Meeting Date/Time: February 16, 1995/0830

Meeting Location: Advanced Sciences, Inc. (ASI), Lakewood, CO

Meeting Subject: Review of Background Comparison and Application of Professional Judgement for Arsenic, Operable Unit No. 5, Rocky Flats Environmental Technology Site

Attendees:

Name	Affiliation
Carol Bicher	EG&G
Sherry Boboricken	ASI
Win Chromec	EG&G
Doug Dennison	ASI
Mary Lee Hogg	ICF Kaiser
Mike Kelly	Dames & Moore
Bonnie Lavelle	EPA
Kurt Muenchow	DOE/RFFO
Al Palachek	EG&G
Rotha Randall	EG&G
Mary Siders	EG&G
Paul Singh	ORNL/RFFO
Carl Spreng	CDPHE

Materials that were handed out during this meeting were the viewgraphs (Attachment 2) and ordered listings, probability plots, and other information regarding the distribution of arsenic in several media.

Introduction- C. Bicher restated the purpose and goal of this meeting. K. Muenchow discussed that the goal of the meeting should be revised to state that arsenic may be retained for evaluation in the risk assessment without being referred to as a chemical of concern (COC).

B. Lavelle - Stated that EPA believes that there is a misunderstanding between EPA's understanding of a COC versus what DOE/RFFO and EG&G consider a COC. In EPA's CERCLA process, a COC indicates that this chemical should be looked at further, not that it has to be evaluated in the quantitative risk assessment. The COC-selection process is not used at all sites and should be very conservative. The COCs may be readdressed during the exposure assessment and the toxicity assessment using more realistic assumptions and data aggregation. The exposure and toxicity assessments feed the risk characterization, and the reality of all assumptions can be re-evaluated during the risk characterization phase. At the completion of the risk characterization, interface with the feasibility study (FS) is crucial; note that EPA's decision

Arsenic in Pond Sediments

C. Bicher - Discussed that, due to the lack of background data (Rock Creek) for pond sediments, the background comparison for pond sediments was performed using background data for both seep sediments and stream sediments. Due to differences in geochemical setting of pond sediments and stream sediments, the background comparison should be limited to only seep sediments. A seep is more like a pond in that it is a zone of accumulation for sediment, whereas stream sediments are in transport.

M. Siders - Discussed that the distribution of trace elements is controlled by sediments, shale, etc. that contain large quantities of fine-grained material (clays). Pond and seep sediments are more geochemically similar due to low-energy environments where more fine-grained materials would accumulate. Therefore, comparison to stream sediments is probably not appropriate due to differing geochemical regimes.

C. Spreng - Questioned whether the small sample size also creates problems.

A. Palachek - Discussed that the question is whether the samples are a representative population.

C. Bicher - Stated that OU3 compiled data for other Front Range reservoirs and lakes that could be used for comparison.

C. Spreng - Questioned whether more samples are needed.

A. Palachek - Stated that the question is whether more samples will produce a better representation of the site conditions. The small sample size is very important when determining average concentrations for risk assessment. The uncertainty associated with a small sample size will produce a large UCL.

B. Lavelle - Questioned if it would be valid to perform a background comparison using both OU5 and OU6 data for pond sediments.

R. Randall - Presented a map of arsenic concentrations in surface soils and sediments across RFETS.

C. Bicher - Stated that OU6 compared to seep sediments and did not identify arsenic as a PCOC. A combined analysis would not likely identify arsenic as a PCOC.

C. Spreng - Questioned whether the statistical comparisons could be performed with the combined OU5 and OU6 data sets.

C. Bicher - Stated that the comparisons could be performed with the combined data sets relatively easily.

B. Lavelle - Questioned if COCs for the drainages should be considered on a site-wide basis.

K. Muenchow - Stated that, due to similar potential sources, this may be appropriate.

M. L. Hogg - Stated that because the statistical comparisons of pond sediment data for OUs 5 and 6 to background seep sediment data individually do not indicated that arsenic is a PCOC, statistical tests on the combined OU5 and OU6 data sets will not likely tell us anything new.

B. Lavelle - Agreed. But looking to the future, it may make sense to look at the drainages on a site-wide basis.

C. Bicher - Questioned if it can be concluded that arsenic is not a PCOC for pond sediments in OU5 based on comparison to seep-sediment background.

B. Lavelle - Agreed with this argument, based on the statistical tests.

C. Spreng - Also agreed, but would like to confirm this with his department.

D. Dennison - Discussed that by using only seep sediment background, many of the metals previously identified as PCOCs would not be identified as PCOCs. Only mercury, potassium and zinc would be identified as PCOCs in pond sediments.

M. L. Hogg/W. Chromec - Stated that it would be likely that only mercury would be identified as a COC.

B. Lavelle - Agreed with using only seep sediment background data for comparison with pond sediments..

C. Spreng - Agreed.

Arsenic in Stream Sediments

C. Bicher - Presented information for arsenic in stream sediments. Discussed that only the Gehan test indicated a difference in OU5 concentrations versus background and that the small sample size may limit the validity of the statistical tests.

