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GROUND-WATER/SURFACE-WATER INVESTIGATION PLAN

PHASE 2 REMEDIAL INVESTIGATION DRAFT REPORT

VOLUME III of III

Appendix D

May 29, 1992

Prepared for:

Industri-Plex Site Remedial Trust
36 Commerce Way
Woburn, Massachusetts

Prepared by:

Roux Associates, Inc.
Environmental Science & Engineering, Inc.
PTI Environmental Services

ROUX

MO06624Y.2r.1 cov

APPENDIX D

Analytical Data and
Validation Documentation

D1 Ground-Water Data Validation Documentation
D2 Surface-Water and Stream-Sediment Data Validation Documentation
D3 Hall's Brook Holding Area and Metals Mobility Data Validation Documentation
D4 Hall's Brook Holding Area Calculations
D5 Fish Tissue: Laboratory Analytical Results
D6 Ecological Assessment: Exposure Parameters and Example Calculation

APPENDIX D1

Ground-Water Data Validation Documentation

APPENDIX D1

Ground-Water Data Validation Documentation

Organic Data

Gradient Corporation

March 19, 1992

Ms. Martha Smith
Roux Associates, Inc.
775 Park Avenue, Suite 255
Huntington, NY 11743

RE: Industri-Plex
Woburn, Massachusetts
ENSECO-East
Volatiles: 14 low concentration aqueous samples

Dear Ms. Smith:

A validation was performed on the organic analytical data from 14 low level aqueous samples collected at the Industri-Plex site. The data were evaluated based on the following parameters according to the Region I Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses, November, 1988:

* - data completeness
- holding times
* - GC/MS tuning
- calibrations
- field and laboratory blank results
* - system monitoring compounds/surrogate spike recoveries
* - matrix spike/matrix spike duplicate
- field duplicates
* - internal standard performance
- tentatively identified compounds
* - compound identification
- compound quantitation

* All criteria were met for this parameter.

Table I summarizes the validation recommendations which were based on the following information:

44 Brattle Street, Cambridge, MA 02138 • (617)576-1555 • Telefax (617)864-8469
Environmental Consultants with Offices in Cambridge, MA and Boulder, CO

General

The data were provided in two packages. The first case, 18710, contained the data for the 12/16/91 sampling. The second package, case 18748, contained the data for the 12/17/91 sampling. Both cases are included in this report and are considered to be part of the same sample delivery group.

Holding Times

Samples OW-52B, OW-54B, OW-54C, OW-56B, OW-56C, and OW-100 were not preserved and were analyzed 8 to 10 days from sampling, which exceeds the Functional Guidelines criterion of analysis of unpreserved volatile samples within 7 days of sampling. The criterion applies to aromatic compounds only, which may be subject to bacteriological degradation. The positive results have been estimated (J) as well as the nondetect results (UJ) due to the possibility of compound degradation. The positive results may be biased low and the possibility of false negatives exists.

Calibrations

The volatile organics analyses were performed on instrument HP-V2. The initial calibration, performed on 10/15/91, was compliant. High percent differences (%Ds) were noted for chloromethane (29.3%) and chloroethane (25.3%) for the water continuing calibration on 12/24/91, but these compounds were not detected in the associated samples and therefore no action was required. A high %D was also noted for chloromethane (26.0%) for the continuing calibration on 12/27/92. No action was required as the compound was not found in any field samples. All other water volatile calibrations were acceptable.

Field and Laboratory Blank Results

Contaminants detected in the volatile field, trip, and laboratory blanks are summarized in the following table. There were two trip blanks and one field blank associated with this project. The action do not apply to the trip and equipment blank samples.

Compound	Max. Concentration (ug/L)	Action Level Water (ug/L)
methylene chloride	1	10
acetone	4	40
2-butanone	7	70

Blank Actions:

- value < CRQL; report CRQL followed by a U.
- value > CRQL and < action level; report value with a U.
- value > CRQL and > action level; report value unqualified.

The action level values were compared to sample values after application of sample dilution factors. There were no positive results for methylene chloride in any field samples. The positive acetone results in samples OW-56B, OW-56C, and OW-100 were considered nondetects due to blank contamination and the results were qualified with U. The positive acetone result in sample OW-54A was replaced with the CRQL which were qualified U due to uncertainty in the quantitation limit. The positive 2-butanone result in sample OW-54C was changed to a nondetect and qualified with U. The positive 2-butanone result in sample OW-56C was changed to the CRQL followed by U.

Field Duplicates

Samples OW-56C and OW-100 were the field duplicate pair which were both analyzed at 1:20 and 1:80 dilutions. All results were comparable with the exception of toluene in the 1:20 dilution analyses, which had a relative percent difference of 48%. The toluene value for OW-100 was higher than OW-56C (750 ug/L versus 460). The high value is also inconsistent with the results of the 1:80 analyses, which averaged 490 ug/L. The toluene result from the 1:80 dilution analyses was incorporated in the summary sheets.

Tentatively Identified Compounds

TICs were reported in only two samples. Alkylbenzene compounds and hydrocarbons were reported in sample OW-52B, and a dichlorobenzene isomer was reported in sample OW-30A. It is recommended to accept the TIC results.

Compound Quantitation

Samples OW-56C, OW-100, and OW-54C had benzene detected above the quantitation range in the initial volatile organics analyses. The samples were re-analyzed with a lower sample volume (dilution), and benzene was within the calibration range. The benzene results from the re-analyses are included in the data summary table. Acetone and toluene were also detected above the calibration range in sample OW-54C. The toluene result from the dilution analysis was reported in the data summary tables. The acetone result in the dilution would be below the blank action level, and therefore the acetone value from the original analysis was included in the summary tables. The value has been estimated (J) as it is above the instrument calibration range.

Summary

The holding time for unpreserved aromatic compounds (7 days) was exceeded for samples OW-52B, OW-54B, OW-54C, OW-56B, OW-56C, and OW-100. The positive and nondetect aromatic results have been estimated (J, UJ). Blank contamination consisted of methylene chloride, acetone, and 2-butanone. All other results are valid and usable except where noted above.

Table I is the Recommendation Summary for the data based on the data review for the aqueous samples. Table II displays the analytical results for the aqueous samples. Qualifiers have been added to Table II as a result of the review. In addition to Tables I and II, the worksheets associated with this data validation are attached.

Very truly yours,

GRADIENT CORPORATION

Philip J. Doherty
Senior Analytical Chemist

Industri-Plex
Groundwater Samples

Table I - Recommendation Summary	
TR#	**VOA**
OW-30A	A
OW-30B	A
OW-52A	A
OW-52B	A^{1}
OW-54A	A^{2}
OW-54B	A^{1}
OW-54C	$A^{1,3,6}$
OW-56A	A
OW-56B	$A^{1,4}$
OW-56C	$A^{1,4,5}$
OW-100	$A^{1,4}$
FIELD_BLANK 1	A
TRIP_BLANK 1	A
TRIP_BLANK 2	A

A - Accept all data.

A^{1} - Accept data, but estimated positive (J) and nondetect (UJ) aromatic results due to exceeded holding times.

A^{2} - Accept data, but change the acetone value to nondetect at CRQL due to blank contamination.

A^{3} - Accept data, but consider the 2-butanone result a nondetect; qualify the value with U.

A^{4} - Accept data, but consider the acetone result a nondetect; qualify the value with U.

A^{5} - Accept data, but change the 2-butanone value to nondetect at CRQL due to blank contamination.

A^{6} - Accept data, but estimate (J) the acetone value due to detection above the quantitation range.

Data Summary Key

A - Acceptable data.

J - The associated numerical value is an estimated quantity.

U - The compound was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

UJ - The compound was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.

R - Reject data due to quality control criteria exceeded. The data are unusable (compound may or may not be present). Resampling and reanalysis is necessary for verification.

Site: Industri-Plex, Groundwater
Laboratory: ENSECO-East
File: ROUXV2A

CLP VOLATILE ORGANIC ANALYSIS
AQUEOUS ANALYTICAL RESULTS (ug/L)

Sample Location		OW-52A	OW-52B	OW-54A	OW-54B	OW-54C	FIELD_BLANK 1	TRIP_BLANK 2				
Remarks						D = 1:4		12/17				
Sampling Date		12/17/91	12/17/91	12/17/91	12/17/91	12/17/91	12/17/91	12/17/91				
Analysis Date		12/27/91	12/27/91	12/27/91	12/27/91	12/27/91	12/27/91	12/27/91				
Dilution Factor		1	1	1	4	1	1	1				
VOLATILE ORGANIC COMPOUND	CRQL (ug/L)											
Chloromethane	10											
Bromomethane	10											
Vinyl Chloride	10											
Chloroethane	10											
Methylene Chloride	10							1 J				
Acetone	10			10 U		210 J	3 J	4 J				
Carbon Disulfide	10											
1,1-Dichloroethene	10											
1,1-Dichloroethane	10											
1,2-Dichloroethene(Total)	10											
Chloroform	10					4 J						
1,2-Dichloroethane	10											
2-Butanone	10					17 U	7 J					
1,1,1-Trichloroethane	10											
Carbon Tetrachloride	10											
Bromodichloromethane	10											
1,2-Dichloropropane	10											
cis-1,3-Dichloropropene	10											
Trichloroethene	10											
Dibromochloromethane	10											
1,1,2-Trichloroethane	10					1 J						
Benzene	10	1 J	6 J	1 J	620 J	200 DJ						
trans-1,3-Dichloropropene	10											
Bromoform	10											
4-Methyl-2-pentanone	10					29						
2-Hexanone	10											
Tetrachloroethene	10											
1,1,2,2-Tetrachloroethane	10											
Toluene	10		29 J		UJ	430 DJ						
Chlorobenzene	10		UJ		UJ	UJ						
Ethylbenzene	10		6 J		UJ	4 J						
Styrene	10		UJ		UJ	UJ						
Xylene (Total)	10		66 J		13 J	25 J						

J - The associated numerical value is an estimated quantity.
U - The compound was considered not detected due to blank contamination. The associated numerical value is the quantitation limit.
UJ - The compound was not detected. The sample quantitation limit is an estimated value.
D - The value was taken from analysis of the diluted sample.
R - The datum was rejected.
CRQL - Contract Required Quantitation Limit

REGION I
Data Review Worksheets

Site Name: **Industri-Plex**
Reference Number: **NA**

REGION I REVIEW OF ORGANIC CONTRACT LABORATORY DATA PACKAGE

The hardcopied **ENSECO-East** data package received at Region I been reviewed and the quality assurance and performance data summarized. The data review included:

Case No.: **18710,18748** SAS No.: **NA** Sampling Date(s): **12/16-17/91**
SDG No.: **NA** Matrix: **Water** Shipping Date(s): **12/16-17/91**
No. of Samples: **14** Date Rec'd by Lab: **12/16-17/91**

Traffic Report Nos: **OW-30A, OW-30B, OW-56A, OW-56B, OW-56C, OW-100 OW-52A, OW-52B, OW-54A, OW-54B, OW-54C**
Trip Blank No.: **TRIP BLANK #1, TRIP BLANK #2**
Equipment Blank No.: **FIELD BLANK #1**
Field Duplicate Nos.: **OW-56C and OW-100**

SOW No. **3/90** requires that specific analytical work be done and that associated reports be provided by the laboratory to the Regions, EMSL-LV and SMO. The general criteria used to determine the performance were based on an examination of:

- Data Completeness
- Holding Times
- GC/MS Tuning
- Calibrations
- Blanks
- Surrogate Recoveries
- Matrix Spike/Matrix Spike
- Field Duplicates
- Internal Standard Performance
- Pesticide Inst. Performance
- Compound Identification
- Compound Quantitation

Overall Comments:

No semivolatile or pesticide/PCB analyses were required for this project. The data packages were complete and legible.

Definitions and Qualifiers:

A - Acceptable data.
J - Approximate data due to quality control criteria.
R - Reject data due to quality control criteria.
U - Compound not detected.

Reviewer: **Philip J. Doherty** Date: **2/27/92**

osum

REGION I
Data Review Worksheets

Data package was complete

I. DATA COMPLETENESS

MISSING INFORMATION	DATE LAB CONTACTED	DATE REC'D

Reviewer: PJD

Date: 2/27/92

orgl

II. HOLDING TIMES Complete table for all samples and circle the fractions which are not within criteria.

SAMPLE ID	DATE SAMPLED	VOA DATE ANAL	BNA DATE EXTR	BNA DATE ANAL	PEST DATE EXTR	PEST DATE ANAL
OW-30A	12/16/91	12/26/91	NA	NA	NA	NA
OW-30B	12/16/91	12/26/91	NA	NA	NA	NA
OW-56A	12/16/91	12/26/91	NA	NA	NA	NA
OW-56B	12/16/91	12/26/91	NA	NA	NA	NA
OW-56C	12/16/91	12/24/91	NA	NA	NA	NA
OW-56C DL	12/16/91	12/26/91	NA	NA	NA	NA
OW-100	12/16/91	12/24/91	NA	NA	NA	NA
OW-100 DL	12/16/91	12/26/91	NA	NA	NA	NA
TRIP_BLANK	12/16/91	12/26/91	NA	NA	NA	NA

VOA - Unpreserved: Aromatic within 7 days, non-aromatic within 14 days of sample collection.
Preserved: Both within 14 days of sample collection.
Soils: Both within 14 days of sample collection.

BNA & PEST - Extracted within 7 days, analyzed within 40 days, soils and water.

ACTION:
1. If holding times are exceeded all positive results are estimated (J) and non-detects are estimated (UJ).
2. If holding times are grossly exceed, the reviewer may determine that non-detects are unusable(*).

Reviewer: PJD Date: 2/27/92

org2

II. HOLDING TIMES Complete table for all samples and circle the fractions which are not within criteria.

SAMPLE ID	DATE SAMPLED	VOA DATE ANAL	BNA DATE EXTR	BNA DATE ANAL	PEST DATE EXTR	PEST DATE ANAL
OW-52A	12/17/91	12/27/91	NA	NA	NA	NA
OW-52B	12/17/91	12/27/91	NA	NA	NA	NA
OW-54A	12/17/91	12/27/91	NA	NA	NA	NA
OW-54B	12/17/91	12/27/91	NA	NA	NA	NA
OW-54C	12/17/91	12/27/91	NA	NA	NA	NA
OW-52C DL	12/17/91	12/28/91	NA	NA	NA	NA
OW-52B MS	12/17/91	12/27/91	NA	NA	NA	NA
OW-52B MSD	12/17/91	12/27/91	NA	NA	NA	NA
FIELD_BLK1	12/17/91	12/27/91	NA	NA	NA	NA
TRIP_BLK2	12/17/91	12/27/91	NA	NA	NA	NA

VOA - Unpreserved: Aromatic within 7 days, non-aromatic within 14 days of sample collection.
Preserved: Both within 14 days of sample collection.
Soils: Both within 14 days of sample collection.

BNA & PEST - Extracted within 7 days, analyzed within 40 days, soils and water.

ACTION:
1. If holding times are exceeded all positive results are estimated (J) and non-detects are estimated (UJ).
2. If holding times are grossly exceed, the reviewer may determine that non-detects are unusable(*).

Reviewer: PJD Date: 2/27/92

org2

REGION I
Data Review Worksheets

III. GC/MS TUNING

NA The DFTPP performance results were reviewed and found to be within the specified critiera.

If NO,
Samples affected:

YES The BFB performance results were reviewed and found to be within the specified criteria.

If NO,
Samples affected:

If mass calibration is in error refer to the Region guidelines for expanded criteria. If necessary, flag all associated data as unusable (R).

Reviewer: PJD Date: 2/27/92

org3

REGION I
Data Review Worksheets

IV A. VOLATILE CALIBRATION VERIFICATION

Date of Initial Calibration : 10/15/91
Dates of Continuing Calibrations: 12/24-28/91
Instrument ID : V2
Matrix/Level : water/low

DATE	CRITERIA OUT RRF,%RSD,RRF,%D	COMPOUND (VALUE)
12/24	%D	chloromethane (29.3%)
	Samples Affected:	OW-56C, OW-100, VBLK01
12/24	%D	chloroethane (25.3%)
	Samples Affected:	OW-56C, OW-100, VBLK01
12/27	%D	chloroethane (26.0%)
	Samples Affected:	OW-52A-B, OW54A-C,Field Blank1, Trip Blank2
	Samples Affected:	
	Samples Affected:	
	Samples Affected:	
	Samples Affected:	
	Samples Affected:	
	Samples Affected:	
	Samples Affected:	

1. All RRFs and RRFs must be >0.05
2. All %RSDs must be <30%
3. All %Ds must be <25%

ACTION:
1. If any compound has an initial RRF or continuing RRF of <0.05:
   a. Flag positive results for that compound as estimated (J).
   b. Flag non-detects for that compound as unusable (R).
2. If any compound has a %RSD > 30% or a %D > 25%:
   a. Flag positive results for that compound as estimated (J).
   b. Flag non-detects for that compound as estimated (UJ) if %RSD or %D is > 50%.

A separate worksheet should be filled out for each initial curve.

Reviewer: PJD Date: 2/27/92

org4a

REGION I
Data Review Worksheets

No semivolatile in this case

IV B. SEMIVOLATILE CALIBRATION VERIFICATION

Date of Initial Calibration : _____
Dates of Continuing Calibrations: _____
Instrument ID : _____

DATE	CRITERIA OUT RRF,%RSD,RRF,%D	COMPOUND (VALUE)
_____	_____ Samples Affected:	_____
_____	_____ Samples Affected:	_____
_____	_____ Samples Affected:	_____
_____	_____ Samples Affected:	_____
_____	_____ Samples Affected:	_____
_____	_____ Samples Affected:	_____
_____	_____ Samples Affected:	_____
_____	_____ Samples Affected:	_____
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_____	_____ Samples Affected:	_____
_____	_____ Samples Affected:	_____
_____	_____ Samples Affected:	_____
_____	_____ Samples Affected:	_____
_____	_____ Samples Affected:	_____

A separate worksheet should be filled out for each initial curve.

Reviewer: PJD Date: 2/27/92

org4b

REGION I
Data Review Worksheets

V A. BLANK ANALYSIS RESULTS (Section 1 & 2)

List the contamination in the blanks belows.

1. Laboratory Blanks

Level: Low

DATE	LAB ID	FRACTION/ MATRIX	COMPOUND	CONCENTRATION UNITS

2. Equipment and Trip Blanks

DATE	LAB ID	FRACTION/ MATRIX	COMPOUND	CONCENTRATION UNITS
12/26	TB#1	VOA/Aqu.	methylene chloride	1 ug/L
12/26	TB#1	VOA/Aqu.	acetone	4 ug/L
12/27	FB#1	VOA/Aqu.	acetone	3 ug/L
12/27	FB#1	VOA/Aqu.	2-butanone	7 ug/L
12/27	FB#2	VOA/Aqu.	methylene chloride	1 ug/L
12/27	FB#2	VOA/Aqu.	acetone	4 ug/L

A separate worksheet should be used for low and medium level blanks.

Reviewer: PJD Date: 2/27/92

org5a

REGION I
Data Review Worksheets

V B. BLANK ANALYSIS RESULTS (Section 3)

3. Blank Actions

Action levels should be based upon the highest concentration of contaminant determined in any blank. The action level for samples which have been concentrated or diluted should be multiplied by the concentration/dilution factor. No positive sample results should be reported unless the concentration of the compound in the sample exceeds the action level of 10 x's the amount in the blank for the common contaminants, or 5 x's the amount for any other compound. Specific actions are as follows:

1. The concentration is less than the CRQL, report the CRQL.

2. The concentration is greater than the CRQL, but less than the action level, report the concentration found U.

3. The concentration is greater than the action level, report the concentration unqualified.

For examples refer to the Regional Guidelines.

Common contaminants = methylene chloride, acetone, 2-butanone, toluene and phthalates.

LEVEL: Low

COMPOUND	MAX CONC./ UNITS	ACTION LEVEL/ UNITS	CRQL
acetone	4 ug/L	40 ug/L	10
methylene chloride	1 ug/L	10 ug/L	10
2-butanone	7 ug/L	70 ug/L	10

A separate worksheet should be used for low and medium level blanks.

Reviewer: PJD Date: 2/27/92

org5b

REGION I
Data Review Worksheets

All acceptable

VI. SURROGATES SPIKE RECOVERIES

List the percent recoveries which do not meet the criteria for surrogate recovery.

Matrix: **Water**

	VOA			B/N			A			PEST*
OTR #'s	TOL	BFB	DCE	NBZ	FBP	TPH	PHL	2FP	TBP	DBC
_____										
_____										
_____										
_____										
_____										
_____										
_____										
_____										
_____										
_____										
_____										
_____										
QC Limits	___ to ___	___ to ___	___ to ___	___ to ___	___ to ___	___ to ___	___ to ___	___ to ___	___ to ___	___ to ___

Surrogate Actions

* Advisory only

	PERCENT RECOVERY		
	<10%	10%-CRR	>CRR
Positive samples results	J	J	J
Non-detected results	R	UJ	A

CRR = Contract Required Recovery Range.
Surrogate action should be applied:

1. If at least two surrogates in a B/N or A fraction or one surrogate in the VOA fraction are out of specification, but have recoveries of >10%.
2. If any one surrogate in a fraction shows <10% recovery.

Reviewer: PJD

Date: 2/27/91

org6

REGION I
Data Review Worksheets

All acceptable

VII A. MATRIX SPIKE/MATRIX SPIKE DUPLICATE

1. Matrix Spike/Matrix Spike Duplicate Recoveries and Precision

TR Nos.: OW-52MS, OW-52MSD Level: Low Matrix: Water

List the percent recoveries and RPD's of compounds which did not meet the criteria stated on Form 3.

FRACTION MS or MSD	COMPOUND	%REC/ RPD	QC LIMITS

QUALIFICATION IS LIMITED TO THE UNSPIKED SAMPLE ONLY.

1. If any compound does not meet the Contract Required Recovery range (CRR) follow the actions stated below:

	PERCENT RECOVERY		
	<10%	10%-CRR	>CRR
Positive Sample Results	J	J	J
Nom-detected Results	R	A	A

2. If any compound does not meet the RPD criteria, flag positive results of that compound as estimated (J).

A separate worksheet should be used for each MS/MSD pair.

Reviewer: PJD Date: 2/27/92

org7a

REGION I
Data Review Worksheets

Note: Sample was analyzed at 1:20 and 1:80 dilutions

VIII. FIELD DUPLICATE PRECISION

TR Nos.: OW-56C , OW-100 (1:20 and 1:80) Matrix: Water

List the concentrations of the compounds which did not meet the following RPD criteria:

1. An RPD of <30% for water duplicates
2. An RPD of <50% for soil duplicates

FRACTION	COMPOUND	SAMPLE CONC	DUP SAMPLE CONC	RPD
VOA	toluene (1:20)	460	750	48%
VOA	toluene (1:80)	520 J	460 J	12%

ACTIONS:

1. If the results for any compounds do not meet the RPD criteria, flag the positive results for that compound as estimated.

2. If one value is non-detected, and one is above the CRQL:
   a. Flag the positive result as estimated (J).
   b. Flag the non-detected result as estimated (UJ)

NOTE: Professional judgement may be utilized to apply duplicate actions to all samples of a similar matrix.

A separate worksheet should be used for each MS/MSD pair.

Reviewer: PJD Date: 2/27/92

org8

REGION I
Data Review Worksheets

All acceptable

IX. INTERNAL STANDARDS PERFORMANCE

List the internal standard areas of samples which do not meet the criteria of +100% or -50% of the internal standard areas in the associated continuing calibration standard.

SAMPLE ID	DATE	IS OUT	IS AREA/RT	ACCEPTABLE RANGE	ACTION

ACTIONS:

1. If an IS area count is outside the criteria -50% or -100% of the associated standard:

   a. Positive results for compounds quantitated using that IS are flagged as estimated (J) for that sample fraction.
   b. Non-detects for compounds quantitated using that IS are flagged as estimated (UJ) for that sample fraction.
   c. If extremely low area counts are reported, or if performance exhibits a major drop-off, then a severe loss of sensitivity is indicated. Non-detects should be flagged as unusable (R).

2. If an IS retention time varies by more than 30 seconds, the chromatographic profile for that sample must be examined to determine if any false positives or negatives exist. For shifts of a large magnitude, the reviewer may consider partial or total rejection of the data for that sample fraction.

Reviewer: PJD

Date: 2/27/92

org9

REGION I
Data Review Worksheets

XII. SAMPLE QUANTITATION

In the space below, please show a minimum of one sample calculation per fraction:

VOA:

OW-54C Ethylbenzene

$\frac{10022}{247712} \times \frac{50}{0.475} = 4.3$ ug/L vs 4J reported ✓

BNA:

Not Analyzed

PEST/PCB:

Not Analyzed

Reviewer: PXD Date: 2/27/92

org12

REGION I
Data Review Worksheets

VII B. MATRIX SPIKE/MATRIX SPIKE DUPLICATE (Section 2)

2. Matrix Spike Duplicate - Unspiked Compounds

TR Nos.: OW-52MS,OW-52MSD

List the concentrations of the unspiked compounds and determine the percent RSD's of the unspiked sample, matrix spike, and matrix spike duplicate. No limits have been developed for the RSD values of the unspiked compounds.

FRACTION	COMPOUND	SAMPLE, MS, MSD CONC	%RSD
VOA	ethylbenzene	6 J, 5 J, 6 J	10%
VOA	total xylenes	66, 61, 63	4%

The reviewer should use professional judgement to determine if there is a need to qualify any of the unspiked compounds in the sample.

NC - Not calculated

Reviewer: PJD Date: 2/27/92

org7a

Gradient Corporation

March 24, 1992

Ms. Martha Smith
Roux Associates, Inc.
775 Park Avenue, Suite 255
Huntington, NY 11743

RE: Industri-Plex
Woburn, Massachusetts
ENSECO-East
Volatiles: 12 low concentration aqueous samples

Dear Ms. Smith:

A validation was performed on the organic analytical data from 12 low level aqueous samples collected at the Industri-Plex site. The data were evaluated based on the following parameters according to the Region I Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses, November, 1988:

* - data completeness
- holding times
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- calibrations
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* - system monitoring compounds/surrogate spike recoveries
* - matrix spike/matrix spike duplicate
* - field duplicates
* - internal standard performance
- tentatively identified compounds
* - compound identification
- compound quantitation

* All criteria were met for this parameter.

Table I summarizes the validation recommendations which were based on the following information:

General

The data were provided in two packages. The first case, 18811, contained the data for the 12/18/91 sampling. The second package, case 18820, contained the data for the 12/18/91 sampling. Both cases are included in this report and are considered to be part of the same sample delivery group.

44 Brattle Street, Cambridge, MA 02138 • (617)576-1555 • Telefax (617)864-8469
Environmental Consultants with Offices in Cambridge, MA and Boulder, CO

Holding Times

The laboratory met all contractual holding times for the volatile organic analyses, which must be completed with 10 days of sample receipt according to the CLP Statement of Work. However, sample WP-4 was not preserved and was analyzed 10 days from sampling, which exceeds the Functional Guidelines criterion of analysis of unpreserved volatile samples within 7 days of sampling. The criterion applies to aromatic compounds only, which may be subject to bacteriological degradation. The positive results have been estimated (J) as well as the nondetect results (UJ) due to the possibility of compound degradation in sample WP-4 only. The positive results may be biased low and the possibility of false negatives exists. All other samples analyzed within the holding times

Calibrations

The volatile organics analyses were performed on instrument HP-V2. The initial calibration, performed on 10/15/91, was compliant. High percent differences (%Ds) were noted for chloromethane (29.3%) and chloroethane (25.3%) for the water continuing calibration on 12/24/91, but these compounds were not detected in the associated samples and therefore no action was required. A high %D was also noted for 2-butanone (28.1%) for the continuing calibration on 12/23/92. The positive 2-butanone result in samples OW-55 was estimated (J) due to variability in instrument calibrations. The positive 2-butanone result in the field blank was already estimated (J) as it was below the CRQL. No additional action was required as the compound was not found in any other field samples. All other water volatile calibrations were acceptable.

Field and Laboratory Blank Results

Contaminants detected in the volatile field, trip, and laboratory blanks are summarized in the following table. There were two trip blanks and one field blank associated with this project. The action do not apply to the trip and equipment blank samples.

Compound	Max. Concentration (ug/L)	Action Level Water (ug/L)
methylene chloride	1	10
acetone	4	40
2-butanone	6	60

Blank Actions:

- value < CRQL; report CRQL followed by a U.
- value > CRQL and < action level; report value with a U.
- value > CRQL and > action level; report value unqualified.

The action level values were compared to sample values after application of sample dilution factors. The positive methylene chloride result in sample WP-4 was replaced with the CRQL and qualified with U. The positive acetone results in samples WP-3, WP-4, and OW-31 were considered nondetects due to blank contamination and the results were qualified with U. The positive acetone results in samples WP-5 and OW-101 were replaced with the CRQL which were qualified U due to uncertainty in the quantitation limit. The positive 2-butanone result in sample WP-4 was changed to the CRQL followed by U.

Tentatively Identified Compounds

TICs are summarized in Table II. The compound 1-(1-isobutyl-3-methyl-1-butenyl)-pyrrolidine was reported in sample WP-4; this maybe a C_9-ketone such as nonanone or dimethylheptanone.

Compound Quantitation

Samples OW-31, OW-55, and WP-3 had benzene detected above the quantitation range in the initial volatile organics analyses. The samples were re-analyzed with a lower sample volume (dilution), and benzene was within the calibration range. The benzene results from the re-analyses are included in the data summary table. Acetone and toluene were also detected above the calibration range in sample OW-55. The toluene and acetone results from the dilution analysis were reported in the data summary tables. The dilution results in sample WP-3 for toluene and total xylenes were also included in the summary tables as the original analyses were over the calibration range.

According to the laboratory narrative, sample OW-31 was originally analyzed at a 1:50 dilution, followed by a 1:400 dilution. However, the laboratory reported the original results as undiluted, which is consistent with the raw data. Total xylenes were initially reported above the instrument calibration (320 ug/L) but were not detected in the 1:400 dilution. If the original analyses was a 1:50 dilution, the xylenes would have been detectable in the 1:400 dilution. It is recommended to accept the data, but qualify the total xylenes results as estimated (J) due to quantitation above the calibration range.

Summary

The holding time for unpreserved aromatic compounds (7 days) was exceeded for sample WP-4. The positive and nondetect aromatic results have been estimated (J, UJ). Blank contamination consisted of methylene chloride, acetone, and 2-butanone. All other results are valid and usable except where noted above.

Table I is the Recommendation Summary for the data based on the data review for the aqueous samples. Table II is a summary of the TIC results. Table III displays the analytical results for the aqueous samples. Qualifiers have been added to Table III as a result of the review. In addition to Tables I - III, the worksheets associated with this data validation are attached.

Very truly yours,

GRADIENT CORPORATION

Philip J. Doherty
Senior Analytical Chemist

Industri-Plex
Groundwater Samples

Table I - Recommendation Summary	
TR#	VOA
OW-31	$A^{5,6}$
OW-37	A
OW-37A	A
OW-55	A^{7}
WP-1	A
WP-3	A^{5}
WP-4	$A^{1,3\text{-}5}$
WP-5	A^{2}
OW-101	A^{2}
FIELD_BLANK 2	A
TRIP_BLANK 3	A
TRIP_BLANK 4	A

A - Accept all data.

A^1 - Accept data, but estimated positive (J) and nondetect (UJ) aromatic results due to exceeded holding times.

A^2 - Accept data, but change the acetone value to nondetect at CRQL due to blank contamination.

A^3 - Accept data, but change the methylene chloride value to nondetect at CRQL due to blank contamination.

A^4 - Accept data, but change the 2-butanone value to nondetect at CRQL due to blank contamination.

A^5 - Accept data, but consider the acetone result a nondetect; qualify the value with U.

A^6 - Accept data, but estimate (J) the total xylenes value due to detection above the quantitation range.

A^7 - Accept data, but estimate (J) the positive 2-butanone result due to variability in instrument response.

Data Summary Key

A - Acceptable data.

J - The associated numerical value is an estimated quantity.

U - The compound was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

UJ - The compound was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.

R - Reject data due to quality control criteria exceeded. The data are unusable (compound may or may not be present). Resampling and reanalysis is necessary for verification.

Industri-Plex
Groundwater Samples

Table II - Tentatively Identified Compounds				
Compound	**OW-31**	**OW-55**	**WP-1**	**WP-4**
Unknown ketone (RT=11.16)	X			
Unknown (RT=11.46)		X		
Dipropyldisulfide		X		
C_6H_{14} isomer			X	
C_9-ketone				X
C_3-benzene				X
Dichlorobenzene isomer				2X

X - Compound was detected. Numerical values indicates number of isomers found.

Site: Industri-Plex, Groundwater
Laboratory: ENSECO-East
File: ROUXV2B

CLP VOLATILE ORGANIC ANALYSIS
AQUEOUS ANALYTICAL RESULTS (ug/L)

Sample Location		OW-31	OW-37	OW-37A	OW-55	FIELD_BLANK 2	TRIP_BLANK 3					
Remarks		D = 1:400			D = 1:20							
Sampling Date		12/18/91	12/18/91	12/18/91	12/18/91	12/18/91	12/18/91					
Analysis Date		12/23/91	12/23/91	12/24/91	12/23/91	12/24/91	12/24/91					
Dilution Factor		1	1	1	1	1	1					
VOLATILE ORGANIC COMPOUND	CRQL (ug/L)											
Chloromethane	10											
Bromomethane	10											
Vinyl Chloride	10											
Chloroethane	10											
Methylene Chloride	10											
Acetone	10	16 U			1800 D	4 J						
Carbon Disulfide	10	2 J										
1,1-Dichloroethene	10											
1,1-Dichloroethane	10											
1,2-Dichloroethene(Total)	10											
Chloroform	10											
1,2-Dichloroethane	10											
2-Butanone	10				110 J	6 J						
1,1,1-Trichloroethane	10											
Carbon Tetrachloride	10											
Bromodichloromethane	10											
1,2-Dichloropropane	10											
cis-1,3-Dichloropropene	10											
Trichloroethene	10											
Dibromochloromethane	10											
1,1,2-Trichloroethane	10											
Benzene	10	63000 D			1800 D							
trans-1,3-Dichloropropene	10											
Bromoform	10											
4-Methyl-2-pentanone	10	4 J			83							
2-Hexanone	10				2 J							
Tetrachloroethene	10											
1,1,2,2-Tetrachloroethane	10											
Toluene	10	84			2100 D							
Chlorobenzene	10											
Ethylbenzene	10	62			8 J							
Styrene	10											
Xylene (Total)	10	320 J			49							

J - The associated numerical value is an estimated quantity.
U - The compound was considered not detected due to blank contamination. The associated numerical value is the quantitation limit.
UJ - The compound was not detected. The sample quantitation limit is an estimated value.
D - The value was taken from analysis of the diluted sample.
R - The datum was rejected.
CRQL- Contract Required Quantitation Limit

Site: Industri-Plex, Groundwater
Laboratory: ENSECO-East
File: ROUXV1B

CLP VOLATILE ORGANIC ANALYSIS
AQUEOUS ANALYTICAL RESULTS (ug/L)

Sample Location		WP-1	WP-3	WP-4	WP-5	OW-101	TRIP_BLANK 4					
Remarks			D = 1:100			Dup. WP-5						
Sampling Date		12/19/91	12/19/91	12/19/91	12/19/91	12/19/91	12/19/91					
Analysis Date		12/29/91	12/29/91	12/29/91	12/29/91	12/29/91	12/28/91					
Dilution Factor		1	1	1	1	1	1					
VOLATILE ORGANIC COMPOUND	CRQL (ug/L)											
Chloromethane	10											
Bromomethane	10											
Vinyl Chloride	10											
Chloroethane	10											
Methylene Chloride	10			10 U			1 J					
Acetone	10		28 U	16 U	10 U	10 U						
Carbon Disulfide	10											
1,1-Dichloroethene	10											
1,1-Dichloroethane	10											
1,2-Dichloroethene(Total)	10											
Chloroform	10											
1,2-Dichloroethane	10											
2-Butanone	10			10 U								
1,1,1-Trichloroethane	10											
Carbon Tetrachloride	10											
Bromodichloromethane	10											
1,2-Dichloropropane	10											
cis-1,3-Dichloropropene	10											
Trichloroethene	10											
Dibromochloromethane	10											
1,1,2-Trichloroethane	10											
Benzene	10		12000 D	UJ	2 J	2 J						
trans-1,3-Dichloropropene	10											
Bromoform	10											
4-Methyl-2-pentanone	10			3 J								
2-Hexanone	10											
Tetrachloroethene	10											
1,1,2,2-Tetrachloroethane	10											
Toluene	10		440 DJ	41 J								
Chlorobenzene	10			UJ								
Ethylbenzene	10		31	UJ								
Styrene	10			UJ								
Xylene (Total)	10		250 DJ	1 J								

J - The associated numerical value is an estimated quantity.
U - The compound was considered not detected due to blank contamination. The associated numerical value is the quantitation limit.
UJ - The compound was not detected. The sample quantitation limit is an estimated value.
D - The value was taken from analysis of the diluted sample.
R - The datum was rejected.
CRQL- Contract Required Quantitation Limit

REGION I
Data Review Worksheets

Site Name: **Industri-Plex**
Reference Number: **NA**

REGION I REVIEW OF ORGANIC
CONTRACT LABORATORY DATA PACKAGE

The hardcopied **ENSECO-East** data package received at Region I been reviewed and the quality assurance and performance data summarized. The data review included:

Case No.: **18811,18820** SAS No.: **NA** Sampling Date(s): **12/18-19/91**
SDG No.: **NA** Matrix: **Water** Shipping Date(s): **12/18-19/91**
No. of Samples: **12** Date Rec'd by Lab: **12/19-20/91**

Traffic Report Nos: **OW-37, OW-37A, OW-55, OW-31, WP-1, WP-3, WP-4 WP-5, OW-101**
Trip Blank No.: **TRIP BLANK #3, TRIP BLANK #4**
Equipment Blank No.: **FIELD BLANK #2**
Field Duplicate Nos.: **PW-5 and OW-101**

SOW No. **3/90** requires that specific analytical work be done and that associated reports be provided by the laboratory to the Regions, EMSL-LV and SMO. The general criteria used to determine the performance were based on an examination of:

- Data Completeness
- Holding Times
- GC/MS Tuning
- Calibrations
- Blanks
- Surrogate Recoveries
- Matrix Spike/Matrix Spike
- Field Duplicates
- Internal Standard Performance
- Pesticide Inst. Performance
- Compound Identification
- Compound Quantitation

Overall Comments:

No semivolatile or pesticide/PCB analyses were required for this project The data packages were complete and legible.

Definitions and Qualifiers:

A - Acceptable data.
J - Approximate data due to quality control criteria.
R - Reject data due to quality control criteria.
U - Compound not detected.

Reviewer: **Philip J. Doherty** Date: **2/27/92**

osum

REGION I
Data Review Worksheets

Data package was complete

I. DATA COMPLETENESS

MISSING INFORMATION	DATE LAB CONTACTED	DATE REC'D

Reviewer: PJD

Date: 2/27/92

org1

II. HOLDING TIMES Complete table for all samples and circle the fractions which are not within criteria.

SAMPLE ID	DATE SAMPLED	VOA DATE ANAL	BNA DATE EXTR	BNA DATE ANAL	PEST DATE EXTR	PEST DATE ANAL
OW-37	12/18/91	12/23/91	NA	NA	NA	NA
OW-55	12/18/91	12/23/91	NA	NA	NA	NA
OW-55 DL	12/18/91	12/24/91	NA	NA	NA	NA
OW-31	12/18/91	12/23/91	NA	NA	NA	NA
OW-31 DL	12/18/91	12/26/91	NA	NA	NA	NA
OW-37A	12/18/91	12/24/91	NA	NA	NA	NA
OW-37A MS	12/18/91	12/23/91	NA	NA	NA	NA
OW-37A MSD	12/18/91	12/23/91	NA	NA	NA	NA
TRIP_BLK 3	12/18/91	12/24/91	NA	NA	NA	NA
FIELD_BLK2	12/18/91	12/24/91	NA	NA	NA	NA

VOA - Unpreserved: Aromatic within 7 days, non-aromatic within 14 days of sample collection.
Preserved: Both within 14 days of sample collection.
Soils: Both within 14 days of sample collection.

BNA & PEST - Extracted within 7 days, analyzed within 40 days, soils and water.

ACTION:
1. If holding times are exceeded all positive results are estimated (J) and non-detects are estimated (UJ).
2. If holding times are grossly exceed, the reviewer may determine that non-detects are unusable(*).

Reviewer: PJD Date: 2/27/92

org2

II. HOLDING TIMES Complete table for all samples and circle the fractions which are not within criteria.

SAMPLE ID	DATE SAMPLED	VOA DATE ANAL	BNA DATE EXTR	BNA DATE ANAL	PEST DATE EXTR	PEST DATE ANAL
WP-1	12/19/91	12/29/91	NA	NA	NA	NA
WP-3	12/19/91	12/29/91	NA	NA	NA	NA
WP-3 DL	12/19/91	12/29/91	NA	NA	NA	NA
WP-4	12/19/91	12/29/91	NA	NA	NA	NA
WP-5	12/19/91	12/29/91	NA	NA	NA	NA
OW-101	12/19/91	12/29/91	NA	NA	NA	NA
TRIP_BLK 4	12/19/91	12/28/91	NA	NA	NA	NA

VOA - Unpreserved: Aromatic within 7 days, non-aromatic within 14 days of sample collection.
Preserved: Both within 14 days of sample collection.
Soils: Both within 14 days of sample collection.

BNA & PEST - Extracted within 7 days, analyzed within 40 days, soils and water.

ACTION:
1. If holding times are exceeded all positive results are estimated (J) and non-detects are estimated (UJ).
2. If holding times are grossly exceed, the reviewer may determine that non-detects are unusable(*).

Reviewer: PJD Date: 2/27/92

org2

REGION I
Data Review Worksheets

III. GC/MS TUNING

NA The DFTPP performance results were reviewed and found to be within the specified critiera.

If NO,
Samples affected:

YES The BFB performance results were reviewed and found to be within the specified criteria.

If NO,
Samples affected:

If mass calibration is in error refer to the Region guidelines for expanded criteria. If necessary, flag all associated data as unusable (R).

Reviewer: PJD Date: 2/27/92

org3

REGION I
Data Review Worksheets

IV A. VOLATILE CALIBRATION VERIFICATION

Date of Initial Calibration : 10/15/91
Dates of Continuing Calibrations: 12/23-29/91
Instrument ID : V2
Matrix/Level : water/low

DATE	CRITERIA OUT RRF,%RSD,RRF,%D	COMPOUND (VALUE)
12/24	%D	chloromethane (29.3%)
	Samples Affected:	OW-55DL, FB 2, TB 3, OW-37A
12/24	%D	chloroethane (25.3%)
	Samples Affected:	OW-55DL, FB 2, TB 3, OW-37A
12/23	%D	2-butanone (28.1%)
	Samples Affected:	OW-37,OW-55,OW-31,OW-37A MS/MSD
	Samples Affected:	
	Samples Affected:	
	Samples Affected:	
	Samples Affected:	
	Samples Affected:	
	Samples Affected:	
	Samples Affected:	

1. All RRFs and RRFs must be >0.05
2. All %RSDs must be <30%
3. All %Ds must be <25%

ACTION:
1. If any compound has an initial RRF or continuing RRF of <0.05:
   a. Flag positive results for that compound as estimated (J).
   b. Flag non-detects for that compound as unusable (R).
2. If any compound has a %RSD > 30% or a %D > 25%:
   a. Flag positive results for that compound as estimated (J).
   b. Flag non-detects for that compound as estimated (UJ) if %RSD or %D is > 50%.

A separate worksheet should be filled out for each initial curve.

Reviewer: PJD Date: 2/27/92

org4a

REGION I
Data Review Worksheets

No semivolatile in this case

IV B. SEMIVOLATILE CALIBRATION VERIFICATION

Date of Initial Calibration : _____
Dates of Continuing Calibrations: _____
Instrument ID : _____

DATE	CRITERIA OUT RRF,%RSD,RRF,%D	COMPOUND (VALUE)
_____	_____	_____
	Samples Affected:	
_____	_____	_____
	Samples Affected:	
_____	_____	_____
	Samples Affected:	
_____	_____	_____
	Samples Affected:	
_____	_____	_____
	Samples Affected:	
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_____	_____	_____
	Samples Affected:	
_____	_____	_____
	Samples Affected:	
_____	_____	_____
	Samples Affected:	

A separate worksheet should be filled out for each initial curve.

Reviewer: PJD Date: 2/27/92

org4b

REGION I
Data Review Worksheets

V A. BLANK ANALYSIS RESULTS (Section 1 & 2)

List the contamination in the blanks belows.

1. Laboratory Blanks

Level: Low

DATE	LAB ID	FRACTION/ MATRIX	COMPOUND	CONCENTRATION UNITS

2. Equipment and Trip Blanks

DATE	LAB ID	FRACTION/ MATRIX	COMPOUND	CONCENTRATION UNITS
12/28	TB#4	VOA/Aqu.	methylene chloride	1 ug/L
12/24	FB#2	VOA/Aqu.	acetone	4 ug/L
12/24	FB#2	VOA/Aqu.	2-butanone	6 ug/L

A separate worksheet should be used for low and medium level blanks.

Reviewer: PJD Date: 2/27/92

org5a

REGION I
Data Review Worksheets

V B. BLANK ANALYSIS RESULTS (Section 3)

3. Blank Actions

Action levels should be based upon the highest concentration of contaminant determined in any blank. The action level for samples which have been concentrated or diluted should be multiplied by the concentration/dilution factor. No positive sample results should be reported unless the concentration of the compound in the sample exceeds the action level of 10 x's the amount in the blank for the common contaminants, or 5 x's the amount for any other compound. Specific actions are as follows:

1. The concentration is less than the CRQL, report the CRQL.

2. The concentration is greater than the CRQL, but less than the action level, report the concentration found U.

3. The concentration is greater than the action level, report the concentration unqualified.

For examples refer to the Regional Guidelines.

Common contaminants = methylene chloride, acetone, 2-butanone, toluene and phthalates.

LEVEL: Low

COMPOUND	MAX CONC./ UNITS	ACTION LEVEL/ UNITS	CRQL
acetone	4 ug/L	40 ug/L	10
methylene chloride	1 ug/L	10 ug/L	10
2-butanone	6 ug/L	60 ug/L	10

A separate worksheet should be used for low and medium level blanks.

Reviewer: PJD Date: 2/27/92

org5b

REGION I
Data Review Worksheets

All acceptable

VI. SURROGATES SPIKE RECOVERIES

List the percent recoveries which do not meet the criteria for surrogate recovery.

Matrix: Water

	VOA			B/N			A			PEST*
OTR #'s	TOL	BFB	DCE	NBZ	FBP	TPH	PHL	2FP	TBP	DBC
QC Limits	to	to	to	to	to	to	to	to	to	to

Surrogate Actions

* Advisory only

	PERCENT RECOVERY		
	<10%	10%-CRR	>CRR
Positive samples results	J	J	J
Non-detected results	R	UJ	A

CRR = Contract Required Recovery Range.
Surrogate action should be applied:

1. If at least two surrogates in a B/N or A fraction or one surrogate in the VOA fraction are out of specification, but have recoveries of >10%.
2. If any one surrogate in a fraction shows <10% recovery.

Reviewer: PJD

Date: 2/27/91

org6

REGION I
Data Review Worksheets

All acceptable

VII A. MATRIX SPIKE/MATRIX SPIKE DUPLICATE

1. Matrix Spike/Matrix Spike Duplicate Recoveries and Precision

TR Nos.: OW-37AMS, OW-52A MSD Level: Low Matrix: Water

List the percent recoveries and RPD's of compounds which did not meet the criteria stated on Form 3.

FRACTION MS or MSD	COMPOUND	%REC/ RPD	QC LIMITS

QUALIFICATION IS LIMITED TO THE UNSPIKED SAMPLE ONLY.

1. If any compound does not meet the Contract Required Recovery range (CRR) follow the actions stated below:

	PERCENT RECOVERY		
	<10%	10%-CRR	>CRR
Positive Sample Results	J	J	J
Nom-detected Results	R	A	A

2. If any compound does not meet the RPD criteria, flag positive results of that compound as estimated (J).

A separate worksheet should be used for each MS/MSD pair.

Reviewer: PJD Date: 2/27/92

org7a

REGION I
Data Review Worksheets

None found

VII B. MATRIX SPIKE/MATRIX SPIKE DUPLICATE (Section 2)

2. Matrix Spike Duplicate - Unspiked Compounds

TR Nos.: OW-37AMS, OW-37AMSD

List the concentrations of the unspiked compounds and determine the percent RSD's of the unspiked sample, matrix spike, and matrix spike duplicate. No limits have been developed for the RSD values of the unspiked compounds.

FRACTION	COMPOUND	SAMPLE, MS, MSD CONC	%RSD

The reviewer should use professional judgement to determine if there is a need to qualify any of the unspiked compounds in the sample.

NC - Not calculated

Reviewer: PJD

Date: 2/27/92

org7a

REGION I
Data Review Worksheets

VIII. FIELD DUPLICATE PRECISION

TR Nos.: WP-5 , OW-101 Matrix: Water

List the concentrations of the compounds which did not meet the following RPD criteria:

1. An RPD of <30% for water duplicates
2. An RPD of <50% for soil duplicates

FRACTION	COMPOUND	SAMPLE CONC	DUP SAMPLE CONC	RPD
VOA	acetone	3 J	3 J	0%
VOA	benzene	2 J	2 J	0%

ACTIONS:

1. If the results for any compounds do not meet the RPD criteria, flag the positive results for that compound as estimated.

2. If one value is non-detected, and one is above the CRQL:
   a. Flag the positive result as estimated (J).
   b. Flag the non-detected result as estimated (UJ)

NOTE: Professional judgement may be utilized to apply duplicate actions to all samples of a similar matrix.

A separate worksheet should be used for each MS/MSD pair.

Reviewer: PJD Date: 2/27/92

org8

REGION I
Data Review Worksheets

All acceptable

IX. INTERNAL STANDARDS PERFORMANCE

List the internal standard areas of samples which do not meet the criteria of +100% or -50% of the internal standard areas in the associated continuing calibration standard.

SAMPLE ID	DATE	IS OUT	IS AREA/RT	ACCEPTABLE RANGE	ACTION

ACTIONS:

1. If an IS area count is outside the criteria -50% or -100% of the associated standard:

   a. Positive results for compounds quantitated using that IS are flagged as estimated (J) for that sample fraction.
   b. Non-detects for compounds quantitated using that IS are flagged as estimated (UJ) for that sample fraction.
   c. If extremely low area counts are reported, or if performance exhibits a major drop-off, then a severe loss of sensitivity is indicated. Non-detects should be flagged as unusable (R).

2. If an IS retention time varies by more than 30 seconds, the chromatographic profile for that sample must be examined to determine if any false positives or negatives exist. For shifts of a large magnitude, the reviewer may consider partial or total rejection of the data for that sample fraction.

Reviewer: PJD

Date: 2/27/92

REGION I
Data Review Worksheets

XII. SAMPLE QUANTITATION

In the space below, please show a minimum of one sample calculation per fraction:

VOA:

OW-55DL (1:20

Benzene @ 1800

$$\frac{458277}{300383} \times \frac{50}{0.853} \times 20 = 1789 \text{ ug/L} \sim 1800 \checkmark$$

BNA:

Not Applicable

PEST/PCB:

Not Applicable

Reviewer: RD Date: 2/27/92

org12

APPENDIX D1

Ground-Water Data Validation Documentation

Inorganic Data

Gradient Corporation

RECEIVED
MAR 18 '92

March 13, 1992

Ms. Martha Smith
Roux Associates, Inc.
775 Park Avenue
Suite 255
Huntington, NY 11743

RE: Data Validation Letter Report
Project #s: 18710 and 18748
Enseco-East Laboratory
Industri-Plex Site, Woburn, Massachusetts
Metals: 12 Samples/water (dissolved)/sample #s: OW-30A, OW-30B, OW-52A, OW-52B, OW-54A, OW-54B, OW-54C, OW-56A, OW-56B, OW-56C, OW-100, and FB-1

Dear Ms. Smith:

A validation was performed on the dissolved metals analytical data from 12 groundwater samples collected by Roux Associates, Inc. at the Industri-Plex site in Woburn, MA. The data were evaluated based on the following parameters according to the Region I Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses, February 1989:

	Data completeness
	Holding times/pH
*	Calibration verification
	Field and laboratory blank results
	ICP interference check results
	Matrix spike percent recovery results
*	Laboratory and field duplicates
NA	Laboratory control sample results
*	Furnace atomic absorption analysis/duplicate precision
	Furnace atomic absorption analysis/post digestion spike recoveries
	Serial dilution results
*	Detection limit results
	Sample results

* All criteria were met for this parameter
NA Not applicable

Table I summarizes the validation recommendations which were based on the following information:

44 Brattle Street, Cambridge, MA 02138 • (617)576-1555 • Telefax (617)864-8469
Environmental Consultants with Offices in Cambridge, MA and Boulder, CO

Data Completeness

The following information was missing or incorrect in the original data package and required a resubmittal of the data:

- Incomplete quarterly information including inaccurate dates, IDLs, and linear ranges.
- Inconsistent mercury IDLs in package.
- Sodium misquantitated from low channel, rather than high channel, on ICP.
- Arsenic miscalculated for sample OW-101.

The above items were requested on 2/25/92 and were received on 2/28/92 and 3/03/92. Additionally, other discrepancies were present in the data package; however, no resubmittals were requested because they did not affect the quantitation of the results. These included:

- The cover page was missing the matrix spike (MS) and duplicate (D) for sample OW-52B.
- The Form Is were all missing the sample descriptions.
- Raw data for furnace MSA, pg 000427, labeled the second added concentration as +0.020 where it actually was +0.040.
- Raw data pg 000522 mislabeled samples. Data labels samples as 18710-06 and -06A whereas they actually were 18748-06 and -06A.

No actions were taken for these discrepancies noted in the data package.

Holding Times/pH

All holding times were met, however, the pH for two samples, OW-56B and OW-54C, was greater than 2. All positive results will be estimated (J) and all nondetects will be estimated (UJ) because of improper preservation of the sample. These estimated results may be biased low as metals may adsorb to the walls of the sample container at pH > 2.

Field and Laboratory Blanks

The blank data were reviewed and the maximum concentrations and action levels are summarized in the following table. Sample FB-1 was the field blank associated with these samples. The actions do not apply to the field blank.

Analyte	Maximum Concentration (ug/L)	Action Level (ug/L)
Arsenic	1.7	8.5
Barium	1.8	9.0
Beryllium	2.5	12.5
Calcium	121.1	606
Iron	21.4	107
Manganese	2.4	12
Silver	-4.0	20.0
Zinc	2.5	12.5

All maximum concentrations were derived from the laboratory blanks (intitial and continuing calibration blanks).

Sample values which are greater than the IDL, but less than the Action Level are considered nondetect due to the possibility of false positives; report the sample concentration with a U for the following sample analytes:

arsenic: OW-30A, OW-30B, OW-54A, OW-56B, OW-56C, OW-100
barium: OW-30B
beryllium: OW-56C, OW-100
manganese: OW-30B
zinc: OW-30B, OW-54C, OW-56A

Sample values greater than the IDL, but less than 2xIDL, less than the CRDL, and less than the Action Level are considered nondetect with the detection limit raised and estimated (UJ) due to the possibility of false positives and uncertainty near the instrument detection limit. Report the following sample analytes with a "UJ":

beryllium: OW-54C
iron: OW-30B

ICP Interference Check Sample

All analytes met criteria for the ICS AB standard. However, several analytes were detected in the ICSA solution, at levels greater than 2xIDL, that should not have been present. The following table summarizes these false positives:

Analyte	Concentration found in the ICS (ug/L)	Concentration of interferents in the ICS (ug/L)			
		Al	Ca	Fe	Mg
Manganese	15	476798	522034	171525	460176
Zinc	15	476798	522034	171525	460176

Samples OW-52A, OW-52B, OW-54B, OW-56C, and OW-100 had concentrations of calcium greater than 50% of the level found in the ICS. Additionally, samples OW-56C and OW-100 also contained iron at levels exceeding 50% of the level found in the ICS. The effect of these interferents, calcium and iron, were reviewed for these samples. The estimated interferences on manganese and zinc for the positive results in the affected samples were calculated and are listed in the following table:

Sample Affected	Analyte Affected	Interferent Concentration (ug/L)	Estimated Interference (ug/L)	Action
OW-52A	manganese	561000 (calcium)	15.0	no action
"	zinc	"	15.0	R
OW-52B	manganese	268000 (calcium)	7.7	no action
OW-54B	manganese	305000 (calcium)	8.8	no action
"	zinc	"	8.8	J
OW-56C	manganese	503000 (calcium); 568000 (iron)	15.0	no action
OW-100	manganese	505000 (calcium); 566000 (iron)	15.0	no action

Actions were taken if the estimated concentration was greater than 10% of the measured value of the affected analyte in the sample. No actions were applied when the estimated concentrations were below 10% of the reported concentrations for those analytes as listed above. The positive sample value for zinc was considered estimated (J) because the calculated interference is greater than 10% of the amount of zinc found in the sample OW-54B (zinc was 14.3 ug/L in the sample). The zinc value reported for sample OW-52A was rejected (R) because the estimated interference concentration was greater than the reported sample analyte value. Therefore, it is expected that the entire reported value for zinc in this sample was due to an interference effect and was not actually present in the sample.

Matrix Spike Percent Recovery Results

The review of the matrix spike results revealed the deficiencies summarized in the following table. The actions apply to all samples of the same matrix.

Sample #	Analyte	% Recovery	Action
OW-52B	Silver	46.1	(UJ) all samples
OW-52B	Thallium	64.6	(UJ) all samples

The low percent recoveries for silver and thallium indicate a matrix suppression of these analytes and therefore a low bias is expected in the estimated detection limits of these nondetected analytes.

Furnace Atomic Absorption Analysis/Post-Digestion Spike Recoveries

The following sample analytes had low post-digestion spike recoveries but did not require the method of standard additions (MSA) for the following samples/analytes:

Analyte	Samples Affected
arsenic	OW-56B
lead	OW-30A, OW-56B, OW-56C, OW-100, FB-1
thallium	OW-30A, OW-30B, OW-52A, OW-52B, OW-54C, OW-56A, OW-56B, OW-56C, OW-100

Actions for the above sample analytes are J(+) and UJ(ND). All the thallium results have already been estimated (UJ) due to low matrix spike recovery; therefore, no further action is applied. The low post-digestion spike recoveries are an indication of matrix suppression of these analytes. All estimated results (J) and detection limits (UJ) are therefore biased low. Note that the interpretation of post-digestion spike recovery is generally related to sample matrix effects; however, in the case of lead for the above samples, a laboratory effect is likely because the field blank sample (FB-1) had poor post-digestion spike recovery. Matrix interferences are not expected in a field blank sample that consists of laboratory grade deionized water.

The following sample analytes had high post-digestion spike recoveries but did not require the MSA for the following samples/analytes:

Analyte	Samples Affected
selenium	OW-52B, OW-54A, OW-56B, FB-1
thallium	FB-1

No action was taken for the selenium because the post-digestion spike was high but the samples were nondetects. The thallium value has already been estimated (UJ) due to low matrix spike recovery. Note that this is a field blank sample and therefore, the poor post-digestion spike recovery is likely to be a laboratory effect because no matrix effects on recovery would be expected in the quantitation of a field blank sample.

ICP Serial Dilution Results

A serial dilution was performed, but analytical results did not meet validation criteria for iron as listed in the following table. Action affects all samples of the same matrix.

Analyte	Sample Result (ug/L)	Serial Dilution (ug/L)	Percent Difference (%)
Iron	839.49	1276.47	52.1

The serially diluted result for iron is greater than the initial sample result. This is an indication of matrix suppression in the initial sample. Therefore, all positive results for iron are estimated (J) and may be biased low.

Sample Results

The following sample analytes were detected at less than 2xIDL and have therefore been estimated (J) due to the uncertainty in the quantitation near the IDL. This table does not include sample analytes previously estimated due to other validation criteria.

Analyte	Samples Affected
Arsenic	FB-1
Nickel	OW-30A, OW-54A, OW-54B, OW-56A
Sodium	FB-1

Overall Assessment

All holding times were met. Many discrepancies, incorrectly reported data or QC, were observed in the data package. Where these items affected the reported values, resubmittals were requested from the laboratory. Inconsistencies and incorrectly reported data that did not directly affect the analyte quantitation were recorded in this review but resubmittals were not requested. The number of errors noted indicates poor quality in data package preparation. The pH for samples OW-56B and OW-54C were both greater than 2, therefore all positive and nondetect results have been estimated (J and UJ, respectively) and may be biased low. All calibration criteria were met for all analytes. Blank contamination in the laboratory blanks was observed for arsenic, barium, beryllium, iron, manganese, and zinc and associated sample results were considered nondetects with the detection limit raised (U) or raised and estimated (UJ). All criteria were met for the ISC AB recoveries; however, manganese and zinc were detected in the ICS A at levels greater than 2xIDL. Estimated interferences for manganese and zinc for samples with high levels of calcium and iron were calculated and the zinc for sample OW-52A was rejected (R) and for OW-54B was estimated (J) based upon interference effects. Accuracy, as indicated by the matrix spike (MS), was good for all analytes except for silver and thallium. Both recovered low in the MS and therefore all associated data were estimated at the detection limit (UJ) and are biased low. Precision in for these samples was also good as all analytes met criteria for both the laboratory and field duplicates. Several furnace analytes were qualified for poor post-digestion spike recoveries. A matrix suppression of iron is expected as evidenced by the high percent difference in the serial dilution result. All iron results have therefore been estimated (J) and are biased low.

Attached are the Recommendations Summary Table I, the Data Summary Table II, and the worksheets associated with this data validation review.

Very truly yours,

GRADIENT CORPORATION

Susan D. Chapnick

Susan D. Chapnick
Senior Analytical Chemist
Data Reviewer

INDUSTRI-PLEX
PROJECT #s: 18710 and 18748
GROUNDWATER SAMPLES - DISSOLVED METALS

Table I - Recommendation Summary			
Aluminum	J^{2}	Magnesium	J^{2}
Antimony	J^{2}	Manganese	A^{1}, J^{2}
Arsenic	$A^{1}, J^{2,5,7}$	Mercury	J^{2}
Barium	A^{1}, J^{2}	Nickel	$J^{2,7}$
Beryllium	$A^{1}, J^{1,2}$	Potassium	J^{2}
Cadmium	J^{2}	Selenium	J^{2}
Calcium	J^{2}	Silver	$J^{2,4}$
Chromium	J^{2}	Sodium	$J^{2,7}$
Cobalt	J^{2}	Thallium	$J^{2,4,5}$
Copper	J^{2}	Vanadium	J^{2}
Iron	$J^{1,2,6}$	Zinc	$A^{1}, J^{2,3}, R^{1}$
Lead	$J^{2,5}$		

See Codes defined on following page.

INDUSTRI-PLEX
PROJECT #s: 18710 and 18748
GROUNDWATER SAMPLES - DISSOLVED METALS

TABLE I - Recommendation Summary
(Continued)

Codes:

If the field is left blank, the qualifier is A - Accept all data.

A[1] - Accept all data, but consider positive results greater than 2xIDL and less than the blank action level as nondetect because false positives are expected due to blank contamination. Report the sample concentration with a U for: arsenic (OW-30A, OW-30B, OW-54A, OW-56B, OW-56C, OW-100), barium (OW-30B), beryllium (OW-56C, OW-100), manganese (OW-30B), and zinc (OW-30B, OW-54C, OW-56A).

J[1] - Consider positive results less than 2xIDL and less than the blank action level as nondetect and estimated due to the possibility of false positives and uncertainty near the instrument detection limit. Report the sample concentrations with a UJ for: beryllium (OW-54C) and iron (OW-30B).

J[2] - Estimate (J) positive results and (UJ) nondetects for samples OW-54C and OW-56B due to improper preservation (pH > 2).

J[3] - Estimate (J) positive zinc result in sample OW-54B because reported value is biased high due to positive interference from calcium.

J[4] - Estimate (UJ) nondetected results due to low matrix spike recoveries. Estimated sample detection limits are biased low.

J[5] - Estimate (J) positive results and (UJ) nondetected results due to low post-digestion spike recoveries for: arsenic (OW-56B), lead (OW-30A, OW-56B, OW-56C, OW-100, FB-1), and thallium (OW-30A, OW-30B, OW-52A, OW-52B, OW-54C, OW-56A, OW-56B, OW-56C, OW-100). Estimated results and detection limits are biased low.

J[6] - Estimate (J) positive results for iron due to matrix suppression seen in the ICP serial dilution. Estimated results are biased low.

J[7] - Estimate (J) positive results that are greater than the IDL but less than 2xIDL due to the possibility of false positives and the uncertainty near the instrument detection limit for: arsenic (FB-1), nickel (OW-30A, OW-54A, OW-54B, OW-56A), and sodium (FB-1).

R[1] - Reject (R) zinc result in sample OW-52A because reported value is attributed to interference from calcium.

Data Summary Key

A	Accept all data.
J	Estimate positive results due to quality control criteria.
UJ	Estimate nondetected results due to quality control criteria.
R	Data are unusable due to quality control criteria.

Site: Industri-Plex
Laboratory: Enseco East
File: ROUXMAG1.WK1

CLP INORGANIC ANALYSIS
Project #s: 18710 and 18748
AQUEOUS ANALYTICAL RESULTS (ug/L) - GROUNDWATER DISSOLVED METALS

Sample Location				OW-30A		OW-30B		OW-52A		OW-52B		OW-54A		OW-54B		OW-54C		OW-56A		OW-56B	
Remarks (Dissolved Metals)																					
Sampling Date				12/16/91		12/16/91		12/17/91		12/17/91		12/17/91		12/17/91		12/17/91		12/16/91		12/16/91	
Dilution Factor				1		1		1		1		1		1		1		1		1	
INORGANIC ANALYTES		IDL (ug/L)	CRDL (ug/L)					As 5x Dilution		As 10x Dilution						As 20x Dilution		As 5x Dilution		As, Tl 5x Dilutions	
Aluminum	P	36.0	200							86.5						41.1	J				UJ
Antimony	P	18.0	60														UJ				UJ
Arsenic	F	1.0	10	2.2	U	4.0	U	400		394		3.9	U	84.3		949	J	528		25.0	UJ
Barium	P	1.0	200	87.0		5.8	U	29.9		80.5		12.1		41.1		232	J	44.5		85.2	J
Beryllium	P	1.0	5													1.2	UJ				UJ
Cadmium	P	3.0	5														UJ				UJ
Calcium	P	8.0	5000	60800		55100		561000		268000		99700		305000		23000	J	196000		105000	J
Chromium	P	4.0	10					5.6		70.6				46.1		145	J	18.5		53.9	J
Cobalt	P	4.0	50	42.9													UJ			19.4	J
Copper	P	3.0	25														UJ				UJ
Iron	P	8.0	100	3990	J	11.8	UJ	14000	J	184	J	839	J	149	J	849	J	161	J	4870	J
Lead	F	1.0	3		UJ												UJ				UJ
Magnesium	P	34.0	5000	4870		9200		7300		19900		2820		88200		75900	J	29700		73000	J
Manganese	P	1.0	15	3080		5.8	U	607	J	313	J	351		373	J	63.6	J	362		2590	J
Mercury	CV	0.2	0.2														UJ				UJ
Nickel	P	10.0	40	18.6	J							11.5	J	11.1	J	37.5	J	14.3	J	18.0	J
Potassium	P	671	5000	8790		5370		12300		18100		4180		7280		34500	J	3800		39600	J
Selenium	F	2.0	5														UJ			3.7	J
Silver	P	4.0	10.0		UJ		UJ		UJ		UJ		UJ		UJ		UJ		UJ		UJ
Sodium	P	1737	5000	31700		38000		20300		61900		9870		108000		244000	J	41300		1090000	J
Thallium	F	3.0	10		UJ		UJ		UJ		UJ		UJ		UJ		UJ		UJ	30.0	UJ
Vanadium	P	4.0	50							6.2	J			29.6		181	J	22.1			UJ
Zinc	P	2.0	20	335		7.4	U		R			39.0		14.3	J	11.8	UJ	9.2	U		UJ

Analytical Method
F Furnace AA
P ICP
CV Cold Vapor AA

J - The associated numerical value is an estimated quantity.
U - The analyte is considered not detected. The associated numerical value is the sample detection limit.
UJ - The analyte was not detected. The sample detection limit is an estimated value.
R - The datum was rejected.
" " - The blank space indicates the analyte was not detected.
IDL - Instrument Detection Limit.
CRDL - Contract Required Detection Limit.

Site: Industri-Plex
Laboratory: Enseco East
File: ROUXMAG1.WK2

CLP INORGANIC ANALYSIS
Project #s: 18710 and 18748
AQUEOUS ANALYTICAL RESULTS (ug/L) - GROUNDWATER DISSOLVED METALS

Sample Location				OW-56C		OW-100		FB-1	
Remarks (Dissolved Metals)						Dup. of OW-56C		Field Blank	
Sampling Date				12/16/91		12/16/91		12/17/91	
Dilution Factor				2 (ICP)		2 (ICP)			
INORGANIC ANALYTES		IDL (ug/L)	CRDL (ug/L)	As, Tl 10x, Pb 5x Dilutions		As, Tl 10x, Pb 5x Dilutions			
Aluminum	P	36.0	200	87.8		132			
Antimony	P	18.0	60	36.0	U	36.0	U		
Arsenic	F	1.0	10	20.0	U	20.0	U	1.2	J
Barium	P	1.0	200	13.8		13.4			
Beryllium	P	1.0	5	5.0	U	4.8	U		
Cadmium	P	3.0	5	6.2		6.4			
Calcium	P	8.0	5000	503000		505000		89.5	
Chromium	P	4.0	10	40.8		40.8			
Cobalt	P	4.0	50	26.6		29.2			
Copper	P	3.0	25	6.0	U	6.0	U		
Iron	P	8.0	100	568000	J	566000	J	9.3	J
Lead	F	1.0	3	5.0	U	5.0	U	5.0	UJ
Magnesium	P	34.0	5000	167000		168000			
Manganese	P	1.0	15	15400		152000			
Mercury	CV	0.2	0.2						
Nickel	P	10.0	40	20.0	U	20.0	U		
Potassium	P	671	5000	67600		68300			
Selenium	F	2.0	5	4.2		6.1			UJ
Silver	P	4.0	10.0	8.0	UJ	8.0	UJ		UJ
Sodium	P	1737	5000	2380000		2390000		266	
Thallium	F	3.0	10	30.0	UJ	30.0	UJ		UJ
Vanadium	P	4.0	50	29.8		36.3			
Zinc	P	2.0	20	4.0	U	4.0	U		

Analytical Method
F Furnace AA
P ICP
CV Cold Vapor AA

J - The associated numerical value is an estimated quantity.
U - The analyte is considered not detected. The associated numerical value is the sample detection limit.
UJ - The analyte was not detected. The sample detection limit is an estimated value.
R - The datum was rejected.
" " - The blank space indicates the analyte was not detected.
IDL - Instrument Detection Limit.
CRDL - Contract Required Detection Limit.

Region I
Data Review Worksheet

Site Name: Industriplex
Reference Number:

REGION I REVIEW OF INORGANIC CONTRACT LABORATORY DATA PACKAGE

The hardcopied(laboratory name) Enseco-East data package received at Region I has been reviewed and the quality assurance and performance data summarized. The data review included:

Lab: Project #s 18710 and 18748

~~Case No.~~		SAS No.		Sampling Date(s)	12/16 + 12/17/91
SDG No.	18710	Matrix	water (dissolved)	Shipping Date(s)	12/16 + 12/17/91
No. of Samples	12			Date(s) rec'd by lab	12/17 + 12/18/91

Traffic Report Nos.: OW-30A, OW30-B, OW-56A, OW-56B, OW-56C, OW-100
OW-52A, OW-52B, OW-54A, OW-54B, OW-54C, FB#1

Trip Blank No.: No trip blank

Equipment Blank No.: Field blank: FB#1

Field Dup Nos.: OW-56C + OW-100

SOW No. 3/90 requires that specific analytical work be done and that associated reports be provided by the laboratory to the Regions, EMSL-LV, and SMO. The general criteria used to determine the performance were based on an examination of:

- -Data Completeness
- -Holding Times
- -Calibrations
- -Blanks
- -ICP Interference Check Results
- -Matrix Spike Recoveries
- -Laboratory Duplicates
- -Field Duplicates
- -Lab Control Sample Results
- -Furnace AA results
- -ICP Serial Dilution Results
- -Detection Limit Results
- -Sample Quantitation

Overall Comments: Overall ~~Data package~~ are of good quality. Data package production, however, showed poor quality with numerous errors. pH for two samples (OW-54B, OW-54C) were >2. Blank contamination evident for arsenic, barium, beryllium, iron, manganese, + zinc. Zinc rejected in sample OW-52A due to interference effects of calcium and iron. Silver and thallium should pool MS recoveries. All analytes met precision criteria in both lab and field duplicates.

Definitions and Qualifiers:

- A - Acceptable data
- J - Approximate data due to quality control criteria
- R - Reject data due to quality control criteria
- U - Analyte not detected

Reviewer: S. Chapnick

Date: 3/10/92

Region I
Data Review Worksheet

I. DATA COMPLETENESS

MISSING INFORMATION	DATE LAB CONTACTED	DATE RECEIVED
1) Cover page missing OW-52B Dup + HS.		
2) Form I's missing sample description.		
3) pg 000477 labeled 2nd added conc for MSA as +0.020 it Ca + 0.040.	no resubmittals requested because discrepancies do not affect reported results	
~~4) ICP linear ranges dated 11/20/90~~		
4 ~~5~~) pg 000522, raw data labeled samples 18710-06 +-06A as 18748-06 + 06A.		

Resubmittals requested for: 2/25/92 2/28/92 and 3/3/92

1. Incomplete quantitely information
2. Inconsistent IDLs
3. Sodium misquantitated from low channel
4. Arsenic miscalculated, sample OW-101

(see resubmittal request attached for details).

Reviewer: BC

Date: 3/10/92

Request for Information/Resubmission

Laboratory Name:	**Enseco - East**	Lab Code: **ENSECO**
SDG/Project Numbers:	**18710 and 18811**	Analysis: **Metals**
Date of Request:	**February 25, 1992**	

1. Quarterly information is incorrect or incomplete. Please resubmit the quarterly IDL and Linear Range information. Specifically, the ICP IDLs are incorrect on Form 10, they do not match the nondetects reported on the Form Is. Also, the Linear Range date is 11/20/90 - if this is true it is non-compliant. Linear Range for sodium is probably incorrect at 100 ppb. Since the laboratory quantitated sodium from two channels on the ICP, a high and a low channel, two linear ranges must be reported for sodium. Please correct and resubmit.

2. Inconsistent IDLs reported for mercury. Please advise on correct IDL and resubmit results which show discrepancy. Nondetected results for mercury are reported as 0.1 U for project 18710 and as 0.2 U for project 18811.

3. Sodium was misquantitated from the low channel instead of the high channel on ICP for the following samples: OW-55 (1881105), OW-56B (1871004), OW-56C (1871005), OW-100 (1874806). Sodium for samples OW-55, OW-56B, and OW-56C were incorrectly reported as nondetects. The raw data shows that the low channel was saturated with sodium, the high channel should have been used to quantitate for these high level sodium samples. Sodium for sample OW-100 was incorrectly reported from the saturated low channel when it should have been reported from the high channel. Please resubmit Form Is with correct sodium values.

4. Since the laboratory quantitated sodium from two channels on ICP, two sets of ICVs, CCVs, ICBs, and CCBs need to be reported for sodium. Only the low channel sodium QC was reported on the CLP Forms 2A and 3. Please submit additional forms with laboratory QC data for the high channel sodium by ICP.

5. Arsenic was incorrectly reported for sample OW-101 (1882005). The raw data shows that the analyst performed a 10x dilution on the MSA. This dilution was not taken into account in reporting the final result on the Form I. Please correct the result to 637 ug/L (laboratory previously reported 63.7 ug/L) and resubmit the Form I for this sample.

Region I
Data Review Worksheet

II. HOLDING TIMES

Complete table for all samples and circle the analysis date for samples not within criteria.

SAMPLE ID	DATE SAMPLED	HG ANALYSIS DATE	CYANIDE ANALYSIS DATE	OTHERS ANALYSIS DATE	pH	ACTION
OW-30A	12-16-91	12-30-91	NA	As - 1/15/92	<2	
OW-30B	12-16-91	12-30-91	NA	As - 1/16/92	<2	
OW-56A	12-16-91	12-30-91	NA	Se - 1/15/92	<2	
OW-56B	12-16-91	12-30-91	NA	Tl - 1/15/92	>2	'J' pos. results 'UJ' nondetects
OW-56C	12-16-91	12-30-91	NA	Tl - 1/17/92	<2	
OW-100	12-16-91	12-30-91	NA	Pb - 1/15/92	<2	
OW-52A	12-17-91	12-30-91	NA	ICP - 1/23/92	<2	
OW-52B	12-17-91	12-30-91	NA	ICP - 1/21/92	<2	
OW-52B DUP	12-17-91	12-30-91	NA		<2	
OW-52B MS	12-17-91	12-30-91	NA		<2	
OW-54A	12-17-91	12-30-91	NA		<2	
OW-54B	12-17-91	12-30-91	NA		<2	
OW-54C	12-17-91	12-30-91	NA		>2	'J' pos. results 'UJ' nondetects
FB-1	12-17-91	12-30-91	NA		<2	

METALS 180 DAYS FROM SAMPLE COLLECTION
MERCURY 28 DAYS FROM SAMPLE COLLECTION
CYANIDE 14 DAYS FROM SAMPLE COLLECTION

ACTION:

1. If holding times are exceeded all positive results are estimated (J) and all non-detects are estimated (UJ).
2. If holding times are grossly exceeded, the reviewer may determine that non-detects are unusable (R).

