KAYMARK
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# Appendix F

## Human Health Risk Assessment

APPENDIX F - Human Health Risk Assessment


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# Appendix F.1

## Correlation of Copper and Lead
## Field Screening Data vs. Fixed Lab Data

Appendix F-1
Field Screening – CLP Data Correlation

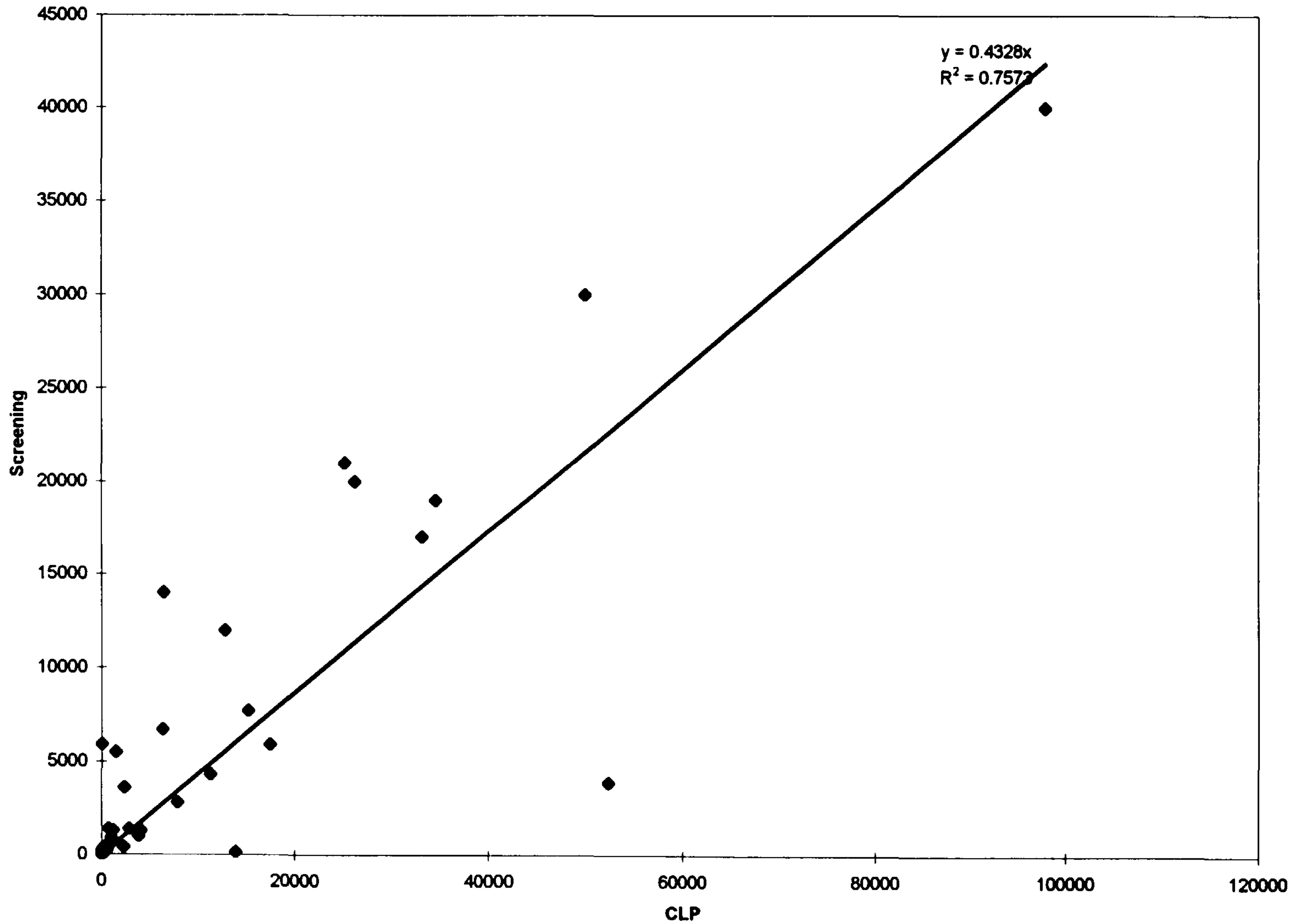
EPA directed Brown and Root Environmental to determine the correlation between data analyzed by field screening and CLP methodologies at the Raymark – Ferry Creek site. A strong correlation would allow for the use of field screening data in quantifying risk at the site. Two statistical procedures were used to determine the correlation between data analyzed by field screening and CLP methodologies: linear regression, which evaluates the correlation on a point-by-point basis; and a nonparametric t-test, which compares the means of two data sets for each method. Paired data selected for the correlation determination were collected at the same location and same depth.

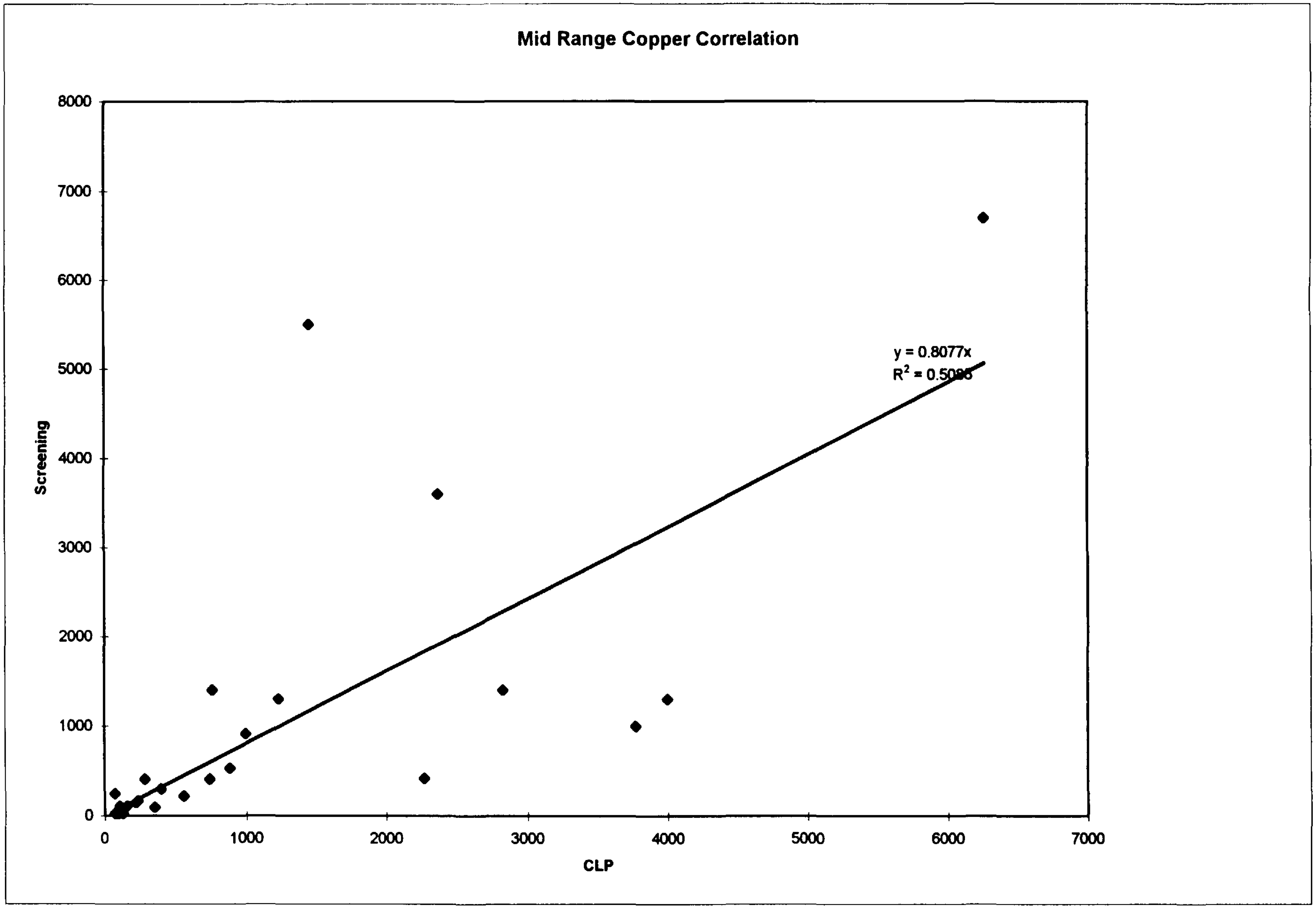
For the first statistical analysis, a scatter plot of paired data was generated for each chemical with the field screening results plotted along the x-axis and the CLP results plotted along the y-axis. A linear regression was then performed on the scatter plot and a correlation coefficient was generated. For data that are strongly correlated, the scatter plot will exhibit a linear relationship with a correlation coefficient (r) of slightly less than 1. The copper and lead data had relatively high correlation coefficients of 0.87 and 0.86, respectively. The PCB data had extremely low correlation coefficients. The PCB scatter plots show that some correlation exists at low concentrations (< 1 ppm), but that this correlation weakens as concentrations increase. This may be due to the narrower calibration ranges of the field screening techniques.

For the second statistical analysis, the field screening data was grouped into one population and the CLP data was grouped into a second population. The Wilcoxon Rank-Sum (WRS) test, a distribution-free or nonparametric t-test, was performed on the two populations to determine whether their means were statistically equivalent. The copper and lead data had statistically equivalent means; the PCB data did not.

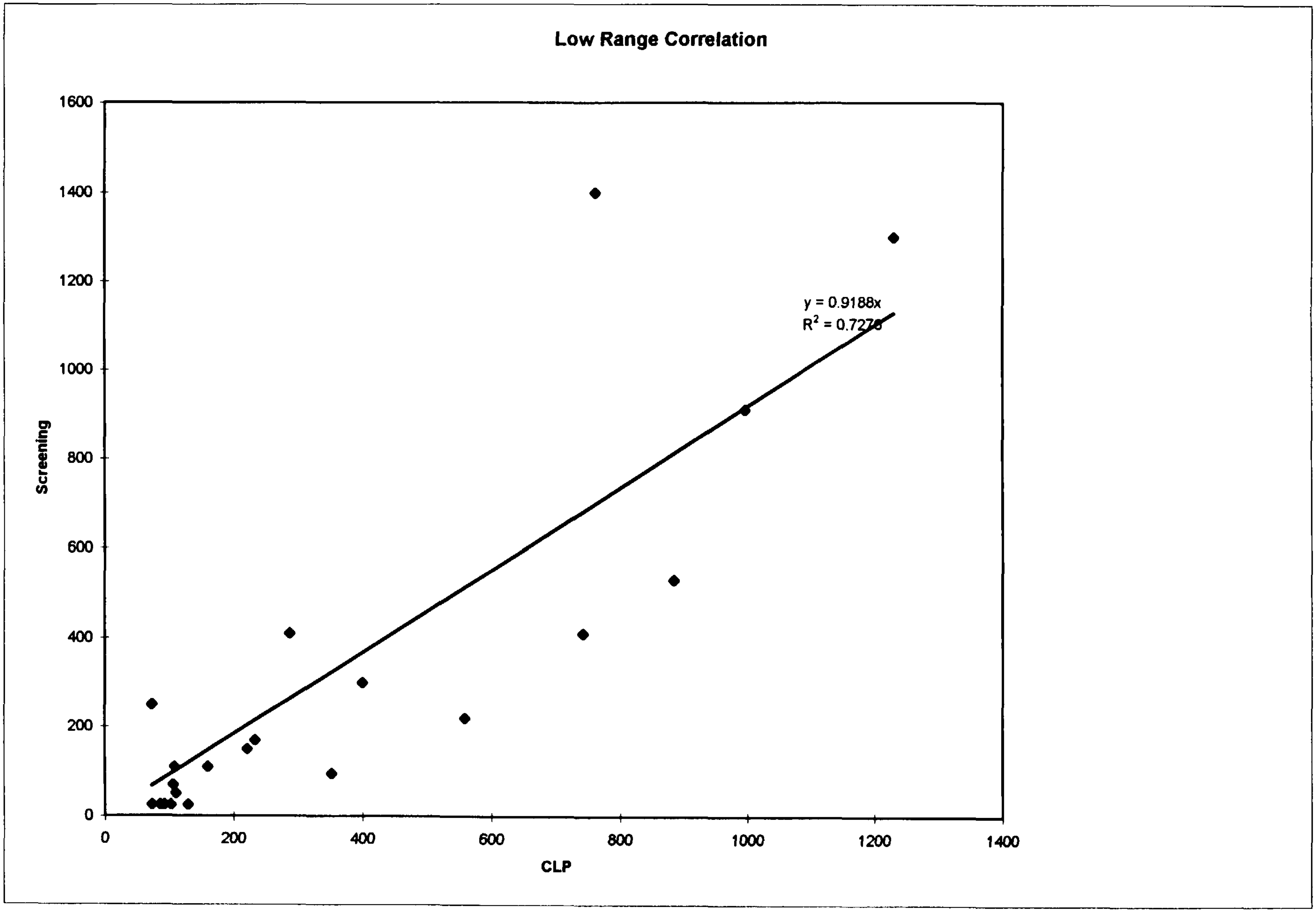
Based on the results of the two statistical analyses, the use of field screening data to quantify risk at the site is acceptable for copper and lead, but not for PCBs

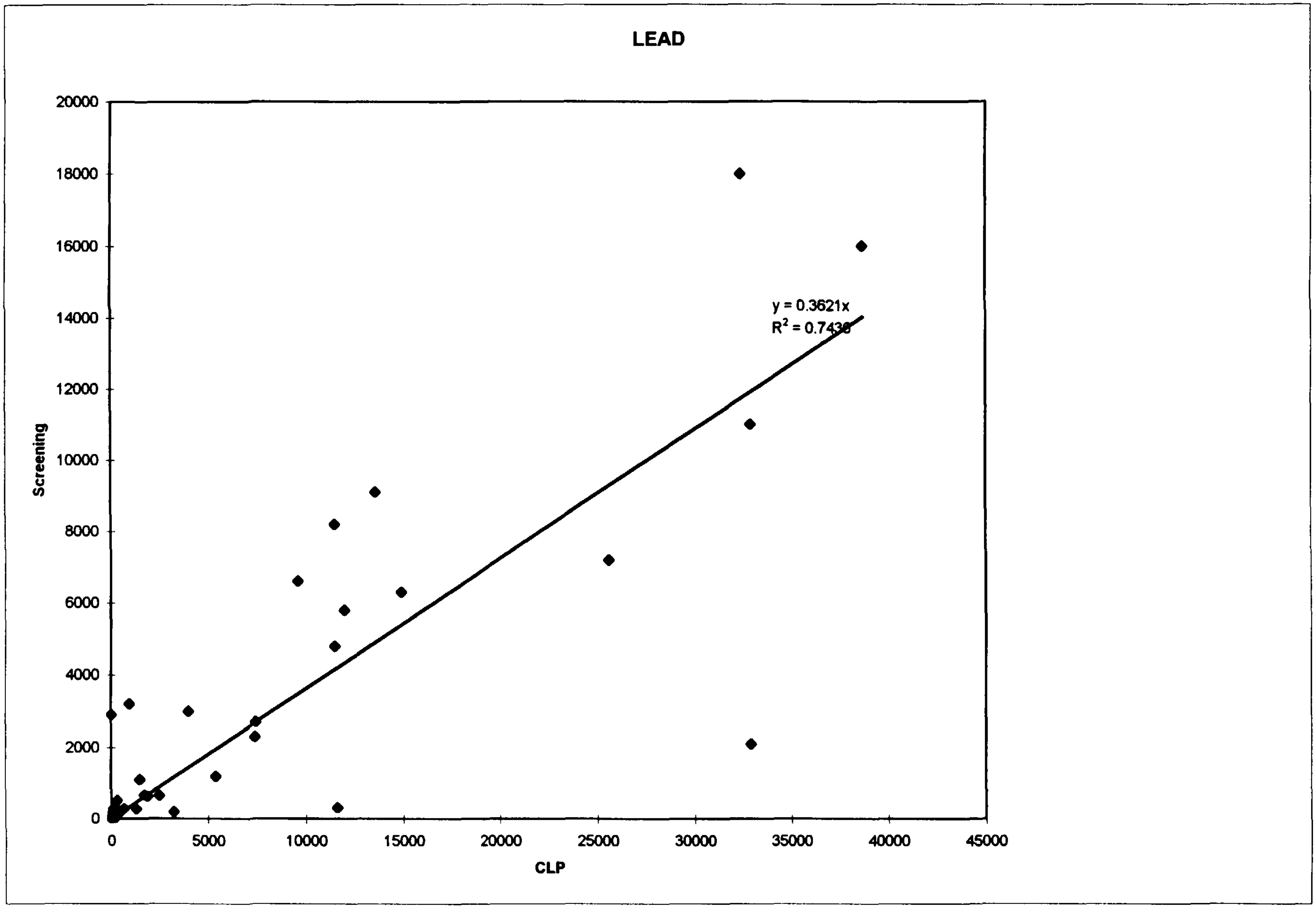
**Copper - Correlation of CLP vs. Screening Data**



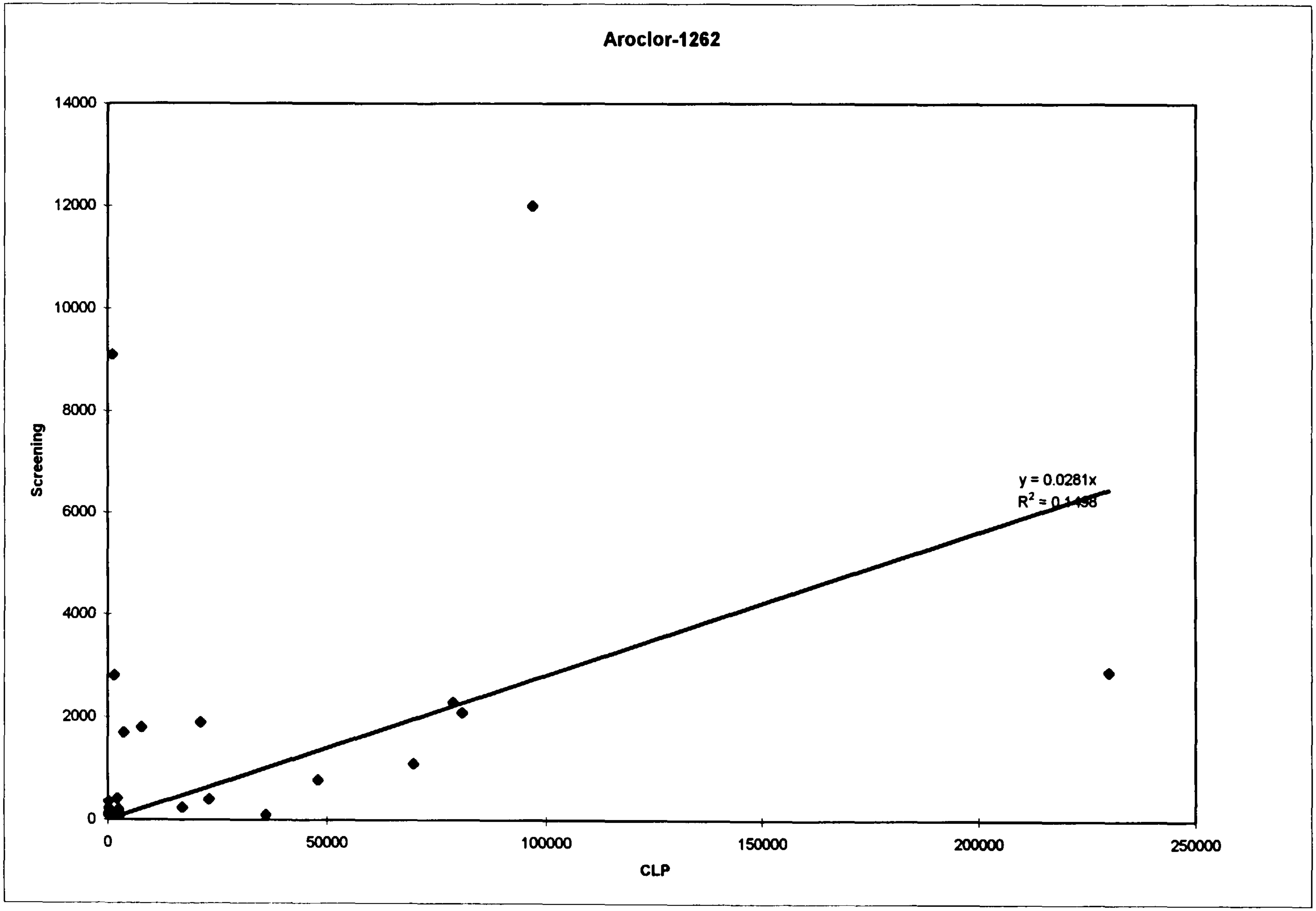


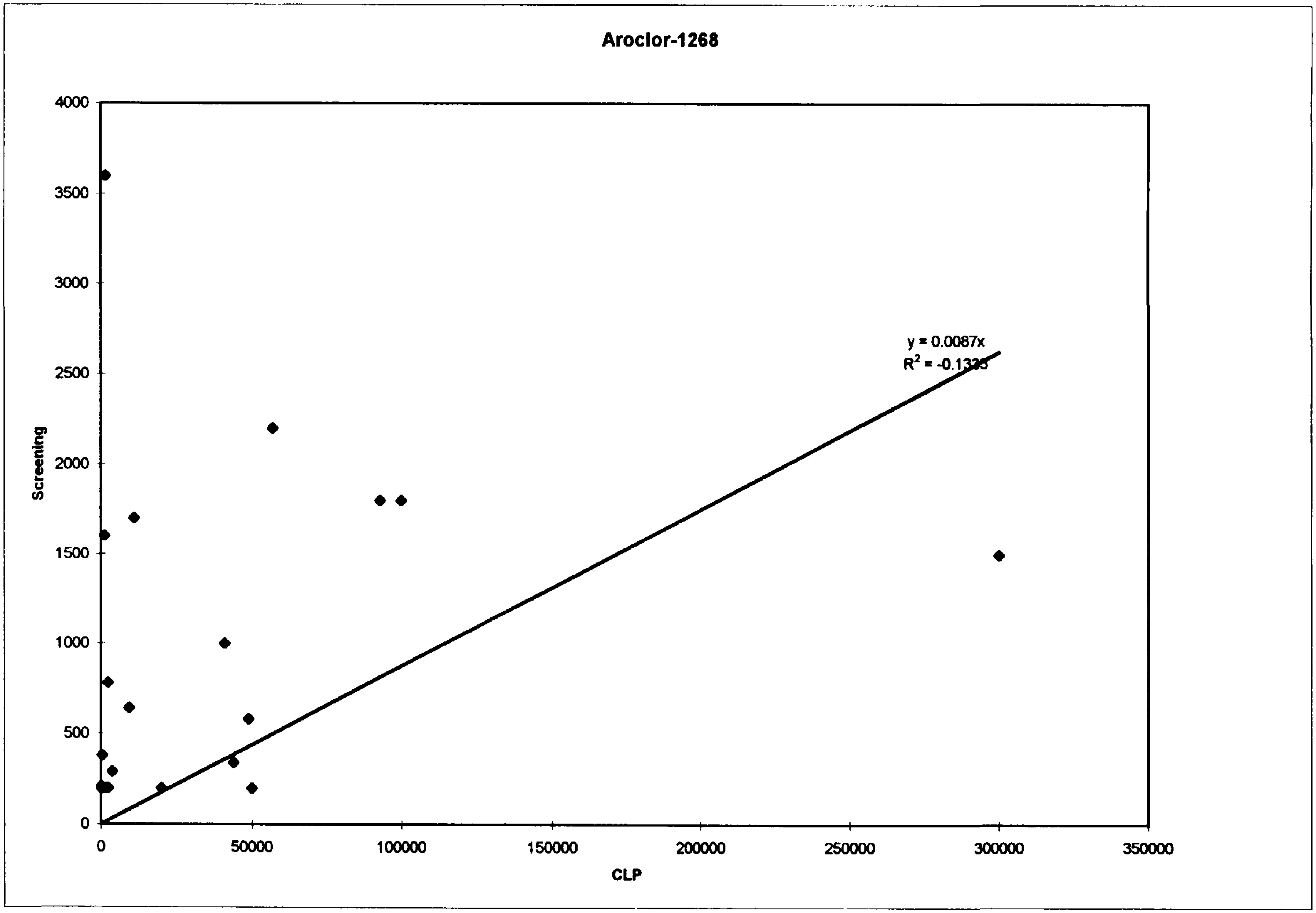
Mid Range Copper Correlation
y = 0.8077x
$R^2$ = 0.5096
Screening
CLP
0
1000
2000
3000
4000
5000
6000
7000
8000


Low Range Correlation
y = 0.9188x
R2 = 0.7276
Screening
CLP
0
200
400
600
800
1000
1200
1400
1600



LEAD
y = 0.3621x
$R^2$ = 0.7438
Screening
CLP
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
0
5000
10000
15000
20000
25000
30000
35000
40000
45000


Aroclor-1262
Screening
CLP
y = 0.0281x
R² = 0.1498
0
2000
4000
6000
8000
10000
12000
14000
0
50000
100000
150000
200000
250000


Aroclor-1268
Screening
CLP
y = 0.0087x
R2 = -0.1325
0
500
1000
1500
2000
2500
3000
3500
4000
0
50000
100000
150000
200000
250000
300000
350000

Copper Correlation Data

| nsample | para | clp_res | clp_result | clp_qual | clp_units | scr_res | scr_result | scr_qual | | clp_res | scr_res |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SP-SO-MW110D-1820 | COPPER | 7 | 7 | | MG/KG | 25 | ND | U | | 7 | 25 |
| MF-SO-MW101D-4850-D | COPPER | 7.9 | 7.9 | | MG/KG | 25 | ND | U | | 7.9 | 25 |
| MF-SO-MW101D-4850 | COPPER | 8.7 | 8.7 | | MG/KG | 25 | ND | U | | 8.7 | 25 |
| SP-SO-MW112B-2628 | COPPER | 10.6 | 10.6 | | MG/KG | 25 | ND | U | | 10.6 | 25 |
| MF-SO-MW104D-6062 | COPPER | 11.9 | 11.9 | | MG/KG | 25 | ND | U | | 11.9 | 25 |
| MF-SO-MW101D-2830 | COPPER | 12.4 | 12.4 | | MG/KG | 25 | ND | U | | 12.4 | 25 |
| MF-SO-SB5-1416 | COPPER | 13.8 | 13.8 | | MG/KG | 8 | 8 | | | 13.8 | 8 |
| MF-SO-MW104D-1618 | COPPER | 15.2 | 15.2 | | MG/KG | 25 | ND | U | | 15.2 | 25 |
| MF-SO-MW102-7880 | COPPER | 17.2 | 17.2 | | MG/KG | 25 | ND | U | | 17.2 | 25 |
| MF-SO-MW104D-3234 | COPPER | 17.2 | 17.2 | | MG/KG | 25 | ND | U | | 17.2 | 25 |
| SP-SO-SB9-0608 | COPPER | 17.4 | 17.4 | J | MG/KG | 25 | ND | U | | 17.4 | 25 |
| MF-SO-MW102-2224 | COPPER | 18.5 | 18.5 | | MG/KG | 25 | ND | U | | 18.5 | 25 |
| MF-SO-TP3-0405 | COPPER | 22.1 | 22.1 | | MG/KG | 53 | 53 | U | | 22.1 | 53 |
| BC-SO-SB8A-0810 | COPPER | 22.9 | 22.9 | J | MG/KG | 25 | ND | U | | 22.9 | 25 |
| MF-SO-MW102-4244 | COPPER | 23.4 | 23.4 | | MG/KG | 25 | ND | U | | 23.4 | 25 |
| MF-SO-MW104D-4648 | COPPER | 28.9 | 28.9 | | MG/KG | 25 | ND | U | | 28.9 | 25 |
| SP-SO-SB1-0406B | COPPER | 32.9 | 32.9 | J | MG/KG | 21 | 21 | | | 32.9 | 21 |
| SP-SO-MW113B-0810 | COPPER | 33.8 | 33.8 | J | MG/KG | 25 | ND | U | | 33.8 | 25 |
| MF-SO-MW103-1416 | COPPER | 34.4 | 34.4 | | MG/KG | 5900 | 5900 | | | 34.4 | 5900 |
| MF-SO-SB1-0810 | COPPER | 35.8 | 35.8 | | MG/KG | 26 | 26 | | | 35.8 | 26 |
| BC-SO-SB9-0608 | COPPER | 37.4 | 37.4 | J | MG/KG | 25 | ND | U | | 37.4 | 25 |
| MF-SO-MW104D-0002 | COPPER | 40.3 | 40.3 | J | MG/KG | 25 | ND | U | | 40.3 | 25 |
| SP-SO-SB5-1214 | COPPER | 63.5 | 63.5 | | MG/KG | 25 | ND | U | | 63.5 | 25 |
| SP-SO-SB9-0810 | COPPER | 73.3 | 73.3 | J | MG/KG | 250 | 250 | J | | 73.3 | 250 |
| SP-SO-SB7-0204 | COPPER | 73.5 | 73.5 | J | MG/KG | 25 | ND | U | | 73.5 | 25 |
| BC-SO-SB2-1214 | COPPER | 85.4 | 85.4 | J | MG/KG | 25 | ND | U | | 85.4 | 25 |
| SP-SO-MW111D-1012 | COPPER | 91.8 | 91.8 | J | MG/KG | 25 | ND | U | | 91.8 | 25 |
| SP-SO-MW110D-0406 | COPPER | 102 | 102 | | MG/KG | 25 | ND | U | | 102 | 25 |
| MF-SO-MW101D-0608 | COPPER | 106 | 106 | J | MG/KG | 70 | 70 | | | 106 | 70 |
| BC-SO-MW120-0406 | COPPER | 108 | 108 | | MG/KG | 110 | 110 | J | | 108 | 110 |
| MF-SO-SB2-1416 | COPPER | 110 | 110 | | MG/KG | 51 | 51 | | | 110 | 51 |
| BC-SO-SB8A-1012 | COPPER | 129 | 129 | J | MG/KG | 25 | ND | U | | 129 | 25 |
| SP-SO-MW110D-1012 | COPPER | 160 | 160 | | MG/KG | 110 | 110 | J | | 160 | 110 |
| SP-SO-MW111D-0810 | COPPER | 222 | 222 | J | MG/KG | 150 | 150 | J | | 222 | 150 |
| BC-SO-SB9-0204B | COPPER | 234 | 234 | J | MG/KG | 170 | 170 | J | | 234 | 170 |
| MF-SO-SB8-0608 | COPPER | 287 | 287 | J | MG/KG | 410 | 410 | | | 287 | 410 |
| MF-SO-SB3-0810 | COPPER | 352 | 352 | J | MG/KG | 95 | 95 | | | 352 | 95 |
| SP-SO-SB6-0608A | COPPER | 400 | 400 | | MG/KG | 300 | 300 | | | 400 | 300 |
| SP-SO-SB3-1416 | COPPER | 559 | 559 | J | MG/KG | 220 | 220 | | | 559 | 220 |
| MF-SO-SB2-0608 | COPPER | 742 | 742 | | MG/KG | 410 | 410 | | | 742 | 410 |
| MF-SO-MW103-1618 | COPPER | 762 | 762 | | MG/KG | 1400 | 1400 | | | 762 | 1400 |
| SP-SO-MW113B-0406 | COPPER | 885 | 885 | J | MG/KG | 530 | 530 | | | 885 | 530 |
| SP-SO-MW113B-0204B | COPPER | 997 | 997 | J | MG/KG | 910 | 910 | | | 997 | 910 |
| SP-SO-SB8-0002 | COPPER | 1230 | 1230 | J | MG/KG | 1300 | 1300 | | | 1230 | 1300 |
| BC-SO-SB6-0810 | COPPER | 1450 | 1450 | | MG/KG | 5500 | 5500 | | | 1450 | 5500 |
| MF-SO-TP2-0506 | COPPER | 2270 | 2270 | | MG/KG | 420 | 420 | | | 2270 | 420 |
| MF-SO-SB7-1416 | COPPER | 2370 | 2370 | J | MG/KG | 3600 | 3600 | | | 2370 | 3600 |
| SP-SO-MW112B-0810A | COPPER | 2830 | 2830 | | MG/KG | 1400 | 1400 | | | 2830 | 1400 |
| BC-SO-SB5-0002B | COPPER | 3770 | 3770 | | MG/KG | 1000 | 1000 | | | 3770 | 1000 |
| MF-SO-SB7-0406 | COPPER | 4000 | 4000 | J | MG/KG | 1300 | 1300 | | | 4000 | 1300 |
| MF-SO-SB4-1214 | COPPER | 6260 | 6260 | | MG/KG | 6700 | 6700 | | | 6260 | 6700 |
| MF-SO-SB6-0204 | COPPER | 6390 | 6390 | | MG/KG | 14000 | 14000 | | | 6390 | 14000 |
| SP-SO-MW112B-0608 | COPPER | 7850 | 7850 | | MG/KG | 2800 | 2800 | | | 7850 | 2800 |
| MF-SO-MW102-0406 | COPPER | 11300 | 11300 | J | MG/KG | 4300 | 4300 | | | 11300 | 4300 |
| SP-SO-SB4-0406 | COPPER | 12800 | 12800 | J | MG/KG | 12000 | 12000 | | | 12800 | 12000 |
| MF-SO-SB4-0406 | COPPER | 13900 | 13900 | J | MG/KG | 150 | 150 | | | 13900 | 150 |
| BC-SO-SB3-0204A | COPPER | 15200 | 15200 | J | MG/KG | 7700 | 7700 | | | 15200 | 7700 |
| BC-SO-SB1-0608 | COPPER | 17500 | 17500 | J | MG/KG | 5900 | 5900 | | | 17500 | 5900 |
| SP-SO-SB2-0204B | COPPER | 25200 | 25200 | | MG/KG | 21000 | 21000 | | | 25200 | 21000 |
| BC-SO-SB4-0204 | COPPER | 26300 | 26300 | | MG/KG | 20000 | 20000 | | | 26300 | 20000 |
| BC-SO-SB1-0406 | COPPER | 33200 | 33200 | J | MG/KG | 17000 | 17000 | | | 33200 | 17000 |

Copper Correlation Data

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MF-SO-MW103-0810 | COPPER | 34600 | 34600 | | MG/KG | 19000 | 19000 | | | | 34600 | 19000 |
| BC-SO-SB8-0204A | COPPER | 49900 | 49900 | J | MG/KG | 30000 | 30000 | | | | 49900 | 30000 |
| BC-SO-SB1-0204B | COPPER | 52300 | 52300 | J | MG/KG | 3900 | 3900 | | | | 52300 | 3900 |
| MF-SO-MW103-0608 | COPPER | 97900 | 97900 | | MG/KG | 40000 | 40000 | | | | 97900 | 40000 |

Lead Correlation Data

| nsample | sample_no | location | para | clp_res | scr_res | clp_qual | scr_qual | units |
|---|---|---|---|---|---|---|---|---|
| SP-SO-MW112B-2628 | MAES96 | SP-SO-MW112B-2628 | LEAD | 2.1 | 0 | J | U | MG/KG |
| MF-SO-MW104D-3234 | MAES95 | MF-SO-MW104D-3234 | LEAD | 2.2 | 0 | J | U | MG/KG |
| MF-SO-MW101D-4850 | MAES80 | MF-SO-MW101D-4850 | LEAD | 2.3 | 0 | UJ | U | MG/KG |
| MF-SO-MW101D-4850-D | MAES81 | MF-SO-MW101D-4850 | LEAD | 2.3 | 0 | UJ | U | MG/KG |
| MF-SO-MW104D-6062 | MAET04 | MF-SO-MW104D-6062 | LEAD | 2.5 | 30 | J | J | MG/KG |
| SP-SO-MW110D-1820 | MAET10 | SP-SO-MW110D-1820 | LEAD | 3 | 0 | J | U | MG/KG |
| MF-SO-MW101D-2830 | MAES78 | MF-SO-MW101D-2830 | LEAD | 3.1 | 0 | UJ | U | MG/KG |
| MF-SO-SB5-1416 | MAEG35 | MF-SO-SB5-1416 | LEAD | 3.3 | 9 | | U | MG/KG |
| MF-SO-MW102-4244 | MAES94 | MF-SO-MW102-4244 | LEAD | 3.8 | 0 | J | U | MG/KG |
| MF-SO-MW104D-4648 | MAET03 | MF-SO-MW104D-4648 | LEAD | 5.6 | 0 | J | U | MG/KG |
| MF-SO-SB1-0810 | MAEG32 | MF-SO-SB1-0810 | LEAD | 6 | 10 | | U | MG/KG |
| MF-SO-MW102-7880 | MAET02 | MF-SO-MW102-7880 | LEAD | 6.5 | 0 | J | U | MG/KG |
| MF-SO-MW102-2224 | MAES79 | MF-SO-MW102-2224 | LEAD | 6.7 | 0 | J | U | MG/KG |
| MF-SO-MW104D-1618 | MAES91 | MF-SO-MW104D-1618 | LEAD | 7.3 | 0 | J | U | MG/KG |
| BC-SO-SB8A-0810 | MAET39 | BC-SO-SB8A-0810 | LEAD | 12.3 | 0 | U | U | MG/KG |
| MF-SO-MW103-1416 | MAES98 | MF-SO-MW103-1416 | LEAD | 18.2 | 2900 | J | | MG/KG |
| BC-SO-SB9-0608 | MAET35 | BC-SO-SB9-0608 | LEAD | 20.8 | 39 | | J | MG/KG |
| SP-SO-SB1-0406B | MAES73 | SP-SO-SB1-0406B | LEAD | 26.6 | 16 | J | | MG/KG |
| MF-SO-MW104D-0002 | MAES87 | MF-SO-MW104D-0002 | LEAD | 26.8 | 0 | J | U | MG/KG |
| SP-SO-SB9-0608 | MAET37 | SP-SO-SB9-0608 | LEAD | 32 | 0 | | U | MG/KG |
| SP-SO-MW113B-0810 | MAET25 | SP-SO-MW113B-0810 | LEAD | 40.1 | 0 | | U | MG/KG |
| SP-SO-SB5-1214 | MAES83 | SP-SO-SB5-1214 | LEAD | 52.7 | 0 | J | U | MG/KG |
| BC-SO-MW120-0406 | MAES77 | BC-SO-MW120-0406 | LEAD | 55.3 | 61 | J | J | MG/KG |
| MF-SO-TP3-0405 | MAEH50 | MF-SO-TP3-0405 | LEAD | 59.8 | 173 | | | MG/KG |
| MF-SO-SB2-1416 | MAEG34 | MF-SO-SB2-1416 | LEAD | 72.5 | 31 | | | MG/KG |
| BC-SO-SB2-1214 | MAEF93 | BC-SO-SB2-1214 | LEAD | 75.9 | 0 | J | U | MG/KG |
| SP-SO-SB7-0204 | MAET06 | SP-SO-SB7-0204 | LEAD | 89.9 | 53 | | | MG/KG |
| BC-SO-SB8A-1012 | MAET40 | BC-SO-SB8A-1012 | LEAD | 94.1 | 49 | | J | MG/KG |
| SP-SO-SB9-0810 | MAET38 | SP-SO-SB9-0810 | LEAD | 101 | 280 | | | MG/KG |
| SP-SO-MW111D-0810-D | MAET22 | SP-SO-MW111D-0810 | LEAD | 122 | 140 | | | MG/KG |
| MF-SO-MW101D-0608 | MAEH58 | MF-SO-MW101D-0608 | LEAD | 130 | 71 | J | | MG/KG |
| BC-SO-SB9-0204B | MAET34 | BC-SO-SB9-0204B | LEAD | 137 | 140 | | | MG/KG |
| SP-SO-MW113B-0204B | MAET24 | SP-SO-MW113B-0204B | LEAD | 157 | 120 | | | MG/KG |
| SP-SO-MW113B-0406 | MAET29 | SP-SO-MW113B-0406 | LEAD | 182 | 170 | | | MG/KG |
| SP-SO-MW111D-1012 | MAET23 | SP-SO-MW111D-1012 | LEAD | 183 | 130 | | | MG/KG |
| MF-SO-SB3-0810 | MAEH53 | MF-SO-SB3-0810 | LEAD | 189 | 18 | J | | MG/KG |
| SP-SO-MW113B-0608 | MAET26 | SP-SO-MW113B-0608 | LEAD | 215 | 210 | | | MG/KG |
| MF-SO-SB3-0810-D | MAEH54 | MF-SO-SB3-0810 | LEAD | 227 | 59 | J | | MG/KG |
| SP-SO-SB6-0608A | MAES84 | SP-SO-SB6-0608A | LEAD | 273 | 270 | J | | MG/KG |
| MF-SO-MW103-1618 | MAET00 | MF-SO-MW103-1618 | LEAD | 275 | 500 | J | | MG/KG |
| SP-SO-MW110D-0406 | MAET08 | SP-SO-MW110D-0406 | LEAD | 305 | 160 | J | | MG/KG |
| MF-SO-SB8-0608 | MAET18 | MF-SO-SB8-0608 | LEAD | 310 | 530 | | | MG/KG |
| SP-SO-MW111D-0810 | MAET21 | SP-SO-MW111D-0810 | LEAD | 354 | 130 | | | MG/KG |
| SP-SO-MW110D-1012 | MAET13 | SP-SO-MW110D-1012 | LEAD | 363 | 160 | J | | MG/KG |
| SP-SO-SB3-1416 | MAES85 | SP-SO-SB3-1416 | LEAD | 459 | 180 | J | | MG/KG |
| MF-SO-SB2-0608 | MAEG33 | MF-SO-SB2-0608 | LEAD | 678 | 290 | | | MG/KG |
| BC-SO-SB6-0810 | MAES76 | BC-SO-SB6-0810 | LEAD | 946 | 3200 | J | | MG/KG |
| MF-SO-TP2-0506 | MAEH49 | MF-SO-TP2-0506 | LEAD | 1290 | 270 | | | MG/KG |
| SP-SO-SB8-0002 | MAET33 | SP-SO-SB8-0002 | LEAD | 1480 | 1100 | | | MG/KG |
| MF-SO-SB7-0406 | MAET17 | MF-SO-SB7-0406 | LEAD | 1690 | 670 | | | MG/KG |
| SP-SO-MW112B-0810A | MAES93 | SP-SO-MW112B-0810A | LEAD | 1870 | 630 | J | | MG/KG |
| BC-SO-SB5-0002B | MAES75 | BC-SO-SB5-0002B | LEAD | 2460 | 660 | J | | MG/KG |
| MF-SO-SB4-1214 | MAEH55 | MF-SO-SB4-1214 | LEAD | 3220 | 200 | | | MG/KG |
| MF-SO-SB7-1416 | MAET16 | MF-SO-SB7-1416 | LEAD | 3980 | 3000 | | | MG/KG |

Lead Correlation Data

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SP-SO-MW112B-0608 | MAES92 | SP-SO-MW112B-0608 | LEAD | 5390 | 1200 | J | | MG/KG |
| MF-SO-MW102-0406 | MAES71 | MF-SO-MW102-0406 | LEAD | 7400 | 2300 | J | | MG/KG |
| MF-SO-MW102-0406-D | MAES72 | MF-SO-MW102-0406 | LEAD | 7450 | 2700 | J | | MG/KG |
| MF-SO-SB6-0204 | MAEH48 | MF-SO-SB6-0204 | LEAD | 9600 | 6600 | | | MG/KG |
| SP-SO-SB4-0406 | MAES86 | SP-SO-SB4-0406 | LEAD | 11500 | 8200 | J | | MG/KG |
| BC-SO-SB1-0608 | MAES89 | BC-SO-SB1-0608 | LEAD | 11500 | 4800 | J | | MG/KG |
| MF-SO-SB4-0406 | MAES88 | MF-SO-SB4-0406 | LEAD | 11600 | 310 | J | | MG/KG |
| BC-SO-SB3-0204A | MAEH57 | BC-SO-SB3-0204A | LEAD | 12000 | 5800 | J | | MG/KG |
| SP-SO-SB2-0204B | MAES82 | SP-SO-SB2-0204B | LEAD | 13600 | 9100 | J | | MG/KG |
| MF-SO-MW103-0810 | MAES99 | MF-SO-MW103-0810 | LEAD | 14900 | 6300 | J | | MG/KG |
| MF-SO-MW103-0608 | MAET01 | MF-SO-MW103-0608 | LEAD | 25600 | 7200 | J | | MG/KG |
| BC-SO-SB8-0204A | MAET27 | BC-SO-SB8-0204A | LEAD | 32400 | 18000 | | | MG/KG |
| BC-SO-SB4-0204 | MAES74 | BC-SO-SB4-0204 | LEAD | 32900 | 11000 | J | | MG/KG |
| BC-SO-SB1-0204B | MAEF91 | BC-SO-SB1-0204B | LEAD | 32900 | 2100 | J | | MG/KG |
| BC-SO-SB1-0406 | MAEF92 | BC-SO-SB1-0406 | LEAD | 38700 | 16000 | J | | MG/KG |

Aroclor 1262 Correlation Data

| nsample | sample_no | location | para | clp_res | scr_res | qual | units | scr_qual |
|---|---|---|---|---|---|---|---|---|
| MF-SO-MW104D-6062 | SAA687 | MF-SO-MW104D-6062 | AROCLOR-1262 | 18.5 | 100 | U | UG/KG | U |
| MF-SO-MW102-2224 | SAA663 | MF-SO-MW102-2224 | AROCLOR-1262 | 18.5 | 100 | U | UG/KG | U |
| MF-SO-MW102-7880 | SAA685 | MF-SO-MW102-7880 | AROCLOR-1262 | 19 | 100 | U | UG/KG | U |
| MF-SO-SB5-1416 | SA4046 | MF-SO-SB5-1416 | AROCLOR-1262 | 19 | 100 | U | UG/KG | U |
| SP-SO-MW110D-1820 | SAA694 | SP-SO-MW110D-1820 | AROCLOR-1262 | 19.5 | 100 | UJ | UG/KG | U |
| MF-SO-SB1-0810 | SA4043 | MF-SO-SB1-0810 | AROCLOR-1262 | 20 | 100 | U | UG/KG | U |
| MF-SO-MW104D-0002 | SAA671 | MF-SO-MW104D-0002 | AROCLOR-1262 | 20 | 100 | U | UG/KG | U |
| MF-SO-MW104D-3234 | SAA678 | MF-SO-MW104D-3234 | AROCLOR-1262 | 20 | 100 | U | UG/KG | U |
| MF-SO-MW101D-4850 | SAA664 | MF-SO-MW101D-4850 | AROCLOR-1262 | 20 | 100 | U | UG/KG | U |
| MF-SO-MW101D-4850-D | SAA665 | MF-SO-MW101D-4850 | AROCLOR-1262 | 20 | 100 | U | UG/KG | U |
| MF-SO-MW101D-2830 | SAA662 | MF-SO-MW101D-2830 | AROCLOR-1262 | 20.5 | 100 | U | UG/KG | U |
| SP-SO-MW112B-2628 | SAA679 | SP-SO-MW112B-2628 | AROCLOR-1262 | 20.5 | 100 | U | UG/KG | U |
| MF-SO-MW102-4244 | SAA677 | MF-SO-MW102-4244 | AROCLOR-1262 | 22.5 | 100 | U | UG/KG | U |
| MF-SO-MW104D-4648 | SAA686 | MF-SO-MW104D-4648 | AROCLOR-1262 | 23.5 | 100 | U | UG/KG | U |
| SP-SO-SB1-0406B | SAA651 | SP-SO-SB1-0406B | AROCLOR-1262 | 26 | 100 | J | UG/KG | U |
| BC-SO-SB9-0608 | SA9041 | BC-SO-SB9-0608 | AROCLOR-1262 | 29 | 100 | J | UG/KG | U |
| MF-SO-MW104D-1618 | SAA674 | MF-SO-MW104D-1618 | AROCLOR-1262 | 31.5 | 100 | U | UG/KG | U |
| MF-SO-MW103-1416 | SAA681 | MF-SO-MW103-1416 | AROCLOR-1262 | 38.5 | 100 | U | UG/KG | U |
| SP-SO-SB5-1214 | SAA667 | SP-SO-SB5-1214 | AROCLOR-1262 | 51 | 100 | J | UG/KG | U |
| SP-SO-MW113B-0810 | SA2742 | SP-SO-MW113B-0810 | AROCLOR-1262 | 58 | 100 | J | UG/KG | U |
| BC-SO-SB8A-0810 | SA2773 | BC-SO-SB8A-0810 | AROCLOR-1262 | 69 | 100 | J | UG/KG | U |
| SP-SO-MW113B-0204B | SA2741 | SP-SO-MW113B-0204B | AROCLOR-1262 | 72 | 100 | J | UG/KG | U |
| MF-SO-SB2-1416 | SA4045 | MF-SO-SB2-1416 | AROCLOR-1262 | 76 | 100 | J | UG/KG | U |
| MF-SO-TP3-0405 | SAA640 | MF-SO-TP3-0405 | AROCLOR-1262 | 79 | 100 | | UG/KG | U |
| SP-SO-SB7-0204 | SA2748 | SP-SO-SB7-0204 | AROCLOR-1262 | 90 | 100 | J | UG/KG | U |
| SP-SO-MW113B-0406 | SA2746 | SP-SO-MW113B-0406 | AROCLOR-1262 | 99 | 100 | J | UG/KG | U |
| SP-SO-MW110D-0002 | SAA696 | SP-SO-MW110D-0002 | AROCLOR-1262 | 140 | 100 | J | UG/KG | U |
| BC-SO-SB9-0204B | SAA656 | BC-SO-SB9-0204B | AROCLOR-1262 | 180 | 100 | J | UG/KG | U |
| SP-SO-SB9-0810 | SA9043 | SP-SO-SB9-0810 | AROCLOR-1262 | 230 | 360 | J | UG/KG | |
| MF-SO-SB3-0810 | SAA652 | MF-SO-SB3-0810 | AROCLOR-1262 | 230 | 100 | J | UG/KG | U |
| SP-SO-MW110D-0406 | SAA692 | SP-SO-MW110D-0406 | AROCLOR-1262 | 240 | 100 | J | UG/KG | U |
| SP-SO-SB6-0608A | SAA668 | SP-SO-SB6-0608A | AROCLOR-1262 | 260 | 100 | J | UG/KG | U |
| MF-SO-SB4-1214 | SAA654 | MF-SO-SB4-1214 | AROCLOR-1262 | 280 | 100 | | UG/KG | U |
| BC-SO-SB2-1214 | SAA645 | BC-SO-SB2-1214 | AROCLOR-1262 | 280 | 220 | | UG/KG | |
| MF-SO-SB3-0810-D | SAA653 | MF-SO-SB3-0810 | AROCLOR-1262 | 320 | 100 | J | UG/KG | U |
| BC-SO-SB8A-1012 | SA2774 | BC-SO-SB8A-1012 | AROCLOR-1262 | 330 | 100 | J | UG/KG | U |
| SP-SO-MW111D-0810-D | SA2739 | SP-SO-MW111D-0810 | AROCLOR-1262 | 340 | 100 | J | UG/KG | U |
| MF-SO-SB8-0608 | SA2734 | MF-SO-SB8-0608 | AROCLOR-1262 | 340 | 100 | J | UG/KG | U |
| BC-SO-MW120-0406 | SAA661 | BC-SO-MW120-0406 | AROCLOR-1262 | 380 | 100 | | UG/KG | U |
| SP-SO-MW111D-0810 | SA2738 | SP-SO-MW111D-0810 | AROCLOR-1262 | 500 | 100 | J | UG/KG | U |
| MF-SO-MW101D-0608 | SAA648 | MF-SO-MW101D-0608 | AROCLOR-1262 | 540 | 100 | | UG/KG | U |
| MF-SO-TP2-0506 | SA4048 | MF-SO-TP2-0506 | AROCLOR-1262 | 550 | 100 | | UG/KG | U |
| SP-SO-SB9-0608 | SA9042 | SP-SO-SB9-0608 | AROCLOR-1262 | 580 | 100 | J | UG/KG | U |
| MF-SO-SB7-0406 | SA2733 | MF-SO-SB7-0406 | AROCLOR-1262 | 650 | 100 | J | UG/KG | U |
| SP-SO-SB4-0406 | SAA670 | SP-SO-SB4-0406 | AROCLOR-1262 | 1100 | 9100 | | UG/KG | |
| MF-SO-SB2-0608 | SA4044 | MF-SO-SB2-0608 | AROCLOR-1262 | 1500 | 2800 | J | UG/KG | |
| BC-SO-SB5-0002B | SAA659 | BC-SO-SB5-0002B | AROCLOR-1262 | 2100 | 410 | J | UG/KG | |
| MF-SO-MW102-0406-D | SAA650 | MF-SO-MW102-0406 | AROCLOR-1262 | 2600 | 200 | | UG/KG | |
| SP-SO-SB3-1416 | SAA669 | SP-SO-SB3-1416 | AROCLOR-1262 | 2800 | 100 | J | UG/KG | U |
| MF-SO-MW102-0406 | SAA649 | MF-SO-MW102-0406 | AROCLOR-1262 | 2900 | 100 | | UG/KG | U |
| SP-SO-MW112B-0608 | SAA675 | SP-SO-MW112B-0608 | AROCLOR-1262 | 3600 | 1700 | J | UG/KG | |
| SP-SO-SB8-0002 | SAA655 | SP-SO-SB8-0002 | AROCLOR-1262 | 7700 | 1800 | J | UG/KG | |
| BC-SO-SB1-0204B | SAA643 | BC-SO-SB1-0204B | AROCLOR-1262 | 17000 | 240 | | UG/KG | |
| MF-SO-MW103-0810 | SAA682 | MF-SO-MW103-0810 | AROCLOR-1262 | 21000 | 1900 | | UG/KG | |
| BC-SO-SB6-0810 | SAA660 | BC-SO-SB6-0810 | AROCLOR-1262 | 23000 | 400 | | UG/KG | |
| MF-SO-SB7-1416 | SAA690 | MF-SO-SB7-1416 | AROCLOR-1262 | 36000 | 100 | J | UG/KG | U |

Aroclor 1262 Correlation Data

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| MF-SO-SB6-0204 | SA4047 | MF-SO-SB6-0204 | AROCLOR-1262 | 48000 | 780 | | UG/KG | |
| BC-SO-SB3-0204A | SAA647 | BC-SO-SB3-0204A | AROCLOR-1262 | 70000 | 1100 | | UG/KG | |
| BC-SO-SB4-0204 | SAA658 | BC-SO-SB4-0204 | AROCLOR-1262 | 79000 | 2300 | | UG/KG | |
| BC-SO-SB1-0406 | SAA644 | BC-SO-SB1-0406 | AROCLOR-1262 | 81000 | 2100 | | UG/KG | |
| SP-SO-SB2-0204B | SAA666 | SP-SO-SB2-0204B | AROCLOR-1262 | 97000 | 12000 | | UG/KG | |
| BC-SO-SB8-0204A | SA2744 | BC-SO-SB8-0204A | AROCLOR-1262 | 230000 | 2900 | J | UG/KG | |

Aroclor 1268 Correlation Data

| nsample | sample_no | location | para | clp_res | scr_res | clp_qual | scr_qual | units |
|---|---|---|---|---|---|---|---|---|
| MF-SO-MW102-2224 | SAA663 | MF-SO-MW102-2224 | AROCLOR-1268 | 3 | 200 | J | U | UG/KG |
| MF-SO-MW102-7880 | SAA685 | MF-SO-MW102-7880 | AROCLOR-1268 | 3.5 | 200 | J | U | UG/KG |
| MF-SO-TP3-0405 | SAA640 | MF-SO-TP3-0405 | AROCLOR-1268 | 19 | 200 | J | U | UG/KG |
| SP-SO-SB1-0406B | SAA651 | SP-SO-SB1-0406B | AROCLOR-1268 | 32 | 200 | J | U | UG/KG |
| BC-SO-SB9-0608 | SA9041 | BC-SO-SB9-0608 | AROCLOR-1268 | 33 | 200 | J | U | UG/KG |
| MF-SO-MW103-1416 | SAA681 | MF-SO-MW103-1416 | AROCLOR-1268 | 34 | 200 | J | U | UG/KG |
| MF-SO-MW104D-6062 | SAA687 | MF-SO-MW104D-6062 | AROCLOR-1268 | 37 | 200 | U | U | UG/KG |
| MF-SO-SB5-1416 | SA4046 | MF-SO-SB5-1416 | AROCLOR-1268 | 38 | 200 | U | U | UG/KG |
| SP-SO-MW110D-1820 | SAA694 | SP-SO-MW110D-1820 | AROCLOR-1268 | 39 | 200 | UJ | U | UG/KG |
| MF-SO-SB1-0810 | SA4043 | MF-SO-SB1-0810 | AROCLOR-1268 | 40 | 200 | U | U | UG/KG |
| MF-SO-MW104D-0002 | SAA671 | MF-SO-MW104D-0002 | AROCLOR-1268 | 40 | 200 | U | U | UG/KG |
| MF-SO-MW104D-3234 | SAA678 | MF-SO-MW104D-3234 | AROCLOR-1268 | 40 | 200 | U | U | UG/KG |
| MF-SO-MW101D-4850 | SAA664 | MF-SO-MW101D-4850 | AROCLOR-1268 | 40 | 200 | U | U | UG/KG |
| MF-SO-MW101D-4850-D | SAA665 | MF-SO-MW101D-4850 | AROCLOR-1268 | 40 | 200 | U | U | UG/KG |
| MF-SO-MW101D-2830 | SAA662 | MF-SO-MW101D-2830 | AROCLOR-1268 | 41 | 200 | U | U | UG/KG |
| SP-SO-MW112B-2628 | SAA679 | SP-SO-MW112B-2628 | AROCLOR-1268 | 41 | 200 | U | U | UG/KG |
| MF-SO-MW102-4244 | SAA677 | MF-SO-MW102-4244 | AROCLOR-1268 | 45 | 200 | U | U | UG/KG |
| MF-SO-MW104D-4648 | SAA686 | MF-SO-MW104D-4648 | AROCLOR-1268 | 47 | 200 | U | U | UG/KG |
| SP-SO-SB6-0608A | SAA668 | SP-SO-SB6-0608A | AROCLOR-1268 | 51 | 200 | J | U | UG/KG |
| MF-SO-MW104D-1618 | SAA674 | MF-SO-MW104D-1618 | AROCLOR-1268 | 63 | 200 | U | U | UG/KG |
| SP-SO-MW113B-0204B | SA2741 | SP-SO-MW113B-0204B | AROCLOR-1268 | 65 | 200 | J | U | UG/KG |
| SP-SO-MW113B-0810 | SA2742 | SP-SO-MW113B-0810 | AROCLOR-1268 | 78 | 200 | J | U | UG/KG |
| BC-SO-SB8A-0810 | SA2773 | BC-SO-SB8A-0810 | AROCLOR-1268 | 82 | 200 | J | U | UG/KG |
| SP-SO-SB5-1214 | SAA667 | SP-SO-SB5-1214 | AROCLOR-1268 | 84 | 200 | | U | UG/KG |
| MF-SO-SB2-1416 | SA4045 | MF-SO-SB2-1416 | AROCLOR-1268 | 92 | 200 | | U | UG/KG |
| BC-SO-MW120-0406 | SAA661 | BC-SO-MW120-0406 | AROCLOR-1268 | 120 | 200 | J | U | UG/KG |
| SP-SO-SB7-0204 | SA2748 | SP-SO-SB7-0204 | AROCLOR-1268 | 130 | 200 | J | U | UG/KG |
| BC-SO-SB9-0204B | SAA656 | BC-SO-SB9-0204B | AROCLOR-1268 | 130 | 200 | J | U | UG/KG |
| SP-SO-MW113B-0406 | SA2746 | SP-SO-MW113B-0406 | AROCLOR-1268 | 150 | 200 | J | U | UG/KG |
| SP-SO-MW110D-0002 | SAA696 | SP-SO-MW110D-0002 | AROCLOR-1268 | 200 | 210 | J | | UG/KG |
| MF-SO-SB3-0810 | SAA652 | MF-SO-SB3-0810 | AROCLOR-1268 | 250 | 200 | J | U | UG/KG |
| SP-SO-SB9-0608 | SA9042 | SP-SO-SB9-0608 | AROCLOR-1268 | 260 | 200 | J | U | UG/KG |
| MF-SO-SB4-1214 | SAA654 | MF-SO-SB4-1214 | AROCLOR-1268 | 260 | 200 | | U | UG/KG |
| SP-SO-MW110D-0406 | SAA692 | SP-SO-MW110D-0406 | AROCLOR-1268 | 270 | 200 | J | U | UG/KG |
| MF-SO-SB7-0406 | SA2733 | MF-SO-SB7-0406 | AROCLOR-1268 | 340 | 200 | J | U | UG/KG |
| BC-SO-SB2-1214 | SAA645 | BC-SO-SB2-1214 | AROCLOR-1268 | 340 | 200 | | U | UG/KG |
| MF-SO-SB3-0810-D | SAA653 | MF-SO-SB3-0810 | AROCLOR-1268 | 350 | 200 | J | U | UG/KG |
| SP-SO-SB9-0810 | SA9043 | SP-SO-SB9-0810 | AROCLOR-1268 | 400 | 380 | J | | UG/KG |
| SP-SO-MW111D-0810 | SA2738 | SP-SO-MW111D-0810 | AROCLOR-1268 | 420 | 200 | J | U | UG/KG |
| BC-SO-SB8A-1012 | SA2774 | BC-SO-SB8A-1012 | AROCLOR-1268 | 490 | 200 | J | | UG/KG |
| MF-SO-SB8-0608 | SA2734 | MF-SO-SB8-0608 | AROCLOR-1268 | 490 | 200 | J | U | UG/KG |
| MF-SO-TP2-0506 | SA4048 | MF-SO-TP2-0506 | AROCLOR-1268 | 500 | 200 | | U | UG/KG |
| MF-SO-MW101D-0608 | SAA648 | MF-SO-MW101D-0608 | AROCLOR-1268 | 620 | 200 | | U | UG/KG |
| SP-SO-MW111D-0810-D | SA2739 | SP-SO-MW111D-0810 | AROCLOR-1268 | 760 | 200 | J | U | UG/KG |
| MF-SO-SB2-0608 | SA4044 | MF-SO-SB2-0608 | AROCLOR-1268 | 1200 | 1600 | | | UG/KG |
| SP-SO-SB4-0406 | SAA670 | SP-SO-SB4-0406 | AROCLOR-1268 | 1600 | 3600 | | | UG/KG |
| MF-SO-MW102-0406-D | SAA650 | MF-SO-MW102-0406 | AROCLOR-1268 | 1600 | 200 | | U | UG/KG |
| MF-SO-MW102-0406 | SAA649 | MF-SO-MW102-0406 | AROCLOR-1268 | 1800 | 200 | | U | UG/KG |
| SP-SO-SB3-1416 | SAA669 | SP-SO-SB3-1416 | AROCLOR-1268 | 2400 | 200 | | U | UG/KG |
| SP-SO-MW112B-0608 | SAA675 | SP-SO-MW112B-0608 | AROCLOR-1268 | 2400 | 780 | | | UG/KG |
| BC-SO-SB5-0002B | SAA659 | BC-SO-SB5-0002B | AROCLOR-1268 | 3800 | 290 | | | UG/KG |
| MF-SO-MW103-0810 | SAA682 | MF-SO-MW103-0810 | AROCLOR-1268 | 9300 | 640 | | | UG/KG |
| SP-SO-SB8-0002 | SAA655 | SP-SO-SB8-0002 | AROCLOR-1268 | 11000 | 1700 | J | | UG/KG |
| BC-SO-SB1-0204B | SAA643 | BC-SO-SB1-0204B | AROCLOR-1268 | 20000 | 200 | | U | UG/KG |
| BC-SO-SB6-0810 | SAA660 | BC-SO-SB6-0810 | AROCLOR-1268 | 41000 | 1000 | | | UG/KG |
| BC-SO-SB3-0204A | SAA647 | BC-SO-SB3-0204A | AROCLOR-1268 | 44000 | 340 | | | UG/KG |
| MF-SO-SB6-0204 | SA4047 | MF-SO-SB6-0204 | AROCLOR-1268 | 49000 | 580 | | | UG/KG |
| MF-SO-SB7-1416 | SAA690 | MF-SO-SB7-1416 | AROCLOR-1268 | 50000 | 200 | J * | U | UG/KG |

Aroclor 1268 Correlation Data

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SP-SO-SB2-0204B | SAA666 | SP-SO-SB2-0204B | AROCLOR-1268 | 57000 | 2200 | | | UG/KG |
| BC-SO-SB4-0204 | SAA658 | BC-SO-SB4-0204 | AROCLOR-1268 | 93000 | 1800 | | | UG/KG |
| BC-SO-SB1-0406 | SAA644 | BC-SO-SB1-0406 | AROCLOR-1268 | 100000 | 1800 | | | UG/KG |
| BC-SO-SB8-0204A | SA2744 | BC-SO-SB8-0204A | AROCLOR-1268 | 300000 | 1500 | J | | UG/KG |

Lead Linear Regression Output

SUMMARY OUTPUT

| Regression Statistics | |
|---|---|
| Multiple R | 0.864407719 |
| R Square | 0.747200705 |
| Adjusted R Square | 0.743427582 |
| Standard Error | 4504.308087 |
| Observations | 69 |

ANOVA

| | df | SS | MS | F | Significance F |
|---|---|---|---|---|---|
| Regression | 1 | 4017837739 | 4017837739 | 198.032385 | 1.10015E-21 |
| Residual | 67 | 1359349020 | 20288791.34 | | |
| Total | 68 | 5377186759 | | | |

| | Coefficients | Standard Error | t Stat | P-value | Lower 95% | Upper 95% | Lower 50.0% | Upper 50.0% |
|---|---|---|---|---|---|---|---|---|
| Intercept | 557.588161 | 600.8487517 | 0.928000865 | 0.356738283 | -641.7112978 | 1756.88762 | 150.1110006 | 965.0653215 |
| X Variable 1 | 2.124784321 | 0.150989499 | 14.07239798 | 1.10015E-21 | 1.823407937 | 2.426160706 | 2.022387883 | 2.22718076 |

Copper Linear Regression Output (Low-range Data)

SUMMARY OUTPUT

| *Regression Statistics* | |
|---|---|
| Multiple R | 0.852977736 |
| R Square | 0.727571018 |
| Adjusted R Square | 0.677571018 |
| Standard Error | 212.3416465 |
| Observations | 21 |

ANOVA

| | *df* | *SS* | *MS* | *F* | *Significance F* |
|---|---|---|---|---|---|
| Regression | 1 | 2408365.741 | 2408365.741 | 53.41362827 | 6.24751E-07 |
| Residual | 20 | 901779.4968 | 45088.97484 | | |
| Total | 21 | 3310145.238 | | | |

| | *Coefficients* | *Standard Error* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* | *Lower 95.0%* | *Upper 95.0%* |
|---|---|---|---|---|---|---|---|---|
| Intercept | 0 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| X Variable 1 | 0.918791541 | 0.092076695 | 9.978546048 | 3.28009E-09 | 0.72672301 | 1.110860072 | 0.72672301 | 1.110860072 |

Copper Linear Regression Output (Mid-range Data)

SUMMARY OUTPUT

| Regression Statistics | |
|---|---|
| Multiple R | 0.713327397 |
| R Square | 0.508835975 |
| Adjusted R Square | 0.471798938 |
| Standard Error | 1153.781792 |
| Observations | 28 |

ANOVA

| | df | SS | MS | F | Significance F |
|---|---|---|---|---|---|
| Regression | 1 | 37235945.5 | 37235945.5 | 27.9714528 | 1.57064E-05 |
| Residual | 27 | 35942735.46 | 1331212.425 | | |
| Total | 28 | 73178680.96 | | | |

| | Coefficients | Standard Error | t Stat | P-value | Lower 95% | Upper 95% | Lower 95.0% | Upper 95.0% |
|---|---|---|---|---|---|---|---|---|
| Intercept | 0 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| X Variable 1 | 0.807749021 | 0.118003473 | 6.845129239 | 2.3605E-07 | 0.565626057 | 1.049871986 | 0.565626057 | 1.049871986 |

Copper Linear Regression Output (All Data)

SUMMARY OUTPUT

| Regression Statistics | |
|---|---|
| Multiple R | 0.870217975 |
| R Square | 0.757279324 |
| Adjusted R Square | 0.741654324 |
| Standard Error | 3786.611241 |
| Observations | 65 |

ANOVA

| | df | SS | MS | F | Significance F |
|---|---|---|---|---|---|
| Regression | 1 | 2863061909 | 2863061909 | 199.6775776 | 3.35283E-21 |
| Residual | 64 | 917659180.1 | 14338424.69 | | |
| Total | 65 | 3780721089 | | | |

| | Coefficients | Standard Error | t Stat | P-value | Lower 95% | Upper 95% | Lower 95.0% | Upper 95.0% |
|---|---|---|---|---|---|---|---|---|
| Intercept | 0 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| X Variable 1 | 0.432816293 | 0.027008707 | 16.02506504 | 4.38521E-24 | 0.378860246 | 0.48677234 | 0.378860246 | 0.48677234 |

Aroclor 1262 Linear Regression Output

SUMMARY OUTPUT

| *Regression Statistics* | |
|---|---|
| Multiple R | 0.386977446 |
| R Square | 0.149751544 |
| Adjusted R Square | 0.133358101 |
| Standard Error | 1802.075377 |
| Observations | 62 |

ANOVA

| | *df* | *SS* | *MS* | *F* | *Significance F* |
|---|---|---|---|---|---|
| Regression | 1 | 34890018.25 | 34890018.25 | 10.74373509 | 0.001742955 |
| Residual | 61 | 198096015.6 | 3247475.666 | | |
| Total | 62 | 232986033.9 | | | |

| | *Coefficients* | *Standard Error* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* | *Lower 95.0%* | *Upper 95.0%* |
|---|---|---|---|---|---|---|---|---|
| Intercept | 0 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| X Variable 1 | 0.028137317 | 0.006181947 | 4.551529905 | 2.5955E-05 | 0.015775746 | 0.040498888 | 0.015775746 | 0.040498888 |

Aroclor 1268 Linear Regression Output

SUMMARY OUTPUT

| Regression Statistics | |
|---|---|
| Multiple R | 0.429221558 |
| R Square | 0.184231146 |
| Adjusted R Square | 0.170634998 |
| Standard Error | 38817.30776 |
| Observations | 62 |

ANOVA

| | df | SS | MS | F | Significance F |
|---|---|---|---|---|---|
| Regression | 1 | 20417285635 | 20417285635 | 13.55024609 | 0.000499429 |
| Residual | 60 | 90407002918 | 1506783382 | | |
| Total | 61 | 1.10824E+11 | | | |

| | Coefficients | Standard Error | t Stat | P-value | Lower 95% | Upper 95% | Lower 50.0% | Upper 50.0% |
|---|---|---|---|---|---|---|---|---|
| Intercept | -204.9824707 | 6072.973874 | -0.033753228 | 0.973185972 | -12352.73494 | 11942.77 | -4326.106874 | 3916.141933 |
| X Variable 1 | 29.09476683 | 7.90389732 | 3.681065891 | 0.000499429 | 13.28462337 | 44.90491029 | 23.73117647 | 34.45835719 |

Copper t-Test Output

t-Test: Two-Sample Assuming Equal Variances

| | *Variable 1* | *Variable 2* |
|---|---|---|
| Mean | 6700.495385 | 3549.830769 |
| Variance | 261525929.3 | 59073767.02 |
| Observations | 65 | 65 |
| Pooled Variance | 160299848.2 | |
| Hypothesized Mean Difference | 0 | |
| df | 128 | |
| t Stat | 1.418656658 | |
| P(T<=t) one-tail | 0.079214719 | |
| t Critical one-tail | 1.656844688 | |
| P(T<=t) two-tail | 0.158429439 | |
| t Critical two-tail | 1.978669388 | |

Lead t-Test Output

t-Test: Two-Sample Assuming Equal Variances

| | *Variable 1* | *Variable 2* |
|---|---|---|
| Mean | 4199.56087 | 1714.043478 |
| Variance | 79076275.86 | 13087412.01 |
| Observations | 69 | 69 |
| Pooled Variance | 46081843.94 | |
| Hypothesized Mean Difference | 0 | |
| df | 136 | |
| t Stat | 2.150608854 | |
| P(T<=t) one-tail | 0.016637564 | |
| t Critical one-tail | 1.656135282 | |
| P(T<=t) two-tail | 0.033275128 | |
| t Critical two-tail | 1.977559805 | |

## Appendix F.2

## Summary of RSRs Developed by B&RE for New London (1998)

Brown & Root Environmental

Foster Plaza VII
661 Andersen Drive
Pittsburgh, PA 15220-2745

(412) 921-7090
FAX: (412) 921-4040

C-49-12-7-188

December 23, 1997

Brown & Root Environmental Project Number 7237

Mr. Mark Lewis
Connecticut Department of Environmental Protection
Water Management Bureau
Permitting, Enforcement, and Remediation Division
Federal Remediation Program
79 Elm Street
Hartford, Connecticut 06106-5127

Reference: CLEAN Contract No. N62472-90-D-1298
Contract Task Order No. 0260

Subject: Calculated CTDEP Remediation Standards
Lower Subase Remedial Investigation
Naval Submarine Base - New London, Groton, Connecticut

Dear Mr. Lewis:

In preparation of the Lower Subase Remedial Investigation (RI) Report, Brown & Root (B&R) Environmental has calculated Remediation Standards following the State of Connecticut Remediation Standard Regulations of January 1996. Standards were developed for all chemicals that were analyzed for during the RI sampling and analysis program that did not have previously established CTDEP standards. The intent of this memo is to identify the sources of the standards to be used in the RI Report and to identify those values which have been developed by B&R Environmental using the State guidance.

Background information and the calculated Remediation Standards are provided in Table 1 and Table 2, respectively, which are enclosed. Table 1 summarizes the basis for the chemical-specific remediation standards (i.e., promulgated, calculated, or calculated using a surrogate) to be included in the RI. The calculated soil Direct Exposure and Pollutant Mobility standards, as well as the Groundwater Standard, are provided in Table 2.

It should be noted that pollutant mobility and groundwater standards for GA classified groundwater are provided in Table 2 for completeness. The groundwater at the Lower Subase is classified as GB, therefore standards applicable to GB classified groundwater will be emphasized in the Lower Subase RI Report.

B&R Environmental intends on using these criteria, as well as Region III RBCs, as part of the human health risk assessment for the Lower Subase RI to screen for chemicals of potential concern. Therefore, B&R Environmental, on the behalf of the United States Navy, requests that the CTDEP review and approve the standards in Table 2. It is hoped that prior approval of the criteria will alleviate unnecessary revisions to the RI Report in the future and expedite any additional risk-related work required by the State (i.e., application for use of alternative criteria).

Due to the current time constraints for preparing the Lower Subase RI, it is requested that the CTDEP complete their review by no later than January 16, 1997. If you have any questions regarding the information provided in the tables or the schedule for the review please contact Mr. Mark Evans at (610) 595-0567 (ext. 162) or me at (412) 921-8244.

Very truly yours,

Corey A. Rich

Corey A. Rich, P.E.
Project Manager

Enclosure(s)

c: Mr. Mark Evans, NORTHDIV
Mr. Richard Conant, NSB-NLON Environmental
Ms. Karen Smecker, B&R Environmental
File: CTO 0260

# TABLE 1

## SOURCE OF CONNECTICUT REMEDIATION STANDARDS
## CTO 260 LOWER SUBASE RI
## NEW LONDON, GROTON, CONNECTICUT


| Chemical | CAS Number | Chemical Fraction | Basis of Value to be Used in RI Report | | |
|---|---|---|---|---|---|
| | | | Promulgated Value(1) | Calculated Value(2) | Surrogate Calculated Value(3) |
| Acenaphthene | 83329 | SVOC | | X | |
| Acenaphthylene | 208968 | SVOC | X | | |
| Anthracene | 120127 | SVOC | X | | |
| Acetone | 67641 | VOC | X | | |
| Aldrin | 309002 | PEST | | X | |
| Aluminum | 7429905 | INORG | (4) | (4) | (4) |
| Antimony | 7440360 | INORG | X | | |
| Arsenic | 7440382 | INORG | X | | |
| Barium | 7440393 | INORG | X | | |
| Benzene | 71432 | VOC | X | | |
| Benz(a)anthracene | 56553 | SVOC | X | | |
| Benzo(b)fluoranthene | 205992 | SVOC | X | | |
| Benzo(k)fluoranthene | 207089 | SVOC | X | | |
| Benzo(g,h,i)perylene | 191242 | SVOC | | | X (naphthalene) |
| Benzo(a)pyrene | 50328 | SVOC | X | | |
| Beryllium | 7440417 | INORG | X | | |
| BCH (alpha-) | 319846 | PEST | | X | |
| BCH (beta-) | 319857 | PEST | | X | |
| BCH (delta-) | 319868 | PEST | | | X (alpha-BHC) |
| BCH (gamma-; Lindane) | 58899 | PEST | X | | |
| Bis(2-chloroethoxy)methane | 111911 | SVOC | (5) | (5) | (5) |
| Bis(2-chloroethyl)ether | 111444 | SVOC | X | | |
| Bis(2-ethylhexyl)phthalate | 117817 | SVOC | X | | |
| Bromochloromethane | 74975 | VOC | | | X (chloromethane) |
| Bromodichloromethane | 75274 | VOC | | X | |
| Bromoform | 75252 | VOC | X | | |
| Bromomethane | 74839 | VOC | | X | |
| 4-Bromophenyl-phenylether | 101553 | SVOC | | X | |
| 2-Butanone | 78933 | VOC | X | | |
| Butylbenzylphthalate | 85687 | SVOC | X | | |
| Cadmium | 7440439 | INORG | X | | |
| Calcium | 7440702 | INORG | (6) | (6) | (6) |
| Carbazole | 86748 | SVOC | | X | |
| Carbon disulfide | 75150 | VOC | | X | |
| Carbon tetrachloride | 56235 | VOC | X | | |
| Chlordane (alpha-) | 57749 | PEST | X(7) | | |
| Chlordane (gamma-) | 57749 | PEST | X(7) | | |
| 4-Chloroaniline | 106478 | SVOC | | X | |
| Chlorobenzene | 108907 | VOC | X | | |
| Chlorodibromomethane | 124481 | VOC | X | | |
| Chloroethane | 75003 | VOC | | X | |
| Chloroform | 67663 | VOC | X | | |
| Chloromethane | 74873 | VOC | | X | |

TABLE 1

SOURCE OF CONNECTICUT REMEDIATION STANDARDS
CTO 260 LOWER SUBASE RI
NEW LONDON, GROTON, CONNECTICUT


| Chemical | CAS Number | Chemical Fraction | Basis of Value to be Used in RI Report | | |
|---|---|---|---|---|---|
| | | | Promulgated Value(1) | Calculated Value(2) | Surrogate Calculated Value(3) |
| 4-Chloro-3-methylphenol | 59507 | SVOC | | | X (3-methylphenol) |
| 2-Chloronaphthalene | 91587 | SVOC | | X | |
| 2-Chlorophenol | 95578 | SVOC | X | | |
| 4-Chlorophenyl-phenylether | 7005723 | SVOC | | | X (4-Bromophenyl-phenylether) |
| Chromium (total) | | INORG | X(8) | | |
| Chrysene | 218019 | SVOC | | X | |
| Cobalt | 7440484 | INORG | | X | |
| Copper | 7440508 | INORG | (4) | (4) | (4) |
| 4,4'-DDD | 72548 | PEST | | X | |
| 4,4'-DDE | 72559 | PEST | | X | |
| 4,4'-DDT | 50293 | PEST | | X | |
| Dibenzofuran | 132649 | SVOC | | X | |
| Dibenz(a,h)anthracene | 53703 | SVOC | | X | |
| 1,2-Dibromo-3-chloropropane | 96128 | VOC | | X | |
| 1,2-Dibromoethane | 106934 | VOC | | X | |
| 1,2-Dichlorobenzene | 95501 | VOC/SVOC | X | | |
| 1,3-Dichlorobenzene | 541731 | VOC/SVOC | X | | |
| 1,4-Dichlorobenzene | 106467 | VOC/SVOC | X | | |
| 3,3'-Dichlorobenzidine | 91941 | SVOC | | X | |
| 1,1-Dichloroethane | 75343 | VOC | X | | |
| 1,2-Dichloroethane | 107062 | VOC | X | | |
| 1,1-Dichloroethene | 75354 | VOC | X | | |
| 1,2-Dichloroethene (cis-) | 156592 | VOC | X | | |
| 1,2-Dichloroethene (trans-) | 156605 | VOC | X | | |
| 1,2-Dichloroethene (total) | 156605 | VOC | | X | |
| 2,4-Dichlorophenol | 120832 | SVOC | X | | |
| 1,2-Dichloropropane | 78875 | VOC | X | | |
| 1,3-Dichloropropene (cis-) | 542756 | VOC | X | | |
| 1,3-Dichloropropene (trans-) | 542756 | VOC | X | | |
| Dieldrin | 60571 | PEST | X | | |
| Diethyl phthalate | 84662 | SVOC | | X | |
| 2,4-Dimethylphenol | 105679 | SVOC | | X | |
| Dimethylphthalate | 131113 | SVOC | | X | |
| Di-n-butylphthalate | 84742 | SVOC | X | | |
| Di-n-octylphthalate | 117840 | SVOC | X | | |
| 4,6-Dinitro-2-methylphenol | 534521 | SVOC | | X | |
| 2,4-Dinitrophenol | 51285 | SVOC | | X | |
| 2,4-Dinitrotoluene | 121142 | SVOC | | X | |
| 2,6-Dinitrotoluene | 606202 | SVOC | | X | |
| Endosulfan I | 115297 | PEST | | X(9) | |
| Endosulfan II | 115297 | PEST | | X(9) | |
| Endosulfan sulfate | 1031078 | PEST | | | X (endosulfan) |

TABLE 1

SOURCE OF CONNECTICUT REMEDIATION STANDARDS
CTO 260 LOWER SUBASE RI
NEW LONDON, GROTON, CONNECTICUT


| Chemical | CAS Number | Chemical Fraction | Basis of Value to be Used in RI Report | | |
|---|---|---|---|---|---|
| | | | Promulgated Value(1) | Calculated Value(2) | Surrogate Calculated Value(3) |
| Endrin | 72208 | PEST | X | | |
| Endrin aldehyde | 7421363 | PEST | | | X (endrin) |
| Endrin ketone | 53494705 | PEST | | | X (endrin) |
| Ethylbenzene | 100414 | VOC | X | | |
| Fluoranthene | 206440 | SVOC | X | | |
| Fluorene | 86737 | SVOC | X | | |
| Heptachlor | 76448 | PEST | X | | |
| Heptachlor epoxide | 1024573 | PEST | X | | |
| Hexachlorobenzene | 118741 | SVOC | X | | |
| Hexachlorobutadiene | 87683 | SVOC | | X | |
| Hexachlorocyclopentadiene | 77474 | SVOC | | X | |
| Hexachloroethane | 67721 | SVOC | X | | |
| 2-Hexanone | 73663715 | VOC | | X | |
| Indeno(1,2,3-cd)pyrene | 193395 | SVOC | | X | |
| Iron | 7439896 | INORG | (4) | (4) | (4) |
| Isophorone | 78591 | SVOC | | X | |
| Lead | 7439291 | INORG | X | | |
| Magnesium | 7439954 | INORG | (6) | (6) | (6) |
| Manganese | 7439965 | INORG | | X | |
| Mercury | 7439976 | INORG | X | | |
| Methoxychlor | 72435 | PEST | X | | |
| Methylene chloride | 75092 | VOC | X | | |
| 2-Methylnaphthalene | 91576 | SVOC | | X | |
| 4-Methyl-2-pentanone | 108101 | VOC | X | | |
| 2-Methylphenol | 95487 | SVOC | | X | |
| 4-Methylphenol | 106445 | SVOC | | X | |
| Naphthalene | 91203 | SVOC | X | | |
| Nickel | 7440020 | INORG | X | | |
| 2-Nitroaniline | 88744 | SVOC | | X | |
| 3-Nitroaniline | 99092 | SVOC | | X | |
| 4-Nitroaniline | 100016 | SVOC | | X | |
| Nitrobenzene | 98953 | SVOC | | X | |
| 2-Nitrophenol | 88755 | SVOC | | | X (4-nitrophenol) |
| 4-Nitrophenol | 100027 | SVOC | | X | |
| N-Nitrosodiphenylamine | 86306 | SVOC | | X | |
| N-Nitrosodi-n-propylamine | 621647 | SVOC | | X | |
| 2,2'-Oxybis(1-chloropropane) | 108601 | SVOC | (5) | (5) | (5) |
| Pentachlorophenol | 87865 | SVOC | X | | |
| Phenanthrene | 85018 | SVOC | | | X (naphthalene) |
| Phenol | 108952 | SVOC | X | | |
| Potassium | 7440097 | INORG | (6) | (6) | (6) |
| Pyrene | 129000 | SVOC | X | | |

TABLE 1

SOURCE OF CONNECTICUT REMEDIATION STANDARDS
CTO 260 LOWER SUBASE RI
NEW LONDON, GROTON, CONNECTICUT


| Chemical | CAS Number | Chemical Fraction | Basis of Value to be Used in RI Report | | |
|---|---|---|---|---|---|
| | | | Promulgated Value(1) | Calculated Value(2) | Surrogate Calculated Value(3) |
| Selenium | 7782492 | INORG | X | | |
| Silver | 7440224 | INORG | X | | |
| Sodium | 7440235 | INORG | (6) | (6) | (6) |
| Styrene | 100425 | VOC | X | | |
| 1,1,2,2-Tetrachloroethane | 79345 | VOC | X | | |
| Tetrachloroethylene | 127184 | VOC | X | | |
| Thallium | 6533739 | INORG | X | | |
| Toluene | 108883 | VOC | X | | |
| Toxaphene | 8001352 | PEST | X | | |
| 1,2,4-Trichlorobenzene | 120821 | SVOC | | X | |
| 1,1,1-Trichloroethane | 71556 | VOC | X | | |
| 1,1,2-Trichloroethane | 79005 | VOC | X | | |
| Trichloroethylene | 79016 | VOC | X | | |
| 2,4,5-Trichlorophenol | 95954 | SVOC | | X | |
| 2,4,6-Trichlorophenol | 88062 | SVOC | | X | |
| Vanadium | 7440622 | INORG | X | | |
| Vinyl chloride | 75014 | VOC | X | | |
| Xylene (total) | 1330207 | VOC | X | | |
| Zinc | 7440666 | INORG | X | | |

INORG Inorganic
PEST Pesticide
SVOC Semivolatile organic compound
VOC Volatile organic compound

1 State of Connecticut Remediation Standard Regulations, Section 22a-133k (January 1996).
2 Published toxicity criteria is available. Toxicity criteria from the current USEPA Region III Risk-Based Concentration Table (October 22, 1997) will be used to calculate a value using the methodology presented in the State guidance (January 1996).
3 No toxicity criteria is available. Toxicity criteria for a similarly structured chemical (noted in parentheses) will be used to calculate a value.
4 Region I does not advocate a quantitative evaluation of this chemical. Exposure to this chemical will be addressed in a qualitative fashion.
5 No promulgated value or published toxicity criteria are available. A similarly structured chemical with published toxicity criteria could not be identified. Exposure to this chemical will be addressed in a qualitative fashion.
6 Chemical is an essential nutrient.
7 Value for chlordane is used.
8 Value for hexavalent chromium is used for conservative purposes.
9 Value for endosulfan is used.

TABLE 2

CALCULATED AND SURROGATE CALCULATED VALUES
CTO 260 LOWER SUBASE RI
NEW LONDON, GROTON, CONNECTICUT


| Chemical | Published Toxciological Criteria[1] | | Calculated Remediation Standards[2] | | | | |
|---|---|---|---|---|---|---|---|
| | | | Soil (mg/kg) | | | | Groundwater (ug/L) |
| | $RfD_{oral}$ (mg/kg/day) | $CSF_{oral}$ (kg/day/mg) | RES DE[3] | I/C DE[3] | GA/GAA PM | GB PM | GA/GAA GP |
| Acenaphthene | 6.00E-02 | NA | 1000[4] | 2500[4] | 8.4 | 84 | 420 |
| Aldrin | 3.00E-05 | 1.70E+01 | 0.036 | 0.34 | 0.000041 | 0.00041 | 0.0021 |
| Benzo(g,h,i)perylene | NA | NA | 1000[5] | 2500[5] | 5.6[5] | 56[5] | 280[5] |
| BCH (alpha-) | NA | 6.30E+00 | 0.097 | 0.91 | 0.00011 | 0.0011 | 0.0056 |
| BCH (beta-) | NA | 1.80E+00 | 0.34 | 3.2 | 0.00039 | 0.0039 | 0.0194 |
| BCH (delta-) | NA | NA | 0.097[6] | 0.91[6] | 0.00011[6] | 0.0011[6] | 0.0056[6] |
| Bromochloromethane | NA | NA | 47[7] | 440[7] | 0.054[7] | 0.54[7] | 2.7[7] |
| Bromodichloromethane | 2.00E-02 | 6.20E-02 | 9.9 | 92 | 0.011 | 0.11 | 0.56 |
| Bromomethane | 1.40E-03 | NA | 95 | 1000[4] | 0.2 | 2 | 9.8 |
| 4-Bromophenyl-phenylether | 5.80E-02 | NA | 500[4] | 1000[4] | 8.2 | 82 | 410 |
| Carbazole | NA | 2.00E-02 | 31 | 290 | 0.036 | 0.36 | 1.8 |
| Carbon disulfide | 1.00E-01 | NA | 500[4] | 1000[4] | 14 | 140 | 700 |
| 4-Chloroaniline | 4.00E-03 | NA | 270 | 2500[4] | 0.56 | 5.6 | 28 |
| Chloroethane | 4.00E-01 | 2.90E-03 | 210 | 1000[4] | 0.24 | 2.4 | 12 |
| Chloromethane | NA | 1.30E-02 | 47 | 440 | 0.054 | 0.54 | 2.7 |
| 4-Chloro-3-methylphenol | NA | NA | 1000[8] | 2500[8] | 7[8] | 70[8] | 350[8] |
| 2-Chloronaphthalene | 8.00E-02 | NA | 1000[4] | 2500[4] | 11 | 110 | 560 |
| 4-Chlorophenyl-phenylether | NA | NA | 500[9] | 1000[9] | 8.2[9] | 82[9] | 410[9] |
| Chrysene | NA | 7.30E-03 | 84 | 780 | 0.096 | 0.96 | 4.8 |
| Cobalt | 6.00E-02 | NA | 1000[4] | 2500[4] | 2200[10][11] | 22000[10][11] | 420 |
| 4,4'-DDD | NA | 2.40E-01 | 2.6 | 24 | 0.0029 | 0.029 | 0.15 |
| 4,4'-DDE | NA | 3.40E-01 | 1.8 | 17 | 0.0021 | 0.021 | 0.1 |
| 4,4'-DDT | 5.00E-04 | 3.40E-01 | 1.8 | 17 | 0.0021 | 0.021 | 0.1 |
| Dibenzofuran | 4.00E-03 | NA | 270 | 2500[4] | 0.56 | 5.6 | 28 |
| Dibenz(a,h)anthracene | NA | 7.30E+00 | 0.084 | 0.78 | 0.000096 | 0.00096 | 0.0048 |
| 1,2-Dibromo-3-chloropropane | NA | 1.40E+00 | 0.44 | 4.1 | 0.0005 | 0.005 | 0.025 |
| 1,2-Dibromoethane | NA | 8.50E+01 | 0.0072 | 0.067 | 0.0000082 | 0.000082 | 0.00041 |
| 3,3'-Dichlorobenzidine | NA | 4.50E-01 | 1.4 | 13 | 0.0016 | 0.016 | 0.078 |
| 1,2-Dichloroethene (total) | 2.00E-02 | NA | 500[4] | 1000[4] | 2.8 | 28 | 140 |
| Diethyl phthalate | 8.00E-01 | NA | 1000[4] | 2500[4] | 110 | 1100 | 5600 |

TABLE 2

CALCULATED AND SURROGATE CALCULATED VALUES
CTO 260 LOWER SUBASE RI
NEW LONDON, GROTON, CONNECTICUT


| Chemical | Published Toxciological Criteria[1] | | Calculated Remediation Standards[2] | | | | |
|---|---|---|---|---|---|---|---|
| | | | Soil (mg/kg) | | | | Groundwater (ug/L) |
| | RfD$_{oral}$ (mg/kg/day) | CSF$_{oral}$ (kg/day/mg) | RES DE[3] | I/C DE[3] | GA/GAA PM | GB PM | GA/GAA GP |
| 2,4-Dimethylphenol | 2.00E-02 | NA | 1000[4] | 2500[4] | 2.8 | 28 | 140 |
| Dimethylphthalate | 1.00E+01 | NA | 1000[4] | 2500[4] | 1400 | 1400 | 70000 |
| 4,6-Dinitro-2-methylphenol | 1.00E-04 | NA | 6.8 | 200 | 0.014 | 0.14 | 0.7 |
| 2,4-Dinitrophenol | 2.00E-03 | NA | 140 | 2500[4] | 0.28 | 2.8 | 14 |
| 2,4-Dinitrotoluene | 2.00E-03 | NA | 140 | 2500[4] | 0.28 | 2.8 | 14 |
| 2,6-Dinitrotoluene | 1.00E-03 | NA | 68 | 2000 | 0.14 | 1.4 | 7 |
| Endosulfan I | 6.00E-03 | NA | 410 | 1200 | 0.84 | 8.4 | 42 |
| Endosulfan II | 6.00E-03 | NA | 410 | 1200 | 0.84 | 8.4 | 42 |
| Endosulfan sulfate | NA | NA | 410[12] | 1200[12] | 0.84[12] | 8.4[12] | 42[12] |
| Endrin aldehyde | NA | NA | 20[13] | 610[13] | NE[13] | NE[13] | NE[13] |
| Endrin ketone | NA | NA | 20[13] | 610[13] | NE[13] | NE[13] | NE[13] |
| Hexachlorobutadiene | 2.00E-04 | 7.80E-02 | 7.9 | 73 | 0.009 | 0.09 | 0.45 |
| Hexachlorocyclopentadiene | 7.00E-03 | NA | 470 | 2500[4] | 0.98 | 9.8 | 49 |
| 2-Hexanone | 4.00E-02 | NA | 500[4] | 1000[4] | 5.6 | 56 | 280 |
| Indeno(1,2,3-cd)pyrene | NA | 7.30E-01 | 0.84 | 7.8 | 0.00096 | 0.0096 | 0.045 |
| Isophorone | 2.00E-01 | 9.50E-04 | 640 | 2500[4] | 0.74 | 7.4 | 37 |
| Manganese | 2.30E-02 | NA | 1600 | 47000 | 50[10][14] | 500[10][14] | 160 |
| 2-Methylnaphthalene | 4.00E-02 | NA | 1000[4] | 2500[4] | 5.6 | 56 | 280 |
| 2-Methylphenol | 5.00E-02 | NA | 1000[4] | 2500[4] | 7 | 70 | 350 |
| 4-Methylphenol | 5.00E-03 | NA | 340 | 2500[4] | 0.7 | 7 | 35 |
| 2-Nitroaniline | 6.00E-05 | NA | 4.1 | 1200 | 0.0084 | 0.084 | 0.42 |
| 3-Nitroaniline | 3.00E-03 | NA | 200 | 2500[4] | 0.42 | 4.2 | 21 |
| 4-Nitroaniline | 3.00E-03 | NA | 200 | 2500[4] | 0.42 | 4.2 | 21 |
| Nitrobenzene | 5.00E-04 | NA | 34 | 1000 | 0.07 | 0.7 | 3.5 |
| 2-Nitrophenol | NA | NA | 540[15] | 2500[15] | 1.1[15] | 11[15] | 56[15] |
| 4-Nitrophenol | 8.00E-03 | NA | 540 | 2500[4] | 1.1 | 11 | 56 |
| N-Nitrosodiphenylamine | NA | 4.90E-03 | 130 | 1200 | 0.14 | 1.4 | 7.1 |
| N-Nitrosodi-n-propylamine | NA | 7.00E+00 | 0.088 | 0.82 | 0.0001 | 0.001 | 0.005 |
| Phenanthrene | NA | NA | 1000[5] | 2500[5] | 5.6[5] | 56[5] | 280[5] |
| 1,2,4-Trichlorobenzene | 1.00E-02 | NA | 680 | 2500[4] | 1.4 | 14 | 70 |

## TABLE 2

CALCULATED AND SURROGATE CALCULATED VALUES
CTO 260 LOWER SUBASE RI
NEW LONDON, GROTON, CONNECTICUT


| Chemical | Published Toxciological Criteria[1] | | Calculated Remediation Standards[2] | | | | |
|---|---|---|---|---|---|---|---|
| | RfD$_{oral}$ (mg/kg/day) | CSF$_{oral}$ (kg/day/mg) | Soil (mg/kg) | | | | Groundwater (ug/L) |
| | | | RES DE[3] | I/C DE[3] | GA/GAA PM | GB PM | GA/GAA GP |
| 2,4,5-Trichlorophenol | 1.00E-01 | NA | 1000[4] | 2500[4] | 14 | 140 | 700 |
| 2,4,6-Trichlorophenol | NA | 1.10E-02 | 56 | 520 | 0.064 | 0.64 | 3.2 |

| | |
|---|---|
| RfD | Reference dose |
| CSF | Cancer slope factor |
| RES DE | Direct exposure criteria for residential land use |
| I/C DE | Direct exposure criteria for industrial/commercial land use. |
| GA/GAA PM | Pollutant mobility criteria for a GA/GAA classified area |
| GB PM | Pollutant mobility criteria for a GB classified area |
| GA/GAA GP | Groundwater protection criteria for a GA/GAA classified area |
| NA | Not available |
| NE | None established by Connecticut DEP (January 1996) |

1 Values obtained from current USEPA Region III Risk-Based Concentration Table (October 22, 1997)
2 Calculated using methodologies presented in State guidance (January 1996).
3 Calculated value for direct exposure for volatile and semivolatile organics is replaced with the appropriate ceiling limit if the calculated value exceeds the ceiling limit. Ceiling limit for volatiles is 500 mg/kg for residential exposure and 1000 mg/kg for industrial/commercial exposure. Ceiling limit for semivolatiles is 1000 mg/kg for residential exposure and 2500 mg/kg for industrial/commercial exposure
4 Ceiling limit. Calculated value exceeds the ceiling limit.
5 Value for naphthalene is used.
6 Value for alpha-BHC is used.
7 Value for chloromethane is used.
8 Value for 3-methylphenol is used.
9 Value for 4-bromophenyl-phenylether is used.
10 Value is for aqueous units (ug/L) and is based on SPLP or TCLP analytical results.
11 Value is based on the Region III RBC for tap water (2200 ug/L)
12 Value for endosulfan is used.
13 Value for endrin is used.
14 Value is based on the secondary Federal MCL for drinking water (50 ug/L).
15 Value for 4-nitrophenol is used.

Brown & Root Environmental

A Division of Halliburton NUS Corporation

Foster Plaza
661 Andersen Drive
Pittsburgh, PA 15220-2745

(412) 921-7090
FAX: (412) 921-4040

C-49-03-8-156

March 20, 1998

Brown & Root Environmental Project Number 7237

Mr. Mark Lewis
Connecticut Department of Environmental Protection
Water Management Bureau
Permitting, Enforcement, and Remediation Division
Federal Remediation Program
79 Elm Street
Hartford, Connecticut 06106-5127

Reference: CLEAN Contract No. N62472-90-D-1298
Contract Task Order No. 0260

Subject: Responses to CTDEP's Comments on Calculated Remediation Standards
Lower Subase Remedial Investigation
Naval Submarine Base - New London, Groton, Connecticut

Dear Mr. Lewis:

Brown & Root (B&R) Environmental and the Navy received your February 27, 1998 comment letter regarding the Remediation Standards that were calculated for use in the Lower Subase Remedial Investigation. Responses to CTDEP's comments have been prepared and the appropriate revisions have been made to Tables 1 and 2, which were previously enclosed in B&R Environmental's December 23, 1997 letter. B&R Environmental, on the behalf of the United States Navy, Northern Division Facilities Engineering Command and Naval Submarine Base - New London, has enclosed the Navy's responses to CTDEP's comments and the revised tables for your review and approval.

If you have any questions regarding the responses or the information provided in the revised tables, please contact Mr. Mark Evans at (610) 595-0567 (ext. 162) or me at (412) 921-8244. It is anticipated that any remaining issues can be resolved during a conference call.

Very truly yours,

Corey A. Rich

Corey A. Rich, P.E.
Project Manager

Enclosure(s)

c: Mr. Roger Boucher, NORTHDIV (letter only)
Mr. Mark Evans, NORTHDIV
Mr. Andy Stackpole, NSB-NLON Environmental
Mr. John Trepanowski, B&R Environmental
Mr. Daryl Hutson, B&R Environmental (letter only)
Ms. Karen Smecker, B&R Environmental
File: CTO 0260

**RESPONSES TO CTDEP'S COMMENTS (2/27/98)**
**ON THE CALCULATED CTDEP REMEDIATION STANDARDS (12/23/97)**
**CTO 260 - LOWER SUBASE REMEDIAL INVESTIGATION**
**NAVAL SUBMARINE BASE-NEW LONDON, GROTON, CONNECTICUT**
**MARCH 20, 1998**

## I. SURROGATE CHEMICALS USED TO SUPPLY TOXICITY VALUES

**Comment:**

1. **The Navy has used naphthalene as a surrogate to represent the toxicity of benzo(g,h,I)perylene. As noted in Dr. Ginsberg's memorandum, pyrene (RfD 0.03 mg/kg/d) is a more appropriate surrogate. The RfD for naphthalene has been withdrawn from IRIS. Please recalculate the direct exposure, pollutant mobility, and ground water protection criteria for benzo(g,h,i)perylene using this approach. This approach is appropriate for a screening level risk assessment. However, the uncertainties involved with this approach should be acknowledged if these two chemicals are found to be major risk drivers at the site.**

Response:

The direct exposure, pollutant mobility, and groundwater protection criteria for benzo(g,h,i)perylene will be recalculated using pyrene as a surrogate. Benzo(g,h,i)perylene was detected in soil and groundwater at the Lower Subase but was not found to be a major risk driver at any of the zones that were evaluated in the risk assessment. Benzo(g,h,i)perylene was only identified as a COC in groundwater at Zone 4 where it was detected in one sample at a concentration exceeding the State's Ambient Water Quality Criteria (AWQC) for the protection of human health. Consequently, this does not have any impact on the human health risk assessment.

Comment:

2. **It is unclear why the Navy calculated criteria for phenanthrene since the regulations list direct exposure, pollutant mobility, and groundwater protection criteria for this compound. Please use the criteria listed in the Regulations for this compound. The Navy should either withdraw their request for approval of criteria for phenanthrene, or, if the Navy is requesting approval of alternative criteria for this compound under the Regulations, the Navy should so state.**

Response:

The Navy retracts its request for approval of criteria for phenanthrene. The promulgated criteria for phenanthrene were used in the selection of COCs in the human health risk assessment. Consequently, this does not have any impact on the human health risk assessment.

Comment:

3. **Bromodichloromethane should be used as a surrogate for bromochlorome'hane. Please use the criteria calculated for bromodichloromethane in place of those :ul: : using chloromethane as a surrogate.**

Response:

Bromodichloromethane will be used as a surrogate for mochloromethane. Bromodichloromethane was not detected in soil and groundwater samples ;r any of the zones evaluated in the human health risk assessment, consequently this does not have any impact on the analysis.

Comment:

4. **The Navy's proposal to use 3-methylphenol as a surrogate for 4-chloro-3-methylphenol is not appropriate, due to structural differences between the two compounds. The use of a qualitative risk assessment would be acceptable assuming that concentrations of this chemical do not exceed the low part-per-billion range. Please see Dr. Ginsberg's comments for additional details.**

Response:

No criteria will be developed for 4-chloro-3-methylphenol. Instead, as suggested, 4-chloro-3-methylphenol will be evaluated qualitatively. 4-Chloro-3-methylphenol was only detected in one soil sample at the Lower Subase and at a low concentration (34 ppb), consequently, this does not have any impact on the human health risk assessment.

II. INCORRECT OR UNSUPPORTED POTENCY VALUES

Comment:

5. **Several of the CSFs or RfDs used by the Navy appeared to be incorrect, based on a comparison to the values listed in the EPA Region III Risk Based Concentrations table, IRIS, or HEAST. Please recalculate the direct exposure, pollutant mobility, and ground water protection criteria using correct values for total 1,2-dichloroethene. Please assume that this value pertains to the mixture of *cis* and *trans* isomers. The RfD for the mixture should be 9E-3 mg/kg/d.**

Response:

The direct exposure, pollutant mobility, and groundwater protection criteria for total 1,2-dichloroethene will be recalculated using an oral reference dose of 9E-3 mg/kg/day. This revision does not impact the human health risk assessment since all detected concentrations of total 1,2-dichloroethene are less than the recalculated criteria.

Comment:

6. **The Department was unable to verify the potency factors listed by the Navy for several chemicals. Please either provide references to support the listed potency factors, or derive criteria using acceptable surrogates for the following compounds: chloroethane, 4,6-dinitro-2-methylphenol, 2-hexanone, and 2-methylnaphthalene. Please note that naphthalene is not an appropriate surrogate for 2-methylnaphthalene as the RfD for naphthalene has been withdrawn from IRIS. Please refer to Dr. Ginsberg's memo for additional guidance.**

Response:

The toxicity criteria for chloroethane, 4,6-dinitro-2-methylphenol, 2-hexanone, and 2-methylnaphthalene were obtained from the current U.S. EPA Region III Risk-based Concentration (RBC) Table dated October 22, 1997. The RBC table cites EPA's National Center for Environmental Assessment (NCEA) as the source for the values for chloroethane, 4,6-dinitro-2-methylphenol, and 2-methylnaphthalene. Although not cited in the RBC table, EPA Region III stated in telephone call on March 12, 1998, that NCEA is also the source for the toxicity criteria for 2-hexanone. Therefore, there are no changes necessary to the proposed values.

Comment:

7. **The Department was unable to verify the RfD listed by the Navy for 4-nitrophenol (8.00E-3 mg/kg/d). Please either provide a reference for the listed value, or use the default RfD currently listed in the RBC tables (6.2E-2 mg/kg/d).**

Response:

The current RBC table lists 8.00E-3 mg/kg/day as the oral RfD for 4-nitrophenol and cites EPA's NCEA as the source for the value. The value of 6.2E-2 mg/kg/day was listed in the previous, outdated version of the RBC table. Therefore, there are no changes necessary to the proposed criteria.

## III. POLLUTANT MOBILITY CRITERIA FOR METALS

Comment:

8. **The ground water protection criterion for cobalt was calculated correctly by the Navy. However, the approach used by the Navy in calculating pollutant mobility criteria for cobalt is unacceptable. Rather than using the calculated ground water protection criterion (420 $\mu$g/l) to establish a pollutant mobility criterion for cobalt, the Navy used the EPA Region III Risk Based Criteria for tap water (2,200 $\mu$g/L) as the GAA/GA pollutant mobility criterion. This approach is less conservative than using the calculated ground water protection criterion. The correct pollutant mobility criteria for cobalt, based on the groundwater protection criteria calculated by the Navy, are 420 $\mu$g/L for a GAA/GA area, and 4,200 $\mu$g/L for a GB area (measurement by TCLP or SPLP).**

Response:

The pollutant mobility criteria for cobalt will be changed to 420 µg/L for a GAA/GA area and 4,200 µg/L for a GB area. This revision has no impact on the human health risk assessment because of the following reasons: (1) none of the historical soil samples that were analyzed by TCLP had leachates that were analyzed for cobalt, and (2) only the soil samples from Zone 6 had SPLP leachates that were analyzed for cobalt and all of the results were nondetects.

Comment:

9. **The ground water protection criterion for manganese was calculated correctly by the Navy. Rather than using the calculated ground water protection criterion (160 µg/l) to establish a pollutant mobility criterion for manganese, the Navy used the EPA Secondary MCL for drinking water (50 µg/L) as the GAA/GA pollutant mobility criterion. This approach is acceptable as it is more conservative than using the calculated ground water protection criterion.**

Response:

No response required.

## IV. GB POLLUTANT MOBILITY CRITERIA FOR DIMETHYLPHTHALATE

Comment:

10. **The GB pollutant mobility criteria listed for dimethylphthalate (1,400 mg/kg) in the Navy's Table 2 appears to be a typo. The correct value should be listed as 14,000 mg/kg.**

Response:

The GB pollutant mobility criteria for dimethylphthalate will be corrected to 14,000 mg/kg. This revision has no impact on the analysis since dimethylphthalate was not detected in soil samples in any of the zones that were evaluated in the human health risk assessment.

## V. BIS(2-CHLOROETHOXY)METHANE

Comment:

11. **The Navy proposes a qualitative risk assessment for this compound. This approach is acceptable provided that the compound is not present at concentrations above the low part-per-billion range. As noted by Dr. Ginsberg, if it is present above this range, a more quantitative risk assessment may be required.**

Response:

Bis(2-chloroethoxy)methane was not detected in soil or groundwater samples for any of the zones evaluated in the human health risk assessment, consequently this does not have any impact on the analysis.