D. Dennison - Discussed that although arsenic concentrations in stream sediments generally increase with distance downstream, they show a different pattern than that shown by the other metals. Arsenic concentrations in sediments from Woman Creek and the South Interceptor Ditch

(SID) are similar and show similar increases in concentration with distance downstream, while the concentrations of copper, mercury, and zinc are relatively high at sampling station SED507 located in the SID within IHSS 115 (Attachment 2). Copper, mercury, and zinc are also identified as PCOCs for surface soils and are present in high concentrations in surface soils within IHSS 115.

B. Lavelle - Expressed concern with this argument, because, in the January meeting, the presentation indicated that the histograms and box plots showed a difference in populations. Questioned why the t-test was not run.

D. Dennison - Stated that the t-test is not run when the sample size is less than 20.

C. Spreng - Stated that the increase in concentrations with downstream distance is not a convincing argument.

M. Siders - Stated that the concentrations of arsenic detected in stream sediments are within the range found in surface soils throughout the Front Range.

K. Muenchow - Questioned whether arsenic can be excluded as a COC or called background if the risk associated with it is calculated and included in uncertainty section.

W. Chromec - Stated that the ultimate goal of the process must be kept in mind. Even if arsenic is carried through the risk assessment, it will not drive a remedial decision. We appear to be struggling with the terminology of a COC. To call a chemical a COC does not imply that Rocky Flats introduced this chemical to the environment.

M. Siders - Discussed that the geometric mean of arsenic concentrations in shale is approximately 10 mg/kg and that shale is very prominent in the Front Range. From a geochemical interpretation, it isn't appropriate to call arsenic a PCOC when it is at background levels.

M. L. Hogg - Stated that background risk for OU5 will be calculated.

C. Spreng - Expressed concern that the agreed-to process was being circumvented.

M. Siders - Stated that Phase V of Gilbert's process allows professional judgement to determine the reasonableness of retaining each chemical as a PCOC, by looking at the geochemistry, the site's history, etc.

K. Muenchow - Stated that it will be very important to put the site risk in perspective by showing background risk in the RI Report.

R. Randall/W. Chromec - Discussed that EG&G is considering preparing a background risk paper that can be referenced by and incorporated into each RI Report.

B. Lavelle - Stated that she will discuss this approach with EPA toxicologists and risk assessors.

C. Bicher - Restated that the agreement is to calculate background risk for arsenic, but questioned whether it be should be retained as a PCOC and included in the concentration-toxicity screen.

B. Lavelle - Stated that arsenic in stream sediments should not be a PCOC and should be considered to be background, based on the geochemical interpretation that professional judgement indicates that arsenic levels are attributable to background.

C. Spreng - Agreed, but will need to confirm this with his department.

Arsenic in Groundwater

C. Bicher - Presented information for arsenic in groundwater. Discussed that due to the low frequency of detection, only the $UTL_{99/99}$ comparison was performed and a normal $UTL_{99/99}$ was used. It may be more appropriate to use a lognormal $UTL_{99/99}$.

M. Siders - Discussed that, due to large number of nondetects, even the $UTL_{99/99}$ comparison is not valid. It may be more appropriate to compare to the background range of concentrations.

B. Lavelle - Stated that it appears from the ordered listing that the OU5 data are within the background range.

W. Chromec - Stated that OU2 and OU6 are handling arsenic in groundwater in the uncertainty section.

B. Lavelle - Questioned why the other tests were not run, when Gilbert does not have a cut-off for percent non-detects for the statistical tests.

M. Siders - Discussed that anything greater than 50 percent non-detects is recognized by most statisticians as a cut-off for all statistical tests and referenced several sources.

B. Lavelle - Agreed with handling arsenic in groundwater as background, calculating the risk and discussing in the uncertainty section. Also, stated that the statistics are not conclusive and that the decision is based on Phase V of the Gilbert Methodology, professional judgement.

C. Spreng - Agreed with handling groundwater the same as stream sediments but will need to confirm with his department.

Status of Comments on COC TM and EATM

C. Bicher - Comment responses for the COC TM were sent to both agencies. Carl Spreng has indicated agreement with responses. For EPA comments, the comment response sheets will be revised to incorporate barium as a PCOC in subsurface soils and sent for approval.

B. Lavelle - Agreed to send a letter stating that EPA understands that the comment responses will be revised to reflect retainment of barium as a PCOC in subsurface soils. Comments on the EATM will be sent after the exposure factors meeting to be held February 21, 1995.

Summary

The following action items resulted from this meeting:

1. Carl Spreng, CDPHE, will confirm that arsenic will not be included as a PCOC for groundwater, stream sediments, and pond sediments.

2. Bonnie Lavelle, EPA, will discuss the proposed approach for preparing a report discussing background risk with EPA toxicologists and risk assessment staff.