Reviewer: [signature] Date: 3/10/92

Region I
Data Review Worksheets

III A. INSTRUMENT CALIBRATION (Section 1)

1. Recovery Criteria

List the analytes which did not meet the percent recovery (%R) criteria for Initial and/or Continuing Calibration.

DATE	ICV/CCV#	ANALYTE	%R	SAMPLES AFFECTED	ACTION
all analytes met criteria					

ACTIONS:

If any analyte does not meet the %R criteria follow the actions stated below:

For positive results:

	Accept	Estimate (J)	Reject (R)
Metals	90%-110%	75%-89% or 111%-125%	< 75% or > 125%
Mercury	80%-120%	65%-79% or 121%-135%	< 65% or > 135%
Cyanide	85%-115%	70%-84% or 116%-130%	< 70% or > 130%

For non-detected results:

	Accept	Estimate (UJ)	Reject (R)
Metals	90%-125%	75%-89%	< 75% or > 125%
Mercury	80%-130%	65%-79%	< 65% or > 135%
Cyanide	85%-130%	70%-84%	< 70% or > 130%

Reviewer: [signature] Date: 3/10/92

Region I
Data Review Worksheets

III B. INSTRUMENT CALIBRATION (Section 2)

2. Analytical Sequence

A. Did the laboratory use the proper number of standards for calibration as described in the SOW? Yes or No

B. Were calibrations performed at the beginning of each analysis? Yes or No

C. Were calibration standards analyzed at the beginning of sample analysis and at a minimum frequency of ten percent or every two hours during analysis, whichever is more frequent? Yes or No

D. Were the correlation coefficients for the calibration curve for AA, Hg, and CN ≥ 0.9957 Yes or No

E. Was a standard at 2X CRDL analyzed for all ICP analyses? Yes or No

If no, the data may be affected. Use professional judgement to determine the severity of the effect and qualify the data accordingly. Discuss any actions below and list the samples affected.

Samples Affected:

Region I
Data Review Worksheet

IV A. BLANK ANALYSIS RESULTS (Sections 1-3)

List the blank contamination in sections 1 and 2 below. A separate worksheet should be used for soil and water blanks.

1. Laboratory Blanks

Matrix: water

DATE	ICB/CCB#	PREP BL	ANALYTE	CONCENTRATION/UNITS
1/23/92	ICB		Na	-739 ug/L
	CCB1		Be	1.8 ug/L
	CCB1		Ca	49.7 ug/L
	CCB1		Mn	1.0 ug/L
	CCB2		Ca	19.3 ug/L

2. Equipment/Trip Blanks

DATE	EQUIP BL#	TRIP BL#	ANALYTE	CONCENTRATION/UNITS
1/15/92	FB-1		As	1.2 ug/L
1/23/92	FB-1		Ca	89.5 ug/L
	FB-1		Fe	9.3 ug/L
	FB-1		Na	2606 ug/L

resubmitted data has nondetect DC 3/10/

3. Frequency Requirements

A. Was a preparation blank analyzed for each matrix, for every 20 samples, and for each digestion batch? Yes or No *

B. Was a calibration blank run at the beginning of the run, and every 10 samples or every 2 hours whichever is more frequent? Yes or No

If no, the data may be affected. Use professional judgement to determine the severity of the effect and qualify the data accordingly. Discuss any actions below, and list the samples affected:

No preparation blank required for dissolved metals because no preparation was performed.

Samples Affected:

Reviewer: DC

Date: 3/10/92

REGION I
Data Review Worksheet

IV A. BLANK ANALYSIS RESULTS (Sections 1-3) (cont.)

1. Laboratory Blanks (cont.) MATRIX: water

DATE	ICB/CCB#	PREP BL	ANALYTE	CONC./UNITS
1/23/92	CCB2		Ag	-4.0 ug/L
	~~CCB2~~	~~nondetect on resubmittal DC 3/10/92~~	~~Na~~	~~-259 ug/L~~
	CCB3		Be	1.8 ug/L
	CCB3		Be	2.5 ug/L
	CCB3		Ca	121.1 ug/L
	CCB3		Fe	21.4 ug/L
	CCB3		Mn	2.4 ug/L
	CCB3		Zn	2.5 ug/L
	CCB4		Ca	29.8 ug/L
	CCB4		Fe	8.0 ug/L
	~~CCB4~~	resubmitted data has nondetect DC 3/10/92	~~Na~~	~~-122.10 ug/L~~
1/16/92	CCB2		As	1.7 ug/L

Region I
Data Review worksheet

IV B. BLANK ANALYSIS RESULTS (Section 4)

4. Blank Actions

The Action Level for any analyte is equal to 5X the highest concentration of that analyte found in any blank. The Action Level for samples which have been concentrated or diluted should be multiplied by the concentration/dilution factor. No positive result should be reported unless the concentration of the analyte in the sample exceeds the Action Level (AL) for that analyte. Specific actions are as follows:

1. When the concentration is greater than the IDL, but less than the Action Level, report the sample concentration detected, qualified with a U.

2. When the sample concentration is greater than the Action Level, report the sample concentration unqualified.

Matrix: water

ANALYTE	MAX. CONC/ UNITS	AL/ UNITS
Ag	4.0 ug/L	80.0 ug/L
Ba	1.8 ug/L	9.0 ug/L
Be	2.5 ug/L	12.5 ug/L
Ca	121.1 ug/L	6056 ug/L
Fe	21.4 ug/L	107 ug/L
Mn	2.4 ug/L	12 ug/L
~~* Na~~	~~2662 ug/L~~	~~1330 ug/L~~
Zn	2.5 ug/L	12.5 ug/L
As	1.7 ug/L	8.5 ug/L

Matrix: water

ANALYTE	MAX. CONC/ UNITS	AL/ UNITS

resubmitted data has non detect SDC 3/10/

~~* Derived from Field Blank.~~

NOTE: Blanks analyzed during a soil case must be converted to mg/kg in order to compare them with the sample results.

conc. in ug/l X Volume diluted to (200ml) / Weight digested (1gram) X 1L / 1000ml X 1000g / 1kg X 1mg / 1000ug = mg/kg

Multiplying this result by 5 to arrive at the Action Level gives a final result in mg/kg which can then be compared to sample results.

Reviewer: SDC

Date: 3/10/91

Actions		Samples affected
	"U" =	OW-30B
Ba	"U" =	
Be	"U" =	OW-56C, OW-100
Be	"UJ" =	OW-54C
Fe	"UJ" =	OW-30A

Analyte		Samples Affected
Mn	"U" =	OW-30B
Zn	"U" =	OW-30B, OW-56A, OW-54C
Arsenic	"U" =	OW-30A, -30B, -56B, -56C, -100

Region I
Data Review Worksheet

V A. ICP INTERFERENCE CHECK SAMPLE (Sections 1 and 2)

1. Recovery Criteria

List any elements in the ICS AB solution which did not meet the percent recovery criteria.

DATE	ANALYTE	% REC	SAMPLES AFFECTED	ACTION
All analytes met criteria				

ACTIONS:

If an analyte does not meet the %R criteria, follow the actions stated below:

	PERCENT RECOVERY		
	< 50%	50%-79%	> 120%
Positive Sample Results	R	J	J
Non-detected Sample Results	R	UJ	A

2. Frequency Requirements

Were Interference QC samples run at the beginning and end of each sample analysis run or a minimum of twice per 8 hour shift, whichever is more frequent? Yes or No

If no, the data may be affected. Use professional judgement to determine the severity of the effect and qualify the data accordingly. Discuss any actions below and list the samples affected:

Samples Affected:

Reviewer: [signature] Date: 3/10/92

Region I
Data Review Worksheet

V B. ICP INTERFERENCE CHECK SAMPLE (Section 3)

3. Report the concentration of any analytes detected in the ICS A solution greater than 2X IDL that should not be present.

(note: ICS data correctly reported on original submission; incorrect on resubmittal missing the false <

ANALYTE	CONC. IN THE ICS	CONC. OF INTERFERENTS IN THE ICS: AL	CA	FE	MG
Mn	15	4716798	522034	171525	4601716
~~Na~~	~~251~~				
Zn	15				

quantitated results from high channel. DL 3/10/92

Estimate the concentration produced by the interfering element in all affected samples. See the guidelines for examples. List the samples affected by the interferences below:

SAMPLE AFFECTED	ANALYTE AFFECTED	SAMPLE CONC. (ug/L)	SAMPLE INTERFERENT CONC. AL	CA	FE	MG	ESTIMATED INTERFERENCE (ug/L)	Action
OW-52A	Mn	6.07		561000			15	no action
	~~Na~~	~~199000~~					~~251~~	~~no action~~
	Zn	2.8					15	Reject
OW-52B	Mn	313		268000			7.7	no action
	~~Na~~	~~38100~~					~~129~~	~~no action~~
	Zn	2.0 u					not calculated – Sample was nondetect	

DL

DL

ACTIONS:

1. In general, the sample data can be accepted without qualification if the sample concentrations of Al, Ca, Fe, and Mg are less than 50% of their respective levels in the ICS.
2. Estimate (J) positive results for affected analytes for samples with levels of interferents of 50% or more of that in the ICS solution in cases where estimate interference is > 10% sample conc.
3. Reject (R) positive results if the reported concentration is due entirely to the interfering analyte.
4. Estimate (UJ) non-detected results for which false negatives are suspected, due to interfering analytes.

Give an explanation for any actions taken below:
estimated interferences calculated by assuming the false positive analyte concentration would be present when interferent concentration was of a concentration equal to the ICSA solution. In cases where the interferent in the sample was < ICSA solution, possible interference was estimated by extrapolation.
example: 268000 of CA in OW-52B : $\frac{268000}{522034} = 0.51$

Reviewer: DL Date: 3/10/92

Region I
Data Review Worksheet

V B. ICP INTERFERENCE CHECK SAMPLE (Section 3)

3. Report the concentration of any analytes detected in the ICS A solution greater than 2X IDL that should not be present.

ANALYTE	CONC. IN THE ICS	CONC. OF INTERFERENTS IN THE ICS			
		AL	CA	FE	MG

Estimate the concentration produced by the interfering element in all affected samples. See the guidelines for examples. List the samples affected by the interferences below:

SAMPLE AFFECTED	ANALYTE AFFECTED	SAMPLE CONC. (ug/L)	SAMPLE INTERFERENT CONC. AL	CA	FE	MG	ESTIMATED INTERFERENCE (ug/L)	Action
OW-54B	Mn	373		305000			8.8	no action
	~~Na~~	~~109000~~					~~147~~	~~no act~~
	Zn	14.3					8.8	J(+)
OW-56C	Mn	15400		503000	5680000		minimum of 15.0	no
	~~Na~~	~~2380000~~					~~minimum of 251~~	~~no~~
	Zn	nondetect					not calculated	

SDC 3/10/92

SDC 3/10/92

ACTIONS:

1. In general, the sample data can be accepted without qualification if the sample concentrations of Al, Ca, Fe, and Mg are less than 50% of their respective levels in the ICS.
2. Estimate (J) positive results for affected analytes for samples with levels of interferents of 50% or more of that in the ICS solution.
3. Reject (R) positive results if the reported concentration is due entirely to the interfering analyte.
4. Estimate (UJ) non-detected results for which false negatives are suspected, due to interfering analytes.

Give an explanation for any actions taken below:
Samples Rejected: Zn in OW-52A; entire reported result expected to be due to interference
Samples estimated: Zn in OW-54B because >10% of reported value could be due to interference from calcium. Value estimated - biased high.

Reviewer: SDC Date: 3/10/92

Region I
Data Review Worksheet

V B. ICP INTERFERENCE CHECK SAMPLE (Section 3)

3. Report the concentration of any analytes detected in the ICS A solution greater than 2X IDL that should not be present.

ANALYTE	CONC. IN THE ICS	CONC. OF INTERFERENTS IN THE ICS			
		AL	CA	FE	MG

Estimate the concentration produced by the interfering element in all affected samples. See the guidelines for examples. List the samples affected by the interferences below:

SAMPLE AFFECTED	ANALYTE AFFECTED	SAMPLE CONC. (ug/L)	SAMPLE INTERFERENT CONC. AL	CA	FE	MG	ESTIMATED INTERFERENCE (ug/L)
OW-100	Mn	15200		505000	566000		minimum of 15.0
	~~Na~~	~~2391000~~		↓	↓		~~minimum of 25~~

no ac

ACTIONS:

1. In general, the sample data can be accepted without qualification if the sample concentrations of Al, Ca, Fe, and Mg are less than 50% of their respective levels in the ICS.
2. Estimate (J) positive results for affected analytes for samples with levels of interferents of 50% or more of that in the ICS solution.
3. Reject (R) positive results if the reported concentration is due entirely to the interfering analyte.
4. Estimate (UJ) non-detected results for which false negatives are suspected, due to interfering analytes.

Give an explanation for any actions taken below:

Reviewer: [signature] Date: 3/10/92

Region I
Data Review Worksheet

VI. MATRIX SPIKE

TR # OW-52B Matrix: water

1. Recovery Criteria

List the percent recoveries for analytes which did not meet the required criteria.

S - amount of spike added
SSR - spiked sample result
SR - sample result

ANALYTE	SSR	SR	S	%R	ACTION
Ag	23.07	3.0 u	50.0	46.1	
Tl	38.3	3.0 u	50.0	64.6	'UJ' nondetects - all samp

Matrix Spike Actions apply to all samples of the same matrix.

ACTIONS:

1. If the sample concentration exceed the spike concentration by a factor of 4 or more, no action is taken.
2. If any analyte does not meet the percent recovery criteria, follow the actions stated below:

	PERCENT RECOVERY		
	< 30%	30%-74%	>125%
Positive Sample Results	J	J	J
Non-detected Results	R	UJ	A

2. Frequency Criteria

A. Was a matrix spike prepared at the required frequency? Yes or No
B. Was a post digest spike analyzed for analytes that did not meet the required criteria for matrix spike recovery? Not applicable Yes or No
post not required for silver -

A separate worksheet should be filled out for each matrix spike pair.
Reviewer: [signature] Date: 3/10/92

[signature] 3/10/92

Region I
Data Review Worksheet

all analytes met criteria

VII. LABORATORY DUPLICATES

List the concentrations of any analyte not meeting the criteria for duplicate precision. For soil duplicates, calculate the CRDL in mg/kg using the sample weight, volume and percent solids data for the sample. Indicate what criteria was used to evaluate precision by circling either the RPD or CRDL for each analyte.

Matrix: water

ANALYTE	CRDL		SAMPLE #	DUPLICATE #	RPD	ACTION
	WATER ug/L	SOIL mg/kg	GW-52B	GW-52B Dup		
Aluminum	200					
Antimony	60					
Barium	10					
Beryllium	200					
Cadmium	5					
Calcium	5000					
Chromium	10					
Cobalt	50					
Copper	25					
Iron	100					
Lead	5					
Magnesium	5000					
Manganese	15					
Mercury	0.2					
Nickel	40					
Potassium	5000					
Selenium	5					
Silver	10					
Sodium	5000					
Thallium	10					
Vanadium	50					
Zinc	20					
Cyanide	10					

Laboratory duplicate actions should be applied to all other samples of the same matrix type.

ACTION:

1. Estimate (J) positive results for analytes which have an RPD > 20% for waters and > 35% for soils.
2. If sample results are less than 5X the CRDL, estimate (J) positive results for analytes whose absolute difference is > CRDL (2X CRDL for soils). If both samples are non-detected, the RPD is not calculated (NC).

Reviewer: [signature] Date: 3/10/92

Region I
Data Review Worksheet

VIII. FIELD DUPLICATES

all met criteria

List the concentrations of all analytes in the field duplicate pair. For soil duplicates, calculate the CRDL in mg/kg using the sample weight, volume and percent solids data for the sample. Indicate what criteria was used to evaluate precision by circling either the RPD or CRDL for each analyte.

Matrix: water

ANALYTE	CRDL WATER ug/L	CRDL SOIL mg/kg	SAMPLE # OW-516C	DUPLICATE # OW-100	RPD	ACTION
Aluminum	200		87.8 B	132 B	40.2	No Action
Antimony	60		360.0 U	360.0 U	NC	
Barium	10		13.8 B	13.4 B	2.9	
Beryllium	200		5.0 B	4.8 B	4.1	
Cadmium	5		6.2 B	6.4 B	3.2	
Calcium	5000		503000	505000	0.4	
Chromium	10		40.8	40.8	0.0	
Cobalt	50		260.6 B	29.2 B	9.3	
Copper	25		6.0 U	6.0 U	NC	
Iron	100		5608000	5660000	0.4	
Lead	5		5.0 U	5.0 U	NC	
Magnesium	5000		1667000	1668000	0.6	
Manganese	15		15400	15200	1.3	
Mercury	0.2		0.1 U	0.1 U	NC	
Nickel	40		20.0 U	20.0 U	NC	
Potassium	5000		676000	668300	1.0	
Selenium	5		4.2 B	6.1	36.9	
Silver	10		6.0 U	6.0 U	NC	
Sodium	5000		2380000	2390000	0.5	
Thallium	10		30.0 U	30.0 U	NC	
Vanadium	50		29.8 B	36.3 B	19.7	
Zinc	20		4.0 U	4.0 U	NC	
~~Cyanide~~ Arsenic	10		20.0 B	20.0 B	0.0	✓

Field duplicate actions should be applied to all other samples of the same matrix type.

ACTION:

1. Estimate (J) positive results for analytes which have an RPD > 30% for waters and > 50% for soils.
2. If sample results are less than 5X the CRDL, estimate (J) positive results for analytes whose absolute difference is > 2X CRDL (4X CRDL for soils). If both samples are non-detected, the RPD is not calculated (NC).

Reviewer: KWC

Date: 3/10/92

Region I
Data Review Worksheet

IX. LABORATORY CONTROL SAMPLE

Dissolved water samples no LCS is required because no preparation was performed.

1. Aqueous LCS

List any LCS recoveries not within the 80%-120% criteria and the affected samples.

DATE	ANALYTE	%REC	SAMPLES AFFECTED	ACTION

2. Solid LCS

List any analytes that were not within the control windows set by the EPA for the solid LCS sample. The 80%-120% criteria is not used to evaluate solid LCS results.

ANALYTE	LCS CONC.	CONTROL WINDOWS	SAMPLES AFFECTED	ACTION

ACTION:

	PERCENT RECOVERY		
AQUEOUS LCS	<50%	51%-79%	> 120%
Positive Results	R	J	J
Non-detected Results	R	UJ	A

SOLID LCS	< EPA Control Windows	> EPA Control Windows
Positive Results	J	J
Non-detected Results	UJ	A

3. Frequency Criteria

A. Was an LCS analyzed for each matrix, for every digestion batch, and for every 20 samples? Not Applicable ~~Yes or No~~

Reviewer: [signature] Date: 3/10/92

Region I
Data Review Worksheet

X A. FURNACE ATOMIC ABSORBTION ANALYSIS

1. Duplicate precision

__X__ Duplicate injections and one point analytical spikes were performed for all samples and duplicate injections agreed within ± 20%.

_____ Duplicate injections and/or spikes were not performed for the following samples/analytes:

_____ Duplicate injections did not agree within ± 20% for the following samples/analytes:

2. Post Digestion Spike Recoveries

_____ Spike recoveries met the 85%-115% recovery criteria for all samples.

__X__ Spike recoveries did not meet the 85%-115% criteria but did not require MSA for the following samples/analytes:
Se- OW56B, OW-52B, OW-52BD, OW-54A, FB-1. (all > 120%)
Tl- all samples except OW-54A + OW-54B. (all <85% except FB-1).
Pb- OW-50A, OW-56B, OW-56C, OW-100, FB1 (all < 85%)
As- OW-56B (< 85%)

__X__ MSA was used to quantitate analytical results when contractually required.
__X__ The correlation coefficients were all ≥0.995, accept results.
____ The following samples/analytes had correlation coefficients < 0.995:

_____ MSA was not performed as required for the following samples/analytes:

ACTION:

1. Estimate (J) positive results if duplicate injections are outside ± 20% RSD or CV.
2. If the sample absorbance is < 50% of the post digestion spike absorbance the following actions should be applied.

	PERCENT RECOVERY		
	<10%	11%-84%	> 115%
Positive Sample Results	J or R	J	J
Non-detected Results	R	UJ	A

3. Estimate (J) sample results if MSA was required and not performed.
4. Estimate (J) sample results if the correlation coefficient of the MSA was <0.995.

Reviewer: DC Date: 3/10/92

Region I
Data Review Worksheets

XI. INDUCTIVELY COUPLED PLASMA (ICP) SERIAL DILUTION ANALYSIS

_____ Serial dilutions were performed for each matrix and results of the diluted sample analysis agreed within ± 10% of the original undiluted analysis.

_____ Serial dilution was not performed for the following:

_____

_X_ Serial dilutions were performed, but analytical results did not agree within ± 10% for analyte concentrations greater than 50X the IDL before dilution.

Report all results below that do not meet the required laboratory criteria for ICP serial dilution analysis.

Matrix: water

ANALYTE	IDL	50X IDL	SAMPLE RESULT	SERIAL DILUTION	% DIFF	ACTION
Aluminum						
Barium						
Beryllium						
Cadmium						
Calcium						
Cobalt						
Copper						
Iron	8	400	839.49	1276.47	52.1	J' pos. results
Lead						
Magnesium						
Manganese						
Nickel						
Potassium						
Silver						
Sodium						
Vanadium						
Zinc						

Actions apply to all samples of the same matrix

Matrix suppression evident by higher serial dilution result.

ACTIONS:

1. Estimate (J) all positive results if the % D > 15%.

Reviewer: [signature]

Date: 3/10/93

Region I
Data Review Worksheets

XII. DETECTION LIMIT RESULTS

1. Instrument Detection Limits

X Instrument detection limit results were present and found to be less than the CRDL.

_____ IDLs were not included in the data package on Form XI.

_____ IDLs were present, but the criteria was not met for the following analytes:

_____

Reason: _____

2. Reporting requirements

Were sample results on Form I reported down to the IDL not the CRDL for all analytes? Yes or No

Were sample results that were analyzed by ICP for Se, Tl, As, or Pb at least 5x IDL? Yes, No or NA

Were sample weights, volumes, and dilution factors taken into account when reporting detection limits on Form I? Yes or No

If no, the reported results may be inaccurate. Make the necessary changes on the data summary tables and request that the laboratory resubmit the corrected data.

Reviewer: RJC Date: 3/10/92

Region I
Data Review Worksheets

XIII. SAMPLE QUANTITATION

✓ Sample results fall within the linear range for ICP and within the calibrated range for all other parameters. Note: Sodium results from high channel (low channel saturated).

_____ Sample results were beyond the linear range on ICP and/or beyond the calibration range for other parameters for the following samples/analytes:

_____

_____

In the space below, please show a minimum of one sample calculation per method:

ICP instrument printout in mg/L
Sample OW-54C Aluminum = $0.0411 \frac{mg}{L} \times \frac{1000\ ug}{1\ mg} = \boxed{41.1\ ug/L}$

FURNACE instrument printout in ug/L - no calculation required except in cases of dilutions.
Arsenic: Sample OW-52B $\frac{1000\ ug}{1\ mg} \times 0.0394 \frac{mg}{L} \times 10$ dilution = $\boxed{394\ ug/}$

MERCURY instrument printout in mv. apply linear regression of standard curve to get concentration in ug/L.
example: OW52BMS mv. = 47 converts to 1.0733 ug/L
(regression r = 0.9987; m = 41.996, b = 1.925 where y = mx + b).

CYANIDE
Not required

For soil samples, the following equation may be necessary to convert raw data values (usually reported in ug/L) to actual sample concentrations (mg/kg):

The lab is required to use 1 gram of sample (wet weight) to 200mL final volume.

Wet weight concentration =

$$\text{digest conc. in ug/L} \times \frac{200mL}{1g} \times \frac{1L}{1000mL} \times \frac{1000g}{1kg} \times \frac{1mg}{1000ug} = \frac{mg}{kg}$$

In addition, the sample results are converted to dry weight using the percent solids calculations:

$$\frac{\text{wet weight conc.}}{\text{\% solids}} \times 100 = \text{Final concentration, dry weight (mg/kg)}$$

Gradient Corporation

March 18, 1992

Ms. Martha Smith
Roux Associates, Inc.
775 Park Avenue
Suite 255
Huntington, NY 11743

RE: Data Validation Letter Report
Project #s: 18811 and 18820
Enseco-East Laboratory
Industri-Plex Site, Woburn, Massachusetts
Metals: 10 samples/water (dissolved)/sample #s: WP-1, WP-3, WP-4, WP-5, OW-31, OW-37, OW-37A, OW-55, OW-101, FB-2

Dear Ms. Smith:

A validation was performed on the dissolved metals analytical data from 10 groundwater samples collected by Roux Associates, Inc. at the Industri-Plex site in Woburn, MA. The data were evaluated based on the following parameters according to the Region I Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses, February 1989:

	Data completeness
	Holding times/pH
	Calibration verification
	Field and laboratory blank results
	ICP interference check results
	Matrix spike percent recovery results
	Laboratory and field duplicates
NA	Laboratory control sample results
*	Furnace atomic absorption analysis/duplicate precision
	Furnace atomic absorption analysis/post digestion spike recoveries
	Serial dilution results
*	Detection limit results
	Sample results

* All criteria were met for this parameter
NA Not applicable

Table I summarizes the validation recommendations which were based on the following information:

44 Brattle Street, Cambridge, MA 02138 • (617)576-1555 • Telefax (617)864-8469
Environmental Consultants with Offices in Cambridge, MA and Boulder, CO

Data Completeness

The following information was missing or incorrect in the original data package and required a resubmittal of the data:

- Incomplete quarterly information including inaccurate dates, IDLs, and linear ranges.
- Inconsistent mercury IDLs in package.
- Sodium misquantitated from low channel, rather than high channel, on ICP.
- Arsenic miscalculated for sample OW-101.

The above items were requested on 2/25/92 and were received on 2/28/92 and 3/03/92. Sample FB-2 did not have a Form I in the data package. Two Form Is were included for sample OW-37A with two separate laboratory ID#s. One of these, corresponding to laboratory ID #1881105, was actually the field blank sample FB-2. The laboratory was requested to resubmit a corrected Form I on 3/17/92. Additionally, other discrepancies were present in the data package; however, no resubmittals were requested because they did not affect the quantitation of the results. These included:

- The cover page was missing the matrix spike (MS) and duplicate (D) for sample OW-52B.
- The Form Is were all missing the sample descriptions.
- Incorrectly reported sodium for the serially diluted result and therefore incorrectly calculated the percent difference as exceeding criteria. Laboratory reported sodium in serial dilution for sample OW-55 as 57550.00 ug/L whereas the actual result, from the raw data, is 575500.00 ug/L. With the correct result, the percent difference meets criteria (corrected percent difference = 0.9%; laboratory reported 89.9%). All the "E" qualifiers on the Form Is of the data package should therefore be removed for sodium.
- Several forms in the raw data contain no signature or date. For example, pg 000518 is a notebook page without a title, without an analyst signature, and without a date.
- Form IV, for reporting the ICS data, did not include false positives and false negatives of analytes found in the solution that should not have been present. CLP SOW 3/90 requires that <u>all</u> analytes be reported on this form. The ICSA was therefore reviewed from the raw data in order to assess interference effects as part of the validation process.
- The MSA performed on sample OW-37A dup. is missing from Form VIII.
- Correlation coefficients (r) for the MSAs performed for arsenic are incorrect for the following samples:

Sample	r value reported by laboratory	corrected r value
WP-3	0.9990	0.9996
WP-4	0.9980	0.9983
WP-5	0.9970	0.9972
OW-101	0.9990	0.9994

No actions were taken for these discrepancies as they did not directly affect the sample results; however, they are evidence of poor quality in the data package preparation and review.

Holding Times/pH

All holding times were met; however, the pH for three samples, WP-4, OW-31, and OW-55, was greater than 2. All positive results and nondetects have been estimated (J and UJ, respectively) because of improper preservation of the sample. These estimated results may be biased low as metals may adsorb to the walls of the sample container at pH > 2.

Calibration Verification

All calibration recovery and frequency criteria were met; however, the CRDL standard did not meet recovery criterion of 80 - 120% for the following analytes:

Analyte	% Recovery CRDL	Action
Chromium	77.8	UJ(ND)
Silver	64.2	UJ(ND)

Actions were taken where the CRDL standard recovery was less than 80% for positive values that were less than 3xCRDL and for all associated nondetects. All positive chromium results were greater than 3xCRDL; therefore, no action was applied. All chromium nondetects (WP-1, WP-3, WP-5, OW-37, OW-37A, OW-101, FB-2) are estimated (UJ). All silver results were nondetects and all detection limits are estimated (UJ). Low recovery of the CRDL standard may indicate a low bias in these estimated detection limits.

Field and Laboratory Blanks

The blank data were reviewed and the maximum concentrations and action levels are summarized in the following table. Sample FB-2 was the field blank associated with these samples. Note that the laboratory incorrectly labeled FB-2 as OW-37A, laboratory ID # 1881105, throughout the data package. The actions do not apply to the field blank.

BLANK ACTION TABLE

Analyte	Maximum Concentration (ug/L)	Action Level (ug/L)
Arsenic	1.7	8.5
Barium*	6.4	32.0
Calcium*	212	1060
Iron	12.0	60.0
Silver	-7.0	35.0

* Indicates that the maximum concentration was derived from contamination present in the field blank. Other maximum concentrations were derived from the laboratory blanks (initial and continuing calibration blanks).

Sample values which are greater than the IDL, but less than the Action Level are considered nondetect due to the possibility of false positives; report the sample concentration with a U for the following sample analytes:

arsenic: WP-1
barium: WP-3

No actions were taken for calcium or iron because all positive values were greater than the blank action level. All silver results were nondetects; therefore, blank actions do not apply.

ICP Interference Check Sample

All analytes met criteria for the ICS AB standard. However, several analytes were detected in the ICSA solution, at levels greater than 2xIDL, that should not have been present. The following table summarizes these false positives:

Analyte	Concentration found in the ICS (ug/L)	Concentration of interferents in the ICS (ug/L)			
		Al	Ca	Fe	Mg
Chromium	50.8	488859	531311	174047	469957
Copper	6.3	"	"	"	"
Manganese	11.3	"	"	"	"
Silver	-9.0	"	"	"	"
Zinc	18.3	"	"	"	"

Samples WP-1, WP-3, WP-5, OW-31, and OW-101 had concentrations of calcium greater than 50% of the level found in the ICS. The effects of this calcium interferent on the quantitation of the analytes listed in the previous table were reviewed for the affected samples. The estimated interferences on chromium, copper, manganese, and zinc for the positive results in the affected samples were calculated and the negative interference for silver was estimated. The estimated interferences and the actions taken are summarized in the following table:

Sample Affected	Analyte Affected	Interferent Concentration (ug/L)	Estimated Interference (ug/L)	Action
WP-1	silver	575000 (calcium)	-9.0	UJ(ND)
	zinc	"	18.3	J(+)
WP-3	copper	606000 (calcium)	6.3	no action
	silver	"	-9.0	UJ(ND)
	zinc	"	18.3	J(+)
WP-5	silver	328000 (calcium)	-5.6	UJ(ND)
	zinc	"	11.3	J(+)
OW-31	chromium	365000 (calcium)	34.9	R
	silver	"	-6.2	UJ(ND)
	zinc	"	12.6	R
OW-101	silver	324000	-5.5	UJ(ND)
	zinc	"	11.2	J(+)

The positive sample results for the above listed analytes were estimated (J) when the estimated concentration was greater than 10% of the measured value of the affected analyte in the sample. No actions were applied when the estimated concentrations were below 10% of the reported concentrations for those analytes as listed above (as was the case for copper in sample WP-3). The chromium and zinc values reported for sample OW-31 were rejected (R) because the estimated interference concentration was 95% and 91% of the reported sample analyte concentrations for the respective analytes. Therefore, it is expected that the entire reported value for chromium and zinc in this sample was due to an interference effect and was not actually present in the sample.

Matrix Spike Percent Recovery Results

The review of the matrix spike results revealed the deficiencies summarized in the following table. The actions apply to all samples of the same matrix.

MATRIX SPIKE RECOVERY ACTION TABLE

Sample #	Analyte	% Recovery	Action
OW-37A	Silver	70.0	(UJ) all samples
OW-37A	Thallium	68.4	(UJ) all samples

The low percent recoveries for silver and thallium indicate a matrix suppression of these analytes and therefore a low bias is expected in the estimated detection limits of these nondetected analytes.

Laboratory and Field Duplicate Results

The laboratory duplicate data were reviewed and the results not meeting the validation criteria are included in the following table. Actions are applied to all samples of the same matrix.

PRECISION ACTION TABLE FOR LABORATORY DUPLICATE

Sample #	Analyte	% RPD	Action
OW-37A	Arsenic	65.0	J(+)

All results for arsenic have been estimated (J) due to poor laboratory duplicate precision.

A field duplicate pair, WP-5 and OW-101, was collected with this set of samples. Field duplicate results met precision criteria for all analytes.

Furnace Atomic Absorption Analysis/Post-Digestion Spike Recoveries

The following sample analytes had low post-digestion spike recoveries (< 85%) but did not require the method of standard additions (MSA) for the following samples/analytes:

Analyte	Samples Affected
Arsenic	WP-1
Lead	WP-1, WP-3, WP-4, WP-5, OW-37, OW-37A, OW-55
Selenium	WP-3, WP-4, WP-5, OW-31, OW-55, OW-101, FB-2
Thallium	WP-1, WP-3, WP-4, OW-31, OW-37, OW-37A, OW-55, FB-2

Actions for the above sample analytes are J(+) and UJ(ND). All the thallium results have already been estimated (UJ) due to low matrix spike recovery; therefore, no further action is applied. The low post-digestion spike recoveries are an indication of matrix suppression of these analytes. All estimated results (J) and detection limits (UJ) are therefore biased low. Note that the interpretation of post-digestion spike recovery is generally related to sample matrix effects; however, in the case of selenium and thallium for the above samples, a laboratory effect is likely because the field blank sample (FB-2) had poor post-digestion spike recoveries. Matrix interferences are not expected in a field blank sample that consists of laboratory-grade deionized water.

ICP Serial Dilution Results

Two serial dilutions were performed with this set of data. Analytical results not meeting criteria are listed in the following table. Actions affect all samples of the same matrix.

Sample #	Analyte	Sample Result (ug/L)	Serial Dilution (ug/L)	Percent Difference (%)
WP-3	Calcium	605573.48	496183.53	18.1
•	Magnesium	228638.73	202194.33	11.6
•	Sodium	275800.00	244800.00	11.2
OW-55	Zinc	258.95	296.23	14.4

Actions were taken where the percent difference between the sample result and the serially diluted result was greater than 15%. Therefore, all positive calcium results are estimated (J) due to the indication of matrix effects on the quantitation of this analyte as seen by the high percent difference in the serial dilution.

Sample Results

The following sample analytes were detected at less than 2xIDL and have therefore been estimated (J) due to the uncertainty in the quantitation near the IDL. This table does not include sample analytes previously estimated due to other validation criteria.

Analyte	Samples Affected
Nickel	WP-3, WP-5

Overall Assessment

All holding times were met. Many discrepancies, incorrectly reported data or QC, were observed in the data package. Where these items affected the reported values, resubmittals were requested from the laboratory. Inconsistencies and incorrectly reported data that did not directly affect the analyte quantitation were recorded in this review but resubmittals were not requested. The number of errors noted indicates poor quality in data package preparation. The pH for samples WP-4, OW-31, and OW-55 were greater than 2; therefore, all positive and nondetect results have been estimated (J and UJ, respectively). All calibration criteria were met for all analytes; however, the CRDL standard did not recover within validation criteria for chromium and silver. Therefore, all nondetects for these analytes were estimated (UJ) and may be biased low. Blank contamination was minimal and affected the quantitation of a single sample for arsenic and barium only. All criteria were met for the interference check standard (ISC AB) recoveries; however, chromium, copper, manganese, and zinc were detected in the ICS A at levels greater than 2xIDL and silver at a negative level greater than -2xIDL. Therefore, estimated interferences for these analytes in samples with high levels of calcium were calculated. Based upon these calculations, chromium and zinc in sample OW-31 were rejected (R) and copper, silver and zinc were estimated (J). Accuracy, as indicated by the matrix spike (MS), was good for all analytes except for silver and thallium. Both recovered low in the MS; therefore, all associated data were estimated at the detection limit (UJ) and are biased low. Precision for these samples was also good as all analytes except arsenic met criteria in the laboratory duplicate pair and all analytes met criteria in the field duplicate pair. All arsenic data were estimated (J) due to poor duplicate precision. A matrix effect on calcium is expected as evidenced by the high percent difference in the serial dilution result. Therefore, all calcium results have been estimated (J).

Attached are the Recommendations Summary Table I, the Data Summary Table II, and the worksheets associated with this data validation review.

Very truly yours,

GRADIENT CORPORATION

Susan D. Chapnick

Susan D. Chapnick
Senior Analytical Chemist
Data Reviewer

INDUSTRI-PLEX
PROJECT #s: 18811 and 18820
GROUNDWATER SAMPLES - DISSOLVED METALS

Table I - Recommendation Summary			
Aluminum	J^{1}	Magnesium	J^{1}
Antimony	J^{1}	Manganese	J^{1}
Arsenic	A^{1}, $J^{1,4}$	Mercury	J^{1}
Barium	A^{1}, J^{1}	Nickel	$J^{1,7}$
Beryllium	J^{1}	Potassium	J^{1}
Cadmium	J^{1}	Selenium	$J^{1,4}$
Calcium	$J^{1,5}$	Silver	$J^{1,2,3,6}$
Chromium	R^{1}, $J^{1,6}$	Sodium	J^{1}
Cobalt	J^{1}	Thallium	$J^{1,3,4}$
Copper	J^{1}	Vanadium	J^{1}
Iron	J^{1}	Zinc	R^{1}, $J^{1,2}$
Lead	$J^{1,4}$		

See Codes defined on following page.

INDUSTRI-PLEX
PROJECT #s: 18811 and 18820
GROUNDWATER SAMPLES - DISSOLVED METALS

TABLE I - Recommendation Summary
(Continued)

Codes:

If the field is left blank, the qualifier is A - Accept all data.

A[1] - Accept all data, but consider positive results greater than 2xIDL and less than the blank action level as nondetect because false positives are expected due to blank contamination. Report the sample concentration with a U for: arsenic (WP-1) and barium (WP-3).

J[1] - Estimate (J) positive results and (UJ) nondetects for samples WP-4, OW-31, and OW-55 due to improper preservation (pH > 2). Sample results may be biased low.

J[2] - Estimate (J) positive zinc results in samples WP-1, WP-3, WP-5, and OW-101 because reported values are biased high due to positive interference from calcium. Estimate (UJ) nondetected results for silver because false negatives are suspected due to interference from calcium in samples WP-1, WP-3, WP-5, OW-31, and OW-101. Estimated detection limit may be biased low.

J[3] - Estimate (UJ) all nondetected results due to low matrix spike recoveries for silver and thallium. Estimated sample detection limits are biased low.

J[4] - Estimate (J) positive results and (UJ) nondetected results due to low post-digestion spike recoveries for: arsenic (WP-1), lead (WP-1, WP-3, WP-4, WP-5, OW-37, OW-37A, OW-55), selenium (WP-3, WP-4, WP-5, OW-31, OW-55, OW-101, FB-2), and thallium (WP-1, WP-3, WP-4, OW-31, OW-37, OW-37A, OW-55, FB-2). Estimated results and detection limits are biased low.

J[5] - Estimate (J) positive results for calcium due to matrix effects seen in the ICP serial dilution.

J[6] - Estimate (UJ) all nondetects for chromium and silver due to low CRDL standard recoveries (< 80%). Estimated detection limits are biased low.

J[7] - Estimate (J) positive results that are greater than the IDL but less than 2xIDL due to the possibility of false positives and the uncertainty near the instrument detection limit for: nickel (WP-3, WP-5).

R[1] - Reject (R) chromium and zinc results in sample OW-31 because entire reported values are attributed to interference from calcium.

Data Summary Key

A	Accept all data.
J	Estimate positive results due to quality control criteria.
UJ	Estimate nondetected results due to quality control criteria.
R	Data are unusable due to quality control criteria.

Site: Industri-Plex
Laboratory: Enseco East
File: ROUXMAG2.WK1

CLP INORGANIC ANALYSIS
Project #s: 18811 and 18820
AQUEOUS ANALYTICAL RESULTS (ug/L) - GROUNDWATER DISSOLVED METALS

Sample Location				WP-1		WP-3		WP-4		WP-5		OW-31		OW-37		OW-37A		OW-55		OW-101	
Remarks (Dissolved Metals)																				Dup. of WP-5	
Sampling Date				12/19/91		12/19/91		12/19/91		12/19/91		12/18/91		12/18/91		12/18/91		12/18/91		12/19/91	
Dilution Factor				1		1		1		1		1		1		1		1		1	
INORGANIC ANALYTES		IDL (ug/L)	CRDL (ug/L)	As,Pb 5x Dilutions		Pb 5x Dilution		As,Se 10x Dilutions		As 10x Dilution		As 10x, Pb 5x Dilution		As 2x Dilution		As 50x Dilution		As, Tl 5x Dilutions		As 10x Dilution	
Aluminum	P	36.0	200					52.7	J	73.2		152	J						UJ		
Antimony	P	18.0	60						UJ				UJ					29.3	J		
Arsenic	F	1.0	10	5.0	UJ	20.4	J	545	J	869	J	484	J	112	J	2010	J	193	J	63.7	J
Barium	P	1.0	200			12.6	U	70.4	J	85.0		230	J	56.6		45.6		201	J	71.5	
Beryllium	P	1.0	5						UJ				UJ						UJ		
Cadmium	P	2.0	5						UJ				UJ						UJ		
Calcium	P	8.0	5000	575000	J	606000	J	256000	J	328000	J	365000	J	59100	J	48700	J	98700	J	324000	J
Chromium	P	4.0	10		UJ		UJ	61.6	J		UJ		R		UJ		UJ	122	J		UJ
Cobalt	P	4.0	50			77.5			UJ				UJ						UJ		
Copper	P	3.0	25			76.7			UJ				UJ					52.4	J		
Iron	P	8.0	100	436		720		127	J	60200		267	J	830		1770		1160	J	59400	
Lead	F	1.0	3	5.0	UJ	5.0	UJ		UJ		UJ	5.0	UJ		UJ		UJ		UJ		
Magnesium	P	34.0	5000	23300		229000		77700	J	77200		169000	J	7260		6450		96200	J	76100	
Manganese	P	1.0	15	655		440		3220	J	4520		5300	J	582		374		349	J	4570	
Mercury	CV	0.2	0.2						UJ				UJ						UJ		
Nickel	P	10.0	40	19.5		16.3	J	21.8	J	11.6	J		UJ					60.4	J		
Potassium	P	671	5000	17600		15800		18300	J	19300		40200	J	2760		2620		84400	J	19200	
Selenium	F	2.0	5	7.5			UJ	20.0	UJ		UJ		UJ						UJ		UJ
Silver	P	4.0	10.0		UJ		UJ		UJ		UJ		UJ		UJ		UJ		UJ		UJ
Sodium	P	1737	5000	16000		276000		34200	J	110000		114000	J	21000		28900		570000	J	102000	
Thallium	F	3.0	10		UJ		UJ		UJ		UJ		UJ		UJ		UJ	15.0	UJ		UJ
Vanadium	P	4.0	50					5.1	J			29.3	J					83.3	J		
Zinc	P	2.0	20	22.8	J	112	J	15.3	J	21.2	J		R	14.1		32.8		259	J	17.8	J

Analytical Method
F Furnace AA
P ICP
CV Cold Vapor AA

J - The associated numerical value is an estimated quantity.
U - The analyte is considered not detected. The associated numerical value is the sample detection limit.
UJ - The analyte was not detected. The sample detection limit is an estimated value.
R - The datum was rejected.
" " - The blank space indicates the analyte was not detected.
IDL - Instrument Detection Limit.
CRDL - Contract Required Detection Limit.

Site: Industri-Plex
Laboratory: Enseco East
File: ROUXMAG2.WK2

CLP INORGANIC ANALYSIS
Project #s: 18811 and 18820
AQUEOUS ANALYTICAL RESULTS (ug/L) - GROUNDWATER DISSOLVED METALS

Sample Location				FB-2	
Remarks (Dissolved Metals)				Field Blank	
Sampling Date				12/18/91	
Dilution Factor				1	
INORGANIC ANALYTES		IDL (ug/L)	CRDL (ug/L)		
Aluminum	P	36.0	200		
Antimony	P	18.0	60		
Arsenic	F	1.0	10	1.4	J
Barium	P	1.0	200	6.4	
Beryllium	P	1.0	5		
Cadmium	P	3.0	5		
Calcium	P	8.0	5000	212	J
Chromium	P	4.0	10		UJ
Cobalt	P	4.0	50		
Copper	P	3.0	25		
Iron	P	8.0	100		
Lead	F	1.0	3		UJ
Magnesium	P	34.0	5000		
Manganese	P	1.0	15		
Mercury	CV	0.2	0.2		
Nickel	P	10.0	40		
Potassium	P	671	5000		
Selenium	F	2.0	5		UJ
Silver	P	4.0	10.0		UJ
Sodium	P	1737	5000		
Thallium	F	3.0	10		UJ
Vanadium	P	4.0	50		
Zinc	P	2.0	20		

Analytical Method
F Furnace AA
P ICP
CV Cold Vapor AA

J - The associated numerical value is an estimated quantity.
U - The analyte is considered not detected. The associated numerical value is the sample detection limit.
UJ - The analyte was not detected. The sample detection limit is an estimated value.
R - The datum was rejected.
" " - The blank space indicates the analyte was not detected.
IDL - Instrument Detection Limit.
CRDL - Contract Required Detection Limit.

Region I
Data Review Worksheet

Site Name: Industriplex
Reference Number:

REGION I REVIEW OF INORGANIC
CONTRACT LABORATORY DATA PACKAGE

The hardcopied(laboratory name) Enseco-East data package received at Region I has been reviewed and the quality assurance and performance data summarized. The data review included:

~~Case No.~~ Proj. #s	18811 and 18820	SAS No.		Sampling Date(s)	12/18 + 12/19/91
SDG No.	18811	Matrix	water dissolved	Shipping Date(s)	12/18 + 12/19/91
No. of Samples	10			Date(s) rec'd by lab	12/19 + 12/20/91

Traffic Report Nos.: WP-1, WP-3, WP-4, WP-5, OW-101, OW-31, OW-37, OW-37A, OW-55, FB-2

Trip Blank No.: no trip blank.

Equipment Blank No.: Field blank No. FB-2 (laboratory ID# 18811C-

Field Dup Nos.: WP5 + OW-101

SOW No. 3/90 requires that specific analytical work be done and that associated reports be provided by the laboratory to the Regions, EMSL-LV, and SMO. The general criteria used to determine the performance were based on an examination of:

- -Data Completeness
- -Holding Times
- -Calibrations
- -Blanks
- -ICP Interference Check Results
- -Matrix Spike Recoveries
- -Laboratory Duplicates
- -Field Duplicates
- -Lab Control Sample Results
- -Furnace AA results
- -ICP Serial Dilution Results
- -Detection Limit Results
- -Sample Quantitation

Overall Comments: pH for samples WP-4, OW-31, OW-55 > 2; therefore all data estimated (J or UJ) for these samples. Estimated interferences for chromium and zinc caused rejection of this in sample OW-31; other samples have estimated (J) values for silver and zinc due to interference effects of high calcium matrix spike recovery was low for silver and thallium: all associated data were estimated (UJ). Precision was good for all analytes except arsenic: all associated data estimated (J). Many discrepancies observed in data package. Some addressed by resubmit. Poor grading in data package reporting. Though many errors did not affect validity.

Definitions and Qualifiers:

- A - Acceptable data
- J - Approximate data due to quality control criteria
- R - Reject data due to quality control criteria
- U - Analyte not detected

Reviewer: DC

Date: 3-16-92

Region I
Data Review Worksheet

I. DATA COMPLETENESS

MISSING INFORMATION	DATE LAB CONTACTED	DATE RECEIVED

1) OW-37A Dup and MS not included on cover page.
2) FB-2 omitted on cover page and no Form I submitted.
3) No sample descriptions on Form I's.
4) 2 Form I's submitted for sample OW-37A - assume that the one for labID# 1881105 = FB-2.
5) Linear ranges page date listed as 11/20/90.
6) Se run#2 (pg. 000344), CCV4/CCB4 pair labeled as CCV3/CCB3.
7) pg 000423, replicate #2 for ICB for Tl run#1 is cut off.
8) Form IX did not report analytes found in the ICSA.
9) As matrix spike is reported wrong. The lab did not take into account the dilution on the samples
10) MSA for OW-37A Dup not included on form 8.
11) Form 8 reported corr. coeff. wrong
As for WP-3 lab reported 0.9990 value is 0.9996

WP-4	0.9980	0.9983
WP-5	0.9970	0.9972
OW-101	0.9990	0.9994

12) Form I for OW-101 did not take into account a 10x dilution on AS - the result reported was 63.7

Reviewer: [illegible] Date: 3-16-92

the actual value is 637.
also see attached resubmittal requests.

Request for Information/Resubmission

Laboratory Name:	**Enseco - East**	Lab Code: **ENSECO**
SDG/Project Numbers:	**18710 and 18811**	Analysis: **Metals**
Date of Request:	**February 25, 1992**	

1. Quarterly information is incorrect or incomplete. Please resubmit the quarterly IDL and Linear Range information. Specifically, the ICP IDLs are incorrect on Form 10, they do not match the nondetects reported on the Form Is. Also, the Linear Range date is 11/20/90 - if this is true it is non-compliant. Linear Range for sodium is probably incorrect at 100 ppb. Since the laboratory quantitated sodium from two channels on the ICP, a high and a low channel, two linear ranges must be reported for sodium. Please correct and resubmit.

2. Inconsistent IDLs reported for mercury. Please advise on correct IDL and resubmit results which show discrepancy. Nondetected results for mercury are reported as 0.1 U for project 18710 and as 0.2 U for project 18811.

3. Sodium was misquantitated from the low channel instead of the high channel on ICP for the following samples: OW-55 (1881105), OW-56B (1871004), OW-56C (1871005), OW-100 (1874806). Sodium for samples OW-55, OW-56B, and OW-56C were incorrectly reported as nondetects. The raw data shows that the low channel was saturated with sodium, the high channel should have been used to quantitate for these high level sodium samples. Sodium for sample OW-100 was incorrectly reported from the saturated low channel when it should have been reported from the high channel. Please resubmit Form Is with correct sodium values.

4. Since the laboratory quantitated sodium from two channels on ICP, two sets of ICVs, CCVs, ICBs, and CCBs need to be reported for sodium. Only the low channel sodium QC was reported on the CLP Forms 2A and 3. Please submit additional forms with laboratory QC data for the high channel sodium by ICP.

5. Arsenic was incorrectly reported for sample OW-101 (1882005). The raw data shows that the analyst performed a 10x dilution on the MSA. This dilution was not taken into account in reporting the final result on the Form I. Please correct the result to 637 ug/L (laboratory previously reported 63.7 ug/L) and resubmit the Form I for this sample.

Region I
Data Review Worksheet

II. HOLDING TIMES

Complete table for all samples and circle the analysis date for samples not within criteria.

SAMPLE ID	DATE SAMPLED	HG ANALYSIS DATE	CYANIDE ANALYSIS DATE	OTHERS ANALYSIS DATE	pH	ACTION
WP-1	12-19-91	1-7-92	NA	ICP- 1/20/92	<2	
WP-3	12-19-91	1-7-92	NA	As- 1/15/92	<2	
WP-4	12-19-91	1-7-92	NA	As- 1/17/92	>2	'J' pos. results 'UJ' nondetects
WP-5	12-19-91	1-7-92	NA	Se- 1/15/92	<2	
OW-101	12-19-91	1-7-92	NA	Se- 1/20/92	<2	
OW-31	12-18-91	12-30-91	NA	Tl- 1/17/92	>2	'J' pos. results 'UJ' nondetects
OW-37	12-18-91	12-30-91	NA	Pb- 1/15/92	<2	
OW-37A	12-18-91	12-30-91	NA	Pb- 1/16/92	<2	
OW-37A D	12-18-91	12-30-91	NA	Pb- 1/16/92	<2	
OW-37A S	12-18-91	12-30-91	NA	Hg- 12/30/91	<2	
OW-55	12-18-91	12-30-91	NA	Hg- 1/7/92	>2	'J' pos results 'UJ' nondetects
FB-2	12-18-91	12-30-91	NA	↓	<2	

METALS 180 DAYS FROM SAMPLE COLLECTION
MERCURY 28 DAYS FROM SAMPLE COLLECTION
CYANIDE 14 DAYS FROM SAMPLE COLLECTION

ACTION:

1. If holding times are exceeded all positive results are estimated (J) and all non-detects are estimated (UJ).
2. If holding times are grossly exceeded, the reviewer may determine that non-detects are unusable (R).

Reviewer: DC

Date: 3-16-92

Region I
Data Review Worksheets

III B. INSTRUMENT CALIBRATION (Section 2)

2. Analytical Sequence

A. Did the laboratory use the proper number of standards for calibration as described in the SOW? Yes or No

B. Were calibrations performed at the beginning of each analysis? Yes or No

C. Were calibration standards analyzed at the beginning of sample analysis and at a minimum frequency of ten percent or every two hours during analysis, whichever is more frequent? Yes or No

D. Were the correlation coefficients for the calibration curve for AA, Hg, and CN ≥ 0.995? Yes or No

E. Was a standard at 2X CRDL analyzed for all ICP analyses. Yes or No

If no, the data may be affected. Use professional judgement to determine the severity of the effect and qualify the data accordingly. Discuss any actions below and list the samples affected.

CRDL standard recovery did not meet criteria for Cr (77.8%) and Ag (64.2%)
Actions: all chromium nondetects ~~results~~ are ~~estimated J(+) and~~ UJ(ND); all silver results are estimated (UJ). Estimated results and detection limits are biased low.

2/16/92
DC no action on positives because they are > 3x CRDL.

Samples Affected: Cr: ~~J(+) WP-4, OW-31, OW-55~~ ~~superseded by "R" for intfe effects~~
UJ(ND) WP-1, WP-3, WP-5
OW-101, OW-37, OW-37A,
FB-2
Silver: UJ all samples

Region I
Data Review Worksheets

III A. INSTRUMENT CALIBRATION (Section 1)

1. Recovery Criteria

List the analytes which did not meet the percent recovery (%R) criteria for Initial and/or Continuing Calibration.

DATE	ICV/CCV#	ANALYTE	%R	SAMPLES AFFECTED	ACTION
all analytes met criteria					

ACTIONS:

If any analyte does not meet the %R criteria follow the actions stated below:

For positive results:

	Accept	Estimate (J)	Reject (R)
Metals	90%-110%	75%-89% or 111%-125%	< 75% or > 125%
Mercury	80%-120%	65%-79% or 121%-135%	< 65% or > 135%
Cyanide	85%-115%	70%-84% or 116%-130%	< 70% or > 130%

For non-detected results:

	Accept	Estimate (UJ)	Reject (R)
Metals	90%-125%	75%-89%	< 75% or > 125%
Mercury	80%-130%	65%-79%	< 65% or > 135%
Cyanide	85%-130%	70%-84%	< 70% or > 130%

Reviewer: [signature] Date: 3-16-92

Region I
Data Review Worksheet

IV A. BLANK ANALYSIS RESULTS (Sections 1-3)

List the blank contamination in sections 1 and 2 below. A separate worksheet should be used for soil and water blanks.

1. Laboratory Blanks Matrix: water

DATE	ICB/CCB#	PREP BL	ANALYTE	CONCENTRATION/UNITS
1/20/92	ICB		Ag	-7.0 ug/L
	CCB1		Ca	25.5 ug/L
	CCB1		Fe	12.0 ug/L
	CCB1		Ag	5.0 ug/L
1/15/92	CCB2		As	1.7 ug/L

2. Equipment/Trip Blanks

DATE	EQUIP BL#	TRIP BL#	ANALYTE	CONCENTRATION/UNITS
1/15/92	FB-2		As	1.4 ug/L
1/20/92	FB-2		Ba	16.4 ug/L
	FB-2		Ca	212 ug/L
	FB-2		Na	1620 ug/L

3. Frequency Requirements

A. Was a preparation blank analyzed for each matrix, for every 20 samples, and for each digestion batch? Yes or No

B. Was a calibration blank run at the beginning of the run, and every 10 samples or every 2 hours whichever is more frequent? Yes or No

If no, the data may be affected. Use professional judgement to determine the severity of the effect and qualify the data accordingly. Discuss any actions below, and list the samples affected:

Samples Affected:

Reviewer: DC. Date: 3-16-92

REGION I
Data Review Worksheet

IV A. BLANK ANALYSIS RESULTS (Sections 1-3) (cont.)

1. Laboratory Blanks (cont.) MATRIX: water

DATE	ICB/CCB#	PREP BL	ANALYTE	CONC./UNITS
1/20/92	CCB2		Ca	53.1 ug/L
	CCB2		Fe	7.8 ug/L
	CCB2		Ag	-5.0 ug/L
	CCB3		Ca	11.7 ug/L
	CCB3		Ag	-5.7 ug/L
	~~CCB3~~		~~Na~~	~~77.2 ug/L~~
	resubmitted data shows Na IDL as 1737 ug/L			
			[signature] 3-16-92	

Region I
Data Review worksheet

IV B. BLANK ANALYSIS RESULTS (Section 4)

4. Blank Actions

The Action Level for any analyte is equal to 5X the highest concentration of that analyte found in any blank. The Action Level for samples which have been concentrated or diluted should be multiplied by the concentration/dilution factor. No positive result should be reported unless the concentration of the analyte in the sample exceeds the Action Level (AL) for that analyte. Specific actions are as follows:

1. When the concentration is greater than the IDL, but less than the Action Level, report the sample concentration detected, qualified with a U.

2. When the sample concentration is greater than the Action Level, report the sample concentration unqualified.

Matrix: water

ANALYTE	MAX. CONC/ UNITS	AL/ UNITS
Ag	7.0 ug/l	35.0 ug/l
As	1.7 ug/l	8.5 ug/l
* Ba	6.4 ug/l	32.0 ug/l
* Ca	212 ug/l	1060 ug/l
Fe	12.0 ug/l	60.0 ug/l
~~* Na~~	~~1630 ug/l~~	~~8150 ug/l~~

Matrix: _____

ANALYTE	MAX. CONC/ UNITS	AL/ UNITS

DC 3-16-92
resubmitted data shows Na IDL at 1737 ug/L.

* Derived from field blank contamination

NOTE: Blanks analyzed during a soil case must be converted to mg/kg in order to compare them with the sample results.

conc. in ug/l X Volume diluted to (200ml) / Weight digested (1gram) X 1L / 1000ml X 1000g / 1kg X 1mg / 1000ug = mg/kg

Multiplying this result by 5 to arrive at the Action Level gives a final result in mg/kg which can then be compared to sample results.

Reviewer: DC

Date: 3-16-92

Sample/Analytes Affected:

Analyte	Action	Samples Affected
Ag	no action	
As	U	WP-1
Ba	U	WP-3

Analyte	Action	Samples Affec
Ca	no action	
Fe	no action	
~~Na~~	~~no action~~	DC 3-16-9

Region I
Data Review Worksheet

V A. ICP INTERFERENCE CHECK SAMPLE (Sections 1 and 2)

1. Recovery Criteria

List any elements in the ICS AB solution which did not meet the percent recovery criteria.

DATE	ANALYTE	% REC	SAMPLES AFFECTED	ACTION
all analytes met criteria				

ACTIONS:

If an analyte does not meet the %R criteria, follow the actions stated below:

	PERCENT RECOVERY		
	< 50%	50%-79%	> 120%
Positive Sample Results	R	J	J
Non-detected Sample Results	R	UJ	A

2. Frequency Requirements

Were Interference QC samples run at the beginning and end of each sample analysis run or a minimum of twice per 8 hour shift, whichever is more frequent? Yes or No

If no, the data may be affected. Use professional judgement to determine the severity of the effect and qualify the data accordingly. Discuss any actions below and list the samples affected:

Samples Affected:

Reviewer: [illegible] Date: 3-16-92

Region I
Data Review Worksheet

V B. ICP INTERFERENCE CHECK SAMPLE (Section 3)

3. Report the concentration of any analytes detected in the ICS A solution greater than 2X IDL that should not be present.

ANALYTE	CONC. IN THE ICS	CONC. OF INTERFERENTS IN THE ICS			
		AL	CA	FE	MG

Estimate the concentration produced by the interfering element in all affected samples. See the guidelines for examples. List the samples affected by the interferences below:

SAMPLE AFFECTED	ANALYTE AFFECTED	SAMPLE CONC. (ug/L)	SAMPLE INTERFERENT CONC. AL	CA	FE	MG	ESTIMATED INTERFERENCE (ug/L)	Act.
WP-3	Cu	76.7		1010000			6.3	No Act.
	Ag	3.0 u		↓			-9.0	U
	Zn	112		↓			18.3	J
WP-5	Ag	3.0 u		328000			-5.6	U
	Zn	21.2		↓			11.3	J

ACTIONS:

1. In general, the sample data can be accepted without qualification if the sample concentrations of Al, Ca, Fe, and Mg are less than 50% of their respective levels in the ICS.
2. Estimate (J) positive results for affected analytes for samples with levels of interferents of 50% or more of that in the ICS solution.
3. Reject (R) positive results if the reported concentration is due entirely to the interfering analyte.
4. Estimate (UJ) non-detected results for which false negatives are suspected, due to interfering analytes.

Give an explanation for any actions taken below:

Samples Rejected: entire result expected due to interference: Cr for OW31.

Samples estimated: >10% of reported value could be due to interference. (biased high): Zn in OW-31, WP-1, WP-3, WP-5, OW-101

Reviewer: [illegible] Date: 3-16-92

nondetects estimated (UJ) because false negatives expected: Ag for WP-1, WP-3, WP-5, OW-31, OW-101

Region I
Data Review Worksheet

V B. ICP INTERFERENCE CHECK SAMPLE (Section 3)

3. Report the concentration of any analytes detected in the ICS A solution greater than 2X IDL that should not be present.

ANALYTE	CONC. IN THE ICS	CONC. OF INTERFERENTS IN THE ICS			
		AL	CA	FE	MG
Cr	50.8	488859	531311	174047	469957
Cu	6.3				
Mn	11.3				
Ag	-9.0				
~~Na~~	~~2244~~ quantitated results from high channel				
Zn	18.3				

DC 3/16/92

Estimate the concentration produced by the interfering element in all affected samples. See the guidelines for examples. List the samples affected by the interferences below:

SAMPLE AFFECTED	ANALYTE AFFECTED	SAMPLE CONC. (ug/L)	SAMPLE INTERFERENT CONC. AL	CA	FE	MG	ESTIMATED INTERFERENCE (ug/L)	Action
OW-31	Cr	36.8		365000			34.9	R
	Ag	3.0U					-6.2	UJ
	Zn	13.8					12.6	R
WP-1	Ag	3.0U		575000			-9.0	UJ
	Zn	22.8					18.3	J

DC 3-16-92

ACTIONS:

1. In general, the sample data can be accepted without qualification if the sample concentrations of Al, Ca, Fe, and Mg are less than 50% of their respective levels in the ICS.
2. Estimate (J) positive results for affected analytes for samples with levels of interferents of 50% or more of that in the ICS solution.
3. Reject (R) positive results if the reported concentration is due entirely to the interfering analyte.
4. Estimate (UJ) non-detected results for which false negatives are suspected, due to interfering analytes.

Give an explanation for any actions taken below:
Estimated interferences calculated by assuming the false positive analyte concentration would be present when interferent concentration was of a concentration equal to the ICSA solution. In cases where the interferent in the sample was < ICSA solution value, possible interference was estimated by extrapolation:

Reviewer: DC Date: 3/16/92

Example: 365000 of Ca in OW-31: $\frac{365000}{531311 \text{ (ICSA conc)}} = 0.687$

0.687 × 50.8 ug/L of Cr expected = 34.9 ug/L

Region I
Data Review Worksheet

V B. ICP INTERFERENCE CHECK SAMPLE (Section 3)

3. Report the concentration of any analytes detected in the ICS A solution greater than 2X IDL that should not be present.

ANALYTE	CONC. IN THE ICS	CONC. OF INTERFERENTS IN THE ICS			
		AL	CA	FE	MG

Estimate the concentration produced by the interfering element in all affected samples. See the guidelines for examples. List the samples affected by the interferences below:

SAMPLE AFFECTED	ANALYTE AFFECTED	SAMPLE CONC. (ug/L)	SAMPLE INTERFERENT CONC. AL	CA	FE	MG	ESTIMATED INTERFERENCE (ug/L)	Act
QW-101	Ag	3.04		324000			-5.5	UJ
	Zn	17.8		↓			11.2	J

ACTIONS:

1. In general, the sample data can be accepted without qualification if the sample concentrations of Al, Ca, Fe, and Mg are less than 50% of their respective levels in the ICS.
2. Estimate (J) positive results for affected analytes for samples with levels of interferents of 50% or more of that in the ICS solution.
3. Reject (R) positive results if the reported concentration is due entirely to the interfering analyte.
4. Estimate (UJ) non-detected results for which false negatives are suspected, due to interfering analytes.

Give an explanation for any actions taken below:

Reviewer: [signature] Date: 3-16-92

Region I
Data Review Worksheet

VI. MATRIX SPIKE

TR # QW37A Matrix: water

1. Recovery Criteria

List the percent recoveries for analytes which did not meet the required criteria.

S - amount of spike added
SSR - spiked sample result
SR - sample result

ANALYTE	SSR	SR	S	%R	ACTION
Ag	35.02	3.0 u	50.0	70.0	'J' nondetects
Tl	34.2	3.0 u	50.0	68.4	'UJ' nondetects

Matrix Spike Actions apply to all samples of the same matrix.

ACTIONS:

1. If the sample concentration exceed the spike concentration by a factor of 4 or more, no action is taken.
2. If any analyte does not meet the percent recovery criteria, follow the actions stated below:

	PERCENT RECOVERY		
	< 30%	30%-74%	>125%
Positive Sample Results	J	J	J
Non-detected Results	R	UJ	A

2. Frequency Criteria

A. Was a matrix spike prepared at the required frequency? Yes or No
B. Was a post digest spike analyzed for analytes that did not meet the required criteria for matrix spike recovery? NA Yes or No

A separate worksheet should be filled out for each matrix spike pair.
Reviewer: [signature] Date: 3/16/92

Region I
Data Review Worksheet

VII. LABORATORY DUPLICATES

List the concentrations of any analyte not meeting the criteria for duplicate precision. For soil duplicates, calculate the CRDL in mg/kg using the sample weight, volume and percent solids data for the sample. Indicate what criteria was used to evaluate precision by circling either the RPD or CRDL for each analyte.

Matrix: water

ANALYTE	CRDL WATER ug/L	CRDL SOIL mg/kg	SAMPLE # OW-37A	DUPLICATE # OW-37A D	RPD	ACTION
Aluminum	200					
Antimony	60					
Barium	10					
Beryllium	200					
Cadmium	5					
Calcium	5000					
Chromium	10					
Cobalt	50					
Copper	25					
Iron	100					
Lead	5					
Magnesium	5000					
Manganese	15					
Mercury	0.2					
Nickel	40					
Potassium	5000					
Selenium	5					
Silver	10					
Sodium	5000					
Thallium	10					
Vanadium	50					
Zinc	20					
~~Cyanide~~ Arsenic	10		2010	3945	65.0	'J' pos. results

Laboratory duplicate actions should be applied to all other samples of the same matrix type.

ACTION:

1. Estimate (J) positive results for analytes which have an RPD > 20% for waters and > 35% for soils.
2. If sample results are less than 5X the CRDL, estimate (J) positive results for analytes whose absolute difference is > CRDL (2X CRDL for soils). If both samples are non-detected, the RPD is not calculated (NC).

Reviewer: [signature]

Date: 3-16-92

Region I
Data Review Worksheet

VIII. FIELD DUPLICATES

List the concentrations of all analytes in the field duplicate pair. For soil duplicates, calculate the CRDL in mg/kg using the sample weight, volume and percent solids data for the sample. Indicate what criteria was used to evaluate precision by circling either the RPD or CRDL for each analyte.

Matrix: water

ANALYTE	CRDL WATER ug/L	CRDL SOIL mg/kg	SAMPLE # WP-5	DUPLICATE # DW-101	RPD	ACTION
Aluminum	200		73.2 B	316.0 U	200	No Action
Antimony	60		18.0 U	18.0 U	NC	
Barium	10		85.0 B	71.5 B	17.2	
Beryllium	200		1.0 U	1.0 U	NC	
Cadmium	5		2.0 U	2.0 U	NC	
Calcium	5000		328000	324000	1.2	
Chromium	10		4.0 U	4.0 U	NC	
Cobalt	50		3.0 U	3.0 U	NC	
Copper	25		3.0 U	3.0 U	NC	
Iron	100		600200	594400	1.3	
Lead	5		1.0 U	1.0 U	NC	
Magnesium	5000		77200	76100	1.4	
Manganese	15		4520	4570	1.1	
Mercury	0.2		0.1 U	0.1 U	NC	
Nickel	40		11.6 B	10.0 U	800	
Potassium	5000		19800	19300	0.5	
Selenium	5		2.0 U	2.0 U	NC	
Silver	10		3.0 U	3.0 U	NC	
Sodium	5000		110000	102000	7.5	
Thallium	10		3.0 U	3.0 U	NC	
Vanadium	50		3.0 U	3.0 U	NC	
Zinc	20		21.2	17.8 B	17.4	
~~Cyanide~~ Arsenic	10		869	637	30.8	↓

Field duplicate actions should be applied to all other samples of the same matrix type.

ACTION:

1. Estimate (J) positive results for analytes which have an RPD > 30% for waters and > 50% for soils.
2. If sample results are less than 5X the CRDL, estimate (J) positive results for analytes whose absolute difference is > 2X CRDL (4X CRDL for soils). If both samples are non-detected, the RPD is not calculated (NC).

Reviewer: DC

Date: 3-16-92

Region I
Data Review Worksheet

dissolved water samples.
LCS not required

IX. LABORATORY CONTROL SAMPLE

1. Aqueous LCS

List any LCS recoveries not within the 80%-120% criteria and the affected samples.

DATE	ANALYTE	%REC	SAMPLES AFFECTED	ACTION

2. Solid LCS

List any analytes that were not within the control windows set by the EPA for the solid LCS sample. The 80%-120% criteria is not used to evaluate solid LCS results.

ANALYTE	LCS CONC.	CONTROL WINDOWS	SAMPLES AFFECTED	ACTION

ACTION:

	PERCENT RECOVERY		
AQUEOUS LCS	<50%	51%-79%	> 120%
Positive Results	R	J	J
Non-detected Results	R	UJ	A

SOLID LCS	< EPA Control Windows	> EPA Control Windows
Positive Results	J	J
Non-detected Results	UJ	A

3. Frequency Criteria

A. Was an LCS analyzed for each matrix, for every digestion batch, and for every 20 samples? Not applicable to dissolved samples Yes or No

Reviewer: [signature]

Date: 3-16-92

Region I
Data Review Worksheet

X A. FURNACE ATOMIC ABSORPTION ANALYSIS

1. Duplicate precision

X Duplicate injections and one point analytical spikes were performed for all samples and duplicate injections agreed within ± 20%.

____ Duplicate injections and/or spikes were not performed for the following samples/analytes:

____ Duplicate injections did not agree within ± 20% for the following samples/analytes:

2. Post Digestion Spike Recoveries

____ Spike recoveries met the 85%-115% recovery criteria for all samples.

X Spike recoveries did not meet the 85%-115% criteria but did not require MSA for the following samples/analytes:

Se - WP-3, WP-4, WP-5, OW-101, OW-55, OW-31, OW-37A D, FB-2.
Tl - WP-1, WP-3, WP-4, OW-31, OW-37, OW-37A, OW-37A D, OW-55, FB-2.
PD - WP-1, WP-3, WP-4, WP-5, OW-37, OW-37A, OW-37A D, OW-55, ~~[illegible]~~
AS - WP-1

____ MSA was used to quantitate analytical results when contractually required.

X The correlation coefficients were all ≥0.995, accept results.

____ The following samples/analytes had correlation coefficients < 0.995:

see additional page for actions

____ MSA was not performed as required for the following samples/analytes:

ACTION:

1. Estimate (J) positive results if duplicate injections are outside ± 20% RSD or CV.
2. If the sample absorbance is < 50% of the post digestion spike absorbance the following actions should be applied.

	PERCENT RECOVERY		
	<10%	11%-84%	> 115%
Positive Sample Results	J or R	J	J
Non-detected Results	R	UJ	A

3. Estimate (J) sample results if MSA was required and not performed.
4. Estimate (J) sample results if the correlation coefficient of the MSA was <0.995.

Reviewer: [signature] Date: 3-16-92

XA Furnace Atomic Absorption Analysis Continued
Post Digestion Spike recoveries and actions:

Analyte	Sample / post recovery	Action	
Arsenic	WP-1 / 84.0 %	J	already J for Ta. dup. precis
Selenium	WP-3 / 45.0	UJ	all samples ~~already UJ for~~ nondetec
	WP-4 / 30.0	UJ	
	WP-5 / 66.0	UJ	
	OW-31 / 62	UJ	
	OW-55 / 79.0	UJ	
	OW-101 / 82.0	UJ	
	FB-2 / 83	UJ	
Thallium	WP-1 / 81	UJ	already UJ for low Ma. Spike recovery
	WP-3 / 74	UJ	
	WP-4 / 44	UJ	
	OW-31 / 55.5	UJ	
	OW-37 / 74	UJ	
	OW-37A / 68	UJ	
	OW-55 / 36	UJ	
	FB-2 / 81	UJ	
Lead	WP-1 / 34	UJ	all nondetects
	WP-3 / 54	UJ	
	WP-4 / 45.5	UJ	
	WP-5 / 67.5	UJ	
	OW-37 / 64	UJ	
	OW-37A / 47	UJ	
	OW-55 / 55.5	UJ	

[illegible] 3-16-92

Region I
Data Review Worksheets

XI. INDUCTIVELY COUPLED PLASMA (ICP) SERIAL DILUTION ANALYSIS

____ Serial dilutions were performed for each matrix and results of the diluted sample analysis agreed within ± 10% of the original undiluted analysis.

____ Serial dilution was not performed for the following:

_____

X Serial dilutions were performed, but analytical results did not agree within ± 10% for analyte concentrations greater than 50X the IDL before dilution.

Report all results below that do not meet the required laboratory criteria for ICP serial dilution analysis.

Matrix: water

WP-3

ANALYTE	IDL	50X IDL	SAMPLE RESULT	SERIAL DILUTION	% DIFF	ACTION
Aluminum						
Barium						
Beryllium						
Cadmium						
Calcium	8.0	400	6005573.48	4961183.53	18.1	J' pos. results
Cobalt						
Copper						
Iron						
Lead						
Magnesium	34.0	1700	2286038.13	202194.33	11.6	NONE
Manganese						
Nickel						
Potassium						
Silver						
Sodium	1737	86,850	275800.00	244800.00	11.2	NONE
Vanadium						
Zinc						

Actions apply to all samples of the same matrix

ACTIONS:

1. Estimate (J) all positive results if the % D > 15%.

Reviewer: [signature] Date: 3-16-92

Region I
Data Review Worksheets

XI. INDUCTIVELY COUPLED PLASMA (ICP) SERIAL DILUTION ANALYSIS

_____ Serial dilutions were performed for each matrix and results of the diluted sample analysis agreed within ± 10% of the original undiluted analysis.

_____ Serial dilution was not performed for the following:

_____

X Serial dilutions were performed, but analytical results did not agree within ± 10% for analyte concentrations greater than 50X the IDL before dilution.

Report all results below that do not meet the required laboratory criteria for ICP serial dilution analysis.

Matrix: water

OW-55

ANALYTE	IDL	50X IDL	SAMPLE RESULT	SERIAL DILUTION	% DIFF	ACTION
Aluminum						
Barium						
Beryllium						
Cadmium						
Calcium						
Cobalt						
Copper						
Iron						
Lead						
Magnesium						
Manganese						
Nickel						
Potassium						
Silver						
Sodium	1737	86,850	576100.00	57550.00	89.9	No Action – see bel
Vanadium						
Zinc	2.0	100	258.95	296.23	14.4	NONE

Actions apply to all samples of the same matrix

lab incorrectly reported sodium as 57550.00 for serial dilution. Raw data shows value is 575500. corrected value for % Diff is therefore 0.9%

ACTIONS:

1. Estimate (J) all positive results if the % D > 15%.

no action applied

Reviewer: [signature]

Date: 3-16-92

Region I
Data Review Worksheets

XII. DETECTION LIMIT RESULTS

1. Instrument Detection Limits

__X__ Instrument detection limit results were present and found to be less than the CRDL.

_____ IDLs were not included in the data package on Form XI.

_____ IDLs were present, but the criteria was not met for the following analytes:

_____

Reason: _____

2. Reporting requirements

Were sample results on Form I reported down to the IDL not the CRDL for all analytes? (Yes) or No

Were sample results that were analyzed by ICP for Se, Tl, As, or Pb at least 5x IDL? Yes, No or (NA)

Were sample weights, volumes, and dilution factors taken into account when reporting detection limits on Form I? (Yes) or No

If no, the reported results may be inaccurate. Make the necessary changes on the data summary tables and request that the laboratory resubmit the corrected data.

