HAZWRAP

HAZARDOUS WASTE REMEDIAL ACTIONS PROGRAM

CRUTCHO AND KUHLMAN CREEKS AND TRIBUTARIES OF ELM CREEK

FINAL
REMEDIAL INVESTIGATION REPORT
VOLUME III OF III: APPENDICES F & G

U.S. AIR FORCE
INSTALLATION RESTORATION PROGRAM
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA

OCTOBER 1992

prepared by
HALLIBURTON NUS
Environmental Corporation

Prepared for
HAZARDOUS WASTE REMEDIAL ACTIONS PROGRAM
Oak Ridge, Tennessee 37831-7606
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MARTIN MARIETTA ENERGY SYSTEMS, INC.
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HALLIBURTON NUS ENVIRONMENTAL CORPORATION
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PREPARED FOR:

HAZARDOUS WASTE REMEDIAL ACTIONS PROGRAM
OAK RIDGE, TENNESSEE
GENERAL ORDER NUMBER 13B-997840
TASK ORDER Y-04

technologies and services for a cleaner and safer world

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APPENDIX F

SURFACE WATER AND SEDIMENT SAMPLE DATA VALIDATION SUMMARIES AND SUPPORTING QA/QC DATA

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F-1

SEDIMENT SAMPLE DATA VALIDATION SUMMARIES - JULY 1991

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NUS CORPORATION

INTERNAL CORRESPONDENCE

C-49-9-1-48

TO: PHIL OTTINGER

DATE: SEPTEMBER 5, 1991

FROM: KAREN M. SMECKER

CC: D. A. SCHEIB

SUBJECT: INORGANIC DATA VALIDATION - MISC. TAL METALS & CYANIDE
TINKER AIR FORCE BASE
CASE NO. TNK, SDG PKG2

SAMPLES:

Soil:

TCC-

SD06-E-0000	SD06-F-0000	SD07-E-0000
SD07-F-0000	SD08-E-0000	SD09-E-0000
SD10-E-0000	SD13-E-0000	SD14-E-0000

TEC-

SD22-E-0000	SD23-E-0000	SD24-E-0000

TKC-

SD-1-E-0000	SD02-E-0000	SD03-E-0000
SD04-E-0000		

NUS Laboratories analyzed 16 soil samples (including two field duplicate pairs) for various Target Analyte List (TAL) metals. In addition, four of these samples were analyzed for cyanide. No field quality control blanks were included in this sample set.

Data for these analyses were reviewed with reference to the EPA "Functional Guidelines for Inorganic Data Validation" and the Hazardous Waste Remedial Action Program's (HAZWRAP) "Requirements for Quality Control of Analytical Data." The analyses were conducted under Level D QA/QC criteria and were evaluated according to the following parameters:

- o Data Completeness
- o Holding Times
- * o Calibration Verification
- * o Laboratory Blank Analyses
- * o Matrix Spike Recoveries
- o Laboratory Duplicates
- * o Field Duplicate Precision

(continued)

* o Furnace Atomic Absorption Results
  o ICP Serial Dilution Results
  o Detection Limits

The symbol (*) indicates that quality control criteria were not met for this parameter. The data provided for the ICP Interference Check Sample (ICS) analysis was not suitable for validation purposes. Consequently, the sample data was not evaluated for this parameter. Problems affecting data usability are addressed below and the attached Table 1 summarizes the validation qualifications.

Calibration Verification

CRDL Standard analysis Percent Recoveries (%Rs) for several analytes were low (< 80%). No actions were necessary for manganese, zinc and cadmium since all positive cadmium results < 3X CRDL are qualified due to blank contamination and all positive results for manganese and zinc are greater than 3X CRDL. Positive results < 3X CRDL and nondetects for the other analytes are qualified as estimated, "J" and "UJ", respectively.

The CRDL Standard analysis %R for nickel exceeded the 120% upper quality control limit. Qualifications were not made because positive results < 3X CRDL for this analyte are qualified on the basis of blank contamination.

Blanks

Laboratory method blank analyses yielded the following contaminants in the maximum concentrations indicated:

Contaminant	Maximum Concentration (ug/l)	Action Level (mg/kg)
beryllium	4.4	4.4
cadmium	4.2	4.2
cobalt	24.4	24.4
chromium	5.4	5.4
iron	15.0	15.0
lead	2.1	2.1
nickel	29.2	29.2
zinc	12.0	12.0

Positive sample results less than the action level are qualified as undetected, "U". Adjustments for individual sample size, dilutions and moisture content were made prior to the application of all action levels. No actions were taken for chromium, lead and iron

because all sample concentrations for these analytes were above the action level.

Negative blank contamination at the following maximum levels were evident for the analytes indicated below:

Contaminant	Maximum Concentration (ug/l)
antimony	- 3.7
arsenic	- 2.0
barium	- 31.0
magnesium	- 346.0
manganese	- 7.2
vanadium	- 46.0

Negative blank contamination is an indication of poor instrument performance. Positive results and nondetects for these analytes are qualified as estimated, "J" and "UJ", respectively; no nondetects were reported for barium, magnesium and manganese.

Matrix Spike Recoveries

The Matrix Spike (MS) %R for barium was extremely low (< 30%). Only positive results were reported for this analyte, and these results are qualified as estimated, "J".

Field Duplicate Precision

The Relative Percent Difference (RPD) for iron exceeded the 50% quality control criterion for one of the field duplicate pairs. Positive iron results are qualified as estimated, "J"; no nondetects were reported.

Furnace Atomic Absorption Results

Three samples had Post Digestion Spike (PDS) %Rs for selenium below the 85% lower quality control limit. The positive selenium result in sample TCC-SD10-E-0000 and selenium nondetects in sample TCC-SD14-E-0000 and TCC-SD08-E-0000 are qualified as estimated, "J" and "UJ", respectively.

Please do not hesitate to contact me with questions regarding this review.

TINKER AIR FORCE BASE
CASE # TNK, SDG PKG2

TABLE 1 - RECOMMENDATION SUMMARY

Aluminum		Magnesium	J^1, J^5
Antimony	J^1	Manganese	J^1
Arsenic	J^1, J^5	Mercury	
Barium	J^1, J^2	Nickel	A^1
Beryllium	A^1	Potassium	
Boron	J^5	Selenium	J^4
Cadmium	A^1	Silver	
Calcium		Sodium	J^5
Chromium		Strontium	
Cobalt	A^1	Thallium	J^5
Copper	J^5	Vanadium	J^1, J^5
Iron	J^3	Zinc	A^1
Lead		Cyanide	

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

A^1 - Accept data, but raise soil sample detection limits (where appropriate) due to blank contamination.

J^1 - Estimate "J" positive results and "UJ" nondetects due to negative blank contamination.

J^2 - Estimate "J" positive results due to extremely low MS recovery.

J^3 - Estimate "J" positive results due to field duplicate imprecision.

J^4 - Estimate "J" positive result in one sample and "UJ" nondetects in two samples due to graphite furnace PDS %R < 85.

J^5 - Estimate "J" positive results < 3X CRDL and "UJ" nondetects due to low CRDL Standard analysis recovery.

TINKER AIR FORCE BASE
CASE # TNK, SDG PKG2

TABLE 1 - RECOMMENDATION SUMMARY

Aluminum		Magnesium	J^1, J^5
Antimony	J^1	Manganese	J^1
Arsenic	J^1, J^5	Mercury	
Barium	J^1, J^2	Nickel	A^1
Beryllium	A^1	Potassium	
Boron	J^5	Selenium	J^4
Cadmium	A^1	Silver	
Calcium		Sodium	J^5
Chromium		Strontium	
Cobalt	A^1	Thallium	J^5
Copper	J^5	Vanadium	J^1, J^5
Iron	J^3	Zinc	A^1
Lead		Cyanide	

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

A^1 - Accept data, but raise soil sample detection limits (where appropriate) due to blank contamination.

J^1 - Estimate "J" positive results and "UJ" nondetects due to negative blank contamination.

J^2 - Estimate "J" positive results due to extremely low MS recovery.

J^3 - Estimate "J" positive results due to field duplicate imprecision.

J^4 - Estimate "J" positive result in one sample and "UJ" nondetects in two samples due to graphite furnace PDS %R < 85.

J^5 - Estimate "J" positive results < 3X CRDL and "UJ" - nondetects due to low CRDL Standard analysis recovery.

U.S. EPA - CLP

2B
CRDL STANDARD FOR AA AND ICP

Lab Name: NUS Laboratory Contract: Tinker AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: PKG2

AA CRDL Standard Source: HP

ICP CRDL Standard Source: HP

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
				Initial			Final	
	True	Found	%R	True	Found	%R	Found	%R
Aluminum				400.0	398.00	99.5	418.00	104.
Antimony	60.0	59.20	98.7					
Arsenic								
Barium				400.0	395.00	98.8	397.00	
Beryllium				10.0	10.00	100.0	9.80	
Cadmium				10.0	9.30	93.0	10.70	107.
Calcium				5000.0	4677.00	93.5	4885.00	97.
Chromium				20.0	21.70	108.5	18.70	93.
Cobalt				100.0	107.20	107.2	112.00	112.
Copper				50.0	53.40	106.8	46.40	92.
Iron				200.0	204.00	102.0	205.00	102.
Lead	3.0	3.00	100.0					
Magnesium				5000.0	4293.00	85.9	4761.00	95.
Manganese				30.0	23.40	78.0	22.40	74.
Mercury								
Nickel				80.0	96.20	120.2	82.70	103.
Potassium				5000.0	4804.00	96.1	5001.00	100.
Selenium	5.0	5.15	103.0					
Silver				20.0	21.90	109.5	21.00	105.
Sodium				5000.0	3720.00	74.4	5027.00	100.
Thallium	10.0	4.65	46.5					
Vanadium				100.0	97.00	97.0	93.00	93.
Zinc				40.0	39.40	98.5	40.10	100.
Boron				150.0	147.80	98.5	116.60	77.
Strontium				200.0	221.00	110.1	219.00	109.

U.S. EPA - CLP

2B
CRDL STANDARD FOR AA AND ICP

Lab Name: NUS Laboratory Contract: Tinker AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: PKG2

AA CRDL Standard Source: HP

ICP CRDL Standard Source: HP

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
					Initial		Final	
	True	Found	%R	True	Found	%R	Found	%R
Aluminum								
Antimony								
Arsenic	10.0	9.80	98.0					
Barium				400.0	381.00	95.2	382.00	95.5
Beryllium				10.0	10.50	105.0	10.70	107.0
Cadmium				10.0	11.10	111.0	13.20	132.0
Calcium				200.0	204.80	102.4	220.20	110.1
Chromium				20.0	21.70	108.5	20.70	103.5
Cobalt				100.0	108.70	108.7	111.80	111.8
Copper				50.0	39.60	79.2	45.50	91.0
Iron								
Lead								
Magnesium				200.0	144.40	72.2	210.30	105.1
Manganese								
Mercury								
Nickel				80.0	98.30	122.9	107.30	134.1
Potassium								
Selenium								
Silver								
Sodium								
Thallium								
Vanadium				100.0	78.00	78.0	74.00	74.0
Zinc				40.0	47.70	119.2	50.00	125.0

U.S. EPA - CLP

2B
CRDL STANDARD FOR AA AND ICP

Lab Name: NUS Laboratory Contract: Tinker AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: PKG2

AA CRDL Standard Source: HP

ICP CRDL Standard Source: HP

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
					Initial		Final	
	True	Found	%R	True	Found	%R	Found	%R
Aluminum								
Antimony								
Arsenic	10.0	4.70	47.0					
Barium				400.0	385.00	96.2	373.00	[illegible]
Beryllium								
Cadmium								
Calcium								
Chromium				20.0	16.90	84.5	18.10	90.5
Cobalt				100.0	109.20	109.2	108.10	108.1
Copper				50.0	50.20	100.4	49.50	99.0
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel				80.0	108.00	135.0	103.00	128.8
Potassium								
Selenium								
Silver								
Sodium								
Thallium								
Vanadium				50.0	58.00	116.0	50.00	100.0
Zinc				40.0	33.10	82.8	35.10	87.8

U.S. EPA - CLP

3
BLANKS

Lab Name: NUS Laboratory Contract: Tinker AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: PKG2

Preparation Blank Matrix (soil/water): SOIL

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

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum											
Antimony											
Arsenic	2.0	U	2.0	U	2.0	U	2.0	U			P
Barium	9.0	U	9.0	U							P
Beryllium	3.1	B	4.4	B							P
Cadmium	3.0	U	3.0	U							P
Calcium	129.0	U	129.0	U							P
Chromium	5.0	U	5.4	B							P
Cobalt	24.4	B	19.1	B							P
Copper	10.0	U	10.0	U							P
Iron											
Lead											
Magnesium	327.0	U	327.0	U							P
Manganese											
Mercury											
Nickel	26.6	B	18.4	B							P
Potassium											
Selenium											
Silver											
Sodium											
Thallium											
Vanadium	-21.0	B	-21.0	B							P
Zinc	10.5	B	12.0	B							P
Cyanide											

U.S. EPA - CLP

3
BLANKS

Lab Name: NUS Laboratory Contract: Tinker AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: PKG2

Preparation Blank Matrix (soil/water): SOIL

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

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum	30.0	U	30.0	U	30.0	U			30.000	U	P
Antimony	3.0	U	3.0	U	3.0	U	3.0	U	-3.700	B	P
Arsenic	2.0	U	-2.0	B					2.000	U	P
Barium	-9.0	B	9.0	U	9.0	U	9.0	U	9.000	U	
Beryllium	2.0	B	2.8	B	2.7	B	2.6	B	2.900	B	
Cadmium	3.0	U	4.2	B	3.0	U	3.0	U	3.000	U	P
Calcium	129.0	U	129.0	U	129.0	U			129.000	U	P
Chromium	-5.0	U	5.0	U	-5.0	U	5.0	U	5.000	U	P
Cobalt	14.6	B	14.3	B	13.5	B	13.9	B	13.000	B	P
Copper	10.0	U	10.0	U	10.0	U	10.0	U	10.000	U	P
Iron	10.0	B	11.0	B	9.0	B			15.000	B	P
Lead	1.0	U	1.0	U	1.0	U	1.0	U	2.100	B	P
Magnesium	-346.0	B	327.0	U	327.0	U			327.000	U	P
Manganese	-6.5	B	-6.5	B	-7.2	B			-6.700	B	P
Mercury	0.1	U	0.1	U					0.100	U	CV
Nickel	16.8	B	16.0	B	24.9	B	16.0	U	16.000	U	P
Potassium	452.0	U	452.0	U					452.000	U	P
Selenium	1.0	U	1.0	U	1.0	U	1.0	U	1.000	U	P
Silver	5.0	U	5.0	U	5.0	U	5.0	U	5.000	U	P
Sodium	2699.0	U	2699.0	U	2699.0	U			2699.000	U	P
Thallium	2.0	U	2.0	U	2.0	U	2.0	U	2.000	U	P
Vanadium	9.0	U	9.0	U	9.0	U	9.0	U	9.000	U	P
Zinc	6.0	U	6.0	U	6.0	U	6.0	U	6.000	U	P
Cyanide											
Boron	-100.0	U	-100.0	U	-100.0	U	-100.0	U	-100.000	U	P
Strontium	100.0	U	100.0	U	100.0	U			100.000	U	P

U.S. EPA - CLP

3
BLANKS

Lab Name: NUS Laboratory Contract: Tinker AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: PK62

Preparation Blank Matrix (soil/water): SOIL

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

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Preparation Blank	C	M
Aluminum											
Antimony											
Arsenic	2.0	U	2.0	U	2.0	U					P
Barium	-31.0	B	-30.0	B							P
Beryllium											
Cadmium											
Calcium											
Chromium	-5.0	U	5.0	U							P
Cobalt	9.0	U	12.0	B							P
Copper	10.0	U	10.0	U							P
Iron											
Lead											
Magnesium											
Manganese											
Mercury											
Nickel	29.2	B	21.2	B							P
Potassium											
Selenium											
Silver											
Sodium											
Thallium											
Vanadium	-38.0	B	-46.0	B							P
Zinc	6.0	U	6.0	U							P
Cyanide											

U.S. EPA - CLP

4

ICP INTERFERENCE CHECK SAMPLE

Lab Name: NUS Laboratory | Contract: Tinker AFB

Lab Code: | Case No.: TNK | SAS No.: | SDG No.: PK62

ICP ID Number: MET500 | ICS Source: NUS Lab

Concentration Units: ug/L

Analyte	True Sol. A	True Sol. AB	Initial Found Sol. A	Initial Found Sol. AB	Initial Found %R	Final Found Sol. A	Final Found Sol. AB	Final Found %R
Aluminum								
Antimony								
Arsenic								
Barium	1	475	-8	509.0	107.2	-6	509.0	1[illegible]
Beryllium	4	492	3	526.9	107.1	2	519.9	1[illegible]
Cadmium	2	881	-3	944.4	107.2	2	899.3	102.1
Calcium								
Chromium								
Cobalt	4	469	20	507.8	108.3	20	501.6	107.0
Copper	-12	451	-5	517.7	114.8	-2	520.8	115.5
Iron								
Lead								
Magnesium								
Manganese	5	480	-3	453.1	94.4	-2	467.3	97.4
Mercury								
Nickel	10	930	2	1004.8	108.0	14	997.0	107.2
Potassium								
Selenium								
Silver	2	952	2	867.0	91.1	2	875.1	91.9
Sodium								
Thallium								
Vanadium	-8	470	15	524.0	111.5	3	523.0	111.3
Zinc	-4	953	47	1079.4	113.3	24	1078.2	113.1
Boron	1	2040	-61	2088.8	102.4	-57	2079.5	101.9
Strontium	21	1880	31	1918.0	102.0	29	1877.0	99.8

ICS data provided not suitable for validation purposes, therefore sample data was not evaluated on this basis.

U.S. EPA - CLP

5A
SPIKE SAMPLE RECOVERY

EPA SAMPLE NO
TCCSF6S

Lab Name: NUS Laboratory Contract: Tinker AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: PKG2

Matrix (soil/water): SOIL Level (low/med): LOW
% Solids for Sample: 75.6

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

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum									NR
Antimony	75-125	19.9905		0.7622	U	25.96	77.0		P
Arsenic	75-125	10.8086		0.8757	B	10.44	95.1		P
Barium	75-125	1195.0195		1472.0102		519.24	-53.3	N	P
Beryllium	75-125	12.6693		0.6860	B	12.98	92.3		P
Cadmium	75-125	12.0203		1.0416	B	12.98	84.6		P
Calcium									NR
Chromium	75-125	51.0600		10.4800		51.90	78.2		P
Cobalt	75-125	122.4356		6.0212	B	129.81	89.7		P
Copper	75-125	66.9294		3.4044	B	64.90	97.9		P
Iron									NR
Lead	75-125	9.6887		5.5341		5.32	78.1		P
Magnesium									NR
Manganese		542.8862		470.4132		64.90	111.7		P
Mercury	75-125	0.5022		0.0629	U	0.63	79.7		CV
Nickel	75-125	134.5338		8.9936	B	129.81	96.7		P
Potassium									NR
Selenium	75-125	2.5153		0.2527	U	2.66	94.6		P
Silver	75-125	11.3656		1.2635	U	13.31	85.4		P
Sodium									NR
Thallium	75-125	5.0519		0.5228	U	5.30	95.3		P
Vanadium	75-125	136.5588		10.9245	B	129.81	96.8		P
Zinc	75-125	133.7290		16.9456		129.81	90.0		P
Cyanide									NR
Boron	75-125	518.2000		25.4000	U	519.20	99.8		P
Strontium	75-125	401.5000		25.4000	U	425.90	94.3		P

Comments:

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ANALYSIS RUN LOG

Lab Name: NUS Laboratory
Lab Code: Case No.: TNK
Instrument ID Number: MET405
Start Date: 07/18/91

Contract: Tinker AFB
SAS No.: SDG No.: PKG2
Method: P
End Date: 07/18/91

EPA Sample No.	D/F	Time	% R	Analytes																						
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN
TECS23	1.00	1431																			X					
TECS23A	1.00	1436	108.5																		X					
TECS24	1.00	1441																			X					
TECS24A	1.00	1446	96.5																		X					
TCCSD7	1.00	1451																			X					
TCCSD7A	1.00	1456	95.5																		X					
TCCSE7	1.00	1501																			X					
TCCSE7A	1.00	1505	103.0																		X					
CCV3	1.00	1510																			X					
CCB3	1.00	1515																			X					
TCCSD8	1.00	1520																			X					
TCCSD8A	1.00	1525	79.5																		X					
TCCSD9	1.00	1530																			X					
TCCSD9A	1.00	1535	96.0																		X					
TCCS10	1.00	1540																			X					
TCCS10A	1.00	1545	84.0																		X					
TCCS13	1.00	1549																			X					
TCCS13A	1.00	1554	95.0																		X					
TCCS14	1.00	1559																			X					
TCCS14A	1.00	1604	81.0																		X					
CCV4	1.00	1609																			X					
CCB4	1.00	1614																			X					

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NUS CORPORATION

INTERNAL CORRESPONDENCE

C-49-9-1-49

TO: PHIL OTTINGER

DATE: SEPTEMBER 5, 1991

FROM: KAREN M. SMECKER

CC: D. A. SCHEIB

SUBJECT: INORGANIC DATA VALIDATION - MISC. TAL METALS & CYANIDE
TINKER AIR FORCE BASE
CASE NO. TNK, SDG PKG3

SAMPLES:

Soil:

TCC-

SD11-E-0000	SD12-E-0000	SD15-E-0000
SD16-E-0000	SD17-E-0000	SD18-E-0000
SD19-E-0000	SD20-E-0000	SD21-E-0000
SD25-E-0000	SD25-F-0000	SD26-E-0000

TKC-SD05-E-0000

NUS Laboratories analyzed 13 soil samples (including one field duplicate pair) for various Target Analyte List (TAL) metals. In addition, two of these samples were analyzed for cyanide. No field quality control blanks were included in this sample set.

Data for these analyses were reviewed with reference to the EPA "Functional Guidelines for Inorganic Data Validation" and the Hazardous Waste Remedial Action Program's (HAZWRAP) "Requirements for Quality Control of Analytical Data". The analyses were conducted under Level D QA/QC criteria and were evaluated according to the following parameters:

- o Data Completeness
- o Holding Times
- * o Calibration Verification
- * o Laboratory Blank Analyses
- * o Matrix Spike Recoveries
- * o Laboratory Duplicates
- o Field Duplicate Precision
- * o Furnace Atomic Absorption Results
- o ICP Serial Dilution Results
- o Detection Limits

The symbol (*) indicates that quality control criteria were not met for this parameter. The data provided for the ICP Interference Check Sample (ICS) analysis was not suitable for validation purposes. Consequently, the sample data was not evaluated

according to this parameter. Problems affecting data usability are addressed below and the attached Table 1 summarizes the validation qualifications.

Calibration Verification

CRDL Standard analysis Percent Recoveries (%Rs) for beryllium, chromium, cadmium and magnesium were below the lower 80% quality control limit. Only positive results were reported for magnesium and beryllium; positive results < 3X CRDL for beryllium are qualified due to blank contamination and all positive results for magnesium are > 3X CRDL, therefore, no actions were taken. Positive chromium results < 3X CRDL are qualified as estimated, "J"; positive results < 3X CRDL for cadmium are qualified on the basis of blank contamination. Cadmium nondetects are qualified as estimated, "UJ"; no nondetects were reported for chromium.

The CRDL Standard analysis %R for silver was high (> 120%). No actions were necessary because the only positive silver result is > 3X CRDL.

Blanks

Laboratory method blank analyses yielded the following contaminants in the maximum concentrations indicated:

Contaminant	Maximum Concentration (ug/l)	Action Level (mg/kg)
beryllium	2.1	2.1
barium	13.0	13.0
cadmium	3.1	3.1
cobalt	18.0	18.0
iron	32.0	32.0
nickel	27.0	27.0
silver	5.4	5.4
zinc	6.9	6.9

Positive sample results less than the action level are qualified as undetected, "U". Adjustments for individual sample size, dilutions and moisture content were made prior to the application of all action levels. No actions were taken for barium, iron, silver and zinc as all sample concentrations for these analytes were above the action level.

Negative blank contamination at the following maximum levels were evident for the analytes indicated below:

Contaminant	Maximum Concentration (ug/l)
antimony	- 3.6
barium	- 63.0
calcium	- 130
chromium	- 6.8
iron	- 22.0
magnesium	- 691

Negative blank contamination is an indication of poor instrument performance. Positive results and nondetects for these analytes are qualified as estimated, "J" and "UJ", respectively; no nondetects were reported for barium, calcium, chromium, iron and magnesium.

Matrix Spike Recoveries

The Matrix Spike (MS) %R for silver was < 30. The positive result for silver is qualified as estimated, "J". Nondetects for silver are considered unreliable and are qualified as rejected, "R".

MS %Rs for arsenic, lead and selenium were low (< 75%, but > 30%). Positive results and nondetects for these analytes are qualified as estimated, "J" and "UJ", respectively; no nondetects were reported for arsenic and lead.

Laboratory Duplicates

Relative Percent Differences (RPDs) for calcium, magnesium and manganese exceeded the 35% quality control criterion. Positive results for these analytes are qualified as estimated, "J".

Furnace Atomic Absorption Results

Post Digestion Spike (PDS) %Rs for selenium and thallium in several samples were below the 85% lower quality control limit. Nondetects in affected samples are qualified as estimated, "UJ".

Please do not hesitate to contact me with questions regarding this review.

TINKER AIR FORCE BASE
CASE # TNK, SDG PKG3

TABLE 1 - RECOMMENDATION SUMMARY

Aluminum		Magnesium	J^1, J^3
Antimony	J^1	Manganese	J^3
Arsenic	J^2	Mercury	
Barium	J^1	Nickel	A^1
Beryllium	A^1	Potassium	
Boron		Selenium	J^2, J^4
Cadmium	A^1, J^5	Silver	J^6, R^1
Calcium	J^1, J^3	Sodium	
Chromium	J^1, J^5	Strontium	
Cobalt	A^1	Thallium	J^4
Copper		Vanadium	
Iron	J^1	Zinc	
Lead	J^2	Cyanide	

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

A^1 - Accept data, but raise sample detection limit (where appropriate) due to blank contamination.

J^1 - Estimate "J" positive results and "UJ" nondetects due to negative blank contamination.

J^2 - Estimate "J" positive results due to MS %R < 75.

J^3 - Estimate "J" positive results due to poor laboratory duplicate precision.

J^4 - Estimate "UJ" nondetects in inaffected samples due to low graphite furnace PDS recovery.

J^5 - Estimate "J" positive chromium results < 3X CRDL and "UJ" nondetects for cadmium due to CRDL Standard analysis %R < 80.

J^6 - Estimate "J" positive result due to extremely low MS recovery.

R^1 - Reject "R" nondetects due to extremely low MS recovery.

APPENDIX B: SUPPORT DOCUMENTATION

U.S. EPA - CLP

2B
CRDL STANDARD FOR AA AND ICP

Lab Name: NUS Laboratory Contract: Tinker AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: PKG3

AA CRDL Standard Source: HP

ICP CRDL Standard Source: HP

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
					Initial		Final	
	True	Found	%R	True	Found	%R	Found	%R
Aluminum				400.0	409.00	102.2	393.00	98.
Antimony	60.0	62.00	103.3					
Arsenic	10.0	10.00	100.0					
Barium				400.0	413.00	103.2	408.00	102.
Beryllium				10.0	7.90	79.0	7.10	71.
Cadmium				10.0	8.10	81.0	10.10	101.
Calcium				5000.0	4766.00	95.3	4819.00	96.
Chromium				20.0	18.40	92.0	15.00	75.
Cobalt				100.0	102.00	102.0	111.50	111.
Copper				50.0	50.90	101.8	42.50	85.
Iron				200.0	184.00	92.0	175.00	87.
Lead	3.0	3.50	116.7					
Magnesium				5000.0	4508.00	90.2	4527.00	90.
Manganese				30.0	33.40	111.3	31.50	105.
Mercury								
Nickel				80.0	88.80	111.0	72.00	90.
Potassium				5000.0	5058.00	101.2	5218.00	104.
Selenium	5.0	4.45	89.0					
Silver				20.0	22.30	111.5	24.60	123.
Sodium				5000.0	4118.00	82.4	4631.00	92.
Thallium	10.0	10.10	101.0					
Vanadium				100.0	96.00	96.0	85.00	85.
Zinc				40.0	40.00	100.0	45.40	113.
Boron				200.0	162.8	81.4	170.6	85.
Strontium				200.0	195.0	97.5	200.0	100.

U.S. EPA - CLP

2B
CRDL STANDARD FOR AA AND ICP

Lab Name: NUS Laboratory Contract: Tinker AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: PKG3

AA CRDL Standard Source: HP

ICP CRDL Standard Source: HP

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
					Initial		Final	
	True	Found	%R	True	Found	%R	Found	%R
Aluminum								
Antimony								
Arsenic								
Barium				400.0	357.00	89.2	348.00	87.0
Beryllium				10.0	8.20	82.0	7.30	[illegible]
Cadmium				10.0	6.70	67.0	9.00	[illegible]
Calcium				200.0	204.80	102.4	220.20	110.1
Chromium								
Cobalt				100.0	106.90	106.9	112.60	112.6
Copper				50.0	42.50	85.0	40.90	81.8
Iron								
Lead								
Magnesium				200.0	144.40	72.2	210.30	105.2
Manganese								
Mercury								
Nickel				80.0	72.50	90.6	78.90	98.6
Potassium								
Selenium	5.0	5.50	110.0					
Silver								
Sodium								
Thallium	10.0	9.70	97.0					
Vanadium								
Zinc				40.0	32.00	80.0	31.50	78.8

3
BLANKS

Lab Name: NUS Laboratory Contract: Tinker AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: PKG3

Preparation Blank Matrix (soil/water): SOIL

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

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum	30.0	U	30.0	U	30.0	U			30.000	U	P
Antimony	-3.4	B	3.0	U	3.0	U	3.0	U	-3.600	B	F
Arsenic	2.0	U	2.0	U	2.0	U	2.0	U	2.000	U	F
Barium	13.0	B	10.0	B	10.0	B	10.0	B	10.000	B	P
Beryllium	1.0	U	1.0	B	1.0	U	1.2	B	1.000	B	P
Cadmium	3.0	U	3.0	U	3.1	B	3.0	U	3.000	U	P
Calcium	-130.0	B	-130.0	B	-130.0	B			-130.000	B	P
Chromium	5.0	U	5.0	U	-6.8	B	5.0	U	5.000	U	P
Cobalt	9.0	U	9.1	B	9.0	U	18.0	B	9.000	U	P
Copper	10.0	U	10.0	U	10.0	U	10.0	U	10.000	U	P
Iron	-19.0	B	-19.0	B	-22.0	B			32.000	B	P
Lead	1.0	U	1.0	U	1.0	U	1.0	U	1.000	U	F
Magnesium	-672.0	B	-691.0	B	-684.0	B			-652.000	B	P
Manganese	6.0	U	6.0	U	6.0	U			6.000	U	P
Mercury	0.1	U	0.1	U					0.100	U	CV
Nickel	16.8	B	16.0	U	16.0	U	16.0	U	27.000	B	P
Potassium	452.0	U	452.0	U					452.000	U	P
Selenium	1.0	U	1.0	U					1.000	U	F
Silver	5.0	U	5.0	U	5.0	U	5.1	B	5.400	B	P
Sodium	2699.0	U	2699.0	U	2699.0	U			2699.000	U	P
Thallium	2.0	U	2.0	U	2.0	U			2.000	U	F
Vanadium	9.0	U	9.0	U	9.0	U	9.0	U	9.000	U	P
Zinc	6.0	U	6.0	U	6.0	U	6.9	B	6.000	U	P
Cyanide											
Boron	-100.0	U	-100.0	U	-100.0	U			-100.000	U	P
Strontium	100.0	U	100.0	U	100.0	U			100.000	U	P

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3
BLANKS

Lab Name: NUS Laboratory Contract: Tinker AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: PKG3

Preparation Blank Matrix (soil/water): SOIL

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

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum											
Antimony											
Arsenic											
Barium	-60.0	B	-61.0	B					-63.000	B	P
Beryllium	1.0	U	2.1	B					1.000		
Cadmium	3.0	U	3.0	U					3.000	U	
Calcium	129.0	U	129.0	U							P
Chromium											
Cobalt	9.0	U	9.0	U					9.000	U	P
Copper	10.0	U	10.0	U					10.000	U	P
Iron											
Lead											
Magnesium	327.0	U	327.0	U							P
Manganese											
Mercury											
Nickel	16.0	U	16.0	U					16.000	U	P
Potassium											
Selenium	1.0	U	1.0	U	1.0	U	1.0	U			F
Silver											
Sodium											
Thallium	2.0	U	2.0	U	2.0	U					F
Vanadium											
Zinc	6.0	U	6.0	U	6.0	U					P
Cyanide											

U.S. EPA - CLP

4

ICP INTERFERENCE CHECK SAMPLE

Lab Name: NUS Laboratory Contract: Tinker AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: PKG3

ICP ID Number: MET500 ICS Source: NUS Lab

Concentration Units: ug/L

Analyte	True Sol. A	True Sol. AB	Initial Found Sol. A	Initial Found Sol. AB	Initial Found %R	Final Found Sol. A	Final Found Sol. AB	Final Found %R
Aluminum								
Antimony								
Arsenic								
Barium	1	475	15	559.0	117.7	14	555.0	116.8
Beryllium	4	492	1	484.0	98.4	2	488.9	99.4
Cadmium	2	881	-4	975.5	110.7	-2	982.1	111.5
Calcium								
Chromium								
Cobalt	4	469	10	557.0	118.8	4	547.0	116.6
Copper	-12	451	-8	480.5	106.5	-4	489.7	108.6
Iron								
Lead								
Magnesium								
Manganese	5	480	0	464.7	96.8	0	464.1	96.7
Mercury								
Nickel	10	930	14	913.4	98.2	14	913.4	98.2
Potassium								
Selenium								
Silver	2	952	2	876.4	92.1	3	861.7	90.5
Sodium								
Thallium								
Vanadium	-8	470	-2	503.0	107.0	-4	488.0	103.8
Zinc	-4	953	54	1101.8	115.6	61	1121.8	117.7
Boron	1	2040	-34	2065.4	101.2	-34	2094.5	102.7
Strontium	21	1880	14	1851.0	98.5	13	1856.0	98.7

ICS data not sufficient for validation purposes, therefore sample data was not evaluated on this basis.

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5A
SPIKE SAMPLE RECOVERY

EPA SAMPLE N

TCCS2

Lab Name: NUS Laboratory Contract: Tinker AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: PKG3

Matrix (soil/water): SOIL Level (low/med): LOW

% Solids for Sample: 73.7

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

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum									N
Antimony	75-125	23.2008		0.7870	U	26.36	88.0		F
Arsenic	75-125	10.0836		2.1735	B	10.57	74.8	N	F
Barium	75-125	938.0511		310.6173		527.29	119.0		P
Beryllium	75-125	11.8641		0.3673	B	13.18	87.2		P
Cadmium	75-125	13.9469		0.7870	U	13.18	105.8		P
Calcium									N
Chromium	75-125	78.9882		17.1312		52.73	117.3		P
Cobalt	75-125	142.5004		4.1975	B	131.82	104.		P
Copper	75-125	64.1186		3.4892	B	65.91	92.6		
Iron									N
Lead	75-125	13.7443		10.6317		5.29	58.8	N	F
Magnesium									N
Manganese	75-125	549.8856		388.0880		131.82	122.7		P
Mercury	75-125	0.6148		0.0617	U	0.62	99.2		C
Nickel	75-125	124.8626		4.8272	B	131.82	91.1		P
Potassium									N
Selenium	75-125	1.5494		0.2672	U	2.70	57.4	N	F
Silver	75-125	34.1941		1.3359	U	133.00	25.7	N	P
Sodium									N
Thallium	75-125	11.8941		0.5237	U	13.22	90.0		F
Vanadium	75-125	131.5592		8.6574	B	131.82	93.2		P
Zinc	75-125	154.2590		23.7948		131.82	99.0		P
Cyanide									N
Boron	75-125	110.9394		26.2345	U	131.82	84.1		I
Strontium	75-125	103.6839		26.2345	U	131.82	78.7		I

Comments:

U.S. EPA - CLP

6
DUPLICATES

EPA SAMPLE NO.

TCCS21D

Lab Name: NUS Laboratory Contract: Tinker AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: PKG3

Matrix (soil/water): SOIL Level (low/med): LOW

% Solids for Sample: 73.7 % Solids for Duplicate: 73.7

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

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Aluminum		3300.0469		3835.8233		15.0		P
Antimony		0.7870	U	0.7930	U			P
Arsenic		2.1735	B	2.3645	B	8.4		P
Barium		310.6173		408.1394		27.1	*	P
Beryllium		0.3673	B	0.3701	B	0.8		P
Cadmium		0.7870	U	0.7930	U			P
Calcium	1311.7	6435.0784		20300.1780		103.7	*	P
Chromium		17.1312		21.8608		24.3	*	P
Cobalt		4.1975	B	4.2823	B	2.0		P
Copper		3.4892	B	3.1985	B	8.7		P
Iron		4720.9114		6626.9788		33.6	*	P
Lead		10.6317		14.1075		28.1	*	P
Magnesium	1311.7	2470.7721		5810.1713		80.7	*	P
Manganese		388.0880		579.3518		39.5	*	P
Mercury		0.0617	U	0.0627	U			CV
Nickel		4.8272	B	7.9302	B	48.6		P
Potassium		451.4970	B	468.9374	B	3.8		P
Selenium		0.2672	U	0.2707	U			P
Silver		1.3359	U	1.3537	U			P
Sodium		708.0711	U	713.4510	U			P
Thallium		0.5237	U	0.5284	U			P
Vanadium		8.6574	B	11.6309	B	29.3		P
Zinc	5.2	23.7948		24.2663		2.0		P
Cyanide								
Boron		26.2345	U	26.2345	U			P
Strontium		26.2345	U	26.2345	U			P

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ANALYSIS RUN LOG

Lab Name: NUS Laboratory
Lab Code: Case No.: TNK
Instrument ID Number: MET405
Start Date: 07/18/91

Contract: Tinker AFB
SAS No.: SDG No.: PKG3
Method: F
End Date: 07/18/91

EPA Sample No.	D/F	Time	% R	Analytes																						
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
S0	1.00	1729																			X						
S20	1.00	1734																			X						
S50	1.00	1739																			X						
S5.0	1.00	1744																			X						
ICV	1.00	1749																			X						
ICB	1.00	1754																			X						
CRA	1.00	1758																			X						
PBS	1.00	1803																			X						
PBSA	1.00	1808	87.0																		X						
LCSS	1.00	1813																			X						
LCSSA	1.00	1817	97.0																		X						
TCCS21S	1.00	1822																			X						
TCCS21D	1.00	1827																			X						
TCCS21DA	1.00	1832	77.5																		X						
TCCS21	1.00	1837																			X						
TCCS21A	1.00	1842	73.5																		X						
CCV1	1.00	1847																			X						
CCB1	1.00	1852																			X						
ZZZZZZ	1.00	1856																			X						
ZZZZZZ	1.00	1901																			X						
ZZZZZZ	1.00	1906																			X						
ZZZZZZ	1.00	1911																			X						
ZZZZZZ	1.00	1916																			X						
ZZZZZZ	1.00	1921																			X						
ZZZZZZ	1.00	1926																			X						
ZZZZZZ	1.00	1932																			X						
ZZZZZZ	1.00	1937																			X						
ZZZZZZ	1.00	1942																			X						
ZZZZZZ	1.00	1947																			X						
ZZZZZZ	1.00	1952																			X						
S0-2	1.00	2000																			X						
S20-2	1.00	2005																			X						

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ANALYSIS RUN LOG

Lab Name: NUS Laboratory
Lab Code: Case No.: TNK
Instrument ID Number: MET405
Start Date: 07/18/91

Contract: Tinker AFB
SAS No.: SDG No.: PKG3
Method: F
End Date: 07/18/91

EPA Sample No.	D/F	Time	% R	Analytes																						
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
S50-2	1.00	2010																			X						
S5.0	1.00	2015																			X						
ICV-2	1.00	2020																			X						
ICB-2	1.00	2025																			X						
CRA-2	1.00	2029																			X						
CCV1-2	1.00	2034																			X						
CCB1-2	1.00	2039																			X						
TCCS11	1.00	2044																			X						
TCCS11A	1.00	2049	65.5																		X						
TCCS16	1.00	2054																			X						
TCCS16A	1.00	2059	88.0																		X						
TKCSD5	1.00	2104																			X						
TKCSD5A	1.00	2109	92.0																		X						
CCS12	1.00	2114																			X						
CCS12A	1.00	2119	72.0																		X						
TCCS15	1.00	2124																			X						
TCCS15A	1.00	2129	80.0																		X						
CCV2-2	1.00	2134																			X						
CCB2-2	1.00	2139																			X						
TCCS17	1.00	2144																			X						
TCCS17A	1.00	2149	102.5																		X						
TCCS18	1.00	2154																			X						
TCCS18A	1.00	2159	86.0																		X						
TCCS19	1.00	2204																			X						
TCCS19A	1.00	2209	81.5																		X						
TCCS20	1.00	2214																			X						
TCCS20A	1.00	2219	89.5																		X						
TCCS25	1.00	2224																			X						
TCCS25A	1.00	2229	90.0																		X						
CCV3-2	1.00	2234																			X						
CCB3-2	1.00	2239																			X						
TCCF25	1.00	2244																			X						

14

ANALYSIS RUN LOG

Lab Name: NUS Laboratory
Lab Code: Case No.: TNK
Instrument ID Number: MET405
Start Date: 07/18/91

Contract: Tinker AFB
SAS No.: SDG No.: PKG3
Method: F
End Date: 07/18/91

EPA Sample No.	D/F	Time	% R	Analytes																						
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
TCCF25A	1.00	2249	88.5																		X						
TCCS26	1.00	2254																			X						
TCCS26A	1.00	2258	82.0																		X						
CCV4-2	1.00	2303																			X						
CCB4-2	1.00	2308																			X						

14

ANALYSIS RUN LOG

Lab Name: NUS Laboratory
Lab Code: Case No.: TNK
Instrument ID Number: MET305
Start Date: 07/22/91

Contract: Tinker AFB
SAS No.: SDG No.: PKG3
Method: F
End Date: 07/22/91

EPA Sample No.	D/F	Time	% R	Analytes																							
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
S0	1.00	0810																						X			
S20	1.00	0814																						X			
S50	1.00	0818																						X			
S10	1.00	0822																						X			
ICV	1.00	0826																						X			
ICB	1.00	0830																						X			
CRA	1.00	0834																						X			
PBS	1.00	0838																						X			
PBSA	1.00	0842	94.5																					X			
LCSS	1.00	0846																						X			
LCSSA	2.00	0850	98.2																					X			
TCCS21S	1.00	0854																						X			
TCCS21D	1.00	0858																						X			
TCCS21DA	1.00	0902	87.5																					X			
TCCS21	1.00	0906																						X			
TCCS21A	1.00	0910	86.0																					X			
CCV1	1.00	0914																						X			
CCB1	1.00	0918																						X			
TCCS11	1.00	0922																						X			
TCCS11A	1.00	0926	83.0																					X			
TCCS16	1.00	0930																						X			
TCCS16A	1.00	0934	81.5																					X			
TKCSD5	1.00	0938																						X			
TKCSD5A	1.00	0942	84.5																					X			
TCCS12	1.00	0946																						X			
TCCS12A	1.00	1000	86.0																					X			
TCCS15	1.00	1004																						X			
TCCS15A	1.00	1008	83.5																					X			
CCV2	1.00	1012																						X			
CCB2	1.00	1016																						X			
S0-2	1.00	1020																						X			
S20-2	1.00	1024																						X			

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NUS CORPORATION

INTERNAL CORRESPONDENCE

C-49-9-1-84

TO: PHIL OTTINGER

DATE: SEPTEMBER 6, 1991

FROM: DEB SCHEIB

COPIES: FILE

SUBJECT: DATA VALIDATION - APPENDIX IX ORGANICS (less Herbicides)

TINKER AIR FORCE BASE, PACKAGES #2 & 3

SAMPLES:

TKC-SD01-E0001	TCC-SD20-E0001
TCC-SD06-F0000	TCC-SD11-E0000
TCC-SD06-E0000	TCC-SD16-E0000
	TCC-SD21-E0000

NUS Laboratories analyzed 7 soil samples (including one field duplicate pair) for Appendix IX organic compounds.

The data for these analyses were reviewed according to the Hazardous Waste Remedial Action Program's (HAZWRAP) "Requirements for Quality Control of Analytical Data", and with reference to the EPA "Functional Guidelines for Organic Data Validation". The analyses were conducted under Level C Quality Assurance/Quality Control (QA/QC) criteria, and were evaluated according to the following parameters:

- Data completeness
- Holding times
- * Calibrations
- Laboratory blank analyses
- Surrogate spike recoveries
- Matrix spike/matrix spike duplicate results
- Field duplicate precision
- Pesticide/PCB fraction instrument performance
- Detection limits
- Sample quantitation

The symbol (*) indicates that quality control criteria were not met for this parameter. Problems affecting data usability are discussed below and the attached Table 1 summarizes the validation qualifications.

Volatile Fraction

No problems were noted.

Semivolatile Fraction

The continuing calibration Percent Difference (%D) for 4-amino-

biphenyl exceeded 50%. All results for this compound are nondetects and are qualified as estimated, UJ.

The laboratory could not achieve some continuing calibration responses for aramite and pentachloronitrobenzene. Nondetects for these compounds in the affected samples are rejected, qualified R.

The continuing calibration Percent Differences (%Ds) for several compounds exceeded 50%. Nondetects for the affected compounds in associated samples are qualified as estimated, UJ. The continuing calibration %Ds for several other compounds exceeded 20.5%, but no qualifications are necessary since no positive results are reported for these compounds.

Pesticide/PCB Fraction

The continuing calibration %D for heptachlor epoxide exceeded 50% for the quantitation column. Affected nondetects are rejected, qualified R.

Continuing calibration %Ds for several compounds exceeded the 15% quality control limit for the quantitation column. Nondetects for the affected compounds in associated samples are qualified as estimated, UJ.

The continuing calibration %D for endrin exceeded 20% on the confirmation column. No actions are necessary since all quality control criteria were met for endrin on the quantitation column, and the confirmation of endrin nondetects is not impacted by this noncompliance.

No other problems were noted. Please do not hesitate to contact me if you have any questions regarding this review.

TINKER AIR FORCE BASE
APPENDIX IX ANALYSES

TABLE 1 - RECOMMENDATION SUMMARY

Sample	VOA	BNA	Pest./PCB
TKC-SD01-E0001		J^3	J^2, R^1
TCC-SD06-F0000		$J^{3,4}$	J^2, R^1
TCC-SD06-E0000		J^3	J^2
TCC-SD20-E0001		J^3	$J^{1,4}$, R^1
TCC-SD11-E0000		J^3	$J^{1,4}$, R^1
TCC-SD16-E0000		J^3	$J^{1,4}$, R^1
TCC-SD21-E0000		J^3	J^1, R^1

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

J^1 - Estimate, UJ, nondetect for endosulfan sulfate because of continuing calibration %D > 15% on the quantitation column.

J^2 - Estimate, UJ, nondetects for d-BHC, endrin and methoxychlor because of continuing calibration %D > 15% on the quantitation column.

J^3 - Estimate, UJ, nondetects for 4-aminobiphenyl because of continuing calibration %Ds > 50.

J^4 - Estimate, UJ, nondetects for affected compounds in associated samples because of continuing calibration %Ds > 50.

R^1 - Reject, R, nondetects for heptachlor epoxide because of continuing calibration %Ds > 50 on the quantitation column.

APPENDIX I

QUALIFIED LABORATORY RESULTS

SUPPORT DOCUMENTATION

TINKER PKG 2 / SEMIVOLATILE

7B

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: NUS-LSG Contract:

Lab Code: NUS-LSG Case No.: TNK SAS No.: SDG No.: PKG2

Instrument ID: GCMSA Calibration date: 07/25/91 Time: 948

Lab File ID: ABT07259101 Init. Calib. Date(s): 04/23/91 04/24/91

*Compounds with minimum RRF and maximum %D criteria

TCC - SDCG - FA

COMPOUND	RRF	RRF50	%D
N-Nitrosodimethylamine	0.879	0.810	7.8
Phenol *	2.012	1.653	17.8 *
Aniline	2.147	1.892	11.9
bis(2-Chloroethyl)Ether *	1.545	1.303	15.7 *
2-Chlorophenol *	1.545	1.352	12.5 *
1,3-Dichlorobenzene *	1.592	1.394	12.4 *
1,4-Dichlorobenzene *	1.653	1.436	13.1 *
Benzyl Alcohol	0.881	0.758	14.0
1,2-Dichlorobenzene *	1.493	1.346	9.8 *
2-Methylphenol *	1.361	1.205	11.5 *
bis(2-Chloroisopropyl)Ether	1.608	1.966	-22.3
4-Methylphenol *	1.124	0.992	11.7 *
N-Nitroso-Di-n-Propylamine *	0.884	0.902	-2.0 *
Hexachloroethane *	0.652	0.560	14.1 *
Nitrobenzene *	0.369	0.352	4.6 *
Isophorone *	0.720	0.707	1.8 *
2-Nitrophenol *	0.265	0.241	9.1 *
2,4-Dimethylphenol *	0.326	0.308	5.5 *
bis(2-Chloroethoxy)Methane *	0.465	0.443	4.7 *
2,4-Dichlorophenol *	0.309	0.278	10.0 *
1,2,4-Trichlorobenzene *	0.337	0.319	5.3 *
Naphthalene *	1.042	1.042	0.0 *
4-Chloroaniline	0.464	0.421	9.3
Hexachlorobutadiene	0.174	0.165	5.2
4-Chloro-3-Methylphenol *	0.254	0.250	1.6 *
2-Methylnaphthalene *	0.547	0.520	4.9 *
Hexachlorocyclopentadiene	0.277	0.269	2.9
2,4,6-Trichlorophenol *	0.338	0.344	-1.8 *
2,4,5-Trichlorophenol *	0.377	0.350	7.2 *
2-Chloronaphthalene *	1.449	1.207	16.7 *
2-Nitroaniline	0.296	0.295	0.3
Dimethyl Phthalate	1.190	1.204	-1.2
Acenaphthylene *	1.583	1.598	-0.9 *
2,6-Dinitrotoluene *	0.297	0.276	7.1 *
3-Nitroaniline	0.303	0.275	9.2
Acenaphthene *	1.166	1.016	12.9 *
2,4-Dinitrophenol	0.150	0.107	28.7
4-Nitrophenol	0.076	0.043	43.4

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: NUS-LSG Contract:

Lab Code: NUS-LSG Case No.: TNK SAS No.: SDG No.: PKG2

Instrument ID: GCMSA Calibration date: 07/25/91 Time: 948

Lab File ID: ABT07259101 Init. Calib. Date(s): 04/23/91 04/24/91

*Compounds with minimum RRF and maximum %D criteria

COMPOUND	RRF	RRF50	%D	
Dibenzofuran	1.527	1.396	8.6	*
2,4-Dinitrotoluene	0.319	0.342	-7.2	*
Diethylphthalate	1.046	1.022	2.3	
4-Chlorophenyl-phenylether	0.493	0.549	-11.4	*
Fluorene	1.224	1.176	3.9	*
4-Nitroaniline	0.227	0.213	6.2	
4,6-Dinitro-2-Methylphenol	0.182	0.139	23.6	
N-Nitrosodiphenylamine (1)	0.502	0.589	-17.3	
4-Bromophenyl-phenylether	0.250	0.218	12.8	*
Hexachlorobenzene	0.272	0.253	7.0	*
Pentachlorophenol	0.134	0.173	-29.1	*
Phenanthrene	1.194	1.065	10.8	*
Anthracene	1.002	1.013	-1.1	*
Di-n-Butylphthalate	1.199	1.129	5.8	
Fluoranthene	0.969	0.974	-0.5	*
Pyrene	1.821	1.455	20.1	*
Butylbenzylphthalate	0.771	0.514	33.3	
3,3'-Dichlorobenzidine	0.574	0.411	28.4	
Benzo(a)Anthracene	1.449	1.101	24.0	*
Chrysene	1.265	0.932	26.3	*
bis(2-Ethylhexyl)Phthalate	1.018	0.757	25.6	
Di-n-Octyl Phthalate	1.668	1.372	17.8	
Benzo(b)Fluoranthene	1.387	1.280	7.7	*
Benzo(k)Fluoranthene	1.252	1.218	2.7	*
Benzo(a)Pyrene	1.216	1.142	6.1	*
Indeno(1,2,3-cd)Pyrene	1.085	1.231	-13.5	*
Dibenzo(a,h)Anthracene	0.992	1.102	-11.1	*
Benzo(g,h,i)Perylene	0.909	0.980	-7.8	*
Nitrobenzene-d5	0.401	0.364	9.2	*
2-Fluorobiphenyl	1.446	1.191	17.6	*
Terphenyl-d14	1.731	1.261	27.2	*
Phenol-d5	1.875	1.650	12.0	*
2-Fluorophenol	1.341	1.192	11.1	*
2,4,6-Tribromophenol	0.141	0.190	-34.8	
2,3,4,6-Tetrachlorophenol	0.294	0.252	14.3	
Pyridine, 2-Methyl (2-Picol	0.579	0.729	-25.9	
Methanesulfonic acid, Ethyl	1.060	0.963	9.2	
N-Nitrosopiperidine	0.696	0.883	-26.9	
2,6-Dichlorophenol	0.312	0.287	8.0	

Tic SDG File

N-Nitroso-di-n-butylamine	0.224	0.227	-1.3
Methanesulfonic acid, Methy	0.138	0.243	-76.1
Acetophenone	1.556	1.599	-2.8
A,A-Dimethylphenylamine	0.589	0.572	2.9
Pentachlorobenzene	0.494	0.458	7.3
4-Amino Biphenyl	0.059	0.622	-99.9
P-Dimethylaminoazobenzene	0.521	0.375	28.0
7,12-Dimethyl Benzo(A)Anthr	0.123	0.618	-99.9
1,2,4,5-Tetrachlorobenzene	0.326	0.293	10.1
Diphenylamine	0.502	0.589	-17.3
Phenacetin	0.313	0.240	23.3
3-Methylcholanthrene	0.630	0.668	-6.0
Pronamide	0.253	0.304	-20.2
1,4-Benzenediamine			
Isosafrole			
2-Naphthaleneamine			
5-Nitro-O-Toluidine			
4-Nitroquinoline-1-Oxide			
Methapyrilene			
2-Acetylaminofluorene			
N-Nitrosomethylethylamine			
N-Nitrosodiethylamine			
N-Nitrosopyrrolidine			
N-Nitrosomorpholine			
O-Toluidine			
O,O,O,-Triethylphosphorthio			
Pentachloronitrobenzene	0.042		100.0
Safrole			
1,4-Napthoquinone			
1,3,5-Trinitrobenzene			
Hexachloropropene			
1,3-Dinitrobenzene			
3,3,-Dimethylbenzidine			
Hexachlorophene			
Dimethoate			
Diallate			
Pyridine			
Aramite			
2-Secbutyl-4,6-Dinitropheno			
M-Cresol			

TCC-SDCG-FCC

N-Nitroso-di-n-butylamine			
Methanesulfonic acid, Methy			
Acetophenone			
A,A-Dimethylphenylamine			
Pentachlorobenzene			
4-Amino Biphenyl			
P-Dimethylaminoazobenzene			
7,12-Dimethyl Benzo(A)Anthr			
1,2,4,5-Tetrachlorobenzene			
Diphenylamine			
Phenacetin			
3-Methylcholanthrene			
Pronamide			
1,4-Benzenediamine	0.200	0.120	40.0
Isosafrole	0.402	0.426	-6.0
2-Naphthaleneamine			
5-Nitro-O-Toluidine	0.276	0.271	1.8
4-Nitroquinoline-1-Oxide	0.044	0.038	13.6
Methapyrilene	0.362	0.337	6.9
2-Acetylaminofluorene	0.434	0.444	-2.3
N-Nitrosomethylethylamine	0.546	0.559	-2.4
N-Nitrosodiethylamine	0.596	0.590	1.0
N-Nitrosopyrrolidine	0.639	0.602	5.8
N-Nitrosomorpholine	0.682	0.706	-3.5
O-Toluidine	1.131	1.169	-3.4
O,O,O,-Triethylphosphorthio	0.153	0.178	-16.3
Pentachloronitrobenzene			
Safrole	0.433	0.457	-5.5
1,4-Napthoquinone	0.270	0.401	-48.5
1,3,5-Trinitrobenzene	0.150	0.151	-0.7
Hexachloropropene	0.029	0.033	-13.8
1,3-Dinitrobenzene	0.156	0.159	-1.9
3,3,-Dimethylbenzidine	0.068	0.058	14.7
Hexachlorophene	0.085	0.098	-15.3
Dimethoate	0.266	0.349	-31.2
Diallate	0.340	0.341	-0.3
Pyridine	1.025	1.118	-9.1
Aramite	0.067		100.0
2-Secbutyl-4,6-Dinitropheno	0.195	0.220	-12.8
M-Cresol	1.115	1.042	6.5

TIC - 5004 - F

7B

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: NUS-LSG Contract:

Lab Code: NUS-LSG Case No.: TNK SAS No.: SDG No.: PKG2

Instrument ID: GCMSA Calibration date: 07/26/91 Time: 1138

Lab File ID: ABT07269102 Init. Calib. Date(s): 04/23/91 04/24/91

*Compounds with minimum RRF and maximum %D criteria

COMPOUND	RRF	RRF50	%D	
N-Nitrosodimethylamine	0.879	0.808	8.1	
Phenol	2.012	1.706	15.2	*
Aniline	2.147	1.924	10.4	
bis(2-Chloroethyl)Ether	1.545	1.307	15.4	*
2-Chlorophenol	1.545	1.368	11.5	*
1,3-Dichlorobenzene	1.592	1.410	11.4	*
1,4-Dichlorobenzene	1.653	1.432	13.4	*
Benzyl Alcohol	0.881	0.773	12.3	
1,2-Dichlorobenzene	1.493	1.348	9.7	*
2-Methylphenol	1.361	1.216	10.6	*
bis(2-Chloroisopropyl)Ether	1.608	1.969	-22.4	
4-Methylphenol	1.124	0.985	12.4	*
N-Nitroso-Di-n-Propylamine	0.884	0.911	-3.1	*
Hexachloroethane	0.652	0.556	14.7	*
Nitrobenzene	0.369	0.344	6.8	*
Isophorone	0.720	0.684	5.0	*
2-Nitrophenol	0.265	0.238	10.2	*
2,4-Dimethylphenol	0.326	0.303	7.1	*
bis(2-Chloroethoxy)Methane	0.465	0.446	4.1	*
2,4-Dichlorophenol	0.309	0.287	7.1	*
1,2,4-Trichlorobenzene	0.337	0.313	7.1	*
Naphthalene	1.042	1.045	-0.3	*
4-Chloroaniline	0.464	0.410	11.6	
Hexachlorobutadiene	0.174	0.158	9.2	
4-Chloro-3-Methylphenol	0.254	0.252	0.8	*
2-Methylnaphthalene	0.547	0.521	4.8	*
Hexachlorocyclopentadiene	0.277	0.272	1.8	
2,4,6-Trichlorophenol	0.338	0.343	-1.5	*
2,4,5-Trichlorophenol	0.377	0.350	7.2	*
2-Chloronaphthalene	1.449	1.216	16.1	*
2-Nitroaniline	0.296	0.295	0.3	
Dimethyl Phthalate	1.190	1.188	0.2	
Acenaphthylene	1.583	1.606	-1.5	*
2,6-Dinitrotoluene	0.297	0.272	8.4	*
3-Nitroaniline	0.303	0.269	11.2	
Acenaphthene	1.166	1.016	12.9	*
2,4-Dinitrophenol	0.150	0.101	32.7	
4-Nitrophenol	0.076	0.036	52.6	

TRC-5001-E0000
TCC-5006-E0

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: NUS-LSG Contract:

Lab Code: NUS-LSG Case No.: TNK SAS No.: SDG No.: PKG2

Instrument ID: GCMSA Calibration date: 07/26/91 Time: 1138

Lab File ID: ABT07269102 Init. Calib. Date(s): 04/23/91 04/24/91

*Compounds with minimum RRF and maximum %D criteria

COMPOUND		RRF	RRF50	%D	
Dibenzofuran	*	1.527	1.410	7.7	*
2,4-Dinitrotoluene	*	0.319	0.333	-4.4	*
Diethylphthalate		1.046	1.008	3.6	
4-Chlorophenyl-phenylether	*	0.493	0.543	-10.1	*
Fluorene	*	1.224	1.189	2.9	*
4-Nitroaniline		0.227	0.200	11.9	
4,6-Dinitro-2-Methylphenol		0.182	0.134	26.4	
N-Nitrosodiphenylamine (1)		0.502	0.606	-20.7	
4-Bromophenyl-phenylether	*	0.250	0.222	11.2	*
Hexachlorobenzene	*	0.272	0.255	6.2	*
Pentachlorophenol	*	0.134	0.170	26.9	*
Phenanthrene	*	1.194	1.062	11.1	*
Anthracene	*	1.002	1.013	-1.1	*
Di-n-Butylphthalate		1.199	1.064	11.3	
Fluoranthene	*	0.969	0.914	5.7	*
Pyrene	*	1.821	1.409	22.6	*
Butylbenzylphthalate		0.771	0.538	30.2	
3,3'-Dichlorobenzidine		0.574	0.412	28.2	
Benzo(a)Anthracene	*	1.449	1.117	22.9	*
Chrysene	*	1.265	0.978	22.7	*
bis(2-Ethylhexyl)Phthalate		1.018	0.823	19.2	
Di-n-Octyl Phthalate		1.668	1.455	12.8	
Benzo(b)Fluoranthene	*	1.387	1.235	11.0	*
Benzo(k)Fluoranthene	*	1.252	1.277	-2.0	*
Benzo(a)Pyrene	*	1.216	1.150	5.4	*
Indeno(1,2,3-cd)Pyrene	*	1.085	1.195	-10.1	*
Dibenzo(a,h)Anthracene	*	0.992	1.107	-11.6	*
Benzo(g,h,i)Perylene	*	0.909	0.980	-7.8	*
Nitrobenzene-d5	*	0.401	0.364	9.2	*
2-Fluorobiphenyl	*	1.446	1.183	18.2	*
Terphenyl-d14	*	1.731	1.299	25.0	*
Phenol-d5	*	1.875	1.694	9.7	*
2-Fluorophenol	*	1.341	1.226	8.6	*
2,4,6-Tribromophenol		0.141	0.183	-29.8	
2,3,4,6-Tetrachlorophenol		0.294	0.250	15.0	
Pyridine, 2-Methyl (2-Picol		0.579	0.704	-21.6	
Methanesulfonic acid, Ethyl		1.060	0.984	7.2	
N-Nitrosopiperidine		0.696	0.893	-28.3	
2,6-Dichlorophenol		0.312	0.292	6.4	

TRC SOLI EOOO
TCC SOOO - EOOO

N-Nitroso-di-n-butylamine	0.224	0.225	-0.4
Methanesulfonic acid, Methy	0.138	0.245	-77.5
Acetophenone	1.556	1.618	-4.0
A,A-Dimethylphenylamine	0.589	0.660	-12.0
Pentachlorobenzene	0.494	0.457	7.5
4-Amino Biphenyl	0.059	0.500	-99.9
P-Dimethylaminoazobenzene	0.521	0.380	27.1
7,12-Dimethyl Benzo(A)Anthr	0.123	0.627	-99.9
1,2,4,5-Tetrachlorobenzene	0.326	0.293	10.1
Diphenylamine	0.502	0.606	-20.7
Phenacetin	0.313	0.222	29.1
3-Methylcholanthrene	0.630	0.652	-3.5
Pronamide	0.253	0.285	-12.6
1,4-Benzenediamine			
Isosafrole			
2-Naphthaleneamine		0.820	-99.9
5-Nitro-O-Toluidine			
4-Nitroquinoline-1-Oxide			
Methapyrilene			
2-Acetylaminofluorene			
N-Nitrosomethylethylamine			
N-Nitrosodiethylamine			
N-Nitrosopyrrolidine			
N-Nitrosomorpholine			
O-Toluidine			
O,O,O,-Triethylphosphorthio			
Pentachloronitrobenzene	0.042		100.0
Safrole			
1,4-Napthoquinone			
1,3,5-Trinitrobenzene			
Hexachloropropene			
1,3-Dinitrobenzene			
3,3,-Dimethylbenzidine			
Hexachlorophene			
Dimethoate			
Diallate			
Pyridine			
Aramite			
2-Secbutyl-4,6-Dinitropheno			
M-Cresol			

TKC-5001-F0000
TCC-5000-F0

N-Nitroso-di-n-butylamine			
Methanesulfonic acid, Methy			
Acetophenone			
A,A-Dimethylphenylamine			
Pentachlorobenzene			
4-Amino Biphenyl			
P-Dimethylaminoazobenzene			
7,12-Dimethyl Benzo(A)Anthr			
1,2,4,5-Tetrachlorobenzene			
Diphenylamine			
Phenacetin			
3-Methylcholanthrene			
Pronamide			
1,4-Benzenediamine	0.200	0.146	27.0
Isosafrole	0.402	0.426	-6.0
2-Naphthaleneamine			
5-Nitro-O-Toluidine	0.276	0.252	8.7
4-Nitroquinoline-1-Oxide	0.044	0.041	6.8
Methapyrilene	0.362	0.223	38.4
2-Acetylaminofluorene	0.434	0.428	1.4
N-Nitrosomethylethylamine	0.546	0.542	0.7
N-Nitrosodiethylamine	0.596	0.596	0.0
N-Nitrosopyrrolidine	0.639	0.627	1.9
N-Nitrosomorpholine	0.682	0.728	-6.7
O-Toluidine	1.131	1.183	-4.6
O,O,O,-Triethylphosphorthio	0.153	0.177	-15.7
Pentachloronitrobenzene			
Safrole	0.433	0.451	-4.2
1,4-Napthoquinone	0.270	0.398	-47.4
1,3,5-Trinitrobenzene	0.150	0.141	6.0
Hexachloropropene	0.029	0.032	-10.3
1,3-Dinitrobenzene	0.156	0.155	0.6
3,3,-Dimethylbenzidine	0.068	0.096	-41.2
Hexachlorophene	0.085	0.101	-18.8
Dimethoate	0.266	0.326	-22.6
Diallate	0.340	0.361	-6.2
Pyridine	1.025	1.110	-8.3
Aramite	0.067	0.096	-43.3
2-Secbutyl-4,6-Dinitropheno	0.195	0.203	-4.1
M-Cresol	1.115	1.096	1.7

5B

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

Lab Name: NUS-LSG Contract:

Lab Code: NUS-LSG Case No.: TNK SAS No.: SDG No.: PKG2

Lab File ID: ADF07259101 DFTPP Injection Date: 07/25/91

Instrument ID: GCMSA DFTPP Injection Time: 0926

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	37.5
68	Less than 2.0% of mass 69	0.0 (0.0)1
69	Mass 69 relative abundance	44.0
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	100.0
199	5.0 to 9.0% of mass 198	6.2
275	10.0 - 30.0% of mass 198	22.9
365	Greater than 1.00% of mass 198	1.35
441	Present, but less than mass 443	8.1
442	Greater than 40.0% of mass 198	65.9
443	17.0 - 23.0% of mass 442	12.3 (18.7)2

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

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

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD050	SSTD050	ABT07259101	07/25/91	948
02	SSTD050	SSTD050	ABT07259102	07/25/91	1033
03	SBLKAS	SBLKAS	ABB07259103	07/25/91	2039
04	TCCSD06F0000	P167564	ABP07259110	07/25/91	2124

FORM V SV 1/87 Rev.

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

Lab Name: NUS-LSG Contract:

ab Code: NUS-LSG Case No.: TNK SAS No.: SDG No.: PKG3

Lab File ID: ADF07269101 DFTPP Injection Date: 07/26/91

Instrument ID: GCMSA DFTPP Injection Time: 1025

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	39.5
68	Less than 2.0% of mass 69	0.0 (0.0)1
69	Mass 69 relative abundance	43.7
70	Less than 2.0% of mass 69	0.0 (0.0)1
127	40.0 - 60.0% of mass 198	44.7
197	Less than 1.0% of mass 198	0.0
198	Base peak, 100% relative abundance	100.0
199	5.0 to 9.0% of mass 198	5.9
275	10.0 - 30.0% of mass 198	23.1
365	Greater than 1.00% of mass 198	1.61
441	Present, but less than mass 443	8.2
442	Greater than 40.0% of mass 198	66.7
443	17.0 - 23.0% of mass 442	12.6 (18.9)2

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

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

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD050	SSTD050	ABT07269102	07/26/91	1138
02	SSTD050	SSTD050	ABT07269103	07/26/91	1242
03	TKCSD11E0000	P167638	ABP07269102	07/26/91	1504
04	TCCSD16E0000	P167641	ABP07269103	07/26/91	1549
05	TCCSD20E0000	P167645	ABP07269104	07/26/91	1635

FORM V SV 1/87 Rev.

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

Lab Name: NUS-LSG Contract:

Lab Code: NUS-LSG Case No.: TNK SAS No.: SDG No.: PKG2

Lab File ID: ADF07269101 DFTPP Injection Date: 07/26/91

Instrument ID: GCMSA DFTPP Injection Time: 1025

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	39.5
68	Less than 2.0% of mass 69	0.0 (0.0)1
69	Mass 69 relative abundance	43.7
70	Less than 2.0% of mass 69	0.0 (0.0)1
127	40.0 - 60.0% of mass 198	44.7
197	Less than 1.0% of mass 198	0.0
198	Base peak, 100% relative abundance	100.0
199	5.0 to 9.0% of mass 198	5.9
275	10.0 - 30.0% of mass 198	23.1
365	Greater than 1.00% of mass 198	1.61
441	Present, but less than mass 443	8.2
442	Greater than 40.0% of mass 198	66.7
443	17.0 - 23.0% of mass 442	12.6 (18.9)2

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

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

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD050	SSTD050	ABT07269102	07/26/91	1138
02	SSTD050	SSTD050	ABT07269103	07/26/91	1242
03	SBLKAT	SBLKAT	ABB07269101	07/26/91	1332
04	TKCSD01E0000	P167566	ABP07269101	07/26/91	1418
05	TCCSD06E0000	P167563	ABP07269105	07/26/91	1720
06	TCCSD06Y0000	P167563MS	ABP07269106	07/26/91	1805
07	TCCSD06X0000	P167563MSD	ABP07269107	07/26/91	1850

FORM V SV 1/87 Rev.

2,6-Dichlorophenol	0.288	0.293	0.322	0.331	0.326	0.312	6.4
N-Nitroso-di-n-butylamine	0.224	0.218	0.231	0.228	0.217	0.224	2.7
Methanesulfonic acid, Methy	0.129	0.132	0.139	0.147	0.143	0.138	5.4
Acetophenone	1.512	1.498	1.565	1.606	1.600	1.556	3.2
A,A-Dimethylphenylamine	0.574	0.617	0.692	0.622	0.442	0.589	15.7
Pentachlorobenzene	0.456	0.473	0.490	0.516	0.533	0.494	6.3
4-Amino Biphenyl	0.030	0.041	0.056	0.076	0.090	0.059	41.3
P-Dimethylaminoazobenzene	0.604	0.556	0.504	0.476	0.464	0.521	11.2
7,12-Dimethyl Benzo(A)Anthr	0.113	0.111	0.115	0.133	0.143	0.123	11.6
1,2,4,5-Tetrachlorobenzene	0.299	0.307	0.329	0.344	0.350	0.326	6.9
Diphenylamine	0.448	0.485	0.519	0.531	0.526	0.502	7.0
Phenacetin	0.268	0.305	0.309	0.332	0.349	0.313	9.8
3-Methylcholanthrene	0.584	0.617	0.614	0.650	0.684	0.630	6.1
Pronamide	0.245	0.251	0.253	0.250	0.264	0.253	2.8
1,4-Benzenediamine							
Isosafrole							
2-Naphthaleneamine							
5-Nitro-O-Toluidine							
4-Nitroquinoline-1-Oxide							
Methapyrilene							
2-Acetylaminofluorene							
N-Nitrosomethylethylamine							
N-Nitrosodiethylamine							
N-Nitrosopyrrolidine							
N-Nitrosomorpholine							
O-Toluidine							
O,O,O,-Triethylphosphorthio							
Pentachloronitrobenzene	0.041	0.044	0.042	0.044	0.041	0.042	3.6
Safrole							
1,4-Napthoquinone							
1,3,5-Trinitrobenzene							
Hexachloropropene							
1,3-Dinitrobenzene							
3,3,-Dimethylbenzidine							
Hexachlorophene							
Dimethoate							
Diallate							
Pyridine							
Aramite							
2-Secbutyl-4,6-Dinitropheno							
M-Cresol							

(1) Cannot be separated from Diphenylamine

PESTICIDE/PCB STANDARDS SUMMARY

Lab Name: NUS-LSG Contract:

Lab Code: NUS Case No.: TNK SAS No.: SDG No.: PKG2

Instrument ID: VA3700_3 GC Column ID: SP2250

DATE(S) OF ANALYSIS	FROM: 07/24/91 TO: 07/24/91	DATE OF ANALYSIS 07/25/91
TIME(S) OF ANALYSIS	FROM: 2003 TO: 2152	TIME OF ANALYSIS 0207
		EPA SAMPLE NO. (STANDARD) INDB

COMPOUND	RT	RT WINDOW FROM	RT WINDOW TO	CALIBRATION FACTOR	RT	CALIBRATION FACTOR	QNT Y/N	%D
alpha-BHC	1.40	1.34	1.46	86.0	1.38	92.6	N	-7.7
beta-BHC	2.17	2.11	2.23	30.4	2.13	33.5	N	-10.2
delta-BHC	2.53	2.44	2.62	78.6	2.50	84.2	N	-7.1
gamma-BHC	1.82	1.74	1.90	89.4				
Heptachlor	2.25	2.16	2.34	60.4				
Aldrin	2.75	2.65	2.85	84.7				
Hept. epoxide	4.35	4.18	4.52	73.9				
Endosulfan I	5.55	5.35	5.75	107				
Dieldrin	6.90	6.65	7.15	80.4				
4,4'-DDE	6.63	6.44	6.82	71.7	6.55	77.5	N	-8.1
Endrin	8.45	8.23	8.67	38.4	8.37	47.9	N	[illegible]
Endosulfan II	10.52	10.17	10.87	75.2				
4,4'-DDD	10.52	10.22	10.82	57.2	10.40	60.5	N	-5.8
Endo. sulfate	17.25	16.87	17.63	39.2	17.02	42.5	N	-8.4
4,4'-DDT	12.78	12.37	13.19	90.8				
Methoxychlor	26.18	25.41	26.95	16.3				
Endrin ketone								
a. Chlordane	5.35	5.33	5.37	73.3	5.28	79.9	N	-9.0
g. Chlordane	4.87	4.85	4.89	72.6	4.80	77.6	N	-6.5
Toxaphene								
Aroclor-1016	2.25	2.22	2.28	30.9				
Aroclor-1221								
Aroclor-1232								
Aroclor-1242								
Aroclor-1248								
Aroclor-1254								
Aroclor-1260	12.37	12.05	12.69	31.1				

Under QNT Y/N: enter Y if quantitation was performed, N if not performed.
%D must be less than or equal to 15.0% for quantitiation. and less than or equal to 20.0% for confirmation.

Note: Determining that no compounds were found above the CRDL is a form of quantitation, and therefore at least one column must meet the 15.0% criteria.

For multicomponent analytes, the single largest peak that is characteris of the component should be used to establish retention time and %D. Identification of such analytes is based primarily on pattern recognition.

FORM IX PEST 8/87 Rev.

BE

PESTICIDE EVALUATION STANDARDS SUMMARY

Evaluation of Retention Time Shift for Dibutylchlorendate

ab Name: NUS-LSG Contract: _____

Lab Code: NUS Case No.: TNK SAS No.: _____ SDG No.: PKG2

Instrument ID: VA3700 3 GC Column ID: SP2250

Dates of Analyses: 07/24/91 to 07/25/91

	EPA SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED	TIME ANALYZED	% D	*
01	EVALA	4-310-90-13	07/24/91	1642	0.0	
02	EVALB	7-310-90-12	07/24/91	1718	-0.2	
03	EVALC	6-310-90-13	07/24/91	1757	-0.3	
04	INDA	2-310-90-63	07/24/91	2003	0.1	
05	INDB	4-310-90-64	07/24/91	2039	0.3	
06	AR1660	1-310-90-73	07/24/91	2152	0.3	
07	PBLKT2	PBLKT2	07/24/91	2305	1.0	
08	TKCSD01E0000	P167566	07/24/91	2342	1.3	
09	EVALB	7-310-90-12	07/25/91	0055	1.3	
10	INDA	2-310-90-63	07/25/91	0131	1.7	
11	INDB	4-310-90-64	07/25/91	0207	1.7	

* Values outside of QC limits (2.0% for packed columns, 0.3% for capillary columns)

FORM VIII PEST-2 1/87 Rev.

BE

PESTICIDE EVALUATION STANDARDS SUMMARY

Evaluation of Retention Time Shift for Dibutylchlorendate

Name: NUS-LSG Contract: _____

Code: NUS Case No.: TNK SAS No.: _____ SDG No.: PKG2

Instrument ID: VA3700 2 GC Column ID: DB608

Date of Analyses: 07/17/91 to 07/18/91

	EPA SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED	TIME ANALYZED	% D	*
01	EVALA	4-310-90-13	07/17/91	1007	0.0	
02	EVALB	7-310-90-12	07/17/91	1040	-0.1	
03	EVALC	6-310-90-13	07/17/91	1203	-0.2	
04	INDA	2-310-90-63	07/17/91	1245	-0.3	
05	INDB	1-310-90-65	07/17/91	1317	-0.3	
06	TOXAPH	4-310-90-37	07/17/91	1420	-0.6	
07	AR1660	1-310-90-73	07/17/91	1600	-0.5	
08	AR1221	8-310-90-23	07/17/91	1714	-0.7	
09	AR1232	8-310-90-21	07/17/91	1746	-0.7	
10	AR1242	3-310-90-57	07/17/91	1817	-0.7	
11	AR1248	2-310-90-17	07/17/91	1849	-0.5	
12	AR1254	4-310-90-19	07/17/91	1920	-0.6	
13	ZZZZZ	PBLKT1	07/17/91	2023	-0.4	
14	ZZZZZ	P167561	07/17/91	2055	-0.3	
15	ZZZZZ	P167572	07/17/91	2126	-0.2	
16	ZZZZZ	P167573MSD	07/17/91	2158	0.1	
17	ZZZZZ	P167573MS	07/17/91	2229	0.2	
18	EVALB	7-310-90-12	07/17/91	2332	0.4	
19	ZZZZZ	P167573	07/18/91	0003	0.4	
20	ZZZZZ	P167577	07/18/91	0106	0.5	
21	PBLKT2	PBLKT2	07/18/91	0209	0.6	
22	TCCSD06E0000	P167563	07/18/91	0241	0.6	
23	TCCSD06F0000	P167564	07/18/91	0312	0.7	
24	INDA	2-310-90-63	07/18/91	0942	0.0	
25	INDB	1-310-90-65	07/18/91	1014	-0.1	

* Values outside of QC limits (2.0% for packed columns, 0.3% for capillary columns)

FORM VIII PEST-2 1/87 Rev.

PESTICIDE/PCB STANDARDS SUMMARY

Lab Name: NUS-LSG Contract: _____

Lab Code: NUS Case No.: TNK SAS No.: _____ SDG No.: PKG2

Instrument ID: VA3700 2 GC Column ID: DB608

DATE(S) OF ANALYSIS	FROM: 07/17/91	TO: 07/17/91
TIME(S) OF ANALYSIS	FROM: 1245	TO: 1920
DATE OF ANALYSIS	07/18/91	
TIME OF ANALYSIS	0942	
EPA SAMPLE NO. (STANDARD)	INDA	

COMPOUND	RT	RT WINDOW FROM	RT WINDOW TO	CALIBRATION FACTOR	RT	CALIBRATION FACTOR	QNT Y/N	%D
alpha-BHC	5.78	5.66	5.90	153				
beta-BHC	7.54	7.51	7.57	56.2				
delta-BHC	9.01	8.99	9.03	142				
gamma-BHC	7.30	7.22	7.38	166	7.24	189	N	-13.9
Heptachlor	8.54	8.50	8.58	136	8.50	160	N	-17.6
Aldrin	9.82	9.77	9.87	148	9.74	167	N	-12.8
Hept. epoxide	12.07	12.03	12.11	124	11.98	146	N	-17.7
Endosulfan I	13.38	13.28	13.48	175	13.34	200	N	-14.3
Dieldrin	14.57	14.52	14.62	121	14.53	143	N	-18.2
4,4'-DDE	14.42	14.38	14.46	123				
Endrin	15.93	15.92	15.94	63.1				
Endosulfan II	16.62	16.57	16.67	110	16.61	130	N	-18.2
4,4'-DDD	16.52	16.48	16.56	99.4				
Endo. sulfate	18.34	18.29	18.39	113				
4,4'-DDT	17.61	17.58	17.64	113	17.57	129	N	-14.2
Methoxychlor	21.74	21.66	21.82	40.9	21.67	52.4	N	-28.1
Endrin ketone	21.98	21.92	22.04	116				
a. Chlordane	13.28	13.26	13.30	130				
g. Chlordane	12.68	12.60	12.76	131				
Toxaphene	16.73	16.71	16.75	27.6				
Aroclor-1016	8.71	8.69	8.73	22.3				
Aroclor-1221	5.69	5.65	5.73	3.78				
Aroclor-1232	8.63	8.62	8.64	10.9				
Aroclor-1242	8.66	8.64	8.68	24.5				
Aroclor-1248	12.45	12.43	12.47	37.7				
Aroclor-1254	14.99	14.97	15.01	62.5				
Aroclor-1260	16.03	15.97	16.09	58.2				

SAMPLES AFFECTED
TCC - SD06 - E0000
TCC SD06 - F0000
UJ methoxychlor

Under QNT Y/N: enter Y if quantitation was performed. N if not performed.
%D must be less than or equal to 15.0% for quantitiation, and less than or equal to 20.0% for confirmation.

Note: Determining that no compounds were found above the CRDL is a form of quantitation, and therefore at least one column must meet the 15.0% criteria.

For multicomponent analytes, the single largest peak that is characteristic of the component should be used to establish retention time and %D. Identification of such analytes is based primarily on pattern recognition.

FORM IX PEST 8/87 Rev.

PESTICIDE/PCB STANDARDS SUMMARY

Lab Name: NUS-LSG Contract: _____

Lab Code: NUS Case No.: TNK SAS No.: _____ SDG No.: PKG2

Instrument ID: VA3700 2 GC Column ID: DB608

DATE(S) OF ANALYSIS FROM: 07/17/91 TO: 07/17/91
TIME(S) OF ANALYSIS FROM: 1245 TO: 1920

DATE OF ANALYSIS 07/18/91
TIME OF ANALYSIS 1014
EPA SAMPLE NO. (STANDARD) INDB

COMPOUND	RT	RT WINDOW FROM	RT WINDOW TO	CALIBRATION FACTOR	RT	CALIBRATION FACTOR	QNT Y/N	%D
alpha-BHC	5.78	5.66	5.90	153	5.76	183	N	-19.6
beta-BHC	7.54	7.51	7.57	56.2	7.49	67.6	N	-20.3
delta-BHC	9.01	8.99	9.03	142	8.93	174	N	-22.5
gamma-BHC	7.30	7.22	7.38	166				
Heptachlor	8.54	8.50	8.58	136				
Aldrin	9.82	9.77	9.87	148				
Hept. epoxide	12.07	12.03	12.11	124				
Endosulfan I	13.38	13.28	13.48	175				
Dieldrin	14.57	14.52	14.62	121				
4,4'-DDE	14.42	14.38	14.46	123	14.33	139	N	-13.0
Endrin	15.93	15.92	15.94	63.1	15.86	105	N	-[illegible]
Endosulfan II	16.62	16.57	16.67	110				
4,4'-DDD	16.52	16.48	16.56	99.4	16.48	119	N	-19.7
Endo. sulfate	18.34	18.29	18.39	113	18.32	134	N	-18.6
4,4'-DDT	17.61	17.58	17.64	113				
Methoxychlor	21.74	21.66	21.82	40.9				
Endrin ketone	21.98	21.92	22.04	116	21.91	133	N	-14.7
a. Chlordane	13.28	13.26	13.30	130	13.26	148	N	-13.8
g. Chlordane	12.68	12.60	12.76	131	12.60	151	N	-15.3
Toxaphene	16.73	16.71	16.75	27.6				
Aroclor-1016	8.71	8.69	8.73	22.3				
Aroclor-1221	5.69	5.65	5.73	3.78				
Aroclor-1232	8.63	8.62	8.64	10.9				
Aroclor-1242	8.66	8.64	8.68	24.5				
Aroclor-1248	12.45	12.43	12.47	37.7				
Aroclor-1254	14.99	14.97	15.01	62.5				
Aroclor-1260	16.03	15.97	16.09	58.2				

SAMPLES AFFECTED
TCC-5006-E0000
TCC-5006-F0000

UJ delta
UJ endrin

Under QNT Y/N: enter Y if quantitation was performed. N if not performed.
%D must be less than or equal to 15.0% for quantitiation, and less than or equal to 20.0% for confirmation.

Note: Determining that no compounds were found above the CRDL is a form of quantitation, and therefore at least one column must meet the 15.0% criteria.

For multicomponent analytes, the single largest peak that is characteris of the component should be used to establish retention time and %D. Identification of such analytes is based primarily on pattern recognition.

PKG 3

PESTICIDE/PCB STANDARDS SUMMARY

Lab Name: NUS-LSG Contract: _____

Lab Code: NUS Case No.: TNK SAS No.: _____ SDG No.: PKG3

Instrument ID: VA3700 2 GC Column ID: DB608

DATE(S) OF ANALYSIS FROM: 07/22/91 TO: 07/22/91
TIME(S) OF ANALYSIS FROM: 1312 TO: 1826

DATE OF ANALYSIS 07/23/91
TIME OF ANALYSIS 0630
EPA SAMPLE NO. (STANDARD) INDB

COMPOUND	RT	RT WINDOW FROM	RT WINDOW TO	CALIBRATION FACTOR	RT	CALIBRATION FACTOR	QNT Y/N	%D
alpha-BHC	5.73	5.61	5.85	187	5.55	197	N	-5.3
beta-BHC	7.48	7.45	7.51	61.8	7.30	69.3	N	-12.1
delta-BHC	8.91	8.89	8.93	181	8.72	198	N	-9.4
gamma-BHC	7.20	7.12	7.28	187				
Heptachlor	8.44	8.40	8.48	167				
Aldrin	9.72	9.67	9.77	166	9.52	179	N	-7.8
Hept. epoxide	11.96	11.92	12.00	146				
Endosulfan I	13.28	13.18	13.38	199				
Dieldrin	14.44	14.39	14.49	137				
4,4'-DDE	14.32	14.28	14.36	132	14.12	157	N	-18.9
Endrin	15.82	15.81	15.83	86.0	15.63	124	N	-44.2
Endosulfan II	16.52	16.47	16.57	125				
4,4'-DDD	16.42	16.38	16.46	102	16.22	115	N	-12.8
Endo. sulfate	18.28	18.23	18.33	132	18.03	72.6	N	45.0
4,4'-DDT	17.51	17.48	17.54	129				
Methoxychlor	21.58	21.50	21.66	50.0				
Endrin ketone	21.80	21.74	21.86	132	21.48	140	N	-6.1
a. Chlordane	13.19	13.17	13.21	140	13.00	154	N	-10.0
g. Chlordane	12.57	12.49	12.65	146	12.38	158	N	-8.2
Toxaphene	16.62	16.60	16.64	73.1				
Aroclor-1016	8.54	8.52	8.56	21.8				
Aroclor-1221	5.62	5.58	5.66	4.09				
Aroclor-1232	8.62	8.61	8.63	10.2				
Aroclor-1242	8.60	8.58	8.62	25.4				
Aroclor-1248	12.38	12.36	12.40	38.5				
Aroclor-1254	14.93	14.91	14.95	59.1				
Aroclor-1260	15.92	15.86	15.98	55.1				

SAMPLES ATTACHED
TCC + SD11 - E0000
TCC + SD16 - E0000
TCC + SD21 - E0000

Under QNT Y/N: enter Y if quantitation was performed, N if not performed.
%D must be less than or equal to 15.0% for quantitiation, and less than or equal to 20.0% for confirmation.

Note: Determining that no compounds were found above the CRDL is a form of quantitation, and therefore at least one column must meet the 15.0% criteria

For multicomponent analytes, the single largest peak that is characteristic of the component should be used to establish retention time and %D. Identification of such analytes is based primarily on pattern recognition.

PESTICIDE/PCB STANDARDS SUMMARY

: NUS-LSG Contract: _____

: NUS Case No.: TNK SAS No.: _____ SDG No.: PKG3

ent ID: VA3700 2 GC Column ID: DB608

DATE(S) OF ANALYSIS	FROM: 07/22/91	TO: 07/22/91
TIME(S) OF ANALYSIS	FROM: 1312	TO: 1826

DATE OF ANALYSIS 07/23/91
TIME OF ANALYSIS 0558
EPA SAMPLE NO. (STANDARD) INDA

OUND	RT	RT WINDOW FROM	RT WINDOW TO	CALIBRATION FACTOR	RT	CALIBRATION FACTOR	QNT Y/N	%D
BHC	5.73	5.61	5.85	187				
HC	7.48	7.45	7.51	61.8				
BHC	8.91	8.89	8.93	181				
BHC	7.20	7.12	7.28	187	7.00	200	N	-7.0
lor	8.44	8.40	8.48	167	8.23	175	N	-4.8
	9.72	9.67	9.77	166	9.51	179	N	-7.8
epoxide	11.96	11.92	12.00	146	11.70	20.4	N	86.0
fan I	13.28	13.18	13.38	199	13.07	208	N	-4.5
n	14.44	14.39	14.49	137	14.25	150	N	-9.5
E	14.32	14.28	14.36	132				
	15.82	15.81	15.83	86.0				
fan II	16.52	16.47	16.57	125	16.32	133	N	-
D	16.42	16.38	16.46	102				
sulfate	18.28	18.23	18.33	132				
T	17.51	17.48	17.54	129	17.32	134	N	-3.9
chlor	21.58	21.50	21.66	50.0	21.30	54.4	N	-8.8
ketone	21.80	21.74	21.86	132				
ordane	13.19	13.17	13.21	140				
ordane	12.57	12.49	12.65	146				
ene	16.62	16.60	16.64	73.1				
-1016	8.54	8.52	8.56	21.8				
-1221	5.62	5.58	5.66	4.09				
-1232	8.62	8.61	8.63	10.2				
-1242	8.60	8.58	8.62	25.4				
-1248	12.38	12.36	12.40	38.5				
-1254	14.93	14.91	14.95	59.1				
-1260	15.92	15.86	15.98	55.1				

SAMPLES AFFECTED
TCC - SD11 - E0000
TCC - SD16 - E0000
TCC - SD21 - E0000

T Y/N: enter Y if quantitation was performed, N if not performed.
be less than or equal to 15.0% for quantitiation, and less than
to 20.0% for confirmation.

Determining that no compounds were found above the CRDL is a form of
stion, and therefore at least one column must meet the 15.0% criteria.

ticomponent analytes, the single largest peak that is characterist
component should be used to establish retention time and %D.
ication of such analytes is based primarily on pattern recognition.

FORM IX PEST 8/87 Rev.

8E

PESTICIDE EVALUATION STANDARDS SUMMARY

Evaluation of Retention Time Shift for Dibutylchlorendate

Lab Name: NUS-LSG Contract: _____

Lab Code: NUS Case No.: TNK SAS No.: _____ SDG No.: PKG3

Instrument ID: VA3700 2 GC Column ID: DB608

Dates of Analyses: 07/22/91 to 07/23/91

	EPA SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED	TIME ANALYZED	% D	*
01	EVALA	4-310-90-13	07/22/91	0952	0.0	
02	EVALB	7-310-90-12	07/22/91	1201	-0.5	
03	EVALC	6-310-90-13	07/22/91	1232	-0.4	
04	INDA	2-310-90-63	07/22/91	1312	-0.6	
05	INDB	4-310-90-64	07/22/91	1343	-0.6	
06	TOXAPH	4-310-90-37	07/22/91	1446	-0.8	
07	AR1660	1-310-90-73	07/22/91	1517	0.8	
08	AR1221	8-310-90-23	07/22/91	1620	-1.0	
09	AR1232	8-310-90-21	07/22/91	1652	-1.1	
10	AR1242	3-310-90-57	07/22/91	1723	-1.1	
11	AR1248	2-310-90-17	07/22/91	1755	-1.0	
12	AR1254	4-310-90-19	07/22/91	1826	-1.0	
13	ZZZZZ	P167566RE	07/22/91	1929	-0.8	
14	TCCSD11E0000	P167638	07/22/91	2032	-0.6	
15	TCCSD16E0000	P167641	07/22/91	2135	-0.4	
16	TCCSD21E0000	P167646	07/22/91	2206	-0.3	
17	PBLKT5	PBLKT5	07/22/91	2309	-0.1	
18	EVALB	7-310-90-12	07/22/91	2341	0.0	
19	INDA	2-310-90-63	07/23/91	0558	0.5	
20	INDB	4-310-90-64	07/23/91	~~0630~~	0.5	

* Values outside of QC limits (2.0% for packed columns, 0.3% for capillary columns)

FORM VIII PEST-2 1/87 Rev.

8E

PESTICIDE EVALUATION STANDARDS SUMMARY

Evaluation of Retention Time Shift for Dibutylchlorendate

Lab Name: NUS-LSG Contract: _____

Lab Code: NUS Case No.: TNK SAS No.: _____ SDG No.: PKG3

Instrument ID: VA3700 6 GC Column ID: DB608

Dates of Analyses: 07/23/91 to 07/24/91

	EPA SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED	TIME ANALYZED	% D	*
01	EVALA	4-310-90-13	07/23/91	0926	0.0	
02	EVALB	7-310-90-12	07/23/91	0959	0.0	
03	EVALC	6-310-90-13	07/23/91	1031	-0.1	
04	INDA	2-310-90-63	07/23/91	1115	-0.2	
05	INDB	4-310-90-64	07/23/91	1147	-0.2	
06	TOXAPHA	7-310-90-37	07/23/91	1252	-0.3	
07	AR1660	1-310-90-73	07/23/91	1324	-0.4	
08	AR1221	8-310-90-23	07/23/91	1429	-0.3	
09	AR1232	8-310-90-21	07/23/91	1501	-0.3	
10	AR1242	3-310-90-57	07/23/91	1533	-0.2	
11	AR1248	2-310-90-17	07/23/91	1605	-0.2	
12	AR1254	4-310-90-19	07/23/91	1637	-0.3	
13	PBLKT6	PBLKT6	07/23/91	1741	-0.2	
14	BLKSPIKE_S	BLKSPIKE_S	07/23/91	1814	-0.2	
15	TCCSD20E00001	P167645	07/23/91	1846	-0.2	
16	ZZZZZ	PBLKTB	07/23/91	1950	-0.2	
17	ZZZZZ	BLKSPIKE	07/23/91	2022	-0.2	
18	EVALB	7-310-90-12	07/23/91	2126	-0.2	
19	ZZZZZ	PBLKT3	07/23/91	2158	-0.2	
20	ZZZZZ	P167651	07/23/91	2231	-0.1	
21	ZZZZZ	P167566	07/23/91	2303	-0.2	
22	INDA	2-310-90-63	07/24/91	0007	-0.2	
23	INDB	4-310-90-64	07/24/91	0039	-0.1	

* Values outside of QC limits (2.0% for packed columns, 0.3% for capillary columns)

FORM VIII PEST-2 1/87 Rev.

NUS CORPORATION

INTERNAL CORRESPONDENCE

C-49-9-1-85

TO: PHIL OTTINGER

DATE: SEPTEMBER 6, 1991

FROM: DEB SCHEIB

COPIES: FILE

SUBJECT: DATA VALIDATION - MISCELLANEOUS PARAMETERS
TINKER AIR FORCE BASE, PACKAGES #1 THROUGH #4

NUS Laboratories analyzed 7 samples for Total, Carbonate, Bicarbonate and Potentiometric Alkalinity; Chloride, Sulfates, Total Organic Carbon (TOC), Total Organic Halogens (TOX), Nitrates, Phenolics, Fluoride, Total Phosphorous, pH, percent moisture, and Biological Oxygen Demand (BOD). Not all samples were analyzed for all parameters. Several samples also received gross alpha and beta radionucleide screening. All analyses were conducted under Level E Quality Assurance/Quality Control (QA/QC) criteria, and were evaluated according to HAZWRAP-contract and method-specific quality control criteria.

Matrix Spike (MS) recoveries were characteristically low for total phosphorous, chloride and TOX analyses. Hence, positive results and nondetects for these results are qualified as estimated, J. MS recoveries were characteristically high (184%) for TOC; all positive TOC results are qualified as estimated, J.

No other problems were encountered. Please do not hesitate to contact me if you have any questions regarding this review.

APPENDIX II

SUPPORT DOCUMENTATION

HALLIBURTON NUS
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205
800-228-6870

6751-L Engle Road
Cleveland, OH 44130
216-891-4700

CLIENT DUPLICATE

August 07, 1991
Report No.: 00001845
Section F Page 1

QUALITY CONTROL REPORT
DUPLICATE AND MATRIX SPIKE DATA

PREP BATCH: 1515 — NUS SAMPLE NO: P01675

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT
I120	COD(O2)	26	26.1	mg/L	.6	mg/L	

PREP BATCH: 1642 — NUS SAMPLE NO: P01675

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT
I4905	pH (in soil)	7.7	7.74		0.259		

PREP BATCH: 1745 — NUS SAMPLE NO: P01675

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT
I1079	Carbon, Total Organic (C)	2300	2300	mg/kg	1.76	mg/kg	5800

PREP BATCH: 1714 — NUS SAMPLE NO: P01675

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT
I0239	Alkalinity, Total (as CaCO3)	200	200	mg/kg	0.96	mg/kg	

PREP BATCH: 1748 — NUS SAMPLE NO: P01675

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT
I3159	Halogens, Total Organic (EOX)	< 20	< 40	mg/kg		mg/kg	160

CLIENT ORIGINAL

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August 07, 1991
Report No.: 00001846
Section F Page 7

QUALITY CONTROL REPORT
DUPLICATE AND MATRIX SPIKE DATA

PREP BATCH: 1748 — NUS SAMPLE NO: P01675E

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	R
I315S	Halogens, Total Organic (EOX)	32	47.5	mg/kg	15.6	mg/kg	153	(

PREP BATCH: 1859 — NUS SAMPLE NO: P01675E

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	R
I390S	Nitrate (as N)	1.8 **	2.4	mg/kg	74.2	mg/kg	5.1	

PREP BATCH: 1884 — NUS SAMPLE NO: P01[illegible]5E

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	(
I130S	Chloride (Cl)	21	16	mg/kg	21.2	mg/kg	57.0	(

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CLIENT DUPLICATE

August 07, 1991
Report No.: 00001849
Section F Page 6

QUALITY CONTROL REPORT
DUPLICATE AND MATRIX SPIKE DATA

PREP BATCH: 1469 NUS SAMPLE NO: P0167

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT
I590	Solids, Dissolved at 180C	390	364	mg/L	6.38	mg/L	

PREP BATCH: 1515 NUS SAMPLE NO: P0167

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT
I120	COD(O2)	26	26.1	mg/L	.6	mg/L	

PREP BATCH: 1600 NUS SAMPLE NO: P0167

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT
I5405	Phosphorus, Total (as P)	57	83.1	mg/kg	7.43	mg/kg	83.1

PREP BATCH: 1604 NUS SAMPLE NO: P0167

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT
I023	Alkalinity, Total (as CaCO3)	150	142	mg/L	3.49	mg/L	

PREP BATCH: 1677 NUS SAMPLE NO: P0167

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT
I7309	Sulfate (as SO4)	44	56	mg/kg	12	mg/kg	560

CLIENT DUPLICATE

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August 07, 1991
Report No.: 00001844
Section F Page 5

QUALITY CONTROL REPORT
DUPLICATE AND MATRIX SPIKE DATA

PREP BATCH: 1563 — NUS SAMPLE NO: P016763

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	R
I800	CLP - percent moisture	28.2	28.2	%	0	%		

PREP BATCH: 1745 — NUS SAMPLE NO: P016758

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	R
I107S	Carbon, Total Organic (C)	2300	2300	mg/kg	1.76	mg/kg	5800	

PREP BATCH: 1746 — NUS SAMPLE NO: P016763

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	R
I107S	Carbon, Total Organic (C)	1300	1500	mg/kg	12.5	mg/kg	3400	

PREP BATCH: 1956 — NUS SAMPLE NO: P016758

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	R
I500S	Phenolics	2.5	2.5	mg/kg	0	mg/kg	11.6	

CLIENT DUPLICATE

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August 07, 1991
Report No.: 00001844
Section F Page 3

QUALITY CONTROL REPORT
DUPLICATE AND MATRIX SPIKE DATA

PREP BATCH: 1884 — NUS SAMPLE NO: P016756

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	R
I130S	Chloride (Cl)	21	16	mg/kg	21.2	mg/kg	57.0	(

PREP BATCH: 1746 — NUS SAMPLE NO: P016756

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	R
I315S	Halogens, Total Organic (EOX)	32	47.5	mg/kg	15.6	mg/kg	153	(

PREP BATCH: 1854 — NUS SAMPLE NO: P016756

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	R
I500S	Phenolics	3	3.38	mg/kg	0.00	mg/kg	14.0	

PREP BATCH: 1458 — NUS SAMPLE NO: P016757

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	R
I120	COD(O2)	27	25.7	mg/L	3.82	mg/L		

PREP BATCH: 1416 — NUS SAMPLE NO: P016757

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	R
I730	Sulfate, Turbidimetric (as SO4)	60	48	mg/L	12.7	mg/L	158	

CLIENT DUPLICATE

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August 07, 1991
Report No.: 00001844
Section F Page 2

QUALITY CONTROL REPORT
DUPLICATE AND MATRIX SPIKE DATA

PREP BATCH: 1600 — NUS SAMPLE NO: P01675

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT
I540S	Phosphorus, Total (as P)	57	83.1	mg/kg	7.43	mg/kg	83.1

PREP BATCH: 1642 — NUS SAMPLE NO: P01675

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT
I490S	pH (in soil)	7.6	7.66		0.261		

PREP BATCH: 1677 — NUS SAMPLE NO: 5

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT
I730S	Sulfate (as SO4)	44	56	mg/kg	12	mg/kg	560

PREP BATCH: 1714 — NUS SAMPLE NO: P01675

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT
I023S	Alkalinity, Total (as CaCO3)	210	210	mg/kg	1.20	mg/kg	

PREP BATCH: 1859 — NUS SAMPLE NO: P0167

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT
I390S	Nitrate (as N)	1.8 **	2.4	mg/kg	74.2	mg/kg	5.1

CLIENT DUPLICATE

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August 07, 1991
Report No.: 00001846
Section F Page 2

QUALITY CONTROL REPORT
DUPLICATE AND MATRIX SPIKE DATA

PREP BATCH: 1752 — NUS SAMPLE NO: P016764

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	R
I540S	Phosphorus, Total (as P)	52 *	91	mg/kg	55.3	mg/kg	62.9	

PREP BATCH: 1563 — NUS SAMPLE NO: P016764

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	R
I800	CLP - percent moisture	22.8	26.0	%	13.1	%		

PREP BATCH: 1563 — NUS SAMPLE NO: P016764

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	R
I800	CLP - percent moisture	30.0	36.2	%	18.7	%		

PREP BATCH: 1696 — NUS SAMPLE NO: P016764

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	R
I107S	Carbon, Total Organic (C)	1500	1300	mg/kg	34.7	mg/kg		

PREP BATCH: 1956 — NUS SAMPLE NO: P016764

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	R
I500S	Phenolics	1.5	< 1.0	mg/kg	0.00	mg/kg	11.4	

CLIENT DUPLICATE

HALLIBURTON NUS
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205
800-228-6870

6751-L Engle Road
Cleveland, OH 44130
216-891-4700

August 07, 1991
Report No.: 00001846
Section F Page 1

QUALITY CONTROL REPORT
DUPLICATE AND MATRIX SPIKE DATA

PREP BATCH: 1563 — NUS SAMPLE NO: P0167637

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	R
I800	CLP - percent moisture	28.2	28.2	%	0	%		

PREP BATCH: 1746 — NUS SAMPLE NO: P0167639

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	R
I107S	Carbon, Total Organic (C)	1300	1500	mg/kg	12.5	mg/kg	3400	

PREP BATCH: 1642 — NUS SAMPLE NO: P[illegible]

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	R
I490S	pH (in soil)	7.8	7.80		0.512	[illegible]		

PREP BATCH: 1714 — NUS SAMPLE NO: P0167640

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	R
I023S	Alkalinity, Total (as CaCO3)	290	290	mg/kg	0.35	mg/kg		

PREP BATCH: 1750 — NUS SAMPLE NO: P0167643

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	R
I315S	Halogens, Total Organic (EOX)	< 20	< 40	mg/kg		mg/kg	99.3	[illegible]

F-2

SURFACE WATER SAMPLE DATA VALIDATION SUMMARIES - JULY 1991

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NUS CORPORATION

INTERNAL CORRESPONDENCE

C-49-8-1-290

TO: PHIL OTTINGER

DATE: AUGUST 23, 1991

FROM: KAREN M. SMECKER

CC: D. A. SCHEIB

SUBJECT: INORGANIC DATA VALIDATION - MISC. TAL METALS & CYANIDE
TINKER AIR FORCE BASE
CASE NO. TNK, SDG PKG1

SAMPLES:

Water:

TEC-SW22-W-0001

TCC-

SW06-C-0001	SW06-W-0001	SW07-W-0001
SW08-W-0001	SW09-W-0001	SW10-W-0001
SW14-W-0001		

TKC-

SW01-W-0001	SW02-W-0001	SW03-W-0001
SW04-W-0001		

NUS Laboratories analyzed 12 water samples (including one field duplicate pair) for all Target Analyte List (TAL) metals except aluminum, iron, manganese and potassium. In addition, three of these samples were analyzed for cyanide.

Data for these analyses were reviewed with reference to the EPA "Functional Guidelines for Inorganic Data Validation" and the Harzardous Waste Remedial Action Program's (HAZWRPA) "Requirements for Quality Control of Analytical Data". The analyses were conducted under Level D QA/QC criteria and were evaluated according to the following parameters:

- o - Data Completeness
- o Holding Times
- * o Calibration Verification
- * o Laboratory and Field Blank Analyses
- * o Matrix Spike Recoveries
- * o Laboratory Duplicates
- o Field Duplicate Precision
- * o Furnace Atomic Absorption Results
- o ICP Serial Dilution Results
- o Detection Limits

The symbol (*) indicates that quality control criteria were not met

for this parameter. Sample data was not evaluated on the basis of ICP Interference Check Sample (ICS) results since the analysis of aluminum and iron was not required for this sample set and no interfering analyte concentrations were reported on the ICP ICS Form IV. Problems affecting data usability are addressed below and the attached Table 1 summarizes the validation qualifications.

Calibration Verification

CRDL Standard analysis Percent Recoveries (%Rs) for beryllium and manganese were low (< 80%). No actions were required since all positive beryllium results < 3X CRDL are qualified due to blank contamination and all positive results for manganese are greater than 3X CRDL. No nondetects were reported for these analytes.

CRDL Standard analysis %Rs for zinc and antimony exceeded the 120% upper quality control limit. No positive results were reported for antimony, and all positive zinc results < 3X CRDL are qualified due to blank contamination; no further actions were necessary.