TABLE 2

CALCULATED AND SURROGATE CALCULATED VALUES
CTO 260 LOWER SUBASE RI
NEW LONDON, GROTON, CONNECTICUT
PAGE 1 OF 3

| Chemical | Published Toxciological Criteria[1] | | Calculated Remediation Standards[2] | | | | |
|---|---|---|---|---|---|---|---|
| | $RfD_{oral}$ (mg/kg/day) | $CSF_{oral}$ (kg/day/mg) | Soil (mg/kg) | | | | Groundwater (ug/L) |
| | | | RES DE[3] | I/C DE[3] | GA/GAA PM | GB PM | GA/GAA GP |
| Acenaphthene | 6.00E-02 | NA | 1000[4] | 2500[4] | 8.4 | 84 | 420 |
| Aldrin | 3.00E-05 | 1.70E+01 | 0.036 | 0.34 | 0.000041 | 0.00041 | 0.0021 |
| Benzo(g,h,i)perylene | NA | NA | 1000[5] | 2500[5] | 4[5] | 40[5] | 200[5] |
| BCH (alpha-) | NA | 6.30E+00 | 0.097 | 0.91 | 0.00011 | 0.0011 | 0.0056 |
| BCH (beta-) | NA | 1.80E+00 | 0.34 | 3.2 | 0.00039 | 0.0039 | 0.0194 |
| BCH (delta-) | NA | NA | 0.097[6] | 0.91[6] | 0.00011[6] | 0.0011[6] | 0.0056[6] |
| Bromochloromethane | NA | NA | 9.9[7] | 92[7] | 0.011[7] | 0.11[7] | 0.56[7] |
| Bromodichloromethane | 2.00E-02 | 6.20E-02 | 9.9 | 92 | 0.011 | 0.11 | 0.56 |
| Bromomethane | 1.40E-03 | NA | 95 | 1000[4] | 0.2 | 2 | 9.8 |
| 4-Bromophenyl-phenylether | 5.80E-02 | NA | 500[4] | 1000[4] | 8.2 | 82 | 410 |
| Carbazole | NA | 2.00E-02 | 31 | 290 | 0.036 | 0.36 | 1,8 |
| Carbon disulfide | 1.00E-01 | NA | 500[4] | 1000[4] | 14 | 140 | 700 |
| 4-Chloroaniline | 4.00E-03 | NA | 270 | 2500[4] | 0.56 | 5.6 | 28 |
| Chloroethane | 4.00E-01 | 2.90E-03 | 210 | 1000[4] | 0.24 | 2.4 | 12 |
| Chloromethane | NA | 1.30E-02 | 47 | 440 | 0.054 | 0.54 | 2.7 |
| 4-Chloro-3-methylphenol | NA | NA | NA[8] | NA[8] | NA[8] | NA[8] | NA[8] |
| 2-Chloronaphthalene | 8.00E-02 | NA | 1000[4] | 2500[4] | 11 | 110 | 560 |
| 4-Chlorophenyl-phenylether | NA | NA | 500[9] | 1000[9] | 8.2[9] | 82[9] | 410[9] |
| Chrysene | NA | 7.30E-03 | 84 | 780 | 0.096 | 0.96 | 4.8 |
| Cobalt | 6.00E-02 | NA | 1000[4] | 2500[4] | 420[10] | 4200[10] | 420 |
| 4,4'-DDD | NA | 2.40E-01 | 2.6 | 24 | 0.0029 | 0.029 | 0.15 |
| 4,4'-DDE | NA | 3.40E-01 | 1.8 | 17 | 0.0021 | 0.021 | 0.1 |
| 4,4'-DDT | 5.00E-04 | 3.40E-01 | 1.8 | 17 | 0.0021 | 0.021 | 0.1 |
| Dibenzofuran | 4.00E-03 | NA | 270 | 2500[4] | 0.56 | 5.6 | 28 |
| Dibenz(a,h)anthracene | NA | 7.30E+00 | 0.084 | 0.78 | 0.000096 | 0.00096 | 0.0048 |
| 1,2-Dibromo-3-chloropropane | NA | 1.40E+00 | 0.44 | 4.1 | 0.0005 | 0.005 | 0.025 |
| 1,2-Dibromoethane | NA | 8.50E+01 | 0.0072 | 0.067 | 0.0000082 | 0.000082 | 0.00041 |
| 3,3'-Dichlorobenzidine | NA | 4.50E-01 | 1.4 | 13 | 0.0016 | 0.016 | 0.078 |
| 1,2-Dichloroethene (total) | 9.00E-03 | NA | 500[4] | 1000[4] | 1.2 | 12 | 63 |
| Diethyl phthalate | 8.00E-01 | NA | 1000[4] | 2500[4] | 110 | 1100 | 5600 |
| 2,4-Dimethylphenol | 2.00E-02 | NA | 1000[4] | 2500[4] | 2,8 | 28 | 140 |
| Dimethylphthalate | 1.00E+01 | NA | 1000[4] | 2500[4] | 1400 | 14000 | 70000 |

TABLE 2

CALCULATED AND SURROGATE CALCULATED VALUES
CTO 280 LOWER SUBASE RI
NEW LONDON, GROTON, CONNECTICUT


| Chemical | Published Toxicological Criteria[1] | | Calculated Remediation Standards[2] | | | | |
|---|---|---|---|---|---|---|---|
| | | | Soil (mg/kg) | | | | Groundwater (ug/L) |
| | $RfD_{oral}$ (mg/kg/day) | $CSF_{oral}$ (kg/day/mg) | RES DE[3] | I/C DE[3] | GA/GAA PM | GB PM | GA/GAA GP |
| 4,6-Dinitro-2-methylphenol | 1.00E-04 | NA | 6.8 | 200 | 0.014 | 0.14 | 0.7 |
| 2,4-Dinitrophenol | 2.00E-03 | NA | 140 | 2500[4] | 0.28 | 2.8 | 14 |
| 2,4-Dinitrotoluene | 2.00E-03 | NA | 140 | 2500[4] | 0.28 | 2.8 | 14 |
| 2,6-Dinitrotoluene | 1.00E-03 | NA | 68 | 2000 | 0.14 | 1.4 | 7 |
| Endosulfan I | 6.00E-03 | NA | 410 | 1200 | 0.84 | 8.4 | 42 |
| Endosulfan II | 6.00E-03 | NA | 410 | 1200 | 0.84 | 8.4 | 42 |
| Endosulfan sulfate | NA | NA | 410[12] | 1200[12] | 0.84[12] | 8.4[12] | 42[12] |
| Endrin aldehyde | NA | NA | 20[13] | 610[13] | NE[13] | NE[13] | NE[13] |
| Endrin ketone | NA | NA | 20[13] | 610[13] | NE[13] | NE[13] | NE[13] |
| Hexachlorobutadiene | 2.00E-04 | 7.80E-02 | 7.9 | 73 | 0.009 | 0.09 | 0.45 |
| Hexachlorocyclopentadiene | 7.00E-03 | NA | 470 | 2500[4] | 0.98 | 9.8 | 49 |
| 2-Hexanone | 4.00E-02 | NA | 500[4] | 1000[4] | 5.6 | 56 | 280 |
| Indeno(1,2,3-cd)pyrene | NA | 7.30E-01 | 0.84 | 7.8 | 0.00096 | 0.0096 | 0.045 |
| Isophorone | 2.00E-01 | 9.50E-04 | 640 | 2500[4] | 0.74 | 7.4 | 37 |
| Manganese | 2.30E-02 | NA | 1600 | 47000 | 50[10][14] | 500[10][14] | 160 |
| 2-Methylnaphthalene | 4.00E-02 | NA | 1000[4] | 2500[4] | 5.6 | 56 | 280 |
| 2-Methylphenol | 5.00E-02 | NA | 1000[4] | 2500[4] | 7 | 70 | 350 |
| 4-Methylphenol | 5.00E-03 | NA | 340 | 2500[4] | 0.7 | 7 | 35 |
| 2-Nitroaniline | 6.00E-05 | NA | 4.1 | 1200 | 0.0084 | 0.084 | 0.42 |
| 3-Nitroaniline | 3.00E-03 | NA | 200 | 2500[4] | 0.42 | 4.2 | 21 |
| 4-Nitroaniline | 3.00E-03 | NA | 200 | 2500[4] | 0.42 | 4.2 | 21 |
| Nitrobenzene | 5.00E-04 | NA | 34 | 1000 | 0.07 | 0.7 | 3.5 |
| 2-Nitrophenol | NA | NA | 540[15] | 2500[15] | 1.1[15] | 11[15] | 56[15] |
| 4-Nitrophenol | 8.00E-03 | NA | 540 | 2500[4] | 1.1 | 11 | 56 |
| N-Nitrosodiphenylamine | NA | 4.90E-03 | 130 | 1200 | 0.14 | 1.4 | 7.1 |
| N-Nitrosodi-n-propylamine | NA | 7.00E+00 | 0.088 | 0.82 | 0.0001 | 0.001 | 0.005 |
| 1,2,4-Trichlorobenzene | 1.00E-02 | NA | 680 | 2500[4] | 1.4 | 14 | 70 |
| 2,4,5-Trichloroph[illegible] | 1.00E-01 | NA | 1000[4] | 2500[4] | 14 | 140 | 700 |
| 2,4,6-Trichlorophenol | NA | 1.10E-02 | 56 | 520 | 0.064 | 0.64 | 3.2 |

RfD Reference dose
CSF Cancer slope factor

TABLE 2

CALCULATED AND SURROGATE CALCULATED VALUES
CTO 260 LOWER SUBASE RI
NEW LONDON, GROTON, CONNECTICUT


| | |
|---|---|
| RES DE | Direct exposure criteria for residential land use |
| I/C DE | Direct exposure criteria for industrial/commercial land use |
| GA/GAA PM | Pollutant mobility criteria for a GA/GAA classified area |
| GB PM | Pollutant mobility criteria for a GB classified area |
| GA/GAA GP | Groundwater protection criteria for a GA/GAA classified area |
| NA | Not available |
| NE | None established by Connecticut DEP (January 1996) |

1 Values obtained from current USEPA Region III Risk-Based Concentration Table (October 22, 1997)
2 Calculated using methodologies presented in State guidance (January 1996).
3 Calculated value for direct exposure for volatile and semivolatile organics is replaced with the appropriate ceiling limit if the calculated value exceeds the ceiling limit. Ceiling limit for volatiles is 500 mg/kg for residential exposure and 1000 mg/kg for industrial/commercial exposure. Ceiling limit for semivolatiles is 1000 mg/kg for residential exposure and 2500 mg/kg for industrial/commercial exposure.
4 Ceiling limit. Calculated value exceeds the ceiling limit.
5 Value for pyrene is used.
6 Value for alpha-BHC is used.
7 Value for bromodichloromethane is used.
8 Chemical will be addressed qualitatively at CTEP's request
9 Value for 4-bromophenyl-phenylether is used.
10 Value is for aqueous units (ug/L) and is based on SPLP or TCLP analytical results.
11 Value is based on the Region III RBC for tap water (2200 ug/L).
12 Value for endosulfan is used.
13 Value for endrin is used.
14 Value is based on the secondary Federal MCL for drinking water (50 ug/L).
15 Value for 4-nitrophenol is used.

**TABLE 1**

**SOURCE OF CONNECTICUT REMEDIATION STANDARDS**
**CTO 260 LOWER SUBASE RI**
**NEW LONDON, GROTON, CONNECTICUT**


| Chemical | CAS Number | Chemical Fraction | Basis of Value to be Used in RI Report | | |
|---|---|---|---|---|---|
| | | | Promulgated Value(1) | Calculated Value(2) | Surrogate Calculated Value(3) |
| Acenaphthene | 83329 | SVOC | | X | |
| Acenaphthylene | 208968 | SVOC | X | | |
| Anthracene | 120127 | SVOC | X | | |
| Acetone | 67641 | VOC | X | | |
| Aldrin | 309002 | PEST | | X | |
| Aluminum | 7429905 | INORG | (4) | (4) | (4) |
| Antimony | 7440360 | INORG | X | | |
| Arsenic | 7440382 | INORG | X | | |
| Barium | 7440393 | INORG | X | | |
| Benzene | 71432 | VOC | X | | |
| Benz(a)anthracene | 56553 | SVOC | X | | |
| Benzo(b)fluoranthene | 205992 | SVOC | X | | |
| Benzo(k)fluoranthene | 207089 | SVOC | X | | |
| Benzo(g,h,i)perylene | 191242 | SVOC | | | X (pyrene) |
| Benzo(a)pyrene | 50328 | SVOC | X | | |
| Beryllium | 7440417 | INORG | X | | |
| BCH (alpha-) | 319846 | PEST | | X | |
| BCH (beta-) | 319857 | PEST | | X | |
| BCH (delta-) | 319868 | PEST | | | X (alpha-BHC) |
| BCH (gamma-; Lindane) | 58899 | PEST | X | | |
| Bis(2-chloroethoxy)methane | 111911 | SVOC | (5) | (5) | (5) |
| Bis(2-chloroethyl)ether | 111444 | SVOC | X | | |
| Bis(2-ethylhexyl)phthalate | 117817 | SVOC | X | | |
| Bromochloromethane | 74975 | VOC | | | X (bromodichloro-methane) |
| Bromodichloromethane | 75274 | VOC | | X | |
| Bromoform | 75252 | VOC | X | | |
| Bromomethane | 74839 | VOC | | X | |
| 4-Bromophenyl-phenylether | 101553 | SVOC | | X | |
| 2-Butanone | 78933 | VOC | X | | |
| Butylbenzylphthalate | 85687 | SVOC | X | | |
| Cadmium | 7440439 | INORG | X | | |
| Calcium | 7440702 | INORG | (6) | (6) | (6) |
| Carbazole | 86748 | SVOC | | X | |
| Carbon disulfide | 75150 | VOC | | X | |
| Carbon tetrachloride | 56235 | VOC | X | | |
| Chlordane (alpha-) | 57749 | PEST | X(7) | | |
| Chlordane (gamma-) | 57749 | PEST | X(7) | | |
| 4-Chloroaniline | 106478 | SVOC | | X | |
| Chlorobenzene | 108907 | VOC | X | | |
| Chlorodibromomethane | 124481 | VOC | X | | |
| Chloroethane | 75003 | VOC | | X | |
| Chloroform | 67663 | VOC | X | | |
| Chloromethane | 74873 | VOC | | X | |
| 4-Chloro-3-methylphenol | 59507 | SVOC | (5) | (5) | (5) |

TABLE 1

SOURCE OF CONNECTICUT REMEDIATION STANDARDS
CTO 260 LOWER SUBASE RI
NEW LONDON, GROTON, CONNECTICUT


| Chemical | CAS Number | Chemical Fraction | Basis of Value to be Used in RI Report | | |
|---|---|---|---|---|---|
| | | | Promulgated Value(1) | Calculated Value(2) | Surrogate Calculated Value(3) |
| 2-Chloronaphthalene | 91587 | SVOC | | X | |
| 2-Chlorophenol | 95578 | SVOC | X | | |
| 4-Chlorophenyl-phenylether | 7005723 | SVOC | | | X (4-Bromophenyl-phenylether) |
| Chromium (total) | | INORG | X(8) | | |
| Chrysene | 218019 | SVOC | | X | |
| Cobalt | 7440484 | INORG | | X | |
| Copper | 7440508 | INORG | (4) | (4) | (4) |
| 4,4'-DDD | 72548 | PEST | | X | |
| 4,4'-DDE | 72559 | PEST | | X | |
| 4,4'-DDT | 50293 | PEST | | X | |
| Dibenzofuran | 132649 | SVOC | | X | |
| Dibenz(a,h)anthracene | 53703 | SVOC | | X | |
| 1,2-Dibromo-3-chloropropane | 96128 | VOC | | X | |
| 1,2-Dibromoethane | 106934 | VOC | | X | |
| 1,2-Dichlorobenzene | 95501 | VOC/SVOC | X | | |
| 1,3-Dichlorobenzene | 541731 | VOC/SVOC | X | | |
| 1,4-Dichlorobenzene | 106467 | VOC/SVOC | X | | |
| 3,3'-Dichlorobenzidine | 91941 | SVOC | | X | |
| 1,1-Dichloroethane | 75343 | VOC | X | | |
| 1,2-Dichloroethane | 107062 | VOC | X | | |
| 1,1-Dichloroethene | 75354 | VOC | X | | |
| 1,2-Dichloroethene (cis-) | 156592 | VOC | X | | |
| 1,2-Dichloroethene (trans-) | 156605 | VOC | X | | |
| 1,2-Dichloroethene (total) | 156605 | VOC | | X | |
| 2,4-Dichlorophenol | 120832 | SVOC | X | | |
| 1,2-Dichloropropane | 78875 | VOC | X | | |
| 1,3-Dichloropropene (cis-) | 542756 | VOC | X | | |
| 1,3-Dichloropropene (trans-) | 542756 | VOC | X | | |
| Dieldrin | 60571 | PEST | X | | |
| Diethyl phthalate | 84662 | SVOC | | X | |
| 2,4-Dimethylphenol | 105679 | SVOC | | X | |
| Dimethylphthalate | 131113 | SVOC | | X | |
| Di-n-butylphthalate | 84742 | SVOC | X | | |
| Di-n-octylphthalate | 117840 | SVOC | X | | |
| 4,6-Dinitro-2-methylphenol | 534521 | SVOC | | X | |
| 2,4-Dinitrophenol | 51285 | SVOC | | X | |
| 2,4-Dinitrotoluene | 121142 | SVOC | | X | |
| 2,6-Dinitrotoluene | 606202 | SVOC | | X | |
| Endosulfan I | 115297 | PEST | | X(9) | |
| Endosulfan II | 115297 | PEST | | X(9) | |
| Endosulfan sulfate | 1031078 | PEST | | | X (endosulfan) |
| Endrin | 72208 | PEST | X | | |
| Endrin aldehyde | 7421363 | PEST | | | X (endrin) |
| Endrin ketone | 53494705 | PEST | | | X (endrin) |

TABLE 1

SOURCE OF CONNECTICUT REMEDIATION STANDARDS
CTO 260 LOWER SUBASE RI
NEW LONDON, GROTON, CONNECTICUT
PAGE 3 OF 4

| Chemical | CAS Number | Chemical Fraction | Basis of Value to be Used in RI Report | | |
|---|---|---|---|---|---|
| | | | Promulgated Value(1) | Calculated Value(2) | Surrogate Calculated Value(3) |
| Ethylbenzene | 100414 | VOC | X | | |
| Fluoranthene | 206440 | SVOC | X | | |
| Fluorene | 86737 | SVOC | X | | |
| Heptachlor | 76448 | PEST | X | | |
| Heptachlor epoxide | 1024573 | PEST | X | | |
| Hexachlorobenzene | 118741 | SVOC | X | | |
| Hexachlorobutadiene | 87683 | SVOC | | X | |
| Hexachlorocyclopentadiene | 77474 | SVOC | | X | |
| Hexachloroethane | 67721 | SVOC | X | | |
| 2-Hexanone | 73663715 | VOC | | X | |
| Indeno(1.2.3-cd)pyrene | 193395 | SVOC | | X | |
| Iron | 7439896 | INORG | (4) | (4) | (4) |
| Isophorone | 78591 | SVOC | | X | |
| Lead | 7439291 | INORG | X | | |
| Magnesium | 7439954 | INORG | (6) | (6) | (6) |
| Manganese | 7439965 | INORG | | X | |
| Mercury | 7439976 | INORG | X | | |
| Methoxychlor | 72435 | PEST | X | | |
| Methylene chloride | 75092 | VOC | X | | |
| 2-Methylnaphthalene | 91576 | SVOC | | X | |
| 4-Methyl-2-pentanone | 108101 | VOC | X | | |
| 2-Methylphenol | 95487 | SVOC | | X | |
| 4-Methylphenol | 106445 | SVOC | | X | |
| Naphthalene | 91203 | SVOC | X | | |
| Nickel | 7440020 | INORG | X | | |
| 2-Nitroaniline | 88744 | SVOC | | X | |
| 3-Nitroaniline | 99092 | SVOC | | X | |
| 4-Nitroaniline | 100016 | SVOC | | X | |
| Nitrobenzene | 98953 | SVOC | | X | |
| 2-Nitrophenol | 88755 | SVOC | | | X (4-nitrophenol) |
| 4-Nitrophenol | 100027 | SVOC | | X | |
| N-Nitrosodiphenylamine | 86306 | SVOC | | X | |
| N-Nitrosodi-n-propylamine | 621647 | SVOC | | X | |
| 2.2'-Oxybis(1-chloropropane) | 108601 | SVOC | (5) | (5) | (5) |
| Pentachlorophenol | 87865 | SVOC | X | | |
| Phenanthrene | 85018 | SVOC | X | | |
| Phenol | 108952 | SVOC | X | | |
| Potassium | 7440097 | INORG | (6) | (6) | (6) |
| Pyrene | 129000 | SVOC | X | | |
| Selenium | 7782492 | INORG | X | | |
| Silver | 7440224 | INORG | X | | |
| Sodium | 7440235 | INORG | (6) | (6) | (6) |
| Styrene | 100425 | VOC | X | | |
| 1.1.2.2-Tetrachloroethane | 79345 | VOC | X | | |
| Tetrachloroethylene | 127184 | VOC | X | | |
| Thallium | 6533739 | INORG | X | | |
| Toluene | 108883 | VOC | X | | |
| Toxaphene | 8001352 | PEST | X | | |

## TABLE 1

**SOURCE OF CONNECTICUT REMEDIATION STANDARDS**
**CTO 260 LOWER SUBASE RI**
**NEW LONDON, GROTON, CONNECTICUT**


| Chemical | CAS Number | Chemical Fraction | Basis of Value to be Used in RI Report | | |
|---|---|---|---|---|---|
| | | | Promulgated Value(1) | Calculated Value(2) | Surrogate Calculated Value(3) |
| 1,2,4-Trichlorobenzene | 120821 | SVOC | | X | |
| 1,1,1-Trichloroethane | 71556 | VOC | X | | |
| 1,1,2-Trichloroethane | 79005 | VOC | X | | |
| Trichloroethylene | 79016 | VOC | X | | |
| 2,4,5-Trichlorophenol | 95954 | SVOC | | X | |
| 2,4,6-Trichlorophenol | 88062 | SVOC | | X | |
| Vanadium | 7440622 | INORG | X | | |
| Vinyl chloride | 75014 | VOC | X | | |
| Xylene (total) | 1330207 | VOC | X | | |
| Zinc | 7440666 | INORG | X | | |

INORG Inorganic
PEST Pesticide
SVOC Semivolatile organic compound
VOC Volatile organic compound

1 State of Connecticut Remediation Standard Regulations, Section 22a-133k (January 1996).
2 Published toxicity criteria is available. Toxicity criteria from the current USEPA Region III Risk-Based Concentration Table (October 22, 1997) will be used to calculate a value using the methodology presented in the State guidance (January 1996).
3 No toxicity criteria is available. Toxicity criteria for a similarly structured chemical (noted in parentheses) will be used to calculate a value.
4 Region I does not advocate a quantitative evaluation of this chemical. Exposure to this chemical will be addressed in a qualitative fashion.
5 No promulgated value or published toxicity criteria are available. A similarly structured chemical with published toxicity criteria could not be identified. Exposure to this chemical will be addressed in a qualitative fashion.
6 Chemical is an essential nutrient.
7 Value for chlordane is used.
8 Value for hexavalent chromium is used for conservative purposes.
9 Value for endosulfan is used.

# Appendix F.3

# Background Concentrations

Appendix F-3
Raymark OU3
Soil/Sediment Background Data

| Matrix | Fraction | Parameter | Units | Frequency | Range Of Detects | Range Of Nondetects | Average | Maximum | Location of Maximum |
|---|---|---|---|---|---|---|---|---|---|
| SOIL/SEDIMENT/WETLAND | DIOXI | 1,2,3,4,6,7,8-HPCDD | UG/KG | 4/4 | 0.00726 - 0.34857 | - | 0.11011 | 0.34857 | RM-SD-RF01-04 |
| SOIL/SEDIMENT/WETLAND | DIOXI | 1,2,3,4,6,7,8-HPCDF | UG/KG | 4/4 | 0.00263 - 0.10316 | - | 0.043245 | 0.10316 | RM-SD-RF01-04 |
| SOIL/SEDIMENT/WETLAND | DIOXI | 1,2,3,4,7,8-HXCDD | UG/KG | 2/4 | 0.00022 - 0.00622 | 0.0006 - 0.00984 | 0.002915 | 0.00622 | RM-SD-RF01-04 |
| SOIL/SEDIMENT/WETLAND | DIOXI | 1,2,3,4,7,8-HXCDF | UG/KG | 1/4 | 0.00078 - 0.00078 | 0.00066 - 0.00973 | 0.0024325 | 0.00078 | RM-SD-GM07-04 |
| SOIL/SEDIMENT/WETLAND | DIOXI | 1,2,3,6,7,8-HXCDD | UG/KG | 2/4 | 0.00033 - 0.01788 | 0.00075 - 0.00968 | 0.00585625 | 0.01788 | RM-SD-RF01-04 |
| SOIL/SEDIMENT/WETLAND | DIOXI | 1,2,3,6,7,8-HXCDF | UG/KG | 1/4 | 0.00055 - 0.00055 | 0.00081 - 0.0068 | 0.0018375 | 0.00055 | RM-SD-GM02-01 |
| SOIL/SEDIMENT/WETLAND | DIOXI | 1,2,3,7,8,9-HXCDD | UG/KG | 1/4 | 0.00033 - 0.00033 | 0.00072 - 0.01678 | 0.003745 | 0.00033 | RM-SD-GM02-01 |
| SOIL/SEDIMENT/WETLAND | DIOXI | 1,2,3,7,8,9-HXCDF | UG/KG | 2/4 | 0.00031 - 0.00755 | 0.00103 - 0.00644 | 0.00289875 | 0.00755 | RM-SD-GM08-04 |
| SOIL/SEDIMENT/WETLAND | DIOXI | 2,3,7,8-TCDF | UG/KG | 3/4 | 0.00097 - 0.00994 | 0.00053 - 0.00053 | 0.00418625 | 0.00994 | RM-SD-GM08-04 |
| SOIL/SEDIMENT/WETLAND | DIOXI | OCDD | UG/KG | 4/4 | 0.16671 - 3.64659 | - | 1.6016375 | 3.64659 | RM-SD-RF01-04 |
| SOIL/SEDIMENT/WETLAND | DIOXI | OCDF | UG/KG | 4/4 | 0.00672 - 0.2442 | - | 0.115875 | 0.2442 | RM-SD-GM08-04 |
| SOIL/SEDIMENT/WETLAND | DIOXI | TOTAL HPCDD | UG/KG | 4/4 | 0.01589 - 0.76351 | - | 0.2595375 | 0.76351 | RM-SD-RF01-04 |
| SOIL/SEDIMENT/WETLAND | DIOXI | TOTAL HPCDF | UG/KG | 4/4 | 0.01013 - 0.64704 | - | 0.23091 | 0.64704 | RM-SD-RF01-04 |
| SOIL/SEDIMENT/WETLAND | DIOXI | TOTAL HXCDD | UG/KG | 4/4 | 0.00112 - 0.05964 | - | 0.0254 | 0.05964 | RM-SD-GM08-04 |
| SOIL/SEDIMENT/WETLAND | DIOXI | TOTAL HXCDF | UG/KG | 4/4 | 0.00637 - 0.65412 | - | 0.2633475 | 0.65412 | RM-SD-RF01-04 |
| SOIL/SEDIMENT/WETLAND | DIOXI | TOTAL PECDF | UG/KG | 4/4 | 0.00616 - 0.87881 | - | 0.4017375 | 0.87881 | RM-SD-GM08-04 |
| SOIL/SEDIMENT/WETLAND | DIOXI | TOTAL TCDD | UG/KG | 3/4 | 0.00048 - 0.00546 | 0.00013 - 0.00013 | 0.00277125 | 0.00546 | RM-SD-RF01-04 |
| SOIL/SEDIMENT/WETLAND | DIOXI | TOTAL TCDF | UG/KG | 3/4 | 0.01123 - 0.72167 | 0.00399 - 0.00399 | 0.25400625 | 0.72167 | RM-SD-GM08-04 |
| SOIL/SEDIMENT/WETLAND | DIOXI | TOXICITY EQUIVALENCY FACTOR | UG/KG | 4/4 | 0.000461 - 0.01133 | - | 0.00451775 | 0.01133 | RM-SD-RF01-04 |
| SOIL/SEDIMENT/WETLAND | M | ALUMINUM | MG/KG | 43/43 | 926 - 22600 | - | 12784.32558 | 22600 | SMS-G3 |
| SOIL/SEDIMENT/WETLAND | M | ARSENIC | MG/KG | 42/43 | 0.62 - 14.2 | 1.5 - 1.5 | 5.836511628 | 14.2 | RM-SD-GM07-04 |
| SOIL/SEDIMENT/WETLAND | M | BARIUM | MG/KG | 42/43 | 5.3 - 329 | 4.1 - 4.1 | 55.13837209 | 329 | EX-91 |
| SOIL/SEDIMENT/WETLAND | M | BERYLLIUM | MG/KG | 37/43 | 0.26 - 1.3 | 0.25 - 0.82 | 0.694302326 | 1.3 | EWS-G5B |
| SOIL/SEDIMENT/WETLAND | M | BERYLLIUM | MG/KG | 37/43 | 0.26 - 1.3 | 0.25 - 0.82 | 0.694302326 | 1.3 | THN-G2 |
| SOIL/SEDIMENT/WETLAND | M | CADMIUM | MG/KG | 8/43 | 0.43 - 1.4 | 0.39 - 1.4 | 0.388139535 | 1.4 | EX-91 |
| SOIL/SEDIMENT/WETLAND | M | CALCIUM | MG/KG | 43/43 | 161 - 7420 | - | 1637.976744 | 7420 | UMC-92 |
| SOIL/SEDIMENT/WETLAND | M | CHROMIUM | MG/KG | 43/43 | 6.2 - 107 | - | 21.04418605 | 107 | RM-SD-GM07-04 |
| SOIL/SEDIMENT/WETLAND | M | COBALT | MG/KG | 33/43 | 1.6 - 14.9 | 2 - 8.8 | 6.565116279 | 14.9 | RM-SD-GM08-04 |
| SOIL/SEDIMENT/WETLAND | M | COPPER | MG/KG | 42/43 | 9.2 - 336 | 11.9 - 11.9 | 41.06860465 | 336 | RM-SD-GM07-04 |
| SOIL/SEDIMENT/WETLAND | M | IRON | MG/KG | 43/43 | 3110 - 35300 | - | 16604.65116 | 35300 | RM-SD-GM08-04 |
| SOIL/SEDIMENT/WETLAND | M | LEAD | MG/KG | 40/42 | 3.7 - 344 | 19.1 - 21.7 | 81.83095238 | 344 | EX-91 |
| SOIL/SEDIMENT/WETLAND | M | MAGNESIUM | MG/KG | 43/43 | 368 - 10400 | - | 3530.186047 | 10400 | RM-SD-GM08-04 |
| SOIL/SEDIMENT/WETLAND | M | MANGANESE | MG/KG | 43/43 | 35.8 - 660 | - | 297.0674419 | 660 | LSSE+125 |
| SOIL/SEDIMENT/WETLAND | M | MERCURY | MG/KG | 28/43 | 0.07 - 1.2 | 0.07 - 0.12 | 0.158139535 | 1.2 | RM-SD-GM07-04 |
| SOIL/SEDIMENT/WETLAND | M | NICKEL | MG/KG | 33/43 | 4.4 - 40.4 | 3 - 18.1 | 13.25465116 | 40.4 | LSSA+00 |
| SOIL/SEDIMENT/WETLAND | M | POTASSIUM | MG/KG | 27/43 | 517 - 5020 | 53.7 - 894 | 1134.054651 | 5020 | RM-SD-GM08-04 |
| SOIL/SEDIMENT/WETLAND | M | SELENIUM | MG/KG | 6/43 | 0.95 - 3.3 | 0.31 - 3.4 | 0.54 | 3.3 | THN-G2 |
| SOIL/SEDIMENT/WETLAND | M | SILVER | MG/KG | 2/43 | 0.58 - 3.3 | 0.31 - 1.9 | 0.509883721 | 3.3 | GLC004 |
| SOIL/SEDIMENT/WETLAND | M | SODIUM | MG/KG | 25/38 | 66.4 - 15000 | 50 - 168 | 953.7026316 | 15000 | RM-SD-GM08-04 |
| SOIL/SEDIMENT/WETLAND | M | VANADIUM | MG/KG | 42/43 | 6.5 - 81.9 | 3.1 - 3.1 | 34.38255814 | 81.9 | SH-A+00 |
| SOIL/SEDIMENT/WETLAND | M | ZINC | MG/KG | 43/43 | 9.8 - 604 | - | 114.3651163 | 604 | LBP012 |
| SOIL/SEDIMENT/WETLAND | OS | ANTHRACENE | UG/KG | 1/4 | 1300 - 1300 | 430 - 820 | 577.5 | 1300 | RM-SD-RF01-04 |
| SOIL/SEDIMENT/WETLAND | OS | BENZO(A)ANTHRACENE | UG/KG | 2/4 | 460 - 7000 | 430 - 770 | 2015 | 7000 | RM-SD-RF01-04 |
| SOIL/SEDIMENT/WETLAND | OS | BENZO(A)PYRENE | UG/KG | 1/4 | 5800 - 5800 | 430 - 820 | 1702.5 | 5800 | RM-SD-RF01-04 |
| SOIL/SEDIMENT/WETLAND | OS | BENZO(B)FLUORANTHENE | UG/KG | 3/4 | 300 - 12000 | 430 - 430 | 3291.25 | 12000 | RM-SD-RF01-04 |
| SOIL/SEDIMENT/WETLAND | OS | BENZO(G,H,I)PERYLENE | UG/KG | 1/4 | 2700 - 2700 | 430 - 820 | 927.5 | 2700 | RM-SD-RF01-04 |
| SOIL/SEDIMENT/WETLAND | OS | BIS(2-ETHYLHEXYL)PHTHALATE | UG/KG | 2/4 | 270 - 1600 | 430 - 770 | 617.5 | 1600 | RM-SD-RF01-04 |

Appendix F-3
Raymark OU3
Soil/Sediment Background Data

| Matrix | Fraction | Parameter | Units | Frequency | Range Of Detects | Range Of Nondetects | Average | Maximum | Location of Maximum |
|---|---|---|---|---|---|---|---|---|---|
| SOIL/SEDIMENT/WETLAND | OS | CARBAZOLE | UG/KG | 1/4 | 1100 - 1100 | 430 - 820 | 527.5 | 1100 | RM-SD-RF01-04 |
| SOIL/SEDIMENT/WETLAND | OS | CHRYSENE | UG/KG | 2/4 | 450 - 6700 | 430 - 770 | 1937.5 | 6700 | RM-SD-RF01-04 |
| SOIL/SEDIMENT/WETLAND | OS | DIBENZO(A,H)ANTHRACENE | UG/KG | 1/4 | 2000 - 2000 | 430 - 820 | 752.5 | 2000 | RM-SD-RF01-04 |
| SOIL/SEDIMENT/WETLAND | OS | FLUORANTHENE | UG/KG | 4/4 | 23 - 14000 | - | 3770.75 | 14000 | RM-SD-RF01-04 |
| SOIL/SEDIMENT/WETLAND | OS | INDENO(1,2,3-CD)PYRENE | UG/KG | 1/4 | 5200 - 5200 | 430 - 820 | 1552.5 | 5200 | RM-SD-RF01-04 |
| SOIL/SEDIMENT/WETLAND | OS | PHENANTHRENE | UG/KG | 2/4 | 300 - 6700 | 430 - 770 | 1900 | 6700 | RM-SD-RF01-04 |
| SOIL/SEDIMENT/WETLAND | OS | PYRENE | UG/KG | 4/4 | 22 - 9300 | - | 2485.5 | 9300 | RM-SD-RF01-04 |
| SOIL/SEDIMENT/WETLAND | OV | CARBON DISULFIDE | UG/KG | 2/4 | 8 - 31 | 13 - 18 | 13.625 | 31 | RM-SD-GM08-04 |
| SOIL/SEDIMENT/WETLAND | OV | TOLUENE | UG/KG | 1/4 | 7 - 7 | 13 - 25 | 9.375 | 7 | RM-SD-RF01-04 |
| SOIL/SEDIMENT/WETLAND | PESTP | 4,4'-DDD | UG/KG | 3/39 | 0.28 - 5.8 | 3.3 - 20 | 4.478974359 | 5.8 | RM-SD-RF01-04 |
| SOIL/SEDIMENT/WETLAND | PESTP | 4,4'-DDE | UG/KG | 14/38 | 0.15 - 240 | 3.3 - 20 | 15.94315789 | 240 | THG005 |
| SOIL/SEDIMENT/WETLAND | PESTP | 4,4'-DDT | UG/KG | 15/38 | 0.22 - 400 | 3.3 - 20 | 27.77026316 | 400 | THG005 |
| SOIL/SEDIMENT/WETLAND | PESTP | ALDRIN | UG/KG | 3/40 | 0.14 - 2.6 | 1.7 - 10 | 2.2645 | 2.6 | RM-SD-RF01-04 |
| SOIL/SEDIMENT/WETLAND | PESTP | ALPHA-CHLORDANE | UG/KG | 12/39 | 0.05 - 44 | 1.7 - 9.8 | 4.535307692 | 44 | NS-E+200 |
| SOIL/SEDIMENT/WETLAND | PESTP | AROCLOR, TOTAL | UG/KG | 10/41 | 154 - 810 | 165.5 - 1005 | 252.4390244 | 810 | NS-G+300 |
| SOIL/SEDIMENT/WETLAND | PESTP | AROCLOR, TOTAL | UG/KG | 10/41 | 154 - 810 | 165.5 - 1005 | 252.4390244 | 810 | NS-B+200 |
| SOIL/SEDIMENT/WETLAND | PESTP | DELTA-BHC | UG/KG | 1/40 | 1.3 - 1.3 | 1.7 - 10 | 2.17125 | 1.3 | THG005 |
| SOIL/SEDIMENT/WETLAND | PESTP | DIELDRIN | UG/KG | 8/37 | 2.6 - 190 | 3.3 - 19 | 12.92162162 | 190 | NS-E+200 |
| SOIL/SEDIMENT/WETLAND | PESTP | ENDOSULFAN I | UG/KG | 3/39 | 22 - 47 | 1.7 - 9.8 | 4.264102564 | 47 | NS-E+200 |
| SOIL/SEDIMENT/WETLAND | PESTP | ENDOSULFAN II | UG/KG | 7/40 | 0.16 - 6 | 3.3 - 20 | 4.34925 | 6 | SH-A+00 |
| SOIL/SEDIMENT/WETLAND | PESTP | ENDRIN | UG/KG | 4/40 | 0.12 - 4.5 | 3.3 - 20 | 4.412 | 4.5 | HBN-G4 |
| SOIL/SEDIMENT/WETLAND | PESTP | ENDRIN ALDEHYDE | UG/KG | 3/40 | 0.2 - 3.7 | 3.3 - 20 | 4.21575 | 3.7 | HP-GR7 |
| SOIL/SEDIMENT/WETLAND | PESTP | ENDRIN KETONE | UG/KG | 4/39 | 1.8 - 9.5 | 3.3 - 20 | 5.071794872 | 9.5 | LSSE+125 |
| SOIL/SEDIMENT/WETLAND | PESTP | GAMMA-BHC (LINDANE) | UG/KG | 3/40 | 0.03 - 2.2 | 1.7 - 10 | 2.249 | 2.2 | RM-SD-RF01-04 |
| SOIL/SEDIMENT/WETLAND | PESTP | GAMMA-CHLORDANE | UG/KG | 8/37 | 0.15 - 13 | 1.7 - 9.8 | 2.82027027 | 13 | EWS-G5B |
| SOIL/SEDIMENT/WETLAND | PESTP | HEPTACHLOR | UG/KG | 2/39 | 0.28 - 1 | 1.7 - 10 | 2.090512821 | 1 | THG005 |
| SOIL/SEDIMENT/WETLAND | PESTP | HEPTACHLOR EPOXIDE | UG/KG | 3/39 | 1.6 - 2.3 | 1.7 - 10 | 2.266666667 | 2.3 | LSSB+365 |
| SOIL/SEDIMENT/WETLAND | PESTP | METHOXYCHLOR | UG/KG | 4/38 | 4.1 - 18 | 3.6 - 100 | 21.79736842 | 18 | CC5 |
| SOIL/SEDIMENT/WETLAND | PESTP | TOXAPHENE | UG/KG | 2/40 | 1.4 - 5.7 | 170 - 1000 | 221.4275 | 5.7 | HBN-G4 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Note: | Average concentrations were calculated assuming 1/2 Detection Limit for all reported non-detect values. | | | | | | | | |

ANALYTICAL RESULTS
DRAFT REMEDIAL INVESTIGATION REPORT
RAYMARK-FERRY CREEK - OU3
STRATFORD, CONNECTICUT

| Sample Number | RM-SD-GM02-01 | | RM-SD-GM07-04 | | RM-SD-GM08-04 | | RM-SD-RF01-04 | |
|---|---|---|---|---|---|---|---|---|
| Sample Location | GM02 | | GM07 | | GM08 | | RF01 | |
| Date Sampled | 8/16/94 | | 8/16/95 | | 8/16/95 | | 8/7/95 | |
| QC Type | None | | None | | None | | None | |
| MATRIX | SEDIMENT | | SEDIMENT | | SEDIMENT | | SEDIMENT | |
| Filtering | NA | | NA | | NA | | NA | |
| *Volatile Organic Compounds (UG/KG)* | | | | | | | | |
| 1,1,1-TRICHLOROETHANE | 13 | U | 23 | U | 25 | U | 18 | U |
| 1,1,2,2-TETRACHLOROETHANE | 13 | U | 23 | U | 25 | U | 18 | U |
| 1,1,2-TRICHLOROETHANE | 13 | U | 23 | U | 25 | U | 18 | U |
| 1,1-DICHLOROETHANE | 13 | U | 23 | U | 25 | U | 18 | U |
| 1,1-DICHLOROETHENE | 13 | U | 23 | U | 25 | U | 18 | U |
| 1,2-DICHLOROETHANE | 13 | U | 23 | U | 25 | U | 18 | U |
| 1,2-DICHLOROETHENE (TOTAL) | 13 | U | 23 | U | 25 | U | 18 | U |
| 1,2-DICHLOROPROPANE | 13 | U | 23 | U | 25 | U | 18 | U |
| 2-BUTANONE | 13 | U | 23 | U | 25 | U | 18 | U |
| 2-HEXANONE | 13 | U | 23 | U | 25 | U | 18 | U |
| 4-METHYL-2-PENTANONE | 13 | U | 23 | U | 25 | U | 18 | U |
| ACETONE | 13 | U | 81 | UJ | 110 | UJ | 38 | U |
| BENZENE | 13 | U | 23 | U | 25 | U | 18 | U |
| BROMODICHLOROMETHANE | 13 | U | 23 | U | 25 | U | 18 | U |
| BROMOFORM | 13 | U | 23 | U | 25 | U | 18 | U |
| BROMOMETHANE | 13 | UJ | 23 | UJ | 25 | UJ | 18 | U |
| CARBON DISULFIDE | 13 | U | 8 | J | 31 | | 18 | U |
| CARBON TETRACHLORIDE | 13 | U | 23 | U | 25 | U | 18 | U |
| CHLOROBENZENE | 13 | U | 23 | U | 25 | U | 18 | U |
| CHLOROETHANE | 13 | U | 23 | U | 25 | U | 18 | U |
| CHLOROFORM | 13 | U | 23 | U | 25 | U | 18 | U |
| CHLOROMETHANE | 13 | U | 23 | U | 25 | U | 18 | U |
| CIS-1,3-DICHLOROPROPENE | 13 | U | 23 | U | 25 | U | 18 | U |
| DIBROMOCHLOROMETHANE | 13 | U | 23 | U | 25 | U | 18 | U |
| ETHYLBENZENE | 13 | U | 23 | U | 25 | U | 18 | U |
| METHYLENE CHLORIDE | 13 | U | 23 | U | 25 | U | 18 | U |
| STYRENE | 13 | U | 23 | U | 25 | U | 18 | U |
| TETRACHLOROETHENE | 13 | U | 23 | U | 25 | U | 18 | U |
| TOLUENE | 13 | U | 23 | U | 25 | U | 7 | J |
| TRANS-1,3-DICHLOROPROPENE | 13 | U | 23 | U | 25 | U | 18 | U |
| TRICHLOROETHENE | 13 | U | 23 | U | 25 | U | 18 | U |
| VINYL CHLORIDE | 13 | U | 23 | U | 25 | U | 18 | U |
| XYLENES, TOTAL | 13 | U | 23 | U | 25 | U | 18 | U |



U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; NA - Not Analyzed

ANALYTICAL RESULTS
DRAFT REMEDIAL INVESTIGATION REPORT
RAYMARK-FERRY CREEK - OU3
STRATFORD, CONNECTICUT

| Sample Number | RM-SD-GM02-01 | | RM-SD-GM07-04 | | RM-SD-GM08-04 | | RM-SD-RF01-04 | |
|---|---|---|---|---|---|---|---|---|
| Sample Location | GM02 | | GM07 | | GM08 | | RF01 | |
| Date Sampled | 8/16/94 | | 8/16/95 | | 8/16/95 | | 8/7/95 | |
| QC Type | None | | None | | None | | None | |
| MATRIX | SEDIMENT | | SEDIMENT | | SEDIMENT | | SEDIMENT | |
| Filtering | NA | | NA | | NA | | NA | |
| Semivolatile Organic Compounds (UG/KG) | | | | | | | | |
| 1,2,4-TRICHLOROBENZENE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| 1,2-DICHLOROBENZENE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| 1,3-DICHLOROBENZENE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| 1,4-DICHLOROBENZENE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| 2,2'-OXYBIS(1-CHLOROPROPANE) | 430 | UJ | 770 | U | 820 | U | 2900 | UJ |
| 2,4,5-TRICHLOROPHENOL | 1000 | U | 1900 | U | 2000 | U | 7100 | UJ |
| 2,4,6-TRICHLOROPHENOL | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| 2,4-DICHLOROPHENOL | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| 2,4-DIMETHYLPHENOL | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| 2,4-DINITROPHENOL | 1000 | U | 1900 | U | 2000 | U | 7100 | UJ |
| 2,4-DINITROTOLUENE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| 2,6-DINITROTOLUENE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| 2-CHLORONAPHTHALENE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| 2-CHLOROPHENOL | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| 2-METHYLNAPHTHALENE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| 2-METHYLPHENOL | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| 2-NITROANILINE | 1000 | U | 1900 | U | 2000 | U | 7100 | UJ |
| 2-NITROPHENOL | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| 3,3'-DICHLOROBENZIDINE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| 3-NITROANILINE | 1000 | U | 1900 | UJ | 2000 | UJ | 7100 | UJ |
| 4,6-DINITRO-2-METHYLPHENOL | 1000 | U | 1900 | U | 2000 | U | 7100 | UJ |
| 4-BROMOPHENYL PHENYL ETHER | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| 4-CHLORO-3-METHYLPHENOL | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| 4-CHLOROANILINE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| 4-CHLOROPHENYL PHENYL ETHER | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| 4-METHYLPHENOL | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| 4-NITROANILINE | 1000 | U | 1900 | U | 2000 | U | 7100 | UJ |
| 4-NITROPHENOL | 1000 | U | 1900 | U | 2000 | U | 7100 | UJ |
| ACENAPHTHENE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| ACENAPHTHYLENE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| ANTHRACENE | 430 | U | 770 | U | 820 | U | 1300 | J |
| BENZO(A)ANTHRACENE | 430 | U | 770 | U | 460 | J | 7000 | J |
| BENZO(A)PYRENE | 430 | U | 770 | U | 820 | U | 5800 | J |
| BENZO(B)FLUORANTHENE | 430 | U | 300 | J | 650 | J | 12000 | J |
| BENZO(G,H,I)PERYLENE | 430 | U | 770 | U | 820 | U | 2700 | J |
| BENZO(K)FLUORANTHENE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| BIS(2-CHLOROETHOXY)METHANE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| BIS(2-CHLOROETHYL)ETHER | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| BIS(2-ETHYLHEXYL)PHTHALATE | 430 | U | 770 | U | 270 | J | 1600 | J |
| BUTYLBENZYL PHTHALATE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| CARBAZOLE | 430 | U | 770 | U | 820 | U | 1100 | J |
| CHRYSENE | 430 | U | 770 | U | 450 | J | 6700 | J |
| DI-N-BUTYL PHTHALATE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| DI-N-OCTYL PHTHALATE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| DIBENZO(A,H)ANTHRACENE | 430 | U | 770 | U | 820 | U | 2000 | J |



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ANALYTICAL RESULTS
DRAFT REMEDIAL INVESTIGATION REPORT
RAYMARK-FERRY CREEK - OU3
STRATFORD, CONNECTICUT

| Sample Number | RM-SD-GM02-01 | | RM-SD-GM07-04 | | RM-SD-GM08-04 | | RM-SD-RF01-04 | |
|---|---|---|---|---|---|---|---|---|
| Sample Location | GM02 | | GM07 | | GM08 | | RF01 | |
| Date Sampled | 8/16/94 | | 8/16/95 | | 8/16/95 | | 8/7/95 | |
| QC Type | None | | None | | None | | None | |
| MATRIX | SEDIMENT | | SEDIMENT | | SEDIMENT | | SEDIMENT | |
| Filtering | NA | | NA | | NA | | NA | |
| DIBENZOFURAN | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| DIETHYL PHTHALATE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| DIMETHYL PHTHALATE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| FLUORANTHENE | 23 | J | 320 | J | 740 | J | 14000 | J |
| FLUORENE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| HEXACHLOROBENZENE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| HEXACHLOROBUTADIENE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| HEXACHLOROCYCLOPENTADIENE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| HEXACHLOROETHANE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| INDENO(1,2,3-CD)PYRENE | 430 | U | 770 | U | 820 | U | 5200 | J |
| ISOPHORONE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| N-NITROSO-DI-N-PROPYLAMINE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| N-NITROSODIPHENYLAMINE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| NAPHTHALENE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| NITROBENZENE | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| PENTACHLOROPHENOL | 1000 | U | 1900 | U | 2000 | U | 7100 | UJ |
| PHENANTHRENE | 430 | U | 770 | U | 300 | J | 6700 | J |
| PHENOL | 430 | U | 770 | U | 820 | U | 2900 | UJ |
| PYRENE | 22 | J | 260 | J | 360 | J | 9300 | J |
| **Pesticides/PCBs (UG/KG)** | | | | | | | | |
| 4,4'-DDD | 3.3 | U | 0.28 | J | 1.5 | J | 5.8 | |
| 4,4'-DDE | 3.3 | U | 0.15 | J | 0.54 | J | 3.6 | U |
| 4,4'-DDT | 3.3 | U | 3.3 | U | 0.22 | J | 4.4 | |
| ALDRIN | 1.7 | U | 0.14 | J | 0.19 | J | 2.6 | |
| ALPHA-BHC | 1.7 | U | 1.7 | U | 1.7 | U | 6.1 | U |
| ALPHA-CHLORDANE | 0.077 | J | 0.05 | J | 0.15 | J | 1.8 | U |
| AROCLOR, TOTAL | 165.5 | U | 165.5 | U | 165.5 | U | 180 | U |
| AROCLOR-1016 | 33 | U | 33 | U | 33 | U | 36 | U |
| AROCLOR-1221 | 67 | U | 67 | U | 67 | U | 72 | U |
| AROCLOR-1232 | 33 | U | 33 | U | 33 | U | 36 | U |
| AROCLOR-1242 | 33 | U | 33 | U | 33 | U | 36 | U |
| AROCLOR-1248 | 33 | U | 33 | U | 33 | U | 36 | UJ |
| AROCLOR-1254 | 33 | U | 33 | U | 33 | U | 36 | U |
| AROCLOR-1260 | 33 | U | 33 | U | 33 | U | 36 | U |
| AROCLOR-1262 | 33 | U | 33 | U | 33 | U | 36 | U |
| AROCLOR-1268 | 33 | U | 33 | U | 33 | U | 36 | U |
| BETA-BHC | 1.7 | U | 1.7 | U | 1.7 | U | 1.8 | U |
| DELTA-BHC | 1.7 | U | 1.7 | U | 1.7 | U | 1.8 | U |
| DIELDRIN | 3.3 | U | 3.3 | U | 3.3 | U | 3.6 | U |
| ENDOSULFAN I | 1.7 | U | 1.7 | U | 1.7 | U | 1.8 | U |
| ENDOSULFAN II | 0.16 | J | 0.31 | J | 3.3 | U | 3.6 | U |
| ENDOSULFAN SULFATE | 3.3 | U | 3.3 | U | 3.3 | U | 3.6 | U |
| ENDRIN | 0.12 | J | 3.3 | U | 0.26 | J | 2.7 | J |
| ENDRIN ALDEHYDE | 0.53 | J | 3.3 | U | 0.2 | J | 4.3 | U |
| ENDRIN KETONE | 3.3 | U | 3.3 | U | 3.3 | U | 3.6 | U |
| GAMMA-BHC (LINDANE) | 1.7 | U | 0.08 | J | 0.03 | J | 2.2 | |

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**ANALYTICAL RESULTS**
**DRAFT REMEDIAL INVESTIGATION REPORT**
**RAYMARK-FERRY CREEK - OU3**
**STRATFORD, CONNECTICUT**

| Sample Number | RM-SD-GM02-01 | | RM-SD-GM07-04 | | RM-SD-GM08-04 | | RM-SD-RF01-04 | |
|---|---|---|---|---|---|---|---|---|
| Sample Location | GM02 | | GM07 | | GM08 | | RF01 | |
| Date Sampled | 8/16/94 | | 8/16/95 | | 8/16/95 | | 8/7/95 | |
| QC Type | None | | None | | None | | None | |
| MATRIX | SEDIMENT | | SEDIMENT | | SEDIMENT | | SEDIMENT | |
| Filtering | NA | | NA | | NA | | NA | |
| GAMMA-CHLORDANE | 1.7 | U | 1.7 | U | 0.15 | J | 6.3 | |
| HEPTACHLOR | 1.7 | U | 1.7 | U | 1.7 | U | 0.28 | J |
| HEPTACHLOR EPOXIDE | 1.7 | U | 1.7 | U | 1.7 | U | 1.9 | |
| METHOXYCHLOR | 17 | U | 17 | U | 17 | U | 3.6 | U |
| TOXAPHENE | 170 | U | 170 | U | 170 | U | 180 | U |
| Dioxin (UG/KG) | | | | | | | | |
| 1,2,3,4,6,7,8-HPCDD | 0.00726 | J | 0.00849 | J | 0.07612 | J | 0.34857 | |
| 1,2,3,4,6,7,8-HPCDF | 0.00409 | J | 0.00263 | J | 0.0631 | J | 0.10316 | |
| 1,2,3,4,7,8,9-HPCDF | 0.00034 | U | 0.00218 | UJ | 0.01215 | UJ | 0.01776 | U |
| 1,2,3,4,7,8-HXCDD | 0.00022 | J | 0.0006 | UJ | 0.00984 | UJ | 0.00622 | J |
| 1,2,3,4,7,8-HXCDF | 0.00066 | UJ | 0.00078 | J | 0.00973 | UJ | 0.00751 | UJ |
| 1,2,3,6,7,8-HXCDD | 0.00033 | J | 0.00075 | UJ | 0.00968 | UJ | 0.01788 | |
| 1,2,3,6,7,8-HXCDF | 0.00055 | J | 0.00081 | UJ | 0.00599 | UJ | 0.0068 | U |
| 1,2,3,7,8,9-HXCDD | 0.00033 | J | 0.00072 | UJ | 0.0118 | UJ | 0.01678 | UJ |
| 1,2,3,7,8,9-HXCDF | 0.00031 | J | 0.00103 | UJ | 0.00755 | J | 0.00644 | U |
| 1,2,3,7,8-PECDD | 0.00042 | U | 0.00102 | UJ | 0.00309 | UJ | 0.00605 | U |
| 1,2,3,7,8-PECDF | 0.00038 | UJ | 0.00186 | UJ | 0.00579 | UJ | 0.00647 | U |
| 2,3,4,6,7,8-HXCDF | 0.00046 | U | 0.0014 | UJ | 0.00533 | UJ | 0.0108 | U |
| 2,3,4,7,8-PECDF | 0.0002 | U | 0.00171 | UJ | 0.00567 | UJ | 0.00629 | U |
| 2,3,7,8-TCDD | 0.00013 | U | 0.00034 | UJ | 0.00128 | UJ | 0.00123 | U |
| 2,3,7,8-TCDF | 0.00053 | UJ | 0.00097 | J | 0.00994 | J | 0.00557 | J |
| OCDD | 0.16671 | J | 0.25361 | J | 2.33964 | J | 3.64659 | |
| OCDF | 0.00672 | J | 0.00977 | J | 0.2442 | J | 0.20281 | J |
| TOTAL HPCDD | 0.01589 | J | 0.02729 | J | 0.23146 | J | 0.76351 | J |
| TOTAL HPCDF | 0.01013 | J | 0.01564 | J | 0.25083 | J | 0.64704 | J |
| TOTAL HXCDD | 0.00112 | J | 0.00864 | J | 0.05964 | J | 0.0322 | J |
| TOTAL HXCDF | 0.00779 | J | 0.00637 | J | 0.38511 | J | 0.65412 | J |
| TOTAL PECDD | 0.00042 | UJ | 0.00102 | UJ | 0.00309 | UJ | 0.00605 | UJ |
| TOTAL PECDF | 0.00616 | J | 0.00904 | J | 0.87881 | J | 0.71294 | J |
| TOTAL TCDD | 0.00013 | UJ | 0.00048 | J | 0.00508 | J | 0.00546 | J |
| TOTAL TCDF | 0.00399 | UJ | 0.01123 | J | 0.72167 | J | 0.28113 | J |
| TOXICITY EQUIVALENCY FACTOR | 0.000461 | J | 0.00055 | J | 0.00573 | J | 0.01133 | J |
| Metals (MG/KG) | | | | | | | | |
| ALUMINUM | 2950 | | 18400 | | 19000 | | 5590 | |
| ANTIMONY | 1.2 | U | 6.3 | UJ | 6.8 | UJ | 5.1 | UJ |
| ARSENIC | 1.5 | U | 14.2 | | 12.5 | | 2.2 | |
| BARIUM | 4.1 | U | 51.2 | J | 50.1 | J | 26.4 | |
| BERYLLIUM | 0.25 | U | 0.8 | | 0.58 | J | 0.31 | |
| CADMIUM | 0.5 | U | 0.65 | UJ | 0.64 | UJ | 0.66 | U |
| CALCIUM | 696 | | 2580 | J | 2650 | J | 2200 | J |
| CHROMIUM | 7.8 | J | 107 | J | 89.2 | J | 39 | |
| COBALT | 1.6 | | 12.5 | | 14.9 | | 5.7 | |
| COPPER | 11 | J | 336 | | 194 | | 102 | J |
| IRON | 4940 | | 33900 | | 35300 | | 14100 | |
| LEAD | 8.1 | | 91.8 | J | 46.4 | J | 141 | |
| MAGNESIUM | 1210 | | 9920 | | 10400 | | 3460 | |

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**ANALYTICAL RESULTS**
**DRAFT REMEDIAL INVESTIGATION REPORT**
**RAYMARK-FERRY CREEK - OU3**
**STRATFORD, CONNECTICUT**

| Sample Number | RM-SD-GM02-01 | | RM-SD-GM07-04 | | RM-SD-GM08-04 | | RM-SD-RF01-04 | |
|---|---|---|---|---|---|---|---|---|
| Sample Location | GM02 | | GM07 | | GM08 | | RF01 | |
| Date Sampled | 8/16/94 | | 8/16/95 | | 8/16/95 | | 8/7/95 | |
| QC Type | None | | None | | None | | None | |
| MATRIX | SEDIMENT | | SEDIMENT | | SEDIMENT | | SEDIMENT | |
| Filtering | NA | | NA | | NA | | NA | |
| MANGANESE | 43.5 | | 354 | | 321 | | 106 | |
| MERCURY | 0.12 | U | 1.2 | | 1.1 | | 0.13 | |
| NICKEL | 4.4 | | 28.8 | J | 33.9 | J | 14.7 | |
| POTASSIUM | 420 | U | 4920 | | 5020 | | 1130 | |
| SELENIUM | 0.99 | UJ | 2.2 | UJ | 3.4 | U | 0.94 | U |
| SILVER | 0.74 | UJ | 1.2 | U | 1.3 | U | 1 | U |
| SODIUM | 2070 | | 14400 | | 15000 | | 1790 | |
| THALLIUM | 1.7 | U | 2.4 | U | 2.6 | U | 1.9 | U |
| VANADIUM | 8.3 | J | 55 | | 56.2 | | 24.7 | J |
| ZINC | 24.1 | J | 163 | | 192 | | 158 | |



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ANALYTICAL RESULTS
DRAFT REMEDIAL INVESTIGATION REPORT
RAYMARK-FERRY CREEK - OU3
STRATFORD, CONNECTICUT

| Sample Number | AHP008 | | BES002 | | BESB+300 | | BESD+300 | | BS-D+00 | | BS-G7 | | BSC+400 | | CC5 | | CF-A+00 | | CF-B+480 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Location | AHP008 | | BES002 | | BESB+300 | | BESD+300 | | BS-D+00 | | BS-G7 | | BSC+400 | | CC5 | | CF-A+00 | | CF-B+480 | |
| Date Sampled | | | | | | | | | | | | | | | | | | | | | | |
| QC Type | None | | None | | None | | None | | Field Dup. (3002) | | None | | Field Dup. (3003) | | None | | None | | None | |
| MATRIX | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | |
| Filtering | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | |
| Pesticides/PCBs (UG/KG) | | | | | | | | | | | | | | | | | | | | | | |
| 4,4'-DDD | 3.4 | UJ | 21 | UJ | 3.5 | UJ | 3.5 | UJ | 6.8 | U | 220 | J | 2.3 | | 3.5 | UJ | 21 | U | 3.8 | U |
| 4,4'-DDE | 110 | J | 11 | J | 14 | J | 19 | J | | NA | 230 | | 10 | | 3.5 | UJ | 6.8 | J | 10 | |
| 4,4'-DDT | 49 | J | | R | 12 | J | 16 | J | | R | 200 | | 7.5 | | 3.5 | UJ | | R | 9.1 | J |
| ALDRIN | 1.7 | U | 11 | UJ | 1.8 | UJ | 1.8 | UJ | 3.5 | U | 1.7 | U | 1.8 | U | 1.8 | UJ | 11 | UJ | 2 | UJ |
| ALPHA-BHC | 1.7 | U | 11 | UJ | 1.8 | UJ | 1.8 | UJ | 3.5 | U | 1.7 | U | 1.8 | U | 1.8 | UJ | 11 | U | 2 | U |
| ALPHA-CHLORDANE | 1.7 | UJ | | R | 1.8 | UJ | 1.8 | UJ | 3 | | 2.7 | J | 1.8 | U | 1.8 | UJ | 940 | * | 2 | U |
| AROCLOR, TOTAL | 156 | | 1215 | | 151.5 | | 228 | | 386 | | 191 | | 192 | | 175.5 | U | 945 | | 193.5 | |
| AROCLOR-1016 | 34 | U | 420 | UJ | 35 | UJ | 35 | UJ | 68 | U | 34 | U | 34 | U | 35 | UJ | 210 | U | 38 | U |
| AROCLOR-1221 | 68 | U | 210 | UJ | 71 | UJ | 72 | UJ | 140 | U | 68 | U | 70 | U | 71 | UJ | 420 | U | 77 | U |
| AROCLOR-1232 | 34 | U | 210 | UJ | 35 | UJ | 35 | UJ | 68 | U | 34 | U | 34 | U | 35 | UJ | 210 | U | 38 | U |
| AROCLOR-1242 | 34 | U | 210 | UJ | 35 | UJ | 35 | UJ | 68 | U | 34 | U | 34 | U | 35 | UJ | 210 | U | 38 | U |
| AROCLOR-1248 | 34 | U | 210 | UJ | 35 | UJ | 35 | UJ | 68 | U | 34 | U | 34 | U | 35 | UJ | 210 | U | 38 | U |
| AROCLOR-1254 | 34 | U | 210 | UJ | 35 | UJ | 35 | UJ | 68 | U | 34 | U | 34 | U | 35 | UJ | 210 | U | 38 | U |
| AROCLOR-1260 | 34 | U | 210 | UJ | 35 | UJ | 35 | UJ | 68 | U | 34 | U | 34 | U | 35 | UJ | 210 | U | 38 | U |
| AROCLOR-1262 | | R | 270 | J | | R | 87 | J | 78 | | 38 | J | 38 | | 35 | UJ | | R | 22 | J |
| AROCLOR-1268 | 20 | J | 210 | UJ | 11 | J | | R | 68 | U | 34 | U | 34 | U | 35 | UJ | 210 | U | 38 | U |
| BETA-BHC | 1.7 | U | 11 | UJ | 1.8 | UJ | 0.56 | J | 3.5 | U | 1.7 | U | 1.8 | U | | R | 11 | U | 2 | U |
| DELTA-BHC | 1.7 | UJ | 1.7 | J | 1.8 | UJ | 1.8 | UJ | 3.5 | U | 1.7 | U | 1.8 | U | 1.8 | UJ | 11 | U | 2 | U |
| DIELDRIN | 3.4 | UJ | 21 | UJ | 3.5 | UJ | 3.5 | UJ | | NA | 3.4 | UJ | 3.4 | U | 3.5 | UJ | 4.4 | J | 3.8 | UJ |
| ENDOSULFAN I | 1.7 | U | 11 | UJ | 1.8 | UJ | 1.8 | UJ | 3.5 | U | | R | 1.8 | U | 1.8 | UJ | 11 | U | 2 | U |
| ENDOSULFAN II | 3.4 | U | 21 | UJ | 0.75 | J | 0.86 | J | | NA | 3.4 | U | 3.4 | U | 3.5 | UJ | 21 | U | 0.78 | J |
| ENDOSULFAN SULFATE | 3.4 | U | 12 | J | 3.5 | UJ | 3.5 | UJ | 6.8 | U | 3.4 | U | 3.4 | U | 3.5 | UJ | 21 | U | 3.8 | U |
| ENDRIN | 3.4 | U | 13 | J | 3.5 | UJ | 3.5 | UJ | 3.5 | U | 3.4 | U | 3.4 | U | 3.5 | UJ | 13 | J | 3.8 | UJ |
| ENDRIN ALDEHYDE | 3.4 | U | 11 | UJ | 3.5 | UJ | 3.5 | UJ | | NA | 3.4 | U | 3.4 | U | 3.5 | UJ | 21 | U | 3.8 | U |
| ENDRIN KETONE | 3.4 | UJ | 21 | UJ | 3.5 | UJ | 3.5 | UJ | 7.5 | | 3.4 | U | 3.4 | U | 3.5 | UJ | 21 | U | 0.86 | J |
| GAMMA-BHC (LINDANE) | 1.7 | U | 11 | UJ | 1.8 | UJ | 1.8 | UJ | 3.5 | U | 1.7 | U | 1.8 | U | 1.8 | UJ | 11 | UJ | 2 | UJ |
| GAMMA-CHLORDANE | 1.7 | UJ | 1100 | UJ | 1.8 | UJ | 1.8 | UJ | | NA | | R | 1.8 | U | 1.8 | UJ | | R | 2 | U |
| HEPTACHLOR | 1.7 | UJ | | R | 0.36 | J | 1.8 | UJ | 3.5 | U | 1.7 | U | 1.8 | U | 1.8 | UJ | 5.2 | J | 0.24 | J |
| HEPTACHLOR EPOXIDE | 1.7 | U | 11 | UJ | 1.8 | UJ | 1.8 | UJ | 3.5 | U | 1.7 | U | 1.8 | U | 1.8 | UJ | | R | 2 | U |
| METHOXYCHLOR | | R | 16 | J | 2.6 | J | 3 | J | 3.5 | U | 17 | U | 12 | | 18 | J | 110 | U | 2.1 | J |
| TOXAPHENE | 170 | U | 210 | UJ | 180 | UJ | 180 | UJ | 350 | U | 170 | U | 180 | U | 180 | UJ | 1100 | U | 200 | U |

U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; NA - Not Analyzed

ANALYTICAL RESULTS
DRAFT REMEDIAL INVESTIGATION REPORT
RAYMARK-FERRY CREEK - OU3
STRATFORD, CONNECTICUT

| Sample Number | AHP008 | | BES002 | | BESB+300 | | BESD+300 | | BS-D+00 | | BS-G7 | | BSC+400 | | CC5 | | CF-A+00 | | CF-B+480 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Location | AHP008 | | BES002 | | BESB+300 | | BESD+300 | | BS-D+00 | | BS-G7 | | BSC+400 | | CC5 | | CF-A+00 | | CF-B+480 | |
| Date Sampled | | | | | | | | | | | | | | | | | | | | |
| QC Type | None | | None | | None | | None | | Field Dup. (3002) | | None | | Field Dup. (3003) | | None | | None | | None | |
| MATRIX | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | |
| *Filtering* | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | |
| **Metals (MG/KG)** | | | | | | | | | | | | | | | | | | | | |
| ALUMINUM | 9900 | J | 11300 | J | 9480 | J | 8910 | J | 11100 | J | 9750 | | 11900 | | 926 | J | | NA | 17900 | J |
| ANTIMONY | 5.6 | UJ | 6.9 | UJ | 6 | UJ | 5.9 | UJ | 6.6 | UJ | 6.6 | UJ | 6.6 | U | 5.6 | UJ | | NA | 6.3 | UJ |
| ARSENIC | 15.3 | | 6.1 | | 4 | | 4 | | 5.4 | J | 1.4 | J | 5.3 | | 3.8 | J | | NA | 3.7 | J |
| BARIUM | 34.7 | | 38.5 | J | 32.4 | J | 33.1 | J | 40.1 | | 44.8 | | 38.6 | | 5.3 | | | NA | 63.7 | J |
| BERYLLIUM | 0.76 | | 0.43 | U | 0.53 | J | 0.42 | J | 0.71 | | 0.46 | | 0.64 | | 0.35 | U | | NA | 1.4 | |
| CADMIUM | 0.63 | J | 0.94 | U | 0.42 | UJ | 0.5 | UJ | 0.64 | U | 0.64 | U | 0.64 | U | 0.39 | UJ | | NA | 0.44 | U |
| CALCIUM | 897 | J | 1130 | J | 894 | J | 536 | J | 2720 | | 1450 | | 1400 | | 309 | J | | NA | 28100 | J |
| CHROMIUM | 23.4 | | 15.6 | | 10.7 | | 8.8 | | 11.6 | | 7.7 | J | 13.1 | | 9 | | | NA | 20.4 | |
| COBALT | 6.5 | | 4.2 | | 5.3 | | 2.5 | J | 5.5 | | 4 | | 7 | | 2 | U | | NA | 9.4 | |
| COPPER | 63.7 | J | 39.7 | | 15.1 | | 16.3 | | 21 | | 12.4 | | 24.9 | | 9.7 | J | | NA | 34.3 | J |
| IRON | 12700 | J | 9150 | J | 11100 | J | 9050 | J | 16300 | | 8520 | | 16400 | | 3110 | J | | NA | 19500 | J |
| LEAD | 132 | | 158 | | 38.2 | | 49.5 | | 27.5 | | 17 | *J | 34.4 | | 5.4 | J | | NA | 67.3 | J |
| MAGNESIUM | 2780 | J | 1710 | J | 2030 | J | 1000 | J | 2390 | J | 2330 | | 3160 | | 368 | J | | NA | 10400 | J |
| MANGANESE | 234 | J | 126 | J | 196 | J | 146 | J | 247 | J | 264 | J | 281 | | 35.8 | J | | NA | 438 | J |
| MERCURY | 0.26 | | 0.14 | J | 0.08 | J | 0.12 | J | 0.11 | J | 0.1 | UJ | 0.12 | | 0.08 | UJ | | NA | 0.13 | J |
| NICKEL | 12 | J | 17.1 | U | 10.9 | U | 8.8 | U | 13.8 | | 7.6 | J | 13.6 | | 3 | U | | NA | 15.2 | |
| POTASSIUM | 884 | U | 413 | UJ | 285 | UJ | 89.3 | UJ | 1120 | | 856 | | 1290 | | 53.7 | UJ | | NA | 983 | UJ |
| SELENIUM | 0.36 | J | 0.48 | J | 0.33 | UJ | 0.34 | UJ | 0.69 | UJ | 0.4 | UJ | 0.4 | | 0.33 | UJ | | NA | 3.6 | UJ |
| SILVER | 0.31 | U | 0.39 | U | 0.33 | U | 0.33 | U | | R | 0.72 | UJ | 0.72 | U | 0.31 | U | | NA | 0.35 | U |
| SODIUM | 111 | | 187 | | 89.6 | | 64.2 | | 338 | UJ | 323 | U | 284 | U | 69.2 | | | NA | 109 | U |
| THALLIUM | 0.4 | UJ | 0.19 | UJ | 0.16 | UJ | 0.17 | UJ | 0.47 | J | 0.23 | UJ | 0.5 | | 0.17 | UJ | | NA | 0.45 | U |
| VANADIUM | 36.9 | | 37.1 | | 23.2 | | 23.3 | | 23.4 | | 20.9 | | 29.9 | | 3.1 | UJ | | NA | 46.2 | |
| ZINC | 67.9 | J | 173 | J | 65 | J | 40.5 | J | 136 | UJ | 72.7 | | 91.7 | | 9.8 | J | | NA | 114 | J |



U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; NA - Not Analyzed

**ANALYTICAL RESULTS**
**DRAFT REMEDIAL INVESTIGATION REPORT**
**RAYMARK-FERRY CREEK - OU3**
**STRATFORD, CONNECTICUT**

| Sample Number | CF-G8 | | CS-B+00 | | CS-D+300 | | EWS-G5A | | EWS-G5B | | EWS-G7 | | EX-91 | | FLS-A+250 | | FLS-G1 | | FLS-G2 | | FS-A+150 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Location | CF-G8 | | CS-B+00 | | CS-D+300 | | EWS-G5 | | EWS-G5 | | EWS-G7 | | EX-91 | | FLS-A+250 | | FLS-G1 | | FLS-G2 | | FS-A+150 |
| Date Sampled | | | | | | | | | | | | | | | | | | | | | |
| QC Type | None | | None | | None | | | | | | None | | None | | None | | None | | Field Dup. (3004) | | None |
| MATRIX | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL |
| Filtering | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA |
| Pesticides/PCBs (UG/KG) | | | | | | | | | | | | | | | | | | | | | |
| 4,4'-DDD | 8.2 | U | 3.6 | U | 3.7 | U | 18 | U | 18 | U | 3.4 | U | 4.1 | U | 6.9 | U | 3.4 | U | 3.4 | U | 18 |
| 4,4'-DDE | 12 | J | 2.8 | J | 5.8 | | 18 | U | 18 | U | 3.4 | U | 5.9 | J | 4.9 | J | 3.4 | U | 3.4 | U | 18 |
| 4,4'-DDT | 3.5 | J | 7 | J | 12 | J | 18 | U | 18 | U | 2.6 | J | 7.8 | J | 6.9 | U | 3.4 | U | 2 | | 18 |
| ALDRIN | 2.9 | J | 1.8 | U | 1.9 | U | 9 | U | 9.2 | U | 1.8 | U | 2.1 | U | 3.5 | U | 1.8 | U | 1.8 | U | 9.3 |
| ALPHA-BHC | 4.2 | UJ | 1.8 | U | 1.9 | U | 9 | U | 9.2 | U | 1.8 | U | 2.1 | U | 3.5 | U | 1.8 | U | 1.8 | U | 9.3 |
| ALPHA-CHLORDANE | 14 | J | 1.8 | UJ | 1.2 | J | 21 | | 20 | | 1.8 | U | 2.1 | U | 1.9 | J | 1.8 | U | 2.6 | | 9.3 |
| AROCLOR, TOTAL | 372 | | 180.5 | U | 269 | | 900 | U | 900 | U | 170.5 | U | 206 | U | 346 | U | 171 | U | 171 | U | 905 |
| AROCLOR-1016 | 82 | U | 36 | U | 37 | U | 180 | U | 180 | U | 34 | U | 41 | U | 69 | U | 34 | U | 34 | U | 180 |
| AROCLOR-1221 | 170 | U | 73 | U | 74 | U | 360 | U | 360 | U | 69 | U | 84 | U | 140 | U | 70 | U | 70 | U | 370 |
| AROCLOR-1232 | 82 | U | 36 | U | 37 | U | 180 | U | 180 | U | 34 | U | 41 | U | 69 | U | 34 | U | 34 | U | 180 |
| AROCLOR-1242 | 82 | U | 36 | U | 37 | U | 180 | U | 180 | U | 34 | U | 41 | U | 69 | U | 34 | U | 34 | U | 180 |
| AROCLOR-1248 | 82 | U | 36 | U | 37 | U | 180 | U | 180 | U | 34 | U | 41 | U | 69 | U | 34 | U | 34 | U | 180 |
| AROCLOR-1254 | 82 | U | 36 | U | 37 | U | 180 | U | 180 | UJ | 34 | U | 41 | U | 69 | U | 34 | U | 34 | U | 180 |
| AROCLOR-1260 | 82 | U | 36 | U | 37 | U | 180 | U | 180 | UJ | 34 | U | 41 | U | 69 | U | 34 | U | 34 | U | 180 |
| AROCLOR-1262 | | R | 36 | U | 98 | J | 180 | U | 180 | UJ | 34 | U | 41 | U | 69 | U | 34 | U | 34 | U | 180 |
| AROCLOR-1268 | 82 | U | 36 | U | 23 | J | 180 | U | 180 | UJ | 34 | U | 41 | U | 69 | U | 34 | U | 34 | U | 180 |
| BETA-BHC | 4.2 | UJ | 1.8 | U | 1.9 | U | 9 | U | 9.2 | U | 1.8 | U | 2.1 | U | 3.5 | U | 1.8 | U | 1.8 | U | 9.3 |
| DELTA-BHC | 5.7 | J | 1.8 | U | 1.9 | U | 9 | U | 9.2 | U | 1.8 | U | 2.1 | U | 3.5 | UJ | 1.8 | U | 1.8 | U | 9.3 |
| DIELDRIN | 8.2 | UJ | 3.6 | U | 3.7 | U | 74 | | 74 | | 3.4 | U | 4.1 | U | 5 | J | 3.4 | U | 3.4 | U | 18 |
| ENDOSULFAN I | 1.1 | J | 1.8 | UJ | 1.9 | U | 22 | | 22 | | 1.8 | U | 2.1 | U | 3.5 | UJ | 1.8 | U | 1.8 | U | 9.3 |
| ENDOSULFAN II | | R | 3.6 | U | 3.7 | U | 18 | U | 18 | U | 3.4 | U | 2.6 | J | 6.9 | U | 3.4 | U | 3.4 | U | 18 |
| ENDOSULFAN SULFATE | 8.2 | U | 3.6 | U | 2 | J | 18 | U | 18 | U | 3.4 | U | 4.1 | U | 6.9 | U | 3.4 | U | 3.4 | U | 18 |
| ENDRIN | 4 | J | 3.6 | U | 3.7 | U | 18 | U | 18 | U | 3.4 | U | 4.1 | U | 6.9 | U | 3.4 | U | 3.4 | U | 18 |
| ENDRIN ALDEHYDE | 5.9 | J | 3.6 | U | 3.7 | U | 18 | U | 18 | U | 3.4 | U | 4.1 | U | 6.9 | U | 3.4 | U | 3.4 | U | 18 |
| ENDRIN KETONE | 14 | J | 3.6 | U | 3.7 | U | 18 | U | 18 | U | 3.4 | U | 4.1 | U | 6.9 | U | 3.4 | U | 3.4 | U | 18 |
| GAMMA-BHC (LINDANE) | 4.2 | UJ | 1.8 | U | 1.9 | U | 9 | U | 9.2 | U | 1.8 | U | 2.1 | U | 3.5 | U | 1.8 | U | 1.8 | U | 9.3 |
| GAMMA-CHLORDANE | | R | 1.8 | UJ | 3.5 | J | | R | 13 | J | 1.8 | U | 2.1 | U | 2.6 | J | 1.8 | U | 5.6 | | 9.3 |
| HEPTACHLOR | 4.2 | UJ | 1.8 | U | 1.9 | U | 9 | U | 9.2 | U | 1.8 | U | 2.1 | U | 3.5 | U | 1.8 | U | 1.8 | U | 9.3 |
| HEPTACHLOR EPOXIDE | 4.2 | UJ | 1.8 | U | 1.9 | U | 9 | U | 9.2 | U | 1.8 | U | 2.1 | U | 3.5 | U | 1.8 | U | 1.8 | U | 9.3 |
| METHOXYCHLOR | 13 | J | 18 | U | 19 | U | 90 | U | 92 | U | 18 | U | 21 | U | 35 | U | 18 | U | 18 | U | 93 |
| TOXAPHENE | 420 | U | 180 | U | 190 | U | 900 | U | 920 | U | 180 | U | 210 | U | 350 | U | 180 | U | 180 | U | 930 |



U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; NA - Not Analyzed

**ANALYTICAL RESULTS**
**DRAFT REMEDIAL INVESTIGATION REPORT**
**RAYMARK-FERRY CREEK - OU3**
**STRATFORD, CONNECTICUT**

| Sample Number | CF-G8 | | CS-B+00 | | CS-D+300 | | EWS-G5A | | EWS-G5B | | EWS-G7 | | EX-91 | | FLS-A+250 | | FLS-G1 | | FLS-G2 | | FS-A+150 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Location | CF-G8 | | CS-B+00 | | CS-D+300 | | EWS-G5 | | EWS-G5 | | EWS-G7 | | EX-91 | | FLS-A+250 | | FLS-G1 | | FLS-G2 | | FS-A+150 | |
| Date Sampled | | | | | | | | | | | | | | | | | | | | | | |
| QC Type | None | | None | | None | | | | | | None | | None | | None | | None | | Field Dup. (3004) | | None | |
| MATRIX | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | |
| Filtering | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | |
| Metals (MG/KG) | | | | | | | | | | | | | | | | | | | | | | |
| ALUMINUM | | NA | 15300 | | 16600 | | 16100 | J | 16200 | J | 3930 | J | 15800 | | | NA | | NA | | NA | | |
| ANTIMONY | | NA | | R | 6.7 | J | 6.1 | UJ | 5.6 | UJ | 5.5 | UJ | 5.7 | UJ | | NA | | NA | | NA | | |
| ARSENIC | | NA | 7.5 | | 16.7 | | 5.7 | J | 4.7 | J | 1.5 | J | 5.8 | | | NA | | NA | | NA | | |
| BARIUM | | NA | 55 | | 54.8 | | 46.4 | | 45 | | 22.3 | | 329 | J | | NA | | NA | | NA | | |
| BERYLLIUM | | NA | 0.65 | | 0.77 | | 1.2 | | 1.3 | | 0.35 | U | 0.7 | | | NA | | NA | | NA | | |
| CADMIUM | | NA | 0.65 | U | 0.66 | U | 0.42 | UJ | 0.55 | J | 0.43 | J | 1.4 | J | | NA | | NA | | NA | | |
| CALCIUM | | NA | 2400 | J | 821 | J | 1400 | J | 1410 | J | 1210 | J | 5170 | J | | NA | | NA | | NA | | |
| CHROMIUM | | NA | 18 | | 24.4 | | 16.8 | | 17.1 | | 6.7 | | 19.1 | | | NA | | NA | | NA | | |
| COBALT | | NA | 6.9 | | 6.3 | | 8.7 | | 10.2 | | 4.7 | | 7.6 | UJ | | NA | | NA | | NA | | |
| COPPER | | NA | 23.6 | J | 56.6 | J | 23.5 | J | 21.5 | J | 9.4 | J | 123 | J | | NA | | NA | | NA | | |
| IRON | | NA | 15600 | | 18000 | | 20200 | J | 20000 | J | 8300 | J | 18500 | | | NA | | NA | | NA | | |
| LEAD | | NA | 64.3 | | 224 | | 51.8 | J | | R | 13.5 | J | 344 | J | | NA | | NA | | NA | | |
| MAGNESIUM | | NA | 3390 | | 3090 | | 3610 | J | 3620 | J | 1790 | J | 3350 | | | NA | | NA | | NA | | |
| MANGANESE | | NA | 322 | | 233 | | 307 | J | 329 | J | 223 | J | 613 | J | | NA | | NA | | NA | | |
| MERCURY | | NA | 0.25 | | 0.14 | | 0.11 | J | 0.12 | J | 0.08 | UJ | 0.14 | J | | NA | | NA | | NA | | |
| NICKEL | | NA | 12.9 | J | 17.2 | J | 14.3 | | 12.6 | | 7.3 | | 14.9 | J | | NA | | NA | | NA | | |
| POTASSIUM | | NA | 1420 | | 746 | | 1270 | | 1270 | | 634 | U | 1680 | | | NA | | NA | | NA | | |
| SELENIUM | | NA | 0.86 | U | 1.2 | | 0.33 | UJ | 0.31 | UJ | 0.31 | UJ | 1 | U | | NA | | NA | | NA | | |
| SILVER | | NA | 1.5 | UJ | 2.1 | UJ | 0.34 | U | 0.31 | U | 0.31 | U | 1.9 | UJ | | NA | | NA | | NA | | |
| SODIUM | | NA | 162 | UJ | 153 | UJ | 221 | | | R | 96 | | 109 | UJ | | NA | | NA | | NA | | |
| THALLIUM | | NA | 1.5 | U | 1.6 | U | 0.16 | UJ | 0.16 | UJ | 0.15 | UJ | 1.7 | U | | NA | | NA | | NA | | |
| VANADIUM | | NA | 30.1 | | 55.4 | | 36.2 | | 35.4 | | 14.4 | | 39.1 | | | NA | | NA | | NA | | |
| ZINC | | NA | 65.8 | J | 111 | J | 66.7 | J | 62.6 | J | 245 | J | 553 | J | | NA | | NA | | NA | | |



U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; NA - Not Analyzed

ANALYTICAL RESULTS
DRAFT REMEDIAL INVESTIGATION REPORT
RAYMARK-FERRY CREEK - OU3
STRATFORD, CONNECTICUT

| Sample Number | | FS-AH50 | | GC-94 | | GLC004 | | HBN-94 | | HBN-G4 | | HP-C+500 | | HP-GR7 | | HP-GR9 | | JA-C+400 | | JA-C+900 | | LBB012 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Location | | FS-AH50 | | GC-94 | | GLC004 | | HBN-94 | | HBN-G4 | | HP-C+500 | | HP-GR7 | | HP-GR9 | | JA-C+400 | | JA-C+900 | | LBB012 | |
| Date Sampled | | | | | | | | | | | | | | | | | | | | | | | |
| QC Type | | None | | None | | None | | None | | None | | None | | None | | None | | None | | None | | None | |
| MATRIX | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | |
| Filtering | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | |
| Pesticides/PCBs (UG/KG) | | | | | | | | | | | | | | | | | | | | | | | |
| 4,4'-DDD | U | | NA | 3.5 | UJ | | NA | | NA | 3.3 | U | 3.6 | U | 17 | UJ | 19 | U | 3.7 | UJ | | NA | 3.7 | UJ |
| 4,4'-DDE | U | | NA | 5 | | | NA | | NA | 3.3 | U | 9.3 | | 9.4 | J | 18 | J | 2.2 | J | | NA | 26 | J |
| 4,4'-DDT | U | | NA | 11 | | | NA | | NA | 3.3 | U | 12 | | 14 | J | 29 | J | 4.5 | J | | NA | 38 | J |
| ALDRIN | U | | NA | 1.8 | U | | NA | | NA | 1.7 | U | 1.9 | U | 8.8 | UJ | 9.8 | U | 1.9 | UJ | | NA | 1.9 | UJ |
| ALPHA-BHC | U | | NA | 1.8 | U | | NA | | NA | 1.7 | U | 1.9 | U | 8.8 | UJ | 9.8 | U | 1.9 | UJ | | NA | 1.9 | UJ |
| ALPHA-CHLORDANE | U | | NA | 4.2 | | | NA | | NA | 3.3 | U | 1.9 | U | 8.8 | UJ | 9.8 | U | 1.9 | UJ | | NA | 1.9 | UJ |
| AROCLOR, TOTAL | U | | NA | 175.5 | U | | NA | | NA | 234 | U | 181 | U | 855 | U | 955 | U | 166.5 | | | NA | 167.5 | |
| AROCLOR-1016 | U | | NA | 35 | U | | NA | | NA | 170 | U | 36 | U | 170 | UJ | 190 | U | 37 | UJ | | NA | 37 | UJ |
| AROCLOR-1221 | U | | NA | 71 | U | | NA | | NA | 33 | U | 74 | U | 350 | UJ | 390 | U | 74 | UJ | | NA | 76 | UJ |
| AROCLOR-1232 | U | | NA | 35 | U | | NA | | NA | 67 | U | 36 | U | 170 | UJ | 190 | U | 37 | UJ | | NA | 37 | UJ |
| AROCLOR-1242 | U | | NA | 35 | U | | NA | | NA | 33 | U | 36 | U | 170 | UJ | 190 | U | 37 | UJ | | NA | 37 | UJ |
| AROCLOR-1248 | U | | NA | 35 | U | | NA | | NA | 33 | U | 36 | U | 170 | UJ | 190 | U | 37 | UJ | | NA | 37 | UJ |
| AROCLOR-1254 | U | | NA | 35 | U | | NA | | NA | 33 | U | 36 | U | 170 | UJ | 190 | UJ | 37 | UJ | | NA | 37 | UJ |
| AROCLOR-1260 | U | | NA | 35 | U | | NA | | NA | 33 | U | 36 | U | 170 | UJ | 190 | UJ | 37 | UJ | | NA | 37 | UJ |
| AROCLOR-1262 | U | | NA | 35 | UJ | | NA | | NA | 33 | U | 36 | U | 170 | UJ | 190 | UJ | | R | | NA | | R |
| AROCLOR-1268 | U | | NA | 35 | U | | NA | | NA | 33 | U | 36 | U | 170 | UJ | 190 | UJ | 37 | UJ | | NA | 37 | UJ |
| BETA-BHC | U | | NA | 1.8 | U | | NA | | NA | 1.7 | U | 1.9 | U | 8.8 | UJ | 9.8 | U | 1.9 | UJ | | NA | 1.9 | UJ |
| DELTA-BHC | U | | NA | 1.8 | U | | NA | | NA | 1.7 | U | 1.9 | U | 8.8 | UJ | 9.8 | U | 1.9 | UJ | | NA | 1.9 | UJ |
| DIELDRIN | U | | NA | 3.5 | UJ | | NA | | NA | 3.3 | U | 3.6 | U | 17 | UJ | | R | 3.7 | UJ | | NA | 3.7 | UJ |
| ENDOSULFAN I | U | | NA | 1.8 | U | | NA | | NA | | R | 1.9 | U | 8.8 | UJ | 9.8 | U | 1.9 | UJ | | NA | 1.9 | UJ |
| ENDOSULFAN II | U | | NA | 3.5 | U | | NA | | NA | 3.3 | U | 3.6 | U | 5.2 | J | 19 | U | 2 | J | | NA | 3.7 | UJ |
| ENDOSULFAN SULFATE | U | | NA | 3.5 | U | | NA | | NA | 3.3 | U | 3.6 | U | 17 | UJ | 19 | U | 3.7 | UJ | | NA | 3.7 | UJ |
| ENDRIN | U | | NA | 3.5 | U | | NA | | NA | 4.5 | J | 3.6 | U | 17 | UJ | 19 | U | 3.7 | UJ | | NA | 3.7 | UJ |
| ENDRIN ALDEHYDE | U | | NA | 3.5 | U | | NA | | NA | 3.3 | U | 3.6 | U | 3.7 | J | 19 | U | 3.7 | UJ | | NA | 3.7 | UJ |
| ENDRIN KETONE | U | | NA | 3.5 | U | | NA | | NA | 17 | U | 3.6 | U | | R | 19 | U | 3.7 | UJ | | NA | 3.7 | UJ |
| GAMMA-BHC (LINDANE) | U | | NA | 1.8 | U | | NA | | NA | 1.7 | U | 1.9 | U | 8.8 | UJ | 9.8 | U | 1.9 | UJ | | NA | 1.9 | UJ |
| GAMMA-CHLORDANE | U | | NA | 2.1 | J | | NA | | NA | 9.2 | J | 1.9 | U | 8.8 | UJ | 9.8 | U | 1.9 | UJ | | NA | 1.9 | UJ |
| HEPTACHLOR | U | | NA | 1.8 | U | | NA | | NA | 1.7 | U | 1.9 | U | | R | 9.8 | U | 1.9 | UJ | | NA | 1.9 | UJ |
| HEPTACHLOR EPOXIDE | U | | NA | 1.6 | J | | NA | | NA | 1.7 | U | 1.9 | U | 8.8 | UJ | | R | 1.9 | UJ | | NA | 1.9 | UJ |
| METHOXYCHLOR | U | | NA | 18 | U | | NA | | NA | 4.1 | J | 19 | U | | R | 98 | U | 19 | UJ | | NA | 22 | J |
| TOXAPHENE | U | | NA | 180 | U | | NA | | NA | 5.7 | J | 190 | U | 880 | UJ | 980 | U | 190 | UJ | | NA | 190 | UJ |



U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; NA - Not Analyzed

**ANALYTICAL RESULTS**
**DRAFT REMEDIAL INVESTIGATION REPORT**
**RAYMARK-FERRY CREEK - OU3**
**STRATFORD, CONNECTICUT**

| Sample Number | | FS-AH50 | | GC-94 | | GLC004 | | HBN-94 | | HBN-G4 | | HP-C+500 | | HP-GR7 | | HP-GR9 | | JA-C+400 | | JA-C+900 | | LBB012 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Location | | FS-AH50 | | GC-94 | | GLC004 | | HBN-94 | | HBN-G4 | | HP-C+500 | | HP-GR7 | | HP-GR9 | | JA-C+400 | | JA-C+900 | | LBB012 | |
| Date Sampled | | | | | | | | | | | | | | | | | | | | | | | |
| QC Type | | None | | None | | None | | None | | None | | None | | None | | None | | None | | None | | None | |
| MATRIX | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | |
| Filtering | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | |
| Metals (MG/KG) | | | | | | | | | | | | | | | | | | | | | | | |
| ALUMINUM | NA | 16400 | J | | NA | 16700 | | 14000 | | | NA | 10400 | J | 11400 | J | 15400 | J | | NA | 11300 | | | NA |
| ANTIMONY | NA | 6.1 | UJ | | NA | 9.3 | U | 8.3 | UJ | | NA | 6.1 | UJ | 5.5 | UJ | 6.2 | UJ | | NA | 9.1 | UJ | | NA |
| ARSENIC | NA | 4.5 | | | NA | 9 | | 8.6 | | | NA | 5.4 | | 6.9 | | 11 | | | NA | 3.6 | | | NA |
| BARIUM | NA | 172 | J | | NA | 48.4 | | 55 | J | | NA | 54 | J | 53.6 | J | 126 | J | | NA | 93.7 | J | | NA |
| BERYLLIUM | NA | 1.1 | | | NA | 1.2 | | 0.64 | | | NA | 0.58 | J | 0.65 | J | 0.83 | | | NA | 0.34 | J | | NA |
| CADMIUM | NA | 0.48 | UJ | | NA | 0.72 | U | 0.64 | U | | NA | 0.42 | UJ | 0.67 | UJ | 1.4 | U | | NA | 1.1 | J | | NA |
| CALCIUM | NA | 161 | J | | NA | 1110 | | 1310 | J | | NA | 1210 | J | 1470 | J | 1560 | J | | NA | 1160 | J | | NA |
| CHROMIUM | NA | 35.2 | | | NA | 17.5 | | 15 | | | NA | 14.9 | | 15.7 | | 23.9 | | | NA | 14.5 | | | NA |
| COBALT | NA | 7.5 | | | NA | 8.5 | | 6.9 | UJ | | NA | 8.8 | | 6.7 | | 7.7 | | | NA | 2.8 | UJ | | NA |
| COPPER | NA | 54 | | | NA | 49.2 | | 23.9 | J | | NA | 17.1 | | 24.7 | | 44 | | | NA | 45.3 | J | | NA |
| IRON | NA | 19400 | J | | NA | 17800 | | 17400 | | | NA | 16100 | J | 16600 | J | 17800 | J | | NA | 11100 | | | NA |
| LEAD | NA | 193 | | | NA | 97 | | 40.3 | J | | NA | 28.1 | | 64.3 | | 300 | | | NA | 286 | J | | NA |
| MAGNESIUM | NA | 3390 | J | | NA | 3250 | | 3610 | | | NA | 3620 | J | 2590 | J | 2990 | J | | NA | 1730 | | | NA |
| MANGANESE | NA | 262 | J | | NA | 247 | | 263 | J | | NA | 338 | J | 316 | J | 341 | J | | NA | 126 | J | | NA |
| MERCURY | NA | 0.08 | J | | NA | 0.12 | U | 0.12 | J | | NA | 0.08 | UJ | 0.21 | J | 0.14 | J | | NA | 0.18 | J | | NA |
| NICKEL | NA | 17.9 | U | | NA | 17 | | 11.5 | J | | NA | 15.2 | U | 13.4 | U | 18.1 | U | | NA | 10.1 | J | | NA |
| POTASSIUM | NA | 894 | UJ | | NA | 1330 | | 1500 | | | NA | 1710 | | 984 | J | 731 | UJ | | NA | 517 | | | NA |
| SELENIUM | NA | 0.33 | UJ | | NA | 0.72 | UJ | 0.85 | U | | NA | 0.34 | UJ | 0.31 | UJ | 0.35 | UJ | | NA | 1.3 | J | | NA |
| SILVER | NA | 0.34 | U | | NA | 3.3 | J | 1.5 | UJ | | NA | 0.34 | U | 0.31 | U | 0.34 | U | | NA | 1.9 | UJ | | NA |
| SODIUM | NA | 116 | | | NA | 112 | U | 65.4 | UJ | | NA | 116 | | 246 | | 106 | | | NA | 50 | UJ | | NA |
| THALLIUM | NA | 0.16 | U | | NA | 1.2 | U | 1.5 | U | | NA | 0.17 | U | 0.15 | UJ | 0.18 | U | | NA | 1.6 | U | | NA |
| VANADIUM | NA | 46.7 | | | NA | 42.5 | | 32.8 | | | NA | 31.8 | | 33.4 | | 48.4 | | | NA | 29.7 | | | NA |
| ZINC | NA | 229 | J | | NA | 80.8 | | 76 | J | | NA | 45.4 | J | 109 | J | 235 | J | | NA | 254 | J | | NA |

ANALYTICAL RESULTS
DRAFT REMEDIAL INVESTIGATION REPORT
RAYMARK-FERRY CREEK - OU3
STRATFORD, CONNECTICUT

| Sample Number | LBP005 | | LBP012 | | LBP019 | | LBP029 | | LBP039 | | LBPAA+400 | | LBPC+200 | | LBPD+300 | | LC-92 | | LOX-63 | | LP-61 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Location | LBP005 | | LBP012 | | LBP019 | | LBP029 | | LBP039 | | LBPAA+400 | | LBPC+200 | | LBPD+300 | | LC-92 | | LOX-63 | | LP-61 | |
| Date Sampled | | | | | | | | | | | | | | | | | | | | | | |
| QC Type | None | | None | | None | | None | | None | | None | | None | | Field Dup. (3005) | | None | | None | | None | |
| MATRIX | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | |
| Filtering | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | |
| Pesticides/PCBs (UG/KG) | | | | | | | | | | | | | | | | | | | | | | |
| 4,4'-DDD | 3.7 | UJ | | NA | 4 | UJ | 2.4 | J | 3.5 | UJ | | R | | R | 2.05 | | 3.5 | U | 3.4 | UJ | | NA |
| 4,4'-DDE | 7.7 | J | | NA | | R | 3.6 | UJ | 3.9 | J | 61 | J | 72 | J | | NA | 3.5 | U | 3.4 | UJ | | NA |
| 4,4'-DDT | 5.4 | J | | NA | 4 | UJ | 3.2 | J | 6.6 | J | 120 | J | 62 | J | 2 | | 3.5 | U | 3.4 | U | | NA |
| ALDRIN | 1.9 | U | | NA | 2 | UJ | 1.8 | UJ | 1.8 | UJ | 2 | UJ | 1.9 | U | 2.1 | U | 1.8 | U | 1.7 | U | | NA |
| ALPHA-BHC | 1.9 | U | | NA | 2 | UJ | 1.8 | UJ | 1.8 | UJ | 2 | UJ | 1.9 | U | 2.1 | U | 1.8 | U | 1.7 | U | | NA |
| ALPHA-CHLORDANE | | R | | NA | 4.8 | UJ | 9.6 | J | 1.8 | UJ | 21 | J | | R | 4 | | 1.8 | U | 1.7 | U | | NA |
| AROCLOR, TOTAL | 172.5 | | | NA | 200.5 | U | 162.5 | | 176 | U | 305 | | 183 | | 205 | | 175.5 | U | 170 | U | | NA |
| AROCLOR-1016 | 37 | U | | NA | 40 | UJ | 36 | UJ | 35 | UJ | 38 | UJ | 37 | U | 41 | U | 35 | U | 34 | U | | NA |
| AROCLOR-1221 | 75 | U | | NA | 81 | UJ | 73 | UJ | 72 | UJ | 78 | UJ | 75 | U | 83 | U | 71 | U | 68 | U | | NA |
| AROCLOR-1232 | 37 | U | | NA | 40 | UJ | 36 | UJ | 35 | UJ | 38 | UJ | 37 | U | 41 | U | 35 | U | 34 | U | | NA |
| AROCLOR-1242 | 37 | U | | NA | 40 | UJ | 36 | UJ | 35 | UJ | 38 | UJ | 37 | U | 41 | U | 35 | U | 34 | U | | NA |
| AROCLOR-1248 | 37 | U | | NA | 40 | UJ | 36 | UJ | 35 | UJ | 38 | UJ | 37 | U | 41 | U | 35 | U | 34 | U | | NA |
| AROCLOR-1254 | 37 | U | | NA | 40 | UJ | 36 | UJ | 35 | UJ | 38 | UJ | 37 | U | 41 | U | 35 | U | 34 | U | | NA |
| AROCLOR-1260 | 37 | U | | NA | 40 | UJ | 36 | UJ | 35 | UJ | 38 | UJ | 37 | U | 41 | U | 35 | U | 34 | U | | NA |
| AROCLOR-1262 | | R | | NA | 40 | UJ | | R | 35 | UJ | 110 | J | 16 | J | 20 | | 35 | UJ | 34 | U | | NA |
| AROCLOR-1268 | 24 | J | | NA | 40 | UJ | 36 | UJ | 35 | UJ | 42 | J | 37 | U | 41 | U | 35 | U | 34 | U | | NA |
| BETA-BHC | 1.9 | U | | NA | 2 | UJ | 1.8 | UJ | 1.8 | UJ | 2 | UJ | 1.9 | U | 2.1 | U | 1.8 | U | 1.7 | U | | NA |
| DELTA-BHC | | R | | NA | 2 | UJ | 1.8 | UJ | 1.8 | UJ | 2 | UJ | 1.9 | UJ | 1.05 | | 1.8 | U | 1.7 | U | | NA |
| DIELDRIN | | R | | NA | | R | 3.6 | UJ | 3.5 | UJ | 3.8 | UJ | | R | | R | 3.5 | U | 3.4 | U | | NA |
| ENDOSULFAN I | 1.9 | U | | NA | 2 | UJ | 10 | J | 1.8 | UJ | 23 | J | 1.9 | U | | NA | 1.8 | U | 1.7 | U | | NA |
| ENDOSULFAN II | 3.7 | U | | NA | 4 | UJ | 3.6 | UJ | 3.5 | UJ | 3.8 | UJ | 3.7 | U | | NA | 3.5 | U | 3.4 | U | | NA |
| ENDOSULFAN SULFATE | 3.7 | U | | NA | 4 | UJ | 3.6 | UJ | 3.5 | UJ | 3.8 | UJ | 3.7 | U | 4.1 | U | 3.5 | U | 3.4 | U | | NA |
| ENDRIN | 3.7 | U | | NA | 4 | UJ | | R | 3.5 | UJ | 3.8 | UJ | 3.7 | U | 4.1 | U | 3.5 | U | 3.4 | U | | NA |
| ENDRIN ALDEHYDE | 3.7 | U | | NA | 4 | UJ | 3.6 | UJ | 3.5 | UJ | 3.8 | UJ | 3.7 | U | | NA | 3.5 | U | 3.4 | U | | NA |
| ENDRIN KETONE | 3.7 | UJ | | NA | | R | | R | 3.5 | UJ | 3.8 | UJ | 3.7 | UJ | 3.6 | | 3.5 | U | 3.4 | U | | NA |
| GAMMA-BHC (LINDANE) | 1.9 | U | | NA | 2 | UJ | 1.8 | UJ | 1.8 | UJ | 2 | UJ | 1.9 | U | 2.1 | U | 1.8 | U | 1.7 | U | | NA |
| GAMMA-CHLORDANE | | R | | NA | | R | | R | 1.8 | UJ | | R | 1.9 | UJ | 2.1 | U | 1.8 | U | 1.7 | U | | NA |
| HEPTACHLOR | | R | | NA | 2 | UJ | 1.8 | UJ | 1.8 | UJ | 2 | UJ | | R | | R | 1.8 | U | 1.7 | U | | NA |
| HEPTACHLOR EPOXIDE | 1.9 | U | | NA | 2 | UJ | 1.8 | UJ | 1.8 | UJ | 2 | UJ | 1.9 | U | 2.1 | U | 1.8 | U | 1.7 | UJ | | NA |
| METHOXYCHLOR | 5 | J | | NA | 3.9 | J | 18 | UJ | 18 | UJ | 20 | UJ | 5.8 | J | | NA | 18 | U | 17 | U | | NA |
| TOXAPHENE | 190 | U | | NA | 200 | UJ | 180 | UJ | 180 | UJ | 200 | UJ | 190 | U | 210 | U | 180 | U | 170 | U | | NA |



U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; NA - Not Analyzed

ANALYTICAL RESULTS
DRAFT REMEDIAL INVESTIGATION REPORT
RAYMARK-FERRY CREEK - OU3
STRATFORD, CONNECTICUT

| Sample Number | LBP005 | | LBP012 | | LBP019 | | LBP029 | | LBP039 | | LBPAA+400 | | LBPC+200 | | LBPD+300 | | LC-92 | | LOX-63 | | LP-61 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Location | LBP005 | | LBP012 | | LBP019 | | LBP029 | | LBP039 | | LBPAA+400 | | LBPC+200 | | LBPD+300 | | LC-92 | | LOX-63 | | LP-61 | |
| Date Sampled | | | | | | | | | | | | | | | | | | | | | | |
| QC Type | None | | None | | None | | None | | None | | None | | None | | Field Dup. (3005) | | None | | None | | None | |
| MATRIX | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | |
| Filtering | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | |
| Metals (MG/KG) | | | | | | | | | | | | | | | | | | | | | | |
| ALUMINUM | 15000 | J | 12200 | J | 9520 | J | 3740 | J | 15100 | J | 13800 | J | 18500 | J | 21500 | | 7130 | | | NA | 11100 | J |
| ANTIMONY | 6.3 | UJ | 6.3 | UJ | 6.7 | UJ | 5.7 | UJ | 6 | UJ | 6.1 | UJ | 6.3 | UJ | 6.7 | U | 6.5 | UJ | | NA | 5.7 | UJ |
| ARSENIC | 8.9 | | 7.5 | | 7.7 | | 1.1 | | 8.5 | | 10.3 | J | 4.3 | | 8.3 | | 3.8 | | | NA | 7.8 | |
| BARIUM | 45.7 | | 42.1 | | 42.9 | | 22 | | 42.4 | | 48.5 | J | 49.1 | | 51.3 | | 41.4 | J | | NA | 30.2 | J |
| BERYLLIUM | 1.1 | | 0.82 | U | 0.87 | U | 0.4 | UJ | 0.97 | U | 1.1 | | 1.3 | | 1.3 | | 0.26 | J | | NA | 0.69 | J |
| CADMIUM | 0.44 | U | 0.78 | UJ | 0.78 | UJ | 0.4 | UJ | 0.7 | UJ | 1.4 | | 0.44 | U | 0.53 | | 0.63 | U | | NA | 0.44 | UJ |
| CALCIUM | 637 | J | 3830 | J | 1910 | J | 2010 | J | 781 | J | 938 | J | 731 | J | 751 | | 1300 | J | | NA | 703 | J |
| CHROMIUM | 15.7 | | 14.8 | | 15.3 | | 10.2 | | 16.2 | | 20.2 | | 16 | | 20.1 | | 10.9 | | | NA | 16.4 | |
| COBALT | 6.9 | | 7.2 | | 7.7 | | 2.6 | J | 6.9 | | 7.6 | | 7.2 | | 9.4 | | 5.7 | UJ | | NA | 6.3 | |
| COPPER | 26.9 | J | 42.8 | J | 31.5 | J | 18.3 | J | 22.9 | J | 30.1 | J | 22.7 | J | 17.6 | | 11.9 | UJ | | NA | 15.1 | |
| IRON | 17300 | J | 16000 | J | 17300 | J | 8220 | J | 16700 | J | 17100 | J | 17700 | J | 21600 | | 13100 | | | NA | 14800 | J |
| LEAD | 82.6 | | 85.5 | J | 67.7 | J | 43.2 | J | 74 | J | 165 | J | 55.2 | | 60 | | 3.7 | J | | NA | 47.3 | |
| MAGNESIUM | 2860 | J | 3910 | J | 2710 | J | 1840 | J | 2720 | J | 2580 | J | 2990 | J | 3350 | | 3310 | | | NA | 2630 | J |
| MANGANESE | 284 | J | 224 | J | 406 | J | 98.2 | J | 251 | J | 299 | J | 411 | J | 309 | | 201 | J | | NA | 239 | J |
| MERCURY | 0.12 | J | 0.08 | U | 0.09 | U | 0.08 | J | 0.08 | J | 0.14 | J | 0.12 | J | 0.17 | | 0.11 | U | | NA | 0.09 | J |
| NICKEL | 11.9 | J | 11.7 | | 16.3 | | 10.7 | | 13.7 | | 12.8 | | 14.2 | J | 15.3 | | 7.9 | J | | NA | 13.7 | U |
| POTASSIUM | 834 | UJ | 388 | UJ | 594 | UJ | 529 | J | 610 | J | 691 | UJ | 740 | UJ | 884 | U | 2680 | | | NA | 732 | UJ |
| SELENIUM | 0.24 | UJ | 0.34 | UJ | 0.39 | UJ | 0.32 | UJ | 0.33 | UJ | 0.34 | UJ | 0.64 | J | 0.66 | | 0.84 | U | | NA | 0.31 | UJ |
| SILVER | 0.35 | U | 0.35 | U | 0.37 | U | 0.32 | U | 0.33 | U | 0.34 | U | 0.35 | U | 0.37 | U | 1.5 | UJ | | NA | 0.32 | U |
| SODIUM | 105 | | 129 | U | 126 | U | 118 | U | 95.9 | U | 71.8 | U | 104 | | 99.3 | U | 65.6 | UJ | | NA | 82.6 | |
| THALLIUM | 0.43 | UJ | 0.17 | U | 0.19 | UJ | 0.16 | U | 0.17 | UJ | 0.43 | U | 0.42 | UJ | 0.48 | U | 1.5 | U | | NA | 0.15 | U |
| VANADIUM | 36.8 | | 28.6 | | 29 | | 15.3 | | 38.1 | | 41.5 | | 39.7 | | 52.3 | | 19.7 | | | NA | 32.3 | |
| ZINC | 66.7 | J | 604 | J | 76.7 | J | 42.6 | J | 55.4 | J | 450 | J | 52.3 | J | 58.9 | | 29.4 | J | | NA | 49.9 | J |



U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; NA - Not Analyzed

ANALYTICAL RESULTS
DRAFT REMEDIAL INVESTIGATION REPORT
RAYMARK-FERRY CREEK - OU3
STRATFORD, CONNECTICUT

| Sample Number | LP-A+50 | | LP-G1 | | LSSA+00 | | LSSB+365 | | LSSE+125 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Location | LP-A+50 | | LP-G1 | | LSSA+00 | | LSSB+365 | | LSSE+125 | |
| Date Sampled | | | | | | | | | | |
| QC Type | None | | None | | None | | None | | None | |
| MATRIX | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | |
| Filtering | NA | | NA | | NA | | NA | | NA | |
| Pesticides/PCBs (UG/KG) | | | | | | | | | | |
| 4,4'-DDD | 16 | U | 17 | U | 3.5 | UJ | 3.7 | UJ | | R |
| 4,4'-DDE | 16 | U | 74 | | 3.5 | UJ | | R | 110 | J |
| 4,4'-DDT | 16 | U | 280 | | 3.5 | UJ | | R | 160 | J |
| ALDRIN | 8.5 | U | 8.9 | U | 1.8 | UJ | 1.9 | UJ | 3.5 | UJ |
| ALPHA-BHC | 8.5 | U | 8.9 | U | 1.8 | UJ | 1.9 | UJ | 3.5 | UJ |
| ALPHA-CHLORDANE | 8.5 | U | 8.9 | U | 1.8 | UJ | 3.5 | J | | R |
| AROCLOR, TOTAL | 810 | U | 855 | U | 158.5 | | 166.5 | | 311.5 | |
| AROCLOR-1016 | 160 | U | 170 | U | 35 | UJ | 37 | UJ | 69 | UJ |
| AROCLOR-1221 | 340 | U | 350 | U | 72 | UJ | 74 | UJ | 140 | UJ |
| AROCLOR-1232 | 160 | U | 170 | U | 35 | UJ | 37 | UJ | 69 | UJ |
| AROCLOR-1242 | 160 | U | 170 | U | 35 | UJ | 37 | UJ | 69 | UJ |
| AROCLOR-1248 | 160 | U | 170 | U | 35 | UJ | 37 | UJ | 69 | UJ |
| AROCLOR-1254 | 160 | UJ | 170 | U | 35 | UJ | 37 | UJ | 69 | UJ |
| AROCLOR-1260 | 160 | UJ | 170 | U | 35 | UJ | 37 | UJ | 69 | UJ |
| AROCLOR-1262 | 160 | UJ | 170 | U | | R | | R | | R |
| AROCLOR-1268 | 160 | U | 170 | U | 35 | UJ | 37 | UJ | 69 | UJ |
| BETA-BHC | 8.5 | U | 8.9 | U | 1.8 | UJ | 1.9 | UJ | 3.5 | UJ |
| DELTA-BHC | 8.5 | U | 8.9 | U | 1.8 | UJ | 1.9 | UJ | 3.5 | UJ |
| DIELDRIN | 16 | U | 17 | U | 3.5 | UJ | 6.9 | J | | R |
| ENDOSULFAN I | 8.5 | U | 8.9 | U | 1.8 | UJ | 1.9 | UJ | 3.5 | UJ |
| ENDOSULFAN II | 16 | U | 17 | U | 3.5 | UJ | 1.8 | J | 6.9 | UJ |
| ENDOSULFAN SULFATE | 16 | U | 17 | U | 3.5 | UJ | 3.7 | UJ | 6.9 | UJ |
| ENDRIN | 16 | U | 17 | U | 3.5 | UJ | 3.7 | UJ | 6.9 | UJ |
| ENDRIN ALDEHYDE | 16 | U | 17 | U | 3.5 | UJ | 3.7 | UJ | 6.9 | UJ |
| ENDRIN KETONE | 16 | U | 17 | U | 3.5 | UJ | 1.8 | J | 9.5 | J |
| GAMMA-BHC (LINDANE) | 8.5 | U | 8.9 | U | 1.8 | UJ | 1.9 | UJ | 3.5 | UJ |
| GAMMA-CHLORDANE | 8.5 | U | 8.9 | U | 1.8 | UJ | 1.9 | UJ | 3.5 | UJ |
| HEPTACHLOR | 8.5 | U | 8.9 | U | 1.8 | UJ | 1.9 | UJ | 3.5 | UJ |
| HEPTACHLOR EPOXIDE | 8.5 | U | 8.9 | U | 1.8 | UJ | 2.3 | J | 3.5 | UJ |
| METHOXYCHLOR | 85 | U | 89 | U | 18 | UJ | 19 | UJ | | R |
| TOXAPHENE | 850 | U | 890 | U | 180 | UJ | 190 | UJ | 350 | UJ |