Reviewer: _____ Date: 3-16-92

Region I
Data Review Worksheets

XIII. SAMPLE QUANTITATION

X Sample results fall within the linear range for ICP and within the calibrated range for all other parameters.

_____ Sample results were beyond the linear range on ICP and/or beyond the calibration range for other parameters for the following samples/analytes:

_____

_____

In the space below, please show a minimum of one sample calculation per method:

ICP instrument printout in $\frac{mg}{L} \times 1000 \frac{ug}{mg} = \frac{ug}{L}$

example: WP-1 Aluminum = $0.0109 \frac{mg}{L} \times \frac{1000\ ug}{1\ mg} = 10.9\ ug/L$ which is $\boxed{36.0\ U\ ug/L}$

FURNACE

instrument printout in $\frac{mg}{L} \times 1000 \frac{ug}{mg} = \frac{ug}{L}$

Example: OW-37 for arsenic: $0.0562\ mg/L \times 2$ dilution $\times \frac{1000\ ug}{1\ mg} = \boxed{112\ ug/L}$

MERCURY

$y = mx + b$

example: OW-37A-MS

$m = 41.9946$

$b = 1.925$

$y = (41.9946)x + 1.925$

$46 = (41.9946)x + 1.925$

$x = 1.0495$

CYANIDE

NA.

For soil samples, the following equation may be necessary to convert raw data values (usually reported in ug/L) to actual sample concentrations (mg/kg):

The lab is required to use 1 gram of sample (wet weight) to 200mL final volume.

Wet weight concentration =

$$\text{digest conc. in ug/L} \times \frac{200mL}{1g} \times \frac{1L}{1000mL} \times \frac{1000g}{1kg} \times \frac{1mg}{1000ug} = \frac{mg}{kg}$$

In addition, the sample results are converted to dry weight using the percent solids calculations:

$$\frac{\text{wet weight conc.}}{\%\ \text{solids}} \times 100 = \text{Final concentration, dry weight (mg/kg)}$$

Reviewer: DC

Date: 3-16-92

APPENDIX D2

Surface-Water and Stream-Sediment
Data Validation Documentation

APPENDIX D2

Surface-Water and Stream-Sediment
Data Validation Documentation

Organic Data

Gradient Corporation

February 17, 1992

Ms. Martha M. Smith
Project Hydrogeologist
Roux Associates, Inc.
775 Park Avenue
Suite 255
Huntington, NY 11743

Subject: Data Validation Report for Surface Water/Sediment Samples

Dear Ms. Smith:

Enclosed in the organic data validation report in EPA Region I format for your review. I apologize for the delay in providing this report. A diskette is also enclosed with the validated results in Lotus 1-2-3 spreadsheets. The inorganic data validation report should follow later this week. We did not send the raw data, pending your review and comments. Please let us know when you would like to have the data forwarded.

We have received the ground water data, and we will begin the review immediately. We intend to send the data validation report by the end of the month.

If you have any questions or wish to discuss the report, please do not hesitate to call me at 617-576-1555.

Sincerely,

GRADIENT CORPORATION

Philip J. Doherty
Senior Analytical Chemist

44 Brattle Street, Cambridge, MA 02138 • (617)576-1555 • Telefax (617)864-8469
Environmental Consultants with Offices in Cambridge, MA and Boulder, CO

Gradient Corporation

February 14, 1992

Ms. Martha Smith
Roux Associates, Inc.
775 Park Avenue, Suite 255
Huntington, NY 11743

RE: Industri-Plex
Woburn, Massachusetts
ENSECO-East

Volatiles:	10 low concentration aqueous samples
	7 low concentration soil samples
Semivolatiles:	8 low concentration aqueous samples
	7 low concentration soil samples

Dear Ms. Smith:

A validation was performed on the organic analytical data from 10 low level aqueous samples and 7 low concentration coil samples collected at the Industri-Plex site. The data were evaluated based on the following parameters according to the Region I Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses, November, 1988:

* - data completeness
- holding times
* - GC/MS tuning
- calibrations
- field and laboratory blank results
* - system monitoring compounds/surrogate spike recoveries
- matrix spike/matrix spike duplicate
- field duplicates
* - internal standard performance
- tentatively identified compounds
* - compound identification
- compound quantitation

* All criteria were met for this parameter.

Table I summarizes the validation recommendations which were based on the following information:

General

The data were provided in two packages. The first case, 16790, contained the data for the 10/02/91 sampling. The second package, case 16811, contained the data for the 10/03/91 sampling. Both cases are included in this report and are considered to be part of the same sample delivery group.

Samples SED-21 and SED-23 have solids contents of 12% and 21%, respectively. The positive results have been estimated (J) and the nondetect results have been rejected (R) as the percent solids are less than 30% but greater than 10%. Low solids content results in elevated quantitation limits.

Sample SED-22 had a solids content of 8%. All results for sample SED-22 have been rejected (R) due to a solids content of less than 10%.

Holding Times

The laboratory met all contractual holding times for the semivolatile extractions, which must be completed with 10 days of sample receipt according to the CLP Statement of Work. However, samples SED-21, SED-22, and SED-23 were extracted 8 days from sampling, which exceeds the Functional Guidelines criterion of extraction within 7 days of sampling. The positive results have been estimated (J) as well as the nondetect results (UJ) due to the possibility of compound degradation. The positive results may be biased low and the possibility of false negatives exists. However, as noted above, the nondetect results in samples SED-21 and SED-23 and all results in sample SED-22 have been rejected due to low solids content. No further action was required.

Calibrations

The soil volatile calibrations were acceptable with the exception of acetone in the continuing calibration on 10/09/91 on instrument V2. The percent difference (%D) for acetone (31.7%) exceeded the 25 %D maximum for data validation. The only samples affected were SED-21, SED-22, and SED-23 which were previously qualified due to low solids content, and therefore no additional action is required. High %Ds were noted for vinyl chloride (25.2%) and chloromethane (27.0%) for the water continuing calibration on 10/09/91, but these compounds were not detected in the associated samples and therefore no action was required. All other water volatile calibrations were acceptable.

The semivolatile calibration compounds which did not meet criteria are summarized below:

Instrument ID: HP-S4 Level: Low Semivolatile Compound	IC 9/18/91	CC 10/08/91	CC 10/11/91
4-methylphenol		x	
2,2'-oxybis(1-chloropropane)			x
4-chloroaniline		x	x
2,4-dinitrophenol	x	xx	
4-nitrophenol		x	x
4,6-dinitro-2-methylphenol		x	
Associated samples:	ALL	SW-18,SW-24, SW-19,SW-100, SBLK01(10/4)	SW-21,SW-22, SBLK01(10/7)

Instrument ID: HP-S4 Level: Low Semivolatile Compound	CC 10/11/91 Second Shift	CC 10/12/91	CC 10/17/91
hexachlorocyclopentadiene	x	x	xx
2,2'-oxybis(1-chloropropane)		xx	x
N-nitroso-di-n-propylamine		x	
isophorone		x	
4-chloroaniline		x	x
2-nitroaniline		x	
2,4-dinitrophenol	x	x	xx
4-nitrophenol	x	x	x
4,6-dinitro-2-methylphenol	x		
pentachlorophenol		x	
Associated samples:	SED-24,SED-19, SED-100,SW-23, SW-23MS/MSD, FIELD_BLANK, SBLK02(10/4)	SED-18, SED-18DL	SED-21, SED-22, SED-23, SED-23MS SBLK02(10/11)

Key:

X - %RSD>20.5, or %D>25, and both <50; estimate (J) positive results and accept nondetects.

XX - %RSD or %D >50; estimate (J) positive results and estimate (UJ) nondetects.

+ - RF< specified minimum RF or <0.01; estimate (J) positive results and reject (R) nondetects.

The nondetect 2,4-dinitrophenol results in samples SW-18, SW-24, SW-19, and SW-100 and the nondetect 2,2'-oxybis(1-chloropropane) result in sample SED-18 have been estimated (UJ) due to variability in instrument response. No other action was necessary as the affected compounds were not detected in the samples.

Field and Laboratory Blank Results

Contaminants detected in the volatile and semivolatile laboratory blanks are summarized in the following table. There were two trip blanks and one field blank associated with this project. The action levels do not apply to the trip and equipment blank samples.

Compound	Max. Concentration (ug/L)	Action Level Water (ug/L)	Action Level Soil (ug/Kg)
methylene chloride	2	20	20
acetone	6	60	60
phenol	4	20	660
bis(2-ethylhexyl)phthalate	2	20	660

Blank Actions:

- value < CRQL; report CRQL followed by a U.
- value > CRQL and < action level; report value with a U.
- value > CRQL and > action level; report value unqualified.

The action level values were compared to sample values after application of sample dilution factors. The positive results for methylene chloride in sample SED-23 and acetone in samples SW-18 and SW-21 were considered nondetects due to blank contamination. The positive results were replaced with the CRQL which were qualified U due to uncertainty in the quantitation limit. The positive bis(2-ethylhexyl)phthalate results in samples SW-18, SW-19, SED-19, and SED-100 were also considered nondetects and the values were replaced with the CRQL qualified with U. There were no positive detects of phenol except in the field blank.

Matrix Spike/Matrix Spike Duplicate

The following results did not meet QC criteria:

Sample	Spike Compound	% Recovery
SW-23 MS/MSD	4-nitrophenol	122%, 129%
SW-23 MS/MSD	pentachlorophenol	111%, 120%
SED-23MS	4-nitrophenol	161%

In addition, the relative percent difference (RPD) between the 4-nitrophenol results for SED-23MS and SED-23MSD was 67%, which exceeded the 50% limit. No action was taken on the unspiked samples as the compounds were not detected.

The compound di-n-octylphthalate was reported in SW-23MSD (1 ug/L) but not in the unspiked or MS samples. It is recommended to accept the nondetect result in the unspiked sample. Fluorene and carbazole were reported in SED-23MSD (below the CRQL) but not in the unspiked or MS samples. No action was taken as the nondetect results in this sample were rejected due to low solids content.

Field Duplicates

Samples SW-19 and SW-100 were the aqueous field duplicate pair. All results were comparable with the exception of bis(2-ethylhexyl)phthalate, which was reported in sample SW-19 but not in SW-100. However, the positive result was changed to a nondetect due to suspected blank contamination and no further action was required.

Samples SED-19 and SED-100 were the soil field duplicate pair. All results were comparable (less than 50% RPD) and acceptable.

Tentatively Identified Compounds

The TICs are summarized in Table II. Two unknown amines were reported in the water semivolatile method blank and in all water samples. Most other aqueous TICs were unknowns. The soil TICs were usually unknowns or unknown hydrocarbons. The sediment samples had unresolved hydrocarbon complexes that indicate the presence of degraded petroleum products, which is consistent with the polycyclic aromatic hydrocarbons that were reported in the semivolatile samples.

A dichlorobenzene isomer was reported as a volatile TIC in sample SED-21. No dichlorobenzenes were reported in the semivolatile analysis of this samples, and it is recommended to reject this TIC.

Compound Quantitation

Samples SED-23 and SED-24 had acetone above the quantitation range in the initial volatile organics analyses. The samples were re-analyzed with a lower sample volume (dilution), and acetone was within the calibration range. The acetone results from the re-analyses are included in the data summary table. Bis(2-ethylhexyl)phthalate was detected above the calibration range in sample SED-18. The extract was diluted and re-analyzed; the dilution analysis result for bis(2-ethylhexyl)phthalate is included in the data summary tables.

Summary

The nondetect 2,4-dinitrophenol results in samples SW-18, SW-24, SW-19, and SW-100 and the nondetect 2,2'-oxybis(1-chloropropane) result in sample SED-18 have been estimated (UJ) due to variability in instrument response. Blank contamination consisted of methylene chloride, acetone, phenol, and bis(2-ethylhexyl)phthalate. Positive results have been estimated (J) and nondetects rejected (R) in samples SED-21 and SED-23 due to high water content (70-90%). All results have been rejected in sample SED-22 due to high water content (greater than 90%). All other results are valid and usable except where noted above.

Tables Ia and Ib are the Recommendation Summaries for the data based on the data review for the aqueous and soil samples, respectively. Table II summarizes the TIC results. Tables III and IV display the analytical results for the aqueous and soil samples, respectively. Table V displays the soil quantitation limits. Qualifiers have been added to Tables III - V as a result of the review. In addition to Tables I - V, the worksheets associated with this data validation are attached.

Very truly yours,

GRADIENT CORPORATION

Philip J. Doherty
Senior Analytical Chemist

Table Ia - Recommendation Summary for Aqueous Samples			
TR#	**VOA**	**Base/Neutral**	**Acid**
SW-18	A^1	A^2	A^3
SW-19	A	A^2	A^3
SW-21	A^1	A	A
SW-22	A	A	A
SW-23	A	A	A
SW-24	A	A	A^3
SW-100	A	A	A^3
FIELD_BLANK	A	A	A
TRIP_BLANK (10/2)	A	NA	NA
TRIP_BLANK (10/3)	A	NA	NA

A - Accept all data.

A^1 - Accept data, but change acetone value to nondetect at CRQL due to blank contamination.

A^2 - Accept data, but change bis(2-ethylhexyl)phthalate value to nondetect at CRQL due to blank contamination.

A^3 - Accept data, but estimate 2,4-dinitrophenol nondetects (UJ) due to poor instrument calibration.

NA - Not analyzed.

Table Ib - Recommendation Summary for Soil Samples			
TR#	**VOA**	**Base/Neutral**	**Acid**
SED-18	A	A^3	A
SED-19	A	A^2	A
SED-21	J^1	J^1	J^1
SED-22	R^1	R^1	R^1
SED-23	J^1	J^1	J^1
SED-24	A	A	A
SED-100	A	A^2	A

A - Accept all data.

A^1 - Accept data, but change methylene chloride value to nondetect at CRQL due to blank contamination.

A^2 - Accept data, but change bis(2-ethylhexyl)phthalate value to nondetect at CRQL due to blank contamination.

A^3 - Accept data, but estimate 2,2'-oxybis(1-chloropropane) nondetect (UJ) due to poor instrument calibration.

J^1 - Estimate (J) positive results and reject nondetects (R) due to percent solids less than 30% but greater than 10%.

R^1 - Reject data due to percent solids less than 10%.

Data Summary Key

A - Acceptable data.

J - The associated numerical value is an estimated quantity.

U - The compound was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

UJ - The compound was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.

R - Reject data due to quality control criteria exceeded. The data are unusable (compound may or may not be present). Resampling and reanalysis is necessary for verification.

Table II - Tentatively Identified Compounds						
Compound	SED-22	SED-24	SED-19	SED-100	SW-18	SW-24
9,10-anthracenedione	X	X				
benzo(e)pyrene		X				
$C_{17}H_{12}$ isomer (11H-benzofluorene or methylpyrene)		2X				
benzo(g,h,i) fluoranthene		X				
9-hexadecenoic acid			X	X		
1,1'-oxybis(2-methoxy)-ethane					X	
1,1'-sulfonylbis-benzene						X

X - Compound was detected. Numerical values indicates number of isomers found.

Site: Industri-Plex
Laboratory: ENSECO-East
File: ROUXVAR

CLP VOLATILE ORGANIC ANALYSIS
AQUEOUS ANALYTICAL RESULTS (ug/L)

Sample Location		SW-18	SW-19	SW-21	SW-22	SW-23	SW-24	SW-100	FIELD_BLANK1	TRIP_BLANK	TRIP_BLANK	
Remarks			Dup.SW-19					Dup.SW-19	Blank	10/2	10/3	
Sampling Date		10/02/91	10/02/91	10/03/91	10/03/91	10/03/91	10/02/91	10/02/91	10/03/91	10/02/91	10/03/91	
Analysis Date		10/08/91	10/08/91	10/09/91	10/09/91	10/10/91	10/08/91	10/08/91	10/09/91	10/08/91	10/09/91	
Dilution Factor		1	1	1	1	1	1	1	1	1	1	
VOLATILE ORGANIC COMPOUND	CRQL (ug/L)											
Chloromethane	10											
Bromomethane	10											
Vinyl Chloride	10											
Chloroethane	10											
Methylene Chloride	10								2 J			
Acetone	10	10 U		10 U						6 J	6 J	
Carbon Disulfide	10											
1,1-Dichloroethene	10											
1,1-Dichloroethane	10			2 J								
1,2-Dichloroethene(Total)	10	11		3 J	1 J							
Chloroform	10											
1,2-Dichloroethane	10											
2-Butanone	10											
1,1,1-Trichloroethane	10											
Carbon Tetrachloride	10											
Bromodichloromethane	10											
1,2-Dichloropropane	10											
cis-1,3-Dichloropropene	10											
Trichloroethene	10	11	2 J	3 J	2 J	1 J		2 J				
Dibromochloromethane	10											
1,1,2-Trichloroethane	10											
Benzene	10											
trans-1,3-Dichloropropene	10											
Bromoform	10											
4-Methyl-2-pentanone	10	2 J										
2-Hexanone	10											
Tetrachloroethene	10											
1,1,2,2-Tetrachloroethane	10											
Toluene	10	130										
Chlorobenzene	10											
Ethylbenzene	10	1 J										
Styrene	10											
Xylene (Total)	10	7 J										

J - The associated numerical value is an estimated quantity.
U - The compound was considered not detected due to blank contamination. The associated numerical value is the quantitation limit.
UJ - The compound was not detected. The sample quantitation limit is an estimated value.
R - The datum was rejected.
CRQL- Contract Required Quantitation Limit

Site: Industri-Plex
Laboratory: ENSECO-East
File: ROUXS1A

CLP SEMIVOLATILE ORGANIC ANALYSIS
AQUEOUS ANALYTICAL RESULTS (ug/L)

Sample Location		SW-18	SW-19	SW-21	SW-22	SW-23	SW-24	SW-100	FIELD_BLANK1		
Remarks											
Sampling Date		10/02/91	10/02/91	10/03/91	10/03/91	10/03/91	10/02/91	10/02/91	10/03/91		
Extraction Date		10/04/91	10/04/91	10/07/91	10/07/91	10/07/91	10/04/91	10/04/91	10/07/91		
Analysis Date		10/08/91	10/08/91	10/11/91	10/11/91	10/11/91	10/08/91	10/08/91	10/12/91		
Dilution Factor		1	1	1	1	1	1	1	1		
SEMI-VOLATILE COMPOUND	CRQL (ug/L)										
Phenol	10										
bis (2-Chloroethyl) ether	10								4 J		
2-Chlorophenol	10										
1,3-Dichlorobenzene	10										
1,4-Dichlorobenzene	10										
1,2-Dichlorobenzene	10										
2-Methylphenol	10	6 J									
2,2'-oxybis(1-chloropropane)	10										
4-Methylphenol	10										
N-Nitroso-di-n-propylamine	10										
Hexachloroethane	10										
Nitrobenzene	10										
Isophorone	10										
2-Nitrophenol	10										
2,4-Dimethylphenol	10										
bis(2-Chloroethoxy)methane	10										
2,4-Dichlorophenol	10										
1,2,4-Trichlorobenzene	10										
Naphthalene	10										
4-Chloroaniline	10										
Hexachlorobutadiene	10										
4-Chloro-3-methylphenol	10										
2-Methylnaphthalene	10										
Hexachlorocyclopentadiene	10										
2,4,6-Trichlorophenol	10										
2,4,5-Trichlorophenol	25										
2-Chloronaphthalene	10										
2-Nitroaniline	25										
Dimethylphthalate	10										
Acenaphthylene	10										
2,6-Dinitrotoluene	10										

CRQL - Contract Required Quantitation Limit

J - The associated numerical value is an estimated quantity.
U - The compound was considered not detected due to blank contamination. The associated numerical value is the sample quantitation limit.
UJ - The compound was not detected. The sample quantitation limit is an estimated value.
R - The datum was rejected.
" " - Blank space indicates the compound was not detected.

Site: Industri-Plex
Laboratory: ENSECO-East
File: ROUXS2A

CLP SEMIVOLATILE ORGANIC ANALYSIS
AQUEOUS ANALYTICAL RESULTS (ug/L)

Sample Location		SW-18	SW-19	SW-21	SW-22	SW-23	SW-24	SW-100	FIELD_BLANK1		
Remarks			Dup.SW-100					Dup.SW-19			
Dilution Factor		1	1	1	1	1	1	1	1		
SEMI-VOLATILE COMPOUND	CRQL (ug/L)										
3-Nitroaniline	25										
Acenaphthene	10										
2,4-Dinitrophenol	25	UJ	UJ				UJ	UJ			
4-Nitrophenol	25										
Dibenzofuran	10										
2,4-Dinitrotoluene	10										
Diethylphthalate	10										
4-Chlorophenyl-phenylether	10										
Fluorene	10										
4-Nitroaniline	25										
4,6-Dinitro-2-methylphenol	25										
N-Nitrosodiphenylamine	10										
4-Bromophenyl-phenylether	10										
Hexachlorobenzene	10										
Pentachlorophenol	25										
Phenanthrene	10										
Anthracene	10										
Carbazole	10										
Di-n-butylphthalate	10										
Fluoranthene	10										
Pyrene	10										
Butylbenzylphthalate	10										
3,3'-Dichlorobenzidine	10										
Benzo(a)anthracene	10										
Chrysene	10										
bis(2-Ethylhexyl)phthalate	10	10 U	10 U						2 J		
Di-n-octyl phthalate	10										
Benzo(b)fluoranthene	10										
Benzo(k)fluoranthene	10										
Benzo(a)pyrene	10										
Indeno (1,2,3-cd)pyrene	10										
Dibenz(a,h)anthracene	10										
Benzo(g,h,i)perylene	10										

CRQL - Contract Required Quantitation Limit

J - The associated numerical value is an estimated quantity.
U - The compound was considered not detected due to blank contamination. The associated numerical value is the sample quantitation limit.
UJ - The compound was not detected. The sample quantitation limit is an estimated value.
R - The datum was rejected.
" " - The blank space indicates the compound was not detected.

Site: Industri-Plex
Laboratory: ENSECO-East
File: ROUXVSR

CLP VOLATILE ORGANIC ANALYSIS
SOIL ANALYTICAL RESULTS (ug/Kg)

Sample Location	SED-18	SED-19	SED-21	SED-22	SED-23	SED-24	SED-100			
Remarks		Dup.SED-100			* Dilution	* Dilution	Dup.SED-19			
Sampling Date	10/02/91	10/02/91	10/03/91	10/03/91	10/03/91	10/02/91	10/02/91			
Analysis Date	10/07/91	10/07/91	10/07/91	10/07/91	10/07/91	10/07/91	10/07/91			
Dilution Factor	5	1	1.0	1	1.0	1	1			
Percent Solids	47%	63%	12%	8%	21%	43%	72%			
VOLATILE ORGANIC COMPOUND										
Chloromethane			R	R	R					
Bromomethane			R	R	R					
Vinyl Chloride			R	R	R					
Chloroethane			R	R	R					
Methylene Chloride			R	R	48 U					
Acetone	880	110	640 J	R	2200 J*	460 *	120			
Carbon Disulfide			R	R	R					
1,1-Dichloroethene			R	R	R					
1,1-Dichloroethane			R	R	R					
1,2-Dichloroethene(Total)			12 J	R	10 J		2 J			
Chloroform			R	R	R					
1,2-Dichloroethane			R	R	R					
2-Butanone	140	31	170 J	R	410 J	120	31			
1,1,1-Trichloroethane			R	R	R					
Carbon Tetrachloride			R	R	R					
Vinyl Acetate			R	R	R					
Bromodichloromethane			R	R	R					
1,2-Dichloropropane			R	R	R					
cis-1,3-Dichloropropene			R	R	R					
Trichloroethene			R	R	R					
Dibromochloromethane			R	R	R					
1,1,2-Trichloroethane			R	R	R					
Benzene			R	R	R					
trans-1,3-Dichloropropene			R	R	R					
Bromoform			R	R	R					
4-Methyl-2-pentanone			R	R	R					
2-Hexanone			R	R	R					
Tetrachloroethene			R	R	R					
1,1,2,2-Tetrachloroethane			R	R	R					
Toluene		9 J	R	R	R		7 J			
Chlorobenzene			13 J	R	R					
Ethylbenzene			R	R	R					
Styrene			R	R	R					
Xylene (Total)			R	R	R					

CRQL- Contract Required Quantitation Limit

Sample Results are reported on a dry weight basis.
J - The associated numerical value is an estimated quantity.
U - The compound was considered not detected due to blank contamination. The associated numerical value is the smaple quantitation limit.
UJ - The compound was not detected. The sample quantitation limit is an estimated value.
R - The datum was rejected.

Site: Industri-Plex
Laboratory: ENSECO-East
File: ROUXS1S

CLP SEMIVOLATILE ORGANIC ANALYSIS
SOIL ANALYTICAL RESULTS (ug/Kg)

Sample Location	SED-18	SED-19	SED-21	SED-22	SED-23	SED-24	SED-100			
Remarks		Dup.SED-100					Dup.SED-19			
Sampling Date	10/02/91	10/02/91	10/03/91	10/03/91	10/03/91	10/02/91	10/02/91			
Extraction Date	10/04/91	10/04/91	10/11/91	10/11/91	10/11/91	10/04/91	10/04/91			
Analysis Date	10/12/91	10/12/91	10/17/91	10/17/91	10/17/91	10/12/91	10/12/91			
Dilution Factor	50	1	1	1	1	10	1			
Percent Solid	37%	63%	12%	8%	21%	43%	72%			
SEMI-VOLATILE COMPOUND										
Phenol			R	R	R					
bis(2-Chloroethyl)ether			R	R	R					
2-Chlorophenol			R	R	R					
1,3-Dichlorobenzene			R	R	R					
1,4-Dichlorobenzene			R	R	R					
1,2-Dichlorobenzene			R	R	R					
2-Methylphenol			R	R	R					
2,2'-oxybis(1-chloropropane)	UJ		R	R	R					
4-Methylphenol		220 J	R	R	R		330 J			
N-Nitroso-di-n-propylamine			R	R	R					
Hexachloroethane			R	R	R					
Nitrobenzene			R	R	R					
Isophorone			R	R	R					
2-Nitrophenol			R	R	R					
2,4-Dimethylphenol			R	R	R					
bis(2-Chloroethoxy)methane			R	R	R					
2,4-Dichlorophenol			R	R	R					
1,2,4-Trichlorobenzene			R	R	R					
Naphthalene			R	R	R					
4-Chloroaniline			R	R	R					
Hexachlorobutadiene			R	R	R					
4-Chloro-3-methylphenol			R	R	R					
2-Methylnaphthalene			R	R	R					
Hexachlorocyclopentadiene			R	R	R					
2,4,6-Trichlorophenol			R	R	R					
2,4,5-Trichlorophenol			R	R	R					
2-Chloronaphthalene			R	R	R					
2-Nitroaniline			R	R	R					
Dimethylphthalate			R	R	R					
Acenaphthylene			R	R	R					
2,6-Dinitrotoluene			R	R	R					

Sample results are reported on a dry weight basis.
Definitions of qualifier codes are provided on the following page.

Site: Industri-Plex
Laboratory: ENSECO-East
File: ROUXS2S

CLP SEMIVOLATILE ORGANIC ANALYSIS
SOIL ANALYTICAL RESULTS (ug/Kg)

Sample Location	SED-18	SED-19	SED-21	SED-22	SED-23	SED-24	SED-100			
Remarks	* Dilution	Dup.SED-100					Dup.SED-19			
Dilution Factor	50	1	1	1	1	10	1			
Percent Solid	37%	63%	12%	8%	21%	43%	72%			
SEMI-VOLATILE COMPOUND										
3-Nitroaniline			R	R	R					
Acenaphthene			R	R	R					
2,4-Dinitrophenol			R	R	R					
4-Nitrophenol			R	R	R					
Dibenzofuran			R	R	R					
2,4-Dinitrotoluene			R	R	R					
Diethylphthalate			R	R	R					
4-Chlorophenyl-phenylether			R	R	R					
Fluorene			R	R	R					
4-Nitroaniline			R	R	R					
4,6-Dinitro-2-methylphenol			R	R	R					
N-Nitrosodiphenylamine			R	R	680 J					
4-Bromophenyl-phenylether			R	R	R					
Hexachlorobenzene			R	R	R					
Pentachlorophenol			R	R	R					
Phenanthrene		250 J	620 J	R	890 J	8000	210 J			
Anthracene		65 J	R	R	240 J	1200 J	56 J			
Carbazole			R	R	R	1500 J				
Di-n-butylphthalate			R	R	R					
Fluoranthene		440 J	2200 J	R	2700	19000	420 J			
Pyrene		310 J	1600 J	R	2100	13000	310 J			
Butylbenzylphthalate			R	R	R					
3,3'-Dichlorobenzidine			R	R	R					
Benzo(a)anthracene		170 J	690 J	R	780 J	5800 J	170 J			
Chrysene		200 J	1100 J	R	1200 J	8900	210 J			
bis(2-Ethylhexyl)phthalate	2200000 *	520 U	16000	R	2800	4400 J	460 U			
Di-n-octylphthalate			R	R	R					
Benzo(b)fluoranthene		310 J	2000 J	R	2000 J	15000	310 J			
Benzo(k)fluoranthene		110 J	580 J	R	720 J	4900 J	120 J			
Benzo(a)pyrene		190 J	1100 J	R	1200 J	8700	200 J			
Indeno(1,2,3-cd)pyrene		130 J	600 J	R	530 J	6100 J	100 J			
Dibenz(a,h)anthracene			R	R	170 J	2100 J				
Benzo(g,h,i)perylene		97 J	720 J	R	560 J	5700 J	92 J			

Sample results are reported on a dry weight basis.
J - The associated numerical value is an estimated quantity.
U - The compound was considered not detected due to blank contamination.
The associated numerical value is the sample quantitation limit.
UJ - The compound was not detected. The sample quantitation limit is an estimated value.
R - The datum was rejected.
" " - The blank space indicates the compound was not detected.

Site: Industri-Plex
Laboratory: ENSECO-East
File: ROUXVSQ

CLP VOLATILE ORGANIC ANALYSIS
SOIL QUANTITATION LIMITS (ug/Kg)

Sample Location	SED-18	SED-19	SED-21	SED-22	SED-23	SED-24	SED-100			
Remarks		Dup.SED-100					Dup.SED-19			
Sampling Date	10/02/91	10/02/91	10/03/91	10/03/91	10/03/91	10/02/91	10/02/91			
Analysis Date	10/07/91	10/07/91	10/07/91	10/07/91	10/07/91	10/07/91	10/07/91			
Dilution Factor	5	1	1.0	1	1.0	1	1			
Percent Solids	47%	63%	12%	8%	21%	43%	72%			
VOLATILE ORGANIC COMPOUND										
Chloromethane	140	16	R	R	R	23	14			
Bromomethane	140	16	R	R	R	23	14			
Vinyl Chloride	140	16	R	R	R	23	14			
Chloroethane	140	16	R	R	R	23	14			
Methylene Chloride	140	16	R	R	48 U	23	14			
Acetone	140	16	R	R	R	23	14			
Carbon Disulfide	140	16	R	R	R	23	14			
1,1-Dichloroethene	140	16	R	R	R	23	14			
1,1-Dichloroethane	140	16	R	R	R	23	14			
1,2-Dichloroethene(Total)	140	16	R	R	R	23	14			
Chloroform	140	16	R	R	R	23	14			
1,2-Dichloroethane	140	16	R	R	R	23	14			
2-Butanone	140	16	R	R	R	23	14			
1,1,1-Trichloroethane	140	16	R	R	R	23	14			
Carbon Tetrachloride	140	16	R	R	R	23	14			
Vinyl Acetate	140	16	R	R	R	23	14			
Bromodichloromethane	140	16	R	R	R	23	14			
1,2-Dichloropropane	140	16	R	R	R	23	14			
cis-1,3-Dichloropropene	140	16	R	R	R	23	14			
Trichloroethene	140	16	R	R	R	23	14			
Dibromochloromethane	140	16	R	R	R	23	14			
1,1,2-Trichloroethane	140	16	R	R	R	23	14			
Benzene	140	16	R	R	R	23	14			
trans-1,3-Dichloropropene	140	16	R	R	R	23	14			
Bromoform	140	16	R	R	R	23	14			
4-Methyl-2-pentanone	140	16	R	R	R	23	14			
2-Hexanone	140	16	R	R	R	23	14			
Tetrachloroethene	140	16	R	R	R	23	14			
1,1,2,2-Tetrachloroethane	140	16	R	R	R	23	14			
Toluene	140	16	R	R	R	23	14			
Chlorobenzene	140	16	R	R	R	23	14			
Ethylbenzene	140	16	R	R	R	23	14			
Styrene	140	16	R	R	R	23	14			
Xylene (Total)	140	16	R	R	R	23	14			

CRQL- Contract Required Quantitation Limit

Sample Results are reported on a dry weight basis.
J - The associated numerical value is an estimated quantity.
U - The compound was considered not detected due to blank contamination. The associated numerical value is the smaple quantitation limit.
UJ - The compound was not detected. The sample quantitation limit is an estimated value.
R - The datum was rejected.

Site: Industri-Plex
Laboratory: ENSECO-East
File: ROUXS1Q

CLP SEMIVOLATILE ORGANIC ANALYSIS
SOIL QUANTIATION LIMITS (ug/Kg)

Sample Location	SED-18	SED-19	SED-21	SED-22	SED-23	SED-24	SED-100			
Remarks		Dup.SED-100					Dup.SED-19			
Sampling Date	10/02/91	10/02/91	10/03/91	10/03/91	10/03/91	10/02/91	10/02/91			
Extraction Date	10/04/91	10/04/91	10/11/91	10/11/91	10/11/91	10/04/91	10/04/91			
Analysis Date	10/12/91	10/12/91	10/17/91	10/17/91	10/17/91	10/12/91	10/12/91			
Dilution Factor	50	1	1	1	1	10	1			
Percent Solid	37%	63%	12%	8%	21%	43%	72%			
SEMI-VOLATILE COMPOUND										
Phenol	45000	520	R	R	R	7700	460			
bis(2-Chloroethyl)ether	45000	520	R	R	R	7700	460			
2-Chlorophenol	45000	520	R	R	R	7700	460			
1,3-Dichlorobenzene	45000	520	R	R	R	7700	460			
1,4-Dichlorobenzene	45000	520	R	R	R	7700	460			
1,2-Dichlorobenzene	45000	520	R	R	R	7700	460			
2-Methylphenol	45000	520	R	R	R	7700	460			
2,2'-oxybis(1-chloropropane)	45000 UJ	520	R	R	R	7700	460			
4-Methylphenol	45000	520	R	R	R	7700	460			
N-Nitroso-di-n-propylamine	45000	520	R	R	R	7700	460			
Hexachloroethane	45000	520	R	R	R	7700	460			
Nitrobenzene	45000	520	R	R	R	7700	460			
Isophorone	45000	520	R	R	R	7700	460			
2-Nitrophenol	45000	520	R	R	R	7700	460			
2,4-Dimethylphenol	45000	520	R	R	R	7700	460			
bis(2-Chloroethoxy)methane	45000	520	R	R	R	7700	460			
2,4-Dichlorophenol	45000	520	R	R	R	7700	460			
1,2,4-Trichlorobenzene	45000	520	R	R	R	7700	460			
Naphthalene	45000	520	R	R	R	7700	460			
4-Chloroaniline	45000	520	R	R	R	7700	460			
Hexachlorobutadiene	45000	520	R	R	R	7700	460			
4-Chloro-3-methylphenol	45000	520	R	R	R	7700	460			
2-Methylnaphthalene	45000	520	R	R	R	7700	460			
Hexachlorocyclopentadiene	45000	520	R	R	R	7700	460			
2,4,6-Trichlorophenol	45000	520	R	R	R	7700	460			
2,4,5-Trichlorophenol	110000	1300	R	R	R	19000	1100			
2-Chloronaphthalene	45000	520	R	R	R	7700	460			
2-Nitroaniline	110000	1300	R	R	R	19000	1100			
Dimethylphthalate	45000	520	R	R	R	7700	460			
Acenaphthylene	45000	520	R	R	R	7700	460			
2,6-Dinitrotoluene	45000	520	R	R	R	7700	460			

Sample results are reported on a dry weight basis.
Definitions of qualifier codes are provided on the following page.

Site: Industri-Plex
Laboratory: ENSECO-East
File: ROUXS2Q

CLP SEMIVOLATILE ORGANIC ANALYSIS
SOIL QUANTITATION LIMITS (ug/Kg)

Sample Location	SED-18	SED-19	SED-21	SED-22	SED-23	SED-24	SED-100			
Remarks	* Dilution	Dup.SED-100					Dup.SED-19			
Dilution Factor	50	1	1	1	1	10	1			
Percent Solid	37%	63%	12%	8%	21%	43%	72%			
SEMI-VOLATILE COMPOUND										
3-Nitroaniline	110000	1300	R	R	R	19000	1100			
Acenaphthene	45000	520	R	R	R	7700	460			
2,4-Dinitrophenol	110000	1300	R	R	R	19000	1100			
4-Nitrophenol	110000	1300	R	R	R	19000	1100			
Dibenzofuran	45000	520	R	R	R	7700	460			
2,4-Dinitrotoluene	45000	520	R	R	R	7700	460			
Diethylphthalate	45000	520	R	R	R	7700	460			
4-Chlorophenyl-phenylether	45000	520	R	R	R	7700	460			
Fluorene	45000	520	R	R	R	7700	460			
4-Nitroaniline	110000	1300	R	R	R	19000	1100			
4,6-Dinitro-2-methylphenol	110000	1300	R	R	R	19000	1100			
N-Nitrosodiphenylamine	45000	520	R	R	R	7700	460			
4-Bromophenyl-phenylether	45000	520	R	R	R	7700	460			
Hexachlorobenzene	45000	520	R	R	R	7700	460			
Pentachlorophenol	110000	1300	R	R	R	19000	1100			
Phenanthrene	45000	520	R	R	R	7700	460			
Anthracene	45000	520	R	R	R	7700	460			
Carbazole	45000	520	R	R	R	7700	460			
Di-n-butylphthalate	45000	520	R	R	R	7700	460			
Fluoranthene	45000	520	R	R	R	7700	460			
Pyrene	45000	520	R	R	R	7700	460			
Butylbenzylphthalate	45000	520	R	R	R	7700	460			
3,3'-Dichlorobenzidine	45000	520	R	R	R	7700	460			
Benzo(a)anthracene	45000	520	R	R	R	7700	460			
Chrysene	45000	520	R	R	R	7700	460			
bis(2-Ethylhexyl)phthalate	45000	520 U	R	R	R	7700	460 U			
Di-n-octylphthalate	45000	520	R	R	R	7700	460			
Benzo(b)fluoranthene	45000	520	R	R	R	7700	460			
Benzo(k)fluoranthene	45000	520	R	R	R	7700	460			
Benzo(a)pyrene	45000	520	R	R	R	7700	460			
Indeno(1,2,3-cd)pyrene	45000	520	R	R	R	7700	460			
Dibenz(a,h)anthracene	45000	520	R	R	R	7700	460			
Benzo(g,h,i)perylene	45000	520	R	R	R	7700	460			

Sample results are reported on a dry weight basis.
J - The associated numerical value is an estimated quantity.
U - The compound was considered not detected due to blank contamination.
The associated numerical value is the sample quantitation limit.
UJ - The compound was not detected. The sample quantitation limit is an estimated value.
R - The datum was rejected.
" " - The blank space indicates the compound was not detected.

REGION I
Data Review Worksheets

Site Name: Industri-Plex
Reference Number: NA

REGION I REVIEW OF ORGANIC CONTRACT LABORATORY DATA PACKAGE

The hardcopied ENSECO-East data package received at Region I been reviewed and the quality assurance and performance data summarized. The data review included:

Case No.: 16790,16811 SAS No.: NA Sampling Date(s): 10/2-3/91
SDG No.: NA Matrix: Aqu/soil Shipping Date(s): 10/2-3/91
No. of Samples: 17 Date Rec'd by Lab: 10/3-4/91

Traffic Report Nos: SW-18, SW-19, SW-21 to SW-24, SW-100, SED-18, SED-19, SED-21 to SED-24, SED-100
Trip Blank No.: TRIP BLANK (10/2), TRIP BLANK (10/3)
Equipment Blank No.: FIELD BLANK
Field Duplicate Nos.: SW-19 and SW-100; SED-19 and SED-100

SOW No. 3/90 requires that specific analytical work be done and that associated reports be provided by the laboratory to the Regions, EMSL-LV and SMO. The general criteria used to determine the performance were based on an examination of:

- Data Completeness
- Holding Times
- GC/MS Tuning
- Calibrations
- Blanks
- Surrogate Recoveries
- Matrix Spike/Matrix Spike
- Field Duplicates
- Internal Standard Performance
- Pesticide Inst. Performance
- Compound Identification
- Compound Quantitation

Overall Comments:

No pesticide/PCB analyses were required for this project. The data package was complete and legible.

Definitions and Qualifiers:

A - Acceptable data.
J - Approximate data due to quality control criteria.
R - Reject data due to quality control criteria.
U - Compound not detected.

Reviewer: Philip J. Doherty Date: 1/27/92

osum

REGION I
Data Review Worksheets

Data package was complete

I. DATA COMPLETENESS

MISSING INFORMATION	DATE LAB CONTACTED	DATE REC'D

Reviewer: PJD

Date: 1/27/92

org1

II. HOLDING TIMES Complete table for all samples and circle the fractions which are not within criteria.

SAMPLE ID	DATE SAMPLED	VOA DATE ANAL	BNA DATE EXTR	BNA DATE ANAL	PEST DATE EXTR	PEST DATE ANAL
SW-18	10/02/91	10/08/91	10/04/91	10/08/91	NA	NA
SW-24	10/02/91	10/08/91	10/04/91	10/08/91	NA	NA
SW-19	10/02/91	10/08/91	10/04/91	10/08/91	NA	NA
SW-100	10/02/91	10/08/91	10/04/91	10/08/91	NA	NA
TRIP_BLANK	10/02/91	10/08/91	NA	NA	NA	NA
SED-18	10/02/91	10/07/91	10/04/91	10/12/91	NA	NA
SED-18DL	10/02/91	NA	10/04/91	10/12/91	NA	NA
SED-24	10/02/91	10/07/91	10/04/91	10/12/91	NA	NA
SED-24DL	10/02/91	10/09/91	NA	NA	NA	NA
SED-19	10/02/91	10/07/91	10/04/91	10/12/91	NA	NA
SED-100	10/02/91	10/07/91	10/04/91	10/12/91		

VOA - Unpreserved: Aromatic within 7 days, non-aromatic within 14 days of sample collection.
Preserved: Both within 14 days of sample collection.
Soils: Both within 14 days of sample collection.

BNA & PEST - Extracted within 7 days, analyzed within 40 days, soils and water.

ACTION:
1. If holding times are exceeded all positive results are estimated (J) and non-detects are estimated (UJ).
2. If holding times are grossly exceed, the reviewer may determine that non-detects are unusable(*).

Reviewer: PJD Date: 1/27/92

org2

II. HOLDING TIMES Complete table for all samples and circle the fractions which are not within criteria.

SAMPLE ID	DATE SAMPLED	VOA DATE ANAL	BNA DATE EXTR	BNA DATE ANAL	PEST DATE EXTR	PEST DATE ANAL
SW-21	10/03/91	10/09/91	10/07/91	10/11/91	NA	NA
SW-22	10/03/91	10/09/91	10/07/91	10/11/91	NA	NA
SW-23	10/03/91	10/10/91	10/07/91	10/11/91	NA	NA
FIELD_BLAN	10/03/91	10/09/91	10/07/91	10/12/91	NA	NA
TRIP_BLANK	10/03/91	10/09/91	NA	NA	NA	NA
SW-23MS	10/03/91	10/10/91	10/07/91	10/11/91	NA	NA
SW-23MSD	10/03/91	10/10/91	10/07/91	10/12/91	NA	NA
SED-21	10/03/91	10/07/91	10/11/91	10/17/91	NA	NA
SED-22	10/03/91	10/07/91	10/11/91	10/17/91	NA	NA
SED-23	10/03/91	10/07/91	10/11/91	10/17/91	NA	NA
SED-23DL	10/03/91	10/09/91	NA	NA	NA	NA
SED-23MS	10/03/91	10/11/91	10/11/91	10/17/91	NA	NA
SED-23MSD	10/03/91	10/11/91	10/11/91	10/18/91	NA	NA

VOA - Unpreserved: Aromatic within 7 days, non-aromatic within 14 days of sample collection.
Preserved: Both within 14 days of sample collection.
Soils: Both within 14 days of sample collection.

BNA & PEST - Extracted within 7 days, analyzed within 40 days, soils and water.

ACTION:
1. If holding times are exceeded all positive results are estimated (J) and non-detects are estimated (UJ).
2. If holding times are grossly exceed, the reviewer may determine that non-detects are unusable(*).

Reviewer: PJD Date: 1/27/92

org2

REGION I
Data Review Worksheets

III. GC/MS TUNING

YES The DFTPP performance results were reviewed and found to be within the specified critiera.

If NO,
Samples affected:

YES The BFB performance results were reviewed and found to be within the specified criteria.

If NO,
Samples affected:

If mass calibration is in error refer to the Region guidelines for expanded criteria. If necessary, flag all associated data as unusable (R).

Reviewer: PJD Date: 1/27/92

org3

IV A. VOLATILE CALIBRATION VERIFICATION

Date of Initial Calibration : 10/03/91
Dates of Continuing Calibrations: 10/08-11/91
Instrument ID : V2
Matrix/Level : water/low

DATE	CRITERIA OUT RRF,%RSD,RRF,%D	COMPOUND (VALUE)
10/09	%D	chloromethane (27.0%)
	Samples Affected:	SW-21 to SW-23, TRIP_BLANK, FIELD_BLANK
10/09	%D	vinyl chloride (25.2%)
	Samples Affected:	SW-21 to SW-23, TRIP_BLANK, FIELD_BLANK
	Samples Affected:	
	Samples Affected:	
	Samples Affected:	
	Samples Affected:	
	Samples Affected:	
	Samples Affected:	
	Samples Affected:	
	Samples Affected:	

1. All RRFs and RRFs must be >0.05
2. All %RSDs must be <30%
3. All %Ds must be <25%

ACTION:
1. If any compound has an initial RRF or continuing RRF of <0.05:
   a. Flag positive results for that compound as estimated (J).
   b. Flag non-detects for that compound as unusable (R).
2. If any compound has a %RSD > 30% or a %D > 25%:
   a. Flag positive results for that compound as estimated (J).
   b. Flag non-detects for that compound as estimated (UJ) if %RSD or %D is > 50%.

A separate worksheet should be filled out for each initial curve.

Reviewer: PJD Date: 1/27/92

IV A. VOLATILE CALIBRATION VERIFICATION

Date of Initial Calibration : 10/07/91
Dates of Continuing Calibrations: 10/09/91
Instrument ID : V2
Matrix/Level : soil/low

DATE	CRITERIA OUT RRF,%RSD,RRF,%D	COMPOUND (VALUE)
10/09	%D	acetone (31.7%)
	Samples Affected:	SED-21 to SED-23, SED-23DL
	Samples Affected:	
	Samples Affected:	
	Samples Affected:	
	Samples Affected:	
	Samples Affected:	
	Samples Affected:	
	Samples Affected:	
	Samples Affected:	

1. All RRFs and RRFs must be >0.05
2. All %RSDs must be <30%
3. All %Ds must be <25%

ACTION:
1. If any compound has an initial RRF or continuing RRF of <0.05:
   a. Flag positive results for that compound as estimated (J).
   b. Flag non-detects for that compound as unusable (R).
2. If any compound has a %RSD > 30% or a %D > 25%:
   a. Flag positive results for that compound as estimated (J).
   b. Flag non-detects for that compound as estimated (UJ) if %RSD or %D is > 50%.

A separate worksheet should be filled out for each initial curve.

Reviewer: PJD Date: 1/27/92

org4a

IV B. SEMIVOLATILE CALIBRATION VERIFICATION

Date of Initial Calibration : 9/18/91
Dates of Continuing Calibrations: 10/8-11/91
Instrument ID : HP-84

DATE	CRITERIA OUT RRF,%RSD,RRF,%D	COMPOUND (VALUE)
9/18	%RSD	2,4-dinitrophenol (43.0%)
	Samples Affected:	All
10/08	%D	4-methylphenol (32.7%)
	Samples Affected:	SW-18,SW-24,SW-19,SW-100,SBLK01(10/4)
10/08	%D	4-chloroaniline (29.7%)
	Samples Affected:	SW-18,SW-24,SW-19,SW-100,SBLK01(10/4)
10/08	%D	2,4-dinitrophenol (59.5%)
	Samples Affected:	SW-18,SW-24,SW-19,SW-100,SBLK01(10/4)
10/08	%D	4-nitrophenol (26.0%)
	Samples Affected:	SW-18,SW-24,SW-19,SW-100,SBLK01(10/4)
10/08	%D	4,6-dinitro-2-methylphenol (31.1%)
	Samples Affected:	SW-18,SW-24,SW-19,SW-100,SBLK01(10/4)
10/11	%D	2,2'-oxybis(1-chloropropane) (27.2%)
	Samples Affected:	SW-21,SW-22,SBLK01(10/7)
10/11	%D	4-chloroaniline (34.9%)
	Samples Affected:	SW-21,SW-22,SBLK01(10/7)
10/11	%D	4-nitrophenol (31.4%)
	Samples Affected:	SW-21,SW-22,SBLK01(10/7)
10/11 *	%D	hexachlorocyclopentadiene (38.3%)
	Samples Affected:	SED-24,SED-19,SED-100,SBLK02(10/4),SW-23 SW-23MS/MSD,FIELD_BLANK1
10/11 *	%D	2,4-dinitrophenol (44.6%)
	Samples Affected:	SED-24,SED-19,SED-100,SBLK02(10/4),SW-23 SW-23MS/MSD,FIELD_BLANK1
10/11 *	%D	4-nitrophenol (34.6%)
	Samples Affected:	SED-24,SED-19,SED-100,SBLK02(10/4),SW-23 SW-23MS/MSD,FIELD_BLANK1
10/11 *	%D	4,6-dinitro-2-methylphenol (28.4%)
	Samples Affected:	SED-24,SED-19,SED-100,SBLK02(10/4),SW-23 SW-23MS/MSD,FIELD_BLANK1
	Samples Affected:	

A separate worksheet should be filled out for each initial curve.

Reviewer: PJD Date: 1/27/92

org4b * Second shift

IV B. SEMIVOLATILE CALIBRATION VERIFICATION

Date of Initial Calibration : 9/18/91
Dates of Continuing Calibrations: 10/11,17/91
Instrument ID : HP-84

DATE	CRITERIA OUT RRF,%RSD,RRF,%D	COMPOUND (VALUE)
10/12	%D	2,2'-oxybis(1-chloropropane) (58.9%)
	Samples Affected:	SED-18, SED-18DL
10/12	%D	N-nitroso-di-n-propylamine (29.5%)
	Samples Affected:	SED-18, SED-18DL
10/12	%D	isophorone (28.7%)
	Samples Affected:	SED-18, SED-18DL
10/12	%D	4-chloroaniline (38.4%)
	Samples Affected:	SED-18, SED-18DL
10/12	%D	hexachlorocyclopentadiene (30.7%)
	Samples Affected:	SED-18, SED-18DL
10/12	%D	2-nitroaniline (35.5%)
	Samples Affected:	SED-18, SED-18DL
10/12	%D	2,4-dinitrophenol (34.7%)
	Samples Affected:	SED-18, SED-18DL
10/12	%D	4-nitrophenol (42.2%)
	Samples Affected:	SED-18, SED-18DL
10/12	%D	pentachlorophenol (27.0%)
	Samples Affected:	SED-18, SED-18DL
10/17	%D	hexachlorocyclopentadiene (73.1%)
	Samples Affected:	SED-21 TO SED-23, SED-23MS; SBLK02
10/17	%D	2,4-dinitrophenol (72.7%)
	Samples Affected:	SED-21 TO SED-23, SED-23MS; SBLK02
10/17	%D	4-nitrophenol (33.5%)
	Samples Affected:	SED-21 TO SED-23, SED-23MS; SBLK02
10/17	%D	4-chloroaniline (26.9%)
	Samples Affected:	SED-21 TO SED-23, SED-23MS; SBLK02
10/17	%D	2,2'-oxybis(1-chloropropane) (49.6%)
	Samples Affected:	SED-21 TO SED-23, SED-23MS; SBLK02

A separate worksheet should be filled out for each initial curve.

Reviewer: PJD Date: 1/27/92

org4b * Second shift

REGION I
Data Review Worksheets

V A. BLANK ANALYSIS RESULTS (Section 1 & 2)

List the contamination in the blanks belows.

1. Laboratory Blanks

Level: Low

DATE	LAB ID	FRACTION/ MATRIX	COMPOUND	CONCENTRATION UNITS
10/11	VBLK04	VOA/Aqu.	acetone	4 ug/L

2. Equipment and Trip Blanks

DATE	LAB ID	FRACTION/ MATRIX	COMPOUND	CONCENTRATION UNITS
10/8	TB(10/2)	VOA/Aqu.	acetone	6 ug/L
10/9	TB(10/3)	VOA/Aqu.	acetone	6 ug/L
10/9	FB	VOA/Aqu.	methylene chloride	2 ug/L
10/12	FB	BNA/Aqu.	phenol	4 ug/L
10/12	FB	BNA/Aqu.	bis(2-ethylhexyl)phthalate	2 ug/L

A separate worksheet should be used for low and medium level blanks.

Reviewer: PJD Date: 1/27/92

org5a

REGION I
Data Review Worksheets

V B. BLANK ANALYSIS RESULTS (Section 3)

3. Blank Actions

Action levels should be based upon the highest concentration of contaminant determined in any blank. The action level for samples which have been concentrated or diluted should be multiplied by the concentration/dilution factor. No positive sample results should be reported unless the concentration of the compound in the sample exceeds the action level of 10 x's the amount in the blank for the common contaminants, or 5 x's the amount for any other compound. Specific actions are as follows:

1. The concentration is less than the CRQL, report the CRQL.

2. The concentration is greater than the CRQL, but less than the action level, report the concentration found U.

3. The concentration is greater than the action level, report the concentration unqualified.

For examples refer to the Regional Guidelines.

Common contaminants = methylene chloride, acetone, 2-butanone, toluene and phthalates.

LEVEL: Low

COMPOUND	MAX CONC./ UNITS	ACTION LEVEL/ UNITS	CRQL
acetone	6 ug/L	60 ug/L or ug/kg	10
methylene	2 ug/L	20 ug/L or ug/kg	10
phenol	4 ug/L	20 ug/L	10
		660 ug/kg	330
bis(2-ethylhexyl)-	2 ug/L	20 ug/L	10
phthalate		660 ug/kg	330

A separate worksheet should be used for low and medium level blanks.

Reviewer: PJD Date: 1/27/92

org5b

REGION I
Data Review Worksheets

All acceptable

VI. SURROGATES SPIKE RECOVERIES

List the percent recoveries which do not meet the criteria for surrogate recovery.

Matrix: **Water**

	VOA			B/N			A			PEST*
OTR #'s	TOL	BFB	DCE	NBZ	FBP	TPH	PHL	2FP	TBP	DBC
_____										
_____										
_____										
_____										
_____										
_____										
_____										
_____										
_____										
_____										
_____										
_____										
QC Limits	___ to ___	___ to ___	___ to ___	___ to ___	___ to ___	___ to ___	___ to ___	___ to ___	___ to ___	___ to ___

Surrogate Actions

* Advisory only

	PERCENT RECOVERY		
	<10%	10%-CRR	>CRR
Positive samples results	J	J	J
Non-detected results	R	UJ	A

CRR = Contract Required Recovery Range.
Surrogate action should be applied:

1. If at least two surrogates in a B/N or A fraction or one surrogate in the VOA fraction are out of specification, but have recoveries of >10%.
2. If any one surrogate in a fraction shows <10% recovery.

Reviewer: PJD

Date: 1/27/91

org6

REGION I
Data Review Worksheets

All acceptable

VI. SURROGATES SPIKE RECOVERIES

List the percent recoveries which do not meet the criteria for surrogate recovery.

Matrix: Soil

	VOA			B/N			A			PEST*
OTR #'s	TOL	BFB	DCE	NBZ	FBP	TPH	PHL	2FP	TBP	DBC
_____										
_____										
_____										
_____										
_____										
_____										
_____										
_____										
_____										
_____										
_____										
_____										
QC Limits	___ to ___	___ to ___	___ to ___	___ to ___	___ to ___	___ to ___	___ to ___	___ to ___	___ to ___	___ to ___

Surrogate Actions

* Advisory only

	PERCENT RECOVERY		
	<10%	10%-CRR	>CRR
Positive samples results	J	J	J
Non-detected results	R	UJ	A

CRR = Contract Required Recovery Range.
Surrogate action should be applied:

1. If at least two surrogates in a B/N or A fraction or one surrogate in the VOA fraction are out of specification, but have recoveries of >10%.
2. If any one surrogate in a fraction shows <10% recovery.

Reviewer: PJD

Date: 1/27/91

org6

REGION I
Data Review Worksheets

VII A. MATRIX SPIKE/MATRIX SPIKE DUPLICATE

1. Matrix Spike/Matrix Spike Duplicate Recoveries and Precision

TR Nos.: SW-23MS, SW-23MSD Level: Low Matrix: Water

List the percent recoveries and RPD's of compounds which did not meet the criteria stated on Form 3.

FRACTION MS or MSD	COMPOUND	%REC/ RPD	QC LIMITS
BNA/MS	4-nitrophenol	122%	10 - 80%
BNA/MSD	4-nitrophenol	129%	10 - 80%
BNA/MS	pentachlorophenol	111%	9 - 103%
BNA/MSD	pentachlorophenol	120%	9 - 103%

QUALIFICATION IS LIMITED TO THE UNSPIKED SAMPLE ONLY.

1. If any compound does not meet the Contract Required Recovery range (CRR) follow the actions stated below:

	PERCENT RECOVERY		
	<10%	10%-CRR	>CRR
Positive Sample Results	J	J	J
Nom-detected Results	R	A	A

2. If any compound does not meet the RPD criteria, flag positive results of that compound as estimated (J).

A separate worksheet should be used for each MS/MSD pair.

Reviewer: PJD Date: 1/27/92

org7a

REGION I
Data Review Worksheets

VII B. MATRIX SPIKE/MATRIX SPIKE DUPLICATE (Section 2)

2. Matrix Spike Duplicate - Unspiked Compounds

TR Nos.: SW-23MS,SW-23MSD

List the concentrations of the unspiked compounds and determine the percent RSD's of the unspiked sample, matrix spike, and matrix spike duplicate. No limits have been developed for the RSD values of the unspiked compounds.

FRACTION	COMPOUND	SAMPLE, MS, MSD CONC	%RSD
BNA	di-n-octylphthalate	10 U, 10 U, 1 J	NC

The reviewer should use professional judgement to determine if there is a need to qualify any of the unspiked compounds in the sample.

NC - Not calculated

Reviewer: PJD Date: 1/27/92

org7a

REGION I
Data Review Worksheets

VII A. MATRIX SPIKE/MATRIX SPIKE DUPLICATE

1. Matrix Spike/Matrix Spike Duplicate Recoveries and Precision

TR Nos.: SED-23MS,SED-23MSD Level: Low Matrix: Soil

List the percent recoveries and RPD's of compounds which did not meet the criteria stated on Form 3.

FRACTION MS or MSD	COMPOUND	%REC/ RPD	QC LIMITS
BNA/MS	4-nitrophenol	161%	11 - 114%
BNA	4-nitrophenol	67%RPD	50%

QUALIFICATION IS LIMITED TO THE UNSPIKED SAMPLE ONLY.

1. If any compound does not meet the Contract Required Recovery range (CRR) follow the actions stated below:

	PERCENT RECOVERY		
	<10%	10%-CRR	>CRR
Positive Sample Results	J	J	J
Nom-detected Results	R	A	A

2. If any compound does not meet the RPD criteria, flag positive results of that compound as estimated (J).

A separate worksheet should be used for each MS/MSD pair.

Reviewer: PJD Date: 1/27/92

org7a

REGION I
Data Review Worksheets

VII B. MATRIX SPIKE/MATRIX SPIKE DUPLICATE (Section 2)

2. Matrix Spike Duplicate - Unspiked Compounds

TR Nos.: SED-23MS, SED-23MSD

List the concentrations of the unspiked compounds and determine the percent RSD's of the unspiked sample, matrix spike, and matrix spike duplicate. No limits have been developed for the RSD values of the unspiked compounds.

FRACTION	COMPOUND	SAMPLE, MS, MSD CONC	%RSD
BNA	fluorene	ND ND 200 J	NC
BNA	carbazole	ND ND 230 J	NC
VOA	methylene chloride	33 DJ, 19 DJ, 23 DJ	29%
VOA	acetone	2200 D, 1300 D, 2900 D	38%
VOA	2-butanone	~~ND~~ 410, 320 D, 760 D	~~NC~~ 47%

The reviewer should use professional judgement to determine if there is a need to qualify any of the unspiked compounds in the sample.

NC - Not calculated

Reviewer: PJD Date: 1/27/92

org7a

REGION I
Data Review Worksheets

VIII. FIELD DUPLICATE PRECISION

TR Nos.: SW-19 , SW-100 Matrix: Water

List the concentrations of the compounds which did not meet the following RPD criteria:

1. An RPD of <30% for water duplicates
2. An RPD of <50% for soil duplicates

FRACTION	COMPOUND	SAMPLE CONC	DUP SAMPLE CONC	RPD
BNA	bis(2-ethylhexyl)phthalate	2 J	10 U	NC

ACTIONS:

1. If the results for any compounds do not meet the RPD criteria, flag the positive results for that compound as estimated.

2. If one value is non-detected, and one is above the CRQL:
   a. Flag the positive result as estimated (J).
   b. Flag the non-detected result as estimated (UJ)

NOTE: Professional judgement may be utilized to apply duplicate actions to all samples of a similar matrix.

A separate worksheet should be used for each MS/MSD pair.

Reviewer: PJD Date: 1/27/92

org8

REGION I
Data Review Worksheets

All acceptable

VIII. FIELD DUPLICATE PRECISION

TR Nos.: SED-19 , SED-100 Matrix: Soil

List the concentrations of the compounds which did not meet the following RPD criteria:

1. An RPD of <30% for water duplicates
2. An RPD of <50% for soil duplicates

FRACTION	COMPOUND	SAMPLE CONC	DUP SAMPLE CONC	RPD

ACTIONS:

1. If the results for any compounds do not meet the RPD criteria, flag the positive results for that compound as estimated.

2. If one value is non-detected, and one is above the CRQL:
   a. Flag the positive result as estimated (J).
   b. Flag the non-detected result as estimated (UJ)

NOTE: Professional judgement may be utilized to apply duplicate actions to all samples of a similar matrix.

A separate worksheet should be used for each MS/MSD pair.

Reviewer: PJD Date: 1/27/92

org8

REGION I
Data Review Worksheets

All acceptable

IX. INTERNAL STANDARDS PERFORMANCE

List the internal standard areas of samples which do not meet the criteria of +100% or -50% of the internal standard areas in the associated continuing calibration standard.

SAMPLE ID	DATE	IS OUT	IS AREA/RT	ACCEPTABLE RANGE	ACTION

ACTIONS:

1. If an IS area count is outside the criteria -50% or -100% of the associated standard:

   a. Positive results for compounds quantitated using that IS are flagged as estimated (J) for that sample fraction.
   b. Non-detects for compounds quantitated using that IS are flagged as estimated (UJ) for that sample fraction.
   c. If extremely low area counts are reported, or if performance exhibits a major drop-off, then a severe loss of sensitivity is indicated. Non-detects should be flagged as unusable (R).

2. If an IS retention time varies by more than 30 seconds, the chromatographic profile for that sample must be examined to determine if any false positives or negatives exist. For shifts of a large magnitude, the reviewer may consider partial or total rejection of the data for that sample fraction.

Reviewer: PJD Date: 1/27/92

org9

REGION I
Data Review Worksheets

XII. SAMPLE QUANTITATION

In the space below, please show a minimum of one sample calculation per fraction:

VOA:

Acetone in SW-21 ; reported @ 2J

$$\frac{588}{66474} \times \frac{50}{0.235} = 1.88 \text{ ug/L} \sim 2 \text{ ug/L}$$

BNA:

Phenanthrene in sample SED-21 : 620 J

$$\frac{4456}{29800} \times \frac{20}{1.338} \times \frac{1}{0.03 \times 0.12} = 619 \text{ ug/kg} \sim 620$$

PEST/PCB: Not Applicable

Reviewer: PJD Date: 1/27/92

org12

Gradient Corporation

March 5, 1992

Ms. Martha M. Smith
Project Hydrogeologist
Roux Associates, Inc.
775 Park Avenue, Suite 255
Huntington, NY 11743

Subject: High % Moisture in Sediment Samples

Dear Ms. Smith:

The sediment samples SED-21, SED-22, and SED-23 from the Industri-Plex site had low solids content, with the percent solids less than 30% in each sample. The current EPA Region I guidelines for data validation require that the nondetect results of these samples be rejected (R) as unusable. The guidelines also require that positive results be rejected in samples which contain less than 10% solids, as was the case for sample SED-22. These requirements were included in the data validation report dated February 14, 1992.

However, it is often difficult to obtain a sediment sample with sufficient percent solids if the sediment contains very fine particles and/or water-retaining organic matter. Resampling and re-analysis of these samples would probably result in similar problems. I would recommend that data from these samples be used, despite the low percent solids.

As noted in the data validation report, these samples were extracted for semivolatile analyses within the laboratory's contractual holding time (10 days from sample receipt, according to the SOW) but were one day outside of the data validation requirement of extraction within 7 days of sampling. All reported positive results would be estimated (J), as well as the nondetect results (UJ). For volatile organics, the positive methylene chloride results in sample SED-22 would be changed to a nondetect due to blank contamination, and the acetone results in all three samples would be estimated (J) due to a noncompliant calibration. However, all other results would be acceptable if the low solids content is disregarded.

I have attached revised versions of the sediment analytical results tables, which reflect the above violations but do not account for the low solids content. It is my professional opinion that these results are usable as estimated values.

44 Brattle Street, Cambridge, MA 02138 • (617)576-1555 • Telefax (617)864-8469
Environmental Consultants with Offices in Cambridge, MA and Boulder, CO

I hope that this information is helpful. If you have any questions or wish to discuss my conclusions, please do not hesitate to call me at 617-576-1555.

Sincerely,

GRADIENT CORPORATION

Philip J. Doherty
Senior Analytical Chemist

Enclosures

Site: Industri-Plex
Laboratory: ENSECO-East
File: ROUXTSR

CLP VOLATILE ORGANIC ANALYSIS
SOIL ANALYTICAL RESULTS (ug/Kg)

Sample Location	SED-18	SED-19	SED-21	SED-22	SED-23	SED-24	SED-100			
Remarks		Dup.SED-100			* Dilution	* Dilution	Dup.SED-19			
Sampling Date	10/02/91	10/02/91	10/03/91	10/03/91	10/03/91	10/02/91	10/02/91			
Analysis Date	10/07/91	10/07/91	10/07/91	10/07/91	10/07/91	10/07/91	10/07/91			
Dilution Factor	5	1	1.0	1	1.0	1	1			
Percent Solids	47%	63%	12%	8%	21%	43%	72%			
VOLATILE ORGANIC COMPOUND										
Chloromethane										
Bromomethane										
Vinyl Chloride				52 J						
Chloroethane										
Methylene Chloride				120 U	48 U					
Acetone	880	110	640 J	1900 J	2200 J*	460 *	120			
Carbon Disulfide										
1,1-Dichloroethene										
1,1-Dichloroethane										
1,2-Dichloroethene(Total)			12 J		10 J		2 J			
Chloroform										
1,2-Dichloroethane										
2-Butanone	140	31	170	550	410	120	31			
1,1,1-Trichloroethane										
Carbon Tetrachloride										
Vinyl Acetate										
Bromodichloromethane										
1,2-Dichloropropane										
cis-1,3-Dichloropropene										
Trichloroethene										
Dibromochloromethane										
1,1,2-Trichloroethane										
Benzene										
trans-1,3-Dichloropropene										
Bromoform										
4-Methyl-2-pentanone										
2-Hexanone										
Tetrachloroethene										
1,1,2,2-Tetrachloroethane										
Toluene		9 J					7 J			
Chlorobenzene			13 J							
Ethylbenzene				15 J						
Styrene										
Xylene (Total)										

CRQL- Contract Required Quantitation Limit

Sample Results are reported on a dry weight basis.
J - The associated numerical value is an estimated quantity.
U - The compound was considered not detected due to blank contamination. The associated numerical value is the smaple quantitation limit.
UJ - The compound was not detected. The sample quantitation limit is an estimated value.
R - The datum was rejected.

Site: Industri-Plex
Laboratory: ENSECO-East
File: ROUXT1S

CLP SEMIVOLATILE ORGANIC ANALYSIS
SOIL ANALYTICAL RESULTS (ug/Kg)

Sample Location	SED-18	SED-19	SED-21	SED-22	SED-23	SED-24	SED-100			
Remarks		Dup.SED-100					Dup.SED-19			
Sampling Date	10/02/91	10/02/91	10/03/91	10/03/91	10/03/91	10/02/91	10/02/91			
Extraction Date	10/04/91	10/04/91	10/11/91	10/11/91	10/11/91	10/04/91	10/04/91			
Analysis Date	10/12/91	10/12/91	10/17/91	10/17/91	10/17/91	10/12/91	10/12/91			
Dilution Factor	50	1	1	1	1	10	1			
Percent Solid	37%	63%	12%	8%	21%	43%	72%			
SEMI-VOLATILE COMPOUND										
Phenol			UJ	UJ	UJ					
bis(2-Chloroethyl)ether			UJ	UJ	UJ					
2-Chlorophenol			UJ	UJ	UJ					
1,3-Dichlorobenzene			UJ	UJ	UJ					
1,4-Dichlorobenzene			UJ	UJ	UJ					
1,2-Dichlorobenzene			UJ	UJ	UJ					
2-Methylphenol			UJ	UJ	UJ					
2,2'-oxybis(1-chloropropane)	UJ		UJ	UJ	UJ					
4-Methylphenol		220 J	UJ	UJ	UJ		330 J			
N-Nitroso-di-n-propylamine			UJ	UJ	UJ					
Hexachloroethane			UJ	UJ	UJ					
Nitrobenzene			UJ	UJ	UJ					
Isophorone			UJ	UJ	UJ					
2-Nitrophenol			UJ	UJ	UJ					
2,4-Dimethylphenol			UJ	UJ	UJ					
bis(2-Chloroethoxy)methane			UJ	UJ	UJ					
2,4-Dichlorophenol			UJ	UJ	UJ					
1,2,4-Trichlorobenzene			UJ	UJ	UJ					
Naphthalene			UJ	UJ	UJ					
4-Chloroaniline			UJ	UJ	UJ					
Hexachlorobutadiene			UJ	UJ	UJ					
4-Chloro-3-methylphenol			UJ	UJ	UJ					
2-Methylnaphthalene			UJ	UJ	UJ					
Hexachlorocyclopentadiene			UJ	UJ	UJ					
2,4,6-Trichlorophenol			UJ	UJ	UJ					
2,4,5-Trichlorophenol			UJ	UJ	UJ					
2-Chloronaphthalene			UJ	UJ	UJ					
2-Nitroaniline			UJ	UJ	UJ					
Dimethylphthalate			UJ	UJ	UJ					
Acenaphthylene			UJ	UJ	UJ					
2,6-Dinitrotoluene			UJ	UJ	UJ					

Sample results are reported on a dry weight basis.
Definitions of qualifier codes are provided on the following page.

Site: Industri-Plex
Laboratory: ENSECO-East
File: ROUXT2S

CLP SEMIVOLATILE ORGANIC ANALYSIS
SOIL ANALYTICAL RESULTS (ug/Kg)

Sample Location	SED-18	SED-19	SED-21	SED-22	SED-23	SED-24	SED-100			
Remarks	* Dilution	Dup.SED-100					Dup.SED-19			
Dilution Factor	50	1	1	1	1	10	1			
Percent Solid	37%	63%	12%	8%	21%	43%	72%			
SEMI-VOLATILE COMPOUND										
3-Nitroaniline			UJ	UJ	UJ					
Acenaphthene			UJ	UJ	UJ					
2,4-Dinitrophenol			UJ	UJ	UJ					
4-Nitrophenol			UJ	UJ	UJ					
Dibenzofuran			UJ	UJ	UJ					
2,4-Dinitrotoluene			UJ	UJ	UJ					
Diethylphthalate			UJ	UJ	UJ					
4-Chlorophenyl-phenylether			UJ	UJ	UJ					
Fluorene			UJ	UJ	UJ					
4-Nitroaniline			UJ	UJ	UJ					
4,6-Dinitro-2-methylphenol			UJ	UJ	UJ					
N-Nitrosodiphenylamine			UJ	UJ	680 J					
4-Bromophenyl-phenylether			UJ	UJ	UJ					
Hexachlorobenzene			UJ	UJ	UJ					
Pentachlorophenol			UJ	UJ	UJ					
Phenanthrene		250 J	620 J	1500 J	890 J	8000	210 J			
Anthracene		65 J	UJ	UJ	240 J	1200 J	56 J			
Carbazole			UJ	UJ	UJ	1500 J				
Di-n-butylphthalate			UJ	UJ	UJ					
Fluoranthene		440 J	2200 J	5100 J	2700	19000	420 J			
Pyrene		310 J	1600 J	4100 J	2100	13000	310 J			
Butylbenzylphthalate			UJ	UJ	UJ					
3,3'-Dichlorobenzidine			UJ	UJ	UJ					
Benzo(a)anthracene		170 J	690 J	1900 J	780 J	5800 J	170 J			
Chrysene		200 J	1100 J	2600 J	1200 J	8900	210 J			
bis(2-Ethylhexyl)phthalate	2200000 *	520 U	16000	10000 J	2800	4400 J	460 U			
Di-n-octylphthalate			UJ	UJ	UJ					
Benzo(b)fluoranthene		310 J	2000 J	5300 J	2000 J	15000	310 J			
Benzo(k)fluoranthene		110 J	580 J	1200 J	720 J	4900 J	120 J			
Benzo(a)pyrene		190 J	1100 J	3100 J	1200 J	8700	200 J			
Indeno(1,2,3-cd)pyrene		130 J	600 J	1500 J	530 J	6100 J	100 J			
Dibenz(a,h)anthracene			UJ	460 J	170 J	2100 J				
Benzo(g,h,i)perylene		97 J	720 J	1700 J	560 J	5700 J	92 J			

Sample results are reported on a dry weight basis.
J - The associated numerical value is an estimated quantity.
U - The compound was considered not detected due to blank contamination.
The associated numerical value is the sample quantitation limit.
UJ - The compound was not detected. The sample quantitation limit is an estimated value.
R - The datum was rejected.
" " - The blank space indicates the compound was not detected.

Site: Industri-Plex
Laboratory: ENSECO-East
File: ROUXTSQ

CLP VOLATILE ORGANIC ANALYSIS
SOIL QUANTITATION LIMITS (ug/Kg)

Sample Location	SED-18	SED-19	SED-21	SED-22	SED-23	SED-24	SED-100			
Remarks		Dup.SED-100					Dup.SED-19			
Sampling Date	10/02/91	10/02/91	10/03/91	10/03/91	10/03/91	10/02/91	10/02/91			
Analysis Date	10/07/91	10/07/91	10/07/91	10/07/91	10/07/91	10/07/91	10/07/91			
Dilution Factor	5	1	1.0	1	1.0	1	1			
Percent Solids	47%	63%	12%	8%	21%	43%	72%			
VOLATILE ORGANIC COMPOUND										
Chloromethane	140	16	83	120	48	23	14			
Bromomethane	140	16	83	120	48	23	14			
Vinyl Chloride	140	16	83	120	48	23	14			
Chloroethane	140	16	83	120	48	23	14			
Methylene Chloride	140	16	83	120 U	48 U	23	14			
Acetone	140	16	83	120	48	23	14			
Carbon Disulfide	140	16	83	120	48	23	14			
1,1-Dichloroethene	140	16	83	120	48	23	14			
1,1-Dichloroethane	140	16	83	120	48	23	14			
1,2-Dichloroethene(Total)	140	16	83	120	48	23	14			
Chloroform	140	16	83	120	48	23	14			
1,2-Dichloroethane	140	16	83	120	48	23	14			
2-Butanone	140	16	83	120	48	23	14			
1,1,1-Trichloroethane	140	16	83	120	48	23	14			
Carbon Tetrachloride	140	16	83	120	48	23	14			
Vinyl Acetate	140	16	83	120	48	23	14			
Bromodichloromethane	140	16	83	120	48	23	14			
1,2-Dichloropropane	140	16	83	120	48	23	14			
cis-1,3-Dichloropropene	140	16	83	120	48	23	14			
Trichloroethene	140	16	83	120	48	23	14			
Dibromochloromethane	140	16	83	120	48	23	14			
1,1,2-Trichloroethane	140	16	83	120	48	23	14			
Benzene	140	16	83	120	48	23	14			
trans-1,3-Dichloropropene	140	16	83	120	48	23	14			
Bromoform	140	16	83	120	48	23	14			
4-Methyl-2-pentanone	140	16	83	120	48	23	14			
2-Hexanone	140	16	83	120	48	23	14			
Tetrachloroethene	140	16	83	120	48	23	14			
1,1,2,2-Tetrachloroethane	140	16	83	120	48	23	14			
Toluene	140	16	83	120	48	23	14			
Chlorobenzene	140	16	83	120	48	23	14			
Ethylbenzene	140	16	83	120	48	23	14			
Styrene	140	16	83	120	48	23	14			
Xylene (Total)	140	16	83	120	48	23	14			

CRQL- Contract Required Quantitation Limit

Sample Results are reported on a dry weight basis.
J - The associated numerical value is an estimated quantity.
U - The compound was considered not detected due to blank contamination. The associated numerical value is the smaple quantitation limit.
UJ - The compound was not detected. The sample quantitation limit is an estimated value.
R - The datum was rejected.

