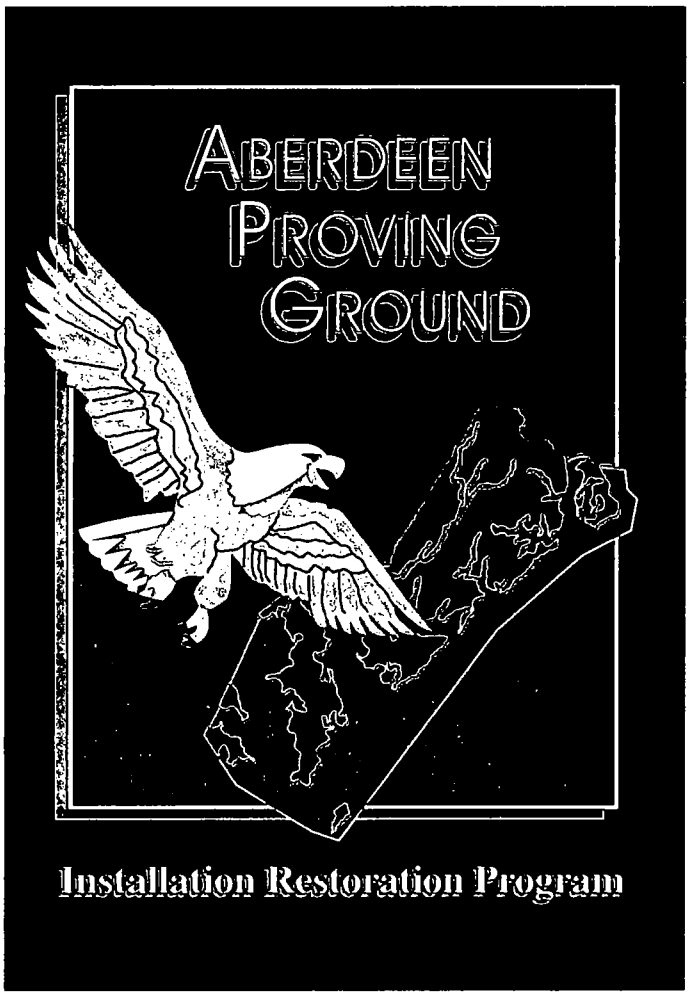
SDMS DocID 2138811

ORIGINAL



OTHER EDGEWOOD AREAS

BASELINE HUMAN HEALTH RISK ASSESSMENT FOR THE MAXWELL POINT INVESTIGATION AREA

Final
August 2009

U.S. Army Garrison
Aberdeen Proving Ground, Maryland

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ATTACHMENT 1

to the
Response to Comments for
"Baseline Human Health Risk Assessment for the Maxwell Point Investigation Area"
Draft, November 2008

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
MAXWELL POINT INVESTIGATION AREA
GROUNDWATER EVALUATION

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Maxwell Point Investigation Area

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		Reasonable Maximum Exposure		Carcinogenic Risk Results
							Medium EPC Value	Medium EPC Statistic	Revised Medium EPC Value	Revised Medium EPC Statistic	
VOLATILE ORGANIC COMPOUNDS											
1,1,2,2-Tetrachloroethane	ug/L	4.13E+02	2.88E+02	1.20E+03	J	ug/L	2.88E+02	95 UCLM-KMt	1.20E+03	UCL>Maximum	8.10E-06
1,1,2-Trichloroethane	ug/L	1.00E+01	8.80E+00	3.75E+01	/	ug/L	8.80E+00	95 UCLM-KMt	2.32E+01	95 UCLM-C	1.20E-07
1,2-Dichloroethane	ug/L	9.70E+00	6.94E+00	3.60E+01	J	ug/L	6.94E+00	95 UCLM-KMt	1.28E+01	95 UCLM-KMp	1.40E-07
1,2-Dichloroethene	ug/L	5.85E+01	3.71E+01	1.60E+02		ug/L	3.71E+01	95 UCLM-KMt	1.01E+02	95 UCLM-KMt	
Benzene	ug/L	4.84E+02	3.45E+02	2.15E+03	E/L	ug/L	3.45E+02	95 UCLM-KMt	1.74E+03	95 UCLM-G	3.10E-05
Chloroform	ug/L	1.92E+01	1.31E+01	4.80E+01	/	ug/L	1.31E+01	95 UCLM-KMt	2.81E+01	95 UCLM-KMp	1.10E-06
Tetrachloroethene	ug/L	5.82E+00	6.86E+00	1.10E+01	/	ug/L	6.86E+00	95 UCLM-KMt	8.12E+00	95 UCLM-KMt	3.00E-08
Trichloroethene	ug/L	5.73E+01	3.79E+01	1.70E+02	J	ug/L	3.79E+01	95 UCLM-KMt	1.45E+02	95 UCLM-C	9.90E-07
Vinyl chloride	ug/L	5.79E+00	6.71E+00	7.60E+00	J	ug/L	6.71E+00	95 UCLM-KMt	7.28E+00	95 UCLM-KMt	4.90E-07
										Cumulative Carcinogenic Risk =	**4.20E-05**

Notes:

Statistics calculated by the USEPA program ProUCL 4.0. ProUCL outputs are presented in Appendix X.

95 UCLM-C indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Chebyshev test.

95 UCLM-KMp indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Kaplan-Meier (KM) percentile boostrap test.

95 UCLM-KMt indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Kaplan-Meier (KM) student's t-test.

Low %Detects indicates low percentage of detects.

UCL>Maximum indicates that the recommended 95 UCL exceeds the maximum detected value, therefore the maximum detected value is used.

Definitions:

95 UCLM = 95 percent upper confidence limit of the mean
EPC = exposure point concentration
NA = not applicable
mg/kg = milligrams per kilogram
USEPA = United States Environmental Protection Agency

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\Projects\APG\OEA\Maxwell Point\Final\GW input.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_1122PCE

General Statistics

Number of Valid Observations 12

Number of Distinct Observations 11

Raw Statistics

Minimum	16
Maximum	1200
Mean	607.9
Median	600
SD	503.6
Coefficient of Variation	0.828
Skewness	-0.0542

Log-transformed Statistics

Minimum of Log Data	2.773
Maximum of Log Data	7.09
Mean of log Data	5.607
SD of log Data	1.708

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.828
Shapiro Wilk Critical Value	0.859

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.8
Shapiro Wilk Critical Value	0.859

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	869

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	844.6
95% Modified-t UCL	868.6

Assuming Lognormal Distribution

95% H-UCL	10924
95% Chebyshev (MVUE) UCL	3110
97.5% Chebyshev (MVUE) UCL	4055
99% Chebyshev (MVUE) UCL	5910

Gamma Distribution Test

k star (bias corrected)	0.615
Theta Star	988.4
nu star	14.76
Approximate Chi Square Value (.05)	7.096
Adjusted Level of Significance	0.029
Adjusted Chi Square Value	6.301
Anderson-Darling Test Statistic	0.94
Anderson-Darling 5% Critical Value	0.766
Kolmogorov-Smirnov Test Statistic	0.236
Kolmogorov-Smirnov 5% Critical Value	0.255

Data follow Appr. Gamma Distribution at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	1265
95% Adjusted Gamma UCL	1424

Data Distribution

Data Follow Appr. Gamma Distribution at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	847
95% Jackknife UCL	869
95% Standard Bootstrap UCL	838.5
95% Bootstrap-t UCL	862.1
95% Hall's Bootstrap UCL	815.9
95% Percentile Bootstrap UCL	834.1
95% BCA Bootstrap UCL	834.1
95% Chebyshev(Mean, Sd) UCL	1242
97.5% Chebyshev(Mean, Sd) UCL	1516
99% Chebyshev(Mean, Sd) UCL	2054

Potential UCL to Use

Use 95% Approximate Gamma UCL 1265

Recommended UCL exceeds the maximum observation

GW_112TCA

General Statistics

Number of Valid Data	12	Number of Detected Data	11
Number of Distinct Detected Data	10	Number of Non-Detect Data	1
		Percent Non-Detects	8.33%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.7	Minimum Detected	0.531
Maximum Detected	37.5	Maximum Detected	3.624
Mean of Detected	11.5	Mean of Detected	2.11
SD of Detected	9.841	SD of Detected	0.925
Minimum Non-Detect	10	Minimum Non-Detect	2.303
Maximum Non-Detect	10	Maximum Non-Detect	2.303

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.802	Shapiro Wilk Test Statistic	0.915
5% Shapiro Wilk Critical Value	0.85	5% Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	10.96	Mean	2.068
SD	9.569	SD	0.893
95% DL/2 (t) UCL	15.92	95% H-Stat (DL/2) UCL	24.58
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	5.964	Mean in Log Scale	2.06
SD	14.1	SD in Log Scale	0.898
95% MLE (t) UCL	13.27	Mean in Original Scale	10.92
95% MLE (Tiku) UCL	16.13	SD in Original Scale	9.596
		95% Percentile Bootstrap UCL	15.77
		95% BCA Bootstrap UCL	17.29

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.26
Theta Star	9.133
nu star	27.71

A-D Test Statistic	0.346
5% A-D Critical Value	0.741
K-S Test Statistic	0.741
5% K-S Critical Value	0.259

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data

Minimum	1.7
Maximum	37.5
Mean	11.09
Median	9.425
SD	9.49
k star	1.356
Theta star	8.185
Nu star	32.53
AppChi2	20.5
95% Gamma Approximate UCL	17.61
95% Adjusted Gamma UCL	18.95

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	11.03
SD	9.167
SE of Mean	2.792
95% KM (t) UCL	16.05
95% KM (z) UCL	15.63
95% KM (jackknife) UCL	16.04
95% KM (bootstrap t) UCL	19.13
95% KM (BCA) UCL	16.13
95% KM (Percentile Bootstrap) UCL	15.89
95% KM (Chebyshev) UCL	23.2
97.5% KM (Chebyshev) UCL	28.47
99% KM (Chebyshev) UCL	38.82

Potential UCLs to Use

95% KM (Chebyshev) UCL	23.2

GW_12DCA

General Statistics

Number of Valid Data	12	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	7
		Percent Non-Detects	58.33%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	4.3	Minimum Detected	1.459
Maximum Detected	36	Maximum Detected	3.584
Mean of Detected	11.24	Mean of Detected	2.006
SD of Detected	13.86	SD of Detected	0.891
Minimum Non-Detect	10	Minimum Non-Detect	2.303
Maximum Non-Detect	10	Maximum Non-Detect	2.303

Warning: There are only 5 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.595	Shapiro Wilk Test Statistic	0.68
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	7.6	Mean	1.775
SD	8.953	SD	0.575
95% DL/2 (t) UCL	12.24	95% H-Stat (DL/2) UCL	9.369
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	1.829
		SD in Log Scale	0.698
		Mean in Original Scale	8.337
		SD in Original Scale	9.089
		95% Percentile Bootstrap UCL	13.09
		95% BCA Bootstrap UCL	15.94

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.674
Theta Star	16.69
nu star	6.736
A-D Test Statistic	1.044
5% A-D Critical Value	0.688
K-S Test Statistic	0.688
5% K-S Critical Value	0.362

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data

Minimum	1E-09
Maximum	36
Mean	10.27
Median	6.418
SD	9.751
k star	0.299
Theta star	34.3
Nu star	7.187
AppChi2	2.274
95% Gamma Approximate UCL	32.46
95% Adjusted Gamma UCL	39.35