U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; NA - Not Analyzed

**ANALYTICAL RESULTS**
**DRAFT REMEDIAL INVESTIGATION REPORT**
**RAYMARK-FERRY CREEK - OU3**
**STRATFORD, CONNECTICUT**

| Sample Number | LP-A+50 | | LP-G1 | | LSSA+00 | | LSSB+365 | | LSSE+125 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Location | LP-A+50 | | LP-G1 | | LSSA+00 | | LSSB+365 | | LSSE+125 | |
| Date Sampled | | | | | | | | | | |
| QC Type | None | | None | | None | | None | | None | |
| MATRIX | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | |
| Filtering | NA | | NA | | NA | | NA | | NA | |
| Metals (MG/KG) | | | | | | | | | | |
| ALUMINUM | 13500 | J | | NA | 16500 | | 13400 | | 17100 | |
| ANTIMONY | 6 | UJ | | NA | | R | | R | | R |
| ARSENIC | 3.6 | J | | NA | 8.3 | | 5.4 | | 10.1 | |
| BARIUM | 64.3 | | | NA | 44.2 | J | 49.6 | | 69.9 | J |
| BERYLLIUM | 0.7 | J | | NA | 0.65 | | 0.49 | | 0.72 | |
| CADMIUM | 0.41 | UJ | | NA | 0.64 | UJ | 0.67 | UJ | 0.98 | J |
| CALCIUM | 545 | J | | NA | 960 | J | 1780 | J | 1280 | J |
| CHROMIUM | 14.1 | | | NA | 31.1 | | 21.6 | | 28.6 | |
| COBALT | 6.2 | | | NA | 11.7 | | 6.4 | | 12.4 | |
| COPPER | 22.9 | J | | NA | 32.6 | J | 25.9 | J | 60.8 | J |
| IRON | 14500 | J | | NA | 24100 | | 16200 | | 21700 | |
| LEAD | 84.2 | J | | NA | 22.2 | J | 72.9 | | 167 | |
| MAGNESIUM | 2190 | J | | NA | 5690 | | 3630 | | 5210 | |
| MANGANESE | 262 | J | | NA | 483 | J | 305 | J | 660 | J |
| MERCURY | 0.12 | J | | NA | 0.11 | U | 0.11 | U | 0.22 | |
| NICKEL | 11.4 | | | NA | 40.4 | J | 17 | J | 31.6 | J |
| POTASSIUM | 316 | UJ | | NA | 1490 | | 1070 | | 1590 | |
| SELENIUM | 0.34 | UJ | | NA | 0.85 | UJ | 0.89 | UJ | 0.95 | J |
| SILVER | 0.33 | U | | NA | 1.5 | U | 1.6 | U | 1.5 | U |
| SODIUM | 97.6 | | | NA | | R | 150 | UJ | | R |
| THALLIUM | 0.17 | UJ | | NA | 1.5 | UJ | 1.6 | U | 1.5 | UJ |
| VANADIUM | 33.4 | | | NA | 39.1 | J | 31.8 | | 54.2 | J |
| ZINC | 66.3 | J | | NA | 109 | J | 79.5 | J | 203 | J |



U - Not detected; UJ.- Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; NA - Not Analyzed

ANALYTICAL RESULTS
DRAFT REMEDIAL INVESTIGATION REPORT
RAYMARK-FERRY CREEK - OU3
STRATFORD, CONNECTICUT

| Sample Number | NEP-C+200 | | NEP-GR6 | | NEP-GRG | | NS-B+200 | | NS-E+200 | | NS-F+00 | | NS-G+300 | | SB-925-D | | SB-950-F | | SB-970-L | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Location | NEP-C+200 | | NEP-GR6 | | NEP-GRG | | NS-B+200 | | NS-E+200 | | NS-F+00 | | NS-G+300 | | SB-925-D | | SB-950-F | | SB-970-L | |
| Date Sampled | | | | | | | | | | | | | | | | | | | | |
| QC Type | None | | None | | None | | None | | None | | None | | None | | None | | None | | None | |
| MATRIX | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | |
| Filtering | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | |
| Pesticides/PCBs (UG/KG) | | | | | | | | | | | | | | | | | | | | |
| 4,4'-DDD | 3.4 | U | | NA | 18 | U | 18 | U | 20 | UJ | 3.6 | U | 18 | U | 3.8 | U | 3.3 | U | 3.6 | U |
| 4,4'-DDE | 2.5 | J | | NA | 18 | U | 18 | U | 20 | UJ | 9 | | 18 | U | 3.4 | J | 3.3 | U | 4.5 | J |
| 4,4'-DDT | 3.4 | U | | NA | 18 | U | 18 | U | 20 | UJ | 9.7 | J | 18 | U | 9.5 | | 2.6 | J | | R |
| ALDRIN | 1.8 | U | | NA | 9.1 | U | 9.2 | U | 10 | UJ | 1.9 | U | 9 | U | 2 | U | 1.7 | U | 1.8 | U |
| ALPHA-BHC | 1.8 | U | | NA | 9.1 | U | 9.2 | U | 10 | UJ | 1.9 | U | 9 | U | 2 | U | 1.7 | U | 1.8 | U |
| ALPHA-CHLORDANE | 3.4 | U | | NA | 9.1 | U | 9.2 | U | 44 | J | 1.9 | U | 9 | U | 2 | U | 1.7 | U | 10.4 | |
| AROCLOR, TOTAL | 244 | U | | NA | 900 | U | 810 | | 1005 | U | 163 | | 810 | | 190.5 | U | 166 | U | 241.5 | |
| AROCLOR-1016 | 180 | U | | NA | 180 | U | 180 | U | 200 | UJ | 36 | U | 180 | U | 38 | U | 33 | U | 36 | U |
| AROCLOR-1221 | 34 | U | | NA | 360 | U | 360 | U | 410 | UJ | 74 | U | 360 | U | 77 | U | 68 | U | 73 | U |
| AROCLOR-1232 | 70 | U | | NA | 180 | U | 180 | U | 200 | UJ | 36 | U | 180 | U | 38 | U | 33 | U | 36 | U |
| AROCLOR-1242 | 34 | U | | NA | 180 | U | 180 | U | 200 | UJ | 36 | U | 180 | U | 38 | U | 33 | U | 36 | U |
| AROCLOR-1248 | 34 | U | | NA | 180 | U | 180 | U | 200 | UJ | 36 | U | 180 | U | 38 | U | 33 | U | 36 | U |
| AROCLOR-1254 | 34 | U | | NA | 180 | U | 180 | UJ | 200 | UJ | 36 | U | 180 | U | 38 | U | 33 | U | 36 | U |
| AROCLOR-1260 | 34 | U | | NA | 180 | U | 180 | UJ | 200 | UJ | 36 | U | 180 | U | 38 | U | 33 | U | 36 | U |
| AROCLOR-1262 | 34 | U | | NA | 180 | U | | R | 200 | UJ | | R | | R | 38 | U | 33 | UJ | 79 | J |
| AROCLOR-1268 | 34 | U | | NA | 180 | U | 180 | UJ | 200 | UJ | 36 | U | 180 | U | 38 | U | 33 | UJ | 36 | UJ |
| BETA-BHC | 1.8 | U | | NA | 9.1 | U | 9.2 | U | 10 | UJ | 1.9 | U | 9 | U | 2 | U | 1.7 | U | 1.8 | U |
| DELTA-BHC | 1.8 | U | | NA | 9.1 | U | 9.2 | U | 10 | UJ | 1.9 | U | 9 | U | 2 | U | 1.7 | U | 1.8 | U |
| DIELDRIN | 2.6 | J | | NA | 18 | U | 18 | U | 190 | J | 4.6 | J | 18 | U | 3.8 | U | 3.3 | U | | R |
| ENDOSULFAN I | 1.8 | U | | NA | 9.1 | U | 9.2 | U | 47 | J | 1.9 | U | 9 | U | 2 | U | 1.7 | U | 1.8 | U |
| ENDOSULFAN II | 3.4 | U | | NA | 18 | U | 18 | U | 20 | UJ | 3.6 | U | 18 | U | 3.8 | U | 3.3 | U | 3.6 | U |
| ENDOSULFAN SULFATE | 3.4 | U | | NA | 18 | U | 18 | U | 20 | UJ | 3.6 | U | 18 | U | 3.8 | U | 3.3 | U | 3.6 | U |
| ENDRIN | 3.4 | U | | NA | 18 | U | 18 | U | 20 | UJ | 3.6 | U | 18 | U | 3.8 | U | 3.3 | U | 3.6 | U |
| ENDRIN ALDEHYDE | 3.4 | U | | NA | 18 | U | 18 | U | 20 | UJ | 3.6 | U | 18 | U | 3.8 | U | 3.3 | U | 3.6 | U |
| ENDRIN KETONE | 9.3 | J | | NA | 18 | U | 18 | U | 20 | UJ | 3.6 | U | 18 | U | 3.8 | U | 3.3 | U | 4.2 | J |
| GAMMA-BHC (LINDANE) | 1.8 | U | | NA | 9.1 | U | 9.2 | U | 10 | UJ | 1.9 | U | 9 | U | 2 | U | 1.7 | U | 1.8 | U |
| GAMMA-CHLORDANE | 1 | J | | NA | 9.1 | U | 9.2 | U | | R | 1.9 | U | 9 | U | 2 | U | 1.7 | U | | R |
| HEPTACHLOR | 1.8 | U | | NA | 9.1 | U | 9.2 | U | 10 | UJ | 1.9 | U | 9 | U | 2 | U | 1.7 | U | 1.8 | U |
| HEPTACHLOR EPOXIDE | 1.8 | U | | NA | 9.1 | U | 9.2 | U | 10 | UJ | 1.9 | U | 9 | U | 2 | U | 1.7 | U | 1.8 | U |
| METHOXYCHLOR | 4.6 | | | NA | 91 | U | 92 | U | 100 | UJ | 19 | U | 90 | U | 20 | U | 17 | U | | R |
| TOXAPHENE | 1.4 | J | | NA | 910 | U | 920 | U | 1000 | UJ | 190 | U | 900 | U | 200 | U | 170 | U | 180 | U |

U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate;
* - *From dilution analysis*; R - Rejected; NA - Not Analyzed

**ANALYTICAL RESULTS**
**DRAFT REMEDIAL INVESTIGATION REPORT**
**RAYMARK-FERRY CREEK - OU3**
**STRATFORD, CONNECTICUT**

| Sample Number | NEP-C+200 | | NEP-GR6 | | NEP-GRG | | NS-B+200 | | NS-E+200 | | NS-F+00 | | NS-G+300 | | SB-925-D | | SB-950-F | | SB-970-L | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Location | NEP-C+200 | | NEP-GR6 | | NEP-GRG | | NS-B+200 | | NS-E+200 | | NS-F+00 | | NS-G+300 | | SB-925-D | | SB-950-F | | SB-970-L | |
| Date Sampled | | | | | | | | | | | | | | | | | | | | |
| QC Type | None | | None | | None | | None | | None | | None | | None | | None | | None | | None | |
| MATRIX | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | |
| Filtering | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | |
| **Metals (MG/KG)** | | | | | | | | | | | | | | | | | | | | |
| ALUMINUM | 13200 | J | 10200 | J | | NA | 15000 | J | 17100 | J | 14600 | J | 16100 | J | 9810 | J | 2320 | J | 4190 | J |
| ANTIMONY | 5.8 | UJ | 5.7 | UJ | | NA | 6.2 | UJ | 6.6 | UJ | 6 | UJ | 5.9 | UJ | 6.3 | UJ | 5.5 | UJ | 5.8 | UJ |
| ARSENIC | 3.5 | | 2.9 | | | NA | 5.8 | J | 6 | J | 5.5 | J | 4.3 | J | 4.1 | J | 0.99 | J | 1.6 | J |
| BARIUM | 30.6 | J | 32.6 | J | | NA | 60.4 | | 47.8 | | 49.1 | | 67 | | 30.5 | | 8 | | 24.4 | |
| BERYLLIUM | 0.98 | | 0.61 | J | | NA | 1.1 | | 1.1 | | 1.1 | | 0.95 | | 0.52 | J | 0.35 | U | 0.37 | U |
| CADMIUM | 0.41 | UJ | 0.4 | UJ | | NA | 0.73 | J | 0.46 | UJ | 0.42 | UJ | 0.55 | J | 0.44 | UJ | 0.39 | UJ | 0.41 | UJ |
| CALCIUM | 775 | J | 1020 | J | | NA | 800 | J | 1150 | J | 600 | J | 1030 | J | 821 | J | 2600 | J | 1170 | J |
| CHROMIUM | 14.2 | | 9.5 | | | NA | 19.4 | | 18.5 | | 16.1 | | 15.4 | | 12.4 | | 4.9 | | 7.5 | |
| COBALT | 8 | | 6.6 | | | NA | 8.5 | | 9.6 | | 8 | | 8.7 | | 6.9 | | 2 | U | 3.1 | J |
| COPPER | 18.3 | | 14.2 | | | NA | 35.8 | J | 20 | J | 33.4 | J | 24.3 | J | 14.6 | J | 15.3 | J | 13.3 | J |
| IRON | 18900 | J | 14100 | J | | NA | 16500 | J | 18700 | J | 17500 | J | 18300 | J | 12600 | J | 3900 | J | 6140 | J |
| LEAD | 43 | | 22.7 | | | NA | 129 | J | 53.8 | J | 79.1 | J | 69.3 | J | 13.6 | *J | 13.2 | UJ | 27.4 | U |
| MAGNESIUM | 3200 | J | 2980 | J | | NA | 3080 | J | 3240 | J | 3150 | J | 3620 | J | 3290 | J | 1170 | J | 1830 | J |
| MANGANESE | 304 | J | 182 | J | | NA | 338 | J | 291 | J | 307 | J | 409 | J | 329 | J | 65.6 | J | 94.5 | J |
| MERCURY | 0.16 | J | 0.08 | UJ | | NA | 0.17 | J | 0.13 | J | 0.13 | J | 0.13 | J | 0.09 | U | 0.07 | U | 0.08 | U |
| NICKEL | 16.9 | U | 9.8 | U | | NA | 15.5 | | 13.1 | | 14.1 | | 14.2 | | 9.8 | | 4.2 | J | 7.3 | |
| POTASSIUM | 1300 | J | 1770 | | | NA | 760 | J | 845 | U | 633 | U | 1570 | | 1000 | J | 273 | UJ | 345 | UJ |
| SELENIUM | 0.32 | UJ | 0.32 | UJ | | NA | 0.35 | UJ | 0.37 | UJ | 0.34 | UJ | 0.33 | UJ | 0.34 | UJ | 0.32 | UJ | 0.3 | UJ |
| SILVER | 0.33 | U | 0.32 | U | | NA | 0.34 | U | 0.37 | U | 0.33 | U | 0.33 | U | 0.35 | UJ | 0.31 | UJ | 0.33 | UJ |
| SODIUM | 72.4 | | 88.3 | U | | NA | 123 | | 154 | | 109 | | 120 | | 105 | J | 43.6 | J | 50.4 | J |
| THALLIUM | 0.16 | U | 0.16 | U | | NA | 0.17 | UJ | 0.19 | UJ | 0.17 | UJ | 0.16 | UJ | 0.17 | U | 0.16 | U | 0.15 | U |
| VANADIUM | 36.7 | | 24.2 | | | NA | 47.6 | | 33.5 | | 44.9 | | 34.5 | | 23.1 | | 4.8 | J | 9.9 | J |
| ZINC | 50.9 | J | 34.8 | J | | NA | 80.5 | J | 58.5 | J | 69.2 | J | 79.2 | J | 39.4 | J | 27.4 | J | 46.1 | J |



U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; NA - Not Analyzed

**ANALYTICAL RESULTS**
**DRAFT REMEDIAL INVESTIGATION REPORT**
**RAYMARK-FERRY CREEK - OU3**
**STRATFORD, CONNECTICUT**

| Sample Number | SB1+300 | | SB2+200 | | SBB1E+00 | | SBB1K+00 | | SBB1K+003 | | SBB1P+100 | | SBB1Q+00 | | SBI+300 | | SBP E+130 | | SBP+E+130 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Location | SB1+300 | | SB2+200 | | SBB1E+00 | | SBB1K+00 | | SBB1K+003 | | SBB1P+100 | | SBB1Q+00 | | SBI+300 | | SBP E+130 | | SBP+E+130 | |
| Date Sampled | | | | | | | | | | | | | | | | | | | | |
| QC Type | None | | None | | None | | None | | None | | None | | None | | None | | None | | None | |
| MATRIX | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | |
| Filtering | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | |
| **Pesticides/PCBs (UG/KG)** | | | | | | | | | | | | | | | | | | | | |
| 4,4'-DDD | | R | | R | 3.5 | U | | NA | 3.4 | U | 3.5 | U | 17 | UJ | | NA | 0.44 | J | | NA |
| 4,4'-DDE | 3.5 | UJ | 19 | UJ | 3.5 | U | | NA | 3.4 | U | 3.9 | J | 17 | UJ | | NA | 2.4 | J | | NA |
| 4,4'-DDT | 6.7 | J | 19 | UJ | 3.5 | U | | NA | 3.4 | U | 10 | J | 17 | UJ | | NA | 4.4 | J | | NA |
| ALDRIN | 1.8 | UJ | 10 | UJ | 1.8 | U | | NA | 1.8 | U | 1.8 | U | 8.9 | UJ | | NA | 2 | UJ | | NA |
| ALPHA-BHC | 1.8 | UJ | 10 | UJ | 1.8 | U | | NA | 1.8 | U | 1.8 | U | 8.9 | UJ | | NA | 2 | UJ | | NA |
| ALPHA-CHLORDANE | 2.9 | J | 10 | UJ | 1.8 | U | | NA | 1.8 | U | 3.5 | U | 8.9 | UJ | | NA | 2 | UJ | | NA |
| AROCLOR, TOTAL | 241.5 | | 955 | U | 175 | U | | NA | 171 | U | 195.5 | | 855 | U | | NA | 251 | | | NA |
| AROCLOR-1016 | 35 | UJ | 190 | UJ | 35 | U | | NA | 34 | U | 35 | U | 170 | UJ | | NA | 39 | UJ | | NA |
| AROCLOR-1221 | 72 | UJ | 390 | UJ | 70 | U | | NA | 70 | U | 72 | U | 350 | UJ | | NA | 79 | UJ | | NA |
| AROCLOR-1232 | 35 | UJ | 190 | UJ | 35 | U | | NA | 34 | U | 35 | U | 170 | UJ | | NA | 39 | UJ | | NA |
| AROCLOR-1242 | 35 | UJ | 190 | UJ | 35 | U | | NA | 34 | U | 35 | U | 170 | UJ | | NA | 39 | UJ | | NA |
| AROCLOR-1248 | 35 | UJ | 190 | UJ | 35 | U | | NA | 34 | U | 35 | U | 170 | UJ | | NA | 39 | UJ | | NA |
| AROCLOR-1254 | 35 | UJ | 190 | UJ | 35 | U | | NA | 34 | U | 35 | U | 170 | UJ | | NA | 39 | UJ | | NA |
| AROCLOR-1260 | 35 | UJ | 190 | UJ | 35 | U | | NA | 34 | U | 35 | U | 170 | UJ | | NA | 39 | UJ | | NA |
| AROCLOR-1262 | 83 | J | 190 | UJ | 35 | UJ | | NA | 34 | UJ | 37 | J | 170 | UJ | | NA | 75 | J | | NA |
| AROCLOR-1268 | 35 | UJ | 190 | UJ | 35 | UJ | | NA | 34 | UJ | 35 | UJ | 170 | UJ | | NA | 39 | UJ | | NA |
| BETA-BHC | 1.8 | UJ | 10 | UJ | 1.8 | U | | NA | 1.8 | U | 1.8 | U | 8.9 | UJ | | NA | 2 | UJ | | NA |
| DELTA-BHC | 1.8 | UJ | 10 | UJ | 1.8 | U | | NA | 1.8 | U | 1.8 | U | 8.9 | UJ | | NA | 2 | UJ | | NA |
| DIELDRIN | | R | 19 | UJ | 3.5 | U | | NA | 3.4 | U | | R | 17 | UJ | | NA | 3.9 | UJ | | NA |
| ENDOSULFAN I | 1.8 | UJ | 10 | UJ | 1.8 | U | | NA | 1.8 | U | 1.8 | U | 8.9 | UJ | | NA | 2 | UJ | | NA |
| ENDOSULFAN II | 3.5 | UJ | 19 | UJ | 3.5 | U | | NA | 3.4 | U | 3.5 | U | 17 | UJ | | NA | 2.4 | J | | NA |
| ENDOSULFAN SULFATE | 3.5 | UJ | 19 | UJ | 3.5 | U | | NA | 3.4 | U | 3.5 | U | 17 | UJ | | NA | 3.9 | UJ | | NA |
| ENDRIN | 3.5 | UJ | 19 | UJ | 3.5 | U | | NA | 3.4 | U | 3.5 | U | 17 | UJ | | NA | 3.9 | UJ | | NA |
| ENDRIN ALDEHYDE | 3.5 | UJ | 19 | UJ | 3.5 | U | | NA | 3.4 | U | 3.5 | U | 17 | UJ | | NA | 3.9 | UJ | | NA |
| ENDRIN KETONE | | R | | R | 2.1 | J | | NA | | R | 3.9 | J | | R | | NA | 1.3 | J | | NA |
| GAMMA-BHC (LINDANE) | 1.8 | UJ | 10 | UJ | 1.8 | U | | NA | 1.8 | U | 1.8 | U | 8.9 | UJ | | NA | 2 | UJ | | NA |
| GAMMA-CHLORDANE | | R | | R | 1.8 | U | | NA | 1.8 | U | 3.5 | U | 8.9 | UJ | | NA | 2 | UJ | | NA |
| HEPTACHLOR | 1.8 | UJ | 10 | UJ | 1.8 | U | | NA | 1.8 | U | 1.8 | U | 8.9 | UJ | | NA | 0.23 | J | | NA |
| HEPTACHLOR EPOXIDE | 1.8 | UJ | 10 | UJ | 1.8 | U | | NA | 1.8 | U | 1.8 | U | 8.9 | UJ | | NA | 2 | UJ | | NA |
| METHOXYCHLOR | 18 | UJ | 100 | UJ | 18 | U | | NA | 18 | U | | R | 89 | UJ | | NA | 4.1 | J | | NA |
| TOXAPHENE | 180 | UJ | 1000 | UJ | 180 | U | | NA | 180 | U | 180 | U | 890 | UJ | | NA | 200 | UJ | | NA |



U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; NA - Not Analyzed

ANALYTICAL RESULTS
DRAFT REMEDIAL INVESTIGATION REPORT
RAYMARK-FERRY CREEK - OU3
STRATFORD, CONNECTICUT

| Sample Number | SB1+300 | | SB2+200 | | SBB1E+00 | | SBB1K+00 | | SBB1K+003 | | SBB1P+100 | | SBB1Q+00 | | SBI+300 | | SBP E+130 | | SBP+E+130 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Location | SB1+300 | | SB2+200 | | SBB1E+00 | | SBB1K+00 | | SBB1K+003 | | SBB1P+100 | | SBB1Q+00 | | SBI+300 | | SBP E+130 | | SBP+E+130 | |
| Date Sampled | | | | | | | | | | | | | | | | | | | | |
| QC Type | None | | None | | None | | None | | None | | None | | None | | None | | None | | None | |
| MATRIX | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | |
| Filtering | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | |
| Metals (MG/KG) | | | | | | | | | | | | | | | | | | | | |
| ALUMINUM | | NA | 6640 | J | 2360 | J | 2500 | J | | NA | 2550 | J | 2680 | J | 4380 | J | | NA | 15000 | J |
| ANTIMONY | | NA | 6.4 | UJ | 5.6 | UJ | 5.6 | UJ | | NA | 5.7 | UJ | 6 | UJ | 5.6 | UJ | | NA | 6.3 | UJ |
| ARSENIC | | NA | 5.7 | J | 0.53 | J | 0.62 | J | | NA | 0.87 | J | 0.78 | J | 1.8 | J | | NA | 12.3 | |
| BARIUM | | NA | 23.2 | | 8.8 | | 16.4 | | | NA | 14 | | 26.8 | | 22.6 | | | NA | 54.2 | J |
| BERYLLIUM | | NA | 0.51 | J | 0.35 | U | 0.35 | U | | NA | 0.36 | U | 0.37 | U | 0.35 | U | | NA | 1.1 | |
| CADMIUM | | NA | 0.44 | UJ | 0.39 | UJ | 0.39 | UJ | | NA | 0.4 | UJ | 0.46 | J | 0.39 | UJ | | NA | 1.2 | U |
| CALCIUM | | NA | 1600 | J | 33100 | J | 3760 | J | | NA | 797 | J | 2430 | J | 1040 | J | | NA | 1500 | J |
| CHROMIUM | | NA | 13.5 | | 5.9 | | 6.2 | | | NA | 5 | | 6.8 | | 14.9 | | | NA | 21.8 | |
| COBALT | | NA | 4.6 | | 2 | U | 2.4 | J | | NA | 2.1 | U | 2.2 | U | 3.1 | J | | NA | 8.2 | |
| COPPER | | NA | 68.4 | J | 16.5 | J | 16.7 | J | | NA | 11.2 | J | 13.1 | J | 39.3 | J | | NA | 36.7 | |
| IRON | | NA | 14700 | J | 5560 | J | 4420 | J | | NA | 3930 | J | 4580 | J | 7730 | J | | NA | 28000 | J |
| LEAD | | NA | 50.4 | | 10.5 | UJ | 19.1 | U | | NA | 47.7 | | 65 | | 21.7 | U | | NA | 76.4 | J |
| MAGNESIUM | | NA | 2340 | J | 1420 | J | 1390 | J | | NA | 1240 | J | 1230 | J | 1710 | J | | NA | 5410 | J |
| MANGANESE | | NA | 152 | J | 73.1 | J | 61.8 | J | | NA | 68.3 | J | 71.2 | J | 95.8 | J | | NA | 253 | J |
| MERCURY | | NA | 0.18 | | 0.09 | U | 0.07 | U | | NA | 0.09 | U | 0.09 | U | 0.07 | J | | NA | 0.14 | J |
| NICKEL | | NA | 17 | | 8.3 | | 5.4 | J | | NA | 5 | J | 6.4 | | 7.6 | | | NA | 14.5 | UJ |
| POTASSIUM | | NA | 518 | UJ | 286 | UJ | 387 | UJ | | NA | 263 | UJ | 324 | UJ | 396 | UJ | | NA | 1790 | |
| SELENIUM | | NA | 0.37 | UJ | 0.3 | UJ | 0.32 | UJ | | NA | 0.33 | UJ | 0.31 | UJ | 0.33 | UJ | | NA | 0.37 | UJ |
| SILVER | | NA | 0.35 | UJ | 0.31 | UJ | 0.31 | UJ | | NA | 0.32 | UJ | 0.33 | UJ | 0.31 | UJ | | NA | 0.35 | U |
| SODIUM | | NA | 86.9 | J | 290 | | 66.4 | J | | NA | 31.4 | J | 38.1 | J | 76.9 | J | | NA | | R |
| THALLIUM | | NA | 0.19 | UJ | 0.15 | UJ | 0.16 | UJ | | NA | 0.17 | U | 0.16 | U | 0.16 | U | | NA | 0.18 | UJ |
| VANADIUM | | NA | 16.3 | J | 6.8 | J | 6.5 | J | | NA | 6.2 | J | 6.7 | J | 10.4 | J | | NA | 49.4 | |
| ZINC | | NA | 117 | J | 26.6 | J | 37 | J | | NA | 50.7 | J | 68.6 | J | 61.4 | J | | NA | 710 | J |



U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; NA - Not Analyzed

ANALYTICAL RESULTS
DRAFT REMEDIAL INVESTIGATION REPORT
RAYMARK-FERRY CREEK - OU3
STRATFORD, CONNECTICUT

| Sample Number | SBP005 | | SBPF+00 | | SH-97 | | SH-A+00 | | SH-D+695 | | SH-E+400 | | SH400 | | SMS-G3 | | SPB 005 | | THG005 | | THN-62 | | THN-G2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Location | SBP005 | | SBPF+00 | | SH-97 | | SH-A+00 | | SH-D+695 | | SH-E+400 | | SH400 | | SMS-G3 | | SPB 005 | | THG005 | | THN-62 | | THN-G2 | |
| Date Sampled | | | | | | | | | | | | | | | | | | | | | | | | |
| QC Type | None | | None | | None | | None | | None | | None | | None | | None | | None | | None | | None | | None | |
| MATRIX | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | |
| Filtering | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | |
| Pesticides/PCBs (UG/KG) | | | | | | | | | | | | | | | | | | | | | | | | |
| 4,4'-DDD | | NA | 3.4 | UJ | 3.6 | UJ | 4.4 | UJ | 4 | UJ | 3.4 | UJ | | NA | 3.6 | U | | R | 18 | UJ | 19 | UJ | | NA |
| 4,4'-DDE | | NA | 3.4 | UJ | 3.6 | UJ | | R | 4 | UJ | 3.4 | UJ | | NA | 3.6 | UJ | 2.9 | J | 240 | J | 19 | UJ | | NA |
| 4,4'-DDT | | NA | 1.4 | J | 3.6 | UJ | | R | 4 | UJ | 3.2 | J | | NA | 3.6 | U | 2.7 | UJ | 400 | J | 19 | UJ | | NA |
| ALDRIN | | NA | 1.8 | UJ | 1.8 | UJ | 2.3 | UJ | 2.1 | UJ | 1.8 | UJ | | NA | 1.8 | U | 1.9 | UJ | 9.4 | UJ | 9.8 | UJ | | NA |
| ALPHA-BHC | | NA | 1.8 | UJ | 1.8 | UJ | 2.3 | UJ | 2.1 | UJ | 1.8 | UJ | | NA | 1.8 | U | 1.9 | UJ | 9.4 | UJ | 9.8 | UJ | | NA |
| ALPHA-CHLORDANE | | NA | 1.8 | UJ | 1.8 | UJ | 1.3 | J | 2.1 | UJ | 1.8 | UJ | | NA | 1.8 | U | 0.33 | J | 15 | J | 9.8 | UJ | | NA |
| AROCLOR, TOTAL | | NA | 303.5 | | 162.5 | | 198.5 | | 201 | U | 154 | | 170 | U | 180.5 | U | 167.5 | | 905 | U | 955 | U | | NA |
| AROCLOR-1016 | | NA | 34 | UJ | 36 | UJ | 44 | UJ | 40 | UJ | 34 | UJ | 34 | U | 36 | U | 37 | UJ | 180 | UJ | 190 | UJ | | NA |
| AROCLOR-1221 | | NA | 69 | UJ | 73 | UJ | 89 | UJ | 82 | UJ | 70 | UJ | 68 | U | 73 | U | 76 | UJ | 370 | UJ | 390 | UJ | | NA |
| AROCLOR-1232 | | NA | 34 | UJ | 36 | UJ | 44 | UJ | 40 | UJ | 34 | UJ | 34 | U | 36 | U | 37 | UJ | 180 | UJ | 190 | UJ | | NA |
| AROCLOR-1242 | | NA | 34 | UJ | 36 | UJ | 44 | UJ | 40 | UJ | 34 | UJ | 34 | U | 36 | U | 37 | UJ | 180 | UJ | 190 | UJ | | NA |
| AROCLOR-1248 | | NA | 34 | UJ | 36 | UJ | 44 | UJ | 40 | UJ | 34 | UJ | 34 | U | 36 | U | 37 | UJ | 180 | UJ | 190 | UJ | | NA |
| AROCLOR-1254 | | NA | 34 | UJ | 36 | UJ | 44 | UJ | 40 | UJ | 34 | UJ | 34 | U | 36 | U | 37 | UJ | 180 | UJ | 190 | UJ | | NA |
| AROCLOR-1260 | | NA | 34 | UJ | 36 | UJ | 44 | UJ | 40 | UJ | 34 | UJ | 34 | U | 36 | U | 37 | UJ | 180 | UJ | 190 | UJ | | NA |
| AROCLOR-1262 | | NA | 150 | J | | R | | R | 40 | UJ | | R | 34 | U | 36 | U | | R | 180 | UJ | 190 | UJ | | NA |
| AROCLOR-1268 | | NA | 34 | UJ | 36 | UJ | 44 | UJ | 40 | UJ | 34 | UJ | 34 | U | 36 | U | 37 | UJ | 180 | UJ | 190 | UJ | | NA |
| BETA-BHC | | NA | 1.8 | UJ | 1.8 | UJ | 2.3 | UJ | 2.1 | UJ | 1.8 | UJ | | NA | 1.8 | U | 1.9 | UJ | 9.4 | UJ | 9.8 | UJ | | NA |
| DELTA-BHC | | NA | 1.8 | UJ | 1.8 | UJ | 2.3 | UJ | 2.1 | UJ | 1.8 | UJ | | NA | 1.8 | U | 0.34 | J | 1.3 | J | 9.8 | UJ | | NA |
| DIELDRIN | | NA | 3.4 | UJ | 5.9 | J | 4.4 | UJ | 4 | UJ | 3.4 | UJ | | NA | 3.6 | U | | R | | R | 19 | UJ | | NA |
| ENDOSULFAN I | | NA | 1.8 | UJ | 1.8 | UJ | 2.3 | UJ | 2.1 | UJ | 1.8 | UJ | | NA | 1.8 | U | 1.9 | UJ | 9.4 | UJ | 9.8 | UJ | | NA |
| ENDOSULFAN II | | NA | 3.9 | J | 3.6 | UJ | 6 | J | 4 | UJ | 3.4 | UJ | | NA | 3.6 | U | 1.4 | J | 18 | UJ | 19 | UJ | | NA |
| ENDOSULFAN SULFATE | | NA | 3.4 | UJ | 3.6 | UJ | 4.4 | UJ | 4 | UJ | 3.4 | UJ | | NA | 3.6 | U | 3.7 | UJ | 18 | UJ | 19 | UJ | | NA |
| ENDRIN | | NA | | R | 3.6 | UJ | 4.4 | UJ | 4 | UJ | 3.4 | UJ | | NA | 3.6 | U | 3.7 | UJ | 18 | UJ | 19 | UJ | | NA |
| ENDRIN ALDEHYDE | | NA | | R | 3.6 | UJ | 4.4 | UJ | 4 | UJ | 3.4 | UJ | | NA | 3.6 | U | 3.7 | UJ | 18 | UJ | 19 | UJ | | NA |
| ENDRIN KETONE | | NA | 4.8 | J | 18 | UJ | 5.2 | J | 4 | UJ | 3.4 | UJ | | NA | 3.6 | U | 0.81 | J | 18 | UJ | 19 | UJ | | NA |
| GAMMA-BHC (LINDANE) | | NA | 1.8 | UJ | 1.8 | UJ | 2.3 | UJ | 2.1 | UJ | 1.8 | UJ | | NA | 1.8 | U | 1.9 | UJ | 9.4 | UJ | 9.8 | UJ | | NA |
| GAMMA-CHLORDANE | | NA | 1.2 | J | 1.8 | UJ | 2.3 | UJ | 2.1 | UJ | 1.8 | UJ | | NA | 1.8 | U | 1.9 | UJ | | R | 9.8 | UJ | | NA |
| HEPTACHLOR | | NA | 1.8 | UJ | 1.8 | UJ | 2.3 | UJ | 2.1 | UJ | 1.8 | UJ | | NA | 1.8 | U | 1.9 | UJ | 1 | J | 9.8 | UJ | | NA |
| HEPTACHLOR EPOXIDE | | NA | 1.8 | UJ | 1.8 | UJ | 2.3 | UJ | 2.1 | UJ | 1.8 | UJ | | NA | 1.8 | U | 1.9 | UJ | 9.4 | UJ | 9.8 | UJ | | NA |
| METHOXYCHLOR | | NA | 4.3 | J | 3.6 | UJ | 13 | J | 21 | UJ | 18 | UJ | | NA | 18 | U | 2.2 | J | 94 | UJ | 98 | UJ | | NA |
| TOXAPHENE | | NA | 180 | UJ | 180 | UJ | 230 | UJ | 210 | UJ | 180 | UJ | | NA | 180 | U | 190 | UJ | 940 | UJ | 980 | UJ | | NA |



U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; NA - Not Analyzed

ANALYTICAL RESULTS
DRAFT REMEDIAL INVESTIGATION REPORT
RAYMARK-FERRY CREEK - OU3
STRATFORD, CONNECTICUT

| Sample Number | SBP005 | | SBPF+00 | | SH-97 | | SH-A+00 | | SH-D+695 | | SH-E+400 | | SH400 | | SMS-G3 | | SPB 005 | | THG005 | | THN-62 | | THN-G2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Location | SBP005 | | SBPF+00 | | SH-97 | | SH-A+00 | | SH-D+695 | | SH-E+400 | | SH400 | | SMS-G3 | | SPB 005 | | THG005 | | THN-62 | | THN-G2 | |
| Date Sampled | | | | | | | | | | | | | | | | | | | | | | | | |
| QC Type | None | | None | | None | | None | | None | | None | | None | | None | | None | | None | | None | | None | |
| MATRIX | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | |
| Filtering | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | | NA | |
| Metals (MG/KG) | | | | | | | | | | | | | | | | | | | | | | | | |
| ALUMINUM | 7960 | J | 10800 | J | 16900 | | 21200 | | 16400 | | 10300 | | | NA | 22600 | | | NA | 15900 | J | | NA | 21200 | |
| ANTIMONY | 6.4 | UJ | 5.6 | UJ | 9.8 | UJ | 12.6 | UJ | 5.6 | UJ | 10.1 | UJ | | NA | | R | | NA | 5.9 | UJ | | NA | | R |
| ARSENIC | 3.9 | | 10.5 | | 3.5 | | 11.6 | | 3.4 | | 4.3 | | | NA | 8.4 | | | NA | 11.2 | | | NA | 8.9 | |
| BARIUM | 29.4 | J | 53.1 | J | 35.7 | J | 41.8 | J | 57.1 | J | 40 | J | | NA | 62.1 | J | | NA | 58 | J | | NA | 64.1 | J |
| BERYLLIUM | 0.61 | J | 0.62 | J | 0.78 | | 1.1 | | 0.81 | | 0.43 | | | NA | 1.1 | | | NA | 0.7 | J | | NA | 1.3 | |
| CADMIUM | 0.45 | UJ | 0.73 | UJ | 0.65 | U | 0.82 | U | 0.74 | U | 0.63 | U | | NA | 0.66 | U | | NA | 0.47 | UJ | | NA | 0.89 | J |
| CALCIUM | 850 | J | 2090 | J | 653 | J | 1390 | J | 2320 | J | 1310 | J | | NA | 646 | J | | NA | 2760 | J | | NA | 3640 | J |
| CHROMIUM | 8.8 | | 14.8 | | 19.3 | | 24.9 | | 19.5 | | 18.4 | | | NA | 17.3 | | | NA | 25.2 | | | NA | 18.9 | |
| COBALT | 6.3 | | 10.5 | | 6.5 | UJ | 8.8 | UJ | 7.5 | UJ | 6.2 | UJ | | NA | 9.5 | | | NA | 8 | | | NA | 8 | |
| COPPER | 15.2 | | 34.7 | | 20.5 | J | 38.6 | J | 18.1 | J | 15.7 | J | | NA | 16.5 | J | | NA | 35.2 | | | NA | 37.9 | J |
| IRON | 15800 | J | 16900 | J | 17800 | | 21500 | | 18500 | | 14400 | | | NA | 22800 | | | NA | 17900 | J | | NA | 22800 | |
| LEAD | 22.8 | | 53 | | 60.9 | J | 118 | J | 32 | J | 42.3 | J | | NA | 21.7 | | | NA | 90.9 | | | NA | 124 | |
| MAGNESIUM | 2270 | J | 3600 | J | 3730 | | 4520 | | 4190 | | 4380 | | | NA | 3960 | | | NA | 3520 | J | | NA | 4990 | |
| MANGANESE | 185 | J | 272 | J | 213 | J | 567 | J | 612 | J | 234 | J | | NA | 597 | | | NA | 328 | J | | NA | 522 | |
| MERCURY | 0.09 | UJ | 0.08 | UJ | 0.16 | J | 0.28 | | 0.14 | J | 0.11 | J | | NA | 0.11 | U | | NA | 0.16 | J | | NA | 0.12 | U |
| NICKEL | 11.6 | U | 15.6 | U | 13 | J | 19.8 | J | 14.3 | J | 16.6 | J | | NA | 14.4 | J | | NA | 17.1 | U | | NA | 21.6 | J |
| POTASSIUM | 605 | UJ | 1260 | J | 1180 | | 1170 | | 1370 | | 1710 | | | NA | 1720 | | | NA | 767 | UJ | | NA | 1480 | |
| SELENIUM | 0.33 | UJ | 0.31 | UJ | 1.3 | J | 2.2 | J | 0.98 | U | 0.84 | U | | NA | 1.4 | | | NA | 0.33 | UJ | | NA | 3.3 | J |
| SILVER | 0.36 | U | 0.31 | U | 1.5 | UJ | 1.9 | UJ | 1.7 | UJ | 1.5 | UJ | | NA | 1.5 | UJ | | NA | 0.58 | J | | NA | 1.9 | U |
| SODIUM | 82.4 | | 105 | | 75.3 | UJ | 168 | UJ | 97.3 | UJ | 62.7 | UJ | | NA | | R | | NA | 116 | | | NA | | R |
| THALLIUM | 0.17 | UJ | 0.16 | J | 1.5 | U | 1.9 | U | 1.7 | U | 1.5 | U | | NA | 1.5 | U | | NA | 0.16 | U | | NA | 1.6 | UJ |
| VANADIUM | 21.3 | | 29.6 | | 49.6 | | 81.9 | | 45.1 | | 30.6 | | | NA | 37.2 | J | | NA | 34.5 | | | NA | 53.5 | J |
| ZINC | 35.2 | J | 66 | J | 45 | J | 87.6 | J | 76.1 | J | 49.6 | J | | NA | 63.5 | J | | NA | 77.8 | J | | NA | 134 | J |



U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; NA - Not Analyzed

ANALYTICAL RESULTS
DRAFT REMEDIAL INVESTIGATION REPORT
RAYMARK-FERRY CREEK - OU3
STRATFORD, CONNECTICUT

| Sample Number | UMC-92 | | WBG008 | | WEP-2-63 | | WEP-2-G3 | | WX-G3 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Location | UMC-92 | | WBG008 | | WEP-2-63 | | WEP-2-G3 | | WX-G3 | |
| Date Sampled | | | | | | | | | | |
| QC Type | None | | None | | None | | None | | None | |
| MATRIX | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | |
| Filtering | NA | | NA | | NA | | NA | | NA | |
| Pesticides/PCBs (UG/KG) | | | | | | | | | | |
| 4,4'-DDD | | NA | | NA | | NA | 18 | U | | NA |
| 4,4'-DDE | | NA | | NA | | NA | 18 | U | | NA |
| 4,4'-DDT | | NA | | NA | | NA | 18 | U | | NA |
| ALDRIN | | NA | | NA | | NA | 9.3 | U | | NA |
| ALPHA-BHC | | NA | | NA | | NA | 9.3 | U | | NA |
| ALPHA-CHLORDANE | | NA | | NA | | NA | 9.3 | U | | NA |
| AROCLOR, TOTAL | | NA | | NA | | NA | 905 | U | | NA |
| AROCLOR-1016 | | NA | | NA | | NA | 180 | U | | NA |
| AROCLOR-1221 | | NA | | NA | | NA | 370 | U | | NA |
| AROCLOR-1232 | | NA | | NA | | NA | 180 | U | | NA |
| AROCLOR-1242 | | NA | | NA | | NA | 180 | U | | NA |
| AROCLOR-1248 | | NA | | NA | | NA | 180 | U | | NA |
| AROCLOR-1254 | | NA | | NA | | NA | 180 | U | | NA |
| AROCLOR-1260 | | NA | | NA | | NA | 180 | U | | NA |
| AROCLOR-1262 | | NA | | NA | | NA | 180 | U | | NA |
| AROCLOR-1268 | | NA | | NA | | NA | 180 | U | | NA |
| BETA-BHC | | NA | | NA | | NA | 9.3 | U | | NA |
| DELTA-BHC | | NA | | NA | | NA | 9.3 | U | | NA |
| DIELDRIN | | NA | | NA | | NA | 18 | U | | NA |
| ENDOSULFAN I | | NA | | NA | | NA | 9.3 | U | | NA |
| ENDOSULFAN II | | NA | | NA | | NA | 18 | U | | NA |
| ENDOSULFAN SULFATE | | NA | | NA | | NA | 18 | U | | NA |
| ENDRIN | | NA | | NA | | NA | 18 | U | | NA |
| ENDRIN ALDEHYDE | | NA | | NA | | NA | 18 | U | | NA |
| ENDRIN KETONE | | NA | | NA | | NA | 18 | U | | NA |
| GAMMA-BHC (LINDANE) | | NA | | NA | | NA | 9.3 | U | | NA |
| GAMMA-CHLORDANE | | NA | | NA | | NA | 9.3 | U | | NA |
| HEPTACHLOR | | NA | | NA | | NA | 9.3 | U | | NA |
| HEPTACHLOR EPOXIDE | | NA | | NA | | NA | 9.3 | U | | NA |
| METHOXYCHLOR | | NA | | NA | | NA | 93 | U | | NA |
| TOXAPHENE | | NA | | NA | | NA | 930 | U | | NA |



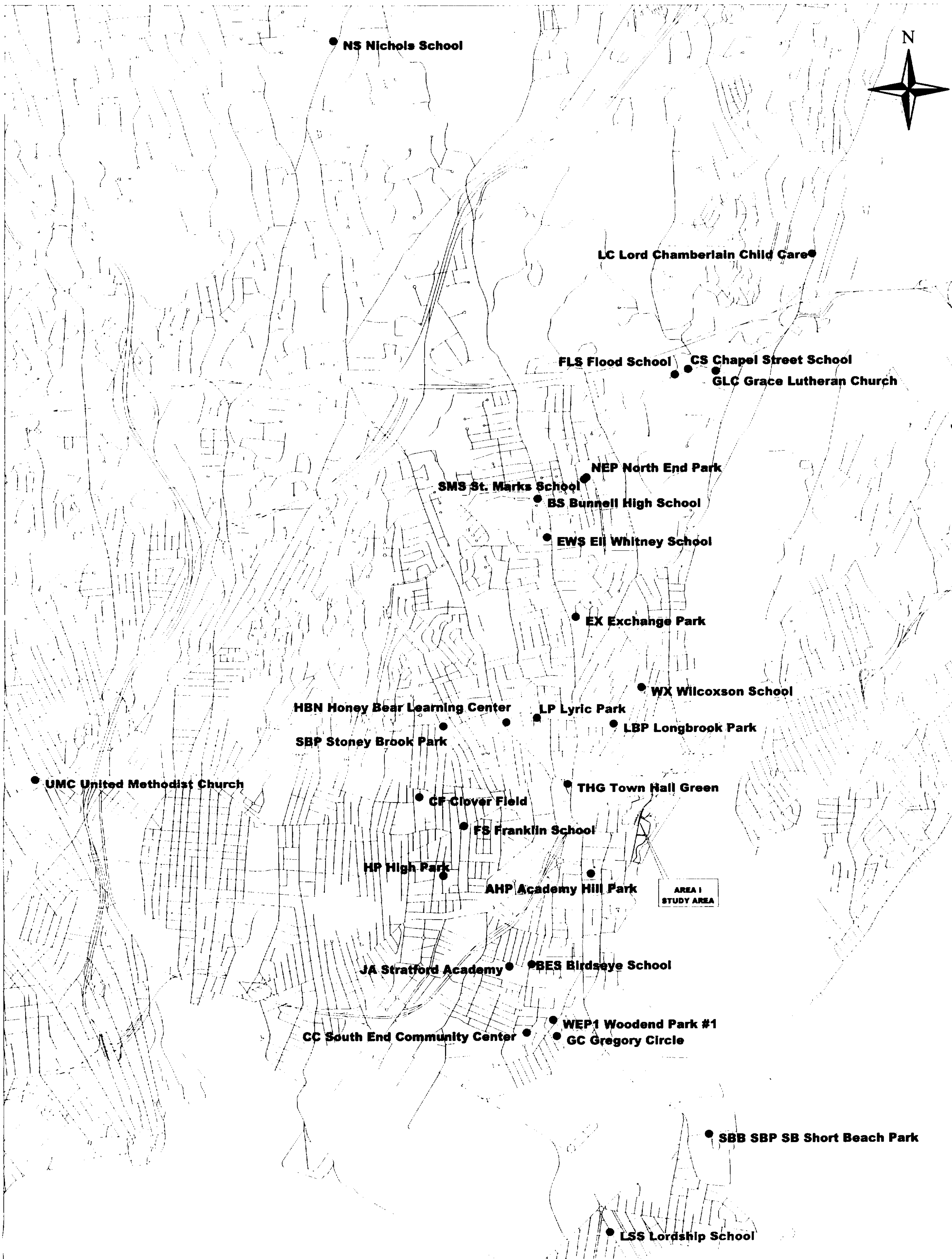
U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; NA - Not Analyzed

**ANALYTICAL RESULTS**
**DRAFT REMEDIAL INVESTIGATION REPORT**
**RAYMARK-FERRY CREEK - OU3**
**STRATFORD, CONNECTICUT**

| Sample Number | UMC-92 | | WBG008 | | WEP-2-63 | | WEP-2-G3 | | WX-G3 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Location | UMC-92 | | WBG008 | | WEP-2-63 | | WEP-2-G3 | | WX-G3 | |
| Date Sampled | | | | | | | | | | |
| QC Type | None | | None | | None | | None | | None | |
| MATRIX | SOIL | | SOIL | | SOIL | | SOIL | | SOIL | |
| Filtering | NA | | NA | | NA | | NA | | NA | |
| Metals (MG/KG) | | | | | | | | | | |
| ALUMINUM | 7120 | | 12400 | J | 11600 | J | | NA | 7640 | |
| ANTIMONY | 4.8 | UJ | 5.7 | UJ | 6 | UJ | | NA | 5 | UJ |
| ARSENIC | 4.2 | | 8.5 | | 4 | J | | NA | 2 | J |
| BARIUM | 32.8 | J | 34.4 | | 33.7 | | | NA | 33.2 | |
| BERYLLIUM | 0.31 | J | 1 | | 0.55 | J | | NA | 0.35 | J |
| CADMIUM | 0.63 | U | 0.4 | U | 0.42 | UJ | | NA | 0.62 | UJ |
| CALCIUM | 7420 | J | 775 | J | 1260 | J | | NA | 1230 | J |
| CHROMIUM | 11.3 | | 16.2 | | 12.7 | | | NA | 12.3 | |
| COBALT | 4.2 | UJ | 7 | | 7.1 | | | NA | 4.7 | |
| COPPER | 17 | J | 27.3 | J | 18.4 | J | | NA | 9.2 | J |
| IRON | 11300 | | 16100 | J | 12800 | J | | NA | 11200 | |
| LEAD | 65.4 | J | 192 | | 44.6 | J | | NA | 11.5 | |
| MAGNESIUM | 4710 | | 2760 | J | 2540 | J | | NA | 2380 | |
| MANGANESE | 212 | J | 253 | J | 216 | J | | NA | 247 | |
| MERCURY | 0.17 | J | 0.11 | J | 0.19 | J | | NA | 0.1 | U |
| NICKEL | 9.7 | J | 12.8 | J | 11.2 | | | NA | 8.8 | J |
| POTASSIUM | 941 | | 615 | UJ | 548 | U | | NA | 1150 | |
| SELENIUM | 0.84 | U | 2.1 | UJ | 0.33 | UJ | | NA | 0.83 | UJ |
| SILVER | 1.5 | UJ | 0.32 | U | 0.33 | U | | NA | 1.7 | U |
| SODIUM | 74.4 | UJ | 109 | | 100 | | | NA | 77.7 | J |
| THALLIUM | 1.5 | U | 0.38 | UJ | 0.16 | UJ | | NA | 1.4 | UJ |
| VANADIUM | 20.6 | | 46.3 | | 23 | | | NA | 21.3 | |
| ZINC | 76.1 | J | 58.9 | J | 57.1 | J | | NA | 40.8 | J |



U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; NA - Not Analyzed




Notes:
All Locations Considered Approximate
Plan Not to be Used For Design
Coordinates Obtained from EPA Region I GIS
Coordinates for THN Second Hill Lane School
and SH Tree House Nursery Not Available

SOIL BACKGROUND LOCATIONS
DRAFT REMEDIAL INVESTIGATION REPORT - AREA I
RAYMARK - FERRY CREEK - OU3
STRATFORD, CONNECTICUT

TETRA TECH NUS, INC.

55 JONSPIN ROAD WILMINGTON, MA 01887
(978)658-7899

| | |
|---|---|
| Drawn By: D.A. Chisholm | Date: February 27, 1999 |
| Scale: As Shown | File: ...\Raymark\OU3FIGS.APR |

# Appendix F.4

## State of Connecticut
## Water Quality Standards

**TABLE F.4.1**
**STATE OF CONNECTICUT WATER QUALITY STANDARDS**
**AREA A-1, MORGAN FRANCIS PROPERTIES**
**SURFACE WATER**
***FERRY CREEK, STRATFORD, CT***


| Parameter | Frequency | Range Of Detects | Range Of Nondetects | Average | Location of Maximum | State WQS Freshwater Chronic(1) | State WQS Saltwater Chronic(1) | State WQS Water Only(1) | State WQS Water and Organisms(1) |
|---|---|---|---|---|---|---|---|---|---|
| **Volatiles (ug/L)** | | | | | | | | | |
| 1,1,1-TRICHLOROETHANE | 6/6 | 3 - 170 | - | 57 | RM-SW-MF01-02 | | | 3100 | |
| 1,1-DICHLOROETHANE | 6/6 | 6 - 45 | - | 20 | RM-SW-MF01-02 | | | | |
| 1,1-DICHLOROETHENE | 4/6 | 8 - 95 | 10 - 10 | 32 | RM-SW-MF01-02 | | | | |
| 1,2-DICHLOROETHENE (TOTAL) | 6/6 | 7 - 110 | - | 48 | RM-SW-MF01-02 | | | | |
| BENZENE | 5/6 | 1 - 2 | 10 - 10 | 2 | RM-SW-MF02-01, 02, & 03; RM-SW-MF01-02 | | | | 71 |
| BROMODICHLOROMETHANE | 1/6 | 1 - 1 | 10 - 10 | 4 | RM-SW-MF02-01 | | | 0.27 | 22 |
| CARBON DISULFIDE | 1/6 | 36 - 36 | 10 - 10 | 10 | RM-SW-MF03-03 | | | | |
| CHLOROBENZENE | 5/6 | 1 - 4 | 10 - 10 | 3 | RM-SW-MF02-02 | | | 680 | 21000 |
| CHLOROFORM | 5/6 | 1 - 4 | 10 - 10 | 3 | RM-SW-MF02-01 | | | 5.7 | 470 |
| METHYLENE CHLORIDE | 1/6 | 2 - 2 | 10 - 17 | 5 | RM-SW-MF03-03 | | | 4.7 | 1600 |
| TETRACHLOROETHENE | 3/6 | 1 - 3 | 10 - 10 | 3 | RM-SW-MF03-03 | | | | 8.85 |
| TOLUENE | 1/6 | 5 - 5 | 10 - 10 | 5 | RM-SW-MF01-02 | | | 6800 | 200000 |
| TRICHLOROETHENE | 6/6 | 1 - 76 | - | 30 | RM-SW-MF01-02 | | | | 81 |
| VINYL CHLORIDE | 6/6 | 3 - 24 | - | 10 | RM-SW-MF01-02 | | | | 525 |
| **Semivolatiles (ug/L)** | | | | | | | | | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 2/6 | 1 - 1 | 10 - 10 | 4 | RM-SW-MF01 & 02-02 | | | 1.8 | 5.9 |
| DI-N-OCTYL PHTHALATE | 3/6 | 1 - 2 | 10 - 10 | 3 | RM-SW-MF03-03 | | | | |
| DIETHYL PHTHALATE | 2/6 | 2 - 3 | 10 - 10 | 4 | RM-SW-MF03-03 | | | 23000 | 120000 |
| DIMETHYL PHTHALATE | 1/6 | 4 - 4 | 10 - 10 | 5 | RM-SW-MF01-01 | | | 313000 | 2900000 |
| **Pesticides/PCBs (ug/L)** | | | | | | | | | |
| 4,4'-DDT | 1/6 | 0.0015 - 0.0015 | 0.1 - 0.1 | 0.04 | RM-SW-MF01-02 | | | | |
| ALDRIN | 1/6 | 0.001 - 0.001 | 0.05 - 0.05 | 0.02 | RM-SW-MF02-03 | 1.5 | 0.65 | | |
| ALPHA-BHC | 2/6 | 0.0035 - 0.0039 | 0.05 - 0.05 | 0.02 | RM-SW-MF02-02 | | | | 0.013 |
| DELTA-BHC | 1/6 | 0.001 - 0.001 | 0.05 - 0.05 | 0.02 | RM-SW-MF01-02 | | | | |
| DIELDRIN | 3/6 | 0.001 - 0.0039 | 0.1 - 0.1 | 0.03 | RM-SW-MF01-02 | | | | |
| GAMMA-CHLORDANE | 1/6 | 0.002 - 0.002 | 0.05 - 0.05 | 0.02 | RM-SW-MF03-03 | 0.0043 | 0.004 | | |
| HEPTACHLOR | 1/6 | 0.0011 - 0.0011 | 0.05 - 0.05 | 0.02 | RM-SW-MF01-02 | 0.0038 | 0.0036 | | |
| **Inorganics (ug/L)** | | | | | | | | | |
| ANTIMONY | 1/6 | 63.7 - 63.7 | 5 - 26.3 | 14 | RM-SW-MF03-03 | | | | 4300 |
| ARSENIC | 2/6 | 17.9 - 18.8 | 1.8 - 14.7 | 8 | RM-SW-MF01-01 | 190 | 36 | | |
| BARIUM | 6/6 | 29.8 - 75.1 | - | 41 | RM-SW-MF02-03 | | | | |
| CALCIUM | 6/6 | 29900 - 50000 | - | 37633 | RM-SW-MF01-01 | | | | |
| COPPER | 2/6 | 8.1 - 9.8 | 8 - 14.1 | 6 | RM-SW-MF02-02 | | | | |
| IRON | 6/6 | 231 - 943 | - | 701 | RM-SW-MF02-02 | | | | |
| MAGNESIUM | 6/6 | 12900 - 51000 | - | 26717 | RM-SW-MF01-02 | | | | |
| MANGANESE | 6/6 | 379 - 1600 | - | 860 | RM-SW-MF01-02 | | | | |
| MERCURY | 2/6 | 0.11 - 0.12 | 0.2 - 0.2 | 0.11 | RM-SW-MF03-03 | | | 0.14 | 0.15 |
| POTASSIUM | 5/6 | 7270 - 30500 | 5930 - 5930 | 14979 | RM-SW-MF01-02 | | | | |
| SELENIUM | 1/6 | 4 - 4 | 2.5 - 5 | 2 | RM-SW-MF01-01 | 5 | 71 | 100 | 6800 |
| SODIUM | 6/6 | 61100 - 454000 | - | 213000 | RM-SW-MF01-02 | | | | |
| ZINC | 6/6 | 35 - 77.7 | - | 58 | RM-SW-MF02-01 | | 86 | | |

(1) State of Connecticut Department of Environmental Protection, Water Quality Standards, Appendix D: Numerical Water Quality Criteria for Chemical Constituents, March 17, 1997.

TABLE F.4.2
STATE OF CONNECTICUT WATER QUALITY STANDARDS
AREA A-3, RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE
SURFACE WATER
FERRY CREEK, STRATFORD, CT


| Parameter | Frequency | Range Of Detects | Range Of Nondetects | Average | Location of Maximum | State WQS Freshwater Chronic[1] | State WQS Saltwater Chronic[1] | State WQS Water Only[1] | State WQS Water and Organisms[1] |
|---|---|---|---|---|---|---|---|---|---|
| **Volatiles (ug/L)** | | | | | | | | | |
| 1,1,1-TRICHLOROETHANE | 16/17 | 1 - 130 | 10 - 10 | 41 | RM-SW-SD06 & 14-02 | | | 3100 | |
| 1,1-DICHLOROETHANE | 11/17 | 3 - 29 | 10 - 10 | 11 | RM-SW-SD23-04 | | | | |
| 1,1-DICHLOROETHENE | 12/17 | 4 - 50 | 10 - 10 | 17 | RM-SW-SD06-02 | | | | |
| 1,2-DICHLOROETHENE (TOTAL) | 15/17 | 2 - 81 | 10 - 10 | 25 | RM-SW-SD23-04 | | | | |
| BENZENE | 3/17 | 1 - 1 | 10 - 10 | 4 | RM-SW-SD12 & 14-02; RM-SW-SD06-02 | | | 1.2 | 71 |
| CHLOROBENZENE | 6/17 | 1 - 4 | 10 - 10 | 4 | RM-SW-SD06-02 | | | 680 | 21000 |
| CHLOROETHANE | 1/17 | 1 - 1 | 10 - 10 | 5 | RM-SW-SD12-02 | | | | |
| TRICHLOROETHENE | 15/17 | 2 - 78 | 10 - 10 | 20 | RM-SW-SD23-04 | | | | 81 |
| VINYL CHLORIDE | 6/17 | 2 - 12 | 10 - 10 | 6 | RM-SW-SD06-02 | | | | 525 |
| **Semivolatiles (ug/L)** | | | | | | | | | |
| BUTYLBENZYL PHTHALATE | 1/17 | 1 - 1 | 10 - 10 | 5 | RM-SW-SD13-02 | | | | |
| DI-N-BUTYL PHTHALATE | 1/17 | 1 - 1 | 10 - 10 | 5 | RM-SW-SD06-01 | | | 2700 | 12000 |
| **Pesticides/PCBs (ug/L)** | | | | | | | | | |
| ALPHA-BHC | 1/17 | 0.0024 - 0.0024 | 0.05 - 0.05 | 0.02 | RM-SW-SD13-02 | | | 0.0039 | 0.013 |
| AROCLOR-1262 | 2/17 | 0.072 - 0.23 | 0.5 - 1 | 0.27 | RM-SW-SD13-02 | | | | |
| BETA-BHC | 1/17 | 0.033 - 0.033 | 0.05 - 0.05 | 0.03 | RM-SW-SD01-01 | | | | 0.046 |
| DIELDRIN | 2/17 | 0.002 - 0.0025 | 0.1 - 0.1 | 0.04 | RM-SW-SD14-02 | | | | |
| ENDRIN KETONE | 1/17 | 0.0024 - 0.0024 | 0.1 - 0.1 | 0.05 | RM-SW-SD13-02 | | | | |
| **Inorganics (ug/L)** | | | | | | | | | |
| ALUMINUM | 5/17 | 186 - 2180 | 25 - 148 | 220 | RM-SW-SD13-04 | | | | |
| ANTIMONY | 2/16 | 6 - 20.8 | 5 - 26.3 | 7 | RM-SW-SD13-04 | | | | 4300 |
| ARSENIC | 3/17 | 4.8 - 75.1 | 2.7 - 66 | 20 | RM-SW-SD22-04 | 190 | | | |
| BARIUM | 17/17 | 9.5 - 173 | - | 37 | RM-SW-SD13-02 | | | | |
| BERYLLIUM | 1/17 | 0.31 - 0.31 | 0.3 - 1 | 0 | RM-SW-SD01-04 | | | | |
| CALCIUM | 17/17 | 15100 - 197000 | - | 119182 | RM-SW-SD05-01 | | | | |
| CHROMIUM | 9/17 | 8.8 - 20.5 | 4.7 - 5 | 7 | RM-SW-SD13-04 | | 50 | 170 | 3400 |
| COPPER | 8/17 | 3.4 - 156 | 3 - 29.1 | 26 | RM-SW-SD13-02 | | | | |
| IRON | 17/17 | 241 - 4500 | - | 696 | RM-SW-SD13-04 | | | | |
| LEAD | 5/17 | 5.5 - 147 | 1.5 - 42 | 23 | RM-SW-SD13-04 | | | | |
| MAGNESIUM | 17/17 | 23000 - 675000 | - | 339729 | RM-SW-SD05-01 | | | | |
| MANGANESE | 17/17 | 105 - 2910 | - | 675 | RM-SW-SD23-04 | | | | |
| MERCURY | 7/17 | 0.3 - 3.3 | 0.1 - 0.2 | 0.48 | RM-SW-SD12-04 | | | | |
| NICKEL | 2/17 | 4.2 - 11.7 | 3.6 - 15.4 | 4 | RM-SW-SD13-04 | 88 | | 610 | 4600 |
| POTASSIUM | 17/17 | 12400 - 275000 | - | 123459 | RM-SW-SD05-01 | | | | |
| SODIUM | 17/17 | 148000 - 7600000 | - | 3244059 | RM-SW-SD14-02 | | | | |
| VANADIUM | 4/17 | 2.8 - 9.8 | 2 - 8.6 | 2 | RM-SW-SD13-04 | | | | |
| ZINC | 6/15 | 38.3 - 127 | 18.4 - 43.6 | 39 | RM-SW-SD13-04 | | | | |

(1) State of Connecticut Department of Environmental Protection, Water Quality Standards, Appendix D: Numerical Water Quality Criteria for Chemical Constituents, March 17, 1997.

# Appendix F.5

## Sample Subsets

**TABLE 5-1**
**SAMPLE LIST AREA A1**
**CURRENT COMMERCIALWORKER**

| AOC | RECEPTOR | MATRIX | BORING |
|---|---|---|---|
| A1 | CM | SOIL | A1-SB01 |
| A1 | CM | SOIL | A1-SB02 |
| A1 | CM | SOIL | A1-SB03 |
| A1 | CM | SOIL | A1-SB04 |
| A1 | CM | SOIL | A1-SB07 |
| A1 | CM | SOIL | A1-SB11 |
| A1 | CM | SOIL | A1-SS06 |
| A1 | CM | SOIL | EB E+300 |
| A1 | CM | SOIL | EB E+400 |
| A1 | CM | SOIL | EB E+500 |
| A1 | CM | SOIL | EB E+600 |
| A1 | CM | SOIL | EB E+700 |
| A1 | CM | SOIL | EB E+800 |
| A1 | CM | SOIL | EB W+100 |
| A1 | CM | SOIL | EB W+130 |
| A1 | CM | SOIL | EB W+200 |
| A1 | CM | SOIL | EB W+300 |
| A1 | CM | SOIL | EB W+400 |
| A1 | CM | SOIL | EB W+500 |
| A1 | CM | SOIL | EB W+600 |
| A1 | CM | SOIL | FB W+1300 |
| A1 | CM | SOIL | FB W+1350 |
| A1 | CM | SOIL | FB W+1400 |
| A1 | CM | SOIL | FB W+1450 |
| A1 | CM | SOIL | FB W+1500 |
| A1 | CM | SOIL | FB W+1550 |
| A1 | CM | SOIL | FB W+1600 |
| A1 | CM | SOIL | FB W+1650 |
| A1 | CM | SOIL | FB W+1700 |
| A1 | CM | SOIL | FB W+1750 |
| A1 | CM | SOIL | FB W+1800 |
| A1 | CM | SOIL | MF C+00 |
| A1 | CM | SOIL | MF D+00 |
| A1 | CM | SOIL | MF D+100 |
| A1 | CM | SOIL | MF E+00 |
| A1 | CM | SOIL | MF E+050 |
| A1 | CM | SOIL | MF E+080 |
| A1 | CM | SOIL | MF E+100 |
| A1 | CM | SOIL | MF F+100 |
| A1 | CM | SOIL | MF F-010 |
| A1 | CM | SOIL | MF-SB5 |
| A1 | CM | SOIL | MF-SB6 |
| A1 | CM | SOIL | MFP-5 |
| A1 | CM | SOIL | PP CD+00 |
| A1 | CM | SOIL | PP CD+050 |
| A1 | CM | SOIL | PP CD+100 |
| A1 | CM | SOIL | PP CD+110 |
| A1 | CM | SOIL | PP DDE+00 |
| A1 | CM | SOIL | PP DDE+050 |
| A1 | CM | SOIL | PP DDE+100 |
| A1 | CM | SOIL | PP-DDE+110 |
| A1 | CM | SOIL | PP DE+00 |
| A1 | CM | SOIL | PP DE+050 |

**TABLE 5-1**
**SAMPLE LIST AREA A1**
**CURRENT COMMERCIALWORKER**

| AOC | RECEPTOR | MATRIX | BORING |
|---|---|---|---|
| A1 | CM | SOIL | PP DE+100 |
| A1 | CM | SOIL | PP DE+110 |
| A1. | CM | SOIL | PP EF+00 |
| A1 | CM | SOIL | PP EF+050 |
| A1 | CM | SOIL | PP-EF+100 |
| A1 | CM | SOIL | PP EF+110 |
| A1 | CM | SOIL | PP-DDE+110 |
| A1 | CM | SOIL | PP-EF+100 |
| A1 | CM | SOIL | SCT A+88 |
| A1 | CM | SOIL | SCT-G1 |
| A1 | CM | SOIL | SCT-G10 |
| A1 | CM | SOIL | SCT-G2 |
| A1 | CM | SOIL | SCT-G3 |
| A1 | CM | SOIL | SCT-G4 |
| A1 | CM | SOIL | SCT-G5 |
| A1 | CM | SOIL | SCT-G6 |
| A1 | CM | SOIL | SCT-G7 |
| A1 | CM | SOIL | SCT-G8 |
| A1 | CM | SOIL | SCT-G9 |
| A1 | CM | SOIL | SLE-CR+00 |
| A1 | CM | SOIL | SLE-G1 |
| A1 | CM | SOIL | SLE-G10 |
| A1 | CM | SOIL | SLE-G11 |
| A1 | CM | SOIL | SLE-G2 |
| A1 | CM | SOIL | SLE-G3 |
| A1 | CM | SOIL | SLE-G4 |
| A1 | CM | SOIL | SLE-G5 |
| A1 | CM | SOIL | SLE-G6 |
| A1 | CM | SOIL | SLE-G7 |
| A1 | CM | SOIL | SLE-G8 |
| A1 | CM | SOIL | SLE-G9 |

TABLE 5-2
SAMPLE LIST AREA A1
FUTURE COMMERCIAL WORKERS

| AOC | RECEPTOR | MATRIX | BORING |
|---|---|---|---|
| A1 | a1scn | SOIL | A1-SB01 |
| A1 | a1scn | SOIL | A1-SB02 |
| A1 | a1scn | SOIL | A1-SB03 |
| A1 | a1scn | SOIL | A1-SB04 |
| A1 | a1scn | SOIL | A1-SB07 |
| A1 | a1scn | SOIL | A1-SB11 |
| A1 | a1scn | SOIL | A1-SS01 |
| A1 | a1scn | SOIL | A1-SS02 |
| A1 | a1scn | SOIL | A1-SS03 |
| A1 | a1scn | SOIL | A1-SS04 |
| A1 | a1scn | SOIL | A1-SS05 |
| A1 | a1scn | SOIL | A1-SS06 |
| A1 | a1scn | SOIL | BP106A S286,E150 |
| A1 | a1scn | SOIL | BP106A S309,E145 |
| A1 | a1scn | SOIL | BP116A S230,E162 |
| A1 | a1scn | SOIL | BP126A S175,E213 |
| A1 | a1scn | SOIL | BP68A S535,E172 |
| A1 | a1scn | SOIL | BP70A S485,E160 |
| A1 | a1scn | SOIL | BP70A S528,E172 |
| A1 | a1scn | SOIL | BP78A S453,E162 |
| A1 | a1scn | SOIL | BP96A S342,E166 |
| A1 | a1scn | SOIL | BP96A S365,E168 |
| A1 | a1scn | SOIL | EB E+300 |
| A1 | a1scn | SOIL | EB E+400 |
| A1 | a1scn | SOIL | EB E+500 |
| A1 | a1scn | SOIL | EB E+600 |
| A1 | a1scn | SOIL | EB E+700 |
| A1 | a1scn | SOIL | EB E+800 |
| A1 | a1scn | SOIL | EB W+100 |
| A1 | a1scn | SOIL | EB W+130 |
| A1 | a1scn | SOIL | EB W+200 |
| A1 | a1scn | SOIL | EB W+300 |
| A1 | a1scn | SOIL | EB W+400 |
| A1 | a1scn | SOIL | EB W+500 |
| A1 | a1scn | SOIL | EB W+600 |
| A1 | a1scn | SOIL | EB W+700 |
| A1 | a1scn | SOIL | EB W+800 |
| A1 | a1scn | SOIL | EB640A N124,E156 |
| A1 | a1scn | SOIL | EB640A N68,E167 |
| A1 | a1scn | SOIL | EB650A N148,E95 |
| A1 | a1scn | SOIL | EB728A N247,E46 |
| A1 | a1scn | SOIL | EB728A N277,E37 |
| A1 | a1scn | SOIL | FB W+1300 |
| A1 | a1scn | SOIL | FB W+1350 |
| A1 | a1scn | SOIL | FB W+1400 |
| A1 | a1scn | SOIL | FB W+1450 |
| A1 | a1scn | SOIL | FB W+1500 |
| A1 | a1scn | SOIL | FB W+1550 |
| A1 | a1scn | SOIL | FB W+1600 |
| A1 | a1scn | SOIL | FB W+1650 |
| A1 | a1scn | SOIL | FB W+1700 |

TABLE 5-2
SAMPLE LIST AREA A1
FUTURE COMMERCIAL WORKERS

| AOC | RECEPTOR | MATRIX | BORING |
|---|---|---|---|
| A1 | a1scn | SOIL | FB W+1750 |
| A1 | a1scn | SOIL | FB W+1800 |
| A1 | a1scn | SOIL | H2A N250,E6 |
| A1 | a1scn | SOIL | H2A N256,W41 |
| A1 | a1scn | SOIL | MF A+00 |
| A1 | a1scn | SOIL | MF A+050 |
| A1 | a1scn | SOIL | MF A+100 |
| A1 | a1scn | SOIL | MF A+200 |
| A1 | a1scn | SOIL | MF A+300 |
| A1 | a1scn | SOIL | MF AY0 |
| A1 | a1scn | SOIL | MF AY1 |
| A1 | a1scn | SOIL | MF AY2 |
| A1 | a1scn | SOIL | MF AY3 |
| A1 | a1scn | SOIL | MF AY4 |
| A1 | a1scn | SOIL | MF AZ+365 |
| A1 | a1scn | SOIL | MF B+00 |
| A1 | a1scn | SOIL | MF B+050 |
| A1 | a1scn | SOIL | MF B+100 |
| A1 | a1scn | SOIL | MF B+200 |
| A1 | a1scn | SOIL | MF B+300 |
| A1 | a1scn | SOIL | MF B+400 |
| A1 | a1scn | SOIL | MF B+425 |
| A1 | a1scn | SOIL | MF C+00 |
| A1 | a1scn | SOIL | MF C+050 |
| A1 | a1scn | SOIL | MF C+200 |
| A1 | a1scn | SOIL | MF C+300 |
| A1 | a1scn | SOIL | MF C+360 |
| A1 | a1scn | SOIL | MF D+00 |
| A1 | a1scn | SOIL | MF D+100 |
| A1 | a1scn | SOIL | MF D+200 |
| A1 | a1scn | SOIL | MF D+300 |
| A1 | a1scn | SOIL | MF D+335 |
| A1 | a1scn | SOIL | MF E+00 |
| A1 | a1scn | SOIL | MF E+050 |
| A1 | a1scn | SOIL | MF E+080 |
| A1 | a1scn | SOIL | MF E+100 |
| A1 | a1scn | SOIL | MF E+200 |
| A1 | a1scn | SOIL | MF E+300 |
| A1 | a1scn | SOIL | MF E+325 |
| A1 | a1scn | SOIL | MF F+050 |
| A1 | a1scn | SOIL | MF F+100 |
| A1 | a1scn | SOIL | MF F+200 |
| A1 | a1scn | SOIL | MF F+279 |
| A1 | a1scn | SOIL | MF F-010 |
| A1 | a1scn | SOIL | MF G+100 |
| A1 | a1scn | SOIL | MF G+200 |
| A1 | a1scn | SOIL | MF G+265 |
| A1 | a1scn | SOIL | MF-A+400 |
| A1 | a1scn | SOIL | MF-AZ+300 |
| A1 | a1scn | SOIL | MF-C+100 |
| A1 | a1scn | SOIL | MF-G+200 |

TABLE 5-2
SAMPLE LIST AREA A1
FUTURE COMMERCIAL WORKERS

| AOC | RECEPTOR | MATRIX | BORING |
|---|---|---|---|
| A1 | a1scn | SOIL | MF-G1 |
| A1 | a1scn | SOIL | MF-G2 |
| A1 | a1scn | SOIL | MF-G3 |
| A1 | a1scn | SOIL | MF-G4 |
| A1 | a1scn | SOIL | MF-G5 |
| A1 | a1scn | SOIL | MF-G6 |
| A1 | a1scn | SOIL | MF-SB1 |
| A1 | a1scn | SOIL | MF-SB2 |
| A1 | a1scn | SOIL | MF-SB3 |
| A1 | a1scn | SOIL | MF-SB4 |
| A1 | a1scn | SOIL | MF-SB5 |
| A1 | a1scn | SOIL | MF-SB6 |
| A1 | a1scn | SOIL | MF-SB7 |
| A1 | a1scn | SOIL | MF-SB8 |
| A1 | a1scn | SOIL | MF-TP1 |
| A1 | a1scn | SOIL | MF-TP2 |
| A1 | a1scn | SOIL | MF-TP3 |
| A1 | a1scn | SOIL | MFP-1 |
| A1 | a1scn | SOIL | MFP-2 |
| A1 | a1scn | SOIL | MFP-5 |
| A1 | a1scn | SOIL | MFP-6 |
| A1 | a1scn | SOIL | MFTP4 |
| A1 | a1scn | SOIL | MS74A E290,S145 |
| A1 | a1scn | SOIL | MS74A E305,S20 |
| A1 | a1scn | SOIL | MW-101D |
| A1 | a1scn | SOIL | MW-102D |
| A1 | a1scn | SOIL | MW-103D |
| A1 | a1scn | SOIL | MW-104D |
| A1 | a1scn | SOIL | PP CD+00 |
| A1 | a1scn | SOIL | PP CD+050 |
| A1 | a1scn | SOIL | PP CD+100 |
| A1 | a1scn | SOIL | PP CD+110 |
| A1 | a1scn | SOIL | PP DDE+00 |
| A1 | a1scn | SOIL | PP DDE+050 |
| A1 | a1scn | SOIL | PP DDE+100 |
| A1 | a1scn | SOIL | PP DE+00 |
| A1 | a1scn | SOIL | PP DE+050 |
| A1 | a1scn | SOIL | PP DE+100 |
| A1 | a1scn | SOIL | PP DE+110 |
| A1 | a1scn | SOIL | PP EF+00 |
| A1 | a1scn | SOIL | PP EF+050 |
| A1 | a1scn | SOIL | PP EF+110 |
| A1 | a1scn | SOIL | PP-DDE+110 |
| A1 | a1scn | SOIL | PP-EF+100 |
| A1 | a1scn | SOIL | SCT A+188 |
| A1 | a1scn | SOIL | SCT A+88 |
| A1 | a1scn | SOIL | SCT-G1 |
| A1 | a1scn | SOIL | SCT-G10 |
| A1 | a1scn | SOIL | SCT-G2 |
| A1 | a1scn | SOIL | SCT-G3 |
| A1 | a1scn | SOIL | SCT-G4 |

TABLE 5-2
SAMPLE LIST AREA A1
FUTURE COMMERCIAL WORKERS

| AOC | RECEPTOR | MATRIX | BORING |
|---|---|---|---|
| A1 | a1scn | SOIL | SCT-G5 |
| A1 | a1scn | SOIL | SCT-G6 |
| A1 | a1scn | SOIL | SCT-G7 |
| A1 | a1scn | SOIL | SCT-G8 |
| A1 | a1scn | SOIL | SCT-G9 |
| A1 | a1scn | SOIL | SLE-CR+00 |
| A1 | a1scn | SOIL | SLE-G1 |
| A1 | a1scn | SOIL | SLE-G10 |
| A1 | a1scn | SOIL | SLE-G11 |
| A1 | a1scn | SOIL | SLE-G2 |
| A1 | a1scn | SOIL | SLE-G3 |
| A1 | a1scn | SOIL | SLE-G4 |
| A1 | a1scn | SOIL | SLE-G5 |
| A1 | a1scn | SOIL | SLE-G6 |
| A1 | a1scn | SOIL | SLE-G7 |
| A1 | a1scn | SOIL | SLE-G8 |
| A1 | a1scn | SOIL | SLE-G9 |
| A1 | a1scn | SOIL/PAVEMENT | A1-SB05 |
| A1 | a1scn | SOIL/PAVEMENT | A1-SB06 |
| A1 | a1scn | SOIL/PAVEMENT | A1-SB09 |
| A1 | a1scn | SOIL/PAVEMENT | A1-SB10 |

TABLE 5-3
SAMPLE LIST AREA A1
RECREATIONAL USERS

| AOC | RECEPTOR | MATRIX | BORING |
|---|---|---|---|
| A1 | FR | SOIL | A1-SS01 |
| A1 | FR | SOIL | BP106A S286,E150 |
| A1 | FR | SOIL | BP106A S309,E145 |
| A1 | FR | SOIL | BP116A S230,E162 |
| A1 | FR | SOIL | BP126A S175,E213 |
| A1 | FR | SOIL | BP68A S535,E172 |
| A1 | FR | SOIL | BP70A S485,E160 |
| A1 | FR | SOIL | BP70A S528,E172 |
| A1 | FR | SOIL | BP78A S453,E162 |
| A1 | FR | SOIL | BP96A S342,E166 |
| A1 | FR | SOIL | BP96A S365,E168 |
| A1 | FR | SOIL | EB W+700 |
| A1 | FR | SOIL | EB W+800 |
| A1 | FR | SOIL | EB640A N124,E156 |
| A1 | FR | SOIL | EB640A N68,E167 |
| A1 | FR | SOIL | EB650A N148,E95 |
| A1 | FR | SOIL | EB728A N247,E46 |
| A1 | FR | SOIL | EB728A N277,E37 |
| A1 | FR | SOIL | H2A N250,E6 |
| A1 | FR | SOIL | H2A N256,W41 |
| A1 | FR | SOIL | MF A+00 |
| A1 | FR | SOIL | MF A+050 |
| A1 | FR | SOIL | MF A+100 |
| A1 | FR | SOIL | MF A+200 |
| A1 | FR | SOIL | MF-A+400 |
| A1 | FR | SOIL | MF AY0 |
| A1 | FR | SOIL | MF AY1 |
| A1 | FR | SOIL | MF AY2 |
| A1 | FR | SOIL | MF AY3 |
| A1 | FR | SOIL | MF AY4 |
| A1 | FR | SOIL | MF-AZ+300 |
| A1 | FR | SOIL | MF AZ+365 |
| A1 | FR | SOIL | MF B+00 |
| A1 | FR | SOIL | MF B+400 |
| A1 | FR | SOIL | MF B+425 |
| A1 | FR | SOIL | MF C+300 |
| A1 | FR | SOIL | MF C+360 |
| A1 | FR | SOIL | MF D+300 |
| A1 | FR | SOIL | MF D+335 |
| A1 | FR | SOIL | MF E+300 |
| A1 | FR | SOIL | MF E+325 |
| A1 | FR | SOIL | MF-SB1 |
| A1 | FR | SOIL | MF-SB3 |
| A1 | FR | SOIL | MF-SB4 |
| A1 | FR | SOIL | MF-SB8 |
| A1 | FR | SOIL | MF-TP1 |
| A1 | FR | SOIL | MF-TP2 |
| A1 | FR | SOIL | MFP-6 |
| A1 | FR | SOIL | MS74A E290,S145 |
| A1 | FR | SOIL | MS74A E305,S20 |
| A1 | FR | SOIL | MW-101D |
| A1 | FR | SOIL | MW-102D |

TABLE 5-4
SAMPLE LIST AREA A1
ADOLESCENT TRESPASSERS

| AOC | RECEPTOR | MATRIX | BORING |
|---|---|---|---|
| A1 | a1str | SEDIMENT | A1-SD01 |
| A1 | a1str | SEDIMENT | A1-SD02 |
| A1 | a1str | SEDIMENT | A1-SD03 |
| A1 | a1str | SEDIMENT | MF01 |
| A1 | a1str | SEDIMENT | MF02 |
| A1 | a1str | SEDIMENT | MF03 |
| A1 | a1str | SEDIMENT | SD16W |
| A1 | a1str | SEDIMENT | SD17W |
| A1 | a1str | SEDIMENT | SD18W |
| A1 | a1str | SOIL | A1-SB01 |
| A1 | a1str | SOIL | A1-SB02 |
| A1 | a1str | SOIL | A1-SB03 |
| A1 | a1str | SOIL | A1-SB04 |
| A1 | a1str | SOIL | A1-SB07 |
| A1 | a1str | SOIL | A1-SB11 |
| A1 | a1str | SOIL | A1-SS01 |
| A1 | a1str | SOIL | A1-SS02 |
| A1 | a1str | SOIL | A1-SS03 |
| A1 | a1str | SOIL | A1-SS04 |
| A1 | a1str | SOIL | A1-SS05 |
| A1 | a1str | SOIL | A1-SS06 |
| A1 | a1str | SOIL | BP106A S286,E150 |
| A1 | a1str | SOIL | BP106A S309,E145 |
| A1 | a1str | SOIL | BP116A S230,E162 |
| A1 | a1str | SOIL | BP126A S175,E213 |
| A1 | a1str | SOIL | BP68A S535,E172 |
| A1 | a1str | SOIL | BP70A S485,E160 |
| A1 | a1str | SOIL | BP70A S528,E172 |
| A1 | a1str | SOIL | BP78A S453,E162 |
| A1 | a1str | SOIL | BP96A S342,E166 |
| A1 | a1str | SOIL | BP96A S365,E168 |
| A1 | a1str | SOIL | EB E+300 |
| A1 | a1str | SOIL | EB E+400 |
| A1 | a1str | SOIL | EB E+500 |
| A1 | a1str | SOIL | EB E+600 |
| A1 | a1str | SOIL | EB E+700 |
| A1 | a1str | SOIL | EB E+800 |
| A1 | a1str | SOIL | EB W+100 |
| A1 | a1str | SOIL | EB W+130 |
| A1 | a1str | SOIL | EB W+200 |
| A1 | a1str | SOIL | EB W+300 |
| A1 | a1str | SOIL | EB W+400 |
| A1 | a1str | SOIL | EB W+500 |
| A1 | a1str | SOIL | EB W+600 |
| A1 | a1str | SOIL | EB W+700 |
| A1 | a1str | SOIL | EB W+800 |
| A1 | a1str | SOIL | EB640A N124,E156 |
| A1 | a1str | SOIL | EB640A N68,E167 |
| A1 | a1str | SOIL | EB650A N148,E95 |
| A1 | a1str | SOIL | EB728A N247,E46 |
| A1 | a1str | SOIL | EB728A N277,E37 |

TABLE 5-4
SAMPLE LIST AREA A1
ADOLESCENT TRESPASSERS

| AOC | RECEPTOR | MATRIX | BORING |
|---|---|---|---|
| A1 | a1str | SOIL | FB W+1300 |
| A1 | a1str | SOIL | FB W+1350 |
| A1 | a1str | SOIL | FB W+1400 |
| A1 | a1str | SOIL | FB W+1450 |
| A1 | a1str | SOIL | FB W+1500 |
| A1 | a1str | SOIL | FB W+1550 |
| A1 | a1str | SOIL | FB W+1600 |
| A1 | a1str | SOIL | FB W+1650 |
| A1 | a1str | SOIL | FB W+1700 |
| A1 | a1str | SOIL | FB W+1750 |
| A1 | a1str | SOIL | FB W+1800 |
| A1 | a1str | SOIL | H2A N250,E6 |
| A1 | a1str | SOIL | H2A N256,W41 |
| A1 | a1str | SOIL | MF A+00 |
| A1 | a1str | SOIL | MF A+050 |
| A1 | a1str | SOIL | MF A+100 |
| A1 | a1str | SOIL | MF A+200 |
| A1 | a1str | SOIL | MF A+300 |
| A1 | a1str | SOIL | MF AY0 |
| A1 | a1str | SOIL | MF AY1 |
| A1 | a1str | SOIL | MF AY2 |
| A1 | a1str | SOIL | MF AY3 |
| A1 | a1str | SOIL | MF AY4 |
| A1 | a1str | SOIL | MF AZ+365 |
| A1 | a1str | SOIL | MF B+00 |
| A1 | a1str | SOIL | MF B+050 |
| A1 | a1str | SOIL | MF B+100 |
| A1 | a1str | SOIL | MF B+200 |
| A1 | a1str | SOIL | MF B+300 |
| A1 | a1str | SOIL | MF B+400 |
| A1 | a1str | SOIL | MF B+425 |
| A1 | a1str | SOIL | MF C+00 |
| A1 | a1str | SOIL | MF C+050 |
| A1 | a1str | SOIL | MF C+200 |
| A1 | a1str | SOIL | MF C+300 |
| A1 | a1str | SOIL | MF C+360 |
| A1 | a1str | SOIL | MF D+00 |
| A1 | a1str | SOIL | MF D+100 |
| A1 | a1str | SOIL | MF D+200 |
| A1 | a1str | SOIL | MF D+300 |
| A1 | a1str | SOIL | MF D+335 |
| A1 | a1str | SOIL | MF E+00 |
| A1 | a1str | SOIL | MF E+050 |
| A1 | a1str | SOIL | MF E+080 |
| A1 | a1str | SOIL | MF E+100 |
| A1 | a1str | SOIL | MF E+200 |
| A1 | a1str | SOIL | MF E+300 |
| A1 | a1str | SOIL | MF E+325 |
| A1 | a1str | SOIL | MF F+050 |
| A1 | a1str | SOIL | MF F+100 |
| A1 | a1str | SOIL | MF F+200 |

TABLE 5-4
SAMPLE LIST AREA A1
ADOLESCENT TRESPASSERS

| AOC | RECEPTOR | MATRIX | BORING |
|---|---|---|---|
| A1 | a1str | SOIL | MF F+279 |
| A1 | a1str | SOIL | MF F-010 |
| A1 | a1str | SOIL | MF G+100 |
| A1 | a1str | SOIL | MF G+200 |
| A1 | a1str | SOIL | MF G+265 |
| A1 | a1str | SOIL | MF-A+400 |
| A1 | a1str | SOIL | MF-AZ+300 |
| A1 | a1str | SOIL | MF-C+100 |
| A1 | a1str | SOIL | MF-G+200 |
| A1 | a1str | SOIL | MF-G1 |
| A1 | a1str | SOIL | MF-G2 |
| A1 | a1str | SOIL | MF-G3 |
| A1 | a1str | SOIL | MF-G4 |
| A1 | a1str | SOIL | MF-G5 |
| A1 | a1str | SOIL | MF-G6 |
| A1 | a1str | SOIL | MF-SB1 |
| A1 | a1str | SOIL | MF-SB2 |
| A1 | a1str | SOIL | MF-SB3 |
| A1 | a1str | SOIL | MF-SB4 |
| A1 | a1str | SOIL | MF-SB5 |
| A1 | a1str | SOIL | MF-SB6 |
| A1 | a1str | SOIL | MF-SB7 |
| A1 | a1str | SOIL | MF-SB8 |
| A1 | a1str | SOIL | MFP-1 |
| A1 | a1str | SOIL | MFP-2 |
| A1 | a1str | SOIL | MFP-5 |
| A1 | a1str | SOIL | MFP-6 |
| A1 | a1str | SOIL | MS74A E290,S145 |
| A1 | a1str | SOIL | MS74A E305,S20 |
| A1 | a1str | SOIL | MW-101D |
| A1 | a1str | SOIL | MW-102D |
| A1 | a1str | SOIL | MW-103D |
| A1 | a1str | SOIL | MW-104D |
| A1 | a1str | SOIL | PP CD+00 |
| A1 | a1str | SOIL | PP CD+050 |
| A1 | a1str | SOIL | PP CD+100 |
| A1 | a1str | SOIL | PP CD+110 |
| A1 | a1str | SOIL | PP DDE+00 |
| A1 | a1str | SOIL | PP DDE+050 |
| A1 | a1str | SOIL | PP DDE+100 |
| A1 | a1str | SOIL | PP DE+00 |
| A1 | a1str | SOIL | PP DE+050 |
| A1 | a1str | SOIL | PP DE+100 |
| A1 | a1str | SOIL | PP DE+110 |
| A1 | a1str | SOIL | PP EF+00 |
| A1 | a1str | SOIL | PP EF+050 |
| A1 | a1str | SOIL | PP EF+110 |
| A1 | a1str | SOIL | PP-DDE+110 |
| A1 | a1str | SOIL | PP-EF+100 |
| A1 | a1str | SOIL | SCT A+188 |
| A1 | a1str | SOIL | SCT A+88 |

TABLE 5-4
SAMPLE LIST AREA A1
ADOLESCENT TRESPASSERS

| AOC | RECEPTOR | MATRIX | BORING |
|---|---|---|---|
| A1 | a1str | SOIL | SCT-G1 |
| A1 | a1str | SOIL | SCT-G10 |
| A1 | a1str | SOIL | SCT-G2 |
| A1 | a1str | SOIL | SCT-G3 |
| A1 | a1str | SOIL | SCT-G4 |
| A1 | a1str | SOIL | SCT-G5 |
| A1 | a1str | SOIL | SCT-G6 |
| A1 | a1str | SOIL | SCT-G7 |
| A1 | a1str | SOIL | SCT-G8 |
| A1 | a1str | SOIL | SCT-G9 |
| A1 | a1str | SOIL | SLE-CR+00 |
| A1 | a1str | SOIL | SLE-G1 |
| A1 | a1str | SOIL | SLE-G10 |
| A1 | a1str | SOIL | SLE-G11 |
| A1 | a1str | SOIL | SLE-G2 |
| A1 | a1str | SOIL | SLE-G3 |
| A1 | a1str | SOIL | SLE-G4 |
| A1 | a1str | SOIL | SLE-G5 |
| A1 | a1str | SOIL | SLE-G6 |
| A1 | a1str | SOIL | SLE-G7 |
| A1 | a1str | SOIL | SLE-G8 |
| A1 | a1str | SOIL | SLE-G9 |
| A1 | a1str | WETLAND | A1-SD04 |
| A1 | a1str | WETLAND | SCT A+138 |
| A1 | a1str | WETLAND | SLE-CR+100 |
| A1 | a1str | WETLAND | SLE-CR+200 |
| A1 | a1str | WETLAND | SLE-CR+300 |
| A1 | a1str | WETLAND | SLE-CR+400 |
| A1 | a1str | WETLAND | SLE-CR+460 |
| A1 | a1str | WETLAND | SLE-CR+500 |
| A1 | a1str | WETLAND | SLE-CR+600 |
| A1 | a1str | WETLAND | SLE-CR+640 |
| A1 | a1wtr | SW | MF01 |
| A1 | a1wtr | SW | MF02 |
| A1 | a1wtr | SW | MF03 |

TABLE 5-5
SAMPLE LIST AREA A2
CURRENT COMMERCIAL WORKERS AND ADOLESCENT TRESPASSERS

| AOC | RECEPTOR | MATRIX | BORING |
|---|---|---|---|
| A2 | a2scm | SOIL | A2-SB01 |
| A2 | a2scm | SOIL | A2-SB02 |
| A2 | a2scm | SOIL | A2-SB03 |
| A2 | a2scm | SOIL | A2-SB04 |
| A2 | a2scm | SOIL | A2-SS01 |
| A2 | a2scm | SOIL | A2-SS03 |
| A2 | a2scm | SOIL | A2-SS04 |
| A2 | a2scm | SOIL | DPS3 |
| A2 | a2scm | SOIL | DPS6 |
| A2 | a2scm | SOIL | FB E+00 |
| A2 | a2scm | SOIL | FB E+0050 |
| A2 | a2scm | SOIL | FB E+0100 |
| A2 | a2scm | SOIL | FB E+0150 |
| A2 | a2scm | SOIL | FB E+0200 |
| A2 | a2scm | SOIL | FB E+0250 |
| A2 | a2scm | SOIL | FB E+0350 |
| A2 | a2scm | SOIL | FB E+0450 |
| A2 | a2scm | SOIL | FB E+0500 |
| A2 | a2scm | SOIL | FB E+0550 |
| A2 | a2scm | SOIL | FB E+0600 |
| A2 | a2scm | SOIL | FB E+0700 |
| A2 | a2scm | SOIL | FB E+0800 |
| A2 | a2scm | SOIL | FB E+0900 |
| A2 | a2scm | SOIL | FB E+1000 |
| A2 | a2scm | SOIL | FB E+1100 |
| A2 | a2scm | SOIL | FB E+1200 |
| A2 | a2scm | SOIL | FB E+1400 |
| A2 | a2scm | SOIL | FB E+1500 |
| A2 | a2scm | SOIL | FB E+1550 |
| A2 | a2scm | SOIL | FB E+1600 |
| A2 | a2scm | SOIL | FB E+1650 |
| A2 | a2scm | SOIL | FB E+1690 |
| A2 | a2scm | SOIL | FBE+1300 |
| A2 | a2scm | SOIL | FBE+400 |
| A2 | a2scm | SOIL | MW-113B |
| A2 | a2scm | SOIL | SDFB-001 |
| A2 | a2scm | SOIL | SDFB-002 |
| A2 | a2scm | SOIL | SDFB-003 |
| A2 | a2scm | SOIL | SDFB-004 |
| A2 | a2scm | SOIL | SPBG1 A+00 |
| A2 | a2scm | SOIL | SPBG1 B+00 |
| A2 | a2scm | SOIL | SPBG1 B+100 |
| A2 | a2scm | SOIL | SPBG1 B+200 |
| A2 | a2scm | SOIL | SPBG2 A-080 |
| A2 | a2scm | SOIL | SPBG2 A-160 |
| A2 | a2scm | SOIL | SPDPS-002 |
| A2 | a2scm | SOIL | SPDPS-004 |
| A2 | a2scm | SOIL | SPDPS-005 |
| A2 | a2scm | SOIL | SPDPS001 |
| A2 | a2scm | SOIL | SPEL-001 |
| A2 | a2scm | SOIL | SPEL-002 |

TABLE 5-5
SAMPLE LIST AREA A2
CURRENT COMMERCIAL WORKERS AND ADOLESCENT TRESPASSERS

| AOC | RECEPTOR | MATRIX | BORING |
|---|---|---|---|
| A2 | a2scm | SOIL | SPEL-003 |
| A2 | a2scm | SOIL | SPEL-004 |
| A2 | a2scm | SOIL | SPEL-005 |
| A2 | a2scm | SOIL | SPEL-006 |
| A2 | a2scm | SOIL | SPEL-007 |
| A2 | a2scm | SOIL | SPEL-008 |
| A2 | a2scm | SOIL | SPEL-009 |
| A2 | a2scm | SOIL | SPEL-010 |
| A2 | a2scm | SOIL | SPHM A+00 |
| A2 | a2scm | SOIL | SPHM A+100 |
| A2 | a2scm | SOIL | SPHM A+175 |
| A2 | a2scm | SOIL | SPHM AA+200 |
| A2 | a2scm | SOIL | SPHM AA+300 |
| A2 | a2scm | SOIL | SPHM AA+370 |
| A2 | a2scm | SOIL | SPHM B+00 |
| A2 | a2scm | SOIL | SPHM B+200 |
| A2 | a2scm | SOIL | SPHM B+300 |
| A2 | a2scm | SOIL | SPHM B+370 |
| A2 | a2scm | SOIL | SPHM-001 |
| A2 | a2scm | SOIL | SPHM-002 |
| A2 | a2scm | SOIL | SPHMB+100 |
| A2 | a2scm | SOIL | SPIM-001 |
| A2 | a2scm | SOIL | SPIM-002 |
| A2 | a2scm | SOIL | SPIM-003 |
| A2 | a2scm | SOIL | SPIM-004 |
| A2 | a2scm | SOIL | SPIM-005 |
| A2 | a2scm | SOIL | SPSC A+00 |
| A2 | a2scm | SOIL | SPSC A+050 |
| A2 | a2scm | SOIL | SPSC A+100 |
| A2 | a2scm | SOIL | SPSC A+150 |
| A2 | a2scm | SOIL | SPSC A+200 |
| A2 | a2scm | SOIL | SPSC A+250 |
| A2 | a2scm | SOIL | SPSC A+300 |
| A2 | a2scm | SOIL | SPSC A+350 |
| A2 | a2scm | SOIL | SPSC B+00 |
| A2 | a2scm | SOIL | SPSC C+00 |
| A2 | a2scm | SOIL | SPSC D+00 |
| A2 | a2scm | SOIL | SPSC E+00 |
| A2 | a2scm | SOIL | SPSC-001 |
| A2 | a2scm | SOIL | SPSC-002 |
| A2 | a2scm | SOIL | SPSCA+390 |
| A2 | a2scm | SOIL | SPTS-001 |
| A2 | a2scm | SOIL | SPTS-002 |
| A2 | a2scm | SOIL | SPTS-003 |
| A2 | a2scm | SOIL | SPTS-004 |
| A2 | a2scm | SOIL | SPTS-005 |
| A2 | a2scm | SOIL | SPTS-007 |
| A2 | a2scm | SOIL | SPTS006 |
| A2 | a2scm | SOIL | SPVM-001 |
| A2 | a2scm | SOIL | SPVM-002 |
| A2 | a2scm | SOIL | SPVM-003 |

TABLE 5-5
SAMPLE LIST AREA A2
CURRENT COMMERCIAL WORKERS AND ADOLESCENT TRESPASSERS

| AOC | RECEPTOR | MATRIX | BORING |
|---|---|---|---|
| A2 | a2scm | SOIL | SPVM-004 |
| A2 | a2scm | SOIL | SPVM-005 |
| A2 | a2scm | SOIL | SPVM-006 |
| A2 | a2scm | SOIL | SPVM-008 |
| A2 | a2scm | SOIL | SPVM-009 |
| A2 | a2scm | SOIL | SPVM-010 |
| A2 | a2scm | SOIL | SPVM007 |

TABLE 5-6
SAMPLE LIST AREA A2
FUTURE COMMERCIAL WORKERS

| AOC | RECEPTOR | MATRIX | BORING |
|---|---|---|---|
| A2 | a2scn | SOIL | A2-SB01 |
| A2 | a2scn | SOIL | A2-SB02 |
| A2 | a2scn | SOIL | A2-SB03 |
| A2 | a2scn | SOIL | A2-SB04 |
| A2 | a2scn | SOIL | A2-SB04A |
| A2 | a2scn | SOIL | A2-SS01 |
| A2 | a2scn | SOIL | A2-SS03 |
| A2 | a2scn | SOIL | A2-SS04 |
| A2 | a2scn | SOIL | DPS3 |
| A2 | a2scn | SOIL | DPS6 |
| A2 | a2scn | SOIL | FB E+00 |
| A2 | a2scn | SOIL | FB E+0050 |
| A2 | a2scn | SOIL | FB E+0100 |
| A2 | a2scn | SOIL | FB E+0150 |
| A2 | a2scn | SOIL | FB E+0200 |
| A2 | a2scn | SOIL | FB E+0250 |
| A2 | a2scn | SOIL | FB E+0350 |
| A2 | a2scn | SOIL | FB E+0450 |
| A2 | a2scn | SOIL | FB E+0500 |
| A2 | a2scn | SOIL | FB E+0550 |
| A2 | a2scn | SOIL | FB E+0600 |
| A2 | a2scn | SOIL | FB E+0700 |
| A2 | a2scn | SOIL | FB E+0800 |
| A2 | a2scn | SOIL | FB E+0900 |
| A2 | a2scn | SOIL | FB E+1000 |
| A2 | a2scn | SOIL | FB E+1100 |
| A2 | a2scn | SOIL | FB E+1200 |
| A2 | a2scn | SOIL | FB E+1400 |
| A2 | a2scn | SOIL | FB E+1500 |
| A2 | a2scn | SOIL | FB E+1550 |
| A2 | a2scn | SOIL | FB E+1600 |
| A2 | a2scn | SOIL | FB E+1650 |
| A2 | a2scn | SOIL | FB E+1690 |
| A2 | a2scn | SOIL | FBE+1300 |
| A2 | a2scn | SOIL | FBE+400 |
| A2 | a2scn | SOIL | MW-113B |
| A2 | a2scn | SOIL | SDFB-001 |
| A2 | a2scn | SOIL | SDFB-002 |
| A2 | a2scn | SOIL | SDFB-003 |
| A2 | a2scn | SOIL | SDFB-004 |
| A2 | a2scn | SOIL | SPBG1 A+00 |
| A2 | a2scn | SOIL | SPBG1 B+00 |
| A2 | a2scn | SOIL | SPBG1 B+100 |
| A2 | a2scn | SOIL | SPBG1 B+200 |
| A2 | a2scn | SOIL | SPBG2 A-080 |
| A2 | a2scn | SOIL | SPBG2 A-160 |
| A2 | a2scn | SOIL | SPDPS-002 |
| A2 | a2scn | SOIL | SPDPS-004 |
| A2 | a2scn | SOIL | SPDPS-005 |
| A2 | a2scn | SOIL | SPDPS001 |
| A2 | a2scn | SOIL | SPEL-001 |

TABLE 5-6
SAMPLE LIST AREA A2
FUTURE COMMERCIAL WORKERS

| AOC | RECEPTOR | MATRIX | BORING |
|---|---|---|---|
| A2 | a2scn | SOIL | SPEL-002 |
| A2 | a2scn | SOIL | SPEL-003 |
| A2 | a2scn | SOIL | SPEL-004 |
| A2 | a2scn | SOIL | SPEL-005 |
| A2 | a2scn | SOIL | SPEL-006 |
| A2 | a2scn | SOIL | SPEL-007 |
| A2 | a2scn | SOIL | SPEL-008 |
| A2 | a2scn | SOIL | SPEL-009 |
| A2 | a2scn | SOIL | SPEL-010 |
| A2 | a2scn | SOIL | SPHM A+00 |
| A2 | a2scn | SOIL | SPHM A+100 |
| A2 | a2scn | SOIL | SPHM A+175 |
| A2 | a2scn | SOIL | SPHM AA+200 |
| A2 | a2scn | SOIL | SPHM AA+300 |
| A2 | a2scn | SOIL | SPHM AA+370 |
| A2 | a2scn | SOIL | SPHM B+00 |
| A2 | a2scn | SOIL | SPHM B+200 |
| A2 | a2scn | SOIL | SPHM B+300 |
| A2 | a2scn | SOIL | SPHM B+370 |
| A2 | a2scn | SOIL | SPHM-001 |
| A2 | a2scn | SOIL | SPHM-002 |
| A2 | a2scn | SOIL | SPHMB+100 |
| A2 | a2scn | SOIL | SPIM-001 |
| A2 | a2scn | SOIL | SPIM-002 |
| A2 | a2scn | SOIL | SPIM-003 |
| A2 | a2scn | SOIL | SPIM-004 |
| A2 | a2scn | SOIL | SPIM-005 |
| A2 | a2scn | SOIL | SPSC A+00 |
| A2 | a2scn | SOIL | SPSC A+050 |
| A2 | a2scn | SOIL | SPSC A+100 |
| A2 | a2scn | SOIL | SPSC A+150 |
| A2 | a2scn | SOIL | SPSC A+200 |
| A2 | a2scn | SOIL | SPSC A+250 |
| A2 | a2scn | SOIL | SPSC A+300 |
| A2 | a2scn | SOIL | SPSC A+350 |
| A2 | a2scn | SOIL | SPSC B+00 |
| A2 | a2scn | SOIL | SPSC C+00 |
| A2 | a2scn | SOIL | SPSC D+00 |
| A2 | a2scn | SOIL | SPSC E+00 |
| A2 | a2scn | SOIL | SPSC-001 |
| A2 | a2scn | SOIL | SPSC-002 |
| A2 | a2scn | SOIL | SPSCA+390 |
| A2 | a2scn | SOIL | SPTS-001 |
| A2 | a2scn | SOIL | SPTS-002 |
| A2 | a2scn | SOIL | SPTS-003 |
| A2 | a2scn | SOIL | SPTS-004 |
| A2 | a2scn | SOIL | SPTS-005 |
| A2 | a2scn | SOIL | SPTS-007 |
| A2 | a2scn | SOIL | SPTS006 |
| A2 | a2scn | SOIL | SPVM-001 |
| A2 | a2scn | SOIL | SPVM-002 |

TABLE 5-6
SAMPLE LIST AREA A2
FUTURE COMMERCIAL WORKERS

| AOC | RECEPTOR | MATRIX | BORING |
|---|---|---|---|
| A2 | a2scn | SOIL | SPVM-003 |
| A2 | a2scn | SOIL | SPVM-004 |
| A2 | a2scn | SOIL | SPVM-005 |
| A2 | a2scn | SOIL | SPVM-006 |
| A2 | a2scn | SOIL | SPVM-008 |
| A2 | a2scn | SOIL | SPVM-009 |
| A2 | a2scn | SOIL | SPVM-010 |
| A2 | a2scn | SOIL | SPVM007 |
| A2 | a2scn | SOIL/PAVEMEN | A2-SS02 |
| A2 | a2scn | SOIL/PAVEMEN | A2-SS05 |
| A2 | a2scn | SOIL/PAVEMEN | MW-110D |
| A2 | a2scn | SOIL/PAVEMEN | MW-111D |
| A2 | a2scn | SOIL/PAVEMEN | MW-112B |
| A2 | a2scn | SOIL/PAVEMEN | SP-SB1 |
| A2 | a2scn | SOIL/PAVEMEN | SP-SB2 |
| A2 | a2scn | SOIL/PAVEMEN | SP-SB3 |
| A2 | a2scn | SOIL/PAVEMEN | SP-SB4 |
| A2 | a2scn | SOIL/PAVEMEN | SP-SB5 |
| A2 | a2scn | SOIL/PAVEMEN | SP-SB6 |
| A2 | a2scn | SOIL/PAVEMEN | SP-SB7 |
| A2 | a2scn | SOIL/PAVEMEN | SP-SB8 |
| A2 | a2scn | SOIL/PAVEMEN | SP-SB9 |

TABLE 5-7
SAMPLE LIST AREA A3
RECREATIONAL USERS

| AOC | RECEPTOR | MATRIX | BORING |
|---|---|---|---|
| A3 | a3sfr | SEDIMENT | A3-SD01 |
| A3 | a3sfr | SEDIMENT | A3-SD02 |
| A3 | a3sfr | SEDIMENT | A3-SD03 |
| A3 | a3sfr | SEDIMENT | A3-SD04 |
| A3 | a3sfr | SEDIMENT | A3-SD05 |
| A3 | a3sfr | SEDIMENT | A3-SD06 |
| A3 | a3sfr | SEDIMENT | A3-SD07 |
| A3 | a3sfr | SEDIMENT | A3-SD08 |
| A3 | a3sfr | SEDIMENT | A3-SD09 |
| A3 | a3sfr | SEDIMENT | A3SD10 |
| A3 | a3sfr | SEDIMENT | SD01 |
| A3 | a3sfr | SEDIMENT | SD05 |
| A3 | a3sfr | SEDIMENT | SD06 |
| A3 | a3sfr | SEDIMENT | SD08W |
| A3 | a3sfr | SEDIMENT | SD09W |
| A3 | a3sfr | SEDIMENT | SD12 |
| A3 | a3sfr | SEDIMENT | SD13 |
| A3 | a3sfr | SEDIMENT | SD14 |
| A3 | a3sfr | SEDIMENT | SD18 |
| A3 | a3sfr | SEDIMENT | SD20-04 |
| A3 | a3sfr | SEDIMENT | SD21 |
| A3 | a3sfr | SEDIMENT | SD22 |
| A3 | a3sfr | SEDIMENT | SD23 |
| A3 | a3sfr | SEDIMENT | SD24 |
| A3 | a3sfr | SOIL | HU103A N720,W258 |
| A3 | a3sfr | SOIL | HU121A N915,W215 |
| A3 | a3sfr | SOIL | HU121A N920,W170 |
| A3 | a3sfr | SOIL | HU135A N950,W140 |
| A3 | a3sfr | SOIL | HU135A N995,W120 |
| A3 | a3sfr | SOIL | HU15A N296,W113 |
| A3 | a3sfr | SOIL | HU15A N305,W113 |
| A3 | a3sfr | SOIL | HU161 A+00 |
| A3 | a3sfr | SOIL | HU161 A+25 |
| A3 | a3sfr | SOIL | HU161 A+50 |
| A3 | a3sfr | SOIL | HU161 B+00 |
| A3 | a3sfr | SOIL | HU161 B+25 |
| A3 | a3sfr | SOIL | HU161 B+50 |
| A3 | a3sfr | SOIL | HU161 C+00 |
| A3 | a3sfr | SOIL | HU161 C+50 |
| A3 | a3sfr | SOIL | HU161A N1015,W115 |
| A3 | a3sfr | SOIL | HU161A N1050,W113 |
| A3 | a3sfr | SOIL | HU161A N1050,W154 |
| A3 | a3sfr | SOIL | HU171 A+25 |
| A3 | a3sfr | SOIL | HU171 B+25 |
| A3 | a3sfr | SOIL | HU171 C+00 |
| A3 | a3sfr | SOIL | HU171 C+25 |
| A3 | a3sfr | SOIL | HU171A N1133,W110 |
| A3 | a3sfr | SOIL | HU181A N1180,W148 |
| A3 | a3sfr | SOIL | HU191 A+00 |
| A3 | a3sfr | SOIL | HU191 B+00 |
| A3 | a3sfr | SOIL | HU191 C+00 |

TABLE 5-7
SAMPLE LIST AREA A3
RECREATIONAL USERS

| AOC | RECEPTOR | MATRIX | BORING |
|---|---|---|---|
| A3 | a3sfr | SOIL | HU191A N1200,W133 |
| A3 | a3sfr | SOIL | HU207A N1335,W145 |
| A3 | a3sfr | SOIL | HU231A N1540,W140 |
| A3 | a3sfr | SOIL | HU239A N1640,W150 |
| A3 | a3sfr | SOIL | HU263A N1695,W192 |
| A3 | a3sfr | SOIL | HU273A N1755,W210 |
| A3 | a3sfr | SOIL | HU59A N475,W190 |
| A3 | a3sfr | SOIL | SD03 |
| A3 | a3sfr | SOIL | SPBG2 A+050 |
| A3 | a3sfr | SOIL | SPBG2 A+267 |
| A3 | a3sfr | SOIL | SPBG2 B+050 |
| A3 | a3sfr | SOIL | SPBG2 B+150 |
| A3 | a3sfr | SOIL | SPBG2 B+267 |
| A3 | a3sfr | SOIL | SPBG2 C+050 |
| A3 | a3sfr | SOIL | SPBG2 C+150 |
| A3 | a3sfr | SOIL | SPBG2C+267 |
| A3 | a3sfr | SOIL | SPD G3 |
| A3 | a3sfr | SOIL | SPD G4 |
| A3 | a3sfr | SOIL | SPD H1 |
| A3 | a3sfr | SOIL | SPD H2 |
| A3 | a3sfr | SOIL | SPD H3 |
| A3 | a3sfr | SOIL | SPD H4 |
| A3 | a3sfr | SOIL | SPD I1 |
| A3 | a3sfr | SOIL | SPD I2 |
| A3 | a3sfr | SOIL | SPD I3 |
| A3 | a3sfr | SOIL | SPD I4 |
| A3 | a3sfr | SOIL | SPDA E222,S132 |
| A3 | a3sfr | SOIL | SPDA E228,N0 |
| A3 | a3sfr | SOIL | SPDA E275,S130 |
| A3 | a3sfr | SOIL | SPDA E280,S40 |
| A3 | a3sfr | SOIL | SPDA E325,S38 |
| A3 | a3sfr | SOIL | WA106A E375,S135 |
| A3 | a3sfr | SOIL | WA68A E212,S121 |
| A3 | a3sfr | SOIL | WA86A E280,S135 |
| A3 | a3sfr | SOIL | WA96A E347,S133 |
| A3 | a3sfr | WETLAND | A3-SB03 |
| A3 | a3sfr | WETLAND | HU103A N790,W245 |
| A3 | a3sfr | WETLAND | HU171 A+00 |
| A3 | a3sfr | WETLAND | HU171 B+00 |
| A3 | a3sfr | WETLAND | HU171 D+00 |
| A3 | a3sfr | WETLAND | HU171 E+00 |
| A3 | a3sfr | WETLAND | HU171A N1124,W149 |
| A3 | a3sfr | WETLAND | HU191A N1235,W165 |
| A3 | a3sfr | WETLAND | HU201A N1270,W160 |
| A3 | a3sfr | WETLAND | HU221A N1465,W140 |
| A3 | a3sfr | WETLAND | HU235A N1380,W182 |
| A3 | a3sfr | WETLAND | HU239A N1592,W215 |
| A3 | a3sfr | WETLAND | HU35A N408,W198 |
| A3 | a3sfr | WETLAND | HU75A N647,W285 |
| A3 | a3sfr | WETLAND | HU75A N686,W285 |
| A3 | a3sfr | WETLAND | SD02 |

TABLE 5-7
SAMPLE LIST AREA A3
RECREATIONAL USERS

| AOC | RECEPTOR | MATRIX | BORING |
|---|---|---|---|
| A3 | a3sfr | WETLAND | SD04 |
| A3 | a3sfr | WETLAND | SD15 |
| A3 | a3sfr | WETLAND | SD16 |
| A3 | a3sfr | WETLAND | SD17 |
| A3 | a3sfr | WETLAND | SD18 |
| A3 | a3sfr | WETLAND | SPD A1 |
| A3 | a3sfr | WETLAND | SPD B1 |
| A3 | a3sfr | WETLAND | SPD B2 |
| A3 | a3sfr | WETLAND | SPD C1 |
| A3 | a3sfr | WETLAND | SPD C2 |
| A3 | a3sfr | WETLAND | SPD C3 |
| A3 | a3sfr | WETLAND | SPD D1 |
| A3 | a3sfr | WETLAND | SPD D2 |
| A3 | a3sfr | WETLAND | SPD D3 |
| A3 | a3sfr | WETLAND | SPD E1 |
| A3 | a3sfr | WETLAND | SPD E2 |
| A3 | a3sfr | WETLAND | SPD E3 |
| A3 | a3sfr | WETLAND | SPD F1 |
| A3 | a3sfr | WETLAND | SPD F2 |
| A3 | a3sfr | WETLAND | SPD F3 |
| A3 | a3sfr | WETLAND | SPD G1 |
| A3 | a3sfr | WETLAND | SPD G2 |
| A3 | a3sfr | WETLAND | SPDA E310,S100 |
| A3 | a3sfr | WETLAND | SPDA E360,S250 |
| A3 | a3wfr | SW | SD01 |
| A3 | a3wfr | SW | SD05 |
| A3 | a3wfr | SW | SD06 |
| A3 | a3wfr | SW | SD12 |
| A3 | a3wfr | SW | SD13 |
| A3 | a3wfr | SW | SD14 |
| A3 | a3wfr | SW | SD20-04 |
| A3 | a3wfr | SW | SD21 |
| A3 | a3wfr | SW | SD22 |
| A3 | a3wfr | SW | SD23 |
| A3 | a3wfr | SW | SD24 |

TABLE F.5-8 A-1

| AREA A-1 | SAMPLE LIST FOR HOT SPOT ANALYSIS | |
|---|---|---|
| Commercial Workers<br>SURFACE SOIL | Recreational Users<br>SURFACE SOIL | Trespassers<br>SURFACE SEDIMENTS/WETLAND SOILS/SOILS |
| A1-SB03 | A1-SS01 | A1-SD02 |
| A1-SB11 | MFP-6 | A1-SD03 |
| MFP-5 | MW-102D | MF02 |
| MF E+080 | EB728A N247,E46 | MF03 |
| MF E+100 | EB728A N277,E37 | SLE-CR+100 |
| MF F+050 | BP68A S535,E172 | SLE-CR+200 |
| MFP-1 | BP70A S485,E160 | SLE-CR+300 |
| MFP-2 | BP70A S528,E172 | SLE-CR+400 |
| PP EF+050 | BP78A S453,E162 | SLE-CR+460 |
| PP EF+100 | BP96A S342,E166 | SLE-CR+500 |
| | BP96A S365,E168 | |
| | MF A+400 | |
| | MF AZ+300 | |
| | MF AZ+365 | |

AREA A-2 SAMPLE LIST FOR HOT SPOT ANALYSIS

Commercial Workers
EXPOSED SURFACE SOIL

A2-SB01
A2-SS02
A2-SS03
DPS3
DPS6
MW-112B
SP-SB2
SP-SB3
SPCA+390
SPDPS-001
SPDPS-002
SPDPS-004
SPDPS-005
SPHM A+175
SPHM AA+200
SPHM AA+300
SPHM AA+370
SPHM-002
SPHM B+200
SPHM B+300
SPHM B+370
SPSC-002
SPSC A+150
SPSC A+200
SPSC A+250
SPSC A+300
SPSC A+350
SPCA+390
SPDPS-003

## Appendix F.6

## Sample Calculations for UCL Statistics

TEQ Calculation Check 9/27/99 Checked by Gary [illegible]

| NSAMPLE | PARAMETER | FRACTION | LAB_RESULT | QUAL | UNITS | TEF | DETECT | DETECT × TEF | 1/2 ND | 1/2 ND × TEF | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MFP-1 | 1,2,3,4,6,7,8-HpCDD | DIOXI | 5 4 | J | UG/KG | 0 01 | 5.4 | 0.054 | | | | |
| MFP-1 | 1,2,3,4,6,7,8-HpCDF | DIOXI | 1 9 | J | UG/KG | 0 01 | 1 9 | 0.019 | | | | |
| MFP-1 | 1,2,3,4,7,8,9-HpCDF | DIOXI | 0 0208 | UJ | UG/KG | 0 01 | | | 0.0104 | 0.000104 | | |
| MFP-1 | 1,2,3,4,7,8-HxCDD | DIOXI | 0 0229 | UJ | UG/KG | 0 1 | | | 0.01145 | 0.001145 | | |
| MFP-1 | 1,2,3,4,7,8-HxCDF | DIOXI | 0 0216 | UJ | UG/KG | 0 1 | | | 0.0108 | 0.00108 | | |
| MFP-1 | 1,2,3,6,7,8-HxCDD | DIOXI | 1 7 | J | UG/KG | 0 1 | 1.7 | 0.17 | | | | |
| MFP-1 | 1,2,3,6,7,8-HxCDF | DIOXI | 1 4 | J | UG/KG | 0 1 | 1.4 | 0.14 | | | | |
| MFP-1 | 1,2,3,7,8,9-HxCDD | DIOXI | 0 1 | J | UG/KG | 0 1 | 0.1 | 0.01 | | | | |
| MFP-1 | 1,2,3,7,8,9-HxCDF | DIOXI | 0 028 | UJ | UG/KG | 0 1 | | | 0.014 | 0.0014 | | |
| MFP-1 | 1,2,3,7,8-PeCDD | DIOXI | 2 4 | | UG/KG | 1 | 2.4 | 2.4 | | | | |
| MFP-1 | 1,2,3,7,8-PeCDF | DIOXI | 2 2 | J | UG/KG | 0 05 | 2.2 | 0.11 | | | | |
| MFP-1 | 2,3,4,6,7,8-HxCDF | DIOXI | 0 0184 | UJ | UG/KG | 0 1 | | | 0.0092 | 0.00092 | | |
| MFP-1 | 2,3,4,7,8-PeCDF | DIOXI | 0 1 | J | UG/KG | 0 5 | 0.1 | 0.05 | | | | |
| MFP-1 | 2,3,7,8-TCDD | DIOXI | 0 0161 | UJ | UG/KG | 1 | | | 0.00805 | 0.00805 | | |
| MFP-1 | 2,3,7,8-TCDF | DIOXI | 0 8 | | UG/KG | 0 1 | 0.8 | 0.08 | | | | |
| MFP-1 | OCDD | DIOXI | 6 8 | J | UG/KG | 0.0001 | 6.8 | 0.00068 | | | | |
| MFP-1 | OCDF | DIOXI | 2 1 | J | UG/KG | 0 0001 | 2.1 | 0.00021 | | | | |
| | Toxicity Equivalency | | | | | | | 3.03389 | + | 0.012699 | = | 3.046589 ✓ |

MFP-1 is grouped in receptors A1SCN, A1SFR, and A1STR. All 17 dioxin parameters with TEFs were detected at least once in receptors A1SCN, A1SFR, or A1STR. All 17 parameters were therefore used in the calculation of the TEQ for MFP-1.

