SUMMARY OF RESULTS
Kuwait/Saudia Arabia
39-22-L192

The samples were collected between 31 Oct and 08 Nov 93. All samples were received on 12 Nov 93, extracted on 16, 17, 18, 22, and 23 Nov, and their analysis completed on 07 Dec 93.

Naphthalene and 2-methylnaphthalene were the only target polycyclic aromatic hydrocarbons, (PAHs) detected above the quantitation limit of ten micrograms/sample.

The samples were spiked with 5 deuterated PAHs in the field, immediately prior to sampling. The five deuterated PAHs were used to quantitate the target PAHs, compensating for both retention and extractability. Samples R3707, R3708, and R3719 were either trip blanks or field blanks and were not spiked with the deuterated PAHs. A tabulation of the responses of the deuterated PAHs is attached.

Extractor: J. Shanks
Analyst: M. Sheely Date: 13 Dec 1993

Analysis Data Sheet Qualifier Codes:

B - Indicates analyte was found in the associated blank as well as in the sample.

D - Indicates sample was diluted.

E - Indicates reported value exceeds the upper limit of the quantitation curve.

J - Indicates reported value is an estimate.

U - Indicates compound was analyzed for but not detected.

AEHA-DLS-SAB
KUWAIT 39-22-L192

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

LCSD No.

BLANK

Installation: Kuwait ,

Matrix: XAD-2

Level: Low

Extraction: Soxhlet

Dilution Factor: 1.0

Field Id: BLANK EXT 23 NOV 93

Lab File ID: >SSC00

Date Collected: --/--/--

Date Received: --/--/--

Date Extracted: 11/23/93

Date Analyzed: 12/04/93

CONCENTRATION UNITS:

CAS NO.	COMPOUND	uG	Q
91-20-3	Naphthalene	10.	U
91-57-6	2-Methylnaphthalene	10.	U
208-96-8	Acenaphthylene	10.	U
83-32-9	Acenaphthene	10.	U
132-64-9	Dibenzofuran	10.	U
86-73-7	Fluorene	10.	U
85-01-8	Phenanthrene	10.	U
86-74-8	Carbazole	10.	U
120-12-7	Anthracene	10.	U
206-44-o	Fluoranthene	10.	U
129-00-0	Pyrene	10.	U
56-55-3	Benzo(a)anthracene	10.	U
218-01-g	Chrysene	10.	U
205-99-2	Benzo(b)fluoranthene	10.	U
207-08-g	Benzo(k)fluoranthene	10.	U
50-32-a	Benzo(a)pyrene	10.	U
193-39-5	Indeno(1,2,3-cd)pyrene	10.	U
53-70-3	Dibenzo(a,h)anthracene	10.	U
191-24-2	Benzo(g,h,i)perylene	10.	U

AEHA-DLS-SAB
KUWAIT 39-22-L192

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

LCSD No.

BLANK

Installation: Kuwait ,

Matrix: XAD-2

Level: Low

Extraction: Soxhlet

Dilution Factor: 1.0

Field Id: BLANK EXT 23 NOV 9

Lab File ID: >SSC00

Date Collected: --/--/--

Date Received: --/--/--

Date Extracted: 11/23/93

Date Analyzed: 12/03/93

CONCENTRATION UNITS:

CAS NO.	COMPOUND	uG	Q
91-20-3	Naphthalene	10.	U
91-57-6	2-Methylnaphthalene	10.	U
208-96-S	Acenaphthylene	10.	U
83-32-9	Acenaphthene	10.	U
132-64-9	Dibenzofuran	10.	U
86-73-7	Fluorene	10.	U
85-01-S	Phenanthrene	10.	U
06-74-8	Carbazole	10.	U
120-12-7	Anthracene	10.	U
206-44-o	Fluoranthene	10.	U
129-00-O	Pyrene	10.	U
56-55-3	Benzo(a)anthracene	10 --	U
218-01-9	Chrysene	10.	U
205-99-2	Benzo(b)fluoranthene	10.	U
207-08-9	Benzo(k)fluoranthene	10.	U
50-32-8	Benzo(a)pyrene	10.	U
193-39-5	Indeno(1,2,3-cd)pyrene	10.	U
53-70-3	Dibenzo(a,h)anthracene	10.	U
191-24-2	Benzo(g,h,i)perylene	10.	U

AEKA-DLS-SAB
KUWAIT 39-22-L192

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

LCSD No.

R3701

Installation: DOHA

Matrix: XAD-2

Level: Low

Extraction: Soxhlet

Dilution Factor: 1.0

Field Id: XAD-07C

Lab File ID: >SSB07

Date Collected: 11/07/93

Date Received: 11/12/93

Date Extracted: 11/18/93

Date Analyzed: 12/02/93

CONCENTRATION UNITS: uG

CAS NO.	COMPOUND		Q
91-20-3	Naphthalene	6.	J
91-57-6	2-Methylnaphthalene	2.	J
208-96-s	Acenaphthylene	10.	U
83-32-9	Acenaphthene	10.	U
132-64-g	Dibenzofuran	10.	U
86-73-7	Fluorene	10.	U
85-01-g	Phenanthrene	10.	U
86-74-8	Carbazole	10.	U
120-12-7	Anthracene	10.	U
206-44-0	Fluoranthene	10.	U
129-00-o	Pyrene	10.	U
56-55-3	Benzo(a)anthracene	10.	U
218-01-9	Chrysene	10.	U
205-99-2	Benzo(b)fluoranthene	10.	U
207-08-g	Benzo(k)fluoranthene	10.	U
50-32-8	Benzo(a)pyrene	10.	U
193-39-5	Indeno(1,2,3-cd)pyrene	10.	U
53-70-3	Dibenzo(a,h)anthracene	10.	U
191-24-2	Benzo(g,h,i)perylene	10.	U

AEHA-DLS-SAB
KUWAIT 39-22-L192

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

LCSD No.

R3702

Installation: DOHA

Matrix: XAD-2

Level: Low

Extraction: Soxhlet

Dilution Factor: 1.0

Field Id: XAD-08C

Lab File ID: >SSB08

Date Collected: 11/08/93

Date Received: 11/12/93

Date Extracted: 11/18/93

Date Analyzed: 12/02/93

CAS NO.	COMPOUND	CONCENTRATION KNITS: uG	Q
91-20-3	Naphthalene	7.	J
91-57-6	2-Methylnaphthalene	2.	J
208-96-8	Acenaphthylene	10.	U
83-32-9	Acenaphthene	10.	U
132-64-g	Dibenzofuran	10.	U
86-73-7	Fluorene	10.	U
85-01-E	Phenanthrene	10.	U
86-74-8	Carbazole	10.	U
120-12-7	Anthracene	10.	U
206-44-o	Fluoranthene	10.	U
129-00-O	Pyrene	10.	U
56-55-3	Benzo(a)anthracene	10.	U
218-01-9	Chrysene	10.	U
205-99-2	Benzo(b)fluoranthene	10.	U
207-08-g	Benzo(k)fluoranthene	10.	U
50-32-8	Benzo(a)pyrene	10.	U
193-39-5	Indeno(1,2,3-cd)pyrene	10.	U
53-70-3	Dibenzo(a,h)anthracene	10.	U
191-24-2	Benzo(g,h,i)perylene	10.	U

AEHA-DLS-SAB
KUWAIT 39-22-L192

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

LCSD No.

R3703

Installation: DOHA

Matrix: XAD-2

Level: Low

Extraction: Soxhlet

Dilution Factor: 1.0

Field Id: XAD-06C

Lab File ID: >SSC10

Date Collected: 11/06/93

Date Received: 11/12/93

Date Extracted: 11/18/93

Date Analyzed: 12/06/93

CONCENTRATION UNITS:

CAS NO.	COMPOUND	uG	Q
91-20-3	Naphthalene	7.	J
91-57-6	2-Methylnaphthalene	2.	J
208-96-8	Acenaphthylene	10.	U
83-32-9	Acenaphthene	10.	U
132-64-9	Dibenzofuran	10.	U
86-73-7	Fluorene	10.	U
85-01-8	Phenanthrene	10.	U
86-74-8	Carbazole	10.	U
120-12-7	Anthracene	10.	U
206-44-o	Fluoranthene	10.	U
129-00-0	Pyrene	10.	U
56-55-3	Benzo(a)anthracene	10.	U
218-01-g	Chrysene	10.	U
205-99-2	Benzo(b)fluoranthene	10.	U
207-08-g	Benzo(k)fluoranthene	10.	U
50-32-8	Benzo(a)pyrene	10.	U
193-39-5	Indeno(1,2,3-cd)pyrene	10.	U
53-70-3	Dibenzo(a,h)anthracene	10.	U
191-24-2	Benzo(g,h,i)perylene	10.	U

AEHA-DLS-SAB
KUWAIT 39-22-L192

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

LCSD No.

R3704

Installation: DOHA

Matrix: XAD-2

Level: Low

Extraction: Soxhlet

Dilution Factor: 1.0

Field Id: XAD-05C

Lab File ID: >SSC11

Date Collected: 11/05/93

Date Received: 11/12/93

Date Extracted: 11/18/93

Date Analyzed: 12/06/93

CONCENTRATION UNITS:

CAS NO.	COMPOUND	uG	Q
91-20-3	Naphthalene	7.	J
91-57-6	2-Methylnaphthalene	2.	J
208-96-8	Acenaphthylene	10.	U
83-32-9	Acenaphthene	10.	U
132-64-9	Dibenzofuran	10.	U
86-73-7	Fluorene	10.	U
85-01-8	Phenanthrene	10.	U
86-74-8	Carbazole	10.	U
120-12-7	Anthracene	10.	U
206-44-o	Fluoranthene	10.	U
129-00-0	Pyrene	10.	U
56-55-3	Benzo(a)anthracene	10.	U
218-01-9	Chrysene	10.	U
205-99-2	Benzo(b)fluoranthene	10.	U
207-08-g	Benzo(k)fluoranthene	10.	U
50-32-8	Benzo(a)pyrene	10.	U
193-39-5	Indeno(1,2,3-cd)pyrene	10.	U
53-70-3	Dibenzo(a,h)anthracene	10.	U
191-24-2	Benzo(g,h,i)perylene	10.	U

AEHA-DLS-SAB
KUWAIT 39-22-L192

SEMIVOLATTLE ORGANICS ANALYSIS DATA SHEET

LCSD No.

R3705

Installation: DOHA

Matrix: XAD-2

Level: Low

Extraction: Soxhlet

Dilution Factor: 1.0

Field Id: XAD-04C

Lab File ID: >SSC05

Date Collected: 11/04/93

Date Received: 11/12/93

Date Extracted: 11/17/93

Date Analyzed: 12/04/93

CONCENTRATION UNITS:

CAS NO.	COMPOUND	UC	Q
91-20-3	Naphthalene	9.	J
91-57-6	2-Methylnaphthalene	3.	J
208-96-8	Acenaphthylene	10.	U
83-32-9	Acenaphthene	10.	U
132-64-9	Dibenzofuran	10.	U
86-73-7	Fluorene	10.	U
85-01-a	Phenanthrene	1.	J
86-74-8	Carbazole	10.	U
120-12-T	Anthracene	10.	U
206-44-o	Fluoranthene	10.	U
129-00-0	Pyrene	10.	U
56-55-3	Benzo(a)anthracene	10.	U
218-01-g	Chrysene	10.	U
205-99-2	Benzo(b)fluoranthene	10.	U
207-08-g	Benzo(k)fluoranthene	10.	U
50-32-8	Benzo(a)pyrene	10.	U
193-39-5	Indeno(1,2,3-cd)pyrene	10.	U
53-70-3	Dibenzo(a,h)anthracene	10.	U
191-24-2	Benzo(g,h,i)perylene	10.	U

AEHA-DLS-SAB
KUWAIT 39-22-L192

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

LCSD No.

R3706

Installation: DOHA

Matrix: XAD-2

Level: Low

Extraction: Soxhlet

Dilution Factor: 1.0

Field Id: XAD-03C

Lab File ID: >SSC12

Date Collected: 11/03/93

Date Received: 11/12/93

Date Extracted: 11/16/93

Date Analyzed: 12/06/93

CONCENTRATION UNITS:

CAS NO.	COMPOUND	UG	Q
91-20-3	Naphthalene	15.	
91-57-6	2-Methylnaphthalene	7.	J
208-96-a	Acenaphthylene	10.	U
83-32-g	Acenaphthene	10.	U
132-64-9	Dibenzofuran	10.	U
86-73-7	Fluorene	10.	U
85-01-8	Phenanthrene	2.	J
86-74-8	Carbazole	10.	U
120-12-7	Anthracene	10.	U
206-44-o	Fluoranthene	10.	U
129-00-0	Pyrene	10.	U
56-55-3	Benzo(a) anthracene	10.	U
218-01-g	Chrysene	10.	U
205-99-2	Benzo(b)fluoranthene	10.	U
207-08-g	Benzo(k)fluoranthene	10.	U
50-32-8	Benzo(a)pyrene	10.	U
193-39-5	Indeno(1,2,3-cd)pyrene	10.	U
53-70-3	Dibenzo(a,h)anthracene	10.	U
191-24-2	Benzo(g,h,i)perylene	10.	U

AEHA-DLS-SAB
KUWAIT 39-22-L192

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

LCSD No.

R3707

Installation: DOHA

Matrix: XAD-2

Level: Low

Extraction: Soxhlet

Dilution Factor: 1.0

Field Id: XAD-02TB

Lab File ID: >SSC13

Date collected: 11/08/93

Date Received: 11/12/93

Date Extracted: 11/18/93

Date Analyzed: 12/06/93

CONCENTRATION UNITS:

CAS NO.	COMPOUND	uG	Q
91-20-3	Naphthalene	10.	U
91-57-6	2-Methylnaphthalene	10.	U
208-96-8	Acenaphthylene	10.	U
83-32-9	Acenaphthene	10.	U
132-64-9	Dibenzofuran	10.	U
86-73-7	Fluorene	10.	U
85-01-8	Phenanthrene	10.	U
86-74-8	Carbazole	10.	U
120-12-7	Anthracene	10.	U
206-44-o	Fluoranthene	10.	U
129-00-O	Pyrene	10.	U
56-55-3	Benzo(a)anthracene	10.	U
218-01-g	Chrysene	10.	U
205-99-2	Benzo(b)fluoranthene	10.	U
207-08-g	Benzo(k)fluoranthene	10.	U
50-32-8	Benzo(a)pyrene	10.	U
193-39-5	Indeno(1,2,3-cd)pyrene	10.	U
53-70-3	Dibenzo(a,h)anthracene	10.	U
191-24-2	Benzo(g,h,i)perylene	10.	U

AEHA-DLS-SAB
KUWAIT 39-22-L192

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

LCSD No.

R3708

Installation: DOHA

Matrix: XAD-2

Level: Low

Extraction: Soxhlet

Dilution Factor: 1.0

Field Id: XAD-028

Lab File ID: >SSC14

Date Collected: 11/08/93

Date Received: 11/12/93

Date Extracted: 11/22/93

Date Analyzed: 12/06/93

CONCENTRATION UNITS:

CAS NO.	COMPOUND	uG	Q
91-20-3	Naphthalene	10.	U
91-57-6	2-Methylnaphthalene	10.	U
208-96-8	Acenaphthylene	10.	U
83-32-9	Acenaphthene	10.	U
132-64-g	Dibenzofuran	10.	U
86-73-7	Fluorene	10.	U
85-01-8	Phenanthrene	10.	U
86-74-8	Carbazole	10.	U
120-12-7	Anthracene	10.	U
206-44-0	Fluoranthene	10.	U
129-00-0	Pyrene	10.	U
56-55-3	Benzo(a)anthracene	10.	U
218-01-9	Chrysene	10.	U
205-99-2	Benzo(b)fluoranthene	10.	U
207-08-g	Benzo(k)fluoranthene	10.	U
50-32-8	Benzo(a)pyrene	10.	U
193-39-5	Indeno(1,2,3-cd)pyrene	10.	U
53-70-3	Dibenzo(a,h)anthracene	10.	U
191-24-2	Benzo(g,h,i)perylene	10.	U

AEHA-DLS-SAB
KUWAIT 39-22-L192

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

LCSD No.

R3709

Installation: KHOBAR

Field Id: XAD-07

Matrix: XAD-2

Lab File ID: >SSC15

Level: Low

Date Collected: 11/07/93

Extraction: Soxhlet

Date Received: 11/12/93

Dilution Factor: 1.0

Date Extracted: 11/22/93

Date Analyzed: 12/06/93

CONCENTRATION UNITS:

CAS NO.	COMPOUND	uG	Q
91-20-3	Naphthalene	64.	
91-57-6	2-Methylnaphthalene	28.	
208-96-a	Acenaphthylene	10.	U
83-32-g	Acenaphthene	10.	U
132-64-9	Dibenzofuran	1.	J
86-73-7	Fluorene	1.	J
85-01-8	Phenanthrene	3.	J
86-74-8	Carbazole	10.	U
120-12-7	Anthracene	10.	U
206-44-o	Fluoranthene	10.	U
129-00-0	Pyrene	10.	U
56-55-3	Benzo(a)anthracene	10.	U
218-01-g	Chrysene	10.	U
205-99-2	Benzo(b)fluoranthene	10.	U
207-08-g	Benzo(k)fluoranthene	10.	U
50-32-8	Benzo(a)pyrene	10.	U
193-39-s	Indeno(1,2,3-cd)pyrene	10.	U
53-70-3	Dibenzo(a,h)anthracene	10.	U
191-24-2	Benzo(g,h,i)perylene	10.	U

AEHA-DLS-SAB
KUWAIT 39-22-L192

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

LCSD No.

R3710

Installation: KHOBAR ,

Field Id: XAD-06

Matrix: XAD-2

Lab File ID: >SSC16

Level: Low

Date Collected: 11/07/93

Extraction: Soxhlet

Date Received: 11/12/93

Dilution Factor: 1.0

Date Extracted: 11/22/93

Date Analyzed: 12/07/93

CONCENTRATION UNITS:

CAS NO.	COMPOUND	uG	Q
91-20-3	Naphthalene	37.	
91-57-6	2-Methylnaphthalene	18.	
208-96-8	Acenaphthylene	10.	U
83-32-9	Acenaphthene	10.	U
132-64-9	Dibenzofuran	1.	J
86-73-7	Fluorene	1.	J
85-01-8	Phenanthrene	3.	J
86-74-8	Carbazole	10.	U
120-12-7	Anthracene	10.	U
206-44-o	Fluoranthene	10.	U
129-00-0	Pyrene	10.	U
56-55-3	Benzo(a)anthracene	10.	U
218-01-9	Chrysene	10.	U
20s-99-2	Benzo(b) fluoranthene	10.	U
207-08-9	Benzo(k)fluoranthene	10.	U
so-32-8	Benzo(a)pyrene	10.	U
193-39-5	Indeno(1,2,3-cd)pyrene	10.	U
53-70-3	Dibenzo(a,h)anthracene	10.	U
191-24-2	Benzo(g,h,i)perylene	10:	U

AEHA-DLS-SAB
KUWAIT 39-22-L192

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

LCSD No.

R3711

Installation: KHOBAR

Matrix: XAD-2

Level: Low

Extraction: Soxhlet

Dilution Factor: 1.0

Field Id: XAD-09

Lab File ID: >SSC17

Date Collected: 11/07/93

Date Received: 11/12/93

Date Extracted: 11/22/93

Date Analyzed: 12/07/93

CONCENTRATION UNITS:

CAS NO.	COMPOUND	uG	Q
91-20-3	Naphthalene	29.	
91-57-6	2-Methylnaphthalene	14.	
208-96-a	Acenaphthylene	10.	U
83-32-9	Acenaphthene	10.	U
132-64-9	Dibenzofuran	10.	U
86-73-7	Fluorene	10.	U
85-01-8	Phenanthrene	2.	J
86-74-8	Carbazole	10.	U
120-12-7	Anthracene	10.	U
206-44-0	Fluoranthene	10.	U
129-00-0	Pyrene	10.	U
56-55-3	Benzo(a)anthracene	10.	U
218-01-g	Chrysene	10.	U
205-99-2	Benzo(b)fluoranthene	10.	U
207-08-g	Benzo(k)fluoranthene	10.	U
50-32-8	Benzo(a)pyrene	10.	U
193-39-5	Indeno(1,2,3-cd)pyrene	10.	U
53-70-3	Dibenzo(a,h)anthracene	10.	U
191-24-2	Benzo(g,h,i)perylene	10.	U
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AEHA-DLS-SAB
KUWAIT 39-22-L192

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

LCSD No.

R3712

Installation: KHOBAR

Field Id: XAD-10

Matrix: XAD-2

Lab File ID: >SSC18

Level: Low

Date Collected: 11/07/93

Extraction: Soxhlet

Date Received: 11/12/93

Dilution Factor: 1.0

Date Extracted: 11/22/93

Date Analyzed: 12/07/93

CONCENTRATION UNITS:

CAS NO.	COMPOUND	uG	Q
91-20-3	Naphthalene	44.	
91-57-6	2-Methylnaphthalene	25.	
208-96-8	Acenaphthylene	10.	U
83-32-9	Acenaphthene	10.	U
132-64-9	Dibenzofuran	10.	U
86-73-7	Fluorene	10.	U
85-01-8	Phenanthrene	2.	J
86-74-8	Carbazole	10.	U
120-12-7	Anthracene	10.	U
206-44-o	Fluoranthene	10.	U
129-00-0	Pyrene	10.	U
56-55-3	Benzo(a)anthracene	10.	U
218-01-g	Chrysene	10.	U
205-99-2	Benzo(b)fluoranthene	10.	U
207-08-9	Benzo(k)fluoranthene	10.	U
50-32-8	Benzo(a)pyrene	10.	U
193-39-5	Indeno(1,2,3-cd)pyrene	10.	U
53-70-3	Dibenzo(a,h)anthracene	10.	U
191-24-2	Benzo(g,h,i)perylene	10.	U

AEHA-DLS-SAB
KUWAIT 39-22-L192

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

LCSD No.

R3713

Installation: KHOBAR

Matrix: XAD-2

Level: Low

Extraction: Soxhlet

Dilution Factor: 1.0

Field Id: XAD-08

Lab File ID: >SSC19

Date collected: 11/07/93

Date Received: 11/12/93

Date Extracted: 11/23/93

Date Analyzed: 12/07/93

CONCENTRATION UNITS:

CAS NO.	COMPOUND	uG	Q
91-20-3	Naphthalene	40.	
91-57-6	2-Methylnaphthalene	20.	
208-96-a	Acenaphthylene	10.	U
83-32-9	Acenaphthene	10.	U
132-64-9	Dibenzofuran	10.	U
86-73-7	Fluorene	1.	J
85-01-S	Phenanthrene	2.	J
86-74-8	Carbazole	10.	U
120-12-7	Anthracene	10.	U
206-44-o	Fluoranthene	10.	U
129-00-0	Pyrene	10.	U
56-55-3	Benzo(a)anthracene	10.	U
218-01-9	Chrysene	10.	U
205-99-2	Bento(b)fluoranthene	10.	U
207-08-g	Benzo(k)fluoranthene	10.	U
50-32-B	Benzo(a)pyrene	10.	U
193-39-5	Indeno(1,2,3-cd)pyrene	10.	U
53-70-3	Dibenzo(a,h)anthracene	10.	U
191-24-2	Benzo(g,h,i)perylene	10.	U

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KUWAIT 39-22-L192

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

LCSD No.

R3714

Installation: KHOBAR ,

Field Id: XAD-11

Matrix: XAD-2

Lab File ID: >SSC02

Level: Low

Date Collected: 11/07/93

Extraction: Soxhlet

Date Received: 11/12/93

Dilution Factor: 1.0

Date Extracted: 11/23/93

Date Analyzed: 12/03/93

CONCENTRATION UNITS:

CAS NO.	COMPOUND	uG	Q
91-20-3	Naphthalene	10.	U
91-57-6	2-Methylnaphthalene	10.	U
208-96-S	Acenaphthylene	10.	U
83-32-9	Acenaphthene	10.	U
132-64-9	Dibenzofuran	10.	U
86-73-7	Fluorene	10.	U
85-01-S	Phenanthrene	10.	U
86-74-8	Carbazole	10.	U
120-12-7	Anthracene	10.	U
206-44-0	Fluoranthene	1 0 .	U
129-00-0	Pyrene	10.	U
56-55-3	Benzo(a)anthracene	10.	U
218-01-9	Chrysene	10.	U
205-99-2	Benzo(b)fluoranthene	10.	U
207-08-9	Benzo(k)fluoranthene	10.	U
50-32-8	Benzo(a)pyrene	10.	U
193-39-5	Indeno(1,2,3-cd) pyrene	10.	U
53-70-3	Dibenzo(a.h)anthracene	10.	U
191-24-2	Benzo(g,h,i)perylene	10.	U

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KUWAIT 39-22-L192

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

LCSD No,.

R3715

Installation: KHOBAR

Matrix: XAD-2

Level: Low

Extraction: Soxhlet

Dilution Factor: 1.0

Field Id: XAD-05

Lab File ID: >SSC01

Date Collected: 11/07/93

Date Received: 11/12/93

Date Extracted: 11/23/93

Date Analyzed: 12/07/93

CONCENTRATION UNITS: UG

CAS NO.	COMPOUND		Q
91-20-3	Naphthalene	25.	
91-57-6	2-Methylnaphthalene	11.	
208-96-a	Acenaphthylene	10.	U
83-32-9	Acenaphthene	10.	U
132-64-9	Dibenzofuran	1.	J
86-73-7	Fluorene	1.	J
85-01-8	Phenanthrene	3.	J
86-74-8	Carbazole	10.	U
120-12-7	Anthracene	10.	U
206-44-0	Fluoranthene	10.	U
129-00-0	Pyrene	10.	U
56-55-3	Benzo(a)anthracene	10.	U
218-01-g	Chrysene	10.	U
205-99-2	Benzo(b)fluoranthene	10.	U
207-08-9	Benzo(k)fluoranthene	10.	U
50-32-S	Benzo(a)pyrene	10.	U
193-39-8	Indeno(1,2,3-cd)pyrene	10.	U
53-70-3	Dibenzo(a,h)anthracene	10.	U
191-24-2	Benzo(g,h,i)perylene	10.	U

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KUWAIT 39-22-L192

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

LCSD No.

R3716

Installation: DOHA

Matrix: XAD-2

Level: Low

Extraction: Soxhlet

Dilution Factor: 1.0

Field Id: XAD-01C

Lab File ID: >SSC09

Date Collected: 11/01/93

Date Received: 11/12/93

Date Extracted: 11/16/93

Date Analyzed: 12/04/93

CONCENTRATION UNITS:

CAS NO.	COMPOUND	uG	Q
91-20-3	Naphthalene	23.	
91-57-6	2-Methylnaphthalene	10.	J
208-96-8	Acenaphthylene	10.	U
83-32-9	Acenaphthene	10.	U
132-64-9	Dibenzofuran	10.	U
86-73-7	Fluorene	10.	U
85-01-8	Phenanthrene	2.	J
86-74-8	Carbazole	10.	U
120-12-7	Anthracene	10.	U
206-44-0	Fluoranthene	10.	U
129-00-0	Pyrene	10.	U
56-55-3	Benzo(a)anthracene	10.	U
218-01-9	Chrysene	10.	U
205-99-2	Benzo(b)fluoranthene	10.	U
207-08-g	Benzo(k)fluoranthene - I	10.	U
50-32-8	Benzo(a) pyrene	10.	U
193-39-5	Indeno(1,2,3-cd)pyrene	10.	U
53-70-3	Dibenzo(a,h)anthracene	10.	U
191-24-2	Benzo(g,h,i)perylene	10.	U

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KUWAIT 39-22-L192

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

LCSD No.

R3717

Installation: DOHA

Matrix: XAD-2

Level: Low

Extraction: Soxhlet

Dilution Factor: 1.0

Field Id: XAD-02C

Lab File ID: >SSC08

Date Collected: 11/02/93

Date Received: 11/12/93

Date Extracted: 11/16/93

Date Analyzed: 12/04/93

CONCENTRATION UNITS:

CAS NO.	COMPOUND	uG	Q
91-20-3	Naphthalene	29.	
91-57-6	2-Methylnaphthalene	13.	
208-96-8	Acenaphthylene	10.	U
83-32-9	Acenaphthene	10.	U
132-64-9	Dibenzofuran	10.	U
86-73-7	Fluorene	10.	U
85-01-8	Phenanthrene	3.	J
86-74-8	Carbazole	10.	U
120-12-7	Anthracene	10.	U
206-44-o	Fluoranthene	10.	U
129-00-O	Pyrene	10.	U
56-55-3	Benzo(a)anthracene	10.	U
218-01-B	Chrysene	10.	U
205-99-2	Benzo(b)fluoranthene	10.	U
207-08-g	Benzo(k)fluoranthene	10.	U
50-32-8	Benzo(a)pyrene	10.	U
193-39-5	Indeno(1,2,3-cd)pyrene	10.	U
53-70-3	Dibenzo(a,h)anthracene	10.	U
191-24-2	Benzo(g,h,i)perylene	10.	U

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SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

LCSD No.

I R3718

Installation: DOHA

Field Id: XAD-03FB

Matrix: XAD-2

Lab File ID: >SSC07

Level: Low

Date Collected: 11/03/93

Extraction: Soxhlet

Date Received: 11/12/93

Dilution Factor: 1.0

Date Extracted: 11/16/93

Date Analyzed: 12/04/93

CONCENTRATION UNITS:

CAS NO.	COMPOUND	uG	Q
91-20-3	Naphthalene	10.	U
91-57-6	2-Methylnaphthalene	10.	U
208-96-8	Acenaphthylene	10.	U
83-32-9	Acenaphthene	10.	U
132-64-9	Dibenzofuran	10.	U
86-73-7	Fluorene	10.	U
85-01-8	Phenanthrene	10.	U
86-74-8	Carbazole	10.	U
120-12-7	Anthracene	10.	U
206-44-0	Fluoranthene	10.	U
129-00-0	Pyrene	10.	UJ
56-55-3	Benzo(a)anthracene	10.	U
218-01-9	Chrysene	10.	U
205-99-2	Benzo(b)fluoranthene	10.	U
207-08-9	Benzo(k)fluoranthene	10.	UJ
50-32-8	Benzo (a)pyrene	10.	U
193-39-5	Indeno(1,2,3-cd)pyrene	10.	U
53-70-3	Dibenzo(a,h)anthracene	10.	U
191-24-2	Benzo(g,h,i)perylene	10.	U

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KUWAIT 39-22-L192

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

LCSD No.

R3719

Installation: DOHA

Matrix: XAD-2

Level: Lou

Extraction: Soxhlet

Dilution Factor: 1.0

Field Id: XAD-03B

Lab File ID: >SSC06

Date Collected: 11/03/93

Date Received: 11/12/93

Date Extracted: 11/16/93

Date Analyzed: 12/04/93

CONCENTRATION UNITS: uG

CAS NO.	COMPOUND			Q
91-20-3	Naphthalene		10.	U
91-57-6	2-Methylnaphthalene		10.	U
208-96-8	Acenaphthylene		10.	U
83-32-9	Acenaphthene		10.	U
132-64-9	Dibenzofuran		10.	U
86-73-7	Fluorene		10.	U
85-01-8	Phenanthrene		10.	U
86-74-8	Carbazole	I	10.	U
120-12-7	Anthracene		10.	U
206-44-o	Fluoranthene		10.	U
129-00-0	Pyrene		10.	U
56-55-3	Benzo(a)anthracene		10.	U
218-01-9	Chrysene		10.	U
205-99-2	Benzo(b)fluoranthene		10.	U
207-08-g	Benzo(k)fluoranthene		10.	U
50-32-8	Benzo(a)pyrene		10.	U
193-39-5	Indeno(1,2,3-cd)pyrene		10.	U
53-70-3	Dibenzo(a,h)anthracene		10.	U
191-24-2	Benzo(g,h,i)perylene		10.	U

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KUWAIT 39-22-L192

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

LCSD No.

R3720

Installation: KHOBAR

Matrix: XAD-2

Level: Low

Extraction: Soxhlet

Dilution Factor: 1.0

Field Id: XAD-01

Lab File ID: >SSC04

Date Collected: 11/02/93

Date Received: 11/12/93

Date Extracted: 11/17/93

Date Analyzed: 12/04/93

CONCENTRATION UNITS:

CAS NO.	COMPOUND	UG	Q
91-20-3	Naphthalene	44.	
91-57-6	2-Methylnaphthalene	20.	
208-96-8	Acenaphthylene	10.	U
83-32-9	Acenaphthene	2.	J
132-64-9	Dibenzofuran	2.	J
86-73-7	Fluorene	2.	J
85-01-8	Phenanthrene	4.	J
86-74-8	Carbazole	10.	U
120-12-7	Anthracene	10.	U
206-44-o	Fluoranthene	10.	U
129-00-0	Pyrene	10.	U
56-55-3	Benzo(a)anthracene	10.	U
218-01-9	Chrysene	10.	U
205-99-2	Benzo(b)f luoranthene	10.	U
207-08-9	Benzo(k)fluoranthene	10.	U
SO-32-8	Benzo(a)pyrene	10.	U
193-39-5	Indeno(1,2,3-cd)pyrene	10.	U
53-70-3	Dibenzo(a,h)anthracene	10.	U
191-24-2	Benzo(g,h,i)perylene	10.	U

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SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

LCSD No.

R3721

Installation: KHOBAR

Field Id: XAD-02

Matrix: XAD-2

Lab File ID: >SSC03

Level: Low

Date Collected: 11/03/93

Extraction: Soxhlet

Date Received: 11/12/93

Dilution Factor: 1.0

Date Extracted: 11/17/93

Date Analyzed: 12/04/93

CONCENTRATION UNITS: uG

CAS NO.	COMPOUND		Q
91-20-3	Naphthalene	6.	J
91-57-6	2-Hethylnaphthalene	2.	J
208-96-8	Acenaphthylene	10.	U
83-32-9	Acenaphthene	10.	U
132-64-9	Dibenzofuran	10.	U
86-73-7	Fluorene	10.	U
85-01-8	Phenanthrene	1.	J
86-74-8	Carbazole	10.	U
120-12-7	Anthracene	10.	U
206-44-o	Fluoranthene	10.	U
129-00-0	Pyrene	10.	U
56-55-3	Benzo(a)anthracene	10.	U
218-01-9	Chrysene	10.	U
205-99-2	Benzo(b)fluoranthene	10.	U
207-08-g	Benzo(k)fluoranthene	10.	U
50-32-8	Benzo(a)pyrene	10.	U
193-39-5	Indeno(1,2,3-cd)pyrene	10.	U
53-70-3	Dibenzo(a,h)anthracene	10.	U
191-24-2	Benzo(g,h,i)perylene	10.	U

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KUWAIT 39-22-L192

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

LCSD No.

R3722

Installation: Kuwait

Matrix: XAD-2

Level: Low

Extraction: Soxhlet

Dilution Factor: 1.0

Field Id: XAD-03

Lab File ID: >SSC02

Date Collected: 11/04/93

Date Received: 11/12/93

Date Extracted: 11/17/93

Date Analyzed: 12/04/93

CONCENTRATION UNITS:

CAS NO.	COMPOUND	UG	Q
91-20-3	Naphthalene	10.	U
91-57-6	2-Methylnaphthalene	10.	U
208-96-s	Acenaphthylene	10.	U
83-32-9	Acenaphthene	10.	U
132-64-9	Dibenzofuran	10.	U
86-73-7	Fluorene	10.	U
85-01-8	Phenanthrene	10.	U
86-74-8	Carbazole	10.	U
120-12-7	Anthracene	10.	U
206-44-o	Fluoranthene	10.	U
129-00-0	Pyrene	10.	U
56-55-3	Benzo(a)anthracene	10.	U
218-01-9	Chrysene	10.	U
205-99-2	Benzo(b)fluoranthene	10.	U
207-08-g	Benzo(k)fluoranthene	10.	U
50-32-8	Benzo(a)pyrene	10.	U
193-39-5	Indeno(1,2,3-cd)pyrene	10.	U
53-70-3	Dibenzo(a,h)anthracene	10.	U
191-24-2	Benzo(g,h,i)perylene	10.	U

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KUWAIT 39-22-L192

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

LCSD No.

R3723

Installation: KHOBAR ,

Matrix: XAD-2

Level: Low

Extraction: Soxhlet

Dilution Factor: 1.0

Field Id: XAD-04

Lab File ID: >SSC01

Date Collected: 11/04/93

Date Received: 11/12/93

Date Extracted: 11/17/93

Date Analyzed: 12/04/93

CONCENTRATION UNITS:

CAS NO.	COMPOUND		uG	Q
91-20-3	Naphthalene	I	10.	U
91-57-6	2-Methylnaphthalene		10.	U
208-96-8	Acenaphthylene		10.	U
83-32-9	Acenaphthene		10.	U
132-64-9	Dibenzofuran		10.	U
86-73-7	Fluorene		10.	U
85-01-8	Phenanthrene		10.	U
86-74-8	Carbazole		10.	U
120-12-7	Anthracene		10.	U
206-44-0	Fluoranthene		10.	U
129-00-0	Pyrene		10.	U
56-55-3	Benzo (a)anthracene		10.	U
218-01-9	Chrysene		10.	U
205-99-2	Benzo(b)fluoranthene		10.	U
207-08-9	Benzo(k)fluoranthene		10.	U
50-32-8	Benzo(a)pyrene		10.	U
193-39-5	Indeno(1,2,3-cd)pyrene		10.	U
53-70-3	Dibenzo(a,h)anthracene		10.	U
191-24-2	Benzo(g,h,i)perylene		10.	U

ANNEX E-20

ANALYTICAL METHODOLOGY AND QUALITY ASSURANCE FOR THE ANALYSIS OF WATER SOLUBLE HEXAVALENT CHROMIUM IN SOIL

I. Method of Analysis. Two totally diverse methods were used in the analysis of soil samples for hexavalent chromium. The HACH Company recently developed a field procedure for the analysis of hexavalent chromium (CrVI) in soil (reference 1-2). This commercially available colorimetric screening field test kit was used for the screening of CrVI. Also a method for the on site extraction and fixation of water soluble hexavalent chromium salts onto small disposable C18 chromatographic cartridges was used. These cartridges were sent to an analytical laboratory for the analysis of hexavalent chromium (reference 3-4).

A. HACH Kit Field Screening.

1. Principle. Reagents and supplies are provided in a field screening test kit Cat. No. 24618-00 obtained from the HACH Co. A 40 mL volume of aqueous alkaline solution is added to 20 grams of soil. Water soluble hexavalent chromium salts present in the soil sample are extracted and filtered. A 10 mL aliquot of the filtrate is brought to a 25 mL volume with deionized water. An acid buffered color reagent containing 1,5-diphenylcarbazide is added to this 25 mL sample. Cr(VI) is determined colorimetrically by measuring the red-violet color intensity produced from the reaction. Maximum absorbance for this chromaphore is achieved at 540 nm. The color intensity is measured using a visual handheld color comparator provided with the kit. A detection level of 100 ppb was reported.

2. Method Evaluation. To demonstrate the capability of the test kit, soil samples collected during the 1991 survey of Kuwait and Saudi Arabia, a standard quality control soil and a local soil containing high organic matter were spiked using the 50 mg/L chromium standard provided with the HACH field test. It was determined from the results of these initial spikes that the method using the reagents as provided with the kit simply did not work. Following continued investigations it was determined that the proportions of reagents as provided in the kit were not in the correct ratio to produce a reaction and color development. A chromaphore formation or color reaction only occurs between CrVI and diphenylcarbazide in a narrow acid pH range of 1 to 2 (reference 5). Since the soils that were spiked were of a neutral or slightly alkaline pH, the 1 gram prepackaged amount of the alkaline extraction reagent provided with the kit made the sample too alkaline. Therefore, with the addition of the acid buffered color reagent that was intended to bring the pH down into a 1 to 2 acid pH range to allow for color formation, a pH reduction to only pH 7 or neutrality was achieved which resulted in no color formation. With a reduction of the amount of the extraction reagent from 1 gram to 200 mg, the correct pH range was obtained and a color reaction was achieved between the CrVI and the color reagent.

a. Following the above mentioned method modification, an evaluation using recovery of spiked or fortified samples continued in an attempt to determine the accuracy and precision of the method.

b. Another modification was made to the procedure in order to reduce analysis time. This was accomplished by replacing the slower gravimetric filtration with a vacuum assisted filtration process.

c. A change in the procedure was made in adding the extraction reagent directly to the soil sample rather than first dissolving it in distilled/deionized water. The method called for dissolving the reagent in water first and then adding the 40 mL solution to the sample. This change was also initiated to shorten the analytical time.

d. The use of a spectrophotometer rather than a hand held color comparator was investigated. A linear range from 125 ppb through 1250 ppb CrVI in soil was examined.

e. An investigation was also initiated to demonstrate analyte specificity for CrVI and the extent of interferant ions.

f. One last endeavor was to investigate the use of this method for the determination of total chromium.

3. In Country Spiking.

a. While in Kuwait, 50 composite soil samples collected from selected sites were spiked with 250 ppb of CrVI. These samples were stored at room temperature in clear plastic bags unprotected from Light and analyzed over a 31-day timeframe in an attempt to determine the holding time or shelf life for CrVI in soil. Additionally, spikes were made using soils collected from each sample site and analyzed with the samples collected from that site.

b. All sample sites in Saudi Arabia were also spiked and analyzed with the samples collected from that particular location.

B. Field Fixation.

1. Method Principle. A 50 mL volume of aqueous extracting solution is added to a known weight of soil. This water and soil mixture is filtered through 10 μ filters. The filtrate is then passed through C-18 Sep Pac® cartridges that were impregnated with tributyltin chloride (TBT). The CrVI is bound by the TBT and retained on the resin in the cartridge as per the reference. Following collection, these cartridges were sent to an analytical laboratory in the States and analyzed for chromium.

2. Method Evaluation. All evaluations concerning this field fixation procedure were conducted by the contractor(5) that provided the methodology. The resulting data and information on this procedure will be provided in a report furnished by the contractor.

3. In Country Spiking. Spiking of each sample set with concentrations of CrVI was conducted in country. These spikes were analyzed by the laboratory that developed the procedure after the survey team returned to the states.

II. Investigative Results.

A. HACH Kit.

1. Soil spiking over a 100 ppb to 1250 ppb range conducted prior to the survey resulted in recoveries from 80% to 100% with a mean recovery of 91%. Insufficient data was obtained to provide a good precision statement for this procedure, but it is estimated to be ±10%. This analytical spiking range was also shown to be within the linear range of the method.

2. The vacuum filtration and the other modifications made to the procedure reduced the analysis time by more than 50%. With these changes, it was possible to analyze a set of 10 samples in approximately 1 hour.

3. The use of a portable spectrophotometer worked very well for the measurement of the absorbance of water spikes; however, light scatter caused by the unfiltered particulate matter present in the sample following filtration of soil spike caused an increase in the absorbance readings and a shift of the calibration curves. As a result, an additional step to remove this particulate matter would be required for use of the spectrophotometer.

4. Analyzing soil samples spiked with chromium with valance states other than VI, revealed that this colorimeteric method was specific for CrVI. It was also determined that the method was not interference free and high concentrations of iron could cause a reduction in the color response for chrome VI. This interferant issue was addressed by preparing calibration curves in the soil matrix that was being tested and also by conducting standard additions on all positive samples.

5. The possible analysis of total chromium was indicated by adding 100 uB of 4% potassium permanganate ($KMnO_4$) to filtered samples spiked with trivalent chromium. The analysis of the total soluble chromium content could possibly be determined using this method with the use of $KMnO_4$ to oxidize all soluble chromium to CrVI valence state and then analyzing as such (reference 5).

B. Field Fixation. There is no information on the presurvey evaluation of this procedure available at this time and will be provided by the contractor.

