENZO(K)FLUORANTHENE	48			330		0.15		
SD00102	1	Subsurfac	BENZO-A-PYRENE	100		88.8	330	1.13	0.30	Yes	
SD00102	1	Subsurfac	CHRYSENE	160		108	330	1.48	0.48	Yes	
SD00102	1	Subsurfac	FLUORANTHENE	180		113	330	1.59	0.55	Yes	
SD00102	1	Subsurfac	FLUORENE	9.6		21.2	330	0.45	0.03		
SD00102	1	Subsurfac	INDENO (1,2,3-CD) PYRENE	91			330		0.28		
SD00102	1	Subsurfac	NAPHTHALENE	32		34.6	330	0.92	0.10		
SD00102	1	Subsurfac	PHENANTHRENE	65		86.7	330	0.75	0.20		
SD00102	1	Subsurfac	PYRENE	190		153	330	1.24	0.58	Yes	
SD00201	2	Surface	ANTHRACENE	18	J	46.9	330	0.38	0.05		
SD00201	2	Surface	BENZO(A)ANTHRACENE	95	J	74.8	330	1.27	0.29	Yes	
SD00201	2	Surface	BENZO(B)FLUORANTHENE	250	J		330		0.76		
SD00201	2	Surface	BENZO(GHI)PERYLENE	58	J		330		0.18		
SD00201	2	Surface	BENZO(K)FLUORANTHENE	78	J		330		0.24		
SD00201	2	Surface	BENZO-A-PYRENE	86	J	88.8	330	0.97	0.26		
SD00201	2	Surface	CHRYSENE	240	J	108	330	2.22	0.73	Yes	
SD00201	2	Surface	FLUORANTHENE	61	J	113	330	0.54	0.18		
SD00201	2	Surface	INDENO (1,2,3-CD) PYRENE	69	J		330		0.21		
SD00201	2	Surface	PHENANTHRENE	52	J	86.7	330	0.60	0.16		
SD00201	2	Surface	PYRENE	99	J	153	330	0.65	0.30		
SD00301	3	Surface	ANTHRACENE	9.8		46.9	330	0.21	0.03		
SD00301	3	Surface	BENZO(A)ANTHRACENE	49		74.8	330	0.66	0.15		
SD00301	3	Surface	BENZO(B)FLUORANTHENE	170			330		0.52		
SD00301	3	Surface	BENZO(GHI)PERYLENE	59			330		0.18		
SD00301	3	Surface	BENZO(K)FLUORANTHENE	48			330		0.15		
SD00301	3	Surface	BENZO-A-PYRENE	62		88.8	330	0.70	0.19		
SD00301	3	Surface	CHRYSENE	93		108	330	0.86	0.28		
SD00301	3	Surface	DIBENZO(A,H)ANTHRACENE	15		74.8	330	0.20	0.05		
SD00301	3	Surface	FLUORANTHENE	91		113	330	0.81	0.28		
SD00301	3	Surface	INDENO (1,2,3-CD) PYRENE	44			330		0.13		
SD00301	3	Surface	NAPHTHALENE	71		34.6	330	2.05	0.22	Yes	
SD00301	3	Surface	PHENANTHRENE	39		86.7	330	0.45	0.12		
SD00301	3	Surface	PYRENE	91		153	330	0.59	0.28		
SD00302	3	Subsurfac	ANTHRACENE	64		46.9	330	1.36	0.19	Yes	
SD00302	3	Subsurfac	BENZO(A)ANTHRACENE	360		74.8	330	4.81	1.09	Yes	Yes
SD00302	3	Subsurfac	BENZO(B)FLUORANTHENE	1200			330		3.64		Yes
SD00302	3	Subsurfac	BENZO(GHI)PERYLENE	380			330		1.15		Yes
SD00302	3	Subsurfac	BENZO(K)FLUORANTHENE	290			330		0.88		
SD00302	3	Subsurfac	BENZO-A-PYRENE	460		88.8	330	5.18	1.39	Yes	Yes
SD00302	3	Subsurfac	CHRYSENE	850		108	330	7.87	2.58	Yes	Yes
SD00302	3	Subsurfac	DIBENZO(A,H)ANTHRACENE	110		74.8	330	1.47	0.33	Yes	

Pensacola NAS PAH HQ Analysis

SAMPLE	DU	Depth	COMPOUND (ug/kg)	AMOUNT	FNT	Effects Value	Benchmark Value	HQ EV	HQ BV	Effects HQs>1	Benchmark HQs>1
SD00302	3	Subsurfac	FLUORANTHENE	530		113	330	4.69	1.61	Yes	Yes
SD00302	3	Subsurfac	INDENO (1,2,3-CD) PYRENE	360			330		1.09		Yes
SD00302	3	Subsurfac	PHENANTHRENE	210		86.7	330	2.42	0.64	Yes	
SD00302	3	Subsurfac	PYRENE	890		153	330	5.82	2.70	Yes	Yes
SD00401	4	Surface	ANTHRACENE	45	J	46.9	330	0.96	0.14		
SD00401	4	Surface	BENZO(A)ANTHRACENE	160	J	74.8	330	2.14	0.48	Yes	
SD00401	4	Surface	BENZO(B)FLUORANTHENE	430	J		330		1.30		Yes
SD00401	4	Surface	BENZO(GHI)PERYLENE	150	J		330		0.45		
SD00401	4	Surface	BENZO(K)FLUORANTHENE	120	J		330		0.36		
SD00401	4	Surface	BENZO-A-PYRENE	180	J	88.8	330	2.03	0.55	Yes	
SD00401	4	Surface	CHRYSENE	350	J	108	330	3.24	1.06	Yes	Yes
SD00401	4	Surface	DIBENZO(A,H)ANTHRACENE	44	J	74.8	330	0.59	0.13		
SD00401	4	Surface	FLUORANTHENE	300	J	113	330	2.65	0.91	Yes	
SD00401	4	Surface	INDENO (1,2,3-CD) PYRENE	160	J		330		0.48		
SD00401	4	Surface	PHENANTHRENE	130	J	86.7	330	1.50	0.39	Yes	
SD00401	4	Surface	PYRENE	270	J	153	330	1.76	0.82	Yes	
SD00402	4	Subsurfac	ANTHRACENE	42		46.9	330	0.90	0.13		
SD00402	4	Subsurfac	BENZO(A)ANTHRACENE	120		74.8	330	1.60	0.36	Yes	
SD00402	4	Subsurfac	BENZO(B)FLUORANTHENE	340			330		1.03		Yes
SD00402	4	Subsurfac	BENZO(GHI)PERYLENE	150			330		0.45		
SD00402	4	Subsurfac	BENZO(K)FLUORANTHENE	97			330		0.29		
SD00402	4	Subsurfac	BENZO-A-PYRENE	160		88.8	330	1.80	0.48	Yes	
SD00402	4	Subsurfac	CHRYSENE	260		108	330	2.41	0.79	Yes	
SD00402	4	Subsurfac	DIBENZO(A,H)ANTHRACENE	41		74.8	330	0.55	0.12		
SD00402	4	Subsurfac	FLUORANTHENE	260		113	330	2.30	0.79	Yes	
SD00402	4	Subsurfac	FLUORENE	26		21.2	330	1.23	0.08	Yes	
SD00402	4	Subsurfac	INDENO (1,2,3-CD) PYRENE	140			330		0.42		
SD00402	4	Subsurfac	PHENANTHRENE	160		86.7	330	1.85	0.48	Yes	
SD00402	4	Subsurfac	PYRENE	270		153	330	1.76	0.82	Yes	
SD00501	5	Surface	ANTHRACENE	59	J	46.9	330	1.26	0.18	Yes	
SD00501	5	Surface	BENZO(A)ANTHRACENE	310	J	74.8	330	4.14	0.94	Yes	
SD00501	5	Surface	BENZO(B)FLUORANTHENE	1000	J		330		3.03		Yes
SD00501	5	Surface	BENZO(GHI)PERYLENE	390	J		330		1.18		Yes
SD00501	5	Surface	BENZO(K)FLUORANTHENE	280	J		330		0.85		
SD00501	5	Surface	BENZO-A-PYRENE	440	J	88.8	330	4.95	1.33	Yes	Yes
SD00501	5	Surface	CHRYSENE	1000	J	108	330	9.26	3.03	Yes	Yes
SD00501	5	Surface	DIBENZO(A,H)ANTHRACENE	110	J	74.8	330	1.47	0.33	Yes	
SD00501	5	Surface	FLUORANTHENE	710	J	113	330	6.28	2.15	Yes	Yes
SD00501	5	Surface	INDENO (1,2,3-CD) PYRENE	380	J		330		1.15		Yes
SD00501	5	Surface	PHENANTHRENE	230	J	86.7	330	2.65	0.70	Yes	
SD00501	5	Surface	PYRENE	720	J	153	330	4.71	2.18	Yes	Yes
SD00502	5	Subsurfac	ANTHRACENE	35		46.9	330	0.75	0.11		
SD00502	5	Subsurfac	BENZO(A)ANTHRACENE	130		74.8	330	1.74	0.39	Yes	
SD00502	5	Subsurfac	BENZO(B)FLUORANTHENE	490			330		1.48		Yes
SD00502	5	Subsurfac	BENZO(GHI)PERYLENE	140			330		0.42		
SD00502	5	Subsurfac	BENZO(K)FLUORANTHENE	88			330		0.27		
SD00502	5	Subsurfac	BENZO-A-PYRENE	160		88.8	330	1.80	0.48	Yes	
SD00502	5	Subsurfac	CHRYSENE	250		108	330	2.31	0.76	Yes	
SD00502	5	Subsurfac	DIBENZO(A,H)ANTHRACENE	41		74.8	330	0.55	0.12		
SD00502	5	Subsurfac	FLUORANTHENE	260		113	330	2.30	0.79	Yes	
SD00502	5	Subsurfac	INDENO (1,2,3-CD) PYRENE	110			330		0.33		
SD00502	5	Subsurfac	PHENANTHRENE	130		86.7	330	1.50	0.39	Yes	
SD00502	5	Subsurfac	PYRENE	290		153	330	1.90	0.88	Yes	
SD00601	6	Surface	2-METHYLNAPHTHALENE	8.6		20.23	330	0.43	0.03		
SD00601	6	Surface	ANTHRACENE	2.0		46.9	330	0.04	0.01		
SD00601	6	Surface	BENZO(A)ANTHRACENE	8.4		74.8	330	0.11	0.03		
SD00601	6	Surface	BENZO(B)FLUORANTHENE	27			330		0.08		

Pensacola NAS PAH HQ Analysis

SAMPLE	DU	Depth	COMPOUND (ug/kg)	AMOUNT FNT	Effects Value	Benchmark Value	HQ EV	HQ BV	Effects HQs>1	Benchmark HQs>1
SD00601	6	Surface	BENZO(GHI)PERYLENE	11		330		0.03		
SD00601	6	Surface	BENZO(K)FLUORANTHENE	7.0		330		0.02		
SD00601	6	Surface	BENZO-A-PYRENE	9.7	88.8	330	0.11	0.03		
SD00601	6	Surface	CHRYSENE	20	108	330	0.19	0.06		
SD00601	6	Surface	DIBENZO(A,H)ANTHRACENE	2.9	74.8	330	0.04	0.01		
SD00601	6	Surface	FLUORANTHENE	16	113	330	0.14	0.05		
SD00601	6	Surface	INDENO (1,2,3-CD) PYRENE	8.8		330		0.03		
SD00601	6	Surface	NAPHTHALENE	18	34.6	330	0.52	0.05		
SD00601	6	Surface	PHENANTHRENE	7.8	86.7	330	0.09	0.02		
SD00601	6	Surface	PYRENE	21	153	330	0.14	0.06		
SD00701	7	Surface	ANTHRACENE	11 J	46.9	330	0.23	0.03		
SD00701	7	Surface	BENZO(A)ANTHRACENE	41 J	74.8	330	0.55	0.12		
SD00701	7	Surface	BENZO(B)FLUORANTHENE	110 J		330		0.33		
SD00701	7	Surface	BENZO(GHI)PERYLENE	37 J		330		0.11		
SD00701	7	Surface	BENZO(K)FLUORANTHENE	28 J		330		0.08		
SD00701	7	Surface	BENZO-A-PYRENE	45 J	88.8	330	0.51	0.14		
SD00701	7	Surface	CHRYSENE	92 J	108	330	0.85	0.28		
SD00701	7	Surface	DIBENZO(A,H)ANTHRACENE	11 J	74.8	330	0.15	0.03		
SD00701	7	Surface	FLUORANTHENE	66 J	113	330	0.58	0.20		
SD00701	7	Surface	INDENO (1,2,3-CD) PYRENE	35 J		330		0.11		
SD00701	7	Surface	NAPHTHALENE	62 J	34.6	330	1.79	0.19	Yes	
SD00701	7	Surface	PHENANTHRENE	35 J	86.7	330	0.40	0.11		
SD00701	7	Surface	PYRENE	71 J	153	330	0.46	0.22		
SD00801	8	Surface	ANTHRACENE	42 J	46.9	330	0.90	0.13		
SD00801	8	Surface	BENZO(A)ANTHRACENE	210 J	74.8	330	2.81	0.64	Yes	
SD00801	8	Surface	BENZO(B)FLUORANTHENE	570 J		330		1.73		Yes
SD00801	8	Surface	BENZO(GHI)PERYLENE	200 J		330		0.61		
SD00801	8	Surface	BENZO(K)FLUORANTHENE	140 J		330		0.42		
SD00801	8	Surface	BENZO-A-PYRENE	240 J	88.8	330	2.70	0.73	Yes	
SD00801	8	Surface	CHRYSENE	380 J	108	330	3.52	1.15	Yes	Yes
SD00801	8	Surface	DIBENZO(A,H)ANTHRACENE	56 J	74.8	330	0.75	0.17		
SD00801	8	Surface	FLUORANTHENE	570 J	113	330	5.04	1.73	Yes	Yes
SD00801	8	Surface	INDENO (1,2,3-CD) PYRENE	230 J		330		0.70		
SD00801	8	Surface	NAPHTHALENE	160 J	34.6	330	4.62	0.48	Yes	
SD00801	8	Surface	PHENANTHRENE	140 J	86.7	330	1.61	0.42	Yes	
SD00801	8	Surface	PYRENE	560 J	153	330	3.66	1.70	Yes	Yes
SD00901	9	Surface	ANTHRACENE	22 J	46.9	330	0.47	0.07		
SD00901	9	Surface	BENZO(A)ANTHRACENE	85 J	74.8	330	1.14	0.26	Yes	
SD00901	9	Surface	BENZO(B)FLUORANTHENE	250 J		330		0.76		
SD00901	9	Surface	BENZO(GHI)PERYLENE	100 J		330		0.30		
SD00901	9	Surface	BENZO(K)FLUORANTHENE	60 J		330		0.18		
SD00901	9	Surface	BENZO-A-PYRENE	110 J	88.8	330	1.24	0.33	Yes	
SD00901	9	Surface	CHRYSENE	170 J	108	330	1.57	0.52	Yes	
SD00901	9	Surface	DIBENZO(A,H)ANTHRACENE	26 J	74.8	330	0.35	0.08		
SD00901	9	Surface	FLUORANTHENE	180 J	113	330	1.59	0.55	Yes	
SD00901	9	Surface	INDENO (1,2,3-CD) PYRENE	92 J		330		0.28		
SD00901	9	Surface	NAPHTHALENE	110 J	34.6	330	3.18	0.33	Yes	
SD00901	9	Surface	PHENANTHRENE	62 J	86.7	330	0.72	0.19		
SD00901	9	Surface	PYRENE	160 J	153	330	1.05	0.48	Yes	
SD00902	9	Subsurfac	ANTHRACENE	25	46.9	330	0.53	0.08		
SD00902	9	Subsurfac	BENZO(A)ANTHRACENE	110	74.8	330	1.47	0.33	Yes	
SD00902	9	Subsurfac	BENZO(B)FLUORANTHENE	340		330		1.03		Yes
SD00902	9	Subsurfac	BENZO(GHI)PERYLENE	130		330		0.39		
SD00902	9	Subsurfac	BENZO(K)FLUORANTHENE	85		330		0.26		
SD00902	9	Subsurfac	BENZO-A-PYRENE	140	88.8	330	1.58	0.42	Yes	
SD00902	9	Subsurfac	CHRYSENE	250	108	330	2.31	0.76	Yes	
SD00902	9	Subsurfac	DIBENZO(A,H)ANTHRACENE	36	74.8	330	0.48	0.11		

Pensacola NAS PAH HQ Analysis

SAMPLE	DU	Depth	COMPOUND (ug/kg)	AMOUNT FNT	Effects Value	Benchmark Value	HQ EV	HQ BV	Effects HQs>1	Benchmark HQs>1
SD00902	9	Subsurfac	FLUORANTHENE	230	113	330	2.04	0.70	Yes	
SD00902	9	Subsurfac	FLUORENE	11	21.2	330	0.52	0.03		
SD00902	9	Subsurfac	INDENO (1,2,3-CD) PYRENE	120		330		0.36		
SD00902	9	Subsurfac	NAPHTHALENE	47	34.6	330	1.36	0.14	Yes	
SD00902	9	Subsurfac	PHENANTHRENE	100	86.7	330	1.15	0.30	Yes	
SD00902	9	Subsurfac	PYRENE	250	153	330	1.63	0.76	Yes	
SD01001	10	Surface	BENZO(A)ANTHRACENE	0.69 J	74.8	330	0.01	0.00		
SD01001	10	Surface	BENZO(B)FLUORANTHENE	3.3 J		330		0.01		
SD01001	10	Surface	BENZO(K)FLUORANTHENE	1.5 J		330		0.00		
SD01001	10	Surface	BENZO-A-PYRENE	1.1 J	88.8	330	0.01	0.00		
SD01001	10	Surface	CHRYSENE	1.6 J	108	330	0.01	0.00		
SD01001	10	Surface	INDENO (1,2,3-CD) PYRENE	1.0 J		330		0.00		
SD01001	10	Surface	PYRENE	1.8 J	153	330	0.01	0.01		
SD01101	11	Surface	ANTHRACENE	43 J	46.9	330	0.92	0.13		
SD01101	11	Surface	BENZO(A)ANTHRACENE	240 J	74.8	330	3.21	0.73	Yes	
SD01101	11	Surface	BENZO(B)FLUORANTHENE	980 J		330		2.97		Yes
SD01101	11	Surface	BENZO(GHI)PERYLENE	330 J		330		1.00		
SD01101	11	Surface	BENZO(K)FLUORANTHENE	270 J		330		0.82		
SD01101	11	Surface	BENZO-A-PYRENE	410 J	88.8	330	4.62	1.24	Yes	Yes
SD01101	11	Surface	CHRYSENE	630 J	108	330	5.83	1.91	Yes	Yes
SD01101	11	Surface	DIBENZO(A,H)ANTHRACENE	100 J	74.8	330	1.34	0.30	Yes	
SD01101	11	Surface	FLUORANTHENE	470 J	113	330	4.16	1.42	Yes	Yes
SD01101	11	Surface	INDENO (1,2,3-CD) PYRENE	370 J		330		1.12		Yes
SD01101	11	Surface	NAPHTHALENE	130 J	34.6	330	3.76	0.39	Yes	
SD01101	11	Surface	PHENANTHRENE	160 J	86.7	330	1.85	0.48	Yes	
SD01101	11	Surface	PYRENE	440 J	153	330	2.88	1.33	Yes	Yes
SD01102	11	Subsurfac	ANTHRACENE	91	46.9	330	1.94	0.28	Yes	
SD01102	11	Subsurfac	BENZO(A)ANTHRACENE	390	74.8	330	5.21	1.18	Yes	Yes
SD01102	11	Subsurfac	BENZO(B)FLUORANTHENE	1100		330		3.33		Yes
SD01102	11	Subsurfac	BENZO(GHI)PERYLENE	440		330		1.33		Yes
SD01102	11	Subsurfac	BENZO(K)FLUORANTHENE	250		330		0.76		
SD01102	11	Subsurfac	BENZO-A-PYRENE	460	88.8	330	5.18	1.39	Yes	Yes
SD01102	11	Subsurfac	CHRYSENE	790	108	330	7.31	2.39	Yes	Yes
SD01102	11	Subsurfac	DIBENZO(A,H)ANTHRACENE	120	74.8	330	1.60	0.36	Yes	
SD01102	11	Subsurfac	FLUORANTHENE	800	113	330	7.08	2.42	Yes	Yes
SD01102	11	Subsurfac	FLUORENE	48	21.2	330	2.26	0.15	Yes	
SD01102	11	Subsurfac	INDENO (1,2,3-CD) PYRENE	390		330		1.18		Yes
SD01102	11	Subsurfac	PHENANTHRENE	390	86.7	330	4.50	1.18	Yes	Yes
SD01102	11	Subsurfac	PYRENE	1000	153	330	6.54	3.03	Yes	Yes
SD01801	18	Surface	BENZO(A)ANTHRACENE	2.7 J	74.8	330	0.04	0.01		
SD01801	18	Surface	BENZO(B)FLUORANTHENE	26 J		330		0.08		
SD01801	18	Surface	BENZO(GHI)PERYLENE	4.9 J		330		0.01		
SD01801	18	Surface	BENZO(K)FLUORANTHENE	2.6 J		330		0.01		
SD01801	18	Surface	BENZO-A-PYRENE	3.8 J	88.8	330	0.04	0.01		
SD01801	18	Surface	CHRYSENE	6.1 J	108	330	0.06	0.02		
SD01801	18	Surface	FLUORANTHENE	6.8 J	113	330	0.06	0.02		
SD01801	18	Surface	INDENO (1,2,3-CD) PYRENE	3.8 J		330		0.01		
SD01801	18	Surface	NAPHTHALENE	17 J	34.6	330	0.49	0.05		
SD01801	18	Surface	PHENANTHRENE	3.2 J	86.7	330	0.04	0.01		
SD01801	18	Surface	PYRENE	6.7 J	153	330	0.04	0.02		
SD01802	18	Subsurfac	ANTHRACENE	3.0	46.9	330	0.06	0.01		
SD01802	18	Subsurfac	BENZO(A)ANTHRACENE	14	74.8	330	0.19	0.04		
SD01802	18	Subsurfac	BENZO(B)FLUORANTHENE	72		330		0.22		
SD01802	18	Subsurfac	BENZO(GHI)PERYLENE	25		330		0.08		
SD01802	18	Subsurfac	BENZO(K)FLUORANTHENE	14		330		0.04		
SD01802	18	Subsurfac	BENZO-A-PYRENE	22	88.8	330	0.25	0.07		
SD01802	18	Subsurfac	CHRYSENE	32	108	330	0.30	0.10		

Pensacola NAS PAH HQ Analysis

SAMPLE	DU	Depth	COMPOUND (ug/kg)	AMOUNT FNT	Effects Value	Benchmark Value	HQ EV	HQ BV	Effects HQs>1	Benchmark HQs>1
SD01802	18	Subsurfac	DIBENZO(A,H)ANTHRACENE	6.6	74.8	330	0.09	0.02		
SD01802	18	Subsurfac	FLUORANTHENE	30	113	330	0.27	0.09		
SD01802	18	Subsurfac	INDENO (1,2,3-CD) PYRENE	21		330		0.06		
SD01802	18	Subsurfac	PHENANTHRENE	17	86.7	330	0.20	0.05		
SD01802	18	Subsurfac	PYRENE	30	153	330	0.20	0.09		
SD02201	22	Surface	FLUORANTHENE	250 J	113	330	2.21	0.76	Yes	
SD02201	22	Surface	INDENO (1,2,3-CD) PYRENE	100 J		330		0.30		
SD02201	22	Surface	PYRENE	200 J	153	330	1.31	0.61	Yes	
SD02201	22	Surface	ANTHRACENE	29	46.9	330	0.62	0.09		
SD02201	22	Surface	BENZO(A)ANTHRACENE	95	74.8	330	1.27	0.29	Yes	
SD02201	22	Surface	BENZO(B)FLUORANTHENE	290		330		0.88		
SD02201	22	Surface	BENZO(GHI)PERYLENE	120		330		0.36		
SD02201	22	Surface	BENZO(K)FLUORANTHENE	59		330		0.18		
SD02201	22	Surface	BENZO-A-PYRENE	120	88.8	330	1.35	0.36	Yes	
SD02201	22	Surface	CHRYSENE	210	108	330	1.94	0.64	Yes	
SD02201	22	Surface	DIBENZO(A,H)ANTHRACENE	31	74.8	330	0.41	0.09		
SD02201	22	Surface	FLUORENE	13	21.2	330	0.61	0.04		
SD02201	22	Surface	PHENANTHRENE	130	86.7	330	1.50	0.39	Yes	
SD02202	22	Subsurfac	ANTHRACENE	22	46.9	330	0.47	0.07		
SD02202	22	Subsurfac	BENZO(A)ANTHRACENE	99	74.8	330	1.32	0.30	Yes	
SD02202	22	Subsurfac	BENZO(B)FLUORANTHENE	250		330		0.76		
SD02202	22	Subsurfac	BENZO(GHI)PERYLENE	140		330		0.42		
SD02202	22	Subsurfac	BENZO(K)FLUORANTHENE	77		330		0.23		
SD02202	22	Subsurfac	BENZO-A-PYRENE	120	88.8	330	1.35	0.36	Yes	
SD02202	22	Subsurfac	CHRYSENE	200	108	330	1.85	0.61	Yes	
SD02202	22	Subsurfac	DIBENZO(A,H)ANTHRACENE	36	74.8	330	0.48	0.11		
SD02202	22	Subsurfac	FLUORANTHENE	210	113	330	1.86	0.64	Yes	
SD02202	22	Subsurfac	FLUORENE	11	21.2	330	0.52	0.03		
SD02202	22	Subsurfac	INDENO (1,2,3-CD) PYRENE	120		330		0.36		
SD02202	22	Subsurfac	NAPHTHALENE	32	34.6	330	0.92	0.10		
SD02202	22	Subsurfac	PHENANTHRENE	94	86.7	330	1.08	0.28	Yes	
SD02202	22	Subsurfac	PYRENE	210	153	330	1.37	0.64	Yes	
SD10601	106	Surface	ANTHRACENE	3.0 J	46.9	330	0.06	0.01		
SD10601	106	Surface	BENZO(A)ANTHRACENE	10 J	74.8	330	0.13	0.03		
SD10601	106	Surface	BENZO(B)FLUORANTHENE	39 J		330		0.12		
SD10601	106	Surface	BENZO(GHI)PERYLENE	11 J		330		0.03		
SD10601	106	Surface	BENZO(K)FLUORANTHENE	9.1 J		330		0.03		
SD10601	106	Surface	BENZO-A-PYRENE	12 J	88.8	330	0.14	0.04		
SD10601	106	Surface	CHRYSENE	28 J	108	330	0.26	0.08		
SD10601	106	Surface	DIBENZO(A,H)ANTHRACENE	3.1 J	74.8	330	0.04	0.01		
SD10601	106	Surface	FLUORANTHENE	22 J	113	330	0.19	0.07		
SD10601	106	Surface	INDENO (1,2,3-CD) PYRENE	11 J		330		0.03		
SD10601	106	Surface	NAPHTHALENE	18 J	34.6	330	0.52	0.05		
SD10601	106	Surface	PHENANTHRENE	10 J	86.7	330	0.12	0.03		
SD10601	106	Surface	PYRENE	23 J	153	330	0.15	0.07		
SD10901	109	Surface	ANTHRACENE	6.1 J	46.9	330	0.13	0.02		
SD10901	109	Surface	BENZO(A)ANTHRACENE	29 J	74.8	330	0.39	0.09		
SD10901	109	Surface	BENZO(B)FLUORANTHENE	120 J		330		0.36		
SD10901	109	Surface	BENZO(GHI)PERYLENE	41 J		330		0.12		
SD10901	109	Surface	BENZO(K)FLUORANTHENE	29 J		330		0.09		
SD10901	109	Surface	BENZO-A-PYRENE	47 J	88.8	330	0.53	0.14		
SD10901	109	Surface	CHRYSENE	86 J	108	330	0.80	0.26		
SD10901	109	Surface	DIBENZO(A,H)ANTHRACENE	12 J	74.8	330	0.16	0.04		
SD10901	109	Surface	FLUORANTHENE	48 J	113	330	0.42	0.15		
SD10901	109	Surface	INDENO (1,2,3-CD) PYRENE	38 J		330		0.12		
SD10901	109	Surface	PHENANTHRENE	17 J	86.7	330	0.20	0.05		
SD10901	109	Surface	PYRENE	57 J	153	330	0.37	0.17		

Pensacola NAS PAH HQ Analysis

SAMPLE	DU	Depth	COMPOUND (ug/kg)	AMOUNT	FNT	Effects Value	Benchmark Value	HQ EV	HQ BV	Effects HQs>1	Benchmark HQs>1
All Locations and Compounds Below are Nondetects											
SD00102	1	Subsurfac	1-METHYLNAPHTHALENE	8.5	U		330	0.42	0.03		
SD00102	1	Subsurfac	2-METHYLNAPHTHALENE	10	U	20.23	330	0.49	0.03		
SD00102	1	Subsurfac	ACENAPHTHENE	31	U		330	4.62	0.09	Yes	
SD00102	1	Subsurfac	ACENAPHTHYLENE	49	U		330	8.35	0.15	Yes	
SD00102	1	Subsurfac	BENZO(B)FLUORANTHENE	2.8	U		330		0.01		
SD00102	1	Subsurfac	DIBENZO(A,H)ANTHRACENE	4.2	U	74.8	330	0.06	0.01		
SD00101	1	Surface	ACENAPHTHENE	170	UJ	6.71	330	25.34	0.52	Yes	
SD00101	1	Surface	ACENAPHTHYLENE	280	UJ	5.87	330	47.70	0.85	Yes	
SD00101	1	Surface	1-METHYLNAPHTHALENE	48	UJ		330	2.37	0.15	Yes	
SD00101	1	Surface	2-METHYLNAPHTHALENE	56	UJ	20.23	330	2.77	0.17	Yes	
SD00101	1	Surface	FLUORENE	21	UJ	21.2	330	0.99	0.06		
SD00201	2	Surface	ACENAPHTHENE	130	UJ	6.71	330	19.37	0.39	Yes	
SD00201	2	Surface	ACENAPHTHYLENE	220	UJ	5.87	330	37.48	0.67	Yes	
SD00201	2	Surface	1-METHYLNAPHTHALENE	37	UJ		330	1.83	0.11	Yes	
SD00201	2	Surface	2-METHYLNAPHTHALENE	44	UJ	20.23	330	2.17	0.13	Yes	
SD00201	2	Surface	DIBENZO(A,H)ANTHRACENE	18	UJ	74.8	330	0.24	0.05		
SD00201	2	Surface	FLUORENE	17	UJ	21.2	330	0.80	0.05		
SD00201	2	Surface	NAPHTHALENE	91	UJ	34.6	330	2.63	0.28	Yes	
SD00301	3	Surface	1-METHYLNAPHTHALENE	7.9	U		330	0.39	0.02		
SD00301	3	Surface	2-METHYLNAPHTHALENE	9.3	U	20.23	330	0.46	0.03		
SD00301	3	Surface	ACENAPHTHENE	28	U		330	4.17	0.08	Yes	
SD00301	3	Surface	ACENAPHTHYLENE	46	U		330	7.84	0.14	Yes	
SD00301	3	Surface	FLUORENE	3.5	U	21.2	330	0.17	0.01		
SD00302	3	Subsurfac	ACENAPHTHENE	310	U	6.71	330	46.20	0.94	Yes	
SD00302	3	Subsurfac	ACENAPHTHYLENE	500	U	5.87	330	85.18	1.52	Yes	Yes
SD00302	3	Subsurfac	1-METHYLNAPHTHALENE	86	U		330	4.25	0.26	Yes	
SD00302	3	Subsurfac	2-METHYLNAPHTHALENE	100	U	20.23	330	4.94	0.30	Yes	
SD00302	3	Subsurfac	FLUORENE	38	U	21.2	330	1.79	0.12	Yes	
SD00302	3	Subsurfac	NAPHTHALENE	210	U	34.6	330	6.07	0.64	Yes	
SD00402	4	Subsurfac	ACENAPHTHENE	160	U	6.71	330	23.85	0.48	Yes	
SD00402	4	Subsurfac	ACENAPHTHYLENE	260	U	5.87	330	44.29	0.79	Yes	
SD00402	4	Subsurfac	1-METHYLNAPHTHALENE	46	U		330	2.27	0.14	Yes	
SD00402	4	Subsurfac	2-METHYLNAPHTHALENE	54	U	20.23	330	2.67	0.16	Yes	
SD00402	4	Subsurfac	NAPHTHALENE	110	U	34.6	330	3.18	0.33	Yes	
SD00401	4	Surface	ACENAPHTHYLENE	420	UJ	5.87	330	71.55	1.27	Yes	Yes
SD00401	4	Surface	1-METHYLNAPHTHALENE	73	UJ		330	3.61	0.22	Yes	
SD00401	4	Surface	2-METHYLNAPHTHALENE	86	UJ	20.23	330	4.25	0.26	Yes	
SD00401	4	Surface	ACENAPHTHENE	45	UJ		330	6.71	0.14	Yes	
SD00401	4	Surface	FLUORENE	32	UJ	21.2	330	1.51	0.10	Yes	
SD00401	4	Surface	NAPHTHALENE	180	UJ	34.6	330	5.20	0.55	Yes	
SD00502	5	Subsurfac	ACENAPHTHENE	280	U	6.71	330	41.73	0.85	Yes	
SD00502	5	Subsurfac	ACENAPHTHYLENE	450	U	5.87	330	76.66	1.36	Yes	Yes
SD00502	5	Subsurfac	1-METHYLNAPHTHALENE	78	U		330	3.86	0.24	Yes	
SD00502	5	Subsurfac	2-METHYLNAPHTHALENE	92	U	20.23	330	4.55	0.28	Yes	
SD00502	5	Subsurfac	FLUORENE	35	U	21.2	330	1.65	0.11	Yes	
SD00502	5	Subsurfac	NAPHTHALENE	190	U	34.6	330	5.49	0.58	Yes	
SD00501	5	Surface	ACENAPHTHENE	250	UJ	6.71	330	37.26	0.76	Yes	
SD00501	5	Surface	ACENAPHTHYLENE	410	UJ	5.87	330	69.85	1.24	Yes	Yes
SD00501	5	Surface	1-METHYLNAPHTHALENE	71	UJ		330	3.51	0.22	Yes	
SD00501	5	Surface	2-METHYLNAPHTHALENE	83	UJ	20.23	330	4.10	0.25	Yes	
SD00501	5	Surface	FLUORENE	31	UJ	21.2	330	1.46	0.09	Yes	
SD00501	5	Surface	NAPHTHALENE	170	UJ	34.6	330	4.91	0.52	Yes	
SD00601	6	Surface	1-METHYLNAPHTHALENE	4.1	U		330	0.20	0.01		
SD00601	6	Surface	ACENAPHTHENE	15	U		330	2.24	0.05	Yes	
SD00601	6	Surface	ACENAPHTHYLENE	24	U		330	4.09	0.07	Yes	
SD00601	6	Surface	FLUORENE	1.8	U	21.2	330	0.08	0.01		

Pensacola NAS PAH HQ Analysis

SAMPLE	DU	Depth	COMPOUND (ug/kg)	AMOUNT	FNT	Effects Value	Benchmark Value	HQ EV	HQ BV	Effects HQs>1	Benchmark HQs>1
SD00701	7	Surface	1-METHYLNAPHTHALENE	4.5	UJ		330	0.22	0.01		
SD00701	7	Surface	2-METHYLNAPHTHALENE	5.3	UJ	20.23	330	0.26	0.02		
SD00701	7	Surface	ACENAPHTHENE	16	UJ		330	2.38	0.05	Yes	
SD00701	7	Surface	ACENAPHTHYLENE	26	UJ		330	4.43	0.08	Yes	
SD00701	7	Surface	FLUORENE	2.0	UJ	21.2	330	0.09	0.01		
SD00801	8	Surface	FLUORENE	29	U	21.2	330	1.37	0.09	Yes	
SD00801	8	Surface	ACENAPHTHENE	230	UJ	6.71	330	34.28	0.70	Yes	
SD00801	8	Surface	ACENAPHTHYLENE	370	UJ	5.87	330	63.03	1.12	Yes	Yes
SD00801	8	Surface	1-METHYLNAPHTHALENE	65	UJ		330	3.21	0.20	Yes	
SD00801	8	Surface	2-METHYLNAPHTHALENE	76	UJ	20.23	330	3.76	0.23	Yes	
SD00902	9	Subsurfac	1-METHYLNAPHTHALENE	9.1	U		330	0.45	0.03		
SD00902	9	Subsurfac	2-METHYLNAPHTHALENE	11	U	20.23	330	0.54	0.03		
SD00902	9	Subsurfac	ACENAPHTHENE	33	U		330	4.92	0.10	Yes	
SD00902	9	Subsurfac	ACENAPHTHYLENE	53	U		330	9.03	0.16	Yes	
SD00901	9	Surface	ACENAPHTHYLENE	61	UJ	5.87	330	10.39	0.18	Yes	
SD00901	9	Surface	1-METHYLNAPHTHALENE	11	UJ		330	0.54	0.03		
SD00901	9	Surface	2-METHYLNAPHTHALENE	12	UJ	20.23	330	0.59	0.04		
SD00901	9	Surface	ACENAPHTHENE	38	UJ		330	5.66	0.12	Yes	
SD00901	9	Surface	FLUORENE	4.7	UJ	21.2	330	0.22	0.01		
SD01001	10	Surface	1-METHYLNAPHTHALENE	3.7	UJ		330	0.18	0.01		
SD01001	10	Surface	2-METHYLNAPHTHALENE	4.3	UJ	20.23	330	0.21	0.01		
SD01001	10	Surface	ACENAPHTHENE	13	UJ		330	1.94	0.04	Yes	
SD01001	10	Surface	ACENAPHTHYLENE	21	UJ		330	3.58	0.06	Yes	
SD01001	10	Surface	ANTHRACENE	0.75	UJ	46.9	330	0.02	0.00		
SD01001	10	Surface	BENZO(GHI)PERYLENE	1.2	UJ		330		0.00		
SD01001	10	Surface	DIBENZO(A,H)ANTHRACENE	1.8	UJ	74.8	330	0.02	0.01		
SD01001	10	Surface	FLUORANTHENE	1.3	UJ	113	330	0.01	0.00		
SD01001	10	Surface	FLUORENE	1.6	UJ	21.2	330	0.08	0.00		
SD01001	10	Surface	NAPHTHALENE	9.0	UJ	34.6	330	0.26	0.03		
SD01001	10	Surface	PHENANTHRENE	1.0	UJ	86.7	330	0.01	0.00		
SD01102	11	Subsurfac	ACENAPHTHENE	320	U	6.71	330	47.69	0.97	Yes	
SD01102	11	Subsurfac	ACENAPHTHYLENE	510	U	5.87	330	86.88	1.55	Yes	Yes
SD01102	11	Subsurfac	1-METHYLNAPHTHALENE	88	U		330	4.35	0.27	Yes	
SD01102	11	Subsurfac	2-METHYLNAPHTHALENE	100	U	20.23	330	4.94	0.30	Yes	
SD01102	11	Subsurfac	NAPHTHALENE	210	U	34.6	330	6.07	0.64	Yes	
SD01101	11	Surface	ACENAPHTHENE	190	UJ	6.71	330	28.32	0.58	Yes	
SD01101	11	Surface	ACENAPHTHYLENE	300	UJ	5.87	330	51.11	0.91	Yes	
SD01101	11	Surface	1-METHYLNAPHTHALENE	52	UJ		330	2.57	0.16	Yes	
SD01101	11	Surface	2-METHYLNAPHTHALENE	62	UJ	20.23	330	3.06	0.19	Yes	
SD01101	11	Surface	FLUORENE	23	UJ	21.2	330	1.08	0.07	Yes	
SD01802	18	Subsurfac	1-METHYLNAPHTHALENE	4.4	U		330	0.22	0.01		
SD01802	18	Subsurfac	2-METHYLNAPHTHALENE	5.2	U	20.23	330	0.26	0.02		
SD01802	18	Subsurfac	ACENAPHTHENE	16	U		330	2.38	0.05	Yes	
SD01802	18	Subsurfac	ACENAPHTHYLENE	26	U		330	4.43	0.08	Yes	
SD01802	18	Subsurfac	FLUORENE	2.0	U	21.2	330	0.09	0.01		
SD01802	18	Subsurfac	NAPHTHALENE	11	U	34.6	330	0.32	0.03		
SD01801	18	Surface	1-METHYLNAPHTHALENE	4.9	UJ		330	0.24	0.01		
SD01801	18	Surface	2-METHYLNAPHTHALENE	5.8	UJ	20.23	330	0.29	0.02		
SD01801	18	Surface	ACENAPHTHENE	18	UJ		330	2.68	0.05	Yes	
SD01801	18	Surface	ACENAPHTHYLENE	28	UJ		330	4.77	0.08	Yes	
SD01801	18	Surface	ANTHRACENE	0.99	UJ	46.9	330	0.02	0.00		
SD01801	18	Surface	DIBENZO(A,H)ANTHRACENE	2.4	UJ	74.8	330	0.03	0.01		
SD01801	18	Surface	FLUORENE	2.2	UJ	21.2	330	0.10	0.01		
SD02201	22	Surface	1-METHYLNAPHTHALENE	10	U		330	0.49	0.03		
SD02201	22	Surface	2-METHYLNAPHTHALENE	12	U	20.23	330	0.59	0.04		
SD02201	22	Surface	ACENAPHTHENE	36	U		330	5.37	0.11	Yes	
SD02201	22	Surface	ACENAPHTHYLENE	58	U		330	9.88	0.18	Yes	

Pensacola NAS PAH HQ Analysis

SAMPLE	DU	Depth	COMPOUND (ug/kg)	AMOUNT FNT	Effects Value	Benchmark Value	HQ EV	HQ BV	Effects HQs>1	Benchmark HQs>1
SD02201	22	Surface	NAPHTHALENE	25 U	34.6	330	0.72	0.08		
SD02202	22	Subsurfac	1-METHYLNAPHTHALENE	7.9 U		330	0.39	0.02		
SD02202	22	Subsurfac	2-METHYLNAPHTHALENE	9.3 U	20.23	330	0.46	0.03		
SD02202	22	Subsurfac	ACENAPHTHENE	29 U		330	4.32	0.09	Yes	
SD02202	22	Subsurfac	ACENAPHTHYLENE	46 U		330	7.84	0.14	Yes	
SD10601	106	Surface	1-METHYLNAPHTHALENE	4.1 UJ		330	0.20	0.01		
SD10601	106	Surface	2-METHYLNAPHTHALENE	4.8 UJ	20.23	330	0.24	0.01		
SD10601	106	Surface	ACENAPHTHENE	15 UJ		330	2.24	0.05	Yes	
SD10601	106	Surface	ACENAPHTHYLENE	24 UJ		330	4.09	0.07	Yes	
SD10601	106	Surface	FLUORENE	1.8 UJ	21.2	330	0.08	0.01		
SD10901	109	Surface	ACENAPHTHYLENE	59 UJ	5.87	330	10.05	0.18	Yes	
SD10901	109	Surface	1-METHYLNAPHTHALENE	10 UJ	20.23	330	0.49	0.03		
SD10901	109	Surface	2-METHYLNAPHTHALENE	12 UJ	20.23	330	0.59	0.04		
SD10901	109	Surface	ACENAPHTHENE	37 UJ		330	5.51	0.11	Yes	
SD10901	109	Surface	FLUORENE	4.6 UJ	21.2	330	0.22	0.01		
SD10901	109	Surface	NAPHTHALENE	25 UJ	34.6	330	0.72	0.08		

Hazard Quotients for Pesticides and PCBs

Pe. .cola NAS Pesticide/PCB Hazard Quotient Analysis

Sample ID	Grid	Depth	Compound	Units	Amount	FNT	10% of Non-detects	Effects Value (ug/kg)	Benchmark Value (ug/kg)	HQ EV	HQ BV	HQ EV > 1	HQ BV >1
SD00101	1	SF	PCB-1254 (AROCLOR 1254)	UG/KG	67.00	A			21.6		3.10		Yes
SD00101	1	SF	PCB-1260 (AROCLOR 1260)	UG/KG	190.00	A			21.6		8.80		Yes
SD00501	5	SF	PCB-1260 (AROCLOR 1260)	UG/KG	84.00	A			21.6		3.89		Yes
SD00801	8	SF	4,4'-DDT (P,P'-DDT)	UG/KG	1.80	J		1.2	3.3	1.50	0.55	Yes	
SD01102	11	SB	4,4'-DDT (P,P'-DDT)	UG/KG	1.80	J		1.2	3.3	1.50	0.55	Yes	
SD02202	22	SB	4,4'-DDT (P,P'-DDT)	UG/KG	1.20	J		1.2	3.3	1.00	0.36		
SD00402	4	SB	DELTA-BHC	UG/KG	0.78	J							
SD00502	5	SB	DELTA-BHC	UG/KG	2.60	J							
SD02202	22	SB	DELTA-BHC	UG/KG	2.60	J							
SD10601	106	SF	DELTA-BHC	UG/KG	0.91	J							
SD10901	109	SF	DELTA-BHC	UG/KG	5.20	J							
SD00201	2	SF	DIELDRIN	UG/KG	3.50	J		0.02	3.3	175.00	1.06	Yes	Yes
SD00402	4	SB	ENDOSULFAN SULFATE	UG/KG	1.00	J			5.4		0.19		
SD01101	11	SF	ENDOSULFAN SULFATE	UG/KG	1.10	J			5.4		0.20		
SD01801	18	SF	ENDOSULFAN SULFATE	UG/KG	1.10	J			5.4		0.20		
SD01101	11	SF	ENDRIN	UG/KG	1.10	J		0.02	3.3	55.00	0.33	Yes	
SD01101	11	SF	HEPTACHLOR EPOXIDE	UG/KG	0.95	J			0.6		1.58		Yes
SD00402	4	SB	METHOXYCHLOR	UG/KG	2.60	J			19		0.14		
SD00902	9	SB	METHOXYCHLOR	UG/KG	13.00	J			19		0.68		
SD01001	10	SF	METHOXYCHLOR	UG/KG	6.10	J			19		0.32		
SD00302	3	SB	PCB-1254 (AROCLOR 1254)	UG/KG	58.00	J			21.6		2.69		Yes
SD00501	5	SF	PCB-1254 (AROCLOR 1254)	UG/KG	28.00	J			21.6		1.30		Yes
SD00302	3	SB	PCB-1260 (AROCLOR 1260)	UG/KG	98.00	J			21.6		4.54		Yes
SD00401	4	SF	PCB-1260 (AROCLOR 1260)	UG/KG	33.00	J			21.6		1.53		Yes
SD01101	11	SF	4,4'-DDD (P,P'-DDD)	UG/KG	2.50	JN		1.22	3.3	2.05	0.76	Yes	
SD00302	3	SB	BETA-BHC	UG/KG	1.90	JN							
SD00901	9	SF	DELTA-BHC	UG/KG	3.90	JN							
SD00902	9	SB	DELTA-BHC	UG/KG	3.00	JN							
SD01801	18	SF	DELTA-BHC	UG/KG	1.10	JN							
SD00502	5	SB	ENDOSULFAN SULFATE	UG/KG	1.20	JN			5.4		0.22		
SD01102	11	SB	ENDRIN KETONE	UG/KG	1.30	JN							
SD10901	109	SF	METHOXYCHLOR	UG/KG	10.00	JN			19		0.53		

Pensacola NAS Pesticide/PCB Hazard Quotient Analysis

Sample ID	Grid	Depth	Compound	Units	Amount	FNT	10% of Non-detects	Effects Value (ug/kg)	Benchmark Value (ug/kg)	HQ EV	HQ BV	HQ EV > 1	HQ BV >1
All Locations and Compounds Below Were Non-detect													
SD00201	2	SF	ALDRIN	UG/KG	2.40	U	0.24		2.5		0.96		
SD00101	1	SF	ENDOSULFAN I (ALPHA)	UG/KG	2.70	U	0.27		2.9		0.93		
SD00201	2	SF	ENDOSULFAN I (ALPHA)	UG/KG	2.40	U	0.24		2.9		0.83		
SD00601	6	SF	ENDOSULFAN I (ALPHA)	UG/KG	2.50	U	0.25		2.9		0.86		
SD00701	7	SF	ENDOSULFAN I (ALPHA)	UG/KG	2.70	U	0.27		2.9		0.93		
SD01802	18	SB	ENDOSULFAN I (ALPHA)	UG/KG	2.50	U	0.25		2.9		0.86		
SD00101	1	SF	ENDOSULFAN II (BETA)	UG/KG	5.20	U	0.52		14		0.37		
SD00201	2	SF	ENDOSULFAN II (BETA)	UG/KG	4.60	U	0.46		14		0.33		
SD00301	3	SF	ENDOSULFAN II (BETA)	UG/KG	11.00	U	1.10		14		0.79		
SD00302	3	SB	ENDOSULFAN II (BETA)	UG/KG	10.00	U	1.00		14		0.71		
SD00501	5	SF	ENDOSULFAN II (BETA)	UG/KG	7.50	U	0.75		14		0.54		
SD00601	6	SF	ENDOSULFAN II (BETA)	UG/KG	4.80	U	0.48		14		0.34		
SD00701	7	SF	ENDOSULFAN II (BETA)	UG/KG	5.20	U	0.52		14		0.37		
SD00801	8	SF	ENDOSULFAN II (BETA)	UG/KG	7.70	U	0.77		14		0.55		
SD01802	18	SB	ENDOSULFAN II (BETA)	UG/KG	4.80	U	0.48		14		0.34		
SD02201	22	SF	ENDOSULFAN II (BETA)	UG/KG	11.00	U	1.10		14		0.79		
SD00101	1	SF	ENDOSULFAN SULFATE	UG/KG	5.20	U	0.52		5.4		0.96		
SD00201	2	SF	ENDOSULFAN SULFATE	UG/KG	4.60	U	0.46		5.4		0.85		
SD00601	6	SF	ENDOSULFAN SULFATE	UG/KG	4.80	U	0.48		5.4		0.89		
SD00701	7	SF	ENDOSULFAN SULFATE	UG/KG	5.20	U	0.52		5.4		0.96		
SD01802	18	SB	ENDOSULFAN SULFATE	UG/KG	4.80	U	0.48		5.4		0.89		
SD00101	1	SF	GAMMA-BHC (LINDANE)	UG/KG	2.70	U	0.27	0.32	3.3	8.44	0.82	Yes	
SD00201	2	SF	GAMMA-BHC (LINDANE)	UG/KG	2.40	U	0.24	0.32	3.3	7.50	0.73	Yes	
SD00601	6	SF	GAMMA-BHC (LINDANE)	UG/KG	2.50	U	0.25	0.32	3.3	7.81	0.76	Yes	
SD00701	7	SF	GAMMA-BHC (LINDANE)	UG/KG	2.70	U	0.27	0.32	3.3	8.44	0.82	Yes	
SD01802	18	SB	GAMMA-BHC (LINDANE)	UG/KG	2.50	U	0.25	0.32	3.3	7.81	0.76	Yes	
SD00101	1	SF	GAMMA-CHLORDANE /2	UG/KG	2.70	U	0.27	0.5	3.3	5.40	0.82	Yes	
SD00201	2	SF	GAMMA-CHLORDANE /2	UG/KG	2.40	U	0.24	0.5	3.3	4.80	0.73	Yes	
SD00601	6	SF	GAMMA-CHLORDANE /2	UG/KG	2.50	U	0.25	0.5	3.3	5.00	0.76	Yes	
SD00701	7	SF	GAMMA-CHLORDANE /2	UG/KG	2.70	U	0.27	0.5	3.3	5.40	0.82	Yes	
SD01802	18	SB	GAMMA-CHLORDANE /2	UG/KG	2.50	U	0.25	0.5	3.3	5.00	0.76	Yes	
SD01001	10	SF	ALDRIN	UG/KG	2.10	UJ	0.21		2.5		0.84		
SD10601	106	SF	ALDRIN	UG/KG	2.40	UJ	0.24		2.5		0.96		
SD00402	4	SB	ENDOSULFAN I (ALPHA)	UG/KG	2.50	UJ	0.25		2.9		0.86		

Pe cola NAS Pesticide/PCB Hazard Quotient Analysis

Sample ID	Grid	Depth	Compound	Units	Amount	FNT	10% of Non-detects	Effects Value (ug/kg)	Benchmark Value (ug/kg)	HQ EV	HQ BV	HQ EV > 1	HQ BV >1
SD01001	10	SF	ENDOSULFAN I (ALPHA)	UG/KG	2.10	UJ	0.21		2.9		0.72		
SD10601	106	SF	ENDOSULFAN I (ALPHA)	UG/KG	2.40	UJ	0.24		2.9		0.83		
SD00401	4	SF	ENDOSULFAN II (BETA)	UG/KG	9.20	UJ	0.92		14		0.66		
SD00402	4	SB	ENDOSULFAN II (BETA)	UG/KG	4.80	UJ	0.48		14		0.34		
SD00502	5	SB	ENDOSULFAN II (BETA)	UG/KG	9.70	UJ	0.97		14		0.69		
SD00901	9	SF	ENDOSULFAN II (BETA)	UG/KG	12.00	UJ	1.20		14		0.86		
SD00902	9	SB	ENDOSULFAN II (BETA)	UG/KG	10.00	UJ	1.00		14		0.71		
SD01001	10	SF	ENDOSULFAN II (BETA)	UG/KG	4.00	UJ	0.40		14		0.29		
SD01101	11	SF	ENDOSULFAN II (BETA)	UG/KG	6.50	UJ	0.65		14		0.46		
SD01102	11	SB	ENDOSULFAN II (BETA)	UG/KG	9.70	UJ	0.97		14		0.69		
SD01801	18	SF	ENDOSULFAN II (BETA)	UG/KG	5.70	UJ	0.57		14		0.41		
SD02202	22	SB	ENDOSULFAN II (BETA)	UG/KG	8.90	UJ	0.89		14		0.64		
SD10601	106	SF	ENDOSULFAN II (BETA)	UG/KG	4.60	UJ	0.46		14		0.33		
SD10901	109	SF	ENDOSULFAN II (BETA)	UG/KG	12.00	UJ	1.20		14		0.86		
SD01001	10	SF	ENDOSULFAN SULFATE	UG/KG	4.00	UJ	0.40		5.4		0.74		
SD10601	106	SF	ENDOSULFAN SULFATE	UG/KG	4.60	UJ	0.46		5.4		0.85		
SD00402	4	SB	GAMMA-BHC (LINDANE)	UG/KG	2.50	UJ	0.25	0.32	3.3	7.81	0.76	Yes	
SD01001	10	SF	GAMMA-BHC (LINDANE)	UG/KG	2.10	UJ	0.21	0.32	3.3	6.56	0.64	Yes	
SD01801	18	SF	GAMMA-BHC (LINDANE)	UG/KG	2.90	UJ	0.29	0.32	3.3	9.06	0.88	Yes	
SD10601	106	SF	GAMMA-BHC (LINDANE)	UG/KG	2.40	UJ	0.24	0.32	3.3	7.50	0.73	Yes	
SD00402	4	SB	GAMMA-CHLORDANE /2	UG/KG	2.50	UJ	0.25	0.5	3.3	5.00	0.76	Yes	
SD01001	10	SF	GAMMA-CHLORDANE /2	UG/KG	2.10	UJ	0.21	0.5	3.3	4.20	0.64	Yes	
SD01801	18	SF	GAMMA-CHLORDANE /2	UG/KG	2.90	UJ	0.29	0.5	3.3	5.80	0.88	Yes	
SD10601	106	SF	GAMMA-CHLORDANE /2	UG/KG	2.40	UJ	0.24	0.5	3.3	4.80	0.73	Yes	
SD00101	1	SF	4,4'-DDD (P,P'-DDD)	UG/KG	5.20	U	0.52	1.22	3.3	4.26	1.58	Yes	Yes
SD00201	2	SF	4,4'-DDD (P,P'-DDD)	UG/KG	4.60	U	0.46	1.22	3.3	3.77	1.39	Yes	Yes
SD00301	3	SF	4,4'-DDD (P,P'-DDD)	UG/KG	11.00	U	1.10	1.22	3.3	9.02	3.33	Yes	Yes
SD00302	3	SB	4,4'-DDD (P,P'-DDD)	UG/KG	10.00	U	1.00	1.22	3.3	8.20	3.03	Yes	Yes
SD00501	5	SF	4,4'-DDD (P,P'-DDD)	UG/KG	7.50	U	0.75	1.22	3.3	6.15	2.27	Yes	Yes
SD00601	6	SF	4,4'-DDD (P,P'-DDD)	UG/KG	4.80	U	0.48	1.22	3.3	3.93	1.45	Yes	Yes
SD00701	7	SF	4,4'-DDD (P,P'-DDD)	UG/KG	5.20	U	0.52	1.22	3.3	4.26	1.58	Yes	Yes
SD00801	8	SF	4,4'-DDD (P,P'-DDD)	UG/KG	7.70	U	0.77	1.22	3.3	6.31	2.33	Yes	Yes
SD01802	18	SB	4,4'-DDD (P,P'-DDD)	UG/KG	4.80	U	0.48	1.22	3.3	3.93	1.45	Yes	Yes
SD02201	22	SF	4,4'-DDD (P,P'-DDD)	UG/KG	11.00	U	1.10	1.22	3.3	9.02	3.33	Yes	Yes
SD00101	1	SF	4,4'-DDE (P,P'-DDE)	UG/KG	5.20	U	0.52	2.1	3.3	2.48	1.58	Yes	Yes

Pensacola NAS Pesticide/PCB Hazard Quotient Analysis

Sample ID	Grid	Depth	Compound	Units	Amount	FNT	10% of Non-detects	Effects Value (ug/kg)	Benchmark Value (ug/kg)	HQ EV	HQ BV	HQ EV > 1	HQ BV >1
SD00201	2	SF	4,4'-DDE (P,P'-DDE)	UG/KG	4.60	U	0.46	2.1	3.3	2.19	1.39	Yes	Yes
SD00301	3	SF	4,4'-DDE (P,P'-DDE)	UG/KG	11.00	U	1.10	2.1	3.3	5.24	3.33	Yes	Yes
SD00302	3	SB	4,4'-DDE (P,P'-DDE)	UG/KG	10.00	U	1.00	2.1	3.3	4.76	3.03	Yes	Yes
SD00501	5	SF	4,4'-DDE (P,P'-DDE)	UG/KG	7.50	U	0.75	2.1	3.3	3.57	2.27	Yes	Yes
SD00601	6	SF	4,4'-DDE (P,P'-DDE)	UG/KG	4.80	U	0.48	2.1	3.3	2.29	1.45	Yes	Yes
SD00701	7	SF	4,4'-DDE (P,P'-DDE)	UG/KG	5.20	U	0.52	2.1	3.3	2.48	1.58	Yes	Yes
SD00801	8	SF	4,4'-DDE (P,P'-DDE)	UG/KG	7.70	U	0.77	2.1	3.3	3.67	2.33	Yes	Yes
SD01802	18	SB	4,4'-DDE (P,P'-DDE)	UG/KG	4.80	U	0.48	2.1	3.3	2.29	1.45	Yes	Yes
SD02201	22	SF	4,4'-DDE (P,P'-DDE)	UG/KG	11.00	U	1.10	2.1	3.3	5.24	3.33	Yes	Yes
SD00101	1	SF	4,4'-DDT (P,P'-DDT)	UG/KG	5.20	U	0.52	1.2	3.3	4.33	1.58	Yes	Yes
SD00201	2	SF	4,4'-DDT (P,P'-DDT)	UG/KG	4.60	U	0.46	1.2	3.3	3.83	1.39	Yes	Yes
SD00301	3	SF	4,4'-DDT (P,P'-DDT)	UG/KG	11.00	U	1.10	1.2	3.3	9.17	3.33	Yes	Yes
SD00302	3	SB	4,4'-DDT (P,P'-DDT)	UG/KG	10.00	U	1.00	1.2	3.3	8.33	3.03	Yes	Yes
SD00501	5	SF	4,4'-DDT (P,P'-DDT)	UG/KG	7.50	U	0.75	1.2	3.3	6.25	2.27	Yes	Yes
SD00601	6	SF	4,4'-DDT (P,P'-DDT)	UG/KG	4.80	U	0.48	1.2	3.3	4.00	1.45	Yes	Yes
SD00701	7	SF	4,4'-DDT (P,P'-DDT)	UG/KG	5.20	U	0.52	1.2	3.3	4.33	1.58	Yes	Yes
SD01802	18	SB	4,4'-DDT (P,P'-DDT)	UG/KG	4.80	U	0.48	1.2	3.3	4.00	1.45	Yes	Yes
SD02201	22	SF	4,4'-DDT (P,P'-DDT)	UG/KG	11.00	U	1.10	1.2	3.3	9.17	3.33	Yes	Yes
SD00101	1	SF	ALDRIN	UG/KG	2.70	U	0.27		2.5		1.08		Yes
SD00301	3	SF	ALDRIN	UG/KG	5.70	U	0.57		2.5		2.28		Yes
SD00302	3	SB	ALDRIN	UG/KG	5.30	U	0.53		2.5		2.12		Yes
SD00501	5	SF	ALDRIN	UG/KG	3.90	U	0.39		2.5		1.56		Yes
SD00601	6	SF	ALDRIN	UG/KG	2.50	U	0.25		2.5		1.00		
SD00701	7	SF	ALDRIN	UG/KG	2.70	U	0.27		2.5		1.08		Yes
SD00801	8	SF	ALDRIN	UG/KG	4.00	U	0.40		2.5		1.60		Yes
SD01802	18	SB	ALDRIN	UG/KG	2.50	U	0.25		2.5		1.00		
SD02201	22	SF	ALDRIN	UG/KG	5.90	U	0.59		2.5		2.36		Yes
SD00101	1	SF	ALPHA-BHC	UG/KG	2.70	U	0.27						
SD00201	2	SF	ALPHA-BHC	UG/KG	2.40	U	0.24						
SD00301	3	SF	ALPHA-BHC	UG/KG	5.70	U	0.57						
SD00302	3	SB	ALPHA-BHC	UG/KG	5.30	U	0.53						
SD00501	5	SF	ALPHA-BHC	UG/KG	3.90	U	0.39						
SD00601	6	SF	ALPHA-BHC	UG/KG	2.50	U	0.25						
SD00701	7	SF	ALPHA-BHC	UG/KG	2.70	U	0.27						
SD00801	8	SF	ALPHA-BHC	UG/KG	4.00	U	0.40						

Pensacola NAS Pesticide/PCB Hazard Quotient Analysis

Sample ID	Grid	Depth	Compound	Units	Amount	FNT	10% of Non-detects	Effects Value (ug/kg)	Benchmark Value (ug/kg)	HQ EV	HQ BV	HQ EV > 1	HQ BV >1
SD01802	18	SB	ALPHA-BHC	UG/KG	2.50	U	0.25						
SD02201	22	SF	ALPHA-BHC	UG/KG	5.90	U	0.59						
SD00101	1	SF	ALPHA-CHLORDANE /2	UG/KG	2.70	U	0.27	1.7	1.7		1.59		Yes
SD00201	2	SF	ALPHA-CHLORDANE /2	UG/KG	2.40	U	0.24		1.7		1.41		Yes
SD00301	3	SF	ALPHA-CHLORDANE /2	UG/KG	5.70	U	0.57		1.7		3.35		Yes
SD00302	3	SB	ALPHA-CHLORDANE /2	UG/KG	5.30	U	0.53		1.7		3.12		Yes
SD00501	5	SF	ALPHA-CHLORDANE /2	UG/KG	3.90	U	0.39		1.7		2.29		Yes
SD00601	6	SF	ALPHA-CHLORDANE /2	UG/KG	2.50	U	0.25		1.7		1.47		Yes
SD00701	7	SF	ALPHA-CHLORDANE /2	UG/KG	2.70	U	0.27		1.7		1.59		Yes
SD00801	8	SF	ALPHA-CHLORDANE /2	UG/KG	4.00	U	0.40		1.7		2.35		Yes
SD01802	18	SB	ALPHA-CHLORDANE /2	UG/KG	2.50	U	0.25		1.7		1.47		Yes
SD02201	22	SF	ALPHA-CHLORDANE /2	UG/KG	5.90	U	0.59		1.7		3.47		Yes
SD00101	1	SF	BETA-BHC	UG/KG	2.70	U	0.27						
SD00201	2	SF	BETA-BHC	UG/KG	2.40	U	0.24						
SD00301	3	SF	BETA-BHC	UG/KG	5.70	U	0.57						
SD00501	5	SF	BETA-BHC	UG/KG	3.90	U	0.39						
SD00601	6	SF	BETA-BHC	UG/KG	2.50	U	0.25						
SD00701	7	SF	BETA-BHC	UG/KG	2.70	U	0.27						
SD00801	8	SF	BETA-BHC	UG/KG	4.00	U	0.40						
SD01802	18	SB	BETA-BHC	UG/KG	2.50	U	0.25						
SD02201	22	SF	BETA-BHC	UG/KG	5.90	U	0.59						
SD00101	1	SF	DELTA-BHC	UG/KG	2.70	U	0.27						
SD00201	2	SF	DELTA-BHC	UG/KG	2.40	U	0.24						
SD00301	3	SF	DELTA-BHC	UG/KG	5.70	U	0.57						
SD00302	3	SB	DELTA-BHC	UG/KG	5.30	U	0.53						
SD00501	5	SF	DELTA-BHC	UG/KG	3.90	U	0.39						
SD00601	6	SF	DELTA-BHC	UG/KG	2.50	U	0.25						
SD00701	7	SF	DELTA-BHC	UG/KG	2.70	U	0.27						
SD00801	8	SF	DELTA-BHC	UG/KG	4.00	U	0.40						
SD01802	18	SB	DELTA-BHC	UG/KG	2.50	U	0.25						
SD02201	22	SF	DELTA-BHC	UG/KG	5.90	U	0.59						
SD00101	1	SF	DIELDRIN	UG/KG	5.20	U	0.52	0.02	3.3	260.00	1.58	Yes	Yes
SD00301	3	SF	DIELDRIN	UG/KG	11.00	U	1.10	0.02	3.3	550.00	3.33	Yes	Yes
SD00302	3	SB	DIELDRIN	UG/KG	10.00	U	1.00	0.02	3.3	500.00	3.03	Yes	Yes
SD00501	5	SF	DIELDRIN	UG/KG	7.50	U	0.75	0.02	3.3	375.00	2.27	Yes	Yes

Pensacola NAS Pesticide/PCB Hazard Quotient Analysis

Sample ID	Grid	Depth	Compound	Units	Amount	FNT	10% of Non-detects	Effects Value (ug/kg)	Benchmark Value (ug/kg)	HQ EV	HQ BV	HQ EV > 1	HQ BV >1
SD00601	6	SF	DIELDRIN	UG/KG	4.80	U	0.48	0.02	3.3	240.00	1.45	Yes	Yes
SD00701	7	SF	DIELDRIN	UG/KG	5.20	U	0.52	0.02	3.3	260.00	1.58	Yes	Yes
SD00801	8	SF	DIELDRIN	UG/KG	7.70	U	0.77	0.02	3.3	385.00	2.33	Yes	Yes
SD01802	18	SB	DIELDRIN	UG/KG	4.80	U	0.48	0.02	3.3	240.00	1.45	Yes	Yes
SD02201	22	SF	DIELDRIN	UG/KG	11.00	U	1.10	0.02	3.3	550.00	3.33	Yes	Yes
SD00301	3	SF	ENDOSULFAN I (ALPHA)	UG/KG	5.70	U	0.57		2.9		1.97		Yes
SD00302	3	SB	ENDOSULFAN I (ALPHA)	UG/KG	5.30	U	0.53		2.9		1.83		Yes
SD00501	5	SF	ENDOSULFAN I (ALPHA)	UG/KG	3.90	U	0.39		2.9		1.34		Yes
SD00801	8	SF	ENDOSULFAN I (ALPHA)	UG/KG	4.00	U	0.40		2.9		1.38		Yes
SD02201	22	SF	ENDOSULFAN I (ALPHA)	UG/KG	5.90	U	0.59		2.9		2.03		Yes
SD00301	3	SF	ENDOSULFAN SULFATE	UG/KG	11.00	U	1.10		5.4		2.04		Yes
SD00302	3	SB	ENDOSULFAN SULFATE	UG/KG	10.00	U	1.00		5.4		1.85		Yes
SD00501	5	SF	ENDOSULFAN SULFATE	UG/KG	7.50	U	0.75		5.4		1.39		Yes
SD00801	8	SF	ENDOSULFAN SULFATE	UG/KG	7.70	U	0.77		5.4		1.43		Yes
SD02201	22	SF	ENDOSULFAN SULFATE	UG/KG	11.00	U	1.10		5.4		2.04		Yes
SD00101	1	SF	ENDRIN	UG/KG	5.20	U	0.52	0.02	3.3	260.00	1.58	Yes	Yes
SD00201	2	SF	ENDRIN	UG/KG	4.60	U	0.46	0.02	3.3	230.00	1.39	Yes	Yes
SD00301	3	SF	ENDRIN	UG/KG	11.00	U	1.10	0.02	3.3	550.00	3.33	Yes	Yes
SD00302	3	SB	ENDRIN	UG/KG	10.00	U	1.00	0.02	3.3	500.00	3.03	Yes	Yes
SD00501	5	SF	ENDRIN	UG/KG	7.50	U	0.75	0.02	3.3	375.00	2.27	Yes	Yes
SD00601	6	SF	ENDRIN	UG/KG	4.80	U	0.48	0.02	3.3	240.00	1.45	Yes	Yes
SD00701	7	SF	ENDRIN	UG/KG	5.20	U	0.52	0.02	3.3	260.00	1.58	Yes	Yes
SD00801	8	SF	ENDRIN	UG/KG	7.70	U	0.77	0.02	3.3	385.00	2.33	Yes	Yes
SD01802	18	SB	ENDRIN	UG/KG	4.80	U	0.48	0.02	3.3	240.00	1.45	Yes	Yes
SD02201	22	SF	ENDRIN	UG/KG	11.00	U	1.10	0.02	3.3	550.00	3.33	Yes	Yes
SD00101	1	SF	ENDRIN ALDEHYDE	UG/KG	5.20	U	0.52						
SD00201	2	SF	ENDRIN ALDEHYDE	UG/KG	4.60	U	0.46						
SD00301	3	SF	ENDRIN ALDEHYDE	UG/KG	11.00	U	1.10						
SD00302	3	SB	ENDRIN ALDEHYDE	UG/KG	10.00	U	1.00						
SD00501	5	SF	ENDRIN ALDEHYDE	UG/KG	7.50	U	0.75						
SD00601	6	SF	ENDRIN ALDEHYDE	UG/KG	4.80	U	0.48						
SD00701	7	SF	ENDRIN ALDEHYDE	UG/KG	5.20	U	0.52						
SD00801	8	SF	ENDRIN ALDEHYDE	UG/KG	7.70	U	0.77						
SD01802	18	SB	ENDRIN ALDEHYDE	UG/KG	4.80	U	0.48						
SD02201	22	SF	ENDRIN ALDEHYDE	UG/KG	11.00	U	1.10						

Pensacola NAS Pesticide/PCB Hazard Quotient Analysis

Sample ID	Grid	Depth	Compound	Units	Amount	FNT	10% of Non-detects	Effects Value (ug/kg)	Benchmark Value (ug/kg)	HQ EV	HQ BV	HQ EV > 1	HQ BV >1
SD00101	1	SF	ENDRIN KETONE	UG/KG	5.20	U	0.52						
SD00201	2	SF	ENDRIN KETONE	UG/KG	4.60	U	0.46						
SD00301	3	SF	ENDRIN KETONE	UG/KG	11.00	U	1.10						
SD00302	3	SB	ENDRIN KETONE	UG/KG	10.00	U	1.00						
SD00501	5	SF	ENDRIN KETONE	UG/KG	7.50	U	0.75						
SD00601	6	SF	ENDRIN KETONE	UG/KG	4.80	U	0.48						
SD00701	7	SF	ENDRIN KETONE	UG/KG	5.20	U	0.52						
SD00801	8	SF	ENDRIN KETONE	UG/KG	7.70	U	0.77						
SD01802	18	SB	ENDRIN KETONE	UG/KG	4.80	U	0.48						
SD02201	22	SF	ENDRIN KETONE	UG/KG	11.00	U	1.10						
SD00301	3	SF	GAMMA-BHC (LINDANE)	UG/KG	5.70	U	0.57	0.32	3.3	17.81	1.73	Yes	Yes
SD00302	3	SB	GAMMA-BHC (LINDANE)	UG/KG	5.30	U	0.53	0.32	3.3	16.56	1.61	Yes	Yes
SD00501	5	SF	GAMMA-BHC (LINDANE)	UG/KG	3.90	U	0.39	0.32	3.3	12.19	1.18	Yes	Yes
SD00801	8	SF	GAMMA-BHC (LINDANE)	UG/KG	4.00	U	0.40	0.32	3.3	12.50	1.21	Yes	Yes
SD02201	22	SF	GAMMA-BHC (LINDANE)	UG/KG	5.90	U	0.59	0.32	3.3	18.44	1.79	Yes	Yes
SD00301	3	SF	GAMMA-CHLORDANE /2	UG/KG	5.70	U	0.57	0.5	3.3	11.40	1.73	Yes	Yes
SD00302	3	SB	GAMMA-CHLORDANE /2	UG/KG	5.30	U	0.53	0.5	3.3	10.60	1.61	Yes	Yes
SD00501	5	SF	GAMMA-CHLORDANE /2	UG/KG	3.90	U	0.39	0.5	3.3	7.80	1.18	Yes	Yes
SD00801	8	SF	GAMMA-CHLORDANE /2	UG/KG	4.00	U	0.40	0.5	3.3	8.00	1.21	Yes	Yes
SD02201	22	SF	GAMMA-CHLORDANE /2	UG/KG	5.90	U	0.59	0.5	3.3	11.80	1.79	Yes	Yes
SD00101	1	SF	HEPTACHLOR	UG/KG	2.70	U	0.27						
SD00201	2	SF	HEPTACHLOR	UG/KG	2.40	U	0.24						
SD00301	3	SF	HEPTACHLOR	UG/KG	5.70	U	0.57						
SD00302	3	SB	HEPTACHLOR	UG/KG	5.30	U	0.53						
SD00501	5	SF	HEPTACHLOR	UG/KG	3.90	U	0.39						
SD00601	6	SF	HEPTACHLOR	UG/KG	2.50	U	0.25						
SD00701	7	SF	HEPTACHLOR	UG/KG	2.70	U	0.27						
SD00801	8	SF	HEPTACHLOR	UG/KG	4.00	U	0.40						
SD01802	18	SB	HEPTACHLOR	UG/KG	2.50	U	0.25						
SD02201	22	SF	HEPTACHLOR	UG/KG	5.90	U	0.59						
SD00101	1	SF	HEPTACHLOR EPOXIDE	UG/KG	2.70	U	0.27		0.6		4.50		Yes
SD00201	2	SF	HEPTACHLOR EPOXIDE	UG/KG	2.40	U	0.24		0.6		4.00		Yes
SD00301	3	SF	HEPTACHLOR EPOXIDE	UG/KG	5.70	U	0.57		0.6		9.50		Yes
SD00302	3	SB	HEPTACHLOR EPOXIDE	UG/KG	5.30	U	0.53		0.6		8.83		Yes
SD00501	5	SF	HEPTACHLOR EPOXIDE	UG/KG	3.90	U	0.39		0.6		6.50		Yes

Pensacola NAS Pesticide/PCB Hazard Quotient Analysis

Sample ID	Grid	Depth	Compound	Units	Amount	FNT	10% of Non-detects	Effects Value (ug/kg)	Benchmark Value (ug/kg)	HQ EV	HQ BV	HQ EV > 1	HQ BV >1
SD00601	6	SF	HEPTACHLOR EPOXIDE	UG/KG	2.50	U	0.25		0.6		4.17		Yes
SD00701	7	SF	HEPTACHLOR EPOXIDE	UG/KG	2.70	U	0.27		0.6		4.50		Yes
SD00801	8	SF	HEPTACHLOR EPOXIDE	UG/KG	4.00	U	0.40		0.6		6.67		Yes
SD01802	18	SB	HEPTACHLOR EPOXIDE	UG/KG	2.50	U	0.25		0.6		4.17		Yes
SD02201	22	SF	HEPTACHLOR EPOXIDE	UG/KG	5.90	U	0.59		0.6		9.83		Yes
SD00101	1	SF	METHOXYCHLOR	UG/KG	27.00	U	2.70		19		1.42		Yes
SD00201	2	SF	METHOXYCHLOR	UG/KG	24.00	U	2.40		19		1.26		Yes
SD00301	3	SF	METHOXYCHLOR	UG/KG	57.00	U	5.70		19		3.00		Yes
SD00302	3	SB	METHOXYCHLOR	UG/KG	53.00	U	5.30		19		2.79		Yes
SD00501	5	SF	METHOXYCHLOR	UG/KG	39.00	U	3.90		19		2.05		Yes
SD00601	6	SF	METHOXYCHLOR	UG/KG	25.00	U	2.50		19		1.32		Yes
SD00701	7	SF	METHOXYCHLOR	UG/KG	27.00	U	2.70		19		1.42		Yes
SD00801	8	SF	METHOXYCHLOR	UG/KG	40.00	U	4.00		19		2.11		Yes
SD01802	18	SB	METHOXYCHLOR	UG/KG	25.00	U	2.50		19		1.32		Yes
SD02201	22	SF	METHOXYCHLOR	UG/KG	59.00	U	5.90		19		3.11		Yes
SD00101	1	SF	PCB-1016 (AROCLOR 1016)	UG/KG	52.00	U	5.20		33		1.58		Yes
SD00201	2	SF	PCB-1016 (AROCLOR 1016)	UG/KG	46.00	U	4.60		33		1.39		Yes
SD00301	3	SF	PCB-1016 (AROCLOR 1016)	UG/KG	110.00	U	11.00		33		3.33		Yes
SD00302	3	SB	PCB-1016 (AROCLOR 1016)	UG/KG	100.00	U	10.00		33		3.03		Yes
SD00501	5	SF	PCB-1016 (AROCLOR 1016)	UG/KG	75.00	U	7.50		33		2.27		Yes
SD00601	6	SF	PCB-1016 (AROCLOR 1016)	UG/KG	48.00	U	4.80		33		1.45		Yes
SD00701	7	SF	PCB-1016 (AROCLOR 1016)	UG/KG	52.00	U	5.20		33		1.58		Yes
SD00801	8	SF	PCB-1016 (AROCLOR 1016)	UG/KG	77.00	U	7.70		33		2.33		Yes
SD01802	18	SB	PCB-1016 (AROCLOR 1016)	UG/KG	48.00	U	4.80		33		1.45		Yes
SD02201	22	SF	PCB-1016 (AROCLOR 1016)	UG/KG	110.00	U	11.00		33		3.33		Yes
SD00101	1	SF	PCB-1221 (AROCLOR 1221)	UG/KG	100.00	U	10.00		21.6		4.63		Yes
SD00201	2	SF	PCB-1221 (AROCLOR 1221)	UG/KG	93.00	U	9.30		21.6		4.31		Yes
SD00301	3	SF	PCB-1221 (AROCLOR 1221)	UG/KG	220.00	U	22.00		21.6		10.19		Yes
SD00302	3	SB	PCB-1221 (AROCLOR 1221)	UG/KG	210.00	U	21.00		21.6		9.72		Yes
SD00501	5	SF	PCB-1221 (AROCLOR 1221)	UG/KG	150.00	U	15.00		21.6		6.94		Yes
SD00601	6	SF	PCB-1221 (AROCLOR 1221)	UG/KG	97.00	U	9.70		21.6		4.49		Yes
SD00701	7	SF	PCB-1221 (AROCLOR 1221)	UG/KG	100.00	U	10.00		21.6		4.63		Yes
SD00801	8	SF	PCB-1221 (AROCLOR 1221)	UG/KG	160.00	U	16.00		21.6		7.41		Yes
SD01802	18	SB	PCB-1221 (AROCLOR 1221)	UG/KG	97.00	U	9.70		21.6		4.49		Yes
SD02201	22	SF	PCB-1221 (AROCLOR 1221)	UG/KG	230.00	U	23.00		21.6		10.65		Yes

Pe..acola NAS Pesticide/PCB Hazard Quotient Analysis

Sample ID	Grid	Depth	Compound	Units	Amount	FNT	10% of Non-detects	Effects Value (ug/kg)	Benchmark Value (ug/kg)	HQ EV	HQ BV	HQ EV > 1	HQ BV >1
SD00101	1	SF	PCB-1232 (AROCLOR 1232)	UG/KG	52.00	U	5.20		21.6		2.41		Yes
SD00201	2	SF	PCB-1232 (AROCLOR 1232)	UG/KG	46.00	U	4.60		21.6		2.13		Yes
SD00301	3	SF	PCB-1232 (AROCLOR 1232)	UG/KG	110.00	U	11.00		21.6		5.09		Yes
SD00302	3	SB	PCB-1232 (AROCLOR 1232)	UG/KG	100.00	U	10.00		21.6		4.63		Yes
SD00501	5	SF	PCB-1232 (AROCLOR 1232)	UG/KG	75.00	U	7.50		21.6		3.47		Yes
SD00601	6	SF	PCB-1232 (AROCLOR 1232)	UG/KG	48.00	U	4.80		21.6		2.22		Yes
SD00701	7	SF	PCB-1232 (AROCLOR 1232)	UG/KG	52.00	U	5.20		21.6		2.41		Yes
SD00801	8	SF	PCB-1232 (AROCLOR 1232)	UG/KG	77.00	U	7.70		21.6		3.56		Yes
SD01802	18	SB	PCB-1232 (AROCLOR 1232)	UG/KG	48.00	U	4.80		21.6		2.22		Yes
SD02201	22	SF	PCB-1232 (AROCLOR 1232)	UG/KG	110.00	U	11.00		21.6		5.09		Yes
SD00101	1	SF	PCB-1242 (AROCLOR 1242)	UG/KG	52.00	U	5.20		21.6		2.41		Yes
SD00201	2	SF	PCB-1242 (AROCLOR 1242)	UG/KG	46.00	U	4.60		21.6		2.13		Yes
SD00301	3	SF	PCB-1242 (AROCLOR 1242)	UG/KG	110.00	U	11.00		21.6		5.09		Yes
SD00302	3	SB	PCB-1242 (AROCLOR 1242)	UG/KG	100.00	U	10.00		21.6		4.63		Yes
SD00501	5	SF	PCB-1242 (AROCLOR 1242)	UG/KG	75.00	U	7.50		21.6		3.47		Yes
SD00601	6	SF	PCB-1242 (AROCLOR 1242)	UG/KG	48.00	U	4.80		21.6		2.22		Yes
SD00701	7	SF	PCB-1242 (AROCLOR 1242)	UG/KG	52.00	U	5.20		21.6		2.41		Yes
SD00801	8	SF	PCB-1242 (AROCLOR 1242)	UG/KG	77.00	U	7.70		21.6		3.56		Yes
SD01802	18	SB	PCB-1242 (AROCLOR 1242)	UG/KG	48.00	U	4.80		21.6		2.22		Yes
SD02201	22	SF	PCB-1242 (AROCLOR 1242)	UG/KG	110.00	U	11.00		21.6		5.09		Yes
SD00101	1	SF	PCB-1248 (AROCLOR 1248)	UG/KG	52.00	U	5.20		21.6		2.41		Yes
SD00201	2	SF	PCB-1248 (AROCLOR 1248)	UG/KG	46.00	U	4.60		21.6		2.13		Yes
SD00301	3	SF	PCB-1248 (AROCLOR 1248)	UG/KG	110.00	U	11.00		21.6		5.09		Yes
SD00302	3	SB	PCB-1248 (AROCLOR 1248)	UG/KG	100.00	U	10.00		21.6		4.63		Yes
SD00501	5	SF	PCB-1248 (AROCLOR 1248)	UG/KG	75.00	U	7.50		21.6		3.47		Yes
SD00601	6	SF	PCB-1248 (AROCLOR 1248)	UG/KG	48.00	U	4.80		21.6		2.22		Yes
SD00701	7	SF	PCB-1248 (AROCLOR 1248)	UG/KG	52.00	U	5.20		21.6		2.41		Yes
SD00801	8	SF	PCB-1248 (AROCLOR 1248)	UG/KG	77.00	U	7.70		21.6		3.56		Yes
SD01802	18	SB	PCB-1248 (AROCLOR 1248)	UG/KG	48.00	U	4.80		21.6		2.22		Yes
SD02201	22	SF	PCB-1248 (AROCLOR 1248)	UG/KG	110.00	U	11.00		21.6		5.09		Yes
SD00201	2	SF	PCB-1254 (AROCLOR 1254)	UG/KG	46.00	U	4.60		21.6		2.13		Yes
SD00301	3	SF	PCB-1254 (AROCLOR 1254)	UG/KG	110.00	U	11.00		21.6		5.09		Yes
SD00601	6	SF	PCB-1254 (AROCLOR 1254)	UG/KG	48.00	U	4.80		21.6		2.22		Yes
SD00701	7	SF	PCB-1254 (AROCLOR 1254)	UG/KG	52.00	U	5.20		21.6		2.41		Yes
SD00801	8	SF	PCB-1254 (AROCLOR 1254)	UG/KG	77.00	U	7.70		21.6		3.56		Yes

Pensacola NAS Pesticide/PCB Hazard Quotient Analysis

Sample ID	Grid	Depth	Compound	Units	Amount	FNT	10% of Non-detects	Effects Value (ug/kg)	Benchmark Value (ug/kg)	HQ EV	HQ BV	HQ EV > 1	HQ BV >1
SD01802	18	SB	PCB-1254 (AROCLOR 1254)	UG/KG	48.00	U	4.80		21.6		2.22		Yes
SD02201	22	SF	PCB-1254 (AROCLOR 1254)	UG/KG	110.00	U	11.00		21.6		5.09		Yes
SD00201	2	SF	PCB-1260 (AROCLOR 1260)	UG/KG	46.00	U	4.60		21.6		2.13		Yes
SD00301	3	SF	PCB-1260 (AROCLOR 1260)	UG/KG	110.00	U	11.00		21.6		5.09		Yes
SD00601	6	SF	PCB-1260 (AROCLOR 1260)	UG/KG	48.00	U	4.80		21.6		2.22		Yes
SD00701	7	SF	PCB-1260 (AROCLOR 1260)	UG/KG	52.00	U	5.20		21.6		2.41		Yes
SD00801	8	SF	PCB-1260 (AROCLOR 1260)	UG/KG	77.00	U	7.70		21.6		3.56		Yes
SD01802	18	SB	PCB-1260 (AROCLOR 1260)	UG/KG	48.00	U	4.80		21.6		2.22		Yes
SD02201	22	SF	PCB-1260 (AROCLOR 1260)	UG/KG	110.00	U	11.00		21.6		5.09		Yes
SD00101	1	SF	TOXAPHENE	UG/KG	270.00	U	27.00		28		9.64		Yes
SD00201	2	SF	TOXAPHENE	UG/KG	240.00	U	24.00		28		8.57		Yes
SD00301	3	SF	TOXAPHENE	UG/KG	570.00	U	57.00		28		20.36		Yes
SD00302	3	SB	TOXAPHENE	UG/KG	530.00	U	53.00		28		18.93		Yes
SD00501	5	SF	TOXAPHENE	UG/KG	390.00	U	39.00		28		13.93		Yes
SD00601	6	SF	TOXAPHENE	UG/KG	250.00	U	25.00		28		8.93		Yes
SD00701	7	SF	TOXAPHENE	UG/KG	270.00	U	27.00		28		9.64		Yes
SD00801	8	SF	TOXAPHENE	UG/KG	400.00	U	40.00		28		14.29		Yes
SD01802	18	SB	TOXAPHENE	UG/KG	250.00	U	25.00		28		8.93		Yes
SD02201	22	SF	TOXAPHENE	UG/KG	590.00	U	59.00		28		21.07		Yes
SD00401	4	SF	4,4'-DDD (P,P'-DDD)	UG/KG	9.20	UJ	0.92	1.22	3.3	7.54	2.79	Yes	Yes
SD00402	4	SB	4,4'-DDD (P,P'-DDD)	UG/KG	4.80	UJ	0.48	1.22	3.3	3.93	1.45	Yes	Yes
SD00502	5	SB	4,4'-DDD (P,P'-DDD)	UG/KG	9.70	UJ	0.97	1.22	3.3	7.95	2.94	Yes	Yes
SD00901	9	SF	4,4'-DDD (P,P'-DDD)	UG/KG	12.00	UJ	1.20	1.22	3.3	9.84	3.64	Yes	Yes
SD00902	9	SB	4,4'-DDD (P,P'-DDD)	UG/KG	10.00	UJ	1.00	1.22	3.3	8.20	3.03	Yes	Yes
SD01001	10	SF	4,4'-DDD (P,P'-DDD)	UG/KG	4.00	UJ	0.40	1.22	3.3	3.28	1.21	Yes	Yes
SD01102	11	SB	4,4'-DDD (P,P'-DDD)	UG/KG	9.70	UJ	0.97	1.22	3.3	7.95	2.94	Yes	Yes
SD01801	18	SF	4,4'-DDD (P,P'-DDD)	UG/KG	5.70	UJ	0.57	1.22	3.3	4.67	1.73	Yes	Yes
SD02202	22	SB	4,4'-DDD (P,P'-DDD)	UG/KG	8.90	UJ	0.89	1.22	3.3	7.30	2.70	Yes	Yes
SD10601	106	SF	4,4'-DDD (P,P'-DDD)	UG/KG	4.60	UJ	0.46	1.22	3.3	3.77	1.39	Yes	Yes
SD10901	109	SF	4,4'-DDD (P,P'-DDD)	UG/KG	12.00	UJ	1.20	1.22	3.3	9.84	3.64	Yes	Yes
SD00401	4	SF	4,4'-DDE (P,P'-DDE)	UG/KG	9.20	UJ	0.92	2.1	3.3	4.38	2.79	Yes	Yes
SD00402	4	SB	4,4'-DDE (P,P'-DDE)	UG/KG	4.80	UJ	0.48	2.1	3.3	2.29	1.45	Yes	Yes
SD00502	5	SB	4,4'-DDE (P,P'-DDE)	UG/KG	9.70	UJ	0.97	2.1	3.3	4.62	2.94	Yes	Yes
SD00901	9	SF	4,4'-DDE (P,P'-DDE)	UG/KG	12.00	UJ	1.20	2.1	3.3	5.71	3.64	Yes	Yes
SD00902	9	SB	4,4'-DDE (P,P'-DDE)	UG/KG	10.00	UJ	1.00	2.1	3.3	4.76	3.03	Yes	Yes

Pe .cola NAS Pesticide/PCB Hazard Quotient Analysis

Sample ID	Grid	Depth	Compound	Units	Amount	FNT	10% of Non-detects	Effects Value (ug/kg)	Benchmark Value (ug/kg)	HQ EV	HQ BV	HQ EV > 1	HQ BV >1
SD01001	10	SF	4,4'-DDE (P,P'-DDE)	UG/KG	4.00	UJ	0.40	2.1	3.3	1.90	1.21	Yes	Yes
SD01101	11	SF	4,4'-DDE (P,P'-DDE)	UG/KG	6.50	UJ	0.65	2.1	3.3	3.10	1.97	Yes	Yes
SD01102	11	SB	4,4'-DDE (P,P'-DDE)	UG/KG	9.70	UJ	0.97	2.1	3.3	4.62	2.94	Yes	Yes
SD01801	18	SF	4,4'-DDE (P,P'-DDE)	UG/KG	5.70	UJ	0.57	2.1	3.3	2.71	1.73	Yes	Yes
SD02202	22	SB	4,4'-DDE (P,P'-DDE)	UG/KG	8.90	UJ	0.89	2.1	3.3	4.24	2.70	Yes	Yes
SD10601	106	SF	4,4'-DDE (P,P'-DDE)	UG/KG	4.60	UJ	0.46	2.1	3.3	2.19	1.39	Yes	Yes
SD10901	109	SF	4,4'-DDE (P,P'-DDE)	UG/KG	12.00	UJ	1.20	2.1	3.3	5.71	3.64	Yes	Yes
SD00401	4	SF	4,4'-DDT (P,P'-DDT)	UG/KG	9.20	UJ	0.92	1.2	3.3	7.67	2.79	Yes	Yes
SD00402	4	SB	4,4'-DDT (P,P'-DDT)	UG/KG	4.80	UJ	0.48	1.2	3.3	4.00	1.45	Yes	Yes
SD00502	5	SB	4,4'-DDT (P,P'-DDT)	UG/KG	9.70	UJ	0.97	1.2	3.3	8.08	2.94	Yes	Yes
SD00901	9	SF	4,4'-DDT (P,P'-DDT)	UG/KG	12.00	UJ	1.20	1.2	3.3	10.00	3.64	Yes	Yes
SD00902	9	SB	4,4'-DDT (P,P'-DDT)	UG/KG	10.00	UJ	1.00	1.2	3.3	8.33	3.03	Yes	Yes
SD01001	10	SF	4,4'-DDT (P,P'-DDT)	UG/KG	4.00	UJ	0.40	1.2	3.3	3.33	1.21	Yes	Yes
SD01101	11	SF	4,4'-DDT (P,P'-DDT)	UG/KG	6.50	UJ	0.65	1.2	3.3	5.42	1.97	Yes	Yes
SD01801	18	SF	4,4'-DDT (P,P'-DDT)	UG/KG	5.70	UJ	0.57	1.2	3.3	4.75	1.73	Yes	Yes
SD10601	106	SF	4,4'-DDT (P,P'-DDT)	UG/KG	4.60	UJ	0.46	1.2	3.3	3.83	1.39	Yes	Yes
SD10901	109	SF	4,4'-DDT (P,P'-DDT)	UG/KG	12.00	UJ	1.20	1.2	3.3	10.00	3.64	Yes	Yes
SD00401	4	SF	ALDRIN	UG/KG	4.70	UJ	0.47		2.5		1.88		Yes
SD00402	4	SB	ALDRIN	UG/KG	2.50	UJ	0.25		2.5		1.00		
SD00502	5	SB	ALDRIN	UG/KG	5.00	UJ	0.50		2.5		2.00		Yes
SD00901	9	SF	ALDRIN	UG/KG	6.10	UJ	0.61		2.5		2.44		Yes
SD00902	9	SB	ALDRIN	UG/KG	5.30	UJ	0.53		2.5		2.12		Yes
SD01101	11	SF	ALDRIN	UG/KG	3.30	UJ	0.33		2.5		1.32		Yes
SD01102	11	SB	ALDRIN	UG/KG	5.00	UJ	0.50		2.5		2.00		Yes
SD01801	18	SF	ALDRIN	UG/KG	2.90	UJ	0.29		2.5		1.16		Yes
SD02202	22	SB	ALDRIN	UG/KG	4.60	UJ	0.46		2.5		1.84		Yes
SD10901	109	SF	ALDRIN	UG/KG	6.10	UJ	0.61		2.5		2.44		Yes
SD00401	4	SF	ALPHA-BHC	UG/KG	4.70	UJ	0.47						
SD00402	4	SB	ALPHA-BHC	UG/KG	2.50	UJ	0.25						
SD00502	5	SB	ALPHA-BHC	UG/KG	5.00	UJ	0.50						
SD00901	9	SF	ALPHA-BHC	UG/KG	6.10	UJ	0.61						
SD00902	9	SB	ALPHA-BHC	UG/KG	5.30	UJ	0.53						
SD01001	10	SF	ALPHA-BHC	UG/KG	2.10	UJ	0.21						
SD01101	11	SF	ALPHA-BHC	UG/KG	3.30	UJ	0.33						
SD01102	11	SB	ALPHA-BHC	UG/KG	5.00	UJ	0.50						

Pe ola NAS Pesticide/PCB Hazard Quotient Analysis

Sample ID	Grid	Depth	Compound	Units	Amount	FNT	10% of Non-detects	Effects Value (ug/kg)	Benchmark Value (ug/kg)	HQ EV	HQ BV	HQ EV > 1	HQ BV >1
SD01801	18	SF	ALPHA-BHC	UG/KG	2.90	UJ	0.29						
SD02202	22	SB	ALPHA-BHC	UG/KG	4.60	UJ	0.46						
SD10601	106	SF	ALPHA-BHC	UG/KG	2.40	UJ	0.24						
SD10901	109	SF	ALPHA-BHC	UG/KG	6.10	UJ	0.61						
SD00401	4	SF	ALPHA-CHLORDANE /2	UG/KG	4.70	UJ	0.47		1.7		2.76		Yes
SD00402	4	SB	ALPHA-CHLORDANE /2	UG/KG	2.50	UJ	0.25		1.7		1.47		Yes
SD00502	5	SB	ALPHA-CHLORDANE /2	UG/KG	5.00	UJ	0.50		1.7		2.94		Yes
SD00901	9	SF	ALPHA-CHLORDANE /2	UG/KG	6.10	UJ	0.61		1.7		3.59		Yes
SD00902	9	SB	ALPHA-CHLORDANE /2	UG/KG	5.30	UJ	0.53		1.7		3.12		Yes
SD01001	10	SF	ALPHA-CHLORDANE /2	UG/KG	2.10	UJ	0.21		1.7		1.24		Yes
SD01101	11	SF	ALPHA-CHLORDANE /2	UG/KG	3.30	UJ	0.33		1.7		1.94		Yes
SD01102	11	SB	ALPHA-CHLORDANE /2	UG/KG	5.00	UJ	0.50		1.7		2.94		Yes
SD01801	18	SF	ALPHA-CHLORDANE /2	UG/KG	2.90	UJ	0.29		1.7		1.71		Yes
SD02202	22	SB	ALPHA-CHLORDANE /2	UG/KG	4.60	UJ	0.46		1.7		2.71		Yes
SD10601	106	SF	ALPHA-CHLORDANE /2	UG/KG	2.40	UJ	0.24		1.7		1.41		Yes
SD10901	109	SF	ALPHA-CHLORDANE /2	UG/KG	6.10	UJ	0.61		1.7		3.59		Yes
SD00401	4	SF	BETA-BHC	UG/KG	4.70	UJ	0.47						
SD00402	4	SB	BETA-BHC	UG/KG	2.50	UJ	0.25						
SD00502	5	SB	BETA-BHC	UG/KG	5.00	UJ	0.50						
SD00901	9	SF	BETA-BHC	UG/KG	6.10	UJ	0.61						
SD00902	9	SB	BETA-BHC	UG/KG	5.30	UJ	0.53						
SD01001	10	SF	BETA-BHC	UG/KG	2.10	UJ	0.21						
SD01101	11	SF	BETA-BHC	UG/KG	3.30	UJ	0.33						
SD01102	11	SB	BETA-BHC	UG/KG	5.00	UJ	0.50						
SD01801	18	SF	BETA-BHC	UG/KG	2.90	UJ	0.29						
SD02202	22	SB	BETA-BHC	UG/KG	4.60	UJ	0.46						
SD10601	106	SF	BETA-BHC	UG/KG	2.40	UJ	0.24						
SD10901	109	SF	BETA-BHC	UG/KG	6.10	UJ	0.61						
SD00401	4	SF	DELTA-BHC	UG/KG	4.70	UJ	0.47						
SD01001	10	SF	DELTA-BHC	UG/KG	2.10	UJ	0.21						
SD01101	11	SF	DELTA-BHC	UG/KG	3.30	UJ	0.33						
SD01102	11	SB	DELTA-BHC	UG/KG	5.00	UJ	0.50						
SD00401	4	SF	DIELDRIN	UG/KG	9.20	UJ	0.92	0.02	3.3	460.00	2.79	Yes	Yes
SD00402	4	SB	DIELDRIN	UG/KG	4.80	UJ	0.48	0.02	3.3	240.00	1.45	Yes	Yes
SD00502	5	SB	DIELDRIN	UG/KG	9.70	UJ	0.97	0.02	3.3	485.00	2.94	Yes	Yes

Pen. .ola NAS Pesticide/PCB Hazard Quotient Analysis

Sample ID	Grid	Depth	Compound	Units	Amount	FNT	10% of Non-detects	Effects Value (ug/kg)	Benchmark Value (ug/kg)	HQ EV	HQ BV	HQ EV > 1	HQ BV >1
SD00901	9	SF	DIELDRIN	UG/KG	12.00	UJ	1.20	0.02	3.3	600.00	3.64	Yes	Yes
SD00902	9	SB	DIELDRIN	UG/KG	10.00	UJ	1.00	0.02	3.3	500.00	3.03	Yes	Yes
SD01001	10	SF	DIELDRIN	UG/KG	4.00	UJ	0.40	0.02	3.3	200.00	1.21	Yes	Yes
SD01101	11	SF	DIELDRIN	UG/KG	6.50	UJ	0.65	0.02	3.3	325.00	1.97	Yes	Yes
SD01102	11	SB	DIELDRIN	UG/KG	9.70	UJ	0.97	0.02	3.3	485.00	2.94	Yes	Yes
SD01801	18	SF	DIELDRIN	UG/KG	5.70	UJ	0.57	0.02	3.3	285.00	1.73	Yes	Yes
SD02202	22	SB	DIELDRIN	UG/KG	8.90	UJ	0.89	0.02	3.3	445.00	2.70	Yes	Yes
SD10601	106	SF	DIELDRIN	UG/KG	4.60	UJ	0.46	0.02	3.3	230.00	1.39	Yes	Yes
SD10901	109	SF	DIELDRIN	UG/KG	12.00	UJ	1.20	0.02	3.3	600.00	3.64	Yes	Yes
SD00401	4	SF	ENDOSULFAN I (ALPHA)	UG/KG	4.70	UJ	0.47		2.9		1.62		Yes
SD00502	5	SB	ENDOSULFAN I (ALPHA)	UG/KG	5.00	UJ	0.50		2.9		1.72		Yes
SD00901	9	SF	ENDOSULFAN I (ALPHA)	UG/KG	6.10	UJ	0.61		2.9		2.10		Yes
SD00902	9	SB	ENDOSULFAN I (ALPHA)	UG/KG	5.30	UJ	0.53		2.9		1.83		Yes
SD01101	11	SF	ENDOSULFAN I (ALPHA)	UG/KG	3.30	UJ	0.33		2.9		1.14		Yes
SD01102	11	SB	ENDOSULFAN I (ALPHA)	UG/KG	5.00	UJ	0.50		2.9		1.72		Yes
SD01801	18	SF	ENDOSULFAN I (ALPHA)	UG/KG	2.90	UJ	0.29		2.9		1.00		
SD02202	22	SB	ENDOSULFAN I (ALPHA)	UG/KG	4.60	UJ	0.46		2.9		1.59		Yes
SD10901	109	SF	ENDOSULFAN I (ALPHA)	UG/KG	6.10	UJ	0.61		2.9		2.10		Yes
SD00401	4	SF	ENDOSULFAN SULFATE	UG/KG	9.20	UJ	0.92		5.4		1.70		Yes
SD00901	9	SF	ENDOSULFAN SULFATE	UG/KG	12.00	UJ	1.20		5.4		2.22		Yes
SD00902	9	SB	ENDOSULFAN SULFATE	UG/KG	10.00	UJ	1.00		5.4		1.85		Yes
SD01102	11	SB	ENDOSULFAN SULFATE	UG/KG	9.70	UJ	0.97		5.4		1.80		Yes
SD02202	22	SB	ENDOSULFAN SULFATE	UG/KG	8.90	UJ	0.89		5.4		1.65		Yes
SD10901	109	SF	ENDOSULFAN SULFATE	UG/KG	12.00	UJ	1.20		5.4		2.22		Yes
SD00401	4	SF	ENDRIN	UG/KG	9.20	UJ	0.92	0.02	3.3	460.00	2.79	Yes	Yes
SD00402	4	SB	ENDRIN	UG/KG	4.80	UJ	0.48	0.02	3.3	240.00	1.45	Yes	Yes
SD00502	5	SB	ENDRIN	UG/KG	9.70	UJ	0.97	0.02	3.3	485.00	2.94	Yes	Yes
SD00901	9	SF	ENDRIN	UG/KG	12.00	UJ	1.20	0.02	3.3	600.00	3.64	Yes	Yes
SD00902	9	SB	ENDRIN	UG/KG	10.00	UJ	1.00	0.02	3.3	500.00	3.03	Yes	Yes
SD01001	10	SF	ENDRIN	UG/KG	4.00	UJ	0.40	0.02	3.3	200.00	1.21	Yes	Yes
SD01102	11	SB	ENDRIN	UG/KG	9.70	UJ	0.97	0.02	3.3	485.00	2.94	Yes	Yes
SD01801	18	SF	ENDRIN	UG/KG	5.70	UJ	0.57	0.02	3.3	285.00	1.73	Yes	Yes
SD02202	22	SB	ENDRIN	UG/KG	8.90	UJ	0.89	0.02	3.3	445.00	2.70	Yes	Yes
SD10601	106	SF	ENDRIN	UG/KG	4.60	UJ	0.46	0.02	3.3	230.00	1.39	Yes	Yes
SD10901	109	SF	ENDRIN	UG/KG	12.00	UJ	1.20	0.02	3.3	600.00	3.64	Yes	Yes

Pensacola NAS Pesticide/PCB Hazard Quotient Analysis

Sample ID	Grid	Depth	Compound	Units	Amount	FNT	10% of Non-detects	Effects Value (ug/kg)	Benchmark Value (ug/kg)	HQ EV	HQ BV	HQ EV > 1	HQ BV >1
SD00401	4	SF	ENDRIN ALDEHYDE	UG/KG	9.20	UJ	0.92						
SD00402	4	SB	ENDRIN ALDEHYDE	UG/KG	4.80	UJ	0.48						
SD00502	5	SB	ENDRIN ALDEHYDE	UG/KG	9.70	UJ	0.97						
SD00901	9	SF	ENDRIN ALDEHYDE	UG/KG	12.00	UJ	1.20						
SD00902	9	SB	ENDRIN ALDEHYDE	UG/KG	10.00	UJ	1.00						
SD01001	10	SF	ENDRIN ALDEHYDE	UG/KG	4.00	UJ	0.40						
SD01101	11	SF	ENDRIN ALDEHYDE	UG/KG	6.50	UJ	0.65						
SD01102	11	SB	ENDRIN ALDEHYDE	UG/KG	9.70	UJ	0.97						
SD01801	18	SF	ENDRIN ALDEHYDE	UG/KG	5.70	UJ	0.57						
SD02202	22	SB	ENDRIN ALDEHYDE	UG/KG	8.90	UJ	0.89						
SD10601	106	SF	ENDRIN ALDEHYDE	UG/KG	4.60	UJ	0.46						
SD10901	109	SF	ENDRIN ALDEHYDE	UG/KG	12.00	UJ	1.20						
SD00401	4	SF	ENDRIN KETONE	UG/KG	9.20	UJ	0.92						
SD00402	4	SB	ENDRIN KETONE	UG/KG	4.80	UJ	0.48						
SD00502	5	SB	ENDRIN KETONE	UG/KG	9.70	UJ	0.97						
SD00901	9	SF	ENDRIN KETONE	UG/KG	12.00	UJ	1.20						
SD00902	9	SB	ENDRIN KETONE	UG/KG	10.00	UJ	1.00						
SD01001	10	SF	ENDRIN KETONE	UG/KG	4.00	UJ	0.40						
SD01101	11	SF	ENDRIN KETONE	UG/KG	6.50	UJ	0.65						
SD01801	18	SF	ENDRIN KETONE	UG/KG	5.70	UJ	0.57						
SD02202	22	SB	ENDRIN KETONE	UG/KG	8.90	UJ	0.89						
SD10601	106	SF	ENDRIN KETONE	UG/KG	4.60	UJ	0.46						
SD10901	109	SF	ENDRIN KETONE	UG/KG	12.00	UJ	1.20						
SD00401	4	SF	GAMMA-BHC (LINDANE)	UG/KG	4.70	UJ	0.47	0.32	3.3	14.69	1.42	Yes	Yes
SD00502	5	SB	GAMMA-BHC (LINDANE)	UG/KG	5.00	UJ	0.50	0.32	3.3	15.63	1.52	Yes	Yes
SD00901	9	SF	GAMMA-BHC (LINDANE)	UG/KG	6.10	UJ	0.61	0.32	3.3	19.06	1.85	Yes	Yes
SD00902	9	SB	GAMMA-BHC (LINDANE)	UG/KG	5.30	UJ	0.53	0.32	3.3	16.56	1.61	Yes	Yes
SD01101	11	SF	GAMMA-BHC (LINDANE)	UG/KG	3.30	UJ	0.33	0.32	3.3	10.31	1.00	Yes	
SD01102	11	SB	GAMMA-BHC (LINDANE)	UG/KG	5.00	UJ	0.50	0.32	3.3	15.63	1.52	Yes	Yes
SD02202	22	SB	GAMMA-BHC (LINDANE)	UG/KG	4.60	UJ	0.46	0.32	3.3	14.38	1.39	Yes	Yes
SD10901	109	SF	GAMMA-BHC (LINDANE)	UG/KG	6.10	UJ	0.61	0.32	3.3	19.06	1.85	Yes	Yes
SD00401	4	SF	GAMMA-CHLORDANE /2	UG/KG	4.70	UJ	0.47	0.5	3.3	9.40	1.42	Yes	Yes
SD00502	5	SB	GAMMA-CHLORDANE /2	UG/KG	5.00	UJ	0.50	0.5	3.3	10.00	1.52	Yes	Yes
SD00901	9	SF	GAMMA-CHLORDANE /2	UG/KG	6.10	UJ	0.61	0.5	3.3	12.20	1.85	Yes	Yes
SD00902	9	SB	GAMMA-CHLORDANE /2	UG/KG	5.30	UJ	0.53	0.5	3.3	10.60	1.61	Yes	Yes

Pensacola NAS Pesticide/PCB Hazard Quotient Analysis

Sample ID	Grid	Depth	Compound	Units	Amount	FNT	10% of Non-detects	Effects Value (ug/kg)	Benchmark Value (ug/kg)	HQ EV	HQ BV	HQ EV > 1	HQ BV >1
SD01101	11	SF	GAMMA-CHLORDANE /2	UG/KG	3.30	UJ	0.33	0.5	3.3	6.60	1.00	Yes	
SD01102	11	SB	GAMMA-CHLORDANE /2	UG/KG	5.00	UJ	0.50	0.5	3.3	10.00	1.52	Yes	Yes
SD02202	22	SB	GAMMA-CHLORDANE /2	UG/KG	4.60	UJ	0.46	0.5	3.3	9.20	1.39	Yes	Yes
SD10901	109	SF	GAMMA-CHLORDANE /2	UG/KG	6.10	UJ	0.61	0.5	3.3	12.20	1.85	Yes	Yes
SD00401	4	SF	HEPTACHLOR	UG/KG	4.70	UJ	0.47						
SD00402	4	SB	HEPTACHLOR	UG/KG	2.50	UJ	0.25						
SD00502	5	SB	HEPTACHLOR	UG/KG	5.00	UJ	0.50						
SD00901	9	SF	HEPTACHLOR	UG/KG	6.10	UJ	0.61						
SD00902	9	SB	HEPTACHLOR	UG/KG	5.30	UJ	0.53						
SD01001	10	SF	HEPTACHLOR	UG/KG	2.10	UJ	0.21						
SD01101	11	SF	HEPTACHLOR	UG/KG	3.30	UJ	0.33						
SD01102	11	SB	HEPTACHLOR	UG/KG	5.00	UJ	0.50						
SD01801	18	SF	HEPTACHLOR	UG/KG	2.90	UJ	0.29						
SD02202	22	SB	HEPTACHLOR	UG/KG	4.60	UJ	0.46						
SD10601	106	SF	HEPTACHLOR	UG/KG	2.40	UJ	0.24						
SD10901	109	SF	HEPTACHLOR	UG/KG	6.10	UJ	0.61						
SD00401	4	SF	HEPTACHLOR EPOXIDE	UG/KG	4.70	UJ	0.47		0.6		7.83		Yes
SD00402	4	SB	HEPTACHLOR EPOXIDE	UG/KG	2.50	UJ	0.25		0.6		4.17		Yes
SD00502	5	SB	HEPTACHLOR EPOXIDE	UG/KG	5.00	UJ	0.50		0.6		8.33		Yes
SD00901	9	SF	HEPTACHLOR EPOXIDE	UG/KG	6.10	UJ	0.61		0.6		10.17		Yes
SD00902	9	SB	HEPTACHLOR EPOXIDE	UG/KG	5.30	UJ	0.53		0.6		8.83		Yes
SD01001	10	SF	HEPTACHLOR EPOXIDE	UG/KG	2.10	UJ	0.21		0.6		3.50		Yes
SD01102	11	SB	HEPTACHLOR EPOXIDE	UG/KG	5.00	UJ	0.50		0.6		8.33		Yes
SD01801	18	SF	HEPTACHLOR EPOXIDE	UG/KG	2.90	UJ	0.29		0.6		4.83		Yes
SD02202	22	SB	HEPTACHLOR EPOXIDE	UG/KG	4.60	UJ	0.46		0.6		7.67		Yes
SD10601	106	SF	HEPTACHLOR EPOXIDE	UG/KG	2.40	UJ	0.24		0.6		4.00		Yes
SD10901	109	SF	HEPTACHLOR EPOXIDE	UG/KG	6.10	UJ	0.61		0.6		10.17		Yes
SD00401	4	SF	METHOXYCHLOR	UG/KG	47.00	UJ	4.70		19		2.47		Yes
SD00502	5	SB	METHOXYCHLOR	UG/KG	50.00	UJ	5.00		19		2.63		Yes
SD00901	9	SF	METHOXYCHLOR	UG/KG	61.00	UJ	6.10		19		3.21		Yes
SD01101	11	SF	METHOXYCHLOR	UG/KG	33.00	UJ	3.30		19		1.74		Yes
SD01102	11	SB	METHOXYCHLOR	UG/KG	50.00	UJ	5.00		19		2.63		Yes
SD01801	18	SF	METHOXYCHLOR	UG/KG	29.00	UJ	2.90		19		1.53		Yes
SD02202	22	SB	METHOXYCHLOR	UG/KG	46.00	UJ	4.60		19		2.42		Yes
SD10601	106	SF	METHOXYCHLOR	UG/KG	24.00	UJ	2.40		19		1.26		Yes

Pensacola NAS Pesticide/PCB Hazard Quotient Analysis

Sample ID	Grid	Depth	Compound	Units	Amount	FNT	10% of Non-detects	Effects Value (ug/kg)	Benchmark Value (ug/kg)	HQ EV	HQ BV	HQ EV > 1	HQ BV >1
SD00401	4	SF	PCB-1016 (AROCLOR 1016)	UG/KG	92.00	UJ	9.20		33		2.79		Yes
SD00402	4	SB	PCB-1016 (AROCLOR 1016)	UG/KG	48.00	UJ	4.80		33		1.45		Yes
SD00502	5	SB	PCB-1016 (AROCLOR 1016)	UG/KG	97.00	UJ	9.70		33		2.94		Yes
SD00901	9	SF	PCB-1016 (AROCLOR 1016)	UG/KG	120.00	UJ	12.00		33		3.64		Yes
SD00902	9	SB	PCB-1016 (AROCLOR 1016)	UG/KG	100.00	UJ	10.00		33		3.03		Yes
SD01001	10	SF	PCB-1016 (AROCLOR 1016)	UG/KG	40.00	UJ	4.00		33		1.21		Yes
SD01101	11	SF	PCB-1016 (AROCLOR 1016)	UG/KG	65.00	UJ	6.50		33		1.97		Yes
SD01102	11	SB	PCB-1016 (AROCLOR 1016)	UG/KG	97.00	UJ	9.70		33		2.94		Yes
SD01801	18	SF	PCB-1016 (AROCLOR 1016)	UG/KG	57.00	UJ	5.70		33		1.73		Yes
SD02202	22	SB	PCB-1016 (AROCLOR 1016)	UG/KG	89.00	UJ	8.90		33		2.70		Yes
SD10601	106	SF	PCB-1016 (AROCLOR 1016)	UG/KG	46.00	UJ	4.60		33		1.39		Yes
SD10901	109	SF	PCB-1016 (AROCLOR 1016)	UG/KG	120.00	UJ	12.00		33		3.64		Yes
SD00401	4	SF	PCB-1221 (AROCLOR 1221)	UG/KG	190.00	UJ	19.00		21.6		8.80		Yes
SD00402	4	SB	PCB-1221 (AROCLOR 1221)	UG/KG	97.00	UJ	9.70		21.6		4.49		Yes
SD00502	5	SB	PCB-1221 (AROCLOR 1221)	UG/KG	200.00	UJ	20.00		21.6		9.26		Yes
SD00901	9	SF	PCB-1221 (AROCLOR 1221)	UG/KG	240.00	UJ	24.00		21.6		11.11		Yes
SD00902	9	SB	PCB-1221 (AROCLOR 1221)	UG/KG	210.00	UJ	21.00		21.6		9.72		Yes
SD01001	10	SF	PCB-1221 (AROCLOR 1221)	UG/KG	82.00	UJ	8.20		21.6		3.80		Yes
SD01101	11	SF	PCB-1221 (AROCLOR 1221)	UG/KG	130.00	UJ	13.00		21.6		6.02		Yes
SD01102	11	SB	PCB-1221 (AROCLOR 1221)	UG/KG	200.00	UJ	20.00		21.6		9.26		Yes
SD01801	18	SF	PCB-1221 (AROCLOR 1221)	UG/KG	120.00	UJ	12.00		21.6		5.56		Yes
SD02202	22	SB	PCB-1221 (AROCLOR 1221)	UG/KG	180.00	UJ	18.00		21.6		8.33		Yes
SD10601	106	SF	PCB-1221 (AROCLOR 1221)	UG/KG	94.00	UJ	9.40		21.6		4.35		Yes
SD10901	109	SF	PCB-1221 (AROCLOR 1221)	UG/KG	240.00	UJ	24.00		21.6		11.11		Yes
SD00401	4	SF	PCB-1232 (AROCLOR 1232)	UG/KG	92.00	UJ	9.20		21.6		4.26		Yes
SD00402	4	SB	PCB-1232 (AROCLOR 1232)	UG/KG	48.00	UJ	4.80		21.6		2.22		Yes
SD00502	5	SB	PCB-1232 (AROCLOR 1232)	UG/KG	97.00	UJ	9.70		21.6		4.49		Yes
SD00901	9	SF	PCB-1232 (AROCLOR 1232)	UG/KG	120.00	UJ	12.00		21.6		5.56		Yes
SD00902	9	SB	PCB-1232 (AROCLOR 1232)	UG/KG	100.00	UJ	10.00		21.6		4.63		Yes
SD01001	10	SF	PCB-1232 (AROCLOR 1232)	UG/KG	40.00	UJ	4.00		21.6		1.85		Yes
SD01101	11	SF	PCB-1232 (AROCLOR 1232)	UG/KG	65.00	UJ	6.50		21.6		3.01		Yes
SD01102	11	SB	PCB-1232 (AROCLOR 1232)	UG/KG	97.00	UJ	9.70		21.6		4.49		Yes
SD01801	18	SF	PCB-1232 (AROCLOR 1232)	UG/KG	57.00	UJ	5.70		21.6		2.64		Yes
SD02202	22	SB	PCB-1232 (AROCLOR 1232)	UG/KG	89.00	UJ	8.90		21.6		4.12		Yes
SD10601	106	SF	PCB-1232 (AROCLOR 1232)	UG/KG	46.00	UJ	4.60		21.6		2.13		Yes

Pensacola NAS Pesticide/PCB Hazard Quotient Analysis

Sample ID	Grid	Depth	Compound	Units	Amount	FNT	10% of Non-detects	Effects Value (ug/kg)	Benchmark Value (ug/kg)	HQ EV	HQ BV	HQ EV > 1	HQ BV >1
SD10901	109	SF	PCB-1232 (AROCLOR 1232)	UG/KG	120.00	UJ	12.00		21.6		5.56		Yes
SD00401	4	SF	PCB-1242 (AROCLOR 1242)	UG/KG	92.00	UJ	9.20		21.6		4.26		Yes
SD00402	4	SB	PCB-1242 (AROCLOR 1242)	UG/KG	48.00	UJ	4.80		21.6		2.22		Yes
SD00502	5	SB	PCB-1242 (AROCLOR 1242)	UG/KG	97.00	UJ	9.70		21.6		4.49		Yes
SD00901	9	SF	PCB-1242 (AROCLOR 1242)	UG/KG	120.00	UJ	12.00		21.6		5.56		Yes
SD00902	9	SB	PCB-1242 (AROCLOR 1242)	UG/KG	100.00	UJ	10.00		21.6		4.63		Yes
SD01001	10	SF	PCB-1242 (AROCLOR 1242)	UG/KG	40.00	UJ	4.00		21.6		1.85		Yes
SD01101	11	SF	PCB-1242 (AROCLOR 1242)	UG/KG	65.00	UJ	6.50		21.6		3.01		Yes
SD01102	11	SB	PCB-1242 (AROCLOR 1242)	UG/KG	97.00	UJ	9.70		21.6		4.49		Yes
SD01801	18	SF	PCB-1242 (AROCLOR 1242)	UG/KG	57.00	UJ	5.70		21.6		2.64		Yes
SD02202	22	SB	PCB-1242 (AROCLOR 1242)	UG/KG	89.00	UJ	8.90		21.6		4.12		Yes
SD10601	106	SF	PCB-1242 (AROCLOR 1242)	UG/KG	46.00	UJ	4.60		21.6		2.13		Yes
SD10901	109	SF	PCB-1242 (AROCLOR 1242)	UG/KG	120.00	UJ	12.00		21.6		5.56		Yes
SD00401	4	SF	PCB-1248 (AROCLOR 1248)	UG/KG	92.00	UJ	9.20		21.6		4.26		Yes
SD00402	4	SB	PCB-1248 (AROCLOR 1248)	UG/KG	48.00	UJ	4.80		21.6		2.22		Yes
SD00502	5	SB	PCB-1248 (AROCLOR 1248)	UG/KG	97.00	UJ	9.70		21.6		4.49		Yes
SD00901	9	SF	PCB-1248 (AROCLOR 1248)	UG/KG	120.00	UJ	12.00		21.6		5.56		Yes
SD00902	9	SB	PCB-1248 (AROCLOR 1248)	UG/KG	100.00	UJ	10.00		21.6		4.63		Yes
SD01001	10	SF	PCB-1248 (AROCLOR 1248)	UG/KG	40.00	UJ	4.00		21.6		1.85		Yes
SD01101	11	SF	PCB-1248 (AROCLOR 1248)	UG/KG	65.00	UJ	6.50		21.6		3.01		Yes
SD01102	11	SB	PCB-1248 (AROCLOR 1248)	UG/KG	97.00	UJ	9.70		21.6		4.49		Yes
SD01801	18	SF	PCB-1248 (AROCLOR 1248)	UG/KG	57.00	UJ	5.70		21.6		2.64		Yes
SD02202	22	SB	PCB-1248 (AROCLOR 1248)	UG/KG	89.00	UJ	8.90		21.6		4.12		Yes
SD10601	106	SF	PCB-1248 (AROCLOR 1248)	UG/KG	46.00	UJ	4.60		21.6		2.13		Yes
SD10901	109	SF	PCB-1248 (AROCLOR 1248)	UG/KG	120.00	UJ	12.00		21.6		5.56		Yes
SD00401	4	SF	PCB-1254 (AROCLOR 1254)	UG/KG	92.00	UJ	9.20		21.6		4.26		Yes
SD00402	4	SB	PCB-1254 (AROCLOR 1254)	UG/KG	48.00	UJ	4.80		21.6		2.22		Yes
SD00502	5	SB	PCB-1254 (AROCLOR 1254)	UG/KG	97.00	UJ	9.70		21.6		4.49		Yes
SD00901	9	SF	PCB-1254 (AROCLOR 1254)	UG/KG	120.00	UJ	12.00		21.6		5.56		Yes
SD00902	9	SB	PCB-1254 (AROCLOR 1254)	UG/KG	100.00	UJ	10.00		21.6		4.63		Yes
SD01001	10	SF	PCB-1254 (AROCLOR 1254)	UG/KG	40.00	UJ	4.00		21.6		1.85		Yes
SD01101	11	SF	PCB-1254 (AROCLOR 1254)	UG/KG	65.00	UJ	6.50		21.6		3.01		Yes
SD01102	11	SB	PCB-1254 (AROCLOR 1254)	UG/KG	97.00	UJ	9.70		21.6		4.49		Yes
SD01801	18	SF	PCB-1254 (AROCLOR 1254)	UG/KG	57.00	UJ	5.70		21.6		2.64		Yes
SD02202	22	SB	PCB-1254 (AROCLOR 1254)	UG/KG	89.00	UJ	8.90		21.6		4.12		Yes

Pensacola NAS Pesticide/PCB Hazard Quotient Analysis

Sample ID	Grid	Depth	Compound	Units	Amount	FNT	10% of Non-detects	Effects Value (ug/kg)	Benchmark Value (ug/kg)	HQ EV	HQ BV	HQ EV > 1	HQ BV >1
SD10601	106	SF	PCB-1254 (AROCLOR 1254)	UG/KG	46.00	UJ	4.60		21.6		2.13		Yes
SD10901	109	SF	PCB-1254 (AROCLOR 1254)	UG/KG	120.00	UJ	12.00		21.6		5.56		Yes
SD00402	4	SB	PCB-1260 (AROCLOR 1260)	UG/KG	48.00	UJ	4.80		21.6		2.22		Yes
SD00502	5	SB	PCB-1260 (AROCLOR 1260)	UG/KG	97.00	UJ	9.70		21.6		4.49		Yes
SD00901	9	SF	PCB-1260 (AROCLOR 1260)	UG/KG	120.00	UJ	12.00		21.6		5.56		Yes
SD00902	9	SB	PCB-1260 (AROCLOR 1260)	UG/KG	100.00	UJ	10.00		21.6		4.63		Yes
SD01001	10	SF	PCB-1260 (AROCLOR 1260)	UG/KG	40.00	UJ	4.00		21.6		1.85		Yes
SD01101	11	SF	PCB-1260 (AROCLOR 1260)	UG/KG	65.00	UJ	6.50		21.6		3.01		Yes
SD01102	11	SB	PCB-1260 (AROCLOR 1260)	UG/KG	97.00	UJ	9.70		21.6		4.49		Yes
SD01801	18	SF	PCB-1260 (AROCLOR 1260)	UG/KG	57.00	UJ	5.70		21.6		2.64		Yes
SD02202	22	SB	PCB-1260 (AROCLOR 1260)	UG/KG	89.00	UJ	8.90		21.6		4.12		Yes
SD10601	106	SF	PCB-1260 (AROCLOR 1260)	UG/KG	46.00	UJ	4.60		21.6		2.13		Yes
SD10901	109	SF	PCB-1260 (AROCLOR 1260)	UG/KG	120.00	UJ	12.00		21.6		5.56		Yes
SD00401	4	SF	TOXAPHENE	UG/KG	470.00	UJ	47.00		28		16.79		Yes
SD00402	4	SB	TOXAPHENE	UG/KG	250.00	UJ	25.00		28		8.93		Yes
SD00502	5	SB	TOXAPHENE	UG/KG	500.00	UJ	50.00		28		17.86		Yes
SD00901	9	SF	TOXAPHENE	UG/KG	610.00	UJ	61.00		28		21.79		Yes
SD00902	9	SB	TOXAPHENE	UG/KG	530.00	UJ	53.00		28		18.93		Yes
SD01001	10	SF	TOXAPHENE	UG/KG	210.00	UJ	21.00		28		7.50		Yes
SD01101	11	SF	TOXAPHENE	UG/KG	330.00	UJ	33.00		28		11.79		Yes
SD01102	11	SB	TOXAPHENE	UG/KG	500.00	UJ	50.00		28		17.86		Yes
SD01801	18	SF	TOXAPHENE	UG/KG	290.00	UJ	29.00		28		10.36		Yes
SD02202	22	SB	TOXAPHENE	UG/KG	460.00	UJ	46.00		28		16.43		Yes
SD10601	106	SF	TOXAPHENE	UG/KG	240.00	UJ	24.00		28		8.57		Yes
SD10901	109	SF	TOXAPHENE	UG/KG	610.00	UJ	61.00		28		21.79		Yes

Pensacola NAS Pesticide/PCB Hazard Quotient Analysis

Sample ID	Grid	Depth	Compound	Units	Amount	FNT	10% of Non-detects	Effects Value (ug/kg)	Benchmark Value (ug/kg)	HQ EV	HQ BV	HQ EV > 1	HQ BV >1
SD10601	106	SF	PCB-1254 (AROCLOR 1254)	UG/KG	46.00	UJ	4.60		21.6		2.13		Yes
SD10901	109	SF	PCB-1254 (AROCLOR 1254)	UG/KG	120.00	UJ	12.00		21.6		5.56		Yes
SD00402	4	SB	PCB-1260 (AROCLOR 1260)	UG/KG	48.00	UJ	4.80		21.6		2.22		Yes
SD00502	5	SB	PCB-1260 (AROCLOR 1260)	UG/KG	97.00	UJ	9.70		21.6		4.49		Yes
SD00901	9	SF	PCB-1260 (AROCLOR 1260)	UG/KG	120.00	UJ	12.00		21.6		5.56		Yes
SD00902	9	SB	PCB-1260 (AROCLOR 1260)	UG/KG	100.00	UJ	10.00		21.6		4.63		Yes
SD01001	10	SF	PCB-1260 (AROCLOR 1260)	UG/KG	40.00	UJ	4.00		21.6		1.85		Yes
SD01101	11	SF	PCB-1260 (AROCLOR 1260)	UG/KG	65.00	UJ	6.50		21.6		3.01		Yes
SD01102	11	SB	PCB-1260 (AROCLOR 1260)	UG/KG	97.00	UJ	9.70		21.6		4.49		Yes
SD01801	18	SF	PCB-1260 (AROCLOR 1260)	UG/KG	57.00	UJ	5.70		21.6		2.64		Yes
SD02202	22	SB	PCB-1260 (AROCLOR 1260)	UG/KG	89.00	UJ	8.90		21.6		4.12		Yes
SD10601	106	SF	PCB-1260 (AROCLOR 1260)	UG/KG	46.00	UJ	4.60		21.6		2.13		Yes
SD10901	109	SF	PCB-1260 (AROCLOR 1260)	UG/KG	120.00	UJ	12.00		21.6		5.56		Yes
SD00401	4	SF	TOXAPHENE	UG/KG	470.00	UJ	47.00		28		16.79		Yes
SD00402	4	SB	TOXAPHENE	UG/KG	250.00	UJ	25.00		28		8.93		Yes
SD00502	5	SB	TOXAPHENE	UG/KG	500.00	UJ	50.00		28		17.86		Yes
SD00901	9	SF	TOXAPHENE	UG/KG	610.00	UJ	61.00		28		21.79		Yes
SD00902	9	SB	TOXAPHENE	UG/KG	530.00	UJ	53.00		28		18.93		Yes
SD01001	10	SF	TOXAPHENE	UG/KG	210.00	UJ	21.00		28		7.50		Yes
SD01101	11	SF	TOXAPHENE	UG/KG	330.00	UJ	33.00		28		11.79		Yes
SD01102	11	SB	TOXAPHENE	UG/KG	500.00	UJ	50.00		28		17.86		Yes
SD01801	18	SF	TOXAPHENE	UG/KG	290.00	UJ	29.00		28		10.36		Yes
SD02202	22	SB	TOXAPHENE	UG/KG	460.00	UJ	46.00		28		16.43		Yes
SD10601	106	SF	TOXAPHENE	UG/KG	240.00	UJ	24.00		28		8.57		Yes
SD10901	109	SF	TOXAPHENE	UG/KG	610.00	UJ	61.00		28		21.79		Yes

Appendix C
Negative Control Test Results

Phys.