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	7.629
SD	8.577
SE of Mean	2.781
95% KM (t) UCL	12.62
95% KM (z) UCL	12.2
95% KM (jackknife) UCL	12.31
95% KM (bootstrap t) UCL	60.57
95% KM (BCA) UCL	12.99
95% KM (Percentile Bootstrap) UCL	12.75
95% KM (Chebyshev) UCL	19.75
97.5% KM (Chebyshev) UCL	25
99% KM (Chebyshev) UCL	35.3

Potential UCLs to Use

95% KM (t) UCL	12.62
95% KM (% Bootstrap) UCL	12.75

GW_12DCE

General Statistics

Number of Valid Data	12	Number of Detected Data	11
Number of Distinct Detected Data	11	Number of Non-Detect Data	1
		Percent Non-Detects	8.33%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	13	Minimum Detected	2.565
Maximum Detected	160	Maximum Detected	5.075
Mean of Detected	79.77	Mean of Detected	4.16
SD of Detected	49.45	SD of Detected	0.755
Minimum Non-Detect	10	Minimum Non-Detect	2.303
Maximum Non-Detect	10	Maximum Non-Detect	2.303

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.917	Shapiro Wilk Test Statistic	0.928
5% Shapiro Wilk Critical Value	0.85	5% Shapiro Wilk Critical Value	0.85
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	73.54	Mean	3.947
SD	51.85	SD	1.03
95% DL/2 (t) UCL	100.4	95% H-Stat (DL/2) UCL	164.3
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	71.79	Mean in Log Scale	4.011
SD	52.72	SD in Log Scale	0.886
95% MLE (t) UCL	99.13	Mean in Original Scale	74.02
95% MLE (Tiku) UCL	98.92	SD in Original Scale	51.19
		95% Percentile Bootstrap UCL	97.64
		95% BCA Bootstrap UCL	99.06

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.83
Theta Star	43.6
nu star	40.25
A-D Test Statistic	0.317
5% A-D Critical Value	0.737
K-S Test Statistic	0.737
5% K-S Critical Value	0.258

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data

Minimum	1E-09
Maximum	160
Mean	73.13
Median	59.5
SD	52.47
k star	0.289
Theta star	253.3
Nu star	6.928
AppChi2	2.131
95% Gamma Approximate UCL	237.7
95% Adjusted Gamma UCL	289.6

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	74.21
SD	48.77
SE of Mean	14.76
95% KM (t) UCL	100.7
95% KM (z) UCL	98.49
95% KM (jackknife) UCL	100.2
95% KM (bootstrap t) UCL	103.5
95% KM (BCA) UCL	100.2
95% KM (Percentile Bootstrap) UCL	98.46
95% KM (Chebyshev) UCL	138.6
97.5% KM (Chebyshev) UCL	166.4
99% KM (Chebyshev) UCL	221.1

Potential UCLs to Use

95% KM (t) UCL	100.7
95% KM (Percentile Bootstrap) UCL	98.46

GW_Benzene

General Statistics

Number of Valid Observations	12	Number of Distinct Observations	11

Raw Statistics

Minimum	5.2
Maximum	2150
Mean	719.2
Median	430
SD	762.8
Coefficient of Variation	1.061
Skewness	0.625

Log-transformed Statistics

Minimum of Log Data	1.649
Maximum of Log Data	7.673
Mean of log Data	5.389
SD of log Data	2.096

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.844
Shapiro Wilk Critical Value	0.859

Data not Normal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	1115

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	1124
95% Modified-t UCL	1121

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.878
Shapiro Wilk Critical Value	0.859

Data appear Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL	51660
95% Chebyshev (MVUE) UCL	4977
97.5% Chebyshev (MVUE) UCL	6570
99% Chebyshev (MVUE) UCL	9698

Gamma Distribution Test

k star (bias corrected)	0.453
Theta Star	1589
nu star	10.86
Approximate Chi Square Value (.05)	4.487
Adjusted Level of Significance	0.029
Adjusted Chi Square Value	3.881
Anderson-Darling Test Statistic	0.573
Anderson-Darling 5% Critical Value	0.783
Kolmogorov-Smirnov Test Statistic	0.197
Kolmogorov-Smirnov 5% Critical Value	0.258

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	1741
95% Adjusted Gamma UCL	2013

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	1081
95% Jackknife UCL	1115
95% Standard Bootstrap UCL	1060
95% Bootstrap-t UCL	1164
95% Hall's Bootstrap UCL	1073
95% Percentile Bootstrap UCL	1074
95% BCA Bootstrap UCL	1107
95% Chebyshev(Mean, Sd) UCL	1679
97.5% Chebyshev(Mean, Sd) UCL	2094
99% Chebyshev(Mean, Sd) UCL	2910

Potential UCL to Use

Use 95% Approximate Gamma UCL 1741

GW_Chloroform

General Statistics

Number of Valid Data	12	Number of Detected Data	8
Number of Distinct Detected Data	8	Number of Non-Detect Data	4
		Percent Non-Detects	33.33%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	8.5	Minimum Detected	2.14
Maximum Detected	48	Maximum Detected	3.871
Mean of Detected	25.63	Mean of Detected	3.067
SD of Detected	15.78	SD of Detected	0.646
Minimum Non-Detect	10	Minimum Non-Detect	2.303
Maximum Non-Detect	10	Maximum Non-Detect	2.303

Warning: There are only 8 Detected Values in this data

Note: *It should be noted that even though bootstrap may be performed on this data set*

the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.86	*Shapiro Wilk Test Statistic*	0.917
5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	18.75	Mean	2.581
SD	16.17	SD	0.883
95% DL/2 (t) UCL	27.13	95% H-Stat (DL/2) UCL	24.82
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	14.03	Mean in Log Scale	2.683
SD	21.33	SD in Log Scale	0.789
95% MLE (t) UCL	25.08	Mean in Original Scale	19.45
95% MLE (Tiku) UCL	26.64	SD in Original Scale	15.59
		95% Percentile Bootstrap UCL	26.83
		95% BCA Bootstrap UCL	27.79

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.949
Theta Star	13.15
nu star	31.18
A-D Test Statistic	0.44
5% A-D Critical Value	0.722
K-S Test Statistic	0.722
5% K-S Critical Value	0.296

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data

Minimum	3.863
Maximum	48
Mean	22.41
Median	18.16
SD	14.4
k star	1.926
Theta star	11.64
Nu star	46.22
AppChi2	31.62
95% Gamma Approximate UCL	32.75
95% Adjusted Gamma UCL	34.77

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	19.92
SD	14.5
SE of Mean	4.476
95% KM (t) UCL	27.96
95% KM (z) UCL	27.28
95% KM (jackknife) UCL	27.3
95% KM (bootstrap t) UCL	29.57
95% KM (BCA) UCL	29.5
95% KM (Percentile Bootstrap) UCL	28.13
95% KM (Chebyshev) UCL	39.43
97.5% KM (Chebyshev) UCL	47.87
99% KM (Chebyshev) UCL	64.45

Potential UCLs to Use

95% KM (t) UCL	27.96
95% KM (Percentile Bootstrap) UCL	28.13

GW_PCE

General Statistics

Number of Valid Data	12	Number of Detected Data	7
Number of Distinct Detected Data	7	Number of Non-Detect Data	5
		Percent Non-Detects	41.67%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	2.5	Minimum Detected	0.916
Maximum Detected	11	Maximum Detected	2.398
Mean of Detected	6.914	Mean of Detected	1.852
SD of Detected	2.642	SD of Detected	0.471
Minimum Non-Detect	10	Minimum Non-Detect	2.303
Maximum Non-Detect	10	Maximum Non-Detect	2.303

Warning: There are only 7 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.959	Shapiro Wilk Test Statistic	0.874
5% Shapiro Wilk Critical Value	0.803	5% Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	6.117	Mean	1.751
SD	2.186	SD	0.37
95% DL/2 (t) UCL	7.25	95% H-Stat (DL/2) UCL	8.685
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	1.804
		SD in Log Scale	0.397
		Mean in Original Scale	6.483
		SD in Original Scale	2.275
		95% Percentile Bootstrap UCL	7.505
		95% BCA Bootstrap UCL	7.52

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	3.709
Theta Star	1.864
nu star	51.93

A-D Test Statistic	0.405
5% A-D Critical Value	0.709
K-S Test Statistic	0.709
5% K-S Critical Value	0.313

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data

Minimum	2.5
Maximum	11
Mean	6.975
Median	7.331
SD	1.996
k star	7.833
Theta star	0.89
Nu star	188
AppChi2	157.3
95% Gamma Approximate UCL	8.337
95% Adjusted Gamma UCL	8.571

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	6.631
SD	2.272
SE of Mean	0.883
95% KM (t) UCL	8.216
95% KM (z) UCL	8.082
95% KM (jackknife) UCL	8.274
95% KM (bootstrap t) UCL	8.031
95% KM (BCA) UCL	7.95
95% KM (Percentile Bootstrap) UCL	7.963
95% KM (Chebyshev) UCL	10.48
97.5% KM (Chebyshev) UCL	12.14
99% KM (Chebyshev) UCL	15.41

Potential UCLs to Use

95% KM (t) UCL	8.216
95% KM (Percentile Bootstrap) UCL	7.963

GW_TCE

General Statistics

Number of Valid Observations	12	Number of Distinct Observations	12

Raw Statistics		Log-transformed Statistics	
Minimum	25	Minimum of Log Data	3.219
Maximum	170	Maximum of Log Data	5.136
Mean	79.08	Mean of log Data	4.136
Median	66	SD of log Data	0.736
SD	52.68		
Coefficient of Variation	0.666		
Skewness	0.411		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.857	Shapiro Wilk Test Statistic	0.853
Shapiro Wilk Critical Value	0.859	Shapiro Wilk Critical Value	0.859
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	106.4	95% H-UCL	141.8
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	157.1
95% Adjusted-CLT UCL	106	97.5% Chebyshev (MVUE) UCL	190.5
95% Modified-t UCL	106.7	99% Chebyshev (MVUE) UCL	256.2

Gamma Distribution Test		Data Distribution
k star (bias corrected)	1.769	**Data do not follow a Discernable Distribution (0.05)**
Theta Star	44.71	
nu star	42.45	
Approximate Chi Square Value (.05)	28.52	**Nonparametric Statistics**
Adjusted Level of Significance	0.029	95% CLT UCL 104.1
Adjusted Chi Square Value	26.78	95% Jackknife UCL 106.4
		95% Standard Bootstrap UCL 103.3
Anderson-Darling Test Statistic	0.846	95% Bootstrap-t UCL 109.1
Anderson-Darling 5% Critical Value	0.741	95% Hall's Bootstrap UCL 102.4
Kolmogorov-Smirnov Test Statistic	0.256	95% Percentile Bootstrap UCL 102.9
Kolmogorov-Smirnov 5% Critical Value	0.248	95% BCA Bootstrap UCL 104.3
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 145.4
		97.5% Chebyshev(Mean, Sd) UCL 174.1
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 230.4
95% Approximate Gamma UCL	117.7	
95% Adjusted Gamma UCL	125.4	

Potential UCL to Use	Use 95% Chebyshev (Mean, Sd) UCL 145.4

GW_VC

General Statistics

Number of Valid Data	12	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	7
		Percent Non-Detects	58.33%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	2.65	Minimum Detected	0.975
Maximum Detected	7.6	Maximum Detected	2.028
Mean of Detected	5.79	Mean of Detected	1.698
SD of Detected	1.861	SD of Detected	0.415
Minimum Non-Detect	10	Minimum Non-Detect	2.303
Maximum Non-Detect	10	Maximum Non-Detect	2.303