III. Results and Quality Control.

A. HACH.

1. Results from the in Country soil screening for chrome VI using the HACH field test kit are provided in Table I for the Kuwait sample sites and in Table II for the Saudi Arabia sites.

2. In Country spiking results are provided in Table III.

3. The results of analysis of spiked soil that was conducted over a 31 day time frame are provided in Table IV.

B. Field Fixation.

1. Analytical results obtained from the analysis of soil samples using this method are provided in Table V.

2. Control results of spikes that were conducted in Country are also provided in Table VI.

IV. Conclusions and Recommendations.

A. HACH. The CrVI screening using this procedure seemed to work very well providing 100 ppb detection of CrVI in soil. It provided ease of operation and offered reliability as indicated from sample spiking. Recovery of the field spikes produced a mean recovery of 83 % ± 11 A. Additional analytical testing should be conducted using this procedure to determine the exact extent of interferences, establishing more complete accuracy and precision data, use of KMnO4 for the determination total chromium content and possibly investigating lowering of the detection level of the method. Overall, the method provided a good field screening procedure for water soluble CrVI salts present in soil. The 31 day stability study indicated a 36% reduction in CrVI during the first three days and then only an additional 16% loss over the next 28 days. At the end of 31 days, 52% of the spiked CrVI was detected. This demonstrated that the analysis for VrVI in soil should be conducted as soon after collection as possible if the samples are stored as were these spiked soils.

B. Field Fixation. This procedure also provided acceptable results as indicated from the field spiking data. Overall recoveries of 120% ± 30 % were achieved from the in field spikes. With this method a much lower reported detection level of 3 ppb was reported, but at a much greater cost per sample when compared to cost per sample of the HACH procedure. At this time, no data supporting the developers claims of detection levels and or precision or accuracy achieved during their method evaluation have been provided. One concern with this procedure is the toxicity and the potential hazard associated with the use of TBT. A

significant odor detected during sample preparation which was thought to be TBT being washed from the impregnated C18 Sep Pac. Also, the filters used with this procedure quickly clogged making the completion of the filtration step very arduous and time consuming.

REFERENCES

1. HACH Company, P.O. Box 389, Loveland, CO 80539.

2. DeYong, Gregory et al., Determination of Hexavalent Chromium in Soil Samples, Superfund '90 Proceedings of the 11th National Conference, Greenbelt, MD 20770.

3. R.J. Lee Inc., Monroeville, PA 15146.

4. Morocco, Mania T., et al, Pre-Concentration of Aqueous Hexavalent Chromium Using Tributyltin Chloride Immobilized on C18 Cartridges, Journal of Analytical Atomic Spectrometry, February 1990, Vol.5, pp. 29-33.

5. Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992, Chromium VI Colormetric Method, pp. 3-59 to 360.

CHROMIUM IN SOIL

SAMPLE FIELD #	SAMPLE DEPTH	SAMPLE SITE	DISC READING (MG/L)	CHROMIUM (PPB)
CT14-1	0"-6"	DOHA	< 0.02	<100
CT14-2	0"-6"	DOHA	< 0.02	<100
CT14-3	0"-6"	DOHA	< 0.02	<100
CT14-4	0"-6"	DOHA	< 0.02	<100
CT14-5	0"-6"	DOHA	< 0.02	<100
CT15-1	0"-6"	DOHA	< 0.02	<100
CT15-2	0"-6"	DOHA	< 0.02	<100
CT15-3	0"-6"	DOHA	< 0.02	<100
CT15-4	0"-6"	DOHA	< 0.02	<100
CT15-5	0"-6"	DOHA	< 0.02	<100
CT11-1	0"-6"	DOHA	< 0.02	<100
CT11-2	0"-6"	DOHA	< 0.02	<100
CT11-3	0"-6"	DOHA	< 0.02	<100
CT11-4	0"-6"	DOHA	< 0.02	<100
CT11-5	0"-6"	DOHA	< 0.02	<100
EM13-1	0"-6"	EMBASSY	< 0.02	<100
EM13-1	6"-12	EMBASSY	< 0.02	<100
EM13-1	2'-3'	EMBASSY	< 0.02	<100
EM14-1	0"-6"	EMBASSY	< 0.02	<100
EM14-2	0"-6"	EMBASSY	< 0.02	<100
EM14-3	0"-6"	EMBASSY	< 0.02	<100
EM13-2	0"-6"	EMBASSY	< 0.02	<100
EM13-3	0"-6"	EMBASSY	< 0.02	<100
EM11-1	0"-6"	EMBASSY	< 0.02	<100
EM11-2	0"-6"	EMBASSY	< 0.02	<100
EM11-3	0"-6"	EMBASSY	< 0.02	<100
EM12-1	0"-6"	EMBASSY	< 0.02	<100
EM12-2	0"-6"	EMBASSY	< 0.02	<100
EM12-3	0"-6"	EMBASSY	< 0.02	<100
MH11-T	0"-6"	HOSPITAL	< 0.02	<100
MH11-T	6"-12	HOSPITAL	< 0.02	<100
MH11-T	1'-2'	HOSPITAL	< 0.02	<100
MH11-T	2'-3'	HOSPITAL	< 0.02	<100
MH11-1	0"-6"	HOSPITAL	< 0.02	<100
MH12-1	0"-6"	HOSPITAL	< 0.02	<100
MH13-4	0"-6"	HOSPITAL	< 0.02	<100
AH13-1	0"-6"	AHMADI	< 0.02	<100

* ANALYSIS CONDUCTED USING A HACH HEXAVALENT CHROMIUM FIELD TEST KIT CAT. NO. 24618-00

TABLE I CONTINUED

SAMPLE FIELD #		SAMPLE SITE	READING (MG/L)	CHROMIUM (PPB)
CF11-1	0"-6"	FREEDOM	< 0.02	<100
CF11-1	6"-12"	FREEDOM	< 0.02	<100
CF11-1	1'-2'	FREEDOM	< 0.02	<100
CF11-1	2'-3'	FREEDOM	< 0.02	<100
CF12-1	0"-6"	FREEDOM	< 0.02	<100
CF13-1	0"-6"	FREEDOM	< 0.02	<100

* ANALYSIS CONDUCTED USING A HACH HEXAVALENT CHROMIUM FIELD TEST KIT CAT. NO. 24618-00

TABLE II
FIELD ANALYSIS* FOR HEXAVALENT CHROMIUM IN SOIL

SAMPLE FIELD #	SAMPLE DEPTH	SAMPLE SITE	DISC READING (MG/L)	CHROMIUM (PPB)
BIGAJ	0"–6"	ALJABAIL	< 0.02	<100
AJ11SC	0"–6"	ALJABAIL	< 0.02	<100
AJ12SC	0"–6"	ALJABAIL	< 0.02	<100
AJ13SC	0"–6"	ALJABAIL	< 0.02	<100
AJ14–1	0"–6"	ALJABAIL	< 0.02	<100
AJ14–1	6"–12"	ALJABAIL	< 0.02	<100
AJ14–1	1'–2'	ALJABAIL	< 0.02	<100
AJ14SC	6"–12"	ALJABAIL	< 0.02	<100
AJ14–1	2'–3'	ALJABAIL	< 0.02	<100
AJ14SC	0"–6"	ALJABAIL	< 0.02	<100
AJ14SC	6"–12	ALJABAIL	< 0.02	<100
AJ14SC	1'–2'	ALJABAIL	< 0.02	<100
AJ14SC	2–3'	ALJABAIL	< 0.02	<100
AJ15SC	0"–6"	ALJABAIL	< 0.02	<100
R15A	0"–6"	ESKAN	< 0.02	<100
R15B	0"–6"	ESKAN	< 0.02	<100
R15C	0"–6"	ESKAN	< 0.02	<100
BIGR	0"–6"	ESKAN	< 0.02	<100
R12SC	0"–6"	ESKAN	< 0.02	<100
R13SC	0"–6"	ESKAN	< 0.02	<100
R14SC	0"–6"	ESKAN	< 0.02	<100
R15SC	0"–6"	ESKAN	< 0.02	<100
BIGDA	0"–6"	DHAHRAN	<0.02	<100
DA11SC	0"–6"	DHAHRAN	<0.02	<100
DA11	0"–6"	DHAHRAN	<0.02	<100
DA11	6"–12"	DHAHRAN	<0.02	<100
DA11	1'–2'	DHAHRAN	<0.02	<100
DA11	2'–3'	DHAHRAN	<0.02	<100
DA12SC	0"–6"	DHAHRAN	<0.02	<100
DA14SC	0"–6"	DHAHRAN	<0.02	<100
DA14–1	0"–6"	DHAHRAN	<0.02	<100
DA15SC	0"–6"	DHAHRAN	<0.02	<100
DA15–1	0"–6"	DHAHRAN	<0.02	<100

* ANALYSIS CONDUCTED USING A HACH HEXAVALENT CHROMIUM FIELD TEST KIT CAT. NO. 24618–00

TABLE III
HEXAVALENT CHROMIUM SPIKE RECOVERIES USING A HACH FIELD SCREENING TEST KIT

SAMPLE SPIKE ID	SAMPLE SITE	THEORETICAL CONC PPB	OBSERVED CONC PPB	RECOVERY %
CT14A	DOHA	750	500	67
CT15A	DOHA	750	600	80
CT14B	DOHA	750	600	80
CT15B	DOHA	750	650	87
EM13-1A	EMBASSY*	500	300	60
EM14-2A	EMBASSY*	500	300	60
EM12-2A	EMBASSY*	500	500	100
EM11-3A	EMBASSY*	500	200	40
MH11-TA	HOSPITAL	500	550	110
MH11-1A	HOSPITAL	500	450	85
AH13-1A	HOSPITAL	500	400	80
CF11-1A	FREEDOM	500	500	100
CF11A	FREEDOM	500	400	80
CF11B	FREEDOM	500	400	80
CF11C	FREEDOM	500	300	60
CF11D	FREEDOM	500	450	90
CF11E	FREEDOM	500	450	90
CF11G	FREEDOM	500	450	90
DA14ASC	KHOBAR	250	250	100
DA11A	KHOBAR	250	250	100
AJ15A-SC	JABAIL	250	200	80
BIG-AJ	JABAIL	250	200	80
R15 SPIKE A	ESKAN	250	200	80
R15 SPIKE B	ESKAN	250	250	100
R14 SPIKE	ESKAN	250	250	100
			MEAN %	83
			STD %	11.2

* = Filtration Difficulty Experienced With These Samples

TABLE IV

STABILITY STUDY FOR CHROME VI IN SOIL*

DAY	SPIKE ID	DISC READING (mg/L)	LONG PATH (mg/L)	CHROME VI (ppb)	RECOVERY (%)
I	01	.25	.050	250	100
I	13	.23	.046	230	92
I	04	.25	.050	250	100
I	03	.25	.050	250	100
I	SO	.23	.046	230	92
1	28	.23	.046	230	92
I	02	.25	.050	250	100
					AVG 97 %
2	20	.20	.040	200	80
2	37	.17	.034	170	68
2	14	.18	.036	180	72
2	18	.18	.036	180	72
2	05	.19	.038	190	76
2	10	.20	.040	200	80
2	48	.21	.042	210	84
					AVG 76 %
5	31	.15	.030	150	60
5	30	.15	.030	150	60
5	07	.15	.030	150	60
5	39	.17	.034	170	66
5	29	.15	.030	150	60
5	47	.15	.030	150	60
5	09	.20	.040	200	80
					AVG 64 %
IO	06	.20	.040	200	80
IO	11	.18	,036	180	72
10	I 2	.20	.040	200	80
IO	16	.20	.040	200	80
IO	I 9	.18	.036	180	72
10	33	.18	.036	180	72
IO	34	.18	.036	180	72
					AVG 75 %

* SOIL SPIKED WITH 250 ppb CHROME VI

TABLE IV CONT.

DAY	SPIKE ID	DISC READING (mg/L)	LONG PATH (mg/L)	CHROME VI (ppb)	RECOVERY (%)
17	23	.17	.034	170	68
17	24	.15	.030	150	60
17	32	.17	.034	170	68
17	35	.17	.034	170	68
17	38	.17	.034	170	68
17	43	.12	.024	120	48
17	44	.15	.030	150	60
					AVG 63 %
24	42	.15	.030	150	60
24	41	.15	.030	150	60
24	25	.17	.034	170	65
24	22	.15	.030	150	60
24	08	.17	.034	170	65
24	21	.15	.030	150	60
24	15	.15	.030	150	60
					AVG 61 %
31	17	.13	.026	130	52
31	26	.13	.026	130	52
31	27	.13	.026	130	52
31	45	.13	.026	130	52
31	49	.13	.026	130	52
31	36	.12	.024	120	48
31	40	.15	.030	130	52
31	46	.13	.026	130	52
					AVG 52 %

TABLE V

Results Summary
Water Extractable Hexavalent Chromium in Kuwaiti Sand

Laboratory Sample Id	Bar Code	Client Sample Id	Total Cr (ppb) *	CrVI (ppb) *
605059	RJL0021	(C) AH Comp. (Big Ahmadi)	<17.9	<5.0
605060	RJL0023	(C) AH12 Ahmadi Surf. Comp.	x17.9	<5.0
605061	RJL0024	(C) AH13 Surface Composite	<17.9	<5.0
605073	RJL0045	(C) AJ Composite (Big AJ)	<17.9	<5.0
605075	RJL0047	(C) AJ11 Surface Composite	<17.9	<5.0
605076	RJL0048	(C) AJ12 Surface Composite	<17.9	<5.0
605077	RJL0049	(C) AJ13 Surface Composite	<17.9	<5.0
605079	RJL0051	(C) AJ14 (0-6)	<17.9	<5.0
605080	RJL0053	(C) AJ14 (1-2)	<17.9	<5.0
605081	RJL0054	(C) AJ14 (2-3)	x17.9	<5.0
605074	RJL0052	(C) AJ14 (6-12)	<17.9	<5.0
605078	RJL0050	(C) AJ14 Surface Composite	<17.9	<5.0
605082	RJL0055	(C) AJ15 Surface Composite	<17.9	<5.0
605088	RJL0025	(C) CF Composite (Big CF)	<17.9	<5.0
605089	RJL0027	(C) CF11 Surface Composite	<17.9	<5.0
605090	RJL0028	(C) CF12 Surface Composite	<17.9	<5.0
605091	RJL0029	(C) CF13 Surface Composite	<17.9	<5.0
605126	RJL0009	(C) CT Composite (Big Doha)	<17.9	<5.0
605127	RJL0012	(C) CT11	<17.9	<5.0
605128	RJL0001	(C) CT11-1	<17.9	<5.0
605129	RJL0003	(C) CT11-2	<17.9	<5.0
605130	RJL0004	(C) CT11-3	<17.9	<5.0
605131	RJL0005	(C) CT11-4	c17.9	<5.0
605132	RJL0008	(C) CT11-5	<17.9	<5.0
605133	RJL0006	(C) CT12	<17.9	<5.0
605134	RJL0002	(C) CT13	<17.9	<5.0
605135	RJL0017	(C) CT13 (0-6)	<17.9	<5.0
605182	RJL0010	(C) CT13 (1-2)	47.9	<5.0
605137	RJL0018	(C) CT13 (2-3)	<17.9	<5.0
605136	RJL0007	(C) CT13 (6-12)	<17.9	<5.0
605138	RJL0016	(C) CT14	<17.9	<5.0
605139	RJL0011	(C) CT15	<17.9	<5.0
605102	RJL0035	(C) DA Dhahran Composite (Big DA)	<17.9	<5.0
605104	RJL0038	(C) DA11 (0-6) Composite	<17.9	<5.0
605106	RJL0040	(C) DA11 (1-2) Composite	<17.9	<5.0
605107	RJL0041	(C) DA11 (2-3) Composite	<17.9	<5.0
605105	RJL0039	(C) DA11 (6-12) Composite	47.9	<5.0
605103	RJL0037	(C) DA11 Surface Composite	<17.9	<5.0
605108	RJL0042	(C) DA12 Surface Composite	<17.9	<5.0
605109	RJL0043	(C) DA14 Surface Composite	<17.9	<5.0
605110	RJL0044	(C) DA15 Surface Composite	<17.9	<5.0
605168	RJL0015	(C) EM11 Surface Comp (0-6)	<17.9	<5.0
605169	RJL0069	(C) EM11-1 Surface (0-6)	47.9	<5.0
605 170	RJL0019	(C) EM12 Surface Composite	<17.9	<5.0
6005171	RJL0071	(C) EM12-1 Surface (0-6)	<17.9	<5.0

TABLE V

Results Summary
Water Extractable Hexavalent Chromium in Kuwaiti Sand

Laboratory Sample Id	Bar Code	Client Sample Id	Total Cr (ppb) *	CrVI (ppb) *
605172	RJL0020	(C) EM13 (0-6) Composite	<17.9	<5.0
605174	RJL0064	(C) EM13 (1-2 Composite)	<17.9	<5.0
605175	RJL0065	(C) EM13 (2-3 Composite)	<17.9	<5.0
605173	RJL0062	(C) EM13 (6-12 Composite)	<17.9	<5.0
605176	RJL0072	(C) EM13-1 Surface (0-6)	<17.9	<5.0
605177	RJL0073	(C) EM13-2 Surface (0-6)	<17.9	<5.0
605178	RJL0067	(C) EM14 Surface Composite	<17.9	<5.0
605179	RJL0074	(C) EM14-1 Surface (0-6)	<17.9	<5.0
605167	RJL0014	(C) Embassy Comp. (Big M)	<17.9	<5.0
605144	RJL0058	(C) ES15 Surface Composite	<17.9	<5.0
605143	RJL0057	(C) EV Area Surface Comp.	<17.9	<5.0
605149	RJL0030	(C) MH Composite (Big MH)	<17.9	<5.0
605150	RJL0032	(C) MH11 (Surface CompOS.)	<17.9	<5.0
605151	RJL0033	(C) MH12 Surface Composite	<17.9	<5.0
605152	RJL0034	(C) MH13 Surface Composite	<17.9	<5.0
605180	RJL0013	(C) Spike A Embassy Comp	N/A	9727
605140	RJL0068	(C) Spike B CT (Big Doha)	N/A	85.48
605062	RJL0022	(C) Spike C AH Comp. (Big AH)	N/A	155.65
605092	RJL0026	(C) Spike D-CF Comp. (Big CF)	N/A	180.66
605153	RJL0031	(C) Spike E (Big MH)	WA	107.97
605111	RJL0036	(C) Spike F Big DA Composite	N/A	301.13
605083	RJL0046	(C) Spike G - Big AJ	N/A	159.08

* CrVI in Sand Assuming a 20 g sample and all sample charged onto the Cartridge.
N/A Not applicable

TABLE VI

Results Summary
Water Extractable Hexavalent Chromium in Kuwaiti Sand

Laboratory Sample Id	Bar Code	Client Sample Id	Total Cr (ppb)	CrVI (ppb)	Spike Level (ppb)	% Spike Recovery
605180	RJL0013	(C) Spike A Embassy Comp	N/A	97.27	105.00	92.6%
605140	RJL0068	(C) Spike B CT (Big Doha)	N/A	85.48	103.00	83.0%
605062	RJL0022	(C) Spike C AH Comp. (Big AH)	N/A	155.65	106.00	146.8%
605092	RJL0026	(C) Spike D-CF Comp. (Big CF)	N/A	180.66	115.00	157.1%
605153	RJL0031	(C) Spike E (Big MH)	N/A	10797	110.00	982%
605111	RJL0036	(C) Spike F Big DA Composite	N/A	301.13	209.00	144.1%
605083	RJL0046	(C) Spike G - Big AJ	N/A	159.08	Not Determined	
					Average	120.3%

ANNEX E-21

U.S. ARMY ENVIRONMENTAL HYGIENE AGENCY

METALS ANALYSIS REPORT-KUWAIT PROJECT
SUMMARY Of RESULTS

Report ID.....F2001L.2
Report Seq#....8931
OLS JOB#.....3A0606
Proj. Officer..JACK HELLER
Timekeeping....39-L192
Date.....30 NOV 93

Fifty-four soil samples were received on 18 Nov 93. They were analyzed IAW EPA SW-846 procedures for the listed 14 metals. The data were consistent; the results for calcium, magnesium, iron, and aluminum were greater than 1000 mg/kg. For the toxic metals: chromium, lead, nickel, and vanadium, the results generally ranged from 10 to 80 mg/kg. The arsenic and beryllium values ranged from less than 1 mg/kg to 4 mg/kg. The majority of the values for cadmium were less than 1 mg/kg, and mercury was not detected in any the soil samples. There was a matrix problem with the calcium, sodium, and magnesium technique, however, it was corrected by dilution prior to instrument analysis. The detection limits were dependent on the exact sample size taken. The approximate detection limits in mg/kg on a dry weight basis are listed below:

The analysts were S. Norman, J. Courts, M. Kefauve, W. Lanahan, E. Gordon, M. Buckler, R. Davie, L.C. Thompson, B. O'Donnell, and M. Burns.

---Analytical Results - Final Branch Report -
U.S. Army Environmental Hygiene Agency
Directorate of Laboratory Sciences
Aberdeen Proving Grounds, MD 21010-5422

Report ID....: R2001C.4
Report Seq#..: 8960
Generated by.: SNORMAN

Note: This report shall not be reproduced except in full, without the written approval of the laboratory.

DLS Job.....: 3A0606
DLS Job Status: 0 - WORK REQUEST LOGGED IN
Proj. Officer.: JACK HELLER
Timekeeping#..: 39-22-L192
Installation..: KUWAIT

Lab Status: ALL RESULTS RELEASED BY LAB MAB 30-NOV-93

Signature.: Lillian L. Boyd for 11/30/93
MR. DAVID ROSAK Date
Title.....: CHIEF, METALS ANALYSIS BRANCH

DLS Sample#.....: R3971
Field Id.....: CT
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	5960	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	3.44	mg/kg	EPA 7060	22-NOV-93	MJL	MAB
Be	.674	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Ca	155000	mg/kg	EPA 6010	22 -NOV-93	SDN	MAB
Cd	.037	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	23.2	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	3510	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	CO.1	mg/kg	EPA 245.5	30-NOV-93	BJO	MAB

DLS Sample#.....: R3971
Field Id.....: CT
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Mg	4480	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Na	16200	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	30.1	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	53.2	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
V	20.2	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Zn	30.9	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample#.....: R3972
Field Id.....: CT13 (0-6")
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	7840	mg/kg	EPA 6010	23-NOV-93	SDN	MA
AS	3.32	mg/kg	EPA 7060	22-NOV-93	MJL	MAB
Be	.838	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Ca	133000	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.0307	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	34.0	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	5350	mg/kg	EPA 6010	23-NOV-93	JWC	MAa
Hg	<.100	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	6430	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Na	6860	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
[illegible]	[illegible]	mg/kg	EPA 6010	23-NOV-93	JWC	

DLS Sample#.....: R3972
Field Id.....: CT13 (0-6")
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Pb	64.0	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
V	28.0	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Zn	36.4	mg/kg	EPA 6010	23-NOV-93	J-WC	MAB

DLS Sample#.....: R3973
Field Id.....: CT13 (6-12")
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab.
Al	6790	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	3.20	mg/kg	EPA 7060	22-NOV-93	MJL	MAB
Be	.755	mg/kg	EPA 6010	23-NOV-9 3	JWC	MAB
'Ca	104000	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.067	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	32.9	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	5190	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	7050	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Na	5020	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	43.0	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	58.3	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
V	22.7	mg/kg	EPA 6010	23-NOV-[illegible]	JWC	MAB
Zn	32.9	mg/kg	EPA 60[illegible]	23-[illegible]	[illegible]	MAB

DLS Sample#.....: R3974
Field Id.....: CT13 (l-2')
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	7450	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	2.81	mg/kg	EPA 7060	22-NOV-93	MJL	MAB
Be	.671	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Ca	62300	mg/kg	EPA 6010	22 -NOV-93	SDN	MAB
Cd	.030	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	34.8	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	5720	mg/kg	EPA 6010	23-NOV-93	J W C	MAB
Hg	<.100	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	7150	mg/kg	EPA 6010	23-NOV-93	JWC	ma
Na	3890	mg/kg	EPA 6010	20-NOV-93	SDN	MA[illegible]
Ni	42.7	mg/kg	EPA 6010	23-NOV-93	JWC	MA[illegible]
Pb	54.6	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
V	22.3	mg/kg	EPA 6010	23 -NOV-93	JWC	MAB
Zn	31.9	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample#.....: R3975
Field Id.....: CT13 (2-3')
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	7770	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	2.47	mg/[illegible]	EPA 7060	22-NOV-93	MJL	MAB
Be	.663	-	EPA 601[illegible]	[illegible]	[illegible]	MAB

DLS Sample#.....: R3975
Field Id.....: CT13 (2-3')
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Ca	39300	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.051	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	33.9	mg/kg	EPA 6010	23-NOV-93	J-WC	MAB
Fe	5840	mg/kg	EPA 6010	23 -NOV-93	JWC	MAB
Hg	<0.174	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	6460	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
N a	1840	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	42.2	mg/kg	EPA 6010	23-NOV-93	J-WC	MAa
Pb	48.0	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
V	22.2	mg/kg	EPA 6010	23-NOV-93	J-WC	MAB
Zn	28.7	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample#.....: R3976
Field Id.....: CT11SUB STE CMP
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	5720	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	3.11	mg/kg	EPA 7060	22-NOV-93	MJL	MAB
Be	.670	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Ca	136000	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.036	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
[illegible]	3.67	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample#.....: R3976
Field Id.....: CT11SUB STE CMP
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	iab
Fe	4050	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	4080	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Na	2750	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	34.6	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	56.6	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
V	22.2	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Zn	27.5	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample#.....: R3977
Field Id.....: EM13 (0-6")
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	7760	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
AS	1.65	mg/kg	EPA 7060	22-NOV-93	MJL	MAB
Be	.612	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Ca	69900	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.067	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	30.6	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	5370	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-[illegible]	BJO	MAB
Mg	4780	mg/kg	EPA 6010	23-NOV-[illegible]	JWC	

DLS Sample#.....: R3977
Field Id.....: EM13 (0-6"
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Na	440	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	39.4	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	66.7	mg/kg	EPA 6010	23-NOV-93	J-WC	MAB
V	21.3	mg/kg	EPA 6010	23-NOV-93'	JWC	MAB
Zn	64.8	mg/kg	EPA 6010	23-NOV-93	JWC	MAa

DLS Sample#.....: R3978
Field Id.....: EM13(6-12")
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	5340	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	1.85	mg/kg	EPA 7060	22-NOV-93	MJL	MAB
Be	.570	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Ca	95300	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.072	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	23.8	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	3710	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	CO.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	3820	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Na	663	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	30.1	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	53.5	[illegible]	[illegible]	[illegible]	JWC	MAB

DLS Sample#.....: R3978
Field Id.....: EM13(6-12"
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
V	16.6	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Zn	46.1	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample%.....: R3979
Field Id.....: EM13 (l-2")
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	4320	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	.725	mg/kg	EPA 7060	23-NOV-93	MJL	MAB
Be	.556	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Ca	141000	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.088	mg/kg	EPA 7131	22-NOV-93	MPK	M
Cr	20.3	mg/kg	EPA 6010	23-NOV-93	JWC	MAI
Fe	2740	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	3380	mg/kg	EPA 6010	23-NOV-93	JWC	MAa
Na	1020	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	25.7	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	52.6	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
[illegible]	14.0	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Zn	31.8	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample#.....: R3980
Field Id,.....: EM13 (2-5')
Sample Description: Soils

Parameter	Result	Unit5	Method	Analyzed	Analyst	Lab
Al	2460	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	2.18	mg/kg	EPA 7060	23-NOV-93	MJL	MAB
Be	.515	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Ca	160000	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.0467	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	15.3	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	1540	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	2230	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Na	1190	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	19.6	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	45.5	mg/kg	EPA 6010	23-NOU-93	JWC	MAB
V	10.0	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Zn	22.5	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample#.....: R3981
Field Id.....,: EM14SUB STE CMP
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	5490	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	1.68	mg/kg	EPA 7060	23-NOV-93	MJL	MAB
Be	.718	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample#.....: R3981
Field Id.....: EM14SUB STE CMP
Sample Description: Soil5

Parameter	Result	Unit5	Method	Analyzed	Analyst	Lab
Ca	140000	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.091	mg/kg	EPA 7131	22-NW-93	MPK	MAB
Cr	24.8	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	3940	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	3980	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Na	974	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	33.6	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	76.8	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
V	16.5	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Zn	64.7	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample#.....: R3982
Field Id.....: EM COMPOSITE
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	5930	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	1.44	mg/kg	EPA 7060	23-NOV-93	MJL	MAB
Be	.567	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Ca	101000	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.051	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
[illegible]	[illegible]	mg/[illegible]	EPA 6010	[illegible]-NOV-93	JWC	MAB

DLS Sample#.....: k3982
Field Id.....-..: EM COMPOSITE
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Fe	4160	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	4160	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Na	686	mg/kg	EPA 6010	20-NOV-93	SDN	MA3
Ni	34.2	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	62.6	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
V	17.6	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Zn	53.4	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample#.....: R3983
Field Id.....; AH12SUB STE CMP
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	10050	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	3.78	mg/kg	EPA 7060	23-NOV-93	MJL	MAB
Be	.765	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Ca	43300	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	-061	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	36.3	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	6610	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA [illegible]	20-NOV-93	[illegible]	MAB
Mg	6580	mg/[illegible]	EPA [illegible]	23-NOV-[illegible]	[illegible]	MAB

DLS Sample+.....: R3963
Field Id.....: AH12SUB STE CMP
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Na	403	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	43.2	mg/kg	EPA 6010	23-NOV-93	J-WC	MAB
Pb	62.8	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
V	31.5	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Zn	49.3	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample#.....: R3984
Field Id. . . . . AH COMPOSITE
Sample Description: Soils

Parameter	Result	units	Method	Analyzed	Analyst	Lab
Al	7260	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	1.70	mg/kg	EPA 7060	23-NOV-93	MJL	MAL
Be	.609	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Ca	32000	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.035	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	26	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	5190	mg/kg	EPA 6010	23-NOV-93	JWC	MA5
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	m a
Mg	4640	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Na	477	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	32.9	mg/kcj	EPA 6010	[illegible]	JWC	MAB
Pb	32.0	. .		[illegible]	JWC	MAB

DLS Sample+.....: R3984
Field Id.....: AH COMPOSITE
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
*--L-W----						
V	24.7	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Zn	33.5	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample#.....: R3985
Field Id.....: CF11 (l-2')
Sample Description: Soils

Parameter	Result	units	Method	Analyzed	Analyst	Lab
Al	3600	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	.816	mg/kg	EPA 7060	23-NOV-93	MJL	MAB
Be	.404	mg/kg	EPA 6010	23-NOV-9 3	JWC	MAB
Ca	25800	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
cd	.025	mg/kg	EPA 7131	22-NOV-93	MPX	MAB
Cr	17.9	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	3190	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	2730	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Na	126	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	22.6	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	29.2	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
V	12.7	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Zn	18.6	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample#.....: R3986
Field Id.....: CF11 (0-6")
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	5960	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	1.17	mg/kg	EPA 7060	23-NOV-93	MJ'L	MAB
Be	.556	mg/kg	EPA 6010	23 -NOV-93	JWC	MAB
Ca	44100	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.051	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	24.7	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	4620	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.100	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	4160	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Na	181	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	32.3	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	43.5	mg/kg	EPA 6010	23-NOV-93	'JWC	MAB
V	18.6	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Zn	25.8	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample+.....: R3987
Field Id.....: CF11 (2-3')
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	4060	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	1.01	mg/kg	EPA 7060	23-NOV-93	MJL	MAB
Be	.498	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample#.....: R3987
Field Id.....; CF11 (Z-3')
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Ca	34000	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	<.1	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	17.2	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	2990	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.100	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	2560	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Na	1 0 7	mg/kg	EPA 6010	20-NOV-9 3	SDN	MAB
Ni	23.7	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	28.0	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
V	12.6	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Zn	15.2	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample#.....: R3988
Field Id.....: CF COMPOSITE
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	analyst	Lab
Al	4880	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	1.28	mg/kg	EPA 7050	23-NOV-93	MJL	MAB
Be	.455	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Ca	31000	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.041	mg/kg	EPA 7131	22-NOV-9 3	MPK	MAB
Cr		mg/kg	EPA 6010	23-NOV-9	[illegible]	MAB

DLS Sample#.....: R3988
Field Id.....: CF COMPOSITE
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Fe	3830	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.100	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	2930	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Na	273	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	22.6	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	34.8	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
V	14.8	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Zn	25.4	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample#.....: R3989
Field Id.....: CF12
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed'	Analyst	Lab
Al	3230	mg/kg	EPA 5010	23-NOV-93	SDN	MAB
As	1.52	mg/kg	EPA 7060	23-NOV-93	MJL	MAB
Be	.402	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Ca	24300	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.051	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	14.5	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	2780	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<.100	mg/kg	EPA [illegible]	20-NOV-93	BJO	MAB
Mg	2730	mg/kg	EPA [illegible]	[illegible]-NOV-93	JWC	MAB

DLS Sample#.....: R3989
Field Id.....: CF12
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Na	114	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	18.5	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	29.4	mg/kg	EPA 6010	23 -NOV-93	J-WC	MAB
V	11.1	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Zn	19.3	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sampled.....: R3990
Field Id.....: CK11 (6-12")
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	3930	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	1.23	mg/kg	EPA 7060	23-NOV-93	MJL	MAB
Be	.459	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Ca	33200	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.036	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	16.4	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	3 100	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	2750	mg/kg	EPA 6010	23-NOV-43	JWC	MAB
Na	139	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	21.1	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
	31.0	mg/kg	EPA 6010	23-[illegible]	JWC	[illegible]

DLS Sampled.....: R3990
Field Id.....: CK11 (6-12")
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
		m-11-1----	m----a------			
V	13.3	mg/kg	EPA 6010	23-NOV-93	JWC	NAB
Zn	20.0	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample#.....: R3991
Field Id.....: MH11 (6-12")
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
		-d---w----				
Al	3850	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	2.70	mg/kg	EPA 7060	23-NOV-93	MJL	MAB
Be	.503	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Ca	18700	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.029	mg/kg	EPA 7131	22-NOV-93	MPK	MA
Cr	13.7	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	2930	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	2190	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Na	126	mg/kg	EPA- 6010	20-NOV-93	SDN	MAB
Ni	14.4	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	24.0	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
V	19.3	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Zn	13.9	mg/kg	EPA 6010	23-NOV-[illegible]	[illegible]	MAB

DLS Sample#.....: R3992
Field Id.....: MH11 (0-6')
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	3820	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	2.90	mg/kg	EPA 7060	24-NOV-93	MJL	MAB
Be	.457	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Ca	19100	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
cd	,025	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	13.3	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	2860	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	2350	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Na	731	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	13.4	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	23.1	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
V	18.8	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Zn	13.8	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample+.....: R3993
Field Id.....: MH11 (1-3')
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	5380	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	3.62	mg/kg	EPA 7060	23-NOV-93	MJL	MAB
Be	[illegible]	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample#.....: R3993
Field Id.....: MH11 (l-2')
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Ca	22700	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.0251	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	18.1	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	3950	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.01	mg/kg	E-PA 245.5	20-NOV-93	BJO	MAB
Mg	3090	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Na	350	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	20.0	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	29.0	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
V	22.6	mg/kg	EPA 6010	23-NOV-93	JWC	MA
Zn	17.2	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample#.....: R3994
Field Id.....: MH11 (2-3')
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	5260	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
AS	3.14	mg/kg	EPA 7060	23-NOV-93	MJL	MAB
Be	.515	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Ca	22400	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	[illegible]	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
[illegible]		mg/kg	[illegible]	23-NOV-93	JWC	MAB

DLS Sample#.....: R3994
Field Id.....-...: MH11 (2-3')
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Fe	3760	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	3010	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Na	285	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	17.2	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	30.1	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
V	21.3	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Zn	15.6	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample#.....: R3995
Field Id.....: MH11SUB STE CMP
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	7190	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	3.18	mg/kg	EPA 7060	23-NOV-93	MJL	MAB
Be	.561	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Ca	29000	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.0455	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	23.1	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	4880	mg/kg	EPA 601[illegible]	[illegible]-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.[illegible]	[illegible]-NOV-[illegible]	BJO	MAB
Mg	4200	mg/kg	EPA 6[illegible]	[illegible]-NOV-	JWC	MAB

DLS Sample??.....: R3995
Field Id.....: MH11SUB STE CMP
sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Na	260	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	25.1	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	38.5	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
V	21.7	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Zn	40.9	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample#.....: R3996
Field Id.....: MH COMPOSITE
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	5730	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	2.85	mg/kg	EPA 7060	23-NOV-93	MJL	MJ
Be	.553	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Ca	22600	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.0259	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	19.4	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	4040	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.3	20-NOV-93	BJO	MAB
Mg	2890	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Na	121	mg/kg	EPA [illegible]	20-NOV-93	SDN	MAB
Ni	19.1	mg/kg	EPA 601[illegible]	23-NOV-[illegible]	JWC	MAB
Pb	30.7	mg/kg	EPA	[illegible]	[illegible]	[illegible]

DLS Sample#.....: R3996
Field Id.....: MH COMPOSITE
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
V	23.3	mg/kg	EPA 6010	23-NOV-93	J-WC	MAB
Zn	18.7	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample#.....: R3997
Field Id.....: DA11 (0-6")
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	3690	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	1.13	mg/kg	EPA 7060	23-NOV-93	MJL	MAB
Be	.505	mg/kg	EPA 6010	23-NOV-93	JWC	m a
Ca	65700	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.0512	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	18.6	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	2720	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	co.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	4530	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Na	192	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	20.0	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	37.5	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
V	13.7	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Zn	19.8	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample+.....: R3998
Field Id.....: DA11 (6-12")
sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	3560	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	1.45	mg/kg	EPA 7060	23-NOV-93	MJL	MAB
Be	.457	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Ca	51800	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.0302	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	18.68	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	2630	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	CO. 1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	3750	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Na	268	mg/kg	EPA 6010	20-NOV-93	SDN	MA
Ni	19.2	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	32.8	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
V	12.9	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Zn	17.0	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample#.....: R3999
Field Id.....: DA11 (l-2')
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
[illegible]	3030	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	1.12	mg/kg	EPA 70G0	23-NOV-93	MJL	MAB
[illegible]	.408	mg/kg	EPA 6010	23-NOV-	JWC	[illegible]

DLS Sample#.....: R3999
Field Id.....: DA11 (l-2')
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Ca	51000	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	<.0255	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	17.3	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	2250	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MA3
Mg	3260	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Na	249	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	16.8	mg/kg	EPA 6010	23-NOV-93	JWC	MAa
Pb	30.6	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
V	11.3	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Zn	15.4	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample#.....: R4000
Field Id.....: DA11 (2-3')
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	3190	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	1.18	mg/kg	EPA 7060	23-NOV-93	MJL	MAB
Be	.503	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Ca	53300	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.0307	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	20.9	[illegible]	EPA 6010	[illegible]-NOV-[illegible]	JWC	MAB

DLS Sample#.....: R4000
Field Id.....: DA11 (2-3')
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Fe	2900	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	4160	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Na	302	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	20.2	mg/kg	EPA' 6010	23-NOV-93	JWC	MAB
Pb	34.9	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
V	14.1	mg/kg	EPA 6010	24-NOV-93	JWC	MAB
Zn	18.1	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sample#.....: R4001
-Field Id.....: DA OVERALL COMP
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	2990	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	1.56	mg/kg	EPA 7060	23-NOV-93	MJL	MAB
Be	.663	mg/kg	EPA 6010	24-NOV-93	JWC	m a
Ca	85200	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	-1205	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	16.9	mg/kg	EPA 6010	23-NOV-93	J-WC	MAB
Fe	2010	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EP.4 245.5	20-NOV-93	BJO	MAB
Mg	7310	mg/kg	EPA	[illegible]	JWC	MAB

DLS Sample#.....: R4001
Field Id.....: DA OVERALL COMP
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Na	1690	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	19.5	mg/kg	EPA 6010	23-NOV-93	J-WC	MAB
Pb	39.9	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
V	14.8	mg/kg	EPA 6010	24-NOV-93	JWC	MAB
Zn	27.8	mg/kg	EPA 6010	24-NOV-93	JWC	MAB

DLS Sample#.....: R4002
Field Id.....,.: DA15SUB STE CMP
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	3100	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	1.28	mg/kg	EPA 7060	23-NOV-93	MJL	MAB
Be	.612	mg/kg	EPA 6010	24-NOV-93	JWC	MAB
Ca	66300	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.0718	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	17.8	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	2400	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	4880	mg/kg	EPA 6010	24-NOV-93	JWC	MAB
Na	496	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
[illegible]	19.2	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
	37.1	mg/kg	EPA 6010	23-NOV-93	JWC	[illegible]

DLS Sample+.....: R4002
Field Id.....: DA15SUB STE CMP
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
V	12.7	mg/kg	EPA 6010	24-NOV-93	JWC	MAB
Zn	21.9	mg/kg	EPA 6010	24-NOV-93	JWC	MAB

DLS Sample#.....: R4003
Field Id.....: AJ14 (0-6")
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	3140	mg/kg	EPA 6010	23-NOV-93	SDN	MAa
As	.92	mg/kg	EPA 7060	23-NOV-93	MJL	MAB
Be	.606	mg/kg	EPA 6010	24-NOV-93	JWC	MAB
Cd	43400	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.0357	mg/kg	EPA 7131	22-NOV-93	MPK	MA
Cr	17.4	mg/kg	EPA 6010	23 -NOV-93	JWC	MAB
Fe	2780	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	4070	mg/kg	EPA 6010	24-NOV-93	JWC	MAB
Na	178	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	19.8	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	33.8	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
	13.3	mg/kg	EPA 6010	24-NOV-93	[illegible]	MAB
Zn	26.8	mg/kg	EPA 6010	24-NOV-93	[illegible]	[illegible]

DLS Sample#.....: R4004
Field Id.....: AJ14 (6012")
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	2680	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	.98	mg/kg	EPA 7060	23-NOV-93	MJL	MAB
Be	.510	mg/kg	EPA 6010	24-NOV-93	JWC	MAB
Ca	36500	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.0878	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	16.1	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	2450	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	2960	mg/kg	EPA 6010	24-NOV-93	JWC	MAB
Na	193	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	16.0	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	27.3	mg/kg	EPA 6010	23-NOV-93	JWC	MAE
V	11.4	mg/kg	EPA 6010	24-NOV-93	JWC	MAB
Zn	16.9	mg/kg	EPA 6010	24-NOV-9	JWC	MAB

DLS Sample#.....: R4005
Field Id.....AJ14 (1-[illegible])
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	1530	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	.a5	mg/kg	EPA [illegible]	23-NOV-93	MJL	MAB
Be	[illegible]	mg/kg	EPA [illegible]	[illegible]	JWC	MAB

DLS Sample#.....: R4005
Field Id.....: AJ14 (l-2')
sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	iab
Ca	26800	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.0350	mg/kg	EPA 7131	22-NOV-93	M m	MAB
Cr	10.1	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	1390	mg/kg	EPA 6010	23-NOV-93	JWC	MAa
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	2060	mg/kg	EPA 6010	24-NOV-93	JWC	MAB
Na	185	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	10.9	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	19.5	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
V	7.04	mg/kg	EPA 6010	24-NOV-93	JWC	MAP
Zn	11.5	mg/kg	EPA 6010	24 -NOV-93	JWC	MAE