Site: Industri-Plex
Laboratory: ENSECO-East
File: ROUXT1Q

CLP SEMIVOLATILE ORGANIC ANALYSIS
SOIL QUANTIATION LIMITS (ug/Kg)

Sample Location	SED-18	SED-19	SED-21	SED-22	SED-23	SED-24	SED-100			
Remarks		Dup.SED-100					Dup.SED-19			
Sampling Date	10/02/91	10/02/91	10/03/91	10/03/91	10/03/91	10/02/91	10/02/91			
Extraction Date	10/04/91	10/04/91	10/11/91	10/11/91	10/11/91	10/04/91	10/04/91			
Analysis Date	10/12/91	10/12/91	10/17/91	10/17/91	10/17/91	10/12/91	10/12/91			
Dilution Factor	50	1	1	1	1	10	1			
Percent Solid	37%	63%	12%	8%	21%	43%	72%			
SEMI-VOLATILE COMPOUND										
Phenol	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
bis(2-Chloroethyl)ether	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
2-Chlorophenol	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
1,3-Dichlorobenzene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
1,4-Dichlorobenzene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
1,2-Dichlorobenzene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
2-Methylphenol	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
2,2'-oxybis(1-chloropropane)	45000 UJ	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
4-Methylphenol	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
N-Nitroso-di-n-propylamine	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
Hexachloroethane	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
Nitrobenzene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
Isophorone	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
2-Nitrophenol	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
2,4-Dimethylphenol	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
bis(2-Chloroethoxy)methane	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
2,4-Dichlorophenol	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
1,2,4-Trichlorobenzene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
Naphthalene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
4-Chloroaniline	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
Hexachlorobutadiene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
4-Chloro-3-methylphenol	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
2-Methylnaphthalene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
Hexachlorocyclopentadiene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
2,4,6-Trichlorophenol	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
2,4,5-Trichlorophenol	110000	1300	6600 UJ	10000 UJ	3800 UJ	19000	1100			
2-Chloronaphthalene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
2-Nitroaniline	110000	1300	6600 UJ	10000 UJ	3800 UJ	19000	1100			
Dimethylphthalate	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
Acenaphthylene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
2,6-Dinitrotoluene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			

Sample results are reported on a dry weight basis.
Definitions of qualifier codes are provided on the following page.

Site: Industri-Plex
Laboratory: ENSECO-East
File: ROUXT2Q

CLP SEMIVOLATILE ORGANIC ANALYSIS
SOIL QUANTITATION LIMITS (ug/Kg)

Sample Location	SED-18	SED-19	SED-21	SED-22	SED-23	SED-24	SED-100			
Remarks	* Dilution	Dup.SED-100					Dup.SED-19			
Dilution Factor	50	1	1	1	1	10	1			
Percent Solid	37%	63%	12%	8%	21%	43%	72%			
SEMI-VOLATILE COMPOUND										
3-Nitroaniline	110000	1300	6600 UJ	10000 UJ	3800 UJ	19000	1100			
Acenaphthene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
2,4-Dinitrophenol	110000	1300	6600 UJ	10000 UJ	3800 UJ	19000	1100			
4-Nitrophenol	110000	1300	6600 UJ	10000 UJ	3800 UJ	19000	1100			
Dibenzofuran	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
2,4-Dinitrotoluene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
Diethylphthalate	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
4-Chlorophenyl-phenylether	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
Fluorene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
4-Nitroaniline	110000	1300	6600 UJ	10000 UJ	3800 UJ	19000	1100			
4,6-Dinitro-2-methylphenol	110000	1300	6600 UJ	10000 UJ	3800 UJ	19000	1100			
N-Nitrosodiphenylamine	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
4-Bromophenyl-phenylether	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
Hexachlorobenzene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
Pentachlorophenol	110000	1300	6600 UJ	10000 UJ	3800 UJ	19000	1100			
Phenanthrene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
Anthracene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
Carbazole	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
Di-n-butylphthalate	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
Fluoranthene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
Pyrene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
Butylbenzylphthalate	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
3,3'-Dichlorobenzidine	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
Benzo(a)anthracene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
Chrysene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
bis(2-Ethylhexyl)phthalate	45000	520 U	2700 UJ	4400 UJ	1600 UJ	7700	460 U			
Di-n-octylphthalate	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
Benzo(b)fluoranthene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
Benzo(k)fluoranthene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
Benzo(a)pyrene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
Indeno(1,2,3-cd)pyrene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
Dibenz(a,h)anthracene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			
Benzo(g,h,i)perylene	45000	520	2700 UJ	4400 UJ	1600 UJ	7700	460			

Sample results are reported on a dry weight basis.
J - The associated numerical value is an estimated quantity.
U - The compound was considered not detected due to blank contamination.
The associated numerical value is the sample quantitation limit.
UJ - The compound was not detected. The sample quantitation limit is an estimated value.
R - The datum was rejected.
" " - The blank space indicates the compound was not detected.

APPENDIX D2

Surface-Water and Stream-Sediment
Data Validation Documentation

Inorganic Data

March 17, 1992

Ms. Martha Smith
Roux Associates, Inc.
The Huntington Atrium
775 Park avenue
Suite 255
Huntington, NY 11743

RE: Data Validation Report Letter
Project #s: 16790 and 16811
Enseco-East Laboratory
Industri-Plex Site, Woburn, Massachusetts
Metals: 16 samples/water (dissolved/total)/sample #s: SW-18, SW-19, SW-21, SW22, SW-23, SW-24, SW-100
7 samples/sediment/sample #s: SED-18, SED-19, SED-21, SED-22, SED-23, SED-24, SED-100

Dear Ms. Smith:

A validation was performed on the surface water and stream-sediment inorganic analytical data from 7 sediment samples and 16 water samples (including two field blanks) collected by Roux Associates, Inc. at the Industri-Plex site in Woburn, MA. The data were evaluated based on the Region I Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses, February 1989:

- data completeness
* - holding times
- calibration verification
- laboratory and field blank analyses
- ICP interference check sample results
- matrix spike percent recovery results
- laboratory and field duplicates
* - laboratory control sample results
* - furnace atomic absorption analysis/duplicate precision
- furnace atomic absorption analysis/post-digestion spike recoveries
* - ICP serial dilution result
* - detection limit results
- sample results

* = All criteria were met for this parameter.

Table I summarizes the validation recommendations that were based on the following information:

Data Completeness

There were numerous discrepancies noted in the data package concerning incorrectly reported data and missing information. These were addressed in several communications during the months of January and February, 1992, as delineated in the worksheets attached to this report. In summary, the discrepancies included: incorrect percent solids applied to final data, incorrectly reported IDL for mercury and linear range for sodium, incorrectly calculated spike added concentrations for the sediment matrix spike (MS), missing analysis run logs (CLP SOW 3/90 Form XIV), missing data on the Interference Check Sample Form IV, missing information on pH check for water samples, and missing information on the solid LCS source. All corrected forms and missing information, except for the recalculated MS Form V, were received by February 28, 1992. The data validator recalculated the MS spike levels and percent recoveries during the validation process. A corrected copy of the laboratory's Form V is included in the worksheets attached to this report.

In addition to the above items, several minor discrepancies were noted in the data package. No action was taken as these items, though contractually non-compliant with CLP SOW 3/90, did not affect the reported data. Examples of these minor issues included: incorrect reporting of solid preparation blank (PBS) for lead (laboratory reported 0.001 U mg/Kg, correct value should be 0.2 U mg/Kg), omission of explanation on Form I for "E" qualifiers on arsenic and thallium (explanatory note is required under CLP SOW 3/90, Section III, B-20), incorrectly reporting silver in SED-19 as 1.1B mg/Kg on the Form I (correct value should be 1.3 U mg/Kg), and incorrectly reporting thallium in SED-21 as 3.0 B mg/Kg on the Form I (correct value should be 3.3 U mg/Kg). The validation data summary tables reflect the corrected data.

Calibration Verification

All correlation coefficients, ICVs, and CCVs met criteria. The CRDL standard did not meet criteria of 80 - 120% recovery for the following analytes. Actions apply to all matrices (total water, dissolved water, and sediment).

CRDL ACTION CRITERIA

Analyte	% Recovery	Action(s)
antimony	125.2	J(+), UJ(ND)
cadmium	77.3	J(+), UJ(ND)

All positive results for the analytes listed in both tables above that were less than 3x CRDL were estimated (J) and all nondetects estimated at the detection limit (UJ) as indicated in the table. Actions affected all samples for antimony. The reported results and the estimated detection limits may be biased high based upon the high percent recovery of the CRDL standard. For cadmium, actions affected all water samples (dissolved and total) and sediment samples SED-19, SED-24, and SED-100. The reported results and the estimated detection limits may be biased low for cadmium based upon the low percent recovery of the CRDL standard.

Field and Laboratory Blank Results

The blank data were reviewed and the maximum concentrations and the action levels are summarized in the following table. Two field blanks were included with these samples: FB-1 (dissolved water blank - field-filter water) and FB-1 SED (sediment sampling equipment blank). The blank actions are divided into three matrices: total water, dissolved (field-filtered) water, and sediment. The blank action levels are presented in the following tables. Blank actions do not apply to the field blanks.

BLANK ACTION LEVELS FOR TOTAL WATERS

Analyte	Maximum Concentration (ug/L)	Action Level (ug/L)
antimony	30.5	152
barium	4.8	24.0
calcium	69.2	346
copper	5.6	28.0
iron	25.8	129
lead	1.2	6.0
silver	5.1	25.5
sodium	-299.2	1496

No field blank is associated with the surface water sampling for total metals. Therefore, the blank action levels are derived from contamination found in the laboratory blanks (preparation, initial calibration and continuing calibration blanks).

Actions for the total water samples affected only antimony, copper, and lead. Positive results for the other analytes were all greater than the blank action levels. Sample values greater than IDL, but less than the Action Level are considered nondetect due to the possibility of false positives; report the sample concentration with a "U" for the following sample analytes:

copper: SW-18, SW-21, SW-22, SW-23, SW-24, SW-100
lead: SW-19, SW-21, SW-22, SW-23, SW-24, SW-100

Sample values greater than IDL, but less than 2xIDL, less than CRDL, and less than the Action Level are considered nondetect with the detection limit raised and estimated (UJ) due to the possibility of false positives and uncertainty near the instrument detection limit. Report the following sample analytes with a "UJ":

antimony: SW-18, SW-19, SW-23
lead: SW-18

BLANK ACTION LEVELS FOR DISSOLVED WATERS

Analyte	Maximum Concentration (ug/L)	Action Level (ug/L)
antimony*	31.3	156
barium	4.8	24.0
calcium*	261	1300
silver	5.1	25.5
sodium*	1680	8400

* Indicates that the Blank Action Level was derived from contamination observed in the field blank, FB-1. The other blank action levels were derived from laboratory blank contamination in either the initial or continuing calibration blanks. No preparation was performed on these dissolved metal samples; therefore, a preparation blank does not apply.

Actions affected only antimony and silver. Reported results for barium, calcium, and sodium were all greater than the blank action levels. Sample values greater than IDL, but less than 2xIDL, less than CRDL, and less than the Action Level are considered nondetect with the detection limit raised and estimated (UJ) due to the possibility of false positives and uncertainty near the instrument detection limit. Report the following sample analytes with a "UJ":

antimony: SW-18, SW-21, SW-22
silver: SW-22

BLANK ACTION LEVELS FOR SEDIMENTS

Analyte	Maximum Concentration (units indicated)	Action Level (mg/Kg)
antimony	30.5 ug/L	30.5
arsenic*	1.3 ug/L	1.3
barium	4.8 ug/L	4.8
calcium*	132 ug/L	132
copper*	5.0 ug/L	5.0
iron*	193 ug/L	193
lead*	1.2 ug/L	1.2
manganese*	4.5 ug/L	4.5
silver	5.1 ug/L	5.1
sodium	-70.718 mg/Kg	354
zinc*	33.1 ug/L	33.1

* Indicates that the Blank Action Level was derived from contamination observed in the field blank, FB-1 SED. All other blank action levels were derived from laboratory blank contamination (preparation, initial calibration, or continuing calibration blanks).

Blank actions for the sediment samples affected antimony, silver, sodium, and zinc only. All other reported results were greater than the blank action levels. Sample values greater than IDL, but less than the Action Level are considered nondetect due to the possibility of false positive; report the sample concentration with a "U" for the following sample analytes:

sodium: SED-19, SED-23

The "U" value for sodium in sample SED-23 is superceded by rejection (R) of this value due to ICP interference criteria explained later in this report.

Sample values greater than IDL, but less than 2xIDL, less than CRDL, and less than the Action Level are considered nondetect with the detection limit raised and estimated (UJ) due to the possibility of false positives and uncertainty near the instrument detection limit. Report the following sample analytes with a "UJ":

antimony:	all positive results
silver:	all positive results
sodium:	SED-21, SED-24
zinc:	SED-19

Positive results for antimony in samples SED-18, SED-21, SED-22, and SED-23 are rejected (R) based on ICP interference criteria and percent solids criteria explained later in this report. The positive result for silver in sample SED-22 is rejected (R) based upon percent solids criteria. Additionally, for sodium, sample SED-21 is rejected (R) for sodium due to ICP interference criteria. In all cases, the "R" qualifier supercedes the "UJ" applied here.

ICP Interference Check Sample Results

Though all ICP percent recovery criteria were met, several analytes were detected in the ICSA solution at levels greater than 2x IDL that should not have been present. For the water samples, no interferent concentration was greater than half of the concentration of that interferent in the ICS solution. Therefore, no sample analytes were affected. For the sediment samples, however, samples SED-18, SED-21, SED-22, and SED-23 contained sufficiently high concentrations of iron, an interferent, to require calculations of the estimated interference on affected analytes. As all reported results for SED-22 are rejected (R) due to percent solids criteria (explained in the Sample Results section of this report), discussion of this sample is not included herein. However, if it were reviewed, antimony and sodium values for this sample would have been rejected due to the magnitude of the estimated interference. The following table summarizes the estimated interferences and actions for samples SED18, SED-21, and SED-23.

ICP INTERFERENCE ESTIMATIONS AND ACTIONS

Sample Affected	Analyte Affected	Interferent Concentration (mg/Kg)	Estimated Interference (mg/Kg)	Action
SED-18	antimony	33900 (iron)	32.4	R
"	barium	"	2.0	No Action
"	chromium	"	9.2	No Action
"	manganese	"	5.4	No Action
SED-21	barium	97500 (iron)	9.1	J
"	chromium	"	28.1	No Action
"	manganese	"	16.5	No Action
"	sodium	"	410	R
SED-23	antimony	69400 (iron)	57.4	R
"	barium	"	5.3	No Action
"	chromium	"	16.3	No Action
"	manganese	"	9.6	J
"	sodium	"	237	R

The above estimated interferences were calculated from the concentration detected of that analyte in the ICSA solution. Appropriate preparation and percent solids factors were applied to convert all values to mg/Kg dry weight. Actions were taken if the estimated concentration was greater than or equal to 10% of the measured value of the affected analyte in the sample. For the sample analytes listed above, no actions were applied when the estimated concentrations were below 10% of the reported concentrations for those analytes. Sample values were estimated (J) in those cases where the estimated interference concentration was greater than or equal to 10% of the reported sample concentrations. Values were rejected (R) if the estimated interference concentration was greater than or equal to the reported sample analyte value. In these cases, it is expected that the entire reported value for that analyte was due to an interference effect and was not actually present in the sample.

Matrix Spike Recovery Results

The review of the matrix spike results revealed the deficiencies summarized in the following table. The actions apply to all the samples of the same matrix. A matrix spike was performed for each matrix, therefore, three sets of matrix spike results are tabulated below (including total water, dissolved water, and sediment).

Matrix Spike Recovery Table

Sample #	Matrix	Analyte	% Recovery
SW-23	total water	iron	58.1
"	"	thallium	35.2
SW-23 (dissolved)	dissolved water	selenium	138.0
"	"	thallium	62.0
SED-23	sediment	arsenic	-670.2*
"	"	cadmium	62.3
"	"	chromium	-594.4*
"	"	copper	-644.1
"	"	lead	-790.0*
"	"	manganese	14.7
"	"	selenium	54.0
"	"	zinc	-405.5*

* No action was taken as the sample concentration exceeded the spike concentration by more than a factor of 4.

The following actions were taken:

Total Waters:

Analyte	Action/Samples Affected
iron	J(+) all samples
thallium	UJ(ND) all samples

The low percent recoveries for iron and thallium in the total water samples indicate a matrix supression of these analytes and therefore a low bias in the estimated values and the estimated detection limits are expected.

Dissolved Waters:

Analyte	Action/Samples Affected
selenium	no action
thallium	UJ(ND) all samples

No action is taken for selenium because the matrix spike recovery was high but all the associated samples were nondetects. Thallium recovered low in the matrix spike and therefore a low bias in the estimated detection limit is expected.

Sediments:

Analyte	Action/Samples Affected
cadmium	J(+), UJ(ND)
copper	J(+) all samples
manganese	J(+) all samples
selenium	J(+), UJ(ND)

As listed in the table, no actions were taken for arsenic, chromium, lead, or zinc because the reported sample concentration exceeded the spike added concentration by a factor of 4 or more. All of the other analytes recovered low in the matrix spiked sample. This is evidence of matrix suppression of these analytes in the sediments. Therefore, a low bias is expected for cadmium, copper, manganese, and selenium in all estimated reported results (J) and estimated detection limits (UJ). Note that in all cases for sample SED-22, the "J" and "UJ" qualifiers are superceded by "R" as explained later in this report.

Laboratory and Field Duplicates

Laboratory duplicate data were reviewed and the results not meeting the validation criteria are included in the following table. Actions apply to all samples of the same matrix. A laboratory duplicate was performed for each of the three matrices (total water, dissolved water, and sediment). All precision criteria were met for all analytes in the total and dissolved waters. For the sediments, the laboratory duplicate, performed on sample SED-23, did not meet precision criteria for the following analytes:

PRECISION ACTION TABLE
LABORATORY DUPLICATES - SEDIMENTS

Analyte	% RPD	Action
aluminum	101.1	J(+)
cadmium	74.9	J(+)
chromium	94.8	J(+)
copper	124.6	J(+)
iron	75.4	J(+)
lead	97.1	J(+)
manganese	58.3	J(+)
zinc	61.3	J(+)

Cadmium, copper, and manganese samples have already been estimated (J) due to poor matrix spike recoveries; therefore, no further action is taken for these analytes. Again, all data for sample SED-22 have been rejected (R), which supercedes the estimated qualifier (J) as discussed in the Sample Results section of this report.

A field duplicate pair was collected for all three matrices. All analytes in the total and dissolved field duplicate pairs (SW-19 and SW-100) met precision criteria. In the sediment pair (SED-19 and SED-100), the following analytes did not meet field duplicate precision criteria:

PRECISION ACTION TABLE
FIELD DUPLICATES - SEDIMENTS

Analyte	% RPD	Action
iron	89.8	J(+)
manganese	54.5	J(+)

Both iron and manganese have already been estimated (J) due to either poor matrix spike criteria or poor laboratory duplicate precision; therefore, no further action is applied to these analytes.

Note that the overall precision in the field duplicate pair was better than the precision in the laboratory duplicate pair. This outcome is not expected; generally, the laboratory precision is better because the added factor of possible sampling effects on precision is not present. The poorer laboratory precision performance is likely due to the very low percent solids (20.9%) of the laboratory duplicate pair. This factor makes it difficult to obtain homogeneous aliquots for preparation. The higher percent solids of the field duplicate pair (63.1% and 71.6%, respectively), would make it easier to obtain a representative aliquot for preparation and analysis and probably contributed to the better field duplicate precision.

Furnace Atomic Absorption Analysis/Post Digestion Spike Recoveries

The following sample analytes had low post-digestion spike recoveries but did not require the method of standard additions for the following samples/analytes:

Matrix	Analyte	Samples Affected
total water	selenium	SW-18
"	thallium	SW-19, SW-21, SW-22, SW-23, SW-24, SW-100
dissolved water	arsenic	SW-19, SW-21, SW-22, SW-24, SW-100
"	selenium	SW-21, SW-24
"	thallium	SW-18, SW-19, SW-21, SW-22, SW-23, SW-100
sediment	selenium	SED-18
"	thallium	SED-18, SED-21, SED-22, SED-23, SED-24, SED-100

Actions for the above sample analytes are J (+) and UJ (ND). For the thallium in both the total and dissolved waters and the selenium in the sediment, the affected samples have already been estimated (J) due to poor matrix spike recoveries. Therefore, no further actions are applied. These low post-digestion spike recoveries are an indication of matrix supression for these analytes. All estimated (J) results and detection limits (UJ) are therefore biased low.

The following sample analyte had a high post-digestion spike recovery but did not require the method of standard additions:

Matrix	Analyte	Samples Affected
dissolved water	selenium	SW-18, FB-1

No action is taken for these sample analytes because the post-digestion spike was high but the samples were nondetects.

The following sample analyte, quantitated by the method of standard additions (MSA), did not meet criteria for the correlation coefficient of r > 0.995.

Matrix	Analyte	Samples Affected
sediment	selenium	SED-23

The sample analyte should be estimated (J), due to the uncertainty in the quantitation evidenced by the poor linearity of the MSA. However, it has already been estimated due to poor matrix spike recovery; therefore, no further action is applied.

Again note that several of the actions for post-digestion spike recoveries are superceded by "R" for low percent solids criteria as explained in the Sample Results section below.

Sample Results

The following sample analytes were detected at less than 2x IDL and have therefore been estimated due to the uncertainty in the quantitation near the IDL. These tables do not include sample analytes previously estimated (UJ) due to blank criteria.

Matrix	Analyte	Samples Affected
total water	arsenic	FB-1 SED
"	copper	FB-1 SED
"	lead	FB-1 SED
"	nickel	SW-19
dissolved water	copper	SW-18, SW-22, SW-24
"	lead	SW-19, SW-21, SW-22, SW-23

Three of the sediment samples contained less than 30% solids. Samples SED-21, SED-22, and SED-23 contained 12.1%, 8.1%, and 20.9%, respectively. For sample SED-22, with less than 10% solids, all data have been rejected (R). All nondetects reported for samples SED-21 and SED-23, which have less than 30% but greater than 10% solids, have been rejected (R) and all other reported results have been estimated (J), except where previously rejected or estimated due to other criteria as listed within this report.

The following sediment sample analytes were rejected (R) due to low percent solids:

Analyte	Samples Rejected (R)
aluminum	SED-22
antimony	SED-21, SED-22
arsenic	SED-22
barium	SED-22
beryllium	SED-21, SED-22
cadmium	SED-22
calcium	SED-22
chromium	SED-22
cobalt	SED-22
copper	SED-22
iron	SED-22
lead	SED-22
magnesium	SED-22
manganese	SED-22
mercury	SED-22
nickel	SED-22
potassium	SED-21, SED-22
selenium	SED-22
silver	SED-22
sodium	SED-22
thallium	SED-22
vanadium	SED-22
zinc	SED-22

Overall Assessment

The data package was complete with the addition of the resubmittals from the laboratory; including corrected Form Is for all sediments, corrected Form V and Form VI for sediments, corrected forms for quarterly verifications of instrument detection limits and linear ranges, corrected cover page to indicate background correction on ICP, submittal of missing data for Form IV and missing data for pH checks. Several minor errors were found in the data package concerning contractual compliance with CLP SOW 3/90. For the sediments, all data reported for sample SED-22 were rejected (R) due to extremely low percent solids (8.1%) and the uncertainty of the representativeness of the sample and the quantitation due to this matrix. All nondetected results for samples SED-21 and SED-23 were also rejected (R) and all positive results were estimated (J) due to low percent solids (between 10-30%). Overall precision for the sediment data was poor; results for aluminum, cadmium, chromium, copper, iron, lead, manganese and zinc were estimated (J or UJ) due to poor laboratory duplicate precision. All results for cadmium, copper, manganese, and selenium were also estimated (J) due to low matrix spike recoveries. A low bias is expected for these analytes in the sediment samples. The cumulative effects of poor precision and matrix spike recoveries, interference effects of iron, and low percent solids, are evidence of significant matrix effects on the quantitation of analytes in these sediments. Blank contamination caused several sediment sample analytes to be considered nondetects, with the detection limit raised (U) or raised and estimated (UJ) for: antimony, silver, sodium, and zinc. Indication of interference on ICP analysis, due to high concentrations of iron, caused the rejection (R) of the following sample analytes: antimony (SED-18, SED-22, SED-23), and sodium (SED-21, SED-22, SED-23). Furthermore, several analytes were estimated (J) due to a high bias expected from this same iron interference: barium (SED-21) and manganese (SED-23).

Validated data for the total and dissolved waters were estimated (J or UJ) due to several criteria. Low matrix spike and post-digestion spike recoveries were found for thallium in both the total and dissolved waters. All thallium detection limits are therefore estimated (UJ) and biased low. Low matrix spike recovery was observed for iron in the total waters. All associated iron values are estimated (J) and are biased low. Blank contamination caused several sample analytes to be considered nondetects, with the detection limit raised (U) or raised and estimated (UJ) for the following analytes: antimony, copper, and lead in the total waters and antimony and silver in the dissolved water samples. Poor CRDL percent recoveries were found for antimony and cadmium and all associated total and dissolved water samples that were less than 3x CRDL were estimated (J or UJ). The overall precision for the waters was good; all analytes detected in the laboratory and field duplicate pairs met precision criteria.

Attached are Table I which is the Recommendation Summary for the data based on the data review; the data summary table, Table II, which displays the data with qualifiers added as a result of the review; and the worksheets associated with this data validation review.

Very truly yours,

GRADIENT CORPORATION

Susan D. Chapnick

Susan D. Chapnick
Senior Analytical Chemist
Data Reviewer

INDUSTRI-PLEX
PROJECT #s: 16790 and 16811
SURFACE WATER SAMPLES

TABLE Ia - Recommendation Summary for Total Water Samples

Aluminum		Magnesium	
Antimony	$J^{1,2}$	Manganese	
Arsenic	J^{6}	Mercury	
Barium		Nickel	J^{6}
Beryllium		Potassium	
Cadmium	J^{2}	Selenium	J^{4}
Calcium		Silver	
Chromium		Sodium	
Cobalt		Thallium	$J^{3,4}$
Copper	A^{1}, J^{6}	Vanadium	
Iron	J^{3}	Zinc	
Lead	A^{1}, $J^{1,6}$		

See Codes on following page.

INDUSTRI-PLEX
PROJECT #s: 16790 and 16811
SURFACE WATER SAMPLES

TABLE Ia - Recommendation Summary for Total Water Samples
(Continued)

Codes:

If the field is left blank, the qualifier is A - Accept all data.

A[1] - Accept all data, but consider positive results > 2xIDL and < blank action level as nondetect because false positives are expected due to blank contamination. Report the sample concentrations with a U for: copper (all samples except SW-19) and lead (all samples except SW-18).

J[1] - Consider positive results < 2x IDL and < blank action level as nondetect and estimated due to the possibility of false positive and uncertainty near the instrument detection limit. Report the sample concentrations with a UJ for: antimony (SW-18, SW-19, SW-23) and lead (SW-18).

J[2] - Estimate (UJ) non-detected results and (J) positive results due % recoveries of CRDL < 80% or > 120%. Estimated results and detection limits are biased low for cadmium and high for antimony.

J[3] - Estimate (J) positive results and (UJ) nondetected results due to low matrix spike recovery. Sample results and detection limits are biased low.

J[4] - Estimate (J) positive results and (UJ) nondetected results due to poor post-digestion spike recoveries for selenium (SW-18) and thallium (all samples except SW-18). Estimated results and detection limits are biased low.

J[6] - Estimate (J) positive results that are > IDL but < 2xIDL due to the possibility of false positive and uncertainty near the instrument detection limit for arsenic, copper, and lead in the field blank (FB-1 SED), and nickel in sample SW-19.

INDUSTRI-PLEX
PROJECT #s: 16790 and 16811
SURFACE WATER SAMPLES

TABLE Ib - Recommendation Summary for Dissolved Water Samples

Aluminum		Magnesium	
Antimony	J[1,2]	Manganese	
Arsenic	J[4]	Mercury	
Barium		Nickel	
Beryllium		Potassium	
Cadmium	J[2]	Selenium	J[4]
Calcium		Silver	
Chromium		Sodium	
Cobalt		Thallium	J[3,4]
Copper	J[6]	Vanadium	
Iron		Zinc	
Lead	J[6]		

See Codes on following page.

INDUSTRI-PLEX
PROJECT #s: 16790 and 16811
SURFACE WATER SAMPLES

TABLE Ib - Recommendation Summary for Dissolved Water Samples
(Continued)

Codes:

If the field is left blank, the qualifier is A - Accept all data.

J[1] - Consider positive results < 2x IDL and < blank action level as nondetect and estimated due to the possibility of false positive and uncertainty near the instrument detection limit. Report the sample concentrations with a UJ for: antimony (SW-18, SW-21, SW-22) and silver (SW-22).

J[2] - Estimate (UJ) non-detected results and (J) positive results due % recoveries of CRDL < 80% or > 120%. Estimated results and detection limits are biased low for cadmium and high for antimony.

J[3] - Estimate (J) positive results and (UJ) nondetected results due to low matrix spike recovery. Sample results and detection limits are biased low.

J[4] - Estimate (J) positive results and (UJ) nondetected results due to poor post-digestion spike recoveries for arsenic (all samples except SW-18 and SW-23), selenium (SW-21, SW-24), and thallium (all samples except SW-24). Estimated results and detection limits are biased low.

J[6] - Estimate (J) positive results that are > IDL but < 2xIDL due to the possibility of false positive and uncertainty near the instrument detection limit for copper (SW-18, SW-22, SW-24) and lead (SW-19, SW-21, SW-22, SW-23).

INDUSTRI-PLEX
PROJECT #s: 16790 and 16811
SEDIMENT SAMPLES

TABLE Ic - Recommendation Summary for Sediment Samples

Aluminum	$J^{4,8}$, R^{2}	Magnesium	J^{8}, R^{2}
Antimony	$J^{1,2,8}$, $R^{1,2,3}$	Manganese	$J^{3,4,7,8}$, R^{2}
Arsenic	J^{8}, R^{2}	Mercury	J^{8}, R^{2}
Barium	$J^{7,8}$, R^{2}	Nickel	J^{8}, R^{2}
Beryllium	J^{8}, $R^{2,3}$	Potassium	J^{8}, $R^{2,3}$
Cadmium	$J^{2,3,4,8}$, R^{2}	Selenium	$J^{3,5,6,8}$, R^{2}
Calcium	J^{8}, R^{2}	Silver	$J^{1,8}$, R^{2}
Chromium	$J^{4,8}$, R^{2}	Sodium	A^{1}, $J^{1,8}$, $R^{1,2}$
Cobalt	J^{8}, R^{2}	Thallium	$J^{5,8}$, $R^{2,3}$
Copper	$J^{3,4,8}$, R^{2}	Vanadium	J^{8}, R^{2}
Iron	$J^{4,8}$, R^{2}	Zinc	$J^{1,4,8}$, R^{2}
Lead	$J^{4,8}$, R^{2}		

See Codes on following page.

INDUSTRI-PLEX
PROJECT #s: 16790 and 16811
SEDIMENT SAMPLES

TABLE Ic - Recommendation Summary for Sediment Samples
(Continued)

Codes:

If the field is left blank, the qualifier is A - Accept all data.

A[1] - Accept all data, but consider positive results > 2xIDL and < blank action level as nondetect because false positives are expected due to blank contamination. Report the sample concentrations with a U for: sodium (SED-19, SED-23).

J[1] - Consider positive results < 2x IDL and < blank action level as nondetect and estimated due to the possibility of false positive and uncertainty near the instrument detection limit. Report the sample concentrations with a UJ for: antimony (all samples except SED-21), silver (all samples except SED-100), sodium (SED-21, SED-24), and zinc (SED-19).

J[2] - Estimate (J) positive results and (UJ) nondetects due % recoveries of CRDL < 80% or > 120% for the following sample analytes: antimony (all samples) and cadmium (SED-19, SED-24, SED-100). Estimated results and detection limits are biased high for antimony and low for cadmium.

J[3] - Estimate (J) positive results and (UJ) nondetected results due to low matrix spike recovery. Sample results and detection limits are biased low for cadmium, copper, manganese, and selenium.

J[4] - Estimate (J) positive results due to poor laboratory duplicate precision for aluminum, cadmium, chromium, copper, iron, lead, manganese, and zinc. Additionally, iron and manganese did not meet precision criteria in the field duplicate pair.

J[5] - Estimate (J) positive results and (UJ) nondetected results due to poor post-digestion spike recoveries for selenium (SED-18) and thallium (all samples except SED-19). Estimated results and detection limits are biased low.

J[6] - Estimate (J) positive result due to low correlation coefficient in MSA quantitation for selenium in sample SED-23.

J[7] - Estimate (J) positive results due to estimated interferences from iron. Estimated results are biased high for barium (SED-21) and manganese (SED-23).

J[8] - Estimate (J) all positive results for samples SED-21 and SED-23 due to low percent solids (< 30% but > 10%).

INDUSTRI-PLEX
PROJECT #s: 16790 and 16811
SEDIMENT SAMPLES

TABLE Ic - Recommendation Summary for Sediment Samples
(Continued)

Codes (continued):

R^1 - Reject (R) positive results due to interference from iron in the affected sample. It is expected that the entire reported concentration is due to a positive interference effect for antimony (SED-18, SED-23) and sodium (SED-21, SED-23).

R^2 - Reject (R) all data for sample SED-22 due to extremely low percent solids (8.1%). Data are unreliable.

R^3 - Reject (R) all nondetects for samples SED-21 and SED-23 due to low percent solids (< 30%). Action affects antimony, beryllium, and potassium in SED-21 and thallium in SED-23.

Site: Industri-Plex
Laboratory: Enseco East
File: ROUXMAD

CLP INORGANIC ANALYSIS
Project #s: 16790 and 16811
AQUEOUS ANALYTICAL RESULTS (ug/L) - DISSOLVED METALS

Sample Location				SW-18	SW-19	SW-21	SW-22	SW-23	SW-24	SW-100	FB-1
Remarks (Dissolved Metals)										Dup. of SW-19	Field Blank Dissolved
Sampling Date				10/02/91	10/02/91	10/03/91	10/03/91	10/03/91	10/02/91	10/02/91	10/03/91
Dilution Factor				1	1	1	1	1	1	1	1
INORGANIC ANALYTES		IDL (ug/L)	CRDL (ug/L)	Tl at 5x Dilution	As at 5x Dilution	As at 5x Dilution			As at 5x Dilution	As at 5x Diltuion	
Aluminum	P	43.0	200	136					74.2	108	
Antimony	P	24.0	60	34.6 UJ	UJ	26.2 UJ	44.2 UJ	UJ	UJ	UJ	31.3 J
Arsenic	F	1.0	10		5.0 UJ	7.5 J	6.5 J	9.0	10.5 J	5.0 UJ	
Barium	P	1.0	200	26.8	25.8	31.6	31.1	32.2	24.3	28.3	3.1
Beryllium	P	1.0	5								
Cadmium	P	3.0	5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ
Calcium	P	41.0	5000	30700	22000	32300	31300	33100	30300	22400	261
Chromium	P	8.0	10	15.6							
Cobalt	P	5.0	50	7.4							
Copper	P	4.0	25	6.7 J	8.4	9.0	6.8 J		5.7 J	10.1	
Iron	P	10.0	100	361	421	689	898	749	721	446	
Lead	F	1.0	3		1.9 J	1.6 J	1.1 J	1.2 J	2.2	2.2	
Magnesium	P	73.0	5000	5570	3870	5560	5330	5640	5670	4010	
Manganese	P	2.0	15	753	40.6	380	460	503	161	45.2	
Mercury	CV	0.1	0.2								
Nickel	P	13.0	40	108					126		
Potassium	P	1009	5000	4940	3930	6030	4960	5610	3380	4140	
Selenium	F	2.0	5			UJ			UJ		
Silver	P	4.0	10				4.3 UJ				
Sodium	P	53.0	5000	107000	36300	46800	40700	42900	31700	36100	1680
Thallium	F	2.0	10	10.0 UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ
Vanadium	P	6.0	50								
Zinc	P	3.0	20	23.8	17.3	89.0	106	121	23.8	29.8	

Analytical Method
F Furnace AA
P ICP
CV Cold Vapor AA

J - The associated numerical value is an estimated quantity.
U - The analyte is considered not detected. The associated numerical value is the sample detection limit.
UJ - The analyte was not detected. The sample detection limit is an estimated value.
R - The datum was rejected.
" " - The blank space indicates the analyte was not detected.
IDL - Instrument Detection Limit.
CRDL - Contract Required Detection Limit.

Site: Industri-Plex
Laboratory: Enseco East
File: ROUXMAD

CLP INORGANIC ANALYSIS
Project #s: 16790 and 16811
AQUEOUS ANALYTICAL RESULTS (ug/L) - DISSOLVED METALS

Sample Location				SW-18	SW-19	SW-21	SW-22	SW-23	SW-24	SW-100	FB-1
Remarks (Dissolved Metals)										Dup. of SW-19	Field Blank Dissolved
Sampling Date				10/02/91	10/02/91	10/03/91	10/03/91	10/03/91	10/02/91	10/02/91	10/03/91
Dilution Factor				1	1	1	1	1	1	1	1
INORGANIC ANALYTES		IDL (ug/L)	CRDL (ug/L)	As, Tl at 5x Dilution	As at 5x Dilution	As at 5x Dilution			As at 5x Dilution	As at 5x Diltuion	
Aluminum	P	43.0	200	136					74.2	108	
Antimony	P	24.0	60	34.6 UJ	UJ	26.2 UJ	44.2 UJ	UJ	UJ	UJ	31.3 J
Arsenic	F	1.0	10	5.0 U	5.0 UJ	7.5 J	6.5 J	9.0	10.5 J	5.0 UJ	
Barium	P	1.0	200	26.8	25.8	31.6	31.1	32.2	24.3	28.3	3.1
Beryllium	P	1.0	5								
Cadmium	P	3.0	5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ
Calcium	P	41.0	5000	30700	22000	32300	31300	33100	30300	22400	261
Chromium	P	8.0	10	15.6							
Cobalt	P	5.0	50	7.4							
Copper	P	4.0	25	6.7 J	8.4	9.0	6.8 J		5.7 J	10.1	
Iron	P	10.0	100	361	421	689	898	749	721	446	
Lead	F	1.0	3		1.9 J	1.6 J	1.1 J	1.2 J	2.2	2.2	
Magnesium	P	73.0	5000	5570	3870	5560	5330	5640	5670	4010	
Manganese	P	2.0	15	753	40.6	380	460	503	161	45.2	
Mercury	CV	0.1	0.2								
Nickel	P	13.0	40	108					126		
Potassium	P	1009	5000	4940	3930	6030	4960	5610	3380	4140	
Selenium	F	2.0	5			UJ			UJ		
Silver	P	4.0	10				4.3 UJ				
Sodium	P	53.0	5000	107000	36300	46800	40700	42900	31700	36100	1680
Thallium	F	2.0	10	10.0 UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ
Vanadium	P	6.0	50								
Zinc	P	3.0	20	23.8	17.3	89.0	106	121	23.8	29.8	

Analytical Method
F Furnace AA
P ICP
CV Cold Vapor AA

J - The associated numerical value is an estimated quantity.
U - The analyte is considered not detected. The associated numerical value is the sample detection limit.
UJ - The analyte was not detected. The sample detection limit is an estimated value.
R - The datum was rejected.
" " - The blank space indicates the analyte was not detected.
IDL - Instrument Detection Limit.
CRDL - Contract Required Detection Limit.

Site: Industri-Plex
Laboratory: ENSECO-East
File: ROUXMAT

CLP INORGANIC ANALYSIS
Project #s: 16790 and 16811
AQUEOUS ANALYTICAL RESULTS (ug/L) - TOTAL METALS

Sample Location				SW-18	SW-19	SW-21	SW-22	SW-23	SW-24	SW-100	FB-1 SED
Remarks (Total Metals)										Dup. of SW-19	Field Blank Sediments
Sampling Date				10/02/91	10/02/91	10/03/91	10/03/91	10/03/91	10/02/91	10/02/91	10/03/91
Dilution Factor				1	1	1	1	1	1	1	1
INORGANIC ANALYTES		IDL (ug/L)	CRDL (ug/L)								
Aluminum	P	43.0	200	1640	75.5	123	92.7	103	85.2	82.7	
Antimony	P	24.0	60	32.4 UJ	37.1 UJ	UJ	UJ	30.6 UJ	UJ	UJ	27.3 J
Arsenic	F	1.0	10	3.6		14.6	13.1	14.5	12.6		1.3 J
Barium	P	1.0	200	25.7	27.8	31.8	31.8	31.6	24.8	27.6	4.0
Beryllium	P	1.0	5								
Cadmium	P	3.0	5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ
Calcium	P	41.0	5000	28900	20400	30300	31700	31800	28400	20800	132
Chromium	P	8.0	10	195	10.9	14.6	12.3	10.9	8.5		
Cobalt	P	5.0	50	9.5							
Copper	P	4.0	25	9.6 U	32.4	15.3 U	15.4 U	16.3 U	10.6 U	11.1 U	5.0 J
Iron	P	10.0	100	1760 J	607 J	1700 J	2530 J	2310 J	1090 J	609 J	193 J
Lead	F	1.0	3	1.1 UJ	3.6 U	4.3 U	3.7 U	3.6 U	4.0 U	5.0 U	1.2 J
Magnesium	P	73.0	5000	5130	3550	5160	5270	5300	5180	3590	
Manganese	P	2.0	15	777	48.5	380	497	489	170	48.7	4.5
Mercury	CV	0.1	0.2								
Nickel	P	13.0	40		13.5 J						
Potassium	P	1009	5000	4960	4420	4840	5260	5260	3130	3670	
Selenium	F	2.0	5	UJ							
Silver	P	4.0	10								
Sodium	P	53.0	5000	94200	28500	40200	40700	40800	23600	29000	
Thallium	F	2.0	10	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ
Vanadium	P	6.0	50								
Zinc	P	3.0	20	28.2	28.7	206	206	193	46.9	28.8	33.1

Analytical Method
F Furnace AA
P ICP
CV Cold Vapor AA

J - The associated numerical value is an estimated quantity.
U - The analyte is considered not detected due to blank contamination. The associated numerical value is the sample detection limit.
UJ - The analyte was not detected. The sample detection limit is an estimated value.
R - The datum was rejected.
" " - The blank space indicates the analyte was not detected.
IDL - Instrument Detection Limit.
CRDL - Contract Required Detection Limit.

Site: Industri-Plex
Laboratory: Enseco-East

File: ROUXMSR.WK1

CLP INORGANIC ANALYSIS
PROJECT #s: 16790 and 16811
SOIL ANALYTICAL RESULTS (mg/Kg)

Sample Location		SED-18	SED-19	SED-21	SED-22	SED-23	SED-24	SED-100		
Remarks								Dup. of SED-19		
Sampling Date		10/02/91	10/02/91	10/03/91	10/03/91	10/03/91	10/02/91	10/02/91		
Percent Solid		37.0%	63.1%	12.1%	8.1%	20.9%	42.9%	71.6%		
Dilution Factor		1.0	1.0	1.0	1.0	1.0	1.0	1.0		
INORGANIC ANALYTES										
Aluminum	P	16600 J	2880 J	8840 J	R	24500 J	8000 J	3160 J		
Antimony	P	R	8.8 UJ	R	R	R	18.5 UJ	7.6 UJ		
Arsenic	F	80.0	4.1	607 J	R	791 J	91.5	3.0		
Barium	P	38.4	13.4	63.3 J	R	91.6 J	41.9	18.5		
Beryllium	P	2.3		R	R	1.6 J	0.63			
Cadmium	P	1.6 J	UJ	26.8 J	R	32.5 J	4.2 J	UJ		
Calcium	P	3000	889	6350 J	R	5660 J	3080	1550		
Chromium	P	1530 J	24.9 J	441 J	R	2180 J	116 J	30.1 J		
Cobalt	P	13.4	2.4	52.1 J	R	39.0 J	8.3	1.7		
Copper	P	34.8 J	13.0 J	650 J	R	2450 J	112 J	20.2 J		
Iron	P	33900 J	4710 J	97500 J	R	69400 J	17600 J	4500 J		
Lead	F	46.5 J	25.3 J	294 J	R	348 J	108 J	26.1 J		
Magnesium	P	1100	959	1490 J	R	1270 J	2400	830		
Manganese	P	216 J	108 J	1820 J	R	854 J	229 J	189 J		
Mercury	CV			0.91 J	R	5.7 J	2.4			
Nickel	P	21.7	6.8	42.6 J	R	34.2 J	16.3	6.9		
Potassium	P		580	R	R	978 J	1090	273		
Selenium	F	UJ	UJ	3.6 J	R	8.1 J	1.0 J	UJ		
Silver	P	3.2 UJ		7.4 UJ	R	5.5 UJ	6.7 UJ			
Sodium	P		130 U	R	R	R	33.5 UJ			
Thallium	F	UJ		3.3 UJ	R	R	UJ	UJ		
Vanadium	P	27.4	7.6	36.0 J	R	48.6 J	32.2	8.0		
Zinc	P	175 J	46.0 UJ	5730 J	R	5630 J	387 J	55.8 J		

Analytical Method
F Furnace AA
P ICP
CV Cold Vapor AA

Sample Results are reported on dry weight basis.
J - The associated numerical value is an estimated quantity.
U - The analyte is considered nondetected due to blank contamination. The associated numerical value is the sample detection limit.
UJ - The analyte was not detected. The sample detection limit is an estimated value.
" " - The blank space indicates the analyte was not detected.
R - The datum was rejected.

Site: Industri-Plex
Laboratory: Enseco-East

File: ROUXMSID.WK1

CLP INORGANIC ANALYSIS
PROJECT #s: 16790 and 16811
SOIL SAMPLE DETECTION LIMITS (mg/Kg)

Sample Location			SED-18	SED-19	SED-21	SED-22	SED-23	SED-24	SED-100		
Remarks									Dup. of SED-19		
Sampling Date			10/02/91	10/02/91	10/03/91	10/03/91	10/03/91	10/02/91	10/02/91		
Percent Solid			37.0%	63.1%	12.1%	8.1%	20.9%	42.9%	71.6%		
Dilution Factor			1.0	1.0	1.0	1.0	1.0	1.0	1.0		
INORGANIC ANALYTES		IDL (ug/L)	As 5x, Pb 10x Dilutions	Pb 10x Dilution	As 5x, Pb 10x Dilutions	Pb 10x Dilution	As 20x,Pb 10x Dilutions	As 5x,Pb 10x Dilutions	Pb 2x Dilution		
Aluminum	P	43.0	23.2	13.6	71.1	R	41.1	20.0	12.0		
Antimony	P	24.0	R	8.8 UJ	R	R	R	18.5 UJ	7.6 UJ		
Arsenic	F	1.0	2.7	0.32	8.3	R	19.1	2.3	0.28		
Barium	P	1.0	0.54	0.32	1.7	R	1.0	0.47	0.28		
Beryllium	P	1.0	0.54	0.32	R	R	0.96	0.47	0.28		
Cadmium	P	3.0	1.6	0.95 UJ	5.0	R	2.9	1.4	0.84 UJ		
Calcium	P	41.0	22.2	13.0	67.8	R	39.2	19.1	11.5		
Chromium	P	8.0	4.3	2.5	13.2	R	7.7	3.7	2.2		
Cobalt	P	5.0	2.7	1.6	8.3	R	4.8	2.3	1.4		
Copper	P	4.0	2.2	1.3	6.6	R	3.8	1.9	1.1		
Iron	P	10.0	5.4	3.2	16.5	R	9.6	4.7	2.8		
Lead	F	1.0	5.4	3.2	16.5	R	9.6	4.7	0.56		
Magnesium	P	73.0	39.5	23.1	121	R	69.9	34.0	20.4		
Manganese	P	2.0	1.1	0.63	3.3	R	1.9	0.93	0.56		
Mercury	CV	0.2	0.27	0.16	0.83	R	0.48	0.23	0.14		
Nickel	P	13.0	7.0	4.1	21.5	R	12.4	6.1	3.6		
Potassium	P	1009	545	320	R	R	966	470	282		
Selenium	F	2.0	1.1 UJ	0.63 UJ	3.3	R	1.9	0.93	0.56 UJ		
Silver	P	4.0	3.2 UJ	1.3	7.4 UJ	R	5.5 UJ	6.7 UJ	1.1		
Sodium	P	53.0	28.6	130 U	R	R	R	33.5 UJ	14.8		
Thallium	F	2.0	1.1 UJ	0.63	3.3 UJ	R	R	0.93 UJ	0.56 UJ		
Vanadium	P	6.0	3.2	1.9	9.9	R	5.7	2.8	1.7		
Zinc	P	3.0	1.6	46.0 UJ	5.0	R	2.9	1.4	0.84		

Analytical Method
F Furnace AA
P ICP
CV Cold Vapor AA

Sample Detection Limits are reported on dry weight basis and calculated from the IDL.
U - The analyte is considered nondetected due to blank contamination.
The associated numerical value is the sample detection limit.
UJ - The analyte was not detected. The sample detection limit is an estimated value.
IDL - Instrument Detection Limit.
R - The datum was rejected.

Site: Industri-Plex
Laboratory: Enseco-East

File: ROUXMSCD.WK1

CLP INORGANIC ANALYSIS
PROJECT #s: 16790 and 16811
SOIL CONTRACT REQUIRED DETECTION LIMITS (mg/Kg)

Sample Location			SED-18	SED-19	SED-21	SED-22	SED-23	SED-24	SED-100		
Remarks									Dup. of SED-19		
Sampling Date			10/02/91	10/02/91	10/03/91	10/03/91	10/03/91	10/02/91	10/02/91		
Percent Solid			37.0%	63.1%	12.1%	8.1%	20.9%	42.9%	71.6%		
Dilution Factor			1.0	1.0	1.0	1.0	1.0	1.0	1.0		
INORGANIC ANALYTES		CRDL (mg/kg)									
Aluminum	P	40.0	108	63.4	331	494	191	93.2	55.9		
Antimony	P	12.0	32.4	19.0	99.2	148	57.4	28.0	16.8		
Arsenic	F	2.0	5.4	3.2	16.5	24.7	9.6	4.7	2.8		
Barium	P	40.0	108	63.4	331	494	191	93.2	55.9		
Beryllium	P	1.0	2.7	1.6	8.3	12.3	4.8	2.3	1.4		
Cadmium	P	1.0	2.7	1.6	8.3	12.3	4.8	2.3	1.4		
Calcium	P	1000	2703	1585	8264	12346	4785	2331	1397		
Chromium	P	2.0	5.4	3.2	16.5	24.7	9.6	4.7	2.8		
Cobalt	P	10.0	27.0	15.8	82.6	123	47.8	23.3	14.0		
Copper	P	5.0	13.5	7.9	41.3	61.7	23.9	11.7	7.0		
Iron	P	20.0	54.1	31.7	165.3	247	95.7	46.6	27.9		
Lead	F	0.60	1.6	1.0	5.0	7.4	2.9	1.4	0.84		
Magnesium	P	1000	2703	1585	8264	12346	4785	2331	1397		
Manganese	P	3.0	8.1	4.8	24.8	37.0	14.4	7.0	4.2		
Mercury	CV	0.10	0.27	0.16	0.83	1.2	0.48	0.23	0.14		
Nickel	P	8.0	21.6	12.7	66.1	98.8	38.3	18.6	11.2		
Potassium	P	1000	2703	1585	8264	12346	4785	2331	1397		
Selenium	F	1.0	2.7	1.6	8.3	12.3	4.8	2.3	1.4		
Silver	P	2.0	5.4	3.2	16.5	24.7	9.6	4.7	2.8		
Sodium	P	1000	2703	1585	8264	12346	4785	2331	1397		
Thallium	F	2.0	5.4	3.2	16.5	24.7	9.6	4.7	2.8		
Vanadium	P	10.0	27.0	15.8	82.6	123	47.8	23.3	14.0		
Zinc	P	4.0	10.8	6.3	33.1	49.4	19.1	9.3	5.6		

Analytical Method
F Furnace AA
P ICP
CV Cold Vapor AA

Sample contract required detection limits are reported on dry weight basis and are calculated using the CRDL.
CRDL - Contract Required Detection Limit reported as mg/kg.
R - The datum was rejected.

REGION I
Data Review Worksheets

Site Name INDUSTRI-PLEX
Reference Number

REGION I REVIEW OF INORGANIC CONTRACT LABORATORY DATA PACKAGE

The hardcopied (laboratory name) ENSECO-EAST data package received at Region I has been reviewed and the quality assurance and performance data summarized. The data review included:

(lab proj. #s)
Case No. 16790 and 16811 SAS No. / Sampling Date(s) 10/2/91, 10/3/91
SDG. No. Matrix WATER Shipping Date(s) 10/2/91, 10/3/91
No. of Samples 23 (total + dissolved waters + soils). and SOIL Date Rec'd by Lab 10/3/91,

Traffic Report Nos: FB-1, SW-100, SW-18, SW-19, SW-21, SW-22, SW-23, SW-24, SED-100, SED-18, SED-19, SED-21, SED-22, SED-23, SED-24
Trip Blank No.:
Equipment Blank No.: "Field Blank 1 - sediments", "Field Blank 1 - water" (dissolved)
Field Dup Nos: SW-19 and SW-100 ; SED-19 and SED-100

SOW No. 3/90 requires that specific analytical work be done and that associated reports be provided by the laboratory to the Regions, EMSL-LV, and SMO. The general criteria used to determine the performance were based on an examination of:

- Data Completeness
- Holding Times
- Calibrations
- Blanks
- ICP Interference Check Results
- Matrix Spike Recoveries
- Laboratory Duplicates
- Field Duplicates
- Lab Control Sample Results
- Furnace AA Results
- ICP Serial Dilution Results
- Detection Limit Results
- Sample Quantitation

Overall Comments: low % solids on several sediment samples caused values to be rejected (R) or estimated (J); very poor precision and MS recoveries for sediments caused majority of reported data to be qualified (J). Blank contamination from lab and field blanks caused sample results to be considered nondetects with the detection limit raised for antimony, copper, lead, and silver in the waters and antimony, silver, sodium, and zinc for the sediments.

Definitions and Qualifiers:

A - Acceptable data.
J - Approximate data due to quality control criteria.
R - Reject data due to quality control criteria.
U - Analyte not detected.

Reviewer: Judy Pierre-Antoine Ligonde Date: 2/4/92
Chapnick 3/3/92.

REGION I
Data Review Worksheets

I. DATA COMPLETENESS

MISSING INFORMATION	DATE LAB CONTACTED	DATE REC'D
Analysis Run logs.	1/14/92	1/28/92
~~Log #~~		
Background Correction not used before analysis.		
ICSA not reported for all elements.		
Linear range incorrect for sodium		
% solids incorrectly reported on all soil samples; laboratory reported % moisture in error.	Requested 2/19/92 resubmittal of all Form Is and MS and Duplicate page for soils.	Received 2/18/92 and 2/28/92
Inconsistent mercury IDLs listed		

see attached resubmittal request

Request for Information/Resubmission

Data Validator:	**Gradient Corporation**	Date of Request:	**January 14, 1992**
Laboratory:	**Enseco - East**	Analysis:	**Metals**
SDG:	**SED-18**	Date Submitted:	**October 31, 1991**
CASE #:	**16790**	CLIENT:	**Roux**

✓ 1. **Missing Form XIV for all analyses.**
Please submit the Analysis Run Logs (Form XIV) for all ICP, furnace, and CV analyses performed with this case as required under CLP SOW 3/90 protocols.

✓ 2. **Resubmit corrected Form IV.**
Please resubmit corrected Form IV for the ICP Interference Check sample. CLP SOW 3/90 requires that all analyte values be reported. "For All found values of solutions A and AB, enter the concentration (positive, negative, or zero) of each analyte at each wavelength used for analysis by ICP," pg. B-26 of CLP SOW 3/90 (ILM01.0). These data are required to assess false positives and negatives that may be associated with the reported sample values due to interelement interferences that are not fully corrected by your IECs.

✓ 3. **Resubmit corrected Form XII.**
This linear range quarterly form indicates that the linear range for sodium is 100 ug/L. This is probably a typo, given the higher linear ranges you list for other analytes. Please correct this form with the linear range for sodium that was employed during these analyses.

✓ 4. **Request for Information - solid LCS source.**
Please include information on your solid LCS source since it was not obtained by EPA. The source listed on the forms is "JTBaker". Is this a solid or aqueous LCS matrix? How were the control limits derived?

✓ 5. **Request for Information - cover page.**
Please explain why background corrections were not applied during the ICP analyses. Usually, for a simultaneous ICP such as the one used for these analyses, background corrections are automatically applied during data aquisition. If this is an error, please resubmit corrected cover page with "Yes" indicated for background correction. If this is not an error, please submit justifications for not applying background corrections for all wavelenghts used.

✓ 6. **Request for Information - pH checks.**
Please provide information that the pH of all water samples were checked prior to preparation for metals analyses. A single pH value for a water sample is reported in the Wet Chemistry section of the data package for sample FB-1 (lab ID# 016811-0004-FB).

Thank you for your prompt attention to these issues.

Gradient Corporation

[redacted]

TELECOPIER TRANSMISSION

To: Martha Smith Date: 2/19/92

Company: Roux

Fax #: 516 - 673 - 7216

From: Susan Chapnick

Gradient Proposal/Project #: 91091

Total Number of Pages Sent (including cover sheet): 4

Comments: Here are the forms that need to be redone by Ensico-East. I have marked them with comments explaining what needs to be fixed.

Sent by: SAC

Verification #: (617)576-1555

Gradient Telecopier #: (617) 864-8469

U.S. EPA - CLP

5A
SPIKE SAMPLE RECOVERY

EPA SAMPLE NO.

Lab Name: ENSECO_EAST Contract: ROUX_ASSOC SED-23S

Lab Code: ENSECO Case No.: ____ SAS No.: ____ SDG No.: 16790_

Matrix: SOIL Level (low/med): LOW

% Solids for Sample: 79.1 incorrect should be 20.9%

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

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum									NR
Antimony	75-125	133.8748		11.7697	B	126.42	96.6		P
Arsenic		141.0872		208.8799		10.11	-670.6		F
Barium	75-125	498.9034		24.1942	B	508.69	93.9		P
Beryllium	75-125	11.8582		0.4346	B	12.64	90.4		P
Cadmium	75-125	16.4531		8.5760		12.64	62.3	N	P
Calcium									NR
Chromium		274.8880		575.4619		50.57	-594.4		P
Cobalt	75-125	120.6048		10.3082	B	126.42	87.2		P
Copper		239.0056		646.1694		63.21	-644.1		P
Iron									NR
Lead		52.0860		92.0354		5.06	-789.5		F
Magnesium									NR
Manganese	75-125	244.1798		225.5643		126.42	14.7	N	P
Mercury	75-125	2.1966		1.4949		0.63	111.4		CV
Nickel	75-125	120.9530		9.0475	B	126.42	88.5		P
Potassium									NR
Selenium	75-125	3.5145		2.1492		2.53	54.0	N	F
Silver	75-125	13.4341		1.4657	B	12.64	94.7		P
Sodium									NR
Thallium	75-125	12.8698		0.5057	U	12.64	101.8		F
Vanadium	75-125	137.1494		12.8521		126.42	98.3		P
Zinc		974.6088		1487.2129		126.42	-405.5		P
Cyanide									NR

Comments: recalculate with correct % solids.
PLANTS

FORM V (Part 1) - IN 3/90

U.S. EPA - CLP

6
DUPLICATES

EPA SAMPLE NO

SED-23D

Lab Name: ENSECO_EAST Contract: ROUX_ASSOC

Lab Code: ENSECO Case No.: ____ SAS No.: ____ SDG No.: 16790

Matrix (soil/water): SOIL Level (low/med): LOW

% Solids for Sample: 79.1 incorrect should be: 20.9% % Solids for Duplicate: 77 incorrect should be 22.3

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

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Aluminum		6470.5661		2125.4635		101.1	*	P
Antimony		11.7697	B	7.7161	B	41.6		P
Arsenic		208.8799		148.6726		33.7	*	F
Barium		24.1942	B	11.6526	B	70.0		P
Beryllium		0.4346	B	0.2528	U	200.0		P
Cadmium	1.3	8.5760		3.9042		74.9	*	P
Calcium	1264.2	1495.3039		902.0207	B	49.5		P
Chromium		575.4619		205.3482		94.8	*	P
Cobalt		10.3082	B	5.5482	B	60.0		P
Copper		646.1694		150.2000		124.6	*	P
Iron		18344.2536		8298.9381		75.4	*	P
Lead		92.0354		31.8584		97.1	*	F
Magnesium		335.1681	B	221.2650	B	40.9		P
Manganese		225.5643		123.7828		58.3	*	P
Mercury		1.4949		1.4020		6.4		CV
Nickel		9.0475	B	4.7322	B	62.6		P
Potassium		258.3654	B	304.5992	B	16.4		P
Selenium	1.3	2.1492		0.9861	B	74.2		F
Silver		1.4657	B	1.0114	U	200.0		P
Sodium		58.6728	B	25.0913	B	80.2		P
Thallium		0.5057	U	0.5057	U			F
Vanadium	12.6	12.8521		6.5461	B	65.0		P
Zinc		1487.2129		789.5082		61.3	*	P
Cyanide								NR

recalculate with correct % solids

FORM VI - IN

3/90

REGION 1
Data Review Worksheets

II. HOLDING TIMES

Complete table for all samples and circle the analysis date for samples not within criteria.

SAMPLE ID	DATE SAMPLED	HG DATE ANALYSIS *	CYANIDE DATE ANALYSIS	OTHERS DATE ANALYSIS	pH	ACTION
SW-18	10/02/91	10/8/91 AD 10/9/91 AT.	NA	ICP 10/16/91 As 10/9/91 (AD)	pH<2	no action
SW-19	10/02/91	10/8/91 and 10/9/91		10/10/91 (AT) 10/11/91 Se 10/9/91 AD		
SW-21	10/03/91	10/8/91 and 10/11/91	FOR ALL analyses	10/11/91 (AT) 10/17/91 S		
SW-22	10/03/91	10/8/91 and 10/11/91		Pb. 10/10/91 10/11/91 S		
SW-23	10/03/91	10/8/91 and 10/11/91		Tl 10/17/91 AT 10/17/91 ADS.		
SW-24	10/02/91	10/8/91 10/9/91 and				
SW-100	10/02/91	10/8/91 and 10/9/91				
FB-1 (dissolved)	10/ /91	~~10/8/91~~ AWC 10/9/91 2/11/92				
SED-18	10/02/91	10/11/91			N/A	
SED-19	10/02/91	10/11/91				
SED-21	10/03/91	10/11/91				
SED-22	10/03/91	10/11/91				
SED-23	10/03/91	10/11/91				
SED-24	10/02/91	10/11/91				
SED-100	10/02/91	10/11/91				
FB-1 (sed. field BLK)	10/03/91	10/8/91			pH<2 OK	

METALS - 180 DAYS FROM SAMPLE COLLECTION
MERCURY - 28 DAYS FROM SAMPLE COLLECTION
CYANIDE - 14 DAYS FROM SAMPLE COLLECTION

ACTION:

1. If holding times are exceeded all positive results are estimated (J) and non-detects are estimated (UJ).

2. If holding times are grossly exceeded, the reviewer may determine that non-detects are unusable (R).

* "AD" = Aqueous dissolved metals
"AT" = Aqueous total metals.

REGION I
Data Review worksheets

III A. INSTRUMENT CALIBRATION (Section 1)

1. Recovery Criteria ALL ICVs ARE within CRiteRia.

List the analytes which did not meet the percent recovery (%R) criteria for Initial or Continuing Calibration.

DATE	ICV/CCV#	ANALYTE	%R	ACTION	SAMPLES AFFECTED

ACTIONS:

If any analyte does not meet the %R criteria follow the actions stated below:

For Positive Results:

	Accept	Estimate (J)	Reject (R)
Metals	90-110%R	75-89%R, 111-125%R	<75%R, >125%R
Mercury	80-120%R	65-79%R, 121-135%R	<65%R, >135%R
Cyanide	85-115%R	70-84%R, 116-130%R	<70%R, >130%R

For Non-detected Results:

	Accept	Estimate (UJ)	Reject (R)
Metals	90-125%R	75-89%R	<75%R, >125%R
Mercury	80-135%R	65-79%R	<65%R, >135%R
Cyanide	85-130%R	70-84%R	<70%R, >130%R

REGION I
Data Review Worksheets

III B. INSTRUMENT CALIBRATION (Section 2)

2. Analytical Sequence

A. Did the laboratory use the proper number of standards for calibration as described in the SOW? **Yes** or No

B. Were calibrations performed at the beginning of each analysis? **Yes** or No

C. Were calibration standards analyzed at the beginning of sample analysis and at a minimum frequency of ten percent or every two hours during analysis, whichever is more frequent? **Yes** or No

D. Were the correlation coefficients for the calibration curves for AA, Hg, and CN $\geq$ 0.995? **Yes** or No

E. Was a standard at 2xCRDL analyzed for all ICP analyses? **Yes** or No

If No,

The data may be affected. Use professional judgement to determine the severity of the effect and qualify the data accordingly. Discuss any actions below and list the samples affected.

CRDL standard analyses did not meet criteria of 80-120% recovery for cadmium - final CRI 77.3% Action: J(+) UJ (nondetects)
antimony - final CRI 125.2% : J(+) ~~on to~~ UJ(ND)

3/3/92

Actions affect samples SED-A, SED-24, SED-100 and all waters for Cd.
all sediment + water samples for antimony (Sb).

REGION I
Data Review Worksheet

IV A. BLANK ANALYSIS RESULTS (Sections 1-3)

List the blank contamination in Sections 1 & 2 below. A separat worksheet should be used for soil and water blanks.

1. Laboratory Blanks

MATRIX: WATER

DATE	ICB/CCB#	PREP BL	ANALYTE	CONC./UNITS
10/16/91	ICB		Barium	1.1 ug/L
	CCB#1			4.8
	CCB #2			3.1
	CCB #3			3.0
	CCB #4			3.0

2. Equipment/Trip Blanks

DATE	EQUIP BL#	ANALYTE	CONC./UNITS
10/16/91	FB-1 sed lab designated this as "Total"	Antimony	27.3 ug/L
10/10/91		Arsenic	1.3
10/16/91		Barium	4.0
		Calcium	132
		Copper	5.0
10/10/91		Lead	1.2

3. Frequency Requirements

A. Was a preparation blank analyzed for each matrix, for every 20 samples and for each digestion batch? Yes or N

B. Was a calibration blank run every 10 samples or every 2 hours whichever is more frequent? Yes or N

If No,

The data may be affected. Use professional judgement to determine the severity of the effect and qualify the data accordingly. Discuss any actions below, and list the samples affected.

REGION 1
Data Review Worksheet

IV A. BLANK ANALYSIS RESULTS (Sections 1-3)

List the blank contamination in Sections 1 & 2 below. A separate worksheet should be used for soil and water blanks.

1. Laboratory Blanks

MATRIX: WATER/SO

DATE	ICB/CCB#	PREP BL	ANALYTE	CONC./UNITS
10/16/91	CCB#5		Barium	4.3 ug/L
	CCB#6			3.0 ug/L
	CCB#7			3.3 ug/L
		PBW		3.0 ug/L
		PBS		0.592 mg/kg

2. Equipment/Trip Blanks

DATE	EQUIP BL#	ANALYTE	CONC./UNITS
10/16/91	FB-1 Sed	Iron	193 ug/L
10/16/91	FB-1 Sed	Manganese	4.5 ug/L
		zinc	33.1 ug/L
10/16/91	FB-1 dissolved metals	Antimony	31.3 ug/L
		Barium	3.1 ug/L
		Calcium	261 ug/L
		Sodium	1680 ug/L

3. Frequency Requirements

A. Was a preparation blank analyzed for each matrix, for every 20 samples and for each digestion batch? Yes or No

B. Was a calibration blank run every 10 samples or every 2 hours whichever is more frequent? Yes or No

If No,

The data may be affected. Use professional judgement to determine the severity of the effect and qualify the data accordingly. Discuss any actions below, and list the samples affected.

REGION I
Data Review Worksheet

IV A. BLANK ANALYSIS RESULTS (Sections 1-3)

List the blank contamination in Sections 1 & 2 below. A separate worksheet should be used for soil and water blanks.

1. Laboratory Blanks

MATRIX: Water/Soil

DATE	ICB/CCB#	PREP BL	ANALYTE	CONC./UNITS
10/16/91	CCB #3		Antimony	24.2 ug/L
	CCB#7			30.5 ug/L
		PBW		25.1 ug/L
		PBS		5.161 mg/kg
		PBW	Calcium	69.2 ug/L
		PBS	Calcium	9.027 mg/kg

2. Equipment/Trip Blanks

DATE	EQUIP BL#	ANALYTE	CONC./UNITS

3. Frequency Requirements

A. Was a preparation blank analyzed for each matrix, for every 20 samples and for each digestion batch? Yes or No

B. Was a calibration blank run every 10 samples or every 2 hours whichever is more frequent? Yes or No

If No,

The data may be affected. Use professional judgement to determine the severity of the effect and qualify the data accordingly. Discuss any actions below, and list the samples affected.

REGION I
Data Review Worksheet

IV A. BLANK ANALYSIS RESULTS (Sections 1-3)

List the blank contamination in Sections 1 & 2 below. A separate worksheet should be used for soil and water blanks.

1. Laboratory Blanks

MATRIX: Water/Soil

DATE	ICB/CCB#	PREP BL	ANALYTE	CONC./UNITS
10/16/91		PBW	Copper	5.6 ug/L
		PBW	Iron	25.8 ug/L
		PBS	Iron	2.579 mg/Kg
10/10/91		PBW	Lead	1.2 ug/L
10/16/91	CCB#1		Silver	5.1 ug/L
10/16/91		PBS	Silver	0.857 mg/Kg
10/16/91	CCV#7		Silver	4.7 ug/L

2. Equipment/Trip Blanks

DATE	EQUIP BL#	ANALYTE	CONC./UNITS

3. Frequency Requirements

A. Was a preparation blank analyzed for each matrix, for every 20 samples and for each digestion batch? Yes or No

B. Was a calibration blank run every 10 samples or every 2 hours whichever is more frequent? Yes or No

If No,

The data may be affected. Use professional judgement to determine the severity of the effect and qualify the data accordingly. Discuss any actions below, and list the samples affected.

REGION I
Data Review Worksheet

IV A. BLANK ANALYSIS RESULTS (Sections 1-3)

List the blank contamination in Sections 1 & 2 below. A separate worksheet should be used for soil and water blanks.

1. Laboratory Blanks

MATRIX: Water / Soil

DATE	ICB/CCB#	PREP BL	ANALYTE	CONC./UNITS
10/16/91	ICB		Sodium	-117.0 ug/L
	CCB#1			-239.1
	CCB#2			-216.8
	CCB#3			-249.6
	CCB#4			-299.2

2. Equipment/Trip Blanks

DATE	EQUIP BL#	ANALYTE	CONC./UNITS

3. Frequency Requirements

A. Was a preparation blank analyzed for each matrix, for every 20 samples and for each digestion batch? Yes or No

B. Was a calibration blank run every 10 samples or every 2 hours whichever is more frequent? Yes or No

If No,

The data may be affected. Use professional judgement to determine the severity of the effect and qualify the data accordingly. Discuss any actions below, and list the samples affected.

REGION I
Data Review Worksheet

IV A. BLANK ANALYSIS RESULTS (Sections 1-3)

List the blank contamination in Sections 1 & 2 below. A separate worksheet should be used for soil and water blanks.

1. Laboratory Blanks

MATRIX: Water/Soil

DATE	ICB/CCB#	PREP BL	ANALYTE	CONC./UNITS
10/16/91	CCB#5		Sodium	-99.5 ug/L
	CCB#6			-123.3
	CCB#7	~~PBW~~ DC 2/11/92		-153.6
		PBW		-129.3
		PBS		-70.718 mg/kg
10/16/91		PBS	Zinc	1.283 mg/kg

2. Equipment/Trip Blanks

DATE	EQUIP BL#	ANALYTE	CONC./UNITS

3. Frequency Requirements

A. Was a preparation blank analyzed for each matrix, for every 20 samples and for each digestion batch? Yes or No

B. Was a calibration blank run every 10 samples or every 2 hours whichever is more frequent? Yes or No

If No,

The data may be affected. Use professional judgement to determine the severity of the effect and qualify the data accordingly. Discuss any actions below, and list the samples affected.

REGION I
Data Review Worksheets

IV B. BLANK ANALYSIS RESULTS (Section 4)

4. Blank Actions

The Action Levels for any analyte is equal to five times the highest concentration of that element's contamination in any blank. The action level for samples which have been concentrated or diluted should be multiplied by the concentration/dilution factor. No positive sample result should be reported unless the concentration of the analyte in the sample exceeds the Action Level (AL). Specific actions are as follows:

1. When the concentration is greater than the IDL, but less than the Action Level, report the sample concentration detected with a U.

2. When the sample concentration is greater than the Action Level, report the sample concentration unqualified.

MATRIX: WATER

	ELEMENT	MAX. CONC./ UNITS	AL/ UNITS
(diss. FB)	Sb	31.3 ug/L	156 ug/L
(CCB)	Ba	4.8 ug/L	24.0 ug/L
(diss. FB)	Ca	261 ug/L	1300 ug/L
(PB)	Cu	5.6 ug/L	28.0 ug/L
(PB)	Fe	25.8 ug/L	129 ug/L
(PB)	Pb	1.2 ug/L	6.0 ug/L
	Ag	~~4.7~~ 5.1 ug/L	25.5 ug/L

MATRIX: WATER

	ELEMENT	MAX. CONC./ UNITS	AL/ UNITS
(diss. FB)	Na	1680 ug/L	8400 ug/L
total water	Sb	30.5 ug/L	152 ug/L
	Ca	69.2 ug/L	346 ug/L
	Na	299.2 ug/L	1496 ug/L ⇒ 1500 ug/L

NOTE: Blanks analyzed during a soil case must be converted to mg/kg in order to compare them with the sample results.

$$\text{Conc. in ug/L} \times \frac{\text{Volume diluted to (200ml)}}{\text{Weight digested (1gram)}} \times \frac{1\text{L}}{1000\text{ml}} \times \frac{1000\text{gm}}{1\text{kg}} \times \frac{1\text{mg}}{1000\text{ug}} = \text{mg/kg}$$

Multiplying this result by 5 to arrive at the action level gives a final result in mg/kg which can then be compared to sample results.

Note: Roux Assoc. collected a filtered field blank for dissolved metals. No Field Blank was collected for applicable total aqueous metals. Therefore, several analytes have two action levels: one for dissolved metals + one for total metals

IV B. BLANK ANALYSIS RESULTS (Section 4)

4. Blank Actions

The Action Levels for any analyte is equal to five times the highest concentration of that element's contamination in any blank. The action level for samples which have been concentrated or diluted should be multiplied by the concentration/dilution factor. No positive sample result should be reported unless the concentration of the analyte in the sample exceeds the Action Level (AL). Specific actions are as follows:

1. When the concentration is greater than the IDL, but less than the Action Level, report the sample concentration detected with a U.
2. When the sample concentration is greater than the Action Level, report the sample concentration unqualified.

MATRIX: Soil/Sediment

ELEMENT	MAX. CONC./ UNITS	AL/ UNITS
Sb	30.5 ug/L	30.5 mg/Kg
(FB) As	1.3 ug/L	1.3 mg/Kg
Ba	4.8 ug/L	4.8 mg/Kg
(FB) Ca	132 ug/L	132 mg/Kg
(FB) Cu	5.0 ug/L	5.0 mg/Kg
(FB) (PB) Pb	1.2 ug/L	1.2 mg/Kg
(FB) Fe	193 ug/L	193 mg/Kg

MATRIX: Soil/Sediment

ELEMENT	MAX. CONC./ UNITS	AL/ UNITS
Ag	5.1 ug/L	5.1 mg/Kg
(PB) Na	70.718 mg/Kg	354 mg/Kg
(FB) Mn	4.5 ug/L	4.5 mg/Kg
(FB) Zn	33.1 ug/L	33.1 mg/Kg

NOTE: Blanks analyzed during a soil case must be converted to mg/kg in order to compare them with the sample results.

$$\text{Conc. in ug/L} \times \frac{\text{Volume diluted to (200ml)}}{\text{Weight digested (1gram)}} \times \frac{1\text{L}}{1000\text{ml}} \times \frac{1000\text{gm}}{1\text{kg}} \times \frac{1\text{mg}}{1000\text{ug}} = \text{mg/kg}$$

Multiplying this result by 5 to arrive at the action level gives a final result in mg/kg which can then be compared to sample results.

Sediment Actions:

Sb: UJ all (+) results
As: no action
Ba: " "
Ca: no action
Cu: no action
Pb: " "
Fe: " "
Ag: UJ all (+) results
Na: UJ SED-21, SED-24 & SED-M, SED-23
Mn: No action
Zn: SED-19 only

REGION I
Data Review Worksheets

V A. ICP INTERFERENCE CHECK SAMPLE (Sections 1 & 2)

1. Recovery Criteria *All meet criteria.*

List any elements in the ICS AB solution which did not meet the criteria for %R.