C-17-1	IJ-12	GH12	IJ34	GH34	EF-23	C-17-2	IJ56	GH56	EF45	CD-23	C-17-3	18	22	KL34	GH67
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4
5	5	5	5	5	5	5	5	5	4	5	5	5	5	4	4
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4
5	5	5	5	4	5	5	5	5	5	5	3	5	4	4	5
4	5	5	5	5	4	5	5	5	5	5	5	3	5	5	5
5	5	5	4	5	5	5	4	5	5	5	4	5	4	5	3
5	5	5	5	5	5	5	5	4	5	5	5	5	5	5	4
5	5	5	5	5	5	5	5	5	5	5	5	3	4	5	5
C-17	0.167141	0.167141	0.5	0.5	0.5		0.167140972	0.16714097	0.167141			0.385163	0.5	0.346347	0.159482
Site 18	0.074452	0.074452	0.15130405	0.151304	0.151304		0.151304055	0.15130405	0.151304	0.074451937			0.371911	0.252837	0.276792
Site 22	0.029823	0.029823	0.13910927	0.139109	0.139109		0.139109273	0.13910927	0.139109	0.029823082		0.371911		0.30928	0.123079
C-17-1	IJ-12	GH12	IJ34	GH34	EF-23	C-17-2	IJ56	GH56	EF45	CD-23	C-17-3	18	22	KL34	GH67
0.3	0.36	0.38	0.42	0.42	0.34	0.44	0.48	0.4	0.42	0.4	0.26	0.36	0.34	0.34	0.25
0.38	0.36	0.38	0.4	0.32	0.36	0.4	0.6	0.36	0.4	0.52	0.28	0.34	0.26	0.35	0.3
0.32	0.32	0.3	0.38	0.18	0.32	0.46	0.48	0.42	0.5	0.44	0.3	0.26	0.24	0.24	0.33
0.36	0.38	0.38	0.38	0.32	0.32	0.4	0.48	0.42	0.32	0.48	0.43	0.3	0.35	0.3	0.24
0.3	0.32	0.26	0.44	0.35	0.3	0.38	0.5	0.4	0.4	0.4	0.26	0.27	0.22	0.3	0.24
0.3	0.38	0.36	0.34	0.3	0.4	0.32	0.47	0.4	0.3	0.44	0.35	0.26	0.37	0.4	0.25
0.32	0.4	0.36	0.36	0.42	0.36	0.38	0.6	0.4	0.34	0.48	0.36	0.24	0.38	0.44	0.32
0.26	0.36	0.34	0.4	0.46	0.34	0.4	0.6	0.42	0.28	0.58	0.32	0.2	0.42	0.36	0.34
C-17	0.011548	0.099731	0.00049766	0.484764	0.084863		0.000121003	0.38261623	0.186378	0.009279845		0.07958	0.470382	0.246624	0.089559
Site 18	0.000877	0.007944	7.8598E-05	0.042506	0.005206		2.73673E-07	1.0848E-05	0.006263	5.83321E-06			0.095265	0.023977	0.419008
Site 22	0.098583	0.233593	0.01563756	0.283967	0.243871		1.5458E-05	0.00487529	0.107569	0.000367307		0.095265		0.294863	0.10856
C-17-1	IJ-12	GH12	IJ34	GH34	EF-23	C-17-2	IJ56	GH56	EF45	CD-23	C-17-3	18	22	KL34	GH67
# females	% w/eggs														
17	20	12	17	14	15	15	16	17	16	20	17	15	9	17	13
52.9	85	91.7	94.1	100	66.7	93.3	93.8	88.2	75	95	52.9	20	22.2	88.2	69.2
std dev															
0.353553	0	0	0.35355339	0.353553	0.353553	0	0.353553391	0.35355339	0.353553	0	0.744024	0.92582	0.517549	0.46291	0.707107
Mean															
4.875	5	5	4.875	4.875	4.875	5	4.875	4.875	4.875	5	4.625	4.5	4.625	4.75	4.25
CV															
0.072	0	0	0.072	0.072	0.072	0	0.072	0.072	0.072	0	0.16	0.205	0.111	0.097	0.166
CV = %															
7.2	0	0	7.2	7.2	7.2	0	7.2	7.2	7.2	0	16	20.5	11.1	9.7	16.6

Lepto

C-17-1	IJ-12	GH12	IJ34	GH34	EF-23	C-17-2	IJ56	GH56	EF45	CD-23	C-17-3	18	22	KL34	GH67
20	20	17	20	18	19	20	17	15	15	17	20	20	20	19	20
18	16	17	18	18	20	17	16	20	15	15	20	19	19	20	19
20	19	17	19	20	18	17	17	18	13	15	20	20	19	19	20
17	17	17	19	19	19	20	15	12	16	15	20	20	19	20	20
18	17	20	19	20		20	16	17	14	16					
C-17	0.211785	0.136228	0.285811	0.303756	0.309508		0.006768919	0.079964	0.000774985	0.002527805		0.177959	0.012004	0.066987	0.177959
Station 18	0.029037	0.009867	0.058823	0.108419	0.084114		7.27605E-05	0.034573	3.52558E-05	3.7849E-05			0.103516	0.268482	0.5
Station 22	0.068151	0.027172	0.285414	0.332329	0.31011		0.000186368	0.055405	6.75868E-05	8.54578E-05		0.103516		0.268482	0.103516
C-17-1	IJ-12	GH12	IJ34	GH34	EF-23	C-17-2	IJ56	GH56	EF45	CD-23	C-17-3	18	22	KL34	GH67
0.16	0.13	0.16	0.2	0.18	0.13	0.28	0.37	0.29	0.33	0.26	0.18	0.11	0.14	0.28	0.12
0.19	0.13	0.15	0.18	0.18	0.15	0.19	0.2	0.31	0.13	0.36	0.25	0.12	0.12	0.25	0.13
0.23	0.15	0.12	0.19	0.2	0.19	0.19	0.16	0.32	0.22	0.22	0.21	0.16	0.16	0.33	0.15
0.25	0.14	0.08	0.19	0.19	0.17	0.3	0.19	0.34	0.35	0.34	0.26	0.11	0.14	0.25	0.12
0.25	0.12	0.2	0.19	0.2		0.15	0.13	0.15	0.16	0.19					
C-17	0.001093	0.012379	0.093913	0.096914	0.022998		0.409656185	0.107648	0.384801717	0.135263086		0.001949	0.002823	0.047035	0.0015
Station 18	0.237899	0.259777	0.000305	0.00041	0.046649		0.061799926	0.002825	0.031539079	0.003255238			0.169376	0.000241	0.365179
Station 22	0.267809	0.467816	0.000215	0.00037	0.119166		0.093945824	0.004231	0.047079004	0.00495461		0.169376		0.000271	0.195129
Std dev															
1.341641	1.643168	1.341641	0.707107	1	0.816497	1.643168	0.836660027	3.04959	1.140175425	0.894427191	0	0.5	0.5	0.57735	0.5
Mean															
18.6	17.8	17.6	19	19	19	18.8	16.2	16.4	14.6	15.6	20	19.75	19.25	19.5	19.75
CV															
0.072	0.092	0.076	0.037	0.052	0.042	0.087	0.05	0.185	0.078	0.057	0	0.025	0.025	0.029	0.025
CV in %															
7.2	9.2	7.6	3.7	5.2	4.2	8.7	5	18.5	7.8	5.7	0	2.5	2.5	2.9	2.5

B&B Laboratories Project J99066
Report 00-413

Gulf of Mexico Sediment Evaluation
Grain Size Distribution
Client Submitted Samples

EPA Project No. QQ3006 OT-RT-98-001884

Sample Name	PBS0221	PBS0222	PBS0223	PBS0224
Client ID	ESC02	SR27	C17	Pcola12
Matrix	Sediment	Sediment	Sediment	Sediment
Received Date	12/9/99	12/9/99	12/9/99	12/9/99
Process Date	1/25/00	1/25/00	1/25/00	1/25/00
Method	Pipette	Pipette	Pipette	Pipette
Sample Weight (g)	2.936	16.738	4.448	4.816

Target Analysis	Percent (%)	Q	Percent (%)	Q	Percent (%)	Q	Percent (%)	Q
Sand	6.34%		97.61%		1.08%		12.79%	
Silt	28.95%		0.00%		52.83%		45.57%	
Clay	64.71%		2.39%		46.09%		44.64%	

Sample Name	PBS0225	PBS0226	PBS0227	PBS0228
Client ID	Pcola13	Pcola16	Pcola21	Pcola24
Matrix	Sediment	Sediment	Sediment	Sediment
Received Date	12/9/99	12/9/99	12/9/99	12/9/99
Process Date	1/25/00	1/25/00	1/25/00	1/25/00
Method	Pipette	Pipette	Pipette	Pipette
Sample Weight (g)	21.398	14.573	2.827	3.235

Target Analysis	Percent (%)	Q	Percent (%)	Q	Percent (%)	Q	Percent (%)	Q
Sand	96.26%		96.23%		9.80%		25.81%	
Silt	1.64%		0.00%		45.98%		46.37%	
Clay	2.10%		3.77%		44.22%		27.82%	

Sample Name	PBS0229	PBS0230	PBS0231
Client ID	Pcola28	Pcola36	Pcola38
Matrix	Sediment	Sediment	Sediment
Received Date	12/9/99	12/9/99	12/9/99
Process Date	1/25/00	1/25/00	1/25/00
Method	Pipette	Pipette	Pipette
Sample Weight (g)	17.685	3.019	6.507

Target Analysis	Percent (%)	Q	Percent (%)	Q	Percent (%)	Q
Sand	96.89%		23.82%		59.89%	
Silt	2.54%		33.12%		24.22%	
Clay	0.57%		43.06%		15.89%	

B&B Laboratories Project J99066
Report 00-413

Gulf of Mexico Sediment Evaluation
Total Organic Carbon
Client Submitted Samples

EPA Project No. QQ3006 OT-RT-98-001884

Sample Name	PBS0221	PBS0222	PBS0223	PBS0224
Client ID	Esc02	SR27	C17	Pcola12
Matrix	Sediment	Sediment	Sediment	Sediment
Received Date	12/9/99	12/9/99	12/9/99	12/9/99
Process Date	Mar-01-00	Mar-01-00	Mar-01-00	Mar-01-00
Method	SED-TOC	SED-TOC	SED-TOC	SED-TOC
Sample Weight (mg)	351.3	361.6	354.3	351.0

Target Analysis	% Carbon	Q	% Carbon	Q	% Carbon	Q	% Carbon	Q
TOC	2.90		0.15		3.90		4.35	

Sample Name	PBS0225	PBS0226	PBS0227	PBS0228
Client ID	Pcola13	Pcola16	Pcola21	Pcola24
Matrix	Sediment	Sediment	Sediment	Sediment
Received Date	12/9/99	12/9/99	12/9/99	12/9/99
Process Date	Mar-01-00	Mar-01-00	Mar-01-00	Mar-01-00
Method	SED-TOC	SED-TOC	SED-TOC	SED-TOC
Sample Weight (mg)	350.8	351.1	355.3	349.9

Target Analysis	% Carbon	Q	% Carbon	Q	% Carbon	Q	% Carbon	Q
TOC	0.15		0.13		3.12		5.11	

Sample Name	PBS0229	PBS0230	PBS0231
Client ID	Pcola28	Pcola36	Pcola38
Matrix	Sediment	Sediment	Sediment
Received Date	12/9/99	12/9/99	12/9/99
Process Date	Mar-01-00	Mar-01-00	Mar-01-00
Method	SED-TOC	SED-TOC	SED-TOC
Sample Weight (mg)	353.4	350.2	349.0

Target Analysis	% Carbon	Q	% Carbon	Q	% Carbon	Q
TOC	0.16		3.38		1.49	

Dry Weight

R&B Laboratories Project J99066
Report 00-413

EPA Gulf Breeze-Pen
Sediment
Polycyclic Aromatic Hydrocarbon Data
Client Submitted Samples

Client Project QQ3006
QT-RT-98-001884

Sample Name	PBS0221.D	PBS0222.D	PBS0223.D	PBS0224.D	PBS0225.D	PBS0226.D
Client Name	ESC 02	SR 27	C 17	Pcola 12	Pcola 13	Pcola 16
Matrix	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
Collection Date	11/15/99	12/1/99	12/1/99	11/17/99	12/3/99	11/17/99
Received Date	12/9/99	12/9/99	12/9/99	12/9/99	12/9/99	12/9/99
Extraction Date	12/21/99	12/21/99	12/21/99	12/21/99	12/21/99	12/21/99
Extraction Batch	ENV120	ENV120	ENV120	ENV120	ENV120	ENV120
Date Acquired	1/4/00	1/4/00	1/4/00	1/4/00	1/4/00	1/4/00
Method	PAH	PAH	PAH	PAH	PAH	PAH
Sample Dry Weight (g)	15.1	15.0	14.9	15.0	15.0	15.1
% Moisture	67	24	74	73	28	18
% Dry	33	76	26	27	72	82

Target Compounds	Su Corrected Conc. (ng/dry g)	Q	Su Corrected Conc. (ng/dry g)	Q	Su Corrected Conc. (ng/dry g)	Q	Su Corrected Conc. (ng/dry g)	Q	Su Corrected Conc. (ng/dry g)	Q	Su Corrected Conc. (ng/dry g)	Q
Naphthalene	28.0		0.6		12.9		25.7		2.4		1.5	
C1-Naphthalenes	71.4		0.3		13.0		22.6		1.7		0.5	
C2-Naphthalenes	58.7		0.4		13.3		14.0		1.7		0.8	
C3-Naphthalenes	50.0		0.3		11.2		12.1		1.8		0.6	
C4-Naphthalenes	39.3		0.4		8.7		17.1		1.2		0.4	
Biphenyl	7.1		0.1	J	3.0		4.5		0.3		0.2	
Acenaphthylene	9.8		0.1	J	6.0		20.8		1.6		0.7	
Acenaphthene	3.4		<0.1	U	2.0		9.4		2.7		0.1	J
Fluorene	7.8		<0.1	U	4.8		8.9		2.0		0.2	
C1-Fluorenes	13.4		0.3		5.4		12.0		1.3		0.4	
C2-Fluorenes	21.8		0.7		10.4		27.4		2.8		1.7	
C3-Fluorenes	19.0		0.4		11.1		35.0		0.8		0.5	
Phenanthrene	40.0		0.3		20.3		121		20.3		1.8	
Anthracene	25.8		0.1	J	11.8		47.5		5.9		0.9	
C1-Phenanthrenes/Anthracenes	47.7		0.2	J	12.0		63.9		7.2		1.8	
C2-Phenanthrenes/Anthracenes	46.0		0.4	J	12.8		56.7		10.3		1.5	
C3-Phenanthrenes/Anthracenes	46.4		0.2	J	10.8		44.0		7.6		1.1	
C4-Phenanthrenes/Anthracenes	38.8		0.2	J	35.8		42.5		2.5		1.0	
Dibenzothiophene	5.0		<0.1	U	1.9		7.7		1.0		0.1	
C1-Dibenzothiophenes	9.1		0.2		2.5		9.3		0.8		0.2	
C2-Dibenzothiophenes	13.4		0.2		5.5		24.0		1.0		0.5	
C3-Dibenzothiophenes	11.2		0.2		5.7		32.1		0.6		0.6	
Fluoranthene	105		0.4		38.4		649		45.7		4.6	
Pyrene	94.5		0.3		29.9		538		35.9		4.3	
C1-Fluoranthenes/Pyrenes	115		0.4		35.2		337		29.2		4.3	
Benz(a)anthracene	77.5		0.3		35.6		387		22.9		3.3	
Chrysene	56.1		0.4		19.1		446		27.8		4.1	
C1-Chrysenes	77.5		0.4		23.7		248		18.8		4.3	
C2-Chrysenes	57.9		0.6		21.0		175		10.6		3.0	
C3-Chrysenes	17.1		1.2		18.6		105		8.6		2.0	
C4-Chrysenes	3.9		0.3		3.9		55.3		3.2		0.4	
Benzo(b)fluoranthene	93.3		1.1		46.6		759		48.2		8.2	
Benzo(k)fluoranthene	20.9		0.6		10.0		215		11.2		1.9	
Benzo(e)pyrene	38.4		0.6		16.6		350		23.1		4.5	
Benzo(a)pyrene	43.2		0.6		18.8		428		31.6		5.0	
Perylene	64.4		0.3	J	45.7		138		8.6		2.3	
Indeno(1,2,3-c,d)pyrene	34.7		0.9		24.1		450		28.3		5.2	
Dibenzo(a,h)anthracene	9.2		0.3		4.6		99.7		5.8		1.0	
Benzo(g,h,i)perylene	28.9		0.9		18.9		375		25.5		5.8	
Total PAHs	1550		14.8		632		6410		461		81.5	
Individual Isomers												
2-Methylnaphthalene	44.8		0.2		9.4		16.1		1.0		0.3	
1-Methylnaphthalene	26.7		0.1	J	3.6		8.5		0.7		0.2	
2,6-Dimethylnaphthalene	25.4		0.3		11.0		8.2		1.0		0.7	
1,6,7-Trimethylnaphthalene	8.0		0.1	J	1.6		2.2		0.2		0.1	J
1-Methylphenanthrene	11.9		0.1		3.6		12.1		1.6		0.4	

Surrogate (Su)	Su Recovery (%)	Su Recovery (%)	Su Recovery (%)	Su Recovery (%)	Su Recovery (%)	Su Recovery (%)
Naphthalene-d8	53	54	41	61	72	61
Acenaphthene-d10	61	57	49	70	77	63
Phenanthrene-d10	59	62	50	73	81	70
Chrysene-d12	53	44	45	62	69	51
Perylene-d12	52	48	57	53	73	56

Qualifiers (Q): J=Below the MDL, U=Not detected, B=In procedural blank > 3x MDL, I=Interference, D=Diluted value, *=Outside QA limits, refer to narrative

Wet Weight

B&B Laboratories Project J99066
Report 00-413

EPA Gulf Breeze- Pen Sediment
Polycyclic Aromatic Hydrocarbon Data
Client Submitted Samples

Client Project QQ3006
QT-RT-98-001884

Sample Name	PBS0221.D	PBS0222.D	PBS0223.D	PBS0224.D	PBS0225.D	PBS0226.D
Client Name	ESC 02	SR 27	C 17	Pcola 12	Pcola 13	Pcola 16
Matrix	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
Collection Date	11/19/99	12/1/99	12/1/99	11/17/99	12/3/99	11/17/99
Received Date	12/9/99	12/9/99	12/9/99	12/9/99	12/9/99	12/9/99
Extraction Date	12/21/99	12/21/99	12/21/99	12/21/99	12/21/99	12/21/99
Extraction Batch	ENV120	ENV120	ENV120	ENV120	ENV120	ENV120
Date Acquired	1/4/00	1/4/00	1/4/00	1/4/00	1/4/00	1/4/00
Method	PAH	PAH	PAH	PAH	PAH	PAH
Sample Wet Weight (g)	46.26	19.78	57.88	54.63	20.88	18.52
% Moisture	67	24	74	73	28	18
% Dry	33	76	26	27	72	82

Target Compounds	Su Corrected Conc. (ng/wet g)	Q	Su Corrected Conc. (ng/wet g)	Q	Su Corrected Conc. (ng/wet g)	Q	Su Corrected Conc. (ng/wet g)	Q	Su Corrected Conc. (ng/wet g)	Q	Su Corrected Conc. (ng/wet g)	Q
Naphthalene	9.1		0.5		3.3		7.0		1.7		1.2	
C1-Naphthalenes	23.3		0.3		3.3		6.2		1.2		0.4	
C2-Naphthalenes	19.1		0.3		3.4		3.8		1.2		0.7	
C3-Naphthalenes	16.3		0.2		2.9		3.3		1.3		0.5	
C4-Naphthalenes	12.8		0.3		2.2		4.7		0.8		0.3	
Biphenyl	2.3		0.1	J	0.8		1.2		0.2		0.1	J
Acenaphthylene	3.2		0.1	J	1.5		5.7		1.2		0.6	
Acenaphthene	1.1		<0.1	U	0.5		2.6		2.0		0.1	
Fluorene	2.5		<0.1	U	1.2		2.4		1.5		0.2	
C1-Fluorenes	4.4		0.2		1.4		3.3		0.9		0.3	
C2-Fluorenes	7.1		0.5		2.7		7.5		2.0		1.4	
C3-Fluorenes	6.2		0.3		2.9		9.6		0.5		0.4	
Phenanthrene	13.0		0.2		5.2		33.2		14.7		1.5	
Anthracene	8.4		0.1	J	3.0		13.0		4.3		0.8	
C1-Phenanthrenes/Anthracenes	15.6		0.2	J	3.1		17.5		5.2		1.3	
C2-Phenanthrenes/Anthracenes	15.6		0.3	J	3.3		15.5		7.5		1.2	
C3-Phenanthrenes/Anthracenes	15.1		0.1	J	2.8		12.1		5.5		0.9	
C4-Phenanthrenes/Anthracenes	12.6		0.1	J	9.2		11.6		1.8		0.8	
Dibenzothiophene	1.6		<0.1	U	0.5		2.1		0.7		0.1	
C1-Dibenzothiophenes	3.0		0.1	J	0.6		2.6		0.4		0.2	
C2-Dibenzothiophenes	4.4		0.1	J	1.4		6.6		0.8		0.4	
C3-Dibenzothiophenes	3.6		0.1	J	1.5		8.8		0.4		0.5	
Fluoranthene	34.3		0.3		9.9		178		33.0		3.7	
Pyrene	30.8		0.2		7.7		147		26.0		3.5	
C1-Fluoranthenes/Pyrenes	37.6		0.3		9.0		92.3		20.4		3.5	
Benz(a)anthracene	25.2		0.2		9.1		106		16.5		2.7	
Chrysene	18.3		0.3		4.9		122		20.1		3.3	
C1-Chrysenes	25.2		0.3		6.1		68.1		13.6		3.5	
C2-Chrysenes	16.9		0.4		5.4		47.9		7.6		2.5	
C3-Chrysenes	5.6		0.9		4.8		28.8		6.2		1.7	
C4-Chrysenes	1.3		0.2		1.0		15.2		2.3		0.3	
Benzo(b)fluoranthene	30.4		0.8		12.0		208		34.9		6.7	
Benzo(k)fluoranthene	6.8		0.4		2.6		59		8.1		1.6	
Benzo(e)pyrene	11.9		0.4		4.3		85.9		16.7		3.8	
Benzo(a)pyrene	14.1		0.4		4.8		117		22.9		4.1	
Perylene	21.0		0.3	J	11.7		37.9		6.3		1.9	
Indeno(1,2,3-c,d)pyrene	11.3		0.7		6.2		124		20.5		4.3	
Dibenzo(a,h)anthracene	3.0		0.2		1.2		27.3		4.2		0.8	
Benzo(g,h,i)perylene	9.4		0.7		4.9		103		18.4		4.8	
Total PAHs	505		11.2		162		1760		334		66.5	
Individual Isomers												
2-Methylnaphthalene	14.6		0.2		2.4		4.4		0.7		0.3	
1-Methylnaphthalene	8.7		0.1		0.9		1.6		0.5		0.2	
2,6-Dimethylnaphthalene	8.3		0.2		2.8		2.3		0.7		0.8	
1,6,7-Trimethylnaphthalene	2.8		<0.1	U	0.4		0.6		0.2		<0.1	U
1-Methylphenanthrene	3.9		0.1		0.9		3.3		1.2		0.4	

Surrogate (Su)	Su Recovery (%)	Su Recovery (%)	Su Recovery (%)	Su Recovery (%)	Su Recovery (%)	Su Recovery (%)
Naphthalene-d8	53	54	41	61	72	61
Acenaphthene-d10	61	57	49	70	77	83
Phenanthrene-d10	59	62	50	73	81	70
Chrysene-d12	53	44	45	82	69	51
Perylene-d12	52	48	57	53	73	66

Qualifiers (Q): J=Below the MDL, U=Not detected, B=In procedural blank > 3x MDL, I=Interference, D=Diluted value, *=Outside QA limits, refer to narrative

Organochlorine Concentrations

Dry Weight

B&B Laboratories Project J99066
Report 00-413

EPA Gulf Breeze-Pen Sediment
Organochlorine Data
Client Submitted Samples

EPA Project No. QQ3008 OT-RT-98-001884

Sample Name	PBS0223	PBS0224	PBS0225	PBS0226
Client Name	C17	PCOLA12	PCOLA13	PCOLA16
Matrix	Sediment	Sediment	Sediment	Sediment
Collection Date	NA	NA	NA	NA
Received Date	9/23/99	9/23/99	9/23/99	9/23/99
Extraction Date	12/21/99	12/21/99	12/21/99	12/21/99
Extraction Batch	ENV120	ENV120	ENV120	ENV120
Date Acquired	1/3/00	1/3/00	1/3/00	1/3/00
Method	ECDDUAL.M	ECDDUAL.M	ECDDUAL.M	ECDDUAL.M
Sample Dry Weight (g)	14.87	14.98	14.97	15.10
% Dry	26	27	72	82

Target Compounds	Su Corrected Conc. (ng/dry g)	Q	Su Corrected Conc. (ng/dry g)	Q	Su Corrected Conc. (ng/dry g)	Q	Su Corrected Conc. (ng/dry g)	Q
Aldrin	<0.07	U	<0.07	U	<0.07	U	<0.07	U
Dieldrin	<0.06	U	5.60		0.10		<0.06	U
Endrin	0.10		0.10		<0.05	U	<0.05	U
Heptachlor	<0.06	U	0.50		<0.06	U	<0.06	U
Heptachlor-Epoxide	<0.08	U	0.50		0.10		<0.08	U
Oxychlordane	<0.07	U	1.10		<0.07	U	<0.07	U
Alpha-Chlordane	<0.05	U	9.50		0.10		<0.05	U
Gamma-Chlordane	<0.05	U	16.40		0.10		<0.05	U
Trans-Nonachlor	<0.05	U	7.40		0.10		<0.05	U
Cis-Nonachlor	0.20		5.10		<0.07	U	<0.07	U
Alpha-HCH	<0.12	U	1.10		<0.12	U	<0.12	U
Beta-HCH	<0.05	U	<0.05	U	<0.05	U	<0.05	U
Delta-HCH	<0.06	U	<0.06	U	<0.06	U	<0.06	U
Gamma-HCH	<0.05	U	0.10		<0.05	U	<0.05	U
2,4'-DDD	0.20		2.20		0.10		<0.05	U
4,4'-DDD	0.20		3.40		<0.08	U	<0.08	U
2,4'-DDE	0.20		0.20		<0.05	U	<0.05	U
4,4'-DDE	1.90		39.50		0.20		<0.05	U
2,4'-DDT	0.10		1.60		<0.09	U	<0.09	U
4,4'-DDT	0.20		3.10		0.10		<0.06	U
Hexachlorobenzene	<0.07	U	0.10		<0.07	U	<0.07	U
Endosulfan II	<0.06	U	0.50		<0.06	U	<0.06	U
Endosulfan I	<0.07	U	<0.07	U	<0.07	U	<0.07	U
Mirex	<0.08	U	<0.08	U	<0.08	U	<0.08	U
Chlorpyrifos	<0.12	U	<0.12	U	<0.12	U	<0.12	U
PCB8/5	0.10		0.10		<0.05	U	<0.05	U
PCB18	0.10		0.10		<0.08	U	<0.08	U
PCB28	0.10		1.30		<0.06	U	<0.06	U
PCB29	<0.06	U	<0.06	U	<0.06	U	<0.06	U
PCB44	0.10		0.70		<0.05	U	<0.05	U
PCB52	0.40		1.30		0.10		<0.05	U
PCB66	0.30		0.90		<0.09	U	<0.09	U
PCB87/115	0.10		0.90		<0.07	U	<0.07	U
PCB101/90	0.90		2.80		0.10		0.10	
PCB105	0.20		1.10		<0.06	U	<0.06	U
PCB118	0.50		2.40		0.10		<0.05	U
PCB126	0.10	J	0.60		<0.12	U	<0.12	U
PCB138	0.80		3.40		0.20		0.20	
PCB153/132/168	1.50		5.20		0.20		0.20	
PCB170/190	1.70	I	25.00	I	0.90	I	0.40	I
PCB180	0.30		1.00		<0.07	U	0.10	
PCB187	0.60		1.00		<0.09	U	0.10	
PCB195/208	0.10		0.20		<0.09	U	<0.09	U
PCB201/173/157	0.10	J	0.20		<0.1	U	<0.1	U
PCB206	<0.14	U	0.10	J	<0.14	U	<0.14	U
PCB209	0.10	B	0.30	B	<0.05	U	<0.05	U
Total HCH		U	1.20			U		U
Total Chlordane		0.20	40.60			0.40		U
Total DDT		2.80	50.00			0.40		U
Total PCB		6.40	23.60			0.70		0.70

Surrogate (Su)	Su Recovery (%)	Su Recovery (%)	Su Recovery (%)	Su Recovery (%)
DBOFB	55	81	103	83
PCB 103	45	64	88	66
PCB 198	40	41	85	72

Qualifiers (Q): J=Below the MDL, U=Not detected, B=In procedural blank > 3x MDL, I=Interference, D=Diluted value, *=Outside QA limits, refer to narrative

2/9/00

Wet Weight

B&B Laboratories Project J99066
Report 00-413

EPA Gulf Breeze-Pen Sediment
Organochlorine Data
Client Submitted Samples

EPA Project No. QQ3006 OT-RT-98-001884

Sample Name	PBS0223	PBS0224	PBS0225	PBS0226
Client Name	C17	PCOLA12	PCOLA13	PCOLA16
Matrix	Sediment	Sediment	Sediment	Sediment
Collection Date	NA	NA	NA	NA
Received Date	9/23/99	9/23/99	9/23/99	9/23/99
Extraction Date	12/21/99	12/21/99	12/21/99	12/21/99
Extraction Batch	ENV120	ENV120	ENV120	ENV120
Date Acquired	1/3/00	1/3/00	1/3/00	1/3/00
Method	ECDDUAL.M	ECDDUAL.M	ECDDUAL.M	ECDDUAL.M
Sample Wet Weight (g)	57.88	54.63	20.68	18.52
% Moisture	74	73	28	19

Target Compounds	Su Corrected Conc. (ng/wet g)	Q	Su Corrected Conc. (ng/wet g)	Q	Su Corrected Conc. (ng/wet g)	Q	Su Corrected Conc. (ng/wet g)	Q
Aldrin	<0.05	U	<0.05	U	<0.05	U	<0.06	U
Dieldrin	<0.04	U	1.50		0.10		<0.05	U
Endrin	<0.04	U	<0.04	U	<0.04	U	<0.04	U
Heptachlor	<0.04	U	0.20		<0.04	U	<0.05	U
Heptachlor-Epoxide	<0.06	U	0.10		<0.06	U	<0.06	U
Oxychlordane	<0.05	U	0.30		<0.05	U	<0.06	U
Alpha-Chlordane	<0.04	U	2.60		0.10		<0.04	U
Gamma-Chlordane	<0.04	U	4.50		0.10		<0.04	U
Trans-Nonachlor	<0.04	U	2.00		0.10		<0.04	U
Cis-Nonachlor	<0.05	U	1.40		<0.05	U	<0.05	U
Alpha-HCH	<0.09	U	0.30		<0.09	U	<0.1	U
Beta-HCH	<0.04	U	<0.04	U	<0.04	U	<0.04	U
Delta-HCH	<0.04	U	<0.04	U	<0.04	U	<0.05	U
Gamma-HCH	<0.04	U	<0.04	U	<0.04	U	<0.04	U
2,4'-DDD	<0.04	U	0.60		0.10		<0.04	U
4,4'-DDD	<0.06	U	0.90		<0.06	U	<0.06	U
2,4'-DDE	<0.04	U	0.10		<0.04	U	<0.04	U
4,4'-DDE	0.50		10.80		0.20		<0.04	U
2,4'-DDT	<0.06	U	0.40		<0.06	U	<0.07	U
4,4'-DDT	<0.04	U	0.80		<0.04	U	<0.05	U
Hexachlorobenzene	<0.05	U	<0.05	U	<0.05	U	<0.05	U
Endosulfan II	<0.04	U	0.10		<0.04	U	<0.05	U
Endosulfan I	<0.05	U	<0.05	U	<0.05	U	<0.06	U
Mirex	<0.06	U	<0.06	U	<0.06	U	<0.06	U
Chlorpyrifos	<0.09	U	<0.09	U	<0.09	U	<0.1	U
PCB8/5	<0.04	U	<0.04	U	<0.04	U	<0.04	U
PCB18	<0.06	U	<0.06	U	<0.06	U	<0.06	U
PCB28	<0.04	U	0.40		<0.04	U	<0.05	U
PCB29	<0.04	U	<0.04	U	<0.04	U	<0.05	U
PCB44	<0.04	U	0.20		<0.04	U	<0.04	U
PCB52	0.10		0.40		<0.04	U	<0.04	U
PCB66	0.10		0.30		<0.07	U	<0.08	U
PCB87/115	<0.05	U	0.20		<0.05	U	<0.05	U
PCB101/90	0.20		0.80		0.10		<0.07	U
PCB105	0.10		0.30		<0.04	U	<0.05	U
PCB118	0.10		0.70		0.10		<0.04	U
PCB128	<0.09	U	0.20		<0.09	U	<0.1	U
PCB138	0.20		0.90		0.10		0.10	
PCB153/132/168	0.40		1.40		0.10		0.20	
PCB170/190	0.40	I	5.80	I	0.70	I	0.30	I
PCB180	0.10		0.30		<0.05	U	0.10	
PCB187	0.20		0.30		<0.07	U	0.10	
PCB195/208	<0.06	U	0.10		<0.06	U	<0.07	U
PCB201/173/157	<0.07	U	0.10		<0.07	U	<0.08	U
PCB206	<0.1	U	<0.1	U	<0.1	U	<0.11	U
PCB209	<0.04	U	0.10		<0.04	U	<0.04	U
Total HCH		U	0.30			U		U
Total Chlordane		U	11.10		0.30			U
Total DDT	0.50		13.60		0.30			U
Total PCB	1.50		5.70		0.40		0.50	

Surrogate (Su)	Su Recovery (%)	Su Recovery (%)	Su Recovery (%)	Su Recovery (%)
DBOFB	55	81	103	83
PCB 103	45	64	88	88
PCB 198	40	41	85	72

Qualifiers (Q): J=Below the MDL. U=Not detected. B=In procedural blank > 3x MDL. I=Interference. D=Diluted value. *=Outside QA limits, refer to narrative

2/9/00

Appendix D
Toxicity Test Results

TRAC

Environmental/Biomedical Chemistry and Toxicology

February 27, 2003

Barbara Albrecht
Ensafe
201 North Palafox Street
Suite 2000
Pensacola, Florida 32501

Dear Ms. Albrecht:

From 13 March through 24 April 2000, TRAC Laboratories conducted a series of thirteen 7-day chronic screening whole sediment tests with *Mysidopsis bahia* and thirteen 10-day whole sediment screening tests with *Leptocheirus plumulosus* (project number 119-2502-2514). Effect criteria for *M. bahia* tests were survival, growth and fecundity. Effect criteria for *L. plumulosus* were survival and growth. Each replicate of the *M. bahia* tests was fed approximately 75 *Artemia* nauplii per mysid twice daily, once before overlying water renewal and once after. *L. plumulosus* were not fed during testing.

If you have any other questions concerning these tests, please do not hesitate to contact me at 456-5836.

Best Regards,

Dan Johnson
Laboratory Director

14 S. 2nd Street • Pensacola, Florida 32507 • (850) 456-5836 • Fax (850) 456-5838
113 Cedar Street • Denton, Texas 76201 • (940) 566-3359 • Fax (940) 566-2698
www.traclaboratories.com

7 Day Chronic Survival, Growth and Fecundity Tests Exposing *Mysidopsis bahia* to Thirteen Sediments from Ensafe

Submitted to:

Barbara Albrecht
Ensafe
201 North Palafox Street, Suite 200
Pensacola, Florida 32501
(850) 434-2230

Submitted by:

TRAC Laboratories, Inc.
14 South 2nd Street
Pensacola, Florida 32507
(904) 456-5836

Florida Department of Health and Rehabilitative Services
Certification Number E81181

Project Number: 119-2502-2514

June 2000

Table of Contents

Summary Sheet 3

Introduction 4

Material & Methods 5
- Test Material 5
- Control Water 5
- Test Animals 5
- Test Conditions 5
- Sediment Preparation 6
- Test Initiation 6
- Ammonia Analysis 6
- Test Termination 7
- Reference Toxicant (Positive Control) 7
- Reference Toxicant (Negative Control) 7
- Statistical Analysis 8

Results & Discussion 8
- Survival Analysis 8
- Growth Analysis 8
- Fecundity Analysis 8
- Ammonia Analysis 9
- Physical Parameters 9
- Outliers and Deviations in Protocol 9

Figures

1. Reference Toxicant (SDS) vs *Mysidopsis bahia* 1996-2000.

Data Files

1. Summary of Sediment Sample Collection, Processing, Survival and Holding Period.
2. Summary of *Mysidopsis bahia* Survival and Performance vs. the Control Survival.
3. Summary of *Mysidopsis bahia* Growth and Performance vs. the Control Growth.
4. Summary of *Mysidopsis bahia* Fecundity and Performance vs. the Control Growth
5. Conversion of Total Ammonia to Un-ionized Ammonia Measurements from Interstitial Sample Water.
6. Summary of Physical Parameters Monitored during the 7 Day Exposure of *Mysidopsis bahia*.

Toxicity Test Summary Sheet

Client:	Ensafe
Project Number:	119-2502-2514
Study Director:	Dan Johnson
Test Material:	Sediment samples from the Pensacola Bay area.
Date Materials Received:	8-9 March 2000
Date of Tests:	13 March through 24 April 2000
Test Conditions:	Static Renewal, 7 day duration.
Test Procedures:	1994 U.S. EPA. (EPA-600-4-91-003). Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms.
Test Animals:	*Mysidopsis bahia*
Source:	*Mysidopsis bahia* were obtained from in-house cultures.
Control and Dilution Water:	Natural sea water at a salinity of 20 parts per thousand (ppt).
Exposure Concentration:	0, 25, 50 and 100% sediment.
Effect Criteria:	Survival, Growth and Fecundity

INTRODUCTION

Thirteen sediment samples were collected by Ensafe and U.S. EPA personnel and tested at TRAC Laboratories Inc., Pensacola, Florida, to determine chronic effects to *Mysidopsis bahia*. The criteria for effect were survival, growth and fecundity. Tests were conducted from 14 through 26 March 2000. All raw data related to this study are stored at TRAC. Data are presented as hard copy data files and also supplied on 3.5 inch disk in Excel worksheet format.

MATERIALS AND METHODS

Test Material

Thirteen sediment samples were obtained from Ensafe by TRAC personnel on 8 and 9 March 2000. The samples were contained in large mouth, high density polyethylene (HDPE) 3.75 L jars.

A chain of custody form accompanied each group of samples. The samples arrived intact surrounded by wet ice. Sample label information was recorded in the test material log as was arrival temperature and the date received at TRAC Laboratories in Florida. Arrival temperatures of the samples ranged from 1.6 - 19.6 °C. The sediments ranged in color and texture from light, coarse sand to dark, silty mud.

All sediments except 002MGH67 were press sieved through a 1 mm stainless steel sieve to remove particles which may have interfered with the bioassay. Sample 002MGH67 was press sieved through a 2 mm sieve because of the coarse texture. Sample volume, sieve size, date of receipt and processing data were recorded in the sample log prior to test initiation and are summarized as data file 1.

Control Water

Natural sea water collected from the Gulf of Mexico was cleaned and conditioned by running it through a sand filter numerous times followed by biological and 5μ filtration. The conditioned water was then adjusted to 20ppt salinity using deionized water. The salinity adjusted and conditioned water was then acclimated to the test temperature of 26°C. This treated water was then used as overlying water for the sediment exposures.

Test Animals

Mysidopsis bahia (lot # MB-00-U158, MB-00-X158 and MB-00-A159), were obtained from in-house cultures at TRAC Laboratories and were 7 days of age at test initiation.

Test Conditions

Tests were conducted in a temperature-controlled (25±2°C) environmental chamber under a 16 hour light, 8 hour dark photo period. Dissolved oxygen, pH and temperature were measured in one replicate of the control and exposure samples daily. Salinity was measured four times during the test. Daily animal observations were attempted, but the sediment matrix made observations difficult. Each replicate was aerated throughout the 7-day test, and frequent daily checks insured airlines were aerating the water column.

Daily renewal of overlying water was accomplished by gently removing approximately eighty percent of overlying water with a nitex covered, small bore siphon. Care was taken to minimize sediment disturbance. After the overlying water was removed, the interior of each test vessel was inspected to insure no *M. bahia* were adhered to the exposed side walls. Water was

gently replaced over a turbidity reducer to again minimize sediment disturbance.

Sediment Preparation

Sediment samples were press sieved through a 1 mm or 2 mm stainless steel sieve to remove particles and predators which may have interfered with the testing process. The complete contents of each sample, including the sediment porewater, were captured and used to aid the sample in passing through the sieve.

Following the press sieving step and prior to test initiation, sediments were homogenized by blending the sediment 3 - 5 minutes using a stainless steel paddle drill bit or stirring with a stainless steel spoon.

Once homogenized, the sediments were measured out in mixing vessels and mixed with the appropriate amount of C17 to achieve exposure concentrations of 25, 50 and 100% test sediment. Eight replicates were measured out for each sediment concentration. Total ammonia was measured in the overlying water as *M. bahia* has minimal contact with porewater.

Test Initiation

The trays containing test sediment concentrations were placed in the environmental chamber in numerical order. Numbers were assigned randomly from a master list. One hundred fifty ml of natural seawater diluted to 20 ppt was carefully poured over a turbidity reducer to fill the test vessels. The exposure vessels were then allowed to settle 14 - 16 hours before *M. bahia* were introduced.

M. bahia were added via Nitex® screen in random sequence to each exposure vessel, releasing five animals into the sediment exposure.

Physical parameters (pH, DO, temperature and salinity) were monitored and recorded on the physical data sheets.

Ammonia Analysis

Fifteen ml of overlying water were randomly removed from one exposure vessel of each sediment concentration approximately 16-20 hours into the test (Day 1). Temperature, salinity and pH measurements were recorded prior to the total ammonia analysis. The Orion 250A pH/ISE meter and 95-12 gas-sensing ammonia electrode measures the aqueous ammonia ($NH_{3(aq)}$) after conversion from dissolved ammonia ($NH_{3(aq)}$ and NH_4^+). Sample color and turbidity does not affect the measurement. Other ionic species do not interfere with this probe. The ammonia-selective electrode method (4500-NH_3, ASTM 13th Edition, 1992) was followed by raising each sample pH to above 11 with 10 N NaOH, and measuring ammonia across the probe's membrane as it was converted from dissolved NH_3 and NH_4^+. Potentiometric measurements were recorded for each sample in millivolts (mV), and extrapolated to mg/l of total ammonia from the standard curve constructed with each test series. Previous to the addition of NaOH, sample pH and temperature were measured to calculate unionized ammonia. The conversion table used was by Teresa Norberg-King, U.S. EPA Environmental Research Laboratory, Duluth Mn. (1985). Sample salinity was measured to document the interstitial salinity amphipods were exposed to.

A standard ammonia curve was constructed for each test series using 4 standards (0.1, 1.0, 10, and 100 mg/L) diluted from a 1000 mg/L stock of ammonia. The log transformed standard concentrations were entered into a linear regression formula with their potentiometric responses (mV) yielding correlations of 98 to 100%. All sample measurements were then entered into this same formula to retrieve a total ammonia measurement in mg/L.

In each test series, DI blanks were measured to calibrate a zero-ammonia point for the probe. When enough sample was available, a sample was duplicated to measure variation. A blind quality control sample was ordered through a private vendor (reference #ERA06119602) and was included in the analyses. Results were satisfactory. Total and unionized ammonia concentrations for each station ID are presented in Data Files 4 and 5. Un-ionized ammonia was calculated as a percentage of total ammonia compensating for temperature and pH. Ammonia analyses were performed on day 1 and day 7 of testing.

Test Termination

Sediment tests were terminated after 7 days. Sediment trays were removed in numerical order individually from the environmental chamber for animal recovery and microscopic examination for reproductive structures. Overlying water and some sediment if necessary, were passed through a 250 micron mesh sieve which was designed to capture the *M. bahia*. *M. bahia* were counted and recorded on the breakdown sheet. *M. bahia* were then placed on a glass slide and examined for sexual development. *M. bahia* were then placed into tared, aluminum weigh boats, dried and weighed. Once all sediment concentrations had been broken down, the data was grouped according to the sediment IDs. The randomization sheet was used to unscramble the exposure tray numbers which in turn accounted for the eight replicates. The descrambling sheet provides sample IDs matched to vessel numbers.

Reference Toxicant (Positive Control)

A positive control "reference toxicant" test is conducted monthly with *M. bahia* cultured in-house. The reference toxicant used was sodium dodecyl sulfate (SDS) and tests are conducted in accordance with EPA/600/4-89/013. Values are plotted to determine if the results are within prescribed limits. In this technique, a running plot is maintained for the toxicity values from successive tests with a given reference toxicant. For regression analysis results (i.e. LC50s), the mean (x) and upper and lower control limits (±2SD) are recalculated with each successive point until the statistics stabilize.

The LC50s for *M. bahia* reference toxicant tests conducted since April of 1996 ranged from 4.0-12.0 mg/l. A control chart is presented as Figure 1.

Reference Sediment (Negative Control)

All sediment tests were accompanied by a negative control reference sediment test. Replication of these control samples were the same as for the study site sediment concentrations (8 exposure replicates). Reference sediment (C-17) was collected by TRAC field personnel. The principal reason for selecting C-17 as a suitable reference sediment is in the toxicological data

base developed for *Ampelisca abdita* by USEPA EMAP Louisianian Province (1990-1994).

Statistical Analysis

The sediment samples were tested in groups of five or four with a common control. ANOVA and Dunnett's multiple range test were used to identify samples in which survival, growth or reproductive development was statistically lower from the negative controls. The survival proportions and proportions of females with eggs were transformed using Arcsin ($\sqrt{p2_i}$) where p_i = proportion surviving in replicate I. Weight data was not transformed. The data was then examined for homogeneity of variance and departure from normality using Bartlett's and Shapiro-Wilks tests, respectively. If the data were normally distributed and the variances homogenous, the transformed data was analyzed with a one-way ANOVA. If the F test of the ANOVA was significant ($p<0.05$), differences between the mean of each sample were compared with the control using Dunnett's test. Dunnett's test is specifically intended to compare treatment means with a control. If the F test in the ANOVA is not significant, no further analysis is performed, and the sample means are then statistically similar to the control. When the assumptions of normality and variance homogeneity cannot be verified, Steel's Many One Rank Test is used to examine differences between the control and each mean. Steel's Test is specifically intended to examine differences between treatments and a control when assumptions of normality and variance homogeneity cannot be verified.

RESULTS AND DISCUSSION

Survival Analysis

Survival data was calculated for each replicate as percent survival; mean and standard deviation were calculated for each sample.

Statistical analysis was performed separately on each set of sediment concentrations to identify samples in which survival was statistically lower from negative controls. No significant reduction in survival occurred in any test sediment concentration. Survival data are presented as Data File 2.

Growth Analysis

Weight data was analyzed for each replicate as mean weight in milligrams (mg) per individual.

Statistical analysis was performed on each set of sediment concentrations to identify samples in which mean weights were statistically lower from negative controls. No significant reduction in weights occurred in any test sediment concentration. Weight data are presented as Data File 3.

Fecundity Analysis

Fecundity measurements were analyzed as the proportions of surviving females with eggs either in the oviducts or brood chamber. Males, females with no eggs and immature individuals were excluded from analysis.

Statistical analysis was performed on each set of sediment concentrations to identify samples in which numbers of egg carrying females was statistically lower from negative controls. Significant reductions in numbers of females with eggs occurred in the 50% sediment concentration of sample 002MEF45 and the 50% sediment concentration of sample 002M2200. Fecundity data are presented as Data File 4.

Ammonia Analysis

Overlying water samples were collected from each test sediment concentration and the control within 24 hours of overlying water addition on day 1 and at test termination on day 7. Temperature, salinity and pH measurements were recorded prior to the total ammonia analysis. The Orion 250A pH/ISE meter and 95-12 gas sensing ammonia electrode were used to measure total ammonia. Data File 5 displays ammonia analyses from day 7. No data file is included in this report for day 1 ammonia analyses as measurements from all sediment concentrations and controls on day 1 were below detectable limits (0.05 mg/l). No data file was created to correlate total and un-ionized ammonia values with mean percent survival and weight values as no significant reductions in survival or weight were observed in any test treatment of any sample.

Physical Parameters

Dissolved oxygen, pH, temperature and salinity were measured daily in one replicate of each sediment concentration. Data File 6 provides a summary of parameter ranges for each test series. Temperature ranges for this testing effort remained between 24.0 - 26.9 °C. Control sediment samples (C-17) are enumerated and matched with each sediment series.

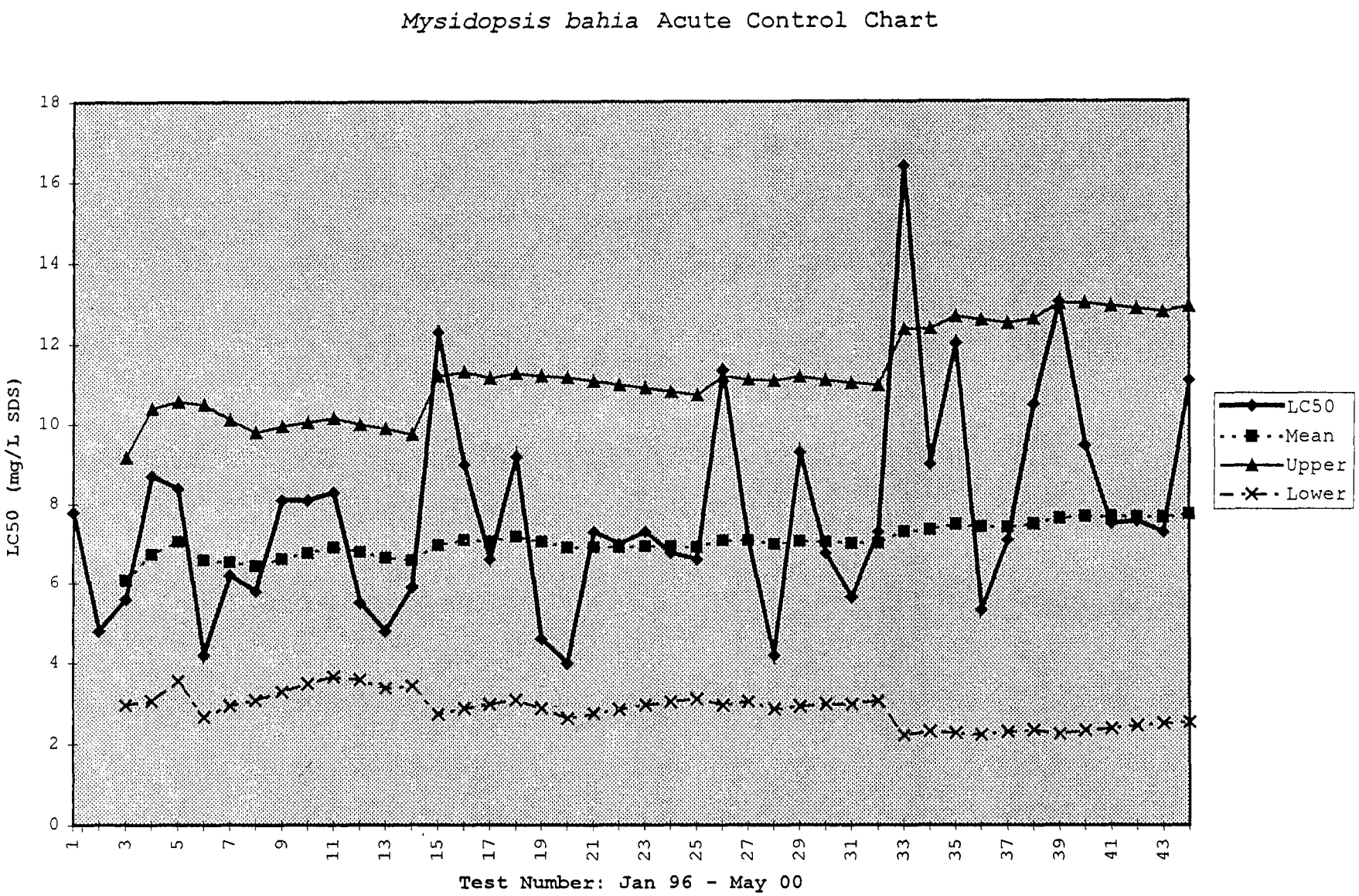
Parameters were monitored daily, as stated above, and were maintained well within recommendations. Temperatures were consistently 26°C ±2°C. Test target temperature was 26°C ±1°C however, aeration of small volumes (150 ml) of water as employed in these tests made high temperature control difficult. Temperatures remained favorable for development of test endpoints. Dissolved oxygen levels were maintained with gentle aeration throughout the 7 day exposure and levels stayed above 60% of saturation.

Overlying water from individual test site exposures varied from 19-23ppt (Data File 6).

Outliers and Deviations in Protocol

No deviations in testing protocols or errors capable of invalidating test results occurred during the above sediment tests.

Figure 1.



Appendix B

DATA FILE 1

Summary of Sediment Sample Collection, Processing, Survival and Holding Period

Summary of Sediment Information

Sample ID	Sample Collection Date	Sample Receipt Date	Arrival Temp. (0C)	Date Sample Sieved	Sieve Size	Date Sample Tested	Days From Collection to Testing
002MIJ12	03/07/00	03/08/00	2.2	03/09/00	1.0mm	03/14/00	7
002MGH12	03/07/00	03/08/00	1.6	03/09/00	1.0mm	03/14/00	7
002MIJ34	03/08/00	03/08/00	15.5	03/09/00	1.0mm	03/14/00	6
002MGH34	03/08/00	03/08/00	14.3	03/09/00	1.0mm	03/14/00	6
002MEF23	03/08/00	03/08/00	15.5	03/09/00	1.0mm	03/14/00	6
002MIJ56	03/08/00	03/08/00	13.4	03/09/00	1.0mm	03/17/00	9
002MGH56	03/08/00	03/08/00	16.8	03/09/00	1.0mm	03/17/00	9
002MEF45	03/08/00	03/09/00	3.3	03/09/00	1.0mm	03/17/00	9
002MCD23	03/09/00	03/09/00	14.1	03/10/00	1.0mm	03/17/00	8
002M1800	03/09/00	03/09/00	15.9	03/10/00	1.0mm	03/19/00	10
002M2200	03/09/00	03/09/00	19.6	03/10/00	1.0mm	03/19/00	10
002MKL34	03/09/00	03/09/00	17.8	03/10/00	1.0mm	03/19/00	10
002MGH67	03/09/00	03/09/00	10.3	03/10/00	2.0mm	03/19/00	10

DATA FILE 2

Summary of *Mysidopsis bahia* Survival and Performance vs. Control Survival

Survival of *Mysidopsis bahia* in 7 Day Sediment Tests Conducted 13-26 March 2000

Sample ID	Number Surviving	Percent Survival	Mean Survival	Standard Deviation	% of control	p Value	Statistical Difference
C17-1	5	100	97.5	7.1	NA	NA	NA
	5	100					
	5	100					
	5	100					
	4	80					
	5	100					
	5	100					
	5	100					
002MIJ12 25%	5	100	97.5	7.1	100.0	0.05	NO
	5	100					
	5	100					
	5	100					
	5	100					
	4	80					
	5	100					
	5	100					
002MIJ12 50%	5	100	100.0	0.0	102.6	0.05	NO
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
002MIJ12 100%	5	100	100.0	0.0	102.6	0.05	NO
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
002MGH12 25%	5	100	92.5	10.4	94.9	0.05	NO
	4	80					
	5	100					
	5	100					
	4	80					
	4	80					
	5	100					
	5	100					
002MGH12 50%	5	100	97.5	7.1	100.0	0.05	NO
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					

Survival of *Mysidopsis bahia* in 7 Day Sediment Tests Conducted 13-26 March 2000

	4	80					
	5	100					
002MGH12 100%	5	100	100.0	0.0	102.6	0.05	NO
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
002MIJ34 25%	5	100	95.0	9.3	97.4	0.05	NO
	5	100					
	5	100					
	5	100					
	4	80					
	5	100					
	4	80					
	5	100					
002MIJ34 50%	5	100	100.0	0.0	102.6	0.05	NO
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
002MIJ34 100%	5	100	97.5	7.1	100.0	0.05	NO
	5	100					
	5	100					
	5	100					
	5	100					
	4	80					
	5	100					
	5	100					
002MGH34 25%	5	100	97.5	7.1	100.0	0.05	NO
	4	80					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
002MGH34 50%	5	100	97.5	7.1	100.0	0.05	NO
	5	100					
	5	100					
	5	100					
	5	100					

Survival of *Mysidopsis bahia* in 7 Day Sediment Tests Conducted 13-26 March 2000

	5	100					
	4	80					
	5	100					
002MGH34 100%	5	100	97.5	7.1	100.0	0.05	NO
	5	100					
	5	100					
	5	100					
	4	80					
	5	100					
	5	100					
	5	100					
002MEF23 25%	5	100	95.0	14.1	97.4	0.05	NO
	5	100					
	3	60					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
002MEF23 50%	5	100	97.5	7.1	100.0	0.05	NO
	4	80					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
002MEF23 100%	5	100	97.5	7.1	100.0	0.05	NO
	5	100					
	5	100					
	5	100					
	4	80					
	5	100					
	5	100					
	5	100					
C17-2	5	100	100.0	0.0	NA	NA	NA
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
002MIJ56 25%	5	100	97.5	7.1	97.5	0.05	NO
	5	100					
	5	100					
	5	100					
	5	100					

Survival of *Mysidopsis bahia* in 7 Day Sediment Tests Conducted 13-26 March 2000

	5	100					
	4	80					
	5	100					
002MIJ56 50%	5	100	100.0	0.0	100.0	0.05	NO
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
002MIJ56 100%	5	100	97.5	7.1	97.5	0.05	NO
	5	100					
	5	100					
	5	100					
	5	100					
	4	80					
	5	100					
	5	100					
002MGH56 25%	5	100	97.5	7.1	97.5	0.05	NO
	5	100					
	5	100					
	5	100					
	5	100					
	4	80					
	5	100					
	5	100					
002MGH56 50%	5	100	100.0	0.0	100.0	0.05	NO
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
002MGH56 100%	5	100	97.5	7.1	97.5	0.05	NO
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
	4	80					
	5	100					
002MEF45 25%	5	100	97.5	7.1	97.5	0.05	NO
	5	100					
	4	80					
	5	100					

Survival of *Mysidopsis bahia* in 7 Day Sediment Tests Conducted 13-26 March 2000

	5	100					
	5	100					
	5	100					
	5	100					
002MEF45 50%	5	100	100.0	0.0	100.0	0.05	NO
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
002MEF45 100%	5	100	97.5	7.1	97.5	0.05	NO
	4	80					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
002MCD23 25%	5	100	100.0	0.0	100.0	0.05	NO
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
002MCD23 50%	5	100	100.0	0.0	100.0	0.05	NO
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
002MCD23 100%	5	100	100.0	0.0	100.0	0.05	NO
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
	5	100					
C17-3	5	100	92.5	14.9	NA	NA	NA
	5	100					
	5	100					
	3	60					

Survival of *Mysidopsis bahia* in 7 Day Sediment Tests Conducted 13-26 March 2000

	5	100					
	4	80					
	5	100					
	5	100					
002M1800 25%	5	100	95.0	9.3	102.7	0.05	NO
	5	100					
	5	100					
	4	80					
	5	100					
	5	100					
	4	80					
	5	100					
002M1800 50%	4	80	87.5	14.9	94.6	0.05	NO
	4	80					
	5	100					
	4	80					
	3	60					
	5	100					
	5	100					
	5	100					
002M1800 100%	5	100	90.0	18.5	97.3	0.05	NO
	5	100					
	5	100					
	5	100					
	3	60					
	5	100					
	5	100					
	3	60					
002M2200 25%	5	100	95.0	9.3	102.7	0.05	NO
	5	100					
	5	100					
	4	80					
	4	80					
	5	100					
	5	100					
	5	100					
002M2200 50%	5	100	92.5	14.9	100.0	0.05	NO
	5	100					
	5	100					
	3	60					
	5	100					
	4	80					
	5	100					
	5	100					
002M2200 100%	5	100	92.5	10.4	100.0	0.05	NO-
	5	100					
	5	100					

Survival of *Mysidopsis bahia* in 7 Day Sediment Tests Conducted 13-26 March 2000

	4	80					
	5	100					
	4	80					
	5	100					
	4	80					
002MKL34 25%	5	100	92.5	10.4	100.0	0.05	NO
	4	80					
	5	100					
	4	80					
	5	100					
	5	100					
	5	100					
	4	80					
002MKL34 50%	5	100	85.0	14.1	91.9	0.05	NO
	5	100					
	3	60					
	5	100					
	4	80					
	4	80					
	4	80					
	4	80					
002MKL34 100%	5	100	95.0	9.3	102.7	0.05	NO
	4	80					
	5	100					
	4	80					
	5	100					
	5	100					
	5	100					
	5	100					
002MGH67 25%	5	100	95.0	9.3	102.7	0.05	NO
	4	80					
	5	100					
	5	100					
	5	100					
	5	100					
	4	80					
	5	100					
002MGH67 50%	5	100	92.5	14.9	100.0	0.05	NO
	5	100					
	5	100					
	5	100					
	5	100					
	4	80					
	5	100					
	3	60					
002MGH67 100%	4	80	85.0	14.1	91.9	0.05	NO
	4	80					

	4	80					
	5	100					
	5	100					
	3	60					
	4	80					
	5	100					

DATA FILE 3

Summary of *Mysidopsis bahia* Growth and Performance vs. Control Growth

Weights of *Mysidopsis bahia* Exposed to Sediments in 7 Day Tests Conducted 13-26 March 2000

Sample ID	Number Surviving	Mean Weight/ Replicate (mg)	Mean Weight/ conc. (mg)	Standard Deviation	p Value	Statistical Difference
C17-1	5	0.30	0.32	0.035	NA	NA
	5	0.38				
	5	0.32				
	5	0.36				
	4	0.30				
	5	0.30				
	5	0.32				
	5	0.26				
002MIJ12 25%	5	0.38	0.37	0.039	0.05	NO
	5	0.38				
	5	0.36				
	5	0.40				
	5	0.32				
	4	0.43				
	5	0.30				
	5	0.38				
002MIJ12 50%	5	0.42	0.34	0.043	0.05	NO
	5	0.38				
	5	0.30				
	5	0.32				
	5	0.30				
	5	0.30				
	5	0.34				
	5	0.38				
002MIJ12 100%	5	0.36	0.36	0.026	0.05	NO
	5	0.36				
	5	0.32				
	5	0.38				
	5	0.32				
	5	0.38				
	5	0.40				
	5	0.36				
002MGH12 25%	5	0.28	0.35	0.051	0.05	NO
	4	0.40				
	5	0.30				
	5	0.38				
	4	0.38				
	4	0.43				
	5	0.30				
	5	0.34				
002MGH12 50%	5	0.40	0.35	0.032	0.05	NO
	5	0.38				
	5	0.30				
	5	0.32				

Weights of *Mysidopsis bahia* Exposed to Sediments in 7 Day Tests Conducted 13-26 March 2000

	5	0.34				
	5	0.34				
	4	0.38				
	5	0.34				
002MGH12 100%	5	0.38	0.35	0.041	0.05	NO
	5	0.38				
	5	0.30				
	5	0.38				
	5	0.26				
	5	0.36				
	5	0.36				
	5	0.34				
002MIJ34 25%	5	0.40	0.38	0.032	0.05	NO
	5	0.36				
	5	0.32				
	5	0.38				
	4	0.40				
	5	0.36				
	4	0.43				
	5	0.40				
002MIJ34 50%	5	0.28	0.36	0.046	0.05	NO
	5	0.36				
	5	0.30				
	5	0.42				
	5	0.40				
	5	0.38				
	5	0.36				
	5	0.40				
002MIJ34 100%	5	0.42	0.39	0.030	0.05	NO
	5	0.40				
	5	0.38				
	5	0.38				
	5	0.44				
	4	0.34				
	5	0.36				
	5	0.40				
002MGH34 25%	5	0.48	0.41	0.043	0.05	NO
	4	0.45				
	5	0.38				
	5	0.38				
	5	0.34				
	5	0.40				
	5	0.44				
	5	0.38				
002MGH34 50%	5	0.42	0.38	0.028	0.05	NO
	5	0.38				
	5	0.38				

Weights of *Mysidopsis bahia* Exposed to Sediments in 7 Day Tests Conducted 13-26 March 2000

	5	0.42				
	5	0.38				
	5	0.36				
	4	0.33				
	5	0.36				
002MGH34 100%	5	0.42	0.35	0.083	0.05	NO
	5	0.32				
	5	0.18				
	5	0.32				
	4	0.35				
	5	0.30				
	5	0.42				
	5	0.46				
002MEF23 25%	5	0.36	0.38	0.040	0.05	NO
	5	0.40				
	3	0.47				
	5	0.36				
	5	0.34				
	5	0.38				
	5	0.34				
	5	0.36				
002MEF23 50%	5	0.34	0.35	0.014	0.05	NO
	4	0.38				
	5	0.36				
	5	0.34				
	5	0.34				
	5	0.34				
	5	0.34				
	5	0.34				
002MEF23 100%	5	0.34	0.34	0.029	0.05	NO
	5	0.36				
	5	0.32				
	5	0.32				
	4	0.30				
	5	0.40				
	5	0.36				
	5	0.34				
C17-2	5	0.44	0.40	0.039	NA	NA
	5	0.40				
	5	0.46				
	5	0.40				
	5	0.38				
	5	0.32				
	5	0.38				
	5	0.40				
002MIJ56 25%	5	0.42	0.44	0.026	0.05	NO
	5	0.42				
	5	0.46				

Weights of *Mysidopsis bahia* Exposed to Sediments in 7 Day Tests Conducted 13-26 March 2000

	5	0.48				
	5	0.40				
	5	0.46				
	4	0.42				
	5	0.42				
002MIJ56 50%	5	0.46	0.41	0.033	0.05	NO
	5	0.46				
	5	0.40				
	5	0.36				
	5	0.40				
	5	0.42				
	5	0.38				
	5	0.40				
002MIJ56 100%	5	0.48	0.53	0.058	0.05	NO
	5	0.60				
	5	0.48				
	5	0.48				
	5	0.50				
	4	0.47				
	5	0.60				
	5	0.60				
002MGH56 25%	5	0.44	0.42	0.049	0.05	NO
	5	0.40				
	5	0.48				
	5	0.50				
	5	0.40				
	4	0.45				
	5	0.36				
	5	0.36				
002MGH56 50%	5	0.42	0.42	0.038	0.05	NO
	5	0.42				
	5	0.42				
	5	0.48				
	5	0.46				
	5	0.38				
	5	0.38				
	5	0.36				
002MGH56 100%	5	0.40	0.40	0.019	0.05	NO
	5	0.36				
	5	0.42				
	5	0.42				
	5	0.40				
	5	0.40				
	4	0.40				
	5	0.42				
002MEF45 25%	5	0.48	0.42	0.039	0.05	NO
	5	0.38				

Weights of *Mysidopsis bahia* Exposed to Sediments in 7 Day Tests Conducted 13-26 March 2000

	4	0.37				
	5	0.44				
	5	0.38				
	5	0.44				
	5	0.44				
	5	0.46				
002MEF45 50%	5	0.34	0.33	0.037	0.05	NO
	5	0.34				
	5	0.28				
	5	0.34				
	5	0.26				
	5	0.38				
	5	0.32				
	5	0.36				
002MEF45 100%	5	0.42	0.37	0.069	0.05	NO
	4	0.40				
	5	0.50				
	5	0.32				
	5	0.40				
	5	0.30				
	5	0.34				
	5	0.28				
002MCD23 25%	5	0.42	0.44	0.049	0.05	NO
	5	0.42				
	5	0.44				
	5	0.52				
	5	0.48				
	5	0.44				
	5	0.34				
	5	0.46				
002MCD23 50%	5	0.46	0.51	0.044	0.05	NO
	5	0.50				
	5	0.52				
	5	0.54				
	5	0.48				
	5	0.60				
	5	0.52				
	5	0.46				
002MCD23 100%	5	0.40	0.47	0.057	0.05	NO
	5	0.52				
	5	0.44				
	5	0.48				
	5	0.40				
	5	0.44				
	5	0.48				
	5	0.58				
C17-3	5	0.26	0.32	0.055	NA	NA
	5	0.28				

Weights of *Mysidopsis bahia* Exposed to Sediments in 7 Day Tests Conducted 13-26 March 2000

	5	0.30				
	3	0.43				
	5	0.26				
	4	0.35				
	5	0.36				
	5	0.32				
002M1800 25%	5	0.30	0.31	0.052	0.05	NO
	5	0.36				
	5	0.20				
	4	0.35				
	5	0.28				
	5	0.30				
	4	0.35				
	5	0.36				
002M1800 50%	4	0.42	0.43	0.060	0.05	NO
	4	0.50				
	5	0.36				
	4	0.37				
	3	0.53				
	5	0.42				
	5	0.36				
	5	0.44				
002M1800 100%	5	0.36	0.28	0.049	0.05	NO
	5	0.34				
	5	0.26				
	5	0.30				
	3	0.27				
	5	0.26				
	5	0.24				
	3	0.20				
002M2200 25%	5	0.32	0.31	0.033	0.05	NO
	5	0.30				
	5	0.30				
	4	0.37				
	4	0.27				
	5	0.30				
	5	0.34				
	5	0.26				
002M2200 50%	5	0.30	0.33	0.058	0.05	NO
	5	0.32				
	5	0.34				
	3	0.47				
	5	0.26				
	4	0.32				
	5	0.30				
	5	0.32				
002M2200 100%	5	0.34	0.32	0.068	0.05	NO

Weights of *Mysidopsis bahia* Exposed to Sediments in 7 Day Tests Conducted 13-26 March 2000

	5	0.26				
	5	0.24				
	4	0.35				
	5	0.22				
	4	0.37				
	5	0.38				
	4	0.42				
002MKL34 25%	5	0.32	0.37	0.050	0.05	NO
	4	0.42				
	5	0.32				
	4	0.35				
	5	0.34				
	5	0.40				
	5	0.36				
	4	0.47				
002MKL34 50%	5	0.40	0.33	0.036	0.05	NO
	5	0.32				
	3	0.33				
	5	0.28				
	4	0.35				
	4	0.30				
	4	0.30				
	4	0.35				
002MKL34 100%	5	0.34	0.34	0.058	0.05	NO
	4	0.35				
	5	0.24				
	4	0.30				
	5	0.30				
	5	0.40				
	5	0.44				
	5	0.36				
002MGH67 25%	5	0.35	0.33	0.033	0.05	NO
	4	0.30				
	5	0.34				
	5	0.30				
	5	0.30				
	5	0.40				
	4	0.35				
	5	0.32				
002MGH67 50%	5	0.32	0.33	0.033	0.05	NO
	5	0.36				
	5	0.26				
	5	0.32				
	5	0.32				
	4	0.37				
	5	0.36				
	3	0.33				

Weights of *Mysidopsis bahia* Exposed to Sediments in 7 Day Tests Conducted 13-26 March 2000

002MGH67 100%	4	0.25	0.28	0.040	0.05	NO
	4	0.30				
	4	0.33				
	5	0.24				
	5	0.24				
	3	0.25				
	4	0.32				
	5	0.34				

DATA FILE 4

Summary of *Mysidopsis bahia* Fecundity and Performance vs. Control Fecundity

Fecundity of Mysidopsis bahia in 7 Day Sediment Tests Conducted 13-26 March 2000

Sample ID	Total Number of Females	Number of Females w/ Eggs	Number of Replicates w/ Females	Percent of Females w/ Eggs	Statistical Difference p = 0.05 (*)
C17-1	17	9	8	52.9	
002MIJ12					
25%	11	10	8	90.9	
50%	20	14	8	70.0	
100%	20	17	8	85.0	
002MGH12					
25%	11	9	6	81.8	
50%	18	18	8	100.0	
100%	12	11	8	91.7	
002MIJ34					
25%	16	14	8	87.5	
50%	19	11	8	57.9	
100%	17	16	8	94.1	
002MGH34					
25%	25	23	8	92.0	
50%	22	18	8	81.8	
100%	14	14	7	100.0	
002MEF23					
25%	16	13	7	81.3	
50%	20	16	8	80.0	
100%	15	10	8	66.7	
C17-2	15	14	6	93.3	
002MIJ56					
25%	22	22	8	100.0	
50%	23	22	8	95.7	
100%	16	15	8	93.8	
002MGH56					
25%	11	10	7	90.9	
50%	17	16	7	94.1	
100%	17	15	7	88.2	
002MEF45					
25%	19	16	7	84.2	
50%	16	10	8	62.5	*
100%	16	12	7	75.0	
002MCD23					
25%	16	12	7	75.0	
50%	17	15	8	88.2	
100%	20	19	8	95.0	
C17-3	17	9	7	52.9	
002M1800					
25%	14	13	8	92.9	
50%	19	16	8	84.2	
100%	15	3	7	20.0	
002M2200					
25%	11	6	8	54.5	

Fecundity of Mysidopsis bahia in 7 Day Sediment Tests Conducted 13-26 March 2000

50%	12	0	7	0.0	*
100%	9	2	3	22.2	
002MKL34					
25%	10	8	7	80.0	
50%	9	8	5	88.9	
100%	17	15	8	88.2	
002MGH67					
25%	16	9	8	56.3	
50%	12	12	7	100.0	
100%	13	9	8	69.2	

DATA FILE 5

Conversion of Total Ammonia to Un-ionized Ammonia Measurements from Overlying Water

Mysidopsis bahia Day 7 Ammonia Analyses

Sample ID	Day	Total Ammonia (mg/L)	Temp (^{0}C)	Salinity (ppt)	pH	Un-ionized Ammonia (mg/L)
C17-1	7	0.64	25	22	7.9	0.02
002MIJ12						
25%	7	1.34	25	21	7.9	0.05
50%	7	1.47	25	21	8.0	0.07
100%	7	1.34	25	21	7.9	0.05
002MGH12						
25%	7	0.85	25	21	7.9	0.03
50%	7	0.70	25	22	7.9	0.03
100%	7	0.93	25	21	8.0	0.05
002MIJ34						
25%	7	0.70	25	22	7.9	0.03
50%	7	0.77	25	22	7.9	0.03
100%	7	0.72	25	22	7.9	0.03
002MGH34						
25%	7	0.67	25	21	8.0	0.03
50%	7	0.64	25	22	7.9	0.02
100%	7	0.58	25	22	7.9	0.02
002MEF23						
25%	7	0.63	25	22	7.9	0.02
50%	7	0.67	25	21	7.9	0.02
100%	7	0.58	25	22	7.9	0.02
C17-2	7	1.77	25	22	7.9	0.07
002MIJ56						
25%	7	0.93	25	22	7.9	0.04
50%	7	0.61	25	22	7.9	0.02
100%	7	0.64	25	22	7.9	0.02
002MGH56						
25%	7	0.58	25	22	7.9	0.02
50%	7	0.57	25	21	7.9	0.02
100%	7	0.56	25	22	7.9	0.02
002MEF45						
25%	7	0.41	25	22	7.9	0.01
50%	7	0.35	25	22	7.9	0.01
100%	7	0.56	25	22	7.9	0.02
002MCD23						
25%	7	0.61	25	22	7.9	0.02
50%	7	0.38	25	21	7.9	0.01
100%	7	0.38	25	22	7.9	0.01
C17-3	7	1.69	25	21	7.9	0.07
002M1800						
25%	7	1.23	25	22	8.0	0.06
50%	7	1.02	25	21	7.9	0.04
100%	7	1.54	25	21	7.9	0.06
002M2200						
25%	7	0.48	25	21	7.9	0.02
50%	7	0.20	25	22	8.0	0.01

Mysidopsis bahia Day 7 Ammonia Analyses

100%	7	0.23	25	22	8.0	0.01
002MKL34						
25%	7	0.25	25	22	7.9	0.01
50%	7	0.24	25	21	7.9	0.01
100%	7	0.26	25	22	8.0	0.01
002MGH67						
25%	7	0.21	25	22	7.9	0.009
50%	7	4.89	25	21	7.9	0.21
100%	7	10.00	25	21	8.0	0.53

DATA FILE 6

Summary of Physical Parameters Monitored during the 7 Day Exposure of *Mysidopsis bahia*

Summary of Physical Parameters During 7 Day Sediment Tests With *Mysidopsis bahia*

Sample ID		Day 0-10 pH		Day 0-10 DO(mg/l)		Day 0-10 Salinity (ppt)		Day 0-10 Temp. (^{0}C)
C17-1		7.8 - 8.0		6.0 - 8.3		20 - 22		24.3-26.8
002MIJ12								
25%		7.9 - 8.1		6.7 - 8.0		21 - 22		24.3-25.1
50%		7.9 - 8.1		6.8 - 8.0		21 - 22		24.0-25.5
100%		7.9 - 8.1		6.9 - 8.1		20 - 21		24.2-26.9
002MGH12								
25%		7.8 - 8.0		6.8 - 8.4		19 - 21		24.4-27.4
50%		7.9 - 8.1		6.7 - 7.9		20 - 22		24.6-25.1
100%		8.0 - 8.1		6.7 - 7.9		20 - 21		24.9-25.2
002MIJ34								
25%		7.9 - 8.0		6.8 - 8.2		20 - 22		24.2-25.9
50%		7.9 - 8.1		6.5 - 7.8		20 - 22		24.2-25.6
100%		7.9 - 8.0		6.5 - 8.2		20 - 22		24.2-25.6
002MGH34								
25%		7.8 - 8.0		6.6 - 7.9		21 - 22		24.8-25.3
50%		7.9 - 8.1		6.9 - 8.2		20 - 22		24.4-25.9
100%		7.9 - 8.1		6.8 - 8.3		20 - 22		24.4-26.9
002MEF23								
25%		7.9 - 8.1		6.7 - 8.1		20 - 22		24.0-25.5
50%		7.9 - 8.1		6.9 - 8.2		20 - 21		24.4-26.8
100%		7.9 - 8.0		6.7 - 7.9		20 - 22		24.8-25.4
C17-2		7.8 - 8.1		6.7 - 7.7		22		24.9-25.8
002MIJ56								
25%		7.8 - 8.1		6.6 - 7.6		21 - 23		25.0-26.7
50%		7.9 - 8.1		6.7 - 7.8		21 - 23		25.0-25.9
100%		7.9 - 8.1		6.8 - 7.8		22		24.6-25.4
002MGH56								
25%		7.9 - 8.1		6.7 - 7.7		22		24.9-25.9
50%		7.7 - 8.1		6.7 - 7.4		21 - 23		25.1-26.6
100%		7.9 - 8.1		6.8 - 7.8		22 - 23		24.7-25.8
002MEF45								
25%		7.8 - 8.1		6.7 - 7.8		21 - 23		25.2-26.6
50%		7.9 - 8.1		6.8 - 7.8		22		24.3-25.4
100%		7.9 - 8.2		6.8 - 7.9		21 - 22		24.6-25.4
002MCD23								
25%		7.8 - 8.1		6.6 - 7.7		21 - 23		25.2-26.6
50%		7.8 - 8.1		6.8 - 7.8		21 - 22		24.8-25.8
100%		7.9 - 8.1		6.7 - 7.9		21 - 23		25.0-26.0
C17-3		7.8 - 8.0		6.8 - 8.4		21 - 22		24.7-26.1
002M1800								
25%		7.9 - 8.0		6.6 - 8.4		22 - 23		24.8-26.4
50%		7.9 - 8.0		6.8 - 8.8		21		25.4-26.2
100%		7.9 - 8.2		6.8 - 8.5		21 - 23		25.4-26.6
002M2200								
25%		7.9 - 8.1		6.8 - 8.8		21		25.5-26.2
50%		7.9 - 8.1		6.7 - 8.4		22 - 23		24.6-26.4

Summary of Physical Parameters During 7 Day Sediment Tests With *Mysidopsis bahia*

100%		7.9 - 8.1		6.8 - 8.4		22 - 23		24.9-26.2
002MKL34								
25%		7.9 - 8.1		6.8 - 8.7		21 - 22		25.6-26.3
50%		7.9 - 8.0		6.8 - 8.4		21 - 22		24.3-26.3
100%		7.9 - 8.1		6.8 - 8.5		22 - 23		24.7-26.3
002MGH67								
25%		7.9 - 8.1		6.8 - 8.5		22 - 23		25.6-26.4
50%		7.9 - 8.0		6.7 - 8.4		21 - 22		25.1-25.7
100%		8.0 - 8.1		6.8 - 8.6		21 - 22		25.3-26.6

10 Day Sediment Toxicity Screens Exposing *Leptocheirus plumulosus* to Thirteen Sediments from Ensafe

Submitted to:

Barbara Albrecht
Ensafe
201 North Palafox Street, Suite 200
Pensacola, Florida 32501
(850) 434-2230

Submitted by:

TRAC Laboratories, Inc.
14 South 2nd Street
Pensacola, Florida 32507
(904) 456-5836

Florida Department of Health and Rehabilitative Services
Certification Number E81181

Project Number: 119-2502-2514

June 2000

Table of Contents

Summary Sheet 3

Introduction 4

Material & Methods 5
- Test Material 5
- Control Water 5
- Test Animals 5
- Test Conditions 5
- Sediment Preparation 6
- Test Initiation 6
- Ammonia Analysis 6
- Test Termination 7
- Reference Toxicant (Positive Control) 8
- Reference Toxicant (Negative Control) 8
- Statistical Analysis 8

Results & Discussion 9
- Survival Information 9
- Ammonia Analysis 9
- Physical Parameters 9
- Outliers and Deviations in Protocol 10

Figures

1. Reference Toxicant (SDS) vs *Leptocheirus plumulosus* 1996-2000.

Data Files

1. Summary of Sediment Sample Collection, Processing, Survival and Holding Period.
2. Summary of *Leptocheirus plumulosus* Survival and Performance vs. the Control Survival.
3. Summary of *Leptocheirus plumulosus* Growth and Performance vs. the Control Growth.
4. Conversion of Total Ammonia to Un-ionized Ammonia Measurements from Interstitial Sample Water.
5. Summary of Ammonia Analysis vs *Leptocheirus plumulosus* Survival and Growth Performance.
6. Summary of Physical Parameters Monitored during the 10 Day Exposure of *Leptocheirus plumulosus*.

Toxicity Test Summary Sheet

Client:	Ensafe
Project Number:	119-2502-2514
Study Director:	Dan Johnson
Test Material:	Sediment samples from the Pensacola Bay area.
Date Materials Received:	8-9 March 2000
Date of Tests:	13 March through 24 April 2000
Test Conditions:	Static, 10 day duration.
Test Procedures:	1995 U.S. EPA. (EPA/620/R-95/008). Environmental Monitoring and Assessment Program (EMAP): Laboratory Methods Manual - Estuaries, Volume 1: Biological and Physical Analyses. 1994 U.S. EPA. (EPA/600/R-94/025). Methods for Assessing the Toxicity of Sediment-associated Contaminants with Estuarine and Marine Amphipods.
Test Animals:	The amphipod, *Leptocheirus plumulosus.*
Source:	*Leptocheirus plumulosus* were supplied by Chesapeake Cultures.
Control and Dilution Water:	Natural sea water at a salinity of 20 parts per thousand (ppt).
Exposure Concentration:	100% sediment.
Effect Criteria:	Survival and Growth

INTRODUCTION

Thirteen sediment samples were collected by Ensafe and U.S. EPA personnel and tested at TRAC Laboratories Inc., Pensacola, Florida, to determine acute effects to *Leptocheirus plumulosus*. The criteria for effect were survival and growth. Tests were conducted from 13 March through 24 April 2000. All raw data related to this study are stored at TRAC. Data are presented as hard copy data files and also supplied on 3.5 inch disk in Excel worksheet format.

MATERIALS AND METHODS

Test Material

Thirteen sediment samples were obtained from Ensafe by TRAC personnel on 8 and 9 March 2000. The samples were contained in large mouth, high density polyethylene (HDPE) 3.75 L jars.

A chain of custody form accompanied each group of samples. The samples arrived intact surrounded by wet ice. Sample label information was recorded in the test material log as was arrival temperature and the date received at TRAC Laboratories in Florida. Arrival temperatures of the samples ranged from 1.6 - 19.6 °C. The sediments ranged in color and texture from light, coarse sand to dark, silty mud.

All sediments except 002MGH67 were press sieved through a 1 mm stainless steel sieve to remove particles which may have interfered with the bioassay. Sample 002MGH67 was press sieved through a 2 mm sieve because of the coarse texture. Sample volume, sieve size, date of receipt and processing data were recorded in the sample log prior to test initiation and are summarized as data file 1.

Control Water

Natural sea water collected from the Gulf of Mexico was cleaned and conditioned by running it through a sand filter numerous times followed by biological and 5μ filtration. The conditioned water was then adjusted to 20ppt salinity using deionized water. The salinity adjusted and conditioned water was then acclimated to the test temperature of 25°C. This treated water was then used as overlying water for the sediment exposures.

Test Animals

Leptocheirus plumulosus (lot # LP-00-01 and LP-00-03), were obtained from a commercial supplier (Chesapeake Cultures, Hayes, VA). Amphipods were collected from culture and shipped to TRAC Laboratories in Florida.

Amphipod holding time began when the animals were removed from their habitat and prepared for shipment (Day 0). Animals were shipped (via overnight courier) in culture sediment with overlying natural sea water. Upon arrival, temperature and salinity were noted, water was exchanged and renewed with fresh control water (natural sea water adjusted to 20ppt) for acclimation to test conditions.

Test Conditions

Tests were conducted in a temperature-controlled (25±2°C) environmental chamber under a 24-hour light photo period. Dissolved oxygen, pH and temperature were measured in one replicate of the control and exposure samples daily. Salinity was measured four times during the test. Daily animal observations were attempted, but the sediment matrix made observations

difficult. Each replicate was aerated throughout the 10-day test, and frequent daily checks insured airlines were aerating the water column.

Sediment Preparation

Sediment samples were press sieved through a 1 mm or 2 mm stainless steel sieve to remove particles and predators which may have interfered with the testing process. The complete contents of each sample, including the sediment porewater, were captured and used to aid the sample in passing through the sieve.

Following the press sieving step and prior to test initiation, sediments were homogenized by blending the sediment 3 - 5 minutes using a stainless steel paddle drill bit or stirring with a stainless steel spoon.

Once homogenized, the sediments were measured out in 175 ml aliquots and transferred to one liter glass jars. Six replicates were measured out for each sediment sample. Five replicates were set up for the 10 day bioassay and the sixth replicate was used to measure total ammonia in the interstitial porewater. Sediments labeled as 002M1800, 002M220, 002MKL34 and 002MGH67 which were retested had only four test replicates due to an insufficient amount of sediment. However a fifth replicate was used for ammonia analysis.

Test Initiation

The jars containing test sediments were placed in the environmental chamber in numerical order. Numbers were assigned randomly from a master list. Seven hundred and fifty ml of natural seawater diluted to 20 ppt was carefully poured over a turbidity reducer to fill the test vessel. The exposure vessels were then allowed to settle 14 - 16 hours before animals were introduced.

Once the amphipods were acclimated to laboratory conditions (temperature, lighting), the *L. plumulosus* were removed from sediment and prepared for test size sorting. *L. plumulosus*, 2 - 4 mm, were selected individually with a small bore pipette and transferred to a 10 ml beaker. Ten *L. plumulosus* were collected in each beaker and observed for good color, full gut, and size.

Two beakers of animals were combined and added in random sequence to each exposure vessel, releasing twenty amphipods into the sediment exposure. Two extra beakers with ten animals each were randomly selected for dry weight measurements at test initiation and recorded on the day 0 setup sheet.

Physical parameters (pH, DO, temperature and salinity) were monitored and recorded on the physical data sheets.

Ammonia Analysis

The sixth replicate was brought into the environmental chamber (with the 10-day sediment exposures) and treated the same (aerated) as the five test replicates. Before addition of overlying water, a glass fritted sampler was placed approximately 2.5 cm into the sediment. The sampler was held rigid by an external device to keep the samplers from floating up to the surface. Hydrostatic pressure forces interstitial water into the sample after passing through a 1.0 μ pore

glass fiber filter (Gelman Sciences, type A/E) which was wrapped around the fritted portion of the sampler.

Fifteen to Twenty ml of interstitial water were removed from the neck of the fritted sampler about 16-20 hours into the test (Day 1). Temperature, salinity and pH measurements were recorded prior to the total ammonia analysis. The Orion 250A pH/ISE meter and 95-12 gas-sensing ammonia electrode measures the aqueous ammonia ($NH_{3(aq)}$) after conversion from dissolved ammonia ($NH_{3(aq)}$ and NH_4^+). Sample color and turbidity does not affect the measurement. Other ionic species do not interfere with this probe. The ammonia-selective electrode method (4500-NH_3, ASTM 13th Edition, 1992) was followed by raising each sample pH to above 11 with 10 N NaOH, and measuring ammonia across the probe's membrane as it was converted from dissolved NH_3 and NH_4^+. Potentiometric measurements were recorded for each sample in millivolts (mV), and extrapolated to mg/L of total ammonia from the standard curve constructed with each test series. Previous to the addition of NaOH, sample pH and temperature were measured to calculate unionized ammonia. The conversion table used was by Teresa Norberg-King, U.S. EPA Environmental Research Laboratory, Duluth Mn. (1985). Sample salinity was measured to document the interstitial salinity amphipods were exposed to.

A standard ammonia curve was constructed for each test series using 4 standards (0.1, 1.0, 10, and 100 mg/L) diluted from a 1000 mg/L stock of ammonia. The log transformed standard concentrations were entered into a linear regression formula with their potentiometric responses (mV) yielding correlations of 98 to 100%. All sample measurements were then entered into this same formula to retrieve a total ammonia measurement in mg/L.

In each test series, DI blanks were measured to calibrate a zero-ammonia point for the probe. When enough sample was available, a sample was duplicated to measure variation. A blind quality control sample was ordered through a private vendor (reference #ERA06119602) and was included in the analyses. Results were satisfactory. Total and unionized ammonia concentrations for each station ID are presented in Data Files 4 and 5. Un-ionized ammonia was calculated as a percentage of total ammonia compensating for temperature and pH. Ammonia analyses were performed on day 1 and day 10 of testing.

Test Termination

Sediment tests were terminated after 10 days. Sediment vessels were removed in numerical order from the environmental chamber in groups of five for animal recovery. Sediments and overlying water were passed through a 250 micron mesh sieve which was designed to capture the *L. plumulosus* while allowing some sediments to pass through. *L. plumulosus* were recovered with a screen, counted, and recorded on the breakdown sheet. *L. plumulosus* were then placed into tared, aluminum weigh boats, dried and weighed. Exposure replicates which did not account for the twenty *L. plumulosus* originally added were collected, preserved and stained for later observation. Any *L. plumulosus* not initially recovered were excluded from growth analysis due to water loss by the desiccating effect of ethanol preservation. The *L. plumulosus* breakdown sheet was designed with additional columns for repicking information. Once all the samples had been broken down and repicked (if necessary), the data was grouped according to the sediment IDs. The randomization sheet was used to unscramble the exposure vessel numbers which in turn accounted for the five replicates. The descrambling sheet provides sample IDs

matched to vessel numbers.

Reference Toxicant (Positive Control)

A positive control "reference toxicant" test was conducted with each shipment of test organisms. The reference toxicant used was sodium dodecyl sulfate (SDS) and the test was conducted in accordance with EPA/600/4-89/013. Values were plotted to determine if the results were within prescribed limits. In this technique, a running plot is maintained for the toxicity values from successive tests with a given reference toxicant. For regression analysis results (i.e. LC50s), the mean (x) and upper and lower control limits (±2SD) are recalculated with each successive point until the statistics stabilize.

The LC50s for *L. plumulosus* reference toxicant tests conducted since April of 1996 ranged from 6.5 - 12.8 mg/l. A control chart is presented as Figure 1.

Reference Sediment (Negative Control)

All sediment tests were accompanied by a negative control reference sediment test. Replication of these control samples were the same as for the study site samples (5 exposure replicates: 1 replicate for interstitial ammonia analysis). Reference sediment (C-17) was collected by TRAC field personnel. The principal reason for selecting C-17 as a suitable reference sediment is in the toxicological data base developed for *Ampelisca abdita* by USEPA EMAP Louisianian Province (1990-1994).

Statistical Analysis

The sediment samples were tested in groups of five or four with a common control. ANOVA and Dunnett's multiple range test were used to identify samples in which survival or growth was statistically lower from the negative controls. The survival proportions were transformed using Arcsin ($\sqrt{p2_i}$) where p_i = proportion surviving in replicate I. Weight data was not transformed. The data was then examined for homogeneity of variance and departure from normality using Bartlett's and Shapiro-Wilks tests, respectively. If the data were normally distributed and the variances homogenous, the transformed data was analyzed with a one-way ANOVA. If the F test of the ANOVA was significant ($p<0.05$), differences between the mean of each sample were compared with the control using Dunnett's test. Dunnett's test is specifically intended to compare treatment means with a control. If the F test in the ANOVA is not significant, no further analysis is performed, and the sample means are then statistically similar to the control. When the assumptions of normality and variance homogeneity cannot be verified, Steel's Many One Rank Test is used to examine differences between the control and each mean. Steel's Test is specifically intended to examine differences between treatments and a control when assumptions of normality and variance homogeneity cannot be verified.

RESULTS AND DISCUSSION

Survival Analysis

Survival data was calculated for each replicate as percent survival; mean and standard deviation were calculated for each sample.

Statistical analysis was performed on each test block using an ANOVA and Dunnett's multiple range test to identify samples in which survival was statistically lower from negative controls. Survival in samples 002MIJ56, 002MEF45 and 002MCD23 was found to be statistically lower at alpha = 0.05 and are denoted in Data File 2.

Growth Analysis

Weight data was analyzed for each replicate as mean weight in milligrams (mg) per individual.

Statistical analysis was performed on each test block using an ANOVA and Dunnett's multiple range test to identify samples in which mean weights were statistically lower from negative controls. Weights in samples 002MIJ12, 002MGH12, 002M1800, 002M2200 and 002MGH67 were found to be statistically lower at alpha = 0.05 and are denoted in Data File 3. Weights were not examined in those test sediments where survival was significantly less than corresponding controls.

Ammonia Analysis

Interstitial water samples were collected from fritted samplers within 24 hours of placement on day 1 and at test termination on day 10. Temperature, salinity and pH measurements were recorded prior to the total ammonia analysis. The Orion 250A pH/ISE meter and 95-12 gas sensing ammonia electrode were used to measure total ammonia. Data File 4 displays interstitial parameters measured. Data File 5 correlates total and un-ionized ammonia values with mean percent survival of sample IDs and denotes statistical significance when data sets are compared to their corresponding control treatments.

Physical Parameters

Dissolved oxygen, pH, temperature and salinity were measured daily in one replicate of each sediment sample. Data File 6 provides a summary of parameter ranges for each test series. Temperature ranges for this testing effort remained between 24.1 - 26.4 °C. Control sediment samples (C-17) are enumerated and matched with each sediment series.

Parameters were monitored daily, as stated above, and were maintained well within recommendations. Temperatures were consistently 25°C ±2°C. Dissolved oxygen levels were maintained with gentle aeration throughout the ten day exposure and levels stayed above 60% of saturation.

Interstitial water from individual site exposures varied from 20-24ppt (Data File 4).

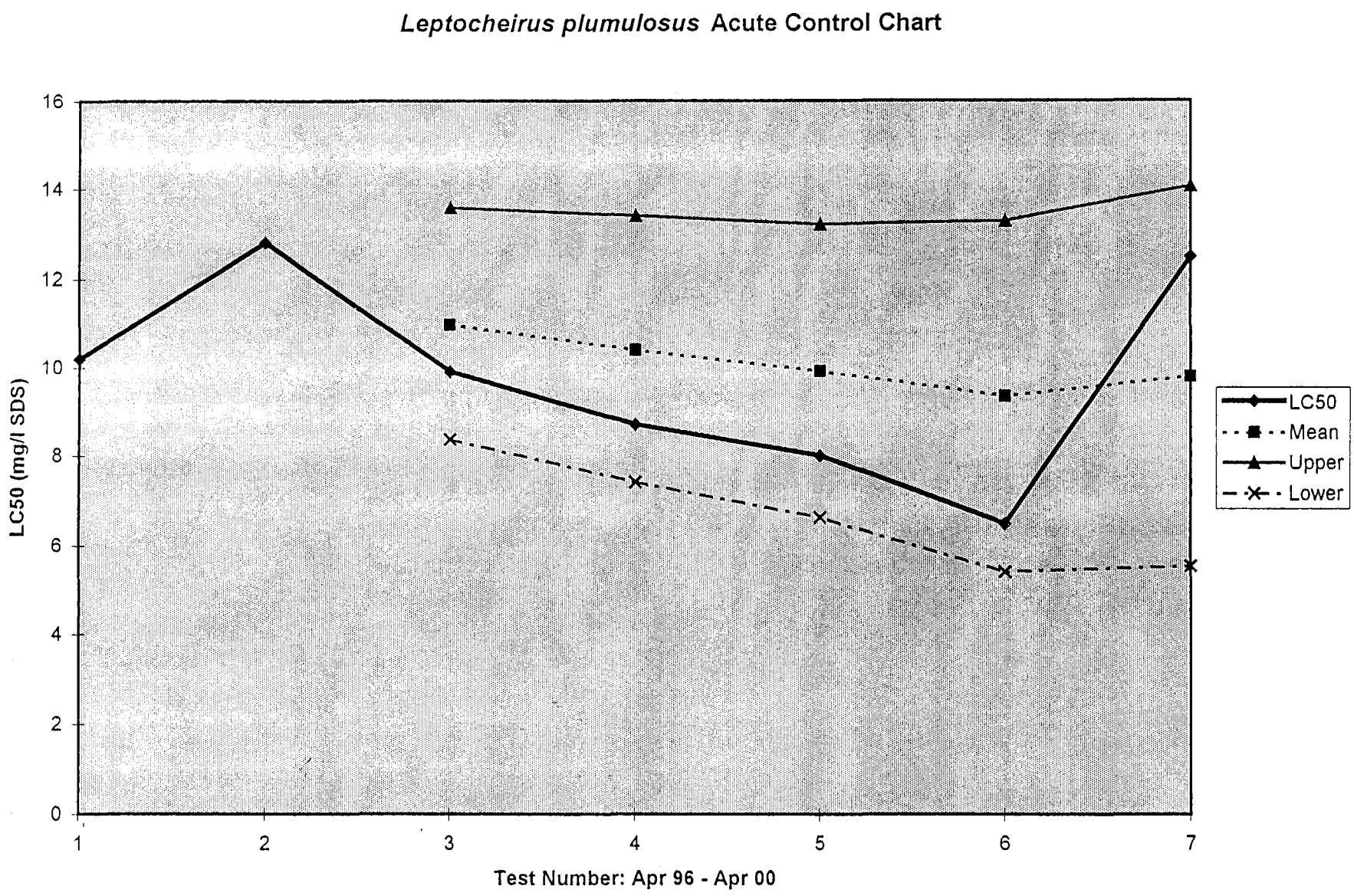
Interstitial waters were analyzed on day 1 (for ammonia analysis) and day 10 at test termination.

Outliers and Deviations in Protocol

Analysis of sample 002MEF23 (data file 2) reflects 4 replicates as opposed to 5. This was due to recovery of 31 individuals at test termination in one of the replicates for this sample. Because of the obvious organism loading error, an accurate beginning number of individuals in this replicate could not be determined. Therefore only 4 replicates were entered for statistical analysis.

Samples 002M1800, 002M2200, 002MKL34 and 002MGH67 were initially tested from 19 through 29 March 2000. However, at test termination significant negative control mortality was observed which exceeded the allowed 10% mortality occurrence. Ensafe was contacted immediately and informed of the invalid results. TRAC was then instructed to retest these samples. Retesting was conducted from 14 through 24 April 2000. Initial testing of the above samples was conducted with *L. plumulosus* obtained from a different source due to a shortage of the proper size *L. plumulosus* at Chesapeake Cultures. These organisms proved unsuitable for the purposes of this testing event. Retesting was postponed until *L. plumulosus* could be obtained from Chesapeake Cultures.

Figure 1.