Warning: There are only 5 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.84	Shapiro Wilk Test Statistic	0.753
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	5.329	Mean	1.646
SD	1.194	SD	0.254
95% DL/2 (t) UCL	5.948	95% H-Stat (DL/2) UCL	7.925
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	1.698
		SD in Log Scale	0.371
		Mean in Original Scale	5.792
		SD in Original Scale	1.939
		95% Percentile Bootstrap UCL	6.677
		95% BCA Bootstrap UCL	6.685

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	3.649
Theta Star	1.587
nu star	36.49
A-D Test Statistic	0.694
5% A-D Critical Value	0.679
K-S Test Statistic	0.679
5% K-S Critical Value	0.358

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data

Minimum	2.65
Maximum	7.935
Mean	5.768
Median	6.105
SD	1.74
k star	7.192
Theta star	0.802
Nu star	172.6
AppChi2	143.2
95% Gamma Approximate UCL	6.951
95% Adjusted Gamma UCL	7.155

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	5.79
SD	1.664
SE of Mean	0.832
95% KM (t) UCL	7.285
95% KM (z) UCL	7.159
95% KM (jackknife) UCL	7.39
95% KM (bootstrap t) UCL	6.966
95% KM (BCA) UCL	6.883
95% KM (Percentile Bootstrap) UCL	6.925
95% KM (Chebyshev) UCL	9.418
97.5% KM (Chebyshev) UCL	10.99
99% KM (Chebyshev) UCL	14.07

Potential UCLs to Use

95% KM (t) UCL	7.285
95% KM (Percentile Bootstrap) UCL	6.925

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

GW-ADV
Version 2.3; 03/01

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
107062	1.28E+01	1,2-Dichloroethane

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
10	200	418	418			A	SL	SL		

MORE ↓

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.15	1.5	0.43	0.25	1.7	0.34	0.26

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1
				Used to calculate risk-based groundwater concentration.	

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	8.52E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1.4E-07	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

DATA[illegible]Y SHEET

GW-ADV
Version 2.3; 03/01

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [x]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
156592	1.01E+02	cis-1,2-Dichloroethylene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
10	200	418	418			A	SL	SL		

MORE ↓

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.15	1.5	0.43	0.25	1.7	0.34	0.26

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1
				Used to calculate risk-based groundwater concentration.	

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	3.50E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	1.1E-02

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

END

DATA [illegible] SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" [illegible])

GW-ADV
Version 2.3; 03/01

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
79005	2.32E+01	1,1,2-Trichloroethane

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
10	200	418	418			A	SL	SL		

MORE ↓

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.15	1.5	0.43	0.25	1.7	0.34	0.26

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1
				Used to calculate risk-based groundwater concentration.	

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	4.42E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1.2E-07	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

DATA [illegible] SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

GW-ADV
Version 2.3; 03/01

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
79345	1.20E+03	1,1,2,2-Tetrachloroethane

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
10	200	418	418			A	SL	SL		

MORE ↓

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.15	1.5	0.43	0.25	1.7	0.34	0.26

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1
				Used to calculate risk-based groundwater concentration.	

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	2.97E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
8.1E-06	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

DATA [illegible] SHEET

GW-ADV
Version 2.3; 03/01

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
71432	1.20E+03	Benzene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
10	200	418	418			A	SL	SL		

MORE ↓

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.15	1.5	0.43	0.25	1.7	0.34	0.26

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1
				Used to calculate risk-based groundwater concentration.	

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	1.75E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
2.2E-05	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

DATA [illegible] SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

GW-ADV
Version 2.3; 03/01

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
67663	2.81E+01	Chloroform

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
10	200	418	418			A	SL	SL		

MORE ↓

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.15	1.5	0.43	0.25	1.7	0.34	0.26

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1
				Used to calculate risk-based groundwater concentration.	

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	7.92E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1.1E-06	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

GW-ADV
Version 2.3; 03/01

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
127184	8.12E+00	Tetrachloroethylene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
10	200	418	418			A	SL	SL		

MORE ↓

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.15	1.5	0.43	0.25	1.7	0.34	0.26

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

MORE ↓

ENTER Averaging time for *carcinogens*, AT_C (yrs)	ENTER Averaging time for *noncarcinogens*, AT_{NC} (yrs)	ENTER Exposure *duration*, ED (yrs)	ENTER Exposure *frequency*, EF (days/yr)	ENTER Target risk for *carcinogens*, TR (unitless)	ENTER Target hazard quotient for *noncarcinogens*, THQ (unitless)
70	30	30	350	1.0E-06	1
				Used to calculate risk-based groundwater concentration.	

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	2.00E+05	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
3.0E-08	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

GW-ADV
Version 2.3; 03/01

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
79016	1.45E+02	Trichloroethylene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
10	200	418	418			A	SL	SL		

MORE ↓

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.15	1.5	0.43	0.25	1.7	0.34	0.26

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1
				Used to calculate risk-based groundwater concentration.	

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	1.10E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
9.9E-07	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

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DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

GW-ADV
Version 2.3; 03/01

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
75014	7.28E+00	Vinyl chloride (chloroethene)

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
10	200	418	418			A	SL	SL		

MORE ↓

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.15	1.5	0.43	0.25	1.7	0.34	0.26

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1
				Used to calculate risk-based groundwater concentration.	

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	2.76E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
4.9E-07	2.6E-03

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

ATTACHMENT 2

to the
Response to Comments for
"Baseline Human Health Risk Assessment for the Maxwell Point Investigation Area"
Draft, November 2008

DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-REH

MEMORANDUM FOR Environmental Conservation and Restoration (AMSSB-GSH-ER/ Mr. Paul), US Army Garrison, Aberdeen Proving Ground, 2201 Aberdeen Blvd, Aberdeen Proving Ground, MD 21005-5001

SUBJECT: Draft Baseline Human Health Risk Assessments for the Maxwell Point Investigation Area, Other Edgewood Areas, Aberdeen Proving Ground, Maryland, November 2008

1. The US Army Center for Health Promotion and Preventive Medicine reviewed the subject document on behalf of the Office of The Surgeon General pursuant to Army Regulation 200-1 (Environmental Protection and Enhancement). We appreciate the opportunity to review this risk assessment and concur with the conclusions as presented.

2. The review of the above subject document and point of contact is Mr. Keith Hoddinott, Environmental Health Risk Assessment Program, DSN 584-5209 or commercial (410) 436-5209.

FOR THE COMMANDER:

JEFFREY S. KIRKPATRICK
Director, Health Risk Management

CF:
HQDA (DASG-PPM-NC)
IMCOM-NE (IMNE-PWD-E)
USACE (CEHNC-CX-ES)
USAEC (IMAE-CDN)

TABLE OF CONTENTS

LIST OF FIGURES iv
LIST OF TABLES v
LIST OF ACRONYMS AND ABBREVIATIONS xi
EXECUTIVE SUMMARY ES-1

1. PROJECT SCOPE AND INTRODUCTION 1-1
   1.1 Project Background 1-1
   1.2 Project Objectives 1-4
   1.3 Data Included in the HHRA 1-5
   1.4 General HHRA Approach 1-6

2. RISK ASSESSMENT METHODOLOGY 2-1
   2.1 Hazard Assessment 2-2
      2.1.1 Data Quality Evaluation 2-2
      2.1.2 Risk-Based Screening 2-3
      2.1.3 Analytes Exceeding Risk-Based Screening Levels 2-4
      2.1.4 Background Comparison Results 2-4
   2.2 Exposure Assessment 2-5
      2.2.1 Conceptual Site Models 2-5
      2.2.2 Receptors of Concern 2-6
         2.2.2.1 Current Use Receptors 2-6
         2.2.2.2 Future Use Receptors 2-7
      2.2.3 Selection of Exposure Point Concentrations 2-9
      2.2.4 Exposure Intake Equations 2-9
   2.3 Toxicity Assessment 2-10
      2.3.1 Toxicity Assessment for Non-Carcinogens 2-12
      2.3.2 Toxicity Assessment for Carcinogenicity 2-13
      2.3.3 Special Chemicals – Lead 2-14
   2.4 Risk Characterization 2-14
      2.4.1 Hazard Index for Non-Carcinogenic Effects 2-14
      2.4.2 Carcinogenic Risks 2-15
      2.4.3 Lead 2-16

3. MAXWELL POINT INVESTIGATION AREA, BUILDING E7340/7350 TEST SITE RISK ASSESSMENT 3-1
   3.1 Site Description 3-1
   3.2 Samples Included in the HHRA For Maxwell Point Investigation Area – Building E7340/7350 Test Site 3-1
   3.3 Hazard Assessment – Maxwell Point Investigation Area – Building E7340/7350 Test Site 3-1
      3.3.1 Analytes Exceeding Risk-Based Screening Levels 3-1
         3.3.1.1 COPCs in Surface Soil 3-1
         3.3.1.2 COPCs in Total Soil 3-2
         3.3.1.3 COPCs in Sediment 3-2
         3.3.1.4 COPCs in Surface Water 3-2
   3.4 Exposure Assessment – Maxwell Point Investigation Area – Building E7340/7350 Test Site 3-2

3.5 Toxicity Assessment – Maxwell Point Investigation Area – Building E7340/7350 Test Site 3-3
3.6 Risk Characterization – Maxwell Point Investigation Area – Building E7340/7350 Test Site 3-3
3.6.1 Adolescent Trespasser Results 3-3
3.6.2 Maintenance Worker Results 3-4
3.6.3 Commercial Worker Results 3-5
3.6.4 Construction Worker Results 3-5
3.6.5 Resident Adult and Child Results 3-5
3.6.6 Lead Evaluation 3-6
3.6.7 Uncertainty in Background 3-7
3.7 Maxwell Point Investigation Area – Building E7340/7350 Test Site HHRA Conclusions 3-7

4. MAXWELL POINT INVESTIGATION AREA, SMOKE GENERATOR DEBRIS AREA RISK ASSESSMENT 4-1

4.1 Site Description 4-1
4.2 Samples Included in the HHRA For Maxwell Point Investigation Area – Smoke Generator Debris area 4-1
4.3 Hazard Assessment – Maxwell Point Investigation Area – Smoke Generator Debris Area 4-1
4.3.1 Analytes Exceeding Risk-Based Screening Levels 4-1
4.3.1.1 COPCs in Surface Soil 4-1
4.3.1.2 COPCs in Total Soil 4-2
4.3.1.3 COPCs in Sediment 4-2
4.3.1.4 COPCs in Surface Water 4-2
4.4 Exposure Assessment – Maxwell Point Investigation Area – Smoke Generator Debris Area 4-2
4.5 Toxicity Assessment – Maxwell Point Investigation Area – Smoke Generator Debris Area 4-3
4.6 Risk Characterization – Maxwell Point Investigation Area – Smoke Generator Debris Area 4-3
4.6.1 Adolescent Trespasser Results 4-3
4.6.2 Maintenance Worker Results 4-4
4.6.3 Commercial Worker Results 4-5
4.6.4 Construction Worker Results 4-5
4.6.5 Resident Adult and Child Results 4-5
4.6.6 Uncertainty in Background 4-6
4.7 Maxwell Point Investigation Area – Smoke Generator Debris Area HHRA Conclusions 4-7