3. Bonnie Lavelle, EPA, will send a letter regarding responses to comments on the COC TM and will send comments on the EATM after the meeting to be held on February 21, 1995.

ATTACHMENT 2

MEETING AGENDA

OU 5 Woman Creek Priority Drainage

February 16, 1995
Advance Sciences, Inc.
8:30

I. Introduction

II. Status of the COC TM

III. Process Knowledge of Arsenic

IV. Arsenic in Pond Sediments

V. Arsenic in Stream Sediments

VI. Arsenic in Groundwater

VII. Summary

OPERABLE UNIT 5
WOMAN CREEK PRIORITY DRAINAGE

FEBRUARY 16, 1995 MEETING

Human Health Risk Assessment
ARSENIC

PURPOSE: To review the Background Comparison and the applied Professional Judgment of Arsenic in OU 5.

GOAL: By media, agree on whether or not arsenic is attributable to background or a chemical of concern, and if a quantitative risk assessment should be conducted with the results discussed in the uncertainty analysis of the HHRA.

DRAFT-FINAL CHEMICALS OF CONCERN TECHNICAL MEMORANDUM
(Also Reference January 9, 1995 Meeting Notes and Handouts)

MEDIA	PCOC?
Surface Soils	No
Groundwater	Yes
Subsurface Soils	No
Surface Water	No
Seep Water	No
Pond Sediments	Yes
Seep Sediments	No
Stream Sediments	Yes

SUMMARY OF ARSENIC DATA FOR OU5

MEDIUM	SAMPLE SIZE	MEAN	MAXIMUM
Surface Soil (mg/kg)	91	4.6	8.9
Subsurface Soil (mg/kg)	239	3.9	18.9
UHSU Groundwater - total (µg/l)	17	5.6	13.3
UHSU Groundwater - dissolved (µg/l)	14	4.1	8.1
Surface water - total (µg/l)	27	4.4	5.7
Surface water - dissolved (µg/l)	27	4.8	3.6
Seep water - total (µg/l)	1	10U	10U
Seep water - dissolved (µg/l)	0	NA	NA
Pond Sediments (mg/kg)	6	5.5	9.8
Seep Sediments (mg/kg)	4	5.7	6.5
Stream Sediments (mg/kg)	8	3.5	5.5

U = Not detected

NA = Samples not taken in this medium.

PROCESS KNOWLEDGE

No references were found indicating that arsenic was used in any large quantities at RFETS

- Reconstruction of Historical Rocky Flats Operations & Identification of Release Points (CDH, 1992)
- Historical Release Report for the Rocky Flats Plant (EG&G, 1992)
- ERPD Library search: some references discussing arsenic as a sample analyte or within a general discussion of chemicals.

POND SEDIMENTS

- No background data available for Pond Sediments
- Background Comparison to Seep Sediments: No statistical difference
- Background to Comparison to Stream Sediments: Not appropriate because constituents in a stream are in transport where as a seeps and ponds are a zone of accumulation. This correction needs to be made in the COC TM.
- Other metals?

FIGURE 1 - HISTOGRAM, ARSENIC IN POND SEDIMENTS
(VERSUS STREAM SEDIMENT BACKGROUND)