DLS Sample#.....: R4006
Field Id.....: AJ14 (2-3')
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	2080	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
AS	.89	mg/kg	EPA 70C0	23-NOV-93	MJL	MAB
Be	.503	mg/kg	EPA 6010	24-NOV-93	JWC	MAa
Ca	3670	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	<.0251	mg/kg	EPA 7131	22 -NOV-93	MPK	MAB
Cr	[illegible]	mg/kg	EPA 6010	23-NOV-93	JWC	MAB

DLS Sampled.....: R4006
Field Id.....: AJ14 (2-3')
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Fe	1810	mg/kg	EPA 6010	23-NOV-93	J-WC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	2310	mg/kg	EPA 6010	24-NOV-93	JWC	MAB
Na	260	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	14.0	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	23.3	mg/kg	EPA 6010	2 3-NOV-93	JWC	MAB
V	8.89	mg/kg	EPA 6010	24-NOV-93	JWC	MAB
In	12.5	mg/kg	EPA 6010	24-NOV-93	JWC	MAB

DLS Sample#.....: R4007
Field Id.....: AJ11 SITE COMP
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al'	3550	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	1.03	mg/kg	EPA 7060	23-NOV-93	MJL	MAB
ae	.660	mg/kg	EPA 6010	24-NOV-93	JWC	MAB
Ca	67000	mg/kg	EPA 6010	22 -NOV-93	SDN	MAB
Cd	.0721	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	19.1	mg/kg	EPA 6010	23 -NOV-93	JWC	MAB
Fe	2880	mg/kg	EPA 6010	23-NOV-91	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	5720	mg/kg	EPA 6010	24-NOV-93		MAB

DLS Sample#..... . R4007
Field Id.....: AJ11 SITE COMP
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Na	1590	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	23.2	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	46.2	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
V	15.3	mg/kg	EPA 6010	24-NOV-93	JWC	MAB
Zn	46.3	mg/kg	EPA 6010	24-NOV-93	JWC	MAB

DLS Sample#.....: R4008
Field Id.....: AJ TOTAL COMP
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
			---m&I------			
Al	3460	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	<.51	mg/kg	EPA 7060	23-NOV-93	MJL	MA
Be	.663	mg/kg	EPA 6010	24-NOV-9:	JWC	MAB
Ca	76500	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.0302	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	20.7	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	2980	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJC	MAB
Mg	6720	mg/kg	EPA 6010	24-NOV-93	JWC	MAB
Na	1510	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	24.3	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	51.6	mg/kg	EPA 6010	23-[illegible]	JWC	MAB

DLS Sample#.....: R4008
Field Id.....-: AJ TOTAL COMP
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
V	16.6	mg/kg	EPA 6010	24-NOV-93	JWC	MAB
Zn	45.8	mg/kg	EPA 6010	24-NOV-93	JWC	MAB

DLS Sample#.....: R4009
Field Id.....-...: ESKAN TOTAL CMP
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	1670	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	2.3	mg/kg	EPA 7060	23-NOV-93	MJL	MAB
Be	.505	mg/kg	EPA 6010	24-NOV-93	JWC	MAB
Ca	37800	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	<.0255	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	9.5	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	1800	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	847	mg/kg	EPA 6010	24-NOV-93	JWC	MAB
Na	135	mg/kg	EPA 6010	20-NOV-93	SDN	MAa
Ni	11.9	mg/kg	EPA 6010	23-NOV-93	J-WC	MAB
Pb	22.6	mg/kg	EPA 6010	23-NOV-93	J-WC	MAB
V	7.47	mg/kg	EPA 6010	24-NOV-93	JWC	MAB
Zn	12.1	mg/kg	EPA 6010	24-NOV-93	JWC	MAB

DLS Sample#.....: R4010
Field Id.....: R15 SUB STE CMP
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	4460	mg/kg	EPA 6010	23-NOV-93	SDN	MAB
As	2.45	mg/kg	EPA 7060	23-NOV-93	MJL	MAB
Be	.718	mg/kg	EPA 6010	24-NOV-93	JWC	MAB
Ca	151000	mg/kg	EPA 6010	22-NOV-93	SDN	MAB
Cd	.0357	mg/kg	EPA 7131	22-NOV-93	MPK	MAB
Cr	20.6	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Fe	3690	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB
Mg	2220	mg/kg	EPA 6010	24-NOV-93	JWC	MAB
Na	4670	mg/kg	EPA 6010	20-NOV-93	SDN	MAB
Ni	24.2	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Pb	46.0	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
V	16.6	mg/kg	EPA 6010	24-NOV-93	JWC	MAB
Zn	23.7	mg/kg	EPA 6010	24-NOV-93	JWC	MAB

DLS Sample#.....: R4011
Field Id.....AH13-1 (0-6")
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Cr	28.1	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB

DLS Sample#.....: R4012
Field Id.....: CF11-1 (6-12")
Sample Description: soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Cr	28.6	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB

DLS Sample#.....: R4013
Field Id.....: CF11-1 (l-2")
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Cr	22.8	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB

DLS Sample#.....: R4014
Field Id.....: CF12-1 (0-6")
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Cr	10.6	mg/L	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.083	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB

DLS Sample#.....: R4015
Field Id.....: CT12-3
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
CT	30.3	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB

DLS Sample#.....: R4016
Field Id.....: CT13-4 (0-6")
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Cr	31.9	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	CO.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB

DLS Sample#.....: R4017
Field Id.....: CT13-4 (Z-3'
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Cr	29.2	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	CO.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB

DLS Sample#.....: R4018
Field Id.....: CT13 COMPOSITE
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Cr	32.9	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	CO.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB

DLS Sample#.....: R4019
Field Id.....: EM13-1 (6-12")
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Cr	25.9	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB

LS Sample#.....: R4020
Field Id.....: EM14-1 (0-6")
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Cr	23.9	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB

DLS Sample#.....: R4021
Field Id.....: EM14-2 (0-6")
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Cr	16.9	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB

DLS Sample#..... R4022
Field Id..... MH-11-T (0-6")
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Cr	15.3	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB

DLS Sample#.....: R4023
Field Id.....: MH-11-T (6-12")
Sample Description: Soils

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Cr	16.9	mg/kg	EPA 6010	23-NOV-93	JWC	MAB
Hg	<0.1	mg/kg	EPA 245.5	20-NOV-93	BJO	MAB

ANNEX E-22

Analytical Result.5 - Final Branch Report
U.S. Army Environmental Hygiene Agency
Directorate of Laboratory Sciences
Aberdeen Proving Grounds, MD 21010-5422

Report ID....: R2001C.4
Report Seq#..: 8914
Generated by.: SNORMAN

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DLS Job.....: 310574
DLS Job Status: 0 - WORK REQUEST LOGGED IN
Proj. Officer.: JACX HELLER
Timekeeping#..: 39-22-L192
Installation..: KUWAIT

Lab Status: ALL RESULTS RELEASED BY LAB MAB 29-NOV-93

Signature.: Lillian L. Boyd 29 Nov 93
MR. DAVID ROSAK Date
Title.....: CHIEF, METALS ANALYSIS BRANCH

OLS Sample#.....: R3883
Field Id.....: PS/3/AS/SD-21
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	.52	mg/filter	EPA 200.7	23-NOV-93	SDN	MAB
AS	0.0012	mg/filter	EPA 206.2	18-NOV-93	MJL	MAB
3e	.002	mg/ filter	EPA 200.7	22-NOV-93	JWC	MAB
Ca	17.3	mg/filter	EPA 200.7	22-NOV-93	SDN	MAB
Cd	.0005	mg/filter	EPA 213.2	20-NOV-93	MPK	MAB
Cr	.012	mg/filter	EPA 2Q0.7	22-NOV-93	JWC	MAB
Fe	.745	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Hg	<0.0008	mg/filter	EPA 245.1	19-NOV-93	DAV/BJO	MAB

DLS Sample#.....: R3883
Field Id.....: PS/3/AS/SD-21
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
W	2.24	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Na	1.95	mg/filter	EPA 200.7	20-NOV-93	SDN	MAB
Ni	<.02	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Pb	.896	mg/filter	EPA 239.2	21-NOV-93	MJL	MAB
V	<.02	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Zn	.16	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB

DLS Sample#.....: R3884
Field Id.....: CS/3/AS/SD-22
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	.544	mg/filter	EPA 200.7	23-NOV-93	SDN	MAB
As	0.0016	mg/filter	EPA 206.2	18-NOV-93	MJL	MAB
Be	.002	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Ca	14.7	mg/filter	EPA 200.7	22-NOV-93	SDN	MAB
Cd	.0004	mg/filter	EPA 213.2	20-NOV-93	MPK	MAB
Cr	.015	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Fe	.715	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Hg	<0.0008	mg/filter	EPA 245.1	19-NOV-93	DAV/BJO	MAB
Mg	1.97	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Na	2.51	mg/filter	EPA 200.7	20-NOV-93	SDN	MAB
Ni	<.02	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

DLS Sample#.....: R3884
Field Id.....: CS/3/AS/SD-22
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Pb	.644	mg/filter	EPA 239.2	21-NOV-93	MJL	MAB
V	<.02	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Zn	.164	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

DLS Sample#.....: R3885
Field Id.....: PS/3/AS/SD-19
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	.572	mg/filter	EPA 200.7	23-NOV-93	SDN	MAB
As	0.0015	mg/filter	EPA 206.2	18-NOV-93	MJL	MAB
Be	.002	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Ca	12.4	mg/filter	EPA 200.7	22-NOV-93	SDN	MAB
Cd	.0006	mg/filter	EPA 213.2	20-NOV-93	MPK	MAB
Cr	.0096	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Fe	.759	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Hg	<0.0008	mg/filter	EPA 245.1	19-NOV-93	DAV/BJO	MAB
Mg	1.80	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Na	3.31	mg/filter	EPA 200.7	20-NOV-93	SDN	MAB
Ni	.021	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Pb	.48	mg/filter	EPA 239.2	21-NOV-93	MJL	MAB
V	<.02	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Zn	.128	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

DLS Sampled.....: R3886
Field Id.....: PS/3/AS/SD-15
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	.46	mg/filter	EPA 200.7	23-NOV-93	SDN	MAB
As	0.0015	mg/filter	EPA 206.2	18-NOV-93	MJL	MAB
Be	.002	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Ca	10.3	mg/filter	EPA 200.7	22-NW-93	SDN	MAB
cd	.0005	mg/filter	EPA 213.2	20-NOV-93	MPK	MAB
Cr	.0088	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Fe	.66	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Hg	<0.0008	mg/filter	EPA 245.1	19-NOV-93	DAV/BJO	MAB
Mg	1.83	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Na	4.8	mg/filter	EPA 200.7	20-NOV-93	SDN	MAB
	<.02	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Pb	.636	mg/filter	EPA 239.2	21-NOV-93	MJL	MAB
V	x.02	mg/filter	EPA.200.7	22-NOV-93	JWC	MAB
Zn	.143	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

DLS Sample#.....: R3887
Field Id.....: PS/3/AS/SD-12
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	.556	mg/filter	EPA 200.7	23-NOV-93	SDN	MAB
AS	0.0012	mg/filter	EPA 206.2	18-NOV-93	MJL	MAB
Be	.002	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

DLS Sample#.....: R3887
Field Id.....: PS/3/AS/SD-12
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Ca	13.7	rag/filter	EPA 200.7	22-NOV-93	SDN	MAB
Cd	.0003	mg/filter	EPA 213.2	20-NOV-93	MPK	MAB
Cr	.0088	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Fe	.733	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Hg	<0.0008	mg/filter	EPA 245.1	19-NOV-93	DAV/BJO	MAB
Mg	2.38	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Na	4.6	mg/filter	EPA 200.7	20-NOV-93	SDN	MAB
Ni	.022	mg/filter	EPA 200.7	22-NOV-93	J-WC	MA5
Pb	.512	mg/filter	EPA 239.2	21-NOV-93	MJL	MAB
V	<.02	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Zn	.130	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

DLS Sample#.....: R3888
Field Id.....: PS/3/AS/SD-10
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	.692	mg/filter	EPA 200.7	23-NOV-93	SDN	MAB
A5	0.0018	mg/filter	EPA 206.2	18-NOV-93	MJL	MAB
Be	.002	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Ca	18.3	mg/filter	EPA 200.7	22-NOV-93	SDN	MAB
Cd	.0004	mg/filter	EPA 213.2	20-NOV-93	MPK	MAB
Cr	.011	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

.S Sample#.....: R3888
Field Id.....: PS/3/AS/SD-10
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Fe	-813	mg/filter	EPA zoo.7	22-NOV-93	JWC	MAB
Hg	<0.0008	mg/filter	EPA 245.1	19-NOV-93	DAV/BJO	MAB
Mg	3.40	mg/filter	EPA 200.7	22-NOV-93	Jwc	MAB
Na	6.68	mg/filter	EPA 200.7	20-NOV-93	SDN	MAB
Ni	.028	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Pb	.404	mg/filter	EPA 239.2	21-NOV-93	MJL	MAB
V	<.02	rag/filter	EPA 200.7	22-NOV-93	JWC	MAB
Zn	.113	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

DLS Sample#.....: R3889
Field Id.....,...: PS/3/AS/SD-5
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	.612	mg/filter	EPA 200.7	23-NOV-93	SDN	MAB
As	0.0016	mg/filter	EPA 206.2	18-NOV-93	MJL	MAB
Be	.002	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Ca	6.72	mg/filter	EPA 200.7	22-NOV-93	SDN	MAB
Cd	.0008	mg/filter	EPA 213.2	20-NOV-93	MPK	MAB
Cr	<.008	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Fe	.672	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Hg	<0.0008	mg/filter	EPA 245.1	19-NOV-93	DAV/BJO	MAB
Mg	1.42	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

DLS Sample#.....: R3889
Field Id.....: PS/3/AS/SD-5
sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Na	4.36	mg/filter	EPA 200.7	20-NOV-93	SDN	MAE
Ni	x.02	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Pb	.42	mg/filter	EPA 239.2	21-NOV-93	MJL	MAB
V	<.02	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Zn	.115	mg/filter	EPA 200.7	22-NOV-93	JWC	MAE

DLS Sample#.....: R3890
Field Id.....: CS/3/AS/SD3
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	.708	rug/filter	EPA 200.7	23-NOV-93	SDN	MAB
As	0.0011	mg/filter	EPA 206.2	18-NOV-93	MJL	MAB
Be	.002	mg/filter	EPA 200.7.	22-NOV-93	JWC	MAB
Ca	4.44	mg/filter	EPA 200.7	22-NOV-93	SDN	MAB
cd	.0006	mg/filter	EPA 213.2	20-NOV-93	MPK	MAB
Cr	.011	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Fe	.8	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Hg	<0.0008	mg/ filter	EPA 245.1	19-NOV-93	DAV/BJO	MAB
Mg	.903	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Na	1.92	mg/filter	EPA 200.7	20-NOV-93	SDN	MAB
Ni	<.02	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Pb	.204	mg/filter	EPA 239.2	21-NOV-93	MJL	MAB

DLS Sample#.....: R3890
Field Id.....: CS/3/AS/SD3
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
V	<.02	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Zn	.087	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

DLS Sample#.....: R3891
Field Id.....: PS/3/AS/SD1
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	.592	mg/filter	EPA 200.7	23-NOV-93	SDN	MAB
As	0.0014	mg/filter	EPA 206.2	18-NOV-93	MJL	MAB
Be	.002	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Ca	5.24	mg/filter	EPA-200.7	22-NOV-93	SDN	MAB
Cd	.0006	mg/filter	EPA 213.2	20-NOV-93	MPK	MAB
Cr	.029	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Fe	.85	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Hg	<0.0008	mg/filter	EPA 245.1	19-NOV-93	DAV/BJO	MAB
Mg	.953	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Na	2.28	mg/filter	EPA 200.7	20-NOV-93	SDN	MAB
Ni	<.02	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Pb	.568	mg/filter	EPA 239-2	21-NOV-93	MJL	MAB
V	<.02	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Zn	.128	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

DLS Sample#.....: R3892
Field Id.....: PS/3/AS/SD4
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	.712	mg/filter	EPA 200.7	23-NOV-93	SDN	MAB
As	0.001s	mg/filter	EPA 206.2	18-NOV-93	MJL	MAB
Be	.0012	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Ca	4.92	mg/filter	EPA 200.7	22-NOV-93	SDN	MAB
cd	.0003	mg/filter	EPA 213.2	20-NOV-93	MPK	MAB
Cr	<.008	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Fe	.833	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Hg	<0.0008	mg/filter	EPA 245-l	19-NOV-93	DAV/BJO	MAB
Mg	.949	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Na	1.97	mg/filter	EPA 200.7	20-NOV-93	SDN	MAB
N i	.022	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Pb	.196	mg/filter	EPA 239.2	21-NOV-93	MJL	MAB
V	<.02	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Zn	.029	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

DLS Sample%.....: R3893
Field Id.....: FB/3/AS/SD8
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	<.1	mg/filter	EPA 200.7	23-NOV-93	SDN	MAB
As	<0.0004	mg/filter	EPA 206.2	18-NOV-93	MJL	MAB
Be	.0012	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

.S Sample#.....: R3893
rield Id.....: FB/3/AS/SD8
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Ca	.2	mg/filter	EPA 200.7	22-NOV-93	SDN	MAB
Cd	<.0002	mg/filter	EPA 213-2	20-NOV-93	MPK	MAB
Cr	<.008	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Fe	.0 2 5	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Hg	co. 0008	mg/filter	EPA 245.1	19-NOV-93	DAV/BJO	MAB
Mg	<.1	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Na	.936	mg/filter	EPA 200.7	2 0-NOV-93	SDN	MAB
Ni	<.02	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Pb	.0006	mg/filter	EPA 239.2	21-NOV-93	MJL	MAB
V	<.02	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
1	.029	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB

DLS Sample#.....: R3894
Field Id,.....: SD-49
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	.92	mg/filter	EPA 200.7	23 -NOV-93	SDN	MAB
AS	0.00092	mg/filter	EPA 206.2	18-NOV-93	MJL	MAB
Be	.0012	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Ca	5.24	mg/filter	EPA 200.7	22-NOV-93	SDN	MAB
Cd	.0004	mg/filter	EPA 213.2	20-NOV-93	MPK	MAB
Cr	<.008	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

DLS Sample#.....: R3894
Field Id.....: SD-49
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Fe	.847	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Hg	<0.0008	mg/filter	EPA 245.1	19-NOV-93	DAV/BJO	MAB
Mg	.998	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Na	1.38	mg/filter	EPA 200.7	20-NOV-93	SDN	MAB
Ni	.026	rag/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Pb	.030	mg/filter	EPA 239.2	21-NOV-93	MJL	MAB
V	<.02	mg/f ilter	EPA 200.7	22-NOV-93	JWC	MAB
Zn	.074	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

DLS Sample#.....: R3895
Field Id.....: SD-15
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	.968	mg/filter	EPA 200.7	23-NOV-93	SDN	MAB
As	0.0022	mg/filter	EPA 206.2	18-NOV-93	MJL	MAB
Be	.0012	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Ca	7.44	mg/filter	EPA 200.7	22-NOV-93	SDN	MAB
Cd	.0003	mg/filter	EPA 213.2	20-NOV-93	MPK	MAB
Cr	.011	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Fe	1.09	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Hg	<0.0008	mg/filter	EPA 245.1	19-NOV-93	DAV/BJO	MAB
Mg	1.32	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

.S Sample#.....: R3895
Field Id.....: SD-15
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Na	2.86	mg/filter	EPA 200.7	20-NOV-93	SDN	MAB
Ni	.038	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Pb	.059	mg/filter	EPA 239.2	21-NOV-93	MJL	MAB
V	<.02	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Zn	.119	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

DLS Sample%....,..: R3896
Field Id.....: SD-54
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	1.31	mg/filter	EPA 200.7	23-NOV-93	SDN	MAB
As	0.0013	mg/filter	EPA 206.2	18-NOV-93	MJL	MAB
Se	.0012	mg/filter	EPA 200.7.	22-NOV-93	J-WC	MAB
Ca	6.72	mg/filter	EPA 200.7	22-NOV-93	SDN	MAB
Cd	.0003	rug/filter	EPA 213.2	20-NOV-93	MPK	MAB
Cr	. 0092	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Fe	.96	mg/filter	EPA 200.7	22-NOV-93	Jwc	MAB
Hg	<0.0008	mg/filter	EPA 245.1	19-NOV-93	DAV/BJO	MAB
Mg	1.19	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Na	2.70	mg/filter	EPA 200.7	20-NOV-93	SDN	MAB
Ni	.032	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Pb	.058	mg/filter	EPA 239.2	21-NOV-93	MJL	MAB

DLS Sample&.....: R3896
Field Id.....: SD-54
Sample Description: APED - hi vol filter, impinger

Parameter am--------	Result -c---------	Units	Method	Analyzed	Analyst	Lab
V	<.02	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Zn	.090	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

DLS Sample#.....: R3897
Field Id.....: SD-57
sample Description: APED - hi vol filter, impinger

Parameter	Result --I------e-	Units	Method --w----e----	Analyzed	Analyst	Lab
Al	.896	mg/filter	EPA 200.7	23-NOV-93	SDN	MAB
As	0.0020	mg/filter	EPA 206.2	18-NOV-93	MJL	MAB
Be	.0012	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Ca	7.64	mg/filter	EPA 200.7	22-NOV-93	SDN	MAB
Cd	• 0003	mg/filter	EPA 213.2	20-NOV-93	MPK	MAB
Cr	.0 1	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Fe	1.06	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Hg	~0.0008	mg/filter	EPA 245.1	19-NOV-93	DAV/BJO	MAB
Mg	1.21	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Na	2.70	mg/filter	EPA 200.7	20-NOV-93	SDN	MAB
Ni	.036	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Pb	.084	mg/filter	EPA 239.2	21-NOV-93	MJL	MAB
V	<.02	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Zn	.055	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

.S Sample#.....: R3898
rield Id.....: SD-59
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Unit5	Method	Analyzed	Analyst	Lab
Al	* 792	mg/filter	EPA 200.7	23-NOV-93	SDN	MAB
As	0.0021	mg/filter	EPA 206.2	18-NOV-93	MJL	MAB
Be	-0012	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Ca	7.84	mg/filter	EPA 200.7	22-NOV-93	SDN	MAB
Cd	.0005	mg/filter	EPA 213.2	20-NOV-93	MPK	MAB
Cr	.010	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Fe	.905	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Hg	<0.0008	mg/filter	EPA 245.1	19-NOV-93	DAV/BJO	MAB
Mg	1.13	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Na	2.70	mg/filter	EPA 200.7	20-NOV-93	SDN	MAB
i	.032	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Pb	.173	mg/filter	EPA 239.2	21-NOV-93	MJL	MAB
V	<.02	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Zn	.063	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

DLS Sample#.....: R3899
Field Id.....,.: SD-63
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	<.1	mg/filter	EPA 200.7	23-NOV-93	SDN	MAB
As	<0.0004	mg/filter	EPA 206.2	18-NOV-93	MJL	MAB
Be	.0008	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

DLS Sample#.....: R3899
Field Id.....: SD-63
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Ca	0.74	mg/filter	EPA 200.7	22-NOV-93	SDN	MAB
Cd	x.0002	m&/filter	EPA 213.2	20-NOV-93	MPK	MAB
Cr	<.008	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Fe	.047	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Hg	<0.0008	mg/filter	EPA 245.1	19-NOV-93	DAV/BJO	MAB
Mg	<.1	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Na	1.38	mg/filter	EPA 200.7	20-NOV-93	SDN	MAB
Ni	<.02	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Pb	.0019	mg/filter	EPA 239.2	21-NOV-93	MJL	MAB
V	<.02	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Zn	.034	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

DLS Sample#.....: R3900
Field Id.....: SD-38
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	1.43	mg/filter	EPA 200-7	23-NOV-93	SDN	MAB
As	0.0016	mg/filter	EPA 206.2	18-NOV-93	MJL	MAB
Be	.0012	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Ca	10.7	mg/filter	EPA 200.7	22-NOV-93	SDN	MAB
Cd	.0008	mg/filter	EPA 213.2	20-NOV-93	MPK	MAB
Cr	.014	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

LS Sample#.....: R3900
Field Id....,.....: SD-38
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Fe	1.7	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Hg	<0.0008	mg/filter	EPA 245.1	19-NOV-93	DAV/BJO	MAB
Mg	2.13	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Na	2.53	mg/filter	EPA 200.7	20-NOV-93	SDN	MAB
Ni	.051	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Pb	-596	mg/filter	EPA 239.2	21-NOV-93	MJL	MAB
V	<.02	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Zn	.193	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB

DLS Sample#.....: R3901
Field Id.....: SD-39
'ample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	2.08	mg/filter	EPA 200.7	23 -NOV-93	SDN	MAB
As	0.002	mg/filter	EPA i06.2	18-NOV-93	MJL	MAB
Be	-0012	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Ca	11.4	mg/filter	EPA 200.7	22-NOV-93	SDN	MAB
Cd	.0008	mg/filter	EPA 213.2	20-NOV-93	MPK	MAB
Cr	. 016	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Fe	2.47	mg/filter	EPA 200-7	22-NOV-93	JWC	MAB
Hg	<0.0008	mg/filter	EPA 245.1	19-NOV-93	DAV/BJO	MAB
Mg	2.53	mg/filter	EPA 200.7	22-NOV-93	Jwc	MAB

DLS Sample#.....: R3901
Field Id.....: SD-39
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Na	2.60	mg/filter	EPA 200.7	20-NOV-93	SDN	MAB
Ni	.066	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Pb	.588	mg/filter	EPA 239.2	21-NOV-93	MJL	MAB
V	<.02	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Zn	.193	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

DLS Sample%.....: R3902
Field Id.....: SD-40
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	.968	mg/filter	EPA 200.7	23-NOV-93	SDN	MAB
As	0.00052	mg/filter	EPA 206.2	18-NOV-93	MJL	MAB
Be	.0012	mg/filter	EPA 2U0.7	22-NOV-93	JWC	MAB
Ca	5.36	mg/filter	EPA 200.7	22-NOV-93	SDN	MAB
Cd	.0004	mg/filter	EPA 213.2	20-NOV-93	MPK	MAB
Cr	.0088	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Fe	1.12	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Hg	<0.0008	mg/filter	EPA 245.1	19-NOV-93	DAV/BJO	MAB
Mg	1.10	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Na	2.63	mg/filter	EPA 200.7	2 0-NOV-93	SDN	MAB
Ni	.035	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Pb	.42	mg/filter	EPA 239.2	21-NOV-93	MJL	MAB

DLS Sample?!.....: R3902
Field Id.....: SD-40
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
V	<.02	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Zn	.102	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

DLS Sample#.....: R3903
Field Id.....,..: SD-41
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	.92	mg/filter	EPA 200.7	23-NOV-93	SDN	MAB
As	0.0006	mg/filter	EPA 206.2	18-NOV-93	MJL	MAB
Be	-0012	mg/filter	EPA 200-7	22-NOV-93	JWC	MAB
Ca	5.52	mg/filter	EPA 200.7	22-NOV-93	SDN	MAB
Cd	.0005	mg/filter	EPA 213.2	20-NOV-93	MPK	MAB
Cr	.0088	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Fe	1.06	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Hg	<0.0008	mg/ filter	EPA 245.1	19-NOV-93	DAV/BJO	MAB
Mg	1.07	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Na	2.66	mg/filter	EPA 200.7	20-NOV-93	SDN	MAB
Ni	.032	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Pb	.472	mg/filter	EPA 239.2	21-NOV-93	MJL	MAB
V	<.02	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Zn	.118	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

DLS Sample#.....: R3904
Field Id.....: SD-42
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	.251	rag/filter	EPA 200.7	23-NOV-93	SDN	MAB
As	<0.0004	mg/filter	EPA 206.2	18-NOV-93	MJL	MAB
Be	.0008	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Ca	1.97	mg/filter	EPA 200.7	22-NOV-93	SDN	MAB
Cd	.0003	mg/filter	EPA 213.2	20-NOV-93	MPK	MAB
Cr	<.008	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Fe	.252	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Hg	<0.0008	mg/filter	EPA 245.1	19-NOV-93	DAV/BJO	MAB
Mg	.388	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Na	1.80	mg/filter	EPA 200.7	20-NOV-93	SDN	MAB
Ni	.206	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Pb	.0716	mg/filter	EPA 239.2	21-NOV-93	MJL	MAB
V	<.02	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Zn	.101	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB

DLS Sample#..... R3905
Field Id..... SD-44
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	<.1	mg/filter	EPA 200.7	23-NOV-93	SDN	MAB
AS	<0.0004	mg/filter	EPA 206.2	18-NOV-93	MJL	MAB
Be	.0008	mg/filter	EPA 260.7	22-NOV-93	JWC	MAB

S Sample#.....: R3905
Field Id.....: SD-44
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Ca	.404	mg/filter	EPA 200.7	22-NOV-93	SDN	MAB
Cd	<.0002	mg/filter	EPA 213.2	20-NOV-93	MPK	MAB
Cr	<.008	mg/filter	EPA 200.7	22-NOU-93	JWC	MAB
Fe	.059	mg/filter	EPA 200.7	22-NOU-93	J-WC	MAB
Hg	<0.0008	mg/filter	EPA 245.1	19-NOV-93	DAV/BJO	MAB
Mg	<.1	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Na	.948	mg/filter	EPA 200.7	20-NOV-93	SDN	MAB
Ni	<.02	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Pb	.0013	mg/filter	EPA 239.2	21-NOV-93	MJL	MAB
V	<.02	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Zn	.044	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB

DLS Sample#.....: R3906
Field Id.....: SD-47
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Al	<.1	mg/filter	EPA 200.7	23-NOV-93	SDN	MAB
As	<0.0004	mg/filter	EPA 206.2	18-NOV-93	MJL	MAB
Be	.0008	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Ca	.276	mg/filter	EPA 200.7	22-NOV-93	SDN	MAB
Cd	<.0002	mg/filter	EPA 213.2	20-NOV-93	MPK	MAB
Cr	<.008	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

Run Date: 29-NOV-93

DLS Sample#.....: R3906 .
Field Id.....: SD-47
Sample Description: APED - hi vol filter, impinger

Parameter	Result	Units	Method	Analyzed	Analyst	Lab
Fe	.029	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Hg	<0.0008	mg/filter	EPA 245.1	19-NOV-93	DAV/BJO	MAB
Mg	<.1	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Na	.900	mg/filter	EPA 200.7	20-NOV-93	SDN	MAB
Ni	<.02	mg/filter	EPA 200.7	22-NOV-93	J-WC	MAB
Pb	.0011	mg/filter	EPA 239.2	21-NOV-93	MJL	MAB
u	<.02	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB
Zn	.032	mg/filter	EPA 200.7	22-NOV-93	JWC	MAB

ANNEX E-23

TABLE V

Results Summary
Water Extractable Hexavalent Chromium in Kuwaiti Sand

Laboratory Sample Id	Bar Code	Client Sample Id	Total Cr (ppb) *	CrVI (ppb) .
605059	RJL0021	(C) AH Comp. (Big Ahmadi)	<17.9	<5.0
605060	RJL0023	(C) AH12 Ahmadi Surf. Comp.	<17.9	<5.0
605061	RJL0024	(C) AH13 Surface Composite	<17.9	<5.0
605073	RJL0045	(C) AJ Composite (Big AJ)	<17.9	<5.0
605075	RJL0047	(C) AJ11 Surface Composite	<17.9	<5.0
605076	RJL0048	(C) AJ12 Surface Composite	<17.9	<5.0
605077	RJL0049	(C) AJ13 Surface Composite	<17.9	<5.0
605079	RJL0051	(C) AJ14 (0-6)	47.9	<5.0
605080	RJL0053	(C) AJ14 (1-2)	<17.9	<5.0
605081	RJL0054	(C) AJ14 (2-3)	<17.9	<5.0
605074	RJL0052	(C) AJ14 (6-12)	<17.9	<5.0
605078	RJL0050	(C) AJ14 Surface Composite	<17.9	<5.0
605082	RJL0055	(C) AJ15 Surface Composite	<17.9	<5.0
605088	RJL0025	(C) CF Composite (Big CF)	<17.9	<5.0
605089	RJL0027	(C) CF11 Surface Composite	<17.9	<5.0
605090	RJL0028	(C) CF12 Surface Composite	x17.9	<5.0
605091	RJL0029	(C) CF13 Surface Composite	<17.9	<5.0
605126	RJL0009	(C) CT Composite (Big Doha)	x17.9	<5.0
605127	RJL0012	(C) CT11	x17.9	<5.0
605128	RJL0001	(C) CT11-1	<17.9	<5.0
605129	RJL0003	(C) CT11-2	<17.9	<5.0
605130	RJL0004	(C) CT11-3	<17.9	<5.0
605131	RJL0005	(C) CT11-4	<17.9	<5.0
605132	RJL0008	(C) CT11-5	<17.9	<5.0
605133	RJL0006	(C) CT12	<17.9	<5.0
605134	RJL0002	(C) CT13	<17.9	<5.0
605135	RJL0017	(C) CT13 (0-6)	<17.9	<5.0
605182	RJL0010	(C) CT13 (1-2)	<17.9	<5.0
605137	RJL0018	(C) crl3 (2-3)	<17.9	<5.0
605136	RJL0007	(C) CT13 (6-12)	<17.9	<5.0
605138	RJL0016	(C) CT14	<17.9	<5.0
605139	RJL0011	(C) CT15	<17.9	<5.0
605102	RJL0035	(C) DA Dhahran Composite (Big DA)	<17.9	<5.0
605104	RJL0038	(C) DA11 (0-6) Composite	4 7 3	<5.0
605106	RJL0040	(C) DA11 (1-2) Composite	<17.9	<5.0
605107	RJL0041	(C) DA11 (2-3) Composite	<17.9	<5.0
605105	RJL0039	(C) DA11 (6-12) Composite	47.9	<5.0
605103	RJL0037	(C) DA11 Surface Composite	47.9	<5.0
605108	RJL0042	(C) DA12 Surface Composite	<17.9	<5.0
605109	RJL0043	(C) DA14 Surface Composite	<17.9	<5.0
605110	RJL0044	(C) DA15 Surface Composite	<17.9	<5.0
605168	RJL0015	(C) EM11 Surface Comp (0-6)	47.9	<5.0
605169	RJL0069	(C) EM11-1 Surface (0-6)	<17.9	<5.0
605170	RJL0019	(C) EM12 Surface Composite	<17.9	<5.0
605171	RJL0071	(C) EM12-1 Surface (0-6)	x17.9	<5.0

TABLE V

Results Summary
Water Extractable Hexavalent Chromium in Kuwaiti Sand

Laboratory Sample Id	Bar Code	Client Sample Id	Total Cr (ppb) •	CrVI (ppb) *
605172	RJL0020	(C) EM13 (0-6) Composite	<17.9	<5.0
605174	RJL0064	(C) EM13 (1-2 Composite)	<17.9	6.0
605175	RJL0065	(C) EM13 (2-3 Composite)	<17.9	<5.0
605173	RJL0062	(C) EM13 (6-12 Composite)	<17.9	<5.0
605176	RJL0072	(C) EM13-1 Surface (0-6)	479	<5.0
605177	RJL0073	(C) EM13-2 Surface (0-6)	<17.9	<5.0
605178	RJL0067	(C) EM14 Surface Composite	<17.9	6.0
605179	RJL0074	(C) EM14-1 Surface (0-6)	<17.9	<5.0
605167	RJL0014	(C) Embassy Comp. (Big M)	<17.9	<5.0
605144	RJL0058	(C) ES15 Surface Composite	<17.9	0.0
605143	RJL0057	(C) EV Area Surface Comp.	<17.9	<5.0
605149	RJL0030	(C) MH Composite (Big MH)	<17.9	<5.0
605150	RJL0032	(C) MH11 (Surface CompOS.)	<17.9	<5.0
605151	RJL0033	(C) MH12 Surface Composite	472	<5.0
605152	RJL0034	(C) MH13 Surface Composite	<17.9	<5.0
605180	RJL0013	(C) Spike A Embassy Comp	N/A	97.27
605140	RJL0068	(C) Spike B CT (Big Doha)	N/A	85.48
605062	RJL0022	(C) Spike C AH Comp. (Big AH)	N/A	155.65
605092	RJL0026	(C) Spike D-CF Comp. (Big CF)	N/A	180.66
605153	RJL0031	(C) Spike E (Big MH)	N/A	107.97
605111	RJL0036	(C) Spike F Big DA Composite	N/A	301.13
605083	RJL0046	(C) Spike G - Big AJ	WA	159.08

* CrVI in Sand Assuming a 20 g sample and all sample charged onto the Cartridge.
N/A Not applicable

ANNEX E-24

FORM 5
VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: USAEHA-OECD-CAB

Lab File ID: >BFK12 BFB Injection Date: 11/12/93

Instrument ID: CHEMSTATION . BFB Injection Time: 17:12

Matrix: AIR Column: (pack/cap) Cap

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% OF MASS 95	22.6
75	30.0 - 60.0% OF MASS 95	48.6
95	Base peak, 100% relative abundance	100.
96	5.0 - 9.0% of mass 95	5.7
173	Less than 2.0% of mass 174	0.0 (0.0)1
174	Greater than 50.0% of mass 95	74.8
175	5.0 - 9.0% of mass 174	6.0 (8.1)1
176	Greater than 95.0%, but less than 101.0% of mass 174	73.1 (97.7)1
177	5.0 - 9.0% of mass 176	5.0 (6.9)2

1-Value is % mass 174 2-Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	AQAD SAMPLE NO.	FIELD SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	50 NG CHECK	50 NG ISTD/SU	>JA15A	11/12/93	17:57
02	SYSTEMBLANK	50 NG ISTD	>JA16A	11/12/93	18:53
03	R3724	TCTASF0506	>JA17A	11/12/93	20:13
04	R3725	TCTASF0507	>JA18A	11/12/93	21:07
05	R2726	TCTASF0600	>JA19A	11/12/93	22:01
06	R3727	TCTASF0605	>JA20A	11/12/93	22:55
07	43728	TCTASF0602	>JA21A	11/12/93	23:49
08	R3729	TCTASF0606	>JA22A	11/13/93	0:43
09	R3730	TCTFB0603	>JA23A	11/13/93	1:37
10	R3731	T3ASF0809	>JA24A	11/13/93	2:31
11	R3732	T3ASF0803	>JA25A	11/13/93	3:23
12	R3733	T3ASF0808	>JA26A	[illegible]	[illegible]
13					
14					
15					

FORM 5 T01 [illegible] Rev

FORM 5
VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: USAEHA-OECD-CAB

Lab File ID: >BFK13 — BFB Injection Date: 11/13/93

Instrument ID: CHEMSTATION — BFB Injection Time: 12:25

Matrix: AIR — Column:(pack/cap) Cap

m/e	TON ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% OF MASS 95	21.2
75	30.0 - 60.0% OF MASS 95	49.6
95	3ase peak, 100% relativa abundance	100.
96	5.0 - 9.0% of mass 95	6.9
173	Less than 2.0% of mass 174	0.0(0.0)1
174	Greater than 50.0% of mass 95	78.9
175	5.0 - 9.0% of mass 174	6.2(7.9)1
176	Greater than 95.0%, but less than 101.0% of mass 174	76.4(96.9)1
177	5.0 - 9.0% of mass 175	3.8(5.0)2

1-Value is % mass 174 — 2-Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	AQAD SAMPLE NO.	FIELD SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	50 NG CHECK	50 NG ISTD/SU	>JA27A	11/13/93	13:27
02	LAB BLANK	50 NG ISTD	>JA28A	11/13/93	14:21
03	R3734	T3ASF0802	>JA29A	11/13/93	15:24
04	R3735	TCTASF0501	>JA30A	11/13/93	16:23
05	R3737	TCTMSF0901	>JA32A	11/13/93	18:26
06	R3738	TCTASF0509	>JA33A	11/13/93	19:23
07	R3739	TCTASF0505	>JA34A	11/13/93	20:20
08	R3740	TCTASF0503	>JA35A	11/13/93	21:17
09	R3741	TCTASF0508	>JA36A	11/13/93	22:15
10	R3742	T3MSF0901	>JA37A	11/13/93	23:11
11	R3743	T3MSB0406	>JA38A	11/14/93	0:09
12	R3744	T3ASF0807	>JA39A	11/14/93	1:06
13					
14					
15					

FORM 5 T01 — 4/93 Rev.