5. GROUNDWATER RISK ASSESSMENT 5-1

5.1 Groundwater Evaluation AREA Description 5-1
5.2 Samples Included in the HHRA For Maxwell Point Investigation Area – Groundwater 5-1
5.3 Hazard Assessment – Maxwell Point Investigation Area – Groundwater 5-1
5.3.1 Analytes Exceeding Risk-Based Screening Levels 5-1

5.3.1.1 COPCs in Groundwater 5-1
5.4 Exposure Assessment – Maxwell Point Investigation Area – Groundwater 5-2
5.5 Toxicity Assessment – Maxwell Point Investigation Area – Groundwater 5-2
5.6 Risk Characterization – Maxwell Point Investigation Area – Groundwater 5-3
5.6.1 Resident Adult and Child Results 5-3
5.6.2 Construction Worker Results 5-4
5.6.3 Commercial Worker Results 5-5
5.6.4 Johnson and Ettinger Results 5-5
5.7 Maxwell Point Investigation Area – Groundwater HHRA Conclusions 5-5

6. RISK ASSESSMENT UNCERTAINTY 6-1

6.1 Uncertainties in the HHRA 6-1
6.1.1 Sampling and Analysis Uncertainties 6-1
6.1.2 Uncertainties Analysis of Exposure Assessment 6-1
6.1.3 Uncertainties of Toxicity Assessment 6-1
6.1.3.1 Uncertainties Associated With Non-Carcinogenic Effects 6-1
6.1.3.2 Uncertainties Associated With Carcinogenic Effects 6-2
6.1.4 Uncertainties in Risk Characterization 6-3

7. HHRA CONCLUSIONS 7-1

7.1 Maxwell Point Investigation Area – Building E7340/7350 Test Site HHRA Conclusions 7-1
7.2 Maxwell Point Investigation Area – Smoke Generator Debris Area HHRA Conclusions 7-1
7.3 Maxwell Point Investigation Area – Groundwater HHRA Conclusions 7-2

8. REFERENCES 8-1

APPENDIX A: DATA USED IN RISK ASSESSMENT
APPENDIX B: PRO UCL OUTPUTS
APPENDIX C: TOXICITY PROFILES
APPENDIX D: LEAD MODELING
APPENDIX E: JOHNSON AND ETTINGER MODELING

LIST OF FIGURES

Figure 1	Location of Other Edgewood Area Study Area and Maxwell Point Investigation Area (Aberdeen Proving Ground, Maryland)
Figure 2	Site Features of Maxwell Point Investigation Area
Figure 3	Soil Samples Used in Human Health Risk Assessment for Maxwell Point Investigation Area
Figure 4	Sediment and Surface Water Samples Used in Human Health Risk Assessment for Maxwell Point Investigation Area
Figure 5	Groundwater Samples Used in Human Health Risk Assessment for Maxwell Point Investigation Area
Figure 6	Conceptual Site Model, Maxwell Point Investigation Area

LIST OF TABLES

Table 2-1 Selection of Exposure Pathways, Maxwell Point Investigation Area.

Table 3-2.1 Occurrence, Distribution and Selection of Chemicals of Potential Concern, Maxwell Point Investigation Area – Building E7340/7350 Test Site – Surface Soil - Residential.

Table 3-2.2 Occurrence, Distribution and Selection of Chemicals of Potential Concern, Maxwell Point Investigation Area – Building E7340/7350 Test Site – Surface Soil - Industrial.

Table 3-2.3 Occurrence, Distribution and Selection of Chemicals of Potential Concern, Maxwell Point Investigation Area – Building E7340/7350 Test Site – Total Soil-Residential.

Table 3-2.4 Occurrence, Distribution and Selection of Chemicals of Potential Concern, Maxwell Point Investigation Area – Building E7340/7350 Test Site – Total Soil-Industrial.

Table 3-2.5 Occurrence, Distribution and Selection of Chemicals of Potential Concern, Maxwell Point Investigation Area – Building E7340/7350 Test Site – Sediment - Residential.

Table 3-2.6 Occurrence, Distribution and Selection of Chemicals of Potential Concern, Maxwell Point Investigation Area – Building E7340/7350 Test Site – Sediment - Industrial.

Table 3-2.7 Occurrence, Distribution and Selection of Chemicals of Potential Concern, Maxwell Point Investigation Area – Building E7340/7350 Test Site – Surface Water.

Table 3-3.1 Medium-specific Exposure Point Concentration Summary, Other Maxwell Point Investigation Area – Building E7340/7350 Test Site – Surface Soil - Residential.

Table 3-3.2 Medium-specific Exposure Point Concentration Summary, Maxwell Point Investigation Area – Building E7340/7350 Test Site – Surface Soil - Industrial.

Table 3-3.3 Medium-specific Exposure Point Concentration Summary, Other Maxwell Point Investigation Area – Building E7340/7350 Test Site – Total Soil - Residential.

Table 3-3.4 Medium-specific Exposure Point Concentration Summary, Maxwell Point Investigation Area – Building E7340/7350 Test Site – Total Soil - Industrial.

Table 3-3.5 Medium-specific Exposure Point Concentration Summary, Maxwell Point Investigation Area – Building E7340/7350 Test Site – Sediment - Residential.

Table 3-3.6 Medium-specific Exposure Point Concentration Summary, Maxwell Point Investigation Area – Building E7340/7350 Test Site – Sediment - Industrial.

Table 3-3.7 Medium-specific Exposure Point Concentration Summary, Maxwell Point Investigation Area – Building E7340/7350 Test Site – Surface Water.

Table 3-4.1 Values Used for Resident Adult Daily Soil Intake Equations, Maxwell Point – Other Edgewood Area.

Table 3-4.2 Values Used for Resident Child Daily Soil Intake Equations, Maxwell Point – Other Edgewood Area.

Table 3-4.3 Values Used for Adolescent Trespasser Daily Soil Intake Equations, Maxwell Point – Other Edgewood Area.

Table 3-4.4 Values Used for Construction Worker Daily Soil Intake Equations, Maxwell Point – Other Edgewood Area.

Table 3-4.5 Values Used for Commercial Worker Daily Soil Intake Equations, Maxwell Point – Other Edgewood Area.

Table 3-4.6 Values Used for Maintenance Worker Daily Soil Intake Equations, Maxwell Point – Other Edgewood Area.

Table 3-4.7 Values Used for Resident Adult Daily Surface Water Intake Equations, Maxwell Point – Other Edgewood Area.

Table 3-4.8 Values Used for Resident Child Daily Surface Water Intake Equations, Maxwell Point – Other Edgewood Area.

Table 3-4.9 Values Used for Adolescent Trespasser Daily Surface Water Intake Equations, Maxwell Point – Other Edgewood Area.

Table 3-4.10 Values Used for Maintenance Worker Daily Surface Water Intake Equations, Maxwell Point – Other Edgewood Area.

Table 3-4.11 Values Used for Resident Adult Daily Sediment Intake Equations, Maxwell Point – Other Edgewood Area.

Table 3-4.12 Values Used for Resident Child Daily Sediment Intake Equations, Maxwell Point – Other Edgewood Area.

Table 3-4.13 Values Used for Adolescent Trespasser Daily Sediment Intake Equations, Maxwell Point – Other Edgewood Area.

Table 3-4.14 Values Used for Maintenance Worker Daily Sediment Intake Equations, Building E7340/7350 Test Site, Maxwell Point – Other Edgewood Area.

Table 3-5.1 Non-cancer Toxicity Data – Oral/Dermal, Building E7340/7350 Test Site, Maxwell Point – Other Edgewood Area.

Table 3-5.2 Non-cancer Toxicity Data – Inhalation, Building E7340/7350 Test Site, Maxwell Point – Other Edgewood Area.

Table 3-5.3 Chemical-specific Parameters, Building E7340/7350 Test Site, Maxwell Point – Other Edgewood Area.

Table 3-6.1 Cancer Toxicity Data – Oral/Dermal, Building E7340/7350 Test Site, Maxwell Point – Other Edgewood Area.

Table 3-6.2 Cancer Toxicity Data – Inhalation, Building E7340/7350 Test Site, Maxwell Point – Other Edgewood Area.

Table 3-7.1 Calculation of Chemical Cancer Risks and Non-cancer Hazards, Reasonable Maximum Exposure, Building E7340/7350 Test Site, Maxwell Point – Other Edgewood Area, Current/Future Adolescent Trespasser.

Table 3-7.2 Calculation of Chemical Cancer Risks and Non-cancer Hazards, Reasonable Maximum Exposure, Building E7340/7350 Test Site, Maxwell Point – Other Edgewood Area, Current/Future Maintenance Worker.

Table 3-7.3 Calculation of Chemical Cancer Risks and Non-cancer Hazards, Reasonable Maximum Exposure, Building E7340/7350 Test Site, Maxwell Point – Other Edgewood Area, Future Commercial Worker.

Table 3-7.4 Calculation of Chemical Cancer Risks and Non-cancer Hazards, Reasonable Maximum Exposure, Building E7340/7350 Test Site, Maxwell Point – Other Edgewood Area, Future Construction Worker.

Table 3-7.5 Calculation of Chemical Cancer Risks and Non-cancer Hazards, Reasonable Maximum Exposure, Building E7340/7350 Test Site, Maxwell Point – Other Edgewood Area, Future Resident Adult.

Table 3-7.6 Calculation of Chemical Cancer Risks and Non-cancer Hazards, Reasonable Maximum Exposure, Maxwell Building E7340/7350 Test Site, Maxwell Point – Other Edgewood Area, Future Resident Child.

Table 3-8 Summary of Resident Child Lead Modeling, Maxwell Building E7340/7350 Test Site, Maxwell Point – Other Edgewood Area.

Table 3-9.1 Summary of Receptor Risks and Hazards for COPCs, Reasonable Maximum Exposure, Building E7340/7350 Test Site, Maxwell Point – Other Edgewood Area, Current/Future Adolescent Trespasser.

Table 3-9.2 Summary of Receptor Risks and Hazards for COPCs, Reasonable Maximum Exposure, Building E7340/7350 Test Site, Maxwell Point – Other Edgewood Area, Current/Future Maintenance Worker.

Table 3-9.3 Summary of Receptor Risks and Hazards for COPCs, Reasonable Maximum Exposure, Building E7340/7350 Test Site, Maxwell Point – Other Edgewood Area, Future Commercial Worker.

Table 3-9.4 Summary of Receptor Risks and Hazards for COPCs, Reasonable Maximum Exposure, Building E7340/7350 Test Site, Maxwell Point – Other Edgewood Area, Future Construction Worker.

Table 3-9.5 Summary of Receptor Risks and Hazards for COPCs, Reasonable Maximum Exposure, Building E7340/7350 Test Site, Maxwell Point – Other Edgewood Area, Future Resident Adult and Child.

Table 3-10.1 Risk Assessment Summary, Reasonable Maximum Exposure, Building E7340/7350 Test Site, Maxwell Point – Other Edgewood Area, Current/Future Adolescent Trespasser.

Table 3-10.2 Summary of Significant Contributors to Risk, Reasonable Maximum Exposure, Building E7340/7350 Test Site, Maxwell Point – Other Edgewood Area, Current/Future Maintenance Worker.

Table 3-10.3 Summary of Significant Contributors to Risk, Reasonable Maximum Exposure, Building E7340/7350 Test Site, Maxwell Point – Other Edgewood Area, Future Commercial Worker.