DATE	ELEMENT	%R	ACTION	SAMPLES AFFECTED

ACTIONS:

If an element does not meet the %R criteria , follow the actions stated below:

	PERCENT RECOVERY		
	<50%	50-79%	>120%
Positive Sample Results	R	J	J
Non-detected Sample Results	R	UJ	A

2. Frequency Requirements

Were Interference QC samples run at the beginning and end of each sample analysis run or a minimum of twice per 8 hour working shift, whichever is more frequent? Yes or No

If no,

The data may be affected. Use professional judgement to determine the severity of the effect and qualify the data accordingly. Discuss any actions below and list the samples affected.

_____

_____

_____

REGION I
Data Review Worksheets

V B. ICP INTERFERENCE CHECK SAMPLE (Section 3)

3. Report the concentration of any elements detected in the ICS A solution > 2xIDL that should not be present.

ELEMENT	CONC. DETECTED IN THE ICS ug/L	Avg ug/L	CONC. OF INTERFERENTS IN THE ICS AL	CA	FE	MG	
Cr	17	17	499080	~~180940~~ 516120	180940	491260	ug/
Mn	10 / 10	10	↓	↓	↓	↓	
Na	211 / 285	248	↓	↓	↓	↓	
Ba	6 / 5	5.5	↓	↓	↓	↓	
Sb	49 / 71	60	↓	↓	↓	↓	

Estimate the concentration produced by the interfering element in all affected samples. See guidelines for examples. List the samples affected by interferences below: (all ~~any~~ analytes < half the values in the ICS check sample in waters) soils are review below.

SAMPLE AFFECTED	ELEMENT AFFECTED	SAMPLE CONC. mg/kg (ug/L)	SAMPLE INTERFERENT CONC. AL	CA	FE	MG	ESTIMATED INTERF. (ug/L)	Acti
SED-18	Antimony	20.4			(33900 mg/kg)		32.4 mg/kg	R
SED-21	↓	nondetect			(97500 mg/kg)		99.2	No Acti
SED-23	↓	44.5			(69400 mg/kg)		57.4	R
SED-18	Barium	38.4			(33900 mg/kg)		3.0	No Acti

ACTIONS:

1. In general, the sample data can be accepted without qualification if the sample concentrations of Al, Ca, Fe, and Mg are less than 50% of their respective levels in the ICS solution.

2. Estimate (J) positive results for affected elements for samples with levels of interferents 50% or more of that in the ICS solution.

3. Reject (R) positive results if the reported concentration is due entirely to the interfering element.

4. Estimate (UJ) non-detected results for which false negatives are suspect.

Give explanations for any actions taken below:
Estimated interference calculated as follows:
(False positive in ICSA solution) x 200 (prep factor) ÷ % solids = estimated interf. in mg/kg.
If two values were reported for concentration of affected element in ICSA solution, the average was used for the calculations.
Values rejected "R" if estimated interference ≥ value reported for sample.

REGION I
Data Review Worksheets

V B. ICP INTERFERENCE CHECK SAMPLE (Section 3)

3. Report the concentration of any elements detected in the ICS A solution > 2xIDL that should not be present.

ELEMENT	CONC. DETECTED IN THE ICS	CONC. OF INTERFERENTS IN THE ICS			
		AL	CA	FE	MG

Estimate the concentration produced by the interfering element in all affected samples. See guidelines for examples. List the samples affected by interferences below:

SOILS - cont'd

SAMPLE AFFECTED	ELEMENT AFFECTED	SAMPLE CONC. ~~(ug/L)~~ mg/kg	SAMPLE INTERFERENT CONC. mg/kg AL	CA	FE	MG	ESTIMATED INTERF. ~~(ug/L)~~ mg/kg	Action
SED-21	barium	63.3			97500		9.1	
SED-23	↓	91.6			69400		5.3	No Action
SED-18	chromium	1530			33900		9.2	No Action
SED-21	↓	441			97500		28.1	No Action
SED-23		2180			69400		16.3	No Action

ACTIONS:

1. In general, the sample data can be accepted without qualification if the sample concentrations of Al, Ca, Fe, and Mg are less than 50% of their respective levels in the ICS solution.

2. Estimate (J) positive results for affected elements for samples with levels of interferents 50% or more of that in the ICS solution.

3. Reject (R) positive results if the reported concentration is due entirely to the interfering element.

4. Estimate (UJ) non-detected results for which false negatives are suspect.

Give explanations for any actions taken below:
No Action taken if estimated interference < 10% sample analyte concentration. J(+) if estimated interference > 10% of sample concentration (SED-23 for barium).

REGION I
Data Review Worksheets

V B. ICP INTERFERENCE CHECK SAMPLE (Section 3)

3. Report the concentration of any elements detected in the ICS A solution > 2xIDL that should not be present.

ELEMENT	CONC. DETECTED IN THE ICS	CONC. OF INTERFERENTS IN THE ICS			
		AL	CA	FE	MG

Estimate the concentration produced by the interfering element in all affected samples. See guidelines for examples. List the samples affected by interferences below:

SOILS - Cont'd.

SAMPLE AFFECTED	ELEMENT AFFECTED	SAMPLE CONC. ~~(ug/L)~~ (mg/kg)	SAMPLE INTERFERENT CONC. (mg/kg) AL	CA	FE	MG	ESTIMATED INTERF. ~~(ug/L)~~ (mg/kg)	
SED-18	manganese	216			33500		5.4	No action
SED-21		1820			97500		16.5	No Action
SED-23		854			69400		9.6	J (+)
SED-18	Sodium	non-detected			33900		—	No Action

ACTIONS:

1. In general, the sample data can be accepted without qualification if the sample concentrations of Al, Ca, Fe, and Mg are less than 50% of their respective levels in the ICS solution.

2. Estimate (J) positive results for affected elements for samples with levels of interferents 50% or more of that in the ICS solution.

3. Reject (R) positive results if the reported concentration is due entirely to the interfering element.

4. Estimate (UJ) non-detected results for which false negatives are suspect.

Give explanations for any actions taken below:
"J" estimate sample value if estimated interference is >10% of sample value

REGION I
Data Review Worksheets

V B. ICP INTERFERENCE CHECK SAMPLE (Section 3)

3. Report the concentration of any elements detected in the ICS A solution > 2xIDL that should not be present.

ELEMENT	CONC. DETECTED IN THE ICS	CONC. OF INTERFERENTS IN THE ICS			
		AL	CA	FE	MG

Estimate the concentration produced by the interfering element in all affected samples. See guidelines for examples. List the samples affected by interferences below:

SOILS - Cont'd

SAMPLE AFFECTED	ELEMENT AFFECTED	SAMPLE CONC. ~~(ug/L)~~ mg/Kg	SAMPLE INTERFERENT CONC. AL	CA	FE	MG	ESTIMATED INTERF. ~~(ug/L)~~ mg/Kg
SED-21	Sodium	96.9			97500		410 Reject
SED-23	↓	222			69400		237 Reject

ACTIONS:

1. In general, the sample data can be accepted without qualification if the sample concentrations of Al, Ca, Fe, and Mg are less than 50% of their respective levels in the ICS solution.

2. Estimate (J) positive results for affected elements for samples with levels of interferents 50% or more of that in the ICS solution.

3. Reject (R) positive results if the reported concentration is due entirely to the interfering element.

4. Estimate (UJ) non-detected results for which false negatives are suspect.

Give explanations for any actions taken below:
Values "R" rejected because sample result due entirely to interference.

REGION I
Data Review Worksheets

VI. MATRIX SPIKE

TR # SW-23 MATRIX: WATER (Total)

1. Recovery Criteria

List the percent recoveries for analytes which did not meet the required criteria.

S - amount of spike added
SSR - spikes sample result
SR - sample result

Analyte	SSR	SR	S	%R	Action all samples
IRON	2890.0	2309.0	1000.0	58.1	J(+); ~~UJ ND~~ [illegible]
Thallium	17.6	2.0 U	50.0	35.2	UJ All samples

Matrix Spike Actions apply to all samples of the same matrix.

ACTIONS:

1. If the sample concentration exceeds the spike concentration by a factor of 4 or more, no action is taken.

2. If any analyte does not meet the %R criteria follow the actions stated below:

	PERCENT RECOVERY		
	<30%	30%-74%	>125%
Positive Sample Results	J	J	J
Non-detected Results	R	UJ	A

2. Frequency Criteria

A. Was a matrix spike prepared at the required frequency? Yes or No

B. Was a post digestion spike analyzed for elements that did not meet required criteria for matrix spike recovery? Yes or No

A separate worksheet should be used for each matrix spike pair.

REGION I
Data Review Worksheets

VI. MATRIX SPIKE

TR # SW-23 MATRIX: WATER (Dissolved).

1. Recovery Criteria

List the percent recoveries for analytes which did not meet the required criteria.

S - amount of spike added
SSR - spikes sample result
SR - sample result

Analyte	SSR	SR	S	%R	Action
THALLIUM	31.0	2.0 U	50.0	62.0	UJ ALL samples
Selenium	13.8	2.0 U	10.0	138	No Action

Matrix Spike Actions apply to all samples of the same matrix.

ACTIONS:

1. If the sample concentration exceeds the spike concentration by a factor of 4 or more, no action is taken.

2. If any analyte does not meet the %R criteria follow the actions stated below:

	PERCENT RECOVERY		
	<30%	30%-74%	>125%
Positive Sample Results	J	J	J
Non-detected Results	R	UJ	A

2. Frequency Criteria

A. Was a matrix spike prepared at the required frequency? Yes or No

B. Was a post digestion spike analyzed for elements that did not meet required criteria for matrix spike recovery? Yes or No

A separate worksheet should be used for each matrix spike pair.

REGION I
Data Review Worksheets

VI. MATRIX SPIKE

TR # SED-23 MATRIX: Sediment

1. Recovery Criteria

List the percent recoveries for analytes which did not meet the required criteria.

S - amount of spike added
SSR - spikes sample result
SR - sample result

Analyte	SSR	SR	S	%R	Action
arsenic	533.9713	790.5455	38.28	-670.2	No Action (sample > 4X spi
cadmium	62.2699	32.4574	47.847	62.3	J(+) UJ(ND)
chromium	1040.3656	2177.9445	191.388	-594.4	No Action (sample > 4X spike)
copper	904.5617	2445.5502	239.23	-644.1	J(+)
lead	197.1292	348.3254	19.139	-790.0	No Action (sample > 4X spike)
manganese	924.1445	853.6909	478.47	14.7	J(+)
~~mercury~~	~~8.3134~~	~~5.6579~~	~~4.78~~	~~55.6~~	~~J(+) UJ(ND)~~
selenium	13.3014	8.1340	9.569	54.0	J(+) UJ(ND)
zinc	3688.5914	5628.6383	478.47	-405.5	No Action (sample > 4X spike

mercury spike meets criteria KAP 3/13/92 based on resubmittals from Lab dat 3/13/9

Matrix Spike Actions apply to all samples of the same matrix

ACTIONS:

1. If the sample concentration exceeds the spike concentration by a factor of 4 or more, no action is taken.

2. If any analyte does not meet the %R criteria follow the actions stated below:

	PERCENT RECOVERY		
	<30%	30%-74%	>125%
Positive Sample Results	J	J	J
Non-detected Results	R	UJ	A

2. Frequency Criteria

A. Was a matrix spike prepared at the required frequency? (Yes) or No

B. Was a post digestion spike analyzed for elements that did not meet required criteria for matrix spike recovery? (Yes) or No

A separate worksheet should be used for each matrix spike pair.

U.S. EPA - CLP

5A
SPIKE SAMPLE RECOVERY

EPA SAMPLE NO

SED-23S

Lab Name: ENSECO_EAST Contract: ROUX_ASSOC

Lab Code: ENSECO Case No.: _____ SAS No.: _____ SDG No.: 16790

Matrix (soil/water): SOIL Level (low/med): LOW

% Solids for Sample: 20.9

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

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	
Aluminum									NR
Antimony	75-125	506.6746		44.5445	B	478.47 ~~2392.34~~	96.6 ~~19.3~~	N	P
Arsenic		533.9713		790.5455		38.28 ~~191.39~~	70.3 ~~134.1~~		P
Barium	75-125	1888.1943		91.5675	B	1915.88 ~~9569.38~~	92.9 ~~18.8~~	N	P
Beryllium	75-125	44.8794		1.6450	B	47.847 ~~239.23~~	90.4 ~~18.1~~	N	P
Cadmium	75-125	62.2699		32.4574		47.847 ~~239.23~~	62.3 ~~12.5~~	N	P
Calcium							-594		NR
Chromium	75-125	1040.3656		2177.9445		191.388 ~~956.94~~	~~-118.9~~	N	P
Cobalt	75-125	456.4517		39.0134	B	478.47 ~~2392.34~~	87.2 ~~17.4~~	N	P
Copper	75-125	904.5617		2445.5502		239.23 ~~1196.17~~	~~-128.8~~	N	P
Iron							-644.0		NR
Lead	75-125	197.1292		348.3254		19.139 ~~95.69~~	~~-158.0~~	N	F
Magnesium							-790.8		N
Manganese	75-125	924.1445		853.6909		478.47 ~~2392.34~~	14.7 ~~2.9~~	N	P
Mercury	75-125	8.3134		5.6579		2.39 ~~4.78~~	111.1 ~~55.6~~	N	C
Nickel	75-125	457.7694		34.2421	B	478.47 ~~2392.34~~	88.5 ~~17.7~~	N	P
Potassium									NR
Selenium	75-125	13.3014		8.1340		9.569 ~~47.85~~	54.0 ~~10.8~~	N	F
Silver	75-125	50.8440		5.5474	B	47.847 ~~239.23~~	94.7 ~~18.9~~	N	P
Sodium									NR
Thallium	75-125	48.7081		0.9569	U	47.847 ~~239.23~~	101.8 ~~20.4~~	N	F
Vanadium	75-125	519.0679		48.6411		478.47 ~~2392.34~~	98.3 ~~19.7~~	N	P
Zinc	75-125	3688.5914		5628.6383		478.47 ~~2392.34~~	~~-81.1~~	N	P
Cyanide							-405.5		NR

Comments:
PLANTS

Corrected SAC 3/3/92
(at Data Validation Review)

FORM V (Part 1) - IN 3/90

VII. LABORATORY DUPLICATES

all total and dissolved water analytes met duplicate precision criteria (SW-23 and SW-23D)

List the concentrations of any analyte not meeting the criteria for duplicate precision. For soil duplicates, calculate the CRDL in mg/kg using the sample weight, volume and percent solids data for the sample. Indicate what criteria was used to evaluate precision by circling either the RPD or CRDL for each element.

MATRIX: Sediment

Element	CRDL water ug/L	CRDL soil mg/kg	Sample # SED-23	Duplicate# SED-23 D	RPD	Action
Aluminum	200	191	24489.0804	8044.2182	101.1	J(+)
Antimony	60	57.4	44.5445	29.2029	41.6	No Action
Arsenic	10	9.6	790.5455	562.6794	33.7	
Barium	200	191	91.5675	44.1014	70.0	
Beryllium	5	4.8	1.6450	0.9569	200.0	
Cadmium	5	4.8	32.4574	14.7761	74.9	J(+)
Calcium	5000	4785	5659.2603	3413.8679	49.5	No Action
Chromium	10	9.6	2177.9445	777.1789	94.8	J(+)
Cobalt	50	47.8	39.0134	20.9981	60.0	No Action
Copper	25	23.9	2445.5502	568.4603	124.6	J(+)
Iron	100	95.7	69427.2947	31408.8995	75.4	J(+)
Lead	5	2.9	348.3254	120.5742	97.0	J(+)
Magnesium	5000	4785	1268.5072	837.4191	40.9	No Action
Manganese	15	14.4	853.6909	468.4794	58.3	J(+)
Mercury	0.2	0.48				
Nickel	40	38.3	34.2421	17.9100	62.6	No Action
Potassium	5000					
Selenium	5	4.8	8.1340	3.7321	74.2	No Action
Silver	10	9.6	5.5474	3.8278	200.0	
Sodium	5000	4785	232.0584	94.9627	8.2	
Thallium	10	9.6				
Vanadium	50	47.8	48.6411	24.7751	65.0	No Action
Zinc	20	19.1	5628.6383	2988.0431	61.3	J(+)
Cyanide	10	Not Required				

Laboratory Duplicate Actions should be applied to all other samples of the same matrix type.

ACTIONS:

1. Estimate (J) positive results for elements which have an RPD >20% for waters and >35% for soils.

2. If sample results are less than 5x the CRDL, estimate (J) positive results for elements whose absolute difference is >CRDL, (2xCRDL for soils). If both samples are non-detected, the RPD is not calculated (NC).

REGION I
Data Review Worksheets

VIII. FIELD DUPLICATES

List the concentrations of all analytes in the field duplicate pair. For soil duplicates, calculate the CRDL in mg/kg using the sample weight, volume and percent solids data for the sample. Indicate what criteria was used to evalute the precision by circling either the RPD or CRDL for each element.

MATRIX: WATER (TOTAL)

Element	CRDL water ug/L	CRDL soil mg/kg	Sample # SW-19	Duplicate# SW-100	RPD	Action
Aluminum	200		75.5 B	82.7	9.1	No Action
Antimony	60		37.1 B	24.0 U	200	
Arsenic	10		1.0 U	1.0 U	NC	
Barium	200		27.8 B	27.6 B	0.7	
Beryllium	5		1.0 U	1.0 U	NC	
Cadmium	5		3.0 U	3.0 U	NC	
Calcium	5000		20400	20800	1.9	
Chromium	10		10.9	8.0 U	200	
Cobalt	50		5.0 U	5.0 U	NC	
Copper	25		32.4	11.1 B	98	
Iron	100		607	609	0.3	
Lead	5		3.6	5.0	32.5	
Magnesium	5000		3550 B	3590 B	1.1	
Manganese	15		48.5	48.7	0.4	
Mercury	0.2		0.20 U	0.20 U	NC	
Nickel	40		13.5 B	13.0 U	200	
Potassium	5000		4420 B	3670 B	18.5	
Selenium	5		2.0 U	2.0 U	NC	
Silver	10		4.0 U	4.0 U	NC	
Sodium	5000		28500	29000	1.7	
Thallium	10		2.0 U	2.0 U	NC	
Vanadium	50		6.0 U	6.0 U	NC	
Zinc	20		28.7	28.8	0.3	
Cyanide	10					

Field Duplicate Actions should be applied to all other samples of the same matrix type.

ACTIONS:

1. Estimate (J) positive results for elements which have an RPD >30% for waters and >50% for soils.

2. If sample results are less than 5x the CRDL, estimate (J) positive results ~~and (UJ) nondetected results~~ for elements whose absolute difference is >2xCRDL, (4xCRDL for soils). If both samples are non-detected, the RPD is not calculated (NC).

REGION I
Data Review Worksheets

VIII. FIELD DUPLICATES

List the concentrations of all analytes in the field duplicate pair. For soil duplicates, calculate the CRDL in mg/kg using the sample weight, volume and percent solids data for the sample. Indicate what criteria was used to evalute the precision by circling either the RPD or CRDL for each element.

MATRIX: WATER. Dissolved

Element	CRDL water ug/L	CRDL soil mg/kg	Sample # SW-19	Duplicate# SW-100	RPD	Action
Aluminum	200		43.0 U	108 B	200	no action
Antimony	60		24.0 U	24.0 U	NC	
Arsenic	10		5.0 U	5.0 U	NC	
Barium	200		25.8 B	28.3 B	9.2	
Beryllium	5		1.0 U	1.0 U	NC	
Cadmium	5		3.0 U	3.0 U	NC	
Calcium	5000		22000	22400	1.8	
Chromium	10		8.0 U	8.0 U	NC	
Cobalt	50		5.0 U	5.0 U	NC	
Copper	25		8.4 B	10.1 B	18.4	
Iron	100		421.	446	5.8	
Lead	5		1.9 B	3.2 B	14.6	
Magnesium	5000		3870 B	4010 B	3.6	
Manganese	15		40.6	45.2	10.7	
Mercury	0.2		0.20 U	0.20 U	NC	
Nickel	40		13.0 U	13.0 U	NC	
Potassium	5000		3930 B	4140 B	5.2	
Selenium	5		2.0 U	2.0 U	NC	
Silver	10		4.0 U	4.0 U	NC	
Sodium	5000		36300	36100	0.6	
Thallium	10		2.0 U	2.0 U	NC	
Vanadium	50		6.0 U	6.0 U	NC	
Zinc	20		17.3 B	29.8	53.0	
Cyanide	10					

Field Duplicate Actions should be applied to all other samples of the same matrix type.

ACTIONS:

1. Estimate (J) positive results for elements which have an RPD >30% for waters and >50% for soils.

2. If sample results are less than 5x the CRDL, estimate (J) positive results ~~and (UJ) nondetected results~~ for elements whose absolute difference is >2xCRDL, (4xCRDL for soils). If both samples are non-detected, the RPD is not calculated (NC).

REGION I
Data Review Worksheets

VIII. FIELD DUPLICATES

List the concentrations of all analytes in the field duplicate pair. For soil duplicates, calculate the CRDL in mg/kg using the sample weight, volume and percent solids data for the sample. Indicate what criteri was used to evalute the precision by circling either the RPD or CRDL fo each element.

63.1% Solids SED-19
71.6% Solids SED-100

MATRIX: Sediment

Element	CRDL water ug/L	CRDL soil mg/kg	Sample # SED-19	Duplicate# SED-100	RPD	Action
Aluminum	200	63.4	2880	3160	9.3	No Action
Antimony	60	19.0	8.8	7.6	14.6	
Arsenic	10	3.2	4.1	3.0	31.0	
Barium	200	63.4	13.4	18.5	32.0	
Beryllium	5	1.6	U	U	NC	
Cadmium	5	1.6	U	U	NC	
Calcium	5000	1585	889	1550	54.2	No Action
Chromium	10	3.2	24.9	30.1	18.9	
Cobalt	50	15.8	2.4	1.7	34.1	
Copper	25	7.9	13.0	20.2	43.3	
Iron	100	31.7	1710	4500	89.8	J(+) already J(+) Table
Lead	5	1.0	25.3	26.1	3.0	No Action
Magnesium	5000	1585	959	830	14.4	
Manganese	15	4.8	108	189	54.5	J(+) already J(+)
Mercury	0.2	0.16	U	U	NC	
Nickel	40	12.7	6.8	6.9	1.4	No Action
Potassium	5000	1585	580	273	72.0	
Selenium	5	1.6	U	U	NC	
Silver	10	3.2	1.1	U	200.0	No Action
Sodium	5000	1585	130	U	200.0	
Thallium	10	3.2	U	U	NC	
Vanadium	50	15.8	7.6	8.0	5.1	No Action
Zinc	20	6.3	46.0	55.8	19.2	
Cyanide	10					

Field Duplicate Actions should be applied to all other samples of the same matrix type.

ACTIONS:

1. Estimate (J) positive results for elements which have an RPD >30% for waters and >50% for soils.

2. If sample results are less than 5x the CRDL, estimate (J) positive results ~~and (UJ) nondetected results~~ for elements whose absolute difference is >2xCRDL, (4xCRDL for soils). If both samples are non-detected, the RPD is not calculated (NC).

REGION I
Data Review Worksheets

IX. LABORATORY CONTROL SAMPLE

1. Aqueous LCS ALL elements met criteria for the LCS.

List any LCS recoveries not within the 80-120% criteria and the samples affected.

DATE	ELEMENT	%R	ACTION	SAMPLES AFFECTED

2. Solid LCS All elements met criteria.

List any analytes that were not within the control windows set by the EPA for the solid LCS sample. The 80-120% criteria is not used to evaluate solid LCS results.

ELEMENT	LCS CONC.	CONTROL WINDOWS	ACTION	SAMPLES AFFECTED

ACTIONS:

AQUEOUS LCS	Percent Recovery <50%	51-79%	>120%
Positive Results	R	J	J
Non-detected Results	R	UJ	A

SOLID LCS	<EPA Control Windows	>EPA Control Windows
Positive Results	J	J
Non-detected Results	UJ	A

3. Frequency Criteria

A. Was an LCS analyzed for every matrix, every digestion batch, and every 20 samples? Yes or No

REGION I
Data Review Worksheets

X A. FURNACE ATOMIC ABSORPTION ANALYSIS

1. Duplicate Precision

✓ -------- Duplicate injections and one-point analytical spikes were performed for all samples: duplicate injections agreed within ± 20%.

-------- Duplicate injections and/or spikes were not performed for the following samples/elements: _____

-------- Duplicate injections did not agree within ± 20% for samples/elements: _____

2. Post Digestion Spike Recoveries

-------- Spike recoveries met the 85-115% recovery criteria for all samples.

-------- Spike recoveries did not meet the 85-115% criteria but did not require MSA for the following samples/elements:
Total SW-18/~~Fe~~Se. ~~SW-22/As~~ SW-24, SW-19, SW-100, SW-21, SW-22,
Dissolved. SW-18, SW-24, SW-21, FB-1/Se. SW-22/AS
SW-18, SW-24, SW-19, SW-100, SW-21, SW-22, SW-23/Tl.

✓ -------- MSA was used to quantitate analytical results when contractually required.
✓ Correlation coefficients ≥0.995, accept results for
✓ Correlation coefficients <0.995 for sample for soils
numbers/elements: SED-23 Selenium; estimate "J"

-------- Method of Standard Addition (MSA) was not performed as required for samples/elements: _____

ACTIONS:

1. Estimate (J) positive results if duplicate injections are outside ± 20 % RSD or CV.

2. If the sample absorbance is <50% of post digestion spike absorbance the following actions should be applied:

	PERCENT RECOVERY		
	<10%	11%-84%	≥115%
Positive Sample Results	J or R	J	J
Non-detected Results	R	UJ	A

3. Estimate (J) sample results if MSA was required and not performed.

4. Estimate (J) sample results if correlation coefficient was <0.995.

As Done @ 5X dilution.
SW-24 (D), SW-19 (D), SW-100 (D), SW-21 (D)

IA. 2. continued

Post Digestion Spike Recoveries - Actions.

Total Water Samples

Analyte	Samples Affected	Action
~~Arsenic~~	~~SW-22~~	~~J~~ ~~UJ~~ 3/3/92
Selenium	SW-18	UJ
thallium	SW-19, -21, -22, -23, -24 -100	UJ

(low Recovery 11-84%)

Dissolved Water Samples

Analyte	Samples Affected	Action
Selenium	SW-18, FB-1	No Action
	SW-21, SW-24	UJ
thallium	SW-18, -19, -21, -22 -23, -100	UJ
Arsenic	SW-22, SW-19, -21, -24, -100	J (+), UJ(ND)

(recovery >115%)
(recovery 11-84%)

Sediment Samples

Analyte	Samples Affected	Action
Selenium	SED-18	UJ
Thallium	SED-18, -21, -22, -23, -24, -100	UJ all.

(recovery 11-84%)

REGION I
Data Review Worksheets

XI. INDUCTIVELY COUPLED PLASMA (ICP) SERIAL DILUTION ANALYSIS

✓ All Sediment serial dilutions met criteria.

_____ Serial Dilutions were performed for each matrix and results of the diluted sample analysis agreed within ten percent of the original undiluted analysis.

_____ Serial Dilutions were not performed for the following:

_____

Water ✓ Serial Dilutions were performed, but analytical results did not agree within 10% for analyte concentrations greater than 50x the IDL before dilution.

Report all results below that do not meet the required laboratory criteria for ICP serial dilution analysis.

MATRIX: WATER - TOTAL (Sample SW-21 Total water)

ELEMENT	IDL	50xIDL	SAMPLE RESULT	SERIAL DILUTION	%D	ACTION
(all dissolved water serial dilution %D met criteria).						
Aluminum						
Barium						
Beryllium						
Cadmium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Magnesium						
Manganese						
Nickel						
Potassium						
Silver						
Sodium	53.0	2650	40173.91	35,774.96	10.9	NO ACTION
Vanadium						
Zinc						

Actions apply to all samples of the same matrix.

ACTIONS:

1. Estimate (J) positive results if %D >15.

REGION I
Data Review Worksheets

XI. INDUCTIVELY COUPLED PLASMA (ICP) SERIAL DILUTION ANALYSIS

_____ Serial Dilutions were performed for each matrix and results of the diluted sample analysis agreed within ten percent of the original undiluted analysis.

_____ Serial Dilutions were not performed for the following: _____

✓ Serial Dilutions were performed, but analytical results did not agree within 10% for analyte concentrations greater than 50x the IDL before dilution.

Report all results below that do not meet the required laboratory criteria for ICP serial dilution analysis.

MATRIX: Water - Total TRESW-24

ELEMENT	IDL	50xIDL	SAMPLE RESULT	SERIAL DILUTION	%D	ACTION
Aluminum						
Barium						
Beryllium						
Cadmium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Magnesium						
Manganese						
Nickel						
Potassium						
Silver						
Sodium	53	2650	23589.77	20858.28	11.6	No Action
Vanadium						
Zinc						

Actions apply to all samples of the same matrix.

ACTIONS:

1. Estimate (J) positive results if %D >15.

XII. DETECTION LIMIT RESULTS

1. Instrument Detection Limits

✓ Instrument Detection Limit results were present and found to be less than the Contract Required Detection Limits.

_____ IDLs were not included in the data package on Form XI.

_____ IDLs were present, but the criteria was not met for th following elements:_____

2. Reporting Requirements

✓ Were sample results on Form I reported down to the IDL not the CRDL for all analytes? Yes or No

NA Were sample results that were analyzed by ICP for Se, Tl, As, or Pb at least 5x IDL. Not applicable. Yes or No 2/11/92

✓ Were sample weights, volumes, and dilutions taken into account when reporting detection limits on Form I. Yes or N-

If No,

The reported results may be inaccurate. Make the necessary changes on the data summary tables and request that the laboratory resubmit the corrected data.

REGION I
Data Review Worksheets

XIII. SAMPLE QUANTITATION

✓ Sample results fall within the linear range for ICP and within the calibrated range for all other parameters.

_____ Sample results were beyond the linear range/ calibration range of the instrument for the following samples/elements:

Total: WATERS:

In the space below, please show a minimum of one sample calculation per method:

ICP SW-18 Aluminum 1.639 mg/L instrument print-out.
$\times \frac{1000 ug}{1 mg}$ = 1640 ug/L final result

FURNACE SW-18 Arsenic instrument printout = 0.0036 mg/L
$\times \frac{1000 ug}{1 mg}$ = 3.6 ug/L final result.

MERCURY SW-18 instrument in ug/L printout = −0.0744 = 0.2 U ug/L

CYANIDE Not required

For soil samples, the following equation may be necessary to convert raw data values (usually reported in ug/L) to actual sample concentrations (mg/kg):

The lab is required to use 1 gram sample (wet weight) to 200 ml.

Wet weight concentration =

$$\text{digest conc. in } \frac{ug}{L} \times \frac{200ml}{1\ gm} \times \frac{1L}{1000\ ml} \times \frac{1000gm}{1kg} \times \frac{1mg}{1000ug} = \frac{mg}{kg}$$

In addition the sample results are converted to dry weight using the percent solids calculations:

$$\frac{\text{Wet weight conc.}}{\%\text{solids}} \times 100 = \text{final concentration, dry weight (mg/kg)}$$

REGION I
Data Review Worksheets

XIII. SAMPLE QUANTITATION

✓ Sample results fall within the linear range for ICP and withi the calibrated range for all other parameters.

_____ Sample results were beyond the linear range/ calibration rang of the instrument for the following samples/elements_

Sediment/SOILS:

In the space below, please show a minimum of one sample calculation per method:

ICP SED-18 Aluminum: inst. reading = 6156 mg/L (includes 200ml prep factor).
% Solids = 37.0 %

$\times \frac{1\,L}{1000\,mL} \times \frac{1000\,gm}{1\,Kg} \times \frac{1\,ml}{1\,gm}$ (for units; 200g already applied) $\div$ % Solids 0.37 = 16,6.0 mg dry wt

FURNACE SED-18 Arsenic: inst. reading = 0.0296 mg/L
% Solids = 37.0%

$\times \frac{200\,mL}{1\,g} \times 5$ (inst. dilution) $\times \frac{1000\,gm}{1\,Kg} \times \frac{1\,L}{1000\,mL} \times \frac{1}{0.37}$ % solids = 80.0

MERCURY SED-23 Instrument reading initial concentration calculated from linear regression of curve = 2.3654 ug/L
% solids = 20.9 %

$\times \frac{1\,mg}{1000\,ug} \times \frac{100\,ml}{0.2\,g} \times \frac{1000\,gm}{1\,Kg} \times \frac{1\,L}{1000\,mL} \times \frac{1}{0.209}$ % solids = 5.7 mg/Kg dry wt.

CYANIDE

Not required.

For soil samples, the following equation may be necessary to convert raw data values (usually reported in ug/L) to actual sample concentrations (mg/kg):

The lab is required to use 1 gram sample (wet weight) to 200 ml.

Wet weight concentration =

digest conc. in $\frac{ug}{L} \times \frac{200ml}{1\,gm} \times \frac{1L}{1000\,ml} \times \frac{1000gm}{1kg} \times \frac{1mg}{1000ug} = \frac{mg}{kg}$

In addition the sample results are converted to dry weight using the percent solids calculations:

$\frac{\text{Wet weight conc.}}{\text{\%solids}} \times 100$ = final concentration, dry weight (mg/kg)

Gradient Corporation

RECEIVED
MAR - 9 1992

March 6, 1992

Ms. Martha M. Smith
Project Hydrogeologist
Roux Associates, Inc.
775 Park Avenue, Suite 255
Huntington, NY 11743

Subject: High % Moisture in Sediment Samples - Metals

Dear Ms. Smith:

Percent solids content for the sediment samples SED-21, SED-22, and SED-23 from the Industri-Plex site were determined to be less than 30% in each sample. The current EPA Region I guidelines for data validation require that the nondetect results of these samples be rejected (R) as unusable. The guidelines also require that positive results be rejected in samples which contain less than 10% solids, as was the case for sample SED-22. These requirements were included in the data validation report dated March 5, 1992.

However, it is often difficult to obtain a sediment sample with sufficient percent solids if the sediment contains very fine particles and/or water-retaining organic matter. Resampling and re-analysis of these samples would probably result in similar problems. I would recommend that data from these samples be used as estimated results, despite the low percent solids.

As noted in the previous data validation report, several quality control criteria were not met for the sediment sample analyses. The estimated values (J), detection limits (UJ) and rejected data (R) that were applied to the other sediment samples in this set would also apply to these samples. Values previously rejected (R) for percent solids criteria are estimated (J or UJ) herein. Values previously rejected due to interference criteria remain unusable. The following information summarizes the revisions substituting estimated values and detection limits for data that were previously rejected based upon percent solids content.

For sample SED-21, the values that were previously rejected because they were nondetects would now be estimated at the detection limit (UJ) due to the following reasons:

antimony:	high CRDL percent recovery and low percent solids
beryllium:	low percent solids
potassium:	low percent solids

In sample SED-23, thallium was previously rejected due to low percent solids; it has now been estimated at the detection limit (UJ). All data for sample SED-22, that were previously rejected due to less than 10% solids content, are now usable but estimated (J or UJ) with

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Environmental Consultants with Offices in Cambridge, MA and Boulder, CO

qualifiers (except results rejected for interference criteria). The following table identifies the criteria used in determining the validation codes for this sample:

SAMPLE SED-22 (8.1% solids)

Analyte	Qualifier	Criteria for Qualification
aluminum	J	poor duplicate RPD, low percent solids
antimony	R	interference from iron
arsenic	J	low percent solids
barium	J	low percent solids
beryllium	J	low percent solids
cadmium	J	poor duplicate RPD, low MS recovery, low percent solids
calcium	J	low percent solids
chromium	J	poor duplicate RPD, low percent solids
cobalt	J	low percent solids
copper	J	poor duplicate RPD, low MS recovery, low percent solids
iron	J	poor duplicate RPD, low percent solids
lead	J	poor duplicate RPD, low percent solids
magnesium	J	low percent solids
manganese	J	poor duplicate RPD, low MS recovery, low percent solids
mercury	J	low MS recovery, low percent solids
nickel	J	low percent solids
potassium	UJ	low percent solids
selenium	J	low MS recovery, low percent solids
silver	UJ	blank contamination, low percent solids
sodium	R	interference from iron
thallium	J	low post-digest spike recovery, low percent solids
vanadium	J	low percent solids
zinc	J	poor duplicate RPD, low percent solids

RPD = Relative Percent Difference, a measure of duplicate precision.
MS = Matrix Spiked Sample, low recovery indicates a matrix suppression of the analyte.
Note that all data are estimated based upon the low percent solids and the effects this matrix may have on accurate quantitation of these analytes.

I have attached revised versions of the sediment analytical results table, and the sample detection limit table, that now reflect the above violations but do not reject (R) data based upon the low solids content. It is my professional opinion that these results (qualified as J or UJ) are usable as estimated values. The rejected (R) results for antimony and sodium, based upon interference from iron in these samples, are unusable.

I hope that this information is helpful. If you have any questions or wish to discuss my conclusions, please do not hesitate to call me at 617-576-1555.

Sincerely,

GRADIENT CORPORATION

Susan D. Chapnick

Susan D. Chapnick
Senior Associate - Analytical Chemistry

Enclosures

Site: Industri-Plex
Laboratory: Enseco-East

File: ROUXMSR.WK2

CLP INORGANIC ANALYSIS
PROJECT #s: 16790 and 16811
SOIL ANALYTICAL RESULTS (mg/Kg)

Sample Location		SED-18	SED-19	SED-21	SED-22	SED-23	SED-24	SED-100		
Remarks								Dup. of SED-19		
Sampling Date		10/02/91	10/02/91	10/03/91	10/03/91	10/03/91	10/02/91	10/02/91		
Percent Solid		37.0%	63.1%	12.1%	8.1%	20.9%	42.9%	71.6%		
Dilution Factor		1.0	1.0	1.0	1.0	1.0	1.0	1.0		
INORGANIC ANALYTES										
Aluminum	P	16600 J	2880 J	8840 J	19900 J	24500 J	8000 J	3160 J		
Antimony	P	R	8.8 UJ	UJ	R	R	18.5 UJ	7.6 UJ		
Arsenic	F	80.0	4.1	607 J	1380 J	791 J	91.5	3.0		
Barium	P	38.4	13.4	63.3 J	282 J	91.6 J	41.9	18.5		
Beryllium	P	2.3		UJ	2.9 J	1.6 J	0.63			
Cadmium	P	1.6 J	UJ	26.8 J	77.4 J	32.5 J	4.2 J	UJ		
Calcium	P	3000	889	6350 J	16700 J	5660 J	3080	1550		
Chromium	P	1530 J	24.9 J	441 J	1040 J	2180 J	116 J	30.1 J		
Cobalt	P	13.4	2.4	52.1 J	121 J	39.0 J	8.3	1.7		
Copper	P	34.8 J	13.0 J	650 J	1100 J	2450 J	112 J	20.2 J		
Iron	P	33900 J	4170 J	97500 J	37600 J	69400 J	17600 J	4500 J		
Lead	F	46.5 J	25.3 J	294 J	452 J	348 J	108 J	26.1 J		
Magnesium	P	1100	959	1490 J	2900 J	1270 J	2400	830		
Manganese	P	216 J	108 J	1820 J	7220 J	854 J	229 J	189 J		
Mercury	CV			0.91 J	2.4 J	5.7 J	2.4			
Nickel	P	21.7	6.8	42.6 J	88.1 J	34.2 J	16.3	6.9		
Potassium	P		580	UJ	UJ	978 J	1090	273		
Selenium	F	UJ	UJ	3.6 J	7.2 J	8.1 J	1.0 J	UJ		
Silver	P	3.2 UJ		7.4 UJ	15.3 UJ	5.5 UJ	6.7 UJ			
Sodium	P		130 U	R	R	R	33.5 UJ			
Thallium	F	UJ		3.3 UJ	4.9 UJ	UJ	UJ	UJ		
Vanadium	P	27.4	7.6	36.0 J	96.9 J	48.6 J	32.2	8.0		
Zinc	P	175 J	46.0 UJ	5730 J	17900 J	5630 J	387 J	55.8 J		

Analytical Method
F Furnace AA
P ICP
CV Cold Vapor AA

Sample Results are reported on dry weight basis.
J - The associated numerical value is an estimated quantity.
U - The analyte is considered nondetected due to blank contamination. The associated numerical value is the sample detection limit.
UJ - The analyte was not detected. The sample detection limit is an estimated value.
" " - The blank space indicates the analyte was not detected.
R - The datum was rejected. (Substitution of "J" for "R" in % solids criteria was applied.)

Site: Industri-Plex
Laboratory: Enseco-East

File: ROUXMSID.WK2

CLP INORGANIC ANALYSIS
PROJECT #s: 16790 and 16811
SOIL SAMPLE DETECTION LIMITS (mg/Kg)

Sample Location			SED-18	SED-19	SED-21	SED-22	SED-23	SED-24	SED-100		
Remarks									Dup. of SED-19		
Sampling Date			10/02/91	10/02/91	10/03/91	10/03/91	10/03/91	10/02/91	10/02/91		
Percent Solid			37.0%	63.1%	12.1%	8.1%	20.9%	42.9%	71.6%		
Dilution Factor			1.0	1.0	1.0	1.0	1.0	1.0	1.0		
INORGANIC ANALYTES		IDL (ug/L)	As 5x, Pb 10x Dilutions	Pb 10x Dilution	As 5x, Pb 10x Dilutions	Pb 10x Dilution	As 20x,Pb 10x Dilutions	As 5x,Pb 10x Dilutions	Pb 2x Dilution		
Aluminum	P	43.0	23.2	13.6	71.1	106.2	41.1	20.0	12.0		
Antimony	P	24.0	R	8.8 UJ	39.7 UJ	R	R	18.5 UJ	7.6 UJ		
Arsenic	F	1.0	2.7	0.32	8.3	12.3	19.1	2.3	0.28		
Barium	P	1.0	0.54	0.32	1.7	2.5	1.0	0.47	0.28		
Beryllium	P	1.0	0.54	0.32	1.65 UJ	2.47	0.96	0.47	0.28		
Cadmium	P	3.0	1.6	0.95 UJ	5.0	7.4	2.9	1.4	0.84 UJ		
Calcium	P	41.0	22.2	13.0	67.8	101.2	39.2	19.1	11.5		
Chromium	P	8.0	4.3	2.5	13.2	19.8	7.7	3.7	2.2		
Cobalt	P	5.0	2.7	1.6	8.3	12.3	4.8	2.3	1.4		
Copper	P	4.0	2.2	1.3	6.6	9.9	3.8	1.9	1.1		
Iron	P	10.0	5.4	3.2	16.5	24.7	9.6	4.7	2.8		
Lead	F	1.0	5.4	3.2	16.5	24.7	9.6	4.7	0.56		
Magnesium	P	73.0	39.5	23.1	121	180	69.9	34.0	20.4		
Manganese	P	2.0	1.1	0.63 UJ	3.3	4.9	1.9	0.93	0.56		
Mercury	CV	0.2	0.27	0.16	0.83	1.2	0.48	0.23	0.14		
Nickel	P	13.0	7.0	4.1	21.5	32.1	12.4	6.1	3.6		
Potassium	P	1009	545	320	1668 UJ	2491 UJ	966	470	282		
Selenium	F	2.0	1.1 UJ	0.63	3.3	4.9	1.9	0.93	0.56 UJ		
Silver	P	4.0	3.2 UJ	1.3	7.4 UJ	15.3 UJ	5.5 UJ	6.7 UJ	1.1		
Sodium	P	53.0	28.6	130 U	R	R	R	33.5 UJ	14.8		
Thallium	F	2.0	1.1 UJ	0.63	3.3 UJ	4.9 UJ	1.9 UJ	0.93 UJ	0.56 UJ		
Vanadium	P	6.0	3.2	1.9	9.9	14.8	5.7	2.8	1.7		
Zinc	P	3.0	1.6	46.0 UJ	5.0	7.4	2.9	1.4	0.84		

Analytical Method
F Furnace AA
P ICP
CV Cold Vapor AA

Sample Detection Limits are reported on dry weight basis and calculated from the IDL.
U - The analyte is considered nondetected due to blank contamination.
The associated numerical value is the sample detection limit.
UJ - The analyte was not detected. The sample detection limit is an estimated value.
IDL - Instrument Detection Limit.
R - The datum was rejected.
(Substitution of "J" for "R" in % solids criteria was applied.)

Gradient Corporation

March 13, 1992

Ms. Martha Smith
Roux Associates, Inc.
The Huntington Atrium
775 Park Avenue
Suite 225
Huntington, NY 11743

RE: Data Validation Report Letter
Project#s: 16790 and 16811
Enseco-East Laboratory
Industri-Plex Site, Woburn, Massachusetts
Wet Chemistry: 8 samples/water/sample #s: **SW-18, SW-19, SW-21, SW-22, SW-23, SW-24, SW-100, FB-1**
7 samples/sediment/sample #s: **SED-18, SED-19, SED-21, SED-22, SED-23, SED-24, SED-100**

Dear Ms. Smith:

A validation was performed on the surface water and stream-sediment wet chemistry analytical data from 7 sediment samples and 8 water samples (including 1 field blank) collected by Roux Associates, Inc. at the Industri-Plex site in Woburn, MA. The data were evaluated based on the following parameters according to EPA methodology criteria and the Region I Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses, February 1989, where applicable:

- data completeness
- holding times
- calibration verification
- laboratory and field blank analysis
- matrix spike percent recovery results
- laboratory and field duplicates
- laboratory control sample results
- detection limit results
- sample results

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Environmental Consultants with Offices in Cambridge, MA and Boulder, CO

Each parameter that did not meet criteria was addressed, where applicable, for each of the following analyses: percent solids, total organic carbon (TOC), total suspended solids (TSS), ammonia, pH, total sulfide, oxidation-reduction potential (eH), and grain size distribution. Each analysis is reviewed individually, including explanations of any validation qualifiers.

Table I summarizes the validated results for all parameters, Table II shows the sample reporting limits for the sediments, and Table III summarizes the validation recommendations that were based on the following information.

Data Completeness

All information was present in the data package, with the exception of raw data for the sediment TOC and oxidation-reduction potential (eH). Both of these analyses were sub-contracted and only final results were included in the data package.

Holding Time Violations

Holding time criteria were reviewed based upon method criteria. All holding times met criteria with the following exception. FB-1 exceeded the 24 hour holding time recommended for pH analysis of water samples by one day and is estimated (J).

Percent Solid

Based upon the Functional Guidelines for data validation the following qualifiers were applied. The percent solid determination yielded percent solids for samples SED-21 and SED-23 that were less than 30% but greater than 10% (20.9% and 12.1% respectively). All positive results for parameters for these two samples have been estimated (J) and all nondetects have been rejected (R). Sample SED-22 yielded a percent solid that was less than 10% (8.1%). All results for all parameters associated with this sample, except for pH, have been rejected (R). It is not expected that pH determination would be significantly affected by a low percent solids; therefore, pH has been estimated (J) rather than rejected in this sample.

Total Organic Carbon (TOC)

Raw data and QC data submitted for the water samples were checked and verified. All QC met criteria including: blanks-all laboratory, method, and field blanks; initial calibration verification standards (ICV); continuing calibration verification standards (CCV); matrix spike sample (MS); matrix/laboratory duplicate (MD); and laboratory control sample (LCS). Therefore, all data are accepted without qualification.

The TOC analyses for all sediment samples were subcontracted and the final results were included with no supporting raw data. Since no raw data or QC data were available for review, the results are reported unqualified (except for those samples already qualified J and R for percent solids criteria).

Total Suspended Solids (TSS)

All TSS analyses performed on the water samples were checked and verified. All QC criteria (blanks and LCS) were met. Therefore, all results are reported unqualified. It is unusual that none of the samples contained detectable levels of TSS. The metals data indicated the presence of particulates since several analytes usually associated with particualtes were higher in the total vs. the dissolved metals fraction. This descrepancy is noted here for data usablity; however, no action was taken.

Ammonia

All QC criteria (calibration, ICV, CCV, MS, blanks) were met except for duplicate precision. The laboratory duplicate relative percent difference (RPD) was 65%. This exceeds the validation criterion of 35%. All results were positive and have been estimated (J), with the exception of sample SED-22 which has previously been rejected due to low percent solids.

pH

All QC results (calibration, ICV, CCV) met acceptable criteria limits. All samples are reported unqualified, with the exception of SED-21, SED-22, and SED-23 which have been previously estimated (J) due to low percent solids. Instrument calibration utilized two standards, pH4 and pH7, respectively, with a check standard of pH10. One sample, SED-22, exceeded the calibration range (pH 7.48). This may be the result of the presence of high levels of calcium (as evident in the metals fraction), as calcium carbonate, which may increase the pH. Since the check standard (pH10) met recovery criteria of +/- 2%, the datum is considered acceptable; however, analysis of samples greater than pH7 should be calibrated between pH4 and pH10, with pH7 as a check standard.

Total Sulfide

All QC criteria were met (calibaration, ICV, CCV, blanks) except for the matrix spike recovery for sample SED-23 at 48%. This does not meet the validation criterion of 75%-125%. All samples were nondetects, and are estimated at the detection limit (UJ), with the exception of samples SED-21, SED-22, and SED-23 that have been previously rejected due to low percent solids. Estimated detection limits are biased low.

Oxidation-Reduction Potential (eH)

This analysis was subcontracted, thus, no raw data were included for review. The method for this analysis applies only to water samples. Therefore, the method applicablility to sediments is questionable. As a result all sediment results for eH have been estimated (J).

Grain Size Distribution

No quality control samples are applicable to this method. There is a difference in the field duplicate pair distributions for this parameter; according to the raw data trace fine gravel was detected in SED-100 but not in SED-19. This may indicate a precision effect for this parameter; however, no action was taken because it is not evident that this difference can be extrapolated to the other samples.

Overall Assessment

Although the samples were divided into two projects by the laboratory, validation criteria and resultant qualifiers were applied to all samples of the same matrix. The data package was complete, except that raw data was not supplied for sediment parameters for TOC and oxidation-reduction potential (eH). These results could not be verified, therefore, the results are reported unqualified.

One sample missed the 24 hour aqueous holding time for pH analysis; this sample has therefore been estimated (J).

Low percent solids will adversely affect the quanitation of sediment samples SED-22 (< 10% solids), SED-21, and SED-23 (both < 30% but > 10%). As a result, all parameters except pH were rejected (R) in the sediment sample SED-22. The pH was estimated (J) for this sample. In samples SED-21 and SED-23, total sulfide data were rejected (R) and all other parameters were estimated (J).

The method for oxidation-reduction potential (eH) applies to aqueous matrices. Thus, it is necessary to question the method application to sediment samples. Therefore, all data have been estimated (J).

All data for sulfide have been estimated (UJ) at the detection limit due to low matrix spike recoveries. Estimated detection limits are biased low. All ammonia data have been estimated (J) due to poor laboratory duplicate precision.

Attached are the following supporting information: Table I (Results Summary), Table II (Reporting Limit Summary for Sediments), Table III (Recommendations Summary Based on QC Review), and the worksheets associated with this data validation review.

Very truly yours,

GRADIENT CORPORATION

Kim A. Reynolds

Kim A. Reynolds
Data Reviewer

Susan D. Chapnick

Susan D. Chapnick
Senior Data Reviewer

Table 1A - Results Summary (Aqueous)									
SAMPLE	Lab Rep. Limit	SW-18	SW-19	SW-21	SW-22	SW-23	SW-24	SW-100	FB-1
REMARKS								Dup of SW-100	
TSS(mg/L)	10.0								
TOC(mg/L)	1.0	7.5	9.5	10.9	9.5	9.0	7.3	9.5	
pH	0.01	NA	NA	NA	NA	NA	NA	NA	6.5J
Total Sulfide (mg/L)	0.10	NA	NA	NA	NA	NA	NA	NA	
Ox.-Red (eH)	NA	NA	NA	NA	NA	NA	NA	NA	192
Ammonia (mg/L)	0.20	NA	NA	NA	NA	NA	NA	NA	

Qualifier Codes

J	The associated numerical result is an estimated quantity.
UJ	The parameter was not detected. The sample detection limit is an estimated value.
R	The datum was rejected.
" "	A blank space indicates the parameter was not detected. Sample detection limit equals the laboratory reporting limit.
NA	Not applicable or not analyzed.

Table IB - Results Summary (Sediments)							
SAMPLE	SED-18	SED-19	SED-21	SED-22	SED-23	SED-24	SED-100
REMARKS							Dup of SED-19
% Solid	37.0	63.1	12.1	8.1	20.9	42.9	71.6
TOC (mg/kg)	8045	3580	22465 J	R	63893 J	20689	3238
pH	6.9	6.3	6.9 J	6.5 J	6.9 J	5.6	5.5
Total Sulfide (mg/kg)	UJ	UJ	R	R	R	UJ	UJ
Oxidation-Reduction Potential (eH)	-192 J	-153 J	-269 J	R	-191 J	-033 J	-217 J
Ammonia(mg/kg)	162 J	60 J	661 J	R	434 J	216 J	52.9 J

Qualifier Codes

J The associated numerical result is an estimated quantity.

UJ The parameter was not detected. The sample detection limit is an estimated value.

R The datum was rejected.

" " A blank space indicates the parameter was not detected. Sample detection limit equals the reporting limit.

Table IC- Grain Size Summary		
SAMPLE	SYMBOL	MODIFIED DESCRIPTION
SED-18	SM	Fine to medium sand; trace clayey silt; trace fine gravel
SED-19	SM	Organic fine to medium sand; trace clayey silt
SED-21	SM	Organic fine to medium sand; some clayey silt; little fine gravel
SED-22	SM	Organic fine gravel; some fine to medium sand; little clayey silt
SED-23	SM	Organic fine gravel; some fine to medium sand; little clayey silt
SED-24	SM	Organic fine sand; some clayey silt; trace fine gravel
SED-100	SM	Organic fine to medium sand; trace fine gravel; trace clayey silt

Table II - Reporting Limits Summary For Sediments							
SAMPLE	SED-18	SED-19	SED-21	SED-22	SED-23	SED-24	SED-100
REMARKS							Dup of SED-19
% SOLIDS	37.1	63.1	12.1	8.1	20.9	42.9	71.6
TOC(mg/kg)	2.7	1.6	8.3	1.2	4.8	2.3	1.4
pH	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Total Sulfide (mg/kg)	1.4	0.79	4.1	6.2	2.4	1.2	0.70
Oxidation-Reduction potential (eH)	NA	NA	NA	NA	NA	NA	NA
Ammonia(mg/kg)	16.2	9.8	49.7	76.5	26.6	14.0	8.5

NA Not applicable.

Table III - Recommendations Summary															
Parameter	SW-18	SW-19	SW-21	SW-22	SW-23	SW-24	SW-100	FB-1	SED-18	SED-19	SED-21	SED-22	SED-23	SED-24	SED-100
TOC	A	A	J_1	A	J^2	A	A	A	A	A	A	R^1	A	A	A
TSS	A	A	A	A	A	A	A	A	NA	NA	NA	NA	NA	NA	NA
Ammonia	NA	NA	NA	NA	NA	NA	NA	A	J^2	J^2	J^1,J^2	R^1	J^1,J^2	J^2	J^2
pH	NA	NA	NA	NA	NA	NA	NA	A	A	A	J^1	J^1	J^1	A	A
Ox.-Red. Potential	NA	NA	NA	NA	NA	NA	NA	A	J^4	J^4	J^1,J^4	R^1	J^1,J^4	J^4	J^4
Total Sulfide	NA	NA	NA	NA	NA	NA	NA	A	J^3	J^3	R^2	R^1	R^2	J^3	J^3

DATA QUALIFIER CODES

A Accept all data.
NA Not analyzed.
R^1 Reject all data due to low percent solids (< 10%).
R^2 Reject non-detects due to low percent solids (<30% but >10%).
J^1 Estimate (J) positive results due to low percent solids.
J^2 Estimate (J) positive results due to laboratory duplicate precision exceeding criteria.
J^3 Estimate (UJ) nondetects due to low matrix spike recovery, estimated detection limit is biased low.
J^4 Estimate (J) results due to uncertainty in appropriateness of method to a sediment matrix.

Region I
Data Review Worksheet

Site Name: Industriplex
Referencew Number:

REGION I REVIEW OF INORGANIC CONTRACT LABORATORY DATA PACKAGE

The hardcopied(laboratory name) ENSECO EAST data package received at Region I has been reviewed and the quality assurance and performance data summarized. The data review included:

Case No. 16790, 16811 SAS No. _____ Sampling Date(s) 10/2/91, 10/3/91
SDG No. _____ Matrix Soils + water Shipping Date(s) 10/2/91, 10/3/91
No. of Samples 7 soils 1 water / 8 total Date(s) rec'd by lab 10/3/91

Traffic Report Nos.: SED 18, SED 19, SED 24, SED 100
SED 21, SED 22, SED 23
FB-1

Trip Blank No.: _____

Equipment Blank No.: _____

Field Dup Nos.: SED 19, SED 100

SOW No. 3/90 requires that specific analytical work be done and that associated reports be provided by the laboratory to the Regions, EMSL-LV, and SMO. The general criteria used to determine the performance were based on an examination of:

- -Data Completeness
- -Holding Times
- -Calibrations
- -Blanks
- -ICP Interference Check Results
- -Matrix Spike Recoveries
- -Laboratory Duplicates
- -Field Duplicates
- -Lab Control Sample Results
- -Furnace AA results
- -ICP Serial Dilution Results
- -Detection Limit Results
- -Sample Quantitation

Overall Comments: pH results. All samples unqualified with the exceptions of: SED 22, SED 23, and SED 24, which will be estimated "J" due to low percent solids; FB-1 exceeded holding time of 24 hours, and will be designated "J". KXL

Definitions and Qualifiers:

A - Acceptable data
J - Approximate data due to quality control criteria
R - Reject data due to quality control criteria
U - Analyte not detected

Reviewer: Kim A Reynolds

Date: 3-13-92

Region I
Data Review Worksheet

I. DATA COMPLETENESS

MISSING INFORMATION	DATE LAB CONTACTED	DATE RECEIVED
all info present		

Region I
Data Review Worksheet

pH

II. HOLDING TIMES

Complete table for all samples and circle the analysis date for samples not within criteria.

SAMPLE ID	DATE SAMPLED	HG ANALYSIS DATE	CYANIDE ANALYSIS DATE	OTHERS pH ANALYSIS DATE	pH	ACTION
FB I	10-3-91			10-5-91		J
SED18	10/2/91			10/28/91		J
SED19	↓			↓		↓
SED21	10/3/91					
SED22	↓					
SED23	↓					
SED24	10/2/91					
SED100	↓			↓		↓

METALS 180 DAYS FROM SAMPLE COLLECTION
MERCURY 28 DAYS FROM SAMPLE COLLECTION
CYANIDE 14 DAYS FROM SAMPLE COLLECTION
pH 24hrs waters from sample collection

ACTION:

1. If holding times are exceeded all positive results are estimated (J) and all non-detects are estimated (UJ).
2. If holding times are grossly exceeded, the reviewer may determine that non-detects are unusable (R).

KAR 3-12-92

All samples will be estimated (J). According to OI leach logs, samples were leached 10/15/91. There is no log for SED 18, SED 19, SED 24, SED 100. Samples should be leached and analyzed within 24hrs; after leaching aqueous holding times

Region I
Data Review Worksheets

pH

III A. INSTRUMENT CALIBRATION (Section 1)

1. Recovery Criteria

List the analytes which did not meet the percent recovery (%R) criteria for Initial and/or Continuing Calibration.

DATE	ICV/CCV#	ANALYTE	%R	SAMPLES AFFECTED	ACTION
all calibration criteria met					

ACTIONS:

If any analyte does not meet the %R criteria follow the actions stated below:

For positive results:

	Accept	Estimate (J)	Reject (R)
Metals	90%-110%	75%-89% or 111%-125%	< 75% or > 125%
Mercury	80%-120%	65%-79% or 121%-135%	< 65% or > 135%
Cyanide	85%-115%	70%-84% or 116%-130%	< 70% or > 130%

For non-detected results:

	Accept	Estimate (UJ)	Reject (R)
Metals	90%-125%	75%-89%	< 75% or > 125%
Mercury	80%-130%	65%-79%	< 65% or > 135%
Cyanide	85%-130%	70%-84%	< 70% or > 130%

Region I
Data Review Worksheets

pH

III B. INSTRUMENT CALIBRATION (Section 2)

2. Analytical Sequence

A. Did the laboratory use the proper number of standards for calibration as described in the SOW? Yes or No

B. Were calibrations performed at the beginning of each analysis? Yes or No

C. Were calibration standards analyzed at the beginning of sample analysis and at a minimum frequency of ten percent or every two hours during analysis, whichever is more frequent? Yes or No

D. Were the correlation coefficients for the calibration curve for AA, Hg, and CN ≥ 0.995? Yes or No N/A

E. Was a standard at 2X CRDL analyzed for all ICP analyses. Yes or No N/A

If no, the data may be affected. Use professional judgement to determine the severity of the effect and qualify the data accordingly. Discuss any actions below and list the samples affected.

pH meter was calibrated between values of pH 4 and pH 7; one sample was out of this calibration range. However, since a pH 10 buffer was analyzed as a check standard and recovered within the 2% control limit, the data is acceptable but will be estimated (J). This sample also contained low % solids, which may affect homogeneity and sample representation; again this results in an estimate (J). SED 23 and SED 24 contained low % solids; these will also be estimated (J).

Samples Affected: 16811-9 (SED 22); 7.48 pH, low % solids
16811-10 SED 23 } % solids >10% but < 30%.
16790-7 SED 24 }

Region I
Data Review Worksheet

IV A. BLANK ANALYSIS RESULTS (Sections 1-3) N/A

List the balnk contamination in sections 1 and 2 below. A separate worksheet should be used for soil and water blanks.

1. Laboratory Blanks Matrix:_____

DATE	ICB/CCB#	PREP BL	ANALYTE	CONCENTRATION/UNITS

2. Equipment/Trip Blanks

DATE	EQUIP BL#	TRIP BL#	ANALYTE	CONCENTRATION/UNITS

3. Frequency Requirements

A. Was a preparation blank analyzed for each matrix, for every 20 samples, and for each digestion batch? Yes or No NA

B. Was a calibration blank run at the beginning of the run, and every 10 samples or every 2 hours whichever is more frequent? Yes or No NA

If no, the data may be affected. Use professional judgement to determine the severity of the effect and qualify the data accordingly. Discuss any actions below, and list the samples affected:

Prep blank indicated in leaching log does not appear to be analyzed in ptt run. All samples will be U estimated; this does not affect data.

KAR 3/12/92

Samples Affected: _____

Region I
Data Review worksheet

IV B. BLANK ANALYSIS RESULTS (Section 4) N/A

4. Blank Actions

The Action Level for any analyte is equal to 5X the highest concentration of that analyte found in any blank. The Action Level for samples which have been concentrated or diluted should be multiplied by the concentration/dilution factor. No positive result should be reported unless the concentration of the analyte in the sample exceeds the Action Level (AL) for that analyte. Specific actions are as follows:

1. When the concentration is greater than the IDL, but less than the Action Level, report the sample concentration detected, qualified with a U.

2. When the sample concentration is greater than the Action Level, report the sample concentration unqualified.

Matrix:_____ Matrix:_____

ANALYTE	MAX. CONC/ UNITS	AL/ UNITS	ANALYTE	MAX. CONC/ UNITS	AL/ UNITS

NOTE: Blanks analyzed during a soil case must be converted to mg/kg in order to compare them with the sample results.

$$\text{conc. in ug/l} \times \frac{\text{Volume diluted to (200ml)}}{\text{Weight digested (1gram)}} \times \frac{1\text{L}}{1000\text{ml}} \times \frac{1000\text{g}}{1\text{kg}} \times \frac{1\text{mg}}{1000\text{ug}} = \text{mg/kg}$$

Multiplying this result by 5 to arrive at the Action Level gives a final result in mg/kg which can then be compared to sample results.

Region I
Data Review Worksheet

VI. MATRIX SPIKE

N/A

TR # _____ Matrix:_____

1. Recovery Criteria

List the percent recoveries for analytes which did not meet the required criteria.

S - amount of spike added
SSR - spiked sample result
SR - sample result

ANALYTE	SSR	SR	S	%R	ACTION

Matrix Spike Actions apply to all samples of the same matrix.

ACTIONS:

1. If the sample concentration exceed the spike concentration by a factor of 4 or more, no action is taken.
2. If any analyte does not meet the percent recovery criteria, follow the actions stated below:

	PERCENT RECOVERY		
	< 30%	30%-74%	>125%
Positive Sample Results	J	J	J
Non-detected Results	R	UJ	A

2. Frequency Criteria

A. Was a matrix spike prepared at the required frequency? Yes or No
B. Was a post digest spike analyzed for analytes that did not meet the required criteria for matrix spike recovery? Yes or No

A separate worksheet should be filled out for each matrix spike pair.

Region I
Data Review Worksheet

PH

VII. LABORATORY DUPLICATES

List the concentrations of any analyte not meeting the criteria for duplicate precision. For soil duplicates, calculate the CRDL in mg/kg using the sample weight, volume and percent solids data for the sample. Indicate what criteria was used to evaluate precision by circling either the RPD or CRDL for each analyte.

Matrix: Soils

ANALYTE	CRDL WATER ug/L	CRDL SOIL mg/kg	SAMPLE # SED23 16811-10	DUPLICATE # SED23 16811-10	RPD	ACTION
Aluminum	200		6.92	6.92	0%	none
Antimony	60					
Barium	10					
Beryllium	200					
Cadmium	5					
Calcium	5000					
Chromium	10					
Cobalt	50					
Copper	25					
Iron	100					
Lead	5					
Magnesium	5000					
Manganese	15					
Mercury	0.2					
Nickel	40					
Potassium	5000					
Selenium	5					
Silver	10					
Sodium	5000					
Thallium	10					
Vanadium	50					
Zinc	20					
Cyanide	10					

KAR
3-12-92

Laboratory duplicate actions should be applied to all other samples of the same matrix type.

ACTION:

1. Estimate (J) positive results for analytes which have an RPD > 20% for waters and > 35% for soils.
2. If sample results are less than 5X the CRDL, estimate (J) positive results for analytes whose absolute difference is > CRDL (2X CRDL for soils). If both samples are non-detected, the RPD is not calculated (NC).

Region I
Data Review Worksheet

VIII. FIELD DUPLICATES

pH

List the concentrations of all analytes in the field duplicate pair. For soil duplicates, calculate the CRDL in mg/kg using the sample weight, volume and percent solids data for the sample. Indicate what criteria was used to evaluate precision by circling either the RPD or CRDL for each analyte.

Matrix: Soil

ANALYTE	CRDL		SAMPLE # 16811-8 SED19	DUPLICATE # 16811-9 SED100	RPD	ACTION
	WATER ug/L	SOIL mg/kg				
Aluminum	200		6.91	7.48	.05%	none
Antimony	60					
Barium	10					
Beryllium	200					
Cadmium	5					
Calcium	5000					
Chromium	10					
Cobalt	50					
Copper	25					
Iron	100					
Lead	5					
Magnesium	5000					
Manganese	15					
Mercury	0.2					
Nickel	40					
Potassium	5000					
Selenium	5					
Silver	10					
Sodium	5000					
Thallium	10					
Vanadium	50					
Zinc	20					
Cyanide	10					

Field duplicate actions should be applied to all other samples of the same matrix type.

ACTION:

1. Estimate (J) positive results for analytes which have an RPD > 30% for waters and > 50% for soils.
2. If sample results are less than 5X the CRDL, estimate (J) positive results for analytes whose absolute difference is > 2X CRDL (4X CRDL for soils). If both samples are non-detected, the RPD is not calculated (NC).

Region I
Data Review Worksheet

pH

IX. LABORATORY CONTROL SAMPLE

1. Aqueous LCS

List any LCS recoveries not within the 80%-120% criteria and the affected samples.

DATE	ANALYTE	%REC	SAMPLES AFFECTED	ACTION
			NA	

2. Solid LCS

List any analytes that were not within the control windows set by the EPA for the solid LCS sample. The 80%-120% criteria is not used to evaluate solid LCS results.

ANALYTE	LCS CONC.	CONTROL WINDOWS	SAMPLES AFFECTED	ACTION
LCS used for soils aqueous in matrix. All LCS met criteria.				

ACTION:

	PERCENT RECOVERY		
AQUEOUS LCS	<50%	51%-79%	> 120%
Positive Results	R	J	J
Non-detected Results	R	UJ	A

SOLID LCS	< EPA Control Windows	> EPA Control Windows
Positive Results	J	J
Non-detected Results	UJ	A

3. Frequency Criteria

A. Was an LCS analyzed for each matrix, for every digestion batch, and for every 20 samples? Yes or No

XII. DETECTION LIMIT RESULTS

1. Instrument Detection Limits

_____ Instrument detection limit results were present and found to be less than the CRDL.

_____ IDLs were not included in the data package on Form XI.

_____ IDLs were present, but the criteria was not met for the following analytes:

_____

Reason: _____

Not applicable to this test.

2. Reporting requirements

Were sample results on Form I reported down to the IDL not the CRDL for all analytes? Yes or No NA

Were sample results that were analyzed by ICP for Se, Tl, As, or Pb at least 5x IDL? Yes, No or NA

Were sample weights, volumes, and dilution factors taken into account when reporting detection limits on Form I? Yes or No NA

Reporting limit for pH is 0.010 units.

If no, the reported results may be inaccurate. Make the necessary changes on the data summary tables and request that the laboratory resubmit the corrected data.

Region I
Data Review Worksheets

XIII. SAMPLE QUANTITATION

N/A

_____ Sample results fall within the linear range for ICP and within the calibrated range for all other parameters.

_____ Sample results were beyond the linear range on ICP and/or beyond the calibration range for other parameters for the following samples/analytes:

_____

_____

In the space below, please show a minimum of one sample calculation per method:

ICP

For each sample analyzed, ppt units taken directly from analysis benchsheet.

FURNACE

MERCURY

CYANIDE

For soil samples, the following equation may be necessary to convert raw data values (usually reported in ug/L) to actual sample concentrations (mg/kg):

The lab is required to use 1 gram of sample (wet weight) to 200mL final volume.

Wet weight concentration =

$$\text{digest conc. in ug/L} \times \frac{200\text{mL}}{1\text{g}} \times \frac{1\text{L}}{1000\text{mL}} \times \frac{1000\text{g}}{1\text{kg}} \times \frac{1\text{mg}}{1000\text{ug}} = \frac{\text{mg}}{\text{kg}}$$

In addition, the sample results are converted to dry weight using the percent solids calculations:

$$\frac{\text{wet weight conc.}}{\text{\% solids}} \times 100 = \text{Final concentration, dry weight (mg/kg)}$$

Region I
Data Review Worksheet

Site Name: Industri-Plex
Referencew Number:

REGION I REVIEW OF INORGANIC CONTRACT LABORATORY DATA PACKAGE

The hardcopied(laboratory name) Enseco-East data package received at Region I has been reviewed and the quality assurance and performance data summarized. The data review included:

Case No. 116790 and 16811 SAS No. — Sampling Date(s) 10/2/91; 10/3/91
SDG No. — Matrix water — Shipping Date(s) 10/2/91; 10/3/91
No. of Samples ~~12~~ (8 waters) 15 total — Date(s) rec'd by lab 10/3/91
KAR 8-11-92 ~~4~~ soils

Traffic Report Nos.: SW124, SW119, SW100, SW118, SW121, SW122, SW123, FB1,
SEO 18, SEO24, SEO19, SEO100, SEO 21, SEO22, SEO 23

Trip Blank No.:

Equipment Blank No.:

Field Dup Nos.: SEO 19, SEO100 ; SW19, SW100 .

SOW No. 3/90 requires that specific analytical work be done and that associated reports be provided by the laboratory to the Regions, EMSL-LV, and SMO. The general criteria used to determine the performance were based on an examination of:

- -Data Completeness
- -Holding Times
- -Calibrations
- -Blanks
- -ICP Interference Check Results
- -Matrix Spike Recoveries
- -Laboratory Duplicates
- -Field Duplicates
- -Lab Control Sample Results
- -Furnace AA results
- -ICP Serial Dilution Results
- -Detection Limit Results
- -Sample Quantitation

Overall Comments: TOC review. TOC water raw data and results complete. TOC soil raw data not presented; samples were sent out. Since only results for TOC soils were included, the results cannot be verified and only TOC waters will be addressed. Thus, all soil TOC will be estimated (J) with the exception of SEO 22 which will be rejected (R) due to low % solids.

Definitions and Qualifiers:

- A - Acceptable data
- J - Approximate data due to quality control criteria
- R - Reject data due to quality control criteria
- U - Analyte not detected

Reviewer: Kim A Reynolds

Date: 3/13/92

Region I
Data Review Worksheet

I. DATA COMPLETENESS

MISSING INFORMATION	DATE LAB CONTACTED	DATE RECEIVED
soil TOC - no raw data provided.		

Region I
Data Review Worksheet

II. HOLDING TIMES

Complete table for all samples and circle the analysis date for samples not within criteria.

SAMPLE ID	DATE SAMPLED	~~HG~~ ANALYSIS DATE	~~CYANIDE~~ KAR 3/11/92 ~~ANALYSIS DATE~~	OTHERS TOC ANALYSIS DATE	pH	ACTION
SW 18	10/2/91	10/14/91		10/14/91		
SW 19	10/2/91	10/14/91		10/14/91		
SW 21	10/3/91	10/22/91		10/22/91		
SW 22	10/3/91	10/22/91		10/22/91		
SW 23	10/3/91	10/22/91		10/22/91		
SW 24	~~10/2/91~~ 10/2/91 KAR	10/14/91		10/14/91		
SW 100	10/2/91	10/14/91		10/14/91		
FB 1	10/3/91	10/22/91		10/22/91		
SED 18	10/2/91	not available in data package		for all soil samples sub-contracted, analysis raw data not present. soil samples taken 10/2/91 and 10/3/91 assumed to be within holding time since results sent 10/22 and 10/23 are well within 28 days.		
SED 19	10/2/91					
SED 21	10/3/91					
SED 22	10/3/91					
SED 23	10/3/91					
SED 24	10/2/91					
SED 100	10/2/91					

METALS 180 DAYS FROM SAMPLE COLLECTION
MERCURY 28 DAYS FROM SAMPLE COLLECTION
CYANIDE 14 DAYS FROM SAMPLE COLLECTION
TOC 28 days from sample collection for waters

ACTION:

1. If holding times are exceeded all positive results are estimated (J) and all non-detects are estimated (UJ).
2. If holding times are grossly exceeded, the reviewer may determine that non-detects are unusable (R).

Region I
Data Review Worksheets

III A. INSTRUMENT CALIBRATION (Section 1) TOC

1. Recovery Criteria

List the analytes which did not meet the percent recovery (%R) criteria for Initial and/or Continuing Calibration.

DATE	ICV/CCV#	ANALYTE	%R	SAMPLES AFFECTED	ACTION
all calibration criteria was met. for water					

ACTIONS: FOR TOC

If any analyte does not meet the %R criteria follow the actions stated below:

For positive results:

	Accept	Estimate (J)	Reject (R)
Metals	90%-110%	75%-89% or 111%-125%	< 75% or > 125%
Mercury	80%-120%	65%-79% or 121%-135%	< 65% or > 135%
Cyanide	85%-115%	70%-84% or 116%-130%	< 70% or > 130%

For non-detected results:

	Accept	Estimate (UJ)	Reject (R)
Metals	90%-125%	75%-89%	< 75% or > 125%
Mercury	80%-130%	65%-79%	< 65% or > 135%
Cyanide	85%-130%	70%-84%	< 70% or > 130%

Region I
Data Review Worksheets

III B. INSTRUMENT CALIBRATION (Section 2) TOC

2. Analytical Sequence

A. Did the laboratory use the proper number of standards for calibration as described in the SOW? Yes or No

B. Were calibrations performed at the beginning of each analysis? Yes or No

C. Were calibration standards analyzed at the beginning of sample analysis and at a minimum frequency of ten percent or every two hours during analysis, whichever is more frequent? Yes or No

D. Were the correlation coefficients for the calibration curve for AA, ~~Hg, and CN~~ TOC ≥ 0.995? KAR 3-11-92 Yes or No N/A

E. Was a standard at 2X CRDL ~~analyzed~~ for all ICP analyses. KAR 3-11-92 Yes or No N/A

If no, the data may be affected. Use professional judgement to determine the severity of the effect and qualify the data accordingly. Discuss any actions below and list the samples affected.

~~No calibration was shown on the raw data.~~ KAR 3-11-92

Linear regression was not applicable; laboratory used a one point calibration for water

Samples Affected:

Region I
Data Review Worksheet

IV A. BLANK ANALYSIS RESULTS (Sections 1-3)

List the balnk contamination in sections 1 and 2 below. A separate worksheet should be used for soil and water blanks.

1. Laboratory Blanks Matrix: waters

DATE	ICB/CCB#	PREP BL	ANALYTE	CONCENTRATION/UNITS
	no blank contamination			occurred.

2. Equipment/Trip Blanks

DATE	EQUIP BL#	TRIP BL#	ANALYTE	CONCENTRATION/UNITS

3. Frequency Requirements

A. Was a preparation blank analyzed for each matrix, for every 20 samples, and for each digestion batch? Yes or No

B. Was a calibration blank run at the beginning of the run, and every 10 samples or every 2 hours whichever is more frequent? Yes or No

If no, the data may be affected. Use professional judgement to determine the severity of the effect and qualify the data accordingly. Discuss any actions below, and list the samples affected:

Samples Affected:

Region I
Data Review worksheet

IV B. BLANK ANALYSIS RESULTS (Section 4) TOC

4. Blank Actions

The Action Level for any analyte is equal to 5X the highest concentration of that analyte found in any blank. The Action Level for samples which have been concentrated or diluted should be multiplied by the concentration/dilution factor. No positive result should be reported unless the concentration of the analyte in the sample exceeds the Action Level (AL) for that analyte. Specific actions are as follows:

1. When the concentration is greater than the IDL, but less than the Action Level, report the sample concentration detected, qualified with a U.