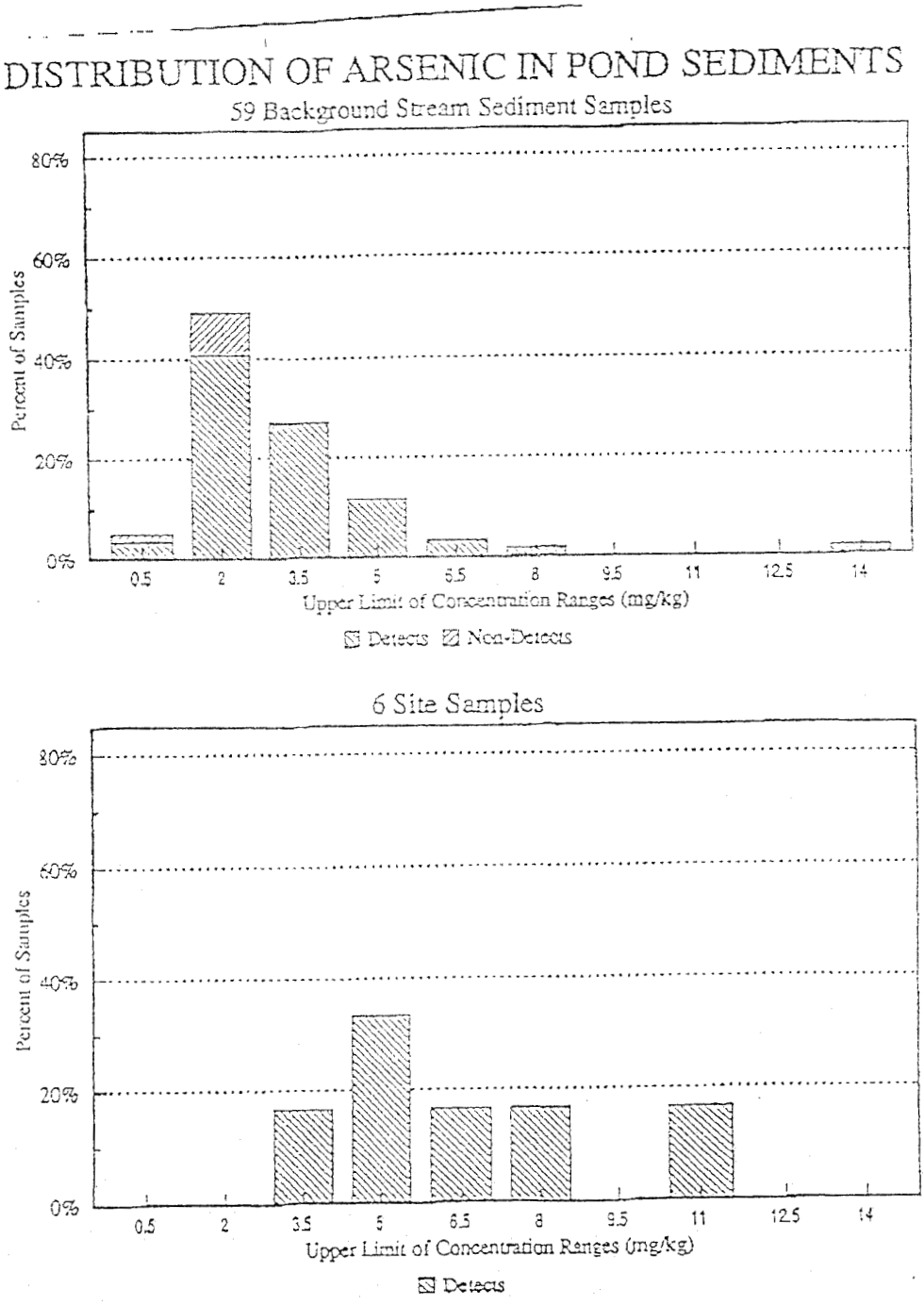