Blanks

Laboratory method blank analyses yielded the following contaminants in the maximum concentrations indicated:

Contaminant	Maximum Concentration (ug/l)	Action Level (ug/l)
beryllium	2.3	11.5
cadmium	3.0	15.0
chromium	5.6	28.0
nickel	18.3	91.5
zinc	9.2	46.0

Positive sample results less than the action levels are qualified as undetected, "U". Adjustments for dilutions were made prior to the application of the action levels. No actions were taken for cadmium because no positive results were reported for this analyte.

Negative blank contamination at the following maximum levels were evident for the analytes indicated below:

Contaminant	Maximum Concentration (ug/l)
barium	- 13.0
vanadium	- 10.0

Negative blank contamination is an indication of poor instrument performance. Positive barium results and nondetects for vanadium are qualified as estimated, "J" and "UJ", respectively; no positive results were reported for vanadium, and no nondetects were reported for barium.

Matrix Spike Recoveries

The Matrix Spike (MS) %R for silver was below the 75% quality control limit, but > 30%. Only nondetects were reported for this analyte, and these results are qualified as estimated, "UJ".

Laboratory Duplicates

The Relative Percent Difference (RPD) for lead exceeded the 20% quality control limit for waters. Positive results for this analyte are qualified as estimated, "J"; no nondetects were reported.

Furnace Atomic Absorption Results

Several samples had Post Digestion Spike (PDS) %Rs for antimony or arsenic below the 85% lower quality control limit. Positive arsenic results and nondetects for antimony in affected samples are qualified as estimated, "J" and "UJ", respectively.

Please do not hesitate to contact me with questions regarding this review.

TINKER AIR FORCE BASE
CASE # TNK, SDG PKG1

TABLE 1 - RECOMMENDATION SUMMARY

Aluminum		Magnesium	
Antimony	J^4	Manganese	
Arsenic	J^4	Mercury	
Barium	J^1	Nickel	A^1
Beryllium	A^1	Potassium	
Cadmium		Selenium	
Calcium		Silver	J^2
Chromium	A^1	Sodium	
Cobalt		Thallium	
Copper		Vanadium	J^1
Iron		Zinc	A^1
Lead	J^3	Cyanide	

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

A^1 - Accept data, but raise soil sample detection limits (where appropriate) due to blank contamination.

J^1 - Estimate "J" positive barium results and "UJ" nondetects for vanadium due to negative blank contamination.

J^2 - Estimate "UJ" nondetects due to low MS recovery.

J^3 - Estimate "J" positive results due to laboratory duplicate imprecision.

J^4 - Estimate "J" positive arsenic results and "UJ" antimony nondetects in affected samples due to low graphite furnace PDS recoveries.

APPENDIX B: SUPPORT DOCUMENTATION

U.S. EPA - CLP

2B

CRDL STANDARD FOR AA AND ICP

Lab Name: NUS Laboratory Contract: TINKER AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: PR61

AA CRDL Standard Source: HP

ICP CRDL Standard Source: HP

Concentration Units: ug/L

Analyte	CRDL Standard for AA True	Found	%R	CRDL Standard for ICP Initial True	Found	%R	Final Found	%R
Aluminum								
Antimony	120.0	98.95	82.5					
Arsenic	10.0	9.30	93.0					
Barium				400.0	412.00	103.0	408.00	[illegible]
Beryllium				10.0	6.90	69.0	7.20	[illegible]
Cadmium				10.0	10.60	106.0	8.90	89.[illegible]
Calcium				5000.0	4960.00	99.2	5052.00	101.[illegible]
Chromium				20.0	19.70	98.5	22.20	111.[illegible]
Cobalt				100.0	114.60	114.6	103.80	103.8
Copper				50.0	46.80	93.6	48.10	96.[illegible]
Iron								
Lead	3.0	2.90	96.7					
Magnesium				5000.0	4872.00	97.4	5357.00	107.1
Manganese								
Mercury								
Nickel				80.0	92.50	115.6	95.30	119.[illegible]
Potassium								
Selenium	5.0	5.95	99.0					
Silver				20.0	20.70	103.5	19.50	97.5
Sodium				5000.0	4920.00	98.4	4554.00	91.[illegible]
Thallium								
Vanadium				100.0	86.00	86.0	82.00	82.[illegible]
Zinc				40.0	47.10	117.8	49.50	123.8

U.S. EPA - CLP

2B
CRDL STANDARD FOR AA AND ICP

Lab Name: NUS Laboratory Contract: TINKER AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: PRE.

AA CRDL Standard Source: HF

ICP CRDL Standard Source: HF

Concentration Units: ug/L

Analyte	CRDL Standard for AA True	Found	%R	CRDL Standard for ICP True	Initial Found	%R	Final Found	%R
Aluminum								
Antimony	60.0	102.40	171.3					
Arsenic								
Barium				400.0	410.00	102.5	396.00	99.
Beryllium								
Cadmium								
Calcium				200.0	204.80	102.4	220.20	110.
Chromium								
Cobalt								
Copper								
Iron								
Lead								
Magnesium				200.0	144.40	72.2	210.30	105.
Manganese								
Mercury								
Nickel								
Potassium								
Selenium								
Silver								
Sodium	-			5000.0	5128.00	102.6	4045.00	80.
Thallium	10.0	9.90	99.0					
Vanadium								
Zinc								

U.S. EPA - CLP

3
BLANKS

Lab Name: NUS Laboratory Contract: TINKER AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: FFG1

Preparation Blank Matrix (soil/water): WATER

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

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum											
Antimony	6.0	U	6.0	U	6.0	U			6.0	U	P
Arsenic	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	P
Barium	9.0	U	9.0	U	9.0	U	9.0	U	9.0	U	P
Beryllium	1.7	B	1.1	B	1.2	B	1.2	B	2.3	B	
Cadmium	3.0	U	3.0	U	3.0	U	3.0	U	3.0	B	P
Calcium	129.0	U	129.0	U	129.0	U			129.0	U	P
Chromium	5.3	B	5.0	U	5.0	U	5.0	U	5.0	B	P
Cobalt	9.0	U	9.0	U	9.0	U	9.0	U	9.0	U	P
Copper	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	P
Iron											
Lead	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	P
Magnesium	327.0	U	327.0	U	327.0	U			327.0	U	P
Manganese											
Mercury	0.1	U	0.1	U					0.1	U	CV
Nickel	16.3	B	16.0	U	16.0	U	16.8	B	16.9	B	P
Potassium											
Selenium	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	P
Silver	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	P
Sodium	2699.0	U	2699.0	U	2699.0	U			2699.0	U	P
Thallium	2.0	U	2.0	U					2.0	U	P
Vanadium	-9.0	B	-10.0	B	9.0	U	9.0	U	9.0	U	P
Zinc	6.0	U	6.0	U	7.1	B	6.0	U	9.2	B	P
Cyanide											

U.S. EPA - CLP

3
BLANKS

Lab Name: NUS Laboratory Contract: TINKER AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: PR01

Preparation Blank Matrix (soil/water): WATER

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

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Preparation blank	C	M
Aluminum											
Antimony	6.0	U	6.0	U	6.0	U	6.0	U			
Arsenic											
Barium	-10.0	B	-13.0	B							
Beryllium											
Cadmium											
Calcium	129.0	U	129.0	U							
Chromium											
Cobalt											
Copper											
Iron											
Lead											
Magnesium	327.0	U	327.0	U							
Manganese											
Mercury											
Nickel											
Potassium											
Selenium											
Silver											
Sodium	2633.0	U	2633.0	U							
Thallium	2.0	U	2.0	U	2.0	U	2.0	U			
Vanadium											
Zinc											
Cyanide											

U.S. EPA - CLP

4

ICP INTERFERENCE CHECK SAMPLE

Lab Name: NUS Laboratory Contract: TINKER AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: PKG1

ICP ID Number: MET500 ICS Source: NUS Lab

Concentration Units: ug/L

Analyte	True Sol. A	True Sol. AB	Initial Found Sol. A	Initial Found Sol. AB	Initial Found %R	Final Found Sol. A	Final Found Sol. AB	Final Found %R
Aluminum								
Antimony								
Arsenic								
Barium	1	475	-1	563.0	118.5	0	561.0	118.1
Beryllium	4	492	3	479.1	97.4	2	489.7	99.[illegible]
Cadmium	2	881	-2	1011.1	114.8	-4	986.7	112.[illegible]
Calcium								
Chromium								
Cobalt	4	469	14	551.2	117.5	17	558.7	119.1
Copper	-12	451	-2	464.6	103.0	-6	489.0	108.4
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel	10	930	26	1095.8	117.8	14	1085.7	116.7
Potassium								
Selenium								
Silver	2	952	1	853.0	89.6	1	813.6	85.5
Sodium								
Thallium								
Vanadium	-8	470	-5	456.0	97.0	-2	482.0	102.6
Zinc	-4	953	47	963.1	101.1	53	1005.5	105.5

— [illegible]

5A
SPIKE SAMPLE RECOVERY

EPA SAMPLE NO.

TCCSC6S

Lab Name: NUS Laboratory Contract: TINKER AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: FF51

Matrix (soil/water): WATER Level (low/med): LOW

% Solids for Sample: 0.0

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

Analyte	Control Limit % R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	% R	C	M
Aluminum									NR
Antimony	75-125	78.8000		6.0000	U	100.00	78.8		P
Arsenic	75-125	88.1000		2.7000	B	80.00	88.5		P
Barium	75-125	2900.0000		447.0000		2000.00	122.6		P
Beryllium	75-125	47.7000		1.8000	B	50.00	91.8		P
Cadmium	75-125	52.4000		3.0000	U	50.00	104.8		P
Calcium									NR
Chromium	75-125	195.1000		7.7000	B	200.00	93.7		P
Cobalt	75-125	540.7000		9.0000	U	500.00	108.1		P
Copper	75-125	248.8000		10.0000	U	250.00	99.5		P
Iron									NR
Lead	75-125	48.4000		6.2000		40.00	105.5		P
Magnesium									NR
Manganese									NR
Mercury	75-125	1.0000		0.1000	U	1.00	100.0		CV
Nickel	75-125	559.1000		22.7000	B	500.00	107.3		P
Potassium									NR
Selenium	75-125	9.9000		1.0000	U	10.00	99.0		P
Silver	75-125	36.2000		5.0000	U	50.00	72.4	N	P
Sodium									NR
Thallium	75-125	37.7000		2.0000	U	50.00	75.4		P
Vanadium	75-125	460.0000		9.0000	U	500.00	92.0		P
Zinc	75-125	484.6000		16.1000	B	500.00	93.7		P
Cyanide	--								NR

Comments:

U.S. EPA - CLP

6
DUPLICATES

EPA SAMPLE NO.

TDCS06D

Lab Name: NUS Laboratory Contract: TINKER AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: [illegible]

Matrix (soil/water): WATER Level (low/med): LOW

% Solids for Sample: 0.0 % Solids for Duplicate:

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

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Aluminum								
Antimony		6.0000	U	6.0000	U			P
Arsenic		2.7000	B	2.7500	B	1.8		P
Barium	200.0	447.0000		430.0000		3.9		P
Beryllium		1.8000	B	1.7000	B	5.7		P
Cadmium		3.0000	U	3.0000	U			P
Calcium		35456.0000		35164.0000		0.8		
Chromium		7.7000	B	8.6000	B	11.0		
Cobalt		5.0000	U	5.0000	B	200.0		P
Copper		10.0000	U	10.0000	U			P
Iron								
Lead	3.0	6.2000		10.4000		50.6	*	P
Magnesium	5000.0	16867.0000		15734.0000		3.9		P
Manganese								
Mercury		0.1000	U	0.1000	U			CV
Nickel		22.7000	B	16.0000	U	200.0		P
Potassium								
Selenium		1.0000	U	1.0000	U			P
Silver		5.0000	U	5.0000	U			P
Sodium		31215.0000		29875.0000		4.4		P
Thallium		2.0000	U	2.0000	U			P
Vanadium		3.0000	U	3.0000	U			P
Zinc		16.1000	B	14.5000	B	10.5		P
Cyanide								

U.S. EPA - CLP

14

ANALYSIS RUN LOG

Lab Name: NUS Laboratory Contract: TINKER AFB
Lab Code: Case No.: TNA SAS No.: SDG No.: FN61
Instrument ID Number: ME1405 Method: F
Start Date: 07/17/91 End Date: 07/18/91

EPA Sample No.	D/F	Time	% R	Analytes																			
				ALKB	BAS	BAA	BBE	CDA	CRO	CUU	CUE	FBB	MBG	MNG	HGI	NIB	SEB	AGA	NAL	TIV	ZIN
S0	1.00	2042		X																	
S100	1.00	2047		X																	
S200	1.00	2052		X																	
S60	1.00	2057		X																	
ICV	1.00	2102		X																	
ICB	1.00	2107		X																	
CRA	1.00	2112		X																	
PBW	1.00	2117		X																	
PBWA	1.00	2121	83.5	X																	
LCSW	2.00	2126		X																	
LCSWA	2.00	2131	86.3	X																	
TCCSC6S	1.00	2136		X																	
TCCSC6D	1.00	2141		X																	
TCCSC6DA	1.00	2146	84.2	X																	
TCCSC6	1.00	2150		X																	
TCCSC6A	1.00	2155	86.7	X																	
CCV1	1.00	2200		X																	
CCB1	1.00	2205		X																	
TCCSW1	1.00	2210		X																	
TCCSW1A	1.00	2215	84.7	X																	
TCCSW2	1.00	2220		X																	
TCCSW2A	1.00	2225	84.9	X																	
TCCSW6	1.00	2230		X																	
TCCSW6A	1.00	2235	83.7	X																	
TCCSW4	1.00	2240		X																	
TCCSW4A	1.00	2245	83.7	X																	
TCCS22	1.00	2250		X																	
TCCS22A	1.00	2255	83.2	X																	
CCV2	1.00	2300		X																	
CCB2	1.00	2305		X																	
S0-2	1.00	2316		X																	
S100-2	1.00	2320		X																	

14

ANALYSIS RUN LOG

Lab Name: NUS Laboratory
Lab Code: Case No.: TNK
Instrument ID Number: MET405
Start Date: 07/15/91

Contract: TINKER AFB
SAS No.: SDG No.: PMG1
Method: P
End Date: 07/15/91

EPA Sample No.	D/F	Time	% R	Analytes																				
				ALB	SB	ASB	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
S0	1.00	0836				X																					
S20	1.00	0841				X																					
S50	1.00	0847				X																					
ZZZZZZ	1.00	0852				X																					
S10	1.00	0858				X																					
ICV	1.00	0904				X																					
ICB	1.00	0909				X																					
CRA	1.00	0914				X																					
PBW	1.00	0919				X																					
PBWA	1.00	0924	86.7			X																					
LCSW	2.00	0930				X																					
LCSWA	2.00	0935	94.8			X																					
TCCSL65	1.00	0940				X																					
TCCSL65	1.00	0945				X																					
TCCSL65A	1.00	0950	76.5			X																					
TCCSC6	1.00	0955				X																					
TCCSC6A	1.00	1000	89.2			X																					
CCV1	1.00	1005				X																					
CCB1	1.00	1011				X																					
TKCSW1	1.00	1016				X																					
TKCSW1A	1.00	1021	79.0			X																					
TKCSW3	1.00	1026				X																					
TKCSW3A	1.00	1032	87.7			X																					
TCCSW5	1.00	1037				X																					
TCCSW5A	1.00	1042	89.5			X																					
TKCSW4	1.00	1047				X																					
TKCSW4A	1.00	1053	88.5			X																					
TCCS22	1.00	1058				X																					
TCCS22A	1.00	1103	105.8			X																					
CCV2	1.00	1108				X																					
CCB2	1.00	1113				X																					
CCSW2	1.00	1118				X																					

NUS CORPORATION

INTERNAL CORRESPONDENCE

C-49-8-1-287

TO: PHIL OTTINGER

DATE: AUGUST 23, 1991

FROM: KAREN M. SMECKER

CC: D. A. SCHEIB

SUBJECT: INORGANIC DATA VALIDATION - MISC. TAL METALS & CYANIDE
TINKER AIR FORCE BASE
CASE NO. TNK, SDG PKG4

SAMPLES:

Water:

TKC-SW05-W-0001

TCC-

SW11-W-0001	SW12-W-0001	SW15-W-0001
SW16-W-0001	SW17-W-0001	SW18-W-0001
SW19-W-0001	SW20-W-0001	SW20-C-0001
SW21-W-0001	SW26-W-0001	

NUS Laboratories analyzed 12 water samples (including one field duplicate pair) for all Target Analyte List (TAL) metals except aluminum, iron, manganese and potassium. In addition, one of these samples was analyzed for cyanide.

Data for these analyses were reviewed with reference to the EPA "Functional Guidelines for Inorganic Data Validation" and the Harzardous Waste Remedial Action Program's (HAZWRPA) "Requirements for Quality Control of Analytical Data". The analyses were conducted under Level D QA/QC criteria and were evaluated according to the following parameters:

- o Data Completeness
- o Holding Times
- * o Calibration Verification
- * o Laboratory and Field Blank Analyses
- * o Matrix Spike Recoveries
- o Laboratory Duplicates
- o Field Duplicate Precision
- * o Furnace Atomic Absorption Results
- o ICP Serial Dilution Results
- o Detection Limits

The symbol (*) indicates that quality control criteria were not met for this parameter. Sample data was not evaluated on the basis of ICP Interference Check Sample (ICS) results since the analysis of aluminum and iron was not required for this sample set and no interfering analyte concentrations were reported on the ICP ICS

Form IV. Problems affecting data usability are addressed below and the attached Table 1 summarizes the validation qualifications.

Calibration Verification

CRDL Standard analysis Percent Recoveries (%Rs) for beryllium, chromium and manganese were below the 80% lower quality control criterion. Positive results < 3X CRDL and nondetects for chromium are qualified as estimated, "J" and "UJ", respectively. Only positive results were reported for the other analytes. All positive results for beryllium are qualified due to blank contamination, and positive manganese results are reported at levels above 3X CRDL; no actions are required.

CRDL Standard analysis %Rs for cadmium, vanadium and silver were high (> 120%). No other actions were taken since only nondetects were reported for silver and positive results < 3X CRDL for vanadium and cadmium are qualified because of blank contamination.

The Laboratory Control Sample (LCS) %R for silver exceeded the 120% quality control limit. However, no qualifications were made because no positive results were reportred for this analyte.

Blanks

Laboratory method blank analyses yielded the following contaminants in the maximum concentrations indicated:

Contaminant	Maximum Concentration (ug/l)	Action Level (ug/l)
beryllium	2.9	14.5
cadmium	4.8	24.0
cobalt	19.3	96.5
silver	2.6	13.0
vanadium	43.0	215

Positive sample results less than the action levels are qualified as undetected, "U". Adjustments for dilutions were made prior to application of the action levels. No action was taken for silver as no positive results were reported for this analyte.

Negative blank contamination at the following maximum levels were evident for the analytes indicated below:

Contaminant	Maximum Concentration (ug/l)
antimony	- 5.4
arsenic	- 2.2
barium	- 16.0
calcium	- 173
chromium	- 5.1
zinc	- 10.3

Negative blank contamination is an indication of poor instrument performance. Positive results and nondetects for these analytes are qualified as estimated, "J" and "UJ", respectively.

Matrix Spike Recoveries

The Matrix Spike (MS) %R for silver was extremely low (< 30). Only nondetects were reported for this analyte, and these results are considered unreliable and are qualified as rejected, "R".

Furnace Atomic Absorption Results

Post Digestion Spike (PDS) %Rs for selenium in seven samples were below the 85% lower quality control limit. Selenium nondetects in five samples are qualified as estimated, "UJ"; no actions were taken for the positive results in the other two samples since these results are qualified because of blank contamination.
The PDS %R for lead in one sample was high (> 115). Qualification was not necessary since the affected sample result is a nondetect.

Please do not hesitate to contact me with questions regarding this review.

TINKER AIR FORCE BASE
CASE # TNK, SDG PKG4

TABLE 1 - RECOMMENDATION SUMMARY

Aluminum		Magnesium	
Antimony	J^1	Manganese	
Arsenic	J^1	Mercury	
Barium	J^1	Nickel	
Beryllium	A^1	Potassium	
Cadmium	A^1	Selenium	A^1, J^3
Calcium	J^1	Silver	R^1, A^1
Chromium	J^1, J^2	Sodium	
Cobalt	A^1	Thallium	
Copper		Vanadium	A^1
Iron		Zinc	J^1
Lead		Cyanide	

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

A^1 - Accept data, but raise sample detection limit (where appropriate) due to blank contamination.

J^1 - Estimate "J" positive results and "UJ" nondetects due to negative blank contamination.

J^2 - Estimate "J" positive results < 3X CRDL and "UJ" nondetects due to low CRDL Standard analysis recovery.

J^3 - Estimate "UJ" nondetects in affected samples due to low GFAA PDS recoveries.

R^1 - Reject "R" nondetects due to extremely low MS recovery.

APPENDIX A: QUALIFIED LABORATORY RESULTS

APPENDIX B: SUPPORT DOCUMENTATION

U.S. EPA - CLP

2B

CRDL STANDARD FOR AA AND ICP

Lab Name: NLS Laboratory Contract: TINKER AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: PH64

AA CRDL Standard Source: HP

ICP CRDL Standard Source: HP

Concentration Units: ug/L

Analyte	CRDL Standard for AA True	Found	%R	CRDL Standard for ICP Initial True	Initial Found	Initial %R	Final Found	Final %R
Aluminum								
Antimony	60.0	63.40	105.7					
Arsenic	10.0	9.45	94.5					
Barium				400.0	388.00	97.0	395.00	98.8
Beryllium				10.0	7.40	74.0	7.70	77.0
Cadmium				10.0	12.40	124.0	12.30	123.0
Calcium				5000.0	4788.00	95.8	4791.00	95.8
Chromium				20.0	15.30	76.5	16.10	80.5
Cobalt				100.0	106.60	106.6	116.20	116.2
Copper				50.0	55.70	111.4	53.60	107.2
Iron								
Lead	3.0	3.10	103.3					
Magnesium				5000.0	4842.00	96.8	5185.00	103.7
Manganese								
Mercury								
Nickel				80.0	81.10	101.4	70.50	88.1
Potassium								
Selenium	5.0	5.25	105.0					
Silver				20.0	25.20	126.0	24.20	121.0
Sodium				5000.0	4066.00	81.4	4010.00	80.2
Thallium	10.0	10.40	104.0					
Vanadium				100.0	136.00	136.0	132.00	132.0
Zinc				20.0	18.90	94.5	20.60	103.0

U.S. EPA - CLP

2B
CRDL STANDARD FOR AA AND ICP

Lab Name: NUS Laboratory Contract: TINKER AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: PKG4

AA CRDL Standard Source: HP

ICP CRDL Standard Source: HP

Concentration Units: ug/L

Analyte	CRDL Standard for AA True	Found	%R	CRDL Standard for ICP True	Initial Found	%R	Final Found	%R
Aluminum								
Antimony								
Arsenic	10.0	9.05	90.5					
Barium								
Beryllium								
Cadmium								
Calcium				200.0	204.80	102.4	220.20	110.1
Chromium								
Cobalt								
Copper								
Iron								
Lead								
Magnesium				200.0	144.40	72.2	210.30	105.1
Manganese								
Mercury								
Nickel								
Potassium								
Selenium	5.0	5.10	102.0					
Silver								
Sodium	-							
Thallium								
Vanadium								
Zinc								

U.S. EPA - CLP

3
BLANKS

Lab Name: NUS Laboratory Contract: TINKER AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: PN04

Preparation Blank Matrix (soil/water): WATER

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

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum											
Antimony	3.0	U	-3.6	B	3.0	U	3.0	U	-5.4	B	P
Arsenic	2.0	U	2.0	U	2.0	U	2.0	U	-2.2	B	P
Barium	-14.0	B	-12.0	B	-13.0	B	-16.0	B	-15.0	B	P
Beryllium	1.8	B	2.5	B	2.1	B	2.8	B	1.7	B	P
Cadmium	4.0	B	3.8	B	3.0	U	4.4	B	4.5	B	P
Calcium	-160.0	B	-173.0	B	-158.0	B			129.0	U	P
Chromium	-5.1	B	5.0	U	5.0	U	5.0	U	5.0	U	P
Cobalt	13.1	B	12.3	B	11.3	B	12.5	B	10.7	B	P
Copper	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	P
Iron											
Lead	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	P
Magnesium	327.0	U	327.0	U	327.0	U			327.0	U	P
Manganese											
Mercury	0.1	U	0.1	U					0.1	U	CV
Nickel	16.0	U	16.0	U	16.0	U	16.0	U	16.0	U	P
Potassium											
Selenium	1.0	U	-1.0	B	1.0	U			1.0	U	P
Silver	5.0	U	5.0	U	5.1	B	5.0	U	5.0	U	P
Sodium	2699.0	U	2699.0	U	2699.0	U			2699.0	U	P
Thallium	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	P
Vanadium	38.0	B	41.0	B	41.0	B	43.0	B	38.0	B	P
Zinc	-9.3	B	-9.7	B	-9.8	B	-10.3	B	6.0	U	P
Cyanide											

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3
BLANKS

Lab Name: NJS Laboratory Contract: TINKER AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: PN64

Preparation Blank Matrix (soil/water): WATER

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

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Preparation Blank	C	M
Aluminum											
Antimony											
Arsenic	2.0	U	2.0	U	2.0	U					
Barium											
Beryllium											
Cadmium											
Calcium	129.0	U	129.0	U							P
Chromium											
Cobalt											
Copper											
Iron											
Lead											
Magnesium	327.0	U	327.0	U							
Manganese											
Mercury											
Nickel											
Potassium											
Selenium	1.0	B	1.0	U	2.6	B					P
Silver											
Sodium											
Thallium											
Vanadium											
Zinc											
Cyanide											

U.S. EPA - CLP

4

ICP INTERFERENCE CHECK SAMPLE

Lab Name: NUS Laboratory | Contract: TINKER AFB

Lab Code: | Case No.: TNK | SAS No.: | SDG No.: PKG4

ICP ID Number: MET500 | ICS Source: NUS Lab

Concentration Units: ug/L

Analyte	True Sol. A	True Sol. AB	Initial Found Sol. A	Initial Found Sol. AB	Initial Found %R	Final Found Sol. A	Final Found Sol. AB	Final Found %R
Aluminum								
Antimony								
Arsenic								
Barium	1	475	-10	455.0	95.8	-18	455.0	95.8
Beryllium	4	492	2	522.9	106.3	3	501.8	102.0
Cadmium	2	881	0	818.0	92.8	-1	860.4	97.7
Calcium								
Chromium								
Cobalt	4	469	18	465.4	99.2	17	474.7	101.4
Copper	-12	451	-2	466.9	103.5	-6	497.4	110.3
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel	10	930	-2	865.4	93.1	7	891.3	95.8
Potassium								
Selenium								
Silver	2	952	1	876.8	92.1	2	773.1	81.2
Sodium								
Thallium								
Vanadium	-8	470	48	511.0	108.7	50	511.0	108.7
Zinc	-4	953	34	941.7	98.8	34	966.6	101.4

- Data will not be evaluated on this analysis since no concs. reported for interfering analytes and also the analysis of Al & Fe were not required for this SDG

U.S. EPA - CLP

5A
SPIKE SAMPLE RECOVERY

EPA SAMPLE NO.

TDCU20S

Lab Name: NUS Laboratory Contract: TINKER AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: [illegible]

Matrix (soil/water): WATER Level (low/med): LOW

% Solids for Sample: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum									NR
Antimony	75-125	91.9000		3.0000	U	100.00	91.9		P
Arsenic	75-125	45.8000		2.0000	U	40.00	114.5		P
Barium	75-125	2330.0000		416.0000		2000.00	95.7		P
Beryllium	75-125	49.9000		2.2000	B	50.00	95.4		P
Cadmium	75-125	48.3000		4.3000	B	50.00	88.0		P
Calcium									NR
Chromium	75-125	195.9000		5.0000	U	200.00	98.0		
Cobalt	75-125	486.4000		16.4000	B	500.00	94.0		
Copper	75-125	241.0000		10.0000	U	250.00	96.4		P
Iron									NR
Lead	75-125	20.5000		1.0000	U	20.00	102.5		P
Magnesium									NR
Manganese									NR
Mercury	75-125	1.0000		0.1000	U	1.00	100.0		CV
Nickel	75-125	447.1000		16.0000	U	500.00	89.4		P
Potassium									NR
Selenium	75-125	17.5000		1.9000	B	20.00	78.0		P
Silver	75-125	12.8000		5.0000	U	50.00	25.6	N	P
Sodium									NR
Thallium	75-125	41.2000		2.0000	U	50.00	82.4		P
Vanadium	75-125	508.0000		45.0000	B	500.00	92.6		P
Zinc	75-125	499.9000		33.0000		500.00	93.4		P
Cyanide	-								NR

Comments:

U.S. EPA - CLP

7

LABORATORY CONTROL SAMPLE

Lab Name: NUS Laboratory Contract: TINKER AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: PKG4

Solid LCS Source: SPEX,IV,F,HP

Aqueous LCS Source: SPEX,IV,F,HP

Analyte	Aqueous (ug/L) True	Aqueous (ug/L) Found	Aqueous (ug/L) %R	Solid (mg/kg) True	Solid (mg/kg) Found	Solid (mg/kg) C	Solid (mg/kg) Limits	Solid (mg/kg) %R
Aluminum								
Antimony	100.0	92.10	92.1					
Arsenic	40.0	35.45	88.6					
Barium	2000.0	1985.00	99.2					
Beryllium	50.0	49.70	99.4					
Cadmium	50.0	53.10	106.2					
Calcium	1250.0	1424.80	114.0					
Chromium	200.0	193.20	96.6					
Cobalt	500.0	489.30	97.9					
Copper	250.0	247.20	98.9					
Iron								
Lead	20.0	19.90	99.5					
Magnesium	1250.0	1171.00	93.7					
Manganese								
Mercury								
Nickel	500.0	462.80	92.6					
Potassium								
Selenium	20.0	16.60	83.0					
Silver	50.0	84.30	168.6					
Sodium	12500.0	12471.00	99.8					
Thallium	50.0	48.30	96.6					
Vanadium	500.0	499.00	99.8					
Zinc	500.0	497.00	99.4					
Cyanide								

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ANALYSIS RUN LOG

Lab Name: NUS Laboratory
Lab Code: Case No.: TNK
Instrument ID Number: MET405
Start Date: 07/23/91

Contract: TINKER AFB
SAS No.: SDG No.: PK64
Method: P
End Date: 07/23/91

EPA Sample No.	D/F	Time	% R	Analytes																						
				ALK	BRS	ASA	BAE	BCD	CAR	CHU	CUE	FEB	PHB	MOD	MNG	HGI	NIC	SEE	AGG	ALA	TIL	VIN	ZIN	CN	
TCCS11	1.00	1131											X												
TCCS11A	1.00	1136	98.3										X												
TCCS16	1.00	1141											X												
TCCS16A	1.00	1146	90.0										X												
TCCS12	1.00	1151											X												
TCCS12A	1.00	1155	100.0										X												
TCCS15	1.00	1200											X												
TCCS15A	1.00	1205	100.0										X												
CCV3	1.00	1210											X												
CCB3	1.00	1214											X												
TCCS26	1.00	1219											X												
TCCS26A	1.00	1224	121.7										X												
CCV4	1.00	1229											X												
CCB4	1.00	1234											X												

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ANALYSIS RUN LOG

Lab Name: NUS Laboratory
Lab Code:
Case No.: TNK
Instrument ID Number: MET405
Start Date: 07/19/91

Contract: TINKER AFB
SAS No.:
SDG No.: PFG4
Method: F
End Date: 07/19/91

EPA Sample No.	D/F	Time	% R	Analytes: ALBS	ASAE	BBSA	BEDA	CARB	CDUE	CFBE	PMEN	MGNI	KSES	ANAL	TVIN
S0	1.00	0647											X		
S20	1.00	0652											X		
S50	1.00	0656											X		
S5	1.00	0702											X		
ICV	1.00	0709											X		
LCB	1.00	0714											X		
LCA	1.00	0718											X		
PBW	1.00	0723											X		
PBWA	1.00	0728	88.0										X		
LCSW	1.00	0733											X		
LCSWA	1.00	0737	102.0										X		
TCCC20S	1.00	0742											X		
TCCC20D	1.00	0747											X		
TCCC20DA	1.00	0752	75.0										X		
TCCC20	1.00	0757											X		
TCCC20A	1.00	0801	69.5										X		
CCV1	1.00	0806											X		
CCB1	1.00	0811											X		
TCCSW5	1.00	0816											X		
TCCSW5A	1.00	0821	85.0										X		
TCCS19	1.00	0826											X		
TCCS19A	1.00	0831	86.5										X		
TCCS20	1.00	0836											X		
TCCS20A	1.00	0841	77.5										X		
TCCS21	1.00	0846											X		
TCCS21A	1.00	0851	84.5										X		
TCCS17	1.00	0856											X		
TCCS17A	1.00	0901	86.0										X		
CCV2	1.00	0906											X		
CCB2	1.00	0911											X		
ZZZZZZ	1.00	0916											X		
ZZZZZZ	1.00	0920											X		

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ANALYSIS RUN LOG

Lab Name: NUS Laboratory
Lab Code: Case No.: TNK
Instrument ID Number: MLT405
Start Date: 07/19/91

Contract: TINKER AFB
SAS No.: SDG No.: PHG4
Method: F
End Date: 07/19/91

| EPA Sample No. | D/F | Time | % R | Analytes | | |

HALLIBURTON NUS
Environmental Corporation

INTERNAL CORRESPONDENCE

C-49-8-1-356

TO: PHIL OTTINGER

DATE: AUGUST 30, 1991

FROM: DEB SCHEIB DAS

COPIES: FILE

SUBJECT: DATA VALIDATION - APPENDIX IX ORGANICS (less Herbicides)

TINKER AIR FORCE BASE, PACKAGE #1

SAMPLES:

TKC-SW01-W0001	TCC-SW06-W0001
TTB-W1070491	TCC-SW06-C0001
TCC-SW22-W0001	

NUS Laboratories analyzed 3 water samples (including one field duplicate pair), and 1 trip blank for Appendix IX organic compounds. One sample, TCC-SW22-W0001, was analyzed for pesticides and PCB compounds only.

The data for these analyses were reviewed according to the Hazardous Waste Remedial Action Program's (HAZWRAP) "Requirements for Quality Control of Analytical Data", and with reference to the EPA "Functional Guidelines for Organic Data Validation". The analyses were conducted under Level C Quality Assurance/Quality Control (QA/QC) criteria, and were evaluated according to the following parameters:

- Data completeness
- Holding times
- * Calibrations
- Laboratory blank analyses
- Surrogate spike recoveries
- Matrix spike/matrix spike duplicate results
- Field duplicate precision
- Pesticide/PCB fraction instrument performance
- Detection limits
- Sample quantitation

The symbol (*) indicates that quality control criteria were not met for this parameter. Problems affecting data usability are discussed below and the attached Table 1 summarizes the validation qualifications.

Volatile Fraction

The initial calibration Percent Relative Standard Deviation (%RSD) for acetone exceeded 50%; nondetects for acetone in all samples are qualified as estimated, UJ.

One continuing calibration %D for pripionitrile exceeded 25%. No qualifications to the data were made since no positive results were reported for this compound.

Semivolatile Fraction

Several initial calibration %RSDs exceeded the 20.5% quality control limit, however, no actions were taken because no positive results were reported for the affected compounds in associated samples.

Continuing calibration Percent Differences (%Ds) for several compounds exceeded 50%. Nondetects for the affected compounds in associated samples are qualified as estimated, UJ. Several other %Ds exceeded 25%, but no actions were taken since no positive results were reported for the affected compounds in associated samples.

Pesticide/PCB Fraction

The continuing calibration %Ds for several compounds exceeded 20% on the confirmation column. No actions are necessary since all quality control criteria were met for the quantitation column, and the confirmation of nondetects is not impacted by this noncompliance.

The Matrix Spike/Matrix Spike Duplicate (MS/MSD) recoveries for endirin exceeded the upper quality control limit. No qualifications were made since no positive result was reported for endrin in the unspiked sample.

No other problems were noted. Please do not hesitate to contact me if you have any questions regarding this review.

TINKER AIR FORCE BASE
APPENDIX IX ANALYSES

TABLE 1 - RECOMMENDATION SUMMARY

Sample	VOA	BNA	Pest./PCB
TKC-SW01-W0001	J[1]	J[2]	
TTB-W1070491	J[1]	J[2]	
TCC-SW06-W0001	J[1]	J[2]	
TCC-SW06-C0001	J[1]	J[2]	
TCC-SW22-W0001	J[1]	J[2]	

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

J[1] - Estimate, UJ, nondetects for acetone because of initial calibration %RSD > 50.

J[2] - Estimate, UJ, nondetects for aramite, pentachloro-nitrobenzene, 7,12-dimethyl-benzo (a) anthracene, 4-aminobiphenyl, and methyl methanesulfonic acid because of continuing calibration %Ds > 50.

APPENDIX I

QUALIFIED LABORATORY RESULTS

1X

ORGANICS ANALYSIS DATA SHEET

SAMPLE NO

TTBW1070491

Lab Name: NUS-LSG Contract: _____

Lab Code: NUS-LSG Case No.: TNK SAS No.: _____ SDG No.: PKG1

Matrix: (soil/water) WATER Lab Sample ID: P167574

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: DVP07179102

Level: (low/med) LOW Date Received: 07/04/91

% Moisture: not dec. _____ Date Analyzed: 07/17/91

Column Type: (Pack/Cap/Wide) CAP Dilution Factor: 1.0

TRIP BLANK

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
74-87-3	Chloromethane	10	U
74-83-9	Bromomethane	10	U
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	5	U
67-64-1	Acetone	10	U
75-15-0	Carbon Disulfide	5	U
75-35-4	1,1-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
156-60-5	trans-1,2-Dichloroethene	5	U
67-66-3	Chloroform	5	U
107-06-2	1,2-Dichloroethane	5	U
78-93-3	2-Butanone	10	U
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
108-05-4	Vinyl Acetate	10	U
75-27-4	Bromodichloromethane	5	U
78-87-5	1,2-Dichloropropane	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-01-6	Trichloroethene	5	U
124-48-1	Dibromochloromethane	5	U
79-00-5	1,1,2-Trichloroethane	5	U
71-43-2	Benzene	5	U
10061-02-6	trans-1,3-Dichloropropene	5	U
75-25-2	Bromoform	5	U

NOT QUALIFIED FOR ANY OCCURRENCE ACCORDING TO HAZWRAP DATA VALIDATION PROTOCOL.

ORGANICS ANALYSIS DATA SHEET

TTBW1070491

Lab Name: NUS-LSG Contract: _____

Lab Code: NUS-LSG Case No.: TNK SAS No.: _____ SDG No.: PKG1

Matrix: (soil/water) WATER Lab Sample ID: P167574

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: DVP07179102

Level: (low/med) LOW Date Received: 07/04/91

% Moisture: not dec. ____ Date Analyzed: 07/17/91

Column Type: (Pack/Cap/Wide) CAP Dilution Factor: 1.0

TRIP BLANK

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
108-10-1	4-Methyl-2-Pentanone	10	
591-78-6	2-Hexanone	10	U
127-18-4	Tetrachloroethene	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U
108-88-3	Toluene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethylbenzene	5	U
100-42-5	Styrene	5	U
1330-20-7	Xylene (total)	5	U
107-02-8	Arolein	100	U
107-13-1	Acrylonitrile	100	U
91-59-8	2-Naphthaleneamine	5	U
75-71-8	Dichlorodifluoromethane	5	U
74-88-4	Iodomethane	5	U
74-95-3	Dibromomethane	10	U
97-63-2	Ethyl methacrylate	5	U
96-18-4	1,2,3-Trichloropropane	5	U
764-41-0	1,4-Dichloro-2-butene	10	U
107-05-1	Allyl Chloride	5	U
107-12-0	Propionitrile	10	U
126-98-7	Methacrylonitrile	5	U
80-62-6	Methylmethacrylate	10	U
106-93-4	1,2-Dibromoethane	5	U
630-20-6	1,1,1,2-Tetrachloroethane	5	U
76-01-7	Pentachloroethane	5	U

1X

ORGANICS ANALYSIS DATA SHEET

SAMPLE N

TTBW1070491

Lab Name: NUS-LSG Contract: _____

Lab Code: NUS-LSG Case No.: TNK SAS No.: _____ SDG No.: PKG1

Matrix: (soil/water) WATER Lab Sample ID: P167574

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: DVP07179102

Level: (low/med) LOW Date Received: 07/04/91

% Moisture: not dec. ____ Date Analyzed: 07/17/91

Column Type: (Pack/Cap/Wide) CAP Dilution Factor: 1.0

TRIP BLANK

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
----------	1,2-Dibromo-3-Chloropropane	10	U

SUPPORT DOCUMENTATION

6A

VOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: NUS-LSG Contract:

Lab Code: NUS-LSG Case No.: TNK SAS No.: SDG No.: PKG1

Instrument ID: GCMSD Calibration Date(s): 07/16/91 07/16/91

Matrix:(soil/water) WATER Level:(low/med) LOW Column:(pack/cap) CAP

* Compounds with minimum RRF amd maximum %RSD criteria

LAB FILE ID: RRF20 = DVT07169102 RRF50 = DVT07169101
RRF100= DVT07169103 RRF150= DVT07169104 RRF200= DVT07169105

COMPOUND	RRF20	RRF50	RRF100	RRF150	RRF200	RRF	% RSD
Chloromethane	1.648	1.748	1.717	1.719	1.693	1.705	2.
Bromomethane *	1.636	1.692	1.546	1.350	1.315	1.508	11.
Vinyl Chloride *	2.121	2.172	2.104	2.027	2.000	2.085	3.
Chloroethane	1.346	1.335	1.316	1.121	1.140	1.252	8.
Methylene Chloride	2.876	2.914	2.744	2.719	2.668	2.784	3.
Acetone	1.559	0.536	0.492	0.471	0.527	0.717	65.
Carbon Disulfide	2.382	2.521	3.021	3.080	2.997	2.800	11.
1,1-Dichloroethene *	1.280	1.279	1.194	1.224	1.204	1.236	3.
1,1-Dichloroethane *	3.647	3.530	3.419	3.426	3.247	3.454	4.
trans-1,2-Dichloroethene	1.504	1.449	1.391	1.411	1.347	1.420	4.
Chloroform *	4.092	3.857	3.767	3.712	3.543	3.794	5.
1,2-Dichloroethane *	2.768	2.724	2.641	2.647	2.593	2.675	2.
2-Butanone	0.195	0.182	0.163	0.167	0.168	0.175	7.
1,1,1-Trichloroethane *	0.745	0.765	0.685	0.686	0.667	0.710	6.
Carbon Tetrachloride *	0.603	0.603	0.573	0.587	0.600	0.593	2.
Vinyl Acetate	1.255	1.299	1.173	1.179	1.094	1.200	6.
Bromodichloromethane *	0.736	0.765	0.735	0.774	0.772	0.756	2.
1,2-Dichloropropane	0.413	0.423	0.383	0.400	0.406	0.405	3.
cis-1,3-Dichloropropene *	0.631	0.659	0.611	0.625	0.593	0.624	3.
Trichloroethene *	0.428	0.408	0.386	0.401	0.414	0.407	3.
Dibromochloromethane *	0.646	0.639	0.605	0.630	0.653	0.635	2.
1,1,2-Trichloroethane *	0.361	0.363	0.331	0.345	0.346	0.349	3.
Benzene *	0.991	0.980	0.911	0.922	0.898	0.940	4.
trans-1,3-Dichloropropene *	0.609	0.617	0.574	0.596	0.604	0.600	2.
Bromoform *	0.463	0.490	0.449	0.462	0.461	0.465	3.
4-Methyl-2-Pentanone	0.837	0.621	0.557	0.567	0.564	0.629	18.
2-Hexanone	0.398	0.422	0.391	0.405	0.390	0.401	3.
Tetrachloroethene *	0.464	0.451	0.443	0.447	0.447	0.450	1.
1,1,2,2-Tetrachloroethane *	0.850	0.829	0.805	0.822	0.811	0.823	2.
Toluene *	0.707	0.677	0.679	0.699	0.712	0.695	2.
Chlorobenzene *	0.960	0.935	0.929	0.939	0.910	0.935	1.
Ethylbenzene *	0.451	0.431	0.440	0.455	0.467	0.449	3.
Styrene *	1.016	0.985	1.002	1.029	0.966	1.000	2.
Xylene (total) *	0.612	0.565	0.569	0.578	0.597	0.584	3.
Arolein	0.170	0.174	0.160	0.157	0.145	0.161	7.
Acrylonitrile	0.410	0.424	0.377	0.382	0.367	0.392	6.
Toluene-d8	1.012	1.064	1.038	1.064	1.018	1.039	2.
Bromofluorobenzene *	0.794	0.831	0.827	0.856	0.849	0.831	2.

5A

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

Lab Name: NUS-LSG Contract: _____

Lab Code: NUS-LSG Case No.: TNK SAS No.: _____ SDG No.: PKG1

Lab File ID: DBF07179101 BFB Injection Date: 07/17/91

Instrument ID: GCMSD BFB Injection Time: 1333

Matrix:(soil/water) WATER Level:(low/med) LOW Column:(pack/cap) CAP

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	27.6
75	30.0 - 60.0% of mass 95	53.4
95	Base peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	6.8
173	Less than 2.0% of mass 174	0.2 (0.3)1
174	Greater than 50.0% of mass 95	67.6
175	5.0 - 9.0% of mass 174	5.1 (7.5)1
176	Greater than 95.0%, but less than 101.0% of mass 174	65.2 (96.4)1
177	5.0 - 9.0% of mass 176	4.2 (6.5)2

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

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

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD050	VSTD050	DVT07179102	07/17/91	1351
02	VBLKDN	VBLKDN	DVB07179101	07/17/91	1446
03	TKCSW01W0001	P167575	DVP07179101	07/17/91	1530
04	TTBW1070491	P167574	DVP07179102	07/17/91	1614
05	TCCSW06W0001	P167572	DVP07179103	07/17/91	1719
06	TCCSW06C0001	P167573	DVP07179104	07/17/91	1838
07	TCCSW06Z0001	P167573MSD	DVP07179106	07/17/91	2013
08	TCCSW06Q0001	P167573MS	DVP07179108	07/17/91	2151

CC %D > 25 PROPIONITRILE, NO ACTION, NO AFFECTED POSITIVES.

FORM V VOA 1/87 Rev.

1,2-Dichloroethane-d4	2.287	2.575	-12.6
Trichlorofluoromethane	2.691	3.183	-18.3
Dichlorodifluoromethane	0.790	0.926	-17.2
Iodomethane	2.950	3.404	-15.4
Dibromethane	0.369	0.435	-17.9
Ethyl methacrylate	0.597	0.653	-9.4
1,2,3-Trichloropropane	0.639	0.725	-13.5
1,4-Dichloro-2-butene	0.382	0.414	-8.4
Allyl Chloride	3.701	4.280	-15.6
Propionitrile	0.214	0.280	-30.8
Methacrylonitrile	0.602	0.710	-17.9
Methylmethacrylate	0.278	0.306	-10.1
1,2-Dibromoethane	0.723	0.801	-10.8
1,1,1,2-Tetrachloroethane	0.590	0.659	-11.7
Pentachloroethane	0.478	0.507	-6.1
1,2-Dibromo-3-Chloropropane	0.233	0.261	-12.0

2,6-Dichlorophenol	0.288	0.293	0.322	0.331	0.326	0.312	6.[illegible]
N-Nitroso-di-n-butylamine	0.224	0.218	0.231	0.228	0.217	0.224	[illegible]
Methanesulfonic acid, Methy	0.129	0.132	0.139	0.147	0.143	0.138	[illegible]
Acetophenone	1.512	1.498	1.565	1.606	1.600	1.556	[illegible]
A,A-Dimethylphenylamine	0.574	0.617	0.692	0.622	0.442	0.589	15.[illegible]
Pentachlorobenzene	0.456	0.473	0.490	0.516	0.533	0.494	6.[illegible]
4-Amino Biphenyl	0.030	0.041	0.056	0.076	0.090	0.059	41.[illegible]
P-Dimethylaminoazobenzene	0.604	0.556	0.504	0.476	0.464	0.521	11.[illegible]
7,12-Dimethyl Benzo(A)Anthr	0.113	0.111	0.115	0.133	0.143	0.123	11.[illegible]
1,2,4,5-Tetrachlorobenzene	0.299	0.307	0.329	0.344	0.350	0.326	6.[illegible]
Diphenylamine	0.448	0.485	0.519	0.531	0.526	0.502	7.[illegible]
Phenacetin	0.268	0.305	0.309	0.332	0.349	0.313	9.[illegible]
3-Methylcholanthrene	0.584	0.617	0.614	0.650	0.684	0.630	6.[illegible]
Pronamide	0.245	0.251	0.253	0.250	0.264	0.253	2.[illegible]
1,4-Benzenediamine							
Isosafrole							
2-Naphthaleneamine							
5-Nitro-O-Toluidine							
4-Nitroquinoline-1-Oxide							
Methapyrilene							
2-Acetylaminofluorene							
N-Nitrosomethylethylamine							
N-Nitrosodiethylamine							
N-Nitrosopyrrolidine							
N-Nitrosomorpholine							
O-Toluidine							
O,O,O,-Triethylphosphorthio							
Pentachloronitrobenzene	0.041	0.044	0.042	0.044	0.041	0.042	[illegible]
Safrole							
1,4-Napthoquinone							
1,3,5-Trinitrobenzene							
Hexachloropropene							
1,3-Dinitrobenzene							
3,3,-Dimethylbenzidine							
Hexachlorophene							
Dimethoate							
Diallate							
Pyridine							
Aramite							
2-Secbutyl-4,6-Dinitropheno							
M-Cresol							

(1) Cannot be separated from Diphenylamine

2,6-Dichlorophenol							
N-Nitroso-di-n-butylamine							
Methanesulfonic acid, Methy							
Acetophenone							
A,A-Dimethylphenylamine							
Pentachlorobenzene							
4-Amino Biphenyl							
P-Dimethylaminoazobenzene							
7,12-Dimethyl Benzo(A)Anthr							
1,2,4,5-Tetrachlorobenzene							
Diphenylamine							
Phenacetin							
3-Methylcholanthrene							
Pronamide							
1,4-Benzenediamine	0.131	0.245	0.265	0.183	0.177	0.200	27.2
Isosafrole	0.366	0.414	0.403	0.410	0.415	0.402	5.1
2-Naphthaleneamine							
5-Nitro-O-Toluidine	0.231	0.290	0.275	0.288	0.298	0.276	9.7
4-Nitroquinoline-1-Oxide	0.029	0.053	0.050	0.047	0.043	0.044	21.3
Methapyrilene	0.280	0.370	0.354	0.396	0.412	0.362	14.2
2-Acetylaminofluorene	0.349	0.451	0.437	0.468	0.463	0.434	11.2
N-Nitrosomethylethylamine	0.595	0.536	0.515	0.546	0.537	0.546	5.5
N-Nitrosodiethylamine	0.547	0.620	0.597	0.611	0.605	0.596	4.8
N-Nitrosopyrrolidine	0.563	0.626	0.652	0.669	0.685	0.639	7.5
N-Nitrosomorpholine	0.622	0.701	0.685	0.701	0.702	0.682	5.0
O-Toluidine	1.007	1.112	1.144	1.188	1.206	1.131	7.0
O,O,O,-Triethylphosphorthio	0.160	0.178	0.138	0.161	0.127	0.153	13.2
Pentachloronitrobenzene							
Safrole	0.410	0.454	0.429	0.435	0.439	0.433	3.7
1,4-Napthoquinone	0.357	0.320	0.299	0.226	0.149	0.270	30.7
1,3,5-Trinitrobenzene	0.121	0.163	0.148	0.156	0.162	0.150	11.5
Hexachloropropene	0.025	0.031	0.029	0.030	0.031	0.029	8.6
1,3-Dinitrobenzene	0.121	0.160	0.160	0.166	0.175	0.156	13.3
3,3,-Dimethylbenzidine	0.086	0.085	0.072	0.057	0.039	0.068	29.3
Hexachlorophene	0.060	0.080	0.096	0.098	0.092	0.085	18.5
Dimethoate	0.359	0.310	0.265	0.226	0.171	0.266	27.4
Diallate	0.295	0.321	0.283	0.387	0.415	0.340	17.1
Pyridine	0.949	1.032	1.021	1.048	1.074	1.025	4.6
Aramite	0.076	0.080	0.068	0.061	0.052	0.067	16.9
2-Secbutyl-4,6-Dinitropheno	0.149	0.193	0.196	0.209	0.229	0.195	15.1
M-Cresol	0.914	1.082	1.148	1.205	1.228	1.115	11.3

(1) Cannot be separated from Diphenylamine

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: NUS-LSG Contract:

Lab Code: NUS-LSG Case No.: TNK SAS No.: SDG No.: PKG1

Instrument ID: GCMSA Calibration date: 07/25/91 Time: 948

Lab File ID: ABT07259101 Init. Calib. Date(s): 04/23/91 04/24/91

*Compounds with minimum RRF and maximum %D criteria

COMPOUND		RRF	RRF50	%D	
N-Nitrosodimethylamine		0.879	0.810	7.8	
Phenol	*	2.012	1.653	17.8	*
Aniline		2.147	1.892	11.9	
bis(2-Chloroethyl)Ether	*	1.545	1.303	15.7	*
2-Chlorophenol	*	1.545	1.352	12.5	*
1,3-Dichlorobenzene	*	1.592	1.394	12.4	*
1,4-Dichlorobenzene	*	1.653	1.436	13.1	*
Benzyl Alcohol		0.881	0.758	14.0	
1,2-Dichlorobenzene	*	1.493	1.346	9.8	*
2-Methylphenol	*	1.361	1.205	11.5	*
bis(2-Chloroisopropyl)Ether		1.608	1.966	-22.3	
4-Methylphenol	*	1.124	0.992	11.7	*
N-Nitroso-Di-n-Propylamine	*	0.884	0.902	-2.0	*
Hexachloroethane	*	0.652	0.560	14.1	*
Nitrobenzene	*	0.369	0.352	4.6	*
Isophorone	*	0.720	0.707	1.8	*
2-Nitrophenol	*	0.265	0.241	9.1	*
2,4-Dimethylphenol	*	0.326	0.308	5.5	*
bis(2-Chloroethoxy)Methane	*	0.465	0.443	4.7	*
2,4-Dichlorophenol	*	0.309	0.278	10.0	*
1,2,4-Trichlorobenzene	*	0.337	0.319	5.3	*
Naphthalene	*	1.042	1.042	0.0	*
4-Chloroaniline		0.464	0.421	9.3	
Hexachlorobutadiene		0.174	0.165	5.2	
4-Chloro-3-Methylphenol	*	0.254	0.250	1.6	*
2-Methylnaphthalene	*	0.547	0.520	4.9	*
Hexachlorocyclopentadiene		0.277	0.269	2.9	
2,4,6-Trichlorophenol	*	0.338	0.344	-1.8	*
2,4,5-Trichlorophenol	*	0.377	0.350	7.2	*
2-Chloronaphthalene	*	1.449	1.207	16.7	*
2-Nitroaniline		0.296	0.295	0.3	
Dimethyl Phthalate		1.190	1.204	-1.2	
Acenaphthylene	*	1.583	1.598	-0.9	*
2,6-Dinitrotoluene	*	0.297	0.276	7.1	*
3-Nitroaniline		0.303	0.275	9.2	
Acenaphthene	*	1.166	1.016	12.9	*
2,4-Dinitrophenol		0.150	0.107	28.7	
4-Nitrophenol		0.076	0.043	43.4	

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: NUS-LSG Contract:

Lab Code: NUS-LSG Case No.: TNK SAS No.: SDG No.: PKG1

Instrument ID: GCMSA Calibration date: 07/25/91 Time: 948

Lab File ID: ABT07259101 Init. Calib. Date(s): 04/23/91 04/24/91

*Compounds with minimum RRF and maximum %D criteria

COMPOUND		RRF	RRF50	%D	
Dibenzofuran	*	1.527	1.396	8.6	*
2,4-Dinitrotoluene	*	0.319	0.342	-7.2	*
Diethylphthalate		1.046	1.022	2.3	
4-Chlorophenyl-phenylether	*	0.493	0.549	-11.4	*
Fluorene	*	1.224	1.176	3.9	*
4-Nitroaniline		0.227	0.213	6.2	
4,6-Dinitro-2-Methylphenol		0.182	0.139	23.6	
N-Nitrosodiphenylamine (1)		0.502	0.589	-17.3	
4-Bromophenyl-phenylether	*	0.250	0.218	12.8	*
Hexachlorobenzene	*	0.272	0.253	7.0	*
Pentachlorophenol	*	0.134	0.173	-29.1	*
Phenanthrene	*	1.194	1.065	10.8	*
Anthracene	*	1.002	1.013	-1.1	*
Di-n-Butylphthalate		1.199	1.129	5.8	
Fluoranthene	*	0.969	0.974	-0.5	*
Pyrene	*	1.821	1.455	20.1	*
Butylbenzylphthalate		0.771	0.514	33.3	
3,3'-Dichlorobenzidine		0.574	0.411	28.4	
Benzo(a)Anthracene	*	1.449	1.101	24.0	*
Chrysene	*	1.265	0.932	26.3	*
bis(2-Ethylhexyl)Phthalate		1.018	0.757	25.6	
Di-n-Octyl Phthalate		1.668	1.372	17.8	
Benzo(b)Fluoranthene	*	1.387	1.280	7.7	*
Benzo(k)Fluoranthene	*	1.252	1.218	2.7	*
Benzo(a)Pyrene	*	1.216	1.142	6.1	*
Indeno(1,2,3-cd)Pyrene	*	1.085	1.231	-13.5	*
Dibenzo(a,h)Anthracene	*	0.992	1.102	-11.1	*
Benzo(g,h,i)Perylene	*	0.909	0.980	-7.8	*
Nitrobenzene-d5	*	0.401	0.364	9.2	*
2-Fluorobiphenyl	*	1.446	1.191	17.6	*
Terphenyl-d14	*	1.731	1.261	27.2	*
Phenol-d5	*	1.875	1.650	12.0	*
2-Fluorophenol	*	1.341	1.192	11.1	*
2,4,6-Tribromophenol		0.141	0.190	-34.8	
2,3,4,6-Tetrachlorophenol		0.294	0.252	14.3	
Pyridine, 2-Methyl (2-Picol		0.579	0.729	-25.9	
Methanesulfonic acid, Ethyl		1.060	0.963	9.2	
N-Nitrosopiperidine		0.696	0.883	-26.9	
2,6-Dichlorophenol		0.312	0.287	8.0	

N-Nitroso-di-n-butylamine	0.224	0.227	-1.3
Methanesulfonic acid, Methy	0.138	0.243	-76.1
Acetophenone	1.556	1.599	-2.8
A,A-Dimethylphenylamine	0.589	0.572	2.9
Pentachlorobenzene	0.494	0.458	7.3
4-Amino Biphenyl	0.059	0.622	-99.9
P-Dimethylaminoazobenzene	0.521	0.375	28.0
7,12-Dimethyl Benzo(A)Anthr	0.123	0.618	-99.9
1,2,4,5-Tetrachlorobenzene	0.326	0.293	10.1
Diphenylamine	0.502	0.589	-17.3
Phenacetin	0.313	0.240	23.3
3-Methylcholanthrene	0.630	0.668	-6.0
Pronamide	0.253	0.304	-20.2
1,4-Benzenediamine			
Isosafrole			
2-Naphthaleneamine			
5-Nitro-O-Toluidine			
4-Nitroquinoline-1-Oxide			
Methapyrilene			
2-Acetylaminofluorene			
N-Nitrosomethylethylamine			
N-Nitrosodiethylamine			
N-Nitrosopyrrolidine			
N-Nitrosomorpholine			
O-Toluidine			
O,O,O,-Triethylphosphorthio			
Pentachloronitrobenzene	0.042		100.0
Safrole			
1,4-Napthoquinone			
1,3,5-Trinitrobenzene			
Hexachloropropene			
1,3-Dinitrobenzene			
3,3,-Dimethylbenzidine			
Hexachlorophene			
Dimethoate			
Diallate			
Pyridine			
Aramite			
2-Secbutyl-4,6-Dinitropheno			
M-Cresol			

N-Nitroso-di-n-butylamine			
Methanesulfonic acid, Methy			
Acetophenone			
A,A-Dimethylphenylamine			
Pentachlorobenzene			
4-Amino Biphenyl			
P-Dimethylaminoazobenzene			
7,12-Dimethyl Benzo(A)Anthr			
1,2,4,5-Tetrachlorobenzene			
Diphenylamine			
Phenacetin			
3-Methylcholanthrene			
Pronamide			
1,4-Benzenediamine	0.200	0.120	40.0
Isosafrole	0.402	0.426	-6.0
2-Naphthaleneamine			
5-Nitro-O-Toluidine	0.276	0.271	1.8
4-Nitroquinoline-1-Oxide	0.044	0.038	13.6
Methapyrilene	0.362	0.337	6.9
2-Acetylaminofluorene	0.434	0.444	-2.3
N-Nitrosomethylethylamine	0.546	0.559	-2.4
N-Nitrosodiethylamine	0.596	0.590	1.0
N-Nitrosopyrrolidine	0.639	0.602	5.8
N-Nitrosomorpholine	0.682	0.706	-3.5
O-Toluidine	1.131	1.169	-3.4
O,O,O,-Triethylphosphorthio	0.153	0.178	-16.3
Pentachloronitrobenzene			
Safrole	0.433	0.457	-5.5
1,4-Napthoquinone	0.270	0.401	-48.5
1,3,5-Trinitrobenzene	0.150	0.151	-0.7
Hexachloropropene	0.029	0.033	-13.8
1,3-Dinitrobenzene	0.156	0.159	-1.9
3,3,-Dimethylbenzidine	0.068	0.058	14.7
Hexachlorophene	0.085	0.098	-15.3
Dimethoate	0.266	0.349	-31.2
Diallate	0.340	0.341	-0.3
Pyridine	1.025	1.118	-9.1
Aramite	0.067		100.0
2-Secbutyl-4,6-Dinitropheno	0.195	0.220	-12.8
M-Cresol	1.115	1.042	6.5

FORM VII SV-3

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

Lab Name: NUS-LSG Contract:

Lab Code: NUS-LSG Case No.: TNK SAS No.: SDG No.: PKG1

Lab File ID: ADF07259101 DFTPP Injection Date: 07/25/91

Instrument ID: GCMSA DFTPP Injection Time: 0926

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	37.5
68	Less than 2.0% of mass 69	0.0 (0.0)1
69	Mass 69 relative abundance	44.0
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	100.0
199	5.0 to 9.0% of mass 198	6.2
275	10.0 - 30.0% of mass 198	22.9
365	Greater than 1.00% of mass 198	1.35
441	Present, but less than mass 443	8.1
442	Greater than 40.0% of mass 198	65.9
443	17.0 - 23.0% of mass 442	12.3 (18.7)2

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

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

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD050	SSTD050	ABT07259101	07/25/91	0948
02	SSTD050	SSTD050	ABT07259102	07/25/91	1033
03	SBLKAQ	SBLKAQ	ABB07259101	07/25/91	1137
04	TKCSW01W0001	P167561	ABP07259101	07/25/91	1309
05	TCCSW06W0001	P167572	ABP07259102	07/25/91	1355
06	TCCSW06C0001	P167573	ABP07259103	07/25/91	1441
07	TCCSW06Q0001	P167573MS	ABP07259104	07/25/91	1526
08	TCCSW06Z0001	P167573MSD	ABP07259105	07/25/91	1612

SEVERAL CC %D > 50 ; WJ NDs

FORM V SV 1/87 Rev.

PESTICIDE/PCB STANDARDS SUMMARY

Name: NUS-LSG Contract: _____

Lab Code: NUS Case No.: TNK SAS No.: _____ SDG No.: PKG1

Instrument ID: VA3700 2 GC Column ID: DB608

DATE(S) OF ANALYSIS FROM: 07/17/91 TO: 07/17/91
TIME(S) OF ANALYSIS FROM: 1245 TO: 1920

DATE OF ANALYSIS 07/18/91
TIME OF ANALYSIS 1014
EPA SAMPLE NO. (STANDARD) INDB

COMPOUND	RT	RT WINDOW FROM	RT WINDOW TO	CALIBRATION FACTOR	RT	CALIBRATION FACTOR	QNT Y/N	%D
alpha-BHC	5.78	5.66	5.90	153	5.76	183	N	-19.
beta-BHC	7.54	7.51	7.57	56.2	7.49	67.6	N	-20.
delta-BHC	9.01	8.99	9.03	142	8.93	174	N	-22.
gamma-BHC	7.30	7.22	7.38	166				
Heptachlor	8.54	8.50	8.58	136				
Aldrin	9.82	9.77	9.87	148				
Hept. epoxide	12.07	12.03	12.11	124				
Endosulfan I	13.38	13.28	13.48	175				
Dieldrin	14.57	14.52	14.62	121				
4,4'-DDE	14.42	14.38	14.46	123	14.33	139	N	-13
Endrin	15.93	15.92	15.94	63.1	15.86	105	N	-66
Endosulfan II	16.62	16.57	16.67	110				
4,4'-DDD	16.52	16.48	16.56	99.4	16.48	119	N	-19
Endo. sulfate	18.34	18.29	18.39	113	18.32	134	N	-18
4,4'-DDT	17.61	17.58	17.64	113				
Methoxychlor	21.74	21.66	21.82	40.9				
Endrin ketone	21.98	21.92	22.04	116	21.91	133	N	-14
a. Chlordane	13.28	13.26	13.30	130	13.26	148	N	-13
g. Chlordane	12.68	12.60	12.76	131	12.60	151	N	-15
Toxaphene	16.73	16.71	16.75	27.6				
Aroclor-1016	8.71	8.69	8.73	22.3				
Aroclor-1221	5.69	5.65	5.73	3.78				
Aroclor-1232	8.63	8.62	8.64	10.9				
Aroclor-1242	8.66	8.64	8.68	24.5				
Aroclor-1248	12.45	12.43	12.47	37.7				
Aroclor-1254	14.99	14.97	15.01	62.5				
Aroclor-1260	16.03	15.97	16.09	58.2				

Under QNT Y/N: enter Y if quantitation was performed, N if not performed.
%D must be less than or equal to 15.0% for quantitiation, and less than or equal to 20.0% for confirmation.

Note: Determining that no compounds were found above the CRDL is a form quantitation, and therefore at least one column must meet the 15.0% crite

For multicomponent analytes, the single largest peak that is characterist of the component should be used to establish retention time and %D. Identification of such analytes is based primarily on pattern recognition

PESTICIDE/PCB STANDARDS SUMMARY

Lab: NUS-LSG Contract: _____

Code: NUS Case No.: TNK SAS No.: _____ SDG No.: PKG1

Instrument ID: VA3700 2 GC Column ID: DB608

DATE(S) OF ANALYSIS	FROM: 07/17/91	DATE OF ANALYSIS 07/18/91
	TO: 07/17/91	TIME OF ANALYSIS 0942
TIME(S) OF ANALYSIS	FROM: 1245	EPA SAMPLE NO.
	TO: 1920	(STANDARD) INDA

COMPOUND	RT	RT WINDOW FROM	RT WINDOW TO	CALIBRATION FACTOR	RT	CALIBRATION FACTOR	QNT Y/N	%D
aloha-BHC	5.78	5.66	5.90	153				
beta-BHC	7.54	7.51	7.57	56.2				
delta-BHC	9.01	8.99	9.03	142				
gamma-BHC	7.30	7.22	7.38	166	7.24	189	N	-13.9
Heptachlor	8.54	8.50	8.58	136	8.50	160	N	-17.6
Aldrin	9.82	9.77	9.87	148	9.74	167	N	-12.8
Hept. epoxide	12.07	12.03	12.11	124	11.98	146	N	-17.7
Endosulfan I	13.38	13.28	13.48	175	13.34	200	N	-14.3
Dieldrin	14.57	14.52	14.62	121	14.53	143	N	-18.2
4,4'-DDE	14.42	14.38	14.46	123				
Endrin	15.93	15.92	15.94	63.1				
Endosulfan II	16.62	16.57	16.67	110	16.61	130	N	-18.2
4,4'-DDD	16.52	16.48	16.56	99.4				
Endo. sulfate	18.34	18.29	18.39	113				
4,4'-DDT	17.61	17.58	17.64	113	17.57	129	N	-14.2
Methoxychlor	21.74	21.66	21.82	40.9	21.67	52.4	N	-28.1
Endrin ketone	21.98	21.92	22.04	116				
a. Chlordane	13.28	13.26	13.30	130				
g. Chlordane	12.68	12.60	12.76	131				
Toxaphene	16.73	16.71	16.75	27.6				
Aroclor-1016	8.71	8.69	8.73	22.3				
Aroclor-1221	5.69	5.65	5.73	3.78				
Aroclor-1232	8.63	8.62	8.64	10.9				
Aroclor-1242	8.66	8.64	8.68	24.5				
Aroclor-1248	12.45	12.43	12.47	37.7				
Aroclor-1254	14.99	14.97	15.01	62.5				
Aroclor-1260	16.03	15.97	16.09	58.2				

Under QNT Y/N: enter Y if quantitation was performed, N if not performed.
%D must be less than or equal to 15.0% for quantitiation, and less than or equal to 20.0% for confirmation.

Note: Determining that no compounds were found above the CRDL is a form of quantitation, and therefore at least one column must meet the 15.0% criteria.

For multicomponent analytes, the single largest peak that is characteristic of the component should be used to establish retention time and %D. Identification of such analytes is based primarily on pattern recognitic

3E

WATER PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: NUS-LSG Contract: _____

ab Code: NUS Case No.: TNK SAS No.: _____ SDG No.: PKG1

Matrix Spike - EPA Sample No.: TCCSW06C0001

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC LIMITS REC.
gamma-BHC (Lindane)	0.200	0	0.210	105	56-123
Heptachlor	0.200	0	0.236	118	40-131
Aldrin	0.200	0	0.226	113	40-120
Dieldrin	0.500	0	0.560	112	52-126
Endrin	0.500	0	0.779	156 *	56-121
4,4'-DDT	0.500	0	0.513	103	38-127

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
gamma-BHC (Lindane)	0.200	0.218	109	-4	15	56-123
Heptachlor	0.200	0.247	124	-5	20	40-131
Aldrin	0.200	0.232	116	-3	22	40-120
Dieldrin	0.500	0.578	116	-4	18	52-126
Endrin	0.500	0.808	162 *	-4	21	56-121
4,4'-DDT	0.500	0.529	106	-3	27	38-127

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 0 out of 6 outside limits
Spike Recovery: 2 out of 12 outside limits

COMMENTS:

HALLIBURTON NUS
Environmental Corporation

INTERNAL CORRESPONDENCE

C-49-8-1-355

TO: PHIL OTTINGER

DATE: AUGUST 30, 1991

FROM: DEB SCHEIB

COPIES: FILE

SUBJECT: DATA VALIDATION - APPENDIX IX ORGANICS (less Herbicides)

TINKER AIR FORCE BASE, PACKAGE #4

SAMPLES:

TKC-SW05-W0001
TTB-W1070791
TCC-SW11-W0001
TCC-SW16-W0001

TCC-SW15-W0001

NUS Laboratories analyzed 3 water samples and 1 trip blank for Appendix IX organic compounds. One sample, TCC-SW15-W0001, was analyzed for pesticides and PCB compounds only.

The data for these analyses were reviewed according to the Hazardous Waste Remedial Action Program's (HAZWRAP) "Requirements for Quality Control of Analytical Data", and with reference to the EPA "Functional Guidelines for Organic Data Validation". The analyses were conducted under Level C Quality Assurance/Quality Control (QA/QC) criteria, and were evaluated according to the following parameters:

- Data completeness
- Holding times
- * Calibrations
- * Laboratory blank analyses
- Surrogate spike recoveries
- Matrix spike/matrix spike duplicate results
- Field duplicate precision
- Pesticide/PCB fraction instrument performance
- Detection limits
- Sample quantitation

The symbol (*) indicates that quality control criteria were not met for this parameter. Problems affecting data usability are discussed below and the attached Table 1 summarizes the validation qualifications.

Volatile Fraction

A concentration of 9 ug/L acetone was detected in an associated laboratory method blank, and 11 ug/L 4-methyl-2-pentanone was detected in the trip blank. No qualifications were necessary since no positive results for these compounds were reported for any

environmental sample.

The initial calibration Percent Relative Standard Deviation (%RSD) for acetone exceeded 50%; nondetects for acetone in all samples are qualified as estimated, UJ.

One continuing calibration %D for pripionitrile exceeded 25%. No qualifications to the data were made since no positive results were reported for this compound.

Semivolatile Fraction

The initial calibration Percent Relative Standard Deviations (%RSDs) for several compounds exceeded the 20.5% quality control criterion, but were less than 50%. No actions were taken since no positive results were reported for the affected compounds, and nondetects are not impacted.

The continuing calibration Percent Differences (%Ds) for several compounds exceeded 50%. Nondetects for these compounds in the affected samples are qualified as estimated, UJ. Several other %Ds exceeded 25%, but were less than 50%; no actions were taken since no positive results were reported for the affected compounds in associated samples.

Pesticide/PCB Fraction

No problems were noted.

Please do not hesitate to contact me if you have any questions regarding this review.

TINKER AIR FORCE BASE
APPENDIX IX ANALYSES

TABLE 1 - RECOMMENDATION SUMMARY

Sample	VOA	BNA	Pest./PCB
TKC-SW05-W0001	J[1]	J[2]	
TTB-W1070791	J[1]	J[2]	
TCC-SW11-W0001	J[1]	J[2]	
TCC-SW16-W0001	J[1]	J[2]	
TEC-SW22-W0001	J[1]	J[2]	

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

J[1] - Estimate, UJ, nondetects for acetone because of initial calibration %RSD > 50.

J[2] - Estimate, UJ, nondetects, in affected samples, for compounds whose continuing calibration %Ds are > 50.

APPENDIX I

QUALIFIED LABORATORY RESULTS

1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

TTBW1070791

Lab Name: NUS-LSG Contract: _____

Lab Code: NUS-LSG Case No.: TNK SAS No.: _____ SDG No.: PKG4

Matrix: (soil/water) WATER Lab Sample ID: P167664

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: DVP07179107

Level: (low/med) LOW Date Received: 07/07/91

% Moisture: not dec. ____ Date Analyzed: 07/17/91

Column Type: (Pack/Cap/Wide) CAP Dilution Factor: 1.0

TRIP BLANK

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane	10	U
74-83-9	Bromomethane	10	U
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	5	U
67-64-1	Acetone	10	U
75-15-0	Carbon Disulfide	5	U
75-35-4	1,1-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
156-60-5	trans-1,2-Dichloroethene	5	U
67-66-3	Chloroform	5	U
107-06-2	1,2-Dichloroethane	5	U
78-93-3	2-Butanone	10	U
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
108-05-4	Vinyl Acetate	10	U
75-27-4	Bromodichloromethane	5	U
78-87-5	1,2-Dichloropropane	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-01-6	Trichloroethene	5	U
124-48-1	Dibromochloromethane	5	U
79-00-5	1,1,2-Trichloroethane	5	U
71-43-2	Benzene	5	U
10061-02-6	trans-1,3-Dichloropropene	5	U
75-25-2	Bromoform	5	U

NOT QUALIFIED FOR ANY OCCURRENCE ACCORDING TO HAZWRAP DATA VALIDATION PROTOCOL.

1A

ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

TTBW1070791

Lab Name: NUS-LSG Contract: _____

Lab Code: NUS-LSG Case No.: TNK SAS No.: _____ SDG No.: PKG4

Matrix: (soil/water) WATER Lab Sample ID: P167664

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: DVP07179107

Level: (low/med) LOW Date Received: 07/07/91

% Moisture: not dec. ____ Date Analyzed: 07/17/91

Column Type: (Pack/Cap/Wide) CAP Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
108-10-1	4-Methyl-2-Pentanone	11	
591-78-6	2-Hexanone	10	U
127-18-4	Tetrachloroethene	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U
108-88-3	Toluene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethylbenzene	5	U
100-42-5	Styrene	5	U
1330-20-7	Xylene (total)	5	U
107-02-8	Arolein	100	U
107-13-1	Acrylonitrile	100	U
91-59-8	2-Naphthaleneamine	5	U
75-71-8	Dichlorodifluoromethane	5	U
74-88-4	Iodomethane	5	U
74-95-3	Dibromomethane	10	U
97-63-2	Ethyl methacrylate	5	U
96-18-4	1,2,3-Trichloropropane	5	U
764-41-0	1,4-Dichloro-2-butene	10	U
107-05-1	Allyl Chloride	5	U
107-12-0	Propionitrile	10	U
126-98-7	Methacrylonitrile	5	U
80-62-6	Methylmethacrylate	10	U
106-93-4	1,2-Dibromoethane	5	U
630-20-6	1,1,1,2-Tetrachloroethane	5	U
76-01-7	Pentachloroethane	5	U

1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO

TTBW1070791

Lab Name: NUS-LSG Contract: _____

Lab Code: NUS-LSG Case No.: TNK SAS No.: _____ SDG No.: PKG4

Matrix: (soil/water) WATER Lab Sample ID: P167664

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: DVP07179107

Level: (low/med) LOW Date Received: 07/07/91

% Moisture: not dec. ____ Date Analyzed: 07/17/91

Column Type: (Pack/Cap/Wide) CAP Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
	1,2-Dibromo-3-Chloropropane	10	U

SUPPORT DOCUMENTATION

1X

ORGANICS ANALYSIS DATA SHEET

SAMPLE N

VBLKDN

Lab Name: NUS-LSG Contract: _____

Lab Code: NUS-LSG Case No.: TNK SAS No.: _____ SDG No.: PKG4

Matrix: (soil/water) WATER Lab Sample ID: VBLKDN

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: DVB07179101

Level: (low/med) LOW Date Received: _____

% Moisture: not dec. _____ Date Analyzed: 07/17/91

Column Type: (Pack/Cap/Wide) CAP Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
74-87-3	Chloromethane	10	U
74-83-9	Bromomethane	10	U
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	5	U
67-64-1	Acetone	9	J
75-15-0	Carbon Disulfide	5	U
75-35-4	1,1-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
156-60-5	trans-1,2-Dichloroethene	5	U
67-66-3	Chloroform	5	U
107-06-2	1,2-Dichloroethane	5	U
78-93-3	2-Butanone	10	U
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
108-05-4	Vinyl Acetate	10	U
75-27-4	Bromodichloromethane	5	U
78-87-5	1,2-Dichloropropane	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-01-6	Trichloroethene	5	U
124-48-1	Dibromochloromethane	5	U
79-00-5	1,1,2-Trichloroethane	5	U
71-43-2	Benzene	5	U
10061-02-6	trans-1,3-Dichloropropene	5	U
75-25-2	Bromoform	5	U

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

Lab Name: NUS-LSG Contract: _____

Lab Code: NUS-LSG Case No.: TNK SAS No.: _____ SDG No.: PKG4

Lab File ID: DBF07179101 BFB Injection Date: 07/17/91

Instrument ID: GCMSD BFB Injection Time: 1333

Matrix:(soil/water) WATER Level:(low/med) LOW Column:(pack/cap) CAP

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	27.6
75	30.0 - 60.0% of mass 95	53.4
95	Base peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	6.8
173	Less than 2.0% of mass 174	0.2 (0.3)1
174	Greater than 50.0% of mass 95	67.6
175	5.0 - 9.0% of mass 174	5.1 (7.5)1
176	Greater than 95.0%, but less than 101.0% of mass 174	65.2 (96.4)1
177	5.0 - 9.0% of mass 176	4.2 (6.5)2

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

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

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD050	VSTD050	DVT07179102	07/17/91	1351
02	VBLKDN	VBLKDN	DVB07179101	07/17/91	1446
03	TTBW1070791	P167664	DVP07179107	07/17/91	2110
04	TKCSW05W0001	P167660	DVP07179109	07/17/91	2228
05	TCCSW11W0001	P167662	DVP07179110	07/17/91	2308
06	TCCSW16W0001	P167663	DVP07179111	07/17/91	2341
07	TCCSW11W0001	P167662MS	DVP07179112	07/18/91	030
08	TCCSW11Z0001	P167662MSD	DVP07179113	07/18/91	103

6A

VOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: NUS-LSG Contract:

Lab Code: NUS-LSG Case No.: TNK SAS No.: SDG No.: PKG4

Instrument ID: GCMSD Calibration Date(s): 07/16/91 07/16/91

Matrix:(soil/water) WATER Level:(low/med) LOW Column:(pack/cap) CAP

* Compounds with minimum RRF amd maximum %RSD criteria

LAB FILE ID: RRF20 = DVT07169102 RRF50 = DVT07169101
RRF100= DVT07169103 RRF150= DVT07169104 RRF200= DVT07169105

COMPOUND	RRF20	RRF50	RRF100	RRF150	RRF200	$\overline{RRF}$	% RSD
Chloromethane	1.648	1.748	1.717	1.719	1.693	1.705	2.2
* Bromomethane	1.636	1.692	1.546	1.350	1.315	1.508	11.2
* Vinyl Chloride	2.121	2.172	2.104	2.027	2.000	2.085	3.4
Chloroethane	1.346	1.335	1.316	1.121	1.140	1.252	8.9
Methylene Chloride	2.876	2.914	2.744	2.719	2.668	2.784	3.8
Acetone	1.559	0.536	0.492	0.471	0.527	0.717	65.8
Carbon Disulfide	2.382	2.521	3.021	3.080	2.997	2.800	11.6
* 1,1-Dichloroethene	1.280	1.279	1.194	1.224	1.204	1.236	3.3
* 1,1-Dichloroethane	3.647	3.530	3.419	3.426	3.247	3.454	4.3
trans-1,2-Dichloroethene	1.504	1.449	1.391	1.411	1.347	1.420	[illegible]
* Chloroform	4.092	3.857	3.767	3.712	3.543	3.794	[illegible]
* 1,2-Dichloroethane	2.768	2.724	2.641	2.647	2.593	2.675	2.6
2-Butanone	0.195	0.182	0.163	0.167	0.168	0.175	7.6
* 1,1,1-Trichloroethane	0.745	0.765	0.685	0.686	0.667	0.710	6.0
* Carbon Tetrachloride	0.603	0.603	0.573	0.587	0.600	0.593	2.2
Vinyl Acetate	1.255	1.299	1.173	1.179	1.094	1.200	6.6
* Bromodichloromethane	0.736	0.765	0.735	0.774	0.772	0.756	2.6
1,2-Dichloropropane	0.413	0.423	0.383	0.400	0.406	0.405	3.7
* cis-1,3-Dichloropropene	0.631	0.659	0.611	0.625	0.593	0.624	3.9
* Trichloroethene	0.428	0.408	0.386	0.401	0.414	0.407	3.8
* Dibromochloromethane	0.646	0.639	0.605	0.630	0.653	0.635	2.9
* 1,1,2-Trichloroethane	0.361	0.363	0.331	0.345	0.346	0.349	3.8
* Benzene	0.991	0.980	0.911	0.922	0.898	0.940	4.5
* trans-1,3-Dichloropropene	0.609	0.617	0.574	0.596	0.604	0.600	2.7
* Bromoform	0.463	0.490	0.449	0.462	0.461	0.465	3.2
4-Methyl-2-Pentanone	0.837	0.621	0.557	0.567	0.564	0.629	18.9
2-Hexanone	0.398	0.422	0.391	0.405	0.390	0.401	3.3
* Tetrachloroethene	0.464	0.451	0.443	0.447	0.447	0.450	1.8
* 1,1,2,2-Tetrachloroethane	0.850	0.829	0.805	0.822	0.811	0.823	2.1
* Toluene	0.707	0.677	0.679	0.699	0.712	0.695	2.3
* Chlorobenzene	0.960	0.935	0.929	0.939	0.910	0.935	1.9
* Ethylbenzene	0.451	0.431	0.440	0.455	0.467	0.449	3.1
* Styrene	1.016	0.985	1.002	1.029	0.966	1.000	2.5
* Xylene (total)	0.612	0.565	0.569	0.578	0.597	0.584	3.4
Arolein	0.170	0.174	0.160	0.157	0.145	0.161	[illegible]
Acrylonitrile	0.410	0.424	0.377	0.382	0.367	0.392	[illegible]
Toluene-d8	1.012	1.064	1.038	1.064	1.018	1.039	2.4
* Bromofluorobenzene	0.794	0.831	0.827	0.856	0.849	0.831	2.9

1,2-Dichloroethane-d4	2.287	2.575	-12.6
Trichlorofluoromethane	2.691	3.183	-18.3
Dichlorodifluoromethane	0.790	0.926	-17.2
Iodomethane	2.950	3.404	-15.4
Dibromethane	0.369	0.435	-17.9
Ethyl methacrylate	0.597	0.653	-9.4
1,2,3-Trichloropropane	0.639	0.725	-13.5
1,4-Dichloro-2-butene	0.382	0.414	-8.4
Allyl Chloride	3.701	4.280	~~-15.6~~
Propionitrile	0.214	0.280	-30.8
Methacrylonitrile	0.602	0.710	-17.9
Methylmethacrylate	0.278	0.306	-10.1
1,2-Dibromoethane	0.723	0.801	-10.8
1,1,1,2-Tetrachloroethane	0.590	0.659	-11.7
Pentachloroethane	0.478	0.507	-6.1
1,2-Dibromo-3-Chloropropane	0.233	0.261	-12.0

4-23-91 INITIAL CALIBRATION

2,6-Dichlorophenol	0.288	0.293	0.322	0.331	0.326	0.312	6.
N-Nitroso-di-n-butylamine	0.224	0.218	0.231	0.228	0.217	0.224	
Methanesulfonic acid, Methy	0.129	0.132	0.139	0.147	0.143	0.138	
Acetophenone	1.512	1.498	1.565	1.606	1.600	1.556	
A,A-Dimethylphenylamine	0.574	0.617	0.692	0.622	0.442	0.589	15.
Pentachlorobenzene	0.456	0.473	0.490	0.516	0.533	0.494	6.
4-Amino Biphenyl	0.030	0.041	0.056	0.076	0.090	0.059	41.
P-Dimethylaminoazobenzene	0.604	0.556	0.504	0.476	0.464	0.521	11.
7,12-Dimethyl Benzo(A)Anthr	0.113	0.111	0.115	0.133	0.143	0.123	11.
1,2,4,5-Tetrachlorobenzene	0.299	0.307	0.329	0.344	0.350	0.326	6.
Diphenylamine	0.448	0.485	0.519	0.531	0.526	0.502	7.
Phenacetin	0.268	0.305	0.309	0.332	0.349	0.313	9.
3-Methylcholanthrene	0.584	0.617	0.614	0.650	0.684	0.630	6.
Pronamide	0.245	0.251	0.253	0.250	0.264	0.253	2.
1,4-Benzenediamine							
Isosafrole							
2-Naphthaleneamine							
5-Nitro-O-Toluidine							
4-Nitroquinoline-1-Oxide							
Methapyrilene							
2-Acetylaminofluorene							
N-Nitrosomethylethylamine							
N-Nitrosodiethylamine							
N-Nitrosopyrrolidine							
N-Nitrosomorpholine							
O-Toluidine							
O,O,O,-Triethylphosphorthio							
Pentachloronitrobenzene	0.041	0.044	0.042	0.044	0.041	0.042	
Safrole							
1,4-Napthoquinone							
1,3,5-Trinitrobenzene							
Hexachloropropene							
1,3-Dinitrobenzene							
3,3,-Dimethylbenzidine							
Hexachlorophene							
Dimethoate							
Diallate							
Pyridine							
Aramite							
2-Secbutyl-4,6-Dinitropheno							
M-Cresol							

(1) Cannot be separated from Diphenylamine

2,6-Dichlorophenol							
N-Nitroso-di-n-butylamine							
Methanesulfonic acid, Methy							
Acetophenone							
A,A-Dimethylphenylamine							
Pentachlorobenzene							
4-Amino Biphenyl							
P-Dimethylaminoazobenzene							
7,12-Dimethyl Benzo(A)Anthr							
1,2,4,5-Tetrachlorobenzene							
Diphenylamine							
Phenacetin							
3-Methylcholanthrene							
Pronamide							
1,4-Benzenediamine	0.131	0.245	0.265	0.183	0.177	0.200	27.
Isosafrole	0.366	0.414	0.403	0.410	0.415	0.402	5.
2-Naphthaleneamine							
5-Nitro-O-Toluidine	0.231	0.290	0.275	0.288	0.298	0.276	9.
4-Nitroquinoline-1-Oxide	0.029	0.053	0.050	0.047	0.043	0.044	21.
Methapyrilene	0.280	0.370	0.354	0.396	0.412	0.362	14.
2-Acetylaminofluorene	0.349	0.451	0.437	0.468	0.463	0.434	11.
N-Nitrosomethylethylamine	0.595	0.536	0.515	0.546	0.537	0.546	5.
N-Nitrosodiethylamine	0.547	0.620	0.597	0.611	0.605	0.596	4.
N-Nitrosopyrrolidine	0.563	0.626	0.652	0.669	0.685	0.639	7.
N-Nitrosomorpholine	0.622	0.701	0.685	0.701	0.702	0.682	5.
O-Toluidine	1.007	1.112	1.144	1.188	1.206	1.131	7.
O,O,O,-Triethylphosphorthio	0.160	0.178	0.138	0.161	0.127	0.153	13.
Pentachloronitrobenzene							
Safrole	0.410	0.454	0.429	0.435	0.439	0.433	3.
1,4-Napthoquinone	0.357	0.320	0.299	0.226	0.149	0.270	30.
1,3,5-Trinitrobenzene	0.121	0.163	0.148	0.156	0.162	0.150	11.
Hexachloropropene	0.025	0.031	0.029	0.030	0.031	0.029	8.
1,3-Dinitrobenzene	0.121	0.160	0.160	0.166	0.175	0.156	13.
3,3,-Dimethylbenzidine	0.086	0.085	0.072	0.057	0.039	0.068	29.
Hexachlorophene	0.060	0.080	0.096	0.098	0.092	0.085	18.
Dimethoate	0.359	0.310	0.265	0.226	0.171	0.266	27.
Diallate	0.295	0.321	0.283	0.387	0.415	0.340	17.
Pyridine	0.949	1.032	1.021	1.048	1.074	1.025	4.
Aramite	0.076	0.080	0.068	0.061	0.052	0.067	16.
2-Secbutyl-4,6-Dinitropheno	0.149	0.193	0.196	0.209	0.229	0.195	15.
M-Cresol	0.914	1.082	1.148	1.205	1.228	1.115	11.

(1) Cannot be separated from Diphenylamine

7C

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: NUS-LSG Contract:

Lab Code: NUS-LSG Case No.: TNK SAS No.: SDG No.: PKG4

Instrument ID: GCMSA Calibration date: 07/25/91 Time: 948

Lab File ID: ABT07259101 Init. Calib. Date(s): 04/23/91 04/24/91

*Compounds with minimum RRF and maximum %D criteria

COMPOUND		RRF	RRF50	%D	
Dibenzofuran	*	1.527	1.396	8.6	*
2,4-Dinitrotoluene	*	0.319	0.342	-7.2	*
Diethylphthalate		1.046	1.022	2.3	
4-Chlorophenyl-phenylether	*	0.493	0.549	-11.4	*
Fluorene	*	1.224	1.176	3.9	*
4-Nitroaniline		0.227	0.213	6.2	
4,6-Dinitro-2-Methylphenol		0.182	0.139	23.6	
N-Nitrosodiphenylamine (1)		0.502	0.589	-17.3	
4-Bromophenyl-phenylether	*	0.250	0.218	12.8	*
Hexachlorobenzene	*	0.272	0.253	7.0	*
Pentachlorophenol	*	0.134	0.173	-29.1	*
Phenanthrene	*	1.194	1.065	10.8	*
Anthracene	*	1.002	1.013	-1.1	*
Di-n-Butylphthalate		1.199	1.129	5.8	
Fluoranthene	*	0.969	0.974	-0.5	*
Pyrene	*	1.821	1.455	20.1	*
Butylbenzylphthalate		0.771	0.514	33.3	
3,3'-Dichlorobenzidine		0.574	0.411	28.4	
Benzo(a)Anthracene	*	1.449	1.101	24.0	*
Chrysene	*	1.265	0.932	26.3	*
bis(2-Ethylhexyl)Phthalate		1.018	0.757	25.6	
Di-n-Octyl Phthalate		1.668	1.372	17.8	
Benzo(b)Fluoranthene	*	1.387	1.280	7.7	*
Benzo(k)Fluoranthene	*	1.252	1.218	2.7	*
Benzo(a)Pyrene	*	1.216	1.142	6.1	*
Indeno(1,2,3-cd)Pyrene	*	1.085	1.231	-13.5	*
Dibenzo(a,h)Anthracene	*	0.992	1.102	-11.1	*
Benzo(g,h,i)Perylene	*	0.909	0.980	-7.8	*
Nitrobenzene-d5	*	0.401	0.364	9.2	*
2-Fluorobiphenyl	*	1.446	1.191	17.6	*
Terphenyl-d14	*	1.731	1.261	27.2	*
Phenol-d5	*	1.875	1.650	12.0	*
2-Fluorophenol	*	1.341	1.192	11.1	*
2,4,6-Tribromophenol		0.141	0.190	-34.8	
2,3,4,6-Tetrachlorophenol		0.294	0.252	14.3	
Pyridine, 2-Methyl (2-Picol		0.579	0.729	-25.9	
Methanesulfonic acid, Ethyl		1.060	0.963	9.2	
N-Nitrosopiperidine		0.696	0.883	-26.9	
2,6-Dichlorophenol		0.312	0.287	8.0	

N-Nitroso-di-n-butylamine	0.224	0.227	-1.3
Methanesulfonic acid, Methy	0.138	0.243	-76.1
Acetophenone	1.556	1.599	-2.8
A,A-Dimethylphenylamine	0.589	0.572	2.9
Pentachlorobenzene	0.494	0.458	7.3
4-Amino Biphenyl	0.059	0.622	-99.9
P-Dimethylaminoazobenzene	0.521	0.375	28.0
7,12-Dimethyl Benzo(A)Anthr	0.123	0.618	-99.9
1,2,4,5-Tetrachlorobenzene	0.326	0.293	10.1
Diphenylamine	0.502	0.589	-17.3
Phenacetin	0.313	0.240	23.3
3-Methylcholanthrene	0.630	0.668	-6.0
Pronamide	0.253	0.304	-20.2
1,4-Benzenediamine			
Isosafrole			
2-Naphthaleneamine			
5-Nitro-O-Toluidine			
4-Nitroquinoline-1-Oxide			
Methapyrilene			
2-Acetylaminofluorene			
N-Nitrosomethylethylamine			
N-Nitrosodiethylamine			
N-Nitrosopyrrolidine			
N-Nitrosomorpholine			
O-Toluidine			
O,O,O,-Triethylphosphorthio			
Pentachloronitrobenzene	0.042		100.0
Safrole			
1,4-Napthoquinone			
1,3,5-Trinitrobenzene			
Hexachloropropene			
1,3-Dinitrobenzene			
3,3,-Dimethylbenzidine			
Hexachlorophene			
Dimethoate			
Diallate			
Pyridine			
Aramite			
2-Secbutyl-4,6-Dinitropheno			
M-Cresol			

7B

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: NUS-LSG Contract:

Lab Code: NUS-LSG Case No.: TNK SAS No.: SDG No.: PKG

Instrument ID: GCMSA Calibration date: 07/25/91 Time: 948

Lab File ID: ABT07259101 Init. Calib. Date(s): 04/23/91 04/24/91

*Compounds with minimum RRF and maximum %D criteria

COMPOUND	RRF	RRF50	%D
N-Nitrosodimethylamine	0.879	0.810	7.8
Phenol *	2.012	1.653	17.8 *
Aniline	2.147	1.892	11.9
bis(2-Chloroethyl)Ether *	1.545	1.303	15.7 *
2-Chlorophenol *	1.545	1.352	12.5 *
1,3-Dichlorobenzene *	1.592	1.394	12.4 *
1,4-Dichlorobenzene *	1.653	1.436	13.1 *
Benzyl Alcohol	0.881	0.758	14.0
1,2-Dichlorobenzene *	1.493	1.346	9.8 *
2-Methylphenol *	1.361	1.205	11.5 *
bis(2-Chloroisopropyl)Ether	1.608	1.966	-22.3
4-Methylphenol *	1.124	0.992	11.7 *
N-Nitroso-Di-n-Propylamine *	0.884	0.902	-2.0 *
Hexachloroethane *	0.652	0.560	14.1 *
Nitrobenzene *	0.369	0.352	4.6 *
Isophorone *	0.720	0.707	1.8 *
2-Nitrophenol *	0.265	0.241	9.1 *
2,4-Dimethylphenol *	0.326	0.308	5.5 *
bis(2-Chloroethoxy)Methane *	0.465	0.443	4.7 *
2,4-Dichlorophenol *	0.309	0.278	10.0 *
1,2,4-Trichlorobenzene *	0.337	0.319	5.3 *
Naphthalene *	1.042	1.042	0.0 *
4-Chloroaniline	0.464	0.421	9.3
Hexachlorobutadiene	0.174	0.165	5.2
4-Chloro-3-Methylphenol *	0.254	0.250	1.6 *
2-Methylnaphthalene *	0.547	0.520	4.9 *
Hexachlorocyclopentadiene	0.277	0.269	2.9
2,4,6-Trichlorophenol *	0.338	0.344	-1.8 *
2,4,5-Trichlorophenol *	0.377	0.350	7.2 *
2-Chloronaphthalene *	1.449	1.207	16.7 *
2-Nitroaniline	0.296	0.295	0.3
Dimethyl Phthalate	1.190	1.204	-1.2
Acenaphthylene *	1.583	1.598	-0.9 *
2,6-Dinitrotoluene *	0.297	0.276	7.1 *
3-Nitroaniline	0.303	0.275	9.2
Acenaphthene *	1.166	1.016	12.9 *
2,4-Dinitrophenol	0.150	0.107	28.7
4-Nitrophenol	0.076	0.043	43.4

N-Nitroso-di-n-butylamine			
Methanesulfonic acid, Methy			
Acetophenone			
A,A-Dimethylphenylamine			
Pentachlorobenzene			
4-Amino Biphenyl			
P-Dimethylaminoazobenzene			
7,12-Dimethyl Benzo(A)Anthr			
1,2,4,5-Tetrachlorobenzene			
Diphenylamine			
Phenacetin			
3-Methylcholanthrene			
Pronamide			
1,4-Benzenediamine	0.200	0.120	40.0
Isosafrole	0.402	0.426	-6.0
2-Naphthaleneamine			
5-Nitro-O-Toluidine	0.276	0.271	1.8
4-Nitroquinoline-1-Oxide	0.044	0.038	13.6
Methapyrilene	0.362	0.337	6.9
2-Acetylaminofluorene	0.434	0.444	-2.3
N-Nitrosomethylethylamine	0.546	0.559	-2.4
N-Nitrosodiethylamine	0.596	0.590	1.0
N-Nitrosopyrrolidine	0.639	0.602	5.8
N-Nitrosomorpholine	0.682	0.706	-3.5
O-Toluidine	1.131	1.169	-3.4
O,O,O,-Triethylphosphorthio	0.153	0.178	-16.3
Pentachloronitrobenzene			
Safrole	0.433	0.457	-5.5
1,4-Napthoquinone	0.270	0.401	-48.5
1,3,5-Trinitrobenzene	0.150	0.151	-0.7
Hexachloropropene	0.029	0.033	-13.8
1,3-Dinitrobenzene	0.156	0.159	-1.9
3,3,-Dimethylbenzidine	0.068	0.058	14.7
Hexachlorophene	0.085	0.098	-15.3
Dimethoate	0.266	0.349	-31.2
Diallate	0.340	0.341	-0.3
Pyridine	1.025	1.118	-9.1
Aramite	0.067		100.0
2-Secbutyl-4,6-Dinitropheno	0.195	0.220	-12.8
M-Cresol	1.115	1.042	6.5

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

Lab Name: NUS-LSG Contract:

Lab Code: NUS-LSG Case No.: TNK SAS No.: SDG No.: PKG4

Lab File ID: ADF07259101 DFTPP Injection Date: 07/25/9

Instrument ID: GCMSA DFTPP Injection Time: 0926

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	37.5
68	Less than 2.0% of mass 69	0.0 (0.0)1
69	Mass 69 relative abundance	44.0
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	100.0
199	5.0 to 9.0% of mass 198	6.2
275	10.0 - 30.0% of mass 198	22.9
365	Greater than 1.00% of mass 198	1.35
441	Present, but less than mass 443	8.1
442	Greater than 40.0% of mass 198	65.9
443	17.0 - 23.0% of mass 442	12.3 (18.7)2

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

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

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD050	SSTD050	ABT07259101	07/25/91	0948
02	SSTD050	SSTD050	ABT07259102	07/25/91	1033
03	SBLKAR	SBLKAR	ABB07259102	07/25/91	1222
04	TCCSW11W0001	P167650	ABP07259106	07/25/91	1657
05	TCCSW16W0001	P167651	ABP07259107	07/25/91	1743
06	TCCSW21W0001	P167659	ABP07259108	07/25/91	1828
07	TKCSW05W0001	P167660	ABP07259109	07/25/91	1913

FORM V SV 1/87 Rev.

HALLIBURTON NUS
Environmental Corporation

INTERNAL CORRESPONDENCE

C-49-8-1-354

TO: PHIL OTTINGER

DATE: AUGUST 30, 1991

FROM: DEB SCHEIB

COPIES: FILE

SUBJECT: DATA VALIDATION - MISCELLANEOUS PARAMETERS
TINKER AIR FORCE BASE, PACKAGE #1 & #4

NUS Laboratories analyzed 23 water samples (including two field duplicate pairs) for Alkalinity, Chemical Oxygen Demand (COD), Chloride, Sulfates, Total Organic Carbon (TOC), Total Organic Halogens (TOX), Nitrates, Phenolics, Specific Conductance; and Total, Total Suspended and Total Dissolved Solids. All analyses were conducted under Level E Quality Assurance/Quality Control (QA/QC) criteria, and were evaluated according to HAZWRAP-contract and method-specific quality control criteria.

Matrix Spike (MS) recoveries were characteristically low (< 75% but > 50%) for chloride and TOX analyses. Hence, these results are qualified as estimated, J. MS recoveries were characteristically high (184%) for TOC; all positive TOC results are qualified as estimated, J.

No other problems were encountered. Please do not hesitate to contact me if you have any questions regarding this review.

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SURFACE WATER SAMPLE DATA VALIDATION SUMMARIES - OCTOBER 1991

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HALLIBURTON NUS
Environmental Corporation

INTERNAL CORRESPONDENC

C-49-2-1-26

TO: PHIL OTTINGER

DATE: DECEMBER 30, 1991

FROM: KAREN M. SMECKER

CC: D. A. SCHEIB

SUBJECT: INORGANIC DATA VALIDATION - MISC. TAL METALS
TINKER AIR FORCE BASE
CASE NO. TNK, SDG PKG5

SAMPLES:

Water:

TCC-

SW13-W0001 SW13-C0001 SW25-W0001

TEC-

SW23-W0001 SW24-W0001

TKC-SW27-W0001

HALLIBURTON NUS Laboratories analyzed 6 water samples (including one field duplicate pair) for Target Analyte List (TAL) metals except aluminum, iron, manganese and potassium. No field quality control blanks were analyzed under this sample set.

Data for these analyses were reviewed with reference to the EPA "Functional Guidelines for Inorganic Data Validation" and the Harzardous Waste Remedial Action Program's (HAZWRPA) "Requirements for Quality Control of Analytical Data". The analyses were conducted under Level D QA/QC criteria and were evaluated according to the following parameters:

- o Data Completeness
- o Holding Times
- * o Calibration Verification
- * o Laboratory Blank Analyses
- o Matrix Spike Recoveries
- * o Laboratory Duplicates
- * o Field Duplicate Precision
- * o Furnace Atomic Absorption Results
- o ICP Serial Dilution Results
- o Detection Limits
- o Sample Quantitation

The symbol (*) indicates that quality control criteria were not met for this parameter. Sample data was not evaluated on the basis of ICP Interference Check Sample (ICS) results since the analysis of aluminum and iron was not required for this sample set and no

interfering analyte concentrations were reported on the ICP ICS Form IV. Problems affecting data usability are addressed below and the attached Table 1 summarizes the validation qualifications.

Calibration Verification

CRDL Standard analysis Percent Recoveries (%Rs) for cadmium, chromium and vanadium were below the 80% lower quality control criterion. Only nondetects were reported for these analytes, and these results are qualified as estimated, "UJ".

CRDL Standard analysis %Rs for copper and silver exceeded the 120% upper quality control limit. Positive copper results < 3X CRDL are qualified as estimated, "J". No other actions were taken because all positive results for silver were > 3X CRDL.

Blanks

Laboratory method blank analyses yielded the following contaminants in the maximum concentrations indicated:

Contaminant	Maximum Concentration (ug/l)	Action Level (ug/l)
beryllium	4.1	20.5
cobalt	14.3	71.5

Positive sample results for these analytes less than the action levels are qualified as undetected, "U". Adjustments for dilutions were made prior to application of the action levels.

Negative blank contamination at the following maximum levels were evident for the analytes indicated below:

Contaminant	Maximum Concentration (ug/l)
barium	- 15.0
calcium	- 366
vanadium	- 33.0
zinc	- 5.0

These occurences are indications of poor instrument performance not blank contamination. Consequently, positive results and nondetects for these analytes are qualified as estimated, "J" and "UJ", respectively; no positive results were reported for vanadium and no nondetects were reported for barium and calcium.

Laboratory Duplicates

Relative Percent Differences (RPDs) for calcium and lead exceeded the 20% quality control criterion for waters. Positive results and nondetects for these analytes are qualified as estimated, "J" and "UJ", respectively; only positive results were reported for calcium.

Field Duplicate Precision

The RPD for lead exceeded the 30% quality control criterion for waters. Positive results and nondetects for lead are qualified as estimated, "J" and "UJ", respectively.

Furnace Atomic Absorption Results

Post Digestion Spike (PDS) %Rs for arsenic in four samples and antimony in one sample were below the 85% lower quality control limit. Positive arsenic results in affected samples are qualified as estimated, "J". The antimony nondetect in sample TCC-SW25-W0001 is qualified as estimated, "UJ".

TINKER AIR FORCE BASE
CASE # TNK, SDG PKG5

TABLE 1 - RECOMMENDATION SUMMARY

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

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

A^1 - Accept data, but raise sample detection limit (where appropriate) due to blank contamination.

J^1 - Estimate "J" positive results and "UJ" nondetects due to negative concentrations reported in the laboratory method blanks.

J^2 - Estimate "UJ" nondetects due to low CRDL Standard analysis recovery.

J^3 - Estimate "J" positive results < 3X CRDL due to high CRDL Standard analysis recovery.

J^4 - Estimate "J" positive results and "UJ" nondetects due to laboratory duplicate imprecision.

J^5 - Estimate "J" positive results and "UJ" nondetects due to poor field duplicate precision.

J^6 - Estimate "J" positive arsenic results in affected samples and "UJ" the nondetect in one sample due to low graphite furnace PDS recovery.