2. When the sample concentration is greater than the Action Level, report the sample concentration unqualified.

Matrix: aqueous Matrix: _____

ANALYTE	MAX. CONC/ UNITS	AL/ UNITS	ANALYTE	MAX. CONC/ UNITS	AL/ UNITS
no contamination evident in blanks for water analysis.					
	or in field blank applicable to soils				

NOTE: Blanks analyzed during a soil case must be converted to mg/kg in order to compare them with the sample results.

conc. in ug/l X $\frac{\text{Volume diluted to (200ml)}}{\text{Weight digested (1gram)}}$ X $\frac{1L}{1000ml}$ X $\frac{1000g}{1kg}$ X $\frac{1mg}{1000ug}$ = mg/kg

Multiplying this result by 5 to arrive at the Action Level gives a final result in mg/kg which can then be compared to sample results.

Region I
Data Review Worksheet

VI. MATRIX SPIKE TOC

TR # _____ **Matrix:** waters

1. **Recovery Criteria** Aqueous matrix spike recovery meet criteria.

List the percent recoveries for analytes which did not meet the required criteria.

S - amount of spike added
SSR - spiked sample result
SR - sample result

ANALYTE	SSR	SR	S	%R	ACTION

Matrix Spike Actions apply to all samples of the same matrix.

ACTIONS:

1. If the sample concentration exceed the spike concentration by a factor of 4 or more, no action is taken.
2. If any analyte does not meet the percent recovery criteria, follow the actions stated below:

	PERCENT RECOVERY		
	< 30%	30%-74%	>125%
Positive Sample Results	J	J	J
Non-detected Results	R	UJ	A

2. **Frequency Criteria**

A. Was a matrix spike prepared at the required frequency? Yes or No
B. Was a post digest spike analyzed for analytes that did not meet the required criteria for matrix spike recovery? Yes or No NA

A separate worksheet should be filled out for each matrix spike pair.

no matrix spike for TOC soils included in results, thus estimate all results (J) that are positive.

Region I
Data Review Worksheet

VII. LABORATORY DUPLICATES – TOC

List the concentrations of any analyte not meeting the criteria for duplicate precision. For soil duplicates, calculate the CRDL in mg/kg using the sample weight, volume and percent solids data for the sample. Indicate what criteria was used to evaluate precision by circling either the RPD or CRDL for each analyte.

Matrix: waters

TOC ANALYTE	CRDL WATER ug/L	CRDL SOIL mg/kg	SAMPLE # KAR 7-13-92 SW23 ~~SW19~~	DUPLICATE # SW23 DUP ~~SW10~~	RPD	ACTION
Aluminum	200		duplicates	met criteria.		
Antimony	60		~~9.5~~	~~9.5~~	~~0%~~	~~none~~
Barium	10		9.0441	9.2485	1%	none
Beryllium	200					
Cadmium	5					
Calcium	5000					
Chromium	10					
Cobalt	50					
Copper	25					
Iron	100					
Lead	5					
Magnesium	5000					
Manganese	15					
Mercury	0.2					
Nickel	40					
Potassium	5000					
Selenium	5					
Silver	10					
Sodium	5000					
Thallium	10					
Vanadium	50					
Zinc	20					
Cyanide	10					

KAR
3-11-92

Laboratory duplicate actions should be applied to all other samples of the same matrix type.

ACTION:

1. Estimate (J) positive results for analytes which have an RPD > 20% for waters and > 35% for soils.
2. If sample results are less than 5X the CRDL, estimate (J) positive results for analytes whose absolute difference is > CRDL (2X CRDL for soils). If both samples are non-detected, the RPD is not calculated (NC).

Region I
Data Review Worksheet

VIII. FIELD DUPLICATES - TOC

List the concentrations of all analytes in the field duplicate pair. For soil duplicates, calculate the CRDL in mg/kg using the sample weight, volume and percent solids data for the sample. Indicate what criteria was used to evaluate precision by circling either the RPD or CRDL for each analyte.

Matrix: waters

KAR
3-11-92

TOC ANALYTE	CRDL WATER ug/L	CRDL SOIL mg/kg	SAMPLE # SW19	DUPLICATE # SW19D	RPD	ACTION
Aluminum	200		duplicates	met criteria.		
Antimony	60		9.5	9.5	0%	none)
Barium	10					
Beryllium	200					
Cadmium	5					
Calcium	5000					
Chromium	10					
Cobalt	50					
Copper	25					
Iron	100					
Lead	5					
Magnesium	5000					
Manganese	15					
Mercury	0.2					
Nickel	40					
Potassium	5000					
Selenium	5					
Silver	10					
Sodium	5000					
Thallium	10					
Vanadium	50					
Zinc	20					
Cyanide	10					

Field duplicate actions should be applied to all other samples of the same matrix type.

ACTION:

1. Estimate (J) positive results for analytes which have an RPD > 30% for waters and > 50% for soils.
2. If sample results are less than 5X the CRDL, estimate (J) positive results for analytes whose absolute difference is > 2X CRDL (4X CRDL for soils). If both samples are non-detected, the RPD is not calculated (NC).

Region I
Data Review Worksheet

VIII. FIELD DUPLICATES

List the concentrations of all analytes in the field duplicate pair. For soil duplicates, calculate the CRDL in mg/kg using the sample weight, volume and percent solids data for the sample. Indicate what criteria was used to evaluate precision by circling either the RPD or CRDL for each analyte.

Matrix: SOILS

ANALYTE	CRDL WATER ug/L	CRDL SOIL mg/kg	SAMPLE # SED-19	DUPLICATE # SED-100	RPD	ACTION
Aluminum	200	(TOC)	3580	3238	10.0%	no action
Antimony	60					
Barium	10					
Beryllium	200					
Cadmium	5					
Calcium	5000					
Chromium	10					
Cobalt	50					
Copper	25					
Iron	100					
Lead	5					
Magnesium	5000					
Manganese	15					
Mercury	0.2					
Nickel	40					
Potassium	5000					
Selenium	5					
Silver	10					
Sodium	5000					
Thallium	10					
Vanadium	50					
Zinc	20					
Cyanide	10					

Field duplicate actions should be applied to all other samples of the same matrix type.

ACTION:

1. Estimate (J) positive results for analytes which have an RPD > 30% for waters and > 50% for soils.
2. If sample results are less than 5X the CRDL, estimate (J) positive results for analytes whose absolute difference is > 2X CRDL (4X CRDL for soils). If both samples are non-detected, the RPD is not calculated (NC).

Region I
Data Review Worksheet

IX. LABORATORY CONTROL SAMPLE

1. Aqueous LCS

List any LCS recoveries not within the 80%-120% criteria and the affected samples.

DATE	ANALYTE	%REC	SAMPLES AFFECTED	ACTION
	LCS recoveries		within criteria.	

2. Solid LCS

List any analytes that were not within the control windows set by the EPA for the solid LCS sample. The 80%-120% criteria is not used to evaluate solid LCS results.

ANALYTE	LCS CONC.	CONTROL WINDOWS	SAMPLES AFFECTED	ACTION
	N/A - samples subcontracted.			

ACTION:

	PERCENT RECOVERY		
AQUEOUS LCS	≤50%	51%-79%	> 120%
Positive Results	R	J	J
Non-detected Results	R	UJ	A

SOLID LCS	< EPA Control Windows	> EPA Control Windows
Positive Results	J	J
Non-detected Results	UJ	A

3. Frequency Criteria

A. Was an LCS analyzed for each matrix, for every digestion batch, and for every 20 samples? Yes or No

XII. DETECTION LIMIT RESULTS - TOC

1. Instrument Detection Limits

_____ Instrument detection limit results were present and found to be less than the CRDL.

_____ IDLs were not included in the data package on Form XI.

_____ IDLs were present, but the criteria was not met for the following analytes:

_____

Reason: _____

CRDL not applicable. method 415.2 lists acceptable range of detection as .05mg/L – 10mg/L. Method does not list specific detection limit.

2. Reporting requirements

Were sample results on Form I reported down to the IDL not the CRDL for all analytes? Yes or No N/A

Were sample results that were analyzed by ICP for Se, Tl, As, or Pb at least 5x IDL? Yes, No or NA

Were sample weights, volumes, and dilution factors taken into account when reporting detection limits on Form I? Yes or No NA

If no, the reported results may be inaccurate. Make the necessary changes on the data summary tables and request that the laboratory resubmit the corrected data.

Region I
Data Review Worksheets

XIII. SAMPLE QUANTITATION — TOC

_____ Sample results fall within the linear range for ~~ICP~~ TOC and within the calibrated range for all other parameters.

KAR 3-11-92

_____ Sample results were beyond the linear range on ~~ICP~~ TOC and/or beyond the calibration range for other parameters for the following samples/analytes:

_____

_____

In the space below, please show a minimum of one sample calculation per method:

ICP

FURNACE

MERCURY

CYANIDE

~~Waters~~ reported in mg/L.
instrument printout in mg/L. thus,
16811-3 (SW-23): 9.0 mg/L.

Soils reported in mg/kg — no raw data provided.

For soil samples, the following equation may be necessary to convert raw data values (usually reported in ug/L) to actual sample concentrations (mg/kg):

The lab is required to use 1 gram of sample (wet weight) to 200mL final volume.

Wet weight concentration =

$$\text{digest conc. in ug/L} \times \frac{200\text{mL}}{1\text{g}} \times \frac{1\text{L}}{1000\text{mL}} \times \frac{1000\text{g}}{1\text{kg}} \times \frac{1\text{mg}}{1000\text{ug}} = \frac{\text{mg}}{\text{kg}}$$

In addition, the sample results are converted to dry weight using the percent solids calculations:

$$\frac{\text{wet weight conc.}}{\text{\% solids}} \times 100 = \text{Final concentration, dry weight (mg/kg)}$$

Region I
Data Review Worksheet

Site Name: Industri-Plex
Referencew Number:

REGION I REVIEW OF INORGANIC CONTRACT LABORATORY DATA PACKAGE

The hardcopied(laboratory name) ENSECO-EAST data package received at Region I has been reviewed and the quality assurance and performance data summarized. The data review included:

Case No.	16790, 16811	SAS No.		Sampling Date(s)	10/2/91, 10/3/91
SDG No.		Matrix	Soils	Shipping Date(s)	10/2/91, 10/3/91
No. of Samples	8 7 soils 1 water (FB)		water	Date(s) rec'd by lab	10/3/91

Traffic Report Nos.: SED 18, SED 19, SED 21, SED 22, SED 23, SED 24
SED 100
FB 1

Trip Blank No.:

Equipment Blank No.:

Field Dup Nos.: SED 19, SED 100

SOW No. 3/90 requires that specific analytical work be done and that associated reports be provided by the laboratory to the Regions, EMSL-LV, and SMO. The general criteria used to determine the performance were based on an examination of:

- -Data Completeness
- -Holding Times
- -Calibrations
- -Blanks
- -ICP Interference Check Results
- -Matrix Spike Recoveries
- -Laboratory Duplicates
- -Field Duplicates
- -Lab Control Sample Results
- -Furnace AA results
- -ICP Serial Dilution Results
- -Detection Limit Results
- -Sample Quantitation

Overall Comments: Total Sulfide results. Due to low matrix spike recovery, samples will be designated UJ (undetects). Sample SED 22 will be rejected (R) due to low % solids, as will SED 23 and SED24.

Definitions and Qualifiers:

A - Acceptable data
J - Approximate data due to quality control criteria
R - Reject data due to quality control criteria
U - Analyte not detected

Reviewer: Kim A Reynolds

Date: 3-17-92

Region I
Data Review Worksheet

I. DATA COMPLETENESS

Total Sulfide

MISSING INFORMATION	DATE LAB CONTACTED	DATE RECEIVED
all present		

Region I
Data Review Worksheet

II. HOLDING TIMES

Complete table for all samples and circle the analysis date for samples not within criteria.

SAMPLE ID	DATE SAMPLED	HG ANALYSIS DATE	CYANIDE ANALYSIS DATE	OTHERS Total Sulfide ANALYSIS DATE	pH	ACTION
SED18	10/2/89			10/7/91		
SED19				10/7/91		
SED21	10/3/89			10/19/91		
SED22	10/3/89					
SED23	10/3/89					
SED24	10/2/89			10/7/91		
SED100				10/7/91		

METALS 180 DAYS FROM SAMPLE COLLECTION
MERCURY 28 DAYS FROM SAMPLE COLLECTION
CYANIDE 14 DAYS FROM SAMPLE COLLECTION

ACTION:

1. If holding times are exceeded all positive results are estimated (J) and all non-detects are estimated (UJ).
2. If holding times are grossly exceeded, the reviewer may determine that non-detects are unusable (R).

Region I
Data Review Worksheets

Total Sulfide

III A. INSTRUMENT CALIBRATION (Section 1)

1. Recovery Criteria

List the analytes which did not meet the percent recovery (%R) criteria for Initial and/or Continuing Calibration.

DATE	ICV/CCV#	ANALYTE	%R	SAMPLES AFFECTED	ACTION
	all	calibration criteria met			

ACTIONS:

If any analyte does not meet the %R criteria follow the actions stated below:

For positive results:

	Accept	Estimate (J)	Reject (R)
Metals	90%-110%	75%-89% or 111%-125%	< 75% or > 125%
Mercury	80%-120%	65%-79% or 121%-135%	< 65% or > 135%
Cyanide	85%-115%	70%-84% or 116%-130%	< 70% or > 130%

For non-detected results:

	Accept	Estimate (UJ)	Reject (R)
Metals	90%-125%	75%-89%	< 75% or > 125%
Mercury	80%-130%	65%-79%	< 65% or > 135%
Cyanide	85%-130%	70%-84%	< 70% or > 130%

Region I
Data Review Worksheets

Total Sulfide

III B. INSTRUMENT CALIBRATION (Section 2)

2. Analytical Sequence

A. Did the laboratory use the proper number of standards for calibration as described in the SOW? Yes or No

B. Were calibrations performed at the beginning of each analysis? Yes or No

C. Were calibration standards analyzed at the beginning of sample analysis and at a minimum frequency of ten percent or every two hours during analysis, whichever is more frequent? Yes or No

D. Were the correlation coefficients for the calibration curve for ~~AA, Hg, and CN~~ Sulfide ≥ 0.995? Yes or No

E. Was a standard at 2X CRDL analyzed for all ICP analyses. Yes or No N/A

If no, the data may be affected. Use professional judgement to determine the severity of the effect and qualify the data accordingly. Discuss any actions below and list the samples affected.

Samples Affected:

Region I
Data Review Worksheet

IV A. BLANK ANALYSIS RESULTS (Sections 1-3)

List the balnk contamination in sections 1 and 2 below. A separate worksheet should be used for soil and water blanks.

1. Laboratory Blanks Matrix: Soils

DATE	ICB/CCB#	PREP BL	ANALYTE	CONCENTRATION/UNITS
	no blank contamination occurred.			

2. Equipment/Trip Blanks

DATE	EQUIP BL#	TRIP BL#	ANALYTE	CONCENTRATION/UNITS

3. Frequency Requirements

A. Was a preparation blank analyzed for each matrix, for every 20 samples, and for each digestion batch? Yes or No

B. Was a calibration blank run at the beginning of the run, and every 10 samples or every 2 hours whichever is more frequent? Yes or No

If no, the data may be affected. Use professional judgement to determine the severity of the effect and qualify the data accordingly. Discuss any actions below, and list the samples affected:

Samples Affected:

Region I
Data Review worksheet

IV B. BLANK ANALYSIS RESULTS (Section 4)

4. Blank Actions

The Action Level for any analyte is equal to 5X the highest concentration of that analyte found in any blank. The Action Level for samples which have been concentrated or diluted should be multiplied by the concentration/dilution factor. No positive result should be reported unless the concentration of the analyte in the sample exceeds the Action Level (AL) for that analyte. Specific actions are as follows:

1. When the concentration is greater than the IDL, but less than the Action Level, report the sample concentration detected, qualified with a U.

2. When the sample concentration is greater than the Action Level, report the sample concentration unqualified.

Matrix: Soils

ANALYTE	MAX. CONC/ UNITS	AL/ UNITS
no	contamination	occurred.

Matrix: waters (field blank)

ANALYTE	MAX. CONC/ UNITS	AL/ UNITS

NOTE: Blanks analyzed during a soil case must be converted to mg/kg in order to compare them with the sample results.

$$\text{conc. in ug/l} \times \frac{\text{Volume diluted to (200ml)}}{\text{Weight digested (1gram)}} \times \frac{1\text{L}}{1000\text{ml}} \times \frac{1000\text{g}}{1\text{kg}} \times \frac{1\text{mg}}{1000\text{ug}} = \text{mg/kg}$$

Multiplying this result by 5 to arrive at the Action Level gives a final result in mg/kg which can then be compared to sample results.

Region I
Data Review Worksheet

VI. MATRIX SPIKE

Total Sulfide

TR # SED-23

Matrix: Soil
water

1. Recovery Criteria

List the percent recoveries for analytes which did not meet the required criteria.

S - amount of spike added
SSR - spiked sample result
SR - sample result

YAR 3-12-92

ANALYTE	SSR	SR	S	%R	ACTION
	~~11.9~~ 5.2	~~5.7~~ ND	11.9	48%	UJ

Matrix Spike Actions apply to all samples of the same matrix.

ACTIONS:

1. If the sample concentration exceed the spike concentration by a factor of 4 or more, no action is taken.
2. If any analyte does not meet the percent recovery criteria, follow the actions stated below:

	PERCENT RECOVERY		
	< 30%	30%-74%	>125%
Positive Sample Results	J	J	J
Non-detected Results	R	UJ	A

2. Frequency Criteria

A. Was a matrix spike prepared at the required frequency? Yes or No
B. Was a post digest spike analyzed for analytes that did not meet the required criteria for matrix spike recovery? Yes or No NA

A separate worksheet should be filled out for each matrix spike pair.

Region I
Data Review Worksheet

VII. LABORATORY DUPLICATES

Total Sulfide

List the concentrations of any analyte not meeting the criteria for duplicate precision. For soil duplicates, calculate the CRDL in mg/kg using the sample weight, volume and percent solids data for the sample. Indicate what criteria was used to evaluate precision by circling either the RPD or CRDL for each analyte.

Matrix: Soil

ANALYTE	CRDL WATER ug/L	CRDL SOIL mg/kg	SAMPLE # SED23	DUPLICATE # SED23	RPD	ACTION
Aluminum	200		.039	.041	3.03%	none
Antimony	60					
Barium	10					
Beryllium	200					
Cadmium	5					
Calcium	5000					
Chromium	10					
Cobalt	50					
Copper	25					
Iron	100					
Lead	5					
Magnesium	5000					
Manganese	15					
Mercury	0.2					
Nickel	40					
Potassium	5000					
Selenium	5					
Silver	10					
Sodium	5000					
Thallium	10					
Vanadium	50					
Zinc	20					
Cyanide	10					

Laboratory duplicate actions should be applied to all other samples of the same matrix type.

ACTION:

1. Estimate (J) positive results for analytes which have an RPD > 20% for waters and > 35% for soils.
2. If sample results are less than 5X the CRDL, estimate (J) positive results for analytes whose absolute difference is > CRDL (2X CRDL for soils). If both samples are non-detected, the RPD is not calculated (NC).

Region I
Data Review Worksheet

VIII. FIELD DUPLICATES

List the concentrations of all analytes in the field duplicate pair. For soil duplicates, calculate the CRDL in mg/kg using the sample weight, volume and percent solids data for the sample. Indicate what criteria was used to evaluate precision by circling either the RPD or CRDL for each analyte.

Matrix: Soil

ANALYTE	CRDL WATER ug/L	CRDL SOIL mg/kg	SAMPLE # SE019	DUPLICATE # SE016D	RPD	ACTION
Aluminum	200		.035	.042	12.5%	None
Antimony	60					
Barium	10					
Beryllium	200					
Cadmium	5					
Calcium	5000					
Chromium	10					
Cobalt	50					
Copper	25					
Iron	100					
Lead	5					
Magnesium	5000					
Manganese	15					
Mercury	0.2					
Nickel	40					
Potassium	5000					
Selenium	5					
Silver	10					
Sodium	5000					
Thallium	10					
Vanadium	50					
Zinc	20					
Cyanide	10					

Field duplicate actions should be applied to all other samples of the same matrix type.

ACTION:

1. Estimate (J) positive results for analytes which have an RPD > 30% for waters and > 50% for soils.
2. If sample results are less than 5X the CRDL, estimate (J) positive results for analytes whose absolute difference is > 2X CRDL (4X CRDL for soils). If both samples are non-detected, the RPD is not calculated (NC).

Region I
Data Review Worksheet

IX. LABORATORY CONTROL SAMPLE Total Sulfide

1. Aqueous LCS

List any LCS recoveries not within the 80%-120% criteria and the affected samples.

DATE	ANALYTE	%REC	SAMPLES AFFECTED	ACTION

2. Solid LCS

List any analytes that were not within the control windows set by the EPA for the solid LCS sample. The 80%-120% criteria is not used to evaluate solid LCS results.

ANALYTE	LCS CONC.	CONTROL WINDOWS	SAMPLES AFFECTED	ACTION
Aqueous	~~DCS~~ LCS utilized.	All ~~DCS~~ LCS	met criteria.	

ACTION:

AQUEOUS LCS	PERCENT RECOVERY ≤50%	51%-79%	≥ 120%
Positive Results	R	J	J
Non-detected Results	R	UJ	A

SOLID LCS	< EPA Control Windows	> EPA Control Windows
Positive Results	J	J
Non-detected Results	UJ	A

3. Frequency Criteria

A. Was an LCS analyzed for each matrix, for every digestion batch, and for every 20 samples? Yes or No

Region I
Data Review Worksheets

Total Sulfide.

XII. DETECTION LIMIT RESULTS

1. Instrument Detection Limits

_____ Instrument detection limit results were present and found to be less than the CRDL.

_____ IDLs were not included in the data package on Form XI.

_____ IDLs were present, but the criteria was not met for the following analytes:

_____

Reason: Not applicable to this test.

2. Reporting requirements

Were sample results on Form I reported down to the IDL not the CRDL for all analytes? Yes or No Nt

Were sample results that were analyzed by ICP for Se, Tl, As, or Pb at least 5x IDL? Yes, No or NA

Were sample weights, volumes, and dilution factors taken into account when reporting detection limits on Form I? Yes or No

Reporting limit is 0.10 for waters.

If no, the reported results may be inaccurate. Make the necessary changes on the data summary tables and request that the laboratory resubmit the corrected data.

Region I
Data Review Worksheets

XIII. SAMPLE QUANTITATION

✓ Sample results fall within the linear range for ICP and within the calibrated range for all other parameters.

_____ Sample results were beyond the linear range on ICP and/or beyond the calibration range for other parameters for the following samples/analytes:

In the space below, please show a minimum of one sample calculation per method:

ICP — Total Sulfide
correlation coefficient = .999
Calculations done using linear regression.
Example 1: DCS for QC LOT 190CT91-A

FURNACE — .494 absorbance = .532mg/L TV = .5 107% rec.

MERCURY — FOR SED 23: absorbance reported: ~~.041~~ .225
matrix spike
~~.040 x~~ .239 x 5 (prep factor) = 1.20
1.20 ÷ .21 (21% solid) = 5.7

CYANIDE — For spike: true value = 2.5 (.5 x 5 dilution factor)
2.5/.21 (21% solid) = 11.9 5.7/11.9 = 48% rec.

For soil samples, the following equation may be necessary to convert raw data values (usually reported in ug/L) to actual sample concentrations (mg/kg):

The lab is required to use 1 gram of sample (wet weight) to 200mL final volume.

Wet weight concentration =

$$\text{digest conc. in ug/L} \times \frac{200\text{mL}}{1\text{g}} \times \frac{1\text{L}}{1000\text{mL}} \times \frac{1000\text{g}}{1\text{kg}} \times \frac{1\text{mg}}{1000\text{ug}} = \frac{\text{mg}}{\text{kg}}$$

In addition, the sample results are converted to dry weight using the percent solids calculations:

$$\frac{\text{wet weight conc.}}{\text{\% solids}} \times 100 = \text{Final concentration, dry weight (mg/kg)}$$

SED 23 contained <10% solids.
SED 21 and SED 22 contained <30% but >10% solids. These will be therefore designated UJ, since all samples are non-detects

Region I
Data Review Worksheet

Site Name: Industri-Plex
Referencew Number:

REGION I REVIEW OF INORGANIC CONTRACT LABORATORY DATA PACKAGE

The hardcopied(laboratory name) ENSECO-EAST data package received at Region I has been reviewed and the quality assurance and performance data summarized. The data review included:

Case No.	16790, 16811	SAS No.		Sampling Date(s)	10/2/91, 10/3/91
SDG No.		Matrix	soils	Shipping Date(s)	10/2/91, 10/3/91
No. of Samples	7 soils + 1 water			Date(s) rec'd by lab	10/3/91, 10/4/91
	1 water (Field blank)				

Traffic Report Nos.: SED19, SED 21, SED 22, SED 23, SED 24, SED100
SED 18
FB I

Trip Blank No.:

Equipment Blank No.:

Field Dup Nos.:

SOW No. 3/90 requires that specific analytical work be done and that associated reports be provided by the laboratory to the Regions, EMSL-LV, and SMO. The general criteria used to determine the performance were based on an examination of:

- -Data Completeness
- -Holding Times
- -Calibrations
- -Blanks
- -ICP Interference Check Results
- -Matrix Spike Recoveries
- -Laboratory Duplicates
- -Field Duplicates
- -Lab Control Sample Results
- -Furnace AA results
- -ICP Serial Dilution Results
- -Detection Limit Results
- -Sample Quantitation

Overall Comments: Ammonia (NH_3) results. All results (soils) will be estimated J due to an RPD of 165% for laboratory duplicates SED23 and SED23 DUP. Because SED22 contained low % solids results for this analysis will be rejected. SED 23 AND SED 24 will be estimated due to low % solids.

Definitions and Qualifiers:

- A - Acceptable data
- J - Approximate data due to quality control criteria
- R - Reject data due to quality control criteria
- U - Analyte not detected

Reviewer: Kim A Reynolds

Date: 8-17-92

Region I
Data Review Worksheet

I. DATA COMPLETENESS

MISSING INFORMATION	DATE LAB CONTACTED	DATE RECEIVED
all info. present		

Region I
Data Review Worksheet

II. HOLDING TIMES

Complete table for all samples and circle the analysis date for samples not within criteria.

SAMPLE ID	DATE SAMPLED	HG ANALYSIS DATE	CYANIDE ANALYSIS DATE	OTHERS NH3 ANALYSIS DATE	pH	ACTION
SED18	10/2/91			11/5/91		
SED19						
SED21	10/3/91					
SED22						
SED23						
SED24	10/2/91					
SED100						
EB1	10/3/91			10/23/91		

METALS 180 DAYS FROM SAMPLE COLLECTION
MERCURY 28 DAYS FROM SAMPLE COLLECTION
CYANIDE 14 DAYS FROM SAMPLE COLLECTION
AMMONIA-

ACTION:

1. If holding times are exceeded all positive results are estimated (J) and all non-detects are estimated (UJ).
2. If holding times are grossly exceeded, the reviewer may determine that non-detects are unusable (R).

Region I
Data Review Worksheets

III A. INSTRUMENT CALIBRATION (Section 1) NH_3

1. Recovery Criteria

List the analytes which did not meet the percent recovery (%R) criteria for Initial and/or Continuing Calibration.

DATE	ICV/CCV#	ANALYTE	%R	SAMPLES AFFECTED	ACTION
	all calibration criteria met				

ACTIONS:

If any analyte does not meet the %R criteria follow the actions stated below:

For positive results:

	Accept	Estimate (J)	Reject (R)
Metals	90%-110%	75%-89% or 111%-125%	< 75% or > 125%
Mercury	80%-120%	65%-79% or 121%-135%	< 65% or > 135%
Cyanide	85%-115%	70%-84% or 116%-130%	< 70% or > 130%

For non-detected results:

	Accept	Estimate (UJ)	Reject (R)
Metals	90%-125%	75%-89%	< 75% or > 125%
Mercury	80%-130%	65%-79%	< 65% or > 135%
Cyanide	85%-130%	70%-84%	< 70% or > 130%

Region I
Data Review Worksheets

III B. INSTRUMENT CALIBRATION (Section 2) NH3

2. Analytical Sequence

A. Did the laboratory use the proper number of standards for calibration as described in the SOW? Yes or No

B. Were calibrations performed at the beginning of each analysis? Yes or No

C. Were calibration standards analyzed at the beginning of sample analysis and at a minimum frequency of ten percent or every two hours during analysis, whichever is more frequent? Yes or No

D. Were the correlation coefficients for the calibration curve ~~for AA, Hg, and CN~~ KAR ≥ 0.995? Yes or No

E. Was a standard at 2X CRDL analyzed for all ICP analyses. Yes or No N/A

If no, the data may be affected. Use professional judgement to determine the severity of the effect and qualify the data accordingly. Discuss any actions below and list the samples affected.

Samples Affected:

Region I
Data Review Worksheet

IV A. BLANK ANALYSIS RESULTS (Sections 1-3)

List the balnk contamination in sections 1 and 2 below. A separate worksheet should be used for soil and water blanks.

1. Laboratory Blanks Matrix: Soils

DATE	ICB/CCB#	PREP BL	ANALYTE	CONCENTRATION/UNITS
	ND contamination occurred.			

2. Equipment/Trip Blanks

DATE	EQUIP BL#	TRIP BL#	ANALYTE	CONCENTRATION/UNITS

3. Frequency Requirements

A. Was a preparation blank analyzed for each matrix, for every 20 samples, and for each digestion batch? Yes or No

B. Was a calibration blank run at the beginning of the run, and every 10 samples or every 2 hours whichever is more frequent? Yes or No

If no, the data may be affected. Use professional judgement to determine the severity of the effect and qualify the data accordingly. Discuss any actions below, and list the samples affected:

Samples Affected:

Region I
Data Review worksheet

IV B. BLANK ANALYSIS RESULTS (Section 4)

4. Blank Actions

The Action Level for any analyte is equal to 5X the highest concentration of that analyte found in any blank. The Action Level for samples which have been concentrated or diluted should be multiplied by the concentration/dilution factor. No positive result should be reported unless the concentration of the analyte in the sample exceeds the Action Level (AL) for that analyte. Specific actions are as follows:

1. When the concentration is greater than the IDL, but less than the Action Level, report the sample concentration detected, qualified with a U.

2. When the sample concentration is greater than the Action Level, report the sample concentration unqualified.

Matrix:_____ Matrix:_____

ANALYTE	MAX. CONC/ UNITS	AL/ UNITS	ANALYTE	MAX. CONC/ UNITS	AL/ UNITS
	No contamination occurred,				

NOTE: Blanks analyzed during a soil case must be converted to mg/kg in order to compare them with the sample results.

$$\text{conc. in ug/l} \times \frac{\text{Volume diluted to (200ml)}}{\text{Weight digested (1gram)}} \times \frac{1\text{L}}{1000\text{ml}} \times \frac{1000\text{g}}{1\text{kg}} \times \frac{1\text{mg}}{1000\text{ug}} = \text{mg/kg}$$

Multiplying this result by 5 to arrive at the Action Level gives a final result in mg/kg which can then be compared to sample results.

Region I
Data Review Worksheet

VI. MATRIX SPIKE

TR # SED-23 Matrix: SOIL

1. Recovery Criteria met criteria (83% recovery)

List the percent recoveries for analytes which did not meet the required criteria.

S - amount of spike added
SSR - spiked sample result
SR - sample result

ANALYTE	SSR	SR	S	%R	ACTION

Matrix Spike Actions apply to all samples of the same matrix.

ACTIONS:

1. If the sample concentration exceed the spike concentration by a factor of 4 or more, no action is taken.
2. If any analyte does not meet the percent recovery criteria, follow the actions stated below:

	PERCENT RECOVERY		
	< 30%	30%-74%	>125%
Positive Sample Results	J	J	J
Non-detected Results	R	UJ	A

2. Frequency Criteria

A. Was a matrix spike prepared at the required frequency? Yes or No
B. Was a post digest spike analyzed for analytes that did not meet the required criteria for matrix spike recovery? NA Yes or No

A separate worksheet should be filled out for each matrix spike pair.

Region I
Data Review Worksheet

VII. LABORATORY DUPLICATES

List the concentrations of any analyte not meeting the criteria for duplicate precision. For soil duplicates, calculate the CRDL in mg/kg using the sample weight, volume and percent solids data for the sample. Indicate what criteria was used to evaluate precision by circling either the RPD or CRDL for each analyte.

Matrix: soils

ANALYTE	CRDL WATER ug/L	CRDL SOIL mg/kg	SAMPLE # SED ~~19~~ 23	DUPLICATE # SED ~~19D~~ 23DUP	RPD	ACTION
Aluminum	200		434	851	65%	J(+)
Antimony	60					
Barium	10					
Beryllium	200					
Cadmium	5					
Calcium	5000					
Chromium	10					
Cobalt	50					
Copper	25					
Iron	100					
Lead	5					
Magnesium	5000					
Manganese	15					
Mercury	0.2					
Nickel	40					
Potassium	5000					
Selenium	5					
Silver	10					
Sodium	5000					
Thallium	10					
Vanadium	50					
Zinc	20					
Cyanide	10					

Laboratory duplicate actions should be applied to all other samples of the same matrix type.

ACTION:

1. Estimate (J) positive results for analytes which have an RPD > 20% for waters and > 35% for soils.
2. If sample results are less than 5X the CRDL, estimate (J) positive results for analytes whose absolute difference is > CRDL (2X CRDL for soils). If both samples are non-detected, the RPD is not calculated (NC).

Region I
Data Review Worksheet

VIII. FIELD DUPLICATES

List the concentrations of all analytes in the field duplicate pair. For soil duplicates, calculate the CRDL in mg/kg using the sample weight, volume and percent solids data for the sample. Indicate what criteria was used to evaluate precision by circling either the RPD or CRDL for each analyte.

Matrix: soil

ANALYTE	CRDL		SAMPLE #	DUPLICATE #	RPD	ACTION
	WATER ug/L	SOIL mg/kg	SED 19	SED 160		
Aluminum	200		66.0	52.9	22%	none
Antimony	60					
Barium	10					
Beryllium	200					
Cadmium	5					
Calcium	5000					
Chromium	10					
Cobalt	50					
Copper	25					
Iron	100					
Lead	5					
Magnesium	5000					
Manganese	15					
Mercury	0.2					
Nickel	40					
Potassium	5000					
Selenium	5					
Silver	10					
Sodium	5000					
Thallium	10					
Vanadium	50					
Zinc	20					
Cyanide	10					

Field duplicate actions should be applied to all other samples of the same matrix type.

ACTION:

1. Estimate (J) positive results for analytes which have an RPD > 30% for waters and > 50% for soils.
2. If sample results are less than 5X the CRDL, estimate (J) positive results for analytes whose absolute difference is > 2X CRDL (4X CRDL for soils). If both samples are non-detected, the RPD is not calculated (NC).

Region I
Data Review Worksheet

IX. LABORATORY CONTROL SAMPLE

1. Aqueous LCS

List any LCS recoveries not within the 80%-120% criteria and the affected samples.

DATE	ANALYTE	%REC	SAMPLES AFFECTED	ACTION
	~~LCS recoveries meet criteria~~			

2. Solid LCS

List any analytes that were not within the control windows set by the EPA for the solid LCS sample. The 80%-120% criteria is not used to evaluate solid LCS results.

ANALYTE	LCS CONC.	CONTROL WINDOWS	SAMPLES AFFECTED	ACTION
	LCS recoveries meet criteria.			
	Laboratory used an aqueous LCS for			
	solid samples.			

ACTION:

	PERCENT RECOVERY		
AQUEOUS LCS	<50%	51%-79%	> 120%
Positive Results	R	J	J
Non-detected Results	R	UJ	A

SOLID LCS	< EPA Control Windows	> EPA Control Windows
Positive Results	J	J
Non-detected Results	UJ	A

3. Frequency Criteria

A. Was an LCS analyzed for each matrix, for every digestion batch, and for every 20 samples? Yes or No

XII. DETECTION LIMIT RESULTS

1. Instrument Detection Limits

_____ Instrument detection limit results were present and found to be less than the CRDL.

_____ IDLs were not included in the data package on Form XI.

_____ IDLs were present, but the criteria was not met for the following analytes:

_____

Reason: No IDL reported; reporting limit is 10mg/kg.

2. Reporting requirements

Were sample results on Form I reported down to the IDL not the CRDL for all analytes? Yes or No NA

Were sample results that were analyzed by ICP for Se, Tl, As, or Pb at least 5x IDL? Yes, No or NA

Were sample weights, volumes, and dilution factors taken into account when reporting detection limits on Form I? Yes or No

If no, the reported results may be inaccurate. Make the necessary changes on the data summary tables and request that the laboratory resubmit the corrected data.

Region I
Data Review Worksheets

XIII. SAMPLE QUANTITATION

__X__ Sample results fall within the linear range for ~~ICP~~ NH_3 and within the calibrated range for all other parameters. KAR 3-12-98

_____ Sample results were beyond the linear range on ICP and/or beyond the calibration range for other parameters for the following samples/analytes:

In the space below, please show a minimum of one sample calculation per method:

ICP

KAR 3/11/92

FURNACE

MERCURY

CYANIDE

NH_3 - Ammonia
example used: SED 18 (16790-6) initial weight: 5.08 g
initial volume: 150 ml
final volume: 150 ml
Dilution factor at instrument was 150 ml / 5.08 g, or 29.5 (round up to 30
Instrument printout for this sample was 59.751 mg/L
Prep factors already considered in dilution.
% moisture = 63%, thus % solid = 37%.
Therefore, $\frac{59.751 \text{ mg/L}}{.37} \times 100 = 161.489 = 161.5$.
This value was rounded up to 162 mg/kg.

For soil samples, the following equation may be necessary to convert raw data values (usually reported in ug/L) to actual sample concentrations (mg/kg):

The lab is required to use 1 gram of sample (wet weight) to 200mL final volume.

Wet weight concentration =

$$\text{digest conc. in ug/L} \times \frac{200\text{mL}}{1\text{g}} \times \frac{1\text{L}}{1000\text{mL}} \times \frac{1000\text{g}}{1\text{kg}} \times \frac{1\text{mg}}{1000\text{ug}} = \frac{\text{mg}}{\text{kg}}$$

In addition, the sample results are converted to dry weight using the percent solids calculations:

$$\frac{\text{wet weight conc.}}{\text{\% solids}} \times 100 = \text{Final concentration, dry weight (mg/kg)}$$

Region I
Data Review Worksheet

Site Name: Industri-Plex
Referencew Number:

REGION I REVIEW OF INORGANIC CONTRACT LABORATORY DATA PACKAGE

The hardcopied(laboratory name) ENSECO-EAST data package received at Region I has been reviewed and the quality assurance and performance data summarized. The data review included:

Case No.	16790, 16811	SAS No.	/	Sampling Date(s)	10/2/91, 10/3/91,
SDG No.		Matrix	waters	Shipping Date(s)	10/2/91, 10/3/91
No. of Samples	7 waters			Date(s) rec'd by lab	10/2/91, 10/3/91

Traffic Report Nos.: SW18, SW19, SW21, SW22, SW23, SW24, SW100

Trip Blank No.:

Equipment Blank No.:

Field Dup Nos.: SW19, SW100

SOW No. 3/90 requires that specific analytical work be done and that associated reports be provided by the laboratory to the Regions, EMSL-LV, and SMO. The general criteria used to determine the performance were based on an examination of:

- -Data Completeness
- -Holding Times
- -Calibrations
- -Blanks
- -ICP Interference Check Results
- -Matrix Spike Recoveries
- -Laboratory Duplicates
- -Field Duplicates
- -Lab Control Sample Results
- -Furnace AA results
- -ICP Serial Dilution Results
- -Detection Limit Results
- -Sample Quantitation

Overall Comments: TSS results

Definitions and Qualifiers:

A - Acceptable data
J - Approximate data due to quality control criteria
R - Reject data due to quality control criteria
U - Analyte not detected

Reviewer: Kim A. Reynolds

Date: 3-13-92

Region I
Data Review Worksheet

I. DATA COMPLETENESS TSS

MISSING INFORMATION	DATE LAB CONTACTED	DATE RECEIVED
all data present		

Region I
Data Review Worksheet

TSS

II. HOLDING TIMES

Complete table for all samples and circle the analysis date for samples not within criteria.

SAMPLE ID	DATE SAMPLED	~~HG~~ ANALYSIS DATE	~~CYANIDE~~ ANALYSIS DATE	OTHERS TSS ANALYSIS DATE	pH	ACTION
SW18	10/2/91			10/07/91 10/10/91	KAR 3/19/92	J
SW19	↓			10/10/91		J
SW21	10/3/91					
SW22	↓					
SW23	↓					
SW24	10/2/91			10/09/92 10/10/91	KAR	J
SW100	↓			10/10/91	3/18/92	J

KAR 3/11/92

METALS 180 DAYS FROM SAMPLE COLLECTION
MERCURY 28 DAYS FROM SAMPLE COLLECTION
CYANIDE 14 DAYS FROM SAMPLE COLLECTION
TSS 7 days from sample collection KAR

ACTION:

1. If holding times are exceeded all positive results are estimated (J) and all non-detects are estimated (UJ).
2. If holding times are grossly exceeded, the reviewer may determine that non-detects are unusable (R).

Holding time is defined as 7 days from sample collection. Thus, samples ~~SW18~~ KAR 3/18/92, SW19, ~~SW24~~ KAR 3/18/92, and SW100 are out of holding time, exceeding by one day. However, samples were not received by laboratory until 10/4/91.

NOTE: Samples SW18 and SW24 within holding time. KAR 3-19-92

Region I
Data Review Worksheets

III A. INSTRUMENT CALIBRATION (Section 1) N/A TSS

1. Recovery Criteria

List the analytes which did not meet the percent recovery (%R) criteria for Initial and/or Continuing Calibration.

DATE	ICV/CCV#	ANALYTE	%R	SAMPLES AFFECTED	ACTION

ACTIONS:

If any analyte does not meet the %R criteria follow the actions stated below:

For positive results:

	Accept	Estimate (J)	Reject (R)
Metals	90%-110%	75%-89% or 111%-125%	< 75% or > 125%
Mercury	80%-120%	65%-79% or 121%-135%	< 65% or > 135%
Cyanide	85%-115%	70%-84% or 116%-130%	< 70% or > 130%

For non-detected results:

	Accept	Estimate (UJ)	Reject (R)
Metals	90%-125%	75%-89%	< 75% or > 125%
Mercury	80%-130%	65%-79%	< 65% or > 135%
Cyanide	85%-130%	70%-84%	< 70% or > 130%

III B. INSTRUMENT CALIBRATION (Section 2)

N/A

2. Analytical Sequence

A.	Did the laboratory use the proper number of standards for calibration as described in the SOW?	Yes or No
B.	Were calibrations performed at the beginning of each analysis?	Yes or No
C.	Were calibration standards analyzed at the beginning of sample analysis and at a minimum frequency of ten percent or every two hours during analysis, whichever is more frequent?	Yes or No
D.	Were the correlation coefficients for the calibration curve for AA, Hg, and CN $\geq$ 0.995?	Yes or No
E.	Was a standard at 2X CRDL analyzed for all ICP analyses.	Yes or No

If no, the data may be affected. Use professional judgement to determine the severity of the effect and qualify the data accordingly. Discuss any actions below and list the samples affected.

Samples Affected:

Region I
Data Review Worksheet

IV A. BLANK ANALYSIS RESULTS (Sections 1-3) TSS

List the balnk contamination in sections 1 and 2 below. A separate worksheet should be used for soil and water blanks.

1. Laboratory Blanks Matrix: waters

DATE	ICB/CCB#	PREP BL	ANALYTE	CONCENTRATION/UNITS
	no contamination present.			

2. Equipment/Trip Blanks

DATE	EQUIP BL#	TRIP BL#	ANALYTE	CONCENTRATION/UNITS

3. Frequency Requirements

A. Was a preparation blank analyzed for each matrix, for every 20 samples, and for each digestion batch? Yes or No

B. Was a calibration blank run at the beginning of the run, and every 10 samples or every 2 hours whichever is more frequent? Yes or No

If no, the data may be affected. Use professional judgement to determine the severity of the effect and qualify the data accordingly. Discuss any actions below, and list the samples affected:

Samples Affected:

Region I
Data Review worksheet

IV B. BLANK ANALYSIS RESULTS (Section 4) TSS

4. Blank Actions

The Action Level for any analyte is equal to 5X the highest concentration of that analyte found in any blank. The Action Level for samples which have been concentrated or diluted should be multiplied by the concentration/dilution factor. No positive result should be reported unless the concentration of the analyte in the sample exceeds the Action Level (AL) for that analyte. Specific actions are as follows:

1. When the concentration is greater than the IDL, but less than the Action Level, report the sample concentration detected, qualified with a U.

2. When the sample concentration is greater than the Action Level, report the sample concentration unqualified.

Matrix: Water Matrix: _____

ANALYTE	MAX. CONC/ UNITS	AL/ UNITS	ANALYTE	MAX. CONC/ UNITS	AL/ UNITS
	no contamination present.				

NOTE: Blanks analyzed during a soil case must be converted to mg/kg in order to compare them with the sample results.

$$\text{conc. in ug/l} \times \frac{\text{Volume diluted to (200ml)}}{\text{Weight digested (1gram)}} \times \frac{1\text{L}}{1000\text{ml}} \times \frac{1000\text{g}}{1\text{kg}} \times \frac{1\text{mg}}{1000\text{ug}} = \text{mg/kg}$$

Multiplying this result by 5 to arrive at the Action Level gives a final result in mg/kg which can then be compared to sample results.

Region I
Data Review Worksheet

VI. MATRIX SPIKE

N/A TSS

TR # _____ Matrix:_____

1. Recovery Criteria

List the percent recoveries for analytes which did not meet the required criteria.

S - amount of spike added
SSR - spiked sample result
SR - sample result

ANALYTE	SSR	SR	S	%R	ACTION

Matrix Spike Actions apply to all samples of the same matrix.

ACTIONS:

1. If the sample concentration exceed the spike concentration by a factor of 4 or more, no action is taken.
2. If any analyte does not meet the percent recovery criteria, follow the actions stated below:

	PERCENT RECOVERY		
	< 30%	30%-74%	>125%
Positive Sample Results	J	J	J
Non-detected Results	R	UJ	A

2. Frequency Criteria

A. Was a matrix spike prepared at the required frequency? Yes or No
B. Was a post digest spike analyzed for analytes that did not meet the required criteria for matrix spike recovery? Yes or No

A separate worksheet should be filled out for each matrix spike pair.

Region I
Data Review Worksheet

VII. LABORATORY DUPLICATES

TSS

List the concentrations of any analyte not meeting the criteria for duplicate precision. For soil duplicates, calculate the CRDL in mg/kg using the sample weight, volume and percent solids data for the sample. Indicate what criteria was used to evaluate precision by circling either the RPD or CRDL for each analyte.

Matrix: waters

ANALYTE	CRDL		SAMPLE #	DUPLICATE #	RPD	ACTION
	WATER ug/L	SOIL mg/kg	SW23	SW23		
Aluminum	200		duplicates	met criteria		
Antimony	60					
Barium	10					
Beryllium	200					
Cadmium	5					
Calcium	5000					
Chromium	10					
Cobalt	50					
Copper	25					
Iron	100					
Lead	5					
Magnesium	5000					
Manganese	15					
Mercury	0.2					
Nickel	40					
Potassium	5000					
Selenium	5					
Silver	10					
Sodium	5000					
Thallium	10					
Vanadium	50					
Zinc	20					
Cyanide	10					

Laboratory duplicate actions should be applied to all other samples of the same matrix type.

ACTION:

1. Estimate (J) positive results for analytes which have an RPD > 20% for waters and > 35% for soils.
2. If sample results are less than 5X the CRDL, estimate (J) positive results for analytes whose absolute difference is > CRDL (2X CRDL for soils). If both samples are non-detected, the RPD is not calculated (NC).

Region I
Data Review Worksheet

VIII. FIELD DUPLICATES

TSS

List the concentrations of all analytes in the field duplicate pair. For soil duplicates, calculate the CRDL in mg/kg using the sample weight, volume and percent solids data for the sample. Indicate what criteria was used to evaluate precision by circling either the RPD or CRDL for each analyte.

Matrix: waters

ANALYTE	CRDL WATER ug/L	CRDL SOIL mg/kg	SAMPLE # SW19	DUPLICATE # SW100	RPD	ACTION
Aluminum	200		duplicates met criteria.			
Antimony	60		0	0.2	.02%	none
Barium	10					
Beryllium	200					
Cadmium	5					
Calcium	5000					
Chromium	10					
Cobalt	50					
Copper	25					
Iron	100					
Lead	5					
Magnesium	5000					
Manganese	15					
Mercury	0.2					
Nickel	40					
Potassium	5000					
Selenium	5					
Silver	10					
Sodium	5000					
Thallium	10					
Vanadium	50					
Zinc	20					
Cyanide	10					

Field duplicate actions should be applied to all other samples of the same matrix type.

ACTION:

1. Estimate (J) positive results for analytes which have an RPD > 30% for waters and > 50% for soils.
2. If sample results are less than 5X the CRDL, estimate (J) positive results for analytes whose absolute difference is > 2X CRDL (4X CRDL for soils). If both samples are non-detected, the RPD is not calculated (NC).

Region I
Data Review Worksheet

IX. LABORATORY CONTROL SAMPLE TSS

1. Aqueous LCS

List any LCS recoveries not within the 80%-120% criteria and the affected samples.

DATE	ANALYTE	%REC	SAMPLES AFFECTED	ACTION
	LCS recoveries meet criteria			

2. Solid LCS N/A

List any analytes that were not within the control windows set by the EPA for the solid LCS sample. The 80%-120% criteria is not used to evaluate solid LCS results.

ANALYTE	LCS CONC.	CONTROL WINDOWS	SAMPLES AFFECTED	ACTION

ACTION:

	PERCENT RECOVERY		
AQUEOUS LCS	< 50%	51%-79%	> 120%
Positive Results	R	J	J
Non-detected Results	R	UJ	A

SOLID LCS	< EPA Control Windows	> EPA Control Windows
Positive Results	J	J
Non-detected Results	UJ	A

3. Frequency Criteria

A. Was an LCS analyzed for each matrix, for every digestion batch, and for every 20 samples? Yes or No

XII. DETECTION LIMIT RESULTS

1. Instrument Detection Limits

_____ Instrument detection limit results were present and found to be less than the CRDL.

_____ IDLs were not included in the data package on Form XI.

_____ IDLs were present, but the criteria was not met for the following analytes:

_____

Reason: _____

2. Reporting requirements Reporting limit for TSS is 10mg/L, as stated in method 160.2.

Were sample results on Form I reported down to the IDL not the CRDL for all analytes? Yes or No N/A

Were sample results that were analyzed by ICP for Se, Tl, As, or Pb at least 5x IDL? Yes, No or NA

Were sample weights, volumes, and dilution factors taken into account when reporting detection limits on Form I? Yes or No

If no, the reported results may be inaccurate. Make the necessary changes on the data summary tables and request that the laboratory resubmit the corrected data.

Region I
Data Review Worksheets

XIII. SAMPLE QUANTITATION

TSS

X Sample results fall within the linear range for ~~ICP~~ TSS and within the calibrated range for all other parameters. KAR 3-11-92

_____ Sample results were beyond the linear range on ICP and/or beyond the calibration range for other parameters for the following samples/analytes:

In the space below, please show a minimum of one sample calculation per method:

ICP

NA

FURNACE

MERCURY

CYANIDE

residue = $(w_2 - w_1) \times 1000$

For sample 116811-3,

$(.1186 - .1184) \times 1000 = .2mg$ residue.

KAR 3-11-92

TSS = residue x 1000/sample volume.

THUS, TSS (16811-3) = .2mg x 1000/100ml

= 2.0mg/L.

Since reporting limit is 10mg/L, and TSS 2.0mg/L is less than reporting limit, sample 16811-3 is ND.

For soil samples, the following equation may be necessary to convert raw data values (usually reported in ug/L) to actual sample concentrations (mg/kg):

The lab is required to use 1 gram of sample (wet weight) to 200mL final volume.

Wet weight concentration =

digest conc. in ug/L X $\frac{200mL}{1g}$ X $\frac{1L}{1000mL}$ X $\frac{1000g}{1kg}$ X $\frac{1mg}{1000ug}$ = $\frac{mg}{kg}$

In addition, the sample results are converted to dry weight using the percent solids calculations:

$\frac{\text{wet weight conc.}}{\text{\% solids}}$ X 100 = Final concentration, dry weight (mg/kg)

Gradient Corporation

MAR 6 1992

March 24, 1992

Ms. Martha M. Smith
Project Hydrogeologist
Roux Associates, Inc.
775 Park Avenue, Suite 255
Huntington, NY 11743

Subject: High % Moisture in Sediment Samples - Wet Chemistry

Dear Ms. Smith:

Percent solids content for the sediment samples SED-21, SED-22, and SED-23 from the Industri-Plex site were determined to be less than 30% in each sample. The current EPA Region I guidelines for data validation require that the nondetect results of these samples be rejected (R) as unusable. The guidelines also require that positive results be rejected in samples which contain less than 10% solids, as was the case for sample SED-22. These requirements were included in the data validation report dated March 13, 1992.

However, it is often difficult to obtain a sediment sample with sufficient percent solids if the sediment contains very fine particles and/or water-retaining organic matter. Resampling and re-analysis of these samples would probably result in similar problems. It is recommended that data from these samples be used as estimated results, despite the low percent solids.

As noted in the previous data validation report, several quality control criteria were not met for the sediment sample analyses. The estimated values (J) and detection limits (UJ) that were applied to the other sediment samples in this set would also apply to these samples. Values previously rejected (R) for percent solids criteria are estimated (J or UJ) herein. The following information summarizes the revisions substituting estimated values and detection limits for data that were previously rejected based upon percent solids content.

For samples SED-21 and SED-23, the total sulfide results that were previously rejected because they were nondetects would now be estimated at the detection limit (UJ) due to low percent solids and low matrix spike recovery. All data for sample SED-22, that were previously rejected due to less than 10% solids content, are now usable but estimated results. The nondetect total sulfide result is estimated (UJ) at the detection limit due to low matrix spike recovery and low % solids; the result for oxidation-reduction potential (eH) is estimated (J) due to uncertainty in appropriateness of the method and low % solids; the ammonia result is estimated (J) due to poor laboratory duplicate precision and low % solids; and the TOC result is estimated due to low % solids.

44 Brattle Street, Cambridge, MA 02138 • (617)576-1555 • Telefax (617)864-8469
Environmental Consultants with Offices in Cambridge, MA and Boulder, CO

Gradient Corporation

Please find attached the revised version of the sediment results summary (Table IB of the original validation report). It is my professional opinion that these results are usable as estimated values (J or UJ).

If you have any questions, please do not hesitate to call me at 617-576-1555.

Sincerely,

GRADIENT CORPORATION

Susan D. Chapnick

Susan D. Chapnick
Senior Associate-Analytical Chemistry

Table IB - Results Summary (Sediments)							
SAMPLE	SED-18	SED-19	SED-21	SED-22	SED-23	SED-24	SED-100
REMARKS							Dup of SED-19
% Solid	37.0	63.1	12.1	8.1	20.9	42.9	71.6
TOC (mg/kg)	8045	3580	22465 J	45003 J	63893 J	20689	3238
pH	6.9	6.3	6.9 J	6.5 J	6.9 J	5.6	5.5
Total Sulfide (mg/kg)	UJ	UJ	UJ	UJ	UJ	UJ	UJ
Oxidation-Reduction Potential (eH)	-192 J	-153 J	-269 J	-233 J	-191 J	-033 J	-217 J
Ammonia(mg/kg)	162 J	60 J	661 J	1050 J	434 J	216 J	52.9 J

Qualifier Codes

J The associated numerical result is an estimated quantity.

UJ The parameter was not detected. The sample detection limit is an estimated value.

R The datum was rejected.

" " A blank space indicates the parameter was not detected. Sample detection limit equals the reporting limit.

APPENDIX D3

Hall's Brook Holding Area and
Metals Mobility
Data Validation Documentation

APPENDIX D3

Hall's Brook Holding Area and
Metals Mobility
Data Validation Documentation

Metals Data

April 10, 1992

Mr. Robert Barrick
PTI Environmental Services
15375 S.E. 30th Place
Suite 250
Bellevue, WA 98007

RE: Data Validation Report Letter
PTI Project #C1320301
Columbia Analytical Services
Laboratory Work Order Numbers: K916931, K917192, K916925, K916927, K916923
Metal Analyses: See Table 1 for Identification of Samples Reviewed.

Dear Mr. Barrick:

A validation was performed on the inorganic analytical data from 56 aqueous samples and 15 soil samples collected by PTI Environmental Services at the Industri-Plex site in Woburn, MA. The data were evaluated based on the Region I Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses, February, 1988:

*	-	data completeness
	-	holding times
	-	calibration verification
	-	laboratory and field blank analyses
*	-	ICP interference check samples results
	-	matrix spike percent recovery results
*	-	laboratory and field duplicates
	-	laboratory control sample results
	-	furnace atomic absorption results
	-	ICP serial dilution result
*	-	detection limit results
*	-	sample results

* All criteria were met for this parameter.

Tables 2a and 2b summarize the validation recommendations which were based on the following information:

Holding Times

Compound	Qualifier	Sample Number	Reason
Mercury	J(+)/ UJ(ND)	SC1-14; SC1-7; SC2-1; SC2-5; SC2-11; SC3-2; SC3-8; BW1	Holding time of 28 days exceeded by 27 to 29 days.

All soil and water samples were analyzed for total metals within the recommended holding time of 180 days. Eight mercury analyses (six soil and two water) were outside the recommended holding time for waters, of 28 days by 27 to 29 days. Since no holding times have been established for soils, all affected mercury results were qualified based on the water recommended holding times. Positive results are qualified as estimated (J) and results below the instrument detection limit (IDL) are estimated as (UJ). Qualified data are summarized above.

Calibration Verification

All initial and continuing calibration verification (ICV and CCV) standards used for sample determination were within the control limits for all water and soil samples. All standard curve correlation coefficients met criteria. For lead in the data groups K916931 and K916925, no calibration standard was analyzed at the CRDL of 3.0 µg/L. The lowest calibration standard was 5.0 µg/L. Since linearity cannot be verified to the CRDL, results less than 5.0 µg/L and greater than the CRDL (3.0µg/L) are qualified as estimated (J). Qualified data are listed below.

Analyte	Qualifier	Sample Number	Reason
Lead	J	EQ1A-26,27	Result less than lowest calibration standard, and greater than CRDL.

Laboratory and Field Blank Analyses

Three types of blanks are evaluated for possible contamination affects. These blanks are: calibration blanks, preparation blanks, and field blanks.

One field blank (OW101) was submitted for analysis. Calcium, lead, sodium, and zinc were detected in the field blank. Since these analytes were also detected in the associated calibration blank, no data are qualified based on field blank contamination.

For all laboratory blanks, both positive and negative blank concentration is evaluated for each analyte. For analytes with positive blank values, if the sample result was less than the

action limit, it should be considered undetected at the reported concentration and assigned a U qualifier. No data qualifiers are required for undetected sample results. For analytes with negative blank values, the raw data were reviewed, and each sample raw data result was checked to see if a possible false negative or biased sample result was reported. Samples to be qualified, based on this review, are summarized in the following tables.

Blank Action Levels for Soil - Laboratory work order number K917192

Analyte	Maximum Concentration µg/L	Action Level µg/L
Potassium	1135.7	5678.5

Data Qualifiers for Soil - Laboratory work order number K917192

Compound	Qualifier	Sample Number	Reason
Potassium	U	SC1-14	Sample value less than 5 times blank concentration.

Blank Action Level for Water - Laboratory work order number K917192

Analyte	Maximum Concentration µg/L	Action Level µg/L
Arsenic	-1.7	8.5
Chromium	3.3	16.5

Data Qualifiers for Water - Laboratory work order number K917192

Compound	Qualifier	Sample Number	Reason
Arsenic	J	BW1	Negative blank results. Results could be biased low.
Chromium	U	BW1	Sample value is less than 5 times blank concentration.

Blank Action Levels for Water - Laboratory work order number K916927

Analyte	Maximum Concentration µg/L	Action Level µg/L
Aluminum	35.0	175
Arsenic	1.6	8.0
Calcium	46.8	234
Selenium	1.2	6.0
Zinc	2.3	11.5
Iron	58.1	290.5
Potassium	1005.5	5027.5
Sodium	67.7	338.5
Thallium	-1.0	5.0
Lead	1.7	8.5

Data Qualifiers for Water - Laboratory work order number K916927

Compound	Qualifier	Sample Number	Reason
Aluminum	U	OW31; OW32; OW37; OW38; OW41; OW12; OW16; OW19A; EQ1A-13,14	Sample concentration less than 5 times blank concentration.
Arsenic	U	OW15; OW19A	Sample concentration less than 5 times blank concentration.
Calcium	U	OW101	Sample concentration less than 5 times blank concentration.
Selenium	U	OW11; OW31; OW38; OW12; OW15; OW16; SM3	Sample concentration less than 5 times blank concentration.
Zinc	U	OW31; OW32; OW36; OW37; OW101	Sample concentration less than 5 times blank concentration.
Barium	U	OW36	Sample concentration less than 5 times blank concentration.

Iron	U	OW36; OW15	Sample concentration less than 5 times blank concentration.
Potassium	U	OW15; OW19A; OW36; OW37; OW41	Sample concentration less than 5 times blank concentration.
Sodium	U	OW101	Sample concentration less than 5 times blank concentration.
Thallium	J(+)/ UJ(ND)	OW48A; SM3; OW38	Negative blank results. Results could be biased low.
Lead	U	OW43; OW11; OW48A; OW31; OW16; EQ2A-9,10; OW101; EQ2A-30,29	Sample concentration less than 5 times blank concentration.

Blank Action Level for Water - Laboratory work order number K916931

Analyte	Maximum Concentration µg/L	Action Level µg/L
Aluminum	31.1	155.5
Chromium	3.2	16.0
Lead	1.2	6.0

Blank Action Level for Water - Laboratory work order number K916931

Compound	Qualifier	Sample Number	Reason
Aluminum	U	EQ1A-41,42	Sample concentration less than 5 times blank concentration.
Chromium	U	EQ1A-41,42; EQ1A-6,7	Sample concentration less than 5 times blank concentration.
Lead	U	EQ1A-41,42; EQ1A-6,7; EQ1A-26,27	Sample concentration less than 5 times blank concentration.

Blank Action Levels for Water - Laboratory work order number K916925

Analyte	Maximum Concentration µg/L	Action Level µg/L
Iron	41.9	209.5
Nickel	7.9	39.5
Potassium	753.2	3766
Thallium	1.7	8.5
Zinc	2.8	14
Aluminum	35.2	176
Arsenic	1.3	6.5
Selenium	-1.4	7.0

Blank Action Levels for Water - Laboratory work order number K916925

Compound	Qualifier	Sample Number	Reason
Iron	U	OW33A; OW1A	Sample value less than 5 times blank concentration.
Nickel	U	OW42; EQ3A-9,10; OW17B; OW1A; OW17	Sample value less than 5 times blank concentration.
Potassium	U	OW33A	Sample value less than 5 times blank concentration.
Thallium	U	EQ2A-42,43; EQ2A-22,23; EQ3A-9,10	Sample value less than 5 times blank concentration.
Zinc	U	OW33A	Sample value less than 5 times blank concentration.
Aluminum	U	EQ3A-9,10; OW1A; OW47; OW17B; OW33A; OW17	Sample value less than 5 times blank concentration.
Arsenic	U	OW33A; OW1A	Sample value less than 5 times blank concentration.
Selenium	UJ	OW17B; OW42; OW1A; OW47; OW17; OW33A; EQ2A-22,23; EQ2A-42,43; EQ3A-9,10	Negative blank results. Results could be biased low.

Matrix Spike Percent Recovery Results

Matrix spike (MS) percent recoveries were within control limits, except for the matrix spike recoveries associated with work order number K917192 and K916931 for antimony, arsenic, cadmium, lead, and iron. Sample qualifications were determined by following the 1988 Inorganic Functional Guidelines. Recovery results and samples to be qualified are summarized below.

Sample Number	Matrix	Analyte	% Recovery
SC114 (spike)	SOIL	Antimony	68.5
SC114 (spike)	SOIL	Arsenic	59.0
SC114 (spike)	SOIL	Cadmium	74.7
SC114 (spike)	SOIL	Lead	65.5

Analyte	Qualifier	Sample Number	Reason
Antimony Lead Arsenic Cadmium	J(+)/ UJ(ND)	SC1-14; SC1-7; SC1-10; SC1-2; SC1-6; SC2-1; SC2-11; SC2-5; SC2-7; SC2-3; SC3-9; SC3-2; SC3-6; SC3-8; SC3-10	Spike recoveries outside control limit of 75-125%.

Furnace Atomic Absorption Results

The laboratory is required to perform a post-digestion spike on each analyte analyzed by graphite furnace (GFAA). The percent recovery control limits of the post-digestion spike are 85 - 115%. If recoveries fall outside the control limits, matrix interference (positive or negative) may be present. If the sample result is less than 50% of the post-digestion spike concentration and the percent recovery is greater than 40%, sample results greater than the IDL are qualified as estimated (J). These qualified values are summarized below.

Analyte	Matrix	Qualifier	Sample Number	Reason
Lead	WATER	UJ	EQ2A-14,15	Post digestion %R outside 85-115%. %R = 76.0.
Lead	WATER	UJ	OW41	Post digestion %R outside 85-115%. %R = 75.0.

Lead	WATER	UJ	OW15	Post digestion %R outside 85-115%. %R = 76.0.
Lead	WATER	UJ	OW37	Post digestion %R outside 85-115%. %R = 78.0.
Lead	WATER	UJ	EQ3B-10,14	Post digestion spike %R outside control limits 85-115%. %R = 81.0.
Lead	WATER	UJ	OW17B	Post digestion %R outside 85-115%. %R = 69.5.
Lead	WATER	UJ	OW17	Post digestion %R outside 85-115%. %R = 67.0.
Selenium	WATER	J	OW31	Post digestion %R outside 85-115%. %R = 73%.
Selenium	WATER	UJ	OW47	Post digestion %R outside 85-115%. %R = 77.0.
Selenium	WATER	UJ	OW17B	Post digestion %R outside 85-115%. %R = 54.0.
Selenium	WATER	UJ	OW17	Post digestion %R outside 85-115%. %R = 43.0.
Thallium	WATER	J	EQ3A-9,10	Post digestion %R outside 85-115%. %R = 84.0.
Thallium	WATER	J	EW2A-22,23	Post digestion %R outside 85-115%. %R = 80.0.
Thallium	WATER	J	EQ2A-42,43	Post digestion %R outside 85-115%. %R = 83.0.
Thallium	WATER	UJ	OW42	Post digestion %R outside 85-115%. %R = 83.5.

Thallium	**WATER**	**UJ**	**OW17B**	**Post digestion %R outside 85-115%. %R = 72.0.**
Thallium	**WATER**	**UJ**	**OW17**	**Post digestion %R outside 85-115%. %R = 77.5.**
Selenium	**SOIL**	**J**	**SC17**	**Post digestion spike recoveries out of control limits 85-115%. %R = 122.0.**
Selenium	**SOIL**	**J**	**SC2 1**	**Post digestion %R outside 85-115%. %R = 127.0.**
Selenium	**SOIL**	**J**	**SC2 5**	**Post digestion %R outside 85-115%. %R = 130.0.**

If the GFAA sample absorbance is greater than 50% of the post-digestion spike concentration and the percent recovery is outside the control limits, the laboratory is required to analyze the sample by method of standard additions (MSA). The laboratory performed MSA analyses when required except the lead analysis for Sample SM3. Therefore, this lead value should be qualified as estimated (J).

Correlation coefficients for MSA analyses were within the control limits (>0.995), except for one arsenic analysis which should be considered estimated (J). Samples to be qualified are summarized in the table below.

Analyte	Matrix	Qualifier	Sample Number	Reason
Lead	**WATER**	**J**	**SM3**	**MSA required but not performed.**
Arsenic	**WATER**	**J**	**OW17**	**MSA correlation coefficient less than 0.995. r = 0.9808.**

ICP Serial Dilution Results

The laboratory analyzed one serial dilution with each water and soil sample data group. Results were within control limits, except for zinc in laboratory work order numbers K917192 (%D = 19.3) and K916925 (%D = 14.9). The high %D indicate that ICP suppression may be occurring and results could be biased low. Following the 1988 Inorganics Functional Guidelines, for analytes with the %D outside the control limits, all sample results should be considered as estimates and assigned a J qualifier. Samples to be qualified are summarized in the table below.

Analyte	Matrix	Qualifier	Sample Number	Reason
Zinc	SOIL	J(+)	SC1-7; SC1-14; SC2-1; SC2-5; SC2-11; SC3-2; SC3-8	%D between initial and diluted sample results were outside control limits. (%D = 19.3)
Zinc	WATER	J(+)	EQ3B-10,14; EQ3A-22,23; OW1A; OW17; EQ3A-9,10; EQ2A-22,23; EQ2A-42,43; OW42; OW47; OW33A; OW17B	%D between initial and diluted sample results were outside control limits. (%D = 14.9)

Overall Assessment of Data:

The laboratory generally performed the metal analyses to meet all standard quality control requirements. Samples were primarily qualified because sample results were within 5 times the associated laboratory blank concentration; low matrix spike recovery for antimony, lead, arsenic, and cadmium in the soil samples; poor graphite furnace post-digestion spike recoveries for sample results within two times the IDL; and high percent difference between the serial dilution results for zinc.

The data, as qualified, are acceptable for use.

Attached are Table 1 - Identification of Samples Reviewed; Table 2a and 2b - Recommendation Summaries; Table 3 - Data Summary with Qualifiers; and Metals Data Validation Worksheet.

Sincerely,

Ann K. Bailey
President
EcoChem, Inc.

Attachments

Table 1. Identification of Samples Reviewed

Sample Identification (Metals)

Water:

OW43	OW11	OW32	OW36
SM4	OW31	OW48A	OW101
OW37	OW16	OW38	SM3
SM1	OWA	OW17	EQ2A-14,15
OW12	OW19A	EQ2A-30,29	OW41
EQ2A-9,10	EQ1A-13,14	OW15	EQ1A-32,33
EQ1A-13,19	BW1	EQ3A-29,30	EQ3A-14,15
EQ3A-9,10	EQ2B-11,12,13,14	EQ2A-22,23	EQ2A-34,35
EQ2A-1,2	EQ2A-42,43	OW42	OW47
OW33A	OW17B	OW41	EQ1A-38
OW103	EQ3A-35,36	EQ3B-10,14	EQ3A-12,34
EQ3A-22,23	EQ3A-43,44	EQ1A-28	OW1A
EQ2A-26	EQ2A-13	OW15	OW12
EQ1A-41,42	EQ1A-21,22	EQ1A-67	EQ1A-26,27

Soil:

SC1-14	SC1-7	SC1-10	SC1-2
SC1-6	SC2-1	SC2-5	SC2-11
SC2-3	SC2-7	SC3-2	SC3-9
SC3-8	SC3-6	SC3-10	

Table 2a: Recommendation Summary for Water Samples.

Analyte	Qualifier	Analyte	Qualifier
Aluminum	U^1	**Magnesium**	
Antimony		**Manganese**	
Arsenic	U^1, J^4	**Mercury**	UJ^1
Barium		**Nickel**	U^1
Beryllium		**Potassium**	U^1
Cadmium		**Selenium**	U^1, J^3
Calcium	U^1	**Silver**	
Chromium	U^1	**Sodium**	U^1
Cobalt		**Thallium**	J^2, U^1, J^3
Copper		**Vanadium**	
Iron	U^1	**Zinc**	U^1, J^5
Lead	J^1, U^1, J^3		

Codes:

UJ^1 Consider nondetect results for one sample estimated due to analysis beyond holding time.

J^1 Consider one result estimated because standard was not analyzed at the CRDL.

U^1 Consider positive results for some samples as nondetected due to the possibility of false positive based on laboratory blank concentration.

J^2 Consider results for three samples estimated because negative blank results indicate potential low bias.

J^3 Consider results for some samples estimated because GFAA post digestion spike recoveries were outside control limits.

J^4 Consider results for one sample estimated because MSA correlation coefficient was less than 0.995.

J^5 Consider results for twenty samples estimated because ICP serial dilution results did not meet criteria.

NOTE: **See report narrative for affected samples.**

Table 2b: Recommendation Summary for Soil Samples.

Analyte	Qualifier	Analyte	Qualifier
Aluminum		Magnesium	
Antimony	J^2	Manganese	
Arsenic	J^2	Mercury	J^1
Barium		Nickel	
Beryllium		Potassium	U^1
Cadmium	J^2	Selenium	J^3
Calcium		Silver	
Chromium		Sodium	
Cobalt		Thallium	
Copper		Vanadium	
Iron		Zinc	J^4
Lead	J^2		

Codes:

J^1 Consider results for seven samples estimated due to analysis performed beyond holding time.

U^1 Consider positive results for one sample as nondetected due to the possibility of false positive based on laboratory blank concentration.

J^2 Consider results for all samples estimated because low matrix spike recovery. Results could be biased low.

J^3 Consider results for some samples estimated because GFAA post digestion spike recoveries were outside control limits.

J^4 Consider results for all samples estimated because ICP serial dilution results did not meet criteria.

NOTE: **See report narrative for affected samples.**

Table 3. Metals Data Summary with Qualifiers

Sample Number	S32002		S32002A		S32002C		S32003		S32004		S32265		S32967		S32969		S32973		S32973A	
Location	SC-1-14		SC-1-14		SC-1-14		SC-1-7		SC-1-10		OW-17		SC-1-2		SC-1-6		BW-1		BW-1	
Depth (cm)	53.7		53.7		53.7		24.25		36.3				6		20.25					
Sampling Date	11/18/91		11/18/91		11/18/91		11/18/91		11/18/91		11/20/91		11/18/91		11/18/91		11/18/91		11/18/91	
Units	(µg/Kg)		(µg/Kg)		(µg/Kg)		(µg/Kg)		(µg/Kg)		(µg/L)		(µg/Kg)		(µg/Kg)		(µg/L)		(µg/L)	
Aluminum	6110000		6440000				18000000				145	B					38.5	B	41.3	
Antimony	2500	UJ	2530	U	2530		12300	UJ			20	U					10	U	10	
Arsenic	13400	J	13400		15424		1520000	J	124000	J	13.3		1770000	J	2410000	J	8.1	BJ	9.3	B
Barium	25900	B	25900	B	8040		239000	B			25.3	B					27.7	B	27.2	B
Beryllium	370	B	372		316	B	2400	B			3	B					1	U	1	
Cadmium	510	UJ	506	U	506		28700				3	U					2	U	2	
Calcium	1500000	UJ	1420000				12100000				516000						46500		45600	
Chromium	13000		13900		13000		853000		87800		54		1110000		1100000		3.6	U	2.3	
Cobalt	10000	B	10000		10600		138000				3.8	B					3.4	B	3.4	
Copper	18100		18100		19400		1650000				2	U					4.9	B	6.3	
Iron	10600000		11600000				189000000				118000						1060		1060	
Lead	4300	J	4470		4270		985000	J	102000	J	1	U	642000	J	1230000	J	1.4	B	1	
Magnesium	2440000		2620000				3590000	B			135000						7530		7450	5
Manganese	143000		148000		14600		1650000				3060						588		578	
Mercury	110	UJ	120	U	115		2900	J			0.2	U					0.2	UJ	0.2	
Nickel	11900		11884		12500		68200				9.9	B					10	U	10	
Potassium	965000	B	1040000	B			1170000	B			70700						6060		5610	
Selenium	250	U	510	U	506		5300	BJ			5	U					1	U	1	
Silver	510	U	506	U	506		5800	B			3	U					2	U	2	
Sodium	149000	B	134000	B			806000	B			1840000						5260		52000	
Titanium	300	B	303	B	253	U	4900	B			1	U					1	U	0.2	U
Vanadium	14700		15500		14700		69700				53.3						2	U	2	
Zinc	52100		52100		55600		7620000	J			18.2	B					440		429	

unflagged - The data were reviewed and all criteria were met.

U - The metal was considered not detected. The associated numerical value is the quantitation limit.

UJ - The metal was not detected. The sample quantitation limit is an estimated value.

J - The associated numerical value is an estimated quantity.

B - The metal was detected above the instrument detection limit.

R - Result rejected, matrix spike recovery < 30 percent.

* - Determination of organically complexed chromium.