Leptocheirus plumulosus Acute Control Chart
LC50 (mg/l SDS)
16
14
12
10
8
6
4
2
0
1
2
3
4
5
6
7
Test Number: Apr 96 - Apr 00
LC50
Mean
Upper
Lower

DATA FILE 1

Summary of Sediment Sample Collection, Processing, Survival and Holding Period

Summary of Sediment Information

Sample ID	Sample Collection Date	Sample Receipt Date	Arrival Temp. (0C)	Date Sample Sieved	Sieve Size	Date Sample Tested	Days From Collection to Testing	Days From Collection to Re-test
002MIJ12	03/07/00	03/08/00	2.2	03/09/00	1.0mm	03/13/00	6	NA
002MGH12	03/07/00	03/08/00	1.6	03/09/00	1.0mm	03/13/00	6	NA
002MIJ34	03/08/00	03/08/00	15.5	03/09/00	1.0mm	03/13/00	5	NA
002MGH34	03/08/00	03/08/00	14.3	03/09/00	1.0mm	03/13/00	5	NA
002MEF23	03/08/00	03/08/00	15.5	03/09/00	1.0mm	03/13/00	5	NA
002MIJ56	03/08/00	03/08/00	13.4	03/09/00	1.0mm	03/17/00	9	NA
002MGH56	03/08/00	03/08/00	16.8	03/09/00	1.0mm	03/17/00	9	NA
002MEF45	03/08/00	03/09/00	3.3	03/09/00	1.0mm	03/17/00	9	NA
002MCD23	03/09/00	03/09/00	14.1	03/10/00	1.0mm	03/17/00	8	NA
002M1800	03/09/00	03/09/00	15.9	03/10/00	1.0mm	03/19/00	10	36
002M2200	03/09/00	03/09/00	19.6	03/10/00	1.0mm	03/19/00	10	36
002MKL34	03/09/00	03/09/00	17.8	03/10/00	1.0mm	03/19/00	10	36
002MGH67	03/09/00	03/09/00	10.3	03/10/00	2.0mm	03/19/00	10	36

DATA FILE 2

Summary of *Leptocheirus plumulosus* Survival and Performance vs. Control Survival

Survival of *Leptocheirus plumulosus* in Ten Day Sediment Tests Conducted 13 March-24 April 2000

Sample ID	Number Surviving	Percent Survival	Mean Survival	Standard Deviation	% of control	p Value	Statistical Difference
C17-1	20	100	93.0	6.708	NA	NA	NA
	18	90					
	20	100					
	17	85					
	18	90					
002MIJ12	20	100	89.0	8.216	95.7	0.05	NO
	16	80					
	19	95					
	17	85					
	17	85					
002MGH12	17	85	88.0	6.708	94.6	0.05	NO
	17	85					
	17	85					
	17	85					
	20	100					
002MIJ34	20	100	95.0	3.536	102.2	0.05	NO
	18	90					
	19	95					
	19	95					
	19	95					
002MGH34	18	90	95.0	5.000	102.2	0.05	NO
	18	90					
	20	100					
	19	95					
	20	100					
002MEF23	19	95	95.0	4.082	102.2	0.05	NO
	20	100					
	18	90					
	19	95					
C17-2	20	100	94.0	8.216	NA	NA	NA
	17	85					
	17	85					
	20	100					
	20	100					
002MIJ56	17	85	81.0	4.183	86.2	0.05	YES
	16	80					
	17	85					
	15	75					
	16	80					
002MGH56	15	75	82.0	15.248	87.2	0.05	NO
	20	100					
	18	90					
	12	60					
	17	85					
002MEF45	15	75	73.0	5.701	77.7	0.05	YES
	15	75					
	13	65					
	16	80					
	14	70					

Survival of *Leptocheirus plumulosus* in Ten Day Sediment Tests Conducted 13 March-24 April 2000

002MCD23	17	85	78.0	4.472	83.0	0.05	YES
	15	75					
	15	75					
	15	75					
	16	80					
C17-3	20	100	100.0	0.000	NA	NA	NA
	20	100					
	20	100					
	20	100					
002M1800	20	100	98.8	2.500	98.8	0.05	NO
	19	95					
	20	100					
	20	100					
002M220	20	100	96.3	2.500	96.3	0.05	NO
	19	95					
	19	95					
	19	95					
002MKL34	19	95	97.5	2.887	97.5	0.05	NO
	20	100					
	19	95					
	20	100					
002MGH67	20	100	98.8	2.500	98.8	0.05	NO
	19	95					
	20	100					
	20	100					

DATA FILE 3

Summary of *Leptocheirus plumulosus* Growth and Performance vs. Control Growth

Weights of *Leptocheirus plumulosus* Exposed to Sediments in Ten Day Tests Conducted 13 March-24 April 2000

Sample ID	Number Surviving	Mean Weight/ Replicate (mg)	Mean Weight (mg)	Standard Deviation	p Value	Statistical Difference
C17-1	20	0.16	0.22	0.040	NA	NA
	18	0.19				
	20	0.23				
	17	0.25				
	18	0.25				
002MIJ12	20	0.13	0.13	0.011	0.05	YES
	16	0.13				
	19	0.15				
	17	0.14				
	17	0.12				
002MGH12	17	0.16	0.14	0.045	0.05	YES
	17	0.15				
	17	0.12				
	17	0.08				
	20	0.2				
002MIJ34	20	0.2	0.19	0.007	0.05	NO
	18	0.18				
	19	0.19				
	19	0.19				
	19	0.19				
002MGH34	18	0.18	0.19	0.010	0.05	NO
	18	0.18				
	20	0.2				
	19	0.19				
	20	0.2				
002MEF23	19	0.13	0.16	0.026	0.05	NO
	20	0.15				
	18	0.19				
	19	0.17				
C17-2	20	0.28	0.22	0.065	NA	NA
	17	0.19				
	17	0.19				
	20	0.3				
	20	0.15				
002MIJ56	17	0.37	0.21	0.094	NA	NA
	16	0.2				
	17	0.16				
	15	0.19				
	16	0.13				
002MGH56	15	0.29	0.28	0.076	0.05	NO
	20	0.31				
	18	0.32				
	12	0.34				
	17	0.15				
002MEF45	15	0.33	0.24	0.099	NA	NA
	15	0.13				
	13	0.22				
	16	0.35				

Weights of *Leptocheirus plumulosus* Exposed to Sediments in Ten Day Tests Conducted 13 March-24 April 2000

	14	0.16				
002MCD23	17	0.26	0.27	0.074	NA	NA
	15	0.36				
	15	0.22				
	15	0.34				
	16	0.19				
C17-3	20	0.18	0.23	0.037	NA	NA
	20	0.25				
	20	0.21				
	20	0.26				
002M1800	20	0.11	0.13	0.024	0.05	YES
	19	0.12				
	20	0.16				
	20	0.11				
002M220	20	0.14	0.14	0.016	0.05	YES
	19	0.12				
	19	0.16				
	19	0.14				
002MKL34	19	0.28	0.28	0.038	0.05	NO
	20	0.25				
	19	0.33				
	20	0.25				
002MGH67	20	0.12	0.13	0.014	0.05	YES
	19	0.13				
	20	0.15				
	20	0.12				
NA = Weights not applicable due to significant survival reduction						

DATA FILE 4

Conversion of Total Ammonia to Un-ionized Ammonia Measurements from Interstitial Water

Leptocheirus plumulosus Day 1 Ammonia Analyses

Sample ID	Day	Total Ammonia (mg/L)	Temp (^{0}C)	Salinity (ppt)	pH	Un-ionized Ammonia (mg/L)
C17-1	1	0.98	25	20	8.1	0.06
002MIJ12	1	1.41	25	20	7.9	0.06
002MGH12	1	1.17	25	20	7.9	0.05
002MIJ34	1	1.31	25	21	7.9	0.05
002MGH34	1	1.44	25	20	8.0	0.07
002MEF23	1	1.14	25	20	8.0	0.06
C17-2	1	3.01	25	21	8.0	0.16
002MIJ56	1	1.94	25	22	8.0	0.10
002MGH56	1	1.32	25	22	8.0	0.07
002MEF45	1	7.41	25	22	8.0	0.39
002MCD23	1	2.39	25	21	8.1	0.15
C17-3	1	1.86	25	20	8.1	0.12
002M1800	1	2.57	25	20	8.0	0.13
002M2200	1	0.70	25	20	8.0	0.03
002MKL34	1	0.85	25	20	7.9	0.03
002MGH67	1	2.51	25	20	7.9	0.10

Leptocheirus plumulosus Day 10 Ammonia Analyses

Sample ID	Day	Total Ammonia (mg/L)	Temp (^{0}C)	Salinity (ppt)	pH	Un-ionized Ammonia (mg/L)
C17-1	10	24.50	25	23	7.8	0.84
002MIJ12	10	11.22	25	22	8.0	0.60
002MGH12	10	6.00	25	23	8.0	0.32
002MIJ34	10	6.00	25	23	8.0	0.32
002MGH34	10	5.24	25	23	8.0	0.28
002MEF23	10	3.89	25	23	8.0	0.20
C17-2	10	1.44	25	23	8.0	0.07
002MIJ56	10	0.79	25	24	8.0	0.04
002MGH56	10	0.97	25	23	8.0	0.05
002MEF45	10	0.74	25	23	8.1	0.04
002MCD23	10	0.77	25	23	8.0	0.04
C17-3	10	2.40	25	20	7.9	0.10
002M1800	10	3.90	25	20	7.9	0.17
002M2200	10	2.60	25	21	7.9	0.11
002MKL34	10	3.40	25	22	7.9	0.14
002MGH67	10	1.80	25	20	7.9	0.08

DATA FILE 5

Summary of 10 Day Ammonia Analyses vs. *Leptocheirus plumulosus* Survival and Growth Performance

Ammonia vs. *Leptocheirus plumulosus* Survival and Weight

Sample ID	Mean % Survival	Mean Weight (mg)	Significant Survival Reduction (*)	Significant Weight Reduction (**)	Total Ammonia (mg/L)	Un-ionized Ammonia (mg/L)
C17-1	93	0.21			24.50	0.84
002MIJ12	89	0.13		**	11.22	0.60
002MGH12	88	0.14		**	6.00	0.32
002MIJ34	95	0.25			6.00	0.32
002MGH34	95	0.21			5.24	0.28
002MEF23	95	0.16			3.89	0.20
C17-2	94	0.22			1.44	0.07
002MIJ56	81	NA	*		0.79	0.04
002MGH56	82	0.28			0.97	0.05
002MEF45	73	NA	*		0.74	0.04
002MCD23	78	NA	*		0.77	0.04
C17-3	100	0.22			2.40	0.10
002M1800	98.8	0.12		**	3.90	0.17
002M2200	96.3	0.14		**	2.60	0.11
002MKL34	97.5	0.28			3.40	0.14
002MGH67	98.8	0.13		**	1.80	0.08
NA = Weights not applicable due to significant survival reduction						

DATA FILE 6

Summary of Physical Parameters Monitored during the 10 Day Exposure of *Leptocheirus plumulosus*

Summary of Physical Parameters During 10 Day Sediment Tests With *Leptocheirus plumulosus*

Sample ID		Day 0-10 pH		Day 0-10 DO		Day 0-10 Salinity		Day 0-10 Temp. (^{0}C)
C17-1		7.8 - 8.1		7.3 - 8.0		20 - 23		24.4-25.8
002MIJ12		7.8 - 8.2		7.4 - 8.0		20 - 23		24.1-25.8
002MGH12		7.9 - 8.2		7.6 - 8.1		20 - 23		24.2-25.8
002MIJ34		7.9 - 8.1		7.4 - 8.1		20 - 24		24.2-25.6
002MGH34		7.9 - 8.2		6.8 - 8.1		20 - 23		24.2-25.3
002MEF23		7.8 - 8.1		7.2 - 8.0		20 - 23		24.3-26.0
C17-2		7.8 - 8.1		6.8 - 7.2		21 - 23		24.9-26.1
002MIJ56		7.9 - 8.1		6.8 - 7.3		21 - 24		24.8-26.1
002MGH56		7.9 - 8.1		6.8 - 7.4		21 - 23		25.0-26.0
002MEF45		7.9 - 8.1		6.7 - 7.3		21 - 23		25.0-26.4
002MCD23		8.0 - 8.2		6.8 - 7.4		21 - 23		25.1-26.1
C17-3		7.5 - 8.1		7.1 - 8.2		20 - 21		24.8-26.1
002M1800		7.7 - 8.2		7.1 - 8.2		20 - 22		24.8-26.1
002M2200		7.7 - 8.2		7.1 - 8.2		20 - 22		24.7-26.0
002MKL34		7.8 - 8.3		7.0 - 8.3		20 - 22		24.7-26.0
002MGH67		7.7 - 8.2		7.1 - 8.3		20 - 21		24.8-26.0

ENSAFE

800-588-7962
MEMPHIS, TENNESSEE
CHARLESTON, SC; CINCINNATI, OH; DALLAS, TX; JACKSON, TN; KNOXVILLE, TN; LANCASTER, PA; NASHVILLE, TN; NORFOLK, VA; PADUCAH, KY; PENSACOLA, FL; RALEIGH, NC; COLOGNE, GERMANY

CHAIN OF CUSTODY RECORD

PAGE 1 OF ___

PROJECT/JOB NO: ___
COC NO: ___
PO NO: ___
REL NO: ___
LAB NAME: ___

CLIENT ___ PROJECT MANAGER A. Harris
LOCATION Site 2 TELE/FAX NO. ___
SAMPLERS: (SIGNATURE) ___

ANALYSIS REQUIRED

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION TEMP.	PRESERVATION CHEMICAL	NO. OF CONTAINERS	7-day Hybrid	10-day Depto									REMARKS TRAC SDS
2J-34	8 March 00	1000	Sed	3.75 L	Ambient	Ø	1	X	X									119-2504 15.5
GH-34	8 March 00	1115	Sed	3.75 L	Ambient	Ø	1	X	X									119-2505 14.3
EF-23	8 March 00	1225	Sed	3.75 L	Ambient	Ø	1	X	X									119-2506 15.5 °C
CJ-56	8 March 00	1400	Sed	3.75 L	Ambient	Ø	1	X	X									119-2507 13.4 °C
GH-56	8 March 00	1445	Sed	3.75 L	Ambient	Ø	1	X	X									119-2508 16.8 °C

RELINQUISHER	DATE	RECEIVER	DATE	RELINQUISHER	DATE	RECEIVER	DATE
B. Albrecht	3/8/00	Bill Hill	3/8/00	Bill Hill	3/8/00	[illegible]	8 Mar 00
PRINTED: B. ALBRECHT	TIME 1520	PRINTED: BILL HILL	TIME 1520	PRINTED: BILL HILL	TIME 1540	PRINTED: Don Johnson	TIME 1540
COMPANY: ENSAFE		COMPANY: SOUTHNAVFAC		COMPANY: SOUTHNAVFAC		COMPANY: TRAC	

METHOD OF SHIPMENT: ___
SHIPMENT NO. ___
SEND RESULTS TO: ___

COMMENTS: ___

ANALYTICAL DATA RECEIVED BY (INITIALS/DATE) ___

ENSCOC2
REV. 05/98

ENSAFE

800-588-7962
MEMPHIS, TENNESSEE
CHARLESTON, SC; CINCINNATI, OH; DALLAS, TX; JACKSON, TN; KNOXVILLE, TN; LANCASTER, PA; NASHVILLE, TN; NORFOLK, VA; PADUCAH, KY; PENSACOLA, FL; RALEIGH, NC; COLOGNE, GERMANY

CHAIN OF CUSTODY RECORD

PAGE _____ OF _____

PROJECT/JOB NO: _____

COC NO: _____

PO NO: _____

REL NO: _____

LAB NAME: _____

CLIENT _____ PROJECT MANAGER A. Harris

LOCATION _____ TELE/FAX NO. _____

SAMPLERS: (SIGNATURE) _____

ANALYSIS REQUIRED

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION TEMP.	PRESERVATION CHEMICAL	NO. OF CONTAINERS	Multiple 7-day	Lapse 10 day										REMARKS
BJ-12	7 March 00	1400	Seal	3.75L		Ø	1	X	X										
GH-12	7 March 00	1600	Seal	3.75L		Ø	1	X	X										

RELINQUISHER	DATE	RECEIVER	DATE	RELINQUISHER	DATE	RECEIVER	DATE
[signature]	8 March 00	BILL HILL		[signature]	3/8/00	[signature]	3/8/00
PRINTED: B. ALBRECHT	TIME 0745	PRINTED: Bill Hill	TIME	PRINTED: BILL HILL	TIME 0910	PRINTED: Don Johnson	TIME 0910
COMPANY: ENSAFE		COMPANY: SOUTHNAVFAC		COMPANY: SOUTHNAVFAC		COMPANY: TRAC	

METHOD OF SHIPMENT: _____

SHIPMENT NO. _____

SEND RESULTS TO: _____

COMMENTS: _____

ANALYTICAL DATA RECEIVED BY (INITIALS/DATE) _____

ENSCOC2
REV. 05/98

ENSAFE

800-588-7962
MEMPHIS, TENNESSEE
CHARLESTON, SC; CINCINNATI, OH; DALLAS, TX; JACKSON, TN; KNOXVILLE, TN; LANCASTER, PA; NASHVILLE, TN; NORFOLK, VA; PADUCAH, KY; PENSACOLA, FL; RALEIGH, NC; COLOGNE, GERMANY

CHAIN OF CUSTODY RECORD

PAGE 1 OF 1

PROJECT/JOB NO:
COC NO:
PO NO:
REL NO:
LAB NAME:

CLIENT
PROJECT MANAGER A. Harris
LOCATION Site 2
TELE/FAX NO.
SAMPLERS: (SIGNATURE)

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION TEMP.	PRESERVATION CHEMICAL	NO. OF CONTAINERS	7 day Thyb	10 day Cepto										REMARKS
EE45	9 Mar 00	1650	Sed	3.75L	Ambient	0	1	X	X										

RELINQUISHER	DATE	RECEIVER	DATE	RELINQUISHER	DATE	RECEIVER	DATE
B. Muecht	3/9/00	Bill Hill	3/9/00	Bill Hill	3/9/00	[illegible]	[illegible]
PRINTED: B. MUECHT	TIME 0800	PRINTED: BILL HILL	TIME 0800	PRINTED: BILL HILL	TIME 0835	PRINTED: Don Johnson	TIME [illegible]
COMPANY: ENSAFE		COMPANY: SOUTHNAVFAC		COMPANY: SOUTHDIVNAVFAC		COMPANY: TTEC	

METHOD OF SHIPMENT:
SHIPMENT NO.
SEND RESULTS TO:

COMMENTS:

ANALYTICAL DATA RECEIVED BY (INITIALS/DATE)

ENSCOC2
REV. 05/98

ENSAFE

800-588-7962
MEMPHIS, TENNESSEE
CHARLESTON, SC; CINCINNATI, OH; DALLAS, TX; JACKSON, TN; KNOXVILLE, TN; LANCASTER, PA; NASHVILLE, TN; NORFOLK, VA; PADUCAH, KY; PENSACOLA, FL; RALEIGH, NC; COLOGNE, GERMANY

CHAIN OF CUSTODY RECORD

PAGE 1 OF 1

PROJECT/JOB NO:
COC NO:
PO NO:
REL NO:
LAB NAME:

CLIENT
LOCATION Site 2
SAMPLERS: (SIGNATURE)

PROJECT MANAGER A Harris / B. Albrecht
TELE/FAX NO. 850-434-2230

ANALYSIS REQUIRED

	FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION TEMP.	PRESERVATION CHEMICAL	NO. OF CONTAINERS	7 day Hybrid	10 Lepto									REMARKS
510	CD-23	9 March 00	1130	Sed Tox	3.75 L	Ø	NA	1	X	X									14.1°C
511	1800	9 March 00	1330	"	"	Ø	↓	1	X	X									15.9°C
512	2200	9 March 00	1500	"	"	Ø	↓	1	X	X									19.6°C
513	KL-34	9 March 00	1015	"	"	Ø	↓	1	X	X									17.8°C
514	GH-67	9 March 00	0900	"	"	Ø	↓	1	X	X									10.3°C

RELINQUISHER	DATE	RECEIVER	DATE	RELINQUISHER	DATE	RECEIVER	DATE
D. Albrecht	9 March	[signature]	9 Mar 00				
PRINTED: B. ALBRECHT	TIME 1630	PRINTED: Ben Johnson	TIME 1630	PRINTED:	TIME	PRINTED:	TIME
COMPANY: ENSAFE		COMPANY: TRAC		COMPANY:		COMPANY:	

METHOD OF SHIPMENT:
SHIPMENT NO.
SEND RESULTS TO:

COMMENTS:

ANALYTICAL DATA RECEIVED BY (INITIALS/DATE)

ENSCOC2
REV. 05/98

Appendix E
Taxonomic Results

BARRY A. VITTOR & ASSOCIATES, INC.
ENVIRONMENTAL RESEARCH & CONSULTING
8060 Cottage Hill Road Mobile, Alabama 36695
Phone (334) 633-6100 Fax (334) 633-6738

Ms. Barbara Albrecht
Ensafe
201 N. Palafox St.
Pensacola, FL 32501

April 14, 2000

Dear Ms. Albrecht:

Please find enclosed the Taxonomic Species List, Community Parameters Table, and Station Reports for the Pensacola samples collected in March of 2000. Electronic versions of the Archive, Taxonomic Species List, Community Parameters Table, and Station Reports have also been sent out.

Thank you for your time. Please call if you have any questions.

Sincerely,

Michele Cheney

Michele Cheney
Data Manager

TAXONOMIC SPECIES LIST

Client: Ensafe
Project: Ensafe - NAS Pensacola

Project Date: 03/01/2000
Total Number of Taxa: 168

ANNELIDA
- CLASS OLIGOCHAETA
  - Order TUBIFICIDA
    - FAMILY TUBIFICIDAE
      - Tubificidae (LPIL)

- CLASS POLYCHAETA
  - Order AMPHINOMIDA
    - FAMILY AMPHINOMIDAE
      - Paramphinome sp. B
  - Order ARCHIANNELIDA
    - FAMILY POLYGORDIIDAE
      - Polygordius (LPIL)
  - Order CAPITELLIDA
    - FAMILY CAPITELLIDAE
      - Capitella capitata
      - Capitella jonesi
      - Mediomastus (LPIL)
      - Mediomastus ambiseta
      - Notomastus (LPIL)
      - Notomastus latericeus
    - FAMILY MALDANIDAE
      - Maldanidae (LPIL)
      - Maldane sp. A
  - Order COSSURIDA
    - FAMILY COSSURIDAE
      - Cossura soyeri
  - Order EUNICIDA
    - FAMILY DORVILLEIDAE
      - Schistomeringos rudolphi
    - FAMILY LUMBRINERIDAE
      - Scoletoma verrilli
    - FAMILY ONUPHIDAE
      - Onuphidae (LPIL)
  - Order OPHELIIDA
    - FAMILY OPHELIIDAE
      - Armandia maculata
      - Travisia hobsonae
  - Order ORBINIIDA
    - FAMILY ORBINIIDAE
      - Orbiniidae (LPIL)
      - Leitoscoloplos (LPIL)

Leitoscoloplos robustus
FAMILY PARAONIDAE
Aricidea (LPIL)
Aricidea suecica
Aricidea taylori
Cirrophorus (LPIL)
Order OWENIIDA
FAMILY OWENIIDAE
Galathowenia oculata
Owenia fusiformis
Order PHYLLODOCIDA
FAMILY CHRYSOPETALIDAE
Bhawania heteroseta
FAMILY GLYCERIDAE
Glyceridae (LPIL)
Glycera americana
Glycera sp. E
FAMILY GONIADIDAE
Glycinde solitaria
Goniadides carolinae
FAMILY HESIONIDAE
Parahesione luteola
Podarkeopsis levifuscina
FAMILY NEPHTYIDAE
Nephtyidae (LPIL)
Aglaophamus verrilli
Nephtys (LPIL)
Nephtys picta
FAMILY NEREIDAE
Nereis micromma
FAMILY PHYLLODOCIDAE
Phyllodocidae (LPIL)
Eumida sanguinea
Phyllodoce arenae
FAMILY PILARGIIDAE
Ancistrosyllis jonesi
Ancistrosyllis sp. B
Sigambra tentaculata
FAMILY POLYNOIDAE
Lepidonotus sp. A
FAMILY SIGALIONIDAE
Sthenelais sp. A
Order SABELLIDA
FAMILY SABELLIDAE
Sabellidae (LPIL)
Chone (LPIL)
Megalomma (LPIL)
Megalomma bioculatum
FAMILY SERPULIDAE

Serpulidae (LPIL)
Hydroides sp. B
Hydroides sp. H
Pomatoceros americanus
Order SPIONIDA
FAMILY CHAETOPTERIDAE
Spiochaetopterus oculatus
FAMILY CIRRATULIDAE
Cirratulidae (LPIL)
Chaetozone (LPIL)
Chaetozone sp. D
Monticellina dorsobranchialis
Tharyx acutus
FAMILY MAGELONIDAE
Magelona sp. H
FAMILY SPIONIDAE
Spionidae (LPIL)
Apoprionospio pygmaea
Carazziella hobsonae
Dipolydora socialis
Malacoceros vanderhorsti
Paraprionospio pinnata
Prionospio (LPIL)
Prionospio cristata
Prionospio heterobranchia
Prionospio perkinsi
Spio pettiboneae
Spiophanes bombyx
Streblospio benedicti
Order TEREBELLIDA
FAMILY PECTINARIIDAE
Pectinaria gouldii
FAMILY SABELLARIIDAE
Sabellaria vulgaris
FAMILY TEREBELLIDAE
Terebellidae (LPIL)
Pista palmata
Polycirrus sp. M

ARTHROPODA
CLASS MALACOSTRACA
Order AMPHIPODA
FAMILY AMPELISCIDAE
Ampelisca (LPIL)
Ampelisca sp. A
FAMILY AMPITHOIDAE
Cymadusa compta
FAMILY AORIDAE
Paramicrodeutopus myersi

FAMILY COROPHIIDAE
Corophium (LPIL)
Corophium sp. O
FAMILY HAUSTORIIDAE
Acanthohaustorius (LPIL)
FAMILY ISAEIDAE
Photis (LPIL)
FAMILY ISCHYROCERIDAE
Erichthonius brasiliensis
FAMILY LILJEBORGIIDAE
Listriella barnardi
FAMILY MELITIDAE
Elasmopus (LPIL)
Elasmopus levis
FAMILY OEDICEROTIDAE
Hartmanodes nyei
Monoculodes sp. F
FAMILY PHOXOCEPHALIDAE
Metharpinia floridana
Order CUMACEA
FAMILY DIASTYLIDAE
Oxyurostylis (LPIL)
FAMILY LEUCONIDAE
Leucon americanus
Order DECAPODA
FAMILY ALPHEIDAE
Automate evermanni
FAMILY CALAPPIDAE
Hepatus epheliticus
FAMILY DIOGENIDAE
Diogenidae (LPIL)
Paguristes hummi
FAMILY PAGURIDAE
Paguridae (LPIL)
FAMILY PALAEMONIDAE
Periclimenes americanus
FAMILY PINNOTHERIDAE
Pinnixa pearsei
FAMILY PORTUNIDAE
Portunidae (LPIL)
Callinectes sapidus
Ovalipes stephensoni
FAMILY PROCESSIDAE
Processa hemphilli
FAMILY XANTHIDAE
Xanthidae (LPIL)
Order MYSIDACEA
FAMILY MYSIDAE
Americamysis furca

Order TANAIDACEA
FAMILY PARATANAIDAE
Hargeria rapax

CLASS OSTRACODA
Order MYODOCOPINA
FAMILY SARSIELLIDAE
Eusarsiella cresseyi
Eusarsiella sp. E
Eusarsiella spinosa
Eusarsiella texana
Order PODOCOPIDA
FAMILY CYTHERIDEIDAE
Haplocytheridea setipunctata

CHORDATA
CLASS ASCIDIACEA
Order STOLIDOBRANCHIA
FAMILY MOLGULIDAE
Molgula (LPIL)

CLASS LEPTOCARDIA
Order AMPHIOXI
FAMILY BRANCHIOSTOMIDAE
Branchiostoma floridae

CNIDARIA
Cnidaria (LPIL)

ECHINODERMATA
CLASS HOLOTHUROIDEA
Order APODIDA
FAMILY SYNAPTIDAE
Leptosynapta multigranula

CLASS OPHIUROIDEA
Ophiuroidea (LPIL)
Order OPHIURIDA
FAMILY AMPHIURIDAE
Amphiuridae (LPIL)

HEMICHORDATA
CLASS ENTEROPNEUSTA
FAMILY PTYCHODERIDAE
Balanoglossus (LPIL)

MOLLUSCA
CLASS BIVALVIA
Bivalvia (LPIL)

Order ARCOIDA
FAMILY ARCIDAE
Anadara transversa
Order MYOIDA
FAMILY CORBULIDAE
Corbula barrattiana
Order MYTILOIDA
FAMILY MYTILIDAE
Brachidontes exustus
Order NUCULOIDA
FAMILY NUCULANIDAE
Nuculana acuta
Order PHOLADOMYOIDA
FAMILY LYONSIIDAE
Lyonsia hyalina hyalina
Order VENEROIDA
FAMILY ASTARTIDAE
Astarte (LPIL)
FAMILY CARDIIDAE
Laevicardium laevigatum
FAMILY CARDITIDAE
Carditidae (LPIL)
FAMILY LUCINIDAE
Lucinidae (LPIL)
Linga amiantus
Lucina multilineata
FAMILY MACTRIDAE
Mulinia lateralis
FAMILY MONTACUTIDAE
Mysella planulata
FAMILY SEMELIDAE
Semele (LPIL)
Semele nuculoides
FAMILY TELLINIDAE
Tellinidae (LPIL)
Macoma tenta
Tellina (LPIL)
Tellina versicolor
FAMILY UNGULINIDAE
Diplodonta semiaspera
FAMILY VENERIDAE
Chione (LPIL)
Chione grus

CLASS GASTROPODA
Gastropoda (LPIL)
Order ARCHAEOGASTROPODA
FAMILY TROCHIDAE
Trochidae (LPIL)

Order CEPHALASPIDEA
FAMILY ACTEONIDAE
Rictaxis punctostriatus
FAMILY HAMINEIDAE
Haminoea succinea
FAMILY SCAPHANDRIDAE
Acteocina canaliculata
Order MESOGASTROPODA
FAMILY CAECIDAE
Caecum pulchellum
FAMILY CALYPTRAEIDAE
Crepidula maculosa
FAMILY CERITHIIDAE
Bittium varium
FAMILY NATICIDAE
Natica pusilla
Neverita duplicata
FAMILY VITRINELLIDAE
Circulus suppressus
Order NEOGASTROPODA
FAMILY COLUMBELLIDAE
Anachis obesa
FAMILY NASSARIIDAE
Nassarius acutus
Nassarius vibex
FAMILY OLIVIDAE
Olivella dealbata
Order PYRAMIDELLOIDA
FAMILY PYRAMIDELLIDAE
Turbonilla (LPIL)

RHYNCHOCOELA
Rhynchocoela (LPIL)

CLASS ANOPLA
Order HETERONEMERTEA
FAMILY LINEIDAE
Lineidae (LPIL)
Order PALEONEMERTEA
FAMILY TUBULANIDAE
Tubulanus sp. A

SIPUNCULA
Sipuncula (LPIL)
FAMILY ASPIDOSIPHONIDAE
Aspidosiphon albus
FAMILY GOLFINGIIDAE
Phascolion strombi

SUMMARY OF COMMUNITY PARAMETERS

Client: Ensafe
Project: NAS Pensacola
Sample Date: 3/00

FAUNAL PARAMETERS

Station	Date (m/d/y)	Total No. Taxa	Mean No. of Taxa per Repl.	No. of Taxa per Repl. (std dev)	Total No. Individuals	Mean Density (nos/m2)	Density (std dev)	H' Shannon (log e)	d Diversity (log 2)	1/S Simpson Diversity	J' Pielou Evenness	D Margalef Richness	e Equitability
CD-23	3/1/00	32	17.5	10.6	74	4683.5	4117.5	3.02	4.35	16.37	0.87	7.20	0.93
CDEF2345AC	3/1/00	17	17.0	0.0	53	6709.0	0.0	2.30	3.32	7.37	0.81	4.03	0.84
EF-23	3/1/00	44	20.0	5.3	180	7595.0	4127.1	2.87	4.15	10.19	0.76	8.28	0.59
EF-45	3/1/00	45	25.5	2.1	187	11835.5	7250.0	2.73	3.94	6.74	0.72	8.41	0.49
GH-34	3/1/00	37	25.5	0.7	130	8228.0	715.6	3.15	4.54	16.67	0.87	7.40	0.93
GHIJ3456CA	3/1/00	24	24.0	0.0	125	15823.0	0.0	2.63	3.80	11.31	0.83	4.76	0.84
GH-12	3/1/00	28	17.5	7.8	85	5379.5	447.6	2.58	3.72	7.58	0.77	6.08	0.68
GH-134CA	3/1/00	24	24.0	0.0	45	5696.0	0.0	2.57	3.71	6.97	0.81	6.04	0.78
GH-67	3/1/00	30	14.0	3.6	74	3122.3	1176.2	3.06	4.41	20.62	0.90	6.74	1.04
GH-56	3/1/00	46	18.7	6.5	203	8565.3	6943.8	3.16	4.56	15.51	0.83	8.47	0.76
IJ-12	3/1/00	53	23.0	5.6	194	8185.3	2229.8	3.04	4.39	9.35	0.77	9.87	0.58
IJ-34	3/1/00	35	21.5	4.9	118	7468.0	2148.2	3.08	4.44	15.83	0.87	7.13	0.91
IJ-56	3/1/00	35	22.0	0.0	95	6012.5	805.4	3.12	4.50	18.08	0.88	7.47	0.95
KL-34	3/1/00	49	24.3	5.0	223	9409.3	2967.0	3.11	4.48	12.79	0.80	8.88	0.67
KL-18	3/1/00	40	23.3	3.1	299	12616.3	2751.0	2.81	4.06	10.34	0.76	6.84	0.60
KL-22	3/1/00	19	9.3	3.2	53	2236.0	1353.4	2.57	3.71	11.11	0.87	4.53	0.99
GH12XTRA	3/1/00	0	0.0	0.0	0	0.0	0.0	0.00	0.00	–	0.00	0.00	–

Station Data Summary Report
Station CD-23

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 001
Sample Type: Macrofauna
Replicates: 2
Sample Area: 0.0079

TAXON	Rep A		Rep B		Station		
	Count	Density	Count	Density	Total	Percent	Mean Density
Annelida							
Oligochaeta							
Tubificida							
Tubificidae							
Tubificidae (LPIL)	1	127	1	127	2	2.7	127
Polychaeta							
Capitellida							
Capitellidae							
Mediomastus (LPIL)	1	127	2	253	3	4.1	190
Opheliida							
Opheliidae							
Armandia maculata	0	0	6	759	6	8.1	380
Orbiniida							
Paraonidae							
Aricidea (LPIL)	0	0	1	127	1	1.4	64
Aricidea suecica	0	0	1	127	1	1.4	64
Oweniida							
Oweniidae							
Owenia fusiformis	0	0	5	633	5	6.8	317
Phyllodocida							
Glyceridae							
Glycera americana	0	0	1	127	1	1.4	64
Nephtyidae							
Nephtys (LPIL)	0	0	1	127	1	1.4	64
Pilargiidae							
Sigambra tentaculata	0	0	1	127	1	1.4	64
Sabellida							
Sabellidae							
Megalomma (LPIL)	0	0	1	127	1	1.4	64
Spionida							
Cirratulidae							
Cirratulidae (LPIL)	0	0	1	127	1	1.4	64
Spionidae							
Paraprionospio pinnata	0	0	1	127	1	1.4	64
Prionospio (LPIL)	1	127	0	0	1	1.4	64
Prionospio heterobranchia	0	0	1	127	1	1.4	64
Spio pettiboneae	2	253	0	0	2	2.7	127
Spiophanes bombyx	4	506	5	633	9	12.2	570
Terebellida							
Pectinariidae							
Pectinaria gouldii	0	0	3	380	3	4.1	190
Arthropoda							
Malacostraca							
Amphipoda							
Corophiidae							
Corophium (LPIL)	1	127	0	0	1	1.4	64
Decapoda							
Diogenidae							
Diogenidae (LPIL)	0	0	1	127	1	1.4	64
Paguristes hummi	1	127	0	0	1	1.4	64
Portunidae							
Callinectes sapidus	1	127	0	0	1	1.4	64

Station Data Summary Report
Station CD-23

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 001
Sample Type: Macrofauna
Replicates: 2
Sample Area: 0.0079

TAXON	Rep A		Rep B		Station		
	Count	Density	Count	Density	Total	Percent	Mean Density
Echinodermata							
Ophiuroidea							
Ophiuroidea (LPIL)	0	0	1	127	1	1.4	64
Mollusca							
Bivalvia							
Pholadomyoida							
Lyonsiidae							
Lyonsia hyalina hyalina	0	0	1	127	1	1.4	64
Veneroida							
Cardiidae							
Laevicardium laevigatum	1	127	0	0	1	1.4	64
Lucinidae							
Lucinidae (LPIL)	0	0	3	380	3	4.1	190
Tellinidae							
Tellina (LPIL)	0	0	6	759	6	8.1	380
Tellina versicolor	0	0	13	1646	13	17.6	823
Gastropoda							
Mesogastropoda							
Caecidae							
Caecum pulchellum	0	0	1	127	1	1.4	64
Cerithiidae							
Bittium varium	1	127	0	0	1	1.4	64
Neogastropoda							
Columbellidae							
Anachis obesa	0	0	1	127	1	1.4	64
Rhynchocoela							
Rhynchocoela (LPIL)	0	0	1	127	1	1.4	64
Sipuncula							
Aspidosiphonidae							
Aspidosiphon albus	0	0	1	127	1	1.4	64

Note: LPIL designates the LOWEST PRACTICAL IDENTIFICATION LEVEL

Station Data Summary Report
Station CD-23

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 001
Sample Type: Macrofauna
Replicates: 2
Sample Area: 0.0079

DATA SUMMARY

FAUNAL PARAMETERS	Station	Rep A	Rep B	Mean	Std Dev
Total Taxa	32	10	25	17.5	10.6
Total Individuals	74	14	60	37	32.5
Density (nos/sq.m.)		1772	7595	4684	4117.5

FAUNAL INDICES

Species Diversity (Shannon; log base e)	H'	=	3.02
Species Diversity (Shannon; log base 2)	d	=	4.35
Species Diversity (Shannon; log base 10)	H	=	1.31
Species Diversity (Simpson; 1/S)	1/S	=	16.37
Species Evenness (Pielou)	J'	=	0.87
Species Richness (Margalef)	D	=	7.2
Equitability Index (Lloyd & Ghelardi)	e	=	0.93

MAJOR TAXONOMIC GROUPS	Total No. Taxa	Taxa % Total	Total No. Individuals	Individuals % Total
Annelida	17	53.1	40	54
Mollusca	8	25	27	36.4
Arthropoda	4	12.5	4	5.4
Echinodermata	1	3.1	1	1.3
OTHER TAXA	2	6.2	2	2.7
TOTALS	32		74	

Station Data Summary Report
Station CDEF-2345-AC

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 002
Sample Type: Macrofauna
Replicates: 1
Sample Area: 0.0079

TAXON	Rep A		Station		
	Count	Density	Total	Percent	Mean Density
Annelida					
Polychaeta					
Capitellida					
Capitellidae					
Mediomastus (LPIL)	4	506	4	7.5	506
Cossurida					
Cossuridae					
Cossura soyeri	1	127	1	1.9	127
Eunicida					
Onuphidae					
Onuphidae (LPIL)	1	127	1	1.9	127
Opheliida					
Opheliidae					
Armandia maculata	1	127	1	1.9	127
Oweniida					
Oweniidae					
Owenia fusiformis	2	253	2	3.8	253
Sabellida					
Sabellidae					
Megalomma bioculatum	1	127	1	1.9	127
Spionida					
Spionidae					
Paraprionospio pinnata	1	127	1	1.9	127
Terebellida					
Pectinariidae					
Pectinaria gouldii	1	127	1	1.9	127
Terebellidae					
Terebellidae (LPIL)	1	127	1	1.9	127
Arthropoda					
Malacostraca					
Amphipoda					
Ampeliscidae					
Ampelisca sp. A	1	127	1	1.9	127
Cumacea					
Leuconidae					
Leucon americanus	1	127	1	1.9	127
Echinodermata					
Ophiuroidea					
Ophiuroidea (LPIL)	3	380	3	5.7	380
Mollusca					
Bivalvia					
Veneroida					
Lucinidae					
Lucina multilineata	10	1266	10	18.9	1266

Station Data Summary Report
Station CDEF-2345-AC

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 002
Sample Type: Macrofauna
Replicates: 1
Sample Area: 0.0079

TAXON	Rep A		Station		
	Count	Density	Total	Percent	Mean Density
Tellinidae					
Tellina (LPIL)	5	633	5	9.4	633
Tellina versicolor	16	2025	16	30.2	2025
Rhynchocoela					
Anopla					
Paleonemertea					
Tubulanidae					
Tubulanus sp. A	2	253	2	3.8	253
Sipuncula					
Golfingiidae					
Phascolion strombi	2	253	2	3.8	253

Note: LPIL designates the LOWEST PRACTICAL IDENTIFICATION LEVEL

Station Data Summary Report
Station CDEF-2345-AC

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 002
Sample Type: Macrofauna
Replicates: 1
Sample Area: 0.0079

DATA SUMMARY

FAUNAL PARAMETERS	Station	Rep A	Mean	Std Dev
Total Taxa	17	17	17	0
Total Individuals	53	53	53	0
Density (nos/sq.m.)		6709	6709	0

FAUNAL INDICES

Species Diversity (Shannon; log base e)	H'	=	2.3
Species Diversity (Shannon; log base 2)	d	=	3.32
Species Diversity (Shannon; log base 10)	H	=	1
Species Diversity (Simpson; 1/S)	1/S	=	7.37
Species Evenness (Pielou)	J'	=	0.81
Species Richness (Margalef)	D	=	4.03
Equitability Index (Lloyd & Ghelardi)	e	=	0.84

MAJOR TAXONOMIC GROUPS	Total No. Taxa	Taxa % Total	Total No. Individuals	Individuals % Total
Annelida	9	52.9	13	24.5
Mollusca	3	17.6	31	58.4
Arthropoda	2	11.7	2	3.7
Echinodermata	1	5.8	3	5.6
OTHER TAXA	2	11.7	4	7.5
TOTALS	17		53	

Station Data Summary Report
Station EF-23

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 003
Sample Type: Macrofauna
Replicates: 3
Sample Area: 0.0079

TAXON	Rep A		Rep B		Rep C		Station		
	Count	Density	Count	Density	Count	Density	Total	Percent	Mean Density
Annelida									
Oligochaeta									
Tubificida									
Tubificidae									
Tubificidae (LPIL)	0	0	0	0	2	253	2	1.1	84
Polychaeta									
Capitellida									
Capitellidae									
Capitella jonesi	0	0	0	0	1	127	1	0.6	42
Mediomastus (LPIL)	2	253	4	506	24	3038	30	16.7	1266
Mediomastus ambiseta	0	0	0	0	28	3544	28	15.6	1181
Notomastus (LPIL)	0	0	1	127	0	0	1	0.6	42
Maldanidae									
Maldane sp. A	1	127	0	0	0	0	1	0.6	42
Cossurida									
Cossuridae									
Cossura soyeri	0	0	0	0	3	380	3	1.7	127
Opheliida									
Opheliidae									
Armandia maculata	6	759	4	506	0	0	10	5.6	422
Orbiniida									
Paraonidae									
Aricidea suecica	1	127	2	253	0	0	3	1.7	127
Oweniida									
Oweniidae									
Galathowenia oculata	1	127	0	0	0	0	1	0.6	42
Owenia fusiformis	1	127	1	127	1	127	3	1.7	127
Phyllodocida									
Glyceridae									
Glycera americana	0	0	1	127	0	0	1	0.6	42
Goniadidae									
Glycinde solitaria	0	0	0	0	1	127	1	0.6	42
Sabellida									
Sabellidae									
Megalomma bioculatum	0	0	1	127	0	0	1	0.6	42
Sabellidae (LPIL)	0	0	0	0	1	127	1	0.6	42
Spionida									
Cirratulidae									
Chaetozone sp. D	1	127	0	0	0	0	1	0.6	42
Cirratulidae (LPIL)	0	0	0	0	1	127	1	0.6	42
Spionidae									
Prionospio (LPIL)	2	253	0	0	3	380	5	2.8	211
Prionospio perkinsi	0	0	0	0	2	253	2	1.1	84
Spiophanes bombyx	1	127	3	380	1	127	5	2.8	211
Terebellida									
Pectinariidae									
Pectinaria gouldii	0	0	3	380	0	0	3	1.7	127
Terebellidae									
Polycirrus sp. M	1	127	0	0	0	0	1	0.6	42
Arthropoda									
Malacostraca									
Amphipoda									
Corophiidae									
Corophium sp. O	0	0	1	127	0	0	1	0.6	42
Decapoda									
Portunidae									
Callinectes sapidus	0	0	1	127	0	0	1	0.6	42
Ostracoda									
Myodocopina									
Sarsiellidae									
Eusarsiella spinosa	0	0	1	127	0	0	1	0.6	42
Eusarsiella texana	1	127	2	253	0	0	3	1.7	127

Station Data Summary Report
Station EF-23

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 003
Sample Type: Macrofauna
Replicates: 3
Sample Area: 0.0079

TAXON	Rep A		Rep B		Rep C		Station		
	Count	Density	Count	Density	Count	Density	Total	Percent	Mean Density
Echinodermata									
Ophiuroidea									
Ophiuroidea (LPIL)	0	0	1	127	1	127	2	1.1	85
Mollusca									
Bivalvia									
Bivalvia (LPIL)	0	0	1	127	0	0	1	0.6	42
Nuculoida									
Nuculanidae									
Nuculana acuta	0	0	1	127	0	0	1	0.6	42
Veneroida									
Astartidae									
Astarte (LPIL)	0	0	1	127	0	0	1	0.6	42
Lucinidae									
Lucina multilineata	1	127	3	380	6	759	10	5.6	422
Montacutidae									
Mysella planulata	0	0	0	0	1	127	1	0.6	42
Tellinidae									
Macoma tenta	0	0	0	0	1	127	1	0.6	42
Tellina versicolor	9	1139	20	2532	7	886	36	20	1519
Veneridae									
Chione (LPIL)	0	0	1	127	0	0	1	0.6	42
Gastropoda									
Cephalaspidea									
Hamineidae									
Haminoea succinea	0	0	1	127	0	0	1	0.6	42
Scaphandridae									
Acteocina canaliculata	0	0	1	127	0	0	1	0.6	42
Mesogastropoda									
Calyptraeidae									
Crepidula maculosa	0	0	1	127	0	0	1	0.6	42
Cerithiidae									
Bittium varium	0	0	0	0	1	127	1	0.6	42
Rhynchocoela									
Rhynchocoela (LPIL)	0	0	1	127	2	253	3	1.7	127
Anopla									
Heteronemertea									
Lineidae									
Lineidae (LPIL)	0	0	0	0	4	506	4	2.2	169
Paleonemertea									
Tubulanidae									
Tubulanus sp. A	0	0	0	0	2	253	2	1.1	84
Sipuncula									
Sipuncula (LPIL)	1	127	0	0	0	0	1	0.6	42
Golfingiidae									
Phascolion strombi	0	0	0	0	1	127	1	0.6	42

Not LPIL designates the LOWEST PRACTICAL IDENTIFICATION LEVEL

Station Data Summary Report
Station EF-23

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 003
Sample Type: Macrofauna
Replicates: 3
Sample Area: 0.0079

DATA SUMMARY

FAUNAL PARAMETERS	Station	Rep A	Rep B	Rep C	Mean	Std Dev
Total Taxa	44	14	24	22	20	5.3
Total Individuals	180	29	57	94	60	32.6
Density (nos/sq.m.)		3671	7215	11899	7595	4127.1

FAUNAL INDICES			
Species Diversity (Shannon; log base e)	H'	=	2.87
Species Diversity (Shannon; log base 2)	d	=	4.15
Species Diversity (Shannon; log base 10)	H	=	1.25
Species Diversity (Simpson; 1/S)	1/S	=	10.19
Species Evenness (Pielou)	J'	=	0.76
Species Richness (Margalef)	D	=	8.28
Equitability Index (Lloyd & Ghelardi)	e	=	0.59

MAJOR TAXONOMIC GROUPS	Total No. Taxa	Taxa % Total	Total No. Individuals	Individuals % Total
Annelida	22	50	105	58.3
Mollusca	12	27.2	56	31.1
Arthropoda	4	9	6	3.3
Echinodermata	1	2.2	2	1.1
OTHER TAXA	5	11.3	11	6.1
TOTALS	44		180	

Station Data Summary Report
Station EF-45

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 004
Sample Type: Macrofauna
Replicates: 2
Sample Area: 0.0079

TAXON	Rep A		Rep B		Station		
	Count	Density	Count	Density	Total	Percent	Mean Density
Annelida							
Polychaeta							
Capitellida							
Capitellidae							
Capitella jonesi	1	127	0	0	1	0.5	64
Mediomastus (LPIL)	1	127	1	127	2	1.1	127
Cossurida							
Cossuridae							
Cossura soyeri	0	0	1	127	1	0.5	64
Opheliida							
Opheliidae							
Armandia maculata	10	1266	16	2025	26	13.9	1646
Orbiniida							
Paraonidae							
Aricidea suecica	0	0	2	253	2	1.1	127
Oweniida							
Oweniidae							
Owenia fusiformis	0	0	1	127	1	0.5	64
Phyllodocida							
Glyceridae							
Glycera americana	1	127	0	0	1	0.5	64
Nephtyidae							
Nephtyidae (LPIL)	0	0	2	253	2	1.1	127
Nephtys picta	0	0	1	127	1	0.5	64
Phyllodocidae							
Eumida sanguinea	1	127	0	0	1	0.5	64
Phyllodoce arenae	0	0	1	127	1	0.5	64
Polynoidae							
Lepidonotus sp. A	1	127	0	0	1	0.5	64
Sabellida							
Sabellidae							
Sabellidae (LPIL)	1	127	0	0	1	0.5	64
Serpulidae							
Hydroides sp. B	1	127	0	0	1	0.5	64
Hydroides sp. H	2	253	0	0	2	1.1	127
Pomatoceros americanus	11	1392	0	0	11	5.9	696
Serpulidae (LPIL)	2	253	0	0	2	1.1	127
Spionida							
Cirratulidae							
Chaetozone (LPIL)	0	0	1	127	1	0.5	64
Cirratulidae (LPIL)	2	253	0	0	2	1.1	127
Monticellina dorsobranchialis	0	0	1	127	1	0.5	64
Spionidae							
Dipolydora socialis	1	127	0	0	1	0.5	64
Prionospio (LPIL)	8	1013	2	253	10	5.3	633
Prionospio cristata	0	0	1	127	1	0.5	64
Spio pettiboneae	0	0	3	380	3	1.6	190
Terebellida							
Sabellariidae							
Sabellaria vulgaris	4	506	0	0	4	2.1	253
Terebellidae							
Polycirrus sp. M	0	0	2	253	2	1.1	127
Arthropoda							
Malacostraca							
Amphipoda							
Corophiidae							
Corophium sp. O	3	380	0	0	3	1.6	190
Liljeborgiidae							
Listriella barnardi	0	0	1	127	1	0.5	64
Melitidae							
Elasmopus levis	1	127	0	0	1	0.5	64

Station Data Summary Report
Station EF-45

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 004
Sample Type: Macrofauna
Replicates: 2
Sample Area: 0.0079

TAXON	Rep A		Rep B		Station		
	Count	Density	Count	Density	Total	Percent	Mean Density
Oedicerotidae							
Monoculodes sp. F	1	127	0	0	1	0.5	64
Decapoda							
Alpheidae							
Automate evermanni	0	0	1	127	1	0.5	64
Diogenidae							
Diogenidae (LPIL)	5	633	0	0	5	2.7	317
Paguristes hummi	65	8228	0	0	65	34.8	4114
Paguridae							
Paguridae (LPIL)	0	0	1	127	1	0.5	64
Xanthidae							
Xanthidae (LPIL)	1	127	1	127	2	1.1	127
Echinodermata							
Ophiuroidea							
Ophiurida							
Amphiuridae							
Amphiuridae (LPIL)	0	0	1	127	1	0.5	64
Mollusca							
Bivalvia							
Arcoida							
Arcidae							
Anadara transversa	3	380	0	0	3	1.6	190
Nuculoida							
Nuculanidae							
Nuculana acuta	0	0	1	127	1	0.5	64
Veneroida							
Semelidae							
Semele nuculoides	1	127	0	0	1	0.5	64
Tellinidae							
Tellina versicolor	2	253	7	886	9	4.8	570
Veneridae							
Chione (LPIL)	1	127	0	0	1	0.5	64
Gastropoda							
Mesogastropoda							
Calyptraeidae							
Crepidula maculosa	3	380	0	0	3	1.6	190
Neogastropoda							
Nassariidae							
Nassarius acutus	0	0	2	253	2	1.1	127
Rhynchocoela							
Rhynchocoela (LPIL)	1	127	2	253	3	1.6	190
Anopla							
Heteronemertea							
Lineidae							
Lineidae (LPIL)	0	0	1	127	1	0.5	64

Note: LPIL designates the LOWEST PRACTICAL IDENTIFICATION LEVEL

Station Data Summary Report
Station EF-45

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 004
Sample Type: Macrofauna
Replicates: 2
Sample Area: 0.0079

DATA SUMMARY

FAUNAL PARAMETERS	Station	Rep A	Rep B	Mean	Std Dev
Total Taxa	45	27	24	25.5	2.1
Total Individuals	187	134	53	93.5	57.3
Density (nos/sq.m.)		16962	6709	11836	7250

FAUNAL INDICES

Species Diversity (Shannon; log base e)	H'	=	2.73
Species Diversity (Shannon; log base 2)	d	=	3.94
Species Diversity (Shannon; log base 10)	H	=	1.19
Species Diversity (Simpson; 1/S)	1/S	=	6.74
Species Evenness (Pielou)	J'	=	0.72
Species Richness (Margalef)	D	=	8.41
Equitability Index (Lloyd & Ghelardi)	e	=	0.49

MAJOR TAXONOMIC GROUPS	Total No. Taxa	Taxa % Total	Total No. Individuals	Individuals % Total
Annelida	26	57.7	82	43.8
Mollusca	7	15.5	20	10.6
Arthropoda	9	20	80	42.7
Echinodermata	1	2.2	1	0.5
OTHER TAXA	2	4.4	4	2.1
TOTALS	45		187	

Station Data Summary Report
Station GH-34

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 005
Sample Type: Macrofauna
Replicates: 2
Sample Area: 0.0079

TAXON	Rep A		Rep B		Station		
	Count	Density	Count	Density	Total	Percent	Mean Density
Annelida							
Oligochaeta							
Tubificida							
Tubificidae							
Tubificidae (LPIL)	3	380	0	0	3	2.3	190
Polychaeta							
Amphinomida							
Amphinomidae							
Paramphinome sp. B	2	253	0	0	2	1.5	127
Capitellida							
Capitellidae							
Mediomastus (LPIL)	7	886	2	253	9	6.9	570
Mediomastus ambiseta	2	253	1	127	3	2.3	190
Cossurida							
Cossuridae							
Cossura soyeri	4	506	1	127	5	3.8	317
Opheliida							
Opheliidae							
Armandia maculata	5	633	4	506	9	6.9	570
Orbiniida							
Orbiniidae							
Leitoscoloplos (LPIL)	0	0	1	127	1	0.8	64
Phyllodocida							
Goniadidae							
Glycinde solitaria	0	0	1	127	1	0.8	64
Hesionidae							
Parahesione luteola	3	380	0	0	3	2.3	190
Podarkeopsis levifuscina	1	127	0	0	1	0.8	64
Nephtyidae							
Nephtyidae (LPIL)	0	0	4	506	4	3.1	253
Pilargiidae							
Sigambra tentaculata	5	633	0	0	5	3.8	317
Sabellida							
Sabellidae							
Megalomma bioculatum	1	127	0	0	1	0.8	64
Spionida							
Chaetopteridae							
Spiochaetopterus oculatus	1	127	1	127	2	1.5	127
Cirratulidae							
Chaetozone sp. D	2	253	0	0	2	1.5	127
Cirratulidae (LPIL)	0	0	1	127	1	0.8	64
Spionidae							
Apoprionospio pygmaea	0	0	1	127	1	0.8	64
Malacoceros vanderhorsti	1	127	1	127	2	1.5	127
Paraprionospio pinnata	1	127	0	0	1	0.8	64
Prionospio perkinsi	5	633	0	0	5	3.8	317
Spiophanes bombyx	1	127	3	380	4	3.1	254
Arthropoda							
Malacostraca							
Amphipoda							
Ampeliscidae							
Ampelisca sp. A	0	0	1	127	1	0.8	64

Station Data Summary Report
Station GH-34

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 005
Sample Type: Macrofauna
Replicates: 2
Sample Area: 0.0079

TAXON	Rep A		Rep B		Station		
	Count	Density	Count	Density	Total	Percent	Mean Density
Liljeborgiidae							
Listriella barnardi	0	0	1	127	1	0.8	64
Decapoda							
Portunidae							
Callinectes sapidus	0	0	1	127	1	0.8	64
Ostracoda							
Myodocopina							
Sarsiellidae							
Eusarsiella texana	1	127	1	127	2	1.5	127
Echinodermata							
Ophiuroidea							
Ophiurida							
Amphiuridae							
Amphiuridae (LPIL)	1	127	3	380	4	3.1	254
Mollusca							
Bivalvia							
Bivalvia (LPIL)	1	127	1	127	2	1.5	127
Nuculoida							
Nuculanidae							
Nuculana acuta	1	127	2	253	3	2.3	190
Veneroida							
Lucinidae							
Linga amiantus	0	0	1	127	1	0.8	64
Lucina multilineata	9	1139	6	759	15	11.5	949
Tellinidae							
Tellina versicolor	5	633	18	2278	23	17.7	1456
Gastropoda							
Mesogastropoda							
Naticidae							
Neverita duplicata	0	0	1	127	1	0.8	64
Vitrinellidae							
Circulus suppressus	2	253	0	0	2	1.5	127
Neogastropoda							
Columbellidae							
Anachis obesa	0	0	2	253	2	1.5	127
Nassariidae							
Nassarius acutus	1	127	2	253	3	2.3	190
Rhynchocoela							
Rhynchocoela (LPIL)	2	253	0	0	2	1.5	127
Anopla							
Paleonemertea							
Tubulanidae							
Tubulanus sp. A	2	253	0	0	2	1.5	127

Note: LPIL designates the LOWEST PRACTICAL IDENTIFICATION LEVEL

Station Data Summary Report
Station GH-34

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 005
Sample Type: Macrofauna
Replicates: 2
Sample Area: 0.0079

DATA SUMMARY

FAUNAL PARAMETERS	Station	Rep A	Rep B	Mean	Std Dev
Total Taxa	37	26	25	25.5	0.7
Total Individuals	130	69	61	65	5.7
Density (nos/sq.m.)		8734	7722	8228	715.6

FAUNAL INDICES

Species Diversity (Shannon; log base e)	H'	=	3.15
Species Diversity (Shannon; log base 2)	d	=	4.54
Species Diversity (Shannon; log base 10)	H	=	1.37
Species Diversity (Simpson; 1/S)	1/S	=	16.67
Species Evenness (Pielou)	J'	=	0.87
Species Richness (Margalef)	D	=	7.40
Equitability Index (Lloyd & Ghelardi)	e	=	0.93

MAJOR TAXONOMIC GROUPS	Total No. Taxa	Taxa % Total	Total No. Individuals	Individuals % Total
Annelida	21	56.7	65	50
Mollusca	9	24.3	52	40
Arthropoda	4	10.8	5	3.8
Echinodermata	1	2.7	4	3
OTHER TAXA	2	5.4	4	3
TOTALS	37		130	

Station Data Summary Report
Station GHIJ-3456-CA

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 006
Sample Type: Macrofauna
Replicates: 1
Sample Area: 0.0079

TAXON	Rep A		Station		
	Count	Density	Total	Percent	Mean Density
Annelida					
Oligochaeta					
Tubificida					
Tubificidae					
Tubificidae (LPIL)	1	127	1	0.8	127
Polychaeta					
Capitellida					
Capitellidae					
Capitella jonesi	7	886	7	5.6	886
Mediomastus (LPIL)	21	2658	21	16.8	2658
Mediomastus ambiseta	13	1646	13	10.4	1646
Opheliida					
Opheliidae					
Armandia maculata	19	2405	19	15.2	2405
Oweniida					
Oweniidae					
Owenia fusiformis	2	253	2	1.6	253
Spionida					
Cirratulidae					
Chaetozone sp. D	2	253	2	1.6	253
Spionidae					
Prionospio (LPIL)	1	127	1	0.8	127
Prionospio perkinsi	1	127	1	0.8	127
Arthropoda					
Malacostraca					
Amphipoda					
Ampeliscidae					
Ampelisca sp. A	4	506	4	3.2	506
Isaeidae					
Photis (LPIL)	1	127	1	0.8	127
Liljeborgiidae					
Listriella barnardi	2	253	2	1.6	253
Oedicerotidae					
Hartmanodes nyei	1	127	1	0.8	127
Cumacea					
Leuconidae					
Leucon americanus	14	1772	14	11.2	1772
Decapoda					
Portunidae					
Portunidae (LPIL)	1	127	1	0.8	127
Echinodermata					
Ophiuroidea					
Ophiurida					
Amphiuridae					
Amphiuridae (LPIL)	8	1013	8	6.4	1013

Station Data Summary Report
Station GHIJ-3456-CA

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 006
Sample Type: Macrofauna
Replicates: 1
Sample Area: 0.0079

TAXON	Rep A		Station		
	Count	Density	Total	Percent	Mean Density
Mollusca					
Bivalvia					
Bivalvia (LPIL)	1	127	1	0.8	127
Nuculoida					
Nuculanidae					
Nuculana acuta	2	253	2	1.6	253
Veneroida					
Lucinidae					
Lucina multilineata	10	1266	10	8	1266
Tellinidae					
Macoma tenta	1	127	1	0.8	127
Tellina versicolor	8	1013	8	6.4	1013
Gastropoda					
Cephalaspidea					
Acteonidae					
Rictaxis punctostriatus	1	127	1	0.8	127
Mesogastropoda					
Naticidae					
Natica pusilla	1	127	1	0.8	127
Rhynchocoela					
Rhynchocoela (LPIL)	3	380	3	2.4	380

Note: LPIL designates the LOWEST PRACTICAL IDENTIFICATION LEVEL

Station Data Summary Report
Station GHIJ-3456-CA

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 006
Sample Type: Macrofauna
Replicates: 1
Sample Area: 0.0079

DATA SUMMARY

FAUNAL PARAMETERS	Station	Rep A	Mean	Std Dev
Total Taxa	24	24	24	0
Total Individuals	125	125	125	0
Density (nos/sq.m.)		15823	15823	0

FAUNAL INDICES

Species Diversity (Shannon; log base e)	H'	=	2.63
Species Diversity (Shannon; log base 2)	d	=	3.80
Species Diversity (Shannon; log base 10)	H	=	1.14
Species Diversity (Simpson; 1/S)	1/S	=	11.31
Species Evenness (Pielou)	J'	=	0.83
Species Richness (Margalef)	D	=	4.76
Equitability Index (Lloyd & Ghelardi)	e	=	0.84

MAJOR TAXONOMIC GROUPS	Total No. Taxa	Taxa % Total	Total No. Individuals	Individuals % Total
Annelida	9	37.5	67	53.6
Mollusca	7	29.1	24	19.2
Arthropoda	6	25	23	18.4
Echinodermata	1	4.1	8	6.4
OTHER TAXA	1	4.1	3	2.4
TOTALS	24		125	

Station Data Summary Report
Station GH-12

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 007
Sample Type: Macrofauna
Replicates: 2
Sample Area: 0.0079

TAXON	Rep A		Rep B		Station		
	Count	Density	Count	Density	Total	Percent	Mean Density
Annelida							
Polychaeta							
Archiannelida							
Polygordiidae							
Polygordius (LPIL)	0	0	1	127	1	1.2	64
Capitellida							
Capitellidae							
Capitella jonesi	2	253	0	0	2	2.4	127
Mediomastus (LPIL)	1	127	3	380	4	4.7	254
Mediomastus ambiseta	2	253	0	0	2	2.4	127
Opheliida							
Opheliidae							
Armandia maculata	20	2532	7	886	27	31.8	1709
Phyllodocida							
Goniadidae							
Goniadides carolinae	1	127	0	0	1	1.2	64
Hesionidae							
Podarkeopsis levifuscina	0	0	1	127	1	1.2	64
Nephtyidae							
Nephtyidae (LPIL)	0	0	1	127	1	1.2	64
Sabellida							
Sabellidae							
Chone (LPIL)	1	127	0	0	1	1.2	64
Spionida							
Spionidae							
Dipolydora socialis	0	0	1	127	1	1.2	64
Spio pettiboneae	0	0	1	127	1	1.2	64
Spiophanes bombyx	6	759	2	253	8	9.4	506
Terebellida							
Pectinariidae							
Pectinaria gouldii	0	0	1	127	1	1.2	64
Arthropoda							
Malacostraca							
Amphipoda							
Liljeborgiidae							
Listriella barnardi	1	127	5	633	6	7.1	380
Cumacea							
Diastylidae							
Oxyurostylis (LPIL)	0	0	1	127	1	1.2	64
Decapoda							
Calappidae							
Hepatus epheliticus	0	0	1	127	1	1.2	64
Portunidae							
Portunidae (LPIL)	0	0	1	127	1	1.2	64
Ostracoda							
Myodocopina							
Sarsiellidae							
Eusarsiella sp. E	0	0	1	127	1	1.2	64
Chordata							
Leptocardia							
Amphioxi							
Branchiostomidae							
Branchiostoma floridae	1	127	1	127	2	2.4	127

Station Data Summary Report
Station GH-12

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 007
Sample Type: Macrofauna
Replicates: 2
Sample Area: 0.0079

TAXON	Rep A		Rep B		Station		
	Count	Density	Count	Density	Total	Percent	Mean Density
Mollusca							
Bivalvia							
Nuculoida							
Nuculanidae							
Nuculana acuta	0	0	2	253	2	2.4	127
Pholadomyoida							
Lyonsiidae							
Lyonsia hyalina hyalina	0	0	1	127	1	1.2	64
Veneroida							
Cardiidae							
Laevicardium laevigatum	0	0	1	127	1	1.2	64
Carditidae							
Carditidae (LPIL)	0	0	1	127	1	1.2	64
Lucinidae							
Lucinidae (LPIL)	1	127	1	127	2	2.4	127
Mactridae							
Mulinia lateralis	1	127	0	0	1	1.2	64
Tellinidae							
Tellina versicolor	3	380	9	1139	12	14.1	760
Ungulinidae							
Diplodonta semiaspera	0	0	1	127	1	1.2	64
Rhynchocoela							
Anopla							
Heteronemertea							
Lineidae							
Lineidae (LPIL)	0	0	1	127	1	1.2	64

Note: LPIL designates the LOWEST PRACTICAL IDENTIFICATION LEVEL

Station Data Summary Report
Station GH-12

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 007
Sample Type: Macrofauna
Replicates: 2
Sample Area: 0.0079

DATA SUMMARY

FAUNAL PARAMETERS	Station	Rep A	Rep B	Mean	Std Dev
Total Taxa	28	12	23	17.5	7.8
Total Individuals	85	40	45	42.5	3.5
Density (nos/sq.m.)		5063	5696	5380	447.6

FAUNAL INDICES

Species Diversity (Shannon; log base e)	H'	=	2.58
Species Diversity (Shannon; log base 2)	d	=	3.72
Species Diversity (Shannon; log base 10)	H	=	1.12
Species Diversity (Simpson; 1/S)	1/S	=	7.58
Species Evenness (Pielou)	J'	=	0.77
Species Richness (Margalef)	D	=	6.08
Equitability Index (Lloyd & Ghelardi)	e	=	0.68

MAJOR TAXONOMIC GROUPS	Total No. Taxa	Taxa % Total	Total No. Individuals	Individuals % Total
Annelida	13	46.4	51	60
Mollusca	8	28.5	21	24.7
Arthropoda	5	17.8	10	11.7
OTHER TAXA	2	7.1	3	3.5
TOTALS	28		85	

Station Data Summary Report
Station GH-134-CA

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 008
Sample Type: Macrofauna
Replicates: 1
Sample Area: 0.0079

DATA SUMMARY

FAUNAL PARAMETERS	Station	Rep A	Mean	Std Dev
Total Taxa	24	24	24	0
Total Individuals	45	45	45	0
Density (nos/sq.m.)		5696	5696	0

FAUNAL INDICES

Species Diversity (Shannon; log base e)	H'	=	2.57
Species Diversity (Shannon; log base 2)	d	=	3.71
Species Diversity (Shannon; log base 10)	H	=	1.12
Species Diversity (Simpson; 1/S)	1/S	=	6.97
Species Evenness (Pielou)	J'	=	0.81
Species Richness (Margalef)	D	=	6.04
Equitability Index (Lloyd & Ghelardi)	e	=	0.78

MAJOR TAXONOMIC GROUPS	Total No. Taxa	Taxa % Total	Total No. Individuals	Individuals % Total
Annelida	7	29.1	8	17.7
Mollusca	8	33.3	27	60
Arthropoda	4	16.6	4	8.8
Echinodermata	2	8.3	3	6.6
OTHER TAXA	3	12.5	3	6.6
TOTALS	24		45	

Station Data Summary Report
Station GH-67

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 009
Sample Type: Macrofauna
Replicates: 3
Sample Area: 0.0079

TAXON	Rep A		Rep B		Rep C		Station		
	Count	Density	Count	Density	Count	Density	Total	Percent	Mean Density
Annelida									
Polychaeta									
Archiannelida									
Polygordiidae									
Polygordius (LPIL)	2	253	1	127	0	0	3	4.1	127
Capitellida									
Capitellidae									
Capitella jonesi	1	127	0	0	0	0	1	1.4	42
Mediomastus (LPIL)	0	0	1	127	4	506	5	6.8	211
Mediomastus ambiseta	0	0	0	0	1	127	1	1.4	42
Opheliida									
Opheliidae									
Armandia maculata	3	380	0	0	1	127	4	5.4	169
Travisia hobsonae	0	0	6	759	3	380	9	12.2	380
Oweniida									
Oweniidae									
Owenia fusiformis	0	0	3	380	0	0	3	4.1	127
Phyllodocida									
Glyceridae									
Glycera sp. E	1	127	1	127	1	127	3	4.1	127
Glyceridae (LPIL)	0	0	1	127	0	0	1	1.4	42
Goniadidae									
Goniadides carolinae	0	0	4	506	1	127	5	6.8	211
Nephtyidae									
Nephtys picta	0	0	0	0	1	127	1	1.4	42
Phyllodocidae									
Phyllodoce arenae	1	127	0	0	0	0	1	1.4	42
Spionida									
Cirratulidae									
Cirratulidae (LPIL)	0	0	1	127	0	0	1	1.4	42
Spionidae									
Dipolydora socialis	0	0	1	127	0	0	1	1.4	42
Spio pettiboneae	2	253	0	0	6	759	8	10.8	337
Spiophanes bombyx	0	0	3	380	3	380	6	8.1	253
Terebellida									
Terebellidae									
Pista palmata	1	127	1	127	0	0	2	2.7	85
Arthropoda									
Malacostraca									
Amphipoda									
Ampeliscidae									
Ampelisca sp. A	1	127	0	0	0	0	1	1.4	42
Liljeborgiidae									
Listriella barnardi	0	0	0	0	1	127	1	1.4	42
Oedicerotidae									
Hartmanodes nyei	0	0	1	127	0	0	1	1.4	42
Phoxocephalidae									
Metharpinia floridana	0	0	1	127	1	127	2	2.7	85
Decapoda									
Pinnotheridae									
Pinnixa pearsei	0	0	1	127	0	0	1	1.4	42
Portunidae									
Ovalipes stephensoni	0	0	0	0	1	127	1	1.4	42
Portunidae (LPIL)	1	127	0	0	0	0	1	1.4	42
Processidae									
Processa hemphilli	1	127	0	0	0	0	1	1.4	42

Station Data Summary Report
Station GH-67

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 009
Sample Type: Macrofauna
Replicates: 3
Sample Area: 0.0079

TAXON	Rep A		Rep B		Rep C		Station		
	Count	Density	Count	Density	Count	Density	Total	Percent	Mean Density
Chordata									
Leptocardia									
Amphioxi									
Branchiostomidae									
Branchiostoma floridae	0	0	1	127	5	633	6	8.1	253
Mollusca									
Bivalvia									
Bivalvia (LPIL)	0	0	1	127	0	0	1	1.4	42
Veneroida									
Semelidae									
Semele nuculoides	0	0	0	0	1	127	1	1.4	42
Rhynchocoela									
Rhynchocoela (LPIL)	0	0	1	127	0	0	1	1.4	42
Sipuncula									
Golfingiidae									
Phascolion strombi	0	0	0	0	1	127	1	1.4	42

Note: LPIL designates the LOWEST PRACTICAL IDENTIFICATION LEVEL

Station Data Summary Report
Station GH-67

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 009
Sample Type: Macrofauna
Replicates: 3
Sample Area: 0.0079

DATA SUMMARY

FAUNAL PARAMETERS	Station	Rep A	Rep B	Rep C	Mean	Std Dev
Total Taxa	30	10	17	15	14	3.6
Total Individuals	74	14	29	31	24.7	9.3
Density (nos/sq.m.)		1772	3671	3924	3122	1176.2

FAUNAL INDICES

Species Diversity (Shannon; log base e)	H'	=	3.06
Species Diversity (Shannon; log base 2)	d	=	4.41
Species Diversity (Shannon; log base 10)	H	=	1.33
Species Diversity (Simpson; 1/S)	1/S	=	20.62
Species Evenness (Pielou)	J'	=	0.9
Species Richness (Margalef)	D	=	6.74
Equitability Index (Lloyd & Ghelardi)	e	=	1.04

MAJOR TAXONOMIC GROUPS	Total No. Taxa	Taxa % Total	Total No. Individuals	Individuals % Total
Annelida	17	56.6	55	74.3
Mollusca	2	6.6	2	2.7
Arthropoda	8	26.6	9	12.1
OTHER TAXA	3	10	8	10.8
TOTALS	30		74	

Station Data Summary Report
Station GH-56

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 010
Sample Type: Macrofauna
Replicates: 3
Sample Area: 0.0079

TAXON	Rep A		Rep B		Rep C		Station		
	Count	Density	Count	Density	Count	Density	Total	Percent	Mean Density
Annelida									
Polychaeta									
Amphinomida									
Amphinomidae									
Paramphinome sp. B	0	0	0	0	1	127	1	0.5	42
Capitellida									
Capitellidae									
Mediomastus (LPIL)	25	3165	0	0	3	380	28	13.8	1182
Mediomastus ambiseta	3	380	0	0	0	0	3	1.5	127
Cossurida									
Cossuridae									
Cossura soyeri	4	506	0	0	0	0	4	2	169
Opheliida									
Opheliidae									
Armandia maculata	0	0	4	506	3	380	7	3.4	295
Travisia hobsonae	0	0	0	0	5	633	5	2.5	211
Oweniida									
Oweniidae									
Owenia fusiformis	4	506	0	0	3	380	7	3.4	295
Phyllodocida									
Nephtyidae									
Nephtys picta	0	0	0	0	1	127	1	0.5	42
Phyllodocidae									
Phyllodocidae (LPIL)	1	127	0	0	0	0	1	0.5	42
Pilargiidae									
Sigambra tentaculata	1	127	0	0	0	0	1	0.5	42
Sigalionidae									
Sthenelais sp. A	0	0	1	127	0	0	1	0.5	42
Spionida									
Cirratulidae									
Chaetozone (LPIL)	0	0	1	127	0	0	1	0.5	42
Spionidae									
Prionospio (LPIL)	0	0	0	0	2	253	2	1	84
Prionospio cristata	0	0	0	0	1	127	1	0.5	42
Prionospio perkinsi	6	759	0	0	1	127	7	3.4	295
Spio pettiboneae	1	127	0	0	0	0	1	0.5	42
Spionidae (LPIL)	4	506	2	253	0	0	6	3	253
Spiophanes bombyx	0	0	0	0	7	886	7	3.4	295
Terebellida									
Pectinariidae									
Pectinaria gouldii	1	127	0	0	0	0	1	0.5	42
Arthropoda									
Malacostraca									
Amphipoda									
Ampeliscidae									
Ampelisca sp. A	1	127	0	0	0	0	1	0.5	42
Liljeborgiidae									
Listriella barnardi	0	0	0	0	1	127	1	0.5	42
Cumacea									
Leuconidae									
Leucon americanus	4	506	0	0	0	0	4	2	169
Decapoda									
Paguridae									
Paguridae (LPIL)	0	0	0	0	1	127	1	0.5	42
Portunidae									
Portunidae (LPIL)	3	380	0	0	0	0	3	1.5	127
Mysidacea									
Mysidae									
Americamysis furca	1	127	0	0	0	0	1	0.5	42
Ostracoda									
Myodocopina									
Sarsiellidae									
Eusarsiella texana	2	253	0	0	0	0	2	1	84

Station Data Summary Report
Station GH-56

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 010
Sample Type: Macrofauna
Replicates: 3
Sample Area: 0.0079

TAXON	Rep A		Rep B		Rep C		Station		
	Count	Density	Count	Density	Count	Density	Total	Percent	Mean Density
Chordata									
Ascidiacea									
Stolidobranchia									
Molgulidae									
Molgula (LPIL)	32	4051	0	0	0	0	32	15.8	1350
Leptocardia									
Amphioxi									
Branchiostomidae									
Branchiostoma floridae	0	0	0	0	1	127	1	0.5	42
Echinodermata									
Ophiuroidea									
Ophiuroidea (LPIL)	0	0	1	127	0	0	1	0.5	42
Ophiurida									
Amphiuridae									
Amphiuridae (LPIL)	5	633	0	0	0	0	5	2.5	211
Mollusca									
Bivalvia									
Bivalvia (LPIL)	3	380	0	0	0	0	3	1.5	127
Arcoida									
Arcidae									
Anadara transversa	0	0	1	127	0	0	1	0.5	42
Myoida									
Corbulidae									
Corbula barrattiana	7	886	0	0	1	127	8	3.9	338
Mytiloida									
Mytilidae									
Brachidontes exustus	0	0	1	127	0	0	1	0.5	42
Nuculoida									
Nuculanidae									
Nuculana acuta	0	0	6	759	0	0	6	3	253
Pholadomyoida									
Lyonsiidae									
Lyonsia hyalina hyalina	1	127	0	0	1	127	2	1	85
Veneroida									
Carditidae									
Carditidae (LPIL)	0	0	0	0	1	127	1	0.5	42
Lucinidae									
Lucinidae (LPIL)	14	1772	2	253	0	0	16	7.9	675
Tellinidae									
Tellina versicolor	3	380	14	1772	0	0	17	8.4	717
Gastropoda									
Archaeogastropoda									
Trochidae									
Trochidae (LPIL)	0	0	0	0	1	127	1	0.5	42
Mesogastropoda									
Calyptraeidae									
Crepidula maculosa	0	0	0	0	1	127	1	0.5	42
Vitrinellidae									
Circulus suppressus	1	127	0	0	0	0	1	0.5	42
Rhynchocoela									
Rhynchocoela (LPIL)	0	0	1	127	2	253	3	1.5	127
Anopla									
Heteronemertea									
Lineidae									
Lineidae (LPIL)	3	380	0	0	0	0	3	1.5	127
Paleonemertea									
Tubulanidae									
Tubulanus sp. A	1	127	0	0	0	0	1	0.5	42
Sipuncula									
Golfingiidae									
Phascolion strombi	0	0	1	127	0	0	1	0.5	42

Note: LPIL designates the LOWEST PRACTICAL IDENTIFICATION LEVEL

Station Data Summary Report
Station GH-56

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 010
Sample Type: Macrofauna
Replicates: 3
Sample Area: 0.0079

DATA SUMMARY

FAUNAL PARAMETERS	Station	Rep A	Rep B	Rep C	Mean	Std Dev
Total Taxa	46	25	12	19	18.7	6.5
Total Individuals	203	131	35	37	67.7	54.9
Density (nos/sq.m.)		16582	4430	4684	8565.0	6943.8

FAUNAL INDICES

Species Diversity (Shannon; log base e)	H'	=	3.16
Species Diversity (Shannon; log base 2)	d	=	4.56
Species Diversity (Shannon; log base 10)	H	=	1.37
Species Diversity (Simpson; 1/S)	1/S	=	15.51
Species Evenness (Pielou)	J'	=	0.83
Species Richness (Margalef)	D	=	8.47
Equitability Index (Lloyd & Ghelardi)	e	=	0.76

MAJOR TAXONOMIC GROUPS	Total No. Taxa	Taxa % Total	Total No. Individuals	Individuals % Total
Annelida	19	41.3	85	41.8
Mollusca	12	26	58	28.5
Arthropoda	7	15.2	13	6.4
Echinodermata	2	4.3	6	2.9
OTHER TAXA	6	13	41	20.1
TOTALS	46		203	

Station Data Summary Report
Station IJ-12

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 011
Sample Type: Macrofauna
Replicates: 3
Sample Area: 0.0079

TAXON	Rep A		Rep B		Rep C		Station		
	Count	Density	Count	Density	Count	Density	Total	Percent	Mean Density
Annelida									
Oligochaeta									
Tubificida									
Tubificidae									
Tubificidae (LPIL)	0	0	1	127	1	127	2	1	85
Polychaeta									
Capitellida									
Capitellidae									
Capitella capitata	1	127	0	0	0	0	1	0.5	42
Mediomastus (LPIL)	5	633	4	506	14	1772	23	11.9	970
Mediomastus ambiseta	0	0	0	0	1	127	1	0.5	42
Notomastus (LPIL)	1	127	0	0	0	0	1	0.5	42
Maldanidae									
Maldanidae (LPIL)	1	127	0	0	0	0	1	0.5	42
Opheliida									
Opheliidae									
Armandia maculata	7	886	0	0	0	0	7	3.6	295
Orbiniida									
Orbiniidae									
Leitoscoloplos (LPIL)	0	0	0	0	1	127	1	0.5	42
Paraonidae									
Aricidea suecica	0	0	1	127	0	0	1	0.5	42
Oweniida									
Oweniidae									
Galathowenia oculata	0	0	2	253	0	0	2	1	84
Owenia fusiformis	2	253	0	0	0	0	2	1	84
Phyllodocida									
Goniadidae									
Glycinde solitaria	1	127	0	0	0	0	1	0.5	42
Nephtyidae									
Nephtys (LPIL)	0	0	1	127	0	0	1	0.5	42
Nephtys picta	2	253	0	0	0	0	2	1	84
Pilargiidae									
Ancistrosyllis jonesi	1	127	0	0	0	0	1	0.5	42
Sigambra tentaculata	2	253	1	127	0	0	3	1.5	127
Sabellida									
Sabellidae									
Megalomma bioculatum	1	127	1	127	0	0	2	1	85
Spionida									
Chaetopteridae									
Spiochaetopterus oculatus	0	0	1	127	0	0	1	0.5	42
Cirratulidae									
Chaetozone (LPIL)	1	127	0	0	0	0	1	0.5	42
Spionidae									
Apoprionospio pygmaea	3	380	0	0	0	0	3	1.5	127
Carazziella hobsonae	0	0	0	0	1	127	1	0.5	42
Dipolydora socialis	0	0	2	253	0	0	2	1	84
Paraprionospio pinnata	1	127	0	0	2	253	3	1.5	127
Prionospio (LPIL)	0	0	0	0	1	127	1	0.5	42
Prionospio cristata	0	0	0	0	1	127	1	0.5	42
Prionospio heterobranchia	2	253	0	0	1	127	3	1.5	127
Prionospio perkinsi	0	0	0	0	1	127	1	0.5	42
Spiophanes bombyx	1	127	0	0	0	0	1	0.5	42
Streblospio benedicti	0	0	0	0	3	380	3	1.5	127
Terebellida									
Pectinariidae									
Pectinaria gouldii	6	759	0	0	0	0	6	3.1	253
Arthropoda									
Malacostraca									
Amphipoda									
Ampeliscidae									
Ampelisca sp. A	0	0	0	0	2	253	2	1	84

Station Data Summary Report
Station LJ-12

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 011
Sample Type: Macrofauna
Replicates: 3
Sample Area: 0.0079

TAXON	Rep A		Rep B		Rep C		Station		
	Count	Density	Count	Density	Count	Density	Total	Percent	Mean Density
Decapoda									
Paguridae									
Paguridae (LPIL)	2	253	0	0	0	0	2	1	84
Palaemonidae									
Periclimenes americanus	0	0	0	0	1	127	1	0.5	42
Portunidae									
Callinectes sapidus	1	127	0	0	1	127	2	1	85
Ostracoda									
Myodocopina									
Sarsiellidae									
Eusarsiella spinosa	0	0	1	127	0	0	1	0.5	42
Eusarsiella texana	2	253	0	0	0	0	2	1	84
Podocopida									
Cytherideidae									
Haplocytheridea setipunctata	0	0	1	127	0	0	1	0.5	42
Chordata									
Ascidiacea									
Stolidobranchia									
Molgulidae									
Molgula (LPIL)	0	0	0	0	13	1646	13	6.7	549
Echinodermata									
Holothuroidea									
Apodida									
Synaptidae									
Leptosynapta multigranula	1	127	0	0	0	0	1	0.5	42
Ophiuroidea									
Ophiurida									
Amphiuridae									
Amphiuridae (LPIL)	3	380	2	253	0	0	5	2.6	211
Mollusca									
Bivalvia									
Myoida									
Corbulidae									
Corbula barrattiana	0	0	0	0	1	127	1	0.5	42
Nuculoida									
Nuculanidae									
Nuculana acuta	5	633	4	506	0	0	9	4.6	380
Veneroida									
Carditidae									
Carditidae (LPIL)	1	127	0	0	0	0	1	0.5	42
Lucinidae									
Linga amiantus	0	0	1	127	0	0	1	0.5	42
Lucina multilineata	0	0	1	127	0	0	1	0.5	42
Lucinidae (LPIL)	0	0	0	0	1	127	1	0.5	42
Tellinidae									
Tellina versicolor	26	3291	26	3291	4	506	56	28.9	2363
Gastropoda									
Cephalaspidea									
Scaphandridae									
Acteocina canaliculata	1	127	2	253	0	0	3	1.5	127
Neogastropoda									
Columbellidae									
Anachis obesa	1	127	0	0	0	0	1	0.5	42
Rhynchocoela									
Rhynchocoela (LPIL)	1	127	0	0	1	127	2	1	85
Anopla									
Heteronemertea									
Lineidae									
Lineidae (LPIL)	0	0	0	0	1	127	1	0.5	42
Paleonemertea									
Tubulanidae									
Tubulanus sp. A	3	380	3	380	1	127	7	3.6	296
Sipuncula									
Golfingiidae									
Phascolion strombi	0	0	0	0	1	127	1	0.5	42

Note: LPIL designates the LOWEST PRACTICAL IDENTIFICATION LEVEL

Station Data Summary Report
Station IJ-12

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 011
Sample Type: Macrofauna
Replicates: 3
Sample Area: 0.0079

DATA SUMMARY

FAUNAL PARAMETERS	Station	Rep A	Rep B	Rep C	Mean	Std Dev
Total Taxa	53	29	18	22	23.0	5.6
Total Individuals	194	85	55	54	64.7	17.6
Density (nos/sq.m.)		10759	6962	6835	8185.0	2229.8

FAUNAL INDICES

Species Diversity (Shannon; log base e)	H'	=	3.04
Species Diversity (Shannon; log base 2)	d	=	4.39
Species Diversity (Shannon; log base 10)	H	=	1.32
Species Diversity (Simpson; 1/S)	1/S	=	9.35
Species Evenness (Pielou)	J'	=	0.77
Species Richness (Margalef)	D	=	9.87
Equitability Index (Lloyd & Ghelardi)	e	=	0.58

MAJOR TAXONOMIC GROUPS	Total No. Taxa	Taxa % Total	Total No. Individuals	Individuals % Total
Annelida	30	56.6	79	40.7
Mollusca	9	16.9	74	38.1
Arthropoda	7	13.2	11	5.6
Echinodermata	2	3.7	6	3
OTHER TAXA	5	9.4	24	12.3
TOTALS	53		194	

Station Data Summary Report
Station IJ-34

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 012
Sample Type: Macrofauna
Replicates: 2
Sample Area: 0.0079

TAXON	Rep A		Rep B		Station		
	Count	Density	Count	Density	Total	Percent	Mean Density
Annelida							
Oligochaeta							
Tubificida							
Tubificidae							
Tubificidae (LPIL)	4	506	1	127	5	4.2	317
Polychaeta							
Capitellida							
Capitellidae							
Mediomastus (LPIL)	17	2152	6	759	23	19.5	1456
Mediomastus ambiseta	6	759	2	253	8	6.8	506
Cossurida							
Cossuridae							
Cossura soyeri	2	253	5	633	7	5.9	443
Eunicida							
Onuphidae							
Onuphidae (LPIL)	1	127	0	0	1	0.8	64
Opheliida							
Opheliidae							
Armandia maculata	4	506	0	0	4	3.4	253
Phyllodocida							
Pilargiidae							
Sigambra tentaculata	2	253	0	0	2	1.7	127
Sigalionidae							
Sthenelais sp. A	1	127	0	0	1	0.8	64
Sabellida							
Sabellidae							
Megalomma bioculatum	1	127	0	0	1	0.8	64
Spionida							
Chaetopteridae							
Spiochaetopterus oculatus	1	127	1	127	2	1.7	127
Cirratulidae							
Chaetozone sp. D	1	127	0	0	1	0.8	64
Spionidae							
Paraprionospio pinnata	1	127	0	0	1	0.8	64
Prionospio perkinsi	8	1013	1	127	9	7.6	570
Arthropoda							
Malacostraca							
Amphipoda							
Ampeliscidae							
Ampelisca sp. A	0	0	2	253	2	1.7	127
Aoridae							
Paramicrodeutopus myersi	0	0	1	127	1	0.8	64
Cumacea							
Leuconidae							
Leucon americanus	0	0	4	506	4	3.4	253
Decapoda							
Portunidae							
Callinectes sapidus	0	0	1	127	1	0.8	64

Station Data Summary Report
Station LJ-34

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 012
Sample Type: Macrofauna
Replicates: 2
Sample Area: 0.0079

TAXON	Rep A		Rep B		Station		
	Count	Density	Count	Density	Total	Percent	Mean Density
Chordata							
Ascidiacea							
Stolidobranchia							
Molgulidae							
Molgula (LPIL)	1	127	0	0	1	0.8	64
Echinodermata							
Holothuroidea							
Apodida							
Synaptidae							
Leptosynapta multigranula	1	127	0	0	1	0.8	64
Ophiuroidea							
Ophiuroidea (LPIL)	0	0	2	253	2	1.7	127
Ophiurida							
Amphiuridae							
Amphiuridae (LPIL)	2	253	0	0	2	1.7	127
Mollusca							
Bivalvia							
Bivalvia (LPIL)	2	253	0	0	2	1.7	127
Myoida							
Corbulidae							
Corbula barrattiana	1	127	0	0	1	0.8	64
Veneroida							
Lucinidae							
Lucina multilineata	0	0	7	886	7	5.9	443
Lucinidae (LPIL)	2	253	0	0	2	1.7	127
Mactridae							
Mulinia lateralis	1	127	0	0	1	0.8	64
Tellinidae							
Tellina versicolor	3	380	3	380	6	5.1	380
Veneridae							
Chione grus	0	0	2	253	2	1.7	127
Gastropoda							
Gastropoda (LPIL)	0	0	1	127	1	0.8	64
Mesogastropoda							
Cerithiidae							
Bittium varium	0	0	1	127	1	0.8	64
Pyramidelloida							
Pyramidellidae							
Turbonilla (LPIL)	1	127	0	0	1	0.8	64
Rhynchocoela							
Rhynchocoela (LPIL)	1	127	6	759	7	5.9	443
Anopla							
Heteronemertea							
Lineidae							
Lineidae (LPIL)	2	253	0	0	2	1.7	127
Paleonemertea							
Tubulanidae							
Tubulanus sp. A	5	633	0	0	5	4.2	317
Sipuncula							
Golfingiidae							
Phascolion strombi	0	0	1	127	1	0.8	64

Note: LPIL designates the LOWEST PRACTICAL IDENTIFICATION LEVEL

Station Data Summary Report
Station IJ-34

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 012
Sample Type: Macrofauna
Replicates: 2
Sample Area: 0.0079

DATA SUMMARY

FAUNAL PARAMETERS	Station	Rep A	Rep B	Mean	Std Dev
Total Taxa	35	25	18	21.5	4.9
Total Individuals	118	71	47	59	17
Density (nos/sq.m.)		8987	5949	7468	2148.2

FAUNAL INDICES

Species Diversity (Shannon; log base e)	H'	=	3.08
Species Diversity (Shannon; log base 2)	d	=	4.44
Species Diversity (Shannon; log base 10)	H	=	1.34
Species Diversity (Simpson; 1/S)	1/S	=	15.83
Species Evenness (Pielou)	J'	=	0.87
Species Richness (Margalef)	D	=	7.13
Equitability Index (Lloyd & Ghelardi)	e	=	0.91

MAJOR TAXONOMIC GROUPS	Total No. Taxa	Taxa % Total	Total No. Individuals	Individuals % Total
Annelida	13	37.1	65	55
Mollusca	10	28.5	24	20.3
Arthropoda	4	11.4	8	6.7
Echinodermata	3	8.5	5	4.2
OTHER TAXA	5	14.2	16	13.5
TOTALS	35		118	

Station Data Summary Report
Station IJ-56

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 013
Sample Type: Macrofauna
Replicates: 2
Sample Area: 0.0079

TAXON	Rep A		Rep B		Station		
	Count	Density	Count	Density	Total	Percent	Mean Density
Annelida							
Oligochaeta							
Tubificida							
Tubificidae							
Tubificidae (LPIL)	1	127	0	0	1	1.1	64
Polychaeta							
Amphinomida							
Amphinomidae							
Paramphinome sp. B	0	0	1	127	1	1.1	64
Capitellida							
Capitellidae							
Mediomastus (LPIL)	2	253	1	127	3	3.2	190
Cossurida							
Cossuridae							
Cossura soyeri	0	0	1	127	1	1.1	64
Opheliida							
Opheliidae							
Armandia maculata	4	506	3	380	7	7.4	443
Orbiniida							
Paraonidae							
Aricidea taylori	0	0	1	127	1	1.1	64
Cirrophorus (LPIL)	0	0	1	127	1	1.1	64
Oweniida							
Oweniidae							
Owenia fusiformis	5	633	11	1392	16	16.8	1013
Phyllodocida							
Nephtyidae							
Nephtys (LPIL)	0	0	1	127	1	1.1	64
Nereidae							
Nereis micromma	1	127	0	0	1	1.1	64
Spionida							
Cirratulidae							
Chaetozone sp. D	1	127	0	0	1	1.1	64
Cirratulidae (LPIL)	0	0	3	380	3	3.2	190
Monticellina dorsobranchialis	1	127	0	0	1	1.1	64
Spionidae							
Apoprionospio pygmaea	2	253	1	127	3	3.2	190
Prionospio (LPIL)	1	127	0	0	1	1.1	64
Prionospio cristata	0	0	4	506	4	4.2	253
Spio pettiboneae	0	0	6	759	6	6.3	380
Spiophanes bombyx	0	0	8	1013	8	8.4	507
Terebellida							
Terebellidae							
Pista palmata	0	0	2	253	2	2.1	127
Arthropoda							
Malacostraca							
Amphipoda							
Ampeliscidae							
Ampelisca sp. A	0	0	1	127	1	1.1	64
Haustoriidae							
Acanthohaustorius (LPIL)	1	127	0	0	1	1.1	64
Liljeborgiidae							
Listriella barnardi	1	127	1	127	2	2.1	127
Ostracoda							
Myodocopina							
Sarsiellidae							
Eusarsiella texana	1	127	1	127	2	2.1	127

Station Data Summary Report
Station IJ-56

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 013
Sample Type: Macrofauna
Replicates: 2
Sample Area: 0.0079

TAXON	Rep A		Rep B		Station		
	Count	Density	Count	Density	Total	Percent	Mean Density
Chordata							
Leptocardia							
Amphioxi							
Branchiostomidae							
Branchiostoma floridae	1	127	0	0	1	1.1	64
Echinodermata							
Ophiuroidea							
Ophiuroidea (LPIL)	1	127	0	0	1	1.1	64
Mollusca							
Bivalvia							
Nuculoida							
Nuculanidae							
Nuculana acuta	4	506	1	127	5	5.3	317
Veneroida							
Lucinidae							
Lucinidae (LPIL)	1	127	0	0	1	1.1	64
Semelidae							
Semele (LPIL)	1	127	0	0	1	1.1	64
Tellinidae							
Tellina versicolor	8	1013	0	0	8	8.4	507
Gastropoda							
Mesogastropoda							
Naticidae							
Natica pusilla	1	127	0	0	1	1.1	64
Neogastropoda							
Olividae							
Olivella dealbata	0	0	1	127	1	1.1	64
Rhynchocoela							
Rhynchocoela (LPIL)	1	127	1	127	2	2.1	127
Anopla							
Paleonemertea							
Tubulanidae							
Tubulanus sp. A	0	0	1	127	1	1.1	64
Sipuncula							
Aspidosiphonidae							
Aspidosiphon albus	1	127	0	0	1	1.1	64
Golfingiidae							
Phascolion strombi	3	380	1	127	4	4.2	254

Note: LPIL designates the LOWEST PRACTICAL IDENTIFICATION LEVEL

Station Data Summary Report
Station IJ-56

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 013
Sample Type: Macrofauna
Replicates: 2
Sample Area: 0.0079

DATA SUMMARY

FAUNAL PARAMETERS	Station	Rep A	Rep B	Mean	Std Dev
Total Taxa	35	22	22	22	0
Total Individuals	95	43	52	47.5	6.4
Density (nos/sq.m.)		5443	6582	6013	805.4

FAUNAL INDICES

Species Diversity (Shannon; log base e)	H'	=	3.12
Species Diversity (Shannon; log base 2)	d	=	4.5
Species Diversity (Shannon; log base 10)	H	=	1.35
Species Diversity (Simpson; 1/S)	1/S	=	18.08
Species Evenness (Pielou)	J'	=	0.88
Species Richness (Margalef)	D	=	7.47
Equitability Index (Lloyd & Ghelardi)	e	=	0.95

MAJOR TAXONOMIC GROUPS	Total No. Taxa	Taxa % Total	Total No. Individuals	Individuals % Total
Annelida	19	54.2	62	65.2
Mollusca	6	17.1	17	17.8
Arthropoda	4	11.4	6	6.3
Echinodermata	1	2.8	1	1
OTHER TAXA	5	14.2	9	9.4
TOTALS	35		95	

Station Data Summary Report
Station KL-34

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 014
Sample Type: Macrofauna
Replicates: 3
Sample Area: 0.0079

TAXON	Rep A		Rep B		Rep C		Station		
	Count	Density	Count	Density	Count	Density	Total	Percent	Mean Density
Annelida									
Oligochaeta									
Tubificida									
Tubificidae									
Tubificidae (LPIL)	1	127	1	127	0	0	2	0.9	85
Polychaeta									
Capitellida									
Capitellidae									
Mediomastus (LPIL)	18	2278	26	3291	6	759	50	22.4	2109
Mediomastus ambiseta	6	759	4	506	0	0	10	4.5	422
Cossurida									
Cossuridae									
Cossura soyeri	5	633	1	127	0	0	6	2.7	253
Opheliida									
Opheliidae									
Armandia maculata	2	253	0	0	2	253	4	1.8	169
Travisia hobsonae	0	0	1	127	0	0	1	0.4	42
Orbiniida									
Orbiniidae									
Leitoscoloplos (LPIL)	0	0	0	0	2	253	2	0.9	84
Oweniida									
Oweniidae									
Galathowenia oculata	1	127	0	0	0	0	1	0.4	42
Owenia fusiformis	0	0	1	127	6	759	7	3.1	295
Phyllodocida									
Goniadidae									
Goniadides carolinae	0	0	1	127	0	0	1	0.4	42
Phyllodocidae									
Phyllodoce arenae	0	0	1	127	0	0	1	0.4	42
Phyllodocidae (LPIL)	0	0	0	0	1	127	1	0.4	42
Pilargiidae									
Sigambra tentaculata	0	0	1	127	0	0	1	0.4	42
Spionida									
Cirratulidae									
Chaetozone (LPIL)	0	0	0	0	1	127	1	0.4	42
Chaetozone sp. D	0	0	0	0	1	127	1	0.4	42
Monticellina dorsobranchialis	0	0	1	127	0	0	1	0.4	42
Magelonidae									
Magelona sp. H	1	127	0	0	1	127	2	0.9	85
Spionidae									
Carazziella hobsonae	0	0	1	127	0	0	1	0.4	42
Paraprionospio pinnata	0	0	0	0	3	380	3	1.3	127
Prionospio (LPIL)	0	0	2	253	0	0	2	0.9	84
Prionospio heterobranchia	0	0	1	127	0	0	1	0.4	42
Prionospio perkinsi	5	633	11	1392	0	0	16	7.2	675
Spiophanes bombyx	0	0	0	0	2	253	2	0.9	84
Terebellida									
Pectinariidae									
Pectinaria gouldii	0	0	0	0	1	127	1	0.4	42
Arthropoda									
Malacostraca									
Amphipoda									
Ampeliscidae									
Ampelisca sp. A	0	0	3	380	7	886	10	4.5	422
Ampithoidae									
Cymadusa compta	1	127	0	0	0	0	1	0.4	42
Aoridae									
Paramicrodeutopus myersi	1	127	0	0	0	0	1	0.4	42
Isaeidae									
Photis (LPIL)	0	0	0	0	1	127	1	0.4	42
Ischyroceridae									
Erichthonius brasiliensis	0	0	0	0	2	253	2	0.9	84
Melitidae									
Elasmopus (LPIL)	0	0	0	0	1	127	1	0.4	42

Station Data Summary Report
Station KL-34

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 014
Sample Type: Macrofauna
Replicates: 3
Sample Area: 0.0079

TAXON	Rep A		Rep B		Rep C		Station		
	Count	Density	Count	Density	Count	Density	Total	Percent	Mean Density
Cumacea									
Leuconidae									
Leucon americanus	6	759	3	380	1	127	10	4.5	422
Decapoda									
Portunidae									
Portunidae (LPIL)	0	0	0	0	1	127	1	0.4	42
Ostracoda									
Myodocopina									
Sarsiellidae									
Eusarsiella texana	0	0	0	0	1	127	1	0.4	42
Chordata									
Ascidiacea									
Stolidobranchia									
Molgulidae									
Molgula (LPIL)	2	253	1	127	1	127	4	1.8	169
Echinodermata									
Ophiuroidea									
Ophiuroidea (LPIL)	0	0	3	380	1	127	4	1.8	169
Mollusca									
Bivalvia									
Bivalvia (LPIL)	2	253	2	253	1	127	5	2.2	211
Myoida									
Corbulidae									
Corbula barrattiana	0	0	15	1899	0	0	15	6.7	633
Nuculoida									
Nuculanidae									
Nuculana acuta	0	0	0	0	1	127	1	0.4	42
Veneroida									
Lucinidae									
Linga amiantus	1	127	0	0	0	0	1	0.4	42
Lucina multilineata	7	886	11	1392	3	380	21	9.4	886
Mactridae									
Mulinia lateralis	1	127	0	0	0	0	1	0.4	42
Tellinidae									
Tellina versicolor	1	127	1	127	1	127	3	1.3	127
Tellinidae (LPIL)	0	0	6	759	5	633	11	4.9	464
Gastropoda									
Gastropoda (LPIL)	0	0	0	0	1	127	1	0.4	42
Cephalaspidea									
Scaphandridae									
Acteocina canaliculata	0	0	0	0	1	127	1	0.4	42
Neogastropoda									
Olividae									
Olivella dealbata	0	0	0	0	1	127	1	0.4	42
Rhynchocoela									
Rhynchocoela (LPIL)	3	380	0	0	0	0	3	1.3	127
Anopla									
Paleonemertea									
Tubulanidae									
Tubulanus sp. A	1	127	2	253	1	127	4	1.8	169
Sipuncula									
Golfingiidae									
Phascolion strombi	0	0	1	127	0	0	1	0.4	42

Note: LPIL designates the LOWEST PRACTICAL IDENTIFICATION LEVEL

Station Data Summary Report
Station KL-34

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 014
Sample Type: Macrofauna
Replicates: 3
Sample Area: 0.0079

DATA SUMMARY

FAUNAL PARAMETERS	Station	Rep A	Rep B	Rep C	Mean	Std Dev
Total Taxa	49	19	25	29	24.3	5.0
Total Individuals	223	65	101	57	74.3	23.4
Density (nos/sq.m.)		8228	12785	7215	9409.0	2967.0

FAUNAL INDICES

Species Diversity (Shannon; log base e)	H'	=	3.11
Species Diversity (Shannon; log base 2)	d	=	4.48
Species Diversity (Shannon; log base 10)	H	=	1.35
Species Diversity (Simpson; 1/S)	1/S	=	12.79
Species Evenness (Pielou)	J'	=	0.8
Species Richness (Margalef)	D	=	8.88
Equitability Index (Lloyd & Ghelardi)	e	=	0.67

MAJOR TAXONOMIC GROUPS	Total No. Taxa	Taxa % Total	Total No. Individuals	Individuals % Total
Annelida	24	48.9	118	52.9
Mollusca	11	22.4	61	27.3
Arthropoda	9	18.3	28	12.5
Echinodermata	1	2	4	1.7
OTHER TAXA	4	8.1	12	5.3
TOTALS	49		223	

Station Data Summary Report
Station KL-18

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 015
Sample Type: Macrofauna
Replicates: 3
Sample Area: 0.0079

TAXON	Rep A		Rep B		Rep C		Station		
	Count	Density	Count	Density	Count	Density	Total	Percent	Mean Density
Annelida									
Polychaeta									
Amphinomida									
Amphinomidae									
Paramphinome sp. B	5	633	16	2025	0	0	21	7	886
Capitellida									
Capitellidae									
Mediomastus (LPIL)	16	2025	29	3671	24	3038	69	23.1	2911
Mediomastus ambiseta	11	1392	3	380	2	253	16	5.4	675
Notomastus latericeus	0	0	1	127	0	0	1	0.3	42
Opheliida									
Opheliidae									
Armandia maculata	1	127	1	127	0	0	2	0.7	85
Travisia hobsonae	1	127	0	0	0	0	1	0.3	42
Orbiniida									
Orbiniidae									
Orbiniidae (LPIL)	0	0	1	127	0	0	1	0.3	42
Oweniida									
Oweniidae									
Owenia fusiformis	14	1772	12	1519	14	1772	40	13.4	1688
Phyllodocida									
Chrysopetalidae									
Bhawania heteroseta	1	127	0	0	0	0	1	0.3	42
Hesionidae									
Podarkeopsis levifuscina	1	127	0	0	0	0	1	0.3	42
Nephtyidae									
Aglaophamus verrilli	0	0	0	0	1	127	1	0.3	42
Phyllodocidae									
Phyllodoce arenae	0	0	0	0	1	127	1	0.3	42
Pilargiidae									
Ancistrosyllis sp. B	1	127	0	0	0	0	1	0.3	42
Sigalionidae									
Sthenelais sp. A	1	127	0	0	1	127	2	0.7	85
Spionida									
Chaetopteridae									
Spiochaetopterus oculatus	0	0	0	0	1	127	1	0.3	42
Cirratulidae									
Chaetozone sp. D	1	127	0	0	1	127	2	0.7	85
Spionidae									
Carazziella hobsonae	13	1646	10	1266	3	380	26	8.7	1097
Paraprionospio pinnata	1	127	0	0	3	380	4	1.3	169
Prionospio (LPIL)	0	0	2	253	0	0	2	0.7	84
Spionidae (LPIL)	3	380	0	0	2	253	5	1.7	211
Spiophanes bombyx	1	127	2	253	1	127	4	1.3	169
Arthropoda									
Malacostraca									
Amphipoda									
Ampeliscidae									
Ampelisca (LPIL)	2	253	1	127	0	0	3	1	127
Ampelisca sp. A	4	506	7	886	7	886	18	6	759
Ischyroceridae									
Erichthonius brasiliensis	0	0	0	0	1	127	1	0.3	42
Liljeborgiidae									
Listriella barnardi	2	253	3	380	0	0	5	1.7	211
Oedicerotidae									
Hartmanodes nyei	1	127	0	0	1	127	2	0.7	85
Cumacea									
Leuconidae									
Leucon americanus	1	127	1	127	1	127	3	1	127
Decapoda									
Pinnotheridae									
Pinnixa pearsei	0	0	0	0	1	127	1	0.3	42
Ostracoda									
Myodocopina									
Sarsiellidae									
Eusarsiella cresseyi	0	0	0	0	1	127	1	0.3	42
Eusarsiella texana	0	0	0	0	3	380	3	1	127

Station Data Summary Report
Station KL-18

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 015
Sample Type: Macrofauna
Replicates: 3
Sample Area: 0.0079

TAXON	Rep A		Rep B		Rep C		Station		
	Count	Density	Count	Density	Count	Density	Total	Percent	Mean Density
Echinodermata									
Ophiuroidea									
Ophiuroidea (LPIL)	1	127	3	380	0	0	4	1.3	169
Hemichordata									
Enteropneusta									
Ptychoderidae									
Balanoglossus (LPIL)	7	886	9	1139	2	253	18	6	759
Mollusca									
Bivalvia									
Bivalvia (LPIL)	1	127	0	0	0	0	1	0.3	42
Veneroida									
Lucinidae									
Lucina multilineata	0	0	7	886	0	0	7	2.3	295
Tellinidae									
Tellina (LPIL)	0	0	1	127	0	0	1	0.3	42
Tellina versicolor	0	0	0	0	2	253	2	0.7	84
Ungulinidae									
Diplodonta semiaspera	1	127	0	0	1	127	2	0.7	85
Rhynchocoela									
Rhynchocoela (LPIL)	2	253	9	1139	5	633	16	5.4	675
Anopla									
Heteronemertea									
Lineidae									
Lineidae (LPIL)	3	380	5	633	0	0	8	2.7	338
Paleonemertea									
Tubulanidae									
Tubulanus sp. A	0	0	0	0	1	127	1	0.3	42

Note: LPIL designates the LOWEST PRACTICAL IDENTIFICATION LEVEL

Station Data Summary Report
Station KL-18

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 015
Sample Type: Macrofauna
Replicates: 3
Sample Area: 0.0079

DATA SUMMARY

FAUNAL PARAMETERS	Station	Rep A	Rep B	Rep C	Mean	Std Dev
Total Taxa	40	26	20	24	23.3	3.1
Total Individuals	299	96	123	80	99.7	21.7
Density (nos/sq.m.)		12152	15570	10127	12616.0	2751.0

FAUNAL INDICES

Species Diversity (Shannon; log base e)	H'	=	2.81
Species Diversity (Shannon; log base 2)	d	=	4.06
Species Diversity (Shannon; log base 10)	H	=	1.22
Species Diversity (Simpson; 1/S)	1/S	=	10.34
Species Evenness (Pielou)	J'	=	0.76
Species Richness (Margalef)	D	=	6.84
Equitability Index (Lloyd & Ghelardi)	e	=	0.6

MAJOR TAXONOMIC GROUPS	Total No. Taxa	Taxa % Total	Total No. Individuals	Individuals % Total
Annelida	21	52.5	202	67.5
Mollusca	5	12.5	13	4.3
Arthropoda	9	22.5	37	12.3
Echinodermata	1	2.5	4	1.3
OTHER TAXA	4	10	43	14.3
TOTALS	40		299	

Station Data Summary Report
Station KL-22

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 016
Sample Type: Macrofauna
Replicates: 3
Sample Area: 0.0079

TAXON	Rep A		Rep B		Rep C		Station		
	Count	Density	Count	Density	Count	Density	Total	Percent	Mean Density
Annelida									
Polychaeta									
Capitellida									
Capitellidae									
Mediomastus (LPIL)	5	633	4	506	1	127	10	18.9	422
Mediomastus ambiseta	1	127	0	0	1	127	2	3.8	85
Notomastus latericeus	1	127	1	127	0	0	2	3.8	85
Cossurida									
Cossuridae									
Cossura soyeri	1	127	0	0	0	0	1	1.9	42
Eunicida									
Dorvilleidae									
Schistomeringos rudolphi	0	0	1	127	0	0	1	1.9	42
Lumbrineridae									
Scoletoma verrilli	1	127	1	127	0	0	2	3.8	85
Opheliida									
Opheliidae									
Armandia maculata	0	0	0	0	1	127	1	1.9	42
Orbiniida									
Orbiniidae									
Leitoscoloplos robustus	0	0	0	0	11	1392	11	20.8	464
Oweniida									
Oweniidae									
Owenia fusiformis	0	0	0	0	2	253	2	3.8	84
Spionida									
Cirratulidae									
Cirratulidae (LPIL)	0	0	2	253	1	127	3	5.7	127
Tharyx acutus	0	0	0	0	3	380	3	5.7	127
Spionidae									
Carazziella hobsonae	0	0	0	0	1	127	1	1.9	42
Paraprionospio pinnata	0	0	1	127	0	0	1	1.9	42
Arthropoda									
Malacostraca									
Amphipoda									
Liljeborgiidae									
Listriella barnardi	0	0	0	0	1	127	1	1.9	42
Cumacea									
Leuconidae									
Leucon americanus	1	127	0	0	4	506	5	9.4	211
Cnidaria									
Cnidaria (LPIL)	0	0	0	0	1	127	1	1.9	42
Mollusca									
Bivalvia									
Veneroida									
Lucinidae									
Lucina multilineata	1	127	0	0	1	127	2	3.8	85
Rhynchocoela									
Rhynchocoela (LPIL)	1	127	0	0	2	253	3	5.7	127
Anopla									
Heteronemertea									
Lineidae									
Lineidae (LPIL)	0	0	1	127	0	0	1	1.9	42

Note: LPIL designates the LOWEST PRACTICAL IDENTIFICATION LEVEL

Station Data Summary Report
Station KL-22

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 016
Sample Type: Macrofauna
Replicates: 3
Sample Area: 0.0079

DATA SUMMARY

FAUNAL PARAMETERS	Station	Rep A	Rep B	Rep C	Mean	Std Dev
Total Taxa	19	8	7	13	9.3	3.2
Total Individuals	53	12	11	30	17.7	10.7
Density (nos/sq.m.)		1519	1392	3797	2236.0	1353.4

FAUNAL INDICES

Species Diversity (Shannon; log base e)	H'	=	2.57
Species Diversity (Shannon; log base 2)	d	=	3.71
Species Diversity (Shannon; log base 10)	H	=	1.12
Species Diversity (Simpson; 1/S)	1/S	=	11.11
Species Evenness (Pielou)	J'	=	0.87
Species Richness (Margalef)	D	=	4.53
Equitability Index (Lloyd & Ghelardi)	e	=	0.99

MAJOR TAXONOMIC GROUPS	Total No. Taxa	Taxa % Total	Total No. Individuals	Individuals % Total
Annelida	13	68.4	40	75.4
Mollusca	1	5.2	2	3.7
Arthropoda	2	10.5	6	11.3
OTHER TAXA	3	15.7	5	9.4
TOTALS	19		53	

Station Data Summary Report
Station GH-12-XTRA

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 017
Sample Type: Macrofauna
Replicates: 1
Sample Area: 0.0079

TAXON	Rep A		Station		
	Count	Density	Total	Percent	Mean Density

***** Sample clean of marcoinfaunal organisms**

Note: LPIL designates the LOWEST PRACTICAL IDENTIFICATION LEVEL

Station Data Summary Report
Station GH-12-XTRA

Client: Ensafe
Project: Ensafe - NAS Pensacola
Location:
Sample Date: 3/1/00

BVA Station: 017
Sample Type: Macrofauna
Replicates: 1
Sample Area: 0.0079

DATA SUMMARY

FAUNAL PARAMETERS	Station	Rep A	Mean	Std Dev
Total Taxa	0	0	0	0
Total Individuals	0	0	0	0
Density (nos/sq.m.)		0	0	0

FAUNAL INDICES

Species Diversity (Shannon; log base e)	H'	=	0
Species Diversity (Shannon; log base 2)	d	=	0
Species Diversity (Shannon; log base 10)	H	=	0
Species Diversity (Simpson; 1/S)	1/S	=	
Species Evenness (Pielou)	J'	=	0
Species Richness (Margalef)	D	=	0
Equitability Index (Lloyd & Ghelardi)	e	=	

MAJOR TAXONOMIC GROUPS	Total No. Taxa	Taxa % Total	Total No. Individuals	Individuals % Total
TOTALS	0		0	