APPENDIX B: SUPPORT DOCUMENTATION

U.S. EPA - CLP

2B
CRDL STANDARD FOR AA AND ICP

Lab Name: HALLIBURTON NUS Lab. Contract: TINKER

Lab Code: Case No.: TNK SAS No.: SDG No.: PKGS

AA CRDL Standard Source: HP

ICP CRDL Standard Source: HP

Concentration Units: ug/L

Analyte	CRDL Standard for AA True	Found	%R	CRDL Standard for ICP Initial True	Found	%R	Final Found	%R
Aluminum								
Antimony	60.0	59.95	99.9					
Arsenic	10.0	9.85	98.5					
Barium				400.0	386.00	96.5	389.00	[illegible]
Beryllium				10.0	8.90	89.0	8.90	89.0
Cadmium				10.0	6.10	61.0	7.10	71.0
Calcium				10000.0	10128.00	101.3	10294.00	102.9
Chromium				20.0	13.60	68.0	15.80	79.0
Cobalt				100.0	106.60	106.6	106.70	106.7
Copper				50.0	62.40	124.8	45.10	90.2
Iron								
Lead	3.0	2.85	95.0					
Magnesium				10000.0	9919.00	99.2	9994.00	99.9
Manganese								
Mercury								
Nickel				80.0	74.50	93.1	87.50	109.4
Potassium								
Selenium	5.0	4.90	98.0					
Silver				20.0	22.90	114.5	24.20	121.0
Sodium				10000.0	9288.00	92.9	9855.00	98.6
Thallium	10.0	10.40	104.0					
Vanadium				100.0	71.00	71.0	68.00	68.0
Zinc				40.0	36.10	90.2	35.80	89.5

U.S. EPA - CLP

3
BLANKS

Lab Name: HALLIBURTON NUS Lab. Contract: TINKER

Lab Code: Case No.: TNK SAS No.: SDG No.: PK65

Preparation Blank Matrix (soil/water): WATER

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

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum											
Antimony	8.0	U	8.0	U	8.0	U			8.0	U	F
Arsenic	1.0	U	1.0	U	1.0	U			1.0	U	F
Barium	-15.0	B	13.0	U	13.0	U			-15.0	B	F
Beryllium	3.5	B	3.9	B	4.1	B			3.9	B	F
Cadmium	5.0	U	5.0	U	5.0	U			5.0	U	F
Calcium	-358.0	B	-362.0	B	-366.0	B			-358.0	B	F
Chromium	6.0	U	6.0	U	6.0	U			6.0	U	F
Cobalt	14.3	B	13.0	U	13.0	U			13.0	U	F
Copper	15.0	U	15.0	U	15.0	U			15.0	U	F
Iron											
Lead	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	F
Magnesium	375.0	U	375.0	U	375.0	U			375.0	U	F
Manganese											
Mercury	0.1	U	0.1	U					0.1	U	C
Nickel	26.0	U	26.0	U	26.0	U			26.0	U	F
Potassium											
Selenium	1.0	U	1.0	U	1.0	U			1.0	U	F
Silver	6.0	U	6.0	U	6.0	U			6.0	U	F
Sodium	4254.0	U	4254.0	U	4254.0	U			4254.0	U	F
Thallium	1.0	U	1.0	U	1.0	U			1.0	U	F
Vanadium	-21.0	B	-23.0	B	-21.0	B			-25.0	B	F
Zinc	-5.0	B	5.0	U	5.0	U			5.0	U	F
Cyanide											

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ICP INTERFERENCE CHECK SAMPLE

Lab Name: HALLIBURTON NUS Lab. Contract: TINKER

Lab Code: Case No.: TNK SAS No.: SDG No.: PH65

ICP ID Number: MET500 ICS Source: HNUS Lab

Concentration Units: ug/L

Analyte	True Sol. A	True Sol. AB	Initial Found Sol. A	Initial Found Sol. AB	Initial Found %R	Final Found Sol. A	Final Found Sol. AB	Final Found %R
Aluminum								
Antimony								
Arsenic								
Barium	-30	460	-7	454.0	98.7	-15	442.0	96.
Beryllium	1	491	4	477.6	97.3	4	472.6	96.3
Cadmium	2	886	-5	918.2	103.6	0	901.8	101.8
Calcium								
Chromium								
Cobalt	17	458	15	441.2	96.3	5	465.0	101.5
Copper	7	439	0	448.6	102.2	-1	455.5	103.8
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel	-7	872	18	906.1	103.9	5	874.6	100.3
Potassium								
Selenium								
Silver	2	952	1	913.5	96.0	2	918.1	96.4
Sodium								
Thallium								
Vanadium	4	480	-37	431.0	89.8	-19	436.0	90.8
Zinc	25	980	9	930.4	94.9	12	938.0	95.7

. cannot be evaluated since the appropriate data was not pr

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6
DUPLICATES

EPA SAMPLE NO

TC1301D

Lab Name: HALLIBURTON NUS Lab. Contract: TINKER

Lab Code: Case No.: TNK SAS No.: SDG No.: PH65

Matrix (soil/water): WATER Level (low/med): LOW

% Solids for Sample: 0.0 % Solids for Duplicate: 0.0

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

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Aluminum								
Antimony		8.0000	U	8.0000	U			P
Arsenic		2.3000	B	1.9000	B	19.0		P
Barium	200.0	625.0000		618.0000		1.1		P
Beryllium		3.7000	B	4.2000	B	12.7		P
Cadmium		5.0000	U	5.0000	U			P
Calcium		26287.0000		32743.0000		21.9	*	P
Chromium		6.0000	U	6.0000	U			P
Cobalt		13.0000	U	13.0000	U			P
Copper		15.0000	U	15.0000	U			P
Iron								
Lead	3.0	8.3000		1.0000	U	200.0	*	P
Magnesium	5000.0	15466.0000		15592.0000		0.8		P
Manganese								
Mercury		0.1000	B	0.2000		66.7	*	CV
Nickel		26.0000	U	26.0000	U			P
Potassium								
Selenium		1.0000	U	1.0000	U			P
Silver		6.0000	U	6.0000	U			P
Sodium	5000.0	12344.0000		13418.0000		8.3		P
Thallium		1.0000	U	1.0000	U			P
Vanadium		17.0000	U	17.0000	U			P
Zinc		5.0000	U	5.0000	U			P
Cyanide								

U.S. EPA - CLP

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ANALYSIS RUN LOG

Lab Name: HALLIBURTON NUS Lab.
Lab Code: Case No.: TNK
Instrument ID Number: MET405
Start Date: 11/06/91

Contract: TINKER
SAS No.: SDG No.: PKG5
Method: F
End Date: 11/07/91

EPA Sample No.	D/F	Time	% R	Analytes																							
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
TC13C1	1.00	2310			X																						
TC13C1A	1.00	2314	86.6		X																						
CCV1	1.00	2318			X																						
CCB1	1.00	2322			X																						
TC13W1	1.00	2327			X																						
TC13W1A	1.00	2331	85.8		X																						
TE23W1	1.00	2336			X																						
TE23W1A	1.00	2340	86.1		X																						
TE24W1	1.00	2344			X																						
TE24W1A	1.00	2349	84.9		X																						
TC25W1	1.00	2353			X																						
TC25W1A	1.00	2358	84.1		X																						
TK27W1A	1.00	0006	91.1		X																						
CCV2	1.00	0011			X																						
CCB2	1.00	0015			X																						

U.S. EPA - CLP

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ANALYSIS RUN LOG

Lab Name: HALLIBURTON NUS Lab. Contract: TINKER
Lab Code: Case No.: TNK SAS No.: SDG No.: PRGS
Instrument ID Number: MET500 Method: F
Start Date: 11/06/91 End Date: 11/06/91

| EPA Sample No. | D/F | Time | % R | Analytes | | |

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HALLIBURTON NUS
Environmental Corporation

INTERNAL CORRESPONDEN(

C-49-12-1-290

TO: PHIL OTTINGER

DATE: DECEMBER 31, 1991

FROM: KAREN M. SMECKER

CC: D. A. SCHEIB

SUBJECT: INORGANIC DATA VALIDATION - MISC. PARAMETERS
TINKER AIR FORCE BASE
CASE NO. TNK, SDG PKG5

SAMPLES:

Water:

TCC-

SW13-W0001 SW13-C0001 SW25-W0001

TEC-

SW23-W0001 SW24-W0001

TKC-SW27-W0001

HALLIBURTON NUS Laboratories analyzed 6 water samples (including one field duplicate pair) for various miscellaneous parameters such as alkalinity, Chemical Oxygen Demand (COD), chloride, total solids, suspended solids, dissolved solids, nonpurgeable organic carbon, sulfate, phenolics and Total Organic Halogens (TOX). No field quality control blanks were analyzed under this sample set.

Data for these analyses were reviewed with reference to method-specific quality control criteria, the EPA "Functional Guidelines for Inorganic Data Validation" and the Harzardous Waste Remedial Action Program's (HAZWRPA) "Requirements for Quality Control of Analytical Data". The analyses were conducted under Level E QA/QC criteria and were evaluated according to the following parameters:

- o Holding Times
- o Laboratory Blank Analyses
- * o Matrix Spike Recoveries
- * o Laboratory Duplicates
- * o Field Duplicate Precision

The symbol (*) indicates that quality control criteria were not met for this parameter. Problems affecting data usability are addressed below and the attached Table 1 summarizes the validation qualifications.

Matrix Spike Recoveries

The Matrix Spike (MS) recovery for the TOX analysis was low (< 75%

yet > 30%). Positive results and nondetects for this parameter are qualified as estimated, "J" and "UJ", respectively.

Laboratory Duplicates

The Relative Percent Difference (RPD) for suspended solids was high (> 20%). Sample data for suspended solids are qualified as estimated, "J" and "UJ".

Field Duplicate Precision

RPDs for the analyses of COD and TOX were high (> 30%) for the field duplicate pair consisting of samples TCC-SW13-W001 and TCC-SW13-C001. Positive results and nondetects for these parameters in this sample pair are qualified as estimated, "J" and "UJ", respectively; no nondetects were reported for COD.

TINKER AIR FORCE BASE
CASE # TNK, PKG5

TABLE 1 - RECOMMENDATION SUMMARY

alkalinity chloride phenolics TOX sulfate	$J^{1,3}$	COD total solids suspended solids dissolved solids nonpurgeable organic carbon	J^1 J^2

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

J^1 - Estimate "J" positive results and "UJ" nondetects in samples TCC-SW13-W001 and TCC-SW13-C001 due to field duplicate imprecision.

J^2 - Estimate "J" positive results and "UJ" nondetects due to poor laboratory duplicate precision.

J^3 - Estimate "J" positive results and "UJ" nondetects due to low MS recovery.

APPENDIX B: SUPPORT DOCUMENTATION

HALLIBURTON NUS
Environmental Corporation

LABORATORY SERVICES DIVISION
900 GEMINI AVENUE
HOUSTON, TX 77058
713-488-1810

November 26, 1991
Report No.: 00014656
Section A Page 2

LABORATORY ANALYSIS REPORT

CLIENT NAME: HALLIBURTON NUS ENVIRONMENTAL/TI
ADDRESS: 800 OAKRIDGE TURNPIKE, C-200
OAK RIDGE, TN 37830-
ATTENTION: PHIL OTTINGER

NUS CLIENT NO: 0191 0023
WORK ORDER NO: 3K920
VENDOR NO:

SAMPLE ID: TCC-SW13-C0001 MS
NUS SAMPLE NO: H0187473
P.O. NO.:

DATE SAMPLED: 26-OCT-91
DATE RECEIVED: 31-OCT-91
APPROVED BY: R Mayo

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	ACLPW	TAL METALS AND CLP DATA PACKAGE	Done	
2	I023	Alkalinity, Total (as CaCO3)	350	mg/L
3	I120	COD(O2)	75	mg/L
4	I130	Chloride (Cl)	220	mg/L
5	I620	Solids, Total at 103C	230	mg/L
6	I610	Solids, Suspended at 103C	10	mg/L
7	I590	Solids, Dissolved at 180C	220	mg/L
8	I106	Carbon, Organic - Nonpurgeable	17	mg/L
9	I730	Sulfate, Turbidimetric (as SO4)	34	mg/L
10	I500	Phenolics	0.47	mg/L
11	I315	Halogens, Total Organic (TOX)	730	ug/L
12	DPACK	CLP Data Package Deliverable	done	

COMMENTS: MS percent recoveries are as follows:
Sulfate = 75.0
TOX = 72.2
Chloride = 104.5%
Total Alkalinity= 84.0%
COD = 102%
Phenol = 88.7%.
TOC = 100.0%.

HALLIBURTON NUS
Environmental Corporation

LABORATORY SERVICES DIVISION
900 GEMINI AVENUE
HOUSTON, TX 77058
713-488-1810

November 26, 1991
Report No.: 00014656
Section F Page 1

QUALITY CONTROL REPORT
DUPLICATE AND MATRIX SPIKE DATA

PREP BATCH: 18579 NUS SAMPLE NO: H0187472

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	M RC
1610	Solids, Suspended at 103C	< 10	10	mg/L	10	mg/L		

PREP BATCH: 18685 NUS SAMPLE NO: H0187479

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	M RC
1390	Nitrate (as N)	0.2	0.2	mg/L	0.00	mg/L	5.3	10

PREP BATCH: 18667 NUS SAMPLE NO: H0187495

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	M RC
1590	Solids, Dissolved at 180C	58,100	60,500	mg/L	4.05	mg/L		

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SEDIMENT SAMPLE DATA VALIDATION SUMMARIES - FEBRUARY 1992

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HALLIBURTON NUS
Environmental Corporation

INTERNAL CORRESPONDENCE

C-49-2-3-320

TO: PHIL OTTINGER

DATE: MARCH 25, 1992

FROM: KAREN M. SMECKER

CC: D. A. SCHEIB

SUBJECT: INORGANIC DATA VALIDATION - SELECTED TAL METALS
TINKER AIR FORCE BASE
CASE NO. TNK, SDG PKG7

SAMPLES:

Soil:

TCC-

SDB1-E-0002 SD15-E-0002 SDB2-E-0002 SD06-E-0002

TEC-

SD22-E-0002 SD24-E-0002

TKC-

SD01-E-0002 SD01-F-0002 SD05-E-0002

Soil:

T-FBS1-020992 T-RBS1-020992

HALLIBURTON NUS Laboratories analyzed 9 soil samples (including one field duplicate pair), 1 field blank and 1 rinsate blank for all Target Analyte List (TAL) metals except aluminum, calcium, iron, magnesium, manganese, potassium and sodium. In addition, nine of these samples were also analyzed for cyanide.

Data for these analyses were reviewed with reference to the EPA "Functional Guidelines for Inorganic Data Validation" and the Harzardous Waste Remedial Action Program's (HAZWRPA) "Requirements for Quality Control of Analytical Data". The analyses were conducted under Level C QA/QC criteria and were evaluated according to the following parameters:

- o Data Completeness
- o Holding Times
- * o Calibration Verification
- * o Laboratory and Field Blank Analyses
- * o Matrix Spike Recoveries
- o Laboratory Duplicates
- * o Field Duplicate Precision

(continued)

* o Furnace Atomic Absorption Results
  o ICP Serial Dilution Results
  o Detection Limits
  o Sample Quantitation

The symbol (*) indicates that quality control criteria were not met for this parameter. Sample data was not evaluated on the basis of ICP Interference Check Sample (ICS) results since interfering analyte analyses were not required for this sample set. Also, graphite furnace sample results were not evaluated on the basis of percent differences for duplicate injections since raw data is not presented in a Level C data package. Problems affecting data usability are addressed below and the attached Table 1 summarizes the validation qualifications.

Calibration Verification

The CRDL Standard analysis Percent Recovery (%R) for chromium was below the 80% lower quality control criterion. Only positive results were reported for this analyte, and these results were > 3X CRDL; no actions were necessary.

CRDL Standard analysis %Rs for cadmium, copper and nickel exceeded the 120% upper quality control limit. No further actions were taken for positive nickel results < 3X CRDL since they are qualified due to blank contamination. Positive results < 3X CRDL for the remaining analytes are qualified as estimated, "J".

Blanks

Laboratory method, rinsate and field blank analyses yielded the following contaminants in the maximum concentrations indicated:

Contaminant	Maximum Concentration (ug/l)	Action Level (mg/kg)
beryllium	3.9	3.9
cobalt	30.5	30.5
nickel	44.7	44.7
zinc	0.01	0.01

All positive sample results for these analytes, except zinc, are less than the action levels and are qualified as undetected, "U". All positive results for zinc exceeded the action level, therefore, no qualifications were needed.

Negative concentrations were reported for barium in the laboratory method blanks. These occurences are indications of poor instrument

performance not blank contamination. Consequently, positive results for this analyte are qualified as estimated, "J"; no nondetects were reported.

Matrix Spike Recoveries

Matrix Spike (MS) %Rs for antimony, arsenic and selenium were low (< 75% yet > 30%). Positive results and nondetects for these analytes are qualified as estimated, "J" and "UJ", respectively; no nondetects were reported for arsenic and only nondetects were reported for the other two analytes.

The MS %R for barium was high (> 125%). Positive results for this analyte are qualified as estimated, "J".

Field Duplicate Precision

Relative Percent Differences (RPDs) for lead and mercury exceeded the 50% quality control criterion for soils. Positive results and nondetects for these analytes are qualified as estimated, "J" and "UJ", respectively; ony positive results were reported for lead.

Furnace Atomic Absorption Results

Post Digestion Spike (PDS) %Rs for selenium in most samples were below the 85% lower quality control limit. Nondetects in affected samples are are qualified as estimated, "UJ"; no positive results were reported.

TINKER AIR FORCE BASE
CASE # TNK, SDG PKG7

TABLE 1 - RECOMMENDATION SUMMARY

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

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

A^1 - Accept data, but raise sample detection limit (where appropriate) due to blank contamination.

J^1 - Estimate "J" positive results and "UJ" nondetects due to negative concentrations reported in the laboratory method blanks.

J^2 - Estimate "J" positive results < 3X CRDL due to high CRDL Standard analysis recovery.

J^3 - Estimate "J" positive arsenic results and "UJ" nondetects for antimony and selenium due to low MS recovery.

J^4 - Estimate "J" positive results and "UJ" nondetects due to field duplicate imprecision.

J^5 - Estimate "UJ" nondetects in affected samples due to low graphite furnace PDS recovery.

APPENDIX A: QUALIFIED LABORATORY RESULTS

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

TRB209

Lab Name: HALLIBURTON NUS Lab. Contract: TINKER

Lab Code: Case No.: TNK SAS No.: SDG No.: FK67

Matrix (soil/water): SOIL Lab Sample ID: H198014

Level (low/med): LOW Date Received: 02/11/92

% Solids: 0.0

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony	0.01	U	N	F
7440-38-2	Arsenic	0.00	U	N	F
7440-39-3	Barium	0.01	U	N	F
7440-41-7	Beryllium	0.00	U		F
7440-43-9	Cadmium	0.00	U		F
7440-70-2	Calcium				NR
7440-47-3	Chromium	0.01	U		F
7440-48-4	Cobalt	0.03	U		F
7440-50-8	Copper	0.02	U		F
7439-89-6	Iron				NR
7439-92-1	Lead	0.00	U	N	F
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.00	U		CV
7440-02-0	Nickel	0.04	U		F
7440-09-7	Potassium				NR
7782-49-2	Selenium	0.00	U		F
7440-22-4	Silver	0.01	U		F
7440-23-5	Sodium				NR
7440-28-0	Thallium	0.00	U		F
7440-62-2	Vanadium	0.02	U		F
7440-66-6	Zinc	0.01	U		F
	Cyanide				NR

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:
CLIENT ID: T-RBS1-020992 Rinsate blank

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

TRB209

Lab Name: HALLIBURTON_NUS Contract: _____

Lab Code: HNUS Case No.: TNK SAS No.: _____ SDG No.: PKG7

Matrix (soil/water): WATER Lab Sample ID: P189229

Level (low/med): _____ Date Received: 02/09/92

% Solids: 0.0

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminium				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury				NR
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
---------	Cyanide	10.0	U		C

Color Before: COLORLESS Clarity Before: CLEAR Texture: _____

Color After: COLORLESS Clarity After: CLEAR Artifacts: _____

Comments: T-RBS1-020992

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

TFB209

Lab Name: HALLIBURTON NUS Lab. Contract: TINKER

Lab Code: Case No.: TNK SAS No.: SDG No.: PKG7

Matrix (soil/water): SOIL Lab Sample ID: H198015

Level (low/med): LOW Date Received: 02/11/92

% Solids: 0.0

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony	0.01	U	N	P
7440-38-2	Arsenic	0.00	U	N	P
7440-39-3	Barium	0.01	U	N	P
7440-41-7	Beryllium	0.00	U		P
7440-43-9	Cadmium	0.00	U		P
7440-70-2	Calcium				NR
7440-47-3	Chromium	0.01	U		P
7440-48-4	Cobalt	0.03	U		P
7440-50-8	Copper	0.02	U		P
7439-89-6	Iron				NR
7439-92-1	Lead	0.00	U	N	P
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.00	U		CV
7440-02-0	Nickel	0.04	U		P
7440-09-7	Potassium				NR
7782-49-2	Selenium	0.00	U	N	P
7440-22-4	Silver	0.01	U		P
7440-23-5	Sodium				NR
7440-28-0	Thallium	0.00	U		P
7440-62-2	Vanadium	0.02	U		P
7440-66-6	Zinc	0.01	E		P
	Cyanide				NR

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:
CLIENT ID: T-FBS1-020992

field blank

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

TFB209

Lab Name: HALLIBURTON_NUS_____ Contract: _____

Lab Code: HNUS__ Case No.: TNK___ SAS No.: _____ SDG No.: PKG7__

Matrix (soil/water): WATER Lab Sample ID: P189230___

Level (low/med): _____ Date Received: 02/09/92

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminium				NR
7440-36-0	Antimony_				NR
7440-38-2	Arsenic__				NR
7440-39-3	Barium___				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium__				NR
7440-70-2	Calcium__				NR
7440-47-3	Chromium_				NR
7440-48-4	Cobalt___				NR
7440-50-8	Copper___				NR
7439-89-6	Iron_____				NR
7439-92-1	Lead_____				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury__				NR
7440-02-0	Nickel___				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium_				NR
7440-22-4	Silver___				NR
7440-23-5	Sodium___				NR
7440-28-0	Thallium_				NR
7440-62-2	Vanadium_				NR
7440-66-6	Zinc_____				NR
---------	Cyanide__	10.0	U		C

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: _____

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ___

Comments: T- FBS1-020992

APPENDIX B: SUPPORT DOCUMENTATION

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2B
CRDL STANDARD FOR AA AND ICP

Lab Name: HALLIBURTON NUS Lab. Contract: TINKER

Lab Code: Case No.: TNK SAS No.: SDG No.: PKG7

AA CRDL Standard Source: HP

ICP CRDL Standard Source: HP

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
					Initial		Final	
	True	Found	%R	True	Found	%R	Found	%R
Aluminum								
Antimony	60.0	59.75	99.6					
Arsenic	10.0	10.30	103.0					
Barium				400.0	405.00	101.2	390.00	97.5
Beryllium				10.0	9.10	91.0	9.20	92.0
Cadmium				10.0	14.20	142.0	12.30	123.0
Calcium								
Chromium				20.0	15.60	78.0	25.00	125.0
Cobalt				100.0	105.20	105.2	97.00	97.0
Copper				50.0	61.20	122.4	58.80	117.6
Iron								
Lead	3.0	3.05	101.7					
Magnesium								
Manganese								
Mercury								
Nickel				80.0	99.70	124.6	91.70	114.6
Potassium								
Selenium	5.0	5.25	105.0					
Silver				20.0	20.90	104.5	22.20	111.0
Sodium								
Thallium	10.0	9.55	95.5					
Vanadium				100.0	99.00	99.0	94.00	94.0
Zinc				40.0	38.40	96.0	38.20	95.5

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

TFB209

Lab Name: HALLIBURTON NUS Lab. Contract: TINKER

Lab Code: Case No.: TNK SAS No.: SDG No.: PKG7

Matrix (soil/water): SOIL Lab Sample ID: H198015

Level (low/med): LOW Date Received: 02/11/92

% Solids: 0.0

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony	0.01	U	N	P
7440-38-2	Arsenic	0.00	U	N	P
7440-39-3	Barium	0.01	U	N	P
7440-41-7	Beryllium	0.00	B		P
7440-43-9	Cadmium	0.00	U	*	P
7440-70-2	Calcium				NR
7440-47-3	Chromium	0.01	U	*	P
7440-48-4	Cobalt	0.03	U		P
7440-50-8	Copper	0.02	U		P
7439-89-6	Iron				NR
7439-92-1	Lead	0.00	U	N	P
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.00	U		CV
7440-02-0	Nickel	0.04	U		P
7440-09-7	Potassium				NR
7782-49-2	Selenium	0.00	U	N	P
7440-22-4	Silver	0.01	U		P
7440-23-5	Sodium				NR
7440-28-0	Thallium	0.00	U		P
7440-62-2	Vanadium	0.02	U		P
7440-66-6	Zinc	0.01	B	*	P
	Cyanide				NR

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:
CLIENT ID: T-FBS1-020992

field blank

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BLANKS

Lab Name: HALLIBURTON NUS Lab. Contract: TINKER

Lab Code: Case No.: TNK SAS No.: SDG No.: PKG7

Preparation Blank Matrix (soil/water): SOIL

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

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum											
Antimony	6.0	U	6.0	U	6.0	U	6.0	U	6.000	U	F
Arsenic	1.0	U	1.0	U	1.0	U			1.000	U	F
Barium	13.0	U	13.0	U	13.0	U	13.0	U	13.000	U	P
Beryllium	3.1	B	3.5	B	3.4	B	3.9	B	2.000	U	P
Cadmium	4.0	U	4.0	U	4.0	U	4.0	U	4.000	U	P
Calcium											
Chromium	10.0	U	10.0	U	10.0	U	10.0	U	10.000	U	P
Cobalt	30.5	B	27.0	U	27.0	U	27.0	U	27.000	U	P
Copper	16.0	U	16.0	U	16.0	U	16.0	U	16.000	U	P
Iron											
Lead	1.0	U	1.0	U	1.0	U	1.0	U	1.000	U	F
Magnesium											
Manganese											
Mercury	0.1	U	0.1	U	0.1	U			0.100	U	CV
Nickel	38.0	U	38.0	U	44.7		38.0	U	38.000	U	P
Potassium											
Selenium	1.0	U	1.0	U	1.0	U	1.0	U	1.000	U	F
Silver	9.0	U	9.0	U	9.0	U	9.0	U	9.000	U	P
Sodium											
Thallium	2.0	U	2.0	U	2.0	U	2.0	U	2.000	U	F
Vanadium	23.0	U	23.0	U	23.0	U	23.0	U	23.000	U	P
Zinc	6.0	U	6.0	U	6.0	U	6.0	U	6.000	U	P
Cyanide											

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3
BLANKS

Lab Name: HALLIBURTON NUS Lab. Contract: TINKER

Lab Code: Case No.: TNK SAS No.: SDG No.: PKG7

Preparation Blank Matrix (soil/water): SOIL

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

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum											
Antimony											
Arsenic	1.0	U	1.0	U	1.0	U	1.0	U			F
Barium	-27.0	B	-21.0	B							
Beryllium											
Cadmium											
Calcium											
Chromium											
Cobalt											
Copper											
Iron											
Lead	1.0	U	1.0	U							F
Magnesium											
Manganese											
Mercury	0.1	U	0.1	U	0.1	U					CV
Nickel											
Potassium											
Selenium	1.0	U	1.0	U							F
Silver											
Sodium											
Thallium											
Vanadium											
Zinc											
Cyanide											

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ICP INTERFERENCE CHECK SAMPLE

Lab Name: HALLIBURTON NUS Lab. Contract: TINKER

Lab Code: Case No.: TNK SAS No.: SDG No.: PK67

ICP ID Number: MET500 ICS Source: HNUS Lab

Concentration Units: ug/L

Analyte	True Sol. A	True Sol. AB	Initial Found Sol. A	Initial Found Sol. AB	Initial Found %R	Final Found Sol. A	Final Found Sol. AB	Final Found %R
Aluminum								
Antimony								
Arsenic								
Barium	-30	460	0	448.0	97.4	-4	450.0	97.8
Beryllium	1	491	4	485.9	99.0	5	483.1	98.4
Cadmium	2	886	3	964.4	108.8	4	968.7	109.3
Calcium								
Chromium								
Cobalt	17	458	9	458.1	100.0	20	441.4	96.4
Copper	7	439	3	462.8	105.4	12	476.6	108.6
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel	-7	872	8	925.1	106.1	26	904.5	103.7
Potassium								
Selenium								
Silver	2	863	5	800.5	92.8	5	881.5	102.1
Sodium								
Thallium								
Vanadium	4	480	12	434.0	90.4	5	445.0	92.7
Zinc	25	980	22	976.7	99.7	24	963.3	98.3

- can not be evaluated due to insuff. data.

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5A
SPIKE SAMPLE RECOVERY

EPA SAMPLE NO.

TEC22ES

Lab Name: HALLIBURTON NUS Lab. Contract: TINKER

Lab Code: Case No.: TNK SAS No.: SDG No.: PKG7

Matrix (soil/water): SOIL Level (low/med): LOW
% Solids for Sample: 25.4

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

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum									NR
Antimony	75-125	24.6111		2.3474	U	38.10	64.6	N	F
Arsenic	75-125	17.2357		7.4920		15.44	63.1	N	F
Barium	75-125	4933.2606		2277.7760		761.95	348.5	N	P
Beryllium	75-125	20.4584		3.9906		19.05	86.4		P
Cadmium	75-125	21.8299		1.5649	U	19.05	114.6		P
Calcium									NR
Chromium	75-125	126.2936		60.3286		76.20	86.6		
Cobalt	75-125	260.7782		50.7042		190.49	110.3		
Copper	75-125	112.3118		22.4178		95.24	94.4		P
Iron									NR
Lead	75-125	90.9075		44.4223		7.72	602.1	N	F
Magnesium									NR
Manganese									NR
Mercury	75-125	2.0911		0.1907	U	1.90	110.1		CV
Nickel	75-125	262.5688		47.8090		190.49	112.7		P
Potassium									NR
Selenium	75-125	1.5441	B	0.3922	U	3.86	40.0	N	F
Silver	75-125	15.0547		3.5302	U	19.30	78.0		P
Sodium									NR
Thallium	75-125	17.6218		0.7845	U	19.30	91.3		F
Vanadium	75-125	289.5419		106.8074		190.49	95.9		P
Zinc	75-125	273.4266		87.8716		190.49	97.4		P
Cyanide									NR

Comments:

no action, ·)
initial sample re
>4x spike add

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ANALYSIS RUN LOG

Lab Name: HALLIBURTON NUS Lab. Contract: TINKER
Lab Code: Case No.: TNK SAS No.: SDG No.: PKG7
Instrument ID Number: MET405 Method: F
Start Date: 02/25/92 End Date: 02/26/92

EPA Sample No.	D/F	Time	% R	Analytes																						
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
TEC22EDA	1.00	2048	40.5																		X						
CCV1	1.00	2056																			X						
CCB1	1.00	2100																			X						
ZZZZZZ	1.00	2104																			X						
TEC22E	1.00	2108																			X						
TEC22EA	1.00	2112	43.5																		X						
TRB209	1.00	2116																			X						
TRB209A	1.00	2120	103.0																		X						
TFB209	1.00	2124																			X						
TFB209A	1.00	2128	104.0																		X						
TKCD1E	1.00	2133																			X						
TKCD1EA	1.00	2137	66.0																		X						
CCV2	1.00	2141																			X						
CCB2	1.00	2145																			X						
ZZZZZZ	1.00	2149																			X						
ZZZZZZ	1.00	2153																			X						
ZZZZZZ	1.00	2157																			X						
ZZZZZZ	1.00	2201																			X						
TCD15E	1.00	2206																			X						
TCD15EA	1.00	2210	49.0																		X						
ZZZZZZ	1.00	2214																			X						
ZZZZZZ	1.00	2218																			X						
ZZZZZZ	1.00	2222																			X						
ZZZZZZ	1.00	2226																			X						
CCV3	1.00	2230																			X						
CCB3	1.00	2234																			X						
TEC24E	1.00	2238																			X						
TEC24EA	1.00	2242	45.5																		X						
TCCB1E	1.00	2246																			X						
TCCB1EA	1.00	2250	47.5																		X						
CCV4	1.00	2254																			X						
CCB4	1.00	2258																			X						

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ANALYSIS RUN LOG

Lab Name: HALLIBURTON NUS Lab.
Lab Code: Case No.: TNK
Instrument ID Number: MET405
Start Date: 02/25/92

Contract: TINKER
SAS No.: SDG No.: PKG7
Method: F
End Date: 02/26/92

EPA Sample No.	D/F	Time	% R	Analytes																							
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
ZZZZZZ	1.00	0756																			X						
ZZZZZZ	1.00	0758																			X						
S0-2	1.00	0804																			X						
S5-2	1.00	0808																			X						
S20-2	1.00	0812																			X						
S50-2	1.00	0816																			X						
ICV-2	1.00	0820																			X						
ICB-2	1.00	0824																			X						
CRA-2	1.00	0828																			X						
TKSD1F	2.00	0832																			X						
TKSD1FA	2.00	0836	73.0																		X						
TCSD6E	2.00	0840																			X						
TCSD6EA	2.00	0845	66.0																		X						
TKSD5E	2.00	0849																			X						
TKSD5EA	2.00	0853	60.0																		X						
TCDB2E	2.00	0857																			X						
TCDB2EA	2.00	0901	64.5																		X						
CCV1-2	1.00	0905																			X						
CCB1-2	1.00	0909																			X						

HALLIBURTON NUS
Environmental Corporation

INTERNAL CORRESPONDENCE

C-49-3-2-331

TO: PHIL OTTINGER

DATE: MARCH 26, 1992

FROM: KAREN SABOLOSKY

CC: DEB SCHEIB

SUBJECT: ORGANIC DATA VALIDATION - BNA/PESTICIDE/PCB
TINKER AIR FORCE BASE
CASE ID. TINKER, SDG PKG 7

SAMPLES:

Soils:

TKC-

SD01-E-0002 SD01-F-0002 SD05-E-0002

TCC-

SDB1-E-0002 SDB2-E-0002 SD06-E-0002 SD15-E-0002

TEC-

SD22-E-0002 SD24-E-0002

TRBS1020992 TFBS1020992

HALLIBURTON NUS Laboratories analyzed 9 soil samples (including one field duplicate pair), 1 field blank and 1 rinsate blank for Target Compound List (TCL) semivolatile, and pesticide/PCB organic compounds.

The data for these analyses were reviewed with reference to the EPA "Functional Guidelines for Organic Data Validation" and the Hazardous Waste Remedial Action Program's (HAZWRAP) "Requirements for Quality Control of Analytical Data". The analyses were conducted under HAZWRAP Level C QA/QC criteria and were evaluated according to the following parameters:

- Data completeness
- Holding times
- GC/MS tuning and mass calibration
- * Initial and continuing calibrations
- Laboratory and field blank analyses
- Internal standards and performance
- Surrogate spike recoveries
- * Matrix spike/matrix spike duplicate results
- Field duplicate precision
- * Detection limits

- Sample quantitation

The symbol (*) indicates that quality control criteria were not met for this parameter. Problems affecting data usability are discussed below and the attached Table 1 summarizes the validation qualifications.

Tentatively Identified Compounds (TICs) were not included in this data package since TICs are not required by HAZWRAP Level C protocol.

Semivolatile Fraction

Based on the analytical method requested, the laboratory could not analyze for 3,3'-dimethylbenzidine. A zero result followed by the laboratory undetected qualifier, "U", is reported for this compound on the Form Is. Therefore, all 3,3'-dimethylbenzidine results for these samples have been qualified as rejected, "R".

An initial calibration average Relative Response Factor (RRF average) for 4-nitroquinoline-1-oxide was less than 0.05. No positive results were reported for this compound in affected samples and associated nondetects are unreliable and therefore are qualified as rejected, "R".

Several continuing calibration RRFs for 4-nitroquinoline-1-oxide and hexachloropropene were less than 0.05. No positive results for these compounds were reported in affected samples and associated nondetects for 4-nitroquinoline 1-oxide had been previously qualified for initial calibration noncompliance. Nondetects for hexachloropropene in affected samples are unreliable and therefore are qualified as rejected, "R".

Percent Relative Standard Deviation (%RSDs) for the initial calibrations of isosafrole, 1,4-naphthoquinone, hexachloropropene, M-dinitrobenzene, and pyridine exceeded 50%. No positive results for these compounds were reported in affected samples and nondetects for hexachloropropene had been previously qualified for relative response noncompliance. Nondetects for the remaining samples are qualified as estimated, "UJ".

The %RSDs for the initial calibrations of benzo(k)fluoranthene, 2,4,5-trichlorophenol, 4-nitrophenol, N-nitrosopiperidine, 4-nitroquinoline 1-oxide, O-toluidine, aramite and M-cresol exceeded 30%. No positive results were reported for these compounds in affected samples and nondetects for 4-nitroquinoline-1-oxide had been previously qualified for calibration noncompliance. Nondetects for the remaining compounds in affected samples are

qualified as estimated, "UJ".

The continuing calibration Percent Differences (%Ds) for 4-nitrophenol, A,A'-dimethylphenethylamine, 1,4-naphthoquinone, hexachloropropene, M-cresol, aramite, methyapyriline, N-nitrosomethylethylamine, N-nitrosopyrrolidine, N-nitrosomorpholine, sym-trinitrobenzene, and diallite exceeded 50%. No positive results for these compounds were reported in affected samples and nondetects for hexachloropropene had been previously qualified for initial calibration noncompliance. Nondetects for the remaining compounds in affected samples were qualified as estimated, "UJ".

Several continuing calibration %Ds for 2,4,5-trichlorophenol, 4-aminobiphenyl, hexachlorocyclopentadiene, 4-chloronaphthalene, 2-nitroaniline, dimethylphthalate, 2,6-dinitrotoluene, 3-nitroaniline, dibenzofuran, 2,4-dinitrotoluene, diethylphthalate, 4-chlorophenyl-phenylether, fluorene, acetophenone, A,A'-dimethylphenethylamine, 4-methylphenol, 4-nitrophenol, benzo(k)flouranthene, 4-nitroaniline, N-nitrosomethylethylamine, N-nitrosopyrrolidine, sym-trinitrobenzene, M-dinitrobenzene, dimethoate, diallate, aramite, 2-sec-butyl-4,6-dinitrophenol, isosafrole, 4-nitroquinoline 1-oxide, hexachloropropene, P-phenylenediamine, and pyridine exceeded 25%. No action was necessary since no positive results for these compounds were reported in affected samples and associated nondetects are not compromised.

The Matrix Spike/Matrix Spike Duplicate (MS/MSD) Percent Recoveries (%Rs) for phenol, 2-chlorophenol, 1,2,4-trichlorobenzene, 4-chloro-3-methylphenol, 2,4-dinitrotoluene and pentachlorophenol in sample TEC-SD-E-0002 exceeded the quality control limits. No action was necessary since no positive results were reported for these compounds in the unspiked sample and associated nondetects are not compromised.

<u>Pesticide/PCB Fraction</u>

Retention times for heptachlor epoxide and Endosulfan II were outside of established chromatographic windows for these compounds. Since no positive results were reported in affected samples, chromatograms of affected samples were evaluated for false negatives. No peaks of interest were present either within or close to the retention times for these compounds and subsequent continuing calibration %Ds were less than the 15% quantitation column quality control limit. Therefore, nondetects are considered valid and no further action was necessary.

The Matrix Spike/Matrix Spike Duplicate (MS/MSD) Percent Recoveries (%Rs) for endrin and 4,4'-DDT exceeded the upper quality control limits. No action was taken because no positive results were reported for these compounds in the unspiked sample.

Sample TKC-SD01-E-0002 was diluted for analysis thereby elevating detection limits for this sample by four-fold. Subsequent (undiluted) analysis of this sample on the confirmation column confirmed the positive results reported for this sample on the quantitation column. However, dilution increases the possibility of a higher margin of error in quantifying positive results and may introduce false negatives. Therefore, positive results and nondetects in this sample are qualified as estimated, "J" and "UJ", respectively.

Additional Comments

No qualifications were made to samples T-RBS1-020992, T-FBS1-020992 because these samples are trip and rinsate blanks and are not qualified for any occurrence according to HAZWRAP data validation protocol.

TINKER AIR FORCE BASE
CASE ID. TINKER, SDG PKG 7

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.	Semivolatile	Pest/PCB
TKC-SD01-E-0002 (P188956)	$R^{1,2,3}$, J^{5}	J^{8}
TKC-SD01-F-0002 (P188957)	$R^{1,2,3}$, $J^{2,5,6}$	
TKC-SD05-E-0002 (P189154)	$R^{1,2,3}$, $J^{5,6,7}$	
TCC-SDB1-E-0002 (P189288)	$R^{1,2,3}$, $J^{5,6,7}$	
TCC-SDB2-E-0002 (P189223)	$R^{1,2,3}$, $J^{5,6,7}$	
TCC-SD06-E-0002 (P189027)	$R^{1,2,3}$, $J^{1,4}$	
TCC-SD15-E-0002 (P189030)	$R^{1,2,3}$, $J^{1,4}$	
TEC-SD22-E-0002 (P189218)	$R^{1,2,3}$, J^{5}	
TEC-SD24-E-0002 (P189225)	$R^{1,2,3}$, $J^{5,6,7}$	

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

R^1 - Reject "R" results for 3,3'-dimethylbenzidine because analytical method does not detect this analyte.

R^2 - Reject "R" nondetect for 4-nitroquinoline-1-oxide because initial calibration average RRF < 0.05.

R^3 - Reject "R" nondetect for hexachloropropene because continuing calibration RRF < 0.05.

J^1 - Estimate "UJ" nondetects for isosafrole, 1,4-naphthoquinone, M-dinitrobenzene and pyridine because initial calibration %RSD > 50%.

J^2 - Estimate "UJ" nondetects for A,A'-dimethylphenethylamine because continuing calibration %D > 50%.

J^3 - Estimate "UJ" nondetect for 4-nitrophenol because continuing calibration %D > 50%.

J^4 - Estimate "UJ" nondetects for M-cresol because continuing calibration %D > 50.

J^5 - Estimate "UJ" nondetects for methyapyriline, 1,4-naphthoquinone, and aramite because continuing calibration %Ds > 50%.

J^6 - Estimate "UJ" nondetects for N-nitrosomethylethylamine, N-nitrosopyrrolidine, N-nitrosomorpholine, and diallite because continuing calibration %Ds >50%.

J^7 - Estimate "UJ" nondetects for sym-trinitrobenzene because continuing calibration %D > 50.

J^8 - Estimate "J" positive results and "UJ" nondetects because of elevated detection limits.

APPENDIX A

QUALIFIED ANALYTICAL RESULTS

1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

TFBS102099

Lab Name: NUS-LSG Contract: _____

Lab Code: HNUS Case No.: TNK SAS No.: _____ SDG No.: PKG7

Matrix: (soil/water) WATER Lab Sample ID: P189230

Sample wt/vol: 1000 (g/mL) ML Lab File ID: ABP03099201

Level: (low/med) LOW Date Received: 02/09/92

% Moisture: not dec. ____ dec. ____ Date Extracted: 02/13/92

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 03/09/92

GPC Cleanup: (Y/N) N pH: ____ Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
62-75-9	N-NITROSODIMETHYLAMINE	10	U
108-95-2	PHENOL	10	U
62-53-3	ANILINE	10	U
111-44-4	BIS(2-CHLOROETHYL)ETHER	10	U
95-57-8	2-CHLOROPHENOL	10	U
541-73-1	1,3-DICHLOROBENZENE	10	U
106-46-7	1,4-DICHLOROBENZENE	10	U
100-51-6	BENZYL ALCOHOL	10	U
95-50-1	1,2-DICHLOROBENZENE	10	U
95-48-7	2-METHYLPHENOL	10	U
39638-32-9	BIS(2-CHLOROISOPROPYL)ETHER	10	U
106-44-5	4-METHYLPHENOL	10	U
621-64-7	N-NITROSO-DI-N-PROPYLAMINE	10	U
67-72-1	HEXACHLOROETHANE	10	U
98-95-3	NITROBENZENE	10	U
78-59-1	ISOPHORONE	10	U
88-75-5	2-NITROPHENOL	10	U
105-67-9	2,4-DIMETHYLPHENOL	10	U
111-91-1	BIS(2-CHLOROETHOXY)METHANE	10	U
120-83-2	2,4-DICHLOROPHENOL	10	U
120-82-1	1,2,4-TRICHLOROBENZENE	10	U
91-20-3	NAPHTHALENE	10	U
106-47-8	4-CHLOROANILINE	10	U
87-68-3	HEXACHLOROBUTADIENE	10	U
59-50-7	4-CHLORO-3-METHYLPHENOL	10	U
91-57-6	2-METHYLNAPHTHALENE	10	U

1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

TFBS1020992

ab Name: NUS-LSG Contract: _____

Lab Code: HNUS Case No.: TNK SAS No.: _____ SDG No.: PKG7

Matrix: (soil/water) WATER Lab Sample ID: P189230

Sample wt/vol: 1000 (g/mL) ML Lab File ID: ABP03099201

Level: (low/med) LOW Date Received: 02/09/92

% Moisture: not dec. ____ dec. ____ Date Extracted: 02/13/92

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 03/09/92

GPC Cleanup: (Y/N) N pH: ____ Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
77-47-4	HEXACHLOROCYCLOPENTADIENE	10	U
88-06-2	2,4,6-TRICHLOROPHENOL	10	U
95-95-4	2,4,5-TRICHLOROPHENOL	50	U
91-58-7	2-CHLORONAPHTHALENE	10	U
88-74-4	2-NITROANILINE	50	U
131-11-3	DIMETHYLPHTHALATE	10	U
208-96-8	ACENAPHTHYLENE	10	U
606-20-2	2,6-DINITRITOLUENE	10	U
99-09-2	3-NITROANILINE	50	U
83-32-9	ACENAPHTHENE	10	U
51-28-5	2,4-DINITROPHENOL	50	U
100-02-7	4-NITROPHENOL	50	U
132-64-9	DIBENZOFURAN	10	U
121-14-2	2,4-DINITROTOLUENE	10	U
84-66-2	DIETHYLPHTHALATE	10	U
7005-72-3	4-CHLOROPHENYL-PHENYLETHER	10	U
86-73-7	FLUORENE	10	U
100-10-6	4-NITROANILINE	50	U
534-52-1	4,6-DINITRO-2-METHYLPHENOL	50	U
86-30-6	N-NITROSODIPHENYLAMINE (1)	10	U
101-55-3	4-BROMOPHENYL-PHENYLETHER	10	U
118-74-1	HEXACHLOROBENZENE	10	U
87-86-5	PENTACHLOROPHENOL	50	U
85-01-8	PHENANTHRENE	10	U
120-12-7	ANTHRACENE	10	U
84-74-2	DI-N-BUTYLPHTHALATE	10	U

1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

TFBS1020992

Lab Name: NUS-LSG Contract: _____

Lab Code: HNUS Case No.: TNK SAS No.: _____ SDG No.: PKG7

Matrix: (soil/water) WATER Lab Sample ID: P189230

Sample wt/vol: 1000 (g/mL) ML Lab File ID: ABP03099201

Level: (low/med) LOW Date Received: 02/09/92

% Moisture: not dec. ____ dec. ____ Date Extracted: 02/13/92

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 03/09/92

GPC Cleanup: (Y/N) N pH: ____ Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
206-44-0	FLUORANTHENE	10	U
129-00-0	PYRENE	10	U
85-68-7	BUTYLBENZYLPHTHALATE	10	U
91-94-1	3,3'-DICHLOROBENZIDINE	20	U
56-55-3	BENZO(A)ANTHRACENE	10	U
218-01-9	CHRYSENE	10	U
117-81-7	BIS(2-ETHYLHEXYL)PHTHALATE	10	U
117-84-0	DI-N-OCTYL PHTHALATE	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
58-90-2	2,3,4,6-TETRACHLOROPHENOL	10	U
109-06-8	2-PICOLINE	10	U
62-50-0	METHANESULFONIC ACID, ETHYL E	10	U
100-75-4	N-NITROSOPIPERIDINE	20	U
87-65-0	2,6-DICHLOROPHENOL	10	U
924-16-3	NITROSO-DI-N-BUTYLAMINE	10	U
66-27-3	METHANESULFONIC ACID, METHYL	10	U
98-86-2	ACETOPHENONE	10	U
122-09-8	A,A-DIMETHYLPHENETHYLAMINE	10	U
608-93-5	PENTACHLOROBENZENE	10	U
92-67-1	4-AMINOBIPHENYL	10	U
60-11-7	P-DIMETHYLAMINOAZOBENZENE	10	U

1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

TFBS1020992

D Name: NUS-LSG Contract: _____

Lab Code: HNUS Case No.: TNK SAS No.: _____ SDG No.: PKG7

Matrix: (soil/water) WATER Lab Sample ID: P189230

Sample wt/vol: 1000 (g/mL) ML Lab File ID: ABP03099201

Level: (low/med) LOW Date Received: 02/09/92

% Moisture: not dec. ____ dec. ____ Date Extracted: 02/13/92

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 03/09/92

GPC Cleanup: (Y/N) N pH: ____ Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
57-97-6	7,12-DIMETHYLBENZ(A)ANTHRACEN	50	U
95-94-3	1,2,4,5-TETRACHLOROBENZENE	10	U
122-39-4	DIPHENYLAMINE	10	U
62-44-2	PHENACETIN	10	U
56-49-5	3-METHYLCHOLANTHRENE	10	U
23950-58-5	PRONAMIDE	10	U
91-59-8	2-NAPHTHALENEAMINE	10	U
106-50-3	P-PHENYLENEDIAMINE	50	U
120-58-1	ISOSAFROLE	10	U
99-55-8	5-NITRO-O-TOLUIDINE	10	U
56-57-5	4-NITROQUINOLINE 1-OXIDE	~~50~~	~~U~~ 50 U
91-80-5	METHYAPYRILENE	10	U
781-73-7	2-ACETYLAMINOFLUORENE	10	U
10595-95-6	N-NITROSOMETHYLETHYLAMINE	10	U
55-18-5	N-NITROSODIETHYLAMINE	10	U
930-55-2	N-NITROSOPYRROLIDINE	10	U
59-89-2	N-NITROSOMORPHOLINE	10	U
95-53-4	O-TOLUIDINE	10	U
1981-0-0	0,0,0-TRIETHYLPHOSPHOROTHIOAT	50	U
94-59-7	SAFROLE	10	U
130-15-4	1,4-NAPHTHOQUINONE	50	U
99-35-4	SYM-TRINITROBENZENE	50	U
1888-71-7	HEXACHLOROPROPENE	~~50~~	~~U~~ 50 U
99-65-0	M-DINITROBENZENE	20	U
612-82-8	3,3'-DIMETHYLBENZIDINE	0	U
70-30-4	HEXACHLOROPHENE	1000	U

1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

TFBS102099?

Lab Name: NUS-LSG Contract: _____

Lab Code: HNUS Case No.: TNK SAS No.: _____ SDG No.: PKG7

Matrix: (soil/water) WATER Lab Sample ID: P189230

Sample wt/vol: 1000 (g/mL) ML Lab File ID: ABP03099201

Level: (low/med) LOW Date Received: 02/09/92

% Moisture: not dec. ____ dec. ____ Date Extracted: 02/13/92

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 03/09/92

GPC Cleanup: (Y/N) N pH: ____ Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
60-51-5	DIMETHOATE	10	U
2303-16-4	DIALLATE	10	U
110-86-1	PYRIDINE	10	U
140-57-8	ARAMITE	50	U
88-85-7	2-SEC-BUTYL-4,6-DINITROPHENOL	10	U
108-39-4	M-CRESOL	10	U
82-68-8	PENTACHLORONITROBENZENE	50	U

1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

TRBS1020992

ab Name: NUS-LSG Contract: _____

Lab Code: HNUS Case No.: TNK SAS No.: _____ SDG No.: PKG7

Matrix: (soil/water) WATER Lab Sample ID: P189229

Sample wt/vol: 1000 (g/mL) ML Lab File ID: ABP03089204

Level: (low/med) LOW Date Received: 02/09/92

% Moisture: not dec. ____ dec. ____ Date Extracted: 02/13/92

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 03/09/92

GPC Cleanup: (Y/N) N pH: ____ Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
62-75-9	N-NITROSODIMETHYLAMINE	10	U
108-95-2	PHENOL	10	U
62-53-3	ANILINE	10	U
111-44-4	BIS(2-CHLOROETHYL)ETHER	10	U
95-57-8	2-CHLOROPHENOL	10	U
541-73-1	1,3-DICHLOROBENZENE	10	U
106-46-7	1,4-DICHLOROBENZENE	10	U
100-51-6	BENZYL ALCOHOL	10	U
95-50-1	1,2-DICHLOROBENZENE	10	U
95-48-7	2-METHYLPHENOL	10	U
39638-32-9	BIS(2-CHLOROISOPROPYL)ETHER	10	U
106-44-5	4-METHYLPHENOL	10	U
621-64-7	N-NITROSO-DI-N-PROPYLAMINE	10	U
67-72-1	HEXACHLOROETHANE	10	U
98-95-3	NITROBENZENE	10	U
78-59-1	ISOPHORONE	10	U
88-75-5	2-NITROPHENOL	10	U
105-67-9	2,4-DIMETHYLPHENOL	10	U
111-91-1	BIS(2-CHLOROETHOXY)METHANE	10	U
120-83-2	2,4-DICHLOROPHENOL	10	U
120-82-1	1,2,4-TRICHLOROBENZENE	10	U
91-20-3	NAPHTHALENE	10	U
106-47-8	4-CHLOROANILINE	10	U
87-68-3	HEXACHLOROBUTADIENE	10	U
59-50-7	4-CHLORO-3-METHYLPHENOL	10	U
91-57-6	2-METHYLNAPHTHALENE	10	U

1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

TRBS102099

Lab Name: NUS-LSG Contract: _____

Lab Code: HNUS Case No.: TNK SAS No.: _____ SDG No.: PKG7

Matrix: (soil/water) WATER Lab Sample ID: P189229

Sample wt/vol: 1000 (g/mL) ML Lab File ID: ABP03089204

Level: (low/med) LOW Date Received: 02/09/92

% Moisture: not dec. ____ dec. ____ Date Extracted: 02/13/92

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 03/09/92

GPC Cleanup: (Y/N) N pH: ____ Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
77-47-4	HEXACHLOROCYCLOPENTADIENE	10	U
88-06-2	2,4,6-TRICHLOROPHENOL	10	U
95-95-4	2,4,5-TRICHLOROPHENOL	50	U
91-58-7	2-CHLORONAPHTHALENE	10	U
88-74-4	2-NITROANILINE	50	U
131-11-3	DIMETHYLPHTHALATE	10	U
208-96-8	ACENAPHTHYLENE	10	U
606-20-2	2,6-DINITRITOLUENE	10	U
99-09-2	3-NITROANILINE	50	U
83-32-9	ACENAPHTHENE	10	U
51-28-5	2,4-DINITROPHENOL	50	U
100-02-7	4-NITROPHENOL	50	U
132-64-9	DIBENZOFURAN	10	U
121-14-2	2,4-DINITROTOLUENE	10	U
84-66-2	DIETHYLPHTHALATE	10	U
7005-72-3	4-CHLOROPHENYL-PHENYLETHER	10	U
86-73-7	FLUORENE	10	U
100-10-6	4-NITROANILINE	50	U
534-52-1	4,6-DINITRO-2-METHYLPHENOL	50	U
86-30-6	N-NITROSODIPHENYLAMINE (1)	10	U
101-55-3	4-BROMOPHENYL-PHENYLETHER	10	U
118-74-1	HEXACHLOROBENZENE	10	U
87-86-5	PENTACHLOROPHENOL	50	U
85-01-8	PHENANTHRENE	10	U
120-12-7	ANTHRACENE	10	U
84-74-2	DI-N-BUTYLPHTHALATE	10	U

1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

TRBS1020992

Lab Name: NUS-LSG Contract: _____

Lab Code: HNUS Case No.: TNK SAS No.: _____ SDG No.: PKG7

Matrix: (soil/water) WATER Lab Sample ID: P189229

Sample wt/vol: 1000 (g/mL) ML Lab File ID: ABP03089204

Level: (low/med) LOW Date Received: 02/09/92

% Moisture: not dec. ____ dec. ____ Date Extracted: 02/13/92

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 03/09/92

GPC Cleanup: (Y/N) N pH: ____ Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
206-44-0	FLUORANTHENE	10	U
129-00-0	PYRENE	10	U
85-68-7	BUTYLBENZYLPHTHALATE	10	U
91-94-1	3,3'-DICHLOROBENZIDINE	20	U
56-55-3	BENZO(A)ANTHRACENE	10	U
218-01-9	CHRYSENE	10	U
117-81-7	BIS(2-ETHYLHEXYL)PHTHALATE	10	U
117-84-0	DI-N-OCTYL PHTHALATE	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
58-90-2	2,3,4,6-TETRACHLOROPHENOL	10	U
109-06-8	2-PICOLINE	10	U
62-50-0	METHANESULFONIC ACID, ETHYL E	10	U
100-75-4	N-NITROSOPIPERIDINE	20	U
87-65-0	2,6-DICHLOROPHENOL	10	U
924-16-3	NITROSO-DI-N-BUTYLAMINE	10	U
66-27-3	METHANESULFONIC ACID, METHYL	10	U
98-86-2	ACETOPHENONE	10	U
122-09-8	A,A-DIMETHYLPHENETHYLAMINE	10	U
608-93-5	PENTACHLOROBENZENE	10	U
92-67-1	4-AMINOBIPHENYL	10	U
60-11-7	P-DIMETHYLAMINOAZOBENZENE	10	U

1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

TRBS102099

Lab Name: NUS-LSG Contract: _____

Lab Code: HNUS Case No.: TNK SAS No.: _____ SDG No.: PKG7

Matrix: (soil/water) WATER Lab Sample ID: P189229

Sample wt/vol: 1000 (g/mL) ML Lab File ID: ABP03089204

Level: (low/med) LOW Date Received: 02/09/92

% Moisture: not dec. ____ dec. ____ Date Extracted: 02/13/92

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 03/09/92

GPC Cleanup: (Y/N) N pH: ____ Dilution Factor: 1.0

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
57-97-6	7,12-DIMETHYLBENZ(A)ANTHRACEN	50	U
95-94-3	1,2,4,5-TETRACHLOROBENZENE	10	U
122-39-4	DIPHENYLAMINE	10	U
62-44-2	PHENACETIN	10	U
56-49-5	3-METHYLCHOLANTHRENE	10	U
23950-58-5	PRONAMIDE	10	U
91-59-8	2-NAPHTHALENEAMINE	10	U
106-50-3	P-PHENYLENEDIAMINE	50	U
120-58-1	ISOSAFROLE	10	U
99-55-8	5-NITRO-O-TOLUIDINE	10	U
56-57-5	4-NITROQUINOLINE 1-OXIDE	~~50~~	~~U~~ 50 U
91-80-5	METHYAPYRILENE	10	U
781-73-7	2-ACETYLAMINOFLUORENE	10	U
10595-95-6	N-NITROSOMETHYLETHYLAMINE	10	U
55-18-5	N-NITROSODIETHYLAMINE	10	U
930-55-2	N-NITROSOPYRROLIDINE	10	U
59-89-2	N-NITROSOMORPHOLINE	10	U
95-53-4	O-TOLUIDINE	10	U
1981-0-0	0,0,0-TRIETHYLPHOSPHOROTHIOAT	50	U
94-59-7	SAFROLE	10	U
130-15-4	1,4-NAPHTHOQUINONE	50	U
99-35-4	SYM-TRINITROBENZENE	50	U
1888-71-7	HEXACHLOROPROPENE	~~50~~	~~U~~ 50 U
99-65-0	M-DINITROBENZENE	20	U
612-82-8	3,3'-DIMETHYLBENZIDINE	0	U
70-30-4	HEXACHLOROPHENE	1000	U

1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

TRBS1020992

Lab Name: NUS-LSG Contract: _____

Lab Code: HNUS Case No.: TNK SAS No.: _____ SDG No.: PKG7

Matrix: (soil/water) WATER Lab Sample ID: P189229

Sample wt/vol: 1000 (g/mL) ML Lab File ID: ABP03089204

Level: (low/med) LOW Date Received: 02/09/92

% Moisture: not dec. ____ dec. ____ Date Extracted: 02/13/92

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 03/09/92

GPC Cleanup: (Y/N) N pH: ____ Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
60-51-5	DIMETHOATE	10	U
2303-16-4	DIALLATE	10	U
110-86-1	PYRIDINE	10	U
140-57-8	ARAMITE	50	U
88-85-7	2-SEC-BUTYL-4,6-DINITROPHENOL	10	U
108-39-4	M-CRESOL	10	U
82-68-8	PENTACHLORONITROBENZENE	50	U

FORM I X-8 10/89 Rev.

1D

PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

TFBS1020992

Lab Name: NUS-LSG Contract: _____

Lab Code: NUS Case No.: TNK SAS No.: _____ SDG No.: PKG7

Matrix: (soil/water) WATER Lab Sample ID: P189230

Sample wt/vol: 1000 (g/mL) ML Lab File ID: _____

Level: (low/med) LOW Date Received: 02/09/92

% Moisture: not dec. __ dec. __ Date Extracted: 02/13/92

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 02/19/92

GPC Cleanup: (Y/N) N pH: ____ Dilution Factor: 1.00

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
319-84-6	ALPHA-BHC	0.050	U
319-85-7	BETA-BHC	0.050	U
319-86-8	DELTA-BHC	0.050	U
58-89-9	LINDANE	0.050	U
76-44-8	HEPTACHLOR	0.050	U
309-00-2	ALDRIN	0.050	U
1024-57-3	HEPTACHLOR EPOXIDE	0.050	U
959-98-8	ENDOSULFAN I	0.050	U
60-57-1	DIELDRIN	0.10	U
72-55-9	4,4'-DDE	0.10	U
72-20-8	ENDRIN	0.10	U
33213-65-9	ENDOSULFAN II	0.10	U
72-54-8	4,4'-DDD	0.10	U
1031-07-8	ENDOSULFAN SULFATE	0.10	U
50-29-3	4,4'-DDT	0.10	U
72-43-5	METHOXYCHLOR	0.50	U
53494-70-5	ENDRIN KETONE	0.10	U
5103-71-9	ALPHA-CHLORDANE	0.50	U
5103-74-2	GAMMA-CHLORDANE	0.50	U
8001-35-2	TOXAPHENE	1.0	U
12674-11-2	AROCLOR-1016	0.50	U
11104-28-2	AROCLOR-1221	0.50	U
11141-16-5	AROCLOR-1232	0.50	U
53469-21-9	AROCLOR-1242	0.50	U
12672-29-6	AROCLOR-1248	0.50	U
11097-69-1	AROCLOR-1254	1.0	U
11096-82-5	AROCLOR-1260	1.0	U

1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO

TKCSD01E0002

Lab Name: NUS-LSG Contract: _____

Lab Code: NUS Case No.: TNK SAS No.: _____ SDG No.: PKG7

Matrix: (soil/water) SOIL Lab Sample ID: P188956

Sample wt/vol: 30.0 (g/mL) G Lab File ID: _____

Level: (low/med) LOW Date Received: 02/04/92

% Moisture: not dec. 25 dec. __ Date Extracted: 02/06/92

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 02/17/92

GPC Cleanup: (Y/N) N pH: 7.2 Dilution Factor: 4.00

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG

CAS NO.	COMPOUND		Q
319-84-6	ALPHA-BHC	43	U
319-85-7	BETA-BHC	43	U
319-86-8	DELTA-BHC	43	U
58-89-9	LINDANE	43	U
76-44-8	HEPTACHLOR	43	U
309-00-2	ALDRIN	43	U
1024-57-3	HEPTACHLOR EPOXIDE	43	U
959-98-8	ENDOSULFAN I	43	U
60-57-1	DIELDRIN	85	U
72-55-9	4,4'-DDE	85	U
72-20-8	ENDRIN	85	U
33213-65-9	ENDOSULFAN II	85	U
72-54-8	4,4'-DDD	85	U
1031-07-8	ENDOSULFAN SULFATE	85	U
50-29-3	4,4'-DDT	85	U
72-43-5	METHOXYCHLOR	430	U
53494-70-5	ENDRIN KETONE	85	U
5103-71-9	ALPHA-CHLORDANE	430	U
5103-74-2	GAMMA-CHLORDANE	430	U
8001-35-2	TOXAPHENE	850	U
12674-11-2	AROCLOR-1016	430	U
11104-28-2	AROCLOR-1221	430	U
11141-16-5	AROCLOR-1232	430	U
53469-21-9	AROCLOR-1242	430	U
12672-29-6	AROCLOR-1248	430	U
11097-69-1	AROCLOR-1254	850	U
11096-82-5	AROCLOR-1260	120	J

1D

PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

TKCSD01F00

Lab Name: NUS-LSG Contract: _____

Lab Code: NUS Case No.: TNK SAS No.: _____ SDG No.: PKG7

Matrix: (soil/water) SOIL Lab Sample ID: P188957

Sample wt/vol: 30.0 (g/mL) G Lab File ID: _____

Level: (low/med) LOW Date Received: 02/04/92

% Moisture: not dec. 16 dec. __ Date Extracted: 02/06/92

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 02/18/92

GPC Cleanup: (Y/N) N pH: 7.4 Dilution Factor: 1.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	ALPHA-BHC	9.5	U
319-85-7	BETA-BHC	9.5	U
319-86-8	DELTA-BHC	9.5	U
58-89-9	LINDANE	9.5	U
76-44-8	HEPTACHLOR	9.5	U
309-00-2	ALDRIN	9.5	U
1024-57-3	HEPTACHLOR EPOXIDE	9.5	U
959-98-8	ENDOSULFAN I	9.5	U
60-57-1	DIELDRIN	19	U
72-55-9	4,4'-DDE	19	U
72-20-8	ENDRIN	19	U
33213-65-9	ENDOSULFAN II	19	U
72-54-8	4,4'-DDD	19	U
1031-07-8	ENDOSULFAN SULFATE	19	U
50-29-3	4,4'-DDT	19	U
72-43-5	METHOXYCHLOR	95	U
53494-70-5	ENDRIN KETONE	19	U
5103-71-9	ALPHA-CHLORDANE	95	U
5103-74-2	GAMMA-CHLORDANE	95	U
8001-35-2	TOXAPHENE	190	U
12674-11-2	AROCLOR-1016	95	U
11104-28-2	AROCLOR-1221	95	U
11141-16-5	AROCLOR-1232	95	U
53469-21-9	AROCLOR-1242	95	U
12672-29-6	AROCLOR-1248	95	U
11097-69-1	AROCLOR-1254	190	U
11096-82-5	AROCLOR-1260	160	

1D

PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

TRBS1020992

b Name: NUS-LSG Contract: _____

Lab Code: NUS Case No.: TNK SAS No.: _____ SDG No.: PKG7

Matrix: (soil/water) WATER Lab Sample ID: P189229

Sample wt/vol: 1000 (g/mL) ML Lab File ID: _____

Level: (low/med) LOW Date Received: 02/09/92

% Moisture: not dec. ___ dec. ___ Date Extracted: 02/13/92

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 02/18/92

GPC Cleanup: (Y/N) N pH: ____ Dilution Factor: 1.00

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
319-84-6	ALPHA-BHC	0.050	U
319-85-7	BETA-BHC	0.050	U
319-86-8	DELTA-BHC	0.050	U
58-89-9	LINDANE	0.050	U
76-44-8	HEPTACHLOR	0.050	U
309-00-2	ALDRIN	0.050	U
1024-57-3	HEPTACHLOR EPOXIDE	0.050	U
959-98-8	ENDOSULFAN I	0.050	U
60-57-1	DIELDRIN	0.10	U
72-55-9	4,4'-DDE	0.10	U
72-20-8	ENDRIN	0.10	U
33213-65-9	ENDOSULFAN II	0.10	U
72-54-8	4,4'-DDD	0.10	U
1031-07-8	ENDOSULFAN SULFATE	0.10	U
50-29-3	4,4'-DDT	0.10	U
72-43-5	METHOXYCHLOR	0.50	U
53494-70-5	ENDRIN KETONE	0.10	U
5103-71-9	ALPHA-CHLORDANE	0.50	U
5103-74-2	GAMMA-CHLORDANE	0.50	U
8001-35-2	TOXAPHENE	1.0	U
12674-11-2	AROCLOR-1016	0.50	U
11104-28-2	AROCLOR-1221	0.50	U
11141-16-5	AROCLOR-1232	0.50	U
53469-21-9	AROCLOR-1242	0.50	U
12672-29-6	AROCLOR-1248	0.50	U
11097-69-1	AROCLOR-1254	1.0	U
11096-82-5	AROCLOR-1260	1.0	U

APPENDIX B
Support Documentation

SEMIVOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: NUS-LSG Contract:

Lab Code: HNUS Case No.: TNK SAS No.: SDG No.: PKG7

Instrument ID: GCMSA Calibration Date(s): 03/02/92 03/02/92

Min $\overline{RRF}$ for SPCC(#) = 0.050 Max %RSD for CCC(*) = 30.0%

LAB FILE ID: RRF20 = ABT03029209 RRF50 = ABT03029203
RRF80 = ABT03029204 RRF120= ABT03029205 RRF160= ABT03029206

COMPOUND	RRF20	RRF50	RRF80	RRF120	RRF160	$\overline{RRF}$	% RSD
DIBENZOFURAN	1.592	1.559	1.383	1.225	1.308	1.413	11.2
2,4-DINITROTOLUENE	0.400	0.364	0.310	0.308	0.312	0.339	12.2
DIETHYLPHTHALATE	1.156	0.980	0.875	0.824	0.780	0.923	16.3
4-CHLOROPHENYL-PHENYLETHER	0.680	0.630	0.490	0.463	0.432	0.539	20.3
FLUORENE	1.374	1.334	1.035	0.888	0.990	1.124	19.3
4-NITROANILINE		0.357	0.304	0.319	0.285	0.316	9.7
4,6-DINITRO-2-METHYLPHENOL		0.160	0.160	0.173	0.158	0.163	4.2
N-NITROSODIPHENYLAMINE (1) *	0.623	0.623	0.567	0.559	0.589	0.592	5.1*
4-BROMOPHENYL-PHENYLETHER	0.249	0.275	0.271	0.292	0.288	0.275	6.2
HEXACHLOROBENZENE	0.267	0.279	0.288	0.310	0.199	0.269	15.6
PENTACHLOROPHENOL *		0.225	0.235	0.246	0.238	0.236	3.7*
PHENANTHRENE	1.218	1.317	1.284	1.226	1.200	1.249	4.0
ANTHRACENE	1.184	1.167	1.158	1.219	1.156	1.177	2.2
DI-N-BUTYLPHTHALATE	1.299	1.374	1.402	1.521	1.517	1.423	6.7
FLUORANTHENE *	1.234	1.296	1.294	1.331	1.344	1.300	3.3*
PYRENE	1.460	1.406	1.401	1.414	1.403	1.417	1.7
BUTYLBENZYLPHTHALATE	0.562	0.600	0.599	0.633	0.637	0.606	5.0
3,3'-DICHLOROBENZIDINE	0.433	0.427	0.440	0.446	0.425	0.434	2.0
BENZO(A)ANTHRACENE	1.252	1.232	1.253	1.360	1.393	1.298	5.6
CHRYSENE	1.115	0.852	1.025	0.991	0.917	0.980	10.3
BIS(2-ETHYLHEXYL)PHTHALATE	0.834	0.919	0.929	0.959	0.969	0.922	5.8
DI-N-OCTYL PHTHALATE *	1.401	1.584	1.657	1.635	1.462	1.548	7.2*
BENZO(B)FLUORANTHENE	1.181	1.699	1.656	1.140	1.492	1.434	18.2
BENZO(K)FLUORANTHENE	1.490	0.707	0.803	1.116	0.489	0.921	42.3
BENZO(A)PYRENE *	1.185	1.122	1.171	1.131	1.060	1.134	4.3*
INDENO(1,2,3-CD)PYRENE	1.244	1.005	1.096	1.191	0.811	1.069	16.0
DIBENZO(A,H)ANTHRACENE	1.122	1.036	1.066	0.817	0.948	0.998	11.9
BENZO(G,H,I)PERYLENE	0.515	0.900	0.923	1.003	0.804	0.829	22.8

7B

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: NUS-LSG Contract:

Lab Code: HNUS Case No.: TNK SAS No.: SDG No.: PKG7

Instrument ID: GCMSA Calibration date: 03/03/92 Time: 1026

Lab File ID: ABT03039202 Init. Calib. Date(s): 03/02/92 03/02/92

Min RRF50 for SPCC(#) = 0.050 Max %D for CCC(*) = 25.0%

COMPOUND		$\overline{RRF}$	RRF50	%D	
N-NITROSODIMETHYLAMINE		0.794	0.788	0.8	
PHENOL	*	1.688	1.873	-11.0	*
ANILINE		1.990	1.963	1.4	
BIS(2-CHLOROETHYL)ETHER		1.344	1.545	-15.0	
2-CHLOROPHENOL		1.392	1.451	-4.2	
1,3-DICHLOROBENZENE		1.433	1.477	-3.1	
1,4-DICHLOROBENZENE	*	1.440	1.533	-6.5	*
BENZYL ALCOHOL		0.798	0.884	-10.8	
1,2-DICHLOROBENZENE		1.340	1.385	-3.4	
2-METHYLPHENOL		1.341	1.375	-2.5	
BIS(2-CHLOROISOPROPYL)ETHER		2.267	2.327	-2.6	
4-METHYLPHENOL		1.209	1.232	-1.9	
N-NITROSO-DI-N-PROPYLAMINE	#	0.997	1.032	-3.5	#
HEXACHLOROETHANE		0.592	0.614	-3.7	
NITROBENZENE		0.390	0.401	-2.8	
ISOPHORONE		0.739	0.760	-2.8	
2-NITROPHENOL	*	0.273	0.271	0.7	*
2,4-DIMETHYLPHENOL		0.342	0.338	1.2	
BIS(2-CHLOROETHOXY)METHANE		0.499	0.495	0.8	
2,4-DICHLOROPHENOL	*	0.332	0.334	-0.6	*
1,2,4-TRICHLOROBENZENE		0.339	0.348	-2.7	
NAPHTHALENE		1.025	1.060	-3.4	
4-CHLOROANILINE		0.480	0.487	-1.5	
HEXACHLOROBUTADIENE	*	0.181	0.188	-3.9	*
4-CHLORO-3-METHYLPHENOL	*	0.283	0.297	-4.9	*
2-METHYLNAPHTHALENE		0.553	0.570	-3.1	
HEXACHLOROCYCLOPENTADIENE	#	0.224	0.235	-4.9	#
2,4,6-TRICHLOROPHENOL	*	0.351	0.401	-14.2	*
2,4,5-TRICHLOROPHENOL		0.328	0.413	-25.9	
2-CHLORONAPHTHALENE		0.791	0.969	-22.5	
2-NITROANILINE		0.327	0.372	-13.8	
DIMETHYLPHTHALATE		0.997	1.102	-10.5	
ACENAPHTHYLENE		1.452	1.553	-7.0	
2,6-DINITRITOLUENE		0.278	0.306	-10.1	
3-NITROANILINE		0.284	0.333	-17.2	
ACENAPHTHENE	*	0.908	1.005	-10.7	*
2,4-DINITROPHENOL	#	0.121	0.111	8.3	#
4-NITROPHENOL	#	0.100	0.100	0.0	#

COMPOUND	RRF	RRF50	%D
NITROBENZENE-D5	0.380	0.375	1.3
2-FLUOROBIPHENYL	1.111	1.197	-7.7
TERPHENYL-D14	1.358	1.495	-10.1
PHENOL-D5	1.605	1.713	-6.7
2-FLUOROPHENOL	1.140	1.264	-10.9
2,4,6-TRIBROMOPHENOL	0.190	0.179	5.8
2,3,4,6-TETRACHLOROPHENOL	0.276	0.321	-16.3
2-PICOLINE	0.734	0.749	-2.0
METHANESULFONIC ACID, ETHYL	1.019	1.126	-10.5
N-NITROSOPIPERIDINE	0.712	0.789	-10.8
2,6-DICHLOROPHENOL	0.889	0.916	-3.0
NITROSO-DI-N-BUTYLAMINE	0.259	0.282	-8.9
ACETOPHENONE	1.722	1.761	-2.3
A,A-DIMETHYLPHENETHYLAMINE	0.449	0.329	26.7
PENTACHLOROBENZENE	0.463	0.541	-16.8
4-AMINOBIPHENYL	0.868	1.205	-38.8
P-DIMETHYLAMINOAZOBENZENE	0.407	0.390	4.2
7,12-DIMETHYLBENZ(A)ANTHRAC	0.605	0.598	1.2
1,2,4,5-TETRACHLOROBENZENE	0.353	0.369	-4.5
DIPHENYLAMINE	0.592	0.603	-1.9
PHENACETIN	0.417	0.362	13.2
3-METHYLCHOLANTHRENE	0.650	0.623	4.2
PRONAMIDE	0.314	0.311	1.0
2-NAPHTHALENEAMINE	1.004	1.099	-9.5

(1) Cannot be separated from Diphenylamine

FORM VII SV-3 1/87 Rev.

Samples affected:
TCC-SD06-E0002
TCC-SD15-E0002

6B

SEMIVOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: NUS-LSG Contract:

Lab Code: NUS Case No.: TNK SAS No.: SDG No.: PKG7

Instrument ID: GCMSA Calibration Date(s): 03/04/92 03/04/92

Min $\overline{RRF}$ for SPCC(#) = 0.050 Max %RSD for CCC(*) = 30.0%

LAB FILE ID: RRF20 = ABT03049205 RRF50 = ABT03049201
RRF80 = ABT03049202 RRF120= ABT03049203 RRF160= ABT03049204

COMPOUND	RRF20	RRF50	RRF80	RRF120	RRF160	$\overline{RRF}$	% RSD
N-NITROSODIMETHYLAMINE	0.864	0.848	0.766	0.781	0.765	0.805	5.9
PHENOL *	1.861	1.790	1.575	1.601	1.517	1.669	8.9*
ANILINE	1.882	1.980	1.865	1.957	1.898	1.916	2.6
BIS(2-CHLOROETHYL)ETHER	1.576	1.461	1.326	1.316	1.100	1.356	13.2
2-CHLOROPHENOL	1.508	1.494	1.360	1.398	1.358	1.424	5.1
1,3-DICHLOROBENZENE	1.548	1.484	1.359	1.410	1.340	1.428	6.1
1,4-DICHLOROBENZENE *	1.608	1.526	1.362	1.367	1.283	1.429	9.3*
BENZYL ALCOHOL	0.468	0.579	0.643	0.686	0.698	0.615	15.3
1,2-DICHLOROBENZENE	1.461	1.404	1.294	1.328	1.243	1.346	6.5
2-METHYLPHENOL	1.239	1.296	1.227	1.269	1.206	1.247	2.8
BIS(2-CHLOROISOPROPYL)ETHER	2.280	2.358	2.122	2.230	2.161	2.230	4.2
4-METHYLPHENOL	1.326	1.141	1.090	1.127	1.116	1.160	8.[illegible]
N-NITROSO-DI-N-PROPYLAMINE #	1.090	1.074	0.956	0.980	0.974	1.015	6.[illegible]
HEXACHLOROETHANE	0.673	0.646	0.576	0.612	0.581	0.618	6.8
NITROBENZENE	0.417	0.477	0.377	0.386	0.367	0.405	11.0
ISOPHORONE	0.768	0.947	0.729	0.730	0.681	0.771	13.4
2-NITROPHENOL *	0.279	0.299	0.268	0.273	0.259	0.276	5.4*
2,4-DIMETHYLPHENOL	0.367	0.417	0.332	0.343	0.318	0.355	10.9
BIS(2-CHLOROETHOXY)METHANE	0.501	0.550	0.476	0.490	0.461	0.496	6.8
2,4-DICHLOROPHENOL *	0.362	0.418	0.332	0.343	0.319	0.355	10.9*
1,2,4-TRICHLOROBENZENE	0.369	0.440	0.341	0.342	0.316	0.362	13.2
NAPHTHALENE	1.118	1.275	0.995	1.006	0.936	1.066	12.6
4-CHLOROANILINE	0.518	0.591	0.477	0.461	0.426	0.495	12.8
HEXACHLOROBUTADIENE *	0.202	0.231	0.187	0.186	0.172	0.196	11.5*
4-CHLORO-3-METHYLPHENOL *	0.314	0.377	0.285	0.285	0.250	0.302	15.8*
2-METHYLNAPHTHALENE	0.626	0.700	0.544	0.547	0.499	0.583	13.7
HEXACHLOROCYCLOPENTADIENE #	0.226	0.300	0.244	0.247	0.241	0.252	11.2#
2,4,6-TRICHLOROPHENOL *	0.415	0.453	0.324	0.323	0.327	0.368	16.7*
2,4,5-TRICHLOROPHENOL		0.469	0.322	0.275	0.239	0.326	31.0
2-CHLORONAPHTHALENE	1.072	1.143	0.815	0.684	0.620	0.867	26.8
2-NITROANILINE		0.451	0.350	0.312	0.311	0.356	18.5
DIMETHYLPHTHALATE	1.272	1.385	0.991	0.930	0.911	1.098	19.7
ACENAPHTHYLENE	1.692	1.841	1.387	1.340	1.302	1.512	15.9
2,6-DINITRITOLUENE	0.328	0.402	0.263	0.271	0.259	0.305	20.1
3-NITROANILINE		0.431	0.296	0.258	0.244	0.307	27.8
ACENAPHTHENE *	1.068	1.202	0.911	0.860	0.823	0.973	16.3*
2,4-DINITROPHENOL #		0.138	0.112	0.116	0.116	0.120	9.[illegible]
4-NITROPHENOL #		0.147	0.085	0.086	0.084	0.100	31.[illegible]

SEMIVOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: NUS-LSG Contract:

Lab Code: NUS Case No.: TNK SAS No.: SDG No.: PKG7

Instrument ID: GCMSA Calibration Date(s): 03/04/92 03/04/92

Min $\overline{RRF}$ for SPCC(#) = 0.050 Max %RSD for CCC(*) = 30.0%

LAB FILE ID: RRF20 = ABT03049205 RRF50 = ABT03049201
RRF80 = ABT03049202 RRF120= ABT03049203 RRF160= ABT03049204

COMPOUND	RRF20	RRF50	RRF80	RRF120	RRF160	$\overline{RRF}$	% RSD
DIBENZOFURAN	1.585	1.863	1.396	1.327	1.254	1.485	16.5
2,4-DINITROTOLUENE	0.400	0.412	0.331	0.322	0.292	0.351	14.8
DIETHYLPHTHALATE	1.125	1.231	0.873	0.794	0.767	0.958	21.7
4-CHLOROPHENYL-PHENYLETHER	0.695	0.760	0.544	0.462	0.424	0.577	25.3
FLUORENE	1.344	1.560	1.135	1.052	1.048	1.228	18.0
4-NITROANILINE		0.408	0.298	0.304	0.293	0.326	16.9
4,6-DINITRO-2-METHYLPHENOL		0.146	0.149	0.164	0.170	0.157	7.4
-NITROSODIPHENYLAMINE (1) *	0.610	0.628	0.615	0.610	0.622	0.617	1.3*
4-BROMOPHENYL-PHENYLETHER	0.260	0.275	0.289	0.306	0.298	0.286	6.4
HEXACHLOROBENZENE	0.269	0.271	0.323	0.309	0.313	0.297	8.5
PENTACHLOROPHENOL *		0.235	0.228	0.253	0.256	0.243	5.6*
PHENANTHRENE	1.205	1.254	1.370	1.161	1.200	1.238	6.5
ANTHRACENE	1.132	1.046	1.138	1.167	1.153	1.127	4.2
DI-N-BUTYLPHTHALATE	1.295	1.286	1.413	1.509	1.524	1.405	8.1
FLUORANTHENE *	1.288	1.220	1.290	1.324	1.344	1.293	3.7*
PYRENE	1.475	1.411	1.389	1.400	1.366	1.408	2.9
BUTYLBENZYLPHTHALATE	0.565	0.602	0.579	0.645	0.622	0.603	5.3
3,3'-DICHLOROBENZIDINE	0.426	0.468	0.428	0.436	0.419	0.435	4.4
BENZO(A)ANTHRACENE	1.255	1.232	1.188	1.269	1.267	1.242	2.7
CHRYSENE	1.066	0.831	1.028	1.008	0.940	0.975	9.5
BIS(2-ETHYLHEXYL)PHTHALATE	0.834	0.920	0.912	0.945	0.942	0.911	4.9
DI-N-OCTYL PHTHALATE *	1.563	1.796	1.623	1.676	1.509	1.633	6.8*
BENZO(B)FLUORANTHENE	1.079	1.837	1.298	1.612	1.355	1.436	20.4
BENZO(K)FLUORANTHENE	1.922	0.888	1.074	0.730	0.688	1.060	47.6
BENZO(A)PYRENE *	1.249	1.227	1.127	1.167	1.091	1.172	5.7*
INDENO(1,2,3-CD)PYRENE	0.821	1.163	1.027	1.103	1.065	1.036	12.6
DIBENZO(A,H)ANTHRACENE	1.113	1.299	0.970	1.047	0.956	1.077	12.9
BENZO(G,H,I)PERYLENE	1.039	0.928	0.881	1.007	0.657	0.902	16.7

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: NUS-LSG Contract:

Lab Code: NUS Case No.: TNK SAS No.: SDG No.: PKG7

Instrument ID: GCMSA Calibration date: 03/05/92 Time: 1026

Lab File ID: ABT03059201 Init. Calib. Date(s): 03/04/92 03/04/92

Min RRF50 for SPCC(#) = 0.050 Max %D for CCC(*) = 25.0%

COMPOUND		$\overline{RRF}$	RRF50	%D	
N-NITROSODIMETHYLAMINE		0.805	0.862	-7.1	
PHENOL	*	1.669	1.776	-6.4	*
ANILINE		1.916	1.990	-3.9	
BIS(2-CHLOROETHYL)ETHER		1.356	1.503	-10.8	
2-CHLOROPHENOL		1.424	1.464	-2.8	
1,3-DICHLOROBENZENE		1.428	1.469	-2.9	
1,4-DICHLOROBENZENE	*	1.429	1.539	-7.7	*
BENZYL ALCOHOL		0.615	0.624	-1.5	
1,2-DICHLOROBENZENE		1.346	1.443	-7.2	
2-METHYLPHENOL		1.247	1.274	-2.2	
BIS(2-CHLOROISOPROPYL)ETHER		2.230	2.483	-11.4	
4-METHYLPHENOL		1.160	1.134	2.2	
N-NITROSO-DI-N-PROPYLAMINE	#	1.015	1.083	-6.7	#
HEXACHLOROETHANE		0.618	0.647	-4.7	
NITROBENZENE		0.405	0.501	-23.7	
ISOPHORONE		0.771	0.951	-23.4	
2-NITROPHENOL	*	0.276	0.298	-8.0	*
2,4-DIMETHYLPHENOL		0.355	0.422	-18.9	
BIS(2-CHLOROETHOXY)METHANE		0.496	0.563	-13.5	
2,4-DICHLOROPHENOL	*	0.355	0.421	-18.6	*
1,2,4-TRICHLOROBENZENE		0.362	0.442	-22.1	
NAPHTHALENE		1.066	1.290	-21.0	
4-CHLOROANILINE		0.495	0.602	-21.6	
HEXACHLOROBUTADIENE	*	0.196	0.238	-21.4	*
4-CHLORO-3-METHYLPHENOL	*	0.302	0.375	-24.2	*
2-METHYLNAPHTHALENE		0.583	0.721	-23.7	
HEXACHLOROCYCLOPENTADIENE	#	0.252	0.318	-26.2	#
2,4,6-TRICHLOROPHENOL	*	0.368	0.452	-22.8	*
2,4,5-TRICHLOROPHENOL		0.326	0.432	-32.5	
2-CHLORONAPHTHALENE		0.867	1.091	-25.8	
2-NITROANILINE		0.356	0.470	-32.0	
DIMETHYLPHTHALATE		1.098	1.383	-26.0	
ACENAPHTHYLENE		1.512	1.807	-19.5	
2,6-DINITRITOLUENE		0.305	0.402	-31.8	
3-NITROANILINE		0.307	0.428	-39.4	
ACENAPHTHENE	*	0.973	1.193	-22.6	*
2,4-DINITROPHENOL	#	0.120	0.127	-5.8	#
4-NITROPHENOL	#	0.100	0.100	0.0	#

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: NUS-LSG Contract:

Lab Code: NUS Case No.: TNK SAS No.: SDG No.: PKG7

Instrument ID: GCMSA Calibration date: 03/05/92 Time: 1026

Lab File ID: ABT03059201 Init. Calib. Date(s): 03/04/92 03/04/92

Min RRF50 for SPCC(#) = 0.050 Max %D for CCC(*) = 25.0%

COMPOUND		$\overline{RRF}$	RRF50	%D	
DIBENZOFURAN		1.485	1.865	-25.6	
2,4-DINITROTOLUENE		0.351	0.489	-39.3	
DIETHYLPHTHALATE		0.958	1.262	-31.7	
4-CHLOROPHENYL-PHENYLETHER		0.577	0.768	-33.1	
FLUORENE		1.228	1.578	-28.5	
4-NITROANILINE		0.326	0.405	-24.2	
4,6-DINITRO-2-METHYLPHENOL		0.157	0.142	9.6	
N-NITROSODIPHENYLAMINE (1)	*	0.617	0.635	-2.9	*
4-BROMOPHENYL-PHENYLETHER		0.286	0.266	7.0	
HEXACHLOROBENZENE		0.297	0.263	11.4	
PENTACHLOROPHENOL	*	0.243	0.200	17.7	*
PHENANTHRENE		1.238	1.228	0.8	
ANTHRACENE		1.127	1.071	5.0	
DI-N-BUTYLPHTHALATE		1.405	1.247	11.2	
FLUORANTHENE	*	1.293	1.135	12.2	*
PYRENE		1.408	1.434	-1.8	
BUTYLBENZYLPHTHALATE		0.603	0.567	6.0	
3,3'-DICHLOROBENZIDINE		0.435	0.483	-11.0	
BENZO(A)ANTHRACENE		1.242	1.205	3.0	
CHRYSENE		0.975	0.873	10.5	
BIS(2-ETHYLHEXYL)PHTHALATE		0.911	0.870	4.5	
DI-N-OCTYL PHTHALATE	*	1.633	1.578	3.4	*
BENZO(B)FLUORANTHENE		1.436	1.404	2.2	
BENZO(K)FLUORANTHENE		1.060	1.174	-10.8	
BENZO(A)PYRENE	*	1.172	1.183	-0.9	*
INDENO(1,2,3-CD)PYRENE		1.036	1.213	-17.1	
DIBENZO(A,H)ANTHRACENE		1.077	1.330	-23.5	
BENZO(G,H,I)PERYLENE		0.902	0.955	-5.9	

COMPOUND	RRF	RRF50	%D
NITROBENZENE-D5	0.387	0.411	-6.2
2-FLUOROBIPHENYL	1.103	1.138	-3.2
TERPHENYL-D14	1.300	1.202	7.5
PHENOL-D5	1.561	1.472	5.7
2-FLUOROPHENOL	1.101	1.186	-7.7
2,4,6-TRIBROMOPHENOL	0.204	0.172	15.7
2,3,4,6-TETRACHLOROPHENOL	0.309	0.374	-21.0
2-PICOLINE	0.724	0.737	-1.8
METHANESULFONIC ACID, ETHYL	1.106	1.102	0.4
N-NITROSOPIPERIDINE	0.763	0.839	-10.0
2,6-DICHLOROPHENOL	0.914	1.085	-18.7
NITROSO-DI-N-BUTYLAMINE	0.267	0.320	-19.8
ACETOPHENONE	1.791	2.267	-26.6
A,A-DIMETHYLPHENETHYLAMINE	0.476	0.618	-29.8
PENTACHLOROBENZENE	0.513	0.637	-24.2
4-AMINOBIPHENYL	0.855	1.271	-48.6
P-DIMETHYLAMINOAZOBENZENE	0.396	0.386	2.5
7,12-DIMETHYLBENZ(A)ANTHRAC	0.635	0.661	-4.1
1,2,4,5-TETRACHLOROBENZENE	0.370	0.448	-21.1
DIPHENYLAMINE	0.617	0.635	-2.9
PHENACETIN	0.376	0.305	18.9
3-METHYLCHOLANTHRENE	0.691	0.741	-7.2
PRONAMIDE	0.313	0.318	-1.6
2-NAPHTHALENEAMINE	1.042	1.263	-21.2

samples affected:
TKC-SD01-E0002
TEC-SD22-E0002.

SEMIVOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: NUS-LSG Contract:

Lab Code: NUS Case No.: TNK SAS No.: SDG No.: PKG7

Instrument ID: GCMSA Calibration Date(s): 03/07/92 03/07/92

Min $\overline{RRF}$ for SPCC(#) = 0.050 Max %RSD for CCC(*) = 30.0%

LAB FILE ID: RRF20 = ABT03079205 RRF50 = ABT03079201
RRF80 = ABT03079204 RRF120= ABT03079203 RRF160= ABT03079207

COMPOUND	RRF20	RRF50	RRF80	RRF120	RRF160	$\overline{RRF}$	% RSD
DIBENZOFURAN	1.430	1.520	1.235	1.198	1.344	1.345	9.9
2,4-DINITROTOLUENE	0.343	0.384	0.276	0.280	0.315	0.320	14.1
DIETHYLPHTHALATE	1.013	1.073	0.792	0.758	0.867	0.901	15.3
4-CHLOROPHENYL-PHENYLETHER	0.580	0.606	0.468	0.439	0.506	0.520	13.8
FLUORENE	1.076	1.266	0.924	0.892	1.057	1.043	14.2
4-NITROANILINE		0.360	0.259	0.249	0.299	0.292	17.2
4,6-DINITRO-2-METHYLPHENOL		0.146	0.132	0.119	0.132	0.132	8.4
N-NITROSODIPHENYLAMINE (1) *	0.548	0.609	0.510	0.517	0.522	0.541	7.5*
4-BROMOPHENYL-PHENYLETHER	0.215	0.229	0.200	0.194	0.226	0.213	7.3
HEXACHLOROBENZENE	0.227	0.199	0.221	0.224	0.233	0.221	5.9
PENTACHLOROPHENOL *		0.137	0.114	0.122	0.116	0.122	8.5*
PHENANTHRENE	1.003	1.193	1.038	1.041	1.104	1.076	7.0
ANTHRACENE	0.940	1.123	0.901	0.917	0.947	0.966	9.3
DI-N-BUTYLPHTHALATE	1.151	1.209	1.127	1.158	1.163	1.162	2.6
FLUORANTHENE *	0.962	1.087	0.906	0.945	0.971	0.974	7.0*
PYRENE	1.330	1.574	1.241	1.233	1.364	1.348	10.2
BUTYLBENZYLPHTHALATE	0.573	0.651	0.566	0.583	0.630	0.601	6.3
3,3'-DICHLOROBENZIDINE	0.347	0.421	0.360	0.378	0.437	0.389	10.0
BENZO(A)ANTHRACENE	1.031	1.214	1.011	1.037	1.141	1.087	8.0
CHRYSENE	0.902	1.101	0.907	0.894	0.965	0.954	9.1
BIS(2-ETHYLHEXYL)PHTHALATE	0.793	0.928	0.824	0.822	0.892	0.852	6.6
DI-N-OCTYL PHTHALATE *	1.417	1.680	1.407	1.363	1.597	1.493	9.2*
BENZO(B)FLUORANTHENE	1.109	1.308	1.110	1.203	1.459	1.238	12.0
BENZO(K)FLUORANTHENE	1.084	1.175	0.657	0.534	0.633	0.817	35.6
BENZO(A)PYRENE *	0.924	1.133	0.843	0.867	1.042	0.962	12.8*
INDENO(1,2,3-CD)PYRENE	0.939	1.057	0.846	0.892	1.116	0.970	11.7
DIBENZO(A,H)ANTHRACENE	0.763	0.953	0.704	0.761	0.927	0.822	13.5
BENZO(G,H,I)PERYLENE	0.772	0.939	0.671	0.765	0.906	0.811	13.6

COMPOUND	RRF20	RRF50	RRF80	RRF120	RRF160	RRF	%RSD
NITROBENZENE-D5	0.538	0.485	0.433	0.411	0.419	0.457	11.7
2-FLUOROBIPHENYL	1.524	1.190	1.051	0.999	1.063	1.165	18.2
TERPHENYL-D14	1.708	1.249	1.153	1.080	1.191	1.276	19.5
PHENOL-D5	1.874	1.830	1.630	1.525	1.702	1.712	8.4
2-FLUOROPHENOL	1.602	1.307	1.151	1.134	1.478	1.334	15.3
2,4,6-TRIBROMOPHENOL	0.224	0.166	0.165	0.147	0.159	0.172	17.4
2,3,4,6-TETRACHLOROPHENOL	0.300	0.339	0.255	0.227	0.289	0.282	15.2
2-PICOLINE	1.227	1.441	1.227	1.222	1.383	1.300	8.0
METHANESULFONIC ACID, ETHYL	1.098	1.286	1.053	1.085	1.281	1.161	9.8
N-NITROSOPIPERIDINE	1.208	1.223	0.801	1.688	2.057	1.395	34.8
2,6-DICHLOROPHENOL	0.905	0.984	0.831	0.780	0.885	0.877	8.8
NITROSO-DI-N-BUTYLAMINE	0.262	0.279	0.236	0.234	0.265	0.255	7.7
ACETOPHENONE	1.654	1.875	1.568	1.499	1.860	1.691	10.1
A,A-DIMETHYLPHENETHYLAMINE	0.385	0.189	0.266	0.285	0.261	0.277	25.4
PENTACHLOROBENZENE	0.442	0.504	0.401	0.393	0.445	0.437	10.1
4-AMINOBIPHENYL	0.683	0.661	0.679	0.724	0.769	0.703	6.2
P-DIMETHYLAMINOAZOBENZENE	0.357	0.434	0.372	0.386	0.417	0.393	8.1
7,12-DIMETHYLBENZ(A)ANTHRAC	0.527	0.615	0.487	0.445	0.497	0.514	12.4
1,2,4,5-TETRACHLOROBENZENE	0.314	0.343	0.300	0.289	0.323	0.314	6.6
DIPHENYLAMINE	0.548	0.609	0.510	0.517	0.522	0.541	7.5
PHENACETIN	0.331	0.359	0.314	0.343	0.333	0.336	[illegible]
3-METHYLCHOLANTHRENE	0.516	0.576	0.497	0.489	0.577	0.531	[illegible]
PRONAMIDE	0.109	0.124	0.115	0.110		0.114	6.0
2-NAPHTHALENEAMINE	0.910	0.956	0.777	0.790	0.944	0.875	9.8

(1) Cannot be separated from Diphenylamine

7B

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: NUS-LSG Contract:

Lab Code: HNUS Case No.: TNK SAS No.: SDG No.: PKG7

Instrument ID: GCMSA Calibration date: 03/07/92 Time: 1743

Lab File ID: ABT03079208 Init. Calib. Date(s): 03/07/92 03/07/92

Min RRF50 for SPCC(#) = 0.050 Max %D for CCC(*) = 25.0%

COMPOUND		$\overline{RRF}$	RRF50	%D	
N-NITROSODIMETHYLAMINE		0.871	0.798	8.4	
PHENOL	*	1.742	1.622	6.9	*
ANILINE		2.173	1.822	16.2	
BIS(2-CHLOROETHYL)ETHER		1.499	1.462	2.5	
2-CHLOROPHENOL		1.373	1.264	7.9	
1,3-DICHLOROBENZENE		1.343	1.268	5.6	
1,4-DICHLOROBENZENE	*	1.398	1.341	4.1	*
BENZYL ALCOHOL		0.497	0.546	-9.9	
1,2-DICHLOROBENZENE		1.356	1.258	7.2	
2-METHYLPHENOL		1.162	1.102	5.2	
BIS(2-CHLOROISOPROPYL)ETHER		3.041	2.653	12.8	
4-METHYLPHENOL		1.225	2.276	43.9	
N-NITROSO-DI-N-PROPYLAMINE	#	1.118	1.064	4.8	#
HEXACHLOROETHANE		0.606	0.564	6.9	
NITROBENZENE		0.412	0.384	6.8	
ISOPHORONE		0.763	0.719	5.8	
2-NITROPHENOL	*	0.255	0.233	8.6	*
2,4-DIMETHYLPHENOL		0.325	0.303	6.8	
BIS(2-CHLOROETHOXY)METHANE		0.491	0.477	2.9	
2,4-DICHLOROPHENOL	*	0.295	0.281	4.7	*
1,2,4-TRICHLOROBENZENE		0.314	0.289	8.0	
NAPHTHALENE		0.944	0.886	6.1	
4-CHLOROANILINE		0.453	0.411	9.3	
HEXACHLOROBUTADIENE	*	0.163	0.157	3.7	*
4-CHLORO-3-METHYLPHENOL	*	0.310	0.296	4.5	*
2-METHYLNAPHTHALENE		0.526	0.458	12.9	
HEXACHLOROCYCLOPENTADIENE	#	0.264	0.246	6.8	#
2,4,6-TRICHLOROPHENOL	*	0.269	0.274	-1.9	*
2,4,5-TRICHLOROPHENOL		0.287	0.340	-18.5	
2-CHLORONAPHTHALENE		1.351	1.298	3.9	
2-NITROANILINE		0.419	0.366	12.6	
DIMETHYLPHTHALATE		0.957	0.933	2.5	
ACENAPHTHYLENE		1.409	1.346	4.5	
2,6-DINITRITOLUENE		0.277	0.269	2.9	
3-NITROANILINE		0.300	0.304	-1.3	
ACENAPHTHENE	*	0.885	0.846	4.4	*
2,4-DINITROPHENOL	#	0.131	0.101	22.9	#
4-NITROPHENOL	#	0.081	0.107	-32.1	#

COMPOUND	RRF	RRF50	%D
NITROBENZENE-D5	0.457	0.417	8.8
2-FLUOROBIPHENYL	1.165	1.034	11.2
TERPHENYL-D14	1.276	1.063	16.7
PHENOL-D5	1.712	1.412	17.5
2-FLUOROPHENOL	1.334	1.113	16.6
2,4,6-TRIBROMOPHENOL	0.172	0.166	3.5
2,3,4,6-TETRACHLOROPHENOL	0.282	0.280	0.7
2-PICOLINE	1.300	1.215	6.5
METHANESULFONIC ACID, ETHYL	1.161	1.147	1.2
N-NITROSOPIPERIDINE	1.395	1.048	24.9
2,6-DICHLOROPHENOL	0.877	0.816	7.0
NITROSO-DI-N-BUTYLAMINE	0.255	0.235	7.8
ACETOPHENONE	1.691	1.565	7.5
A,A-DIMETHYLPHENETHYLAMINE	0.277	0.168	39.4
PENTACHLOROBENZENE	0.437	0.411	6.0
4-AMINOBIPHENYL	0.703	0.550	21.8
P-DIMETHYLAMINOAZOBENZENE	0.393	0.342	13.0
7,12-DIMETHYLBENZ(A)ANTHRAC	0.514	0.504	1.9
1,2,4,5-TETRACHLOROBENZENE	0.314	0.291	7.3
DIPHENYLAMINE	0.541	0.498	7.9
PHENACETIN	0.336	0.290	13.7
3-METHYLCHOLANTHRENE	0.531	0.470	11.5
PRONAMIDE	0.114	0.100	12.3
2-NAPHTHALENEAMINE	0.875	0.793	9.4

(1) Cannot be separated from Diphenylamine

FORM VII SV-3 1/87 Rev.