Table 3-10.4 Summary of Significant Contributors to Risk, Reasonable Maximum Exposure, Building E7340/7350 Test Site, Maxwell Point – Other Edgewood Area, Future Construction Worker.

Table 3-10.5 Summary of Significant Contributors to Risk, Reasonable Maximum Exposure, Building E7340/7350 Test Site, Maxwell Point – Other Edgewood Area, Future Resident Adult and Child.

Table 3-11.1 Comparison to Reference Data UPLs – Surface Soil, Building E7340/7350 Test Site, Maxwell Point – Other Edgewood Area.

Table 3-11.2 Comparison to Reference Data UPLs – Total Soil, Building E7340/7350 Test Site, Maxwell Point – Other Edgewood Area.

Table 3-11.3 Comparison to Reference Data UPLs – Surface Water, Building E7340/7350 Test Site, Maxwell Point – Other Edgewood Area.

Table 3-11.4 Comparison to Reference Data UPLs – Sediment, Building E7340/7350 Test Site, Maxwell Point – Other Edgewood Area.

Table 4-2.1 Occurrence, Distribution and Selection of Chemicals of Potential Concern, Maxwell Point Investigation Area – Smoke Generator Debris Area – Surface Soil - Residential.

Table 4-2.2 Occurrence, Distribution and Selection of Chemicals of Potential Concern, Maxwell Point Investigation Area – Smoke Generator Debris Area – Surface Soil - Industrial.

Table 4-2.3 Occurrence, Distribution and Selection of Chemicals of Potential Concern, Maxwell Point Investigation Area – Smoke Generator Debris Area – Total Soil - Residential.

Table 4-2.4 Occurrence, Distribution and Selection of Chemicals of Potential Concern, Maxwell Point Investigation Area – Smoke Generator Debris Area – Total Soil - Industrial.

Table 4-2.5 Occurrence, Distribution and Selection of Chemicals of Potential Concern, Maxwell Point Investigation Area – Smoke Generator Debris Area – Sediment - Residential.

Table 4-2.6 Occurrence, Distribution and Selection of Chemicals of Potential Concern, Maxwell Point Investigation Area – Smoke Generator Debris Area – Sediment - Industrial.

Table 4-2.7 Occurrence, Distribution and Selection of Chemicals of Potential Concern, Maxwell Point Investigation Area – Smoke Generator Debris Area – Surface Water.

Table 4-3.1 Medium-specific Exposure Point Concentration Summary, Maxwell Point Investigation Area – Smoke Generator Debris Area – Surface Soil - Residential.

Table 4-3.2 Medium-specific Exposure Point Concentration Summary, Maxwell Point Investigation Area – Smoke Generator Debris Area – Surface Soil - Industrial.

Table 4-3.3 Medium-specific Exposure Point Concentration Summary, Maxwell Point Investigation Area – Smoke Generator Debris Area – Total Soil - Residential.

Table 4-3.4 Medium-specific Exposure Point Concentration Summary, Maxwell Point Investigation Area – Smoke Generator Debris Area – Total Soil - Industrial.

Table 4-3.5 Medium-specific Exposure Point Concentration Summary, Maxwell Point Investigation Area – Smoke Generator Debris Area – Sediment - Residential.

Table 4-3.6 Medium-specific Exposure Point Concentration Summary, Maxwell Point Investigation Area – Smoke Generator Debris Area – Sediment - Industrial.

Table 4-3.7 Medium-specific Exposure Point Concentration Summary, Maxwell Point Investigation Area – Smoke Generator Debris Area – Surface Water.

Table 4-4.1 Values Used for Resident Adult Daily Soil Intake Equations, Maxwell Point – Other Edgewood Area.

Table 4-4.2 Values Used for Resident Child Daily Soil Intake Equations, Maxwell Point – Other Edgewood Area.

Table 4-4.3 Values Used for Adolescent Trespasser Daily Soil Intake Equations, Maxwell Point – Other Edgewood Area.

Table 4-4.4 Values Used for Construction Worker Daily Soil Intake Equations, Maxwell Point – Other Edgewood Area.

Table 4-4.5 Values Used for Commercial Worker Daily Soil Intake Equations, Maxwell Point – Other Edgewood Area.

Table 4-4.6 Values Used for Maintenance Worker Daily Soil Intake Equations, Maxwell Point – Other Edgewood Area.

Table 4-4.7 Values Used for Resident Adult Daily Surface Water Intake Equations, Maxwell Point – Other Edgewood Area.

Table 4-4.8 Values Used for Resident Child Daily Surface Water Intake Equations, Maxwell Point – Other Edgewood Area.

Table 4-4.9 Values Used for Adolescent Trespasser Daily Surface Water Intake Equations, Maxwell Point – Other Edgewood Area.

Table 4-4.10 Values Used for Maintenance Worker Daily Surface Water Intake Equations, Maxwell Point – Other Edgewood Area.

Table 4-4.11 Values Used for Resident Adult Daily Sediment Intake Equations, Maxwell Point – Other Edgewood Area.

Table 4-4.12 Values Used for Resident Child Daily Sediment Intake Equations, Maxwell Point – Other Edgewood Area.

Table 4-4.13 Values Used for Adolescent Trespasser Daily Sediment Intake Equations, Maxwell Point – Other Edgewood Area.

Table 4-4.14 Values Used for Maintenance Worker Daily Sediment Intake Equations, Maxwell Point – Other Edgewood Area.

Table 4-5.1 Non-cancer Toxicity Data – Oral/Dermal, Smoke Generator Debris Area, Maxwell Point – Other Edgewood Area.

Table 4-5.2 Non-cancer Toxicity Data – Inhalation, Smoke Generator Debris Area, Maxwell Point – Other Edgewood Area.

Table 4-5.3 Chemical-specific Parameters, Smoke Generator Debris Area, Maxwell Point – Other Edgewood Area.

Table 4-6.1 Cancer Toxicity Data – Oral/Dermal, Smoke Generator Debris Area, Maxwell Point – Other Edgewood Area.

Table 4-6.2 Cancer Toxicity Data – Inhalation, Maxwell Point Investigation Area – Smoke Generator Debris Area.

Table 4-7.1 Calculation of Chemical Cancer Risks and Non-cancer Hazards, Reasonable Maximum Exposure, Smoke Generator Debris Area, Maxwell Point – Other Edgewood Area, Current/Future Adolescent Trespasser.

Table 4-7.2 Calculation of Chemical Cancer Risks and Non-cancer Hazards, Reasonable Maximum Exposure, Maxwell Point Investigation Area – Smoke Generator Debris Area – Current/Future Maintenance Worker.

Table 4-7.3 Calculation of Chemical Cancer Risks and Non-cancer Hazards, Reasonable Maximum Exposure, Maxwell Point Investigation Area – Smoke Generator Debris Area – Future Commercial Worker.

Table 4-7.4 Calculation of Chemical Cancer Risks and Non-cancer Hazards, Reasonable Maximum Exposure, Maxwell Point Investigation Area – Smoke Generator Debris Area – Future Construction Worker.

Table 4-7.5 Calculation of Chemical Cancer Risks and Non-cancer Hazards, Reasonable Maximum Exposure, Maxwell Point Investigation Area – Smoke Generator Debris Area – Future Resident Adult.

Table 4-7.6 Calculation of Chemical Cancer Risks and Non-cancer Hazards, Reasonable Maximum Exposure, Maxwell Point Investigation Area – Smoke Generator Debris Area – Future Resident Child.

Table 4-9.1 Summary of Receptor Risks and Hazards for COPCs, Reasonable Maximum Exposure, Maxwell Point Investigation Area – Smoke Generator Debris Area – Current/Future Adolescent Trespasser.

Table 4-9.2 Summary of Receptor Risks and Hazards for COPCs, Reasonable Maximum Exposure, Maxwell Point Investigation Area – Smoke Generator Debris Area – Current/Future Maintenance Worker.

Table 4-9.3 Summary of Receptor Risks and Hazards for COPCs, Reasonable Maximum Exposure, Maxwell Point Investigation Area – Smoke Generator Debris Area – Future Commercial Worker.

Table 4-9.4 Summary of Receptor Risks and Hazards for COPCs, Reasonable Maximum Exposure, Maxwell Point Investigation Area – Smoke Generator Debris Area – Future Construction Worker.

Table 4-9.5 Summary of Receptor Risks and Hazards for COPCs, Reasonable Maximum Exposure, Maxwell Point Investigation Area – Smoke Generator Debris Area – Future Resident Adult and Child.

Table 4-10.1 Risk Assessment Summary, Reasonable Maximum Exposure, Maxwell Point Investigation Area – Smoke Generator Debris Area – Current/Future Adolescent Trespasser.

Table 4-10.2 Summary of Significant Contributors to Risk, Reasonable Maximum Exposure, Maxwell Point Investigation Area – Smoke Generator Debris Area – Current/Future Maintenance Worker.

Table 4-10.3 Summary of Significant Contributors to Risk, Reasonable Maximum Exposure, Maxwell Point Investigation Area – Smoke Generator Debris Area –Future Commercial Worker.

Table 4-10.4 Summary of Significant Contributors to Risk, Reasonable Maximum Exposure, Maxwell Point Investigation Area – Smoke Generator Debris Area –Future Construction Worker.

Table 4-10.5 Summary of Significant Contributors to Risk, Reasonable Maximum Exposure, Maxwell Point Investigation Area – Smoke Generator Debris Area –Future Resident Adult and Child.

Table 4-11.1 Comparison to Reference Data UPLs – Surface Soil, Smoke Generator Debris Area, Maxwell Point – Other Edgewood Area.

Table 4-11.2 Comparison to Reference Data UPLs – Total Soil, Smoke Generator Debris Area, Maxwell Point – Other Edgewood Area.

Table 5-2 Occurrence, Distribution and Selection of Chemicals of Potential Concern, Maxwell Point Investigation Area – Groundwater Evaluation.

Table 5-3 Medium-specific Exposure Point Concentration Summary, Maxwell Point Investigation Area – Groundwater Evaluation.

Table 5-4.1 Values Used for Resident Adult Daily Groundwater Intake Equations, Maxwell Point – Other Edgewood Area.

Table 5-4.2 Values Used for Resident Child Daily Groundwater Intake Equations, Maxwell Point – Other Edgewood Area.

Table 5-4.3 Values Used for Construction Worker Daily Groundwater Intake Equations, Maxwell Point – Other Edgewood Area.

Table 5-5.1 Non-cancer Toxicity Data – Oral/Dermal, Groundwater Evaluation, Maxwell Point – Other Edgewood Area.

Table 5-5.2 Non-cancer Toxicity Data – Inhalation, Groundwater Evaluation, Maxwell Point – Other Edgewood Area.

Table 5-5.3 Chemical-specific Parameters, Groundwater Evaluation, Maxwell Point – Other Edgewood Area.

Table 5-6.1 Cancer Toxicity Data – Oral/Dermal, Groundwater Evaluation, Maxwell Point – Other Edgewood Area.

Table 5-6.2 Cancer Toxicity Data – Inhalation, Maxwell Point Investigation Area – Groundwater Evaluation.

Table 5-7.1 Calculation of Chemical Cancer Risks and Non-cancer Hazards, Reasonable Maximum Exposure, Groundwater Evaluation, Maxwell Point – Other Edgewood Area, Adult Resident.