Metals Data Summary with Qualifiers (Continued)

Sample Number:	S32973D		S33413		S33415		S33417B		S33420		S33423		S33433B		S33437		S33439		S33440	
Location:	BW-1		SC-2-1		SC-2-3		SC-2-5		SC-2-7		SC-2-11		SC-3-2		SC-3-6		SC-3-8		SC-3-9	
Depth (cm):			3.5		17.5		31.55		45.6		72.7		7.2		32		42.4		47.9	
Sampling Date:	11/18/91		11/19/91		11/19/91		11/19/91		11/19/91		11/19/91		11/20/91		11/20/91		11/20/91		11/20/91	
Units:	(µg/L)		(µg/Kg)		(µg/Kg)		(µg/Kg)		(µg/Kg)		(µg/Kg)		(µg/Kg)		(µg/Kg)		(µg/Kg)		(µg/Kg)	
Aluminum	38.5	B	16200000				17500000				6450000		19500000				18000000			
Antimony	10	U	20400	UJ			11000	UJ			2500	UJ	20000	UJ			3200	UJ		
Arsenic	6.1	B	2990000	J	1940000	J	1200000	J	1000000	J	9000	J	1830000		713000	J	86900	J	65000	J
Barium	27.7	B	174000	B			194000				30900	B	217000	B			112000	0		
Beryllium	1		2000	U			1100	B			250	B	1700	B			900	B		
Cadmium	2		36700				24600	J			600	BJ	51200	J			1800	J		
Calcium			12100000				7480000				1740000		19200000				3950000			
Chromium	3.6		1340000		1270000		788000		696000		22400		1370000		360000		62800		61300	
Cobalt	4.8	B	22600	B			60500				5900	B	22700	B			65600			
Copper	4.9		657000				1090000				60000		1070000				289000			
Iron	1060		147000000				138000000				10800000		126000000				32600000			
Lead	1.4	B	476000	J	666000	J	821000	J	1010000	J	5040	J	643000	J	568000	J	57300	J	140000	J
Magnesium			2820000	B			3610000	B			2370000		4570000	B			5720000			
Manganese	588		1220000				1190000				86400		1490000				393000			
Mercury	0.2	U	2100				2500	J			110	UJ	2300	J			1400	J		
Nickel	10		38800	B			59500				11100		48700	B			45400			
Potassium			1140000	B			1530000	B			1240000		2020000	B			2310000			
Selenium			10000	BJ			4700	BJ			240	U	1600	U			270	U		
Silver	2	U	4100	U			2600	B			490	U	3300	U			710	B		
Sodium			3180000	B			1150000	B			237000	B	5560000	B			546000	B		
Titanium	1		3100	B			4200	B			250	U	3300	B			750	B		
Vanadium			71200	B			60300				15300		88600				39500			
Zinc	440		6060000	J			6240000	J			72400	J	7020000	J			712000	J		

unflagged - The data were reviewed and all criteria were met.

U - The metal was considered not detected. The associated numerical value is the quantitation limit.

UJ - The metal was not detected. The sample quantitation limit is an estimated value.

J - The associated numerical value is an estimated quantity.

B - The metal was detected above the instrument detection limit.

R - Result rejected, matrix spike recovery < 30 percent.

* - Determination of organically complexed chromium.

Metals Data Summary with Qualifiers (Continued)

Sample Number:	S33441		W10197		W32501		W24205		W24213		W24217		W24229		W24242		W24254		W24259
Location:	SC-3-10		OW-43		EQ-2A-1,2		OW-11		OW-48A*		OW-48A		OW-17B		OW-31		OW-32		OW-42*
Depth (cm):	53.5				11														
Sampling Date:	11/20/91		11/23/91		11/20/91		11/22/91		11/22/91		11/22/91		11/20/91		11/23/91		11/23/91		11/20/91
Units:	(µg/Kg)		(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)
Aluminum			199	B			1200				785		139	U	152	U	39	U	
Antimony			20	U			20	U			20	U	20	U	20	U	20	U	
Arsenic	16100	J	2850		6.8	B	97.6				708		12.4		410		27.4		
Barium			16.7	B			48.3	B			18.7	B	24.8	B	237		188	B	
Beryllium			1	U			1	U			1	U	3.4	B	1	U	1	U	
Cadmium			3	U			4.7	B			4	B	5.3		3	U	3	U	
Calcium			317000				74200				144000		517000		302000		214000		
Chromium	23600		8.2	B	3	U	3	U	0	R	3	U	53.6		29.8		9	B	12.8
Cobalt			8.2	B			15.6	B			320		5.7	B	3.2	B	3	U	
Copper			2	U			6.9	B			2	U	2	U	2	U	2	U	
Iron			37100				21200				249000		117000		1180		8750		
Lead	44200	J	3	U	1	U	1.2	U			2.5	U	1	UJ	5.4	U	1	U	
Magnesium			28900				14900				21800		135000		158000		40000		
Manganese			4000				1890				2580		3100		5270		6890		
Mercury			0.2	U			0.2	U			0.2	U	0.2	U	0.2	U	0.2	U	
Nickel			6	U			13.5	B			15.9	B	8.3	BU	6	U	6	U	
Potassium			18900				10000				11700		71500		40100		9910		
Selenium			5.8				2.7	U			1	U	5	U	2.7	BJ	1	U	
Silver			3	U			3	U			3	U	3	U	3	U	3	U	
Sodium			82300				625000				113000		1850000		103000		13800		
Titanium			1	U			1	U			2	BJ	1	UJ	1	U	1	U	
Vanadium			2	U			2	U			2	U	51.8	J	27.7	B	4.7	B	
Zinc			14.6	B			2800				8020		17.7	BJ	1.8	U	1.2	U	

unflagged - The data were reviewed and all criteria were met.

UJ - The metal was not detected. The sample quantitation limit is an estimated value.

J - The associated numerical value is an estimated quantity.

B - The metal was detected above the instrument detection limit.

R - Result rejected, matrix spike recovery < 30 percent.

* - Determination of organically complexed chromium.

Metals Data Summary with Qualifiers (Continued)

Sample Number:	W24286		W24278		W24290		W24294		W24296		W25523		W25983		W25987		W25995		W25999
Location:	OW-36		OW-37		OW-38		OW-38*		OW-31*		OW-48A*		OW-41		OW-41*		OW-42		OW-42*
Depth (cm):																			
Sampling Date:	11/23/91		11/23/91		11/22/91		11/22/91		11/23/91		11/22/91		11/21/91		11/21/91		11/20/91		11/20/91
Units:	(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)
Aluminum	267		28.4	U	27.5	U							33.3	U			20	U	
Antimony	20	U	20	U	20	U							20	U			20	U	
Arsenic	440		313		36.2								231				1920		
Barium	3.9	U	29.7	B	47.2	B							45.3	B			258		
Beryllium	1	U	1	U	1	U							1	U			1	U	
Cadmium	3	U	3	U	3	U							3	U			7.7		
Calcium	10700		41900		151000								232000				41400		
Chromium	7.7	B	3	U	3	U	4.5	B	32.3		3	U	70.4		57.1		7.7	B	12.7
Cobalt	3	U	3	U	33	B							3	U			11.9	B	
Copper	14.9	B	2	U	5.5	B							2	U			2	U	
Iron	89.7	U	2040		6980								519				33200		
Lead	1	U	1	UJ	1	U							1	UJ			1	U	
Magnesium	2440	B	5640		4350	B							43000				34600		
Manganese	12.4	B	392		143								2240				1020		
Mercury	0.2	U	0.2	U	0.2	U							0.2	U			0.2	U	
Nickel	6	U	6	U	114								10	B			13.4	U	
Potassium	1130	U	3480	U	6000								3530	U			14900		
Selenium	7.1		1	U	3.3	U							1	U			1	U	
Silver	3	U	3	U	3	U							3	U			3	U	
Sodium	361000		16000		19500								52400				32600		
Titanium	1	U	1	U	2	BJ							1	U			1	UJ	
Vanadium	410		2	U	6.3	B							9.2	B			2.6	B	
Zinc	9.6	U	7.7	U	1300								1	U			75.2	J	

unflagged - The data were reviewed and all criteria were met.

U - The metal was considered not detected. The associated numerical value is the quantitation limit.

UJ - The metal was not detected. The sample quantitation limit is an estimated value.

J - The associated numerical value is an estimated quantity.

B - The metal was detected above the instrument detection limit.

R - Result rejected, matrix spike recovery < 30 percent.

* - Determination of organically complexed chromium.

Metals Data Summary with Qualifiers (Continued)

Sample Number:	W32205		W32209		W32217		W32229		W32233	W32241		W32245		W32246		W32253		W32257
Location:	OW-1A		OW-1A*		OW-47		OW-12		OW-12*	OW-15		OW-15*		OW-43*		OW-16		OW-16*
Depth (cm):																		
Sampling Date:	11/18/91		11/18/91		11/21/91		11/21/91		11/21/91	11/19/91		11/19/91		11/23/91		11/22/91		11/21/91
Units:	(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)	(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)
Aluminum	6050	U			50.6	U	30.3	U		20	U					25.5	BU	
Antimony	20	U			20	U	20	U		20	U					20	U	
Arsenic	4.5	U			1480		900			1	U					2280		
Barium	6.8	B			32.7	B	165	B		17.8	B					294		
Beryllium	1	U			1	U	1	U		1	U					1	U	
Cadmium	3	U			11.5		3	U		3	U					3	U	
Calcium	26500				522000		163000			21100						13100		
Chromium	3.2	B	4.2	B	3	U	93.6		88.4	3	U	3	U	3.4	B	115		108
Cobalt	3	U			3	U	3	U		3	U					5.2	B	
Copper	14.8	B			2	U	2	U		2	U					2	U	
Iron	9.8	U			34400		1030			64.6	U					3530		
Lead	1	U			9.8		1	U		1	UJ					1.4	U	
Magnesium	7970				21700		120000			4910	B					190000		
Manganese	7.7	B			483		79.9			25.3						6.5	B	
Mercury	0.2	U			0.2	U	0.2	U		0.2	U					0.2	U	
Nickel	11.6	U			6	U	24.3	B		6	U					33.7	B	
Potassium	9180				14300		26700			2560	U					73000		
Selenium	1	U			1	UJ	1.8	U		1.2	U					1.7	U	
Silver	3	U			3	U	3	U		3	U					3	U	
Sodium	16400				214000		258000			110000						138000		
Titanium	1	U			1	U	1	U		1	U					1	U	
Vanadium	3.4	B			2.2	B	98.8			2	U					153		
Zinc	16.8	B			125	J	1	U		1	U					1	U	

unflagged - The data were reviewed and all criteria were met.

U - The metal was considered not detected. The associated numerical value is the quantitation limit.

UJ - The metal was not detected. The sample quantitation limit is an estimated value.

J - The associated numerical value is an estimated quantity.

B - The metal was detected above the instrument detection limit.

R - Result rejected, matrix spike recovery < 30 percent.

* - Determination of organically complexed chromium.

Metals Data Summary with Qualifiers (Continued)

Sample Number:	W32258	W32269	W32277	W32281	W32289	W32289D	W32293	W32297	W32501	W33455
Location:	OW-37*	OW-17*	OW-19A	OW-19A*	OW-33A	OW-33A	OW-33A*	OW-36*	EQ-2A-22,23	OW-47*
Depth (cm):									-31	
Sampling Date:	11/23/91	11/20/91	11/20/91	11/20/91	11/19/91	11/19/91	11/19/91	11/23/91	11/20/91	11/21/91
Units:	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
Aluminum			88.3 U		189 BU	176 B				
Antimony			20 U		20 U	20 U				
Arsenic			2.1 U		4.3 BU	2.6 B			6.8 B	
Barium			22.2 B		11.1 B	10.6 B				
Beryllium			1 U		1 U	1 U				
Cadmium			3 U		3 U	3 U				
Calcium			18500		8400	8300				
Chromium	3.4 B	44.4	3 U	3 U	3 U	3 U	3 U	11.4	3 U	3 U
Cobalt			31.5 B		3.84 B	3.07 B				
Copper			2 U		3.44 B	2 U				
Iron			297		31 BU	27.4 B				
Lead			1 U		1 U	1 U			1 U	
Magnesium			4050 B		1130 B	1110				
Manganese			1040		747	739				
Mercury			0.2 U		0.2 U	0.2 U				
Nickel			6 U		6 U	6 U				
Potassium			2980 U		830 BU	826				
Selenium			1 U		1 U	1 U				
Silver			3 U		3 U	3 U				
Sodium			31400		8480	8310				
Titanium			1 U		1 U	1 U				
Vanadium			2 U		2 U	2 U				
Zinc			224		10.5 BJ	9.16 B				

unflagged - The data were reviewed and all criteria were met.

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UJ - The metal was not detected. The sample quantitation limit is an estimated value.

J - The associated numerical value is an estimated quantity.

B - The metal was detected above the instrument detection limit

R - Result rejected, matrix spike recovery < 30 percent.

Metals Data Summary with Qualifiers (Continued)

Sample Number	W32502		W32503		W32504		W32505		W32553	W32553A	W32554	W32554A	W32556		W32562	
Location	EQ-2A-22,23		EQ-2A-29,30		EQ-2A-34,35		EQ-2A-42,43		EQ-3A-13*	EQ-3A-13*	EQ-3A-28*	EQ-3A-28*	EQ-3B-10,14		OW-101	
Depth (cm)	-31				-55		-71		-12	-12	-38	-38	-10			
Sampling Date	11/20/91		11/20/91		11/20/91		11/20/91		11/21/91	11/21/91	11/21/91	11/21/91	11/21/91		11/22/91	
Units	(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)		(µg/L)	
Aluminum	200	B					74.7	B							20	U
Antimony	20	U					20	U							20	U
Arsenic	1830		478		260		428						250		1	U
Barium	65.1	B					48.8	B							1	U
Beryllium	1	U					1	U							1	U
Cadmium	16.1						6								3	U
Calcium	122000						90800								30.3	BU
Chromium	61.9		25.4		13.8		13.5		19.36	19.4	11.8	10.09	202		3	U
Cobalt	8	B					35.4	B							3	U
Copper	2	U					2	U							2	U
Iron	342000						238000								5	U
Lead	1	U	1.2	BU	1	U	1.1	B					1	UJ	4.7	U
Magnesium	43700						30700								30	U
Manganese	4500						3440								1	U
Mercury	0.2	U					0.2	U							0.2	U
Nickel	6	U					6	U							6	U
Potassium	10400						9000								500	U
Selenium	1	U					1	U							1	U
Silver	3	U					3	U							3	U
Sodium	231000						183000								113	BU
Titanium	2.5	BJ	1	U			1.1	BJ							1	U
Vanadium	2	BU	2	U			2	U							2	U
Zinc	58.2	J					37.7	J							2.3	BU

unflagged - The data were reviewed and all criteria were met

U - The metal was considered not detected. The associated numerical value is the quantitation limit.

UJ - The metal was not detected. The sample quantitation limit is an estimated value.

J - The associated numerical value is an estimated quantity.

B - The metal was detected above the instrument detection limit

R - Result rejected, matrix spike recovery < 30 percent.

* - Determination of organically complexed chromium.

Metals Data Summary with Qualifiers (Continued)

Sample Number:	W32585	W32585	W32586	W32587	W32588	W32589	W32991	W32992	W32993	W32995
Location:	OW-101*	OW-48A*	OW-11*	OW-41*	SM-1*	OW-103*	EQ-2A-9,10	EQ-2A-14,15	EQ-2A-28*	EQ-2A-13*
Depth (cm):								-15	-38	-12
Sampling Date:	11/22/91	11/22/91	11/22/91	11/21/91	11/22/91	11/22/91	11/20/91	11/20/91	11/20/91	11/20/91
Units:	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
Aluminum							328			
Antimony							20 U			
Arsenic							5460	4500		
Barium							114 B			
Beryllium							1 U			
Cadmium							3 U			
Calcium							124000			
Chromium	3 U	3 U	3.7 B	4.6 B	78.2	3 U	143	94.4	17.5	96.6
Cobalt							8.8 B			
Copper							2 U			
Iron							241000			
Lead							1.3 BU	1 UJ		
Magnesium							35900			
Manganese							1400			
Mercury							0.2 U			
Nickel							6 U			
Potassium							9590			
Selenium							1 U			
Silver							3 U			
Sodium							183000			
Titanium							1 U			
Vanadium							48.7 B			
Zinc							40.6			

unflagged - The data were reviewed and all criteria were met.

U - The metal was considered not detected. The associated numerical value is the quantitation limit.

UJ - The metal was not detected. The sample quantitation limit is an estimated value.

J - The associated numerical value is an estimated quantity.

B - The metal was detected above the instrument detection limit

R - Result rejected, matrix spike recovery < 30 percent.

* - Determination of organically complexed chromium.

Metals Data Summary with Qualifiers (Continued)

Sample Number:	W32996		W33300		W33301		W33302		W33303		W33343		W33344		W33353		W33400		W33401	
Location	EQ-2B-11121314		EQ-1A-6,7		EQ-1A-13,14		EQ-1A-18,19		EQ-1A-18,19		SM-3		SM-1		SM-4		EQ-1A-32,33		EQ-1A-41,42	
Depth (cm):	-17		29				15		-1								-23		-41	
Sampling Date:	11/20/91		11/19/91		11/19/91		11/19/91		11/19/91		11/22/91		11/22/91		11/22/91		11/19/91		11/19/91	
Units:	(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)	
Aluminum					89.6	BU					766		320		431				141	B
Antimony					20	U					20	U	20	U	20	U			20	U
Arsenic	3050		92.4		238		5380		3600		199		16200		82.8		1130		765	
Barium					64.5	B					38.9	B	83.6	B	57.2	B			30	B
Beryllium					1	U					1	U	1	U	1	U			1	U
Cadmium					3	U					3	U	3	U	5.2	U			3	U
Calcium					187000						67400		98200		229000				35600	
Chromium	33.4		13	U	19.7		64.7		42.5		75.9		108		21.9		20		11.6	
Cobalt					13.3	B					3	U	4.9	B	3.2	B			3.6	B
Copper					2	U					62.7		6.7	B	76.3				2	U
Iron					131000						31700		102000		111000				32000	
Lead	1	U	1.7	BU	1	U	2.1	B	2.9	B	27.2	J	12.3		27.8		1.8	B	2.1	B
Magnesium					35100						18500		22100		12600				8610	
Manganese					1910						1310		967		104				524	
Mercury					0.2	U					0.2	U	0.2	U	0.2				0.2	U
Nickel					6.8	B					5860		211		697				6	U
Potassium					13100						8860		9120		14600				3190	B
Selenium					1	U					1	U	1.2	B	2.9	B			1	U
Silver					3	U					3	U	3	U	3	U			3	U
Sodium					257000						160000		137000		75700				24100	
Titanium					1	U					1.2	BJ	1	U	1	U			1	U
Vanadium					6.5	B					4.6	B	53.5		2	U			2	U
Zinc					120						4410		5970		3490				21.1	

unflagged - The data were reviewed and all criteria were met

U - The metal was considered not detected. The associated numerical value is the quantitation limit.

UJ - The metal was not detected. The sample quantitation limit is an estimated value.

J - The associated numerical value is an estimated quantity

B - The metal was detected above the instrument detection limit.

R - Result rejected, matrix spike recovery < 30 percent.

* - Determination of organically complexed chromium

Metals Data Summary with Qualifiers (Continued)

Sample Number:	W33401C		W33402		W33402C		W33402D		W33404		W33405		W33448		W33449C		W33450		W33451	
Location:	EQ-1A-41,42		EQ-1A-26,27		EQ-1A-26,27		EQ-1A-26,27		EQ-1A-28*		EQ-1A-38*		EQ-3A-1,4		EQ-3A-9,10		EQ-3A-14,15		EQ-3A-22,23	
Depth (cm):	-41		-11		-11		-11		-14		-34		9		-5		-15		-31	
Sampling Date:	11/19/91		11/19/91		11/19/91		11/19/91		11/19/91		11/19/91		11/21/91		11/21/91		11/21/91		11/21/91	
Units:	(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)	
Aluminum	141	B	268		268		268.34								138	BU				
Antimony	20	U	20	U	20		20	U							20	U				
Arsenic	30		2090		2100		2090						940		326		46.4		10.6	
Barium	30.74	B	62.5	B	62.5		62.5	B							88.6	B				
Beryllium	1	U	1	U	1		1	U							1	U				
Cadmium	3	U	3	U	3		3	U							5					
Calcium	35800		40300				40300								242000					
Chromium	11.6		30.8		30.8		30.8		26.6		7.2	B	56.2		31.4		21.4		13.4	
Cobalt	3.6	B	3	U	3		3	U							3.4	B				
Copper	2	U	2	U	2	U	2								2	U				
Iron	32000		39800		39800		39800								64100					
Lead	2.7	B	3.2	U	3.2		3.2	U					1	U	1	U	1	U	1	U
Magnesium	8610		9990				9990								25000					
Manganese	524		478		478		478								2190					
Mercury	0.2	U	0.2	U	0.2	U	0.2								0.2	U				
Nickel	6	U	6	U	6	U	6	U							10.3	BU				
Potassium	3190	B	4280	B			4280	B							11800					
Selenium	1	U	1	U	1		1	U							1	U				
Silver	3	U	3	U	3	U	3								3	U				
Sodium	24100		40100				40100								124000					
Titanium	1	U	1.3	B	1.3		1.3	B							1.7	BJ				
Vanadium	2	U	9.5	B	9.5	B	9.47								7.1	B				
Zinc	21.1		18.8	B	18.8		18.8	B							18.8	BJ				

unflagged - The data were reviewed and all criteria were met.

U - The metal was considered not detected. The associated numerical value is the quantitation limit.

UJ - The metal was not detected. The sample quantitation limit is an estimated value.

J - The associated numerical value is an estimated quantity.

B - The metal was detected above the instrument detection limit.

R - Result rejected, matrix spike recovery < 30 percent.

* - Determination of organically complexed chromium.

Metals Data Summary with Qualifiers (Continued)

Sample Number:	W33452		W33453		W33454	
Location:	EQ-3A-29,30		EQ-3A-35,36		EQ-3A-43,44	
Depth (cm):	-45		-57		-73	
Sampling Date:	11/21/91		11/21/91		11/21/91	
Units:	(µg/L)		(µg/L)		(µg/L)	
Aluminum						
Antimony						
Arsenic	8.8	B	11.4		8.9	B
Barium						
Beryllium						
Cadmium						
Calcium						
Chromium	11.8		7.1	B	8.1	B
Cobalt						
Copper						
Iron						
Lead	1	U	1	U	1	U
Magnesium						
Manganese						
Mercury						
Nickel						
Potassium						
Selenium						
Silver						
Sodium						
Titanium						
Vanadium						
Zinc						

Woburn/Project # 1320301

CLP DATA VALIDATION FORM

8 samples

PART D: Inorganics F

As, Cr, Pb

Contract No: PTI

SDG No: K916931

Laboratory: Columbia ~~Atlas~~ Canal

Reviewer: [illegible]

Date: 4-5-92

Sr. Review: AB

Date: 4/10/92

General

1.0 Holding Times - (aqueous and soil samples)
[p. 3 F.G. '88]

[Examine Chain of Custody sheets and digestion/distillation logs. Form XIII-IN]

Yes	No	N/A	
___	[✓]	___	Mercury analysis (28 days) . . . . . exceeded?
___	[ ]	✓	Cyanide distillation (14 days) . . . exceeded?
___	[✓]	___	Other metals analysis (6 months) . . exceeded?

Note: Prepare a list of all samples and analytes for which holding times have been exceeded. Specify the number of days from date of collection to the date of preparation (from raw data). Attach to checklist.

Action: If yes, for aqueous samples, reject (red-line) values less than Instrument Detection Limit (IDL) and flag as estimated (J) the values above IDL even though sample(s) was/were preserved properly. If yes for soil, use professional judgment.

2.0 Raw Data
[CLP Form XIII-IN]

Yes	No	N/A	2.1	Digestion Log for flame AA/ICP (Form XIII) present?
Yes	No	N/A		Digestion Log for furnace AA Form (XIII) present?
Yes	No	N/A		Digestion Log for mercury (Form XIII) present?
Yes	No	N/A		Distillation Log for cyanides Form (XIII) present?
Yes	No	N/A		Are pH values (pH<2 for all metals, pH>12 for cyanide) present?
Yes	No	N/A		Weights, dilutions and volumes used to obtain values?
Yes	No	N/A		Percent solids calculation present for soils/sediments?
Yes	No	N/A		Are preparation dates present on Digestion Log?
			2.2	Measurement read out record present?
Yes	No	N/A		ICP
Yes	No	N/A		Flame AA
Yes	No	N/A		Furnace AA
Yes	No	N/A		Mercury
Yes	No	N/A		Cyanides
Yes	No	N/A	2.3	Are all raw data to support all sample analyses and QC operations present?

III B. INSTRUMENT CALIBRATION (Section 2)

2. Analytical Sequence

A. Did the laboratory use the proper number of standards for calibration as described in the SOW?

Yes or No

B. Were calibrations performed at the beginning of each analysis?

Yes or No

C. Were calibration standards analyzed at the beginning of sample analysis and at a minimum frequency of ten percent or every two hours during analysis, whichever is more frequent?

Yes or No

D. Were the correlation coefficients for the calibration curves for AA, Hg and CN $\geq$ 0.995?

Yes or No

E. Was a standard at 2xCRDL analyzed for all ICP analyses?

Yes or No

If No,

The data may be affected. Use professional judgement to determine the severity of the effect and qualify the data accordingly. Discuss any actions below and list the samples affected.

_____

_____

_____

_____

Yes	No	N/A	
[✓]	___	___	Legible?
[✓]	___	___	Properly labeled?

Action: If no for any of the above, contact laboratory for explanation/resubmittal. Flag metal data as estimated [J(+)/UJ(-)] if pH of sample is greater than 2. Flag cyanide data as estimated [J(+)/UJ(-)] if pH sample is less than 12.

3.0 Data Validation and Verification

3.1 Calibration
[p. 4 (F.G. '88)]

Yes	No	N/A		
[✓]	___	___	3.1.1	Is record of at least 2 point calibration present for ICP analysis?
[✓]	___	___		Is record of 5 point calibration present for Hg analysis?

Action: If no for any of the above, determine if data are within calibration range of the instrument and use best professional judgement under F.G. All data are to be considered unusable.

3.1.2 Is record of 4-point calibration (blank and 3 standards) present for:

Yes	No	N/A	
[ ]	✓	(N/A)	Flame AA?
[✓]	(No)	___	Furnace AA? except for Pb cal. standard was 2.0 ppb not 3 ppb
[ ]	✓	(N/A)	Cyanides?

Note: 1. If less than 4 standards are measured in absorbance mode, then the remaining standards in concentration mode must be run immediately after calibration and be within ±10% of the true value.

2. For all AA (except Hg) and Cyanide analyses, one _____ calibration standard is at CRDL level. If not, discuss below.

Action: Flag associated data as estimated [J(+)/UJ(-)] if standards are not within ±10% of true value (except CRDL calibration standard). Do not flag the data as estimated in linear range indicated by good recovery of standard.

3.1.3 Is correlation *coefficient less than 0.995 for:

Yes	No	N/A	
	[✓]		Mercury Analysis?
		✓	Cyanide Analysis?
	[✓]		Atomic Absorption Analysis?

Action: If yes, use professional judgement to flag the associated data as estimated [(J(+)/UJ(-)].

3.2 Form II A (Initial and Continuing Calibration Verification)

Yes	No	N/A	
[✓]			3.2.1. Present and complete for every metal and cyanide?
[✓]			Present and complete for AA and ICP when both are used for sample analyte?

Action: If no for any of the above, contact laboratory for explanation/resubmittal.

3.2.2. Circle all values on Form IIA that are outside contract windows. Are all calibration standards (initial and continuing) within control limits?

Yes	No	N/A	
[✓]			Metals 90-110%
[✓]			Hg 80-120%
		✓	Cyanides 85-115%

* The reviewer will calculate correlation coefficient.

Action:

Acceptable(A)	Estimate (J/UJ)	Unusable (R)
	-Metals-	
11-125% for (-)	75-89% for (+/-)	<75% for (+/-)
>125% for (-)	111-125 for (+)	>125% for (+)
	-Mercury-	
121-135% for (-)	65-79% for (+/-)	<65% for (+/-)
>135% for (-)	121-135% for (+)	>125% for (+)
	-cyanide-	
116-130% for (-)	70-84% for (+/-)	<70% for (+/-)
>130% for (-)	116-130% for (+)	>130% for (+)

Yes [✓] No ___ N/A ___ Was continuing calibration (CCV and CCB) performed every 10 analyses or every 2 hours (whichever is more frequent)?

Action: If no, flag the excess samples (eleventh and up) data as estimated (J).

Yes [ ] No ___ N/A ✓ Was ICV for cyanides distilled?

Action: If no, discuss below:

_____

_____

_____

3.3 Form II B (CRDL Standards for AA and ICP) [Not discussed in F.G.] NA

Yes [ ] No ___ N/A ___ 3.3.1 Was a CRDL standard (CRA) analyzed after initial calibration for all all AA metals (except Hg)?

Yes [ ] No ___ N/A ___ *Was a mid-range calibration verification standard distilled and analyzed for cyanide analysis?

Yes [ ] No ___ N/A ___ Was a 2xCRDL (or 2xIDL when IDL>CRDL) analyzed (CRI) for each ICP run?

(Note: CRI for Al, Ba, Ca, Fe, Mg, Na or K is not required.)

Action: If no for any of the above, flag as estimated all data falling within the affected ranges. The affected ranges are:

AA Analysis - ** True Value ± CRDL
ICP Analysis - ** True Value ± 2CRDL
CN Analysis - ** True Value ± 0.5 x True Value.

* Find the results of mid-range standard in the raw data.
** True value of CRA, CRI or mid-range standard. Substitute IDL for CRDL when IDL > CRDL.

Yes	No	N/A		
[ ]	___	___	3.3.2	Was CRI analyzed after ICV/ICB and before the final CCV/CCB, and for every four hours of ICP run?

Action: If no, discuss below:

_____

_____

_____

3.3.3 Circle all values on summary sheet (Form IIB) that are outside acceptance windows.

Yes	No	N/A	
[ ]	___	___	Are CRA and CRI standards within control limits: Metals 80-120% R?
[ ]	___	___	Is mid-range standard within control limits: Cyanide 80-120% R?

Action:

FOR SAMPLE VALUES < CRI or CRA + 2CRDL:

Acceptable(A)	Estimate (J/UJ)	Unusable (R)
121-150% for (-)	50-79% for (+/-)	<50% for (+/-)
>150% (+)	121-150-% for (+)	>150% for (+)

4.0 Blanks

4.1 [p.6 (F.G. '88)] CLP Form III-IN

Yes ✓	No	N/A	Present and complete?
Yes ✓	No	N/A	For both AA and ICP when both are used for same analyte?
Yes ✓	No	N/A	Was an initial calibration blank analyzed?
Yes	No ✓	N/A	Was a continuing calibration blank (CCB) analyzed after every 10 samples or every 2 hours (whichever is more frequent)?

Action: If no, contact laboratory for explanation/resubmittal and discuss below:

_____

_____

_____

Was one PB analyzed for:

Yes ✓	No	N/A	each 20 samples?
Yes ✓	No	N/A	each batch?
Yes ✓	No	N/A	each matrix type?
Yes ✓	No	N/A	both AA and ICP when both are used for same analyte?
Yes ✓	No	N/A	blanks ≤ CRDL (Form III)?

Action: If no to any of the above, contact laboratory for explanation/resubmittal. Discuss the deficiencies below.

_____

_____

_____

Note: If the concentration of an analyte is > CRDL, either positive or negative, all associated sample concentrations must be > 10x the blank concentration. If not, for samples with concentrations , 10x CRDL, qualify as follows:

PB: J(+) - all samples.
CCB: J(+) - between CCB>CRDL and nearest good CCB.
J(+) - 5 samples analyzed prior to CCB>CRDL.

4.2 Action Limit

Yes ✓ No [ ] N/A ___

Are there CCB (µg/L) or PB (mg/kg) values reported > IDL ?

If yes, an action level of 5x the highest associated blank value is determined for positive blank values. Samples with detected concentrations < Action Limit are to be considered undetected at the reported concentration. Negative blank results, the raw data are to be reviewed to determine if a negative bias exists. If so, all samples qualify positive and undetected as estimated (J) and discuss under "Reasons."

Analyte	Blank Concentration	A.L.	Qualifier (U or J)	Affected Samples	Reason
Al	CCB 31.1	155.5	U	W33401	not run with the CCB
Ca	CCB 34.7	173.5	—		
Cr	PB 3.2	16	U	W33401 W33300	
Fe	CCB 30.6	153	~~U~~	~~W33302~~ W33300	~~W33400~~ ~~W33303~~
Pb	PB 1.2	6	U	W33401 W33302 W33300	W33402 W33400 W33303
Mg	CCB -37.6	188	—		
Zn	ICB 3.1	15.5	—		
Se	CCB 1.2	6.0	—		

V B. ICP INTERFERENCE CHECK SAMPLE (Section 3)

3. Report the concentration of any elements detected in the ICS A solution > | 2xIDL | that should not be present.

ELEMENT	CONC. DETECTED IN THE ICS	CONC. OF INTERFERENTS IN THE ICS			
		AL	CA	FE	MG
Ba	15	536472	488482	182970	493917
Cd	6	/	/	/	/
Co	-6	/	/	/	/
Cu	13	/	/	/	/
K	-1108	/	/	/	/
Na	1762	/	/	/	/

Estimate the concentration produced by the interfering element in all affected samples. See guidelines for examples. List the samples affected by interferences below:

SAMPLE AFFECTED	ELEMENT AFFECTED	SAMPLE CONC. (µ/L)	SAMPLE INTERFERANT CONC.				ESTIMATED INTERF. (µ/L)
			AL	CA	FE	MG	

ACTIONS:

1. In general, the sample data can be accepted without qualification if the sample concentrations of Al, Ca, Fe and Mg are less than 50% of their respective levels in the ICS solution.

2. Estimate (J) positive results or affected elements for samples with levels of interferents 50% or more of that in the ICS solution.

3. Reject (R) positive results if the reported concentration is due entirely to the interfering element.

4. Estimate (UJ) non-detected results for which false negatives are suspect.

Give explanations for any actions taken below:

1

5.0 **ICP Interference Check Sample [p. 7 (F.G. 1988)] Form IV-IN**

Yes [✓] No ___ N/A ___ Present and complete?

(Note: Not required for furnace AA, flame AA, mercury, cyanide and Ca, Mg, K and Na.)

Yes [✓] No ___ N/A ___ Was ICS analyzed at beginning and end of run (or at least twice every 8 hours)?

Action: If no, flag as estimated (J) all samples for which Al, Ca, Fe, or Mg is higher than in ICS.

Yes [✓] No ___ N/A ___ 5.2 Circle all values on Form IV that are more than ± 20% of true or established mean value (80-120% recovery).

Yes [ ] No ___ N/A ___ If no, is concentration of Al, Ca, Fe, or Mg lower than in ICS?

Action: If no, qualify results for out of control limits ICS as below.

Acceptable(A)	Estimate (J/UJ)	Unusable (R)
>120% for (-)	>120% for (+)	<50% for (+/-)
	50-79% for (+/-)	

Note: If possible, indicate the bias for the estimated data results. Also, evaluate the possibility of false negatives/positives as described on page 8 of the 1988 F.G..

6.0 **Laboratory Control Sample [p. 9, F.G. 1988] CLP Form VII - IN**
(Note: LCS - not required for aqueous Hg and cyanide analyses.)

6.1 Was an LCS prepared and analyzed for:

Yes [✓] No ___ N/A ___ every 20 water samples?

Yes [ ] No [✓] N/A ___ every 20 solid samples?

Yes ✓ No ___ N/A ___ both AA and ICP when both are used for the same analyte?

Action: If no for any of the above, contact laboratory for explanation/resubmittal. Flag as estimated (J) all data for which LCS was not analyzed.

Note: If only one LCS was analyzed for more than 20 samples, then first 20 samples close to LCS do not have to be flagged as estimated.

6.2 Aqueous LCS

Circle all LCS values outside control limits (80-120% -except aqueous Ag and Sb).

Is any LCS recovery:

Yes ___ No ✓ N/A ___ less than 50%?

Yes ___ No ✓ N/A ___ between 50% and 79%?

Yes ___ No ✓ N/A ___ between 121% and 150%?

Yes ___ No ✓ N/A ___ greater than 150%?

Acceptable(A)	Estimate (J/UJ)	Unusable (R)
>120% for (-)	>120% for (+)	<50% for (+/-)
	50-79% for (+/-)	

6.3 Solid LCS NA

Note: 1. If "Found" value of LCS is rejectable due to duplicate injections or analytical spike recovery criteria, regardless of LCS recovery, flag the associated data as estimated (J).

2. If IDL of an analyte is equal to or greater than true value of LCS, disregard the "Action" below even though LCS is out of control limits.

Yes ___ No [ ] N/A ___ Is LCS "Found" value higher than the control limits on Form VII?

Action: If yes, qualify all associated positive data as estimated (J).

Yes ___ No [ ] N/A ___ Is LCS "Found" value lower than the Control limits on Form VII?

Action: If yes, qualify all associated (positive and undetected) data as estimated (J).

7.0 **Duplicates [p. 10, F.G. 1988] CLP Form VI-IN**

7.1 Present and complete for:

Yes [✓] No ___ N/A ___ each 20 samples?

Yes [✓] No ___ N/A ___ each matrix type?

Yes [✓] No ___ N/A ___ each concentration range (i.e. low, med., high)?

Yes [✓] No ___ N/A ___ both AA and ICP when both are used for same analyte?

Action: If no for any of the above, flag as estimated (J) all data >CRDL* for which duplicate sample was not analyzed.

Note: 1. If one duplicate sample was analyzed for more than 20 samples, then the first 20 samples do not have to be flagged as estimated.

2. If percent solids for soil sample and its duplicate differ by more than 1%, prepare a Form VI for each duplicate pair, report concentrations in mg/L on wet weight basis and calculate RPD or Difference for each analyte.

Yes ___ No [✓] N/A ___ 7.2 Was field blank used for duplicate analysis?

Action: If yes, flag all data >CRDL* as estimated (J) for which field blank was used as duplicate.

Note: Duplicate analysis should be performed on a field blank when it is the only aqueous sample in SDG.

Yes	No	N/A		
[✓]	___	___	7.3	Are all values within control limits (RPD 20% or difference < ± CRDL for aqueous, and RPD 35% or difference < ±2x CRDL for solids)?
[___]	___	___		If no, are all results outside the control limits flagged with an * on Form I's and VI?

* Substitute IDL for CRDL when IDL > CRDL.

Action: If no, discuss below:

_____

_____

_____

Note: 1. RPD is not calculable for an analyte of the sample - duplicate pair when both values are less than IDL.

2. If lab duplicate result is rejectable due to coefficient of correlation of MSA, analytical spike recovery, or duplicate injections criteria, do not apply precision criteria.

Yes	No	N/A		
___	[✓]	___	7.4	Is any value for sample duplicate pair less than CRDL* and other value ≥ 10x CRDL*?

Soils - if 1 gram to 200 mL: divide CRDL by 5 (% moist) to get mg/kg.

Action: If yes, flag the associated data as estimated (J).

7.5 **Aqueous Laboratory Duplicates**

Circle all values on Form VI that are:

RPD > 20%

Difference > ± CRDL*

Yes	No	N/A	
___	[✓]	___	Is any RPD greater than 20% where sample and duplicate are both ≥ 5x CRDL*?
[✓]	✓	___	Is any **difference between sample and duplicate greater than CRDL* where sample and /or duplicate is less than 5x CRDL*?

Action: If yes, flag the associated data as estimated (J).

7.6 Soil/Sediment Laboratory Duplicates

Circle all values on Form VI that are: NA
RPD > 35%, or
Difference > 2x CRDL*

* Substitute IDL for CRDl when IDL > CRDL.
** Use absolute values of sample and duplicate to calculate the difference.

Yes	No	N/A	
___	[___]	___	Is any RPD (where sample and duplicate are both greater than or equal to 5x CRDL*)? > 35%?
___	[___]	___	Is any **difference between sample and duplicate (where RPD > 35% and sample and/or duplicate is < 5x CRDL*) > 2x CRDL*?

Action: If yes, flag the associated data as estimated (J).

7.7 Field Duplicates — None identified on COC.

Yes	No	N/A		
[___]	___	___	7.7.1	Were field duplicates analyzed?

Action: If yes, prepare a Form VI for each aqueous field duplicate pair. Prepare a Form VI for each soil duplicate pair, if percent solids for sample and its duplicate differ by more than 1%; report concentrations of soils in µg/L on wet weight basis and calculate RPDs or Difference for each analyte.

Note:
1. Do not calculate RPD when both values are < IDL.
2. Flag all associated data only for field duplicate pair.

Yes	No	N/A		
___	[___]	___	7.7.2	Is any value for sample duplicate pair < CRDL* and other value ≥ 10x CRDL*?

Action: If yes, flag the associated data as estimated (J).

Aqueous

Circle all values on Form VI for field duplicates that are:
RPD > 50%, or
Difference > ± CRDL*

Yes	No	N/A	
___	[ ]	___	Is any RPD > 50% where sample and duplicate are both ≥ 5x

* Substitute IDL for CRDL when IDL > CRDL.
** Use absolute values of sample and duplicate to calculate the difference.

Yes	No	N/A	
___	[ ]	___	Is any **difference between sample and duplicate greater than CRDL* where sample and/or duplicate is < 5x CRDL*?

Action: If yes, flag the associated data as estimated (J).

8.0 **Spiked Sample Recovery - Pre-Digestion/Pre-Distillation [p.11 (F.G. 1988)] Form V - IN**

Yes	No	N/A		
[✓]	___	___	8.1	Present and complete for: each 20 samples?
[✓]	___	___		each matrix type?
[✓]	___	___		each concentration range (i.e. low, med., high)?
[✓]	___	___		for both AA and ICP when both are used for same analyte?

Action: If no for any of the above, flag as estimated (J) all positive data < 4x spiking level for which spiked sample was not analyzed.

Note: If one spiked sample was analyzed for more than 20 samples, then first 20 samples analyzed do not have to be flagged as estimated (J).

Yes	No	N/A		
___	[✓]	___	8.2	Was field blank used for spiked sample?

Action: If yes, flag all positive data , 4x spike added as estimated (J) for which field blank was used as spiked sample.

Note: Matrix spike analysis should be performed on a field blank when it is the only aqueous sample in SDG.

8.3 Circle all values on Data Summary Sheet that are outside control

limits (75% to 125%).

Yes ✓ No ✓ N/A — Are all recoveries within control limits?

As (625%), Fe (-78.5%)

Yes ✓ No N/A — If no, is sample concentration ≥ 4x spike concentration?

Action: Disregard spike recoveries for analytes whose concentrations are ≥ 4x spike added.

Circle those analytes on Form V for which sample concentration is < 4x the spike concentration and recovery outside limits.

Yes No ✓ N/A — Are results outside the control limits (75%-125%) flagged with "N" on Form I's and Form VA?

Action: See Functional Guidelines p. 11.

NA

AB

8.4 Aqueous

Are any spike recoveries:

Yes ✓ No N/A — a) less than 30%?

Fe (-78.5%)

Yes No ✓ N/A — b) between 30-74%?

Yes No ✓ N/A — c) between 126-150%?

Yes ✓ No N/A — d) greater than 150%?

As (625%)

Acceptable(A)	Estimate (J/UJ)	Unusable (R)
>125% for (-)	>125% for (+)	<30% for (+/-)
	30-74% for (+/-)	

Note: If pre-digestion spike result is rejectable due to coefficient of correlation of MSA, analytical spike recovery, or duplicate injections criteria, disregard spike recovery on Form V. Flag the associated data as estimated (J).

VIII. Laboratory Control Sample (Form VII)

✓ Laboratory Control Sample (LCS) analysis was performed for every twenty samples received and met contractual criteria.

____ Laboratory Control Sample (LCS) analysis was performed, but did not meet the criteria for the following elements:._____

Calculation: %R = (Observed/True) x 100

Actions:

	Accept	Approximate	Reject
% Recovery	30-79 for ND[1] 80-120 for ND/+ > 120 for ND	30-79 for + > 120% for + < 30% for +	< 30 for ND

NOTE:

+ - positive result
ND - not detected element
1 - When the percent recovery falls between 30-79 for the LCS, an evaluation of detection limits is beyond the scope of work for a NUS/FIT Level I Data Validation. However, detection limits should be estimated when evaluated under a Level II Data Validation.

An aqueous LCS mercury sample is not required of the laboratory.

IX. Detection Limit Results (Form XI)

✓ Instrument detection limit results were present and found to be less than the Contract Required Detection Limits.

____ Detection limit results were not included in the data package.

____ Detection limits were present, but the criteria was not met for the following elements:

_____

_____

_____

Action:

Adjust sample detection limits for elements not meeting contractual criteria listed above. Elements detected below the adjusted detection limit should be rejected (R'd).

Calculating detection limits for soil samples:
Sample detection limit (mg/kg) =

$$100 \times \frac{\text{IDL (ug/l)}}{\text{\% solids}} \times \frac{\text{Volume diluted to (ml)}}{\text{wet weight digested (gms)}} \times \frac{1\text{L}}{1{,}000\text{ ml}} \times \frac{1{,}000\text{ gm}}{1\text{ kg}} \times \frac{1\text{ mg}}{1{,}000\text{ ug}}$$

X. Furnace Atomic Absorption QC Analysis/Method of Standard Additions

A. Duplicate Injections

✓ Duplicate injections were performed for all samples and agreed within ± 20% Relative Standard Deviation (RSD). The RSD or Coefficient of Variation (CV) is calculated by dividing the standard deviation by the mean and multiplying by one hundered.

NA Duplicate injections were not performed for the following samples/elements: _____

Action: Reject (R) data and notify the NUS/FIT RSCC Manager of the deficiency.

NA Duplicate injections were outside the ± 20% RSD limit and a third injection was not performed as required for the following samples/elements: _____

Action: Approximate (J) data and summarize the lab's deficiency in the memo.

NA Duplicate injections did not agree within ± 20% RSD and the third injection did not agree with either of the first two injections (± 20% RSD) for the following samples/elements: _____

Action: Approximate (J) data.

B. Analytical Spike Percent Recoveries

✓ One-point analytical spikes were performed for all samples and the spike recoveries met the 85-115% recovery criteria (Accept data).

NA The analytical spike recoveries were less than 10% for the following samples/elements: _____

Action: Reject (R) data.

NA Spike recoveries were 10-40% and the laboratory did not dilute and re-analyze the following samples/elements: _____

Action: Approximate (J) positive results and reject (R) non-detected results.

NA Spike recoveries were 10-40% after the following samples/elements were diluted and re-analyzed: _____

Action: Approximate (J) positive results and reject (R) non-detected results.

NA Sample Concentrations were less than 50% of the spike value and spike recoveries were greater than 40%. (Accept data).

NA Sample Concentrations were greater than 50% of the spike value, and spike recoveries did not meet the 85-115% recovery criteria.
The following actions should be taken:

_____ Method of Standard Addition (MSA) was not performed as required for sample numbers/elements: _____

Action: Approximate data and summarize the lab's deficiency in the memo.

all within limits

NA MSA was used to quantitate analytical results for the following samples/elements when correlation coefficients were greater than 0.995:

Action: Accept data.

NA MSA was performed for the following samples/elements and correlation coefficients were less than 0.995:

Action: Approximate (J) data.

Comments:

XI. Inductively Coupled Plasma (ICP) QC Analysis/Serial Dilution Results

✓ Serial Dilutions were performed; but analytical results did not agree within 10% for analyte concentrations greater than 50x the IDL in the original sample. (7/87 SOW). The following elements were evaluated for Matrix interferences:

Element	IDL	IDL X 50	Sample #: ____	Serial Diluted Sample Result	Action
Aluminum					
Barium					
Beryllium					
Cadmium					
Calcium					
Cobalt					
Copper					
Chromium					
Iron					
Lead					
Magnesium					
Manganese					
Nickel					
Potassium					
Silver					
Sodium					
Vanadium					
Zinc					
Other:					

Actions: All data for samples of the same matrix for that element should be approximated (J) when the serial dilution results do not meet contractual requirements.

For example:

1. The IDL for Mg is 10 ppb. Magnesium (Mg) was detected in Sample A at a concentration of 65 ppb. The sample was then diluted by a factor of five. The serially diluted sample result (SR) was 80 ppb. The sample should not be evaluated for matrix interferences, since: 65 ppb (SR) < 500 ppb (IDL x 50).

2. The IDL for Al is 70 ppb. Aluminum (Al) was detected in Sample B at a concentration of 5,000 ppb. The sample was diluted by a factor of five. The serially diluted sample result (SR) was 3,200 ppb. The sample should be evaluated for matrix interferences, since: 5000 ppb > 3500 ppb (IDL x 50). The serially diluted sample result is not within 10% of the original sample result. Therefore, Aluminum results should be approximated (J'd) in all samples of the same matrix.

Project # C1320401

CLP DATA VALIDATION FORM

Contract No: PTI

SDG No: K917192

PART D: Inorganics

Laboratory: ~~#~~ colum analyt

Reviewer: 4-5-92

Date: 4-5-92

Sr. Review: AB

Date: 4/10/92

General

1.0 Holding Times - (aqueous and soil samples)
[p. 3 F.G. '88]

[Examine Chain of Custody sheets and digestion/distillation logs. Form XIII-IN]

Yes	No	N/A	
✓	[ ]	___	Mercury analysis (28 days) . . . . . exceeded?
___	[ ]	✓	Cyanide distillation (14 days) . . . exceeded?
___	[✓]	___	Other metals analysis (6 months) . . exceeded?

Note: Prepare a list of all samples and analytes for which holding times have been exceeded. Specify the number of days from date of collection to the date of preparation (from raw data). Attach to checklist.

Action: If yes, for aqueous samples, reject (red-line) values less than Instrument Detection Limit (IDL) and flag as estimated (J) the values above IDL even though sample(s) was/were preserved properly. If yes for soil, use professional judgment.

See sheet 1

Sheet 1

TABLE I
HOLDING TIMES (INORGANICS)

Sample ID	Matrix (S:W)	Date Sampled	Date VTSR	Analysis Date Metals	Analysis Date Hg	Analysis Date CN	Holding Time (days) Metals	Holding Time (days) Hg	Holding Time (days) CN
719201	S	11/14/91	11/15/91		1-13-92			20	
719202									
719206									
719207		11/19/91						28	
719208									
719211									
719213		11-20-91						27	
719214	Water	11-8-91						29	

VTSR = Validated Time of Sample Receipt

* Holding Time (40 Part CFR 136) = Date of Analysis-Sampling Date
  Holding Time (SOW) = Date of Analysis-VTSR

Holding Time Limits:
SOW (ILM01.0): Metals - 180 d; Mercury - 26 d; Cyanide - 12 d
40 CFR Part 136: Metals - 6 months; Mercury - 28 d; Cyanide - 14 d

2.0 Raw Data
[CLP Form XIII-IN]

Yes	No	N/A	2.1	Digestion Log for flame AA/ICP (Form XIII) present?
Yes	No	N/A		Digestion Log for furnace AA Form (XIII) present?
Yes	No	N/A		Digestion Log for mercury (Form XIII) present?
Yes	No	N/A		Distillation Log for cyanides Form (XIII) present?
Yes	No	N/A		Are pH values (pH<2 for all metals, pH>12 for cyanide) present? Nitric preserved
Yes	No	N/A		Weights, dilutions and volumes used to obtain values?
Yes	No	N/A		Percent solids calculation present for soils/sediments?
Yes	No	N/A		Are preparation dates present on Digestion Log?
			2.2	Measurement read out record present?
Yes	No	N/A		ICP
Yes	No	N/A		Flame AA
Yes	No	N/A		Furnace AA
Yes	No	N/A		Mercury
Yes	No	N/A		Cyanides
Yes	No	N/A	2.3	Are all raw data to support all sample analyses and QC operations present?

Yes ✓	No	N/A	Legible?
Yes ✓	No	N/A	Properly labeled?

Action: If no for any of the above, contact laboratory for explanation/resubmittal. Flag metal data as estimated [J(+)/UJ(-)] if pH of sample is greater than 2. Flag cyanide data as estimated [J(+)/UJ(-)] if pH sample is less than 12.

3.0 Data Validation and Verification

3.1 Calibration
[p. 4 (F.G. '88)]

Yes ✓	No	N/A	3.1.1	Is record of at least 2 point calibration present for ICP analysis?
Yes ✓	No	N/A		Is record of 5 point calibration present for Hg analysis?

Action: If no for any of the above, determine if data are within calibration range of the instrument and use best professional judgement under F.G. All data are to be considered unusable.

3.1.2 Is record of 4-point calibration (blank and 3 standards) present for:

Yes	No ✓	N/A	Flame AA?
Yes ✓	No	N/A	Furnace AA?
Yes	No ✓	N/A	Cyanides?

Note: 1. If less than 4 standards are measured in absorbance mode, then the remaining standards in concentration mode must be run immediately after calibration and be within ±10% of the true value.

2. For all AA (except Hg) and Cyanide analyses, one _____ calibration standard is at CRDL level. If not, discuss below.

note. Pb CRDL 3.0 ug/L IDL 20 ug/L

Action: Flag associated data as estimated [J(+)/UJ(-)] if standards are not within ±10% of true value (except CRDL calibration standard). Do not flag the data as estimated in linear range indicated by good recovery of standard.

3.1.3 Is correlation *coefficient less than 0.995 for:

Yes	No	N/A	
	✓		Mercury Analysis?
		✓	Cyanide Analysis?
	✓		Atomic Absorption Analysis?

Action: If yes, use professional judgement to flag the associated data as estimated [(J(+)/UJ(-)].

3.2 Form II A (Initial and Continuing Calibration Verification)

Yes	No	N/A	
✓			3.2.1. Present and complete for every metal and cyanide?
✓			Present and complete for AA and ICP when both are used for sample analyte?

Action: If no for any of the above, contact laboratory for explanation/resubmittal.

3.2.2. Circle all values on Form IIA that are outside contract windows. Are all calibration standards (initial and continuing) within control limits?

Yes	No	N/A	
✓			Metals 90-110%
✓			Hg 80-120%
	✓	(N/A)	Cyanides 85-115%

* The reviewer will calculate correlation coefficient.

Action:

Acceptable(A)	Estimate (J/UJ)	Unusable (R)
	-Metals-	
11-125% for (-)	75-89% for (+/-)	<75% for (+/-)
>125% for (-)	111-125 for (+)	>125% for (+)
	-Mercury-	
121-135% for (-)	65-79% for (+/-)	<65% for (+/-)
>135% for (-)	121-135% for (+)	>125% for (+)
	-cyanide-	
116-130% for (-)	70-84% for (+/-)	<70% for (+/-)
>130% for (-)	116-130% for (+)	>130% for (+)

Yes [✓] No ___ N/A ___ Was continuing calibration (CCV and CCB) performed every 10 analyses or every 2 hours (whichever is more frequent)?

Action: If no, flag the excess samples (eleventh and up) data as estimated (J).

Yes [ ] No ___ N/A ✓ Was ICV for cyanides distilled?

Action: If no, discuss below:

___

___

___

3.3 **Form II B (CRDL Standards for AA and ICP) [Not discussed in F.G.]** NA

Yes [ ] No ___ N/A ___ 3.3.1 Was a CRDL standard (CRA) analyzed after initial calibration for all all AA metals (<u>except</u> Hg)?

Yes [ ] No ___ N/A ___ *Was a mid-range calibration verification standard distilled and analyzed for cyanide analysis?

Yes [ ] No ___ N/A ___ Was a 2xCRDL (or 2xIDL when IDL>CRDL) analyzed (CRI) for each ICP run?

(Note: CRI for Al, Ba, Ca, Fe, Mg, Na or K is not required.)

Action: If no for any of the above, flag as estimated all data falling within the affected ranges. The affected ranges are:

AA Analysis - ** True Value ± CRDL
ICP Analysis - ** True Value ± 2CRDL
CN Analysis - ** True Value ± 0.5 x True Value.

* Find the results of mid-range standard in the raw data.
** True value of CRA, CRI or mid-range standard. Substitute IDL for CRDL when IDL > CRDL.

Yes	No	N/A		
[ ]	___	___	3.3.2	Was CRI analyzed after ICV/ICB and before the final CCV/CCB, and for every four hours of ICP run?

Action: If no, discuss below:

_____

_____

_____

3.3.3 Circle all values on summary sheet (Form IIB) that are outside acceptance windows.

Yes	No	N/A	
[ ]	___	___	Are CRA and CRI standards within control limits: Metals 80-120% R?
[ ]	___	___	Is mid-range standard within control limits: Cyanide 80-120% R?

Action:

FOR SAMPLE VALUES < CRI or CRA + 2CRDL:

Acceptable(A)	Estimate (J/UJ)	Unusable (R)
121-150% for (-)	50-79% for (+/-)	<50% for (+/-)
>150% (+)	121-150-% for (+)	>150% for (+)

4.0 Blanks

4.1 [p.6 (F.G. '88)] CLP Form III-IN

Yes [✓]	No ___	N/A ___	Present and complete?
Yes [✓]	No ___	N/A ___	For both AA and ICP when both are used for same analyte?
Yes [✓]	No ___	N/A ___	Was an initial calibration blank analyzed?
Yes [✓]	No ___	N/A ___	Was a continuing calibration blank (CCB) analyzed after every 10 samples or every 2 hours (whichever is more frequent)?

Action: If no, contact laboratory for explanation/resubmittal and discuss below:

_____

_____

_____

Was one PB analyzed for:

Yes [✓]	No ___	N/A ___	each 20 samples?
Yes [✓]	No ___	N/A ___	each batch?
Yes [✓]	No ___	N/A ___	each matrix type?
Yes [✓]	No ___	N/A ___	both AA and ICP when both are used for same analyte?
Yes [✓]	No ___	N/A ___	blanks ≤ CRDL (Form III)?

Action: If no to any of the above, contact laboratory for explanation/resubmittal. Discuss the deficiencies below.

_____

_____

_____

Note: If the concentration of an analyte is > CRDL, either positive or negative, all associated sample concentrations must be > 10x the blank concentration. If not, for samples with concentrations , 10x CRDL, qualify as follows:

PB: J(+) - all samples.
CCB: J(+) - between CCB>CRDL and nearest good CCB.
J(+) - 5 samples analyzed prior to CCB>CRDL.

4.2 Action Limit

Yes ✓ No [ ] N/A ___ Are there CCB (µg/L) or PB (mg/kg) values reported > IDL?

If yes, an action level of 5x the highest associated blank value is determined for positive blank values. Samples with detected concentrations < Action Limit are to be considered undetected at the reported concentration. Negative blank results, the raw data are to be reviewed to determine if a negative bias exists. If so, all samples qualify positive and undetected as estimated (J) and discuss under "Reasons."

Analyte	Blank Concentration	A.L.	Qualifier (U or J)	Affected Samples	Reason
Al	PB 8.994	44.97 ~~44.97~~	—		
As	CCB 1.9	1.9 ~~9.5~~	—		
Cr	CCB 2.9	2.9 ~~14.5~~	—		
Fe	CCB 21.5	21.5 ~~107.5~~	—		
K	CCB 856	856 ~~4280~~	—		
Na	CCB 39.8	39.8 ~~199~~	—		
Zn	PB 0.944	~~4.72~~ 4.72	—		

No ICB ran for water matrix

EcoChem, Inc.

CALCULATION SHEET

911 Western Avenue
Seattle, Washington 9810
(206) 233-9332

Date:	Calculation:	Contract No:	Reviewer:

< Blanks >

	Analyte	conc	A.L	Q	affected samples
	As	-2.3 CCB	11.5	—	
	Cr	2.8	14	—	
	Fe	20.3	101.5	—	
	K	1135.7	5678.5	u ~~719201~~,	719201
	Se	2.6	13	u	~~719206~~,
	Na	48.7	243.5		
	Zn	3.7	18.5		
water	As	-1.7	8.5	u	719216
	Ba	1.1	5.5	—	
	Cr	3.3	16.5	u	719216
	Fe	60.9	304.5	—	
	K	1030.5	5152.5	—	
	Na	56.5 CCB, 31.3 IB	282.5	—	
soil –	Pb	2.3	11.5	u	~~719202~~
	Pb	-1.0	5.0		

V B. ICP INTERFERENCE CHECK SAMPLE (Section 3)

3. Report the concentration of any elements detected in the ICS A solution > |2xIDL| that should not be present.

ELEMENT	CONC. DETECTED IN THE ICS	CONC. OF INTERFERENTS IN THE ICS			
		AL	CA	FE	MG
Ba	16	512315	479857	180040	479277
Cd	0				
Co	-6				
Cu	12				
K	-713				
Na	1688				

Estimate the concentration produced by the interfering element in all affected samples. See guidelines for examples. List the samples affected by interferences below:

SAMPLE AFFECTED	ELEMENT AFFECTED	SAMPLE CONC. (µ/L)	SAMPLE INTERFERANT CONC.				ESTIMATED INTERF. (µ/L)
			AL	CA	FE	MG	
719202					X		
719206					X		
719207					X		
719211					X		

ACTIONS:

1. In general, the sample data can be accepted without qualification if the sample concentrations of Al, Ca, Fe and Mg are less than 50% of their respective levels in the ICS solution.

2. Estimate (J) positive results or affected elements for samples with levels of interferents 50% or more of that in the ICS solution.

3. Reject (R) positive results if the reported concentration is due entirely to the interfering element.

4. Estimate (UJ) non-detected results for which false negatives are suspect.

Give explanations for any actions taken below:

_____

_____

_____

5.0 **ICP Interference Check Sample [p. 7 (F.G. 1988)] Form IV-IN**

Yes [✓] No ___ N/A ___ Present and complete?

(Note: Not required for furnace AA, flame AA, mercury, cyanide and Ca, Mg, K and Na.)

Yes [✓] No ___ N/A ___ Was ICS analyzed at beginning and end of run (or at least twice every 8 hours)?

Action: If no, flag as estimated (J) all samples for which Al, Ca, Fe, or Mg is higher than in ICS.

Are all values within 80 - 120%

Yes [✓] No ___ N/A ___ 5.2 Circle all values on Form IV that are more than ± 20% of true or established mean value (80-120% recovery).

Yes [ ] No ___ N/A ___ If no, is concentration of Al, Ca, Fe, or Mg lower than in ICS?

Action: If no, qualify results for out of control limits ICS as below.

Acceptable(A)	Estimate (J/UJ)	Unusable (R)
>120% for (-)	>120% for (+)	<50% for (+/-)
	50-79% for (+/-)	

Note: If possible, indicate the bias for the estimated data results. Also, evaluate the possibility of false negatives/positives as described on page 8 of the 1988 F.G..

6.0 **Laboratory Control Sample [p. 9, F.G. 1988] CLP Form VII - IN**
(Note: LCS - not required for aqueous Hg and cyanide analyses.)

6.1 Was an LCS prepared and analyzed for:

Yes [✓] No ___ N/A ___ every 20 water samples?

Yes [✓] No ___ N/A ___ every 20 solid samples?

Yes ✓ No N/A both AA and ICP when both are used for the same analyte?

Action: If no for any of the above, contact laboratory for explanation/resubmittal. Flag as estimated (J) all data for which LCS was not analyzed.

Note: If only one LCS was analyzed for more than 20 samples, then first 20 samples close to LCS do not have to be flagged as estimated.

6.2 Aqueous LCS

Circle all LCS values outside control limits (80-120% -except aqueous Ag and Sb).

Is any LCS recovery:

Yes No ✓ N/A less than 50%?

Yes No ✓ N/A between 50% and 79%?

Yes No ✓ N/A between 121% and 150%?

Yes No ✓ N/A greater than 150%?

Acceptable(A)	Estimate (J/UJ)	Unusable (R)
>120% for (-)	>120% for (+)	<50% for (+/-)
	50-79% for (+/-)	

6.3 Solid LCS

Note: 1. If "Found" value of LCS is rejectable due to duplicate injections or analytical spike recovery criteria, regardless of LCS recovery, flag the associated data as estimated (J).

2. If IDL of an analyte is equal to or greater than true value of LCS, disregard the "Action" below even though LCS is out of control limits.

Yes ___ No [✓] N/A ___ Is LCS "Found" value higher than the control limits on Form VII?

Action: If yes, qualify all associated positive data as estimated (J).

Yes ___ No [✓] N/A ___ Is LCS "Found" value lower than the Control limits on Form VII?

Action: If yes, qualify all associated (positive and undetected) data as estimated (J).

7.0 <u>Duplicates [p. 10, F.G. 1988] CLP Form VI-IN</u>

7.1 Present and complete for:

Yes [✓] No ___ N/A ___ each 20 samples?

Yes [✓] No ___ N/A ___ each matrix type?

Yes [✓] No ___ N/A ___ each concentration range (i.e. low, med., high)?

Yes [✓] No ___ N/A ___ both AA and ICP when both are used for same analyte?

Action: If no for any of the above, flag as estimated (J) all data >CRDL* for which duplicate sample was not analyzed.

Note: 1. If one duplicate sample was analyzed for more than 20 samples, then the first 20 samples do not have to be flagged as estimated.

2. If percent solids for soil sample and its duplicate differ by more than 1%, prepare a Form VI for each duplicate pair, report concentrations in mg/L on wet weight basis and calculate RPD or Difference for each analyte.

Yes ___ No [✓] N/A ___ 7.2 Was field blank used for duplicate analysis?

Action: If yes, flag all data >CRDL* as estimated (J) for which field blank was used as duplicate.

Note: Duplicate analysis should be performed on a field blank when it is the only aqueous sample in SDG.

Yes	No	N/A		
[✓]	___	___	7.3	Are all values within control limits (RPD 20% or difference < ± CRDL for aqueous, and RPD 35% or difference < ±2x CRDL for solids)?
[___]	___	___		If no, are all results outside the control limits flagged with an * on Form I's and VI?

* Substitute IDL for CRDL when IDL > CRDL.

Action: If no, discuss below:

_____

_____

_____

Note: 1. RPD is not calculable for an analyte of the sample - duplicate pair when both values are less than IDL.

2. If lab duplicate result is rejectable due to coefficient of correlation of MSA, analytical spike recovery, or duplicate injections criteria, do not apply precision criteria.

Yes	No	N/A		
___	[✓]	___	7.4	Is any value for sample duplicate pair less than CRDL* and other value ≥ 10x CRDL*?

Soils - if 1 gram to 200 mL: divide CRDL by 5 (% moist) to get mg/kg.

Action: If yes, flag the associated data as estimated (J).

7.5 **Aqueous Laboratory Duplicates**

Circle all values on Form VI that are:

RPD > 20%

Difference > ± CRDL*

Yes	No	N/A	
___	[✓]	___	Is any RPD greater than 20% where sample and duplicate are both ≥ 5x CRDL*?
[___]	[✓]	___	Is any **difference between sample and duplicate greater than CRDL* where sample and /or duplicate is less than 5x CRDL*?

Action: If yes, flag the associated data as estimated (J).

7.6 Soil/Sediment Laboratory Duplicates

Circle all values on Form VI that are:
RPD > 35%, or
Difference > 2x CRDL*

* Substitute IDL for CRDl when IDL > CRDL.
** Use absolute values of sample and duplicate to calculate the difference.

Yes	No	N/A	
___	[✓]	___	Is any RPD (where sample and duplicate are both greater than or equal to 5x CRDL*)? > 35%?
___	[✓]	___	Is any **difference between sample and duplicate (where RPD > 35% and sample and/or duplicate is < 5x CRDL*) > 2x CRDL*?

Action: If yes, flag the associated data as estimated (J).

7.7 Field Duplicates

Yes	No	N/A		
[ ]	✓	___	7.7.1	Were field duplicates analyzed? None were identified on C.O.C.

Action: If yes, prepare a Form VI for each aqueous field duplicate pair. Prepare a Form VI for each soil duplicate pair, if percent solids for sample and its duplicate differ by more than 1%; report concentrations of soils in µg/L on wet weight basis and calculate RPDs or Difference for each analyte.

Note:
1. Do not calculate RPD when both values are < IDL.
2. Flag all associated data only for field duplicate pair.

Yes	No	N/A		
___	[ ]	___	7.7.2	Is any value for sample duplicate pair < CRDL* and other value ≥ 10x CRDL*?

Action: If yes, flag the associated data as estimated (J).

Aqueous

Circle all values on Form VI for field duplicates that are:
RPD > 50%, or
Difference > ± CRDL*

Yes No N/A Is any RPD > 50% where sample and duplicate are both ≥ 5x

__ [__] __

* Substitute IDL for CRDL when IDL > CRDL.
** Use absolute values of sample and duplicate to calculate the difference.

Yes No N/A Is any **difference between sample and duplicate greater than CRDL* where sample and/or duplicate is < 5x CRDL*?

__ [__] __

Action: If yes, flag the associated data as estimated (J).

8.0 **Spiked Sample Recovery - Pre-Digestion/Pre-Distillation [p.11 (F.G. 1988)] Form V - IN**

Yes No N/A **8.1** Present and complete for: each 20 samples?

[✓] __ __

Yes No N/A each matrix type?

[✓] __ __

Yes No N/A each concentration range (i.e. low, med., high)?

[✓] __ __

Yes No N/A for both AA and ICP when both are used for same analyte?

[✓] __ __

Action: If no for any of the above, flag as estimated (J) all positive data < 4x spiking level for which spiked sample was not analyzed.

Note: If one spiked sample was analyzed for more than 20 samples, then first 20 samples analyzed do not have to be flagged as estimated (J).

Yes No N/A **8.2** Was field blank used for spiked sample?

__ [✓] __

Action: If yes, flag all positive data , 4x spike added as estimated (J) for which field blank was used as spiked sample.

Note: Matrix spike analysis should be performed on a field blank when it is the only aqueous sample in SDG.

8.3 Circle all values on Data Summary Sheet that are outside control

limits (75% to 125%).

Yes [ ] No ✓ N/A [ ] Are all recoveries within control limits?

Yes [ ] No ✓ N/A [ ] If no, is sample concentration ≥ 4x spike concentration?

Action: Disregard spike recoveries for analytes whose concentrations are ≥ 4x spike added.

Circle those analytes on Form V for which sample concentration is < 4x the spike concentration and recovery outside limits.

Yes ✓ No [ ] N/A [ ] Are results outside the control limits (75%-125%) flagged with "N" on Form I's and Form VA?

Action: See Functional Guidelines p. 11.

8.4 Aqueous

Are any spike recoveries:

Yes [ ] No ✓ N/A [ ] a) less than 30%?

Yes ✓ No [ ] N/A [ ] b) between 30-74%?

Yes [ ] No ✓ N/A [ ] c) between 126-150%?

Yes [ ] No ✓ N/A [ ] d) greater than 150%?

Acceptable(A)	Estimate (J/UJ)	Unusable (R)
>125% for (-)	>125% for (+)	<30% for (+/-)
	30-74% for (+/-)	

Note: If pre-digestion spike result is rejectable due to coefficient of correlation of MSA, analytical spike recovery, or duplicate injections criteria, disregard spike recovery on Form V. Flag the associated data as estimated (J).

DATA QUALIFIERS

Compound	Qualifier	Sample Number	Reason
Antimony	J(+)	All soil Samples	Matrix Spike recoveries were outside control limits
	UJ(-)		%R = 68.5
Arsenic			" %R = 59.0
Cadmium			%R = 74.7%
Lead			%R = 65.5

DATAQUAL.TBL

VIII. Laboratory Control Sample (Form VII)

✓ Laboratory Control Sample (LCS) analysis was performed for every twenty samples received and met contractual criteria.

____ Laboratory Control Sample (LCS) analysis was performed, but did not meet the criteria for the following elements:_____

Calculation: %R = (Observed/True) x 100

Actions:

	Accept	Approximate	Reject
% Recovery	30-79 for ND[1] 80-120 for ND/+ > 120 for ND	30-79 for + > 120% for + < 30% for +	< 30 for ND

NOTE:

+ - positive result
ND - not detected element
1 - When the percent recovery falls between 30-79 for the LCS, an evaluation of detection limits is beyond the scope of work for a NUS/FIT Level I Data Validation. However, detection limits should be estimated when evaluated under a Level II Data Validation.

An aqueous LCS mercury sample is not required of the laboratory.

IX. Detection Limit Results (Form XI)

✓ Instrument detection limit results were present and found to be less than the Contract Required Detection Limits. ~~[illegible] = 2.0 ug/L IDL = 20 ug/L~~

____ Detection limit results were not included in the data package. OK AB

✓ Detection limits were present, but the criteria was not met for the following elements:
Pb

Action:

Adjust sample detection limits for elements not meeting contractual criteria listed above. Elements detected below the adjusted detection limit should be rejected (R'd).

Calculating detection limits for soil samples:
Sample detection limit (mg/kg) =

$$100 \times \frac{\text{IDL (ug/l)}}{\text{\% solids}} \times \frac{\text{Volume diluted to (ml)}}{\text{wet weight digested (gms)}} \times \frac{1\text{L}}{1{,}000\text{ ml}} \times \frac{1{,}000\text{ gm}}{1\text{ kg}} \times \frac{1\text{ mg}}{1{,}000\text{ ug}}$$

X. FURNACE ATOMIC ABSORPTION ANALYSIS

1. Duplicate Precision

✓ Duplicate injections and one-point analytical spikes were performed for all samples: duplicate injections agreed within ±20% for sample analyte values ≥ CRDL.

___ Duplicate injections did not agree within ±20% for samples/elements: ___

___ Duplicate injections and/or spikes were not performed for the following samples/elements: ___

Estimate (J) positive results if duplicate injections are outside ±20% RSD or CV.

2. Post digestion analytical spikes

___ Spike recoveries met the 85-115% recovery criteria for all samples.

✓ Spike recoveries did not meet the 85-115% criteria but did not require MSA for the following samples/elements: 719201 S, 719202 S, 719206 S, 719207 S, 719208 S, 719213 S, 719216 S,

If the sample absorbance is <50% of post digestion spike absorbance, the following actions should be applied:

	PERCENT RECOVERY		
	<10%	113-84%	>115%
Positive Sample Results	J or R	J	J
Non-detected Sample Results	R	UJ	A

NA MSA was used to quantitate analytical results when contractually required.

___ Correlation coefficients ≥0.995, accept results.
___ Correlation coefficients <0.995 for sample numbers/ elements ___

Estimate (J) sample results if correlation coefficient was <0.995.

NA Method of Standard Addition (MSA) was not performed as required for samples/elements: ___

Estimate (J) sample results if MSA was required and not performed.

XI. INDUCTIVELY COUPLED PLASMA (ICP) SERIAL DILUTION ANALYSIS

— Serial Dilutions were performed for each matrix and results of the diluted sample analysis agreed within ten percent of the original undiluted analysis for analyte values >50 x the IDL

— Serial Dilutions were not performed for the following:

✓ Serial Dilutions were performed, but analytical results did not agree within 10% for analyte concentrations greater than 50x the IDL before dilution.

Report all results below that do not meet the required laboratory criteria for ICP serial dilution analysis.

MATRIX: Soil

ELEMENT	IDL	50xIDL	SAMPLE RESULT	SERIAL DILUTION	%D	ACTION
Aluminum						
Barium						
Beryllium						
Cadmium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Magnesium						
Manganese						
Nickel						
Potassium						
Silver						
Sodium						
Vanadium						
Soil Zinc	2 ug/L	100 ug/L	~~245.85~~ 206.15	245.85	19.3	J

Actions apply to all samples of the same matrix.

ACTIONS:

1. Estimate (J) positive results if %D >10.

XII. Calculations

A. Soil Sample Results

For soil samples, the following equation may be necessary to convert raw data values (usually reported in ug/l) to actual sample concentrations (mg/kg):

If the lab uses 1 gm sample (wet weight) to 500 milliliters (volume diluted to), then wet weight sample results (mg/kg) are calculated from the following equation:

$$\text{Digest Result (ug/L)} \times \frac{\text{Volume Diluted to (ml)}}{\text{Wet Weight Digested (gm)}} \times \frac{1\text{L}}{1{,}000\text{ ml}} \times \frac{1{,}000\text{ gm}}{1\text{kg}} \times \frac{1\text{ mg}}{1{,}000\text{ ug}}$$

In addition, the results are converted to dry weight using the percent solids calculation:

$$\frac{\text{wet weight sample result (mg/kg)}}{\text{\% solids}} \times 100 = \text{Final Concentration, mg/kg (Dry Weight)}$$

B. Percent Solids

It is recommended that percent solids determination be validated 100% due to the impact an error could have on the results for an entire sample.

$$\text{\% solids} = \frac{\text{Sample Dry Weight}}{\text{Sample Wet Weight}} \times 100$$

Comments: 719201 As = (26.4 mg/L)(2)/5(.791) = 13.35 mg/Kg ✓ ok

719202 As = (24.6)(500)/5(.162) = 1518 mg/Kg

719206 Pb = 23.3(2)/5(.098) = 475.5 mg/Kg ✓ ok

Note: 719201 Pb 4.3 mg/Kg value not reflective of its 1/2 dilution.

719213 Se value was 0.27 U should be 0.48 mg/Kg. V = 0.9(2)/5(.75) = 0.48 mg/Kg

719201 130 mg/Kg should be 0.61 mg/Kg – dil factor not c

719206 3.1 should be 6.1 mg/Kg

lab was contacted, values are okay.

Woburn/project = 1320301

CLP DATA VALIDATION FORM

22 samples

Contract No: PTI

SDG No: K916925

PART D: Inorganics

Laboratory: Columbia Analytical

Reviewer: jk

Date: 4-5-92

Sr. Review: AB

Date: 4/10/92

General

1.0 Holding Times - (aqueous and soil samples) [p. 3 F.G. '88]

[Examine Chain of Custody sheets and digestion/distillation logs. Form XIII-IN]

Yes	No	N/A	
	✓		Mercury analysis (28 days) . . . . . exceeded?
		✓	Cyanide distillation (14 days) . . . exceeded?
	✓		Other metals analysis (6 months) . . exceeded?

Note: Prepare a list of all samples and analytes for which holding times have been exceeded. Specify the number of days from date of collection to the date of preparation (from raw data). Attach to checklist.

Action: If yes, for aqueous samples, reject (red-line) values less than Instrument Detection Limit (IDL) and flag as estimated (J) the values above IDL even though sample(s) was/were preserved properly. If yes for soil, use professional judgment.