Samples affected:

TKC-SD05-E0002
TEC-SD22-Y0002
TEC-SD22-Y0002
TCC-SD82-E0002
TEC-SD24-E0002
TCC-SD81-E0002

7B

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: NUS-LSG Contract:

Lab Code: HNUS Case No.: TNK SAS No.: SDG No.: PKG7

Instrument ID: GCMSA Calibration date: 03/08/92 Time: 1948

Lab File ID: ABT03089201 Init. Calib. Date(s): 03/07/92 03/07/92

Min RRF50 for SPCC(#) = 0.050 Max %D for CCC(*) = 25.0%

COMPOUND		$\overline{RRF}$	RRF50	%D	
N-NITROSODIMETHYLAMINE		0.871	0.959	10.1	
PHENOL	*	1.742	1.906	-9.4	*
ANILINE		2.173	2.337	7.6	
BIS(2-CHLOROETHYL)ETHER		1.499	1.694	-13.0	
2-CHLOROPHENOL		1.373	1.493	-8.7	
1,3-DICHLOROBENZENE		1.343	1.449	-7.9	
1,4-DICHLOROBENZENE	*	1.398	1.574	-12.6	*
BENZYL ALCOHOL		0.497	0.446	10.3	
1,2-DICHLOROBENZENE		1.356	1.478	-9.0	
2-METHYLPHENOL		1.162	1.165	-0.3	
BIS(2-CHLOROISOPROPYL)ETHER		3.041	3.203	-5.3	
4-METHYLPHENOL		1.225	1.297	-5.9	
N-NITROSO-DI-N-PROPYLAMINE	#	1.118	1.301	-16.4	#
HEXACHLOROETHANE		0.606	0.684	-12.9	
NITROBENZENE		0.412	0.464	-12.6	
ISOPHORONE		0.763	0.874	-14.6	
2-NITROPHENOL	*	0.255	0.277	-8.6	*
2,4-DIMETHYLPHENOL		0.325	0.346	-6.5	
BIS(2-CHLOROETHOXY)METHANE		0.491	0.570	-16.1	
2,4-DICHLOROPHENOL	*	0.295	0.311	-5.4	*
1,2,4-TRICHLOROBENZENE		0.314	0.345	-9.9	
NAPHTHALENE		0.944	1.132	-19.9	
4-CHLOROANILINE		0.453	0.520	-14.8	
HEXACHLOROBUTADIENE	*	0.163	0.180	-10.4	*
4-CHLORO-3-METHYLPHENOL	*	0.310	0.324	-4.5	*
2-METHYLNAPHTHALENE		0.526	0.579	-10.1	
HEXACHLOROCYCLOPENTADIENE	#	0.264	0.278	-5.3	#
2,4,6-TRICHLOROPHENOL	*	0.269	0.296	-10.0	*
2,4,5-TRICHLOROPHENOL		0.287	0.419	-46.0	
2-CHLORONAPHTHALENE		1.351	1.557	-15.2	
2-NITROANILINE		0.419	0.464	-10.7	
DIMETHYLPHTHALATE		0.957	1.126	-17.7	
ACENAPHTHYLENE		1.409	1.677	-19.0	
2,6-DINITRITOLUENE		0.277	0.325	-17.3	
3-NITROANILINE		0.300	0.368	-22.7	
ACENAPHTHENE	*	0.885	1.060	-19.8	*
2,4-DINITROPHENOL	#	0.131	0.137	-4.6	#
4-NITROPHENOL	#	0.081	0.128	-58.0	#

7C

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: NUS-LSG Contract:

Lab Code: HNUS Case No.: TNK SAS No.: SDG No.: PKG7

Instrument ID: GCMSA Calibration date: 03/08/92 Time: 1948

Lab File ID: ABT03089201 Init. Calib. Date(s): 03/07/92 03/07/92

Min RRF50 for SPCC(#) = 0.050 Max %D for CCC(*) = 25.0%

COMPOUND		$\overline{RRF}$	RRF50	%D	
DIBENZOFURAN		1.345	1.484	-10.3	
2,4-DINITROTOLUENE		0.320	0.397	-24.1	
DIETHYLPHTHALATE		0.901	1.089	-20.9	
4-CHLOROPHENYL-PHENYLETHER		0.520	0.611	-17.5	
FLUORENE		1.043	1.291	-23.8	
4-NITROANILINE		0.292	0.359	-23.0	
4,6-DINITRO-2-METHYLPHENOL		0.132	0.148	-12.1	
N-NITROSODIPHENYLAMINE (1)	*	0.541	0.606	-12.0	*
4-BROMOPHENYL-PHENYLETHER		0.213	0.223	-4.7	
HEXACHLOROBENZENE		0.221	0.250	-13.1	
PENTACHLOROPHENOL	*	0.122	0.096	21.3	*
PHENANTHRENE		1.076	1.215	-12.9	
ANTHRACENE		0.966	1.145	-18.5	
DI-N-BUTYLPHTHALATE		1.162	1.235	-6.3	
FLUORANTHENE	*	0.974	1.164	-19.5	*
PYRENE		1.348	1.614	-19.7	
BUTYLBENZYLPHTHALATE		0.601	0.662	-10.2	
3,3'-DICHLOROBENZIDINE		0.389	0.429	-10.3	
BENZO(A)ANTHRACENE		1.087	1.210	-11.3	
CHRYSENE		0.954	1.115	-16.9	
BIS(2-ETHYLHEXYL)PHTHALATE		0.852	0.917	-7.6	
DI-N-OCTYL PHTHALATE	*	1.493	1.799	-20.5	*
BENZO(B)FLUORANTHENE		1.238	1.446	-16.8	
BENZO(K)FLUORANTHENE		0.817	1.110	-35.9	
BENZO(A)PYRENE	*	0.962	1.133	-17.8	*
INDENO(1,2,3-CD)PYRENE		0.970	1.039	-7.1	
DIBENZO(A,H)ANTHRACENE		0.822	0.908	-10.5	
BENZO(G,H,I)PERYLENE		0.811	0.912	-12.4	

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COMPOUND	RRF	RRF50	%D
NITROBENZENE-D5	0.457	0.476	-4.2
2-FLUOROBIPHENYL	1.165	1.182	-1.5
TERPHENYL-D14	1.276	1.260	1.3
PHENOL-D5	1.712	1.664	2.8
2-FLUOROPHENOL	1.334	1.223	8.3
2,4,6-TRIBROMOPHENOL	0.172	0.155	9.9
2,3,4,6-TETRACHLOROPHENOL	0.282	0.328	16.3
2-PICOLINE	1.300	1.412	8.6
METHANESULFONIC ACID, ETHYL	1.161	1.297	11.7
N-NITROSOPIPERIDINE	1.395	1.340	3.9
2,6-DICHLOROPHENOL	0.877	0.992	13.1
NITROSO-DI-N-BUTYLAMINE	0.255	0.293	14.9
ACETOPHENONE	1.691	1.855	9.7
A,A-DIMETHYLPHENETHYLAMINE	0.277	0.685	147.3
PENTACHLOROBENZENE	0.437	0.491	12.4
4-AMINOBIPHENYL	0.703	0.800	13.8
P-DIMETHYLAMINOAZOBENZENE	0.393	0.439	11.7
7,12-DIMETHYLBENZ(A)ANTHRAC	0.514	0.625	21.6
1,2,4,5-TETRACHLOROBENZENE	0.314	0.341	8.6
DIPHENYLAMINE	0.541	0.606	12.0
PHENACETIN	0.336	0.365	8.6
3-METHYLCHOLANTHRENE	0.531	0.569	7.2
PRONAMIDE	0.114	0.122	7.0
2-NAPHTHALENEAMINE	0.875	1.008	15.2

(1) Cannot be separated from Diphenylamine

samples affected:
TRBS102092

7B

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: NUS-LSG Contract:

Lab Code: HNUS Case No.: TNK SAS No.: SDG No.: PKG7

Instrument ID: GCMSA Calibration date: 03/09/92 Time: 1643

Lab File ID: ABT03099201 Init. Calib. Date(s): 03/07/92 03/07/92

Min RRF50 for SPCC(#) = 0.050 Max %D for CCC(*) = 25.0%

COMPOUND		$\overline{RRF}$	RRF50	%D	
N-NITROSODIMETHYLAMINE		0.871	1.024	-17.6	
PHENOL	*	1.742	1.935	-11.1	*
ANILINE		2.173	2.326	-7.0	
BIS(2-CHLOROETHYL)ETHER		1.499	1.744	-16.3	
2-CHLOROPHENOL		1.373	1.507	-9.8	
1,3-DICHLOROBENZENE		1.343	1.426	-6.2	
1,4-DICHLOROBENZENE	*	1.398	1.477	-5.7	*
BENZYL ALCOHOL		0.497	0.374	24.8	
1,2-DICHLOROBENZENE		1.356	1.466	-8.1	
2-METHYLPHENOL		1.162	1.257	-8.2	
BIS(2-CHLOROISOPROPYL)ETHER		3.041	3.343	-9.9	
4-METHYLPHENOL		1.225	1.290	-5.3	
N-NITROSO-DI-N-PROPYLAMINE	#	1.118	1.370	-22.5	#
HEXACHLOROETHANE		0.606	0.697	-15.0	
NITROBENZENE		0.412	0.465	-12.9	
ISOPHORONE		0.763	0.885	-16.0	
2-NITROPHENOL	*	0.255	0.273	-7.1	*
2,4-DIMETHYLPHENOL		0.325	0.377	-16.0	
BIS(2-CHLOROETHOXY)METHANE		0.491	0.580	-18.1	
2,4-DICHLOROPHENOL	*	0.295	0.327	-10.8	*
1,2,4-TRICHLOROBENZENE		0.314	0.348	-10.8	
NAPHTHALENE		0.944	1.098	-16.3	
4-CHLOROANILINE		0.453	0.496	-9.5	
HEXACHLOROBUTADIENE	*	0.163	0.183	-12.3	*
4-CHLORO-3-METHYLPHENOL	*	0.310	0.342	-10.3	*
2-METHYLNAPHTHALENE		0.526	0.575	-9.3	
HEXACHLOROCYCLOPENTADIENE	#	0.264	0.244	7.6	#
2,4,6-TRICHLOROPHENOL	*	0.269	0.296	-10.0	*
2,4,5-TRICHLOROPHENOL		0.287	0.344	-19.9	
2-CHLORONAPHTHALENE		1.351	1.539	-13.9	
2-NITROANILINE		0.419	0.478	-14.1	
DIMETHYLPHTHALATE		0.957	1.122	-17.2	
ACENAPHTHYLENE		1.409	1.657	-17.6	
2,6-DINITRITOLUENE		0.277	0.323	-16.6	
3-NITROANILINE		0.300	0.379	-26.3	
ACENAPHTHENE	*	0.885	1.043	-17.8	*
2,4-DINITROPHENOL	#	0.131	0.124	5.3	#
4-NITROPHENOL	#	0.081	0.113	-39.5	#

7C

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: NUS-LSG Contract:

Lab Code: HNUS Case No.: TNK SAS No.: SDG No.: PKG7

Instrument ID: GCMSA Calibration date: 03/09/92 Time: 1643

Lab File ID: ABT03099201 Init. Calib. Date(s): 03/07/92 03/07/92

Min RRF50 for SPCC(#) = 0.050 Max %D for CCC(*) = 25.0%

COMPOUND	$\overline{RRF}$	RRF50	%D
DIBENZOFURAN	1.345	1.480	-10.0
2,4-DINITROTOLUENE	0.320	0.413	-29.1
DIETHYLPHTHALATE	0.901	1.075	-19.3
4-CHLOROPHENYL-PHENYLETHER	0.520	0.617	-18.6
FLUORENE	1.043	1.277	-22.4
4-NITROANILINE	0.292	0.377	-29.1
4,6-DINITRO-2-METHYLPHENOL	0.132	0.139	-5.3
N-NITROSODIPHENYLAMINE (1) *	0.541	0.610	-12.8 *
4-BROMOPHENYL-PHENYLETHER	0.213	0.226	-6.1
HEXACHLOROBENZENE	0.221	0.256	-15.8
PENTACHLOROPHENOL *	0.122	0.136	-11.5 *
PHENANTHRENE	1.076	1.131	-5.1
ANTHRACENE	0.966	1.130	-17.0
DI-N-BUTYLPHTHALATE	1.162	1.205	-3.7
FLUORANTHENE *	0.974	1.059	-8.7 *
PYRENE	1.348	1.583	-17.4
BUTYLBENZYLPHTHALATE	0.601	0.650	-8.2
3,3'-DICHLOROBENZIDINE	0.389	0.427	-9.8
BENZO(A)ANTHRACENE	1.087	1.208	-11.1
CHRYSENE	0.954	1.171	-22.8
BIS(2-ETHYLHEXYL)PHTHALATE	0.852	0.903	-6.0
DI-N-OCTYL PHTHALATE *	1.493	1.689	-13.1 *
BENZO(B)FLUORANTHENE	1.238	1.261	-1.9
BENZO(K)FLUORANTHENE	0.817	1.197	-46.5
BENZO(A)PYRENE *	0.962	1.143	-18.8 *
INDENO(1,2,3-CD)PYRENE	0.970	1.125	-16.0
DIBENZO(A,H)ANTHRACENE	0.822	0.999	-21.5
BENZO(G,H,I)PERYLENE	0.811	0.939	-15.8

FORM VII SV-2 1/87 Rev.

COMPOUND	RRF	RRF50	%D
NITROBENZENE-D5	0.457	0.494	-8.1
2-FLUOROBIPHENYL	1.165	1.156	0.8
TERPHENYL-D14	1.276	1.246	2.4
PHENOL-D5	1.712	1.649	3.7
2-FLUOROPHENOL	1.334	1.233	7.6
2,4,6-TRIBROMOPHENOL	0.172	0.160	7.0
2,3,4,6-TETRACHLOROPHENOL	0.282	0.341	-20.9
2-PICOLINE	1.300	1.412	-8.6
METHANESULFONIC ACID, ETHYL	1.161	1.280	-10.2
N-NITROSOPIPERIDINE	1.395	1.412	-1.2
2,6-DICHLOROPHENOL	0.877	0.985	-12.3
NITROSO-DI-N-BUTYLAMINE	0.255	0.293	-14.9
ACETOPHENONE	1.691	1.891	-11.8
A,A-DIMETHYLPHENETHYLAMINE	0.277	0.565	-99.9
PENTACHLOROBENZENE	0.437	0.486	-11.2
4-AMINOBIPHENYL	0.703	0.701	0.3
P-DIMETHYLAMINOAZOBENZENE	0.393	0.439	-11.7
7,12-DIMETHYLBENZ(A)ANTHRAC	0.514	0.607	-18.1
1,2,4,5-TETRACHLOROBENZENE	0.314	0.338	-7.6
DIPHENYLAMINE	0.541	0.610	-12.8
PHENACETIN	0.336	0.364	-8.3
3-METHYLCHOLANTHRENE	0.531	0.592	-11.5
PRONAMIDE	0.114	0.125	-9.6
2-NAPHTHALENEAMINE	0.875	0.998	-14.1

(1) Cannot be separated from Diphenylamine

FORM VII SV-3 1/87 Rev.

Samples affected:
TFBS1070992
TKCSD01F0002
TKCSD01Y0002
TKCSD01X0002

6B

SEMIVOLATILE ORGANICS INITIAL CALIBRATION DATA

Name: NUS-LSG Contract:

Lab Code: NUS Case No.: TNK SAS No.: SDG No.: PKG7

Instrument ID: GCMSA Calibration Date(s): 02/25/92 02/25/92

Min $\overline{RRF}$ for SPCC(#) = 0.050 Max %RSD for CCC(*) = 30.0%

LAB FILE ID: RRF20 = ATI02259205 RRF50 = ATI02259201
RRF80 = ATI02259202 RRF120= ATI02259203 RRF160= ATI02259204

COMPOUND	RRF20	RRF50	RRF80	RRF120	RRF160	$\overline{RRF}$	% RSD
P-PHENYLENEDIAMINE	0.051	0.064	0.052	0.051	0.051	0.054	10.6
ISOSAFROLE	0.437	1.692	0.446	0.441	0.444	0.692	80.8
5-NITRO-O-TOLUIDINE	0.328	0.432	0.325	0.291	0.293	0.334	17.2
4-NITROQUINOLINE 1-OXIDE	0.014	0.060	0.035	0.037	0.036	0.036	45.2
METHYAPYRILENE	0.451	0.374	0.357	0.357	0.430	0.394	11.1
2-ACETYLAMINOFLUORENE	0.425	0.446	0.415	0.443	0.472	0.440	5.0
N-NITROSOMETHYLETHYLAMINE	0.569	0.637	0.485	0.484	0.503	0.536	12.4
N-NITROSODIETHYLAMINE	0.550	0.644	0.573	0.584	0.576	0.585	6.0
N-NITROSOPYRROLIDINE	0.599	0.620	0.567	0.581	0.555	0.584	4.4
N-NITROSOMORPHOLINE	0.693	0.853	0.664	0.670	0.680	0.712	11.2
O-TOLUIDINE	1.054	2.007	1.057	1.053	1.044	1.243	34.4
0,0-TRIETHYLPHOSPHOROTHIO	0.158	0.162	0.160	0.160	0.156	0.159	1.4
.FROLE	0.452	0.545	0.438	0.460	0.465	0.472	8.9
1,4-NAPHTHOQUINONE	0.253	0.104	0.064	0.042	0.031	0.099	91.5
SYM-TRINITROBENZENE	0.149	0.111	0.144	0.145	0.152	0.140	11.9
HEXACHLOROPROPENE	0.028	0.191	0.030	0.029	0.028	0.061	119.0
M-DINITROBENZENE	0.182	0.637	0.197	0.197	0.197	0.282	70.4
DIMETHOATE	0.329	0.272	0.281	0.255	0.244	0.276	11.9
DIALLATE	0.415	0.402	0.380	0.349	0.382	0.386	6.5
PYRIDINE	0.953	1.454	0.784	0.107	0.970	0.854	57.0
ARAMITE	0.096	0.036	0.094	0.082	0.075	0.077	31.5
2-SEC-BUTYL-4,6-DINITROPHEN	0.116	0.178	0.136	0.152	0.147	0.146	15.6
M-CRESOL	1.164	2.625	1.158	1.114	1.078	1.428	46.9
PENTACHLORONITROBENZENE	0.066	0.072	0.064	0.072	0.079	0.071	8.3

(1) Cannot be separated from Diphenylamine

7B

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: NUS-LSG Contract:

Lab Code: HNUS Case No.: TNK SAS No.: SDG No.: PKG7

Instrument ID: GCMSA Calibration date: 03/03/92 Time: 930

Lab File ID: ATI03039201 Init. Calib. Date(s): 02/25/92 02/25/92

Min RRF50 for SPCC(#) = 0.050 Max %D for CCC(*) = 25.0%

COMPOUND	$\overline{RRF}$	RRF50	%D
P-PHENYLENEDIAMINE	0.054	0.062	-14.8
ISOSAFROLE	0.692	0.656	5.2
5-NITRO-O-TOLUIDINE	0.334	0.374	-12.0
4-NITROQUINOLINE 1-OXIDE	0.036	0.044	-22.2
METHYAPYRILENE	0.394	0.157	60.2
2-ACETYLAMINOFLUORENE	0.440	0.393	10.7
N-NITROSOMETHYLETHYLAMINE	0.536	0.686	-28.0
N-NITROSODIETHYLAMINE	0.585	0.593	-1.4
N-NITROSOPYRROLIDINE	0.584	0.873	-49.5
N-NITROSOMORPHOLINE	0.712	0.822	-15.4
O-TOLUIDINE	1.243	1.296	-4.3
0,0,0-TRIETHYLPHOSPHOROTHIO	0.159	0.148	6.9
SAFROLE	0.472	0.458	3.0
1,4-NAPHTHOQUINONE	0.099	0.434	-99.9
SYM-TRINITROBENZENE	0.140	0.188	-34.3
HEXACHLOROPROPENE	0.061	0.030	50.8
M-DINITROBENZENE	0.282	0.200	29.1
DIMETHOATE	0.276	0.390	-41.3
DIALLATE	0.386	0.506	-31.1
PYRIDINE	0.854	0.976	-14.3
ARAMITE	0.077	0.111	-44.2
2-SEC-BUTYL-4,6-DINITROPHEN	0.146	0.217	-48.6
M-CRESOL	1.428	0.240	83.2
PENTACHLORONITROBENZENE	0.071	0.076	-7.0

FORM VII SV-1 1/87 Rev.

Samples affected:
TCC SD068000Z
TCC SD158000Z

7B

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: NUS-LSG Contract:

Lab Code: NUS Case No.: TNK SAS No.: SDG No.: PKG7

Instrument ID: GCMSA Calibration date: 03/05/92 Time: 1119

Lab File ID: ATI03059201 Init. Calib. Date(s): 02/25/92 02/25/92

Min RRF50 for SPCC(#) = 0.050 Max %D for CCC(*) = 25.0%

COMPOUND	$\overline{RRF}$	RRF50	%D
P-PHENYLENEDIAMINE	0.054	0.065	-20.4
ISOSAFROLE	0.692	0.466	32.7
5-NITRO-O-TOLUIDINE	0.334	0.314	6.0
4-NITROQUINOLINE 1-OXIDE	0.036	0.046	-27.8
METHYAPYRILENE	0.394	0.114	71.1
2-ACETYLAMINOFLUORENE	0.440	0.376	14.6
N-NITROSOMETHYLETHYLAMINE	0.536	0.693	-29.3
N-NITROSODIETHYLAMINE	0.585	0.584	0.2
N-NITROSOPYRROLIDINE	0.584	0.824	-41.1
N-NITROSOMORPHOLINE	0.712	0.837	-17.6
O-TOLUIDINE	1.243	1.090	12.3
0,0,0-TRIETHYLPHOSPHOROTHIO	0.159	0.151	5.0
SAFROLE	0.472	0.461	2.3
1,4-NAPHTHOQUINONE	0.099	0.413	-99.9
SYM-TRINITROBENZENE	0.140	0.149	-6.4
HEXACHLOROPROPENE	0.061	0.036	41.0
M-DINITROBENZENE	0.282	0.226	19.9
DIMETHOATE	0.276	0.329	-19.2
DIALLATE	0.386	0.405	-4.9
PYRIDINE	0.854	0.914	-7.0
ARAMITE	0.077	0.125	-62.3
2-SEC-BUTYL-4,6-DINITROPHEN	0.146	0.204	-39.7
M-CRESOL	1.428	1.083	24.2
PENTACHLORONITROBENZENE	0.071	0.074	-4.2

(1) Cannot be separated from Diphenylamine

FORM VII SV-1 1/87 Rev.

samples affected:
TKC-SD01E0002
TEC-SD22-E0002

7B

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: NUS-LSG Contract:

Lab Code: HNUS Case No.: TNK SAS No.: SDG No.: PKG7

Instrument ID: GCMSA Calibration date: 03/07/92 Time: 1833

Lab File ID: ATI03079201 Init. Calib. Date(s): 02/25/92 02/25/92

Min RRF50 for SPCC(#) = 0.050 Max %D for CCC(*) = 25.0%

COMPOUND	$\overline{RRF}$	RRF50	%D
P-PHENYLENEDIAMINE	0.054	0.069	-27.8
ISOSAFROLE	0.692	0.463	33.1
5-NITRO-O-TOLUIDINE	0.334	0.388	-16.2
4-NITROQUINOLINE 1-OXIDE	0.036	0.034	5.6
METHYAPYRILENE	0.394	0.125	68.3
2-ACETYLAMINOFLUORENE	0.440	0.375	14.8
N-NITROSOMETHYLETHYLAMINE	0.536	1.035	-93.1
N-NITROSODIETHYLAMINE	0.585	0.603	-3.1
N-NITROSOPYRROLIDINE	0.584	1.160	-98.6
N-NITROSOMORPHOLINE	0.712	1.128	-58.4
O-TOLUIDINE	1.243	1.122	9.7
0,0,0-TRIETHYLPHOSPHOROTHIO	0.159	0.151	5.0
SAFROLE	0.472	0.463	1.9
1,4-NAPHTHOQUINONE	0.099	0.432	-99.9
SYM-TRINITROBENZENE	0.140	0.213	-52.1
HEXACHLOROPROPENE	0.061	0.034	44.3
M-DINITROBENZENE	0.282	0.249	11.7
DIMETHOATE	0.276	0.391	-41.7
DIALLATE	0.386	0.627	-62.4
PYRIDINE	0.854	1.127	-32.0
ARAMITE	0.077	0.133	-72.7
2-SEC-BUTYL-4,6-DINITROPHEN	0.146	0.214	-46.6
M-CRESOL	1.428	1.163	18.6
PENTACHLORONITROBENZENE	0.071	0.077	-8.5

FORM VII SV-1 1/87 Rev.

Samples affected:

TKCSD05E000Z
TEC SD22 Y000Z
TEC SD22 X000Z
TCC SDB2 E000Z
TEC SD24 E000Z
TCC SDB1 E000Z

7B

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: NUS-LSG Contract:

Lab Code: NUS Case No.: TNK SAS No.: SDG No.: PKG7

Instrument ID: GCMSA Calibration date: 03/08/92 Time: 1558

Lab File ID: ATI03089201 Init. Calib. Date(s): 02/25/92 02/25/92

Min RRF50 for SPCC(#) = 0.050 Max %D for CCC(*) = 25.0%

COMPOUND	$\overline{RRF}$	RRF50	%D
P-PHENYLENEDIAMINE	0.054	0.068	25.9
ISOSAFROLE	0.692	0.447	35.4
5-NITRO-O-TOLUIDINE	0.334	0.375	-12.3
4-NITROQUINOLINE 1-OXIDE	0.036	0.024	33.3
METHYAPYRILENE	0.394	0.163	58.6
2-ACETYLAMINOFLUORENE	0.440	0.343	22.0
N-NITROSOMETHYLETHYLAMINE	0.536	1.072	99.9
N-NITROSODIETHYLAMINE	0.585	0.629	-7.5
N-NITROSOPYRROLIDINE	0.584	1.275	99.9
N-NITROSOMORPHOLINE	0.712	1.151	61.7
O-TOLUIDINE	1.243	1.233	0.8
0,0,0-TRIETHYLPHOSPHOROTHIO	0.159	0.162	-1.9
SAFROLE	0.472	0.447	5.3
1,4-NAPHTHOQUINONE	0.099	0.405	99.9
SYM-TRINITROBENZENE	0.140	0.193	37.9
HEXACHLOROPROPENE	0.061	0.031	49.2
M-DINITROBENZENE	0.282	0.235	-16.7
DIMETHOATE	0.276	0.394	42.8
DIALLATE	0.386	0.622	61.1
PYRIDINE	0.854	1.125	31.7
ARAMITE	0.077	0.120	55.9
2-SEC-BUTYL-4,6-DINITROPHEN	0.146	0.195	-33.6
M-CRESOL	1.428	1.224	14.3
PENTACHLORONITROBENZENE	0.071	0.076	-7.0

(1) Cannot be separated from Diphenylamine

FORM VII SV-1 1/87 Rev.

Samples affected:
TRBS1020992

7B

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: NUS-LSG Contract:

Lab Code: HNUS Case No.: TNK SAS No.: SDG No.: PKG7

Instrument ID: GCMSA Calibration date: 03/09/92 Time: 1734

Lab File ID: ATI03099201 Init. Calib. Date(s): 02/25/92 02/25/92

Min RRF50 for SPCC(#) = 0.050 Max %D for CCC(*) = 25.0%

COMPOUND	$\overline{RRF}$	RRF50	%D
P-PHENYLENEDIAMINE	0.054	0.074	-37.0
ISOSAFROLE	0.692	0.464	33.0
5-NITRO-O-TOLUIDINE	0.334	0.392	-17.4
4-NITROQUINOLINE 1-OXIDE	0.036	0.030	16.7
METHYAPYRILENE	0.394	0.121	69.3
2-ACETYLAMINOFLUORENE	0.440	0.333	24.3
N-NITROSOMETHYLETHYLAMINE	0.536	1.248	-99.9
N-NITROSODIETHYLAMINE	0.585	0.648	-10.8
N-NITROSOPYRROLIDINE	0.584	1.414	-99.9
N-NITROSOMORPHOLINE	0.712	1.183	-66.2
O-TOLUIDINE	1.243	1.311	-5.5
0,0,0-TRIETHYLPHOSPHOROTHIO	0.159	0.158	0.6
SAFROLE	0.472	0.464	1.7
1,4-NAPHTHOQUINONE	0.099	0.435	-99.9
SYM-TRINITROBENZENE	0.140	0.200	-42.9
HEXACHLOROPROPENE	0.061	0.027	55.7
M-DINITROBENZENE	0.282	0.260	7.8
DIMETHOATE	0.276	0.385	39.5
DIALLATE	0.386	0.640	-65.8
PYRIDINE	0.854	1.087	-27.3
ARAMITE	0.077	0.139	-80.5
2-SEC-BUTYL-4,6-DINITROPHEN	0.146	0.187	-28.1
M-CRESOL	1.428	1.264	11.5
PENTACHLORONITROBENZENE	0.071	0.081	-14.1

(1) Cannot be separated from Diphenylamine

FORM VII SV-1 1/87 Rev.

Samples affected:

TFBS 1020992
TKC SD01 F0002
TKC SD01 Y0002
TKC SD01 X0002

3D

SOIL SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: NUS-LSG Contract: _____

Lab Code: HNUS Case No.: TNK SAS No.: _____ SDG No.: PKG7

Matrix Spike - EPA Sample No.: TECSD22E0002 Level:(low/med) LOW

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC LIMITS REC.
Phenol	4440	0	4800	108 *	26- 90
2-Chlorophenol	4440	0	4930	111 *	25-102
1,4-Dichlorobenzene	2220	0	2130	96	28 104
N-Nitroso-di-n-prop.(1)	2220	0	2460	111	41 126
1,2,4-Trichlorobenzene	2220	0	2390	108 *	38 107
4-Chloro-3-methylphenol	4440	0	4930	111 *	26 103
Acenaphthene	2220	0	2540	114	31-137
4-Nitrophenol	4440	0	3090	70	11-114
2,4-Dinitrotoluene	2220	0	2410	109 *	28- 89
Pentachlorophenol	4440	0	6040	136 *	17-109
Pyrene	2220	0	2470	111	35-142

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
Phenol	4440	4620	104 *	4	35	26- 90
2-Chlorophenol	4440	4840	109 *	2	50	25-102
1,4-Dichlorobenzene	2220	2070	93	3	27	28 104
N-Nitroso-di-n-prop.(1)	2220	2520	114	-3	38	41 126
1,2,4-Trichlorobenzene	2220	2380	107	1	23	38 107
4-Chloro-3-methylphenol	4440	4930	111 *	0	33	26 103
Acenaphthene	2220	2530	114	0	19	31-137
4-Nitrophenol	4440	2590	58	19	50	11-114
2,4-Dinitrotoluene	2220	2410	109 *	0	47	28- 89
Pentachlorophenol	4440	5460	123 *	10	47	17-109
Pyrene	2220	2520	114	-3	36	35-142

(1) N-Nitroso-di-n-propylamine

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: 0 out of 11 outside limits
Spike Recovery: 11 out of 22 outside limits

COMMENTS: CLP,TNK,PKG7,TECSD22E0002,L,S,P189218,S,EPA,100UL BNA
CAP,SEE PARAMETER PAGE INSTRUMENT ID: GCMSA

PESTICIDE/PCB STANDARDS SUMMARY

Lab Name: NUS-LSG Contract: _____

Lab Code: NUS Case No.: TNK SAS No.: _____ SDG No.: PKG7

Instrument ID: VA3700_6 GC Column ID: DB608

DATE(S) OF ANALYSIS FROM: 02/17/92 TO: 02/17/92
TIME(S) OF ANALYSIS FROM: 1109 TO: 1603

DATE OF ANALYSIS 02/18/92
TIME OF ANALYSIS 1721
EPA SAMPLE NO. (STANDARD) INDA

COMPOUND	RT	RT WINDOW FROM	RT WINDOW TO	CALIBRATION FACTOR	RT	CALIBRATION FACTOR	QNT Y/N	%D
alpha-BHC	5.13	5.09	5.17	249				
beta-BHC	6.88	6.83	6.93	87.7				
delta-BHC	8.38	8.33	8.43	240				
gamma-BHC	6.60	6.57	6.63	218	6.63	239	Y	-9.6
Heptachlor	7.88	7.86	7.90	176	7.90	188	Y	-6.8
Aldrin	9.18	9.15	9.21	184	9.21	202	Y	-9.8
Hept. epoxide	11.55	11.53	11.57	165	11.58	177	Y	-7.3
Endosulfan I	12.99	12.96	13.02	228	13.01	247	Y	-8.3
Dieldrin	14.26	14.23	14.29	160	14.28	174	Y	-8.8
4,4'-DDE	14.09	14.03	14.15	171				
Endrin	15.77	15.73	15.81	129				
Endosulfan II	16.52	16.48	16.56	142	16.57	155	Y	-9..
4,4'-DDD	16.40	16.34	16.46	139				
Endo. sulfate	18.41	18.36	18.46	155				
4,4'-DDT	17.62	17.60	17.64	129	17.62	134	Y	-3.9
Methoxychlor	21.90	21.81	21.99	59.9	21.94	63.8	Y	-6.5
Endrin ketone	22.18	22.12	22.24	178				
a. Chlordane	12.91	12.86	12.96	182				
g. Chlordane	12.22	12.17	12.27	188				
Toxaphene	16.63	16.57	16.69	37.1				
Aroclor-1016	7.96	7.92	8.00	30.4				
Aroclor-1221	5.02	4.99	5.05	5.14				
Aroclor-1232	7.96	7.91	8.01	16.2				
Aroclor-1242	7.98	7.94	8.02	39.0				
Aroclor-1248	11.96	11.93	11.99	54.4				
Aroclor-1254	14.72	14.67	14.77	65.1				
Aroclor-1260	17.54	17.49	17.59	52.5				

Under QNT Y/N: enter Y if quantitation was performed, N if not performed.
%D must be less than or equal to 15.0% for quantitiation, and less than or equal to 20.0% for confirmation.

Note: Determining that no compounds were found above the CRDL is a form of quantitation, and therefore at least one column must meet the 15.0% criteria.

For multicomponent analytes, the single largest peak that is characteristi of the component should be used to establish retention time and %D. Identification of such analytes is based primarily on pattern recognition.

8E

PESTICIDE EVALUATION STANDARDS SUMMARY

Evaluation of Retention Time Shift for Dibutylchlorendate

ıme: NUS-LSG Contract:

Code: NUS Case No.: TNK SAS No.: SDG No.: PKG7

:rument ID: VA3700_6 GC Column ID: DB608

es of Analyses: 02/17/92 to 02/19/92

	EPA SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED	TIME ANALYZED	% D	*
01	EVALA	12-310-90-12	02/17/92	0933	0.0	
02	EVALB	11-310-90-12	02/17/92	1005	-0.2	
03	EVALC	13-310-90-12	02/17/92	1037	-0.2	
04	INDA	1-310-90-81	02/17/92	1109	-0.2	
05	INDB	1-310-90-91	02/17/92	1142	-0.2	
06	TOXAPH	14-310-90-36	02/17/92	1214	-0.3	
07	AR1660	5-310-90-73	02/17/92	1246	-0.2	
08	AR1221	10-310-90-22	02/17/92	1354	-0.3	
09	AR1232	10-310-90-21	02/17/92	1426	-0.2	
10	AR1242	7-310-90-57	02/17/92	1458	-0.3	
11	AR1248	6-310-90-17	02/17/92	1531	-0.3	
12	AR1254	7-310-90-19	02/17/92	1603	-0.4	
13	CHLORDANE	16-27-90-158	02/17/92	1635	-0.4	
14	PBLK1K	PBLK1K	02/17/92	1740	-0.3	
15	TKCSD01E0002	P188956	02/17/92	1812	-0.3	
16	ZZZZZ	P188957	02/17/92	1844	-0.2	
17	ZZZZZ	P188957MS	02/17/92	1916	-0.3	
18	ZZZZZ	P188957MSD	02/17/92	1949	-0.1	
19	EVALB	11-310-90-12	02/17/92	2053	-0.3	
20	ZZZZZ	PBLK1H	02/17/92	2125	-0.2	
21	ZZZZZ	P188953	02/17/92	2158	-0.3	
22	ZZZZZ	P188954	02/17/92	2230	-0.4	
23	ZZZZZ	P188954MS	02/17/92	2302	-0.2	
24	ZZZZZ	P188954MSD	02/17/92	2335	-0.4	
25	INDA	1-310-90-81	02/18/92	0039	-0.3	
26	PBLK1M	PBLK1M	02/18/92	0111	-0.4	
27	TCCSD06E0002	P189027	02/18/92	0144	-0.3	
28	TCCSD15E0002	P189030	02/18/92	0216	-0.3	
29	ZZZZZ	PBLK1I	02/18/92	0320	-0.2	
30	ZZZZZ	P189026	02/18/92	0353	-0.3	
31	EVALB	11-310-90-12	02/18/92	0457	-0.2	
32	ZZZZZ	P189029	02/18/92	0529	-0.3	
33	PBLK1N	PBLK1N	02/18/92	0602	-0.2	
34	LCS2-PCB	LCS2-PCB	02/18/92	0634	0.2	
35	LCS2-PEST	LCS2-PEST	02/18/92	0706	-0.2	
36	TKCSD01Z0002	P188957MSD	02/18/92	0858	-0.1	
37	INDB	1-310-90-91	02/18/92	0938	-0.3	
38	TKCSD01Y0002	P188957MS	02/18/92	1018	-0.2	

* Values outside of QC limits (2.0% for packed columns, 0.3% for capillary columns)

FORM VIII PEST-2 1/87 Rev.

8E
PESTICIDE EVALUATION STANDARDS SUMMARY
Evaluation of Retention Time Shift for Dibutylchlorendate

Lab Name: NUS-LSG Contract:

Lab Code: NUS Case No.: TNK SAS No.: SDG No.: PKG7

Instrument ID: VA3700_6 GC Column ID: DB608

Dates of Analyses: 02/17/92 to 02/19/92

	EPA SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED	TIME ANALYZED	% D	*
01	TKCSD01F0002	P188957	02/18/92	1051	-0.2	
02	PBLK1J	PBLK1J	02/18/92	1152	-0.2	
03	LCS1-PEST	LCS1-PEST	02/18/92	1224	-0.4	
04	LCS1-PCB	LCS1-PCB	02/18/92	1257	-0.2	
05	EVALB	11-310-90-12	02/18/92	1329	-0.4	
06	TECSD22E0002	P189218	02/18/92	1404	-0.1	
07	TCCSDBE00002	P189223	02/18/92	1436	-0.3	
08	TECSD24E0002	P189225	02/18/92	1508	-0.4	
09	TCCSDB1E0002	P189228	02/18/92	1541	-0.4	
10	TECSD22Y0002	P189219MS	02/18/92	1617	-0.4	
11	INDA	1-310-90-81	02/18/92	1721	-0.3	
12	TECSD22X0002	P189221MSD	02/18/92	1753	-0.4	
13	ZZZZZ	P189214	02/18/92	1858	-0.5	
14	ZZZZZ	P189215	02/18/92	1930	-0.4	
15	ZZZZZ	P189217	02/18/92	2003	-0.5	
16	ZZZZZ	P189222	02/18/92	2107	-0.4	
17	EVALB	11-310-90-12	02/18/92	2212	-0.4	
18	ZZZZZ	P189224	02/18/92	2244	-0.4	
19	ZZZZZ	P189227	02/18/92	2316	-0.4	
20	TRBS1020992	P189229	02/18/92	2348	-0.4	
21	TFBS1020992	P189230	02/19/92	0021	-0.4	
22	INDB	1-310-90-91	02/19/92	0125	-0.4	

* Values outside of QC limits (2.0% for packed columns, 0.3% for capillary columns)

FORM VIII PEST-2 1/87 Rev.

000063

3-POINT CALIBRATION

DATE: 02/28/92
ANALYST: LG

INSTRUMENT: GC #1
COLUMN: 1.5% SP2250 + 1.95% SP2401

COMPOUND	STANDARD I.D. NO.	STANDARD CONCEN.	RESPONSE	RESPONSE FACTOR	$\bar{X}_{RF}$	S_{RF}	%RSD
	2-310-90-73	0.25 ug/ml	30.6906	0.008146			
AR1016	5-310-90-73	0.5 ug/ml	53.5852	0.009331	0.009489	0.001429	15.0
	3-310-90-73	1.0 ug/ml	90.9724	0.01099			
			62.3592	0.004009			
AR1260			112.3462	0.004450	0.004403	0.0003723	8.4
			210.5552	0.004749			

$\bar{X}_{RF}$ = Average RF

S_{RF} = Standard deviation of RF's

%RSD = Percent Relative Standard Deviation = $\frac{S_{RF}}{\bar{X}_{RF}} \times 100$

3F

SOIL PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: NUS-LSG Contract: _____

Lab Code: NUS Case No.: TNK SAS No.: _____ SDG No.: PKG7

Matrix Spike - EPA Sample No.: TKCSD01F0002 Level:(low/med) LOW

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC LIMITS REC.
gamma-BHC (Lindane)	3.97	0	3.10	78	46-127
Heptachlor	3.97	0	3.93	99	35-130
Aldrin	3.97	0	3.81	96	34-132
Dieldrin	9.53	0	11.5	121	31-134
Endrin	9.53	0	7.30	77	42-139
4,4'-DDT	9.53	0	9.05	95	23-134

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
gamma-BHC (Lindane)	3.97	3.81	96	-21	50	46-127
Heptachlor	3.97	3.97	100	-1	31	35-130
Aldrin	3.97	4.17	105	-9	43	34-132
Dieldrin	9.53	10.8	113	7	38	31-134
Endrin	9.53	16.9	177 *	-79 *	45	42-139
4,4'-DDT	9.53	22.3	234 *	-84 *	50	23-134

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 2 out of 6 outside limits
Spike Recovery: 2 out of 12 outside limits

COMMENTS:

HALLIBURTON NUS
Environmental Corporation

INTERNAL CORRESPONDENCE

C-49-2-3-323

TO: PHIL OTTINGER

DATE: MARCH 25, 1992

FROM: KAREN M. SMECKER

CC: D. A. SCHEIB

SUBJECT: INORGANIC DATA VALIDATION - MISC. PARAMETERS
TINKER AIR FORCE BASE
CASE NO. TNK, SDG PKG6 and PKG7

SAMPLES:

Water:

TCC-

SWB2-W-0002 SW06-W-0002 SW11-W-0002 SW15-W-0002
SW17A-W-0002

TEC-

SW22-W-0002 SW24-W-0002

TKC-

SW01-W-0002 SW01-C-0002 SW05-W-0002 SW05-C-0002

Soil:

TCC-

SD06-E-0002 SD11-E-0002 SD15-E-0002 SD17A-E-0002
SDB1-E-0002 SDB2-E-0002

TEC-

SD22-E-0002 SD24-E-0002

TKC-

SD01-E-0002 SD01-F-0002 SD03-E-0002 SD05-E-0002
SD05-F-0002

Soil:

T-RBS1-020992 T-FBS1-020992

HALLIBURTON NUS Laboratories analyzed 11 water samples (including two field duplicate pair), 13 soil samples (including two field duplicate pairs), 1 field blank and 1 rinsate blank for various

miscellaneous parameters such as alkalinity, Chemical Oxygen Demand (COD), chloride, dissolved solids, nitrate, suspended solids, nonpurgeable organic carbon, Total Organic Carbon (TOC), direct fluoride, total hardness, chlorinated herbicides, gross alpha and beta, pH, Total Organic Halogens (EOX or TOX), percent moisture, grain size and percent solids.

Data for these analyses were reviewed with reference to method-specific quality control criteria, the EPA "Functional Guidelines for Inorganic Data Validation" and the Harzardous Waste Remedial Action Program's (HAZWRAP) "Requirements for Quality Control of Analytical Data". The analyses were conducted under Level E QA/QC criteria and were evaluated according to the following parameters:

- o Holding Times
- o Laboratory and Field Blank Analyses
- * o Matrix Spike Recoveries
- o Laboratory Control Standard Recovery
- o Laboratory Duplicates
- * o Field Duplicate Precision

The symbol (*) indicates that quality control criteria were not met for this parameter. Problems affecting data usability are addressed below and the attached Table 1 summarizes the validation qualifications.

Blanks

Positive concentrations were reported for alkalinity, chloride, dissolved solids and fluoride in the field quality control blanks. No actions were taken since positive results for these parameters in affected samples exceeded the maximum contaminant concentrations.

Matrix Spike Recoveries

Matrix Spike (MS) recoveries for the EOX and TOC analyses were low (< 75% yet > 30%) for the soil matrix. Positive results and nondetects for these parameters in associated samples are qualified as estimated, "J" and "UJ", respectively; no nondetects were reported for TOC analyses.

The MS recovery for chloride was high (> 125%) for the water matrix. Positive results for chloride in associated samples are qualified as estimated, "J".

Field Duplicate Precision

Relative Percent Differences (RPDs) for nitrate, TOC, alkalinity and TOX were high (> 50%) in the field duplicate pair comprised of samples TKC-SD01-F-0002 and TKC-SD01-E-0002. Sample data for these parameters in these samples are qualified as estimated, "J" and "UJ", respectively; no nondetects were reported for nitrate, TOC and TOX.

Relative Percent Differences (RPDs) for COD, nonpurgeable organic carbon and fluoride were high (> 35%) in the field duplicate pair consisting of samples TKC-SW01-C-0002 and TKC-SW01-W-0002. Positive results for these parameters in these samples are qualified as estimated, "J"; no nondetects were reported.

No other problems were noted.

TINKER AIR FORCE BASE
CASE # TNK, PKG6 and PKG7

TABLE 1 - RECOMMENDATION SUMMARY

alkalinity	J^1	COD	J^1
chloride	J^3	dissolved solids	
nitrate	J^1	suspended solids	
TOC	$J^{1,2}$	nonpurgeable organic carbon	J^1
direct fluoride	J^1	total hardness	
EOX	J^2	chlorinated herbicides	
TOX	J^1	gross alpha and beta	
pH		percent moisture	
grain size		percent solids	

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

J^1 - Estimate "J" positive results and "UJ" nondetects in affected samples due to field duplicate imprecision.

J^2 - Estimate "J" positive results and "UJ" nondetects due to low MS recovery.

J^3 - Estimate "J" positive results due to high MS recovery.

APPENDIX A: QUALIFIED LABORATORY RESULTS

CLIENT ORIGINAL

HALLIBURTON NUS
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205
800-228-6870

6751-L Engle Road
Cleveland, OH 44130
216-891-4700

March 20, 1992
Report No.: 00006553
Section A Page 11

LABORATORY ANALYSIS REPORT

CLIENT NAME: TINKER AFB - C/O HALLIBURTON NUS ENVIRONMENTAL
ADDRESS: 800 OAK RIDGE TURNPIKE
OAK RIDGE, TN 37830-
ATTENTION: MR. PHIL OTTINGER

NUS CLIENT NO: 1412 0001
WORK ORDER NO: 3K92-
VENDOR NO: 12990100

Carbon Copy:

SAMPLE ID: T-RBS1-020992
NUS SAMPLE NO: P0189229
P.O. NO.:

RINSATE BLANK

DATE SAMPLED: 09-FEB-92
DATE RECEIVED: 11-FEB-92
APPROVED BY: R Volk

LN	TEST CODE	DETERMINATION	RESULT	UNITS
3	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
4	I023	Alkalinity, Total (as CaCO3)	2	mg/L
5	I120	COD(O2)	< 5	mg/L
6	I130	Chloride (Cl)	2	mg/L
7	I590	Solids, Dissolved at 180C	< 10	mg/L
8	I390	Nitrate (as N)	< 0.1	mg/L
11	I610	Solids, Suspended at 103C	< 10	mg/L
13	I106	Carbon, Organic - Nonpurgeable	< 1	mg/L
16	OSVIXW	APPENDIX IX SEMIVOLATILES IN WATER		
		Data Package - BNA	DONE	
18	GI20WC	PESTICIDES/PCBS + CLP DATA PACKAGE - WATER		
		Data Package - Pesticides/PCBs	DONE	
19	I265WC	CLP - Cyanide (CN)	10 u	ug/L
20	DPACK	CLP Data Package Deliverable	DONE	
23	I300	Fluoride (F) - Direct	0.2	mg/L
24	I320	Hardness, Total (as CaCO3)	< 1	mg/L
27	R03W	Gross Alpha and Beta		
		Gross Alpha	< 3	pCi/L
		Gross Beta	< 5	pCi/L
28	I315	Halogens, Total Organic (TOX)	< 10	ug/L

COMMENTS: Results (except cyanide) have not been adjusted for percent moisture.

CLIENT ORIGINAL

HALLIBURTON NUS
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205
800-228-6870

6751-L Engle Road
Cleveland, OH 44130
216-891-4700

March 20, 1992
Report No.: 00006553
Section A Page 12

LABORATORY ANALYSIS REPORT

CLIENT NAME: TINKER AFB - C/O HALLIBURTON NUS ENVIRONMENTAL
ADDRESS: 800 OAK RIDGE TURNPIKE
OAK RIDGE, TN 37830-
ATTENTION: MR. PHIL OTTINGER

NUS CLIENT NO: 1412 0001
WORK ORDER NO: 3K92-
VENDOR NO: 12990100

Carbon Copy:

SAMPLE ID: T-FBS1-020992
NUS SAMPLE NO: P0189230
P.O. NO.:

FIELD BLANK

DATE SAMPLED: 09-FEB-92
DATE RECEIVED: 11-FEB-92
APPROVED BY: R Volk

4pkg 7

LN	TEST CODE	DETERMINATION	RESULT	UNITS
3	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
4	I023	Alkalinity, Total (as CaCO3)	2	mg/L
5	I120	COD(O2)	< 5	mg/L
6	I130	Chloride (Cl)	3	mg/L
7	I590	Solids, Dissolved at 180C	11	mg/L
8	I390	Nitrate (as N)	< 0.1	mg/L
11	I610	Solids, Suspended at 103C	< 10	mg/L
13	I106	Carbon, Organic - Nonpurgeable	< 1	mg/L
16	OSVIXW	APPENDIX IX SEMIVOLATILES IN WATER		
		Data Package - BNA	DONE	
18	G120WC	PESTICIDES/PCBS + CLP DATA PACKAGE - WATER		
		Data Package - Pesticides/PCBs	DONE	
19	I265WC	CLP - Cyanide (CN)	10 u	ug/L
20	DPACK	CLP Data Package Deliverable	DONE	
23	I300	Fluoride (F) - Direct	0.2	mg/L
24	I320	Hardness, Total (as CaCO3)	< 1	mg/L
25	R03W	Gross Alpha and Beta		
		Gross Alpha	< 3	pCi/L
		Gross Beta	< 5	pCi/L
28	I315	Halogens, Total Organic (TOX)	< 10	ug/L

COMMENTS: Results (except cyanide) have not been adjusted for percent moisture.

APPENDIX B: SUPPORT DOCUMENTATION

CLIENT ORIGINAL

HALLIBURTON NUS
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205
800-228-6870

6751-L Engle Road
Cleveland, OH 44130
216-891-4700

March 19, 1992
Report No.: 00000001
Section F Page 2

QUALITY CONTROL REPORT
DUPLICATE AND MATRIX SPIKE DATA

PREP BATCH: 7062 — NUS SAMPLE NO: P0189150

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	MS RCVR
1320	Hardness, Total (as CaCO3)	310	320	mg/L	2.53	mg/L	821	102

PREP BATCH: 7083 — NUS SAMPLE NO: P0189155

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	MS RCVR
14905	pH (in soil)	7.4	7.35		0.136			

PREP BATCH: 7146 — NUS SAMPLE NO: P0189155

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	MS RCVR
15205	Percent Solids at 103C	86.2	81.4	%	8.0	%		

PREP BATCH: 7629 — NUS SAMPLE NO: P0189155

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	MS RCVR
10075	Carbon, Total Organic (C)	2400 **	3010	mg/kg	29.7	mg/kg	5140	64.3

PREP BATCH: 7189 — NUS SAMPLE NO: P0189219

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	MS RCVR
14905	pH (in soil)	NA	8.06		0.12			

CLIENT ORIGINAL

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Environmental Laboratories

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216-891-4700

March 19, 1992
Report No.: 00000001
Section F Page 3

QUALITY CONTROL REPORT
DUPLICATE AND MATRIX SPIKE DATA

PREP BATCH: 7334 NUS SAMPLE NO: P0189219

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	MS RCVR
I3155	Halogens, Total Organic (EOX)	140	153	mg/kg	14	mg/kg	162	13

PREP BATCH: 7334 NUS SAMPLE NO: P0189223

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	MS RCVR
I3155	Halogens, Total Organic (EOX)	25	< 40	mg/kg	-	mg/kg	101	46

PREP BATCH: 7222 NUS SAMPLE NO: P0[illegible]

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	MS RCVR
I0239	Alkalinity, Total (as CaCO3)	160	161	mg/kg	1.87	mg/kg		

PREP BATCH: 7339 NUS SAMPLE NO: P0189230

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	MS RCVR
I300	Fluoride (F) - Direct	0.2	0.25	mg/L	.04	mg/L		

PREP BATCH: 6950 NUS SAMPLE NO: P0188639

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	MS RCVR
I4900	pH (1:1 soil)	7.5	7.5		.01			

CLIENT ORIGINAL

HALLIBURTON NUS
Environmental Laboratories

5350 Campbells Run Road
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216-891-4700

March 19, 1992
Report No.: 00000001
Section F Page 5

QUALITY CONTROL REPORT
DUPLICATE AND MATRIX SPIKE DATA

PREP BATCH: 7196 NUS SAMPLE NO: P0187441

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	MS RCVR
1130	Chloride (Cl)	310	303	mg/L	1.02	mg/L	612.6	123

PREP BATCH: 7269 NUS SAMPLE NO: P0189823

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	MS RCVR
1290	Nitrate (as N)	0.3	0.333	mg/L	.001	mg/L	1.32	98.

PREP BATCH: 7318 NUS SAMPLE NO: P0189900

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	MS RCVR
1105	Carbon, Organic - Nonpurgeable	1	< 1	mg/L		mg/L	31.1	100.

CLIENT ORIGINAL

HALLIBURTON NUS
Environmental Laboratories

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216-891-4700

March 19, 1992
Report No.: 00000002
Section F Page 1

QUALITY CONTROL REPORT
DUPLICATE AND MATRIX SPIKE DATA

PREP BATCH: 7086 NUS SAMPLE NO: P0188954

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	MS RCVR
1300	Fluoride (F) - Direct	3.3	3.316	mg/L	.013	mg/L	4.4	102

PREP BATCH: 7175 NUS SAMPLE NO: P0188954

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	MS RCVR
1810	Solids, Suspended at 103C	< 10	< 20	mg/L		mg/L		

PREP BATCH: 7196 NUS SAMPLE NO: P01

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	MS RCVR
130	Chloride (Cl)	58	59	mg/L	9.67	mg/L	90.6	129

PREP BATCH: 7269 NUS SAMPLE NO: P0188954

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	MS RCVR
380	Nitrate (as N	1.7	1.72	mg/L	0.461	mg/L	2.70	96.

PREP BATCH: 7080 NUS SAMPLE NO: P0189026

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	MS RCVR
111	COD(O2)	12	12.1	mg/L	.5	mg/L		

CLIENT ORIGINAL

HALLIBURTON NUS
Environmental Laboratories

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Pittsburgh, PA 15205
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6751-L Engle Road
Cleveland, OH 44130
216-891-4700

March 19, 1992
Report No.: 00000002
Section F Page 2

QUALITY CONTROL REPORT
DUPLICATE AND MATRIX SPIKE DATA

PREP BATCH: 7115 — NUS SAMPLE NO: P0189029

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	MS RCVR
1023	Alkalinity, Total (as CaCO3)	310	303	mg/L	1.64	mg/L		

PREP BATCH: 7157 — NUS SAMPLE NO: P0189149

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	MS RCVR
1105	Carbon, Organic - Nonpurgeable	13	11.3	mg/L	6.55	mg/L		

PREP BATCH: 7183 — NUS SAMPLE NO: P0189214

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	MS RCVR
1120	COD(02)	12	12.0	mg/L	0.000	mg/L		

PREP BATCH: 7461 — NUS SAMPLE NO: P0189222

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT	MS RCVR
1131	Chloride (Cl)	830	859	mg/L	2.67	mg/L	2120	124

PREP BATCH: 7062 — NUS SAMPLE NO: P0189150

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE RPD	UNITS	MS RESULT	MS RCVR
1021	Hardness, Total (as CaCO3)	310	320	mg/L	3.53	mg/L	821	102

F-5

SURFACE WATER SAMPLE DATA VALIDATION SUMMARIES - FEBRUARY 1992

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HALLIBURTON NUS
Environmental Corporation

INTERNAL CORRESPONDENCE

C-49-2-3-321

TO: PHIL OTTINGER

DATE: MARCH 25, 1992

FROM: KAREN M. SMECKER

CC: D. A. SCHEIB

SUBJECT: INORGANIC DATA VALIDATION - SELECTED TAL METALS
TINKER AIR FORCE BASE
CASE NO. TNK, SDG PKG6

SAMPLES:

Water:

TCC-

SWB1-W-0002 SWB2-W-0002 SW06-W-0002 SW15-W-0002
SW20-W-0002

TEC-

SW22-W-0002 SW24-W-0002

TKC-

SW01-W-0002 SW01-C-0002 SW05-W-0002 SW05-C-0002

HALLIBURTON NUS Laboratories analyzed 11 water samples (including two field duplicate pairs) for all Target Analyte List (TAL) metals except aluminum, calcium, iron, magnesium, manganese, potassium and sodium. In addition, seven samples were analyzed for cyanide. No field quality control blanks were analyzed under this sample set.

Data for these analyses were reviewed with reference to the EPA "Functional Guidelines for Inorganic Data Validation" and the Harzardous Waste Remedial Action Program's (HAZWRPA) "Requirements for Quality Control of Analytical Data". The analyses were conducted under Level C QA/QC criteria and were evaluated according to the following parameters:

- o Data Completeness
- o Holding Times
- * o Calibration Verification
- * o Laboratory Blank Analyses
- o Matrix Spike Recoveries
- o Laboratory Duplicates
- o Field Duplicate Precision
- * o Furnace Atomic Absorption Results
- o ICP Serial Dilution Results
- o Detection Limits
- o Sample Quantitation

The symbol (*) indicates that quality control criteria were not met for this parameter. Sample data was not evaluated on the basis of ICP Interference Check Sample (ICS) results since interferring analyte analyses were not required for this sample set. In addition due to the absence of raw data in a Level C data package, graphite furnace sample data were not evaluated on the basis of percent differences for duplicate injections. Problems affecting data usability are addressed below and the attached Table 1 summarizes the validation qualifications.

Calibration Verification

The CRDL Standard analysis Percent Recovery (%R) for vanadium was below the 80% lower quality control limit. Only nondetects were reported for this analyte, and these results are qualified as estimated, "UJ".

The CRDL Standard analysis %R for cadmium exceeded the 120% upper quality control limit. No action was taken because all positive results < 3X CRDL for this analyte are qualified due to blank contamination.

Blanks

Laboratory method blank analyses yielded the following contaminants in the maximum concentrations indicated:

Contaminant	Maximum Concentration (ug/l)	Action Level (ug/l)
beryllium	2.9	14.5
cadmium	5.6	28.0

All positive sample results for these analytes were less than the action levels and are qualified as undetected, "U".

Negative blank contamination at the following maximum levels were evident for the analytes indicated below:

Contaminant	Maximum Concentration (ug/l)
barium	- 52.0
vanadium	- 29.0

These occurences are indications of poor instrument performance not blank contamination. Consequently, positive results and nondetects for these analytes are qualified as estimated, "J" and "UJ",

respectively; no positive results were reported for vanadium and no nondetects were reported for barium.

Furnace Atomic Absorption Results

Post Digestion Spike (PDS) %Rs for selenium and thallium in one sample were below the 85% lower quality control criterion. The positive selenium result in sample TCC-SWB2-W-0002 and the nondetect for thallium in sample TCC-SW20-W-0002 are qualified as estimated, "J" and "UJ" , respectively.

Three samples had high (> 115%) PDS recoveries for lead. Qualifications were not needed as reported results in the affected samples were nondetects.

TINKER AIR FORCE BASE
CASE # TNK, SDG PKG6

TABLE 1 - RECOMMENDATION SUMMARY

Aluminum		Magnesium	
Antimony		Manganese	
Arsenic		Mercury	
Barium	J^1	Nickel	
Beryllium	A^1	Potassium	
Cadmium	A^1	Selenium	J^3
Calcium		Silver	
Chromium		Sodium	
Cobalt		Thallium	J^3
Copper		Vanadium	$J^{1,2}$
Iron		Zinc	
Lead			

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

A^1 - Accept data, but raise sample detection limit (where appropriate) due to blank contamination.

J^1 - Estimate "J" positive barium results and "UJ" nondetects for vanadium due to negative concentrations reported in the laboratory method blanks.

J^2 - Estimate "UJ" nondetects due to low CRDL Standard analysis recovery.

J^3 - Estimate "J" positive selenium result and "UJ" thallium nondetect in affected samples due to low graphite furnace PDS recovery.

APPENDIX B: SUPPORT DOCUMENTATION

U.S. EPA - CLP

2B

CRDL STANDARD FOR AA AND ICP

Lab Name: HALLIBURTON NUS Lab. Contract: TINKER AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: PR6E

AA CRDL Standard Source: HP

ICP CRDL Standard Source: HP

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
				Initial			Final	
	True	Found	%R	True	Found	%R	Found	%R
Aluminum								
Antimony	60.0	59.80	99.7					
Arsenic	10.0	10.55	105.5					
Barium				400.0	392.00	98.0	391.00	[illegible]
Beryllium				10.0	11.30	113.0	11.90	119.[illegible]
Cadmium				10.0	13.70	137.0	15.60	156.[illegible]
Calcium								
Chromium				20.0	21.50	107.5	20.60	103.[illegible]
Cobalt				100.0	95.30	95.3	107.20	107.[illegible]
Copper				50.0	48.20	96.4	54.20	108.[illegible]
Iron								
Lead	3.0	3.05	101.7					
Magnesium								
Mercury								
Nickel				80.0	81.00	101.3	78.30	97.[illegible]
Potassium								
Selenium	5.0	5.65	113.0					
Silver				20.0	20.30	102.0	20.80	104.[illegible]
Sodium								
Thallium	10.0	9.80	98.0					
Vanadium				100.0	75.00	[illegible]	73.00	97.[illegible]
Zinc				40.0	40.10	100.3	38.60	96.5

U.S. EPA - CLP

3
BLANKS

Lab Name: HALLIBURTON NUS Lab. Contract: TINKER AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: PRGE

Preparation Blank Matrix (soil/water): WATER

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

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Preparation Blank	C	M
Aluminum											
Antimony	6.0	U	6.0	U	6.0	U	6.0	U	6.0	U	P
Arsenic	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	P
Barium	-20.0	B	-23.0	B	-22.0	B	-23.0	B	-22.0	B	P
Beryllium	2.0	U	2.0	U	2.4	B	2.8	B	2.2	B	P
Cadmium	4.0	U	5.6		4.8	B	4.8	B	4.0	U	P
Calcium											
Chromium	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	P
Cobalt	27.0	U	27.0	U	27.0	U	27.0	U	27.0	U	P
Copper	16.0	U	16.0	U	16.0	U	16.0	U	16.0	U	P
Iron											
Lead	1.0	U	1.0	U	1.0	U			1.0	U	P
Magnesium											
Manganese	0.1	U	0.1	U	0.1	U			0.1	U	CV
Nickel	38.0	U	38.0	U	38.0	U	38.0	U	38.0	U	P
Potassium											
Selenium	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	P
Silver	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	P
Sodium											
Thallium	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	P
Vanadium	22.0	U	-23.0	B	22.0	U	-23.0	B	-23.0	B	P
Zinc	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	P
Cyanide											

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ICP INTERFERENCE CHECK SAMPLE

Lab Name: HALLIBURTON NUS Lab. Contract: TINKER AFB

Lab Code: Case No.: TNK SAS No.: SDG No.: PKGE

ICP ID Number: MET500 ICS Source: HNUS Lab

Concentration Units: ug/L

Analyte	True Sol. A	True Sol. AB	Initial Found Sol. A	Initial Found Sol. AB	Initial Found %R	Final Found Sol. A	Final Found Sol. AB	Final Found %R
Aluminum								
Antimony								
Arsenic								
Barium	-30	460	-21	451.0	98.0	-20	429.0	93.
Beryllium	1	491	2	501.9	102.2	4	475.0	96.7
Cadmium	2	896	4	778.7	87.9	4	833.2	94.0
Calcium								
Chromium								
Cobalt	17	459	13	470.6	102.8	12	449.4	98.1
Copper	7	438	-4	412.8	94.0	3	485.9	110.7
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel	-7	872	7	946.8	105.6	23	874.1	100.2
Potassium								
Selenium								
Silver	2	883	0	844.4	97.8	1	844.8	97.9
Sodium								
Thallium								
Vanadium	4	480	-24	451.0	94.4	-18	423.0	88.1
Zinc	25	990	18	933.0	95.2	23	910.1	92.9

Can not be evaluated due to insufficient data.

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ANALYSIS RUN LOG

Lab Name: HALLIBURTON NUS Lab. Contract: TINKER AFB
Lab Code: Case No.: TNK SAS No.: SDG No.: PKGE
Instrument ID Number: MET405 Method: F
Start Date: 02/24/92 End Date: 02/24/92

EPA Sample No.	D/F	Time	% R	Analytes																							
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
ZZZZZZ	1.00	0850													X												
S0	1.00	0855													X												
S3.0	1.00	0859													X												
S20.0	1.00	0904													X												
S50.0	1.00	0907													X												
ICV	1.00	0912													X												
ICB	1.00	0916													X												
CRA	1.00	0920													X												
PBW	1.00	0924													X												
PBWA	1.00	0928	103.3												X												
LCSW	1.00	0932													X												
LCSWA	1.00	0936	103.3												X												
TEC22WS	1.00	0940													X												
TEC22WD	1.00	0944													X												
TEC22WDA	1.00	0948	118.3												X												
TEC22W	1.00	0952													X												
TEC22WA	1.00	0956	115.0												X												
CCV1	1.00	1001													X												
CCB1	1.00	1005													X												
TK01W2	1.00	1009													X												
TK01W2A	1.00	1013	106.3												X												
TK01[illegible]	1.00	1017													X												
TK01[illegible]A	1.00	1021	113.3												X												
TK06W2	1.00	1026													X												
TK06W2A	1.00	1030	120.0												X												
TK15W2	1.00	1034													X												
TK15W2A	1.00	1038	121.7												X												
TK05W2	1.00	1043													X												
TK05W2A	1.00	1047	125.0												X												
[illegible]	1.00	1051													X												
[illegible]	1.00	1055													X												
[illegible]	1.00	1057													X												

U.S. EPA - CLP

14

ANALYSIS RUN LOG

Lab Name: HALLIBURTON NUS Lab. Contract: TINKER AFB
Lab Code: Case No.: TNK SAS No.: SDG No.: PKGE
Instrument ID Number: MET405 Method: F
Start Date: 02/25/92 End Date: 02/25/92

| EPA Sample No. | D/F | Time | % R | Analytes | | |

U.S. EPA - CLP

14

ANALYSIS RUN LOG

Lab Name: HALLIBURTON NUS Lab. Contract: TINKER AFB
Lab Code: Case No.: TNK SAS No.: SDG No.: PKG6
Instrument ID Number: MET405 Method: F
Start Date: 02/20/92 End Date: 02/20/92

EPA Sample No.	D/F	Time	% R	Analytes																							
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
TCCB2W	1.00	1628																						X			
TCCB2WA	1.00	1632	84.5																					X			
TEC24W	1.00	1637																						X			
TEC24WA	1.00	1641	89.7																					X			
TCCB1W	1.00	1645																						X			
TCCB1WA	1.00	1648	91.5																					X			
TCC20W	1.00	1652																						X			
TCC20WA	1.00	1656	79.8																					X			
CCV3	1.00	1700																						X			
CCB3	1.00	1704																						X			

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J^7 - Estimate "J" positive results reported at levels less than the CRQL.

J^8 - Estimate "J" positive result or "UJ" nondetect for di-n-octylphthalate because of poor field duplicate precision.

R^1 - Reject "R" nondetect for trans-1,4-dichloro-2-butene due to continuing calibration RRF < 0.050.

APPENDIX A
Qualified Laboratory Results

1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO

VBLKDO

Lab Name: NUS-LSG Contract: _____

Lab Code: HNUS Case No.: TNK SAS No.: _____ SDG No.: PKG6

Matrix: (soil/water) WATER Lab Sample ID: VBLKDO

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: DVB02079201

Level: (low/med) LOW Date Received: _____

% Moisture: not dec. ____ Date Analyzed: 02/07/92

Column Type: (Pack/Cap/Wide) CAP Dilution Factor: 1.0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	CHLOROMETHANE	10	U
74-83-9	BROMOMETHANE	10	U
75-01-4	VINYL CHLORIDE	10	U
75-00-3	CHLOROETHANE	10	U
75-09-2	METHYLENE CHLORIDE	5	U
67-64-1	ACETONE	10	U
75-15-0	CARBON DISULFIDE	5	U
75-35-4	1,1-DICHLOROETHENE	5	U
75-34-3	1,1-DICHLOROETHANE	5	U
156-60-5	TRANS-1,2-DICHLOROETHENE	5	U
67-66-3	CHLOROFORM	5	U
107-06-2	1,2-DICHLOROETHANE	5	U
78-93-3	2-BUTANONE	10	U
71-55-6	1,1,1-TRICHLOROETHANE	5	U
56-23-5	CARBON TETRACHLORIDE	5	U
108-05-4	VINYL ACETATE	10	U
75-27-4	BROMODICHLOROMETHANE	5	U
78-87-5	1,2-DICHLOROPROPANE	5	U
10061-01-5	CIS-1,3-DICHLOROPROPENE	5	U
10061-02-6	TRANS-1,3-DICHLOROPROPENE	5	U
79-01-6	TRICHLOROETHENE	5	U
124-48-1	DIBROMOCHLOROMETHANE	5	U
79-00-5	1,1,2-TRICHLOROETHANE	5	U
71-43-2	BENZENE	5	U
10061-02-6	TRANS-1,3-DICHLOROPROPENE	5	U
75-25-2	BROMOFORM	5	U
108-10-1	4-METHYL-2-PENTANONE	10	U

1X

ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

VBLKDO

Lab Name: NUS-LSG Contract: _____

Lab Code: HNUS Case No.: TNK SAS No.: _____ SDG No.: PKG6

Matrix: (soil/water) WATER Lab Sample ID: VBLKDO

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: DVB02079201

Level: (low/med) LOW Date Received: _____

% Moisture: not dec. ____ Date Analyzed: 02/07/92

Column Type: (Pack/Cap/Wide) CAP Dilution Factor: 1.0

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
591-78-6	2-HEXANONE	3	J
127-18-4	TETRACHLOROETHENE	5	U
79-34-5	1,1,2,2-TETRACHLOROETHANE	5	U
108-88-3	TOLUENE	5	U
108-90-7	CHLOROBENZENE	5	U
100-41-4	ETHYLBENZENE	5	U
100-42-5	STYRENE	5	U
1330-20-7	XYLENE (TOTAL)	5	U
1664-42-0	ACROLEIN	100	U
107-13-1	ACRYLONITRILE	8	J
75-71-8	DICHLORODIFLUOROMETHANE	5	U
74-88-4	IODOMETHANE	5	U
74-95-3	METHYLENE BROMIDE	5	U
97-63-2	ETHYL METHYLACRYLATE	10	U
96-18-4	1,2,3-TRICHLOROPROPANE	10	U
110-57-6	1,4-DICHLORO-2-BUTENE (TOTAL)	5	U
75-69-4	TRICHLOROFLUOROMETHANE	5	U
107-05-1	ALLYL CHLORIDE	5	U
126-99-8	CHLOROPRENE	0	U
107-12-0	PROPIONITRILE	10	U
126-98-7	METHACRYLONITRILE	5	U
74-88-4	METHYLMETHACRYLATE	10	U
106-93-4	1,2-DIBROMOETHANE	5	U
630-20-6	1,1,1,2-TETRACHLOROETHANE	10	U
76-01-7	PENTACHLOROETHANE	10	U
96-12-8	1,2-DIBROMO-3-CHLOROPROPANE	10	U

1X

ORGANICS ANALYSIS DATA SHEET

SAMPLE NO

VBLKDP

Lab Name: NUS-LSG Contract: _____

Lab Code: HNUS Case No.: TNK SAS No.: _____ SDG No.: PKG6

Matrix: (soil/water) WATER Lab Sample ID: VBLKDP

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: DVB02099201

Level: (low/med) LOW Date Received: _____

% Moisture: not dec. ____ Date Analyzed: 02/09/92

Column Type: (Pack/Cap/Wide) CAP Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
74-87-3	CHLOROMETHANE	10	U
74-83-9	BROMOMETHANE	10	U
75-01-4	VINYL CHLORIDE	10	U
75-00-3	CHLOROETHANE	10	U
75-09-2	METHYLENE CHLORIDE	5	U
67-64-1	ACETONE	10	U
75-15-0	CARBON DISULFIDE	5	U
75-35-4	1,1-DICHLOROETHENE	5	U
75-34-3	1,1-DICHLOROETHANE	5	U
156-60-5	TRANS-1,2-DICHLOROETHENE	5	U
67-66-3	CHLOROFORM	5	U
107-06-2	1,2-DICHLOROETHANE	5	U
78-93-3	2-BUTANONE	10	U
71-55-6	1,1,1-TRICHLOROETHANE	5	U
56-23-5	CARBON TETRACHLORIDE	5	U
108-05-4	VINYL ACETATE	10	U
75-27-4	BROMODICHLOROMETHANE	5	U
78-87-5	1,2-DICHLOROPROPANE	5	U
10061-01-5	CIS-1,3-DICHLOROPROPENE	5	U
10061-02-6	TRANS-1,3-DICHLOROPROPENE	5	U
79-01-6	TRICHLOROETHENE	5	U
124-48-1	DIBROMOCHLOROMETHANE	5	U
79-00-5	1,1,2-TRICHLOROETHANE	5	U
71-43-2	BENZENE	5	U
10061-02-6	TRANS-1,3-DICHLOROPROPENE	5	U
75-25-2	BROMOFORM	5	U
108-10-1	4-METHYL-2-PENTANONE	10	U

1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

VBLKDP

Lab Name: NUS-LSG Contract: _____

Lab Code: HNUS Case No.: TNK SAS No.: _____ SDG No.: PKG6

Matrix: (soil/water) WATER Lab Sample ID: VBLKDP

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: DVB02099201

Level: (low/med) LOW Date Received: _____

% Moisture: not dec. ____ Date Analyzed: 02/09/92

Column Type: (Pack/Cap/Wide) CAP Dilution Factor: 1.0

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
591-78-6	2-HEXANONE	10	U
127-18-4	TETRACHLOROETHENE	5	U
79-34-5	1,1,2,2-TETRACHLOROETHANE	5	U
108-88-3	TOLUENE	5	U
108-90-7	CHLOROBENZENE	5	U
100-41-4	ETHYLBENZENE	5	U
100-42-5	STYRENE	5	U
1330-20-7	XYLENE (TOTAL)	5	U
1634-42-0	ACROLEIN	100	U
107-13-1	ACRYLONITRILE	100	U
75-71-8	DICHLORODIFLUOROMETHANE	5	U
74-88-4	IODOMETHANE	5	U
74-95 3	METHYLENE BROMIDE	5	U
97-63-2	ETHYL METHYLACRYLATE	10	U
96-18-4	1,2,3-TRICHLOROPROPANE	10	U
110-57-6	1,4-DICHLORO-2-BUTENE (TOTAL)	5	U
75-69-4	TRICHLOROFLUOROMETHANE	5	U
107-05-1	ALLYL CHLORIDE	5	U
126-99-8	CHLOROPRENE	0	U
107-12-0	PROPIONITRILE	10	U
126-98-7	METHACRYLONITRILE	5	U
74-88-4	METHYLMETHACRYLATE	10	U
106-93-4	1,2-DIBROMOETHANE	5	U
630-20-6	1,1,1,2-TETRACHLOROETHANE	10	U
76-01-7	PENTACHLOROETHANE	10	U
96-12-8	1,2-DIBROMO-3-CHLOROPROPANE	10	U

1X

ORGANICS ANALYSIS DATA SHEET

SAMPLE NO

VBLKDR

Lab Name: NUS-LSG Contract: _____

Lab Code: HNUS Case No.: TNK SAS No.: _____ SDG No.: PKG6

Matrix: (soil/water) WATER Lab Sample ID: VBLKDR

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: DVB02119202

Level: (low/med) LOW Date Received: _____

% Moisture: not dec. ____ Date Analyzed: 02/11/92

Column Type: (Pack/Cap/Wide) CAP Dilution Factor: 1.0

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	CHLOROMETHANE	10	U
74-83-9	BROMOMETHANE	10	U
75-01-4	VINYL CHLORIDE	10	U
75-00-3	CHLOROETHANE	10	U
75-09-2	METHYLENE CHLORIDE	5	U
67-64-1	ACETONE	10	U
75-15-0	CARBON DISULFIDE	5	U
75-35-4	1,1-DICHLOROETHENE	5	U
75-34-3	1,1-DICHLOROETHANE	5	U
156-60-5	TRANS-1,2-DICHLOROETHENE	5	U
67-66-3	CHLOROFORM	5	U
107-06-2	1,2-DICHLOROETHANE	5	U
78-93-3	2-BUTANONE	10	U
71-55-6	1,1,1-TRICHLOROETHANE	5	U
56-23-5	CARBON TETRACHLORIDE	5	U
108-05-4	VINYL ACETATE	10	U
75-27-4	BROMODICHLOROMETHANE	5	U
78-87-5	1,2-DICHLOROPROPANE	5	U
10061-01-5	CIS-1,3-DICHLOROPROPENE	5	U
10061-02-6	TRANS-1,3-DICHLOROPROPENE	5	U
79-01-6	TRICHLOROETHENE	5	U
124-48-1	DIBROMOCHLOROMETHANE	5	U
79-00-5	1,1,2-TRICHLOROETHANE	5	U
71-43-2	BENZENE	5	U
10061-02-6	TRANS-1,3-DICHLOROPROPENE	5	U
75-25-2	BROMOFORM	5	U
108-10-1	4-METHYL-2-PENTANONE	10	U

1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO

VBLKDR

Lab Name: NUS-LSG Contract: _____

Lab Code: HNUS Case No.: TNK SAS No.: _____ SDG No.: PKG6

Matrix: (soil/water) WATER Lab Sample ID: VBLKDR

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: DVB02119202

Level: (low/med) LOW Date Received: _____

% Moisture: not dec. ____ Date Analyzed: 02/11/92

Column Type: (Pack/Cap/Wide) CAP Dilution Factor: 1.0

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
591-78-6	2-HEXANONE	10	U
127-18-4	TETRACHLOROETHENE	5	U
79-34-5	1,1,2,2-TETRACHLOROETHANE	5	U
108-88-3	TOLUENE	5	U
108-90-7	CHLOROBENZENE	5	U
100-41-4	ETHYLBENZENE	5	U
100-42-5	STYRENE	5	U
1330-20-7	XYLENE (TOTAL)	5	U
1684-42-0	ACROLEIN	100	U
107-13-1	ACRYLONITRILE	100	U
75-71-8	DICHLORODIFLUOROMETHANE	5	U
74-88-4	IODOMETHANE	5	U
74-95-3	METHYLENE BROMIDE	5	U
97-63-2	ETHYL METHYLACRYLATE	10	U
96-18-4	1,2,3-TRICHLOROPROPANE	10	U
110-57-6	1,4-DICHLORO-2-BUTENE (TOTAL)	5	U
75-69-4	TRICHLOROFLUOROMETHANE	5	U
107-05-1	ALLYL CHLORIDE	5	U
126-99-8	CHLOROPRENE	0	U
107-12-0	PROPIONITRILE	10	U
126-98-7	METHACRYLONITRILE	5	U
74-89-4	METHYLMETHACRYLATE	10	U
106-93-4	1,2-DIBROMOETHANE	5	U
630-20-6	1,1,1,2-TETRACHLOROETHANE	10	U
76-01-7	PENTACHLOROETHANE	10	U
96-12-8	1,2-DIBROMO-3-CHLOROPROPANE	10	U

1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO

VBLKDT

Lab Name: NUS-LSG Contract: _____

Lab Code: HNUS Case No.: TNK SAS No.: _____ SDG No.: PKG6

Matrix: (soil/water) WATER Lab Sample ID: VBLKDT

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: DVB02139202

Level: (low/med) LOW Date Received: _____

% Moisture: not dec. ____ Date Analyzed: 02/13/92

Column Type: (Pack/Cap/Wide) CAP Dilution Factor: 1.0

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND	Q
74-87-3	CHLOROMETHANE	10 U
74-83-9	BROMOMETHANE	10 U
75-01-4	VINYL CHLORIDE	10 U
75-00-3	CHLOROETHANE	10 U
75-09-2	METHYLENE CHLORIDE	5 U
67-64-1	ACETONE	10 U
75-15-0	CARBON DISULFIDE	5 U
75-35-4	1,1-DICHLOROETHENE	5 U
75-34-3	1,1-DICHLOROETHANE	5 U
156-60-5	TRANS-1,2-DICHLOROETHENE	5 U
67-66-3	CHLOROFORM	5 U
107-06-2	1,2-DICHLOROETHANE	5 U
78-93-3	2-BUTANONE	10 U
71-55-6	1,1,1-TRICHLOROETHANE	5 U
56-23-5	CARBON TETRACHLORIDE	5 U
108-05-4	VINYL ACETATE	10 U
75-27-4	BROMODICHLOROMETHANE	5 U
78-87-5	1,2-DICHLOROPROPANE	5 U
10061-01-5	CIS-1,3-DICHLOROPROPENE	5 U
10061-02-6	TRANS-1,3-DICHLOROPROPENE	5 U
79-01-6	TRICHLOROETHENE	5 U
124-48-1	DIBROMOCHLOROMETHANE	5 U
79-00-5	1,1,2-TRICHLOROETHANE	5 U
71-43-2	BENZENE	5 U
10061-02-6	TRANS-1,3-DICHLOROPROPENE	5 U
75-25-2	BROMOFORM	5 U
108-10-1	4-METHYL-2-PENTANONE	10 U

1X

ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

VBLKDT

Lab Name: NUS-LSG Contract: _____

Lab Code: HNUS Case No.: TNK SAS No.: _____ SDG No.: PKG6

Matrix: (soil/water) WATER Lab Sample ID: VBLKDT

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: DVB02139202

Level: (low/med) LOW Date Received: _____

% Moisture: not dec. ____ Date Analyzed: 02/13/92

Column Type: (Pack/Cap/Wide) CAP Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
591-78-6	2-HEXANONE	10	U
127-18-4	TETRACHLOROETHENE	5	U
79-34-5	1,1,2,2-TETRACHLOROETHANE	5	U
108-88-3	TOLUENE	5	U
108-90-7	CHLOROBENZENE	5	U
100-41-4	ETHYLBENZENE	5	U
100-42-5	STYRENE	5	U
1330-20-7	XYLENE (TOTAL)	5	U
1684-42-0	ACROLEIN	100	U
107-13-1	ACRYLONITRILE	100	U
75-71-8	DICHLORODIFLUOROMETHANE	5	U
74-88-4	IODOMETHANE	5	U
74-95-3	METHYLENE BROMIDE	5	U
97-63-2	ETHYL METHYLACRYLATE	10	U
96-18-4	1,2,3-TRICHLOROPROPANE	10	U
110-57-6	1,4-DICHLORO-2-BUTENE (TOTAL)	5	U
75-69-4	TRICHLOROFLUOROMETHANE	5	U
107-05-1	ALLYL CHLORIDE	5	U
126-99-8	CHLOROPRENE	0	U
107-12-0	PROPIONITRILE	10	U
126-98-7	METHACRYLONITRILE	5	U
74-88-4	METHYLMETHACRYLATE	10	U
106-93-4	1,2-DIBROMOETHANE	5	U
630-20-6	1,1,1,2-TETRACHLOROETHANE	10	U
76-01-7	PENTACHLOROETHANE	10	U
96-12-8	1,2-DIBROMO-3-CHLOROPROPANE	10	U

1X

ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

TECSW22Q0002

Lab Name: NUS-LSG Contract: _____

Lab Code: HNUS Case No.: TNK SAS No.: _____ SDG No.: PKG6

Matrix: (soil/water) WATER Lab Sample ID: P189215

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: DVP02139202

Level: (low/med) LOW Date Received: 02/08/92

% Moisture: not dec. ____ Date Analyzed: 02/13/92

Column Type: (Pack/Cap/Wide) CAP Dilution Factor: 1.0

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND	Q
74-87-3	CHLOROMETHANE	10 U
74-83-9	BROMOMETHANE	10 U
75-01-4	VINYL CHLORIDE	10 U
75-00-3	CHLOROETHANE	10 U
75-09-2	METHYLENE CHLORIDE	5 U
67-64-1	ACETONE	10 U
75-15-0	CARBON DISULFIDE	5 U
75-35-4	1,1-DICHLOROETHENE	5 U
75-34-3	1,1-DICHLOROETHANE	5 U
156-60-5	TRANS-1,2-DICHLOROETHENE	5 U
67-66-3	CHLOROFORM	5 U
107-06-2	1,2-DICHLOROETHANE	5 U
78-93-3	2-BUTANONE	10 U
71-55-6	1,1,1-TRICHLOROETHANE	5 U
56-23-5	CARBON TETRACHLORIDE	5 U
108-05-4	VINYL ACETATE	10 U
75-27-4	BROMODICHLOROMETHANE	5 U
78-87-5	1,2-DICHLOROPROPANE	5 U
10061-01-5	CIS-1,3-DICHLOROPROPENE	5 U
10061-02-6	TRANS-1,3-DICHLOROPROPENE	5 U
79-01-6	TRICHLOROETHENE	5 U
124-48-1	DIBROMOCHLOROMETHANE	5 U
79-00-5	1,1,2-TRICHLOROETHANE	5 U
71-43-2	BENZENE	5 U
10061-02-6	TRANS-1,3-DICHLOROPROPENE	5 U
75-25-2	BROMOFORM	5 U
108-10-1	4-METHYL-2-PENTANONE	10 U

1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO

TECSW22(2

Lab Name: NUS-LSG Contract: _____

Lab Code: HNUS Case No.: TNK SAS No.: _____ SDG No.: PKG6

Matrix: (soil/water) WATER Lab Sample ID: P189215

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: DVP02139202

Level: (low/med) LOW Date Received: 02/08/92

% Moisture: not dec. ____ Date Analyzed: 02/13/92

Column Type: (Pack/Cap/Wide) CAP Dilution Factor: 1.0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
591-78-6	2-HEXANONE	10	U
127-18-4	TETRACHLOROETHENE	5	U
79-34-5	1,1,2,2-TETRACHLOROETHANE	5	U
108-88-3	TOLUENE	5	U
108-90-7	CHLOROBENZENE	5	U
100-41-4	ETHYLBENZENE	5	U
100-42-5	STYRENE	5	U
1330-20-7	XYLENE (TOTAL)	5	U
1634-42-0	ACROLEIN	100	U
107-13-1	ACRYLONITRILE	100	U
75-71-8	DICHLORODIFLUOROMETHANE	5	U
74-88-4	IODOMETHANE	5	U
74-95-3	METHYLENE BROMIDE	5	U
97-63-2	ETHYL METHYLACRYLATE	10	U
96-18-4	1,2,3-TRICHLOROPROPANE	10	U
110-57-6	1,4-DICHLORO-2-BUTENE (TOTAL)	5	U
75-69-4	TRICHLOROFLUOROMETHANE	5	U
107-05-1	ALLYL CHLORIDE	5	U
126-99-8	CHLOROPRENE	5	U
107-12-0	PROPIONITRILE	10	U
126-98-7	METHACRYLONITRILE	5	U
74-88-4	METHYLMETHACRYLATE	10	U
106-93-4	1,2-DIBROMOETHANE	5	U
630-20-6	1,1,1,2-TETRACHLOROETHANE	10	U
76-01-7	PENTACHLOROETHANE	10	U
96-12-8	1,2-DIBROMO-3-CHLOROPROPANE	10	U

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1X

ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

TECSW2220002

Lab Name: NUS-LSG Contract: _____

Lab Code: HNUS Case No.: TNK SAS No.: _____ SDG No.: PKG6

Matrix: (soil/water) WATER Lab Sample ID: P189217

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: DVP02139202

Level: (low/med) LOW Date Received: 02/08/92

% Moisture: not dec. ____ Date Analyzed: 02/13/92

Column Type: (Pack/Cap/Wide) CAP Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
74-87-3	CHLOROMETHANE	10	U
74-83-9	BROMOMETHANE	10	U
75-01-4	VINYL CHLORIDE	10	U
75-00-3	CHLOROETHANE	10	U
75-09-2	METHYLENE CHLORIDE	5	U
67-64-1	ACETONE	10	U
75-15-0	CARBON DISULFIDE	5	U
75-35-4	1,1-DICHLOROETHENE	5	U
75-34-3	1,1-DICHLOROETHANE	5	U
156-60-5	TRANS-1,2-DICHLOROETHENE	5	U
67-66-3	CHLOROFORM	5	U
107-06-2	1,2-DICHLOROETHANE	5	U
78-93-3	2-BUTANONE	10	U
71-55-6	1,1,1-TRICHLOROETHANE	5	U
56-23-5	CARBON TETRACHLORIDE	5	U
108-05-4	VINYL ACETATE	10	U
75-27-4	BROMODICHLOROMETHANE	5	U
78-87-5	1,2-DICHLOROPROPANE	5	U
10061-01-5	CIS-1,3-DICHLOROPROPENE	5	U
10061-02-6	TRANS-1,3-DICHLOROPROPENE	5	U
79-01-6	TRICHLOROETHENE	5	U
124-48-1	DIBROMOCHLOROMETHANE	5	U
79-00-5	1,1,2-TRICHLOROETHANE	5	U
71-43-2	BENZENE	5	U
10061-02-6	TRANS-1,3-DICHLOROPROPENE	5	U
75-25-2	BROMOFORM	5	U
108-10-1	4-METHYL-2-PENTANONE	10	U

1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO

TECSW22Z

Lab Name: NUS-LSC Contract: _____

Lab Code: HNUS Case No.: TNK SAS No.: _____ SDG No.: PKG6

Matrix: (soil/water) WATER Lab Sample ID: P189217

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: DVP02139203

Level: (low/med) LOW Date Received: 02/08/92

% Moisture: not dec. ____ Date Analyzed: 02/13/92

Column Type: (Pack/Cap/Wide) CAP Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
591-78-6	2-HEXANONE	10	U
127-18-4	TETRACHLOROETHENE	5	U
79-34-5	1,1,2,2-TETRACHLOROETHANE	5	U
108-88-3	TOLUENE	5	U
108-90-7	CHLOROBENZENE	5	U
100-41-4	ETHYLBENZENE	5	U
100-42-5	STYRENE	5	U
1330-20-7	XYLENE (TOTAL)	5	U
1664-42-0	ACROLEIN	100	U
107-13-1	ACRYLONITRILE	100	U
75-71-8	DICHLORODIFLUOROMETHANE	5	U
74-88-4	IODOMETHANE	5	U
74-95-3	METHYLENE BROMIDE	5	U
97-63-2	ETHYL METHYLACRYLATE	10	U
96-18-4	1,2,3-TRICHLOROPROPANE	10	U
110-57-6	1,4-DICHLORO-2-BUTENE (TOTAL)	5	U
75-69-4	TRICHLOROFLUOROMETHANE	5	U
107-05-1	ALLYL CHLORIDE	5	U
126-99-8	CHLOROPRENE	0	U
107-12-0	PROPIONITRILE	10	U
126-98-7	METHACRYLONITRILE	5	U
74-88-4	METHYLMETHACRYLATE	10	U
106-93-4	1,2-DIBROMOETHANE	5	U
630-20-6	1,1,1,2-TETRACHLOROETHANE	10	U
76-01-7	PENTACHLOROETHANE	10	U
96-12-8	1,2-DIBROMO-3-CHLOROPROPANE	10	U

1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

SBLKAF

Lab Name: NUS-LSG Contract: _____

Lab Code: NUS Case No.: TNK SAS No.: _____ SDG No.: PKG6

Matrix: (soil/water) WATER Lab Sample ID: SBLKAF

Sample wt/vol: 1000 (g/mL) ML Lab File ID: ABB03059203

Level: (low/med) LOW Date Received: _____

% Moisture: not dec. ____ dec. ____ Date Extracted: 02/07/92

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 03/05/92

GPC Cleanup: (Y/N) N pH: ____ Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
62-75-9	N-NITROSODIMETHYLAMINE	10	U
108-95-2	PHENOL	10	U
62-53-3	ANILINE	10	U
111-44-4	BIS(2-CHLOROETHYL)ETHER	10	U
95-57-8	2-CHLOROPHENOL	10	U
541-73-1	1,3-DICHLOROBENZENE	10	U
106-46-7	1,4-DICHLOROBENZENE	10	U
100-51-6	BENZYL ALCOHOL	10	U
95-50-1	1,2-DICHLOROBENZENE	10	U
95-48-7	2-METHYLPHENOL	10	U
39638-32-9	BIS(2-CHLOROISOPROPYL)ETHER	10	U
106-44-5	4-METHYLPHENOL	10	U
621-64-7	N-NITROSO-DI-N-PROPYLAMINE	10	U
67-72-1	HEXACHLOROETHANE	10	U
98-95-3	NITROBENZENE	10	U
78-59-1	ISOPHORONE	10	U
88-75-5	2-NITROPHENOL	10	U
105-67-9	2,4-DIMETHYLPHENOL	10	U
111-91-1	BIS(2-CHLOROETHOXY)METHANE	10	U
120-83-2	2,4-DICHLOROPHENOL	10	U
120-82-1	1,2,4-TRICHLOROBENZENE	10	U
91-20-3	NAPHTHALENE	10	U
106-47-8	4-CHLOROANILINE	10	U
87-68-3	HEXACHLOROBUTADIENE	10	U
59-50-7	4-CHLORO-3-METHYLPHENOL	10	U
91-57-6	2-METHYLNAPHTHALENE	10	U

1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

SBLKAF

Lab Name: NUS-LSG Contract: _____

Lab Code: NUS Case No.: TNK SAS No.: _____ SDG No.: PKG6

Matrix: (soil/water) WATER Lab Sample ID: SBLKAF

Sample wt/vol: 1000 (g/mL) ML Lab File ID: ABB03059203

Level: (low/med) LOW Date Received: _____

% Moisture: not dec. ____ dec. ____ Date Extracted: 02/07/92

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 03/05/92

GPC Cleanup: (Y/N) N pH: ____ Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
77-47-4	HEXACHLOROCYCLOPENTADIENE	10	U
88-06-2	2,4,6-TRICHLOROPHENOL	10	U
95-95-4	2,4,5-TRICHLOROPHENOL	50	U
91-58-7	2-CHLORONAPHTHALENE	10	U
88-74-4	2-NITROANILINE	50	U
131-11-3	DIMETHYLPHTHALATE	10	U
208-96-8	ACENAPHTHYLENE	10	U
606-20-2	2,6-DINITRITOLUENE	10	U
99-09-2	3-NITROANILINE	50	U
83-32-9	ACENAPHTHENE	10	U
51-28-5	2,4-DINITROPHENOL	50	U
100-02-7	4-NITROPHENOL	50	U
132-64-9	DIBENZOFURAN	10	U
121-14-2	2,4-DINITROTOLUENE	10	U
84-66-2	DIETHYLPHTHALATE	10	U
7005-72-3	4-CHLOROPHENYL-PHENYLETHER	10	U
86-73-7	FLUORENE	10	U
100-10-6	4-NITROANILINE	50	U
534-52-1	4,6-DINITRO-2-METHYLPHENOL	50	U
86-30-6	N-NITROSODIPHENYLAMINE (1)	10	U
101-55-3	4-BROMOPHENYL-PHENYLETHER	10	U
118-74-1	HEXACHLOROBENZENE	10	U
87-86-5	PENTACHLOROPHENOL	50	U
85-01-8	PHENANTHRENE	10	U
120-12-7	ANTHRACENE	10	U
84-74-2	DI-N-BUTYLPHTHALATE	10	U

1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

SBLKAF

Lab Name: NUS-LSG Contract: _____

Lab Code: NUS Case No.: TNK SAS No.: _____ SDG No.: PKG6

Matrix: (soil/water) WATER Lab Sample ID: SBLKAF

Sample wt/vol: 1000 (g/mL) ML Lab File ID: ABB03059203

Level: (low/med) LOW Date Received: _____

% Moisture: not dec. ____ dec. ____ Date Extracted: 02/07/92

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 03/05/92

GPC Cleanup: (Y/N) N pH: ____ Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
206-44-0	FLUORANTHENE	10	U
129-00-0	PYRENE	10	U
85-68-7	BUTYLBENZYLPHTHALATE	10	U
91-94-1	3,3'-DICHLOROBENZIDINE	20	U
56-55-3	BENZO(A)ANTHRACENE	10	U
218-01-9	CHRYSENE	10	U
117-81-7	BIS(2-ETHYLHEXYL)PHTHALATE	10	U
117-84-0	DI-N-OCTYL PHTHALATE	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
58-90-2	2,3,4,6-TETRACHLOROPHENOL	10	U
109-06-8	2-PICOLINE	10	U
62-50-0	METHANESULFONIC ACID, ETHYL E	10	U
100-75-4	N-NITROSOPIPERIDINE	20	U
87-65-0	2,6-DICHLOROPHENOL	10	U
924-16-3	NITROSO-DI-N-BUTYLAMINE	10	U
66-27-3	METHANESULFONIC ACID, METHYL	10	U
98-86-2	ACETOPHENONE	10	U
122-09-8	A,A-DIMETHYLPHENETHYLAMINE	10	U
608-93-5	PENTACHLOROBENZENE	10	U
92-67-1	4-AMINOBIPHENYL	10	U
60-11-7	P-DIMETHYLAMINOAZOBENZENE	10	U

1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

SBLKAF

Lab Name: NUS-LSG Contract: _____

Lab Code: NUS Case No.: TNK SAS No.: _____ SDG No.: PKG6

Matrix: (soil/water) WATER Lab Sample ID: SBLKAF

Sample wt/vol: 1000 (g/mL) ML Lab File ID: ABB03059203

Level: (low/med) LOW Date Received: _____

% Moisture: not dec. ____ dec. ____ Date Extracted: 02/07/92

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 03/05/92

GPC Cleanup: (Y/N) N pH: ____ Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
57-97-6	7,12-DIMETHYLBENZ(A)ANTHRACEN	50	U
95-94-3	1,2,4,5-TETRACHLOROBENZENE	10	U
122-39-4	DIPHENYLAMINE	10	U
62-44-2	PHENACETIN	10	U
56-49-5	3-METHYLCHOLANTHRENE	10	U
23950-58-5	PRONAMIDE	10	U
91-59-8	2-NAPHTHALENEAMINE	10	U
106-50-3	P-PHENYLENEDIAMINE	50	U
120-58-1	ISOSAFROLE	10	U
99-55-8	5-NITRO-O-TOLUIDINE	10	U
56-57-5	4-NITROQUINOLINE 1-OXIDE	50	U
91-80-5	METHYAPYRILENE	10	U
781-73-7	2-ACETYLAMINOFLUORENE	10	U
10595-95-6	N-NITROSOMETHYLETHYLAMINE	10	U
55-18-5	N-NITROSODIETHYLAMINE	10	U
930-55-2	N-NITROSOPYRROLIDINE	10	U
59-89-2	N-NITROSOMORPHOLINE	10	U
95-53-4	O-TOLUIDINE	10	U
1981-0-0	0,0,0-TRIETHYLPHOSPHOROTHIOAT	50	U
94-59-7	SAFROLE	10	U
130-15-4	1,4-NAPHTHOQUINONE	50	U
99-35-4	SYM-TRINITROBENZENE	50	U
1888-71-7	HEXACHLOROPROPENE	50	U
99-65-0	M-DINITROBENZENE	20	U
612-82-8	3,3'-DIMETHYLBENZIDINE	0	U
70-30-4	HEXACHLOROPHENE	1000	U

HALLIBURTON NUS
Environmental Corporation

INTERNAL CORRESPONDENCE

C-49-3-2-324

TO: PHILLIP OTTINGER

DATE: MARCH 26, 1992

FROM: KENT WEAVER

COPIES: D. A. SCHEIB

SUBJECT: ORGANIC DATA VALIDATION - VOA/BNA/PEST/PCBs
TINKER AIR FORCE BASE
CASE NO. TNK, SDG PKG6

SAMPLES:

Waters:

TCC-SW06-W0002	TCC-SW15-W0002	TCC-SWB1-W0002
TCC-SWB2-W0002	TEC-SW22-W0002	TEC-SW24-W0002
TKC-SW01-C0002	TKC-SW01-W0002	TKC-SW05-W0002

Waters:

T-TBW2-020592	T-TBW3-020692	T-TBW4-020992
KC-TBW1-020492		

HALLIBURTON NUS Laboratories analyzed 9 water samples (including one field duplicate pair) and 4 trip blanks for modified Target Compound List (TCL) volatile organic compounds. Nine of these samples were also analyzed for semivolatile and pesticide/PCB organic compounds.

The data for these analyses were reviewed with reference to the EPA "Functional Guidelines for Organic Data Validation" and the Hazardous Waste Remedial Action Program's (HAZWRAP) "Requirements for Quality Control of Analytical Data". The analyses were conducted under HAZWRAP Level C QA/QC criteria and were evaluated according to the following parameters:

- Data Completeness
- Holding times
- GC/MS tuning and mass calibration
- * Calibrations
- * Laboratory and field blanks
- Internal standards
- Surrogate spike recoveries
- * Matrix spike/matrix spike duplicate results
- * Field duplicate precision
- Detection limits
- Sample quantitation

The symbol (*) indicates that quality control criteria were not met for this parameter. Problems affecting data usability are discussed below and the attached Table 1 summarizes the validation qualifications.

Volatile Fraction

A continuing calibration Relative Response Factor (RRF) for trans-1,4-dichloro-2-butene was below the 0.050 quality control limit. Nondetects for this compound in the affected samples are considered unreliable and are qualified as rejected, "R".

An initial calibration Percent Relative Standard Deviation (%RSD) for trans-1,4-dichloro-2-butene exceeded the 30% quality control limit. No action was taken as no positive results were reported for this compound in affected samples.

Some continuing calibration Percent Differences (%Ds) for acetone, iodomethane, allyl chloride, methylene bromide, trans-1,4-dichloro-2-butene, 4-methyl-2-pentanone, and dichlorodifluoromethane exceeded 50%. No action was taken for trans-1,4-dichloro-2-butene because affected nondetects for this compound have been rejected based on non-compliant response factors. Nondetects for the other compounds in affected samples have been qualified as estimated, "UJ". No positive results were reported.

Continuing calibration %Ds for several compounds exceeded the 25% quality control criterion. No actions were taken because no positive results were reported for these compounds in affected samples.

The following contaminants were detected in low level trip and/or laboratory blank analyses in the maximum concentrations shown below:

Other Contaminants	Maximum Concentration (ug/l)
2-hexanone	3
acrylonitrile	8

Action levels five times the maximum amount of the other contaminants detected were used to evaluate the data. No actions were taken for 2-hexanone and acrylonitrile because no positive results were reported for these compounds in any sample.

The positive result for xylene (total) in sample TKC-SW05-W0002 has been qualified as estimated, "J", because it is reported at a concentration below the CRQL.

Semivolatile Fraction

An initial calibration %RSD for A,A-dimethylphenethylamine exceeded 50%. Nondetects for this compound in affected samples have been qualified as estimated, "UJ". No positive results were reported.

Some continuing calibration %Ds for A,A-dimethylphenethylamine and 4-nitrophenol exceeded 50%. Non detects for these compounds in affected samples have been qualified as estimated, "UJ". No positive results were reported for these compounds.

Continuing calibration %Ds for several compounds exceeded the 25% quality control criterion. No actions were taken because no positive results were reported for these compounds in affected samples.

The Relative Percent Difference (RPD) for di-n-octylphthalate exceeded the 30% quality control criteria for the water field duplicate pair (TKC-SW01-C0002, TKC-SW01-W0002). The positive result and nondetect for this compound in the field duplicate pair samples are qualified as estimated, "J or UJ".

The positive result for bis(2-ethylhexyl)phthalate in sample TKC-SW01-W0002 is qualified as estimated, "J", because it is below the CRQL.

Pesticide/PCB Fraction

The Pesticide/PCB Standard retention times for heptachlor epoxide and endosulfan II were outside their respective retention time windows. No actions were taken as no positive results were reported for these compounds in affected samples.

Some Matrix Spike/Matrix Spike Duplicate Percent Recoveries (%Rs) for aldrin and 4,4'-DDT exceeded the upper quality control limits. No actions were taken as no positive results were reported for these compounds in the unspiked sample.

Additional Comments

No qualifications were made to samples T-TBW2-020592, T-TBW3-020692, T-TBW4-020992, and KC-TBW1-0204921 because these samples are trip blanks which are not qualified for any occurrence according to HAZWRAP data validation protocol.

TINKER AIR FORCE BASE
CASE NO. TNK, SDG PKG6

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.	Volatile	Semivolatile	Pest/PCB
TCC-SW06-W0002	J[2] R[1]	J[6]	
TCC-SW15-W0002	J[2] R[1]	J[6]	
TCC-SWB1-W0002	J[4]	J[5]	
TCC-SWB2-W0002	J[4]	J[5]	
TEC-SW22-W0002	J[4]		
TEC-SW24-W0002	J[4]	J[5]	
TKC-SW01-C0002	J[1]	J[6,8]	
TKC-SW01-W0002	J[1]	J[6,7,8]	
TKC-SW05-W0002	J[3,7]	J[6]	

J[1] - Estimate "UJ" nondetects for acetone, iodomethane, and allyl chloride due to continuing calibration %Ds > 50.

J[2] - Estimate "UJ" nondetects for methylene bromide, iodomethane, and allyl chloride due to continuing calibration %Ds > 50.

J[3] - Estimate "UJ" nondetect for 4-methyl-2-pentanone due to continuing calibration %D > 50.

J[4] - Estimate "UJ" nondetect for dichlorodifluoromethane due to continuing calibration %D > 50.

J[5] - Estimate "UJ" nondetects for 4-nitrophenol and A,A-dimethylphenethylamine due to continuing calibration %Ds > 50.

J[6] - Estimate "UJ" nondetect for A,A-dimethylphenethylamine due to initial calibration %RSD > 50.

F-6

SURFACE WATER SAMPLE DATA VALIDATION SUMMARIES - MAY 1992

HALLIBURTON NUS
Environmental Corporation

INTERNAL CORRESPONDENC

C-49-2-6-228

TO: PHIL OTTINGER

DATE: JUNE 22, 1992

FROM: KAREN M. SMECKER

CC: D. A. SCHEIB

SUBJECT: INORGANIC DATA VALIDATION - SELECTED TAL METALS & CYANIDE
TINKER AIR FORCE BASE
CASE NO. TNK, SDG PKG8

SAMPLES:

Water:

TCC-

SW06-W-0003 SW06-C-0003 SW15-W-0003

TEC-SW22A-W-0003

TKC-SW01-W-0003

HALLIBURTON NUS Laboratories analyzed 5 water samples (including one field duplicate pair) for all of the Target Analyte List (TAL) metals and cyanide with the exception of aluminum, calcium, iron, magnesium, manganese, potassium and sodium. No field quality control blanks were analyzed under this sample set.

Data for these analyses were reviewed with reference to the EPA "Functional Guidelines for Inorganic Data Validation" and the Hazardous Waste Remedial Action Program's (HAZWRAP) "Requirements for Quality Control of Analytical Data". The analyses were conducted under Level C QA/QC criteria and were evaluated according to the following parameters:

- o Data Completeness
- o Holding Times
- * o Calibration Verification
- * o Laboratory Blank Analyses
- o ICP Interference Check Sample Results
- * o Matrix Spike Recoveries
- * o Laboratory Duplicates
- o Field Duplicate Precision
- * o Furnace Atomic Absorption Results
- o ICP Serial Dilution Results
- o Detection Limits

The symbol (*) indicates that quality control criteria were not met for this parameter. A Level C data package does not contain raw data, consequently, the sample data were not evaluated for sample quantitations, duplicate injections for graphite furnace analytes

Matrix Spike Recoveries

The Matrix Spike (MS) %R for thallium (55.2%) fell below the 75% lower quality control criterion. Thallium nondetects are qualified as estimated, "UJ"; no positive results were reported.

The MS %R for mercury (138.0%) was high (> 125%). No positive results were reported for this analyte, therefore, no actions were necessary.

Laboratory Duplicates

Relative Percent Differences (RPDs) for lead and cadmium exceeded the 20% aqueous quality control limit, thereby, indicating laboratory duplicate imprecision. Cadmium nondetects are qualified as estimated, "UJ"; no nondetects were reported for lead. Positive results for both analytes are qualified on the basis of blank contamination, thus, no further actions were needed.

Furnace Atomic Absorption Results

Post Digestion Spike (PDS) %Rs for lead in one sample and thallium in three samples were below the 85% lower quality control limit. Thallium nondetects in the affected samples are qualified as estimated, "UJ". No further action was taken for the positive lead result in the affected sample because this result is qualified due to blank contamination.

Graphite furnace PDS %Rs for lead in one sample and antimony in another sample were greater than the 115% upper quality control criterion. The affected lead result is qualified because of blank contamination, and antimony result in the affected sample is a nondetect; no further actions were necessary.

No other problems were evident in this case.

APPENDIX A

QUALIFIED LABORATORY RESULTS

U.S. EPA - CLP

2B
CRDL STANDARD FOR AA AND ICP

Lab Name: HALLIBURTON_NUS_____ Contract: _____

Lab Code: HNUS__ Case No.: TNK8_ SAS No.: _____ SDG No.: PKG8_

AA CRDL Standard Source: FISHER_____

ICP CRDL Standard Source: FISHER_____

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
					Initial		Final	
	True	Found	%R	True	Found	%R	Found	%R
Aluminum								
Antimony	60.0	66.10	110.2					
Arsenic	10.0	9.60	96.0					
Barium								
Beryllium				10.0	10.00	100.0	13.00	130.
Cadmium				10.0	17.00	170.0	13.00	130.
Calcium								
Chromium				20.0	12.00	60.0	16.00	80.
Cobalt				100.0	103.00	103.0	103.00	103.
Copper				50.0	50.00	100.0	53.00	106.
Iron								
Lead	3.0	3.40	113.3					
Magnesium								
Manganese								
Mercury								
Nickel				80.0	72.00	90.0	78.00	97.
Potassium								
Selenium	5.0	3.70	74.0					
Silver				20.0	19.00	95.0	26.00	130.
Sodium								
Thallium	10.0	10.50	105.0					
Vanadium				100.0	96.00	96.0	102.00	102.
Zinc				40.0	46.00	115.0	50.00	125.

U.S. EPA - CLP

2B
CRDL STANDARD FOR AA AND ICP

Lab Name: HALLIBURTON_NUS_____ Contract: _____

Lab Code: HNUS__ Case No.: TNK8_ SAS No.: _____ SDG No.: PKG8_

AA CRDL Standard Source: FISHER_____

ICP CRDL Standard Source: _____

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
				Initial			Final	
	True	Found	%R	True	Found	%R	Found	%R
Aluminum								
Antimony	60.0	66.50	110.8					
Arsenic								
Barium								
Beryllium								
Cadmium								
Calcium								
Chromium								
Cobalt								
Copper								
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel								
Potassium								
Selenium	5.0	3.80	76.0					
Silver								
Sodium								
Thallium								
Vanadium								
Zinc								

U.S. EPA - CLP

4

ICP INTERFERENCE CHECK SAMPLE

Lab Name: HALLIBURTON_NUS_____ Contract: _____

Lab Code: HNUS__ Case No.: TNK8_ SAS No: _____ SDG No.: PKG8_

ICP ID Number: ARL3560_____ ICS Source: SPEX_____

Concentration Units: ug/L

Analyte	True Sol. A	True Sol. AB	Initial Found Sol. A	Initial Found Sol. AB	Initial Found %R	Final Found Sol. A	Final Found Sol. AB	Final Found %R
Aluminum								
Antimony								
Arsenic								
Barium	0	500	13	499.0	99.8	92	505.0	101.0
Beryllium	0	500	6	475.0	95.0	76	480.0	96.0
Cadmium	0	1000	-5	908.0	90.8	134	922.0	92.2
Calcium								
Chromium	0	500	-5	464.0	92.8	69	467.0	93.4
Cobalt	0	500	6	459.0	91.8	78	463.0	92.6
Copper	0	500	18	507.0	101.4	93	508.0	101.6
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel	0	1000	-28	910.0	91.0	128	910.0	91.0
Potassium								
Selenium								
Silver	0	1000	-40	935.0	93.5	118	939.0	93.9
Sodium								
Thallium								
Vanadium	0	500	9	480.0	96.0	82	487.0	97.4
Zinc	0	1000	7	906.0	90.6	147	925.0	92.5

- Cannot properly evaluate for ICP interferences due to interfe analytes since Al, Ca, Fe & Mg were not analyzed for in the samples.