Appendix F
TEL and PEL Comparisons and Mean PEL Quotients

Table F-1

Surface Sediment TEL Quotients

Parameters	Reference Conc.	TEL	IJ-12 USEPA 1 Conc.	HQ	GH-12 USEPA 2 Conc.	HQ	IJ-34 USEPA 3 Conc.	HQ	GH-34 USEPA 4 Conc.	HQ	EF-23 USEPA 5 Conc.	HQ	IJ-56 USEPA 6 Conc.	HQ	GH-56 USEPA 7 Conc.	HQ	EF-45 USEPA 8 Conc.	HQ	KL-34 USEPA 9 Conc.	HQ	GH-67 USEPA 10 Conc.	HQ	CD-23 USEPA 11 Conc.	HQ	Reference Stations 18 USEPA 18 CONC.	HQ	22 USEPA 22 CONC.	HQ
Inorganics (mg/kg)																												
Arsenic (As)	23	7.24	4.9	[illegible]	1.5	[illegible]	12	[illegible]	11	[illegible]	16	[illegible]	2.6	[illegible]	3.4	[illegible]	6.9	[illegible]	14	[illegible]	0.52	[illegible]	9.1	[illegible]	5	[illegible]	18	[illegible]
Cadmium (Cd)	0.295	0.676	2.3	[illegible]	0.17	[illegible]	1.7	[illegible]	5.2	[illegible]	4.3	[illegible]	0.07	[illegible]	0.1	[illegible]	0.17	[illegible]	0.39	[illegible]	0.0205	[illegible]	1.3	[illegible]	0.075	[illegible]	0.22	[illegible]
Chromium (Cr)	63	52.3	100	[illegible]	8.9	[illegible]	39	[illegible]	38	[illegible]	75	[illegible]	6.8	[illegible]	13	[illegible]	19	[illegible]	39	[illegible]	1.2	[illegible]	41	[illegible]	13	[illegible]	50	[illegible]
Copper (Cu)	16.7	18.7	25	[illegible]	11	[illegible]	1.4	[illegible]	27	[illegible]	66	[illegible]	3.4	[illegible]	4.4	[illegible]	8.8	[illegible]	23	[illegible]	0.56	[illegible]	48	[illegible]	3.7	[illegible]	13	[illegible]
Lead (Pb)	29.7	30.2	190	[illegible]	16	[illegible]	47	[illegible]	51	[illegible]	640	[illegible]	15	[illegible]	12	[illegible]	17	[illegible]	27	[illegible]	1.1	[illegible]	150	[illegible]	5.7	[illegible]	24	[illegible]
Mercury (Hg)	0.129	0.13	0.086	[illegible]	0.036	[illegible]	0.085	[illegible]	0.082	[illegible]	0.21	[illegible]	0.018	[illegible]	0.026	[illegible]	0.044	[illegible]	0.075	[illegible]	0.0075	[illegible]	0.16	[illegible]	0.019	[illegible]	0.11	[illegible]
Nickel (Ni)	17.7	15.9	3.3	[illegible]	1,1	[illegible]	8.7	[illegible]	10	[illegible]	7.8	[illegible]	2.1	[illegible]	2.4	[illegible]	6.1	[illegible]	9.8	[illegible]	0.34	[illegible]	5.2	[illegible]	3.7	[illegible]	14	[illegible]
Silver (Ag)	ND	0.733	0.077	[illegible]	0.0275	[illegible]	0.06	[illegible]	0.11	[illegible]	0.21	[illegible]	0.06	[illegible]	0.066	[illegible]	0.0475	[illegible]	0.075	[illegible]	0.054	[illegible]	0.2	[illegible]	0.036	[illegible]	0.075	[illegible]
Zinc (Zn)	83	124	75	[illegible]	14	[illegible]	55	[illegible]	59	[illegible]	670	[illegible]	17	[illegible]	19	[illegible]	34	[illegible]	52	[illegible]	2.5	[illegible]	79	[illegible]	13	[illegible]	70	[illegible]
Total PCBs (µg/kg)	ND	21.6	287.8	[illegible]	36.9	[illegible]	88	[illegible]	98	[illegible]	307	[illegible]	38.5	[illegible]	41.2	[illegible]	93	[illegible]	96	[illegible]	32.2	[illegible]	52	[illegible]	46.2	[illegible]	89	[illegible]
Pesticides (µg/kg)																												
4,4'-DDD	ND	1.22	0.52	[illegible]	0.46	[illegible]	1.1	[illegible]	0.92	[illegible]	0.75	[illegible]	0.48	[illegible]	0.52	[illegible]	0.77	[illegible]	1.2	[illegible]	0.4	[illegible]	2.5	[illegible]	0.57	[illegible]	1.1	[illegible]
4,4'-DDE	ND	2.07	0.52	[illegible]	0.46	[illegible]	1.1	[illegible]	0.92	[illegible]	0.75	[illegible]	0.48	[illegible]	0.52	[illegible]	0.77	[illegible]	1.2	[illegible]	0.4	[illegible]	0.65	[illegible]	0.57	[illegible]	1.1	[illegible]
4,4'-DDT	ND	1.19	0.52	[illegible]	0.46	[illegible]	1.1	[illegible]	0.92	[illegible]	0.75	[illegible]	0.48	[illegible]	0.52	[illegible]	1.8	[illegible]	1.2	[illegible]	0.4	[illegible]	0.65	[illegible]	0.57	[illegible]	1.1	[illegible]
Dieldrin	ND	0.715	0.52	[illegible]	3.5	[illegible]	1.1	[illegible]	0.92	[illegible]	0.75	[illegible]	0.48	[illegible]	0.52	[illegible]	0.77	[illegible]	1.2	[illegible]	0.4	[illegible]	0.65	[illegible]	0.57	[illegible]	1.1	[illegible]
Lindane	ND	0.32	0.27	[illegible]	0.24	[illegible]	0.57	[illegible]	0.47	[illegible]	0.39	[illegible]	0.25	[illegible]	0.27	[illegible]	0.4	[illegible]	0.61	[illegible]	0.21	[illegible]	0.33	[illegible]	0.29	[illegible]	0.59	[illegible]
Chlordane	ND	2.26	0.54	[illegible]	0.48	[illegible]	1.14	[illegible]	0.94	[illegible]	0.78	[illegible]	0.5	[illegible]	0.54	[illegible]	0.8	[illegible]	1.22	[illegible]	0.42	[illegible]	0.66	[illegible]	0.58	[illegible]	1.18	[illegible]
PAHs (µg/kg)																												
2-Methylnapthalene	ND	20.2	28	[illegible]	22	[illegible]	4.65	[illegible]	43	[illegible]	41.5	[illegible]	8.6	[illegible]	2.65	[illegible]	38	[illegible]	6	[illegible]	2.15	[illegible]	31	[illegible]	2.9	[illegible]	6	[illegible]
Acenaphthene	ND	6.71	85	[illegible]	65	[illegible]	14	[illegible]	22.5	[illegible]	125	[illegible]	7.5	[illegible]	8	[illegible]	115	[illegible]	19	[illegible]	6.5	[illegible]	95	[illegible]	9	[illegible]	28	[illegible]
Acenaphthylene	ND	5.87	140	[illegible]	110	[illegible]	23	[illegible]	210	[illegible]	205	[illegible]	12	[illegible]	13	[illegible]	185	[illegible]	30.5	[illegible]	10.5	[illegible]	150	[illegible]	14	[illegible]	29	[illegible]
Anthracene	29	46.9	28	[illegible]	18	[illegible]	9.8	[illegible]	45	[illegible]	59	[illegible]	2	[illegible]	11	[illegible]	42	[illegible]	22	[illegible]	0.375	[illegible]	43	[illegible]	0.495	[illegible]	29	[illegible]
Benzo(a)anthracene	97.7	74.8	100	[illegible]	95	[illegible]	49	[illegible]	160	[illegible]	310	[illegible]	8.4	[illegible]	41	[illegible]	210	[illegible]	85	[illegible]	0.69	[illegible]	240	[illegible]	2.7	[illegible]	**95**	[illegible]
Benzo(a)pyrene	123.8	88.8	160	[illegible]	86	[illegible]	62	[illegible]	180	[illegible]	440	[illegible]	9.7	[illegible]	45	[illegible]	240	[illegible]	110	[illegible]	1.1	[illegible]	410	[illegible]	3.8	[illegible]	**120**	[illegible]
Chrysene	216.1	108	280	[illegible]	240	[illegible]	93	[illegible]	350	[illegible]	1,000	[illegible]	20	[illegible]	92	[illegible]	380	[illegible]	170	[illegible]	1.6	[illegible]	630	[illegible]	6.1	[illegible]	210	[illegible]
Dibenz(a,h)anthracene	31	6.22	35	[illegible]	61	[illegible]	15	[illegible]	44	[illegible]	110	[illegible]	2.9	[illegible]	11	[illegible]	56	[illegible]	26	[illegible]	0.9	[illegible]	100	[illegible]	1.2	[illegible]	31	[illegible]
Fluoranthene	256.8	113	210	[illegible]	69	[illegible]	91	[illegible]	300	[illegible]	710	[illegible]	16	[illegible]	66	[illegible]	570	[illegible]	180	[illegible]	1	[illegible]	470	[illegible]	6.8	[illegible]	250	[illegible]
Fluorene	13	21.2	10.5	[illegible]	8.5	[illegible]	1.75	[illegible]	16	[illegible]	15.5	[illegible]	0.9	[illegible]	1	[illegible]	14.5	[illegible]	2.35	[illegible]	0.8	[illegible]	11.5	[illegible]	1.1	[illegible]	13	[illegible]
Naphthalene	17	34.6	180	[illegible]	45.5	[illegible]	71	[illegible]	90	[illegible]	85	[illegible]	18	[illegible]	62	[illegible]	160	[illegible]	110	[illegible]	4.5	[illegible]	130	[illegible]	17	[illegible]	12.5	[illegible]
Phenanthrene	133.2	86.7	97	[illegible]	52	[illegible]	39	[illegible]	130	[illegible]	230	[illegible]	7.8	[illegible]	35	[illegible]	140	[illegible]	62	[illegible]	0.5	[illegible]	160	[illegible]	3.2	[illegible]	130	[illegible]
Pyrene	206.7	153	240	[illegible]	99	[illegible]	91	[illegible]	270	[illegible]	720	[illegible]	21	[illegible]	71	[illegible]	560	[illegible]	160	[illegible]	1.8	[illegible]	440	[illegible]	6.7	[illegible]	200	[illegible]
SVOCs (µg/kg)																												
Bis(2-ethylhexyl)phthalate	ND	182	2,800	[illegible]	230	[illegible]	550	[illegible]	460	[illegible]	1,900	[illegible]	240	[illegible]	260	[illegible]	970	[illegible]	11,000	[illegible]	200	[illegible]	4,700	[illegible]	285	[illegible]	550	[illegible]
Number of TEL Exceedances				17		10		11		19		23		4		6		16		16		3		20		4		14

Notes:

NS = not sampled

NC= not calculated

One half the detection limit was used for parameters that were not detected, except for pesticides and PCBs which used one-tenth the detection limit (See EPA Report in Appendix B)

Table F-2

Surface Sediment PEL Quotients and Mean PEL Quotients

																							Reference Stations			
			IJ-12		GH-12		IJ-34		GH-34		EF-23		IJ-56		GH-56		EF-45		KL-34		GH-67		CD-23		18		22	
	Reference		USEPA 1		USEPA 2		USEPA 3		USEPA 4		USEPA 5		USEPA 6		USEPA 7		USEPA 8		USEPA 9		USEPA 10		USEPA 11		USEPA 18		USEPA 22	
Parameters	Conc.	PEL	Conc.	[redacted]	Conc.	[redacted]	Conc.	[redacted]	Conc.	[redacted]	Conc.	[redacted]	Conc.	[redacted]	Conc.	[redacted]	Conc.	[redacted]	Conc.	[redacted]	Conc.	[redacted]	Conc.	[redacted]	CONC.	HQ	CONC.	HQ
Inorganics (mg/kg)																												
Arsenic (As)	23	41.6	4.9	[redacted]	1.5	[redacted]	12	[redacted]	11	[redacted]	16	[redacted]	2.6	[redacted]	3.4	[redacted]	6.9	[redacted]	14	[redacted]	0.52	[redacted]	9.1	[redacted]	5	[redacted]	18	[redacted]
Cadmium (Cd)	0.295	4.21	2.3	[redacted]	0.17	[redacted]	1.7	[redacted]	5.2	[redacted]	4.3	[redacted]	0.07	[redacted]	0.1	[redacted]	0.17	[redacted]	0.39	[redacted]	0.0205	[redacted]	1.3	[redacted]	0.075	[redacted]	0.22	[redacted]
Chromium (Cr)	63	160	100	[redacted]	8.9	[redacted]	39	[redacted]	38	[redacted]	75	[redacted]	6.8	[redacted]	13	[redacted]	19	[redacted]	39	[redacted]	1.2	[redacted]	41	[redacted]	13	[redacted]	50	[redacted]
Copper (Cu)	16.7	108	25	[redacted]	11	[redacted]	1.4	[redacted]	27	[redacted]	66	[redacted]	3.4	[redacted]	4.4	[redacted]	8.8	[redacted]	23	[redacted]	0.56	[redacted]	48	[redacted]	3.7	[redacted]	13	[redacted]
Lead (Pb)	29.7	112	190	[redacted]	16	[redacted]	47	[redacted]	51	[redacted]	640	[redacted]	15	[redacted]	12	[redacted]	17	[redacted]	27	[redacted]	1.1	[redacted]	150	[redacted]	5.7	[redacted]	24	[redacted]
Mercury (Hg)	0.129	0.696	0.086	[redacted]	0.036	[redacted]	0.085	[redacted]	0.082	[redacted]	0.21	[redacted]	0.018	[redacted]	0.026	[redacted]	0.044	[redacted]	0.075	[redacted]	0.0075	[redacted]	0.16	[redacted]	0.019	[redacted]	0.11	[redacted]
Nickel (Ni)	17.7	42.8	3.3	[redacted]	1,1	[redacted]	8.7	[redacted]	10	[redacted]	7.8	[redacted]	2.1	[redacted]	2.4	[redacted]	6.1	[redacted]	9.8	[redacted]	0.34	[redacted]	5.2	[redacted]	3.7	[redacted]	14	[redacted]
Silver (Ag)	ND	1.77	0.077	[redacted]	0.0275	[redacted]	0.06	[redacted]	0.11	[redacted]	0.21	[redacted]	0.06	[redacted]	0.066	[redacted]	0.0475	[redacted]	0.075	[redacted]	0.054	[redacted]	0.2	[redacted]	0.036	[redacted]	0.075	[redacted]
Zinc (Zn)	83	271	75	[redacted]	14	[redacted]	55	[redacted]	59	[redacted]	670	[redacted]	17	[redacted]	19	[redacted]	34	[redacted]	52	[redacted]	2.5	[redacted]	79	[redacted]	13	[redacted]	70	[redacted]
Total PCBs (µg/kg)	ND	189	287.8	[redacted]	36.9	[redacted]	88	[redacted]	98	[redacted]	307	[redacted]	38.5	[redacted]	41.2	[redacted]	93	[redacted]	96	[redacted]	32.2	[redacted]	52	[redacted]	46.2	[redacted]	89	[redacted]
Pesticides (µg/kg)																												
4,4'-DDD	ND	7.81	0.52	[redacted]	0.46	[redacted]	1.1	[redacted]	0.92	[redacted]	0.75	[redacted]	0.48	[redacted]	0.52	[redacted]	0.77	[redacted]	1.2	[redacted]	0.4	[redacted]	2.5	[redacted]	0.57	[redacted]	1.1	[redacted]
4,4'-DDE	ND	374	0.52	[redacted]	0.46	[redacted]	1.1	[redacted]	0.92	[redacted]	0.75	[redacted]	0.48	[redacted]	0.52	[redacted]	0.77	[redacted]	1.2	[redacted]	0.4	[redacted]	0.65	[redacted]	0.57	[redacted]	1.1	[redacted]
4,4'-DDT	ND	4.77	0.52	[redacted]	0.46	[redacted]	1.1	[redacted]	0.92	[redacted]	0.75	[redacted]	0.48	[redacted]	0.52	[redacted]	1.8	[redacted]	1.2	[redacted]	0.4	[redacted]	0.65	[redacted]	0.57	[redacted]	1.1	[redacted]
Dieldrin	ND	4.3	0.52	[redacted]	3.5	[redacted]	1.1	[redacted]	0.92	[redacted]	0.75	[redacted]	0.48	[redacted]	0.52	[redacted]	0.77	[redacted]	1.2	[redacted]	0.4	[redacted]	0.65	[redacted]	0.57	[redacted]	1.1	[redacted]
Lindane	ND	0.99	0.27	[redacted]	0.24	[redacted]	0.57	[redacted]	0.47	[redacted]	0.39	[redacted]	0.25	[redacted]	0.27	[redacted]	0.4	[redacted]	0.61	[redacted]	0.21	[redacted]	0.33	[redacted]	0.29	[redacted]	0.59	[redacted]
Chlordane	ND	4.79	0.54	[redacted]	0.48	[redacted]	1.14	[redacted]	0.94	[redacted]	0.78	[redacted]	0.5	[redacted]	0.54	[redacted]	0.8	[redacted]	1.22	[redacted]	0.42	[redacted]	0.66	[redacted]	0.58	[redacted]	1.18	[redacted]
PAHs (µg/kg)																												
2-Methylnapthalene	ND	201	28	[redacted]	22	[redacted]	4.65	[redacted]	43	[redacted]	41.5	[redacted]	8.6	[redacted]	2.65	[redacted]	38	[redacted]	6	[redacted]	2.15	[redacted]	31	[redacted]	2.9	[redacted]	6	[redacted]
Acenaphthene	ND	88.9	85	[redacted]	65	[redacted]	14	[redacted]	22.5	[redacted]	125	[redacted]	7.5	[redacted]	8	[redacted]	115	[redacted]	19	[redacted]	6.5	[redacted]	95	[redacted]	9	[redacted]	28	[redacted]
Acenaphthylene	ND	128	140	[redacted]	110	[redacted]	23	[redacted]	210	[redacted]	205	[redacted]	12	[redacted]	13	[redacted]	185	[redacted]	30.5	[redacted]	10.5	[redacted]	150	[redacted]	14	[redacted]	29	[redacted]
Anthracene	29	245	28	[redacted]	18	[redacted]	9.8	[redacted]	45	[redacted]	59	[redacted]	2	[redacted]	11	[redacted]	42	[redacted]	22	[redacted]	0.375	[redacted]	43	[redacted]	0.495	[redacted]	29	[redacted]
Benzo(a)anthracene	97.7	693	100	[redacted]	95	[redacted]	49	[redacted]	160	[redacted]	310	[redacted]	8.4	[redacted]	41	[redacted]	210	[redacted]	85	[redacted]	0.69	[redacted]	240	[redacted]	2.7	[redacted]	95	[redacted]
Benzo(a)pyrene	123.8	763	160	[redacted]	86	[redacted]	62	[redacted]	180	[redacted]	440	[redacted]	9.7	[redacted]	45	[redacted]	240	[redacted]	110	[redacted]	1.1	[redacted]	410	[redacted]	3.8	[redacted]	120	[redacted]
Chrysene	216.1	846	280	[redacted]	240	[redacted]	93	[redacted]	350	[redacted]	1,000	[redacted]	20	[redacted]	92	[redacted]	380	[redacted]	170	[redacted]	1.6	[redacted]	630	[redacted]	6.1	[redacted]	210	[redacted]
Dibenz(a,h)anthracene	31	135	35	[redacted]	61	[redacted]	15	[redacted]	44	[redacted]	110	[redacted]	2.9	[redacted]	11	[redacted]	56	[redacted]	26	[redacted]	0.9	[redacted]	100	[redacted]	1.2	[redacted]	31	[redacted]
Fluoranthene	256.8	1494	210	[redacted]	69	[redacted]	91	[redacted]	300	[redacted]	710	[redacted]	16	[redacted]	66	[redacted]	570	[redacted]	180	[redacted]	1	[redacted]	470	[redacted]	6.8	[redacted]	250	[redacted]
Fluorene	13	144	10.5	[redacted]	8.5	[redacted]	1.75	[redacted]	16	[redacted]	15.5	[redacted]	0.9	[redacted]	1	[redacted]	14.5	[redacted]	2.35	[redacted]	0.8	[redacted]	11.5	[redacted]	1.1	[redacted]	13	[redacted]
Naphthalene	17	391	180	[redacted]	45.5	[redacted]	71	[redacted]	90	[redacted]	85	[redacted]	18	[redacted]	62	[redacted]	160	[redacted]	110	[redacted]	4.5	[redacted]	130	[redacted]	17	[redacted]	12.5	[redacted]
Phenanthrene	133.2	544	97	[redacted]	52	[redacted]	39	[redacted]	130	[redacted]	230	[redacted]	7.8	[redacted]	35	[redacted]	140	[redacted]	62	[redacted]	0.5	[redacted]	160	[redacted]	3.2	[redacted]	130	[redacted]
Pyrene	206.7	1398	240	[redacted]	99	[redacted]	91	[redacted]	270	[redacted]	720	[redacted]	21	[redacted]	71	[redacted]	560	[redacted]	160	[redacted]	1.8	[redacted]	440	[redacted]	6.7	[redacted]	200	[redacted]
SVOCs (µg/kg)																												
Bis(2-ethylhexyl)phthalate	ND	2647	2,800	[redacted]	230	[redacted]	550	[redacted]	460	[redacted]	1,900	[redacted]	240	[redacted]	260	[redacted]	970	[redacted]	11,000	[redacted]	200	[redacted]	4,700	[redacted]	285	[redacted]	550	[redacted]
Total PEL Quotients				11.27		5.26		5.21		9.44		22.82		1.78		2.42		9.13		9.80		1.07		12.73		1.90		7.77
Mean PEL Quotients				0.38		0.18		0.17		0.31		0.76		0.06		0.08		0.30		0.33		0.04		0.42		0.06		0.26
Number of PEL Exceedances				4		0		0		2		7		0		0		2		1		0		4		0		0
Category				2		2		2		2		3		1		1		2		2		1		2		1		2

Notes:

NS = not sampled

NC= not calculated

Table F-3

Subsurface Sediment TEL Quotients

	Reference		IJ-12 USEPA 1		IJ-34 USEPA 3		GH-34 USEPA 4		EF-23 USEPA 5		KL-34 USEPA 9		CD-23 USEPA 11		Reference Stations 18 USEPA 18		Reference Stations 22 USEPA 22	
Parameters	**Conc.**	**TEL**	**Conc.**	**TQ**	**Conc.**	**TQ**	**Conc.**	**TQ**	**Conc.**	**TQ**	**Conc.**	**TQ**	**Conc.**	**TQ**	**Conc.**	**TQ**	**Conc.**	**TQ**
Inorganics (mg/kg)																		
Arsenic (As)	22.1	7.24	14.00	[illegible]	16	[illegible]	12	[illegible]	12	[illegible]	**16**	[illegible]	18	[illegible]	5.1	[illegible]	17	[illegible]
Cadmium (Cd)	0.34	0.676	0.10	[illegible]	2.9	[illegible]	0.46	[illegible]	0.49	[illegible]	**0.36**	[illegible]	0.77	[illegible]	0.09	[illegible]	0.25	[illegible]
Chromium (Cr)	61	52.3	39.0	[illegible]	99	[illegible]	14	[illegible]	36	[illegible]	**48**	[illegible]	49	[illegible]	12	[illegible]	49	[illegible]
Copper (Cu)	16.4	18.7	50	[illegible]	29	[illegible]	14	[illegible]	52	[illegible]	**19**	[illegible]	75	[illegible]	3.4	[illegible]	13	[illegible]
Lead (Pb)	29.6	30.2	52.0	[illegible]	140	[illegible]	230	[illegible]	63	[illegible]	**36**	[illegible]	200	[illegible]	5.6	[illegible]	24	[illegible]
Mercury (Hg)	0.12	0.13	0.21	[illegible]	0.24	[illegible]	0.25	[illegible]	0.46	[illegible]	**0.74**	[illegible]	0.81	[illegible]	0.02	[illegible]	0.1	[illegible]
Nickel (Ni)	16.7	15.9	12.0	[illegible]	13	[illegible]	5.4	[illegible]	11	[illegible]	13	[illegible]	15	[illegible]	3.7	[illegible]	13	[illegible]
Silver (Ag)	ND	0.733	0.07	[illegible]	2.2	[illegible]	0.0335	[illegible]	0.055	[illegible]	**0.065**	[illegible]	0.065	[illegible]	0.0325	[illegible]	0.06	[illegible]
Zinc (Zn)	74	124	51.0	[illegible]	130	[illegible]	41	[illegible]	50	[illegible]	77	[illegible]	95	[illegible]	12	[illegible]	62	[illegible]
Total PCBs	ND	21.6	NS	[illegible]	217	[illegible]	38.5	[illegible]	78.2	[illegible]	**81**	[illegible]	78.2	[illegible]	38.5	[illegible]	71.4	[illegible]
Pesticides (µg/kg)																		
4,4'-DDD	ND	1.22	NS	[illegible]	1	[illegible]	0.48	[illegible]	0.97	[illegible]	1	[illegible]	0.97	[illegible]	0.48	[illegible]	0.89	[illegible]
4,4'-DDE	ND	20.71	NS	[illegible]	1	[illegible]	0.48	[illegible]	0.97	[illegible]	1	[illegible]	0.97	[illegible]	0.48	[illegible]	0.89	[illegible]
4,4'-DDT	ND	1.19	NS	[illegible]	1	[illegible]	0.48	[illegible]	0.97	[illegible]	1	[illegible]	1.8	[illegible]	0.48	[illegible]	1.2	[illegible]
Dieldrin	ND	0.715	NS	[illegible]	1	[illegible]	0.48	[illegible]	0.97	[illegible]	1	[illegible]	0.97	[illegible]	0.48	[illegible]	0.89	[illegible]
Lindane	ND	0.32	NS	[illegible]	0.53	[illegible]	0.25	[illegible]	0.5	[illegible]	**0.5**	[illegible]	0.5	[illegible]	0.25	[illegible]	0.46	[illegible]
Chlordane	ND	2.26	NS	[illegible]	1.06	[illegible]	0.5	[illegible]	1	[illegible]	**1.06**	[illegible]	1	[illegible]	0.5	[illegible]	0.92	[illegible]
PAHs (µg/kg)																		
2-Methylnapthalene	ND	20.2	5	[illegible]	50	[illegible]	27	[illegible]	46	[illegible]	5.5	[illegible]	50	[illegible]	2.6	[illegible]	4.65	[illegible]
Acenaphthene	ND	6.71	15.5	[illegible]	155	[illegible]	80	[illegible]	140	[illegible]	**16.5**	[illegible]	160	[illegible]	8	[illegible]	14.5	[illegible]
Acenaphthylene	ND	5.87	24.5	[illegible]	250	[illegible]	130	[illegible]	225	[illegible]	**26.5**	[illegible]	255	[illegible]	13	[illegible]	23	[illegible]
Anthracene	25	46.9	17	[illegible]	64	[illegible]	42	[illegible]	35	[illegible]	25	[illegible]	91	[illegible]	3.0	[illegible]	22	[illegible]
Benzo(a)anthracene	113	74.8	90.0	[illegible]	360	[illegible]	120	[illegible]	130	[illegible]	**110**	[illegible]	390	[illegible]	14	[illegible]	99	[illegible]
Benzo(a)pyrene	142	88.8	100	[illegible]	460	[illegible]	160	[illegible]	160	[illegible]	**140**	[illegible]	460	[illegible]	22	[illegible]	120	[illegible]
Chrysene	232	108	160	[illegible]	850	[illegible]	260	[illegible]	250	[illegible]	**250**	[illegible]	790	[illegible]	32	[illegible]	200	[illegible]
Dibenz(a,h)anthracene	42.6	6.22	2.1	[illegible]	110	[illegible]	41	[illegible]	41	[illegible]	**36**	[illegible]	120	[illegible]	**6.6**	[illegible]	36	[illegible]
Fluoranthene	240	113	180	[illegible]	530	[illegible]	260	[illegible]	260	[illegible]	**230**	[illegible]	800	[illegible]	30	[illegible]	210	[illegible]
Fluorene	11	21.2	9.6	[illegible]	19	[illegible]	26	[illegible]	17.5	[illegible]	**11**	[illegible]	48	[illegible]	1	[illegible]	11	[illegible]
Naphthalene	32	34.6	32	[illegible]	105	[illegible]	55	[illegible]	95	[illegible]	**47**	[illegible]	105	[illegible]	5.5	[illegible]	32	[illegible]
Phenanthrene	111	86.7	65	[illegible]	210	[illegible]	160	[illegible]	130	[illegible]	**100**	[illegible]	390	[illegible]	17	[illegible]	94	[illegible]
Pyrene	240	153	190	[illegible]	890	[illegible]	270	[illegible]	290	[illegible]	**250**	[illegible]	1,000	[illegible]	30	[illegible]	210	[illegible]
SVOCs (µg/kg)																		
BEHP	ND	182	NS	[illegible]	2900	[illegible]	240	[illegible]	485	[illegible]	500	[illegible]	485	[illegible]	240	[illegible]	445	[illegible]
Number of TEL Exceedances				11		24		17		19		18		23		5		15

Notes:

NS = not sampled

NC= not calculated

One half the detection limit was used for parameters that were not detected, except for pesticides and PCBs which used one-tenth the detection limit (See EPA Report in Appendix B)

Concentrations exceeding the TEL are shown in **bold**

Table F-4

Subsurface Sediment PEL Quotients

	Reference		IJ-12 USEPA 1		IJ-34 USEPA 3		GH-34 USEPA 4		EF-23 USEPA 5		KL-34 USEPA 9		CD-23 USEPA 11		Reference Stations 18 USEPA 18		Reference Stations 22 USEPA 22	
Parameters	**Conc.**	**PEL**	**Conc.**	[illegible]	**Conc.**	[illegible]	**Conc.**	[illegible]	**Conc.**	[illegible]	**Conc.**	[illegible]	**Conc.**	[illegible]	**Conc.**	[illegible]	**Conc.**	[illegible]
Inorganics (mg/kg)																		
Arsenic (As)	22.1	41.6	14.00	[illegible]	16	[illegible]	12	[illegible]	12	[illegible]	16	[illegible]	18	[illegible]	5.1	[illegible]	17	[illegible]
Cadmium (Cd)	0.34	4.21	0.19	[illegible]	2.9	[illegible]	0.46	[illegible]	0.49	[illegible]	0.36	[illegible]	0.77	[illegible]	0.09	[illegible]	0.25	[illegible]
Chromium (Cr)	61	160	39.0	[illegible]	99	[illegible]	14	[illegible]	36	[illegible]	48	[illegible]	49	[illegible]	12	[illegible]	49	[illegible]
Copper (Cu)	16.4	108	50	[illegible]	29	[illegible]	14	[illegible]	52	[illegible]	19	[illegible]	75	[illegible]	3.4	[illegible]	13	[illegible]
Lead (Pb)	29.6	112	52.0	[illegible]	140	[illegible]	230	[illegible]	63	[illegible]	36	[illegible]	200	[illegible]	5.6	[illegible]	24	[illegible]
Mercury (Hg)	0.12	0.696	0.21	[illegible]	0.24	[illegible]	0.25	[illegible]	0.46	[illegible]	0.74	[illegible]	0.81	[illegible]	0.02	[illegible]	0.1	[illegible]
Nickel (Ni)	16.7	42.8	12.0	[illegible]	13	[illegible]	5.4	[illegible]	11	[illegible]	13	[illegible]	15	[illegible]	3.7	[illegible]	13	[illegible]
Silver (Ag)	ND	1.77	0.87	[illegible]	2.2	[illegible]	0.0335	[illegible]	0.055	[illegible]	0.065	[illegible]	0.065	[illegible]	0.0325	[illegible]	0.06	[illegible]
Zinc (Zn)	74	271	51.0	[illegible]	130	[illegible]	41	[illegible]	50	[illegible]	77	[illegible]	95	[illegible]	12	[illegible]	62	[illegible]
Total PCBs	ND	189	NS	[illegible]	217	[illegible]	38.5	[illegible]	78.2	[illegible]	81	[illegible]	78.2	[illegible]	38.5	[illegible]	71.4	[illegible]
Pesticides (µg/kg)																		
4,4'-DDD	ND	7.81	NS	[illegible]	1	[illegible]	0.48	[illegible]	0.97	[illegible]	1	[illegible]	0.97	[illegible]	0.48	[illegible]	0.89	[illegible]
4,4'-DDE	ND	374	NS	[illegible]	1	[illegible]	0.48	[illegible]	0.97	[illegible]	1	[illegible]	0.97	[illegible]	0.48	[illegible]	0.89	[illegible]
4,4'-DDT	ND	4.77	NS	[illegible]	1	[illegible]	0.48	[illegible]	0.97	[illegible]	1	[illegible]	1.8	[illegible]	0.48	[illegible]	1.2	[illegible]
Dieldrin	ND	51.7	NS	[illegible]	1	[illegible]	0.48	[illegible]	0.97	[illegible]	1	[illegible]	0.97	[illegible]	0.48	[illegible]	0.89	[illegible]
Lindane	ND	0.99	NS	[illegible]	0.53	[illegible]	0.25	[illegible]	0.5	[illegible]	0.5	[illegible]	0.5	[illegible]	0.25	[illegible]	0.46	[illegible]
Chlordane	ND	4.79	NS	[illegible]	1.06	[illegible]	0.5	[illegible]	1	[illegible]	1.06	[illegible]	1	[illegible]	0.5	[illegible]	0.92	[illegible]
PAHs (µg/kg)																		
2-Methylnapthalene	ND	201	5	[illegible]	50	[illegible]	27	[illegible]	46	[illegible]	5.5	[illegible]	50	[illegible]	2.6	[illegible]	4.65	[illegible]
Acenaphthene	ND	88.9	15.5	[illegible]	155	[illegible]	80	[illegible]	140	[illegible]	16.5	[illegible]	160	[illegible]	8	[illegible]	14.5	[illegible]
Acenaphthylene	ND	128	24.5	[illegible]	250	[illegible]	130	[illegible]	225	[illegible]	26.5	[illegible]	255	[illegible]	13	[illegible]	23	[illegible]
Anthracene	25	245	17	[illegible]	64	[illegible]	42	[illegible]	35	[illegible]	25	[illegible]	91	[illegible]	3.0	[illegible]	22	[illegible]
Benzo(a)anthracene	113	693	90.0	[illegible]	360	[illegible]	120	[illegible]	130	[illegible]	110	[illegible]	390	[illegible]	14	[illegible]	99	[illegible]
Benzo(a)pyrene	142	763	180	[illegible]	460	[illegible]	160	[illegible]	160	[illegible]	140	[illegible]	460	[illegible]	22	[illegible]	120	[illegible]
Chrysene	232	846	160	[illegible]	850	[illegible]	260	[illegible]	250	[illegible]	250	[illegible]	790	[illegible]	32	[illegible]	200	[illegible]
Dibenz(a,h)anthracene	42.6	135	2.1	[illegible]	110	[illegible]	41	[illegible]	41	[illegible]	36	[illegible]	120	[illegible]	6.6	[illegible]	36	[illegible]
Fluoranthene	240	1494	180	[illegible]	530	[illegible]	260	[illegible]	260	[illegible]	230	[illegible]	800	[illegible]	30	[illegible]	210	[illegible]
Fluorene	11	144	9.6	[illegible]	19	[illegible]	26	[illegible]	17.5	[illegible]	11	[illegible]	48	[illegible]	1	[illegible]	11	[illegible]
Naphthalene	32	391	32	[illegible]	105	[illegible]	55	[illegible]	95	[illegible]	47	[illegible]	105	[illegible]	5.5	[illegible]	32	[illegible]
Phenanthrene	111	544	65	[illegible]	210	[illegible]	160	[illegible]	130	[illegible]	100	[illegible]	390	[illegible]	17	[illegible]	94	[illegible]
Pyrene	240	1398	190	[illegible]	890	[illegible]	270	[illegible]	290	[illegible]	250	[illegible]	1,000	[illegible]	30	[illegible]	210	[illegible]
SVOCs (µg/kg)																		
BEHP	ND	2647	NS	[illegible]	2900	[illegible]	240	[illegible]	485	[illegible]	500	[illegible]	485	[illegible]	240	[illegible]	445	[illegible]
Total PEL Quotients				NC		17.87		8.35		10.15		6.83		17.11		1.75		5.29
Mean PEL Quotients				NC		0.60		0.28		0.34		0.23		0.57		0.06		0.18
Number of PEL Exceedances				0		7		2		2		1		4		0		0
Category				1		3		2		2		2		2		1		2

Notes:

NS = not sampled

NC = not calculated

One half the detection limit was used for parameters that were not detected, except for pesticides and PCBs which used one-tenth the detection limit (See EPA Report in Appendix B)

Concentrations exceeding the TEL are shown in **bold**

Figure F-1 Concentration of Arsenic in Surface Sediment by Station

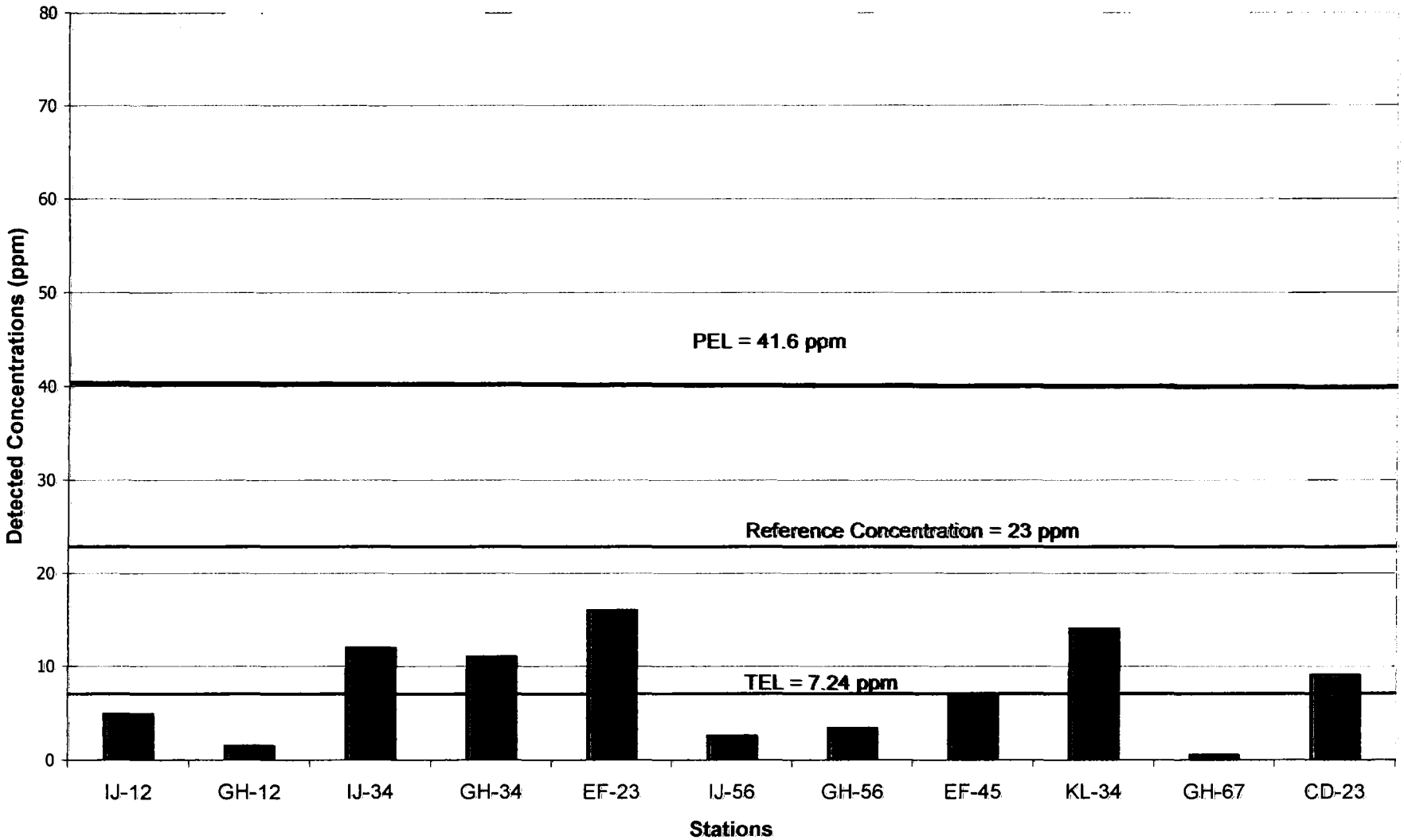


Figure F-2 Concentration of Cadmium in Surface Sediment by Station

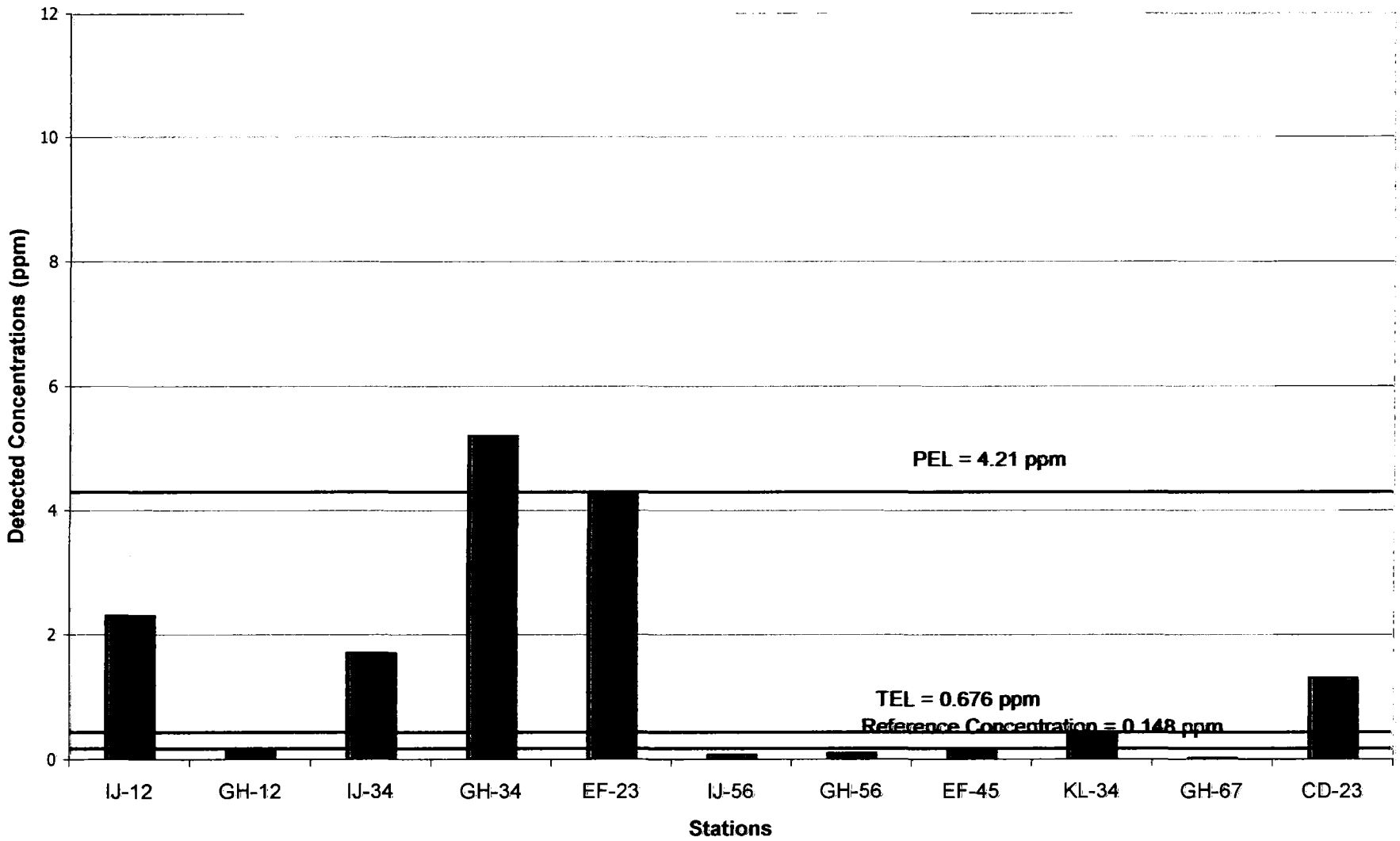


Figure F-3 Concentration of Chromium in Surface Sediment by Station

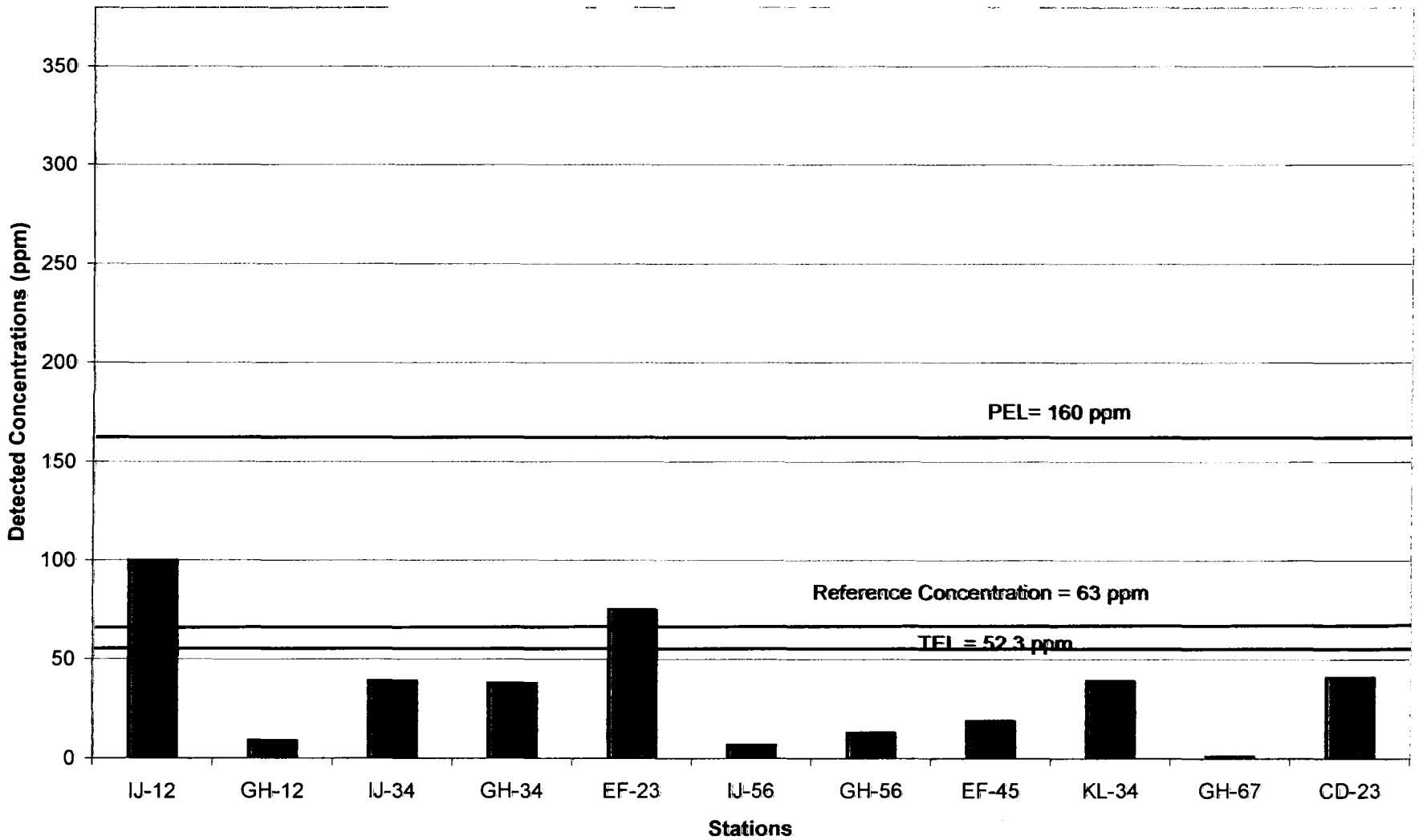


Figure F-4 Concentration of Copper in Surface Sediment by Station

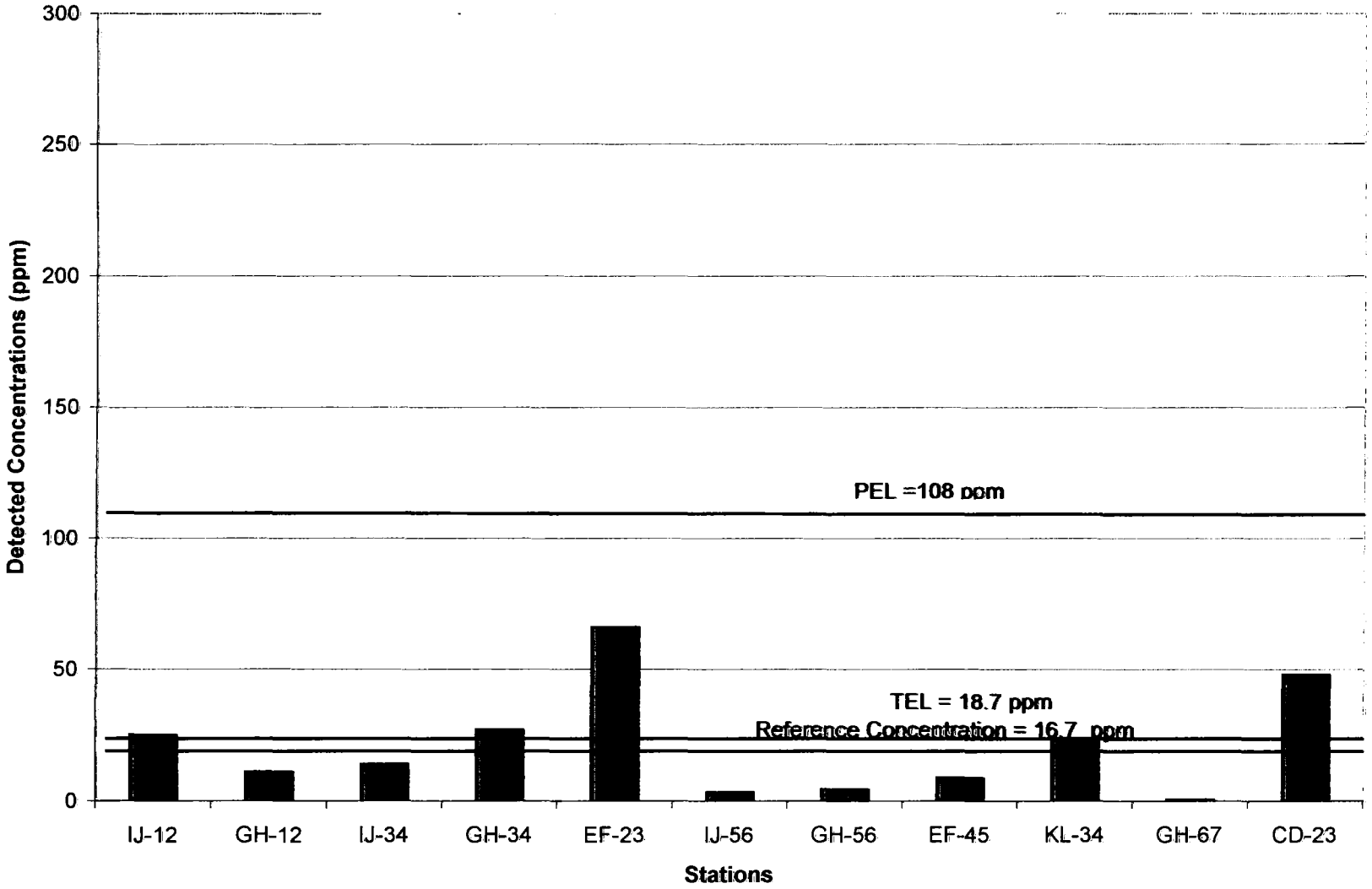


Figure F-5 Concentration of Lead in Surface Sediment by Station

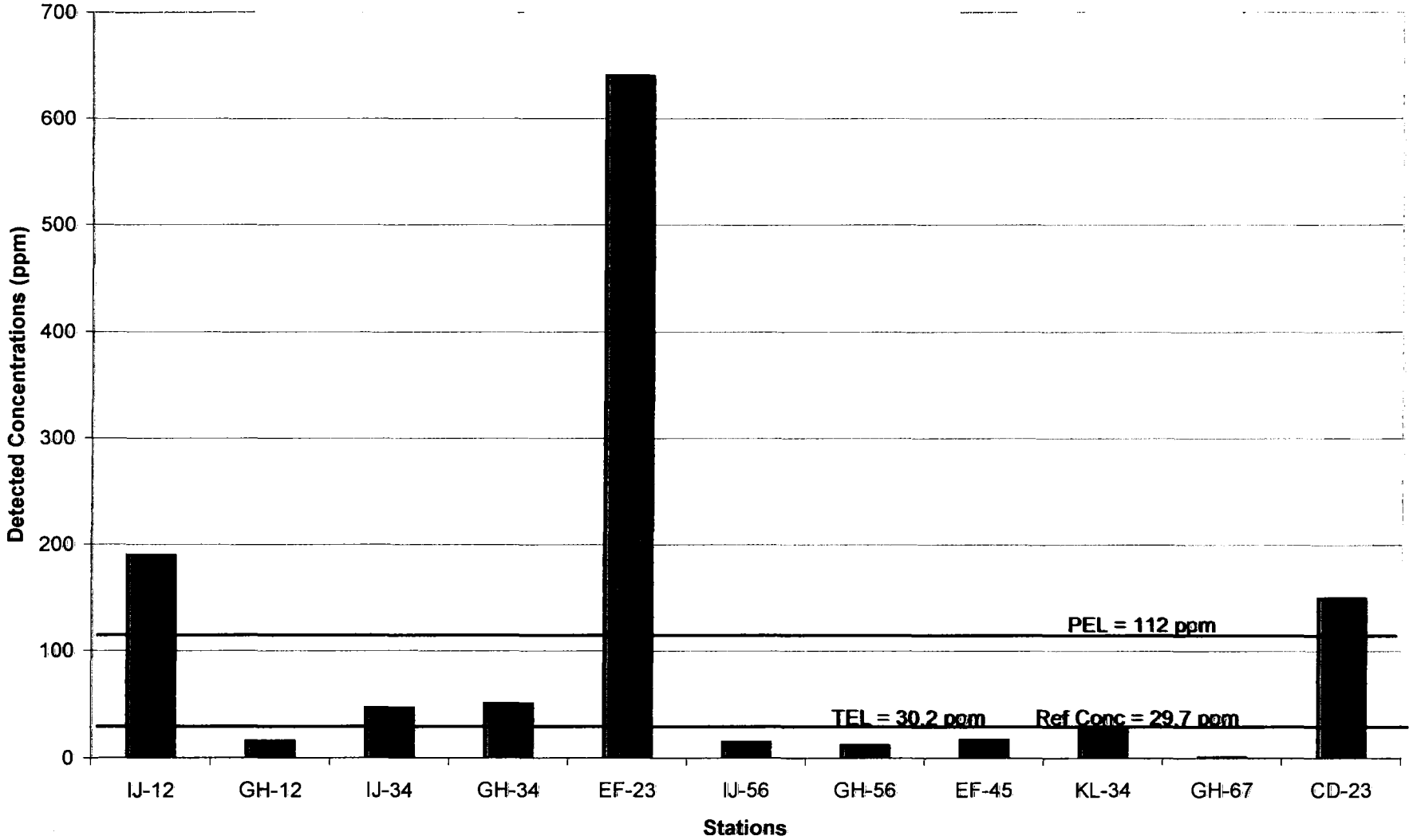


Figure F-6 Concentration of Mercury in Surface Sediment by Station

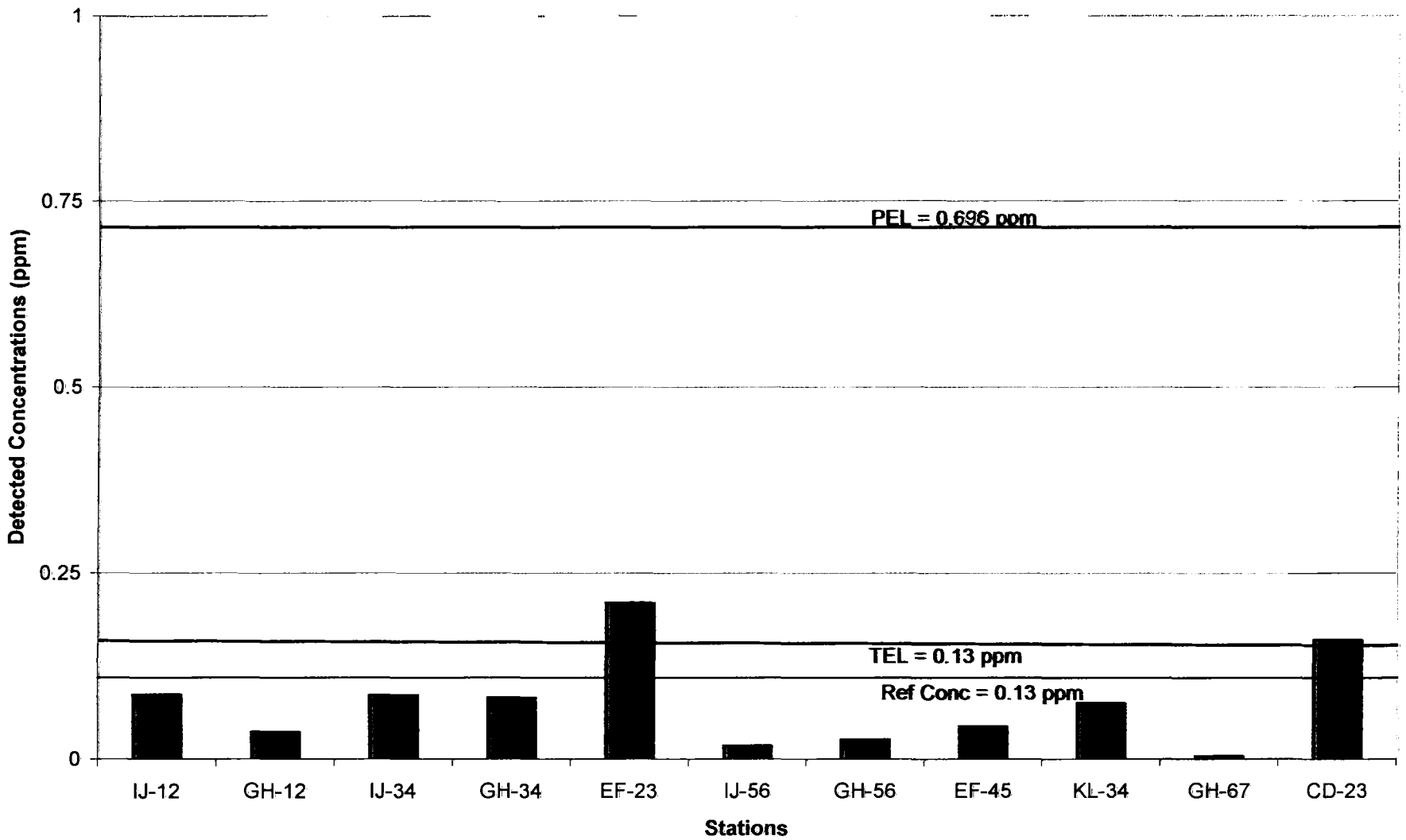


Figure F-7 Concentration of Nickel in Surface Sediment by Station

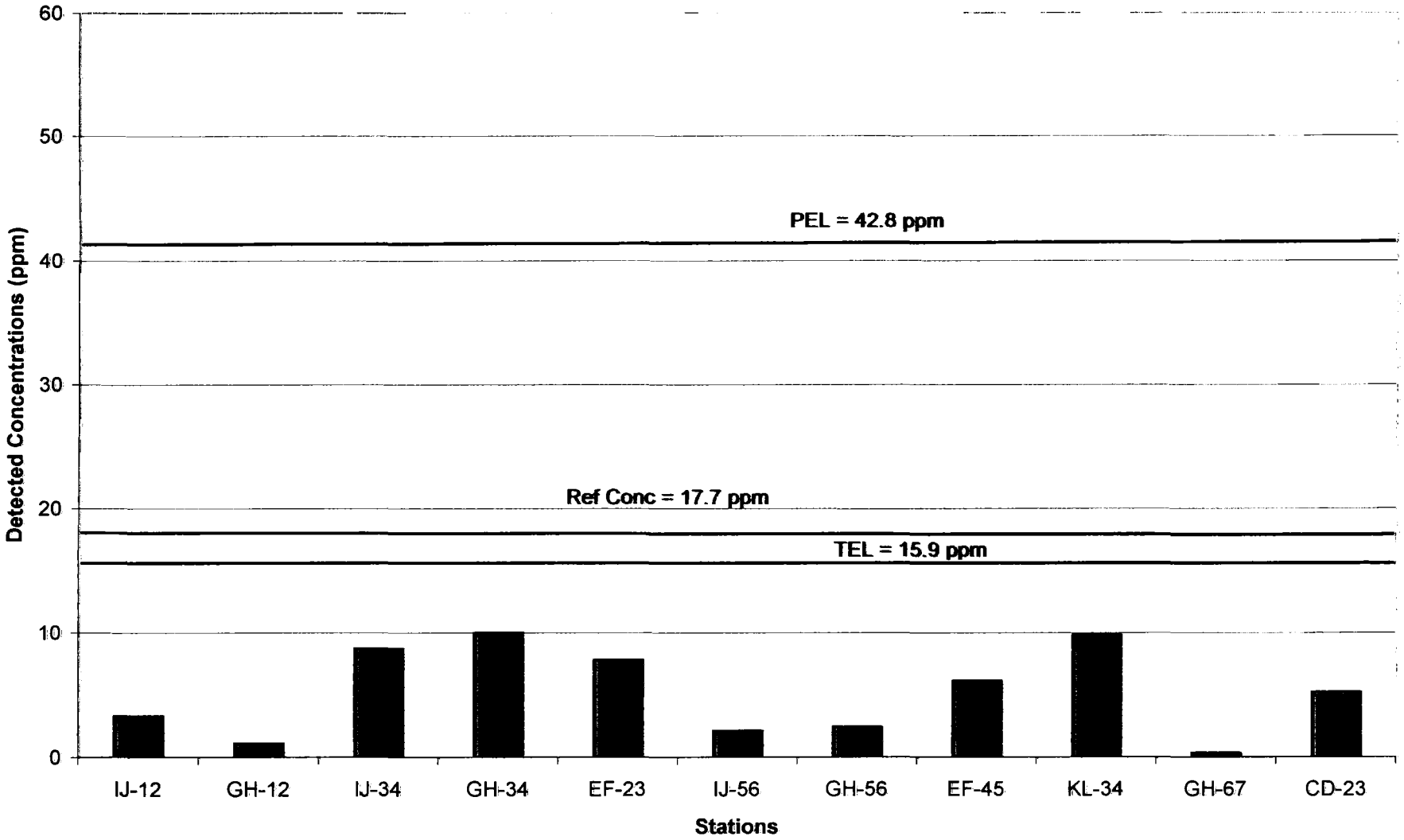


Figure F-8 Concentration of Silver in Surface Sediment by Station

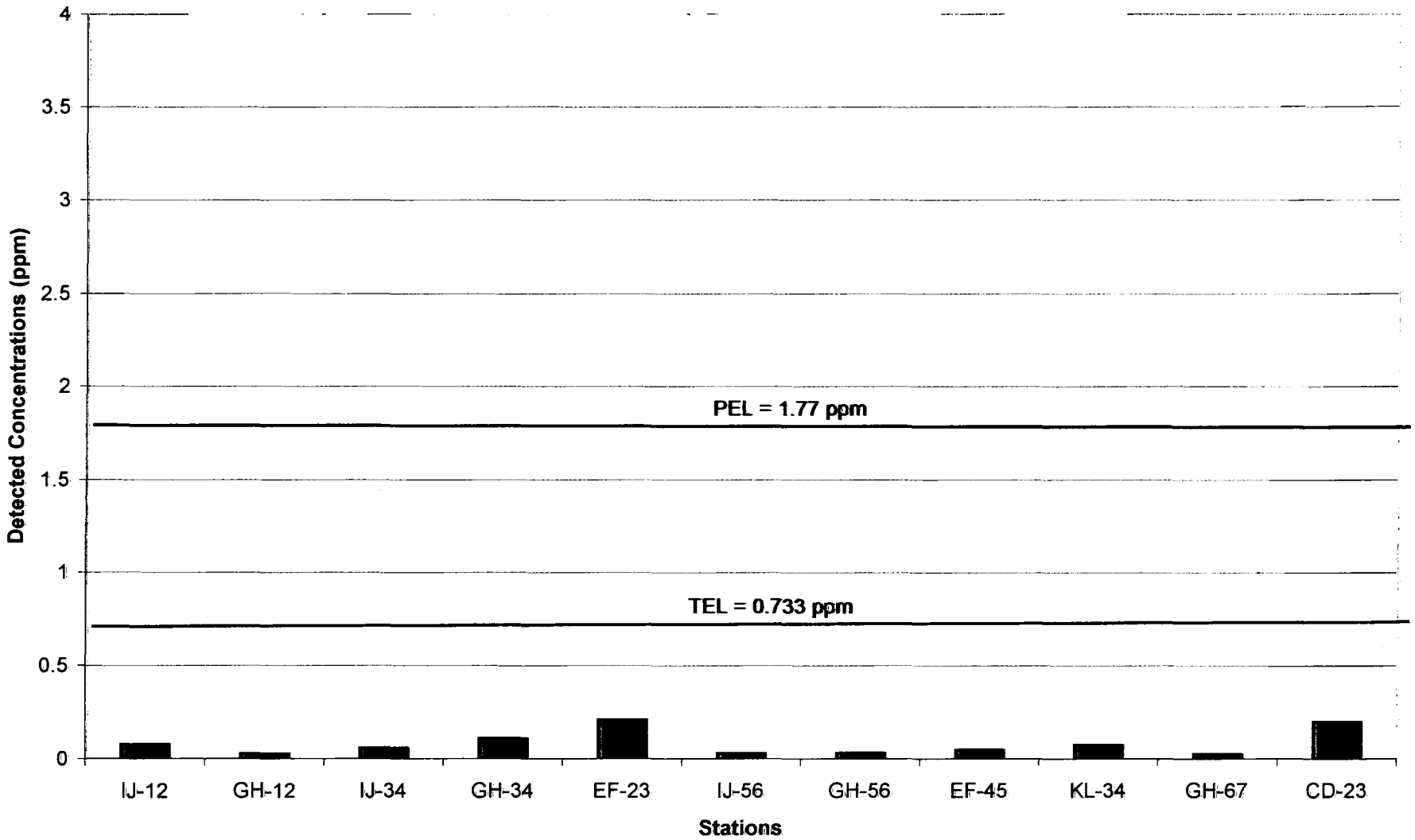


Figure F-9 Concentration of Zinc in Surface Sediment by Station

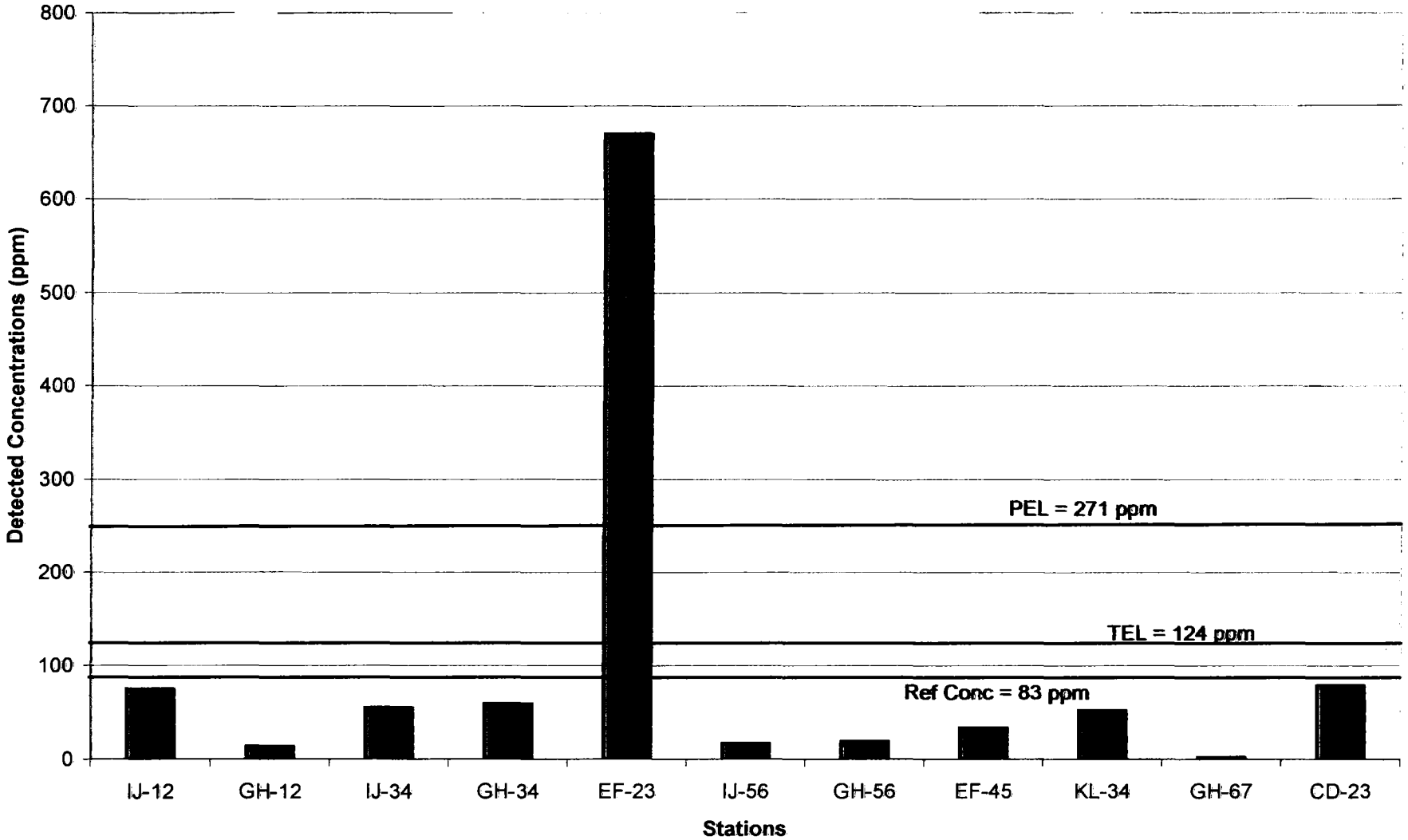


Figure F-10 Concentrtation of Total PAHs in Surface Sediment by Station

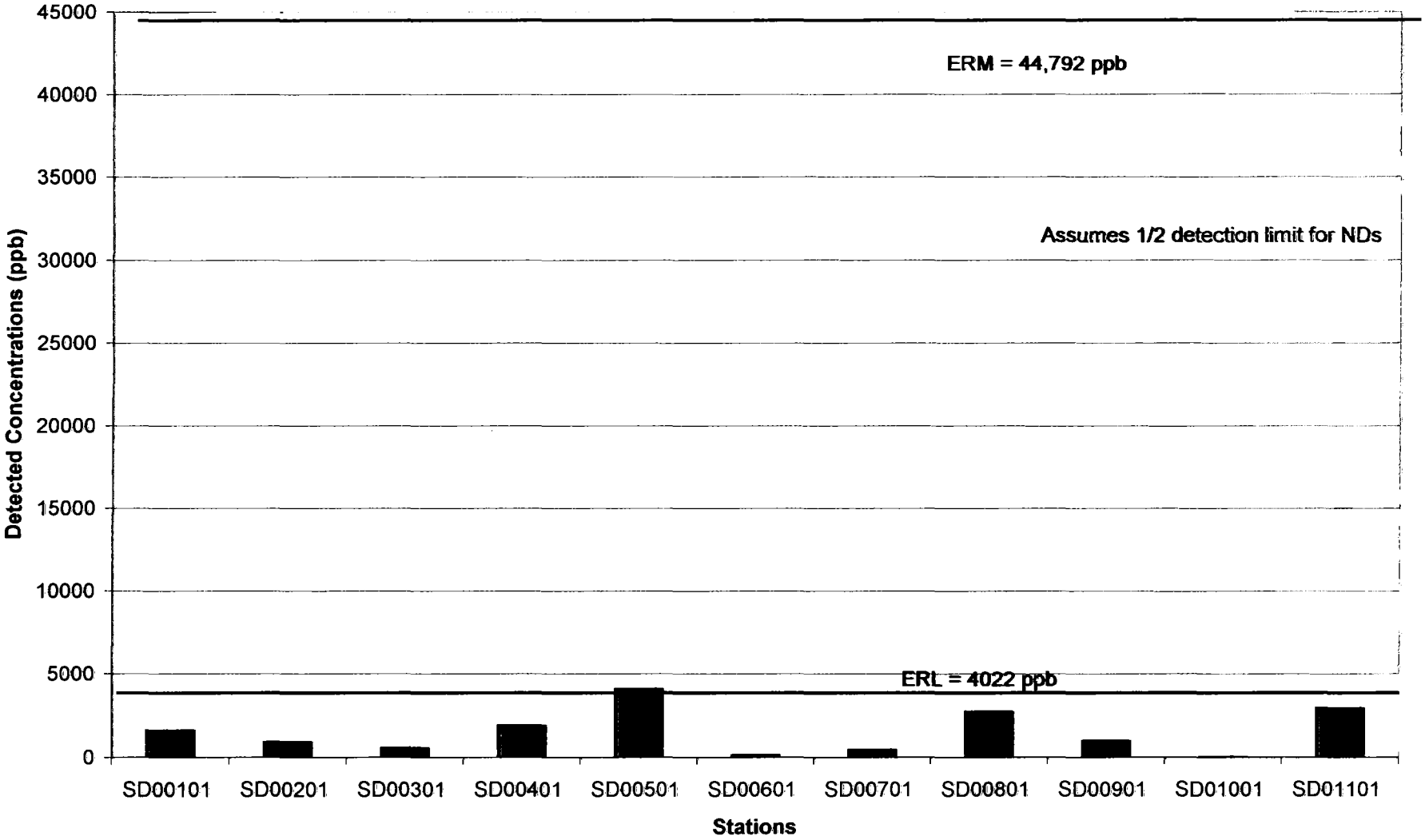


Figure F-11 Total PCBs in Surface Sediment by Station

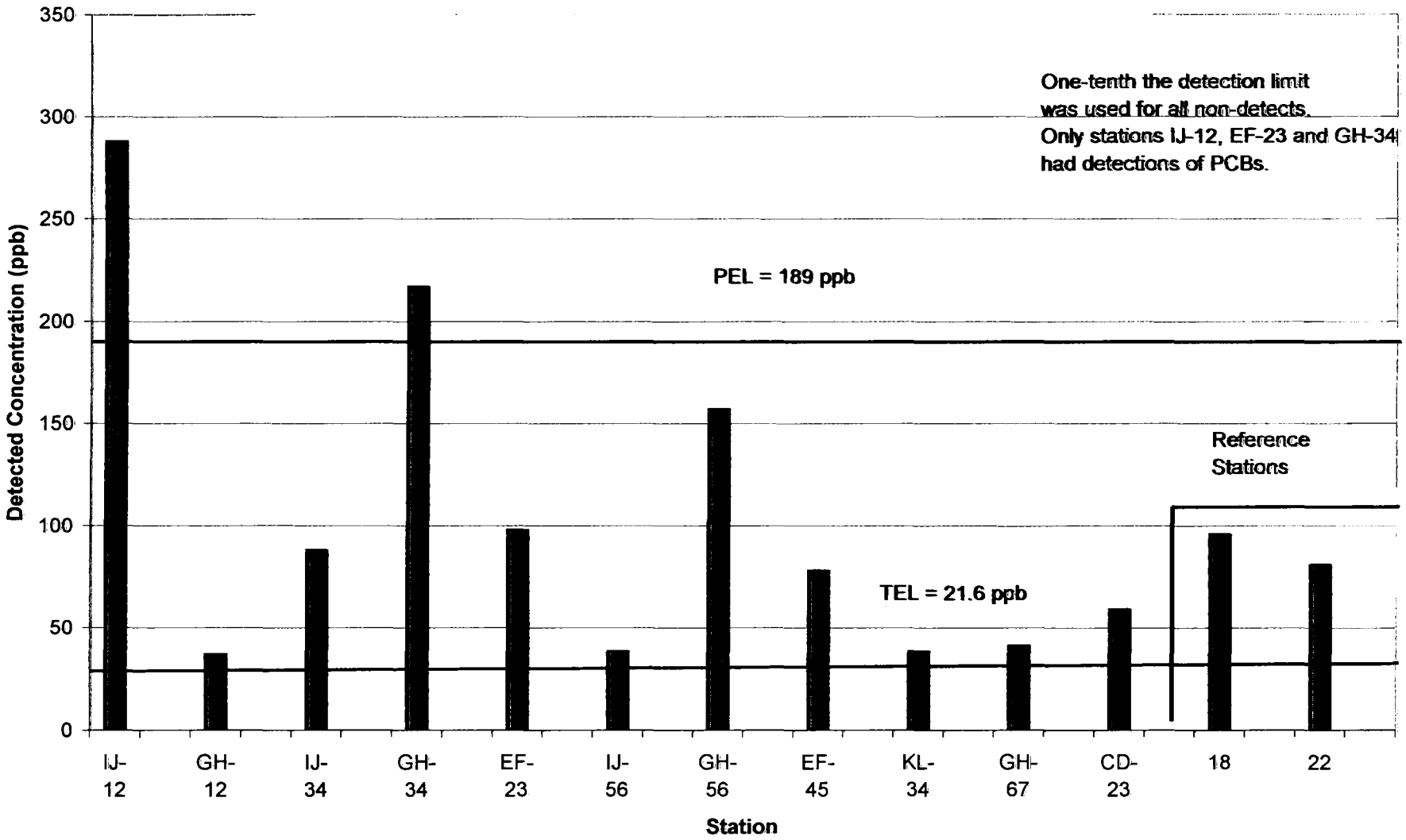
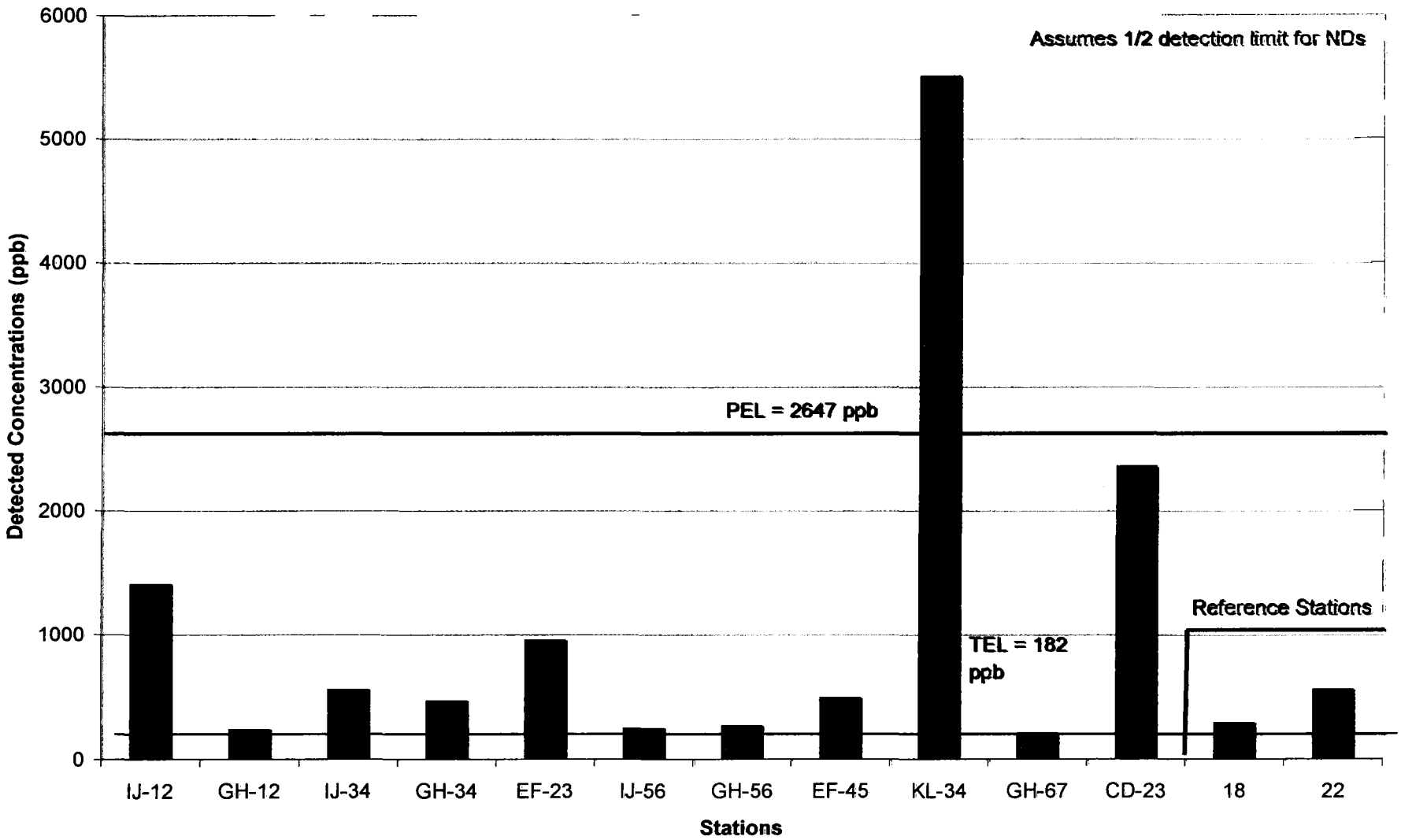
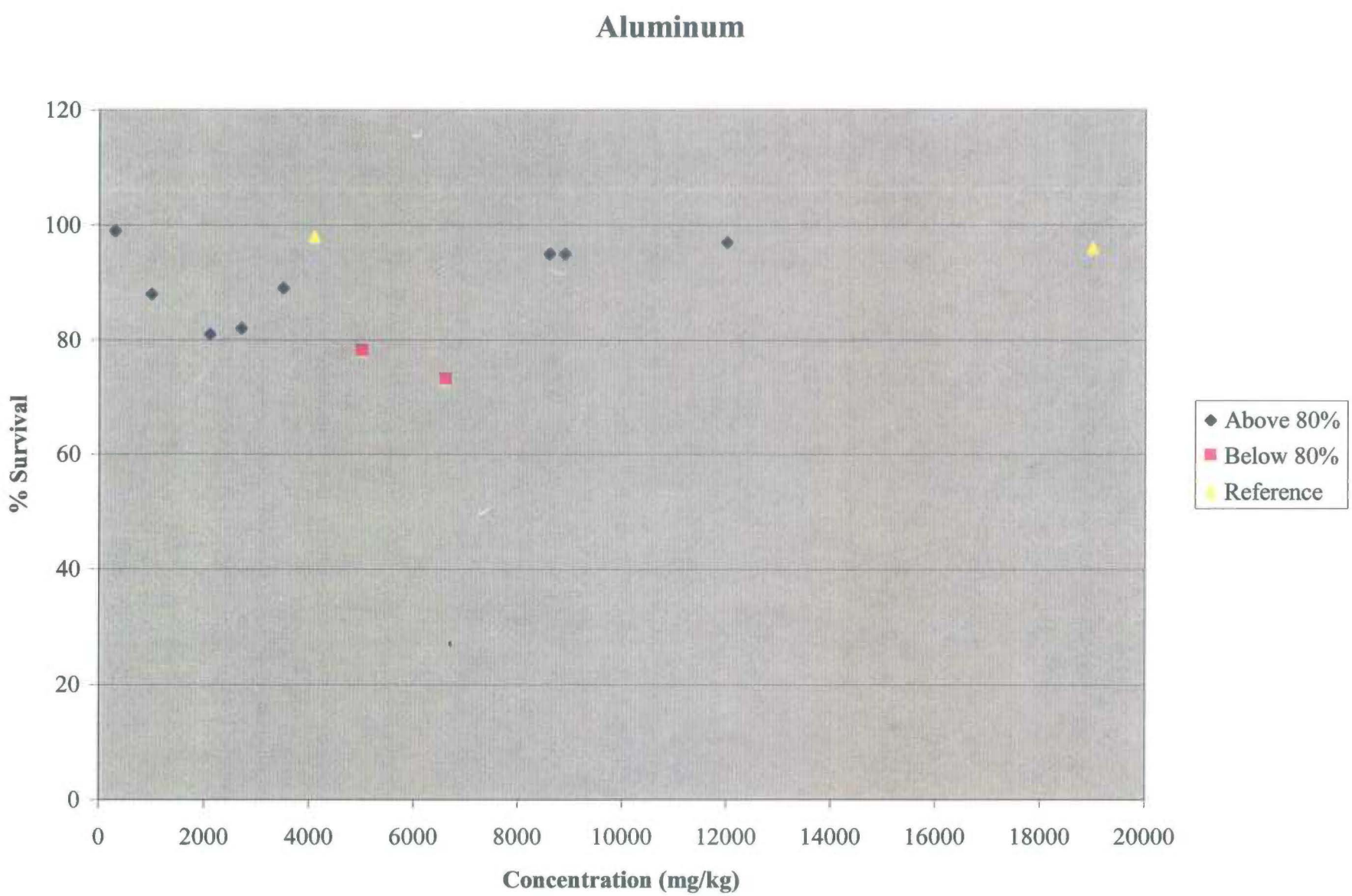
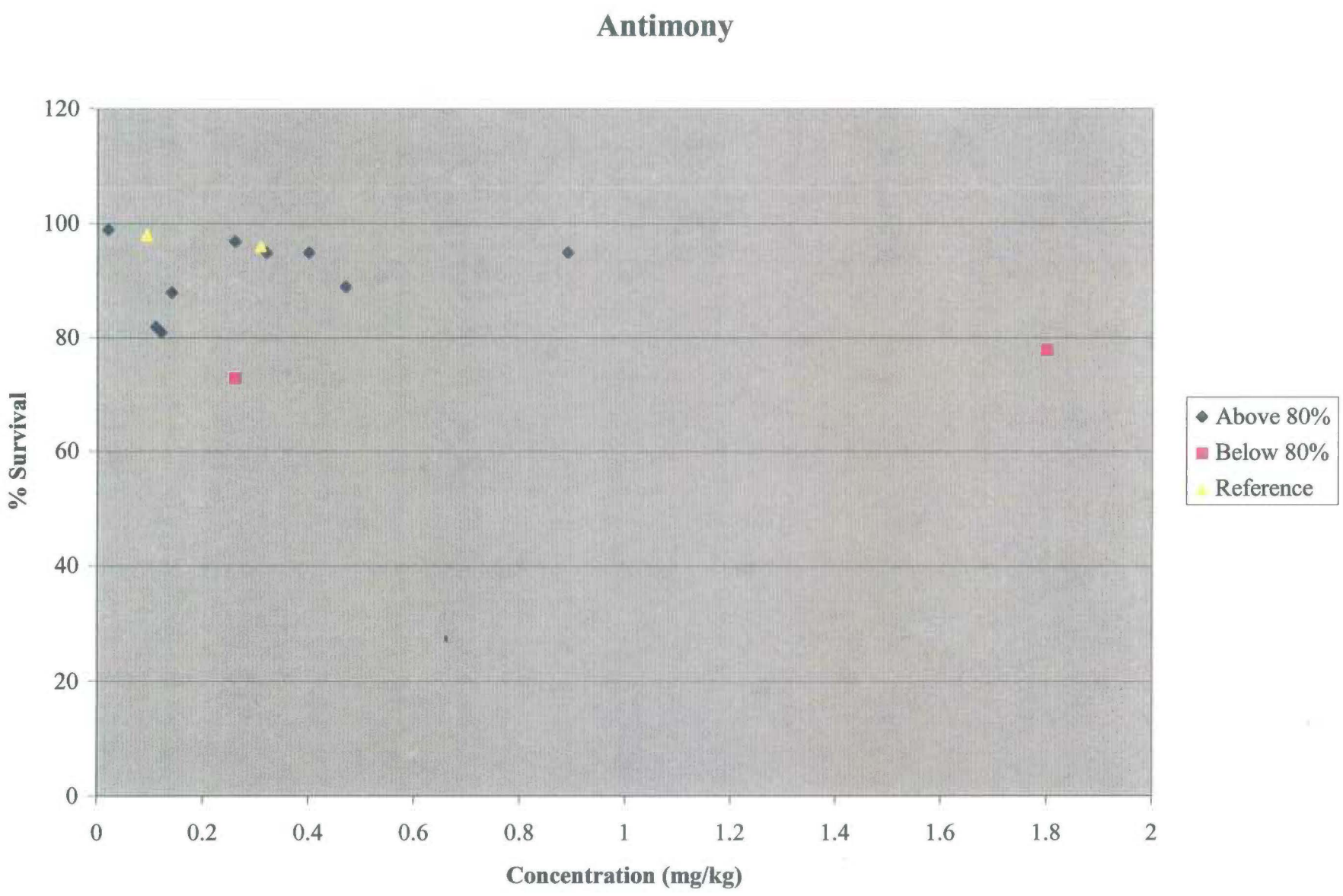


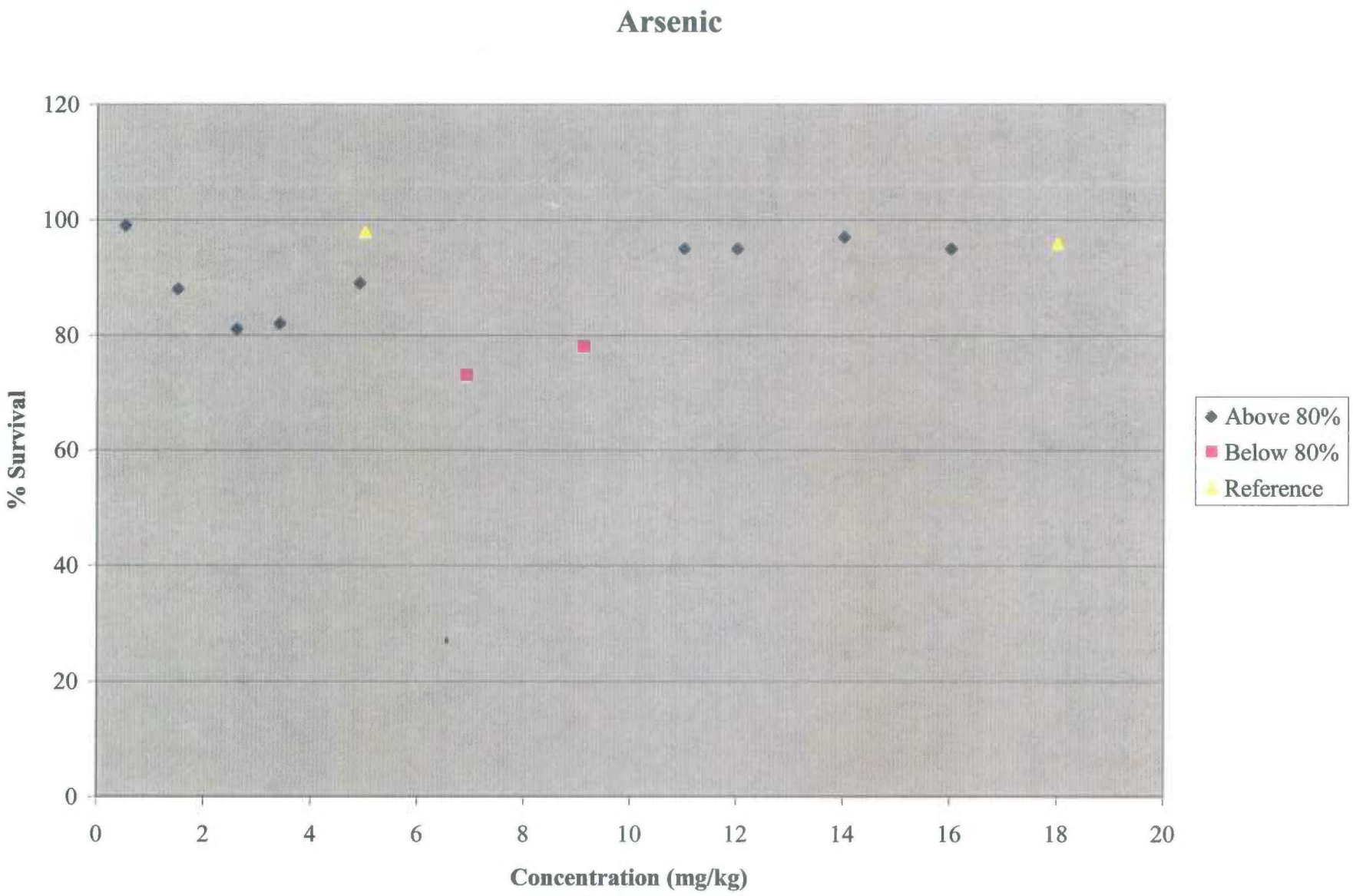
Figure F-12 Concentration of Bis(2-ethylhexyl)phthalate in Surface Sediment by Station

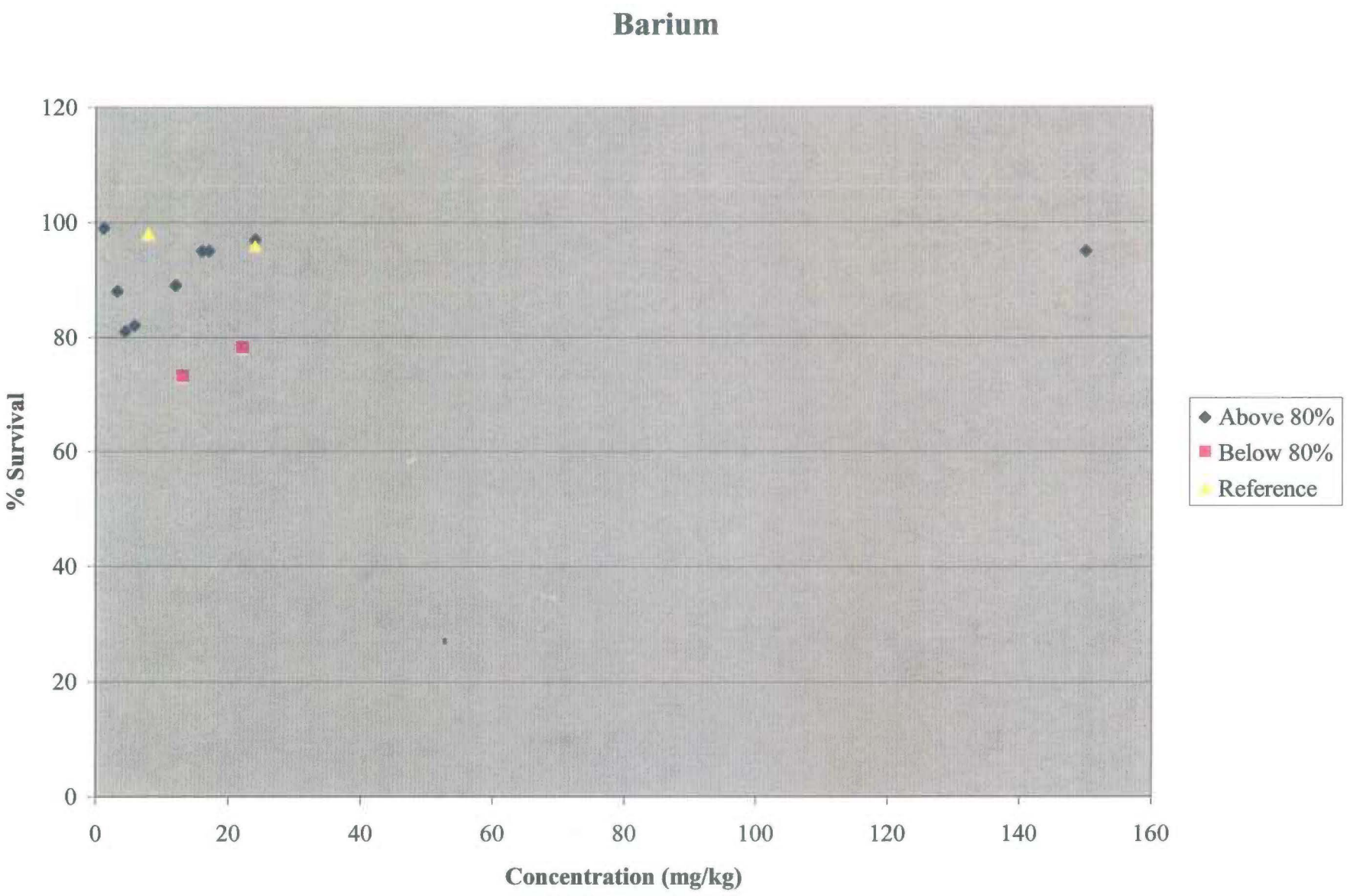


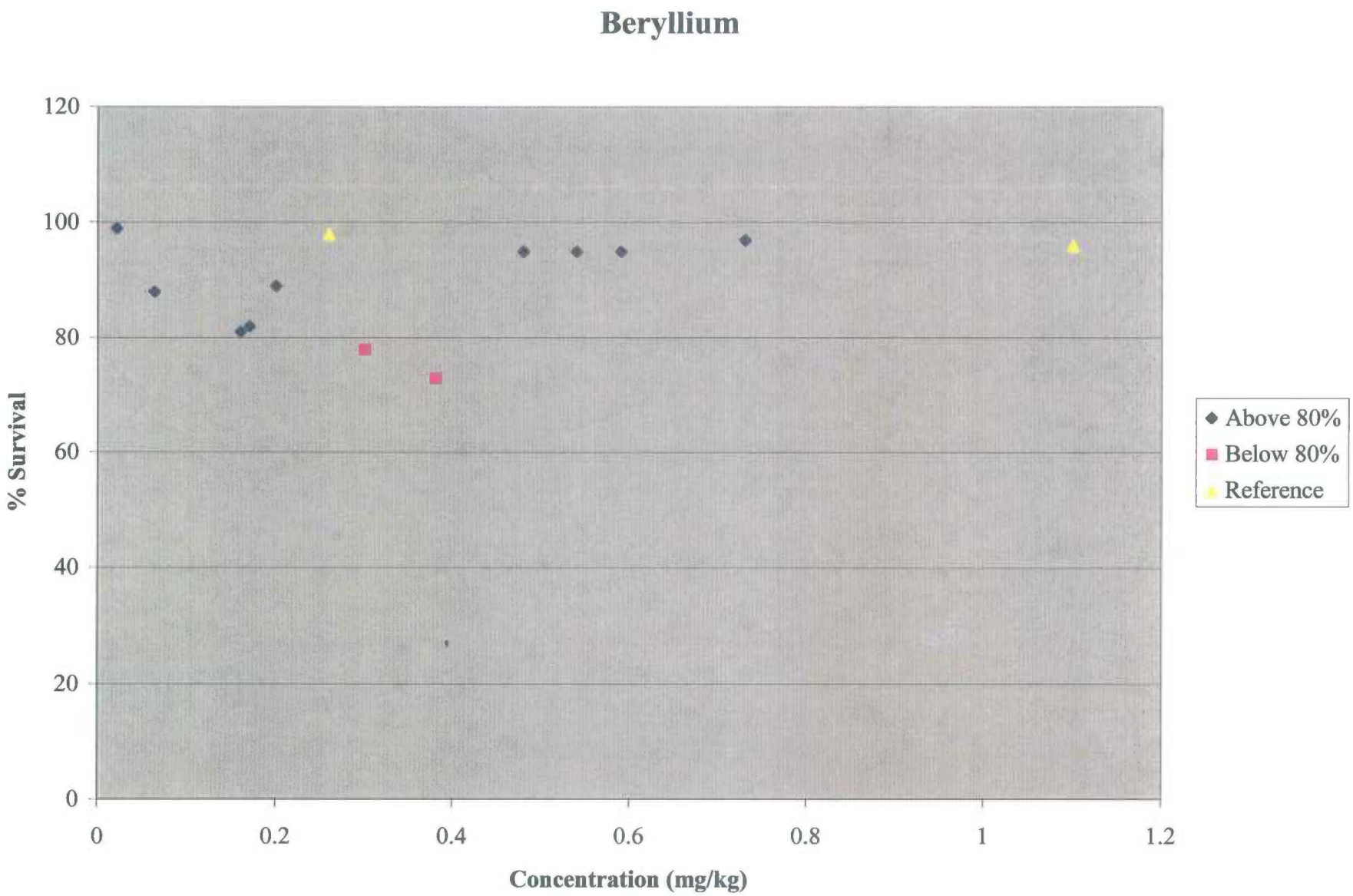
Appendix G
Individual Contaminant Concentrations Compared to *Leptocheirus* Survival

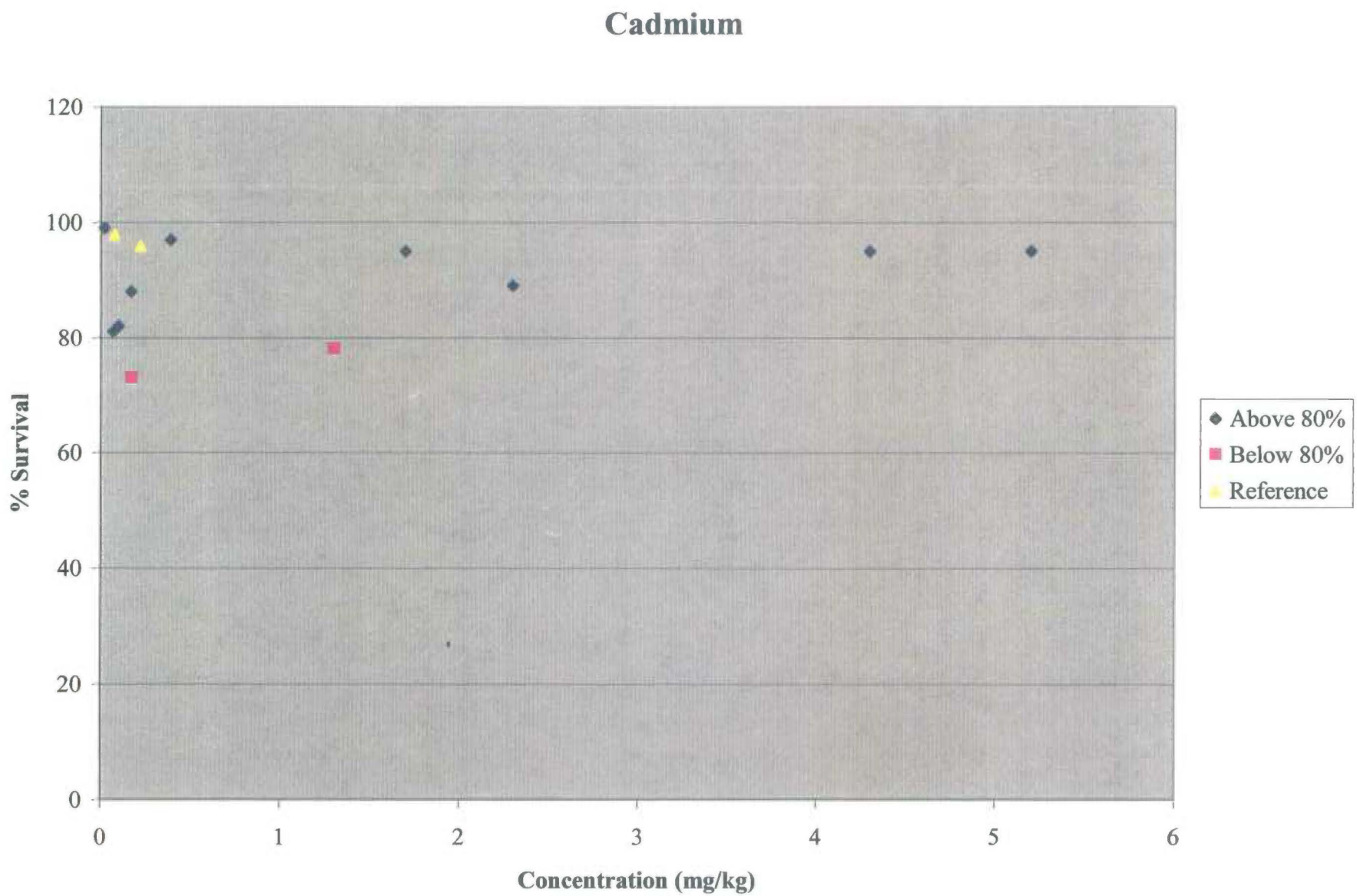

Aluminum
120
100
80
60
40
20
0
% Survival
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
Concentration (mg/kg)
Above 80%
Below 80%
Reference

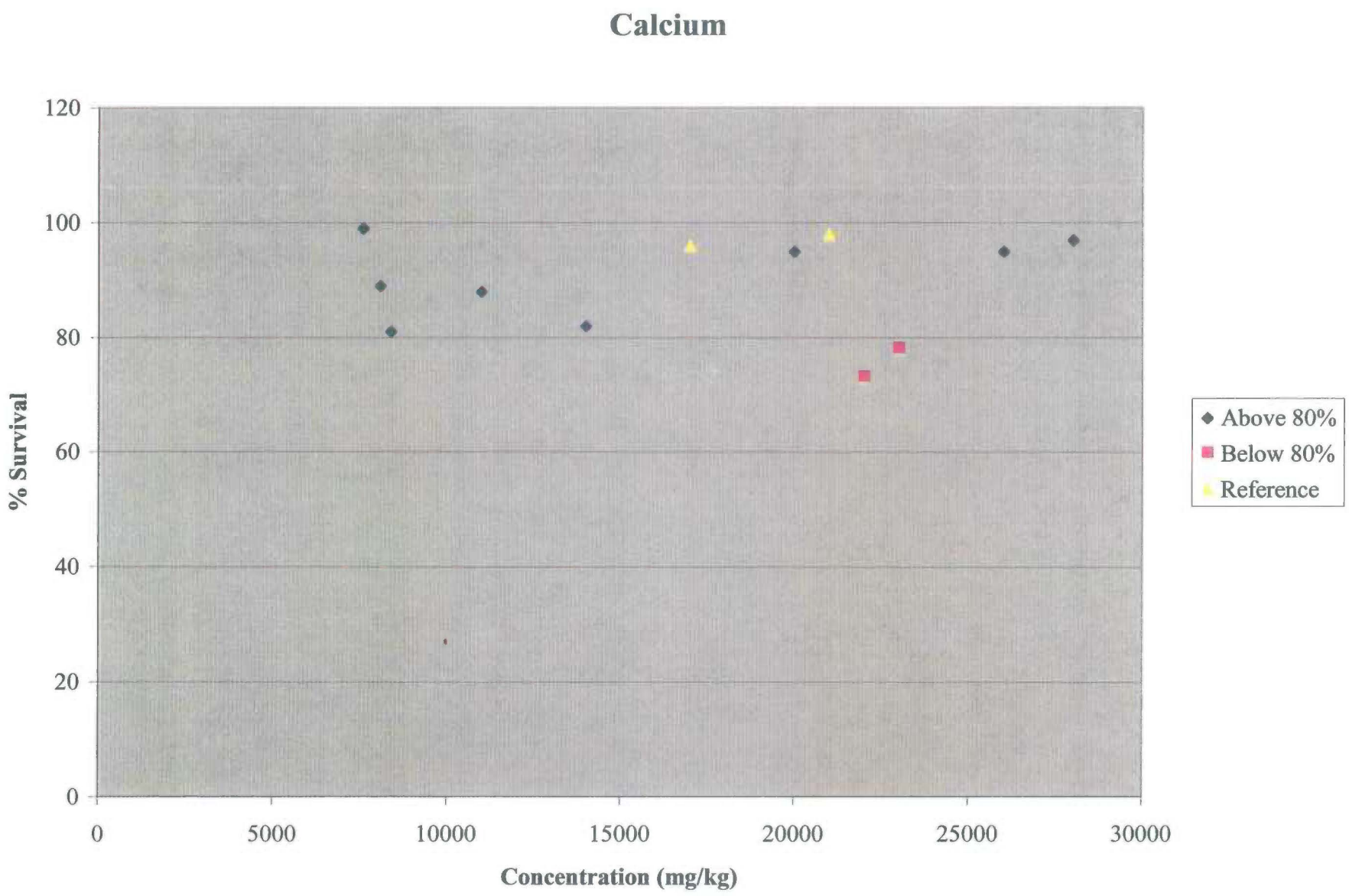

Antimony
120
100
80
60
40
20
0
% Survival
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Concentration (mg/kg)
Above 80%
Below 80%
Reference

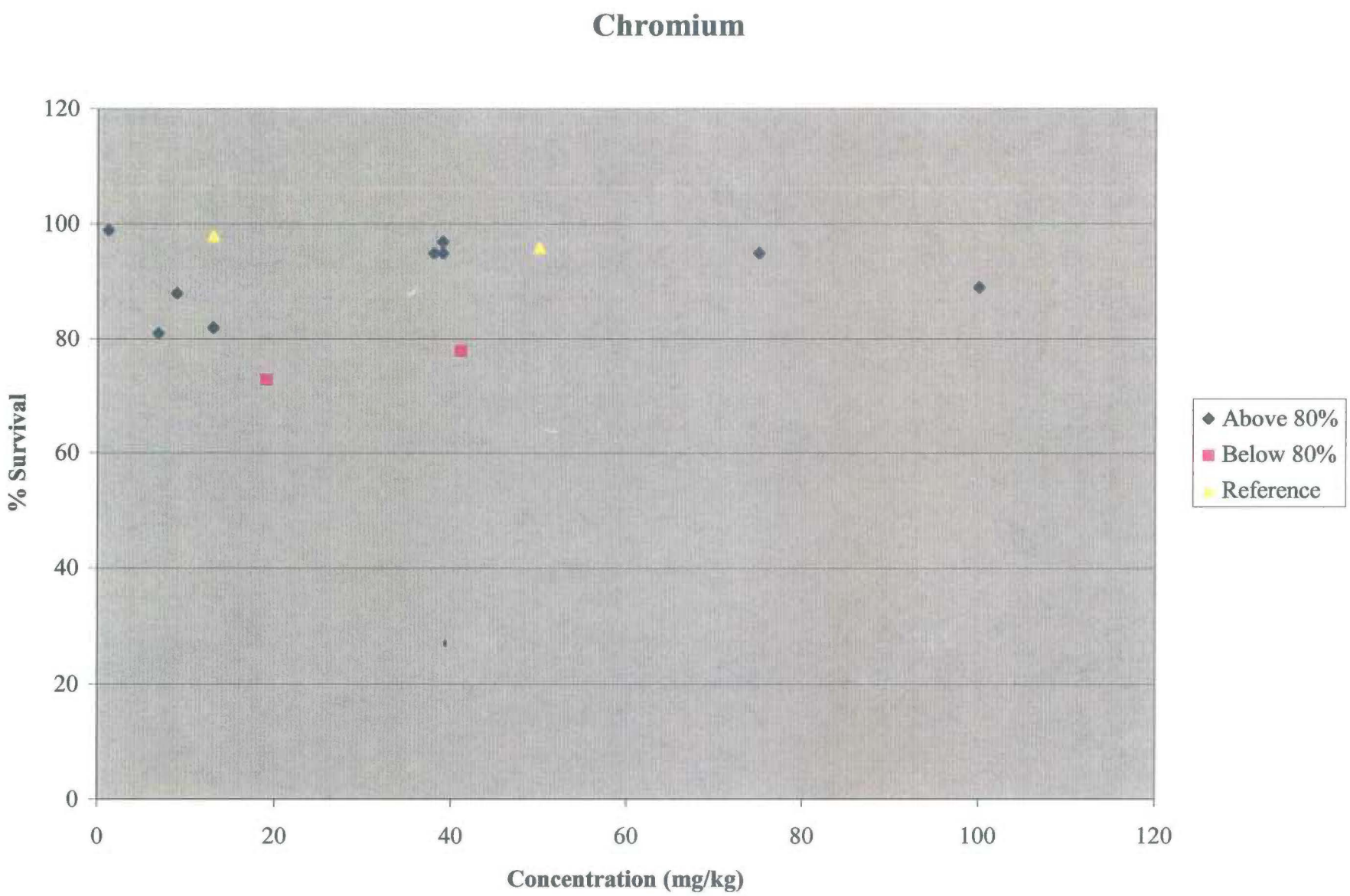

Arsenic
% Survival
120
100
80
60
40
20
0
0
2
4
6
8
10
12
14
16
18
20
Concentration (mg/kg)
Above 80%
Below 80%
Reference

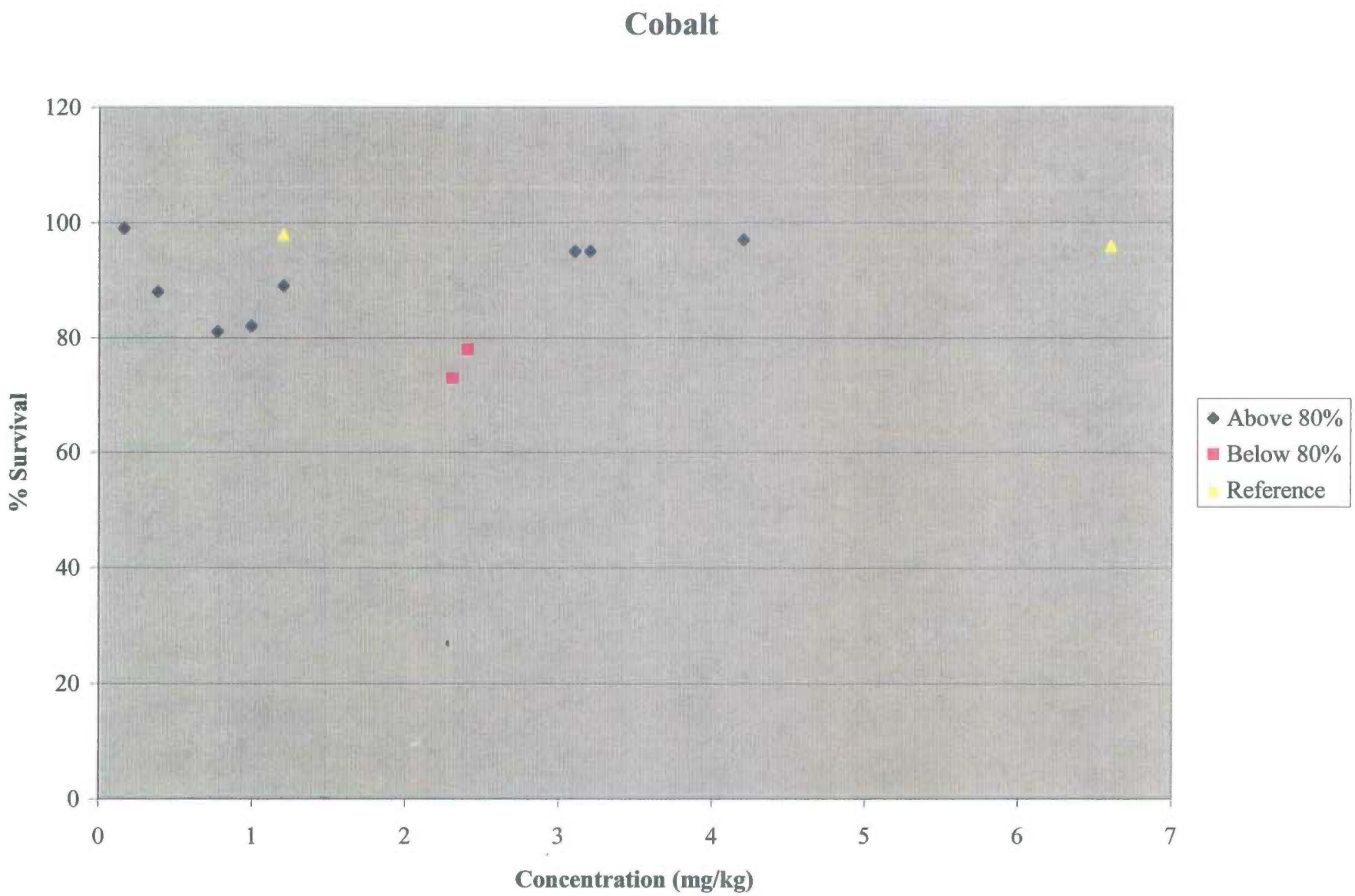

Barium
120
100
80
60
40
20
0
% Survival
0
20
40
60
80
100
120
140
160
Concentration (mg/kg)
Above 80%
Below 80%
Reference

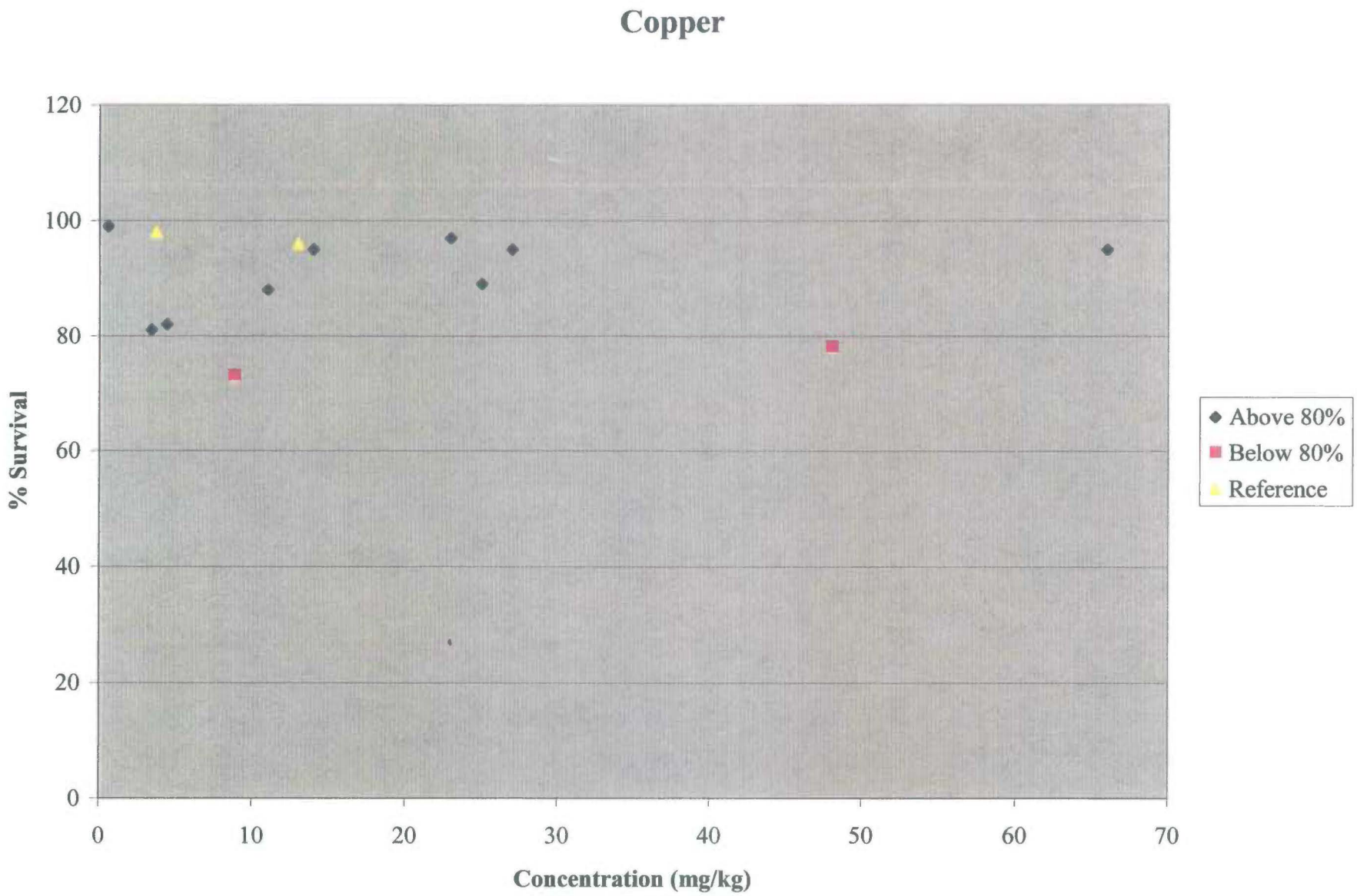

Beryllium
120
100
80
60
40
20
0
% Survival
0
0.2
0.4
0.6
0.8
1
1.2
Concentration (mg/kg)
Above 80%
Below 80%
Reference