Table 5-7.2 Calculation of Chemical Cancer Risks and Non-cancer Hazards, Reasonable Maximum Exposure, Groundwater Evaluation, Maxwell Point – Other Edgewood Area, Child Resident.

Table 5-7.3 Calculation of Chemical Cancer Risks and Non-cancer Hazards, Reasonable Maximum Exposure, Groundwater Evaluation, Maxwell Point – Other Edgewood Area, Construction Worker.

Table 5-9.1 Summary of Receptor Risks and Hazards for COPCs, Reasonable Maximum Exposure, Maxwell Point Investigation Area – Smoke Generator Debris Area – Resident Adult and Child.

Table 5-9.2 Summary of Receptor Risks and Hazards for COPCs, Reasonable Maximum Exposure, Maxwell Point Investigation Area – Smoke Generator Debris Area – Construction Worker.

Table 5-10.1 Risk Assessment Summary, Reasonable Maximum Exposure, Maxwell Point Investigation Area – Smoke Generator Debris Area –Resident Adult and Child.

Table 5-10.2 Risk Assessment Summary, Reasonable Maximum Exposure, Maxwell Point Investigation Area – Smoke Generator Debris Area – Construction Worker.

Table 5-11 Comparison to Reference Data UPLs –Groundwater, Groundwater Evaluation, Maxwell Point – Other Edgewood Area.

LIST OF ACRONYMS AND ABBREVIATIONS

ABS	Dermal Absorption Factor
ADI	Allowable/Average Daily Intake
AL	Action Level
APG	Aberdeen Proving Grounds
ARARS	Applicable or Relevant and Appropriate Requirements
AT	Averaging Time
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	Below ground surface
bw	Body weight
CADI	Carcinogenic Average Daily Intake
CDC	Centers for Disease Control
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COPC	Chemical of Potential Concern
dL	Deciliter(s)
DSHE	Directorate of Safety, Health, and Environment
EA	EA Engineering, Science, and Technology, Inc.
EPC	Exposure Point Concentration
FOD	Frequency of Detection
ft	Foot/Feet
FS	Feasibility Study
g	Gram(s)
GIABS	Gastrointestinal Dermal Absorption Factor
GP	General Physics Corporation
HEAST	Health Effects Assessments Summary Tables
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
IEUBK	Integrated Exposure Uptake Biokinetic Model
in.	Inch(es)
IRIS	Integrated Risk Information System
IRP	Installation Restoration Program
ISL	Industrial Screening Level
IUR	Inhalation Unit Risk
kg	Kilogram(s)

L	Liter(s)
LADI	Lifetime Average Daily Intake
LOAEL	Lowest Observed Adverse Effect Level
m	Meter(s)
MCL	Maximum Contaminant Level
MF	Modifying Factor
mg	Milligram(s)
mL	Milliliter(s)
MRL	Minimal Risk Levels
N	Number of Samples
NCADI	Non-Carcinogenic Average Daily Intake
NCEA	National Center for Environmental Assessment
NCP	National Contingency Plan
NOAEL	No Observed Adverse Effect Level
NRC	National Research Council
OEA	Other Edgewood Area
OEHHA	Office of Environmental Health Hazard Assessment
PPE	Personal Protective Equipment
PPRTV	Provisional Peer Reviewed Toxicity Value
RAGS	Risk Assessment Guidance for Superfund
RBC	Risk-Based Screening Concentration
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RfC	Reference Concentration
RfD	Reference Dose
RI	Remedial Investigation
RL	Reporting Limit
RME	Reasonable Maximum Exposure
ROC	Receptor of Concern
RSAP	Reference Sampling and Analysis Program
RSL	Residential Screening Level
SF	Slope Factor
TRW	Technical Review Workgroup

UCLM	Upper Confidence Limit on the Mean
UF	Uncertainty Factor
µg	Microgram(s)
USC	U.S. Code
USDOE	U.S. Department of Energy
USEPA	U.S. Environmental Protection Agency
XRF	X-ray Fluorescence

EXECUTIVE SUMMARY

The Aberdeen Proving Ground (APG) Directorate of Safety, Health, and Environment (DSHE), has tasked EA Engineering, Science, and Technology, Inc. to conduct human health risk assessments (HHRAs) for various sites within the Other Edgewood Area (OEA) study area. The OEA is being addressed as part of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process per agreements between the Army and the United States Environmental Protection Agency (USEPA). Therefore, this assessment must comply with USEPA guidance for the remedial investigation/feasibility study (RI/FS) process, including specific risk assessment components that must be completed. This document represents the HHRA for the Maxwell Point Investigation Area.

Project Background

The OEA study area is located on the Gunpowder Neck Peninsula, south of the Canal Creek study area and north of the J-Field study area (excluding the new and old O-Field study areas). Historical activities in the OEA study area have included training and testing of vehicles, munitions, and chemical warfare agents. Portions of the OEA study area were also used for disposal of waste and debris resulting from test activities conducted in the Edgewood Area. Portions of the OEA study area are grouped into "clusters" of sites for investigation purposes.

The Maxwell Point investigation area is located on a peninsula, south of Wright Creek, in the central OEA study area of APG. The Maxwell Point investigation area is approximately 36 acres in size and consists primarily of mowed and infrequently mowed fields, mixed hardwood forest, and small fragments of marsh. The Maxwell Point Investigation Area is located within the secured, downrange area of APG. The investigation area includes Cluster 29.

As agreed upon in a 10 October 2007 Project Team Meeting between DSHE, USEPA, and the RI contractor, the Maxwell Point investigation area is divided into two exposure areas for the HHRA. The two areas are termed the Smoke Generator Debris Area (located in the western portion of the investigation area) and the Building E7340/7350 Test Site (located in the central to eastern portion of the investigation area). The majority of the samples were collected in association with these two source areas. Other samples were collected outside of the boundaries of these sources as part of site characterization efforts. These samples are included with the dataset of the nearest exposure area. Therefore, the investigation area is roughly divided into western and eastern exposure areas. All groundwater was grouped into a single evaluation area and evaluated for both areas combined.

The Maxwell Point investigation area HHRA is conducted in accordance with USEPA *Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual (Part A) (Interim Final)* (USEPA 1989a) and USEPA RAGS, *Volume 1 – Human Health Evaluation Manual (Part D), Standardized Planning, Reporting and Review of Superfund Risk Assessments Interim Final* (USEPA 2002a). The HHRA follows the methodologies presented in the *Final Other Edgewood Area, Approach Document for Baseline Human Health Risk Assessment for the Other Edgewood Area Sites* (EA 2005).

The HHRA evaluates potential sources of contamination and routes of migration based on current and potential future site uses. The HHRA results are based upon potential exposure pathways that can occur or are reasonably likely to occur at the Maxwell Point investigation area. The HHRA is conducted to determine baseline risks associated with exposure to the site. The HHRA evaluates the reasonable maximum exposure (RME) that has a potential to occur at the site. The baseline risk assumes no remedial actions or other means of exposure reduction (i.e., the use of personal protective equipment, digging restrictions, etc.). As a result, risks calculated in the HHRA are considered potential and should be used as a guideline in making risk management decisions. The HHRA methodology involves a four-step process:

1. Hazard Assessment – the identification of chemical of potential concern (COPCs),
2. Exposure Assessment – the calculation of exposure point concentrations (EPCs) representative for each COPC and identification of potential receptors and exposure pathways,
3. Toxicity Assessment – the consideration of the types of potential adverse health effects associated with exposures to COPCs, and
4. Risk Characterization – the estimation of chemical intakes for the identified receptor populations and quantitative estimate of both carcinogenic and non-carcinogenic risks.

Hazard Assessment

A risk-based screening assessment is conducted to eliminate chemicals that are not detected at levels resulting in unacceptable risk to identified potential receptors. Risk-based screening is conducted by comparing maximum detected chemical concentrations for a media to USEPA Region III risk-based screening concentrations (RBCs). A chemical in any medium, for which the maximum measured concentration exceeded the RBC, is retained and evaluated further.

Exposure Assessment

An exposure assessment is conducted to calculate EPCs representative for each COPC, and groups of individuals potentially exposed to site media are characterized. For the Maxwell Point

Investigation Area, a human health site conceptual model is developed to identify the receptors and exposure pathways evaluated in this HHRA. Media of concern at Maxwell Point are surface soil, total soil (surface soil and subsurface soil combined), surface water, sediment, and groundwater. In the HHRA, receptors evaluated include adolescent trespasser, maintenance worker, construction worker, commercial worker, and resident adult and child.

EPCs are representative of a RME scenario and are used in the quantification of potential risk by determining intakes of each COPC. To determine the RME EPC values, statistical analyses of the COPC concentrations in each medium are performed using the USEPA program ProUCL.

Toxicity Assessment

The toxicity assessment considers the types of potential adverse health effects and related uncertainties. Both non-carcinogenic and carcinogenic effects are considered. For lead, blood-lead level modeling is conducted utilizing USEPA recommended models. Where lead is a COPC in soil for a residential or trespasser scenario, lead risks for potential future residents are evaluated using EPA's Integrated Exposure Uptake Biokinetic (IEUBK) Lead Model. When lead is also a COPC in soil for the industrial scenarios, potential lead risk is also modeled using *Recommendations of the Technical Review Workgroup for Lead, An Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil.*

Risk Characterization

Risk characterization focuses on COPC comparisons to USEPA recommended toxicity values. Carcinogenic risks and non-carcinogenic hazards are evaluated for each receptor on a cumulative basis across all pathways and media. Carcinogenic risk results are compared to the USEPA carcinogenic "acceptable risk range" of 10^{-4} to 10^{-6}. For non-carcinogens, a threshold of 1.0 is utilized. Unacceptable risks for potential receptors are identified when cumulative carcinogenic risks exceed the upperbound of the "acceptable risk range" (i.e., 10^{-4}) or cumulative non-carcinogenic hazards exceed 1.0, based upon a target organ breakdown.

HHRA Conclusions

Maxwell Point Investigation Area, Building E7340/7350 Test Site–

Receptors evaluated at Maxwell Point, Building E7340/7350 Test Site include adolescent trespasser, maintenance worker, construction worker, commercial worker, and resident adult and child. Media identified include soil (surface and total), surface water, and sediment. Groundwater is evaluated separately.

Non-carcinogenic hazards did not exceed 1.0 for any of the receptors evaluated, except for resident child. The total non-carcinogenic HI for the resident child is 1.4, which is slightly above the acceptable threshold of 1.0. A breakdown by target organ indicates that no COPC has a chemical-specific HQ greater than 1.0. Furthermore, no target-organ specific HI exceeds 1.0. Therefore, there are no non-carcinogenic concerns for the resident child at the Building E7340/7350 Test Site.

Carcinogenic risks for all receptors evaluated are within or below the USEPA's "acceptable risk range." An evaluation of lead in soil indicates that lead is not a site-wide concern. Therefore, the HHRA indicates no concerns for potential receptors exposure to surface soil, total soil, surface water, and sediment at Maxwell Point, Building E7340/7350 Test Site.

Maxwell Point Investigation Area, Smoke Generator Area–
Receptors evaluated at Maxwell Point Investigation Area, Smoke Generator Area include adolescent trespasser, maintenance worker, construction worker, commercial worker, and resident adult and child. Media identified include soil (surface and total), surface water, and sediment. Groundwater is evaluated separately.