FORM 5
VOLATILE ORGANIC GC/MS TUNING AND MASS
CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: USAEHA-OECD-CAB

Lab File ID: >BFK14

BFB Injection Date: 11/14/93

Instrument ID: CHEMSTATION

BFB Injection Time: 12:28

Matrix: AIR

Column: (pack/cap) Cap

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% OF MASS 95	23.0
75	30.0 - 60.0% OF MASS 95	49.5
95	Base peak, 100% relative abundance	100.
96	5.0 - 9.0% of mass 95	5.7
173	Less than 2.0% of mass 174	0.0(0.0) 1
174	Greater than 50.0% of mass 95	70.1
175	5.0 - 9.0% of ma55 174	4.0(3.7) 1
176	Greater than 95.0%, but less than 101.0% of mass 174	69.2(33.5) 1
177	5.0 - 9.0% of mass 176	3.6(5.3) 2

L-Value is % mass 174 2-Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	AQAD SAMPLE NO.	FIELD SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SO NG CHECK	SO NG ISTD/SU	>JA40A	11/14/93	13:17
02	LABBLANK	SO NG ISTD	>JA41A	11/14/93	14:12
03	R3745	T3ASF0804	>JA42A	11/14/93	15:15
94	R3736	T3ASB0405	>JA43A	11/14/93	16:13
05	R3746	T3ASF0801	>JA44A	11/14/93	17:10
06	R3747	T3ASF0806	>JA45A	11/14/93	18:07
07	R3748	T3FB0800	>JA46A	11/14/93	19:04
08	R3749	T3ASF0705	>JA47A	11/14/93	20:01
59	R3750	T3ASF0805	>JA48A	11/14/93	20:58
10	R3751	T3ASB0306	>JA49A	11/14/93	21:55
11	R3752	T3FB0707	>JA50A	11/14/93	22:52
12	R3753	TCTASF0608	>JA51A	11/14/93	23:49
13					
14					
15					

FORM 5 T01

FORM 5
VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: USAEHA-OECD-CAB

Lab File ID: >BFU16 BFB Injection Date: 11/16/93

Instrument ID: CHEMSTATION BFB Injection Time: 12:33

Matrix: AIR Column:(pack/cap) Cap

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% OF MASS 95	23.8
75	30.0 - 60.0% OF MASS 95	59.9
95	Base peak, 100% relative abundance	100.
96	5.0 - 9.0% of mass 95	6.9
173	Less than 2.0% of mass 174	0.0(0.0)1
174	Greater than 50.0% of mass 95	54.6
175	5.0 - 9.0% of mass 174	4.4(8.1)1
176	Greater than 95.0%, but less than 101.0% of mass 174	52.2(95.5)1
177	5.0 - 9.0% of mass 176	4.0(7.7)2

1-Value is % mass 174 2-Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	AQAD SAMPLE NO.	FIELD SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	50 NG CHECK	50 NG ISTD/SU	>JA52A	11/16/93	12:49
02	LAB BLANK	50 NG ISTD	>JA53A	11/16/93	15:01
03	R3754	TCTASF0607	>JA54A	11/16/93	16:02
04	R3755	TCTASB0207	>JA55A	11/16/93	16:59
05	R3756	TCTASF0604	>JA56A	11/16/93	17:56
06	R3757	TCTMSF0904	>JA57A	11/16/93	18:54
07	R3758	TCTASF0601	>JA58A	11/16/93	19:51
08	R3759	TCTASB1202	>JA59A	11/16/93	20:48
09	R3760	T3ASF0703	>JA60A	11/16/93	21:45
10	R3761	T3MSF0903	>JA61A	11/16/93	22:42
11	R3762	T3ASF0704	>JA62A	11/16/93	23:39
12					
13					
14					
15					

FORM 5 T01 4/93

FORM S
VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: USAEHA-OECD-CAB

Lab File ID: >BFK17

BFB Injection Date: 11/17/93

Instrument ID: CHEMSTATION

BFB Injection Time: 10:17

Matrix: AIR

Column: (pack/cap) Cap

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% OF MASS 95	26.0
75	30.0 - 60.0% OF MASS 95	58.9
95	Base peak, 100% relative abundance	100 .
96	5.0 - 9.0% of mass 95	7.4
173	Less than 2.0% of mass 174	0.0(0.0)1
174	Greater than 50.0% of mass 95	57.1
175	5.0 - 9.0% of mass 174	4.3(7.6)1
176	Greater than 95.0%. but less than 101.0% of mass 174	54.4(95.311
177	5.0 - 9.0% of mass 175	3.0(5.6)2

1-Value is % mass 174 2-Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	AQAD SAMPLE NO.	FIELD SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	50 NG CHECK	50 NG ISTD/SU	>JA63A	11/17/93	11:11
02	LABBLANK	SO NG ISTD	>JA64A	11/17/93	12:17
03	R3763	T3ASB0304	>JA65A	11/17/93	13:23
04	R3764	T3ASF0702	>JA66A	11/17/93	14:20
05	R3765	T3ASF0706	>JA67A	11/17/93	15:17
06	R3766	T3ASB0307	>JA68A	11/17/93	16:14
07	R3767	T3ASF1508	>JA69A	11/17/93	17:12
08	R3768	T3ASF1500	>JA70A	11/17/93	18:09
05	7.3769	T3ASF1506	>JA71A	11/17/93	19:06
10	R3770	T3ASB1608	>JA72A	11/17/93	20:03
11	R3771	T3ASF1510	>JA73A	11/17/93	21:01
12	R3772	T3ASF1[illegible]	>JA74A	11/17/93	21:55
13					
14					
15					

FORM 5 T01 4/93 Rev

FORM S
VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: USAEHA-OECD-CAB

Lab File ID: >BFK18 — BFB Injection Date: 11/18/93

Instrument ID: **CHEMSTATION** — **BFB Injection Time:** 10:34

Matrix: AIR — Column: (pack/cap) Cap

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
so	15.0 - 40.0% OF MASS 95	24.7
75	30.0 - 50.0% OF MASS 95	53.I
95	3ase peak, 100% relative abundance	100.
96	5.0 - 9.0% of mass 95	7.1
173	Less than 2.0% of mass 174	0.0(0.0)1
i74	Greater than 50.0% of mass 95	58.4
175	5.0 - 3.0% of mass 174	3.8(6.5)1
176	Greater than 95.0%, but less than 101.0% of mass 174	96.6(96.9)1
177	5.0 - 9.0% of mass 176	4.0(? 1)2

L-Value is % mass 174 — 2-Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	AQAD SAMPLE NO.	FIELD SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	50 NG CHECK	SO NG ISTD/SU	>JA75A	11/18/93	12:25
02	LAB BLANK	SO NG ISTD	>JB76A	11/18/93	15:35
03	R3773	TCTASF0907	>JA77A	11/18/93	14:34
04	R3774	TCTASB1206	>JC734	11/18/93	16:33
05	R3775	TCTASF0906	>JC79A	11/18/93	17:30
06	x3775	TCTMSF1703	>JC80A	11/18/93	18:27
07	R3777	TCTMSB1201	>JC81A	11/18/93	19:24
08	R3778	TCTASF1106	>JC82A	11/18/93	20:21
09	R3779	TCTMSF1701	>JC83A	11/18/93	21:18
10	R3780	TCTASF0909	[illegible]	11/18/93	[illegible]
11					
12					
13					
14					
15					

FORM 5 TCL

FORM 5
VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: USAEHA-OECD-CAB

Lab File ID: >BFU19 BFB Injection Date: 11/19/93

Instrument ID: CHEMSTATION BFB Injection Time: 15:10

Matrix: AIR Column:(pack/cap) Cap

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% OF MASS 95	27.0
75	30.0 - 60.0% OF MASS 95	57.0
95	Base peak, 100% relative abundance	100 .
96	5.0 - 9.0% of mass 95	6.6
173	Less than 2.0% of mass 174	0.0 (0.0)1
174	Greater than 50.0% of mass 95	54.2
175	5.0 - 9.0% of mass 174	5.7(8.9)1
176	Greater than 95.0%, but less than 101.0% of mass 174	62.9(97.9)1
177	5.0 - 9.0% of mass 176	3.5(5.5)2

1-Value is % mass 174 2-Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	AQAD SAMPLE NO.	FIELD SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	50 NG CHECK	50 NG ISTD/SU	>JA87A	11/19/93	16:55
02	LAB BLANK	50 NG ISTD	>JA88A	11/19/93	17:52
03	R3781	TCTASB1209	>JA85A	11/19/93	19:29
94	R3782	TCTASF0908	>JA86A	11/19/93	20:26
05	R3783	TCTASF0905	>JB89A	11/19/93	21:23
06	R3784	T3ASF1507	>JB90A	11/19/93	22:20
57	R3785	T3ASB1600	>JB91A	11/19/93	23:18
08	R3786	T3ASF1509	>JB92A	11/20/93	0:15
09	R3787	T3MSF1702	>JB93A	11/20/93	1:12
10	R3788	T3ASF1303	>JB94A	11/20/93	2:09
11					
12					
13					
14					
15					

FORM 5 T01 4/93 Rev

FORM 5
VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: USAEHA-OECD-CAB

Lab File ID: >BFK20 — BFB Injection Date: 11/20/93

Instrument ID: CHEMSTATION — BFB Injection Time: 11:53

Matrix: AIR — Column: (pack/cap) Cap

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% OF MASS 95	29.5
75	30.0 - 50.0% OF MASS 95	52.5
95	Base peak, 100% relative abundance	100 .
96	5.0 - 9.0% of mass 95	7.2
173	Less than 2.0% of mass 174	0.0(0.0)1
174	Greater than 50.0% of mass 95	54.0
175	5.0 - 3.0% of mass 174	4.6(8.5)1
176	Greater than 95.0%, but less than 101.0% of mass 174	51.4(95.2)1
177	5.0 - 9.0% of mass 176	3.4(6.6)2

1-Value is % mass 174 — 2-Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	AQAD SAMPLE NO.	FIELD SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SO NG CHECK	50 NG ISTD/SU	>JA97A	11/20/93	12:33
02	LAB BLANK	SC NG ISTD	>JA98A	11/20/93	13:37
03	R3789	T3ASB1605	>JA95A	11/20/93	14:44
04	R3790	T3ASF1302	>JA96A	11/20/93	15:56
05	R3791	T3FB1501	>KA01A	11/20/93	16:53
06	R3792	T3ASF1301	>KA02A	11/20/93	17:51
07	R3793	T3ASB1602	>KA03A	11/20/93	18:48
08	R3794	T3ASF1505	>KA04A	11/20/93	19:45
09	R3795	T3ASF1504	>KA05A	11/20/93	20:42
10	R3796	T3ASB1409	>KA06A	11/20/93	21:37
11	R3797	T3TFB1209	>KA07A	11/20/93	22:36
12	R3798	T3TTB0906	>KA08A	11/20/93	23:33
13					
14					

FORM 5 T01 — 4/93 Rev

FORM 5
VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: USAEHA-OECD-CAB

Lab File ID: >BFK21 **BFB Injection Date:** 11/21/93

Instrument ID: CHEMSTATION BFB Injection Time: 18:53

Matrix: AIR **Column:** (pack/cap) Cap

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
SO	IS.0 - 40.0% OF MASS 95	21.3
7s	30.0 - 60.0% OF MASS 95	51.9
9s	Base peak, 100% relative abundance	100.
95	5.0 - 9.0% of mass 95	7.1
173	Less than 2.0% of mass 174	0.0(0.0)1
174	Greatek than 50.0%of mass 95	56.3
175	5.0 - 9.0% of mass 174	4.7(8.4)1
176	Greater than 95.0%, but less than 101.0% of mass 174	56.0(99.5)1
177	5.0 - 9.0% of mass 176	3.8(6.7)2

l-Value is % mass 174 2-Value is % mbss 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	AQAD SAMPLE NO.	FIELD SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SO NG CHECK	SO NG ISTD/SU	>KA09A	11/21/93	19:16
02	LABBLANK	SO NG ISTD	>KA10A	11/21/93	20:49
03	R3799	TCTTB0635	>KA11A	11/21/93	21:46
04	R3800	T3TB0905	>KA12A	11/21/93	22:43
OS					
06					
37					
08					
09					
11					
12					
13					
14					
15					

FORM 5 T01

FORM 8
T01 INTERNAL STANDARD AREA SUMMARY

Lab Name: AEHA-OECD

Lab File ID (Standard) : >JA15A

Date Analyzed:11/12/93

Instrument ID: Chemstation

Time Analyzed: 17:57

Matrix: Air

Column: CAP

		IS1(TOL) AREA #	RT	IS2(***) AREA #	RT	IS3 (***) AREA #	RT
	12 HOUR STD	909289.	10.94	0.	0.00	0.	0.00
	UPPER LIMIT	1618578.		0.		0.	
	LOWER LIMIT	404644.		0.		0.	
	AQAD -SAMPLE-NO.-						
01	SYSTEMBLANK	784753.	10.95	0.	0.00	0.	0.00
02	R3724	811786.	10.95	0.	0.00	0.	0.00
03	R3725	773011.	-10.94	0	0.00	0.	0.00
04	R2726	-795378.	-10.93	0	0.00	0.	0.00
05	R3727	818008.	-10.93	0	0.00	0.	0.00
06	R3728	-462270	-10.94	0	0.00	0.	0.00
07	R3729	-812992:-	-10 . 94	0.	0.00	0.	0.00
08	R3730	-805578.1	-10.94	0.	0.00	0.	0.00
09	R3731	828763.	-10 . 94	0.	0.00	0.	0.00
10	R3732	798754.	10.94	0	0.00	0.	0.00
11	R3733	811104.	10.93	0	0.00	0.	0.00
12							
13							
14							
15							
16							

IS1 (TOL) = Toluene-d8
IS2 (***) =
IS3 (***) =

UPPER LIMIT = [illegible] of internal standard area.
LOWER LIMIT = [illegible] of internal standard area.

= Column used to flag internal standard a[illegible] values with an [illegible]

FORM 8
T01 INTERNAL STANDARD AREASUMMARY

Lab Name: AEHA-OECD

Lab File ID (Standard): >JA27A

Date Analyzed:11/13/93

Instrument ID: Chemstation

Time Analyzed:11/13/93 13:27

Matrix: Air

Column: CAP

		IS1(TOL) AREA #	RT	IS2(***) AREA #	RT	IS3(***) AREA #	RT
	12 HOUR STD	828881.	10.94	0.	0.00	0.	0.00
	UPPER LIMIT	1657762.		0.		0.	
	LOWER LIMIT	414441.		0.		0.	
	AQAD SAMPLE_NO.						
01	LAB_BLANK	646324.	10.94	0.	0.00	0.	0.00
02	R3734	-7913x.	-10.93	0.	0.00	0.	0.00
03	R3735	-795808.	-10.93	0.	0.00	0.	0.00
34	R3737	799415.	10.96	0.	0.00	0.	0.00
OS	R3738	814936.	-10.93	0.	0.00	0.	0.00
06	R3739	817123.	-10.93	0.	0.00	0.	0.00
07	R3740	781431.	-10.94	0.	0.00	0.	0.00
08	R3741	801473.	-10.93	0.1	0.00	0.	0.00
09	R3742	818295.	-10.93	0.	0.00	0.	0.00
10	R3743	782350.	-10.94	0.	0.00	0.	0.00
11	R3744	792028.	10.95	0.	0.00	0.	0.00
12							
13							
14							
15							
16							

IS1 (TOL) = Toluene-d8
IS2 (***) =
IS3 (***) =

UPPER LIMIT = + 100%
of internal standard area.
LOWER LIMIT = - 50%
of internal standard area.

= Column used to flag internal standard area values with an asterisk

FORM 8
T01 INTERNAL STANDARD AREA SUMMARY

Lab Name: AEHA-OECD

Lab File ID (Standard): >JA40A — Date Analyzed: 11/14/93

Instrument ID: Chemstation — Time Analyzed: 11/14/93 13:17

Matrix: Air — Column: CAP

		IS1(TOL) AREA #	RT	IS2(***) AREA #	RT	IS3(***) AREA #	RT
	12 HOUR STD	703334.	10.93;	0.	0.00	0.	0.00
	UPPER LIMIT	1406668.		0.		0.	
	LOWER LIMIT	351667.		0.		0.	
	AQAD -SAMPLE-NO.-						
01	LABBLANK	758568.	10.95	0	0.00	0.	0.00
02	R3745	788387.	-10.94	0	0.00	0.	0.00
03	R3 736	760377.	10.93	0	0.00	0.	0.00
04	R3746	776103.	10.95	0	0.00	0.	0.00
05	R3747	765330.	-10.94	0.	0.00	0.	0.00
06	R3748	760172.	10.94	0.	0.00	0.	0.00
07	R3749	796903	-10.95	0.	0.00	0.	0.00
08	R3750	731764.	-10.94	0.1	0.00	0.	0.00
09	R3751	784443.	-10.93	0	0.00	0.	0.00
10	R3752	763308.	-10.94	0.	0.00	0.	0.00
11	R3753	7X841.	10.94	0.	0.00	0.	0.00
12							
13							
14							
15							
16							

IS1 TOL = Toluene-d8
IS2 *** =
IS3 *** =

UPPER LIMIT = + 100%
of internal standard area.
LOWER LIMIT = - 50%
of internal standard area.

* [illegible] internal standard area values with an asterisk

FORM 8
T01 INTERNAL STANDARD AREA SUMMARY

Lab Name: AEHA-OECD

Lab File ID (Standard) : >JA52A

Date Analyzed:11/16/93

Instrument ID: Chemstation

Time Analyzed:11/16/93 12:49

Matrix: Air

Column : CAP

		IS1(TOL) AREA #	RT	IS2(***) AREA #	RT	IS3(***) AREA #	RT
	12 HOUR STD	715969.	10.93	0.	0.00	0.	0.00
	UPPER LIMIT	1431933.		0.		0.	
	LOWER LIMIT	357984.		0.		0.	
	AQAD SAMPLE_NO.						
01	LAB_BLANK	708006.	-10.93	0.	0.00	0.	0.00
02	R3754	-750865.	10.93	0.	0.00	0.	0.00
03	R3755	726564.	-10.93	0.	0.00	0.	0.00
04	R3756	-715428-I	-10.94	0.	0.00	0.	0.00
05	R3757	723509.	-10.94	0.	0.00	0.	0.00
06	R3758	-7X212.	-10.92	0.	0.00	0.	0.00
07	R3759	-778099 .	-10.94	0.	0.00	0 .	0.00
08	R3760	-728440	-10.93	0.	0.00	0.	0.00
09	R3761	-687246::	-10.92	0	0.00	0.	0 .00
10	R3762	733019.	10.93	0 f-	0.00	0.	0.00
11							
12							
13							
14							
15							
16							

IS1 (TOL) = Toluene-d8
IS2 (***) =
IS3 (***) =

UPPER LIMIT = + 100%
of internal standard area.
LOWER LIMIT = - 50%
of internal standard area

* Column used to flag internal standard area [illegible]

FORM 8
T01 INTERNAL STANDARD AREA SUMMARY

Lab Name: AEHA-OECD

Lab File ID (Standard): >JA63A

Date Analyzed: 11/17/93

Instrument ID: Chemstation

Time Analyzed: 11/17/93 11:11

Matrix: Air

Column: CAP

		IS1(TOL) AREA #	RT	IS2(***) AREA #	RT	IS3(***) AREA #	RT
	12 HOUR STD	595463.	10.93	0.	0.00	0.	0.00
	UPPER LIMIT	1390926.		0.		0.	
	LOWER LIMIT	347731.		0.		0.	
	AQAD -SAMPLE-NO.-						
01	LABBLANK	-671813	-10.93	0.	0.00	0	0.00
02	R3763	664737.	10.94	0.	0.00	0.	-0.00
03	R3764	-620353	10.94	0.	0.00	0.	-0.00
04	R3765	-652870.	-10.93	0.	0.00	0.	0.00
05	R3766	-638617.	-10.94	0.	0.00	0.	**-3.00**
06	R3767	-641677.	10.93	0.	0.00	0.	**-0.00**
07	R3768	-639171.	10.93	0.	0.00	0.	0.00
08	R3769	-635824.	10.93	0.	**0.00**	0.	**-0.00**
09	R3770	344508.*	10.93	0.	**-0.00**	0.	0.00
10	R3771	-577189.	10.93	0.	0.00	0	0.00
11	R3772	-518442.	10.94	0	0.00		0.GO
12							
13							
14							
15							
16							

IS1 (TOL) = Toluene-d8

IS2 (***) =

IS3 (***) =

UPPER LIMIT = [illegible] of internal [illegible] area.

LOWER LIMIT [illegible] of internal [illegible] area.

FORM 8

T01 INTERNAL STANDARD AREA SUMMARY

Lab Name: AEHA-OECD

Lab File ID (Standard): >JA75A

Date Analyzed: 11/18/93

Instrument ID: Chemstation

Time Analyzed: 11/18/93 12:25

Matrix: Air

Column: CAP

		IS1(TOL) AREA #	RT	IS2(***) AREA #	RT	IS3(***) AREA #	RT
	12 HOUR STD	682394.	10.92	0.	0.00	0.	0.00
	UPPER LIMIT	1364788.		0.		0.	
	LOWER LIMIT	341197 .		0.		0.	
	AQAD -SAMPLE-NO.-						
01	LAB_BLANK	658916.	10.94	0.	0.00	0.	0.00
02	R3773	691496.	-10.92	0.	0.00	0.	-0.00
03	R3774	680257.	-10.94	0.	0.00	0.	-0.00
04	R3775	639425.	-10.92	0.	0.00	0.	-0.00
05	R3776	-679446.	-10.93	0.	0.00	0.	-0.00
06	R3777	710761.	-10.93	0.	0.00	0.	-0.00
07	R3778	-727279 .	-10.93	0.	0.00	0.	-0.00
08	R3779	726288.	-10.92	0.	0.00	0.	-0.00
09	R3780	-749243 .	-10.93	0.	0.00	0.	-0.00
10							
11							
12							
13							
14							
15							
16							

IS1 (TOL) = Toluene-d8
IS2 (***) =
IS3 (***) =

UPPER LIMIT = + 100%
of internal standard area.
LOWER LIMIT = - 50%
of internal standard area.

Column used to flag internal standard area values with an asterisk

FORM 8
T01 INTERNAL STANDARD AREA SUMMARY

Lab Name: AEHA-OECD

Lab File ID (Standard): >JA87A — Date Analyzed: 11/19/93

Instrument ID: Chemstation — Time Analyzed: 11/19/93 16:55

Matrix: Air — Column: CAP

		IS1(TOL) AREA #	RT	IS2(***) AREA #	RT	IS3(***) AREA #	RT
	12 HOUR STD	666579.	10.94	0.	0.00	0.	3.00
	UPPER LIMIT	1333158.		0.		0.	
	LOWER LIMIT	333290.		0.		0.	
	AQAD SAMPLE_NO.						
01	LAB_BLANK	643178.	10.94	0.	0.00	0.	0.00
02	R3781	628748.	-10.95	.	0.00	0.	-0.00
03	R3782	600258.	-10.93	0	0.00	0.	-0.00
04	R3783	647771.	-10.94	0	0.00	0	-0.00
05	R3784	-616766-	-10.93	0	0.00	0	-0.00
06	R3785	695495.	-10.93	0	0.00	0	-0.00
07	R3786	721979.	-10.93	0	0.00	0.	-0.00
08	R3787	-729383 .	-10.94	0	0.00	0.	-0.00
09	R3788	694781.	10.94	0	0.00	0.	-0.00
10							
11							
12							
13							
14							
15							
16							

IS1 (TOL) = Toluene-d8
IS2 (***) =
IS3 (***) =

UPPER LIMIT = + 100% of internal standard area.
LOWER LIMIT = - 50% of internal standard area.

= Column used to flag internal standard area values with an asterisk

FORM 8
T01 INTERNAL STANDARD AREA SUMMARY

Lab Name: AEHA-OECD

Lab File ID (Standard1 : >JA97A

Date Analyzed:11/20/93

Instrument ID: Chemstation

Time Analyzed:11/20/93 12:33

Matrix: Air

Column: CAP

		IS1(TOL) AREA #	RT	IS2(***) AREA #	RT	IS3(***) AREA #	RT
	12 HOUR STD	777811.	10.94	0.	0.00	0.	0.00
	UPPER LIMIT	1555622.		0.		0.	
	LOWER LIMIT	388906.		0.		0.	
	AQAD SAMPLE_NO.						
01	LAB_BLANK	956161.	10.93	0.	0.00	0.	0.00
02	R3789	758604.	-10.93	0.	-0.00	0.	-0.00
03	R3790	782704.	-10.95	0.	-0.00	0.	-0.00
04	R3791	781531.	-10.93	0.	-0.00	0.	-0.00
05	R3792	770464.	-10.93	0.	-0.00	0.	-0.00
06	R3793	776246.	-10.93	0.	0.00	0.	-0.00
07	R3794	773063.	-10.93	0.	0.00	0.	-0.00
08	R3795	761739.	-10.93	0.	0.00	0.	-0.00
09	R3796	749036.	-10.93	0.	0.00	0.	-0.00
10	R3797	753991.	-10.93	0.	0.00	0.	0.00
11	R3798	754233.	-10.93	0.	-0.00	0.	-0.90
12							
13							
14							
15							
16							

IS1 (TOL) = Toluene-d8
IS2 (***) =
IS3 (***) =

UPPER LIMIT = - 100%
of internal standard area
LOWER LIMIT = . 50%
of internal standard area

Column used to flag internal standard area values with an asterisk

FORM 8
T01 INTERNAL STANDARD AREA SUMMARY

Lab Name: AEHA-OECD

Lab File ID (Standard) : >KA09A

Date Analyzed:11/21/93

Instrument ID: Chemstation

Time Analyzed:11/21/93 19:16

Matrix: Air

Column: CAP

		IS1(TOL) AREA #	RT	IS2(***) AREA #	RT	IS3(***) AREA #	RT
	12 HOUR STD	777537 .	10.92	0.	0.00	0.	0.00
	UPPER LIMIT	1555194 .		0.		0.	
	LOWER LIMIT	388738.		0.		0.	
	AQAD -SAMPLE-NO.-						
01	LABBLANK	-744974 .	10.93	0.	0.00	0.	0.00
02	R3799	758483.	-10.93	0.	-0.00	.	- 0.00
03	R3800	-790705 .	10.93	0.	-0.00	0.	- 0.00
04							
05							
06							
07							
08							
09							
10							
11							
12							
13							
14							
15							
16							

IS1 (TOL) = Toluene-d8
IS2 (***) =
IS3 (***) =

UPPER LIMIT = [illegible]
of internal standard area.
LOWER LIMIT [illegible]
of internal standard area.

Column used to flag internal standard area values with an asterisk

FORM 8 [illegible] 4/93 Rev.

FORM 2A
VOLATILE SURROGATE RECOVERY
PRIMARY T01 TUBES

Lab Name: USAEHA-OECD

Samples (all primary tubes) spiked with SO ng of both Benzene-d6 and Ethylbenzene-d10 prior to sampling.

	AQAD SAMPLE NO.	S1 (BZE)#	S2 (EBZ)#	S3 (***)#	OTHER	TOT OUT
01	R3731	116	91			0
02	R3732	125	95			0
03	R3733	121	91			0
04	R3734	117	97			0
05	R3735	0 *	98			1
06	R3737	96	94			0
07	R3738	115	97			0
08	R3739	119	97			0
09	R3740	121	103			0
10	R3742	99	97			0
11	R3744	121	93			0
12	R3745	115	94			0
13	R3746	117	94			0
14	R3747	116	95			0
15	R3748	124	92			0
16	R3750	116	100			0
17	R3752	121	90			0
18	R3753	120	90			0
19	R3756	108	91			0
20	R3765	122	91			0
21						
22						
23						
24						
25						

	QC LIMITS
S1 (BZE) = Benzene-d6	(75-125)
52 (EBZ) = Ethylbenzene-d10	(75-125)
s3 (***) =	

Column to be used to flag recovery values

* Values outside of required QC limits

FORM II T01 4/93 Rev.

FORM 2A
VOLATILE SURROGATE RECOVERY
PRIMARY T01 TUBES

Lab Name: USAEHA-OECD

Samples (all primary tubes) spiked with 50 ng of both Benzene-d6 and Ethylbenzene-d10 prior to sampling.

	AQAD SAMPLE NO.	S1 (BZE)#	S2 (EBZ)#	s3 (***)#	OTHER	TOT OUT
01	R3767	96	88			0
02	R3768	94	87			0
03	R3769	93	89			0
04	R3771	35	91			0
05	R3772	101	90			0
06	R3773	98	86			0
07	R3774	107	93			0
08	R3776	88	99			0
09	R3778	102	97			0
10	R3779	104	95			0
11	R3780	102	91			0
12	R3782	107	107			0
13	R3783	102	98			0
14	R3784	105	103			0
15	R3786	106	98			0
16	R3787	99	91			0
17	R3788	100	93			0
18	R3790	99	99			0
19	R3791	102	99			0
20	R3792	103	101			0
21	R3794	99	99			0
22	R3795	103	100			0
23						
24						
25						

QC LIMITS
S1 (BZE) = Benzene-d6 (75-125)
s2 (EBZ) = Ethylbenzene-d10 (75-125)
s3 (***) =

Column to be used to flag recovery values

* Values outside of required QC limits

FORM II T01

FORM 2A
VOLATILE SURROGATE RECOVERY.-- [illegible]
PRIMARY T01 TUBES

Lab Name: USAEHA-OECD

Samples (all primary tubes) spiked with 150 ng of Benzene-d6 and 50 ng of Ethylbenzene-d10 prior to sampling.

	AQAD SAMPLE NO.	S1 (BZE)#	S2 (EBZ)#	S3 (***)#	OTHER	TOT OUT
01	R3724	89	101			0
02	R3725	85	94			0
03	R2726	91	99			0
04	R3727	92	102			0
05	R3728	111	104			0
06	R3729	86	96			0
07	R3741	96	97			0
08	R3730	97	93			0
09	R3749	88	95			0
10	R3754	89	90			0
11	R3758	66	39			i
12	R3760	[illegible]	95			0
13	R3762	[illegible]	95			0
14	R3764	[illegible]	90			0
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						

		QC LIMITS
S1 (BZE)	= Benzene-d6	(75-125)
S2 (EBZ)	= Ethylbenzene-d10	(75-125)
S3 (***)	=	

Column to be used to flag recovery values

* Values outside of required QC limits

FORM II [illegible] [illegible]93 Rev.

FORM 2A
VOLATILE SURROGATE RECOVERY
BACKUP TO1 TUBES

Lab Name: USAEHA-OECD

Samples (all backup tubes and some of the blanks) were not spiked with either surrogate solution prior to sampling. Any surrogate recovery in these samples indicates analyte breakthrough.

	AQAD SAMPLE NO.	S1 (BZE)#	S2 (EBZ)#	S3 (***)#	OTHER	TOT OUT
01	R3743	0	0			0
02	R3736	8 *	0			1
03	R3751	6 *	0			1
04	R3755		3			0
05	R3759		0			0
06	R3763	11 *	0			1
07	R3766	5 *	0			1
08	R3770	0	0			0
09	R3775	0				0
10	R3777	16 *	0			1
11	R3781	0	0			0
12	R3785	0	0			0
13	R3789	0	0			0
14	R3793	0	0			0
15	R3796	0	0			0
16	R3797	0	0			0
17	R3798	2 *	0			1
18	R3799	0	0			0
19	R3800	0	0			0
20						
21						

S1 (BZE) = Benzene-d6
S2 (EBZ) = Ethylbenzene-d10
S3 (***) =

Column to be used to flag recovery values

* Indicates analyte breakthrough

KUWAIT HRA
MATRIX SPIKE RECOVERY DATA

MATRIX SPIKE: TCTMSF0901 (R3737)
MS VOLUME: 17.4L
ASSOCIATED SAMPLE: TCTASF050 1 (R3735)
SAMPLE VOLUME: 17.1L
COLLECTION DATE: 11/03/93(0145)
SPIKED AMOUNT: 100 NG

ANALYTE	MATRIX SPIKE REC (NG)	TCTMSF0901 MATRIX SPIKE RECOVERY (NGIVOL)	ASSOC SAMPLE REC (NG)	TCTASF0501 ASSOC SAMPLE RECOVERY (NG/VOL)	AMOUNT SPIKED (NG/VOL)	THEORETICAL AMOUNT SPIKE (NGIVOL)	PERCENT RECOVERY (%)
BENZENE	123	7.1	26	1.5			95.9
TOLUENE	151	8.7	62	3.6	5.8	9.8	91.6
ETHYLBENZENE	103	5.9	8	0.5	5.8	6.31	93.7
M/P XYLENE	222	12.8	23	1.3	11.7	13.0	97.8
0 XYLENE	109	6.7	10	0.6	5.8	6.4	103.61
NPROPYLBENZEN		6.3	0	0.0	5.8	5.8	107.1

MATRIX SPIKE: T3MSF0902 (R3742)
MS VOLUME: 13.8L
ASSOCIATED SAMPLE; T3ASF0807 (R3744)
SAMPLE VOLUME: 14.3L
COLLECTION DATE: 11/03/93(0500)
SPIKED AMOUNT: 100 NG

ANALYTE	MATRIX SPIKE REC (NG)	T3MSF0902 MATRIX SPIKE RECOVERY (NGIVOL)	ASSOC SAMPLE REC (NG)	T3ASF0807 ASSOC. SAMPLE RECOVERY (NG/VOL)	AMOUNT SPIKED (NGIVOL)	THEORETICAL AMOUNT SPIKE (NGIVOL)	PERCENT RECOVERY (%)
BENZENE	121	8.8	20	1.4	7.0	8.4	104.5
TOLUENE	153	11 1	53	3 7	7 0	10 7	103.6
ETHYLBENZENE	113	9.2	10	3 7	7.0	- -	26.4
M/P XYLENE	228	16.5	26	1.8	14.0	15 8	104.5
0 XYLENE	125,	9.1	11	0.8	7.0	7 8	167
NPROPYLBENZEN	111	8 0	3	0.2	7 0	7 2	7

KUWAIT HRA
MATRIX SPIKE RECOVERY DATA

MATRIX SPIKE: TCTMSF0904 (R3757)
MS VOLUME: 16.6L
ASSOCIATED SAMPLE: TCTASF0601 (R3758)
SAMPLE VOLUME: 16.7L
COLLECTION DATE: 11/06/93(1305)
SPIKED AMOUNT: 100 NG

ANALYTE	MATRIX SPIKE REC (NG)	TCTMSF0904 MATRIX SPIKE RECOVERY (NG/VOL)	ASSOC SAMPLE REC (NG)	TCTASF0601 ASSOC. SAMPL RECOVERY (NG/VOL)	AMOUNT SPIKED (NG/VOL)	THEORETICAL AMOUNT SPIKE (NG/VOL)	PERCENT RECOVERY (%)
BENZENE	119	7.2	24	1.4	6.0	7.4	96.5
TOLUENE	134	6.1	75	4.5	6.0	10.5	77.0
ETHYLBENZENE	109	6.6	4	0.2	6.0	6.2	105.4
M/P XYLENE	219	13.2	5	0.5	12.0	12.5	105.4
O XYLENE	119	7.2	0	0.0	6.0	6.0	114.0
NPROPYLBENZEN	113	6.8					

MATRIX SPIKE: T3MSF0903 (R3761)
MS VOLUME: 15.3L
ASSOCIATED SAMPLE: T3ASF0704 (R3762)
SAMPLE VOLUME: 15.3L
COLLECTION DATE: 11/05/93(0500)
SPIKED AMOUNT: 100 NG

ANALYTE	MATRIX SPIKE REC (NC)	T3MSF0903 MATRIX SPIKE RECOVERY (NG/VOL)	ASSOC SAMPLE REC (NG)	T3ASF0704 ASSOC. SAMPL RECOVERY (NG/VOL)	AMOUNT SPIKED (NGNOL)	THEORETICAL AMOUNT SPIKE (NG/VOL)	PERCENT RECOVERY (%)
BENZENE	134	6.6	31	2.0	6.5	8.6	132.3
TOLUENE	160	10.5	57	3.7	6.5	10.3	101.9
ETHYLBENZENE	122	8.0	14	0.9	6.5	7.5	107.0
M/P XYLENE	250	16.3	37	2.4	13.1	15.5	105.5
O XYLENE	134	6.6	15	1.0	6.5	[illegible]	116.5
NPROPYLBENZEN	117	7.6	4	0.3	6.5	7.2	112.5

KUWAIT HRA
MATRIX SPIKE RECOVERY DATA

MATRIX SPIKE: TCTMSF1 703 (R3776)
MS VOLUME: 16.3L
ASSOCIATED SAMPLE: TCTASF1 106 (R3778)
SAMPLE VOLUME: 16.4L
COLLECTION DATE: 11/07/93(1204)
SPIKED AMOUNT: 200 NG

ANALYTE	MATRIX SPIKE REC (NG)	TCTMSF1703 MATRIX SPIKE RECOVERY (NG/VOL)	ASSOC SAMPLE REC (NG)	TCTASF1106 ASSOC. SAMPLI RECOVERY (NG/VOL)	AMOUNT SPIKED (NG/VOL)	THEORETICAL AMOUNT SPIKE (NG/VOL)	PERCENT RECOVERY (%)
BENZENE	204	12.5	9	0.5	12.2	12.7	96.2
ETHYLBENZENE	200	12.3	12	0.6	12.2	12.8	95.6 99.6
M/P XYLENE	394	24.2	5	0.3	24.4	24.7	97.9
NPROPYLBENZEN	189	11.6	3	0.3	12.2	12.4	106.51 95.1

MATRIX SPIKE: TCTMSF1701 (R3779)
MS VOLUME: 17.8L
ASSOCIATED SAMPLE: TCTASF0909 (R3780)
SAMPLE VOLUME: 16.6L
COLLECTION DATE: 11/07/93(2326)
SPIKED AMOUNT: 200 NG

ANALYTE	MATRIX SPIKE REC (NG)	TCTMSF1701 MATRIX SPIKE RECOVERY (NG/VOL)	ASSOC SAMPLE REC (NG)	TCTASF0909 ASSOC. SAMPLI RECOVER (NG/VOL)	AMOUNT SPIKED (NG/VOL)	THEORETICAL AMOUNT SPIKE (NG/VOL)	PERCENT RECOVERY (%)
BENZENE	201	11.3	18	[illegible]	12.0	[illegible]	86.0
TOLUENE	210	[illegible]	28		[illegible]	[illegible]	55.9
ETHYLBENZENE	198	[illegible]	5	[illegible]	12.0	[illegible]	30.1
M/P XYLENE	397	[illegible]	[illegible]	[illegible]	24.1	[illegible]	90.3
0 XYLENE	221	12.4	6	[illegible]	12.0	[illegible]	100.0
NPROPYLBENZEN	207	[illegible]	0	[illegible]	[illegible]	[illegible]	96.5

KUWAIT HRA
MATRIX SPIKE RECOVERY DATA

MATRIX SPIKE: T3MSF1702 (R3787)
MS VOLUME: 14.4L
ASSOCIATED SAMPLE: T3ASF1303 (R3788)
SAMPLE VOLUME; 14.6L
COLLECTION DATE: 11/09/93(0655)
SPIKED AMOUNT: 200 NG

ANALYTE	MATRIX SPIKE REC (NG)	T3MSF1702 MATRIX SPIKE RECOVERY (NG/VOL)	ASSOC SAMPLE REC (NG)	T3ASF1 303 ASSOC. SAMPLE RECOVERY (NG/VOL)	AMOUNT SPIKED (NG/VOL)	THEORETICAL AMOUNT SPIKE (NG/VOL)	PERCENT RECOVERY (%)
BENZENE	2481	17.2:	561	3.8	13.7	17.5	98.2
TOLUENE	317	22.0	133	9.1	13.7	22.8	96.5
ETHYLBENZENE	229		321	2.2	13.71	15.91	100.1
M/P XYLENE	472	32.8' 15.91	85	5.8	27.4'	33.2	98.7:
O XYLENE N	250	17.4	36	2.5	13.71	16.2	107.4
NPROPYLBENZE	203	14.1'	9	0.6	13.7:	14.3	98.5

ANNEX E-25

5B
SEMIVOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: AEHA-DLS-SAB

Lab File ID: >STA32 DFTPP Injection Date:12/01/93

Instrument ID: HP MSD 002 DFTPP Injection Time: 15:18

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	46.0
68	Less than 2.0% of mass 69	0.0(0.0)1
69	Mass 69 relative abundance	59.
70	Less than 2.0% of mass 69	5(.8)1
127	40.0 - 60.0% of mass 198	41.5
197	Less than 1.0% of mass 198	0.0
198	Base Peak, 100% relative abundance	100.
199	5.0 - 9.0% of mass 198	7.1
275	10.0 - 30.0% of mass 198	18.7
365	Greater than 1.00% of mass 198	1.48
441	Present, but less than mass 443	10.7
442	Greater than 40% of mass 198	77.4
443	17.0 - 23.0% of mass 442	14.0(18.1)

1-Value is % mass 69 2-Value is % mass 442

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	FIELD SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	50 UG/ML ST	CALIBRATION	>SKA32	12/01/93	15:46
02	R 3 7 0 1	XAD-07C	>SSB07	12/02/93	0:15
03	R3702	XAD-08C	>SSB08	12/02/93	1:18
04					
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5B
SEMIVOLATILE ORGANIC GC/MS TUNING AND MASS
CALIBRATION - DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: AEHA-DLS-SAB

Lab File ID: >STC02 DFTPP Injection Date:12/03/93

Instrument ID: HP MSD 002 DFTPP Injection Time: 23:32

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	53.1
68	Less than 2.0% of mass 69	0.0(0.0)1
69	Mass 69 relative abundance	64.
70	Less than 2.0% of mass 69	0.0(0.0)1
127	40.0 - 60.0% of mass 198	42.2
197	Less than 1.0% of mass 198	0.0
198	Base Peak, 100% relative abundance	100.
199	5.0 - 9.0% of mass 198	6.9
275	10.0 - 30.0% Of mass 198	18.1
365	Greater than 1.00% of mass 198	1.63
441	Present, but less than mass 443	8.9
442	Greater than 40% of mass 198	68.6
443	17.0 - 23.0% of mass 442	13.1(19.1)2

1-value is % mass 69 2-Value is % mass 442

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BUNKS, AND STANDARDS:

	FIELD SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	50 UG/ML ST;	CALIBRATION	>SKC12	12/03/93	23:59
02	BLANK	BLANK EXT 28	>SSC00	12/04/93	1:02
03	R3723	XAD-04	>SSC01	12/04/93	2:05
04	R3722	XAD-03	>SSC02	12/04/93	3:08
05	R3721	XAD-02	>SSC03	12/04/93	4:12
06	R3720	XAD-01	>SSC04	12/04/93	5:15
07	R3705	XAD-04C	>SSC05	12/04/93	6:18
08	R3719	XAD-03B	>SSC06	12/04/93	7:21
09	R3718	XAD-03FB	>SSC07	12/04/93	8:24
10	R3717	XAD-02C	>SSC08	12/04/93	9:27
11	R3716	XAD-01C	>SSC09	12/04/93	10:30
12					
13					
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17					
18					
19					

5B

SEMIVOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: AEHA-DLS-SAB

Lab File ID: >STC02 DFTPP Injection Date:12/03/93

Instrument ID: HP MSD 002 DFTPP Injection Time: 19:36

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	49.8
68	Less than 2.0% of mass 69	0.0(0.0)1
69	Mass 69 relative abundance	57.
70	Less than 2.0% of mass 69	0.0(0.0)1
127	40.0 - 60.0% of mass 198	44.5
197	Less than 1.0% of mass 198	0.0
198	Base Peak, 100% relative abundance	100.
199	5.0 - 9.0% of mass 198	6.6
275	10.0 - 30.0% of mass 198	18.7
365	Greater than 1.00% of mass 198	2.36
441	Present, but less than mass 443	8.9
442	Greater than 40% of mass 198	55.9
443	17.0 - 23.0% of mass 442	10.4(18.6)

1-Value is % mass 69 2-Value is % mass 442

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	FIELD SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	50 UG/ML ST	CALIBRATION	>SKC02	12/03/93	19:59
02	BLANK	BLANK EXT 28	>SSC00	12/03/93	21:02
03	R3715	XAD-05	>SSC01	12/03/93	22:06
04	R3714	XAD-11	>SSC02	12/03/93	23:10
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5B
SEMIVOLATILE ORGANIC GC/MS TUNING AND MASS
CALIBRATION - DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: AEHA-DLS-SAB

Lab File ID: >STC05 DFTPP Injection Date:12/06/93

Instrument ID: HP MSD 002 DFTPP Injection Time: 16:21

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	59.2
68	Less than 2.0% of mass 69	0.0(0.0)1
69	Mass 69 relative abundance	73.
70	Less than 2.0% of mass 69	45.5(.5)1
127	40.0 - 60.0% of mass 198	0.0
197	Less than 1.0% of mass 198	100.
198	Base Peak, 100% relative abundance	6.4
199	5.0 - 9.0% of mass 198	16.9
275	10.0 - 30.0% of mass 198	1.49
365	Greater than 1.00% of mass 198	7.8
441	Present, but less than mass 443	59.6
442	Greater than 40% of mass 198	10.5(17.6)2
443	17.0 - 23.0% of mass 442	

1-Value is % mass 69 2-Value is % mass 442

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	FIELD SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	50 UG/ML ST	CALIBRATION	>SKC10	12/06/93	16:48
02	R3703	XAD-06C	>SSC10	12/06/93	17:53
03	R3704	XAD-05C	>SSC11	12/06/93	18:57
04	R3706	XAD-03C	>SSC12	12/06/93	20:02
05	R3707	XAD-02TB	>SSC13	12/06/93	21:05
06	R3708	XAD-02B	>SSC14	12/06/93	22:08
07	R3709	XAD-07	>SSC15	12/06/93	23:11
08	R3710	XAD-06	>SSC16	12/07/93	0:14
09	R3711	XAD-09	>SSC17	12/07/93	1:17
10	R3712	m-10	>SSC18	12/07/93	2:20
11	R3713	XAD-08	>SSC19	12/07/93	3:23
12					
13					
14					
15					
16					
17					
18					
19					

AEHA-DLS-SAB
KUWAIT 39-22-L192

8B
SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: AEHA-DLS-SAB

Lab File ID (Standard): >SKA32 Date Analyzed:12/01/93

Instrument ID: HP MSD 002 Time Analyzed: 15:46

Matrix: WATER Level: LOW

		IS1(DCB) AREA #	RT	IS2(NPT) AREA #	RT	IS3(ANT) AREA #	RT
	12 HOUR STD	53762.	13.32;	197905.	17.28	85168.	22.97
	UPPER LIMIT	107524.		395810.		170336.	
	LOWER LIMIT	26881.		98953.		42584.	
	AQAD SAMPLE; NO.						
01	R3701	31965.	13.33;	174690.	17.28	83932.	22.98;
02	R3702	43641.	13.34	201063.	17.29,	102751.	22.99;
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22							

IS1 (DCB) = 1,4-Dichlorobenzene-d4
IS2 (NPT) = Naphthalene-d8
IS3 (ANT) = Acenaphthene-d8

UPPER LIMIT = + 100%
of internal stansard area.
LOWER LIMIT = - 50%
of internal standard area.