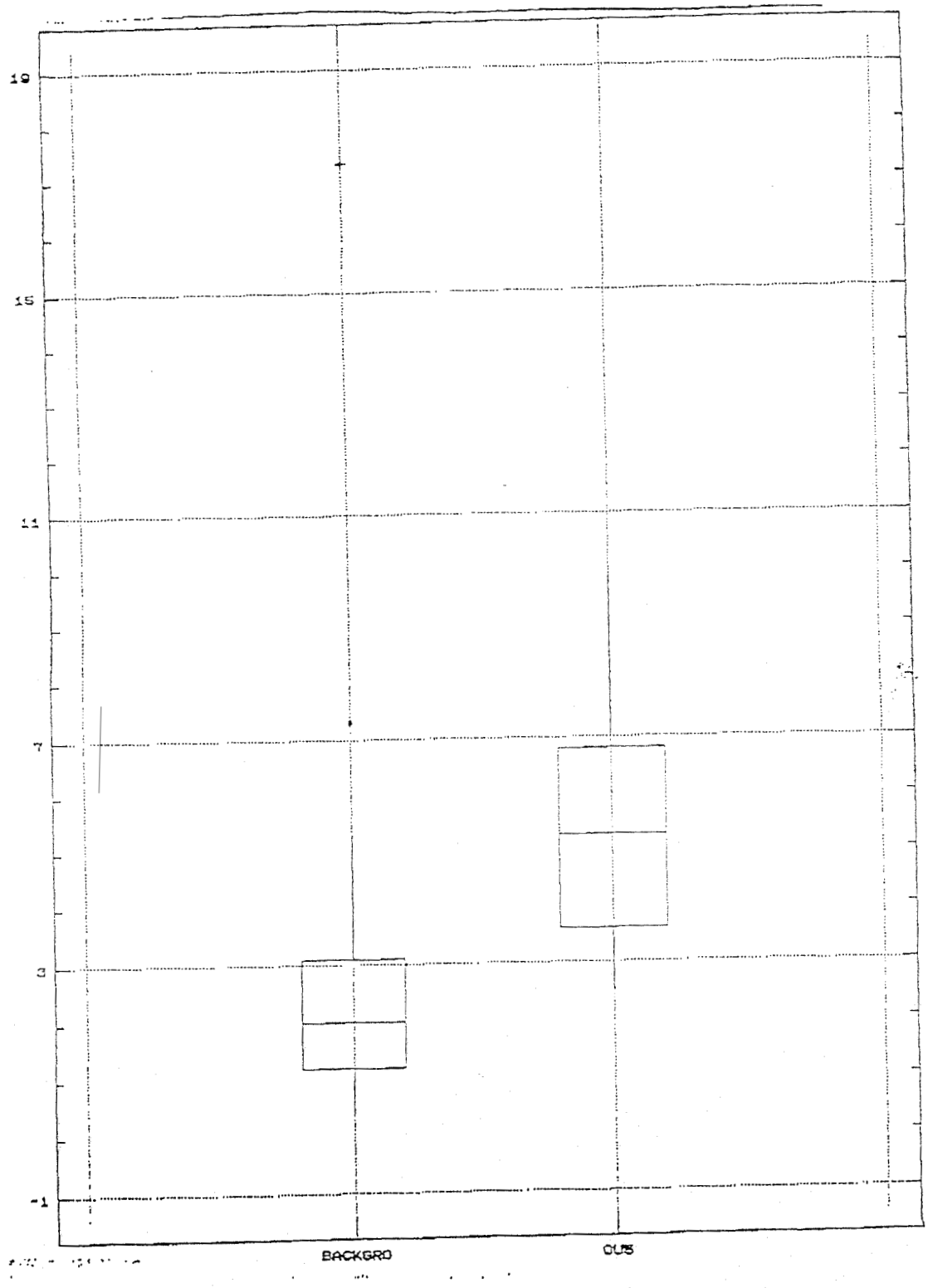