U.S. EPA - CLP

6
DUPLICATES

EPA SAMPLE NO.

P198731D

Lab Name: HALLIBURTON_NUS Contract: _____

Lab Code: HNUS Case No.: TNK8 SAS No.: _____ SDG No.: PKG8

Matrix (soil/water): WATER Level (low/med): LOW

% Solids for Sample: 0 % Solids for Duplicate: _____

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

	Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
	Aluminum								NR
	Antimony		9.0000	U	9.0000	U			F
	Arsenic		1.8000	B	1.5000	B	18.2		F
	Barium	200.0	850.0000		844.0000		0.7		P
	Beryllium		2.0000	B	1.0000	U	200.0		P
<5λ	Cadmium	5.0	6.0000		5.0000	U	200.0		P
	Calcium								NR
	Chromium		9.0000	U	9.0000	U			P
	Cobalt		7.0000	U	7.0000	U			P
<5λ	Copper		6.0000	B	3.0000	B	66.7		P
	Iron								NR
	Lead	3.0	1.1000	B	12.6000		167.9	*	F
	Magnesium								NR
	Manganese								NR
	Mercury		0.2000	U	0.2000	U			CV
	Nickel		20.0000	U	20.0000	U			P
	Potassium								NR
	Selenium		2.0000	U	2.0000	U			F
	Silver		5.0000	B	5.0000	U	200.0		P
	Sodium								NR
	Thallium		1.0000	U	1.0000	U			F
	Vanadium		7.0000	B	6.0000	U	200.0		P
	Zinc		8.0000	B	6.0000	B	28.6		P
	Cyanide		10.0000	U	10.0000	U			C

U.S. EPA - CLP

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ANALYSIS RUN LOG

Lab Name: HALLIBURTON_NUS_____ Contract: _____

Lab Code: HNUS__ Case No.: TNK8__ SAS No.: _____ SDG No.:PKG8__

Instrument ID Number: PE5100_____ Method: F_

Start Date: 05/28/92 End Date: 05/28/92

EPA Sample No.	D/F	Time	% R	Analytes																					
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V
S0	1.00	0835													X										
S10	1.00	0840													X										
S25	1.00	0845													X										
S40	1.00	0849													X										
ICV	4000.00	0909													X										
ICB	1.00	0910													X										
CRA	1.00	0915													X										
PBW-01	1.00	0936																							
PBW-01A		0941																							
LCSW-01	333.30	0946																							
LCSA-01A		0951																							
P198725	1.00	0955													X										
P198725A	1.00	1011	121.7	TCC-SW06+W-003											X										
CCV	4000.00	1016													X										
CCB	1.00	1021													X										
PBW-01	1.00	1052													X										
PBW-01A	1.00	1057	95.0												X										
LCSW-01	333.30	1101													X										
LCSW-01A	333.30	1106	115.0												X										
P198729	1.00	1112													X										
P198729A	1.00	1117	108.3												X										
P198821	1.00	1123													X										
P198821A	1.00	1128	106.7												X										
P198820	1.00	1133													X										
P198820A	1.00	1138	100.0												X										
CCV	4000.00	1145													X										
CCB	1.00	1150													X										

U.S. EPA - CLP

14

ANALYSIS RUN LOG

Lab Name: HALLIBURTON_NUS_____ Contract: _____

Lab Code: HNUS__ Case No.: TNK8__ SAS No.: _____ SDG No.:PKG8__

Instrument ID Number: PE3030_____ Method: F_

Start Date: 06/02/92 End Date: 06/02/92

EPA Sample No.	D/F	Time	% R	Analytes: AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V
S0	1.00	1300																						X	
S10	1.00	1302																						X	
S20	1.00	1304																						X	
S30	1.00	1307																						X	
ICV	5000.00	1309																						X	
ICB	1.00	1311																						X	
CRA	1.00	1314																						X	
ZZZZZ		1316																							
P198820	1.00	1319																						X	
P198820A	1.00	1321	65.5	TEC-SW22A-W-003																				X	
P198821	1.00	1323																						X	
P198821A	1.00	1326	57.0	TCC-SW10-W-003																				X	
P198731	1.00	1328																						X	
P198731A	1.00	1331	52.5	TCC-SW06-C-003																				X	
P198731D	1.00	1333																						X	
P198731D	1.00	1335	52.0																					X	
P198731S	1.00	1338																						X	
CCV	5000.00	1340																						X	
CCB	1.00	1342																						X	

The symbol (*) indicates that quality control criteria were not met for this parameter. Problems affecting data usability are discussed below and the attached Table 1 summarizes the validation qualifications.

Volatile Fraction

The initial calibration Percent Relative Standard Deviation (%RSD) for pentachloroethane exceeded 50%. Nondetects for this compound have been qualified as estimated, "UJ", in the associated samples. No positive results were reported for this compound.

Continuing calibration Percent Differences (%Ds) for acetone, 1,2-dichloroethane, vinyl acetate, 2-hexanone, dichlorodifluoromethane, and pentachloroethane exceeded 50%. Positive results and nondetects for these compounds in affected samples have been qualified as estimated, "J, UJ", respectively.

Continuing calibration %Ds for several compounds exceeded the 25% quality control criterion. No actions were taken because no positive results were reported for these compounds in affected samples.

The following contaminants were detected in low level laboratory blank analyses in the maximum concentrations shown below:

Common Contaminants	Maximum Concentration (ug/l)
2-butanone	8
methylene chloride	5

Action levels ten times the maximum amount of common contaminants detected were used to evaluate the data. Sample contaminant concentrations below the Contract Required Quantitation Limit (CRQL) have been deleted (i.e. the values have been replaced by the CRQL, then qualified "U", undetected). Sample contaminant concentrations above the CRQL and within the action level remain as reported followed by the undetected qualifier, "U".

The matrix spike/matrix spike duplicate (MS/MSD) Percent Recoveries (%Rs) for toluene were below the lower quality control limit. The nondetect for this compound in the unspiked sample (TCC-SW06-C0003) has been qualified as estimated, "UJ".

The MSD %R for pentachlorophenol was below 10%. Also, the RPD for pentachlorophenol exceeded the upper quality control limit. The nondetect for this compound is considered unreliable and qualified as rejected, "R", in the unspiked sample (TCC-SW06-C0003). Additionally, the MS %R for 2,4-dinitrotoluene exceeded the upper quality control limit. No action was taken as no positive result was reported for this compound in the unspiked sample.

Pesticide/PCB Fraction

No problems were noted.

Additional Comments

No qualifications were made to sample T-TBW1-050892 because this samples is a trip blank which is not qualified for any occurrence according to HAZWRAP data validation protocol.

J^7 - Estimate "UJ" nondetects for A,A-dimethylphenethylamine, methapyrilene, n-nitrosomethylethylamine, n-nitrosomorpholine, hexachlorophene, dimethoate, pyridine, 1,3,5-trinitrobenzene and aramite due to continuing calibration %Ds > 50.

R^1 - Reject "R" nondetects for 4-nitroquinoline 1-oxide and hexachloropropene due to initial and/or continuing calibration RRFs < 0.050.

R^2 - Reject, "R", nondetect for pentachlorophenol due to MS/MSD %R < 10%.

APPENDIX B
Support Documentation

5A

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

Lab Name: NUS-LSG Contract: _____

Lab Code: HNUS Case No.: TNK SAS No.: _____ SDG No.: PKG8

Lab File ID: DBF05209201 BFB Injection Date: 05/20/92

Instrument ID: GCMSD BFB Injection Time: 0711

Matrix:(soil/water) WATER Level:(low/med) LOW Column:(pack/cap) CAP

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	29.0
75	30.0 - 60.0% of mass 95	52.4
95	Base peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	6.8
173	Less than 2.0% of mass 174	0.5 (0.8)1
174	Greater than 50.0% of mass 95	63.3
175	5.0 - 9.0% of mass 174	5.2 (8.2)1
176	Greater than 95.0%, but less than 101.0% of mass 174	63.3 (100.0)1
177	5.0 - 9.0% of mass 176	4.4 (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:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD050	VSTD050	DVT05209201	05/20/92	743
02	VBLKDJ	VBLKDJ	DVB05209201	05/20/92	852
03	TKCSW01W0003	P198835	DVP05209201	05/20/92	938
04	TCCSW06W0003	P198836	DVP05209202	05/20/92	1020
05	TCCSW06C0003	P198837	DVP05209203	05/20/92	1101
06	TCCSW05W0003	P198842	DVP05209206	05/20/92	1241
07	TCCSW15W0003	P198841	DVP05209207	05/20/92	1325
08	TECSW22W0003	P198834	DVP05209208	05/20/92	1351
09	TCCSW06Z0003	P198838	DVP05209209	05/20/92	1427
10	TCCSW06Q0003	P198839	DVP05209210	05/20/92	1459
11	TTBW1050892	P198840	DVP05209212	05/20/92	1630

RSD > 50 pentachloroethane - US non

D > 50 acetone - J pos, US non

1,2-dichloroethane
vinyl acetate
2-hexanone
dichlorodifluoromethane
pentachloroethane
US non

D > 25 1,1-dichloroethane
2-butanone
dibromochloromethane
bromoform
acrolein
1,2-dichloroethane-d4
trichlorofluoromethane
1,2,3-trichloropropane
1,4-dichloro-2-butene

propionitrile
1,2-dibromo-3-cl

-no action no positives

FORM V VOA 87 Rev

7A

VOLATILE CONTINUING CALIBRATION CHECK

Lab Name: NUS-LSG Contract:

Lab Code: HNUS Case No.: TNK SAS No.: SDG No.: PKG8

Instrument ID: GCMSD Calibration date: 05/20/92 Time: 743

Lab File ID: DVT05209201 Init. Calib. Date(s): 05/18/92 05/18/92

Matrix:(soil/water) WATER Level:(low/med) LOW Column:(pack/cap) CAP

Min RRF50 for SPCC(#) = 0.300 (0.250 for Bromoform) Max %D for CCC(*) = 25

COMPOUND	RRF	RRF50	%D
CHLOROMETHANE #	2.007	1.741	13.2 #
BROMOMETHANE	1.365	1.243	8.9
VINYL CHLORIDE *	1.977	1.999	-1.1 *
CHLOROETHANE	1.043	0.972	6.8
METHYLENE CHLORIDE	0.817	0.900	-10.2
ACETONE	0.191	0.411	-99.9
CARBON DISULFIDE	1.268	1.494	-17.8
1,1-DICHLOROETHENE *	0.490	0.563	-14.9 *
1,1-DICHLOROETHANE #	1.521	1.912	-25.7 #
TRANS-1,2-DICHLOROETHENE	0.636	0.665	-4.6
CHLOROFORM *	1.703	2.071	-21.6 *
1,2-DICHLOROETHANE	0.962	1.477	-53.5
2-BUTANONE	0.115	0.154	-33.9
1,1,1-TRICHLOROETHANE	0.415	0.435	-4.8
CARBON TETRACHLORIDE	0.297	0.352	-18.5
VINYL ACETATE	0.633	0.950	-50.1
BROMODICHLOROMETHANE	0.542	0.574	-5.9
1,2-DICHLOROPROPANE *	0.360	0.408	-13.3 *
CIS-1,3-DICHLOROPROPENE	0.451	0.513	-13.8
TRICHLOROETHENE	0.282	0.277	1.8
DIBROMOCHLOROMETHANE	0.355	0.470	-32.4
1,1,2-TRICHLOROETHANE	0.298	0.299	-0.3
BENZENE	0.725	0.749	-3.3
TRANS-1,3-DICHLOROPROPENE	0.395	0.459	-16.2
BROMOFORM #	0.300	0.383	-27.7 #
4-METHYL-2-PENTANONE	0.628	0.727	-15.8
2-HEXANONE	0.306	0.470	-53.6
TETRACHLOROETHENE	0.497	0.375	24.6
1,1,2,2-TETRACHLOROETHANE #	0.582	0.666	-14.4 #
TOLUENE *	0.614	0.702	-14.3 *
CHLOROBENZENE #	0.650	0.620	4.6 #
ETHYLBENZENE *	0.330	0.332	-0.6 *
STYRENE	0.691	0.671	2.9
XYLENE (TOTAL)	0.430	0.423	1.6
ACROLEIN	0.061	0.087	-42.6
ACRYLONITRILE	0.313	0.378	-20.8

APPENDIX B
Support Documentation

Modified 3E
WATER PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: RESOURCE ANALYSTS,INC. Contract: HALLIBURTON NUS

Lab Code: Case No.:TINKERAFB SAS No.: SDG No.: 3K92

Matrix Spike - EPA Sample No.: LCS

COMPOUND	SPIKE ADDED (UG/L)	SAMPLE CONCENTRATION (UG/L)	MS CONCENTRATION (UG/L)	MS % REC #	QC LIMI REC
CHLORPYRIFOS/MERPHOS	2.0	0.0	1.8	90	50-1
DEMETON	1.0	0.0	0.82	82	50-1
AZINPHOS METHYL(GUTHION	1.0	0.0	1.2	120	50-1
MALATHION/FENTHION	1.0	0.0	2.0	200 *	50-1
PARATHION	1.0	0.0	7.7	770 *	50-1

COMPOUND	SPIKE ADDED (UG/L)	MSD CONCENTRATION (UG/L)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC
CHLORPYRIFOS/MERPHOS	2.0	1.8	90	0	25	50-1
DEMETON	1.0	0.87	87	6	25	50-1
AZINPHOS METHYL(GUTHION	1.0	1.2	120	0	25	50-1
MALATHION/FENTHION	1.0	1.9	190 *	5	25	50-1
PARATHION	1.0	7.4	740 *	4	25	50-1

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of Advisory QC limits

RPD: 0 out of 5 outside limits
Spike Recovery: 4 out of 10 outside limits

COMMENTS: LCS1PEST (RAI# S-P1850) and LCS2PEST (RAI# S-P1851)

FORM III PEST-1

- Detection limits
- Sample quantitation

The symbol (*) indicates that quality control criteria were not met for this parameter. Problems affecting data usability are discussed below and the attached Table 1 summarizes the validation qualifications.

DATA COMPLETENESS and HOLDING TIMES

No raw data was included with the data package. Holding times could not be evaluated because no date of analysis was included on any of the forms included in the data package.

APPENDIX B

SUPPORT DOCUMENTATION

CLIENT ORIGINAL

HALLIBURTON NUS
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205
800-228-6870

6751-L Engle Road
Cleveland, OH 44113
216-891-4700

June 11, 1992
Report No.: 00000001
Section F Page 1

QUALITY CONTROL REPORT
DUPLICATE AND MATRIX SPIKE DATA

PREP BATCH: 9757 — NUS SAMPLE NO: P0198

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT
I320	Hardness, Total (as CaCO3)	370	380	mg/L	1.6	mg/L	870

PREP BATCH: 9803 — NUS SAMPLE NO: P0198

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT
I610	Solids, Suspended at 103C	< 10	< 20	mg/L		mg/L	

PREP BATCH: 9804 — NUS SAMPLE NO: P0198

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT
I590	Solids, Dissolved at 180C	750	750	mg/L	0.27	mg/L	

PREP BATCH: 9850 — NUS SAMPLE NO: P0198

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT
I023	Alkalinity, Total (as CaCO3)	390	382	mg/L	2.58	mg/L	

PREP BATCH: 9947 — NUS SAMPLE NO: P0198

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT
I120	COD (O2)	14	13.9	mg/L	0	mg/L	

CLIENT ORIGINAL

HALLIBURTON NUS
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205
800-228-6870

6751-L Engle Road
Cleveland, OH 441
216-891-4700

June 11, 1992
Report No.: 00000001
Section H Page 1

QUALITY CONTROL REPORT
MATRIX SPIKE AND MATRIX SPIKE DUPLICATE DATA

PREP BATCH:

NUS SAMPLE NO: P019

TEST	DETERMINATION	MS RESULT	MSD RESULT	UNITS	RPD	MS PCT RECOVERY	MS REC
G130W	2,4,5-TP (Silvex)	0.340	0.346	ug/L	2	68	[illegible]
G130W	2,4-D	4.16	4.16	ug/L	7	83	[illegible]

CLIENT ORIGINAL

HALLIBURTON NUS
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205
800-228-6870

6751-L Engle Road
Cleveland, OH 4413
216-891-4700

Jun
11,
199

Report No.: 00000002
Section D Page 2

QUALITY CONTROL REPORT
LABORATORY CONTROL SAMPLE RECOVERY

TEST CODE	DETERMINATION	PERCENT RECOVERY	ACCEPTANCE LIMITS
	Nickel	DONE	-
	Selenium	DONE	-
	Silver	DONE	-
	Thallium	DONE	-
	Vanadium	DONE	-
	Zinc	DONE	-

BATCH: 10020 SAMPLE ID: Lab Control Sample NUS SAMPLE NO: P0200

R03W	Gross Alpha and Beta		
	Gross Alpha	104	-
	Gross Beta	104	-

CLIENT ORIGINAL

HALLIBURTON NUS
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205
800-228-6870

6751-L Engle Road
Cleveland, OH 4413
216-891-4700

June 11, 1992
Report No.: 00000002
Section E Page 2

QUALITY CONTROL REPORT
METHOD BLANK DATA

TEST CODE	Determination	RESULT	UNITS
	Zinc	DONE	
BATCH: 10020	SAMPLE ID: Method Blank	NUS SAMPLE NO:	P020(
R03W	Gross Alpha and Beta		
	Gross Alpha	< 0.4	pCi/L
	Gross Beta	< 2	pCi/L

APPENDIX B

SUPPORT DOCUMENTATION

ALPHA ANALYTICAL LABORATORIES, Inc.

2700 N.W. 39 Street
Okla. City, Okla. 73112
Ph (405)-948-1979

CHAIN OF CUSTODY RECORD

Package Shipped From: Halliburton Date: 5-7-92
Carrier: Linda Shipping Bill Retained: Yes No
Condition of Package on Receipt: Good
Condition of Custody Seal: Good
Number of Samples Received: 17 Shipping Manifest Attached: Yes No
Purchase Order Number: Project I.D. Tinker AFB #3 [illegible]

Number:	Receiving Sample #:	Description	AAL, Inc. Log #
1		Station #6 1600	920584
2		" #6 1545	585
3		" #6 1530	586
4		" #11 1800	587
5		" #6 1520	588
6		" #20 1715	589
7		" #1 1415	590
8			
9			
10			
11			
12			
13			
14			
15			

(Use Additional Sheets as Needed)

Comments: [illegible] 5/7/92 12 noon

Relinquished	Date: 5-7	Time: 12	Received: [signature]
Relinquished	Date:	Time:	Received:
Relinquished	Date:	Time:	Received:
Relinquished	Date:	Time:	Received:
Relinquished	Date:	Time:	Received:
Relinquished	Date:	Time:	Received:

(Note: If the Seal is Broken or if the Package has Sustained Significant Damage, Contact the Client.)

3C

WATER SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: NUS-LSG Contract: _____

Lab Code: HNUS Case No.: TNK SAS No.: _____ SDG No.: PKG8

Matrix Spike - EPA Sample No.: TCCSW06C0003

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC LIMITS REC.
Phenol	400	0	177	44	12- 89
2-Chlorophenol	400	0	264	66	27-123
1,4-Dichlorobenzene	200	0	143	72	36 97
N-Nitroso-di-n-prop.(1)	200	0	193	96	41 116
1,2,4-Trichlorobenzene	200	0	155	78	39 98
4-Chloro-3-methylphenol	400	0	290	72	23 97
Acenaphthene	200	0	193	96	46-118
4-Nitrophenol	400	0	162	40	10- 80
2,4-Dinitrotoluene	200	0	204	102 *	24- 96
Pentachlorophenol	400	0	82.2	21	9-103
Pyrene	200	0	234	117	26-127

no action ni p

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
Phenol	400	196	49	-11	42	12- 89
2-Chlorophenol	400	290	72	-9	40	27-123
1,4-Dichlorobenzene	200	119	60	18	28	36 97
N-Nitroso-di-n-prop.(1)	200	168	84	13	38	41 116
1,2,4-Trichlorobenzene	200	132	66	17	28	39 98
4-Chloro-3-methylphenol	400	346	86	-18	42	23 97
Acenaphthene	200	168	84	13	31	46-118
4-Nitrophenol	400	185	46	-14	50	10- 80
2,4-Dinitrotoluene	200	172	86	17	38	24- 96
Pentachlorophenol	400	24.6	6 *	111 *	50	9-103
Pyrene	200	197	98	18	31	26-127

"R" non in compliance

(1) N-Nitroso-di-n-propylamine

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: 1 out of 11 outside limits
Spike Recovery: 2 out of 22 outside limits

COMMENTS: CLP,TNK,PKG8,TCCSW06C0003,L,W,P198731,S,EPA,50UL AC/BN
CAP,SEE PARAMETER PAGE INSTRUMENT ID: GCMSA

COMPOUND	RRF	RRF50	%D
TOLUENE-D8	1.230	1.214	1.3
BROMOFLUOROBENZENE	0.650	0.693	-6.6
1,2-DICHLOROETHANE-D4	1.411	2.021	-43.2
TRICHLOROFLUOROMETHANE	0.701	0.995	-41.9
DICHLORODIFLUOROMETHANE	0.584	1.091	-86.8
IODOMETHANE	2.070	2.107	-1.8
METHYLENE BROMIDE	0.515	0.434	15.7
ETHYL METHYLACRYLATE	0.740	0.885	-19.6
1,2,3-TRICHLOROPROPANE	0.627	0.790	-26.0
1,4-DICHLORO-2-BUTENE (TOTA	0.164	0.223	-36.0
ALLYL CHLORIDE	2.146	3.071	-43.1
PROPIONITRILE	0.170	0.226	-32.9
METHACRYLONITRILE	0.542	0.635	-17.2
METHYLMETHACRYLATE	0.359	0.427	-18.9
1,2-DIBROMOETHANE	0.740	0.828	-11.9
1,1,1,2-TETRACHLOROETHANE	0.483	0.498	-3.1
PENTACHLOROETHANE	0.175	0.355	-99.9
1,2-DIBROMO-3-CHLOROPROPANE	0.185	0.249	-34.6

ALPHA ANALYTICAL LABORATORIES, Inc.

2700 N.W. 39 Street
Okla. City, Okla. 73112
Ph (405)-948-1979

CHAIN OF CUSTODY RECORD

Package Shipped From: Tinker / Halliburton Date: 5-8-92
Carrier: Linda Frame Shipping Bill Returned: Yes No
Condition of Package on Receipt: good
Condition of Custody Seal: good
Number of Samples Received: 2 Shipping Manifest Attached: Yes No
Purchase Order Number: Project I.D.

Number:	Receiving Sample #:	Description	AAL Inc. Log #
1		TEC-SW22H-W-0003	920593
2		TCC-SW15W-0003	920594
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

(Use Additional Sheets as Needed)

Comments: Linda Frame

Relinquished	Date: 5-8-92	Time: 1:55	Received: Abby Williams
Relinquished	Date:	Time:	Received:
Relinquished	Date:	Time:	Received:
Relinquished	Date:	Time:	Received:
Relinquished	Date:	Time:	Received:
Relinquished	Date:	Time:	Received:

(Note: If the Seal is Broken or if the Package has Sustained Significant Damage, Contact the Client.)

6B

SEMIVOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: NUS-LSG Contract:

Lab Code: HNUS Case No.: TNK SAS No.: SDG No.: PKG8

Instrument ID: GCMSA Calibration Date(s): 02/25/92 02/25/92

Min $\overline{RRF}$ for SPCC(#) = 0.050 Max %RSD for CCC(*) = 30.0%

LAB FILE ID: RRF20 = ATI02259205 RRF50 = ATI02259201
RRF80 = ATI02259202 RRF120= ATI02259203 RRF160= ATI02259204

COMPOUND	RRF20	RRF50	RRF80	RRF120	RRF160	$\overline{RRF}$	% RSD
P-PHENYLENEDIAMINE	0.051	0.064	0.052	0.051	0.051	0.054	10.6
ISOSAFROLE	0.437	1.692	0.446	0.441	0.444	0.692	80.8
5-NITRO-O-TOLUIDINE	0.328	0.432	0.325	0.291	0.293	0.334	17.2
4-NITROQUINOLINE 1-OXIDE	0.014	0.060	0.035	0.037	0.036	0.036	45.2
METHYPYRILENE	0.451	0.374	0.357	0.357	0.430	0.394	11.1
2-ACETYLAMINOFLUORENE	0.425	0.446	0.415	0.443	0.472	0.440	5.0
N-NITROSOMETHYLETHYLAMINE	0.569	0.637	0.485	0.484	0.503	0.536	12.4
N-NITROSODIETHYLAMINE	0.550	0.644	0.573	0.584	0.576	0.585	6.0
N-NITROSOPYRROLIDINE	0.599	0.620	0.567	0.581	0.555	0.584	4.4
N-NITROSOMORPHOLINE	0.693	0.853	0.664	0.670	0.680	0.712	11.2
O-TOLUIDINE	1.054	2.007	1.057	1.053	1.044	1.243	34.4
0,0,0-TRIETHYLPHOSPHOROTHIO	0.158	0.162	0.160	0.160	0.156	0.159	1.4
SAFROLE	0.452	0.545	0.438	0.460	0.465	0.472	8.9
1,4-NAPHTHOQUINONE	0.253	0.104	0.064	0.042	0.031	0.099	91.5
1,3,5-TRINITROBENZENE	0.149	0.111	0.144	0.145	0.152	0.140	11.9
HEXACHLOROPROPENE	0.028	0.191	0.030	0.029	0.028	0.061	119.0
1,3-DINITROBENZENE	0.182	0.637	0.197	0.197	0.197	0.282	70.4
DIMETHOATE	0.329	0.272	0.281	0.255	0.244	0.276	11.9
DIALLATE	0.415	0.402	0.380	0.349	0.382	0.386	6.5
PYRIDINE	0.953	1.454	0.784	0.107	0.970	0.854	57.0
ARAMITE	0.096	0.036	0.094	0.082	0.075	0.077	31.5
2-SEC-BUTYL-4,6-DINITROPHEN	0.116	0.178	0.136	0.152	0.147	0.146	15.6
M-CRESOL	1.164	2.625	1.158	1.114	1.078	1.428	46.9
PENTACHLORONITROBENZENE	0.066	0.072	0.064	0.072	0.079	0.071	8.3

7B

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: NUS-LSG Contract:

Lab Code: HNUS Case No.: TNK SAS No.: SDG No.: PKG8

Instrument ID: GCMSA Calibration date: 05/19/92 Time: 1528

Lab File ID: ATI05199202 Init. Calib. Date(s): 02/25/92 02/25/92

Min RRF50 for SPCC(#) = 0.050 Max %D for CCC(*) = 25.0%

COMPOUND	$\overline{RRF}$	RRF50	%D
P-PHENYLENEDIAMINE	0.054	0.069	-27.8
ISOSAFROLE	0.692	0.640	7.5
5-NITRO-O-TOLUIDINE	0.334	0.326	2.4
4-NITROQUINOLINE 1-OXIDE	0.036	0.043	-19.4
METHAPYRILENE	0.394	0.160	59.4
2-ACETYLAMINOFLUORENE	0.440	0.359	18.4
N-NITROSOMETHYLETHYLAMINE	0.536	1.064	-98.5
N-NITROSODIETHYLAMINE	0.585	0.763	-30.4
N-NITROSOPYRROLIDINE	0.584	0.443	24.1
N-NITROSOMORPHOLINE	0.712	1.106	-55.3
O-TOLUIDINE	1.243	1.253	-0.8
0,0,0-TRIETHYLPHOSPHOROTHIO	0.159	0.194	-22.0
SAFROLE	0.472	0.452	4.2
1,4-NAPHTHOQUINONE	0.099	0.099	0.0
1,3,5-TRINITROBENZENE	0.140	0.235	-67.9
HEXACHLOROPROPENE	0.061	0.025	59.0
1,3-DINITROBENZENE	0.282	0.268	5.0
HEXACHLOROPHENE	0.004	0.109	-99.9
DIMETHOATE	0.276	0.417	-51.1
DIALLATE	0.386	0.559	-44.8
PYRIDINE	0.854	1.330	-55.7
ARAMITE	0.077	0.156	-99.9
2-SEC-BUTYL-4,6-DINITROPHEN	0.146	0.205	-40.4
M-CRESOL	1.428	1.410	1.3
PENTACHLORONITROBENZENE	0.071	0.079	-11.3

CLIENT ORIGINAL

HALLIBURTON NUS
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205
800-228-6870

6751-L Engle Road
Cleveland, OH 4413
216-891-4700

June 11, 1992
Report No.: 00000002
Section F Page 1

QUALITY CONTROL REPORT
DUPLICATE AND MATRIX SPIKE DATA

PREP BATCH: 9758 — NUS SAMPLE NO: P0198

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT
I390	Nitrate (as N)	0.1	< 0.1	mg/L		mg/L	1.10

PREP BATCH: 9757 — NUS SAMPLE NO: P0198

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT
I320	Hardness, Total (as CaCO3)	370	370	mg/L	0.0	mg/L	870

PREP BATCH: 9822 — NUS SAMPLE NO: P0198

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT
I610	Solids, Suspended at 103C	30	34	mg/L	4	mg/L	

PREP BATCH: 9839 — NUS SAMPLE NO: P0198

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT
I106	Carbon, Organic - Nonpurgeable	6	5.79	mg/L	0.811	mg/L	43.2

PREP BATCH: 9928 — NUS SAMPLE NO: P0198

TEST	DETERMINATION	ORIGINAL RESULT	DUPLICATE RESULT	UNITS	RANGE / RPD	UNITS	MS RESULT
I590	Solids, Dissolved at 180C	440	422	mg/L	5.30	mg/L	

DATA COMPLETENESS

No raw or quality control data was included with the data package. Therefore the data could not be evaluated for the standard data validation criteria.

Pesticide Fraction

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Percent Recoveries (%Rs) for malathion/fenthion and parathion exceeded the upper quality control limits. No actions were taken as no positive results were reported for these compounds in the unspiked sample.

Laboratory Control Spike/Control Spike Duplicate (LCS/LCSD) %Rs for malathion/fenthion and parathion exceeded the upper quality control limits. No actions were taken as no positive results were reported for these compounds in any sample.

APPENDIX G

RISK ASSESSMENT CALCULATIONS

APPENDIX A

HALLIBURTON NUS Environmental Corporation and Subsidiaries			STANDARD CALCULATION SHEET
CLIENT: TINKER AFB	FILE NO.: 3K92-CA05	BY: [illegible]	PAGE 2 OF 2
SUBJECT: Ingestion of Surface Water Contaminants		CHECKED BY: [illegible]	DATE: 4/15/92

Sample Calculations:

for barium @ a concentration of 0.391 mg/L for adult residents (noncarcinogenic)

$$IEX = \frac{(0.391\ mg/L)(2\ L/day)(350\ days/yr)(30\ yr)}{(70\ kg)(365\ days/yr \times 30\ yr)} = 1.1 \times 10^{-2}\ mg/kg/day$$

Hazard Quotient = IEX / Reference Dose

$$= (1.1 \times 10^{-2}\ mg/kg/day) / (5.0 \times 10^{-2}\ mg/kg/day)$$
$$= 2.2 \times 10^{-1}$$

for bis(2-ethylhexyl)phthalate @ a concentration of 0.0055 mg/L for adult residents (carcinogenic)

$$IEX = \frac{(0.0055\ mg/L)(2\ L/day)(350\ days/yr)(30\ yr)}{(70\ kg)(365\ days/yr \times 70\ yr)} = 6.5 \times 10^{-5}\ mg/kg/day$$

Cancer Risk = IEX × Cancer Slope Factor

$$= (6.5 \times 10^{-5}\ mg/kg/day)(1.4 \times 10^{-2}\ kg/day/mg)$$
$$= 9.1 \times 10^{-7}$$

HALLIBURTON NUS Environmental Corporation and Subsidiaries			STANDARD CALCULATION SHEET
CLIENT: INKER AFB	FILE NO.: 3K92-CA05	BY: KMS	PAGE 2 OF 2
SUBJECT: Incidental Ingestion of Surface Water		CHECKED BY: NJS	DATE: 4/15/92

Hazard Quotient = IEX / Reference Dose

$= (1.5 \times 10^{-7}\ mg/kg/day) / (5.0 \times 10^{-2}\ mg/kg/day)$

$= 3.0 \times 10^{-6}$

for bis(2-ethylhexyl)phthalate @ a concentration of 0.0055 mg/L (carcinogenic)

$$IEX = \frac{(0.0055\ mg/L)(0.05\ L/hr)(2.6\ hr/day)(14\ days/yr)(9\ yr)}{(40\ kg)(70\ yr \times 365\ days/yr)}$$

$= 8.8 \times 10^{-8}\ mg/kg/day$

Cancer Risk = IEX × Cancer Slope Factor

$= (8.8 \times 10^{-8}\ mg/kg/day)(1.4 \times 10^{-2}\ kg/day/mg)$

$= 1.2 \times 10^{-9}$

HALLIBURTON NUS Environmental Corporation and Subsidiaries			STANDARD CALCULATION SHEET
CLIENT: Tinker AFB	FILE NO.: 3K92-CA05	BY: [illegible]	PAGE 2 OF 2
SUBJECT: Dermal Contact for Surface Water		CHECKED BY: MJS	DATE: 4/15/92

$$DEX = \frac{(0.0095\ mg/L)(13{,}700\ cm^2)(8.0\times10^{-4}\ cm/hr)(2.6\ hr/day)(14\ day/yr)(9\ yrs)}{(40\ kg)(9\ yr \times 365\ days/yr)(10^3\ cm^3/L)}$$

$$= 2.6\times10^{-7}\ mg/kg/day$$

Hazard Quotient = DEX / Reference Dose

$$= (2.6\times10^{-7}\ mg/kg/day)/(2.0\times10^{-2}\ mg/kg/day)$$
$$= 1.3\times10^{-5}$$

for bis(2-ethylhexyl)phthalate @ a concentration of 0.0055 mg/L (carcinogenic)

$$DEX = \frac{(0.0055\ mg/L)(13{,}700\ cm^2)(8.0\times10^{-4}\ cm/hr)(2.6\ hr/day)(14\ day/yr)(9\ yr)}{(40\ kg)(70\ kg \times 365\ days/yr)(10^3\ cm^3/L)}$$

$$= 1.9\times10^{-8}\ mg/kg/day$$

Cancer Risk = DEX × Cancer Slope Factor

$$= (1.9\times10^{-8}\ mg/kg/day)(1.4\times10^{-2}\ kg/day/mg)$$
$$= 2.7\times10^{-10}$$

HALLIBURTON NUS Environmental Corporation and Subsidiaries			STANDARD CALCULATION SHEET
CLIENT: TINKER AFB	FILE NO.: 3K92-CA05	BY: KMS	PAGE 2 OF 2
SUBJECT: Incidental Ingestion of Sediment		CHECKED BY: RJS	DATE: 4/15/92

$$IEX = \frac{(0.175\ mg/kg)(100\ mg/day)(0.50)(14\ days/yr)(9\ yrs)}{(40\ kg)(365\ days/yr \times 9\ yrs)(10^6)}$$

$$= 8.4 \times 10^{-9}\ mg/kg/day$$

Hazard Quotient = IEX / Reference Dose

$$= (8.4 \times 10^{-9}\ mg/kg/day)/(2.0 \times 10^{-2}\ mg/kg/day)$$
$$= 4.2 \times 10^{-7}$$

for bis(2-ethylhexyl)phthalate (carcinogenic)

$$IEX = \frac{(0.175\ mg/kg)(100\ mg/day)(0.50)(14\ days/yr)(9\ yrs)}{(40\ kg)(365\ days/yr \times 70\ yrs)(10^6\ mg/kg)}$$

$$= 1.1 \times 10^{-9}\ mg/kg/day$$

Cancer Risk = IEX × Cancer Slope Factor

$$= (1.1 \times 10^{-9}\ mg/kg/day)(1.4 \times 10^{-2}\ kg/day/mg)$$
$$= 1.5 \times 10^{-11}$$

HALLIBURTON NUS Environmental Corporation and Subsidiaries		STANDARD CALCULATION SHEET	
CLIENT: Tinker AFB	FILE NO: 3K92-CA05	BY: [illegible]	PAGE 2 OF 2
SUBJECT: Dermal Contact of Sediment		CHECKED BY: [illegible]	DATE: 4/15/92

Sample Calculations:

for pyrene @ a concentration of 0.460 mg/kg (noncarcinogenic)

$$DEX = \frac{(0.460\ mg/L)(8{,}500\ cm^2)(1.45\ mg/cm^2)(0.05)(14\ days/yr)(9\ yr)}{(40\ kg)(365\ days/yr \times 9\ yrs)(10^6\ mg/kg)}$$

$$= 2.7 \times 10^{-7}\ mg/kg/day$$

Hazard Quotient = DEX / Reference Dose

$$= (2.7 \times 10^{-7}\ mg/kg/day)/(3.0 \times 10^{-2}\ mg/kg/day)$$
$$= 9.0 \times 10^{-6}$$

for Aroclor 1260 @ a concentration of 0.167 mg/kg (carcinogenic)

$$DEX = \frac{(0.167\ mg/L)(8{,}500\ cm^2)(1.45\ mg/cm^2)(0.03)(14\ days)(9\ yrs)}{(40\ kg)(365\ days/yr \times 70\ yrs)(10^6\ mg/kg)}$$

$$= 7.6 \times 10^{-9}\ mg/kg/day$$

Cancer Risk = DEX × Cancer Slope Factor

$$= (7.6 \times 10^{-9}\ mg/kg/day)(7.7 \times 10^{0}\ kg/day/mg)$$
$$= 5.9 \times 10^{-8}$$

HALLIBURTON NUS Environmental Corporation and Subsidiaries			STANDARD CALCULATION SHEET
CLIENT: Tinker AFB	FILE NO.: 3K92-CA05	BY: [illegible]	PAGE 2 OF 2
SUBJECT: Calculation of Risks Based on Previously Calculated Risk		CHECKED BY: NHS	DATE: 4/15/92

for barium @ location SD20 based on location SD01 for incidental ingestion while swimming (noncarcinogenic)

$$\frac{HQ_{SD20}}{451\ mg/kg} = \frac{2.0 \times 10^{-3}}{2050\ mg/kg}$$

$$HQ_{SD20} = 4.4 \times 10^{-4}$$

APPENDIX B

TABLE B-1

HAZARD QUOTIENTS
SURFACE WATER EXPOSURES - ADULT RESIDENTS VIA INGESTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA

Chemical	Hazard Quotient(1)								
	Kuhlman Creek						Crutcho Creek		
	SW01	SW02	SW03	SW04	SW05	SW27	SW06	SW07	SW08
Acetone	3.0E-3	NA	NA	NA	2.6E-3	NA	3.6E-3	NA	NA
4-Methyl-2-pentanone	2.9E-3	NA	NA	NA	2.8E-3	NA	3.0E-3	NA	NA
Xylenes	ND	NA	NA	NA	3.8E-5	NA	ND	NA	NA
Bis(2-ethylhexyl)phthalate	7.4E-3	NA	NA	NA	ND	NA	ND	NA	NA
Di-n-octylphthalate	1.2E-2	NA	NA	NA	ND	NA	ND	NA	NA
Chlorpyrifos	1.6E-4	NA	NA	NA	ND	NA	ND	ND	ND
Arsenic	1.3E-1	2.0E-1	ND	2.6E-1	8.2E-2	1.5E-1	2.2E-1	2.4E-1	2.6E-1
Barium	1.5E-1	1.8E-1	1.4E-1	1.3E-1	1.5E-1	2.2E-2	2.3E-1	1.8E-1	2.2E-1
Chromium (III)	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt	3.6E-2	3.4E-2	ND	5.5E-2	ND	ND	2.9E-2	ND	3.2E-2
Copper	ND	ND	ND	ND	6.4E-3	ND	ND	ND	ND
Lead	3.1E-2	1.2E-1	1.5E-1	6.3E-2	1.8E-2	1.1E-1	7.8E-2	6.1E-2	5.1E-2
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	6.6E-4	ND	ND	ND	5.5E-4	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	1.6E-3	ND	ND	ND	1.0E-2	2.5E-3	ND	ND	ND
Total	3.8E-1	5.3E-1	2.9E-1	5.1E-1	2.7E-1	2.8E-1	5.7E-1	4.8E-1	5.5E-1

(1) Calculated as shown in Appendix A.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-1
HAZARD QUOTIENTS
SURFACE WATER EXPOSURES - ADULT RESIDENTS VIA INGESTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE THREE

Chemical	Hazard Quotient(1)						
	Crutcho Creek						
	SW17	SW18	SW19	SW20	SW21	SW25	SW26
Acetone	NA	NA	NA	NA	ND	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	ND	NA	NA
Xylenes	NA	NA	NA	NA	ND	NA	NA
Bis(2-ethylhexyl)phthalate	NA	NA	NA	NA	ND	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	ND	NA	NA
Chlorpyrifos	NA	NA	NA	NA	ND	NA	NA
Arsenic	ND	ND	ND	ND	ND	1.3E-1	ND
Barium	2.1E-1	1.5E-1	2.9E-1	1.7E-1	1.3E-1	8.8E-2	1.2E-1
Chromium (III)	ND	ND	1.4E-4	ND	ND	ND	ND
Cobalt	ND	ND	ND	ND	ND	ND	ND
Copper	ND	8.0E-3	ND	ND	7.5E-3	ND	ND
Lead	5.1E-2	6.3E-2	2.7E-2	ND	4.5E-2	1.1E-1	ND
Mercury	ND	ND	ND	ND	ND	ND	ND
Selenium	ND	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND	ND
Zinc	ND	3.6E-3	ND	4.8E-3	ND	1.7E-3	2.4E-3
Total	2.7E-1	2.3E-1	3.2E-1	1.7E-1	1.9E-1	3.3E-1	1.2E-1

(1) Calculated as shown in Appendix A.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-2

HAZARD QUOTIENTS
SURFACE WATER EXPOSURES - CHILD RESIDENTS VIA INGESTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA

Chemical	Hazard Quotient(1)								
	Kuhlman Creek						Crutcho Creek		
	SW01	SW02	SW03	SW04	SW05	SW27	SW06	SW07	SW08
Acetone	6.9E-3	NA	NA	NA	6.1E-3	NA	8.3E-3	NA	NA
4-Methyl-2-pentanone	6.8E-3	NA	NA	NA	6.6E-3	NA	7.0E-3	NA	NA
Xylenes	ND	NA	NA	NA	9.0E-5	NA	ND	NA	NA
Bis(2-ethylhexyl)phthalate	1.7E-2	NA	NA	NA	ND	NA	ND	NA	NA
Di-n-octylphthalate	2.7E-2	NA	NA	NA	ND	NA	ND	NA	NA
Chlorpyrifos	3.6E-4	NA	NA	NA	ND	NA	ND	NA	NA
Arsenic	3.0E-1	4.7E-1	ND	6.0E-1	1.9E-1	3.4E-1	5.1E-1	5.5E-1	6.0E-1
Barium	3.5E-1	4.1E-1	3.4E-1	3.1E-1	3.4E-1	5.2E-2	5.5E-1	4.3E-1	5.1E-1
Chromium (III)	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt	8.3E-2	7.9E-2	ND	1.3E-1	ND	ND	6.7E-2	ND	7.4E-2
Copper	ND	ND	ND	ND	1.5E-2	ND	ND	ND	ND
Lead	7.3E-2	2.7E-1	3.4E-1	1.5E-1	4.1E-2	2.6E-1	1.8E-1	1.4E-1	1.2E-1
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	1.5E-3	ND	ND	ND	1.3E-3	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	3.1E-3	ND	ND	ND	2.4E-2	5.9E-3	ND	ND	ND
Total	8.9E-1	1.2E+0	6.8E-1	1.2E+0	6.4E-1	6.6E-1	1.3E+0	1.1E+0	1.3E+0

(1) Calculated as shown in Appendix A.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-2
HAZARD QUOTIENTS
SURFACE WATER EXPOSURES - CHILD RESIDENTS VIA INGESTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE THREE

Chemical	Hazard Quotient(1)						
	Crutcho Creek						
	SW17	SW18	SW19	SW20	SW21	SW25	SW26
Acetone	NA	NA	NA	NA	ND	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	ND	NA	NA
Xylenes	NA	NA	NA	NA	ND	NA	NA
Bis(2-ethylhexyl)phthalate	NA	NA	NA	NA	ND	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	ND	NA	NA
Chlorpyrifos	NA	NA	NA	NA	ND	NA	NA
Arsenic	ND	ND	ND	ND	ND	3.0E-1	ND
Barium	5.0E-1	3.6E-1	6.8E-1	3.9E-1	3.1E-1	2.0E-1	2.7E-1
Chromium (III)	ND	ND	3.3E-4	ND	ND	ND	ND
Cobalt	ND	ND	ND	ND	ND	ND	ND
Copper	ND	1.9E-2	ND	ND	1.8E-2	ND	ND
Lead	1.2E-1	1.5E-1	6.4E-2	ND	1.1E-1	2.6E-1	ND
Mercury	ND	ND	ND	ND	ND	ND	ND
Selenium	ND	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND	ND
Zinc	ND	8.5E-3	ND	1.1E-2	ND	4.0E-3	5.5E-3
Total	6.2E-1	5.3E-1	7.4E-1	4.0E-1	4.3E-1	7.6E-1	2.8E-1

(1) Calculated as shown in Appendix A.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-3

HAZARD QUOTIENTS
SURFACE WATER EXPOSURES - ADOLESCENT SWIMMERS VIA INCIDENTAL INGESTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA

Chemical	Hazard Quotient(1)								
	Kuhlman Creek						Crutcho Creek		
	SW01	SW02	SW03	SW04	SW05	SW27	SW06	SW07	SW08
Acetone	1.3E-5	NA	NA	NA	1.2E-5	NA	1.6E-5	NA	NA
4-Methyl-2-pentanone	1.3E-5	NA	NA	NA	1.3E-5	NA	1.4E-4	NA	NA
Xylenes	ND	NA	NA	NA	1.7E-7	NA	ND	NA	NA
Bis(2-ethylhexyl)phthalate	3.4E-5	NA	NA	NA	ND	NA	ND	NA	NA
Di-n-octylphthalate	5.2E-5	NA	NA	NA	ND	NA	ND	NA	NA
Chlorpyrifos	7.1E-7	NA	NA	NA	ND	NA	ND	NA	NA
Arsenic	5.8E-4	9.1E-4	ND	1.2E-3	3.7E-4	6.6E-4	1.0E-3	1.1E-3	1.2E-3
Barium	6.9E-4	8.0E-4	6.6E-4	6.1E-4	6.6E-4	1.0E-4	1.1E-3	8.4E-4	9.8E-4
Chromium (III)	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt	1.6E-4	1.5E-4	ND	2.5E-4	ND	ND	1.3E-4	ND	1.4E-4
Copper	ND	ND	ND	ND	2.9E-5	ND	ND	ND	ND
Lead	1.4E-4	5.3E-4	6.7E-4	2.8E-4	8.0E-5	5.2E-4	3.6E-4	2.8E-4	2.3E-4
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	3.0E-5	ND	ND	ND	2.5E-5	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	6.1E-6	ND	ND	ND	4.7E-5	1.1E-5	ND	ND	ND
Total	1.7E-3	2.4E-3	1.3E-3	2.3E-3	1.2E-3	1.3E-3	2.7E-3	2.2E-3	2.5E-3

(1) Calculated as shown in Appendix A.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-3
HAZARD QUOTIENTS
SURFACE WATER EXPOSURES - ADOLESCENT SWIMMERS VIA INCIDENTAL INGESTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE THREE

Chemical	Hazard Quotient(1)						
	Crutcho Creek						
	SW17	SW18	SW19	SW20	SW21	SW25	SW26
Acetone	NA	NA	NA	NA	ND	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	ND	NA	NA
Xylenes	NA	NA	NA	NA	ND	NA	NA
Bis(2-ethylhexyl)phthalate	NA	NA	NA	NA	ND	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	ND	NA	NA
Chlorpyrifos	NA	NA	NA	NA	ND	NA	NA
Arsenic	ND	ND	ND	ND	ND	5.8E-4	ND
Barium	9.7E-4	7.0E-4	1.3E-3	7.6E-4	6.1E-4	4.0E-4	5.3E-4
Chromium (III)	ND	ND	6.4E-7	ND	ND	ND	ND
Cobalt	ND	ND	ND	ND	ND	ND	ND
Copper	ND	3.6E-5	ND	ND	3.4E-5	ND	ND
Lead	2.3E-4	2.8E-4	1.2E-4	ND	2.0E-4	5.0E-4	ND
Mercury	ND	ND	ND	ND	ND	ND	ND
Selenium	ND	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND	ND
Zinc	ND	1.7E-5	ND	2.2E-5	ND	7.7E-6	1.1E-5
Total	1.2E-3	1.0E-3	1.4E-3	7.8E-4	8.4E-4	1.5E-3	5.4E-4

(1) Calculated as shown in Appendix A.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-4

HAZARD QUOTIENTS
SURFACE WATER EXPOSURES - ADOLESCENT SWIMMERS VIA DERMAL ABSORPTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA

Chemical	Hazard Quotient(1)								
	Kuhlman Creek						Crutcho Creek		
	SW01	SW02	SW03	SW04	SW05	SW27	SW06	SW07	SW08
Acetone	3.7E-6	NA	NA	NA	3.2E-6	NA	4.4E-6	NA	NA
4-Methyl-2-pentanone	3.6E-6	NA	NA	NA	3.6E-6	NA	3.8E-5	NA	NA
Xylenes	ND	NA	NA	NA	4.8E-8	NA	ND	NA	NA
Bis(2-ethylhexyl)phthalate	9.2E-6	NA	NA	NA	ND	NA	ND	NA	NA
Di-n-octylphthalate	1.4E-5	NA	NA	NA	ND	NA	ND	NA	NA
Chlorpyrifos	1.9E-7	NA	NA	NA	ND	NA	ND	NA	NA
Arsenic	1.6E-4	2.5E-4	ND	3.2E-4	1.0E-4	1.8E-4	2.7E-4	3.0E-4	3.2E-4
Barium	1.9E-4	2.2E-4	1.8E-4	1.7E-4	1.8E-4	2.8E-5	2.9E-4	2.3E-4	2.7E-4
Chromium (III)	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt	4.4E-5	4.2E-5	ND	6.9E-5	ND	ND	3.6E-5	ND	4.0E-5
Copper	ND	ND	ND	ND	8.0E-6	ND	ND	ND	ND
Lead	3.9E-5	1.4E-4	1.8E-4	7.8E-5	2.2E-5	1.4E-4	9.8E-5	7.6E-5	6.3E-5
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	8.2E-6	ND	ND	ND	6.8E-6	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	1.7E-6	ND	ND	ND	1.3E-5	3.1E-6	ND	ND	ND
Total	4.7E-4	6.6E-4	3.6E-4	6.3E-4	3.4E-4	3.5E-4	7.4E-4	6.0E-4	6.9E-4

(1) Calculated as shown in Appendix A.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-4
HAZARD QUOTIENTS
SURFACE WATER EXPOSURES - ADOLESCENT SWIMMERS VIA DERMAL ABSORPTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE THREE

Chemical	Hazard Quotient(1)						
	Crutcho Creek						
	SW17	SW18	SW19	SW20	SW21	SW25	SW26
Acetone	NA	NA	NA	NA	ND	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	ND	NA	NA
Xylenes	NA	NA	NA	NA	ND	NA	NA
Bis(2-ethylhexyl)phthalate	NA	NA	NA	NA	ND	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	ND	NA	NA
Chlorpyrifos	NA	NA	NA	NA	ND	NA	NA
Arsenic	ND	ND	ND	ND	ND	1.6E-4	ND
Barium	2.7E-4	1.9E-4	3.6E-4	2.1E-4	1.7E-4	1.1E-4	1.4E-4
Chromium (III)	ND	ND	1.7E-7	ND	ND	ND	ND
Cobalt	ND	ND	ND	ND	ND	ND	ND
Copper	ND	1.0E-5	ND	ND	9.4E-6	ND	ND
Lead	6.3E-5	7.8E-5	3.4E-5	ND	5.6E-5	1.4E-4	ND
Mercury	ND	ND	ND	ND	ND	ND	ND
Selenium	ND	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND	ND
Zinc	ND	4.5E-6	ND	6.0E-6	ND	2.1E-6	3.0E-6
Total	3.3E-4	2.8E-4	4.0E-4	2.1E-4	2.3E-4	4.1E-4	1.5E-4

(1) Calculated as shown in Appendix A.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-4
HAZARD QUOTIENTS
SURFACE WATER EXPOSURES - ADOLESCENT SWIMMERS VIA DERMAL ABSORPTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE FOUR

Chemical	Hazard Quotient(1)		
	Elm Creek		
	SW22	SW23	SW24
Acetone	3.2E-6	ND	ND
4-Methyl-2-pentanone	3.9E-6	ND	ND
Xylenes	ND	ND	ND
Bis(2-ethylhexyl)phthalate	ND	ND	ND
Di-n-octylphthalate	ND	ND	ND
Chlorpyrifos	ND	ND	ND
Arsenic	9.5E-5	1.1E-4	1.4E-4
Barium	1.7E-4	1.9E-4	1.9E-4
Chromium (III)	ND	ND	ND
Cobalt	4.7E-5	ND	ND
Copper	ND2	1.4E-5	9.9E-6
Lead	5.6E-5	ND	2.7E-5
Mercury	ND	ND	ND
Selenium	ND	ND	ND
Vanadium	4.2E-5	ND	ND
Zinc	1.4E-6	1.7E-5	1.9E-6
Total	4.2E-4	3.3E-4	3.8E-4

(1) Calculated as shown in Appendix A.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-5

HAZARD QUOTIENTS
SURFACE WATER EXPOSURES - ADULT FISHERMEN VIA INGESTION OF FISH
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA

Chemical	Hazard Quotient(1)								
	Kuhlman Creek						Crutcho Creek		
	SW01	SW02	SW03	SW04	SW05	SW27	SW06	SW07	SW08
Acetone	1.3E-5	NA	NA	NA	1.1E-5	NA	1.5E-5	NA	NA
4-Methyl-2-pentanone	2.1E-4	NA	NA	NA	2.1E-4	NA	2.2E-4	NA	NA
Xylenes	ND	NA	NA	NA	8.1E-5	NA	ND	NA	NA
Bis(2-ethylhexyl)phthalate	1.4E-2	NA	NA	NA	ND	NA	ND	NA	NA
Di-n-octylphthalate	1.4E-4	NA	NA	NA	ND	NA	ND	NA	NA
Chlorpyrifos	1.0E-3	NA	NA	NA	ND	NA	ND	NA	NA
Arsenic	1.2E-1	1.2E-1	ND	1.6E-1	5.1E-2	9.1E-2	1.4E-1	1.4E-1	1.5E-1
Barium	2.1E-3	2.5E-3	2.0E-3	1.9E-3	2.1E-3	3.1E-4	3.3E-3	2.6E-3	3.0E-3
Chromium (III)	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt	5.0E-4	4.8E-4	ND	7.8E-4	ND	ND	4.1E-4	ND	4.5E-4
Copper	ND	ND	ND	ND	3.3E-3	ND	ND	ND	ND
Lead	4.4E-4	1.6E-3	2.1E-3	8.8E-4	2.5E-4	1.6E-3	1.1E-3	8.5E-4	7.2E-4
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	4.4E-4	ND	ND	ND	3.7E-4	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	8.9E-4	ND	ND	ND	6.9E-3	1.7E-3	ND	ND	ND
Total	1.6E-1	1.3E-1	4.1E-3	1.6E-1	6.4E-2	9.4E-2	1.4E-1	1.5E-1	1.6E-1

(1) Calculated as shown in Appendix A.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-5
HAZARD QUOTIENTS
SURFACE WATER EXPOSURES - ADULT FISHERMEN VIA INGESTION OF FISH
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE TWO

Chemical	Hazard Quotient(1)							
	Crutcho Creek							
	SW09	SW10	SW11	SW12	SW13	SW14	SW15	SW16
Acetone	NA	NA	ND	NA	NA	NA	1.2E-5	ND
4-Methyl-2-pentanone	NA	NA	ND	NA	NA	NA	2.3E-4	ND
Xylenes	NA	NA	ND	NA	NA	NA	ND	ND
Bis(2-ethylhexyl)phthalate	NA	NA	ND	NA	NA	NA	ND	ND
Di-n-octylphthalate	NA	NA	ND	NA	NA	NA	ND	ND
Chlorpyrifos	NA	NA	ND	NA	NA	NA	ND	ND
Arsenic	1.4E-1	1.3E-1	ND	ND	1.1E-1	ND	8.5E-2	ND
Barium	3.5E-3	2.8E-3	2.6E-3	2.9E-3	3.7E-3	3.0E-3	4.3E-3	4.6E-3
Chromium (III)	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt	ND	5.9E-4	ND	ND	ND	5.8E-4	ND	ND
Copper	ND	ND	ND	ND	ND	ND	ND	ND
Lead	3.3E-4	8.5E-4	7.2E-4	7.2E-4	1.2E-3	1.0E-3	4.7E-4	7.7
Mercury	ND	ND	ND	ND	1.0E-4	ND	ND	ND
Selenium	ND	ND	ND	ND	ND	5.2E-4	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	ND	ND	ND	ND	ND	ND	7.7E-4	ND
Total	1.4E-1	1.3E-1	3.3E-3	3.7E-3	1.2E-1	5.1E-3	9.1E-2	5.3E-3

(1) Calculated as shown in Appendix A.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-5
HAZARD QUOTIENTS
SURFACE WATER EXPOSURES - ADULT FISHERMEN VIA INGESTION OF FISH
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE THREE

Chemical	Hazard Quotient(1)						
	Crutcho Creek						
	SW17	SW18	SW19	SW20	SW21	SW25	SW26
Acetone	NA	NA	NA	NA	ND	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	ND	NA	NA
Xylenes	NA	NA	NA	NA	ND	NA	NA
Bis(2-ethylhexyl)phthalate	NA	NA	NA	NA	ND	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	ND	NA	NA
Chlorpyrifos	NA	NA	NA	NA	ND	NA	NA
Arsenic	ND	ND	ND	ND	ND	7.9E-2	ND
Barium	3.0E-3	2.2E-3	4.1E-3	2.3E-3	1.9E-3	1.2E-3	1.6E-3
Chromium (III)	ND	ND	3.1E-5	ND	ND	ND	ND
Cobalt	ND	ND	ND	ND	ND	ND	ND
Copper	ND	4.1E-3	ND	ND	3.8E-3	ND	ND
Lead	7.2E-4	8.8E-4	3.9E-4	ND	6.3E-4	1.5E-3	ND
Mercury	ND	ND	ND	ND	ND	ND	ND
Selenium	ND	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND	ND
Zinc	ND	2.4E-3	ND	3.2E-3	ND	1.1E-3	1.6E-3
Total	3.7E-3	9.5E-3	4.5E-3	5.6E-3	6.3E-3	8.3E-2	3.2E-3

(1) Calculated as shown in Appendix A.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-5
HAZARD QUOTIENTS
SURFACE WATER EXPOSURES - ADULT FISHERMEN VIA INGESTION OF FISH
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE FOUR

Chemical	Hazard Quotient(1)		
	Elm Creek		
	SW22	SW23	SW24
Acetone	1.1E-5	ND	ND
4-Methyl-2-pentanone	2.3E-4	ND	ND
Xylenes	ND	ND	ND
Bis(2-ethylhexyl)phthalate	ND	ND	ND
Di-n-octylphthalate	ND	ND	ND
Chlorpyrifos	ND	ND	ND
Arsenic	4.7E-2	5.7E-2	7.4E-2
Barium	1.9E-3	2.1E-3	2.2E-3
Chromium (III)	ND	ND	ND
Cobalt	5.3E-4	ND	ND
Copper	ND	5.7E-3	4.0E-3
Lead	6.3E-4	ND	3.0E-4
Mercury	ND	ND	ND
Selenium	ND	ND	ND
Vanadium	4.7E-4	ND	ND
Zinc	7.3E-4	8.8E-3	1.0E-3
Total	5.2E-2	7.3E-2	8.1E-2

(1) Calculated as shown in Appendix A.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-6

HAZARD QUOTIENTS
SEDIMENT EXPOSURES - ADOLESCENT SWIMMERS VIA INCIDENTAL INGESTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA

Chemical	Hazard Quotient(1)							
	Kuhlman Creek					Crutcho Creek		
	SD01	SD02	SD03	SD04	SD05	SD06	SD07	SD08
Di-n-butylphthalate	ND	NA	NA	NA	3.1E-8	1.3E-7	NA	NA
Fluoranthene	7.4E-7	NA	NA	NA	1.9E-7	ND	NA	NA
Pyrene	7.4E-7	NA	NA	NA	3.4E-7	ND	NA	NA
Benzo(a)anthracene	(2)	NA	NA	NA	(2)	ND	NA	NA
Chrysene	(2)	NA	NA	NA	(2)	ND	NA	NA
Bis(2-ethylhexyl)phthalate	4.2E-7	NA	NA	NA	2.9E-7	ND	NA	NA
Benzo(b)fluoranthene	(2)	NA	NA	NA	(2)	ND	NA	NA
Benzo(a)pyrene	(2)	NA	NA	NA	(2)	ND	NA	NA
Indeno(1,2,3-cd)pyrene	(2)	NA	NA	NA	ND	ND	NA	NA
Benzo(g,h,i)perylene	(2)	NA	NA	NA	ND	ND	NA	NA
Aroclor 1260	(2)	NA	NA	NA	NA	ND	NA	NA
4,4'-DDD	ND	NA	NA	NA	ND	ND	NA	NA
Antimony	ND	1.2E-4	ND	ND	ND	ND	ND	ND
Arsenic	1.1E-3	1.9E-4	3.5E-4	2.3E-4	1.3E-3	6.2E-4	4.0E-4	8.2E-4
Barium	1.4E-3	3.7E-4	3.8E-4	2.4E-4	6.3E-4	2.9E-3	5.0E-4	8.2E-4
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	2.9E-4	ND	ND	ND	4.1E-4	7.4E-4	ND	ND
Chromium (III)	1.9E-6	7.7E-7	5.1E-7	7.9E-7	2.8E-6	1.3E-6	1.1E-6	7.0E-7
Copper	2.2E-5	1.2E-5	6.0E-6	1.8E-5	5.3E-5	9.9E-6	8.6E-6	1.1E-5
Lead	2.4E-3	4.9E-4	5.3E-4	2.1E-3	2.6E-3	4.3E-4	3.3E-4	4.3E-4
Manganese	2.5E-4	NA	NA	NA	NA	1.3E-4	NA	NA
Mercury	2.9E-4	9.6E-6	ND	ND	ND	ND	1.8E-5	9.6E-6
Selenium	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	2.3E-4	2.1E-4	1.4E-4	1.2E-4	1.4E-4	2.0E-4	1.4E-4	2.2E-4
Zinc	2.4E-5	1.3E-5	1.1E-5	1.4E-5	3.7E-5	7.0E-6	6.6E-6	9.0E-6
Total	6.1E-3	1.4E-3	1.4E-3	2.8E-3	5.2E-3	5.1E-3	1.4E-3	2.3E-3

(1) Calculated as shown in Appendix A.
(2) No Reference Dose available for this chemical and/or exposure route.
NA Chemical not analyzed.
ND Chemical not detected.

TABLE B-6
HAZARD QUOTIENTS
SEDIMENT EXPOSURES - ADOLESCENT SWIMMERS VIA INCIDENTAL INGESTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE TWO

Chemical	Hazard Quotient(1)							
	Crutcho Creek							
	SD09	SD10	SD11	SD12	SD13	SD14	SD15	SD16
Di-n-butylphthalate	NA	NA	ND	NA	NA	NA	ND	ND
Fluoranthene	NA	NA	ND	NA	NA	NA	ND	ND
Pyrene	NA	NA	ND	NA	NA	NA	ND	ND
Benzo(a)anthracene	NA	NA	ND	NA	NA	NA	ND	ND
Chrysene	NA	NA	ND	NA	NA	NA	ND	ND
Bis(2-ethylhexyl)phthalate	NA	NA	1.8E-7	NA	NA	NA	ND	ND
Benzo(b)fluoranthene	NA	NA	ND	NA	NA	NA	ND	ND
Benzo(a)pyrene	NA	NA	ND	NA	NA	NA	ND	ND
Indeno(1,2,3-cd)pyrene	NA	NA	ND	NA	NA	NA	ND	ND
Benzo(g,h,i)perylene	NA	NA	ND	NA	NA	NA	ND	ND
Aroclor 1260	NA	NA	ND	NA	NA	NA	ND	ND
4,4'-DDD	NA	NA	ND	NA	NA	NA	(2)	ND
Antimony	1.2E-4	1.2E-4	ND	ND	ND	ND	ND	ND
Arsenic	3.8E-4	1.1E-3	1.5E-4	2.2E-3	3.2E-4	5.9E-4	6.1E-4	3.2E-4
Barium	8.1E-4	7.5E-4	4.4E-4	7.3E-4	3.5E-4	6.7E-4	1.2E-3	5.6E-4
Beryllium	ND	ND	ND	ND	9.6E-6	ND	ND	ND
Cadmium	ND	ND	ND	ND	ND	ND	2.7E-4	ND
Chromium (III)	3.9E-7	4.3E-7	3.5E-7	4.5E-7	1.1E-6	3.2E-7	1.1E-5	2.4E-6
Copper	7.8E-6	9.6E-6	ND	8.3E-6	1.2E-5	1.0E-5	2.2E-5	3.8E-6
Lead	1.6E-4	2.9E-4	3.8E-4	7.2E-4	2.6E-4	2.7E-4	1.2E-3	6.5E-4
Manganese	NA	NA	1.6E-4	NA	NA	NA	NA	6.7E-4
Mercury	ND	ND	ND	ND	ND	ND	8.2E-5	ND
Selenium	ND	2.7E-6	ND	ND	ND	ND	ND	ND
Vanadium	1.5E-4	2.1E-4	1.2E-4	3.8E-4	2.7E-4	8.9E-5	3.1E-4	1.5E-4
Zinc	6.0E-6	5.6E-6	6.4E-6	7.0E-6	9.0E-6	4.0E-6	1.5E-5	7.2E-6
Total	1.6E-3	2.5E-3	1.3E-3	4.0E-3	1.2E-3	1.6E-3	3.7E-3	2.4E-3

(1) Calculated as shown in Appendix A.
(2) No Reference Dose available for this chemical and/or exposure route.
NA Chemical not analyzed.
ND Chemical not detected.

TABLE B-6
HAZARD QUOTIENTS
SEDIMENT EXPOSURES - ADOLESCENT SWIMMERS VIA INCIDENTAL INGESTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE THREE

Chemical	Hazard Quotient(1)						
	Crutcho Creek						
	SD17	SD18	SD19	SD20	SD21	SD25	SD26
Di-n-butyl phthalate	NA	NA	NA	ND	NA	NA	NA
Fluoranthene	NA	NA	NA	ND	NA	NA	NA
Pyrene	NA	NA	NA	ND	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	ND	NA	NA	NA
Chrysene	NA	NA	NA	ND	NA	NA	NA
Bis(2-ethylhexyl)phthalate	NA	NA	NA	ND	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	ND	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	ND	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	ND	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	ND	NA	NA	NA
Aroclor 1260	NA	NA	NA	ND	NA	NA	NA
4,4'-DDD	NA	NA	NA	ND	NA	NA	NA
Antimony	ND	ND	ND	ND	ND	1.6E-4	ND
Arsenic	3.2E-4	4.2E-4	5.6E-4	4.0E-4	3.5E-4	6.2E-4	3.5E-4
Barium	4.3E-4	3.8E-4	7.7E-4	3.1E-4	2.1E-4	5.4E-4	4.3E-4
Beryllium	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	ND	ND	ND	ND	ND
Chromium (III)	1.8E-6	1.3E-6	1.7E-6	5.5E-7	8.2E-7	8.1E-7	3.9E-7
Copper	9.7E-6	7.3E-6	1.2E-5	5.5E-6	4.2E-6	2.8E-5	7.8E-6
Lead	6.8E-4	6.1E-4	7.3E-4	2.8E-4	3.6E-4	3.4E-3	1.1E-2
Manganese	NA	NA	NA	NA	1.9E-4	NA	NA
Mercury	ND	ND	ND	ND	ND	ND	ND
Selenium	ND	ND	ND	ND	ND	3.2E-6	ND
Vanadium	1.4E-4	1.4E-4	3.0E-4	1.5E-4	6.0E-5	1.8E-4	1.4E-4
Zinc	7.5E-6	8.9E-6	9.4E-6	8.8E-6	5.7E-6	2.2E-5	1.4E-5
Total	1.6E-3	1.6E-3	2.4E-3	1.2E-3	1.2E-3	5.0E-3	1.2E-2

(1) Calculated as shown in Appendix A.
(2) No Reference Dose available for this chemical and/or exposure route.
NA Chemical not analyzed.
ND Chemical not detected.

TABLE B-6
HAZARD QUOTIENTS
SEDIMENT EXPOSURES - ADOLESCENT SWIMMERS VIA INCIDENTAL INGESTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE FOUR

Chemical	Hazard Quotient(1)		
	Elm Creek		
	SD22	SD23	SD24
Di-n-butylphthalate	ND	NA	ND
Fluoranthene	ND	NA	ND
Pyrene	ND	NA	ND
Benzo(a)anthracene	ND	NA	ND
Chrysene	ND	NA	ND
Bis(2-ethylhexyl)phthalate	ND	NA	ND
Benzo(b)fluoranthene	ND	NA	ND
Benzo(a)pyrene	ND	NA	ND
Indeno(1,2,3-cd)pyrene	ND	NA	ND
Benzo(g,h,i)perylene	ND	NA	ND
Aroclor 1260	ND	NA	ND
4,4'-DDD	ND	NA	ND
Antimony	ND	1.3E-4	1.1E-4
Arsenic	6.7E-4	3.7E-4	9.9E-4
Barium	8.7E-4	3.8E-4	5.5E-4
Beryllium	ND	ND	ND
Cadmium	ND	ND	1.9E-4
Chromium (III)	1.8E-6	1.3E-6	8.9E-6
Copper	1.6E-5	1.3E-5	1.5E-5
Lead	8.5E-4	3.6E-4	7.7E-4
Manganese	2.2E-4	NA	NA
Mercury	1.3E-5	ND	ND
Selenium	ND	ND	ND
Vanadium	4.2E-4	4.3E-4	3.9E-4
Zinc	1.3E-5	1.3E-5	2.2E-5
Total	3.1E-3	1.7E-3	3.0E-3

(1) Calculated as shown in Appendix A.
(2) No Reference Dose available for this chemical and/or exposure route.
NA Chemical not analyzed.
ND Chemical not detected.

TABLE B-7

HAZARD QUOTIENTS
SEDIMENT EXPOSURES - ADOLESCENT SWIMMERS VIA DERMAL ABSORPTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA

Chemical	Hazard Quotient(1)							
	Kuhlman Creek					Crutcho Creek		
	SD01	SD02	SD03	SD04	SD05	SD06	SD07	SD08
Di-n-butylphthalate	ND	NA	NA	NA	2.6E-7	1.1E-6	NA	NA
Fluoranthene	6.3E-6	NA	NA	NA	1.6E-6	ND	NA	NA
Pyrene	6.2E-6	NA	NA	NA	2.9E-6	ND	NA	NA
Benzo(a)anthracene	(2)	NA	NA	NA	(2)	ND	NA	NA
Chrysene	(2)	NA	NA	NA	(2)	ND	NA	NA
Bis(2-ethylhexyl)phthalate	3.6E-6	NA	NA	NA	2.4E-6	ND	NA	NA
Benzo(b)fluoranthene	(2)	NA	NA	NA	(2)	ND	NA	NA
Benzo(a)pyrene	(2)	NA	NA	NA	(2)	ND	NA	NA
Indeno(1,2,3-cd)pyrene	(2)	NA	NA	NA	ND	ND	NA	NA
Benzo(g,h,i)perylene	(2)	NA	NA	NA	ND	ND	NA	NA
Aroclor 1260	(2)	NA	NA	NA	NA	ND	NA	NA
4,4'-DDD	ND	NA	NA	NA	ND	ND	NA	NA
Antimony	ND	(3)	ND	ND	ND	ND	ND	ND
Arsenic	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Barium	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	(3)	ND	ND	ND	(3)	(3)	ND	ND
Chromium (III)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Copper	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Lead	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Manganese	(3)	NA	NA	NA	NA	(3)	NA	NA
Mercury	(3)	(3)	ND	ND	ND	ND	(3)	(3)
Selenium	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Zinc	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Total	1.6E-5	-	-	-	7.2E-6	1.1E-6	-	-

(1) Calculated as shown in Appendix A.
(2) No Reference Dose available for this chemical and/or exposure route.
(3) Not applicable; inorganics in soil assumed not to be dermally absorbed.
NA Chemical not analyzed.
ND Chemical not detected.

TABLE B-7
HAZARD QUOTIENTS
SEDIMENT EXPOSURES - ADOLESCENT SWIMMERS VIA DERMAL ABSORPTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE TWO

Chemical	Hazard Quotient(1)							
	Crutcho Creek							
	SD09	SD10	SD11	SD12	SD13	SD14	SD15	SD16
Di-n-butyl phthalate	NA	NA	ND	NA	NA	NA	ND	ND
Fluoranthene	NA	NA	ND	NA	NA	NA	ND	ND
Pyrene	NA	NA	ND	NA	NA	NA	ND	ND
Benzo(a)anthracene	NA	NA	ND	NA	NA	NA	ND	ND
Chrysene	NA	NA	ND	NA	NA	NA	ND	ND
Bis(2-ethylhexyl)phthalate	NA	NA	1.5E-6	NA	NA	NA	ND	ND
Benzo(b)fluoranthene	NA	NA	ND	NA	NA	NA	ND	ND
Benzo(a)pyrene	NA	NA	ND	NA	NA	NA	ND	ND
Indeno(1,2,3-cd)pyrene	NA	NA	ND	NA	NA	NA	ND	ND
Benzo(g,h,i)perylene	NA	NA	ND	NA	NA	NA	ND	ND
Aroclor 1260	NA	NA	ND	NA	NA	NA	ND	ND
4,4'-DDD	NA	NA	ND	NA	NA	NA	(2)	ND
Antimony	(3)	(3)	ND	ND	ND	ND	ND	ND
Arsenic	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Barium	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Beryllium	ND	ND	ND	ND	(3)	ND	ND	ND
Cadmium	ND	ND	ND	ND	ND	ND	(3)	ND
Chromium (III)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Copper	(3)	(3)	ND	(3)	(3)	(3)	(3)	(3)
Lead	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Manganese	NA	NA	(3)	NA	NA	NA	NA	(3)
Mercury	ND	ND	ND	ND	ND	ND	(3)	ND
Selenium	ND	(3)	ND	ND	ND	ND	ND	ND
Vanadium	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Zinc	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Total	-	-	1.5E-6	-	-	-	-	-

(1) Calculated as shown in Appendix A.
(2) No Reference Dose available for this chemical and/or exposure route.
(3) Not applicable; inorganics in soil assumed not to be dermally absorbed.
NA Chemical not analyzed.
ND Chemical not detected.

TABLE B-7
HAZARD QUOTIENTS
SEDIMENT EXPOSURES - ADOLESCENT SWIMMERS VIA DERMAL ABSORPTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE THREE

Chemical	Hazard Quotient(1)						
	Crutcho Creek						
	SD17	SD18	SD19	SD20	SD21	SD25	SD26
Di-n-butyl phthalate	NA	NA	NA	ND	NA	NA	NA
Fluoranthene	NA	NA	NA	ND	NA	NA	NA
Pyrene	NA	NA	NA	ND	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	ND	NA	NA	NA
Chrysene	NA	NA	NA	ND	NA	NA	NA
Bis(2-ethylhexyl)phthalate	NA	NA	NA	ND	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	ND	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	ND	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	ND	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	ND	NA	NA	NA
Aroclor 1260	NA	NA	NA	ND	NA	NA	NA
4,4'-DDD	NA	NA	NA	ND	NA	NA	NA
Antimony	ND	ND	ND	ND	ND	(3)	ND
Arsenic	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Barium	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Beryllium	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	ND	ND	ND	ND	ND
Chromium (III)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Copper	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Lead	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Manganese	NA	NA	NA	NA	(3)	NA	NA
Mercury	ND	ND	ND	ND	ND	ND	ND
Selenium	ND	ND	ND	ND	ND	(3)	ND
Vanadium	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Zinc	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Total	-	-	-	-	-	-	-

(1) Calculated as shown in Appendix A.
(2) No Reference Dose available for this chemical and/or exposure route.
(3) Not applicable; inorganics in soil assumed not to be dermally absorbed.
NA Chemical not analyzed.
ND Chemical not detected.

TABLE B-7
HAZARD QUOTIENTS
SEDIMENT EXPOSURES - ADOLESCENT SWIMMERS VIA DERMAL ABSORPTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE FOUR

Chemical	Hazard Quotient(1)		
	Elm Creek		
	SD22	SD23	SD24
Di-n-butyl phthalate	ND	NA	ND
Fluoranthene	ND	NA	ND
Pyrene	ND	NA	ND
Benzo(a)anthracene	ND	NA	ND
Chrysene	ND	NA	ND
Bis(2-ethylhexyl)phthalate	ND	NA	ND
Benzo(b)fluoranthene	ND	NA	ND
Benzo(a)pyrene	ND	NA	ND
Indeno(1,2,3-cd)pyrene	ND	NA	ND
Benzo(g,h,i)perylene	ND	NA	ND
Aroclor 1260	ND	NA	ND
4,4'-DDD	ND	NA	ND
Antimony	ND	(3)	(3)
Arsenic	(3)	(3)	(3)
Barium	(3)	(3)	(3)
Beryllium	ND	ND	ND
Cadmium	ND	ND	(3)
Chromium (III)	(3)	(3)	(3)
Copper	(3)	(3)	(3)
Lead	(3)	(3)	(3)
Manganese	(3)	NA	NA
Mercury	(3)	ND	ND
Selenium	ND	ND	ND
Vanadium	(3)	(3)	(3)
Zinc	(3)	(3)	(3)
Total	-	-	-

(1) Calculated as shown in Appendix A.
(2) No Reference Dose available for this chemical and/or exposure route.
(3) Not applicable; inorganics in soil assumed not to be dermally absorbed.
NA Chemical not analyzed.
ND Chemical not detected.

TABLE B-8

INCREMENTAL CANCER RISKS
SURFACE WATER EXPOSURES - ADULT RESDIENTS VIA INGESTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA

Chemical	Incremental Cancer Risk(1)								
	Kuhlman Creek						Crutcho Creek		
	SW01	SW02	SW03	SW04	SW05	SW27	SW06	SW07	SW08
Acetone	(2)	NA	NA	NA	(2)	NA	(2)	NA	NA
4-Methyl-2-pentanone	(2)	NA	NA	NA	(2)	NA	(2)	NA	NA
Xylenes	ND	NA	NA	NA	(2)	NA	ND	NA	NA
Bis(2-ethylhexyl)phthalate	8.9E-7	NA	NA	NA	ND	NA	ND	NA	NA
Di-n-octylphthalate	(2)	NA	NA	NA	ND	NA	ND	NA	NA
Chlorpyrifos	(2)	NA	NA	NA	ND	NA	ND	NA	NA
Arsenic	(2)	(2)	ND	(2)	(2)	(2)	(2)	(2)	(2)
Barium	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Chromium (III)	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt	(2)	(2)	ND	(2)	ND	ND	(2)	ND	(2)
Copper	ND	ND	ND	ND	(2)	ND	ND	ND	ND
Lead	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	(2)	ND	ND	ND	(2)	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	(2)	ND	ND	ND	(2)	(2)	ND	ND	ND
Total	8.9E-7	-	-	-	-	-	-	-	-

(1) Calculated as shown in Appendix A.
(2) No Cancer Slope Factor available for this chemical and/or exposure route.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-8
INCREMENTAL CANCER RISKS
SURFACE WATER EXPOSURES - ADULT RESDIENTS VIA INGESTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE TWO

Chemical	Incremental Cancer Risk(1)							
	Crutcho Creek							
	SW09	SW10	SW11	SW12	SW13	SW14	SW15	SW16
Acetone	NA	NA	ND	NA	NA	NA	(2)	ND
4-Methyl-2-pentanone	NA	NA	ND	NA	NA	NA	(2)	ND
Xylenes	NA	NA	ND	NA	NA	NA	ND	ND
Bis(2-ethylhexyl)phthalate	NA	NA	ND	NA	NA	NA	ND	ND
Di-n-octylphthalate	NA	NA	ND	NA	NA	NA	ND	ND
Chlorpyrifos	NA	NA	ND	NA	NA	NA	ND	ND
Arsenic	(2)	(2)	ND	ND	(2)	ND	(2)	ND
Barium	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Chromium (III)	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt	ND	(2)	ND	ND	ND	(2)	ND	ND
Copper	ND	ND	ND	ND	ND	ND	ND	ND
Lead	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Mercury	ND	ND	ND	ND	(2)	ND	ND	ND
Selenium	ND	ND	ND	ND	ND	(2)	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	ND	ND	ND	ND	ND	ND	(2)	ND
Total	-	-	-	-	-	-	-	-

(1) Calculated as shown in Appendix A.
(2) No Cancer Slope Factor available for this chemical and/or exposure route.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-8
INCREMENTAL CANCER RISKS
SURFACE WATER EXPOSURES - ADULT RESDIENTS VIA INGESTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE THREE

Chemical	Incremental Cancer Risk(1)						
	Crutcho Creek						
	SW17	SW18	SW19	SW20	SW21	SW25	SW26
Acetone	NA	NA	NA	NA	ND	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	ND	NA	NA
Xylenes	NA	NA	NA	NA	ND	NA	NA
Bis(2-ethylhexyl)phthalate	NA	NA	NA	NA	ND	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	ND	NA	NA
Chlorpyrifos	NA	NA	NA	NA	ND	NA	NA
Arsenic	ND	ND	ND	ND	ND	(2)	ND
Barium	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Chromium (III)	ND	ND	(2)	ND	ND	ND	ND
Cobalt	ND	ND	ND	ND	ND	ND	ND
Copper	ND	(2)	ND	ND	(2)	ND	ND
Lead	(2)	(2)	(2)	ND	(2)	(2)	ND
Mercury	ND	ND	ND	ND	ND	ND	ND
Selenium	ND	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND	ND
Zinc	ND	(2)	ND	(2)	ND	(2)	(2)
Total	-	-	-	-	-	-	-

(1) Calculated as shown in Appendix A.
(2) No Cancer Slope Factor available for this chemical and/or exposure route.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-8
INCREMENTAL CANCER RISKS
SURFACE WATER EXPOSURES - ADULT RESDIENTS VIA INGESTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE FOUR

Chemical	Incremental Cancer Risk(1)		
	Elm Creek		
	SW22	SW23	SW24
Acetone	(2)	ND	ND
4-Methyl-2-pentanone	(2)	ND	ND
Xylenes	ND	ND	ND
Bis(2-ethylhexyl)phthalate	ND	ND	ND
Di-n-octylphthalate	ND	ND	ND
Chlorpyrifos	ND	ND	ND
Arsenic	(2)	(2)	(2)
Barium	(2)	(2)	(2)
Chromium (III)	ND	ND	ND
Cobalt	(2)	ND	ND
Copper	ND	(2)	(2)
Lead	(2)	ND	(2)
Mercury	ND	ND	ND
Selenium	ND	ND	ND
Vanadium	(2)	ND	ND
Zinc	(2)	(2)	(2)
Total	-	-	-

(1) Calculated as shown in Appendix A.
(2) No Cancer Slope Factor available for this chemical and/or exposure route.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-9

INCREMENTAL CANCER RISKS
SURFACE WATER EXPOSURES - ADOLESCENT SWIMMERS VIA INCIDENTAL INGESTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA

Chemical	Incremental Cancer Risk(1)								
	Kuhlman Creek						Crutcho Creek		
	SW01	SW02	SW03	SW04	SW05	SW27	SW06	SW07	SW08
Acetone	(2)	NA	NA	NA	(2)	NA	(2)	NA	NA
4-Methyl-2-pentanone	(2)	NA	NA	NA	(2)	NA	(2)	NA	NA
Xylenes	ND	NA	NA	NA	(2)	NA	ND	NA	NA
Bis(2-ethylhexyl)phthalate	1.2E-9	NA	NA	NA	ND	NA	ND	NA	NA
Di-n-octylphthalate	(2)	NA	NA	NA	ND	NA	ND	NA	NA
Chlorpyrifos	(2)	NA	NA	NA	ND	NA	ND	NA	NA
Arsenic	(2)	(2)	ND	(2)	(2)	(2)	(2)	(2)	(2)
Barium	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Chromium (III)	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt	(2)	(2)	ND	(2)	ND	ND	(2)	ND	(2)
Copper	ND	ND	ND	ND	(2)	ND	ND	ND	ND
Lead	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	(2)	ND	ND	ND	(2)	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	(2)	ND	ND	ND	(2)	(2)	ND	ND	ND
Total	1.2E-9	-	-	-	-	-	-	-	-

(1) Calculated as shown in Appendix A.
(2) No Cancer Slope Factor available for this chemical and/or exposure route.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-9
INCREMENTAL CANCER RISKS
SURFACE WATER EXPOSURES - ADOLESCENT SWIMMERS VIA INCIDENTAL INGESTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE TWO

Chemical	Incremental Cancer Risk(1)							
	Crutcho Creek							
	SW09	SW10	SW11	SW12	SW13	SW14	SW15	SW16
Acetone	NA	NA	ND	NA	NA	NA	(2)	ND
4-Methyl-2-pentanone	NA	NA	ND	NA	NA	NA	(2)	ND
Xylenes	NA	NA	ND	NA	NA	NA	ND	ND
Bis(2-ethylhexyl)phthalate	NA	NA	ND	NA	NA	NA	ND	ND
Di-n-octylphthalate	NA	NA	ND	NA	NA	NA	ND	ND
Chlorpyrifos	NA	NA	ND	NA	NA	NA	ND	ND
Arsenic	(2)	(2)	ND	ND	(2)	ND	(2)	ND
Barium	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Chromium (III)	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt	ND	(2)	ND	ND	ND	(2)	ND	ND
Copper	ND	ND	ND	ND	ND	ND	ND	ND
Lead	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Mercury	ND	ND	ND	ND	(2)	ND	ND	ND
Selenium	ND	ND	ND	ND	ND	(2)	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	ND	ND	ND	ND	ND	ND	(2)	ND
Total	-	-	-	-	-	-	-	-

(1) Calculated as shown in Appendix A.
(2) No Cancer Slope Factor available for this chemical and/or exposure route.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-9
INCREMENTAL CANCER RISKS
SURFACE WATER EXPOSURES - ADOLESCENT SWIMMERS VIA INCIDENTAL INGESTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE THREE

Chemical	Incremental Cancer Risk(1)						
	Crutcho Creek						
	SW17	SW18	SW19	SW20	SW21	SW25	SW26
Acetone	NA	NA	NA	NA	ND	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	ND	NA	NA
Xylenes	NA	NA	NA	NA	ND	NA	NA
Bis(2-ethylhexyl)phthalate	NA	NA	NA	NA	ND	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	ND	NA	NA
Chlorpyrifos	NA	NA	NA	NA	ND	NA	NA
Arsenic	ND	ND	ND	ND	ND	(2)	ND
Barium	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Chromium (III)	ND	ND	(2)	ND	ND	ND	ND
Cobalt	ND	ND	ND	ND	ND	ND	ND
Copper	ND	(2)	ND	ND	(2)	ND	ND
Lead	(2)	(2)	(2)	ND	(2)	(2)	ND
Mercury	ND	ND	ND	ND	ND	ND	ND
Selenium	ND	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND	ND
Zinc	ND	(2)	ND	(2)	ND	(2)	(2)
Total	-	-	-	-	-	-	-

(1) Calculated as shown in Appendix A.
(2) No Cancer Slope Factor available for this chemical and/or exposure route.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-9
INCREMENTAL CANCER RISKS
SURFACE WATER EXPOSURES - ADOLESCENT SWIMMERS VIA INCIDENTAL INGESTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE FOUR

Chemical	Incremental Cancer Risk(1)		
	Elm Creek		
	SW22	SW23	SW24
Acetone	(2)	ND	ND
4-Methyl-2-pentanone	(2)	ND	ND
Xylenes	ND	ND	ND
Bis(2-ethylhexyl)phthalate	ND	ND	ND
Di-n-octylphthalate	ND	ND	ND
Chlorpyrifos	ND	ND	ND
Arsenic	(2)	(2)	(2)
Barium	(2)	(2)	(2)
Chromium (III)	ND	ND	ND
Cobalt	(2)	ND	ND
Copper	ND	(2)	(2)
Lead	(2)	ND	(2)
Mercury	ND	ND	ND
Selenium	ND	ND	ND
Vanadium	(2)	ND	ND
Zinc	(2)	(2)	(2)
Total	-	-	-

(1) Calculated as shown in Appendix A.
(2) No Cancer Slope Factor available for this chemical and/or exposure route.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-10

INCREMENTAL CANCER RISKS
SURFACE WATER EXPOSURES - ADOLESCENT SWIMMERS VIA DERMAL ABSORPTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA

Chemical	Incremental Cancer Risk(1)								
	Kuhlman Creek						Crutcho Creek		
	SW01	SW02	SW03	SW04	SW05	SW27	SW06	SW07	SW08
Acetone	(2)	NA	NA	NA	(2)	NA	(2)	NA	NA
4-Methyl-2-pentanone	(2)	NA	NA	NA	(2)	NA	(2)	NA	NA
Xylenes	ND	NA	NA	NA	(2)	NA	ND	NA	NA
Bis(2-ethylhexyl)phthalate	3.3E-10	NA	NA	NA	ND	NA	ND	NA	NA
Di-n-octylphthalate	(2)	NA	NA	NA	ND	NA	ND	NA	NA
Chlorpyrifos	(2)	NA	NA	NA	ND	NA	ND	NA	NA
Arsenic	(2)	(2)	ND	(2)	(2)	(2)	(2)	(2)	(2)
Barium	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Chromium (III)	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt	(2)	(2)	ND	(2)	ND	ND	(2)	ND	(2)
Copper	ND	ND	ND	ND	(2)	ND	ND	ND	ND
Lead	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	(2)	ND	ND	ND	(2)	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	(2)	ND	ND	ND	(2)	(2)	ND	ND	ND
Total	3.3E-10	-	-	-	-	-	-	-	-

(1) Calculated as shown in Appendix A.
(2) No Cancer Slope Factor available for this chemical and/or exposure route.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-10
INCREMENTAL CANCER RISKS
SURFACE WATER EXPOSURES - ADOLESCENT SWIMMERS VIA DERMAL ABSORPTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE TWO

Chemical	Incremental Cancer Risk(1)							
	Crutcho Creek							
	SW09	SW10	SW11	SW12	SW13	SW14	SW15	SW16
Acetone	NA	NA	ND	NA	NA	NA	(2)	ND
4-Methyl-2-pentanone	NA	NA	ND	NA	NA	NA	(2)	ND
Xylenes	NA	NA	ND	NA	NA	NA	ND	ND
Bis(2-ethylhexyl)phthalate	NA	NA	ND	NA	NA	NA	ND	ND
Di-n-octylphthalate	NA	NA	ND	NA	NA	NA	ND	ND
Chlorpyrifos	NA	NA	ND	NA	NA	NA	ND	ND
Arsenic	(2)	(2)	ND	ND	(2)	ND	(2)	ND
Barium	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Chromium (III)	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt	ND	(2)	ND	ND	ND	(2)	ND	ND
Copper	ND	ND	ND	ND	ND	ND	ND	ND
Lead	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2
Mercury	ND	ND	ND	ND	(2)	ND	ND	ND
Selenium	ND	ND	ND	ND	ND	(2)	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	ND	ND	ND	ND	ND	ND	(2)	ND
Total	-	-	-	-	-	-	-	-

(1) Calculated as shown in Appendix A.
(2) No Cancer Slope Factor available for this chemical and/or exposure route.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-10
INCREMENTAL CANCER RISKS
SURFACE WATER EXPOSURES - ADOLESCENT SWIMMERS VIA DERMAL ABSORPTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE THREE

Chemical	Incremental Cancer Risk(1)						
	Crutcho Creek						
	SW17	SW18	SW19	SW20	SW21	SW25	SW26
Acetone	NA	NA	NA	NA	ND	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	ND	NA	NA
Xylenes	NA	NA	NA	NA	ND	NA	NA
Bis(2-ethylhexyl)phthalate	NA	NA	NA	NA	ND	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	ND	NA	NA
Chlorpyrifos	NA	NA	NA	NA	ND	NA	NA
Arsenic	ND	ND	ND	ND	ND	(2)	ND
Barium	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Chromium (III)	ND	ND	(2)	ND	ND	ND	ND
Cobalt	ND	ND	ND	ND	ND	ND	ND
Copper	ND	(2)	ND	ND	(2)	ND	ND
Lead	(2)	(2)	(2)	ND	(2)	(2)	ND
Mercury	ND	ND	ND	ND	ND	ND	ND
Selenium	ND	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND	ND
Zinc	ND	(2)	ND	(2)	ND	(2)	(2)
Total	-	-	-	-	-	-	-

(1) Calculated as shown in Appendix A.
(2) No Cancer Slope Factor available for this chemical and/or exposure route.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-10
INCREMENTAL CANCER RISKS
SURFACE WATER EXPOSURES - ADOLESCENT SWIMMERS VIA DERMAL ABSORPTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE FOUR

Chemical	Incremental Cancer Risk(1)		
	Elm Creek		
	SW22	SW23	SW24
Acetone	(2)	ND	ND
4-Methyl-2-pentanone	(2)	ND	ND
Xylenes	ND	ND	ND
Bis(2-ethylhexyl)phthalate	ND	ND	ND
Di-n-octylphthalate	ND	ND	ND
Chlorpyrifos	ND	ND	ND
Arsenic	(2)	(2)	(2)
Barium	(2)	(2)	(2)
Chromium (III)	ND	ND	ND
Cobalt	(2)	ND	ND
Copper	ND	(2)	(2)
Lead	(2)	ND	(2)
Mercury	ND	ND	ND
Selenium	ND	ND	ND
Vanadium	(2)	ND	ND
Zinc	(2)	(2)	(2)
Total	-	-	-

(1) Calculated as shown in Appendix A.
(2) No Cancer Slope Factor available for this chemical and/or exposure route.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-11

INCREMENTAL CANCER RISKS
SURFACE WATER EXPOSURES - ADULT FISHERMAN VIA INGESTION OF FISH
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA

Chemical	Incremental Cancer Risk(1)								
	Kuhlman Creek						Crutcho Creek		
	SW01	SW02	SW03	SW04	SW05	SW27	SW06	SW07	SW08
Acetone	(2)	NA	NA	NA	(2)	NA	(2)	NA	NA
4-Methyl-2-pentanone	(2)	NA	NA	NA	(2)	NA	(2)	NA	NA
Xylenes	ND	NA	NA	NA	(2)	NA	ND	NA	NA
Bis(2-ethylhexyl)phthalate	1.6E-6	NA	NA	NA	ND	NA	ND	NA	NA
Di-n-octylphthalate	(2)	NA	NA	NA	ND	NA	ND	NA	NA
Chlorpyrifos	(2)	NA	NA	NA	ND	NA	ND	NA	NA
Arsenic	(2)	(2)	ND	(2)	(2)	(2)	(2)	(2)	(2)
Barium	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Chromium (III)	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt	(2)	(2)	ND	(2)	ND	ND	(2)	ND	(2)
Copper	ND	ND	ND	ND	(2)	ND	ND	ND	ND
Lead	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	(2)	ND	ND	ND	(2)	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	(2)	ND	ND	ND	(2)	(2)	ND	ND	ND
Total	1.6E-6	-	-	-	-	-	-	-	-

(1) Calculated as shown in Appendix A.
(2) No Cancer Slope Factor available for this chemical and/or exposure route.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-11
INCREMENTAL CANCER RISKS
SURFACE WATER EXPOSURES - ADULT FISHERMAN VIA INGESTION OF FISH
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE TWO

Chemical	Incremental Cancer Risk(1)							
	Crutcho Creek							
	SW09	SW10	SW11	SW12	SW13	SW14	SW15	SW16
Acetone	NA	NA	ND	NA	NA	NA	ND	ND
4-Methyl-2-pentanone	NA	NA	ND	NA	NA	NA	ND	ND
Xylenes	NA	NA	ND	NA	NA	NA	ND	ND
Bis(2-ethylhexyl)phthalate	NA	NA	ND	NA	NA	NA	ND	ND
Di-n-octylphthalate	NA	NA	ND	NA	NA	NA	ND	ND
Chlorpyrifos	NA	NA	ND	NA	NA	NA	ND	ND
Arsenic	(2)	(2)	ND	ND	(2)	ND	(2)	ND
Barium	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Chromium (III)	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt	ND	(2)	ND	ND	ND	(2)	ND	ND
Copper	ND	ND	ND	ND	ND	ND	ND	ND
Lead	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Mercury	ND	ND	ND	ND	(2)	ND	ND	ND
Selenium	ND	ND	ND	ND	ND	(2)	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	ND	ND	ND	ND	ND	ND	(2)	ND
Total	-	-	-	-	-	-	-	-

(1) Calculated as shown in Appendix A.
(2) No Cancer Slope Factor available for this chemical and/or exposure route.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-11
INCREMENTAL CANCER RISKS
SURFACE WATER EXPOSURES - ADULT FISHERMAN VIA INGESTION OF FISH
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE THREE

Chemical	Incremental Cancer Risk(1)						
	Crutcho Creek						
	SW17	SW18	SW19	SW20	SW21	SW25	SW26
Acetone	NA	NA	NA	NA	ND	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	ND	NA	NA
Xylenes	NA	NA	NA	NA	ND	NA	NA
Bis(2-ethylhexyl)phthalate	NA	NA	NA	NA	ND	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	ND	NA	NA
Chlorpyrifos	NA	NA	NA	NA	ND	NA	NA
Arsenic	ND	ND	ND	ND	ND	(2)	ND
Barium	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Chromium (III)	ND	ND	(2)	ND	ND	ND	ND
Cobalt	ND	ND	ND	ND	ND	ND	ND
Copper	ND	(2)	ND	ND	(2)	ND	ND
Lead	(2)	(2)	(2)	ND	(2)	(2)	ND
Mercury	ND	ND	ND	ND	ND	ND	ND
Selenium	ND	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND	ND
Zinc	ND	(2)	ND	(2)	ND	(2)	(2)
Total	-	-	-	-	-	-	-

(1) Calculated as shown in Appendix A.
(2) No Cancer Slope Factor available for this chemical and/or exposure route.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-11
INCREMENTAL CANCER RISKS
SURFACE WATER EXPOSURES - ADULT FISHERMAN VIA INGESTION OF FISH
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE FOUR

Chemical	Incremental Cancer Risk(1)		
	Elm Creek		
	SW22	SW23	SW24
Acetone	(2)	ND	ND
4-Methyl-2-pentanone	(2)	ND	ND
Xylenes	ND	ND	ND
Bis(2-ethylhexyl)phthalate	ND	ND	ND
Di-n-octylphthalate	ND	ND	ND
Chlorpyrifos	ND	ND	ND
Arsenic	(2)	(2)	(2)
Barium	(2)	(2)	(2)
Chromium (III)	ND	ND	ND
Cobalt	(2)	ND	ND
Copper	ND	(2)	(2)
Lead	(2)	ND	(2)
Mercury	ND	ND	ND
Selenium	ND	ND	ND
Vanadium	(2)	ND	ND
Zinc	(2)	(2)	(2)
Total	-	-	-

(1) Calculated as shown in Appendix A.
(2) No Cancer Slope Factor available for this chemical and/or exposure route.
ND Chemical not detected.
NA Chemical not analyzed.

TABLE B-12

INCREMENTAL CANCER RISKS
SEDIMENT EXPOSURES - ADOLESCENT SWIMMERS VIA INCIDENTAL INGESTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA

Chemical	Incremental Cancer Risk(1)							
	Kuhlman Creek					Crutcho Creek		
	SD01	SD02	SD03	SD04	SD05	SD06	SD07	SD08
Di-n-butylphthalate	ND	NA	NA	NA	(2)	(2)	NA	NA
Fluoranthene	(2)	NA	NA	NA	(2)	ND	NA	NA
Pyrene	(2)	NA	NA	NA	(2)	ND	NA	NA
Benzo(a)anthracene	1.5E-9	NA	NA	NA	6.1E-10	ND	NA	NA
Chrysene	4.1E-11	NA	NA	NA	2.2E-11	ND	NA	NA
Bis(2-ethylhexyl)phthalate	1.5E-11	NA	NA	NA	1.0E-11	ND	NA	NA
Benzo(b)fluoranthene	1.5E-9	NA	NA	NA	9.9E-10	ND	NA	NA
Benzo(a)pyrene	1.0E-8	NA	NA	NA	3.2E-9	ND	NA	NA
Indeno(1,2,3-cd)pyrene	1.8E-9	NA	NA	NA	ND	ND	NA	NA
Benzo(g,h,i)perylene	(2)	NA	NA	NA	ND	ND	NA	NA
Aroclor 1260	7.9E-9	NA	NA	NA	NA	ND	NA	NA
4,4'-DDD	ND	NA	NA	NA	ND	ND	NA	NA
Antimony	ND	(2)	ND	ND	ND	ND	ND	ND
Arsenic	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Barium	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	(2)	ND	ND	ND	(2)	(2)	ND	ND
Chromium (III)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Copper	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Lead	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Manganese	(2)	NA	NA	NA	NA	(2)	NA	NA
Mercury	(2)	(2)	ND	ND	ND	ND	(2)	(2)
Selenium	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Zinc	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Total	2.3E-8	-	-	-	4.9E-9	-	-	-

(1) Calculated as shown in Appendix A.
(2) No Cancer Slope Factor available for this chemical and/or exposure route.
NA Chemical not analyzed.
ND Chemical not detected.

TABLE B-12
INCREMENTAL CANCER RISKS
SEDIMENT EXPOSURES - ADOLESCENT SWIMMERS VIA INCIDENTAL INGESTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE TWO

Chemical	Incremental Cancer Risk(1)							
	Crutcho Creek							
	SD09	SD10	SD11	SD12	SD13	SD14	SD15	SD16
Di-n-butylphthalate	NA	NA	ND	NA	NA	NA	ND	ND
Fluoranthene	NA	NA	ND	NA	NA	NA	ND	ND
Pyrene	NA	NA	ND	NA	NA	NA	ND	ND
Benzo(a)anthracene	NA	NA	ND	NA	NA	NA	ND	ND
Chrysene	NA	NA	ND	NA	NA	NA	ND	ND
Bis(2-ethylhexyl)phthalate	NA	NA	6.4E-12	NA	NA	NA	ND	ND
Benzo(b)fluoranthene	NA	NA	ND	NA	NA	NA	ND	ND
Benzo(a)pyrene	NA	NA	ND	NA	NA	NA	ND	ND
Indeno(1,2,3-cd)pyrene	NA	NA	ND	NA	NA	NA	ND	ND
Benzo(g,h,i)perylene	NA	NA	ND	NA	NA	NA	ND	ND
Aroclor 1260	NA	NA	ND	NA	NA	NA	ND	ND
4,4'-DDD	NA	NA	ND	NA	NA	NA	2.7E-11	ND
Antimony	(2)	(2)	ND	ND	ND	ND	ND	ND
Arsenic	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Barium	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Beryllium	ND	ND	ND	ND	2.7E-8	ND	ND	ND
Cadmium	ND	ND	ND	ND	ND	ND	(2)	ND
Chromium (III)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Copper	(2)	(2)	ND	(2)	(2)	(2)	(2)	(2)
Lead	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Manganese	NA	NA	(2)	NA	NA	NA	NA	(2)
Mercury	ND	ND	ND	ND	ND	ND	(2)	ND
Selenium	ND	(2)	ND	ND	ND	ND	ND	ND
Vanadium	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Zinc	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Total	-	-	6.5E-12	-	2.7E-8	-	2.7E-11	-

(1) Calculated as shown in Appendix A.
(2) No Cancer Slope Factor available for this chemical and/or exposure route.
NA Chemical not analyzed.
ND Chemical not detected.

TABLE B-12
INCREMENTAL CANCER RISKS
SEDIMENT EXPOSURES - ADOLESCENT SWIMMERS VIA INCIDENTAL INGESTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE THREE

Chemical	Incremental Cancer Risk(1)						
	Crutcho Creek						
	SD17	SD18	SD19	SD20	SD21	SD25	SD26
Di-n-butyl phthalate	NA	NA	NA	ND	NA	NA	NA
Fluoranthene	NA	NA	NA	ND	NA	NA	NA
Pyrene	NA	NA	NA	ND	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	ND	NA	NA	NA
Chrysene	NA	NA	NA	ND	NA	NA	NA
Bis(2-ethylhexyl)phthalate	NA	NA	NA	ND	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	ND	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	ND	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	ND	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	ND	NA	NA	NA
Aroclor 1260	NA	NA	NA	ND	NA	NA	NA
4,4'-DDD	NA	NA	NA	ND	NA	NA	NA
Antimony	ND	ND	ND	ND	ND	(2)	ND
Arsenic	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Barium	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Beryllium	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	ND	ND	ND	ND	ND
Chromium (III)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Copper	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Lead	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Manganese	NA	NA	NA	NA	(2)	NA	NA
Mercury	ND	ND	ND	ND	ND	ND	ND
Selenium	ND	ND	ND	ND	ND	(2)	ND
Vanadium	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Zinc	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Total	-	-	-	-	-	-	-

(1) Calculated as shown in Appendix A.
(2) No Cancer Slope Factor available for this chemical and/or exposure route.
NA Chemical not analyzed.
ND Chemical not detected.

TABLE B-12
INCREMENTAL CANCER RISKS
SEDIMENT EXPOSURES - ADOLESCENT SWIMMERS VIA INCIDENTAL INGESTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE FOUR

Chemical	Incremental Cancer Risk(1)		
	Elm Creek		
	SD22	SD23	SD24
Di-n-butyl phthalate	ND	NA	ND
Fluoranthene	ND	NA	ND
Pyrene	ND	NA	ND
Benzo(a)anthracene	ND	NA	ND
Chrysene	ND	NA	ND
Bis(2-ethylhexyl)phthalate	ND	NA	ND
Benzo(b)fluoranthene	ND	NA	ND
Benzo(a)pyrene	ND	NA	ND
Indeno(1,2,3-cd)pyrene	ND	NA	ND
Benzo(g,h,i)perylene	ND	NA	ND
Aroclor 1260	ND	NA	ND
4,4'-DDD	ND	NA	ND
Antimony	ND	(2)	(2)
Arsenic	(2)	(2)	(2)
Barium	(2)	(2)	(2)
Beryllium	ND	ND	ND
Cadmium	ND	ND	(2)
Chromium (III)	(2)	(2)	(2)
Copper	(2)	(2)	(2)
Lead	(2)	(2)	(2)
Manganese	(2)	NA	NA
Mercury	(2)	ND	ND
Selenium	ND	ND	ND
Vanadium	(2)	(2)	(2)
Zinc	(2)	(2)	(2)
Total	-	-	-

(1) Calculated as shown in Appendix A.
(2) No Cancer Slope Factor available for this chemical and/or exposure route.
NA Chemical not analyzed.
ND Chemical not detected.