Non-carcinogenic hazards did not exceed 1.0 for the adolescent trespasser, maintenance worker, commercial worker, construction worker, and resident adult. The total non-carcinogenic HI for the resident child is 1.3, which exceeds the acceptable threshold of 1.0. A breakdown by target organ indicates that no target organ has a HI greater than 1.0. No COPC has a chemical-specific HQ greater than 1.0. Therefore, there are no non-carcinogenic concerns for the resident child at the Smoke Generator Debris Area.

Carcinogenic risks for all receptors evaluated are within or below the U.S. EPA's "acceptable risk range." An evaluation of lead in soil indicates that lead is not a site-wide concern. Therefore, the HHRA indicates no concerns for potential receptors exposure to surface soil, total soil, surface water, and sediment at Maxwell Point, Smoke Generator Debris Area.

Maxwell Point Investigation Area, Groundwater Evaluation –
Non-carcinogenic hazards for the construction worker are acceptable potential concern primarily due to benzene in the groundwater. There are no carcinogenic risk concerns for the construction worker exposure to groundwater. Non-carcinogenic hazards for the resident child and adult are calculated above 1.0. Arsenic, beryllium, iron, manganese, nickel, thallium, bis(2-ethylhexyl)phthalate, benzene, and 1,1,2,2-tetrachloroethane have chemical-specific HQs greater than 1. In addition, the central nervous system, skin, liver and immune system all have HIs

greater than 1. Carcinogenic risks for the resident receptor are above the USEPA's "acceptable risk range." Arsenic and 1,1,2,2-tetrachloroethane have carcinogenic risks above 10^{-3}, and bis(2-ethylhexyl)phthalate, benzene, tetrachloroethene, and vinyl chloride have carcinogenic risks above 10^{-4}. Therefore, there are concerns for use of groundwater as a tap water source for residents or commercial workers at the Maxwell Point Investigation Area. Based on the USEPA recommended model, the vapor intrusion of volatile organic compounds (VOCs) from groundwater into site buildings is not of concern.

1. PROJECT SCOPE AND INTRODUCTION

The Aberdeen Proving Ground (APG) Directorate of Safety, Health, and Environment (DSHE), has tasked EA Engineering, Science, and Technology, Inc. (EA) to conduct human health risk assessments (HHRAs) for various sites within the Other Edgewood Area (OEA) study area. The OEA study area is addressed as part of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process per agreements between the Army and the United States Environmental Protection Agency (USEPA); therefore, its assessment must comply with USEPA guidance for the remedial investigation/feasibility study (RI/FS) process, including specific risk assessment components that must be completed. The HHRA is an integral part of the RI/FS process included in the National Contingency Plan (NCP) (40 CFR 300.43) pursuant to CERCLA (42 USC 9605). This document represents the HHRA for the Maxwell Point Investigation Area.

This introduction provides a brief background of the project, a site description, the project's objectives, and the general approach of the HHRA.

1.1 PROJECT BACKGROUND

APG is an approximately 72,000-acre army installation located on the western shore of the northern Chesapeake Bay, in southeastern Baltimore County and southern Harford County, Maryland. APG is geographically divided into two areas, separated by the Bush River. The Edgewood Area is to the west of the river, and the Aberdeen Area lies to the east. The Edgewood Area consists of approximately 9,700 acres, and is divided into several study areas. The OEA study area is the largest study area in the Edgewood Area. The OEA study area is located on the Gunpowder Neck Peninsula, south of the Canal Creek study area and north of the J-Field study area (excluding the new and old O-Field study areas) (Figure 1). Historical activities in the OEA have included training and testing of vehicles, munitions, and chemical warfare agents. Portions of the OEA study area were also used for disposal of waste and debris resulting from test activities conducted in the Edgewood Area. Portions of the OEA study area are grouped into "clusters" of sites for investigation purposes.

The Maxwell Point investigation area is located in the OEA study area of APG, south of Wright Creek, on a peninsula that extends into the Gunpowder River (Figure 1). The investigation area includes limited mowed developed areas, small areas of wetlands along the shoreline, and larger areas of mixed hardwood forests and infrequently mowed grass fields. The Maxwell Point investigation area encompasses approximately 36 acres and includes Cluster 29 (Figure 2). The Maxwell Point Investigation Area is located within the secured, downrange area of APG.

The site history and description of Maxwell Point and Cluster 29 are based on the Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) for the Edgewood Area of APG (USAEHA 1989). Cluster 29 makes up the majority of Maxwell Point and includes the following sites:

- Building E7332 Test Site
- Building E7340/E7350 Test Site
- Building E7365/E7368 Test Site

The Building E7332 Test Site is located in the eastern portion of the Maxwell Point peninsula. This area was used in the 1940s and possibly the early 1950s as a firing point for 4.2 inch chemical mortar. The impact areas for these munitions were Carroll Island and Grace's Quarters. Small amounts of waste powder were generated during firing; however, there is no documentation of disposal of waste powder. It is likely that the waste powder was burned at a nearby location or at one of the other range fields of the Edgewood Area. A drop tower (Crate Test Structure) and an inclined ramp were moved to the area in the mid-1980s. This tower was used in handling tests of equipment and materiel items in crates. Little or no waste was generated during these handling tests. Items that contained liquids were not tested in the Building E7332 Test Site, and all tested items were removed from the site for inspection after the test was complete. The Crate Test Structure remains standing at the site.

The Building E7340/E7350 Test Site is located in the central portion of the Maxwell Point peninsula. This site had the most activity in Cluster 29 since testing and training began in the area. During the WWII period, smoke generator test facilities and explosive barricades were constructed. The E7341 Test Tower was located at this site. Testing included quality assurance proof-testing of items (mostly smoke grenades and pyrotechnic materials). This activity lasted from post-WWII to the mid to late 1970s. There was a large concrete pit (10 feet square by 8 feet deep) adjacent to the E7341 Test Tower that may have been used for immersion tests, and smaller metal pits (4 feet by 6 feet) that may have been used as safety dive pits. After completion of a test, the waste materials were probably collected and burned at another location or disposed of as solid waste if the product was not considered hazardous. The Building E7340/E7350 Test Site also had small storage sheds. There is a fenced area (25 feet square) just north of the site, across Maxwell Point Road that was also used for storage. The area around the test tower site is covered with crushed stone. Site inspection reveals crushed rock, ash, and soil approximately 2 to 3 inches thick, overlying sandy soil. The greatest amount of ash is in the area west of the tower where the top several inches are all rock and ash. Pieces of metal from

previous tests are also found at the site. There are no remaining structures or buildings at this site.

The Building E7365/E7368 Test Site is located in the western portion of the Maxwell Point peninsula. This site was used primarily for testing smoke generators. Dumped generator debris (metal parts) was discovered in the area (Smoke Generator Debris Area) but has since been removed. Oil, for use during testing of smoke generators, was stored in nine tanks (total capacity of 113,000 gallons) located slightly north of the test site within an earthen berm. These tanks were used from WWII to the mid to late 1960s for storing fog oil. During the fuel shortages of the late 1970s and the early 1980s, the fog oil tanks were used for surplus fuel storage. In recent years, one large spill and several smaller leaks have been recorded. The large spill occurred when a heavy rainfall caused oil to overflow the berm. The spill was intercepted by trenches that were dug before the spill could reach the Gunpowder River. The total release was probably less than 100 gallons; little to no oil reached the Gunpowder River, and contaminated soil was removed. The site inspection shows no evidence remains of the release of oil from the berm; the downgradient area is vegetated with grass. Smaller leaks have occurred from valves and pipe joints but have not resulted in significant releases to the environment. The tanks were removed in the early 1990s. A wastewater system is associated with Building E7368 for handling of wastewater from a shower, toilet, and sink, but this wastewater system has not been in use since at least the early 1980s. A supply well was located off the northwestern corner of Building E7368; this well was abandoned in 2002. The only remaining building is E7368 and an associated storage shed for mowing equipment.

Other activities at the Building E7365/E7368 Test Site involved vehicle decontamination tests with DS-2 (a non-aqueous liquid composed of diethylenetriamine, ethylene glycol monomethyl ether, and sodium hydroxide). This testing was conducted on plastic sheeting in Building E7365, and waste DS-2 was not released to the environment. Additionally, approximately 1,000 to 2,000 pounds of C-8 decontaminating emulsion (which contains tetrachlorethylene) was prepared. Another activity involved munitions assembly containing CS (tear gas agent) in the 1960s to early 1970s. The exact location of this assembly activity is unknown, but most likely occurred in Building E7365 or E7368. Hazardous waste storage also occurred in Buildings E7365 and E7368 and included the storage of C-8 emulsion in drums. The floor of the storage building was covered in plastic and the building was bermed. During storage, less than one gallon of emulsion leaked from three drums. There was no release to the environment, as the drums were overpacked by containment drums, and the spill was cleaned up with absorbent material. At a later time (March 1986), at least twenty 55-gallon drums containing thionyl

chloride were stored for one month in Building E7368. There was no chemical release to the environment from this storage.

Another site feature of the Maxwell Point investigation area is the South Beach Munitions Dump, which is located along the south beach of the Maxwell Point peninsula. This area was used as a dump for relatively small caliber munitions (75mm or smaller), most likely before WWII. This site is underwater. It is difficult to visually locate the dumped items because the items have been covered with sand. The actual size of the dump and the amount of disposed munitions are not known. However, the observed items extended over an area for more than 100 feet along the beach. The disposed items were badly corroded, and it is possible that the items were burned prior to disposal. An investigation of the shoreline using off-shore geophysics (both on ice and over the water), followed by dives, has been recently conducted, but no items have been observed. It is very likely that the items, if not previously removed, have been washed away by wave action.

Based on site history, potential source areas at the Maxwell Point investigation area may include:

- waste powder from firing of chemical mortars at the Building E7332 Test Site
- metal debris around the Building E7340/E7350 Test Site
- release of chemicals from testing of smoke grenades and pyrotechnic material at the Building E7340/E7350 Test Site
- small leaks of oil and fuel from storage tanks at the Building E7365/E7368 Test Site
- release of aerosol particles from the smoke cloud produced in the testing of smoke generators at the Building E7365/E7368 Test Site
- spills and leaks of chemicals from use and storage at the Building E7365/E7368 Test Site
- release of chemicals from items disposed at the South Beach Munitions Dump

1.2 PROJECT OBJECTIVES

The objective of the HHRA is to evaluate potential human health risk under current and potential future conditions at the Maxwell Point Investigation Area. The specific objectives of the HHRA include:

- Provide background information and a site description.
- Outline the regulatory basis and guidance for conducting the HHRA.
- Outline the methods for determining chemicals of potential concern (COPCs) for the HHRA.

- Develop a conceptual site model that characterizes relevant contaminant pathways and receptors of concern (ROCs).
- Calculate potential carcinogenic risks and non-carcinogenic hazards to ROCs (e.g., any human contact at the site under present or future scenarios).
- Identify areas that pose no unacceptable risks to human health and require no further action.
- Identify areas that may pose a concern to human health and require further investigation or action.

1.3 DATA INCLUDED IN THE HHRA

Data included in this HHRA were collected from 1999 to 2008 by General Physics Corporation (GP) and Weston Solutions, Inc. The sample locations are biased to areas of likely contamination to characterize areas that were most impacted from historic activities. A detailed listing of the sample locations used in the HHRA is included in Appendix A. Figure 3 shows the soil sample locations collected at the Maxwell Point Investigation Area. The sediment and surface water locations are presented in Figure 4, and the groundwater sample locations are shown in Figure 5. Groundwater samples were collected from monitoring wells installed for the RI. Detailed installation for the monitoring wells is included in the *Maxwell Point Investigation Area Well Installation Report* (GP 2006).