FIGURE 2 - BOX & WHISKER PLOT, ARSENIC IN POND SEDIMENTS
(VERSUS STREAM SEDIMENT BACKGROUND)



STREAM SEDIMENTS

- Background Comparison: The Gehan test indicated a statistical difference.
- OU 5 data set: N=8
- Background Data set: ~~large # of non-detects~~
- Copper, mercury, and zinc: Concentrations do not increase with increasing distance downstream. These metals are COC's in surface soils.
- Arsenic: Concentrations do increase with increasing distance downstream. Arsenic is not a PCOC is surface soils.

FIGURE 4 - BOX & WHISKER PLOT, ARSENIC IN STREAM SEDIMENTS

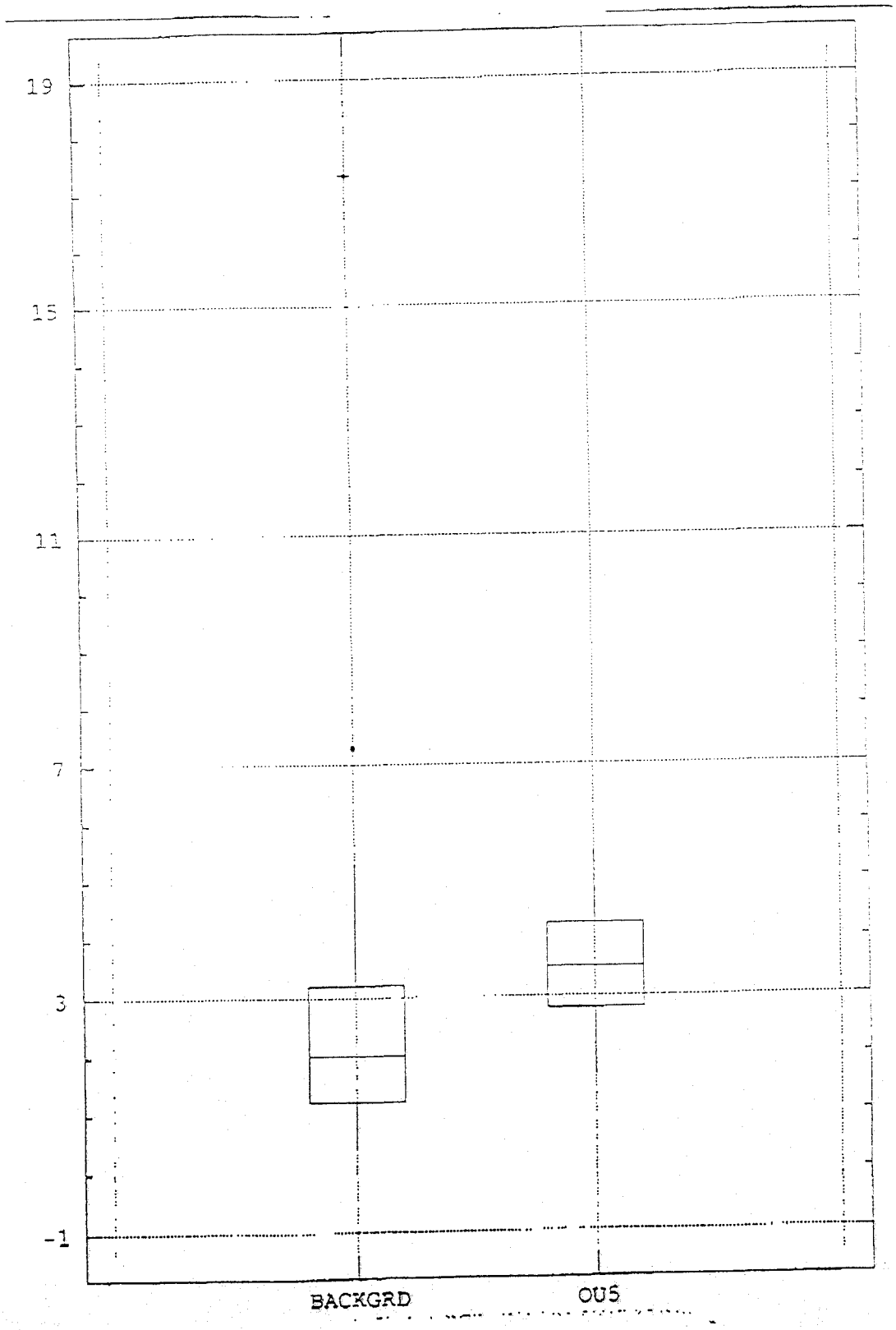
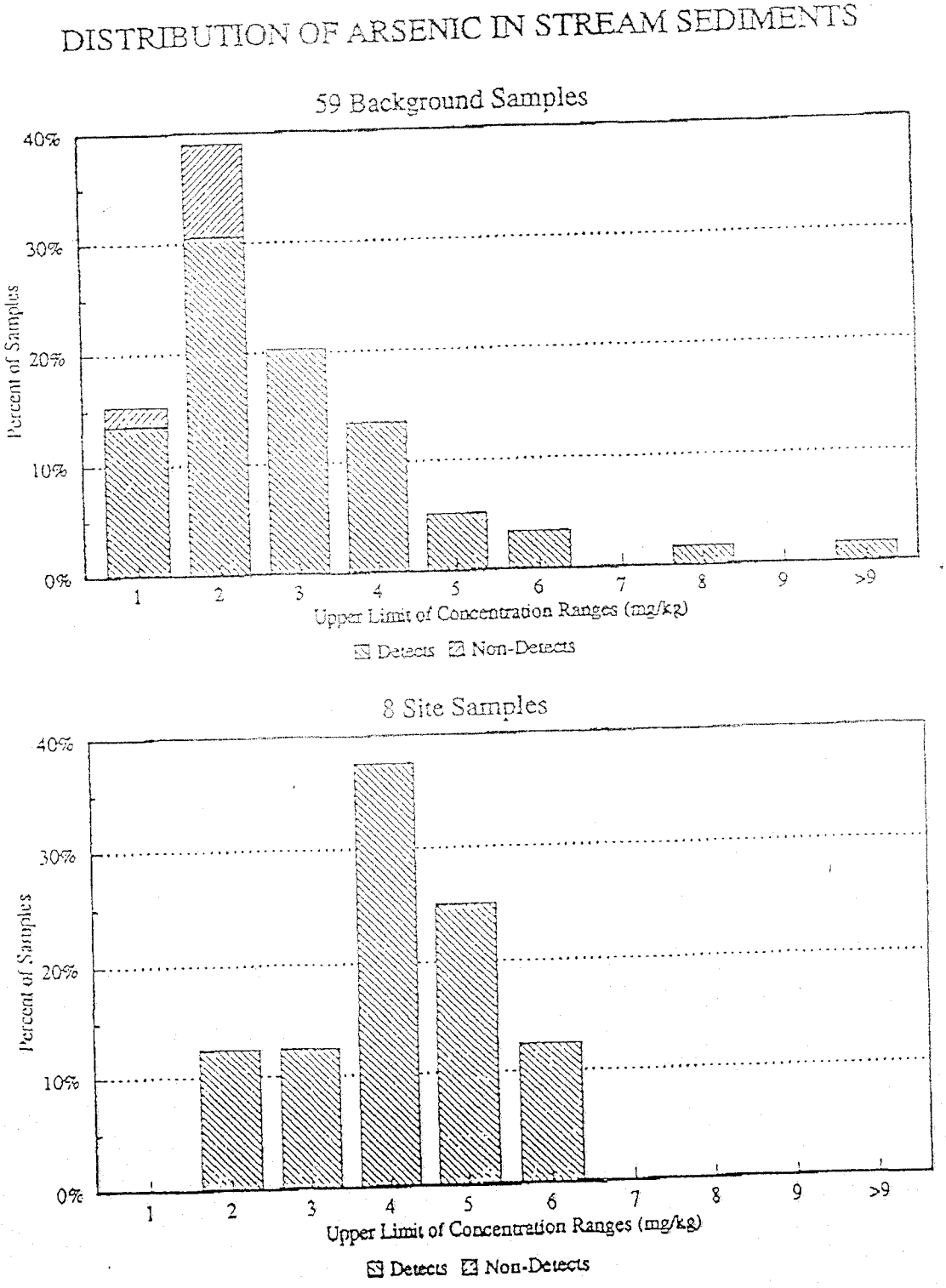
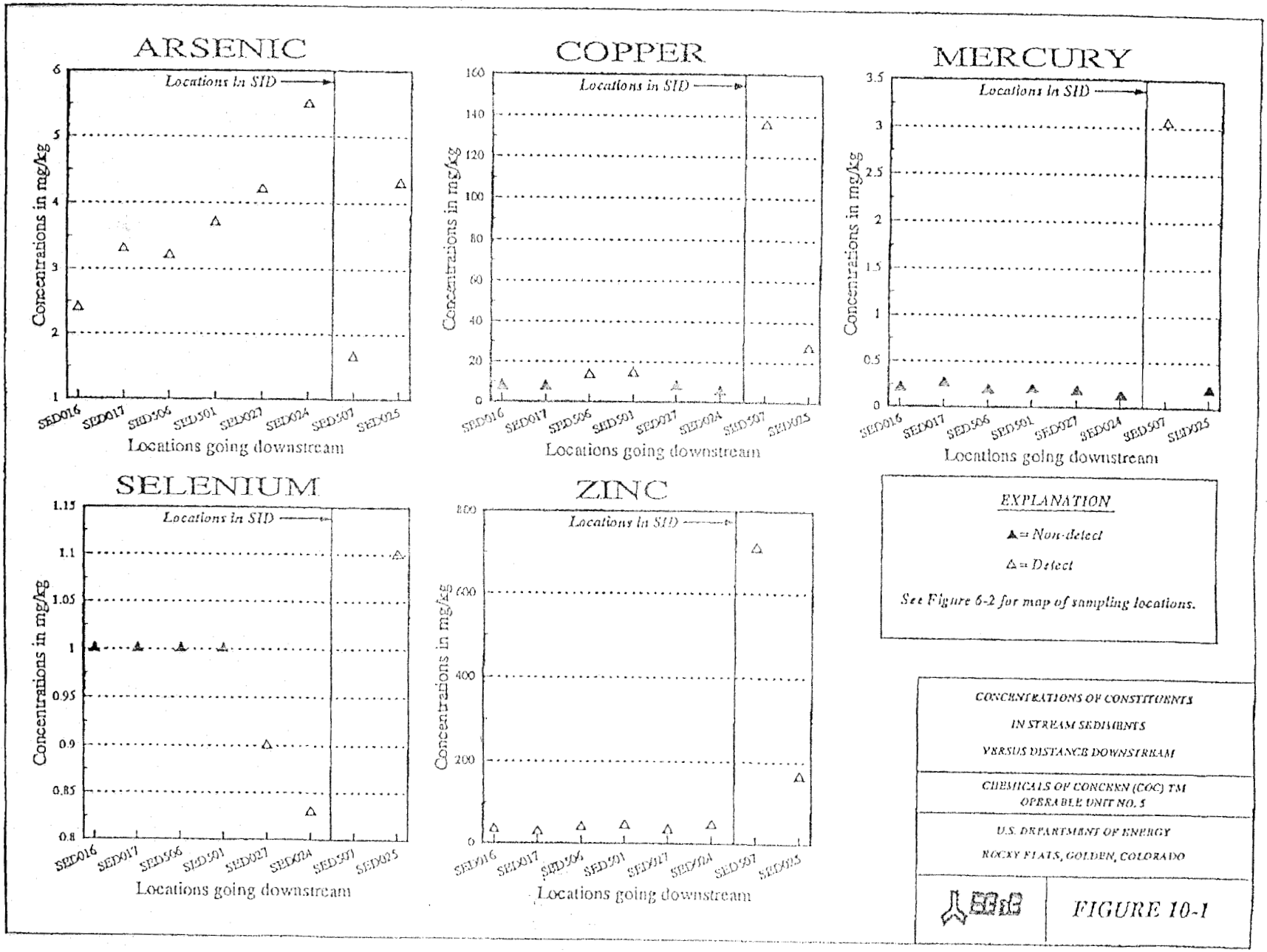