2.0 Raw Data
[CLP Form XIII-IN]

Yes	No	N/A	2.1	Digestion Log for flame AA/ICP (Form XIII) present?
Yes	No	N/A		Digestion Log for furnace AA Form (XIII) present?
Yes	No	N/A		Digestion Log for mercury (Form XIII) present?
Yes	No	N/A		Distillation Log for cyanides Form (XIII) present?
Yes	No	N/A		Are pH values (pH<2 for all metals, pH>12 for cyanide) present?
Yes	No	N/A		Weights, dilutions and volumes used to obtain values?
Yes	No	N/A		Percent solids calculation present for soils/sediments?
Yes	No	N/A		Are preparation dates present on Digestion Log?
			2.2	Measurement read out record present?
Yes	No	N/A		ICP
Yes	No	N/A		Flame AA
Yes	No	N/A		Furnace AA
Yes	No	N/A		Mercury
Yes	No	N/A		Cyanides
Yes	No	N/A	2.3	Are all raw data to support all sample analyses and QC operations present?

Yes	No	N/A	
[✓]	___	___	Legible?
[✓]	___	___	Properly labeled?

Action: If no for any of the above, contact laboratory for explanation/resubmittal. Flag metal data as estimated [J(+)/UJ(-)] if pH of sample is greater than 2. Flag cyanide data as estimated [J(+)/UJ(-)] if pH sample is less than 12.

3.0 Data Validation and Verification

3.1 Calibration
[p. 4 (F.G. '88)]

Yes	No	N/A		
[✓]	___	___	3.1.1	Is record of at least 2 point calibration present for ICP analysis?
[✓]	___	___		Is record of 5 point calibration present for Hg analysis?

Action: If no for any of the above, determine if data are within calibration range of the instrument and use best professional judgement under F.G. All data are to be considered unusable.

3.1.2 Is record of 4-point calibration (blank and 3 standards) present for:

Yes	No	N/A	
[✓]	✓	___	Flame AA? Pb analyses had no cal. std at CRDL
[✓]	✓	___	Furnace AA?
[___]	___	✓	Cyanides?

Note: 1. If less than 4 standards are measured in absorbance mode, then the remaining standards in concentration mode must be run immediately after calibration and be within ±10% of the true value.

2. For all AA (except Hg) and Cyanide analyses, one _____ calibration standard is at CRDL level. If not, discuss below.

Action: Flag associated data as estimated [J(+)/UJ(-)] if standards are not within ±10% of true value (except CRDL calibration standard). Do not flag the data as estimated in linear range indicated by good recovery of standard.

3.1.3 Is correlation *coefficient less than 0.995 for:

Yes	No	N/A	
	✓		Mercury Analysis?
	✓	✓	Cyanide Analysis?
	✓		Atomic Absorption Analysis?

Action: If yes, use professional judgement to flag the associated data as estimated [(J(+)/UJ(-)].

3.2 Form II A (Initial and Continuing Calibration Verification)

Yes	No	N/A	
✓			3.2.1. Present and complete for every metal and cyanide?
✓			Present and complete for AA and ICP when both are used for sample analyte?

Action: If no for any of the above, contact laboratory for explanation/resubmittal.

3.2.2. Circle all values on Form IIA that are outside contract windows. Are all calibration standards (initial and continuing) within control limits?

Yes	No	N/A	
✓			Metals 90-110%
✓			Hg 80-120%
		✓	Cyanides 85-115%

* The reviewer will calculate correlation coefficient.

Action:

Acceptable(A)	Estimate (J/UJ)	Unusable (R)
	-Metals-	
11-125% for (-)	75-89% for (+/-)	<75% for (+/-)
>125% for (-)	111-125 for (+)	>125% for (+)
	-Mercury-	
121-135% for (-)	65-79% for (+/-)	<65% for (+/-)
>135% for (-)	121-135% for (+)	>125% for (+)
	-cyanide-	
116-130% for (-)	70-84% for (+/-)	<70% for (+/-)
>130% for (-)	116-130% for (+)	>130% for (+)

Yes [✓] No ___ N/A ___ Was continuing calibration (CCV and CCB) performed every 10 analyses or every 2 hours (whichever is more frequent)?

Action: If no, flag the excess samples (eleventh and up) data as estimated (J).

Yes [___] No ___ N/A ✓ Was ICV for cyanides distilled?

Action: If no, discuss below:

_____

_____

_____

3.3 **Form II B (CRDL Standards for AA and ICP) [Not discussed in F.G.]** NA

Yes [___] No ___ N/A ___ 3.3.1 Was a CRDL standard (CRA) analyzed after initial calibration for all all AA metals (except Hg)?

Yes [___] No ___ N/A ___ *Was a mid-range calibration verification standard distilled and analyzed for cyanide analysis?

Yes [___] No ___ N/A ___ Was a 2xCRDL (or 2xIDL when IDL>CRDL) analyzed (CRI) for each ICP run?

(Note: CRI for Al, Ba, Ca, Fe, Mg, Na or K is not required.)

Action: If no for any of the above, flag as estimated all data falling within the affected ranges. The affected ranges are:

AA Analysis - ** True Value ± CRDL
ICP Analysis - ** True Value ± 2CRDL
CN Analysis - ** True Value ± 0.5 x True Value.

* Find the results of mid-range standard in the raw data.
** True value of CRA, CRI or mid-range standard. Substitute IDL for CRDL when IDL > CRDL.

Yes [___] No ___ N/A ___ 3.3.2 Was CRI analyzed after ICV/ICB and before the final CCV/CCB, and for every four hours of ICP run?

Action: If no, discuss below:

_____

_____

_____

3.3.3 Circle all values on summary sheet (Form IIB) that are outside acceptance windows.

Yes [___] No ___ N/A ___ Are CRA and CRI standards within control limits: Metals 80-120% R?

Yes [___] No ___ N/A ___ Is mid-range standard within control limits: Cyanide 80-120% R?

Action:

FOR SAMPLE VALUES < CRI or CRA + 2CRDL:

Acceptable(A)	Estimate (J/UJ)	Unusable (R)
121-150% for (-)	50-79% for (+/-)	<50% for (+/-)
>150% (+)	121-150-% for (+)	>150% for (+)

4.0 Blanks

4.1 [p.6 (F.G. '88)] CLP Form III-IN

Yes [✓]	No ___	N/A ___	Present and complete?
Yes [✓]	No ___	N/A ___	For both AA and ICP when both are used for same analyte?
Yes [✓]	No ___	N/A ___	Was an initial calibration blank analyzed?
Yes [✓]	No ___	N/A ___	Was a continuing calibration blank (CCB) analyzed after every 10 samples or every 2 hours (whichever is more frequent)?

Action: If no, contact laboratory for explanation/resubmittal and discuss below:

_____

_____

_____

Was one PB analyzed for:

Yes [✓]	No ___	N/A ___	each 20 samples?
Yes [✓]	No ___	N/A ___	each batch?
Yes [✓]	No ___	N/A ___	each matrix type?
Yes [✓]	No ___	N/A ___	both AA and ICP when both are used for same analyte?
Yes [✓]	No ___	N/A ___	blanks ≤ CRDL (Form III)?

Action: If no to any of the above, contact laboratory for explanation/resubmittal. Discuss the deficiencies below.

_____

_____

_____

Note: If the concentration of an analyte is > CRDL, either positive or negative, all associated sample concentrations must be > 10x the blank concentration. If not, for samples with concentrations , 10x CRDL, qualify as follows:

PB: J(+) - all samples.
CCB: J(+) - between CCB>CRDL and nearest good CCB.
J(+) - 5 samples analyzed prior to CCB>CRDL.

4.2 Action Limit

Yes ✓ No [ ] N/A ___

Are there CCB (µg/L) or PB (mg/kg) values reported > IDL ?

If yes, an action level of 5x the highest associated blank value is determined for positive blank values. Samples with detected concentrations < Action Limit are to be considered undetected at the reported concentration. Negative blank results, the raw data are to be reviewed to determine if a negative bias exists. If so, all samples qualify positive and undetected as estimated (J) and discuss under "Reasons."

Analyte	Blank Concentration	A.L.	Qualifier (U or J)	Affected Samples	Reason
Ca ✓	PB 93.8	469	—		
Fe ✓	PB 32.1	160.5	U	W32289 W32205	
Mg	CCB -43.8	-219	—		
Ni	PB 7.9	39.5	U	W25995 W24229	W33449 W32265 W32205
K	CCB 753.2	3766	U	W32289	
Se	CCB -1.4	-7	—		
Na	PB 285.5	1427.5	—	W32505, W33449	
Tl	PB 1.7	8.5	U	W32502	
Zn	CCB 2.8	14	U	W32289	
Al ✓	CCB3 35.2	176	U	W24229 (W32217) W32265, W32289	only one assoc w/
As ✓	CCB2 1.3	6.5	U	W32505, W33449,	
			U	W32205 (W32289)	not run w/ this [illegible]

EcoChem, Inc.

CALCULATION SHEET

911 Western Avenue
Seattle, Washington 981
(206) 233-9332

Date:	Calculation:	Contract No:	Reviewer:

Blanks:

analyte	conc	A.L	Q	affected samples
Ca	CCB 45.4	227	-	
Fe	CCB 41.9	209.5	-	
Mg	CCB -30.4	152	-	
Ni	CCB 7.4	37	-	
K	593.9	2969.5	-	
Se	1.1	5.5	-	
Na	54.0	270	-	
Zn	1.2	6	-	
As	-1.0	5	-	
Se	-1.9	9.5	-	
As	1.3	6.5	-	

V B. ICP INTERFERENCE CHECK SAMPLE (Section 3)

3. Report the concentration of any elements detected in the ICS A solution > |2xIDL| that should not be present.

ELEMENT	CONC. DETECTED IN THE ICS	CONC. OF INTERFERENTS IN THE ICS			
		AL	CA	FE	MG
Ba	15	536424	488319	186163	499506
Cd	22				
Cu	8				
Ba	15	540321	499671	183059	512967
Cd	24				
Cu	12				

Estimate the concentration produced by the interfering element in all affected samples. See guidelines for examples. List the samples affected by interferences below:

SAMPLE AFFECTED	ELEMENT AFFECTED	SAMPLE CONC. (µ/L)	SAMPLE INTERFERANT CONC.				ESTIMATED INTERF. (µ/L)
			AL	CA	FE	MG	
W24229				X	X		
W22217				X			
W22165				X	X		
W22502					X		
W22505					X		

ACTIONS:

1. In general, the sample data can be accepted without qualification if the sample concentrations of Al, Ca, Fe and Mg are less than 50% of their respective levels in the ICS solution.

2. Estimate (J) positive results or affected elements for samples with levels of interferents 50% or more of that in the ICS solution.

3. Reject (R) positive results if the reported concentration is due entirely to the interfering element.

4. Estimate (UJ) non-detected results for which false negatives are suspect.

Give explanations for any actions taken below:

Ba 1

5.0 **ICP Interference Check Sample [p. 7 (F.G. 1988)] Form IV-IN**

Yes [✓] No ___ N/A ___ Present and complete?

(Note: Not required for furnace AA, flame AA, mercury, cyanide and Ca, Mg, K and Na.)

Yes [✓] No ___ N/A ___ Was ICS analyzed at beginning and end of run (or at least twice every 8 hours)?

Action: If no, flag as estimated (J) all samples for which Al, Ca, Fe, or Mg is higher than in ICS.

are all values w/in 80-120%

Yes [✓] No ___ N/A ___ 5.2 Circle all values on Form IV that are more than ± 20% of true or established mean value (80-120% recovery).

Yes [ ] No ___ N/A ✓ If no, is concentration of Al, Ca, Fe, or Mg lower than in ICS?

Action: If no, qualify results for out of control limits ICS as below.

Acceptable(A)	Estimate (J/UJ)	Unusable (R)
>120% for (-)	>120% for (+)	<50% for (+/-)
	50-79% for (+/-)	

Note: If possible, indicate the bias for the estimated data results. Also, evaluate the possibility of false negatives/positives as described on page 8 of the 1988 F.G..

6.0 **Laboratory Control Sample [p. 9, F.G. 1988] CLP Form VII - IN**
(Note: LCS - not required for aqueous Hg and cyanide analyses.)

6.1 Was an LCS prepared and analyzed for:

Yes [✓] No ___ N/A ___ every 20 water samples?

Yes [ ] No ✓ N/A ___ every 20 solid samples?

Yes ✓ No N/A both AA and ICP when both are used for the same analyte?

Action: If no for any of the above, contact laboratory for explanation/resubmittal. Flag as estimated (J) all data for which LCS was not analyzed.

Note: If only one LCS was analyzed for more than 20 samples, then first 20 samples close to LCS do not have to be flagged as estimated.

6.2 Aqueous LCS

Circle all LCS values outside control limits (80-120% -except aqueous Ag and Sb).

Is any LCS recovery:

Yes No ✓ N/A less than 50%?

Yes No ✓ N/A between 50% and 79%?

Yes No ✓ N/A between 121% and 150%?

Yes No ✓ N/A greater than 150%?

Acceptable(A)	Estimate (J/UJ)	Unusable (R)
>120% for (-)	>120% for (+)	<50% for (+/-)
	50-79% for (+/-)	

6.3 Solid LCS

Note: 1. If "Found" value of LCS is rejectable due to duplicate injections or analytical spike recovery criteria, regardless of LCS recovery, flag the associated data as estimated (J).

2. If IDL of an analyte is equal to or greater than true value of LCS, disregard the "Action" below even though LCS is out of control limits.

Yes No N/A Is LCS "Found" value higher than the control limits on Form VII?

Action: If yes, qualify all associated positive data as estimated (J).

Yes No N/A Is LCS "Found" value lower than the Control limits on Form VII?

Action: If yes, qualify all associated (positive and undetected) data as estimated (J).

7.0 **Duplicates [p. 10, F.G. 1988] CLP Form VI-IN**

7.1 Present and complete for:

Yes No N/A each 20 samples?

Yes No N/A each matrix type?

Yes No N/A each concentration range (i.e. low, med., high)?

Yes No N/A both AA and ICP when both are used for same analyte?

Action: If no for any of the above, flag as estimated (J) all data >CRDL* for which duplicate sample was not analyzed.

Note: 1. If one duplicate sample was analyzed for more than 20 samples, then the first 20 samples do not have to be flagged as estimated.

2. If percent solids for soil sample and its duplicate differ by more than 1%, prepare a Form VI for each duplicate pair, report concentrations in mg/L on wet weight basis and calculate RPD or Difference for each analyte.

Yes No N/A 7.2 Was field blank used for duplicate analysis?

Action: If yes, flag all data >CRDL* as estimated (J) for which field blank was used as duplicate.

Note: Duplicate analysis should be performed on a field blank when it is the only aqueous sample in SDG.

Yes	No	N/A		
[✓]	___	___	7.3	Are all values within control limits (RPD 20% or difference < ± CRDL for aqueous, and RPD 35% or difference < ±2x CRDL for solids)?
[ ]	___	✓		If no, are all results outside the control limits flagged with an * on Form I's and VI?

* Substitute IDL for CRDL when IDL > CRDL

Action: If no, discuss below:

_____

_____

_____

Note: 1. RPD is not calculable for an analyte of the sample - duplicate pair when both values are less than IDL.

2. If lab duplicate result is rejectable due to coefficient of correlation of MSA, analytical spike recovery, or duplicate injections criteria, do not apply precision criteria.

Yes	No	N/A		
___	[✓]	___	7.4	Is any value for sample duplicate pair less than CRDL* and other value ≥ 10x CRDL*?

Soils - if 1 gram to 200 mL: divide CRDL by 5 (% moist) to get mg/kg.

Action: If yes, flag the associated data as estimated (J).

7.5 **Aqueous Laboratory Duplicates**

Circle all values on Form VI that are:

RPD > 20%

Difference > ± CRDL*

Yes	No	N/A	
___	[✓]	___	Is any RPD greater than 20% where sample and duplicate are both ≥ 5x CRDL*?
[ ]	✓	___	Is any **difference between sample and duplicate greater than CRDL* where sample and /or duplicate is less than 5x CRDL*?

Action: If yes, flag the associated data as estimated (J).

7.6 Soil/Sediment Laboratory Duplicates

Circle all values on Form VI that are:
RPD > 35%, or
Difference > 2x CRDL*

* Substitute IDL for CRDl when IDL > CRDL.
** Use absolute values of sample and duplicate to calculate the difference.

Yes	No	N/A	
___	[___]	___	Is any RPD (where sample and duplicate are both greater than or equal to 5x CRDL*)? > 35%?
___	[___]	___	Is any **difference between sample and duplicate (where RPD > 35% and sample and/or duplicate is < 5x CRDL*) > 2x CRDL*?

Action: If yes, flag the associated data as estimated (J).

7.7 Field Duplicates – None identified on COC

Yes	No	N/A		
[___]	___	___	7.7.1	Were field duplicates analyzed?

Action: If yes, prepare a Form VI for each aqueous field duplicate pair. Prepare a Form VI for each soil duplicate pair, if percent solids for sample and its duplicate differ by more than 1%; report concentrations of soils in µg/L on wet weight basis and calculate RPDs or Difference for each analyte.

Note:
1. Do not calculate RPD when both values are < IDL.
2. Flag all associated data only for field duplicate pair.

Yes	No	N/A		
___	[___]	___	7.7.2	Is any value for sample duplicate pair < CRDL* and other value ≥ 10x CRDL*?

Action: If yes, flag the associated data as estimated (J).

Aqueous

Circle all values on Form VI for field duplicates that are:
RPD > 50%, or
Difference > ± CRDL*

Yes No N/A Is any RPD > 50% where sample and duplicate are both ≥ 5x

* Substitute IDL for CRDL when IDL > CRDL.
** Use absolute values of sample and duplicate to calculate the difference.

Yes No N/A Is any **difference between sample and duplicate greater than CRDL* where sample and/or duplicate is < 5x CRDL*?

Action: If yes, flag the associated data as estimated (J).

8.0 **Spiked Sample Recovery - Pre-Digestion/Pre-Distillation [p.11 (F.G. 1988)] Form V - IN**

Yes ✓ No N/A **8.1** Present and complete for: each 20 samples?

Yes ✓ No N/A each matrix type?

Yes ✓ No N/A each concentration range (i.e. low, med., high)?

Yes ✓ No N/A for both AA and ICP when both are used for same analyte?

Action: If no for any of the above, flag as estimated (J) all positive data < 4x spiking level for which spiked sample was not analyzed.

Note: If one spiked sample was analyzed for more than 20 samples, then first 20 samples analyzed do not have to be flagged as estimated (J).

Yes No ✓ N/A **8.2** Was field blank used for spiked sample?

Action: If yes, flag all positive data , 4x spike added as estimated (J) for which field blank was used as spiked sample.

Note: Matrix spike analysis should be performed on a field blank when it is the only aqueous sample in SDG.

8.3 Circle all values on Data Summary Sheet that are outside control

limits (75% to 125%).

Yes [✓] No ___ N/A ___ Are all recoveries within control limits?

Yes ___ No [ ] N/A ✓ If no, is sample concentration ≥ 4x spike concentration?

Action: Disregard spike recoveries for analytes whose concentrations are ≥ 4x spike added.

Circle those analytes on Form V for which sample concentration is < 4x the spike concentration and recovery outside limits.

Yes ___ No [ ] N/A ✓ Are results outside the control limits (75%-125%) flagged with "N" on Form I's and Form VA?

Action: See Functional Guidelines p. 11.

8.4 Aqueous

Are any spike recoveries:

Yes ___ No [✓] N/A ___ a) less than 30%?

Yes ___ No [✓] N/A ___ b) between 30-74%?

Yes ___ No [✓] N/A ___ c) between 126-150%?

Yes ___ No [✓] N/A ___ d) greater than 150%?

Acceptable(A)	Estimate (J/UJ)	Unusable (R)
>125% for (-)	>125% for (+)	<30% for (+/-)
	30-74% for (+/-)	

Note: If pre-digestion spike result is rejectable due to coefficient of correlation of MSA, analytical spike recovery, or duplicate injections criteria, disregard spike recovery on Form V. Flag the associated data as estimated (J).

VIII. Laboratory Control Sample (Form VII)

✓ Laboratory Control Sample (LCS) analysis was performed for every twenty samples received and met contractual criteria.

_____ Laboratory Control Sample (LCS) analysis was performed, but did not meet the criteria for the following elements:_____

Calculation: %R = (Observed/True) x 100

Actions:

	Accept	Approximate	Reject
% Recovery	30-79 for ND[1] 80-120 for ND/+ > 120 for ND	30-79 for + > 120% for + < 30% for +	< 30 for ND

NOTE:

+ - positive result
ND - not detected element
1 - When the percent recovery falls between 30-79 for the LCS, an evaluation of detection limits is beyond the scope of work for a NUS/FIT Level I Data Validation. However, detection limits should be estimated when evaluated under a Level II Data Validation.

An aqueous LCS mercury sample is not required of the laboratory.

IX. Detection Limit Results (Form XI)

✓ Instrument detection limit results were present and found to be less than the Contract Required Detection Limits.

_____ Detection limit results were not included in the data package.

_____ Detection limits were present, but the criteria was not met for the following elements:

_____

_____

_____

Action:

Adjust sample detection limits for elements not meeting contractual criteria listed above. Elements detected below the adjusted detection limit should be rejected (R'd).

Calculating detection limits for soil samples:
Sample detection limit (mg/kg) =

$$100 \times \frac{\text{IDL (ug/l)}}{\text{\% solids}} \times \frac{\text{Volume diluted to (ml)}}{\text{wet weight digested (gms)}} \times \frac{1\text{L}}{1{,}000\text{ ml}} \times \frac{1{,}000\text{ gm}}{1\text{ kg}} \times \frac{1\text{ mg}}{1{,}000\text{ ug}}$$

X. FURNACE ATOMIC ABSORPTION ANALYSIS

1. Duplicate Precision

✓ Duplicate injections and one-point analytical spikes were performed for all samples: duplicate injections agreed within ±20% for sample analyte values ≥ CRDL.

___ Duplicate injections did not agree within ±20% for samples/elements: ___

___ Duplicate injections and/or spikes were not performed for the following samples/elements: ___

Estimate (J) positive results if duplicate injections are outside ±20% RSD or CV.

2. Post digestion analytical spikes

___ Spike recoveries met the 85-115% recovery criteria for all samples.

✓ Spike recoveries did not meet the 85-115% criteria but did not require MSA for the following samples/elements: W32556 Pb, W24229 Pb, W32265 Pb, W32217 Se, W24229 Se, W32265 Se, W32449 Tl, W32502 Tl, W32505 Tl, W25995 Tl, W24229 Tl, W32265 Tl,

If the sample absorbance is <50% of post digestion spike absorbance, the following actions should be applied:

	PERCENT RECOVERY		
	<10%	113-84%	>115%
Positive Sample Results	J or R	J	J
Non-detected Sample Results	R	UJ	A

✓ MSA was used to quantitate analytical results when contractually required.

___ Correlation coefficients ≥0.995, accept results.

✓ Correlation coefficients <0.995 for sample numbers/elements W32265 As r=0.9808 r 0.9732

Estimate (J) sample results if correlation coefficient was <0.995.

___ Method of Standard Addition (MSA) was not performed as required for samples/elements: ___

Estimate (J) sample results if MSA was required and not performed.

XI. Inductively Coupled Plasma (ICP) QC Analysis/Serial Dilution Results

1 Serial Dilutions were performed; but analytical results did not agree within 10% for analyte concentrations greater than 50x the IDL in the original sample (7/87 SOW). The following elements were evaluated for Matrix interferences:

Element	IDL	IDL X 50	Sample #:	Serial Diluted Sample Result	Action
Aluminum					
Barium					
Beryllium					
Cadmium	3.0	150	25905L	15.0 u	
Calcium					
Cobalt	3.0	150		15.2 ug/L	
Copper					
Chromium	3.0	150		19.15 ug/L	
Iron					
Lead					
Magnesium					
Manganese					
Nickel	6.0	300		30 ug/L u	
Potassium					
Silver					
Sodium					
Vanadium	2.0	100		10.0 u	
Zinc	1.0	50		81.35 ug/L	J
Other:					

Actions: All data for samples of the same matrix for that element should be approximated (J) when the serial dilution results do not meet contractual requirements.

For example:

1. The IDL for Mg is 10 ppb. Magnesium (Mg) was detected in Sample A at a concentration of 65 ppb. The sample was then diluted by a factor of five. The serially diluted sample result (SR) was 80 ppb. The sample should not be evaluated for matrix interferences, since: 65 ppb (SR) < 500 ppb (IDL x 50).

2. The IDL for Al is 70 ppb. Aluminum (Al) was detected in Sample B at a concentration of 5,000 ppb. The sample was diluted by a factor of five. The serially diluted sample result (SR) was 3,200 ppb. The sample should be evaluated for matrix interferences, since: 5000 ppb > 3500 ppb (IDL x 50). The serially diluted sample result is not within 10% of the original sample result. Therefore, Aluminum results should be approximated (J'd) in all samples of the same matrix.

____ Sample results fall within the linear range for ICP and within the calibrated range for all other parameters.

✓ Sample results were beyond the linear range/calibration range of the instrument for the following samples/elements:

In the space below, please show a minimum of one sample calculation per method:

ICP

Ca exceeded linear range

W24229, W32217, W32265,

Na

W24229, W32265,

dilutions were perform and results w/in linear range

FURNACE

MERCURY

CYANIDE

For soil samples, the following equation may be necessary to convert raw data values (usually reported in µg/L) to actual samples concentrations (mg/kg):

The lab is required to use 1 gram sample (wet weight) to 200 ml.

Wet weight concentration =

$$\text{digest conc. in } \frac{\mu g}{L} \times \frac{200 ml}{1 g} \times \frac{1 L}{1000 ml} \times \frac{1000 g}{1 kg} \times \frac{1 \mu g}{1000 \mu g} = \frac{mg}{kg}$$

In addition the sample results are converted to dry weight using the percent solids calculations:

$$\frac{\text{Wet weight conc.}}{\text{\% solids}} \times 100 = \text{final concentration, dry weight (mg/kg)}$$

SOG K916927

CLP DATA VALIDATION FORM

Contract No: PT1

SDG No: 1320301

PART D: Inorganics

Laboratory: Columbia analytical

Reviewer: [illegible]

Date: 4-4-92

Sr. Review: AB

Date: 4/10/92

General

1.0 Holding Times - (aqueous and soil samples)
[p. 3 F.G. '88]

[Examine Chain of Custody sheets and digestion/distillation logs. Form XIII-IN]

Yes	No	N/A	
___	[✓]	___	Mercury analysis (28 days) . . . . . exceeded?
___	[ ]	✓	Cyanide distillation (14 days) . . . exceeded?
___	[✓]	___	Other metals analysis (6 months) . . exceeded?

Note: Prepare a list of all samples and analytes for which holding times have been exceeded. Specify the number of days from date of collection to the date of preparation (from raw data). Attach to checklist.

Action: If yes, for aqueous samples, reject (red-line) values less than Instrument Detection Limit (IDL) and flag as estimated (J) the values above IDL even though sample(s) was/were preserved properly. If yes for soil, use professional judgment.

2.0 Raw Data
[CLP Form XIII-IN]

Yes	No	N/A	2.1	Digestion Log for flame AA/ICP (Form XIII) present?
Yes	No	N/A		Digestion Log for furnace AA Form (XIII) present?
Yes	No	N/A		Digestion Log for mercury (Form XIII) present?
Yes	No	N/A		Distillation Log for cyanides Form (XIII) present?
Yes	No	N/A		Are pH values (pH<2 for all metals, pH>12 for cyanide) present? nitric preserved
Yes	No	N/A		Weights, dilutions and volumes used to obtain values?
Yes	No	N/A		Percent solids calculation present for soils/sediments?
Yes	No	N/A		Are preparation dates present on Digestion Log?
			2.2	Measurement read out record present?
Yes	No	N/A		ICP
Yes	No	N/A		Flame AA
Yes	No	N/A		Furnace AA
Yes	No	N/A		Mercury
Yes	No	N/A		Cyanides
Yes	No	N/A	2.3	Are all raw data to support all sample analyses and QC operations present?

Yes	No	N/A	
[✓]	___	___	Legible?
[✓]	___	___	Properly labeled?

Action: If no for any of the above, contact laboratory for explanation/resubmittal. Flag metal data as estimated [J(+)/UJ(-)] if pH of sample is greater than 2. Flag cyanide data as estimated [J(+)/UJ(-)] if pH sample is less than 12.

3.0 <u>Data Validation and Verification</u>

3.1 Calibration
[p. 4 (F.G. '88)]

Yes	No	N/A		
[✓]	___	___	3.1.1	Is record of at least 2 point calibration present for ICP analysis?
[✓]	___	___		Is record of 5 point calibration present for Hg analysis?

Action: If no for any of the above, determine if data are within calibration range of the instrument and use best professional judgement under F.G. All data are to be considered unusable.

3.1.2 Is record of 4-point calibration (blank and 3 standards) present for:

Yes	No	N/A	
[ ]	✓	(N/A)	Flame AA?
[✓]	___	___	Furnace AA?
[ ]	✓	(N/A)	Cyanides?

Note: 1. If less than 4 standards are measured in absorbance mode, then the remaining standards in concentration mode must be run immediately after calibration and be within ±10% of the true value.

2. For all AA (except Hg) and Cyanide analyses, one _____ calibration standard is at CRDL level. If not, discuss below.

Action: Flag associated data as estimated [J(+)/UJ(-)] if standards are not within ±10% of true value (except CRDL calibration standard). Do not flag the data as estimated in linear range indicated by good recovery of standard.

3.1.3 Is correlation *coefficient less than 0.995 for:

Yes	No	N/A	
	✓		Mercury Analysis?
		✓	Cyanide Analysis?
	✓		Atomic Absorption Analysis?

Action: If yes, use professional judgement to flag the associated data as estimated [(J(+)/UJ(-)].

3.2 Form II A (Initial and Continuing Calibration Verification)

Yes	No	N/A	
✓			3.2.1. Present and complete for every metal and cyanide?
✓			Present and complete for AA and ICP when both are used for sample analyte?

Action: If no for any of the above, contact laboratory for explanation/resubmittal.

3.2.2. Circle all values on Form IIA that are outside contract windows. Are all calibration standards (initial and continuing) within control limits?

Yes	No	N/A	
✓			Metals 90-110%
✓			Hg 80-120%
		✓	Cyanides 85-115%

* The reviewer will calculate correlation coefficient.

Action:

Acceptable(A)	Estimate (J/UJ)	Unusable (R)
	-Metals-	
11-125% for (-)	75-89% for (+/-)	<75% for (+/-)
>125% for (-)	111-125 for (+)	>125% for (+)
	-Mercury-	
121-135% for (-)	65-79% for (+/-)	<65% for (+/-)
>135% for (-)	121-135% for (+)	>125% for (+)
	-cyanide-	
116-130% for (-)	70-84% for (+/-)	<70% for (+/-)
>130% for (-)	116-130% for (+)	>130% for (+)

Yes ✓ No ___ N/A ___ Was continuing calibration (CCV and CCB) performed every 10 analyses or every 2 hours (whichever is more frequent)?

Action: If no, flag the excess samples (eleventh and up) data as estimated (J).

Yes ___ No ___ N/A ✓ Was ICV for cyanides distilled?

Action: If no, discuss below:

_____

_____

_____

3.3 Form II B (CRDL Standards for AA and ICP)
[Not discussed in F.G.]

NA

Yes ___ No ___ N/A ___ 3.3.1 Was a CRDL standard (CRA) analyzed after initial calibration for all all AA metals (except Hg)?

Yes ___ No ___ N/A ___ *Was a mid-range calibration verification standard distilled and analyzed for cyanide analysis?

Yes ___ No ___ N/A ___ Was a 2xCRDL (or 2xIDL when IDL>CRDL) analyzed (CRI) for each ICP run?

(Note: CRI for Al, Ba, Ca, Fe, Mg, Na or K is not required.)

Action: If no for any of the above, flag as estimated all data falling within the affected ranges. The affected ranges are:

AA Analysis - ** True Value ± CRDL
ICP Analysis - ** True Value ± 2CRDL
CN Analysis - ** True Value ± 0.5 x True Value.

* Find the results of mid-range standard in the raw data.
** True value of CRA, CRI or mid-range standard. Substitute IDL for CRDL when IDL > CRDL.

Yes [___] No ___ N/A ___ 3.3.2 Was CRI analyzed after ICV/ICB and before the final CCV/CCB, and for every four hours of ICP run?

Action: If no, discuss below:

_____

_____

_____

3.3.3 Circle all values on summary sheet (Form IIB) that are outside acceptance windows.

Yes [___] No ___ N/A ___ Are CRA and CRI standards within control limits: Metals 80-120% R?

Yes [___] No ___ N/A ___ Is mid-range standard within control limits: Cyanide 80-120% R?

Action:

FOR SAMPLE VALUES < CRI or CRA + 2CRDL:

Acceptable(A)	Estimate (J/UJ)	Unusable (R)
121-150% for (-)	50-79% for (+/-)	<50% for (+/-)
>150% (+)	121-150-% for (+)	>150% for (+)

4.0 Blanks

4.1 [p.6 (F.G. '88)] CLP Form III-IN

Yes [✓]	No ___	N/A ___	Present and complete?
Yes [✓]	No ___	N/A ___	For both AA and ICP when both are used for same analyte?
Yes [✓]	No ___	N/A ___	Was an initial calibration blank analyzed?
Yes [✓]	No ___	N/A ___	Was a continuing calibration blank (CCB) analyzed after every 10 samples or every 2 hours (whichever is more frequent)?

Action: If no, contact laboratory for explanation/resubmittal and discuss below:

_____

_____

_____

Was one PB analyzed for:

Yes [✓]	No ___	N/A ___	each 20 samples?
Yes [✓]	No ___	N/A ___	each batch?
Yes [✓]	No ___	N/A ___	each matrix type?
Yes [✓]	No ___	N/A ___	both AA and ICP when both are used for same analyte?
Yes [✓]	No ___	N/A ___	blanks ≤ CRDL (Form III)?

Action: If no to any of the above, contact laboratory for explanation/resubmittal. Discuss the deficiencies below.

_____

_____

_____

Note: If the concentration of an analyte is > CRDL, either positive or negative, all associated sample concentrations must be > 10x the blank concentration. If not, for samples with concentrations , 10x CRDL, qualify as follows:

PB: J(+) - all samples.
CCB: J(+) - between CCB>CRDL and nearest good CCB.
J(+) - 5 samples analyzed prior to CCB>CRDL.

4.2 Action Limit

Yes ✓ No [ ] N/A ___

Are there CCB (µg/L) or PB (mg/kg) values reported > IDL ?

If yes, an action level of 5x the highest associated blank value is determined for positive blank values. Samples with detected concentrations < Action Limit are to be considered undetected at the reported concentration. Negative blank results, the raw data are to be reviewed to determine if a negative bias exists. If so, all samples qualify positive and undetected as estimated (J) and discuss under "Reasons."

Analyte	Blank Concentration	A.L.	Qualifier (U or J)	Affected Samples	Reason
Al	PB 21.8	109	U	W24254 W24278 W24290	W25983 W32229 W32253
As	CCB 1.6	8	U	W32241 W32277	
~~Al~~ Ca	CCB 24.9	124.5	U	W32562 ~~W24205~~	
Fe	CCB 10.2	51	—		
Se	CCB 1.1	5.5	U	W24205 W24242*	W24290 W32229
Zn	ICB 2.3	11.5	U	W24242 W24254	W24266 W24278

W2424- W32277 W33301

W32241 W32253 W33344 W32562

Al	CCB 35.0	175	U	W24242	
As	1.6	8	—		
Ba	1.6	8	U	W24266	
Ca	46.8	234	—		
Fe	58.1 ✓	2905	U	W24266, W32241	
Mg	47.8 ✓	239	—		
K	1005.5	50275	U	W32241, W32277 W24266, W24278, W25983	

EcoChem, Inc.

CALCULATION SHEET

911 Western Avenu
Seattle, Washington 9__
(206) 233-9332

Date:	Calculation:	Contract No:	Reviewer:

Blank

Analyte	Conc	AL	Q	affected Samples
Se	CCB 1.2U	6	—	
Na	67.7 ✓	338.5	U	W32562
Tl	-10 ✓	-5	J (U)	W33343, W24217, W24290
Zn	1.4	7	—	
Pb	CCB 1.7	8.5	U	W10197, W24205
Pb	CCB 1.4	7		W24217, W24242, W32253, W32503
Pb	CCB -1.0	-5.0		W32562, W32991

V B. ICP INTERFERENCE CHECK SAMPLE (Section 3)

3. Report the concentration of any elements detected in the ICS A solution > | 2xIDL | that should not be present.

ELEMENT	CONC. DETECTED IN THE ICS	CONC. OF INTERFERENTS IN THE ICS			
		AL	CA	FE	MG
Cd	9	542422	500082	182573	508626
Cu	11	528260	486246	182581	490910
Cu	12	542422	500082	182573	508626

Estimate the concentration produced by the interfering element in all affected samples. See guidelines for examples. List the samples affected by interferences below:

SAMPLE AFFECTED	ELEMENT AFFECTED	SAMPLE CONC. (µ/L)	SAMPLE INTERFERANT CONC.				ESTIMATED INTERF. (µ/L)
			AL	CA	FE	MG	
W10197	Ca						
W24242							
W32991	Fe						
W33301	Fe						
W33353	d						

ACTIONS:

1. In general, the sample data can be accepted without qualification if the sample concentrations of Al, Ca, Fe and Mg are less than 50% of their respective levels in the ICS solution.

2. Estimate (J) positive results or affected elements for samples with levels of interferents 50% or more of that in the ICS solution.

3. Reject (R) positive results if the reported concentration is due entirely to the interfering element.

4. Estimate (UJ) non-detected results for which false negatives are suspect.

Give explanations for any actions taken below:

Su 7

5.0 **ICP Interference Check Sample [p. 7 (F.G. 1988)] Form IV-IN**

Yes [✓] No ___ N/A ___ Present and complete?

(Note: Not required for furnace AA, flame AA, mercury, cyanide and Ca, Mg, K and Na.)

Yes [✓] No ___ N/A ___ Was ICS analyzed at beginning and end of run (or at least twice every 8 hours)?

Action: If no, flag as estimated (J) all samples for which Al, Ca, Fe, or Mg is higher than in ICS.

are all value w/in limits

Yes [✓] No ___ N/A ___ 5.2 Circle all values on Form IV that are more than ± 20% of true or established mean value (80-120% recovery).

Yes [ ] No ___ N/A ___ If no, is concentration of Al, Ca, Fe, or Mg lower than in ICS?

Action: If no, qualify results for out of control limits ICS as below.

Acceptable(A)	Estimate (J/UJ)	Unusable (R)
>120% for (-)	>120% for (+)	<50% for (+/-)
	50-79% for (+/-)	

Note: If possible, indicate the bias for the estimated data results. Also, evaluate the possibility of false negatives/positives as described on page 8 of the 1988 F.G..

6.0 **Laboratory Control Sample [p. 9, F.G. 1988] CLP Form VII - IN**
(Note: LCS - not required for aqueous Hg and cyanide analyses.)

6.1 Was an LCS prepared and analyzed for:

Yes [✓] No ___ N/A ___ every 20 water samples?

Yes [ ] No ___ N/A ___ every 20 solid samples?

Yes ✓ No ___ N/A ___ both AA and ICP when both are used for the same analyte?

Action: If no for any of the above, contact laboratory for explanation/resubmittal. Flag as estimated (J) all data for which LCS was not analyzed.

Note: If only one LCS was analyzed for more than 20 samples, then first 20 samples close to LCS do not have to be flagged as estimated.

6.2 Aqueous LCS

Circle all LCS values outside control limits (80-120% -except aqueous Ag and Sb).

Is any LCS recovery:

Yes ___ No ✓ N/A ___ less than 50%?

Yes ___ No ✓ N/A ___ between 50% and 79%?

Yes ___ No ✓ N/A ___ between 121% and 150%?

Yes ___ No ✓ N/A ___ greater than 150%?

Acceptable(A)	Estimate (J/UJ)	Unusable (R)
>120% for (-)	>120% for (+)	<50% for (+/-)
	50-79% for (+/-)	

6.3 Solid LCS NA

Note: 1. If "Found" value of LCS is rejectable due to duplicate injections or analytical spike recovery criteria, regardless of LCS recovery, flag the associated data as estimated (J).

2. If IDL of an analyte is equal to or greater than true value of LCS, disregard the "Action" below even though LCS is out of control limits.

Yes No N/A Is LCS "Found" value higher than the control limits on Form VII?
___ [ ] ___

Action: If yes, qualify all associated positive data as estimated (J).

Yes No N/A Is LCS "Found" value lower than the Control limits on Form VII?
___ [ ] ___

Action: If yes, qualify all associated (positive and undetected) data as estimated (J).

7.0 **Duplicates {p. 10, F.G. 1988} CLP Form VI-IN**

7.1 Present and complete for:

Yes No N/A each 20 samples?
[✓] ___ ___

Yes No N/A each matrix type?
[✓] ___ ___

Yes No N/A each concentration range (i.e. low, med., high)?
[✓] ___ ___

Yes No N/A both AA and ICP when both are used for same analyte?
[✓] ___ ___

Action: If no for any of the above, flag as estimated (J) all data >CRDL* for which duplicate sample was not analyzed.

Note: 1. If one duplicate sample was analyzed for more than 20 samples, then the first 20 samples do not have to be flagged as estimated.

2. If percent solids for soil sample and its duplicate differ by more than 1%, prepare a Form VI for each duplicate pair, report concentrations in mg/L on wet weight basis and calculate RPD or Difference for each analyte.

Yes No N/A **7.2** Was field blank used for duplicate analysis?
___ [✓] ___

Action: If yes, flag all data >CRDL* as estimated (J) for which field blank was used as duplicate.

Note: Duplicate analysis should be performed on a field blank when it is the only aqueous sample in SDG.

Yes	No	N/A		
[✓]	___	___	7.3	Are all values within control limits (RPD 20% or difference < ± CRDL for aqueous, and RPD 35% or difference < ±2x CRDL for solids)?
[___]	___	✓		If no, are all results outside the control limits flagged with an * on Form I's and VI?

* Substitute IDL for CRDL when IDL > CRDL.

Action: If no, discuss below:

_____

_____

_____

Note:
1. RPD is not calculable for an analyte of the sample - duplicate pair when both values are less than IDL.
2. If lab duplicate result is rejectable due to coefficient of correlation of MSA, analytical spike recovery, or duplicate injections criteria, do not apply precision criteria.

Yes	No	N/A		
___	[✓]	___	7.4	Is any value for sample duplicate pair less than CRDL* and other value ≥ 10x CRDL*?

Soils - if 1 gram to 200 mL: divide CRDL by 5 (% moist) to get mg/kg.

Action: If yes, flag the associated data as estimated (J).

7.5 **Aqueous Laboratory Duplicates**

Circle all values on Form VI that are:
RPD > 20%
Difference > ± CRDL*

Yes	No	N/A	
___	[✓]	___	Is any RPD greater than 20% where sample and duplicate are both ≥ 5x CRDL*?
[___]	✓	___	Is any **difference between sample and duplicate greater than CRDL* where sample and /or duplicate is less than 5x CRDL*?

Action: If yes, flag the associated data as estimated (J).

7.6 Soil/Sediment Laboratory Duplicates

Circle all values on Form VI that are: NA
RPD > 35%, or
Difference > 2x CRDL*

* Substitute IDL for CRDl when IDL > CRDL
** Use absolute values of sample and duplicate to calculate the difference.

Yes	No	N/A	
___	[ ]	___	Is any RPD (where sample and duplicate are both greater than or equal to 5x CRDL*)? > 35%?
___	[ ]	___	Is any **difference between sample and duplicate (where RPD > 35% and sample and/or duplicate is < 5x CRDL*) > 2x CRDL*?

Action: If yes, flag the associated data as estimated (J).

7.7 Field Duplicates

~~Non identified on COC~~

Yes	No	N/A		
[✓]	~~X~~ AB	___	7.7.1	Were field duplicates analyzed? OW17 OW17B

Action: If yes, prepare a Form VI for each aqueous field duplicate pair. Prepare a Form VI for each soil duplicate pair, if percent solids for sample and its duplicate differ by more than 1%; report concentrations of soils in µg/L on wet weight basis and calculate RPDs or Difference for each analyte.

Note: 1. Do not calculate RPD when both values are < IDL.
2. Flag all associated data only for field duplicate pair.

Yes	No	N/A		
___	[✓]	___	7.7.2	Is any value for sample duplicate pair < CRDL* and other value ≥ 10x CRDL*?

Action: If yes, flag the associated data as estimated (J).

Aqueous

Circle all values on Form VI for field duplicates that are:
RPD > 50%, or
Difference > ± CRDL*

Field Dupl

W32265 Analyte	conc ug/L	W24229 Analyte	conc ug/L	n
Al	145 B	Al	139 B	4
As	13.3	As	12.4	7
Ba	425.3 B	Ba	24.8 B	1
Be	3.0 B	Be	3.4 B	
Cd 3.0u ~~Cd~~ Ca	516000	Cd	5.3	NC
Cr	54.0	Ca	517000	
Co	3.8 B	Cr	53.6	
Fe	118000	Co	5.7 B	
Mg	135000	~~Co~~ Fe	117000	
Mn	3060	~~Fe~~ Mg	135000	
Ni	9.9 B	~~Mg~~ Mn	3100	1.
K	70700	~~Mn~~ Ni	8.3 B	
Na	1840000	~~Ni~~ K	71500	1.
Vn	53.3	~~K~~ Na	1850000	.5
Zn	18.2 B	~~Na~~ Vn	51.8	2.
		~~Vn~~ Zn	17.7 B	2.8
		~~Zn~~		

Yes ___ No [✓] N/A ___ Is any RPD > ~~5~~ 30% where sample and duplicate are both ≥ 5x ~~[illegible]~~ CRDL

* Substitute IDL for CRDL when IDL > CRDL.
** Use absolute values of sample and duplicate to calculate the difference.

Yes ___ No [✓] N/A ___ Is any **difference between sample and duplicate greater than CRDL* where sample and/or duplicate is < 5x CRDL*?

Action: If yes, flag the associated data as estimated (J).

8.0 **Spiked Sample Recovery - Pre-Digestion/Pre-Distillation [p.11 (F.G. 1988)] Form V - IN**

Yes [✓] No ___ N/A ___ **8.1** Present and complete for: each 20 samples?

Yes [✓] No ___ N/A ___ each matrix type?

Yes [✓] No ___ N/A ___ each concentration range (i.e. low, med., high)?

Yes [✓] No ___ N/A ___ for both AA and ICP when both are used for same analyte?

Action: If no for any of the above, flag as estimated (J) all positive data < 4x spiking level for which spiked sample was not analyzed.

Note: If one spiked sample was analyzed for more than 20 samples, then first 20 samples analyzed do not have to be flagged as estimated (J).

Yes ___ No [✓] N/A ___ **8.2** Was field blank used for spiked sample?

Action: If yes, flag all positive data , 4x spike added as estimated (J) for which field blank was used as spiked sample.

Note: Matrix spike analysis should be performed on a field blank when it is the only aqueous sample in SDG.

8.3 Circle all values on Data Summary Sheet that are outside control

limits (75% to 125%).

Yes [✓] No ___ N/A ___ Are all recoveries within control limits?

Yes ___ No [ ] N/A ✓ If no, is sample concentration ≥ 4x spike concentration?

Action: Disregard spike recoveries for analytes whose concentrations are ≥ 4x spike added.

Circle those analytes on Form V for which sample concentration is < 4x the spike concentration and recovery outside limits.

Yes ___ No [ ] N/A ✓ Are results outside the control limits (75%-125%) flagged with "N" on Form I's and Form VA?

Action: See Functional Guidelines p. 11.

8.4 Aqueous

Are any spike recoveries:

Yes ___ No [✓] N/A ___ a) less than 30%?

Yes ___ No [✓] N/A ___ b) between 30-74%?

Yes ___ No [✓] N/A ___ c) between 126-150%?

Yes ___ No [✓] N/A ___ d) greater than 150%?

Acceptable(A)	Estimate (J/UJ)	Unusable (R)
>125% for (-)	>125% for (+)	<30% for (+/-)
	30-74% for (+/-)	

Note: If pre-digestion spike result is rejectable due to coefficient of correlation of MSA, analytical spike recovery, or duplicate injections criteria, disregard spike recovery on Form V. Flag the associated data as estimated (J).

VIII. Laboratory Control Sample (Form VII)

✓ Laboratory Control Sample (LCS) analysis was performed for every twenty samples received and met contractual criteria.

____ Laboratory Control Sample (LCS) analysis was performed, but did not meet the criteria for the following elements:._____

Calculation: %R = (Observed/True) x 100

Actions:

	Accept	Approximate	Reject
% Recovery	30-79 for ND[1] 80-120 for ND/+ > 120 for ND	30-79 for + > 120% for + < 30% for +	< 30 for ND

NOTE:

+ - positive result
ND - not detected element
1 - When the percent recovery falls between 30-79 for the LCS, an evaluation of detection limits is beyond the scope of work for a NUS/FIT Level I Data Validation. However, detection limits should be estimated when evaluated under a Level II Data Validation.

An aqueous LCS mercury sample is not required of the laboratory.

IX. Detection Limit Results (Form XI)

✓ Instrument detection limit results were present and found to be less than the Contract Required Detection Limits.

____ Detection limit results were not included in the data package.

____ Detection limits were present, but the criteria was not met for the following elements:

_____

_____

_____

Action:

Adjust sample detection limits for elements not meeting contractual criteria listed above. Elements detected below the adjusted detection limit should be rejected (R'd).

Calculating detection limits for soil samples:
Sample detection limit (mg/kg) =

$$100 \times \frac{\text{IDL (ug/l)}}{\text{\% solids}} \times \frac{\text{Volume diluted to (ml)}}{\text{wet weight digested (gms)}} \times \frac{1\text{L}}{1{,}000\text{ ml}} \times \frac{1{,}000\text{ gm}}{1\text{ kg}} \times \frac{1\text{ mg}}{1{,}000\text{ ug}}$$

X. FURNACE ATOMIC ABSORPTION ANALYSIS

1. Duplicate Precision

✓ Duplicate injections and one-point analytical spikes were performed for all samples: duplicate injections agreed within ±20% for sample analyte values ≥ CRDL

___ Duplicate injections did not agree within ±20% for samples/elements:___

___ Duplicate injections and/or spikes were not performed for the following samples/elements:___

Estimate (J) positive results if duplicate injections are outside ±20% RSD or CV.

2. Post digestion analytical spikes

___ Spike recoveries met the 85-115% recovery criteria for all samples.

✓ Spike recoveries did not meet the 85-115% criteria but did not require MSA for the following samples/elements: W32229 Pb, W25983 Pb, W33241 Pb, W24278 Pb, W24242 Se,

If the sample absorbance is <50% of post digestion spike absorbance, the following actions should be applied:

	PERCENT RECOVERY		
	<10%	113-84%	>115%
Positive Sample Results	J or R	J	J
Non-detected Sample Results	R	UJ	A

✓ MSA was used to quantitate analytical results when contractually required.

✓ Correlation coefficients ≥0.995, accept results.

___ Correlation coefficients <0.995 for sample numbers/ elements___

Estimate (J) sample results if correlation coefficient was <0.995.

✓ Method of Standard Addition (MSA) was not performed as required for samples/elements: W33743 Pb

Estimate (J) sample results if MSA was required and not performed.

XI. Inductively Coupled Plasma (ICP) QC Analysis/Serial Dilution Results

✓ Serial Dilutions were performed; but analytical results did not agree within 10% for analyte concentrations greater than 50x the IDL in the original sample (7/87 SOW). The following elements were evaluated for Matrix interferences:

Element	IDL	IDL X 50	Sample #:	Serial Diluted Sample Result % D	Action
Aluminum	20 ug/L	1000	W32277L	(36.1) 120.20	—
Barium					
Beryllium					
Cadmium					
Calcium					
Cobalt	3.0	150	"	40.75 (29.2)	—
Copper					
Chromium					
Iron					
Lead					
Magnesium					
Manganese					
Nickel					
Potassium	500	25,000	"	3892.75 (30.5)	—
Silver					
Sodium					
Vanadium					
Zinc					
Other:					

Actions: All data for samples of the same matrix for that element should be approximated (J) when the serial dilution results do not meet contractual requirements.

For example:

1. The IDL for Mg is 10 ppb. Magnesium (Mg) was detected in Sample A at a concentration of 65 ppb. The sample was then diluted by a factor of five. The serially diluted sample result (SR) was 80 ppb. The sample should not be evaluated for matrix interferences, since: 65 ppb (SR) < 500 ppb (IDL x 50).

2. The IDL for Al is 70 ppb. Aluminum (Al) was detected in Sample B at a concentration of 5,000 ppb. The sample was diluted by a factor of five. The serially diluted sample result (SR) was 3,200 ppb. The sample should be evaluated for matrix interferences, since: 5000 ppb > 3500 ppb (IDL x 50). The serially diluted sample result is not within 10% of the original sample result. Therefore, Aluminum results should be approximated (J'd) in all samples of the same matrix.

NO data qualified

<Field blanks>

W32562

Analyte	Conc. ug/L	AL	~~affected samples~~
Ca	30.3 B	qualified J due to blk.	
Lead	4.7	23.5	Blank
Na	113 B	565	Blank
Zinc	2.3 B	11.5	- Blank cont.

Lead	Na	Zinc
W10197	719207	W24242
W24205	719209	W24254
W24217	719212	W24266
W32253	719213	W24278
W32503	719214	~~W32~~ W32289
W32991	719215	
W33344		
719216		
W33300,02,03		
W33400,01,02		
W32217		
W32505		
~~719204~~ 719213		
719201 719216		
719206 ~~719202~~		
719208 ~~719207~~		
719211		

Not affected by field blank contaminant

XII. DETECTION LIMIT RESULTS

1. Instrument Detection Limits

Yes ✓ Instrument Detection Limit results were present and found to be less than the Contract Required Detection Limits.

___ IDLs were not included in the data package on Form XI.

___ IDLs were present, but the criteria was not met for the following elements:_____

2. Reporting Requirements

Yes ✓ Were sample results on Form I reported down to the IDL not the CRDL for all analytes?

___ Were sample results that were analyzed by ICP for Se, Tl, As, or Pb at least 5x IDL?

Yes ✓ Were sample weights, volumes, and dilutions taken into account when reporting detection limits on Form I?

If no,

The reported results may be inaccurate. Make a list of the necessary changes and request that the laboratory resubmit the corrected data.

Woburn/Project # C1320301

CLP DATA VALIDATION FORM

12 samples

PART D: Inorganics

that Cr analyzed

Contract No: PTI

SDG No: K916923

Laboratory: Columbia Analytical

Reviewer: jk

Date: 4-5-92

Sr. Review: AB

Date: 4/9/97

General

1.0 Holding Times - (aqueous and soil samples) [p. 3 F.G. '88]

[Examine Chain of Custody sheets and digestion/distillation logs. Form XIII-IN]

Yes	No	N/A	
___	[ ]	✓	Mercury analysis (28 days) . . . . . exceeded?
___	[ ]	✓	Cyanide distillation (14 days) . . . exceeded?
___	[✓]	___	Other metals (Cr) analysis (6 months) . . exceeded?

Note: Prepare a list of all samples and analytes for which holding times have been exceeded. Specify the number of days from date of collection to the date of preparation (from raw data). Attach to checklist.

Action: If yes, for aqueous samples, reject (red-line) values less than Instrument Detection Limit (IDL) and flag as estimated (J) the values above IDL even though sample(s) was/were preserved properly. If yes for soil, use professional judgment.

not applicable as only Cr analyzed

2.0 Raw Data
[CLP Form XIII-IN]

Yes	No	N/A	2.1	Digestion Log for flame AA/ICP (Form XIII) present?
Yes	No	N/A		Digestion Log for furnace AA Form (XIII) present?
Yes	No	N/A		Digestion Log for mercury (Form XIII) present?
Yes	No	N/A		Distillation Log for cyanides Form (XIII) present?
Yes	No	N/A		Are pH values (pH<2 for all metals, pH>12 for cyanide) present?
Yes	No	N/A		Weights, dilutions and volumes used to obtain values?
Yes	No	N/A		Percent solids calculation present for soils/sediments?
Yes	No	N/A		Are preparation dates present on Digestion Log?
			2.2	Measurement read out record present?
Yes	No	N/A		ICP
Yes	No	N/A		Flame AA
Yes	No	N/A		Furnace AA
Yes	No	N/A		Mercury
Yes	No	N/A		Cyanides
Yes	No	N/A	2.3	Are all raw data to support all sample analyses and QC operations present?

Yes ✓ No ___ N/A ___ Legible?

Yes ✓ No ___ N/A ___ Properly labeled?

Action: If no for any of the above, contact laboratory for explanation/resubmittal. Flag metal data as estimated [J(+)/UJ(-)] if pH of sample is greater than 2. Flag cyanide data as estimated [J(+)/UJ(-)] if pH sample is less than 12.

3.0 <u>Data Validation and Verification</u>

3.1 Calibration
[p. 4 (F.G. '88)]

Yes ✓ No ___ N/A ___ 3.1.1 Is record of at least 2 point calibration present for ICP analysis?

Yes ___ No ✓ N/A (circled) Is record of 5 point calibration present for Hg analysis?

Action: If no for any of the above, determine if data are within calibration range of the instrument and use best professional judgement under F.G. All data are to be considered unusable.

3.1.2 Is record of 4-point calibration (blank and 3 standards) present for:

Yes ___ No ✓ N/A (circled) Flame AA?

Yes ___ No ✓ N/A (circled) Furnace AA?

Yes ___ No ✓ N/A (circled) Cyanides?

Note: 1. If less than 4 standards are measured in absorbance mode, then the remaining standards in concentration mode must be run immediately after calibration and be within ±10% of the true value.

2. For all AA (except Hg) and Cyanide analyses, one _____ calibration standard is at CRDL level. If not, discuss below.

Action: Flag associated data as estimated [J(+)/UJ(-)] if standards are not within ±10% of true value (except CRDL calibration standard). Do not flag the data as estimated in linear range indicated by good recovery of standard.

3.1.3 Is correlation *coefficient less than 0.995 for:

Yes	No	N/A	
		✓	Mercury Analysis?
		✓	Cyanide Analysis?
		✓	Atomic Absorption Analysis?

Action: If yes, use professional judgement to flag the associated data as estimated [(J(+)/UJ(-)].

3.2 Form II A (Initial and Continuing Calibration Verification)

Yes	No	N/A	
✓			3.2.1. Present and complete for every metal and cyanide? only Cr performed
✓			Present and complete for AA and ICP when both are used for sample analyte?

Action: If no for any of the above, contact laboratory for explanation/resubmittal.

3.2.2. Circle all values on Form IIA that are outside contract windows. Are all calibration standards (initial and continuing) within control limits?

Yes	No	N/A	
✓			Metals 90-110%
		✓	Hg 80-120%
		✓	Cyanides 85-115%

* The reviewer will calculate correlation coefficient.

Action:

Acceptable(A)	Estimate (J/UJ)	Unusable (R)
	-Metals-	
11-125% for (-)	75-89% for (+/-)	<75% for (+/-)
>125% for (-)	111-125 for (+)	>125% for (+)
	-Mercury-	
121-135% for (-)	65-79% for (+/-)	<65% for (+/-)
>135% for (-)	121-135% for (+)	>125% for (+)
	-cyanide-	
116-130% for (-)	70-84% for (+/-)	<70% for (+/-)
>130% for (-)	116-130% for (+)	>130% for (+)

Yes [✓] No ___ N/A ___ Was continuing calibration (CCV and CCB) performed every 10 analyses or every 2 hours (whichever is more frequent)?

Action: If no, flag the excess samples (eleventh and up) data as estimated (J).

Yes [ ] No ___ N/A [✓] Was ICV for cyanides distilled?

Action: If no, discuss below:

_____

_____

_____

3.3 Form II B (CRDL Standards for AA and ICP)
[Not discussed in F.G.]

NA

Yes [ ] No ___ N/A ___ **3.3.1** Was a CRDL standard (CRA) analyzed after initial calibration for all all AA metals (except Hg)?

Yes [ ] No ___ N/A ___ *Was a mid-range calibration verification standard distilled and analyzed for cyanide analysis?

Yes [ ] No ___ N/A ___ Was a 2xCRDL (or 2xIDL when IDL>CRDL) analyzed (CRI) for each ICP run?

(Note: CRI for Al, Ba, Ca, Fe, Mg, Na or K is not required.) NA

Action: If no for any of the above, flag as estimated all data falling within the affected ranges. The affected ranges are:

AA Analysis - ** True Value ± CRDL
ICP Analysis - ** True Value ± 2CRDL
CN Analysis - ** True Value ± 0.5 x True Value.

* Find the results of mid-range standard in the raw data.
** True value of CRA, CRI or mid-range standard. Substitute IDL for CRDL when IDL > CRDL.

Yes	No	N/A		
[ ]	___	___	3.3.2	Was CRI analyzed after ICV/ICB and before the final CCV/CCB, and for every four hours of ICP run?

Action: If no, discuss below:

_____

_____

_____

3.3.3 Circle all values on summary sheet (Form IIB) that are outside acceptance windows.

Yes	No	N/A	
[ ]	___	___	Are CRA and CRI standards within control limits: Metals 80-120% R?
[ ]	___	___	Is mid-range standard within control limits: Cyanide 80-120% R?

Action:

FOR SAMPLE VALUES < CRI or CRA + 2CRDL:

Acceptable(A)	Estimate (J/UJ)	Unusable (R)
121-150% for (-)	50-79% for (+/-)	<50% for (+/-)
>150% (+)	121-150-% for (+)	>150% for (+)

4.0 Blanks

4.1 [p.6 (F.G. '88)] CLP Form III-IN

Yes ✓	No	N/A	Present and complete?
Yes ✓	No	N/A	For both AA and ICP when both are used for same analyte?
Yes ✓	No	N/A	Was an initial calibration blank analyzed?
Yes ✓	No	N/A	Was a continuing calibration blank (CCB) analyzed after every 10 samples or every 2 hours (whichever is more frequent)?

Action: If no, contact laboratory for explanation/resubmittal and discuss below:

_____

_____

_____

Was one PB analyzed for:

Yes ✓	No	N/A	each 20 samples?
Yes ✓	No	N/A	each batch?
Yes ✓	No	N/A	each matrix type?
Yes ✓	No	N/A	both AA and ICP when both are used for same analyte?
Yes ✓	No	N/A	blanks ≤ CRDL (Form III)?

Action: If no to any of the above, contact laboratory for explanation/resubmittal. Discuss the deficiencies below.

_____

_____

_____

Note: If the concentration of an analyte is > CRDL, either positive or negative, all associated sample concentrations must be > 10x the blank concentration. If not, for samples with concentrations , 10x CRDL, qualify as follows:

PB: J(+) - all samples.
CCB: J(+) - between CCB>CRDL and nearest good CCB.
J(+) - 5 samples analyzed prior to CCB>CRDL.

4.2 Action Limit

Yes ___ No [✓] N/A ___

Are there CCB (µg/L) or PB (mg/kg) values reported > IDL ?

If yes, an action level of 5x the highest associated blank value is determined for positive blank values. Samples with detected concentrations < Action Limit are to be considered undetected at the reported concentration. Negative blank results, the raw data are to be reviewed to determine if a negative bias exists. If so, all samples qualify positive and undetected as estimated (J) and discuss under "Reasons."

Analyte	Blank Concentration	A.L.	Qualifier (U or J)	Affected Samples	Reason
			limits		
		all w/in			

5.0 **ICP Interference Check Sample [p. 7 (F.G. 1988)] Form IV-IN**

Yes [✓] No ___ N/A ___ Present and complete?

(Note: Not required for furnace AA, flame AA, mercury, cyanide and Ca, Mg, K and Na.)

Yes [✓] No ___ N/A ___ Was ICS analyzed at beginning and end of run (or at least twice every 8 hours)?

Action: If no, flag as estimated (J) all samples for which Al, Ca, Fe, or Mg is higher than in ICS.

Yes [✓] No ___ N/A ___ 5.2 Circle all values on Form IV that are more than ± 20% of true or established mean value (80-120% recovery).

Yes [ ] No ___ N/A ✓ If no, is concentration of Al, Ca, Fe, or Mg lower than in ICS?

Action: If no, qualify results for out of control limits ICS as below.

Acceptable(A)	Estimate (J/UJ)	Unusable (R)
>120% for (-)	>120% for (+)	<50% for (+/-)
	50-79% for (+/-)	

Note: If possible, indicate the bias for the estimated data results. Also, evaluate the possibility of false negatives/positives as described on page 8 of the 1988 F.G..

6.0 **Laboratory Control Sample [p. 9, F.G. 1988] CLP Form VII - IN**
(Note: LCS - not required for aqueous Hg and cyanide analyses.)

6.1 Was an LCS prepared and analyzed for:

Yes [✓] No ___ N/A ___ every 20 water samples?

Yes [ ] No ✓ N/A ___ every 20 solid samples?

Yes ✓ No ___ N/A ___ both AA and ICP when both are used for the same analyte?

Action: If no for any of the above, contact laboratory for explanation/resubmittal. Flag as estimated (J) all data for which LCS was not analyzed.

Note: If only one LCS was analyzed for more than 20 samples, then first 20 samples close to LCS do not have to be flagged as estimated.

6.2 Aqueous LCS

Circle all LCS values outside control limits (80-120% -except aqueous Ag and Sb).

Is any LCS recovery:

Yes ___ No ✓ N/A ___ less than 50%?

Yes ___ No ✓ N/A ___ between 50% and 79%?

Yes ___ No ✓ N/A ___ between 121% and 150%?

Yes ___ No ✓ N/A ___ greater than 150%?

Acceptable(A)	Estimate (J/UJ)	Unusable (R)
>120% for (-)	>120% for (+)	<50% for (+/-)
	50-79% for (+/-)	

6.3 Solid LCS NA

Note: 1. If "Found" value of LCS is rejectable due to duplicate injections or analytical spike recovery criteria, regardless of LCS recovery, flag the associated data as estimated (J).

2. If IDL of an analyte is equal to or greater than true value of LCS, disregard the "Action" below even though LCS is out of control limits.

Yes No N/A Is LCS "Found" value higher than the control limits on Form VII?

Action: If yes, qualify all associated positive data as estimated (J).

Yes No N/A Is LCS "Found" value lower than the Control limits on Form VII?

Action: If yes, qualify all associated (positive and undetected) data as estimated (J).

7.0 **Duplicates [p. 10, F.G. 1988] CLP Form VI-IN**

7.1 Present and complete for:

Yes No N/A each 20 samples?

Yes No N/A each matrix type?

Yes No N/A each concentration range (i.e. low, med., high)?

Yes No N/A both AA and ICP when both are used for same analyte?

Action: If no for any of the above, flag as estimated (J) all data >CRDL* for which duplicate sample was not analyzed.

Note: 1. If one duplicate sample was analyzed for more than 20 samples, then the first 20 samples do not have to be flagged as estimated.

2. If percent solids for soil sample and its duplicate differ by more than 1%, prepare a Form VI for each duplicate pair, report concentrations in mg/L on wet weight basis and calculate RPD or Difference for each analyte.

Yes No N/A 7.2 Was field blank used for duplicate analysis?

Action: If yes, flag all data >CRDL* as estimated (J) for which field blank was used as duplicate.

Note: Duplicate analysis should be performed on a field blank when it is the only aqueous sample in SDG.

Yes	No	N/A		
[✓]	___	___	7.3	Are all values within control limits (RPD 20% or difference < ± CRDL for aqueous, and RPD 35% or difference < ±2x CRDL for solids)?
[___]	___	✓		If no, are all results outside the control limits flagged with an * on Form I's and VI?

* Substitute IDL for CRDL when IDL > CRDL.

Action: If no, discuss below:

_____

_____

_____

Note: 1. RPD is not calculable for an analyte of the sample - duplicate pair when both values are less than IDL.

2. If lab duplicate result is rejectable due to coefficient of correlation of MSA, analytical spike recovery, or duplicate injections criteria, do not apply precision criteria.

Yes	No	N/A		
___	[✓]	___	7.4	Is any value for sample duplicate pair less than CRDL* and other value ≥ 10x CRDL*?

Soils - if 1 gram to 200 mL: divide CRDL by 5 (% moist) to get mg/kg.

Action: If yes, flag the associated data as estimated (J).

7.5 **Aqueous Laboratory Duplicates**

Circle all values on Form VI that are:

RPD > 20%

Difference > ± CRDL*

Yes	No	N/A	
___	[✓]	___	Is any RPD greater than 20% where sample and duplicate are both ≥ 5x CRDL*?
[___]	✓	___	Is any **difference between sample and duplicate greater than CRDL* where sample and /or duplicate is less than 5x CRDL*?

Action: If yes, flag the associated data as estimated (J).

7.6 Soil/Sediment Laboratory Duplicates

Circle all values on Form VI that are:
RPD > 35%, or
Difference > 2x CRDL*

NA

* Substitute IDL for CRDl when IDL > CRDL.
** Use absolute values of sample and duplicate to calculate the difference.

Yes	No	N/A	
___	[ ]	___	Is any RPD (where sample and duplicate are both greater than or equal to 5x CRDL*)? > 35%?
___	[ ]	___	Is any **difference between sample and duplicate (where RPD > 35% and sample and/or duplicate is < 5x CRDL*) > 2x CRDL*?

Action: If yes, flag the associated data as estimated (J).

7.7 Field Duplicates

None identified on COC

Yes	No	N/A		
[ ]	✓	___	7.7.1	Were field duplicates analyzed?

Action: If yes, prepare a Form VI for each aqueous field duplicate pair. Prepare a Form VI for each soil duplicate pair, if percent solids for sample and its duplicate differ by more than 1%; report concentrations of soils in µg/L on wet weight basis and calculate RPDs or Difference for each analyte.

Note:
1. Do not calculate RPD when both values are < IDL.
2. Flag all associated data only for field duplicate pair.

Yes	No	N/A		
___	[ ]	✓	7.7.2	Is any value for sample duplicate pair < CRDL* and other value ≥ 10x CRDL*?

Action: If yes, flag the associated data as estimated (J).

Aqueous

Circle all values on Form VI for field duplicates that are:
RPD > 50%, or
Difference > ± CRDL*

Yes No N/A Is any RPD > 50% where sample and duplicate are both ≥ 5x

* Substitute IDL for CRDL when IDL > CRDL.
** Use absolute values of sample and duplicate to calculate the difference.

Yes No N/A Is any **difference between sample and duplicate greater than CRDL* where sample and/or duplicate is < 5x CRDL*?

Action: If yes, flag the associated data as estimated (J).

8.0 **Spiked Sample Recovery - Pre-Digestion/Pre-Distillation [p.11 (F.G. 1988)] Form V - IN**

Yes No N/A **8.1** Present and complete for: each 20 samples?

Yes No N/A each matrix type?

Yes No N/A each concentration range (i.e. low, med., high)?

Yes No N/A for both AA and ICP when both are used for same analyte?

Action: If no for any of the above, flag as estimated (J) all positive data < 4x spiking level for which spiked sample was not analyzed.

Note: If one spiked sample was analyzed for more than 20 samples, then first 20 samples analyzed do not have to be flagged as estimated (J).

Yes No N/A **8.2** Was field blank used for spiked sample?

Action: If yes, flag all positive data , 4x spike added as estimated (J) for which field blank was used as spiked sample.

Note: Matrix spike analysis should be performed on a field blank when it is the only aqueous sample in SDG.

8.3 Circle all values on Data Summary Sheet that are outside control

limits (75% to 125%).

Yes [✓] No ___ N/A ___ Are all recoveries within control limits?

Yes ___ No [✓] N/A ___ If no, is sample concentration ≥ 4x spike concentration?

Action: Disregard spike recoveries for analytes whose concentrations are ≥ 4x spike added.

Circle those analytes on Form V for which sample concentration is < 4x the spike concentration and recovery outside limits.

Yes ___ No [✓] N/A ___ Are results outside the control limits (75%-125%) flagged with "N" on Form I's and Form VA?

Action: See Functional Guidelines p. 11.

8.4 Aqueous

Are any spike recoveries:

Yes ___ No [✓] N/A ___ a) less than 30%?

Yes ___ No [✓] N/A ___ b) between 30-74%?

Yes ___ No [✓] N/A ___ c) between 126-150%?

Yes ___ No [✓] N/A ___ d) greater than 150%?

Acceptable(A)	Estimate (J/UJ)	Unusable (R)
>125% for (-)	>125% for (+)	<30% for (+/-)
	30-74% for (+/-)	

Note: If pre-digestion spike result is rejectable due to coefficient of correlation of MSA, analytical spike recovery, or duplicate injections criteria, disregard spike recovery on Form V. Flag the associated data as estimated (J).

VIII. Laboratory Control Sample (Form VII)

✓ Laboratory Control Sample (LCS) analysis was performed for every twenty samples received and met contractual criteria.

____ Laboratory Control Sample (LCS) analysis was performed, but did not meet the criteria for the following elements:_____

Calculation: %R = (Observed/True) x 100

Actions:

	Accept	Approximate	Reject
% Recovery	30-79 for ND[1] 80-120 for ND/+ > 120 for ND	30-79 for + > 120% for + < 30% for +	< 30 for ND

NOTE:

+ - positive result
ND - not detected element
1 - When the percent recovery falls between 30-79 for the LCS, an evaluation of detection limits is beyond the scope of work for a NUS/FIT Level I Data Validation. However, detection limits should be estimated when evaluated under a Level II Data Validation.

An aqueous LCS mercury sample is not required of the laboratory.

IX. Detection Limit Results (Form XI)

✓ Instrument detection limit results were present and found to be less than the Contract Required Detection Limits.

____ Detection limit results were not included in the data package.

____ Detection limits were present, but the criteria was not met for the following elements:

_____
_____
_____

Action:

Adjust sample detection limits for elements not meeting contractual criteria listed above. Elements detected below the adjusted detection limit should be rejected (R'd).

Calculating detection limits for soil samples:
Sample detection limit (mg/kg) =

$$100 \times \frac{\text{IDL (ug/l)}}{\text{\% solids}} \times \frac{\text{Volume diluted to (ml)}}{\text{wet weight digested (gms)}} \times \frac{1\text{L}}{1{,}000\text{ ml}} \times \frac{1{,}000\text{ gm}}{1\text{ kg}} \times \frac{1\text{ mg}}{1{,}000\text{ ug}}$$

X. Furnace Atomic Absorption QC Analysis/Method of Standard Additions NA

A. Duplicate Injections

___ Duplicate injections were performed for all samples and agreed within ± 20% Relative Standard Deviation (RSD). The RSD or Coefficient of Variation (CV) is calculated by dividing the standard deviation by the mean and multiplying by one hundered.

___ Duplicate injections were not performed for the following samples/elements:

___

Action: Reject (R) data and notify the NUS/FIT RSCC Manager of the deficiency.

if > CRDL

___ Duplicate injections were outside the ± 20% RSD limit and a third injection was not performed as required for the following samples/elements:

___

Action: Approximate (J) data and summarize the lab's deficiency in the memo.

___ Duplicate injections did not agree within ± 20% RSD and the third injection did not agree with either of the first two injections (± 20% RSD) for the following samples/elements: ___

___

Action: Approximate (J) data.

B. Analytical Spike Percent Recoveries

___ One-point analytical spikes were performed for all samples and the spike recoveries met the 85-115% recovery criteria (Accept data).

___ The analytical spike recoveries were less than 10% for the following samples/elements:

___

Action: Reject (R) data.

___ Spike recoveries were 10-40% and the laboratory did not dilute and re-analyze the following samples/elements: ___
Action: Approximate (J) positive results and reject (R) non-detected results.

___ Spike recoveries were 10-40% after the following samples/elements were diluted and re-analyzed: ___
Action: Approximate (J) positive results and reject (R) non-detected results.

___ Sample Concentrations were less than 50% of the spike value and spike recoveries were greater than 40%. (Accept data).

___ Sample Concentrations were greater than 50% of the spike value, and spike recoveries did not meet the 85-115% recovery criteria.
The following actions should be taken:

___ Method of Standard Addition (MSA) was not performed as required for sample numbers/elements: ___

___

Action: Approximate data and summarize the lab's deficiency in the memo.

NA

✓ MSA was used to quantitate analytical results for the following samples/elements when correlation coefficients were greater than 0.995:

Action: Accept data.

✓ MSA was performed for the following samples/elements and correlation coefficients were less than 0.995:

Action: Approximate (J) data.

Comments:

XI. Inductively Coupled Plasma (ICP) QC Analysis/Serial Dilution Results

Serial Dilutions were performed; but analytical results did not agree within 10% for analyte concentrations greater than 50x the IDL in the original sample. (7/87 SOW). The following elements were evaluated for Matrix interferences:

all w/in limits

Element	IDL	IDL X 50	Sample #:	Serial Diluted Sample Result	Action
Aluminum					
Barium					
Beryllium					
Cadmium					
Calcium					
Cobalt					
Copper					
Chromium					
Iron					
Lead					
Magnesium					
Manganese					
Nickel					
Potassium					
Silver					
Sodium					
Vanadium					
Zinc					
Other:					

Actions: All data for samples of the same matrix for that element should be approximated (J) when the serial dilution results do not meet contractual requirements.

For example:

1. The IDL for Mg is 10 ppb. Magnesium (Mg) was detected in Sample A at a concentration of 65 ppb. The sample was then diluted by a factor of five. The serially diluted sample result (SR) was 80 ppb. The sample should not be evaluated for matrix interferences, since: 65 ppb (SR) < 500 ppb (IDL x 50).

2. The IDL for Al is 70 ppb. Aluminum (Al) was detected in Sample B at a concentration of 5,000 ppb. The sample was diluted by a factor of five. The serially diluted sample result (SR) was 3,200 ppb. The sample should be evaluated for matrix interferences, since: 5000 ppb > 3500 ppb (IDL x 50). The serially diluted sample result is not within 10% of the original sample result. Therefore, Aluminum results should be approximated (J'd) in all samples of the same matrix.