Column used to flag internal standard area values with an asterisk

AEHA-DLS-SAB
KUWAIT 39-22-L192

8C
SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: AEHA-DLS-SAD

Lab File ID (Standard): >SKA32 Date Analyzed:12/01/93

Instrument ID: HP MSD 003 Time Analyzed: 15:46

Matrix: WATER Level: LOW

	IS4(PHN) AREA #	RT	IS5(CRY) AREA #	RT	IS3(PRY) AREA #	RT
12 HOUR STD	111977.	27.75,	80196.	36.38	44662.	42.17
UPPER LIMIT;	223954.		160392.		89324.	
LOWER LIMIT	55989.		40098.		22331.	
AQAD SAMPLE NO.						
01 R3701	110266.	27.75;	72539.	36.38	24533.	42.20
02 R3702	144464.	27.761	103891.	36.39	28241.	42.19
03						
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22						

IS4 (PHN) = Phenanthrene-d10
IS5 (CRY) = Chrysene-d12
IS6 (PRY) = Perylene-d12

UPPER LIMIT = + 100%
of internal stansard area.
LOWER LIMIT = - 50%
of internal standard area.

Column used to flag internal standard area values with an asterisk

8B
SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: AEHA-DLS-SAB

Lab File ID (Standard): >SKC12 — Date Analyzed:12/03/93

Instrument ID: HP MSD 002 — Time Analyzed: 23:59

Matrix: WATER — Level : LOW

		IS1(DCB) AREA #	RT	IS2(NPT) AREA #	RT	IS3(ANT) AREA #	RT
	12 HOUR STD	50149.	13.28,	180290.	17.24		
	UPPER LIMIT	100298.		360580.		165928.	
	LOWER LIMIT	25074.		90145.		41482.	
	AQAD SAMPLE NO.						
01	BLANK	64042.	13.29,	233734.	17.23	110596.	22.92
02	R3723	65567.	13.29;	235138.	17.23	105078.	22.93;
03	R3722	72539.	13.29	259899.	17-23	122038.	
04	R3721	76253.	13.30	334828.	17.24	154765.	
05	R3720	13718.*	13.30	98359.	17.24	46671.	
06	R3705	28143.	13.30	145542.	17.24	66646.	
07	R3719	0.*	0.00;	0.*	0.00	0.*	0.00
08	R3718	52564.	13.29;	193867.	17.24	89649.	22.93;
09	R3717	8757.*	13.30;	108116.	17.25	63281.	22.93;
10	R3716	12032.*	13.30	120472.	17.25	57603.	22.93;
11							
12							
133							
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22							

IS1 (DCB) = 1,4-Dichlorobenzene-d4
IS2 (NPT) = Naphthalene-d8
IS3 (ANT) = Acenaphthene-d8

UPPER LIMIT = + 100% of internal stansard area.
LOWER LIMIT = - 50% of internal standard area.

Column used to flag internal standard area values with an asterisk

AEHA-DLS-SAB
KUWAIT 39-22-L192

8C
SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: AEHA-DLS-SAB

Lab File ID (Standard): >SKC12 — Date Analyzed: 12/03/93

Instrument ID: HP MSD 002 — Time Analyzed: 23:59

Matrix: WATER — Level: LOW

	IS4(PHN) AREA #	RT	IS5(CRY) AREA #	RT	IS3(PRY) AREA #	RT
12 HOUR STD	113416.	27.69	87714.	36.31	78500.	42.09
UPPER LIMIT	226832.		175428.		157000.	
LOWER LIMIT	56708.		43857.		39250.	
AQAD SAMPLE NO.						
01 BLANK	160518.	27.69	114716.	36.31	71463.	42.07
02 R3723	136901.	[illegible]		36.31	91754.	42.08
03 R3722	173780.	27.69	115565. 134754.	36.31	108057.	42.08
04 R3721	225205.	[illegible]		36.33	171461.*	42.14
05 R3720	63606.	27.70	200804183*	36.30	35818.*	42.06
06 R3705	91837.	27.69	75801.	36.31	48744.	42.09
07 R3719	0.*	0.00	0.*	0.00	0.*	0.00
08 R3718	122571.	27.70	99081.	36.32	73278.	42.11
09 R3717	90388.	27.70	80829.	36.32	44441.	42.10
10 R3716	80052.	27.70	66757.	36.32	49266.	42.10
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22						

IS4 (PHN) = Phenanthrene-d10
IS5 (CRY) = Chrysene-d12
IS6 (PRY) = Perylene-d12

UPPER LIMIT = + 100% of internal stansard area.
LOWER LIMIT = - 50% of internal standard area.

Column used to flag internal standard area values with an asterisk

8B

SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: AEHA-DLS-SAB

Lab File ID (Standard): >SKC02 — Date Analyzed: 12/03/93

Instrument ID: HP MSD 002 — Time Analyzed: 19:59

Matrix: WATER — Level: LOW

		IS1 (DCB) AREA #	RT	IS2 (NPT) AREA #	RT	IS3 (ANT) AREA #	RT
	12 HOUR STD	25899.	13.17	107695.	17.11	59029.	22.79
	UPPER LIMIT	51798.		215390.		118058.	
	LOWER LIMIT	12949.		53848.		29514.	
	AQAD SAMPLE NO.						
01	BLANK	37685.	13.17	149129.	17.10	83287.	22.79
02	R3715	9928.*	13.18	74662.	17.10	42754.	22.79
03	R3714	25910.	13.17	104305.	17.09	60579.	22.78
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20							
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22							

IS1 (DCB) = 1,4-Dichlorobenzene-d4
IS2 (NPT) = Naphthalene-d8
IS3 (ANT) = Acenaphthene-d8

UPPER LIMIT = + 100% of internal stansard area.
LOWER LIMIT = - 50% of internal standard area.

Column used to flag internal standard area values with an asterisk

8C
SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: AEHA-DLS-SAB

Lab File ID (Standard): >SKC02 — Date Analyzed: 12/03/93

Instrument ID: HP MSD 002 — Time Analyzed: 19:59

Matrix: WATER — Level: LOW

		IS4(PHN) AREA #	RT	IS5(CRY) AREA-#	RT	IS3(PRY) AREA #	RT
	12 HOUR STD	106372.	27.55	110691.	36.18	74189.	41.85
	UPPER LIMIT	212744.		221382.		148370.	
	LOWER LIMIT	53186.		55345.		[illegible]	
	AQAD SAMPLE NO.						
01	BLANK	140609.	27.55;	136297.	36.17	72020.	41.83
02	R3715	67254.	27.54;	84351.	36.17	[illegible]	41.81
03	R3714	96094.	27.54:	112541.	36.17	[illegible]	41.84
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22							

IS4 (PHN) = Phenanthrene-d10
IS5 (CRY) = Chrysene-d12
IS6 (PRY) = Perylene-d12

UPPER LIMIT = + 100% of internal stansard area.
LOWER LIMIT = - 50% of internal standard area.

Column used to flag internal standard area values with an asterisk

AEHA-DLS-SAB
KUWAIT 39-22-L192

8B
SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: AEHA-DLS-SAB

Lab File ID (Standard): >SKC10 Date Analyzed:12/06/93

Instrument ID: HP MSD 003 Time Analyzed: 16:48

Matrix: WATER Level: LOW

		IS1(DCB) AREA #	RT	IS2(NPT) AREA #	RT	IS3(ANT) AREA #	RT
	12 HOUR STD	56080.	13.31	208484.	17.27;	91135.	22.96
	UPPER LIMIT;	112160.		416968.		182270.	
	LOWER LIMIT	28040.		104242.		45568.	
	i AQAD SAMPLE NO.						
01	R3703	28920.	13.31	153688.	17.26	74444.	22.95
02	R3704	25845.*	13.31	139574.	17.24	64910.	22.941.
03	R3706	20811.*	13.31	114467.	17.25:	49627.	22.94
04	R3707	0.*	0.00	0.*	0.00;	0.*	0.00;
05	R3708	0.*	0.00	0.*	0.00	0.*	0.00
06	R3709	5525.*	13.31;	80668.*	17.25	60153.	22.93
07	R3710	16855.*	13.31;	125860.	17.25;	60898.	22.94:
08	R3711	29951.	13.31	132534.	17.24;	57852.	22.93
09	R3712	18724.*	13.32;	140044.	17.25:	75814.	22.94;
10	R3713	28281.	13.31;	157927.	17.25;	82501.	22.93;
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							

IS1 (DCB) = 1,4-Dichlorobenzene-d4
IS2 (NPT) = Naphthalene-d8
IS3 (ANT) = Acenaphthene-d8

UPPER LIMIT = + 100%
of internal stansard area.
LOWER LIMIT = - 50%
of internal standard area.

Column used to flag internal standard area values with an asterisk

8C
SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: AEHA-DLS-SAB

Lab File ID (Standard): >SKC10 Date Analyzed: 12/06/93

Instrument ID: HP MSD 002 Time Analyzed: 16:48

Matrix: WATER Level: LOW

		IS4(PHN) AREA #	RT	IS5(CRY) AREA #	RT	IS3(PRY) AREA #	RT
	12 HOUR STD	130725.	27.72,	96632.	36.35	91804.	42.16, I
	UPPER LIMIT;	261450.		193264.		183608.	I
	LOWER LIMIT	65363.		48316.		45902.	
	i AQAD SAMPLE NO.						
01	R3703	108580.	27.71,	80609.	36.33;	45179.*	42.11,
02	R3704	86342.	27.70	66251.	36.31;	39082.*	42.09
03	R3706	64321.*	27.701	53266.	36.32;	31589.*	42.10
04	R3707	o.*	0.00;	0.*	0.00;	0.*	0.00
05	R3708	0.*	0.00;	0.*	0.00;	0.”	0.00
06	R3709	83990.	27.70	63920.	36.32;	42680.*	42.09
07	R3710	81605.	27.70;	66267.	36.32	44624.*	42.09
08	R3711	80023.	27.70	67347.	36.32	43708.*	42.08;
09	R3712	101756.	27.70	84301.	36.32;	55810.	42.101
10	R3713	115438.	27.70	90312.	36.31;	69970.	42.08
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							

IS4 (PHN) = Phenanthrene-d10
IS5 (CRY) = Chrysene-d12
IS6 (PRY) = Perylene-dl2

UPPER LIMIT = + 100%
of internal stansard area.
LOWER LIMIT = - 50%
of internal standard area.

Column used to flag internal standard area values with an asterisk

ANNEX E-26

QUALITY CONTROL REPORT

U.S. ARMY ENVIRONMENTAL HYGIENE AGENCY
DIRECTORATE OF LABORATORY SCIENCES
AREROEEN PROVING GROUNDS, HO 21010-5422

Repot-t IO...: R2005L.4
Report Seq #: 8917
Prepared by.: SNORMAN

ROTE: Site or project specific data in this report may not be extracted in part without review end written approval of the USAEHA program manager of concern. Individual specific screening data may be extracted for inclusion in appropriate personnel/medical records.

Signature.: Lillian L. Brock 11/30/93
MR. DAVID ROSAK Date
Title.....: CHIEF, METALS ANALYSIS BRANCH

Installation: KUWAIT Job: 3A0574 Project officer: HELLER Project #: 39-22-L192

QC Coordinator: DAR for S.S.

CALIBRATION VERIFICATION (REFERENCE SAMPLES)
All reference sample results (Q1 table) from analytical runs associated with the job to be reported.

Target	Method	Date	Analyst	Sample	Matrix	True Value	Units	L Limit	U Limit	Observed	%Rec	
AS	EPA 206.2	18-NOV-93	WJL	QS10	QS	.01	MG/L	.009	.011	.0098	98	716
AS	EPA 206.2	18-NOV-93	MJL	QS10	as	.01	MG/L	.009	.011	.0093	93	716
AS	EPA 206.2	18-NOV-93	HJL	QS10	QS	.01	MG/L	.009	.011	.0094	94	716
AS	EPA 206.2	18-NOV-93	MJL	QS10	0S	.01	MG/L	.009	.011	.009	90	716
AS	EPA 206.2	18-NOV-93	MJL	QS10	QS	.01	MG/L	.009	.011	.0093	93	71t
AS	EPA 206.2	18-NOV-93	MJL	QS11	QS	-02	MG/L	.018	.022	.02	100	716
BE	EPA 200.7	22-NOV-93	JCOURTS	as42	0S	.5	MG/L	.45	.55	.505	101	717
BE	EPA 200.7	22-NOV-93	JCWRTS	QS42	QS	.5	MG/L	.45	.55	.479	95.8	717
BE	EPA 200.7	22-NOV-93	JCWRTS	QS7	as	1	MG/L	.9	1.1	1.043	104.3	7 1 7
BE	EPA 200.7	22-NOV-93	JCWRTS	as7	as	1	MG/L	.9	1.1	1.025	102.5	717
CR	EPA 200.7	22-NOV-93	JCWRTS	as42	as	.5	MG/L	.45	.55	.518	103.6	717
CR	EPA 200.7	22-NOV-93	JCWRTS	QS42	as	.5	MG/L	.45	.55	.504	100.8	7 1 7
CR	EPA 200.7	22-NOV-93	JCWRTS	QS7	QS	1	MG/L	.9	1.1	1.054	105.4	717
CR	EPA 200.7	22-NOV-93	JCWRTS	as?	QS	1	MG/L	.9	1.1	1.054	105.4	717
CR	EPA 200.7	22-NOV-93	JCWRTS	as7	as	1	MG/L	.9	1.1	1.06	106	71i
FE	EPA 200.7	22-NOV-93	JYC	QS42	as	.5	MG/L	.45	.55	.509	101.8	717
FE	EPA 200.7	22-NOV-93	JUC	057	QS	1	MG/L	.9	1.1	1.058	105.8	717
FE	EPA 200.7	22-NOV-93	JWC	QS7	as	1	MG/L	.9	1.1	1.062	106.2	717
MG	EPA 200.7	22-NOV-93	JYC	QS42	QS	.5	MG/L	.45	.55	.517	103.4	717
MG	EPA 200.7	22-NOV-93	JUC	QS42	as	.5	MG/L	.45	.55	.508	101.6	717
MG	EPA 200.7	22-NOV-93	JYC	QS7	as	1	MG/L	.9	1.1	1.057	105.7	717
V	EPA 200.7	22-NOV-93	JCWRTS	as42	as	.5	MG/L	.45	.55	.499	99.8	717
V	EPA 200.7	22-NOV-93	JCWRTS	QS42	as	.5	MC/L	.45	.55	.495	99	717
v	EPA 200.7	22-NOV-93	JCWRTS	as7	QS	1	MG/L	.9	1.1	1.013	101.3	[illegible]
ZN	EPA 200.7	22-NOV-93	JUC	QS42	QS	.5	MG/L	.45	.55	.528	105.6	
ZN	EPA 200.7	22-NOV-93	JUC	QS42	as	.5	MG/L	.45	.55	.524	104.8	
ZN	EPA 200.7	22-NOV-93	JUC	QS7	QS	1	MG/L	.9	1.1	1.081	108.1	717

QUALITY CONTROL REPORT

CALIBRATION VERIFICATION (REFERENCE SAMPLES)

All reference sample results (Q1 table) from analytical runs associated with the job to be reported.

Target	Method	Date	Analyst	Sample	Matrix	True Value	Units	L Limit	U Limit	Observed	%Rec	Run
ZN	EPA 200.7	22-NOV-93	JWC	as7	as	1	MG/L	.9	1.1	1.083	108.3	717
HG	EPA 245.1	19-NOV-93	BJO	QS14	as	.002	MG/L	.0016	.0024	.002052	102.6	718
HG	EPA 245.1	19-NOV-93	BJO	QS14	as	.002	MG/L	.0016	.0024	.002093	104.65	718
HG	EPA 245.1	19-NOV-93	BJO	QS14	as	.002	MG/L	.0016	-0024	.002057	102.85	718
NA	EPA 6010	20-NOV-93	SDN	as12	as	4	MG/L	3.6	4.4	3.78	94.5	749
NA	EPA 6010	20-NOV-93	SON	as72	as	4	MG/L	3.6	4.4	4.02	100.5	749
NA	EPA 6010	20-NOV-93	SDN	as12	as	4	MG/L	3.6	4.4	3.95	98.73	749
NA	EPA 6010	20-NOV-93	SDN	as12	as	4	MG/L	3.6	4.4	3.92	98	749
NA	EPA 4010	20-NOV-93	SON	QS12	as	4	MG/L	3.6	4.4	3.77	94.25	749
NA	EPA 6010	20-NOV-93	SDN	QS12	as	4	MG/L	3.6	4.4	3.81	95.25	749
WA	EPA 6010	20-NOV-93	SDN	as12	as	4	MG/L	3.6	4.4	3.9	97.5	749
NA	EPA 6010	20-NOV-93	SON	QS12	as	4	MG/L	3.6	4.1	3.85	96.25	749
NA	EPA 6010	20-NOV-93	SDN	as25	as	.4	MG/L	.36	.44	.41	102s	749
PB	EPA 2392	21-NOV-93	MJL	QS10	as	.01	MG.L	.009	.11	.01	100	751
PB	EPA 2392	20-NOV-93	MJL	QS11	as	.02	MG/L	.018	-022	.0209	104.5	751
PB	EPA 2392	20-NOV-93	MJL	QS11	as	.02	MG/L	.018	.022	.0205	102.5	751
PB	EPA -2392	21-NOV-93	MJL	QS11	as	.02	MG/L	.018	-022	.021	105	751
PB	EPA 2392	21-NOV-93	MJL	QS11	as	.02	MG/L	-018	.022	.0209	104.5	751
PB	EPA 2392	21-NOV-93	MJL	QS11	as	.02	MG/L	.018	.022	.0202	101	751
PB	EPA 2392	21-NOV-93	MJL	QS11	as	.02	MG/L	.018	.022	.0207	103.5	751
PB	EPA 2392	21-NOV-93	MJL	QS11	as	.02	MG/L	.018	.022	.0212	106	751
PB	EPA 2392	21-NOV-93	MJL	QS11	as	.02	MG/L	.018	.022	.0201	100s	751
CA	EPA 200.7	22-NOV-93	SDN	QS7	as	1	MG/L	.9	1.1	.96	96	763
CA	EPA 200.7	22-NOV-93	SDN	as7	as	1	MG/L	.9	1.1	1	100	763
CA	EPA 200.7	22-NOV-93	SDN	as7	as	1	MG/L	.9	1.1	.95	95	763
CD	EPA 213.2	20-NOV-93	MPK	QS10	as	.01	MG/L	.009	.011	.0108	108	766
CD	EPA 213.2	20-NOV-93	MPK	QS10	as	.01	MG/L	.009	.011	.0101	101	766
co	EPA 213.2	20-NOV-93	MPK	QS10	as	.01	MG/L	.009	.011	.011	110	766
co	EPA 213.2	20-NOV-93	MPK	QS10	as	.01	MG/L	.009	.011	.0101	101	766
m	EPA 213.2	20-NOV-93	MPK	QS10	as	.01	MG/L	.009	.011	.0107	107	766
co	EPA 213.2	20-NOV-93	MPK	QS10	as	.01	MG/L	.009	.011	.0101	101	766
AL	EPA 200.7	23-NOV-93	SDN	as12	as	4	MG/L	3.6	4.1	3.93	98.25	767
AL	EPA 200.7	23-NOV-93	SDN	QS12	as	4	MG/L	3.6	4.4	3.94	98.5	767
AL	EPA 200.7	23-NOV-93	SDN	as12	as	4	MG/L	3.6	4.4	4.12	103	767

DUPLICATE ANALYSIS DATA

All duplicate sample results (Q2 table) from analytical runs associated with the job to be reported.

Target	Method	Date	Analyst	Sample	Matrix	Value 1	Value 2	Units	Mean	%Diff	Run Id
AS	EPA 206.2	18-NOV-93	MJL	R3883	AP	.0031	.0036	MG/FI	.00335	14.93	716
AS	EPA 206.2	18-NOV-93	MJL	R3894	AP	-0023	.0018	MG/FI	.00205	24.39	716
AS	EPA 206.2	18-NOV-93	MJL	R3902	AP	.0013	.0019	MG/FI	.0016	37.5	716
BE	EPA 200.7	22-NOV-93	JCOURTS	R3886	AP	.005	.005	MG/L	.005	0	717
BE	EPA 200.7	22-NOV-93	JCWRTS	R3895	AP	.003	-003	MG/L	.003	0	717
BE	EPA 200.7	22-NOV-93	JCOURTS	R3905	AP	.002	.002	MG/L	.002	0	717

QUALITY CONTROL REPORT

DUPLICATE ANALYSIS DATA

All duplicate sample results (Q2 table) from analytical runs associated with the job to be reported.

Target	Method	Date	Analyst	Sample	Matrix	Value 1	Value 2	Units	Mean	%Diff	Run Id
CR	EPA 200.7	22-NOV-93	JCWRTS	R3886	AP	.022	.023	MG/FI	.0225	4.44	717
CR	EPA 200.7	22-NOV-93	JCOURTS	R3895	AP	.027	.026	MG/FI	.0265	3.77	717
CR	EPA 200.7	22-NOV-93	JCOURTS	R3905	A P	<.02	<.02	MG/FI			717
FE	EPA 200.7	22-NOV-93	JYC	R3886	AP	1.648	1.651	MG/L	1.6495	.18	717
FE	EPA 200.7	22-NOV-93	JWC	R3895	A P	2.R	2.70s	MG/L	2.7125	.55	717
FE	EPA 200.7	22-NOV-93	JWC	R3905	A P	.148	.147	MG/L	.1475	.68	717
MG	EPA 200.7	22-NOV-93	JWC	R3886	AP	4.564	4.57	MG/L	4.567	.13	717
MG	EPA 200.7	22-NOV-93	JUC	R3895	A P	3.307	3.285	MG/L	3.296	.67	717
MG	EPA 200.7	22-NOV-93	JWC	R3905	AP	<.25	<.25	MG/L			717
V	EPA 200.7	22-NOV-93	JCOURTS	R3886	A P	<.05	<.05	MG/L			717
V	EPA ZOO.7	22-NOV-93	JCOURTS	R3895	A P	<.05	<.05	MG/L			717
V	EPA 200.7	22-NOV-93	JCWRTS	R3905	AP	<.05	<.05	MG/L			717
ZN	EPA 200.7	22-NOV-93	JWC	R3886	AP	.358	.362	MG/L	.36	1.11	717
ZN	EPA 200.7	22-NOV-93	JWC	R3895	AP	.298	.298	MG/L	.298	0	717
ZN	EPA 200.7	22-NOV-93	JWC	R3905	A P	.109	.111	MG/L	.11	1.82	717
HG	EPA 215.1	19-NOV-93	BJO/RND	R3884	A P	<.2	<.2	MG/FI			718
HG	EPA 245.1	19-NOV-93	BJO/RND	R3898	AP	<.2	<.2	MG/FI			718
HG	EPA 24S.I	19-NOV-93	BJO/RND	R3904	AP	<.2	<.2	MG/FI			718
WA	EPA 6010	20-NOV-93	SDN	R3885	A P	8.28	8.24	MG/L	8.26	.48	749
NA	EPA 6010	20-NOV-93	SON	R3891	AP	s.71	5.65	MG/L	5.68	1.06	749
NA	EPA 6010	20-NOV-93	SON	R3903	A P	6.64	6.65	MG/L	6.645	.15	749
NA	EPA 6010	20-NOV-93	SON	R3904	A P	4.49	4.46	MC/L	4.475	.67	719
NA	EPA 6010	20-NOV-93	SDN	R3978	S O	12.8	12.8	MG/L	12.8	0	749
NA	EPA 6010	20-NOV-93	SDN	R3984	s o	9.4	9.5	MG/L	9.15	1.06	749
NA	EPA 6010	20-NOV-93	SDN	R3995	S O	5.11	5.13	MG/L	5.12	.39	749
WA	EPA 6010	20-NOV-93	SDN	R4006	S O	5.18	5.1	MG/L	5.14	1.56	749
PB	EPA 2392	20-NOV-93	MJL	R3883	AP	2.24	2.15	MG/L	2.195	4.1	751
PB	EPA 2392	20-NOV-93	MJL	R3893	A P	.0014	.0009	MG/L	.00115	43.48	751
PB	EPA 2392	20-NOV-93	MJL	R3900	A P	1.49	1.5	MG/L	1.495	.67	751
PB	EPA 2392	20-NOV-93	MJL	R3906	A P	.0027	.0026	MG/L	. 00265	3 . n	751
CA	EPA 200.7	22-NOV-93	SON	R3884	A P	36.8	37.3	MG/L	37.05	1.35	763
CA	EPA 200.7	22-NOV-93	SDY	R3890	A P	11.1	11.3	MG/L	11.2	1.79	763
CA	EPA 200.7	22-NOV-93	SDN	R3904	A P	4.92	4.8	MG/L	4.86	2.47	763
CD	EPA 213.2	20-NOV-93	MPK	R3884	A P	.0011	.0014	MG/L	.00125	24	766
CD	EPA 213.2	20-NOV-93	MPK	R3895	A P	.0007	.0008	MG/L	.00075	13.33	766
CD	EPA 213.2	20-NOV-93	MPK	R3905	A P	.0006	.0002	MG/L	.0004	100	766
AL	EPA 200.7	23-NOV-93	SDN	R3885	A P	1.43	1.46	MG/L	1.445	2.08	767
AL	EPA 200.7	U-NW-93	SDN	R3887	A P	1.39	1.46	MG/L	1.425	4.91	767
AL	EPA 200.7	23-NOV-93	SDN	R3905	AP	<.25	<.25	MG/L			767

SPIKED SAMPLE ANALYSIS DATA

All spiked sample results (Q3 table) from analytical runs associated with the job to be reported.

Target	Method	Date	Analyst	Sample	Matrix	Unspiked	units	Spike	%Rec	Run Id
as	EPA	18-NOV-93	206.2	R3894	A P	.0018	MG/L	1	96.13	716

QUALITY CONTROL REPORT

SPIKED SAMPLE ANALYSIS DATA

All spiked sample results (a3 table) from analytical runs associated with the job to be reported.

Tat-get	Method	Date	Analyst	Sample	Matrix	Unspiked	Units	Spike	%Rec	Run Id
AS	EPA	18-NOV-93	206.2	R3902	AP	.0013	MG/L	1	92.04	716
BE	EPA 200.7	22-NOV-93	JCWRTS	R3887	A P	.005	MG/L	20	99.22	717
BE	EPA 200.7	22-NOV-93	JCWRTS	R3893	A P	.003	MG/L	20	93.62	717
BE	EPA 200.7	22-NOV-93	JCOURTS	R3901	A P	.003	MG/L	20	96.22	717
CR	EPA 200.7	22-NOV-93	JCWRTS	R3887	AP	.022	MG/FI	20	98.26	717
CR	EPA 200.7	22-NOV-93	JCOURTS	R3893	A P	<.02	MG/FI	20	99.19	717
CR	EPA 200.7	22-NOV-93	JCOURTS	R3901	A P	.041	MG/FI	20	98.1	717
FE	EPA 200.7	22-NOV-93	JWC	R3887	A P	1.833	MG/L	20	96.27	717
FE	EPA 200.7	22-NOV-93	JWC	R3893	A P	.063	MG/L	20	98.6	717
MG	EPA 200.7	22-NOV-93	JWC	R3887	A P	5.943	MC/L	20	99.14	717
MG	EPA 200.7	22-NOV-93	JWC	R3893	A P	<.25	MG/L	20	110.76	717
MG	EPA 200.7	22-NOV-93	JWC	R3901	A P	6.327	MG/L	20	105.48	717
V	EPA 200.7	22-NOV-93	JCOURTS	R3887	A P	<.05	MG/L	20	97.89	717
V	EPA 200.7	22-NOV-93	JCWRTS	R3893	A P	<.05	MG/L	20	94.38	717
V	EPA 200.7	22-NOV-93	JCOURTS	R3901	AP	<.05	MG/L	20	99.84	717
ZN	EPA 200.7	22-NOV-93	JWC	R3887	A P	.325	MG/L	20	93.93	717
ZN	EPA 200.7	22-NOV-93	JWC	R3893	A P	.073	MG/L	20	92.54	717
ZN	EPA 200.7	22-NOV-93	JWC	R3901	A P	.482	MG/L	20	92.89	717
HG	EPA 245.1	19-NOV-93	BJO/RND	R3904	A P	<.2	MG/FI	10	99.77	718
NA	EPA 6010	20-NOV-93	SDN	B0660	s o	15.7	MG/L	100	101 -a	749
NA	EPA 6010	20-NOV-93	SDN	R3885	A P	8.28	MG/L	100	105.3	749
WA	EPA 6010	20-NOV-93	SDN	R3891	AP	5.71	MG/L	1000	102.88	749
NA	EPA 6010	to-NW-93	SDN	R3900	A P	6.64	MG/L	10000	99.77	749
WA	EPA 6010	20-NOV-93	SDN	R3978	S O	12.8	MG/L	10000	105.23	749
NA	EPA 6010	20-NOV-93	SDN	R3984	S O	9.4	MG/L	10000	100.19	749
NA	EPA 6010	20-NOV-93	SDN	R3995	s o	5.11	MG/L	10000	90.04	749
NA	EPA 6010	20-NOV-93	SDN	R4006	S O	5.18	MG/L	100	102.83	749
PB	EPA 2392	21-NOV-93	MJL	R3883	A P	.0224	MG/L	1	90.98	751
PB	EPA 2392	21-NOV-93	MJL	R3893	A P	.0014	MG/L	1	94.07	751
PB	EPA 2392	21-NOV-93	MJL	R3900	AP	.015	MG/L	1	100.48	751
PB	EPA 2392	21-NOV-93	MJL	R3906	A P	.0027	MG/L	1	92.18	751
CA	EPA 200.7	22-NOV-93	SDN	R3884	A P	36.8	MC/L	1000	90.54	763
CA	EPA 200.7	22-NOV-93	SDN	R3892	A P	12.3	MG/L	1000	9.n	763
CA	EPA 200.7	22-NOV-93	SDN	R3904	A P	4.92	MG/L	1000	90.34	763
CD	EPA 213.2	20-NOV-93	MPK	R3883	A P	.0012	MG/L	1	104.15	766
CD	EPA 213.2	20-NOV-93	MPK	R3894	A P	.001	MG/L	1	105.14	766
CD	EPA 213.2	20-NOV-93	MPK	R3906	A P	<.0005	MG/L	1	107.06	766
AL	EPA 200.7	23-NW-93	SDN	R3885	A P	1.43	MG/L	100	93.23	767
AL	EPA 200.7	23-NOV-93	SDN	R3887	A P	1.39	MG/L	100	98.8	767
AL	EPA 200.7	23-NOV-93	SDN	R3905	A P	<.25	MG/L	100	101.49	767

DUPLICATE ANALYSIS DATA

Al 1 "Duplicate" results (Q2 table) from analyses performed on samples in the job to be reported.

Target	Method	Date	Analyst	Sample	Matrix	Value 1	Value 2	Units	Mean	%Diff	Run Id

QUALITY CONTROL REPORT

DUPLICATE ANALYSIS DATA

All "Duplicate" results (Q2 table) from analyses performed on samples in the job to be reported.

Target	Method	Date	Analyst	Sample	Matrix	Value 1	Value 2	Units	Mean	%Diff	Run Id
AS	EPA 206.2	18-NOV-93	MJL	R3883	AP	.0031	.0036	MG/FI	.00335	14.93	716
AS	EPA 206.2	18-NOV-93	MJL	R3894	AP	.0023	.0018	MG/FI	.00205	24.39	716
AS	EPA 206.2	18-NOV-93	MJL	R3902	AP	.0013	.0019	MG/FI	.0016	37.5	716
BE	EPA 200.7	22-NOV-93	JCOURTS	R3886	AP	.005	.005	MG/L	,005	0	717
BE	EPA 200.7	22-NOV-93	JCWRTS	R3895	AP	.003	.003	MG/L	.003	0	717
BE	EPA 200.7	22-NOV-93	JCWRTS	R3905	AP	.002	.002	MG/L	.002	0	717
CR	EPA 200.7	22-NOV-93	JCOURTS	R3886	AP	.022	.023	MG/FI	.0225	4.44	717
CR	EPA ZOO.7	22-NOV-93	JCOURTS	R3895	AP	.027	.026	MG/FI	.0265	3.77	717
CR	EPA 200.7	U-NW-93	JCOURTS	R3905	AP	<.02	<.02	MG/FI			717
FE	EPA 200.7	22-NOV-93	JUC	R3886	AP	1.648	1.651	MG/L	1.6495	.18	717
FE	EPA 200.7	22-NOV-93	JUC	R3895	AP	2.n	2.705	MG/L	2.7125	.55	717
FE	EPA 200-f	22-NOV-93	JWC	R3905	AP	.148	,147	MG/L	.1475	.68	717
MG	EPA 200.7	22-NOV-93	JWC	R3886	AP	4.564	4.57	MG/L	4.567	.13	717
MG	EPA 200.7	22-NOV-93	JWC	R3895	AP	3.307	3.285	MG/L	3.294	.67	717
MG	EPA 200.7	22-NOV-93	JYC	R3905	AP	<.25	<.25	MG/L			717
V	EPA 200.7	22-NOV-93	JCWRTS	R3886	AP	<.05	<.05	MG/L			717
V	EPA 200.7	22-NOV-93	JCWRTS	R3895	AP	<.05	<.05	MG/L			717
V	EPA 200.7	22-NOV-93	JCWRTS	R3905	AP	<.05	<.05	MG/L			717
ZN	EPA 200.7	U-NW-93	JWC	R3886	AP	.358	.362	MG/L	.36	1.11	717
ZN	EPA 200.7	22-NOV-93	JWC	R3895	AP	.298	.298	MG/L	.298	0	717
ZN	EPA 200.7	22-NOV-93	JWC	R3905	AP	.109	.111	MG/L	.11	1.82	7 1 7
HG	EPA 245.1	19-NOV-93	BJO/RND	R3884	AP	x.2	<.2	MG/FI			718
HG	EPA 245.1	19-NOV-93	BJO/RND	R3898	AP	<.2	<.2	MG/FI			718
HG	EPA 245.1	19-NOV-93	BJO/RND	R3904	AP	<.2	<.2	MG/FI			718
WA	EPA 6010	20-NOV-93	SDN	R3885	AP	8.28	8.24	MG/L	8.26	.48	749
NA	EPA 6010	20-NOV-93	SDN	R3891	AP	5.71	5.65	MG/L	5.68	1.06	719
NA	EPA 6010	20-NOV-93	SDN	R3903	AP	6.64	6.65	MG/L	6.645	.15	719
NA	EPA 6010	20-NOV-93	SDN	R3904	AP	4.49	4.46	MG/L	4.475	.67	749
PB	EPA 2392	20-NOV-93	MJL	R3883	AP	2.24	2.15	MG/L	2.1%	4.1	751
PB	EPA 2392	20-NOV-93	MJL	R3893	AP	.0014	.0009	MG/L	.00115	13.48	751
PB	EPA 2392	20-NOV-93	MJL	R3900	AP	1.49	1.5	MG/L	1.495	.67	751
PB	EPA 2392	20-NOV-93	MJL	R3906	AP	.0027	.0026	MG/L	.00265	3.n	7 5 1
CA	EPA 200.7	22-NOV-93	SDN	R3884	AP	36.8	37.3	MG/L	37.05	1.35	763
CA	EPA 200.7	22-NOV-93	SDN	R3890	AP	11.1	11.3	MG/L	11.2	1.79	763
CA	EPA 200.7	22-NOV-93	SDN	R3904	AP	1.92	1.8	MG/L	4.86	2.17	763
CD	EPA 213.2	20-NOV-93	MPK	R3884	AP	.0011	.0014	MG/L	.00125	24	766
CO	EPA 213.2	20-NOV-93	MPK	R3895	AP	.0007	.0008	MG/L	.00075	13.33	766
CD	EPA 213.2	20-NOV-93	RPK	R3905	AP	.0006	.0002	MG/L	.0004	100	766
AL	EPA 200.7	U-NW-93	SDN	R3885	AP	1.43	1.46	MG/L	1.445	2.08	767
AL	EPA 200.7	23-NOV-93	SDN	R3887	AP	I-39	1.46	MG/L	1.125	1.91	767
AL	EPA 200.7	23-NOV-93	SDN	R3905	AP	<.25	<.25	MG/L			767

QUALITY CONTROL REPORT

SPIKED SAMPLE ANALYSIS DATA
ALL "Spike" results (Q3 table) from analyses performed on samples in the job to be reported.

Target	Method	Date	Analyst	Sample	Matrix	Unspiked	Units	Spike	% Rec	Run Id
AS	EPA	18-NOV-93	206.2	R3894	AP	.0018	MG/L	1	96.13	716
AS	EPA	18-NOV-93	206.2	R3902	AP	.0013	MG/L	1	92.04	716
BE	EPA 200.7	22-NOV-93	JCWRTS	R3887	AP	.005	MG/L	20	99.22	717
BE	EPA 200.7	22-NOV-93	JCOURTS	R3893	AP	.003	MG/L	20	93.62	717
BE	EPA 200.7	22-NW-93	JCOURTS	R3901	AP	.003	MG/L	20	96.22	717
CR	EPA 200.7	22-NOV-93	JCOURTS	R3887	AP	.022	MG/FI	20	98.26	717
CR	EPA 200.7	22-NOV-93	JCWRTS	R3893	AP	<.02	MG/FI	20	99.19	717
CR	EPA 200.7	22-NOV-93	JCWRTS	R3901	AP	.041	MG/FI	20	98.1	717
FE	EPA 200.7	22-NOV-93	JWC	R3887	AP	1.833	MG/L	20	96.27	717
FE	EPA 200.7	22-NOV-93	JYC	R3893	AP	.063	MG/L	20	98.6	717
MG	EPA 200.7	22-NOV-93	JUC	R3887	AP	5.943	MG/L	20	99.14	717
MG	EPA 200.7	22-NOV-93	JWC	R3893	AP	<.25	MG/L	20	110.76	717
MG	EPA 200.7	22-NOV-93	JYC	R3901	AP	6.327	MG/L	20	105.48	717
V	EPA 200.7	22-NOV-93	JCWRTS	R3887	AP	<.05	MG/L	20	97.89	717
V	EPA 200.7	22-NOV-93	JCWRTS	R3893	AP	<.05	MG/L	20	9L.38	717
V	EPA 200.7	22-NOV-93	JCOURTS	R3901	AP	<.05	MG/L	20	99.84	717
ZN	EPA 200.7	22-NOV-93	JUC	R3887	AP	.325	MG/L	20	93.93	717
ZN	EPA 200.7	22-NOV-93	JUC	R3893	AP	.073	MG/L	20	92.54	717
ZN	EPA 200.7	22-NOV-93	JWC	R3901	AP	.482	MG/L	20	92.89	717
HG	EPA 245.1	19-NOV-93	BJO/RND	R3904	AP	<.2	MG/FI	10	99.77	718
NA	EPA 6010	20-NOV-93	SDN	R3885	AP	8.28	MG/L	100	105.3	749
NA	EPA 6010	20-NOV-93	SDN	R3891	AP	5.71	MG/L	1000	102.88	749
NA	EPA 6010	20-NOV-93	SON.	R3900	AP	6.64	MG/L	10000	99.77	749
PB	EPA 2392	21 -NOV-93	MJL	R3883	AP	.0224	MG/L	1	90.98	751
PB	EPA 2392	21 -NOV-93	MJL	R3893	AP	.0014	MG/L	1	94.07	751
PB	EPA 2392	21-NOV-93	MJL	R3900	AP	.015	MG/L	1	100.48	751
PB	EPA 2392	21-NOV-93	MJL	R3906	AP	.0027	MG/L	1	92.18	751
CA	EPA 200.7	22-NW-93	SDN	R3884	AP	36.8	MG/L	1000	90.54	763
CA	EPA 200.7	22-NOV-93	SON	R3892	AP	12.3	MG/L	1000	9.77	763
CA	EPA 200.7	22-NOV-93	SDN	R3904	AP	4.92	ME/L	1000	90.34	763
CD	EPA 213.2	20-NOV-93	MPK	R3883	AP	.0012	MG/L	1	104.15	766
co	EPA 213.2	20-NOV-93	MPK	R3894	AP	.001	MG/L	1	105.14	766
CD	EPA 213.2	to-NW-93	MPK	R3906	AP	<.0005	MG/L	1	107.06	766
AL	EPA 200.7	23-NOV-93	SDN	R3885	AP	1.43	MG/L	100	93.23	767
AL	EPA 200.7	23-NOV-93	SDN	R3887	AP	1.39	MG/L	100	98.8	767
AL	EPA 200.7	23-NOV-93	SDN	R3905	AP	<.25	MG/L	100	101.49	767

ANNEX E-27

QUALITY CONTROL REPORT

U.S. ARMY ENVIRONMENTAL HYGIENE AGENCY
DIRECTORATE OF LABORATORY SCIENCES
ABERDEEN PROVING GROUNDS, MD 21010-5422

Report ID...: R200SL.4
Report Seq #: 8959
Prepared by.: SNORMAN

NOTE: Site or project specific data in this report may not be extracted in part without review and written approval of the USAEHA program manager of concern. Individual specific screening data may be extracted for inclusion in appropriate personnel/medical records.

Signature.: Lillian L. Boyd 11/30/93
MR. DAVID ROSAK Date
Title.....: CHIEF, METALS ANALYSIS BRANCH

Installation: KUWAIT Job: 3A0606 Project officer: HELLER Project # : 39-22-L192

QC Coordinator: DAR for SS

CALIBRATION VERIFICATION (REFERENCE SAMPLES)
All reference sample results (01 table) from analytical runs associated with the job to be reported.

Target	Method	Date	Analyst	Sample	Matrix	True Value	Units	L Limit	U Limit	Observed	%Rec	
HG	EPA245.5	20-NOV-93	BJO/RND	QS14	as	.002	MG/L	.0016	.0024	.002052	102.6	747
HG	EPA245.5	20-NOV-93	BJO/RND	QS14	QS	.002	MG/L	.0016	.0024	.002125	106.25	747
HG	EPA245.S	20-NOV-93	BJO/RND	QS14	as	.002	MG/L	.0016	.0024	.002026	101.3	747
HG	EPA245.S	20-NOV-93	BJO/RND	QS14	QS	.002	MG/L	.0016	.0024	.002081	104.05	747
HG	EPA245.s	20-NOV-93	BJO/RND	QS14	as	.002	M/L	.0016	.0024	.001841	92.05	747
HG	EPA245.5	20-NOV-93	BJO/RND	QS14	QS	.002	MG/L	.0016	0024	.002076	103.8	747
NG	EPA24s.s	20-NOV-93	BJO/RND	QS14	as	.002	MG/L	.0016	.0024	.002161	108.05	747
HG	EPA245.5	20-NOV-93	BJO/RND	QS14	as	.002	MG/L	.0016	.0024	.002418	120.9	747
HG	EPA	20-NOV-93	245.5	as24	as	.001	MG/L	.0008	.0012	.000947	94.7	747
NG	EPA	20-NOV-93	245.5	QS24	0S	.001	MG/L	.0008	.0012	.001127	112.7	747
HG	EPA	20-NOV-93	245.5	QS24	as	.001	MG/L	.0008	.0012	.001003	100.3	747
NA	EPA 6010	20-NOV-93	SDN	as12	as	4	MG/L	3.6	4.4	3.78	94.5	749
NA	EPA 6010	20-NOV-93	SDN	QS12	QS	b	MG/L	3.6	4.4	4.02	100.5	749
NA	EPA 6010	20-NOV-93	SDN	QS12	as	4	MG/L	3.6	4.4	3.9s	98.75	749
NA	EPA 6010	to-WV-93	SDN	QS12	QS	4	MG/L	3.6	1.4	3.92	98	749
NA	EPA 6010	20-NOV-93	SDN	QS12	QS	4	MG/L	3.6	4.4	3.77	94.25	749
NA	EPA 6010	20-NOV-93	SDN	as12	QS	b	MG/L	3.6	4.4	3.81	95.25	749
MA	EPA 6010	20-NOV-93	SDN	QS12	as	4	MG/L	3.6	4.4	3.9	97.5	749
WA	EPA 6010	20-NOV-93	SDN	QS12	QS	4	MC/L	3.6	b.4	3.85	76.25	749
WA	EPA 6010	20-NOV-93	SON	QS25	QS	.b	MG/L	.36	.44	.41	102.5	749
AS	EPA 7060	22-NOV-93	MJL	QS10	QS	.01	MG/L	.009	.011	.0094	94	760
AS	EPA 7060	22-NOV-93	MJL	QS10	QS	.01	MG/L	.009	.011	.0099	99	760
AS	EPA 7060	22-NOV-93	MJL	QS10	QS	.01	MG/L	.009	.011	.0105	105	760
AS	EPA 7060	22-NOV-93	MJL	QS11	QS	.02	MG/L	.018	.022	.0206	[illegible]	760
BE	EPA 6010	23-NOV-93	JUC	QS42	as	.5	MG/L	.45	.55	.516	103.2	7
BE	EPA 6010	23-NOV-93	JWC	QS42	as	.5	MG/L	.45	.55	.504	100.8	
BE	EPA 6010	23-NOV-93	JUC	as42	as	.5	MG/L	[illegible]	.55	.525	[illegible]	7 6 1

QUALITY CONTROL REPORT

CALIBRATION VERIFICATION (REFERENCE SAMPLES)
All referencesample results (al table) from analytical runs associated uith the job to be reported.