TABLE B-13

INCREMENTAL CANCER RISKS
SEDIMENT EXPOSURES - ADOLESCENT SWIMMERS VIA DERMAL ABSORPTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA

	Incremental Cancer Risk(1)							
	Kuhlman Creek					Crutcho Creek		
	SD01	SD02	SD03	SD04	SD05	SD06	SD07	SD08
Di-n-butyl phthalate	ND	NA	NA	NA	(2)	(2)	NA	NA
Fluoranthene	(2)	NA	NA	NA	(2)	ND	NA	NA
Pyrene	(2)	NA	NA	NA	(2)	ND	NA	NA
Benzo(a)anthracene	1.3E-8	NA	NA	NA	5.2E-9	ND	NA	NA
Chrysene	3.5E-10	NA	NA	NA	1.8E-10	ND	NA	NA
Bis(2-ethylhexyl)phthalate	1.3E-10	NA	NA	NA	8.8E-11	ND	NA	NA
Benzo(b)fluoranthene	1.3E-8	NA	NA	NA	8.4E-9	ND	NA	NA
Benzo(a)pyrene	8.4E-8	NA	NA	NA	2.8E-8	ND	NA	NA
Indeno(1,2,3-cd)pyrene	1.5E-8	NA	NA	NA	ND	ND	NA	NA
Benzo(g,h,i)perylene	(2)	NA	NA	NA	ND	ND	NA	NA
Aroclor 1260	4.0E-8	NA	NA	NA	NA	ND	NA	NA
4,4'-DDD	ND	NA	NA	NA	ND	ND	NA	NA
Antimony	ND	(3)	ND	ND	ND	ND	ND	ND
Arsenic	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Barium	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	(3)	ND	ND	ND	(3)	(3)	ND	ND
Chromium (III)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Copper	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Lead	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Manganese	(3)	NA	NA	NA	NA	(3)	NA	NA
Mercury	(3)	(3)	ND	ND	ND	ND	(3)	(3)
Selenium	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Zinc	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Total	1.7E-7	-	-	-	4.1E-8	-	-	-

(1) Calculated as shown in Appendix A.
(2) No Cancer Slope Factor available for this chemical and/or exposure route.
(3) Not applicable; inorganics in soil assumed not to be dermally absorbed.
NA Chemical not analyzed.
ND Chemical not detected.

TABLE B-13
INCREMENTAL CANCER RISKS
SEDIMENT EXPOSURES - ADOLESCENT SWIMMERS VIA DERMAL ABSORPTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE TWO

Chemical	Incremental Cancer Risk(1)							
	Crutcho Creek							
	SD09	SD10	SD11	SD12	SD13	SD14	SD15	SD16
Di-n-butyl phthalate	NA	NA	ND	NA	NA	NA	ND	ND
Fluoranthene	NA	NA	ND	NA	NA	NA	ND	ND
Pyrene	NA	NA	ND	NA	NA	NA	ND	ND
Benzo(a)anthracene	NA	NA	ND	NA	NA	NA	ND	ND
Chrysene	NA	NA	ND	NA	NA	NA	ND	ND
Bis(2-ethylhexyl)phthalate	NA	NA	5.5E-11	NA	NA	NA	ND	ND
Benzo(b)fluoranthene	NA	NA	ND	NA	NA	NA	ND	ND
Benzo(a)pyrene	NA	NA	ND	NA	NA	NA	ND	ND
Indeno(1,2,3-cd)pyrene	NA	NA	ND	NA	NA	NA	ND	ND
Benzo(g,h,i)perylene	NA	NA	ND	NA	NA	NA	ND	ND
Aroclor 1260	NA	NA	ND	NA	NA	NA	ND	ND
4,4'-DDD	NA	NA	ND	NA	NA	NA	2.3E-10	ND
Antimony	(3)	(3)	ND	ND	ND	ND	ND	ND
Arsenic	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Barium	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Beryllium	ND	ND	ND	ND	(3)	ND	ND	ND
Cadmium	ND	ND	ND	ND	ND	ND	(3)	ND
Chromium (III)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Copper	(3)	(3)	ND	(3)	(3)	(3)	(3)	(3)
Lead	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Manganese	NA	NA	(3)	NA	NA	NA	NA	(3)
Mercury	ND	ND	ND	ND	ND	ND	(3)	ND
Selenium	ND	(3)	ND	ND	ND	ND	ND	ND
Vanadium	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Zinc	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Total	-	-	5.5E-11	-	-	-	2.3E-10	-

(1) Calculated as shown in Appendix A.
(2) No Cancer Slope Factor available for this chemical and/or exposure route.
(3) Not applicable; inorganics in soil assumed not to be dermally absorbed.
NA Chemical not analyzed.
ND Chemical not detected.

TABLE B-13
INCREMENTAL CANCER RISKS
SEDIMENT EXPOSURES - ADOLESCENT SWIMMERS VIA DERMAL ABSORPTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE THREE

Chemical	Incremental Cancer Risk(1)						
	Crutcho Creek						
	SD17	SD18	SD19	SD20	SD21	SD25	SD26
Di-n-butyl phthalate	NA	NA	NA	ND	NA	NA	NA
Fluoranthene	NA	NA	NA	ND	NA	NA	NA
Pyrene	NA	NA	NA	ND	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	ND	NA	NA	NA
Chrysene	NA	NA	NA	ND	NA	NA	NA
Bis(2-ethylhexyl)phthalate	NA	NA	NA	ND	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	ND	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	ND	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	ND	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	ND	NA	NA	NA
Aroclor 1260	NA	NA	NA	ND	NA	NA	NA
4,4'-DDD	NA	NA	NA	ND	NA	NA	NA
Antimony	ND	ND	ND	ND	ND	(3)	ND
Arsenic	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Barium	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Beryllium	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	ND	ND	ND	ND	ND
Chromium (III)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Copper	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Lead	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Manganese	NA	NA	NA	NA	(3)	NA	NA
Mercury	ND	ND	ND	ND	ND	ND	ND
Selenium	ND	ND	ND	ND	ND	(3)	ND
Vanadium	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Zinc	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Total	-	-	-	-	-	-	-

(1) Calculated as shown in Appendix A.
(2) No Cancer Slope Factor available for this chemical and/or exposure route.
(3) Not applicable; inorganics in soil assumed not to be dermally absorbed.
NA Chemical not analyzed.
ND Chemical not detected.

TABLE B-13
INCREMENTAL CANCER RISKS
SEDIMENT EXPOSURES - ADOLESCENT SWIMMERS VIA DERMAL ABSORPTION
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA - PAGE FOUR

Chemical	Incremental Cancer Risk(1)		
	Elm Creek		
	SD22	SD23	SD24
Di-n-butyl phthalate	ND	NA	ND
Fluoranthene	ND	NA	ND
Pyrene	ND	NA	ND
Benzo(a)anthracene	ND	NA	ND
Chrysene	ND	NA	ND
Bis(2-ethylhexyl)phthalate	ND	NA	ND
Benzo(b)fluoranthene	ND	NA	ND
Benzo(a)pyrene	ND	NA	ND
Indeno(1,2,3-cd)pyrene	ND	NA	ND
Benzo(g,h,i)perylene	ND	NA	ND
Aroclor 1260	ND	NA	ND
4,4'-DDD	ND	NA	ND
Antimony	ND	(3)	(3)
Arsenic	(3)	(3)	(3)
Barium	(3)	(3)	(3)
Beryllium	ND	ND	ND
Cadmium	ND	ND	(3)
Chromium (III)	(3)	(3)	(3)
Copper	(3)	(3)	(3)
Lead	(3)	(3)	(3)
Manganese	(3)	NA	NA
Mercury	(3)	ND	ND
Selenium	ND	ND	ND
Vanadium	(3)	(3)	(3)
Zinc	(3)	(3)	(3)
Total	-	-	-

(1) Calculated as shown in Appendix A.
(2) No Cancer Slope Factor available for this chemical and/or exposure route.
(3) Not applicable; inorganics in soil assumed not to be dermally absorbed.
NA Chemical not analyzed.
ND Chemical not detected.

APPENDIX C

RISK ASSESSMENT SPREADSHEET - EXPOSURES THROUGH HOUSEHOLD USE OF SURFACE WATER

SITE NAME: TINKER AFB - ELM CREEK - SW22
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY ON THE FOLLOWING SPREADSHEETS.
ONLY INGESTION OF SURFACE WATER IS CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO NUMBER 1 - ADULT RESIDENTS

REFERENCES: EPA, DECEMBER 1989
FOSTER AND CHROSTOWSKI, 1987

INGESTION: IEX = (C x IR x EF x ED)/(BW x LT x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
IR = INGESTION RATE (LITERS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

DERMAL CONTACT: DEX = (C x PC x AV x ET x EF x ED)/(BW x LT x 1000 x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
PC = THE PERMEABILITY CONSTANT OF WATER (CM/HR)
AV = THE SKIN SURFACE AREA AVAILABLE FOR CONTACT (CM**2)
ET = EXPOSURE TIME (HRS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

INHALATION: IEX = (S x IR x EF x ED)/(BW x LT x Ra x 1E6)x(Ds + EXP(-Ra x Dt)/Ra - EXP(Ra x (Ds-Dt))/Ra)

WHERE:
S = VOLATILE ORGANIC CHEMICAL GENERATION RATE (UG/CUBIC METER/MIN)
IR = INHALATION RATE (LITERS/MIN)
Ds = SHOWER DURATION (MIN)
Ra = AIR EXCHANGE RATE (1/MIN)
Dt = TOTAL DURATION IN SHOWER ROOM (MIN)
BW = BODY WEIGHT (KG)
SV = SHOWER ROOM AIR VOLUME (m**3)
R = IDEAL GAS LAW CONSTANT (ATM-M**3/MOL/K)

ENTER INPUT PARAMETERS:

INGESTION: ADULT EXPOSURE

IR:	2	CONVERSION FACTOR =	2.740e-2
EF:	350		
ED:	30		
BW:	70		
LT:	70		

DERMAL CONTACT: NOT APPLICABLE

PC:	1e-3	CONVERSION FACTOR =	0
AV:	19400		
ET:	.25		
EF:	0		
ED:	70		
BW:	70		
LT:	70		

INHALATION: NOT APPLICABLE

IR:	0	d:	1
BW:	70	Ts:	2
Ds:	15	T1:	293
Dt:	20	Ts:	318
Ra:	.0083	M1:	.982
SV:	12	M2:	.616
ED:	70	T:	293
R:	.000082	FR:	10
EF:	0	LT:	70

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE TWO)
TINKER AFB - ELM CREEK - SW22
EXPOSURE SCENARIO NUMBER 1 - ADULT RESIDENTS
CALCULATE DOSES:

CHEMICAL	GW CONC. (MG/L)	MOLECULAR WEIGHT	HENRYS LAW CONSTANT	MASS TRANSFER COEFFICIENT (KAl)	INGESTION DOSE	INHALATION DOSE	DERMAL DOSE
Acetone	.0093	58.08	3.43e-5	2.7584e0	2.548e-4	0	0
4-Methyl-2-pentanone	.0057	100.2	4.16e-5	2.4834e0	1.562e-4	0	0
Arsenic	.00083	74.92		0	2.274e-5	0	0
Barium	.351	137.34		0	9.616e-3	0	0
Cobalt	.011			0	3.014e-4	0	0
Copper		63.54		0	0	0	0
Lead	.0023	207.19		0	6.301e-5	0	0
Vanadium	.0086	50.942		0	2.356e-4	0	0
Zinc	.0081	65.38		0	2.219e-4	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
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				0	0	0	0
				0	0	0	0
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				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE THREE)
TINKER AFB - ELM CREEK - SW22
EXPOSURE SCENARIO NUMBER 1 - ADULT RESIDENTS
CALCULATE HAZARD INDICES:

CHEMICAL	ING+DERM DOSE	INHALATION DOSE	REFERENCE DOSE ING.	REFERENCE DOSE INH.	HAZARD IND ING./DERM	HAZARD IND. INH.	HAZARD INDEX
Acetone	2.548e-4	0	1e-1		2.548e-3	0	2.548e-3
4-Methyl-2-pentanone	1.562e-4	0	5e-2	2e-2	3.123e-3	0	3.123e-3
Arsenic	2.274e-5	0	3e-4		7.580e-2	0	7.580e-2
Barium	9.616e-3	0	7e-2	1e-4	1.374e-1	0	1.374e-1
Cobalt	3.014e-4	0	8e-3		3.767e-2	0	3.767e-2
Copper	0	0	4e-2		0	0	0
Lead	6.301e-5	0	1.4e-3	4.3e-4	4.501e-2	0	4.501e-2
Vanadium	2.356e-4	0	7e-3		3.366e-2	0	3.366e-2
Zinc	2.219e-4	0	2e-1		1.110e-3	0	1.110e-3
	0	0	1.4e-3	4.3e-4	0	0	0
	0	0	5e-3		0	0	0
	0	0	2e-1		0	0	0
	0	0	.3		0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
TOTAL HAZARD INDEX					3.363e-1	0	3.363e-1

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE FOUR)
TINKER AFB - ELM CREEK - SW22
EXPOSURE SCENARIO NUMBER 1 - ADULT RESIDENTS
CALCULATE INCREMENTAL CANCER RISK:

CHEMICAL	TIME-WEIGHTED ING & DERM DOSE	TIME-WEIGHTED INHALATION DOSE	CANCER SLOPE FACTOR ING	CANCER SLOPE FACTOR INH	CANCER RISK ING/DERM	CANCER RISK INH	CANCER RISK
Acetone	1.092e-4	0			0	0	0
4-Methyl-2-pentanone	6.693e-5	0			0	0	0
Arsenic	9.746e-6	0		5e1	0	0	0
Barium	4.121e-3	0			0	0	0
Cobalt	1.292e-4	0			0	0	0
Copper	0	0			0	0	0
Lead	2.701e-5	0			0	0	0
Vanadium	1.010e-4	0			0	0	0
Zinc	9.511e-5	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
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	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - EXPOSURES THROUGH HOUSEHOLD USE OF SURFACE WATER

SITE NAME: TINKER AFB - ELM CREEK - SW23
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY ON THE FOLLOWING SPREADSHEETS.
ONLY INGESTION OF SURFACE WATER IS CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO NUMBER 1 - ADULT RESIDENTS

REFERENCES: EPA, DECEMBER 1989
FOSTER AND CHROSTOWSKI, 1987

INGESTION: IEX = (C x IR x EF x ED)/(BW x LT x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
IR = INGESTION RATE (LITERS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

DERMAL CONTACT: DEX = (C x PC x AV x ET x EF x ED)/(BW x LT x 1000 x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
PC = THE PERMEABILITY CONSTANT OF WATER (CM/HR)
AV = THE SKIN SURFACE AREA AVAILABLE FOR CONTACT (CM**2)
ET = EXPOSURE TIME (HRS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

INHALATION: IEX = (S x IR x EF x ED)/(BW x LT x Ra x 1E6)x(Ds + EXP(-Ra x Dt)/Ra - EXP(Ra x (Ds-Dt))/Ra)

WHERE:
S = VOLATILE ORGANIC CHEMICAL GENERATION RATE (UG/CUBIC METER/MIN)
IR = INHALATION RATE (LITERS/MIN)
Ds = SHOWER DURATION (MIN)
Ra = AIR EXCHANGE RATE (1/MIN)
Dt = TOTAL DURATION IN SHOWER ROOM (MIN)
BW = BODY WEIGHT (KG)
SV = SHOWER ROOM AIR VOLUME (m**3)
R = IDEAL GAS LAW CONSTANT (ATM-M**3/MOL/K)

ENTER INPUT PARAMETERS:

INGESTION: ADULT EXPOSURE

IR:	2	CONVERSION FACTOR =	2.740e-2
EF:	350		
ED:	30		
BW:	70		
LT:	70		

DERMAL CONTACT: NOT APPLICABLE

PC:	1e-3	CONVERSION FACTOR =	0
AV:	19400		
ET:	.25		
EF:	0		
ED:	70		
BW:	70		
LT:	70		

INHALATION: NOT APPLICABLE

IR:	0	d:	1
BW:	70	Ts:	2
Ds:	15	T1:	293
Dt:	20	Ts:	318
Ra:	.0083	M1:	.982
SV:	12	M2:	.616
ED:	70	T:	293
R:	.000082	FR:	10
EF:	0	LT:	70

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE TWO)
TINKER AFB - ELM CREEK - SW23
EXPOSURE SCENARIO NUMBER 1 - ADULT RESIDENTS
CALCULATE DOSES:

CHEMICAL	GW CONC. (MG/L)	MOLECULAR WEIGHT	HENRYS LAW CONSTANT	MASS TRANSFER COEFFICIENT (KAl)	INGESTION DOSE	INHALATION DOSE	DERMAL DOSE
Acetone		58.08	3.43e-5	2.7584e0	0	0	0
4-Methyl-2-pentanone		100.2	4.16e-5	2.4834e0	0	0	0
Arsenic	.001	74.92		0	2.740e-5	0	0
Barium	.381	137.34		0	1.044e-2	0	0
Cobalt				0	0	0	0
Copper	.0163	63.54		0	4.466e-4	0	0
Lead		207.19		0	0	0	0
Vanadium		50.942		0	0	0	0
Zinc	.0971	65.38		0	2.660e-3	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
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				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE THREE)
TINKER AFB - ELM CREEK - SW23
EXPOSURE SCENARIO NUMBER 1 - ADULT RESIDENTS
CALCULATE HAZARD INDICES:

CHEMICAL	ING+DERM DOSE	INHALATION DOSE	REFERENCE DOSE ING.	REFERENCE DOSE INH.	HAZARD IND ING./DERM	HAZARD IND. INH.	HAZARD INDEX
Acetone	0	0	1e-1		0	0	0
4-Methyl-2-pentanone	0	0	5e-2	2e-2	0	0	0
Arsenic	2.740e-5	0	3e-4		9.132e-2	0	9.132e-2
Barium	1.044e-2	0	7e-2	1e-4	1.491e-1	0	1.491e-1
Cobalt	0	0	8e-3		0	0	0
Copper	4.466e-4	0	4e-2		1.116e-2	0	1.116e-2
Lead	0	0	1.4e-3	4.3e-4	0	0	0
Vanadium	0	0	7e-3		0	0	0
Zinc	2.660e-3	0	2e-1		1.330e-2	0	1.330e-2
	0	0	1.4e-3	4.3e-4	0	0	0
	0	0	5e-3		0	0	0
	0	0	2e-1		0	0	0
	0	0	.3		0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
TOTAL HAZARD INDEX					2.649e-1	0	2.649e-1

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE FOUR)
TINKER AFB - ELM CREEK - SW23
EXPOSURE SCENARIO NUMBER 1 - ADULT RESIDENTS
CALCULATE INCREMENTAL CANCER RISK:

CHEMICAL	TIME-WEIGHTED ING & DERM DOSE	TIME-WEIGHTED INHALATION DOSE	CANCER SLOPE FACTOR ING	CANCER SLOPE FACTOR INH	CANCER RISK ING/DERM	CANCER RISK INH	CANCER RISK
Acetone	0	0			0	0	0
4-Methyl-2-pentanone	0	0			0	0	0
Arsenic	1.174e-5	0		5e1	0	0	0
Barium	4.474e-3	0			0	0	0
Cobalt	0	0			0	0	0
Copper	1.914e-4	0			0	0	0
Lead	0	0			0	0	0
Vanadium	0	0			0	0	0
Zinc	1.140e-3	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - EXPOSURES THROUGH HOUSEHOLD USE OF SURFACE WATER

SITE NAME: TINKER AFB - ELM CREEK - SW24
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY ON THE FOLLOWING SPREADSHEETS.
ONLY INGESTION OF SURFACE WATER IS CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO NUMBER 1 - ADULT RESIDENTS

REFERENCES: EPA, DECEMBER 1989
FOSTER AND CHROSTOWSKI, 1987

INGESTION: IEX = (C x IR x EF x ED)/(BW x LT x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
IR = INGESTION RATE (LITERS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

DERMAL CONTACT: DEX = (C x PC x AV x ET x EF x ED)/(BW x LT x 1000 x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
PC = THE PERMEABILITY CONSTANT OF WATER (CM/HR)
AV = THE SKIN SURFACE AREA AVAILABLE FOR CONTACT (CM**2)
ET = EXPOSURE TIME (HRS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

INHALATION: IEX = (S x IR x EF x ED)/(BW x LT x Ra x 1E6)x(Ds + EXP(-Ra x Dt)/Ra - EXP(Ra x (Ds-Dt))/Ra)

WHERE:
S = VOLATILE ORGANIC CHEMICAL GENERATION RATE (UG/CUBIC METER/MIN)
IR = INHALATION RATE (LITERS/MIN)
Ds = SHOWER DURATION (MIN)
Ra = AIR EXCHANGE RATE (1/MIN)
Dt = TOTAL DURATION IN SHOWER ROOM (MIN)
BW = BODY WEIGHT (KG)
SV = SHOWER ROOM AIR VOLUME (m**3)
R = IDEAL GAS LAW CONSTANT (ATM-M**3/MOL/K)

ENTER INPUT PARAMETERS:

INGESTION: ADULT EXPOSURE

IR:	2	CONVERSION FACTOR =	2.740e-2
EF:	350		
ED:	30		
BW:	70		
LT:	70		

DERMAL CONTACT: NOT APPLICABLE

PC:	1e-3	CONVERSION FACTOR =	0
AV:	19400		
ET:	.25		
EF:	0		
ED:	70		
BW:	70		
LT:	70		

INHALATION: NOT APPLICABLE

IR:	0	d:	1
BW:	70	Ts:	2
Ds:	15	T1:	293
Dt:	20	Ts:	318
Ra:	.0083	M1:	.982
SV:	12	M2:	.616
ED:	70	T:	293
R:	.000082	FR:	10
EF:	0	LT:	70

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE TWO)
TINKER AFB - ELM CREEK - SW24
EXPOSURE SCENARIO NUMBER 1 - ADULT RESIDENTS
CALCULATE DOSES:

CHEMICAL	GW CONC. (MG/L)	MOLECULAR WEIGHT	HENRYS LAW CONSTANT	MASS TRANSFER COEFFICIENT (KAl)	INGESTION DOSE	INHALATION DOSE	DERMAL DOSE
Acetone		58.08	3.43e-5	2.7584e0	0	0	0
4-Methyl-2-pentanone		100.2	4.16e-5	2.4834e0	0	0	0
Arsenic	.0013	74.92		0	3.562e-5	0	0
Barium	.394	137.34		0	1.079e-2	0	0
Cobalt				0	0	0	0
Copper	.0116	63.54		0	3.178e-4	0	0
Lead	.0011	207.19		0	3.014e-5	0	0
Vanadium		50.942		0	0	0	0
Zinc	.0114	65.38		0	3.123e-4	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
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				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE THREE)
TINKER AFB - ELM CREEK - SW24
EXPOSURE SCENARIO NUMBER 1 - ADULT RESIDENTS
CALCULATE HAZARD INDICES:

CHEMICAL	ING+DERM DOSE	INHALATION DOSE	REFERENCE DOSE ING.	REFERENCE DOSE INH.	HAZARD IND ING./DERM	HAZARD IND. INH.	HAZARD INDEX
Acetone	0	0	1e-1		0	0	0
4-Methyl-2-pentanone	0	0	5e-2	2e-2	0	0	0
Arsenic	3.562e-5	0	3e-4		1.187e-1	0	1.187e-1
Barium	1.079e-2	0	7e-2	1e-4	1.542e-1	0	1.542e-1
Cobalt	0	0	8e-3		0	0	0
Copper	3.178e-4	0	4e-2		7.945e-3	0	7.945e-3
Lead	3.014e-5	0	1.4e-3	4.3e-4	2.153e-2	0	2.153e-2
Vanadium	0	0	7e-3		0	0	0
Zinc	3.123e-4	0	2e-1		1.562e-3	0	1.562e-3
	0	0	1.4e-3	4.3e-4	0	0	0
	0	0	5e-3		0	0	0
	0	0	2e-1		0	0	0
	0	0	.3		0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
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	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
TOTAL HAZARD INDEX					3.040e-1	0	3.040e-1

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE FOUR)
TINKER AFB - ELM CREEK - SW24
EXPOSURE SCENARIO NUMBER 1 - ADULT RESIDENTS
CALCULATE INCREMENTAL CANCER RISK:

CHEMICAL	TIME-WEIGHTED ING & DERM DOSE	TIME-WEIGHTED INHALATION DOSE	CANCER SLOPE FACTOR ING	CANCER SLOPE FACTOR INH	CANCER RISK ING/DERM	CANCER RISK INH	CANCER RISK
Acetone	0	0			0	0	0
4-Methyl-2-pentanone	0	0			0	0	0
Arsenic	1.526e-5	0		5e1	0	0	0
Barium	4.626e-3	0			0	0	0
Cobalt	0	0			0	0	0
Copper	1.362e-4	0			0	0	0
Lead	1.292e-5	0			0	0	0
Vanadium	0	0			0	0	0
Zinc	1.339e-4	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
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	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - EXPOSURES THROUGH HOUSEHOLD USE OF SURFACE WATER

SITE NAME: TINKER AFB - ELM CREEK - SW22
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY ON THE FOLLOWING SPREADSHEETS.
ONLY INGESTION OF SURFACE WATER IS CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO NUMBER 2 - CHILD RESIDENTS

REFERENCES: EPA, DECEMBER 1989
FOSTER AND CHROSTOWSKI, 1987

INGESTION: IEX = (C x IR x EF x ED)/(BW x LT x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
IR = INGESTION RATE (LITERS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

DERMAL CONTACT: DEX = (C x PC x AV x ET x EF x ED)/(BW x LT x 1000 x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
PC = THE PERMEABILITY CONSTANT OF WATER (CM/HR)
AV = THE SKIN SURFACE AREA AVAILABLE FOR CONTACT (CM**2)
ET = EXPOSURE TIME (HRS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

INHALATION: IEX = (S x IR x EF x ED)/(BW x LT x Ra x 1E6)x(Ds + EXP(-Ra x Dt)/Ra - EXP(Ra x (Ds-Dt))/Ra)

WHERE:
S = VOLATILE ORGANIC CHEMICAL GENERATION RATE (UG/CUBIC METER/MIN)
IR = INHALATION RATE (LITERS/MIN)
Ds = SHOWER DURATION (MIN)
Ra = AIR EXCHANGE RATE (1/MIN)
Dt = TOTAL DURATION IN SHOWER ROOM (MIN)
BW = BODY WEIGHT (KG)
SV = SHOWER ROOM AIR VOLUME (m**3)
R = IDEAL GAS LAW CONSTANT (ATM-M**3/MOL/K)

ENTER INPUT PARAMETERS:

INGESTION: CHILD EXPOSURE

IR:	1	CONVERSION FACTOR =	6.393e-2
EF:	350		
ED:	6		
BW:	15		
LT:	70		

DERMAL CONTACT: NOT APPLICABLE

PC:	1e-3	CONVERSION FACTOR =	0
AV:	19400		
ET:	.25		
EF:	0		
ED:	70		
BW:	70		
LT:	70		

INHALATION: NOT APPLICABLE

IR:	0	d:	1
BW:	70	Ts:	2
Ds:	15	T1:	293
Dt:	20	Ts:	318
Ra:	.0083	M1:	.982
SV:	12	M2:	.616
ED:	70	T:	293
R:	.000082	FR:	10
EF:	0	LT:	70

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE TWO)
TINKER AFB - ELM CREEK - SW22
EXPOSURE SCENARIO NUMBER 2 - CHILD RESIDENTS
CALCULATE DOSES:

CHEMICAL	GW CONC. (MG/L)	MOLECULAR WEIGHT	HENRYS LAW CONSTANT	MASS TRANSFER COEFFICIENT (KAl)	INGESTION DOSE	INHALATION DOSE	DERMAL DOSE
Acetone	.0093	58.08	3.43e-5	2.7584e0	5.945e-4	0	0
4-Methyl-2-pentanone	.0057	100.2	4.16e-5	2.4834e0	3.644e-4	0	0
Arsenic	.00083	74.92		0	5.306e-5	0	0
Barium	.351	137.34		0	2.244e-2	0	0
Cobalt	.011			0	7.032e-4	0	0
Copper		63.54		0	0	0	0
Lead	.0023	207.19		0	1.470e-4	0	0
Vanadium	.0086	50.942		0	5.498e-4	0	0
Zinc	.0081	65.38		0	5.178e-4	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
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				0	0	0	0
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				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE THREE)
TINKER AFB - ELM CREEK - SW22
EXPOSURE SCENARIO NUMBER 2 - CHILD RESIDENTS
CALCULATE HAZARD INDICES:

CHEMICAL	ING+DERM DOSE	INHALATION DOSE	REFERENCE DOSE ING.	REFERENCE DOSE INH.	HAZARD IND ING./DERM	HAZARD IND. INH.	HAZARD INDEX
Acetone	5.945e-4	0	1e-1		5.945e-3	0	5.945e-3
4-Methyl-2-pentanone	3.644e-4	0	5e-2	2e-2	7.288e-3	0	7.288e-3
Arsenic	5.306e-5	0	3e-4		1.769e-1	0	1.769e-1
Barium	2.244e-2	0	7e-2	1e-4	3.205e-1	0	3.205e-1
Cobalt	7.032e-4	0	8e-3		8.790e-2	0	8.790e-2
Copper	0	0	4e-2		0	0	0
Lead	1.470e-4	0	1.4e-3	4.3e-4	1.050e-1	0	1.050e-1
Vanadium	5.498e-4	0	7e-3		7.854e-2	0	7.854e-2
Zinc	5.178e-4	0	2e-1		2.589e-3	0	2.589e-3
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
TOTAL HAZARD INDEX					7.847e-1	0	7.847e-1

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE FOUR)
TINKER AFB - ELM CREEK - SW22
EXPOSURE SCENARIO NUMBER 2 - CHILD RESIDENTS
CALCULATE INCREMENTAL CANCER RISK:

CHEMICAL	TIME-WEIGHTED ING & DERM DOSE	TIME-WEIGHTED INHALATION DOSE	CANCER SLOPE FACTOR ING	CANCER SLOPE FACTOR INH	CANCER RISK ING/DERM	CANCER RISK INH	CANCER RISK
Acetone	5.096e-5	0			0	0	0
4-Methyl-2-pentanone	3.123e-5	0			0	0	0
Arsenic	4.548e-6	0		5e1	0	0	0
Barium	1.923e-3	0			0	0	0
Cobalt	6.027e-5	0			0	0	0
Copper	0	0			0	0	0
Lead	1.260e-5	0			0	0	0
Vanadium	4.712e-5	0			0	0	0
Zinc	4.438e-5	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - EXPOSURES THROUGH HOUSEHOLD USE OF SURFACE WATER

SITE NAME: TINKER AFB - ELM CREEK - SW23
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY ON THE FOLLOWING SPREADSHEETS.
ONLY INGESTION OF SURFACE WATER IS CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO NUMBER 2 - CHILD RESIDENTS

REFERENCES: EPA, DECEMBER 1989
FOSTER AND CHROSTOWSKI, 1987

INGESTION: IEX = (C x IR x EF x ED)/(BW x LT x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
IR = INGESTION RATE (LITERS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

DERMAL CONTACT: DEX = (C x PC x AV x ET x EF x ED)/(BW x LT x 1000 x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
PC = THE PERMEABILITY CONSTANT OF WATER (CM/HR)
AV = THE SKIN SURFACE AREA AVAILABLE FOR CONTACT (CM**2)
ET = EXPOSURE TIME (HRS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

INHALATION: IEX = (S x IR x EF x ED)/(BW x LT x Ra x 1E6)x(Ds + EXP(-Ra x Dt)/Ra - EXP(Ra x (Ds-Dt))/Ra)

WHERE:
S = VOLATILE ORGANIC CHEMICAL GENERATION RATE (UG/CUBIC METER/MIN)
IR = INHALATION RATE (LITERS/MIN)
Ds = SHOWER DURATION (MIN)
Ra = AIR EXCHANGE RATE (1/MIN)
Dt = TOTAL DURATION IN SHOWER ROOM (MIN)
BW = BODY WEIGHT (KG)
SV = SHOWER ROOM AIR VOLUME (m**3)
R = IDEAL GAS LAW CONSTANT (ATM-M**3/MOL/K)

ENTER INPUT PARAMETERS:

INGESTION: CHILD EXPOSURE

IR:	1	CONVERSION FACTOR =	6.393e-2
EF:	350		
ED:	6		
BW:	15		
LT:	70		

DERMAL CONTACT: NOT APPLICABLE

PC:	1e-3	CONVERSION FACTOR =	0
AV:	19400		
ET:	.25		
EF:	0		
ED:	70		
BW:	70		
LT:	70		

INHALATION: NOT APPLICABLE

IR:	0	d:	1
BW:	70	Ts:	2
Ds:	15	T1:	293
Dt:	20	Tm:	318
Ra:	.0083	M1:	.982
SV:	12	M2:	.616
ED:	70	T:	293
R:	.000082	FR:	10
EF:	0	LT:	70

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE TWO)
TINKER AFB - ELM CREEK - SW23
EXPOSURE SCENARIO NUMBER 2 - CHILD RESIDENTS
CALCULATE DOSES:

CHEMICAL	GW CONC. (MG/L)	MOLECULAR WEIGHT	HENRYS LAW CONSTANT	MASS TRANSFER COEFFICIENT (KAl)	INGESTION DOSE	INHALATION DOSE	DERMAL DOSE
Acetone		58.08	3.43e-5	2.7584e0	0	0	0
4-Methyl-2-pentanone		100.2	4.16e-5	2.4834e0	0	0	0
Arsenic	.001	74.92		0	6.393e-5	0	0
Barium	.381	137.34		0	2.436e-2	0	0
Cobalt				0	0	0	0
Copper	.0163	63.54		0	1.042e-3	0	0
Lead		207.19		0	0	0	0
Vanadium		50.942		0	0	0	0
Zinc	.0971	65.38		0	6.207e-3	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
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				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE THREE)
TINKER AFB - ELM CREEK - SW23
EXPOSURE SCENARIO NUMBER 2 - CHILD RESIDENTS
CALCULATE HAZARD INDICES:

CHEMICAL	ING+DERM DOSE	INHALATION DOSE	REFERENCE DOSE ING.	REFERENCE DOSE INH.	HAZARD IND ING./DERM	HAZARD IND. INH.	HAZARD INDEX
Acetone	0	0	1e-1		0	0	0
4-Methyl-2-pentanone	0	0	5e-2	2e-2	0	0	0
Arsenic	6.393e-5	0	3e-4		2.131e-1	0	2.131e-1
Barium	2.436e-2	0	7e-2	1e-4	3.479e-1	0	3.479e-1
Cobalt	0	0	8e-3		0	0	0
Copper	1.042e-3	0	4e-2		2.605e-2	0	2.605e-2
Lead	0	0	1.4e-3	4.3e-4	0	0	0
Vanadium	0	0	7e-3		0	0	0
Zinc	6.207e-3	0	2e-1		3.104e-2	0	3.104e-2
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
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	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
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	0	0			0	0	0
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	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
TOTAL HAZARD INDEX					6.181e-1	0	6.181e-1

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE FOUR)
TINKER AFB - ELM CREEK - SW23
EXPOSURE SCENARIO NUMBER 2 - CHILD RESIDENTS
CALCULATE INCREMENTAL CANCER RISK:

CHEMICAL	TIME-WEIGHTED ING & DERM DOSE	TIME-WEIGHTED INHALATION DOSE	CANCER SLOPE FACTOR ING	CANCER SLOPE FACTOR INH	CANCER RISK ING/DERM	CANCER RISK INH	CANCER RISK
Acetone	0	0			0	0	0
4-Methyl-2-pentanone	0	0			0	0	0
Arsenic	5.479e-6	0		5e1	0	0	0
Barium	2.088e-3	0			0	0	0
Cobalt	0	0			0	0	0
Copper	8.932e-5	0			0	0	0
Lead	0	0			0	0	0
Vanadium	0	0			0	0	0
Zinc	5.321e-4	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
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	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - EXPOSURES THROUGH HOUSEHOLD USE OF SURFACE WATER

SITE NAME: TINKER AFB - ELM CREEK - SW24
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY ON THE FOLLOWING SPREADSHEETS.
ONLY INGESTION OF SURFACE WATER IS CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO NUMBER 2 - CHILD RESIDENTS

REFERENCES: EPA, DECEMBER 1989
FOSTER AND CHROSTOWSKI, 1987

INGESTION: IEX = (C x IR x EF x ED)/(BW x LT x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
IR = INGESTION RATE (LITERS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

DERMAL CONTACT: DEX = (C x PC x AV x ET x EF x ED)/(BW x LT x 1000 x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
PC = THE PERMEABILITY CONSTANT OF WATER (CM/HR)
AV = THE SKIN SURFACE AREA AVAILABLE FOR CONTACT (CM**2)
ET = EXPOSURE TIME (HRS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

INHALATION: IEX = (S x IR x EF x ED)/(BW x LT x Ra x 1E6)x(Ds + EXP(-Ra x Dt)/Ra - EXP(Ra x (Ds-Dt))/Ra)

WHERE:
S = VOLATILE ORGANIC CHEMICAL GENERATION RATE (UG/CUBIC METER/MIN)
IR = INHALATION RATE (LITERS/MIN)
Ds = SHOWER DURATION (MIN)
Ra = AIR EXCHANGE RATE (1/MIN)
Dt = TOTAL DURATION IN SHOWER ROOM (MIN)
BW = BODY WEIGHT (KG)
SV = SHOWER ROOM AIR VOLUME (m**3)
R = IDEAL GAS LAW CONSTANT (ATM-M**3/MOL/K)

ENTER INPUT PARAMETERS:

INGESTION: CHILD EXPOSURE

IR:	1	CONVERSION FACTOR =	6.393e-2
EF:	350		
ED:	6		
BW:	15		
LT:	70		

DERMAL CONTACT: NOT APPLICABLE

PC:	1e-3	CONVERSION FACTOR =	0
AV:	19400		
ET:	.25		
EF:	0		
ED:	70		
BW:	70		
LT:	70		

INHALATION: NOT APPLICABLE

IR:	0	d:	1
BW:	70	Ts:	2
Ds:	15	T1:	293
Dt:	20	Ts:	318
Ra:	.0083	M1:	.982
SV:	12	M2:	.616
ED:	70	T:	293
R:	.000082	FR:	10
EF:	0	LT:	70

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE TWO)
TINKER AFB - ELM CREEK - SW24
EXPOSURE SCENARIO NUMBER 2 - CHILD RESIDENTS
CALCULATE DOSES:

CHEMICAL	GW CONC. (MG/L)	MOLECULAR WEIGHT	HENRYS LAW CONSTANT	MASS TRANSFER COEFFICIENT (KAl)	INGESTION DOSE	INHALATION DOSE	DERMAL DOSE
Acetone		58.08	3.43e-5	2.7584e0	0	0	0
4-Methyl-2-pentanone		100.2	4.16e-5	2.4834e0	0	0	0
Arsenic	.0013	74.92		0	8.311e-5	0	0
Barium	.394	137.34		0	2.519e-2	0	0
Cobalt				0	0	0	0
Copper	.0116	63.54		0	7.416e-4	0	0
Lead	.0011	207.19		0	7.032e-5	0	0
Vanadium		50.942		0	0	0	0
Zinc	.0114	65.38		0	7.288e-4	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE THREE)
TINKER AFB - ELM CREEK - SW24
EXPOSURE SCENARIO NUMBER 2 - CHILD RESIDENTS
CALCULATE HAZARD INDICES:

CHEMICAL	ING+DERM DOSE	INHALATION DOSE	REFERENCE DOSE ING.	REFERENCE DOSE INH.	HAZARD IND ING./DERM	HAZARD IND. INH.	HAZARD INDEX
Acetone	0	0	1e-1		0	0	0
4-Methyl-2-pentanone	0	0	5e-2	2e-2	0	0	0
Arsenic	8.311e-5	0	3e-4		2.770e-1	0	2.770e-1
Barium	2.519e-2	0	7e-2	1e-4	3.598e-1	0	3.598e-1
Cobalt	0	0	8e-3		0	0	0
Copper	7.416e-4	0	4e-2		1.854e-2	0	1.854e-2
Lead	7.032e-5	0	1.4e-3	4.3e-4	5.023e-2	0	5.023e-2
Vanadium	0	0	7e-3		0	0	0
Zinc	7.288e-4	0	2e-1		3.644e-3	0	3.644e-3
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
TOTAL HAZARD INDEX					7.092e-1	0	7.092e-1

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE FOUR)
TINKER AFB - ELM CREEK - SW24
EXPOSURE SCENARIO NUMBER 2 - CHILD RESIDENTS
CALCULATE INCREMENTAL CANCER RISK:

CHEMICAL	TIME-WEIGHTED ING & DERM DOSE	TIME-WEIGHTED INHALATION DOSE	CANCER SLOPE FACTOR ING	CANCER SLOPE FACTOR INH	CANCER RISK ING/DERM	CANCER RISK INH	CANCER RISK
Acetone	0	0			0	0	0
4-Methyl-2-pentanone	0	0			0	0	0
Arsenic	7.123e-6	0		5e1	0	0	0
Barium	2.159e-3	0			0	0	0
Cobalt	0	0			0	0	0
Copper	6.356e-5	0			0	0	0
Lead	6.027e-6	0			0	0	0
Vanadium	0	0			0	0	0
Zinc	6.247e-5	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES

SITE NAME: TINKER AFB - ELM CREEK - SW22
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE CONSIDERED: DERMAL CONTACT WITH WATER AND
ACCIDENTAL INGESTION OF WATER DURING SWIMMING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENT SWIMMERS

REFERENCE: EPA, DECEMBER 1989

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x LT x 365) * ED AND LT TERMS FOR CARCINOGENIC RISK ASSESSMENT ONLY.

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x LT x 1000 x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (SQ CM)
PC = DERMAL PERMEABILITY CONSTANT (CM/HR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

ENTER INPUT PARAMETERS:

INGESTION:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
CR:	.05	CONVERSION	N/A	CONVERSION	
ET:	2.6	FACTOR= 1.247e-4	N/A	FACTOR=	N/A
EF:	14		N/A		
ED:	9	TIME-WEIGHTED CONVERSION	N/A		
BW:	40	FACTOR= 1.603e-5	N/A		
LT:	70		N/A		

DERMAL:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
SA:	13700	CONVERSION	N/A	CONVERSION	
PC:	1e-3	FACTOR= 3.416e-5	N/A	FACTOR=	N/A
ET:	2.6		N/A		
EF:	14	TIME-WEIGHTED CONVERSION	N/A		
ED:	9	FACTOR= 4.392e-6	N/A		
BW:	40		N/A		
LT:	70		N/A		

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)
TINKER AFB - ELM CREEK - SW22
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE HAZARD INDICES (ADULT):

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	REFERENCE DOSE-ING.	ADULT HAZARD INDEX-ING.	ADULT HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Acetone	.0093	1.159e-6	3.177e-7	1e-1	1.159e-5	3.177e-6	1.477e-5
4-Methyl-2-pentanone	.0057	7.105e-7	1.947e-7	5e-2	1.421e-5	3.894e-6	1.810e-5
Arsenic	.00083	1.035e-7	2.835e-8	3e-4	3.449e-4	9.450e-5	4.394e-4
Barium	.351	4.375e-5	1.199e-5	7e-2	6.251e-4	1.713e-4	7.963e-4
Cobalt	.011	1.371e-6	3.757e-7	8e-3	1.714e-4	4.696e-5	2.184e-4
Copper	0	0	0	4e-2	0	0	0
Lead	.0023	2.867e-7	7.856e-8	1.4e-3	2.048e-4	5.611e-5	2.609e-4
Vanadium	.0086	1.072e-6	2.937e-7	7e-3	1.532e-4	4.196e-5	1.951e-4
Zinc	.0081	1.010e-6	2.767e-7	2e-1	5.049e-6	1.383e-6	6.432e-6
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL HAZARD INDEX					1.530e-3	4.193e-4	1.949e-3

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE FOUR)
TINKER AFB - ELM CREEK - SW22
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	CANCER SLOPE FACTOR-ING.	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK
Acetone	.0093	1.491e-7	4.084e-8		0	0	0
4-Methyl-2-pentanone	.0057	9.136e-8	2.503e-8		0	0	0
Arsenic	.00083	1.330e-8	3.645e-9		0	0	0
Barium	.351	5.626e-6	1.541e-6		0	0	0
Cobalt	.011	1.763e-7	4.831e-8		0	0	0
Copper	0	0	0		0	0	0
Lead	.0023	3.686e-8	1.010e-8		0	0	0
Vanadium	.0086	1.378e-7	3.777e-8		0	0	0
Zinc	.0081	1.298e-7	3.557e-8		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES

SITE NAME: TINKER AFB - ELM CREEK - SW23
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE CONSIDERED: DERMAL CONTACT WITH WATER AND
ACCIDENTAL INGESTION OF WATER DURING SWIMMING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENT SWIMMERS

REFERENCE: EPA, DECEMBER 1989

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x LT x 365) * ED AND LT TERMS FOR CARCINOGENIC RISK ASSESSMENT ONLY.

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x LT x 1000 x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (SQ CM)
PC = DERMAL PERMEABILITY CONSTANT (CM/HR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

ENTER INPUT PARAMETERS:

INGESTION:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE	
CR:	.05	CONVERSION	N/A	CONVERSION
ET:	2.6	FACTOR= 1.247e-4	N/A	FACTOR= N/A
EF:	14		N/A	
ED:	9	TIME-WEIGHTED CONVERSION	N/A	
BW:	40	FACTOR= 1.603e-5	N/A	
LT:	70		N/A	

DERMAL:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE	
SA:	13700	CONVERSION	N/A	CONVERSION
PC:	1e-3	FACTOR= 3.416e-5	N/A	FACTOR= N/A
ET:	2.6		N/A	
EF:	14	TIME-WEIGHTED CONVERSION	N/A	
ED:	9	FACTOR= 4.392e-6	N/A	
BW:	40		N/A	
LT:	70		N/A	

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)
TINKER AFB - ELM CREEK - SW23
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE HAZARD INDICES (ADULT):

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	REFERENCE DOSE-ING.	ADULT HAZARD INDEX-ING.	ADULT HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Acetone	0	0	0	1e-1	0	0	0
4-Methyl-2-pentanone	0	0	0	5e-2	0	0	0
Arsenic	.001	1.247e-7	3.416e-8	3e-4	4.155e-4	1.139e-4	5.294e-4
Barium	.381	4.749e-5	1.301e-5	7e-2	6.785e-4	1.859e-4	8.644e-4
Cobalt	0	0	0	8e-3	0	0	0
Copper	.0163	2.032e-6	5.567e-7	4e-2	5.080e-5	1.392e-5	6.472e-5
Lead	0	0	0	1.4e-3	0	0	0
Vanadium	0	0	0	7e-3	0	0	0
Zinc	.0971	1.210e-5	3.317e-6	2e-1	6.052e-5	1.658e-5	7.710e-5
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL HAZARD INDEX					1.205e-3	3.303e-4	1.536e-3

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE FOUR)
TINKER AFB - ELM CREEK - SW23
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	CANCER SLOPE FACTOR-ING.	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK
Acetone	0	0	0		0	0	0
4-Methyl-2-pentanone	0	0	0		0	0	0
Arsenic	.001	1.603e-8	4.392e-9		0	0	0
Barium	.381	6.106e-6	1.673e-6		0	0	0
Cobalt	0	0	0		0	0	0
Copper	.0163	2.612e-7	7.158e-8		0	0	0
Lead	0	0	0		0	0	0
Vanadium	0	0	0		0	0	0
Zinc	.0971	1.556e-6	4.264e-7		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES

SITE NAME: TINKER AFB - ELM CREEK - SW24
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE CONSIDERED: DERMAL CONTACT WITH WATER AND
ACCIDENTAL INGESTION OF WATER DURING SWIMMING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENT SWIMMERS

REFERENCE: EPA, DECEMBER 1989

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x LT x 365) * ED AND LT TERMS FOR CARCINOGENIC RISK ASSESSMENT ONLY.

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x LT x 1000 x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (SQ CM)
PC = DERMAL PERMEABILITY CONSTANT (CM/HR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

ENTER INPUT PARAMETERS:

INGESTION:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
CR:	.05	CONVERSION	N/A	CONVERSION	
ET:	2.6	FACTOR= 1.247e-4	N/A	FACTOR=	N/A
EF:	14		N/A		
ED:	9	TIME-WEIGHTED CONVERSION	N/A		
BW:	40	FACTOR= 1.603e-5	N/A		
LT:	70		N/A		

DERMAL:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
SA:	13700	CONVERSION	N/A	CONVERSION	
PC:	1e-3	FACTOR= 3.416e-5	N/A	FACTOR=	N/A
ET:	2.6		N/A		
EF:	14	TIME-WEIGHTED CONVERSION	N/A		
ED:	9	FACTOR= 4.392e-6	N/A		
BW:	40		N/A		
LT:	70		N/A		

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)
TINKER AFB - ELM CREEK - SW24
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE HAZARD INDICES (ADULT):

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	REFERENCE DOSE-ING.	ADULT HAZARD INDEX-ING.	ADULT HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Acetone	0	0	0	1e-1	0	0	0
4-Methyl-2-pentanone	0	0	0	5e-2	0	0	0
Arsenic	.0013	1.621e-7	4.440e-8	3e-4	5.402e-4	1.480e-4	6.882e-4
Barium	.394	4.912e-5	1.346e-5	7e-2	7.016e-4	1.923e-4	8.939e-4
Cobalt	0	0	0	8e-3	0	0	0
Copper	.0116	1.446e-6	3.962e-7	4e-2	3.615e-5	9.905e-6	4.606e-5
Lead	.0011	1.371e-7	3.757e-8	1.4e-3	9.795e-5	2.684e-5	1.248e-4
Vanadium	0	0	0	7e-3	0	0	0
Zinc	.0114	1.421e-6	3.894e-7	2e-1	7.105e-6	1.947e-6	9.052e-6
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	0	0	0		0	0	0
TOTAL HAZARD INDEX					1.383e-3	3.789e-4	1.762e-3

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE FOUR)
TINKER AFB - ELM CREEK - SW24
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	CANCER SLOPE FACTOR-ING.	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK
Acetone	0	0	0		0	0	0
4-Methyl-2-pentanone	0	0	0		0	0	0
Arsenic	.0013	2.084e-8	5.709e-9		0	0	0
Barium	.394	6.315e-6	1.730e-6		0	0	0
Cobalt	0	0	0		0	0	0
Copper	.0116	1.859e-7	5.094e-8		0	0	0
Lead	.0011	1.763e-8	4.831e-9		0	0	0
Vanadium	0	0	0		0	0	0
Zinc	.0114	1.827e-7	5.006e-8		0	0	0
	0	0	0		0	0	0
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	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH

SITE NAME: TINKER AFB - ELM CREEK - SW22
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INGESTION OF GAME FISH ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADULT FISHERMAN

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x BCF x IR x FI x EF x ED)/(BW x AT x LT)

ASSUMPTIONS:

C	= CONCENTRATION IN SURFACE WATER BODY (UG/L)	
BCF	= BIOCONCENTRATION FACTOR (UG/KG/UG/L)	
IR	= AVERAGE FISH INGESTION RATE (KG/MEAL):	.054
FI	= FRACTION INGESTED FROM CONTAMINATED SOURCE: (DIMENSIONLESS)	.5
EF	= EXPOSURE FREQUENCY (MEALS/YEAR):	365
ED	= EXPOSURE DURATION (YEARS)*:	30
BW	= RECEPTOR BODY WEIGHT (KG):	70
AT	= AVERAGING TIME (DAYS/YEAR):	365
LT	= LIFETIME (YEARS)*:	70

* ED AND LT USED FOR CARCINOGENIC RISK CHARACTERIZATION ONLY

DETERMINE CONVERSION FACTORS:

ANNUAL AVERAGE INTAKE: CF1 = 3.857e-7
LIFETIME AVERAGE INTAKE: CF2 = 1.653e-7

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE TWO)
TINKER AFB - ELM CREEK - SW22
EXPOSURE SCENARIO - ADULT FISHERMAN
CALCULATE DOSES:

CHEMICAL	C (UG/L)	BCF (UG/KG/UG/L)	ANNUAL AVERAGE DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Acetone	9.3	3e-1	1.076e-6	4.612e-7	1e-1	
4-Methyl-2-pentanone	5.7	5.2e0	1.143e-5	4.900e-6	5e-2	
Arsenic	.83	4.4e1	1.409e-5	6.037e-6	3e-4	
Barium	351	1e0	1.354e-4	5.802e-5	7e-2	
Cobalt	11	1e0	4.243e-6	1.818e-6	8e-3	
Copper		3.6e1	0	0	4e-2	
Lead	2.3	1e0	8.871e-7	3.802e-7	1.4e-3	
Vanadium	8.6	1e0	3.317e-6	1.422e-6	7e-3	
Zinc	8.1	4.7e1	1.468e-4	6.293e-5	2e-1	
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RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE THREE)
TINKER AFB - ELM CREEK - SW22
EXPOSURE SCENARIO - ADULT FISHERMAN
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX	CANCER RISK LIFETIME
Acetone	1.076e-5	0
4-Methyl-2-pentanone	2.287e-4	0
Arsenic	4.695e-2	0
Barium	1.934e-3	0
Cobalt	5.304e-4	0
Copper	0	0
Lead	6.337e-4	0
Vanadium	4.739e-4	0
Zinc	7.342e-4	0
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TOTAL	5.150e-2	0

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH

SITE NAME: TINKER AFB - ELM CREEK - SW23
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INGESTION OF GAME FISH ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADULT FISHERMAN

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x BCF x IR x FI x EF x ED)/(BW x AT x LT)

ASSUMPTIONS:

C	= CONCENTRATION IN SURFACE WATER BODY (UG/L)	
BCF	= BIOCONCENTRATION FACTOR (UG/KG/UG/L)	
IR	= AVERAGE FISH INGESTION RATE (KG/MEAL):	.054
FI	= FRACTION INGESTED FROM CONTAMINATED SOURCE: (DIMENSIONLESS)	.5
EF	= EXPOSURE FREQUENCY (MEALS/YEAR):	365
ED	= EXPOSURE DURATION (YEARS)*:	30
BW	= RECEPTOR BODY WEIGHT (KG):	70
AT	= AVERAGING TIME (DAYS/YEAR):	365
LT	= LIFETIME (YEARS)*:	70

* ED AND LT USED FOR CARCINOGENIC RISK CHARACTERIZATION ONLY

DETERMINE CONVERSION FACTORS:

ANNUAL AVERAGE INTAKE:	CF1 =	3.857e-7
LIFETIME AVERAGE INTAKE:	CF2 =	1.653e-7

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE TWO)
TINKER AFB - ELM CREEK - SW23
EXPOSURE SCENARIO - ADULT FISHERMAN
CALCULATE DOSES:

CHEMICAL	C (UG/L)	BCF (UG/KG/UG/L)	ANNUAL AVERAGE DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Acetone		3e-1	0	0	1e-1	
4-Methyl-2-pentanone		5.2e0	0	0	5e-2	
Arsenic	1	4.4e1	1.697e-5	7.273e-6	3e-4	
Barium	381	1e0	1.470e-4	6.298e-5	7e-2	
Cobalt		1e0	0	0	8e-3	
Copper	16.3	3.6e1	2.263e-4	9.700e-5	4e-2	
Lead		1e0	0	0	1.4e-3	
Vanadium		1e0	0	0	7e-3	
Zinc	97.1	4.7e1	1.760e-3	7.544e-4	2e-1	
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RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE THREE)
TINKER AFB - ELM CREEK - SW23
EXPOSURE SCENARIO - ADULT FISHERMAN
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX	CANCER RISK LIFETIME
Acetone	0	0
4-Methyl-2-pentanone	0	0
Arsenic	5.657e-2	0
Barium	2.099e-3	0
Cobalt	0	0
Copper	5.658e-3	0
Lead	0	0
Vanadium	0	0
Zinc	8.801e-3	0
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TOTAL	7.313e-2	0

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH

SITE NAME: TINKER AFB - ELM CREEK - SW24
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INGESTION OF GAME FISH ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADULT FISHERMAN

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x BCF x IR x FI x EF x ED)/(BW x AT x LT)

ASSUMPTIONS:

C	= CONCENTRATION IN SURFACE WATER BODY (UG/L)	
BCF	= BIOCONCENTRATION FACTOR (UG/KG/UG/L)	
IR	= AVERAGE FISH INGESTION RATE (KG/MEAL):	.054
FI	= FRACTION INGESTED FROM CONTAMINATED SOURCE: (DIMENSIONLESS)	.5
EF	= EXPOSURE FREQUENCY (MEALS/YEAR):	365
ED	= EXPOSURE DURATION (YEARS)*:	30
BW	= RECEPTOR BODY WEIGHT (KG):	70
AT	= AVERAGING TIME (DAYS/YEAR):	365
LT	= LIFETIME (YEARS)*:	70

* ED AND LT USED FOR CARCINOGENIC RISK CHARACTERIZATION ONLY

DETERMINE CONVERSION FACTORS:

ANNUAL AVERAGE INTAKE:	CF1 =	3.857e-7
LIFETIME AVERAGE INTAKE:	CF2 =	1.653e-7

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE TWO)
TINKER AFB - ELM CREEK - SW24
EXPOSURE SCENARIO - ADULT FISHERMAN
CALCULATE DOSES:

CHEMICAL	C (UG/L)	BCF (UG/KG/UG/L)	ANNUAL AVERAGE DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Acetone		3e-1	0	0	1e-1	
4-Methyl-2-pentanone		5.2e0	0	0	5e-2	
Arsenic	1.3	4.4e1	2.206e-5	9.456e-6	3e-4	
Barium	394	1e0	1.520e-4	6.513e-5	7e-2	
Cobalt		1e0	0	0	8e-3	
Copper	11.6	3.6e1	1.611e-4	6.903e-5	4e-2	
Lead	1.1	1e0	4.243e-7	1.818e-7	1.4e-3	
Vanadium		1e0	0	0	7e-3	
Zinc	11.4	4.7e1	2.067e-4	8.857e-5	2e-1	
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RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE THREE)
TINKER AFB - ELM CREEK - SW24
EXPOSURE SCENARIO - ADULT FISHERMAN
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX	CANCER RISK LIFETIME
Acetone	0	0
4-Methyl-2-pentanone	0	0
Arsenic	7.354e-2	0
Barium	2.171e-3	0
Cobalt	0	0
Copper	4.027e-3	0
Lead	3.031e-4	0
Vanadium	0	0
Zinc	1.033e-3	0
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TOTAL	8.108e-2	0

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: TINKER AFB - ELM CREEK - SD22
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO NUMBER 1- ADOLESCENTS

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x LT x 365 x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

ADOLESCENT:		CHILD:	
IR:	100	IR:	0
EF:	14	EF:	14
Fi:	.5	Fi:	.5
ED:	9	ED:	9
BW:	40	BW:	40
LT:	70	LT:	70

DETERMINE CONVERSION FACTORS:

ADOLESCENT:	YOUTH:	ADULT/YOUTH (CANCER RISK):
CF: 4.795e-8 (AVG ANNUAL DOSE)	CF: 0 (AVG ANNUAL DOSE)	CF: 6.164e-9

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
TINKER AFB - ELM CREEK - SD22
EXPOSURE SCENARIO NUMBER 1- ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (MG/KG)	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Arsenic	4.2	0	2.014e-7	2.589e-8	3e-4	
Antimony		0	0	0	4e-4	
Barium	1277	0	6.123e-5	7.872e-6	7e-2	
Cadmium		0	0	0	5e-4	
Chromium (III)	37.7	0	1.808e-6	2.324e-7	1e0	
Copper	13	0	6.233e-7	8.014e-8	4e-2	
Lead	24.9	0	1.194e-6	1.535e-7	1.4e-3	
Manganese	454	0	2.177e-5	2.799e-6	1e-1	
Mercury	.08	0	3.836e-9	4.93e-10	3e-4	
Vanadium	61.1	0	2.929e-6	3.766e-7	7e-3	
Zinc	56.2	0	2.695e-6	3.464e-7	2e-1	
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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
TINKER AFB - ELM CREEK - SD22
EXPOSURE SCENARIO NUMBER 1- ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX ADOLESCENT	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Arsenic	0	6.712e-4	0
Antimony	0	0	0
Barium	0	8.747e-4	0
Cadmium	0	0	0
Chromium (III)	0	1.808e-6	0
Copper	0	1.558e-5	0
Lead	0	8.527e-4	0
Manganese	0	2.177e-4	0
Mercury	0	1.279e-5	0
Vanadium	0	4.185e-4	0
Zinc	0	1.347e-5	0
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TOTAL	0	3.078e-3	0

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: TINKER AFB - ELM CREEK - SD23
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO NUMBER 1- ADOLESCENTS

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x LT x 365 x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

ADOLESCENT:		CHILD:	
IR:	100	IR:	0
EF:	14	EF:	14
Fi:	.5	Fi:	.5
ED:	9	ED:	9
BW:	40	BW:	40
LT:	70	LT:	70

DETERMINE CONVERSION FACTORS:

ADOLESCENT:		YOUTH:		ADULT/YOUTH (CANCER RISK):	
CF:	4.795e-8 (AVG ANNUAL DOSE)	CF:	0 (AVG ANNUAL DOSE)	CF:	6.164e-9

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
TINKER AFB - ELM CREEK - SD23
EXPOSURE SCENARIO NUMBER 1- ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (MG/KG)	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Arsenic	2.3	0	1.103e-7	1.418e-8	3e-4	
Antimony	1.1	0	5.274e-8	6.781e-9	4e-4	
Barium	552	0	2.647e-5	3.403e-6	7e-2	
Cadmium		0	0	0	5e-4	
Chromium (III)	27.4	0	1.314e-6	1.689e-7	1e0	
Copper	10.9	0	5.226e-7	6.719e-8	4e-2	
Lead	10.5	0	5.034e-7	6.473e-8	1.4e-3	
Manganese		0	0	0	1e-1	
Mercury		0	0	0	3e-4	
Vanadium	63	0	3.021e-6	3.884e-7	7e-3	
Zinc	54.9	0	2.632e-6	3.384e-7	2e-1	
		0	0	0		
		0	0	0		
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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
TINKER AFB - ELM CREEK - SD23
EXPOSURE SCENARIO NUMBER 1- ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX ADOLESCENT	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Arsenic	0	3.676e-4	0
Antimony	0	1.318e-4	0
Barium	0	3.781e-4	0
Cadmium	0	0	0
Chromium (III)	0	1.314e-6	0
Copper	0	1.307e-5	0
Lead	0	3.596e-4	0
Manganese	0	0	0
Mercury	0	0	0
Vanadium	0	4.315e-4	0
Zinc	0	1.316e-5	0
	0	0	0
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	0	0	0
TOTAL	0	1.696e-3	0

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: TINKER AFB - ELM CREEK - SD24
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO NUMBER 1- ADOLESCENTS

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x LT x 365 x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

ADOLESCENT:		CHILD:	
IR:	100	IR:	0
EF:	14	EF:	14
Fi:	.5	Fi:	.5
ED:	9	ED:	9
BW:	40	BW:	40
LT:	70	LT:	70

DETERMINE CONVERSION FACTORS:

ADOLESCENT:		YOUTH:		ADULT/YOUTH (CANCER RISK):	
CF:	4.795e-8 (AVG ANNUAL DOSE)	CF:	0 (AVG ANNUAL DOSE)	CF:	6.164e-9

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
TINKER AFB - ELM CREEK - SD24
EXPOSURE SCENARIO NUMBER 1- ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (MG/KG)	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Arsenic	6.2	0	2.973e-7	3.822e-8	3e-4	
Antimony	.92	0	4.411e-8	5.671e-9	4e-4	
Barium	796	0	3.816e-5	4.907e-6	7e-2	
Cadmium	2	0	9.589e-8	1.233e-8	5e-4	
Chromium (III)	186	0	8.918e-6	1.147e-6	1e0	
Copper	12.7	0	6.089e-7	7.829e-8	4e-2	
Lead	22.5	0	1.079e-6	1.387e-7	1.4e-3	
Manganese		0	0	0	1e-1	
Mercury		0	0	0	3e-4	
Vanadium	57.1	0	2.738e-6	3.520e-7	7e-3	
Zinc	90.5	0	4.339e-6	5.579e-7	2e-1	
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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
TINKER AFB - ELM CREEK - SD24
EXPOSURE SCENARIO NUMBER 1- ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX ADOLESCENT	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Arsenic	0	9.909e-4	0
Antimony	0	1.103e-4	0
Barium	0	5.452e-4	0
Cadmium	0	1.918e-4	0
Chromium (III)	0	8.918e-6	0
Copper	0	1.522e-5	0
Lead	0	7.705e-4	0
Manganese	0	0	0
Mercury	0	0	0
Vanadium	0	3.911e-4	0
Zinc	0	2.170e-5	0
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	0	0	0
TOTAL	0	3.046e-3	0

RISK ASSESSMENT SPREADSHEET - EXPOSURES THROUGH HOUSEHOLD USE OF SURFACE WATER

SITE NAME: TINKER AFB - KUHLMAN CREEK - SW01
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY ON THE FOLLOWING SPREADSHEETS.
ONLY INGESTION OF SURFACE WATER IS CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO NUMBER 1 - ADULT RESIDENTS

REFERENCES: EPA, DECEMBER 1989
FOSTER AND CHROSTOWSKI, 1987

INGESTION: IEX = (C x IR x EF x ED)/(BW x LT x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
IR = INGESTION RATE (LITERS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

DERMAL CONTACT: DEX = (C x PC x AV x ET x EF x ED)/(BW x LT x 1000 x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
PC = THE PERMEABILITY CONSTANT OF WATER (CM/HR)
AV = THE SKIN SURFACE AREA AVAILABLE FOR CONTACT (CM**2)
ET = EXPOSURE TIME (HRS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

INHALATION: IEX = (S x IR x EF x ED)/(BW x LT x Ra x 1E6)x(Ds + EXP(-Ra x Dt)/Ra - EXP(Ra x (Ds-Dt))/Ra)

WHERE:
S = VOLATILE ORGANIC CHEMICAL GENERATION RATE (UG/CUBIC METER/MIN)
IR = INHALATION RATE (LITERS/MIN)
Ds = SHOWER DURATION (MIN)
Ra = AIR EXCHANGE RATE (1/MIN)
Dt = TOTAL DURATION IN SHOWER ROOM (MIN)
BW = BODY WEIGHT (KG)
SV = SHOWER ROOM AIR VOLUME (m**3)
R = IDEAL GAS LAW CONSTANT (ATM-M**3/MOL/K)

ENTER INPUT PARAMETERS:

INGESTION: ADULT EXPOSURE

IR:	2	CONVERSION FACTOR =	2.740e-2
EF:	350		
ED:	30		
BW:	70		
LT:	70		

DERMAL CONTACT: NOT APPLICABLE

PC:	1e-3	CONVERSION FACTOR =	0
AV:	19400		
ET:	.25		
EF:	0		
ED:	70		
BW:	70		
LT:	70		

INHALATION: NOT APPLICABLE

IR:	0	d:	1
BW:	70	Ts:	2
Ds:	15	T1:	293
Dt:	20	Ts:	318
Ra:	.0083	M1:	.982
SV:	12	M2:	.616
ED:	70	T:	293
R:	.000082	FR:	10
EF:	0	LT:	70

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE TWO)
TINKER AFB - KUHLMAN CREEK SW01
EXPOSURE SCENARIO - ADULT RESIDENTS
CALCULATE DOSES:

CHEMICAL	GW CONC. (MG/L)	MOLECULAR WEIGHT	HENRYS LAW CONSTANT	MASS TRANSFER COEFFICIENT (KAl)	INGESTION DOSE	INHALATION DOSE	DERMAL DOSE
Acetone	.0108	58.08	3.43e-5	2.7584e0	2.959e-4	0	0
4-Methyl-2-pentanone	.0053	100.2	4.16e-5	2.4834e0	1.452e-4	0	0
Xylenes		106.16	6.82e-3	1.6337e1	0	0	0
Bis(2-ethylhexyl)phthalate	.0054	390.62	3e-7	1.056e-2	1.479e-4	0	0
Di-n-octylphthalate	.0084	391	1.7e-5	5.610e-1	2.301e-4	0	0
Arsenic	.0014	74.92		0	3.836e-5	0	0
Barium	.388	137.34		0	1.063e-2	0	0
Cobalt	.0104			0	2.849e-4	0	0
Copper		63.54		0	0	0	0
Lead	.0016	207.19		0	4.384e-5	0	0
Selenium	.0012			0	3.288e-5	0	0
Zinc	.0098	65.38		0	2.685e-4	0	0
Chlorpyrifos	.0017			0	4.658e-5	0	0
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RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE THREE)
TINKER AFB - KUHLMAN CREEK SW01
EXPOSURE SCENARIO - ADULT RESIDENTS
CALCULATE HAZARD INDICES:

CHEMICAL	ING+DERM DOSE	INHALATION DOSE	REFERENCE DOSE ING.	REFERENCE DOSE INH.	HAZARD IND ING./DERM	HAZARD IND. INH.	HAZARD INDEX
Acetone	2.959e-4	0	1e-1		2.959e-3	0	2.959e-3
4-Methyl-2-pentanone	1.452e-4	0	5e-2	2e-2	2.904e-3	0	2.904e-3
Xylenes	0	0	2e0	9e-2	0	0	0
Bis(2-ethylhexyl)phthalate	1.479e-4	0	2e-2		7.397e-3	0	7.397e-3
Di-n-octylphthalate	2.301e-4	0	2e-2		1.151e-2	0	1.151e-2
Arsenic	3.836e-5	0	3e-4		1.279e-1	0	1.279e-1
Barium	1.063e-2	0	7e-2	1e-4	1.519e-1	0	1.519e-1
Cobalt	2.849e-4	0	8e-3		3.562e-2	0	3.562e-2
Copper	0	0	4e-2		0	0	0
Lead	4.384e-5	0	1.4e-3	4.3e-4	3.131e-2	0	3.131e-2
Selenium	3.288e-5	0	5e-3		6.575e-3	0	6.575e-3
Zinc	2.685e-4	0	2e-1		1.342e-3	0	1.342e-3
Chlorpyrifos	4.658e-5	0	.3		1.553e-4	0	1.553e-4
	0	0			0	0	0
	0	0			0	0	0
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	0	0			0	0	0
TOTAL HAZARD INDEX					3.795e-1	0	3.795e-1

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE FOUR)
TINKER AFB - KUHLMAN CREEK SW01
EXPOSURE SCENARIO - ADULT RESIDENTS
CALCULATE INCREMENTAL CANCER RISK:

CHEMICAL	TIME-WEIGHTED ING & DERM DOSE	TIME-WEIGHTED INHALATION DOSE	CANCER SLOPE FACTOR ING	CANCER SLOPE FACTOR INH	CANCER RISK ING/DERM	CANCER RISK INH	CANCER RISK
Acetone	1.268e-4	0			0	0	0
4-Methyl-2-pentanone	6.223e-5	0			0	0	0
Xylenes	0	0			0	0	0
Bis(2-ethylhexyl)phthalate	6.341e-5	0	1.4e-2		8.877e-7	0	8.877e-7
Di-n-octylphthalate	9.863e-5	0			0	0	0
Arsenic	1.644e-5	0		5e1	0	0	0
Barium	4.556e-3	0			0	0	0
Cobalt	1.221e-4	0			0	0	0
Copper	0	0			0	0	0
Lead	1.879e-5	0			0	0	0
Selenium	1.409e-5	0			0	0	0
Zinc	1.151e-4	0			0	0	0
Chlorpyrifos	1.996e-5	0			0	0	0
	0	0			0	0	0
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	0	0			0	0	0
TOTAL RISK					8.877e-7	0	8.877e-7

RISK ASSESSMENT SPREADSHEET - EXPOSURES THROUGH HOUSEHOLD USE OF SURFACE WATER

SITE NAME: TINKER AFB - KUHLMAN CREEK - SW01
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY ON THE FOLLOWING SPREADSHEETS.
ONLY INGESTION OF SURFACE WATER IS CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO NUMBER 2 - CHILD RESIDENTS

REFERENCES: EPA, DECEMBER 1989
FOSTER AND CHROSTOWSKI, 1987

INGESTION: IEX = (C x IR x EF x ED)/(BW x LT x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
IR = INGESTION RATE (LITERS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

DERMAL CONTACT: DEX = (C x PC x AV x ET x EF x ED)/(BW x LT x 1000 x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
PC = THE PERMEABILITY CONSTANT OF WATER (CM/HR)
AV = THE SKIN SURFACE AREA AVAILABLE FOR CONTACT (CM**2)
ET = EXPOSURE TIME (HRS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

INHALATION: IEX = (S x IR x EF x ED)/(BW x LT x Ra x 1E6)x(Ds + EXP(-Ra x Dt)/Ra - EXP(Ra x (Ds-Dt))/Ra)

WHERE:
S = VOLATILE ORGANIC CHEMICAL GENERATION RATE (UG/CUBIC METER/MIN)
IR = INHALATION RATE (LITERS/MIN)
Ds = SHOWER DURATION (MIN)
Ra = AIR EXCHANGE RATE (1/MIN)
Dt = TOTAL DURATION IN SHOWER ROOM (MIN)
BW = BODY WEIGHT (KG)
SV = SHOWER ROOM AIR VOLUME (m**3)
R = IDEAL GAS LAW CONSTANT (ATM-M**3/MOL/K)

ENTER INPUT PARAMETERS:

INGESTION: CHILD EXPOSURE

IR:	1	CONVERSION FACTOR =	6.393e-2
EF:	350		
ED:	6		
BW:	15		
LT:	70		

DERMAL CONTACT: NOT APPLICABLE

PC:	1e-3	CONVERSION FACTOR =	0
AV:	19400		
ET:	.25		
EF:	0		
ED:	70		
BW:	70		
LT:	70		

INHALATION: NOT APPLICABLE

IR:	0	d:	1
BW:	70	Ts:	2
Ds:	15	T1:	293
Dt:	20	Ts:	318
Ra:	.0083	M1:	.982
SV:	12	M2:	.616
ED:	70	T:	293
R:	.000082	FR:	10
EF:	0	LT:	70

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE TWO)
TINKER AFB - KUHLMAN CREEK - SW01
EXPOSURE SCENARIO NUMBER 2 - CHILD RESIDENTS
CALCULATE DOSES:

CHEMICAL	GW CONC. (MG/L)	MOLECULAR WEIGHT	HENRYS LAW CONSTANT	MASS TRANSFER COEFFICIENT (KAl)	INGESTION DOSE	INHALATION DOSE	DERMAL DOSE
Acetone	.0108	58.08	3.43e-5	2.7584e0	6.904e-4	0	0
4-Methyl-2-pentanone	.0053	100.2	4.16e-5	2.4834e0	3.388e-4	0	0
Xylenes		106.16	6.82e-3	1.6337e1	0	0	0
Bis(2-ethylhexyl)phthalate	.0054	390.62	3e-7	1.056e-2	3.452e-4	0	0
Di-n-octylphthalate	.0084	391	1.7e-5	5.610e-1	5.370e-4	0	0
Arsenic	.0014	74.92		0	8.950e-5	0	0
Barium	.388	137.34		0	2.480e-2	0	0
Cobalt	.0104			0	6.648e-4	0	0
Copper		63.54		0	0	0	0
Lead	.0016	207.19		0	1.023e-4	0	0
Selenium	.0012			0	7.671e-5	0	0
Zinc	.0098	65.38		0	6.265e-4	0	0
Chlorpyrifos	.0017			0	1.087e-4	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE THREE)
TINKER AFB - KUHLMAN CREEK - SW01
EXPOSURE SCENARIO NUMBER 2 - CHILD RESIDENTS
CALCULATE HAZARD INDICES:

CHEMICAL	ING+DERM DOSE	INHALATION DOSE	REFERENCE DOSE ING.	REFERENCE DOSE INH.	HAZARD IND ING./DERM	HAZARD IND. INH.	HAZARD INDEX
Acetone	6.904e-4	0	1e-1		6.904e-3	0	6.904e-3
4-Methyl-2-pentanone	3.388e-4	0	5e-2	2e-2	6.776e-3	0	6.776e-3
Xylenes	0	0	2e0	9e-2	0	0	0
Bis(2-ethylhexyl)phthalate	3.452e-4	0	2e-2		1.726e-2	0	1.726e-2
Di-n-octylphthalate	5.370e-4	0	2e-2		2.685e-2	0	2.685e-2
Arsenic	8.950e-5	0	3e-4		2.983e-1	0	2.983e-1
Barium	2.480e-2	0	7e-2	1e-4	3.543e-1	0	3.543e-1
Cobalt	6.648e-4	0	8e-3		8.311e-2	0	8.311e-2
Copper	0	0	4e-2		0	0	0
Lead	1.023e-4	0	1.4e-3	4.3e-4	7.306e-2	0	7.306e-2
Selenium	7.671e-5	0	5e-3		1.534e-2	0	1.534e-2
Zinc	6.265e-4	0	2e-1		3.132e-3	0	3.132e-3
Chlorpyrifos	1.087e-4	0	3e-1		3.623e-4	0	3.623e-4
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
TOTAL HAZARD INDEX					8.855e-1	0	8.855e-1

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE FOUR)
TINKER AFB - KUHLMAN CREEK - SW01
EXPOSURE SCENARIO NUMBER 2 - CHILD RESIDENTS
CALCULATE INCREMENTAL CANCER RISK:

CHEMICAL	TIME-WEIGHTED ING & DERM DOSE	TIME-WEIGHTED INHALATION DOSE	CANCER SLOPE FACTOR ING	CANCER SLOPE FACTOR INH	CANCER RISK ING/DERM	CANCER RISK INH	CANCER RISK
Acetone	5.918e-5	0			0	0	0
4-Methyl-2-pentanone	2.904e-5	0			0	0	0
Xylenes	0	0			0	0	0
Bis(2-ethylhexyl)phthalate	2.959e-5	0	1.4e-2		4.142e-7	0	4.142e-7
Di-n-octylphthalate	4.603e-5	0			0	0	0
Arsenic	7.671e-6	0		5e1	0	0	0
Barium	2.126e-3	0			0	0	0
Cobalt	5.699e-5	0			0	0	0
Copper	0	0			0	0	0
Lead	8.767e-6	0			0	0	0
Selenium	6.575e-6	0			0	0	0
Zinc	5.370e-5	0			0	0	0
Chlorpyrifos	9.315e-6	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
TOTAL RISK					4.142e-7	0	4.142e-7

RISK ASSESSMENT SPREADSHEET - EXPOSURES THROUGH HOUSEHOLD USE OF SURFACE WATER

SITE NAME: TINKER AFB - KUHLMAN CREEK - SW05
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY ON THE FOLLOWING SPREADSHEETS.
ONLY INGESTION OF SURFACE WATER IS CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO NUMBER 2 - CHILD RESIDENTS

REFERENCES: EPA, DECEMBER 1989
FOSTER AND CHROSTOWSKI, 1987

INGESTION: IEX = (C x IR x EF x ED)/(BW x LT x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
IR = INGESTION RATE (LITERS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

DERMAL CONTACT: DEX = (C x PC x AV x ET x EF x ED)/(BW x LT x 1000 x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
PC = THE PERMEABILITY CONSTANT OF WATER (CM/HR)
AV = THE SKIN SURFACE AREA AVAILABLE FOR CONTACT (CM**2)
ET = EXPOSURE TIME (HRS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

INHALATION: IEX = (S x IR x EF x ED)/(BW x LT x Ra x 1E6)x(Ds + EXP(-Ra x Dt)/Ra - EXP(Ra x (Ds-Dt))/Ra)

WHERE:
S = VOLATILE ORGANIC CHEMICAL GENERATION RATE (UG/CUBIC METER/MIN)
IR = INHALATION RATE (LITERS/MIN)
Ds = SHOWER DURATION (MIN)
Ra = AIR EXCHANGE RATE (1/MIN)
Dt = TOTAL DURATION IN SHOWER ROOM (MIN)
BW = BODY WEIGHT (KG)
SV = SHOWER ROOM AIR VOLUME (m**3)
R = IDEAL GAS LAW CONSTANT (ATM-M**3/MOL/K)

ENTER INPUT PARAMETERS:

INGESTION: CHILD EXPOSURE

IR:	1	CONVERSION FACTOR =	6.393e-2
EF:	350		
ED:	6		
BW:	15		
LT:	70		

DERMAL CONTACT: NOT APPLICABLE

PC:	1e-3	CONVERSION FACTOR =	0
AV:	19400		
ET:	.25		
EF:	0		
ED:	70		
BW:	70		
LT:	70		

INHALATION: NOT APPLICABLE

IR:	0	d:	1
BW:	70	Ts:	2
Ds:	15	T1:	293
Dt:	20	Ts:	318
Ra:	.0083	M1:	.982
SV:	12	M2:	.616
ED:	70	T:	293
R:	.000082	FR:	10
EF:	0	LT:	70

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE TWO)
TINKER AFB - KUHLMAN CREEK - SW05
EXPOSURE SCENARIO NUMBER 2 - CHILD RESIDENTS
CALCULATE DOSES:

CHEMICAL	GW CONC. (MG/L)	MOLECULAR WEIGHT	HENRYS LAW CONSTANT	MASS TRANSFER COEFFICIENT (KAl)	INGESTION DOSE	INHALATION DOSE	DERMAL DOSE
Acetone	.0095	58.08	3.43e-5	2.7584e0	6.073e-4	0	0
4-Methyl-2-pentanone	.0052	100.2	4.16e-5	2.4834e0	3.324e-4	0	0
Xylenes	.0028	106.16	6.82e-3	1.6337e1	1.790e-4	0	0
Bis(2-ethylhexyl)phthalate		390.62	3e-7	1.056e-2	0	0	0
Di-n-octylphthalate		391	1.7e-5	5.610e-1	0	0	0
Arsenic	.0009	74.92		0	5.753e-5	0	0
Barium	.373	137.34		0	2.384e-2	0	0
Cobalt				0	0	0	0
Copper	.0094	63.54		0	6.009e-4	0	0
Lead	.0009	207.19		0	5.753e-5	0	0
Selenium	.001			0	6.393e-5	0	0
Zinc	.076	65.38		0	4.858e-3	0	0
Chlorpyrifos				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
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				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE THREE)
TINKER AFB - KUHLMAN CREEK - SW05
EXPOSURE SCENARIO NUMBER 2 - CHILD RESIDENTS
CALCULATE HAZARD INDICES:

CHEMICAL	ING+DERM DOSE	INHALATION DOSE	REFERENCE DOSE ING.	REFERENCE DOSE INH.	HAZARD IND ING./DERM	HAZARD IND. INH.	HAZARD INDEX
Acetone	6.073e-4	0	1e-1		6.073e-3	0	6.073e-3
4-Methyl-2-pentanone	3.324e-4	0	5e-2	2e-2	6.648e-3	0	6.648e-3
Xylenes	1.790e-4	0	2e0	9e-2	8.950e-5	0	8.950e-5
Bis(2-ethylhexyl)phthalate	0	0	2e-2		0	0	0
Di-n-octylphthalate	0	0	2e-2		0	0	0
Arsenic	5.753e-5	0	3e-4		1.918e-1	0	1.918e-1
Barium	2.384e-2	0	7e-2	1e-4	3.406e-1	0	3.406e-1
Cobalt	0	0	8e-3		0	0	0
Copper	6.009e-4	0	4e-2		1.502e-2	0	1.502e-2
Lead	5.753e-5	0	1.4e-3	4.3e-4	4.110e-2	0	4.110e-2
Selenium	6.393e-5	0	5e-3		1.279e-2	0	1.279e-2
Zinc	4.858e-3	0	2e-1		2.429e-2	0	2.429e-2
Chlorpyrifos	0	0	3e-1		0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
TOTAL HAZARD INDEX					6.384e-1	0	6.384e-1

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE FOUR)
TINKER AFB - KUHLMAN CREEK - SW05
EXPOSURE SCENARIO NUMBER 2 - CHILD RESIDENTS
CALCULATE INCREMENTAL CANCER RISK:

CHEMICAL	TIME-WEIGHTED ING & DERM DOSE	TIME-WEIGHTED INHALATION DOSE	CANCER SLOPE FACTOR ING	CANCER SLOPE FACTOR INH	CANCER RISK ING/DERM	CANCER RISK INH	CANCER RISK
Acetone	5.205e-5	0			0	0	0
4-Methyl-2-pentanone	2.849e-5	0			0	0	0
Xylenes	1.534e-5	0			0	0	0
Bis(2-ethylhexyl)phthalate	0	0	1.4e-2		0	0	0
Di-n-octylphthalate	0	0			0	0	0
Arsenic	4.932e-6	0		5e1	0	0	0
Barium	2.044e-3	0			0	0	0
Cobalt	0	0			0	0	0
Copper	5.151e-5	0			0	0	0
Lead	4.932e-6	0			0	0	0
Selenium	5.479e-6	0			0	0	0
Zinc	4.164e-4	0			0	0	0
Chlorpyrifos	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - EXPOSURES THROUGH HOUSEHOLD USE OF SURFACE WATER

SITE NAME: TINKER AFB - KUHLMAN CREEK - SW15
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY ON THE FOLLOWING SPREADSHEETS.
ONLY INGESTION OF SURFACE WATER IS CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO NUMBER 1 - ADULT RESIDENTS

REFERENCES: EPA, DECEMBER 1989
FOSTER AND CHROSTOWSKI, 1987

INGESTION: IEX = (C x IR x EF x ED)/(BW x LT x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
IR = INGESTION RATE (LITERS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

DERMAL CONTACT: DEX = (C x PC x AV x ET x EF x ED)/(BW x LT x 1000 x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
PC = THE PERMEABILITY CONSTANT OF WATER (CM/HR)
AV = THE SKIN SURFACE AREA AVAILABLE FOR CONTACT (CM**2)
ET = EXPOSURE TIME (HRS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

INHALATION: IEX = ($ x IR x EF x ED)/(BW x LT x Ra x 1E6)x(Ds + EXP(-Ra x Dt)/Ra - EXP(Ra x (Ds-Dt))/Ra)

WHERE:
$ = VOLATILE ORGANIC CHEMICAL GENERATION RATE (UG/CUBIC METER/MIN)
IR = INHALATION RATE (LITERS/MIN)
Ds = SHOWER DURATION (MIN)
Ra = AIR EXCHANGE RATE (1/MIN)
Dt = TOTAL DURATION IN SHOWER ROOM (MIN)
BW = BODY WEIGHT (KG)
SV = SHOWER ROOM AIR VOLUME (m**3)
R = IDEAL GAS LAW CONSTANT (ATM-M**3/MOL/K)

ENTER INPUT PARAMETERS:

INGESTION: ADULT EXPOSURE

IR:	2	CONVERSION FACTOR =	2.740e-2
EF:	350		
ED:	30		
BW:	70		
LT:	70		

DERMAL CONTACT: NOT APPLICABLE

PC:	1e-3	CONVERSION FACTOR =	0
AV:	19400		
ET:	.25		
EF:	0		
ED:	70		
BW:	70		
LT:	70		

INHALATION: NOT APPLICABLE

IR:	0	d:	1
BW:	70	Ts:	2
Ds:	15	T1:	293
Dt:	20	Ts:	318
Ra:	.0083	M1:	.982
SV:	12	M2:	.616
ED:	70	T:	293
R:	.000082	FR:	10
EF:	0	LT:	70

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE TWO)
TINKER AFB - KUHLMAN CREEK - SW05
EXPOSURE SCENARIO NUMBER 1 - ADULT RESIDENTS
CALCULATE DOSES:

CHEMICAL	GW CONC. (MG/L)	MOLECULAR WEIGHT	HENRYS LAW CONSTANT	MASS TRANSFER COEFFICIENT (KAl)	INGESTION DOSE	INHALATION DOSE	DERMAL DOSE
Acetone	.0095	58.08	3.43e-5	2.7584e0	2.603e-4	0	0
4-Methyl-2-pentanone	.0052	100.2	4.16e-5	2.4834e0	1.425e-4	0	0
Xylenes	.0028	106.16	6.82e-3	1.6337e1	7.671e-5	0	0
Bis(2-ethylhexyl)phthalate		390.62	3e-7	1.056e-2	0	0	0
Di-n-octylphthalate		391	1.7e-5	5.610e-1	0	0	0
Arsenic	.0009	74.92		0	2.466e-5	0	0
Barium	.373	137.34		0	1.022e-2	0	0
Cobalt				0	0	0	0
Copper	.0094	63.54		0	2.575e-4	0	0
Lead	.0009	207.19		0	2.466e-5	0	0
Selenium	.001			0	2.740e-5	0	0
Zinc	.076	65.38		0	2.082e-3	0	0
Chlorpyrifos				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
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				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE THREE)
TINKER AFB - KUHLMAN CREEK - SW05
EXPOSURE SCENARIO NUMBER 1 - ADULT RESIDENTS
CALCULATE HAZARD INDICES:

CHEMICAL	ING+DERM DOSE	INHALATION DOSE	REFERENCE DOSE ING.	REFERENCE DOSE INH.	HAZARD IND ING./DERM	HAZARD IND. INH.	HAZARD INDEX
Acetone	2.603e-4	0	1e-1		2.603e-3	0	2.603e-3
4-Methyl-2-pentanone	1.425e-4	0	5e-2	2e-2	2.849e-3	0	2.849e-3
Xylenes	7.671e-5	0	2e0	9e-2	3.836e-5	0	3.836e-5
Bis(2-ethylhexyl)phthalate	0	0	2e-2		0	0	0
Di-n-octylphthalate	0	0	2e-2		0	0	0
Arsenic	2.466e-5	0	3e-4		8.219e-2	0	8.219e-2
Barium	1.022e-2	0	7e-2	1e-4	1.460e-1	0	1.460e-1
Cobalt	0	0	8e-3		0	0	0
Copper	2.575e-4	0	4e-2		6.438e-3	0	6.438e-3
Lead	2.466e-5	0	1.4e-3	4.3e-4	1.761e-2	0	1.761e-2
Selenium	2.740e-5	0	5e-3		5.479e-3	0	5.479e-3
Zinc	2.082e-3	0	2e-1		1.041e-2	0	1.041e-2
Chlorpyrifos	0	0	.3		0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
TOTAL HAZARD INDEX					2.736e-1	0	2.736e-1

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE FOUR)
TINKER AFB - KUHLMAN CREEK - SW05
EXPOSURE SCENARIO NUMBER 1 - ADULT RESIDENTS
CALCULATE INCREMENTAL CANCER RISK:

CHEMICAL	TIME-WEIGHTED ING & DERM DOSE	TIME-WEIGHTED INHALATION DOSE	CANCER SLOPE FACTOR ING	CANCER SLOPE FACTOR INH	CANCER RISK ING/DERM	CANCER RISK INH	CANCER RISK
Acetone	1.115e-4	0			0	0	0
4-Methyl-2-pentanone	6.106e-5	0			0	0	0
Xylenes	3.288e-5	0			0	0	0
Bis(2-ethylhexyl)phthalate	0	0	1.4e-2		0	0	0
Di-n-octylphthalate	0	0			0	0	0
Arsenic	1.057e-5	0		5e1	0	0	0
Barium	4.380e-3	0			0	0	0
Cobalt	0	0			0	0	0
Copper	1.104e-4	0			0	0	0
Lead	1.057e-5	0			0	0	0
Selenium	1.174e-5	0			0	0	0
Zinc	8.924e-4	0			0	0	0
Chlorpyrifos	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES

SITE NAME: TINKER AFB - KUHLMAN CREEK - SW01
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE CONSIDERED: DERMAL CONTACT WITH WATER AND
ACCIDENTAL INGESTION OF WATER DURING SWIMMING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENT SWIMMERS

REFERENCE: EPA, DECEMBER 1989

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x LT x 365) * ED AND LT TERMS FOR CARCINOGENIC RISK ASSESSMENT ONLY.

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x LT x 1000 x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (SQ CM)
PC = DERMAL PERMEABILITY CONSTANT (CM/HR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

ENTER INPUT PARAMETERS:

INGESTION:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
CR:	.05	CONVERSION	N/A	CONVERSION	
ET:	2.6	FACTOR= 1.247e-4	N/A	FACTOR=	N/A
EF:	14		N/A		
ED:	9	TIME-WEIGHTED CONVERSION	N/A		
BW:	40	FACTOR= 1.603e-5	N/A		
LT:	70		N/A		

DERMAL:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
SA:	13700	CONVERSION	N/A	CONVERSION	
PC:	1e-3	FACTOR= 3.416e-5	N/A	FACTOR=	N/A
ET:	2.6		N/A		
EF:	14	TIME-WEIGHTED CONVERSION	N/A		
ED:	9	FACTOR= 4.392e-6	N/A		
BW:	40		N/A		
LT:	70		N/A		

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)
TINKER AFB - KUHLMAN CREEK - SW01
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE HAZARD INDICES (ADULT):

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	REFERENCE DOSE-ING.	ADULT HAZARD INDEX-ING.	ADULT HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Acetone	.0108	1.346e-6	3.689e-7	1e-1	1.346e-5	3.689e-6	1.715e-5
4-Methyl-2-pentanone	.0053	6.607e-7	1.810e-7	5e-2	1.321e-5	3.621e-6	1.683e-5
Xylenes		0	0	2e0	0	0	0
Bis(2-ethylhexyl)phthalate	.0054	6.732e-7	1.844e-7	2e-2	3.366e-5	9.222e-6	4.288e-5
Di-n-octylphthalate	.0084	1.047e-6	2.869e-7	2e-2	5.236e-5	1.435e-5	6.670e-5
Arsenic	.0014	1.745e-7	4.782e-8	3e-4	5.817e-4	1.594e-4	7.411e-4
Barium	.388	4.837e-5	1.325e-5	7e-2	6.910e-4	1.893e-4	8.803e-4
Cobalt	.0104	1.296e-6	3.552e-7	8e-3	1.621e-4	4.440e-5	2.065e-4
Copper		0	0	4e-2	0	0	0
Lead	.0016	1.995e-7	5.465e-8	1.4e-3	1.425e-4	3.904e-5	1.815e-4
Selenium	.0012	1.496e-7	4.099e-8	5e-3	2.992e-5	8.197e-6	3.812e-5
Zinc	.0098	1.222e-6	3.347e-7	2e-1	6.108e-6	1.674e-6	7.782e-6
Chlorpyrifos	.0017	2.119e-7	5.807e-8	3e-1	7.064e-7	1.936e-7	8.999e-7
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
TOTAL HAZARD INDEX					1.727e-3	4.731e-4	2.200e-3

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE FOUR)
TINKER AFB - KUHLMAN CREEK - SW01
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	CANCER SLOPE FACTOR-ING.	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK
Acetone	.0108	1.731e-7	4.743e-8		0	0	0
4-Methyl-2-pentanone	.0053	8.495e-8	2.327e-8		0	0	0
Xylenes		0	0		0	0	0
Bis(2-ethylhexyl)phthalate	.0054	8.655e-8	2.371e-8	1.4e-2	1.212e-9	3.32e-10	1.544e-9
Di-n-octylphthalate	.0084	1.346e-7	3.689e-8		0	0	0
Arsenic	.0014	2.244e-8	6.148e-9		0	0	0
Barium	.388	6.219e-6	1.704e-6		0	0	0
Cobalt	.0104	1.667e-7	4.567e-8		0	0	0
Copper		0	0		0	0	0
Lead	.0016	2.564e-8	7.026e-9		0	0	0
Selenium	.0012	1.923e-8	5.270e-9		0	0	0
Zinc	.0098	1.571e-7	4.304e-8		0	0	0
Chlorpyrifos	.0017	2.725e-8	7.466e-9		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
TOTAL RISK					1.212e-9	3.32e-10	1.544e-9

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES

SITE NAME: TINKER AFB - KUHLMAN CREEK - SW02
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE CONSIDERED: DERMAL CONTACT WITH WATER AND
ACCIDENTAL INGESTION OF WATER DURING SWIMMING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENT SWIMMERS

REFERENCE: EPA, DECEMBER 1989

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x LT x 365)

* ED AND LT TERMS FOR CARCINOGENIC RISK ASSESSMENT ONLY.

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x LT x 1000 x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (SQ CM)
PC = DERMAL PERMEABILITY CONSTANT (CM/HR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

ENTER INPUT PARAMETERS:

INGESTION:

	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
CR:	.05	CONVERSION	N/A	CONVERSION	
ET:	2.6	FACTOR= 1.247e-4	N/A	FACTOR=	N/A
EF:	14		N/A		
ED:	9	TIME-WEIGHTED CONVERSION	N/A		
BW:	40	FACTOR= 1.603e-5	N/A		
LT:	70		N/A		

DERMAL:

	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
SA:	13700	CONVERSION	N/A	CONVERSION	
PC:	1e-3	FACTOR= 3.416e-5	N/A	FACTOR=	N/A
ET:	2.6		N/A		
EF:	14	TIME-WEIGHTED CONVERSION	N/A		
ED:	9	FACTOR= 4.392e-6	N/A		
BW:	40		N/A		
LT:	70		N/A		

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)
TINKER AFB - KUHLMAN CREEK - SW02
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE HAZARD INDICES (ADULT):

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	REFERENCE DOSE-ING.	ADULT HAZARD INDEX-ING.	ADULT HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Acetone		0	0	1e-1	0	0	0
4-Methyl-2-pentanone		0	0	5e-2	0	0	0
Xylenes		0	0	2e0	0	0	0
Bis(2-ethylhexyl)phthalate		0	0	2e-2	0	0	0
Di-n-octylphthalate		0	0	2e-2	0	0	0
Arsenic	.0022	2.742e-7	7.514e-8	3e-4	9.142e-4	2.505e-4	1.165e-3
Barium	.448	5.585e-5	1.530e-5	7e-2	7.978e-4	2.186e-4	1.016e-3
Cobalt	.0099	1.234e-6	3.381e-7	8e-3	1.543e-4	4.227e-5	1.965e-4
Copper		0	0	4e-2	0	0	0
Lead	.0059	7.355e-7	2.015e-7	1.4e-3	5.253e-4	1.439e-4	6.693e-4
Selenium		0	0	5e-3	0	0	0
Zinc		0	0	2e-1	0	0	0
Chlorpyrifos		0	0	3e-1	0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
TOTAL HAZARD INDEX					2.392e-3	6.553e-4	3.047e-3

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE FOUR)
TINKER AFB - KUHLMAN CREEK - SW02
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	CANCER SLOPE FACTOR-ING.	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK
Acetone		0	0		0	0	0
4-Methyl-2-pentanone		0	0		0	0	0
Xylenes		0	0		0	0	0
Bis(2-ethylhexyl)phthalate		0	0	1.4e-2	0	0	0
Di-n-octylphthalate		0	0		0	0	0
Arsenic	.0022	3.526e-8	9.661e-9		0	0	0
Barium	.448	7.180e-6	1.967e-6		0	0	0
Cobalt	.0099	1.587e-7	4.348e-8		0	0	0
Copper		0	0		0	0	0
Lead	.0059	9.456e-8	2.591e-8		0	0	0
Selenium		0	0		0	0	0
Zinc		0	0		0	0	0
Chlorpyrifos		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES

SITE NAME: TINKER AFB - KUHLMAN CREEK - SW03
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE CONSIDERED: DERMAL CONTACT WITH WATER AND
ACCIDENTAL INGESTION OF WATER DURING SWIMMING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENT SWIMMERS

REFERENCE: EPA, DECEMBER 1989

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x LT x 365) * ED AND LT TERMS FOR CARCINOGENIC RISK ASSESSMENT ONLY.

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x LT x 1000 x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (SQ CM)
PC = DERMAL PERMEABILITY CONSTANT (CM/HR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

ENTER INPUT PARAMETERS:

INGESTION:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
CR:	.05	CONVERSION	N/A	CONVERSION	
ET:	2.6	FACTOR= 1.247e-4	N/A	FACTOR=	N/A
EF:	14		N/A		
ED:	9	TIME-WEIGHTED CONVERSION	N/A		
BW:	40	FACTOR= 1.603e-5	N/A		
LT:	70		N/A		

DERMAL:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
SA:	13700	CONVERSION	N/A	CONVERSION	
PC:	1e-3	FACTOR= 3.416e-5	N/A	FACTOR=	N/A
ET:	2.6		N/A		
EF:	14	TIME-WEIGHTED CONVERSION	N/A		
ED:	9	FACTOR= 4.392e-6	N/A		
BW:	40		N/A		
LT:	70		N/A		

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)
TINKER AFB - KUHLMAN CREEK - SW03
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE HAZARD INDICES (ADULT):

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	REFERENCE DOSE-ING.	ADULT HAZARD INDEX-ING.	ADULT HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Acetone		0	0	1e-1	0	0	0
4-Methyl-2-pentanone		0	0	5e-2	0	0	0
Xylenes		0	0	2e0	0	0	0
Bis(2-ethylhexyl)phthalate		0	0	2e-2	0	0	0
Di-n-octylphthalate		0	0	2e-2	0	0	0
Arsenic		0	0	3e-4	0	0	0
Barium	.369	4.600e-5	1.260e-5	7e-2	6.571e-4	1.801e-4	8.372e-4
Cobalt		0	0	8e-3	0	0	0
Copper		0	0	4e-2	0	0	0
Lead	.0075	9.349e-7	2.562e-7	1.4e-3	6.678e-4	1.830e-4	8.508e-4
Selenium		0	0	5e-3	0	0	0
Zinc		0	0	2e-1	0	0	0
Chlorpyrifos		0	0	3e-1	0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
TOTAL HAZARD INDEX					1.325e-3	3.630e-4	1.688e-3

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE FOUR)
TINKER AFB - KUHLMAN CREEK - SW03
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	CANCER SLOPE FACTOR-ING.	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK
Acetone		0	0		0	0	0
4-Methyl-2-pentanone		0	0		0	0	0
Xylenes		0	0		0	0	0
Bis(2-ethylhexyl)phthalate		0	0	1.4e-2	0	0	0
Di-n-octylphthalate		0	0		0	0	0
Arsenic		0	0	1.8e0	0	0	0
Barium	.369	5.914e-6	1.620e-6		0	0	0
Cobalt		0	0		0	0	0
Copper		0	0		0	0	0
Lead	.0075	1.202e-7	3.294e-8		0	0	0
Selenium		0	0		0	0	0
Zinc		0	0		0	0	0
Chlorpyrifos		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES

SITE NAME: TINKER AFB - KUHLMAN CREEK - SW04
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE CONSIDERED: DERMAL CONTACT WITH WATER AND
ACCIDENTAL INGESTION OF WATER DURING SWIMMING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENT SWIMMERS

REFERENCE: EPA, DECEMBER 1989

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x LT x 365) * ED AND LT TERMS FOR CARCINOGENIC RISK ASSESSMENT ONLY.

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x LT x 1000 x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (SQ CM)
PC = DERMAL PERMEABILITY CONSTANT (CM/HR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

ENTER INPUT PARAMETERS:

INGESTION:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
CR:	.05	CONVERSION	N/A	CONVERSION	
ET:	2.6	FACTOR= 1.247e-4	N/A	FACTOR=	N/A
EF:	14		N/A		
ED:	9	TIME-WEIGHTED CONVERSION	N/A		
BW:	40	FACTOR= 1.603e-5	N/A		
LT:	70		N/A		

DERMAL:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
SA:	13700	CONVERSION	N/A	CONVERSION	
PC:	1e-3	FACTOR= 3.416e-5	N/A	FACTOR=	N/A
ET:	2.6		N/A		
EF:	14	TIME-WEIGHTED CONVERSION	N/A		
ED:	9	FACTOR= 4.392e-6	N/A		
BW:	40		N/A		
LT:	70		N/A		

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)
TINKER AFB - KUHLMAN CREEK - SW04
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE HAZARD INDICES (ADULT):

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	REFERENCE DOSE-ING.	ADULT HAZARD INDEX-ING.	ADULT HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Acetone		0	0	1e-1	0	0	0
4-Methyl-2-pentanone		0	0	5e-2	0	0	0
Xylenes		0	0	2e0	0	0	0
Bis(2-ethylhexyl)phthalate		0	0	2e-2	0	0	0
Di-n-octylphthalate		0	0	2e-2	0	0	0
Arsenic	.0028	3.490e-7	9.564e-8	3e-4	1.163e-3	3.188e-4	1.482e-3
Barium	.343	4.276e-5	1.172e-5	7e-2	6.108e-4	1.674e-4	7.782e-4
Cobalt	.0162	2.019e-6	5.533e-7	8e-3	2.524e-4	6.917e-5	3.216e-4
Copper		0	0	4e-2	0	0	0
Lead	.0032	3.989e-7	1.093e-7	1.4e-3	2.849e-4	7.807e-5	3.630e-4
Selenium		0	0	5e-3	0	0	0
Zinc		0	0	2e-1	0	0	0
Chlorpyrifos		0	0	3e-1	0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
TOTAL HAZARD INDEX					2.312e-3	6.334e-4	2.945e-3

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE FOUR)
TINKER AFB - KUHLMAN CREEK - SW04
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	CANCER SLOPE FACTOR-ING.	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK
Acetone		0	0		0	0	0
4-Methyl-2-pentanone		0	0		0	0	0
Xylenes		0	0		0	0	0
Bis(2-ethylhexyl)phthalate		0	0	1.4e-2	0	0	0
Di-n-octylphthalate		0	0		0	0	0
Arsenic	.0028	4.488e-8	1.230e-8		0	0	0
Barium	.343	5.497e-6	1.506e-6		0	0	0
Cobalt	.0162	2.596e-7	7.114e-8		0	0	0
Copper		0	0		0	0	0
Lead	.0032	5.129e-8	1.405e-8		0	0	0
Selenium		0	0		0	0	0
Zinc		0	0		0	0	0
Chlorpyrifos		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES

SITE NAME: TINKER AFB - KUHLMAN CREEK - SW05
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE CONSIDERED: DERMAL CONTACT WITH WATER AND
ACCIDENTAL INGESTION OF WATER DURING SWIMMING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENT SWIMMERS

REFERENCE: EPA, DECEMBER 1989

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x LT x 365)

* ED AND LT TERMS FOR CARCINOGENIC RISK ASSESSMENT ONLY.