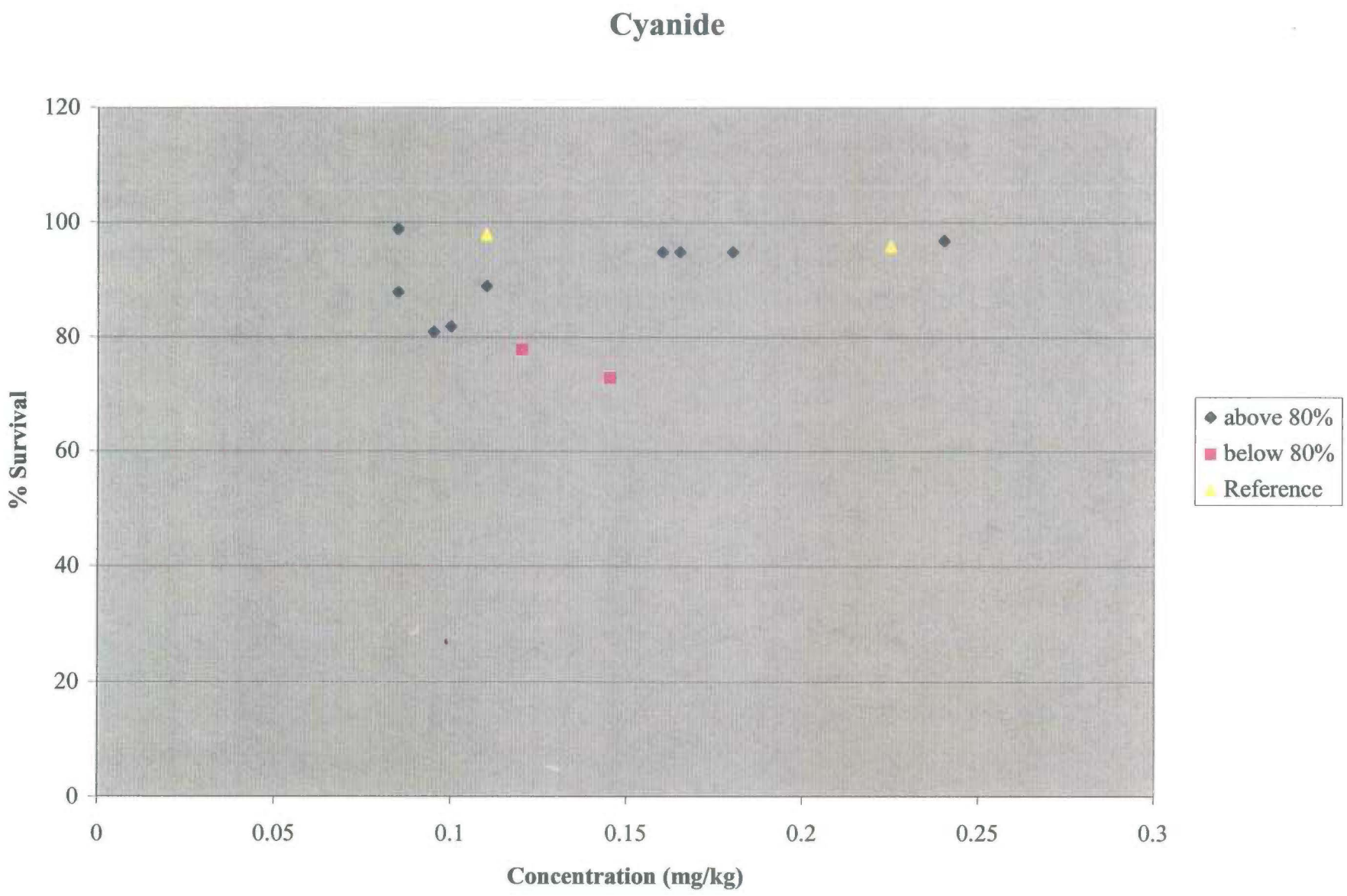

Cadmium
120
100
80
60
40
20
0
% Survival
0
1
2
3
4
5
6
Concentration (mg/kg)
Above 80%
Below 80%
Reference

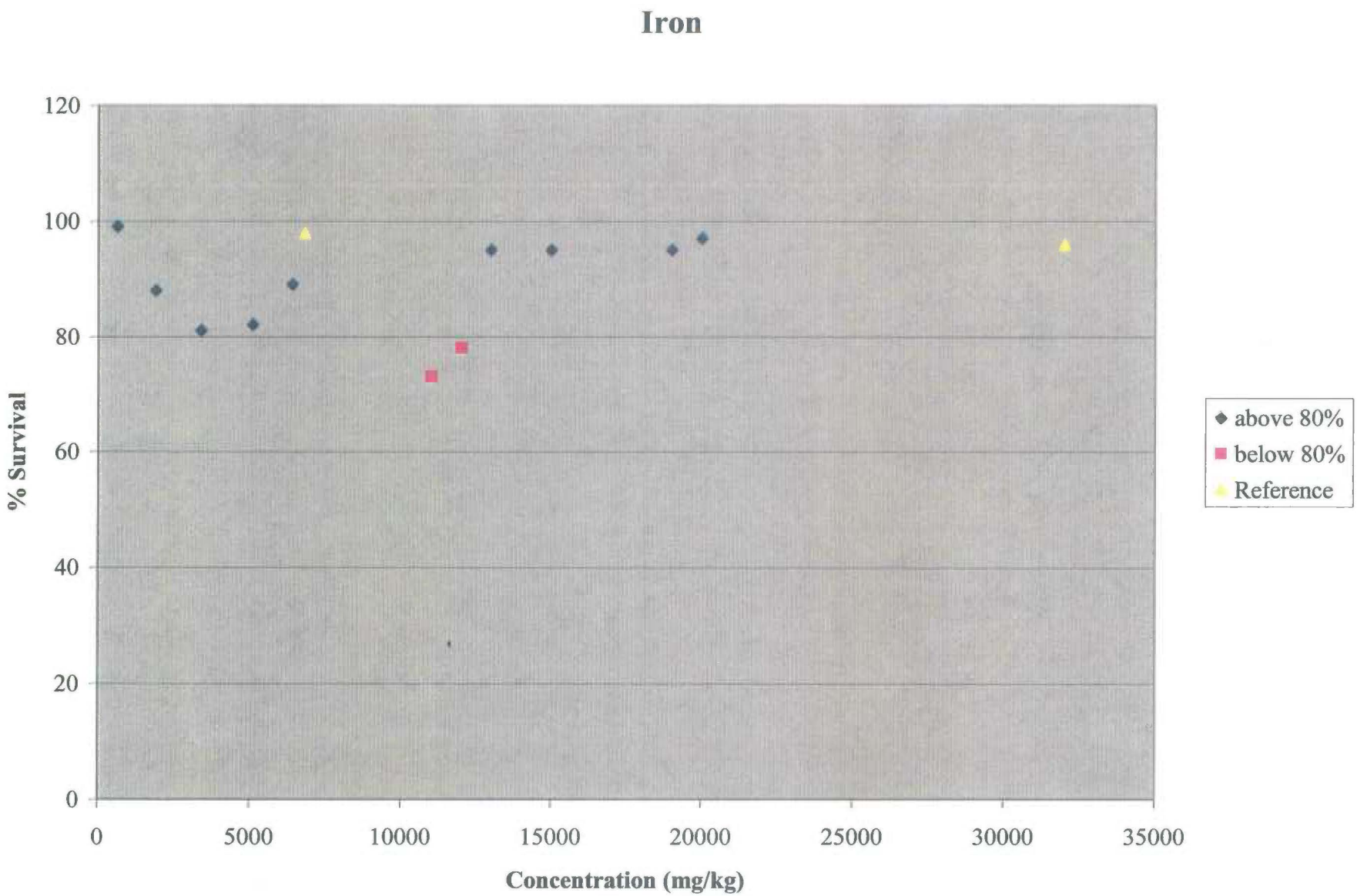

Calcium
120
100
80
60
40
20
0
% Survival
0
5000
10000
15000
20000
25000
30000
Concentration (mg/kg)
Above 80%
Below 80%
Reference

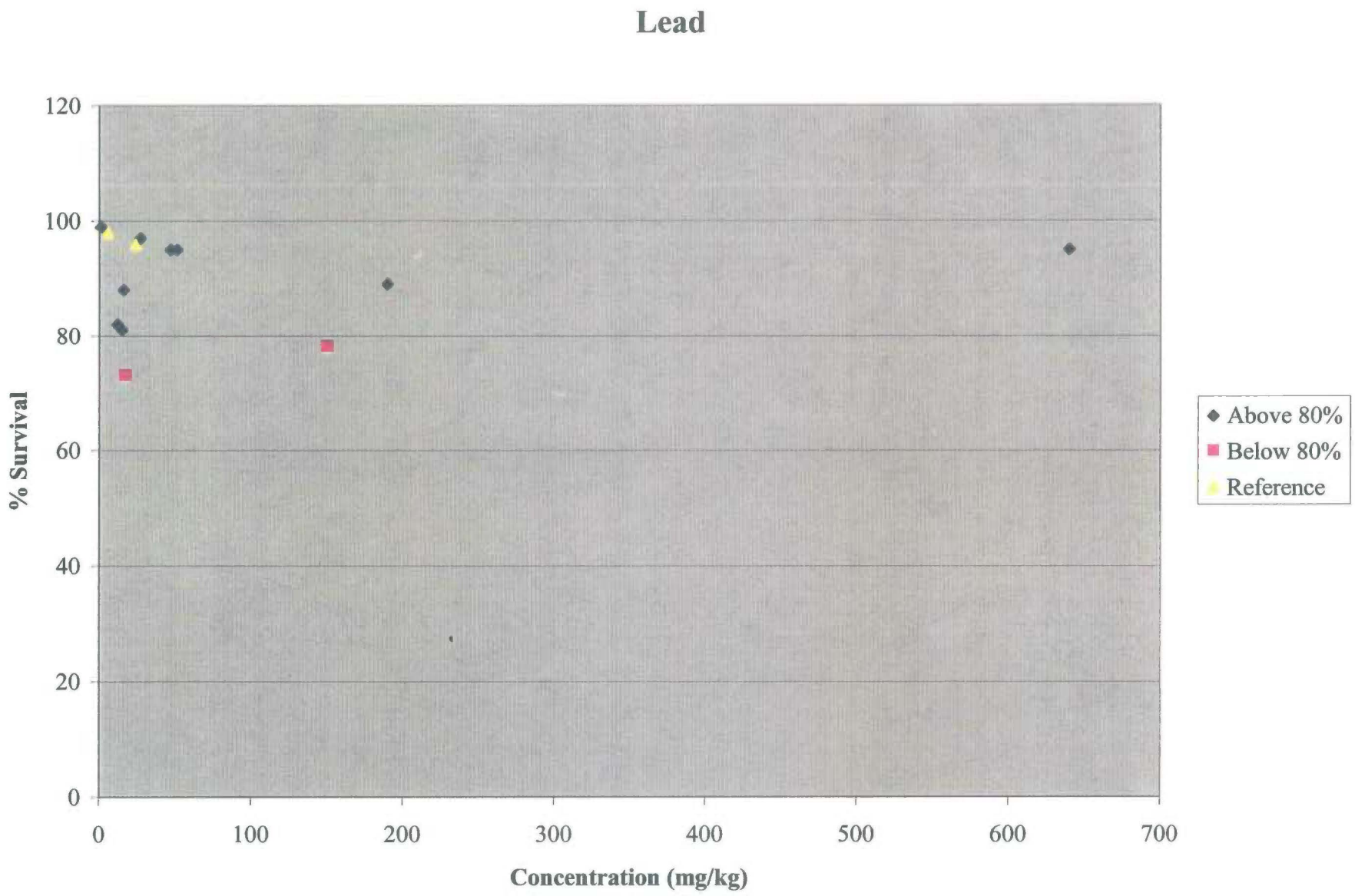

Chromium
120
100
80
60
40
20
0
% Survival
0
20
40
60
80
100
120
Concentration (mg/kg)
Above 80%
Below 80%
Reference

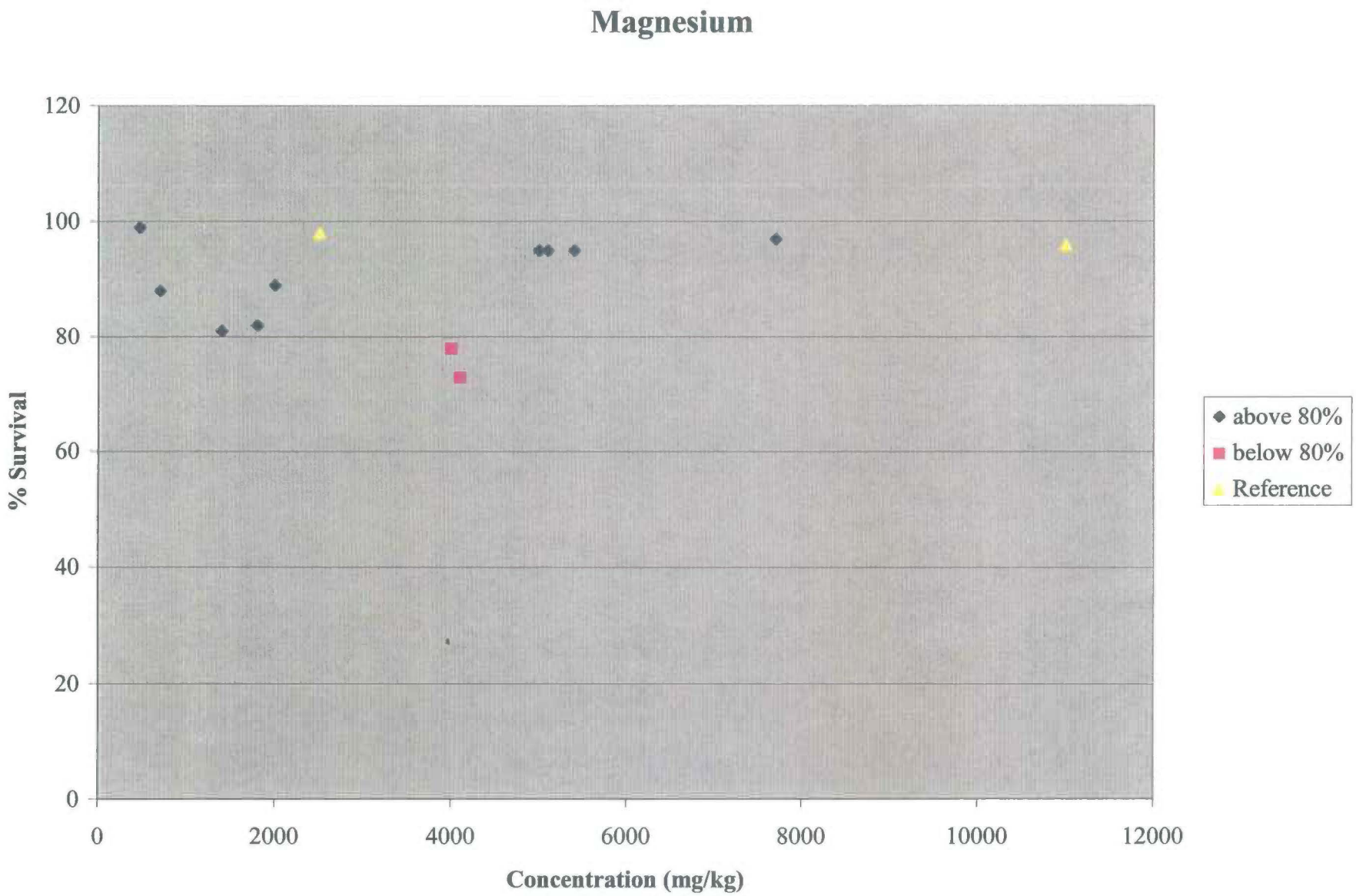

Cobalt
120
100
80
60
40
20
0
% Survival
0
1
2
3
4
5
6
7
Concentration (mg/kg)
Above 80%
Below 80%
Reference

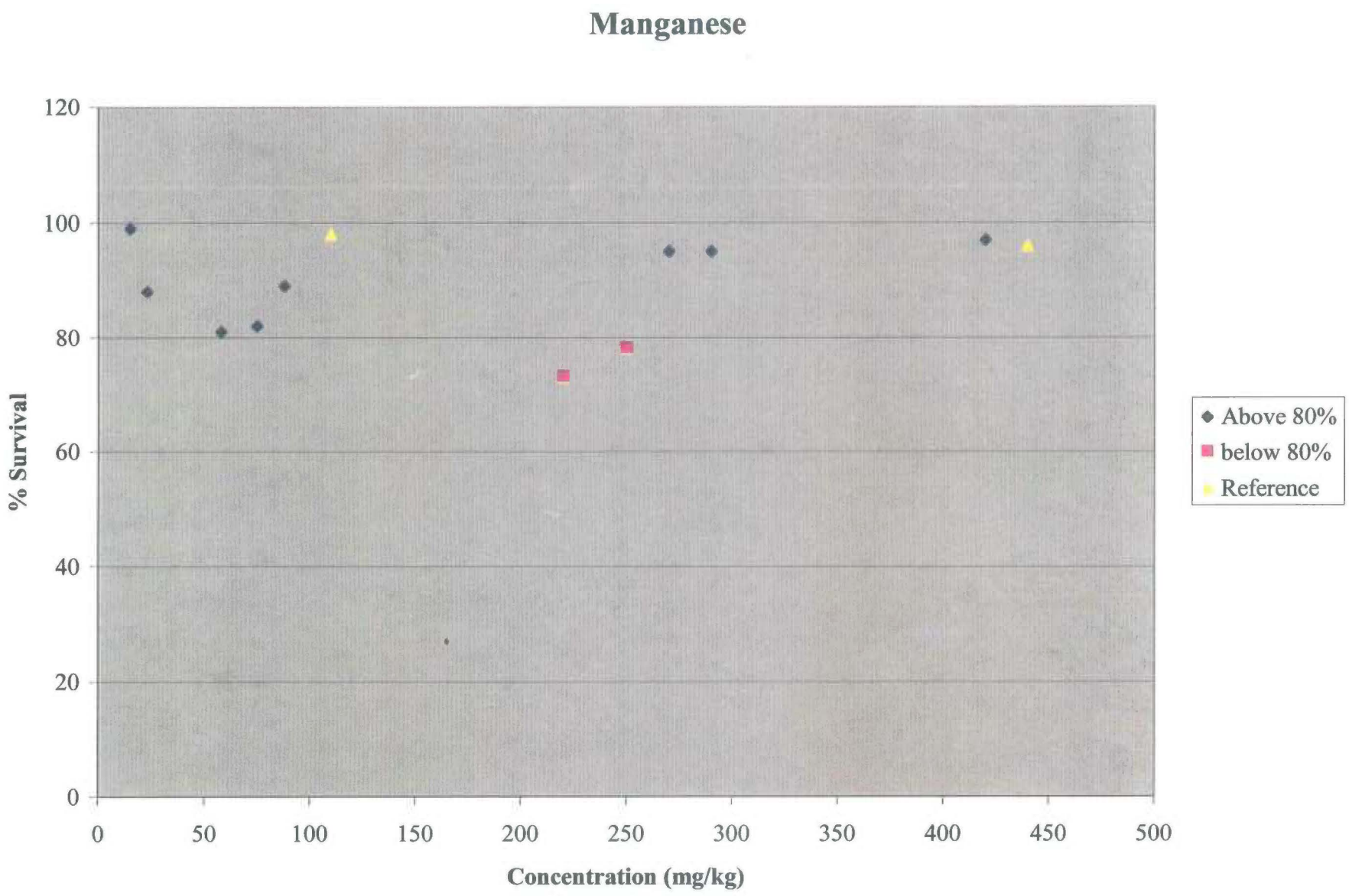

Copper
120
100
80
60
40
20
0
% Survival
0
10
20
30
40
50
60
70
Concentration (mg/kg)
Above 80%
Below 80%
Reference

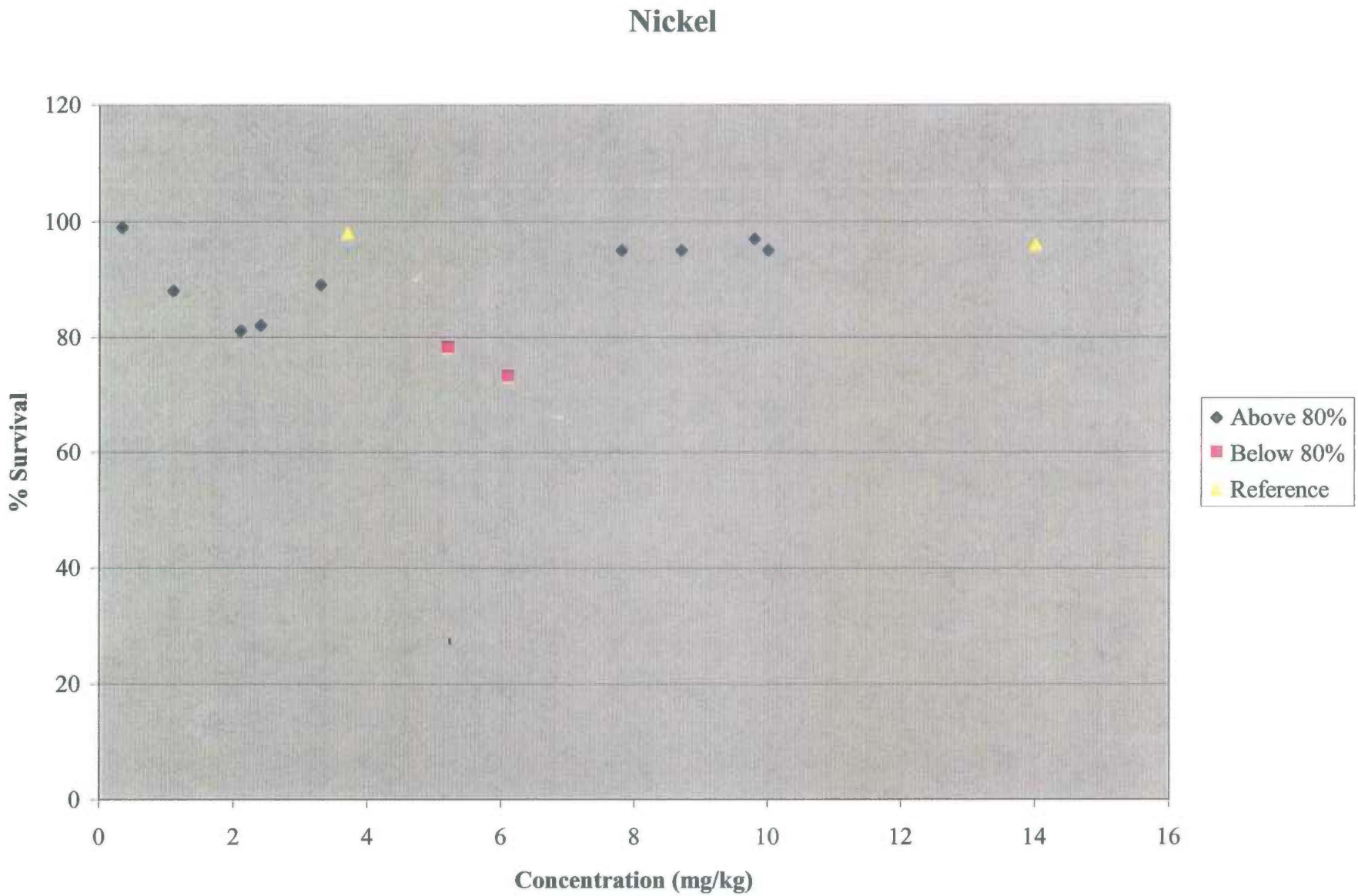

Cyanide
120
100
80
60
40
20
0
% Survival
0
0.05
0.1
0.15
0.2
0.25
0.3
Concentration (mg/kg)
above 80%
below 80%
Reference

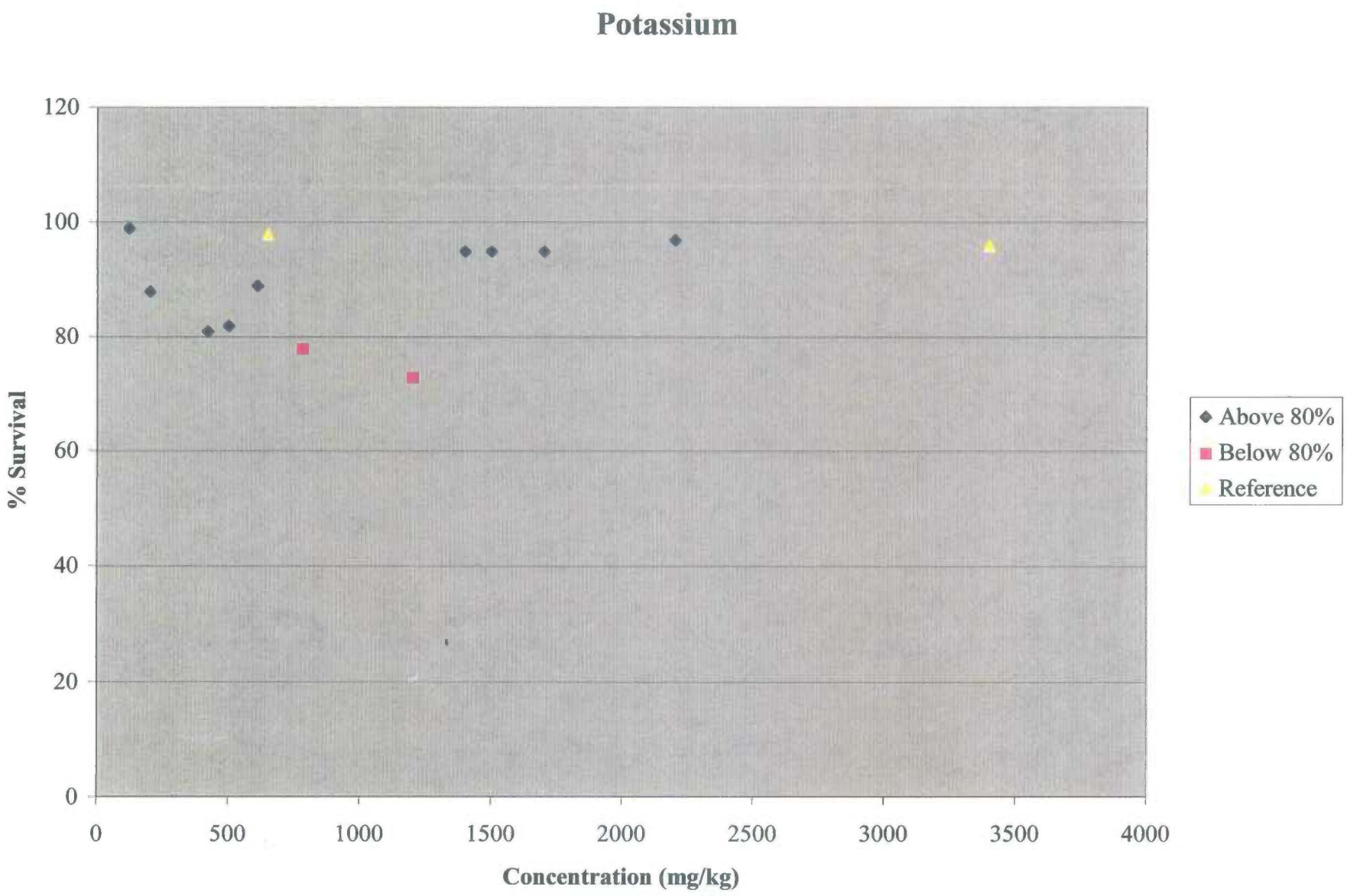

Iron
120
100
80
60
40
20
0
% Survival
0
5000
10000
15000
20000
25000
30000
35000
Concentration (mg/kg)
above 80%
below 80%
Reference

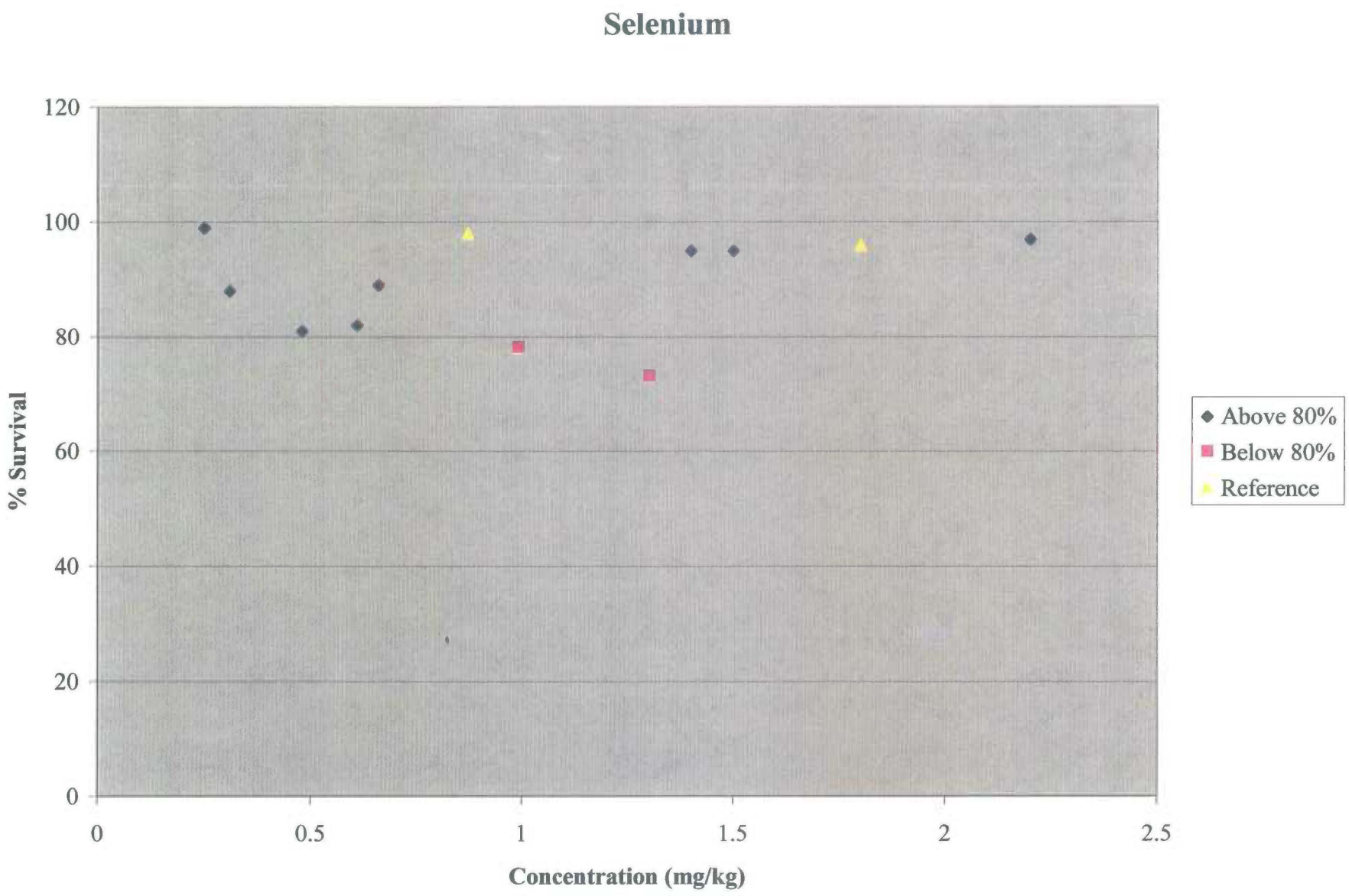

Lead
120
100
80
60
40
20
0
% Survival
0
100
200
300
400
500
600
700
Concentration (mg/kg)
Above 80%
Below 80%
Reference

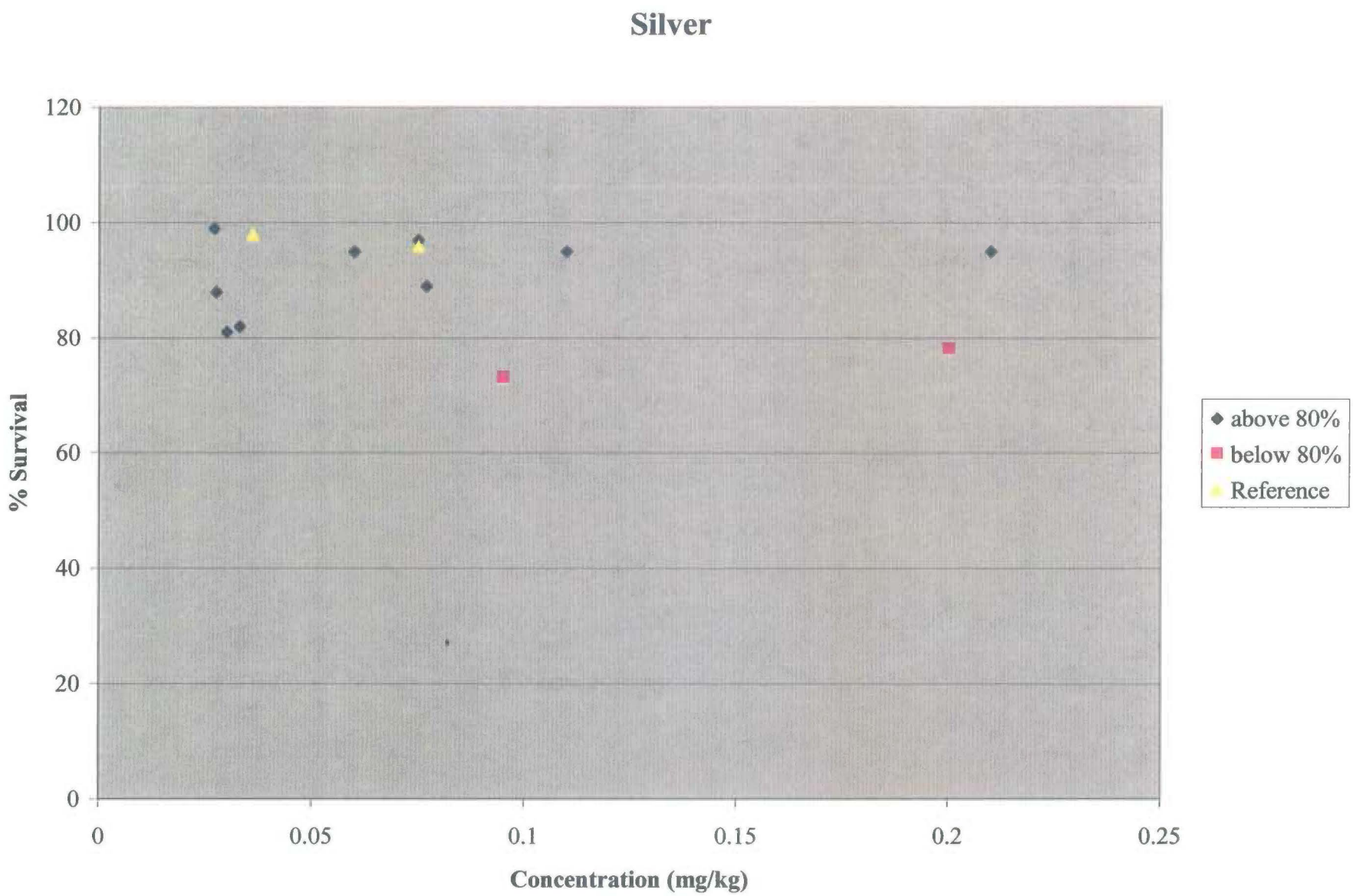

Magnesium
120
100
80
60
40
20
0
% Survival
0
2000
4000
6000
8000
10000
12000
Concentration (mg/kg)
above 80%
below 80%
Reference

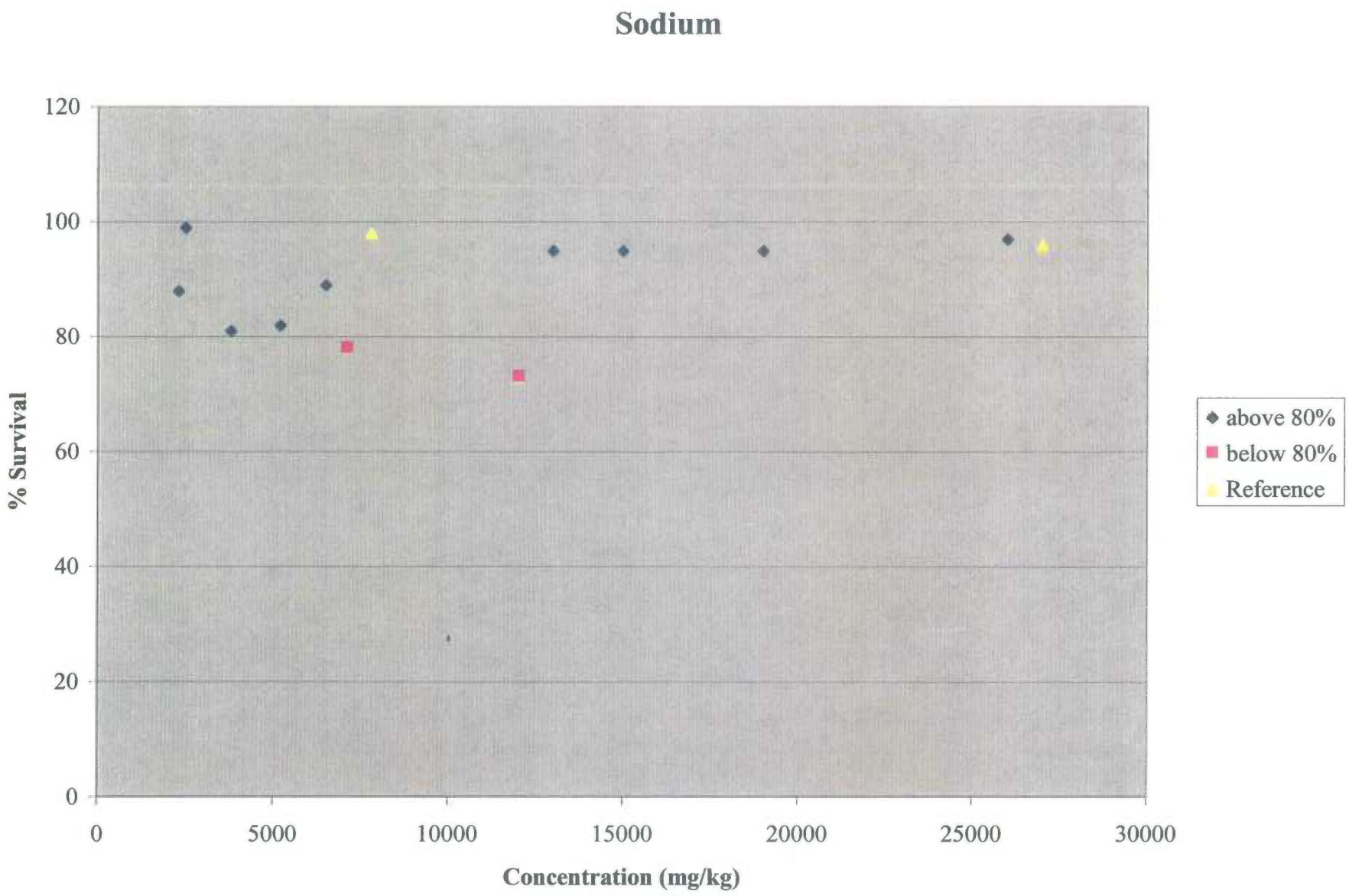

Manganese
120
100
80
60
40
20
0
% Survival
0
50
100
150
200
250
300
350
400
450
500
Concentration (mg/kg)
Above 80%
below 80%
Reference

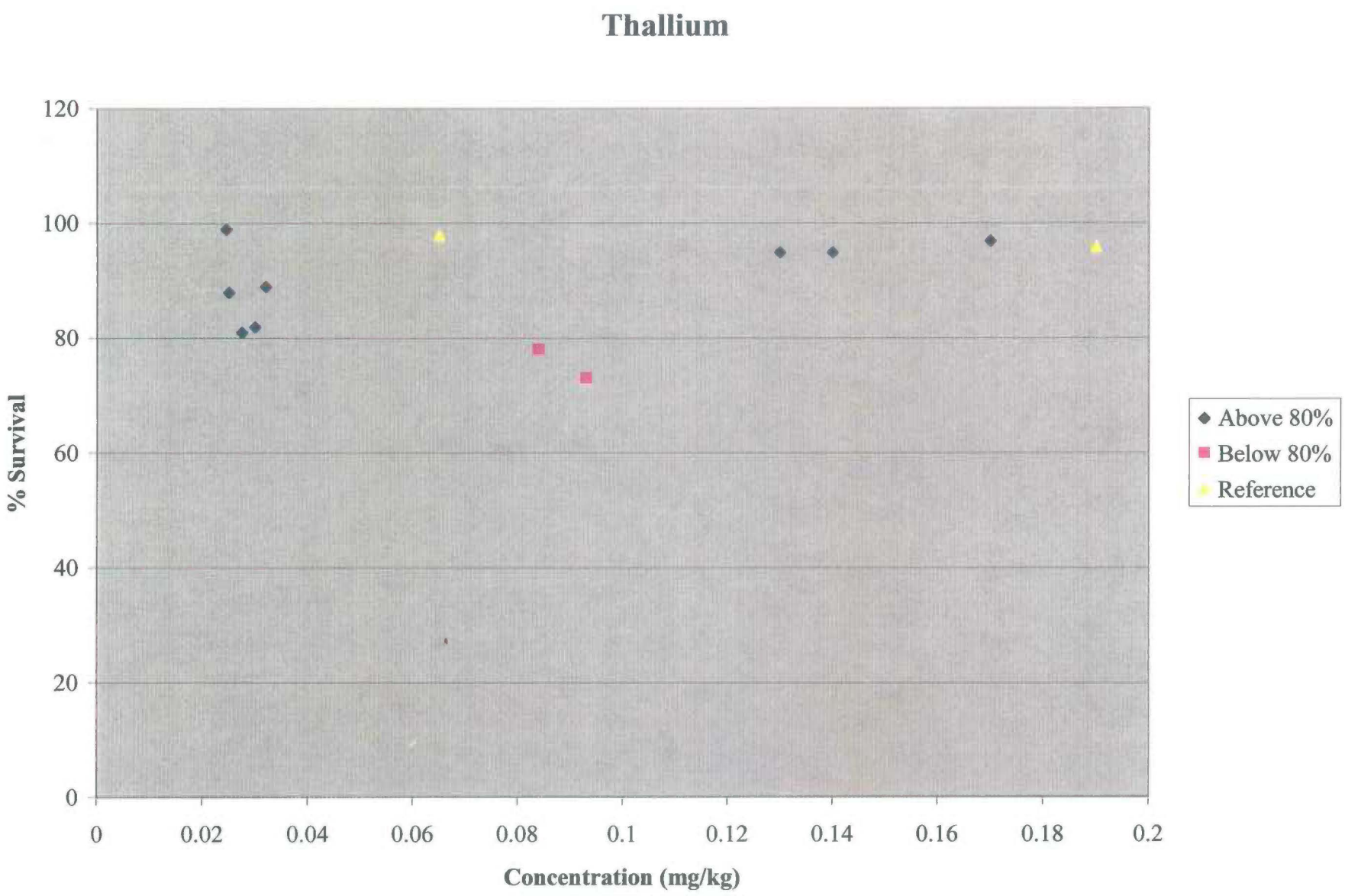

Nickel
120
100
80
60
40
20
0
% Survival
0
2
4
6
8
10
12
14
16
Concentration (mg/kg)
Above 80%
Below 80%
Reference

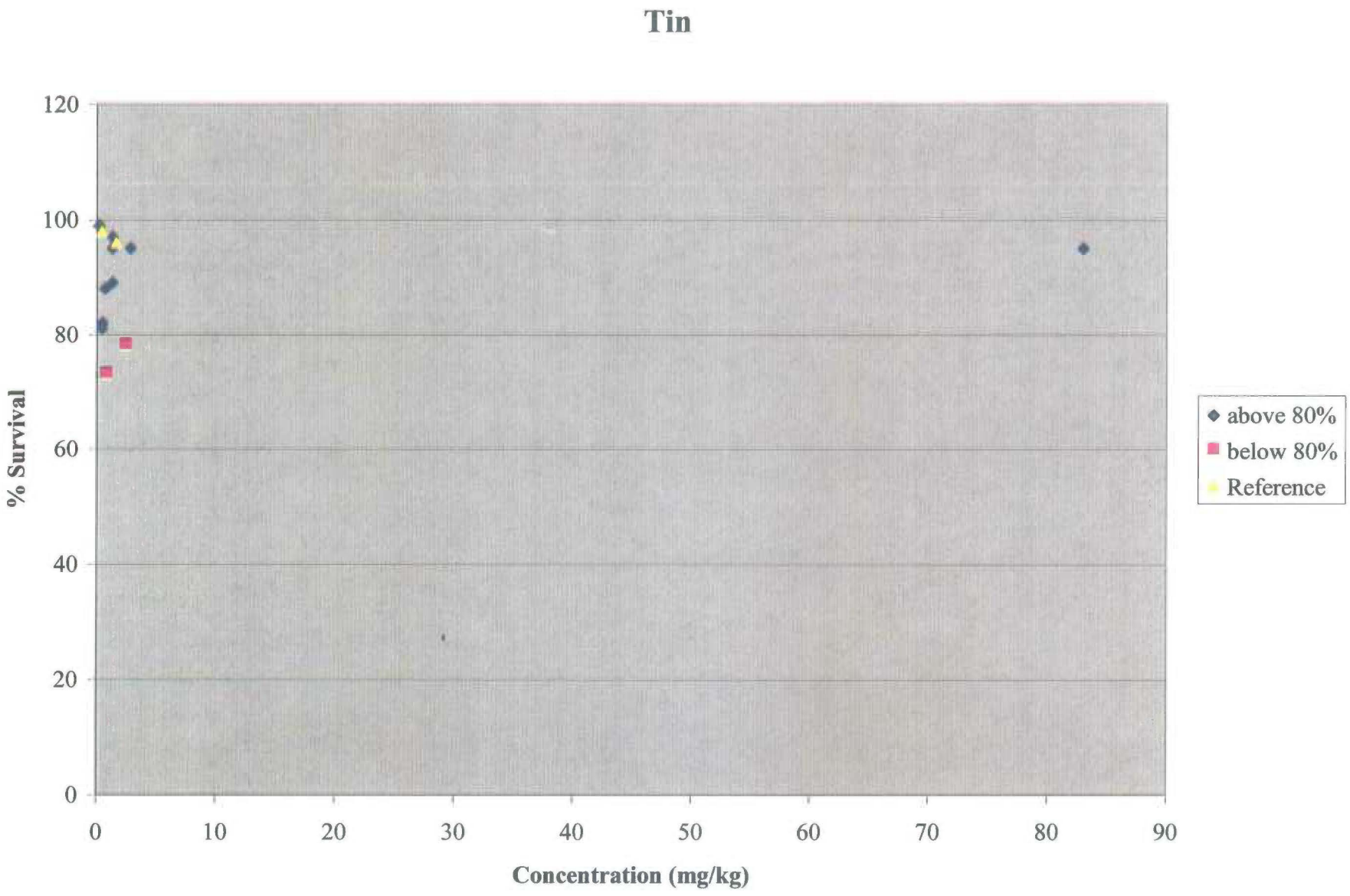

Potassium
120
100
80
60
40
20
0
% Survival
0
500
1000
1500
2000
2500
3000
3500
4000
Concentration (mg/kg)
Above 80%
Below 80%
Reference

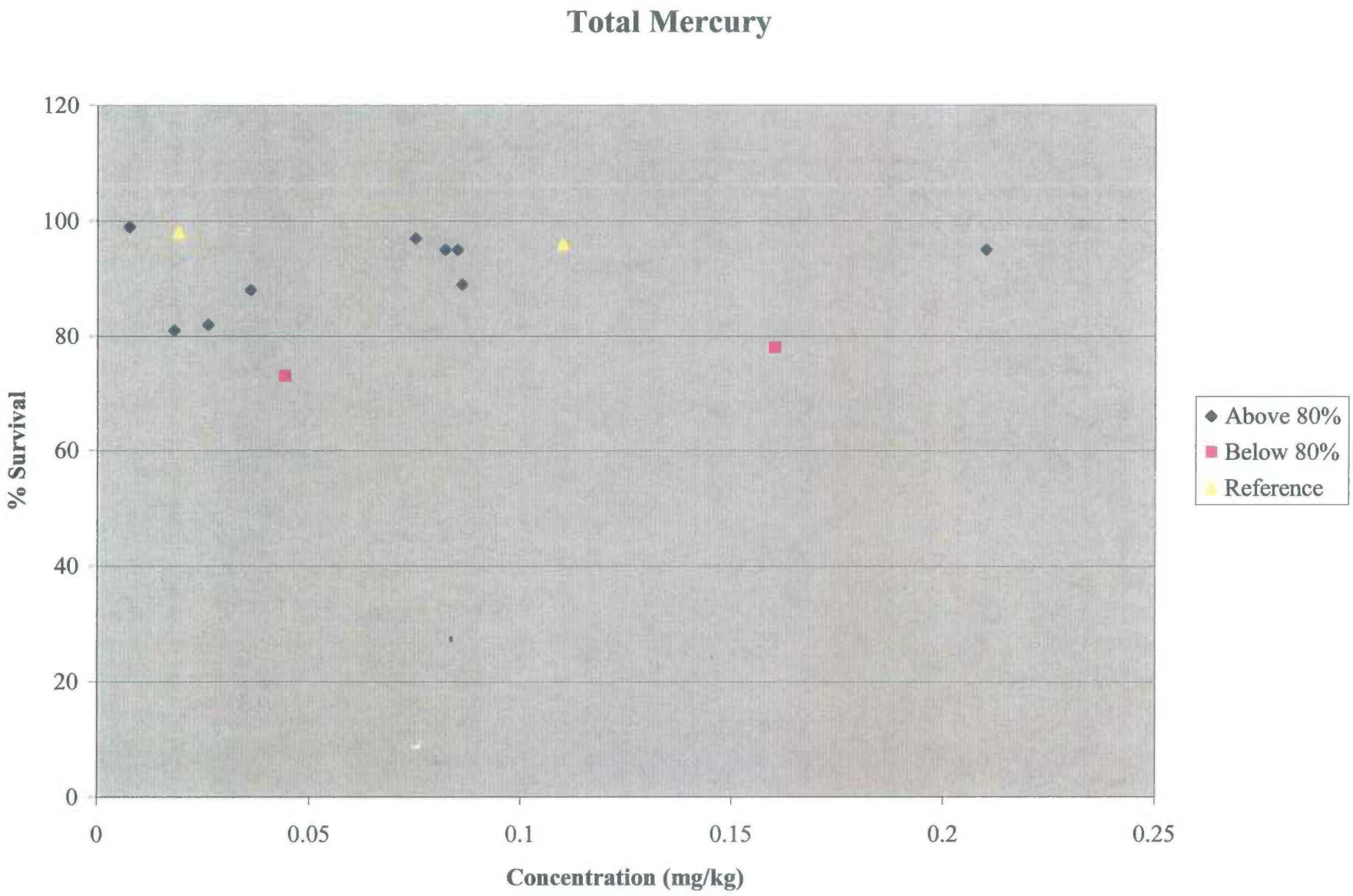

Selenium
120
100
80
60
40
20
0
% Survival
0
0.5
1
1.5
2
2.5
Concentration (mg/kg)
Above 80%
Below 80%
Reference

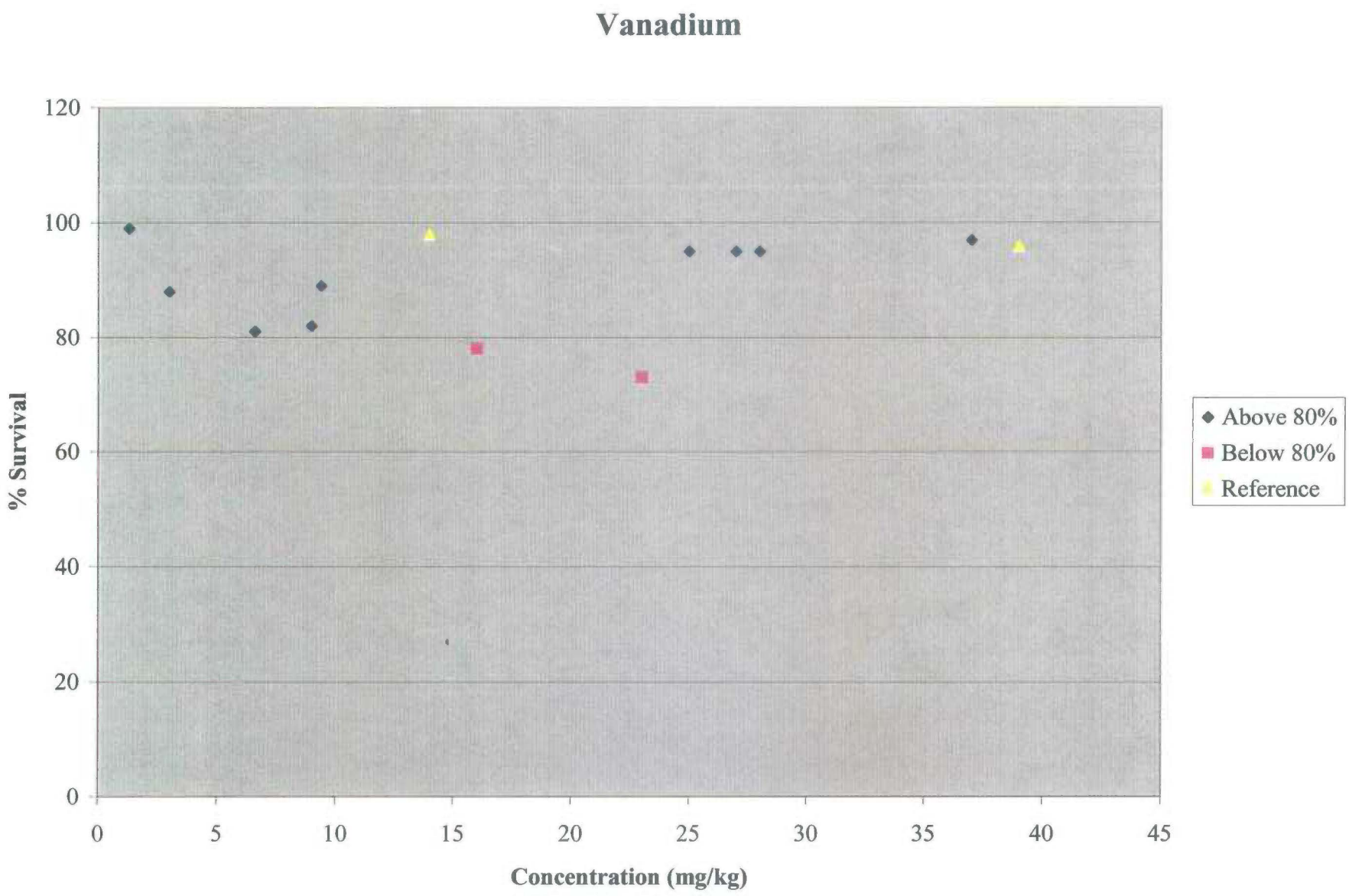

Silver
120
100
80
60
40
20
0
% Survival
0
0.05
0.1
0.15
0.2
0.25
Concentration (mg/kg)
above 80%
below 80%
Reference

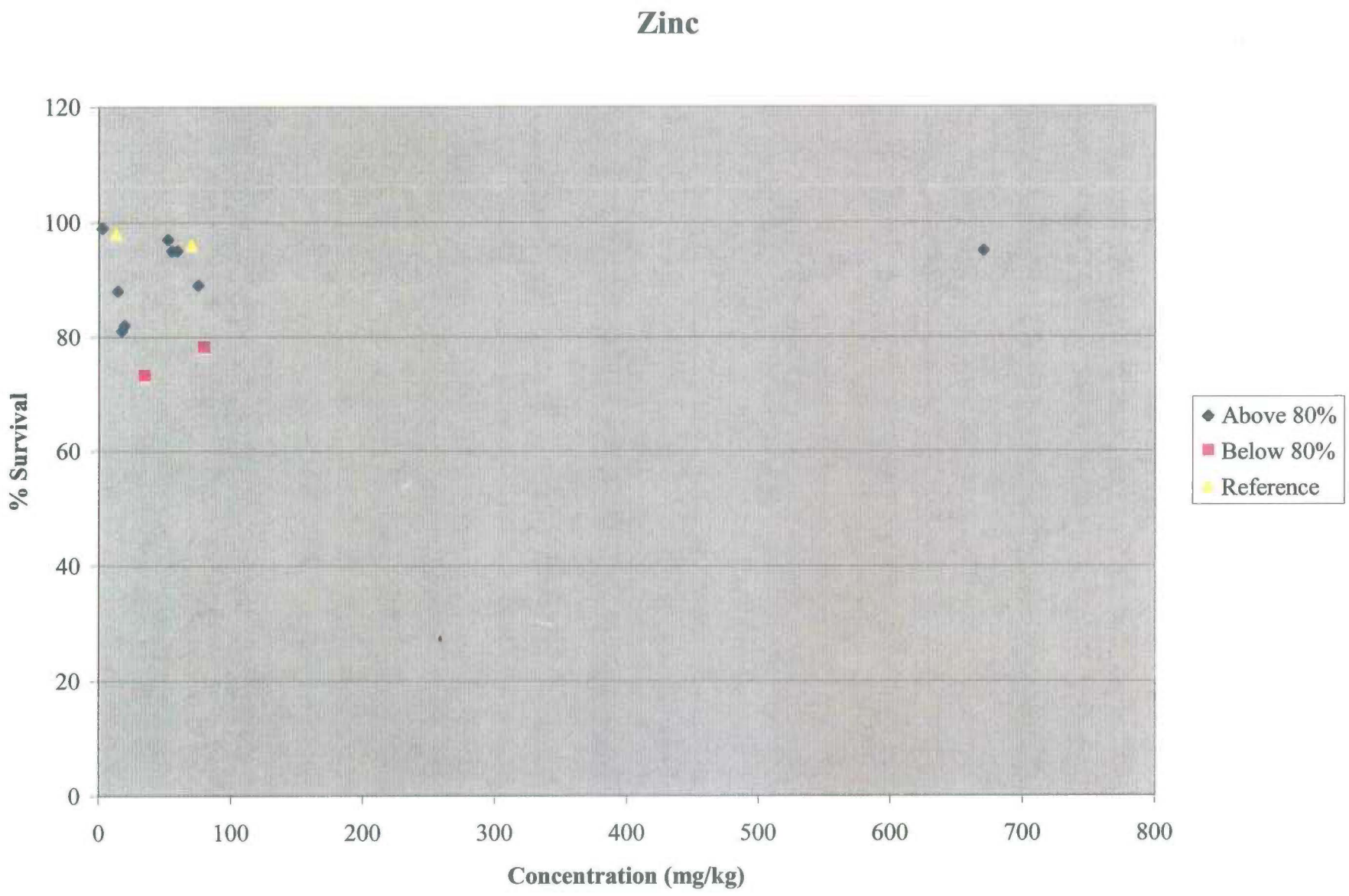

Sodium
120
100
80
60
40
20
0
% Survival
0
5000
10000
15000
20000
25000
30000
Concentration (mg/kg)
above 80%
below 80%
Reference


Thallium
120
100
80
60
40
20
0
% Survival
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Concentration (mg/kg)
Above 80%
Below 80%
Reference

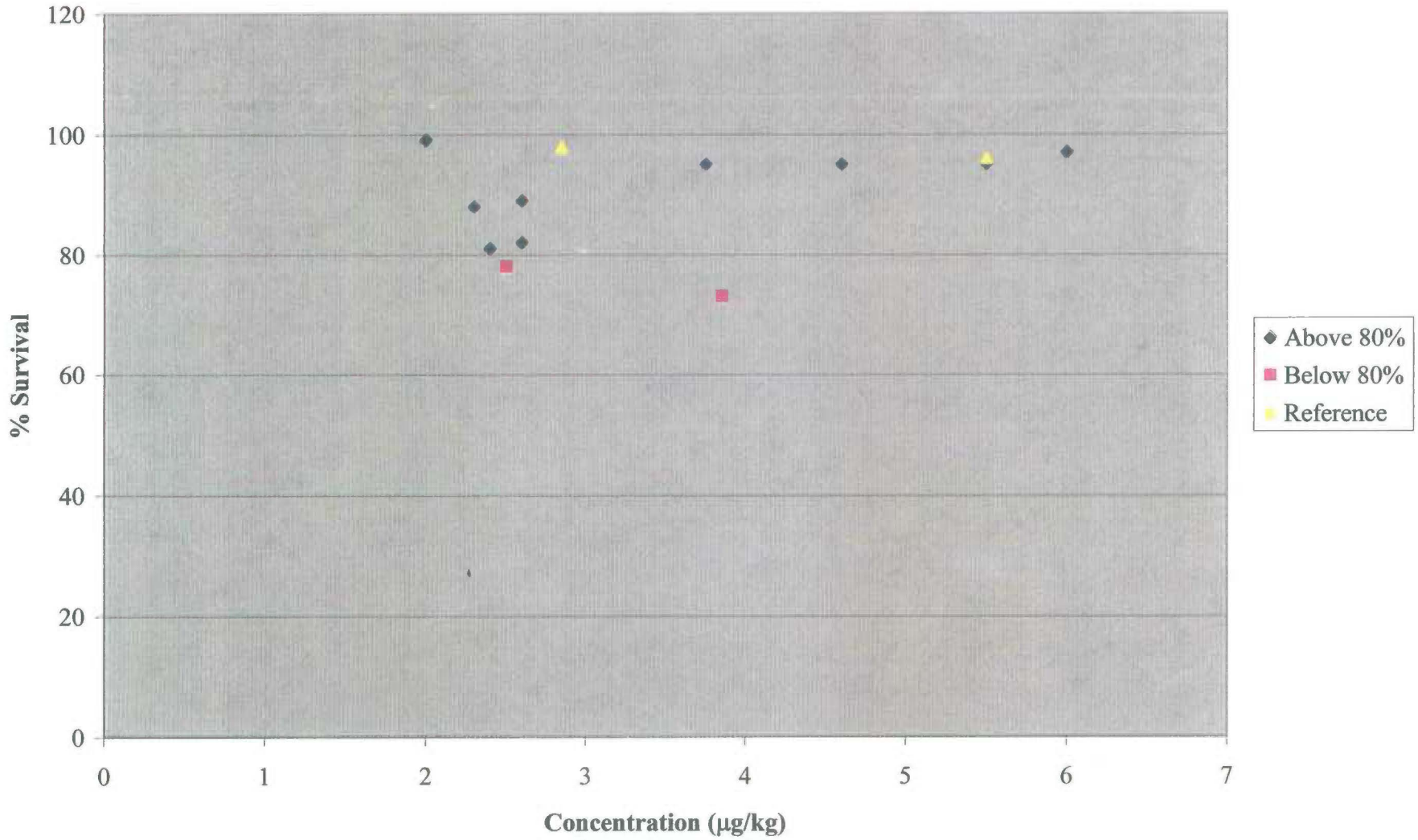

Tin
120
100
80
60
40
20
0
% Survival
0
10
20
30
40
50
60
70
80
90
Concentration (mg/kg)
above 80%
below 80%
Reference


Total Mercury
120
100
80
60
40
20
0
% Survival
0
0.05
0.1
0.15
0.2
0.25
Concentration (mg/kg)
Above 80%
Below 80%
Reference

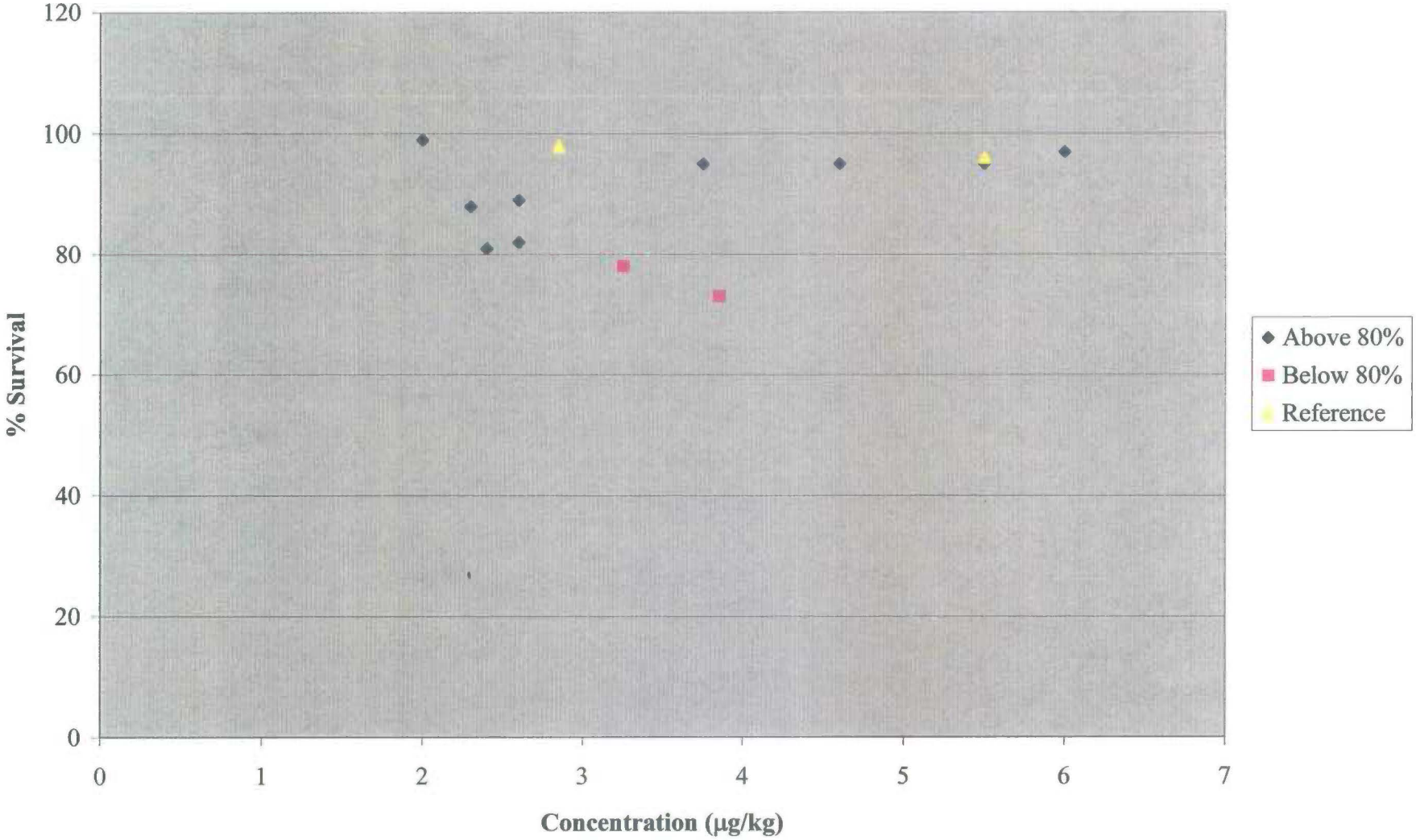

Vanadium
120
100
80
60
40
20
0
% Survival
0
5
10
15
20
25
30
35
40
45
Concentration (mg/kg)
Above 80%
Below 80%
Reference


Zinc
120
100
80
60
40
20
0
% Survival
0
100
200
300
400
500
600
700
800
Concentration (mg/kg)
Above 80%
Below 80%
Reference

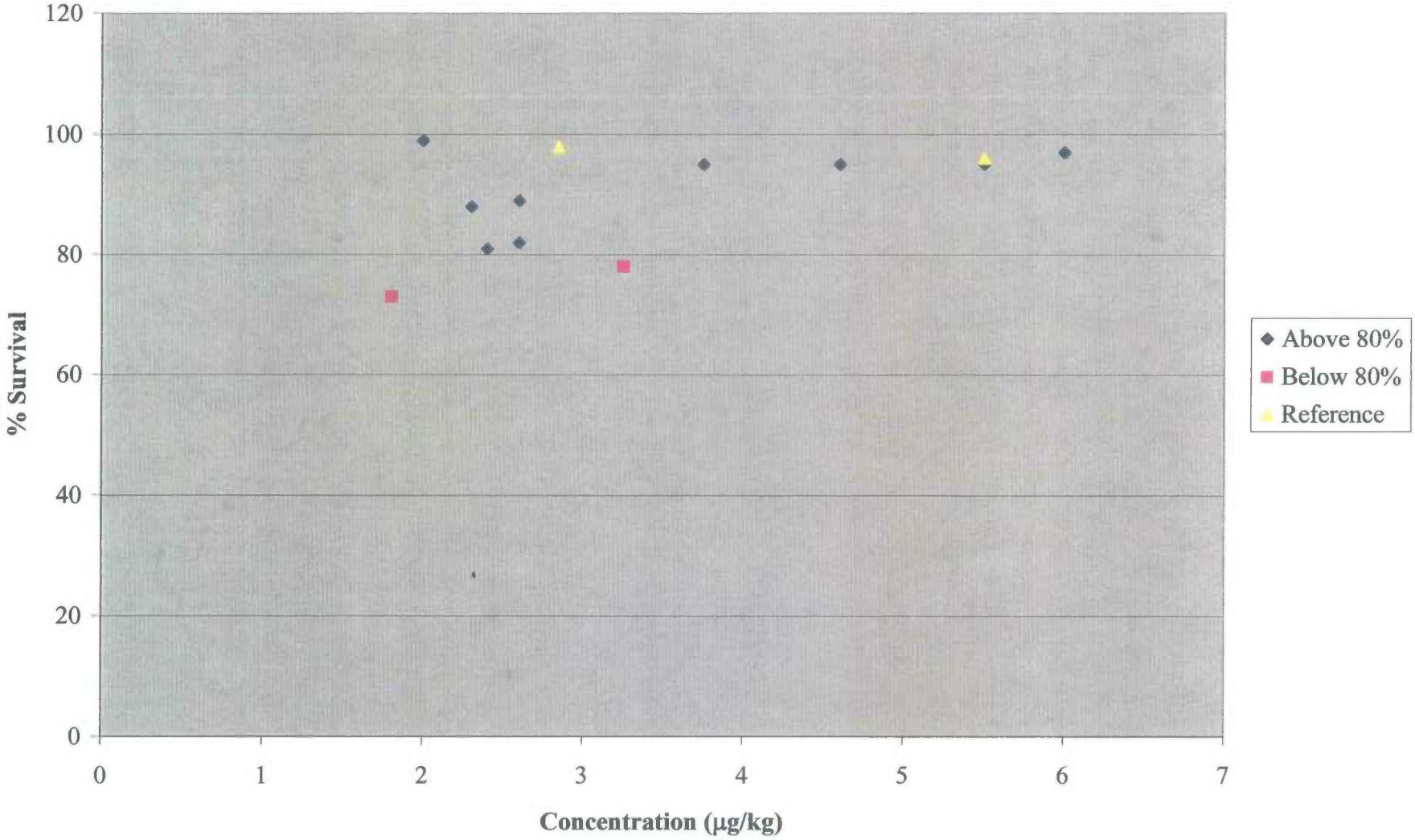
4,4-DDD


120
100
80
60
40
20
0
% Survival
0
1
2
3
4
5
6
7
Concentration (µg/kg)
Above 80%
Below 80%
Reference

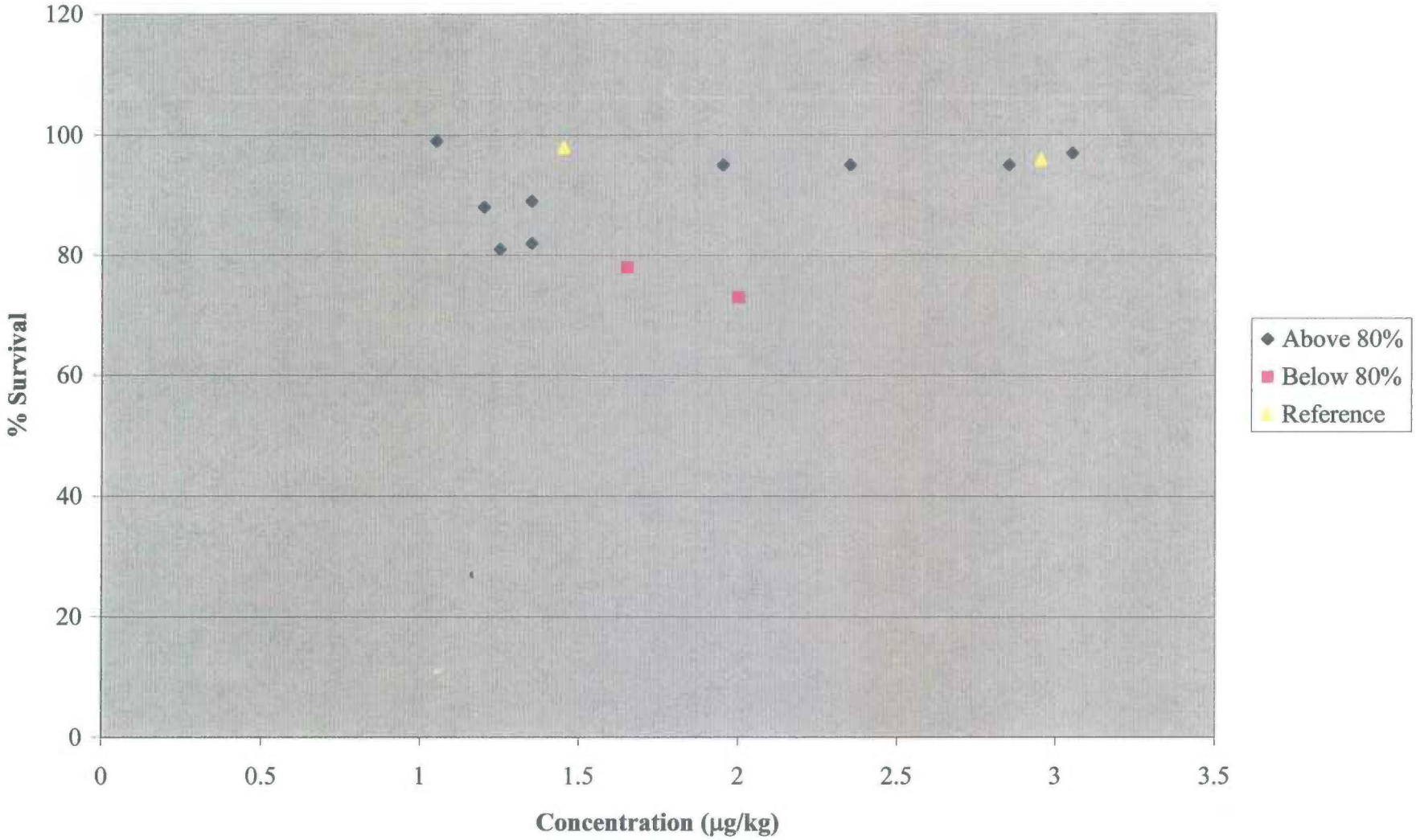
4,4-DDE

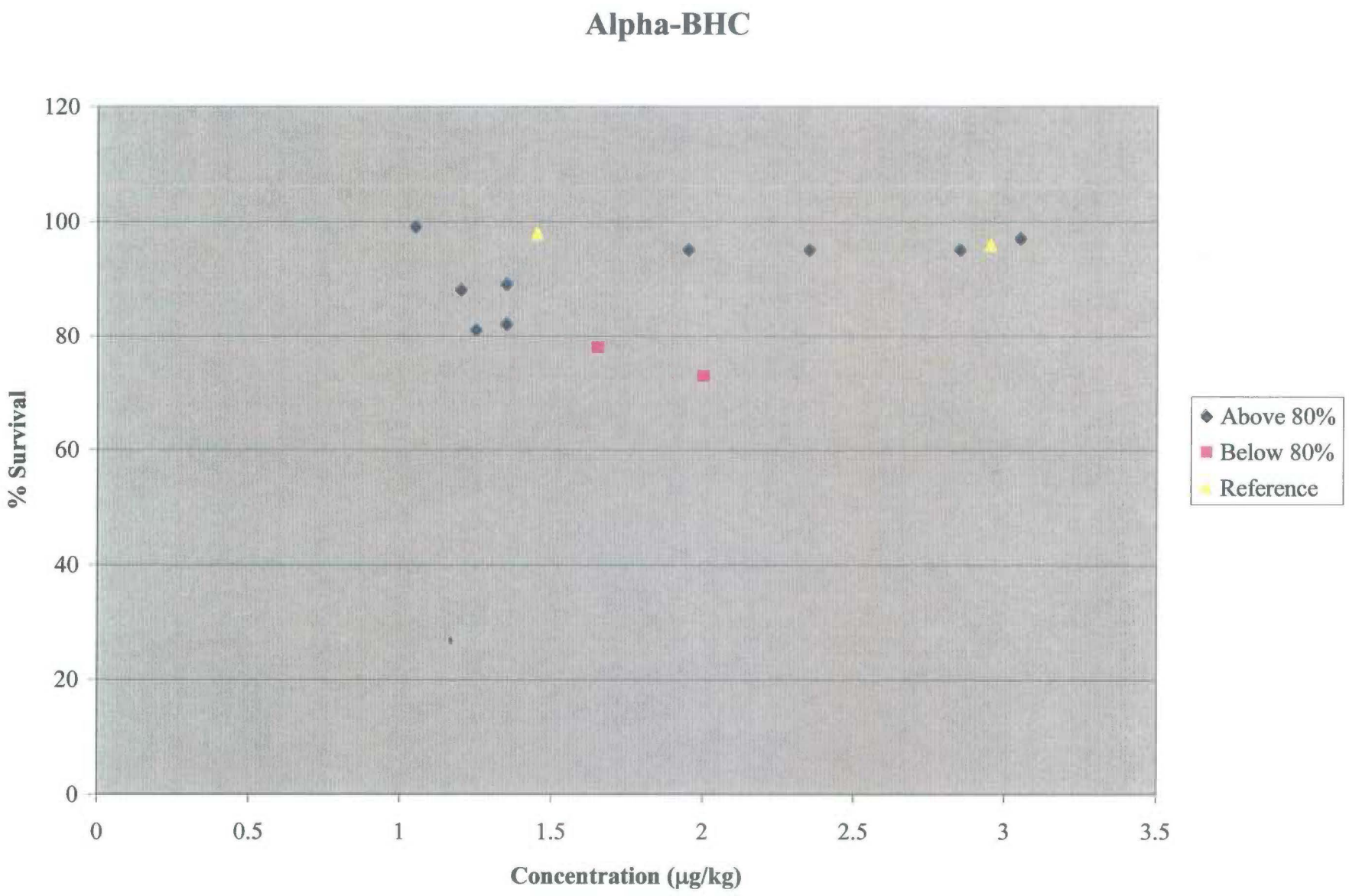

120
100
80
60
40
20
0
% Survival
0
1
2
3
4
5
6
7
Concentration (µg/kg)
Above 80%
Below 80%
Reference

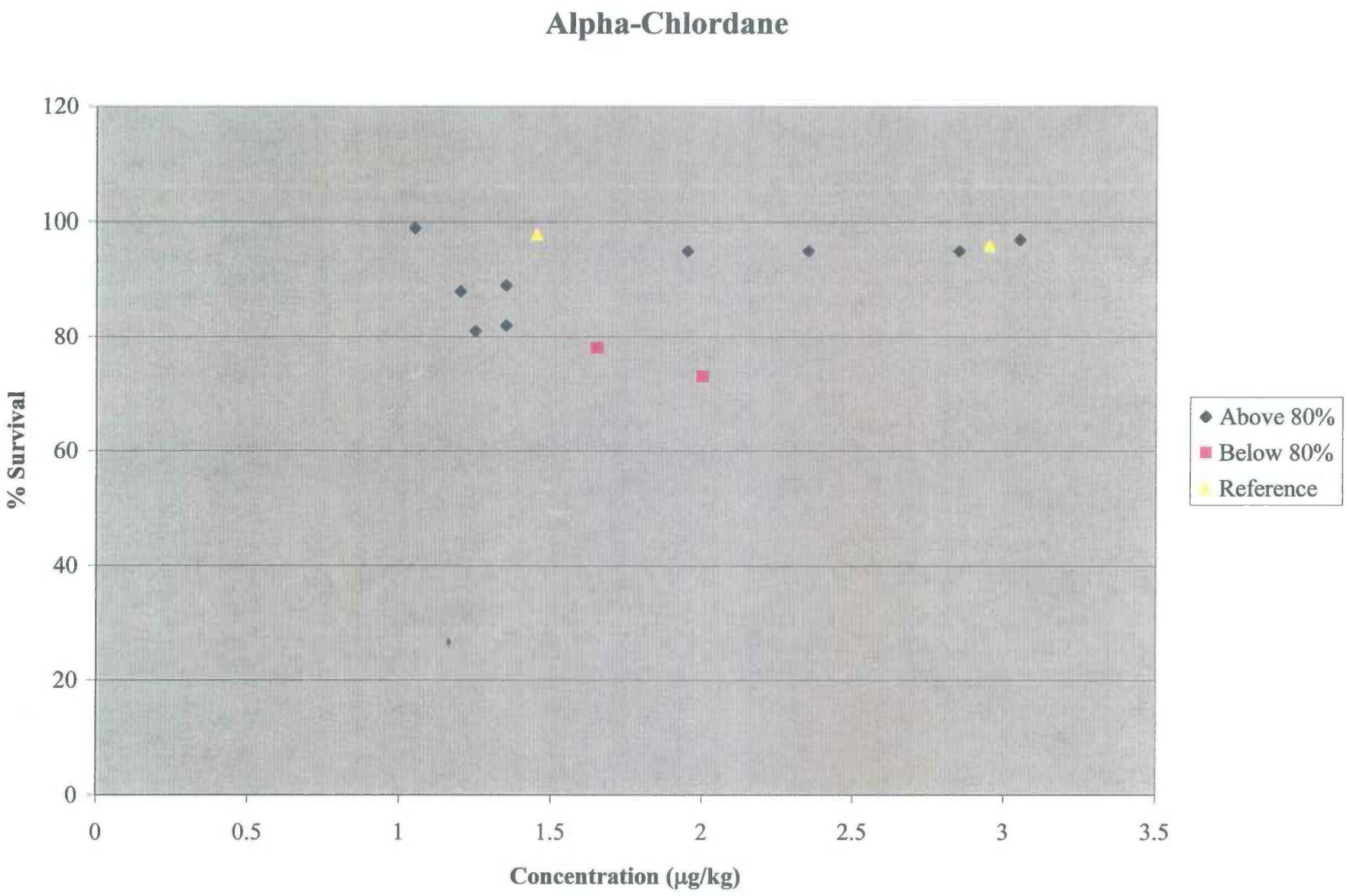
4,4-DDT

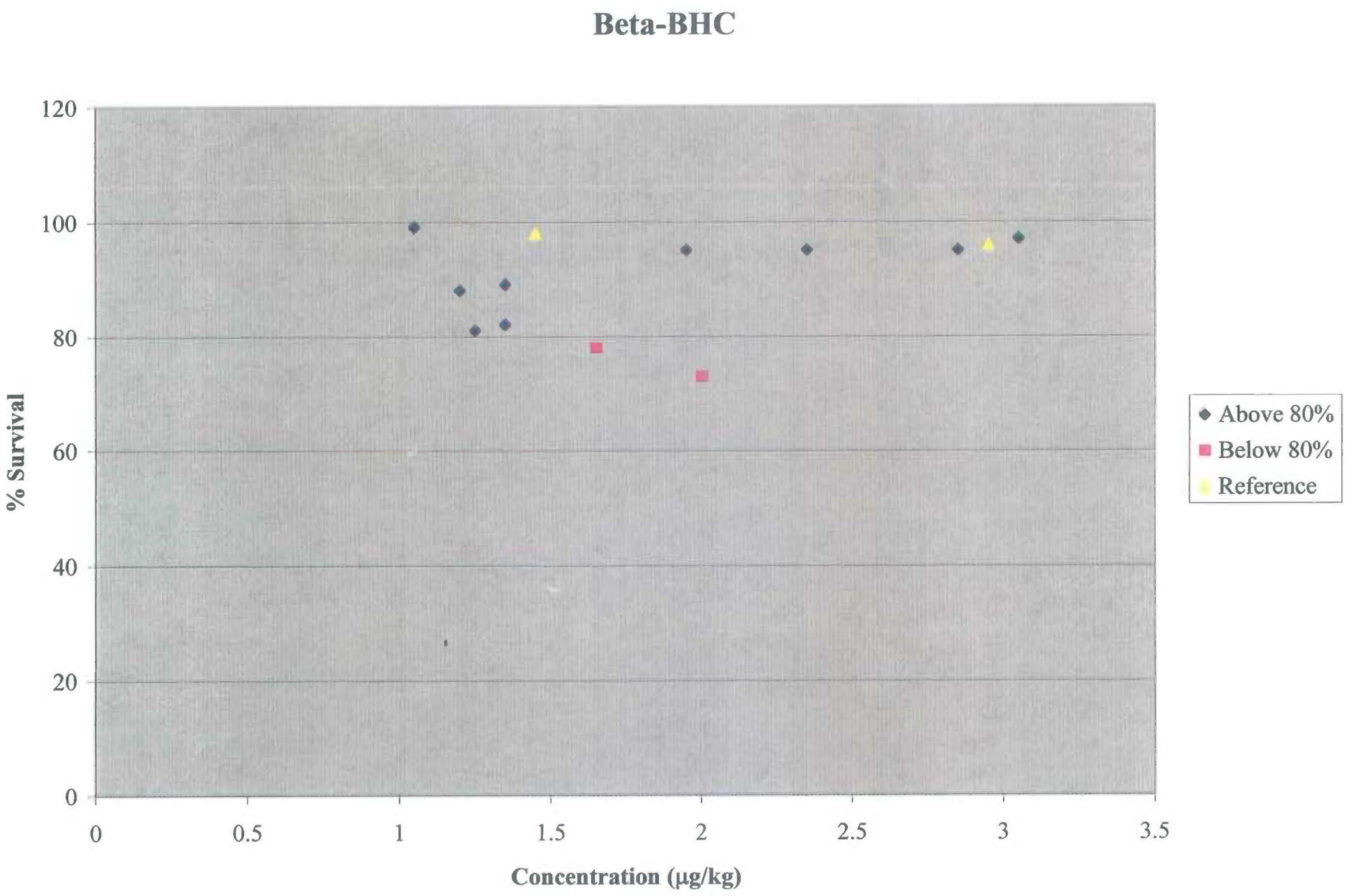

120
100
80
60
40
20
0
% Survival
0
1
2
3
4
5
6
7
Concentration (µg/kg)
Above 80%
Below 80%
Reference

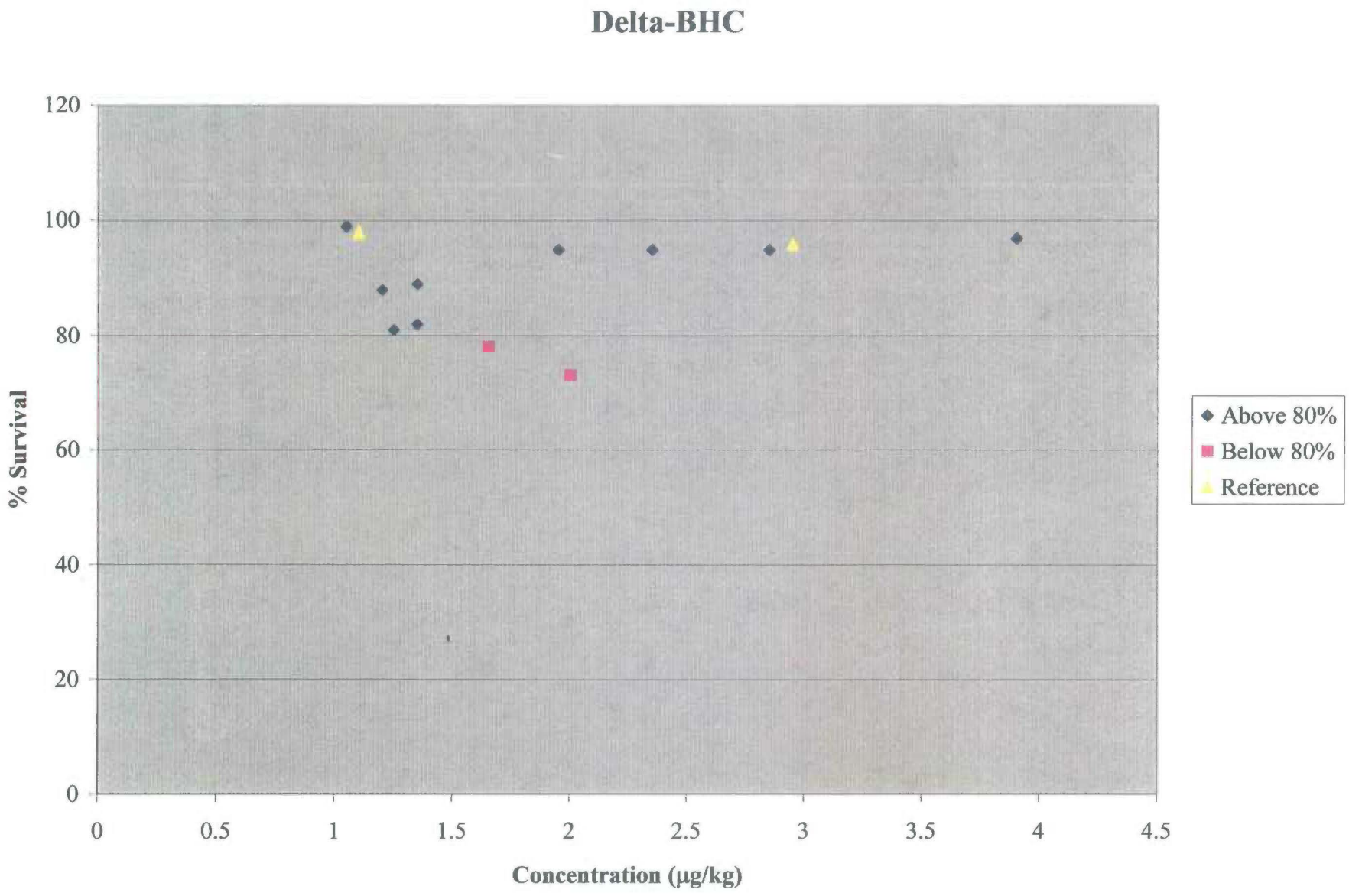
Aldrin


120
100
80
60
40
20
0
% Survival
0
0.5
1
1.5
2
2.5
3
3.5
Concentration (µg/kg)
Above 80%
Below 80%
Reference

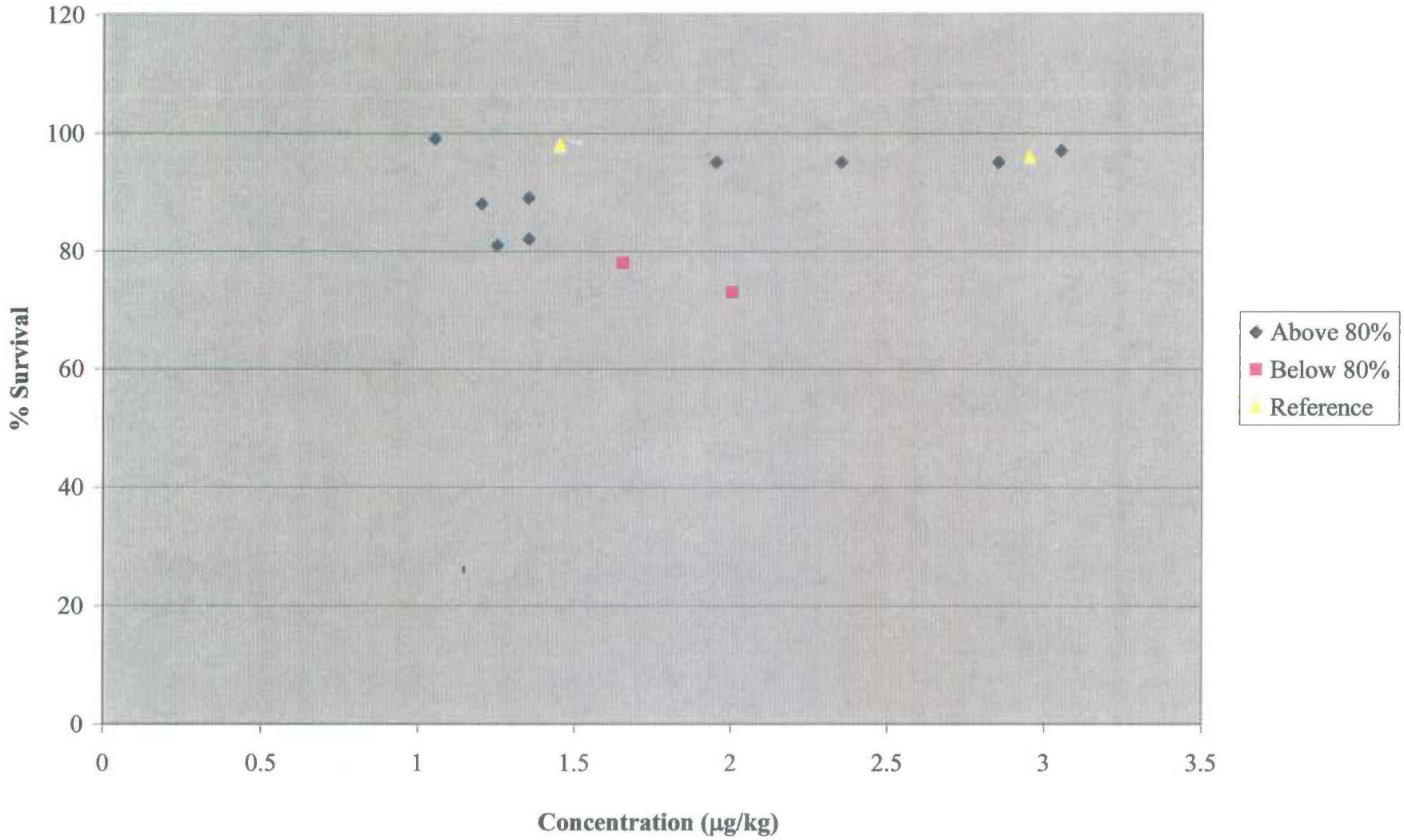

Alpha-BHC
120
100
80
60
40
20
0
% Survival
0
0.5
1
1.5
2
2.5
3
3.5
Concentration (µg/kg)
Above 80%
Below 80%
Reference


Alpha-Chlordane
120
100
80
60
40
20
0
% Survival
0
0.5
1
1.5
2
2.5
3
3.5
Concentration (µg/kg)
Above 80%
Below 80%
Reference

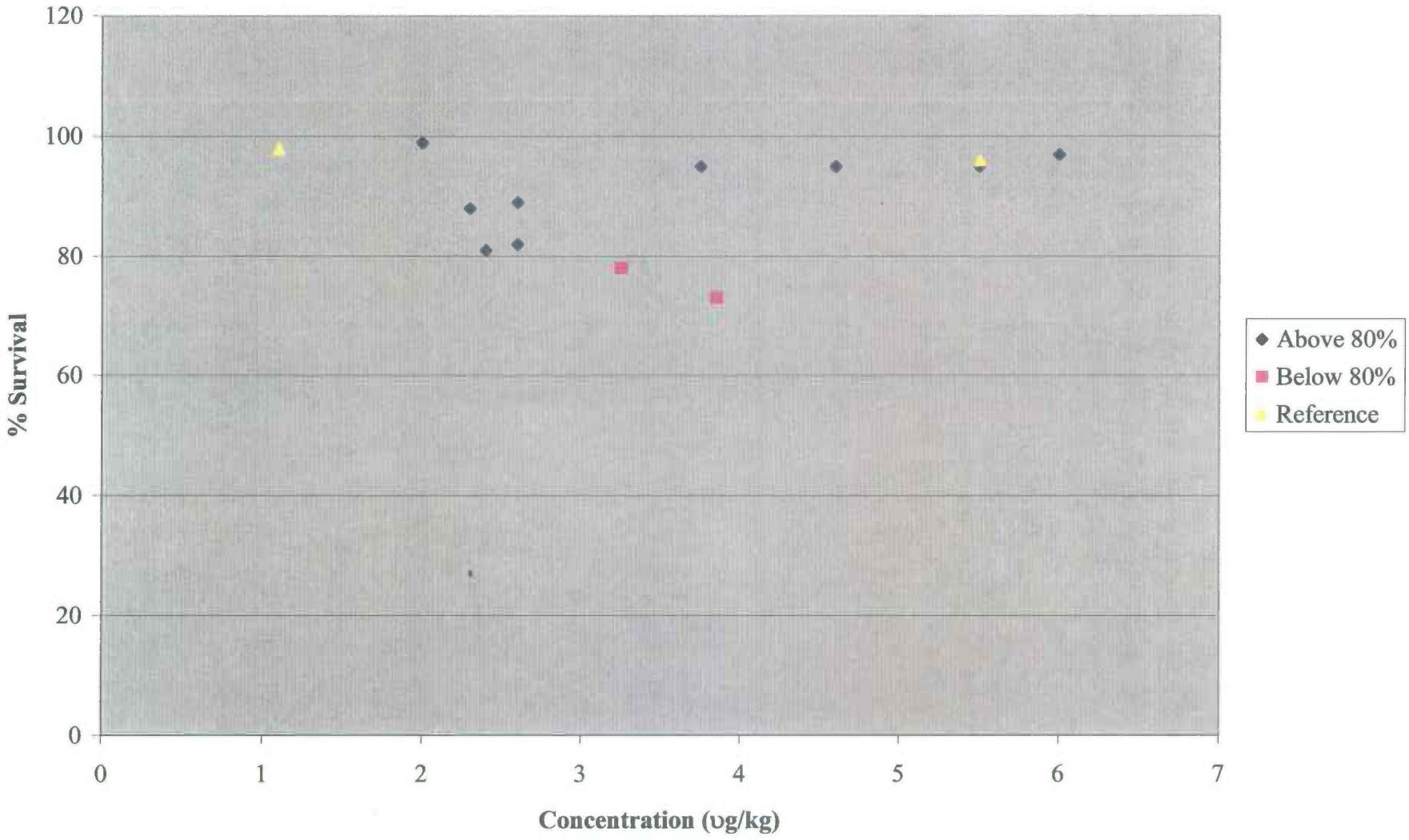

Beta-BHC
120
100
80
60
40
20
0
% Survival
0
0.5
1
1.5
2
2.5
3
3.5
Concentration (µg/kg)
Above 80%
Below 80%
Reference

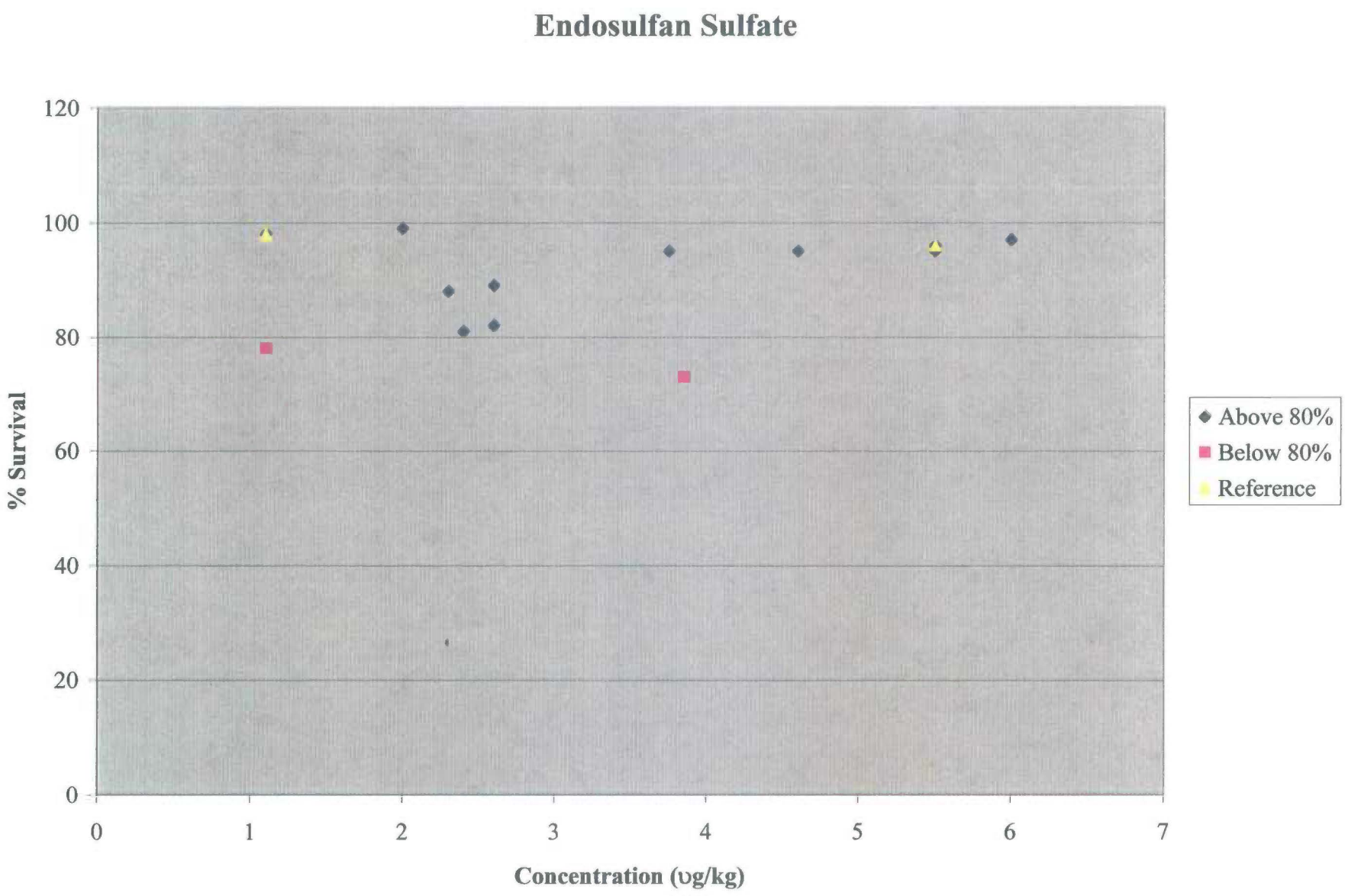

Delta-BHC
% Survival
120
100
80
60
40
20
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
Concentration (µg/kg)
Above 80%
Below 80%
Reference

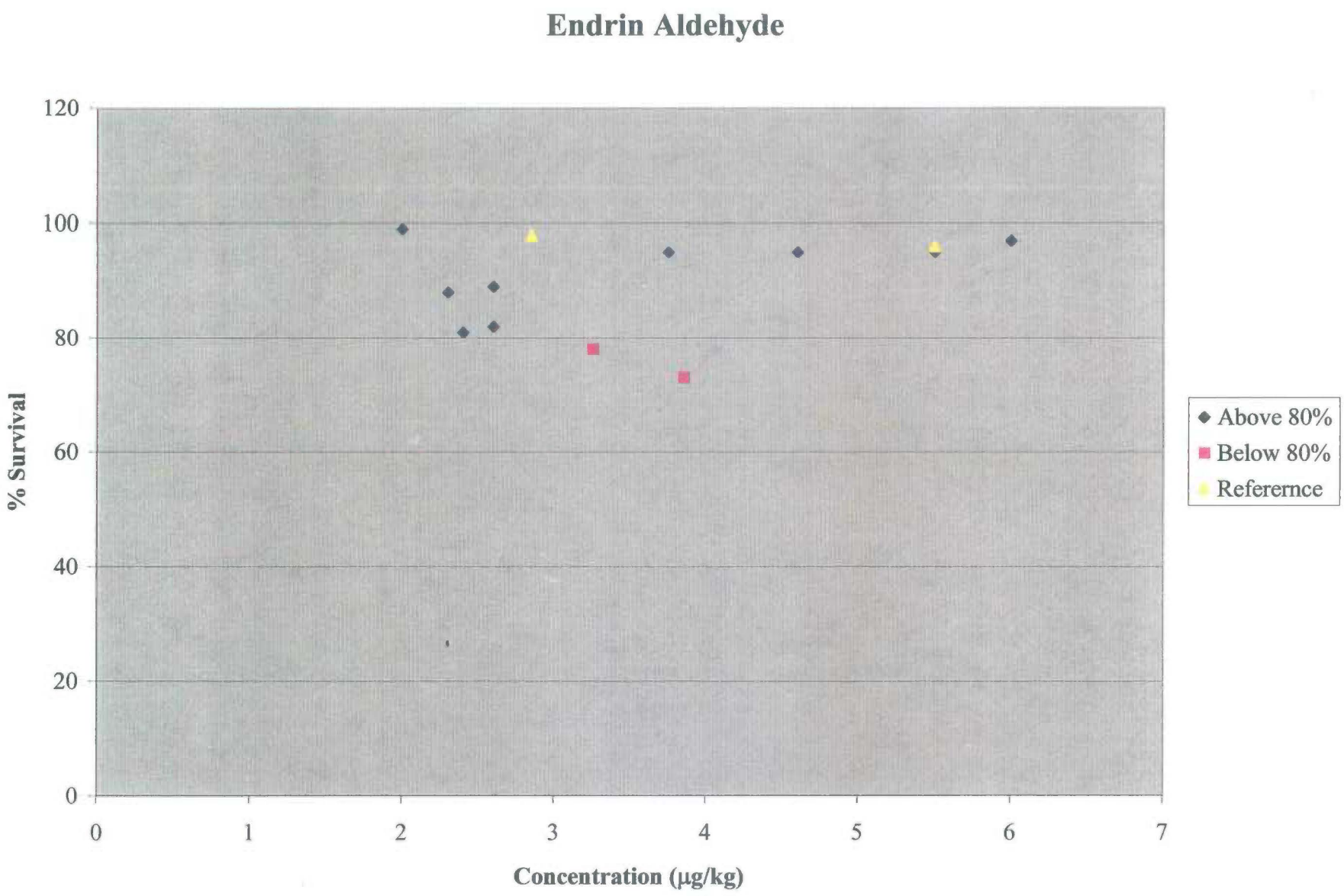
Endosulfan I

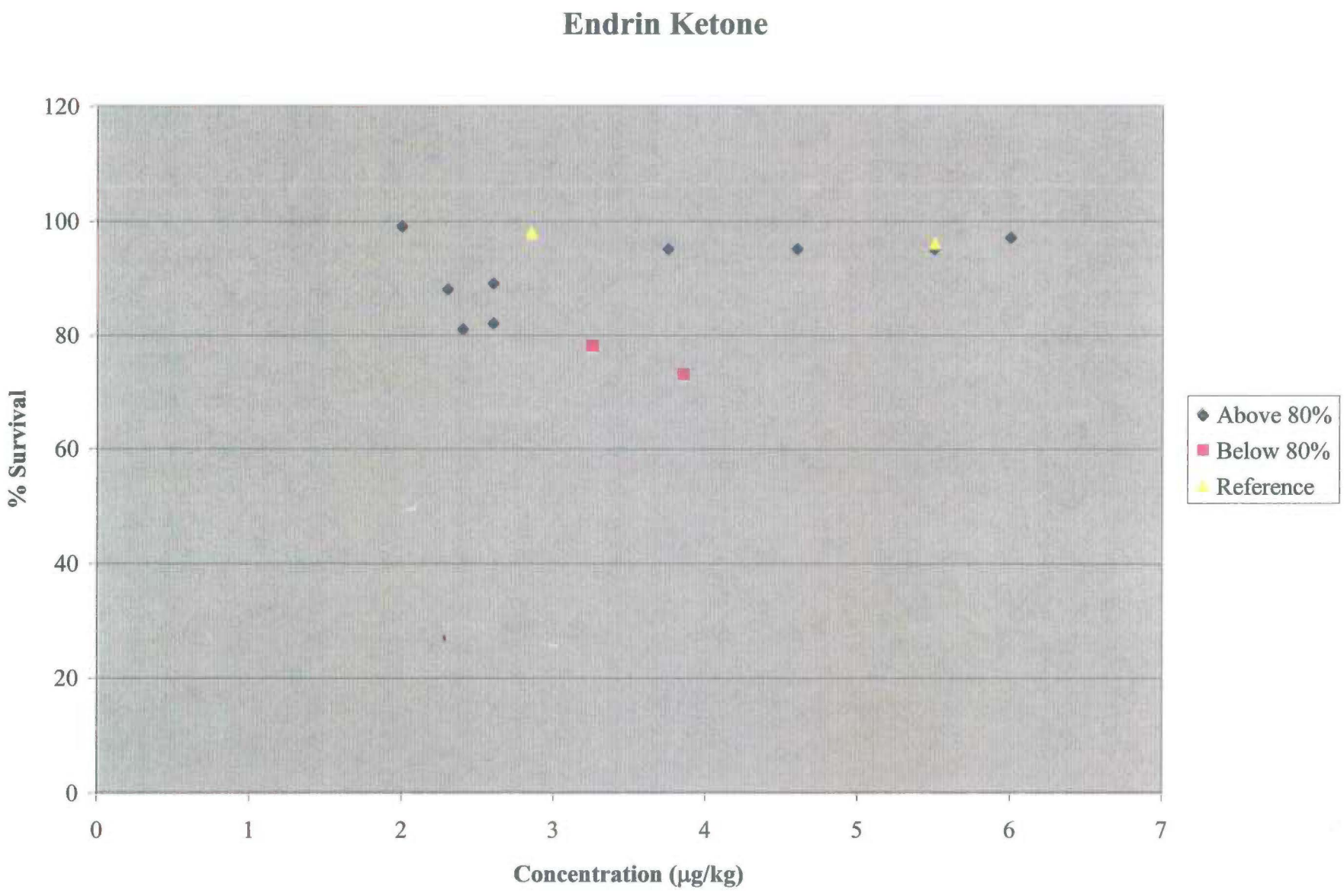


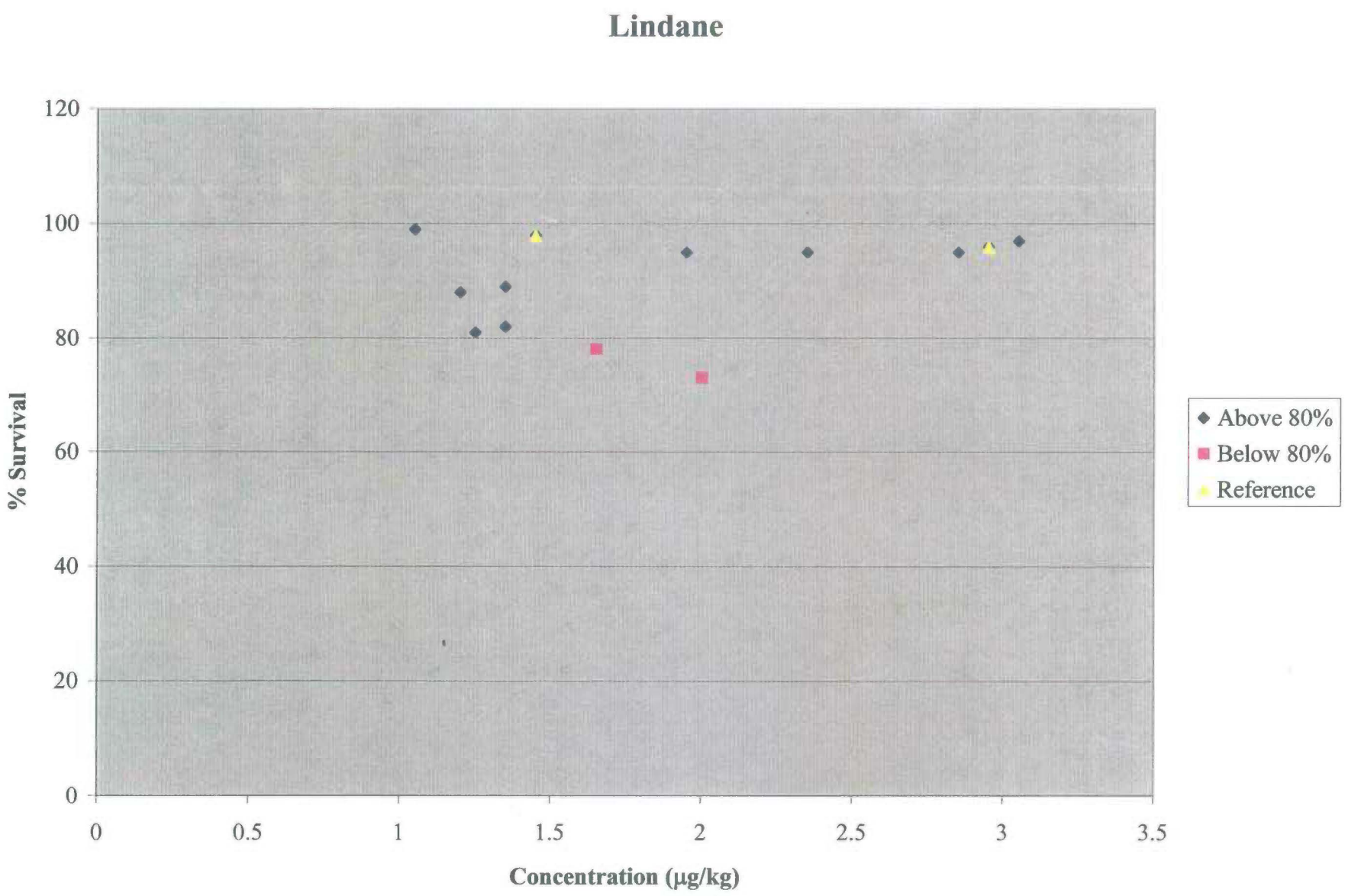
Endosulfan II

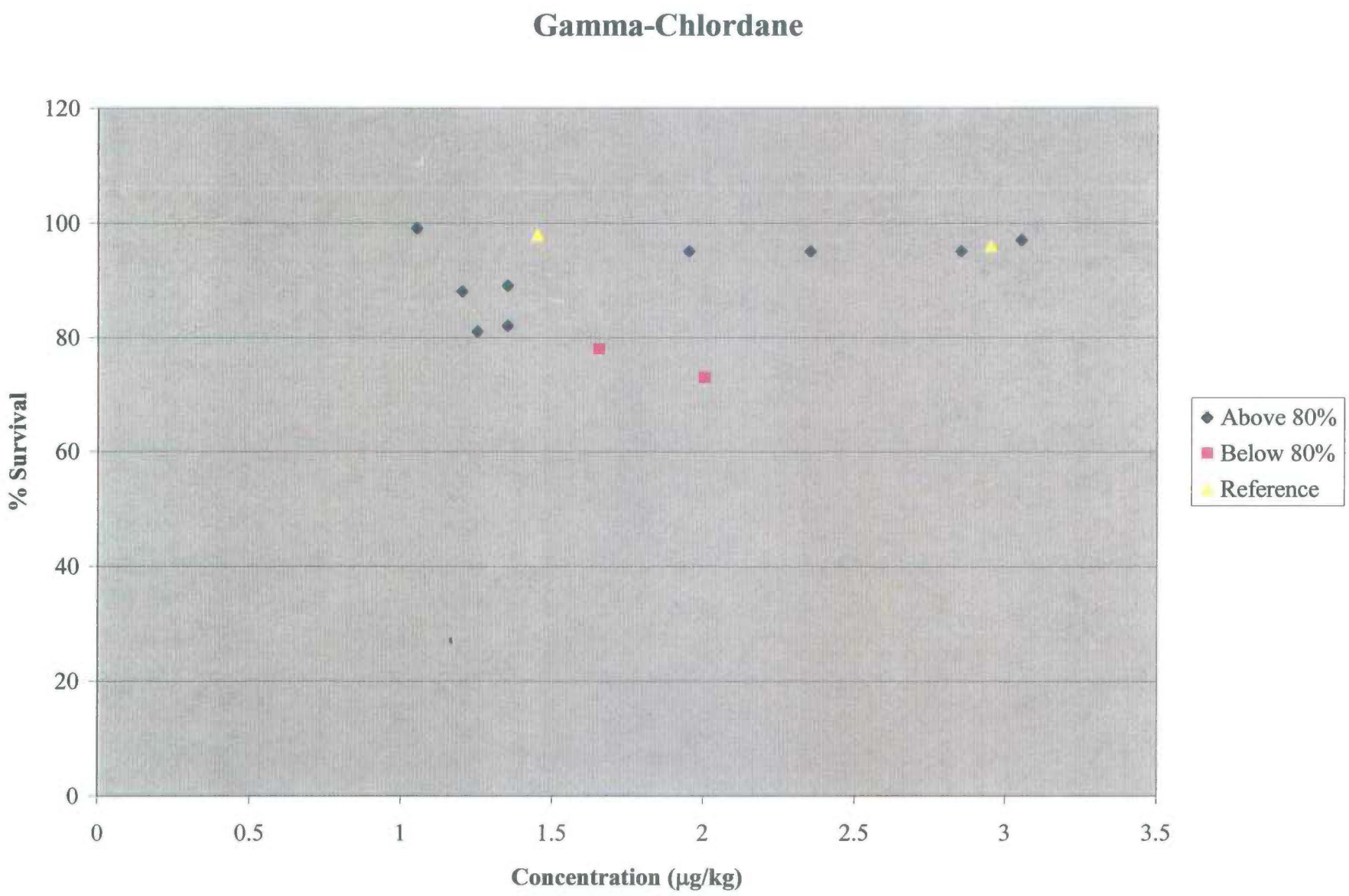


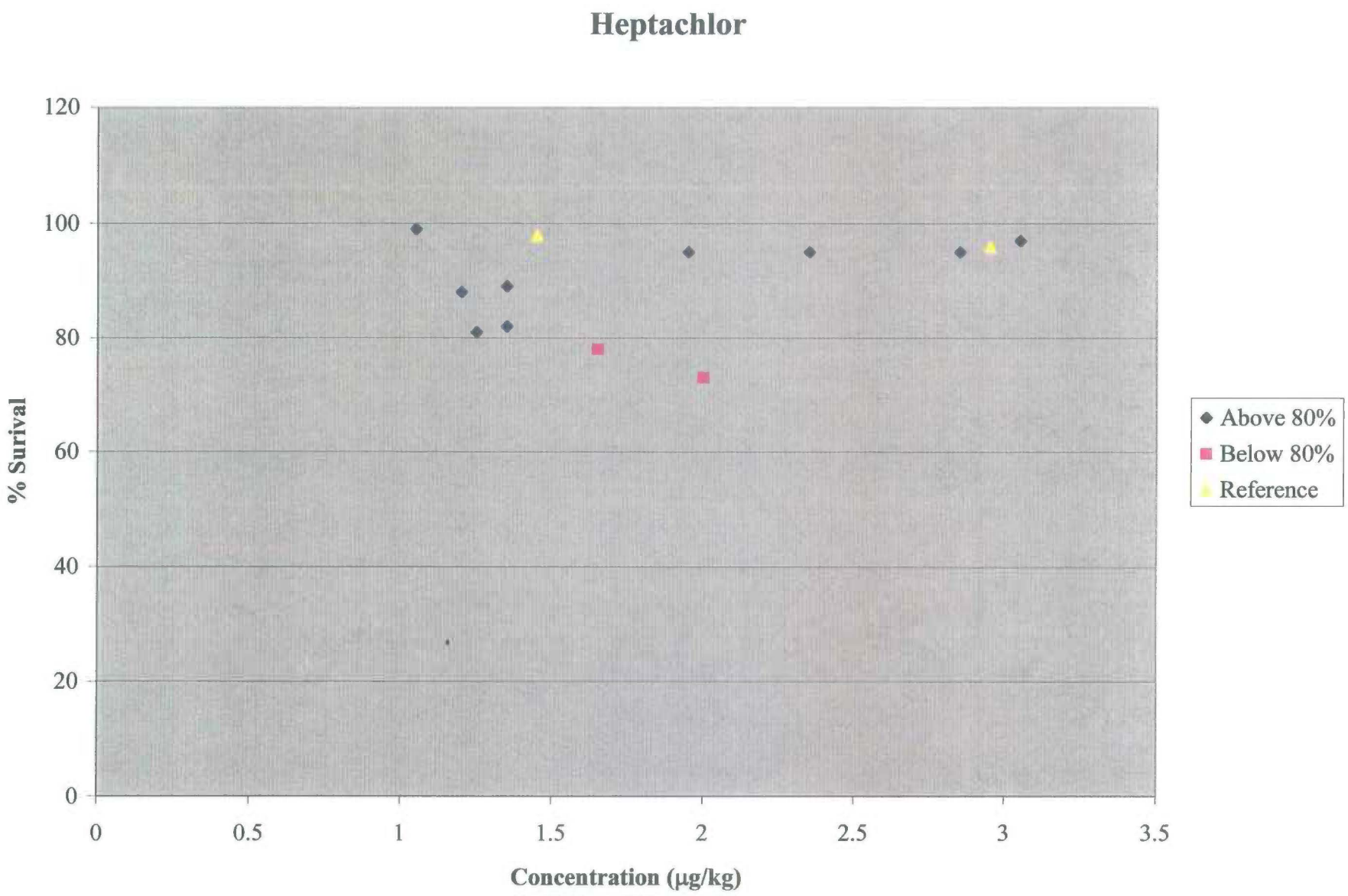

Endosulfan Sulfate
120
100
80
60
40
20
0
% Survival
0
1
2
3
4
5
6
7
Concentration (ug/kg)
Above 80%
Below 80%
Reference