# APPENDIX F.6

## STATISTICS AND EXPOSURE POINT CONCENTRATIONS

### 1 INTRODUCTION

This appendix presents the methodology for statistical analysis of environmental data collected at the site. Tables 1 through 4 are referenced statistical tables.

The statistical methods presented were used to develop summary statistics (e.g., range, mean, standard deviation, 95% Upper Confidence Limits) which describe environmental contaminant concentrations at the facility.

The statistical methods presented were based on:

1. EPA Publication 9285.7-081. "Supplemental Guidance to RAGS: Calculating the Concentration Term." May 1992.

2. Gilbert, Richard O., Statistical Methods for Environmental Pollution Monitoring. Van Nostrand Reinhold Company. New York, New York. 1987.

3. Cochran, William G. and Snedecor, George W. Statistical Methods. The Iowa State University Press. 1980.

### 2 LIMIT OF DETECTION

In the chemical analysis of environmental samples, some analytes may be present at concentrations which are below the sample quantitation limit (SQL) of the analytical procedure. The results are generally reported as not detected (rather than zero), and the appropriate limit of detection is given. The nondetects were replaced with the SQL divided by two prior to statistical analysis. Clearly, if all the observations are nondetect results, no statistical analysis is warranted. In addition, field duplicate results were processed prior to use in statistical analysis. The maximum value was used for solid matrix duplicates. The average value was used for aqueous duplicates.

### 3 STATISTICAL METHODS

### 3.1.1 The Shapiro and Wilk "W-test"

The data must be analyzed to determine whether they were drawn from an underlying normal, lognormal or undetermined distribution. A number of statistical evaluations may be used to determine which, if either, of the distributions are exhibited by a given data set. As recommended by the EPA, the Shapiro and Wilk "W-test" (for sample sets ≤50) and the Shapiro-Francia "W-test" (for sample sets >50) will be used to determine whether the data are normally or lognormally distributed (EPA, 1992).

> The null hypothesis ($H_0$) that is tested is that the population has a normal (or lognormal when the data is log-transformed) distribution.
>
> The alternate hypothesis ($H_A$) is that the population does not have a normal (or lognormal when the data is log-transformed) distribution.

The equation for the W statistic is:

$$W = \left[\frac{b}{S_R\sqrt{n-1}}\right]^2$$

where

$$b = \sum_{i=1}^{k} a_i \left(x_{(n+1)} - x\right) = \sum_{i=1}^{k} b_i$$

and the coefficients $a_1, a_2, a_3, .., a_k$ are found in Table 1.

A "W" statistic ($W_{calc}$) is computed for a data set (or a log transformed data set) and compared to a test statistic ($W_{test}$). The test statistic is determined at the 5% significance level from Table 2. If $W_{calc} > W_{test}$, then the null hypothesis is not rejected (i.e. the data are assumed to be normally distributed [or lognormally distributed if log transformed data are tested]). If $W_{calc} < W_{test}$, then the null hypothesis is rejected and the alternative hypothesis is accepted (i.e., the data are not assumed to be normally distributed [or not log-normally distributed if log transformed data are tested]).

3.1.2 Representative Concentration for a Normal Distribution (Upper One-sided 95% Confidence Limit for the Arithmetic Mean)

The 100(1-$\alpha$) Upper Confidence Limit ($UCL_{100(1-\alpha)}$) of the population mean ($\bar{x}$) is often used as a descriptive statistic for environmental data. When $\alpha$ = 0.05, the 95 percent upper confidence limit (one-tailed test) may be calculated as follows:

$$UCL_{0.95} = \bar{x} + t_{0.95,n-1} \frac{S_x}{\sqrt{n}}$$

$$\bar{X} = \frac{1}{n}\sum_{i=1}^{n} x_i = \text{arithmetic mean}$$

$$S_x = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}} = \text{the sample standard deviation}$$

where: $t_{0.95,n-1} = \text{Value from t - distribution (Table 4)}$

It should be noted that the 95 percent confidence interval for a second sample of size n drawn from the same population will most likely not be the same as that for the first sample. In theory if an interval estimate is calculated for the means of a very large set of samples of size n, the true population mean will be within 95 percent of this limit.

3.1.3 Representative Concentration for a Lognormal Distribution (Upper One-sided 95% Confidence Limit for the Geometric Mean)

The following formula may be used to calculate the upper 95% confidence interval ($UCL_{95\%}$) for the geometric mean ($x_g$):

$$UCL_{0.95} = \exp\left[\bar{y} + 0.5(S_y)^2 + \frac{S_y(H_{0.95,n})}{\sqrt{n}}\right]$$

where: $\bar{y}1$ = arithmetic mean of the log-transformed data, y = ln(x)

$S_y$ = standard deviation of y

$H_{0.95,n}$ = factor for sample size n (Table 3)

## 4 HANDLING OF MULTIPLE ROUND SAMPLES

Multiple round samples are samples collected from the same location on different dates. The individual multiple round sample results were used in the determination of the contaminants of potential concern. The average of multiple round sample results was used to calculate the exposure point concentrations.

## TABLE 1
## COEFFICIENTS $A_i$ FOR W TEST OF NORMALITY FOR N=2 to 50

| i/n | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.7071 | 0.7071 | 0.6872 | 0.6646 | 0.6431 | 0.6233 | 0.6052 | 0.5888 | 0.5739 |
| 2 | | | 0.1677 | 0.2413 | 0.2806 | 0.3031 | 0.3164 | 0.3244 | 0.3291 |
| 3 | | | | | 0.0875 | 0.1401 | 0.1743 | 0.1976 | 0.2141 |
| 4 | | | | | | | 0.0561 | 0.0947 | 0.1224 |
| 5 | | | | | | | | | 0.0399 |

| i/n | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.5601 | 0.5475 | 0.5359 | 0.5251 | 0.5150 | 0.5056 | 0.4968 | 0.4886 | 0.4808 | 0.4734 |
| 2 | 0.3315 | 0.3325 | 0.3325 | 0.3318 | 0.3306 | 0.3290 | 0.3273 | 0.3253 | 0.3232 | 0.3211 |
| 3 | 0.2260 | 0.2347 | 0.2412 | 0.2460 | 0.2495 | 0.2521 | 0.2540 | 0.2553 | 0.2561 | 0.2565 |
| 4 | 0.1429 | 0.1586 | 0.1707 | 0.1802 | 0.1878 | 0.1939 | 0.1988 | 0.2027 | 0.2059 | 0.2085 |
| 5 | 0.0695 | 0.0922 | 0.1099 | 0.1240 | 0.1353 | 0.1447 | 0.1524 | 0.1587 | 0.1641 | 0.1686 |
| 6 | | 0.0303 | 0.0539 | 0.0727 | 0.0880 | 0.1005 | 0.1109 | 0.1197 | 0.1271 | 0.1334 |
| 7 | | | | 0.0240 | 0.0433 | 0.0593 | 0.0725 | 0.0837 | 0.0932 | 0.1013 |
| 8 | | | | | | 0.0196 | 0.0359 | 0.0496 | 0.0612 | 0.0711 |
| 9 | | | | | | | | 0.0163 | 0.0303 | 0.0422 |
| 10 | | | | | | | | | | 0.0140 |

| i/n | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.4643 | 0.4590 | 0.4542 | 0.4493 | 0.4450 | 0.4407 | 0.4366 | 0.4328 | 0.4291 | 0.4254 |
| 2 | 0.3185 | 0.3156 | 0.3126 | 0.3098 | 0.3069 | 0.3043 | 0.3018 | 0.2992 | 0.2968 | 0.2944 |
| 3 | 0.2578 | 0.2571 | 0.2563 | 0.2554 | 0.2543 | 0.2533 | 0.2522 | 0.2510 | 0.2499 | 0.2487 |
| 4 | 0.2119 | 0.2131 | 0.2139 | 0.2145 | 0.2148 | 0.2151 | 0.2152 | 0.2151 | 0.2150 | 0.2148 |
| 5 | 0.1736 | 0.1764 | 0.1787 | 0.1807 | 0.1822 | 0.1836 | 0.1848 | 0.1857 | 0.1864 | 0.1870 |
| 6 | 0.1399 | 0.1443 | 0.1480 | 0.1512 | 0.1539 | 0.1563 | 0.1584 | 0.1601 | 0.1616 | 0.1630 |
| 7 | 0.1092 | 0.1150 | 0.1201 | 0.1245 | 0.1283 | 0.1316 | 0.1346 | 0.1372 | 0.1395 | 0.1415 |
| 8 | 0.0804 | 0.0878 | 0.0941 | 0.0997 | 0.1046 | 0.1089 | 0.1128 | 0.1162 | 0.1192 | 0.1219 |
| 9 | 0.0530 | 0.0618 | 0.0696 | 0.0764 | 0.0823 | 0.0876 | 0.0923 | 0.0965 | 0.1002 | 0.1036 |
| 10 | 0.0263 | 0.0368 | 0.0459 | 0.0539 | 0.0610 | 0.0672 | 0.0728 | 0.0778 | 0.0822 | 0.0862 |
| 11 | | 0.0122 | 0.0228 | 0.0321 | 0.0403 | 0.0476 | 0.0540 | 0.0598 | 0.0650 | 0.0697 |
| 12 | | | | 0.0107 | 0.0200 | 0.0284 | 0.0358 | 0.0424 | 0.0483 | 0.0537 |
| 13 | | | | | | 0.0094 | 0.0178 | 0.0253 | 0.0320 | 0.0381 |
| 14 | | | | | | | | 0.0084 | 0.0159 | 0.0227 |
| 15 | | | | | | | | | | 0.0076 |

| i/n | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.4220 | 0.4188 | 0.4156 | 0.4127 | 0.4096 | 0.4068 | 0.4040 | 0.4015 | 0.9989 | 0.3964 |
| 2 | 0.2921 | 0.2898 | 0.2876 | 0.2854 | 0.2834 | 0.2813 | 0.2794 | 0.2774 | 0.2755 | 0.2737 |
| 3 | 0.2475 | 0.2463 | 0.2451 | 0.2439 | 0.2427 | 0.2415 | 0.2403 | 0.2391 | 0.2380 | 0.2368 |
| 4 | 0.2145 | 0.2141 | 0.2137 | 0.2132 | 0.2127 | 0.2121 | 0.2116 | 0.2110 | 0.2104 | 0.2098 |
| 5 | 0.1874 | 0.1878 | 0.1880 | 0.1882 | 0.1883 | 0.1883 | 0.1883 | 0.1881 | 0.1880 | 0.1878 |
| 6 | 0.1641 | 0.1651 | 0.1660 | 0.1667 | 0.1673 | 0.1678 | 0.1683 | 0.1686 | 0.1689 | 0.1691 |
| 7 | 0.1433 | 0.1449 | 0.1463 | 0.1475 | 0.1487 | 0.1496 | 0.1503 | 0.1513 | 0.1520 | 0.1526 |
| 8 | 0.1243 | 0.1265 | 0.1284 | 0.1301 | 0.1317 | 0.1331 | 0.1344 | 0.1356 | 0.1366 | 0.1376 |
| 9 | 0.1066 | 0.1093 | 0.1118 | 0.1140 | 0.1160 | 0.1179 | 0.1196 | 0.1211 | 0.1225 | 0.1237 |
| 10 | 0.0899 | 0.0931 | 0.0961 | 0.0988 | 0.1013 | 0.1036 | 0.1056 | 0.1075 | 0.1092 | 0.1108 |
| 11 | 0.0739 | 0.0777 | 0.0821 | 0.0844 | 0.0873 | 0.0900 | 0.0924 | 0.0947 | 0.0967 | 0.0986 |
| 12 | 0.0585 | 0.0629 | 0.0669 | 0.0706 | 0.0739 | 0.0770 | 0.0798 | 0.0824 | 0.0848 | 0.0870 |
| 13 | 0.0435 | 0.0485 | 0.0530 | 0.0572 | 0.0610 | 0.0645 | 0.0677 | 0.0706 | 0.0733 | 0.0759 |
| 14 | 0.0289 | 0.0344 | 0.0395 | 0.0441 | 0.0484 | 0.0523 | 0.0559 | 0.0592 | 0.0622 | 0.0651 |
| 15 | 0.0144 | 0.0206 | 0.0262 | 0.0314 | 0.0361 | 0.0404 | 0.0444 | 0.0481 | 0.0515 | 0.0546 |
| 16 | | 0.0068 | 0.0131 | 0.0187 | 0.0239 | 0.0287 | 0.0331 | 0.0372 | 0.0409 | 0.0444 |
| 17 | | | | 0.0062 | 0.0119 | 0.0172 | 0.0220 | 0.0264 | 0.0305 | 0.0343 |
| 18 | | | | | | 0.0057 | 0.0110 | 0.0158 | 0.0203 | 0.0244 |
| 19 | | | | | | | | 0.0053 | 0.0101 | 0.0146 |
| 20 | | | | | | | | | | 0.0049 |

| i/n | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.3940 | 0.3917 | 0.3894 | 0.3872 | 0.3850 | 0.3830 | 0.3808 | 0.3789 | 0.3770 | 0.3751 |
| 2 | 0.2719 | 0.2701 | 0.2684 | 0.2667 | 0.2651 | 0.2635 | 0.2620 | 0.2604 | 0.2589 | 0.2574 |
| 3 | 0.2357 | 0.2345 | 0.2334 | 0.2323 | 0.2313 | 0.2302 | 0.2291 | 0.2281 | 0.2271 | 0.2260 |
| 4 | 0.2091 | 0.2085 | 0.2078 | 0.2072 | 0.2065 | 0.2058 | 0.2052 | 0.2045 | 0.2038 | 0.2032 |
| 5 | 0.1876 | 0.1874 | 0.1871 | 0.1868 | 0.1865 | 0.1862 | 0.1859 | 0.1855 | 0.1851 | 0.1847 |
| 6 | 0.1693 | 0.1694 | 0.1695 | 0.1695 | 0.1695 | 0.1695 | 0.1695 | 0.1693 | 0.1692 | 0.1691 |
| 7 | 0.1531 | 0.1535 | 0.1539 | 0.1542 | 0.1545 | 0.1548 | 0.1550 | 0.1551 | 0.1553 | 0.1554 |
| 8 | 0.1384 | 0.1392 | 0.1398 | 0.1405 | 0.1410 | 0.1415 | 0.1420 | 0.1423 | 0.1427 | 0.1430 |
| 9 | 0.1249 | 0.1259 | 0.1269 | 0.1278 | 0.1286 | 0.1293 | 0.1300 | 0.1306 | 0.1312 | 0.1317 |
| 10 | 0.1123 | 0.1136 | 0.1149 | 0.1160 | 0.1170 | 0.1180 | 0.1189 | 0.1197 | 0.1205 | 0.1212 |
| 11 | 0.1004 | 0.1020 | 0.1035 | 0.1049 | 0.1062 | 0.1073 | 0.1085 | 0.1095 | 0.1105 | 0.1113 |
| 12 | 0.0891 | 0.0909 | 0.0927 | 0.0943 | 0.0959 | 0.0972 | 0.0986 | 0.0998 | 0.1010 | 0.1020 |
| 13 | 0.0782 | 0.0804 | 0.0824 | 0.0842 | 0.0860 | 0.0876 | 0.0892 | 0.0906 | 0.0919 | 0.0932 |
| 14 | 0.0677 | 0.0701 | 0.0724 | 0.0745 | 0.0775 | 0.0785 | 0.0801 | 0.0817 | 0.0832 | 0.0846 |
| 15 | 0.0575 | 0.0602 | 0.0628 | 0.0651 | 0.0673 | 0.0694 | 0.0713 | 0.0731 | 0.0748 | 0.0764 |
| 16 | 0.0476 | 0.0506 | 0.0534 | 0.0560 | 0.0584 | 0.0607 | 0.0628 | 0.0648 | 0.0667 | 0.0685 |
| 17 | 0.0379 | 0.0411 | 0.0442 | 0.0471 | 0.0497 | 0.0522 | 0.0546 | 0.0568 | 0.0588 | 0.0608 |
| 18 | 0.0283 | 0.0318 | 0.0352 | 0.0383 | 0.0412 | 0.0439 | 0.0465 | 0.0489 | 0.0511 | 0.0532 |
| 19 | 0.0188 | 0.0227 | 0.0263 | 0.0296 | 0.0328 | 0.0357 | 0.0385 | 0.0411 | 0.0436 | 0.0459 |
| 20 | 0.0094 | 0.0136 | 0.0175 | 0.0211 | 0.0245 | 0.0277 | 0.0307 | 0.0335 | 0.0361 | 0.0386 |
| 21 | | 0.0045 | 0.0087 | 0.0126 | 0.0163 | 0.0197 | 0.0229 | 0.0259 | 0.0288 | 0.0314 |
| 22 | | | | 0.0042 | 0.0081 | 0.0188 | 0.0153 | 0.0185 | 0.0215 | 0.0244 |
| 23 | | | | | | 0.0039 | 0.0076 | 0.0111 | 0.0143 | 0.0174 |
| 24 | | | | | | | | 0.0037 | 0.0071 | 0.0104 |
| 25 | | | | | | | | | | 0.0350 |

**Table 2**
**PERCENTAGE POINTS OF THE W TEST FOR N=3 to 50**

| n | 0.01 | 0.05 |
|---|---|---|
| 3 | 0.753 | 0.767 |
| 4 | 0.687 | 0.748 |
| 5 | 0.686 | 0.762 |
| 6 | 0.713 | 0.788 |
| 7 | 0.730 | 0.803 |
| 8 | 0.749 | 0.818 |
| 9 | 0.764 | 0.829 |
| 10 | 0.781 | 0.842 |
| 11 | 0.792 | 0.850 |
| 12 | 0.805 | 0.859 |
| 13 | 0.814 | 0.866 |
| 14 | 0.825 | 0.874 |
| 15 | 0.835 | 0.881 |
| 16 | 0.844 | 0.887 |
| 17 | 0.851 | 0.892 |
| 18 | 0.858 | 0.897 |
| 19 | 0.863 | 0.901 |
| 20 | 0.868 | 0.905 |
| 21 | 0.873 | 0.908 |
| 22 | 0.878 | 0.911 |
| 23 | 0.881 | 0.914 |
| 24 | 0.884 | 0.916 |
| 25 | 0.888 | 0.918 |
| 26 | 0.891 | 0.920 |
| 27 | 0.894 | 0.923 |
| 28 | 0.896 | 0.924 |
| 29 | 0.898 | 0.926 |
| 30 | 0.900 | 0.927 |

| n | 0.01 | 0.05 |
|---|---|---|
| 31 | 0.902 | 0.929 |
| 32 | 0.904 | 0.930 |
| 33 | 0.906 | 0.931 |
| 34 | 0.908 | 0.933 |
| 35 | 0.910 | 0.934 |
| 36 | 0.912 | 0.935 |
| 37 | 0.914 | 0.936 |
| 38 | 0.916 | 0.938 |
| 39 | 0.917 | 0.939 |
| 40 | 0.919 | 0.940 |
| 41 | 0.920 | 0.941 |
| 42 | 0.922 | 0.942 |
| 43 | 0.923 | 0.943 |
| 44 | 0.924 | 0.944 |
| 45 | 0.926 | 0.945 |
| 46 | 0.927 | 0.945 |
| 47 | 0.928 | 0.946 |
| 48 | 0.929 | 0.947 |
| 49 | 0.929 | 0.947 |
| 50 | 0.930 | 0.947 |

## TABLE 3
## VALUES OF $H_{0.95}$ FOR COMPUTING A ONE-SIDED UPPER 95% CONFIDENCE LIMIT ON A LOGNORMAL MEAN

| Sy/n | 3 | 5 | 7 | 10 | 12 | 15 | 21 | 31 | 51 | 101 | 201 | 301 | 401 | 601 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.10 | 2.75 | 2.035 | 1.886 | 1.802 | 1.775 | 1.749 | 1.722 | 1.701 | 1.684 | 1.670 | 1.662 | 1.659 | 1.658 | 1.656 |
| 0.20 | 3.295 | 2.198 | 1.992 | 1.881 | 1.843 | 1.809 | 1.771 | 1.742 | 1.718 | 1.697 | 1.685 | 1.680 | 1.677 | 1.674 |
| 0.30 | 4.109 | 2.402 | 2.125 | 1.977 | 1.927 | 1.882 | 1.833 | 1.793 | 1.761 | 1.733 | 1.716 | 1.709 | 1.705 | 1.700 |
| 0.40 | 5.22 | 2.651 | 2.282 | 2.089 | 2.026 | 1.968 | 1.905 | 1.856 | 1.813 | 1.770 | 1.755 | 1.746 | 1.740 | 1.734 |
| 0.50 | 6.495 | 2.947 | 2.465 | 2.220 | 2.141 | 2.068 | 1.989 | 1.928 | 1.876 | 1.830 | 1.802 | 1.790 | 1.784 | 1.776 |
| 0.60 | 7.807 | 3.287 | 2.673 | 2.368 | 2.271 | 2.181 | 2.085 | 2.010 | 1.946 | 1.891 | 1.857 | 1.843 | 1.835 | 1.825 |
| 0.70 | 9.12 | 3.662 | 2.904 | 2.532 | 2.414 | 2.306 | 2.191 | 2.102 | 2.025 | 1.960 | 1.919 | 1.902 | 1.892 | 1.881 |
| 0.80 | 10.43 | 4.062 | 3.155 | 2.710 | 2.570 | 2.443 | 2.307 | 2.202 | 2.112 | 2.035 | 1.988 | 1.968 | 1.957 | 1.944 |
| 0.90 | 11.74 | 4.478 | 3.420 | 2.902 | 2.738 | 2.589 | 2.432 | 2.310 | 2.206 | 2.117 | 2.062 | 2.040 | 2.027 | 2.012 |
| 1.00 | 13.05 | 4.905 | 3.698 | 3.103 | 2.915 | 2.744 | 2.564 | 2.423 | 2.306 | 2.205 | 2.143 | 2.117 | 2.102 | 2.085 |
| 1.25 | 16.33 | 6.001 | 4.426 | 3.639 | 3.389 | 3.163 | 2.923 | 2.737 | 2.580 | 2.447 | 2.364 | 2.330 | 2.310 | 2.288 |
| 1.50 | 19.6 | 7.12 | 5.184 | 4.207 | 3.896 | 3.612 | 3.311 | 3.077 | 2.881 | 2.713 | 2.609 | 2.566 | 2.542 | 2.514 |
| 1.75 | 22.87 | 8.25 | 5.960 | 4.795 | 4.422 | 4.081 | 3.719 | 3.437 | 3.200 | 2.997 | 2.872 | 2.820 | 2.791 | 2.757 |
| 2.00 | 26.14 | 9.387 | 6.747 | 5.396 | 4.962 | 4.564 | 4.141 | 3.912 | 3.533 | 3.295 | 3.148 | 3.088 | 3.053 | 3.013 |
| 2.50 | 32.69 | 11.673 | 8.339 | 6.621 | 6.067 | 5.557 | 5.013 | 4.588 | 4.228 | 3.920 | 3.729 | 3.650 | 3.605 | 3.553 |
| 3.00 | 39.23 | 13.97 | 9.945 | 7.864 | 7.191 | 6.570 | 5.907 | 5.388 | 4.947 | 4.569 | 4.334 | 4.238 | 4.183 | 4.119 |
| 3.50 | 45.77 | 16.27 | 11.560 | 9.118 | 8.326 | 7.596 | 6.815 | 6.201 | 5.681 | 5.233 | 4.956 | 4.842 | 4.776 | 4.700 |
| 4.00 | 52.31 | 18.58 | 13.180 | 10.380 | 9.469 | 8.630 | 7.731 | 7.024 | 6.424 | 5.908 | 5.588 | 5.456 | 5.380 | 5.293 |
| 4.50 | 58.85 | 20.88 | 14.800 | 11.640 | 10.620 | 9.669 | 8.652 | 7.854 | 7.174 | 6.590 | 6.227 | 6.077 | 5.991 | 5.892 |
| 5.00 | 65.39 | 23.19 | 16.430 | 12.910 | 11.770 | 10.710 | 9.579 | 8.688 | 7.929 | 7.277 | 6.871 | 6.704 | 6.608 | 6.497 |
| 6.00 | 78.47 | 27.81 | 19.680 | 15.450 | 14.080 | 12.810 | 11.440 | 10.360 | 9.449 | 8.661 | 8.170 | 7.968 | 7.852 | 7.718 |
| 7.00 | 91.55 | 32.43 | 22.940 | 18.000 | 16.390 | 14.900 | 13.310 | 12.050 | 10.980 | 10.050 | 9.479 | 9.242 | 9.106 | 8.949 |
| 8.00 | 104.6 | 37.06 | 26.200 | 20.550 | 18.710 | 17.010 | 15.180 | 13.740 | 12.510 | 11.450 | 10.790 | 10.520 | 10.370 | 10.190 |
| 9.00 | 117.7 | 41.68 | 29.460 | 123.100 | 21.030 | 19.110 | 17.050 | 15.430 | 14.050 | 12.850 | 12.110 | 11.810 | 11.630 | 11.430 |
| 10.00 | 130.8 | 46.31 | 32.730 | 25.660 | 23.350 | 21.220 | 18.930 | 17.130 | 15.590 | 14.260 | 13.430 | 13.100 | 12.900 | 12.670 |

**TABLE 4**
**PERCENTILES OF STUDENT's t-DISTRIBUTION WITH n DEGREES OF FREEDOM**

| n\F | 0.60 | 0.75 | 0.90 | 0.95 | 0.975 | 0.99 | 0.995 | 0.9995 |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.325 | 1.000 | 3.078 | 6.314 | 12.706 | 31.821 | 63.656 | 636.578 |
| 2 | 0.289 | 0.816 | 1.886 | 2.920 | 4.303 | 6.965 | 9.925 | 31.600 |
| 3 | 0.277 | 0.765 | 1.638 | 2.353 | 3.182 | 4.541 | 5.841 | 12.924 |
| 4 | 0.271 | 0.741 | 1.533 | 2.132 | 2.776 | 3.747 | 4.604 | 8.610 |
| 5 | 0.267 | 0.727 | 1.476 | 2.015 | 2.571 | 3.365 | 4.032 | 6.869 |
| | | | | | | | | |
| 6 | 0.265 | 0.718 | 1.440 | 1.943 | 2.447 | 3.143 | 3.707 | 5.959 |
| 7 | 0.263 | 0.711 | 1.415 | 1.895 | 2.365 | 2.998 | 3.499 | 5.408 |
| 8 | 0.262 | 0.706 | 1.397 | 1.860 | 2.306 | 2.896 | 3.355 | 5.041 |
| 9 | 0.261 | 0.703 | 1.383 | 1.833 | 2.262 | 2.821 | 3.250 | 4.781 |
| 10 | 0.260 | 0.700 | 1.372 | 1.812 | 2.228 | 2.764 | 3.169 | 4.587 |
| | | | | | | | | |
| 11 | 0.260 | 0.697 | 1.363 | 1.796 | 2.201 | 2.718 | 3.106 | 4.437 |
| 12 | 0.259 | 0.695 | 1.356 | 1.782 | 2.179 | 2.681 | 3.055 | 4.318 |
| 13 | 0.259 | 0.694 | 1.350 | 1.771 | 2.160 | 2.650 | 3.012 | 4.221 |
| 14 | 0.258 | 0.692 | 1.345 | 1.761 | 2.145 | 2.624 | 2.977 | 4.140 |
| 15 | 0.258 | 0.691 | 1.341 | 1.753 | 2.131 | 2.602 | 2.947 | 4.073 |
| | | | | | | | | |
| 16 | 0.258 | 0.690 | 1.337 | 1.746 | 2.120 | 2.583 | 2.921 | 4.015 |
| 17 | 0.257 | 0.689 | 1.333 | 1.740 | 2.110 | 2.567 | 2.898 | 3.965 |
| 18 | 0.257 | 0.688 | 1.330 | 1.734 | 2.101 | 2.552 | 2.878 | 3.922 |
| 19 | 0.257 | 0.688 | 1.328 | 1.729 | 2.093 | 2.539 | 2.861 | 3.883 |
| 20 | 0.257 | 0.687 | 1.325 | 1.725 | 2.086 | 2.528 | 2.845 | 3.850 |
| | | | | | | | | |
| 21 | 0.257 | 0.686 | 1.323 | 1.721 | 2.080 | 2.518 | 2.831 | 3.819 |
| 22 | 0.256 | 0.686 | 1.321 | 1.717 | 2.074 | 2.508 | 2.819 | 3.792 |
| 23 | 0.256 | 0.685 | 1.319 | 1.714 | 2.069 | 2.500 | 2.807 | 3.768 |
| 24 | 0.256 | 0.685 | 1.318 | 1.711 | 2.064 | 2.492 | 2.797 | 3.745 |
| 25 | 0.256 | 0.684 | 1.316 | 1.708 | 2.060 | 2.485 | 2.787 | 3.725 |
| | | | | | | | | |
| 26 | 0.256 | 0.684 | 1.315 | 1.706 | 2.056 | 2.479 | 2.779 | 3.707 |
| 27 | 0.256 | 0.684 | 1.314 | 1.703 | 2.052 | 2.473 | 2.771 | 3.689 |
| 28 | 0.256 | 0.683 | 1.313 | 1.701 | 2.048 | 2.467 | 2.763 | 3.674 |
| 29 | 0.256 | 0.683 | 1.311 | 1.699 | 2.045 | 2.462 | 2.756 | 3.660 |
| 30 | 0.256 | 0.683 | 1.310 | 1.697 | 2.042 | 2.457 | 2.750 | 3.646 |
| | | | | | | | | |
| 40 | 0.255 | 0.681 | 1.303 | 1.684 | 2.021 | 2.423 | 2.704 | 3.551 |
| 60 | 0.254 | 0.679 | 1.296 | 1.671 | 2.000 | 2.390 | 2.660 | 3.460 |
| 120 | 0.254 | 0.677 | 1.289 | 1.658 | 1.980 | 2.358 | 2.617 | 3.373 |
| 1,000,000 | 0.253 | 0.674 | 1.282 | 1.645 | 1.960 | 2.326 | 2.576 | 3.290 |

$F = 1 - \alpha$

**CALCULATION WORKSHEET** Order No. 19116 (01-91)



| | |
|---|---|
| CLIENT RAYMARK OU3 | JOB NUMBER |
| SUBJECT CHECK- UCL CALCULATIONS ARSENIC SOIL | |
| ~~BASED ON~~ CONSTRUCTION SCENARIO | DRAWING NUMBER AREA A2 |
| BY GARY GLENNON | CHECKED BY |
| APPROVED BY | DATE 6/1/98 |

## Interpolation of $H_{0.95}$ Table

$n = 49$ $\quad s = 0.6308$

$n_1 = 31$ $\quad s_1 = 0.60$ $\quad H_1 = 2.010$ $\quad H_2 = 1.946$

$n_2 = 51$ $\quad s_2 = 0.70$ $\quad H_3 = 2.102$ $\quad H_4 = 2.025$

$$\begin{aligned} H_{interpol1} &= (((H_2 - H_1)/(n_2 - n_1)) \times (n - n_1)) + H_1 \\ &= (((1.946 - 2.010)/(51-31)) \times (49-31)) + 2.010 \\ &= 1.9524 \end{aligned}$$

$$\begin{aligned} H_{interpol2} &= (((H_4 - H_3)/(n_2 - n_1)) \times (n - n_1)) + H_3 \\ &= (((2.025 - 2.102)/(51-31)) \times (49-31)) + 2.102 \\ &= 2.0327 \end{aligned}$$

$$H = (((H_{interpol2} - H_{interpol1})/(s_2 - s_1) \times (s - s_1)) + H_{interpol1}$$

## Interpolation of $t$

$df = 48$

$df_1 = 40$ $\quad t_1 = 1.684$

$df_2 = 60$ $\quad t_2 = 1.671$

$$t = t_1 + ((df - df_1)/(df_2 - df_1)) \times (t_2 - t_1)$$

$$= 1.684 + ((48-40)/(60-40)) \times (1.671 - 1.684) = 1.6788$$

**CALCULATION WORKSHEET** Order No. 19116 (01-91)



| CLIENT | | JOB NUMBER | |
|---|---|---|---|
| SUBJECT | | | |
| BASED ON | | DRAWING NUMBER | |
| BY | CHECKED BY | APPROVED BY | DATE |

## Calculation of UCL-NORMAL

$\bar{x} = 6.5184$
$t = 1.6788$
$s = 6.3446$
$n = 49$

$$
\begin{aligned}
UCL\text{-}N &= \bar{x} + t\,(s/\sqrt{n}\,) \\
&= 6.5184 + 1.6788\,(6.3446/\sqrt{49}\,) \\
&= 8.0400
\end{aligned}
$$

## Calculation of UCL-LOGNORMAL

$\bar{x} = 1.6470$
$H = 0.6308$
$s = 0.6308$
$n = 49$

$$
\begin{aligned}
UCL\text{-}LOGNORMAL &= e^{(\bar{x} + 0.5 s^2 + sH/\sqrt{n-1})} \\
&= e^{(1.6470 + 0.5(0.6308)^2 + (0.6308 \times 1.977)/\sqrt{49-1})} \\
&= 7.5834
\end{aligned}
$$

| PARAMETER | UNITS | DETECTS | COUNT | AVERAGE | W NORMAL | W LOGNORMAL | W TEST | DISTRIBUTION | UCL - NORMAL | UCL - LOGNORMAL | DETECTS - MAX | EPC | EPC STAT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,2,3,4,6,7,8-HPCDD | UG/KG | 8 | 23 | 0.3394 | 0.7081 | 0.9674 | 0.9140 | LOGNORMAL | 0.4678 | 5.63E-01 | 1.715 | 0.5627 | 95% UCL-T |
| 1,2,3,4,6,7,8-HPCDF | UG/KG | 9 | 23 | 0.8858 | 0.6220 | 0.9670 | 0.9140 | LOGNORMAL | 1.3735 | 2.22E+00 | 5.193 | 2.2198 | 95% UCL-T |
| 1,2,3,4,7,8,9-HPCDF | UG/KG | 5 | 23 | 0.2314 | 0.8403 | 0.8811 | 0.9140 | UNDEFINED | 0.3184 | 3.70E+00 | 0.105 | 0.105 | Max |
| 1,2,3,4,7,8-HXCDD | UG/KG | 5 | 23 | 0.1771 | 0.8809 | 0.8450 | 0.9140 | UNDEFINED | 0.2408 | 4.81E+00 | 0.0159 | 0.0159 | Max |
| 1,2,3,4,7,8-HXCDF | UG/KG | 10 | 23 | 0.5875 | 0.6197 | 0.9580 | 0.9140 | LOGNORMAL | 0.8757 | 1.40E+00 | 3.78 | 1.399 | 95% UCL-T |
| 1,2,3,6,7,8-HXCDD | UG/KG | 5 | 23 | 0.1797 | 0.8456 | 0.7926 | 0.9140 | UNDEFINED | 0.2398 | 2.74E+00 | 0.0879 | 0.0879 | Max |
| 1,2,3,6,7,8-HXCDF | UG/KG | 7 | 23 | 0.2127 | 0.5110 | 0.8224 | 0.9140 | UNDEFINED | 0.3221 | 9.79E-01 | 1.54 | 0.9785 | 95% UCL-T |
| 1,2,3,7,8,9-HXCDD | UG/KG | 5 | 23 | 0.1759 | 0.8888 | 0.8311 | 0.9140 | UNDEFINED | 0.2348 | 1.95E+00 | 0.0745 | 0.0745 | Max |
| 1,2,3,7,8,9-HXCDF | UG/KG | 2 | 23 | 0.0792 | 0.8882 | 0.8153 | 0.9140 | UNDEFINED | 0.1076 | 2.86E+00 | 0.0098 | 0.0098 | Max |
| 1,2,3,7,8-PECDD | UG/KG | 4 | 23 | 0.1950 | 0.8384 | 0.8012 | 0.9140 | UNDEFINED | 0.2681 | 1.89E+01 | 0.0208 | 0.0208 | Max |
| 1,2,3,7,8-PECDF | UG/KG | 5 | 23 | 0.2798 | 0.5001 | 0.9227 | 0.9140 | LOGNORMAL | 0.4744 | 1.93E+00 | 2.544 | 1.9327 | 95% UCL-T |
| 2,3,4,6,7,8-HXCDF | UG/KG | 10 | 23 | 0.3431 | 0.5170 | 0.9507 | 0.9140 | LOGNORMAL | 0.5368 | 7.79E-01 | 2.656 | 0.7793 | 95% UCL-T |
| 2,3,4,7,8-PECDF | UG/KG | 9 | 23 | 0.4737 | 0.4692 | 0.9798 | 0.9140 | LOGNORMAL | 0.8158 | 1.11E+00 | 4.554 | 1.1098 | 95% UCL-T |
| OCDD | UG/KG | 18 | 23 | 2.8527 | 0.7302 | 0.9487 | 0.9140 | LOGNORMAL | 3.8181 | 4.84E+00 | 12.83 | 4.8395 | 95% UCL-T |
| OCDF | UG/KG | 9 | 23 | 0.6822 | 0.7429 | 0.9598 | 0.9140 | LOGNORMAL | 0.9836 | 1.74E+00 | 3.21 | 1.7395 | 95% UCL-T |
| TOTAL HPCDD | UG/KG | 8 | 23 | 0.4539 | 0.5890 | 0.9683 | 0.9140 | LOGNORMAL | 0.6832 | 7.60E-01 | 3.001 | 0.7597 | 95% UCL-T |
| TOTAL HPCDF | UG/KG | 9 | 23 | 0.9940 | 0.6380 | 0.9693 | 0.9140 | LOGNORMAL | 1.5526 | 2.87E+00 | 8.004 | 2.8698 | 95% UCL-T |
| TOTAL HXCDD | UG/KG | 8 | 23 | 0.3029 | 0.5276 | 0.9451 | 0.9140 | LOGNORMAL | 0.4834 | 5.45E-01 | 2.29 | 0.5454 | 95% UCL-T |
| TOTAL HXCDF | UG/KG | 10 | 22 | 1.4866 | 0.5166 | 0.9080 | 0.9110 | UNDEFINED | 2.6602 | 6.46E+00 | 13.895 | 6.4574 | 95% UCL-T |
| TOTAL PECDD | UG/KG | 7 | 23 | 0.4911 | 0.4889 | 0.8236 | 0.9140 | UNDEFINED | 0.8443 | 1.13E+01 | 4.59 | 4.59 | Max |
| TOTAL PECDF | UG/KG | 11 | 23 | 1.5352 | 0.4068 | 0.8788 | 0.9140 | UNDEFINED | 2.995 | 5.23E+00 | 19.228 | 5.2338 | 95% UCL-T |
| TOTAL TCDD | UG/KG | 4 | 23 | 0.6138 | 0.3858 | 0.8504 | 0.9140 | UNDEFINED | 1.2203 | 5.36E+01 | 0.0049 | 0.0049 | Max |
| TOTAL TCDF | UG/KG | 9 | 23 | 0.8130 | 0.5292 | 0.9617 | 0.9140 | LOGNORMAL | 1.4091 | 4.42E+00 | 8.028 | 4.4188 | 95% UCL-T |
| TOXICITY EQUIVALENCY FACTOR | UG/KG | 19 | 19 | 0.3832 | 0.4961 | 0.9152 | 0.9010 | LOGNORMAL | 0.7256 | 2.11E+01 | 3.682 | 3.682 | Max |
| ASBESTOS | % | 141 | 189 | 5.5576 | 0.4946 | 0.9004 | 0.9870 | UNDEFINED | 6.9457 | 1.57E+01 | 75 | 15.6623 | 95% UCL-T |
| ALUMINUM | MG/KG | 49 | 49 | 9812.2449 | 0.9487 | 0.9872 | 0.9470 | LOGNORMAL | 10448.5274 | 1.06E+04 | 20000 | 10575.1292 | 95% UCL-T |
| ARSENIC | MG/KG | 40 | 49 | 6.5184 | 0.5651 | 0.9705 | 0.9470 | LOGNORMAL | 8.04 | 7.58E+00 | 44.5 | 7.5838 | 95% UCL-T |
| BARIUM | MG/KG | 47 | 49 | 1395.4531 | 0.5656 | 0.8995 | 0.9470 | UNDEFINED | 2037.0647 | 3.18E+03 | 10400 | 3182.4448 | 95% UCL-T |
| BERYLLIUM | MG/KG | 30 | 47 | 0.4130 | 0.9399 | 0.8845 | 0.9460 | UNDEFINED | 0.4698 | 5.34E-01 | 0.92 | 0.5344 | 95% UCL-T |
| CADMIUM | MG/KG | 17 | 49 | 0.6437 | 0.8290 | 0.9543 | 0.9470 | LOGNORMAL | 0.829 | 8.09E-01 | 4.8 | 0.809 | 95% UCL-T |
| CALCIUM | MG/KG | 48 | 49 | 8297.3469 | 0.5853 | 0.8862 | 0.9470 | UNDEFINED | 11370.752 | 1.06E+04 | 54600 | 10571.3754 | 95% UCL-T |
| CHROMIUM | MG/KG | 49 | 49 | 47.5082 | 0.7503 | 0.9142 | 0.9470 | UNDEFINED | 58.0134 | 5.84E+01 | 208 | 58.3866 | 95% UCL-T |
| COBALT | MG/KG | 48 | 49 | 9.0806 | 0.8270 | 0.9704 | 0.9470 | LOGNORMAL | 10.1503 | 1.01E+01 | 25.4 | 10.1011 | 95% UCL-T |
| COPPER | MG/KG | 94 | 138 | 2530.3543 | 0.4542 | 0.9156 | 0.9870 | UNDEFINED | 3375.2132 | 3.59E+03 | 40000 | 3594.3347 | 95% UCL-T |
| IRON | MG/KG | 49 | 49 | 17778.1633 | 0.9357 | 0.9676 | 0.9470 | LOGNORMAL | 19078.4828 | 1.92E+04 | 32300 | 19197.3295 | 95% UCL-T |
| LEAD | MG/KG | 208 | 230 | 1395.5735 | 0.4129 | 0.9300 | 0.9870 | UNDEFINED | 1775.0582 | 1.56E+03 | 24000 | 1559.1762 | 95% UCL-T |
| MAGNESIUM | MG/KG | 49 | 49 | 9394.2857 | 0.6528 | 0.9413 | 0.9470 | UNDEFINED | 11798.4158 | 1.13E+04 | 48900 | 11319.423 | 95% UCL-T |
| MANGANESE | MG/KG | 49 | 49 | 237.8306 | 0.6021 | 0.9211 | 0.9470 | UNDEFINED | 271.566 | 2.60E+02 | 1050 | 259.5142 | 95% UCL-T |
| MERCURY | MG/KG | 21 | 49 | 0.1972 | 0.5173 | 0.8849 | 0.9470 | UNDEFINED | 0.2736 | 2.30E-01 | 1.8 | 0.2298 | 95% UCL-T |
| NICKEL | MG/KG | 49 | 49 | 53.4122 | 0.5719 | 0.9030 | 0.9470 | UNDEFINED | 71.5821 | 6.44E+01 | 369 | 64.3865 | 95% UCL-T |
| POTASSIUM | MG/KG | 47 | 49 | 1547.7755 | 0.9301 | 0.9513 | 0.9470 | LOGNORMAL | 1740.1165 | 1.86E+03 | 3640 | 1859.3216 | 95% UCL-T |
| SELENIUM | MG/KG | 6 | 49 | 0.5501 | 0.8110 | 0.9392 | 0.9470 | UNDEFINED | 0.6489 | 6.72E-01 | 1.7 | 0.6719 | 95% UCL-T |
| SILVER | MG/KG | 7 | 49 | 0.5060 | 0.6340 | 0.8638 | 0.9470 | UNDEFINED | 0.6386 | 5.92E-01 | 2.8 | 0.5915 | 95% UCL-T |
| SODIUM | MG/KG | 25 | 47 | 1662.9149 | 0.4476 | 0.8230 | 0.9460 | UNDEFINED | 2634.412 | 2.02E+03 | 17000 | 2021.2101 | 95% UCL-T |
| THALLIUM | MG/KG | 2 | 48 | 0.5482 | 0.7844 | 0.9409 | 0.9470 | UNDEFINED | 0.6888 | 7.62E-01 | 2.8 | 0.7623 | 95% UCL-T |
| VANADIUM | MG/KG | 49 | 49 | 30.5755 | 0.9856 | 0.7873 | 0.9470 | NORMAL | 33.2274 | 3.66E+01 | 60.8 | 33.2274 | 95% UCL-N |
| ZINC | MG/KG | 49 | 49 | 460.0327 | 0.5866 | 0.9220 | 0.9470 | UNDEFINED | 637.9314 | 6.50E+02 | 3260 | 650.3656 | 95% UCL-T |
| 1,1,2,2-TETRACHLOROETHANE | UG/KG | 1 | 22 | 14.3182 | 0.5247 | 0.7107 | 0.9110 | UNDEFINED | 21.0259 | 1.88E+01 | 33 | 18.8202 | 95% UCL-T |
| 1,2-DICHLOROETHENE (TOTAL) | UG/KG | 2 | 22 | 45.9091 | 0.2793 | 0.5968 | 0.9110 | UNDEFINED | 102.35 | 4.47E+01 | 730 | 44.7311 | 95% UCL-T |
| 2-BUTANONE | UG/KG | 4 | 22 | 22.3409 | 0.7413 | 0.8408 | 0.9110 | UNDEFINED | 30.9668 | 3.69E+01 | 81 | 36.9276 | 95% UCL-T |
| 2-HEXANONE | UG/KG | 1 | 22 | 15.0909 | 0.5493 | 0.7312 | 0.9110 | UNDEFINED | 21.9396 | 2.02E+01 | 14 | 14 | Max |
| 4-METHYL-2-PENTANONE | UG/KG | 4 | 22 | 14.1136 | 0.5590 | 0.8184 | 0.9110 | UNDEFINED | 21.1121 | 2.10E+01 | 8 | 8 | Max |
| ACETONE | UG/KG | 8 | 22 | 154.3864 | 0.5102 | 0.9537 | 0.9110 | LOGNORMAL | 268.2118 | 5.25E+02 | 1400 | 524.993 | 95% UCL-T |
| BENZENE | UG/KG | 2 | 22 | 80.7500 | 0.3248 | 0.6373 | 0.9110 | UNDEFINED | 175.9151 | 9.67E+01 | 1200 | 96.707 | 95% UCL-T |
| CARBON DISULFIDE | UG/KG | 10 | 22 | 29.1136 | 0.5063 | 0.9128 | 0.9110 | LOGNORMAL | 50.0179 | 6.59E+01 | 260 | 65.9093 | 95% UCL-T |
| CHLOROBENZENE | UG/KG | 5 | 22 | 18.7955 | 0.5952 | 0.7470 | 0.9110 | UNDEFINED | 27.9484 | 2.76E+01 | 94 | 27.6455 | 95% UCL-T |
| ETHYLBENZENE | UG/KG | 8 | 22 | 70.4773 | 0.3376 | 0.7092 | 0.9110 | UNDEFINED | 148.414 | 1.05E+02 | 1000 | 104.5508 | 95% UCL-T |
| METHYLENE CHLORIDE | UG/KG | 2 | 22 | 18.6818 | 0.6115 | 0.7861 | 0.9110 | UNDEFINED | 26.9619 | 2.72E+01 | 77 | 27.1889 | 95% UCL-T |
| TOLUENE | UG/KG | 5 | 22 | 94.3409 | 0.3589 | 0.6947 | 0.9110 | UNDEFINED | 197.0783 | 1.56E+02 | 1300 | 156.0274 | 95% UCL-T |
| TRICHLOROETHENE | UG/KG | 2 | 22 | 27.6364 | 0.3474 | 0.6178 | 0.9110 | UNDEFINED | 53.2813 | 3.28E+01 | 330 | 32.8138 | 95% UCL-T |
| VINYL CHLORIDE | UG/KG | 1 | 22 | 15.2045 | 0.5305 | 0.6665 | 0.9110 | UNDEFINED | 22.3537 | 2.03E+01 | 51 | 20.3080 | 95% UCL-T |

3

**TABLE 3**

**VALUES OF $H_{0.95}$ FOR COMPUTING A ONE-SIDED**

**UPPER 95% CONFIDENCE LIMIT ON A LOGNORMAL MEAN**

H interpol1 = 1.9524

n = 49

S1

S = 0.6308

S2

| Sy/n | 3 | 5 | 7 | 10 | 12 | 15 | 21 | 31 | 51 | 101 | 201 | 301 | 401 | 601 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.10 | 2.75 | 2.035 | 1.886 | 1.802 | 1.775 | 1.749 | 1.722 | 1.701 | 1.684 | 1.670 | 1.662 | 1.659 | 1.658 | 1.656 |
| 0.20 | 3.295 | 2.198 | 1.992 | 1.881 | 1.843 | 1.809 | 1.771 | 1.742 | 1.718 | 1.697 | 1.685 | 1.680 | 1.677 | 1.674 |
| 0.30 | 4.109 | 2.402 | 2.125 | 1.977 | 1.927 | 1.882 | 1.833 | 1.793 | 1.761 | 1.733 | 1.716 | 1.709 | 1.705 | 1.700 |
| 0.40 | 5.22 | 2.651 | 2.282 | 2.089 | 2.026 | 1.968 | 1.905 | 1.856 | 1.813 | 1.770 | 1.755 | 1.746 | 1.740 | 1.734 |
| 0.50 | 6.495 | 2.947 | 2.465 | 2.220 | 2.141 | 2.068 | 1.989 | 1.928 | 1.876 | 1.830 | 1.802 | 1.790 | 1.784 | 1.776 |
| 0.60 | 7.807 | 3.287 | 2.673 | 2.368 | 2.271 | 2.181 | 2.085 | $H_1$ 2.010 | $H_2$ 1.946 | 1.891 | 1.857 | 1.843 | 1.835 | 1.825 |
| 0.70 | 9.12 | 3.662 | 2.904 | 2.532 | 2.414 | 2.306 | 2.191 | $H_3$ 2.102 | $H_4$ 2.025 | 1.960 | 1.919 | 1.902 | 1.892 | 1.881 |
| 0.80 | 10.43 | 4.062 | 3.155 | 2.710 | 2.570 | 2.443 | 2.307 | 2.202 | 2.112 | 2.035 | 1.988 | 1.968 | 1.957 | 1.944 |
| 0.90 | 11.74 | 4.478 | 3.420 | 2.902 | 2.738 | 2.589 | 2.432 | 2.310 | 2.206 | 2.117 | 2.062 | 2.040 | 2.027 | 2.012 |
| 1.00 | 13.05 | 4.905 | 3.698 | 3.103 | 2.915 | 2.744 | 2.564 | 2.423 | 2.306 | 2.205 | 2.143 | 2.117 | 2.102 | 2.085 |
| 1.25 | 16.33 | 6.001 | 4.426 | 3.639 | 3.389 | 3.163 | 2.923 | 2.737 | 2.580 | 2.447 | 2.364 | 2.330 | 2.310 | 2.288 |
| 1.50 | 19.6 | 7.12 | 5.184 | 4.207 | 3.896 | 3.612 | 3.311 | 3.077 | 2.881 | 2.713 | 2.609 | 2.566 | 2.542 | 2.514 |
| 1.75 | 22.87 | 8.25 | 5.960 | 4.795 | 4.422 | 4.081 | 3.719 | 3.437 | 3.200 | 2.997 | 2.872 | 2.820 | 2.791 | 2.757 |
| 2.00 | 26.14 | 9.387 | 6.747 | 5.396 | 4.962 | 4.564 | 4.141 | 3.912 | 3.533 | 3.295 | 3.148 | 3.088 | 3.053 | 3.013 |
| 2.50 | 32.69 | 11.673 | 8.339 | 6.621 | 6.067 | 5.557 | 5.013 | 4.588 | 4.228 | 3.920 | 3.729 | 3.650 | 3.605 | 3.553 |
| 3.00 | 39.23 | 13.97 | 9.945 | 7.864 | 7.191 | 6.570 | 5.907 | 5.388 | 4.947 | 4.569 | 4.334 | 4.238 | 4.183 | 4.119 |
| 3.50 | 45.77 | 16.27 | 11.560 | 9.118 | 8.326 | 7.596 | 6.815 | 6.201 | 5.681 | 5.233 | 4.956 | 4.842 | 4.776 | 4.700 |
| 4.00 | 52.31 | 18.58 | 13.180 | 10.380 | 9.469 | 8.630 | 7.731 | 7.024 | 6.424 | 5.908 | 5.588 | 5.456 | 5.380 | 5.293 |
| 4.50 | 58.85 | 20.88 | 14.800 | 11.640 | 10.620 | 9.669 | 8.652 | 7.854 | 7.174 | 6.590 | 6.227 | 6.077 | 5.991 | 5.892 |
| 5.00 | 65.39 | 23.19 | 16.430 | 12.910 | 11.770 | 10.710 | 9.579 | 8.688 | 7.929 | 7.277 | 6.871 | 6.704 | 6.608 | 6.497 |
| 6.00 | 78.47 | 27.81 | 19.680 | 15.450 | 14.080 | 12.810 | 11.440 | 10.360 | 9.449 | 8.661 | 8.170 | 7.968 | 7.852 | 7.718 |
| 7.00 | 91.55 | 32.43 | 22.940 | 18.000 | 16.390 | 14.900 | 13.310 | 12.050 | 10.980 | 10.050 | 9.479 | 9.242 | 9.106 | 8.949 |
| 8.00 | 104.6 | 37.06 | 26.200 | 20.550 | 18.710 | 17.010 | 15.180 | 13.740 | 12.510 | 11.450 | 10.790 | 10.520 | 10.370 | 10.190 |
| 9.00 | 117.7 | 41.68 | 29.460 | 123.100 | 21.030 | 19.110 | 17.050 | 15.430 | 14.050 | 12.850 | 12.110 | 11.810 | 11.630 | 11.430 |
| 10.00 | 130.8 | 46.31 | 32.730 | 25.660 | 23.350 | 21.220 | 18.930 | 17.130 | 15.590 | 14.260 | 13.430 | 13.100 | 12.900 | 12.670 |

Hinterpol2 = 2.0327

**TABLE 4**
**PERCENTILES OF STUDENT's t-DISTRIBUTION WITH n DEGREES OF FREEDOM**

| n\F | 0.60 | 0.75 | 0.90 | 0.95 | 0.975 | 0.99 | 0.995 | 0.9995 |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.325 | 1.000 | 3.078 | 6.314 | 12.706 | 31.821 | 63.656 | 636.578 |
| 2 | 0.289 | 0.816 | 1.886 | 2.920 | 4.303 | 6.965 | 9.925 | 31.600 |
| 3 | 0.277 | 0.765 | 1.638 | 2.353 | 3.182 | 4.541 | 5.841 | 12.924 |
| 4 | 0.271 | 0.741 | 1.533 | 2.132 | 2.776 | 3.747 | 4.604 | 8.610 |
| 5 | 0.267 | 0.727 | 1.476 | 2.015 | 2.571 | 3.365 | 4.032 | 6.869 |
| | | | | | | | | |
| 6 | 0.265 | 0.718 | 1.440 | 1.943 | 2.447 | 3.143 | 3.707 | 5.959 |
| 7 | 0.263 | 0.711 | 1.415 | 1.895 | 2.365 | 2.998 | 3.499 | 5.408 |
| 8 | 0.262 | 0.706 | 1.397 | 1.860 | 2.306 | 2.896 | 3.355 | 5.041 |
| 9 | 0.261 | 0.703 | 1.383 | 1.833 | 2.262 | 2.821 | 3.250 | 4.781 |
| 10 | 0.260 | 0.700 | 1.372 | 1.812 | 2.228 | 2.764 | 3.169 | 4.587 |
| | | | | | | | | |
| 11 | 0.260 | 0.697 | 1.363 | 1.796 | 2.201 | 2.718 | 3.106 | 4.437 |
| 12 | 0.259 | 0.695 | 1.356 | 1.782 | 2.179 | 2.681 | 3.055 | 4.318 |
| 13 | 0.259 | 0.694 | 1.350 | 1.771 | 2.160 | 2.650 | 3.012 | 4.221 |
| 14 | 0.258 | 0.692 | 1.345 | 1.761 | 2.145 | 2.624 | 2.977 | 4.140 |
| 15 | 0.258 | 0.691 | 1.341 | 1.753 | 2.131 | 2.602 | 2.947 | 4.073 |
| | | | | | | | | |
| 16 | 0.258 | 0.690 | 1.337 | 1.746 | 2.120 | 2.583 | 2.921 | 4.015 |
| 17 | 0.257 | 0.689 | 1.333 | 1.740 | 2.110 | 2.567 | 2.898 | 3.965 |
| 18 | 0.257 | 0.688 | 1.330 | 1.734 | 2.101 | 2.552 | 2.878 | 3.922 |
| 19 | 0.257 | 0.688 | 1.328 | 1.729 | 2.093 | 2.539 | 2.861 | 3.883 |
| 20 | 0.257 | 0.687 | 1.325 | 1.725 | 2.086 | 2.528 | 2.845 | 3.850 |
| | | | | | | | | |
| 21 | 0.257 | 0.686 | 1.323 | 1.721 | 2.080 | 2.518 | 2.831 | 3.819 |
| 22 | 0.256 | 0.686 | 1.321 | 1.717 | 2.074 | 2.508 | 2.819 | 3.792 |
| 23 | 0.256 | 0.685 | 1.319 | 1.714 | 2.069 | 2.500 | 2.807 | 3.768 |
| 24 | 0.256 | 0.685 | 1.318 | 1.711 | 2.064 | 2.492 | 2.797 | 3.745 |
| 25 | 0.256 | 0.684 | 1.316 | 1.708 | 2.060 | 2.485 | 2.787 | 3.725 |
| | | | | | | | | |
| 26 | 0.256 | 0.684 | 1.315 | 1.706 | 2.056 | 2.479 | 2.779 | 3.707 |
| 27 | 0.256 | 0.684 | 1.314 | 1.703 | 2.052 | 2.473 | 2.771 | 3.689 |
| 28 | 0.256 | 0.683 | 1.313 | 1.701 | 2.048 | 2.467 | 2.763 | 3.674 |
| 29 | 0.256 | 0.683 | 1.311 | 1.699 | 2.045 | 2.462 | 2.756 | 3.660 |
| 30 | 0.256 | 0.683 | 1.310 | 1.697 | 2.042 | 2.457 | 2.750 | 3.646 |
| | | | | | | | | |
| 40 | 0.255 | 0.681 | 1.303 | 1.684 | 2.021 | 2.423 | 2.704 | 3.551 |
| 60 | 0.254 | 0.679 | 1.296 | 1.671 | 2.000 | 2.390 | 2.660 | 3.460 |
| 120 | 0.254 | 0.677 | 1.289 | 1.658 | 1.980 | 2.358 | 2.617 | 3.373 |
| 1,000,000 | 0.253 | 0.674 | 1.282 | 1.645 | 1.960 | 2.326 | 2.576 | 3.290 |

$df_1$ df=48 $df_2$

$t_1$ $t_2$

F= 1 - α

| GROUP | PARA | NSAMPLE | VAL_RES | QUAL | USE |
|---|---|---|---|---|---|
| a2scn | ARSENIC | DPS3 | 6.1 | | 6.1 |
| a2scn | ARSENIC | DPS6 | 11.3 | | 11.3 |
| a2scn | ARSENIC | FBE+1300 | 4.3 | | 4.3 |
| a2scn | ARSENIC | FBE+400 | 3.8 | | 3.8 |
| a2scn | ARSENIC | OU3-A2-SB01-0608 | 7.6 | U | 3.8 |
| a2scn | ARSENIC | OU3-A2-SB01-1416 | 6.6 | UJ | 3.3 |
| a2scn | ARSENIC | OU3-A2-SB02-0406 | 2.3 | UJ | 1.15 |
| a2scn | ARSENIC | OU3-A2-SB02-1416 | 6.5 | UJ | 3.25 |
| a2scn | ARSENIC | OU3-A2-SB03-0002 | 4.2 | U | 2.1 |
| a2scn | ARSENIC | OU3-A2-SB03-1416 | 8.3 | UJ | 4.15 |
| a2scn | ARSENIC | OU3-A2-SB04-0204 | 5.4 | | 5.4 |
| a2scn | ARSENIC | OU3-A2-SB04A-1214 | 5.6 | | 5.6 |
| a2scn | ARSENIC | OU3-A2-SS01-0002 | 44.5 | | 44.5 |
| a2scn | ARSENIC | OU3-A2-SS01-0204 | 11.1 | | 11.1 |
| a2scn | ARSENIC | OU3-A2-SS02-0002 | 10 | | 10 |
| a2scn | ARSENIC | OU3-A2-SS03-0002 | 12.4 | | 12.4 |
| a2scn | ARSENIC | OU3-A2-SS04-0002 | 4.9 | UJ | 2.45 |
| a2scn | ARSENIC | OU3-A2-SS04-0204 | 7.2 | UJ | 3.6 |
| a2scn | ARSENIC | OU3-A2-SS05-0002 | 10.6 | | 10.6 |
| a2scn | ARSENIC | OU3-A2-SS05-0204 | 4.9 | J | 4.9 |
| a2scn | ARSENIC | SP-SO-MW110D-0002 | 5.1 | | 5.1 |
| a2scn | ARSENIC | SP-SO-MW110D-0406 | 5.4 | | 5.4 |
| a2scn | ARSENIC | SP-SO-MW110D-1012 | 4.9 | | 4.9 |
| a2scn | ARSENIC | SP-SO-MW111D-0810 | 15 | | 15 |
| a2scn | ARSENIC | SP-SO-MW111D-1012 | 8.4 | | 8.4 |
| a2scn | ARSENIC | SP-SO-MW112B-0608 | 5.1 | | 5.1 |
| a2scn | ARSENIC | SP-SO-MW112B-0810 | 5.8 | | 5.8 |
| a2scn | ARSENIC | SP-SO-MW113B-0204 | 6.1 | | 6.1 |
| a2scn | ARSENIC | SP-SO-MW113B-0406 | 5.1 | | 5.1 |
| a2scn | ARSENIC | SP-SO-MW113B-0608 | 4.2 | | 4.2 |
| a2scn | ARSENIC | SP-SO-MW113B-0810 | 5.5 | | 5.5 |
| a2scn | ARSENIC | SP-SO-SB1-0406 | 12.6 | J | 12.6 |
| a2scn | ARSENIC | SP-SO-SB2-0204 | 8.5 | | 8.5 |
| a2scn | ARSENIC | SP-SO-SB3-1416 | 5.7 | | 5.7 |
| a2scn | ARSENIC | SP-SO-SB4-0406 | 5.9 | | 5.9 |
| a2scn | ARSENIC | SP-SO-SB5-1214 | 8.2 | | 8.2 |
| a2scn | ARSENIC | SP-SO-SB6-0608 | 3.5 | | 3.5 |
| a2scn | ARSENIC | SP-SO-SB7-0204 | 5.6 | | 5.6 |
| a2scn | ARSENIC | SP-SO-SB8-0002 | 5.2 | | 5.2 |
| a2scn | ARSENIC | SP-SO-SB8-0204 | 2.8 | | 2.8 |
| a2scn | ARSENIC | SP-SO-SB9-0608 | 5.5 | | 5.5 |
| a2scn | ARSENIC | SP-SO-SB9-0810 | 6.7 | | 6.7 |
| a2scn | ARSENIC | SPDPS-002 | 2.1 | | 2.1 |
| a2scn | ARSENIC | SPDPS001 | 4.3 | J | 4.3 |
| a2scn | ARSENIC | SPEL-003 | 3.8 | | 3.8 |
| a2scn | ARSENIC | SPHMB+100 | 8.3 | | 8.3 |
| a2scn | ARSENIC | SPSCA+390 | 2.2 | | 2.2 |
| a2scn | ARSENIC | SPTS006 | 2.4 | | 2.4 |
| a2scn | ARSENIC | SPVM007 | 3.4 | U | 1.7 |

| PARA | AvgOfUSE | StDevOfUSE |
|---|---|---|
| ARSENIC | 6.51836734693878 | 6.34459000085203 |

# Appendix F.7

## Toxicity Profiles

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## F.7.1 ARSENIC

### F.7.1.1 PHARMACOKINETICS

Several studies confirm that soluble inorganic arsenic compounds and organic arsenic compounds are almost completely (>90 percent) absorbed from the GI tract in both animals and humans (Ishinishi et al. 1986). The absorption efficiency of insoluble inorganic arsenic compounds depends on particle size an stomach pH. Initial distribution of absorbed arsenic is to the liver, kidneys, and lungs, flowed by redistribution to hair, nails, teeth, bone, and skin, which are considered tissues of accumulation. Arsenic has a long half-life in the blood of rats, compared with other animals and humans, because of firm binding to the hemoglobin in erythrocytes.

Metabolism of inorganic arsenic includes reversible oxidation-reduction so that both arsenite (valence of 3) and arsenate (valence of 5) are present in the urine of animals treated with arsenic of either valence (Ishinishi et al. 1986). Arsenite is subsequently oxidized and methylated by a saturable mechanism to form mono- or dimethylarsenate; the latter is the predominant metabolite in the urine of animals or humans. Organic arsenic compounds (arsenilic acid, cacodylic acid) are not readily converted to inorganic arsenic. Excretion of organic or inorganic arsenic is largely via the urine, but considerable species variation exists. Continuously exposed humans appear to excrete 60 to 70 percent of their daily intake of arsenate or arsenite via the urine.

### F.7.1.2 NONCANCER TOXICITY

A lethal dose of arsenic trioxide in humans is 70 to 180 mg. (approximately 50 to 140 mg arsenic; Ishinishi et al. 1986). Acute oral exposure of humans to high doses of arsenic produce liver swelling, skin lesions, disturbed heart function, and neurological effects. The only noncarcer effects in humans clearly attributable to chronic oral exposure to arsenic are dermal hyperpigmentation and keratosis, as revealed by studies of several hundred Chinese exposed to naturally occurring arsenic in well water (Tseng 1977; Tseng et al. 1968; EPA 1998b). Similar effects were observed in persons exposed to high levels of arsenic in water in Utah and the northern part of Mexico (Cebrian et al. 1983; Southwick et al. 1983). Occupational (predominantly inhalation) exposure is also associated with neurological deficits, anemia, and cardiovascular effects (Ishinishi et al. 1986), but concomitant exposure to other chemicals cannot be ruled out. The EPA (1998b) derived an RfD of 0.3 ug/kg/day for chronic oral exposure, based on an NOAEL of 0.8 ug/kg/day for skin lesions from Chinese data. The principal target organ for arsenic appears to be the skin. The nervous system and cardiovascular systems appear to be less significant target organs. Inorganic arsenic may be an essential nutrient, exerting beneficial effects on growth, health, and feed conversion efficiency (Underwood 1977).

### F.7.1.3 CARCINOGENICITY

Inorganic arsenic is clearly a carcinogen in humans. Inhalation exposure is associated with increased risk of lung cancer in persons employed as smelter workers, in arsenical pesticide applicators, and in a population residing near a pesticide manufacturing plant (EPA 1998b). Oral exposure to high levels in well water is associated with increased risk of skin cancer (Tseng 1977; EPA 1998b). Extensive animal testing with various forms of arsenic given by many routes of exposure to several species, however, has not demonstrated the carcinogenicity of arsenic (International Agency for Research on Cancer [IARC 1980). The EPA (1998b) classifies inorganic arsenic in cancer weight-of-evidence Group A (human carcinogen), and recommends an oral unit risk of 0.00005 ug/L in drinking water, based on the incidence of skin cancer in the Tseng (1977) study. The EPA presents a chronic oral slope factor of 1.5 per mg/kg/day based on the same information. The EPA (1998b) notes that the uncertainties associated with the oral unit risk are considerably less than those for most carcinogens, so that the unit risk might be reduced in order of magnitude. An inhalation unit risk of 0.0043 per $mg/m^3$ was derived for inorganic arsenic from the incidence of lung cancer in occupationally exposed men (EPA 1998b), equivalent to 15.1 per mg/kg/day, was derived from the same data assuming an inhalation rate of 20 $m^3$/day and a body weight of 70 kg for humans.

## F.7.2 ASBESTOS

### F.7.2.1 NONCANCER TOXICITY

Data not available at this time.

### F.7.2.2 CARCINOGENICITY

This section provides information on three aspects of the carcinogenic assessment for the substance in question; the weight-of-evidence judgment of the likelihood that the substance is a human carcinogen, and quantitative estimates of risk from oral exposure and from inhalation exposure. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. The rationale and methods used to develop the carcinogenicity information in IRIS are described in The Risk Assessment Guidelines of 1986 (EPA/600/8-87/045) and in the IRIS Background Document. IRIS summaries developed since the publication of EPA's more recent Proposed Guidelines for Carcinogen Risk Assessment also utilize those Guidelines where indicated (Federal Register 61(79):17960-18011, April 23, 1996). Users are referred to the following sections for information on long-term toxic effects other than carcinogenicity.

Weight-Of-Evidence Classification

Classification -- A; human carcinogen

Basis -- Observation of increased mortality and incidence of lung cancer, mesotheliomas and gastrointestinal cancer in occupationally exposed workers are consistent across investigators and study populations. Animal studies by inhalation in two strains of rats showed similar findings for lung cancer and mesotheliomas. Animal evidence for carcinogenicity via ingestion is limited (male rats fed intermediate-range chrysotile fibers; i.e., >10 um length, developed benign polyps), and epidemiologic data in this regard are inadequate.

Human Carcinogenicity Data

Sufficient. Numerous epidemiologic studies have reported an increased incidence of deaths due to cancer, primarily lung cancer and mesotheliomas associated with exposure to inhaled asbestos. Among 170 asbestos insulation workers in North Ireland followed for up to 26 years, an increased incidence of death was seen due to all cancers (SMR=390), cancers of the lower respiratory tract and pleura (SMR=1760) (Elmes and Simpson, 1971) and mesothelioma (7 cases). Exposure was not quantified.

Selikoff (1976) reported 59 cases of lung cancer and 31 cases of mesothelioma among 1249 asbestos insulation workers followed prospectively for 11 years. Exposure was not quantified. A retrospective cohort mortality study (Selikoff et al., 1979) of 17,800 U.S. and Canadian asbestos insulation workers for a 10-year period using best available information (autopsy, surgical, clinical) reported an increased incidence of cancer at all sites (319.7 expected vs. 995 observed, SMR=311) and cancer of the lung (105.6 expected vs. 486 observed, SMR=460). A modest increase in deaths from gastrointestinal cancer was reported along with 175 deaths from mesothelioma (none expected). Years of exposure ranged from less than 10 to greater than or equal to 45. Levels of exposure were not quantified. In other pidemiologic studies, the increase for lung and pleural cancers has ranged from a low of 1.9 times the expected rate, in asbestos factory workers in England (Peto et al., 1977), to a high of 28 times the expected rate, in female asbestos textile workers in England (Newhouse et al., 1972). Other occupational studies have demonstrated asbestos exposure-related increases in lung cancer and mesothelioma in several industries including textile manufacturing, friction products manufacture, asbestos cement products, and in the mining and milling of asbestos. The studies used for the inhalation quantitative estimate of risk are listed in the table in Section II.C.2.

A case-control study (Newhouse and Thompson, 1965) of 83 patients with mesothelioma reported 52.6% had occupational exposure to asbestos or lived with asbestos workers compared with 11.8% of the controls. Of the remaining subjects, 30.6% of the mesothelioma cases lived within one-half mile of an asbestos factory compared with 7.6% of the controls.

The occurrence of pleural mesothelioma has been associated with the presence of asbestos fibers in water, fields and streets in a region of Turkey with very high environmental levels of naturally-occurring asbestos (Baris et al., 1979).

Kanarek et al. (1980) conducted an ecologic study of cancer deaths in 722 census tracts in the San Francisco Bay area, using cancer incidence data from the period of 1969-1971. Chrysotile asbestos concentrations in drinking water ranged from nondetectable to 3.6E+7 fibers/L. Statistically significant dose-related trends were reported for lung and peritoneal cancer in white males and for gall bladder, pancreatic and peritoneal cancer in white females. Weaker correlations were reported between asbestos levels and female esophageal, pleural and kidney cancer, and stomach cancer in both sexes. In an extension of this study, Conforti et al. (1981) included cancer incidence data from the period of 1969-1974. Statistically significant positive associations were found between asbestos concentration and cancer of the digestive organs in white females, cancers of the digestive tract in white males and esophageal, pancreatic and stomach cancer in both sexes. These associations appeared to be independent of socioeconomic status and occupational exposure to asbestos.

Marsh (1983) reviewed eight independent ecologic studies of asbestos in drinking water carried out in five geographic areas. It was concluded that even though one or more studies found an association between asbestos in water and cancer mortality (or incidence) due to neoplasms of various organs, no individual study or aggregation of studies exists that would establish risk levels from ingested asbestos. Factors confounding the results of these studies include the possible underestimates of occupational exposure to asbestos and the possible misclassification of peritioneal mesothelioma as GI cancer.

Polissar et al. (1984) carried out a case-control study which included better control for confounding variables at the individual level. The authors concluded that there was no convincing evidence for increased cancer risk from asbestos ingestion. At the present time, an important limitation of both the case-control and the ecologic studies is the short follow-up time relative to the long latent period for the appearance of tumors from asbestos exposure.

<u>Animal Carcinogenicity Data</u>

*Sufficient.* There have been about 20 animal bioassays of asbestos. Gross et al. (1967) exposed 61 white male rats (strain not reported) to 86 mg chrysotile asbestos dust/cu.m for 30 hours/week for 16 months. Of the 41 animals that survived the exposure period, 10 had lung cancer. No lung cancer was observed in 25 controls.

Reeves (1976) exposed 60-77 rats/group for 4 hours/day, 4 days/week for 2 years to doses of 48.7-50.2 mg/cu.m crocidolite, 48.2-48.6 mg/cu.m amosite and 47.4-47.9 mg/cu.m chrysotile. A 5-14% incidence of lung cancer was observed among concentration groups and was concentration-dependent.

Wagner et al. (1974) exposed CD Wistar rats (19-52/group) to 9.7-14.7 mg/cu.m of several types of asbestos for 1 day to 24 months for 7 hours/day, 5 days/week. A duration-dependent increased incidence of lung carcinomas and mesotheliomas was seen for all types of asbestos after 3 months of exposure compared with controls.

F344 rats (88-250/group) were exposed to intermediate range chrysotile asbestos (1291E+8 f/g) in drinking water by gavage to dams during lactation and then in diet throughout their lifetime (NTP, 1985). A statistically significant increase in incidence of benign epithelial neoplasms (adenomatous polyps in the large intestine) was observed in male rats compared with pooled controls of all NTP oral lifetime studies (3/524). In the same study, rats exposed to short range chrysotile asbestos (6081E+9 f/g) showed no significant increase in tumor incidence.

Ward et al. (1980) administered 10 mg UICC amosite asbestos 3 times/week for 10 weeks by gavage to 50 male F344 rats. The animals were observed for an additional 78-79 weeks post-treatment. A total of 17 colon carcinomas were observed. This result was statistically significant compared with historical controls; no concurrent controls were maintained.

Syrian golden hamsters (126-253/group) were exposed to short and intermediate range chrysotile asbestos at a concentration of 1% in the diet for the lifetime of the animals (NTP, 1983). An increased incidence of neoplasia of the adrenal cortex was observed in both males and females exposed to intermediate range fibers and in males exposed to short range fibers. This increase was statistically significant by comparison to pooledcontrols but not by comparison to concurrent controls. NTP suggested that the biologic importance of adrenal tumors in the absence of target organ (GI tract) neoplasia was questionable.

Quantitative Estimate Of Carcinogenic Risk From Oral Exposure

Not available.

Quantitative Estimate Of Carcinogenic Risk From Inhalation Exposure

**SUMMARY OF RISK ESTIMATES**

Inhalation Unit Risk -- 2.3E-1 per (f/mL)

Extrapolation Method -- Additive risk of lung cancer and mesothelioma, using relative risk model for lung cancer and absolute risk model for mesothelioma.

Air Concentrations at Specified Risk Levels:

| Risk Level | Concentration |
|---|---|
| E-4 (1 in 10,000) | 4E-4 f/mL |
| E-5 (1 in 100,000) | 4E-5 f/mL |
| E-6 (1 in 1,000,000) | 4E-6 f/mL |

Additional Comments (Carcinogenicity, Inhalation Exposure)

Risks have been calculated for males and females according to smoking habits for a variety of exposure scenarios (U.S. EPA, 1986). The unit risk value is calculated for the additive combined risk of lung cancer and mesothelioma, and is calculated as a composite value for males and females. The epidemiological data show that cigarette smoking and asbestos exposure interact synergistically for production of lung cancer and do not interact with regard to mesothelioma. The unit risk value is based on risks calculated using U.S. general population cancer rates and mortality patterns without consideration of smoking habits. The risks associated with occupational exposure were adjusted to continuous exposure by applying a factor of 140 cu.m/50 cu.m based on the assumption of 20 cu.m/day for total ventilation and 10 cu.m/8-hour workday in the occupational setting.

The unit risk is based on fiber counts made by phase contrast microscopy (PCM) and should not be applied directly to measurements made by other analytical techniques. The unit risk uses PCM fibers because the measurements made in the occupational environment use this method. Many environmental monitoring measurements are reported in terms of fiber counts or mass as determined by transmission electron microscopy (TEM). PCM detects only fibers longer than 5 um and >0.4 um in diameter, while TEM can detect much smaller fibers. TEM mass units are derived from TEM fiber counts. The correlation between PCM fiber counts and TEM mass measurements is very poor. Six data sets which include both measurements show a conversion between TEM mass and PCM fiber count that range from 5-150 (ug/cu.m)/(f/mL). The geometric mean of these results, 30 (ug/cu.m)/(f/mL), was adopted as a conversion factor (U.S. EPA, 1986), but it should be realized that this value is highly uncertain. Likewise, the correlation between PCM fiber counts and TEM fiber counts is very uncertain and no generally applicable conversion factor exists for these two measurements.

In some cases TEM results are reported as numbers of fibers <5 um long and of fibers longer than 5 um. Comparison of PCM fiber counts and TEM counts of fibers >5 um show that the fraction of fibers detected by TEM that are also >0.4 um in diameter (and detectable by PCM) varies from 22-53% (U.S. EPA, 1986).

It should be understood that while TEM can be specific for asbestos, PCM is a nonspecific technique and will measure any fibrous material. Measurements by PCM which are made in conditions where other types of fibers may be present may not be reliable.

In addition to the studies cited above, there were three studies of asbestos workers in mining and milling which showed an increase in lung cancer (McDonald et al., 1980, Nicholson et al., 1979; Rubino et al., 1979). The slope factor calculated from these studies was lower than the other studies, possibly because of a substantially different fiber size distribution, and they were not included in the calculation. The slope factor was calculated by life table methods for lung cancer using a relative risk model, and for mesothelioma using a absolute risk model. The final slope factor for lung cancer was calculated as the weighted geometric mean of estimates from the 11 studies cited in section II.C.2. The final slope factor for mesothelioma is based on the calculated values from the studies of Selikoff et al. (1979), Peto et al. (1982), Seidman et al. (1979), Peto (1980) and Finkelstein (1983) adjusted for the mesothelioma incidence from several additional studies cited previously.

There is some evidence which suggests that the different types of asbestos fibers vary in carcinogenic potency relative to one another and site specificity. It appears, for example, that the risk of mesothelioma is greater with exposure to crocidolite than with amosite or chrysotile exposure alone. This evidence is limited by the lack of information on fiber exposure by mineral type. Other data indicates that differences in fiber size distribution and other process differences may contribute at least as much to the observed variation in risk as does the fiber type itself.

The unit risk should not be used if the air concentration exceeds 4E-2 fibers/ml, since above this concentration the slope factor may differ from that stated.

Discussion Of Confidence (Carcinogenicity, Inhalation Exposure)

A large number of studies of occupationally-exposed workers have conclusively demonstrated the relationship between asbestos exposure and lung cancer or mesothelioma. These results have been corroborated by animal studies using adequate numbers of animals. The quantitative estimate is limited by uncertainty in the exposure estimates, which results from a lack of data on early exposure in the occupational studies and the uncertainty of conversions between various analytical measurements for asbestos.

## F.7.3 BARIUM

### F.7.3.1 NONCANCER TOXICITY

Barium is a naturally occurring alkaline earth metal that comprises approximately 0.04 percent of the earth's crust (Reeves 1986a). Acute oral toxicity was manifested by GI upset, altered cardiac performance, and transient hypertension, convulsions, and muscular paralysis. Repeated oral exposures were associated with hypertension. Occupational exposure to insoluble barium sulfate induced benign pneumoconiosis (ACGIH 1991). The EPA (1997) presented a verified chronic oral RfD of 0.07 mg/kg/day, based on an NOAEL of 0.21 mg/kg/day in a ten-week study in humans exposed to barium in drinking water and an uncertainty factor of 3. The EPA (1997) presented the same value as a provisional RfD for subchronic oral exposure. A provisional chronic inhalation RfC of 0.0005 $mg/m^3$ and a provisional subchronic inhalation RfC of 0.005 $mg/m^3$ were based on an NOEL for fetotoxicity in a four-month intermittent-exposure inhalation study in rats (EPA 1997). Uncertainty factors of 1000 and 100 were used for the chronic and subchronic RfC values, respectively. The chronic and subchronic inhalation RfC values are equivalent to 0.0001 and 0.001 mg/kg/day, assuming a human inhalation rate of 20 $m^3$/day and body weight of 70 kg. Barium is principally a muscle toxin. Its targets are the GI system, skeletal muscle, the cardiovascular system, and the fetus.

### F.7.3.2 CARCINOGENICITY

The EPA (1997) classifies barium as a cancer weight-of-evidence Group D substance (not classifiable as to carcinogenicity in humans). Cancer risk is not estimated for Group D substances.

## F.7.4 BENZO[A]ANTHRACENE

### F.7.4.1 NONCANCER TOXICITY

The oral and inhalation RfD and RfC are not available at this time (EPA 1998).

### F.7.4.2 CARCINOGENICITY

Benzo[a]anthracene has a weight of evidence classification of B2, a probable human carcinogen. The classification was based on sufficient data from animal bioassays. Benzo[a]anthracene produced tumors in mice exposed by gavage; intraperitoneal, subcutaneous or intramuscular injection; and topical application. Benzo[a]anthracene produced mutations in bacteria and in mammalian cells, and transformed mammalian cells in culture.

Although there are no human data that specifically link exposure to benzo[a]anthracene to human cancers, benzo[a]anthracene is a component of mixtures that have been associated with human cancer. These include coal tar, soot, coke oven emissions and cigarette smoke (U.S. EPA, 1984, 1990; IARC, 1984; Lee et al., 1976; Brockhaus and Tomingas, 1976).

Benzo[a]anthracene administration caused an increase in the incidence of tumors by gavage (Klein, 1963); dermal application (IARC, 1973); and both subcutaneous injection (Steiner and Faulk, 1951; Steiner and Edgecomb, 1952) and intraperitoneal injection (Wislocki et al., 1986) assays. A group of male mice was exposed to gavage solutions containing 3% benzo[a]anthracene for 5 weeks. There was an increased incidence of pulmonary adenomas and hepatomas.

Supporting data for carcinogenicity include genetic mutations in five different strains of Salmonella typhimurium. Benzo[a]anthracene produced positive results in an assay for mutations in Drosophila melongaster (Fahmy and Fahmy, 1973).

The currently used Oral Slope Factor (CSF) for Benzo[a]anthracene is 7.3E-01 per (mg/kg)/day which is extrapolated from the CSF for Benzo[a]pyrene (BaP), i.e., 0.1 x 7.3 (BaP) = 7.3E-01 per (mg/kg)/day (USEPA Region III Risk-Based Concentration Table, 4/1/98).

The inhalation CSF is not available.

## F.7.5 BENZO [A]PYRENE (BAP)

### F.7.5.1 PHARMACOKINETICS

Benzo (a)pyrene was readily absorbed across the GI (Rees et al. 1971) and respiratory epithelia (Kotin et al. 1969; Vainich et al. 1976). Benzo (a)pyrene was distributed widely in the tissues of treated rats and mice, but primarily to tissues high in fat, such as adipose tissue and mammary gland (Kotin et al. 1969; Schlede et al. 1970a).

Studies of the metabolism of benzo(a)pyrene provide information relevant to other PAHs because of the structural similarities of all members of the class. Metabolism involves microsomal mixed function oxidase hydroxylation of one or more of the phenyl rings with the formation of phenols and dihydrodiols, probably via formation of arene oxide intermediates (EPA 1979a). The dihydrodiols may be further oxidized to diol epoxides, which, for certain members of the class, are known to be the ultimate carcinogens (LaVoie et al. 1982). Conjugation with glutathione or glucuronic acid, and reduction to tetrahydrotetrols are important detoxification pathways.

Excretion of benzo(a)pyrene residue was reported to be rapid, although quantitative data were not located (EPA 1979b). Excretion occurred mainly via the feces, probably largely due to biliary secretion (Schlede et al. 1970a, 1970b). The EPA (1980a) concluded that accumulation in the body tissues of PAHs from chronic low level exposure would be unlikely.

### F.7.5.2 NONCANCER TOXICITY

The oral RfD and inhalation RfC are not available at this time.

### F.7.5.3 CARCINOGENICITY

The PAHs are ubiquitous, being released to the environment from anthropogenic as well as from natural sources (ATSDR 1987). Benzo (a)pyrene is the most extensively studied member of the class, inducing tumors in multiple tissues of virtually all laboratory species tested by all routes of exposure. Although epidemiology studies suggested that complex mixtures that contain PAHs (coal tar, soots, coke oven emissions, cigarette smoke) are carcinogenic to humans (EPA 1994), the carcinogenicity cannot be attributed to PAHs alone because of the presence of other potentially carcinogenic substances in these mixtures (ATSDR 1987). In addition, recent investigations showed that the PAH fraction of roofing tar, cigarette smoke, and coke oven emissions accounted for only 0.1 to 8 percent of the total mutagenic activity of the unfractionated complex mixture in Salmonella (Lewtas 1988). Aromatic amines, nitrogen heterocyclic compounds, highly oxygenated quinones, diones, and nitrooxygenated compounds, none of which would be expected to arise from in vivo metabolism of PAHs, probably accounted for the majority of the mutagenicity of coke oven emissions and cigarette smoke. Coal tar, which contains a mixture of many PAHs, has a long history of use in the clinical treatment of a variety of skin disorders in humans (ATSDR 1987).

Because of the lack of human cancer data, assignment of individual PAHs to EPA cancer weight-of-evidence groups was based largely on the results of animal studies with large doses of purified compound (EPA 1994). Frequently, unnatural routes of exposure, including implants of the test chemical in beeswax and trioctanoin in the lungs of female Osborne-Mendel rats, intratracheal instillation, and subcutaneous or intraperitoneal injection, were used. Benzo (a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene were classified in Group B2 (probable human carcinogens).

The EPA (1998) verified a slope factor for oral exposure to benzo(a)pyrene of 7.3 per mg/kg/day, based on several dietary studies in mice and rats. Neither verified nor provisional quantitative risk estimates were available for the other PAHs in Group B2. The EPA (1980) promulgated an ambient water quality criterion for "total carcinogenic PAHs," based on an oral slope factor derived from a study with benzo(a)pyrene, as being sufficiently protective for the class. Largely because of this precedent, the quantitative risk estimates for benzo(a)pyrene were adopted for the other carcinogenic PAHs when quantitative estimates were needed.

Human data specifically linking benzo[a]pyrene (BAP) to a carcinogenic effect are lacking. There are, however, multiple animal studies in many species demonstrating BAP to be carcinogenic following administration by numerous routes. In addition, BAP has produced positive results in numerous genotoxicity assays.

The data for animal carcinogenicity was sufficient. The animal data consist of dietary, gavage, inhalation, intratracheal instillation, dermal and subcutaneous studies in numerous strains of at least four species of rodents and several primates. Repeated BAP administration has been associated with increased incidences of total tumors and of tumors at the site of exposure. The tumor types in mice from oral diet studies include forestomach, squamous cell papillomas and carcinomas (Neal and Rigdon 1967).

Benzo [a]pyrene has been shown to cause genotoxic effects in a broad range of prokaryotic and mammalian cell assay systems (EPA 1991a).

The oral slope factor presented in the Region III Risk-Based Concentration Table is 7.3E+0 per mg/kg/day. The cancer slope factor for inhalation is not available.

## F.7.6 BENZO(B)FLUORANTNENE

### F.7.6.1 NONCANCER TOXICITY

Little information is available on benzo(b)fluoranthene. However based on the similarities of chemical structures, most properties should be similar to benzo(a)pyrene.

### F.7.6.2 CARCINOGENICITY

A Toxicity Equivalency Factor (TEF) has been developed (EPA, 1993) for benzo(b)fluoranthene which allows the estimation of an oral CSF of 0.73 mg/g/day. The EPA (1998b) has classified benzo(b)fluoranthene in cancer weight-of-evidence Group B2 (Probable Human Carcinogen, sufficient evidence of carcinogenicity in animals with inadequate or lack of evidence in humans) based on lung tumors in mice.

## F.7.7 COPPER

### F.7.7.1 NONCANCER TOXICITY

Copper is a nutritionally essential element that functions as a cofactor in several enzyme systems (Aaseth and Norseth 1986). Acute exposure to large oral doses of copper salts was associated with GI disturbances, hemolysis, and liver and kidney lesions. Chronic oral toxicity in humans has not been reported. Chronic oral exposure of animals was associated with an iron-deficiency type of anemia, hemolysis, and lesions in the liver and kidneys. Occupational exposure may induce metal fume fever, and, in cases of chronic exposure to high levels, hemolysis and anemia (ACGIH 1991). Neither oral nor inhalation RfD or RfC values were located for copper. The target organs for copper are the erythrocyte, liver, and kidney, and, for inhalation exposure, the lung. An oral RfD of 0.04 mg/kg/day was presented for copper (EPA, 1997). A RfC value was not located for copper.

### F.7.7.2 CARCINOGENICITY

Copper is classified in cancer weight-of-evidence Group D (not classifiable as to carcinogenicity to humans) (EPA 1997). Quantitative risk estimates are not derived for Group D chemicals.

## F.7.8 DIBENZO[A,H]ANTHRACENE

### F.7.8.1 NONCANCER TOXICITY

The oral RfD and inhalation RfC are not available.

### F.7.8.2 CARCINOGENICITY

Classification -- B2; probable human carcinogen

The EPA (1997) has classified dibenzo(a,h)anthracene in cancer weight-of-evidence group B2 (Probable Human Carcinogen, sufficient evidence of carcinogenicity in animals). Based on carcinomas in mice following oral or dermal exposure and injection site tumors in several species following subcutaneous or intramuscular administration. Dibenzo[a,h]anthracene has induced DNA damage and gene mutations in bacteria as well as gene mutations and transformation in several types of mammalian cell cultures.

Although there are no human data that specifically link exposure to dibenzo[a,h]anthracene with human cancers, dibenzo[a]anthracene is a component of mixtures that have been associated with human cancer. These include coal tar, soot, coke oven emissions and cigarette smoke (EPA, 1984, 1990; IARC, 1984).

Dibenzo[a,h]anthracene has been shown to be carcinogenic when administered to mice by the oral route (Snell and Stewart, 1962, 1963) in a water-olive oil emulsion. Mice developed pulmonary adenomas, pulmonary carcinomas, and mammary carcinomas.

Dibenzo[a,h]anthracene has produced positive results in bacterial DNA damage and mutagenicity assays and in mammalian cell DNA damage, mutagenicity and cell transformation assays.

The currently used Oral Slope Factor (CSF) for Dibenzo[a,h]anthracene is 7.3E+00 per (mg/kg)/day which is extrapolated from the CSF for Benzo[a]pyrene i.e., 1.0 x 7.3 (BaP) = 7.3 per (mg/kg)/day) (USEPA Region III Risk-Based Concentration Table, 4/1/98).

The inhalation Cancer Slope Factor for dibenzo(a,h)anthracene is not available.

## F.7.9 1,1-DICHLOROETHENE

### F.7.9.1 NONCANCER TOXICITY

Chronic oral exposure of laboratory animals to 1,1-dichloroethene induced liver effects (EPA 1998b). In animals, inhalation exposure induced degenerative changes in the liver and kidneys (ATSDR 1989b). No health effects were observed in a limited study of 138 exposed workers (ACGIH 1986). The EPA (1998b) presented a verified RfD for chronic oral exposure of 0.009 mg/kg/day, based on an NOAEL for liver effects in a chronic drinking water study in rats and an uncertainty factor of 1000. The EPA (1998b) presented the same value a s a provisional subchronic oral RfD. The liver and kidneys are the target organs for exposure to 1,1-dichloroethene.

### F.7.9.2 CARCINOGENICITY

EPA classifieds 1,1-dichloroethene as a cancer weight-of-evidence Group C compound (possible human carcinogen), based on an inadequate occupational exposure cancer study, limited data in several animal studies, its mutagenicity and ability to alkylate deoxyribonucleic acid (DNA), and its structural similarity to vinyl chloride, a known human carcinogen (EPA 1998b). The eighteen available animal studies (11 by inhalation exposure, 5 by oral exposure, and 1 each by dermal application and subcutaneous injection) were limited in sensitivity by various deficiencies in design. Credible evidence that1,1-dichlorethene was a complete carcinogen was provide only by one 12-month inhalation study in mice, in which the incidence of kidney adenocarcinomas was significantly greater in the high-dose males than in the control males. A slope factor of 0.6 per mg/kg/day for oral exposure was based on the increase incidence of adrenal pheochromocytomas in male rats treated by gavage for two years, even though the increase was not statistically significant (EPA, 1998b). A unit risk for inhalation exposure of 5.0E-05 per $mg/m^3$ was based on the incidence of kidney adenocarcinomas in male mice in the inhalation study mentioned above (EPA, 1998b). The unit risk is equivalent to 0.175 per mg/kg/day, assuming humans inhale 20 $m^3$ of air/day and weight 70 kg.

## F.7.10 DIELDRIN

### F.7.10.1 NONCANCER TOXICITY

The EPA (1998) derived a RfD of $5 \times 10^{-5}$ mg/kg/day for chronic oral exposure based on a NOAEL of 0.005 mg/kg/day for liver lesions in a two-year rat feeding study (Walker et al., 1969) with an uncertainty factor of 100. The LOAEL was identified as 0.05 mg/kg/day.

At the end of two years the rats had increased liver weights and histopathological examinations revealed liver parenchymal cell changes. These hepatic lesions were considered to be characteristic of exposure to an organochlorine insecticide.

The chronic inhalation RfC is not available at this time.

### F.7.10.2 CARCINOGENICITY

EPA (1997) classifies dieldrin in cancer weight-of-evidence B2. Dieldrin is carcinogenic in seven strains of mice when administered orally. Dieldrin is structurally related to compounds (aldrin, chlordane, heptachlor, heptachlor epoxide, and chlorendic acid) which produce tumors in rodents.

Human carcinogenicity data is considered inadequate. Two studies of workers exposed to aldrin and to dieldrin reported no increased incidence of cancer. Both studies were limited in their ability to detect an excess of cancer deaths.

Animal carcinogenicity data was sufficient. Dieldrin has been shown to be carcinogenic in various strains of mice of both sexes. At different dose levels the effects range from benign liver tumors, to hepatocarcinomas with transplantation confirmation, to pulmonary metastases.

Supporting data for carcinogenicty include genotoxicity tests. Dieldrin causes chromosomal aberrations in mouse cells (Markaryan, 1966; Majumdar et al., 1976) and in human lymphoblastoid cells (Trepanier et al., 1977), mutation in Chinese hamster cells (Ahmed et al., 1977), and unscheduled DNA synthesis in rat (Probst et al., 1981) and human cells (Rocchi et al., 1980).

EPA (1998) reports an Oral Slope Factor of 16 per (mg/kg)/day based on a diet study in mice which produced liver carcinomas.

This inhalation cancer slope factor of 16 per mg/kg/day was calculated from the oral slope factor.

## F.7.11 DIOXINS

Specific congeners and homologues of these classes of interest at this site include 1,2,3,4,6,7,8-heptachlorodibenzofuran and -heptachlorodibenzo-p-dioxin; 1,2,3,4,7,8,9-heptachlorodibenzofuran and -heptachlorodibenzo-p-dioxin; 1,2,3,4,7,8-hexachlorodibenzofuran and -hexachlorodibenzo-p-dioxin; 1,2,3,6,7,8- and 2,3,4,6,7,8-hexachlorodibenzofuran; 1,2,3,7,8,9-hexachlorodibenzofuran and -hexachlorodibenzo-p-dioxin; 1,2,3,6,7,8-hexachlorodibenzo-p-dioxin; unspecified hexachlorodibenzofurans and dibenzo-p-dioxins; 1,2,3,7,8- and 2,3,4,7,8-pentachlorodibenzofuran; unspecified pentachlorodibenzofurans; 2,3,7,8-tetrachlorodibenzofuran; and unspecified tetrachlorodibenzofurans.

### F.7.11.1 NONCANCER TOXICITY

Of the members of these classes, the toxicity of 2,3,7,8-TCDD has been studied most extensively. The only effect in humans clearly attributable to 2,3,7,8-TCDD was chloracne (ATSDR 1989e). The data, however, also associated exposure to 2,3,7,8-TCDD with hepatotoxicity and neurotoxicity in humans. In animals, toxicity of 2,3,7,8-TCDD is most commonly manifested as a wasting syndrome with thymic atrophy, terminating in death, with a large number of organ systems showing nonspecific effects. Chronic treatment of animals with 2,3,7,8-TCDD or a mixture of two isomers of hexachlorodibenzo-p-dioxin resulted in liver damage. Immunologic effects may be among the more sensitive endpoints of exposure to the PCDDs in animals. In animals 2,3,7,8-TCDD is a developmental and reproductive toxicant. No verified or provisional noncancer toxicity values were located for any of the chemicals of interest in these classes (EPA 1994, 1992b).

### F.7.11.3 CARCINOGENICITY

Data regarding the carcinogenicity of 2,3,7,8-TCDD to humans, obtained from epidemiologic studies of workers exposed to pesticides or to other chlorinated chemicals known to be contaminated with 2,3,7,8-TCDD, are conflicting (ATSDR 1989e). The interpretation of these studies is not clear because exposure to 2,3,7,8-TCDD was not quantified, multiple routes of exposure (dermal, inhalation, oral) were involved, and the workers were exposed to other potentially carcinogenic compounds. In animals, however, 2,3,7,8-TCDD is clearly carcinogenic, inducing thyroid, lung, and liver tumors in orally treated rats and mice (EPA 1985). Similarly, oral treatment with a mixture of two hexachlorodibenzo-p-dioxin isomers induced liver tumors in rats and mice. On the basis of the animal data, 2,3,7,8-TCDD and the hexachlorodibenzo-p-dioxins were assigned to EPA cancer weight-of-evidence Group B2 (probable human carcinogen). Although the other PCDDs and PCDFs were not formally classified as to carcinogenicity to humans, for regulatory purposes they are treated as probable human carcinogens.