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x LT x 1000 x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (SQ CM)
PC = DERMAL PERMEABILITY CONSTANT (CM/HR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

ENTER INPUT PARAMETERS:

INGESTION:

	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
CR:	.05	CONVERSION	N/A	CONVERSION	
ET:	2.6	FACTOR= 1.247e-4	N/A	FACTOR=	N/A
EF:	14		N/A		
ED:	9	TIME-WEIGHTED CONVERSION	N/A		
BW:	40	FACTOR= 1.603e-5	N/A		
LT:	70		N/A		

DERMAL:

	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
SA:	13700	CONVERSION	N/A	CONVERSION	
PC:	1e-3	FACTOR= 3.416e-5	N/A	FACTOR=	N/A
ET:	2.6		N/A		
EF:	14	TIME-WEIGHTED CONVERSION	N/A		
ED:	9	FACTOR= 4.392e-6	N/A		
BW:	40		N/A		
LT:	70		N/A		

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)
TINKER AFB - KUHLMAN CREEK - SW05
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE HAZARD INDICES (ADULT):

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	REFERENCE DOSE-ING.	ADULT HAZARD INDEX-ING.	ADULT HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Acetone	.0095	1.184e-6	3.245e-7	1e-1	1.184e-5	3.245e-6	1.509e-5
4-Methyl-2-pentanone	.0052	6.482e-7	1.776e-7	5e-2	1.296e-5	3.552e-6	1.652e-5
Xylenes	.0028	3.490e-7	9.564e-8	2e0	1.745e-7	4.782e-8	2.223e-7
Bis(2-ethylhexyl)phthalate		0	0	2e-2	0	0	0
Di-n-octylphthalate		0	0	2e-2	0	0	0
Arsenic	.0009	1.122e-7	3.074e-8	3e-4	3.740e-4	1.025e-4	4.764e-4
Barium	.373	4.650e-5	1.274e-5	7e-2	6.642e-4	1.820e-4	8.463e-4
Cobalt		0	0	8e-3	0	0	0
Copper	.0094	1.172e-6	3.211e-7	4e-2	2.929e-5	8.027e-6	3.732e-5
Lead	.0009	1.122e-7	3.074e-8	1.4e-3	8.014e-5	2.196e-5	1.021e-4
Selenium	.001	1.247e-7	3.416e-8	5e-3	2.493e-5	6.831e-6	3.176e-5
Zinc	.076	9.474e-6	2.596e-6	2e-1	4.737e-5	1.298e-5	6.035e-5
Chlorpyrifos		0	0	3e-1	0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
TOTAL HAZARD INDEX					1.245e-3	3.411e-4	1.586e-3

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE FOUR)
TINKER AFB - KUHLMAN CREEK - SW05
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	CANCER SLOPE FACTOR-ING.	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK
Acetone	.0095	1.523e-7	4.172e-8		0	0	0
4-Methyl-2-pentanone	.0052	8.334e-8	2.284e-8		0	0	0
Xylenes	.0028	4.488e-8	1.230e-8		0	0	0
Bis(2-ethylhexyl)phthalate		0	0	1.4e-2	0	0	0
Di-n-octylphthalate		0	0		0	0	0
Arsenic	.0009	1.442e-8	3.952e-9		0	0	0
Barium	.373	5.978e-6	1.638e-6		0	0	0
Cobalt		0	0		0	0	0
Copper	.0094	1.507e-7	4.128e-8		0	0	0
Lead	.0009	1.442e-8	3.952e-9		0	0	0
Selenium	.001	1.603e-8	4.392e-9		0	0	0
Zinc	.076	1.218e-6	3.338e-7		0	0	0
Chlorpyrifos		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
TOTAL RISK							

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES

SITE NAME: TINKER AFB - KUHLMAN CREEK - SW27
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE CONSIDERED: DERMAL CONTACT WITH WATER AND
ACCIDENTAL INGESTION OF WATER DURING SWIMMING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENT SWIMMERS

REFERENCE: EPA, DECEMBER 1989

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x LT x 365) * ED AND LT TERMS FOR CARCINOGENIC RISK ASSESSMENT ONLY.

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x LT x 1000 x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (SQ CM)
PC = DERMAL PERMEABILITY CONSTANT (CM/HR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

ENTER INPUT PARAMETERS:

INGESTION:

	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
CR:	.05	CONVERSION	N/A	CONVERSION	
ET:	2.6	FACTOR= 1.247e-4	N/A	FACTOR=	N/A
EF:	14		N/A		
ED:	9	TIME-WEIGHTED CONVERSION	N/A		
BW:	40	FACTOR= 1.603e-5	N/A		
LT:	70		N/A		

DERMAL:

	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
SA:	13700	CONVERSION	N/A	CONVERSION	
PC:	1e-3	FACTOR= 3.416e-5	N/A	FACTOR=	N/A
ET:	2.6		N/A		
EF:	14	TIME-WEIGHTED CONVERSION	N/A		
ED:	9	FACTOR= 4.392e-6	N/A		
BW:	40		N/A		
LT:	70		N/A		

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)
TINKER AFB - KUHLMAN CREEK - SW27
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE HAZARD INDICES (ADULT):

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	REFERENCE DOSE-ING.	ADULT HAZARD INDEX-ING.	ADULT HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Acetone		0	0	1e-1	0	0	0
4-Methyl-2-pentanone		0	0	5e-2	0	0	0
Xylenes		0	0	2e0	0	0	0
Bis(2-ethylhexyl)phthalate		0	0	2e-2	0	0	0
Di-n-octylphthalate		0	0	2e-2	0	0	0
Arsenic	.0016	1.995e-7	5.465e-8	3e-4	6.648e-4	1.822e-4	8.470e-4
Barium	.057	7.105e-6	1.947e-6	7e-2	1.015e-4	2.781e-5	1.293e-4
Cobalt		0	0	8e-3	0	0	0
Copper		0	0	4e-2	0	0	0
Lead	.0058	7.230e-7	1.981e-7	1.4e-3	5.164e-4	1.415e-4	6.579e-4
Selenium		0	0	5e-3	0	0	0
Zinc	.0184	2.294e-6	6.285e-7	2e-1	1.147e-5	3.142e-6	1.461e-5
Chlorpyrifos		0	0	3e-1	0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
		0	0		0	0	0
TOTAL HAZARD INDEX					1.294e-3	3.546e-4	1.649e-3

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE FOUR)
TINKER AFB - KUHLMAN CREEK - SW27
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	CANCER SLOPE FACTOR-ING.	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK
Acetone		0	0		0	0	0
4-Methyl-2-pentanone		0	0		0	0	0
Xylenes		0	0		0	0	0
Bis(2-ethylhexyl)phthalate		0	0	1.4e-2	0	0	0
Di-n-octylphthalate		0	0		0	0	0
Arsenic	.0016	2.564e-8	7.026e-9		0	0	0
Barium	.057	9.136e-7	2.503e-7		0	0	0
Cobalt		0	0		0	0	0
Copper		0	0		0	0	0
Lead	.0058	9.296e-8	2.547e-8		0	0	0
Selenium		0	0		0	0	0
Zinc	.0184	2.949e-7	8.080e-8		0	0	0
Chlorpyrifos		0	0		0	0	0
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		0	0		0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH

SITE NAME: TINKER AFB - KUHLMAN CREEK - SW01
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INGESTION OF GAME FISH ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADULT FISHERMAN

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x BCF x IR x FI x EF x ED)/(BW x AT x LT)

ASSUMPTIONS:

C	= CONCENTRATION IN SURFACE WATER BODY (UG/L)	
BCF	= BIOCONCENTRATION FACTOR (UG/KG/UG/L)	
IR	= AVERAGE FISH INGESTION RATE (KG/MEAL):	.054
FI	= FRACTION INGESTED FROM CONTAMINATED SOURCE: (DIMENSIONLESS)	.5
EF	= EXPOSURE FREQUENCY (MEALS/YEAR):	365
ED	= EXPOSURE DURATION (YEARS)*:	30
BW	= RECEPTOR BODY WEIGHT (KG):	70
AT	= AVERAGING TIME (DAYS/YEAR):	365
LT	= LIFETIME (YEARS)*:	70

* ED AND LT USED FOR CARCINOGENIC RISK CHARACTERIZATION ONLY

DETERMINE CONVERSION FACTORS:

ANNUAL AVERAGE INTAKE: CF1 = 3.857e-7
LIFETIME AVERAGE INTAKE: CF2 = 1.653e-7

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE TWO)
TINKER AFB - KUHLMAN CREEK - SW01
EXPOSURE SCENARIO - ADULT FISHERMAN
CALCULATE DOSES:

CHEMICAL	C (UG/L)	BCF (UG/KG/UG/L)	ANNUAL AVERAGE DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Acetone	10.8	3e-1	1.250e-6	5.356e-7	1e-1	
4-Methyl-2-pentanone	5.3	5.2e0	1.063e-5	4.556e-6	5e-2	
Xylenes		1.5e2	0	0	2e0	
Bis(2-ethylhexyl)phthalate	5.4	1.3e2	2.708e-4	1.160e-4	2e-2	1.4e-2
Di-n-octylphthalate	8.4	8.9e1	2.884e-4	1.236e-4	2e-2	
Arsenic	2.2	4.4e1	3.734e-5	1.600e-5	3e-4	
Barium	388	1e0	1.497e-4	6.414e-5	7e-2	
Cobalt	10.4	1e0	4.011e-6	1.719e-6	8e-3	
Copper		3.6e1	0	0	4e-2	
Lead	1.6	1e0	6.171e-7	2.645e-7	1.4e-3	
Selenium	1.2	4.8e0	2.222e-6	9.522e-7	5e-3	
Zinc	9.8	4.7e1	1.777e-4	7.614e-5	2e-1	
Chlorpyrifos	1.7	4.7e2	3.082e-4	1.321e-4	3e-1	
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RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE THREE)
TINKER AFB - KUHLMAN CREEK - SW01
EXPOSURE SCENARIO - ADULT FISHERMAN
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX	CANCER RISK LIFETIME
Acetone	1.250e-5	0
4-Methyl-2-pentanone	2.126e-4	0
Xylenes	0	0
Bis(2-ethylhexyl)phthalate	1.354e-2	1.625e-6
Di-n-octylphthalate	1.442e-2	0
Arsenic	1.245e-1	0
Barium	2.138e-3	0
Cobalt	5.014e-4	0
Copper	0	0
Lead	4.408e-4	0
Selenium	4.443e-4	0
Zinc	8.883e-4	0
Chlorpyrifos	4.027e-3	0
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TOTAL	1.571e-1	1.625e-6

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH

SITE NAME: TINKER AFB - KUHLMAN CREEK - SW05
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INGESTION OF GAME FISH ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADULT FISHERMAN

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x BCF x IR x FI x EF x ED)/(BW x AT x LT)

ASSUMPTIONS:

C	= CONCENTRATION IN SURFACE WATER BODY (UG/L)	
BCF	= BIOCONCENTRATION FACTOR (UG/KG/UG/L)	
IR	= AVERAGE FISH INGESTION RATE (KG/MEAL):	.054
FI	= FRACTION INGESTED FROM CONTAMINATED SOURCE: (DIMENSIONLESS)	.5
EF	= EXPOSURE FREQUENCY (MEALS/YEAR):	365
ED	= EXPOSURE DURATION (YEARS)*:	30
BW	= RECEPTOR BODY WEIGHT (KG):	70
AT	= AVERAGING TIME (DAYS/YEAR):	365
LT	= LIFETIME (YEARS)*:	70

* ED AND LT USED FOR CARCINOGENIC RISK CHARACTERIZATION ONLY

DETERMINE CONVERSION FACTORS:

ANNUAL AVERAGE INTAKE:	CF1 =	3.857e-7
LIFETIME AVERAGE INTAKE:	CF2 =	1.653e-7

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE TWO)
TINKER AFB - KUHLMAN CREEK - SW05
EXPOSURE SCENARIO - ADULT FISHERMAN
CALCULATE DOSES:

CHEMICAL	C (UG/L)	BCF (UG/KG/UG/L)	ANNUAL AVERAGE DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Acetone	9.5	3e-1	1.099e-6	4.711e-7	1e-1	
4-Methyl-2-pentanone	5.2	5.2e0	1.043e-5	4.470e-6	5e-2	
Xylenes	2.8	1.5e2	1.62e-4	6.943e-5	2e0	
Bis(2-ethylhexyl)phthalate		1.3e2	0	0	2e-2	1.4e-2
Di-n-octylphthalate		8.9e1	0	0	2e-2	
Arsenic	.9	4.4e1	1.527e-5	6.546e-6	3e-4	
Barium	373	1e0	1.439e-4	6.166e-5	7e-2	
Cobalt		1e0	0	0	8e-3	
Copper	9.4	3.6e1	1.305e-4	5.594e-5	4e-2	
Lead	.9	1e0	3.471e-7	1.488e-7	1.4e-3	
Selenium	1	4.8e0	1.851e-6	7.935e-7	5e-3	
Zinc	76	4.7e1	1.378e-3	5.905e-4	2e-1	
Chlorpyrifos			0	0	3e-1	
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RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE THREE)
TINKER AFB - KUHLMAN CREEK - SW05
EXPOSURE SCENARIO - ADULT FISHERMAN
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX	CANCER RISK LIFETIME
Acetone	1.099e-5	0
4-Methyl-2-pentanone	2.086e-4	0
Xylenes	8.1e-5	0
Bis(2-ethylhexyl)phthalate	0	0
Di-n-octylphthalate	0	0
Arsenic	5.091e-2	0
Barium	2.055e-3	0
Cobalt	0	0
Copper	3.263e-3	0
Lead	2.480e-4	0
Selenium	3.703e-4	0
Zinc	6.889e-3	0
Chlorpyrifos	0	0
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TOTAL	6.404e-2	0

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: TINKER AFB - KUHLMAN CREEK - SD01
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO NUMBER 1- ADOLESCENTS

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x LT x 365 x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

ADOLESCENT:		CHILD:	
IR:	100	IR:	0
EF:	14	EF:	14
Fi:	.5	Fi:	.5
ED:	9	ED:	9
BW:	40	BW:	40
LT:	70	LT:	70

DETERMINE CONVERSION FACTORS:

ADOLESCENT:		YOUTH:		ADULT/YOUTH (CANCER RISK):	
CF:	4.795e-8 (AVG ANNUAL DOSE)	CF:	0 (AVG ANNUAL DOSE)	CF:	6.164e-9

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
TINKER AFB - KUHLMAN CREEK - SD01
EXPOSURE SCENARIO NUMBER 1- ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (MG/KG)	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate	.175	0	8.390e-9	1.079e-9	2e-2	1.4e-2
Di-n-butylphthalate		0	0	0	1e-1	
Benzo(a)anthracene	.219	0	1.05e-8	1.35e-9		1.1e0
Benzo(b)fluoranthene	.248	0	1.189e-8	1.529e-9		1e0
Benzo(a)pyrene	.228	0	1.093e-8	1.405e-9		7.3e0
Chrysene	.206	0	9.877e-9	1.270e-9		3.2e-2
Fluoranthene	.62	0	2.973e-8	3.822e-9	4e-2	
Indeno(1,2,3-cd)pyrene	.172	0	8.247e-9	1.060e-9		1.7e0
Pyrene	.46	0	2.205e-8	2.836e-9	3e-2	
Aroclor	.167	0	8.007e-9	1.029e-9		7.7e0
Arsenic	7.1	0	3.404e-7	4.377e-8	3e-4	
Antimony		0	0	0	4e-4	
Barium	2050	0	9.829e-5	1.264e-5	7e-2	
Cadmium	3	0	1.438e-7	1.849e-8	5e-4	
Chromium (III)	38.8	0	1.860e-6	2.392e-7	1e0	
Copper	18.2	0	8.726e-7	1.122e-7	4e-2	
Lead	71.5	0	3.428e-6	4.408e-7	1.4e-3	
Manganese	522	0	2.503e-5	3.218e-6	1e-1	
Mercury	1.8	0	8.630e-8	1.110e-8	3e-4	
Vanadium	33.8	0	1.621e-6	2.084e-7	7e-3	
Zinc	101	0	4.842e-6	6.226e-7	2e-1	
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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
TINKER AFB - KUHLMAN CREEK - SD01
EXPOSURE SCENARIO NUMBER 1- ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX ADOLESCENT	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	0	4.195e-7	1.51e-11
Di-n-butylphthalate	0	0	0
Benzo(a)anthracene	0	0	1.485e-9
Benzo(b)fluoranthene	0	0	1.529e-9
Benzo(a)pyrene	0	0	1.026e-8
Chrysene	0	0	4.06e-11
Fluoranthene	0	7.432e-7	0
Indeno(1,2,3-cd)pyrene	0	0	1.802e-9
Pyrene	0	7.352e-7	0
Aroclor	0	0	7.927e-9
Arsenic	0	1.135e-3	0
Antimony	0	0	0
Barium	0	1.404e-3	0
Cadmium	0	2.877e-4	0
Chromium (III)	0	1.860e-6	0
Copper	0	2.182e-5	0
Lead	0	2.449e-3	0
Manganese	0	2.503e-4	0
Mercury	0	2.877e-4	0
Vanadium	0	2.315e-4	0
Zinc	0	2.421e-5	0
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TOTAL	0	6.094e-3	2.306e-8

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: TINKER AFB - KUHLMAN CREEK - SD02
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO NUMBER 1- ADOLESCENTS

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x LT x 365 x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

ADOLESCENT:		CHILD:	
IR:	100	IR:	0
EF:	14	EF:	14
Fi:	.5	Fi:	.5
ED:	9	ED:	9
BW:	40	BW:	40
LT:	70	LT:	70

DETERMINE CONVERSION FACTORS:

ADOLESCENT:		YOUTH:		ADULT/YOUTH (CANCER RISK):	
CF:	4.795e-8 (AVG ANNUAL DOSE)	CF:	0 (AVG ANNUAL DOSE)	CF:	6.164e-9

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
TINKER AFB - KUHLMAN CREEK - SD02
EXPOSURE SCENARIO NUMBER 1- ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (MG/KG)	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate		0	0	0	2e-2	1.4e-2
Di-n-butylphthalate		0	0	0	1e-1	
Benzo(a)anthracene		0	0	0		1.1e0
Benzo(b)fluoranthene		0	0	0		1e0
Benzo(a)pyrene		0	0	0		7.3e0
Chrysene		0	0	0		3.2e-2
Fluoranthene		0	0	0	4e-2	
Indeno(1,2,3-cd)pyrene		0	0	0		1.7e0
Pyrene		0	0	0	3e-2	
Aroclor		0	0	0		7.7e0
Arsenic	1.2	0	5.753e-8	7.397e-9	3e-4	
Antimony		0	0	0	4e-4	
Barium	545	0	2.613e-5	3.360e-6	7e-2	
Cadmium		0	0	0	5e-4	
Chromium (III)	16.1	0	7.719e-7	9.925e-8	1e0	
Copper	10.1	0	4.842e-7	6.226e-8	4e-2	
Lead	14.3	0	6.856e-7	8.815e-8	1.4e-3	
Manganese		0	0	0	1e-1	
Mercury	.06	0	2.877e-9	3.70e-10	3e-4	
Vanadium	31	0	1.486e-6	1.911e-7	7e-3	
Zinc	54.7	0	2.623e-6	3.372e-7	2e-1	
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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
TINKER AFB - KUHLMAN CREEK - SD02
EXPOSURE SCENARIO NUMBER 1- ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX ADOLESCENT	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	0	0	0
Di-n-butylphthalate	0	0	0
Benzo(a)anthracene	0	0	0
Benzo(b)fluoranthene	0	0	0
Benzo(a)pyrene	0	0	0
Chrysene	0	0	0
Fluoranthene	0	0	0
Indeno(1,2,3-cd)pyrene	0	0	0
Pyrene	0	0	0
Aroclor	0	0	0
Arsenic	0	1.918e-4	0
Antimony	0	0	0
Barium	0	3.733e-4	0
Cadmium	0	0	0
Chromium (III)	0	7.719e-7	0
Copper	0	1.211e-5	0
Lead	0	4.897e-4	0
Manganese	0	0	0
Mercury	0	9.589e-6	0
Vanadium	0	2.123e-4	0
Zinc	0	1.311e-5	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
TOTAL	0	1.303e-3	0

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: TINKER AFB - KUHLMAN CREEK - SD03
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO NUMBER 1- ADOLESCENTS

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x LT x 365 x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

ADOLESCENT:		CHILD:	
IR:	100	IR:	0
EF:	14	EF:	14
Fi:	.5	Fi:	.5
ED:	9	ED:	9
BW:	40	BW:	40
LT:	70	LT:	70

DETERMINE CONVERSION FACTORS:

ADOLESCENT:		YOUTH:		ADULT/YOUTH (CANCER RISK):	
CF:	4.795e-8 (AVG ANNUAL DOSE)	CF:	0 (AVG ANNUAL DOSE)	CF:	6.164e-9

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
TINKER AFB - KUHLMAN CREEK - SD03
EXPOSURE SCENARIO NUMBER 1- ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (MG/KG)	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate		0	0	0	2e-2	1.4e-2
Di-n-butylphthalate		0	0	0	1e-1	
Benzo(a)anthracene		0	0	0		1.1e0
Benzo(b)fluoranthene		0	0	0		1e0
Benzo(a)pyrene		0	0	0		7.3e0
Chrysene		0	0	0		3.2e-2
Fluoranthene		0	0	0	4e-2	
Indeno(1,2,3-cd)pyrene		0	0	0		1.7e0
Pyrene		0	0	0	3e-2	
Aroclor		0	0	0		7.7e0
Arsenic	2.2	0	1.055e-7	1.356e-8	3e-4	
Antimony		0	0	0	4e-4	
Barium	561	0	2.690e-5	3.458e-6	7e-2	
Cadmium		0	0	0	5e-4	
Chromium (III)	10.6	0	5.082e-7	6.534e-8	1e0	
Copper	5	0	2.397e-7	3.082e-8	4e-2	
Lead	15.4	0	7.384e-7	9.493e-8	1.4e-3	
Manganese		0	0	0	1e-1	
Mercury		0	0	0	3e-4	
Vanadium	21.1	0	1.012e-6	1.301e-7	7e-3	
Zinc	46.6	0	2.234e-6	2.873e-7	2e-1	
		0	0	0		
		0	0	0		
		0	0	0		
		0	0	0		
		0	0	0		
		0	0	0		
		0	0	0		
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		0	0	0		
		0	0	0		
		0	0	0		

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
TINKER AFB - KUHLMAN CREEK - SD03
EXPOSURE SCENARIO NUMBER 1- ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX ADOLESCENT	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	0	0	0
Di-n-butylphthalate	0	0	0
Benzo(a)anthracene	0	0	0
Benzo(b)fluoranthene	0	0	0
Benzo(a)pyrene	0	0	0
Chrysene	0	0	0
Fluoranthene	0	0	0
Indeno(1,2,3-cd)pyrene	0	0	0
Pyrene	0	0	0
Aroclor	0	0	0
Arsenic	0	3.516e-4	0
Antimony	0	0	0
Barium	0	3.842e-4	0
Cadmium	0	0	0
Chromium (III)	0	5.082e-7	0
Copper	0	5.993e-6	0
Lead	0	5.274e-4	0
Manganese	0	0	0
Mercury	0	0	0
Vanadium	0	1.445e-4	0
Zinc	0	1.117e-5	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
TOTAL	0	1.425e-3	0

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: TINKER AFB - KUHLMAN CREEK - SD04
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO NUMBER 1- ADOLESCENTS

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x LT x 365 x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

ADOLESCENT:		CHILD:	
IR:	100	IR:	0
EF:	14	EF:	14
Fi:	.5	Fi:	.5
ED:	9	ED:	9
BW:	40	BW:	40
LT:	70	LT:	70

DETERMINE CONVERSION FACTORS:

ADOLESCENT:		YOUTH:		ADULT/YOUTH (CANCER RISK):	
CF:	4.795e-8 (AVG ANNUAL DOSE)	CF:	0 (AVG ANNUAL DOSE)	CF:	6.164e-9

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
TINKER AFB - KUHLMAN CREEK - SD04
EXPOSURE SCENARIO NUMBER 1- ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (MG/KG)	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate		0	0	0	2e-2	1.4e-2
Di-n-butylphthalate		0	0	0	1e-1	
Benzo(a)anthracene		0	0	0		1.1e0
Benzo(b)fluoranthene		0	0	0		1e0
Benzo(a)pyrene		0	0	0		7.3e0
Chrysene		0	0	0		3.2e-2
Fluoranthene		0	0	0	4e-2	
Indeno(1,2,3-cd)pyrene		0	0	0		1.7e0
Pyrene		0	0	0	3e-2	
Aroclor		0	0	0		7.7e0
Arsenic	1.5	0	7.192e-8	9.247e-9	3e-4	
Antimony		0	0	0	4e-4	
Barium	354	0	1.697e-5	2.182e-6	7e-2	
Cadmium		0	0	0	5e-4	
Chromium (III)	16.5	0	7.911e-7	1.017e-7	1e0	
Copper	14.7	0	7.048e-7	9.062e-8	4e-2	
Lead	62.4	0	2.992e-6	3.847e-7	1.4e-3	
Manganese		0	0	0	1e-1	
Mercury		0	0	0	3e-4	
Vanadium	18.2	0	8.726e-7	1.122e-7	7e-3	
Zinc	60.4	0	2.896e-6	3.723e-7	2e-1	
		0	0	0		
		0	0	0		
		0	0	0		
		0	0	0		
		0	0	0		
		0	0	0		
		0	0	0		
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		0	0	0		
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		0	0	0		
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		0	0	0		
		0	0	0		

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
TINKER AFB - KUHLMAN CREEK - SD04
EXPOSURE SCENARIO NUMBER 1- ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX ADOLESCENT	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	0	0	0
Di-n-butylphthalate	0	0	0
Benzo(a)anthracene	0	0	0
Benzo(b)fluoranthene	0	0	0
Benzo(a)pyrene	0	0	0
Chrysene	0	0	0
Fluoranthene	0	0	0
Indeno(1,2,3-cd)pyrene	0	0	0
Pyrene	0	0	0
Aroclor	0	0	0
Arsenic	0	2.397e-4	0
Antimony	0	0	0
Barium	0	2.425e-4	0
Cadmium	0	0	0
Chromium (III)	0	7.911e-7	0
Copper	0	1.762e-5	0
Lead	0	2.137e-3	0
Manganese	0	0	0
Mercury	0	0	0
Vanadium	0	1.247e-4	0
Zinc	0	1.448e-5	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
TOTAL	0	2.777e-3	0

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: TINKER AFB - KUHLMAN CREEK - SD05
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO NUMBER 1- ADOLESCENTS

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x LT x 365 x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

ADOLESCENT:		CHILD:	
IR:	100	IR:	0
EF:	14	EF:	14
Fi:	.5	Fi:	.5
ED:	9	ED:	9
BW:	40	BW:	40
LT:	70	LT:	70

DETERMINE CONVERSION FACTORS:

ADOLESCENT:	YOUTH:	ADULT/YOUTH (CANCER RISK):
CF: 4.795e-8 (AVG ANNUAL DOSE)	CF: 0 (AVG ANNUAL DOSE)	CF: 6.164e-9

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
TINKER AFB - KUHLMAN CREEK - SD05
EXPOSURE SCENARIO NUMBER 1- ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (MG/KG)	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate	.12	0	5.753e-9	7.40e-10	2e-2	1.4e-2
Di-n-butylphthalate	.065	0	3.116e-9	4.01e-10	1e-1	
Benzo(a)anthracene	.09	0	4.315e-9	5.55e-10		1.1e0
Benzo(b)fluoranthene	.16	0	7.671e-9	9.86e-10		1e0
Benzo(a)pyrene	.072	0	3.452e-9	4.44e-10		7.3e0
Chrysene	.11	0	5.274e-9	6.78e-10		3.2e-2
Fluoranthene	.16	0	7.671e-9	9.86e-10	4e-2	
Indeno(1,2,3-cd)pyrene		0	0	0		1.7e0
Pyrene	.21	0	1.007e-8	1.295e-9	3e-2	
Aroclor		0	0	0		7.7e0
Arsenic	8.1	0	3.884e-7	4.993e-8	3e-4	
Antimony		0	0	0	4e-4	
Barium	924	0	4.430e-5	5.696e-6	7e-2	
Cadmium	4.3	0	2.062e-7	2.651e-8	5e-4	
Chromium (III)	57.4	0	2.752e-6	3.538e-7	1e0	
Copper	44.2	0	2.119e-6	2.725e-7	4e-2	
Lead	76.7	0	3.677e-6	4.728e-7	1.4e-3	
Manganese		0	0	0	1e-1	
Mercury		0	0	0	3e-4	
Vanadium	21.1	0	1.012e-6	1.301e-7	7e-3	
Zinc	155	0	7.432e-6	9.555e-7	2e-1	
		0	0	0		
		0	0	0		
		0	0	0		
		0	0	0		
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		0	0	0		

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
TINKER AFB - KUHLMAN CREEK - SD05
EXPOSURE SCENARIO NUMBER 1- ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX ADOLESCENT	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	0	2.877e-7	1.04e-11
Di-n-butylphthalate	0	3.116e-8	0
Benzo(a)anthracene	0	0	6.10e-10
Benzo(b)fluoranthene	0	0	9.86e-10
Benzo(a)pyrene	0	0	3.24e-9
Chrysene	0	0	2.17e-11
Fluoranthene	0	1.918e-7	0
Indeno(1,2,3-cd)pyrene	0	0	0
Pyrene	0	3.356e-7	0
Aroclor	0	0	0
Arsenic	0	1.295e-3	0
Antimony	0	0	0
Barium	0	6.329e-4	0
Cadmium	0	4.123e-4	0
Chromium (III)	0	2.752e-6	0
Copper	0	5.298e-5	0
Lead	0	2.627e-3	0
Manganese	0	0	0
Mercury	0	0	0
Vanadium	0	1.445e-4	0
Zinc	0	3.716e-5	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
TOTAL	0	5.205e-3	4.869e-9

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL

SITE NAME: TINKER AFB - KUHLMAN CREEK - SD01
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

EXPOSURE SCENARIO NUMBER 1 - ADOLESCENT EXPOSURE TO SEDIMENT

RELEVANT EQUATIONS: DEX = (C x SA x AF x ABS x EF x ED)/(BW x AT x LT x 1E6)

ASSUMPTIONS:

C	= CONCENTRATION IN SOIL (MG/KG)		
SA1	= YOUTH SKIN SURFACE AREA (SQ CM/DAY):		0
SA2	= ADOLESCENT SKIN SURFACE AREA (SQ CM/DAY):		8500
AF	= ADHERENCE FACTOR (MG/SQ CM):		1
ABS	= ABSORPTION FRACTION: (DECIMAL FRACTION)	VOCS:	.1
		BNAS/PESTICIDES:	.05
		PCBS:	.03
EF	= EXPOSURE FREQUENCY (DAYS/YEAR)		14
ED1	= YOUTH EXPOSURE DURATION (YEARS):		0
ED2	= ADOLESCENT EXPOSURE DURATION (YEARS):		9
BW1	= BODY WEIGHT YOUTH (KG):		15
BW2	= BODY WEIGHT ADOLESCENT (KG):		40
AT	= AVERAGING TIME (DAYS/YEAR):		365
LT	= LIFETIME (YEARS):		70

DETERMINE CONVERSION FACTORS:
DEX = (C)*(1MG/1000 UG)*(SA SQ CM)*(AF MG/SQ CM)*(ABS)*(EF DAYS/YEAR)/(AT DAYS/YEAR)/(BW KG)/(1 KG/1E6 MG)*

DOSEyouth = (CF1)*(C)*(ABS) CF1 = 0 CANCER RISK = (CF3)*(C)*(ABS) CF3 = 1.048e-9
DOSEadult = (CF2)*(C)*(ABS) CF2 = 8.151e-9

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)
TINKER AFB - KUHLMAN CREEK - SD01
EXPOSURE SCENARIO NUMBER 1 - ADOLESCENT EXPOSURE TO SEDIMENT
CALCULATE DOSES:

CHEMICAL	C (UG/KG)	ABSORPTION FRACTION	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate	175	.05	0	7.132e-8	9.170e-9	2e-2	1.4e-2
Di-n-butylphthalate		.05	0	0	0	1e-1	
Benzo(a)anthracene	219	.05	0	8.925e-8	1.148e-8		1.1e0
Benzo(b)fluoranthene	248	.05	0	1.011e-7	1.299e-8		1e0
Benzo(a)pyrene	219	.05	0	8.925e-8	1.148e-8		7.3e0
Chrysene	206	.05	0	8.395e-8	1.079e-8		3.2e-2
Fluoranthene	620	.05	0	2.527e-7	3.249e-8	4e-2	
Indeno(1,2,3-cd)pyrene	172	.05	0	7.010e-8	9.012e-9		1.7e0
Pyrene	460	.05	0	1.875e-7	2.410e-8	3e-2	
Aroclor	167	.03	0	4.083e-8	5.250e-9		7.7e0
Arsenic	7.1	0	0	0	0	3e-4	
Antimony		0	0	0	0	4e-4	
Barium	2050	0	0	0	0	7e-2	
Cadmium	3	0	0	0	0	5e-4	
Chromium (III)	38.8	0	0	0	0	1e0	
Copper	18.2	0	0	0	0	4e-2	
Lead	71.5	0	0	0	0	1.4e-3	
Manganese	522	0	0	0	0	1e-1	
Mercury	1.8	0	0	0	0	3e-4	
Vanadium	33.8	0	0	0	0	7e-3	
Zinc	101	0	0	0	0	2e-1	
			0	0	0		
			0	0	0		
			0	0	0		
			0	0	0		
			0	0	0		
			0	0	0		
			0	0	0		
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			0	0	0		
			0	0	0		

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE THREE)
TINKER AFB - KUHLMAN CREEK - SD01
EXPOSURE SCENARIO NUMBER 1 - ADOLESCENT EXPOSURE TO SEDIMENT
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX YOUTH	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	0	3.566e-6	1.28e-10
Di-n-butylphthalate	0	0	0
Benzo(a)anthracene	0	0	1.262e-8
Benzo(b)fluoranthene	0	0	1.299e-8
Benzo(a)pyrene	0	0	8.377e-8
Chrysene	0	0	3.45e-10
Fluoranthene	0	6.317e-6	0
Indeno(1,2,3-cd)pyrene	0	0	1.532e-8
Pyrene	0	6.249e-6	0
Aroclor	0	0	4.043e-8
Arsenic	0	0	0
Antimony	0	0	0
Barium	0	0	0
Cadmium	0	0	0
Chromium (III)	0	0	0
Copper	0	0	0
Lead	0	0	0
Manganese	0	0	0
Mercury	0	0	0
Vanadium	0	0	0
Zinc	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
TOTAL	0	1.613e-5	1.656e-7

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL

SITE NAME: TINKER AFB - KUHLMAN CREEK - SD05
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

EXPOSURE SCENARIO NUMBER 1 - ADOLESCENT EXPOSURE TO SEDIMENT

RELEVANT EQUATIONS: DEX = (C x SA x AF x ABS x EF x ED)/(BW x AT x LT x 1E6)

ASSUMPTIONS:

C	= CONCENTRATION IN SOIL (MG/KG)		
SA1	= YOUTH SKIN SURFACE AREA (SQ CM/DAY):		0
SA2	= ADOLESCENT SKIN SURFACE AREA (SQ CM/DAY):		8500
AF	= ADHERENCE FACTOR (MG/SQ CM):		1
ABS	= ABSORPTION FRACTION: (DECIMAL FRACTION)	VOCS:	.1
		BNAS/PESTICIDES:	.05
		PCBS:	.03
EF	= EXPOSURE FREQUENCY (DAYS/YEAR)		14
ED1	= YOUTH EXPOSURE DURATION (YEARS):		0
ED2	= ADOLESCENT EXPOSURE DURATION (YEARS):		9
BW1	= BODY WEIGHT YOUTH (KG):		15
BW2	= BODY WEIGHT ADOLESCENT (KG):		40
AT	= AVERAGING TIME (DAYS/YEAR):		365
LT	= LIFETIME (YEARS):		70

DETERMINE CONVERSION FACTORS:
DEX = (C)*(1MG/1000 UG)*(SA SQ CM)*(AF MG/SQ CM)*(ABS)*(EF DAYS/YEAR)/(AT DAYS/YEAR)/(BW KG)/(1 KG/1E6 MG)*

DOSEyouth = (CF1)*(C)*(ABS) CF1 = 0 CANCER RISK = (CF3)*(C)*(ABS) CF3 = 1.048e-9
DOSEadult = (CF2)*(C)*(ABS) CF2 = 8.151e-9

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)
TINKER AFB - KUHLMAN CREEK - SD05
EXPOSURE SCENARIO NUMBER 1 - ADOLESCENT EXPOSURE TO SEDIMENT
CALCULATE DOSES:

CHEMICAL	C (UG/KG)	ABSORPTION FRACTION	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate	120	.05	0	4.890e-8	6.288e-9	2e-2	1.4e-2
Di-n-butylphthalate	65	.05	0	2.649e-8	3.406e-9	1e-1	
Benzo(a)anthracene	90	.05	0	3.668e-8	4.716e-9		1.1e0
Benzo(b)fluoranthene	160	.05	0	6.521e-8	8.384e-9		1e0
Benzo(a)pyrene	72	.05	0	2.934e-8	3.773e-9		7.3e0
Chrysene	110	.05	0	4.483e-8	5.764e-9		3.2e-2
Fluoranthene	160	.05	0	6.521e-8	8.384e-9	4e-2	
Indeno(1,2,3-cd)pyrene		.05	0	0	0		1.7e0
Pyrene	210	.05	0	8.558e-8	1.100e-8	3e-2	
Aroclor		.03	0	0	0		7.7e0
Arsenic	8.1	0	0	0	0	3e-4	
Antimony		0	0	0	0	4e-4	
Barium	924	0	0	0	0	7e-2	
Cadmium	4.3	0	0	0	0	5e-4	
Chromium (III)	57.4	0	0	0	0	1e0	
Copper	44.2	0	0	0	0	4e-2	
Lead	76.7	0	0	0	0	1.4e-3	
Manganese		0	0	0	0	1e-1	
Mercury		0	0	0	0	3e-4	
Vanadium	21.1	0	0	0	0	7e-3	
Zinc	155	0	0	0	0	2e-1	
			0	0	0		
			0	0	0		
			0	0	0		
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			0	0	0		
			0	0	0		

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE THREE)
TINKER AFB - KUHLMAN CREEK - SD05
EXPOSURE SCENARIO NUMBER 1 - ADOLESCENT EXPOSURE TO SEDIMENT
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX YOUTH	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	0	2.445e-6	8.80e-11
Di-n-butylphthalate	0	2.649e-7	0
Benzo(a)anthracene	0	0	5.187e-9
Benzo(b)fluoranthene	0	0	8.384e-9
Benzo(a)pyrene	0	0	2.754e-8
Chrysene	0	0	1.84e-10
Fluoranthene	0	1.630e-6	0
Indeno(1,2,3-cd)pyrene	0	0	0
Pyrene	0	2.853e-6	0
Aroclor	0	0	0
Arsenic	0	0	0
Antimony	0	0	0
Barium	0	0	0
Cadmium	0	0	0
Chromium (III)	0	0	0
Copper	0	0	0
Lead	0	0	0
Manganese	0	0	0
Mercury	0	0	0
Vanadium	0	0	0
Zinc	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
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	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
TOTAL	0	7.193e-6	4.138e-8

RISK ASSESSMENT SPREADSHEET - EXPOSURES THROUGH HOUSEHOLD USE OF SURFACE WATER

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW06
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY ON THE FOLLOWING SPREADSHEETS.
ONY INGESTION OF SURFACE WATER IS CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADULT RESIDENTS

REFERENCES: EPA, DECEMBER 1989
FOSTER AND CHROSTOWSKI, 1987

INGESTION: IEX = (C x IR x EF x ED)/(BW x LT x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
IR = INGESTION RATE (LITERS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

DERMAL CONTACT: DEX = (C x PC x AV x ET x EF x ED)/(BW x LT x 1000 x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
PC = THE PERMEABILITY CONSTANT OF WATER (CM/HR)
AV = THE SKIN SURFACE AREA AVAILABLE FOR CONTACT (CM**2)
ET = EXPOSURE TIME (HRS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

INHALATION: IEX = (S x IR x EF x ED)/(BW x LT x Ra x 1E6)x(Ds + EXP(-Ra x Dt)/Ra - EXP(Ra x (Ds-Dt))/Ra)

WHERE:
S = VOLATILE ORGANIC CHEMICAL GENERATION RATE (UG/CUBIC METER/MIN)
IR = INHALATION RATE (LITERS/MIN)
Ds = SHOWER DURATION (MIN)
Ra = AIR EXCHANGE RATE (1/MIN)
Dt = TOTAL DURATION IN SHOWER ROOM (MIN)
BW = BODY WEIGHT (KG)
SV = SHOWER ROOM AIR VOLUME (m**3)
R = IDEAL GAS LAW CONSTANT (ATM-M**3/MOL/K)

ENTER INPUT PARAMETERS:

INGESTION: ADULT EXPOSURE

IR:	2	CONVERSION FACTOR =	2.740e-2
EF:	350		
ED:	30		
BW:	70		
LT:	70		

DERMAL CONTACT: NOT APPLICABLE

PC:	1e-3	CONVERSION FACTOR =	0
AV:	19400		
ET:	.25		
EF:	0		
ED:	70		
BW:	70		
LT:	70		

INHALATION: NOT APPLICABLE

IR:	14	d:	1
BW:	70	Ts:	2
Ds:	15	T1:	293
Dt:	20	Ts:	318
Ra:	.0083	M1:	.982
SV:	12	M2:	.616
ED:	70	T:	293
R:	.000082	FR:	10
EF:	0	LT:	70

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SW06
EXPOSURE SCENARIO - ADULT RESIDENTS
CALCULATE DOSES:

CHEMICAL	GW CONC. (MG/L)	MOLECULAR WEIGHT	HENRYS LAW CONSTANT	MASS TRANSFER COEFFICIENT (KAl)	INGESTION DOSE	INHALATION DOSE	DERMAL DOSE
Acetone	.013	58.08	3.43e-5	2.7584e0	3.562e-4	0	0
4-Methyl-2-pentanone	.0055	100.2	4.16e-5	2.4834e0	1.507e-4	0	0
Arsenic	.0024	74.92		0	6.575e-5	0	0
Barium	.599	137.34		0	1.641e-2	0	0
Chromium (III)				0	0	0	0
Cobalt	.0084			0	2.301e-4	0	0
Copper		63.54		0	0	0	0
Lead	.004	207.19		0	1.096e-4	0	0
Mercury		200.59		0	0	0	0
Selenium				0	0	0	0
Zinc		65.38		0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
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				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW06
EXPOSURE SCENARIO - ADULT RESIDENTS
CALCULATE HAZARD INDICES:

CHEMICAL	ING+DERM DOSE	INHALATION DOSE	REFERENCE DOSE ING.	REFERENCE DOSE INH.	HAZARD IND ING./DERM	HAZARD IND. INH.	HAZARD INDEX
Acetone	3.562e-4	0	1e-1		3.562e-3	0	3.562e-3
4-Methyl-2-pentanone	1.507e-4	0	5e-2	2e-2	3.014e-3	0	3.014e-3
Arsenic	6.575e-5	0	3e-4		2.192e-1	0	2.192e-1
Barium	1.641e-2	0	7e-2	1e-4	2.344e-1	0	2.344e-1
Chromium (III)	0	0	1e0	6e-7	0	0	0
Cobalt	2.301e-4	0	8e-3		2.877e-2	0	2.877e-2
Copper	0	0	4e-2		0	0	0
Lead	1.096e-4	0	1.4e-3	4.3e-4	7.828e-2	0	7.828e-2
Mercury	0	0	3e-4	9e-5	0	0	0
Selenium	0	0	5e-3		0	0	0
Zinc	0	0	2e-1		0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
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	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
TOTAL HAZARD INDEX					5.672e-1	0	5.672e-1

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE FOUR)
TINKER AFB - CRUTCHO CREEK - SW06
EXPOSURE SCENARIO - ADULT RESIDENTS
CALCULATE INCREMENTAL CANCER RISK:

CHEMICAL	TIME-WEIGHTED ING & DERM DOSE	TIME-WEIGHTED INHALATION DOSE	CANCER SLOPE FACTOR ING	CANCER SLOPE FACTOR INH	CANCER RISK ING/DERM	CANCER RISK INH	CANCER RISK
Acetone	1.526e-4	0			0	0	0
4-Methyl-2-pentanone	6.458e-5	0			0	0	0
Arsenic	2.818e-5	0		5e1		0	
Barium	7.033e-3	0			0	0	0
Chromium (III)	0	0			0	0	0
Cobalt	9.863e-5	0			0	0	0
Copper	0	0			0	0	0
Lead	4.697e-5	0			0	0	0
Mercury	0	0			0	0	0
Selenium	0	0			0	0	0
Zinc	0	0			0	0	0
	0	0			0	0	0
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	0	0			0	0	0
	0	0			0	0	0
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	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
TOTAL RISK						0	

RISK ASSESSMENT SPREADSHEET - EXPOSURES THROUGH HOUSEHOLD USE OF SURFACE WATER

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW06
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY ON THE FOLLOWING SPREADSHEETS.
ONY INGESTION OF SURFACE WATER IS CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - CHILD RESIDENTS

REFERENCES: EPA, DECEMBER 1989
FOSTER AND CHROSTOWSKI, 1987

INGESTION: IEX = (C x IR x EF x ED)/(BW x LT x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
IR = INGESTION RATE (LITERS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

DERMAL CONTACT: DEX = (C x PC x AV x ET x EF x ED)/(BW x LT x 1000 x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
PC = THE PERMEABILITY CONSTANT OF WATER (CM/HR)
AV = THE SKIN SURFACE AREA AVAILABLE FOR CONTACT (CM**2)
ET = EXPOSURE TIME (HRS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

INHALATION: IEX = (S x IR x EF x ED)/(BW x LT x Ra x 1E6)x(Ds + EXP(-Ra x Dt)/Ra - EXP(Ra x (Ds-Dt))/Ra)

WHERE:
S = VOLATILE ORGANIC CHEMICAL GENERATION RATE (UG/CUBIC METER/MIN)
IR = INHALATION RATE (LITERS/MIN)
Ds = SHOWER DURATION (MIN)
Ra = AIR EXCHANGE RATE (1/MIN)
Dt = TOTAL DURATION IN SHOWER ROOM (MIN)
BW = BODY WEIGHT (KG)
SV = SHOWER ROOM AIR VOLUME (m**3)
R = IDEAL GAS LAW CONSTANT (ATM-M**3/MOL/K)

ENTER INPUT PARAMETERS:

INGESTION: CHILD EXPOSURE

IR:	1	CONVERSION FACTOR =	6.393e-2
EF:	350		
ED:	6		
BW:	15		
LT:	70		

DERMAL CONTACT: NOT APPLICABLE

PC:	1e-3	CONVERSION FACTOR =	0
AV:	19400		
ET:	.25		
EF:	0		
ED:	70		
BW:	70		
LT:	70		

INHALATION: NOT APPLICABLE

IR:	14	d:	1
BW:	70	Ts:	2
Ds:	15	T1:	293
Dt:	20	Ts:	318
Ra:	.0083	M1:	.982
SV:	12	M2:	.616
ED:	70	T:	293
R:	.000082	FR:	10
EF:	0	LT:	70

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SW06
EXPOSURE SCENARIO - CHILD RESIDENTS
CALCULATE DOSES:

CHEMICAL	GW CONC. (MG/L)	MOLECULAR WEIGHT	HENRYS LAW CONSTANT	MASS TRANSFER COEFFICIENT (KAl)	INGESTION DOSE	INHALATION DOSE	DERMAL DOSE
Acetone	.013	58.08	3.43e-5	2.7584e0	8.311e-4	0	0
4-Methyl-2-pentanone	.0055	100.2	4.16e-5	2.4834e0	3.516e-4	0	0
Arsenic	.0024	74.92		0	1.534e-4	0	0
Barium	.599	137.34		0	3.829e-2	0	0
Chromium (III)				0	0	0	0
Cobalt	.0084			0	5.370e-4	0	0
Copper		63.54		0	0	0	0
Lead	.004	207.19		0	2.557e-4	0	0
Mercury		200.59		0	0	0	0
Selenium				0	0	0	0
Zinc		65.38		0	0	0	0
				0	0	0	0
				0	0	0	0
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				0	0	0	0
				0	0	0	0
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RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW06
EXPOSURE SCENARIO - CHILD RESIDENTS
CALCULATE HAZARD INDICES:

CHEMICAL	ING+DERM DOSE	INHALATION DOSE	REFERENCE DOSE ING.	REFERENCE DOSE INH.	HAZARD IND ING./DERM	HAZARD IND. INH.	HAZARD INDEX
Acetone	8.311e-4	0	1e-1		8.311e-3	0	8.311e-3
4-Methyl-2-pentanone	3.516e-4	0	5e-2	2e-2	7.032e-3	0	7.032e-3
Arsenic	1.534e-4	0	3e-4		5.114e-1	0	5.114e-1
Barium	3.829e-2	0	7e-2	1e-4	5.470e-1	0	5.470e-1
Chromium (III)	0	0	1e0	6e-7	0	0	0
Cobalt	5.370e-4	0	8e-3		6.712e-2	0	6.712e-2
Copper	0	0	4e-2		0	0	0
Lead	2.557e-4	0	1.4e-3	4.3e-4	1.826e-1	0	1.826e-1
Mercury	0	0	3e-4	9e-5	0	0	0
Selenium	0	0	5e-3		0	0	0
Zinc	0	0	2e-1		0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
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	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
TOTAL HAZARD INDEX					1.3236e0	0	1.3236e0

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE FOUR)
TINKER AFB - CRUTCHO CREEK - SW06
EXPOSURE SCENARIO - CHILD RESIDENTS
CALCULATE INCREMENTAL CANCER RISK:

CHEMICAL	TIME-WEIGHTED ING & DERM DOSE	TIME-WEIGHTED INHALATION DOSE	CANCER SLOPE FACTOR ING	CANCER SLOPE FACTOR INH	CANCER RISK ING/DERM	CANCER RISK INH	CANCER RISK
Acetone	7.123e-5	0			0	0	0
4-Methyl-2-pentanone	3.014e-5	0			0	0	0
Arsenic	1.315e-5	0		5e1	0	0	0
Barium	3.282e-3	0			0	0	0
Chromium (III)	0	0			0	0	0
Cobalt	4.603e-5	0			0	0	0
Copper	0	0			0	0	0
Lead	2.192e-5	0			0	0	0
Mercury	0	0			0	0	0
Selenium	0	0			0	0	0
Zinc	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - EXPOSURES THROUGH HOUSEHOLD USE OF SURFACE WATER

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW15
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY ON THE FOLLOWING SPREADSHEETS.
ONY INGESTION OF SURFACE WATER IS CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADULT RESIDENTS

REFERENCES: EPA, DECEMBER 1989
FOSTER AND CHROSTOWSKI, 1987

INGESTION: IEX = (C x IR x EF x ED)/(BW x LT x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
IR = INGESTION RATE (LITERS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

DERMAL CONTACT: DEX = (C x PC x AV x ET x EF x ED)/(BW x LT x 1000 x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
PC = THE PERMEABILITY CONSTANT OF WATER (CM/HR)
AV = THE SKIN SURFACE AREA AVAILABLE FOR CONTACT (CM**2)
ET = EXPOSURE TIME (HRS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

INHALATION: IEX = (S x IR x EF x ED)/(BW x LT x Ra x 1E6)x(Ds + EXP(-Ra x Dt)/Ra - EXP(Ra x (Ds-Dt))/Ra)

WHERE:
S = VOLATILE ORGANIC CHEMICAL GENERATION RATE (UG/CUBIC METER/MIN)
IR = INHALATION RATE (LITERS/MIN)
Ds = SHOWER DURATION (MIN)
Ra = AIR EXCHANGE RATE (1/MIN)
Dt = TOTAL DURATION IN SHOWER ROOM (MIN)
BW = BODY WEIGHT (KG)
SV = SHOWER ROOM AIR VOLUME (m**3)
R = IDEAL GAS LAW CONSTANT (ATM-M**3/MOL/K)

ENTER INPUT PARAMETERS:

INGESTION: ADULT EXPOSURE

IR:	2	CONVERSION FACTOR =	2.740e-2
EF:	350		
ED:	30		
BW:	70		
LT:	70		

DERMAL CONTACT: NOT APPLICABLE

PC:	1e-3	CONVERSION FACTOR =	0
AV:	19400		
ET:	.25		
EF:	0		
ED:	70		
BW:	70		
LT:	70		

INHALATION: NOT APPLICABLE

IR:	14	d:	1
BW:	70	Ts:	2
Ds:	15	T1:	293
Dt:	20	Ts:	318
Ra:	.0083	M1:	.982
SV:	12	M2:	.616
ED:	70	T:	293
R:	.000082	FR:	10
EF:	0	LT:	70

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SW15
EXPOSURE SCENARIO - ADULT RESIDENTS
CALCULATE DOSES:

CHEMICAL	GW CONC. (MG/L)	MOLECULAR WEIGHT	HENRYS LAW CONSTANT	MASS TRANSFER COEFFICIENT (KAl)	INGESTION DOSE	INHALATION DOSE	DERMAL DOSE
Acetone	.0103	58.08	3.43e-5	2.7584e0	2.822e-4	0	0
4-Methyl-2-pentanone	.0057	100.2	4.16e-5	2.4834e0	1.562e-4	0	0
Arsenic	.0015	74.92		0	4.110e-5	0	0
Barium	.785	137.34		0	2.151e-2	0	0
Chromium (III)				0	0	0	0
Cobalt				0	0	0	0
Copper		63.54		0	0	0	0
Lead	.0017	207.19		0	4.658e-5	0	0
Mercury		200.59		0	0	0	0
Selenium				0	0	0	0
Zinc	.0085	65.38		0	2.329e-4	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
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				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW15
EXPOSURE SCENARIO - ADULT RESIDENTS
CALCULATE HAZARD INDICES:

CHEMICAL	ING+DERM DOSE	INHALATION DOSE	REFERENCE DOSE ING.	REFERENCE DOSE INH.	HAZARD IND ING./DERM	HAZARD IND. INH.	HAZARD INDEX
Acetone	2.822e-4	0	1e-1		2.822e-3	0	2.822e-3
4-Methyl-2-pentanone	1.562e-4	0	5e-2	2e-2	3.123e-3	0	3.123e-3
Arsenic	4.110e-5	0	3e-4		1.370e-1	0	1.370e-1
Barium	2.151e-2	0	7e-2	1e-4	3.072e-1	0	3.072e-1
Chromium (III)	0	0	1e0	6e-7	0	0	0
Cobalt	0	0	8e-3		0	0	0
Copper	0	0	4e-2		0	0	0
Lead	4.658e-5	0	1.4e-3	4.3e-4	3.327e-2	0	3.327e-2
Mercury	0	0	3e-4	9e-5	0	0	0
Selenium	0	0	5e-3		0	0	0
Zinc	2.329e-4	0	2e-1		1.164e-3	0	1.164e-3
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
TOTAL HAZARD INDEX					4.846e-1	0	4.846e-1

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE FOUR)
TINKER AFB - CRUTCHO CREEK - SW15
EXPOSURE SCENARIO - ADULT RESIDENTS
CALCULATE INCREMENTAL CANCER RISK:

CHEMICAL	TIME-WEIGHTED ING & DERM DOSE	TIME-WEIGHTED INHALATION DOSE	CANCER SLOPE FACTOR ING	CANCER SLOPE FACTOR INH	CANCER RISK ING/DERM	CANCER RISK INH	CANCER RISK
Acetone	1.209e-4	0			0	0	0
4-Methyl-2-pentanone	6.693e-5	0			0	0	0
Arsenic	1.761e-5	0		5e1	0	0	0
Barium	9.217e-3	0			0	0	0
Chromium (III)	0	0			0	0	0
Cobalt	0	0			0	0	0
Copper	0	0			0	0	0
Lead	1.996e-5	0			0	0	0
Mercury	0	0			0	0	0
Selenium	0	0			0	0	0
Zinc	9.980e-5	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - EXPOSURES THROUGH HOUSEHOLD USE OF SURFACE WATER

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW15
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY ON THE FOLLOWING SPREADSHEETS.
ONY INGESTION OF SURFACE WATER IS CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - CHILD RESIDENTS

REFERENCES: EPA, DECEMBER 1989
FOSTER AND CHROSTOWSKI, 1987

INGESTION: IEX = (C x IR x EF x ED)/(BW x LT x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
IR = INGESTION RATE (LITERS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

DERMAL CONTACT: DEX = (C x PC x AV x ET x EF x ED)/(BW x LT x 1000 x 365)

WHERE:
C = GROUNDWATER CONCENTRATION (MG/L)
PC = THE PERMEABILITY CONSTANT OF WATER (CM/HR)
AV = THE SKIN SURFACE AREA AVAILABLE FOR CONTACT (CM**2)
ET = EXPOSURE TIME (HRS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

INHALATION: IEX = (S x IR x EF x ED)/(BW x LT x Ra x 1E6)x(Ds + EXP(-Ra x Dt)/Ra - EXP(Ra x (Ds-Dt))/Ra)

WHERE:
S = VOLATILE ORGANIC CHEMICAL GENERATION RATE (UG/CUBIC METER/MIN)
IR = INHALATION RATE (LITERS/MIN)
Ds = SHOWER DURATION (MIN)
Ra = AIR EXCHANGE RATE (1/MIN)
Dt = TOTAL DURATION IN SHOWER ROOM (MIN)
BW = BODY WEIGHT (KG)
SV = SHOWER ROOM AIR VOLUME (m**3)
R = IDEAL GAS LAW CONSTANT (ATM-M**3/MOL/K)

ENTER INPUT PARAMETERS:

INGESTION: CHILD EXPOSURE

IR:	1	CONVERSION FACTOR =	6.393e-2
EF:	350		
ED:	6		
BW:	15		
LT:	70		

DERMAL CONTACT: NOT APPLICABLE

PC:	1e-3	CONVERSION FACTOR =	0
AV:	19400		
ET:	.25		
EF:	0		
ED:	70		
BW:	70		
LT:	70		

INHALATION: NOT APPLICABLE

IR:	14	d:	1
BW:	70	Ts:	2
Ds:	15	T1:	293
Dt:	20	Ts:	318
Ra:	.0083	M1:	.982
SV:	12	M2:	.616
ED:	70	T:	293
R:	.000082	FR:	10
EF:	0	LT:	70

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SW15
EXPOSURE SCENARIO - CHILD RESIDENTS
CALCULATE DOSES:

CHEMICAL	GW CONC. (MG/L)	MOLECULAR WEIGHT	HENRYS LAW CONSTANT	MASS TRANSFER COEFFICIENT (KAl)	INGESTION DOSE	INHALATION DOSE	DERMAL DOSE
Acetone	.0103	58.08	3.43e-5	2.7584e0	6.584e-4	0	0
4-Methyl-2-pentanone	.0057	100.2	4.16e-5	2.4834e0	3.644e-4	0	0
Arsenic	.0015	74.92		0	9.589e-5	0	0
Barium	.785	137.34		0	5.018e-2	0	0
Chromium (III)				0	0	0	0
Cobalt				0	0	0	0
Copper		63.54		0	0	0	0
Lead	.0017	207.19		0	1.087e-4	0	0
Mercury		200.59		0	0	0	0
Selenium				0	0	0	0
Zinc	.0085	65.38		0	5.434e-4	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
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				0	0	0	0
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				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0
				0	0	0	0

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW15
EXPOSURE SCENARIO - CHILD RESIDENTS
CALCULATE HAZARD INDICES:

CHEMICAL	ING+DERM DOSE	INHALATION DOSE	REFERENCE DOSE ING.	REFERENCE DOSE INH.	HAZARD IND ING./DERM	HAZARD IND. INH.	HAZARD INDEX
Acetone	6.584e-4	0	1e-1		6.584e-3	0	6.584e-3
4-Methyl-2-pentanone	3.644e-4	0	5e-2	2e-2	7.288e-3	0	7.288e-3
Arsenic	9.589e-5	0	3e-4		3.196e-1	0	3.196e-1
Barium	5.018e-2	0	7e-2	1e-4	7.169e-1	0	7.169e-1
Chromium (III)	0	0	1e0	6e-7	0	0	0
Cobalt	0	0	8e-3		0	0	0
Copper	0	0	4e-2		0	0	0
Lead	1.087e-4	0	1.4e-3	4.3e-4	7.763e-2	0	7.763e-2
Mercury	0	0	3e-4	9e-5	0	0	0
Selenium	0	0	5e-3		0	0	0
Zinc	5.434e-4	0	2e-1		2.717e-3	0	2.717e-3
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
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	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
TOTAL HAZARD INDEX					1.1307e0	0	1.1307e0

RISK ASSESSMENT SPREADSHEET - HOUSEHOLD USE OF GROUNDWATER (PAGE FOUR)
TINKER AFB - CRUTCHO CREEK - SW15
EXPOSURE SCENARIO - CHILD RESIDENTS
CALCULATE INCREMENTAL CANCER RISK:

CHEMICAL	TIME-WEIGHTED ING & DERM DOSE	TIME-WEIGHTED INHALATION DOSE	CANCER SLOPE FACTOR ING	CANCER SLOPE FACTOR INH	CANCER RISK ING/DERM	CANCER RISK INH	CANCER RISK
Acetone	5.644e-5	0			0	0	0
4-Methyl-2-pentanone	3.123e-5	0			0	0	0
Arsenic	8.219e-6	0		5e1	0	0	0
Barium	4.301e-3	0			0	0	0
Chromium (III)	0	0			0	0	0
Cobalt	0	0			0	0	0
Copper	0	0			0	0	0
Lead	9.315e-6	0			0	0	0
Mercury	0	0			0	0	0
Selenium	0	0			0	0	0
Zinc	4.658e-5	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
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	0	0			0	0	0
	0	0			0	0	0
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	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
	0	0			0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW06
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE CONSIDERED: DERMAL CONTACT WITH WATER AND
ACCIDENTAL INGESTION OF WATER DURING SWIMMING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENT SWIMMERS

REFERENCE: EPA, DECEMBER 1989

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x LT x 365) * ED AND LT TERMS FOR CARCINOGENIC RISK ASSESSMENT ONLY.

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x LT x 1000 x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (SQ CM)
PC = DERMAL PERMEABILITY CONSTANT (CM/HR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

ENTER INPUT PARAMETERS:

INGESTION:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
CR:	.05	CONVERSION	N/A	CONVERSION	
ET:	2.6	FACTOR= 1.247e-4	N/A	FACTOR=	N/A
EF:	14		N/A		
ED:	9	TIME-WEIGHTED CONVERSION	N/A		
BW:	40	FACTOR= 1.603e-5	N/A		
LT:	70		N/A		

DERMAL:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
SA:	13700	CONVERSION	N/A	CONVERSION	
PC:	1e-3	FACTOR= 3.416e-5	N/A	FACTOR=	N/A
ET:	2.6		N/A		
EF:	14	TIME-WEIGHTED CONVERSION	N/A		
ED:	9	FACTOR= 4.392e-6	N/A		
BW:	40		N/A		
LT:	70		N/A		

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW06
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE HAZARD INDICES (ADULT):

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	REFERENCE DOSE-ING.	ADULT HAZARD INDEX-ING.	ADULT HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Acetone	.013	1.621e-6	4.440e-7	1e-1	1.621e-5	4.440e-6	2.065e-5
4-Methyl-2-pentanone	.055	6.856e-6	1.879e-6	5e-2	1.371e-4	3.757e-5	1.747e-4
Arsenic	.0024	2.992e-7	8.197e-8	3e-4	9.973e-4	2.732e-4	1.271e-3
Barium	.599	7.467e-5	2.046e-5	7e-2	1.067e-3	2.923e-4	1.359e-3
Chromium (III)	0	0	0	1e0	0	0	0
Cobalt	.0084	1.047e-6	2.869e-7	8e-3	1.309e-4	3.586e-5	1.668e-4
Copper	0	0	0	4e-2	0	0	0
Lead	.004	4.986e-7	1.366e-7	1.4e-3	3.562e-4	9.759e-5	4.538e-4
Mercury	0	0	0	3e-4	0	0	0
Selenium	0	0	0	5e-3	0	0	0
Zinc	0	0	0	2e-1	0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL HAZARD INDEX					2.704e-3	7.410e-4	3.445e-3

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE FOUR)
TINKER AFB - CRUTCHO CREEK - SW06
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	CANCER SLOPE FACTOR-ING.	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK
Acetone	.013	2.084e-7	5.709e-8		0	0	0
4-Methyl-2-pentanone	.055	8.815e-7	2.415e-7		0	0	0
Arsenic	.0024	3.847e-8	1.054e-8		0	0	0
Barium	.599	9.600e-6	2.631e-6		0	0	0
Chromium (III)	0	0	0		0	0	0
Cobalt	.0084	1.346e-7	3.689e-8		0	0	0
Copper	0	0	0		0	0	0
Lead	.004	6.411e-8	1.757e-8		0	0	0
Mercury	0	0	0		0	0	0
Selenium	0	0	0		0	0	0
Zinc	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW07
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE CONSIDERED: DERMAL CONTACT WITH WATER AND
ACCIDENTAL INGESTION OF WATER DURING SWIMMING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENT SWIMMERS

REFERENCE: EPA, DECEMBER 1989

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x LT x 365) * ED AND LT TERMS FOR CARCINOGENIC RISK ASSESSMENT ONLY.

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x LT x 1000 x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (SQ CM)
PC = DERMAL PERMEABILITY CONSTANT (CM/HR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

ENTER INPUT PARAMETERS:

INGESTION:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE	
CR:	.05	CONVERSION	N/A	CONVERSION
ET:	2.6	FACTOR= 1.247e-4	N/A	FACTOR= N/A
EF:	14		N/A	
ED:	9	TIME-WEIGHTED CONVERSION	N/A	
BW:	40	FACTOR= 1.603e-5	N/A	
LT:	70		N/A	

DERMAL:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE	
SA:	13700	CONVERSION	N/A	CONVERSION
PC:	1e-3	FACTOR= 3.416e-5	N/A	FACTOR= N/A
ET:	2.6		N/A	
EF:	14	TIME-WEIGHTED CONVERSION	N/A	
ED:	9	FACTOR= 4.392e-6	N/A	
BW:	40		N/A	
LT:	70		N/A	

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW07
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE HAZARD INDICES (ADULT):

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	REFERENCE DOSE-ING.	ADULT HAZARD INDEX-ING.	ADULT HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Acetone	0	0	0	1e-1	0	0	0
4-Methyl-2-pentanone	0	0	0	5e-2	0	0	0
Arsenic	.0026	3.241e-7	8.881e-8	3e-4	1.080e-3	2.960e-4	1.376e-3
Barium	.469	5.846e-5	1.602e-5	7e-2	8.352e-4	2.288e-4	1.064e-3
Chromium (III)	0	0	0	1e0	0	0	0
Cobalt	0	0	0	8e-3	0	0	0
Copper	0	0	0	4e-2	0	0	0
Lead	.0031	3.864e-7	1.059e-7	1.4e-3	2.760e-4	7.563e-5	3.517e-4
Mercury	0	0	0	3e-4	0	0	0
Selenium	0	0	0	5e-3	0	0	0
Zinc	0	0	0	2e-1	0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL HAZARD INDEX					2.192e-3	6.005e-4	2.792e-3

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE FOUR)
TINKER AFB - CRUTCHO CREEK - SW07
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	CANCER SLOPE FACTOR-ING.	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK
Acetone	0	0	0		0	0	0
4-Methyl-2-pentanone	0	0	0		0	0	0
Arsenic	.0026	4.167e-8	1.142e-8		0	0	0
Barium	.469	7.517e-6	2.060e-6		0	0	0
Chromium (III)	0	0	0		0	0	0
Cobalt	0	0	0		0	0	0
Copper	0	0	0		0	0	0
Lead	.0031	4.968e-8	1.361e-8		0	0	0
Mercury	0	0	0		0	0	0
Selenium	0	0	0		0	0	0
Zinc	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW08
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE CONSIDERED: DERMAL CONTACT WITH WATER AND
ACCIDENTAL INGESTION OF WATER DURING SWIMMING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENT SWIMMERS

REFERENCE: EPA, DECEMBER 1989

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x LT x 365) * ED AND LT TERMS FOR CARCINOGENIC RISK ASSESSMENT ONLY.

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x LT x 1000 x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (SQ CM)
PC = DERMAL PERMEABILITY CONSTANT (CM/HR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

ENTER INPUT PARAMETERS:

INGESTION:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
CR:	.05	CONVERSION	N/A	CONVERSION	
ET:	2.6	FACTOR= 1.247e-4	N/A	FACTOR=	N/A
EF:	14		N/A		
ED:	9	TIME-WEIGHTED CONVERSION	N/A		
BW:	40	FACTOR= 1.603e-5	N/A		
LT:	70		N/A		

DERMAL:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
SA:	13700	CONVERSION	N/A	CONVERSION	
PC:	1e-3	FACTOR= 3.416e-5	N/A	FACTOR=	N/A
ET:	2.6		N/A		
EF:	14	TIME-WEIGHTED CONVERSION	N/A		
ED:	9	FACTOR= 4.392e-6	N/A		
BW:	40		N/A		
LT:	70		N/A		

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW08
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE HAZARD INDICES (ADULT):

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	REFERENCE DOSE-ING.	ADULT HAZARD INDEX-ING.	ADULT HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Acetone	0	0	0	1e-1	0	0	0
4-Methyl-2-pentanone	0	0	0	5e-2	0	0	0
Arsenic	.0028	3.490e-7	9.564e-8	3e-4	1.163e-3	3.188e-4	1.482e-3
Barium	.553	6.894e-5	1.889e-5	7e-2	9.848e-4	2.698e-4	1.255e-3
Chromium (III)	0	0	0	1e0	0	0	0
Cobalt	.0093	1.159e-6	3.177e-7	8e-3	1.449e-4	3.971e-5	1.846e-4
Copper	0	0	0	4e-2	0	0	0
Lead	.0026	3.241e-7	8.881e-8	1.4e-3	2.315e-4	6.343e-5	2.949e-4
Mercury	0	0	0	3e-4	0	0	0
Selenium	0	0	0	5e-3	0	0	0
Zinc	0	0	0	2e-1	0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL HAZARD INDEX					2.525e-3	6.918e-4	3.216e-3

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE FOUR)
TINKER AFB - CRUTCHO CREEK - SW08
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	CANCER SLOPE FACTOR-ING.	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK
Acetone	0	0	0		0	0	0
4-Methyl-2-pentanone	0	0	0		0	0	0
Arsenic	.0028	4.488e-8	1.230e-8		0	0	0
Barium	.553	8.863e-6	2.429e-6		0	0	0
Chromium (III)	0	0	0		0	0	0
Cobalt	.0093	1.491e-7	4.084e-8		0	0	0
Copper	0	0	0		0	0	0
Lead	.0026	4.167e-8	1.142e-8		0	0	0
Mercury	0	0	0		0	0	0
Selenium	0	0	0		0	0	0
Zinc	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW09
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE CONSIDERED: DERMAL CONTACT WITH WATER AND
ACCIDENTAL INGESTION OF WATER DURING SWIMMING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENT SWIMMERS

REFERENCE: EPA, DECEMBER 1989

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x LT x 365) * ED AND LT TERMS FOR CARCINOGENIC RISK ASSESSMENT ONLY.

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x LT x 1000 x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (SQ CM)
PC = DERMAL PERMEABILITY CONSTANT (CM/HR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

ENTER INPUT PARAMETERS:

INGESTION:

	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
CR:	.05	CONVERSION	N/A	CONVERSION	
ET:	2.6	FACTOR= 1.247e-4	N/A	FACTOR=	N/A
EF:	14		N/A		
ED:	9	TIME-WEIGHTED CONVERSION	N/A		
BW:	40	FACTOR= 1.603e-5	N/A		
LT:	70		N/A		

DERMAL:

	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
SA:	13700	CONVERSION	N/A	CONVERSION	
PC:	1e-3	FACTOR= 3.416e-5	N/A	FACTOR=	N/A
ET:	2.6		N/A		
EF:	14	TIME-WEIGHTED CONVERSION	N/A		
ED:	9	FACTOR= 4.392e-6	N/A		
BW:	40		N/A		
LT:	70		N/A		

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW09
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE HAZARD INDICES (ADULT):

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	REFERENCE DOSE-ING.	ADULT HAZARD INDEX-ING.	ADULT HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Acetone	0	0	0	1e-1	0	0	0
4-Methyl-2-pentanone	0	0	0	5e-2	0	0	0
Arsenic	.0024	2.992e-7	8.197e-8	3e-4	9.973e-4	2.732e-4	1.271e-3
Barium	.642	8.003e-5	2.193e-5	7e-2	1.143e-3	3.133e-4	1.457e-3
Chromium (III)	0	0	0	1e0	0	0	0
Cobalt	0	0	0	8e-3	0	0	0
Copper	0	0	0	4e-2	0	0	0
Lead	.0012	1.496e-7	4.099e-8	1.4e-3	1.068e-4	2.928e-5	1.361e-4
Mercury	0	0	0	3e-4	0	0	0
Selenium	0	0	0	5e-3	0	0	0
Zinc	0	0	0	2e-1	0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL HAZARD INDEX					2.247e-3	6.158e-4	2.863e-3

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE FOUR)
TINKER AFB - CRUTCHO CREEK - SW09
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	CANCER SLOPE FACTOR-ING.	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK
Acetone	0	0	0		0	0	0
4-Methyl-2-pentanone	0	0	0		0	0	0
Arsenic	.0024	3.847e-8	1.054e-8		0	0	0
Barium	.642	1.029e-5	2.819e-6		0	0	0
Chromium (III)	0	0	0		0	0	0
Cobalt	0	0	0		0	0	0
Copper	0	0	0		0	0	0
Lead	.0012	1.923e-8	5.270e-9		0	0	0
Mercury	0	0	0		0	0	0
Selenium	0	0	0		0	0	0
Zinc	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW10
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE CONSIDERED: DERMAL CONTACT WITH WATER AND
ACCIDENTAL INGESTION OF WATER DURING SWIMMING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENT SWIMMERS

REFERENCE: EPA, DECEMBER 1989

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x LT x 365)

* ED AND LT TERMS FOR CARCINOGENIC RISK ASSESSMENT ONLY.

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x LT x 1000 x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (SQ CM)
PC = DERMAL PERMEABILITY CONSTANT (CM/HR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

ENTER INPUT PARAMETERS:

INGESTION:

	ADOLESCENT EXPOSURE		YOUTH EXPOSURE	
CR:	.05	CONVERSION	N/A	CONVERSION
ET:	2.6	FACTOR= 1.247e-4	N/A	FACTOR= N/A
EF:	14		N/A	
ED:	9	TIME-WEIGHTED CONVERSION	N/A	
BW:	40	FACTOR= 1.603e-5	N/A	
LT:	70		N/A	

DERMAL:

	ADOLESCENT EXPOSURE		YOUTH EXPOSURE	
SA:	13700	CONVERSION	N/A	CONVERSION
PC:	1e-3	FACTOR= 3.416e-5	N/A	FACTOR= N/A
ET:	2.6		N/A	
EF:	14	TIME-WEIGHTED CONVERSION	N/A	
ED:	9	FACTOR= 4.392e-6	N/A	
BW:	40		N/A	
LT:	70		N/A	

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW10
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE HAZARD INDICES (ADULT):

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	REFERENCE DOSE-ING.	ADULT HAZARD INDEX-ING.	ADULT HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Acetone	0	0	0	1e-1	0	0	0
4-Methyl-2-pentanone	0	0	0	5e-2	0	0	0
Arsenic	.0023	2.867e-7	7.856e-8	3e-4	9.557e-4	2.619e-4	1.218e-3
Barium	.508	6.333e-5	1.735e-5	7e-2	9.047e-4	2.479e-4	1.153e-3
Chromium (III)	0	0	0	1e0	0	0	0
Cobalt	.0123	1.533e-6	4.201e-7	8e-3	1.917e-4	5.252e-5	2.442e-4
Copper	0	0	0	4e-2	0	0	0
Lead	.0031	3.864e-7	1.059e-7	1.4e-3	2.760e-4	7.563e-5	3.517e-4
Mercury	0	0	0	3e-4	0	0	0
Selenium	0	0	0	5e-3	0	0	0
Zinc	0	0	0	2e-1	0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL HAZARD INDEX					2.328e-3	6.379e-4	2.966e-3

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE FOUR)
TINKER AFB - CRUTCHO CREEK - SW10
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	CANCER SLOPE FACTOR-ING.	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK
Acetone	0	0	0		0	0	0
4-Methyl-2-pentanone	0	0	0		0	0	0
Arsenic	.0023	3.686e-8	1.010e-8		0	0	0
Barium	.508	8.142e-6	2.231e-6		0	0	0
Chromium (III)	0	0	0		0	0	0
Cobalt	.0123	1.971e-7	5.402e-8		0	0	0
Copper	0	0	0		0	0	0
Lead	.0031	4.968e-8	1.361e-8		0	0	0
Mercury	0	0	0		0	0	0
Selenium	0	0	0		0	0	0
Zinc	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW11
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE CONSIDERED: DERMAL CONTACT WITH WATER AND
ACCIDENTAL INGESTION OF WATER DURING SWIMMING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENT SWIMMERS

REFERENCE: EPA, DECEMBER 1989

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x LT x 365) * ED AND LT TERMS FOR CARCINOGENIC RISK ASSESSMENT ONLY.

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x LT x 1000 x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (SQ CM)
PC = DERMAL PERMEABILITY CONSTANT (CM/HR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

ENTER INPUT PARAMETERS:

INGESTION:

	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
CR:	.05	CONVERSION	N/A	CONVERSION	
ET:	2.6	FACTOR= 1.247e-4	N/A	FACTOR=	N/A
EF:	14		N/A		
ED:	9	TIME-WEIGHTED CONVERSION	N/A		
BW:	40	FACTOR= 1.603e-5	N/A		
LT:	70		N/A		

DERMAL:

	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
SA:	13700	CONVERSION	N/A	CONVERSION	
PC:	1e-3	FACTOR= 3.416e-5	N/A	FACTOR=	N/A
ET:	2.6		N/A		
EF:	14	TIME-WEIGHTED CONVERSION	N/A		
ED:	9	FACTOR= 4.392e-6	N/A		
BW:	40		N/A		
LT:	70		N/A		

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW11
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE HAZARD INDICES (ADULT):

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	REFERENCE DOSE-ING.	ADULT HAZARD INDEX-ING.	ADULT HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Acetone	0	0	0	1e-1	0	0	0
4-Methyl-2-pentanone	0	0	0	5e-2	0	0	0
Arsenic	0	0	0	3e-4	0	0	0
Barium	.469	5.846e-5	1.602e-5	7e-2	8.352e-4	2.288e-4	1.064e-3
Chromium (III)	0	0	0	1e0	0	0	0
Cobalt	0	0	0	8e-3	0	0	0
Copper	0	0	0	4e-2	0	0	0
Lead	.0026	3.241e-7	8.881e-8	1.4e-3	2.315e-4	6.343e-5	2.949e-4
Mercury	0	0	0	3e-4	0	0	0
Selenium	0	0	0	5e-3	0	0	0
Zinc	0	0	0	2e-1	0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL HAZARD INDEX					1.067e-3	2.923e-4	1.359e-3

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE FOUR)
TINKER AFB - CRUTCHO CREEK - SW11
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	CANCER SLOPE FACTOR-ING.	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK
Acetone	0	0	0		0	0	0
4-Methyl-2-pentanone	0	0	0		0	0	0
Arsenic	0	0	0		0	0	0
Barium	.469	7.517e-6	2.060e-6		0	0	0
Chromium (III)	0	0	0		0	0	0
Cobalt	0	0	0		0	0	0
Copper	0	0	0		0	0	0
Lead	.0026	4.167e-8	1.142e-8		0	0	0
Mercury	0	0	0		0	0	0
Selenium	0	0	0		0	0	0
Zinc	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW12
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE CONSIDERED: DERMAL CONTACT WITH WATER AND
ACCIDENTAL INGESTION OF WATER DURING SWIMMING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENT SWIMMERS

REFERENCE: EPA, DECEMBER 1989

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x LT x 365)

* ED AND LT TERMS FOR CARCINOGENIC RISK ASSESSMENT ONLY.

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x LT x 1000 x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (SQ CM)
PC = DERMAL PERMEABILITY CONSTANT (CM/HR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

ENTER INPUT PARAMETERS:

INGESTION:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
CR:	.05	CONVERSION	N/A	CONVERSION	
ET:	2.6	FACTOR= 1.247e-4	N/A	FACTOR=	N/A
EF:	14		N/A		
ED:	9	TIME-WEIGHTED CONVERSION	N/A		
BW:	40	FACTOR= 1.603e-5	N/A		
LT:	70		N/A		

DERMAL:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
SA:	13700	CONVERSION	N/A	CONVERSION	
PC:	1e-3	FACTOR= 3.416e-5	N/A	FACTOR=	N/A
ET:	2.6		N/A		
EF:	14	TIME-WEIGHTED CONVERSION	N/A		
ED:	9	FACTOR= 4.392e-6	N/A		
BW:	40		N/A		
LT:	70		N/A		

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW12
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE HAZARD INDICES (ADULT):

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	REFERENCE DOSE-ING.	ADULT HAZARD INDEX-ING.	ADULT HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Acetone	0	0	0	1e-1	0	0	0
4-Methyl-2-pentanone	0	0	0	5e-2	0	0	0
Arsenic	0	0	0	3e-4	0	0	0
Barium	.533	6.644e-5	1.821e-5	7e-2	9.492e-4	2.601e-4	1.209e-3
Chromium (III)	0	0	0	1e0	0	0	0
Cobalt	0	0	0	8e-3	0	0	0
Copper	0	0	0	4e-2	0	0	0
Lead	.0018	2.244e-7	6.148e-8	1.4e-3	1.603e-4	4.392e-5	2.042e-4
Mercury	0	0	0	3e-4	0	0	0
Selenium	0	0	0	5e-3	0	0	0
Zinc	0	0	0	2e-1	0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL HAZARD INDEX					1.109e-3	3.040e-4	1.413e-3

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE FOUR)
TINKER AFB - CRUTCHO CREEK - SW12
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	CANCER SLOPE FACTOR-ING.	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK
Acetone	0	0	0		0	0	0
4-Methyl-2-pentanone	0	0	0		0	0	0
Arsenic	0	0	0		0	0	0
Barium	.533	8.543e-6	2.341e-6		0	0	0
Chromium (III)	0	0	0		0	0	0
Cobalt	0	0	0		0	0	0
Copper	0	0	0		0	0	0
Lead	.0018	2.885e-8	7.905e-9		0	0	0
Mercury	0	0	0		0	0	0
Selenium	0	0	0		0	0	0
Zinc	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW13
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE CONSIDERED: DERMAL CONTACT WITH WATER AND
ACCIDENTAL INGESTION OF WATER DURING SWIMMING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENT SWIMMERS

REFERENCE: EPA, DECEMBER 1989

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x LT x 365) * ED AND LT TERMS FOR CARCINOGENIC RISK ASSESSMENT ONLY.

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x LT x 1000 x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (SQ CM)
PC = DERMAL PERMEABILITY CONSTANT (CM/HR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

ENTER INPUT PARAMETERS:

INGESTION:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
CR:	.05	CONVERSION	N/A	CONVERSION	
ET:	2.6	FACTOR= 1.247e-4	N/A	FACTOR=	N/A
EF:	14		N/A		
ED:	9	TIME-WEIGHTED CONVERSION	N/A		
BW:	40	FACTOR= 1.603e-5	N/A		
LT:	70		N/A		

DERMAL:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
SA:	13700	CONVERSION	N/A	CONVERSION	
PC:	1e-3	FACTOR= 3.416e-5	N/A	FACTOR=	N/A
ET:	2.6		N/A		
EF:	14	TIME-WEIGHTED CONVERSION	N/A		
ED:	9	FACTOR= 4.392e-6	N/A		
BW:	40		N/A		
LT:	70		N/A		

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW13
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE HAZARD INDICES (ADULT):

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	REFERENCE DOSE-ING.	ADULT HAZARD INDEX-ING.	ADULT HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Acetone	0	0	0	1e-1	0	0	0
4-Methyl-2-pentanone	0	0	0	5e-2	0	0	0
Arsenic	.002	2.493e-7	6.831e-8	3e-4	8.311e-4	2.277e-4	1.059e-3
Barium	.666	8.302e-5	2.275e-5	7e-2	1.186e-3	3.250e-4	1.511e-3
Chromium (III)	0	0	0	1e0	0	0	0
Cobalt	0	0	0	8e-3	0	0	0
Copper	0	0	0	4e-2	0	0	0
Lead	.0044	5.485e-7	1.503e-7	1.4e-3	3.918e-4	1.073e-4	4.991e-4
Mercury	.00008	9.973e-9	2.732e-9	3e-4	3.324e-5	9.108e-6	4.235e-5
Selenium	0	0	0	5e-3	0	0	0
Zinc	0	0	0	2e-1	0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL HAZARD INDEX					2.442e-3	6.691e-4	3.111e-3

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE FOUR)
TINKER AFB - CRUTCHO CREEK - SW13
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	CANCER SLOPE FACTOR-ING.	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK
Acetone	0	0	0		0	0	0
4-Methyl-2-pentanone	0	0	0		0	0	0
Arsenic	.002	3.205e-8	8.783e-9		0	0	0
Barium	.666	1.067e-5	2.925e-6		0	0	0
Chromium (III)	0	0	0		0	0	0
Cobalt	0	0	0		0	0	0
Copper	0	0	0		0	0	0
Lead	.0044	7.052e-8	1.932e-8		0	0	0
Mercury	.00008	1.282e-9	3.51e-10		0	0	0
Selenium	0	0	0		0	0	0
Zinc	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW14
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE CONSIDERED: DERMAL CONTACT WITH WATER AND
ACCIDENTAL INGESTION OF WATER DURING SWIMMING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENT SWIMMERS

REFERENCE: EPA, DECEMBER 1989

* ED AND LT TERMS FOR CARCINOGENIC RISK ASSESSMENT ONLY.

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x LT x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x LT x 1000 x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (SQ CM)
PC = DERMAL PERMEABILITY CONSTANT (CM/HR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

ENTER INPUT PARAMETERS:

INGESTION:

	ADOLESCENT EXPOSURE		YOUTH EXPOSURE	
CR:	.05	CONVERSION FACTOR= 1.247e-4	N/A	CONVERSION FACTOR= N/A
ET:	2.6		N/A	
EF:	14	TIME-WEIGHTED CONVERSION FACTOR= 1.603e-5	N/A	
ED:	9		N/A	
BW:	40		N/A	
LT:	70		N/A	

DERMAL:

	ADOLESCENT EXPOSURE		YOUTH EXPOSURE	
SA:	13700	CONVERSION FACTOR= 3.416e-5	N/A	CONVERSION FACTOR= N/A
PC:	1e-3		N/A	
ET:	2.6	TIME-WEIGHTED CONVERSION FACTOR= 4.392e-6	N/A	
EF:	14		N/A	
ED:	9		N/A	
BW:	40		N/A	
LT:	70		N/A	

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW14
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE HAZARD INDICES (ADULT):

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	REFERENCE DOSE-ING.	ADULT HAZARD INDEX-ING.	ADULT HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Acetone	0	0	0	1e-1	0	0	0
4-Methyl-2-pentanone	0	0	0	5e-2	0	0	0
Arsenic	0	0	0	3e-4	0	0	0
Barium	.539	6.719e-5	1.841e-5	7e-2	9.599e-4	2.630e-4	1.223e-3
Chromium (III)	0	0	0	1e0	0	0	0
Cobalt	.0121	1.508e-6	4.133e-7	8e-3	1.885e-4	5.166e-5	2.402e-4
Copper	0	0	0	4e-2	0	0	0
Lead	.0037	4.612e-7	1.264e-7	1.4e-3	3.295e-4	9.027e-5	4.197e-4
Mercury	0	0	0	3e-4	0	0	0
Selenium	.0014	1.745e-7	4.782e-8	5e-3	3.490e-5	9.564e-6	4.447e-5
Zinc	0	0	0	2e-1	0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL HAZARD INDEX					1.513e-3	4.145e-4	1.927e-3

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE FOUR)
TINKER AFB - CRUTCHO CREEK - SW14
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	CANCER SLOPE FACTOR-ING.	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK
Acetone	0	0	0		0	0	0
4-Methyl-2-pentanone	0	0	0		0	0	0
Arsenic	0	0	0		0	0	0
Barium	.539	8.639e-6	2.367e-6		0	0	0
Chromium (III)	0	0	0		0	0	0
Cobalt	.0121	1.939e-7	5.314e-8		0	0	0
Copper	0	0	0		0	0	0
Lead	.0037	5.930e-8	1.625e-8		0	0	0
Mercury	0	0	0		0	0	0
Selenium	.0014	2.244e-8	6.148e-9		0	0	0
Zinc	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW15
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE CONSIDERED: DERMAL CONTACT WITH WATER AND
ACCIDENTAL INGESTION OF WATER DURING SWIMMING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENT SWIMMERS

REFERENCE: EPA, DECEMBER 1989

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x LT x 365) * ED AND LT TERMS FOR CARCINOGENIC RISK ASSESSMENT ONLY.

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x LT x 1000 x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (SQ CM)
PC = DERMAL PERMEABILITY CONSTANT (CM/HR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

ENTER INPUT PARAMETERS:

INGESTION:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
CR:	.05	CONVERSION	N/A	CONVERSION	
ET:	2.6	FACTOR= 1.247e-4	N/A	FACTOR=	N/A
EF:	14		N/A		
ED:	9	TIME-WEIGHTED CONVERSION	N/A		
BW:	40	FACTOR= 1.603e-5	N/A		
LT:	70		N/A		

DERMAL:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
SA:	13700	CONVERSION	N/A	CONVERSION	
PC:	1e-3	FACTOR= 3.416e-5	N/A	FACTOR=	N/A
ET:	2.6		N/A		
EF:	14	TIME-WEIGHTED CONVERSION	N/A		
ED:	9	FACTOR= 4.392e-6	N/A		
BW:	40		N/A		
LT:	70		N/A		

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW15
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE HAZARD INDICES (ADULT):

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	REFERENCE DOSE-ING.	ADULT HAZARD INDEX-ING.	ADULT HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Acetone	.0103	1.284e-6	3.518e-7	1e-1	1.284e-5	3.518e-6	1.636e-5
4-Methyl-2-pentanone	.0057	7.105e-7	1.947e-7	5e-2	1.421e-5	3.894e-6	1.810e-5
Arsenic	.0015	1.870e-7	5.123e-8	3e-4	6.233e-4	1.708e-4	7.941e-4
Barium	.785	9.786e-5	2.681e-5	7e-2	1.398e-3	3.830e-4	1.781e-3
Chromium (III)	0	0	0	1e0	0	0	0
Cobalt	0	0	0	8e-3	0	0	0
Copper	0	0	0	4e-2	0	0	0
Lead	.0017	2.119e-7	5.807e-8	1.4e-3	1.514e-4	4.148e-5	1.928e-4
Mercury	0	0	0	3e-4	0	0	0
Selenium	0	0	0	5e-3	0	0	0
Zinc	.0085	1.060e-6	2.903e-7	2e-1	5.298e-6	1.452e-6	6.750e-6
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL HAZARD INDEX					2.205e-3	6.042e-4	2.809e-3

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE FOUR)
TINKER AFB - CRUTCHO CREEK - SW15
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	CANCER SLOPE FACTOR-ING.	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK
Acetone	.0103	1.651e-7	4.523e-8		0	0	0
4-Methyl-2-pentanone	.0057	9.136e-8	2.503e-8		0	0	0
Arsenic	.0015	2.404e-8	6.587e-9		0	0	0
Barium	.785	1.258e-5	3.447e-6		0	0	0
Chromium (III)	0	0	0		0	0	0
Cobalt	0	0	0		0	0	0
Copper	0	0	0		0	0	0
Lead	.0017	2.725e-8	7.466e-9		0	0	0
Mercury	0	0	0		0	0	0
Selenium	0	0	0		0	0	0
Zinc	.0085	1.362e-7	3.733e-8		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW16
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE CONSIDERED: DERMAL CONTACT WITH WATER AND
ACCIDENTAL INGESTION OF WATER DURING SWIMMING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENT SWIMMERS

REFERENCE: EPA, DECEMBER 1989

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x LT x 365)

* ED AND LT TERMS FOR CARCINOGENIC RISK ASSESSMENT ONLY.

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x LT x 1000 x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (SQ CM)
PC = DERMAL PERMEABILITY CONSTANT (CM/HR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

ENTER INPUT PARAMETERS:

INGESTION:

	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
CR:	.05	CONVERSION	N/A	CONVERSION	
ET:	2.6	FACTOR= 1.247e-4	N/A	FACTOR=	N/A
EF:	14		N/A		
ED:	9	TIME-WEIGHTED CONVERSION	N/A		
BW:	40	FACTOR= 1.603e-5	N/A		
LT:	70		N/A		

DERMAL:

	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
SA:	13700	CONVERSION	N/A	CONVERSION	
PC:	1e-3	FACTOR= 3.416e-5	N/A	FACTOR=	N/A
ET:	2.6		N/A		
EF:	14	TIME-WEIGHTED CONVERSION	N/A		
ED:	9	FACTOR= 4.392e-6	N/A		
BW:	40		N/A		
LT:	70		N/A		

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW16
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE HAZARD INDICES (ADULT):

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	REFERENCE DOSE-ING.	ADULT HAZARD INDEX-ING.	ADULT HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Acetone	0	0	0	1e-1	0	0	0
4-Methyl-2-pentanone	0	0	0	5e-2	0	0	0
Arsenic	0	0	0	3e-4	0	0	0
Barium	.833	1.038e-4	2.845e-5	7e-2	1.483e-3	4.065e-4	1.890e-3
Chromium (III)	0	0	0	1e0	0	0	0
Cobalt	0	0	0	8e-3	0	0	0
Copper	0	0	0	4e-2	0	0	0
Lead	.0026	3.241e-7	8.881e-8	1.4e-3	2.315e-4	6.343e-5	2.949e-4
Mercury	0	0	0	3e-4	0	0	0
Selenium	0	0	0	5e-3	0	0	0
Zinc	0	0	0	2e-1	0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL HAZARD INDEX					1.715e-3	4.699e-4	2.185e-3

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE FOUR)
TINKER AFB - CRUTCHO CREEK - SW16
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	CANCER SLOPE FACTOR-ING.	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK
Acetone	0	0	0		0	0	0
4-Methyl-2-pentanone	0	0	0		0	0	0
Arsenic	0	0	0		0	0	0
Barium	.833	1.335e-5	3.658e-6		0	0	0
Chromium (III)	0	0	0		0	0	0
Cobalt	0	0	0		0	0	0
Copper	0	0	0		0	0	0
Lead	.0026	4.167e-8	1.142e-8		0	0	0
Mercury	0	0	0		0	0	0
Selenium	0	0	0		0	0	0
Zinc	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW17
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE CONSIDERED: DERMAL CONTACT WITH WATER AND
ACCIDENTAL INGESTION OF WATER DURING SWIMMING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENT SWIMMERS

REFERENCE: EPA, DECEMBER 1989

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x LT x 365) * ED AND LT TERMS FOR CARCINOGENIC RISK ASSESSMENT ONLY.

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x LT x 1000 x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (SQ CM)
PC = DERMAL PERMEABILITY CONSTANT (CM/HR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

ENTER INPUT PARAMETERS:

INGESTION:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
CR:	.05	CONVERSION	N/A	CONVERSION	
ET:	2.6	FACTOR= 1.247e-4	N/A	FACTOR=	N/A
EF:	14		N/A		
ED:	9	TIME-WEIGHTED CONVERSION	N/A		
BW:	40	FACTOR= 1.603e-5	N/A		
LT:	70		N/A		

DERMAL:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
SA:	13700	CONVERSION	N/A	CONVERSION	
PC:	1e-3	FACTOR= 3.416e-5	N/A	FACTOR=	N/A
ET:	2.6		N/A		
EF:	14	TIME-WEIGHTED CONVERSION	N/A		
ED:	9	FACTOR= 4.392e-6	N/A		
BW:	40		N/A		
LT:	70		N/A		

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW17
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE HAZARD INDICES (ADULT):

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	REFERENCE DOSE-ING.	ADULT HAZARD INDEX-ING.	ADULT HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Acetone	0	0	0	1e-1	0	0	0
4-Methyl-2-pentanone	0	0	0	5e-2	0	0	0
Arsenic	0	0	0	3e-4	0	0	0
Barium	.547	6.819e-5	1.868e-5	7e-2	9.741e-4	2.669e-4	1.241e-3
Chromium (III)	0	0	0	1e0	0	0	0
Cobalt	0	0	0	8e-3	0	0	0
Copper	0	0	0	4e-2	0	0	0
Lead	.0026	3.241e-7	8.881e-8	1.4e-3	2.315e-4	6.343e-5	2.949e-4
Mercury	0	0	0	3e-4	0	0	0
Selenium	0	0	0	5e-3	0	0	0
Zinc	0	0	0	2e-1	0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL HAZARD INDEX					1.206e-3	3.303e-4	1.536e-3

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE FOUR)
TINKER AFB - CRUTCHO CREEK - SW17
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	CANCER SLOPE FACTOR-ING.	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK
Acetone	0	0	0		0	0	0
4-Methyl-2-pentanone	0	0	0		0	0	0
Arsenic	0	0	0		0	0	0
Barium	.547	8.767e-6	2.402e-6		0	0	0
Chromium (III)	0	0	0		0	0	0
Cobalt	0	0	0		0	0	0
Copper	0	0	0		0	0	0
Lead	.0026	4.167e-8	1.142e-8		0	0	0
Mercury	0	0	0		0	0	0
Selenium	0	0	0		0	0	0
Zinc	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW18
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE CONSIDERED: DERMAL CONTACT WITH WATER AND
ACCIDENTAL INGESTION OF WATER DURING SWIMMING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENT SWIMMERS

REFERENCE: EPA, DECEMBER 1989

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x LT x 365) * ED AND LT TERMS FOR CARCINOGENIC RISK ASSESSMENT ONLY.

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x LT x 1000 x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (SQ CM)
PC = DERMAL PERMEABILITY CONSTANT (CM/HR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

ENTER INPUT PARAMETERS:

INGESTION:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
CR:	.05	CONVERSION	N/A	CONVERSION	
ET:	2.6	FACTOR= 1.247e-4	N/A	FACTOR=	N/A
EF:	14		N/A		
ED:	9	TIME-WEIGHTED CONVERSION	N/A		
BW:	40	FACTOR= 1.603e-5	N/A		
LT:	70		N/A		

DERMAL:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
SA:	13700	CONVERSION	N/A	CONVERSION	
PC:	1e-3	FACTOR= 3.416e-5	N/A	FACTOR=	N/A
ET:	2.6		N/A		
EF:	14	TIME-WEIGHTED CONVERSION	N/A		
ED:	9	FACTOR= 4.392e-6	N/A		
BW:	40		N/A		
LT:	70		N/A		

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW18
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE HAZARD INDICES (ADULT):

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	REFERENCE DOSE-ING.	ADULT HAZARD INDEX-ING.	ADULT HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Acetone	0	0	0	1e-1	0	0	0
4-Methyl-2-pentanone	0	0	0	5e-2	0	0	0
Arsenic	0	0	0	3e-4	0	0	0
Barium	.394	4.912e-5	1.346e-5	7e-2	7.016e-4	1.923e-4	8.939e-4
Chromium (III)	0	0	0	1e0	0	0	0
Cobalt	0	0	0	8e-3	0	0	0
Copper	.0117	1.458e-6	3.996e-7	4e-2	3.646e-5	9.991e-6	4.645e-5
Lead	.0032	3.989e-7	1.093e-7	1.4e-3	2.849e-4	7.807e-5	3.630e-4
Mercury	0	0	0	3e-4	0	0	0
Selenium	0	0	0	5e-3	0	0	0
Zinc	.0265	3.303e-6	9.051e-7	2e-1	1.652e-5	4.526e-6	2.104e-5
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL HAZARD INDEX					1.040e-3	2.848e-4	1.324e-3

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE FOUR)
TINKER AFB - CRUTCHO CREEK - SW18
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	CANCER SLOPE FACTOR-ING.	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK
Acetone	0	0	0		0	0	0
4-Methyl-2-pentanone	0	0	0		0	0	0
Arsenic	0	0	0		0	0	0
Barium	.394	6.315e-6	1.730e-6		0	0	0
Chromium (III)	0	0	0		0	0	0
Cobalt	0	0	0		0	0	0
Copper	.0117	1.875e-7	5.138e-8		0	0	0
Lead	.0032	5.129e-8	1.405e-8		0	0	0
Mercury	0	0	0		0	0	0
Selenium	0	0	0		0	0	0
Zinc	.0265	4.247e-7	1.164e-7		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW19
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE CONSIDERED: DERMAL CONTACT WITH WATER AND
ACCIDENTAL INGESTION OF WATER DURING SWIMMING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENT SWIMMERS

REFERENCE: EPA, DECEMBER 1989

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x LT x 365) * ED AND LT TERMS FOR CARCINOGENIC RISK ASSESSMENT ONLY.

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x LT x 1000 x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (SQ CM)
PC = DERMAL PERMEABILITY CONSTANT (CM/HR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

ENTER INPUT PARAMETERS:

INGESTION:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
CR:	.05	CONVERSION	N/A	CONVERSION	
ET:	2.6	FACTOR= 1.247e-4	N/A	FACTOR=	N/A
EF:	14		N/A		
ED:	9	TIME-WEIGHTED CONVERSION	N/A		
BW:	40	FACTOR= 1.603e-5	N/A		
LT:	70		N/A		

DERMAL:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
SA:	13700	CONVERSION	N/A	CONVERSION	
PC:	1e-3	FACTOR= 3.416e-5	N/A	FACTOR=	N/A
ET:	2.6		N/A		
EF:	14	TIME-WEIGHTED CONVERSION	N/A		
ED:	9	FACTOR= 4.392e-6	N/A		
BW:	40		N/A		
LT:	70		N/A		

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW19
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE HAZARD INDICES (ADULT):

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	REFERENCE DOSE-ING.	ADULT HAZARD INDEX-ING.	ADULT HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Acetone	0	0	0	1e-1	0	0	0
4-Methyl-2-pentanone	0	0	0	5e-2	0	0	0
Arsenic	0	0	0	3e-4	0	0	0
Barium	.742	9.250e-5	2.534e-5	7e-2	1.321e-3	3.621e-4	1.683e-3
Chromium (III)	.0051	6.358e-7	1.742e-7	1e0	6.358e-7	1.742e-7	8.099e-7
Cobalt	0	0	0	8e-3	0	0	0
Copper	0	0	0	4e-2	0	0	0
Lead	.0014	1.745e-7	4.782e-8	1.4e-3	1.247e-4	3.416e-5	1.588e-4
Mercury	0	0	0	3e-4	0	0	0
Selenium	0	0	0	5e-3	0	0	0
Zinc	0	0	0	2e-1	0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL HAZARD INDEX					1.447e-3	3.964e-4	1.843e-3

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE FOUR)
TINKER AFB - CRUTCHO CREEK - SW19
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	CANCER SLOPE FACTOR-ING.	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK
Acetone	0	0	0		0	0	0
4-Methyl-2-pentanone	0	0	0		0	0	0
Arsenic	0	0	0		0	0	0
Barium	.742	1.189e-5	3.258e-6		0	0	0
Chromium (III)	.0051	8.174e-8	2.240e-8		0	0	0
Cobalt	0	0	0		0	0	0
Copper	0	0	0		0	0	0
Lead	.0014	2.244e-8	6.148e-9		0	0	0
Mercury	0	0	0		0	0	0
Selenium	0	0	0		0	0	0
Zinc	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW20
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE CONSIDERED: DERMAL CONTACT WITH WATER AND
ACCIDENTAL INGESTION OF WATER DURING SWIMMING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENT SWIMMERS

REFERENCE: EPA, DECEMBER 1989

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x LT x 365) * ED AND LT TERMS FOR CARCINOGENIC RISK ASSESSMENT ONLY.

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x LT x 1000 x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (SQ CM)
PC = DERMAL PERMEABILITY CONSTANT (CM/HR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

ENTER INPUT PARAMETERS:

INGESTION:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
CR:	.05	CONVERSION	N/A	CONVERSION	
ET:	2.6	FACTOR= 1.247e-4	N/A	FACTOR=	N/A
EF:	14		N/A		
ED:	9	TIME-WEIGHTED CONVERSION	N/A		
BW:	40	FACTOR= 1.603e-5	N/A		
LT:	70		N/A		

DERMAL:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
SA:	13700	CONVERSION	N/A	CONVERSION	
PC:	1e-3	FACTOR= 3.416e-5	N/A	FACTOR=	N/A
ET:	2.6		N/A		
EF:	14	TIME-WEIGHTED CONVERSION	N/A		
ED:	9	FACTOR= 4.392e-6	N/A		
BW:	40		N/A		
LT:	70		N/A		

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW20
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE HAZARD INDICES (ADULT):

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	REFERENCE DOSE-ING.	ADULT HAZARD INDEX-ING.	ADULT HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Acetone	0	0	0	1e-1	0	0	0
4-Methyl-2-pentanone	0	0	0	5e-2	0	0	0
Arsenic	0	0	0	3e-4	0	0	0
Barium	.425	5.298e-5	1.452e-5	7e-2	7.568e-4	2.074e-4	9.642e-4
Chromium (III)	0	0	0	1e0	0	0	0
Cobalt	0	0	0	8e-3	0	0	0
Copper	0	0	0	4e-2	0	0	0
Lead	0	0	0	1.4e-3	0	0	0
Mercury	0	0	0	3e-4	0	0	0
Selenium	0	0	0	5e-3	0	0	0
Zinc	.0354	4.413e-6	1.209e-6	2e-1	2.206e-5	6.046e-6	2.811e-5
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL HAZARD INDEX					7.789e-4	2.134e-4	9.923e-4

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE FOUR)
TINKER AFB - CRUTCHO CREEK - SW20
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	CANCER SLOPE FACTOR-ING.	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK
Acetone	0	0	0		0	0	0
4-Methyl-2-pentanone	0	0	0		0	0	0
Arsenic	0	0	0		0	0	0
Barium	.425	6.812e-6	1.866e-6		0	0	0
Chromium (III)	0	0	0		0	0	0
Cobalt	0	0	0		0	0	0
Copper	0	0	0		0	0	0
Lead	0	0	0		0	0	0
Mercury	0	0	0		0	0	0
Selenium	0	0	0		0	0	0
Zinc	.0354	5.674e-7	1.555e-7		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW21
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE CONSIDERED: DERMAL CONTACT WITH WATER AND
ACCIDENTAL INGESTION OF WATER DURING SWIMMING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENT SWIMMERS

REFERENCE: EPA, DECEMBER 1989

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x LT x 365) * ED AND LT TERMS FOR CARCINOGENIC RISK ASSESSMENT ONLY.

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x LT x 1000 x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (SQ CM)
PC = DERMAL PERMEABILITY CONSTANT (CM/HR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

ENTER INPUT PARAMETERS:

INGESTION:

	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
CR:	.05	CONVERSION	N/A	CONVERSION	
ET:	2.6	FACTOR= 1.247e-4	N/A	FACTOR=	N/A
EF:	14		N/A		
ED:	9	TIME-WEIGHTED CONVERSION	N/A		
BW:	40	FACTOR= 1.603e-5	N/A		
LT:	70		N/A		

DERMAL:

	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
SA:	13700	CONVERSION	N/A	CONVERSION	
PC:	1e-3	FACTOR= 3.416e-5	N/A	FACTOR=	N/A
ET:	2.6		N/A		
EF:	14	TIME-WEIGHTED CONVERSION	N/A		
ED:	9	FACTOR= 4.392e-6	N/A		
BW:	40		N/A		
LT:	70		N/A		

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW21
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE HAZARD INDICES (ADULT):

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	REFERENCE DOSE-ING.	ADULT HAZARD INDEX-ING.	ADULT HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Acetone	0	0	0	1e-1	0	0	0
4-Methyl-2-pentanone	0	0	0	5e-2	0	0	0
Arsenic	0	0	0	3e-4	0	0	0
Barium	.34	4.238e-5	1.161e-5	7e-2	6.055e-4	1.659e-4	7.714e-4
Chromium (III)	0	0	0	1e0	0	0	0
Cobalt	0	0	0	8e-3	0	0	0
Copper	.011	1.371e-6	3.757e-7	4e-2	3.428e-5	9.393e-6	4.367e-5
Lead	.0023	2.867e-7	7.856e-8	1.4e-3	2.048e-4	5.611e-5	2.609e-4
Mercury	0	0	0	3e-4	0	0	0
Selenium	0	0	0	5e-3	0	0	0
Zinc	0	0	0	2e-1	0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL HAZARD INDEX					8.446e-4	2.314e-4	1.076e-3

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE FOUR)
TINKER AFB - CRUTCHO CREEK - SW21
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	CANCER SLOPE FACTOR-ING.	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK
Acetone	0	0	0		0	0	0
4-Methyl-2-pentanone	0	0	0		0	0	0
Arsenic	0	0	0		0	0	0
Barium	.34	5.449e-6	1.493e-6		0	0	0
Chromium (III)	0	0	0		0	0	0
Cobalt	0	0	0		0	0	0
Copper	.011	1.763e-7	4.831e-8		0	0	0
Lead	.0023	3.686e-8	1.010e-8		0	0	0
Mercury	0	0	0		0	0	0
Selenium	0	0	0		0	0	0
Zinc	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW25
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE CONSIDERED: DERMAL CONTACT WITH WATER AND
ACCIDENTAL INGESTION OF WATER DURING SWIMMING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENT SWIMMERS

REFERENCE: EPA, DECEMBER 1989

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x LT x 365) * ED AND LT TERMS FOR CARCINOGENIC RISK ASSESSMENT ONLY.