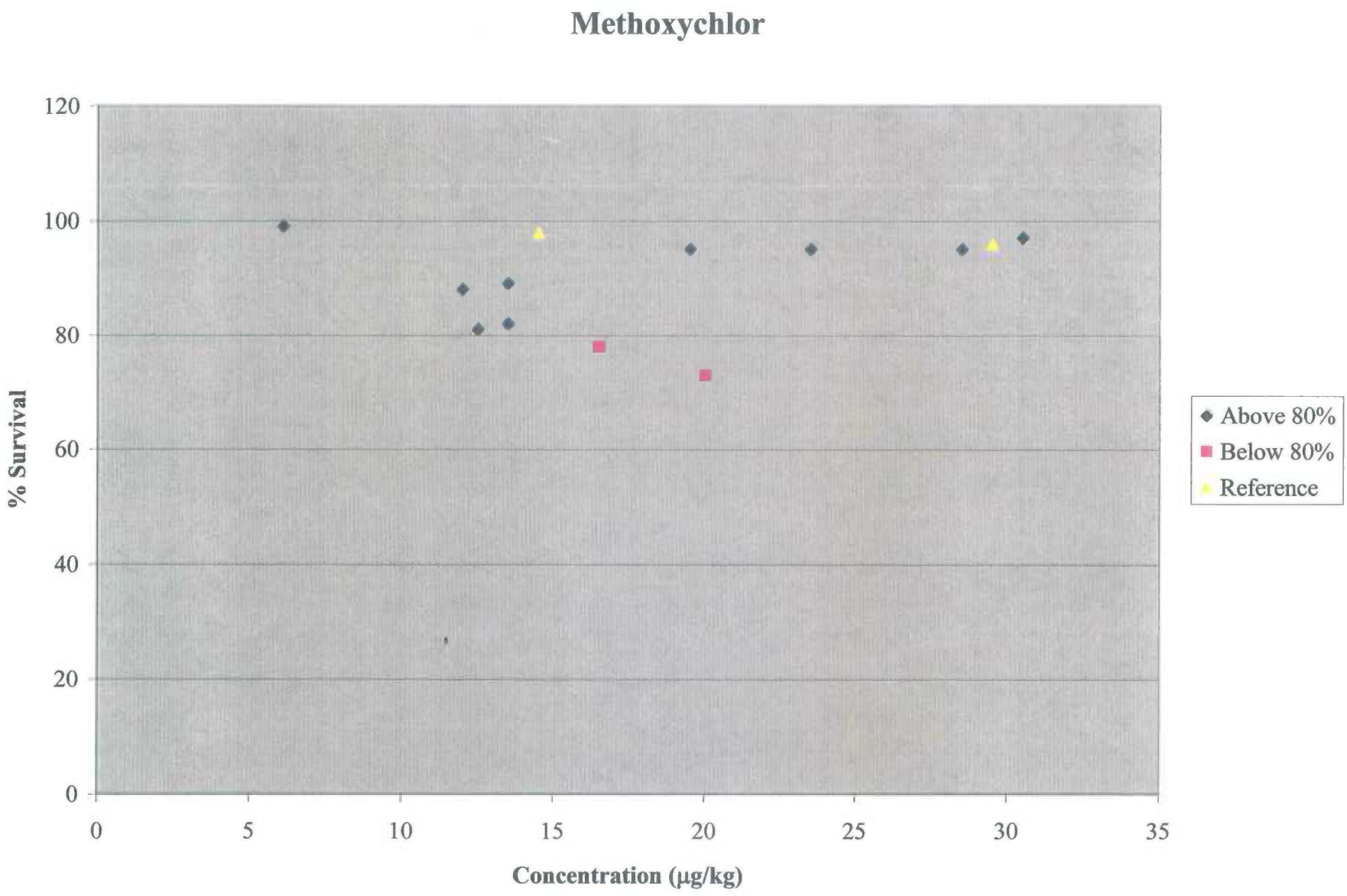

Endrin Aldehyde
120
100
80
60
40
20
0
% Survival
0
1
2
3
4
5
6
7
Concentration (µg/kg)
Above 80%
Below 80%
Referernce


Endrin Ketone
120
100
80
60
40
20
0
% Survival
0
1
2
3
4
5
6
7
Concentration (µg/kg)
Above 80%
Below 80%
Reference

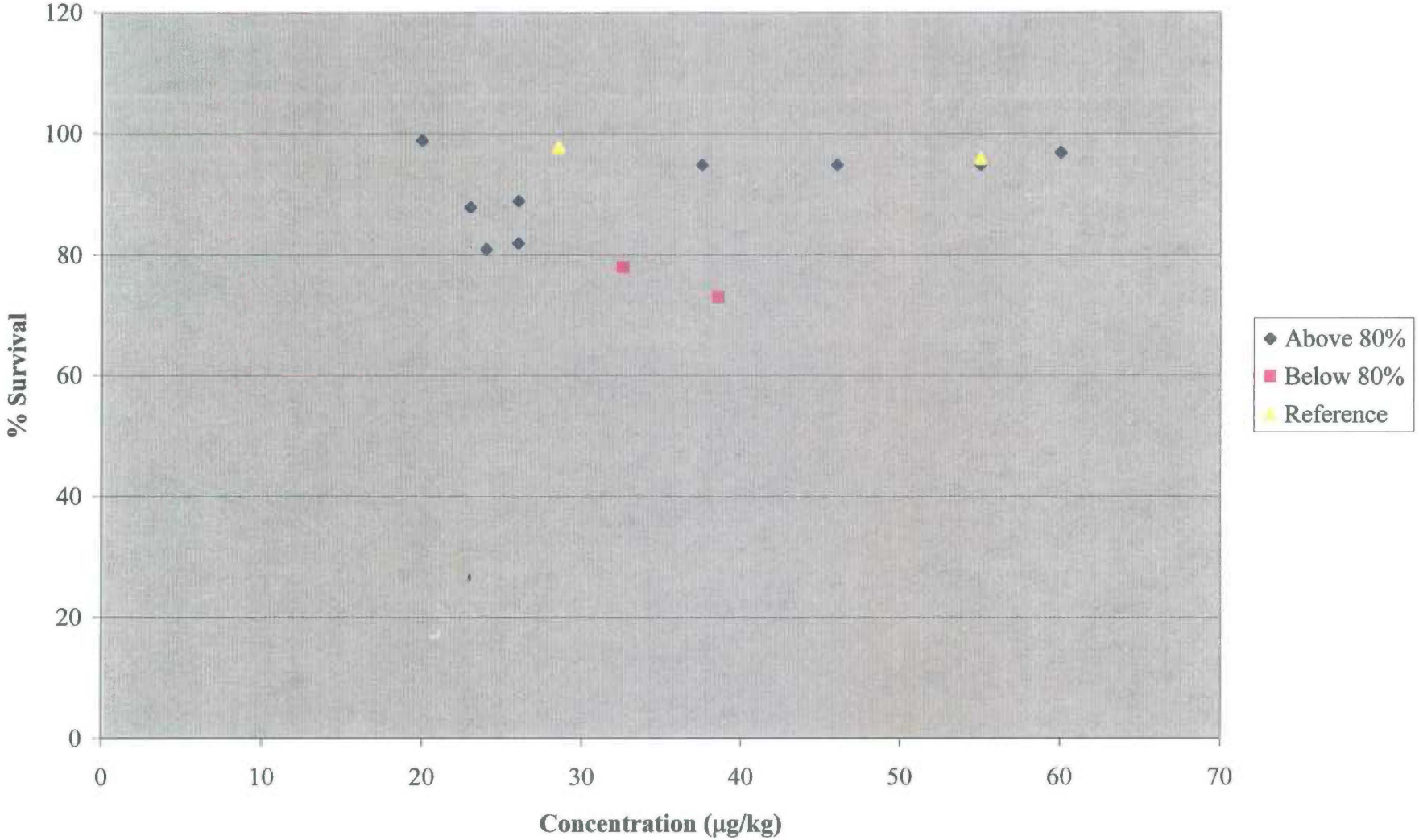

Lindane
120
100
80
60
40
20
0
% Survival
0
0.5
1
1.5
2
2.5
3
3.5
Concentration (µg/kg)
Above 80%
Below 80%
Reference


Gamma-Chlordane
120
100
80
60
40
20
0
% Survival
0
0.5
1
1.5
2
2.5
3
3.5
Concentration (µg/kg)
Above 80%
Below 80%
Reference

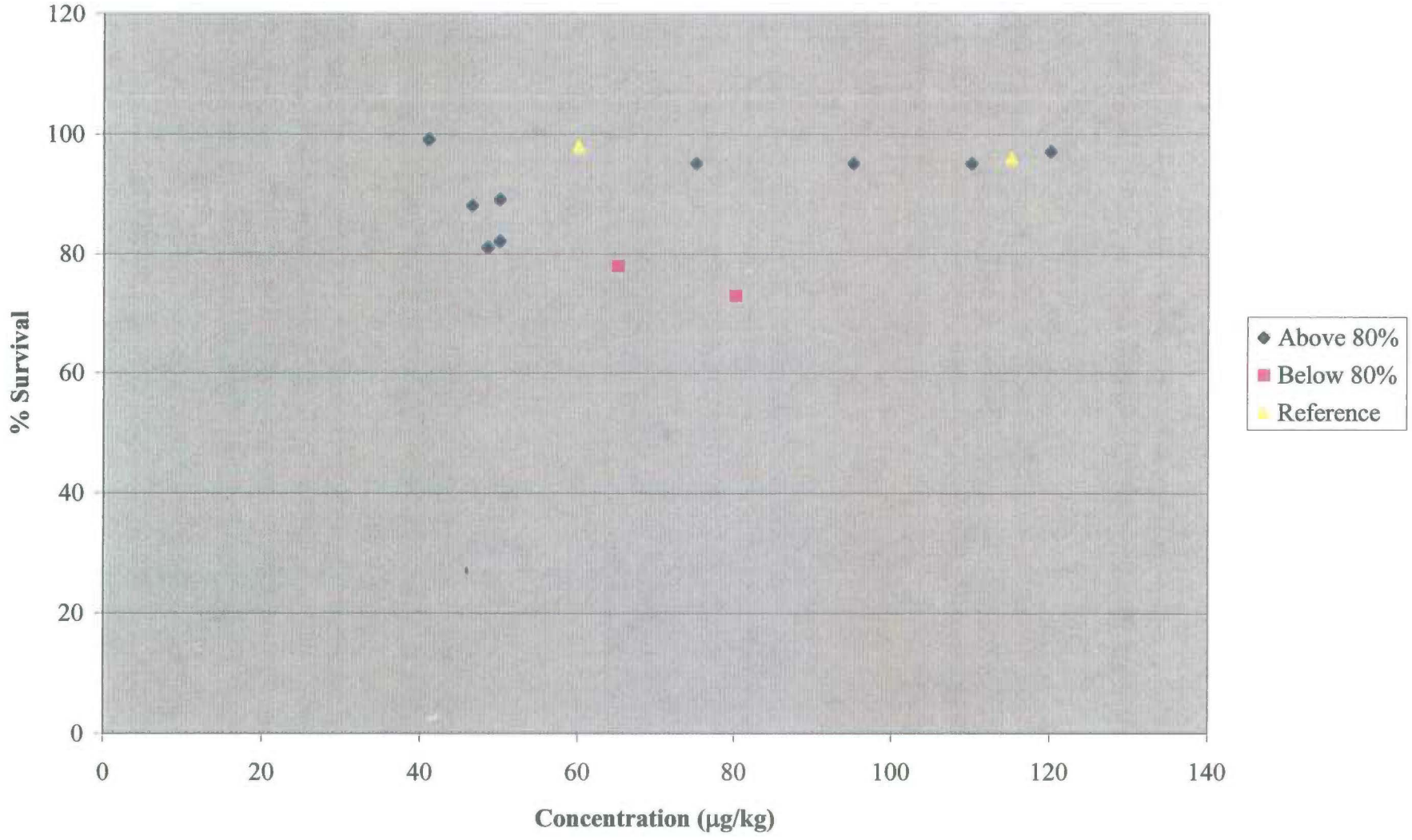

Heptachlor
120
100
80
60
40
20
0
% Surival
0
0.5
1
1.5
2
2.5
3
3.5
Concentration (µg/kg)
Above 80%
Below 80%
Reference


Methoxychlor
% Survival
120
100
80
60
40
20
0
0
5
10
15
20
25
30
35
Concentration (µg/kg)
Above 80%
Below 80%
Reference

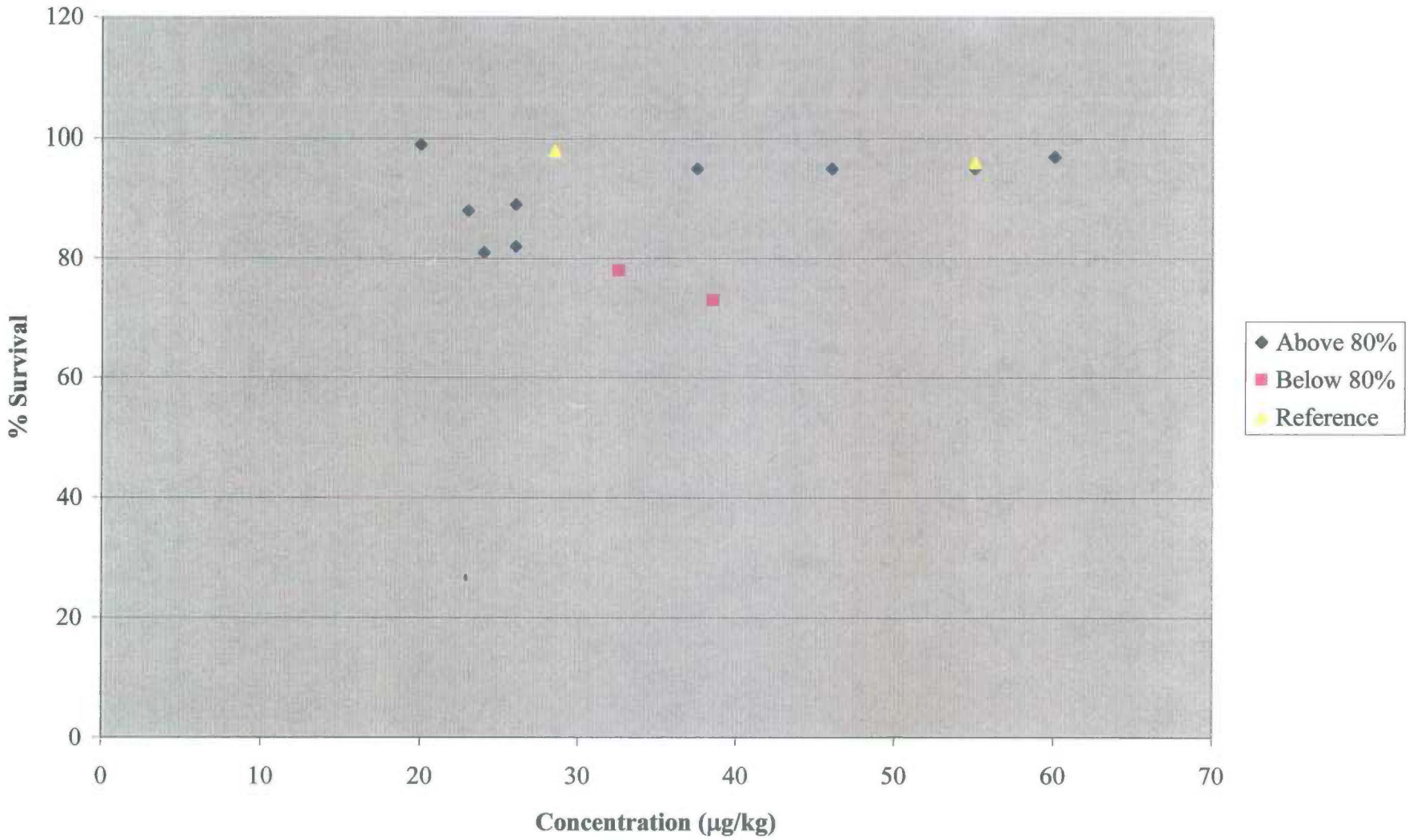
PCB-1016


120
100
80
60
40
20
0
% Survival
0
10
20
30
40
50
60
70
Concentration (µg/kg)
Above 80%
Below 80%
Reference

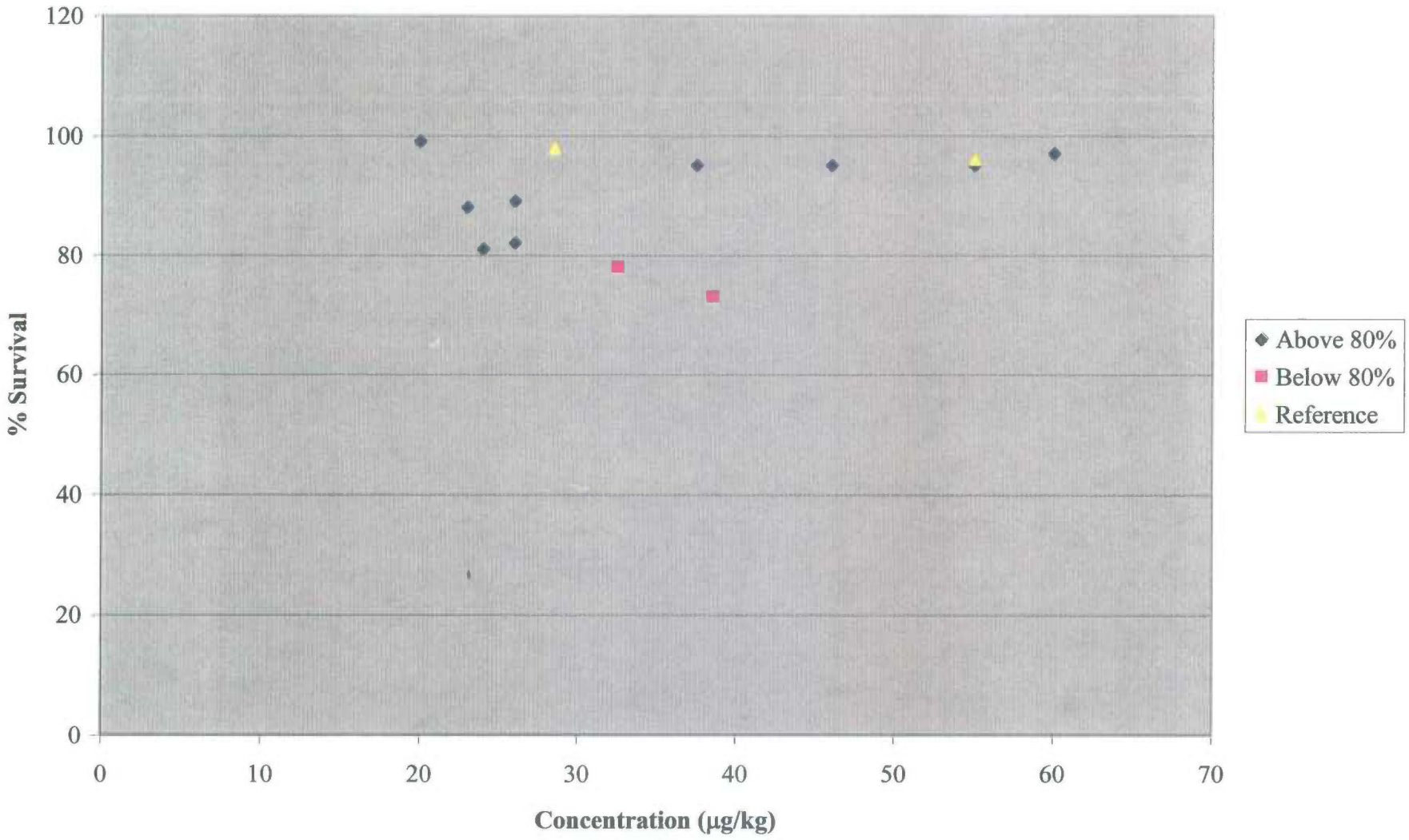
PCB-1221


120
100
80
60
40
20
0
% Survival
0
20
40
60
80
100
120
140
Concentration (µg/kg)
Above 80%
Below 80%
Reference

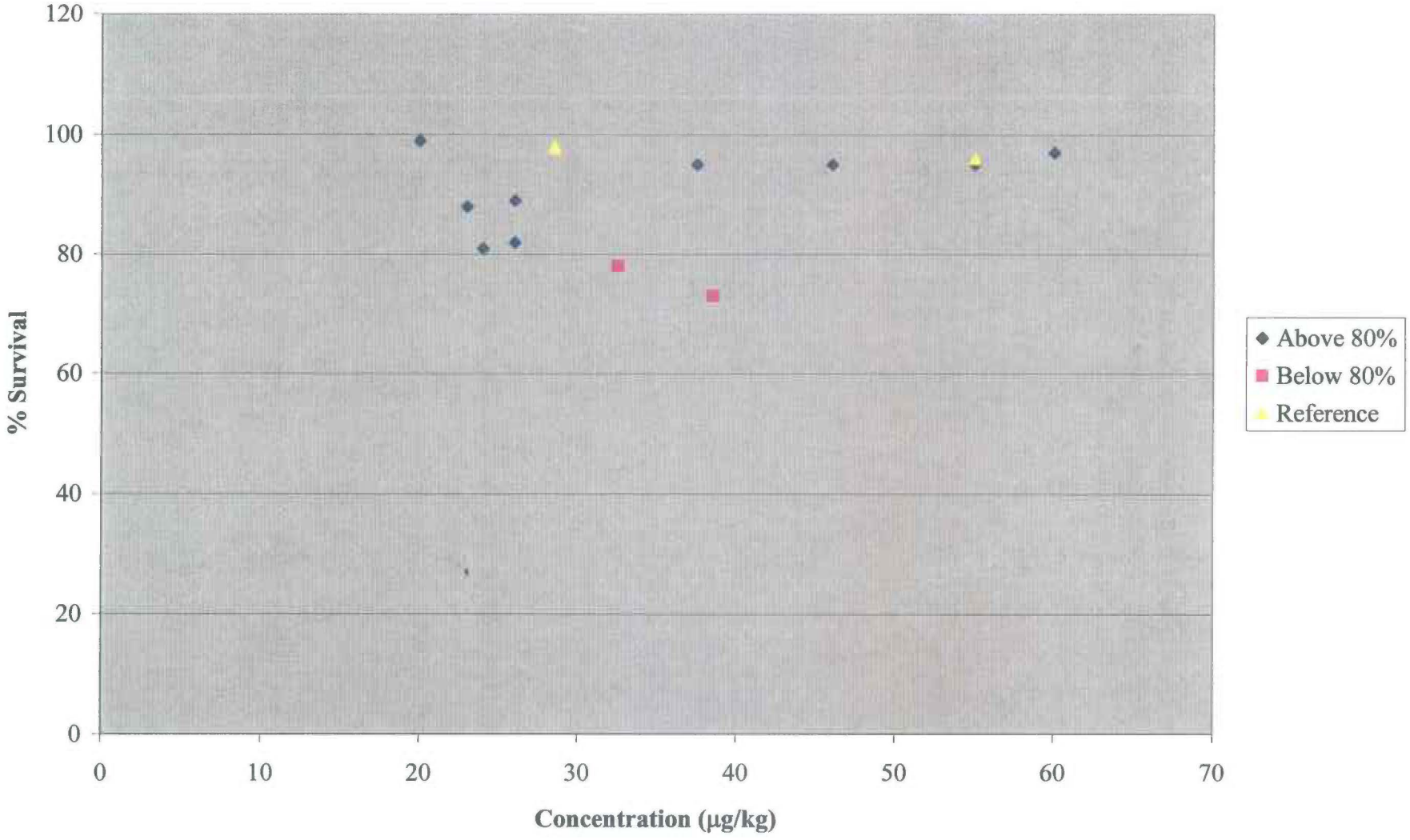
PCB-1232


120
100
80
60
40
20
0
% Survival
0
10
20
30
40
50
60
70
Concentration (µg/kg)
Above 80%
Below 80%
Reference

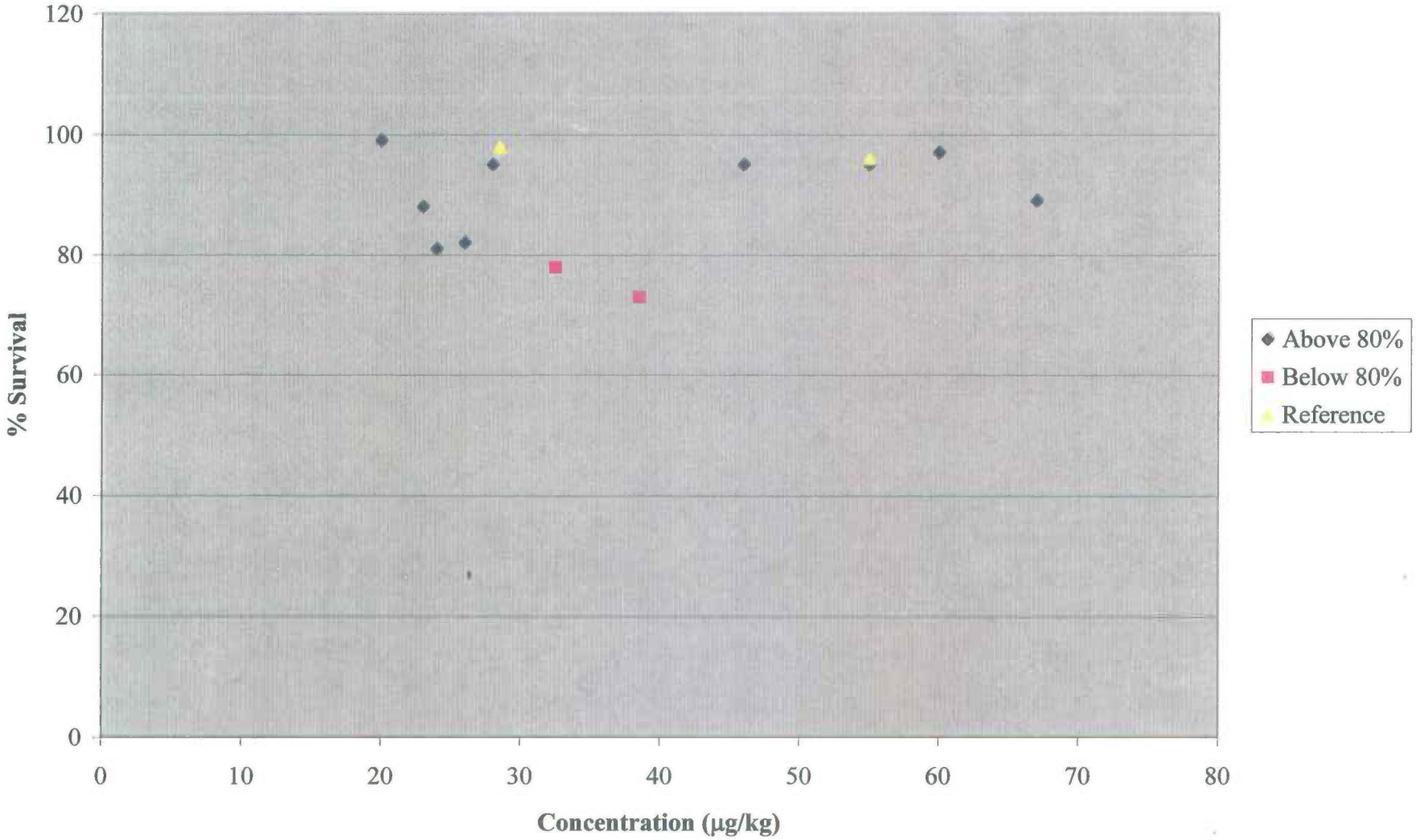
PCB-1242


120
100
80
60
40
20
0
% Survival
0
10
20
30
40
50
60
70
Concentration (µg/kg)
Above 80%
Below 80%
Reference

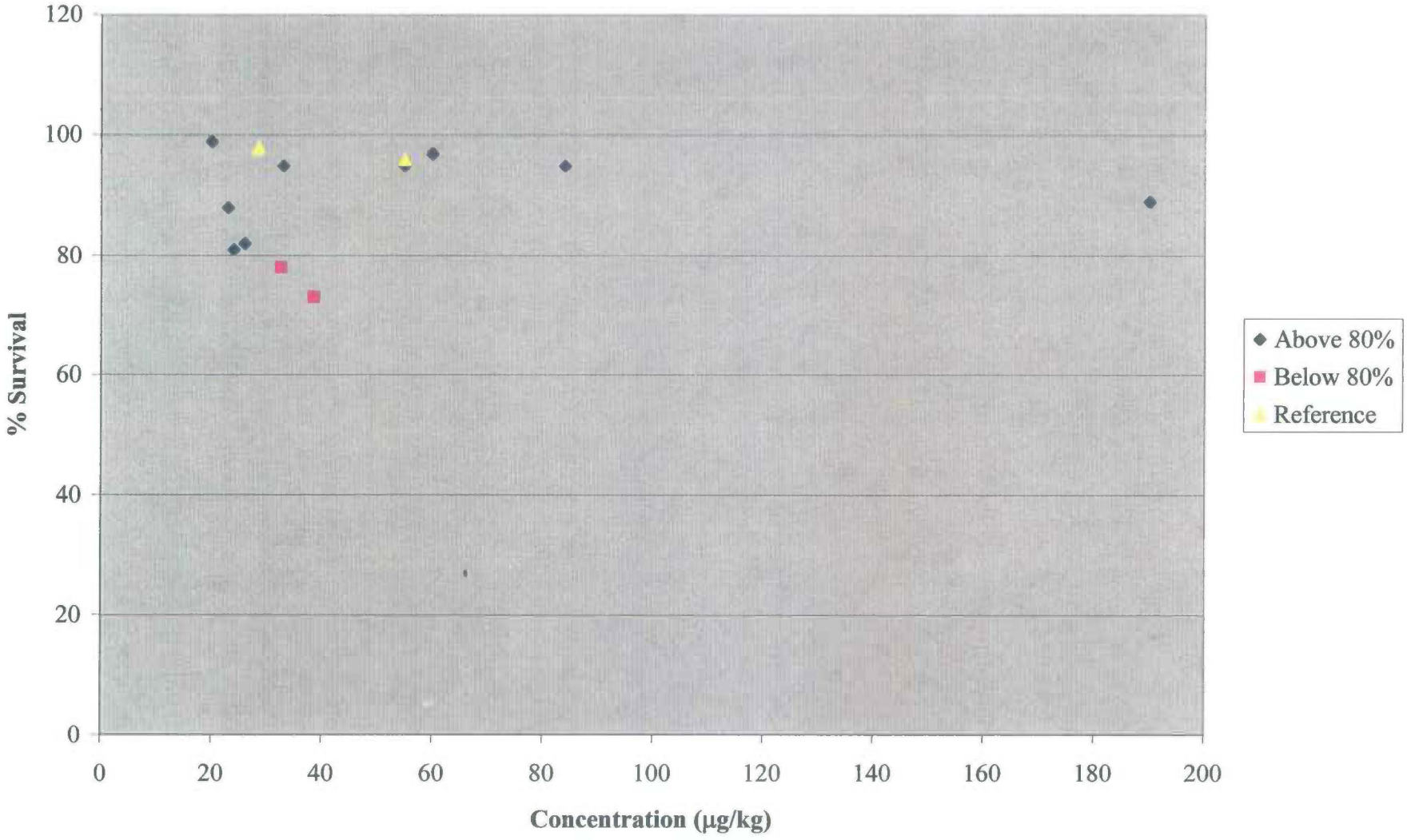
PCB-1248


120
100
80
60
40
20
0
% Survival
0
10
20
30
40
50
60
70
Concentration (µg/kg)
Above 80%
Below 80%
Reference

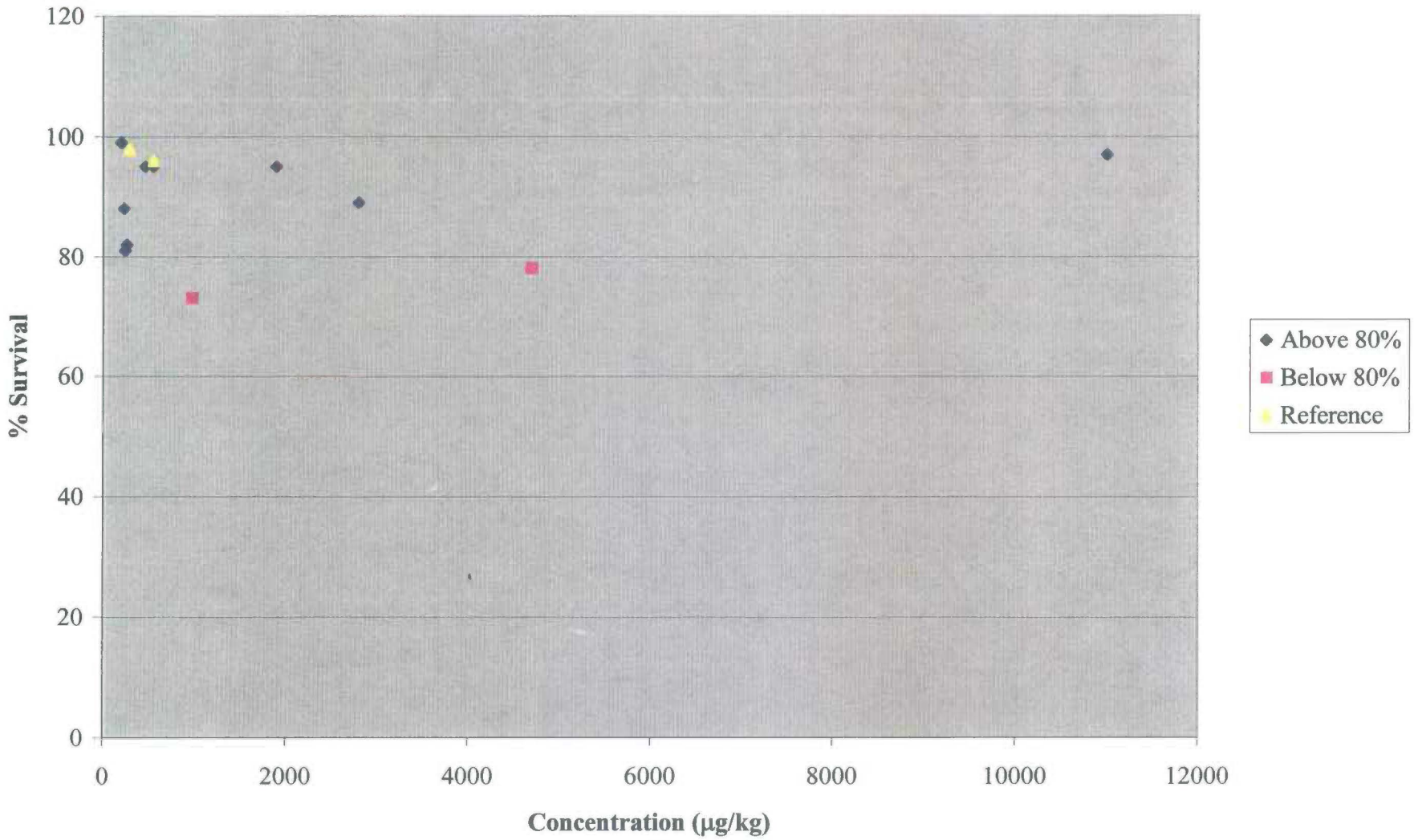
PCB-1254


120
100
80
60
40
20
0
% Survival
0
10
20
30
40
50
60
70
80
Concentration (µg/kg)
Above 80%
Below 80%
Reference

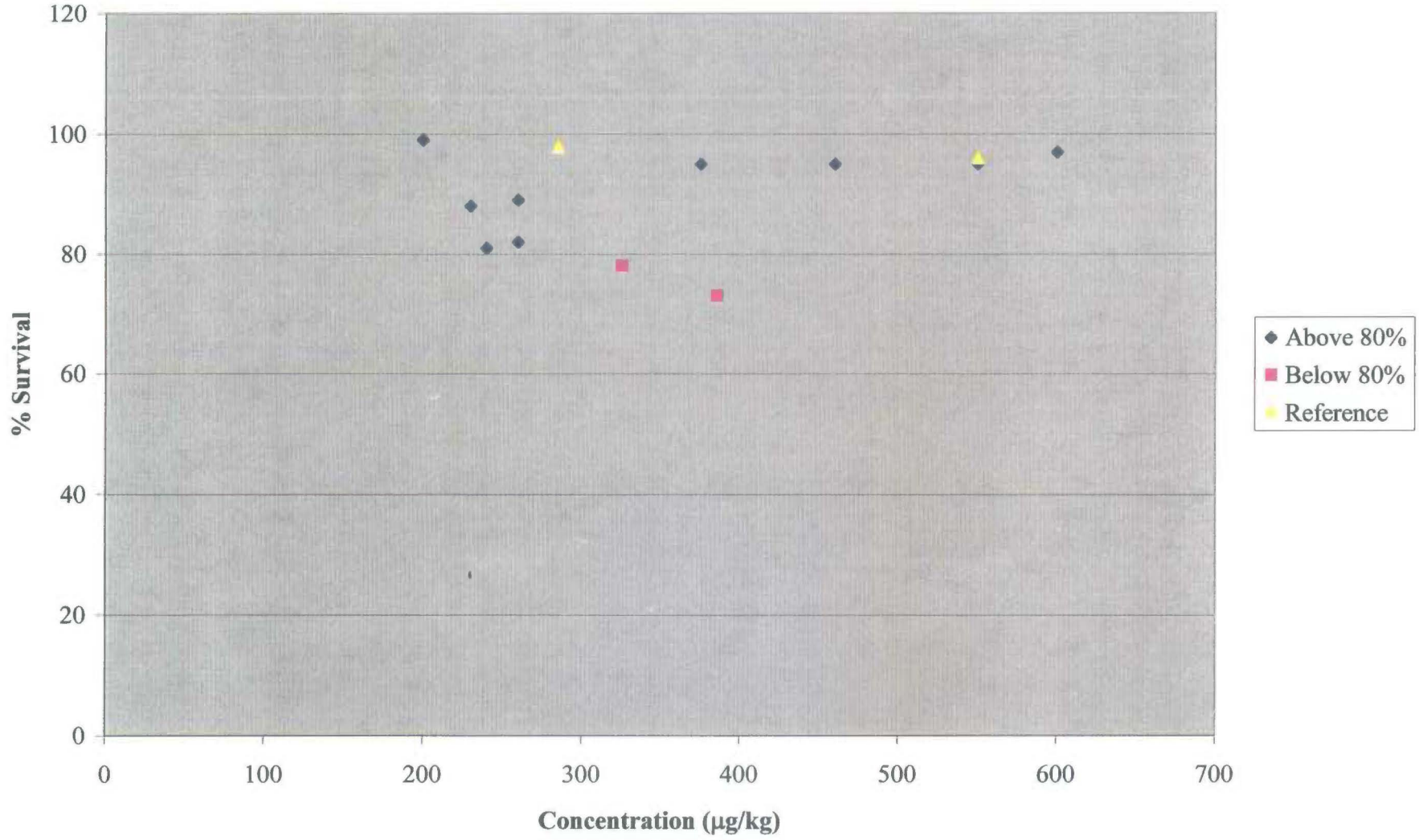
PCB-1260


120
100
80
60
40
20
0
% Survival
0
20
40
60
80
100
120
140
160
180
200
Concentration (µg/kg)
Above 80%
Below 80%
Reference

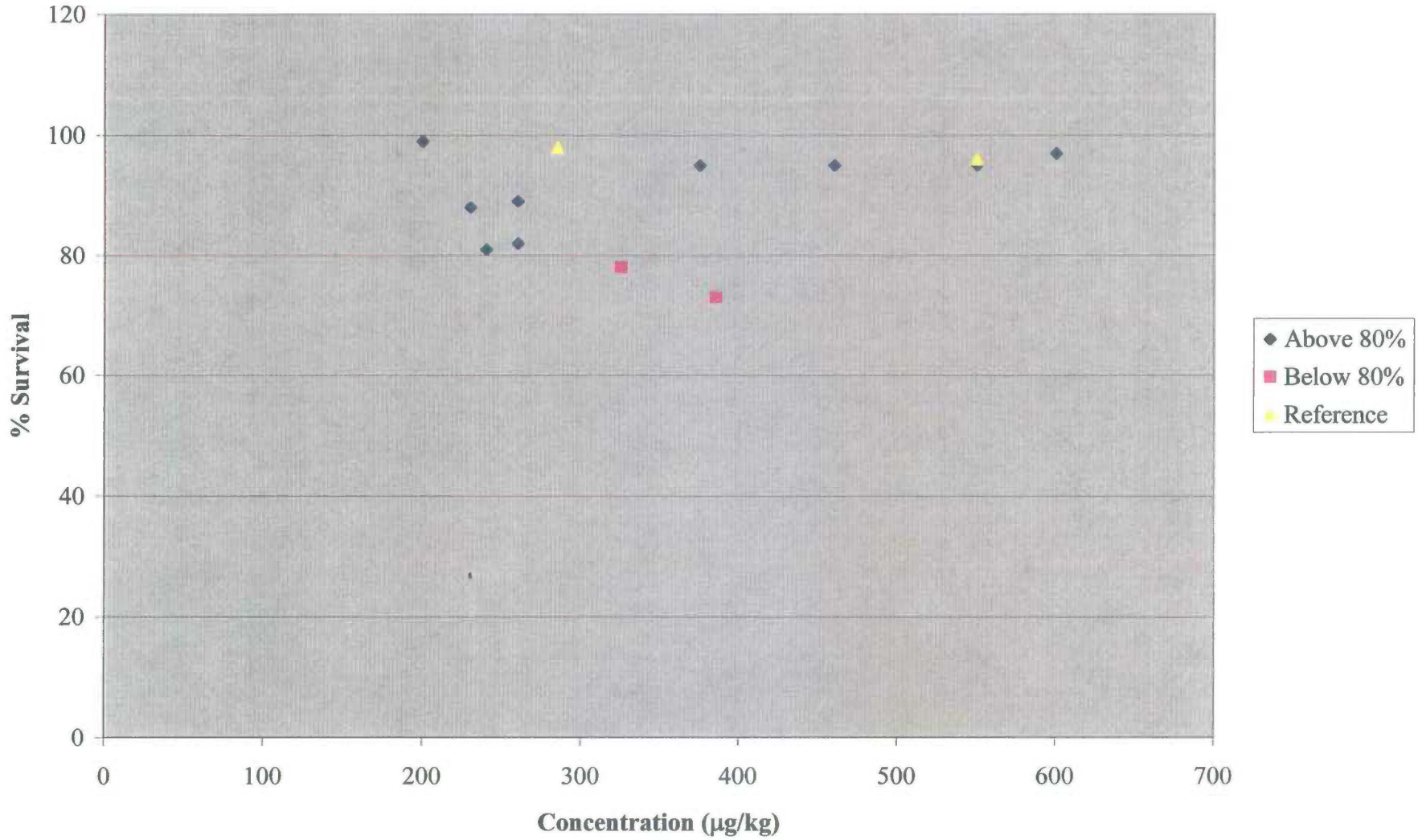
BEHP


120
100
80
60
40
20
0
% Survival
0
2000
4000
6000
8000
10000
12000
Concentration (µg/kg)
Above 80%
Below 80%
Reference

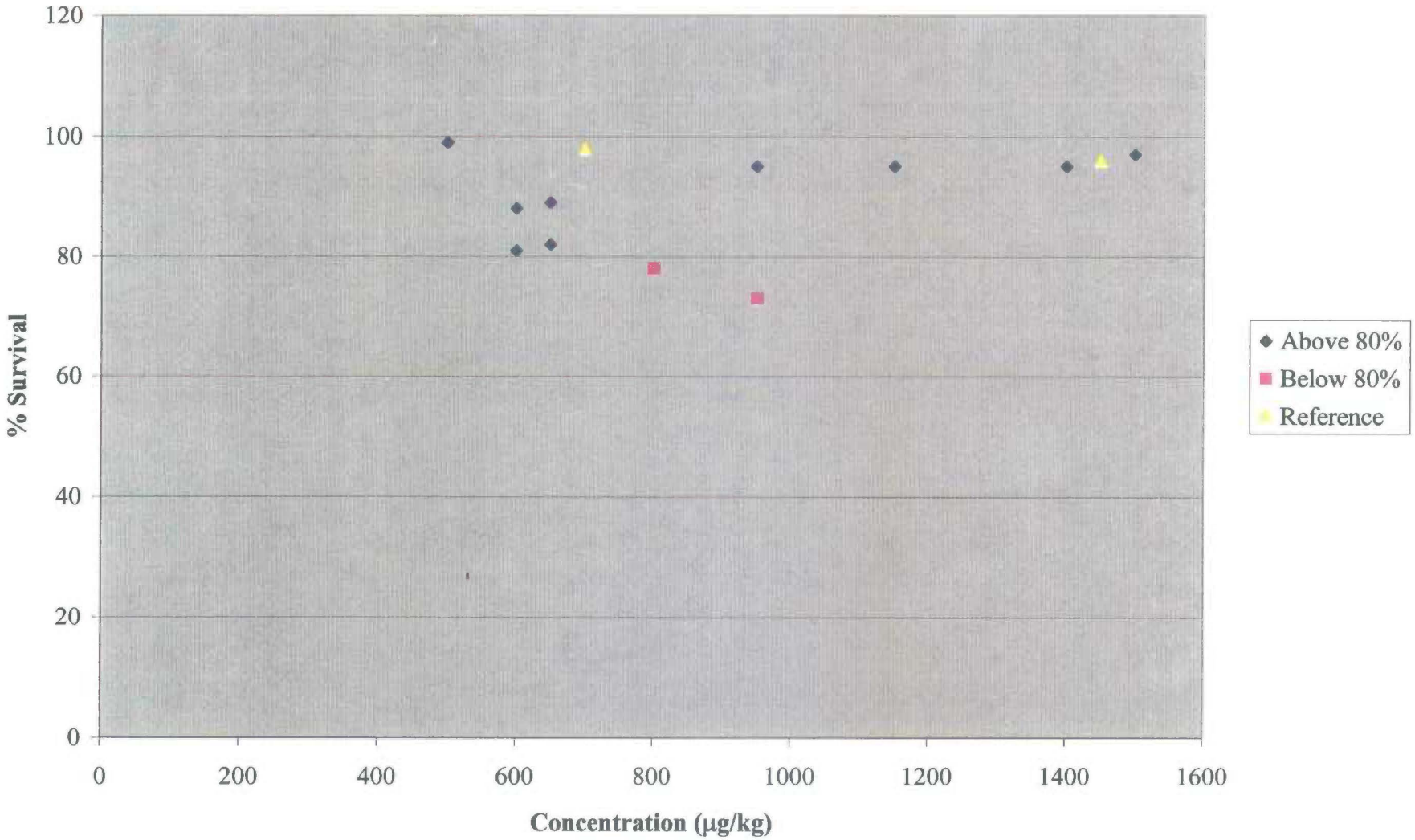
3 and/or 4 Methylphenol



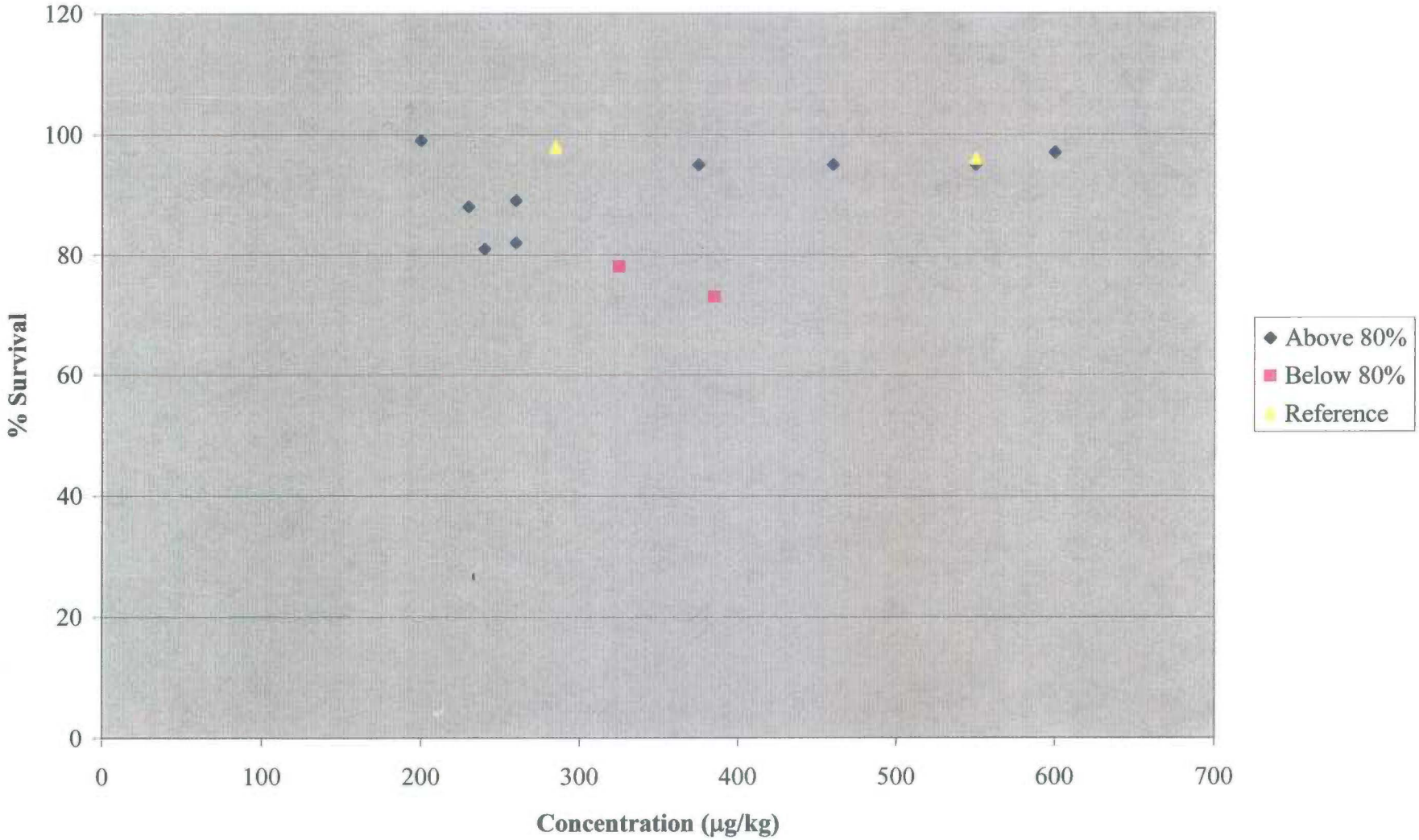
1,1-Biphenyl


120
100
80
60
40
20
0
% Survival
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

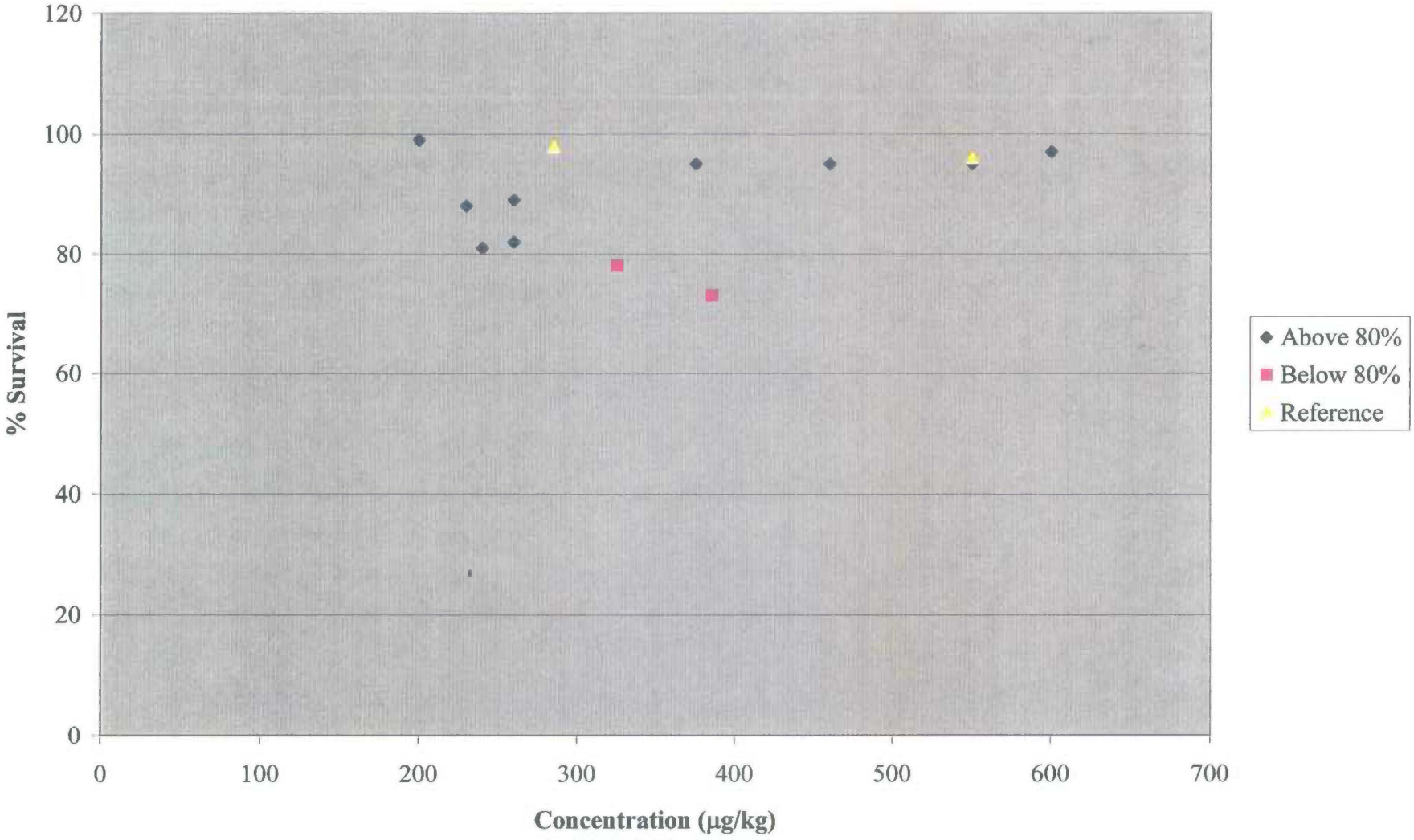
2,4,5-Trichlorophenol



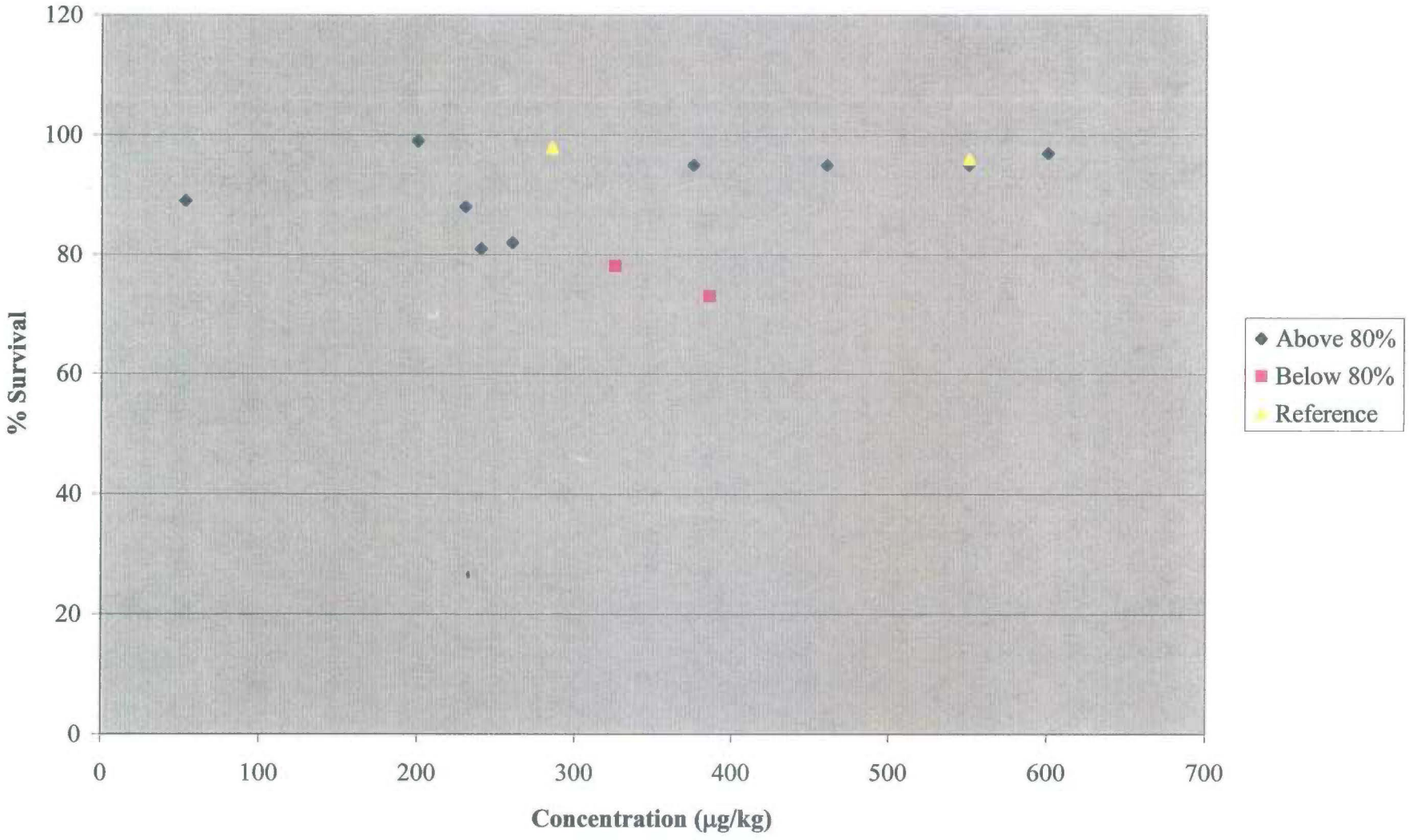
2,4,6-Trichlorophenol



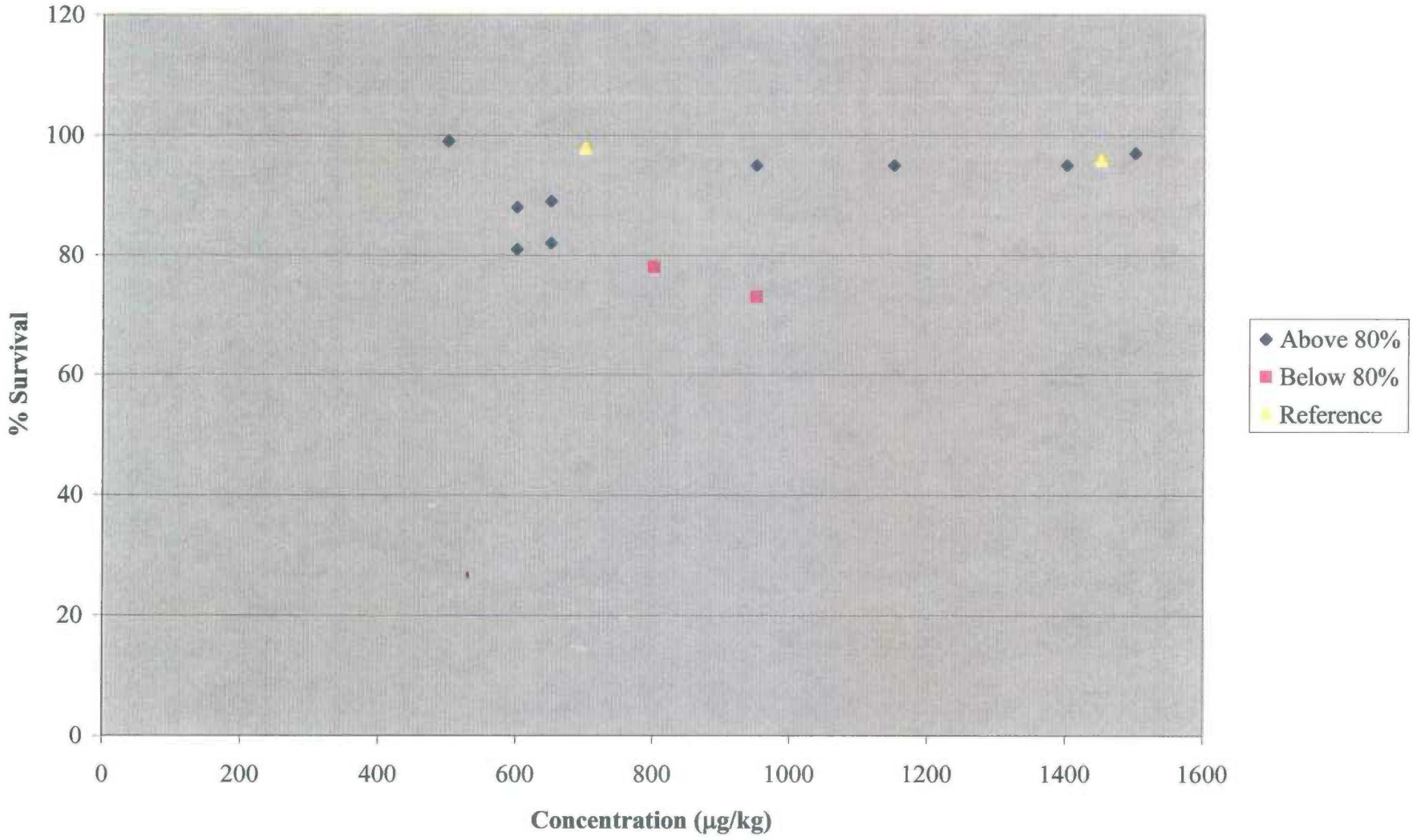
2,4-Dichlorophenol



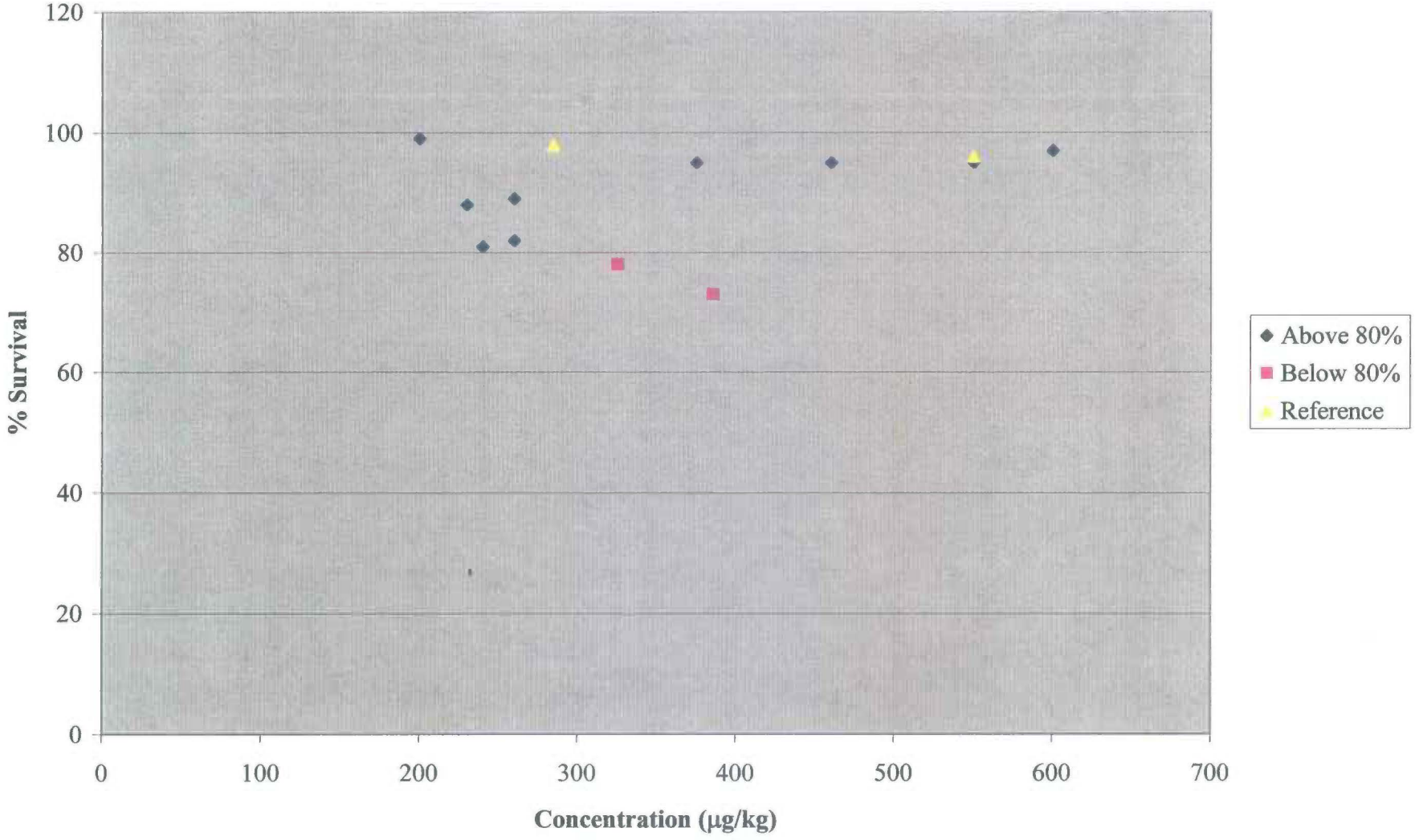
2,4-Dimethylphenol

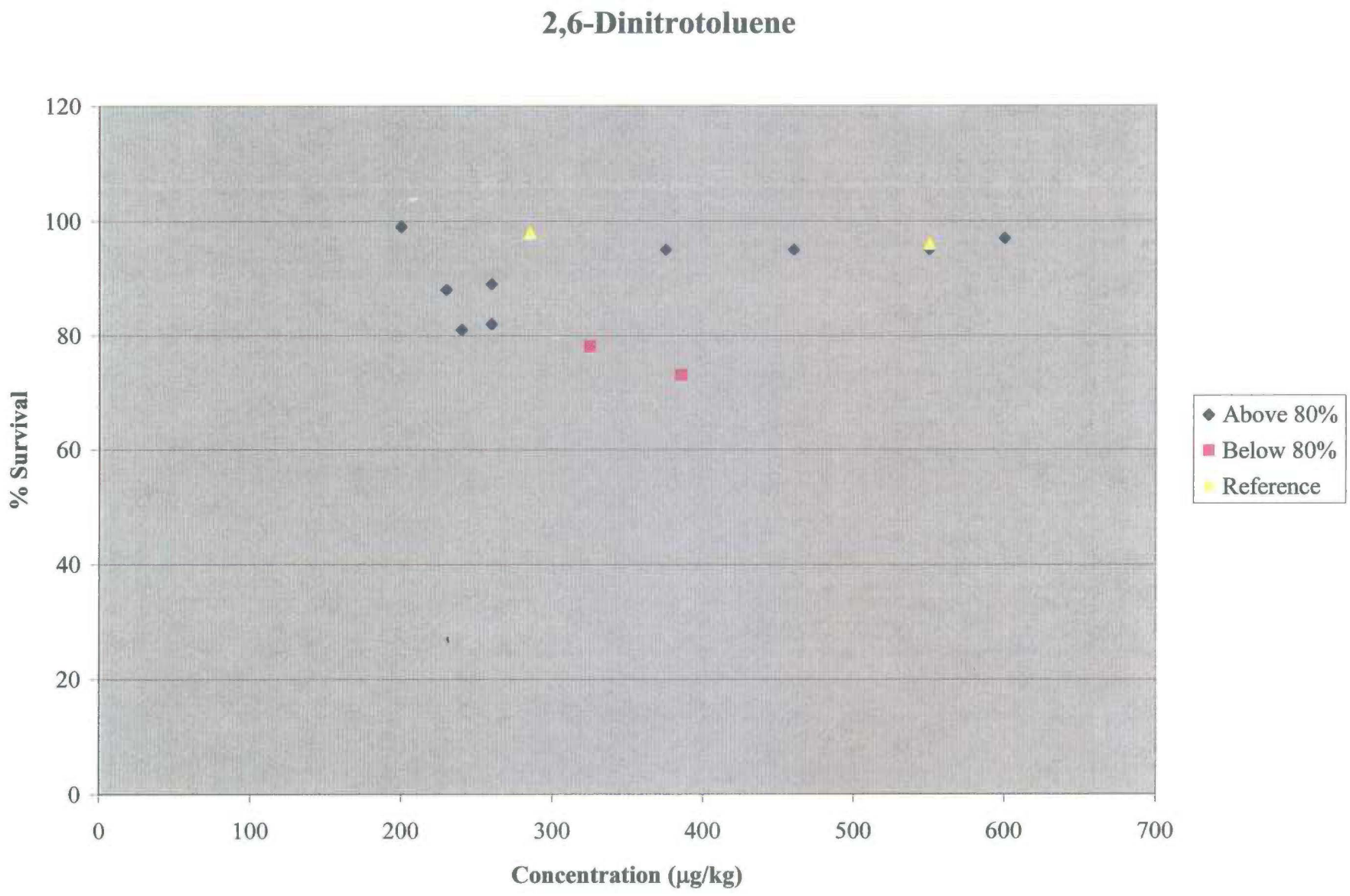


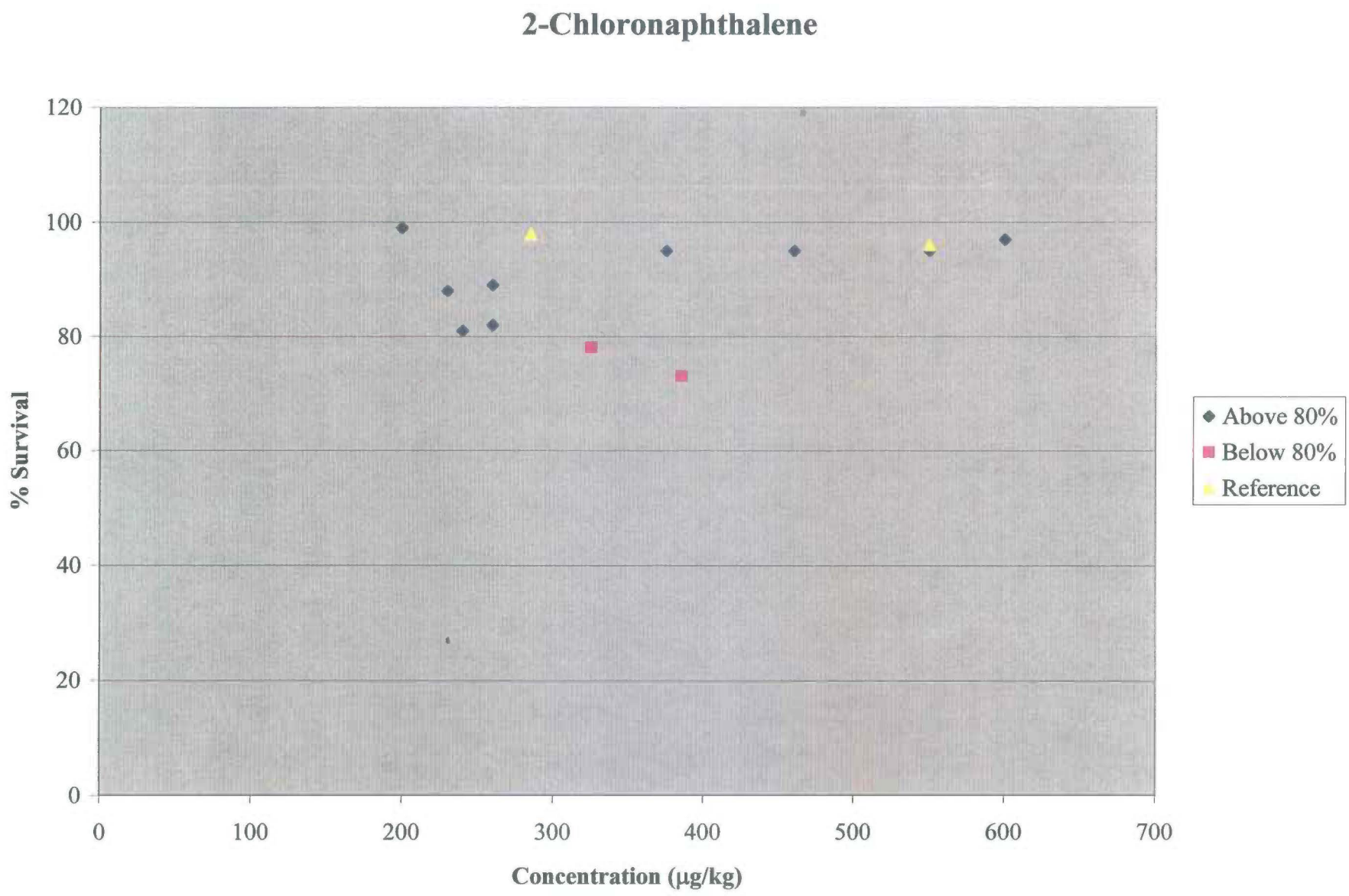
2,4--Dinitrophenol



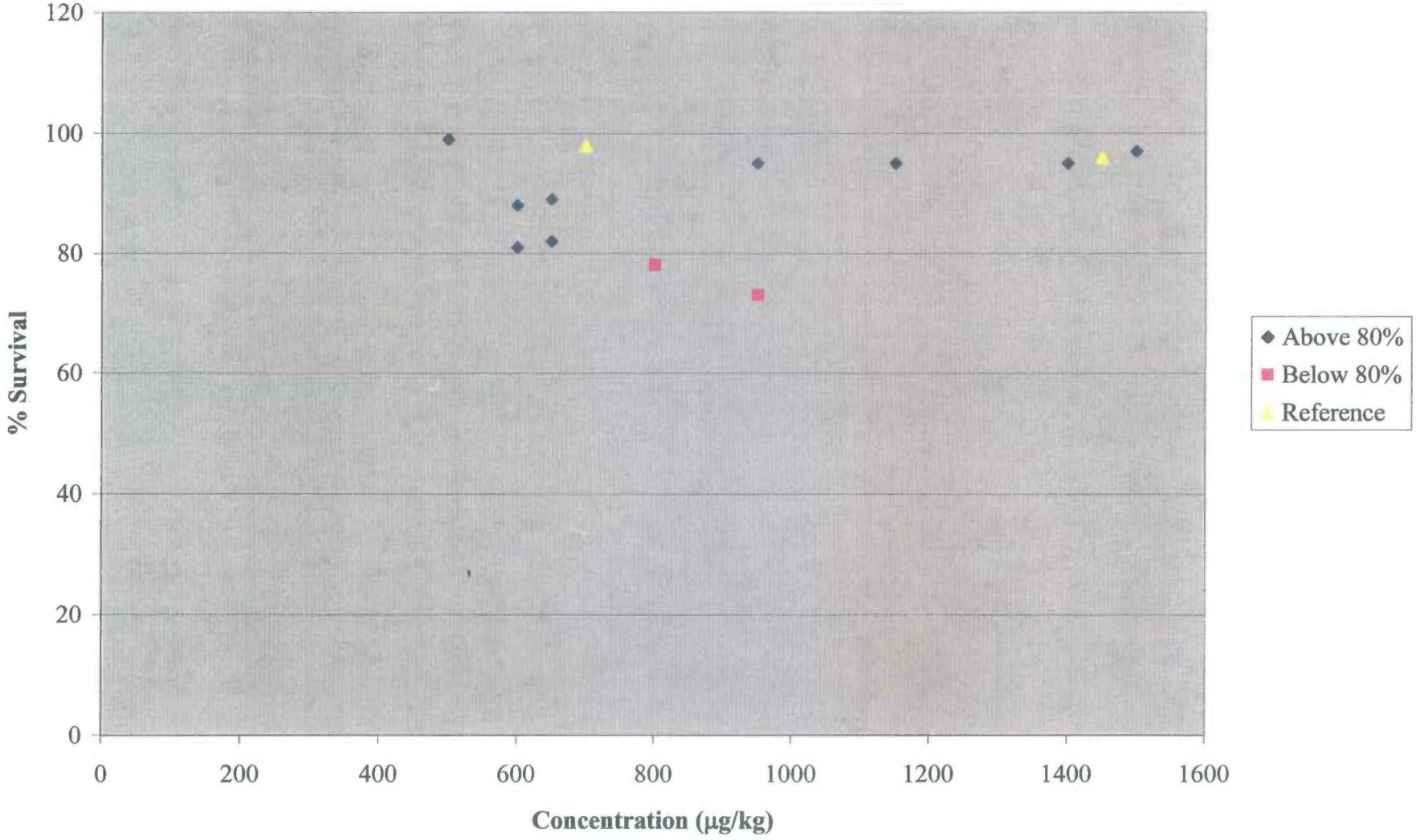
2,4-Dinitrotoluene

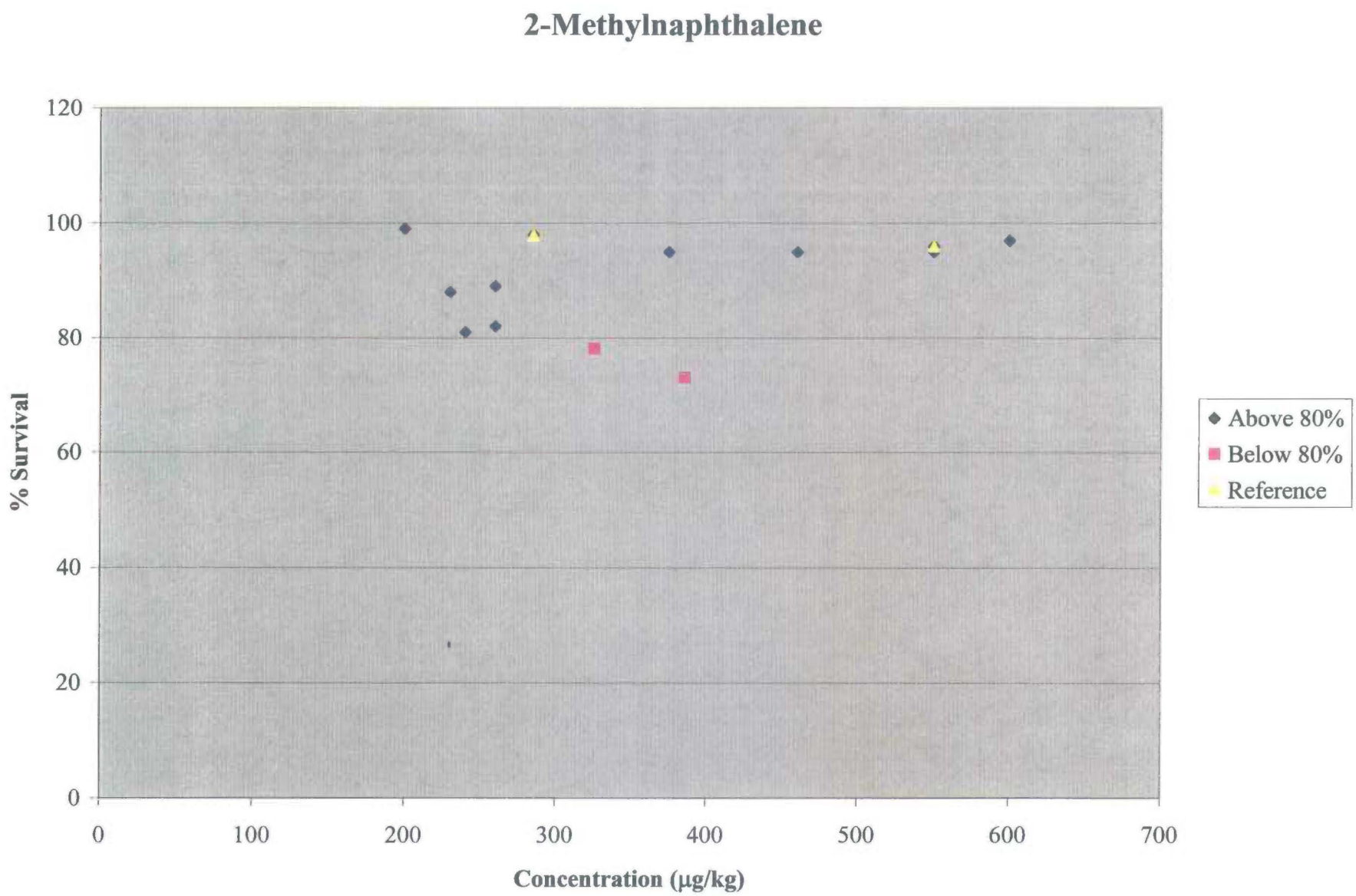


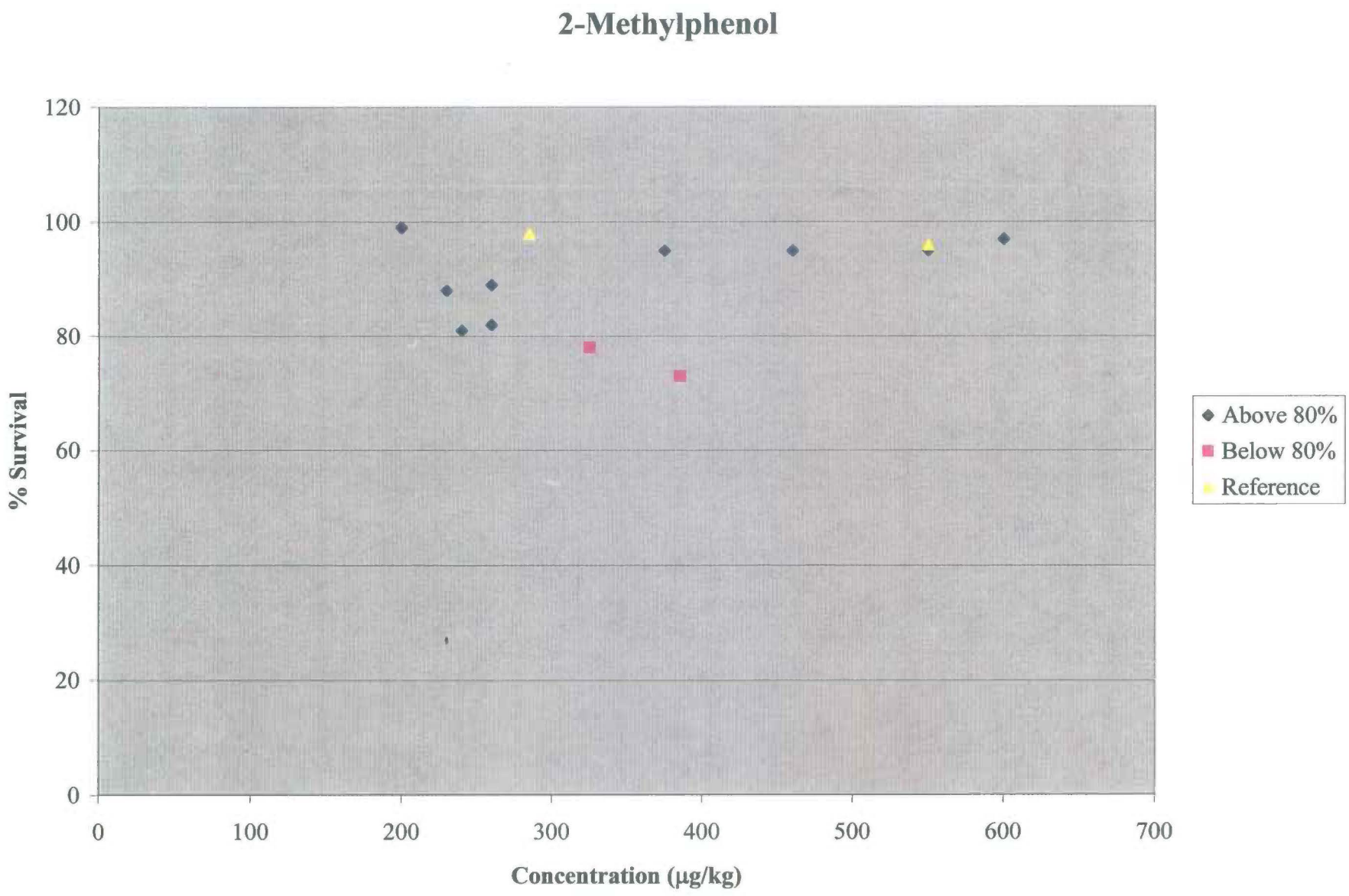

2,6-Dinitrotoluene
% Survival
120
100
80
60
40
20
0
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference


2-Chloronaphthalene
% Survival
120
100
80
60
40
20
0
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

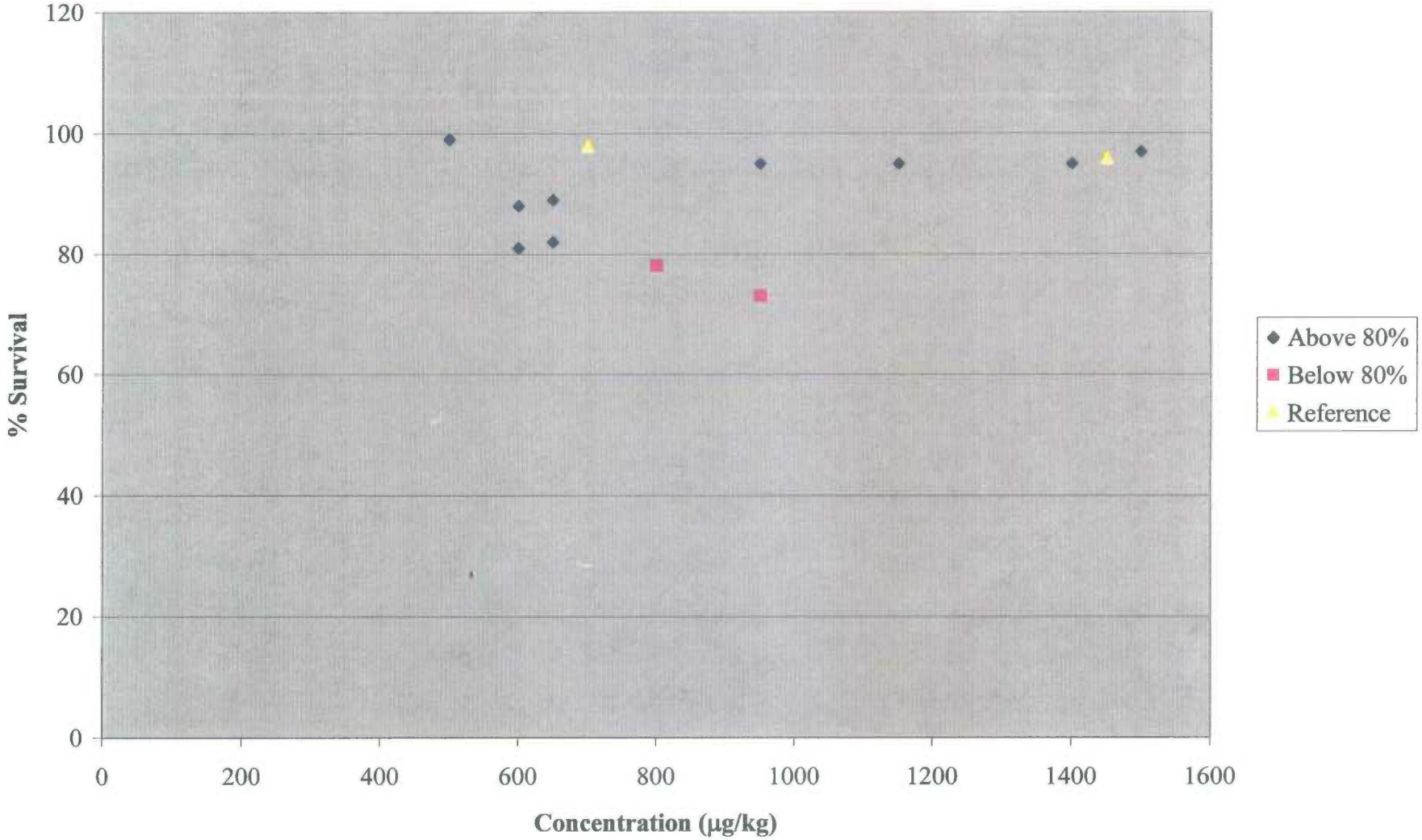
2-Methyl-4,6-Dinitrophenol

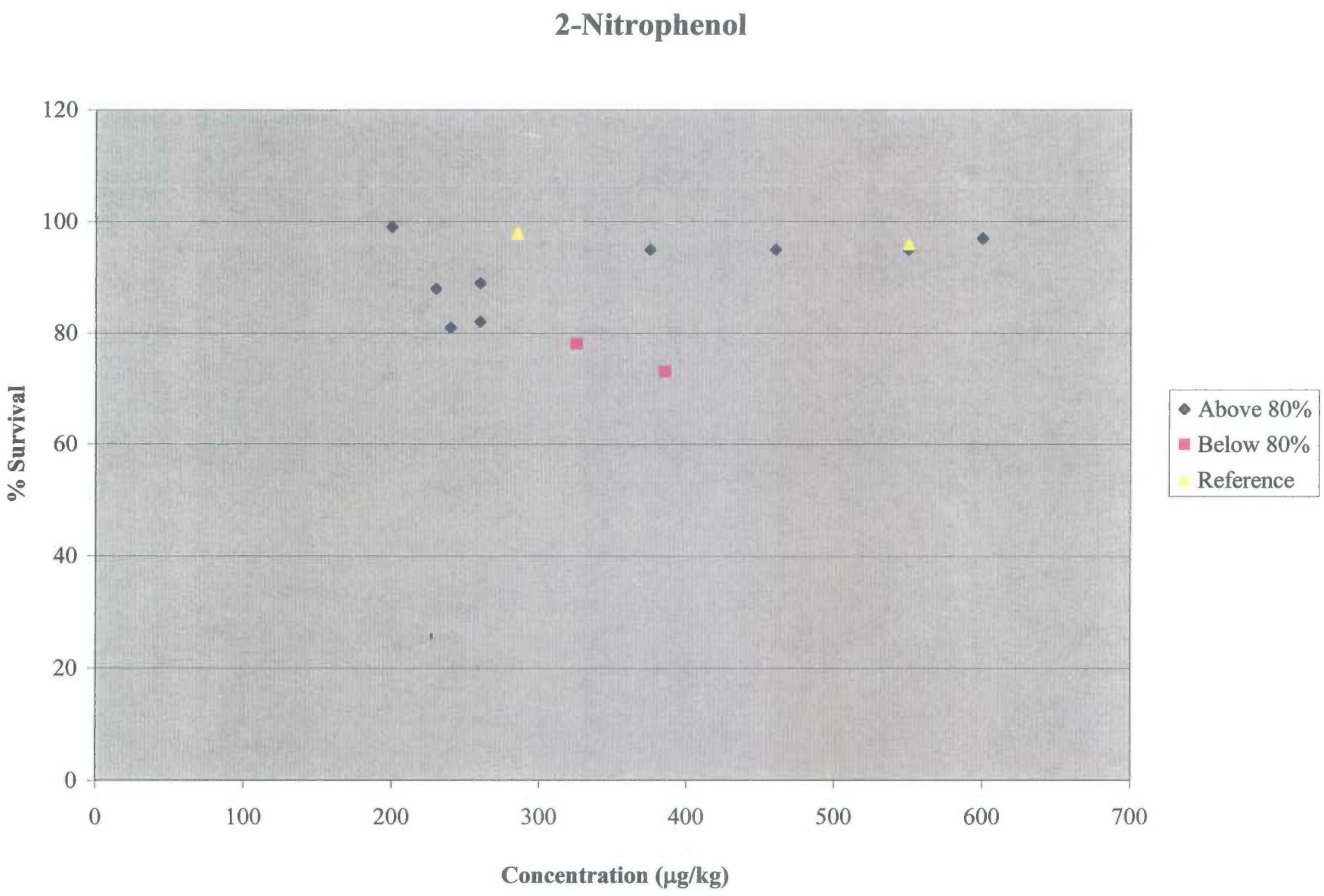



2-Methylnaphthalene
120
100
80
60
40
20
0
% Survival
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

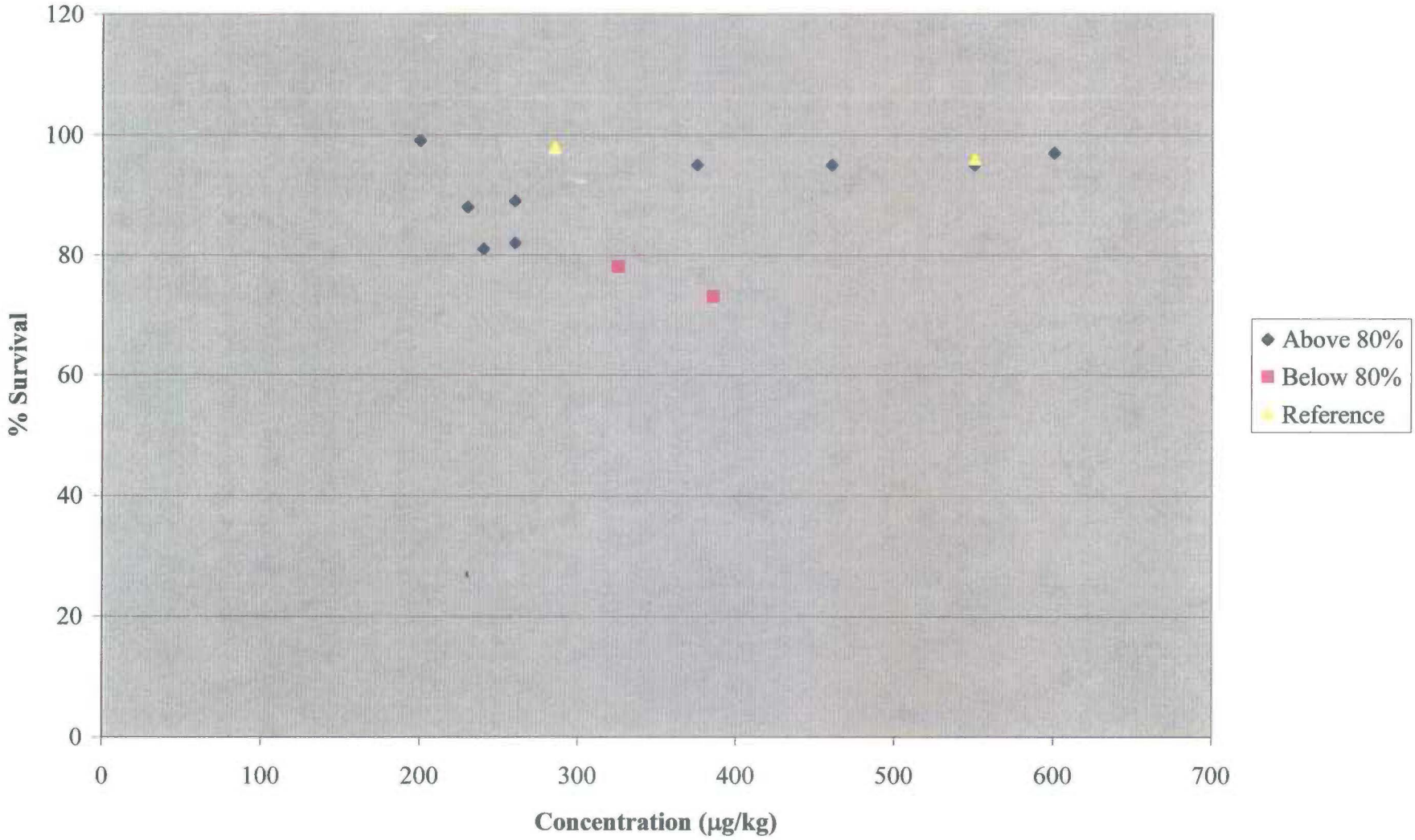

2-Methylphenol
120
100
80
60
40
20
0
% Survival
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

2-Nitroaniline

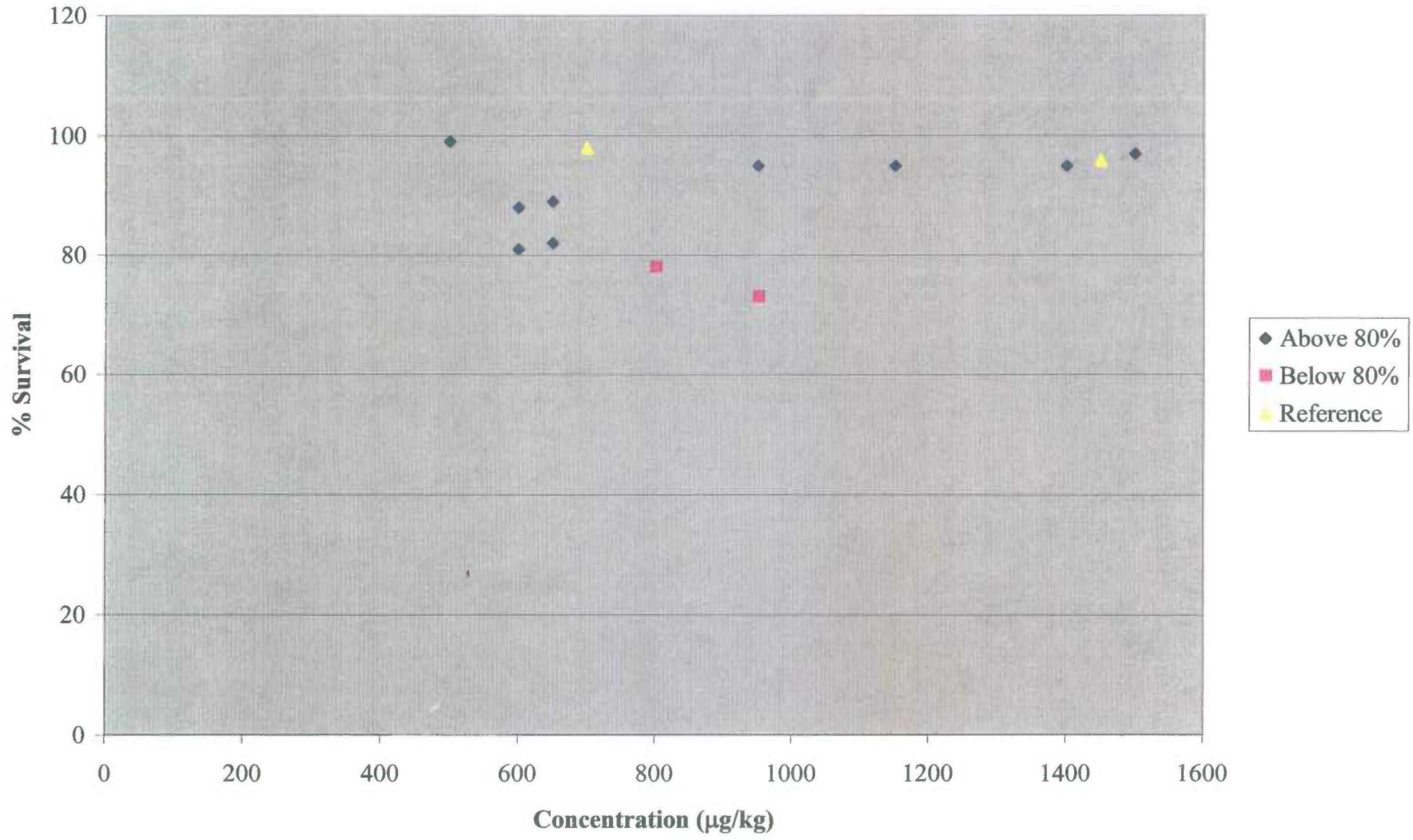



2-Nitrophenol
120
100
80
60
40
20
0
% Survival
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

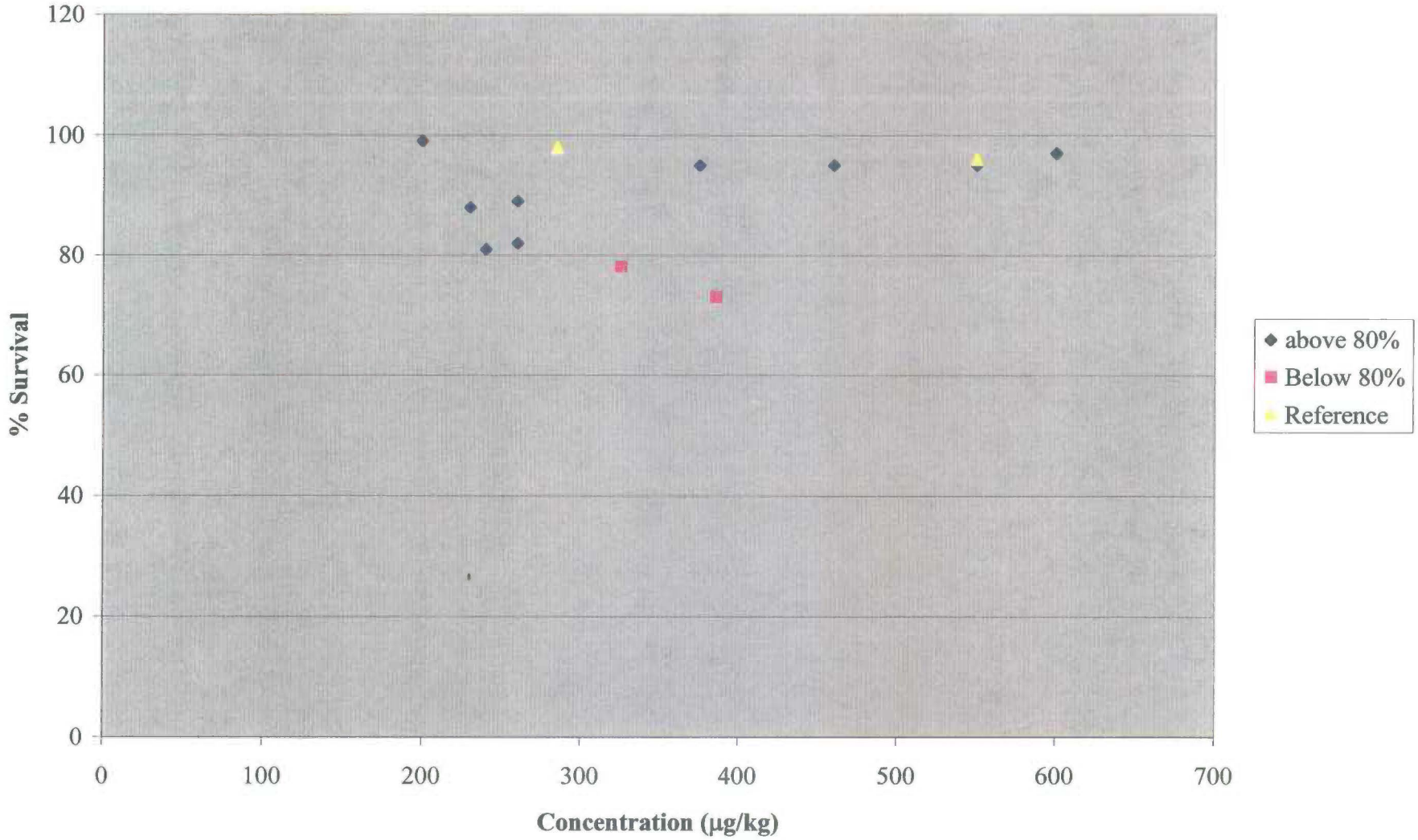
3,3'-Dichlorobenzidine

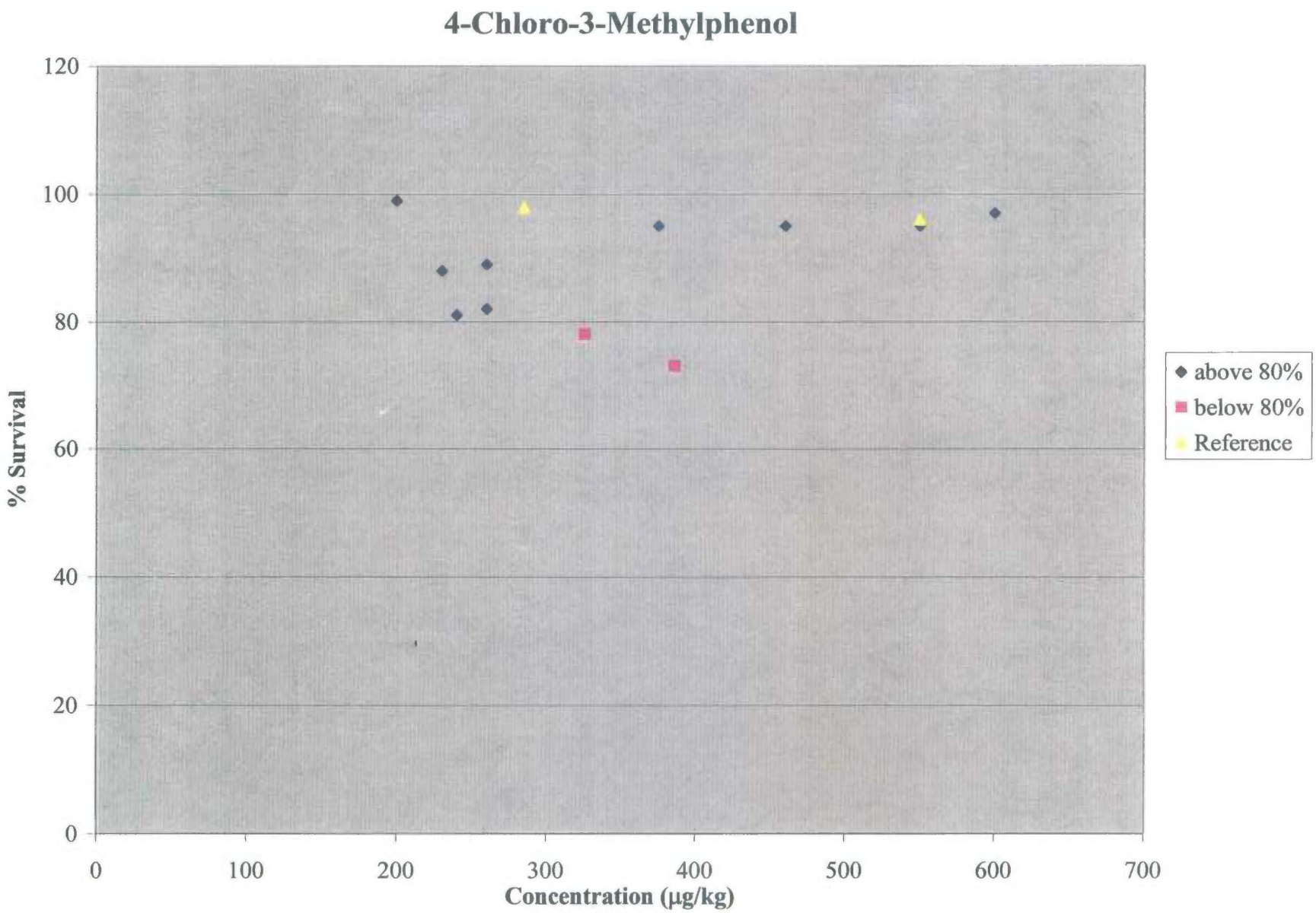


3-Nitroaniline

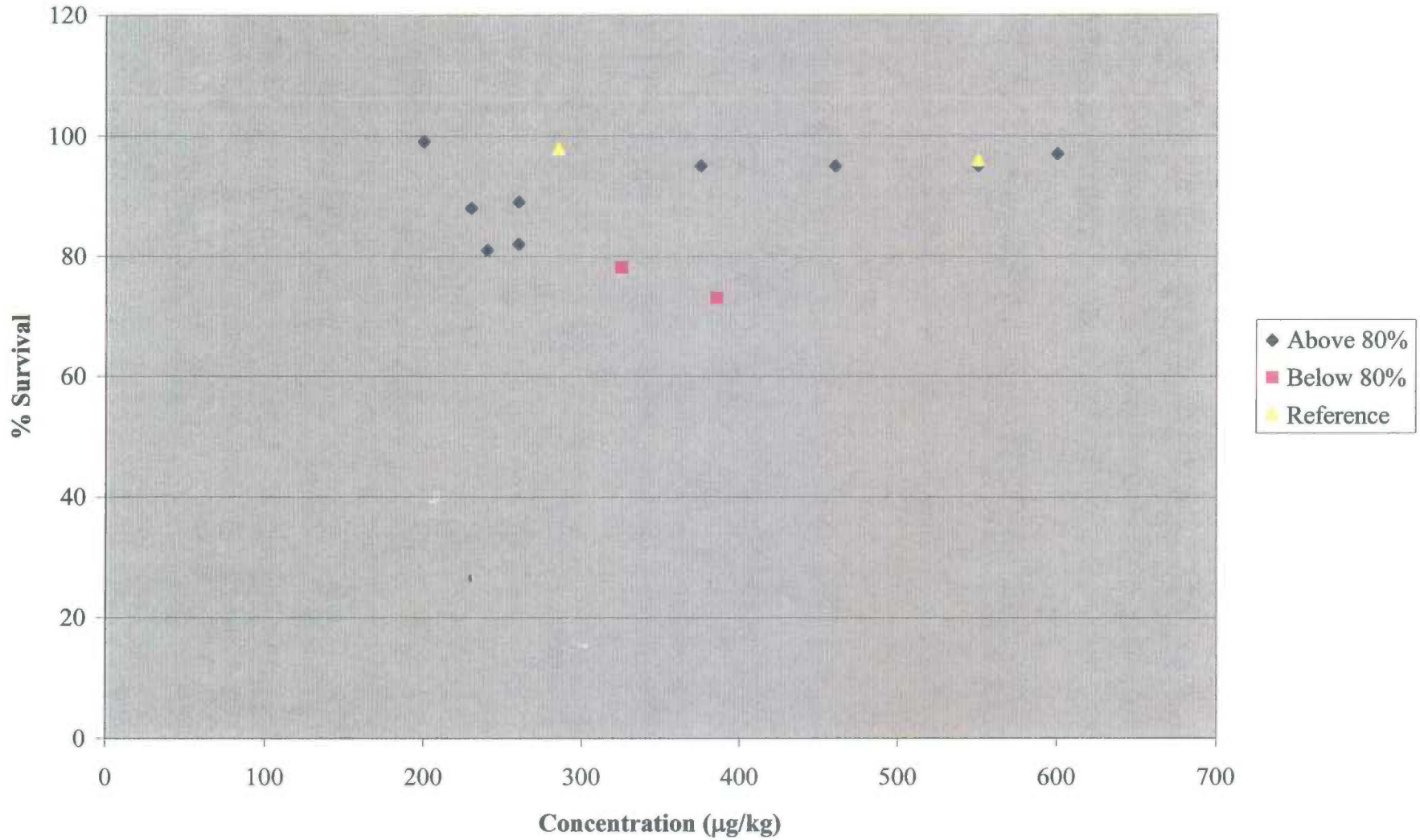


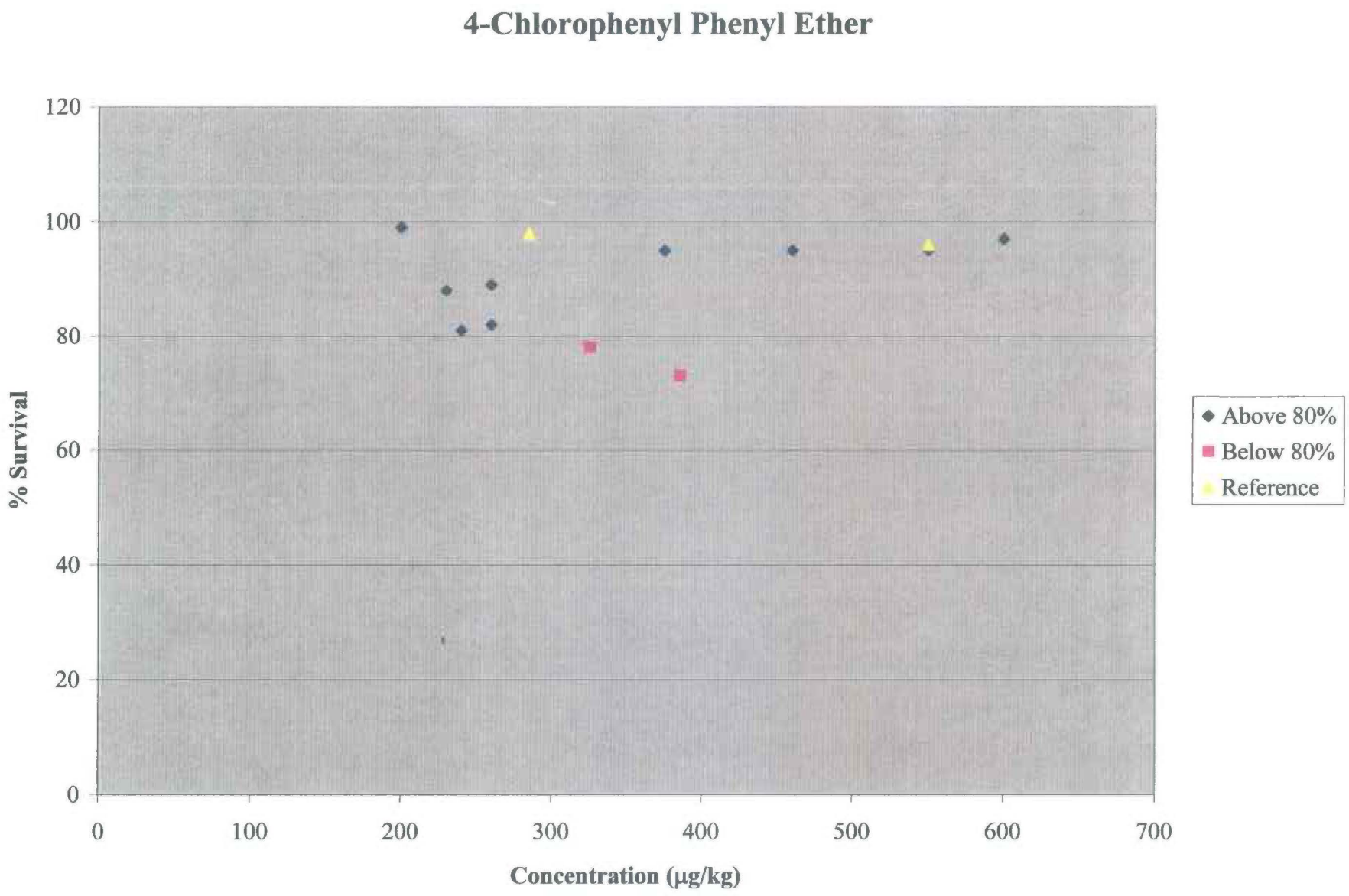
4-Bromophenyl Phenyl Ether

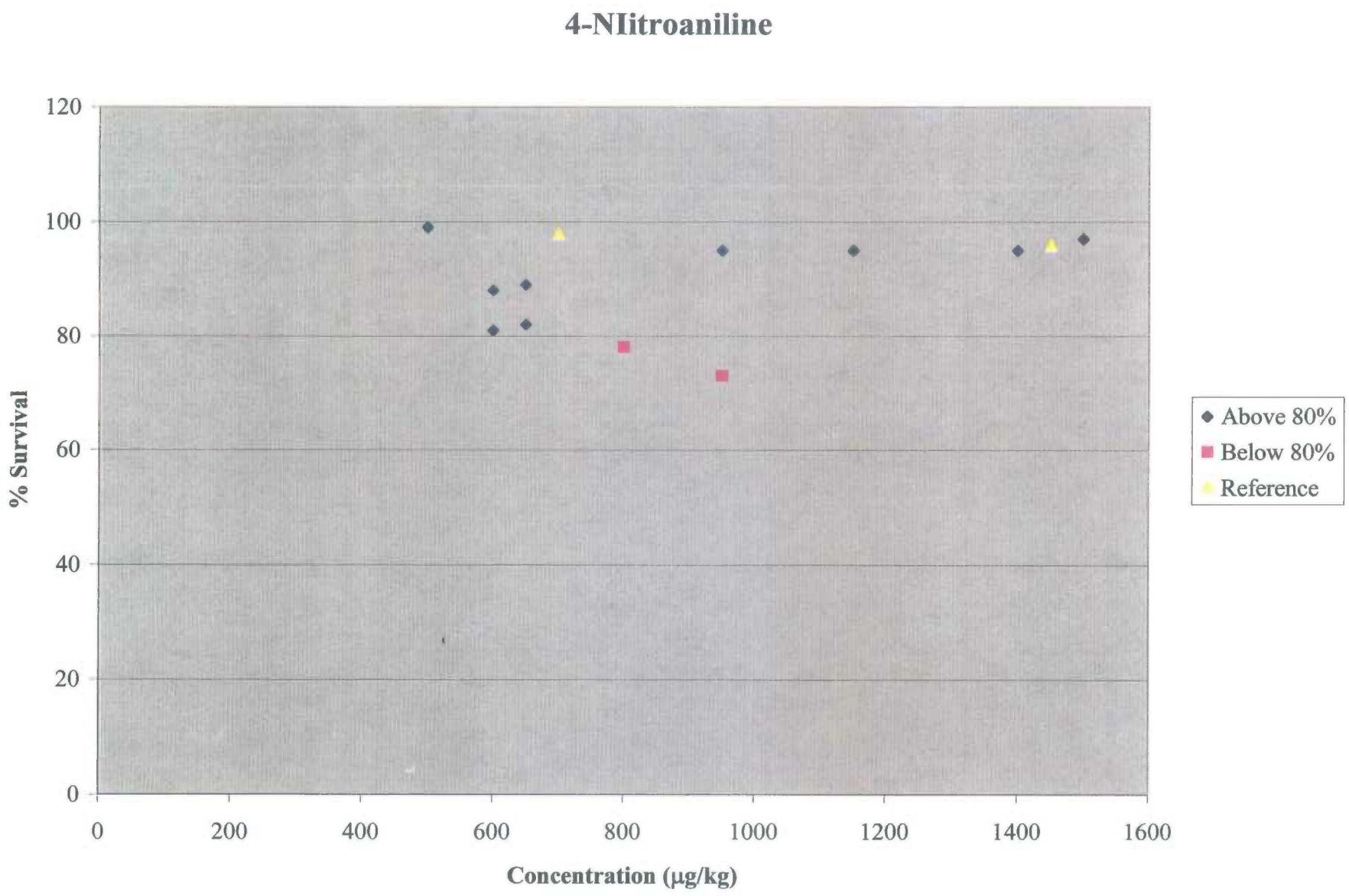



4-Chloro-3-Methylphenol
% Survival
120
100
80
60
40
20
0
0
100
200
300
400
500
600
700
Concentration (µg/kg)
above 80%
below 80%
Reference