The EPA (1993b) presents provisional oral and inhalation slope factors for 2,3,7,8-TCDD of 150,000 per mg/kg/day, based on the incidence of liver and lung tumors in an oral study in rats (Kociba et al. 1978).

Much less is known about the toxicity of other CDD and CDF congeners. Based on available toxicity data, EPA has developed a method for expressing toxicities of these compounds in terms of equivalent amounts of 2,3,7,8-TCDD. "Toxicity equivalency factors", or TEFs, are used to convert the concentration of a given CDD/CDF into an equivalent concentration of 2,3,7,8-TCDD.

## F.7.12 HEPTACHLOR EPOXIDE (CLEMENT, 1985)

### F.7.12.1 HEALTH EFFECTS

Heptachlor epoxide is a liver carcinogens when administered orally to mice. Results from mutagenicity bioassays suggest that this compound also may have genotoxic activity. Reproductive and teratogenic effects in rats include decreased litter size, shortened life span of suckling rats, and development of cataracts in offspring.

Tests with laboratory animals, primarily rodents, demonstrate acute and chronic toxic effects due to heptachlor exposure. Although heptachlor epoxide is absorbed most readily through the gastrointestinal tract, inhalation and skin contact are also potential routes of exposure. Acute exposure by various routes can cause development of hepatic vein thrombi and can effect the central nervous system and cause death. Chronic exposure induces liver changes, affects hepatic microsomal enzyme activity, and causes increased mortality in offspring. The oral $LD_{50}$ for heptachlor epoxide in the rat is 47 mg/kg.

Although there are reports of acute and chronic toxicity in humans, with symptoms including tremors, convulsions, kidney damage, respiratory collapse, and death, details of such episodes are not well documented. Heptachlor epoxide has been found in a high percentage of human adipose tissue samples, and also in human milk samples and biomagnification of heptachlor epoxide occurs. This compound also has been found in the tissues of stillborn infants, suggesting an ability to cross the placenta and bioaccumulate in the fetus.

The oral RfD for heptachlor epoxide is 1.30E-05 mg/kg-day based on increased liver to weight ratios in male and female dogs. Heptachlor epoxide is classified as a B2 carcinogen oral CSF for heptachlor epoxide is 9.1 per mg/kg-day based on an increased incidence of liver carcinomas. The inhalation CSF for heptachlor epoxide is 9.1 per mg/kg-day.

## F.7.13 INDENO(1,2,3-CD)PYRENE

### F.7.13.1 NONCANCER TOXICITY

Little information was found on the toxicity of indeno(1,2,3-cd)pyrene. Because of its structural similarity its properties should resemble benzo(a)pyrene.

### F.7.13.2 CARCINOGENICITY

A Toxicity Equivalency Factor (TEF) has been developed for indeno(1,2,3-cd)pyrene (EPA 1993). This allows the estimation of an oral CSF of 0.73 mg/kg/day. The EPA (1998b) has classified indeno(1,2,3-cd)pyrene in cancer weight-of-evidence Group B2 (Probable Human Carcinogen, sufficient evidence of carcinogenicity in animals with inadequate or lack of evidence in humans) based on tumors in mice following lung implants.

## F.7.14 LEAD

### F.7.14.1 PHARMACOKINETICS

Studies in humans indicate that an average of 10 percent of ingested lead is absorbed, but estimates as high as 40 percent were obtained in some individuals (Tsuchiya, 1986). Nutritional factors have a profound effect on GI absorption efficiency. Children absorb ingested lead more efficiently than adults; absorption efficiencies up to 53 percent were recorded for children three months to eight years of age. Similar results were obtained for laboratory animals; absorption efficiencies of 5 to 10 percent were obtained for adults and > 50 percent were obtained for young animals. The deposition rate of inhaled lead averages approximately 30 to 50 percent, depending on particle size, with as much as 60 percent deposition of very small particles (0.03 mm) near highways. All lead deposited in the lungs is eventually absorbed.

Approximately 95 percent of the lead in the blood is located in the erythrocytes (EPA, 1998). Lead in the plasma exchanges with several body compartments, including the internal organs, bone, and several excretory pathways. In humans, lead concentrations in bone increase with age (Tsuchiya, 1986). About 90 percent of the body burden of lead is located in the skeleton. Neonatal blood concentrations are about 85 percent of maternal concentrations (EPA, 1998). Excretion of absorbed lead is principally through the urine, although GI secretion, biliary excretion, and loss through hair, nails, and sweat are also significant.

### F.7.14.2 NONCANCER TOXICITY

The noncancer toxicity of lead to humans has been well characterized through decades of medical observation and scientific research (EPA, 1990). The principal effects of acute oral exposure are colic with diffuse paroxysmal abdominal pain (probably due to vagal irritation), anemia, and, in severe cases, acute encephalopathy, particularly in children (Tsuchiya, 1986). The primary effects of long-term exposure are neurological and hematological. Limited occupational data indicate that long-term exposure to lead may induce kidney damage. The principal target organs of lead toxicity are the erythrocyte and the nervous system. Some of the effects on the blood, particularly changes in levels of certain blood enzymes, and subtle neurobehavioral changes in children, appear to occur at levels so low as to be considered nonthreshold effects.

The USEPA (1990; July 1995) determined that it is inappropriate to derive an RfD for oral exposure to lead for several reasons. First, the use of an RfD assumes that a threshold for toxicity exists, below which adverse effects are not expected to occur; however, the most sensitive effects of lead exposure, impaired neurobehavioral development in children and altered blood enzyme levels associated with anemia, may occur at blood lead concentrations so low as to be considered practically nonthreshold in nature. Second, RfD values are specific for the route of exposure for which they are derived. Lead, however, is ubiquitous, so that exposure occurs from virtually all media and by all pathways simultaneously, making it practically impossible to quantify the contribution to blood lead from any one route of exposure. Finally, the dose-response relationships common to many toxicants, and upon which derivation of an RfD is based, do not hold true for lead. This is because the fate of lead within the body depends, in part, on the amount and rate of previous exposures, the age of the recipient, and the rate of exposure. There is, however, a reasonably good correlation between blood lead concentration and effect. Therefore, blood lead concentration is the appropriate parameter on which to base the regulation of lead.

USEPA (1997) presented no inhalation RfC for lead, but referred to the National Ambient Air Quality Standard (NAAQS) for lead, which could be used in lieu of an inhalation RfC. The NAAQSs are based solely on human health considerations and are designed to protect the most sensitive subgroup of the human population. The NAAQS for lead is 1.5 mg/m$^3$, averaged quarterly.

### F.7.14.3 CARCINOGENICITY

USEPA (February 1998) classifies lead in cancer weight-of-evidence Group B2 (probable human carcinogen), based on inadequate evidence of cancer in humans and sufficient animal evidence. The human data consist of several epidemiologic occupational studies that yielded confusing results. All of the studies lacked quantitative exposure data and failed to control for smoking and concomitant exposure to other possibly carcinogenic metals. Rat and mouse bioassays showed statistically significant increases in renal tumors following dietary and subcutaneous exposure to several soluble lead salts. Various lead compounds were observed to induce chromosomal alterations in vivo and in vitro, sister chromatic exchange in exposed workers, and cell transformation in Syrian hamster embryo cells; to enhance simian adenovirus induction; and to alter molecular processes that regulate gene expression. USEPA (July 1997) declined to estimate risk for oral exposure to lead because many factors (e.g., age, general health, nutritional status, existing body burden and duration of exposure) influence the bioavailability of ingested lead, introducing a great deal of uncertainty into any estimate of risk.

The USEPA IEUBK lead model is an iterated set of equations that estimate blood lead concentration in children aged 0 to 7 years (USEPA, February 1994). The biokinetic part of the model describes the movement of lead between the plasma and several body compartments and estimates the resultant blood lead concentration. The rate of the movement of lead between the plasma and each compartment is a function of the transition or residence time (i.e., the mean time for lead to leave the plasma and enter a given compartment, or the mean residence time for lead in that compartment). Compartments modeled include the erythrocytes, liver, kidneys, all the other soft tissue of the body, cortical bone, and trabecular bone. Excretory pathways and their rates are also modeled. These include the mean time for excretion from the plasma to the urine, from the liver to the bile, and from the other soft tissues to the hair, skin, sweat, etc. The model permits the user to adjust the transition and residence times.

USEPA guidance (USEPA, July 1994) recommends using 400 mg/kg as a screening level for lead in soil for residential scenarios at CERCLA sties and at RCRA Corrective Action sites. Residential areas with soil lead below 400 mg/kg generally require no further action. However, in some special situations, further study is warranted below the screening level (e.g., wetlands, agricultural areas).

### F.7.15 POLYAROMATIC HYDROCARBONS

PAHs are a large class of ubiquitous natural and anthropogenic chemicals, all with similar chemical structures (ATSDR 1990).

#### F.7.15.1 PHARMACOKINETICS

Although quantitative absorption data for the PAHs were not located, benzo(a)pyrene was readily absorbed across the GI (Rees et al. 1971) and respiratory epithelia (Kotin et al. 1969; Vainich et al. 1976). The high lipophilicity of other compounds in this class suggests that other PAHs also would be readily absorbed across GI and respiratory epithelia.

Benzo(a)pyrene was distributed widely in the tissues of treated rats and mice, but primarily to tissues high in fat, such as adipose tissue and mammary gland (Kotin et al. 1969; Schlede et al. 1970a). Patterns of tissue distribution of other PAHs would be expected to be similar because of the high lipophilicity of the members of this class.

Studies of the metabolism of benzo(a)pyrene provide information relevant to other PAHs because of the structural similarities of all members of the class. Metabolism involves microsomal mixed function oxidase hydroxylation of one or more of the phenyl rings with the formation of phenols and dihydrodiols, probably via formation of arene oxide intermediates (EPA 1979a). The dihydrodiols may be further oxidized to diol epoxides, which, for certain members of the class, are known to be the ultimate carcinogens (LaVoie et al. 1982). Conjugation with glutathione or glucuronic acid, and reduction to tetrahydrotetrols are important detoxification pathways. Metabolism of naphthalene resulted in the formation of 1,2-naphthoquinone, which induced cataract formation and retinal damage in rats and rabbits.

Excretion of benzo(a)pyrene or dibenzo(a,h)anthracene residues was reported to be rapid, although quantitative data were not located (EPA 1979b). Excretion occurred mainly via the feces, probably largely due to biliary secretion (Schlede et al. 1970a, 1970b). The EPA (1980a) concluded that accumulation in the body tissues of PAHs from chronic low level exposure would be unlikely.

#### F.7.15.2 NONCANCER TOXICITY

Oral noncancer toxicity data are available for acenaphthene, anthracene, fluoranthene, fluorene, and naphthalene. Newborn infants, children, and adults exposed to naphthalene by ingestion, inhalation, or possibly by skin contact developed hemolytic anemia with associated jaundice and occasionally renal disease (EPA 1979c). In a 13-week gavage study in rats, treatment with 50 mg naphthalene/kg, 5 days/week for 13 weeks (35.7 mg/kg/day) induced no effects; higher doses presumably reduced the growth rate (National Toxicology Program (NTP) 1980). Application of an uncertainty factor of 1000 yielded a provisional RfD for chronic oral exposure of 0.04 mg/kg/day (EPA 1997). The very mild effect (decreased growth rate) apparently observed at higher doses suggests that the RfD is very conservatively protective.

### F.7.15.3 CARCINOGENICITY

The PAHs are ubiquitous, being released to the environment from anthropogenic as well as from natural sources (ATSDR 1987). Benzo(a)pyrene is the most extensively studied member of the class, inducing tumors in multiple tissues of virtually all laboratory species tested by all routes of exposure. Although epidemiology studies suggested that complex mixtures that contain PAHs (coal tar, soots, coke oven emissions, cigarette smoke) are carcinogenic to humans (EPA 1994), the carcinogenicity cannot be attributed to PAHs alone because of the presence of other potentially carcinogenic substances in these mixtures (ATSDR 1987). In addition, recent investigations showed that the PAH fraction of roofing tar, cigarette smoke, and coke oven emissions accounted for only 0.1 to 8 percent of the total mutagenic activity of the unfractionated complex mixture in Salmonella (Lewtas 1988). Aromatic amines, nitrogen heterocyclic compounds, highly oxygenated quinones, diones, and nitrooxygenated compounds, none of which would be expected to arise from in vivo metabolism of PAHs, probably accounted for the majority of the mutagenicity of coke oven emissions and cigarette smoke. Furthermore, coal tar, which contains a mixture of many PAHs, has a long history of use in the clinical treatment of a variety of skin disorders in humans (ATSDR 1987).

Because of the lack of human cancer data, assignment of individual PAHs to EPA cancer weight-of-evidence groups was based largely on the results of animal studies with large doses of purified compound (EPA 1994). Frequently, unnatural routes of exposure, including implants of the test chemical in beeswax and trioctanoin in the lungs of female Osborne-Mendel rats, intratracheal instillation, and subcutaneous or intraperitoneal injection, were used. Benzo(a)anthracene, benzo(a)pyrene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene were classified in Group B2 (probable human carcinogens).

The EPA (1993a) verified a slope factor for oral exposure to benzo(a)pyrene of 7.3 per mg/kg/day, based on several dietary studies in mice and rats. Neither verified nor provisional quantitative risk estimates were available for the other PAHs in Group B2. The EPA (1980a) promulgated an ambient water quality criterion for "total carcinogenic PAHs," based on an oral slope factor derived from a study with benzo(a)pyrene, as being sufficiently protective for the class. Largely because of this precedent, the quantitative risk estimates for benzo(a)pyrene were adopted for the other carcinogenic PAHs when quantitative estimates were needed.

Recent reevaluations of the carcinogenity and mutagenicity of the Group B2 PAHs suggest that there are large differences between individual PAHs in cancer potency (Krewski et al., 1989). Based on the available cancer and mutagenicity data, and assuming that there is a constant relative potency between different carcinogens across different bioassay systems and that the PAHs under consideration have similar dose-response curves, Thorslund and Charnley (1988) derived relative potency values for several PAHs. A more recent Relative Potency Factor (RPF) scheme for the Group B2 PAHs was based only on the induction of lung epidermoid carcinomas in female Osborne-Mendel rats in the lung-implantation experiments (Clement International 1990).

## F.7.16 POLYCHLORINATED BIPHENYLS

### F.7.16.1 NONCANCER TOXICITY

Epidemiologic studies of women in the United States associated oral PCB exposure with low birth weight or retarded musculoskeletal or neurobehavioral development of their infants (ATSDR 1991). Oral studies in animals established the liver as the target organ in all species, and the thyroid as an additional target organ in the rat. Effects observed in monkeys included gastritis, anemia, chloracne-like dermatitis, and immunosuppression. Oral treatment of animals induced developmental effects, including retarded neurobehavioral and learning development in monkeys. Oral RfD values of 0.02 ug/kg/day for Aroclor-1254 and 0.07 ug/kg/day for Aroclor-1016 were located.

Occupational exposure to PCBs was associated with upper respiratory tract and ocular irritation, loss of appetite, liver enlargement, increased serum concentrations of liver enzymes, skin irritation, rashes and chloracne, and, in heavily exposed female workers, decreased birth weight of their infants (ATSDR 1991). Concurrent exposure to other chemicals confounded the interpretation of the occupational exposure studies. Laboratory animals exposed by inhalation to Aroclor-1254 vapors exhibited moderate liver degeneration, decreased body weight gain and slight renal tubular degeneration. Neither subchronic nor chronic inhalation RfC values were available.

Target organs for PCBs include the skin, liver, fetus, and neonate.

### F.7.16.2 CARCINOGENICITY

The EPA (1997) classifies the PCBs as EPA cancer weight-of-evidence Group B2 substances (probable human carcinogens), based on inadequate data in humans and sufficient data in animals. The human data consist of several epidemiologic occupational and accidental oral exposure studies with serious limitations, including poorly quantified concentrations of PCBs and durations of exposure, and probable exposures to other potential carcinogens.

The animal data consist of several oral studies in rats and mice with various aroclors, kanechlors, or clophens (commercial PCB mixtures manufactured in the United States, Japan and Germany, respectively) that reported increased incidence of liver tumors in both species (EPA 1994).

The EPA (1998) presents a verified oral slope factor and an inhalation slope factor of 2.0 per mg/kg/day for PCBs based on liver tumors in rats treated with Aroclor-1260.

### F.7.17 VINYL CHLORIDE

#### F.7.17.1 NONCANCER TOXICITY

Data were not located regarding oral exposure of humans to vinyl chloride (ATSDR 1989i). In rats, lifetime dietary ingestion of vinyl chloride slightly but significantly increased mortality and induced mild histopathologic effects in the liver. Several early occupational studies associated vinyl chloride exposure with a syndrome known as vinyl chloride disease, which includes acroosteolysis (dissolution of the ends of the distal phalanges of the hands), circulatory disturbances in the extremities, Raynaud syndrome (sudden, recurrent bilateral cyanosis of the digits), scleroderma, hematologic effects, effects on the lungs, and impaired liver function and liver damage. Mild neurologic effects were also associated with occupational exposure. Long-term inhalation studies in rats and mice identified elevated relative liver weight as a sensitive indicator of liver effects. Neither inhalation RfC values nor oral RfD values for vinyl chloride were located. The principal target organs for vinyl chloride appear to be the CNS and the liver.

#### F.7.17.2 CARCINOGENICITY

The EPA (1997) lists vinyl chloride as an EPA cancer weight-of-evidence Group A compound (human carcinogen) and presents a verified oral slope factor of 1.9 per mg/kg/day, based on the increased incidence of liver and lung tumors in a lifetime dietary study in rats. An inhalation unit risk of 8.4E-05 per g/m$^3$, equivalent to 0.3 per mg/kg/day, assuming humans inhale 20 m$^3$ of air/day and weigh 70 kg, is based on liver tumors in rats intermittently exposed by inhalation for 12 months.

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# Appendix F.8

## Sample Calculations

| | |
|---|---|
| CLIENT Raymark - Ferry Creek | JOB NUMBER 7491 |
| SUBJECT Incidental Ingestion of Soil - Commercial Worker (Surface Soil) | |
| BASED ON RAGs 1989 | DRAWING NUMBER |
| BY KAC / CHECKED BY RJJ | APPROVED BY / DATE 9/23/99 |

Purpose: To calculate Noncarcinogenic and Carcinogenic risk for the Commercial Worker via incidental ingestion of site soil.

Relevant Equations:

$$Intake\ (mg/kg\,day) = \frac{C_S \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$$

Where:

$C_S$ = Concentration in Soil (mg/kg)
IR = Soil ingestion Rate (mg/day)
CF = Conversion Factor (kg/mg)
FI = Fraction of soil from Contaminated Source (unitless)
EF = Exposure Frequency (days/year)
ED = Exposure Duration (years)
BW = Body Weight (kg)
$AT_N$ = Averaging Time for noncarcinogenic exposures (days)
$AT_C$ = Averaging Time for carcinogenic exposures (days)

and

| | RME Reasonable Maximum Exposure | CTE Central Tendency Exposure |
|---|---|---|
| $C_S$ | Chemical specific | Chemical specific |
| IR | 100 mg/day | 50 mg/day |
| CF | 1.0 x 10-6 kg/mg | $1.0 \times 10^{-6}$ kg/mg |
| FI | 1 unitless | 1 unitless |
| EF | 250 days/year | 250 days/year |
| ED | 25 years | 9 years |
| BW | 70 kg | 70 kg |
| $AT_N$ | 9125 days | 3285 days |
| $AT_C$ | 25,550 days | 25,550 days |

| | | | |
|---|---|---|---|
| CLIENT Raymark - Ferry Creek | | JOB NUMBER 7491 | |
| SUBJECT Incidental Ingestion of soil - Commercial Worker (surface Soil) | | | |
| BASED ON RAGs 1989 | | DRAWING NUMBER | |
| BY KAC | CHECKED BY RJJ | APPROVED BY | DATE 9/23/99 |

Intake of arsenic at a concentration of 21.9 mg/kg in surface soil at Area A1 under Reasonable Maximum Exposure assumptions.

RME Noncarcinogenic Intake (mg/kg-day) of arsenic $= \dfrac{21.9\ mg/kg \times 100\ mg/day \times 1E\text{-}6\ kg/mg \times 1 \times 250\ days/year \times 25\ years}{70\ kg \times 9125\ days}$

$= \boxed{2.14E\text{-}5\ mg/kg}$

RME Carcinogenic Intake of arsenic (mg/kg-day) $= \dfrac{21.9\ mg/kg \times 100\ mg/day \times 1E\text{-}6\ kg/mg \times 1 \times 250\ day/year \times 25\ years}{70\ kg \times 25550\ days}$

$= \boxed{7.65E\text{-}6\ mg/kg}$

Then Incremental Cancer Risk (ICR) and Hazard Quotient (HQ) are calculated via the following equations.

ICR (unitless) = Carcinogenic Intake (mg/kg-day) x Cancer Slope Factor (CSF) kg/mg-day

HQ (unitless) $= \dfrac{\text{noncarcinogenic Intake mg/kg-day}}{\text{Reference Dose (RfD) mg/kg-day}}$

When the CSF for arsenic = 1.5E+0 and the RfD for arsenic = 3E-4

ICR arsenic (unitless) = 7.65E-6 mg/kg-day x 1.5E+0 kg/mg-day = $\boxed{1.1E\text{-}5}$ under RME

HQ arsenic (unitless) $= \dfrac{2.14E\text{-}5\ mg/kg\text{-}day}{3.0E\text{-}4\ mg/kg\text{-}day} = \boxed{7.1E\text{-}2}$ under RME

| CLIENT Raymark - Ferry Creek | | JOB NUMBER | |
|---|---|---|---|
| SUBJECT Incidental Ingestion of soil - Commercial Worker (surface soil) | | | |
| BASED ON RAGs 1989 | | DRAWING NUMBER | |
| BY KAC | CHECKED BY RJJ | APPROVED BY | DATE 9/23/99 |

Intake of arsenic at a concentration of 8.1 mg/kg in Area A1 surface soil under the Central Tendency Exposure (CTE) assumptions.

CTE Noncarcinogenic Intake (mg/kg-day)

$$= \frac{8.1\ mg/kg \times 50\ mg/day \times 1E\text{-}6\ kg/mg \times 1 \times 250\ days/year \times 9\ years}{70\ kg \times 3285\ days}$$

$$= \boxed{4.0E\text{-}6\ mg/kg\text{-}day}$$

CTE Carcinogenic Intake (mg/kg-day)

$$= \frac{8.1\ mg/kg \times 50\ mg/day \times 1E\text{-}6\ kg/mg \times 1 \times 250\ day/yr \times 9\ years}{70\ kg \times 25550\ days}$$

$$= \boxed{5.1E\text{-}7\ mg/kg\text{-}day}$$

Then ICR and HQ are calculated for arsenic where the

ICR arsenic (unitless) $= 5.1E\text{-}7\ mg/kg\text{-}day \times 1.5\ kg/mg\text{-}day = \boxed{7.6E\text{-}7}$ CTE

HQ arsenic (unitless) $= \dfrac{4.0E\text{-}6\ mg/kg\text{-}day}{3.0E\text{-}4\ mg/kg\text{-}day} = \boxed{1.3E\text{-}2}$ CTE

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USEPA Dec. 1989. Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A) Interim Final. OSWER EPA/540/1-89/002.

| | |
|---|---|
| CLIENT Raymark - Ferry Creek | JOB NUMBER 7491 |
| SUBJECT Direct Dermal Contact with Soil - Commercial Worker (surface soil) | |
| BASED ON RAGs 1989 | DRAWING NUMBER |
| BY KAC / CHECKED BY RJJ | APPROVED BY / DATE 9/23/99 |

Purpose: To calculate carcinogenic and noncarcinogenic risk for the commercial worker via direct dermal contact with site soils.

Relevant Equation:

$$\text{Absorbed Dose (mg/kg-day)} = \frac{C_s \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

Where:

$C_s$ - Chemical Concentration in Soil (mg/kg)
CF - Conversion Factor (kg/mg)
SA - Skin Surface available for contact (cm²/event)
AF = Soil to Skin adherence factor (mg/cm2)
ABS = Absorption factor (unitless)
EF = Exposure Frequency (events/year)
ED = Exposure Duration (years)
BW = Body Weight (kg)
ATN - Averaging Time for noncarcinogenic exposures (days)
ATC = Averaging Time for carcinogenic exposures (days)
and

| | Reasonable Maximum Exposure (RME) | Central Tendency Exposure (CTE) |
|---|---|---|
| $C_s$ | Chemical specific mg/kg | Chemical-Specific mg/kg |
| CF | 1E-6 kg/mg | 1E-6 kg/mg |
| SA | 2500 cm²/event | 2500 cm²/event |
| AF | 0.2 mg/cm² | 0.02 mg/cm² |
| ABS | Chemical-specific | Chemical specific |
| EF | 250 events/year | 250 events/year |
| ED | 25 years | 9 years |
| BW | 70 kg | 70 kg |
| ATN | 9125 days | 3285 days |
| ATC | 25550 days | 25550 days |

| | | | |
|---|---|---|---|
| CLIENT Raymark - Ferry Creek | | JOB NUMBER 7491 | |
| SUBJECT Direct Dermal Contact with Soil - Commercial Worker (surface soil) | | | |
| BASED ON RAGs 1989 | | DRAWING NUMBER | |
| BY KAC | CHECKED BY RJJ | APPROVED BY | DATE 9/23/99 |

Absorbed Dose of arsenic at a concentration of 21.9 mg/kg in area A1 surface soil under Reasonable Maximum Exposure (RME) assumptions is calculated:

RME Noncarc. Absorbed Dose (mg/kg-day) $= \dfrac{21.9\ \text{mg/kg} \times 2500\ \frac{\text{cm}^2}{\text{event}} \times 0.2\ \frac{\text{mg}}{\text{cm}^2} \times 0.03 \times 250\ \frac{\text{event}}{\text{yr}} \times 25\ \text{years}}{70\ \text{kg} \times 9125\ \text{days}} \times 1E\text{-}6\ \text{kg/mg}$

$= \boxed{3.21E\text{-}6\ \text{mg/kg-day RME}}$

RME Carcinog. Absorbed Dose (mg/kg-day) $= \dfrac{21.9\ \text{mg/kg} \times 1E\text{-}6\ \text{kg/mg} \times 2500\ \frac{\text{cm}^2}{\text{event}} \times 0.2\ \frac{\text{mg}}{\text{cm}^2} \times 0.03 \times 250\ \frac{\text{events}}{\text{year}} \times 25\ \text{years}}{70\ \text{kg} \times 25550\ \text{days}}$

$= \boxed{1.15E\text{-}6\ \text{mg/kg-day RME}}$

Then Incremental Cancer Risk (ICR) and Hazard Quotient (HQ) are calculated via the following equations:

ICR (unitless) = Carcinogenic Absorbed Dose (mg/kg-day) x Cancer Slope Factor (CSF) kg/mg-day

HQ (unitless) $= \dfrac{\text{noncarcinogenic Absorbed Dose (mg/kg-day)}}{\text{Reference Dose (RfD) (mg/kg-day)}}$

Where the CSF of Arsenic = 1.5E+0 and the RfD = 3.0E-4

ICR Arsenic (unitless) = 1.15E-6 mg/kg-day x 1.5E+0 kg/mg/day = $\boxed{1.72E\text{-}6\ \text{RME}}$

HQ Arsenic (unitless) $= \dfrac{3.21E\text{-}6\ \text{mg/kg-day}}{3.0E\text{-}4\ \text{mg/kg-day}} = \boxed{1.1E\text{-}2\ \text{RME}}$

| CLIENT Raymark - Ferry Creek | JOB NUMBER 7491 | | |
|---|---|---|---|
| SUBJECT Direct Dermal Contact with Soil - Commercial Worker (surface soil) | | | |
| BASED ON RAGS 1989 | DRAWING NUMBER | | |
| BY KAC | CHECKED BY RJT | APPROVED BY | DATE 9/23/99 |

Absorbed dose of Arsenic at a concentration of 8.1 mg/kg in Area A1 surface Soil under Central Tendency Exposure (CTE) assumptions is calculated:

CTE Noncarc. Absorbed Dose (mg/kg-day)

$$= \frac{8.1\,\frac{mg}{kg} \times 1E\text{-}6\,\frac{kg}{mg} \times 2500\,\frac{cm^2}{event} \times 0.02\,\frac{mg}{cm^2} \times 0.03 \times 250\,\frac{events}{yr} \times 9\text{ years}}{70\text{ kg} \times 3285\text{ days}}$$

$$= \boxed{1.19E\text{-}7\ mg/kg\text{-}day\ CTE}$$

CTE Carc. Absorbed Dose (mg/kg-day)

$$= \frac{8.1\,\frac{mg}{kg} \times 1E\text{-}6\,\frac{kg}{mg} \times 2500\,\frac{cm^2}{event} \times 0.02\,\frac{mg}{cm^2} \times 0.03 \times 250\,\frac{event}{yr} \times 9\text{ yrs}}{70\text{ kg} \times 25550\text{ days}}$$

$$= \boxed{1.53E\text{-}8\ mg/kg\text{-}day\ CTE}$$

ICR Arsenic CTE unitless $= \underset{(mg/kg\text{-}day)}{1.53E\text{-}8} \times \underset{(kg/mg\text{-}day)}{1.5E+0} = \boxed{2.3E\text{-}8\ CTE}$

HQ Arsenic CTE unitless $= \dfrac{1.19E\text{-}7\ mg/kg\text{-}day}{3.0E\text{-}4\ mg/kg\text{-}day} = \boxed{4.0E\text{-}4\ CTE}$


Reference

USEPA 1989. Risk Assessment Guidance for Superfund Volume I Human Health Evaluation manual (Part A) Interim Final. OSWER EPA 540/1-89/002.

| | |
|---|---|
| CLIENT Raymark - Ferry Creek | JOB NUMBER 7491 |
| SUBJECT Incidental Ingestion of Soil - Frequent Recreational User (Adult) | |
| BASED ON KAGs 1989 | DRAWING NUMBER |

| BY | CHECKED BY | APPROVED BY | DATE |
|---|---|---|---|
| KAC | RJJ | | 9/23/99 |

Purpose: To calculate carcinogenic and noncarcinogenic risk for the adult frequent recreational user via incidental ingestion of soil

Relevant Equation:

$$\underset{mg/kg\text{-}day}{\text{Intake}} = \frac{C_s \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$$

Where:

$C_s$ = Concentration in soil (mg/kg)
IR = Soil Ingestion Rate (mg/day)
CF = Conversion Factor (kg/mg)
FI = Fraction ingested from contaminated Source (unitless)
EF = Exposure Frequency (days/year)
ED = Exposure Duration (years)
BW = Body Weight (kg)
ATN = Averaging Time for noncarcinogenic exposures (days)
ATC = Averaging Time for carcinogenic exposures (days)

| | Reasonable Maximum Exposure (RME) | Central Tendency Exposure (CTE) |
|---|---|---|
| $C_s$ | Chemical specific (mg/kg) | Chemical specific (mg/kg) |
| IR | 100 mg/day | 50 mg/day |
| CF | 1E-6 kg/mg | 1E-6 kg/mg |
| FI | 1 unitless | 1 unitless |
| EF | 150 days/year | 150 days/year |
| ED | 24 years | 7 years |
| BW | 70 kg | 70 kg |
| ATN | 8760 days | 2555 days |
| ATC | 25550 days | 25550 days |

| | | | |
|---|---|---|---|
| CLIENT Raymark - Ferry Creek | | JOB NUMBER 7491 | |
| SUBJECT Incidental Ingestion of Soil - Frequent Recreational User Adult | | | |
| BASED ON RAG 1989 | | DRAWING NUMBER | |
| BY KAC | CHECKED BY RJJ | APPROVED BY | DATE 9/23/99 |

Intake of Arsenic at a concentration of 28.1 mg/Kg in Area A-1 surface soil under Reasonable Maximum Exposure assumption

RME Noncarcinogenic Intake of Arsenic (mg/Kg-day) $= \dfrac{28.1\,\frac{mg}{Kg} \times 100\,\frac{mg}{day} \times 1E\text{-}6\,Kg/mg \times 1 \times 150\,\frac{days}{year} \times 24\,years}{70\,Kg \times 8760\,days}$

$= \boxed{1.6E\text{-}5\ mg/Kg\text{-}day\ RME}$

RME Carcinogenic Intake of Arsenic (mg/Kg-day) $= \dfrac{28.1\,mg/Kg \times 100\,mg/day \times 1E\text{-}6\,\frac{Kg}{mg} \times 150\,\frac{day}{year} \times 24\,years}{70\,Kg \times 25550\,days}$

$= \boxed{5.7E\text{-}6\ mg/Kg\text{-}day\ RME}$

Then Incremental Cancer Risk (ICR) and Hazard Quotient (HQ) are calculated via the following equations:

ICR (unitless) = Carcinogenic Intake (mg/Kg-day) × Cancer Slope Factor (CSF) (Kg/mg-day)

HQ (unitless) $= \dfrac{\text{noncarcinogenic Intake (mg/Kg-day)}}{\text{Reference Dose (RfD) (mg/Kg-day)}}$

Where the CSF for Arsenic = 1.5E+0 and the RfD = 3.0E-4

ICR Arsenic RME (unitless) = 5.7E-6 mg/Kg-day × 1.5E+0 Kg/mg-day = $\boxed{8.5E\text{-}6\ RME}$

HQ Arsenic RME (unitless) $= \dfrac{1.6E\text{-}5\ mg/Kg\text{-}day}{3E\text{-}4\ mg/Kg\text{-}day} = \boxed{5.3E\text{-}2\ RME}$

| | |
|---|---|
| CLIENT Raymark - Ferry Creek | JOB NUMBER 7491 |
| SUBJECT Incidental Ingestion of soil - Frequent Recreational User-Adult | |
| BASED ON RAGs 1989 | DRAWING NUMBER |

| | | | |
|---|---|---|---|
| BY KAC | CHECKED BY RJJ | APPROVED BY | DATE 9/23/99 |

Intake of Arsenic at a concentration of 9 mg/kg in surface soil from Area A1 under central tendency Exposures (CTE)

CTE Noncarc. Intake (mg/kg-day) $= \dfrac{9\,\frac{mg}{kg} \times 50\,mg/day \times 1E\text{-}6\,kg/mg \times 1 \times 150\,\frac{days}{year} \times 7\,years}{70\,kg \times 2555\,days}$

$= \boxed{2.6E\text{-}6\ mg/kg\ CTE}$

CTE Carc. Intake (mg/kg-day) $= \dfrac{9\,mg/kg \times 50\,mg/day \times 1E\text{-}6\,kg/mg \times 1 \times 150\,\frac{days}{year} \times 7\,years}{70\,kg \times 25550\,days}$

$= \boxed{2.6E\text{-}7\ mg/kg\ CTE}$

and the ICR and HQ for CTE exposures to Arsenic in Soil

ICR Arsenic CTE (unitless) $= 2.6E\text{-}7\,mg/kg\text{-}day \times 1.5\,kg/mg/day = \boxed{4.0E\text{-}7\ CTE}$

HQ Arsenic CTE (unitless) $= \dfrac{2.6E\text{-}6\,mg/kg\text{-}day}{3E\text{-}4\,mg/kg\text{-}day} = \boxed{8.7E\text{-}3\ CTE}$

## Reference

USEPA Dec. 1989. Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A) Interim Final. OSWER EPA/540/1-89/002.

| | |
|---|---|
| CLIENT Raymark - Ferry Creek | JOB NUMBER 7491 |
| SUBJECT Direct Dermal Contact with Soil - Frequent Recreational User - adult | |
| BASED ON RAGS 1989 | DRAWING NUMBER |
| BY KAC | CHECKED BY RJJ | APPROVED BY | DATE 9/23/99 |

Purpose: To calculate carcinogenic and noncarcinogenic risk for the frequent recreational user (adult) via direct dermal contact with site soils.

Relevant Equation:

$$\text{Absorbed Dose} = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$
(mg/kg-day)

Where:

Cs = Chemical concentration in soil (mg/kg)
CF = Conversion Factor (kg/mg)
SA = Skin Surface available for contact (cm²/event)
AF = Soil to skin adherence factor (mg/cm²)
ABS = Absorption factor (unitless)
EF = Exposure frequency (events/year)
ED = Exposure Duration (years)
BW = Body Weight (kg)
ATN = Averaging Time for noncarcinogens (days)
ATC = Averaging time for carcinogens (days)

| | Reasonable Maximum Exposure | Central Tendency Exposure |
|---|---|---|
| Cs | chemical specific mg/kg | chemical specific mg/kg |
| CF | 1E-6 kg/mg | 1E-6 kg/mg |
| SA | 5700 cm²/event | 5700 cm²/event |
| AF | 0.07 mg/cm² | 0.01 mg/cm² |
| ABS | chemical specific | chemical-specific |
| EF | 150 events/year | 150 events/year |
| ED | 24 years | 7 years |
| BW | 70 kg | 70 kg |
| ATN | 8760 days | 2555 days |
| ATC | 25550 days | 25550 days |

**TETRA TECH NUS, INC.** **CALCULATION WORKSHEET** 

| | |
|---|---|
| CLIENT Raymark Ferry Creek | JOB NUMBER 7491 |
| SUBJECT Direct Dermal Contact with Soil - Frequent Recreational | |
| BASED ON RAGs 1989 | DRAWING NUMBER User - Adult |
| BY KAC / CHECKED BY RJJ | APPROVED BY / DATE 9/23/99 |

Absorbed dose of arsenic at a concentration of 28.1 mg/Kg in Area A1 surface soil under the Reasonable Maximum Exposure (RME) assumptions.

RME Noncarc. Absorbed Dose (mg/Kg-day) $= \dfrac{28.1\ \text{mg/kg} \times 5700\ \frac{\text{cm}^2}{\text{event}} \times 1E\text{-}6\ \frac{\text{Kg}}{\text{mg}} \times 0.07\ \frac{\text{mg}}{\text{cm}^2} \times 0.03 \times 150\ \frac{\text{events}}{\text{yr}} \times 24\ \text{y}}{70\ \text{Kg} \times 8760\ \text{days}}$

$= \boxed{1.97E\text{-}6\ \text{mg/Kg-day RME}}$

RME Carc. Absorbed Dose (mg/Kg-day) $= \dfrac{28.1\ \text{mg/kg} \times 5700\ \frac{\text{cm}^2}{\text{event}} \times 1E\text{-}6\ \frac{\text{Kg}}{\text{mg}} \times 0.07\ \frac{\text{mg}}{\text{cm}^2} \times 0.03 \times 150\ \frac{\text{event}}{\text{yr}} \times 24\ \text{years}}{70\ \text{Kg} \times 25550\ \text{days}}$

$= \boxed{6.77E\text{-}7\ \text{mg/Kg-day RME}}$

Then Incremental Cancer Risk (ICR) and Hazard Quotient (HQ) are calculated via the following equations:

ICR (unitless) = Carcinogenic absorbed dose (mg/Kg-day) × Cancer Slope Factor (CSF) (Kg/mg-day)

HQ (unitless) $= \dfrac{\text{noncarcinogenic absorbed dose (mg/Kg-day)}}{\text{Reference Dose (RfD) (mg/Kg-day)}}$

Where the CSF for arsenic = 1.5E+0 and the RfD = 3.0E-4

ICR Arsenic RME (unitless) = 6.77E-7 mg/Kg-day × 1.5 Kg/mg-day = $\boxed{1.0E\text{-}6\ \text{RME}}$

HQ Arsenic RME (unitless) $= \dfrac{1.97E\text{-}6\ \text{mg/Kg-day}}{3.0E\text{-}4\ \text{mg/Kg-day}} = \boxed{6.6E\text{-}3\ \text{RME}}$

| | |
|---|---|
| CLIENT Raymark - Ferry Creek | JOB NUMBER 7491 |
| SUBJECT Direct Dermal Contact with soil - Frequent Recreational | |
| BASED ON RAG 1989 | DRAWING NUMBER User-adult |

| | | | |
|---|---|---|---|
| BY KAC | CHECKED BY RJJ | APPROVED BY | DATE 9/23/99 |

Absorbed dose of Arsenic at a concentration of 9 mg/kg in Area A-1 surface soil under the Central Tendency Exposure (CTE) assumptions.

CTE Noncarc Absorbed Dose (mg/kg-day) $= \frac{9\ mg/kg \times 1E\text{-}6\ kg/mg \times 5700\ cm^2/event \times 0.01\ mg/cm^2 \times 0.03 \times 150\ events/year \times 7\ years}{70\ kg \times 2555\ days}$

$= \boxed{9.04E\text{-}8\ mg/kg\text{-}day\ CTE}$

CTE Carcinog Absorbed Dose (mg/kg-day) $= \frac{9\ mg/kg \times 1E\text{-}6\ kg/mg \times 5700\ cm^2/event \times 0.01\ mg/cm^2 \times 0.03 \times 150\ event/year \times 7\ years}{70\ kg \times 25550}$

$= \boxed{9.04E\text{-}9\ mg/kg\text{-}day\ CTE}$

The ICR and HQ for arsenic is then calculated

ICR Arsenic CTE unitless $= 9.04E\text{-}9$ mg/kg-day $\times 1.5$ kg/mg-day $= \boxed{1.36E\text{-}8\ CTE}$

HQ Arsenic CTE unitless $= \frac{9.04E\text{-}8\ mg/kg\text{-}day}{3E\text{-}4\ mg/kg\text{-}day} = \boxed{3.0E\text{-}4\ CTE}$

## Reference

USEPA 1989. Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A) Interim Final. OSWER EPA 540/1-89/002.

**TETRA TECH NUS, INC. CALCULATION WORKSHEET** 

| | |
|---|---|
| CLIENT Raymark - Ferry Creek | JOB NUMBER 7491 |
| SUBJECT Incidental Ingestion of Soil - Frequent Recreational User-Child | |
| BASED ON RAGS 1989 | DRAWING NUMBER |
| BY KAC / CHECKED BY RJJ | APPROVED BY / DATE 9/23/99 |

Purpose: To calculate carcinogenic and noncarcinogenic risk for the frequent recreational user-child via the ingestion of site soil.

Relevant Equations:

$$\text{Intake (mg/Kg-day)} = \frac{C_s \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$$

Where;
- $C_s$ = Chemical concentration in soil (mg/Kg)
- $IR$ = Soil Ingestion Rate (mg/day)
- $CF$ = Conversion Factor (Kg/mg)
- $FI$ = Fraction ingested from contaminated source (unitless)
- $EF$ = Exposure Frequency (days/year)
- $ED$ = Exposure Duration (years)
- $BW$ = Body Weight (Kg)
- $AT_N$ = Averaging Time for noncarcinogenic exposures (days)
- $AT_C$ = Averaging time for carcinogenic exposures (days)

| | Reasonable Maximum Exposure | Central Tendency Exposure |
|---|---|---|
| $C_s$ | chemical-specific mg/Kg | chemical specific mg/Kg |
| IR | 200 mg/day | 100 mg/day |
| CF | 1E-6 Kg/mg | 1E-6 Kg/mg |
| FI | 1 unitless | 1 unitless |
| EF | 150 days/year | 150 days/year |
| ED | 6 years | 2 years |
| BW | 15 Kg | 15 Kg |
| $AT_N$ | 2190 days | 730 days |
| $AT_C$ | 25550 days | 25550 days |

| | | | |
|---|---|---|---|
| CLIENT Raymark - Ferry Creek | | JOB NUMBER 7491 | |
| SUBJECT Incidental Ingestion of Soil Frequent Recreational User - Child | | | |
| BASED ON RAGs 1989 | | DRAWING NUMBER | |
| BY KAC | CHECKED BY RJJ | APPROVED BY | DATE 9/23/99 |

Intake of Arsenic at a concentration of 28.1 mg/kg in Area A-1 surface soil under Reasonable Maximum Exposure (RME) assumptions.

$$\text{RME Noncarc. Intake (mg/kg-day)} = \frac{28.1\,\frac{mg}{kg} \times 200\,mg/day \times 1E\text{-}6\,\frac{kg}{mg} \times 1\,unitless \times 150\,\frac{day}{year} \times 6\,years}{15\,kg \times 2190\,days}$$

$$= \boxed{1.5E\text{-}4\ mg/kg\text{-}day\ RME}$$ ✓

$$\text{RME Carcin Intake (mg/kg-day)} = \frac{28.1\,\frac{mg}{kg} \times 200\,\frac{mg}{day} \times 1E\text{-}6\,\frac{kg}{mg} \times 1\,unitless \times 150\,\frac{days}{year} \times 6\,years}{15\,kg \times 25550\,days}$$

$$= \boxed{1.3E\text{-}5\ mg/kg\text{-}day\ RME}$$ ✓

Then Incremental Cancer Risk (ICR) and Hazard Quotient (HQ) are calculated via the following equations:

ICR (unitless) = Carcinogenic Intake (mg/kg-day) × Cancer Slope Factor (CSF) (kg/mg-day)

$$\text{HQ (unitless)} = \frac{\text{noncarcinogenic Intake (mg/kg/day)}}{\text{Reference Dose (RfD) (mg/kg-day)}}$$

Where the CSF for Arsenic = 1.5E+0 and the RfD = 3.0E-4

ICR Arsenic RME (unitless) = 1.3E-5 (mg/kg-day) × 1.5 (kg/mg-day) = $\boxed{1.95E\text{-}5\ RME}$ ✓

$$\text{HQ Arsenic RME (unitless)} = \frac{1.5E\text{-}4\ mg/kg\text{-}day}{3E\text{-}4\ mg/kg\text{-}day} = \boxed{5.0E\text{-}1\ RME}$$ ✓

| | | | |
|---|---|---|---|
| CLIENT Raymark - Ferry Creek | | JOB NUMBER 7491 | |
| SUBJECT Incidental Ingestion of soil - Frequent Recreational User - Child | | | |
| BASED ON RAGS 1989 | | DRAWING NUMBER | |
| BY KAC | CHECKED BY RJJ | APPROVED BY | DATE 9/23/99 |

Intake of arsenic at a concentration of 9 mg/kg in Area A-1 surface soils under central tendency exposure (CTE) assumptions

$$\text{CTE Noncarc. Intake (mg/kg-day)} = \frac{9\frac{mg}{kg} \times 100\frac{mg}{day} \times 1E\text{-}6\frac{kg}{mg} \times 1 \times 150\frac{day}{year} \times 2\,years}{15\,kg \times 730\,days}$$

$$= \boxed{2.5E\text{-}5 \text{ CTE mg/kg-day}} \checkmark$$

$$\text{CTE Carc. Intake (mg/kg-day)} = \frac{9\frac{mg}{kg} \times 100\frac{mg}{day} \times 1E\text{-}6\frac{kg}{mg} \times 1 \times 150\frac{day}{year} \times 2\,years}{15\,kg \times 25550\,days}$$

$$= \boxed{7.0E\text{-}7 \text{ CTE mg/kg-day}} \checkmark$$

Then ICR and HQ are calculated for arsenic CTE.

$$\underset{\text{unitless}}{\text{ICR CTE Arsenic}} = \underset{\text{mg/kg-day}}{7.0E\text{-}7} \times \underset{\text{kg/mg-day}}{1.5} = \boxed{1.0E\text{-}6 \text{ CTE}} \checkmark$$

$$\underset{\text{unitless}}{\text{HQ CTE Arsenic}} = \frac{2.5E\text{-}5 \text{ mg/kg-day}}{3.0E\text{-}4 \text{ mg/kg-day}} = \boxed{8.3E\text{-}2 \text{ CTE}} \checkmark$$

Reference

USEPA Dec. 1989. Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A) Interim Final. OSWER EPA 540/1-89/002.

| | | | |
|---|---|---|---|
| CLIENT Raymark - Ferry Creek | | JOB NUMBER 7491 | |
| SUBJECT Direct Dermal Contact with Soil - Frequent Recreational User - Child | | | |
| BASED ON RAGS 1989 | | DRAWING NUMBER | |
| BY KAC | CHECKED BY RJJ | APPROVED BY | DATE 9/24/99 |

Purpose: To calculate carcinogenic and noncarcinogenic risk for the child frequent recreational user for exposure via direct dermal contact with soil.

Relevant Equation:

$$\text{Absorbed Dose (mg/Kg-day)} = \frac{C_S \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

Where:

$C_S$ = Chemical Concentration in soil (mg/Kg)
CF = Conversion Factor (Kg/mg)
SA = Skin surface area available for contact (cm²/event)
AF = Soil to Skin adherence factor (mg/cm²)
ABS = Absorption factor (unitless)
EF = Exposure Frequency (events/year)
ED = Exposure Duration (years)
BW = Body Weight (Kg)
$AT_N$ = Averaging Time for noncarcinogenic exposures (days)
$AT_C$ = Averaging Time for carcinogenic exposures (days)

| | Reasonable Maximum Exposure | Central Tendency Exposure |
|---|---|---|
| $C_S$ | chemical specific mg/Kg | Chemical specific mg/Kg |
| CF | 1E-6 Kg/mg | 1E-6 Kg/mg |
| SA | 2900 cm²/event | 2900 cm²/event |
| AF | 0.2 mg/cm² | 0.06 mg/cm² |
| ABS | Chemical specific unitless | chemical specific unitless |
| EF | 150 events/year | 150 events/year |
| ED | 6 years | 2 years |
| BW | 15 Kg | 15 Kg |
| $AT_N$ | 2190 days | 730 days |
| $AT_C$ | [illegible] days | [illegible] days |

| | | | |
|---|---|---|---|
| CLIENT Raymark - Ferry Creek | | JOB NUMBER 7491 | |
| SUBJECT Direct Dermal Contact with Soil - Frequent Recreational User - Child | | | |
| BASED ON RAGS 1989 | | DRAWING NUMBER | |
| BY KAC | CHECKED BY RJJ | APPROVED BY | DATE 9/24/99 |

The absorbed dose of arsenic at a concentration of 28.1 mg/Kg for area A1 surface soils under the Reasonable Maximum exposure (RME) assumptions is calculated:

RME Noncarc. Absorbed Dose (mg/Kg-day) $= \frac{28.1\frac{mg}{Kg} \times 1E6\frac{Kg}{mg} \times 2900\frac{cm^2}{event} \times 0.2\frac{mg}{cm^2} \times 0.03 \times 150\frac{event}{yr} \times 6\ years}{15\ Kg \times 2190\ days}$

$= \boxed{1.34E-5\ mg/Kg\text{-}day\ RME}$ ✓

RME Carc. Absorbed Dose (mg/Kg-day) $= \frac{28.1\frac{mg}{Kg} \times 1E\text{-}6\frac{kg}{mg} \times 2900\frac{cm^2}{event} \times 0.2\frac{mg}{cm^2} \times 0.03 \times 150\frac{event}{yr} \times 6\ years}{15\ Kg \times 25550\ days}$

$= \boxed{1.15E-6\ mg/Kg\text{-}day\ RME}$ ✓

Then Incremental Cancer Risk (ICR) and Hazard Quotient (HQ) are calculated via the following equations:

ICR (unitless) = Carcinogenic Absorbed Dose (mg/Kg-day) × Cancer Slope Factor (CSF) (Kg/mg-day)

HQ (unitless) $= \frac{\text{noncarcinogenic Absorbed Dose (mg/Kg-day)}}{\text{Reference Dose (RfD) (mg/Kg-day)}}$

Where the CSF for Arsenic = 1.5 and the RfD = 3.0E-4

RME ICR Arsenic (unitless) = 1.15E-6 mg/Kg-day × 1.5 (Kg/mg-day) = $\boxed{1.73E-6\ RME}$ ✓

RME HQ Arsenic (unitless) $= \frac{1.34E-5\ mg/Kg\text{-}day}{3.0E-4\ mg/Kg\text{-}day} = \boxed{4.5E-2\ RME}$ ✓

| | | | |
|---|---|---|---|
| CLIENT Raymark - Ferry Creek | | JOB NUMBER 7491 | |
| SUBJECT Direct Dermal Contact with Soil - Frequent Recreational User-Child | | | |
| BASED ON RAGS 1989 | | DRAWING NUMBER | |
| BY KAC | CHECKED BY RJJ | APPROVED BY | DATE 9/24/99 |

The absorbed dose of arsenic at a concentration of 9 mg/kg for Area A1 surface soil under the central tendency exposure (CTE) assumptions is calculated:

CTE Noncarc. Absorbed Dose (mg/kg-day) $= \dfrac{9\frac{mg}{kg} \times 1E\text{-}6\frac{kg}{mg} \times 2900\frac{cm^2}{event} \times 0.06\frac{mg}{cm^2} \times 0.03 \times 150\frac{event}{yr} \times 2yr}{15\,kg \times 730\,days}$

$= \boxed{1.29E\text{-}6 \text{ mg/kg-day CTE}}$ ✓

CTE Carcin. Absorbed Dose (mg/kg-day) $= \dfrac{9\frac{mg}{kg} \times 1E\text{-}6\frac{kg}{mg} \times 2900\frac{cm^2}{event} \times 0.06\frac{mg}{cm^2} \times 0.03 \times 150\frac{event}{yr} \times 2\,year}{15\,kg \times 25550\,days}$

$= \boxed{3.68E\text{-}8 \text{ mg/kg-day CTE}}$ ✓

Then ICR and HQ are calculated for arsenic:

ICR CTE Arsenic (unitless) = 3.68E-8 (mg/kg-day) × 1.5 (kg/mg-day) = $\boxed{5.5E\text{-}8}$ CTE ✓

HQ CTE Arsenic (unitless) $= \dfrac{1.29E\text{-}6 \text{ mg/kg-day}}{3.0E\text{-}4 \text{ mg/kg-day}} = \boxed{4.3E\text{-}3 \text{ CTE}}$ ✓

References

USEPA Dec. 1989. Risk Assessment Guidance for Superfund Volume 1 Human Health Evaluation Manual (Part A). OSWER EPA/540/1-89/002.

| | | | |
|---|---|---|---|
| CLIENT Raymark - Ferry Creek | | JOB NUMBER 7491 | |
| SUBJECT Accidental Ingestion of Soil - Adolescent trespasser | | | |
| BASED ON RAGs 1989 | | DRAWING NUMBER | |
| BY KAC | CHECKED BY RJJ | APPROVED BY | DATE 9/24/99 |

Purpose: To calculate carcinogenic and noncarcinogenic risk for the adolescent trespasser for exposure via incidental ingestion of soil.

Relevant Equation:

$$\text{Intake (mg/kg-day)} = \frac{Cs \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$$

Where

$Cs$ = Chemical concentration in soil (mg/Kg)
$IR$ = Soil Ingestion Rate (mg/day)
$CF$ = Conversion Factor (Kg/mg)
$FI$ = Fraction ingested from a contaminated Source (unitless)
$EF$ = Exposure Frequency (days/year)
$ED$ = Exposure Duration (years)
$BW$ = Body Weight (Kg)
$AT_C$ = Averaging Time carcinogenic exposures (days)
$AT_N$ = Averaging Time noncarcinogenic exposures (days)

| | Reasonable Maximum Exposures | Central Tendency Exposure |
|---|---|---|
| Cs | Chemical specific mg/Kg | chemical specific mg/Kg |
| IR | 100 mg/day | 50 mg/day |
| CF | 1.0E-6 (Kg/mg) | 1E-6 Kg/mg |
| FI | 1 unitless | 1 unitless |
| EF | 52 days/year | 52 days/year |
| ED | 10 years | 5 years |
| BW | 51 Kg | 51 Kg |
| $AT_N$ | 3650 days | 1825 days |
| $AT_C$ | 25550 days | 25550 days |

| | | | |
|---|---|---|---|
| CLIENT Raymark - Ferry Creek | | JOB NUMBER 7491 | |
| SUBJECT Incidental Ingestion of soil - Adolescent Trespasser | | | |
| BASED ON RAGs 1989 | | DRAWING NUMBER | |
| BY KAC | CHECKED BY RJJ | APPROVED BY | DATE 9/24/99 |

Intake of Arsenic at a concentration of 9.9 mg/Kg for Area A1 Surface soil under the Reasonable maximum exposure (RME) assumptions is calculated:

RME Noncarc. Intake (mg/Kg-day) $= \dfrac{9.9\,mg/Kg \times 100\,\frac{mg}{day} \times 1E\text{-}6\,\frac{Kg}{mg} \times 1 \times 52\,\frac{days}{year} \times 10\,years}{51\,Kg \times 3650\,days}$

$= \boxed{2.8E\text{-}6\ mg/Kg\text{-}day\ RME}$ ✓

RME Carc. Intake (mg/Kg-day) $= \dfrac{9.9\,\frac{mg}{Kg} \times 100\,mg/day \times 1E\text{-}6\,Kg/mg \times 1 \times 52\,\frac{days}{year} \times 10\,years}{51\,Kg \times 25550\,days}$

$= \boxed{4.0E\text{-}7\ mg/Kg\text{-}day\ RME}$ ✓

Then Incremental Cancer Risk (ICR) and Hazard Quotient are calculated via the following:

ICR (unitless) = Carcinogenic Intake (mg/Kg-day) × Cancer Slope Factor (Kg/mg-day)

HQ (unitless) $= \dfrac{\text{noncarcinogenic Intake mg/Kg-day}}{\text{Reference Dose (RfD) mg/Kg-day}}$

where the CSF for Arsenic = 1.5 and the RfD = 3.0E-4

ICR RME Arsenic unitless = 4E-7 mg/Kg-day × 1.5 Kg/mg-day $= \boxed{6.0E\text{-}7\ RME}$ ✓

HQ RME Arsenic unitless $= \dfrac{2.8E\text{-}6\ mg/Kg\text{-}day}{3.0E\text{-}4\ mg/Kg\text{-}day} = \boxed{9.3E\text{-}3\ RME}$ ✓

| | |
|---|---|
| CLIENT Raymark - Ferry Creek | JOB NUMBER 7491 |
| SUBJECT Incidental Ingestion of Soil - Adolescent trespasser | |
| BASED ON RAGS 1989 | DRAWING NUMBER |
| BY KAC / CHECKED BY RJJ | APPROVED BY / DATE 9/24/99 |

Intake of Arsenic at a concentration of 9.9 mg/kg for area A1 surface soil under a central tendency exposure (CTE) assumptions are calculated:

CTE Noncarc. Intake (mg/kg-day) $= \frac{9.9\,mg/kg \times 50\,mg/day \times 1E\text{-}6\,kg/mg \times 1 \times 52\,day/year \times 5\,years}{51\,kg \times 1825\,days}$

$= \boxed{1.4E\text{-}6\ mg/kg\text{-}day}$ CTE ✓

CTE Carcinog Intake (mg/kg-day $= \frac{9.9\,\frac{mg}{kg} \times 50\,mg/day \times 1E\text{-}6\,kg/mg \times 1 \times 52\,\frac{day}{year} \times 5\,years}{51\,kg \times 25550\,days}$

$= \boxed{9.9E\text{-}8\ mg/kg\text{-}day\ CTE}$ ✓

Then ICR and HQ are calculated for arsenic via the following:

ICR CTE Arsenic (unitless) $=$ 9.9E-8 mg/kg-day $\times$ 1.5 kg/mg-day $= \boxed{1.5\,E\text{-}7\ CTE}$ ✓

HQ CTE Arsenic (unitless) $= \frac{1.4E\text{-}6\ mg/kg\ day}{3E\text{-}4\ mg/kg\text{-}day} = \boxed{4.6E\text{-}3\ CTE}$ ✓

Reference

USEPA Dec. 1989. Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A). OSWER EPA/540/1-89/002.

| | |
|---|---|
| CLIENT Raymark Ferry Creek | JOB NUMBER 7491 |
| SUBJECT Direct Dermal Contact with Soil - Adolescent trespasser | |
| BASED ON RAGs 1989 | DRAWING NUMBER |

| | | | |
|---|---|---|---|
| BY KAC | CHECKED BY RJJ | APPROVED BY | DATE 9/24/99 |

Purpose: To calculate carcinogenic and noncarcinogenic risk for the adolescent trespasser with exposure via direct dermal contact with soil.

Relevant Equations:

$$\text{Absorbed Dose (mg/kg-day)} = \frac{C_S \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

Where:

$C_S$ = Chemical concentration in soil (mg/kg)
CF = Conversion Factor (kg/mg)
SA = Skin surface available for contact ($cm^2$/event)
AF = Soil to skin adherence factor (mg/$cm^2$)
ABS = Absorption factor (unitless)
EF = Exposure Frequency (events/year)
ED = Exposure Duration (years)
BW = Body weight (kg)
ATC = Averaging Time for carcinogenic (days)
ATN = Averaging Time for noncarcinogenic (days)

| | Reasonable Maximum Exposure | Central Tendency Exposure |
|---|---|---|
| $C_S$ | Chemical specific (mg/kg) | chemical specific (mg/kg) |
| CF | 1E-6 kg/mg | 1E-6 kg/mg |
| SA | 3500 $cm^2$/event | 3500 $cm^2$/event |
| AF | 0.07 mg/$cm^2$ | 0.01 mg/$cm^2$ |
| ABS | Chemical-specific (unitless) | Chemical-specific (unitless) |
| EF | 52 events/year | 52 events/year |
| ED | 10 years | 5 years |
| BW | 51 kg | 51 kg |
| ATN | 3650 days | 1825 days |
| ATC | 25550 days | 25550 days |

| | | | |
|---|---|---|---|
| CLIENT Raymark - Ferry Creek | | JOB NUMBER 7491 | |
| SUBJECT Direct Dermal Contact with Soil - Adolescent trespasser | | | |
| BASED ON RAGs 1989 | | DRAWING NUMBER | |
| BY KAC | CHECKED BY RJJ | APPROVED BY | DATE 9/24/99 |

The absorbed dose of arsenic at a concentration of 9.9 mg/Kg for area A1 surface soil under the reasonable maximum exposure (RME) assumptions is calculated:

RME Noncarc. Absorbed Dose (mg/Kg-day)

$$= \frac{9.9\,\frac{mg}{Kg} \times 1E\text{-}6\,\frac{Kg}{mg} \times 3500\,\frac{cm^2}{event} \times 0.07\,\frac{mg}{cm^2} \times 0.03 \times 52\,\frac{events}{year} \times 10\,years}{51\,Kg \times 3650\,days}$$

$$= \boxed{2.03E\text{-}7\ mg/Kg\text{-}day\ RME}$$ ✓

RME Carcinog Absorbed Dose (mg/Kg-day)

$$= \frac{9.9\,\frac{mg}{Kg} \times 1E\text{-}6\,\frac{Kg}{mg} \times 3500\,\frac{cm^2}{event} \times 0.07\,\frac{mg}{cm^2} \times 0.03 \times 52\,\frac{events}{year} \times 10\,yr}{51\,Kg \times 25550\,days}$$

$$= \boxed{2.9E\text{-}8\ mg/Kg\text{-}day\ RME}$$ ✓

Then Incremental Cancer Risk (ICR) and Hazard Quotient (HQ) are calculated via the following equations:

ICR (unitless) = Carcinogenic Absorbed Dose (mg/Kg-day) × Cancer Slope Factor (CSF) (Kg/mg-day)

$$HQ\ (unitless) = \frac{\text{noncarcinogenic Absorbed Dose (mg/Kg-day)}}{\text{Reference Dose (RfD) (mg/Kg-day)}}$$

Where the CSF for arsenic = 1.5 and the RfD = 3.0E-4

RME ICR Arsenic (unitless) = 2.9E-8 mg/Kg-day × 1.5 = $\boxed{4.4E\text{-}8\ RME}$ ✓

RME HQ Arsenic (unitless) = $\frac{2.03E\text{-}7\ mg/Kg\text{-}day}{3.0E\text{-}4\ mg/Kg\text{-}day}$ = $\boxed{6.8E\text{-}4\ RME}$ ✓

| | | | |
|---|---|---|---|
| CLIENT Raymark - Ferry Creek | | JOB NUMBER 7491 | |
| SUBJECT Direct Dermal Contact with Soil - Adolescent trespasser | | | |
| BASED ON RAGs 1989 | | DRAWING NUMBER | |
| BY KAC | CHECKED BY KJJ | APPROVED BY | DATE 9/24/99 |

The absorbed dose of arsenic at a concentration of 9.9 mg/kg for Area A1 surface soil under the central tendency exposure (CTE) assumptions are calculated:

CTE Noncarc. Absorbed Dose (mg/kg-day)

$$= \frac{9.9\,\frac{mg}{kg} \times 1E\text{-}6\,\frac{kg}{mg} \times 3500\,\frac{cm^2}{event} \times 0.01\,\frac{mg}{cm^2} \times 0.03 \times 52\,\frac{events}{yr} \times 5yr}{51\,kg \times 1825\,days}$$

$$= \boxed{2.9E\text{-}8\ mg/kg\text{-}day\ CTE}$$ ✓

CTE Carc Absorbed Dose (mg/kg-day)

$$= \frac{9.9\,mg/kg \times 1E\text{-}6\,\frac{kg}{mg} \times 3500\,\frac{cm^2}{event} \times 0.01\,\frac{mg}{cm^2} \times 0.03 \times 52\,\frac{event}{yr} \times 5yr}{51\,kg \times 25550\,days}$$

$$= \boxed{2.1E\text{-}9\ mg/kg\text{-}day\ CTE}$$ ✓

Then ICR and HQ for arsenic are calculated via the following:

ICR CTE Arsenic unitless $= 2.1E\text{-}9\ (mg/kg\text{-}day) \times 1.5\ (kg/mg\text{-}day) = \boxed{3.15E\text{-}9\ CTE}$ ✓

HQ CTE Arsenic unitless $= \frac{2.9E\text{-}8\ mg/kg\text{-}day}{3E\text{-}4\ mg/kg\text{-}day} = \boxed{9.7E\text{-}5\ CTE}$ ✓

Reference

USEPA Dec. 1989. Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A). OSWER EPA/540/1-89/002.

**TETRA TECH NUS, INC.** **CALCULATION WORKSHEET** PAGE 1 OF 4

| | | | |
|---|---|---|---|
| CLIENT Raymark | | JOB NUMBER | |
| SUBJECT Direct Dermal Contact with Surface Water | | | |
| BASED ON RAGs and Draft Dermal Guidance | | DRAWING NUMBER | |
| BY KAC | CHECKED BY RJ | APPROVED BY | DATE 7/22/99 |

Purpose: To calculate carcinogenic and noncarcinogenic risk via dermal exposure to surface water.

Relevant Equations:

$$\text{Absorbed Dose} = \frac{DA_{event} \times EV \times EF \times ED \times SA}{BW \times AT}$$

For Inorganic Compounds:

$$DA_{event} = Kp \times Cw \times t_{event} \times CF$$

For Organic Compounds:

If $t_{event} \leq t^*$ then,

$$DA_{event} = 2 \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times t_{event}}{\pi}}$$

If $t_{event} > t^*$ then,

$$DA_{event} = Kp \times Cw \times CF \times \left[\frac{t_{event}}{1+B} + 2 \times tau \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

where: If $B \leq 0.6$ then $t^* = 2.4 \times tau$

but If $B > 0.6$ then $t^* = \frac{\left(b - \sqrt{b^2 - c^2}\right) \times 0.000001}{Dsc}$

where $B = Kp \times \sqrt{\frac{MW}{2.6}}$ $\qquad C = \frac{1+3B+3B^2}{3(1+B)}$

$b = \left(\frac{2(1+B)^2}{\pi}\right) - c$ $\qquad Dsc = 0.001 \times 10^{(-2.8 - 0.0056 \times MW)}$

$tau = 0.105 \times 10^{(0.0056 \times MW)}$

| | |
|---|---|
| CLIENT Raymark | JOB NUMBER |
| SUBJECT Direct Dermal Contact with Surface Water | |
| BASED ON RAGs and Draft Dermal Guidance | DRAWING NUMBER |
| BY KAC / CHECKED BY [illegible] | APPROVED BY / DATE 7/22/99 |

Values for the organic compound Trichloroethene in surface water at Area A-3 for the Adult Frequent Recreational User the following exposure assumptions are true:

| | | |
|---|---|---|
| Where: SA = : | 6,600 | Skin surface available for contact ($cm^2$) |
| DAevent = : | | Chemical specific absorbed dose per event ($mg/cm^2$-event) |
| EV = : | 1 | Event frequency (events/days) |
| EF = : | 90 | Exposure frequency (days/year) |
| ED = : | 24 | Exposure duration (years) |
| BW = : | 70 | Body weight (kg) |
| ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| ATn = : | 8,760 | Averaging time for noncarcinogenic exposures (days) |
| CF = : | 0.001 | Conversion Factor ($L/m^3$) |
| Kp = : | 2.90-2 | Chemical specific permeability coefficient (cm/hr) trichloroethene |
| Cw = : | 0.078 | Concentration of chemical in water (mg/L) trichloroethene |
| tevent = : | 1 | duration of event (hr/event) |
| tau = : | | Chemical specific lag time (hr) |
| t* = : | | Chemical specific time it takes to reach steady state (hr) |
| B = : | | Chemical specific dimensionless constant |
| Dsc = : | | Effective diffusivity for chemical transfer through skin ($cm^2/hr$) |
| b, c = : | | chemical specific constants |

MW=: 112.6 Molecular Weight for trichloroethene

$$tau = 0.105 \times 10^{(0.0056 \times 112.6)} = \boxed{4.48E-1 \text{ hr}}$$

$$B = 2.90E-2 \times \sqrt{\frac{112.6}{2.6}} = \boxed{1.18E-1}$$

$$c = \frac{1 + 3(1.18E-1) + 3(1.18E-1)^2}{3(1 + 1.18E-1)} = \boxed{4.16E-1}$$

$$b = \left(\frac{2(1 + 1.18E-1)^2}{\pi}\right) - 4.16E-1 = \boxed{3.79E-1}$$

$$Dsc = 0.001 \times 10^{(-2.8 - 0.0056 \times 112.6)} = \boxed{3.71E-7 \text{ cm}^2/\text{hr}}$$

And $B = 1.18E-1$ which is less than 0.6 hence

$$t^* = 2.4 \times tau \; ; \; \boxed{t^* = 2.4 \times 4.48E-1 = 1.08 \text{ hr}}$$

TETRA TECH NUS, INC. CALCULATION WORKSHEET 

| | | | |
|---|---|---|---|
| CLIENT Raymark | | JOB NUMBER | |
| SUBJECT Direct Dermal Contact with Surface Water | | | |
| BASED ON RAGs and Draft Dermal Guidance | | DRAWING NUMBER | |
| BY KAC | CHECKED BY RH | APPROVED BY | DATE 7/22/99 |

And $t^*$ (1.08) is greater than tevent (1.0) therefore

$$DAevent = 2 \times 2.9E\text{-}2 \times 0.078 \times 0.001 \times \sqrt{\frac{6 \times 4.48E\text{-}1 \times 1.0}{\pi}}$$

DAevent = 4.2E-6 mg/cm²-event
trichloroethene

absorbed dose= $\frac{4.2E\text{-}6 \times 1 \times 90 \times 24 \times 6,600}{70 \times 8760}$ = 9.7E-5 mg/kg-day
noncarcinogen

absorbed dose = $\frac{4.2E\text{-}6 \times 1 \times 90 \times 24 \times 6600}{70 \times 25550}$ = 3.3E-5 mg/kg-day
carcinogen

The cancer slope factor (CSF) for Trichloroethene = 1.1E-2 kg/mg-day
The reference dose (RfD) for trichloroethene = 6.0E-3 mg/kg-day

Lifetime Cancer Risk = CSF x absorbed dose carcinogens = 3.6E-7
1.1E-2 x 3.3E-5
(kg/mg-day) (mg/kg-day)

Hazard Quotient = $\frac{\text{absorbed dose noncarcinogen mg/kg-day}}{\text{RfD mg/kg-day}} = \frac{9.7E\text{-}5}{6.0E\text{-}3}$ = 1.6E-2

Values for the inorganic compound Arsenic in surface water at Area A3 for the adult Frequent Recreational User were also calculated for which the following assumptions are true:

Kp = 1.0E-3 cm/hr permeability coefficient for arsenic
Cw = 0.0751 mg/L concentration of Arsenic in surface water
CF = 0.001 L/m³ Conversion Factor
tevent = 1.0 hr/event duration of event

**TETRA TECH NUS, INC.** **CALCULATION WORKSHEET** 

| | | | |
|---|---|---|---|
| CLIENT Raymark | | JOB NUMBER | |
| SUBJECT Direct Dermal Contact with Surface Water | | | |
| BASED ON RAGs and Draft Dermal Guidance | | DRAWING NUMBER | |
| BY KAC | CHECKED BY RJJ | APPROVED BY | DATE 7/22/99 |

For Inorganics DAevent = Kp x Cw x CF x tevent

$= 1E{-}3 \times 0.0751 \times 0.001 \times 1 = \boxed{7.51E{-}8 \ \frac{mg}{cm^2 event}}$

absorbed dose noncarcinogen $= \frac{7.51E{-}8 \times 1 \times 90 \times 24 \times 6600}{70 \times 8760} = \boxed{1.75E{-}6 \ mg/kg{-}day}$

Absorbed dose Carcinogen $= \frac{7.51E{-}8 \times 1 \times 90 \times 24 \times 6600}{70 \times 25550} = \boxed{5.99E{-}7 \ mg/kg{-}day}$

The cancer slope factor (CSF) for Arsenic = 1.5 kg/mg-day
The reference dose (RfD) for Arsenic = 3.0E-4 mg/kg-day

Lifetime Cancer Risk $= \underbrace{1.5 \ kg/mg/day}_{CSF} \times \underbrace{5.99E{-}7 \ mg/kg\ day}_{\text{absorbed dose carcinogen}} = \boxed{9.0E{-}7}$

Hazard Quotient $= \frac{\text{absorbed dose noncarcinogen mg/kg-day}}{\text{RfD mg/kg-day}} = \frac{1.75E{-}6}{3E{-}4} = \boxed{5.8E{-}3}$

# Appendices F.9 – F.11

## Human Health Risk Assessment Spreadsheets

# Appendix F.9

## Area A-1

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

**SITE NAME:** AREA A-1, MORGAN FRANCIS PROPERTIES
**LOCATION:** FERRY CREEK, STRATFORD, CT
**EXPOSURE SCENARIO:** COMMERCIAL WORKER - RME
**MEDIA:** SURFACE SOIL
**DATE:** SEPTEMBER 28, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INCIDENTAL INGESTION OF SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $\text{Intake} = \dfrac{Cs \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

| | | | |
|---|---|---|---|
| WHERE: | Cs =: | | Concentration in soil (mg/kg) |
| | IR =: | 100 | Soil Ingestion Rate (mg/day) |
| | CF =: | 1.0E-06 | Conversion Factor (kg/mg) |
| | FI =: | 1 | Fraction from contaminated source (unitless) |
| | EF =: | 250 | Exposure Frequency (days/year) |
| | ED =: | 25 | Exposure Duration (years) |
| | BW =: | 70 | Body Weight (kg) |
| | ATc =: | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn =: | 9,125 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | | |
|---|---|---|
| Lifetime Chronic Daily Inta | 3.5E-07 | kg-soil/kg-wt/day |
| Chronic Daily Intake = : | 9.8E-07 | kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 7 | 2.4E-06 | 6.8E-06 | 7.30E-01 | NA | 1.8E-06 | 0.1% | NA | NA |
| Benzo(a)pyrene | 6 | 2.1E-06 | 5.9E-06 | 7.30E+00 | NA | 1.5E-05 | 1.2% | NA | NA |
| Benzo(b)fluoranthene | 6 | 2.1E-06 | 5.9E-06 | 7.30E-01 | NA | 1.5E-06 | 0.1% | NA | NA |
| Dibenzo(a,h)anthracene | 0.2 | 7.0E-08 | 2.0E-07 | 7.30E+00 | NA | 5.1E-07 | 0.0% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 4 | 1.4E-06 | 3.9E-06 | 7.30E-01 | NA | 1.0E-06 | 0.1% | NA | NA |
| Aroclor, total | 410 | 1.4E-04 | 4.0E-04 | 2.00E+00 | NA | 2.9E-04 | 23.2% | NA | NA |
| Antimony | 9.6 | 3.4E-06 | 9.4E-06 | NA | 4.00E-04 | NA | NA | 2.3E-02 | 5.1% |
| Arsenic | 21.9 | 7.7E-06 | 2.1E-05 | 1.50E+00 | 3.00E-04 | 1.1E-05 | 0.9% | 7.1E-02 | 15.5% |
| Barium | 17000 | 5.9E-03 | 1.7E-02 | NA | 7.00E-02 | NA | NA | 2.4E-01 | 51.6% |
| Cadmium | 1.9 | 6.6E-07 | 1.9E-06 | NA | 1.00E-03 | NA | NA | 1.9E-03 | 0.4% |
| Chromium (total) | 215 | 7.5E-05 | 2.1E-04 | NA | 3.00E-03 | NA | NA | 7.0E-02 | 15.2% |
| Lead | 1160 | 4.1E-04 | 1.1E-03 | NA | NA | NA | NA | NA | NA |
| Manganese | 352 | 1.2E-04 | 3.4E-04 | NA | 2.00E-02 | NA | NA | 1.7E-02 | 3.7% |
| Mercury | 0.28 | 9.8E-08 | 2.7E-07 | NA | 3.00E-04 | NA | NA | 9.1E-04 | 0.2% |
| Nickel | 465 | 1.6E-04 | 4.5E-04 | NA | 2.00E-02 | NA | NA | 2.3E-02 | 4.9% |
| Thallium | 0.24 | 8.4E-08 | 2.3E-07 | NA | 7.00E-05 | NA | NA | 3.4E-03 | 0.7% |
| Vanadium | 41.6 | 1.5E-05 | 4.1E-05 | NA | 7.00E-03 | NA | NA | 5.8E-03 | 1.3% |
| Zinc | 1910 | 6.7E-04 | 1.9E-03 | NA | 3.00E-01 | NA | NA | 6.2E-03 | 1.4% |
| TEQ - Dioxins/Furans | 0.0175 | 6.1E-09 | 1.7E-08 | 1.50E+05 | NA | 9.2E-04 | 74.2% | NA | NA |
| | | | | | **Total** | **1.2E-03** | **100.0%** | **4.6E-01** | **100.0%** |

(

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $$\text{Absorbed Dose} = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

| | | | |
|---|---|---|---|
| Where: | Cs = : | | Concentration in soil (mg/kg) |
| | CF = : | 1.0E-06 | Conversion factor (kg/mg) |
| | SA = : | 2,500 | Skin surface available for contact ($cm^2$/event) |
| | AF = : | 0.20 | Soil to skin adherence factor (mg/$cm^2$) |
| | ABS = : | | Absorption factor (unitless) |
| | EF = : | 250 | Exposure frequency (events/year) |
| | ED = : | 25 | Exposure duration (years) |
| | BW = : | 70 | Body weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 9,125 | Averaging time for noncarcinogenic exposures (days) |

| | |
|---|---|
| Unit Dose | |
| Lifetime Chronic Daily Intake | 1.7E-06 kg-soil/kg-wt/day |
| Chronic Daily Intake = : | 4.9E-06 kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | ABS (unitless) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 7 | 0.13 | 1.59E-06 | 4.45E-06 | 7.30E-01 | NA | 1.2E-06 | 0.3% | NA | NA |
| Benzo(a)pyrene | 6 | 0.13 | 1.36E-06 | 3.82E-06 | 7.30E+00 | NA | 9.9E-06 | 2.8% | NA | NA |
| Benzo(b)fluoranthene | 6 | 0.13 | 1.36E-06 | 3.82E-06 | 7.30E-01 | NA | 9.9E-07 | 0.3% | NA | NA |
| Dibenzo(a,h)anthracene | 0.2 | 0.13 | 4.54E-08 | 1.27E-07 | 7.30E+00 | NA | 3.3E-07 | 0.1% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 4 | 0.13 | 9.09E-07 | 2.54E-06 | 7.30E-01 | NA | 6.6E-07 | 0.2% | NA | NA |
| Aroclor, total | 410 | 0.14 | 1.00E-04 | 2.81E-04 | 2.00E+00 | NA | 2.0E-04 | 56.8% | NA | NA |
| Antimony | 9.6 | NA | NA | NA | NA | 6.00E-05 | NA | NA | NA | NA |
| Arsenic | 21.9 | 0.03 | 1.15E-06 | 3.21E-06 | 1.50E+00 | 3.00E-04 | 1.7E-06 | 0.5% | 1.1E-02 | 85.2% |
| Barium | 17000 | NA | NA | NA | NA | 4.90E-03 | NA | NA | NA | NA |
| Cadmium | 1.9 | 0.01 | 3.32E-08 | 9.30E-08 | NA | 5.00E-05 | NA | NA | 1.9E-03 | 14.8% |
| Chromium (total) | 215 | NA | NA | NA | NA | 7.50E-05 | NA | NA | NA | NA |
| Lead | 1160 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | 352 | NA | NA | NA | NA | 1.20E-03 | NA | NA | NA | NA |
| Mercury | 0.28 | NA | NA | NA | NA | 2.10E-05 | NA | NA | NA | NA |
| Nickel | 465 | NA | NA | NA | NA | 8.00E-04 | NA | NA | NA | NA |
| Thallium | 0.24 | NA | NA | NA | NA | 7.00E-05 | NA | NA | NA | NA |
| Vanadium | 41.6 | NA | NA | NA | NA | 1.80E-04 | NA | NA | NA | NA |
| Zinc | 1910 | NA | NA | NA | NA | 3.00E-01 | NA | NA | NA | NA |
| TEQ - Dioxins/Furans | 0.0175 | 0.03 | 9.17E-10 | 2.57E-09 | 1.50E+05 | NA | 1.4E-04 | 39.0% | NA | NA |
| | | | | | | **Total** | **3.5E-04** | **100.0%** | **1.3E-02** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - SUMMARY

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| | Lifetime Cancer Risk | | | | | Hazard Index | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | Incidental Ingestion | Dermal Contact | Inhalation | Total Risk | Percent Risk | Incidental Ingestion | Dermal Contact | Inhalation | Total HI | Percent HI |
| Benzo(a)anthracene | 1.8E-06 | 1.2E-06 | NA | 2.9E-06 | 0.2% | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | 1.5E-05 | 9.9E-06 | NA | 2.5E-05 | 1.6% | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | 1.5E-06 | 9.9E-07 | NA | 2.5E-06 | 0.2% | NA | NA | NA | NA | NA |
| Dibenzo(a,h)anthracene | 5.1E-07 | 3.3E-07 | NA | 8.4E-07 | 0.1% | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | 1.0E-06 | 6.6E-07 | NA | 1.7E-06 | 0.1% | NA | NA | NA | NA | NA |
| Aroclor, total | 2.9E-04 | 2.0E-04 | NA | 4.9E-04 | 30.7% | NA | NA | NA | NA | NA |
| Antimony | NA | NA | NA | NA | NA | 2.3E-02 | NA | NA | 2.3E-02 | 5.0% |
| Arsenic | 1.1E-05 | 1.7E-06 | NA | 1.3E-05 | 0.8% | 7.1E-02 | 1.1E-02 | NA | 8.2E-02 | 17.4% |
| Barium | NA | NA | NA | NA | NA | 2.4E-01 | NA | NA | 2.4E-01 | 50.2% |
| Cadmium | NA | NA | NA | NA | NA | 1.9E-03 | 1.9E-03 | NA | 3.7E-03 | 0.8% |
| Chromium (total) | NA | NA | NA | NA | NA | 7.0E-02 | NA | NA | 7.0E-02 | 14.8% |
| Lead | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | NA | NA | NA | NA | NA | 1.7E-02 | NA | NA | 1.7E-02 | 3.6% |
| Mercury | NA | NA | NA | NA | NA | 9.1E-04 | NA | NA | 9.1E-04 | 0.2% |
| Nickel | NA | NA | NA | NA | NA | 2.3E-02 | NA | NA | 2.3E-02 | 4.8% |
| Thallium | NA | NA | NA | NA | NA | 3.4E-03 | NA | NA | 3.4E-03 | 0.7% |
| Vanadium | NA | NA | NA | NA | NA | 5.8E-03 | NA | NA | 5.8E-03 | 1.2% |
| Zinc | NA | NA | NA | NA | NA | 6.2E-03 | NA | NA | 6.2E-03 | 1.3% |
| TEQ - Dioxins/Furans | 9.2E-04 | 1.4E-04 | NA | 1.1E-03 | 66.4% | NA | NA | NA | NA | NA |
| **Total** | **1.2E-03** | **3.5E-04** | **NA** | **1.6E-03** | **100.0%** | **4.6E-01** | **1.3E-02** | **NA** | **4.7E-01** | **100.0%** |

**RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL**

**SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES**
**LOCATION: FERRY CREEK, STRATFORD, CT**
**EXPOSURE SCENARIO: COMMERCIAL WORKER - CTE**
**MEDIA: SURFACE SOIL**
**DATE: SEPTEMBER 28, 1999**

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INCIDENTAL INGESTION OF SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $\text{Intake} = \dfrac{Cs \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

| | | | |
|---|---|---|---|
| WHERE: | Cs =: | | Concentration in soil (mg/kg) |
| | IR =: | 50 | Soil Ingestion Rate (mg/day) |
| | CF =: | 1.0E-06 | Conversion Factor (kg/mg) |
| | FI =: | 1 | Fraction from contaminated source (unitless) |
| | EF =: | 250 | Exposure Frequency (days/year) |
| | ED =: | 9 | Exposure Duration (years) |
| | BW =: | 70 | Body Weight (kg) |
| | ATc =: | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn =: | 3,285 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | | |
|---|---|---|
| Lifetime Chronic Daily Inta | 6.3E-08 | kg-soil/kg-wt/day |
| Chronic Daily Intake = : | 4.9E-07 | kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 2 | 1.3E-07 | 9.8E-07 | 7.30E-01 | NA | 9.2E-08 | 0.1% | NA | NA |
| Benzo(a)pyrene | 2 | 1.3E-07 | 9.8E-07 | 7.30E+00 | NA | 9.2E-07 | 1.0% | NA | NA |
| Benzo(b)fluoranthene | 2 | 1.3E-07 | 9.8E-07 | 7.30E-01 | NA | 9.2E-08 | 0.1% | NA | NA |
| Dibenzo(a,h)anthracene | 0.2 | 1.3E-08 | 9.8E-08 | 7.30E+00 | NA | 9.2E-08 | 0.1% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 1 | 6.3E-08 | 4.9E-07 | 7.30E-01 | NA | 4.6E-08 | 0.1% | NA | NA |
| Aroclor, total | 44 | 2.8E-06 | 2.2E-05 | 1.00E+00 | NA | 2.8E-06 | 3.1% | NA | NA |
| Antimony | 5.1 | 3.2E-07 | 2.5E-06 | NA | 4.00E-04 | NA | NA | 6.2E-03 | 8.6% |
| Arsenic | 8.1 | 5.1E-07 | 4.0E-06 | 1.50E+00 | 3.00E-04 | 7.6E-07 | 0.9% | 1.3E-02 | 18.2% |
| Barium | 3700 | 2.3E-04 | 1.8E-03 | NA | 7.00E-02 | NA | NA | 2.6E-02 | 35.7% |
| Cadmium | 0.69 | 4.3E-08 | 3.4E-07 | NA | 1.00E-03 | NA | NA | 3.4E-04 | 0.5% |
| Chromium (total) | 68 | 4.3E-06 | 3.3E-05 | NA | 3.00E-03 | NA | NA | 1.1E-02 | 15.3% |
| Lead | 1160 | 7.3E-05 | 5.7E-04 | NA | NA | NA | NA | NA | NA |
| Manganese | 270 | 1.7E-05 | 1.3E-04 | NA | 2.00E-02 | NA | NA | 6.6E-03 | 9.1% |
| Mercury | 0.14 | 8.8E-09 | 6.8E-08 | NA | 3.00E-04 | NA | NA | 2.3E-04 | 0.3% |
| Nickel | 148 | 9.3E-06 | 7.2E-05 | NA | 2.00E-02 | NA | NA | 3.6E-03 | 5.0% |
| Thallium | 0.24 | 1.5E-08 | 1.2E-07 | NA | 7.00E-05 | NA | NA | 1.7E-03 | 2.3% |
| Vanadium | 32.2 | 2.0E-06 | 1.6E-05 | NA | 7.00E-03 | NA | NA | 2.3E-03 | 3.1% |
| Zinc | 806 | 5.1E-05 | 3.9E-04 | NA | 3.00E-01 | NA | NA | 1.3E-03 | 1.8% |
| TEQ - Dioxins/Furans | 0.0089 | 5.6E-10 | 4.4E-09 | 1.50E+05 | NA | 8.4E-05 | 94.6% | NA | NA |
| | | | | | **Total** | **8.9E-05** | **100.0%** | **7.2E-02** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL

**SITE NAME:** AREA A-1, MORGAN FRANCIS PROPERTIES
**LOCATION:** FERRY CREEK, STRATFORD, CT
**EXPOSURE SCENARIO:** COMMERCIAL WORKER - CTE
**MEDIA:** SURFACE SOIL
**DATE:** SEPTEMBER 28, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION:

$$\text{Absorbed Dose} = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

| | | | |
|---|---|---|---|
| Where: | Cs = : | | Concentration in soil (mg/kg) |
| | CF = : | 1.0E-06 | Conversion factor (kg/mg) |
| | SA = : | 2,500 | Skin surface available for contact ($cm^2$/event) |
| | AF = : | 0.02 | Soil to skin adherence factor ($mg/cm^2$) |
| | ABS = : | | Absorption factor (unitless) |
| | EF = : | 250 | Exposure frequency (events/year) |
| | ED = : | 9 | Exposure duration (years) |
| | BW = : | 70 | Body weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 3,285 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | | |
|---|---|---|
| Lifetime Chronic Daily Intake | 6.3E-08 | kg-soil/kg-wt/day |
| Chronic Daily Intake = : | 4.9E-07 | kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | ABS (unitless) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 2 | 0.13 | 1.64E-08 | 1.27E-07 | 7.30E-01 | NA | 1.2E-08 | 0.4% | NA | NA |
| Benzo(a)pyrene | 2 | 0.13 | 1.64E-08 | 1.27E-07 | 7.30E+00 | NA | 1.2E-07 | 3.9% | NA | NA |
| Benzo(b)fluoranthene | 2 | 0.13 | 1.64E-08 | 1.27E-07 | 7.30E-01 | NA | 1.2E-08 | 0.4% | NA | NA |
| Dibenzo(a,h)anthracene | 0.2 | 0.13 | 1.64E-09 | 1.27E-08 | 7.30E+00 | NA | 1.2E-08 | 0.4% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 1 | 0.13 | 8.18E-09 | 6.36E-08 | 7.30E-01 | NA | 6.0E-09 | 0.2% | NA | NA |
| Aroclor, total | 44 | 0.14 | 3.87E-07 | 3.01E-06 | 1.00E+00 | NA | 3.9E-07 | 12.5% | NA | NA |
| Antimony | 5.1 | NA | NA | NA | NA | 6.00E-05 | NA | NA | NA | NA |
| Arsenic | 8.1 | 0.03 | 1.53E-08 | 1.19E-07 | 1.50E+00 | 3.00E-04 | 2.3E-08 | 0.7% | 4.0E-04 | 85.4% |
| Barium | 3700 | NA | NA | NA | NA | 4.90E-03 | NA | NA | NA | NA |
| Cadmium | 0.69 | 0.01 | 4.34E-10 | 3.38E-09 | NA | 5.00E-05 | NA | NA | 6.8E-05 | 14.6% |
| Chromium (total) | 68 | NA | NA | NA | NA | 7.50E-05 | NA | NA | NA | NA |
| Lead | 1160 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | 270 | NA | NA | NA | NA | 1.20E-03 | NA | NA | NA | NA |
| Mercury | 0.14 | NA | NA | NA | NA | 2.10E-05 | NA | NA | NA | NA |
| Nickel | 148 | NA | NA | NA | NA | 8.00E-04 | NA | NA | NA | NA |
| Thallium | 0.24 | NA | NA | NA | NA | 7.00E-05 | NA | NA | NA | NA |
| Vanadium | 32.2 | NA | NA | NA | NA | 1.80E-04 | NA | NA | NA | NA |
| Zinc | 806 | NA | NA | NA | NA | 3.00E-01 | NA | NA | NA | NA |
| TEQ - Dioxins/Furans | 0.0089 | 0.03 | 1.68E-11 | 1.31E-10 | 1.50E+05 | NA | 2.5E-06 | 81.5% | NA | NA |
| | | | | | | **Total** | **3.1E-06** | **100.0%** | **4.6E-04** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - SUMMARY

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| | Lifetime Cancer Risk | | | | | Hazard Index | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | Incidental Ingestion | Dermal Contact | Inhalation | Total Risk | Percent Risk | Incidental Ingestion | Dermal Contact | Inhalation | Total HI | Percent HI |
| Benzo(a)anthracene | 9.2E-08 | 1.2E-08 | NA | 1.0E-07 | 0.1% | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | 9.2E-07 | 1.2E-07 | NA | 1.0E-06 | 1.1% | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | 9.2E-08 | 1.2E-08 | NA | 1.0E-07 | 0.1% | NA | NA | NA | NA | NA |
| Dibenzo(a,h)anthracene | 9.2E-08 | 1.2E-08 | NA | 1.0E-07 | 0.1% | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | 4.6E-08 | 6.0E-09 | NA | 5.2E-08 | 0.1% | NA | NA | NA | NA | NA |
| Aroclor, total | 2.8E-06 | 3.9E-07 | NA | 3.2E-06 | 3.4% | NA | NA | NA | NA | NA |
| Antimony | NA | NA | NA | NA | NA | 6.2E-03 | NA | NA | 6.2E-03 | 8.6% |
| Arsenic | 7.6E-07 | 2.3E-08 | NA | 7.9E-07 | 0.9% | 1.3E-02 | 4.0E-04 | NA | 1.4E-02 | 18.7% |
| Barium | NA | NA | NA | NA | NA | 2.6E-02 | NA | NA | 2.6E-02 | 35.5% |
| Cadmium | NA | NA | NA | NA | NA | 3.4E-04 | 6.8E-05 | NA | 4.1E-04 | 0.6% |
| Chromium (total) | NA | NA | NA | NA | NA | 1.1E-02 | NA | NA | 1.1E-02 | 15.2% |
| Lead | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | NA | NA | NA | NA | NA | 6.6E-03 | NA | NA | 6.6E-03 | 9.1% |
| Mercury | NA | NA | NA | NA | NA | 2.3E-04 | NA | NA | 2.3E-04 | 0.3% |
| Nickel | NA | NA | NA | NA | NA | 3.6E-03 | NA | NA | 3.6E-03 | 5.0% |
| Thallium | NA | NA | NA | NA | NA | 1.7E-03 | NA | NA | 1.7E-03 | 2.3% |
| Vanadium | NA | NA | NA | NA | NA | 2.3E-03 | NA | NA | 2.3E-03 | 3.1% |
| Zinc | NA | NA | NA | NA | NA | 1.3E-03 | NA | NA | 1.3E-03 | 1.8% |
| TEQ - Dioxins/Furans | 8.4E-05 | 2.5E-06 | NA | 8.6E-05 | 94.2% | NA | NA | NA | NA | NA |
| **Total** | **8.9E-05** | **3.1E-06** | **NA** | **9.2E-05** | **100.0%** | **7.2E-02** | **4.6E-04** | **NA** | **7.3E-02** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - RME
MEDIA: ALL SOIL
DATE: SEPTEMBER 28, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INCIDENTAL INGESTION OF SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $\text{Intake} = \dfrac{Cs \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

| | | | |
|---|---|---|---|
| WHERE: | Cs = : | | Concentration in soil (mg/kg) |
| | IR = : | 100 | Soil Ingestion Rate (mg/day) |
| | CF = : | 1.0E-06 | Conversion Factor (kg/mg) |
| | FI = : | 1 | Fraction from contaminated source (unitless) |
| | EF = : | 250 | Exposure Frequency (days/year) |
| | ED = : | 25 | Exposure Duration (years) |
| | BW = : | 70 | Body Weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 9,125 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | | |
|---|---|---|
| Lifetime Chronic Daily Inta | 3.5E-07 | kg-soil/kg-wt/day |
| Chronic Daily Intake = : | 9.8E-07 | kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - RME
MEDIA: ALL SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 2 | 7.0E-07 | 2.0E-06 | 7.30E-01 | NA | 5.1E-07 | 0.4% | NA | NA |
| Benzo(a)pyrene | 2 | 7.0E-07 | 2.0E-06 | 7.30E+00 | NA | 5.1E-06 | 3.6% | NA | NA |
| Benzo(b)fluoranthene | 3 | 1.0E-06 | 2.9E-06 | 7.30E-01 | NA | 7.7E-07 | 0.5% | NA | NA |
| Benzo(k)fluoranthene | 2 | 7.0E-07 | 2.0E-06 | 7.30E-02 | NA | 5.1E-08 | 0.0% | NA | NA |
| Dibenzo(a,h)anthracene | 0.8 | 2.8E-07 | 7.8E-07 | 7.30E+00 | NA | 2.0E-06 | 1.5% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 1 | 3.5E-07 | 9.8E-07 | 7.30E-01 | NA | 2.6E-07 | 0.2% | NA | NA |
| Aldrin | 0.0047 | 1.6E-09 | 4.6E-09 | 1.70E+01 | 3.00E-05 | 2.8E-08 | 0.0% | 1.5E-04 | 0.1% |
| Aroclor-1254 | 0.13 | 4.5E-08 | 1.3E-07 | NA | 2.00E-05 | NA | NA | 6.4E-03 | 3.2% |
| Aroclor, total | 8.8 | 3.1E-06 | 8.6E-06 | 2.00E+00 | NA | 6.2E-06 | 4.4% | NA | NA |
| Antimony | 3.6 | 1.3E-06 | 3.5E-06 | NA | 4.00E-04 | NA | NA | 8.8E-03 | 4.5% |
| Arsenic | 18.4 | 6.4E-06 | 1.8E-05 | 1.50E+00 | 3.00E-04 | 9.6E-06 | 6.9% | 6.0E-02 | 30.6% |
| Barium | 4530 | 1.6E-03 | 4.4E-03 | NA | 7.00E-02 | NA | NA | 6.3E-02 | 32.2% |
| Cadmium | 0.91 | 3.2E-07 | 8.9E-07 | NA | 1.00E-03 | NA | NA | 8.9E-04 | 0.5% |
| Chromium (total) | 60.8 | 2.1E-05 | 5.9E-05 | NA | 3.00E-03 | NA | NA | 2.0E-02 | 10.1% |
| Lead | 674 | 2.4E-04 | 6.6E-04 | NA | NA | NA | NA | NA | NA |
| Manganese | 234 | 8.2E-05 | 2.3E-04 | NA | 2.00E-02 | NA | NA | 1.1E-02 | 5.8% |
| Mercury | 0.53 | 1.9E-07 | 5.2E-07 | NA | 3.00E-04 | NA | NA | 1.7E-03 | 0.9% |
| Nickel | 115 | 4.0E-05 | 1.1E-04 | NA | 2.00E-02 | NA | NA | 5.6E-03 | 2.9% |
| Thallium | 0.67 | 2.3E-07 | 6.6E-07 | NA | 7.00E-05 | NA | NA | 9.4E-03 | 4.8% |
| Vanadium | 33.3 | 1.2E-05 | 3.3E-05 | NA | 7.00E-03 | NA | NA | 4.7E-03 | 2.4% |
| Zinc | 1300 | 4.5E-04 | 1.3E-03 | NA | 3.00E-01 | NA | NA | 4.2E-03 | 2.2% |
| TEQ - Dioxins/Furans | 0.0022 | 7.7E-10 | 2.2E-09 | 1.50E+05 | NA | 1.2E-04 | 82.4% | NA | NA |
| | | | | | **Total** | **1.4E-04** | **100.0%** | **2.0E-01** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL

| | |
|---|---|
| SITE NAME: | AREA A-1, MORGAN FRANCIS PROPERTIES |
| LOCATION: | FERRY CREEK, STRATFORD, CT |
| EXPOSURE SCENARIO: | COMMERCIAL WORKER - RME |
| MEDIA: | ALL SOIL |
| DATE: | SEPTEMBER 28, 1999 |

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $\text{Absorbed Dose} = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$

| | | | |
|---|---|---|---|
| Where: | Cs = : | | Concentration in soil (mg/kg) |
| | CF = : | 1.0E-06 | Conversion factor (kg/mg) |
| | SA = : | 2,500 | Skin surface available for contact ($cm^2$/event) |
| | AF = : | 0.20 | Soil to skin adherence factor ($mg/cm^2$) |
| | ABS = : | | Absorption factor (unitless) |
| | EF = : | 250 | Exposure frequency (events/year) |
| | ED = : | 25 | Exposure duration (years) |
| | BW = : | 70 | Body weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 9,125 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | |
|---|---|
| Lifetime Chronic Daily Inta | 1.7E-06 kg-soil/kg-wt/day |
| Chronic Daily Intake = : | 4.9E-06 kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - RME
MEDIA: ALL SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | ABS (unitless) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 2 | 0.13 | 4.54E-07 | 1.27E-06 | 7.30E-01 | NA | 3.3E-07 | 1.2% | NA | NA |
| Benzo(a)pyrene | 2 | 0.13 | 4.54E-07 | 1.27E-06 | 7.30E+00 | NA | 3.3E-06 | 11.5% | NA | NA |
| Benzo(b)fluoranthene | 3 | 0.13 | 6.81E-07 | 1.91E-06 | 7.30E-01 | NA | 5.0E-07 | 1.7% | NA | NA |
| Benzo(k)fluoranthene | 2 | 0.13 | 4.54E-07 | 1.27E-06 | 7.30E-02 | NA | 3.3E-08 | 0.1% | NA | NA |
| Dibenzo(a,h)anthracene | 0.8 | 0.13 | 1.82E-07 | 5.09E-07 | 7.30E+00 | NA | 1.3E-06 | 4.6% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 1 | 0.13 | 2.27E-07 | 6.36E-07 | 7.30E-01 | NA | 1.7E-07 | 0.6% | NA | NA |
| Aldrin | 0.0047 | NA | NA | NA | 1.70E+01 | 3.00E-05 | NA | NA | NA | NA |
| Aroclor-1254 | 0.13 | 0.14 | 3.18E-08 | 8.90E-08 | NA | 2.00E-05 | NA | NA | 4.5E-03 | 31.0% |
| Aroclor, total | 8.8 | 0.14 | 2.15E-06 | 6.03E-06 | 2.00E+00 | NA | 4.3E-06 | 15.0% | NA | NA |
| Antimony | 3.6 | NA | NA | NA | NA | 6.00E-05 | NA | NA | NA | NA |
| Arsenic | 18.4 | 0.03 | 9.64E-07 | 2.70E-06 | 1.50E+00 | 3.00E-04 | 1.4E-06 | 5.0% | 9.0E-03 | 62.8% |
| Barium | 4530 | NA | NA | NA | NA | 4.90E-03 | NA | NA | NA | NA |
| Cadmium | 0.91 | 0.01 | 1.59E-08 | 4.45E-08 | NA | 5.00E-05 | NA | NA | 8.9E-04 | 6.2% |
| Chromium (total) | 60.8 | NA | NA | NA | NA | 7.50E-05 | NA | NA | NA | NA |
| Lead | 674 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | 234 | NA | NA | NA | NA | 1.20E-03 | NA | NA | NA | NA |
| Mercury | 0.53 | NA | NA | NA | NA | 2.10E-05 | NA | NA | NA | NA |
| Nickel | 115 | NA | NA | NA | NA | 8.00E-04 | NA | NA | NA | NA |
| Thallium | 0.67 | NA | NA | NA | NA | 7.00E-05 | NA | NA | NA | NA |
| Vanadium | 33.3 | NA | NA | NA | NA | 1.80E-04 | NA | NA | NA | NA |
| Zinc | 1300 | NA | NA | NA | NA | 3.00E-01 | NA | NA | NA | NA |
| TEQ - Dioxins/Furans | 0.0022 | 0.03 | 1.15E-10 | 3.23E-10 | 1.50E+05 | NA | 1.7E-05 | 60.2% | NA | NA |
| | | | | | | **Total** | **2.9E-05** | **100.0%** | **1.4E-02** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - SUMMARY

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - RME
MEDIA: ALL SOIL
DATE: SEPTEMBER 28, 1999

| | Lifetime Cancer Risk | | | | | Hazard Index | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | Incidental Ingestion | Dermal Contact | Inhalation | Total Risk | Percent Risk | Incidental Ingestion | Dermal Contact | Inhalation | Total HI | Percent HI |
| Benzo(a)anthracene | 5.1E-07 | 3.3E-07 | NA | 8.4E-07 | 0.5% | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | 5.1E-06 | 3.3E-06 | NA | 8.4E-06 | 5.0% | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | 7.7E-07 | 5.0E-07 | NA | 1.3E-06 | 0.7% | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | 5.1E-08 | 3.3E-08 | NA | 8.4E-08 | 0.0% | NA | NA | NA | NA | NA |
| Dibenzo(a,h)anthracene | 2.0E-06 | 1.3E-06 | NA | 3.4E-06 | 2.0% | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | 2.6E-07 | 1.7E-07 | NA | 4.2E-07 | 0.2% | NA | NA | NA | NA | NA |
| Aldrin | 2.8E-08 | NA | NA | 2.8E-08 | 0.0% | 1.5E-04 | NA | NA | 1.5E-04 | 0.1% |
| Aroclor-1254 | NA | NA | NA | NA | NA | 6.4E-03 | 4.5E-03 | NA | 1.1E-02 | 5.1% |
| Aroclor, total | 6.2E-06 | 4.3E-06 | NA | 1.0E-05 | 6.2% | NA | NA | NA | NA | NA |
| Antimony | NA | NA | NA | NA | NA | 8.8E-03 | NA | NA | 8.8E-03 | 4.2% |
| Arsenic | 9.6E-06 | 1.4E-06 | NA | 1.1E-05 | 6.6% | 6.0E-02 | 9.0E-03 | NA | 6.9E-02 | 32.7% |
| Barium | NA | NA | NA | NA | NA | 6.3E-02 | NA | NA | 6.3E-02 | 30.0% |
| Cadmium | NA | NA | NA | NA | NA | 8.9E-04 | 8.9E-04 | NA | 1.8E-03 | 0.8% |
| Chromium (total) | NA | NA | NA | NA | NA | 2.0E-02 | NA | NA | 2.0E-02 | 9.4% |
| Lead | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | NA | NA | NA | NA | NA | 1.1E-02 | NA | NA | 1.1E-02 | 5.4% |
| Mercury | NA | NA | NA | NA | NA | 1.7E-03 | NA | NA | 1.7E-03 | 0.8% |
| Nickel | NA | NA | NA | NA | NA | 5.6E-03 | NA | NA | 5.6E-03 | 2.7% |
| Thallium | NA | NA | NA | NA | NA | 9.4E-03 | NA | NA | 9.4E-03 | 4.4% |
| Vanadium | NA | NA | NA | NA | NA | 4.7E-03 | NA | NA | 4.7E-03 | 2.2% |
| Zinc | NA | NA | NA | NA | NA | 4.2E-03 | NA | NA | 4.2E-03 | 2.0% |
| TEQ - Dioxins/Furans | 1.2E-04 | 1.7E-05 | NA | 1.3E-04 | 78.7% | NA | NA | NA | NA | NA |
| **Total** | **1.4E-04** | **2.9E-05** | **NA** | **1.7E-04** | **100%** | **2.0E-01** | **1.4E-02** | **NA** | **2.1E-01** | **100%** |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - CTE
MEDIA: ALL SOIL
DATE: SEPTEMBER 28, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INCIDENTAL INGESTION OF SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $\text{Intake} = \dfrac{Cs \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

| | | | |
|---|---|---|---|
| WHERE: | Cs =: | | Concentration in soil (mg/kg) |
| | IR =: | 50 | Soil Ingestion Rate (mg/day) |
| | CF =: | 1.0E-06 | Conversion Factor (kg/mg) |
| | FI =: | 1 | Fraction from contaminated source (unitless) |
| | EF =: | 250 | Exposure Frequency (days/year) |
| | ED =: | 9 | Exposure Duration (years) |
| | BW =: | 70 | Body Weight (kg) |
| | ATc =: | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn =: | 3,285 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | | |
|---|---|---|
| Lifetime Chronic Daily Inta | 6.3E-08 | kg-soil/kg-wt/day |
| Chronic Daily Intake = : | 4.9E-07 | kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - CTE
MEDIA: ALL SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 2 | 1.3E-07 | 9.8E-07 | 7.30E-01 | NA | 9.2E-08 | 0.4% | NA | NA |
| Benzo(a)pyrene | 2 | 1.3E-07 | 9.8E-07 | 7.30E+00 | NA | 9.2E-07 | 3.7% | NA | NA |
| Benzo(b)fluoranthene | 3 | 1.9E-07 | 1.5E-06 | 7.30E-01 | NA | 1.4E-07 | 0.6% | NA | NA |
| Benzo(k)fluoranthene | 2 | 1.3E-07 | 9.8E-07 | 7.30E-02 | NA | 9.2E-09 | 0.0% | NA | NA |
| Dibenzo(a,h)anthracene | 0.8 | 5.0E-08 | 3.9E-07 | 7.30E+00 | NA | 3.7E-07 | 1.5% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 1 | 6.3E-08 | 4.9E-07 | 7.30E-01 | NA | 4.6E-08 | 0.2% | NA | NA |
| Aldrin | 0.0047 | 3.0E-10 | 2.3E-09 | 1.70E+01 | 3.00E-05 | 5.0E-09 | 0.0% | 7.7E-05 | 0.1% |
| Aroclor-1254 | 0.13 | 8.2E-09 | 6.4E-08 | NA | 2.00E-05 | NA | NA | 3.2E-03 | 3.2% |
| Aroclor, total | 8.8 | 5.5E-07 | 4.3E-06 | 1.00E+00 | NA | 5.5E-07 | 2.2% | NA | NA |
| Antimony | 3.6 | 2.3E-07 | 1.8E-06 | NA | 4.00E-04 | NA | NA | 4.4E-03 | 4.5% |
| Arsenic | 18.4 | 1.2E-06 | 9.0E-06 | 1.50E+00 | 3.00E-04 | 1.7E-06 | 7.1% | 3.0E-02 | 30.6% |
| Barium | 4530 | 2.8E-04 | 2.2E-03 | NA | 7.00E-02 | NA | NA | 3.2E-02 | 32.2% |
| Cadmium | 0.91 | 5.7E-08 | 4.5E-07 | NA | 1.00E-03 | NA | NA | 4.5E-04 | 0.5% |
| Chromium (total) | 60.8 | 3.8E-06 | 3.0E-05 | NA | 3.00E-03 | NA | NA | 9.9E-03 | 10.1% |
| Lead | 674 | 4.2E-05 | 3.3E-04 | NA | NA | NA | NA | NA | NA |
| Manganese | 234 | 1.5E-05 | 1.1E-04 | NA | 2.00E-02 | NA | NA | 5.7E-03 | 5.8% |
| Mercury | 0.53 | 3.3E-08 | 2.6E-07 | NA | 3.00E-04 | NA | NA | 8.6E-04 | 0.9% |
| Nickel | 115 | 7.2E-06 | 5.6E-05 | NA | 2.00E-02 | NA | NA | 2.8E-03 | 2.9% |
| Thallium | 0.67 | 4.2E-08 | 3.3E-07 | NA | 7.00E-05 | NA | NA | 4.7E-03 | 4.8% |
| Vanadium | 33.3 | 2.1E-06 | 1.6E-05 | NA | 7.00E-03 | NA | NA | 2.3E-03 | 2.4% |
| Zinc | 1300 | 8.2E-05 | 6.4E-04 | NA | 3.00E-01 | NA | NA | 2.1E-03 | 2.2% |
| TEQ - Dioxins/Furans | 0.0022 | 1.4E-10 | 1.1E-09 | 1.50E+05 | NA | 2.1E-05 | 84.3% | NA | NA |
| | | | | | Total | 2.5E-05 | 100.0% | 9.8E-02 | 100.0% |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - CTE
MEDIA: ALL SOIL
DATE: SEPTEMBER 28, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $\text{Absorbed Dose} = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$

| | | | |
|---|---|---|---|
| Where: | Cs = : | | Concentration in soil (mg/kg) |
| | CF = : | 1.0E-06 | Conversion factor (kg/mg) |
| | SA = : | 2,500 | Skin surface available for contact ($cm^2$/event) |
| | AF = : | 0.02 | Soil to skin adherence factor ($mg/cm^2$) |
| | ABS = : | | Absorption factor (unitless) |
| | EF = : | 250 | Exposure frequency (events/year) |
| | ED = : | 9 | Exposure duration (years) |
| | BW = : | 70 | Body weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 3,285 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | | |
|---|---|---|
| Lifetime Chronic Daily Inta | 6.3E-08 | kg-soil/kg-wt/day |
| Chronic Daily Intake = : | 4.9E-07 | kg-soil/kg-wt/day |