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x LT x 1000 x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (SQ CM)
PC = DERMAL PERMEABILITY CONSTANT (CM/HR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

ENTER INPUT PARAMETERS:

INGESTION:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
CR:	.05	CONVERSION	N/A	CONVERSION	
ET:	2.6	FACTOR= 1.247e-4	N/A	FACTOR=	N/A
EF:	14		N/A		
ED:	9	TIME-WEIGHTED CONVERSION	N/A		
BW:	40	FACTOR= 1.603e-5	N/A		
LT:	70		N/A		

DERMAL:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
SA:	13700	CONVERSION	N/A	CONVERSION	
PC:	1e-3	FACTOR= 3.416e-5	N/A	FACTOR=	N/A
ET:	2.6		N/A		
EF:	14	TIME-WEIGHTED CONVERSION	N/A		
ED:	9	FACTOR= 4.392e-6	N/A		
BW:	40		N/A		
LT:	70		N/A		

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW25
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE HAZARD INDICES (ADULT):

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	REFERENCE DOSE-ING.	ADULT HAZARD INDEX-ING.	ADULT HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Acetone	0	0	0	1e-1	0	0	0
4-Methyl-2-pentanone	0	0	0	5e-2	0	0	0
Arsenic	.0014	1.745e-7	4.782e-8	3e-4	5.817e-4	1.594e-4	7.411e-4
Barium	.224	2.792e-5	7.651e-6	7e-2	3.989e-4	1.093e-4	5.082e-4
Chromium (III)	0	0	0	1e0	0	0	0
Cobalt	0	0	0	8e-3	0	0	0
Copper	0	0	0	4e-2	0	0	0
Lead	.0056	6.981e-7	1.913e-7	1.4e-3	4.986e-4	1.366e-4	6.353e-4
Mercury	0	0	0	3e-4	0	0	0
Selenium	0	0	0	5e-3	0	0	0
Zinc	.0124	1.546e-6	4.235e-7	2e-1	7.729e-6	2.118e-6	9.846e-6
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL HAZARD INDEX					1.487e-3	4.074e-4	1.894e-3

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE FOUR)
TINKER AFB - CRUTCHO CREEK - SW25
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	CANCER SLOPE FACTOR-ING.	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK
Acetone	0	0	0		0	0	0
4-Methyl-2-pentanone	0	0	0		0	0	0
Arsenic	.0014	2.244e-8	6.148e-9		0	0	0
Barium	.224	3.590e-6	9.837e-7		0	0	0
Chromium (III)	0	0	0		0	0	0
Cobalt	0	0	0		0	0	0
Copper	0	0	0		0	0	0
Lead	.0056	8.975e-8	2.459e-8		0	0	0
Mercury	0	0	0		0	0	0
Selenium	0	0	0		0	0	0
Zinc	.0124	1.987e-7	5.445e-8		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
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	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
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	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - SURFACE WATER EXPOSURES

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW26
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
TWO EXPOSURE SCENARIOS ARE CONSIDERED: DERMAL CONTACT WITH WATER AND
ACCIDENTAL INGESTION OF WATER DURING SWIMMING. ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENT SWIMMERS

REFERENCE: EPA, DECEMBER 1989

INGESTION: IEX = (C x CR x ET x EF x ED)/(BW x LT x 365) * ED AND LT TERMS FOR CARCINOGENIC RISK ASSESSMENT ONLY.

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
CR = CONTACT RATE (LITERS/HOUR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

DERMAL CONTACT: DEX = (C x SA x PC x ET x EF)/(BW x LT x 1000 x 365)

WHERE:
C = SURFACE WATER CONCENTRATION (MG/L)
SA = SURFACE AREA AVAILABLE FOR CONTACT (SQ CM)
PC = DERMAL PERMEABILITY CONSTANT (CM/HR)
ET = EXPOSURE TIME (HOURS/DAY)
EF = EXPOSURE FREQUENCY (DAYS/YEAR)
ED = EXPOSURE DURATION (YEARS)*
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)*

ENTER INPUT PARAMETERS:

INGESTION:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
CR:	.05	CONVERSION	N/A	CONVERSION	
ET:	2.6	FACTOR= 1.247e-4	N/A	FACTOR=	N/A
EF:	14		N/A		
ED:	9	TIME-WEIGHTED CONVERSION	N/A		
BW:	40	FACTOR= 1.603e-5	N/A		
LT:	70		N/A		

DERMAL:	ADOLESCENT EXPOSURE		YOUTH EXPOSURE		
SA:	13700	CONVERSION	N/A	CONVERSION	
PC:	1e-3	FACTOR= 3.416e-5	N/A	FACTOR=	N/A
ET:	2.6		N/A		
EF:	14	TIME-WEIGHTED CONVERSION	N/A		
ED:	9	FACTOR= 4.392e-6	N/A		
BW:	40		N/A		
LT:	70		N/A		

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW26
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE HAZARD INDICES (ADULT):

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	REFERENCE DOSE-ING.	ADULT HAZARD INDEX-ING.	ADULT HAZARD INDEX-DERMAL	TOTAL HAZARD INDEX
Acetone	0	0	0	1e-1	0	0	0
4-Methyl-2-pentanone	0	0	0	5e-2	0	0	0
Arsenic	0	0	0	3e-4	0	0	0
Barium	.297	3.702e-5	1.014e-5	7e-2	5.289e-4	1.449e-4	6.738e-4
Chromium (III)	0	0	0	1e0	0	0	0
Cobalt	0	0	0	8e-3	0	0	0
Copper	0	0	0	4e-2	0	0	0
Lead	0	0	0	1.4e-3	0	0	0
Mercury	0	0	0	3e-4	0	0	0
Selenium	0	0	0	5e-3	0	0	0
Zinc	.0173	2.157e-6	5.909e-7	2e-1	1.078e-5	2.955e-6	1.374e-5
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
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	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL HAZARD INDEX					5.397e-4	1.479e-4	6.876e-4

RISK ASSESSMENT SPREADSHEET - SWIMMING (PAGE FOUR)
TINKER AFB - CRUTCHO CREEK - SW26
EXPOSURE SCENARIO - ADOLESCENT SWIMMERS
CALCULATE INCREMENTAL CANCER RISK

CHEMICAL	CONCENTRATION (MG/L)	INGESTION DOSE-ADULT	DERMAL DOSE-ADULT	CANCER SLOPE FACTOR-ING.	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK
Acetone	0	0	0		0	0	0
4-Methyl-2-pentanone	0	0	0		0	0	0
Arsenic	0	0	0		0	0	0
Barium	.297	4.760e-6	1.304e-6		0	0	0
Chromium (III)	0	0	0		0	0	0
Cobalt	0	0	0		0	0	0
Copper	0	0	0		0	0	0
Lead	0	0	0		0	0	0
Mercury	0	0	0		0	0	0
Selenium	0	0	0		0	0	0
Zinc	.0173	2.773e-7	7.597e-8		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
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	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
TOTAL RISK					0	0	0

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW06
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INGESTION OF GAME FISH ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADULT FISHERMAN

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x BCF x IR x FI x EF x ED)/(BW x AT x LT)

ASSUMPTIONS:

C	= CONCENTRATION IN SURFACE WATER BODY (UG/L)	
BCF	= BIOCONCENTRATION FACTOR (UG/KG/UG/L)	
IR	= AVERAGE FISH INGESTION RATE (KG/MEAL):	.054
FI	= FRACTION INGESTED FROM CONTAMINATED SOURCE: (DIMENSIONLESS)	.5
EF	= EXPOSURE FREQUENCY (MEALS/YEAR):	365
ED	= EXPOSURE DURATION (YEARS)*:	30
BW	= RECEPTOR BODY WEIGHT (KG):	70
AT	= AVERAGING TIME (DAYS/YEAR):	365
LT	= LIFETIME (YEARS)*:	70

* ED AND LT USED FOR CARCINOGENIC RISK CHARACTERIZATION ONLY

DETERMINE CONVERSION FACTORS:

ANNUAL AVERAGE INTAKE: CF1 = 3.857e-7
LIFETIME AVERAGE INTAKE: CF2 = 1.653e-7

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SW06
EXPOSURE SCENARIO - ADULT FISHERMAN
CALCULATE DOSES:

CHEMICAL	C (UG/L)	BCF (UG/KG/UG/L)	ANNUAL AVERAGE DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Acetone	13	3e-1	1.504e-6	6.447e-7	1e-1	
4-Methyl-2-pentanone	5.5	5.2e0	1.103e-5	4.728e-6	5e-2	
Arsenic	2.4	4.4e1	4.073e-5	1.746e-5	3e-4	
Barium	599	1e0	2.310e-4	9.902e-5	7e-2	
Chromium (III)		1.6e1	0	0	1e0	
Cobalt	8.4	1e0	3.24e-6	1.389e-6	8e-3	
Copper		3.6e1	0	0	4e-2	
Lead	4	1e0	1.543e-6	6.612e-7	1.4e-3	
Mercury		1e0	0	0	3e-4	
Selenium		4.8e0	0	0	5e-3	
Zinc		4.7e1	0	0	2e-1	
			0	0		
			0	0		
			0	0		
			0	0		
			0	0		
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RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW06
EXPOSURE SCENARIO - ADULT FISHERMAN
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX	CANCER RISK LIFETIME
Acetone	1.504e-5	0
4-Methyl-2-pentanone	2.206e-4	0
Arsenic	1.358e-1	0
Barium	3.301e-3	0
Chromium (III)	0	0
Cobalt	4.05e-4	0
Copper	0	0
Lead	1.102e-3	0
Mercury	0	0
Selenium	0	0
Zinc	0	0
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	0	0
TOTAL	1.408e-1	0

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW07
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INGESTION OF GAME FISH ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADULT FISHERMAN

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x BCF x IR x FI x EF x ED)/(BW x AT x LT)

ASSUMPTIONS:

C	= CONCENTRATION IN SURFACE WATER BODY (UG/L)	
BCF	= BIOCONCENTRATION FACTOR (UG/KG/UG/L)	
IR	= AVERAGE FISH INGESTION RATE (KG/MEAL):	.054
FI	= FRACTION INGESTED FROM CONTAMINATED SOURCE: (DIMENSIONLESS)	.5
EF	= EXPOSURE FREQUENCY (MEALS/YEAR):	365
ED	= EXPOSURE DURATION (YEARS)*:	30
BW	= RECEPTOR BODY WEIGHT (KG):	70
AT	= AVERAGING TIME (DAYS/YEAR):	365
LT	= LIFETIME (YEARS)*:	70

* ED AND LT USED FOR CARCINOGENIC RISK CHARACTERIZATION ONLY

DETERMINE CONVERSION FACTORS:

ANNUAL AVERAGE INTAKE: CF1 = 3.857e-7
LIFETIME AVERAGE INTAKE: CF2 = 1.653e-7

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SW07
EXPOSURE SCENARIO - ADULT FISHERMAN
CALCULATE DOSES:

CHEMICAL	C (UG/L)	BCF (UG/KG/UG/L)	ANNUAL AVERAGE DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Acetone		3e-1	0	0	1e-1	
4-Methyl-2-pentanone		5.2e0	0	0	5e-2	
Arsenic	2.6	4.4e1	4.413e-5	1.891e-5	3e-4	
Barium	469	1e0	1.809e-4	7.753e-5	7e-2	
Chromium (III)		1.6e1	0	0	1e0	
Cobalt		1e0	0	0	8e-3	
Copper		3.6e1	0	0	4e-2	
Lead	3.1	1e0	1.196e-6	5.124e-7	1.4e-3	
Mercury		1e0	0	0	3e-4	
Selenium		4.8e0	0	0	5e-3	
Zinc		4.7e1	0	0	2e-1	
			0	0		
			0	0		
			0	0		
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RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW07
EXPOSURE SCENARIO - ADULT FISHERMAN
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX	CANCER RISK LIFETIME
Acetone	0	0
4-Methyl-2-pentanone	0	0
Arsenic	1.471e-1	0
Barium	2.584e-3	0
Chromium (III)	0	0
Cobalt	0	0
Copper	0	0
Lead	8.541e-4	0
Mercury	0	0
Selenium	0	0
Zinc	0	0
	0	0
	0	0
	0	0
	0	0
	0	0
	0	0
	0	0
	0	0
	0	0
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	0	0
	0	0
	0	0
	0	0
	0	0
	0	0
TOTAL	1.505e-1	0

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW08
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INGESTION OF GAME FISH ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADULT FISHERMAN

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x BCF x IR x FI x EF x ED)/(BW x AT x LT)

ASSUMPTIONS:

C	= CONCENTRATION IN SURFACE WATER BODY (UG/L)	
BCF	= BIOCONCENTRATION FACTOR (UG/KG/UG/L)	
IR	= AVERAGE FISH INGESTION RATE (KG/MEAL):	.054
FI	= FRACTION INGESTED FROM CONTAMINATED SOURCE: (DIMENSIONLESS)	.5
EF	= EXPOSURE FREQUENCY (MEALS/YEAR):	365
ED	= EXPOSURE DURATION (YEARS)*:	30
BW	= RECEPTOR BODY WEIGHT (KG):	70
AT	= AVERAGING TIME (DAYS/YEAR):	365
LT	= LIFETIME (YEARS)*:	70

* ED AND LT USED FOR CARCINOGENIC RISK CHARACTERIZATION ONLY

DETERMINE CONVERSION FACTORS:

ANNUAL AVERAGE INTAKE:	CF1 =	3.857e-7
LIFETIME AVERAGE INTAKE:	CF2 =	1.653e-7

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SW08
EXPOSURE SCENARIO - ADULT FISHERMAN
CALCULATE DOSES:

CHEMICAL	C (UG/L)	BCF (UG/KG/UG/L)	ANNUAL AVERAGE DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Acetone		3e-1	0	0	1e-1	
4-Methyl-2-pentanone		5.2e0	0	0	5e-2	
Arsenic	2.8	4.4e1	4.752e-5	2.037e-5	3e-4	
Barium	553	1e0	2.133e-4	9.141e-5	7e-2	
Chromium (III)		1.6e1	0	0	1e0	
Cobalt	9.3	1e0	3.587e-6	1.537e-6	8e-3	
Copper		3.6e1	0	0	4e-2	
Lead	2.6	1e0	1.003e-6	4.298e-7	1.4e-3	
Mercury		1e0	0	0	3e-4	
Selenium		4.8e0	0	0	5e-3	
Zinc		4.7e1	0	0	2e-1	
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RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW08
EXPOSURE SCENARIO - ADULT FISHERMAN
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX	CANCER RISK LIFETIME
Acetone	0	0
4-Methyl-2-pentanone	0	0
Arsenic	1.584e-1	0
Barium	3.047e-3	0
Chromium (III)	0	0
Cobalt	4.484e-4	0
Copper	0	0
Lead	7.163e-4	0
Mercury	0	0
Selenium	0	0
Zinc	0	0
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TOTAL	1.626e-1	0

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW09
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INGESTION OF GAME FISH ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADULT FISHERMAN

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x BCF x IR x FI x EF x ED)/(BW x AT x LT)

ASSUMPTIONS:

C	= CONCENTRATION IN SURFACE WATER BODY (UG/L)	
BCF	= BIOCONCENTRATION FACTOR (UG/KG/UG/L)	
IR	= AVERAGE FISH INGESTION RATE (KG/MEAL):	.054
FI	= FRACTION INGESTED FROM CONTAMINATED SOURCE: (DIMENSIONLESS)	.5
EF	= EXPOSURE FREQUENCY (MEALS/YEAR):	365
ED	= EXPOSURE DURATION (YEARS)*:	30
BW	= RECEPTOR BODY WEIGHT (KG):	70
AT	= AVERAGING TIME (DAYS/YEAR):	365
LT	= LIFETIME (YEARS)*:	70

* ED AND LT USED FOR CARCINOGENIC RISK CHARACTERIZATION ONLY

DETERMINE CONVERSION FACTORS:

ANNUAL AVERAGE INTAKE:	CF1 =	3.857e-7
LIFETIME AVERAGE INTAKE:	CF2 =	1.653e-7

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SW09
EXPOSURE SCENARIO - ADULT FISHERMAN
CALCULATE DOSES:

CHEMICAL	C (UG/L)	BCF (UG/KG/UG/L)	ANNUAL AVERAGE DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Acetone		3e-1	0	0	1e-1	
4-Methyl-2-pentanone		5.2e0	0	0	5e-2	
Arsenic	2.4	4.4e1	4.073e-5	1.746e-5	3e-4	
Barium	642	1e0	2.476e-4	1.061e-4	7e-2	
Chromium (III)		1.6e1	0	0	1e0	
Cobalt		1e0	0	0	8e-3	
Copper		3.6e1	0	0	4e-2	
Lead	1.2	1e0	4.629e-7	1.984e-7	1.4e-3	
Mercury		1e0	0	0	3e-4	
Selenium		4.8e0	0	0	5e-3	
Zinc		4.7e1	0	0	2e-1	
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RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW09
EXPOSURE SCENARIO - ADULT FISHERMAN
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX	CANCER RISK LIFETIME
Acetone	0	0
4-Methyl-2-pentanone	0	0
Arsenic	1.358e-1	0
Barium	3.538e-3	0
Chromium (III)	0	0
Cobalt	0	0
Copper	0	0
Lead	3.306e-4	0
Mercury	0	0
Selenium	0	0
Zinc	0	0
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TOTAL	1.396e-1	0

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW10
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INGESTION OF GAME FISH ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADULT FISHERMAN

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x BCF x IR x FI x EF x ED)/(BW x AT x LT)

ASSUMPTIONS:

C	= CONCENTRATION IN SURFACE WATER BODY (UG/L)	
BCF	= BIOCONCENTRATION FACTOR (UG/KG/UG/L)	
IR	= AVERAGE FISH INGESTION RATE (KG/MEAL):	.054
FI	= FRACTION INGESTED FROM CONTAMINATED SOURCE: (DIMENSIONLESS)	.5
EF	= EXPOSURE FREQUENCY (MEALS/YEAR):	365
ED	= EXPOSURE DURATION (YEARS)*:	30
BW	= RECEPTOR BODY WEIGHT (KG):	70
AT	= AVERAGING TIME (DAYS/YEAR):	365
LT	= LIFETIME (YEARS)*:	70

* ED AND LT USED FOR CARCINOGENIC RISK CHARACTERIZATION ONLY

DETERMINE CONVERSION FACTORS:

ANNUAL AVERAGE INTAKE:	CF1 =	3.857e-7
LIFETIME AVERAGE INTAKE:	CF2 =	1.653e-7

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SW10
EXPOSURE SCENARIO - ADULT FISHERMAN
CALCULATE DOSES:

CHEMICAL	C (UG/L)	BCF (UG/KG/UG/L)	ANNUAL AVERAGE DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Acetone		3e-1	0	0	1e-1	
4-Methyl-2-pentanone		5.2e0	0	0	5e-2	
Arsenic	2.3	4.4e1	3.903e-5	1.673e-5	3e-4	
Barium	508	1e0	1.959e-4	8.398e-5	7e-2	
Chromium (III)		1.6e1	0	0	1e0	
Cobalt	12.3	1e0	4.744e-6	2.033e-6	8e-3	
Copper		3.6e1	0	0	4e-2	
Lead	3.1	1e0	1.196e-6	5.124e-7	1.4e-3	
Mercury		1e0	0	0	3e-4	
Selenium		4.8e0	0	0	5e-3	
Zinc		4.7e1	0	0	2e-1	
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RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW10
EXPOSURE SCENARIO - ADULT FISHERMAN
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX	CANCER RISK LIFETIME
Acetone	0	0
4-Methyl-2-pentanone	0	0
Arsenic	1.301e-1	0
Barium	2.799e-3	0
Chromium (III)	0	0
Cobalt	5.930e-4	0
Copper	0	0
Lead	8.541e-4	0
Mercury	0	0
Selenium	0	0
Zinc	0	0
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TOTAL	1.344e-1	0

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW11
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INGESTION OF GAME FISH ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADULT FISHERMAN

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x BCF x IR x FI x EF x ED)/(BW x AT x LT)

ASSUMPTIONS:

C	= CONCENTRATION IN SURFACE WATER BODY (UG/L)	
BCF	= BIOCONCENTRATION FACTOR (UG/KG/UG/L)	
IR	= AVERAGE FISH INGESTION RATE (KG/MEAL):	.054
FI	= FRACTION INGESTED FROM CONTAMINATED SOURCE: (DIMENSIONLESS)	.5
EF	= EXPOSURE FREQUENCY (MEALS/YEAR):	365
ED	= EXPOSURE DURATION (YEARS)*:	30
BW	= RECEPTOR BODY WEIGHT (KG):	70
AT	= AVERAGING TIME (DAYS/YEAR):	365
LT	= LIFETIME (YEARS)*:	70

* ED AND LT USED FOR CARCINOGENIC RISK CHARACTERIZATION ONLY

DETERMINE CONVERSION FACTORS:

ANNUAL AVERAGE INTAKE: CF1 = 3.857e-7
LIFETIME AVERAGE INTAKE: CF2 = 1.653e-7

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SW11
EXPOSURE SCENARIO - ADULT FISHERMAN
CALCULATE DOSES:

CHEMICAL	C (UG/L)	BCF (UG/KG/UG/L)	ANNUAL AVERAGE DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Acetone		3e-1	0	0	1e-1	
4-Methyl-2-pentanone		5.2e0	0	0	5e-2	
Arsenic		4.4e1	0	0	3e-4	
Barium	469	1e0	1.809e-4	7.753e-5	7e-2	
Chromium (III)		1.6e1	0	0	1e0	
Cobalt		1e0	0	0	8e-3	
Copper		3.6e1	0	0	4e-2	
Lead	2.6	1e0	1.003e-6	4.298e-7	1.4e-3	
Mercury		1e0	0	0	3e-4	
Selenium		4.8e0	0	0	5e-3	
Zinc		4.7e1	0	0	2e-1	
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RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW11
EXPOSURE SCENARIO - ADULT FISHERMAN
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX	CANCER RISK LIFETIME
Acetone	0	0
4-Methyl-2-pentanone	0	0
Arsenic	0	0
Barium	2.584e-3	0
Chromium (III)	0	0
Cobalt	0	0
Copper	0	0
Lead	7.163e-4	0
Mercury	0	0
Selenium	0	0
Zinc	0	0
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TOTAL	3.301e-3	0

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW12
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INGESTION OF GAME FISH ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADULT FISHERMAN

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x BCF x IR x FI x EF x ED)/(BW x AT x LT)

ASSUMPTIONS:

C	= CONCENTRATION IN SURFACE WATER BODY (UG/L)	
BCF	= BIOCONCENTRATION FACTOR (UG/KG/UG/L)	
IR	= AVERAGE FISH INGESTION RATE (KG/MEAL):	.054
FI	= FRACTION INGESTED FROM CONTAMINATED SOURCE: (DIMENSIONLESS)	.5
EF	= EXPOSURE FREQUENCY (MEALS/YEAR):	365
ED	= EXPOSURE DURATION (YEARS)*:	30
BW	= RECEPTOR BODY WEIGHT (KG):	70
AT	= AVERAGING TIME (DAYS/YEAR):	365
LT	= LIFETIME (YEARS)*:	70

* ED AND LT USED FOR CARCINOGENIC RISK CHARACTERIZATION ONLY

DETERMINE CONVERSION FACTORS:

ANNUAL AVERAGE INTAKE:	CF1 =	3.857e-7
LIFETIME AVERAGE INTAKE:	CF2 =	1.653e-7

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SW12
EXPOSURE SCENARIO - ADULT FISHERMAN
CALCULATE DOSES:

CHEMICAL	C (UG/L)	BCF (UG/KG/UG/L)	ANNUAL AVERAGE DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Acetone		3e-1	0	0	1e-1	
4-Methyl-2-pentanone		5.2e0	0	0	5e-2	
Arsenic		4.4e1	0	0	3e-4	
Barium	533	1e0	2.056e-4	8.811e-5	7e-2	
Chromium (III)		1.6e1	0	0	1e0	
Cobalt		1e0	0	0	8e-3	
Copper		3.6e1	0	0	4e-2	
Lead	2.6	1e0	1.003e-6	4.298e-7	1.4e-3	
Mercury		1e0	0	0	3e-4	
Selenium		4.8e0	0	0	5e-3	
Zinc		4.7e1	0	0	2e-1	
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RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW12
EXPOSURE SCENARIO - ADULT FISHERMAN
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX	CANCER RISK LIFETIME
Acetone	0	0
4-Methyl-2-pentanone	0	0
Arsenic	0	0
Barium	2.937e-3	0
Chromium (III)	0	0
Cobalt	0	0
Copper	0	0
Lead	7.163e-4	0
Mercury	0	0
Selenium	0	0
Zinc	0	0
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TOTAL	3.653e-3	0

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW13
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INGESTION OF GAME FISH ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADULT FISHERMAN

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x BCF x IR x FI x EF x ED)/(BW x AT x LT)

ASSUMPTIONS:

C	= CONCENTRATION IN SURFACE WATER BODY (UG/L)	
BCF	= BIOCONCENTRATION FACTOR (UG/KG/UG/L)	
IR	= AVERAGE FISH INGESTION RATE (KG/MEAL):	.054
FI	= FRACTION INGESTED FROM CONTAMINATED SOURCE: (DIMENSIONLESS)	.5
EF	= EXPOSURE FREQUENCY (MEALS/YEAR):	365
ED	= EXPOSURE DURATION (YEARS)*:	30
BW	= RECEPTOR BODY WEIGHT (KG):	70
AT	= AVERAGING TIME (DAYS/YEAR):	365
LT	= LIFETIME (YEARS)*:	70

* ED AND LT USED FOR CARCINOGENIC RISK CHARACTERIZATION ONLY

DETERMINE CONVERSION FACTORS:

ANNUAL AVERAGE INTAKE: CF1 = 3.857e-7
LIFETIME AVERAGE INTAKE: CF2 = 1.653e-7

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SW13
EXPOSURE SCENARIO - ADULT FISHERMAN
CALCULATE DOSES:

CHEMICAL	C (UG/L)	BCF (UG/KG/UG/L)	ANNUAL AVERAGE DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Acetone		3e-1	0	0	1e-1	
4-Methyl-2-pentanone		5.2e0	0	0	5e-2	
Arsenic	2	4.4e1	3.394e-5	1.455e-5	3e-4	
Barium	666	1e0	2.569e-4	1.101e-4	7e-2	
Chromium (III)		1.6e1	0	0	1e0	
Cobalt		1e0	0	0	8e-3	
Copper		3.6e1	0	0	4e-2	
Lead	4.4	1e0	1.697e-6	7.273e-7	1.4e-3	
Mercury	.08	1e0	3.086e-8	1.322e-8	3e-4	
Selenium		4.8e0	0	0	5e-3	
Zinc		4.7e1	0	0	2e-1	
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RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW13
EXPOSURE SCENARIO - ADULT FISHERMAN
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX	CANCER RISK LIFETIME
Acetone	0	0
4-Methyl-2-pentanone	0	0
Arsenic	1.131e-1	0
Barium	3.670e-3	0
Chromium (III)	0	0
Cobalt	0	0
Copper	0	0
Lead	1.212e-3	0
Mercury	1.029e-4	0
Selenium	0	0
Zinc	0	0
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TOTAL	1.181e-1	0

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW14
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INGESTION OF GAME FISH ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADULT FISHERMAN

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x BCF x IR x FI x EF x ED)/(BW x AT x LT)

ASSUMPTIONS:

C	= CONCENTRATION IN SURFACE WATER BODY (UG/L)	
BCF	= BIOCONCENTRATION FACTOR (UG/KG/UG/L)	
IR	= AVERAGE FISH INGESTION RATE (KG/MEAL):	.054
FI	= FRACTION INGESTED FROM CONTAMINATED SOURCE: (DIMENSIONLESS)	.5
EF	= EXPOSURE FREQUENCY (MEALS/YEAR):	365
ED	= EXPOSURE DURATION (YEARS)*:	30
BW	= RECEPTOR BODY WEIGHT (KG):	70
AT	= AVERAGING TIME (DAYS/YEAR):	365
LT	= LIFETIME (YEARS)*:	70

* ED AND LT USED FOR CARCINOGENIC RISK CHARACTERIZATION ONLY

DETERMINE CONVERSION FACTORS:

ANNUAL AVERAGE INTAKE:	CF1 =	3.857e-7
LIFETIME AVERAGE INTAKE:	CF2 =	1.653e-7

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SW14
EXPOSURE SCENARIO - ADULT FISHERMAN
CALCULATE DOSES:

CHEMICAL	C (UG/L)	BCF (UG/KG/UG/L)	ANNUAL AVERAGE DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Acetone		3e-1	0	0	1e-1	
4-Methyl-2-pentanone		5.2e0	0	0	5e-2	
Arsenic		4.4e1	0	0	3e-4	
Barium	539	1e0	2.079e-4	8.91e-5	7e-2	
Chromium (III)		1.6e1	0	0	1e0	
Cobalt	12.1	1e0	4.667e-6	2.000e-6	8e-3	
Copper		3.6e1	0	0	4e-2	
Lead	3.7	1e0	1.427e-6	6.116e-7	1.4e-3	
Mercury		1e0	0	0	3e-4	
Selenium	1.4	4.8e0	2.592e-6	1.111e-6	5e-3	
Zinc		4.7e1	0	0	2e-1	
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RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW14
EXPOSURE SCENARIO - ADULT FISHERMAN
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX	CANCER RISK LIFETIME
Acetone	0	0
4-Methyl-2-pentanone	0	0
Arsenic	0	0
Barium	2.97e-3	0
Chromium (III)	0	0
Cobalt	5.834e-4	0
Copper	0	0
Lead	1.019e-3	0
Mercury	0	0
Selenium	5.184e-4	0
Zinc	0	0
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TOTAL	5.091e-3	0

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW15
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INGESTION OF GAME FISH ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADULT FISHERMAN

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x BCF x IR x FI x EF x ED)/(BW x AT x LT)

ASSUMPTIONS:

C	= CONCENTRATION IN SURFACE WATER BODY (UG/L)	
BCF	= BIOCONCENTRATION FACTOR (UG/KG/UG/L)	
IR	= AVERAGE FISH INGESTION RATE (KG/MEAL):	.054
FI	= FRACTION INGESTED FROM CONTAMINATED SOURCE: (DIMENSIONLESS)	.5
EF	= EXPOSURE FREQUENCY (MEALS/YEAR):	365
ED	= EXPOSURE DURATION (YEARS)*:	30
BW	= RECEPTOR BODY WEIGHT (KG):	70
AT	= AVERAGING TIME (DAYS/YEAR):	365
LT	= LIFETIME (YEARS)*:	70

* ED AND LT USED FOR CARCINOGENIC RISK CHARACTERIZATION ONLY

DETERMINE CONVERSION FACTORS:

ANNUAL AVERAGE INTAKE: CF1 = 3.857e-7
LIFETIME AVERAGE INTAKE: CF2 = 1.653e-7

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SW15
EXPOSURE SCENARIO - ADULT FISHERMAN
CALCULATE DOSES:

CHEMICAL	C (UG/L)	BCF (UG/KG/UG/L)	ANNUAL AVERAGE DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Acetone	10.3	3e-1	1.192e-6	5.108e-7	1e-1	
4-Methyl-2-pentanone	5.7	5.2e0	1.143e-5	4.900e-6	5e-2	
Arsenic	1.5	4.4e1	2.546e-5	1.091e-5	3e-4	
Barium	785	1e0	3.028e-4	1.298e-4	7e-2	
Chromium (III)		1.6e1	0	0	1e0	
Cobalt		1e0	0	0	8e-3	
Copper		3.6e1	0	0	4e-2	
Lead	1.7	1e0	6.557e-7	2.810e-7	1.4e-3	
Mercury		1e0	0	0	3e-4	
Selenium		4.8e0	0	0	5e-3	
Zinc	8.5	4.7e1	1.541e-4	6.604e-5	2e-1	
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RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW15
EXPOSURE SCENARIO - ADULT FISHERMAN
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX	CANCER RISK LIFETIME
Acetone	1.192e-5	0
4-Methyl-2-pentanone	2.287e-4	0
Arsenic	8.486e-2	0
Barium	4.326e-3	0
Chromium (III)	0	0
Cobalt	0	0
Copper	0	0
Lead	4.684e-4	0
Mercury	0	0
Selenium	0	0
Zinc	7.705e-4	0
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TOTAL	9.066e-2	0

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW16
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INGESTION OF GAME FISH ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADULT FISHERMAN

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x BCF x IR x FI x EF x ED)/(BW x AT x LT)

ASSUMPTIONS:

C	= CONCENTRATION IN SURFACE WATER BODY (UG/L)	
BCF	= BIOCONCENTRATION FACTOR (UG/KG/UG/L)	
IR	= AVERAGE FISH INGESTION RATE (KG/MEAL):	.054
FI	= FRACTION INGESTED FROM CONTAMINATED SOURCE: (DIMENSIONLESS)	.5
EF	= EXPOSURE FREQUENCY (MEALS/YEAR):	365
ED	= EXPOSURE DURATION (YEARS)*:	30
BW	= RECEPTOR BODY WEIGHT (KG):	70
AT	= AVERAGING TIME (DAYS/YEAR):	365
LT	= LIFETIME (YEARS)*:	70

* ED AND LT USED FOR CARCINOGENIC RISK CHARACTERIZATION ONLY

DETERMINE CONVERSION FACTORS:

ANNUAL AVERAGE INTAKE:	CF1 =	3.857e-7
LIFETIME AVERAGE INTAKE:	CF2 =	1.653e-7

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SW16
EXPOSURE SCENARIO - ADULT FISHERMAN
CALCULATE DOSES:

CHEMICAL	C (UG/L)	BCF (UG/KG/UG/L)	ANNUAL AVERAGE DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Acetone		3e-1	0	0	1e-1	
4-Methyl-2-pentanone		5.2e0	0	0	5e-2	
Arsenic		4.4e1	0	0	3e-4	
Barium	833	1e0	3.213e-4	1.377e-4	7e-2	
Chromium (III)		1.6e1	0	0	1e0	
Cobalt		1e0	0	0	8e-3	
Copper		3.6e1	0	0	4e-2	
Lead	2.6	1e0	1.003e-6	4.298e-7	1.4e-3	
Mercury		1e0	0	0	3e-4	
Selenium		4.8e0	0	0	5e-3	
Zinc		4.7e1	0	0	2e-1	
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RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW16
EXPOSURE SCENARIO - ADULT FISHERMAN
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX	CANCER RISK LIFETIME
Acetone	0	0
4-Methyl-2-pentanone	0	0
Arsenic	0	0
Barium	4.59e-3	0
Chromium (III)	0	0
Cobalt	0	0
Copper	0	0
Lead	7.163e-4	0
Mercury	0	0
Selenium	0	0
Zinc	0	0
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TOTAL	5.306e-3	0

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW17
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INGESTION OF GAME FISH ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADULT FISHERMAN

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x BCF x IR x FI x EF x ED)/(BW x AT x LT)

ASSUMPTIONS:

C	= CONCENTRATION IN SURFACE WATER BODY (UG/L)	
BCF	= BIOCONCENTRATION FACTOR (UG/KG/UG/L)	
IR	= AVERAGE FISH INGESTION RATE (KG/MEAL):	.054
FI	= FRACTION INGESTED FROM CONTAMINATED SOURCE: (DIMENSIONLESS)	.5
EF	= EXPOSURE FREQUENCY (MEALS/YEAR):	365
ED	= EXPOSURE DURATION (YEARS)*:	30
BW	= RECEPTOR BODY WEIGHT (KG):	70
AT	= AVERAGING TIME (DAYS/YEAR):	365
LT	= LIFETIME (YEARS)*:	70

* ED AND LT USED FOR CARCINOGENIC RISK CHARACTERIZATION ONLY

DETERMINE CONVERSION FACTORS:

ANNUAL AVERAGE INTAKE: CF1 = 3.857e-7
LIFETIME AVERAGE INTAKE: CF2 = 1.653e-7

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SW17
EXPOSURE SCENARIO - ADULT FISHERMAN
CALCULATE DOSES:

CHEMICAL	C (UG/L)	BCF (UG/KG/UG/L)	ANNUAL AVERAGE DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Acetone		3e-1	0	0	1e-1	
4-Methyl-2-pentanone		5.2e0	0	0	5e-2	
Arsenic		4.4e1	0	0	3e-4	
Barium	547	1e0	2.110e-4	9.042e-5	7e-2	
Chromium (III)		1.6e1	0	0	1e0	
Cobalt		1e0	0	0	8e-3	
Copper		3.6e1	0	0	4e-2	
Lead	2.6	1e0	1.003e-6	4.298e-7	1.4e-3	
Mercury		1e0	0	0	3e-4	
Selenium		4.8e0	0	0	5e-3	
Zinc		4.7e1	0	0	2e-1	
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RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW17
EXPOSURE SCENARIO - ADULT FISHERMAN
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX	CANCER RISK LIFETIME
Acetone	0	0
4-Methyl-2-pentanone	0	0
Arsenic	0	0
Barium	3.014e-3	0
Chromium (III)	0	0
Cobalt	0	0
Copper	0	0
Lead	7.163e-4	0
Mercury	0	0
Selenium	0	0
Zinc	0	0
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TOTAL	3.730e-3	0

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW18
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INGESTION OF GAME FISH ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADULT FISHERMAN

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x BCF x IR x FI x EF x ED)/(BW x AT x LT)

ASSUMPTIONS:

C	= CONCENTRATION IN SURFACE WATER BODY (UG/L)	
BCF	= BIOCONCENTRATION FACTOR (UG/KG/UG/L)	
IR	= AVERAGE FISH INGESTION RATE (KG/MEAL):	.054
FI	= FRACTION INGESTED FROM CONTAMINATED SOURCE: (DIMENSIONLESS)	.5
EF	= EXPOSURE FREQUENCY (MEALS/YEAR):	365
ED	= EXPOSURE DURATION (YEARS)*:	30
BW	= RECEPTOR BODY WEIGHT (KG):	70
AT	= AVERAGING TIME (DAYS/YEAR):	365
LT	= LIFETIME (YEARS)*:	70

* ED AND LT USED FOR CARCINOGENIC RISK CHARACTERIZATION ONLY

DETERMINE CONVERSION FACTORS:

ANNUAL AVERAGE INTAKE:	CF1 =	3.857e-7
LIFETIME AVERAGE INTAKE:	CF2 =	1.653e-7

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SW18
EXPOSURE SCENARIO - ADULT FISHERMAN
CALCULATE DOSES:

CHEMICAL	C (UG/L)	BCF (UG/KG/UG/L)	ANNUAL AVERAGE DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Acetone		3e-1	0	0	1e-1	
4-Methyl-2-pentanone		5.2e0	0	0	5e-2	
Arsenic		4.4e1	0	0	3e-4	
Barium	394	1e0	1.520e-4	6.513e-5	7e-2	
Chromium (III)		1.6e1	0	0	1e0	
Cobalt		1e0	0	0	8e-3	
Copper	11.7	3.6e1	1.625e-4	6.963e-5	4e-2	
Lead	3.2	1e0	1.234e-6	5.290e-7	1.4e-3	
Mercury		1e0	0	0	3e-4	
Selenium		4.8e0	0	0	5e-3	
Zinc	26.5	4.7e1	4.804e-4	2.059e-4	2e-1	
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RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW18
EXPOSURE SCENARIO - ADULT FISHERMAN
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX	CANCER RISK LIFETIME
Acetone	0	0
4-Methyl-2-pentanone	0	0
Arsenic	0	0
Barium	2.171e-3	0
Chromium (III)	0	0
Cobalt	0	0
Copper	4.062e-3	0
Lead	8.816e-4	0
Mercury	0	0
Selenium	0	0
Zinc	2.402e-3	0
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TOTAL	9.516e-3	0

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW19
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INGESTION OF GAME FISH ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADULT FISHERMAN

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x BCF x IR x FI x EF x ED)/(BW x AT x LT)

ASSUMPTIONS:

C	= CONCENTRATION IN SURFACE WATER BODY (UG/L)	
BCF	= BIOCONCENTRATION FACTOR (UG/KG/UG/L)	
IR	= AVERAGE FISH INGESTION RATE (KG/MEAL):	.054
FI	= FRACTION INGESTED FROM CONTAMINATED SOURCE: (DIMENSIONLESS)	.5
EF	= EXPOSURE FREQUENCY (MEALS/YEAR):	365
ED	= EXPOSURE DURATION (YEARS)*:	30
BW	= RECEPTOR BODY WEIGHT (KG):	70
AT	= AVERAGING TIME (DAYS/YEAR):	365
LT	= LIFETIME (YEARS)*:	70

* ED AND LT USED FOR CARCINOGENIC RISK CHARACTERIZATION ONLY

DETERMINE CONVERSION FACTORS:

ANNUAL AVERAGE INTAKE:	CF1 =	3.857e-7
LIFETIME AVERAGE INTAKE:	CF2 =	1.653e-7

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SW19
EXPOSURE SCENARIO - ADULT FISHERMAN
CALCULATE DOSES:

CHEMICAL	C (UG/L)	BCF (UG/KG/UG/L)	ANNUAL AVERAGE DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Acetone		3e-1	0	0	1e-1	
4-Methyl-2-pentanone		5.2e0	0	0	5e-2	
Arsenic		4.4e1	0	0	3e-4	
Barium	742	1e0	2.862e-4	1.227e-4	7e-2	
Chromium (III)	5.1	1.6e1	3.147e-5	1.349e-5	1e0	
Cobalt		1e0	0	0	8e-3	
Copper		3.6e1	0	0	4e-2	
Lead	1.4	1e0	5.4e-7	2.314e-7	1.4e-3	
Mercury		1e0	0	0	3e-4	
Selenium		4.8e0	0	0	5e-3	
Zinc		4.7e1	0	0	2e-1	
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RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW19
EXPOSURE SCENARIO - ADULT FISHERMAN
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX	CANCER RISK LIFETIME
Acetone	0	0
4-Methyl-2-pentanone	0	0
Arsenic	0	0
Barium	4.089e-3	0
Chromium (III)	3.147e-5	0
Cobalt	0	0
Copper	0	0
Lead	3.857e-4	0
Mercury	0	0
Selenium	0	0
Zinc	0	0
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TOTAL	4.506e-3	0

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW20
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INGESTION OF GAME FISH ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADULT FISHERMAN

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x BCF x IR x FI x EF x ED)/(BW x AT x LT)

ASSUMPTIONS:

C	= CONCENTRATION IN SURFACE WATER BODY (UG/L)	
BCF	= BIOCONCENTRATION FACTOR (UG/KG/UG/L)	
IR	= AVERAGE FISH INGESTION RATE (KG/MEAL):	.054
FI	= FRACTION INGESTED FROM CONTAMINATED SOURCE: (DIMENSIONLESS)	.5
EF	= EXPOSURE FREQUENCY (MEALS/YEAR):	365
ED	= EXPOSURE DURATION (YEARS)*:	30
BW	= RECEPTOR BODY WEIGHT (KG):	70
AT	= AVERAGING TIME (DAYS/YEAR):	365
LT	= LIFETIME (YEARS)*:	70

* ED AND LT USED FOR CARCINOGENIC RISK CHARACTERIZATION ONLY

DETERMINE CONVERSION FACTORS:

ANNUAL AVERAGE INTAKE:	CF1 =	3.857e-7
LIFETIME AVERAGE INTAKE:	CF2 =	1.653e-7

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SW20
EXPOSURE SCENARIO - ADULT FISHERMAN
CALCULATE DOSES:

CHEMICAL	C (UG/L)	BCF (UG/KG/UG/L)	ANNUAL AVERAGE DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Acetone		3e-1	0	0	1e-1	
4-Methyl-2-pentanone		5.2e0	0	0	5e-2	
Arsenic		4.4e1	0	0	3e-4	
Barium	425	1e0	1.639e-4	7.026e-5	7e-2	
Chromium (III)		1.6e1	0	0	1e0	
Cobalt		1e0	0	0	8e-3	
Copper		3.6e1	0	0	4e-2	
Lead		1e0	0	0	1.4e-3	
Mercury		1e0	0	0	3e-4	
Selenium		4.8e0	0	0	5e-3	
Zinc	35.4	4.7e1	6.418e-4	2.750e-4	2e-1	
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RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW20
EXPOSURE SCENARIO - ADULT FISHERMAN
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX	CANCER RISK LIFETIME
Acetone	0	0
4-Methyl-2-pentanone	0	0
Arsenic	0	0
Barium	2.342e-3	0
Chromium (III)	0	0
Cobalt	0	0
Copper	0	0
Lead	0	0
Mercury	0	0
Selenium	0	0
Zinc	3.209e-3	0
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TOTAL	5.551e-3	0

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW21
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INGESTION OF GAME FISH ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADULT FISHERMAN

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x BCF x IR x FI x EF x ED)/(BW x AT x LT)

ASSUMPTIONS:

C	= CONCENTRATION IN SURFACE WATER BODY (UG/L)	
BCF	= BIOCONCENTRATION FACTOR (UG/KG/UG/L)	
IR	= AVERAGE FISH INGESTION RATE (KG/MEAL):	.054
FI	= FRACTION INGESTED FROM CONTAMINATED SOURCE: (DIMENSIONLESS)	.5
EF	= EXPOSURE FREQUENCY (MEALS/YEAR):	365
ED	= EXPOSURE DURATION (YEARS)*:	30
BW	= RECEPTOR BODY WEIGHT (KG):	70
AT	= AVERAGING TIME (DAYS/YEAR):	365
LT	= LIFETIME (YEARS)*:	70

* ED AND LT USED FOR CARCINOGENIC RISK CHARACTERIZATION ONLY

DETERMINE CONVERSION FACTORS:

ANNUAL AVERAGE INTAKE: CF1 = 3.857e-7
LIFETIME AVERAGE INTAKE: CF2 = 1.653e-7

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SW21
EXPOSURE SCENARIO - ADULT FISHERMAN
CALCULATE DOSES:

CHEMICAL	C (UG/L)	BCF (UG/KG/UG/L)	ANNUAL AVERAGE DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Acetone		3e-1	0	0	1e-1	
4-Methyl-2-pentanone		5.2e0	0	0	5e-2	
Arsenic		4.4e1	0	0	3e-4	
Barium	340	1e0	1.311e-4	5.620e-5	7e-2	
Chromium (III)		1.6e1	0	0	1e0	
Cobalt		1e0	0	0	8e-3	
Copper	11	3.6e1	1.527e-4	6.546e-5	4e-2	
Lead	2.3	1e0	8.871e-7	3.802e-7	1.4e-3	
Mercury		1e0	0	0	3e-4	
Selenium		4.8e0	0	0	5e-3	
Zinc		4.7e1	0	0	2e-1	
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RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW21
EXPOSURE SCENARIO - ADULT FISHERMAN
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX	CANCER RISK LIFETIME
Acetone	0	0
4-Methyl-2-pentanone	0	0
Arsenic	0	0
Barium	1.873e-3	0
Chromium (III)	0	0
Cobalt	0	0
Copper	3.819e-3	0
Lead	6.337e-4	0
Mercury	0	0
Selenium	0	0
Zinc	0	0
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TOTAL	6.326e-3	0

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW25
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INGESTION OF GAME FISH ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADULT FISHERMAN

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x BCF x IR x FI x EF x ED)/(BW x AT x LT)

ASSUMPTIONS:

C	= CONCENTRATION IN SURFACE WATER BODY (UG/L)	
BCF	= BIOCONCENTRATION FACTOR (UG/KG/UG/L)	
IR	= AVERAGE FISH INGESTION RATE (KG/MEAL):	.054
FI	= FRACTION INGESTED FROM CONTAMINATED SOURCE: (DIMENSIONLESS)	.5
EF	= EXPOSURE FREQUENCY (MEALS/YEAR):	365
ED	= EXPOSURE DURATION (YEARS)*:	30
BW	= RECEPTOR BODY WEIGHT (KG):	70
AT	= AVERAGING TIME (DAYS/YEAR):	365
LT	= LIFETIME (YEARS)*:	70

* ED AND LT USED FOR CARCINOGENIC RISK CHARACTERIZATION ONLY

DETERMINE CONVERSION FACTORS:

ANNUAL AVERAGE INTAKE: CF1 = 3.857e-7
LIFETIME AVERAGE INTAKE: CF2 = 1.653e-7

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SW25
EXPOSURE SCENARIO - ADULT FISHERMAN
CALCULATE DOSES:

CHEMICAL	C (UG/L)	BCF (UG/KG/UG/L)	ANNUAL AVERAGE DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Acetone		3e-1	0	0	1e-1	
4-Methyl-2-pentanone		5.2e0	0	0	5e-2	
Arsenic	1.4	4.4e1	2.376e-5	1.018e-5	3e-4	
Barium	224	1e0	8.64e-5	3.703e-5	7e-2	
Chromium (III)		1.6e1	0	0	1e0	
Cobalt		1e0	0	0	8e-3	
Copper		3.6e1	0	0	4e-2	
Lead	5.6	1e0	2.16e-6	9.257e-7	1.4e-3	
Mercury		1e0	0	0	3e-4	
Selenium		4.8e0	0	0	5e-3	
Zinc	12.4	4.7e1	2.248e-4	9.634e-5	2e-1	
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RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW25
EXPOSURE SCENARIO - ADULT FISHERMAN
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX	CANCER RISK LIFETIME
Acetone	0	0
4-Methyl-2-pentanone	0	0
Arsenic	7.92e-2	0
Barium	1.234e-3	0
Chromium (III)	0	0
Cobalt	0	0
Copper	0	0
Lead	1.543e-3	0
Mercury	0	0
Selenium	0	0
Zinc	1.124e-3	0
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TOTAL	8.310e-2	0

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH

SITE NAME: TINKER AFB - CRUTCHO CREEK - SW26
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INGESTION OF GAME FISH ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADULT FISHERMAN

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x BCF x IR x FI x EF x ED)/(BW x AT x LT)

ASSUMPTIONS:

C	= CONCENTRATION IN SURFACE WATER BODY (UG/L)	
BCF	= BIOCONCENTRATION FACTOR (UG/KG/UG/L)	
IR	= AVERAGE FISH INGESTION RATE (KG/MEAL):	.054
FI	= FRACTION INGESTED FROM CONTAMINATED SOURCE: (DIMENSIONLESS)	.5
EF	= EXPOSURE FREQUENCY (MEALS/YEAR):	365
ED	= EXPOSURE DURATION (YEARS)*:	30
BW	= RECEPTOR BODY WEIGHT (KG):	70
AT	= AVERAGING TIME (DAYS/YEAR):	365
LT	= LIFETIME (YEARS)*:	70

* ED AND LT USED FOR CARCINOGENIC RISK CHARACTERIZATION ONLY

DETERMINE CONVERSION FACTORS:

ANNUAL AVERAGE INTAKE:	CF1 =	3.857e-7
LIFETIME AVERAGE INTAKE:	CF2 =	1.653e-7

RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SW26
EXPOSURE SCENARIO - ADULT FISHERMAN
CALCULATE DOSES:

CHEMICAL	C (UG/L)	BCF (UG/KG/UG/L)	ANNUAL AVERAGE DOSE (MG/KG/DAY)	LIFETIME AVERAGE DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Acetone		3e-1	0	0	1e-1	
4-Methyl-2-pentanone		5.2e0	0	0	5e-2	
Arsenic		4.4e1	0	0	3e-4	
Barium	297	1e0	1.146e-4	4.910e-5	7e-2	
Chromium (III)		1.6e1	0	0	1e0	
Cobalt		1e0	0	0	8e-3	
Copper		3.6e1	0	0	4e-2	
Lead		1e0	0	0	1.4e-3	
Mercury		1e0	0	0	3e-4	
Selenium		4.8e0	0	0	5e-3	
Zinc	17.3	4.7e1	3.136e-4	1.344e-4	2e-1	
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RISK ASSESSMENT SPREADSHEET - INGESTION OF GAME FISH (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SW26
EXPOSURE SCENARIO - ADULT FISHERMAN
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX	CANCER RISK LIFETIME
Acetone	0	0
4-Methyl-2-pentanone	0	0
Arsenic	0	0
Barium	1.637e-3	0
Chromium (III)	0	0
Cobalt	0	0
Copper	0	0
Lead	0	0
Mercury	0	0
Selenium	0	0
Zinc	1.568e-3	0
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TOTAL	3.205e-3	0

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: TINKER AFB - CRUTCHO CREEK - SD06
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENTS

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x LT x 365 x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

ADOLESCENT:		CHILD:	
IR:	100	IR:	0
EF:	14	EF:	14
Fi:	.5	Fi:	.5
ED:	9	ED:	9
BW:	40	BW:	40
LT:	70	LT:	70

DETERMINE CONVERSION FACTORS:

ADOLESCENT:
CF: 4.795e-8 (AVG ANNUAL DOSE)

ADOLESCENT:
CF: 0 (AVG ANNUAL DOSE)

ADULT/ADOLESCENT (CANCER RISK):
CF: 6.164e-9

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SD06
EXPOSURE SCENARIO - ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (MG/KG)	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate		0	0	0	2e-2	1.4e-2
Di-n-butylphthalate	.275	0	1.318e-8	1.695e-9	1e-1	
4,4'-DDD		0	0	0		2.4e-1
Arsenic	3.9	0	1.870e-7	2.404e-8	3e-4	
Antimony		0	0	0	4e-4	
Barium	4273	0	2.049e-4	2.634e-5	7e-2	
Beryllium		0	0	0	5e-3	4.3e0
Cadmium	7.7	0	3.692e-7	4.747e-8	5e-4	
Chromium (III)	27.6	0	1.323e-6	1.701e-7	1e0	
Copper	8.3	0	3.979e-7	5.116e-8	4e-2	
Lead	12.5	0	5.993e-7	7.705e-8	1.4e-3	
Manganese	281	0	1.347e-5	1.732e-6	1e-1	
Mercury		0	0	0	3e-4	
Selenium		0	0	0	5e-3	
Vanadium	29.3	0	1.405e-6	1.806e-7	7e-3	
Zinc	29.2	0	1.4e-6	1.8e-7	2e-1	
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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SD06
EXPOSURE SCENARIO - ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX ADOLESCENT	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	0	0	0
Di-n-butylphthalate	0	1.318e-7	0
4,4'-DDD	0	0	0
Arsenic	0	6.233e-4	0
Antimony	0	0	0
Barium	0	2.927e-3	0
Beryllium	0	0	0
Cadmium	0	7.384e-4	0
Chromium (III)	0	1.323e-6	0
Copper	0	9.949e-6	0
Lead	0	4.281e-4	0
Manganese	0	1.347e-4	0
Mercury	0	0	0
Selenium	0	0	0
Vanadium	0	2.007e-4	0
Zinc	0	7e-6	0
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TOTAL	0	5.070e-3	0

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: TINKER AFB - CRUTCHO CREEK - SD07
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENTS

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x LT x 365 x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

ADOLESCENT:		CHILD:	
IR:	100	IR:	0
EF:	14	EF:	14
Fi:	.5	Fi:	.5
ED:	9	ED:	9
BW:	40	BW:	40
LT:	70	LT:	70

DETERMINE CONVERSION FACTORS:

ADOLESCENT:		ADOLESCENT:		ADULT/ADOLESCENT (CANCER RISK):	
CF:	4.795e-8 (AVG ANNUAL DOSE)	CF:	0 (AVG ANNUAL DOSE)	CF:	6.164e-9

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SD07
EXPOSURE SCENARIO - ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (MG/KG)	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate		0	0	0	2e-2	1.4e-2
Di-n-butylphthalate		0	0	0	1e-1	
4,4'-DDD		0	0	0		2.4e-1
Arsenic	2.5	0	1.199e-7	1.541e-8	3e-4	
Antimony		0	0	0	4e-4	
Barium	724	0	3.471e-5	4.463e-6	7e-2	
Beryllium		0	0	0	5e-3	4.3e0
Cadmium		0	0	0	5e-4	
Chromium (III)	22.7	0	1.088e-6	1.399e-7	1e0	
Copper	7.2	0	3.452e-7	4.438e-8	4e-2	
Lead	9.6	0	4.603e-7	5.918e-8	1.4e-3	
Manganese		0	0	0	1e-1	
Mercury	.11	0	5.274e-9	6.78e-10	3e-4	
Selenium		0	0	0	5e-3	
Vanadium	21	0	1.007e-6	1.295e-7	7e-3	
Zinc	27.6	0	1.323e-6	1.701e-7	2e-1	
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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SD07
EXPOSURE SCENARIO - ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX ADOLESCENT	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	0	0	0
Di-n-butylphthalate	0	0	0
4,4'-DDD	0	0	0
Arsenic	0	3.995e-4	0
Antimony	0	0	0
Barium	0	4.959e-4	0
Beryllium	0	0	0
Cadmium	0	0	0
Chromium (III)	0	1.088e-6	0
Copper	0	8.630e-6	0
Lead	0	3.288e-4	0
Manganese	0	0	0
Mercury	0	1.758e-5	0
Selenium	0	0	0
Vanadium	0	1.438e-4	0
Zinc	0	6.616e-6	0
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TOTAL	0	1.402e-3	0

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: TINKER AFB - CRUTCHO CREEK - SD08
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENTS

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x LT x 365 x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

ADOLESCENT:		CHILD:	
IR:	100	IR:	0
EF:	14	EF:	14
Fi:	.5	Fi:	.5
ED:	9	ED:	9
BW:	40	BW:	40
LT:	70	LT:	70

DETERMINE CONVERSION FACTORS:

ADOLESCENT:
CF: 4.795e-8 (AVG ANNUAL DOSE)

ADOLESCENT:
CF: 0 (AVG ANNUAL DOSE)

ADULT/ADOLESCENT (CANCER RISK):
CF: 6.164e-9

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SD08
EXPOSURE SCENARIO - ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (MG/KG)	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate		0	0	0	2e-2	1.4e-2
Di-n-butylphthalate		0	0	0	1e-1	
4,4'-DDD		0	0	0		2.4e-1
Arsenic	5.1	0	2.445e-7	3.144e-8	3e-4	
Antimony		0	0	0	4e-4	
Barium	1200	0	5.753e-5	7.397e-6	7e-2	
Beryllium		0	0	0	5e-3	4.3e0
Cadmium		0	0	0	5e-4	
Chromium (III)	14.5	0	6.952e-7	8.938e-8	1e0	
Copper	9.5	0	4.555e-7	5.856e-8	4e-2	
Lead	12.7	0	6.089e-7	7.829e-8	1.4e-3	
Manganese		0	0	0	1e-1	
Mercury	.06	0	2.877e-9	3.70e-10	3e-4	
Selenium		0	0	0	5e-3	
Vanadium	31.8	0	1.525e-6	1.960e-7	7e-3	
Zinc	37.6	0	1.803e-6	2.318e-7	2e-1	
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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SD08
EXPOSURE SCENARIO - ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX ADOLESCENT	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	0	0	0
Di-n-butylphthalate	0	0	0
4,4'-DDD	0	0	0
Arsenic	0	8.151e-4	0
Antimony	0	0	0
Barium	0	8.219e-4	0
Beryllium	0	0	0
Cadmium	0	0	0
Chromium (III)	0	6.952e-7	0
Copper	0	1.139e-5	0
Lead	0	4.349e-4	0
Manganese	0	0	0
Mercury	0	9.589e-6	0
Selenium	0	0	0
Vanadium	0	2.178e-4	0
Zinc	0	9.014e-6	0
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TOTAL	0	2.320e-3	0

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: TINKER AFB - CRUTCHO CREEK - SD09
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENTS

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x LT x 365 x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

ADOLESCENT:		CHILD:	
IR:	100	IR:	0
EF:	14	EF:	14
Fi:	.5	Fi:	.5
ED:	9	ED:	9
BW:	40	BW:	40
LT:	70	LT:	70

DETERMINE CONVERSION FACTORS:

ADOLESCENT:
CF: 4.795e-8 (AVG ANNUAL DOSE)

ADOLESCENT:
CF: 0 (AVG ANNUAL DOSE)

ADULT/ADOLESCENT (CANCER RISK):
CF: 6.164e-9

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SD09
EXPOSURE SCENARIO - ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (MG/KG)	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate		0	0	0	2e-2	1.4e-2
Di-n-butylphthalate		0	0	0	1e-1	
4,4'-DDD		0	0	0		2.4e-1
Arsenic	2.4	0	1.151e-7	1.479e-8	3e-4	
Antimony	1	0	4.795e-8	6.164e-9	4e-4	
Barium	1180	0	5.658e-5	7.274e-6	7e-2	
Beryllium		0	0	0	5e-3	4.3e0
Cadmium		0	0	0	5e-4	
Chromium (III)	8.2	0	3.932e-7	5.055e-8	1e0	
Copper	6.5	0	3.116e-7	4.007e-8	4e-2	
Lead	4.6	0	2.205e-7	2.836e-8	1.4e-3	
Manganese		0	0	0	1e-1	
Mercury		0	0	0	3e-4	
Selenium		0	0	0	5e-3	
Vanadium	21.3	0	1.021e-6	1.313e-7	7e-3	
Zinc	24.9	0	1.194e-6	1.535e-7	2e-1	
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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SD09
EXPOSURE SCENARIO - ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX ADOLESCENT	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	0	0	0
Di-n-butylphthalate	0	0	0
4,4'-DDD	0	0	0
Arsenic	0	3.836e-4	0
Antimony	0	1.199e-4	0
Barium	0	8.082e-4	0
Beryllium	0	0	0
Cadmium	0	0	0
Chromium (III)	0	3.932e-7	0
Copper	0	7.791e-6	0
Lead	0	1.575e-4	0
Manganese	0	0	0
Mercury	0	0	0
Selenium	0	0	0
Vanadium	0	1.459e-4	0
Zinc	0	5.969e-6	0
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	0	0	0
TOTAL	0	1.629e-3	0

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: TINKER AFB - CRUTCHO CREEK - SD10
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENTS

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x LT x 365 x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

ADOLESCENT:		CHILD:	
IR:	100	IR:	0
EF:	14	EF:	14
Fi:	.5	Fi:	.5
ED:	9	ED:	9
BW:	40	BW:	40
LT:	70	LT:	70

DETERMINE CONVERSION FACTORS:

ADOLESCENT:		ADOLESCENT:		ADULT/ADOLESCENT (CANCER RISK):	
CF:	4.795e-8 (AVG ANNUAL DOSE)	CF:	0 (AVG ANNUAL DOSE)	CF:	6.164e-9

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SD10
EXPOSURE SCENARIO - ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (MG/KG)	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate		0	0	0	2e-2	1.4e-2
Di-n-butylphthalate		0	0	0	1e-1	
4,4'-DDD		0	0	0		2.4e-1
Arsenic	6.8	0	3.260e-7	4.192e-8	3e-4	
Antimony	.99	0	4.747e-8	6.103e-9	4e-4	
Barium	1100	0	5.274e-5	6.781e-6	7e-2	
Beryllium		0	0	0	5e-3	4.3e0
Cadmium		0	0	0	5e-4	
Chromium (III)	8.9	0	4.267e-7	5.486e-8	1e0	
Copper	8	0	3.836e-7	4.932e-8	4e-2	
Lead	8.5	0	4.075e-7	5.240e-8	1.4e-3	
Manganese		0	0	0	1e-1	
Mercury		0	0	0	3e-4	
Selenium	.28	0	1.342e-8	1.726e-9	5e-3	
Vanadium	30.1	0	1.443e-6	1.855e-7	7e-3	
Zinc	23.3	0	1.117e-6	1.436e-7	2e-1	
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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SD10
EXPOSURE SCENARIO - ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX ADOLESCENT	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	0	0	0
Di-n-butylphthalate	0	0	0
4,4'-DDD	0	0	0
Arsenic	0	1.087e-3	0
Antimony	0	1.187e-4	0
Barium	0	7.534e-4	0
Beryllium	0	0	0
Cadmium	0	0	0
Chromium (III)	0	4.267e-7	0
Copper	0	9.589e-6	0
Lead	0	2.911e-4	0
Manganese	0	0	0
Mercury	0	0	0
Selenium	0	2.685e-6	0
Vanadium	0	2.062e-4	0
Zinc	0	5.586e-6	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
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	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
TOTAL	0	2.474e-3	0

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: TINKER AFB - CRUTCHO CREEK - SD11
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENTS

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x LT x 365 x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

ADOLESCENT:		CHILD:	
IR:	100	IR:	0
EF:	14	EF:	14
Fi:	.5	Fi:	.5
ED:	9	ED:	9
BW:	40	BW:	40
LT:	70	LT:	70

DETERMINE CONVERSION FACTORS:

ADOLESCENT:			ADOLESCENT:			ADULT/ADOLESCENT (CANCER RISK):	
CF:	4.795e-8	(AVG ANNUAL DOSE)	CF:	0	(AVG ANNUAL DOSE)	CF:	6.164e-9

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SD11
EXPOSURE SCENARIO - ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (MG/KG)	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate	.075	0	3.596e-9	4.62e-10	2e-2	1.4e-2
Di-n-butylphthalate		0	0	0	1e-1	
4,4'-DDD		0	0	0		2.4e-1
Arsenic	.93	0	4.459e-8	5.733e-9	3e-4	
Antimony		0	0	0	4e-4	
Barium	647	0	3.102e-5	3.988e-6	7e-2	
Beryllium		0	0	0	5e-3	4.3e0
Cadmium		0	0	0	5e-4	
Chromium (III)	7.3	0	3.5e-7	4.5e-8	1e0	
Copper		0	0	0	4e-2	
Lead	11.2	0	5.370e-7	6.904e-8	1.4e-3	
Manganese	330	0	1.582e-5	2.034e-6	1e-1	
Mercury		0	0	0	3e-4	
Selenium		0	0	0	5e-3	
Vanadium	17.3	0	8.295e-7	1.066e-7	7e-3	
Zinc	26.6	0	1.275e-6	1.640e-7	2e-1	
		0	0	0		
		0	0	0		
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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SD11
EXPOSURE SCENARIO - ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (MG/KG)	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate	.075	0	3.596e-9	4.62e-10	2e-2	1.4e-2
Di-n-butylphthalate		0	0	0	1e-1	
4,4'-DDD		0	0	0		2.4e-1
Arsenic	.93	0	4.459e-8	5.733e-9	3e-4	
Antimony		0	0	0	4e-4	
Barium	647	0	3.102e-5	3.988e-6	7e-2	
Beryllium		0	0	0	5e-3	4.3e0
Cadmium		0	0	0	5e-4	
Chromium (III)	7.3	0	3.5e-7	4.5e-8	1e0	
Copper		0	0	0	4e-2	
Lead	11.2	0	5.370e-7	6.904e-8	1.4e-3	
Manganese	330	0	1.582e-5	2.034e-6	1e-1	
Mercury		0	0	0	3e-4	
Selenium		0	0	0	5e-3	
Vanadium	17.3	0	8.295e-7	1.066e-7	7e-3	
Zinc	26.6	0	1.275e-6	1.640e-7	2e-1	
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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SD11
EXPOSURE SCENARIO - ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX ADOLESCENT	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	0	1.798e-7	6.47e-12
Di-n-butylphthalate	0	0	0
4,4'-DDD	0	0	0
Arsenic	0	1.486e-4	0
Antimony	0	0	0
Barium	0	4.432e-4	0
Beryllium	0	0	0
Cadmium	0	0	0
Chromium (III)	0	3.5e-7	0
Copper	0	0	0
Lead	0	3.836e-4	0
Manganese	0	1.582e-4	0
Mercury	0	0	0
Selenium	0	0	0
Vanadium	0	1.185e-4	0
Zinc	0	6.377e-6	0
	0	0	0
	0	0	0
	0	0	0
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	0	0	0
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	0	0	0
	0	0	0
	0	0	0
TOTAL	0	1.259e-3	6.47e-12

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: TINKER AFB - CRUTCHO CREEK - SD12
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENTS

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x LT x 365 x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

ADOLESCENT:		CHILD:	
IR:	100	IR:	0
EF:	14	EF:	14
Fi:	.5	Fi:	.5
ED:	9	ED:	9
BW:	40	BW:	40
LT:	70	LT:	70

DETERMINE CONVERSION FACTORS:

ADOLESCENT:			ADOLESCENT:			ADULT/ADOLESCENT (CANCER RISK):	
CF:	4.795e-8	(AVG ANNUAL DOSE)	CF:	0	(AVG ANNUAL DOSE)	CF:	6.164e-9

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SD12
EXPOSURE SCENARIO - ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (MG/KG)	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate		0	0	0	2e-2	1.4e-2
Di-n-butylphthalate		0	0	0	1e-1	
4,4'-DDD		0	0	0		2.4e-1
Arsenic	13.5	0	6.473e-7	8.322e-8	3e-4	
Antimony		0	0	0	4e-4	
Barium	1070	0	5.130e-5	6.596e-6	7e-2	
Beryllium		0	0	0	5e-3	4.3e0
Cadmium		0	0	0	5e-4	
Chromium (III)	9.3	0	4.459e-7	5.733e-8	1e0	
Copper	6.9	0	3.308e-7	4.253e-8	4e-2	
Lead	21	0	1.007e-6	1.295e-7	1.4e-3	
Manganese		0	0	0	1e-1	
Mercury		0	0	0	3e-4	
Selenium		0	0	0	5e-3	
Vanadium	55.1	0	2.642e-6	3.397e-7	7e-3	
Zinc	29.3	0	1.405e-6	1.806e-7	2e-1	
		0	0	0		
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		0	0	0		
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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SD12
EXPOSURE SCENARIO - ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX ADOLESCENT	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	0	0	0
Di-n-butylphthalate	0	0	0
4,4'-DDD	0	0	0
Arsenic	0	2.158e-3	0
Antimony	0	0	0
Barium	0	7.329e-4	0
Beryllium	0	0	0
Cadmium	0	0	0
Chromium (III)	0	4.459e-7	0
Copper	0	8.271e-6	0
Lead	0	7.192e-4	0
Manganese	0	0	0
Mercury	0	0	0
Selenium	0	0	0
Vanadium	0	3.774e-4	0
Zinc	0	7.024e-6	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
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	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
TOTAL	0	4.003e-3	0

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: TINKER AFB - CRUTCHO CREEK - SD13
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENTS

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x LT x 365 x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

ADOLESCENT:		CHILD:	
IR:	100	IR:	0
EF:	14	EF:	14
Fi:	.5	Fi:	.5
ED:	9	ED:	9
BW:	40	BW:	40
LT:	70	LT:	70

DETERMINE CONVERSION FACTORS:

ADOLESCENT:		ADOLESCENT:		ADULT/ADOLESCENT (CANCER RISK):
CF:	4.795e-8 (AVG ANNUAL DOSE)	CF:	0 (AVG ANNUAL DOSE)	CF: 6.164e-9

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SD13
EXPOSURE SCENARIO - ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (MG/KG)	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate		0	0	0	2e-2	1.4e-2
Di-n-butylphthalate		0	0	0	1e-1	
4,4' DDD		0	0	0		2.4e-1
Arsenic	2	0	9.589e-8	1.233e-8	3e-4	
Antimony		0	0	0	4e-4	
Barium	505	0	2.421e-5	3.113e-6	7e-2	
Beryllium	1	0	4.795e-8	6.164e-9	5e-3	4.3e0
Cadmium		0	0	0	5e-4	
Chromium (III)	23.8	0	1.141e-6	1.467e-7	1e0	
Copper	10	0	4.795e-7	6.164e-8	4e-2	
Lead	7.6	0	3.644e-7	4.685e-8	1.4e-3	
Manganese		0	0	0	1e-1	
Mercury		0	0	0	3e-4	
Selenium		0	0	0	5e-3	
Vanadium	39.5	0	1.894e-6	2.435e-7	7e-3	
Zinc	37.4	0	1.793e-6	2.305e-7	2e-1	
		0	0	0		
		0	0	0		
		0	0	0		
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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SD13
EXPOSURE SCENARIO - ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX ADOLESCENT	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	0	0	0
Di-n-butylphthalate	0	0	0
4,4'-DDD	0	0	0
Arsenic	0	3.196e-4	0
Antimony	0	0	0
Barium	0	3.459e-4	0
Beryllium	0	9.589e-6	2.651e-8
Cadmium	0	0	0
Chromium (III)	0	1.141e-6	0
Copper	0	1.199e-5	0
Lead	0	2.603e-4	0
Manganese	0	0	0
Mercury	0	0	0
Selenium	0	0	0
Vanadium	0	2.705e-4	0
Zinc	0	8.966e-6	0
	0	0	0
	0	0	0
	0	0	0
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	0	0	0
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	0	0	0
TOTAL	0	1.228e-3	2.651e-8

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: TINKER AFB - CRUTCHO CREEK - SD14
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENTS

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x LT x 365 x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

ADOLESCENT:		CHILD:	
IR:	100	IR:	0
EF:	14	EF:	14
Fi:	.5	Fi:	.5
ED:	9	ED:	9
BW:	40	BW:	40
LT:	70	LT:	70

DETERMINE CONVERSION FACTORS:

ADOLESCENT:		ADOLESCENT:		ADULT/ADOLESCENT (CANCER RISK):
CF:	4.795e-8 (AVG ANNUAL DOSE)	CF:	0 (AVG ANNUAL DOSE)	CF: 6.164e-9

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SD14
EXPOSURE SCENARIO - ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (MG/KG)	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate		0	0	0	2e-2	1.4e-2
Di-n-butylphthalate		0	0	0	1e-1	
4,4'-DDD		0	0	0		2.4e-1
Arsenic	3.7	0	1.774e-7	2.281e-8	3e-4	
Antimony		0	0	0	4e-4	
Barium	979	0	4.694e-5	6.035e-6	7e-2	
Beryllium		0	0	0	5e-3	4.3e0
Cadmium		0	0	0	5e-4	
Chromium (III)	6.7	0	3.212e-7	4.130e-8	1e0	
Copper	8.5	0	4.075e-7	5.240e-8	4e-2	
Lead	7.9	0	3.788e-7	4.870e-8	1.4e-3	
Manganese		0	0	0	1e-1	
Mercury		0	0	0	3e-4	
Selenium		0	0	0	5e-3	
Vanadium	13	0	6.233e-7	8.014e-8	7e-3	
Zinc	16.6	0	7.959e-7	1.023e-7	2e-1	
		0	0	0		
		0	0	0		
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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SD14
EXPOSURE SCENARIO - ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX ADOLESCENT	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	0	0	0
Di-n-butylphthalate	0	0	0
4,4'-DDD	0	0	0
Arsenic	0	5.913e-4	0
Antimony	0	0	0
Barium	0	6.705e-4	0
Beryllium	0	0	0
Cadmium	0	0	0
Chromium (III)	0	3.212e-7	0
Copper	0	1.019e-5	0
Lead	0	2.705e-4	0
Manganese	0	0	0
Mercury	0	0	0
Selenium	0	0	0
Vanadium	0	8.904e-5	0
Zinc	0	3.979e-6	0
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	0	0	0
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	0	0	0
	0	0	0
TOTAL	0	1.636e-3	0

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: TINKER AFB - CRUTCHO CREEK - SD15
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENTS

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x LT x 365 x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

ADOLESCENT:		CHILD:	
IR:	100	IR:	0
EF:	14	EF:	14
Fi:	.5	Fi:	.5
ED:	9	ED:	9
BW:	40	BW:	40
LT:	70	LT:	70

DETERMINE CONVERSION FACTORS:

ADOLESCENT:			ADOLESCENT:			ADULT/ADOLESCENT (CANCER RISK):	
CF:	4.795e-8	(AVG ANNUAL DOSE)	CF:	0	(AVG ANNUAL DOSE)	CF:	6.164e-9

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SD15
EXPOSURE SCENARIO - ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (MG/KG)	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate		0	0	0	2e-2	1.4e-2
Di-n-butylphthalate		0	0	0	1e-1	
4,4'-DDD	.018	0	8.63e-10	1.11e-10		2.4e-1
Arsenic	3.8	0	1.822e-7	2.342e-8	3e-4	
Antimony		0	0	0	4e-4	
Barium	1761	0	8.443e-5	1.086e-5	7e-2	
Beryllium		0	0	0	5e-3	4.3e0
Cadmium	2.8	0	1.342e-7	1.726e-8	5e-4	
Chromium (III)	224	0	1.074e-5	1.381e-6	1e0	
Copper	18.4	0	8.822e-7	1.134e-7	4e-2	
Lead	35.5	0	1.702e-6	2.188e-7	1.4e-3	
Manganese		0	0	0	1e-1	
Mercury	.51	0	2.445e-8	3.144e-9	3e-4	
Selenium		0	0	0	5e-3	
Vanadium	45.3	0	2.172e-6	2.792e-7	7e-3	
Zinc	63.1	0	3.025e-6	3.890e-7	2e-1	
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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SD15
EXPOSURE SCENARIO - ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX ADOLESCENT	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	0	0	0
Di-n-butylphthalate	0	0	0
4,4'-DDD	0	0	2.66e-11
Arsenic	0	6.073e-4	0
Antimony	0	0	0
Barium	0	1.206e-3	0
Beryllium	0	0	0
Cadmium	0	2.685e-4	0
Chromium (III)	0	1.074e-5	0
Copper	0	2.205e-5	0
Lead	0	1.216e-3	0
Manganese	0	0	0
Mercury	0	8.151e-5	0
Selenium	0	0	0
Vanadium	0	3.103e-4	0
Zinc	0	1.513e-5	0
	0	0	0
	0	0	0
	0	0	0
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	0	0	0
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	0	0	0
TOTAL	0	3.737e-3	2.66e-11

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: TINKER AFB - CRUTCHO CREEK - SD16
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENTS

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x LT x 365 x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

ADOLESCENT:		CHILD:	
IR:	100	IR:	0
EF:	14	EF:	14
Fi:	.5	Fi:	.5
ED:	9	ED:	9
BW:	40	BW:	40
LT:	70	LT:	70

DETERMINE CONVERSION FACTORS:

ADOLESCENT:		ADOLESCENT:		ADULT/ADOLESCENT (CANCER RISK):	
CF:	4.795e-8 (AVG ANNUAL DOSE)	CF:	0 (AVG ANNUAL DOSE)	CF:	6.164e-9

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SD16
EXPOSURE SCENARIO - ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (MG/KG)	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate		0	0	0	2e-2	1.4e-2
Di-n-butylphthalate		0	0	0	1e-1	
4,4'-DDD		0	0	0		2.4e-1
Arsenic	2	0	9.589e-8	1.233e-8	3e-4	
Antimony		0	0	0	4e-4	
Barium	815	0	3.908e-5	5.024e-6	7e-2	
Beryllium		0	0	0	5e-3	4.3e0
Cadmium		0	0	0	5e-4	
Chromium (III)	49.1	0	2.354e-6	3.027e-7	1e0	
Copper	3.2	0	1.534e-7	1.973e-8	4e-2	
Lead	19.1	0	9.158e-7	1.177e-7	1.4e-3	
Manganese	1400	0	6.712e-5	8.630e-6	1e-1	
Mercury		0	0	0	3e-4	
Selenium		0	0	0	5e-3	
Vanadium	22.4	0	1.074e-6	1.381e-7	7e-3	
Zinc	30.1	0	1.443e-6	1.855e-7	2e-1	
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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SD16
EXPOSURE SCENARIO - ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX ADOLESCENT	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	0	0	0
Di-n-butylphthalate	0	0	0
4,4'-DDD	0	0	0
Arsenic	0	3.196e-4	0
Antimony	0	0	0
Barium	0	5.582e-4	0
Beryllium	0	0	0
Cadmium	0	0	0
Chromium (III)	0	2.354e-6	0
Copper	0	3.836e-6	0
Lead	0	6.541e-4	0
Manganese	0	6.712e-4	0
Mercury	0	0	0
Selenium	0	0	0
Vanadium	0	1.534e-4	0
Zinc	0	7.216e-6	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
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	0	0	0
TOTAL	0	2.370e-3	0

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: TINKER AFB - CRUTCHO CREEK - SD17
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENTS

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x LT x 365 x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

ADOLESCENT:		CHILD:	
IR:	100	IR:	0
EF:	14	EF:	14
Fi:	.5	Fi:	.5
ED:	9	ED:	9
BW:	40	BW:	40
LT:	70	LT:	70

DETERMINE CONVERSION FACTORS:

ADOLESCENT:
CF: 4.795e-8 (AVG ANNUAL DOSE)

ADOLESCENT:
CF: 0 (AVG ANNUAL DOSE)

ADULT/ADOLESCENT (CANCER RISK):
CF: 6.164e-9

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SD17
EXPOSURE SCENARIO - ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (MG/KG)	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate		0	0	0	2e-2	1.4e-2
Di-n-butylphthalate		0	0	0	1e-1	
4,4'-DDD		0	0	0		2.4e-1
Arsenic	2	0	9.589e-8	1.233e-8	3e-4	
Antimony		0	0	0	4e-4	
Barium	621	0	2.977e-5	3.828e-6	7e-2	
Beryllium		0	0	0	5e-3	4.3e0
Cadmium		0	0	0	5e-4	
Chromium (III)	37.3	0	1.788e-6	2.299e-7	1e0	
Copper	8.1	0	3.884e-7	4.993e-8	4e-2	
Lead	20	0	9.589e-7	1.233e-7	1.4e-3	
Manganese		0	0	0	1e-1	
Mercury		0	0	0	3e-4	
Selenium		0	0	0	5e-3	
Vanadium	20.4	0	9.781e-7	1.258e-7	7e-3	
Zinc	31.3	0	1.501e-6	1.929e-7	2e-1	
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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SD17
EXPOSURE SCENARIO - ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX ADOLESCENT	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	0	0	0
Di-n-butylphthalate	0	0	0
4,4'-DDD	0	0	0
Arsenic	0	3.196e-4	0
Antimony	0	0	0
Barium	0	4.253e-4	0
Beryllium	0	0	0
Cadmium	0	0	0
Chromium (III)	0	1.788e-6	0
Copper	0	9.709e-6	0
Lead	0	6.849e-4	0
Manganese	0	0	0
Mercury	0	0	0
Selenium	0	0	0
Vanadium	0	1.397e-4	0
Zinc	0	7.503e-6	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
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	0	0	0
TOTAL	0	1.589e-3	0

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: TINKER AFB - CRUTCHO CREEK - SD18
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENTS

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x LT x 365 x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

ADOLESCENT:		CHILD:	
IR:	100	IR:	0
EF:	14	EF:	14
Fi:	.5	Fi:	.5
ED:	9	ED:	9
BW:	40	BW:	40
LT:	70	LT:	70

DETERMINE CONVERSION FACTORS:

ADOLESCENT:
CF: 4.795e-8 (AVG ANNUAL DOSE)

ADOLESCENT:
CF: 0 (AVG ANNUAL DOSE)

ADULT/ADOLESCENT (CANCER RISK):
CF: 6.164e-9

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SD18
EXPOSURE SCENARIO - ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (MG/KG)	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate		0	0	0	2e-2	1.4e-2
Di-n-butylphthalate		0	0	0	1e-1	
4,4'-DDD		0	0	0		2.4e-1
Arsenic	2.6	0	1.247e-7	1.603e-8	3e-4	
Antimony		0	0	0	4e-4	
Barium	554	0	2.656e-5	3.415e-6	7e-2	
Beryllium		0	0	0	5e-3	4.3e0
Cadmium		0	0	0	5e-4	
Chromium (III)	26.5	0	1.271e-6	1.634e-7	1e0	
Copper	6.1	0	2.925e-7	3.760e-8	4e-2	
Lead	17.7	0	8.486e-7	1.091e-7	1.4e-3	
Manganese		0	0	0	1e-1	
Mercury		0	0	0	3e-4	
Selenium		0	0	0	5e-3	
Vanadium	19.8	0	9.493e-7	1.221e-7	7e-3	
Zinc	37	0	1.774e-6	2.281e-7	2e-1	
		0	0	0		
		0	0	0		
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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SD18
EXPOSURE SCENARIO - ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX ADOLESCENT	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	0	0	0
Di-n-butylphthalate	0	0	0
4,4'-DDD	0	0	0
Arsenic	0	4.155e-4	0
Antimony	0	0	0
Barium	0	3.795e-4	0
Beryllium	0	0	0
Cadmium	0	0	0
Chromium (III)	0	1.271e-6	0
Copper	0	7.312e-6	0
Lead	0	6.062e-4	0
Manganese	0	0	0
Mercury	0	0	0
Selenium	0	0	0
Vanadium	0	1.356e-4	0
Zinc	0	8.870e-6	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
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	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
TOTAL	0	1.554e-3	0

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: TINKER AFB - CRUTCHO CREEK - SD19
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENTS

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x LT x 365 x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

ADOLESCENT:		CHILD:	
IR:	100	IR:	0
EF:	14	EF:	14
Fi:	.5	Fi:	.5
ED:	9	ED:	9
BW:	40	BW:	40
LT:	70	LT:	70

DETERMINE CONVERSION FACTORS:

ADOLESCENT:
CF: 4.795e-8 (AVG ANNUAL DOSE)

ADOLESCENT:
CF: 0 (AVG ANNUAL DOSE)

ADULT/ADOLESCENT (CANCER RISK):
CF: 6.164e-9

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SD19
EXPOSURE SCENARIO - ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (MG/KG)	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate		0	0	0	2e-2	1.4e-2
Di-n-butylphthalate		0	0	0	1e-1	
4,4'-DDD		0	0	0		2.4e-1
Arsenic	3.5	0	1.678e-7	2.158e-8	3e-4	
Antimony		0	0	0	4e-4	
Barium	1120	0	5.370e-5	6.904e-6	7e-2	
Beryllium		0	0	0	5e-3	4.3e0
Cadmium		0	0	0	5e-4	
Chromium (III)	35.3	0	1.692e-6	2.176e-7	1e0	
Copper	9.7	0	4.651e-7	5.979e-8	4e-2	
Lead	21.3	0	1.021e-6	1.313e-7	1.4e-3	
Manganese		0	0	0	1e-1	
Mercury		0	0	0	3e-4	
Selenium		0	0	0	5e-3	
Vanadium	43.3	0	2.076e-6	2.669e-7	7e-3	
Zinc	39.3	0	1.884e-6	2.423e-7	2e-1	
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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SD19
EXPOSURE SCENARIO - ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX ADOLESCENT	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	0	0	0
Di-n-butylphthalate	0	0	0
4,4'-DDD	0	0	0
Arsenic	0	5.594e-4	0
Antimony	0	0	0
Barium	0	7.671e-4	0
Beryllium	0	0	0
Cadmium	0	0	0
Chromium (III)	0	1.692e-6	0
Copper	0	1.163e-5	0
Lead	0	7.295e-4	0
Manganese	0	0	0
Mercury	0	0	0
Selenium	0	0	0
Vanadium	0	2.966e-4	0
Zinc	0	9.421e-6	0
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	0	0	0
TOTAL	0	2.375e-3	0

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: TINKER AFB - CRUTCHO CREEK - SD20
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENTS

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x LT x 365 x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

ADOLESCENT:		CHILD:	
IR:	100	IR:	0
EF:	14	EF:	14
Fi:	.5	Fi:	.5
ED:	9	ED:	9
BW:	40	BW:	40
LT:	70	LT:	70

DETERMINE CONVERSION FACTORS:

ADOLESCENT:		ADOLESCENT:		ADULT/ADOLESCENT (CANCER RISK):	
CF:	4.795e-8 (AVG ANNUAL DOSE)	CF:	0 (AVG ANNUAL DOSE)	CF:	6.164e-9

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SD20
EXPOSURE SCENARIO - ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (MG/KG)	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate		0	0	0	2e-2	1.4e-2
Di-n-butylphthalate		0	0	0	1e-1	
4,4'-DDD		0	0	0		2.4e-1
Arsenic	2.5	0	1.199e-7	1.541e-8	3e-4	
Antimony		0	0	0	4e-4	
Barium	451	0	2.162e-5	2.780e-6	7e-2	
Beryllium		0	0	0	5e-3	4.3e0
Cadmium		0	0	0	5e-4	
Chromium (III)	11.4	0	5.466e-7	7.027e-8	1e0	
Copper	4.6	0	2.205e-7	2.836e-8	4e-2	
Lead	8.3	0	3.979e-7	5.116e-8	1.4e-3	
Manganese		0	0	0	1e-1	
Mercury		0	0	0	3e-4	
Selenium		0	0	0	5e-3	
Vanadium	22.2	0	1.064e-6	1.368e-7	7e-3	
Zinc	36.9	0	1.769e-6	2.275e-7	2e-1	
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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SD20
EXPOSURE SCENARIO - ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX ADOLESCENT	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	0	0	0
Di-n-butylphthalate	0	0	0
4,4'-DDD	0	0	0
Arsenic	0	3.995e-4	0
Antimony	0	0	0
Barium	0	3.089e-4	0
Beryllium	0	0	0
Cadmium	0	0	0
Chromium (III)	0	5.466e-7	0
Copper	0	5.514e-6	0
Lead	0	2.842e-4	0
Manganese	0	0	0
Mercury	0	0	0
Selenium	0	0	0
Vanadium	0	1.521e-4	0
Zinc	0	8.846e-6	0
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TOTAL	0	1.160e-3	0

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: TINKER AFB - CRUTCHO CREEK - SD21
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENTS

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x LT x 365 x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

ADOLESCENT:		CHILD:	
IR:	100	IR:	0
EF:	14	EF:	14
Fi:	.5	Fi:	.5
ED:	9	ED:	9
BW:	40	BW:	40
LT:	70	LT:	70

DETERMINE CONVERSION FACTORS:

ADOLESCENT:			ADOLESCENT:			ADULT/ADOLESCENT (CANCER RISK):	
CF:	4.795e-8	(AVG ANNUAL DOSE)	CF:	0	(AVG ANNUAL DOSE)	CF:	6.164e-9

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SD21
EXPOSURE SCENARIO - ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (MG/KG)	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate		0	0	0	2e-2	1.4e-2
Di-n-butylphthalate		0	0	0	1e-1	
4,4'-DDD		0	0	0		2.4e-1
Arsenic	2.2	0	1.055e-7	1.356e-8	3e-4	
Antimony		0	0	0	4e-4	
Barium	311	0	1.491e-5	1.917e-6	7e-2	
Beryllium		0	0	0	5e-3	4.3e0
Cadmium		0	0	0	5e-4	
Chromium (III)	17.1	0	8.199e-7	1.054e-7	1e0	
Copper	3.5	0	1.678e-7	2.158e-8	4e-2	
Lead	10.6	0	5.082e-7	6.534e-8	1.4e-3	
Manganese	388	0	1.860e-5	2.392e-6	1e-1	
Mercury		0	0	0	3e-4	
Selenium		0	0	0	5e-3	
Vanadium	8.7	0	4.171e-7	5.363e-8	7e-3	
Zinc	23.8	0	1.141e-6	1.467e-7	2e-1	
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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SD21
EXPOSURE SCENARIO - ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX ADOLESCENT	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	0	0	0
Di-n-butylphthalate	0	0	0
4,4'-DDD	0	0	0
Arsenic	0	3.516e-4	0
Antimony	0	0	0
Barium	0	2.130e-4	0
Beryllium	0	0	0
Cadmium	0	0	0
Chromium (III)	0	8.199e-7	0
Copper	0	4.195e-6	0
Lead	0	3.630e-4	0
Manganese	0	1.860e-4	0
Mercury	0	0	0
Selenium	0	0	0
Vanadium	0	5.959e-5	0
Zinc	0	5.705e-6	0
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	0	0	0
TOTAL	0	1.184e-3	0

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: TINKER AFB - CRUTCHO CREEK - SD25
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENTS

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x LT x 365 x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

ADOLESCENT:		CHILD:	
IR:	100	IR:	0
EF:	14	EF:	14
Fi:	.5	Fi:	.5
ED:	9	ED:	9
BW:	40	BW:	40
LT:	70	LT:	70

DETERMINE CONVERSION FACTORS:

ADOLESCENT:		ADOLESCENT:		ADULT/ADOLESCENT (CANCER RISK):	
CF:	4.795e-8 (AVG ANNUAL DOSE)	CF:	0 (AVG ANNUAL DOSE)	CF:	6.164e-9

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SD25
EXPOSURE SCENARIO - ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (MG/KG)	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate		0	0	0	2e-2	1.4e-2
Di-n-butylphthalate		0	0	0	1e-1	
4,4'-DDD		0	0	0		2.4e-1
Arsenic	3.9	0	1.870e-7	2.404e-8	3e-4	
Antimony	1.3	0	6.233e-8	8.014e-9	4e-4	
Barium	788	0	3.778e-5	4.858e-6	7e-2	
Beryllium		0	0	0	5e-3	4.3e0
Cadmium		0	0	0	5e-4	
Chromium (III)	16.9	0	8.103e-7	1.042e-7	1e0	
Copper	23.5	0	1.127e-6	1.449e-7	4e-2	
Lead	99.2	0	4.756e-6	6.115e-7	1.4e-3	
Manganese		0	0	0	1e-1	
Mercury		0	0	0	3e-4	
Selenium	.33	0	1.582e-8	2.034e-9	5e-3	
Vanadium	26.9	0	1.290e-6	1.658e-7	7e-3	
Zinc	93.5	0	4.483e-6	5.764e-7	2e-1	
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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SD25
EXPOSURE SCENARIO - ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX ADOLESCENT	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	0	0	0
Di-n-butylphthalate	0	0	0
4,4'-DDD	0	0	0
Arsenic	0	6.233e-4	0
Antimony	0	1.558e-4	0
Barium	0	5.397e-4	0
Beryllium	0	0	0
Cadmium	0	0	0
Chromium (III)	0	8.103e-7	0
Copper	0	2.817e-5	0
Lead	0	3.397e-3	0
Manganese	0	0	0
Mercury	0	0	0
Selenium	0	3.164e-6	0
Vanadium	0	1.842e-4	0
Zinc	0	2.241e-5	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
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	0	0	0
TOTAL	0	4.955e-3	0

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: TINKER AFB - CRUTCHO CREEK - SD26
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH PICA INGESTION ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

EXPOSURE SCENARIO - ADOLESCENTS

REFERENCE: EPA, DECEMBER 1989

RELEVANT EQUATION: IEX = (C x IR x Fi x EF x ED)/(BW x LT x 365 x 1E6)

WHERE:
C = MEAN CONCENTRATION IN SOIL SAMPLE (MG/KG)
IR = SOIL INGESTION RATE (MG/EVENT)
EF = EXPOSURE FREQUENCY (EVENTS/YEAR)
Fi = FRACTION FROM CONTAMINATED SOURCE
ED = EXPOSURE DURATION (YEARS)
BW = BODY WEIGHT (KG)
LT = LIFETIME (YEARS)

ENTER INPUT PARAMETERS:

ADOLESCENT:		CHILD:	
IR:	100	IR:	0
EF:	14	EF:	14
Fi:	.5	Fi:	.5
ED:	9	ED:	9
BW:	40	BW:	40
LT:	70	LT:	70

DETERMINE CONVERSION FACTORS:

ADOLESCENT:			ADOLESCENT:			ADULT/ADOLESCENT (CANCER RISK):	
CF:	4.795e-8	(AVG ANNUAL DOSE)	CF:	0	(AVG ANNUAL DOSE)	CF:	6.164e-9

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SD26
EXPOSURE SCENARIO - ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (MG/KG)	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate		0	0	0	2e-2	1.4e-2
Di-n-butylphthalate		0	0	0	1e-1	
4,4'-DDD		0	0	0		2.4e-1
Arsenic	2.2	0	1.055e-7	1.356e-8	3e-4	
Antimony		0	0	0	4e-4	
Barium	629	0	3.016e-5	3.877e-6	7e-2	
Beryllium		0	0	0	5e-3	4.3e0
Cadmium		0	0	0	5e-4	
Chromium (III)	8.2	0	3.932e-7	5.055e-8	1e0	
Copper	6.5	0	3.116e-7	4.007e-8	4e-2	
Lead	309	0	1.482e-5	1.905e-6	1.4e-3	
Manganese		0	0	0	1e-1	
Mercury		0	0	0	3e-4	
Selenium		0	0	0	5e-3	
Vanadium	21	0	1.007e-6	1.295e-7	7e-3	
Zinc	59.1	0	2.834e-6	3.643e-7	2e-1	
		0	0	0		
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RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SD26
EXPOSURE SCENARIO - ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX ADOLESCENT	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	0	0	0
Di-n-butylphthalate	0	0	0
4,4'-DDD	0	0	0
Arsenic	0	3.516e-4	0
Antimony	0	0	0
Barium	0	4.308e-4	0
Beryllium	0	0	0
Cadmium	0	0	0
Chromium (III)	0	3.932e-7	0
Copper	0	7.791e-6	0
Lead	0	1.058e-2	0
Manganese	0	0	0
Mercury	0	0	0
Selenium	0	0	0
Vanadium	0	1.438e-4	0
Zinc	0	1.417e-5	0
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TOTAL	0	1.153e-2	0

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL

SITE NAME: TINKER AFB - CRUTCHO CREEK - SD06
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

EXPOSURE SCENARIO - ADOLESCENTS

RELEVANT EQUATIONS: DEX = (C x SA x AF x ABS x EF x ED)/(BW x AT x LT x 1E6)

ASSUMPTIONS:

C	= CONCENTRATION IN SOIL (MG/KG)		
SA1	= YOUTH SKIN SURFACE AREA (SQ CM/DAY):		8500
SA2	= ADULT SKIN SURFACE AREA (SQ CM/DAY):		0
AF	= ADHERENCE FACTOR (MG/SQ CM):		1
ABS	= ABSORPTION FRACTION: (DECIMAL FRACTION)	VOCS:	.1
		BNAS/PESTICIDES:	.05
		PCBS:	.03
EF	= EXPOSURE FREQUENCY (DAYS/YEAR)		14
ED1	= YOUTH EXPOSURE DURATION (YEARS):		9
ED2	= ADULT EXPOSURE DURATION (YEARS):		0
BW1	= BODY WEIGHT ADOLESCENT (KG):		40
BW2	= BODY WEIGHT ADULT (KG):		70
AT	= AVERAGING TIME (DAYS/YEAR):		365
LT	= LIFETIME (YEARS):		70

DETERMINE CONVERSION FACTORS:
DEX = (C)*(1MG/1000 UG)*(SA SQ CM)*(AF MG/SQ CM)*(ABS)*(EF DAYS/YEAR)/(AT DAYS/YEAR)/(BW KG)/(1 KG/1E6 MG)*

DOSEyouth = (CF1)*(C)*(ABS) CF1 = 8.151e-9 CANCER RISK = (CF3)*(C)*(ABS) CF3 = 1.048e-9
DOSEadult = (CF2)*(C)*(ABS) CF2 = 0

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SD06
EXPOSURE SCENARIO - ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (UG/KG)	ABSORPTION FRACTION	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate		.05	0	0	0	2e-2	1.4e-2
Di-n-butylphthalate	275	.05	1.121e-7	0	1.441e-8	1e-1	
4,4'-DDD		.05	0	0	0		2.4e-1
Arsenic	3900	0	0	0	0	3e-4	
Antimony		0	0	0	0	4e-4	
Barium	4273000	0	0	0	0	7e-2	
Beryllium		0	0	0	0	5e-3	4.3e0
Cadmium	7700	0	0	0	0	5e-4	
Chromium (III)	27600	0	0	0	0	1e0	
Copper	8300	0	0	0	0	4e-2	
Lead	12500	0	0	0	0	1.4e-3	
Manganese	281000	0	0	0	0	1e-1	
Mercury		0	0	0	0	3e-4	
Selenium		0	0	0	0	5e-3	
Vanadium	29300	0	0	0	0	7e-3	
Zinc	29200	0	0	0	0	2e-1	
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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SD06
EXPOSURE SCENARIO - ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX YOUTH	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	0	0	0
Di-n-butylphthalate	1.121e-6	0	0
4,4'-DDD	0	0	0
Arsenic	0	0	0
Antimony	0	0	0
Barium	0	0	0
Beryllium	0	0	0
Cadmium	0	0	0
Chromium (III)	0	0	0
Copper	0	0	0
Lead	0	0	0
Manganese	0	0	0
Mercury	0	0	0
Selenium	0	0	0
Vanadium	0	0	0
Zinc	0	0	0
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TOTAL	1.121e-6	0	0

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL

SITE NAME: TINKER AFB - CRUTCHO CREEK - SD11
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

EXPOSURE SCENARIO - ADOLESCENTS

RELEVANT EQUATIONS: DEX = (C x SA x AF x ABS x EF x ED)/(BW x AT x LT x 1E6)

ASSUMPTIONS:

C	= CONCENTRATION IN SOIL (MG/KG)		
SA1	= YOUTH SKIN SURFACE AREA (SQ CM/DAY):		8500
SA2	= ADULT SKIN SURFACE AREA (SQ CM/DAY):		0
AF	= ADHERENCE FACTOR (MG/SQ CM):		1
ABS	= ABSORPTION FRACTION:	VOCS:	.1
	(DECIMAL FRACTION)	BNAS/PESTICIDES:	.05
		PCBS:	.03
EF	= EXPOSURE FREQUENCY (DAYS/YEAR)		14
ED1	= YOUTH EXPOSURE DURATION (YEARS):		9
ED2	= ADULT EXPOSURE DURATION (YEARS):		0
BW1	= BODY WEIGHT ADOLESCENT (KG):		40
BW2	= BODY WEIGHT ADULT (KG):		70
AT	= AVERAGING TIME (DAYS/YEAR):		365
LT	= LIFETIME (YEARS):		70

DETERMINE CONVERSION FACTORS:
DEX = (C)*(1MG/1000 UG)*(SA SQ CM)*(AF MG/SQ CM)*(ABS)*(EF DAYS/YEAR)/(AT DAYS/YEAR)/(BW KG)/(1 KG/1E6 MG)*

DOSEyouth = (CF1)*(C)*(ABS) CF1 = 8.151e-9 CANCER RISK = (CF3)*(C)*(ABS) CF3 = 1.048e-9
DOSEadult = (CF2)*(C)*(ABS) CF2 = 0

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SD11
EXPOSURE SCENARIO - ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (UG/KG)	ABSORPTION FRACTION	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate	75	.05	3.057e-8	0	3.930e-9	2e-2	1.4e-2
Di-n-butylphthalate		.05	0	0	0	1e-1	
4,4'-DDD		.05	0	0	0		2.4e-1
Arsenic	13500	0	0	0	0	3e-4	
Antimony		0	0	0	0	4e-4	
Barium	1070000	0	0	0	0	7e-2	
Beryllium		0	0	0	0	5e-3	4.3e0
Cadmium		0	0	0	0	5e-4	
Chromium (III)	9300	0	0	0	0	1e0	
Copper	6900	0	0	0	0	4e-2	
Lead	21000	0	0	0	0	1.4e-3	
Manganese		0	0	0	0	1e-1	
Mercury		0	0	0	0	3e-4	
Selenium		0	0	0	0	5e-3	
Vanadium	55100	0	0	0	0	7e-3	
Zinc	29300	0	0	0	0	2e-1	
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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SD11
EXPOSURE SCENARIO - ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX YOUTH	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	1.528e-6	0	5.50e-11
Di-n-butylphthalate	0	0	0
4,4'-DDD	0	0	0
Arsenic	0	0	0
Antimony	0	0	0
Barium	0	0	0
Beryllium	0	0	0
Cadmium	0	0	0
Chromium (III)	0	0	0
Copper	0	0	0
Lead	0	0	0
Manganese	0	0	0
Mercury	0	0	0
Selenium	0	0	0
Vanadium	0	0	0
Zinc	0	0	0
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	0	0	0
TOTAL	1.528e-6	0	5.50e-11

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL

SITE NAME: TINKER AFB - CRUTCHO CREEK - SD15
LOCATION: OKLAHOMA CITY, OK
DATE: 08/11/92

EXPOSURE SCENARIO - ADOLESCENTS

RELEVANT EQUATIONS: DEX = (C x SA x AF x ABS x EF x ED)/(BW x AT x LT x 1E6)

ASSUMPTIONS:

C	= CONCENTRATION IN SOIL (MG/KG)		
SA1	= YOUTH SKIN SURFACE AREA (SQ CM/DAY):		8500
SA2	= ADULT SKIN SURFACE AREA (SQ CM/DAY):		0
AF	= ADHERENCE FACTOR (MG/SQ CM):		1
ABS	= ABSORPTION FRACTION: (DECIMAL FRACTION)	VOCS:	.1
		BNAS/PESTICIDES:	.05
		PCBS:	.03
EF	= EXPOSURE FREQUENCY (DAYS/YEAR)		14
ED1	= YOUTH EXPOSURE DURATION (YEARS):		9
ED2	= ADULT EXPOSURE DURATION (YEARS):		0
BW1	= BODY WEIGHT ADOLESCENT (KG):		40
BW2	= BODY WEIGHT ADULT (KG):		70
AT	= AVERAGING TIME (DAYS/YEAR):		365
LT	= LIFETIME (YEARS):		70

DETERMINE CONVERSION FACTORS:
DEX = (C)*(1MG/1000 UG)*(SA SQ CM)*(AF MG/SQ CM)*(ABS)*(EF DAYS/YEAR)/(AT DAYS/YEAR)/(BW KG)/(1 KG/1E6 MG)*

DOSEyouth = (CF1)*(C)*(ABS) CF1 = 8.151e-9 CANCER RISK = (CF3)*(C)*(ABS) CF3 = 1.048e-9
DOSEadult = (CF2)*(C)*(ABS) CF2 = 0

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)
TINKER AFB - CRUTCHO CREEK - SD15
EXPOSURE SCENARIO - ADOLESCENTS
CALCULATE DOSES:

CHEMICAL	C (UG/KG)	ABSORPTION FRACTION	YOUTH DOSE (MG/KG/DAY)	ADULT DOSE (MG/KG/DAY)	TIME-WEIGHTED DOSE (MG/KG/DAY)	RFD (MG/KG/DAY)	CSF (KG-DAY/MG)
Bis(2-ethylhexyl)phthalate		.05	0	0	0	2e-2	1.4e-2
Di-n-butylphthalate		.05	0	0	0	1e-1	
4,4'-DDD	18	.05	7.336e-9	0	9.43e-10		2.4e-1
Arsenic	3800	0	0	0	0	3e-4	
Antimony		0	0	0	0	4e-4	
Barium	1761000	0	0	0	0	7e-2	
Beryllium		0	0	0	0	5e-3	4.3e0
Cadmium	2800	0	0	0	0	5e-4	
Chromium (III)	224000	0	0	0	0	1e0	
Copper	18400	0	0	0	0	4e-2	
Lead	35500	0	0	0	0	1.4e-3	
Manganese		0	0	0	0	1e-1	
Mercury	510	0	0	0	0	3e-4	
Selenium		0	0	0	0	5e-3	
Vanadium	45300	0	0	0	0	7e-3	
Zinc	63100	0	0	0	0	2e-1	
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RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE THREE)
TINKER AFB - CRUTCHO CREEK - SOIL
EXPOSURE SCENARIO - ADOLESCENTS
DETERMINE HAZARD INDICES AND CANCER RISK:

CHEMICAL	HAZARD INDEX YOUTH	HAZARD INDEX ADULT	CANCER RISK LIFETIME
Bis(2-ethylhexyl)phthalate	0	0	0
Di-n-butylphthalate	0	0	0
4,4'-DDD	0	0	2.26e-10
Arsenic	0	0	0
Antimony	0	0	0
Barium	0	0	0
Beryllium	0	0	0
Cadmium	0	0	0
Chromium (III)	0	0	0
Copper	0	0	0
Lead	0	0	0
Manganese	0	0	0
Mercury	0	0	0
Selenium	0	0	0
Vanadium	0	0	0
Zinc	0	0	0
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TOTAL	0	0	2.26e-10