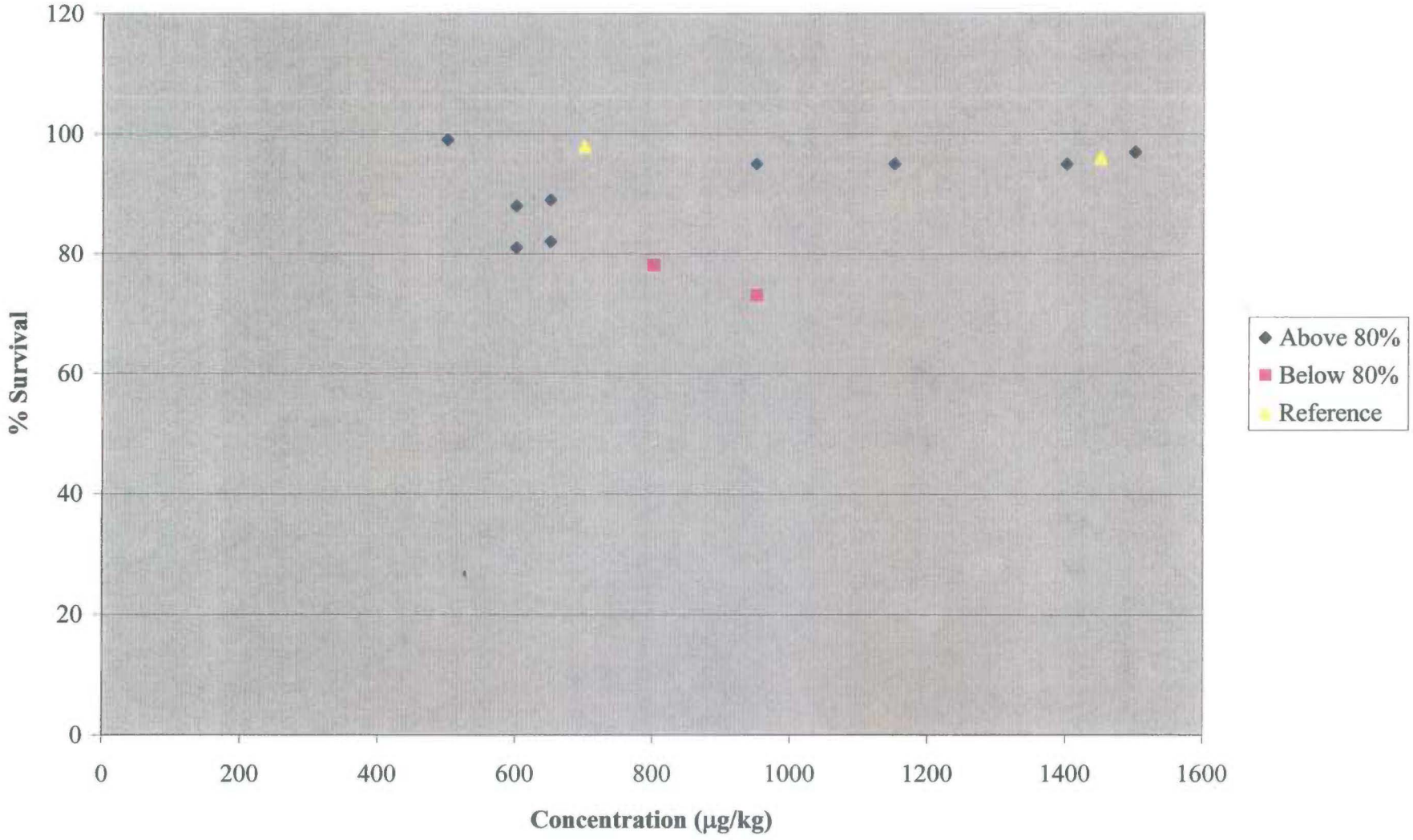
4-Chloroaniline

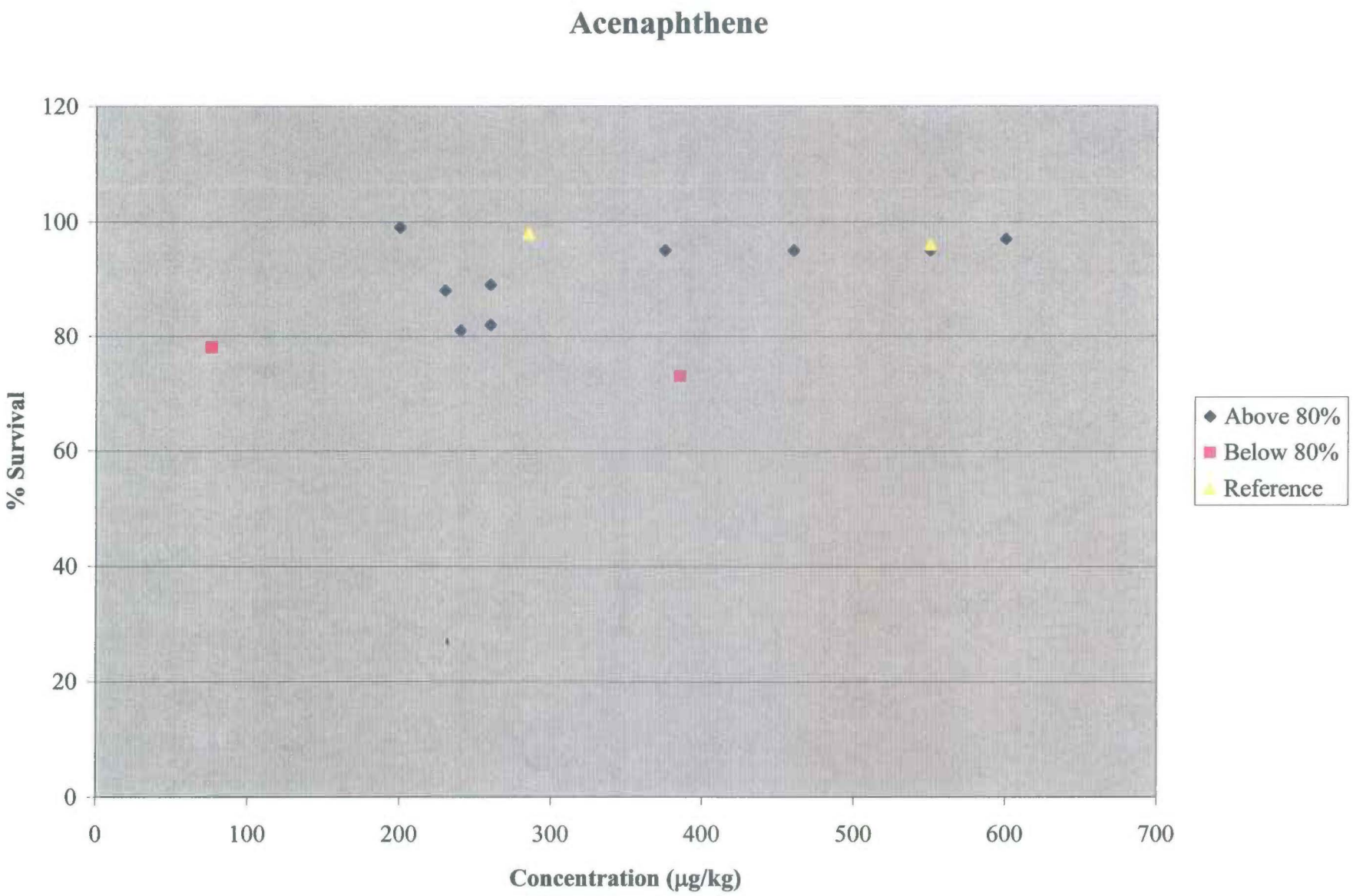


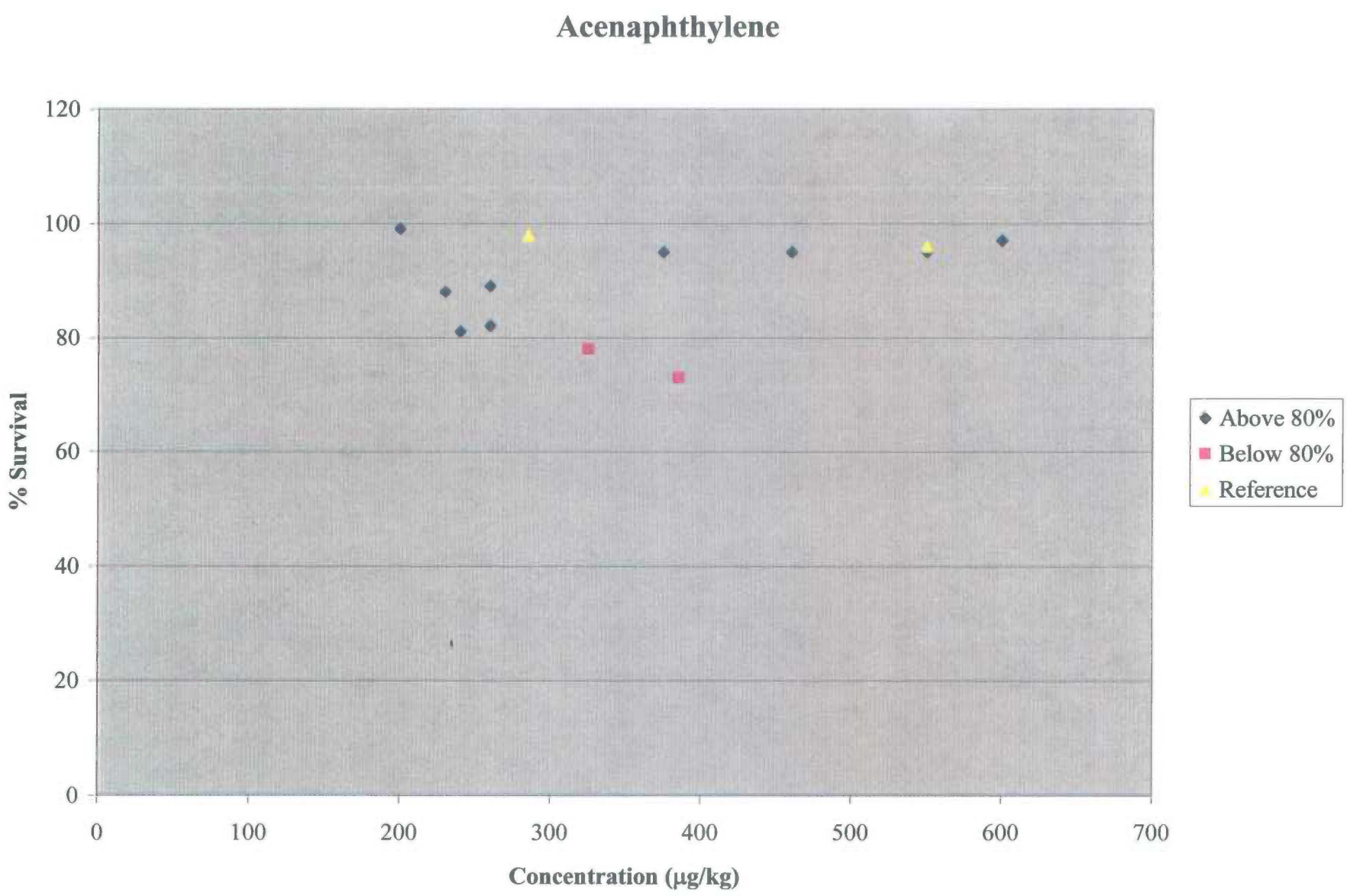

4-Chlorophenyl Phenyl Ether
% Survival
120
100
80
60
40
20
0
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

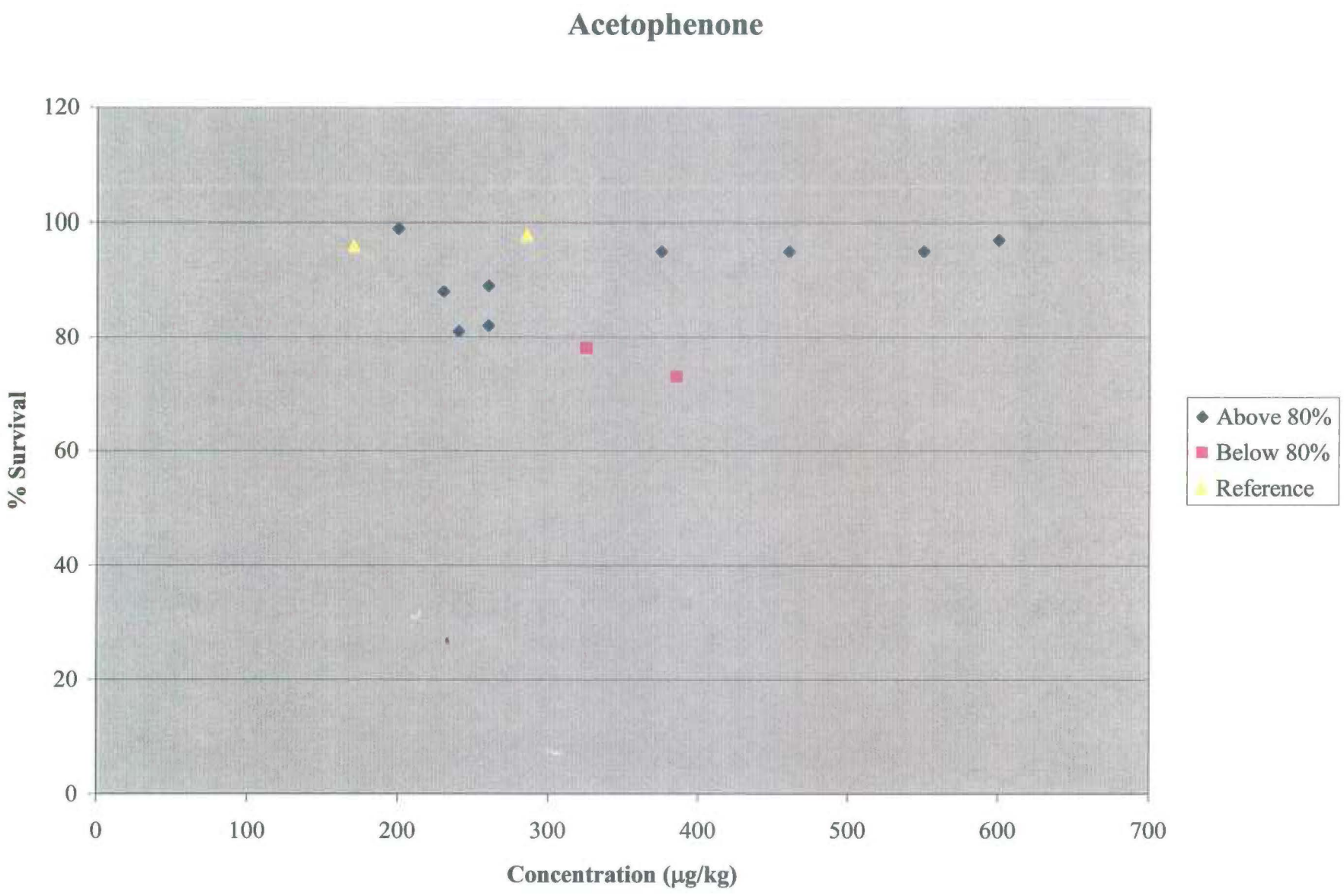

4-NIitroaniline
120
100
80
60
40
20
0
% Survival
0
200
400
600
800
1000
1200
1400
1600
Concentration (µg/kg)
Above 80%
Below 80%
Reference

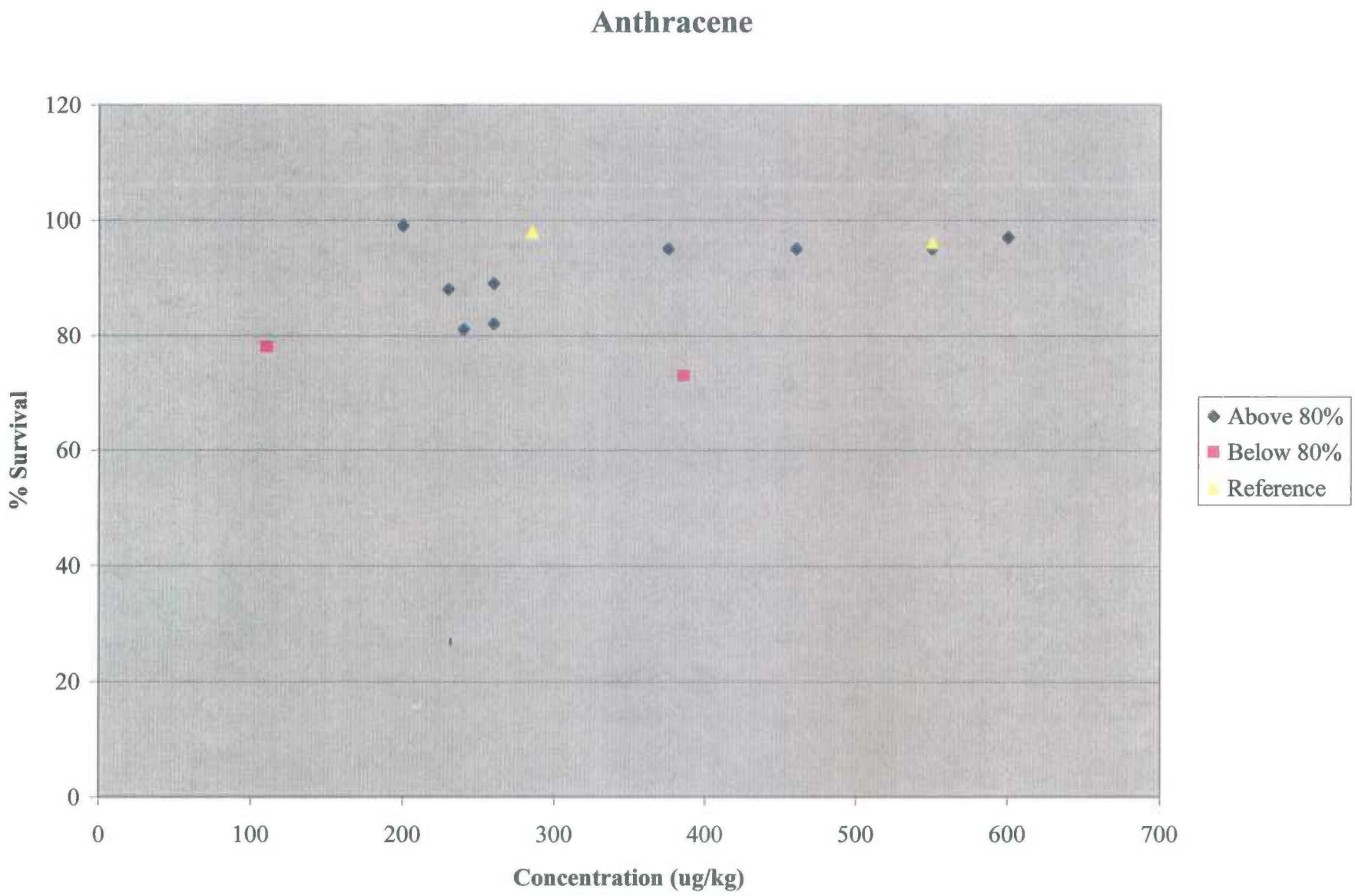
4-Nitrophenol

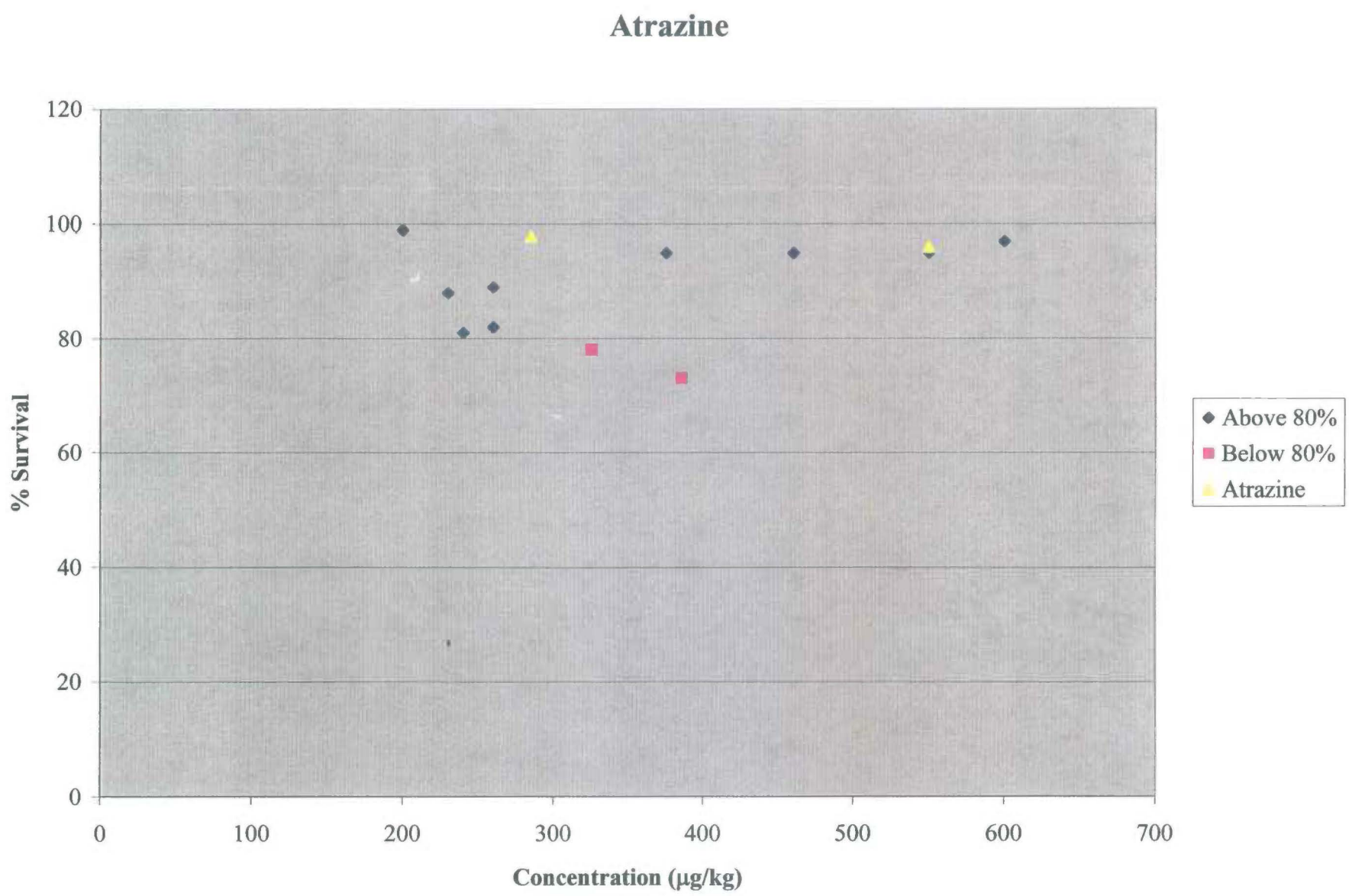


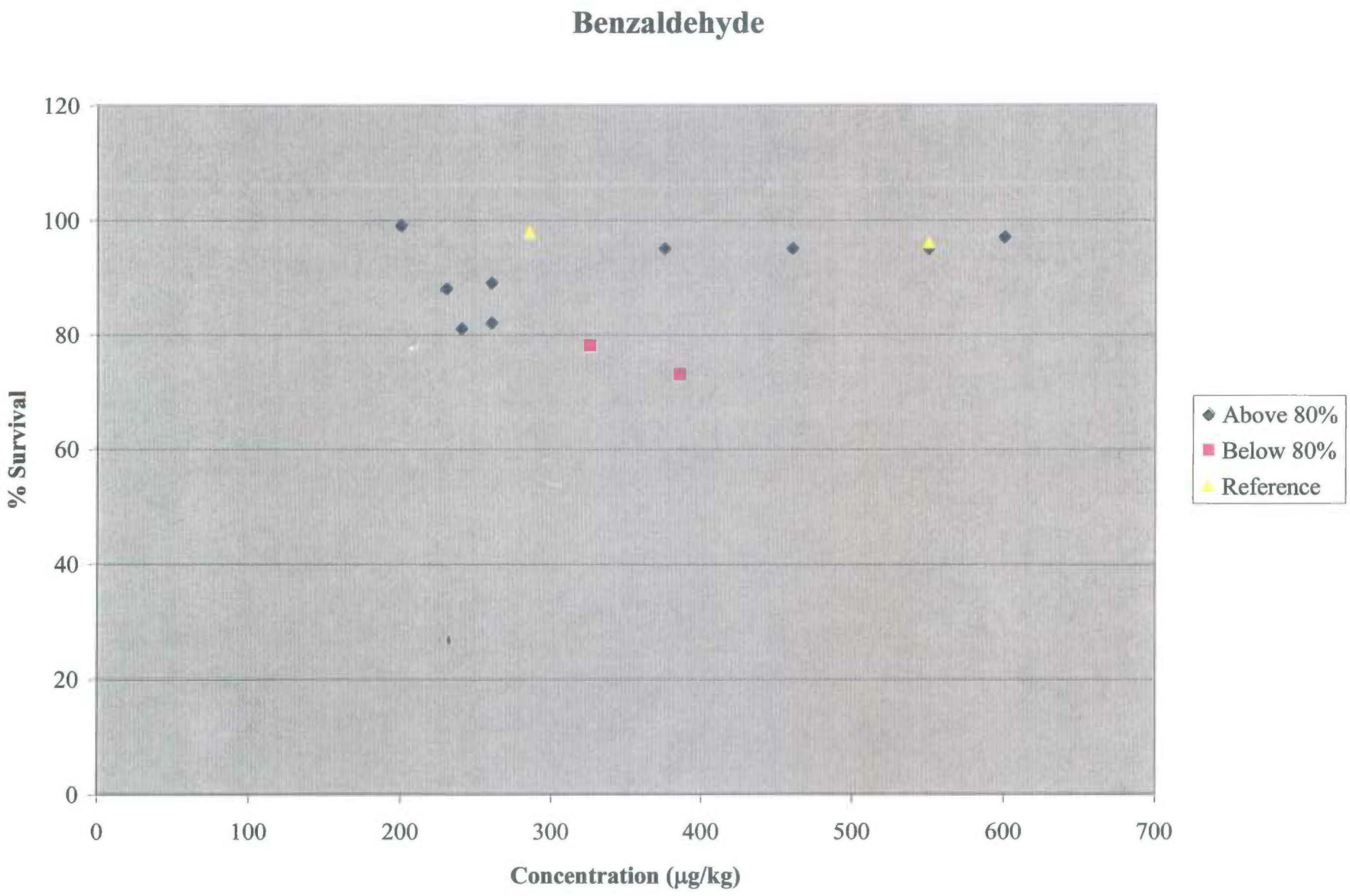

Acenaphthene
120
100
80
60
40
20
0
% Survival
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

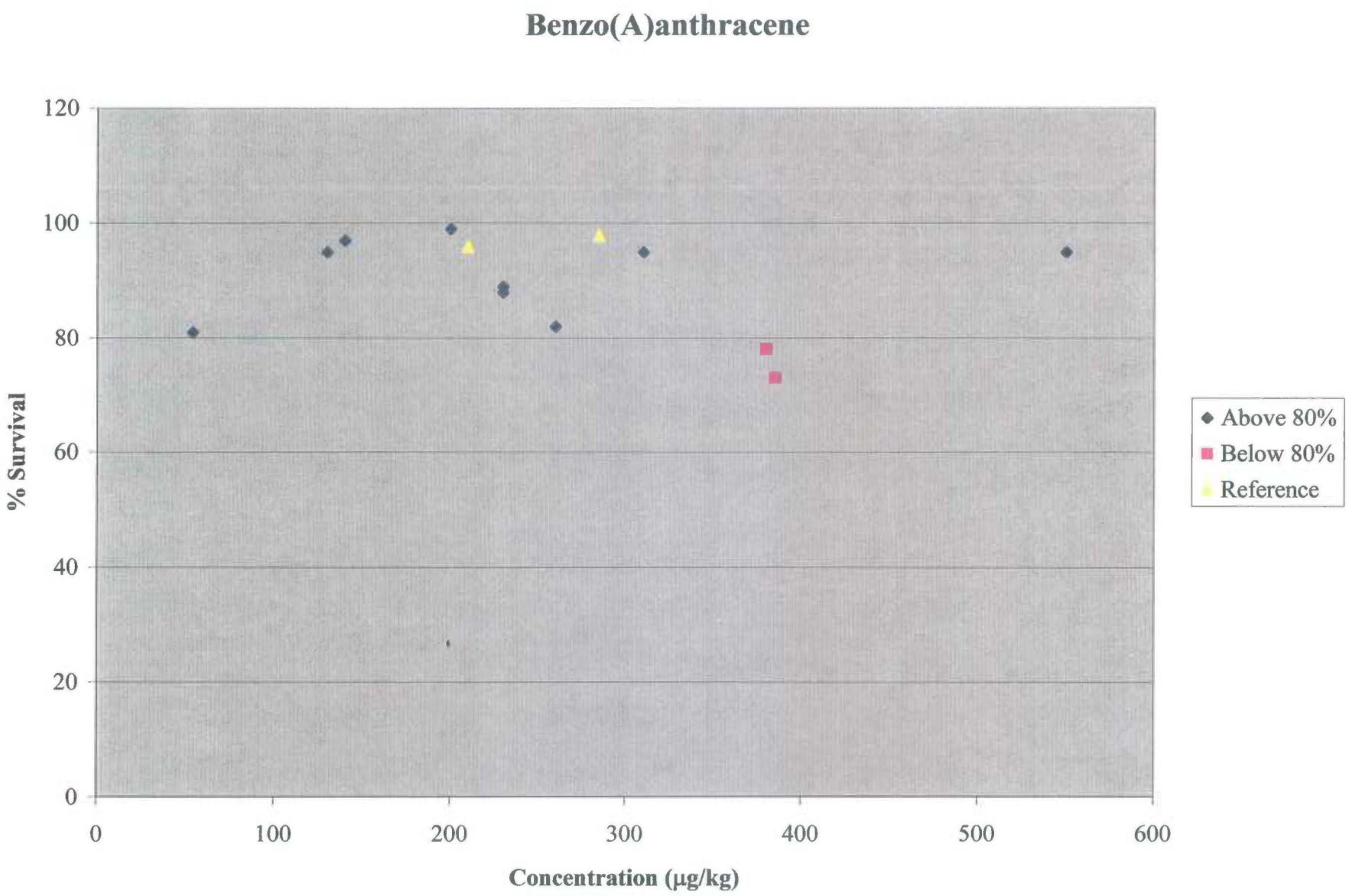

Acenaphthylene
120
100
80
60
40
20
0
% Survival
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

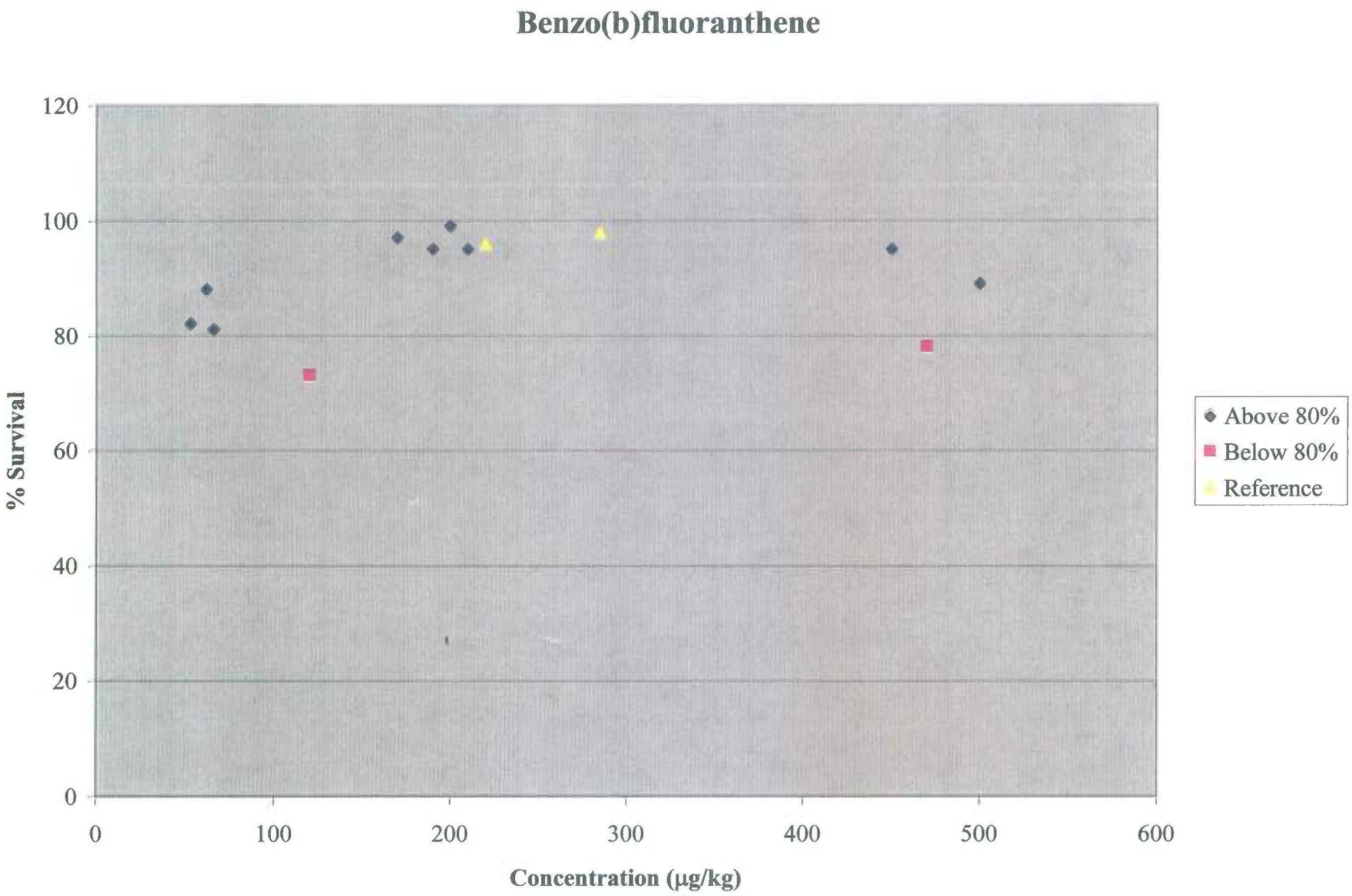

Acetophenone
120
100
80
60
40
20
0
% Survival
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

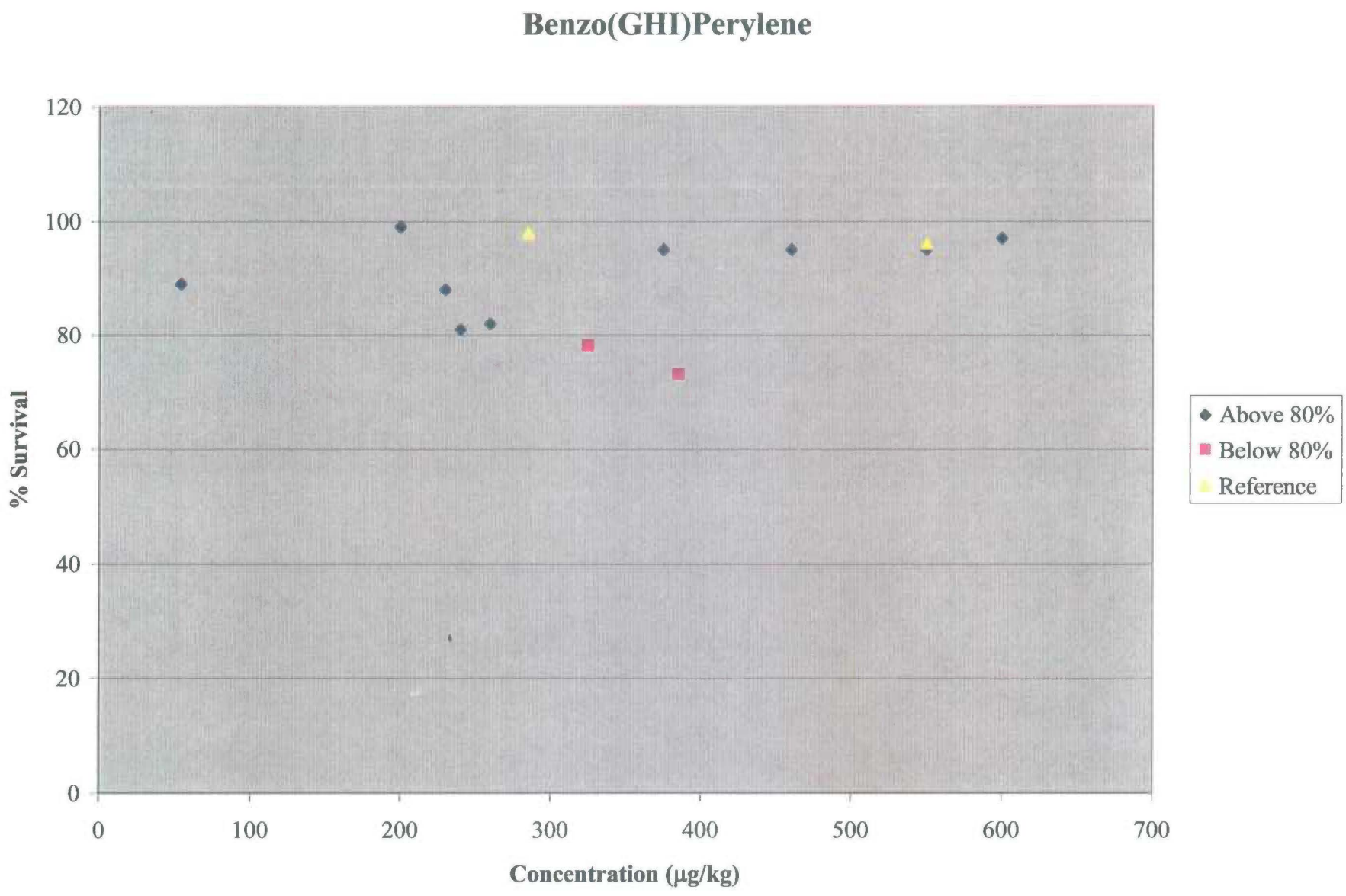

Anthracene
% Survival
120
100
80
60
40
20
0
0
100
200
300
400
500
600
700
Concentration (ug/kg)
Above 80%
Below 80%
Reference

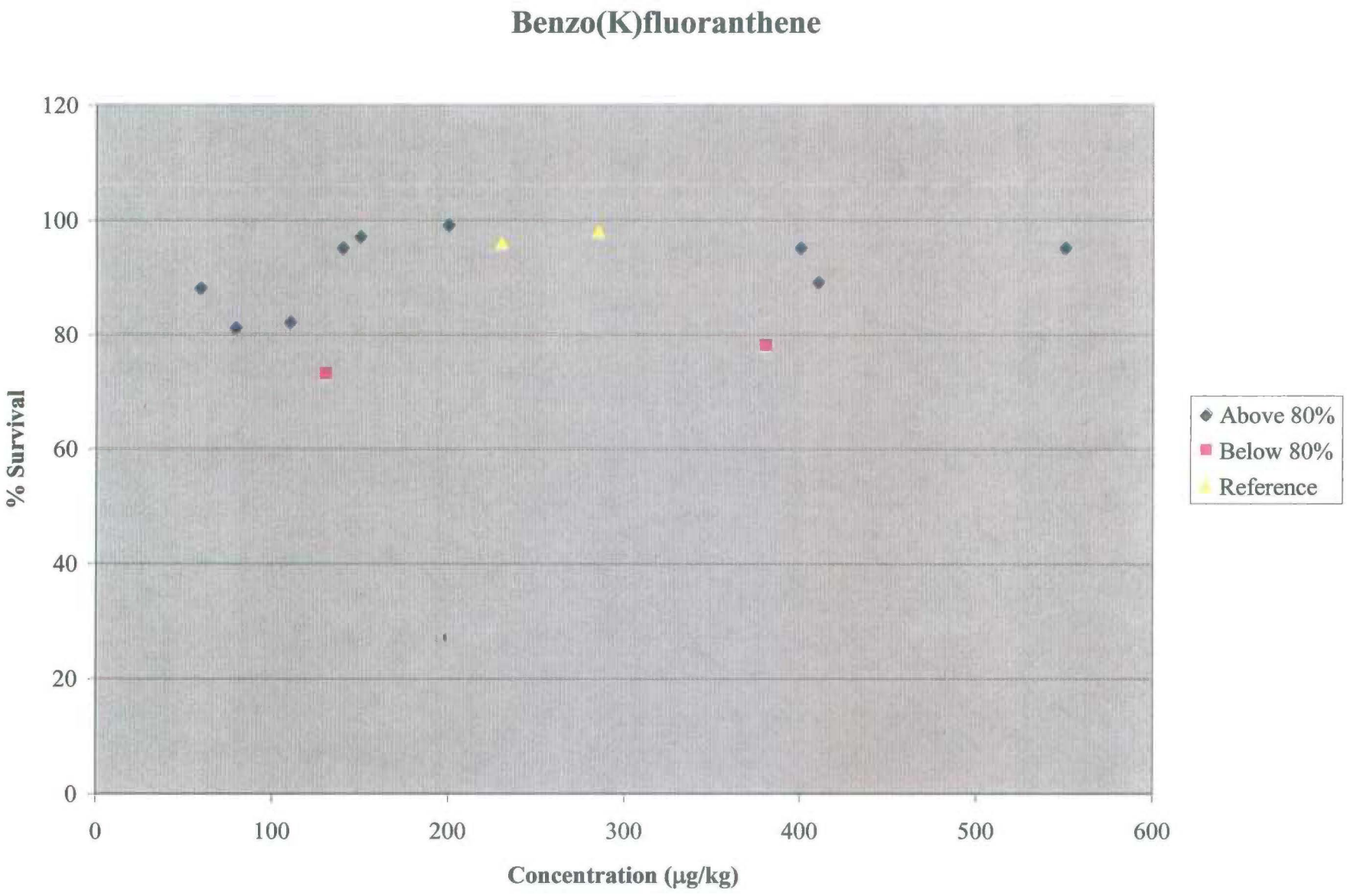

Atrazine
120
100
80
60
40
20
0
% Survival
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Atrazine

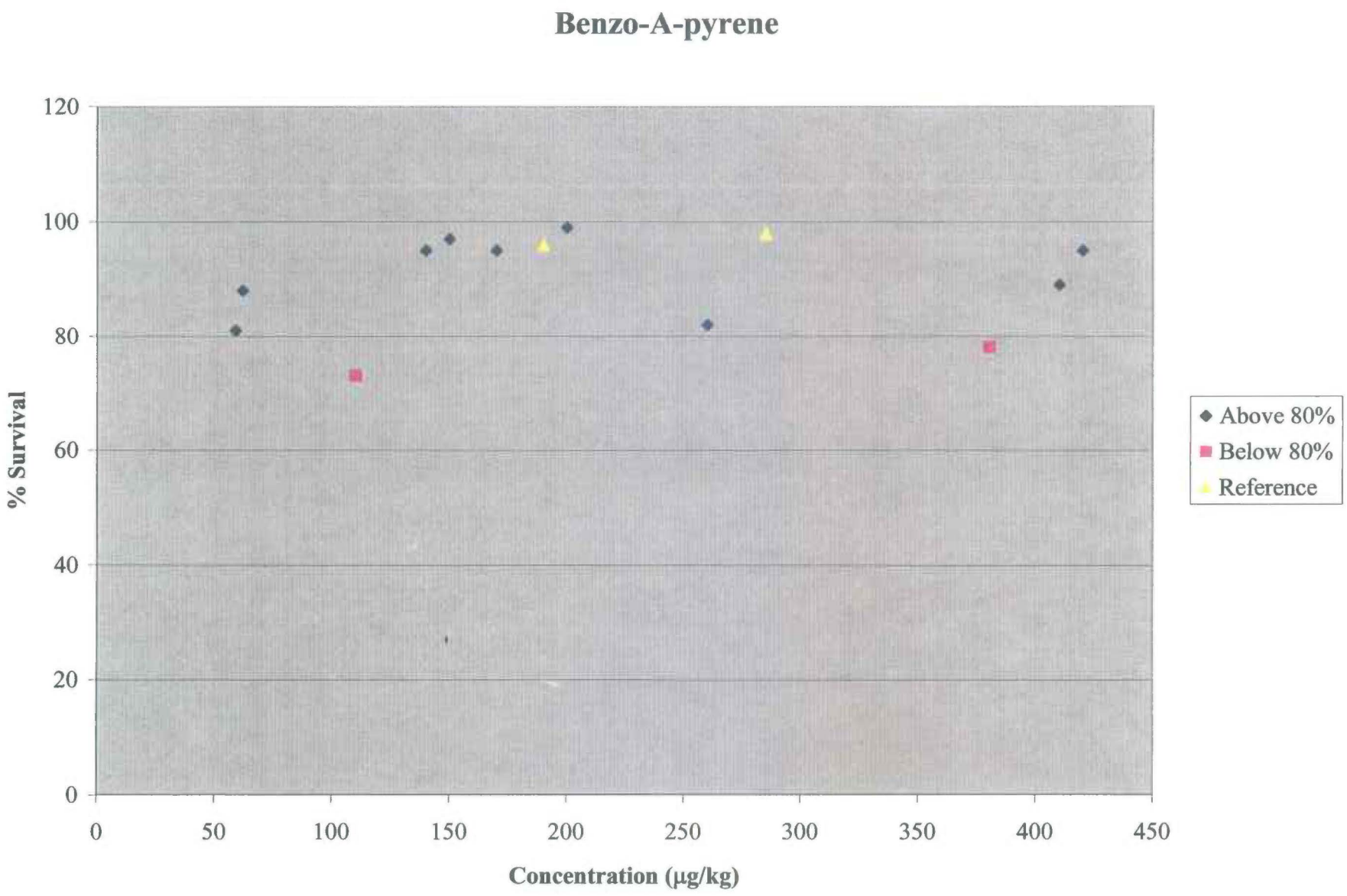

Benzaldehyde
120
100
80
60
40
20
0
% Survival
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

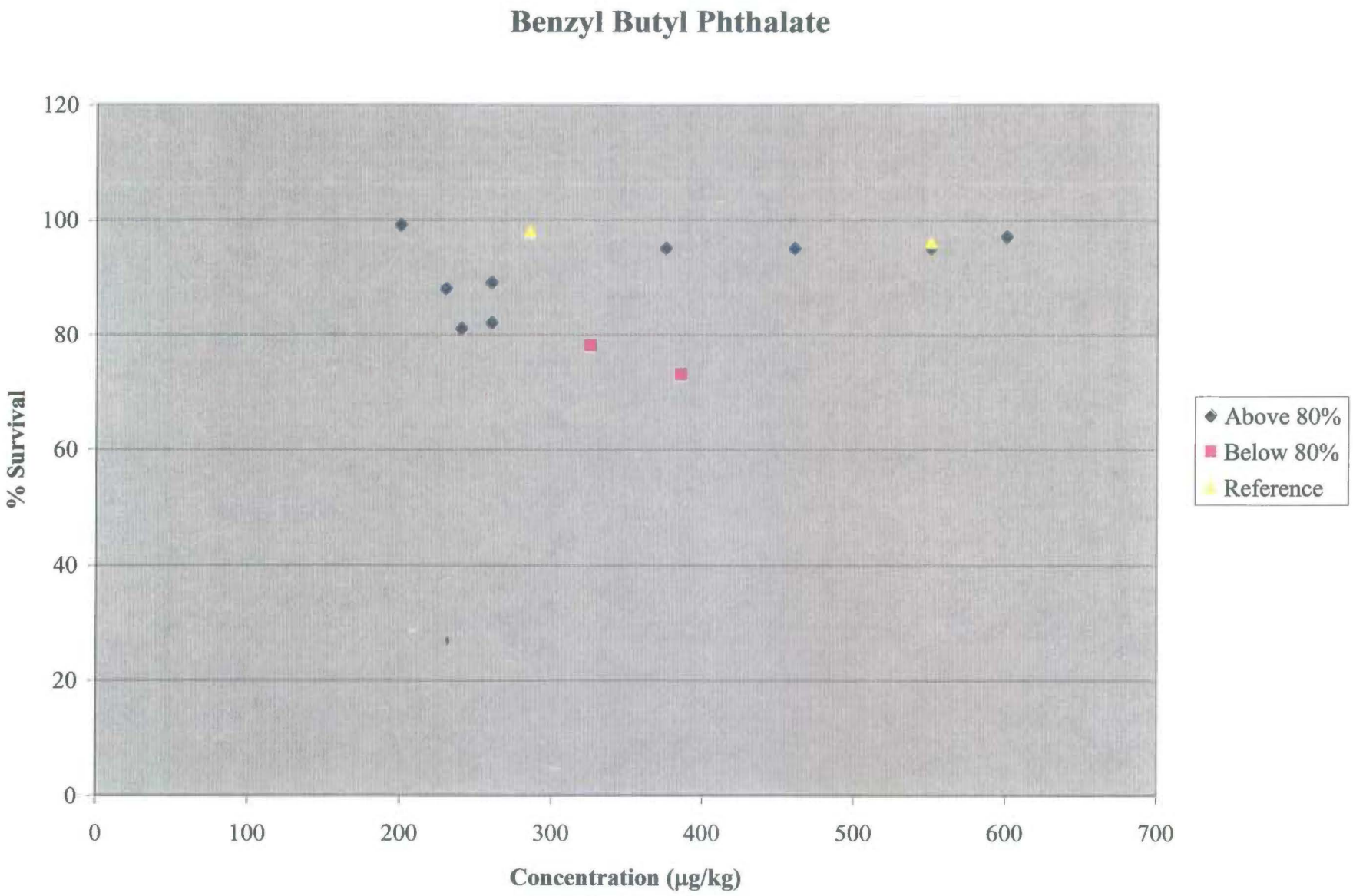

Benzo(A)anthracene
120
100
80
60
40
20
0
% Survival
0
100
200
300
400
500
600
Concentration (µg/kg)
Above 80%
Below 80%
Reference


Benzo(b)fluoranthene
% Survival
120
100
80
60
40
20
0
0
100
200
300
400
500
600
Concentration (µg/kg)
Above 80%
Below 80%
Reference

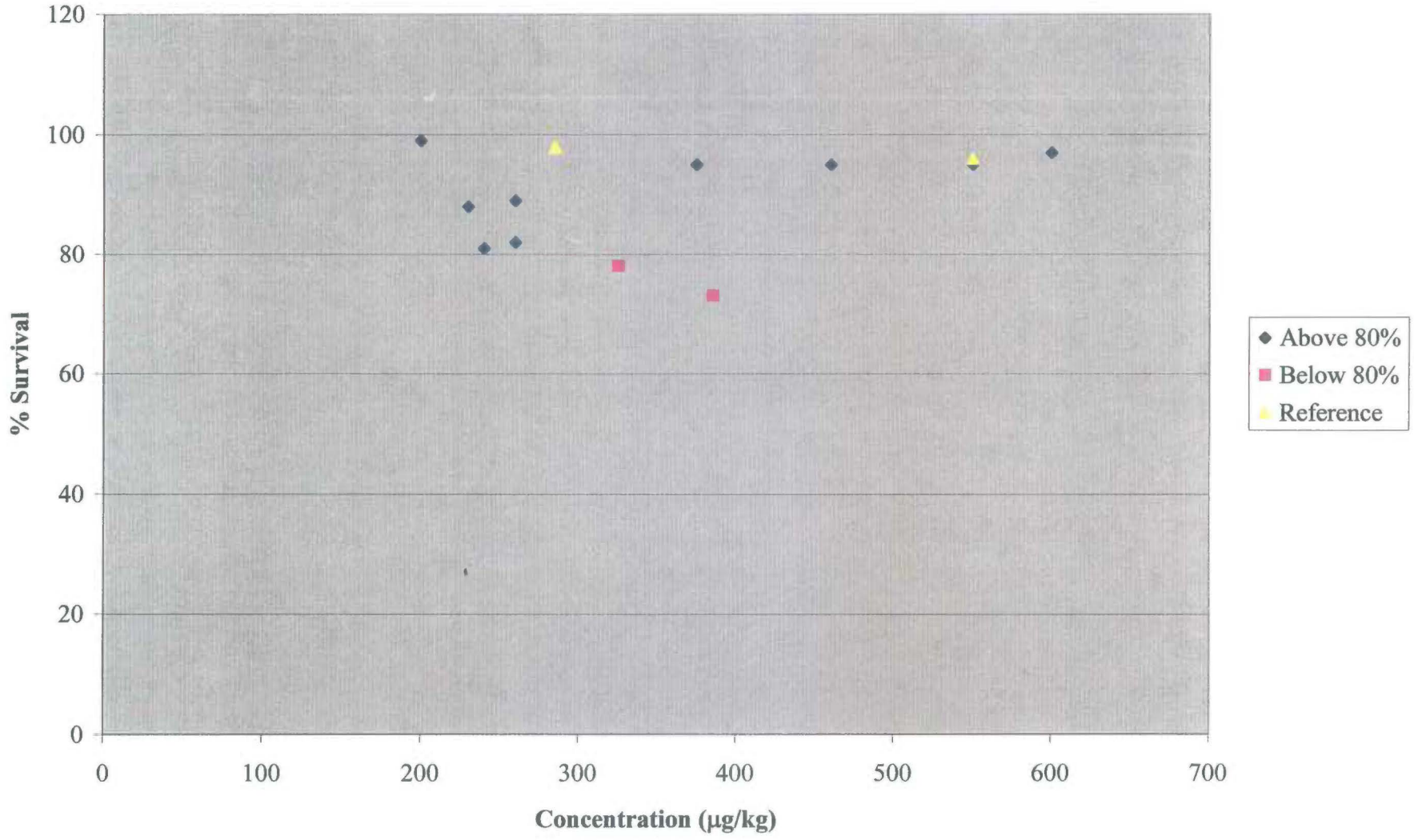

Benzo(GHI)Perylene
% Survival
120
100
80
60
40
20
0
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

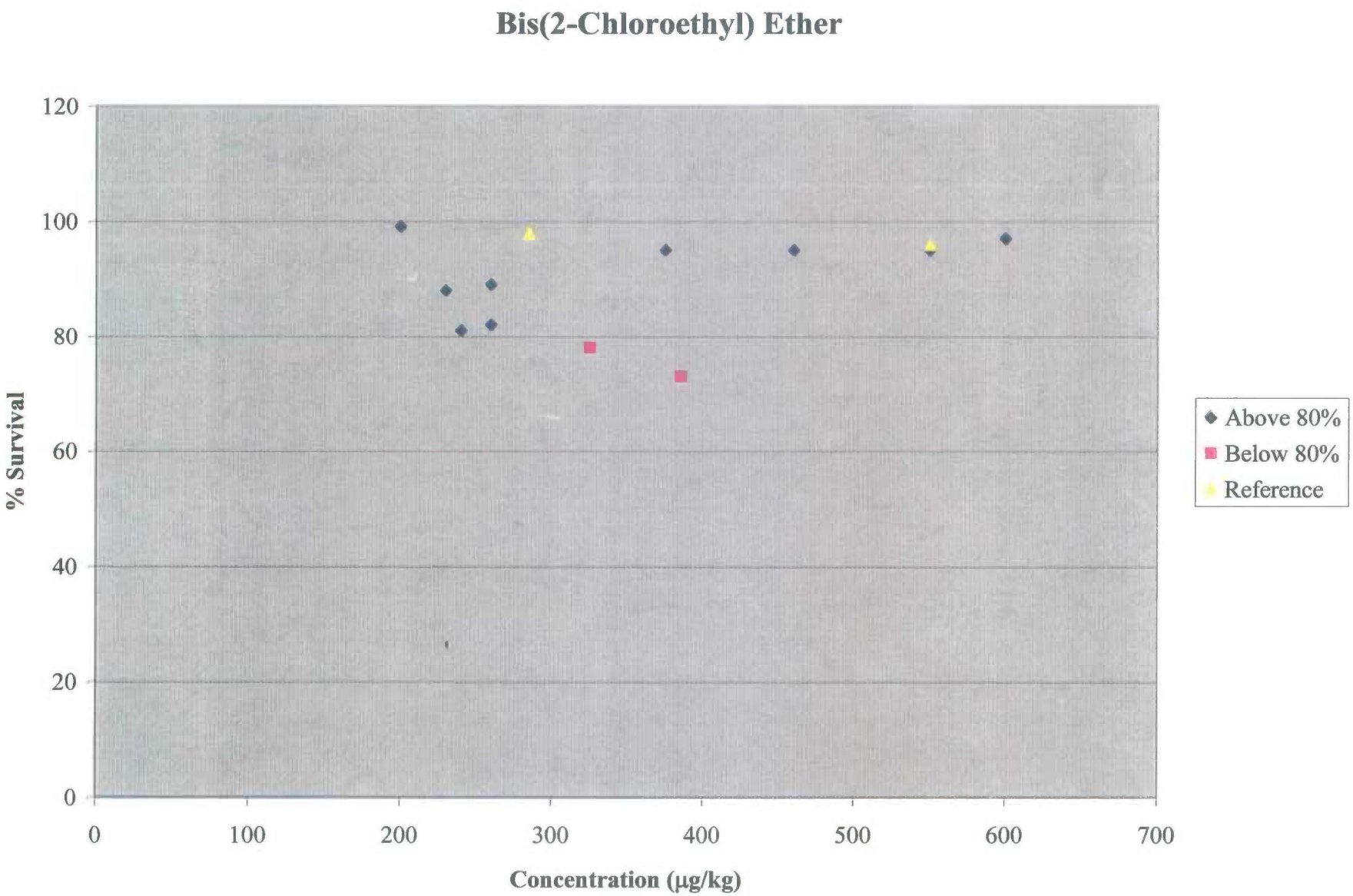

Benzo(K)fluoranthene
120
100
80
60
40
20
0
% Survival
0
100
200
300
400
500
600
Concentration (µg/kg)
Above 80%
Below 80%
Reference

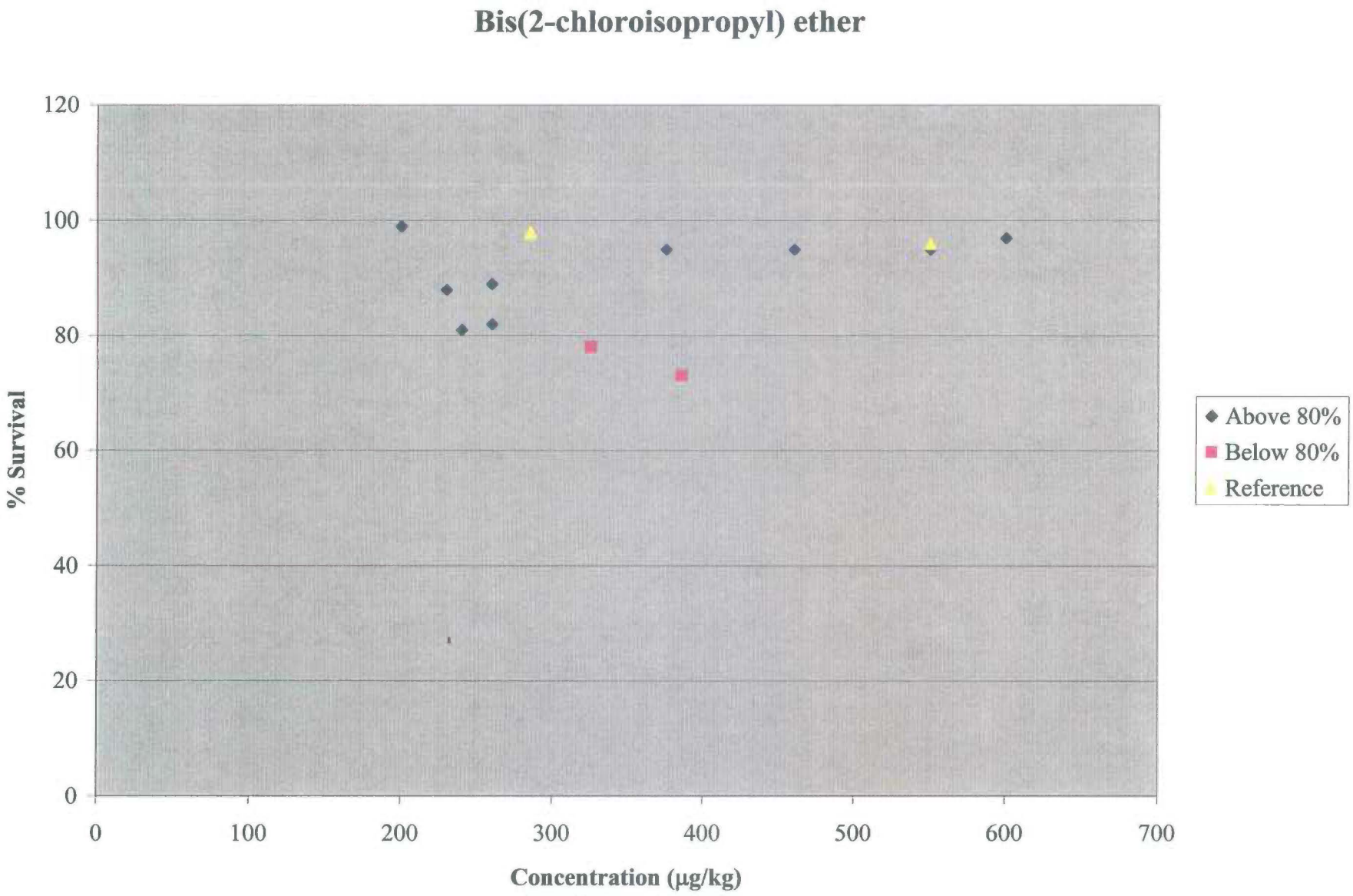

Benzo-A-pyrene
% Survival
120
100
80
60
40
20
0
0
50
100
150
200
250
300
350
400
450
Concentration (µg/kg)
Above 80%
Below 80%
Reference

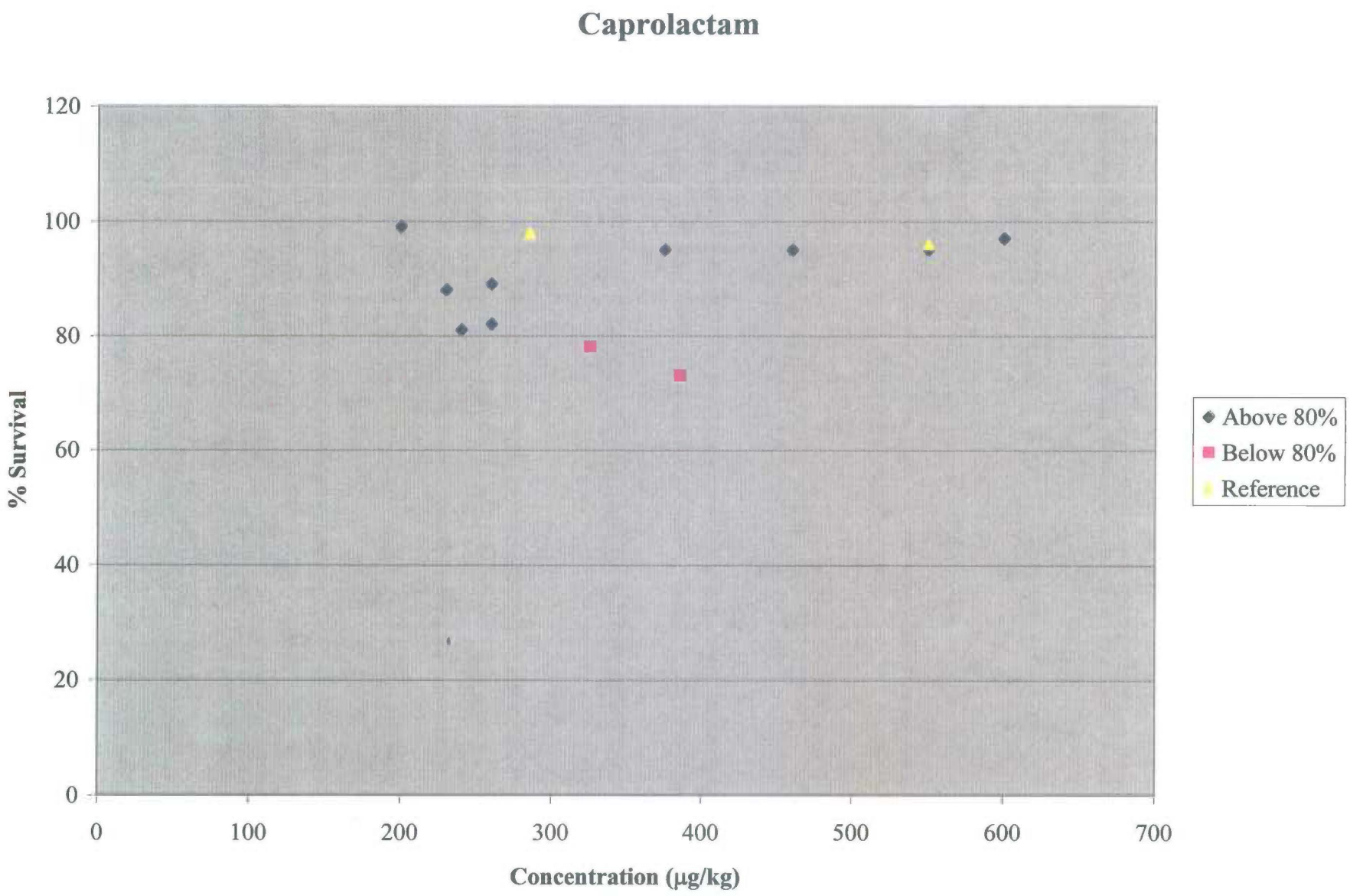

Benzyl Butyl Phthalate
% Survival
120
100
80
60
40
20
0
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

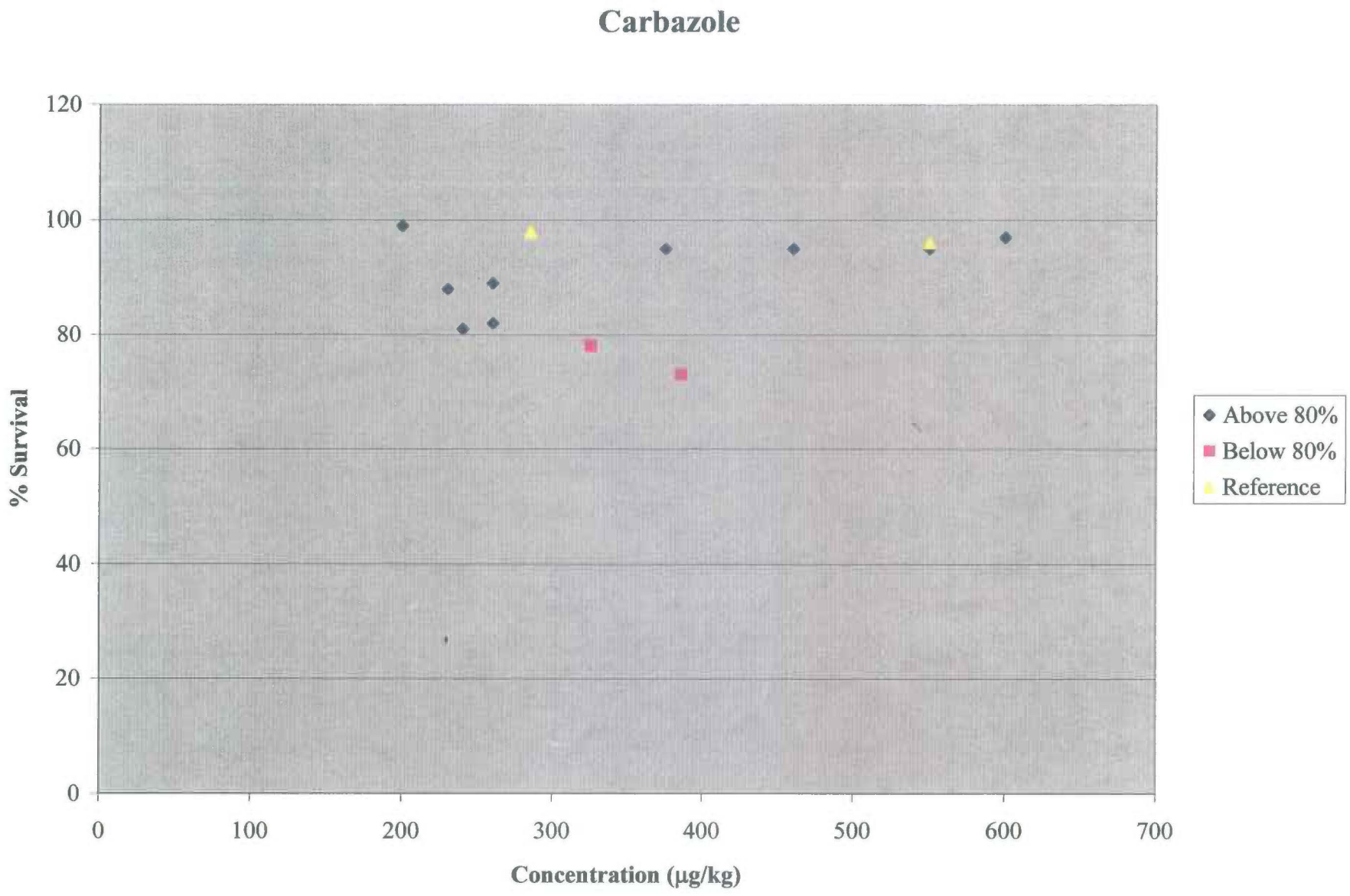
Bis(2-Chloroethoxyl)Methane

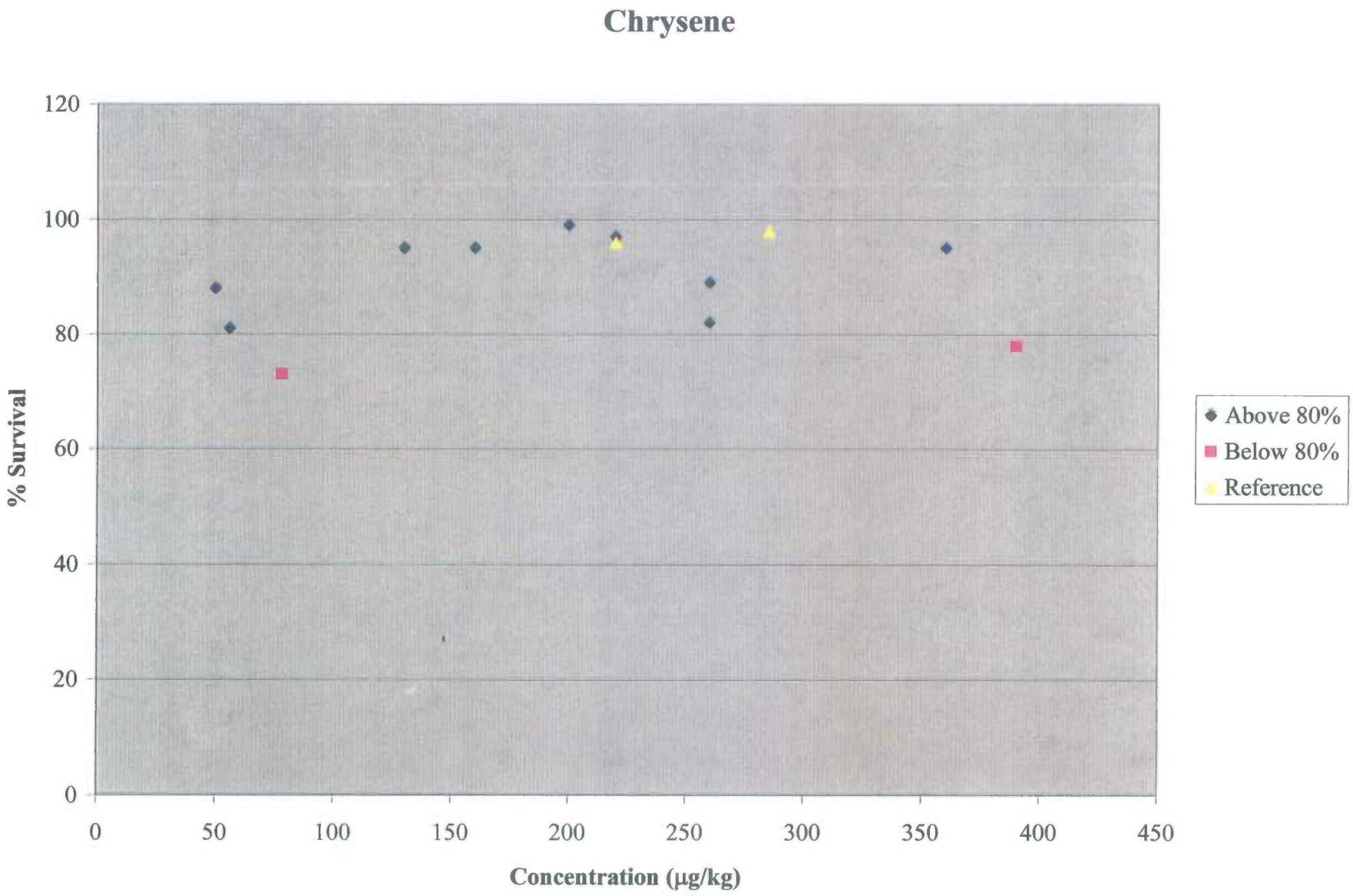


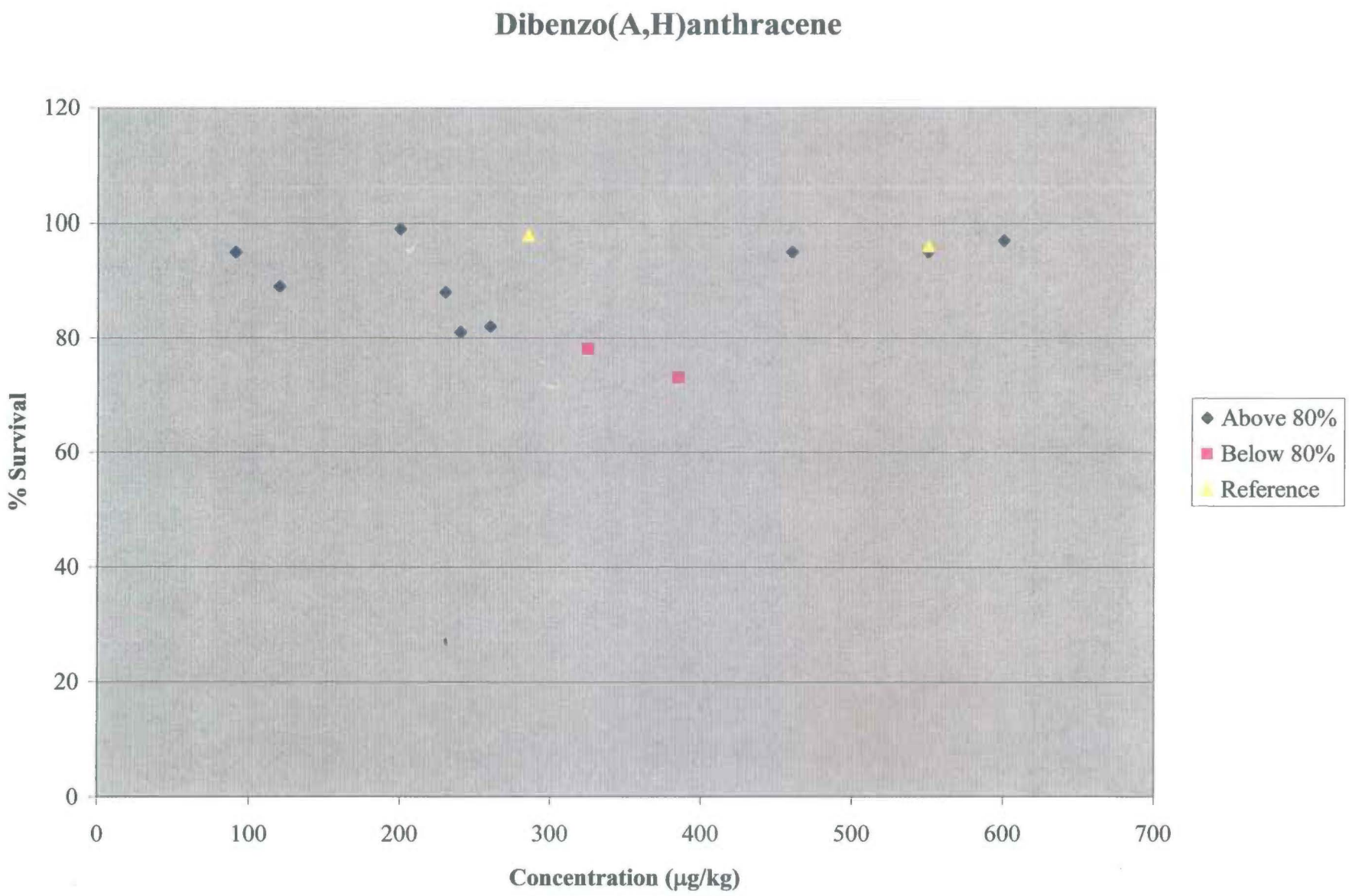

Bis(2-Chloroethyl) Ether
120
100
80
60
40
20
0
% Survival
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

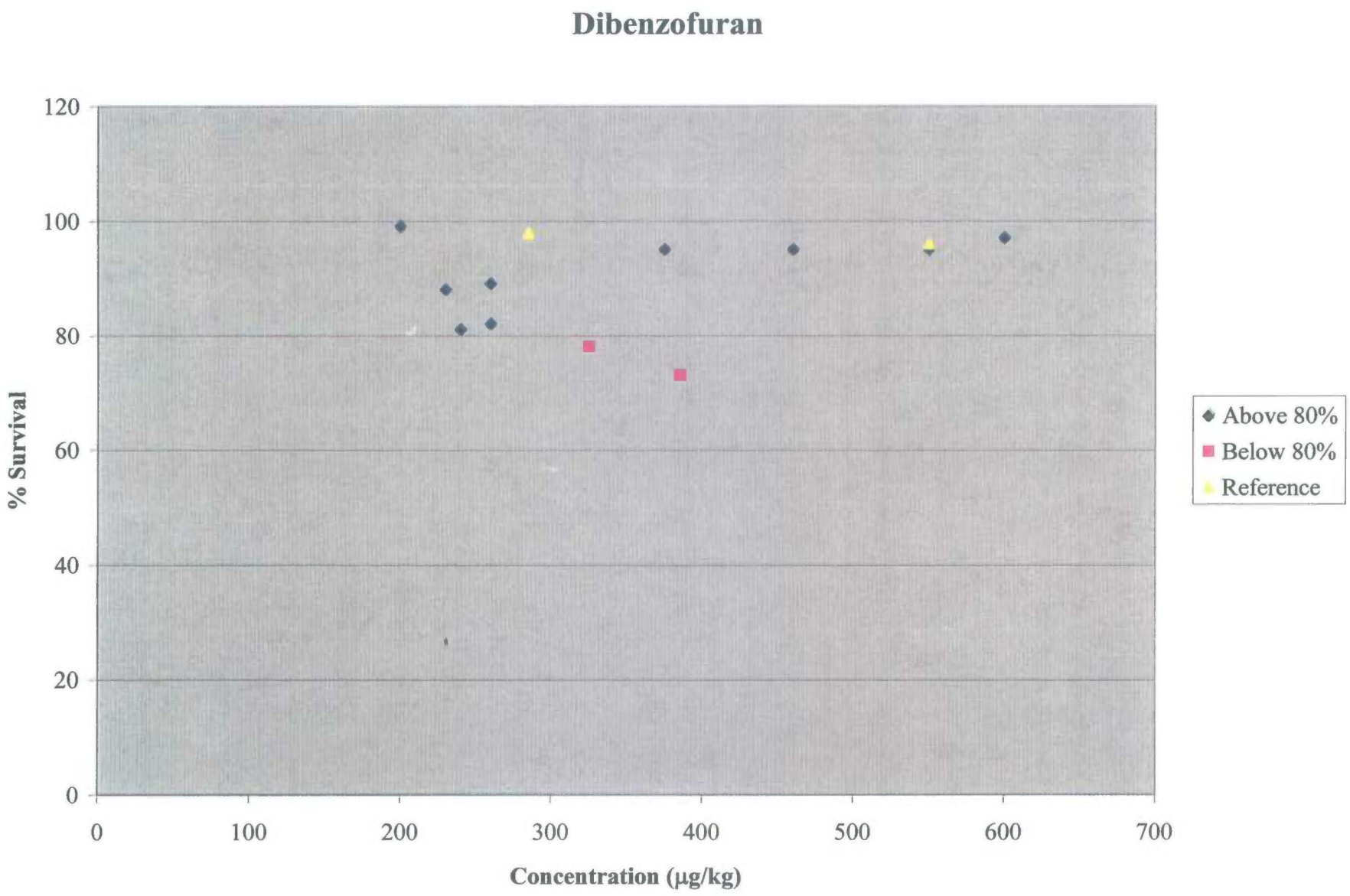

Bis(2-chloroisopropyl) ether
% Survival
120
100
80
60
40
20
0
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

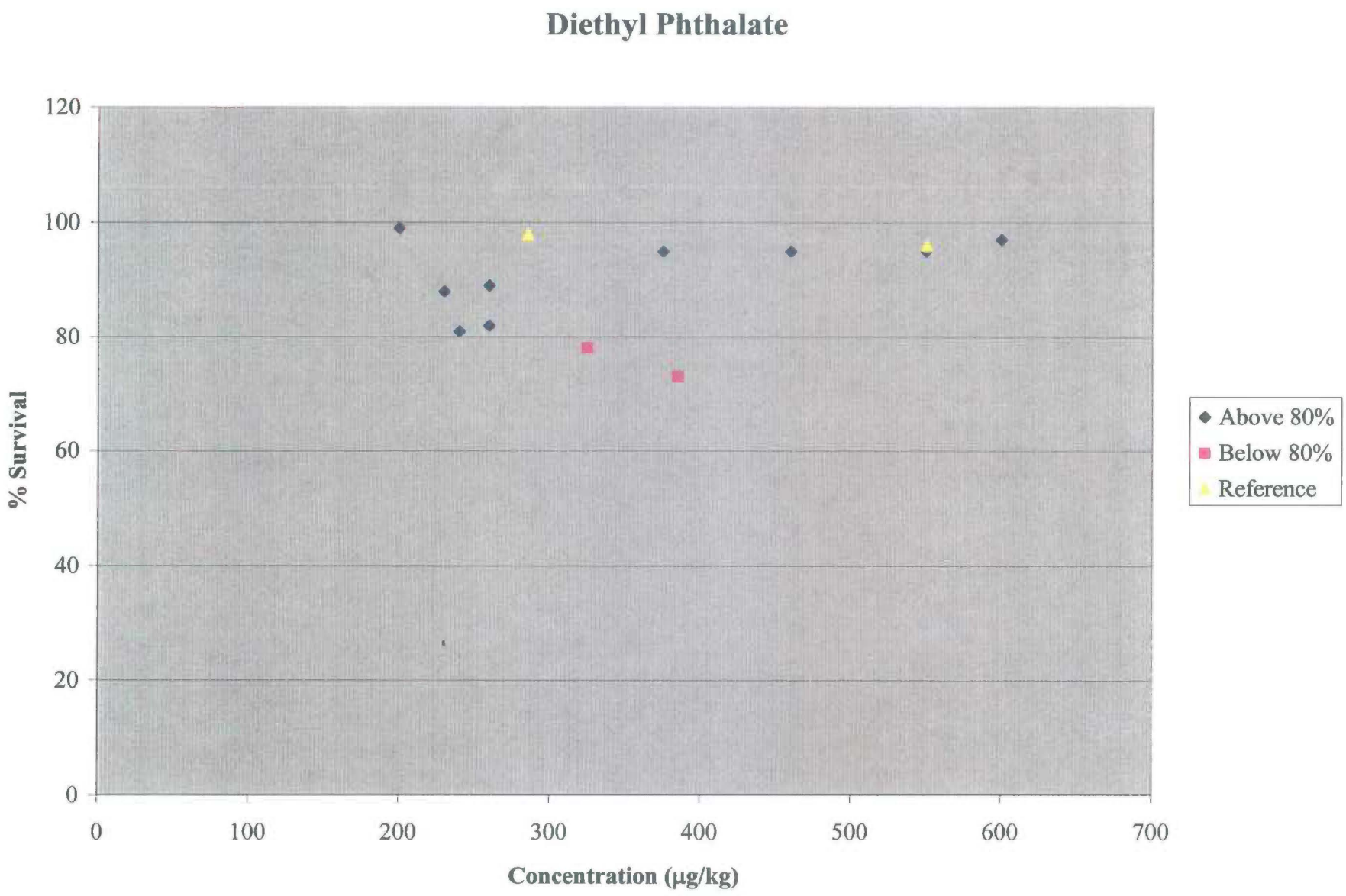

Caprolactam
120
100
80
60
40
20
0
% Survival
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

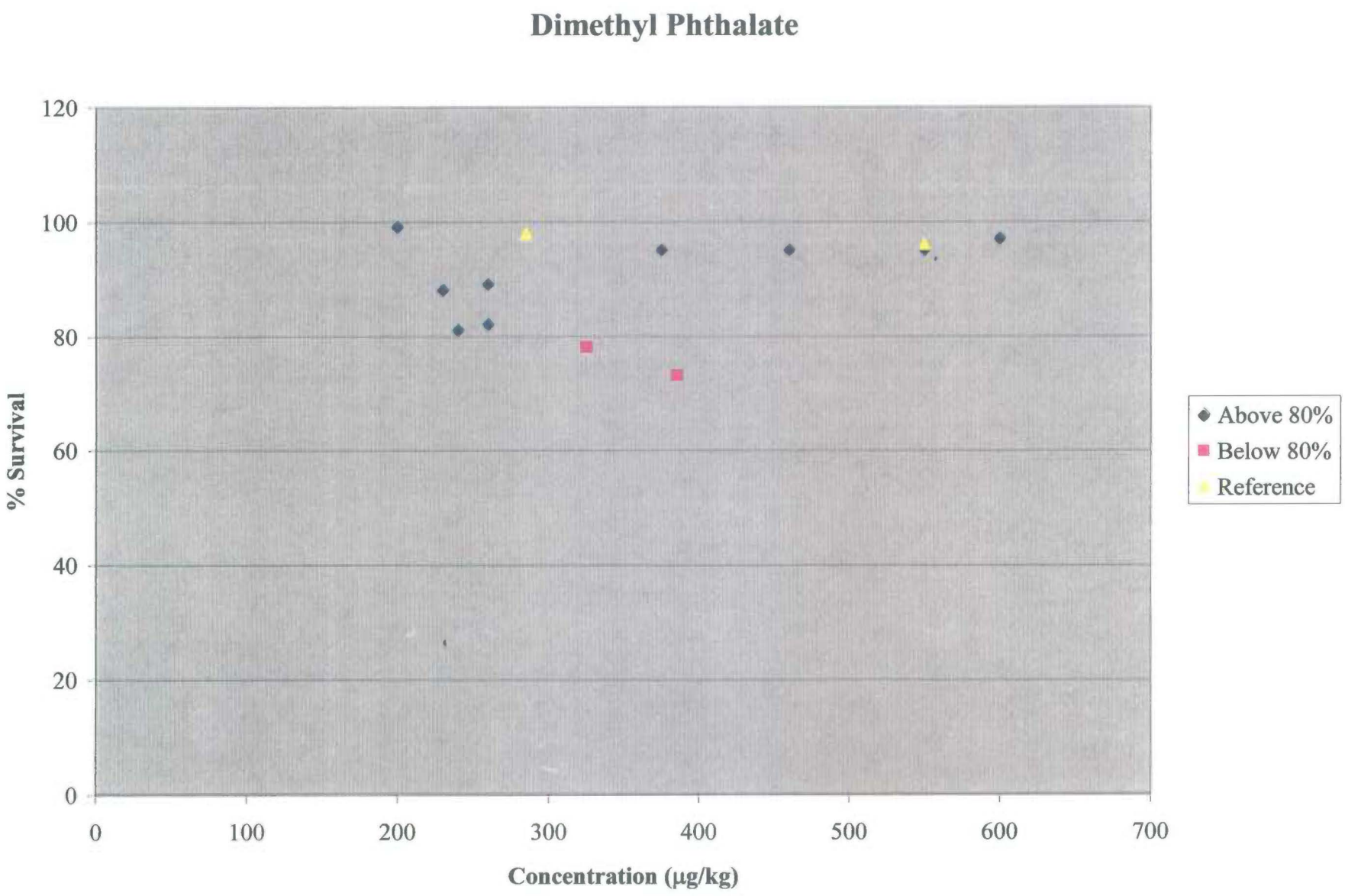

Carbazole
120
100
80
60
40
20
0
% Survival
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

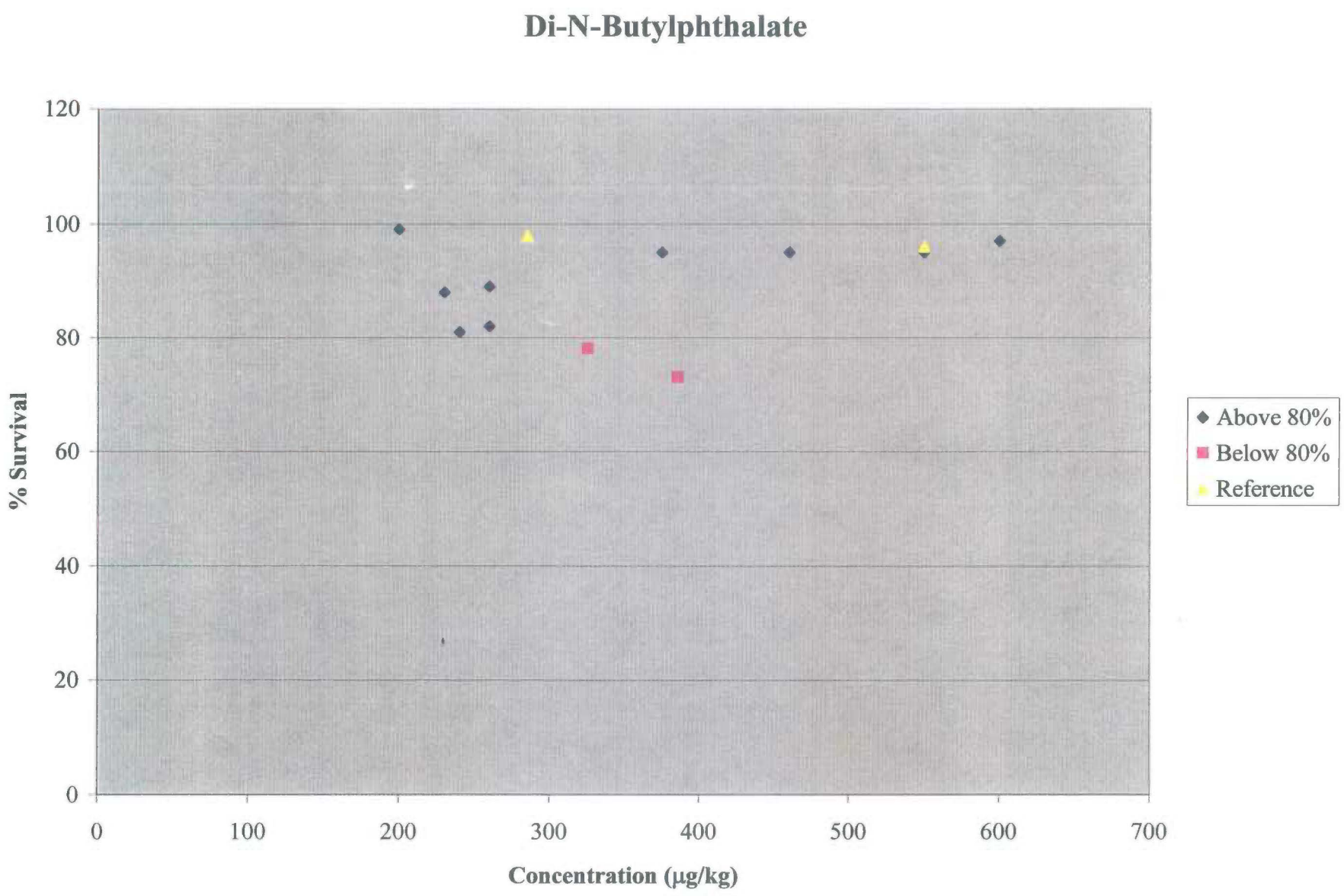

Chrysene
120
100
80
60
40
20
0
% Survival
0
50
100
150
200
250
300
350
400
450
Concentration (µg/kg)
Above 80%
Below 80%
Reference

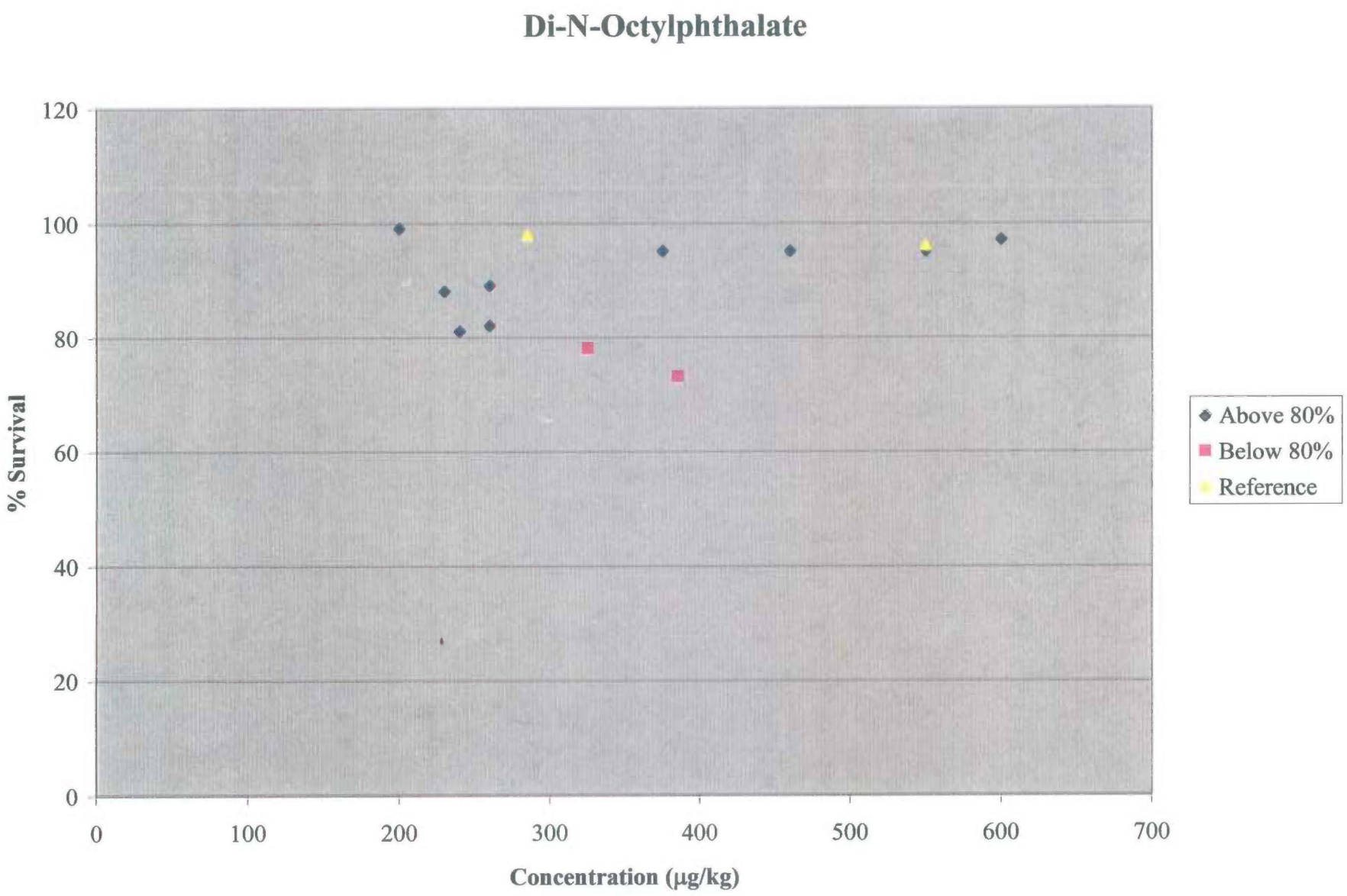

Dibenzo(A,H)anthracene
% Survival
120
100
80
60
40
20
0
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

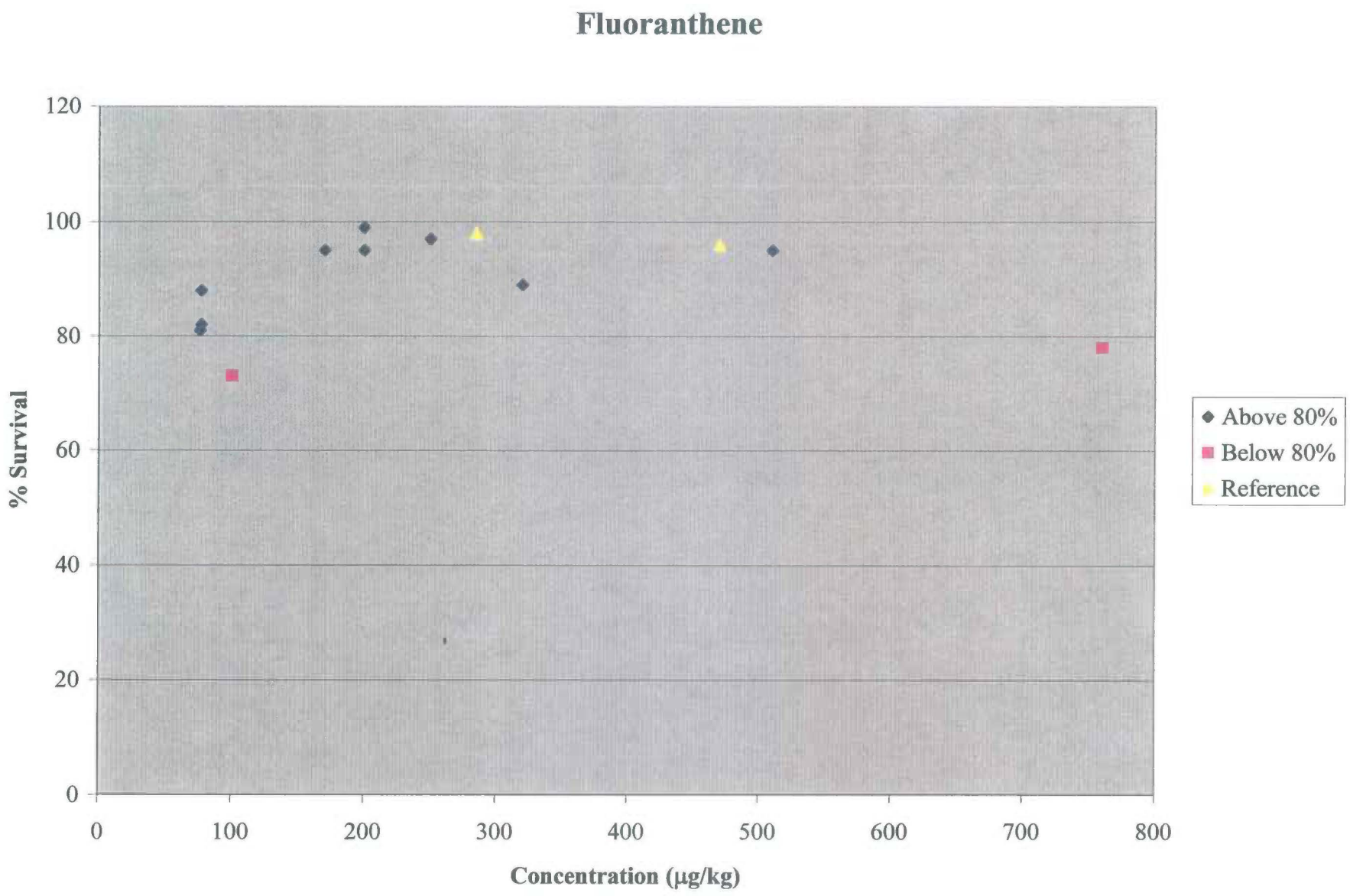

Dibenzofuran
120
100
80
60
40
20
0
% Survival
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

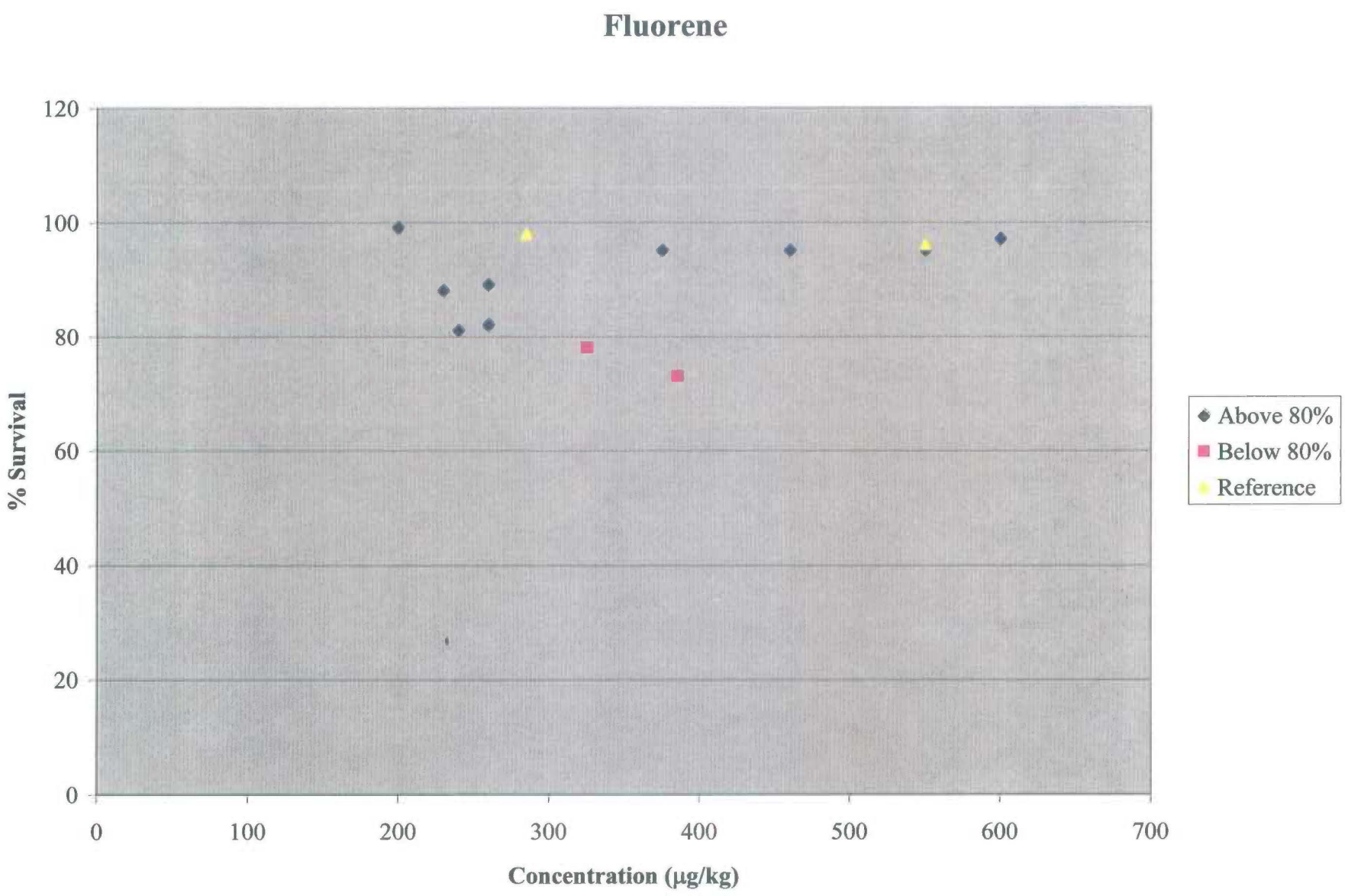

Diethyl Phthalate
% Survival
120
100
80
60
40
20
0
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

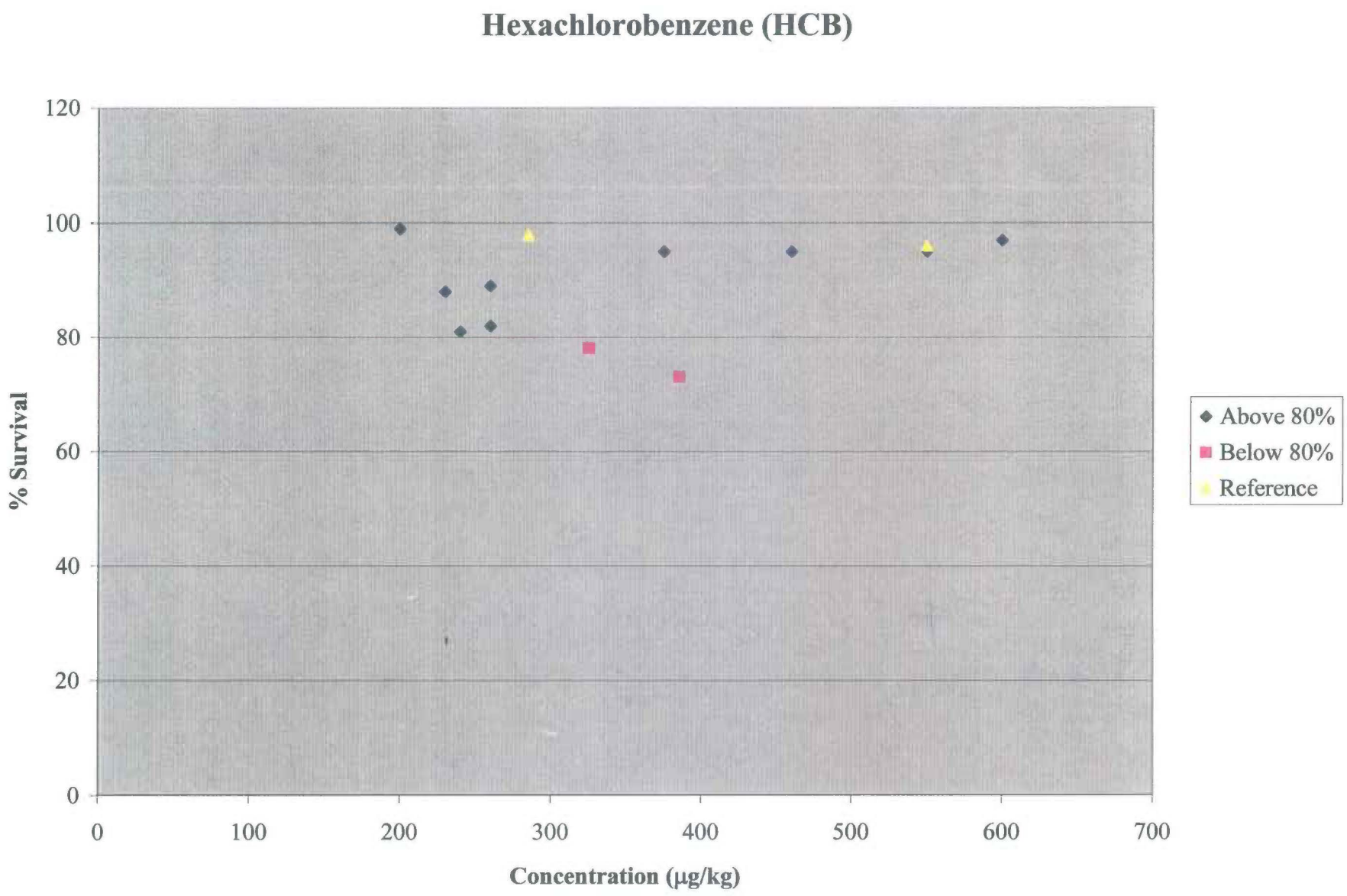

Dimethyl Phthalate
120
100
80
60
40
20
0
% Survival
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

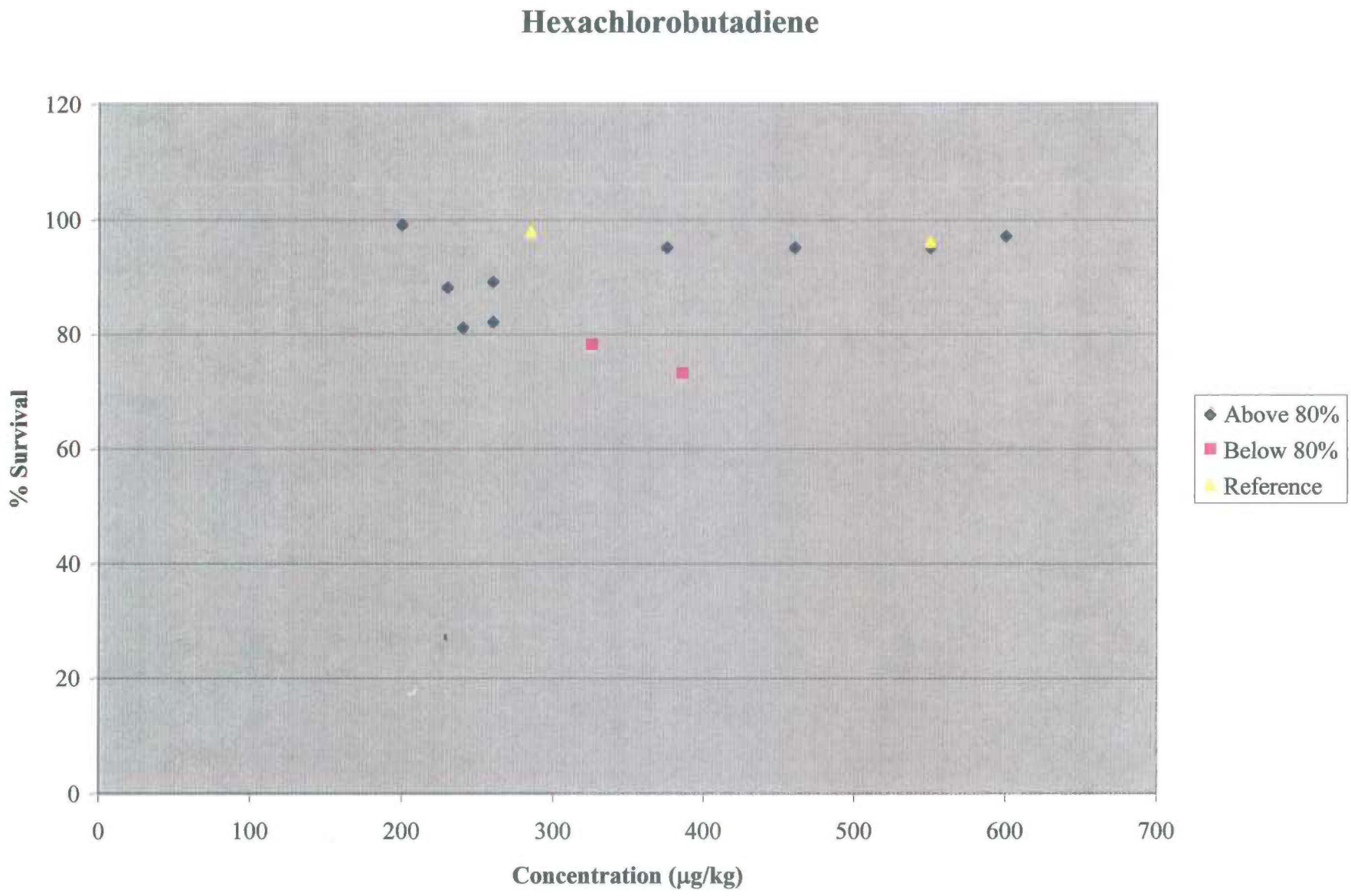

Di-N-Butylphthalate
120
100
80
60
40
20
0
% Survival
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