(

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - CTE
MEDIA: ALL SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | ABS (unitless) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 2 | 0.13 | 1.64E-08 | 1.27E-07 | 7.30E-01 | NA | 1.2E-08 | 1.2% | NA | NA |
| Benzo(a)pyrene | 2 | 0.13 | 1.64E-08 | 1.27E-07 | 7.30E+00 | NA | 1.2E-07 | 12.5% | NA | NA |
| Benzo(b)fluoranthene | 3 | 0.13 | 2.45E-08 | 1.91E-07 | 7.30E-01 | NA | 1.8E-08 | 1.9% | NA | NA |
| Benzo(k)fluoranthene | 2 | 0.13 | 1.64E-08 | 1.27E-07 | 7.30E-02 | NA | 1.2E-09 | 0.1% | NA | NA |
| Dibenzo(a,h)anthracene | 0.8 | 0.13 | 6.54E-09 | 5.09E-08 | 7.30E+00 | NA | 4.8E-08 | 5.0% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 1 | 0.13 | 8.18E-09 | 6.36E-08 | 7.30E-01 | NA | 6.0E-09 | 0.6% | NA | NA |
| Aldrin | 0.0047 | NA | NA | NA | 1.70E+01 | 3.00E-05 | NA | NA | NA | NA |
| Aroclor-1254 | 0.13 | 0.14 | 1.14E-09 | 8.90E-09 | NA | 2.00E-05 | NA | NA | 4.5E-04 | 31.0% |
| Aroclor, total | 8.8 | 0.14 | 7.75E-08 | 6.03E-07 | 1.00E+00 | NA | 7.7E-08 | 8.1% | NA | NA |
| Antimony | 3.6 | NA | NA | NA | NA | 6.00E-05 | NA | NA | NA | NA |
| Arsenic | 18.4 | 0.03 | 3.47E-08 | 2.70E-07 | 1.50E+00 | 3.00E-04 | 5.2E-08 | 5.4% | 9.0E-04 | 62.8% |
| Barium | 4530 | NA | NA | NA | NA | 4.90E-03 | NA | NA | NA | NA |
| Cadmium | 0.91 | 0.01 | 5.72E-10 | 4.45E-09 | NA | 5.00E-05 | NA | NA | 8.9E-05 | 6.2% |
| Chromium (total) | 60.8 | NA | NA | NA | NA | 7.50E-05 | NA | NA | NA | NA |
| Lead | 674 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | 234 | NA | NA | NA | NA | 1.20E-03 | NA | NA | NA | NA |
| Mercury | 0.53 | NA | NA | NA | NA | 2.10E-05 | NA | NA | NA | NA |
| Nickel | 115 | NA | NA | NA | NA | 8.00E-04 | NA | NA | NA | NA |
| Thallium | 0.67 | NA | NA | NA | NA | 7.00E-05 | NA | NA | NA | NA |
| Vanadium | 33.3 | NA | NA | NA | NA | 1.80E-04 | NA | NA | NA | NA |
| Zinc | 1300 | NA | NA | NA | NA | 3.00E-01 | NA | NA | NA | NA |
| TEQ - Dioxins/Furans | 0.0022 | 0.03 | 4.15E-12 | 3.23E-11 | 1.50E+05 | NA | 6.2E-07 | 65.1% | NA | NA |
| | | | | | | Total | 9.6E-07 | 100.0% | 1.4E-03 | 100.0% |

RISK ASSESSMENT SPREADSHEET - SUMMARY

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - CTE
MEDIA: ALL SOIL
DATE: SEPTEMBER 28, 1999

| | Lifetime Cancer Risk | | | | | Hazard Index | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | Incidental Ingestion | Dermal Contact | Inhalation | Total Risk | Percent Risk | Incidental Ingestion | Dermal Contact | Inhalation | Total HI | Percent HI |
| Benzo(a)anthracene | 9.2E-08 | 1.2E-08 | NA | 1.0E-07 | 0.4% | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | 9.2E-07 | 1.2E-07 | NA | 1.0E-06 | 4.1% | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | 1.4E-07 | 1.8E-08 | NA | 1.6E-07 | 0.6% | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | 9.2E-09 | 1.2E-09 | NA | 1.0E-08 | 0.0% | NA | NA | NA | NA | NA |
| Dibenzo(a,h)anthracene | 3.7E-07 | 4.8E-08 | NA | 4.2E-07 | 1.6% | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | 4.6E-08 | 6.0E-09 | NA | 5.2E-08 | 0.2% | NA | NA | NA | NA | NA |
| Aldrin | 5.0E-09 | NA | NA | 5.0E-09 | 0.0% | 7.7E-05 | NA | NA | 7.7E-05 | 0.1% |
| Aroclor-1254 | NA | NA | NA | NA | NA | 3.2E-03 | 4.5E-04 | NA | 3.6E-03 | 3.6% |
| Aroclor, total | 5.5E-07 | 7.7E-08 | NA | 6.3E-07 | 2.5% | NA | NA | NA | NA | NA |
| Antimony | NA | NA | NA | NA | NA | 4.4E-03 | NA | NA | 4.4E-03 | 4.4% |
| Arsenic | 1.7E-06 | 5.2E-08 | NA | 1.8E-06 | 7.0% | 3.0E-02 | 9.0E-04 | NA | 3.1E-02 | 31.0% |
| Barium | NA | NA | NA | NA | NA | 3.2E-02 | NA | NA | 3.2E-02 | 31.8% |
| Cadmium | NA | NA | NA | NA | NA | 4.5E-04 | 8.9E-05 | NA | 5.3E-04 | 0.5% |
| Chromium (total) | NA | NA | NA | NA | NA | 9.9E-03 | NA | NA | 9.9E-03 | 9.9% |
| Lead | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | NA | NA | NA | NA | NA | 5.7E-03 | NA | NA | 5.7E-03 | 5.7% |
| Mercury | NA | NA | NA | NA | NA | 8.6E-04 | NA | NA | 8.6E-04 | 0.9% |
| Nickel | NA | NA | NA | NA | NA | 2.8E-03 | NA | NA | 2.8E-03 | 2.8% |
| Thallium | NA | NA | NA | NA | NA | 4.7E-03 | NA | NA | 4.7E-03 | 4.7% |
| Vanadium | NA | NA | NA | NA | NA | 2.3E-03 | NA | NA | 2.3E-03 | 2.3% |
| Zinc | NA | NA | NA | NA | NA | 2.1E-03 | NA | NA | 2.1E-03 | 2.1% |
| TEQ - Dioxins/Furans | 2.1E-05 | 6.2E-07 | NA | 2.1E-05 | 83.6% | NA | NA | NA | NA | NA |
| **Total** | **2.5E-05** | **9.6E-07** | **NA** | **2.6E-05** | **100.0%** | **9.8E-02** | **1.4E-03** | **NA** | **1.0E-01** | **100.0%** |

**RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL**

**SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES**
**LOCATION: FERRY CREEK, STRATFORD, CT**
**EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT - RME**
**MEDIA: SURFACE SOIL**
**DATE: SEPTEMBER 28, 1999**

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INCIDENTAL INGESTION OF SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $$\text{Intake} = \frac{Cs \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$$

| | | | |
|---|---|---|---|
| WHERE: | Cs =: | | Concentration in soil (mg/kg) |
| | IR =: | 100 | Soil Ingestion Rate (mg/day) |
| | CF =: | 1.0E-06 | Conversion Factor (kg/mg) |
| | FI =: | 1 | Fraction from contaminated source (unitless) |
| | EF =: | 150 | Exposure Frequency (days/year) |
| | ED =: | 24 | Exposure Duration (years) |
| | BW =: | 70 | Body Weight (kg) |
| | ATc =: | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn =: | 8,760 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | | |
|---|---|---|
| Lifetime Chronic Daily Inta | 2.0E-07 | kg-soil/kg-wt/day |
| Chronic Daily Intake =: | 5.9E-07 | kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT - RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 2 | 4.0E-07 | 1.2E-06 | 7.30E-01 | NA | 2.9E-07 | 0.9% | NA | NA |
| Benzo(a)pyrene | 2 | 4.0E-07 | 1.2E-06 | 7.30E+00 | NA | 2.9E-06 | 9.1% | NA | NA |
| Benzo(b)fluoranthene | 4 | 8.1E-07 | 2.3E-06 | 7.30E-01 | NA | 5.9E-07 | 1.8% | NA | NA |
| Dibenzo(a,h)anthracene | 0.4 | 8.1E-08 | 2.3E-07 | 7.30E+00 | NA | 5.9E-07 | 1.8% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 2 | 4.0E-07 | 1.2E-06 | 7.30E-01 | NA | 2.9E-07 | 0.9% | NA | NA |
| Aroclor, total | 19 | 3.8E-06 | 1.1E-05 | 2.00E+00 | NA | 7.6E-06 | 23.7% | NA | NA |
| Arsenic | 28.1 | 5.7E-06 | 1.6E-05 | 1.50E+00 | 3.00E-04 | 8.5E-06 | 26.3% | 5.5E-02 | 25.3% |
| Barium | 9350 | 1.9E-03 | 5.5E-03 | NA | 7.00E-02 | NA | NA | 7.8E-02 | 36.1% |
| Cadmium | 4.4 | 8.9E-07 | 2.6E-06 | NA | 1.00E-03 | NA | NA | 2.6E-03 | 1.2% |
| Chromium (total) | 215 | 4.3E-05 | 1.3E-04 | NA | 3.00E-03 | NA | NA | 4.2E-02 | 19.4% |
| Lead | 478 | 9.6E-05 | 2.8E-04 | NA | NA | NA | NA | NA | NA |
| Manganese | 424 | 8.5E-05 | 2.5E-04 | NA | 2.00E-02 | NA | NA | 1.2E-02 | 5.7% |
| Mercury | 0.77 | 1.5E-07 | 4.5E-07 | NA | 3.00E-04 | NA | NA | 1.5E-03 | 0.7% |
| Nickel | 465 | 9.4E-05 | 2.7E-04 | NA | 2.00E-02 | NA | NA | 1.4E-02 | 6.3% |
| Vanadium | 97.5 | 2.0E-05 | 5.7E-05 | NA | 7.00E-03 | NA | NA | 8.2E-03 | 3.8% |
| Zinc | 1780 | 3.6E-04 | 1.0E-03 | NA | 3.00E-01 | NA | NA | 3.5E-03 | 1.6% |
| TEQ - Dioxins/Furans | 0.00038 | 7.6E-11 | 2.2E-10 | 1.50E+05 | NA | 1.1E-05 | 35.5% | NA | NA |
| | | | | | **Total** | **3.2E-05** | **100.0%** | **2.2E-01** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT - RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $\text{Absorbed Dose} = \dfrac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$

| | | | |
|---|---|---|---|
| Where: | Cs = : | | Concentration in soil (mg/kg) |
| | CF = : | 1.0E-06 | Conversion factor (kg/mg) |
| | SA = : | 5,700 | Skin surface available for contact ($cm^2$/event) |
| | AF = : | 0.07 | Soil to skin adherence factor (mg/$cm^2$) |
| | ABS = : | | Absorption factor (unitless) |
| | EF = : | 150 | Exposure frequency (events/year) |
| | ED = : | 24 | Exposure duration (years) |
| | BW = : | 70 | Body weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 8,760 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | | |
|---|---|---|
| Lifetime Chronic Daily Intak | 8.0E-07 | kg-soil/kg-wt/day |
| Chronic Daily Intake = : | 2.3E-06 | kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT - RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | ABS (unitless) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 2 | 0.13 | 2.09E-07 | 6.09E-07 | 7.30E-01 | NA | 1.5E-07 | 1.7% | NA | NA |
| Benzo(a)pyrene | 2 | 0.13 | 2.09E-07 | 6.09E-07 | 7.30E+00 | NA | 1.5E-06 | 16.8% | NA | NA |
| Benzo(b)fluoranthene | 4 | 0.13 | 4.18E-07 | 1.22E-06 | 7.30E-01 | NA | 3.0E-07 | 3.4% | NA | NA |
| Dibenzo(a,h)anthracene | 0.4 | 0.13 | 4.18E-08 | 1.22E-07 | 7.30E+00 | NA | 3.0E-07 | 3.4% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 2 | 0.13 | 2.09E-07 | 6.09E-07 | 7.30E-01 | NA | 1.5E-07 | 1.7% | NA | NA |
| Aroclor, total | 19 | 0.14 | 2.14E-06 | 6.23E-06 | 2.00E+00 | NA | 4.3E-06 | 46.9% | NA | NA |
| Arsenic | 28.1 | 0.03 | 6.77E-07 | 1.97E-06 | 1.50E+00 | 3.00E-04 | 1.0E-06 | 11.2% | 6.6E-03 | 76.2% |
| Barium | 9350 | NA | NA | NA | NA | 4.90E-03 | NA | NA | NA | NA |
| Cadmium | 4.4 | 0.01 | 3.53E-08 | 1.03E-07 | NA | 5.00E-05 | NA | NA | 2.1E-03 | 23.8% |
| Chromium (total) | 215 | NA | NA | NA | NA | 7.50E-05 | NA | NA | NA | NA |
| Lead | 478 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | 424 | NA | NA | NA | NA | 1.20E-03 | NA | NA | NA | NA |
| Mercury | 0.77 | NA | NA | NA | NA | 2.10E-05 | NA | NA | NA | NA |
| Nickel | 465 | NA | NA | NA | NA | 8.00E-04 | NA | NA | NA | NA |
| Vanadium | 97.5 | NA | NA | NA | NA | 1.80E-04 | NA | NA | NA | NA |
| Zinc | 1780 | NA | NA | NA | NA | 3.00E-01 | NA | NA | NA | NA |
| TEQ - Dioxins/Furans | 0.00038 | 0.03 | 9.16E-12 | 2.67E-11 | 1.50E+05 | NA | 1.4E-06 | 15.1% | NA | NA |
| | | | | | | **Total** | **9.1E-06** | **100.0%** | **8.6E-03** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - SUMMARY

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT - RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| | Lifetime Cancer Risk | | | | | Hazard Index | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Chemical** | **Incidental Ingestion** | **Dermal Contact** | **Inhalation** | **Total Risk** | **Percent Risk** | **Incidental Ingestion** | **Dermal Contact** | **Inhalation** | **Total HI** | **Percent HI** |
| Benzo(a)anthracene | 2.9E-07 | 1.5E-07 | NA | 4.5E-07 | 1.1% | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | 2.9E-06 | 1.5E-06 | NA | 4.5E-06 | 10.8% | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | 5.9E-07 | 3.0E-07 | NA | 8.9E-07 | 2.2% | NA | NA | NA | NA | NA |
| Dibenzo(a,h)anthracene | 5.9E-07 | 3.0E-07 | NA | 8.9E-07 | 2.2% | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | 2.9E-07 | 1.5E-07 | NA | 4.5E-07 | 1.1% | NA | NA | NA | NA | NA |
| Aroclor, total | 7.6E-06 | 4.3E-06 | NA | 1.2E-05 | 28.8% | NA | NA | NA | NA | NA |
| Arsenic | 8.5E-06 | 1.0E-06 | NA | 9.5E-06 | 22.9% | 5.5E-02 | 6.6E-03 | NA | 6.2E-02 | 27.2% |
| Barium | NA | NA | NA | NA | NA | 7.8E-02 | NA | NA | 7.8E-02 | 34.7% |
| Cadmium | NA | NA | NA | NA | NA | 2.6E-03 | 2.1E-03 | NA | 4.6E-03 | 2.1% |
| Chromium (total) | NA | NA | NA | NA | NA | 4.2E-02 | NA | NA | 4.2E-02 | 18.6% |
| Lead | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | NA | NA | NA | NA | NA | 1.2E-02 | NA | NA | 1.2E-02 | 5.5% |
| Mercury | NA | NA | NA | NA | NA | 1.5E-03 | NA | NA | 1.5E-03 | 0.7% |
| Nickel | NA | NA | NA | NA | NA | 1.4E-02 | NA | NA | 1.4E-02 | 6.0% |
| Vanadium | NA | NA | NA | NA | NA | 8.2E-03 | NA | NA | 8.2E-03 | 3.6% |
| Zinc | NA | NA | NA | NA | NA | 3.5E-03 | NA | NA | 3.5E-03 | 1.5% |
| TEQ - Dioxins/Furans | 1.1E-05 | 1.4E-06 | NA | 1.3E-05 | 31.0% | NA | NA | NA | NA | NA |
| **Total** | **3.2E-05** | **9.1E-06** | **NA** | **4.1E-05** | **100.0%** | **2.2E-01** | **8.6E-03** | **NA** | **2.3E-01** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT - CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INCIDENTAL INGESTION OF SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $$\text{Intake} = \frac{Cs \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$$

| | | | |
|---|---|---|---|
| WHERE: | Cs =: | | Concentration in soil (mg/kg) |
| | IR =: | 50 | Soil Ingestion Rate (mg/day) |
| | CF =: | 1.0E-06 | Conversion Factor (kg/mg) |
| | FI =: | 1 | Fraction from contaminated source (unitless) |
| | EF =: | 150 | Exposure Frequency (days/year) |
| | ED =: | 7 | Exposure Duration (years) |
| | BW =: | 70 | Body Weight (kg) |
| | ATc =: | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn =: | 2,555 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | |
|---|---|
| Lifetime Chronic Daily Inta | 2.9E-08 kg-soil/kg-wt/day |
| Chronic Daily Intake = : | 2.9E-07 kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT - CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 0.5 | 1.5E-08 | 1.5E-07 | 7.30E-01 | NA | 1.1E-08 | 0.7% | NA | NA |
| Benzo(a)pyrene | 0.5 | 1.5E-08 | 1.5E-07 | 7.30E+00 | NA | 1.1E-07 | 6.8% | NA | NA |
| Benzo(b)fluoranthene | 0.8 | 2.3E-08 | 2.3E-07 | 7.30E-01 | NA | 1.7E-08 | 1.1% | NA | NA |
| Dibenzo(a,h)anthracene | 0.2 | 5.9E-09 | 5.9E-08 | 7.30E+00 | NA | 4.3E-08 | 2.7% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 0.4 | 1.2E-08 | 1.2E-07 | 7.30E-01 | NA | 8.6E-09 | 0.5% | NA | NA |
| Aroclor, total | 3.6 | 1.1E-07 | 1.1E-06 | 1.00E+00 | NA | 1.1E-07 | 6.7% | NA | NA |
| Arsenic | 9 | 2.6E-07 | 2.6E-06 | 1.50E+00 | 3.00E-04 | 4.0E-07 | 25.3% | 8.8E-03 | 32.2% |
| Barium | 1580 | 4.6E-05 | 4.6E-04 | NA | 7.00E-02 | NA | NA | 6.6E-03 | 24.3% |
| Cadmium | 0.9 | 2.6E-08 | 2.6E-07 | NA | 1.00E-03 | NA | NA | 2.6E-04 | 1.0% |
| Chromium (total) | 47.2 | 1.4E-06 | 1.4E-05 | NA | 3.00E-03 | NA | NA | 4.6E-03 | 16.9% |
| Lead | 478 | 1.4E-05 | 1.4E-04 | NA | NA | NA | NA | NA | NA |
| Manganese | 240 | 7.0E-06 | 7.0E-05 | NA | 2.00E-02 | NA | NA | 3.5E-03 | 12.9% |
| Mercury | 0.21 | 6.2E-09 | 6.2E-08 | NA | 3.00E-04 | NA | NA | 2.1E-04 | 0.8% |
| Nickel | 86.8 | 2.5E-06 | 2.5E-05 | NA | 2.00E-02 | NA | NA | 1.3E-03 | 4.7% |
| Vanadium | 33.7 | 9.9E-07 | 9.9E-06 | NA | 7.00E-03 | NA | NA | 1.4E-03 | 5.2% |
| Zinc | 599 | 1.8E-05 | 1.8E-04 | NA | 3.00E-01 | NA | NA | 5.9E-04 | 2.1% |
| TEQ - Dioxins/Furans | 0.0002 | 5.9E-12 | 5.9E-11 | 1.50E+05 | NA | 8.8E-07 | 56.1% | NA | NA |
| | | | | | **Total** | **1.6E-06** | **100.0%** | **2.7E-02** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT - CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $$\text{AbsorbedDose} = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

| | | | |
|---|---|---|---|
| Where: | Cs = : | | Concentration in soil (mg/kg) |
| | CF = : | 1.0E-06 | Conversion factor (kg/mg) |
| | SA = : | 5,700 | Skin surface available for contact ($cm^2$/event) |
| | AF = : | 0.01 | Soil to skin adherence factor ($mg/cm^2$) |
| | ABS = : | | Absorption factor (unitless) |
| | EF = : | 150 | Exposure frequency (events/year) |
| | ED = : | 7 | Exposure duration (years) |
| | BW = : | 70 | Body weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 2,555 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | | |
|---|---|---|
| Lifetime Chronic Daily Intak | 3.3E-08 | kg-soil/kg-wt/day |
| Chronic Daily Intake = : | 3.3E-07 | kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT - CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | ABS (unitless) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 0.5 | 0.13 | 2.18E-09 | 2.18E-08 | 7.30E-01 | NA | 1.6E-09 | 1.8% | NA | NA |
| Benzo(a)pyrene | 0.5 | 0.13 | 2.18E-09 | 2.18E-08 | 7.30E+00 | NA | 1.6E-08 | 18.0% | NA | NA |
| Benzo(b)fluoranthene | 0.8 | 0.13 | 3.48E-09 | 3.48E-08 | 7.30E-01 | NA | 2.5E-09 | 2.9% | NA | NA |
| Dibenzo(a,h)anthracene | 0.2 | 0.13 | 8.70E-10 | 8.70E-09 | 7.30E+00 | NA | 6.4E-09 | 7.2% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 0.4 | 0.13 | 1.74E-09 | 1.74E-08 | 7.30E-01 | NA | 1.3E-09 | 1.4% | NA | NA |
| Aroclor, total | 3.6 | 0.14 | 1.69E-08 | 1.69E-07 | 1.00E+00 | NA | 1.7E-08 | 19.1% | NA | NA |
| Arsenic | 9 | 0.03 | 9.04E-09 | 9.04E-08 | 1.50E+00 | 3.00E-04 | 1.4E-08 | 15.4% | 3.0E-04 | 83.3% |
| Barium | 1580 | NA | NA | NA | NA | 4.90E-03 | NA | NA | NA | NA |
| Cadmium | 0.9 | 0.01 | 3.01E-10 | 3.01E-09 | NA | 5.00E-05 | NA | NA | 6.0E-05 | 16.7% |
| Chromium (total) | 47.2 | NA | NA | NA | NA | 7.50E-05 | NA | NA | NA | NA |
| Lead | 478 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | 240 | NA | NA | NA | NA | 1.20E-03 | NA | NA | NA | NA |
| Mercury | 0.21 | NA | NA | NA | NA | 2.10E-05 | NA | NA | NA | NA |
| Nickel | 86.8 | NA | NA | NA | NA | 8.00E-04 | NA | NA | NA | NA |
| Vanadium | 33.7 | NA | NA | NA | NA | 1.80E-04 | NA | NA | NA | NA |
| Zinc | 599 | NA | NA | NA | NA | 3.00E-01 | NA | NA | NA | NA |
| TEQ - Dioxins/Furans | 0.0002 | 0.03 | 2.01E-13 | 2.01E-12 | 1.50E+05 | NA | 3.0E-08 | 34.2% | NA | NA |
| | | | | | | **Total** | **8.8E-08** | **100.0%** | **3.6E-04** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - SUMMARY

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT - CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| | Lifetime Cancer Risk | | | | | Hazard Index | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | Incidental Ingestion | Dermal Contact | Inhalation | Total Risk | Percent Risk | Incidental Ingestion | Dermal Contact | Inhalation | Total HI | Percent HI |
| Benzo(a)anthracene | 1.1E-08 | 1.6E-09 | NA | 1.2E-08 | 0.7% | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | 1.1E-07 | 1.6E-08 | NA | 1.2E-07 | 7.4% | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | 1.7E-08 | 2.5E-09 | NA | 2.0E-08 | 1.2% | NA | NA | NA | NA | NA |
| Dibenzo(a,h)anthracene | 4.3E-08 | 6.4E-09 | NA | 4.9E-08 | 3.0% | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | 8.6E-09 | 1.3E-09 | NA | 9.8E-09 | 0.6% | NA | NA | NA | NA | NA |
| Aroclor, total | 1.1E-07 | 1.7E-08 | NA | 1.2E-07 | 7.4% | NA | NA | NA | NA | NA |
| Arsenic | 4.0E-07 | 1.4E-08 | NA | 4.1E-07 | 24.7% | 8.8E-03 | 3.0E-04 | NA | 9.1E-03 | 32.9% |
| Barium | NA | NA | NA | NA | NA | 6.6E-03 | NA | NA | 6.6E-03 | 23.9% |
| Cadmium | NA | NA | NA | NA | NA | 2.6E-04 | 6.0E-05 | NA | 3.2E-04 | 1.2% |
| Chromium (total) | NA | NA | NA | NA | NA | 4.6E-03 | NA | NA | 4.6E-03 | 16.7% |
| Lead | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | NA | NA | NA | NA | NA | 3.5E-03 | NA | NA | 3.5E-03 | 12.7% |
| Mercury | NA | NA | NA | NA | NA | 2.1E-04 | NA | NA | 2.1E-04 | 0.7% |
| Nickel | NA | NA | NA | NA | NA | 1.3E-03 | NA | NA | 1.3E-03 | 4.6% |
| Vanadium | NA | NA | NA | NA | NA | 1.4E-03 | NA | NA | 1.4E-03 | 5.1% |
| Zinc | NA | NA | NA | NA | NA | 5.9E-04 | NA | NA | 5.9E-04 | 2.1% |
| TEQ - Dioxins/Furans | 8.8E-07 | 3.0E-08 | NA | 9.1E-07 | 55.0% | NA | NA | NA | NA | NA |
| **Total** | **1.6E-06** | **8.8E-08** | **NA** | **1.7E-06** | **100.0%** | **2.7E-02** | **3.6E-04** | **NA** | **2.8E-02** | **100.0%** |

**RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL**

| | |
|---|---|
| **SITE NAME:** | **AREA A-1, MORGAN FRANCIS PROPERTIES** |
| **LOCATION:** | **FERRY CREEK, STRATFORD, CT** |
| **EXPOSURE SCENARIO:** | **FREQUENT RECREATIONAL USER - CHILD - RME** |
| **MEDIA:** | **SURFACE SOIL** |
| **DATE:** | **SEPTEMBER 28, 1999** |

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INCIDENTAL INGESTION OF SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $$\text{Intake} = \frac{Cs \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$$

| WHERE: | | | |
|---|---|---|---|
| | Cs =: | | Concentration in soil (mg/kg) |
| | IR =: | 200 | Soil Ingestion Rate (mg/day) |
| | CF =: | 1.0E-06 | Conversion Factor (kg/mg) |
| | FI =: | 1 | Fraction from contaminated source (unitless) |
| | EF =: | 150 | Exposure Frequency (days/year) |
| | ED =: | 6 | Exposure Duration (years) |
| | BW =: | 15 | Body Weight (kg) |
| | ATc =: | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn =: | 2,190 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | |
|---|---|
| Lifetime Chronic Daily Intake | 4.7E-07 kg-soil/kg-wt/day |
| Chronic Daily Intake =: | 5.5E-06 kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - CHILD - RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 2 | 9.4E-07 | 1.1E-05 | 7.30E-01 | NA | 6.9E-07 | 0.9% | NA | NA |
| Benzo(a)pyrene | 2 | 9.4E-07 | 1.1E-05 | 7.30E+00 | NA | 6.9E-06 | 9.1% | NA | NA |
| Benzo(b)fluoranthene | 4 | 1.9E-06 | 2.2E-05 | 7.30E-01 | NA | 1.4E-06 | 1.8% | NA | NA |
| Dibenzo(a,h)anthracene | 0.4 | 1.9E-07 | 2.2E-06 | 7.30E+00 | NA | 1.4E-06 | 1.8% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 2 | 9.4E-07 | 1.1E-05 | 7.30E-01 | NA | 6.9E-07 | 0.9% | NA | NA |
| Aroclor, total | 19 | 8.9E-06 | 1.0E-04 | 2.00E+00 | NA | 1.8E-05 | 23.7% | NA | NA |
| Arsenic | 28.1 | 1.3E-05 | 1.5E-04 | 1.50E+00 | 3.00E-04 | 2.0E-05 | 26.3% | 5.1E-01 | 25.3% |
| Barium | 9350 | 4.4E-03 | 5.1E-02 | NA | 7.00E-02 | NA | NA | 7.3E-01 | 36.1% |
| Cadmium | 4.4 | 2.1E-06 | 2.4E-05 | NA | 1.00E-03 | NA | NA | 2.4E-02 | 1.2% |
| Chromium (total) | 215 | 1.0E-04 | 1.2E-03 | NA | 3.00E-03 | NA | NA | 3.9E-01 | 19.4% |
| Lead | 478 | 2.2E-04 | 2.6E-03 | NA | NA | NA | NA | NA | NA |
| Manganese | 424 | 2.0E-04 | 2.3E-03 | NA | 2.00E-02 | NA | NA | 1.2E-01 | 5.7% |
| Mercury | 0.77 | 3.6E-07 | 4.2E-06 | NA | 3.00E-04 | NA | NA | 1.4E-02 | 0.7% |
| Nickel | 465 | 2.2E-04 | 2.5E-03 | NA | 2.00E-02 | NA | NA | 1.3E-01 | 6.3% |
| Vanadium | 97.5 | 4.6E-05 | 5.3E-04 | NA | 7.00E-03 | NA | NA | 7.6E-02 | 3.8% |
| Zinc | 1780 | 8.4E-04 | 9.8E-03 | NA | 3.00E-01 | NA | NA | 3.3E-02 | 1.6% |
| TEQ - Dioxins/Furans | 0.00038 | 1.8E-10 | 2.1E-09 | 1.50E+05 | NA | 2.7E-05 | 35.5% | NA | NA |
| | | | | | **Total** | **7.5E-05** | **100.0%** | **2.0E+00** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
XPOSURE SCENARIO: FREQUENT RECREATIONAL USER - CHILD - RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $\text{Absorbed Dose} = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$

| | | | |
|---|---|---|---|
| Where: | Cs = : | | Concentration in soil (mg/kg) |
| | CF = : | 1.0E-06 | Conversion factor (kg/mg) |
| | SA = : | 2,900 | Skin surface available for contact ($cm^2$/event) |
| | AF = : | 0.2 | Soil to skin adherence factor ($mg/cm^2$) |
| | ABS = : | | Absorption factor (unitless) |
| | EF = : | 150 | Exposure frequency (events/year) |
| | ED = : | 6 | Exposure duration (years) |
| | BW = : | 15 | Body weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 2,190 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | | |
|---|---|---|
| Lifetime Chronic Daily Inta | 1.4E-06 | kg-soil/kg-wt/day |
| Chronic Daily Intake = : | 1.6E-05 | kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
XPOSURE SCENARIO: FREQUENT RECREATIONAL USER - CHILD - RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | ABS (unitless) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 2 | 0.13 | 3.54E-07 | 4.13E-06 | 7.30E-01 | NA | 2.6E-07 | 1.7% | NA | NA |
| Benzo(a)pyrene | 2 | 0.13 | 3.54E-07 | 4.13E-06 | 7.30E+00 | NA | 2.6E-06 | 16.8% | NA | NA |
| Benzo(b)fluoranthene | 4 | 0.13 | 7.08E-07 | 8.26E-06 | 7.30E-01 | NA | 5.2E-07 | 3.4% | NA | NA |
| Dibenzo(a,h)anthracene | 0.4 | 0.13 | 7.08E-08 | 8.26E-07 | 7.30E+00 | NA | 5.2E-07 | 3.4% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 2 | 0.13 | 3.54E-07 | 4.13E-06 | 7.30E-01 | NA | 2.6E-07 | 1.7% | NA | NA |
| Aroclor, total | 19 | 0.14 | 3.62E-06 | 4.23E-05 | 2.00E+00 | NA | 7.2E-06 | 46.9% | NA | NA |
| Arsenic | 28.1 | 0.03 | 1.15E-06 | 1.34E-05 | 1.50E+00 | 3.00E-04 | 1.7E-06 | 11.2% | 4.5E-02 | 76.2% |
| Barium | 9350 | NA | NA | NA | NA | 4.90E-03 | NA | NA | NA | NA |
| Cadmium | 4.4 | 0.01 | 5.99E-08 | 6.99E-07 | NA | 5.00E-05 | NA | NA | 1.4E-02 | 23.8% |
| Chromium (total) | 215 | NA | NA | NA | NA | 7.50E-05 | NA | NA | NA | NA |
| Lead | 478 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | 424 | NA | NA | NA | NA | 1.20E-03 | NA | NA | NA | NA |
| Mercury | 0.77 | NA | NA | NA | NA | 2.10E-05 | NA | NA | NA | NA |
| Nickel | 465 | NA | NA | NA | NA | 8.00E-04 | NA | NA | NA | NA |
| Vanadium | 97.5 | NA | NA | NA | NA | 1.80E-04 | NA | NA | NA | NA |
| Zinc | 1780 | NA | NA | NA | NA | 3.00E-01 | NA | NA | NA | NA |
| TEQ - Dioxins/Furans | 0.00038 | 0.03 | 1.55E-11 | 1.81E-10 | 1.50E+05 | NA | 2.3E-06 | 15.1% | NA | NA |
| | | | | | | **Total** | **1.5E-05** | **100.0%** | **5.9E-02** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - SUMMARY

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - CHILD - RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| | Lifetime Cancer Risk | | | | | Hazard Index | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | Incidental Ingestion | Dermal Contact | Inhalation | Total Risk | Percent Risk | Incidental Ingestion | Dermal Contact | Inhalation | Total HI | Percent HI |
| Benzo(a)anthracene | 6.9E-07 | 2.6E-07 | NA | 9.4E-07 | 1.0% | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | 6.9E-06 | 2.6E-06 | NA | 9.4E-06 | 10.4% | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | 1.4E-06 | 5.2E-07 | NA | 1.9E-06 | 2.1% | NA | NA | NA | NA | NA |
| Dibenzo(a,h)anthracene | 1.4E-06 | 5.2E-07 | NA | 1.9E-06 | 2.1% | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | 6.9E-07 | 2.6E-07 | NA | 9.4E-07 | 1.0% | NA | NA | NA | NA | NA |
| Aroclor, total | 1.8E-05 | 7.2E-06 | NA | 2.5E-05 | 27.6% | NA | NA | NA | NA | NA |
| Arsenic | 2.0E-05 | 1.7E-06 | NA | 2.2E-05 | 23.7% | 5.1E-01 | 4.5E-02 | NA | 5.6E-01 | 26.7% |
| Barium | NA | NA | NA | NA | NA | 7.3E-01 | NA | NA | 7.3E-01 | 35.1% |
| Cadmium | NA | NA | NA | NA | NA | 2.4E-02 | 1.4E-02 | NA | 3.8E-02 | 1.8% |
| Chromium (total) | NA | NA | NA | NA | NA | 3.9E-01 | NA | NA | 3.9E-01 | 18.8% |
| Lead | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | NA | NA | NA | NA | NA | 1.2E-01 | NA | NA | 1.2E-01 | 5.6% |
| Mercury | NA | NA | NA | NA | NA | 1.4E-02 | NA | NA | 1.4E-02 | 0.7% |
| Nickel | NA | NA | NA | NA | NA | 1.3E-01 | NA | NA | 1.3E-01 | 6.1% |
| Vanadium | NA | NA | NA | NA | NA | 7.6E-02 | NA | NA | 7.6E-02 | 3.7% |
| Zinc | NA | NA | NA | NA | NA | 3.3E-02 | NA | NA | 3.3E-02 | 1.6% |
| TEQ - Dioxins/Furans | 2.7E-05 | 2.3E-06 | NA | 2.9E-05 | 32.0% | NA | NA | NA | NA | NA |
| **Total** | **7.5E-05** | **1.5E-05** | **NA** | **9.1E-05** | **100.0%** | **2.0E+00** | **5.9E-02** | **NA** | **2.1E+00** | **100.0%** |

**RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL**

**SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES**
**LOCATION: FERRY CREEK, STRATFORD, CT**
**EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - CHILD - CTE**
**MEDIA: SURFACE SOIL**
**DATE: SEPTEMBER 28, 1999**

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INCIDENTAL INGESTION OF SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $$\text{Intake} = \frac{Cs \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$$

WHERE:

| | | |
|---|---|---|
| Cs =: | | Concentration in soil (mg/kg) |
| IR =: | 100 | Soil Ingestion Rate (mg/day) |
| CF =: | 1.0E-06 | Conversion Factor (kg/mg) |
| FI =: | 1 | Fraction from contaminated source (unitless) |
| EF =: | 150 | Exposure Frequency (days/year) |
| ED =: | 2 | Exposure Duration (years) |
| BW =: | 15 | Body Weight (kg) |
| ATc =: | 25,550 | Averaging time for carcinogenic exposures (days) |
| ATn =: | 730 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | |
|---|---|
| Lifetime Chronic Daily Intake | 7.8E-08 kg-soil/kg-wt/day |
| Chronic Daily Intake = : | 2.7E-06 kg-soil/kg-wt/day |

(

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - CHILD - CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 0.5 | 3.9E-08 | 1.4E-06 | 7.30E-01 | NA | 2.9E-08 | 0.7% | NA | NA |
| Benzo(a)pyrene | 0.5 | 3.9E-08 | 1.4E-06 | 7.30E+00 | NA | 2.9E-07 | 6.8% | NA | NA |
| Benzo(b)fluoranthene | 0.8 | 6.3E-08 | 2.2E-06 | 7.30E-01 | NA | 4.6E-08 | 1.1% | NA | NA |
| Dibenzo(a,h)anthracene | 0.2 | 1.6E-08 | 5.5E-07 | 7.30E+00 | NA | 1.1E-07 | 2.7% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 0.4 | 3.1E-08 | 1.1E-06 | 7.30E-01 | NA | 2.3E-08 | 0.5% | NA | NA |
| Aroclor, total | 3.6 | 2.8E-07 | 9.9E-06 | 1.00E+00 | NA | 2.8E-07 | 6.7% | NA | NA |
| Arsenic | 9 | 7.0E-07 | 2.5E-05 | 1.50E+00 | 3.00E-04 | 1.1E-06 | 25.3% | 8.2E-02 | 32.2% |
| Barium | 1580 | 1.2E-04 | 4.3E-03 | NA | 7.00E-02 | NA | NA | 6.2E-02 | 24.3% |
| Cadmium | 0.9 | 7.0E-08 | 2.5E-06 | NA | 1.00E-03 | NA | NA | 2.5E-03 | 1.0% |
| Chromium (total) | 47.2 | 3.7E-06 | 1.3E-04 | NA | 3.00E-03 | NA | NA | 4.3E-02 | 16.9% |
| Lead | 478 | 3.7E-05 | 1.3E-03 | NA | NA | NA | NA | NA | NA |
| Manganese | 240 | 1.9E-05 | 6.6E-04 | NA | 2.00E-02 | NA | NA | 3.3E-02 | 12.9% |
| Mercury | 0.21 | 1.6E-08 | 5.8E-07 | NA | 3.00E-04 | NA | NA | 1.9E-03 | 0.8% |
| Nickel | 86.8 | 6.8E-06 | 2.4E-04 | NA | 2.00E-02 | NA | NA | 1.2E-02 | 4.7% |
| Vanadium | 33.7 | 2.6E-06 | 9.2E-05 | NA | 7.00E-03 | NA | NA | 1.3E-02 | 5.2% |
| Zinc | 599 | 4.7E-05 | 1.6E-03 | NA | 3.00E-01 | NA | NA | 5.5E-03 | 2.1% |
| TEQ - Dioxins/Furans | 0.0002 | 1.6E-11 | 5.5E-10 | 1.50E+05 | NA | 2.3E-06 | 56.1% | NA | NA |
| | | | | | **Total** | **4.2E-06** | **100.0%** | **2.5E-01** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
XPOSURE SCENARIO: FREQUENT RECREATIONAL USER - CHILD - CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $\text{Absorbed Dose} = \dfrac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$

| | | | |
|---|---|---|---|
| Where: | Cs = : | | Concentration in soil (mg/kg) |
| | CF = : | 1.0E-06 | Conversion factor (kg/mg) |
| | SA = : | 2,900 | Skin surface available for contact ($cm^2$/event) |
| | AF = : | 0.06 | Soil to skin adherence factor ($mg/cm^2$) |
| | ABS = : | | Absorption factor (unitless) |
| | EF = : | 150 | Exposure frequency (events/year) |
| | ED = : | 2 | Exposure duration (years) |
| | BW = : | 15 | Body weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 730 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose
Lifetime Chronic Daily Inta 1.4E-07 kg-soil/kg-wt/day
Chronic Daily Intake = : 4.8E-06 kg-soil/kg-wt/day

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
XPOSURE SCENARIO: FREQUENT RECREATIONAL USER - CHILD - CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | ABS (unitless) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 0.5 | 0.13 | 8.85E-09 | 3.10E-07 | 7.30E-01 | NA | 6.5E-09 | 1.8% | NA | NA |
| Benzo(a)pyrene | 0.5 | 0.13 | 8.85E-09 | 3.10E-07 | 7.30E+00 | NA | 6.5E-08 | 18.0% | NA | NA |
| Benzo(b)fluoranthene | 0.8 | 0.13 | 1.42E-08 | 4.96E-07 | 7.30E-01 | NA | 1.0E-08 | 2.9% | NA | NA |
| Dibenzo(a,h)anthracene | 0.2 | 0.13 | 3.54E-09 | 1.24E-07 | 7.30E+00 | NA | 2.6E-08 | 7.2% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 0.4 | 0.13 | 7.08E-09 | 2.48E-07 | 7.30E-01 | NA | 5.2E-09 | 1.4% | NA | NA |
| Aroclor, total | 3.6 | 0.14 | 6.86E-08 | 2.40E-06 | 1.00E+00 | NA | 6.9E-08 | 19.1% | NA | NA |
| Arsenic | 9 | 0.03 | 3.68E-08 | 1.29E-06 | 1.50E+00 | 3.00E-04 | 5.5E-08 | 15.4% | 4.3E-03 | 83.3% |
| Barium | 1580 | NA | NA | NA | NA | 4.90E-03 | NA | NA | NA | NA |
| Cadmium | 0.9 | 0.01 | 1.23E-09 | 4.29E-08 | NA | 5.00E-05 | NA | NA | 8.6E-04 | 16.7% |
| Chromium (total) | 47.2 | NA | NA | NA | NA | 7.50E-05 | NA | NA | NA | NA |
| Lead | 478 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | 240 | NA | NA | NA | NA | 1.20E-03 | NA | NA | NA | NA |
| Mercury | 0.21 | NA | NA | NA | NA | 2.10E-05 | NA | NA | NA | NA |
| Nickel | 86.8 | NA | NA | NA | NA | 8.00E-04 | NA | NA | NA | NA |
| Vanadium | 33.7 | NA | NA | NA | NA | 1.80E-04 | NA | NA | NA | NA |
| Zinc | 599 | NA | NA | NA | NA | 3.00E-01 | NA | NA | NA | NA |
| TEQ - Dioxins/Furans | 0.0002 | 0.03 | 8.17E-13 | 2.86E-11 | 1.50E+05 | NA | 1.2E-07 | 34.2% | NA | NA |
| | | | | | | Total | 3.6E-07 | 100.0% | 5.1E-03 | 100.0% |

RISK ASSESSMENT SPREADSHEET - SUMMARY

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - CHILD - CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| | Lifetime Cancer Risk | | | | | Hazard Index | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | Incidental Ingestion | Dermal Contact | Inhalation | Total Risk | Percent Risk | Incidental Ingestion | Dermal Contact | Inhalation | Total HI | Percent HI |
| Benzo(a)anthracene | 2.9E-08 | 6.5E-09 | NA | 3.5E-08 | 0.8% | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | 2.9E-07 | 6.5E-08 | NA | 3.5E-07 | 7.7% | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | 4.6E-08 | 1.0E-08 | NA | 5.6E-08 | 1.2% | NA | NA | NA | NA | NA |
| Dibenzo(a,h)anthracene | 1.1E-07 | 2.6E-08 | NA | 1.4E-07 | 3.1% | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | 2.3E-08 | 5.2E-09 | NA | 2.8E-08 | 0.6% | NA | NA | NA | NA | NA |
| Aroclor, total | 2.8E-07 | 6.9E-08 | NA | 3.5E-07 | 7.7% | NA | NA | NA | NA | NA |
| Arsenic | 1.1E-06 | 5.5E-08 | NA | 1.1E-06 | 24.5% | 8.2E-02 | 4.3E-03 | NA | 8.6E-02 | 33.3% |
| Barium | NA | NA | NA | NA | NA | 6.2E-02 | NA | NA | 6.2E-02 | 23.8% |
| Cadmium | NA | NA | NA | NA | NA | 2.5E-03 | 8.6E-04 | NA | 3.3E-03 | 1.3% |
| Chromium (total) | NA | NA | NA | NA | NA | 4.3E-02 | NA | NA | 4.3E-02 | 16.6% |
| Lead | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | NA | NA | NA | NA | NA | 3.3E-02 | NA | NA | 3.3E-02 | 12.6% |
| Mercury | NA | NA | NA | NA | NA | 1.9E-03 | NA | NA | 1.9E-03 | 0.7% |
| Nickel | NA | NA | NA | NA | NA | 1.2E-02 | NA | NA | 1.2E-02 | 4.6% |
| Vanadium | NA | NA | NA | NA | NA | 1.3E-02 | NA | NA | 1.3E-02 | 5.1% |
| Zinc | NA | NA | NA | NA | NA | 5.5E-03 | NA | NA | 5.5E-03 | 2.1% |
| TEQ - Dioxins/Furans | 2.3E-06 | 1.2E-07 | NA | 2.5E-06 | 54.4% | NA | NA | NA | NA | NA |
| **Total** | **4.2E-06** | **3.6E-07** | **NA** | **4.5E-06** | **100.0%** | **2.5E-01** | **5.1E-03** | **NA** | **2.6E-01** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: ADOLESCENT TRESPASSER - RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INCIDENTAL INGESTION OF SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $\text{Intake} = \dfrac{Cs \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

| | | | |
|---|---|---|---|
| WHERE: | Cs =: | | Concentration in soil (mg/kg) |
| | IR =: | 100 | Soil Ingestion Rate (mg/day) |
| | CF =: | 1.0E-06 | Conversion Factor (kg/mg) |
| | FI =: | 1 | Fraction from contaminated source (unitless) |
| | EF =: | 52 | Exposure Frequency (days/year) |
| | ED =: | 10 | Exposure Duration (years) |
| | BW =: | 51 | Body Weight (kg) |
| | ATc =: | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn =: | 3,650 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | | |
|---|---|---|
| Lifetime Chronic Daily Inta | 4.0E-08 | kg-soil/kg-wt/day |
| Chronic Daily Intake = : | 2.8E-07 | kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: ADOLESCENT TRESPASSER - RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 3 | 1.2E-07 | 8.4E-07 | 7.30E-01 | NA | 8.7E-08 | 0.2% | NA | NA |
| Benzo(a)pyrene | 3 | 1.2E-07 | 8.4E-07 | 7.30E+00 | NA | 8.7E-07 | 1.7% | NA | NA |
| Benzo(b)fluoranthene | 6 | 2.4E-07 | 1.7E-06 | 7.30E-01 | NA | 1.7E-07 | 0.3% | NA | NA |
| Dibenzo(a,h)anthracene | 0.9 | 3.6E-08 | 2.5E-07 | 7.30E+00 | NA | 2.6E-07 | 0.5% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 1 | 4.0E-08 | 2.8E-07 | 7.30E-01 | NA | 2.9E-08 | 0.1% | NA | NA |
| Aroclor-1254 | 0.12 | 4.8E-09 | 3.4E-08 | NA | 2.00E-05 | NA | NA | 1.7E-03 | 3.3% |
| Aroclor, total | 10 | 4.0E-07 | 2.8E-06 | 2.00E+00 | NA | 8.0E-07 | 1.6% | NA | NA |
| Antimony | 6.3 | 2.5E-07 | 1.8E-06 | NA | 4.00E-04 | NA | NA | 4.4E-03 | 8.6% |
| Arsenic | 9.9 | 4.0E-07 | 2.8E-06 | 1.50E+00 | 3.00E-04 | 5.9E-07 | 1.2% | 9.2E-03 | 17.9% |
| Barium | 3510 | 1.4E-04 | 9.8E-04 | NA | 7.00E-02 | NA | NA | 1.4E-02 | 27.3% |
| Cadmium | 2.9 | 1.2E-07 | 8.1E-07 | NA | 1.00E-03 | NA | NA | 8.1E-04 | 1.6% |
| Chromium (total) | 99.5 | 4.0E-06 | 2.8E-05 | NA | 3.00E-03 | NA | NA | 9.3E-03 | 18.0% |
| Lead | 813 | 3.2E-05 | 2.3E-04 | NA | NA | NA | NA | NA | NA |
| Manganese | 298 | 1.2E-05 | 8.3E-05 | NA | 2.00E-02 | NA | NA | 4.2E-03 | 8.1% |
| Mercury | 0.37 | 1.5E-08 | 1.0E-07 | NA | 3.00E-04 | NA | NA | 3.4E-04 | 0.7% |
| Nickel | 134 | 5.3E-06 | 3.7E-05 | NA | 2.00E-02 | NA | NA | 1.9E-03 | 3.6% |
| Thallium | 0.79 | 3.2E-08 | 2.2E-07 | NA | 7.00E-05 | NA | NA | 3.2E-03 | 6.1% |
| Vanadium | 38.4 | 1.5E-06 | 1.1E-05 | NA | 7.00E-03 | NA | NA | 1.5E-03 | 3.0% |
| Zinc | 1030 | 4.1E-05 | 2.9E-04 | NA | 3.00E-01 | NA | NA | 9.6E-04 | 1.9% |
| TEQ - Dioxins/Furans | 0.0081 | 3.2E-10 | 2.3E-09 | 1.50E+05 | NA | 4.8E-05 | 94.5% | NA | NA |
| | | | | | **Total** | **5.1E-05** | **100.0%** | **5.1E-02** | **100.0%** |

(

**RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL**

**SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES**
**LOCATION: FERRY CREEK, STRATFORD, CT**
**EXPOSURE SCENARIO: ADOLESCENT TRESPASSER - RME**
**MEDIA: SURFACE SOIL**
**DATE: SEPTEMBER 28, 1999**

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $$\text{AbsorbedDose} = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

| | | | |
|---|---|---|---|
| Where: | Cs = : | | Concentration in soil (mg/kg) |
| | CF = : | 1.0E-06 | Conversion factor (kg/mg) |
| | SA = : | 3,500 | Skin surface available for contact ($cm^2$/event) |
| | AF = : | 0.07 | Soil to skin adherence factor ($mg/cm^2$) |
| | ABS = : | | Absorption factor (unitless) |
| | EF = : | 52 | Exposure frequency (events/year) |
| | ED = : | 10 | Exposure duration (years) |
| | BW = : | 51 | Body weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 3,650 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose
Lifetime Chronic Daily Intake 9.8E-08 kg-soil/kg-wt/day
Chronic Daily Intake = : 6.8E-07 kg-soil/kg-wt/day

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: ADOLESCENT TRESPASSER - RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | ABS (unitless) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 3 | 0.13 | 3.81E-08 | 2.67E-07 | 7.30E-01 | NA | 2.8E-08 | 0.6% | NA | NA |
| Benzo(a)pyrene | 3 | 0.13 | 3.81E-08 | 2.67E-07 | 7.30E+00 | NA | 2.8E-07 | 6.4% | NA | NA |
| Benzo(b)fluoranthene | 6 | 0.13 | 7.63E-08 | 5.34E-07 | 7.30E-01 | NA | 5.6E-08 | 1.3% | NA | NA |
| Dibenzo(a,h)anthracene | 0.9 | 0.13 | 1.14E-08 | 8.01E-08 | 7.30E+00 | NA | 8.4E-08 | 1.9% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 1 | 0.13 | 1.27E-08 | 8.90E-08 | 7.30E-01 | NA | 9.3E-09 | 0.2% | NA | NA |
| Aroclor-1254 | 0.12 | 0.14 | 1.64E-09 | 1.15E-08 | NA | 2.00E-05 | NA | NA | 5.7E-04 | 33.9% |
| Aroclor, total | 10 | 0.14 | 1.37E-07 | 9.58E-07 | 2.00E+00 | NA | 2.7E-07 | 6.3% | NA | NA |
| Antimony | 6.3 | NA | NA | NA | NA | 3.80E-04 | NA | NA | NA | NA |
| Arsenic | 9.9 | 0.03 | 2.90E-08 | 2.03E-07 | 1.50E+00 | 2.80E-04 | 4.4E-08 | 1.0% | 7.3E-04 | 42.8% |
| Barium | 3510 | NA | NA | NA | NA | 3.50E-03 | NA | NA | NA | NA |
| Cadmium | 2.9 | 0.01 | 2.84E-09 | 1.98E-08 | NA | 5.00E-05 | NA | NA | 4.0E-04 | 23.4% |
| Chromium (total) | 99.5 | NA | NA | NA | NA | 1.00E-04 | NA | NA | NA | NA |
| Lead | 813 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | 298 | NA | NA | NA | NA | 8.00E-04 | NA | NA | NA | NA |
| Mercury | 0.37 | NA | NA | NA | NA | 1.50E-05 | NA | NA | [illegible] | NA |
| Nickel | 134 | NA | NA | NA | NA | 2.00E-03 | NA | NA | NA | NA |
| Thallium | 0.79 | NA | NA | NA | NA | 3.50E-06 | NA | NA | NA | NA |
| Vanadium | 38.4 | NA | NA | NA | NA | 3.50E-04 | NA | NA | NA | NA |
| Zinc | 1030 | NA | NA | NA | NA | 6.00E-02 | NA | NA | NA | NA |
| TEQ - Dioxins/Furans | 0.0081 | 0.03 | 2.38E-11 | 1.66E-10 | 1.50E+05 | NA | 3.6E-06 | 82.2% | NA | NA |
| | | | | | | Total | 4.3E-06 | 100.0% | 1.7E-03 | 100.0% |

RISK ASSESSMENT SPREADSHEET - SUMMARY

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: ADOLESCENT TRESPASSER - RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| | Lifetime Cancer Risk | | | | | Hazard Index | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | Incidental Ingestion | Dermal Contact | Inhalation | Total Risk | Percent Risk | Incidental Ingestion | Dermal Contact | Inhalation | Total HI | Percent HI |
| Benzo(a)anthracene | 8.7E-08 | 2.8E-08 | NA | 1.2E-07 | 0.2% | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | 8.7E-07 | 2.8E-07 | NA | 1.2E-06 | 2.1% | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | 1.7E-07 | 5.6E-08 | NA | 2.3E-07 | 0.4% | NA | NA | NA | NA | NA |
| Dibenzo(a,h)anthracene | 2.6E-07 | 8.4E-08 | NA | 3.5E-07 | 0.6% | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | 2.9E-08 | 9.3E-09 | NA | 3.8E-08 | 0.1% | NA | NA | NA | NA | NA |
| Aroclor-1254 | NA | NA | NA | NA | NA | 1.7E-03 | 5.7E-04 | NA | 2.3E-03 | 4.2% |
| Aroclor, total | 8.0E-07 | 2.7E-07 | NA | 1.1E-06 | 1.9% | NA | NA | NA | NA | NA |
| Antimony | NA | NA | NA | NA | NA | 4.4E-03 | NA | NA | 4.4E-03 | 8.3% |
| Arsenic | 5.9E-07 | 4.4E-08 | NA | 6.4E-07 | 1.1% | 9.2E-03 | 7.3E-04 | NA | 9.9E-03 | 18.7% |
| Barium | NA | NA | NA | NA | NA | 1.4E-02 | NA | NA | 1.4E-02 | 26.4% |
| Cadmium | NA | NA | NA | NA | NA | 8.1E-04 | 4.0E-04 | NA | 1.2E-03 | 2.3% |
| Chromium (total) | NA | NA | NA | NA | NA | 9.3E-03 | NA | NA | 9.3E-03 | 17.4% |
| Lead | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | NA | NA | NA | NA | NA | 4.2E-03 | NA | NA | 4.2E-03 | 7.8% |
| Mercury | NA | NA | NA | NA | NA | 3.4E-04 | NA | NA | 3.4E-04 | 0.6% |
| Nickel | NA | NA | NA | NA | NA | 1.9E-03 | NA | NA | 1.9E-03 | 3.5% |
| Thallium | NA | NA | NA | NA | NA | 3.2E-03 | NA | NA | 3.2E-03 | 5.9% |
| Vanadium | NA | NA | NA | NA | NA | 1.5E-03 | NA | NA | 1.5E-03 | 2.9% |
| Zinc | NA | NA | NA | NA | NA | 9.6E-04 | NA | NA | 9.6E-04 | 1.8% |
| TEQ - Dioxins/Furans | 4.8E-05 | 3.6E-06 | NA | 5.2E-05 | 93.5% | NA | NA | NA | NA | NA |
| **Total** | **5.1E-05** | **4.3E-06** | **NA** | **5.6E-05** | **100.0%** | **5.1E-02** | **1.7E-03** | **NA** | **5.3E-02** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: ADOLESCENT TRESPASSER - CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INCIDENTAL INGESTION OF SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $Intake = \frac{Cs \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

| | | | |
|---|---|---|---|
| WHERE: | Cs =: | | Concentration in soil (mg/kg) |
| | IR =: | 50 | Soil Ingestion Rate (mg/day) |
| | CF =: | 1.0E-06 | Conversion Factor (kg/mg) |
| | FI =: | 1 | Fraction from contaminated source (unitless) |
| | EF =: | 52 | Exposure Frequency (days/year) |
| | ED =: | 5 | Exposure Duration (years) |
| | BW =: | 51 | Body Weight (kg) |
| | ATc =: | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn =: | 1,825 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | | |
|---|---|---|
| Lifetime Chronic Daily Inta | 1.0E-08 | kg-soil/kg-wt/day |
| Chronic Daily Intake =: | 1.4E-07 | kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: ADOLESCENT TRESPASSER - CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 3 | 3.0E-08 | 4.2E-07 | 7.30E-01 | NA | 2.2E-08 | 0.2% | NA | NA |
| Benzo(a)pyrene | 3 | 3.0E-08 | 4.2E-07 | 7.30E+00 | NA | 2.2E-07 | 1.7% | NA | NA |
| Benzo(b)fluoranthene | 6 | 6.0E-08 | 8.4E-07 | 7.30E-01 | NA | 4.4E-08 | 0.3% | NA | NA |
| Dibenzo(a,h)anthracene | 0.9 | 9.0E-09 | 1.3E-07 | 7.30E+00 | NA | 6.6E-08 | 0.5% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 1 | 1.0E-08 | 1.4E-07 | 7.30E-01 | NA | 7.3E-09 | 0.1% | NA | NA |
| Aroclor-1254 | 0.12 | 1.2E-09 | 1.7E-08 | NA | 2.00E-05 | NA | NA | 8.4E-04 | 3.3% |
| Aroclor, total | 10 | 1.0E-07 | 1.4E-06 | 1.00E+00 | NA | 1.0E-07 | 0.8% | NA | NA |
| Antimony | 6.3 | 6.3E-08 | 8.8E-07 | NA | 4.00E-04 | NA | NA | 2.2E-03 | 8.6% |
| Arsenic | 9.9 | 9.9E-08 | 1.4E-06 | 1.50E+00 | 3.00E-04 | 1.5E-07 | 1.2% | 4.6E-03 | 17.9% |
| Barium | 3510 | 3.5E-05 | 4.9E-04 | NA | 7.00E-02 | NA | NA | 7.0E-03 | 27.3% |
| Cadmium | 2.9 | 2.9E-08 | 4.1E-07 | NA | 1.00E-03 | NA | NA | 4.1E-04 | 1.6% |
| Chromium (total) | 99.5 | 9.9E-07 | 1.4E-05 | NA | 3.00E-03 | NA | NA | 4.6E-03 | 18.0% |
| Lead | 813 | 8.1E-06 | 1.1E-04 | NA | NA | NA | NA | NA | NA |
| Manganese | 298 | 3.0E-06 | 4.2E-05 | NA | 2.00E-02 | NA | NA | 2.1E-03 | 8.1% |
| Mercury | 0.37 | 3.7E-09 | 5.2E-08 | NA | 3.00E-04 | NA | NA | 1.7E-04 | 0.7% |
| Nickel | 134 | 1.3E-06 | 1.9E-05 | NA | 2.00E-02 | NA | NA | 9.4E-04 | 3.6% |
| Thallium | 0.79 | 7.9E-09 | 1.1E-07 | NA | 7.00E-05 | NA | NA | 1.6E-03 | 6.1% |
| Vanadium | 38.4 | 3.8E-07 | 5.4E-06 | NA | 7.00E-03 | NA | NA | 7.7E-04 | 3.0% |
| Zinc | 1030 | 1.0E-05 | 1.4E-04 | NA | 3.00E-01 | NA | NA | 4.8E-04 | 1.9% |
| TEQ - Dioxins/Furans | 0.0081 | 8.1E-11 | 1.1E-09 | 1.50E+05 | NA | 1.2E-05 | 95.2% | NA | NA |
| | | | | | **Total** | **1.3E-05** | **100.0%** | **2.6E-02** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL

| | |
|---|---|
| SITE NAME: | AREA A-1, MORGAN FRANCIS PROPERTIES |
| LOCATION: | FERRY CREEK, STRATFORD, CT |
| EXPOSURE SCENARIO: | ADOLESCENT TRESPASSER - CTE |
| MEDIA: | SURFACE SOIL |
| DATE: | SEPTEMBER 28, 1999 |

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $$\text{AbsorbedDose} = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

| | | | |
|---|---|---|---|
| Where: | Cs = : | | Concentration in soil (mg/kg) |
| | CF = : | 1.0E-06 | Conversion factor (kg/mg) |
| | SA = : | 3,500 | Skin surface available for contact ($cm^2$/event) |
| | AF = : | 0.01 | Soil to skin adherence factor ($mg/cm^2$) |
| | ABS = : | | Absorption factor (unitless) |
| | EF = : | 52 | Exposure frequency (events/year) |
| | ED = : | 5 | Exposure duration (years) |
| | BW = : | 51 | Body weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 1,825 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | |
|---|---|
| Lifetime Chronic Daily Intake | 7.0E-09 kg-soil/kg-wt/day |
| Chronic Daily Intake = : | 9.8E-08 kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: ADOLESCENT TRESPASSER - CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | ABS (unitless) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 3 | 0.13 | 2.72E-09 | 3.81E-08 | 7.30E-01 | NA | 2.0E-09 | 0.7% | NA | NA |
| Benzo(a)pyrene | 3 | 0.13 | 2.72E-09 | 3.81E-08 | 7.30E+00 | NA | 2.0E-08 | 6.6% | NA | NA |
| Benzo(b)fluoranthene | 6 | 0.13 | 5.45E-09 | 7.63E-08 | 7.30E-01 | NA | 4.0E-09 | 1.3% | NA | NA |
| Dibenzo(a,h)anthracene | 0.9 | 0.13 | 8.17E-10 | 1.14E-08 | 7.30E+00 | NA | 6.0E-09 | 2.0% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 1 | 0.13 | 9.08E-10 | 1.27E-08 | 7.30E-01 | NA | 6.6E-10 | 0.2% | NA | NA |
| Aroclor-1254 | 0.12 | 0.14 | 1.17E-10 | 1.64E-09 | NA | 2.00E-05 | NA | NA | 8.2E-05 | 34.9% |
| Aroclor, total | 10 | 0.14 | 9.78E-09 | 1.37E-07 | 1.00E+00 | NA | 9.8E-09 | 3.3% | NA | NA |
| Antimony | 6.3 | NA | NA | NA | NA | 3.80E-04 | NA | NA | NA | NA |
| Arsenic | 9.9 | 0.03 | 2.07E-09 | 2.90E-08 | 1.50E+00 | 3.00E-04 | 3.1E-09 | 1.0% | 9.7E-05 | 41.1% |
| Barium | 3510 | NA | NA | NA | NA | 3.50E-03 | NA | NA | NA | NA |
| Cadmium | 2.9 | 0.01 | 2.03E-10 | 2.84E-09 | NA | 5.00E-05 | NA | NA | 5.7E-05 | 24.1% |
| Chromium (total) | 99.5 | NA | NA | NA | NA | 1.00E-04 | NA | NA | NA | NA |
| Lead | 813 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | 298 | NA | NA | NA | NA | 8.00E-04 | NA | NA | NA | NA |
| Mercury | 0.37 | NA | NA | NA | NA | 1.50E-05 | NA | NA | NA | NA |
| Nickel | 134 | NA | NA | NA | NA | 2.00E-03 | NA | NA | NA | NA |
| Thallium | 0.79 | NA | NA | NA | NA | 3.50E-06 | NA | NA | NA | NA |
| Vanadium | 38.4 | NA | NA | NA | NA | 3.50E-04 | NA | NA | NA | NA |
| Zinc | 1030 | NA | NA | NA | NA | 6.00E-02 | NA | NA | NA | NA |
| TEQ - Dioxins/Furans | 0.0081 | 0.03 | 1.70E-12 | 2.38E-11 | 1.50E+05 | NA | 2.5E-07 | 84.9% | NA | NA |
| | | | | | | **Total** | **3.0E-07** | **100.0%** | **2.4E-04** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - SUMMARY

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: ADOLESCENT TRESPASSER - CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| | Lifetime Cancer Risk | | | | | Hazard Index | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | Incidental Ingestion | Dermal Contact | Inhalation | Total Risk | Percent Risk | Incidental Ingestion | Dermal Contact | Inhalation | Total HI | Percent HI |
| Benzo(a)anthracene | 2.2E-08 | 2.0E-09 | NA | 2.4E-08 | 0.2% | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | 2.2E-07 | 2.0E-08 | NA | 2.4E-07 | 1.8% | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | 4.4E-08 | 4.0E-09 | NA | 4.8E-08 | 0.4% | NA | NA | NA | NA | NA |
| Dibenzo(a,h)anthracene | 6.6E-08 | 6.0E-09 | NA | 7.2E-08 | 0.5% | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | 7.3E-09 | 6.6E-10 | NA | 7.9E-09 | 0.1% | NA | NA | NA | NA | NA |
| Aroclor-1254 | NA | NA | NA | NA | NA | 8.4E-04 | 8.2E-05 | NA | 9.2E-04 | 3.5% |
| Aroclor, total | 1.0E-07 | 9.8E-09 | NA | 1.1E-07 | 0.8% | NA | NA | NA | NA | NA |
| Antimony | NA | NA | NA | NA | NA | 2.2E-03 | NA | NA | 2.2E-03 | 8.5% |
| Arsenic | 1.5E-07 | 3.1E-09 | NA | 1.5E-07 | 1.2% | 4.6E-03 | 9.7E-05 | NA | 4.7E-03 | 18.1% |
| Barium | NA | NA | NA | NA | NA | 7.0E-03 | NA | NA | 7.0E-03 | 27.0% |
| Cadmium | NA | NA | NA | NA | NA | 4.1E-04 | 5.7E-05 | NA | 4.6E-04 | 1.8% |
| Chromium (total) | NA | NA | NA | NA | NA | 4.6E-03 | NA | NA | 4.6E-03 | 17.9% |
| Lead | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | NA | NA | NA | NA | NA | 2.1E-03 | NA | NA | 2.1E-03 | 8.0% |
| Mercury | NA | NA | NA | NA | NA | 1.7E-04 | NA | NA | 1.7E-04 | 0.7% |
| Nickel | NA | NA | NA | NA | NA | 9.4E-04 | NA | NA | 9.4E-04 | 3.6% |
| Thallium | NA | NA | NA | NA | NA | 1.6E-03 | NA | NA | 1.6E-03 | 6.1% |
| Vanadium | NA | NA | NA | NA | NA | 7.7E-04 | NA | NA | 7.7E-04 | 3.0% |
| Zinc | NA | NA | NA | NA | NA | 4.8E-04 | NA | NA | 4.8E-04 | 1.8% |
| TEQ - Dioxins/Furans | 1.2E-05 | 2.5E-07 | NA | 1.2E-05 | 95.0% | NA | NA | NA | NA | NA |
| **Total** | **1.3E-05** | **3.0E-07** | **NA** | **1.3E-05** | **100.0%** | **2.6E-02** | **2.4E-04** | **NA** | **2.6E-02** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH WATER

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: ADOLESCENT TRESPASSER - RME
MEDIA: SURFACE WATER
DATE: SEPTEMBER 15, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH WATER ARE CONSIDERED. ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATIONS:

$$\text{Absorbed Dose} = \frac{DAevent \times EV \times EF \times ED \times SA}{BW \times AT}$$

For Inorganics DAevent = Kp x Cw x CF x tevent

For Organics If tevent $\leq t^*$, then : $DAevent = 2 \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$

If tevent $> t^*$, then : $DAevent = Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$

| | | | |
|---|---|---|---|
| Where: | SA = : | 4,500 | Skin surface available for contact ($cm^2$) |
| | DAevent = : | | Chemical specific absorbed dose per event ($mg/cm^2$-event) |
| | EV = : | 1 | Event frequency (events/days) |
| | EF = : | 52 | Exposure frequency (days/year) |
| | ED = : | 10 | Exposure duration (years) |
| | BW = : | 51 | Body weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 3,650 | Averaging time for noncarcinogenic exposures (days) |
| | CF = : | 0.001 | Conversion Factor ($L/m^3$) |
| | Kp =: | | Chemical specific permeability coefficient (cm/hr) |
| | Cw = : | | Concentration of chemical in water (mg/L) |
| | tevent = : | 1 | duration of event (hr/event) |
| | tau = : | | Chemical specific lag time (hr) |
| | t* = : | | Chemical specific time it takes to reach steady state (hr) |
| | B = : | | Chemical specific dimensionless constant |
| | Dsc = : | | Effective diffusivity for chemical transfer through skin ($cm^2/hr$) |
| | b, c = : | | chemical specific constants |

Unit Dose

| | | |
|---|---|---|
| *Lifetime Chronic Daily Intake* = : | 1.8E+00 | $cm^2$-event/(kg-day) |
| Chronic Daily Intake = : | 1.3E+01 | $cm^2$-event/(kg-day) |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH WATER (PAGE TWO)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: ADOLESCENT TRESPASSER - RME
MEDIA: SURFACE WATER
DATE: SEPTEMBER 15, 1999

| CHEMICAL | Cw (mg/L) | Organic or Inorganic | Molecular Weight | Estimated Kp (cm/hr) | tau-event (hr) | B | b | c | Dsc ($cm^2$/hr) | t* (hr) | DAevent (mg/$cm^2$ - event) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1,1-Trichloroethane | 0.092 | O | 133.4 | 1.30E-02 | 5.86E-01 | 5.77E-02 | 3.39E-01 | 3.73E-01 | 2.84E-07 | 1.41E+00 | 2.53E-06 |
| 1,1-Dichloroethene | 0.052 | O | 96.9 | 1.20E-02 | 3.66E-01 | 4.54E-02 | 3.32E-01 | 3.64E-01 | 4.54E-07 | 8.79E-01 | 1.07E-06 |
| 1,2-Dichloroethene (total) | 0.084 | O | 96.9 | 7.90E-03 | 3.66E-01 | 2.99E-02 | 3.22E-01 | 3.54E-01 | 4.54E-07 | 8.79E-01 | 1.15E-06 |
| Benzene | 0.002 | O | 78.1 | 1.50E-02 | 2.87E-01 | 5.10E-02 | 3.35E-01 | 3.68E-01 | 5.79E-07 | 6.90E-01 | 4.67E-08 |
| Bromodichloromethane | 0.004 | O | 163.8 | 4.70E-03 | 8.68E-01 | 2.31E-02 | 3.17E-01 | 3.49E-01 | 1.92E-07 | 2.08E+00 | 4.84E-08 |
| Chlorobenzene | 0.004 | O | 112.6 | 2.90E-02 | 4.48E-01 | 1.18E-01 | 3.80E-01 | 4.16E-01 | 3.71E-07 | 1.08E+00 | 2.15E-07 |
| Chloroform | 0.004 | O | 119.4 | 6.90E-03 | 4.90E-01 | 2.90E-02 | 3.21E-01 | 3.53E-01 | 3.40E-07 | 1.18E+00 | 5.34E-08 |
| Tetrachloroethene | 0.004 | O | 165.8 | 3.40E-02 | 8.91E-01 | 1.68E-01 | 4.15E-01 | 4.54E-01 | 1.87E-07 | 2.14E+00 | 3.55E-07 |
| Trichloroethene | 0.056 | O | 131.4 | 1.20E-02 | 5.72E-01 | 5.29E-02 | 3.36E-01 | 3.69E-01 | 2.91E-07 | 1.37E+00 | 1.40E-06 |
| Vinyl Chloride | 0.016 | O | 62.5 | 5.70E-03 | 2.35E-01 | 1.73E-02 | 3.14E-01 | 3.45E-01 | 7.08E-07 | 5.64E-01 | 1.33E-07 |
| gamma-Chlordane | 0.000002 | O | 409.8 | 3.80E-02 | 2.07E+01 | 2.96E-01 | 5.16E-01 | 5.53E-01 | 8.04E-09 | 4.97E+01 | 9.56E-10 |
| Antimony | 0.0637 | I | 121.76 | 1.00E-03 | 5.05E-01 | 4.24E-03 | 3.06E-01 | 3.36E-01 | 3.30E-07 | 1.21E+00 | 6.37E-08 |
| Arsenic | 0.0131 | I | 74.9 | 1.00E-03 | 2.76E-01 | 3.33E-03 | 3.05E-01 | 3.36E-01 | 6.03E-07 | 6.62E-01 | 1.31E-08 |
| Manganese | 1.23 | I | 54.94 | 1.00E-03 | 2.13E-01 | 2.85E-03 | 3.05E-01 | 3.35E-01 | 7.80E-07 | 5.12E-01 | 1.23E-06 |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH WATER (PAGE THREE)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: ADOLESCENT TRESPASSER - RME
MEDIA: SURFACE WATER
DATE: SEPTEMBER 15, 1999

| CHEMICAL | DAevent (mg/cm$^2$ - event) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor (mg/kg/day)$^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| 1,1,1-Trichloroethane | 2.53E-06 | 4.55E-06 | 3.18E-05 | NA | 2.00E-02 | NA | NA | 1.6E-03 | 4.5% |
| 1,1-Dichloroethene | 1.07E-06 | 1.93E-06 | 1.35E-05 | 6.00E-01 | 9.00E-03 | 1.2E-06 | 67.4% | 1.5E-03 | 4.3% |
| 1,2-Dichloroethene (total) | 1.15E-06 | 2.06E-06 | 1.44E-05 | NA | 9.00E-03 | NA | NA | 1.6E-03 | 4.5% |
| Benzene | 4.67E-08 | 8.38E-08 | 5.87E-07 | 2.90E-02 | 3.00E-03 | 2.4E-09 | 0.1% | 2.0E-04 | 0.6% |
| Bromodichloromethane | 4.84E-08 | 8.69E-08 | 6.09E-07 | 6.20E-02 | 2.00E-02 | 5.4E-09 | 0.3% | 3.0E-05 | 0.1% |
| Chlorobenzene | 2.15E-07 | 3.86E-07 | 2.70E-06 | NA | 2.00E-02 | NA | NA | 1.3E-04 | 0.4% |
| Chloroform | 5.34E-08 | 9.59E-08 | 6.71E-07 | 6.10E-03 | 1.00E-02 | 5.8E-10 | 0.0% | 6.7E-05 | 0.2% |
| Tetrachloroethene | 3.55E-07 | 6.37E-07 | 4.46E-06 | 5.20E-02 | 1.00E-02 | 3.3E-08 | 1.9% | 4.5E-04 | 1.3% |
| Trichloroethene | 1.40E-06 | 2.52E-06 | 1.77E-05 | 1.10E-02 | 6.00E-03 | 2.8E-08 | 1.6% | 2.9E-03 | 8.3% |
| Vinyl Chloride | 1.33E-07 | 2.39E-07 | 1.68E-06 | 1.90E+00 | NA | 4.5E-07 | 26.5% | NA | NA |
| gamma-Chlordane | 9.56E-10 | 1.72E-09 | 1.20E-08 | 3.50E-01 | 5.00E-04 | 6.0E-10 | 0.0% | 2.4E-05 | 0.1% |
| Antimony | 6.37E-08 | 1.14E-07 | 8.01E-07 | NA | 6.00E-05 | NA | NA | 1.3E-02 | 37.8% |
| Arsenic | 1.31E-08 | 2.35E-08 | 1.65E-07 | 1.50E+00 | 3.00E-04 | 3.5E-08 | 2.1% | 5.5E-04 | 1.6% |
| Manganese | 1.23E-06 | 2.21E-06 | 1.55E-05 | NA | 1.20E-03 | NA | NA | 1.3E-02 | 36.5% |
| | | | | | Total | 1.7E-06 | 100.0% | 3.5E-02 | 100.0% |

**RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH WATER**

**SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES**
**LOCATION: FERRY CREEK, STRATFORD, CT**
**EXPOSURE SCENARIO: ADOLESCENT TRESPASSER - CTE**
**MEDIA: SURFACE WATER**
**DATE: SEPTEMBER 15, 1999**

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH WATER ARE CONSIDERED. ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATIONS:

$$\text{Absorbed Dose} = \frac{\text{DAevent} \times \text{EV} \times \text{EF} \times \text{ED} \times \text{SA}}{\text{BW} \times \text{AT}}$$

For Inorganics DAevent = Kp x Cw x CF x tevent

For Organics

$$\text{If tevent} \leq t^*\text{, then : DAevent} = 2 \times \text{Kp} \times \text{Cw} \times \text{CF} \times \sqrt{\frac{6 \times \text{tau} \times \text{tevent}}{\pi}}$$

$$\text{If tevent} > t^*\text{, then : DAevent} = \text{Kp} \times \text{Cw} \times \text{CF} \times \left[\frac{\text{tevent}}{1 + B} + 2 \times \text{tau} \times \left(\frac{1 + 3B + 3B^2}{(1 + B)^2}\right)\right]$$

Where:

| | | |
|---|---|---|
| SA = : | 3,900 | Skin surface available for contact ($cm^2$) |
| DAevent = : | | Chemical specific absorbed dose per event ($mg/cm^2$-event) |
| EV = : | 1 | Event frequency (events/days) |
| EF = : | 52 | Exposure frequency (days/year) |
| ED = : | 5 | Exposure duration (years) |
| BW = : | 51 | Body weight (kg) |
| ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| ATn = : | 1,825 | Averaging time for noncarcinogenic exposures (days) |
| CF = : | 0.001 | Conversion Factor ($L/m^3$) |
| Kp =: | | Chemical specific permeability coefficient (cm/hr) |
| Cw = : | | Concentration of chemical in water (mg/L) |
| tevent = : | 1 | duration of event (hr/event) |
| tau = : | | Chemical specific lag time (hr) |
| t* = : | | Chemical specific time it takes to reach steady state (hr) |
| B = : | | Chemical specific dimensionless constant |
| Dsc = : | | Effective diffusivity for chemical transfer through skin ($cm^2$/hr) |
| b, c = : | | chemical specific constants |

Unit Dose
Lifetime Chronic Daily Intake = : 7.8E-01 $cm^2$-event/(kg-day)
Chronic Daily Intake = : 1.1E+01 $cm^2$-event/(kg-day)

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH WATER (PAGE TWO)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: ADOLESCENT TRESPASSER - CTE
MEDIA: SURFACE WATER
DATE: SEPTEMBER 15, 1999

| CHEMICAL | Cw (mg/L) | Organic or Inorganic | Molecular Weight | Estimated Kp (cm/hr) | tau-event (hr) | B | b | c | Dsc ($cm^2/hr$) | t* (hr) | DAevent ($mg/cm^2$ - event) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1,1-Trichloroethane | 0.055 | O | 133.4 | 1.30E-02 | 5.86E-01 | 5.77E-02 | 3.39E-01 | 3.73E-01 | 2.84E-07 | 1.41E+00 | 1.51E-06 |
| 1,1-Dichloroethene | 0.032 | O | 96.9 | 1.20E-02 | 3.66E-01 | 4.54E-02 | 3.32E-01 | 3.64E-01 | 4.54E-07 | 8.79E-01 | 6.61E-07 |
| 1,2-Dichloroethene (total) | 0.049 | O | 96.9 | 7.90E-03 | 3.66E-01 | 2.99E-02 | 3.22E-01 | 3.54E-01 | 4.54E-07 | 8.79E-01 | 6.68E-07 |
| Benzene | 0.002 | O | 78.1 | 1.50E-02 | 2.87E-01 | 5.10E-02 | 3.35E-01 | 3.68E-01 | 5.79E-07 | 6.90E-01 | 4.67E-08 |
| Bromodichloromethane | 0.004 | O | 163.8 | 4.70E-03 | 8.68E-01 | 2.31E-02 | 3.17E-01 | 3.49E-01 | 1.92E-07 | 2.08E+00 | 4.84E-08 |
| Chlorobenzene | 0.003 | O | 112.6 | 2.90E-02 | 4.48E-01 | 1.18E-01 | 3.80E-01 | 4.16E-01 | 3.71E-07 | 1.08E+00 | 1.61E-07 |
| Chloroform | 0.002 | O | 119.4 | 6.90E-03 | 4.90E-01 | 2.90E-02 | 3.21E-01 | 3.53E-01 | 3.40E-07 | 1.18E+00 | 2.67E-08 |
| Tetrachloroethene | 0.003 | O | 165.8 | 3.40E-02 | 8.91E-01 | 1.68E-01 | 4.15E-01 | 4.54E-01 | 1.87E-07 | 2.14E+00 | 2.66E-07 |
| Trichloroethene | 0.03 | O | 131.4 | 1.20E-02 | 5.72E-01 | 5.29E-02 | 3.36E-01 | 3.69E-01 | 2.91E-07 | 1.37E+00 | 7.52E-07 |
| Vinyl Chloride | 0.01 | O | 62.5 | 5.70E-03 | 2.35E-01 | 1.73E-02 | 3.14E-01 | 3.45E-01 | 7.08E-07 | 5.64E-01 | 8.33E-08 |
| gamma-Chlordane | 0.000002 | O | 409.8 | 3.80E-02 | 2.07E+01 | 2.96E-01 | 5.16E-01 | 5.53E-01 | 8.04E-09 | 4.97E+01 | 9.56E-10 |
| Antimony | 0.0241 | I | 121.76 | 1.00E-03 | 5.05E-01 | 4.24E-03 | 3.06E-01 | 3.36E-01 | 3.30E-07 | 1.21E+00 | 2.41E-08 |
| Arsenic | 0.007 | I | 74.9 | 1.00E-03 | 2.76E-01 | 3.33E-03 | 3.05E-01 | 3.36E-01 | 6.03E-07 | 6.62E-01 | 7.00E-09 |
| Manganese | 0.841 | I | 54.94 | 1.00E-03 | 2.13E-01 | 2.85E-03 | 3.05E-01 | 3.35E-01 | 7.80E-07 | 5.12E-01 | 8.41E-07 |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH WATER (PAGE THREE)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: ADOLESCENT TRESPASSER - CTE
MEDIA: SURFACE WATER
DATE: SEPTEMBER 15, 1999

| CHEMICAL | DAevent ($mg/cm^2$ - event) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| 1,1,1-Trichloroethane | 1.51E-06 | 1.18E-06 | 1.65E-05 | NA | 2.00E-02 | NA | NA | 8.2E-04 | 4.9% |
| 1,1-Dichloroethene | 6.61E-07 | 5.15E-07 | 7.21E-06 | 6.00E-01 | 9.00E-03 | 3.1E-07 | 67.0% | 8.0E-04 | 4.8% |
| 1,2-Dichloroethene (total) | 6.68E-07 | 5.20E-07 | 7.28E-06 | NA | 9.00E-03 | NA | NA | 8.1E-04 | 4.8% |
| Benzene | 4.67E-08 | 3.63E-08 | 5.08E-07 | 2.90E-02 | 3.00E-03 | 1.1E-09 | 0.2% | 1.7E-04 | 1.0% |
| Bromodichloromethane | 4.84E-08 | 3.77E-08 | 5.27E-07 | 6.20E-02 | 2.00E-02 | 2.3E-09 | 0.5% | 2.6E-05 | 0.2% |
| Chlorobenzene | 1.61E-07 | 1.25E-07 | 1.75E-06 | NA | 2.00E-02 | NA | NA | 8.8E-05 | 0.5% |
| Chloroform | 2.67E-08 | 2.08E-08 | 2.91E-07 | 6.10E-03 | 1.00E-02 | 1.3E-10 | 0.0% | 2.9E-05 | 0.2% |
| Tetrachloroethene | 2.66E-07 | 2.07E-07 | 2.90E-06 | 5.20E-02 | 1.00E-02 | 1.1E-08 | 2.3% | 2.9E-04 | 1.7% |
| Trichloroethene | 7.52E-07 | 5.85E-07 | 8.20E-06 | 1.10E-02 | 6.00E-03 | 6.4E-09 | 1.4% | 1.4E-03 | 8.2% |
| Vinyl Chloride | 8.33E-08 | 6.48E-08 | 9.07E-07 | 1.90E+00 | NA | 1.2E-07 | 26.7% | NA | NA |
| gamma-Chlordane | 9.56E-10 | 7.44E-10 | 1.04E-08 | 3.50E-01 | 5.00E-04 | 2.6E-10 | 0.1% | 2.1E-05 | 0.1% |
| Antimony | 2.41E-08 | 1.88E-08 | 2.63E-07 | NA | 6.00E-05 | NA | NA | 4.4E-03 | 26.2% |
| Arsenic | 7.00E-09 | 5.45E-09 | 7.63E-08 | 1.50E+00 | 3.00E-04 | 8.2E-09 | 1.8% | 2.5E-04 | 1.5% |
| Manganese | 8.41E-07 | 6.54E-07 | 9.16E-06 | NA | 1.20E-03 | NA | NA | 7.6E-03 | 45.8% |
| | | | | | **Total** | **4.6E-07** | **100.0%** | **1.7E-02** | **100.0%** |

# Appendix F.10

## Area A-2

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INCIDENTAL INGESTION OF SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $\text{Intake} = \dfrac{Cs \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

| | | | |
|---|---|---|---|
| WHERE: | Cs =: | | Concentration in soil (mg/kg) |
| | IR =: | 100 | Soil Ingestion Rate (mg/day) |
| | CF =: | 1.0E-06 | Conversion Factor (kg/mg) |
| | FI =: | 1 | Fraction from contaminated source (unitless) |
| | EF =: | 250 | Exposure Frequency (days/year) |
| | ED =: | 25 | Exposure Duration (years) |
| | BW =: | 70 | Body Weight (kg) |
| | ATc =: | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn =: | 9,125 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | | |
|---|---|---|
| Lifetime Chronic Daily Inta | 3.5E-07 | kg-soil/kg-wt/day |
| Chronic Daily Intake = : | 9.8E-07 | kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 13 | 4.5E-06 | 1.3E-05 | 7.30E-01 | NA | 3.3E-06 | 2.3% | NA | NA |
| Benzo(a)pyrene | 12 | 4.2E-06 | 1.2E-05 | 7.30E+00 | NA | 3.1E-05 | 21.6% | NA | NA |
| Benzo(b)fluoranthene | 11 | 3.8E-06 | 1.1E-05 | 7.30E-01 | NA | 2.8E-06 | 2.0% | NA | NA |
| Benzo(k)fluoranthene | 11 | 3.8E-06 | 1.1E-05 | 7.30E-02 | NA | 2.8E-07 | 0.2% | NA | NA |
| Dibenzo(a,h)anthracene | 2 | 7.0E-07 | 2.0E-06 | 7.30E+00 | NA | 5.1E-06 | 3.6% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 6 | 2.1E-06 | 5.9E-06 | 7.30E-01 | NA | 1.5E-06 | 1.1% | NA | NA |
| Aroclor, total | 48 | 1.7E-05 | 4.7E-05 | 2.00E+00 | NA | 3.4E-05 | 23.7% | NA | NA |
| Arsenic | 12.5 | 4.4E-06 | 1.2E-05 | 1.50E+00 | 3.00E-04 | 6.6E-06 | 4.6% | 4.1E-02 | 32.4% |
| Barium | 4260 | 1.5E-03 | 4.2E-03 | NA | 7.00E-02 | NA | NA | 6.0E-02 | 47.4% |
| Chromium (total) | 31.9 | 1.1E-05 | 3.1E-05 | NA | 3.00E-03 | NA | NA | 1.0E-02 | 8.3% |
| Lead | 881 | 3.1E-04 | 8.6E-04 | NA | NA | NA | NA | NA | NA |
| Manganese | 307 | 1.1E-04 | 3.0E-04 | NA | 2.00E-02 | NA | NA | 1.5E-02 | 11.9% |
| TEQ-Dioxins/Furans | 0.0011 | 3.8E-10 | 1.1E-09 | 1.50E+05 | NA | 5.8E-05 | 40.8% | NA | NA |
| | | | | | **Total** | **1.4E-04** | **100.0%** | **1.3E-01** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $$\text{Absorbed Dose} = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

| | | | |
|---|---|---|---|
| Where: | Cs = : | | Mean concentration in soil (mg/kg) |
| | CF = : | 1.0E-06 | Conversion factor (kg/mg) |
| | SA = : | 2,500 | Skin surface available for contact ($cm^2$/event) |
| | AF = : | 0.20 | Soil to skin adherence factor (mg/$cm^2$) |
| | ABS = : | | Absorption factor (unitless) |
| | EF = : | 250 | Exposure frequency (events/year) |
| | ED = : | 25 | Exposure duration (years) |
| | BW = : | 70 | Body weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 9,125 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose
Lifetime Chronic Daily Intake 1.7E-06 kg-soil/kg-wt/day
Chronic Daily Intake = : 4.9E-06 kg-soil/kg-wt/day

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | ABS (unitless) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 13 | 0.13 | 2.95E-06 | 8.27E-06 | 7.30E-01 | NA | 2.2E-06 | 3.5% | NA | NA |
| Benzo(a)pyrene | 12 | 0.13 | 2.73E-06 | 7.63E-06 | 7.30E+00 | NA | 2.0E-05 | 32.4% | NA | NA |
| Benzo(b)fluoranthene | 11 | 0.13 | 2.50E-06 | 7.00E-06 | 7.30E-01 | NA | 1.8E-06 | 3.0% | NA | NA |
| Benzo(k)fluoranthene | 11 | 0.13 | 2.50E-06 | 7.00E-06 | 7.30E-02 | NA | 1.8E-07 | 0.3% | NA | NA |
| Dibenzo(a,h)anthracene | 2 | 0.13 | 4.54E-07 | 1.27E-06 | 7.30E+00 | NA | 3.3E-06 | 5.4% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 6 | 0.13 | 1.36E-06 | 3.82E-06 | 7.30E-01 | NA | 9.9E-07 | 1.6% | NA | NA |
| Aroclor, total | 48 | 0.14 | 1.17E-05 | 3.29E-05 | 2.00E+00 | NA | 2.3E-05 | 38.2% | NA | NA |
| Arsenic | 12.5 | 0.03 | 6.55E-07 | 1.83E-06 | 1.50E+00 | 3.00E-04 | 9.8E-07 | 1.6% | 6.1E-03 | 100.0% |
| Barium | 4260 | NA | NA | NA | NA | 4.90E-03 | NA | NA | NA | NA |
| Chromium (total) | 31.9 | NA | NA | NA | NA | 7.50E-05 | NA | NA | NA | NA |
| Lead | 881 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | 307 | NA | NA | NA | NA | 1.20E-03 | NA | NA | NA | NA |
| TEQ-Dioxins/Furans | 0.0011 | 0.03 | 5.77E-11 | 1.61E-10 | 1.50E+05 | NA | 8.6E-06 | 14.1% | NA | NA |
| | | | | | | **Total** | **6.1E-05** | **100%** | **6.1E-03** | **100%** |

RISK ASSESSMENT SPREADSHEET - SUMMARY

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| | Lifetime Cancer Risk | | | | | Hazard Index | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | Incidental Ingestion | Dermal Contact | Inhalation | Total Risk | Percent Risk | Incidental Ingestion | Dermal Contact | Inhalation | Total HI | Percent HI |
| Benzo(a)anthracene | 3.3E-06 | 2.2E-06 | NA | 5.5E-06 | 2.7% | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | 3.1E-05 | 2.0E-05 | NA | 5.1E-05 | 24.9% | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | 2.8E-06 | 1.8E-06 | NA | 4.6E-06 | 2.3% | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | 2.8E-07 | 1.8E-07 | NA | 4.6E-07 | 0.2% | NA | NA | NA | NA | NA |
| Dibenzo(a,h)anthracene | 5.1E-06 | 3.3E-06 | NA | 8.4E-06 | 4.1% | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | 1.5E-06 | 9.9E-07 | NA | 2.5E-06 | 1.2% | NA | NA | NA | NA | NA |
| Aroclor, total | 3.4E-05 | 2.3E-05 | NA | 5.7E-05 | 28.1% | NA | NA | NA | NA | NA |
| Arsenic | 6.6E-06 | 9.8E-07 | NA | 7.5E-06 | 3.7% | 4.1E-02 | 6.1E-03 | NA | 4.7E-02 | 35.6% |
| Barium | NA | NA | NA | NA | NA | 6.0E-02 | NA | NA | 6.0E-02 | 45.2% |
| Chromium (total) | NA | NA | NA | NA | NA | 1.0E-02 | NA | NA | 1.0E-02 | 7.9% |
| Lead | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | NA | NA | NA | NA | NA | 1.5E-02 | NA | NA | 1.5E-02 | 11.4% |
| TEQ-Dioxins/Furans | 5.8E-05 | 8.6E-06 | NA | 6.6E-05 | 32.7% | NA | NA | NA | NA | NA |
| **Total** | **1.4E-04** | **6.1E-05** | **NA** | **2.0E-04** | **100.0%** | **1.3E-01** | **6.1E-03** | **NA** | **1.3E-01** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INCIDENTAL INGESTION OF SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $$\text{Intake} = \frac{Cs \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$$

| | | | |
|---|---|---|---|
| WHERE: | Cs =: | | Concentration in soil (mg/kg) |
| | IR =: | 50 | Soil Ingestion Rate (mg/day) |
| | CF =: | 1.0E-06 | Conversion Factor (kg/mg) |
| | FI =: | 1 | Fraction from contaminated source (unitless) |
| | EF =: | 250 | Exposure Frequency (days/year) |
| | ED =: | 9 | Exposure Duration (years) |
| | BW =: | 70 | Body Weight (kg) |
| | ATc =: | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn =: | 3,285 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | |
|---|---|
| Lifetime Chronic Daily Inta | 6.3E-08 kg-soil/kg-wt/day |
| Chronic Daily Intake =: | 4.9E-07 kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 4 | 2.5E-07 | 2.0E-06 | 7.30E-01 | NA | 1.8E-07 | 2.1% | NA | NA |
| Benzo(a)pyrene | 4 | 2.5E-07 | 2.0E-06 | 7.30E+00 | NA | 1.8E-06 | 21.1% | NA | NA |
| Benzo(b)fluoranthene | 4 | 2.5E-07 | 2.0E-06 | 7.30E-01 | NA | 1.8E-07 | 2.1% | NA | NA |
| Benzo(k)fluoranthene | 4 | 2.5E-07 | 2.0E-06 | 7.30E-02 | NA | 1.8E-08 | 0.2% | NA | NA |
| Dibenzo(a,h)anthracene | 1 | 6.3E-08 | 4.9E-07 | 7.30E+00 | NA | 4.6E-07 | 5.3% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 2 | 1.3E-07 | 9.8E-07 | 7.30E-01 | NA | 9.2E-08 | 1.1% | NA | NA |
| Aroclor, total | 11 | 6.9E-07 | 5.4E-06 | 1.00E+00 | NA | 6.9E-07 | 8.0% | NA | NA |
| Arsenic | 12.5 | 7.9E-07 | 6.1E-06 | 1.50E+00 | 3.00E-04 | 1.2E-06 | 13.6% | 2.0E-02 | 52.2% |
| Barium | 847 | 5.3E-05 | 4.1E-04 | NA | 7.00E-02 | NA | NA | 5.9E-03 | 15.2% |
| Chromium (total) | 31.9 | 2.0E-06 | 1.6E-05 | NA | 3.00E-03 | NA | NA | 5.2E-03 | 13.3% |
| Lead | 881 | 5.5E-05 | 4.3E-04 | NA | NA | NA | NA | NA | NA |
| Manganese | 307 | 1.9E-05 | 1.5E-04 | NA | 2.00E-02 | NA | NA | 7.5E-03 | 19.2% |
| TEQ-Dioxins/Furans | 0.00043 | 2.7E-11 | 2.1E-10 | 1.50E+05 | NA | 4.1E-06 | 46.6% | NA | NA |
| | | | | | **Total** | **8.7E-06** | **100.0%** | **3.9E-02** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $$\text{Absorbed Dose} = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

| | | | |
|---|---|---|---|
| Where: | Cs = : | | Mean concentration in soil (mg/kg) |
| | CF = : | 1.0E-06 | Conversion factor (kg/mg) |
| | SA = : | 2,500 | Skin surface available for contact ($cm^2$/event) |
| | AF = : | 0.02 | Soil to skin adherence factor ($mg/cm^2$) |
| | ABS = : | | Absorption factor (unitless) |
| | EF = : | 250 | Exposure frequency (events/year) |
| | ED = : | 9 | Exposure duration (years) |
| | BW = : | 70 | Body weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 3,285 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose
Lifetime Chronic Daily Intake 6.3E-08 kg-soil/kg-wt/day
Chronic Daily Intake = : 4.9E-07 kg-soil/kg-wt/day

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | ABS (unitless) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 4 | 0.13 | 3.27E-08 | 2.54E-07 | 7.30E-01 | NA | 2.4E-08 | 3.9% | NA | NA |
| Benzo(a)pyrene | 4 | 0.13 | 3.27E-08 | 2.54E-07 | 7.30E+00 | NA | 2.4E-07 | 38.9% | NA | NA |
| Benzo(b)fluoranthene | 4 | 0.13 | 3.27E-08 | 2.54E-07 | 7.30E-01 | NA | 2.4E-08 | 3.9% | NA | NA |
| Benzo(k)fluoranthene | 4 | 0.13 | 3.27E-08 | 2.54E-07 | 7.30E-02 | NA | 2.4E-09 | 0.4% | NA | NA |
| Dibenzo(a,h)anthracene | 1 | 0.13 | 8.18E-09 | 6.36E-08 | 7.30E+00 | NA | 6.0E-08 | 9.7% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 2 | 0.13 | 1.64E-08 | 1.27E-07 | 7.30E-01 | NA | 1.2E-08 | 1.9% | NA | NA |
| Aroclor, total | 11 | 0.14 | 9.69E-08 | 7.53E-07 | 1.00E+00 | NA | 9.7E-08 | 15.8% | NA | NA |
| Arsenic | 12.5 | 0.03 | 2.36E-08 | 1.83E-07 | 1.50E+00 | 3.00E-04 | 3.5E-08 | 5.8% | 6.1E-04 | 100.0% |
| Barium | 847 | NA | NA | NA | NA | 4.90E-03 | NA | NA | NA | NA |
| Chromium (total) | 31.9 | NA | NA | NA | NA | 7.50E-05 | NA | NA | NA | NA |
| Lead | 881 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | 307 | NA | NA | NA | NA | 1.20E-03 | NA | NA | NA | NA |
| TEQ-Dioxins/Furans | 0.00043 | 0.03 | 8.11E-13 | 6.31E-12 | 1.50E+05 | NA | 1.2E-07 | 19.8% | NA | NA |
| | | | | | | **Total** | **6.1E-07** | **100%** | **6.1E-04** | **100%** |

RISK ASSESSMENT SPREADSHEET - SUMMARY

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| | Lifetime Cancer Risk | | | | | Hazard Index | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | Incidental Ingestion | Dermal Contact | Inhalation | Total Risk | Percent Risk | Incidental Ingestion | Dermal Contact | Inhalation | Total HI | Percent HI |
| Benzo(a)anthracene | 1.8E-07 | 2.4E-08 | NA | 2.1E-07 | 2.2% | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | 1.8E-06 | 2.4E-07 | NA | 2.1E-06 | 22.3% | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | 1.8E-07 | 2.4E-08 | NA | 2.1E-07 | 2.2% | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | 1.8E-08 | 2.4E-09 | NA | 2.1E-08 | 0.2% | NA | NA | NA | NA | NA |
| Dibenzo(a,h)anthracene | 4.6E-07 | 6.0E-08 | NA | 5.2E-07 | 5.6% | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | 9.2E-08 | 1.2E-08 | NA | 1.0E-07 | 1.1% | NA | NA | NA | NA | NA |
| Aroclor, total | 6.9E-07 | 9.7E-08 | NA | 7.9E-07 | 8.5% | NA | NA | NA | NA | NA |
| Arsenic | 1.2E-06 | 3.5E-08 | NA | 1.2E-06 | 13.0% | 2.0E-02 | 6.1E-04 | NA | 2.1E-02 | 53.0% |
| Barium | NA | NA | NA | NA | NA | 5.9E-03 | NA | NA | 5.9E-03 | 14.9% |
| Chromium (total) | NA | NA | NA | NA | NA | 5.2E-03 | NA | NA | 5.2E-03 | 13.1% |
| Lead | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | NA | NA | NA | NA | NA | 7.5E-03 | NA | NA | 7.5E-03 | 19.0% |
| TEQ-Dioxins/Furans | 4.1E-06 | 1.2E-07 | NA | 4.2E-06 | 44.9% | NA | NA | NA | NA | NA |
| **Total** | **8.7E-06** | **6.1E-07** | **NA** | **9.3E-06** | **100.0%** | **3.9E-02** | **6.1E-04** | **NA** | **4.0E-02** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - RME
MEDIA: ALL SOIL
DATE: SEPTEMBER 28, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INCIDENTAL INGESTION OF SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $$\text{Intake} = \frac{Cs \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$$

| | | | |
|---|---|---|---|
| WHERE: | Cs =: | | Concentration in soil (mg/kg) |
| | IR =: | 100 | Soil Ingestion Rate (mg/day) |
| | CF =: | 1.0E-06 | Conversion Factor (kg/mg) |
| | FI =: | 1 | Fraction from contaminated source (unitless) |
| | EF =: | 250 | Exposure Frequency (days/year) |
| | ED =: | 25 | Exposure Duration (years) |
| | BW =: | 70 | Body Weight (kg) |
| | ATc =: | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn =: | 9,125 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | | |
|---|---|---|
| Lifetime Chronic Daily Inta | 3.5E-07 | kg-soil/kg-wt/day |
| Chronic Daily Intake =: | 9.8E-07 | kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - RME
MEDIA: ALL SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 4 | 1.4E-06 | 3.9E-06 | 7.30E-01 | NA | 1.0E-06 | 0.7% | NA | NA |
| Benzo(a)pyrene | 4 | 1.4E-06 | 3.9E-06 | 7.30E+00 | NA | 1.0E-05 | 6.6% | NA | NA |
| Benzo(b)fluoranthene | 4 | 1.4E-06 | 3.9E-06 | 7.30E-01 | NA | 1.0E-06 | 0.7% | NA | NA |
| Benzo(k)fluoranthene | 3 | 1.0E-06 | 2.9E-06 | 7.30E-02 | NA | 7.7E-08 | 0.0% | NA | NA |
| Bis(2-ethylhexyl)phthalate | 3 | 1.0E-06 | 2.9E-06 | 1.40E-02 | 2.00E-02 | 1.5E-08 | 0.0% | 1.5E-04 | 0.1% |
| Dibenzo(a,h)anthracene | 2 | 7.0E-07 | 2.0E-06 | 7.30E+00 | NA | 5.1E-06 | 3.3% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 3 | 1.0E-06 | 2.9E-06 | 7.30E-01 | NA | 7.7E-07 | 0.5% | NA | NA |
| Aroclor-1254 | 0.3 | 1.0E-07 | 2.9E-07 | NA | 2.00E-05 | NA | NA | 1.5E-02 | 11.1% |
| Aroclor, total | 31 | 1.1E-05 | 3.0E-05 | 2.00E+00 | NA | 2.2E-05 | 14.1% | NA | NA |
| Arsenic | 7.6 | 2.7E-06 | 7.4E-06 | 1.50E+00 | 3.00E-04 | 4.0E-06 | 2.6% | 2.5E-02 | 18.8% |
| Barium | 3180 | 1.1E-03 | 3.1E-03 | NA | 7.00E-02 | NA | NA | 4.4E-02 | 33.7% |
| Chromium (total) | 58.4 | 2.0E-05 | 5.7E-05 | NA | 3.00E-03 | NA | NA | 1.9E-02 | 14.5% |
| Lead | 1560 | 5.5E-04 | 1.5E-03 | NA | NA | NA | NA | NA | NA |
| Manganese | 260 | 9.1E-05 | 2.5E-04 | NA | 2.00E-02 | NA | NA | 1.3E-02 | 9.7% |
| Nickel | 64.4 | 2.3E-05 | 6.3E-05 | NA | 2.00E-02 | NA | NA | 3.2E-03 | 2.4% |
| Thallium | 0.76 | 2.7E-07 | 7.4E-07 | NA | 7.00E-05 | NA | NA | 1.1E-02 | 8.1% |
| Zinc | 650 | 2.3E-04 | 6.4E-04 | NA | 3.00E-01 | NA | NA | 2.1E-03 | 1.6% |
| TEQ-Dioxins/Furans | 0.0021 | 7.3E-10 | 2.1E-09 | 1.50E+05 | NA | 1.1E-04 | 71.5% | NA | NA |
| | | | | | **Total** | **1.5E-04** | **100.0%** | **1.3E-01** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - RME
MEDIA: ALL SOIL
DATE: SEPTEMBER 28, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $$\text{Absorbed Dose} = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

| | | | |
|---|---|---|---|
| Where: | Cs = : | | Concentration in soil (mg/kg) |
| | CF = : | 1.0E-06 | Conversion factor (kg/mg) |
| | SA = : | 2,500 | Skin surface available for contact ($cm^2$/event) |
| | AF = : | 0.20 | Soil to skin adherence factor ($mg/cm^2$) |
| | ABS = : | | Absorption factor (unitless) |
| | EF = : | 250 | Exposure frequency (events/year) |
| | ED = : | 25 | Exposure duration (years) |
| | BW = : | 70 | Body weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 9,125 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | | |
|---|---|---|
| Lifetime Chronic Daily Intake | 1.7E-06 | kg-soil/kg-wt/day |
| Chronic Daily Intake = : | 4.9E-06 | kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - RME
MEDIA: ALL SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | ABS (unitless) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 4 | 0.13 | 9.09E-07 | 2.54E-06 | 7.30E-01 | NA | 6.6E-07 | 1.5% | NA | NA |
| Benzo(a)pyrene | 4 | 0.13 | 9.09E-07 | 2.54E-06 | 7.30E+00 | NA | 6.6E-06 | 15.0% | NA | NA |
| Benzo(b)fluoranthene | 4 | 0.13 | 9.09E-07 | 2.54E-06 | 7.30E-01 | NA | 6.6E-07 | 1.5% | NA | NA |
| Benzo(k)fluoranthene | 3 | 0.13 | 6.81E-07 | 1.91E-06 | 7.30E-02 | NA | 5.0E-08 | 0.1% | NA | NA |
| Bis(2-ethylhexyl)phthalate | 3 | NA | NA | NA | 1.40E-02 | NA | NA | NA | NA | NA |
| Dibenzo(a,h)anthracene | 2 | 0.13 | 4.54E-07 | 1.27E-06 | 7.30E+00 | NA | 3.3E-06 | 7.5% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 3 | 0.13 | 6.81E-07 | 1.91E-06 | 7.30E-01 | NA | 5.0E-07 | 1.1% | NA | NA |
| Aroclor-1254 | 0.3 | 0.14 | 7.34E-08 | 2.05E-07 | NA | 2.00E-05 | NA | NA | 1.0E-02 | 73.4% |
| Aroclor, total | 31 | 0.14 | 7.58E-06 | 2.12E-05 | 2.00E+00 | NA | 1.5E-05 | 34.4% | NA | NA |
| Arsenic | 7.6 | 0.03 | 3.98E-07 | 1.12E-06 | 1.50E+00 | 3.00E-04 | 6.0E-07 | 1.4% | 3.7E-03 | 26.6% |
| Barium | 3180 | NA | NA | NA | NA | 4.90E-03 | NA | NA | NA | NA |
| Chromium (total) | 58.4 | NA | NA | NA | NA | 7.50E-05 | NA | NA | NA | NA |
| Lead | 1560 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | 260 | NA | NA | NA | NA | 1.20E-03 | NA | NA | NA | NA |
| Nickel | 64.4 | NA | NA | NA | NA | 8.00E-04 | NA | NA | NA | NA |
| Thallium | 0.76 | NA | NA | NA | NA | 7.00E-05 | NA | NA | NA | NA |
| Zinc | 650 | NA | NA | NA | NA | 3.00E-01 | NA | NA | NA | NA |
| TEQ-Dioxins/Furans | 0.0021 | 0.03 | 1.10E-10 | 3.08E-10 | 1.50E+05 | NA | 1.7E-05 | 37.4% | NA | NA |
| | | | | | | **Total** | **4.4E-05** | **100%** | **1.4E-02** | **100%** |

RISK ASSESSMENT SPREADSHEET - SUMMARY

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - RME
MEDIA: ALL SOIL
DATE: SEPTEMBER 28, 1999

| | Lifetime Cancer Risk | | | | | Hazard Index | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | Incidental Ingestion | Dermal Contact | Inhalation | Total Risk | Percent Risk | Incidental Ingestion | Dermal Contact | Inhalation | Total HI | Percent HI |
| Benzo(a)anthracene | 1.0E-06 | 6.6E-07 | NA | 1.7E-06 | 0.9% | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | 1.0E-05 | 6.6E-06 | NA | 1.7E-05 | 8.5% | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | 1.0E-06 | 6.6E-07 | NA | 1.7E-06 | 0.9% | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | 7.7E-08 | 5.0E-08 | NA | 1.3E-07 | 0.1% | NA | NA | NA | NA | NA |
| Bis(2-ethylhexyl)phthalate | 1.5E-08 | NA | NA | 1.5E-08 | 0.0% | 1.5E-04 | NA | NA | 1.5E-04 | 0.1% |
| Dibenzo(a,h)anthracene | 5.1E-06 | 3.3E-06 | NA | 8.4E-06 | 4.3% | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | 7.7E-07 | 5.0E-07 | NA | 1.3E-06 | 0.6% | NA | NA | NA | NA | NA |
| Aroclor-1254 | NA | NA | NA | NA | NA | 1.5E-02 | 1.0E-02 | NA | 2.5E-02 | 17.1% |
| Aroclor, total | 2.2E-05 | 1.5E-05 | NA | 3.7E-05 | 18.6% | NA | NA | NA | NA | NA |
| Arsenic | 4.0E-06 | 6.0E-07 | NA | 4.6E-06 | 2.3% | 2.5E-02 | 3.7E-03 | NA | 2.9E-02 | 19.6% |
| Barium | NA | NA | NA | NA | NA | 4.4E-02 | NA | NA | 4.4E-02 | 30.5% |
| Chromium (total) | NA | NA | NA | NA | NA | 1.9E-02 | NA | NA | 1.9E-02 | 13.1% |
| Lead | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | NA | NA | NA | NA | NA | 1.3E-02 | NA | NA | 1.3E-02 | 8.7% |
| Nickel | NA | NA | NA | NA | NA | 3.2E-03 | NA | NA | 3.2E-03 | 2.2% |
| Thallium | NA | NA | NA | NA | NA | 1.1E-02 | NA | NA | 1.1E-02 | 7.3% |
| Zinc | NA | NA | NA | NA | NA | 2.1E-03 | NA | NA | 2.1E-03 | 1.5% |
| TEQ-Dioxins/Furans | 1.1E-04 | 1.7E-05 | NA | 1.3E-04 | 63.9% | NA | NA | NA | NA | NA |
| **Total** | **1.5E-04** | **4.4E-05** | **NA** | **2.0E-04** | **100.0%** | **1.3E-01** | **1.4E-02** | **NA** | **1.5E-01** | **100.0%** |

**RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL**

**SITE NAME: AREA A-2, SPADA PROPERTY**
**LOCATION: FERRY CREEK, STRATFORD, CT**
**EXPOSURE SCENARIO: COMMERCIAL WORKER - CTE**
**MEDIA: ALL SOIL**
**DATE: SEPTEMBER 28, 1999**

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INCIDENTAL INGESTION OF SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $\text{Intake} = \frac{Cs \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

| | | | |
|---|---|---|---|
| WHERE: | Cs = : | | Concentration in soil (mg/kg) |
| | IR = : | 50 | Soil Ingestion Rate (mg/day) |
| | CF = : | 1.0E-06 | Conversion Factor (kg/mg) |
| | FI = : | 1 | Fraction from contaminated source (unitless) |
| | EF = : | 250 | Exposure Frequency (days/year) |
| | ED = : | 9 | Exposure Duration (years) |
| | BW = : | 70 | Body Weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 3,285 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | |
|---|---|
| Lifetime Chronic Daily Inta | 6.3E-08 kg-soil/kg-wt/day |
| Chronic Daily Intake = : | 4.9E-07 kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - CTE
MEDIA: ALL SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 4 | 2.5E-07 | 2.0E-06 | 7.30E-01 | NA | 1.8E-07 | 0.7% | NA | NA |
| Benzo(a)pyrene | 4 | 2.5E-07 | 2.0E-06 | 7.30E+00 | NA | 1.8E-06 | 7.1% | NA | NA |
| Benzo(b)fluoranthene | 4 | 2.5E-07 | 2.0E-06 | 7.30E-01 | NA | 1.8E-07 | 0.7% | NA | NA |
| Benzo(k)fluoranthene | 3 | 1.9E-07 | 1.5E-06 | 7.30E-02 | NA | 1.4E-08 | 0.1% | NA | NA |
| Bis(2-ethylhexyl)phthalate | 3 | 1.9E-07 | 1.5E-06 | 1.40E-02 | 2.00E-02 | 2.6E-09 | 0.0% | 7.3E-05 | 0.1% |
| Dibenzo(a,h)anthracene | 2 | 1.3E-07 | 9.8E-07 | 7.30E+00 | NA | 9.2E-07 | 3.6% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 3 | 1.9E-07 | 1.5E-06 | 7.30E-01 | NA | 1.4E-07 | 0.5% | NA | NA |
| Aroclor-1254 | 0.3 | 1.9E-08 | 1.5E-07 | NA | 2.00E-05 | NA | NA | 7.3E-03 | 11.1% |
| Aroclor, total | 31 | 1.9E-06 | 1.5E-05 | 1.00E+00 | NA | 1.9E-06 | 7.6% | NA | NA |
| Arsenic | 7.6 | 4.8E-07 | 3.7E-06 | 1.50E+00 | 3.00E-04 | 7.2E-07 | 2.8% | 1.2E-02 | 18.8% |
| Barium | 3180 | 2.0E-04 | 1.6E-03 | NA | 7.00E-02 | NA | NA | 2.2E-02 | 33.7% |
| Chromium (total) | 58.4 | 3.7E-06 | 2.9E-05 | NA | 3.00E-03 | NA | NA | 9.5E-03 | 14.5% |
| Lead | 1560 | 9.8E-05 | 7.6E-04 | NA | NA | NA | NA | NA | NA |
| Manganese | 260 | 1.6E-05 | 1.3E-04 | NA | 2.00E-02 | NA | NA | 6.4E-03 | 9.7% |
| Nickel | 64.4 | 4.1E-06 | 3.2E-05 | NA | 2.00E-02 | NA | NA | 1.6E-03 | 2.4% |
| Thallium | 0.76 | 4.8E-08 | 3.7E-07 | NA | 7.00E-05 | NA | NA | 5.3E-03 | 8.1% |
| Zinc | 650 | 4.1E-05 | 3.2E-04 | NA | 3.00E-01 | NA | NA | 1.1E-03 | 1.6% |
| TEQ-Dioxins/Furans | 0.0021 | 1.3E-10 | 1.0E-09 | 1.50E+05 | NA | 2.0E-05 | 76.9% | NA | NA |
| | | | | | **Total** | **2.6E-05** | **100.0%** | **6.6E-02** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - CTE
MEDIA: ALL SOIL
DATE: SEPTEMBER 28, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION:

$$\text{Absorbed Dose} = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

| | | | |
|---|---|---|---|
| Where: | Cs = : | | Concentration in soil (mg/kg) |
| | CF = : | 1.0E-06 | Conversion factor (kg/mg) |
| | SA = : | 2,500 | Skin surface available for contact ($cm^2$/event) |
| | AF = : | 0.02 | Soil to skin adherence factor ($mg/cm^2$) |
| | ABS = : | | Absorption factor (unitless) |
| | EF = : | 250 | Exposure frequency (events/year) |
| | ED = : | 9 | Exposure duration (years) |
| | BW = : | 70 | Body weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 3,285 | Averaging time for noncarcinogenic exposures (days) |

| | |
|---|---|
| Unit Dose | |
| Lifetime Chronic Daily Intake | 6.3E-08 kg-soil/kg-wt/day |
| Chronic Daily Intake = : | 4.9E-07 kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - CTE
MEDIA: ALL SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | ABS (unitless) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 4 | 0.13 | 3.27E-08 | 2.54E-07 | 7.30E-01 | NA | 2.4E-08 | 1.5% | NA | NA |
| Benzo(a)pyrene | 4 | 0.13 | 3.27E-08 | 2.54E-07 | 7.30E+00 | NA | 2.4E-07 | 15.1% | NA | NA |
| Benzo(b)fluoranthene | 4 | 0.13 | 3.27E-08 | 2.54E-07 | 7.30E-01 | NA | 2.4E-08 | 1.5% | NA | NA |
| Benzo(k)fluoranthene | 3 | 0.13 | 2.45E-08 | 1.91E-07 | 7.30E-02 | NA | 1.8E-09 | 0.1% | NA | NA |
| Bis(2-ethylhexyl)phthalate | 3 | NA | NA | NA | 1.40E-02 | NA | NA | NA | NA | NA |
| Dibenzo(a,h)anthracene | 2 | 0.13 | 1.64E-08 | 1.27E-07 | 2.35E+01 | NA | 3.8E-07 | 24.3% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 3 | 0.13 | 2.45E-08 | 1.91E-07 | 7.30E-01 | NA | 1.8E-08 | 1.1% | NA | NA |
| Aroclor-1254 | 0.3 | 0.14 | 2.64E-09 | 2.05E-08 | NA | 2.00E-05 | NA | NA | 1.0E-03 | 73.4% |
| Aroclor, total | 31 | 0.14 | 2.73E-07 | 2.12E-06 | 1.00E+00 | NA | 2.7E-07 | 17.3% | NA | NA |
| Arsenic | 7.6 | 0.03 | 1.43E-08 | 1.12E-07 | 1.50E+00 | 3.00E-04 | 2.2E-08 | 1.4% | 3.7E-04 | 26.6% |
| Barium | 3180 | NA | NA | NA | NA | 4.90E-03 | NA | NA | NA | NA |
| Chromium (total) | 58.4 | NA | NA | NA | NA | 7.50E-05 | NA | NA | NA | NA |
| Lead | 1560 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | 260 | NA | NA | NA | NA | 1.20E-03 | NA | NA | NA | NA |
| Nickel | 64.4 | NA | NA | NA | NA | 8.00E-04 | NA | NA | NA | NA |
| Thallium | 0.76 | NA | NA | NA | NA | 7.00E-05 | NA | NA | NA | NA |
| Zinc | 650 | NA | NA | NA | NA | 3.00E-01 | NA | NA | NA | NA |
| TEQ-Dioxins/Furans | 0.0021 | 0.03 | 3.96E-12 | 3.08E-11 | 1.50E+05 | NA | 5.9E-07 | 37.6% | NA | NA |
| | | | | | | **Total** | **1.6E-06** | **100%** | **1.4E-03** | **100%** |

RISK ASSESSMENT SPREADSHEET - SUMMARY

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - CTE
MEDIA: ALL SOIL
DATE: SEPTEMBER 28, 1999

| | Lifetime Cancer Risk | | | | | Hazard Index | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | Incidental Ingestion | Dermal Contact | Inhalation | Total Risk | Percent Risk | Incidental Ingestion | Dermal Contact | Inhalation | Total HI | Percent HI |
| Benzo(a)anthracene | 1.8E-07 | 2.4E-08 | NA | 2.1E-07 | 0.8% | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | 1.8E-06 | 2.4E-07 | NA | 2.1E-06 | 7.6% | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | 1.8E-07 | 2.4E-08 | NA | 2.1E-07 | 0.8% | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | 1.4E-08 | 1.8E-09 | NA | 1.6E-08 | 0.1% | NA | NA | NA | NA | NA |
| Bis(2-ethylhexyl)phthalate | 2.6E-09 | NA | NA | 2.6E-09 | 0.0% | 7.3E-05 | NA | NA | 7.3E-05 | 0.1% |
| Dibenzo(a,h)anthracene | 9.2E-07 | 3.8E-07 | NA | 1.3E-06 | 4.8% | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | 1.4E-07 | 1.8E-08 | NA | 1.6E-07 | 0.6% | NA | NA | NA | NA | NA |
| Aroclor-1254 | NA | NA | NA | NA | NA | 7.3E-03 | 1.0E-03 | NA | 8.4E-03 | 12.4% |
| Aroclor, total | 1.9E-06 | 2.7E-07 | NA | 2.2E-06 | 8.1% | NA | NA | NA | NA | NA |
| Arsenic | 7.2E-07 | 2.2E-08 | NA | 7.4E-07 | 2.7% | 1.2E-02 | 3.7E-04 | NA | 1.3E-02 | 19.0% |
| Barium | NA | NA | NA | NA | NA | 2.2E-02 | NA | NA | 2.2E-02 | 33.0% |
| Chromium (total) | NA | NA | NA | NA | NA | 9.5E-03 | NA | NA | 9.5E-03 | 14.2% |
| Lead | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | NA | NA | NA | NA | NA | 6.4E-03 | NA | NA | 6.4E-03 | 9.5% |
| Nickel | NA | NA | NA | NA | NA | 1.6E-03 | NA | NA | 1.6E-03 | 2.3% |
| Thallium | NA | NA | NA | NA | NA | 5.3E-03 | NA | NA | 5.3E-03 | 7.9% |
| Zinc | NA | NA | NA | NA | NA | 1.1E-03 | NA | NA | 1.1E-03 | 1.6% |
| TEQ-Dioxins/Furans | 2.0E-05 | 5.9E-07 | NA | 2.0E-05 | 74.7% | NA | NA | NA | NA | NA |
| **Total** | **2.6E-05** | **1.6E-06** | **NA** | **2.7E-05** | **100.0%** | **6.6E-02** | **1.4E-03** | **NA** | **6.7E-02** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: ADOLESCENT TRESPASSER RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INCIDENTAL INGESTION OF SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $\text{Intake} = \dfrac{Cs \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

| | | | |
|---|---|---|---|
| WHERE: | Cs =: | | Concentration in soil (mg/kg) |
| | IR =: | 100 | Soil Ingestion Rate (mg/day) |
| | CF =: | 1.0E-06 | Conversion Factor (kg/mg) |
| | FI =: | 1 | Fraction from contaminated source (unitless) |
| | EF =: | 52 | Exposure Frequency (days/year) |
| | ED =: | 10 | Exposure Duration (years) |
| | BW =: | 51 | Body Weight (kg) |
| | ATc =: | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn =: | 3,650 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | | |
|---|---|---|
| Lifetime Chronic Daily Inta | 4.0E-08 | kg-soil/kg-wt/day |
| Chronic Daily Intake =: | 2.8E-07 | kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: ADOLESCENT TRESPASSER RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 13 | 5.2E-07 | 3.6E-06 | 7.30E-01 | NA | 3.8E-07 | 2.3% | NA | NA |
| Benzo(a)pyrene | 12 | 4.8E-07 | 3.4E-06 | 7.30E+00 | NA | 3.5E-06 | 21.6% | NA | NA |
| Benzo(b)fluoranthene | 11 | 4.4E-07 | 3.1E-06 | 7.30E-01 | NA | 3.2E-07 | 2.0% | NA | NA |
| Benzo(k)fluoranthene | 11 | 4.4E-07 | 3.1E-06 | 7.30E-02 | NA | 3.2E-08 | 0.2% | NA | NA |
| Dibenzo(a,h)anthracene | 2 | 8.0E-08 | 5.6E-07 | 7.30E+00 | NA | 5.8E-07 | 3.6% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 6 | 2.4E-07 | 1.7E-06 | 7.30E-01 | NA | 1.7E-07 | 1.1% | NA | NA |
| Aroclor, total | 48 | 1.9E-06 | 1.3E-05 | 2.00E+00 | NA | 3.8E-06 | 23.7% | NA | NA |
| Arsenic | 12.5 | 5.0E-07 | 3.5E-06 | 1.50E+00 | 3.00E-04 | 7.5E-07 | 4.6% | 1.2E-02 | 32.4% |
| Barium | 4260 | 1.7E-04 | 1.2E-03 | NA | 7.00E-02 | NA | NA | 1.7E-02 | 47.4% |
| Chromium (total) | 31.9 | 1.3E-06 | 8.9E-06 | NA | 3.00E-03 | NA | NA | 3.0E-03 | 8.3% |
| Lead | 881 | 3.5E-05 | 2.5E-04 | NA | NA | NA | NA | NA | NA |
| Manganese | 307 | 1.2E-05 | 8.6E-05 | NA | 2.00E-02 | NA | NA | 4.3E-03 | 11.9% |
| TEQ-Dioxins/Furans | 0.0011 | 4.4E-11 | 3.1E-10 | 1.50E+05 | NA | 6.6E-06 | 40.8% | NA | NA |
| | | | | | **Total** | **1.6E-05** | **100.0%** | **3.6E-02** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: ADOLESCENT TRESPASSER RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $$\text{Absorbed Dose} = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

| | | | |
|---|---|---|---|
| Where: | Cs = : | | Concentration in soil (mg/kg) |
| | CF = : | 1.0E-06 | Conversion factor (kg/mg) |
| | SA = : | 3,500 | Skin surface available for contact ($cm^2$/event) |
| | AF = : | 0.07 | Soil to skin adherence factor ($mg/cm^2$) |
| | ABS = : | | Absorption factor (unitless) |
| | EF = : | 52 | Exposure frequency (events/year) |
| | ED = : | 10 | Exposure duration (years) |
| | BW = : | 51 | Body weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 3,650 | Averaging time for noncarcinogenic exposures (days) |

| | |
|---|---|
| Unit Dose | |
| Lifetime Chronic Daily Intake | 9.8E-08 kg-soil/kg-wt/day |
| Chronic Daily Intake = : | 6.8E-07 kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: ADOLESCENT TRESPASSER RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | ABS (unitless) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 13 | 0.13 | 1.65E-07 | 1.16E-06 | 7.30E-01 | NA | 1.2E-07 | 3.5% | NA | NA |
| Benzo(a)pyrene | 12 | 0.13 | 1.53E-07 | 1.07E-06 | 7.30E+00 | NA | 1.1E-06 | 32.4% | NA | NA |
| Benzo(b)fluoranthene | 11 | 0.13 | 1.40E-07 | 9.79E-07 | 7.30E-01 | NA | 1.0E-07 | 3.0% | NA | NA |
| Benzo(k)fluoranthene | 11 | 0.13 | 1.40E-07 | 9.79E-07 | 7.30E-02 | NA | 1.0E-08 | 0.3% | NA | NA |
| Dibenzo(a,h)anthracene | 2 | 0.13 | 2.54E-08 | 1.78E-07 | 7.30E+00 | NA | 1.9E-07 | 5.4% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 6 | 0.13 | 7.63E-08 | 5.34E-07 | 7.30E-01 | NA | 5.6E-08 | 1.6% | NA | NA |
| Aroclor, total | 48 | 0.14 | 6.57E-07 | 4.60E-06 | 2.00E+00 | NA | 1.3E-06 | 38.2% | NA | NA |
| Arsenic | 12.5 | 0.03 | 3.67E-08 | 2.57E-07 | 1.50E+00 | 3.00E-04 | 5.5E-08 | 1.6% | 8.6E-04 | 100.0% |
| Barium | 4260 | NA | NA | NA | NA | 4.90E-03 | NA | NA | NA | NA |
| Chromium (total) | 31.9 | NA | NA | NA | NA | 7.50E-05 | NA | NA | NA | NA |
| Lead | 881 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | 307 | NA | NA | NA | NA | 1.20E-03 | NA | NA | NA | NA |
| TEQ-Dioxins/Furans | 0.0011 | 0.03 | 3.23E-12 | 2.26E-11 | 1.50E+05 | NA | 4.8E-07 | 14.1% | NA | NA |
| | | | | | | **Total** | **3.4E-06** | **100%** | **8.6E-04** | **100%** |

RISK ASSESSMENT SPREADSHEET - SUMMARY

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: ADOLESCENT TRESPASSER RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| | Lifetime Cancer Risk | | | | | Hazard Index | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | Incidental Ingestion | Dermal Contact | Inhalation | Total Risk | Percent Risk | Incidental Ingestion | Dermal Contact | Inhalation | Total HI | Percent HI |
| Benzo(a)anthracene | 3.8E-07 | 1.2E-07 | NA | 5.0E-07 | 2.5% | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | 3.5E-06 | 1.1E-06 | NA | 4.6E-06 | 23.5% | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | 3.2E-07 | 1.0E-07 | NA | 4.2E-07 | 2.2% | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | 3.2E-08 | 1.0E-08 | NA | 4.2E-08 | 0.2% | NA | NA | NA | NA | NA |
| Dibenzo(a,h)anthracene | 5.8E-07 | 1.9E-07 | NA | 7.7E-07 | 3.9% | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | 1.7E-07 | 5.6E-08 | NA | 2.3E-07 | 1.2% | NA | NA | NA | NA | NA |
| Aroclor, total | 3.8E-06 | 1.3E-06 | NA | 5.1E-06 | 26.3% | NA | NA | NA | NA | NA |
| Arsenic | 7.5E-07 | 5.5E-08 | NA | 8.0E-07 | 4.1% | 1.2E-02 | 8.6E-04 | NA | 1.2E-02 | 34.0% |
| Barium | NA | NA | NA | NA | NA | 1.7E-02 | NA | NA | 1.7E-02 | 46.3% |
| Chromium (total) | NA | NA | NA | NA | NA | 3.0E-03 | NA | NA | 3.0E-03 | 8.1% |
| Lead | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | NA | NA | NA | NA | NA | 4.3E-03 | NA | NA | 4.3E-03 | 11.7% |
| TEQ-Dioxins/Furans | 6.6E-06 | 4.8E-07 | NA | 7.1E-06 | 36.1% | NA | NA | NA | NA | NA |
| **Total** | **1.6E-05** | **3.4E-06** | **NA** | **2.0E-05** | **100.0%** | **3.6E-02** | **8.6E-04** | **NA** | **3.7E-02** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: ADOLESCENT TRESPASSER CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INCIDENTAL INGESTION OF SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $\text{Intake} = \dfrac{Cs \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

| | | | |
|---|---|---|---|
| WHERE: | Cs =: | | Concentration in soil (mg/kg) |
| | IR =: | 50 | Soil Ingestion Rate (mg/day) |
| | CF =: | 1.0E-06 | Conversion Factor (kg/mg) |
| | FI =: | 1 | Fraction from contaminated source (unitless) |
| | EF =: | 52 | Exposure Frequency (days/year) |
| | ED =: | 5 | Exposure Duration (years) |
| | BW =: | 51 | Body Weight (kg) |
| | ATc =: | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn =: | 1,825 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | | |
|---|---|---|
| Lifetime Chronic Daily Inta | 1.0E-08 | kg-soil/kg-wt/day |
| Chronic Daily Intake =: | 1.4E-07 | kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: ADOLESCENT TRESPASSER CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 4 | 4.0E-08 | 5.6E-07 | 7.30E-01 | NA | 2.9E-08 | 2.1% | NA | NA |
| Benzo(a)pyrene | 4 | 4.0E-08 | 5.6E-07 | 7.30E+00 | NA | 2.9E-07 | 21.1% | NA | NA |
| Benzo(b)fluoranthene | 4 | 4.0E-08 | 5.6E-07 | 7.30E-01 | NA | 2.9E-08 | 2.1% | NA | NA |
| Benzo(k)fluoranthene | 4 | 4.0E-08 | 5.6E-07 | 7.30E-02 | NA | 2.9E-09 | 0.2% | NA | NA |
| Dibenzo(a,h)anthracene | 1 | 1.0E-08 | 1.4E-07 | 7.30E+00 | NA | 7.3E-08 | 5.3% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 2 | 2.0E-08 | 2.8E-07 | 7.30E-01 | NA | 1.5E-08 | 1.1% | NA | NA |
| Aroclor, total | 11 | 1.1E-07 | 1.5E-06 | 1.00E+00 | NA | 1.1E-07 | 8.0% | NA | NA |
| Arsenic | 12.5 | 1.2E-07 | 1.7E-06 | 1.50E+00 | 3.00E-04 | 1.9E-07 | 13.6% | 5.8E-03 | 52.2% |
| Barium | 847 | 8.5E-06 | 1.2E-04 | NA | 7.00E-02 | NA | NA | 1.7E-03 | 15.2% |
| Chromium (total) | 31.9 | 3.2E-07 | 4.5E-06 | NA | 3.00E-03 | NA | NA | 1.5E-03 | 13.3% |
| Lead | 881 | 8.8E-06 | 1.2E-04 | NA | NA | NA | NA | NA | NA |
| Manganese | 307 | 3.1E-06 | 4.3E-05 | NA | 2.00E-02 | NA | NA | 2.1E-03 | 19.2% |
| TEQ-Dioxins/Furans | 0.00043 | 4.3E-12 | 6.0E-11 | 1.50E+05 | NA | 6.4E-07 | 46.6% | NA | NA |
| | | | | | **Total** | **1.4E-06** | **100.0%** | **1.1E-02** | **100.0%** |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: ADOLESCENT TRESPASSER CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $$\text{Absorbed Dose} = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

| | | | |
|---|---|---|---|
| Where: | Cs = : | | Concentration in soil (mg/kg) |
| | CF = : | 1.0E-06 | Conversion factor (kg/mg) |
| | SA = : | 3,500 | Skin surface available for contact ($cm^2$/event) |
| | AF = : | 0.01 | Soil to skin adherence factor ($mg/cm^2$) |
| | ABS = : | | Absorption factor (unitless) |
| | EF = : | 52 | Exposure frequency (events/year) |
| | ED = : | 5 | Exposure duration (years) |
| | BW = : | 51 | Body weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 1,825 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | |
|---|---|
| Lifetime Chronic Daily Intake | 7.0E-09 kg-soil/kg-wt/day |
| Chronic Daily Intake = : | 9.8E-08 kg-soil/kg-wt/day |

( ( (

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: ADOLESCENT TRESPASSER CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| CHEMICAL | Cs (mg/kg) | ABS (unitless) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 4 | 0.13 | 3.63E-09 | 5.08E-08 | 7.30E-01 | NA | 2.7E-09 | 3.9% | NA | NA |
| Benzo(a)pyrene | 4 | 0.13 | 3.63E-09 | 5.08E-08 | 7.30E+00 | NA | 2.7E-08 | 38.9% | NA | NA |
| Benzo(b)fluoranthene | 4 | 0.13 | 3.63E-09 | 5.08E-08 | 7.30E-01 | NA | 2.7E-09 | 3.9% | NA | NA |
| Benzo(k)fluoranthene | 4 | 0.13 | 3.63E-09 | 5.08E-08 | 7.30E-02 | NA | 2.7E-10 | 0.4% | NA | NA |
| Dibenzo(a,h)anthracene | 1 | 0.13 | 9.08E-10 | 1.27E-08 | 7.30E+00 | NA | 6.6E-09 | 9.7% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 2 | 0.13 | 1.82E-09 | 2.54E-08 | 7.30E-01 | NA | 1.3E-09 | 1.9% | NA | NA |
| Aroclor, total | 11 | 0.14 | 1.08E-08 | 1.51E-07 | 1.00E+00 | NA | 1.1E-08 | 15.8% | NA | NA |
| Arsenic | 12.5 | 0.03 | 2.62E-09 | 3.67E-08 | 1.50E+00 | 3.00E-04 | 3.9E-09 | 5.8% | 1.2E-04 | 100.0% |
| Barium | 847 | NA | NA | NA | NA | 4.90E-03 | NA | NA | NA | NA |
| Chromium (total) | 31.9 | NA | NA | NA | NA | 7.50E-05 | NA | NA | NA | NA |
| Lead | 881 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | 307 | NA | NA | NA | NA | 1.20E-03 | NA | NA | NA | NA |
| TEQ-Dioxins/Furans | 0.00043 | 0.03 | 9.01E-14 | 1.26E-12 | 1.50E+05 | NA | 1.4E-08 | 19.8% | NA | NA |
| | | | | | | **Total** | **6.8E-08** | **100%** | **1.2E-04** | **100%** |

RISK ASSESSMENT SPREADSHEET - SUMMARY

SITE NAME: AREA A-2, SPADA PROPERTY
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: ADOLESCENT TRESPASSER CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 28, 1999

| | Lifetime Cancer Risk | | | | | Hazard Index | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | Incidental Ingestion | Dermal Contact | Inhalation | Total Risk | Percent Risk | Incidental Ingestion | Dermal Contact | Inhalation | Total HI | Percent HI |
| Benzo(a)anthracene | 2.9E-08 | 2.7E-09 | NA | 3.2E-08 | 2.2% | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | 2.9E-07 | 2.7E-08 | NA | 3.2E-07 | 21.9% | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | 2.9E-08 | 2.7E-09 | NA | 3.2E-08 | 2.2% | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | 2.9E-09 | 2.7E-10 | NA | 3.2E-09 | 0.2% | NA | NA | NA | NA | NA |
| Dibenzo(a,h)anthracene | 7.3E-08 | 6.6E-09 | NA | 7.9E-08 | 5.5% | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | 1.5E-08 | 1.3E-09 | NA | 1.6E-08 | 1.1% | NA | NA | NA | NA | NA |
| Aroclor, total | 1.1E-07 | 1.1E-08 | NA | 1.2E-07 | 8.3% | NA | NA | NA | NA | NA |
| Arsenic | 1.9E-07 | 3.9E-09 | NA | 1.9E-07 | 13.2% | 5.8E-03 | 1.2E-04 | NA | 5.9E-03 | 52.8% |
| Barium | NA | NA | NA | NA | NA | 1.7E-03 | NA | NA | 1.7E-03 | 15.0% |
| Chromium (total) | NA | NA | NA | NA | NA | 1.5E-03 | NA | NA | 1.5E-03 | 13.2% |
| Lead | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | NA | NA | NA | NA | NA | 2.1E-03 | NA | NA | 2.1E-03 | 19.0% |
| TEQ-Dioxins/Furans | 6.4E-07 | 1.4E-08 | NA | 6.6E-07 | 45.4% | NA | NA | NA | NA | NA |
| **Total** | **1.4E-06** | **6.8E-08** | **NA** | **1.4E-06** | **100.0%** | **1.1E-02** | **1.2E-04** | **NA** | **1.1E-02** | **100.0%** |

# Appendix F.11

## Area A-3

**RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL**

**SITE NAME:** **AREA A-3, RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE**
**LOCATION:** **FERRY CREEK, STRATFORD, CT**
**EXPOSURE SCENARIO:** **FREQUENT RECREATIONAL USER - ADULT RME**
**MEDIA:** **SURFACE SOIL**
**DATE:** **SEPTEMBER 24, 1999**

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INCIDENTAL INGESTION OF SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $\text{Intake} = \dfrac{Cs \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

| | | | |
|---|---|---|---|
| WHERE: | Cs =: | | Concentration in soil (mg/kg) |
| | IR =: | 100 | Soil Ingestion Rate (mg/day) |
| | CF =: | 1.0E-06 | Conversion Factor (kg/mg) |
| | FI =: | 1 | Fraction from contaminated source (unitless) |
| | EF =: | 90 | Exposure Frequency (days/year) |
| | ED =: | 24 | Exposure Duration (years) |
| | BW =: | 70 | Body Weight (kg) |
| | ATc =: | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn =: | 8,760 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | | |
|---|---|---|
| Lifetime Chronic Daily Inta | 1.2E-07 | kg-soil/kg-wt/day |
| Chronic Daily Intake = : | 3.5E-07 | kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)

SITE NAME: AREA A-3, RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 24, 1999

| CHEMICAL | Cs (mg/kg) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 4 | 4.8E-07 | 1.4E-06 | 7.30E-01 | NA | 3.5E-07 | 0.7% | NA | NA |
| Benzo(a)pyrene | 4 | 4.8E-07 | 1.4E-06 | 7.30E+00 | NA | 3.5E-06 | 6.6% | NA | NA |
| Benzo(b)fluoranthene | 8 | 9.7E-07 | 2.8E-06 | 7.30E-01 | NA | 7.1E-07 | 1.3% | NA | NA |
| Bis(2-ethylhexyl)phthalate | 21 | 2.5E-06 | 7.4E-06 | 1.40E-02 | 2.00E-02 | 3.6E-08 | 0.1% | 3.7E-04 | 0.3% |
| Dibenzo(a,h)anthracene | 1 | 1.2E-07 | 3.5E-07 | 7.30E+00 | NA | 8.8E-07 | 1.6% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 2 | 2.4E-07 | 7.0E-07 | 7.30E-01 | NA | 1.8E-07 | 0.3% | NA | NA |
| 4,4-DDT | 0.18 | 2.2E-08 | 6.3E-08 | 3.40E-01 | 5.00E-04 | 7.4E-09 | 0.0% | 1.3E-04 | 0.1% |
| Dieldrin | 0.022 | 2.7E-09 | 7.7E-09 | 1.60E+01 | 5.00E-05 | 4.3E-08 | 0.1% | 1.5E-04 | 0.1% |
| Aroclor-1254 | 0.33 | 4.0E-08 | 1.2E-07 | NA | 2.00E-05 | NA | NA | 5.8E-03 | 5.3% |
| Aroclor, total | 32 | 3.9E-06 | 1.1E-05 | 2.00E+00 | NA | 7.7E-06 | 14.4% | NA | NA |
| Antimony | 5.5 | 6.6E-07 | 1.9E-06 | NA | 4.00E-04 | NA | NA | 4.8E-03 | 4.4% |
| Arsenic | 12.5 | 1.5E-06 | 4.4E-06 | 1.50E+00 | 3.00E-04 | 2.3E-06 | 4.2% | 1.5E-02 | 13.3% |
| Barium | 6890 | 8.3E-04 | 2.4E-03 | NA | 7.00E-02 | NA | NA | 3.5E-02 | 31.4% |
| Cadmium | 4.9 | 5.9E-07 | 1.7E-06 | NA | 1.00E-03 | NA | NA | 1.7E-03 | 1.6% |
| Chromium (total) | 198 | 2.4E-05 | 7.0E-05 | NA | 3.00E-03 | NA | NA | 2.3E-02 | 21.0% |
| Lead | 1280 | 1.5E-04 | 4.5E-04 | NA | NA | NA | NA | NA | NA |
| Manganese | 435 | 5.3E-05 | 1.5E-04 | NA | 2.00E-02 | NA | NA | 7.7E-03 | 6.9% |
| Mercury | 0.55 | 6.6E-08 | 1.9E-07 | NA | 3.00E-04 | NA | NA | 6.5E-04 | 0.6% |
| Nickel | 193 | 2.3E-05 | 6.8E-05 | NA | 2.00E-02 | NA | NA | 3.4E-03 | 3.1% |
| Thallium | 1.5 | 1.8E-07 | 5.3E-07 | NA | 7.00E-05 | NA | NA | 7.5E-03 | 6.8% |
| Vanadium | 88.4 | 1.1E-05 | 3.1E-05 | NA | 7.00E-03 | NA | NA | 4.4E-03 | 4.0% |
| Zinc | 1050 | 1.3E-04 | 3.7E-04 | NA | 3.00E-01 | NA | NA | 1.2E-03 | 1.1% |
| TEQ-Dioxins/Furans | 0.0021 | 2.5E-10 | 7.4E-10 | 1.50E+05 | NA | 3.8E-05 | 70.8% | NA | NA |
| | | | | | **Total** | **5.4E-05** | **100%** | **1.1E-01** | **100%** |

**RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL**

**SITE NAME: AREA A-3, RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE**
**LOCATION: FERRY CREEK, STRATFORD, CT**
**EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT RME**
**MEDIA: SURFACE SOIL**
**DATE: SEPTEMBER 24, 1999**

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $$\text{AbsorbedDose} = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

Where:

| | | |
|---|---|---|
| Cs = : | | Concentration in soil (mg/kg) |
| CF = : | 1.0E-06 | Conversion factor (kg/mg) |
| SA = : | 5,700 | Skin surface available for contact ($cm^2$/event) |
| AF = : | 0.3 | Soil to skin adherence factor ($mg/cm^2$) |
| ABS = : | | Absorption factor (unitless) |
| EF = : | 90 | Exposure frequency (events/year) |
| ED = : | 24 | Exposure duration (years) |
| BW = : | 70 | Body weight (kg) |
| ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| ATn = : | 8,760 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | |
|---|---|
| Lifetime Chronic Daily Intake | 2.1E-06 kg-soil/kg-wt/day |
| Chronic Daily Intake = : | 6.0E-06 kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)

SITE NAME: AREA A-3, RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 24, 1999

| CHEMICAL | Cs (mg/kg) | ABS (unitless) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 4 | 0.13 | 1.07E-06 | 3.13E-06 | 7.30E-01 | NA | 7.8E-07 | 2.4% | NA | NA |
| Benzo(a)pyrene | 4 | 0.13 | 1.07E-06 | 3.13E-06 | 7.30E+00 | NA | 7.8E-06 | 23.9% | NA | NA |
| Benzo(b)fluoranthene | 8 | 0.13 | 2.15E-06 | 6.26E-06 | 7.30E-01 | NA | 1.6E-06 | 4.8% | NA | NA |
| Bis(2-ethylhexyl)phthalate | 21 | NA | NA | NA | 1.40E-02 | 3.80E-03 | NA | NA | NA | NA |
| Dibenzo(a,h)anthracene | 1 | 0.13 | 2.68E-07 | 7.83E-07 | 7.30E+00 | NA | 2.0E-06 | 6.0% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 2 | 0.13 | 5.37E-07 | 1.57E-06 | 7.30E-01 | NA | 3.9E-07 | 1.2% | NA | NA |
| 4,4-DDT | 0.18 | 0.03 | 1.12E-08 | 3.25E-08 | 3.40E-01 | 3.50E-04 | 3.8E-09 | 0.0% | 9.3E-05 | 0.3% |
| Dieldrin | 0.022 | NA | NA | NA | 1.60E+01 | 2.50E-05 | NA | NA | NA | NA |
| Aroclor-1254 | 0.33 | 0.14 | 9.54E-08 | 2.78E-07 | NA | 2.00E-05 | NA | NA | 1.4E-02 | 49.7% |
| Aroclor, total | 32 | 0.14 | 9.25E-06 | 2.70E-05 | 2.00E+00 | NA | 1.9E-05 | 56.3% | NA | NA |
| Antimony | 5.5 | NA | NA | NA | NA | 3.80E-04 | NA | NA | NA | NA |
| Arsenic | 12.5 | 0.03 | 7.74E-07 | 2.26E-06 | 1.50E+00 | 2.80E-04 | 1.2E-06 | 3.5% | 8.1E-03 | 28.8% |
| Barium | 6890 | NA | NA | NA | NA | 3.50E-03 | NA | NA | NA | NA |
| Cadmium | 4.9 | 0.01 | 1.01E-07 | 2.95E-07 | NA | 5.00E-05 | NA | NA | 5.9E-03 | 21.1% |
| Chromium (total) | 198 | NA | NA | NA | NA | 1.00E-04 | NA | NA | NA | NA |
| Lead | 1280 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | 435 | NA | NA | NA | NA | 6.00E-04 | NA | NA | NA | NA |
| Mercury | 0.55 | NA | NA | NA | NA | 1.50E-05 | NA | NA | NA | NA |
| Nickel | 193 | NA | NA | NA | NA | 2.00E-03 | NA | NA | NA | NA |
| Thallium | 1.5 | NA | NA | NA | NA | 4.00E-06 | NA | NA | NA | NA |
| Vanadium | 88.4 | NA | NA | NA | NA | 3.50E-04 | NA | NA | NA | NA |
| Zinc | 1050 | NA | NA | NA | NA | 6.00E-02 | NA | NA | NA | NA |
| TEQ-Dioxins/Furans | 0.0021 | 0.001 | 4.34E-12 | 1.26E-11 | 1.50E+05 | NA | 6.5E-07 | 2.0% | NA | NA |
| | | | | | | Total | 3.3E-05 | 100% | 2.8E-02 | 100% |

RISK ASSESSMENT SPREADSHEET - SUMMARY

SITE NAME: AREA A-3, RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 24, 1999

| | Lifetime Cancer Risk | | | | | Hazard Index | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | Incidental Ingestion | Dermal Contact | Inhalation | Total Risk | Percent Risk | Incidental Ingestion | Dermal Contact | Inhalation | Total HI | Percent HI |
| Benzo(a)anthracene | 3.5E-07 | 7.8E-07 | NA | 1.1E-06 | 1.3% | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | 3.5E-06 | 7.8E-06 | NA | 1.1E-05 | 13.1% | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | 7.1E-07 | 1.6E-06 | NA | 2.3E-06 | 2.6% | NA | NA | NA | NA | NA |
| Bis(2-ethylhexyl)phthalate | 3.6E-08 | NA | NA | 3.6E-08 | 0.0% | 3.7E-04 | NA | NA | 3.7E-04 | 0.3% |
| Dibenzo(a,h)anthracene | 8.8E-07 | 2.0E-06 | NA | 2.8E-06 | 3.3% | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | 1.8E-07 | 3.9E-07 | NA | 5.7E-07 | 0.7% | NA | NA | NA | NA | NA |
| 4,4-DDT | 7.4E-09 | 3.8E-09 | NA | 1.1E-08 | 0.0% | 1.3E-04 | 9.3E-05 | NA | 2.2E-04 | 0.2% |
| Dieldrin | 4.3E-08 | NA | NA | 4.3E-08 | 0.0% | 1.5E-04 | NA | NA | 1.5E-04 | 0.1% |
| Aroclor-1254 | NA | NA | NA | NA | NA | 5.8E-03 | 1.4E-02 | NA | 2.0E-02 | 14.2% |
| Aroclor, total | 7.7E-06 | 1.9E-05 | NA | 2.6E-05 | 30.3% | NA | NA | NA | NA | NA |
| Antimony | NA | NA | NA | NA | NA | 4.8E-03 | NA | NA | 4.8E-03 | 3.5% |
| Arsenic | 2.3E-06 | 1.2E-06 | NA | 3.4E-06 | 4.0% | 1.5E-02 | 8.1E-03 | NA | 2.3E-02 | 16.4% |
| Barium | NA | NA | NA | NA | NA | 3.5E-02 | NA | NA | 3.5E-02 | 25.0% |
| Cadmium | NA | NA | NA | NA | NA | 1.7E-03 | 5.9E-03 | NA | 7.6E-03 | 5.5% |
| Chromium (total) | NA | NA | NA | NA | NA | 2.3E-02 | NA | NA | 2.3E-02 | 16.8% |
| Lead | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | NA | NA | NA | NA | NA | 7.7E-03 | NA | NA | 7.7E-03 | 5.5% |
| Mercury | NA | NA | NA | NA | NA | 6.5E-04 | NA | NA | 6.5E-04 | 0.5% |
| Nickel | NA | NA | NA | NA | NA | 3.4E-03 | NA | NA | 3.4E-03 | 2.5% |
| Thallium | NA | NA | NA | NA | NA | 7.5E-03 | NA | NA | 7.5E-03 | 5.4% |
| Vanadium | NA | NA | NA | NA | NA | 4.4E-03 | NA | NA | 4.4E-03 | 3.2% |
| Zinc | NA | NA | NA | NA | NA | 1.2E-03 | NA | NA | 1.2E-03 | 0.9% |
| TEQ-Dioxins/Furans | 3.8E-05 | 6.5E-07 | NA | 3.9E-05 | 44.7% | NA | NA | NA | NA | NA |
| **Total** | **5.4E-05** | **3.3E-05** | **NA** | **8.7E-05** | **100%** | **1.1E-01** | **2.8E-02** | **NA** | **1.4E-01** | **100%** |

**RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL**

**SITE NAME: AREA A-3, RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE**
**LOCATION: FERRY CREEK, STRATFORD, CT**
**EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT CTE**
**MEDIA: SURFACE SOIL**
**DATE: SEPTEMBER 24, 1999**

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INCIDENTAL INGESTION OF SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $\text{Intake} = \dfrac{Cs \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

| | | | |
|---|---|---|---|
| WHERE: | Cs =: | | Concentration in soil (mg/kg) |
| | IR =: | 50 | Soil Ingestion Rate (mg/day) |
| | CF =: | 1.0E-06 | Conversion Factor (kg/mg) |
| | FI =: | 1 | Fraction from contaminated source (unitless) |
| | EF =: | 90 | Exposure Frequency (days/year) |
| | ED =: | 7 | Exposure Duration (years) |
| | BW =: | 70 | Body Weight (kg) |
| | ATc =: | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn =: | 2,555 | Averaging time for noncarcinogenic exposures (days) |

| | | |
|---|---|---|
| Unit Dose | | |
| Lifetime Chronic Daily Inta | 1.8E-08 | kg-soil/kg-wt/day |
| Chronic Daily Intake = : | 1.8E-07 | kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)

SITE NAME: AREA A-3, RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 24, 1999

| CHEMICAL | Cs (mg/kg) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 4 | 7.0E-08 | 7.0E-07 | 7.30E-01 | NA | 5.1E-08 | 0.7% | NA | NA |
| Benzo(a)pyrene | 4 | 7.0E-08 | 7.0E-07 | 7.30E+00 | NA | 5.1E-07 | 7.1% | NA | NA |
| Benzo(b)fluoranthene | 8 | 1.4E-07 | 1.4E-06 | 7.30E-01 | NA | 1.0E-07 | 1.4% | NA | NA |
| Bis(2-ethylhexyl)phthalate | 21 | 3.7E-07 | 3.7E-06 | 1.40E-02 | 2.00E-02 | 5.2E-09 | 0.1% | 1.8E-04 | 0.3% |
| Dibenzo(a,h)anthracene | 1 | 1.8E-08 | 1.8E-07 | 7.30E+00 | NA | 1.3E-07 | 1.8% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 2 | 3.5E-08 | 3.5E-07 | 7.30E-01 | NA | 2.6E-08 | 0.4% | NA | NA |
| 4,4-DDT | 0.18 | 3.2E-09 | 3.2E-08 | 3.40E-01 | 5.00E-04 | 1.1E-09 | 0.0% | 6.3E-05 | 0.1% |
| Dieldrin | 0.016 | 2.8E-10 | 2.8E-09 | 1.60E+01 | 5.00E-05 | 4.5E-09 | 0.1% | 5.6E-05 | 0.1% |
| Aroclor-1254 | 0.33 | 5.8E-09 | 5.8E-08 | NA | 2.00E-05 | NA | NA | 2.9E-03 | 5.3% |
| Aroclor, total | 32 | 5.6E-07 | 5.6E-06 | 1.00E+00 | NA | 5.6E-07 | 7.7% | NA | NA |
| Antimony | 5.5 | 9.7E-08 | 9.7E-07 | NA | 4.00E-04 | NA | NA | 2.4E-03 | 4.4% |
| Arsenic | 12.5 | 2.2E-07 | 2.2E-06 | 1.50E+00 | 3.00E-04 | 3.3E-07 | 4.5% | 7.3E-03 | 13.3% |
| Barium | 6890 | 1.2E-04 | 1.2E-03 | NA | 7.00E-02 | NA | NA | 1.7E-02 | 31.4% |
| Cadmium | 4.9 | 8.6E-08 | 8.6E-07 | NA | 1.00E-03 | NA | NA | 8.6E-04 | 1.6% |
| Chromium (total) | 198 | 3.5E-06 | 3.5E-05 | NA | 3.00E-03 | NA | NA | 1.2E-02 | 21.0% |
| Lead | 1280 | 2.3E-05 | 2.3E-04 | NA | NA | NA | NA | NA | NA |
| Manganese | 435 | 7.7E-06 | 7.7E-05 | NA | 2.00E-02 | NA | NA | 3.8E-03 | 6.9% |
| Mercury | 0.55 | 9.7E-09 | 9.7E-08 | NA | 3.00E-04 | NA | NA | 3.2E-04 | 0.6% |
| Nickel | 193 | 3.4E-06 | 3.4E-05 | NA | 2.00E-02 | NA | NA | 1.7E-03 | 3.1% |
| Thallium | 1.5 | 2.6E-08 | 2.6E-07 | NA | 7.00E-05 | NA | NA | 3.8E-03 | 6.8% |
| Vanadium | 88.4 | 1.6E-06 | 1.6E-05 | NA | 7.00E-03 | NA | NA | 2.2E-03 | 4.0% |
| Zinc | 1050 | 1.8E-05 | 1.8E-04 | NA | 3.00E-01 | NA | NA | 6.2E-04 | 1.1% |
| TEQ-Dioxins/Furans | 0.0021 | 3.7E-11 | 3.7E-10 | 1.50E+05 | NA | 5.5E-06 | 76.3% | NA | NA |
| | | | | | **Total** | **7.3E-06** | **100%** | 5.5E-02 | **100%** |

**RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL**

**SITE NAME: AREA A-3, RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE**
**LOCATION: FERRY CREEK, STRATFORD, CT**
**EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT CTE**
**MEDIA: SURFACE SOIL**
**DATE: SEPTEMBER 24, 1999**

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $$\text{Absorbed Dose} = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

| | | | |
|---|---|---|---|
| Where: | Cs = : | | Concentration in soil (mg/kg) |
| | CF = : | 1.0E-06 | Conversion factor (kg/mg) |
| | SA = : | 5,700 | Skin surface available for contact ($cm^2$/event) |
| | AF = : | 0.04 | Soil to skin adherence factor ($mg/cm^2$) |
| | ABS = : | | Absorption factor (unitless) |
| | EF = : | 90 | Exposure frequency (events/year) |
| | ED = : | 7 | Exposure duration (years) |
| | BW = : | 70 | Body weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 2,555 | Averaging time for noncarcinogenic exposures (days) |

| | | |
|---|---|---|
| Unit Dose | | |
| Lifetime Chronic Daily Intake | 8.0E-08 | kg-soil/kg-wt/day |
| Chronic Daily Intake = : | 8.0E-07 | kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)

SITE NAME: AREA A-3, RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 24, 1999

| CHEMICAL | Cs (mg/kg) | ABS (unitless) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 4 | 0.13 | 4.18E-08 | 4.18E-07 | 7.30E-01 | NA | 3.0E-08 | 3.3% | NA | NA |
| Benzo(a)pyrene | 4 | 0.13 | 4.18E-08 | 4.18E-07 | 7.30E+00 | NA | 3.0E-07 | 33.2% | NA | NA |
| Benzo(b)fluoranthene | 8 | 0.13 | 8.35E-08 | 8.35E-07 | 7.30E-01 | NA | 6.1E-08 | 6.6% | NA | NA |
| Bis(2-ethylhexyl)phthalate | 21 | NA | NA | NA | 1.40E-02 | 2.00E-02 | NA | NA | NA | NA |
| Dibenzo(a,h)anthracene | 1 | 0.13 | 1.04E-08 | 1.04E-07 | 7.30E+00 | NA | 7.6E-08 | 8.3% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 2 | 0.13 | 2.09E-08 | 2.09E-07 | 7.30E-01 | NA | 1.5E-08 | 1.7% | NA | NA |
| 4,4-DDT | 0.18 | 0.03 | 4.34E-10 | 4.34E-09 | 3.40E-01 | 5.00E-04 | 1.5E-10 | 0.0% | 8.7E-06 | 0.2% |
| Dieldrin | 0.016 | NA | NA | NA | 1.60E+01 | 5.00E-05 | NA | NA | NA | NA |
| Aroclor-1254 | 0.33 | 0.14 | 3.71E-09 | 3.71E-08 | NA | 2.00E-05 | NA | NA | 1.9E-03 | 50.8% |
| Aroclor, total | 32 | 0.14 | 3.60E-07 | 3.60E-06 | 1.00E+00 | NA | 3.6E-07 | 39.2% | NA | NA |
| Antimony | 5.5 | NA | NA | NA | NA | 6.00E-05 | NA | NA | NA | NA |
| Arsenic | 12.5 | 0.03 | 3.01E-08 | 3.01E-07 | 1.50E+00 | 3.00E-04 | 4.5E-08 | 4.9% | 1.0E-03 | 27.5% |
| Barium | 6890 | NA | NA | NA | NA | 4.90E-03 | NA | NA | NA | NA |
| Cadmium | 4.9 | 0.01 | 3.94E-09 | 3.94E-08 | NA | 5.00E-05 | NA | NA | 7.9E-04 | 21.5% |
| Chromium (total) | 198 | NA | NA | NA | NA | 7.50E-05 | NA | NA | NA | NA |
| Lead | 1280 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | 435 | NA | NA | NA | NA | 1.20E-03 | NA | NA | NA | NA |
| Mercury | 0.55 | NA | NA | NA | NA | 2.10E-05 | NA | NA | NA | NA |
| Nickel | 193 | NA | NA | NA | NA | 8.00E-04 | NA | NA | NA | NA |
| Thallium | 1.5 | NA | NA | NA | NA | 7.00E-05 | NA | NA | NA | NA |
| Vanadium | 88.4 | NA | NA | NA | NA | 1.80E-04 | NA | NA | NA | NA |
| Zinc | 1050 | NA | NA | NA | NA | 3.00E-01 | NA | NA | NA | NA |
| TEQ-Dioxins/Furans | 0.0021 | 0.001 | 1.69E-13 | 1.69E-12 | 1.50E+05 | NA | 2.5E-08 | 2.8% | NA | NA |
| | | | | | | **Total** | **9.2E-07** | **100%** | 3.7E-03 | **100%** |

RISK ASSESSMENT SPREADSHEET - SUMMARY

SITE NAME: AREA A-3, RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 24, 1999

| | Lifetime Cancer Risk | | | | | Hazard Index | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | Incidental Ingestion | Dermal Contact | Inhalation | Total Risk | Percent Risk | Incidental Ingestion | Dermal Contact | Inhalation | Total HI | Percent HI |
| Benzo(a)anthracene | 5.1E-08 | 3.0E-08 | NA | 8.2E-08 | 1.0% | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | 5.1E-07 | 3.0E-07 | NA | 8.2E-07 | 10.0% | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | 1.0E-07 | 6.1E-08 | NA | 1.6E-07 | 2.0% | NA | NA | NA | NA | NA |
| Bis(2-ethylhexyl)phthalate | 5.2E-09 | NA | NA | 5.2E-09 | 0.1% | 1.8E-04 | NA | NA | 1.8E-04 | 0.3% |
| Dibenzo(a,h)anthracene | 1.3E-07 | 7.6E-08 | NA | 2.0E-07 | 2.5% | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | 2.6E-08 | 1.5E-08 | NA | 4.1E-08 | 0.5% | NA | NA | NA | NA | NA |
| 4,4-DDT | 1.1E-09 | 1.5E-10 | NA | 1.2E-09 | 0.0% | 6.3E-05 | 8.7E-06 | NA | 7.2E-05 | 0.1% |
| Dieldrin | 4.5E-09 | NA | NA | 4.5E-09 | 0.1% | 5.6E-05 | NA | NA | 5.6E-05 | 0.1% |
| Aroclor-1254 | NA | NA | NA | NA | NA | 2.9E-03 | 1.9E-03 | NA | 4.8E-03 | 8.1% |
| Aroclor, total | 5.6E-07 | 3.6E-07 | NA | 9.2E-07 | 11.3% | NA | NA | NA | NA | NA |
| Antimony | NA | NA | NA | NA | NA | 2.4E-03 | NA | NA | 2.4E-03 | 4.1% |
| Arsenic | 3.3E-07 | 4.5E-08 | NA | 3.8E-07 | 4.6% | 7.3E-03 | 1.0E-03 | NA | 8.3E-03 | 14.2% |
| Barium | NA | NA | NA | NA | NA | 1.7E-02 | NA | NA | 1.7E-02 | 29.4% |
| Cadmium | NA | NA | NA | NA | NA | 8.6E-04 | 7.9E-04 | NA | 1.7E-03 | 2.8% |
| Chromium (total) | NA | NA | NA | NA | NA | 1.2E-02 | NA | NA | 1.2E-02 | 19.7% |
| Lead | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | NA | NA | NA | NA | NA | 3.8E-03 | NA | NA | 3.8E-03 | 6.5% |
| Mercury | NA | NA | NA | NA | NA | 3.2E-04 | NA | NA | 3.2E-04 | 0.5% |
| Nickel | NA | NA | NA | NA | NA | 1.7E-03 | NA | NA | 1.7E-03 | 2.9% |
| Thallium | NA | NA | NA | NA | NA | 3.8E-03 | NA | NA | 3.8E-03 | 6.4% |
| Vanadium | NA | NA | NA | NA | NA | 2.2E-03 | NA | NA | 2.2E-03 | 3.8% |
| Zinc | NA | NA | NA | NA | NA | 6.2E-04 | NA | NA | 6.2E-04 | 1.0% |
| TEQ-Dioxins/Furans | 5.5E-06 | 2.5E-08 | NA | 5.6E-06 | 68.0% | NA | NA | NA | NA | NA |
| **Total** | **7.3E-06** | **9.2E-07** | **NA** | **8.2E-06** | **100%** | 5.5E-02 | 3.7E-03 | **NA** | 5.9E-02 | **100%** |

**RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL**

**SITE NAME:** AREA A-3, RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE
**LOCATION:** FERRY CREEK, STRATFORD, CT
**EXPOSURE SCENARIO:** FREQUENT RECREATIONAL USER - CHILD RME
**MEDIA:** SURFACE SOIL
**DATE:** SEPTEMBER 24, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INCIDENTAL INGESTION OF SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $\text{Intake} = \frac{Cs \; IR \; CF \; FI \; EF \; ED}{BW \; AT}$

| WHERE: | | | |
|---|---|---|---|
| | Cs = : | | *Concentration in soil (mg/kg)* |
| | IR = : | 200 | Soil Ingestion Rate (mg/day) |
| | CF = : | 1.0E-06 | Conversion Factor (kg/mg) |
| | FI = : | 1 | Fraction from contaminated source (unitless) |
| | EF = : | 90 | Exposure Frequency (days/year) |
| | ED = : | 3 | Exposure Duration (years) |
| | BW = : | 17.5 | Body Weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 1,095 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | | |
|---|---|---|
| Lifetime Chronic Daily Int: | 1.2E-07 | kg-soil/kg-wt/day |
| Chronic Daily Intake = : | 2.8E-06 | kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)

SITE NAME: AREA A-3, RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - CHILD RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 24, 1999

| CHEMICAL | Cs (mg/kg) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 4 | 4.8E-07 | 1.1E-05 | 7.30E-01 | NA | 3.5E-07 | 0.7% | NA | NA |
| Benzo(a)pyrene | 4 | 4.8E-07 | 1.1E-05 | 7.30E+00 | NA | 3.5E-06 | 6.6% | NA | NA |
| Benzo(b)fluoranthene | 8 | 9.7E-07 | 2.3E-05 | 7.30E-01 | NA | 7.1E-07 | 1.3% | NA | NA |
| Bis(2-ethylhexyl)phthalate | 21 | 2.5E-06 | 5.9E-05 | 1.40E-02 | 2.00E-02 | 3.6E-08 | 0.1% | 3.0E-03 | 0.3% |
| Dibenzo(a,h)anthracene | 1 | 1.2E-07 | 2.8E-06 | 7.30E+00 | NA | 8.8E-07 | 1.6% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 2 | 2.4E-07 | 5.6E-06 | 7.30E-01 | NA | 1.8E-07 | 0.3% | NA | NA |
| 4,4-DDT | 0.18 | 2.2E-08 | 5.1E-07 | 3.40E-01 | 5.00E-04 | 7.4E-09 | 0.0% | 1.0E-03 | 0.1% |
| Dieldrin | 0.022 | 2.7E-09 | 6.2E-08 | 1.60E+01 | 5.00E-05 | 4.3E-08 | 0.1% | 1.2E-03 | 0.1% |
| Aroclor-1254 | 0.33 | 4.0E-08 | 9.3E-07 | NA | 2.00E-05 | NA | NA | 4.6E-02 | 5.3% |
| Aroclor, total | 32 | 3.9E-06 | 9.0E-05 | 2.00E+00 | NA | 7.7E-06 | 14.4% | NA | NA |
| Antimony | 5.5 | 6.6E-07 | 1.5E-05 | NA | 4.00E-04 | NA | NA | 3.9E-02 | 4.4% |
| Arsenic | 12.5 | 1.5E-06 | 3.5E-05 | 1.50E+00 | 3.00E-04 | 2.3E-06 | 4.2% | 1.2E-01 | 13.3% |
| Barium | 6890 | 8.3E-04 | 1.9E-02 | NA | 7.00E-02 | NA | NA | 2.8E-01 | 31.4% |
| Cadmium | 4.9 | 5.9E-07 | 1.4E-05 | NA | 1.00E-03 | NA | NA | 1.4E-02 | 1.6% |
| Chromium (total) | 198 | 2.4E-05 | 5.6E-04 | NA | 3.00E-03 | NA | NA | 1.9E-01 | 21.0% |
| Lead | 1280 | 1.5E-04 | 3.6E-03 | NA | NA | NA | NA | NA | NA |
| Manganese | 435 | 5.3E-05 | 1.2E-03 | NA | 2.00E-02 | NA | NA | 6.1E-02 | 6.9% |
| Mercury | 0.55 | 6.6E-08 | 1.5E-06 | NA | 3.00E-04 | NA | NA | 5.2E-03 | 0.6% |
| Nickel | 193 | 2.3E-05 | 5.4E-04 | NA | 2.00E-02 | NA | NA | 2.7E-02 | 3.1% |
| Thallium | 1.5 | 1.8E-07 | 4.2E-06 | NA | 7.00E-05 | NA | NA | 6.0E-02 | 6.8% |
| Vanadium | 88.4 | 1.1E-05 | 2.5E-04 | NA | 7.00E-03 | NA | NA | 3.6E-02 | 4.0% |
| Zinc | 1050 | 1.3E-04 | 3.0E-03 | NA | 3.00E-01 | NA | NA | 9.9E-03 | 1.1% |
| TEQ-Dioxins/Furans | 0.0021 | 2.5E-10 | 5.9E-09 | 1.50E+05 | NA | 3.8E-05 | 70.8% | NA | NA |
| | | | | | **Total** | **5.4E-05** | **100%** | **8.8E-01** | **100%** |

**RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL**

**SITE NAME:** AREA A-3, RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE
**LOCATION:** FERRY CREEK, STRATFORD, CT
**EXPOSURE SCENARIO:** FREQUENT RECREATIONAL USER - CHILD RME
**MEDIA:** SURFACE SOIL
**DATE:** SEPTEMBER 24, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: Absorbed Dose $\dfrac{Cs \quad CF \quad SA \quad AF \quad ABS \quad EF \quad ED}{BW \quad AT}$

| | | | |
|---|---|---|---|
| Where: | Cs = : | | Mean concentration in soil (mg/kg) |
| | CF = : | 1.0E-06 | Conversion factor (kg/mg) |
| | SA = : | 2,900 | Skin surface available for contact ($cm^2$/event) |
| | AF = : | 1.0 | Soil to skin adherence factor ($mg/cm^2$) |
| | ABS = : | | Absorption factor (unitless) |
| | EF = : | 90 | Exposure frequency (events/year) |
| | ED = : | 3 | Exposure duration (years) |
| | BW = : | 17.5 | Body weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 1,095 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose
Lifetime Chronic Daily Intake 1.8E-06 kg-soil/kg-wt/day
Chronic Daily Intake = : 4.1E-05 kg-soil/kg-wt/day

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)

SITE NAME: AREA A-3, RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - CHILD RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 24, 1999

| CHEMICAL | Cs (mg/kg) | ABS (unitless) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 4 | 0.13 | 9.11E-07 | 2.12E-05 | 7.30E-01 | NA | 6.6E-07 | 2.4% | NA | NA |
| Benzo(a)pyrene | 4 | 0.13 | 9.11E-07 | 2.12E-05 | 7.30E+00 | NA | 6.6E-06 | 23.9% | NA | NA |
| Benzo(b)fluoranthene | 8 | 0.13 | 1.82E-06 | 4.25E-05 | 7.30E-01 | NA | 1.3E-06 | 4.8% | NA | NA |
| Bis(2-ethylhexyl)phthalate | 21 | NA | NA | NA | 1.40E-02 | 2.00E-02 | NA | NA | NA | NA |
| Dibenzo(a,h)anthracene | 1 | 0.13 | 2.28E-07 | 5.31E-06 | 7.30E+00 | NA | 1.7E-06 | 6.0% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 2 | 0.13 | 4.55E-07 | 1.06E-05 | 7.30E-01 | NA | 3.3E-07 | 1.2% | NA | NA |
| 4,4-DDT | 0.18 | 0.03 | 9.46E-09 | 2.21E-07 | 3.40E-01 | 5.00E-04 | 3.2E-09 | 0.0% | 4.4E-04 | 0.2% |
| Dieldrin | 0.022 | NA | NA | NA | 1.60E+01 | 5.00E-05 | NA | NA | NA | NA |
| Aroclor-1254 | 0.33 | 0.14 | 8.09E-08 | 1.89E-06 | NA | 2.00E-05 | NA | NA | 9.4E-02 | 50.8% |
| Aroclor, total | 32 | 0.14 | 7.85E-06 | 1.83E-04 | 2.00E+00 | NA | 1.6E-05 | 56.3% | NA | NA |
| Antimony | 5.5 | NA | NA | NA | NA | 6.00E-05 | NA | NA | NA | NA |
| Arsenic | 12.5 | 0.03 | 6.57E-07 | 1.53E-05 | 1.50E+00 | 3.00E-04 | 9.9E-07 | 3.5% | 5.1E-02 | 27.5% |
| Barium | 6890 | NA | NA | NA | NA | 4.90E-03 | NA | NA | NA | NA |
| Cadmium | 4.9 | 0.01 | 8.58E-08 | 2.00E-06 | NA | 5.00E-05 | NA | NA | 4.0E-02 | 21.5% |
| Chromium (total) | 198 | NA | NA | NA | NA | 7.50E-05 | NA | NA | NA | NA |
| Lead | 1280 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | 435 | NA | NA | NA | NA | 1.20E-03 | NA | NA | NA | NA |
| Mercury | 0.55 | NA | NA | NA | NA | 2.10E-05 | NA | NA | NA | NA |
| Nickel | 193 | NA | NA | NA | NA | 8.00E-04 | NA | NA | NA | NA |
| Thallium | 1.5 | NA | NA | NA | NA | 7.00E-05 | NA | NA | NA | NA |
| Vanadium | 88.4 | NA | NA | NA | NA | 1.80E-04 | NA | NA | NA | NA |
| Zinc | 1050 | NA | NA | NA | NA | 3.00E-01 | NA | NA | NA | NA |
| TEQ-Dioxins/Furans | 0.0021 | 0.001 | 3.68E-12 | 8.58E-11 | 1.50E+05 | NA | 5.5E-07 | 2.0% | NA | NA |
| | | | | | | **Total** | **2.8E-05** | **100%** | 1.9E-01 | **100%** |

RISK ASSESSMENT SPREADSHEET - SUMMARY

SITE NAME: AREA A-3, RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - CHILD RME
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 24, 1999

| | Lifetime Cancer Risk | | | | | Hazard Index | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Chemical** | **Incidental Ingestion** | **Dermal Contact** | **Inhalation** | **Total Risk** | **Percent Risk** | **Incidental Ingestion** | **Dermal Contact** | **Inhalation** | **Total HI** | **Percent HI** |
| Benzo(a)anthracene | 3.5E-07 | 6.6E-07 | NA | 1.0E-06 | 1.2% | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | 3.5E-06 | 6.6E-06 | NA | 1.0E-05 | 12.5% | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | 7.1E-07 | 1.3E-06 | NA | 2.0E-06 | 2.5% | NA | NA | NA | NA | NA |
| Bis(2-ethylhexyl)phthalate | 3.6E-08 | NA | NA | 3.6E-08 | 0.0% | 3.0E-03 | NA | NA | 3.0E-03 | 0.3% |
| Dibenzo(a,h)anthracene | 8.8E-07 | 1.7E-06 | NA | 2.5E-06 | 3.1% | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | 1.8E-07 | 3.3E-07 | NA | 5.1E-07 | 0.6% | NA | NA | NA | NA | NA |
| 4,4-DDT | 7.4E-09 | 3.2E-09 | NA | 1.1E-08 | 0.0% | 1.0E-03 | 4.4E-04 | NA | 1.5E-03 | 0.1% |
| Dieldrin | 4.3E-08 | NA | NA | 4.3E-08 | 0.1% | 1.2E-03 | NA | NA | 1.2E-03 | 0.1% |
| Aroclor-1254 | NA | NA | NA | NA | NA | 4.6E-02 | 9.4E-02 | NA | 1.4E-01 | 13.2% |
| Aroclor, total | 7.7E-06 | 1.6E-05 | NA | 2.3E-05 | 28.7% | NA | NA | NA | NA | NA |
| Antimony | NA | NA | NA | NA | NA | 3.9E-02 | NA | NA | 3.9E-02 | 3.6% |
| Arsenic | 2.3E-06 | 9.9E-07 | NA | 3.2E-06 | 4.0% | 1.2E-01 | 5.1E-02 | NA | 1.7E-01 | 15.7% |
| Barium | NA | NA | NA | NA | NA | 2.8E-01 | NA | NA | 2.8E-01 | 25.9% |
| Cadmium | NA | NA | NA | NA | NA | 1.4E-02 | 4.0E-02 | NA | 5.4E-02 | 5.0% |
| Chromium (total) | NA | NA | NA | NA | NA | 1.9E-01 | NA | NA | 1.9E-01 | 17.4% |
| Lead | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | NA | NA | NA | NA | NA | 6.1E-02 | NA | NA | 6.1E-02 | 5.7% |
| Mercury | NA | NA | NA | NA | NA | 5.2E-03 | NA | NA | 5.2E-03 | 0.5% |
| Nickel | NA | NA | NA | NA | NA | 2.7E-02 | NA | NA | 2.7E-02 | 2.5% |
| Thallium | NA | NA | NA | NA | NA | 6.0E-02 | NA | NA | 6.0E-02 | 5.6% |
| Vanadium | NA | NA | NA | NA | NA | 3.6E-02 | NA | NA | 3.6E-02 | 3.3% |
| Zinc | NA | NA | NA | NA | NA | 9.9E-03 | NA | NA | 9.9E-03 | 0.9% |
| TEQ-Dioxins/Furans | 3.8E-05 | 5.5E-07 | NA | 3.9E-05 | 47.3% | NA | NA | NA | NA | NA |
| **Total** | **5.4E-05** | **2.8E-05** | **NA** | **8.2E-05** | **100.0%** | **8.8E-01** | **1.9E-01** | **NA** | **1.1E+00** | **100.0%** |

**RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL**

**SITE NAME: AREA A-3, RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE**
**LOCATION: FERRY CREEK, STRATFORD, CT**
**EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - CHILD CTE**
**MEDIA: SURFACE SOIL**
**DATE: SEPTEMBER 24, 1999**

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INCIDENTAL INGESTION OF SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: Intake $\dfrac{Cs\ \ IR\ \ CF\ \ FI\ \ EF\ \ ED}{BW\ \ AT}$

| | | | |
|---|---|---|---|
| WHERE: | Cs =: | | Concentration in soil (mg/kg) |
| | IR =: | 100 | Soil Ingestion Rate (mg/day) |
| | CF =: | 1.0E-06 | Conversion Factor (kg/mg) |
| | FI =: | 1 | Fraction from contaminated source (unitless) |
| | EF =: | 90 | Exposure Frequency (days/year) |
| | ED =: | 3 | Exposure Duration (years) |
| | BW =: | 17.5 | Body Weight (kg) |
| | ATc =: | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn =: | 1,095 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | | |
|---|---|---|
| Lifetime Chronic Daily Int: | 6.0E-08 | kg-soil/kg-wt/day |
| Chronic Daily Intake =: | 1.4E-06 | kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)

SITE NAME: AREA A-3, RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - CHILD CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 24, 1999

| CHEMICAL | Cs (mg/kg) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 4 | 2.4E-07 | 5.6E-06 | 7.30E-01 | NA | 1.8E-07 | 0.7% | NA | NA |
| Benzo(a)pyrene | 4 | 2.4E-07 | 5.6E-06 | 7.30E+00 | NA | 1.8E-06 | 7.1% | NA | NA |
| Benzo(b)fluoranthene | 8 | 4.8E-07 | 1.1E-05 | 7.30E-01 | NA | 3.5E-07 | 1.4% | NA | NA |
| Bis(2-ethylhexyl)phthalate | 21 | 1.3E-06 | 3.0E-05 | 1.40E-02 | 2.00E-02 | 1.8E-08 | 0.1% | 1.5E-03 | 0.3% |
| Dibenzo(a,h)anthracene | 1 | 6.0E-08 | 1.4E-06 | 7.30E+00 | NA | 4.4E-07 | 1.8% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 2 | 1.2E-07 | 2.8E-06 | 7.30E-01 | NA | 8.8E-08 | 0.4% | NA | NA |
| 4,4-DDT | 0.18 | 1.1E-08 | 2.5E-07 | 3.40E-01 | 5.00E-04 | 3.7E-09 | 0.0% | 5.1E-04 | 0.1% |
| Dieldrin | 0.016 | 9.7E-10 | 2.3E-08 | 1.60E+01 | 5.00E-05 | 1.5E-08 | 0.1% | 4.5E-04 | 0.1% |
| Aroclor-1254 | 0.33 | 2.0E-08 | 4.6E-07 | NA | 2.00E-05 | NA | NA | 2.3E-02 | 5.3% |
| Aroclor, total | 32 | 1.9E-06 | 4.5E-05 | 1.00E+00 | NA | 1.9E-06 | 7.7% | NA | NA |
| Antimony | 5.5 | 3.3E-07 | 7.7E-06 | NA | 4.00E-04 | NA | NA | 1.9E-02 | 4.4% |
| Arsenic | 12.5 | 7.5E-07 | 1.8E-05 | 1.50E+00 | 3.00E-04 | 1.1E-06 | 4.5% | 5.9E-02 | 13.3% |
| Barium | 6890 | 4.2E-04 | 9.7E-03 | NA | 7.00E-02 | NA | NA | 1.4E-01 | 31.4% |
| Cadmium | 4.9 | 3.0E-07 | 6.9E-06 | NA | 1.00E-03 | NA | NA | 6.9E-03 | 1.6% |
| Chromium (total) | 198 | 1.2E-05 | 2.8E-04 | NA | 3.00E-03 | NA | NA | 9.3E-02 | 21.0% |
| Lead | 1280 | 7.7E-05 | 1.8E-03 | NA | NA | NA | NA | NA | NA |
| Manganese | 435 | 2.6E-05 | 6.1E-04 | NA | 2.00E-02 | NA | NA | 3.1E-02 | 6.9% |
| Mercury | 0.55 | 3.3E-08 | 7.7E-07 | NA | 3.00E-04 | NA | NA | 2.6E-03 | 0.6% |
| Nickel | 193 | 1.2E-05 | 2.7E-04 | NA | 2.00E-02 | NA | NA | 1.4E-02 | 3.1% |
| Thallium | 1.5 | 9.1E-08 | 2.1E-06 | NA | 7.00E-05 | NA | NA | 3.0E-02 | 6.8% |
| Vanadium | 88.4 | 5.3E-06 | 1.2E-04 | NA | 7.00E-03 | NA | NA | 1.8E-02 | 4.0% |
| Zinc | 1050 | 6.3E-05 | 1.5E-03 | NA | 3.00E-01 | NA | NA | 4.9E-03 | 1.1% |
| TEQ-Dioxins/Furans | 0.0021 | 1.3E-10 | 3.0E-09 | 1.50E+05 | NA | 1.9E-05 | 76.3% | NA | NA |
| | | | | | **Total** | **2.5E-05** | **100%** | **4.4E-01** | **100%** |

**RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL**

**SITE NAME:** AREA A-3, RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE
**LOCATION:** FERRY CREEK, STRATFORD, CT
**EXPOSURE SCENARIO:** FREQUENT RECREATIONAL USER - CHILD CTE
**MEDIA:** SURFACE SOIL
**DATE:** SEPTEMBER 24, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: Absorbed Dose $\frac{Cs \quad CF \quad SA \quad AF \quad ABS \quad EF \quad ED}{BW \quad AT}$

| | | | |
|---|---|---|---|
| Where: | Cs = : | | Mean concentration in soil (mg/kg) |
| | CF = : | 1.0E-06 | Conversion factor (kg/mg) |
| | SA = : | 2,900 | Skin surface available for contact ($cm^2$/event) |
| | AF = : | 0.2 | Soil to skin adherence factor ($mg/cm^2$) |
| | ABS = : | | Absorption factor (unitless) |
| | EF = : | 90 | Exposure frequency (events/year) |
| | ED = : | 3 | Exposure duration (years) |
| | BW = : | 17.5 | Body weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 1,095 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose
Lifetime Chronic Daily Intake 3.5E-07 kg-soil/kg-wt/day
Chronic Daily Intake = : 8.2E-06 kg-soil/kg-wt/day

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)

SITE NAME: AREA A-3, RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - CHILD CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 24, 1999

| CHEMICAL | Cs (mg/kg) | ABS (unitless) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzo(a)anthracene | 4 | 0.13 | 1.82E-07 | 4.25E-06 | 7.30E-01 | NA | 1.3E-07 | 3.3% | NA | NA |
| Benzo(a)pyrene | 4 | 0.13 | 1.82E-07 | 4.25E-06 | 7.30E+00 | NA | 1.3E-06 | 33.2% | NA | NA |
| Benzo(b)fluoranthene | 8 | 0.13 | 3.64E-07 | 8.50E-06 | 7.30E-01 | NA | 2.7E-07 | 6.6% | NA | NA |
| Bis(2-ethylhexyl)phthalate | 21 | NA | NA | NA | 1.40E-02 | 2.00E-02 | NA | NA | NA | NA |
| Dibenzo(a,h)anthracene | 1 | 0.13 | 4.55E-08 | 1.06E-06 | 7.30E+00 | NA | 3.3E-07 | 8.3% | NA | NA |
| Indeno(1,2,3-cd)pyrene | 2 | 0.13 | 9.11E-08 | 2.12E-06 | 7.30E-01 | NA | 6.6E-08 | 1.7% | NA | NA |
| 4,4-DDT | 0.18 | 0.03 | 1.89E-09 | 4.41E-08 | 3.40E-01 | 5.00E-04 | 6.4E-10 | 0.0% | 8.8E-05 | 0.2% |
| Dieldrin | 0.016 | NA | NA | NA | 1.60E+01 | 5.00E-05 | NA | NA | NA | NA |
| Aroclor-1254 | 0.33 | 0.14 | 1.62E-08 | 3.78E-07 | NA | 2.00E-05 | NA | NA | 1.9E-02 | 50.8% |
| Aroclor, total | 32 | 0.14 | 1.57E-06 | 3.66E-05 | 1.00E+00 | NA | 1.6E-06 | 39.2% | NA | NA |
| Antimony | 5.5 | NA | NA | NA | NA | 6.00E-05 | NA | NA | NA | NA |
| Arsenic | 12.5 | 0.03 | 1.31E-07 | 3.06E-06 | 1.50E+00 | 3.00E-04 | 2.0E-07 | 4.9% | 1.0E-02 | 27.5% |
| Barium | 6890 | NA | NA | NA | NA | 4.90E-03 | NA | NA | NA | NA |
| Cadmium | 4.9 | 0.01 | 1.72E-08 | 4.00E-07 | NA | 5.00E-05 | NA | NA | 8.0E-03 | 21.5% |
| Chromium (total) | 198 | NA | NA | NA | NA | 7.50E-05 | NA | NA | NA | NA |
| Lead | 1280 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | 435 | NA | NA | NA | NA | 1.20E-03 | NA | NA | NA | NA |
| Mercury | 0.55 | NA | NA | NA | NA | 2.10E-05 | NA | NA | NA | NA |
| Nickel | 193 | NA | NA | NA | NA | 8.00E-04 | NA | NA | NA | NA |
| Thallium | 1.5 | NA | NA | NA | NA | 7.00E-05 | NA | NA | NA | NA |
| Vanadium | 88.4 | NA | NA | NA | NA | 1.80E-04 | NA | NA | NA | NA |
| Zinc | 1050 | NA | NA | NA | NA | 3.00E-01 | NA | NA | NA | NA |
| TEQ-Dioxins/Furans | 0.0021 | 0.001 | 7.35E-13 | 1.72E-11 | 1.50E+05 | NA | 1.1E-07 | 2.8% | NA | NA |
| | | | | | | **Total** | **4.0E-06** | **100%** | 3.7E-02 | **100%** |

RISK ASSESSMENT SPREADSHEET - SUMMARY

SITE NAME: AREA A-3, RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - CHILD CTE
MEDIA: SURFACE SOIL
DATE: SEPTEMBER 24, 1999

| | Lifetime Cancer Risk | | | | | Hazard Index | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | Incidental Ingestion | Dermal Contact | Inhalation | Total Risk | Percent Risk | Incidental Ingestion | Dermal Contact | Inhalation | Total HI | Percent HI |
| Benzo(a)anthracene | 1.8E-07 | 1.3E-07 | NA | 3.1E-07 | 1.1% | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | 1.8E-06 | 1.3E-06 | NA | 3.1E-06 | 10.7% | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | 3.5E-07 | 2.7E-07 | NA | 6.2E-07 | 2.1% | NA | NA | NA | NA | NA |
| Bis(2-ethylhexyl)phthalate | 1.8E-08 | NA | NA | 1.8E-08 | 0.1% | 1.5E-03 | NA | NA | 1.5E-03 | 0.3% |
| Dibenzo(a,h)anthracene | 4.4E-07 | 3.3E-07 | NA | 7.7E-07 | 2.7% | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | 8.8E-08 | 6.6E-08 | NA | 1.5E-07 | 0.5% | NA | NA | NA | NA | NA |
| 4,4-DDT | 3.7E-09 | 6.4E-10 | NA | 4.3E-09 | 0.0% | 5.1E-04 | 8.8E-05 | NA | 6.0E-04 | 0.1% |
| Dieldrin | 1.5E-08 | NA | NA | 1.5E-08 | 0.1% | 4.5E-04 | NA | NA | 4.5E-04 | 0.1% |
| Aroclor-1254 | NA | NA | NA | NA | NA | 2.3E-02 | 1.9E-02 | NA | 4.2E-02 | 8.8% |
| Aroclor, total | 1.9E-06 | 1.6E-06 | NA | 3.5E-06 | 12.1% | NA | NA | NA | NA | NA |
| Antimony | NA | NA | NA | NA | NA | 1.9E-02 | NA | NA | 1.9E-02 | 4.0% |
| Arsenic | 1.1E-06 | 2.0E-07 | NA | 1.3E-06 | 4.6% | 5.9E-02 | 1.0E-02 | NA | 6.9E-02 | 14.4% |
| Barium | NA | NA | NA | NA | NA | 1.4E-01 | NA | NA | 1.4E-01 | 28.9% |
| Cadmium | NA | NA | NA | NA | NA | 6.9E-03 | 8.0E-03 | NA | 1.5E-02 | 3.1% |
| Chromium (total) | NA | NA | NA | NA | NA | 9.3E-02 | NA | NA | 9.3E-02 | 19.4% |
| Lead | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | NA | NA | NA | NA | NA | 3.1E-02 | NA | NA | 3.1E-02 | 6.4% |
| Mercury | NA | NA | NA | NA | NA | 2.6E-03 | NA | NA | 2.6E-03 | 0.5% |
| Nickel | NA | NA | NA | NA | NA | 1.4E-02 | NA | NA | 1.4E-02 | 2.8% |
| Thallium | NA | NA | NA | NA | NA | 3.0E-02 | NA | NA | 3.0E-02 | 6.3% |
| Vanadium | NA | NA | NA | NA | NA | 1.8E-02 | NA | NA | 1.8E-02 | 3.7% |
| Zinc | NA | NA | NA | NA | NA | 4.9E-03 | NA | NA | 4.9E-03 | 1.0% |
| TEQ-Dioxins/Furans | 1.9E-05 | 1.1E-07 | NA | 1.9E-05 | 66.1% | NA | NA | NA | NA | NA |
| **Total** | **2.5E-05** | **4.0E-06** | **NA** | **2.9E-05** | **100.0%** | **4.4E-01** | **3.7E-02** | **NA** | **4.8E-01** | **100.0%** |

**RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH WATER**

**SITE NAME: AREA A-3, RESIDENTIAL PROPERTIESON HOUSATONIC AVENUE**
**LOCATION: FERRY CREEK, STRATFORD, CT**
**EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT RME**
**MEDIA: SURFACE WATER**
**DATE: SEPTEMBER 15, 199**

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH WATER ARE CONSIDERED. ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATIONS:

$$\text{Absorbed Dose} = \frac{DAevent \times EV \times EF \times ED \times SA}{BW \times AT}$$

For Inorganics $DAevent = Kp \times Cw \times CF \times tevent$

For Organics If $tevent \leq t^*$, then : $DAevent = 2 \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$

If $tevent > t^*$, then : $DAevent = Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$

| | | | |
|---|---|---|---|
| Where: | SA = : | 6,600 | Skin surface available for contact ($cm^2$) |
| | DAevent = : | | Chemical specific absorbed dose per event ($mg/cm^2$-event) |
| | EV = : | 1 | Event frequency (events/days) |
| | EF = : | 90 | Exposure frequency (days/year) |
| | ED = : | 24 | Exposure duration (years) |
| | BW = : | 70 | Body weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 8,760 | Averaging time for noncarcinogenic exposures (days) |
| | CF = : | 0.001 | Conversion Factor ($L/m^3$) |
| | Kp =: | | Chemical specific permeability coefficient (cm/hr) |
| | Cw = : | | Concentration of chemical in water (mg/L) |
| | tevent = : | 1 | duration of event (hr/event) |
| | tau = : | | Chemical specific lag time (hr) |
| | t* = : | | Chemical specific time it takes to reach steady state (hr) |
| | B = : | | Chemical specific dimensionless constant |
| | Dsc = : | | Effective diffusivity for chemical transfer through skin ($cm^2$/hr) |
| | b, c = : | | chemical specific constants |

Unit Dose

| | | |
|---|---|---|
| Lifetime Chronic Daily Intake = : | 8.0E+00 | $cm^2$-event/(kg-day) |
| Chronic Daily Intake = : | 2.3E+01 | $cm^2$-event/(kg-day) |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH WATER (PAGE TWO)

SITE NAME: AREA A-3, RESIDENTIAL PROPERTIESON HOUSATONIC AVENUE
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT RME
MEDIA: SURFACE WATER
DATE: SEPTEMBER 15, 199

| CHEMICAL | Cw (mg/L) | Organic or Inorganic | Molecular Weight | Estimated Kp (cm/hr) | tau-event (hr) | B | b | c | Dsc ($cm^2$/hr) | t* (hr) | DAevent (mg/$cm^2$ - event) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1,1-Trichloroethane | 0.086 | O | 133.4 | 1.30E-02 | 5.86E-01 | 5.77E-02 | 3.39E-01 | 3.73E-01 | 2.84E-07 | 1.41E+00 | 2.37E-06 |
| 1,1-Dichloroethene | 0.03 | O | 96.9 | 1.20E-02 | 3.66E-01 | 4.54E-02 | 3.32E-01 | 3.64E-01 | 4.54E-07 | 8.79E-01 | 6.20E-07 |
| 1,2-Dichloroethene (total) | 0.081 | O | 96.9 | 7.90E-03 | 3.66E-01 | 2.99E-02 | 3.22E-01 | 3.54E-01 | 4.54E-07 | 8.79E-01 | 1.10E-06 |
| Benzene | 0.004 | O | 78.1 | 1.50E-02 | 2.87E-01 | 5.10E-02 | 3.35E-01 | 3.68E-01 | 5.79E-07 | 6.90E-01 | 9.33E-08 |
| Chlorobenzene | 0.004 | O | 163.8 | 4.70E-03 | 8.68E-01 | 2.31E-02 | 3.17E-01 | 3.49E-01 | 1.92E-07 | 2.08E+00 | 4.84E-08 |
| Trichloroethene | 0.078 | O | 112.6 | 2.90E-02 | 4.48E-01 | 1.18E-01 | 3.80E-01 | 4.16E-01 | 3.71E-07 | 1.08E+00 | 4.19E-06 |
| Vinyl Chloride | 0.006 | O | 119.4 | 6.90E-03 | 4.90E-01 | 2.90E-02 | 3.21E-01 | 3.53E-01 | 3.40E-07 | 1.18E+00 | 8.01E-08 |
| Aroclor-1262 | 0.00015 | O | 292 | 7.70E-01 | 4.53E+00 | 5.06E+00 | 1.83E+01 | 5.12E+00 | 3.67E-08 | 1.99E+01 | 6.80E-07 |
| Antimony | 0.0116 | I | 121.76 | 1.00E-03 | 5.05E-01 | 4.24E-03 | 3.06E-01 | 3.36E-01 | 3.30E-07 | 1.21E+00 | 1.16E-08 |
| Arsenic | 0.0751 | I | 74.9 | 1.00E-03 | 2.76E-01 | 3.33E-03 | 3.05E-01 | 3.36E-01 | 6.03E-07 | 6.62E-01 | 7.51E-08 |
| Chromium (total) | 0.0123 | I | 52 | 1.00E-03 | 2.05E-01 | 2.77E-03 | 3.05E-01 | 3.35E-01 | 8.11E-07 | 4.93E-01 | 1.23E-08 |
| Lead | 0.118 | I | 207.2 | 1.00E-04 | 1.52E+00 | 5.54E-04 | 3.04E-01 | 3.34E-01 | 1.10E-07 | 3.65E+00 | 1.18E-08 |
| Manganese | 2.91 | I | 54.94 | 1.00E-03 | 2.13E-01 | 2.85E-03 | 3.05E-01 | 3.35E-01 | 7.80E-07 | 5.12E-01 | 2.91E-06 |
| Mercury | 0.0017 | I | 200.6 | 1.00E-03 | 1.39E+00 | 5.45E-03 | 3.07E-01 | 3.37E-01 | 1.19E-07 | 3.35E+00 | 1.70E-09 |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH WATER (PAGE THREE)

SITE NAME: AREA A-3, RESIDENTIAL PROPERTIESON HOUSATONIC AVENUE
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT RME
MEDIA: SURFACE WATER
DATE: SEPTEMBER 15, 199

| CHEMICAL | DAevent ($mg/cm^2$ - event) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| 1,1,1-Trichloroethane | 2.37E-06 | 1.89E-05 | 5.50E-05 | NA | 2.00E-02 | NA | NA | 2.8E-03 | 2.8% |
| 1,1-Dichloroethene | 6.20E-07 | 4.94E-06 | 1.44E-05 | 6.00E-01 | 9.00E-03 | 3.0E-06 | 18.2% | 1.6E-03 | 1.7% |
| 1,2-Dichloroethene (total) | 1.10E-06 | 8.80E-06 | 2.57E-05 | NA | 9.00E-03 | NA | NA | 2.9E-03 | 3.0% |
| Benzene | 9.33E-08 | 7.44E-07 | 2.17E-06 | 2.90E-02 | 3.00E-03 | 2.2E-08 | 0.1% | 7.2E-04 | 0.7% |
| Chlorobenzene | 4.84E-08 | 3.86E-07 | 1.13E-06 | NA | 2.00E-02 | NA | NA | 5.6E-05 | 0.1% |
| Trichloroethene | 4.19E-06 | 3.34E-05 | 9.73E-05 | 1.10E-02 | 6.00E-03 | 3.7E-07 | 2.3% | 1.6E-02 | 16.8% |
| Vinyl Chloride | 8.01E-08 | 6.38E-07 | 1.86E-06 | 1.90E+00 | NA | 1.2E-06 | 7.4% | NA | NA |
| Aroclor-1262 | 6.80E-07 | 5.42E-06 | 1.58E-05 | 2.00E+00 | NA | 1.1E-05 | 66.5% | NA | NA |
| Antimony | 1.16E-08 | 9.25E-08 | 2.70E-07 | NA | 6.00E-05 | NA | NA | 4.5E-03 | 4.7% |
| Arsenic | 7.51E-08 | 5.99E-07 | 1.75E-06 | 1.50E+00 | 3.00E-04 | 9.0E-07 | 5.5% | 5.8E-03 | 6.0% |
| Chromium (total) | 1.23E-08 | 9.80E-08 | 2.86E-07 | NA | 7.50E-05 | NA | NA | 3.8E-03 | 3.9% |
| Lead | 1.18E-08 | 9.41E-08 | 2.74E-07 | NA | NA | NA | NA | NA | NA |
| Manganese | 2.91E-06 | 2.32E-05 | 6.77E-05 | NA | 1.20E-03 | NA | NA | 5.6E-02 | 58.4% |
| Mercury | 1.70E-09 | 1.36E-08 | 3.95E-08 | NA | 2.10E-05 | NA | NA | 1.9E-03 | 1.9% |
| | | | | | Total | 1.6E-05 | 100.0% | 9.7E-02 | 100.0% |

**RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH WATER**

**SITE NAME: AREA A-3, RESIDENTIAL PROPERTIESON HOUSATONIC AVENUE**
**LOCATION: FERRY CREEK, STRATFORD, CT**
**EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT CTE**
**MEDIA: SURFACE WATER**
**DATE: SEPTEMBER 15, 1999**

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH WATER ARE CONSIDERED. ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATIONS:

$$\text{Absorbed Dose} = \frac{\text{DAevent} \times EV \times EF \times ED \times SA}{BW \times AT}$$

For Inorganics DAevent = Kp x Cw x CF x tevent

For Organics

$$\text{If tevent} \le t^*\text{, then : DAevent} = 2 \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$$

$$\text{If tevent} > t^*\text{, then : DAevent} = Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

| | | | |
|---|---|---|---|
| Where: | SA = : | 5,700 | Skin surface available for contact ($cm^2$) |
| | DAevent = : | | Chemical specific absorbed dose per event ($mg/cm^2$-event) |
| | EV = : | 1 | Event frequency (events/days) |
| | EF = : | 90 | Exposure frequency (days/year) |
| | ED = : | 7 | Exposure duration (years) |
| | BW = : | 70 | Body weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 2,555 | Averaging time for noncarcinogenic exposures (days) |
| | CF = : | 0.001 | Conversion Factor ($L/m^3$) |
| | Kp =: | | Chemical specific permeability coefficient (cm/hr) |
| | Cw = : | | Concentration of chemical in water (mg/L) |
| | tevent = : | 1 | duration of event (hr/event) |
| | tau = : | | Chemical specific lag time (hr) |
| | t* = : | | Chemical specific time it takes to reach steady state (hr) |
| | B = : | | Chemical specific dimensionless constant |
| | Dsc = : | | Effective diffusivity for chemical transfer through skin ($cm^2$/hr) |
| | b, c = : | | chemical specific constants |

Unit Dose

| | | |
|---|---|---|
| Lifetime Chronic Daily Intake = : | 2.0E+00 | $cm^2$-event/(kg-day) |
| Chronic Daily Intake = : | 2.0E+01 | $cm^2$-event/(kg-day) |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH WATER (PAGE TWO)

SITE NAME: AREA A-3, RESIDENTIAL PROPERTIESON HOUSATONIC AVENUE
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT CTE
MEDIA: SURFACE WATER
DATE: SEPTEMBER 15, 1999

| CHEMICAL | Cw (mg/L) | Organic or Inorganic | Molecular Weight | Estimated Kp (cm/hr) | tau-event (hr) | B | b | c | Dsc ($cm^2/hr$) | t* (hr) | DAevent ($mg/cm^2$ - event) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1,1-Trichloroethane | 0.032 | O | 133.4 | 1.30E-02 | 5.86E-01 | 5.77E-02 | 3.39E-01 | 3.73E-01 | 2.84E-07 | 1.41E+00 | 8.81E-07 |
| 1,1-Dichloroethene | 0.014 | O | 96.9 | 1.20E-02 | 3.66E-01 | 4.54E-02 | 3.32E-01 | 3.64E-01 | 4.54E-07 | 8.79E-01 | 2.89E-07 |
| 1,2-Dichloroethene (total) | 0.022 | O | 96.9 | 7.90E-03 | 3.66E-01 | 2.99E-02 | 3.22E-01 | 3.54E-01 | 4.54E-07 | 8.79E-01 | 3.00E-07 |
| Benzene | 0.004 | O | 78.1 | 1.50E-02 | 2.87E-01 | 5.10E-02 | 3.35E-01 | 3.68E-01 | 5.79E-07 | 6.90E-01 | 9.33E-08 |
| Chlorobenzene | 0.004 | O | 163.8 | 4.70E-03 | 8.68E-01 | 2.31E-02 | 3.17E-01 | 3.49E-01 | 1.92E-07 | 2.08E+00 | 4.84E-08 |
| Trichloroethene | 0.02 | O | 112.6 | 2.90E-02 | 4.48E-01 | 1.18E-01 | 3.80E-01 | 4.16E-01 | 3.71E-07 | 1.08E+00 | 1.07E-06 |
| Vinyl Chloride | 0.0054 | O | 119.4 | 6.90E-03 | 4.90E-01 | 2.90E-02 | 3.21E-01 | 3.53E-01 | 3.40E-07 | 1.18E+00 | 7.21E-08 |
| Aroclor-1262 | 0.00015 | O | 292 | 7.70E-01 | 4.53E+00 | 5.06E+00 | 1.83E+01 | 5.12E+00 | 3.67E-08 | 1.99E+01 | 6.80E-07 |
| Antimony | 0.0075 | I | 121.76 | 1.00E-03 | 5.05E-01 | 4.24E-03 | 3.06E-01 | 3.36E-01 | 3.30E-07 | 1.21E+00 | 7.50E-09 |
| Arsenic | 0.0215 | I | 74.9 | 1.00E-03 | 2.76E-01 | 3.33E-03 | 3.05E-01 | 3.36E-01 | 6.03E-07 | 6.62E-01 | 2.15E-08 |
| Chromium (total) | 0.0081 | I | 52 | 1.00E-03 | 2.05E-01 | 2.77E-03 | 3.05E-01 | 3.35E-01 | 8.11E-07 | 4.93E-01 | 8.10E-09 |
| Lead | 0.0217 | I | 207.2 | 1.00E-04 | 1.52E+00 | 5.54E-04 | 3.04E-01 | 3.34E-01 | 1.10E-07 | 3.65E+00 | 2.17E-09 |
| Manganese | 0.694 | I | 54.94 | 1.00E-03 | 2.13E-01 | 2.85E-03 | 3.05E-01 | 3.35E-01 | 7.80E-07 | 5.12E-01 | 6.94E-07 |
| Mercury | 0.0005 | I | 200.6 | 1.00E-03 | 1.39E+00 | 5.45E-03 | 3.07E-01 | 3.37E-01 | 1.19E-07 | 3.35E+00 | 5.00E-10 |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH WATER (PAGE THREE)

SITE NAME: AREA A-3, RESIDENTIAL PROPERTIESON HOUSATONIC AVENUE
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT CTE
MEDIA: SURFACE WATER
DATE: SEPTEMBER 15, 1999

| CHEMICAL | DAevent ($mg/cm^2$ - event) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| 1,1,1-Trichloroethane | 8.81E-07 | 1.77E-06 | 1.77E-05 | NA | 2.00E-02 | NA | NA | 8.8E-04 | 3.6% |
| 1,1-Dichloroethene | 2.89E-07 | 5.81E-07 | 5.81E-06 | 6.00E-01 | 9.00E-03 | 3.5E-07 | 10.1% | 6.5E-04 | 2.6% |
| 1,2-Dichloroethene (total) | 3.00E-07 | 6.02E-07 | 6.02E-06 | NA | 9.00E-03 | NA | NA | 6.7E-04 | 2.7% |
| Benzene | 9.33E-08 | 1.87E-07 | 1.87E-06 | 2.90E-02 | 3.00E-03 | 5.4E-09 | 0.2% | 6.2E-04 | 2.5% |
| Chlorobenzene | 4.84E-08 | 9.72E-08 | 9.72E-07 | NA | 2.00E-02 | NA | NA | 4.9E-05 | 0.2% |
| Trichloroethene | 1.07E-06 | 2.16E-06 | 2.16E-05 | 1.10E-02 | 6.00E-03 | 2.4E-08 | 0.7% | 3.6E-03 | 14.6% |
| Vinyl Chloride | 7.21E-08 | 1.45E-07 | 1.45E-06 | 1.90E+00 | NA | 2.7E-07 | 8.0% | NA | NA |
| Aroclor-1262 | 6.80E-07 | 1.36E-06 | 1.36E-05 | 2.00E+00 | NA | 2.7E-06 | 79.2% | NA | NA |
| Antimony | 7.50E-09 | 1.51E-08 | 1.51E-07 | NA | 6.00E-05 | NA | NA | 2.5E-03 | 10.2% |
| Arsenic | 2.15E-08 | 4.32E-08 | 4.32E-07 | 1.50E+00 | 3.00E-04 | 6.5E-08 | 1.9% | 1.4E-03 | 5.8% |
| Chromium (total) | 8.10E-09 | 1.63E-08 | 1.63E-07 | NA | 7.50E-05 | NA | NA | 2.2E-03 | 8.8% |
| Lead | 2.17E-09 | 4.36E-09 | 4.36E-08 | NA | NA | NA | NA | NA | NA |
| Manganese | 6.94E-07 | 1.39E-06 | 1.39E-05 | NA | 1.20E-03 | NA | NA | 1.2E-02 | 47.1% |
| Mercury | 5.00E-10 | 1.00E-09 | 1.00E-08 | NA | 2.10E-05 | NA | NA | 4.8E-04 | 1.9% |
| | | | | | Total | 3.4E-06 | 100.0% | 2.5E-02 | 100.0% |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH WATER

SITE NAME: AREA A-3, RESIDENTIAL PROPERTIESON HOUSATONIC AVENUE
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - CHILD RME
MEDIA: SURFACE WATER
DATE: SEPTEMBER 15, 1999

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH WATER ARE CONSIDERED. ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATIONS:

$$\text{Absorbed Dose} = \frac{\text{DAevent} \times EV \times EF \times ED \times SA}{BW \times AT}$$

For Inorganics DAevent = Kp x Cw x CF x tevent

For Organics If tevent $\leq t^*$, then : $\text{DAevent} = 2 \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$

If tevent $> t^*$, then : $\text{DAevent} = Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$

| | | | |
|---|---|---|---|
| Where: | SA = : | 2,300 | Skin surface available for contact ($cm^2$) |
| | DAevent = : | | Chemical specific absorbed dose per event ($mg/cm^2$-event) |
| | EV = : | 1 | Event frequency (events/days) |
| | EF = : | 90 | Exposure frequency (days/year) |
| | ED = : | 3 | Exposure duration (years) |
| | BW = : | 17.5 | Body weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 1,095 | Averaging time for noncarcinogenic exposures (days) |
| | CF = : | 0.001 | Conversion Factor ($L/m^3$) |
| | Kp =: | | Chemical specific permeability coefficient (cm/hr) |
| | Cw = : | | Concentration of chemical in water (mg/L) |
| | tevent = : | 1 | duration of event (hr/event) |
| | tau = : | | Chemical specific lag time (hr) |
| | t* = : | | Chemical specific time it takes to reach steady state (hr) |
| | B = : | | Chemical specific dimensionless constant |
| | Dsc = : | | Effective diffusivity for chemical transfer through skin ($cm^2/hr$) |
| | b, c = : | | chemical specific constants |

Unit Dose

| | | |
|---|---|---|
| Lifetime Chronic Daily Intake = : | 1.4E+00 | $cm^2$-event/(kg-day) |
| Chronic Daily Intake = : | 3.2E+01 | $cm^2$-event/(kg-day) |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH WATER (PAGE TWO)

SITE NAME: AREA A-3, RESIDENTIAL PROPERTIESON HOUSATONIC AVENUE
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - CHILD RME
MEDIA: SURFACE WATER
DATE: SEPTEMBER 15, 1999

| CHEMICAL | Cw (mg/L) | Organic or Inorganic | Molecular Weight | Estimated Kp (cm/hr) | tau-event (hr) | B | b | c | Dsc ($cm^2$/hr) | t* (hr) | DAevent ($mg/cm^2$ - event) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1,1-Trichloroethane | 0.086 | O | 133.4 | 1.30E-02 | 5.86E-01 | 5.77E-02 | 3.39E-01 | 3.73E-01 | 2.84E-07 | 1.41E+00 | 2.37E-06 |
| 1,1-Dichloroethene | 0.03 | O | 96.9 | 1.20E-02 | 3.66E-01 | 4.54E-02 | 3.32E-01 | 3.64E-01 | 4.54E-07 | 8.79E-01 | 6.20E-07 |
| 1,2-Dichloroethene (total) | 0.081 | O | 96.9 | 7.90E-03 | 3.66E-01 | 2.99E-02 | 3.22E-01 | 3.54E-01 | 4.54E-07 | 8.79E-01 | 1.10E-06 |
| Benzene | 0.004 | O | 78.1 | 1.50E-02 | 2.87E-01 | 5.10E-02 | 3.35E-01 | 3.68E-01 | 5.79E-07 | 6.90E-01 | 9.33E-08 |
| Chlorobenzene | 0.004 | O | 163.8 | 4.70E-03 | 8.68E-01 | 2.31E-02 | 3.17E-01 | 3.49E-01 | 1.92E-07 | 2.08E+00 | 4.84E-08 |
| Trichloroethene | 0.078 | O | 112.6 | 2.90E-02 | 4.48E-01 | 1.18E-01 | 3.80E-01 | 4.16E-01 | 3.71E-07 | 1.08E+00 | 4.19E-06 |
| Vinyl Chloride | 0.006 | O | 119.4 | 6.90E-03 | 4.90E-01 | 2.90E-02 | 3.21E-01 | 3.53E-01 | 3.40E-07 | 1.18E+00 | 8.01E-08 |
| Aroclor-1262 | 0.00015 | O | 292 | 7.70E-01 | 4.53E+00 | 5.06E+00 | 1.83E+01 | 5.12E+00 | 3.67E-08 | 1.99E+01 | 6.80E-07 |
| Antimony | 0.0116 | I | 121.76 | 1.00E-03 | 5.05E-01 | 4.24E-03 | 3.06E-01 | 3.36E-01 | 3.30E-07 | 1.21E+00 | 1.16E-08 |
| Arsenic | 0.0751 | I | 74.9 | 1.00E-03 | 2.76E-01 | 3.33E-03 | 3.05E-01 | 3.36E-01 | 6.03E-07 | 6.62E-01 | 7.51E-08 |
| Chromium (total) | 0.0123 | I | 52 | 1.00E-03 | 2.05E-01 | 2.77E-03 | 3.05E-01 | 3.35E-01 | 8.11E-07 | 4.93E-01 | 1.23E-08 |
| Lead | 0.118 | I | 207.2 | 1.00E-04 | 1.52E+00 | 5.54E-04 | 3.04E-01 | 3.34E-01 | 1.10E-07 | 3.65E+00 | 1.18E-08 |
| Manganese | 2.91 | I | 54.94 | 1.00E-03 | 2.13E-01 | 2.85E-03 | 3.05E-01 | 3.35E-01 | 7.80E-07 | 5.12E-01 | 2.91E-06 |
| Mercury | 0.0017 | I | 200.6 | 1.00E-03 | 1.39E+00 | 5.45E-03 | 3.07E-01 | 3.37E-01 | 1.19E-07 | 3.35E+00 | 1.70E-09 |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH WATER (PAGE THREE)

SITE NAME: AREA A-3, RESIDENTIAL PROPERTIESON HOUSATONIC AVENUE
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - CHILD RME
MEDIA: SURFACE WATER
DATE: SEPTEMBER 15, 1999

| CHEMICAL | DAevent (mg/cm$^2$ - event) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor (mg/kg/day)$^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| 1,1,1-Trichloroethane | 2.37E-06 | 3.29E-06 | 7.67E-05 | NA | 2.00E-02 | NA | NA | 3.8E-03 | 2.8% |
| 1,1-Dichloroethene | 6.20E-07 | 8.61E-07 | 2.01E-05 | 6.00E-01 | 9.00E-03 | 5.2E-07 | 18.2% | 2.2E-03 | 1.7% |
| 1,2-Dichloroethene (total) | 1.10E-06 | 1.53E-06 | 3.58E-05 | NA | 9.00E-03 | NA | NA | 4.0E-03 | 3.0% |
| Benzene | 9.33E-08 | 1.30E-07 | 3.02E-06 | 2.90E-02 | 3.00E-03 | 3.8E-09 | 0.1% | 1.0E-03 | 0.7% |
| Chlorobenzene | 4.84E-08 | 6.72E-08 | 1.57E-06 | NA | 2.00E-02 | NA | NA | 7.8E-05 | 0.1% |
| Trichloroethene | 4.19E-06 | 5.82E-06 | 1.36E-04 | 1.10E-02 | 6.00E-03 | 6.4E-08 | 2.3% | 2.3E-02 | 16.8% |
| Vinyl Chloride | 8.01E-08 | 1.11E-07 | 2.59E-06 | 1.90E+00 | NA | 2.1E-07 | 7.4% | NA | NA |
| Aroclor-1262 | 6.80E-07 | 9.44E-07 | 2.20E-05 | 2.00E+00 | NA | 1.9E-06 | 66.5% | NA | NA |
| Antimony | 1.16E-08 | 1.61E-08 | 3.76E-07 | NA | 6.00E-05 | NA | NA | 6.3E-03 | 4.7% |
| Arsenic | 7.51E-08 | 1.04E-07 | 2.43E-06 | 1.50E+00 | 3.00E-04 | 1.6E-07 | 5.5% | 8.1E-03 | 6.0% |
| Chromium (total) | 1.23E-08 | 1.71E-08 | 3.99E-07 | NA | 7.50E-05 | NA | NA | 5.3E-03 | 3.9% |
| Lead | 1.18E-08 | 1.64E-08 | 3.82E-07 | NA | NA | NA | NA | NA | NA |
| Manganese | 2.91E-06 | 4.04E-06 | 9.43E-05 | NA | 1.20E-03 | NA | NA | 7.9E-02 | 58.4% |
| Mercury | 1.70E-09 | 2.36E-09 | 5.51E-08 | NA | 2.10E-05 | NA | NA | 2.6E-03 | 1.9% |
| | | | | | Total | 2.8E-06 | 100.0% | 1.3E-01 | 100.0% |

**RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH WATER**

**SITE NAME: AREA A-3, RESIDENTIAL PROPERTIESON HOUSATONIC AVENUE**
**LOCATION: FERRY CREEK, STRATFORD, CT**
**EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - CHILD CTE**
**MEDIA: SURFACE WATER**
**DATE: SEPTEMBER 15, 1999**

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH WATER ARE CONSIDERED. ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATIONS:

$$\text{Absorbed Dose} = \frac{DAevent \times EV \times EF \times ED \times SA}{BW \times AT}$$

For Inorganics DAevent = Kp x Cw x CF x tevent

For Organics If $tevent \leq t^*$, then : $DAevent = 2 \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$

If $tevent > t^*$, then : $DAevent = Kp \times Cw \times CF \times \left[\frac{tevent}{1 + B} + 2 \times tau \times \left(\frac{1 + 3B + 3B^2}{(1 + B)^2}\right)\right]$

| | | | |
|---|---|---|---|
| Where: | SA = : | 2,000 | Skin surface available for contact ($cm^2$) |
| | DAevent = : | | Chemical specific absorbed dose per event ($mg/cm^2$-event) |
| | EV = : | 1 | Event frequency (events/days) |
| | EF = : | 90 | Exposure frequency (days/year) |
| | ED = : | 3 | Exposure duration (years) |
| | BW = : | 17.5 | Body weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 1,095 | Averaging time for noncarcinogenic exposures (days) |
| | CF = : | 0.001 | Conversion Factor ($L/m^3$) |
| | Kp =: | | Chemical specific permeability coefficient (cm/hr) |
| | Cw = : | | Concentration of chemical in water (mg/L) |
| | tevent = : | 1 | duration of event (hr/event) |
| | tau = : | | Chemical specific lag time (hr) |
| | t* = : | | Chemical specific time it takes to reach steady state (hr) |
| | B = : | | Chemical specific dimensionless constant |
| | Dsc = : | | Effective diffusivity for chemical transfer through skin ($cm^2$/hr) |
| | b, c = : | | chemical specific constants |

Unit Dose
Lifetime Chronic Daily Intake = : 1.2E+00 $cm^2$-event/(kg-day)
Chronic Daily Intake = : 2.8E+01 $cm^2$-event/(kg-day)

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH WATER (PAGE TWO)

SITE NAME: AREA A-3, RESIDENTIAL PROPERTIESON HOUSATONIC AVENUE
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - CHILD CTE
MEDIA: SURFACE WATER
DATE: SEPTEMBER 15, 1999

| CHEMICAL | Cw (mg/L) | Organic or Inorganic | Molecular Weight | Estimated Kp (cm/hr) | tau-event (hr) | B | b | c | Dsc ($cm^2/hr$) | t* (hr) | DAevent ($mg/cm^2$ - event) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1,1-Trichloroethane | 0.032 | O | 133.4 | 1.30E-02 | 5.86E-01 | 5.77E-02 | 3.39E-01 | 3.73E-01 | 2.84E-07 | 1.41E+00 | 8.81E-07 |
| 1,1-Dichloroethene | 0.014 | O | 96.9 | 1.20E-02 | 3.66E-01 | 4.54E-02 | 3.32E-01 | 3.64E-01 | 4.54E-07 | 8.79E-01 | 2.89E-07 |
| 1,2-Dichloroethene (total) | 0.022 | O | 96.9 | 7.90E-03 | 3.66E-01 | 2.99E-02 | 3.22E-01 | 3.54E-01 | 4.54E-07 | 8.79E-01 | 3.00E-07 |
| Benzene | 0.004 | O | 78.1 | 1.50E-02 | 2.87E-01 | 5.10E-02 | 3.35E-01 | 3.68E-01 | 5.79E-07 | 6.90E-01 | 9.33E-08 |
| Chlorobenzene | 0.004 | O | 163.8 | 4.70E-03 | 8.68E-01 | 2.31E-02 | 3.17E-01 | 3.49E-01 | 1.92E-07 | 2.08E+00 | 4.84E-08 |
| Trichloroethene | 0.02 | O | 112.6 | 2.90E-02 | 4.48E-01 | 1.18E-01 | 3.80E-01 | 4.16E-01 | 3.71E-07 | 1.08E+00 | 1.07E-06 |
| Vinyl Chloride | 0.0054 | O | 119.4 | 6.90E-03 | 4.90E-01 | 2.90E-02 | 3.21E-01 | 3.53E-01 | 3.40E-07 | 1.18E+00 | 7.21E-08 |
| Aroclor-1262 | 0.00015 | O | 292 | 7.70E-01 | 4.53E+00 | 5.06E+00 | 1.83E+01 | 5.12E+00 | 3.67E-08 | 1.99E+01 | 6.80E-07 |
| Antimony | 0.0075 | I | 121.76 | 1.00E-03 | 5.05E-01 | 4.24E-03 | 3.06E-01 | 3.36E-01 | 3.30E-07 | 1.21E+00 | 7.50E-09 |
| Arsenic | 0.0215 | I | 74.9 | 1.00E-03 | 2.76E-01 | 3.33E-03 | 3.05E-01 | 3.36E-01 | 6.03E-07 | 6.62E-01 | 2.15E-08 |
| Chromium (total) | 0.0081 | I | 52 | 1.00E-03 | 2.05E-01 | 2.77E-03 | 3.05E-01 | 3.35E-01 | 8.11E-07 | 4.93E-01 | 8.10E-09 |
| Lead | 0.0217 | I | 207.2 | 1.00E-04 | 1.52E+00 | 5.54E-04 | 3.04E-01 | 3.34E-01 | 1.10E-07 | 3.65E+00 | 2.17E-09 |
| Manganese | 0.694 | I | 54.94 | 1.00E-03 | 2.13E-01 | 2.85E-03 | 3.05E-01 | 3.35E-01 | 7.80E-07 | 5.12E-01 | 6.94E-07 |
| Mercury | 0.0005 | I | 200.6 | 1.00E-03 | 1.39E+00 | 5.45E-03 | 3.07E-01 | 3.37E-01 | 1.19E-07 | 3.35E+00 | 5.00E-10 |

RISK ASSESSMENT SPREADSHEET - *DIRECT DERMAL CONTACT WITH WATER (PAGE THREE)*

SITE NAME: AREA A-3, RESIDENTIAL PROPERTIESON HOUSATONIC AVENUE
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - CHILD CTE
MEDIA: SURFACE WATER
DATE: SEPTEMBER 15, 1999

| CHEMICAL | DAevent ($mg/cm^2$ - event) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| 1,1,1-Trichloroethane | 8.81E-07 | 1.06E-06 | 2.48E-05 | NA | 2.00E-02 | NA | NA | 1.2E-03 | 3.6% |
| 1,1-Dichloroethene | 2.89E-07 | 3.49E-07 | 8.15E-06 | 6.00E-01 | 9.00E-03 | 2.1E-07 | 10.1% | 9.1E-04 | 2.6% |
| 1,2-Dichloroethene (total) | 3.00E-07 | 3.62E-07 | 8.45E-06 | NA | 9.00E-03 | NA | NA | 9.4E-04 | 2.7% |
| Benzene | 9.33E-08 | 1.13E-07 | 2.63E-06 | 2.90E-02 | 3.00E-03 | 3.3E-09 | 0.2% | 8.8E-04 | 2.5% |
| Chlorobenzene | 4.84E-08 | 5.85E-08 | 1.36E-06 | NA | 2.00E-02 | NA | NA | 6.8E-05 | 0.2% |
| Trichloroethene | 1.07E-06 | 1.30E-06 | 3.03E-05 | 1.10E-02 | 6.00E-03 | 1.4E-08 | 0.7% | 5.0E-03 | 14.6% |
| Vinyl Chloride | 7.21E-08 | 8.70E-08 | 2.03E-06 | 1.90E+00 | NA | 1.7E-07 | 8.0% | NA | NA |
| Aroclor-1262 | 6.80E-07 | 8.21E-07 | 1.92E-05 | 2.00E+00 | NA | 1.6E-06 | 79.2% | NA | NA |
| Antimony | 7.50E-09 | 9.06E-09 | 2.11E-07 | NA | 6.00E-05 | NA | NA | 3.5E-03 | 10.2% |
| Arsenic | 2.15E-08 | 2.60E-08 | 6.06E-07 | 1.50E+00 | 3.00E-04 | 3.9E-08 | 1.9% | 2.0E-03 | 5.8% |
| Chromium (total) | 8.10E-09 | 9.78E-09 | 2.28E-07 | NA | 7.50E-05 | NA | NA | 3.0E-03 | 8.8% |
| Lead | 2.17E-09 | 2.62E-09 | 6.12E-08 | NA | NA | NA | NA | NA | NA |
| Manganese | 6.94E-07 | 8.38E-07 | 1.96E-05 | NA | 1.20E-03 | NA | NA | 1.6E-02 | 47.1% |
| Mercury | 5.00E-10 | 6.04E-10 | 1.41E-08 | NA | 2.10E-05 | NA | NA | 6.7E-04 | 1.9% |
| | | | | | **Total** | **2.1E-06** | **100.0%** | **3.5E-02** | **100.0%** |

# Appendix F.12

## Results of IEUBK and Adult Models for Lead and Lead Hotspots

**Area A-1**

## Calculations of 95th Percentile Fetal Blood Lead Concentrations for Adult Exposure to Soil

**SITE NAME:** **AREA A-1: UPPER FERRY CREEK - MORGAN FRANCIS PROPERTY**
**LOCATION:** **FERRY CREEK, STRATFORD, CONNECTICUT**
**RECEPTOR:** **COMMERCIAL WORKER - SURFACE SOILS - REASONABLE MAXIMUM EXPOSURES**
**DATE:** **SEPTEMBER 13, 1999**

OBJECTIVE: Adult exposure to lead in soil is addressed by an evaluation of the relationship between the site soil lead concentration and the blood lead concentration in the developing fetuses of adult women. This spreadsheet calculates a range of 95th percentile fetal blood lead concentrations from central estimates of blood lead concentrations in pregnant adult women using the exposure parameters identified below (U.S. EPA, Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil, December 1996).