Target	Method	Date	Analyst	Sample	Matrix	True Value	Units	L Limit	U Limit	Observed	%Rec	Run Id
BE	EPA 6010	23-NOV-93	JWC	OS?	QS	1	MG/L	.9	1.1	1.041	104.1	761
BE	EPA 6010	23-NOV-93	JWC	QS7	QS	1	MG/L	.9	1.1	1.106	110.6	761
BE	EPA 6010	x-WV-93	JWC	OS?	QS	1	MG/L	.9	1.1	1.02	102	761
BE	EPA 6010	23-m-93	JWC	QS7	OS	1	MG/L	.9	1.1	1.063	106.3	761
BE	EPA 6010	23-NOV-93	JWC	as7	QS	1	MG/L	.9	1.1	.998	99.8	761
CR	EPA 6010	23-NOV-93	JWC	QS42	as	.5	MG/L	.45	.55	.519	103.8	761
CR	EPA 6010	23-NOV-93	JWC	as7	OS	1	MG/L	.9	1.1	1.069	106.9	761
FE	EPA 6010	23-NOV-93	JWC	QS42	as	.5	MG/L	.45	.55	.616	123.2	761
FE	EPA 6010	23-NOV-93	JWC	QS42	QS	.5	MG/L	.45	.55	.559	111.8	761
FE	EPA 6010	23-NOV-93	JWC	QS42	QS	.5	MG/L	.45	.55	.542	108.4	761
FE	EPA 6010	23-NOV-93	JWC	as7	QS	1	MG/L	.9	1.1	1.143	114.3	761
FE	EPA 6010	23-NOV-93	Jut	QS7	QS	1	MG/L	.9	1.1	1.062	106.2	761
FE	EPA 6010	P-WV-93	JWC	as7	QS	1	MG/L	.9	1.1	1.088	108.8	761
MG	EPA 6010	23-NOV-93	JWC	as7	QS	1	MG/L	.9	1.1	1.157	115.7	761
NI	EPA 6010	23-NOV-93	JWC	QS42	as	.5	MG/L	.45	.55	.522	1oc.c	761
MI	EPA 6010	23-NOV-93	JWC	QS42	as	.5	MG/L	.45	.55	.541	108.2	761
NI	EPA 6010	23-NOV-93	JWC	QS7	OS	1	MG/L	.9	1.1	1.074	107.4	761
NI	EPA 6010	23-NOV-93	JWC	as7	QS	1	MG/L	.9	1.1	1.055	105.5	761
NI	EPA 6010	23-NOV-93	JWC	QS7	QS	1	MG/L	.9	1.1	1.107	110.7	76
PB	EPA 6010	23-NOV-93	JWC	QS42	OS	.5	MG/L	.45	.ss	.536	107.2	761
PB	EPA 6010	x-NW-93	JWC	QS42	QS	.5	MG/L	.45	.55	.521	104.2	761
PB	EPA 6010	23-NOV-93	JWC	QS7	QS	1	MG/L	.9	1.1	1.078	107.8	761
PB	EPA 6010	23-NOV-93	JWC	as7	as	1	MG/L	.9	1.1	1.05	105	761
PB	EPA 6010	23-NOV-93	JWC	as7	OS	1	MG/L	.9	1.1	1.093	109.3	761
PB	EPA 6010	23-NOV-93	JWC	QS7	as	1	MG/L	.9	1.1	1.024	102.4	761
V	EPA 6010	x-WV-93	JWC	QS42	as	.5	MG/L	.45	.55	.521	104.2	761
V	EPA 6010	23-NOV-93	J K	QS42	as	.5	M/L	.45	.55	.51	102	761
V	EPA 6010	23-NOV-93	JWC	QS7	OS	1	MG/L	.9	1.1	1.026	102.6	761
V	EPA 6010	x-WV-93	JWC	QS7	OS	1	MG/L	.9	1.1	1.079	107.9	761
ZN	EPA 6010	23-NOV-93	JWC	QS42	as	.5	MG/L	.45	.55	.564	112.8	761
ZN	EPA 6010	23-NOV-93	JWC	QS42	QS	.5	MG/L	.45	.55	.533	106.6	761
ZN	EPA 6010	23-NOV-93	JWC	QS42	QS	.5	MG/L	.45	.55	.546	109.2	761
ZN	EPA 6010	23-NOV-93	JWC	QS7	as	1	MG/L	.9	1.1	1.109	110.9	761
ZN	EPA 6010	23-NOV-93	JWC	QS7	QS	1	MG/L	.9	1.1	1.088	108.8	761
ZN	EPA 6010	23-NOV-93	JWC	QS7	as	1	MG/L	.9	1.1	1.11	111	761
ZN	EPA 6010	23-NOV-93	JWC	as7	OS	1	MG/L	.9	1.1	1.048	104.8	7 6 1
CA	EPA 6010	22-NOV-93	SON	asiw	OS	200	MG/L	180	220	199	99.5	762
CA	EPA 6010	22-NOV-93	SDN	QS199	as	200	MG/L	180	220	208	104	762
CA	EPA 6010	22-NOV-93	SDN	QS199	OS	200	MG/L	180	220	208	104	762
CA	EPA 6010	22-NOV-93	SDN	QS199	as	200	MG/L	180	220	220	110	762
CA	EPA 6010	22-NOV-93	SDN	QS199	OS	200	MG/L	180	220	212	106	762
CA	EPA 6010	22-NOV-93	SDN	QS199	QS	200	MG/L	180	220	213	106.5	762
AL	EPA 6010	23-NOV-93	S O N	as12	QS	4	MG/L	3.6	4.4	3.79	94.75	768
AL	EPA 6010	23-NOV-93	S O N	as12	OS	4	MG/L	3.6	4.4	3.64	91	768
AL	EPA 6010	23-NOV-93	SDN	QS12	QS	4	MG/L	3.6	4.4	4.38	109.5	766
AL	EPA 6010	23-NOV-93	S D N	QS12	QS	4	MG/L	3.6	4.4	3.76	94	768
AS	EPA 7060	23-NOV-93	MJL	QS10	QS	.01	MG/L	.009	.011	.0095	95	769

QUALITY CONTROL REP&f

CALIBRATION VERIFICATION (REFERENCE SAMPLES)
All reference sample results (Q1 table) from analytical runs associated with the job to be reported.

Target	Method	Date	Analyst	Sample	Matrix	True Value	Units	L Limit	U Limit	Observed	%Rec	Run Id
AS	EPA 7060	23-NOV-93	MJL	QS10	as	.01	MG/L	.009	.011	.0109	109	769
As	EPA 7060	23-NOV-93	MJL	QS11	QS	.02	MG/L	.018	.022	.0202	101	769
AS	EPA 7060	23-NOV-93	MJL	QS11	as	.02	MG/L	.018	.022	.0187	93.5	769
AS	EPA 7060	o-m-93	MJL	QS11	QS	.02	MG/L	.018	.022	.0207	103.5	769
AS	EPA 7060	B-WV-93	MJL	QS11	OS	.02	MG/L	.018	.022	.0189	94.5	749
CD	EPA 7131	22-NOV-93	MPK	QS10	QS	.01	MG/L	.009	.011	.0098	90	772
CD	EPA 7131	22-NOV-93	MPK	QS10	as	.01	MG/L	.OW	.011	.0103	103	772
CD	EPA 7131	22-NOV-93	MPK	QS10	QS	.01	MG/L	.009	.011	.011	110	772
CD	EPA 7131	a-NW-93	MPK	QS10	QS	.01	MG/L	.009	.011	.0097	97	772
CD	EPA 7131	22-NOV-93	MPK	QS10	OS	.01	MG/L	.009	.011	.0106	106	772
CD	EPA 7131	22-NOV-93	MPK	QS10	as	.01	MG/L	.009	.011	.01	100	772
CD	EPA 7131	22-NOV-93	MPK	QS10	QS	.01	MG/L	.ow	.011	.0095	95	772
CD	EPA 7131	22-NOV-93	MPK	QS10	as	.01	MG/L	.009	.011	.0107	107	772
CD	EPA 7131	22-NOV-93	MPK	QS10	OS	.01	MG/L	.009	.011	.0106	106	772
CD	EPA 7131	22-NOV-93	MPK	QS10	as	.01	MG/L	.009	.011	.0091	91	772
AS	EPA 7060	24-NOV-93	MJL	QS10	OS	.01	MG/L	.009	.011	.0095	95	in
AS	EPA 7060	24-m-93	MJL	QS11	QS	.02	MG/L	.018	.022	.0194	97	773
AS	EPA 7060	24-NOV-93	MJL	QS11	as	.02	MG/L	.018	.022	-019	9s	773
AS	EPA 7060	24-m-93	MJL	QS11	OS	.02	MG/L	.018	.022	.0189	94.5	773
AS	EPA 7060	24-NOV-93	MJL	QS11	QS	.02	MG/L	.018	.022	.0215	107.5	773
AS	EPA 7060	24-NOV-93	MJL	QS11	as	.02	MG/L	.018	.022	.0208	104	773
CR	EPA	P-W-93	6010	as42	QS	.5	MG/L	.45	.55	,542	108.4	774
CR	EPA 6010	u-NW-93	JWC	QS42	as	.5	MG/L	.45	.55	.546	109.2	774
CR	EPA	a-NW-93	6010	OS?	QS	1	MG/L	.9	1.1	1.055	105.5	774
CR	EPA	23-NOV-93	6010	QS7	OS	1	MG/L	.9	1.1	1.094	109.4	774
CR	EPA 6010	23-NOV-93	JWC	as7	OS	1	MG/L	.9	1.1	1.066	106.6	774
PB	EPA 6DID	23-NOV-93	JWC	QS42	as	.5	MG/L	.45	.55	.541	108.2	774
PB	EPA 6010	23-NOV-93	JWC	as7	OS	1	MG/L	.9	1.1	1.002	100.2	774
V	EPA 6010	23-NOV-93	JWC	QS42	OS	.5	MG/L	.45	.55	.526	105.2	774

DUPLICATE ANALYSIS DATA
All duplicate sample results (Q2 table) from analytical runs associated with the job to be reported.

Target	Method	Date	Analyst	Sample	Matrix	Value 1	Value 2	Units	Mean	%Diff	Run Id
HG	EPA	20-NOV-93	245.5	R3974	SO	.349	.332	MG/L	.3405	4.99	747
HG	EPA	20-NOV-93	245.5	R3988	SD	<.2	<.2	MG/L			747
WA	EPA 6010	20-NOV-93	SDN	R3885	AP	8.28	a.24	MG/L	8.26	.48	749
NA	EPA 6010	20-NOV-93	SDN	R3891	AP	5.71	5.65	MG/L	5.68	1.06	749
NA	EPA 4010	20-NOV-93	SDN	R3903	AP	6.64	6.65	MG/L	6.645	.15	749
WA	EPA 6010	20-NOV-93	SON	R3904	AP	4.49	4.46	MG/L	4.475	.67	749
NA	EPA 6010	20-NOV-93	SON	R3978	SO	12.8	12.8	MG/L	12.8	0	749
NA	EPA 6010	20-NOV-93	SDN	R3984	so	9.4	9.s	MG/L	9.45	1.06	749
NA	EPA 6010	20-NOV-93	SDN	R3995	SO	5.11	5.13	MG/L	5.12	.39	749
NA	EPA 4010	20-NOV-93	SON	R4006	SO	5.18	5.1	MG/L	5.14	1.56	749
AS	EPA 7060	22-NOV-93	MJL	R3971	SO	.0132	.0133	MG/L	.01325	.75	760

QUALITY CONTROL REPORT

DUPLICATE ANALYSIS DATA

All duplicate sample results (Q2 table) from analytical runs associated with the job to be reported.

Target	Method	Date	Analyst	Sample	Matrix	Value 1	Value 2	Units	Mean	%Diff	Run Id
BE	EPA 6010	23-NOV-93	JYC	R3972	SO	.014	.014	MG/L	.014	0	761
BE	EPA 6010	23-NOV-93	JWC	R3993	SO	.011	.011	MG/L	.011	0	761
BE	EPA 6010	23-NOV-93	JUC	R4006	SO	.01	.01	MG/L	.01	0	761
CR	EPA 6010	23-NOV-93	JWC	R3972	SD	.568	.576	MG/L	.572	1.4	761
CR	EPA 6010	23-NOV-93	JWC	R3993	SO	.361	.363	MG/L	.362	.55	761
CR	EPA 6010	23-NOV-93	JUC	R4006	SO	.245	.256	MG/L	.2505	4.39	761
FE	EPA 6010	23-NOV-93	JWC	R3972	SO	09.356	90.85	MG/L	90.103	1.66	761
FE	EPA 6010	23-NOV-93	JWC	R3993	SO	78.686	78.532	MG/L	78.609	.2	761
FE	EPA 6010	23-NOV-93	JUC	R4006	SO	35.999	37.481	MG/L	36.74	4.03	761
MG	EPA 6010	23-NOV-93	JYC	R3972	SO	107.425	108.674	MG/L	108.049 S	1.16	761
NI	EPA 6010	23-NOV-93	JYC	R3972	SO	.751	.757	MG/L	.754	.8	761
NI	EPA 6010	23-NOV-93	JYC	R3993	SO	.397	.392	MG/L	.3945	1.27	761
WI	EPA 6010	23-NOV-93	JWC	R4006	SO	.279	.286	MG/L	.2825	2.48	761
PB	EPA 6010	23-NOV-93	JWC	R3972	SO	1.068	1.083	MG/L	1.0755	1.39	761
PB	EPA 6010	23-NOV-93	JUC	R3993	SO	.578	.577	MG/L	.5775	.17	761
V	EPA 6010	23-NOV-93	JUC	R3972	SO	.468	.474	MG/L	.471	1.27	761
V	EPA 6010	23-NOV-93	JUC	R3993	SO	.45	.449	MG/L	.4495	.22	761
V	EPA 6010	23-NOV-93	JUC	R4006	SO	.177	.184	MG/L	.1805	3.88	761
ZN	EPA 6010	23-NOV-93	JUC	R3972	SO	.608	.627	MG/L	.6175	3.08	761
ZN	EPA 6010	23-NOV-93	JUC	R3993	SO	.342	.335	MG/L	.3385	2.07	761
ZN	EPA 6010	23-NOV-93	JUC	R4006	SO	.249	.254	MG/L	.2515	1.99	761
CA	EPA 6010	22-NOV-93	SDN	a0660	SO	994	978	MG/L	986	1.62	762
CA	EPA 6010	22-NOV-93	SDN	R3980	SO	620	618	MG/L	619	.32	762
CA	EPA 6010	22-NOV-93	SDN	R3989	SO	483	480	MG/L	481.5	.62	762
CA	EPA 6010	22-NOV-93	SDN	R3999	SO	1000	1010	MG/L	1005	1	762
CA	EPA 6010	22-NOV-93	SDN	R4009	SO	749	739	MG/L	744	1.34	762
AL	EPA 6010	23-NOV-93	SDN	R3979	SO	85-6	84.8	MG/L	as.2	.94	768
AL	EPA 6010	23-NOV-93	SDN	R3990	SO	77	76	MG/L	76.5	1.31	768
AL	EPA 6010	23-NOV-93	SDN	R3997	SO	73	74.1	MG/L	73.55	1.5	768
AL	EPA 6010	23-NOV-93	SDN	R4004	SO	52.6	52.2	MG/L	52.4	.76	768
AS	EPA 7060	23-NOV-93	MJL	R3979	SO	.0014	.0022	MG/L	.0018	44.44	769
AS	EPA 7060	23-NOV-93	MJL	R3991	SD	.0054	.0057	MG/L	.00555	5.41	769
AS	EPA 7060	23-NOV-93	MJL	R3999	SO	.0022	.0022	MG/L	.0022	0	769
AS	EPA 7060	23-NOV-93	MJL	R4007	SO	.002	.0026	MG/L	.0023	26.09	769
CD	EPA 7131	22-NOV-93	MPK	R3972	SO	.0006	.0008	MG/L	.0007	28-57	772
CD	EPA 7131	22-NOV-93	MPK	R3982	SO	.001	.0013	MG/L	.00115	26.09	772
CD	EPA 7131	22-NOV-93	MPK	R3991	SO	<.0005	<.0005	MG/L			772
CD	EPA 7131	22-NOV-93	MPK	R4002	SO	.0014	.0014	MG/L	.0014	0	772
AS	EPA 7060	24-NOV-93	MJL	a0663	SO	<.01	<.01	MG/L			773
CR	EPA 6010	23-NOV-93	JUC	R4018	SO	.649	.654	MG/L	.6515	.77	774
PB	EPA 6010	23-NOV-93	JUC	R4006	SO	.464	.482	MG/L	.473	3.81	774

QUALITY CONTROL REPORT

SPIKED SAMPLE ANALYSIS DATA

All spiked sample results (Q3 table) from analytical runs associated with the job to be reported.

Target	Method	Date	Analyst	Sample	Matrix	Unspiked	Units	Spike	%Rec	Run Id
HG	EPA 245.5	20-NOV-93	BJO/RND	R3971	S O	<.2	MG/L	10	98.89	747
HG	EPA 245.5	to-NW-93	BJO/RND	R3987	SO	<.2	MC/L	10	100.32	747
NA	EPA 6010	20-NOV-93	SDN	20660	SO	15.7	MG/L	100	101.8	749
NA	EPA 6010	to-NW-93	SDN	R3885	AP	8.28	MG/L	100	105.3	749
NA	EPA 6010	20-NOV-93	SDN	R3891	AP	5.71	MG/L	1000	102.1	749
NA	EPA 6010	20-NOV-93	SDN	R3900	AP	6.64	MG/L	10000	99.77	749
NA	EPA 6010	20-NOV-93	SDN	R3978	S D	12.8	MG/L	10000	105.23	749
NA	EPA 6010	to-NW-93	SDN	R3984	s o	9.4	MG/L	10000	100.19	749
NA	EPA 6010	20-NOV-93	SDN	R3995	s o	5.11	MG/L	10000	90.04	749
NA	EPA 6010	20-NOV-93	SDN	R4006	S D	5.18	MG/L	100	102.03	749
AS	EPA 7060	22-NOV-93	MJL	R3971	SO	.0132	MG/L	1	98.28	760
BE	EPA 6010	a-NW-93	JWC	R3972	s o	.014	MG/L	20	77.03	761
BE	EPA 6010	23-NOV-93	J U C	R3972	s o	.002	MG/L	to	92.94	761
BE	EPA 6010	23-NOV-93	JWC	R3985	s o	.008	MG/L	20	85.58	761
BE	EPA 6010	23-NOV-93	JWC	R3985	SO	.001	MG/L	10	96.97	761
BE	EPA 6010	23-NOV-93	JWC	R3989	SO	.008	MG/L	20	86.36	761
BE	EPA 6010	23-NOV-93	JWC	R3989	SO	.001	MG/L	10	98.99	761
BE	EPA 6010	U-NW-93	JYC	R3993	S D	.01	MG/L	20	89.75	761
BE	EPA 6010	23-NOV-93	JYC	R3993	S O	.001	MG/L	10	96.97	761
BE	EPA 6010	23-NOV-93	JWC	R4006	S O	.01	MG/L	10	85.78	761
BE	EPA 6010	23-NOV-93	JWC	R4006	S O	.001	MG/L	10	95.96	761
CR	EPA 6010	23-NOV-93	JWC	R3972	S O	.568	MG/L	20	77.46	761
CR	EPA 6010	23-NOV-93	JWC	R3985	S D	.355	MG/L	20	84.02	761
CR	EPA 6010	a-NW-93	JUC	R3989	SO	.288	MG/L	20	85.42	761
CR	EPA 6010	23-NOV-93	JWC	R3993	S O	.361	MG/L	20	85.27,	761
CR	EPA 6010	23-NOV-93	JWC	R4006	S D	.245	MG/L	10	92.72	761
FE	EPA 6010	23-NOV-93	JWC	R3972	s o	89.356	MG/L	20	473.95	761
FE	EPA 6010	23-NOV-93	JWC	R3985	S O	63.152	MG/L	20	214.1	761
FE	EPA 6010	23-NOV-93	JWC	R3989	SO	55.302	MG/L	20	22.62	761
FE	EPA 6010	23-NOV-93	JWC	R3993	S D	78.684	MG/L	20	153.32	761
FE	EPA 6010	23-NOV-93	JWC	R4006	S O	35.999	MG/L	10	1136.21	761
MG	EPA 6010	23-NOV-93	JWC	R3972	SO	107.425	MG/L	20	576.91	761
MG	EPA 6010	23-NOV-93	JUC	R3985	SO	54.041	MG/L	20	113.3	761
NI	EPA 6010	23-NOV-93	JWC	R3972	s o	.751	MG/L	20	76.69	761
NI	EPA 6010	23-NOV-93	JWC	R3972	s o	3 . m	MG/L	10	89.21	761
NI	EPA 6010	23-NOV-93	J U C	R3985	S O	.448	MG/L	20	84.01	761
NI	EPA 6010	23-NOV-93	JWC	R3985	S O	.607	MG/L	10	97.98	761
NI	EPA 6010	23-NOV-93	JWC	R3989	s o	.369	MG/L	20	83.36	761
NI	EPA 6010	23-NOV-93	JWC	R3989	SO	2.65	MG/L	10	92.15	761
NI	EPA 6010	23-NOV-93	JWC	R3993	S D	.397	MG/L	20	82.59	761
NI	EPA 6010	23-NOV-93	JWC	R3993	S O	.062	MG/L	10	95.56	761
NI	EPA 6010	23-NOV-93	JWC	R4006	SO	.279	MG/L	10	92.55	761
NI	EPA 6010	23-NOV-93	JWC	R4006	s o	.321	MG/L	10	96.13	761
V	EPA 6010	23-NOV-93	JWC	R3972	s o	.067	MG/L	10	95.61	761
V	EPA 6010	23-NOV-93	JWC	R3985	S O	.029	MG/L	10	98.26	761
V	EPA 6010	23-NOV-93	JWC	R3989	SO	.027	MG/L	10	100.26	761
V	EPA 6010	23-NOV-93	JYC	R3993	s o	.052	MG/L	10	97.48	761

QUALITY CONTUOL REPORT

SPIKED SAMPLE ANALYSIS DATA

All spiked sample results (Q3 table) from analytical runs associated uith the job to be reported.

Target	Method	Date	Analyst	Sample	Matrix	Unspiked	Units	Spike	%Rec	R m Id
V	EPA 6010	23-NOV-93	JUC	R4006	SO	.021	MG/L	10	98.18	761
ZN	EPA 6010	23-NOV-93	JUC	R3972	SO	.608	MG/L	20	65.05	761
ZN	EPA 6010	23-NOV-93	JUC	R3972	SO	.249	MG/L	10	82.56	761
ZN	EPA 6010	23-NOV-93	JUC	R3972	SO	.127	MG/L	10	94.19	761
ZN	EPA 6010	23-NOV-93	JUC	R3985	SO	.368	MG/L	20	73.47	761
ZN	EPA 6010	23-NOV-93	JUC	R3985	SO	.051	MG/L	10	95.45	761
ZN	EPA 6010	23-NOV-93	JUC	R3989	SD	.385	MG/L	20	75.51	761
ZN	EPA 6010	23-NOV-93	JWC	R3989	SO	.06	MG/L	10	98.57	761
ZN	EPA 6010	23-NOV-93	JUC	R3993	SO	.342	MG/L	20	76.59	761
ZN	EPA 6010	23-NOV-93	JUC	R3999	SO	.049	MG/L	10	98.46	761
ZN	EPA 6010	U-NW-93	JUC	R4006	SO	.048	MG/L	10	100.47	761
AL	EPA 6010	23-NOV-93	SDN	R3973	SO	108	MG/L	10000	106.29	768
AL	EPA 6010	U-NW-93	SDN	R3987	SO	79.5	MG/L	10000	108.51	768
AL	EPA 6010	23-NOV-93	SDN	R3992	SO	75.2	MG/L	10000	97.45	768
AL	EPA 6010	23-NOV-93	SDN	R3997	SO	73	MG/L	1000	90.12	768
AS	EPA 7060	23-NOV-93	MJL	R3979	SO	.0014	MG/L	1	96.09	769
AS	EPA 7060	23-NOV-93	HJL	R3991	SO	.0054	MG/L	1	86.39	769
AS	EPA 7060	23-NOV-93	MJL	R3999	SD	.0022	MC/L	1	83.04	769
AS	EPA 7060	23-NOV-93	MJL	R4007	SO	.002	MG/L	1	83.02	769
CD	EPA 7131	22-NOV-93	MPK	R3971	SO	.0007	MG/L	1	103.09	772
CD	EPA 7131	22-NOV-93	MPK	R3983	SD	.0012	MG/L	1	93.04	772
CO	EPA 7131	22-NOV-93	MPK	R3991	SO	<.0005	MG/L	1	92.92	772
CD	EPA 7131	22-NOV-93	MPK	R4000	SO	.0006	MG/L	1	105.1	772
AS	EPA 7060	24-NOV-93	MJL	30662	SO	.0041	MG/L	1	91.31	773
CR	EPA 6010	23-NOV-93	JUC	R3972	SO	.429	MG/L	10	96.2	774
CR	EPA 6010	23-NOV-93	JWC	R3985	SO	.242	MG/L	10	97.36	774
CR	EPA 6010	23-NOV-93	JUC	R3989	SO	.306	MG/L	10	94.97	774
CR	EPA 6010	23-NOV-93	JUC	R3993	SO	.063	MG/L	10	95.57	774
CR	EPA 6010	23-NOV-93	JUC	R4006	SO	.07	MG/L	10	95.64	774
CR	EPA 6010	23-NOV-93	JWC	R4014	SD	,211	MG/L	10	88.81	774
CR	EPA 6010	23-NOV-93	JWC	R4014	SO	.119	MG/L	10	91.08	774
PB	EPA 6010	23-NOV-93	JUC	R3972	SO	.244	MG/L	10	95.36	774
PB	EPA 6010	23-WOV-93	JUC	R3989	SO	.104	MG/L	10	91.94	774
PB	EPA 6010	23-NOV-93	JUC	R4006	SO	.464	MG/L	10	92.87	774

DUPLICATE ANALYSIS DATA

All "Duplicate" results (Q2 table) from analyses performed on samples in the job to be reported.

Target	Method	Date	Analyst	Sample	Matrix	Value 1	Value 2	units	Mean	%Diff	Run Id
MG	EPA	20-NOV-93	245.5	R3974	SO	.349	.332	MG/L	.3405	4.99	747
HG	EPA	20-NOV-93	2LS.5	R3988	SO	<.2	<.2	MG/L			747
HA	EPA 6010	20-NOV-93	SDR	R3978	SO	12.8	12.8	MG/L	12.8	0	749
NA	EPA 6010	20-NOV-93	SDN	R3984	SO	9.1	9.5	MG/L	9.15	1.06	749
NA	EPA 6010	20-NOV-93	SDN	R3995	SO	5.11	5.13	MG/L	5.12	.39	749
NA	EPA 6010	20-NOV-93	SDN	R4006	SO	5.18	5.1	MG/L	5.14	1.56	749

QUALITY CONTROL REPORT

DUPLICATE ANALYSIS DATA

All "Duplicate" results (Q2 table) from analyses performed on samples in the job to be reported.

Target	Method	Date	Analyst	Sample	Matrix	Value 1	Value 2	Units	Mean	%Diff	Run Id
HG	EPA	20-NOV-93	245.5	R4001	SO	<.2	<.2	MG/L			750
HG	EPA	20-NOV-93	245.5	R4007	SO	<.2	<.2	MG/L			753
HG	EPA	20-NOV-93	245.5	R4019	SO	<.2	<.2	MG/L			753
HG	EPA	20-NOV-93	245.5	R4023	SO	<.2	<.2	MG/L			757
AS	EPA 7060	22-NOV-93	MJL	R3971	SO	.0132	.0133	MG/L	.01325	.75	760
BE	EPA 6010	23-NOV-93	JWC	R3972	SO	.014	.014	MG/L	.014	0	761
BE	EPA 6010	23-NOV-93	JUC	R3993	SO	.011	.011	MG/L	.011	0	761
BE	EPA 6010	23-NOV-93	JUC	R4006	SO	.01	.01	MG/L	.01	0	761
CR	EPA 6010	23-NOV-93	JWC	R3972	so	.568	.576	MG/L	.572	1.1	761
CR	EPA 6010	23-NOV-93	JWC	R3993	so	.361	.363	MG/L	.362	.55	761
CR	EPA 6010	23-NOV-93	JWC	R4006	SO	.245	.256	MG/L	.2505	4.39	761
FE	EPA 6010	23-NOV-93	JWC	R3972	SO	89.356	90.85	MG/L	90.103	1.64	761
FE	EPA 6010	23-NOV-93	JWC	R3993	SO	78.686	78.532	MG/L	78.609	.2	761
FE	EPA 6010	23-NOV-93	JWC	R4006	so	35.999	37.481	MG/L	36.74	4.03	761
MG	EPA 6010	23-NOV-93	JUC	R3972	SO	107.425	108.671	MG/L	108.019	1.16	761
									5		
WI	EPA 6010	23-NOV-93	JYC	R3972	SO	.751	.757	MG/L	.754	.8	761
NI	EPA 6010	23-NOV-93	JUC	R3993	SO	.397	.392	MG/L	.3945	1.27	761
NI	EPA 6010	23-NOV-93	JWC	R4006	SO	.279	.286	MG/L	.2825	2.48	761
PB	EPA 6010	23-NOV-93	JUC	R3972	SO	1.068	1.083	MG/L	1.0755	1.39	761
PB	EPA 6010	23-NOV-93	JWC	R3993	SO	.578	.577	MG/L	.5775	.17	761
V	EPA 6010	23-NOV-93	JUC	R3972	SO	.468	.474	MG/L	.471	1.27	761
V	EPA 6010	23-NOV-93	JWC	R3993	so	.45	.449	MG/L	.4495	.22	761
V	EPA 6010	23-NOV-93	JWC	R4006	SO	.177	.184	MC/L	.1805	3.88	761
ZN	EPA 6010	23-NOV-93	JWC	R3972	SO	.608	.627	MG/L	.6175	3.08	761
ZN	EPA 6010	23-NOV-93	JWC	R3993	SO	.342	.335	MG/L	.3385	2.07	761
ZN	EPA 6010	23-NOV-93	JUC	R4006	SO	.249	.254	MG/L	.2515	1.99	761
CA	EPA 6010	22-NOV-93	SON	a0660	so	994	978	MG/L	986	1.62	762
CA	EPA 6010	22-NOV-93	SDN	R3980	SO	620	618	MG/L	619	.32	762
CA	EPA 6010	22-NOV-93	SON	R3989	SO	483	480	MG/L	f.81.S	.62	762
CA	EPA 6010	22-NOV-93	SDN	R3999	SO	1000	1010	MG/L	1005		762
CA	EPA 6010	22-NOV-93	SDN	R4009	SO	749	739	MG/L	744	1.34	762
AI	EPA 6010	23-NOV-93	SDN	R3979	SO	85.6	84.8	MG/L	85.2	.94	768
AL	EPA 6010	23-NOV-93	SDN	R3990	SO	77	76	MG/L	76.5	1.31	768
AL	EPA 6010	23-NOV-93	SDN	R3997	SO	73	74.1	MG/L	73.55	1.5	768
AL	EPA 6010	23-NOV-93	SDN	R4004	SO	52.6	52.2	MG/L	52.6	.76	768
AS	EPA 7060	23-NOV-93	MJL	R3979	SO	.0014	.0022	MG/L	.0018	44.44	769
AS	EPA 7060	23-NOV-93	MJL	R3991	so	.0054	.0057	MG/L	.00555	5.41	769
AS	[illegible]	[illegible]	MJL	[illegible]	[illegible]	[illegible]	[illegible]	MG/L	me--		[illegible]
AS	EPA 7060	23-NOV-93	MJL	R4007	SO	.002	.0026	MG/L	.0023	26.09	769
CD	EPA 7131	22-NOV-93	MPK	R3972	SO	.0006	.0008	MG/L	.0007	28.57	772
co	EPA 7131	22-NOV-93	MPK	R3982	SO	.001	.0013	MG/L	.00115	26.09	772
CD	EPA 7131	22-NOV-93	MPK	R3991	SO	<.0005	<.0005	MG/L			772
CD	EPA 7131	22-NOV-93	MPK	R4002	so	.0014	.0014	MG/L	.0014	0	772
AS	EPA 7060	24-NOV-93	MJL	50663	so	<.01	<.01	MG/L			773
CR	EPA 6010	23-NOV-93	JWC	R4018	so	.649	.654	MG/L	.6515	.77	774
PB	EPA 6710	23-NOV-93	JWC	R4006	so	.464	.482	MG/L	.473	3.81	774

QUAL I TY CONTROL REPORT

SPIKED SAMPLE ANALYSIS DATA
All "Spike" results (Q3 table) from analyses performed on samples in the job to be reported.

Target	Method	Date	Analyst	Sample	Matrix	Unspiked	Units	Spike	% Rec	Run Id
HG	EPA 245.5	20-NOV-93	BJO/RND	R3971	SO	<.2	MG/L	10	98.89	747
HG	EPA 245.5	20-NOV-93	BJO/RND	R3987	S O	<.2	MG/L	10	100.32	747
WA	EPA 6010	20-NOV-93	SDN	20660	SO	15.7	MG/L	100	101.8	749
NA	EPA 6010	20-NOV-93	SDN	R3978	SO	12.0	MG/L	10000	105.23	749
NA	EPA 6010	20-NOV-93	SDN	R3984	S O	9.1	MG/L	10000	100.19	749
WA	EPA 6010	20-NOV-93	SON	R3995	SO	5.11	MG/L	10000	90.04	749
NA	EPA 6010	20-NOV-93	SDN	R4006	S O	5.18	MG/L	100	102.83	749
HG	EPA 245.5	20-NOV-93	BJO/RND	R4001	S O	<.2	MG/L	10	87.12	750
HG	EPA 245.5	20-NOV-93	BJO/RND	R4004	S O	<.2	MG/L	10	92.84	753
HG	EPA 245.5	20-NOV-93	BJO/RND	R4012	S O	<.2	MG/L	10	95.55	753
HG	EPA 245.5	20-NOV-93	BJO/RND	R4022	S O	<.2	MG/L	10	121.8	757
HG	EPA 245.5	20-NOV-93	BJO/RND	R4022	S O	<.2	MG/L	10	121.8	757
AS	EPA 7060	22-NOV-93	MJL	R3971	SO	.0132	MG/L	1	98.28	760
BE	EPA 6010	23-NOV-93	JWC	R3972	so	.002	MG/L	10	92.94	761
BE	EPA 6010	23-NOV-93	JWC	R3972	S O	.014	MG/L	20	77.03	761
BE	EPA 6010	23-NOV-93	JWC	R3985	SO	.001	MG/L	10	96.97	761
BE	EPA 6010	23-NOV-93	JWC	R3985	s o	.008	MG/L	20	85.58	761
BE	EPA 6010	23-NOV-93	J Y C	R3989	SO	.001	MG/L	10	98.99	761
BE	EPA 6010	23-NOV-93	J Y C	R3989	S O	.008	MG/L	20	86.36	761
BE	EPA 6010	23-NOV-93	J U C	R3993	S O	.001	MG/L	10	96.97	761
BE	EPA 6010	23-NOV-93	J U C	R3993	S O	.01	MG/L	20	89.75	761
BE	EPA 6010	23-NOV-93	J U C	R4006	S O	.001	MG/L	10	95.96	761
BE	EPA 6010	23-NOV-93	J U C	R4006	S O	.01	MC/L	10	85.78	761
CR	EPA 6010	23-NOV-93	J Y C	R3972	S O	.568	MG/L	20	77.46	761
CR	EPA 6010	23-NOV-93	J U C	R3985	S O	.355	MG/L	20	86.02	761
CR	EPA 6010	23-NOV-93	JWC	R3989	so	.288	MG/L	20	85.42	761
CR	EPA 6010	23-NOV-93	J U C	R3993	S O	.361	MG/L	20	85.27	761
CR	EPA 6010	23-NOV-93	J Y C	R4006	so	.245	MG/L	10	92.72	761
FE	EPA 6010	23-NOV-93	J Y C	R3972	S O	89.356	MG/L	20	473.95	761
FE	EPA 6010	23-NOV-93	JWC	R3985	s o	63.152	MG/L	20	214.1	761
FE	EPA 6010	23-NOV-93	J Y C	R3989	SO	55.302	MG/L	20	22.62	761
FE	EPA 6010	23-NOV-93	J Y C	R3993	S O	78.686	MG/L	20	153.32	761
FE	EPA 6010	23-NOV-93	J Y C	R4006	S O	35.999	MG/L	10	1136.21	761
MG	EPA 6010	23-NOV-93	J Y C	R3972	S O	107.425	MG/L	20	576.91	761
MG	EPA 6010	23-NOV-93	JWC	R3985	s o	54.041	MG/L	20	113.3	761
NI	EPA 6010	23-NOV-93	J U C	R3972	s o	.751	MG/L	20	76.69	761
HI	EPA 6010	23-NOV-93	JWC	R3972	S O	3 . m	MG/L	10	80.21	761
NI	EPA 6010	23-NOV-93	JWC	R3985	SO	.448	MG/L	20	84.01	761
NI	EPA 6010	23-NOV-93	JW[illegible]	R3985	SO	.607	[illegible]	[illegible]	[illegible]	[illegible]
NI	EPA 6010	23-NOV-93	J U C	R3989	SO	.369	MG/L	20	83.36	761
RI	EPA 6010	23-NOV-93	J U C	R3989	S O	2.65	MG/L	10	92.15	761
HI	EPA 6010	23-NOV-93	J Y C	R3993	SO	.062	MG/L	10	95.56	761
NI	EPA 6010	23-NOV-93	JWC	A3993	so	.397	MG/L	20	82.59	761
NI	EPA 6010	23-NOV-93	J Y C	R4006	so	.279	MG/L	10	92.55	761
HI	EPA 6010	23-NOV-93	JWC	R4006	S O	.321	MG/L	10	96.13	761
V	EPA 6010	23-NOV-93	JWC	R3972	$ 0	.067	MG/L	10	95.61	761
V	EPA 6010	23-NOV-93	JWC	R3985	SO	.029	MG/L	10	98.26	761

QUALITY CONTROL REPORT

SPIKED SAMPLE ANALYSIS DATA

All "Spike" results (Q3 table) from analyses performed on samples in the job to be reported.