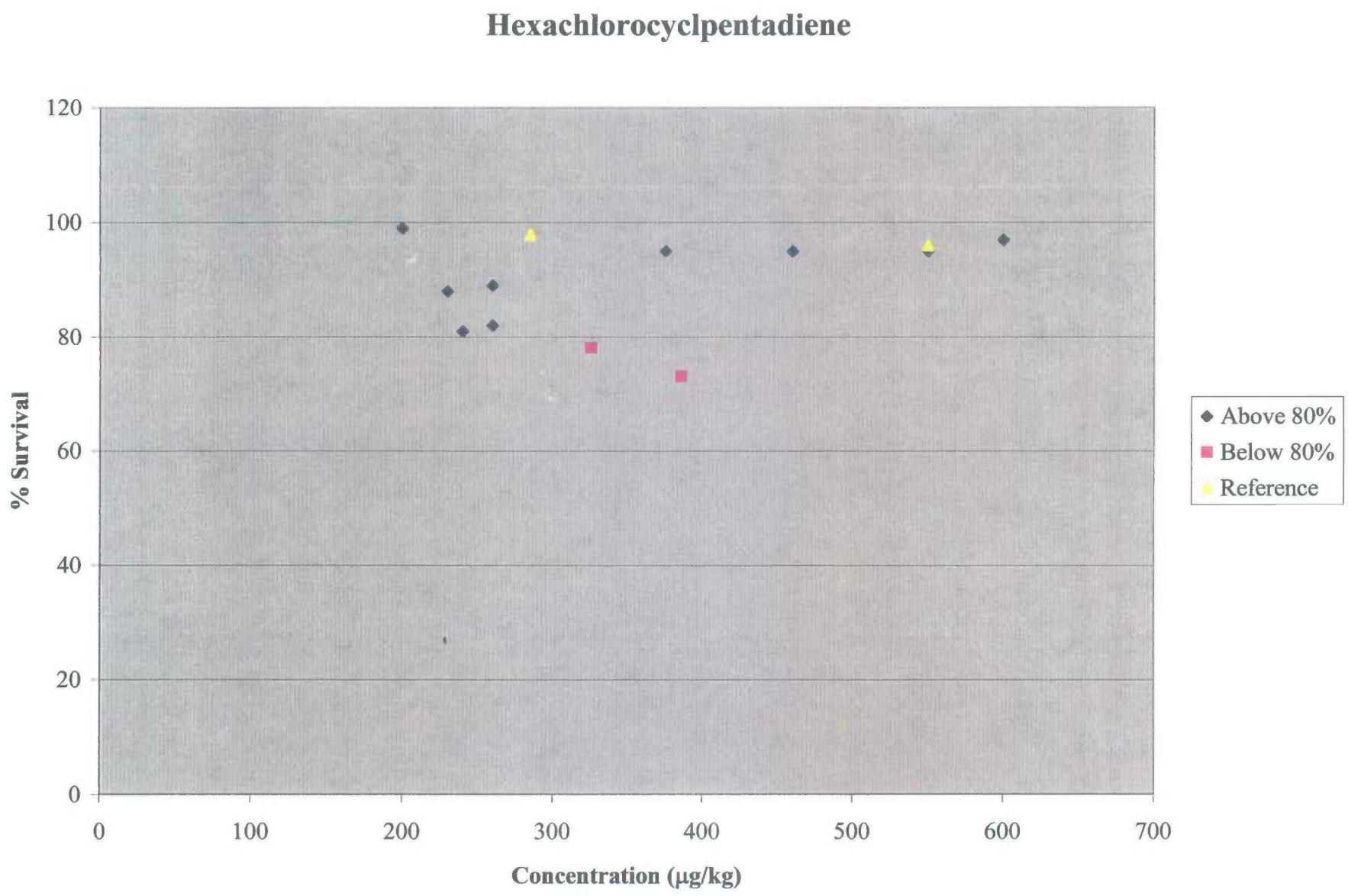

Di-N-Octylphthalate
% Survival
120
100
80
60
40
20
0
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

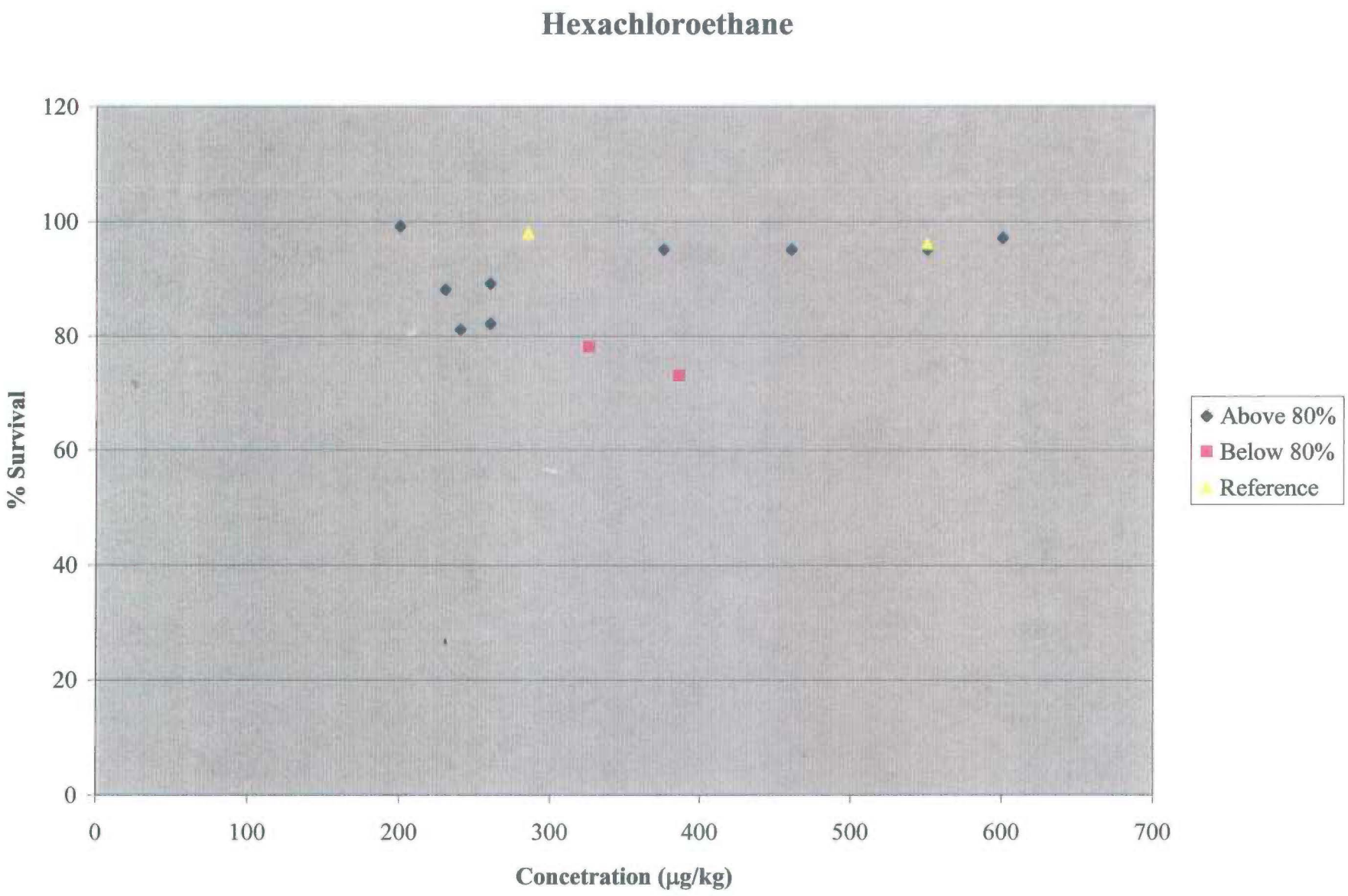

Fluoranthene
120
100
80
60
40
20
0
% Survival
0
100
200
300
400
500
600
700
800
Concentration (µg/kg)
Above 80%
Below 80%
Reference

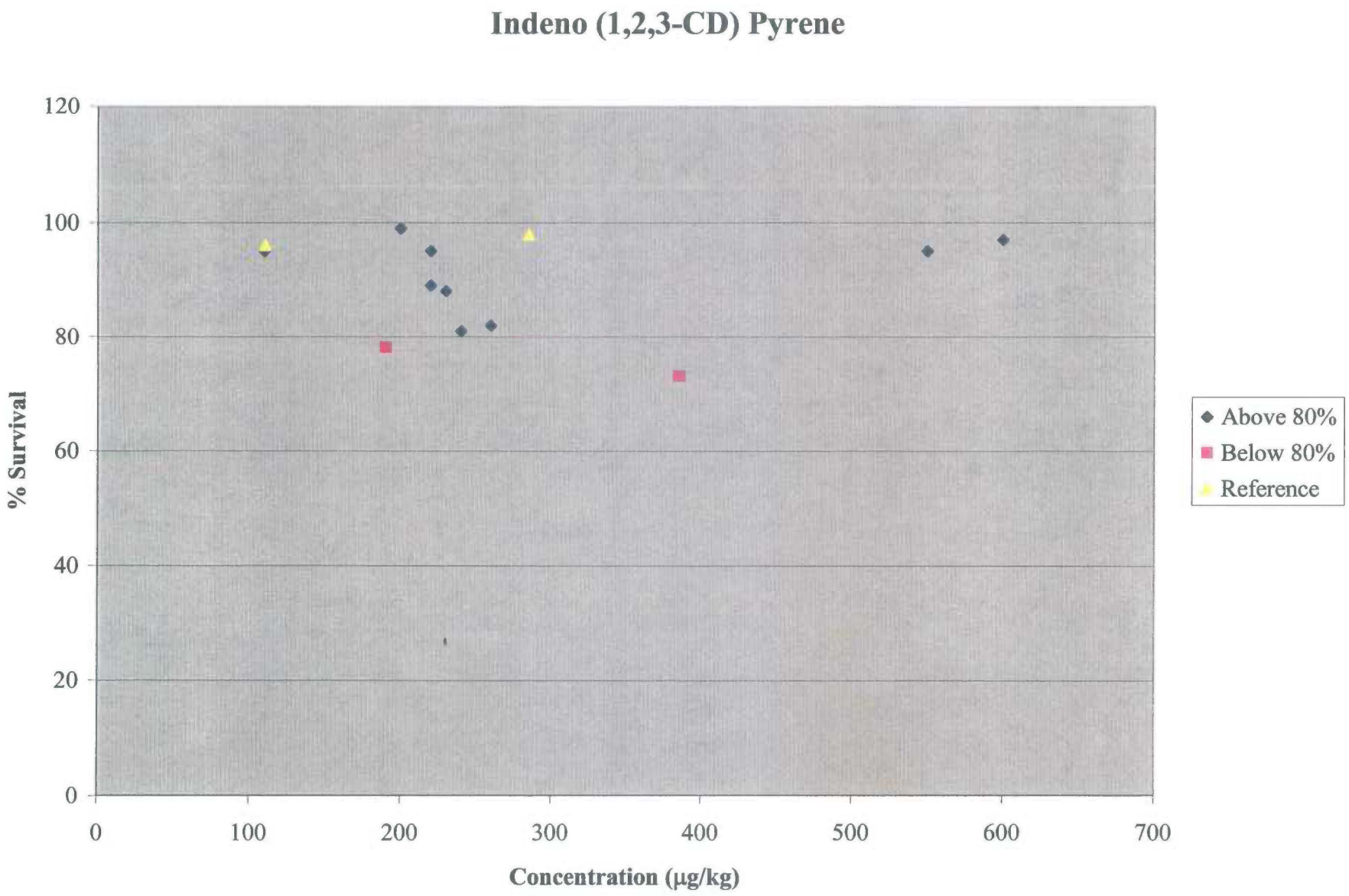

Fluorene
120
100
80
60
40
20
0
% Survival
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

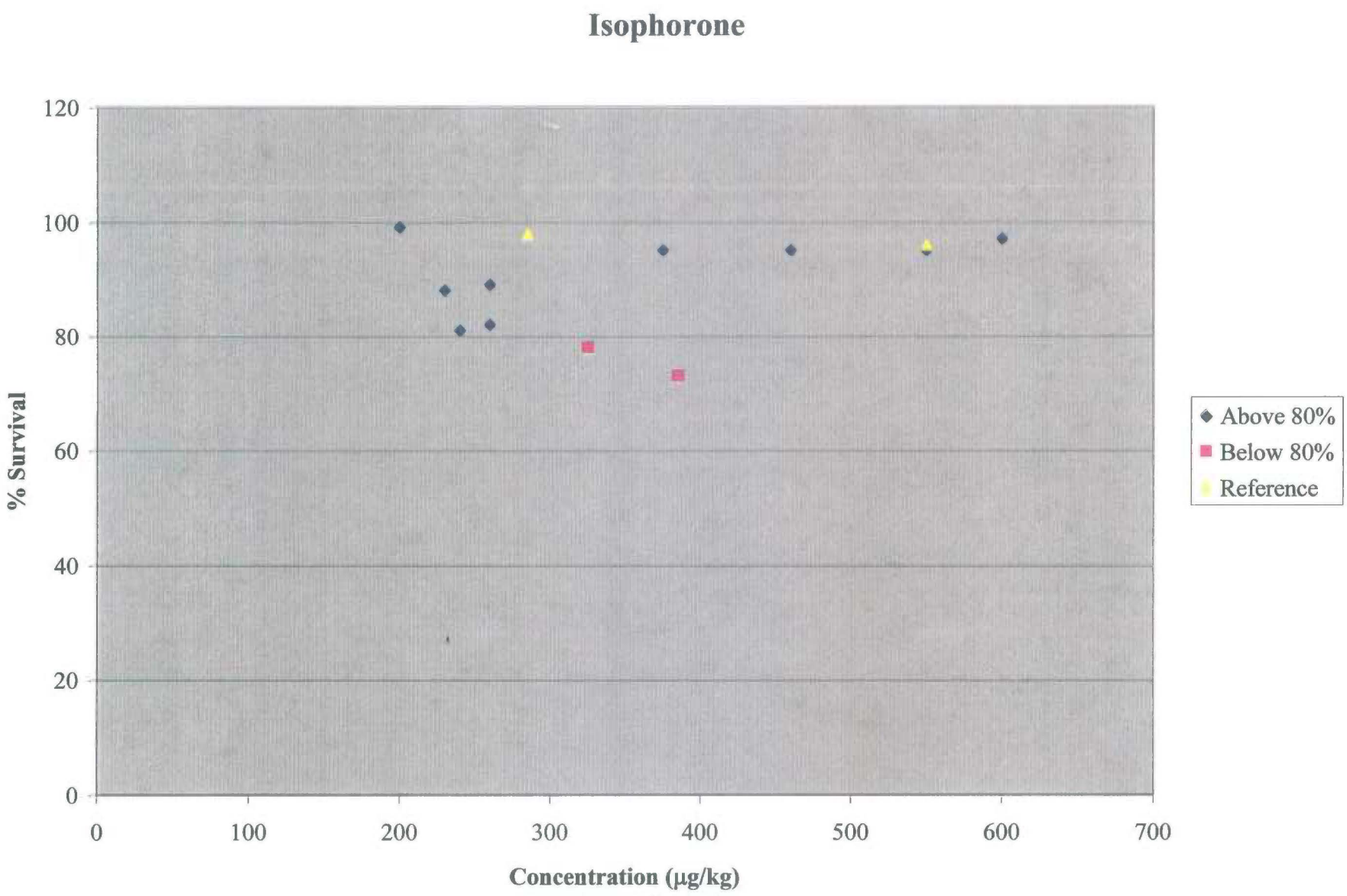

Hexachlorobenzene (HCB)
% Survival
120
100
80
60
40
20
0
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

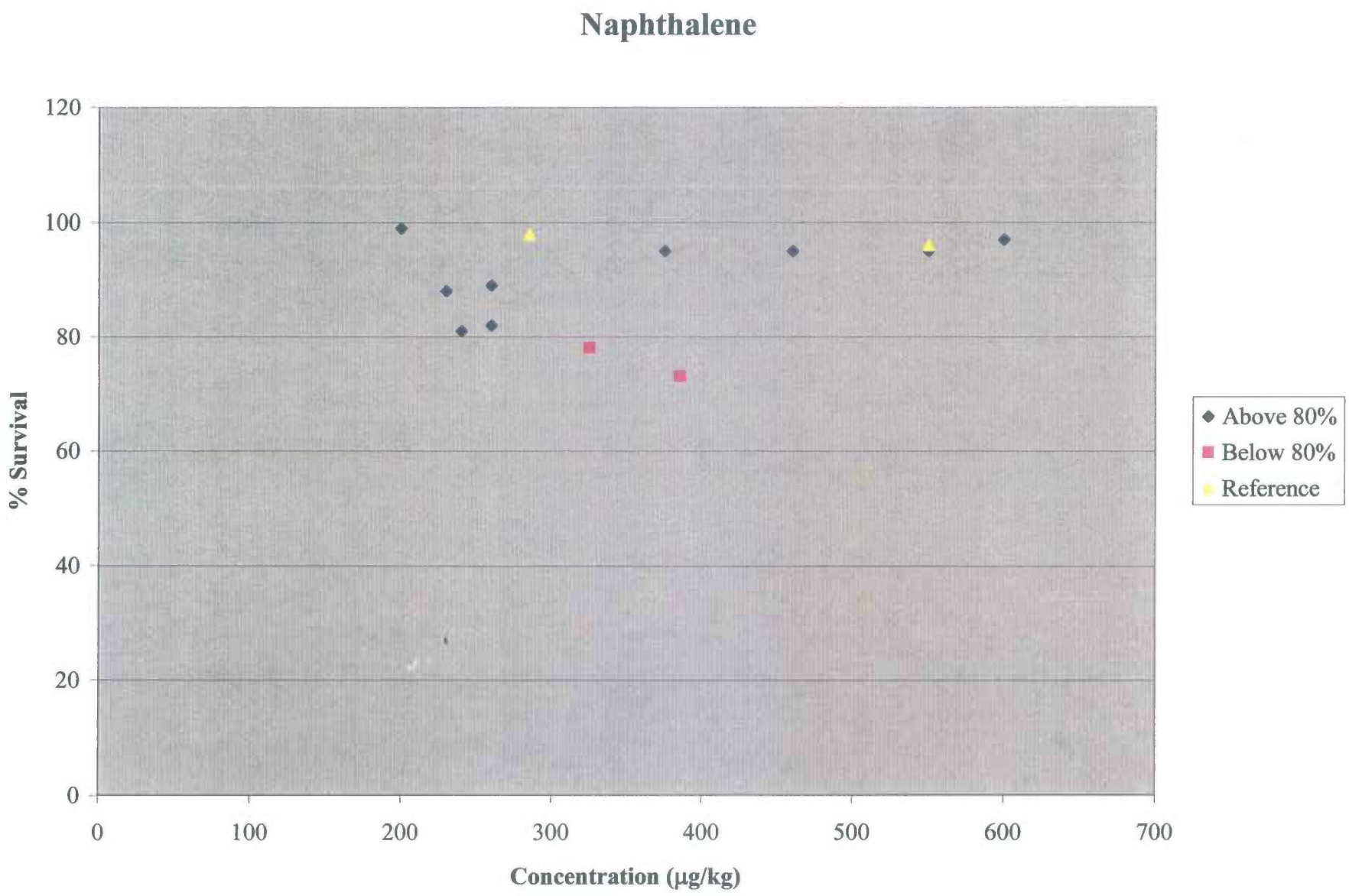

Hexachlorobutadiene
% Survival
120
100
80
60
40
20
0
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

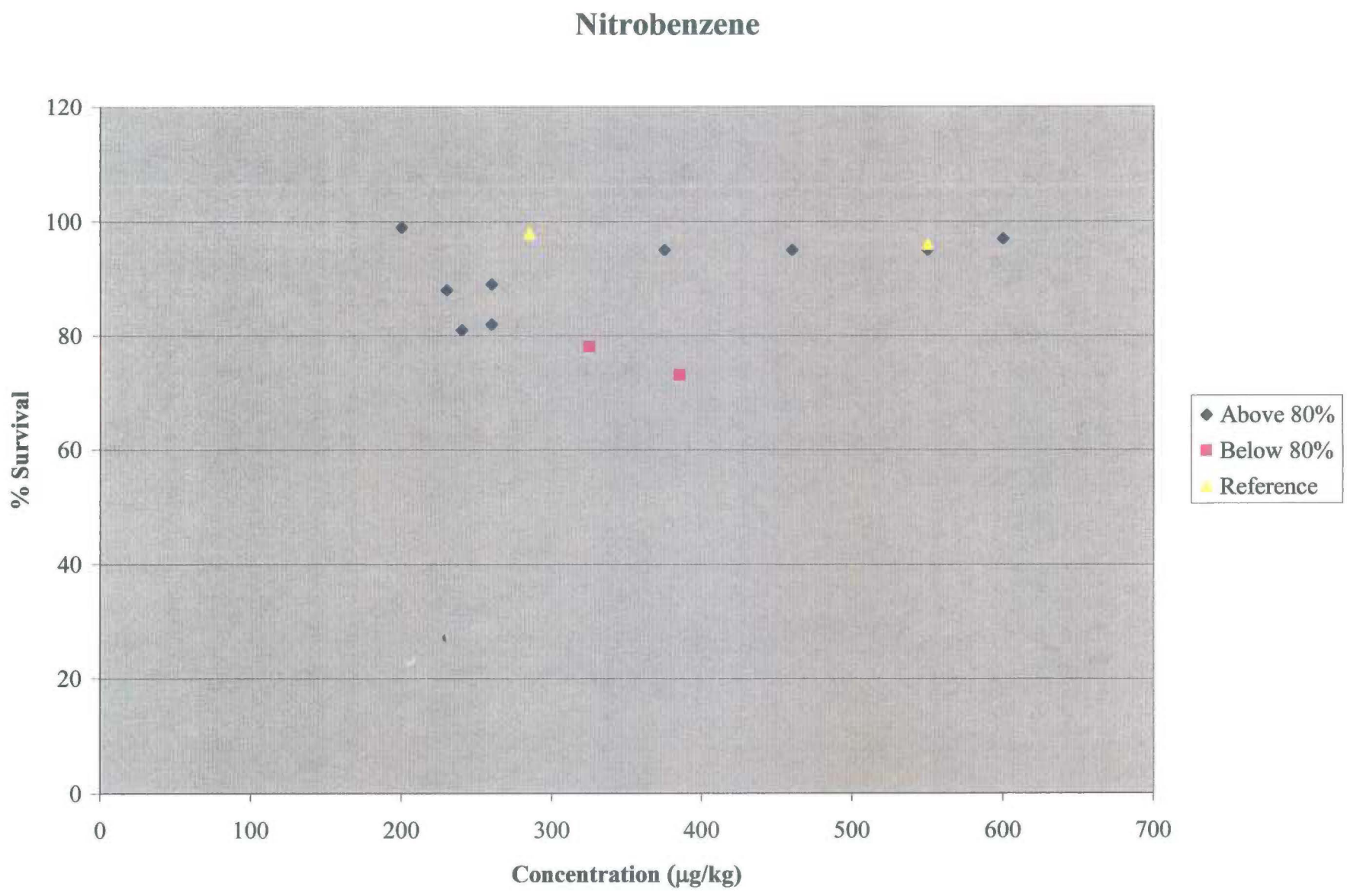

Hexachlorocyclpentadiene
120
100
80
60
40
20
0
% Survival
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

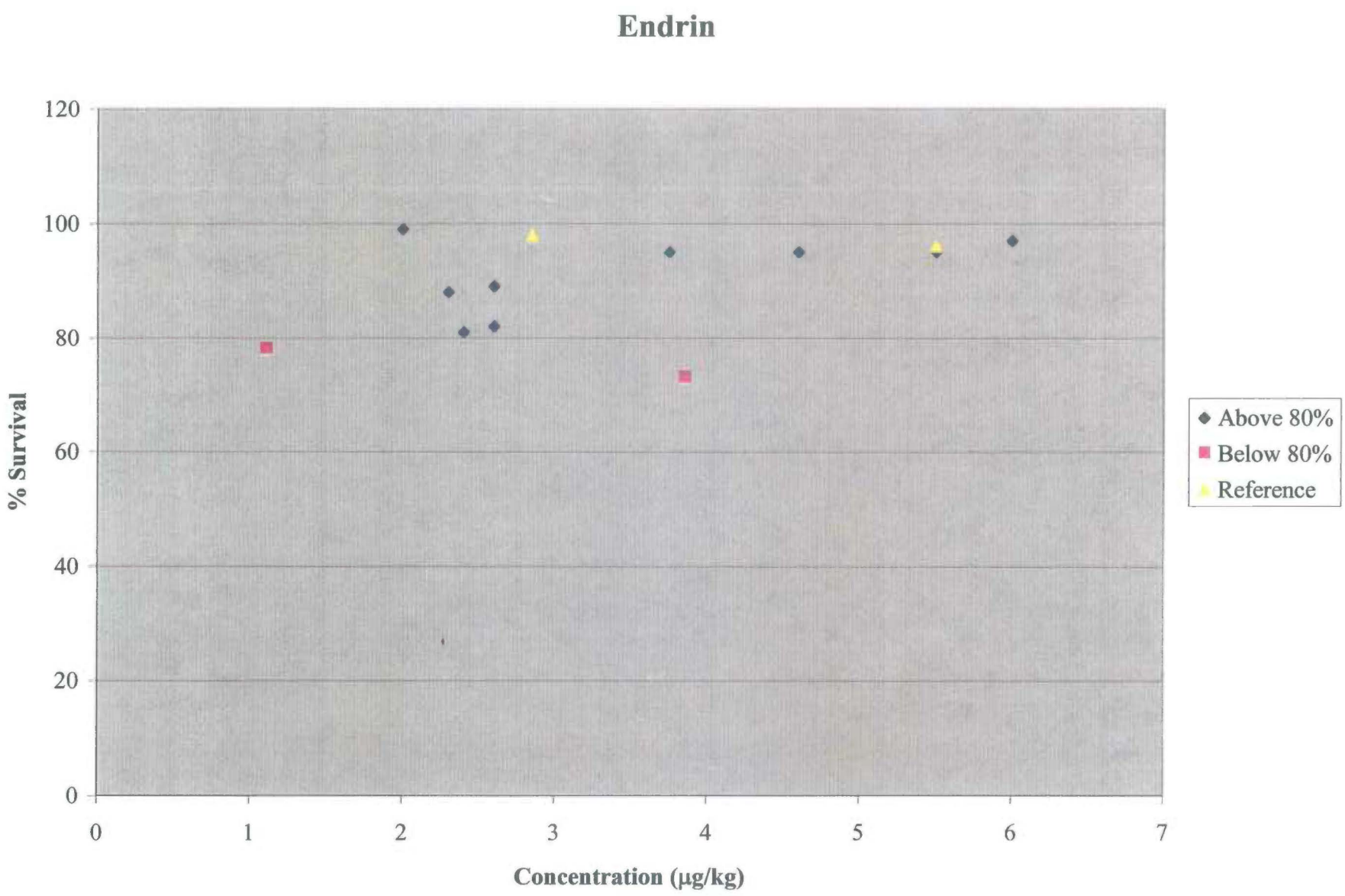

Hexachloroethane
% Survival
120
100
80
60
40
20
0
0
100
200
300
400
500
600
700
Concetration (µg/kg)
Above 80%
Below 80%
Reference

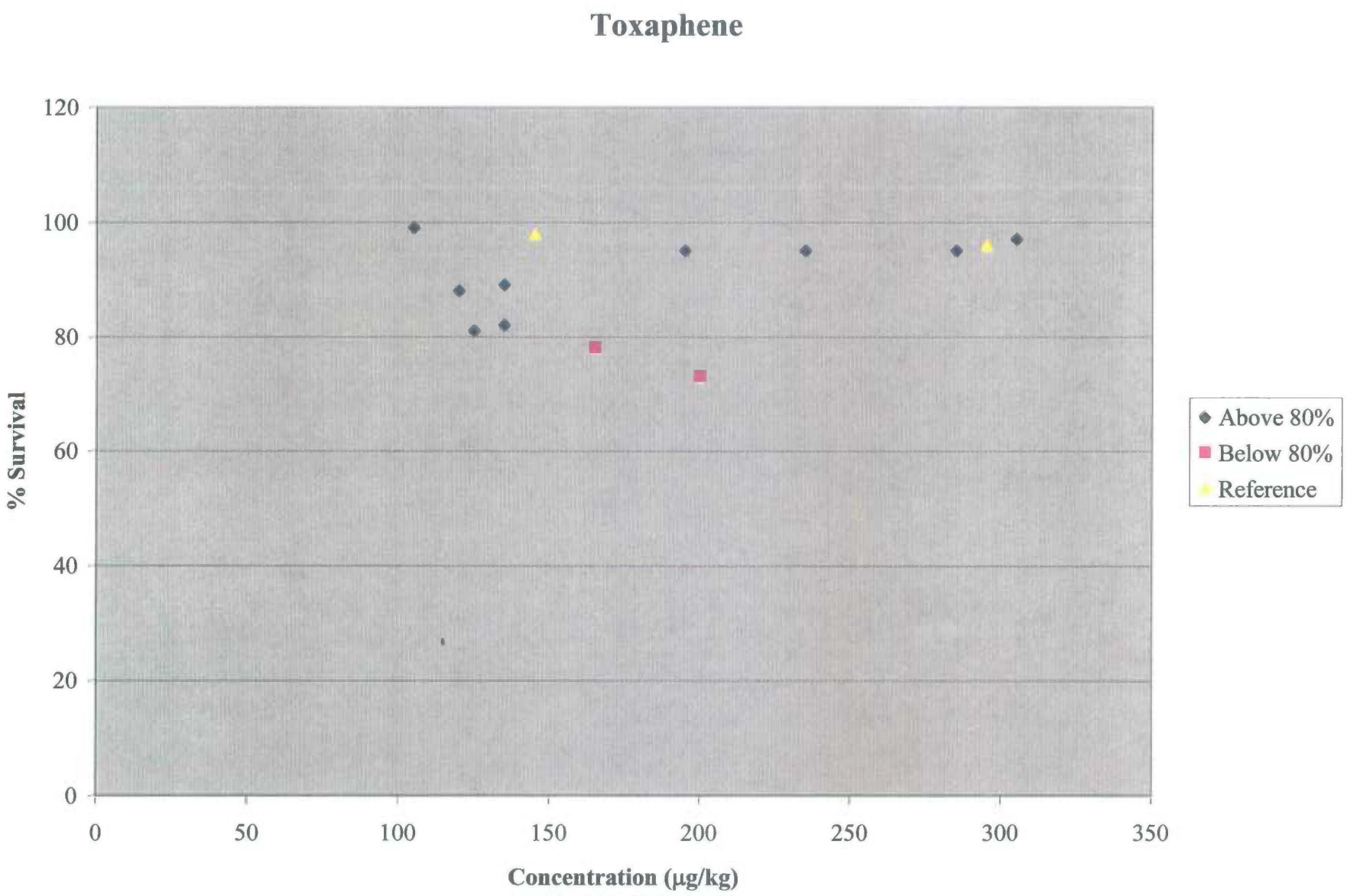

Indeno (1,2,3-CD) Pyrene
% Survival
120
100
80
60
40
20
0
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

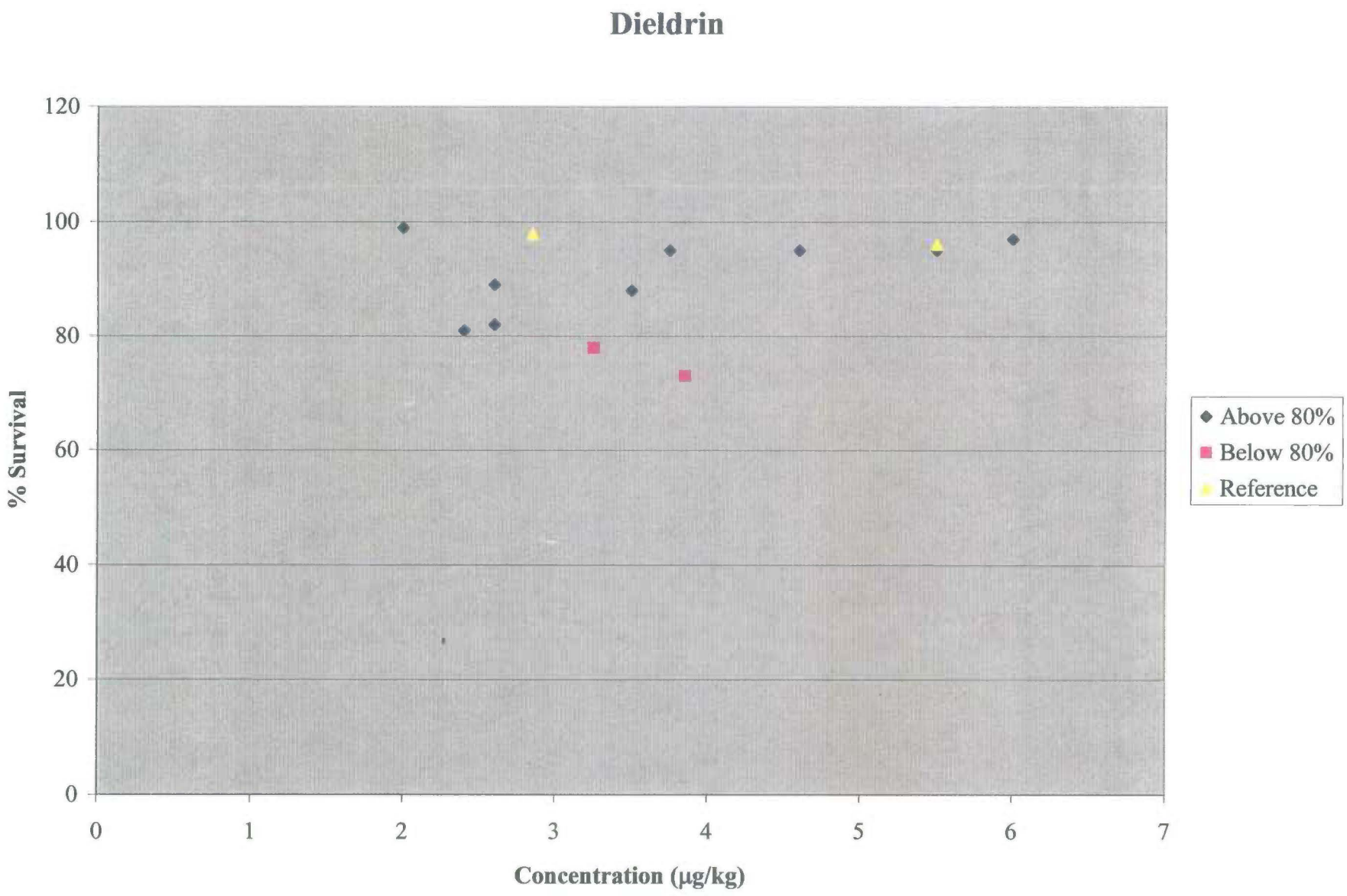

Isophorone
120
100
80
60
40
20
0
% Survival
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

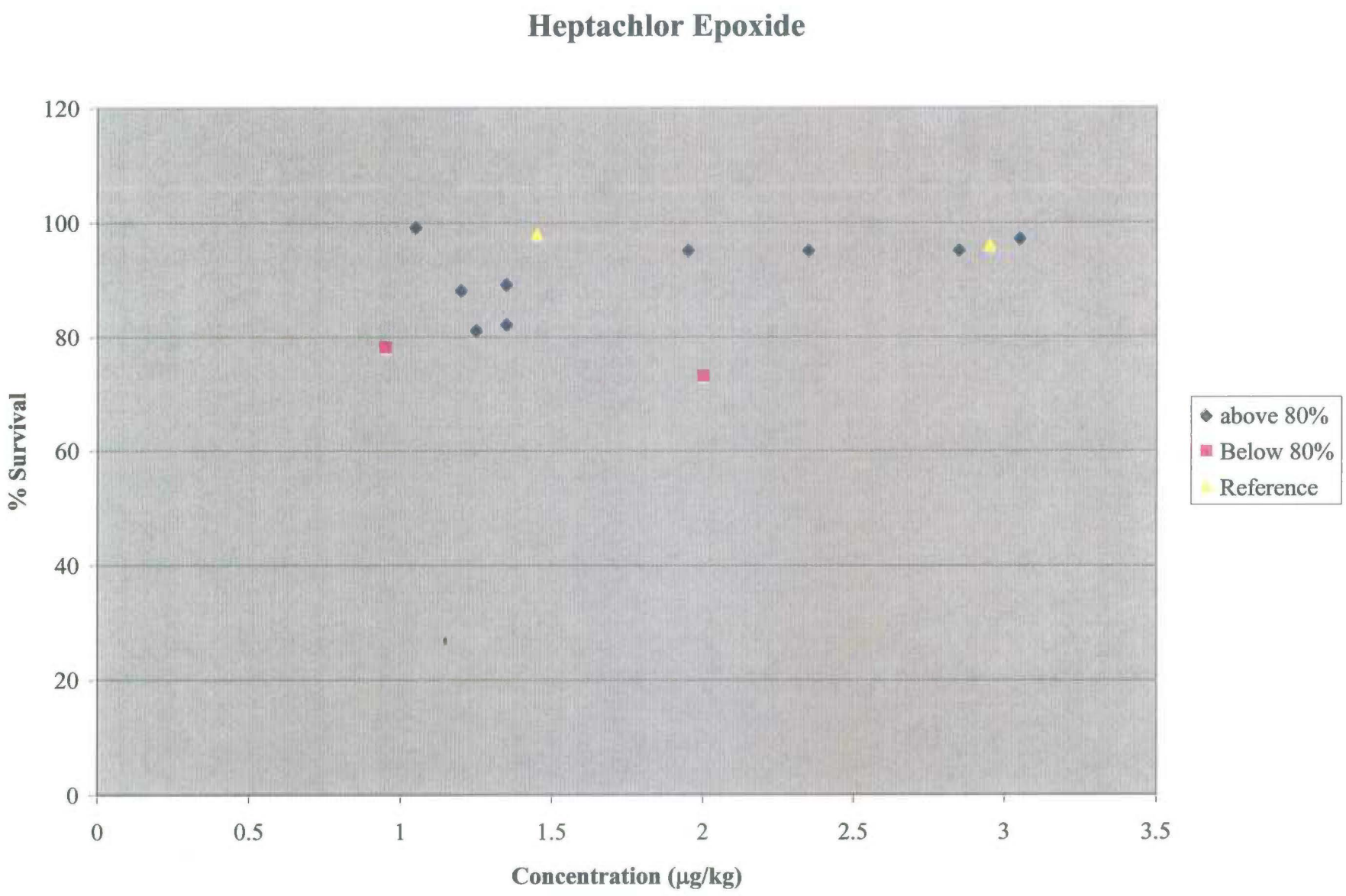

Naphthalene
120
100
80
60
40
20
0
% Survival
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

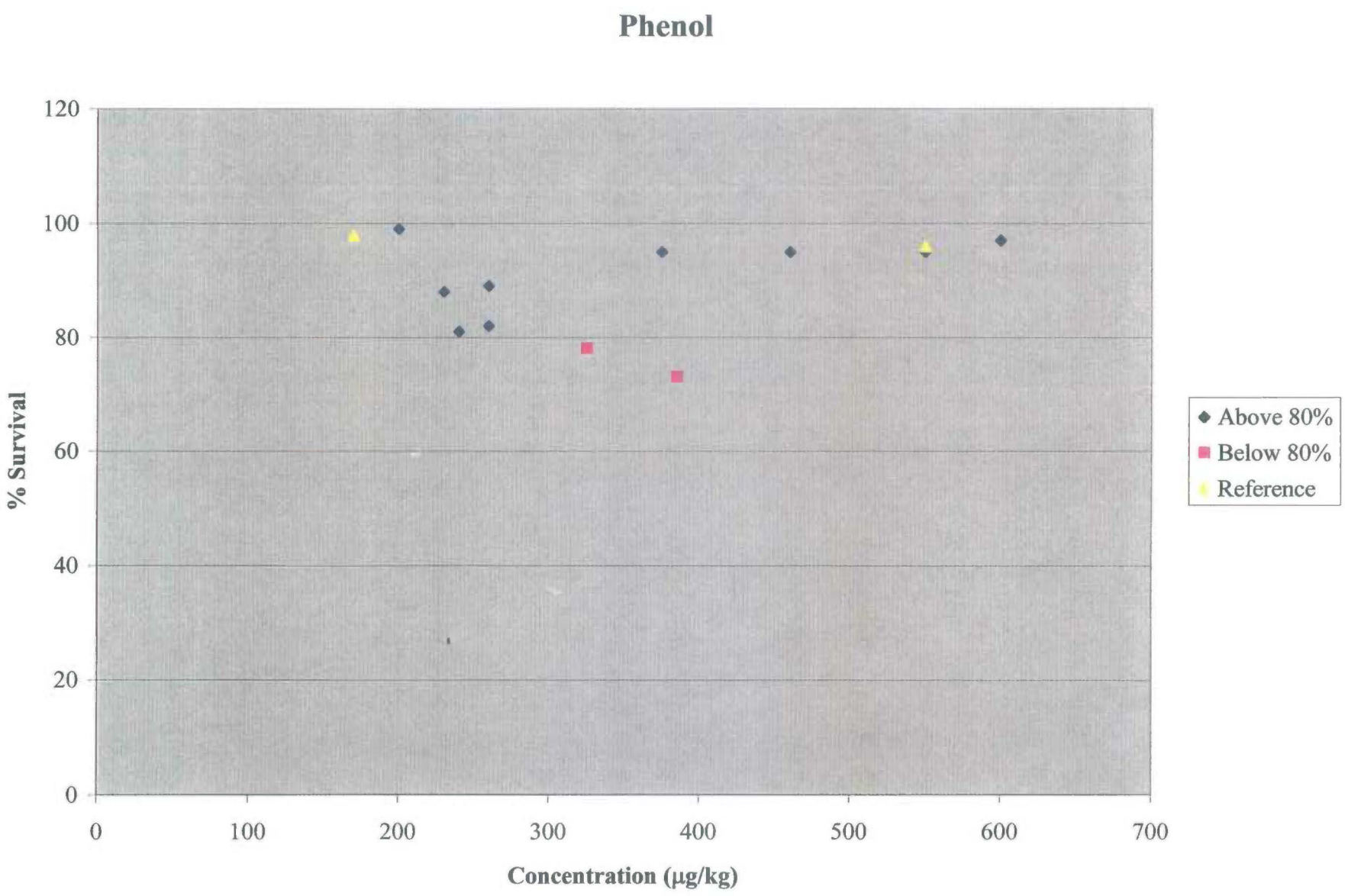

Nitrobenzene
% Survival
120
100
80
60
40
20
0
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference


Endrin
120
100
80
60
40
20
0
% Survival
0
1
2
3
4
5
6
7
Concentration (µg/kg)
Above 80%
Below 80%
Reference

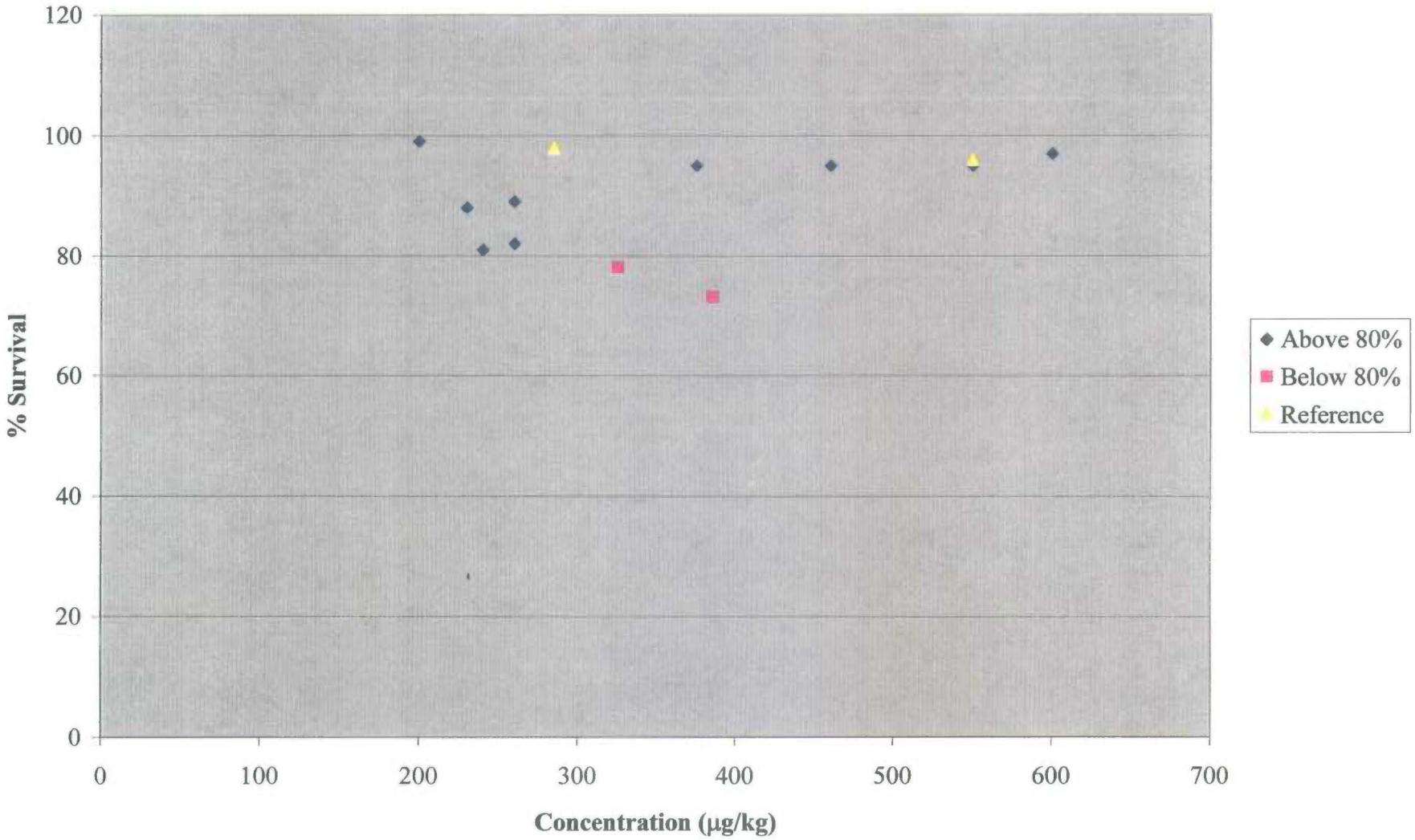

Toxaphene
120
100
80
60
40
20
0
% Survival
0
50
100
150
200
250
300
350
Concentration (µg/kg)
Above 80%
Below 80%
Reference

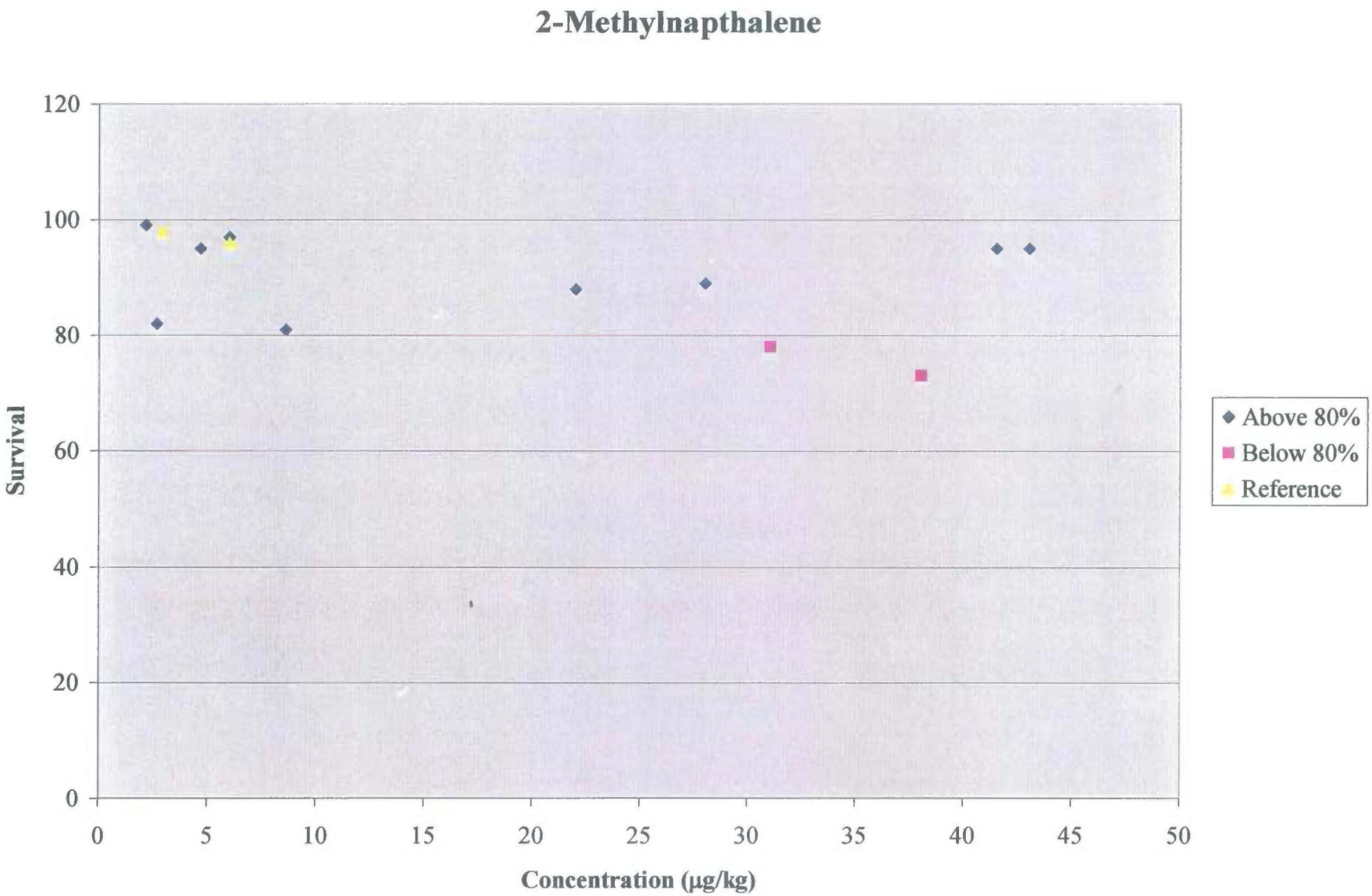

Dieldrin
120
100
80
60
40
20
0
% Survival
0
1
2
3
4
5
6
7
Concentration (µg/kg)
Above 80%
Below 80%
Reference

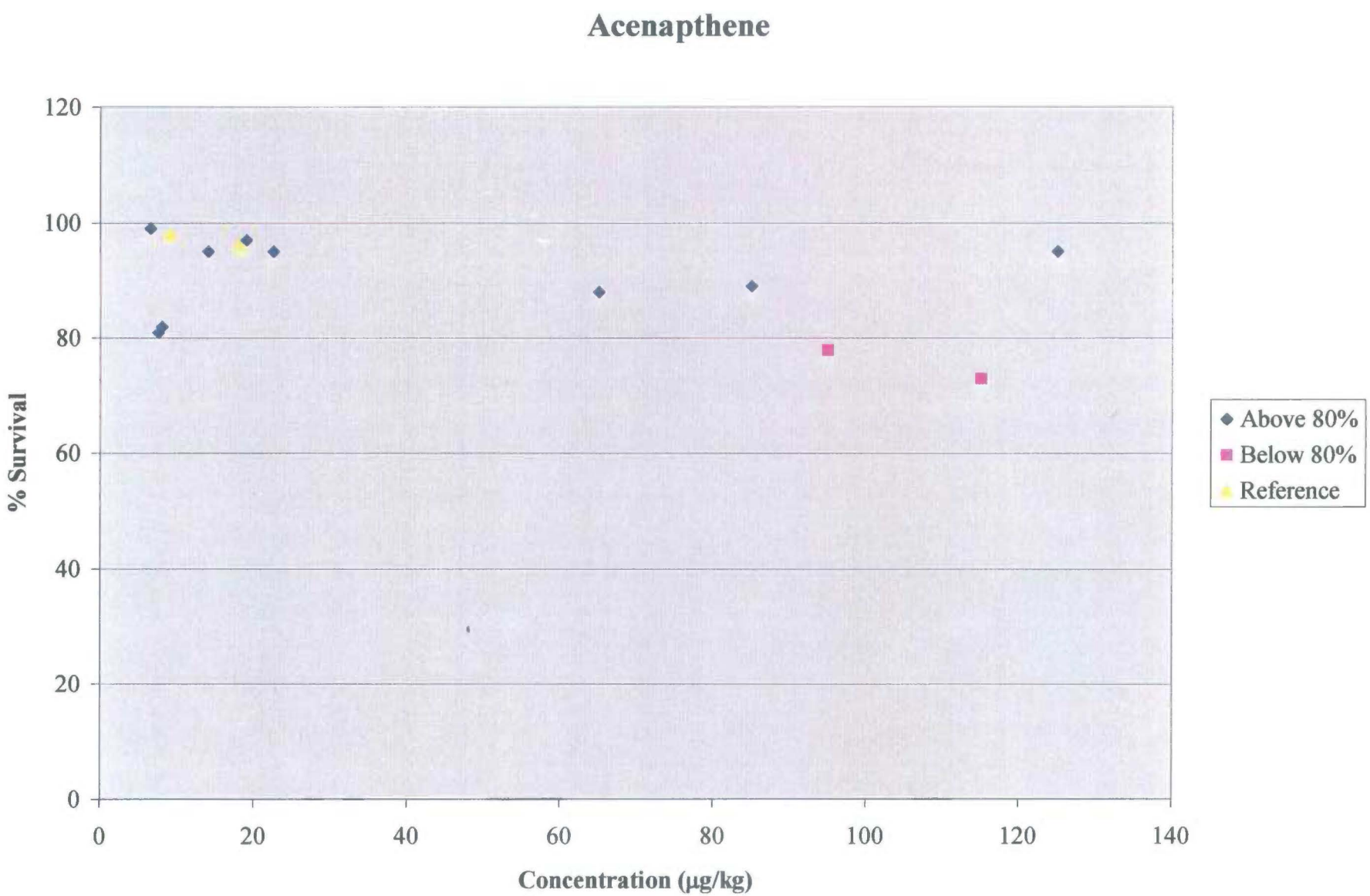

Heptachlor Epoxide
120
100
80
60
40
20
0
% Survival
0
0.5
1
1.5
2
2.5
3
3.5
Concentration (µg/kg)
above 80%
Below 80%
Reference

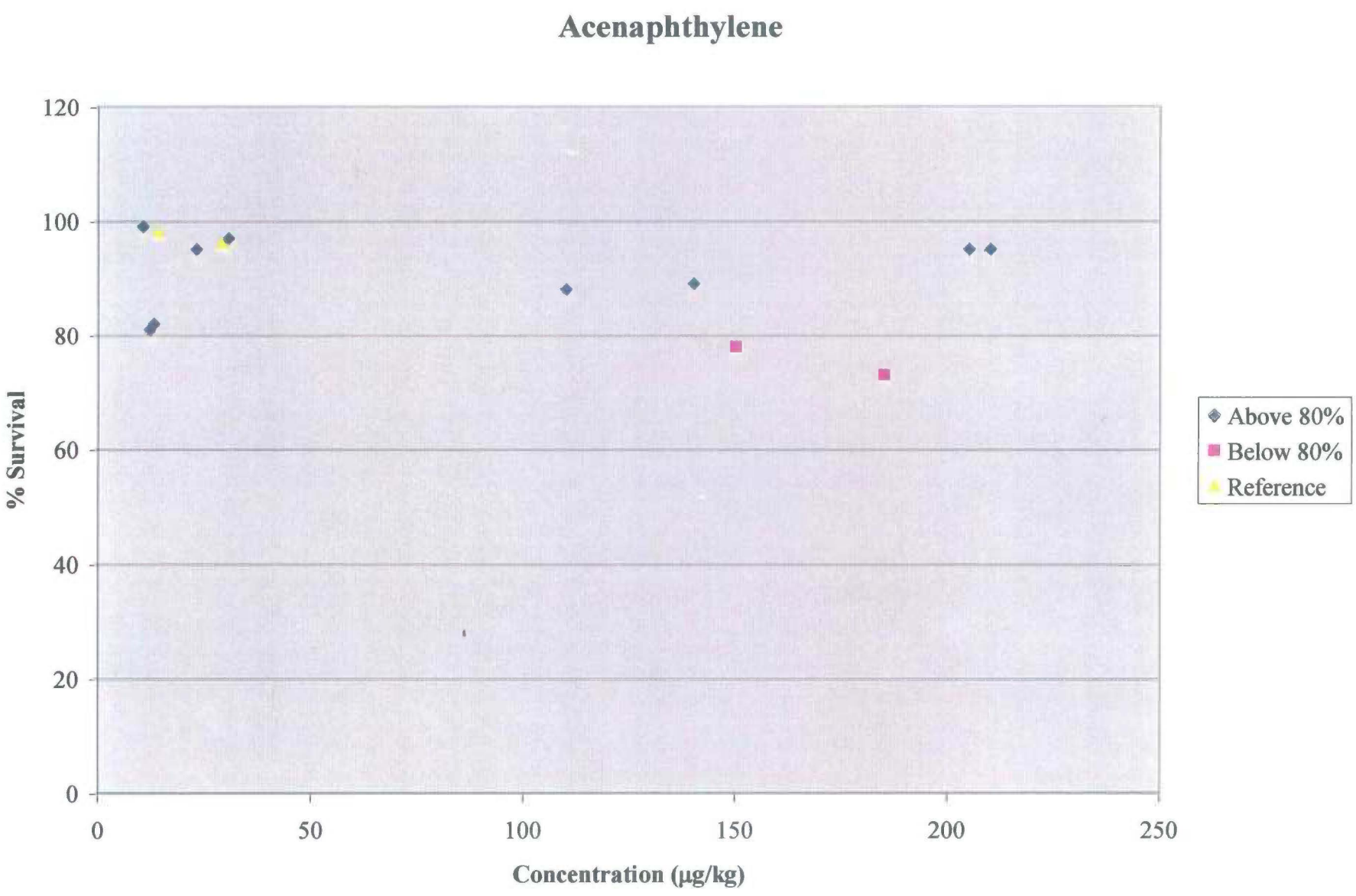

Phenol
120
100
80
60
40
20
0
% Survival
0
100
200
300
400
500
600
700
Concentration (µg/kg)
Above 80%
Below 80%
Reference

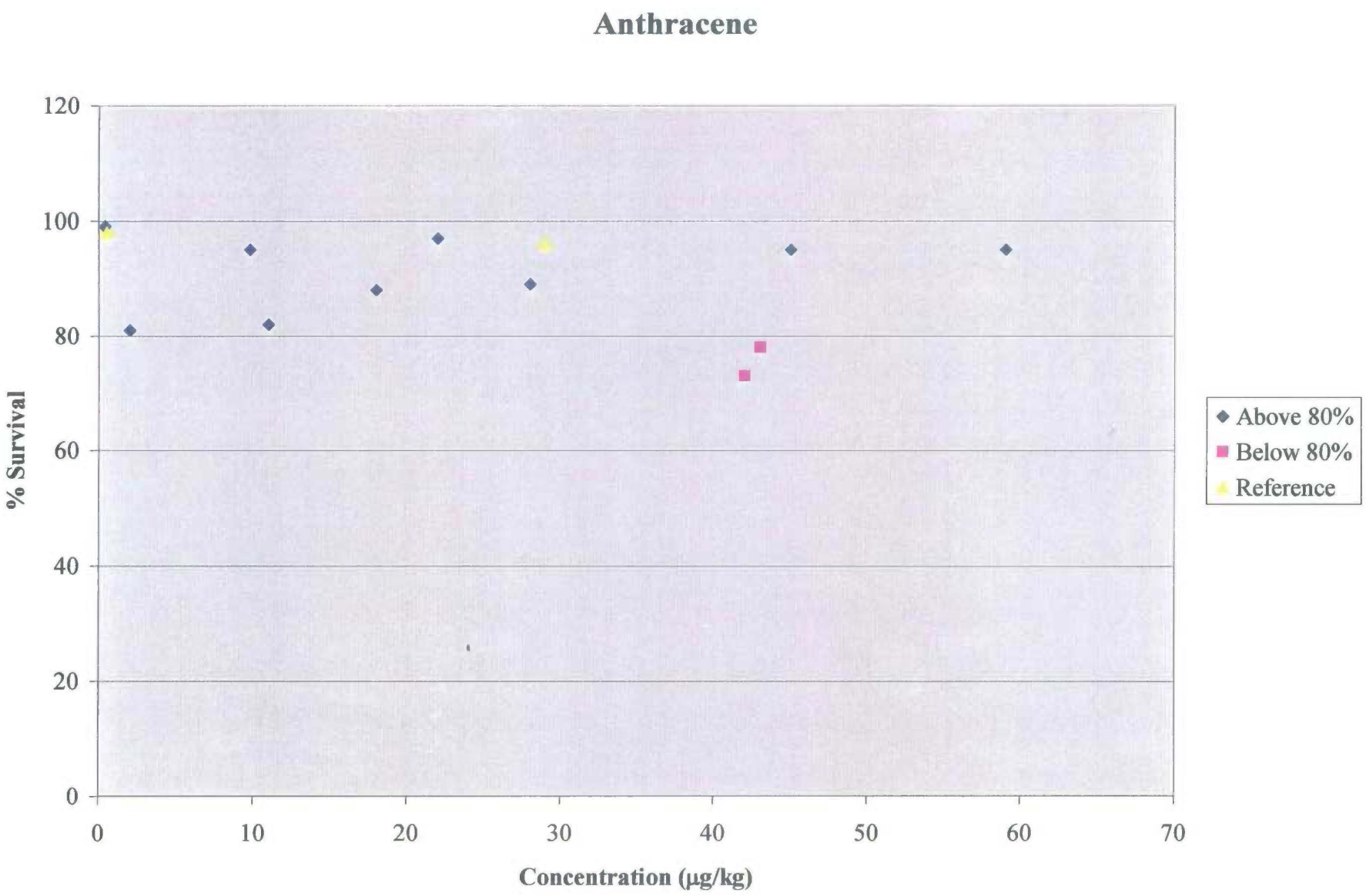
2-Chlorophenol

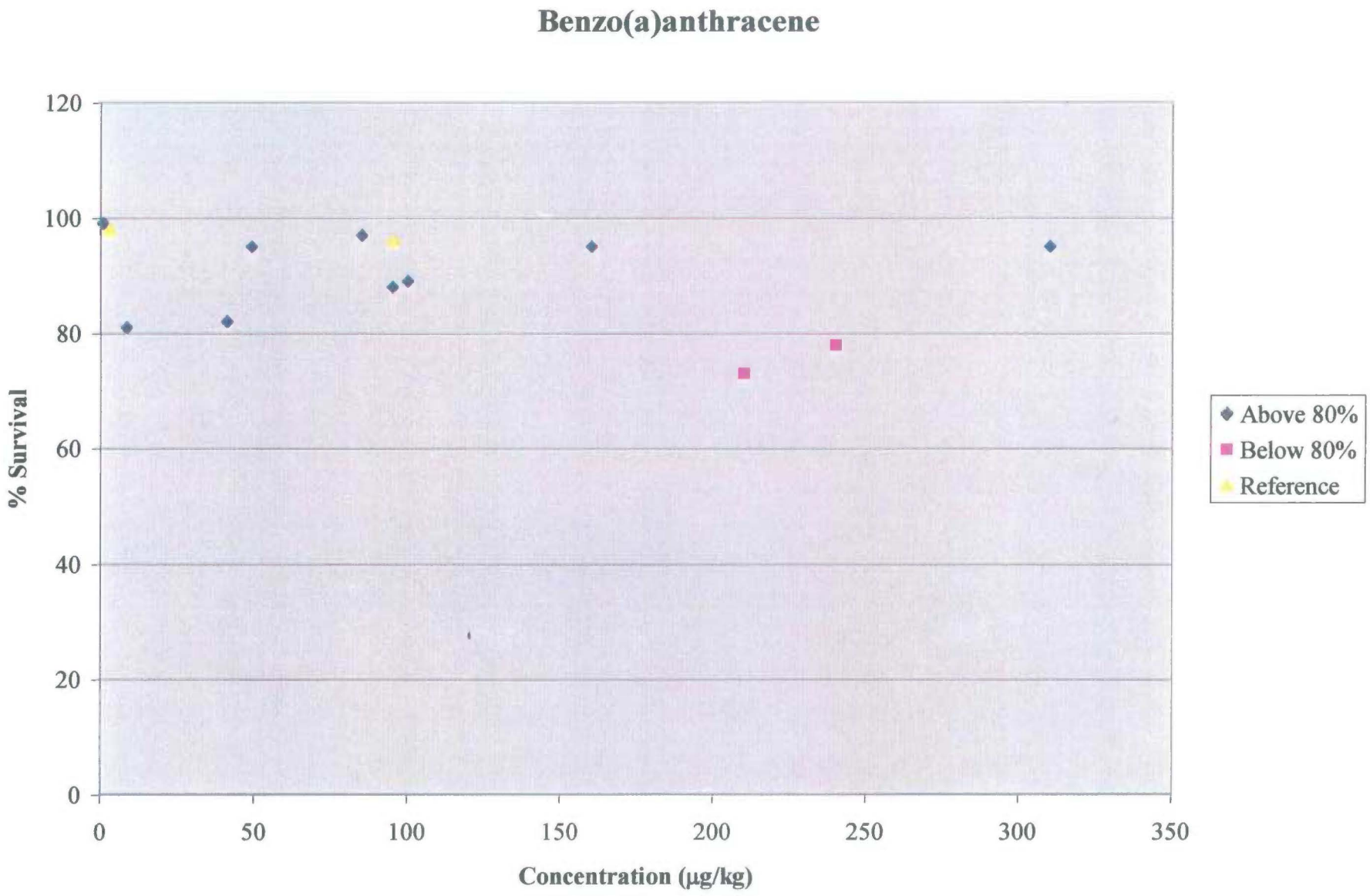


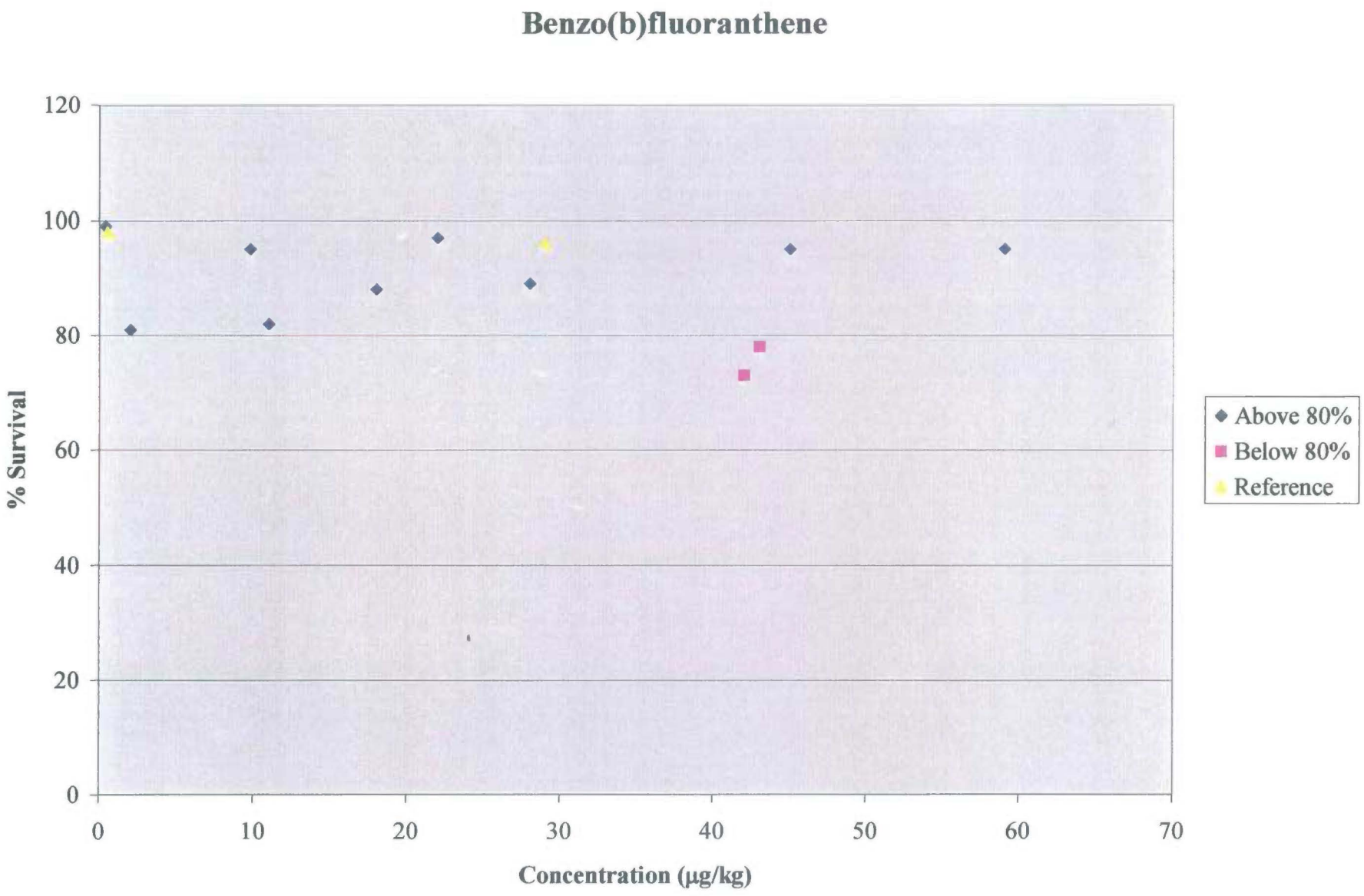

2-Methylnapthalene
Survival
120
100
80
60
40
20
0
0
5
10
15
20
25
30
35
40
45
50
Concentration (µg/kg)
Above 80%
Below 80%
Reference

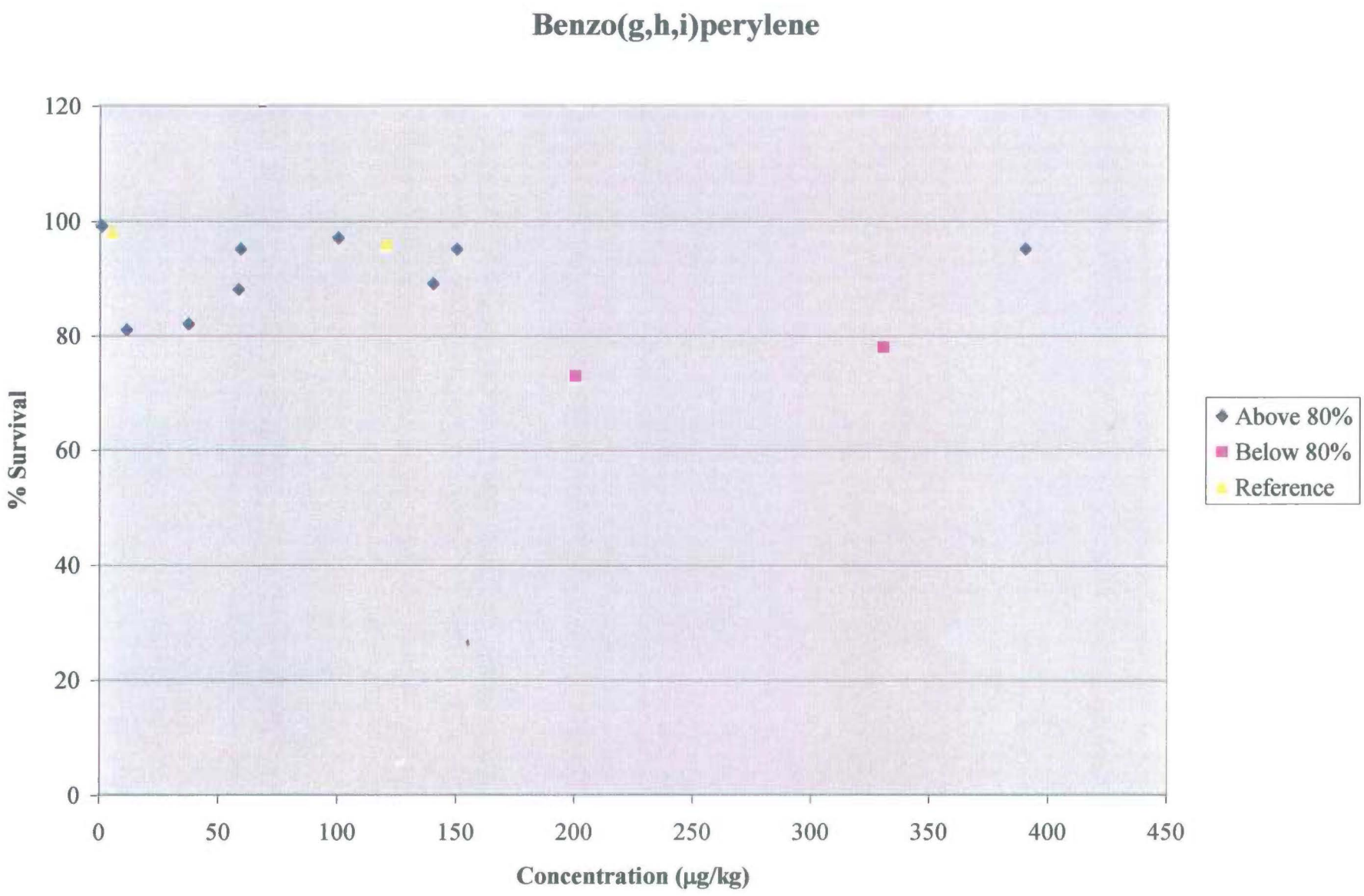

Acenapthene
120
100
80
60
40
20
0
% Survival
0
20
40
60
80
100
120
140
Concentration (µg/kg)
Above 80%
Below 80%
Reference

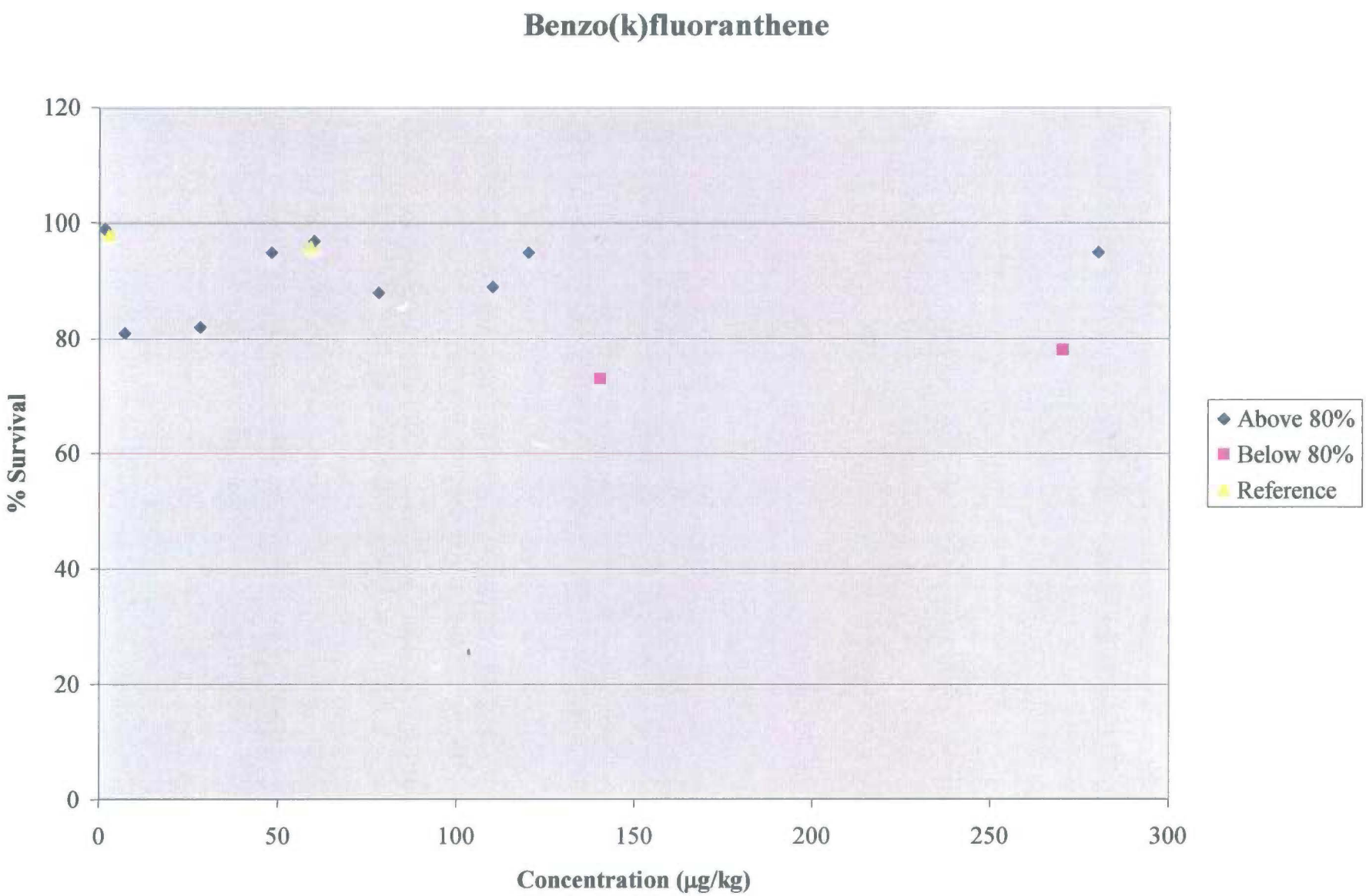

Acenaphthylene
120
100
80
60
40
20
0
% Survival
0
50
100
150
200
250
Concentration (µg/kg)
Above 80%
Below 80%
Reference

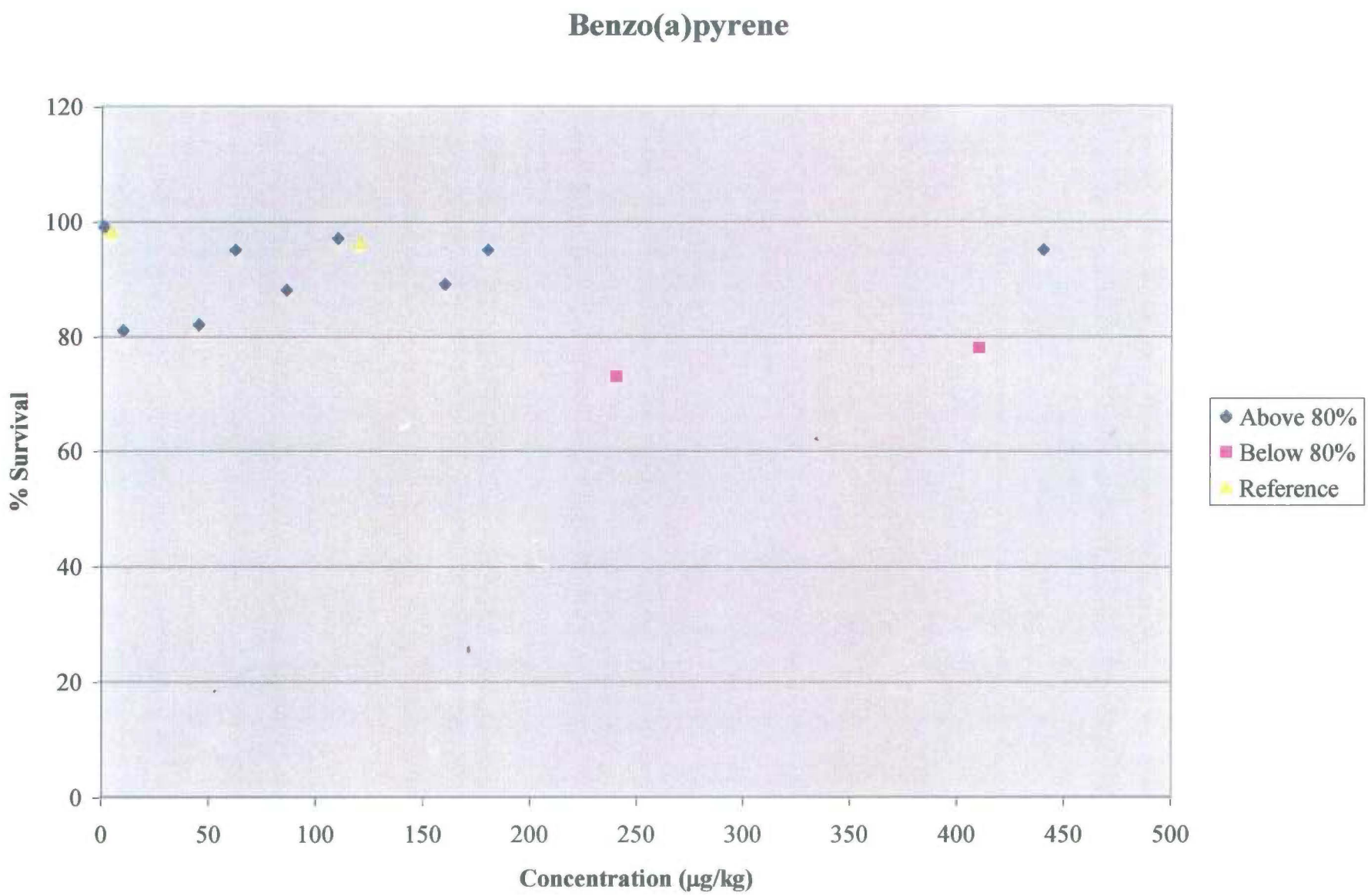

Anthracene
120
100
80
60
40
20
0
% Survival
0
10
20
30
40
50
60
70
Concentration (µg/kg)
Above 80%
Below 80%
Reference

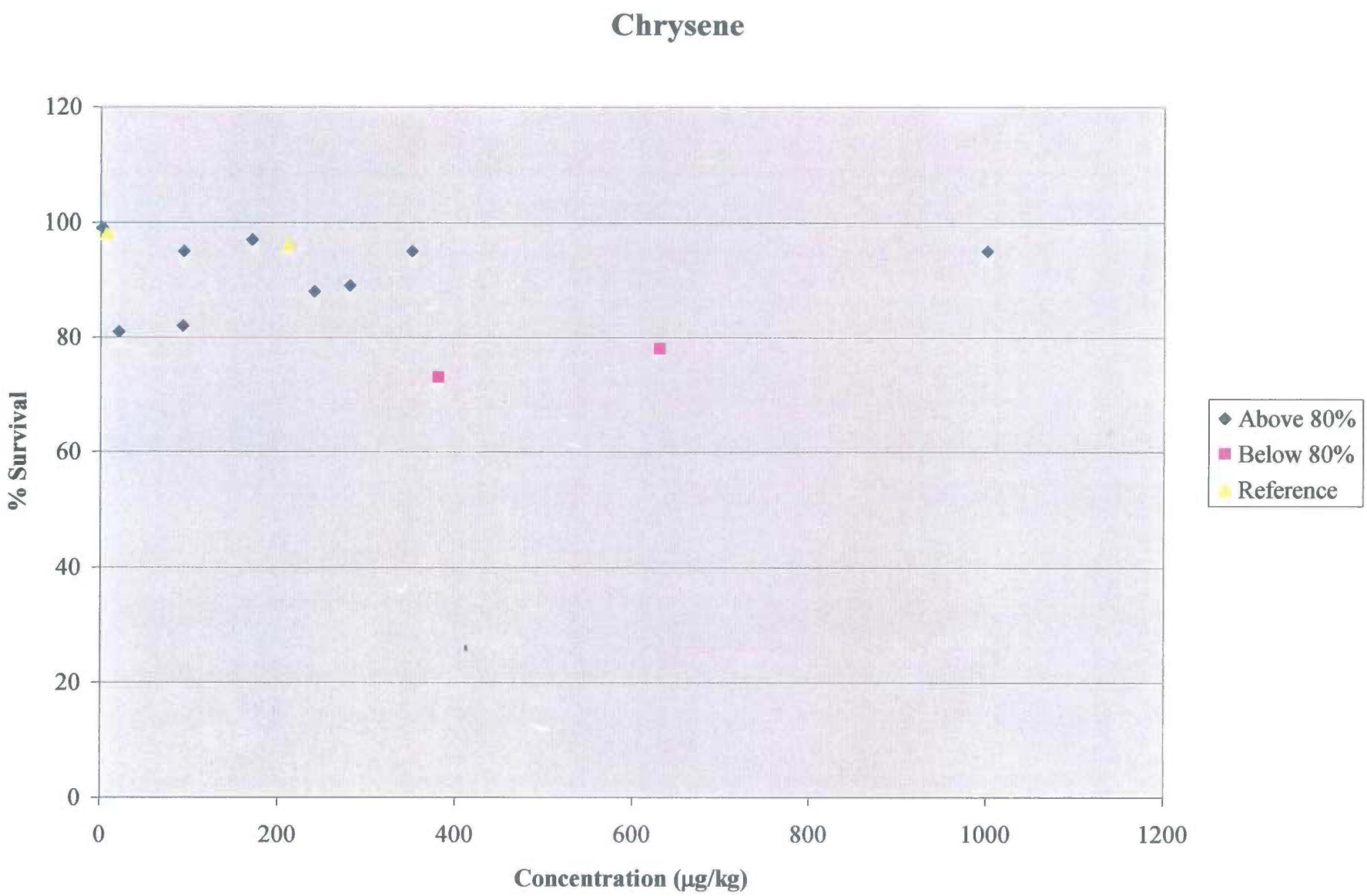

Benzo(a)anthracene
120
100
80
60
40
20
0
% Survival
0
50
100
150
200
250
300
350
Concentration (µg/kg)
Above 80%
Below 80%
Reference

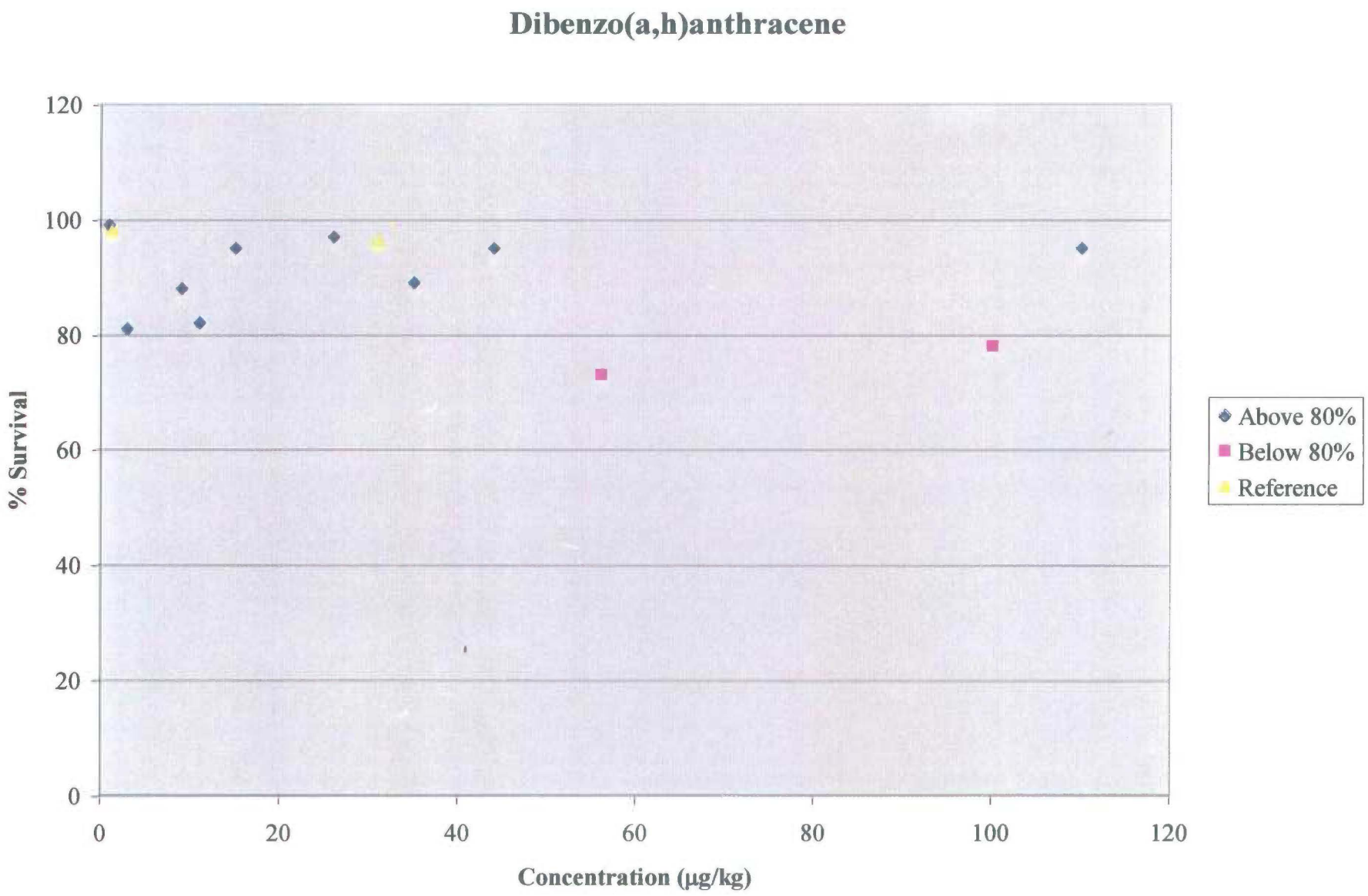

Benzo(b)fluoranthene
120
100
80
60
40
20
0
% Survival
0
10
20
30
40
50
60
70
Concentration (µg/kg)
Above 80%
Below 80%
Reference

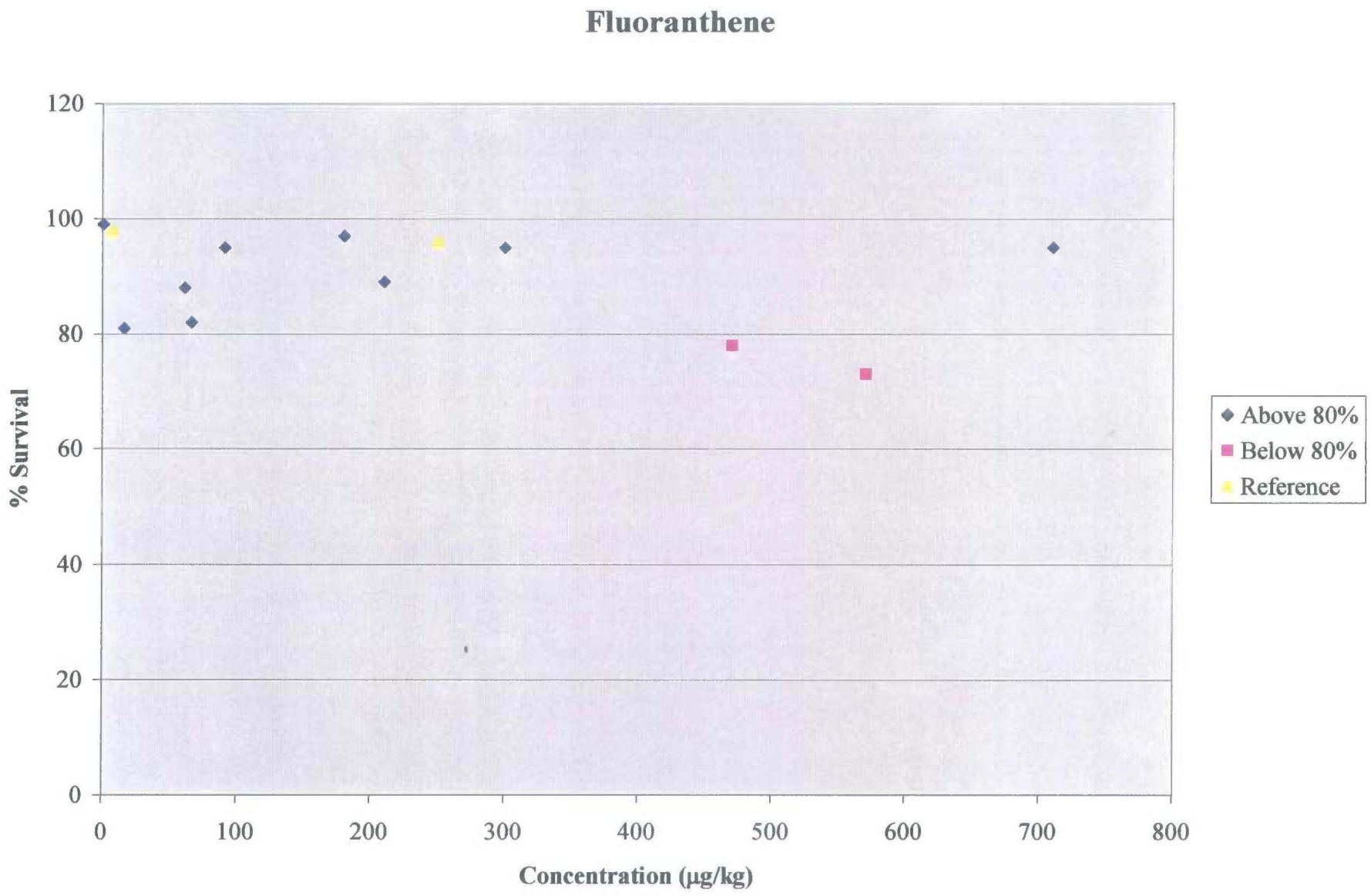

Benzo(g,h,i)perylene
% Survival
120
100
80
60
40
20
0
0
50
100
150
200
250
300
350
400
450
Concentration (µg/kg)
Above 80%
Below 80%
Reference

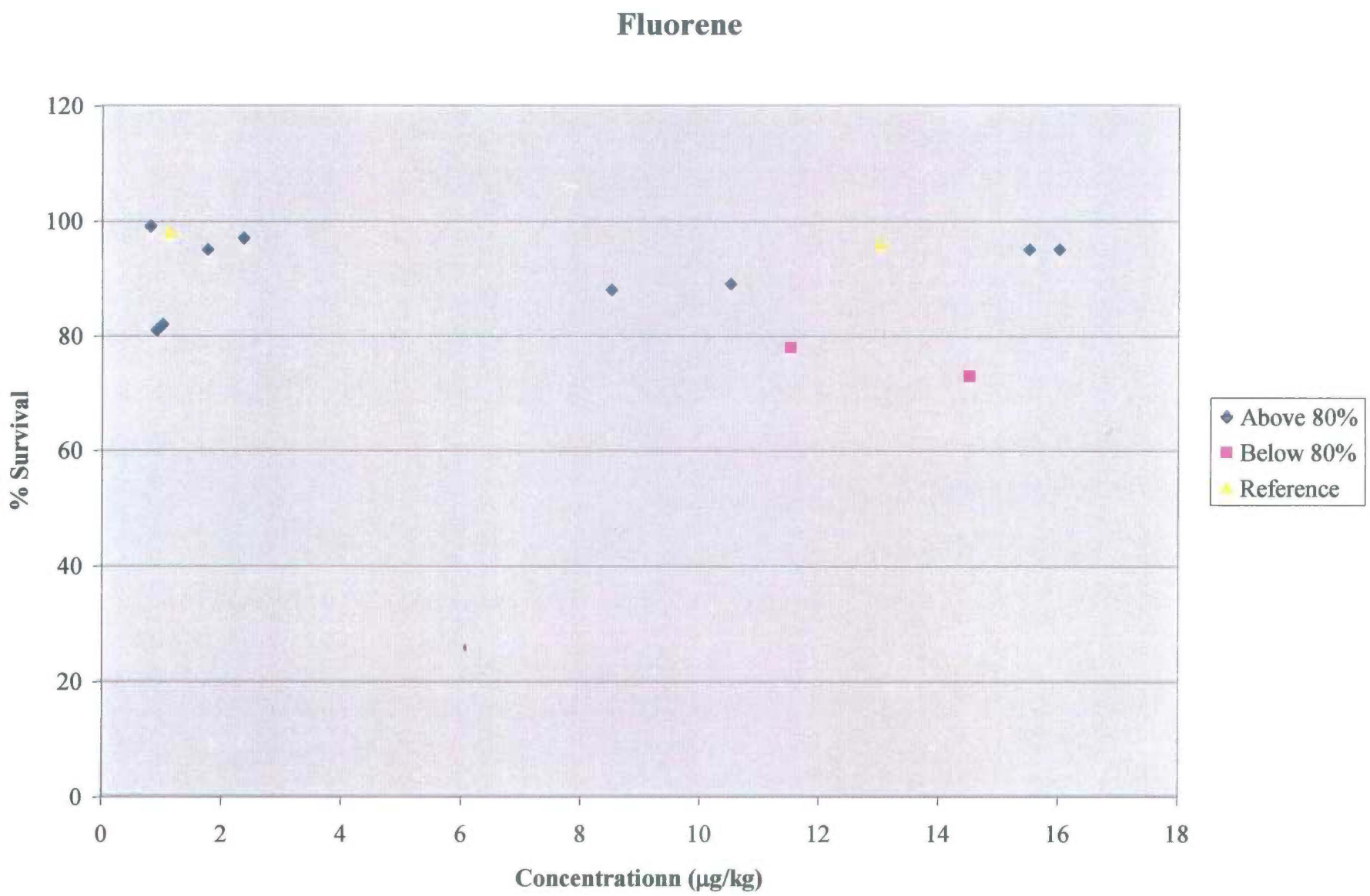

Benzo(k)fluoranthene
% Survival
120
100
80
60
40
20
0
0
50
100
150
200
250
300
Concentration (µg/kg)
Above 80%
Below 80%
Reference

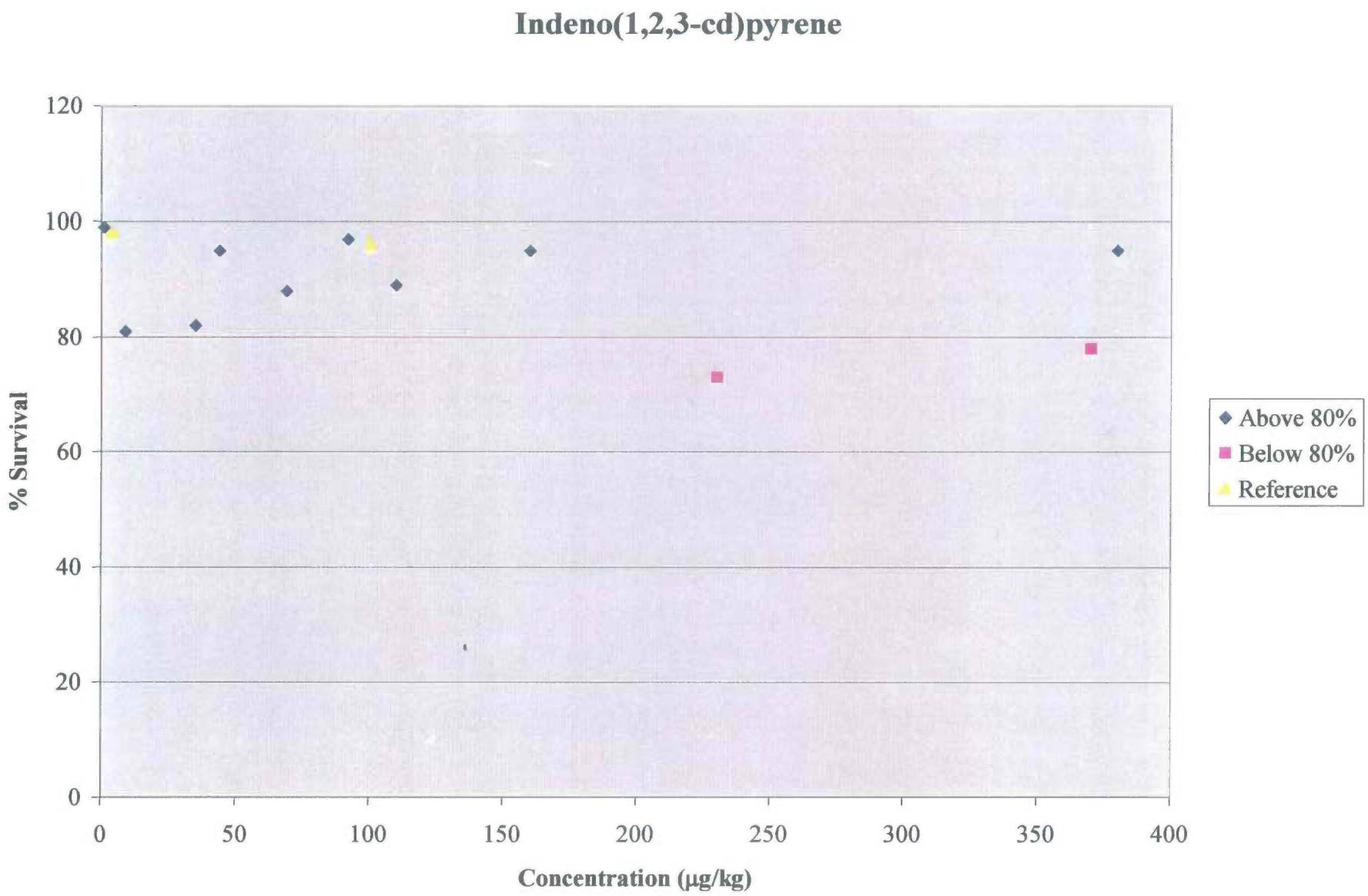

Benzo(a)pyrene
% Survival
120
100
80
60
40
20
0
0
50
100
150
200
250
300
350
400
450
500
Concentration (µg/kg)
Above 80%
Below 80%
Reference

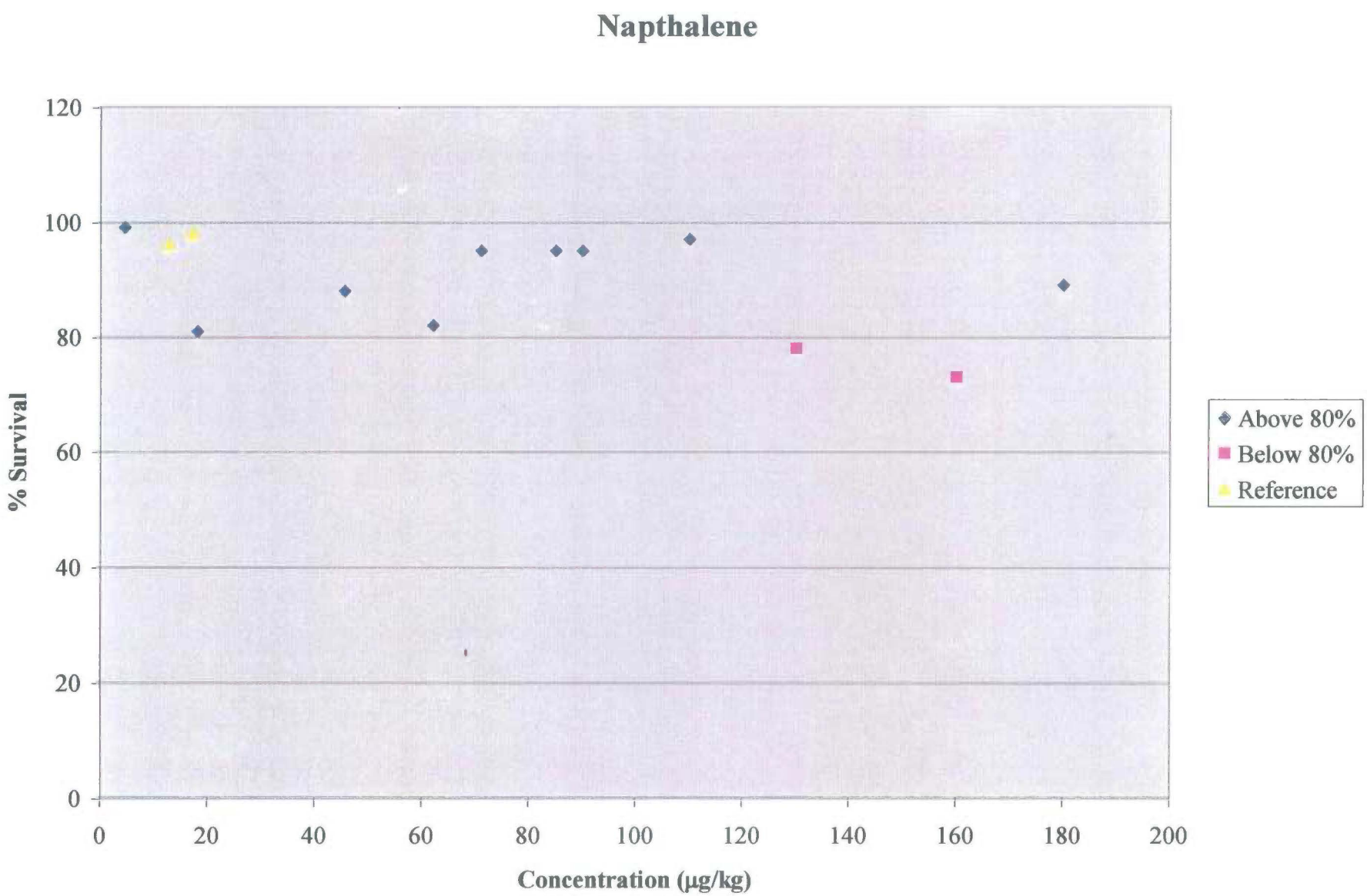

Chrysene
120
100
80
60
40
20
0
% Survival
0
200
400
600
800
1000
1200
Concentration (µg/kg)
Above 80%
Below 80%
Reference

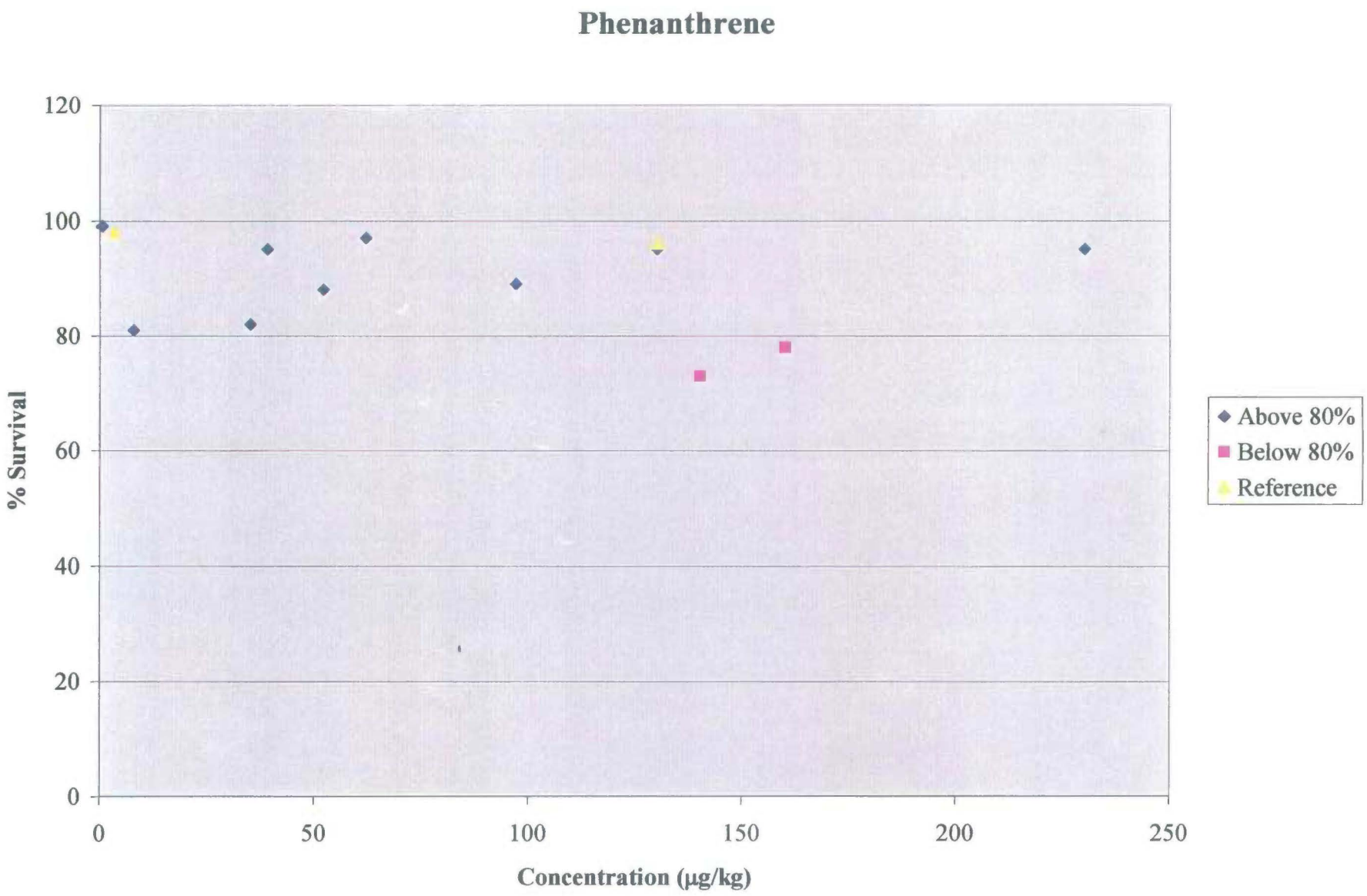

Dibenzo(a,h)anthracene
% Survival
120
100
80
60
40
20
0
0
20
40
60
80
100
120
Concentration (µg/kg)
Above 80%
Below 80%
Reference

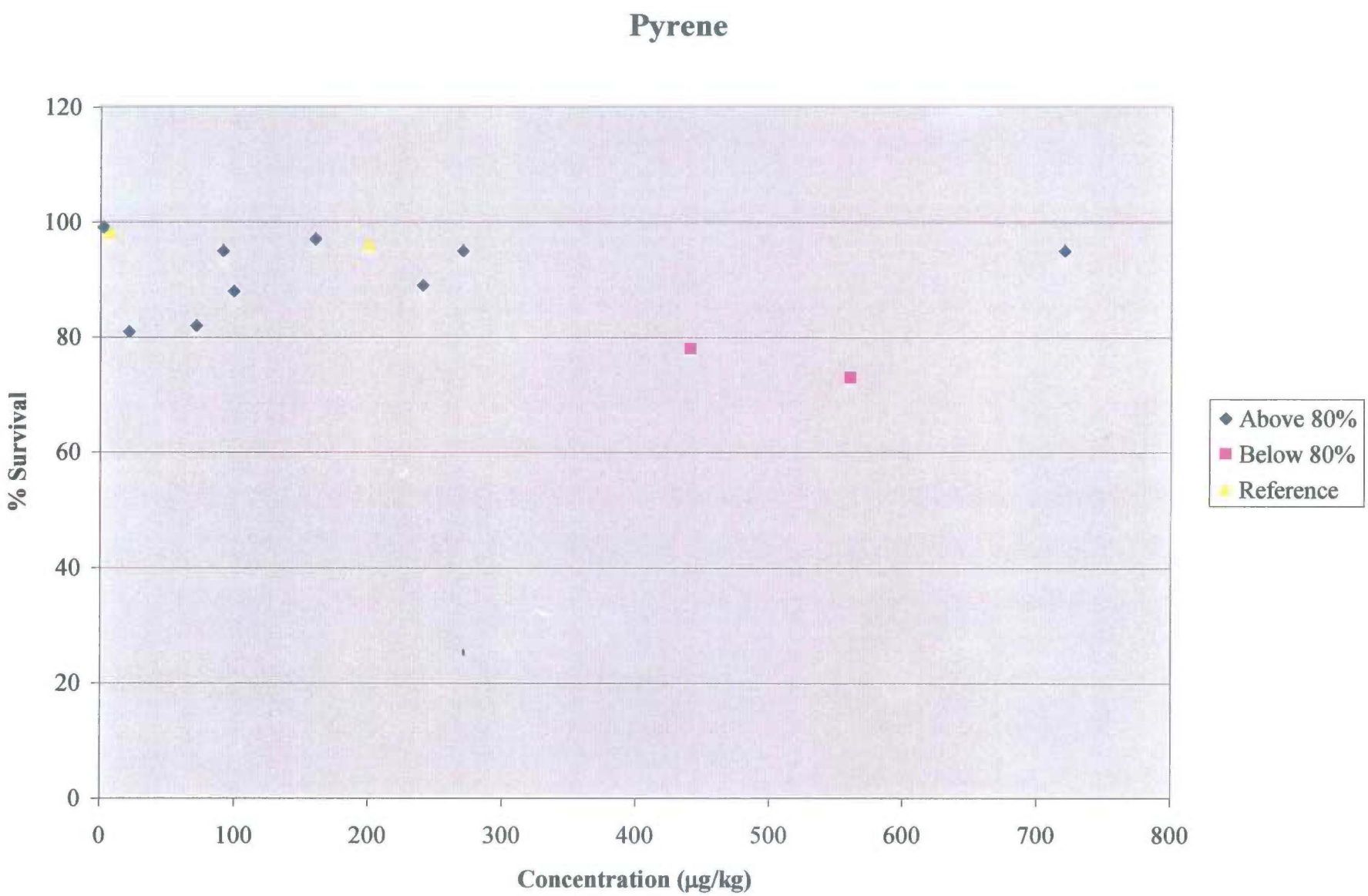
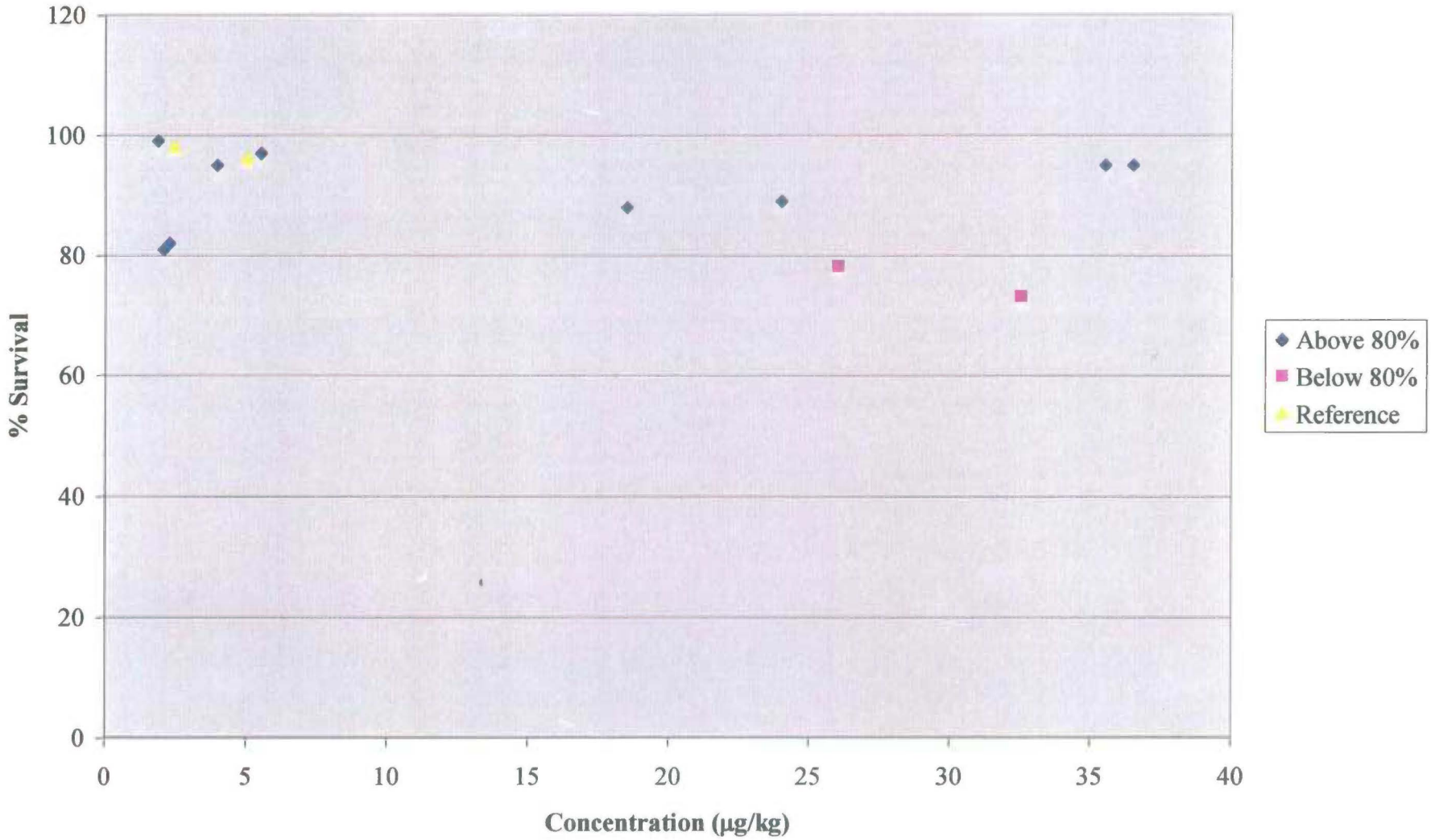

Fluoranthene
120
100
80
60
40
20
0
% Survival
0
100
200
300
400
500
600
700
800
Concentration (µg/kg)
Above 80%
Below 80%
Reference


Fluorene
120
100
80
60
40
20
0
% Survival
0
2
4
6
8
10
12
14
16
18
Concentrationn (µg/kg)
Above 80%
Below 80%
Reference


Indeno(1,2,3-cd)pyrene
120
100
80
60
40
20
0
% Survival
0
50
100
150
200
250
300
350
400
Concentration (µg/kg)
Above 80%
Below 80%
Reference


Napthalene
% Survival
120
100
80
60
40
20
0
0
20
40
60
80
100
120
140
160
180
200
Concentration (µg/kg)
Above 80%
Below 80%
Reference


Phenanthrene
120
100
80
60
40
20
0
% Survival
0
50
100
150
200
250
Concentration (µg/kg)
Above 80%
Below 80%
Reference


Pyrene
120
100
80
60
40
20
0
% Survival
0
100
200
300
400
500
600
700
800
Concentration (µg/kg)
Above 80%
Below 80%
Reference

1-Methylnapthalene