RELEVANT EQUATIONS: $PbB_{adult,\ central} = PbB_{adult,\ 0} + (PbS \times BKSF \times IR_s \times AF_s \times EF_s)/AT$

and

$$PbB_{fetal,\ 0.95} = PbB_{adult,\ central} \times GSD_{i,\ adult}^{\ 1.645} \times R_{fetal/maternal}$$

| Exposure Parameter | Description (units) | $GSD_i$ = 1.8 - 2.1; $PbB_{adult,\ 0}$ = 1.7 - 2.2 | | | |
|---|---|---|---|---|---|
| | | Adult 1 | Adult 2 | Adult 3 | Adult 4 |
| $PbB_{adult,\ 0}$ | Typical blood lead concentration in adult women of child-bearing age in absence of site exposures (ug/dL) | 1.7 | 1.7 | 2.2 | 2.2 |
| PbS | Site-specific soil lead concentration (mg/kg) [1] | 1050 | 1050 | 1050 | 1050 |
| BKSF | Biokinetic slope factor (ug/dL per ug/day)) | 0.4 | 0.4 | 0.4 | 0.4 |
| $IR_s$ | Intake rate of soil, includes outdoor soil and indoor soil-derived dust (g/day) | 0.100 | 0.100 | 0.100 | 0.100 |
| $AF_s$ | Absolute gastrointestinal absorption fraction (unitless) | 0.12 | 0.12 | 0.12 | 0.12 |
| $EF_s$ | Exposure frequency (days/year) | 250 | 250 | 250 | 250 |
| AT | Averaging time (days/year) | 365 | 365 | 365 | 365 |
| $GSD_{i,\ adult}$ | Estimate of individual geometric standard deviation among adults (unitless) | 1.8 | 2.1 | 1.8 | 2.1 |
| $R_{fetal/maternal}$ | Constant of proportionality between fetal blood lead concentraiton at birth and maternal blood lead concentration (unitless) | 0.9 | 0.9 | 0.9 | 0.9 |
| PbB [illegible] | [illegible] central estimate of blood lead concentrations in adult [illegible] child-bearing age [illegible] site exposures (ug/dL) | [illegible] | 5.15 | 5.65 | 5.65 |
| [illegible] | Calculated 95th percentile blood lead concentrations among fetuses born to women having site exposures (ug/dL) | 12.1 | 15.7 | [illegible] | 17.24 |

Note: According to the cited guidance document, this adult exposure model is not applicable for infrequent site exposures, where the EFs is less than 1 day/week.

[1] The arithmetic mean concentration is the exposure point concentration.

## Calculations of 95th Percentile Fetal Blood Lead Concentrations for Adult Exposure to Soil

**SITE NAME: AREA A-1: UPPER FERRY CREEK - MORGAN FRANCIS PROPERTY**
**LOCATION: FERRY CREEK, STRATFORD, CONNECTICUT**
**RECEPTOR: COMMERCIAL WORKER - SURFACE SOIL - CENTRAL TENDENCY EXPOSURE**
**DATE: SEPTEMBER 13, 1999**

OBJECTIVE: Adult exposure to lead in soil is addressed by an evaluation of the relationship between the site soil lead concentration and the blood lead concentration in the developing fetuses of adult women. This spreadsheet calculates a range of 95th percentile fetal blood lead concentrations from central estimates of blood lead concentrations in pregnant adult women using the exposure parameters identified below (U.S. EPA, Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil, December 1996).

RELEVANT EQUATIONS

$$PbB_{adult,central} = PbB_{adult,0} + (PbS \times BKSF \times IR_s \times AF_s \times EF_s)/AT$$

and

$$PbB_{fetal,0.95} = PbB_{adult,central} \times GSD_{i,adult}^{1.645} \times R_{fetal/maternal}$$

| Exposure Parameter | Description (units) | $GSD_i$ = 1.8 - 2.1; $PbB_{adult,0}$ = 1.7 - 2.2 | | | |
|---|---|---|---|---|---|
| | | **Adult 1** | **Adult 2** | **Adult 3** | **Adult 4** |
| $PbB_{adult,0}$ | Typical blood lead concentration in adult women of child-bearing age in absence of site exposures (ug/dL) | 1.7 | 1.7 | 2.2 | 2.2 |
| PbS | Site-specific soil lead concentration (mg/kg) [1] | 1050 | 1050 | 1050 | 1050 |
| BKSF | Biokinetic slope factor (ug/dL per ug/day)) | 0.4 | 0.4 | 0.4 | 0.4 |
| $IR_s$ | Intake rate of soil, includes outdoor soil and indoor soil-derived dust (g/day) | 0.050 | 0.050 | 0.050 | 0.050 |
| $AF_s$ | Absolute gastrointestinal absorption fraction (unitless) | 0.12 | 0.12 | 0.12 | 0.12 |
| $EF_s$ | Exposure frequency (days/year) | 250 | 250 | 250 | 250 |
| AT | Averaging time (days/year) | 365 | 365 | 365 | 365 |
| $GSD_{i,adult}$ | Estimate of individual geometric standard deviation among adults (unitless) | 1.8 | 2.1 | 1.8 | 2.1 |
| $R_{fetal/maternal}$ | Constant of proportionality between fetal blood lead concentraiton at birth and maternal blood lead concentration (unitless) | 0.9 | 0.9 | 0.9 | 0.9 |
| $PbB_{adult,central}$ | Calculated central estimate of blood lead concentrations in adult women of child-bearing age from site exposures (ug/dL) | [illegible] | 3.43 | 3.93 | 3.93 |
| $PbB_{fetal,0.95}$ | Calculated 95th percentile blood lead concentrations among fetuses born to women having site exposures (ug/dL) | [illegible] | 10.45 | 9.29 | 11.97 |

[1] The arithmetic mean concentration is the exposure point concentration.

- 3 -

# Calculations of 95th Percentile Fetal Blood Lead Concentrations for Adult Exposure to Soil

**SITE NAME: AREA A-1: UPPER FERRY CREEK - MORGAN FRANCIS PROPERTY**
**LOCATION: FERRY CREEK, STRATFORD, CONNECTICUT**
**RECEPTOR: COMMERCIAL WORKER - SOILS 0 TO 15 FEET - REASONABLE MAXIMUM EXPOSURES**
**DATE: SEPTEMBER 13, 1999**

OBJECTIVE: Adult exposure to lead in soil is addressed by an evaluation of the relationship between the site soil lead concentration and the blood lead concentration in the developing fetuses of adult women. This spreadsheet calculates a range of 95th percentile fetal blood lead concentrations from central estimates of blood lead concentrations in pregnant adult women using the exposure parameters identified below (U.S. EPA, Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil, December 1996).

RELEVANT EQUATIONS: $PbB_{adult,\ central} = PbB_{adult,\ 0} + (PbS \times BKSF \times IR_s \times AF_s \times EF_s)/AT$

and

$PbB_{fetal,\ 0.95} = PbB_{adult,\ central} \times GSD_{i,\ adult}^{1.645} \times R_{fetal/maternal}$

| Exposure Parameter | Description (units) | $GSD_i$ = 1.8 - 2.1; $PbB_{adult,\ 0}$ = 1.7 - 2.2 | | | |
|---|---|---|---|---|---|
| | | Adult 1 | Adult 2 | Adult 3 | Adult 4 |
| $PbB_{adult,\ 0}$ | Typical blood lead concentration in adult women of child-bearing age in absence of site exposures (ug/dL) | 1.7 | 1.7 | 2.2 | 2.2 |
| PbS | Site-specific soil lead concentration (mg/kg) [1] | 745 | 745 | 745 | 745 |
| BKSF | Biokinetic slope factor (ug/dL per ug/day)) | 0.4 | 0.4 | 0.4 | 0.4 |
| $IR_s$ | Intake rate of soil, includes outdoor soil and indoor soil-derived dust (g/day) | 0.100 | 0.100 | 0.100 | 0.100 |
| $AF_s$ | Absolute gastrointestinal absorption fraction (unitless) | 0.12 | 0.12 | 0.12 | 0.12 |
| $EF_s$ | Exposure frequency (days/year) | 250 | 250 | 250 | 250 |
| AT | Averaging time (days/year) | 365 | 365 | 365 | 365 |
| $GSD_{i,\ adult}$ | Estimate of individual geometric standard deviation among adults (unitless) | 1.8 | 2.1 | 1.8 | 2.1 |
| $R_{fetal/maternal}$ | Constant of proportionality between fetal blood lead concentraiton at birth and maternal blood lead concentration (unitless) | 0.9 | 0.9 | 0.9 | 0.9 |
| $PbB_{adult,\ central}$ | Calculated central estimate of blood lead concentrations in adult women of child-bearing age from site exposures (ug/dL) | 4.15 | 4.15 | 4.65 | 4.65 |
| $PbB_{fetal,\ 0.95}$ | Calculated 95th percentile blood lead concentrations among fetuses born to women having site exposures (ug/dL) | 9.82 | 12.66 | 11.00 | 14.18 |

Note: According to the cited guidance document, this adult exposure model is not applicable for infrequent site exposures, where the EFs is less than 1 day/week.

[1] The arithmetic mean concentration is the exposure point concentration

| -5 |

## Calculations of 95th Percentile Fetal Blood Lead Concentrations for Adult Exposure to Soil

**SITE NAME:** AREA A-1: UPPER FERRY CREEK - MORGAN FRANCIS PROPERTY
**LOCATION:** FERRY CREEK, STRATFORD, CONNECTICUT
**RECEPTOR:** COMMERCIAL WORKER - SOILS 0 TO 15 FEET - CENTRAL TENDENCY EXPOSURES
**DATE:** SEPTEMBER 13, 1999

OBJECTIVE: Adult exposure to lead in soil is addressed by an evaluation of the relationship between the site soil lead concentration and the blood lead concentration in the developing fetuses of adult women. This spreadsheet calculates a range of 95th percentile fetal blood lead concentrations from central estimates of blood lead concentrations in pregnant adult women using the exposure parameters identified below (U.S. EPA, Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil, December 1996).

RELEVANT EQUATIONS: $PbB_{adult,central} = PbB_{adult,0} + (PbS \times BKSF \times IR_s \times AF_s \times EF_s)/AT$

and

$PbB_{fetal,0.95} = PbB_{adult,central} \times GSD_{i,adult}^{1.645} \times R_{fetal/maternal}$

| Exposure Parameter | Description (units) | $GSD_i$ = 1.8 - 2.1; $PbB_{adult,0}$ = 1.7 - 2.2 | | | |
|---|---|---|---|---|---|
| | | Adult 1 | Adult 2 | Adult 3 | Adult 4 |
| $PbB_{adult,0}$ | Typical blood lead concentration in adult women of child-bearing age in absence of site exposures (ug/dL) | 1.7 | 1.7 | 2.2 | 2.2 |
| PbS | Site-specific soil lead concentration (mg/kg) [1] | 745 | 745 | 745 | 745 ✓ |
| BKSF | Biokinetic slope factor (ug/dL per ug/day)) | 0.4 | 0.4 | 0.4 | 0.4 |
| $IR_s$ | Intake rate of soil, includes outdoor soil and indoor soil-derived dust (g/day) | 0.050 | 0.050 | 0.050 | 0.050 |
| $AF_s$ | Absolute gastrointestinal absorption fraction (unitless) | 0.12 | 0.12 | 0.12 | 0.12 |
| $EF_s$ | Exposure frequency (days/year) | 250 | 250 | 250 | 250 |
| AT | Averaging time (days/year) | 365 | 365 | 365 | 365 |
| $GSD_{i,adult}$ | Estimate of individual geometric standard deviation among adults (unitless) | 1.8 | 2.1 | 1.8 | 2.1 |
| $R_{fetal/maternal}$ | Constant of proportionality between fetal blood lead concentraiton at birth and maternal blood lead concentration (unitless) | 0.9 | 0.9 | 0.9 | 0.9 |
| $PbB_{adult,central}$ | Calculated central estimate of blood lead concentrations in adult women [illegible] child-bearing age from site exposures (ug/dL) | 2.92 | 2.92 | 3.42 | 3.42 |
| $PbB_{fetal,0.95}$ | Calculated 95th percentile blood lead concentrations among fetuses born to women having site exposures (ug/dL) | 6.92 | 8.92 | 8.11 | 10.45 |

Note: According to the cited guidance document, this adult exposure model is not applicable for infrequent site exposures, where the EFs is less than 1 day/week.

[1] The arithmetic mean concentration is the exposure point concentration.

## Calculations of 95th Percentile Fetal Blood Lead Concentrations for Adult Exposure to Soil

**SITE NAME: AREA A-1: UPPER FERRY CREEK - MORGAN FRANCIS PROPERTY**
**LOCATION: FERRY CREEK, STRATFORD, CONNECTICUT**
**RECEPTOR: FREQUENT ADULT RECREATIONAL USER- REASONABLE MAXIMUM EXPOSURES** ✓
**DATE: SEPTEMBER 13, 1999**

OBJECTIVE: Adult exposure to lead in soil is addressed by an evaluation of the relationship between the site soil lead concentration and the blood lead concentration in the developing fetuses of adult women. This spreadsheet calculates a range of 95th percentile fetal blood lead concentrations from central estimates of blood lead concentrations in pregnant adult women using the exposure parameters identified below (U.S. EPA, Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil, December 1996).

RELEVANT EQUATIONS: $PbB_{adult,\ central} = PbB_{adult,\ 0} + (PbS \times BKSF \times IR_s \times AF_s \times EF_s)/AT$

and

$PbB_{fetal,\ 0.95} = PbB_{adult,\ central} \times GSD_{i,\ adult}^{1.645} \times R_{fetal/maternal}$

| Exposure Parameter | Description (units) | $GSD_i$ = 1.8 - 2.1; $PbB_{adult,\ 0}$ = 1.7 - 2.2 | | | |
|---|---|---|---|---|---|
| | | Adult 1 | Adult 2 | Adult 3 | Adult 4 |
| $PbB_{adult,\ 0}$ | Typical blood lead concentration in adult women of child-bearing age in absence of site exposures (ug/dL) | 1.7 | 1.7 | 2.2 | 2.2 |
| PbS | Site-specific soil lead concentration (mg/kg) [1] | 455 | 455 | 455 | 455 ✓ |
| BKSF | Biokinetic slope factor (ug/dL per ug/day)) | 0.4 | 0.4 | 0.4 | 0.4 |
| $IR_s$ | Intake rate of soil, includes outdoor soil and indoor soil-derived dust (g/day) | 0.100 | 0.100 | 0.100 | 0.100 |
| $AF_s$ | Absolute gastrointestinal absorption fraction (unitless) | 0.12 | 0.12 | 0.12 | 0.12 |
| $EF_s$ | Exposure frequency (days/year) | 150 | 150 | 150 | 150 |
| AT | Averaging time (days/year) | 365 | 365 | 365 | 365 |
| $GSD_{i,\ adult}$ | Estimate of individual geometric standard deviation among adults (unitless) | 1.8 | 2.1 | 1.8 | 2.1 |
| $R_{fetal/maternal}$ | Constant of proportionality between fetal blood lead concentraiton at birth and maternal blood lead concentration (unitless) | 0.9 | 0.9 | 0.9 | 0.9 |
| $PbB_{adult,\ central}$ | Calculated central estimate of blood lead concentrations in adult women of child-bearing age from site exposures (ug/dL) | 2.60 | 2.60 | 3.10 | 3.10 |
| $PbB_{fetal,\ 0.95}$ | Calculated 95th percentile blood lead concentration among fetuses born to women having site exposures (ug/dL) | [illegible] | 7.92 | [illegible] | 9.45 |

Note: According to the cited guidance document, this adult exposure model is not applicable for infrequent site exposures, where the EFs is less than 1 day/week.

[1] The arithmetic mean concentration is the exposure point concentration. ✓

1-6-1

## Calculations of 95th Percentile Fetal Blood Lead Concentrations for Adult Exposure to Soil

**SITE NAME: AREA A-1: UPPER FERRY CREEK - MORGAN FRANCIS PROPERTY**
**LOCATION: FERRY CREEK, STRATFORD, CONNECTICUT**
**RECEPTOR: FREQUENT ADULT RECREATIONAL USER- CENTRAL TENDENCY EXPOSURES**
**DATE: SEPTEMBER 13, 1999**

OBJECTIVE Adult exposure to lead in soil is addressed by an evaluation of the relationship between the site soil lead concentration and the blood lead concentration in the developing fetuses of adult women. This spreadsheet calculates a range of 95th percentile fetal blood lead concentrations from central estimates of blood lead concentrations in pregnant adult women using the exposure parameters identified below (U.S. EPA, Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil. December 1996).

RELEVANT EQUATIONS. $PbB_{adult,\ central} = PbB_{adult,\ 0} + (PbS \times BKSF \times IR_s \times AF_s \times EF_s)/AT$

and

$PbB_{fetal,\ 0.95} = PbB_{adult,\ central} \times GSD_{i,\ adult}^{1.645} \times R_{fetal/maternal}$

| Exposure Parameter | Description (units) | $GSD_i$ = 1.8 - 2.1; $PbB_{adult,0}$ = 1.7 - 2.2 | | | |
|---|---|---|---|---|---|
| | | Adult 1 | Adult 2 | Adult 3 | Adult 4 |
| $PbB_{adult,\ 0}$ | Typical blood lead concentration in adult women of child-bearing age in absence of site exposures (ug/dL) | 1.7 | 1.7 | 2.2 | 2.2 |
| PbS | Site-specific soil lead concentration (mg/kg) [1] | 455 | 455 | 455 | 455 |
| BKSF | Biokinetic slope factor (ug/dL per ug/day)) | 0.4 | 0.4 | 0.4 | 0.4 |
| $IR_s$ | Intake rate of soil, includes outdoor soil and indoor soil-derived dust (g/day) | 0.050 | 0.050 | 0.050 | 0.050 |
| $AF_s$ | Absolute gastrointestinal absorption fraction (unitless) | 0.12 | 0.12 | 0.12 | 0.12 |
| $EF_s$ | Exposure frequency (days/year) | 150 | 150 | 150 | 150 |
| AT | Averaging time (days/year) | 365 | 365 | 365 | 365 |
| $GSD_{i,\ adult}$ | Estimate of individual geometric standard deviation among adults (unitless) | 1.8 | 2.1 | 1.8 | 2.1 |
| $R_{fetal/maternal}$ | Constant of proportionality between fetal blood lead concentraiton at birth and maternal blood lead concentration (unitless) | 0.9 | 0.9 | 0.9 | 0.9 |
| $PbB_{adult,\ central}$ | Calculated central estimate of blood lead concentrations in adult women of child-bearing age from site exposures (ug/dL) | [illegible] | 2.15 | 2.65 | 2.65 |
| $PbB_{fetal,\ 0.95}$ | Calculated 95th percentile blood lead concentrations among fetuses born to women having site exposures (ug/dL) | 5.09 | 6.55 | 6.27 | 8.08 |

Note: According to the cited guidance document, this adult exposure model is not applicable for infrequent site exposures, where the EFs is less than 1 day/week.

[1] The arithmetic mean concentration is the exposure point concentration.

**Exposure to Lead (455 mg/kg – multi-source analysis)**
**Area A-1: Upper Ferry Creek – Morgan Francis Property**
**Frequent Child Recreational User**
**September 1999**

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.100 ug Pb/m3 DEFAULT
Indoor AIR Pb Conc: 30.0 percent of outdoor.
Other AIR Parameters:

| Age | Time Outdoors (hr) | Vent. Rate (m3/day) | Lung Abs. (%) |
|---|---|---|---|
| 0-1 | 1.0 | 2.0 | 32.0 |
| 1-2 | 2.0 | 3.0 | 32.0 |
| 2-3 | 3.0 | 5.0 | 32.0 |
| 3-4 | 4.0 | 5.0 | 32.0 |
| 4-5 | 4.0 | 5.0 | 32.0 |
| 5-6 | 4.0 | 7.0 | 32.0 |
| 6-7 | 4.0 | 7.0 | 32.0 |

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT
WATER Consumption: DEFAULT

SOIL & DUST:
Soil: constant conc.
Dust: Multiple Source Analysis

| Age | Soil (ug Pb/g) | House Dust (ug Pb/g) |
|---|---|---|
| 0-1 | 455.0 | 328.5 |
| 1-2 | 455.0 | 328.5 |
| 2-3 | 455.0 | 328.5 |
| 3-4 | 455.0 | 328.5 |
| 4-5 | 455.0 | 328.5 |
| 5-6 | 455.0 | 328.5 |
| 6-7 | 455.0 | 328.5 |

Additional Dust Sources: None DEFAULT
Soil contribution conversion factor: 0.70
Air contribution conversion factor: 100.0

PAINT Intake: 0.00 ug Pb/day DEFAULT

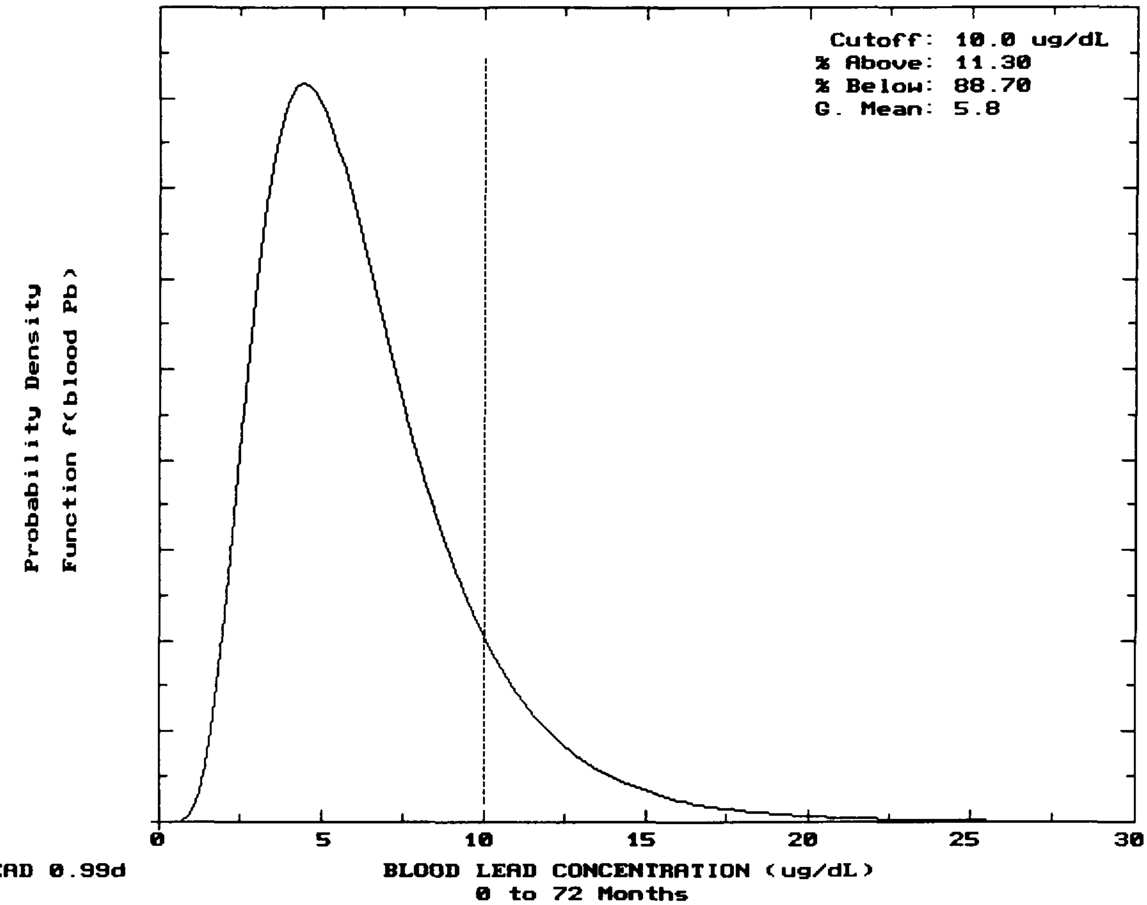
MATERNAL CONTRIBUTION: Infant Model
Maternal Blood Conc: 2.50 ug Pb/dL

**Exposure to Lead (455 mg/kg – multi-source analysis)**
**Area A-1: Upper Ferry Creek – Morgan Francis Property**
**Frequent Child Recreational User**
**September 1999**

CALCULATED BLOOD Pb and Pb UPTAKES:

| YEAR | Blood Level (ug/dL) | Total Uptake (ug/day) | Soil+Dust Uptake (ug/day) |
|---|---|---|---|
| 0.5-1: | 6.1 | 11.41 | 8.62 |
| 1-2: | 6.9 | 16.82 | 13.44 |
| 2-3: | 6.5 | 17.50 | 13.68 |
| 3-4: | 6.2 | 17.73 | 13.93 |
| 4-5: | 5.1 | 14.53 | 10.68 |
| 5-6: | 4.4 | 13.87 | 9.73 |
| 6-7: | 3.9 | 13.74 | 9.25 |

| YEAR | Diet Uptake (ug/day) | Water Uptake (ug/day) | Paint Uptake (ug/day) | Air Uptake (ug/day) |
|---|---|---|---|---|
| 0.5-1: | 2.42 | 0.35 | 0.00 | 0.02 |
| 1-2: | 2.49 | 0.86 | 0.00 | 0.03 |
| 2-3: | 2.84 | 0.91 | 0.00 | 0.06 |
| 3-4: | 2.78 | 0.95 | 0.00 | 0.07 |
| 4-5: | 2.77 | 1.02 | 0.00 | 0.07 |
| 5-6: | 2.96 | 1.08 | 0.00 | 0.09 |
| 6-7: | 3.29 | 1.11 | 0.00 | 0.09 |


Cutoff: 10.0 ug/dL
% Above: 11.30
% Below: 88.70
G. Mean: 5.8
Probability Density
Function f(blood Pb)
0
5
10
15
20
25
30
BLOOD LEAD CONCENTRATION (ug/dL)
0 to 72 Months

LEAD 0.99d

# Area A-2

## Calculations of 95th Percentile Fetal Blood Lead Concentrations for Adult Exposure to Soil

**SITE NAME: AREA A-2: UPPER FERRY CREEK - SPADA PROPERTY**
**LOCATION: FERRY CREEK, STRATFORD, CONNECTICUT**
**RECEPTOR: COMMERCIAL WORKER - SURFACE SOILS - REASONABLE MAXIMUM EXPOSURE**
**DATE: SEPTEMBER 13, 1999**

OBJECTIVE: Adult exposure to lead in soil is addressed by an evaluation of the relationship between the site soil lead concentration and the blood lead concentration in the developing fetuses of adult women. This spreadsheet calculates a range of 95th percentile fetal blood lead concentrations from central estimates of blood lead concentrations in pregnant adult women using the exposure parameters identified below (U.S. EPA, Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil, December 1996)

RELEVANT EQUATIONS: $PbB_{adult\ central} = PbB_{adult,0} + (PbS \times BKSF \times IR_s \times AF_s \times EF_s)/AT$

and

$PbB_{fetal,0.95} = PbB_{adult\ central} \times GSD_{i,\ adult}^{1.645} \times R_{fetal/maternal}$

| Exposure Parameter | Description (units) | $GSD_i$ = 1.8 - 2.1; $PbB_{adult,0}$ = 1.7 - 2.2 | | | |
|---|---|---|---|---|---|
| | | Adult 1 | Adult 2 | Adult 3 | Adult 4 |
| $PbB_{adult,0}$ | Typical blood lead concentration in adult women of child-bearing age in absence of site exposures (ug/dL) | 1.7 | 1.7 | 2.2 | 2.2 |
| PbS | Site-specific soil lead concentration (mg/kg) [1] | 726 | 726 | 726 | 726 |
| BKSF | Biokinetic slope factor (ug/dL per ug/day)) | 0.4 | 0.4 | 0.4 | 0.4 |
| $IR_s$ | Intake rate of soil, includes outdoor soil and indoor soil-derived dust (g/day) | 0.100 | 0.100 | 0.100 | 0.100 |
| $AF_s$ | Absolute gastrointestinal absorption fraction (unitless) | 0.12 | 0.12 | 0.12 | 0.12 |
| $EF_s$ | Exposure frequency (days/year) | 250 | 250 | 250 | 250 |
| AT | Averaging time (days/year) | 365 | 365 | 365 | 365 |
| $GSD_{i,\ adult}$ | Estimate of individual geometric standard deviation among adults (unitless) | 1.8 | 2.1 | 1.8 | 2.1 |
| $R_{fetal/maternal}$ | Constant of proportionality between fetal blood lead concentraiton at birth and maternal blood lead concentration (unitless) | 0.9 | 0.9 | 0.9 | 0.9 |
| $PbB_{adult\ central}$ | Calculated central estimate of blood lead concentrations in adult women of child-bearing age from site exposures (ug/dL) | 4.09 | 4.09 | 4.59 | 4.59 |
| $PbB_{fetal,0.95}$ | Calculated 95th percentile blood lead concentrations among fetuses born to women having site exposures (ug/dL) | 9.67 | 12.46 | 10.86 | 13.99 |

[1] The arithmetic mean concentration is the exposure point concentration

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## Calculations of 95th Percentile Fetal Blood Lead Concentrations for Adult Exposure to Soil

**SITE NAME: AREA A-2: UPPER FERRY CREEK - SPADA PROPERTY**
**LOCATION: FERRY CREEK, STRATFORD, CONNECTICUT**
**RECEPTOR: COMMERCIAL WORKER - SURFACE SOILS - CENTRAL TENDENCY EXPOSURE**
**DATE: SEPTEMBER 13, 1999**

OBJECTIVE: Adult exposure to lead in soil is addressed by an evaluation of the relationship between the site soil lead concentration and the blood lead concentration in the developing fetuses of adult women. This spreadsheet calculates a range of 95th percentile fetal blood lead concentrations from central estimates of blood lead concentrations in pregnant adult women using the exposure parameters identified below (U.S. EPA, Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil. December 1996).

RELEVANT EQUATIONS: $PbB_{adult,\ central} = PbB_{adult,\ 0} + (PbS \times BKSF \times IR_s \times AF_s \times EF_s)/AT$

and

$$PbB_{fetal,\ 0.95} = PbB_{adult,\ central} \times GSD_{i,\ adult}^{\ 1.645} \times R_{fetal/maternal}$$

| Exposure Parameter | Description (units) | $GSD_i$ = 1.8 - 2.1; $PbB_{adult,0}$ = 1.7 - 2.2 | | | |
|---|---|---|---|---|---|
| | | Adult 1 | Adult 2 | Adult 3 | Adult 4 |
| $PbB_{adult,0}$ | Typical blood lead concentration in adult women of child-bearing age in absence of site exposures (ug/dL) | 1.7 | 1.7 | 2.2 | 2.2 |
| PbS | Site-specific soil lead concentration (mg/kg) [1] | 726 | 726 | 726 | 726 ✓ |
| BKSF | Biokinetic slope factor (ug/dL per ug/day)) | 0.4 | 0.4 | 0.4 | 0.4 |
| $IR_s$ | Intake rate of soil, includes outdoor soil and indoor soil-derived dust (g/day) | 0.050 | 0.050 | 0.050 | 0.050 |
| $AF_s$ | Absolute gastrointestinal absorption fraction (unitless) | 0.12 | 0.12 | 0.12 | 0.12 |
| $EF_s$ | Exposure frequency (days/year) | 250 | 250 | 250 | 250 |
| AT | Averaging time (days/year) | 365 | 365 | 365 | 365 |
| $GSD_{i,\ adult}$ | Estimate of individual geometric standard deviation among adults (unitless) | 1.8 | 2.1 | 1.8 | 2.1 |
| $R_{fetal/maternal}$ | Constant of proportionality between fetal blood lead concentraiton at birth and maternal blood lead concentration (unitless) | 0.9 | 0.9 | 0.9 | 0.9 |
| PbB[illegible] | Calculated central estimate of blood lead concentrations in adult women of child-bearing age from site exposures (ug/dL) | 2.89 | 2.89 | 3.39 | 3.39 |
| PbB[illegible] | Calculated 95th percentile blood lead concentrations among fetuses born to women having site exposures (ug/dL) | [illegible] | [illegible] | 8.03 | 10.35 |

[1] The arithmetic mean concentration is the exposure point concentration ✓

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## Calculations of 95th Percentile Fetal Blood Lead Concentrations for Adult Exposure to Soil

**SITE NAME: AREA A-2: UPPER FERRY CREEK - SPADA PROPERTY**
**LOCATION: FERRY CREEK, STRATFORD, CONNECTICUT**
**RECEPTOR: COMMERCIAL WORKER - SOILS 0 TO 15 FEET - REASONABLE MAXIMUM EXPOSURE** ✓
**DATE: SEPTEMBER 13, 1999**

OBJECTIVE   Adult exposure to lead in soil is addressed by an evaluation of the relationship between the site soil lead concentration and the blood lead concentration in the developing fetuses of adult women. This spreadsheet calculates a range of 95th percentile fetal blood lead concentrations from central estimates of blood lead concentrations in pregnant adult women using the exposure parameters identified below (U.S. EPA, Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil, December 1996).

RELEVANT EQUATIONS: $PbB_{adult\ central} = PbB_{adult\ 0} + (PbS \times BKSF \times IR_s \times AF_s \times EF_s)/AT$

and

$PbB_{fetal,\ 0.95} = PbB_{adult\ central} \times GSD_{i,\ adult}^{1.645} \times R_{fetal/maternal}$

| Exposure Parameter | Description (units) | $GSD_i$ = 1.8 - 2.1; $PbB_{adult,\ 0}$ = 1.7 - 2.2 | | | |
|---|---|---|---|---|---|
| | | **Adult 1** | **Adult 2** | **Adult 3** | **Adult 4** |
| $PbB_{adult\ 0}$ | Typical blood lead concentration in adult women of child-bearing age in absence of site exposures (ug/dL) | 1.7 | 1.7 | 2.2 | 2.2 |
| PbS | Site-specific soil lead concentration (mg/kg) [1] | 1400 | 1400 | 1400 | 1400 |
| BKSF | Biokinetic slope factor (ug/dL per ug/day)) | 0.4 | 0.4 | 0.4 | 0.4 |
| $IR_s$ | Intake rate of soil, includes outdoor soil and indoor soil-derived dust (g/day) | 0.100 | 0.100 | 0.100 | 0.100 |
| $AF_s$ | Absolute gastrointestinal absorption fraction (unitless) | 0.12 | 0.12 | 0.12 | 0.12 |
| $EF_s$ | Exposure frequency (days/year) | 250 | 250 | 250 | 250 |
| AT | Averaging time (days/year) | 365 | 365 | 365 | 365 |
| $GSD_{i,\ adult}$ | Estimate of individual geometric standard deviation among adults (unitless) | 1.8 | 2.1 | 1.8 | 2.1 |
| $R_{fetal/maternal}$ | Constant of proportionality between fetal blood lead concentraiton at birth and maternal blood lead concentration (unitless) | 0.9 | 0.9 | 0.9 | 0.9 |
| $PbB_{adult,\ central}$ | **Calculated central estimate of blood lead concentrations in adult women of child-bearing age from site exposures (ug/dL)** | **6.30** | **6.30** | **6.80** | **6.80** |
| $PbB_{fetal,\ 0.95}$ | **Calculated 95th percentile blood lead concentrations among fetuses born to women having site exposures (ug/dL)** | **14.92** | **19.22** | **16.10** | **20.75** |

[1] The arithmetic mean concentration is the exposure point concentration. ✓

## Calculations of 95th Percentile Fetal Blood Lead Concentrations for Adult Exposure to Soil

**SITE NAME: AREA A-2: UPPER FERRY CREEK - SPADA PROPERTY**
**LOCATION: FERRY CREEK, STRATFORD, CONNECTICUT**
**RECEPTOR: COMMERCIAL WORKER - SOILS 0 TO 15 FEET - CENTRAL TENDENCY EXPOSURE** ✓
**DATE: SEPTEMBER 13, 1999**

OBJECTIVE: Adult exposure to lead in soil is addressed by an evaluation of the relationship between the site soil lead concentration and the blood lead concentration in the developing fetuses of adult women. This spreadsheet calculates a range of 95th percentile fetal blood lead concentrations from central estimates of blood lead concentrations in pregnant adult women using the exposure parameters identified below (U.S. EPA, Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil, December 1996).

RELEVANT EQUATIONS: $PbB_{adult,\ central} = PbB_{adult,\ 0} + (PbS \times BKSF \times IR_s \times AF_s \times EF_s)/AT$

and

$PbB_{fetal,\ 0.95} = PbB_{adult,\ central} \times GSD_{i,\ adult}^{1.645} \times R_{fetal/maternal}$

| Exposure Parameter | Description (units) | $GSD_i$ = 1.8 - 2.1; $PbB_{adult,0}$ = 1.7 - 2.2 | | | |
|---|---|---|---|---|---|
| | | Adult 1 | Adult 2 | Adult 3 | Adult 4 |
| $PbB_{adult,\ 0}$ | Typical blood lead concentration in adult women of child-bearing age in absence of site exposures (ug/dL) | 1.7 | 1.7 | 2.2 | 2.2 |
| PbS | Site-specific soil lead concentration (mg/kg) [1] | 1400 | 1400 | 1400 | 1400 ✓ |
| BKSF | Biokinetic slope factor (ug/dL per ug/day)) | 0.4 | 0.4 | 0.4 | 0.4 |
| $IR_s$ | Intake rate of soil, includes outdoor soil and indoor soil-derived dust (g/day) | 0.050 | 0.050 | 0.050 | 0.050 ✓ |
| $AF_s$ | Absolute gastrointestinal absorption fraction (unitless) | 0.12 | 0.12 | 0.12 | 0.12 |
| $EF_s$ | Exposure frequency (days/year) | 250 | 250 | 250 | 250 |
| AT | Averaging time (days/year) | 365 | 365 | 365 | 365 |
| $GSD_{i,\ adult}$ | Estimate of individual geometric standard deviation among adults (unitless) | 1.8 | 2.1 | 1.8 | 2.1 |
| $R_{fetal/maternal}$ | Constant of proportionality between fetal blood lead concentraiton at birth and maternal blood lead concentration (unitless) | 0.9 | 0.9 | 0.9 | 0.9 |
| $PbB_{adult,\ central}$ | Calculated central estimate of blood lead concentrations in adult women of child-bearing age from site exposures (ug/dL) | [illegible] | 4.00 | 4.50 | 4.50 |
| $PbB_{fetal,\ 0.95}$ | Calculated 95th percentile blood lead concentrations among fetuses born to women having site exposures (ug/dL) | [illegible] | 12.20 | 10.65 | 13.73 |

[1] The arithmetic mean concentration is the exposure point concentration.

1-7-1

# Area A-3

## Calculations of 95th Percentile Fetal Blood Lead Concentrations for Adult Exposure to Soil

**SITE NAME: AREA A-3: UPPER FERRY CREEK - RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE**
**LOCATION: FERRY CREEK, STRATFORD, CONNECTICUT**
**RECEPTOR: FREQUENT ADULT RECREATIONAL USER - REASONABLE MAXIMUM EXPOSURE**
**DATE: SEPTEMBER 13, 1999**

OBJECTIVE: Adult exposure to lead in soil is addressed by an evaluation of the relationship between the site soil lead concentration and the blood lead concentration in the developing fetuses of adult women. This spreadsheet calculates a range of 95th percentile fetal blood lead concentrations from central estimates of blood lead concentrations in pregnant adult women using the exposure parameters identified below (U.S. EPA, Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil. December 1996)

RELEVANT EQUATIONS: $PbB_{adult,\ central} = PbB_{adult,\ 0} + (PbS \times BKSF \times IR_s \times AF_s \times EF_s)/AT$

and

$PbB_{fetal,\ 0.95} = PbB_{adult,\ central} \times GSD_{i,\ adult}^{1.645} \times R_{fetal/maternal}$

| Exposure Parameter | Description (units) | $GSD_i$ = 1.8 - 2.1; $PbB_{adult,\ 0}$ = 1.7 - 2.2 | | | |
|---|---|---|---|---|---|
| | | Adult 1 | Adult 2 | Adult 3 | Adult 4 |
| $PbB_{adult,\ 0}$ | Typical blood lead concentration in adult women of child-bearing age in absence of site exposures (ug/dL) | 1.7 | 1.7 | 2.2 | 2.2 |
| PbS | Site-specific soil lead concentration (mg/kg) [1] | 1240 | 1240 | 1240 | 1240 |
| BKSF | Biokinetic slope factor (ug/dL per ug/day)) | 0.4 | 0.4 | 0.4 | 0.4 |
| $IR_s$ | Intake rate of soil, includes outdoor soil and indoor soil-derived dust (g/day) | 0.100 | 0.100 | 0.100 | 0.100 |
| $AF_s$ | Absolute gastrointestinal absorption fraction (unitless) | 0.12 | 0.12 | 0.12 | 0.12 |
| $EF_s$ | Exposure frequency (days/year) | 90 | 90 | 90 | 90 |
| AT | Averaging time (days/year) | 365 | 365 | 365 | 365 |
| $GSD_{i,\ adult}$ | Estimate of individual geometric standard deviation among adults (unitless) | 1.8 | 2.1 | 1.8 | 2.1 |
| $R_{fetal/maternal}$ | Constant of proportionality between fetal blood lead concentraiton at birth and maternal blood lead concentration (unitless) | 0.9 | 0.9 | 0.9 | 0.9 |
| $PbB_{adult,\ central}$ | Calculated central estimate of blood lead concentrations in adult women of child-bearing age from site exposures (ug/dL) | [illegible] | [illegible] | [illegible] | 3.67 |
| $PbB_{fetal,\ 0.95}$ | Calculated 95th percentile blood lead concentrations among fetuses born to women having site exposures (ug/dL) | 7.50 | 9.68 | 8.68 | 11.19 |

[1] The arithmetic mean concentration is the exposure point concentration.

## Calculations of 95th Percentile Fetal Blood Lead Concentrations for Adult Exposure to Soil

**SITE NAME: AREA A-3: UPPER FERRY CREEK - RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE**
**LOCATION: FERRY CREEK, STRATFORD, CONNECTICUT**
**RECEPTOR: FREQUENT ADULT RECREATIONAL USER - CENTRAL TENDENCY EXPOSURE**
**DATE: SEPTEMBER 13, 1999**

OBJECTIVE: Adult exposure to lead in soil is addressed by an evaluation of the relationship between the site soil lead concentration and the blood lead concentration in the developing fetuses of adult women. This spreadsheet calculates a range of 95th percentile fetal blood lead concentrations from central estimates of blood lead concentrations in pregnant adult women using the exposure parameters identified below (U.S. EPA, Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil, December 1996).

RELEVANT EQUATIONS: $PbB_{adult,\ central} = PbB_{adult,\ 0} + (PbS \times BKSF \times IR_s \times AF_s \times EF_s)/AT$

and

$PbB_{fetal,\ 0.95} = PbB_{adult,\ central} \times GSD_{i,\ adult}^{1.645} \times R_{fetal/maternal}$

| Exposure Parameter | Description (units) | $GSD_i$ = 1.8 - 2.1; $PbB_{adult,\ 0}$ = 1.7 - 2.2 | | | |
|---|---|---|---|---|---|
| | | **Adult 1** | **Adult 2** | **Adult 3** | **Adult 4** |
| $PbB_{adult,\ 0}$ | Typical blood lead concentration in adult women of child-bearing age in absence of site exposures (ug/dL) | 1.7 | 1.7 | 2.2 | 2.2 |
| PbS | Site-specific soil lead concentration (mg/kg) [1] | 1240 | 1240 | 1240 | 1240 |
| BKSF | Biokinetic slope factor (ug/dL per ug/day)) | 0.4 | 0.4 | 0.4 | 0.4 |
| $IR_s$ | Intake rate of soil, includes outdoor soil and indoor soil-derived dust (g/day) | 0.050 | 0.050 | 0.050 | 0.050 |
| $AF_s$ | Absolute gastrointestinal absorption fraction (unitless) | 0.12 | 0.12 | 0.12 | 0.12 |
| $EF_s$ | Exposure frequency (days/year) | 90 | 90 | 90 | 90 |
| AT | Averaging time (days/year) | 365 | 365 | 365 | 365 |
| $GSD_{i,\ adult}$ | Estimate of individual geometric standard deviation among adults (unitless) | 1.8 | 2.1 | 1.8 | 2.1 |
| $R_{fetal/maternal}$ | Constant of proportionality between fetal blood lead concentraiton at birth and maternal blood lead concentration (unitless) | 0.9 | 0.9 | 0.9 | 0.9 |
| PbB[illegible] | Calculated central estimate of blood lead concentrations in adult women of child-bearing age from site exposures (ug/dL) | [illegible] | 2.43 | 2.93 | 2.93 |
| PbB[illegible] | Calculated 95th percentile blood lead concentrations among fetuses born to women having site exposures (ug/dL) | 5.78 | 7.42 | 6.94 | 8.95 |

[1] The arithmetic mean concentration is the exposure point concentration.

1-5-1

**Exposure to Lead (1,240 mg/kg –multi-source analysis)**
**Area A-3: Upper Ferry Creek – Residential Properties on Housatonic Avenue**
**Frequent Child Recreational User**
**September 1999**

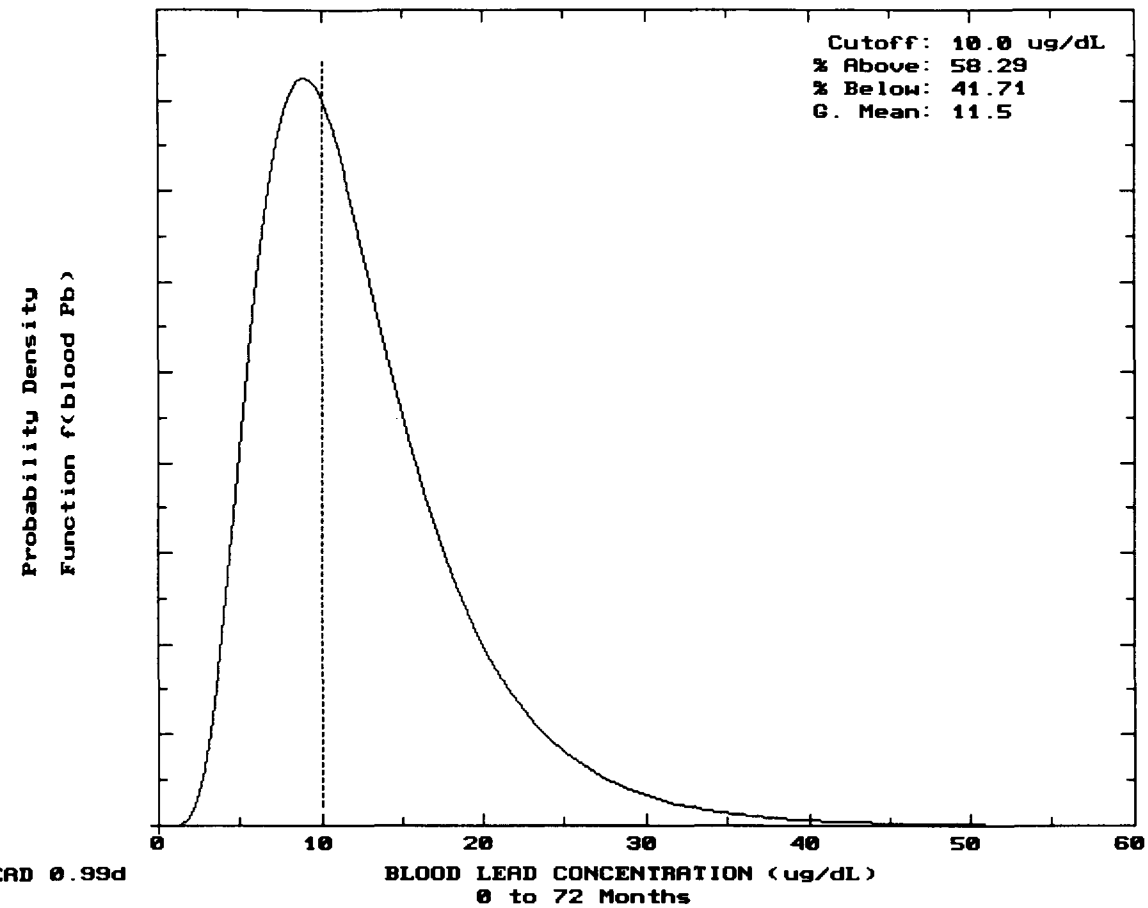
```
LEAD MODEL Version 0.99d

AIR CONCENTRATION:  0.100  ug Pb/m3    DEFAULT
  Indoor AIR Pb Conc:  30.0  percent of outdoor.
  Other AIR Parameters:
     Age     Time Outdoors (hr)     Vent. Rate (m3/day)     Lung Abs. (%)
     0-1           1.0                    2.0                    32.0
     1-2           2.0                    3.0                    32.0
     2-3           3.0                    5.0                    32.0
     3-4           4.0                    5.0                    32.0
     4-5           4.0                    5.0                    32.0
     5-6           4.0                    7.0                    32.0
     6-7           4.0                    7.0                    32.0

DIET:   DEFAULT

DRINKING WATER Conc:  4.00 ug Pb/L   DEFAULT
   WATER Consumption:  DEFAULT

SOIL & DUST:
   Soil:  constant conc.
   Dust:  Multiple Source Analysis

     Age       Soil (ug Pb/g)     House Dust (ug Pb/g)
     0-1          1240.0            878.0
     1-2          1240.0            878.0
     2-3          1240.0            878.0
     3-4          1240.0            878.0
     4-5          1240.0            878.0
     5-6          1240.0            878.0
     6-7          1240.0            878.0

   Additional Dust Sources:  None   DEFAULT
   Soil contribution conversion factor: 0.70
   Air  contribution conversion factor: 100.0

PAINT Intake:  0.00 ug Pb/day    DEFAULT

MATERNAL CONTRIBUTION:  Infant Model
   Maternal Blood Conc:  2.50  ug Pb/dL
```

**Exposure to Lead (1,240 mg/kg –multi-source analysis)**
**Area A-3: Upper Ferry Creek – Residential Properties on Housatonic Avenue**
**Frequent Child Recreational User**
**September 1999**

CALCULATED BLOOD Pb and Pb UPTAKES:

| YEAR | Blood Level (ug/dL) | Total Uptake (ug/day) | Soil+Dust Uptake (ug/day) |
|---|---|---|---|
| 0.5-1: | 11.9 | 22.75 | 20.31 |
| 1-2: | 13.7 | 33.86 | 30.97 |
| 2-3: | 12.9 | 35.41 | 32.08 |
| 3-4: | 12.5 | 36.53 | 33.17 |
| 4-5: | 10.5 | 29.94 | 26.40 |
| 5-6: | 8.9 | 28.30 | 24.44 |
| 6-7: | 7.9 | 27.65 | 23.42 |

| YEAR | Diet Uptake (ug/day) | Water Uptake (ug/day) | Paint Uptake (ug/day) | Air Uptake (ug/day) |
|---|---|---|---|---|
| 0.5-1: | 2.12 | 0.31 | 0.00 | 0.02 |
| 1-2: | 2.12 | 0.73 | 0.00 | 0.03 |
| 2-3: | 2.47 | 0.79 | 0.00 | 0.06 |
| 3-4: | 2.45 | 0.83 | 0.00 | 0.07 |
| 4-5: | 2.54 | 0.93 | 0.00 | 0.07 |
| 5-6: | 2.76 | 1.01 | 0.00 | 0.09 |
| 6-7: | 3.09 | 1.04 | 0.00 | 0.09 |



Cutoff: 10.0 ug/dL
% Above: 58.29
% Below: 41.71
G. Mean: 11.5
Probability Density
Function f(blood Pb)
0
10
20
30
40
50
60
BLOOD LEAD CONCENTRATION (ug/dL)
0 to 72 Months


LEAD 0.99d

# Lead Hotspots

TABLE 2
HOTSPOT STATISTICS

| Receptor | Fraction | Parameter | Cas | Units | Detects | Count | Average | W | WL | WTest | Distribution | UCL_N | UCL_L | MaxOfDetects | EPC (RME/CTE)[1] | EPCStat[2] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| a1scmhs | M | LEAD | 7439921 | MG/KG | 10 | 10 | 6700 | -1 | -1 | -1 | < 11 Samples | -1 | -1 | 24700 | 24700/6700 | Max/arith mean |
| a1scmhs | PESTP | AROCLOR, TOTAL | AROCLORTOT | UG/KG | 5 | 5 | 85000 | -1 | -1 | -1 | < 11 Samples | -1 | -1 | 410000 | 410000/85000 | Max/arith mean |
| a1sfrhs | M | LEAD | 7439921 | MG/KG | 28 | 29 | 1420 | 0.522 | 0.951 | 0.926 | Lognormal | 2280 | 2750 | 11900 | 1420 | Arith mean |
| a1sfrhs | PESTP | AROCLOR, TOTAL | AROCLORTOT | UG/KG | 8 | 9 | 3200 | -1 | -1 | -1 | < 11 Samples | -1 | -1 | 19000 | 19000/3200 | Max/arith mean |
| a1strhs | M | LEAD | 7439921 | MG/KG | 11 | 11 | 2160 | 0.767 | 0.872 | 0.85 | Lognormal | 3580 | 11500 | 7330 | 7330/2160 | Max/arith mean |
| a1strhs | PESTP | AROCLOR, TOTAL | AROCLORTOT | UG/KG | 6 | 6 | 3400 | -1 | -1 | -1 | < 11 Samples | -1 | -1 | 12000 | 12000/3400 | Max/arith mean |
| a2scmhs | M | LEAD | 7439921 | MG/KG | 23 | 24 | 2100 | 0.829 | 0.945 | 0.916 | Lognormal | 2830 | 6240 | 6550 | 2100 | Arith mean |
| a2scmhs | PESTP | AROCLOR, TOTAL | AROCLORTOT | UG/KG | 6 | 6 | 15000 | -1 | -1 | -1 | < 11 Samples | -1 | -1 | 48000 | 48000/15000 | Max/arith mean |

1: RME - Reasonable maximum exposure; CTE - Central tendency exposure
2: Only one statistic presented if the EPC for the RME and CTE is the same.

**Area A-1**

## Calculations of 95th Percentile Fetal Blood Lead Concentrations for Adult Exposure to Soil

**SITE NAME: AREA A-1: UPPER FERRY CREEK - MORGAN FRANCIS PROPERTY**
**LOCATION: FERRY CREEK, STRATFORD, CONNECTICUT**
**RECEPTOR: COMMERCIAL/INDUSTRIAL WORKER - SURFACE SOILS - REASONABLE MAXIMUM EXPOSURES**
**DATE: SEPTEMBER 13, 1999**

OBJECTIVE: Adult exposure to lead in soil is addressed by an evaluation of the relationship between the site soil lead concentration and the blood lead concentration in the developing fetuses of adult women. This spreadsheet calculates a range of 95th percentile fetal blood lead concentrations from central estimates of blood lead concentrations in pregnant adult women using the exposure parameters identified below (U.S. EPA, Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil. December 1996)

RELEVANT EQUATIONS: $PbB_{adult,\,central} = PbB_{adult,\,0} + (PbS \times BKSF \times IR_s \times AF_s \times EF_s)/AT$

and

$$PbB_{fetal,\,0.95} = PbB_{adult,\,central} \times GSD_{i,\,adult}^{1.645} \times R_{fetal/maternal}$$

| Exposure Parameter | Description (units) | $GSD_i$ = 1.8 - 2.1; $PbB_{adult,0}$ = 1.7 - 2.2 | | | |
|---|---|---|---|---|---|
| | | Adult 1 | Adult 2 | Adult 3 | Adult 4 |
| $PbB_{adult,\,0}$ | Typical blood lead concentration in adult women of child-bearing age in absence of site exposures (ug/dL) | 1.7 | 1.7 | 2.2 | 2.2 |
| PbS | Site-specific soil lead concentration (mg/kg) [1] | 24700 | 24700 | 24700 | 24700 |
| BKSF | Biokinetic slope factor (ug/dL per ug/day)) | 0.4 | 0.4 | 0.4 | 0.4 |
| $IR_s$ | Intake rate of soil, includes outdoor soil and indoor soil-derived dust (g/day) | 0.100 | 0.100 | 0.100 | 0.100 |
| $AF_s$ | Absolute gastrointestinal absorption fraction (unitless) | 0.12 | 0.12 | 0.12 | 0.12 |
| $EF_s$ | Exposure frequency (days/year) | 90 | 90 | 90 | 90 |
| AT | Averaging time (days/year) | 365 | 365 | 365 | 365 |
| $GSD_{i,\,adult}$ | Estimate of individual geometric standard deviation among adults (unitless) | 1.8 | 2.1 | 1.8 | 2.1 |
| $R_{fetal/maternal}$ | Constant of proportionality between fetal blood lead concentraiton at birth and maternal blood lead concentration (unitless) | 0.9 | 0.9 | 0.9 | 0.9 |
| $PbB_{adult,\,central}$ | Calculated central estimate of blood lead concentrations in adult women of child-bearing age from site exposures (ug/dL) | [illegible] | 30.93 | 31.43 | 31.43 |
| $PbB_{fetal,\,0.95}$ | Calculated 95th percentile blood lead concentrations among fetuses born to women having site exposures (ug/dL) | 73.22 | 94.35 | 74.40 | 95.87 |

Note: According to the cited guidance document, this adult exposure model is not applicable for infrequent site exposures, where the EFs is less than 1 day/week.
[1] The maximum detected concentration is the exposure point concentration.

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## Calculations of 95th Percentile Fetal Blood Lead Concentrations for Adult Exposure to Soil

**SITE NAME: AREA A-1: UPPER FERRY CREEK - MORGAN FRANCIS PROPERTY**
**LOCATION: FERRY CREEK, STRATFORD, CONNECTICUT**
**RECEPTOR: COMMERCIAL/INDUSTRIAL WORKER - SURFACE SOILS - CENTRAL TENDENCY EXPOSURES**
**DATE: SEPTEMBER 13, 1999**

OBJECTIVE: Adult exposure to lead in soil is addressed by an evaluation of the relationship between the site soil lead concentration and the blood lead concentration in the developing fetuses of adult women. This spreadsheet calculates a range of 95th percentile fetal blood lead concentrations from central estimates of blood lead concentrations in pregnant adult women using the exposure parameters identified below (U.S. EPA, Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil, December 1996).

RELEVANT EQUATIONS: $PbB_{adult,\ central} = PbB_{adult,\ 0} + (PbS \times BKSF \times IR_s \times AF_s \times EF_s)/AT$

and

$PbB_{fetal,\ 0.95} = PbB_{adult,\ central} \times GSD_{i,\ adult}^{1.645} \times R_{fetal/maternal}$

| Exposure Parameter | Description (units) | GSD$_i$ = 1.8 - 2.1; PbB$_{adult,\ 0}$ = 1.7 - 2.2 | | | |
|---|---|---|---|---|---|
| | | **Adult 1** | **Adult 2** | **Adult 3** | **Adult 4** |
| $PbB_{adult,\ 0}$ | Typical blood lead concentration in adult women of child-bearing age in absence of site exposures (ug/dL) | 1.7 | 1.7 | 2.2 | 2.2 |
| PbS | Site-specific soil lead concentration (mg/kg) [1] | 6700 | 6700 | 6700 | 6700 |
| BKSF | Biokinetic slope factor (ug/dL per ug/day)) | 0.4 | 0.4 | 0.4 | 0.4 |
| $IR_s$ | Intake rate of soil, includes outdoor soil and indoor soil-derived dust (g/day) | 0.050 | 0.050 | 0.050 | 0.050 |
| $AF_s$ | Absolute gastrointestinal absorption fraction (unitless) | 0.12 | 0.12 | 0.12 | 0.12 |
| $EF_s$ | Exposure frequency (days/year) | 90 | 90 | 90 | 90 |
| AT | Averaging time (days/year) | 365 | 365 | 365 | 365 |
| $GSD_{i,\ adult}$ | Estimate of individual geometric standard deviation among adults (unitless) | 1.8 | 2.1 | 1.8 | 2.1 |
| $R_{fetal/maternal}$ | Constant of proportionality between fetal blood lead concentraiton at birth and maternal blood lead concentration (unitless) | 0.9 | 0.9 | 0.9 | 0.9 |
| PbB [illegible] | Calculated central estimate of blood lead concentrations in adult women of child-bearing age from site exposures (ug/dL) | [illegible] | 5.66 | 6.16 | 6.16 |
| PbB [illegible] | Calculated 95th percentile blood lead concentrations among fetuses born to women having site exposures (ug/dL) | [illegible] | 17.28 | 14.59 | 18.80 |

Note: According to the cited guidance document, this adult exposure model is not applicable for infrequent site exposures, where the EFs is less than 1 day/wee.

[1] The arithmetic mean concentration is the exposure point concentration

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## Calculations of 95th Percentile Fetal Blood Lead Concentrations for Adult Exposure to Soil

**SITE NAME:** AREA A-1: UPPER FERRY CREEK - MORGAN FRANCIS PROPERTY
**LOCATION:** FERRY CREEK, STRATFORD, CONNECTICUT
**RECEPTOR:** FREQUENT RECREATIONAL USER - REASONABLE MAXIMUM EXPOSURES
**DATE:** SEPTEMBER 13, 1999

OBJECTIVE: Adult exposure to lead in soil is addressed by an evaluation of the relationship between the site soil lead concentration and the blood lead concentration in the developing fetuses of adult women. This spreadsheet calculates a range of 95th percentile fetal blood lead concentrations from central estimates of blood lead concentrations in pregnant adult women using the exposure parameters identified below (U.S. EPA, Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil, December 1996).

RELEVANT EQUATIONS: $PbB_{adult,\ central} = PbB_{adult,\ 0} + (PbS \times BKSF \times IR_s \times AF_s \times EF_s)/AT$

and

$PbB_{fetal,\ 0.95} = PbB_{adult,\ central} \times GSD_{i,\ adult}^{1.645} \times R_{fetal/maternal}$

| Exposure Parameter | Description (units) | $GSD_i$ = 1.8 - 2.1; $PbB_{adult,\ 0}$ = 1.7 - 2.2 | | | |
|---|---|---|---|---|---|
| | | Adult 1 | Adult 2 | Adult 3 | Adult 4 |
| $PbB_{adult,\ 0}$ | Typical blood lead concentration in adult women of child-bearing age in absence of site exposures (ug/dL) | 1.7 | 1.7 | 2.2 | 2.2 |
| PbS | Site-specific soil lead concentration (mg/kg) [1] | 1420 | 1420 | 1420 | 1420 |
| BKSF | Biokinetic slope factor (ug/dL per ug/day)) | 0.4 | 0.4 | 0.4 | 0.4 |
| $IR_s$ | Intake rate of soil, includes outdoor soil and indoor soil-derived dust (g/day) | 0.100 | 0.100 | 0.100 | 0.100 |
| $AF_s$ | Absolute gastrointestinal absorption fraction (unitless) | 0.12 | 0.12 | 0.12 | 0.12 |
| $EF_s$ | Exposure frequency (days/year) | 90 | 90 | 90 | 90 |
| AT | Averaging time (days/year) | 365 | 365 | 365 | 365 |
| $GSD_{i,\ adult}$ | Estimate of individual geometric standard deviation among adults (unitless) | 1.8 | 2.1 | 1.8 | 2.1 |
| $R_{fetal/maternal}$ | Constant of proportionality between fetal blood lead concentraiton at birth and maternal blood lead concentration (unitless) | 0.9 | 0.9 | 0.9 | 0.9 |
| PbB [illegible] | Calculated central estimate of blood lead concentrations in adult [illegible] child-bearing age from site exposures (ug/dL) | [illegible] | [illegible] | [illegible] | [illegible] |
| PbB [illegible] | Calculated 95th percentile blood lead concentrations among fetuses born to [illegible] women having site exposures (ug/dL) | [illegible] | [illegible] | [illegible] | [illegible] |

Note. According to the cited guidance document, this adult exposure model is not applicable for infrequent site exposures, where the EFs is less than 1 day/week.

[1] The arithmetic mean concentration is the exposure point concentration.

## Calculations of 95th Percentile Fetal Blood Lead Concentrations for Adult Exposure to Soil

**SITE NAME: AREA A-1: UPPER FERRY CREEK - MORGAN FRANCIS PROPERTY**
**LOCATION: FERRY CREEK, STRATFORD, CONNECTICUT**
**RECEPTOR: FREQUENT RECREATIONAL USER -CENTRAL TENDENCY EXPOSURES**
**DATE: SEPTEMBER 13, 1999**

OBJECTIVE: Adult exposure to lead in soil is addressed by an evaluation of the relationship between the site soil lead concentration and the blood lead concentration in the developing fetuses of adult women. This spreadsheet calculates a range of 95th percentile fetal blood lead concentrations from central estimates of blood lead concentrations in pregnant adult women using the exposure parameters identified below (U.S. EPA, Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil, December 1996).

RELEVANT EQUATIONS: $PbB_{adult,\ central} = PbB_{adult,\ 0} + (PbS \times BKSF \times IR_s \times AF_s \times EF_s)/AT$

and

$$PbB_{fetal,\ 0.95} = PbB_{adult,\ central} \times GSD_{i,\ adult}^{1.645} \times R_{fetal/maternal}$$

| Exposure Parameter | Description (units) | GSD$_i$ = 1.8 - 2.1; PbB$_{adult,\ 0}$ = 1.7 - 2.2 | | | |
|---|---|---|---|---|---|
| | | Adult 1 | Adult 2 | Adult 3 | Adult 4 |
| $PbB_{adult,\ 0}$ | Typical blood lead concentration in adult women of child-bearing age in absence of site exposures (ug/dL) | 1.7 | 1.7 | 2.2 | 2.2 |
| PbS | Site-specific soil lead concentration (mg/kg) [1] | 1420 | 1420 | 1420 | 1420 ✓ |
| BKSF | Biokinetic slope factor (ug/dL per ug/day)) | 0.4 | 0.4 | 0.4 | 0.4 |
| $IR_s$ | Intake rate of soil, includes outdoor soil and indoor soil-derived dust (g/day) | 0.050 | 0.050 | 0.050 | 0.050 |
| $AF_s$ | Absolute gastrointestinal absorption fraction (unitless) | 0.12 | 0.12 | 0.12 | 0.12 |
| $EF_s$ | Exposure frequency (days/year) | 90 | 90 | 90 | 90 ✓ |
| AT | Averaging time (days/year) | 365 | 365 | 365 | 365 |
| $GSD_{i,\ adult}$ | Estimate of individual geometric standard deviation among adults (unitless) | 1.8 | 2.1 | 1.8 | 2.1 |
| $R_{fetal/maternal}$ | Constant of proportionality between fetal blood lead concentraiton at birth and maternal blood lead concentration (unitless) | 0.9 | 0.9 | 0.9 | 0.9 |
| [illegible] | Calculated central estimate of blood lead concentrations in adult women of child-bearing age from site exposures (ug/dL) | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | Calculated 95th percentile blood lead concentration among fetuses born to women having site exposures (ug/dL) | [illegible] | [illegible] | [illegible] | [illegible] |

Note: According to the cited guidance document, this adult exposure model is not applicable for infrequent site exposures, where the EFs is less than 1 day/week.

[1] The arithmetic mean concentration is the exposure point concentration. ✓

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## Calculations of 95th Percentile Fetal Blood Lead Concentrations for Adult Exposure to Soil

**SITE NAME: AREA A-1: UPPER FERRY CREEK - MORGAN FRANCIS PROPERTY**
**LOCATION: FERRY CREEK, STRATFORD, CONNECTICUT**
**RECEPTOR: ADOLESCENT TRESPASSER - REASONABLE MAXIMUM EXPOSURES**
**DATE: SEPTEMBER 13, 1999**

OBJECTIVE: Adult exposure to lead in soil is addressed by an evaluation of the relationship between the site soil lead concentration and the blood lead concentration in the developing fetuses of adult women. This spreadsheet calculates a range of 95th percentile fetal blood lead concentrations from central estimates of blood lead concentrations in pregnant adult women using the exposure parameters identified below (U.S. EPA, Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil, December 1996).

RELEVANT EQUATIONS: $PbB_{adult\ central} = PbB_{adult,0} + (PbS \times BKSF \times IR_s \times AF_s \times EF_s)/AT$

and

$PbB_{fetal,0.95} = PbB_{adult,central} \times GSD_{i,adult}^{1.645} \times R_{fetal/maternal}$

| Exposure Parameter | Description (units) | $GSD_i$ = 1.8 - 2.1; $PbB_{adult,0}$ = 1.7 - 2.2 | | | |
|---|---|---|---|---|---|
| | | Adult 1 | Adult 2 | Adult 3 | Adult 4 |
| $PbB_{adult,0}$ | Typical blood lead concentration in adult women of child-bearing age in absence of site exposures (ug/dL) | 1.7 | 1.7 | 2.2 | 2.2 |
| PbS | Site-specific soil lead concentration (mg/kg) [1] | 7330 | 7330 | 7330 | 7330 |
| BKSF | Biokinetic slope factor (ug/dL per ug/day)) | 0.4 | 0.4 | 0.4 | 0.4 |
| $IR_s$ | Intake rate of soil, includes outdoor soil and indoor soil-derived dust (g/day) | 0.100 | 0.100 | 0.100 | 0.100 |
| $AF_s$ | Absolute gastrointestinal absorption fraction (unitless) | 0.12 | 0.12 | 0.12 | 0.12 |
| $EF_s$ | Exposure frequency (days/year) | 52 | 52 | 52 | 52 |
| AT | Averaging time (days/year) | 365 | 365 | 365 | 365 |
| $GSD_{i,adult}$ | Estimate of individual geometric standard deviation among adults (unitless) | 1.8 | 2.1 | 1.8 | 2.1 |
| $R_{fetal/maternal}$ | Constant of proportionality between fetal blood lead concentraiton at birth and maternal blood lead concentration (unitless) | 0.9 | 0.9 | 0.9 | 0.9 |
| $PbB_{adult,central}$ | Calculated central estimate of blood lead concentrations in adult women of child-bearing age from site exposures (ug/dL) | [illegible] | [illegible] | 7.21 | [illegible] |
| $PbB_{fetal,0.95}$ | Calculated 95th percentile blood lead concentration among fetuses born to women having site exposures (ug/dL) | [illegible] | 20.47 | 17.07 | 22.00 |

Note: According to the cited guidance document, this adult exposure model is not applicable for infrequent site exposures, where the EFs is less than 1 day/week.
[1] The maximum detected concentration is the exposure point concentration.

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## Calculations of 95th Percentile Fetal Blood Lead Concentrations for Adult Exposure to Soil

**SITE NAME: AREA A-1: UPPER FERRY CREEK - MORGAN FRANCIS PROPERTY**
**LOCATION: FERRY CREEK, STRATFORD, CONNECTICUT**
**RECEPTOR: ADOLESCENT TRESPASSER - CENTRAL TENDENCY EXPOSURES** ✓
**DATE: SEPTEMBER 13, 1999**

OBJECTIVE: Adult exposure to lead in soil is addressed by an evaluation of the relationship between the site soil lead concentration and the blood lead concentration in the developing fetuses of adult women. This spreadsheet calculates a range of 95th percentile fetal blood lead concentrations from central estimates of blood lead concentrations in pregnant adult women using the exposure parameters identified below (U.S. EPA, Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil, December 1996).

RELEVANT EQUATIONS: $PbB_{adult,\ central} = PbB_{adult,\ 0} + (PbS \times BKSF \times IR_s \times AF_s \times EF_s)/AT$

and

$$PbB_{fetal,\ 0.95} = PbB_{adult,\ central} \times GSD_{i,\ adult}^{1.645} \times R_{fetal/maternal}$$

| Exposure Parameter | Description (units) | $GSD_i$ = 1.8 - 2.1; $PbB_{adult,0}$ = 1.7 - 2.2 | | | |
|---|---|---|---|---|---|
| | | Adult 1 | Adult 2 | Adult 3 | Adult 4 |
| $PbB_{adult,\ 0}$ | Typical blood lead concentration in adult women of child-bearing age in absence of site exposures (ug/dL) | 1.7 | 1.7 | 2.2 | 2.2 |
| PbS | Site-specific soil lead concentration (mg/kg) [1] | 2160 | 2160 | 2160 | 2160 |
| BKSF | Biokinetic slope factor (ug/dL per ug/day)) | 0.4 | 0.4 | 0.4 | 0.4 |
| $IR_s$ | Intake rate of soil, includes outdoor soil and indoor soil-derived dust (g/day) | 0.050 | 0.050 | 0.050 | 0.050 |
| $AF_s$ | Absolute gastrointestinal absorption fraction (unitless) | 0.12 | 0.12 | 0.12 | 0.12 |
| $EF_s$ | Exposure frequency (days/year) | 52 | 52 | 52 | 52 |
| AT | Averaging time (days/year) | 365 | 365 | 365 | 365 |
| $GSD_{i,\ adult}$ | Estimate of individual geometric standard deviation among adults (unitless) | 1.8 | 2.1 | 1.8 | 2.1 |
| $R_{fetal/maternal}$ | Constant of proportionality between fetal blood lead concentraiton at birth and maternal blood lead concentration (unitless) | 0.9 | 0.9 | 0.9 | 0.9 |
| $PbB_{adult,\ central}$ | Calculated central estimate of blood lead concentrations in adult women of child-bearing age from site exposures (ug/dL) | [illegible] | [illegible] | [illegible] | 2.94 |
| $PbB_{fetal,\ 0.95}$ | Calculated 95th percentile blood lead concentrations among fetuses born to women having site exposures (ug/dL) | [illegible] | 7.44 | 6.96 | 8.96 |

Note: According to the cited guidance document, this adult exposure model is not applicable for infrequent site exposures, where the EFs is less than 1 day/week.

[1] The arithmetic mean concentration is the exposure point concentration. ✓

**Exposure to Lead (1,420 mg/kg – multi-source analysis)**
**Area A-1: Upper Ferry Creek – Morgan Francis Property**
**Frequent Child Recreational User**
**September 1999**

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.100 ug Pb/m3 DEFAULT
Indoor AIR Pb Conc: 30.0 percent of outdoor.
Other AIR Parameters:

| Age | Time Outdoors (hr) | Vent. Rate (m3/day) | Lung Abs. (%) |
|---|---|---|---|
| 0-1 | 1.0 | 2.0 | 32.0 |
| 1-2 | 2.0 | 3.0 | 32.0 |
| 2-3 | 3.0 | 5.0 | 32.0 |
| 3-4 | 4.0 | 5.0 | 32.0 |
| 4-5 | 4.0 | 5.0 | 32.0 |
| 5-6 | 4.0 | 7.0 | 32.0 |
| 6-7 | 4.0 | 7.0 | 32.0 |

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT
WATER Consumption: DEFAULT

SOIL & DUST:
Soil: constant conc.
Dust: Multiple Source Analysis

| Age | Soil (ug Pb/g) | House Dust (ug Pb/g) |
|---|---|---|
| 0-1 | 1420.0 | 1004.0 |
| 1-2 | 1420.0 | 1004.0 |
| 2-3 | 1420.0 | 1004.0 |
| 3-4 | 1420.0 | 1004.0 |
| 4-5 | 1420.0 | 1004.0 |
| 5-6 | 1420.0 | 1004.0 |
| 6-7 | 1420.0 | 1004.0 |

Additional Dust Sources: None DEFAULT
Soil contribution conversion factor: 0.70
Air contribution conversion factor: 100.0

PAINT Intake: 0.00 ug Pb/day DEFAULT

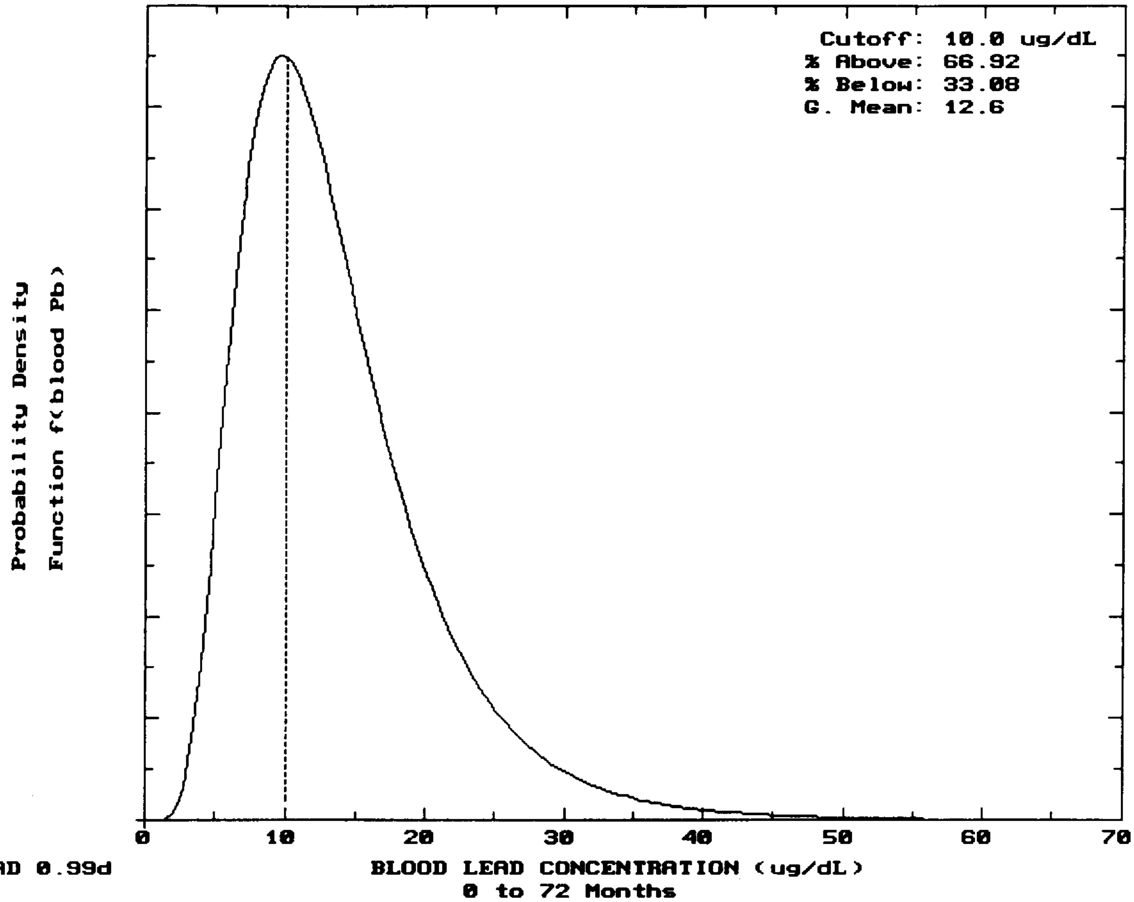
MATERNAL CONTRIBUTION: Infant Model
Maternal Blood Conc: 2.50 ug Pb/dL

**Exposure to Lead (1,420 mg/kg – multi-source analysis)**
**Area A-1: Upper Ferry Creek – Morgan Francis Property**
**Frequent Child Recreational User**
**September 1999**

CALCULATED BLOOD Pb and Pb UPTAKES:

| YEAR | Blood Level (ug/dL) | Total Uptake (ug/day) | Soil+Dust Uptake (ug/day) |
|---|---|---|---|
| 0.5-1: | 13.0 | 24.99 | 22.61 |
| 1-2: | 14.9 | 37.16 | 34.35 |
| 2-3: | 14.1 | 38.93 | 35.70 |
| 3-4: | 13.7 | 40.28 | 37.00 |
| 4-5: | 11.6 | 33.14 | 29.66 |
| 5-6: | 9.8 | 31.34 | 27.53 |
| 6-7: | 8.7 | 30.61 | 26.44 |

| YEAR | Diet Uptake (ug/day) | Water Uptake (ug/day) | Paint Uptake (ug/day) | Air Uptake (ug/day) |
|---|---|---|---|---|
| 0.5-1: | 2.06 | 0.30 | 0.00 | 0.02 |
| 1-2: | 2.06 | 0.71 | 0.00 | 0.03 |
| 2-3: | 2.40 | 0.77 | 0.00 | 0.06 |
| 3-4: | 2.39 | 0.81 | 0.00 | 0.07 |
| 4-5: | 2.49 | 0.91 | 0.00 | 0.07 |
| 5-6: | 2.71 | 0.99 | 0.00 | 0.09 |
| 6-7: | 3.05 | 1.03 | 0.00 | 0.09 |


Cutoff: 10.0 ug/dL
% Above: 66.92
% Below: 33.08
G. Mean: 12.6
Probability Density
Function f(blood Pb)
0
10
20
30
40
50
60
70
BLOOD LEAD CONCENTRATION (ug/dL)
0 to 72 Months

LEAD 0.99d

## Area A-2

## Calculations of 95th Percentile Fetal Blood Lead Concentrations for Adult Exposure to Soil

**SITE NAME: AREA A-2: UPPER FERRY CREEK - SPADA PROPERTY**
**LOCATION: FERRY CREEK, STRATFORD, CONNECTICUT**
**RECEPTOR: COMMERCIAL/INDUSTRIAL WORKER - SURFACE SOILS - REASONABLE MAXIMUM EXPOSURES**
**DATE: SEPTEMBER 13, 1999**

OBJECTIVE: Adult exposure to lead in soil is addressed by an evaluation of the relationship between the site soil lead concentration and the blood lead concentration in the developing fetuses of adult women. This spreadsheet calculates a range of 95th percentile fetal blood lead concentrations from central estimates of blood lead concentrations in pregnant adult women using the exposure parameters identified below (U S EPA, Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil. December 1996)

RELEVANT EQUATIONS. $PbB_{adult,\ central} = PbB_{adult,\ 0} + (PbS \times BKSF \times IR_s \times AF_s \times EF_s)/AT$

and

$PbB_{fetal,\ 0.95} = PbB_{adult\ central} \times GSD_{i,\ adult}^{1.645} \times R_{fetal/maternal}$

| Exposure Parameter | Description (units) | GSD$_i$ = 1.8 - 2.1; PbB$_{adult,\ 0}$ = 1.7 - 2.2 | | | |
|---|---|---|---|---|---|
| | | Adult 1 | Adult 2 | Adult 3 | Adult 4 |
| $PbB_{adult\ 0}$ | Typical blood lead concentration in adult women of child-bearing age in absence of site exposures (ug/dL) | 1.7 | 1.7 | 2.2 | 2.2 |
| PbS | Site-specific soil lead concentration (mg/kg) [1] | 2100 | 2100 | 2100 | 2100 |
| BKSF | Biokinetic slope factor (ug/dL per ug/day)) | 0.4 | 0.4 | 0.4 | 0.4 |
| $IR_s$ | Intake rate of soil, includes outdoor soil and indoor soil-derived dust (g/day) | 0.100 | 0.100 | 0.100 | 0.100 |
| $AF_s$ | Absolute gastrointestinal absorption fraction (unitless) | 0.12 | 0.12 | 0.12 | 0.12 |
| $EF_s$ | Exposure frequency (days/year) | 90 | 90 | 90 | 90 |
| AT | Averaging time (days/year) | 365 | 365 | 365 | 365 |
| $GSD_{i,\ adult}$ | Estimate of individual geometric standard deviation among adults (unitless) | 1.8 | 2.1 | 1.8 | 2.1 |
| $R_{fetal/maternal}$ | Constant of proportionality between fetal blood lead concentraiton at birth and maternal blood lead concentration (unitless) | 0.9 | 0.9 | 0.9 | 0.9 |
| $PbB_{adult,\ central}$ | Calculated central estimate of blood lead concentrations in adult women of child-bearing age from site exposures (ug/dL) | [illegible] | 4.19 | 4.69 | 4.69 |
| $PbB_{fetal,\ 0.95}$ | Calculated 95th percentile blood lead concentrations among fetuses born to women having site exposures (ug/dL) | 9.91 | 12.77 | 11.09 | 14.29 |

Note: According to the cited guidance document, this adult exposure model is not applicable for infrequent site exposures, where the EFs is less than 1 day/week.
[1] The arithmetic mean concentration is the exposure point concentration.

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## Calculations of 95th Percentile Fetal Blood Lead Concentrations for Adult Exposure to Soil

**SITE NAME: AREA A-2: UPPER FERRY CREEK - SPADA PROPERTY**
**LOCATION: FERRY CREEK, STRATFORD, CONNECTICUT**
**RECEPTOR: COMMERCIAL/INDUSTRIAL WORKER - SURFACE SOILS - CENTRAL TENDENCY EXPOSURES**
**DATE: SEPTEMBER 13, 1999**

OBJECTIVE: Adult exposure to lead in soil is addressed by an evaluation of the relationship between the site soil lead concentration and the blood lead concentration in the developing fetuses of adult women. This spreadsheet calculates a range of 95th percentile fetal blood lead concentrations from central estimates of blood lead concentrations in pregnant adult women using the exposure parameters identified below (U.S. EPA, Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil, December 1996)

RELEVANT EQUATIONS: $PbB_{adult,\ central} = PbB_{adult,\ 0} + (PbS \times BKSF \times IR_s \times AF_s \times EF_s)/AT$

and

$$PbB_{fetal,\ 0.95} = PbB_{adult,\ central} \times GSD_{i,\ adult}^{1.645} \times R_{fetal/maternal}$$

| Exposure Parameter | Description (units) | $GSD_i$ = 1.8 - 2.1; $PbB_{adult,\ 0}$ = 1.7 - 2.2 | | | |
|---|---|---|---|---|---|
| | | Adult 1 | Adult 2 | Adult 3 | Adult 4 |
| $PbB_{adult,\ 0}$ | Typical blood lead concentration in adult women of child-bearing age in absence of site exposures (ug/dL) | 1.7 | 1.7 | 2.2 | 2.2 |
| PbS | Site-specific soil lead concentration (mg/kg) [1] | 2100 | 2100 | 2100 | 2100 |
| BKSF | Biokinetic slope factor (ug/dL per ug/day)) | 0.4 | 0.4 | 0.4 | 0.4 |
| $IR_s$ | Intake rate of soil, includes outdoor soil and indoor soil-derived dust (g/day) | 0.050 | 0.050 | 0.050 | 0.050 |
| $AF_s$ | Absolute gastrointestinal absorption fraction (unitless) | 0.12 | 0.12 | 0.12 | 0.12 |
| $EF_s$ | Exposure frequency (days/year) | 90 | 90 | 90 | 90 |
| AT | Averaging time (days/year) | 365 | 365 | 365 | 365 |
| $GSD_{i,\ adult}$ | Estimate of individual geometric standard deviation among adults (unitless) | 1.8 | 2.1 | 1.8 | 2.1 |
| $R_{fetal/maternal}$ | Constant of proportionality between fetal blood lead concentraiton at birth and maternal blood lead concentration (unitless) | 0.9 | 0.9 | 0.9 | 0.9 |
| $PbB_{adult,\ central}$ | Calculated central estimate of blood lead concentrations in adult women of child-bearing age from site exposures (ug/dL) | 2.94 | 2.94 | 3.44 | 3.44 |
| $PbB_{fetal,\ 0.95}$ | Calculated 95th percentile blood lead concentrations among fetuses born to women having site exposures (ug/dL) | 6.95 | 8.98 | 8.15 | 10.50 |

Note: According to the cited guidance document, this adult exposure model is not applicable for infrequent site exposures, where the EFs is less than 1 day/week.
[1] The arithmetic mean concentration is the exposure point concentration.

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# Appendix F.13

## PCB Congeners

## Table F.13.1
## PCB CONGENER AND TOXICITY EQUIVALENT CONCENTRATIONS
## FERRY CREEK, STRATFORD, CT
## PAGE 1 OF 2

| PCB Congeners | TEF | Area A1 Sediment CONC.(ug/kg) | Area A1 Sediment TEQ | Area A3 Sediment CONC.(ug/kg) | Area A3 Sediment TEQ | Area A3 Sediment CONC.(ug/kg) | Area A3 Sediment TEQ |
|---|---|---|---|---|---|---|---|
| **Dioxin-like** | | OU3-A1-SD03-0002 | | OU3-A3-SD05-0002 | | OU3-A3-SD05-0204 | |
| 2',3,4,4',5-Pentachlorobiphenyl (123) | 0.0001 | 8.59 | 0.000859 | 43.4 | 0.00434 | 0.81 | 0.000081 |
| 2,3',4,4',5,5'-Hexachlorbiphenyl (167) | 0.00001 | 0.958 | 9.58E-06 | 4.95 | 4.95E-05 | 0.0266 | 2.66E-07 |
| 2,3'4,4',5-Pentachlorobiphenyl (118) | 0.0001 | 0.2935 | 2.935E-05 | 5.47 | 0.000547 | 0.1165 | 1.165E-05 |
| 2,3,3',4,4',5'-Hexachlorobiphenyl (157) | 0.0005 | 4.16 | 0.00208 | 8.87 | 0.004435 | 0.03665 | 1.833E-05 |
| 2,3,3',4,4',5,5'-Heptachlorobiphenyl (189) | 0.0001 | 2.15 | 0.000215 | R | R | R | R |
| 2,3,3',4,4',5-Hexachlorobiphenyl (156) | 0.0005 | 2.81 | 0.001405 | 42.2 | 0.0211 | 0.02535 | 1.268E-05 |
| 2,3,3',4,4'-Pentachlorobiphenyl (105) | 0.0001 | 2.12 | 0.000212 | 0.00715 | 7.15E-07 | 0.105 | 0.0000105 |
| 2,3,4,4',5-Pentachlorbiphenyl (114) | 0.0005 | 26 | 0.013 | 108 | 0.054 | 0.565 | 0.0002825 |
| 3,3',4,4',5,5'-Hexachlorobiphenyl (169) | 0.01 | 0.131 | 0.00131 | 0.64 | 0.0064 | 0.0136 | 0.000136 |
| 3,3'4,4',5-Pentachlorobiphenyl (126) | 0.1 | 0.119 | 0.0119 | R | R | 0.0329 | 0.00329 |
| 3,3'4,4'-Tetrachlorobiphenyl (77) | 0.0001 | 0.826 | 0.0000826 | 8.01 | 0.000801 | 0.0615 | 6.15E-06 |
| **Total Dioxin-like TEQ** | | | **0.031** | | **0.092** | | **0.0038** |
| **Total Dioxin-like Concentration** | | **48.16** | | **221.55** | | **1.79** | |

**Total PCB Congeners**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Decachlorobiphenyl | | 45.9 | | 382 | | 0.0057 | |
| Total Dichlorobiphenyls | | 6.87 | | 93.5 | | 0.444 | |
| Total Heptachlorobiphenyls | | 746 | | 6890 | | 1.575 | |
| Total Hexachlorobiphenyls | | 302 | | 1770 | | 0.396 | |
| Total Monochlorobiphenyls | | 0.223 | | 4.92 | | 0.0229 | |
| Total Nonachlorobiphenyls | | 64.5 | | 554 | | 0.69 | |
| Total Octachlorobiphenyls | | 805 | | 6270 | | 2.15 | |
| Total Pentachlorobiphenyls | | 239 | | 995 | | 0.1385 | |
| Total Tetrachlorobiphenyls | | 191 | | 662 | | 1.16 | |
| Total Trichlorobiphenyls | | 80.9 | | 404 | | 1.97 | |
| **Total PCB Concentration** | | **2481.39** | | **18025.42** | | **8.55** | |

**Calculation of Non Dioxin-like Concentrations**

Non Dioxin-like concentrations represent the difference between the Total PCB concentrations and the concentrations of the dioxin-like congeners. The Non Dioxin-like concentrations are calculated as follows:

| | | | |
|---|---|---|---|
| **Total PCB Concentration** | 2481.39 | 18025.42 | 8.55 |
| **Total Dioxin-like Concentration** | 48.16 | 221.55 | 1.79 |
| **Total Non Dioxin-like Concentration** | **2433.23** | **17803.87** | **6.76** |

**RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL**

**SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES**
**LOCATION: FERRY CREEK, STRATFORD, CT**
**EXPOSURE SCENARIO: COMMERCIAL WORKER - RME**
**MEDIA: SEDIMENT SAMPLE (PCB CONGENER DATA ONLY)**
**DATE: SEPTEMBER 22, 1999**

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INCIDENTAL INGESTION OF SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION:

$$\text{Intake} = \frac{Cs \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$$

| | | | |
|---|---|---|---|
| WHERE: | Cs =: | | Concentration in soil (mg/kg) |
| | IR =: | 100 | Soil Ingestion Rate (mg/day) |
| | CF =: | 1.0E-06 | Conversion Factor (kg/mg) |
| | FI =: | 1 | Fraction from contaminated source (unitless) |
| | EF =: | 250 | Exposure Frequency (days/year) |
| | ED =: | 25 | Exposure Duration (years) |
| | BW =: | 70 | Body Weight (kg) |
| | ATc =: | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn =: | 9,125 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose
Lifetime Chronic Daily Intake = : 3.5E-07 kg-soil/kg-wt/day
Chronic Daily Intake = : 9.8E-07 kg-soil/kg-wt/day

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - RME
MEDIA: SEDIMENT SAMPLE (PCB CONGENER DATA ONLY)
DATE: SEPTEMBER 22, 1999

| CHEMICAL | Cs (mg/kg) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| Total TEQ - Dioxin-like Congeners | 0.000031 | 1.1E-11 | 3.0E-11 | 1.50E+05 | NA | 1.6E-06 | 49.2% | NA | NA |
| Total - Nondioxin-like Congeners | 2.4 | 8.4E-07 | 2.3E-06 | 2.00E+00 | NA | 1.7E-06 | 50.8% | NA | NA |
| | | | | | **Total** | **3.3E-06** | **100.0%** | **NA** | **NA** |

**RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL**

**SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES**
**LOCATION: FERRY CREEK, STRATFORD, CT**
**EXPOSURE SCENARIO: COMMERCIAL WORKER - RME**
**MEDIA: SEDIMENT SAMPLE (PCB CONGENER DATA ONLY)**
**DATE: SEPTEMBER 22, 1999**

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION:

$$\text{AbsorbedDose} = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

Where:

| | | | |
|---|---|---|---|
| Cs = : | | Concentration in soil (mg/kg) |
| CF = : | 1.0E-06 | Conversion factor (kg/mg) |
| SA = : | 2,500 | Skin surface available for contact ($cm^2$/event) |
| AF = : | 0.2 | Soil to skin adherence factor ($mg/cm^2$) |
| ABS = : | | Absorption factor (unitless) |
| EF = : | 250 | Exposure frequency (events/year) |
| ED = : | 25 | Exposure duration (years) |
| BW = : | 70 | Body weight (kg) |
| ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| ATn = : | 9,125 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose
Lifetime Chronic Daily Intake = : 1.7E-06 kg-soil/kg-wt/day
Chronic Daily Intake = : 4.9E-06 kg-soil/kg-wt/day

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - RME
MEDIA: SEDIMENT SAMPLE (PCB CONGENER DATA ONLY)
DATE: SEPTEMBER 22, 1999

| CHEMICAL | Cs (mg/kg) | ABS (unitless) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|
| Total TEQ - Dioxin-like Congeners | 0.000031 | 0.03 | 1.62E-12 | 4.55E-12 | 1.50E+05 | NA | 2.4E-07 | 17.2% | NA | NA |
| Total - Nondioxin-like Congeners | 2.4 | 0.14 | 5.87E-07 | 1.64E-06 | 2.00E+00 | NA | 1.2E-06 | 82.8% | NA | NA |
| | | | | | | **Total** | **1.4E-06** | **100.0%** | **NA** | **NA** |

RISK ASSESSMENT SPREADSHEET - SUMMARY

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: COMMERCIAL WORKER - RME
MEDIA: SEDIMENT SAMPLE (PCB CONGENER DATA ONLY)
DATE: SEPTEMBER 22, 1999

| | Lifetime Cancer Risk | | | | | Hazard Index | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | Incidental Ingestion | Dermal Contact | Inhalation | Total Risk | Percent Risk | Incidental Ingestion | Dermal Contact | Inhalation | Total HI | Percent HI |
| Total TEQ - Dioxin-like Congeners | 1.6E-06 | 2.4E-07 | NA | 1.9E-06 | 39.6% | NA | NA | NA | NA | NA |
| Total - Nondioxin-like Congeners | 1.7E-06 | 1.2E-06 | NA | 2.9E-06 | 60.4% | NA | NA | NA | NA | NA |
| **Total** | **3.3E-06** | **1.4E-06** | **NA** | **4.7E-06** | **100.0%** | **NA** | **NA** | **NA** | **NA** | **NA** |

**RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL**

**SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES**
**LOCATION: FERRY CREEK, STRATFORD, CT**
**EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT - RME**
**MEDIA: SEDIMENT SAMPLES (PCB CONGENER DATA ONLY)**
**DATE: SEPTEMBER 22, 1999**

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INCIDENTAL INGESTION OF SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION:

$$\text{Intake} = \frac{Cs \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$$

WHERE:

| | | |
|---|---|---|
| Cs =: | | Concentration in soil (mg/kg) |
| IR =: | 100 | Soil Ingestion Rate (mg/day) |
| CF =: | 1.0E-06 | Conversion Factor (kg/mg) |
| FI =: | 1 | *Fraction from contaminated source (unitless)* |
| EF =: | 150 | Exposure Frequency (days/year) |
| ED =: | 24 | Exposure Duration (years) |
| BW =: | 70 | Body Weight (kg) |
| ATc =: | 25,550 | Averaging time for carcinogenic exposures (days) |
| ATn =: | 8,760 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | | |
|---|---|---|
| Lifetime Chronic Daily Intake =: | 2.0E-07 | kg-soil/kg-wt/day |
| Chronic Daily Intake =: | 5.9E-07 | kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT - RME
MEDIA: SEDIMENT SAMPLES (PCB CONGENER DATA ONLY)
DATE: SEPTEMBER 22, 1999

| CHEMICAL | Cs (mg/kg) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| Total TEQ - Dioxin-like Congeners | 0.000031 | 6.2E-12 | 1.8E-11 | 1.50E+05 | NA | 9.4E-07 | 49.2% | NA | NA |
| Total - Nondioxin-like Congeners | 2.4 | 4.8E-07 | 1.4E-06 | 2.00E+00 | NA | 9.7E-07 | 50.8% | NA | NA |
| | | | | | **Total** | **1.9E-06** | **100.0%** | **NA** | **NA** |

**RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL**

**SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES**
**LOCATION: FERRY CREEK, STRATFORD, CT**
**EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT - RME**
**MEDIA: SEDIMENT SAMPLES (PCB CONGENER DATA ONLY)**
**DATE: SEPTEMBER 22, 1999**

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION:

$$\text{Absorbed Dose} = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

| | | | |
|---|---|---|---|
| Where: | Cs = : | | Concentration in soil (mg/kg) |
| | CF = : | 1.0E-06 | Conversion factor (kg/mg) |
| | SA = : | 5,700 | Skin surface available for contact ($cm^2$/event) |
| | AF = : | 0.07 | Soil to skin adherence factor ($mg/cm^2$) |
| | ABS = : | | Absorption factor (unitless) |
| | EF = : | 150 | Exposure frequency (events/year) |
| | ED = : | 24 | Exposure duration (years) |
| | BW = : | 70 | Body weight (kg) |
| | ATc = : | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn = : | 8,760 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose

| | | |
|---|---|---|
| Lifetime Chronic Daily Intake = : | 8.0E-07 | kg-soil/kg-wt/day |
| Chronic Daily Intake = : | 2.3E-06 | kg-soil/kg-wt/day |

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT - RME
MEDIA: SEDIMENT SAMPLES (PCB CONGENER DATA ONLY)
DATE: SEPTEMBER 22, 1999

| CHEMICAL | Cs (mg/kg) | ABS (unitless) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|
| Total TEQ - Dioxin-like Congeners | 0.000031 | 0.03 | 7.47E-13 | 2.18E-12 | 1.50E+05 | NA | 1.1E-07 | 17.2% | NA | NA |
| Total - Nondioxin-like Congeners | 2.4 | 0.14 | 2.70E-07 | 7.87E-07 | 2.00E+00 | NA | 5.4E-07 | 82.8% | NA | NA |
| | | | | | | **Total** | **6.5E-07** | **100.0%** | **NA** | **NA** |

RISK ASSESSMENT SPREADSHEET - SUMMARY

SITE NAME: AREA A-1, MORGAN FRANCIS PROPERTIES
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT - RME
MEDIA: SEDIMENT SAMPLES (PCB CONGENER DATA ONLY)
DATE: SEPTEMBER 22, 1999

| | Lifetime Cancer Risk | | | | | Hazard Index | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | Incidental Ingestion | Dermal Contact | Inhalation | Total Risk | Percent Risk | Incidental Ingestion | Dermal Contact | Inhalation | Total HI | Percent HI |
| Total TEQ - Dioxin-like Congeners | 9.4E-07 | 1.1E-07 | NA | 1.0E-06 | 41.0% | NA | NA | NA | NA | NA |
| Total - Nondioxin-like Congeners | 9.7E-07 | 5.4E-07 | NA | 1.5E-06 | 59.0% | NA | NA | NA | NA | NA |
| **Total** | **1.9E-06** | **6.5E-07** | **NA** | **2.6E-06** | **100.0%** | **NA** | **NA** | **NA** | **NA** | **NA** |

**RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL**

**SITE NAME: AREA A-3, RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE**
**LOCATION: FERRY CREEK, STRATFORD, CT**
**EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT - RME**
**MEDIA: SEDIMENT SAMPLES (PCB CONGENER DATA ONLY)**
**DATE: SEPTEMBER 22, 1999**

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH INCIDENTAL INGESTION OF SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION: $$\text{Intake} = \frac{Cs \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$$

| WHERE: | | | |
|---|---|---|---|
| | Cs =: | | Concentration in soil (mg/kg) |
| | IR =: | 100 | Soil Ingestion Rate (mg/day) |
| | CF =: | 1.0E-06 | Conversion Factor (kg/mg) |
| | FI =: | 1 | Fraction from contaminated source (unitless) |
| | EF =: | 90 | Exposure Frequency (days/year) |
| | ED =: | 24 | Exposure Duration (years) |
| | BW =: | 70 | Body Weight (kg) |
| | ATc =: | 25,550 | Averaging time for carcinogenic exposures (days) |
| | ATn =: | 8,760 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose
Lifetime Chronic Daily Intake = : 1.2E-07 kg-soil/kg-wt/day
Chronic Daily Intake = : 3.5E-07 kg-soil/kg-wt/day

RISK ASSESSMENT SPREADSHEET - INCIDENTAL INGESTION OF SOIL (PAGE TWO)

SITE NAME: AREA A-3, RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT - RME
MEDIA: SEDIMENT SAMPLES (PCB CONGENER DATA ONLY)
DATE: SEPTEMBER 22, 1999

| CHEMICAL | Cs (mg/kg) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|
| Total TEQ - Dioxin-like Congeners | 0.000092 | 1.1E-11 | 3.2E-11 | 1.50E+05 | NA | 1.7E-06 | 27.9% | NA | NA |
| Total - Nondioxin-like Congeners | 17.8 | 2.1E-06 | 6.3E-06 | 2.00E+00 | NA | 4.3E-06 | 72.1% | NA | NA |
| | | | | | **Total** | **6.0E-06** | **100.0%** | **NA** | **NA** |

**RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL**

**SITE NAME: AREA A-3, RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE**
**LOCATION: FERRY CREEK, STRATFORD, CT**
**EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT - RME**
**MEDIA: SEDIMENT SAMPLES (PCB CONGENER DATA ONLY)**
**DATE: SEPTEMBER 22, 1999**

HAZARD INDICES AND INCREMENTAL CANCER RISKS ARE CALCULATED BY THIS SPREADSHEET.
EXPOSURES THROUGH DERMAL CONTACT WITH SOIL ARE CONSIDERED.
ASSUMPTIONS ARE OUTLINED BELOW.

RELEVANT EQUATION:

$$\text{Absorbed Dose} = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

Where:

| | | | |
|---|---|---|---|
| Cs = : | | Concentration in soil (mg/kg) |
| CF = : | 1.0E-06 | Conversion factor (kg/mg) |
| SA = : | 5,700 | Skin surface available for contact ($cm^2$/event) |
| AF = : | 0.3 | Soil to skin adherence factor ($mg/cm^2$) |
| ABS = : | | Absorption factor (unitless) |
| EF = : | 90 | Exposure frequency (events/year) |
| ED = : | 24 | Exposure duration (years) |
| BW = : | 70 | Body weight (kg) |
| ATc = : | 25,550 | *Averaging time for carcinogenic exposures (days)* |
| ATn = : | 8,760 | Averaging time for noncarcinogenic exposures (days) |

Unit Dose
Lifetime Chronic Daily Intake = : 2.1E-06 kg-soil/kg-wt/day
Chronic Daily Intake = : 6.0E-06 kg-soil/kg-wt/day

RISK ASSESSMENT SPREADSHEET - DIRECT DERMAL CONTACT WITH SOIL (PAGE TWO)

SITE NAME: AREA A-3, RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT - RME
MEDIA: SEDIMENT SAMPLES (PCB CONGENER DATA ONLY)
DATE: SEPTEMBER 22, 1999

| CHEMICAL | Cs (mg/kg) | ABS (unitless) | Lifetime Chronic Daily Intake (mg/kg/day) | Chronic Daily Intake (mg/kg/day) | Cancer Slope Factor $(mg/kg/day)^{-1}$ | Reference Dose (mg/kg/day) | Lifetime Cancer Risk | Percent Cancer Risk | Hazard Quotient | Percent Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|
| Total TEQ - Dioxin-like Congene | 0.000092 | 0.001 | 1.90E-13 | 5.54E-13 | 1.50E+05 | NA | 2.8E-08 | 0.3% | NA | NA |
| Total - Nondioxin-like Congeners | 17.8 | 0.14 | 5.15E-06 | 1.50E-05 | 2.00E+00 | NA | 1.0E-05 | 99.7% | NA | NA |
| | | | | | | **Total** | **1.0E-05** | **100.0%** | **NA** | **NA** |

RISK ASSESSMENT SPREADSHEET - SUMMARY

SITE NAME: AREA A-3, RESIDENTIAL PROPERTIES ON HOUSATONIC AVENUE
LOCATION: FERRY CREEK, STRATFORD, CT
EXPOSURE SCENARIO: FREQUENT RECREATIONAL USER - ADULT - RME
MEDIA: SEDIMENT SAMPLES (PCB CONGENER DATA ONLY)
DATE: SEPTEMBER 22, 1999

| | Lifetime Cancer Risk | | | | | Hazard Index | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Chemical** | **Incidental Ingestion** | **Dermal Contact** | **Inhalation** | **Total Risk** | **Percent Risk** | **Incidental Ingestion** | **Dermal Contact** | **Inhalation** | **Total HI** | **Percent HI** |
| Total TEQ - Dioxin-like Congeners | 1.7E-06 | 2.8E-08 | NA | 1.7E-06 | 10.4% | NA | NA | NA | NA | NA |
| Total - Nondioxin-like Congeners | 4.3E-06 | 1.0E-05 | NA | 1.5E-05 | 89.6% | NA | NA | NA | NA | NA |
| **Total** | **6.0E-06** | **1.0E-05** | **NA** | **1.6E-05** | **100.0%** | **NA** | **NA** | **NA** | **NA** | **NA** |