Target	Method	Date	Analyst	Sample	Matrix	Unspiked	Units	Spike	% Rec	Run Id
V	EPA 6010	23-NOV-93	JWC	R3989	SO	.027	MG/L	10	100.26	761
V	EPA 6010	23-NOV-93	JWC	R3993	SO	.052	MG/L	10	97.40	761
V	EPA 6010	23-NOV-93	JWC	R4006	SO	.021	MG/L	10	98.18	761
ZN	EPA 6010	U-NW-93	JWC	R3972	SO	.127	MG/L	10	94.19	761
ZN	EPA 6010	U-NW-93	JWC	R3972	SO	.249	MG/L	10	82.56	761
ZN	EPA 6010	U-NW-93	JWC	R3972	SO	.608	MG/L	20	65.05	761
ZN	EPA 6010	23-NOV-93	JWC	R3985	SO	.051	MG/L	10	95.45	761
ZN	EPA 6010	23-NOV-93	JUC	R3985	SO	.368	MG/L	20	73.47	761
ZN	EPA 6010	U-NW-93	JWC	R3989	SO	.06	MG/L	10	98.57	761
ZN	EPA 6010	23-NOV-93	JWC	R3989	SO	.385	WC/L	20	75.51	761
ZN	EPA 6010	23-NOV-93	JWC	R3993	SO	.342	MG/L	20	76.59	761
ZN	EPA 6010	23-NOV-93	JWC	R4006	SO	.048	MG/L	10	100.47	761
AL	EPA 6010	23-NOV-93	SON	R3973	SO	108	MG/L	10000	106.29	760
AL	EPA 6010	23-NOV-93	SDN	R3987	SO	79.5	MG/L	10000	108.51	768
AL	EPA 6010	U-NW-93	SDN	R3992	SO	75.2	MG/L	10000	97.45	768
AL	EPA 6010	23-NOV-93	SDN	R3997	SO	73	MC/L	1000	90.12	768
AS	EPA 7060	23-NOV-93	MJL	R3979	SO	.0014	MG/L	1	96.09	769
AS	EPA 7060	23-NOV-93	MJL	R3991	SO	.0054	MG/L	1	86.39	769
AS	EPA 7060	23-NOV-93	MJL	R3999	SO	.0022	MG/L	1	83.04	769
AS	EPA 7060	23-NOV-93	MJL	R4007	SO	.002	MG/L	1	83.02	769
CD	EPA 7131	22-NOV-93	MPK	R3971	SO	.0007	MC/L	1	103.09	772
CD	EPA 7131	22-NOV-93	MPK	R3983	SO	.0012	MG/L	1	93.04	772
CD	EPA 7131	22-NOV-93	MPK	R3991	SO	<.0005	MG/L	1	92.92	772
CD	EPA 7131	22-NOV-93	HPK	R4000	SO	.0006	MG/L	1	105.1	772
AS	EPA 7060	24-NOV-93	MJL	a0662	SO	.0041	MG/L	1	91.31	773
CR	EPA 6010	U-NW-93	JWC	R3972	SO	.429	MG/L	10	96.2	774
CR	EPA 6010	23-NOV-93	JWC	R3985	SO	.242	MG/L	10	97.36	774
CR	EPA 6010	U-NW-93	JWC	R3989	SO	.306	MG/L	10	94.97	774
CR	EPA 6010	23-NOV-93	JWC	R3993	SO	.063	MG/L	10	95.57	774
CR	EPA 6010	23-NOV-93	JWC	R4006	SO	.07	MG/L	10	95.66	774
CR	EPA 6010	23-NOV-93	JWC	R4014	SO	.119	MG/L	10	91.08	774
CR	EPA 6010	23-NOV-93	JWC	R4014	SO	.211	MG/L	10	80.81	774
PB	EPA 6010	23-NOV-93	JWC	R3972	SO	.244	MG/L	10	95.36	774
PB	EPA 6010	23-NOV-93	JWC	R3989	SO	.104	MG/L	10	91.94	774
PB	EPA 6010	23-NOV-93	JWC	R4006	SO	.464	MG/L	10	92.87	774

ANNEX E-28

TABLE III
HEXAVALENT CHROMIUM SPIKE RECOVERIES USING A HACH FIELD SCREENING TEST KIT

SAMPLE SPIKE ID	SAMPLE SITE	THEORETICAL CONC PPB	OBSERVED CONC PPB	RECOVERY %
CT14A	DOHA	750	500	67
CT15A	DOHA	750	600	80
CT14B	DOHA	750	600	80
CT15B	DOHA	750	650	87
EM13-1A	EMBASSY*	500	300	60
EM14-2A	EMBASSY*	500	300	60
EM12-2A	EMBASSY*	500	500	100
EM11-3A	EMBASSY*	500	200	40
MH11-TA	HOSPITAL	500	550	110
MH11-IA	HOSPITAL	500	450	85
AH13-1A	HOSPITAL	500	400	80
CF11-1A	FREEDOM	500	500	100
CF11A	FREEDOM	500	400	80
CF11B	FREEDOM	500	400	80
CF11C	FREEDOM	500	300	60
CF11D	FREEDOM	500	450	90
CF11E	FREEDOM	500	450	90
CF11G	FREEDOM	500	450	90
DA14ASC	KHOBAR	250	250	100
DA11A	KHOBAR	250	250	100
AJ15A-SC	JABAIL	250	200	80
BIG-AJ	JABAIL	250	200	80
R15 SPIKE A	ESKAN	250	200	80
R15 SPIKE B	ESKAN	250	250	100
R14 SPIKE	ESKAN	250	250	100
			MEAN %	83
			STD %	11.2

* = Filtration Difficulty Experienced With These Samples

ANNEX E-29

TABLE VI

Results Summary
Water Extractable Hexavalent Chromium in Kuwaiti Sand

Laboratory Sample Id	Bar Code	Client Sample Id	Total Cr (ppb)	CrVI (ppb)	Spike Level (ppb)	% Spike Recovery
605180	RJL0013	(C) Spike A Embassy Comp	N/A	97.27	105.00	92.6%
605140	RJL0068	(C) Spike B CT (Big Doha)	N/A	85.48	103.00	83.0%
605062	RJL0022	(C) Spike C AH Comp. (Big AH)	N/A	155.65	106.00	146.8'36
605092	RJL0026	(C) Spike D-CF Comp. (Big CF)	N/A	180.66	115.00	157.1%
605153	RJL0031	(C) Spike E (Big MH)	N/A	107.97	110.00	982%
605111	RJL0036	(C) Spike F Big DA Composite	N/A	301.13	209.00	144.1%
605083	RJL0046	(C) Spike G - Big AJ	N/A	159.08	Not Determined	
					Average	120.3%

DEPARTMENT OF THE ARMY
U. S. ARMY ENVIRONMENTAL HYGIENE AGENCY
ABERDEEN PROVING GROUNO. MARYLAND 21010-5422

REPLY to
ATTENTION OF

HSHB-ZM

FINALREPORT
KUWAIT OIL FIRE HEALTH RISK ASSESSMENT
NO. 39-26-L192-91
5 MAY - 3 DECEMBER 1991

APPENDIX F
BIOLOGICAL SURVEILLANCE INITIATIVE

1. INTRODUCTION.

a. The Kuwait oil well fires introduced tons of combustion products into the Persian Gulf upper atmosphere from mid-February 1991 until the last fire was extinguished in November 1991. United States military forces operated in the Persian Gulf region during that time and may have been exposed to potential environmental contamination resulting from those fires.

b. In response to tasking by the Joint Chiefs, the U.S. Army Environmental Hygiene Agency (USAEHA) conducted a Health Risk Assessment (HRA) of potential contamination related to the oil well fires. The HRA attempts to quantify long term risks of adverse health outcomes for U.S. soldiers who served in the Persian Gulf/Kuwait Theater of Operations. The human health risk is estimated through models which calculate human exposures based on measured environmental data. The health risks are then quantified on the basis of calculated exposure and existing toxicologic parameters. The HRA methodology makes several assumptions when calculating exposure levels, resulting in some degree of uncertainty as to the accuracy of predicted health effects. Typically, actual biological measures of dosage and tangible health effects are not evaluated concurrently with the environmental measurements of an HRA.

c. The presence of U.S. forces in the Kuwait Theater of Operations presented the opportunity for the biological surveillance of a group of soldiers deploying from Germany, while concurrent measures of environmental contamination were taken. This effort was called the Biological Surveillance Initiative (BSI). The BSI had two objectives:

(1) To quantify exposure to several environmental contaminants by measuring biological markers of exposure and internal dose. These objective measurements of exposure and dose could serve to corroborate or counter the modelled exposures derived from the environmental concentrations. Thus, the BSI effort was an attempt to validate the calculated human exposure levels made in the HRA.

(2) To detect changes in the cohort's well-being through selected objective and subjective measures of health. The rationale for this component of the BSI was that any positive findings in the surveillance population could lead to the early identification of special health care needs and/or requirements for fur&her surveillance in other potentially exposed soldiers.

d. The BSI laboratory results presented in this report meet the firs objective and corroborate the environmental sampling data. Attempts to achieve the second objective were severely hampered by operational requirements and situations, and by equipment problems. These prevented the accurate collection of pulmonary function data, personal information that was to be recorded in diaries and the analysis of data on health care facility use.

e. Questionnaire data were recorded for a large number of soldiers at various times, but analysis of these and some of the laboratory data is still in progress.

2. METHODS.

a. The overall design of the BSI was voluntary medical surveillance of a cohort of soldiers. (Plan for this study is included as Annex F-7, Study Plan.) The project did not include any control group or follow-back investigations, nor did it entail any long term follow up.

b. The total population eligible for study may have consisted of as many as 4700 soldiers assigned to the 1 lth Armored Cavalry Regiment (11th ACR) which deployed from Germany to the Kuwait Theater on and around 10 June 1991. This cohort of soldiers returned to Germany on and around 20 September 1991.

c. Each soldier studied was identified by name, social security number and military unit. Each questionnaire, biological specimen, and test was given an identification number only. Code keys linking identification numbers and other identifying information were maintained under controlled access, locked storage and kept separate from all data files. (All data which may retain inherent identifiable material will remain in locked storage until 5 years after all reporting from the BSI is complete. For future reference, a repository for the permanent records of this study population will be established as directed by the Office of the Surgeon

General, U.S. Army, and under the aegis of the Walter Reed Army Institute of Research and the USAEHA. All records will remain in controlled access storage, will remain as coded information, and will remain with data separated from identifiers.)

d. Different types of information and data were collected from different samples of 11th ACR troops on three separate occasions by BSI team members. The time periods of data collection were identified as (Kuwait Oil Fire) KOF1, KOF2, and KOF3:

- KOF1 - June 1991, before deployment, in Germany.
- KOF2 - August 1991, during deployment, in Kuwait.
- KOF3 - October 1991, post deployment, in Germany.

Attempts were made to obtain demographic and general health related information through a general questionnaire, supplemental questionnaires, pulmonary function tests, personal diaries, and review of medical treatment facility records. Objective laboratory data were obtained through the study of biological specimens (blood and/or urine) for: metals, volatile organic compounds, sister chromatid exchange frequency, polycyclic aromatic hydrocarbon-deoxyribonucleic acid adducts, and urinary tetrols. Testing on urine was done on spot urine specimens.

(1) Comprehensive (General) Questionnaires. Questionnaires were given to as many soldiers of the 11th ACR as could be reached by the BSI team. Questionnaires were completed and returned by individual soldiers on a voluntary basis. Questionnaires addressed the following areas:

- general demographic characteristics.
- medical history.
- smoking history.
- self-reported symptomatology.
- reproductive history.
- occupational

(See hex F-2, Questionnaires)

(2) Supplemental Questionnaires. At the time of specimen collection, individuals providing a blood specimen for volatile organic compound (VOC), polycyclic aromatic hydrocarbon - deoxyribonucleic acid (PAH-DNA) adduct, and sister chromatid exchange (SCE) analyses were asked to complete a supplemental questionnaire. Two supplemental questionnaires were used. A special questionnaire for soldiers tested for PAH-DNA adducts and SCEs and another special questionnaire for those tested for VOCs explored more in-depth information on exposures and activities that could affect the results and interpretation of specimen analyses.

(3) Pulmonary Function Tests.

(a) A group of 11th ACR soldiers underwent pulmonary function tests (PFTs), specifically to measure Forced Vital Capacity (PVC) and Forced Expiratory Volume at one second (FEV_1). Subjects tested consisted of a convenience sample of soldiers readily accessible to the BSI team. Initial PFTs were obtained while the 11th ACR was hurriedly preparing for deployment. Testing conditions were poor and the machines used were not familiar to the testers. Improvements were made in the conduct of later PFTs, but conditions remained less than optimal.

(b) Spirograms were collected on 246 soldiers before deployment (KOF1), on 364 soldiers during deployment (KOF2), and on 420 soldiers post deployment (KOF3). Soldiers with PFTs done in June 1991 were contacted and asked to voluntarily repeat spirograms on the later dates. Those not repeating tests were replaced and additional 11th ACR soldiers were tested during the later test periods.

(4) Medical Treatment Facility Records and Personal Diaries.

(a) The medical components of the 11th ACR were asked to maintain a standardized log of health care facility use. The Mobile Army Surgical Hospital (MASH) at Doha, Kuwait, provided the 11th ACR with health care through 11 August and all health care records were maintained at the MASH.

(b) A small number of soldiers tested for SCEs were provided diaries and were asked to record personal experiences that might be related to exposure and health status.

(5) Metals Analysis.

(a) Blood and urine were collected from a group of 11th ACR soldiers for metals analysis. The metals chosen for analysis included those expected in crude oil (nickel and vanadium), those expected in dietary sources (copper and zinc), and those toxic metals (cadmium, chromium, lead, arsenic, and mercury) which might arise from any number of natural or anthropogenic sources. Subjects providing specimens consisted of a convenience sample of soldiers readily accessible to the BSI team. Specimens were collected from 171 soldiers before deployment (KOF1); from 175 soldiers during deployment (KOF2); and from 143 soldiers post deployment (KOF3). Soldiers providing specimens in the before deployment period were sought out to give subsequent samples. Those soldiers who did not provide subsequent samples were replaced.

(b) Following collection, blood and urine specimens were maintained at -70 to -80 °C until delivered to the Armed Forces Institute of Pathology, where they were analyzed by absorption spectrophotometry using flame and electrothermal sampling techniques.

(c) Analysis results were compared to expected values[1] and were evaluated for changes between collection periods. (See Annex F-3, Metals Analysis.)

(6) Volatile Organic Compounds Assay.

(a) Blood specimens were collected from a group of 11th ACR soldiers for analysis of 31 VOCs most commonly encountered in environmental contamination. Subjects providing specimens consisted of a convenience sample of soldiers readily accessible to the BSI team. Samples were collected from 32 soldiers before deployment (KOF1), 28 samples were collected during deployment (KOF2), and 28 samples were collected after deployment (KOF3). Soldiers giving specimens before deployment were sought out to give subsequent samples. Those soldiers who did not provide subsequent samples were replaced. Twenty-five soldiers gave blood samples on all three occasions. Individuals providing specimens were asked to complete a supplemental questionnaire (each time a specimen was collected) to better define possible VOC exposure sources.

(b) Blood specimens were collected in vacutainers with potassium oxalate/sodium fluoride anticoagulant. Samples were shipped on wet ice via next day carrier to the National Center for Environmental Health, U.S. Centers for Disease Control and Prevention, Atlanta, Georgia, where analyses were performed using gas chromatographic/mass spectroscopic techniques.

(c) Analytical results were compared to U.S. background level norms[2] and were evaluated for changes between collection periods. (See Annex F-4, Volatile Organic Compounds Assay.)

(7) Sister Chromatid Exchange Frequency Assay.

(a) Blood specimens were collected from a sample group of soldiers for assessment of SCE levels. Subjects providing specimens constituted a convenience sample of soldiers readily accessible to the BSI team. Samples were collected from 61 soldiers before deployment (KOF1), from 51 soldiers during deployment (KOF2), and from 36 soldiers post deployment (KOF3). Soldiers giving specimens before deployment were sought out to give subsequent samples. Twenty-six soldiers provided specimens at all three sampling points; 50 soldiers gave KOF1 and KOR samples; and, 35 soldiers provided samples prior to and

following deployment to Kuwait. Individuals providing specimens were asked to complete a supplemental questionnaire (each time a specimen was obtained) to better define possible genotoxic exposures.

(b) Blood specimens were collected in vacutainers with sodium heparin anticoagulant. Samples were shipped on wet ice and arrived at Microbiologicals, Inc., Rockville, Maryland, within 48 hours for cytogenetic evaluation.

(c) Analytical results were evaluated for changes between collection periods.

(d) Forty-seven soldiers from the group sampled before deployment (KOF1) were provided with blank books in which they were asked to keep diaries. These diaries sought to elucidate their experiences and perceived exposures. There was very little interest in maintaining the diaries. Only six diaries were returned and these were not evaluated. (See Annex F-5, Sister Chromatid Exchange Frequency Assay.)

(8) Polycyclic Aromatic Hymn-Deoxyribonucleic Acid Adduct Assay.

(a) Blood specimens were collected for analysis of levels of PAHs adducted to the DNA of white blood cells. Subjects providing specimens consisted of a convenience sample of soldiers. Blood samples were collected from 42 soldiers before deployment (KOF1), from 34 soldiers during deployment (KOF2), and from 38 soldiers after deployment (KOF3). Soldiers giving specimens before deployment were sought out to provide subsequent specimens. Those soldiers who did not provide subsequent specimens were replaced. Only 22 soldiers gave three matched samples. Soldiers provided KOF3 samples approximately 4 weeks after returning to Germany. Individuals providing specimens were asked to complete a supplemental questionnaire to better define possible PAH exposure sources.

(b) Blood specimens were collected in vacutainers containing sodium heparin anticoagulant. After centrifugation and quick-freezing, the specimens were shipped on dry ice, with final analysis for adducts by immunoassay being conducted at the Division of Cancer Etiology, National Cancer Institute, Bethesda, Maryland.

(c) Analysis results were compared to similar measures taken in U.S. foundry worker? and were evaluated for changes between collection periods. (See Annex F-6, Polycyclic Aromatic Hydrocarbon-Deoxyribonucleic Acid Adduct Assay.)

(9) Urinary Tetrols Assay. Urine specimens collected from a group of 1 lth ACR soldiers for analysis of urinary metabolites of polycyclic aromatics are still undergoing laboratory analysis at this time. Therefore, these results are not included in the results or discussion sections.

3. RESULTS. The numbers of soldiers who participated during the three different study periods are shown below for the analysis of questionnaires, metals, and VOCs and the study of SCEs and PAH-DNA adducts. Problems were encountered in the collection of data and information from pulmonary function testing and the review of medical treatment facility records and personal diaries; These problems are discussed below.

Tie of Study	Questionnaires	Metals	VOCs	SCEs	PAH-DNA
KOF1, JUN 91	2,797	171	32	61	42
KOR, AUG 91	355	175	28	51	34
KOF3. OCT 91	1.681	143	28	36	38

a. Questionnaires. The numbers of soldiers completing comprehensive questionnaires are shown above.

(1) Demographic features of the respondents were evaluated for the three different periods of study. Respondents had a mean age of 25.0 to 25.4 years. Race of the respondents was 58 to 60 percent white, 21 to 29 percent black, 8 percent Hispanic, and the remainder of unspecified ethnic origin.

(2) Reported exposures in Kuwait (KOF2) indicated: 44 percent of respondents experienced severe dust exposure; 45 percent experienced exposure to gas or fumes; and 52 percent experienced exposure to smoke (primarily oil fire smoke). Two-thirds reported that the oil fire smoke was more severe than expected and 41 percent reported having been within a mile of an oil fire at some time. Most respondents were in Kuwait 90 to 120 days.

(3) A number of symptoms were reported more frequently in Kuwait, as compared to before deployment to Kuwait or after returning to Germany. In general, the pattern of reported symptoms was: low before, higher during, and lower but not hack to baseline 4 weeks after return to Germany. On an average, reported problems were slightly increased for vision and hearing, somewhat increased for sleeping, concentration, breathing, and prolonged exercise, and noticeably increased for digestion, urination and bowel movements (predominantly diarrhea). Those problems that were increased two-fold or greater in Kuwait included fatigue, burning eyes, eye irritation, trouble breathing, nose and throat irritation, and skin rashes.

(4) In respondents who completed both KOF1 and KOF3 questionnaires, the percent responding "worse" in KOF3 compared to KOF1 at least doubled with regard to self-reported symptoms of weakness/fatigue, urination, vision, breathing, digestion, concentration, hearing, prolonged exercise, bowel movements, sleeping, high blood pressure and frequent colds.

(5) Although soldiers did not work directly with the oil well fires, several symptoms in Kuwait were significantly associated with proximity to the fires. After returning to Germany, the only symptom associated with oil fire proximity was phiegm production.

(6) In Kuwait, personal smoking was an important variable for coughing, phlegm, and wheezing. Personal smoking remained an important variable for each of these symptoms after returning to Germany, and was additionally important for burning eyes, eye irritation, trouble breathing, and nose and throat irritation.

(7) Data analyses from the comprehensive and supplemental questionnaires are still in progress. (See Annex F-2, Questionnaires.)

b. Pulmonary Function. Data collected from attempted spirometry was too poor to allow meaningful analysis. The quality of flow loop curves was unacceptable from all three data collection periods, primarily related to the use of portable pneumotachygraphs and environmental conditions. The first data collection period also suffered from inadequate technician training and improper subject preparation.

c. Medical Treatment Facility Records and Personal Diaries. Data collected on health care facility use by the 11th ACR were destroyed. The MASH hospital at Doha, where records were maintained, was located next to an ammunition dump. A conflagration at the dump on 11 August 1991 destroyed the records. So few soldiers took their diaries to Kuwait that analysis of these would have little, if any, value.

d. Metals Analysis. Analysis of semm for the presence of metals, approximately 110 soldiers provided a specimen in all three collection periods (KOF1, KOR, and KOF3).

(1) Arsenic and mercury levels were below detection levels and will not be further addressed.

(2) The Table F-l summarizes the mean levels (± standard deviation) of serum metals:

TABLE F-l. MEAN SERUM METAL LEVELS

Metal	KOF1	KOR	KOF3
Cadmium	0.87 ± 0.84 ppm	0.84 ± 0.75 ppm	0.95 ± 0.92 ppm
Chromium	3.06 ± 2.41 ppb	2.91 ± 2.34 ppb	1.91 ± 1.85 ppb
Copper	0.84 ± 0.19 ppm	0.84 ± 0.11 ppm	0.86 ± 0.13 ppm
Lead	39.7 ± 22.5 ppb	46.9 ± 13.2 ppb	32.1 ± 11.9 ppb
Nickel	< 1.0 ppb*	< 1.0 ppb*	< 1.0 ppb*
Vanadium	<0.2 ppb*	<0.2 ppb*	0.3 ppb*
Zinc	7.40 ± 1.22 ppm	7.60 ± 1.78 ppm	7.46 ppm ± 0.97

* represent median values, not mean.

(3) Table F-2 summarizes the mean levels (± standard deviation) of urinary metals.

(4) In general, the data indicate the presence of normal levels of metals in all specimens before, during, and after deployment. The only noticeable difference was found in the blood lead levels, where there appears to be a slight elevation of lead levels in blood collected in Kuwait. However, this difference is statistically insignificant, and all the lead concentrations are within the expected "normal" range for healthy young adults.' The majority of soldiers studied had comparable serum lead levels. The elevated value for the KOR lead level in Table F-l is from elevated lead levels in a minority of troops. (See Annex, F-3, Metals Analysis.)

TABLE F-2. MEAN URINE METAL LEVELS

Metal*	KOF1	KOF2	KOF3
Cadmium	0.37 ± 0.27 ppb	0.40 ± 0.31 ppb	0.43 ± 0.43 ppb
Chromium	5.9 ± 3.0 ppb	4.7 ± 3.0 ppb	5.5 ± 3.6 ppb
Lead	20.7 ± 15.9 ppb	11.9 ± 11.9 ppb	13.0 ± 5.4 ppb
Nickel	8.8 ± 5.0 ppb	7.9 ± 6.9 ppb	6.9 ± 7.4 ppb
Zinc	0.64 ± 0.41 ppm	0.76 ± 0.53 ppm	0.65 ± 0.52 ppm

* Vanadium analysis not done due to inadequate volume of urine; Copper analysis not done because, in the establishment of laboratory priorities, the results obtained from the analysis of copper in sera were low and stable.

e. Volatile Organic Compounds Assay.

(1) In the analysis of blood specimens for VOCs, a total of 25 individuals gave blood for assay all three times. Table F-3 summarizes the mean levels of selected serum VOCs (additional results are in Annex F-4).

(2) In general, the results for VOCs measured in the three phases of this surveillance (KOF1, KOF2, and KOF3) do not show substantial phase-related differences. In most cases, the results were similar to and within the range of levels determined by the NCEH to be in their U.S. normal reference range, This reference range was determined by measurement of VOCs on greater than 600 nonoccupationally exposed individuals taken as a subset of the Third National Health and Nutrition Examination Survey. Some exceptions follow.

(a) Ethylbenzene, chlorobenzene, and styrene concentrations were substantially elevated in the blood samples which were collected in Germany (KOF1) before deployment to Kuwait, in comparison to the U.S. normal reference values.

TABLE F-3. MEAN SERUM LEVEL OF SELECTED VOLATILE ORGANIC COMPOUNDS

VOC	KOF1 (ppb)	KOF2 (ppb)	KOF3 (ppb)
Acetone	1200	1600	1300
Benzene	0.098	0.072	0.130
Chlorobenzene	0.044	co.005	< 0.005
Chloroform	0.017	0.020	0.022
Ethylbenzene	0.190	0.071	0.095
m-/p-Xylene	0.21	0.13	0.26
o-Xylene	0.11	0.08	0.12
Perchloroethylene	0.064	0.57	0.074
Styrene	0.14	0.089	0.091
Toluene	0.52	0.21	0.60

(b) Five analytes, ethylbenzene, o-xylene and m-/p-xylene, styrene, and toluene' showed lower levels in Kuwait (KOF2) when compared to KOF1 values. o d concentrations were transformed by taking the natural logarithm in order to obtain a normal distribution. After this transformation, differences for these analytes were significant at the 99 percent level.

(c) Tetrachloroethene (perchloroethylene) was found at higher levels in a large number of samples from the KOR collection. The median values changed from 0.048 ppb (KOF1), to 0.20 ppb (KOF2), back down to 0.067 ppb (KOF3).

(d) Acetone, when measurements are corrected (one measurement from the KOF1 set is an outlier) varied positively with deployment to Kuwait. The mean changed from 1200 ppb to 1600 ppb and back to 1300 ppb. The significance and implications of this numerical comparison will not be known until the distribution of acetone concentrations is analyzed for normalcy. (See Annex F-4, Volatile Organic Compounds Assay.)

f. Sister Chromatid Exchange Frectuencv Assay.

(1) Fifty soldiers (N=50) had samples taken before and during deployment, and 35 soldiers (N=35) had samples taken before and after deployment. Table F-4 summarizes the mean levels (± standard deviation) of SCEs.

TABLE F-4. MEAN SISTER CHROMATID EXCHANGE LEVELS

N	KOF1	KOR	KOF3
50	4.33' ± 0.53	5.12 ± 0.64	
35	4.38[b] ± 0.55		5.28 ± 0.72

• $p < 0.0001$ comparing before to during deployment, paired t-test.
[b] $p < 0.0001$ comparing before to after deployment, paired t-test.

(2) During (KOF2) and post (KOF3) deployment SCE values differ significantly from before (KOF1) deployment values by paired t-test. Nonparametric alternative testing and repeated measures analyses also yielded significant differences. (See Annex F-5, Sister Chromatid Exchange Frequency Assay.)

g. Polycyclic Aromatic Hydrocarbon - Deoxyribonucleic Acid Adduct Assay.

(1) In the analysis of blood specimens taken for PAH-DNA adducts, 22 soldiers had samples taken at all three sample times, 30 soldiers had samples taken before and during deployment, and 26 soldiers had samples taken during and post deployment. Table F-5 summarizes the mean levels (± standard deviation) of PAH-DNA adducts (Number of Adducts per 10^8 Nucleotides).

(2) Post deployment samples (KOF3) revealed PAH-DNA adduct levels elevated to a statistically significant degree as compared to levels from samples obtained during deployment (KOF2). (See Annex F-6, Polycyclic Aromatic Hydrocarbon-Deoxyribonucleic Acid Adduct Assay.)

4. DISCUSSION.

a. Questionnaires. The symptoms reported in the general questionnaires were consistent with exposure to the heat and air conditions in Kuwait, and the start of return towards baseline is consistent with being removed from the Kuwait environment. Further analysis of questionnaire data in light of environmental measurements and supplemental questionnaire data may augment interpretation of questionnaire data.

TABLE F-5. MEAN PAH-DNA ADDUCT LEVELS (per 10^8 nucleotides)

	KOF1	KOR	KOF3
Unmatched (N=42,34,38)	2.62 ± 3.33	2.52 ± 4.14'	4.06 ± 3.20
Matched (N=30)	2.69 ± 3.64	2.27 ± 3.80	
Matched (N=26)		2.05 ± 2.98[b]	3.92 ± 3.49
Matched (N=22)	3.12 ± 4.09	1.63 ± 1.76'	3.96 ± 3.49

[a] p = 0.0002 for KOR compared to KOF3, Wilcoxon Rank Sum Test.
[b] p = 0.0063 for KOR compared to KOF3, Wilcoxon Signed Rank Test.
[c] p = 0.0009 for KOR compared to KOF3, Wilcoxon Signed Rank Test.

b. Metals Analysis.

(1) Of primary interest in this portion of the study are nickel and vanadium specimen levels, as these metals are reported as being present in Kuwait crude oil. Reference data of expected levels' in blood and urine suggest that a detection limit of 0.2 ppb is sufficient for monitoring exposure to vanadium. Levels present in biological specimens collected from soldiers give no indication that vanadium exposure was any greater in Kuwait than in Germany. Similarly, the data for nickel levels are not indicative of a substantial exposure in Kuwait.

(2) The toxic heavy metals cadmium, chromium, and lead were found to be within acceptable ranges. The distribution for cadmium was skewed toward higher concentrations, and may be related to the inclusion of smokers into the sampled population. To be completely certain of this effect, independent verification of individual smoking habits would be necessary. The skewed distribution was similar at all three sampling periods.

(3) Chromium is present in sand and airborne particulate matter and was of concern due to hexavalent chromium's carcinogenic potential. Levels found in blood and urine specimens were normal, suggesting that chromium is not a major concern.

(4) The apparent elevation in blood-lead levels for specimens collected in Kuwait was statistically insignificant. A minority of soldiers exhibited higher lead levels in Kuwait than in Germany, suggesting that these troops were exposed to a localized source of lead in Kuwait. More specimens would be expected to have elevated lead levels if general environmental contamination were the source of lead exposure.

(5) Copper and zinc levels in the specimens collected in both Germany and Kuwait were expected to be normal, and this was found to be the case.

(6) Data analysis are continuing and the results described do not reflect or control for exposure related to smoking, diet or occupational exposure.

c. Volatile Organic Compounds Assay.

(1) The decay rate for VOCs from the body is extremely fast, on the order 10 to 30 minutes after short term exposure. Thus, VOC blood levels are indicative of recent exposures.

(2) The levels of VOCs measured in blood specimens of soldiers while in Kuwait are denotative of minuscule exposures. The exposure to most compounds that can be inferred from these measurements is, in fact, very similar to accepted U.S. normal background levels.[2]

(3) Only tetrachloroethene (perchloroethylene) can reliably be associated with deployment into Kuwait. The mean level of perchloroethylene at 0.20 ppb is orders of magnitude below those levels noted in the literature as causing health effects with short term exposure. As perchloroethylene is a chlorinated hydrocarbon, it is an unlikely product of oil fires.

(4) The mean value for serum acetone was elevated during deployment to Kuwait, however interpretation of this elevation is not possible pending further data analysis.

d. Sister Chromatid Exchange Frequency Assay.

(1) Sister chromatid exchange levels in blood lymphocytes probably represent sum effects of recent and near-past genotoxic exposures. The half-life of peripheral lymphocytes varies; although many lymphocytes are in the circulation less than 30 days, others may persist for up to 9 months. Studies show that SCE increases may remain elevated from days to 8 weeks following cessation of exposure. However, no health effects have been attributed to SCE changes.

(2) The summary comparisons described show higher SCE frequency during deployment to Kuwait and post deployment in Germany as compared to pre-deployment levels in Germany for a small group of 11th ACR soldiers.

(3) Changes in SCE frequency are a nonspecific measure of genic stress. Elevated SCE levels have been associated with a large number of exposures in humans as shown below:[4-36]

DRUGS:	METALS:
Chemotherapeutic drugs	Chromium
Theophylline	Plutonium
Paracetamol	
Sulfasalazine	OTHER:
Valproic acid	
Opiate abuse	Sleep deprivation
	Radiation
CHEMICALS:	Smoking
	coffee
Ethylene oxide	Alcohol
N,N-dimethylformamide	Asbestos
Pesticides	Stone dust
Textile dyes	Coal tar
Polychlorinated biphenyls	Betel chewing
Vinyl chloride	
Benzene	MEDICAL CONDITIONS:
Toluene	
Styrene	Uremia
PAHs	Tuberculosis (untreated)
Sulfur dioxide	1° biliary cirrhosis

(4) Given the very nonspecific nature of SCE frequency changes, the exact nature of the genic stress leading to SCE frequency elevations is not delineated. One interpretation could be that genotoxic exposures increased among these soldiers during their time in Kuwait. This does not discriminate among dietary, occupational, and ambient environmental

sources of genotoxic agents. Also, the results do not discriminate or control for smoking, dietary, or occupational exposures. Ongoing analysis of questionnaire data may shed light on these results.

(5) Since the SCE assay is very nonspecific, there is disagreement on its implication for increased risk of adverse health effects.

e. Polycyclic Aromatic Hydrocarbon - Deoxyribonucleic Acid Adduct Assay.

(1) The PAH-DNA adduct measurements probably reflect both recent and near-past exposures to PAHs. The *in* vivo half-life of PAH-DNA adducts is somewhat unclear. Lymphocytes have a variable circulation half-life, and long lived lymphocytes may contain persistent adducts.

(2) The summary comparisons in this report show consistent trends for higher levels of PAH-DNA adducts for samples taken in Germany (KOF1 and KOF3) as compared to samples taken in Kuwait.

(3) Foundry workers with ambient exposures of up to 60 ng benzo[a]pyrene/m^3 have a mean number of PAH adducts around 10 per 10^8 nucleotides. The mean number of DNA adducts in the KOR sample is around 2.5 per 10^8 nucleotides. Thus, the levels of PAH-DNA adducts measured would appear to be related to a very low level of exposure to PAHs for soldiers while deployed to Kuwait.

(4) The results described do not reflect or control for important potential PAH exposures from smoking, diet, or occupation. Ongoing analysis of questionnaire data may shed light on these results.

5. CONCLUSIONS.

a. Assay results of biological specimens for metals are consistent with extremely low level exposures to metals, as seen with diet and smoking, and are consistent with the low levels of metals measured in the environmental characterization study.

b. Assay results of blood specimens for VOCs are consistent with extremely low VOC exposure levels, and are consistent with the low levels of VOCs found in the environmental characterization study.

c. Assay results of blood specimens for PAH-DNA adducts are consistent with low PAH exposure levels, and are consistent with the low levels of PAHs measured in the environmental characterization study.

d. Assay results of blood for SCE frequency are consistent with an increase in genic stress for soldiers during and after deployment to Kuwait. The source of this genic stress is currently unclear and the reported SCE frequencies cannot be related to any health effects. Further study of genotoxic changes associated with deployments in general may be needed.

e. Pulmonary function tests, medical record surveillance and personal diaries provided no useful information.

f. A more careful analysis of questionnaire data and the analysis of urinary tetrols are in progress.

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ANNEX F-l

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ANNEX F-2

QUESTIONNAIRES

KUWAIT OIL FIRES HEALTH RISK ASSESSMENT BIOLOGIC SURVEILLANCE INITIATIVE

HEALTH AND EXPOSURE QUESTIONNAIRES

Collection of Health and Exposure information by self report using questionnaires, collected from 11 ACR personnel in Germany (5/9 1), Kuwait (8/91) and Germany (1 0/91)

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1. SUMMARY

a. As a part of the evaluation of possible toxic effects from burning petroleum products in the oil fires in the oil fires in Kuwait, questionnaires were administered to soldiers serving in. the Gulf theater. The first questionnaire (hereafter noted as KOF1) was administered in Germany prior to deployment to Kuwait, the second (KOF2) was administered to soldiers in Kuwait, and the third (KOF3) was administered after the soldiers returned to Germany. Soldiers were questioned about demographics, exposures, and health problems. In addition. in Kuwait biologic specimens were obtained on a sample of the soldiers who completed the questionnaires. The parent health risk assessment also included collection of environmental sampling for characterization of the site. This report contains results of the questionnaires.

b. KOF1 was completed by 2797 respondents, KOF2, by 355, and KOF3, by 1681. There is overlap among respondents of the three questionnaires. The mean age of respondents, similar in all three groups, is 25.0 to 25.4 years. About 58-60 percent of the respondents were white. 21 to 29 percent were black, eight percent were Hispanic, and the remainder were of other or unspecified ethnic origin.

c. Exposure to environmental sources while in Kuwait included dust from the extremely fine sand there. About 44 percent of KOF2 respondents indicated the dust exposure was severe. Additionally, 45 percent reported exposure to gas or fumes, 52 percent reported exposure to smoke, primarily oil fire smoke, and 1 S percent reported exposure to asbestos. Although some troops reported asbestos in Kuwait housing . facilities, specimens of the suspected material were analyzed by electron microscopy and no asbestos was found. Asbestos exposure was also reported in vehicle maintenance jobs.

d. Most of the troops questioned had been in Kuwait from 90 to 120 days. They reported living in Doha (98 percent) and Monterey (51 percent) and training in Doha (97 percent) and Monterey (77 percent). Monterey is about 80 miles from the closest oil fire fields and Doha is about 30 miles from the closest fires. Two thirds reported that the oil fire smoke was more severe than expected and 41 percent reported having been within a mile of a fire at some time.

e. Most of the symptoms asked in KOF1 are reported by a similar percentage in Kuwait. The exceptions are for reports of lightheadedness or dizziness which increased from two to ten percent. When focusing on "regular" health problems, the percent answering positively is larger in every category in KOF3 than in KOF1 . Likewise, in every category questioned, a higher percentage of KOF3 respondents than KOF2 respondents reported problems while in Kuwait. The KOF2 questionnaire was administered about two thirds of the way through the time in Kuwait and additional symptoms could have developed in the remaining time in Kuwait. On average, reported problems are slightly increased for vision and hearing, increased somewhat more for sleeping, concentration,

breathing, and prolonged exercise, and noticeably increased for digestion, urination and bowel movements (predominantly diarrhea). No symptom was reported by more than ten percent of the population at "baseline" in KOF1.

f. As reported in KOF3, all symptoms noted were reported less frequently in Germany than in Kuwait. Those differences that are two fold or more larger in Kuwait include fatigue, burning eyes, eye irritation, trouble breathing, nose or throat irritation, and skin rashes.

g. The respondents who completed both KOF1 and KOF3 showed a fairly high rate of agreement in KOF3 three months later. Increases of twice or more in percent responding "worse" in KOF3 as compared to KOF1 were seen for weakness/fatigue, trouble urinating, vision, trouble breathing, digestion, concentration, hearing, prolonged exercise, bowel movements, sleeping, high blood pressure and frequent colds.

h. In KOF3. respondents checked degree of problem for selected symptoms during and four weeks after leaving Kuwait. The higher percentage of more severe responses are always during the time in Kuwait. The greatest differences occurred for fatigue, burning eyes, and eye irritation. Cough, trouble breathing, nose/throat irritation, and skin rash also had noticeable reduction of positive responses back in Germany.

i. Although in KOF3. respondents were asked the closest distance they had been to an oil fire, there was no attempt to document the length of time spent close to fires. For almost all symptoms queried, the frequency of positive responses to health symptoms decreased with greater distance from the oil fires. A higher percentage of soldiers who were within O-l mile of a fire reported more symptoms than those who had not been as close to the fires. In spite of these trends by nearest distance to the oil fires, in the regression models for symptoms in Kuwait, distance from the fire was an important variable only for sore throat, fatigue, burning eyes, nose and throat irritation, rash and phlegm. In the models of symptoms in Germany, distance from the oil fires remained important only for phlegm.

j. Possibly of more importance was personal smoking and/or inhaling while smoking. In Kuwait personal smoking was an important variable for coughing, phlegm. and wheezing. Personal smoking remained an important variable for each of these symptoms back in Germany and was additionally important in the models for burning eyes, eye irritation, trouble breathing, and nose and throat irritation.

k. In conclusion, a number of symptoms were reported more frequently in Kuwait than prior to Kuwait or after returning from Kuwait to Germany. In general, the pattern was: low before, higher during, and lower but not back to baseline after. Follow-up later than four weeks after return to Germany was not attempted.

l. The symptoms reported were consistent with exposure to the heat and air conditions in Kuwait and the start of return towards baseline is consistent with being removed from the Kuwaiti environment. These soldiers did not work directly with the fires, and most were housed and worked 30 to 80 miles from the fires. In spite of that, several symptoms were significantly associated with proximity to the oil fires. Back in Germany, only for phlegm was proximity to the oil fires important. For the symptoms for which personal smoking was important in Kuwait, it was still important back in Germany. As well, back in Germany personal smoking was associated with other respiratory symptoms.