FIGURE 3 - HISTOGRAM, ARSENIC IN STREAM SEDIMENTS




ARSENIC
Concentrations in mg/kg
Locations in SID
SED016
SED017
SED506
SED501
SED027
SED024
SED507
SED025
Locations going downstream
COPPER
Concentrations in mg/kg
Locations in SID
Locations going downstream
MERCURY
Concentrations in mg/kg
Locations in SID
Locations going downstream
SELENIUM
Concentrations in mg/kg
Locations in SID
Locations going downstream
ZINC
Concentrations in mg/kg
Locations in SID
Locations going downstream
EXPLANATION
▲ = Non-detect
△ = Detect
See Figure 6-2 for map of sampling locations.
CONCENTRATIONS OF CONSTITUENTS
IN STREAM SEDIMENTS
VERSUS DISTANCE DOWNSTREAM
CHEMICALS OF CONCERN (COC) TM
OPERABLE UNIT NO. 5
U.S. DEPARTMENT OF ENERGY
ROCKY FLATS, GOLDEN, COLORADO
FIGURE 10-1

GROUNDWATER

- Background Comparison: Statistical tests were not run due to the low frequency of detection (12%) for total arsenic in the UHSU.

- Background Comparison to the $UTL_{99/99}$:

Maximum Concentration in OU5		Background UTL $_{99/99}$ Normal distribution		Background UTL $_{99/99}$ Lognormal distribution
13.3 µg/l	—	8.2 µg/l		19.3 µg/l

- Comparison of the MCL to the lognormal $UTL_{99/99}$ may be more realistic:

  - Issaks and Srivastava, 1989

  - EPA, 1992

SUMMARY

- Is Arsenic a PCOC in Pond Sediments?

  Stream Sediments?

  Groundwater?

- Background Risk Calculations

- Discussion in the Uncertainty Section of the HHRA

MEETING ATTENDANCE

OU 5 Woman Creek Priority Drainage

February 16, 1995
Advance Sciences, Inc.
8:30

	Name	Company	Phone #	Fax #
1	Carol Bicher	EG&G	966-9100	966-8663
2	Wm Clarmec	EG&G	966-8641	966 8663
3	Mary Lee Hogg	ICF	8716	"
4	AL PALACHEK	EG&G	966-7973	966-2263
5	Carl Spreng	CDPHE	692-3358	759-5355
6	PAUL SINGH	ORNL/RFFO	966-3490	966-4871
7	Doug Dennison	ASI	980-0036	980-1206
8	KURT Monchow	~~DOE~~		
9	Sherry Bobrickter	ASI	980-0036	980-1206
10	Ratha Randall	EG&G	966-6924	966-8663
11	Mike Kelly	Dames & Moore	299-7876	299-7977
12	BENNIE LANELLE	EPA	294-1067	294-7559
13				
14				
15				
16				
17				

Feb 16, 1995 CUS Mtg to discuss Arsenic as a PCOC or not and how it should be evaluated in the risk assessment.

1 Introduction

Purpose:

Goal: Arsenic

2 EPA Position, Bonnie Lavelle

- CERCLA position is that a COC value means we need to look at it further, that it is (maybe) above background and should have its risk quantified. COC doesn't necessarily mean site contaminated.
- A COC selection is conservative and at the Exp A and Tox Asmt relook at using more realistic assumptions and data aggregation
- Then this feeds into the risk char. w/ discussion on conservatism, have we overshot, a realistic land use, scenario etc
- at risk char stage can now elim a COC based on relook at this stage

EPA (10^{-4}) - is the decision criteria for remediation

- This feeds the FS: RAOS developed for risk drivers, not necessarily all COC's
- w/in Chronic - FS will address before this - it is preliminary.

Feb 16, 1995 Mtg continued

- EPA has no interest in making a constituent that is not site related a remediation driver.

4 Process Knowledge

- Bonnie was Mtec personnel talk to about use of As
- ECHL Not sure, but used Wedy's wash stream

3 Previous COC TM

Only want to discuss GW, pond sed, stream sed

5 Pond Sediments

- CDH & EPA concur with arguments that based on statistical tests As is not a PCOC; CDH (Carl) stated that he wants to confirm this w/ his dept. (Carl)
- Other metals: Hg & Zn already PCOCs
  - note nads donot chang
  - CDH & EPA concur again but CDH would like to confirm w/ his dep (Carl)

6. Stream Sed

- Gehan test showed stat diff; N=8
- Bkgnd set: large # nondetects
- downstream patterns w/ those for Cu, Hg, Zn
- note that Cu, Hg & Zn are PCOCs in seg sed & H

Feb 16, 1995 OU5 Arsenic Mtg continued

5 Stream Seds continued

- statistics -

Bonnie - why the t-test was not run?

Doug - because sample size < 20

~~Bonnie~~ -

• Kurt - not call it a COC but calc the risk & present in uncertainty

- combine 5 & 6 data & compare to backgrounds solving the small sample size problem

- Mary - geom mean in shale is 10, therefore it is more than reasonable to call it background

- Kurt, Carol, Al - we will calculate the background risk

- Phase V of Gilbert is Prof. Judgement when you look @ geochemistry, history

- EPA & CDH agree that it should not be a PCOC based on Phase V (Geochemist's Prof. Judgement) again CDH would like to confirm this w/ EDept.

- Mary Siders will attend public meetings, per Bonnie's request

Feb 16, 1995 OU5 Arsenic Mtg continued

6. GW

- BKgd Comp - statistical tests not run due to low freq of detection

- Bonnie - OU5 data was normally distributed

- Mary & Al: statistical problems

- Note that dissolved # < total for Ar in GW

- OU 2 & OU 6 handled Ar in the uncertainty section

- Bonnie: why weren't other stat tests used

- Mary - Because the low freq of det. it is not appropriate

- we will calc the bkgd risk but will not carry it as a PCOC: EPA concurs; CDH agrees but will confirm and ~~[illegible]~~

Statistics are not conclusive; decisions based on Phase V Gilbert

- Bonnie - because of too many nondet the lognormal dist of backgrd argument is not all that valid.

CDPHE,
X Carl Spreng — Carl Spreng

X EPA, Bonnie Lavelle — [signature]

X DOE, Kurt Muenchow — [signature]