HEALTH AND EXPOSURES QUESTIONNAIRES REPORT

TABLE OF CONTENTS

SUMMARY i
TAELEOFCONTENTS iii
LIST OF TABLES iv
LIST OF FIGURES viii

METHODS 1

KOF1 5
- Introduction 5
- Demographic Data 5
- Occupational Data 5
- Smoking History 7
- Medical History 8
- Concerns about Kuwait Deployment 11

KOF2 30
- Introduction 30
- Demographic Data 30
- Occupational Data 30
- Smoking History 31
- Medical History 31

KOF3 46
- Introduction 46
- Demographic Data 46
- Occupation 47
- Smoking 48
- Health Related Questions 48

KOF3K 79
- Introduction 79
- Living Environment 79
- Occupation 80
- Smoking 81
- Health Related Questions 81

COMPARISONS 100
- Introduction 100
- Comparisons of Population Positive Responses 100
- Comparisons of Responses by the Same Respondents 101
- Symptoms by Nearest Proximity to Oil Fires 101

APPENDICES . . . . . after 117

LIST OF TABLES

Table 1	Number of Respondents Who Answered KOF Questionnaires	1
Table I-I	Ethnic Distribution of KOF1 Respondents	12
Table 1-2	Distribution of KOF1 Respondents by MOS Group and Grade	13
Table I-3	Most Common Military Occupational Specialties of KOF1 Respondents	14
Table I-4	Distribution of KOF1 Respondents by Squadron and Grade	15
Table I-5	Previous Occupational Experience of KOF1 Respondents	16
Table I-6	Exposure to Potentially Harmful Substances Reported by KOF1 Respondents	17
Table I-7	KOF1 Respondents Reporting Moderate to Severe Exposure to Potentially Harmful Substances During the Last Five Years by MOS Group	18
Table I-8	KOF1 Respondents Reporting Moderate to Severe Exposure to Potentially Harmful Substances During the Last Five Years by Age Group	19
Table I-9	Smoking Habits of KOF1 Respondents by MOS Group	20
Table I-10	Smoking Habits of KOF1 Respondents by Age Group	21
Table I-I 1	Number of KOF1 Respondents Indicating Specific Problems or Conditions	22
Table I-I 2	Frequency of Health Problems by KOF1 Respondents	23
Table I-13	Frequency and Severity of Headaches for KOF1 Respondents	24
Table 1-14	Feelings Stated by KOF1 Respondents About Going to Kuwait	25
Table 1-15	Concerns about Going to Kuwait Given by KOF1 Respondents	26
Table 2-I	Number (and Percent) of KOF2 Respondents by MOS Group and Grade	33
Table 2-2	Age Characteristics of KOF2 Respondents by MOS Group	34
Table 2-3	Exposure to Potentially Harmful Substances Reported by KOF2 Respondents	35
Table 2-4	Estimation of Severity of Exposure to Potentially Harmful Substances by Respondents of KOF1 and KOF2 who Reported Any Exposure	36
Table 2-5	Number (and Percent) Reporting Moderate to Severe Exposure to Potentially Harmful Substances by MOS group: KOF2	37

Table 2-6 Number (and Percent) of Positive Responses to Problems or Conditions by Age Group: KOF2 38

Table 2-7 Number (and Percent) of Positive Responses to Problems or Conditions by MOS Group: KOF2 39

Table 2-8 Frequency (and Percent) of Health Problems Since Arriving in Kuwait KOF2 Respondents 40

Table 2-9 Frequency (and Percent) of Respondents in KOF2 Reporting Health Conditions Weekly or More Often by Five Year Age Group 41

Table 2-10 Frequency (and Percent) of Respondents in KDF2 Reporting Health Conditions Weekly or More Often by MOS Group 42

Table 2-11 Number of Respondents (and Percent) by Condition; KOF2 Respondents 43

Table 2-12 Frequency (and Percent) of Respondents in KOF2 Reporting Health Conditions Weekly or More Often by Five Year Age Group 44

Table 2-13 Frequency land Percent) of Respondents in KOF2 Reporting Health Conditions Weekly or More Often by MOS Group 45

Table 3-l Number (and Percent) Ethnic Distribution and Age Distribution of Respondents Completing Only KOF3 Versus Those Who Completed More Than One KOF Questionnaire; Age, Ethnic Group, Gender, Marital Status, MOS Group, Years in Job 52

Table 3-2 Number (and Percent) of Respondents: Age by Ethnic Origin, Grade, Marital Status, MOS Group, and Years in Job: KOF3 Respondents . . 53

Table 3-3 Number (and Percent) of Respondents: Ethnic Origin by Grade, Marital Status, MOS Group, and Years in Job: KOF3 Respondents 54

Table 3-4 Age Characteristics by MOS Group; KOF3 Respondents 55

Table 3-5 Number (and Percent) by MOS Group and Grade: KOF3 Respondents . . 56

Table 3-6 Hours in Typical Work Day and Days in Typical Work Week by Age, Ethnic Origin, and MOS Group: KOF3 Respondents 57

Table 3-7 Number (and Percent) in MOS Groups by Age, Grade, and Years in Job: KOF3 58

Table 3-8 Positive Responses to: "Have you smoked more than 20 packs of cigarettes in your life?" "Have you ever smoked at least one cigarette a day for a year?" by Age Group. Ethnic Origin, and MOS Group: KOF3 Respondents 59

Table 3-9 Smoking Status by Age, Ethnic Origin, and MOS Group Number (and Percent) of KOF3 Respondents 60

Table 3-l 0 Answers to "Do you smoke now?" by Age, Ethnic Origin, and MOS Group Number (and Percent): KOF3 Respondents 62

Table 3-1 1 Percent Positive for Selected Personal Characteristics by Five Year Age Groups: KOF3 Respondents 63

Table 3-12 Percent Hospitalized in Last Ten Years by Age S-Year Group; KOF3 Respondents 64

Table 3-13 Percent Times To Sick Call in Last Six Months by Age, Ethnic Origin. and MOS Group: KOF3 Respondents 65

Table 3-14 Number (and Percent) of Positive Responses to Problems or Conditions by Age Group "Do you REGULARLY have trouble with PROBLEM?" "Have you EVER been told BY A DOCTOR that you have CONDITION?": KOF3 Respondents . . , ... 66

Table 3-l 5 Number (and Percent) of Positive Responses to Problems or Conditions by Ethnic Origin "Do you REGULARLY have trouble with PROBLEM?" "Have you EVER been told BY A DOCTOR that you have CONDITION?": KOF3 Respondents 67

Table 3-16 Number (and Percent) of Positive Responses to Problems or Conditions by Age Group "Do you REGULARLY have trouble with PROBLEM?" "Have you EVER been told BY A DOCTOR that you have CONDITION?": KOF3 Respondents 68

Table 3-l 7 Frequently (and Percent) of Health Problems "How often do you NORMALLY have these CONDITIONS?": KOF3 Respondents 69

Table 3-18 "How often do you NORMALLY have these CONDITIONS?" WEEKLY OR MORE OFTEN Responses by Age Group; Number (and Percent) of KOF3 Respondents 71

Table 3-l 9 "How often do you NORMALLY have these CONDITIONS!" WEEKLY OR MORE OFTEN Responses by Ethnic Origin; Number (and Percent) of KOF3 Respondents 72

Table 3-20 "How often do you NORMALLY have these CONDITIONS?" WEEKLY OR MORE OFTEN Responses by MOS Group Number (and Percent) of KOF3 Respondents 73

Table 3-21 Frequency of Headache by Age, Ethnic Origin, and MOS Group; Number (and Percent) of KOF3 Respondents 75

Table 3-22 Positive Response to Respiratory Questions by Age; Number (and Percent) of KOF3 Respondents 76

Table 3-23 Positive Response to Respiratory Questions by Ethnic Origin; Number (and Percent) of KOF3 Respondents 77

Table 3-24 Positive Response to Respiratory Questions by MOS Group: Number (and Percent) of KOF3 Respondents 78

Table 3K-1 Number (and Percent) of KOF3 Respondents; Those Who Were vs Those Who Were Not Deployed to Kuwait by Selected Characteristics . 83

Table 3K-2 Number (and Percent) of KOF3 Respondents; Those Who Were vs Those Who Were Not Deployed to Kuwait by Normal Occurrence of Symptom Weekly or More Often 84

Table 3K-3 Number (and Percent) of KOF3 Respondents; Those Who Were vs Those Who Were Not Deployed to Kuwait by REGULAR Trouble with Functions and by Conditions EVER IDENTIFIED BY A DOCTOR 85

Table 3K-4a Number and (percent) Residential Characteristics of Respondents While in Kuwait by Ethnic Origin: KOF3 Respondents Who Had Been in Kuwait . 86

Table 3K-4b Number (and percent) Residential Characteristics of Respondents While in Kuwait by Age Group; KOF3 Respondents Who Had Been in Kuwait 87

Table 3K-4c Number (and percent) Residential Characteristics of Respondents While in Kuwait by MOS Group: KOF3 Respondents Who Had Been in Kuwait 88

Table 3K-5 Number (and percent) by Age Group Worst Part of Deployment and Significant Problems in Kuwait; KOF3 Respondents Who Had Been in Kuwait 89

Table 3K-6 Trouble with Selected Health Symptoms While In Kuwait; Number (and Percent) of KOF3 Respondents Who Had Been in Kuwait by Ethnic Origin. Age Group, and MOS Group 90

Table 3K-7a Health Questions: KOF3 Respondents. Who Had Been, in Kuwait Number (and percent) By Ethnic Origin 91

Table 3K-7b Health Questions: KOF3 Respondents Who Had Been in Kuwait Number (and percent) by Age Group 92

Table 3K-7c Health Questions; KOF3 Respondents Who Had Been in Kuwait Number (and percent) by MOS Group 93

Table 3K-8 Cough Before, During, and After Deployment to Kuwait Number (and percent) by Ethnic Origin, Age Group, and MOS Group: KOF3 Respondents Who Had Been in Kuwait 94

Table 3K-9a Number (and percent) of Symptoms Occurring Most or Every Day in Kuwait and Since Returning to Germany by KOF3 Respondents by Ethnic Origin 96

Table 3K-9b Number (and percent) of Symptoms Occurring Most or Every Day in Kuwait and Since Returning to Germany by KOF3 Respondents by Age Group 97

Table 3K-9c Number (and percent) of Symptoms Occurring Most or Every Day in Kuwait and Since Returning to Germany by KOF3 Respondents by MOS Group 98

Table 3K-10 Comparison of Symptoms: Kuwait vs Normally (answered after return to Germany) Number (and percent) KOF3 Respondents 99

Table C-l Percent of Respondents with Specified Smoking Characteristics KOF1, KOF2, KOF3 . . . . . 1 0 3

Table C-2 Percent of Respondents with Headache KOF1 , KOF2 and KOF3 104

Table C-3 Percent of Respondents with Symptoms KOF1, KOF2. KOF3, KOF3k . . 105

Table C-4 Percent of Respondents Reporting Symptoms Before, During, and After Deployment to Kuwait . . . . . , ... 106

Table C-5 Percent of Respondents Reporting Symptoms During and After Deployment to Kuwait 107

Table C-6 Percent Agreement for Same Respondent in KOF1 vs KOF3 Response Choices: Yes/No and Levels of Choice 108

Table C-7 Percent Agreement for Same Respondent in KOF1 vs KOF3 Response Choices: Yes (no response if no) and Frequency of Occurrence 109

Table C-8 KOF3k Responses Made by the Same Person Problems While in Kuwait and After Returning to Germany 110

Table C-9 Percent of Troops in Each Proximity to Oil Fire Group Who Gave a Positive Response to Symptoms 111

Table C-10 Percent of Positive Responses in Each Nearest Proximity to Oil Fire Group by Symptoms . . . . . _____ . . . . . _____ 112

Table C-l 1 Odds Ratios and 95 Percent Confidence Intervals Unconditional Logistic Regression with Symptom Every or Most Days: Symptoms With Closest Distance to Oil Fire as Significant Variables in Model 1 13

Table C-12 Odds Ratios and 95 Percent Confidence Intervals Unconditional Logistic Regression with Symptom Every or Most Days: Symptoms With Personal Smoking or Inhaling as Significant Variables in Model . . . 1 15

Table C-13 Odds Ratios and 95 Percent Confidence Intervals Unconditional Logistic Regression with Symptom Every or Most Days Symptoms With Neither Distance to Fire Nor Personal Smoking in Model 1 16

LIST OF FIGURES

Figure 1 Overlap of Respondents of Kuwaiti Oil Fires Questionnaires 4
Figure l-l. Age Distribution of KOF1 Respondents 27
Figure 1-2 Distribution of KOF1 Respondents by US. Region 28
Figure 1-3 Distribution of KOF1 Respondents by MOS Group and Grade 29

2. METHODS

a.' This, component of the Biologic Surveillance Initiative included collection of data using self-administered questionnaires. The first questionnaire was administered to 2797 troops from the first to the tenth of June, 1991. A second questionnaire was administered between August 6 to 16 to 355 soldiers in Kuwait. A third questionnaire was administered to 168 1 soldiers between October 4 to 14 after their return to Germany. Some soldiers answered all three questionnaires (see Table 1 and Fig&e 1).

Table 1
Number of Respondents Who Answered KOF Questionnaires

Questionnaire	Number
KOF1 only	1586
KOF2 only	16
KOF3 only	615
KOF1 and KOF2	157
KOF1 and KOF3	884
KOF2 and KOF3	12
KOF1, KOF2, and KOF3	170
Total auestioned	3440

KOF = Kuwait Oil Fire questionnaire

b. The purpose of the questionnaires was to evaluate possible adverse health effects which might have been due to exposure to the oil fires. In addition to demographic information, the questionnaires elicited information about occupational exposures, smoking habits, and frequency and severity of illness. There is some variability among questions asked in the three questionnaires. The questionnaires are attached as Appendix 2.

c. Completion of the questionnaires was voluntary. No data are available on refusal rates because circumstances did not allow a systemic administration of questionnaires. In Germany, troops were detained briefly immediately before deployment. In Kuwait, for logistic reasons, distribution was limited to units whose members were at the Doha encampment during the second data collection mission. In addition, in Kuwait, resources were concentrated on collection of biologic specimens rather than on administering the questionnaire. Back in Germany all elements of the 1 1th ACR were contacted in an attempt to collect as many responses as possible.

d. On all three questionnaires, soldiers were asked about their Military Occupational Specialty (MOS). The MOS code is often six characters long and categorizes jobs into specific job types as well as special skills. The codes differ somewhat between commissioned officers, warrant officers and enlisted personnel. Since the number of MOS codes is very large, for analysis of potential effects by occupational exposure, codes were combined into five categories: combat, maintenance, administration, operations support, and medical. Assignment to these categories took account of grade as well as MOS code. For the precise MOS codes included in each category, consult appendix 1 .

e. Other procedures to prepare the three data sets for analysis included double keying of the data from paper to an EXCEL- data base. Inconsistencies between the two keyings were resolved by consulting the paper copy. A few inconsistencies discovered during exploratory data analysis were found to be accurate reflections of the answers the respondents gave. That is. the inconsistencies were from the respondents, not from the data entry.

f. Questions calling for checking yes or no were originally coded as logical variables ("true" and "false"). These questions were recoded into numeric variables (false =0 and true = 1). Other questions were either coded numerically or alphanumerically. Words filled in by the respondents were entered as they appeared on the form regardless of grammatical or spelling errors. These EXCEL' files were cleaned to assure all the entries for a specific question had the same format. Basic frequencies were run to determine if there were any logical errors in the coded responses to individual questions (i.e., if the question allowed four responses (coded 1-4) and a 6 appeared). If such an error occurred, the original questionnaire was consulted in order to correct the error. Basic frequencies also allowed the combination of answers that were similar into the same format. For example, when unit was requested, it could have been written by the respondent 11 ACR/I Troop or 1 1 th/I Trp or I Troop/I 1 th ACR. For responses to the question on unit, any words related to 11 th ACR were removed because it was assumed that all respondents came from the 1 1 th ACR. Other parts of the unit format were then changed for consistency. Thus, in the example above the three respondents would have the same unit, I Troop, and they would be given a Squadron designation 3. This same procedure was followed for other variables as well. The result is a cleaned database.

g. Once these changes were made, additional frequencies were run on the KOF1 data base and several additional changes were made. Age was calculated from date of birth to a midpoint during administration of KOF1 (June 7, 1991). Variables with many responses, such as age, MOS, and ethnic group were combined into fewer categories to allow more meaningful analyses.

h. In KOF2, changes were made as described above. Since age was not requested on this questionnaire, these records were matched with KOF1 and KOF3 to determine age. To assign an age to the 16 respondents of KOF2 only, means of grade groups (El to E9, 01-04, W 1 -W3) were determined and assigned to those personnel in the same group but with missing age. Unanswered questions were left as blanks so the responses could be considered either negative or missing.

i. Editorial changes to KOF3 include coding responses to standard formats consistent with KOF1 and KOF2 responses- Some systems review questions asked only for a check if the respondent had trouble with a particular body system. In these cases, no response was coded as "no." When "no" was an option and the respondent did not check one choice, the response was left as missing on the analysis file.

j. As in the other questionnaires, unit responses were edited to obtain more consistency. In 42 (of 1681 responses), the question "Did you fill out a questionnaire prior to the group's deployment?" was not answered. A code for "yes" was entered if we had a KOF1 record for that person; otherwise, "no" was coded. This is of interest only in that 76 (12 percent) for whom we have only a KOF3 questionnaire said they did fill out a prior questionnaire. Additionally, 297 for whom we have two or more questionnaires said they did not fill out a prior questionnaire. While not troublesome for this particular question, this instance serves as a reminder that, in spite of best intentions, respondents

do give inconsistent answers both within questionnaires and from one to another questionnaire.

k. If a respondent did not give his grade (11 instances), grade was taken from an earlier questionnaire, thus assuming the person's grade had not changed. Birthplace and residence in cities were extensively edited since the format of response was open. and the responses were keyed as they had been written. State and 'country codes were standardized.

l. For residences, if a city without a state was listed, an atlas was consulted to determine the number of states (or countries) with a city of that name. Judgment was used to select the state of-the largest city. Birthplace was also considered in the judgment. When a reasonable determination was not possible, the response was left blank. One of the most difficult to determine was Springfield. Springfield, MA has about 162,000 residents (Rand McNally World Atlas, 1968), Springfield, MO has about 1 10,000; Springfield, IL has about 88,000; Springfield, OH has about 81,000; thirteen other Springfields have smaller populations. In the absence of other helpful information, in particular the birth state, Springfield was left as unknown state. On the other hand, Berlin was called Berlin, Germany because all the United States Berlins were quite small. Although 18 percent of first large city had questionable states, a reasonable determination was made in all but 1 (0.1 percent). In the second large city question, about 14 percent were problems but only about 5 percent had too little information to make a determination. This variable is of somewhat questionable use, however, because "large or industrial" was defined by the respondent. West Mifflin, PA, with a population of about 27,200, is not really comparable to New York City.

Figure 1 Overlap of Respondents of Kuwaiti Oil Fires Questionnaires Diagram not to scale

3. KOF1

a, Introduction

(1) There were 2797 responses by members of the 11 th ACR to the first Kuwait Oil Fires (KOF1) questionnaire in Germany in June 1991. Because of time pressures, not all respondents completed the questionnaire. Approximately 215 of the questionnaires had incomplete responses to the last questions. The questionnaire contains demographic questions, questions related to present and past jobs, tasks and exposures to potentially hazardous substances, smoking history, health questions on current and past illnesses and several questions related to perceptions of problems to be faced in Kuwait.

(2) Frequencies for all questions and cross-tabulations by Military Occupational Specialty (MOS) group, age, and ethnic group are provided in Appendix 1.

b. Demographic Data

(1) The respondents to the questionnaire are predominantly male (99.4 percent) with an ethnic distribution shown in Table 1-1. Almost sixty percent of the respondents are non-Hispanic White and twenty-eight percent are Black. The mean age of respondents is 25.4" and the median age is 24.0. Figure I-I shows the age distribution for the e&ire population, regardless of race or sex. The ethnic groups were collapsed into three groups, White (Non-Hispanic White), Black (Non-Hispanic Black) and Other. The White respondents were more likely to be younger or older than the other respondents. Sixty percent of the respondents are White, however 67 percent of the respondents in the age group less than twenty and 65.5 percent of the respondents in the age group forty or more were white. Black respondents were generally over-represented in the middle age groups (25-39) and other ethnic respondents showed no clear age pattern.

(2) The mean ages of the three grades of respondents (Enlisted Personnel, Commissioned Officers and Warrant Officers) is significant& different. Warrant Officers are significantly older (mean = 37.6 years) than Commissioned Officers (mean = 28.3 years) and Enlisted Personnel (mean = 25.1 years).

(3) The majority of respondents were born in U.S. states (n = 2543, 90.9 percent) and territories (n = 66, 2.4 percent) and the remainder (n = 188, 6.7 percent) were born in foreign countries. The distribution of those respondents listing a state of birth is shown by U.S. geographic region in Figure 1-2. Proportionally more respondents were born in the Midwest and South than the general U.S. Population.

c. Occupational Data

(1) Respondents were asked to give their military grade, 11 th ACR unit, current Military Occupational Specialty CMOS). previous MOS (if any) and a description of their current job. The questionnaire was completed by 2630 Enlisted Personnel, 148 Commissioned Officers and 14 Warrant Officers. Because of the large number of specific MOS's, the MOS's were grouped into five categories - combat, maintenance, administration, operations support/logistics and medical. The distribution of all respondents by current MOS group and grade is shown in Table f-2. Fifty-six percent of all respondents are in the Combat MOS group, 18 percent are in the Maintenance group, 6 percent are in Administration, 13 percent are in the Operations Support/Logistics group, 5

percent are in the Medical group and the MOS group is not known for 1.5 percent (see Row Total in Table I-2).

(2) The distribution of Enlisted Personnel and Commissioned Officers by MOS group is shown in Figure 1-3. Most of the respondents have combat-related jobs (n = 1480, 56.3 percent for Enlisted Personnel and n = 100, 67.6 percent for Commissioned Officers). The second most frequently occurring MOS is Maintenance for Enlisted Personnel (n =49 1, 18.7 percent) and Administration for Commissioned Officers (n = 16, 10.8 percent).

(3) Respondents from the Combat MOS tended to be younger than the average and respondents from Maintenance and Operations Support/Logistics MOS groups tended to be older than the average. White respondents are more likely to be in Administration, Maintenance or Combat MOS groups; Black respondents are more likely to be in the Operations Support/Logistics MOS group; and Other ethnic respondents are more likely to be in Operations Support/Logistics or Medical MOS groups.

(4) Specific MOS's represented by more than 50 Enlisted Personnel and more than 10 Commissioned Officers are shown in Table I-3. The most common MOS's are those related to the Combat MOS group. The most frequently listed MOS for Warrant Officers is 915, Maintenance Technician with three individuals. The respondents were also asked "What kind of work do you presently do?". In general, the work descriptions fit the stated MOS. In a few cases they did not. For those individuals, the alternative work description was most frequently given as office or administration, warehouse/supply or driver. Many individuals in MOS 190 (Cavalry Scout) listed kind of work as driver.

(5) All respondents were members of the 1 1 th ACR. The distribution of respondents by squadron is shown in Table I-4. Thirty-two percent of all respondents were from Squadron 3. 22 percent were from Squadron 1, and 18 percent were from CBT SPT Squadron (CSS). These three squadrons accounted for 72 percent of all the respondents. The percent distribution (Col Pct in Table 1-3) between Enlisted Personnel and Commissioned Officers is roughly equal for all the squadrons except for a proportionally greater number of officers in HHT Regiment (13.5 percent) compared to Enlisted Personnel (7.8 percent). Units with more than 100 respondents are rhe 51 1 MI Company, 58 CEC, A Troop, C Troop, HHT 1 and HHT 3, HHT Regiment, HWB 1, HWB 3, I Troop, L Troop, Maintenance Troop and the S&T Troop.

(6) Given the young age of the respondent population, it is not surprising that only 707 of the respondents listed a previous MOS. Fifty-five percent of this population worked for two or fewer years in their current job and 78.9 percent worked for five or fewer years in their current job. Respondents belonging to the MOS groups Maintenance (mean =4.2 years) and Operations Support/Logistics (mean =4.8 years) have spent significantly greater amount of time in the current MOS than did respondents in the Combat MOS group (mean=3.2 years). Warrant officers have spent an average of 10.7 years in their current job. This is significantly greater than the mean of 1.8 years for commissioned officers and 3.7 years for enlisted personnel.

(7) There were two questions related to previous work that may have resulted in exposure to substances capable of producing adverse health effects. Question 17 asked if the respondent had worked on a large farm, in a mine, quarry, foundry, pottery or cotton, flax or hemp mill in the past five years. Table 1-5 shows the number of respondents who listed any of these past occupations. Two hundred and nineteen individuals (7.9 percent) stated that they had worked on a farm; 45 of these individuals

indicated 10 or more years of work on a farm. The other workplaces were mentioned fewer than 60 times. Eleven respondents (0.4 percent) worked in a mine, nine (0.3 percent) worked in a foundry, nine (0.3 percent) worked in a pottery and ten (0.4 percent) worked in a cotton, flax or hemp mill. Because of the small number of personnel indicating a history of employment in these workplaces, potential exposures due to these sources would appear to be minimal for the questionnaire respondents.

(8) Question 34 asked about exposure to dust, gases or fumes, smoke or asbestos during the last 5 years. The distribution of respondents who mentioned exposure to any of these substances is shown in Table 1-6. Eight hundred four respondents (28.2 percent) indicated that they had at least mild exposure to dust. The most frequently listed jobs with dust exposure were related to the military (armor, the Army, artillery, grafenwohr, scout and tank *crew)* and others that could be military or civilian jobs (construction, driving, farm work, field work and warehouse worker). Five hundred and twenty-five (18.8 percent) of the respondents indicated exposure to gases or fumes. The jobs most frequently listed with gas or fume exposure were the Army, auto repair, cook, fuel handler, gas attendant. maintenance, mechanic, motor pool, scout, tank crew and welder. Three hundred and eighty-two respondents (13.7 percent) indicated at least mild exposure to smoke. The most frequently mentioned jobs with smoke exposure were the Army, fire fighting, mechanic, motor pool, tank crew and welder. One hundred and fifty-three (5.5 percent) indicated some exposure to asbestos in the last five years with construction and mechanic jobs listed most frequently.

(9) Given the jobs listed above, it is not surprising that when potential exposures are shown by MOS group (Table 1-7) that the highest percent of respondents reporting moderate to severe exposure to dust, gases or fumes, smoke or asbestos in the last five years are in the Maintenance MOS group. For dusts, gases or fumes and smoke, the second largest percent of respondents reporting moderate to severe exposure come from the Combat MOS group. Persons from the Medical MOS group had the second highest percent of respondents indicating moderate or severe exposure to asbestos, however this is only three individuals- For all MOS group/substance combinations, the highest percent of respondents indicating moderate to severe exposure was the Maintenance MOS group exposed to Dust (22.9 percent).

(10) Age group, as a single variable appears to be related to exposure severity as expected. Older workers have more opportunity to be exposed to dusts, gases and fumes. smoke and asbestos and in general, there is a trend of increasing exposure potential with age (Table 1-8). There is very little difference in the distribution of number and severity of exposure by ethnic group.

(11) It is difficult to analyze the relationship between job title and exposure to dusts, smoke, asbestos and gases or fumes because of the number and variety of jobs listed. Mechanic is a job listed most frequently for all exposures except for dust where farming is the most frequently mentioned occupation. No other questions in the KOF1 questionnaire relate to previous exposure to potentially harmful substances.

d. Smoking History

(1) Several questions on the questionnaire relate directly to smoking and others relate indirectly. The indirect questions relate to coughing and respiratory problems. Questions specific to smoking relate to past and current smoking patterns.

(2) There are three questions on smoking history. forty-five percent (n = 1259) of all respondents indicated that they have smoked more than twenty packs of cigarettes in their lives, however, only thirty seven percent (n = 1034) have smoked at least 1 cigarette a day for a year. When asked if they usually inhaled, 48 percent (n = 1342) of the respondents said yes, 11.4 percent (n = 319) said no, 36.8 percent (n = 1029) said they did not smoke and 3.8 percent (n = 107) did. not respond. At the time of the survey, 37.3 percent (n= 1044) of the respondents smoked cigarettes, 1.2 percent (n = 34) smoked a pipe and 2.7 percent (n = 75) smoked cigars.

(3) Table 1-9 shows the distribution of smokers by MOS group. Respondents with Maintenance jobs and Combat jobs are more likely to smoke than others. Almost 54 percent of respondents with Maintenance jobs have smoked more than twenty packs of cigarettes in a lifetime and 46.2 percent of these respondents smoked at the time of the KOF1 survey. Forty five percent of respondents with combat jobs have smoked more than twenty packs of cigarettes in a lifetime and almost 38 percent indicated that they smoked at the time of the survey.

(4) Current and past cigarette smoking increase with age (Table I-10) with less than 25 percent of all respondents less than 20 years of age and more than 62 percent of respondents ages forty and over indicating that they smoked more than one cigarette a day for one year. There is also a general trend for smoking pipes that increases with age. though it is based on very small numbers. The trend for cigar smoking is less obvious.

(5) Blacks are less likely to be smokers than Whites. Thirty percent of blacks indicated that they had smoked more than 20 packs of cigarettes in a lifetime; whereas almost fifty-four percent of whites indicated similar smoking experience. Twenty-five percent of blacks and almost forty-four percent of Whites indicated that they smoked cigarettes at the time of the survey. The smoking experience of other ethnic groups generally fell between Black and White respondents.

e. Medical History

(1) Only seventy-three of the respondents (2.6 percent) have permanent profiles. More than half (52.3 percent, n = 1463) had not been admitted to the hospital in the last ten years and only 3.9 percent (n = 108) regularly take medicine. Thirty-four percent (n = 956) have not reported for sick call in the last six months, forty-seven percent (n = 1341) have reported one or two times, 1 1.6 percent (n = 334) have reported three or four times and 4.5 percent (n = 126) have reported more than four times.

(2) Table I-l 1 indicates responses to specific questions on problems with bodily functions or specific conditions. No specific bodily function problems were listed by more than ten percent of the respondents. Vision problems were the most frequently mentioned problem with 258 positive responses (9.2 percent). No condition was checked by more than five percent of the respondents. The most frequently mentioned condition was high blood pressure (n = 1 18, 4.2 percent).

(3) Responses to these questions did not appear to be significantly different by MOS group, except that respondents with a Maintenance MOS were more than twice as likely to report high blood pressure than were Combat MOS respondents (7.5 percent compared to 3.1 percent). There were no significant differences by age group beyond what might be expected. Problems with hearing, breathing and digestion increased as age

increased; high blood pressure was reported more frequently with increasing age (1.8 percent for respondents less than twenty to 1 1.9 percent for respondents forty and older).

There were significant differences reported by ethnic group for breathing problems (2.1 percent for the ethnic group Other compared to 4.9 percent for Blacks). Ethnic differences occur for the conditions tuberculosis (0.4 percent for Whites and 2.1 percent for Other ethnic), jaundice or hepatitis (0.3 percent for Blacks and 1.8 percent for Other ethnic) and high blood pressure (3.2 percent for Whites and 6.4 percent for Blacks).

(4) There are a number of specific questions related to respiratory problems. Five percent (n = 140) of the respondents indicated that they had a cough that lasts for more than three months or more out of the year. Nineteen percent (n = 5 19) of the respondents indicated that they got colds or sore throats often. Ten percent (n = 282) of the respondents indicated that they have a cough when they got up in the morning and 15.5 (n = 433) indicated that they brought up phlegm when they coughed. In the last five years 5.2 percent had wheezing attacks.

(5) For all of these questions, there were significant differences by MOS group. In general, Maintenance group respondents were more likely to report cough, phlegm production and wheezing than the other groups. Respondents from the Operations Support/Logistics group were more likely to report that they got colds and sore throats often. Reports of both cough that lasts for more than three months and wheezing increase with age. Colds and sore throats are reported more frequently for the youngest and oldest age groups. The only significant difference by ethnic group is that Whites are more likely to report cough first thing in the morning (1 1.5 percent) than Other ethnic groups (6.9 percent).

(6) Responses concerning other 'health problems are shown in Table l-l 2. The most frequently mentioned problem was indigestion. This question was asked twice and the responses were similar but not exactly the same. The first time the question was asked 68.5 percent (n = 19 15) of the respondents indicated that indigestion or heartburn was experienced never or less than twice a year and the second time the question was asked, 69.5 percent (n = 1943) of the respondents indicated little or no problems with indigestion or heartburn. The number of non-respondents changed, however, the first time the question was asked there were 13.7 percent (n = 384) non-respondents and the second time the question was asked there were only 7.5 percent (n = 2 1 1) non-respondents. The first time the question was asked 12.8 percent (n = 359) and the second time 16.9 percent (n = 473) respondents indicated occurrence of indigestion or heartburn every 1-3 months. The next most frequently mentioned health problem that was trouble sleeping. Almost twenty-five percent of the respondents indicated trouble sleeping every 1-3 months or more frequently.

(7) Differences in the most of the responses to frequency of health problems did not appear to differ significantly by MOS group, age group or ethnic group. Maintenance workers were more likely to experience hay fever or allergy symptoms, problems sleeping, skin sores and numbness or tingling in the fingers or toes. Respondents from the Operations Support/logistics were more likely to experience lightheadedness, skin sores and numbness or tingling in the fingers or toes. Respondents from the Medical MOS group were more likely to experience belly cramps and lightheadedness. Respondents from the Combat MOS generally reported fewer problems; numbness and tingling of the fingers and toes was the only problem reported with increased frequency. There was no clear pattern for any of the conditions by age group, although hay fever and allergy frequency, nosebleeds, palpitations, indigestion, heartburn

and numbness and tingling of the fingers and toes were reported with increased frequency for the older age groups. Blacks were slightly more likely to report increased frequency of vomiting, skin sores and numbness and tingling of the fingers and toes. Whites were more likely to report heartburn problems and the Other ethnic group was less likely to report trouble sleeping than Blacks or Whites.

(8) Responses to other questions on health problems were indicated by a yes or no answer. Frequent constipation was mentioned by 1.7 percent (n = 47) of the respondents. Almost three percent of respondents from the MOS group Operations Support/Logistics reported problems with constipation, whereas only 0.7 percent of Medical personnel reported the problem. There appears to be an increasing trend with age for reported constipation. Blacks were the most likely to report the problem (2.3 percent of the Black respondent population).

(9) Diarrhea or bloating that lasted for more than two days in the last month was mentioned by 5.9 percent (n = 165) of the respondents. Combat MOS group respondents were more likely to report problems with diarrhea than respondents in other MOS groups. There was no trend with age and no significant differences among the ethnic groups.

(10) Unexplained weakness or fatigue was mentioned by 10.4 percent (n = 29 1) of all respondents. Thirteen percent of the respondents from the Operations Support/Logistics MOS group (13.2 percent) reported weakness or fatigue, more than any other MOS group. Medical personnel reported the lowest frequency. There is no age trend. Blacks were more likely to report weakness than any other ethnic group.

(11) Unexplained tremors or shakiness in the last six months was mentioned by 4.4 percent (n = 123) of the respondents. Almost five percent of Combat MOS group respondents reported tremors or shakiness compared to only two percent of Medical MOS group respondents. There was no trend with age, however younger respondents reported this condition slightly more frequently. There were no significant differences by ethnic group.

(12) Depression in the last six months was mentioned by 38 percent (n = 1063) of all respondents. Respondents from the Maintenance MOS group were more likely to report depression (42 percent) than any other MOS group. There is a slight decreasing trend with age. Blacks are more likely to report depression (42.9 percent) than persons from the Other ethnic group (31.8 percent).

(13) Nasal polyps were mentioned by 0.8 percent (n = 23) of the respondents. Respondents from the Administration MOS group reported the problem most frequently (1. 1 percent) and persons from the Maintenance MOS group reported the problem least frequently (0.6 percent). There is a trend of increased reporting of nasal polyps with age. Blacks reported nasal polyps twice as frequently as Whites (1.3 percent compared to 0.6 percent).

(14) Frequency and severity of headaches is shown in Table l-l 3. Twenty-six percent of the respondents indicated that they did not get headaches or they did not respond to the question. Fifty-nine percent of the respondents got mild or infrequent headaches. Reports of moderate and severe headaches are more common from Maintenance, Administration and Medical MOS groups. Older workers report headaches of increased severity and frequency. There are no significant differences among ethnic groups.

f. Concerns about Kuwait Deployment

(1) There are two questions with lists about feelings or concerns about going to Kuwait. There was also an open-ended question about other concerns or health problems.

(2) As shown in Table I-I 4, questionnaire respondents appeared to be ambivalent about going to Kuwait. The most common response was that it was part of being a soldier (38.2 percent, n = 1069). One-third of the respondents felt it was the experience of a lifetime and less than six percent (n = 160) would rather not have gone. Forty percent of the persons in the Administration MOS group mentioned that going to Kuwait would be the experience of a lifetime. This group also had the highest percentage of respondents who indicated that they would rather not leave their family and friends (9.7 percent). Respondents from the Medical MOS group were more likely than other MOS groups to say that they were a little nervous (15.5 percent) and would rather not go (6.7 percent). Forty percent of the Maintenance MOS group indicated that they were not complaining about going.

(3) There is no effect of age on how the respondents felt about going to Kuwait except that the percent of each age group not complaining generally increased with age and those nervous about going to Kuwait decreased with age. It was more likely that younger respondents would say that they would rather not go to Kuwait.

(4) There are no significant differences among ethnic group on how the respondents felt about going to Kuwait. White respondents were more likely to say that going to Kuwait was the experience of a lifetime (36.7 percent). Black and other ethnic respondents were more likely to say they were not complaining about going to Kuwait (40.2 percent and 40.8 percent). Black respondents were also more likely to be a little nervous (11.8 percent) and rather not go (7.8 percent) than other ethnic groups.

(5) Respondents were asked to check one or two statements concerning going to Kuwait (Table I-1 5). Half of all respondents indicated that they were concerned about they heat (n = 1273). Combat and Operations Support/Logistics personnel were most likely to mention this concern, as were younger respondents and Black respondents.

(6) The next most frequently mentioned concern was unexploded ordnance (n = 1053). Respondents were more likely to be from the Combat and Administration MOS groups and to be in the age groups less than 25 or greater than 35.

(7) Six hundred and thirty-five respondents checked air pollution from oil fires as a concern about going to Kuwait. Maintenance, Administration, Operations Support/Logistics and Medical MOS groups appeared to be more concerned with this problem than Combat personnel. Older respondents, White and Other Ethnic were more likely to be concerned than younger respondents and Blacks.

(8) In the open-ended question about other concerns or health problems, there are not clear patterns. A number of respondents listed allergies to medicine and other substances. Many listed health problems that were not covered in the questionnaire. Generally, these health problems related to injuries and musculoskeletal problems.

Table I-1
Ethnic Distribution of KOF1 Respondents

Ethnic Group	Number	Percent
White, Not Hispanic	1671	59.7
Black, Not Hispanic	771	27.6
Hispanic	236	8.4
American Indian/Alaskan Native	22	0.8
Asian	48	1.7
Other	28	1.0
No response	21	0.8
TOTAL	2797	100.0

Table 1-2
Distribution of KOF1 Respondents by MOS Group and Grade

GRADE

MOS GROUP	Count Row Pct Col Pct Tot Pct	Enlisted	Officer	Warrant	Unknown	Row Total
	Combat	1480 93.6 56.3 52.9	100 6.3 67.6 3.6	1 .1 7.1 .0		1581 56.5
	Maintenance	491 99.6 18.7 17.6		2 .4 14.3 .1		493 17.6
	Administration	153 87.4 5.8 5.5	16 9.1 10.8 .6	6 3.4 42.9 .2		175 6.3
	Op support/ Logistics	342 95.8 13.0 12.2	11 3.1 7.4 .4	4 1.1 28.6 .1		357 12.8
	Medical	137 92.6 5.2 4.9	11 7.4 7.4 .4			148 5.3
	Unknown	27 62.8 1.0 1.0	10 23.3 6.8 .4	1 2.3 7.1 .0	5 11.6 100.0 .2	43 1.5
	Column Total	2630 94.0	148 5.3	14 .5	5 .2	2797 100.0

Table I-3
Most Common Military Occupational Specialties
of KOF1 Respondents

MOS	Description	Frequency
Enlisted Personnel		
12B	Combat Engineer	104
13B	Cannon Crewmember	225
16S	MANPADS Crewmember	56
19D	Cavalry Scout	455
19K	Ml Armor Crewman	299
63B	Light Wheel Vehicle	67
88M	Mechanic	69
91A	Motor Transport Operator	83
94B	Medic	72
	Food Service Specialist	
Commissioned Officers		
12A	Armor, General	28
12C	Cavalry	17
13A	field Artillery, General	22
35D	Tactical Intelligence	11

Table 14
Distribution of KOF1 Respondents by Squadron and Grade

SQUADRON	Count Row Pct Col Pct Tot Pct	GRADE: Enlisted	Officer	Warrant	Unknown	Row Total
	1 SQDN	583 93.9 22.2 20.8	36 5.8 24.3 1.3		2 .3 40.0 .1	621 22.2
	2 SQDN	253 95.8 9.6 9.0	10 3.8 6.8 .4		1 .4 20.0 .0	264 9.4
	3 SQDN	838 94.3 31.9 30.0	48 5.4 32.4 1.7	3 .3 21.4 .1		889 31.8
	4 SQDN	32 94.1 1.2 1.1	2 5.9 1.4 .1			34 1.2
	AUXILIARY	166 92.7 6.3 5.9	8 4.5. 5.4 .3	5 2.8 35.7 .2		179 6.4
	CSS	467 94.9 17.8 16.7	21 4.3 14.2 .8	3 .6 21.4 .1	1 .2 20.0 .0	492 17.6
	HHT REGT	205 89.9 7.8 7.3	20 8.8 13.5 .7	3 1.3 21.4 .1		228 8.2
	UNKNOWN/ OTHER	86 95.6 3.3 3.1	3 3.3 2.0 .1		1 1.1 20.0 .0	90 3.2
	Column Total	2630 94.0	148 5.3	14 .5	5 .2	2797 100.0

Table I-5
Previous Occupational Experience of KOF1 Respondents

Occupation	Time	Number
Large Farm	I-5 years	148
	6-10 years	42
	> 10 years	29
Mine	I-5 years	11
Quarry	I-5 years	9
Foundry	I-5 years	16
	> 10 years	1
Pottery	1-5 years	8
	> 10 years	1
Cotton. Flax or Hemp Mill	I-5 years	9
	> 10 years	1

Table 1-6
Exposure to Potentially Harmful Substances Reported by KOF1 Respondents

Exposure	Severity	Number of Responses	(Percent of Responses)
Dust	None	1933	(71.2)
	Mild	276	(9.9)
	Moderate	382	(13.7)
	Severe	146	(5.2)
	Total	2796	
Gas or Fume	None	2272	(81.2)
	Mild	253	(9.0)
	Moderate	221	(7.9)
	Severe	51	(1.8)
	Total	2797	
Smoke	None	2415	(86.3)
	Mild	176	(6.3)
	Moderate	168	(6.01
	Severe	3 8	(1.8)
	Total	2797	
Asbestos	None	2644	(94.5)
	Mild	112	(4.0)
	Moderate	33	(1.2)
	Severe	8	(0.2)
	Total	2792	

Table 1-7
KOF1 Respondents Reporting Moderate to Severe Exposure
to Potentially Harmful Substances During the Last Five Years
by MOS Group

	MOS Group					
Exposure	Combat	Maint	Admin	OP Sup	Medical	Total*
Dust	325 (20.6)	113 (22.9)	12 (6.9)	42 (11.8)	29 (19.6)	528 (18.9)
Gases or Fumes	144 (9.1)	86 (17.7)	4 (2.3)	26 (7.3)	8 (5.4)	272 (9.7)
Smoke	120 (7.61	59 (12.0)	4 (2.31	13 (3.61	8 (5.41	206 (7.4)
Asbestos	16 (1.0)	20 (4.1)	0 (0.0)	2 (0.6)	3 (2.01	41 (1.5)
Total Respondents	1581	493	175	356	148	2797

* Includes 44 respondents with unclassified MOS Group

Table 1-8
KOF1 Respondents Reporting Moderate to Severe Exposure to Potentially Harmful Substances During the Last Five Years by Age Group

Age Group	Exposure				Total Respondents
	Dust	Gases/ Fumes	Smoke	Asbestos	
<20	29 (13.1,	14 (6.3)	9 (4.1)	2 (0.9)	221
20-24	235 (18.3)	119 (9.2)	81 (6.3)	20 (1.6)	1289
25-29	137 (21.1)	72 (11.0)	59 (9.0)	10 (1.5)	652
30-34	77 (21.3)	38 (10.5)	32 (8.9)	9 (2.5)	361
35-39	26 (14.0)	22 (11.91	17 (9.2)	0 (0.0)	185
40+	21 (31.31	7 (10.4)	8 (11.9)	0 (0.0)	67
All Ages'	528 (18.9)	272 (9.7)	206 (7.4)	41 (1.5)	2797

' Includes 22 respondents with no age given

Table 1-9
Smoking Habits of KOF1 Respondents by MOS Group

MOS Group	> 20 Packs in Lifetime	> 1 Cigarette per day for 1 year	Do you now smoke Cigarettes	Pipe	Cigar
Combat (n=1581)	717 (45.4)'	582 (36.8)	590 (37.71	17 (1.1)	43 (2.7)
Maintenance (n=493)	264 (53.5)	244 (45.4)	228 (46.2)	8 (1.6)	17 (3.4)
Administ. (n=175)	67 (38.3)	53 (30.3)	48 (27.4)	5 (2.91	8 (4.6)
Ops Support (n=356)	134 (37.6)	112 (31.5)	110 (30.9)	3 (0.8)	3 (0.8)
Medical (n= 148)	59 (39.9)	47 (31.8)	54 (36.5)	1 (0.7)	3 (0.2)
All Groups ** (n = 2797)	1259 (45.0)	1034 (37.0)	1044 (37.3)	34 (1.2)	75 (2.7)

* Percent of MOS Group reporting experience
** Includes 44 respondents without MOS Group

Table 1-10
Smoking Habits of KOF1 Respondents by Age Group

Age Group	> 20 Packs in Lifetime	> 1 Cigarette per day for 1 vear	Do you now smoke		
			Cigarettes	Pipe	Cigar
< 20 (n=221)	82 (37.1)'	54 (24.4)	76 (34.4)	0 (0.0)	4 (1.8)
20-24 (n=1289)	518 (40.2)	406 (31.5)	463 (35.9)	10 (0.8)	35 (2.7)
25-29 (n=652)	289 (44.3)	251 (38.5)	223 (34.2)	6 (0.9)	16 (2.51
30-34 (n=361)	206 (57.1)	170 (47.1)	157 (43.5)	11 (3.0)	12 (3.3)
35-39 (n=185)	110 (59.5)	103 (55.7)	86 (46.5)	4 (2.2)	6 (3.2)
40+ (n = 67)	46 (68.7)	42 (62.7)	31 (46.3)	3 (4.5)	2 (3.0)
All Ages (n = 27971	1259 (45.0)	1034 (37.0)	1044 (37.3)	34 (1.2)	75 (2.7)

* Percent of Age Group reporting experience
** Includes 22 respondents with unknown age

Table 1-11
Number of KOF1 Respondents Indicating Specific Problems or Conditions

PROBLEM WITH:	Number of Respondents (Percent)
Vision	258 (9.2)
Sleeping	136 (4.9)
Hearing	105 (3.8)
Breathing	93 (3.3)
Concentrating	52 (1.9)
Prolonged Exercise	48 (1.7)
Bowel Movements	38 (1.4)
Digestion	33 (1.2)
Urination	10 (0.4)

CONDITION:	Number of Respondents (Percent)
High Blood Pressure	118 (4.2)
Asthma or Wheezing	102 (3.61
Chronic Bronchitis or Emphysema	54 (1.91
Jaundice or Hepatitis	31 (1.1)
Tuberculosis	27 (0.8)
Anemia	17 (0.6)
Leukemia, lymphoma or cancer	3 (0.1)

Table 1-12
Frequency of Health Problems
by KOF1 Respondents

CONDITION	Never or < Twice a year (percent)	Every I-3 Months (percent)	Every I-3 Weeks (percent)	Every I-3 Days (percent)	No Response (percent)
Hay fever or Allergy	2342 (83.7)	240 (8.6)	48 (1.7)	47 (1.7)	120 (4.3)
Nosebleeds	2272 (81.2)	113 (4.0)	25 (0.9)	8 (0.3)	379 (13.6)
Palpitations	2297 (82.1)	13 (0.5)	4 (0.1)	4 (0.1)	479 (17.1)
Indigestion or Heartburn	1915 (68.5)	359 (12.8)	93 (3.3)	46 (1.6)	384 (13.7)
Vomiting or Nausea	2269 (81.1)	82 (2.9)	5 (0.2)	2 (0.1)	439 (15.7)
Belly cramps or Stomach pain	2166 (77.4)	177 (6.3)	45 (1.6)	11 (0.4)	398 (14.2)
Indigestion or Heart burn	1943 (69.5)	473 (16.91	121 (4.3)	49 (1.8)	211 (7.5)
Lightheadedness or Dizziness	2213 (79.1)	315 (11.3)	44 (1.6)	20 (0.7)	205 (7.3)
Trouble Sleeping	1896 (67.8)	463 (16.6)	135 (4.8)	93 (3.3)	210 (7.5)
Skin rashes or Sores	2334 (83.4)	204 (7.3)	33 (1.2)	11 (0.4)	215 (7.7)
Numbness or tingling in fingers or toes	2334 (83.4)	157 (5.6)	53 (1.9)	32 (1.1)	221 (7.9)