The HHRA incorporates the results of samples collected and analyzed as part of the following efforts:

- GP. 1999. Detailed Remedial Investigation Work Plan for Clusters 29 and 52 (Maxwell Point). Final. December 1999.
- GP. 2001. Addendum 1 to the Detailed Remedial Investigation Work Plan for Clusters 29 and 52 (Maxwell Point). Final.
- GP. 2003. Other Edgewood Areas Maxwell Point Investigation Area Work Plan for Supplemental Remedial Investigation Sampling. Final.
- GP. 2005. Other Edgewood Areas Maxwell Point Investigation Area Addendum 1 to the Work Plan for Supplemental Remedial Investigation Sampling. Final. October 2003.

An initial RI sampling effort, as outlined in the Detailed RI Work Plan (GP 1999) was conducted in 1999-2000 and resulted in the collection of 4 surface soil, 3 surface water (two rounds each), 3 sediment, and 3 groundwater (two rounds each) samples. The sample locations were selected to assess potentially contaminated locations within Cluster 29 including potential migration pathways of contaminants. Specifically, samples were associated with the South Beach

Munitions Disposal Site, the Building E7332 Site, the Building E7340/E7350 Site, and the Building E7365/E7368 Test Site.

The next sampling effort was conducted in 2003-2004 under the Supplemental RI Work Plan (GP 2003) and resulted in the collection of 10 surface soil, 21 subsurface soil, 10 surface water (two rounds each), and 9 sediment samples. These samples were collected in Cluster 29 to determine the environmental impacts of historic activities on surface media within the Maxwell Point investigation area. The soil samples were collected as confirmation samples from an x-ray fluorescence (XRF) study. The surface water and co-located sediment samples were collected downgradient of the Building E7332 Site, the Building E7340/E7350 Site, and the Building E7365/E7368 Test Site. Follow-on sampling efforts were conducted in 2004-2006 and 2008 and resulted in the collection of 12 surface soil, 2 subsurface soil, 6 sediment, and 18 groundwater (two rounds each) samples to address data gaps.

As agreed upon in a 10 October 2007 Project Team Meeting between DSHE, USEPA, and the RI contractor, the Maxwell Point Investigation Area is divided into two exposure areas for the HHRA. The two areas are termed the Smoke Generator Debris Area (located in the western portion of the investigation area) and the Building E7340/7350 Test Site (located in the central to eastern portion of the investigation area), because the majority of the samples were collected in association with these two source areas. Other samples were collected outside of the boundaries of these sources as part of site characterization efforts, and these samples are included with the dataset of the nearest exposure area. Therefore, the investigation area is roughly divided into western and eastern exposure areas. All groundwater was grouped into a single evaluation area and evaluated for both areas combined.

1.4 GENERAL HHRA APPROACH

The risk assessment follows guidance as recommended by the USEPA. Specific application of guidance throughout the risk assessment process is detailed in Chapter 2 of this document. The HHRA for the Maxwell Point Investigation Area is conducted in accordance with the following USEPA Guidance:

- *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A) (Interim Final).* Report No. EPA/540/1-89/002. Office of Emergency and Remedial Response, Washington, DC. USEPA, December 1989a.
- *Risk Assessment Guidance for Superfund Volume I-Human Health Evaluation Manual: (Part B - Development of Risk-Based Preliminary Remediation Goals) (Interim Final).* Publication 9285.7-01B. Interim. USEPA, 1991a.

- *Memorandum: Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors"*. Office of Solid Waste and Emergency Response. OSWER Directive: 9285.6-03. March 25. USEPA, 1991b.
- *Exposure Factors Handbook: Volumes I, II, and III.* EPA/600/P-95/002a,b,c. USEPA, August 1997a.
- *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part D)*. Office of Emergency and Remedial Response, Washington, DC. USEPA, December 2002a.
- *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment)*. Final. Office of Superfund Remedial and Technology Innovation. USEPA, July 2004a.
- *Risk Based Concentration Tables. USEPA Region III, October 2007a.*
- *ProUCL Version 4.0.* Software developed by USEPA. Obtained on the Internet at http://www.epa.gov/ nerlesd1/tsc/software.htm. Las Vegas Technical Support Center for Monitoring and Site Characterization. U.S. EPA, 2007b.

2. RISK ASSESSMENT METHODOLOGY

The HHRA evaluates potential sources of contamination and routes of migration based on current and potential future site uses. The HHRA results are based upon potential exposure pathways that can occur or are reasonably likely to occur in the future at the Maxwell Point Investigation Area. The HHRA is conducted to determine baseline risks associated with exposure to the investigation area. The baseline risk assumes no remedial actions or other means of exposure reduction (i.e., the use of personal protective equipment (PPE), digging restrictions, etc.). The HHRA evaluates the reasonable maximum exposure that has the potential to occur at the site. As a result, risks calculated in the HHRA are considered potential and should be used as a guideline in making risk management decisions.

Non-carcinogenic hazards and carcinogenic risks are evaluated using USEPA guidance (USEPA 1989a), and the HHRA includes an uncertainty section to address uncertainties inherent to the risk assessment process. The HHRA methodology involves a four-step process: hazard identification, exposure assessment, toxicity assessment, and risk characterization. A brief description of each step is provided below.

In the *hazard assessment*, site-specific monitoring data are evaluated, COPCs are selected for inclusion throughout the remainder of the risk assessment, and the rationale for their selection is documented. The hazard assessment is discussed further in Section 2.1.

In the *exposure assessment*, the human population, or groups of individuals potentially exposed to COPCs (i.e., potential human receptors) are characterized. From the many potential pathways of exposure, pathways applicable to potential receptors at the site are identified (i.e., ingestion, inhalation). COPC exposure concentrations are estimated based upon the site-specific monitoring data. The concentrations of COPCs in relevant media (e.g., soil, air) are converted into systemic doses, taking into account rates of contact (e.g., ingestion rates) and absorption rates of each COPC. The magnitude, frequency, and duration of these exposures are then integrated to obtain estimates of daily intakes over a specified period of time (e.g., lifetime, activity-specific duration). Section 2.2 presents further details concerning the exposure assessment.

In the *toxicity assessment*, the relationship between extent of exposure and extent of toxic injury or disease is estimated for each COPC. Chemical-specific toxicity values, such as cancer slope factors (SFs) for carcinogenic compounds and reference doses (RfDs) or reference concentrations (RfCs) for non-carcinogens are presented along with a discussion of their

scientific basis and derivation. Further discussion of the toxicity assessment is provided in Section 2.3.

Risk characterization integrates the results of the toxicity assessment and the exposure assessment to derive quantitative estimates of human health risk, including the risk of both cancer and of non-carcinogenic effects. The major uncertainties and limitations associated with the estimates of risk and their potential ramifications are presented in this section. Section 2.4 presents the risk characterization.

2.1 HAZARD ASSESSMENT

The hazard assessment is the first step of the HHRA process. A hazard assessment is conducted to determine COPCs at the site. In the hazard assessment, site-specific data are analyzed and compared to risk-based screening values. Screening is conducted to determine COPCs and whether the area warrants further evaluation. The following sections summarize the hazard assessment performed for this HHRA.

2.1.1 Data Quality Evaluation

Inclusion or exclusion of data on the basis of analytical qualifiers is performed in accordance with USEPA guidance (USEPA 1989a). The first step in the HHRA process is the evaluation of analytical data on the basis of qualifiers in each medium of concern.

- Analytical results bearing the R qualifier (indicating that the data was rejected during the validation process) are not used in the HHRA.
- Analytical results bearing the U or UJ qualifier (indicating that the analyte is not detected at the given reporting limit [RL]) are retained in the data set and considered non-detects. Where warranted for statistical purposes, each COPC is assigned a numerical value equal to its RL.
- Analytical results bearing the J qualifier (the reported value is estimated), D qualifier (the compounds in an analysis are at a secondary dilution factor), K qualifier (reported value may be biased high), L qualifier (reported value may be biased low), N qualifier (the spiked recovery is not within control limits), E qualifier (reported value is estimated because of the presence of interference), P qualifier (there is greater than 25% difference for detected concentrations between the two GC columns), and "*" qualifier (the duplicate analyses is not within control limits) are retained at the measured concentration.
- Analytical results bearing the B or BJ qualifier are retained for further analysis. Analytical results for inorganic compounds are evaluated according to USEPA guidance (USEPA 1989a) for inorganic COPCs bearing the B or BJ qualifiers (which indicate that the reported value is less than the contract-required detection limit, but greater than the instrument detection limit). Inorganic COPCs bearing the B or BJ qualifiers are retained in the data set at the measured concentration. Analytical results

for organic compounds bearing the B qualifier (blank-related data) are evaluated as non-detects.

If duplicate samples are collected or duplicate analyses are conducted on a single sample, the following guidelines are employed to select the appropriate sample measurement:

- If both samples/analyses show that the analyte is present, the average of the two detected concentrations is retained for analysis, based on conservative professional judgment;
- If both samples/analyses are not detected, the average of the two RL concentrations is retained for analysis; and
- If only one sample/analysis indicated that the analyte is present, it is retained for analysis and the non-detect value is discarded.

2.1.2 Risk-Based Screening

After the data quality evaluation, detected chemicals are subjected to a risk-based screening. For the risk-based screening, the maximum detected concentration of detected chemicals is compared to the USEPA Region III Risk-Based Concentrations (RBCs) (USEPA 2007a). The RBCs are based on specific, conservative, fixed levels of risk. For carcinogens, this risk level is 10^{-6}, which is the lower bound for potential acceptable carcinogenic risk as defined by the NCP (USEPA 1990). For non-carcinogens, the RBCs are based on a hazard quotient (HQ) of 1.0. Per USEPA Region III guidance (USEPA 1993), one-tenth of the RBC for non-carcinogens is used. These fixed risk levels are conservative to account for potential additivity or cumulative effects of multiple chemicals and are, thus, protective of human health.

If a chemical-specific maximum detected concentration is below the chemical-specific RBC, that chemical is eliminated from further consideration as a COPC for that medium. If the maximum concentration is detected at levels greater than the RBC or other screening criteria (e.g., MCLs [Maximum Contaminant Levels]), the chemical is retained for further analysis. Chemicals detected at the site that do not have a Region III RBC are evaluated via surrogates or using Applicable or Relevant and Appropriate Requirements (ARARs) as indicated in the screening tables.

Region III RBCs used in the selection of COPCs are medium- and receptor-specific. When a residential or trespasser scenario is evaluated, soil concentrations are compared to the Region III residential soil RBCs. When an industrial scenario is evaluated (i.e., maintenance worker, commercial worker, construction worker), soil concentrations are compared to the Region III industrial soil RBCs.

For sediment, the soil RBCs are increased ten times to more closely represent the types of exposure that are likely to occur in sediment (EA 2005). Surface water maximum concentrations are compared to the tap water RBCs. To account for surface water exposure, the tap water RBCs are increased by a factor of ten (EA 2005).

The maximum concentrations of essential nutrients are compared to dietary Allowable Daily Intakes (ADIs). Essential nutrients include calcium, magnesium, potassium, and sodium. Essential nutrients detected at levels below ADIs are considered unlikely to cause adverse effects to humans and are eliminated from further analysis.

The maximum detected lead concentrations in soil and sediment are compared to the residential soil screening level (RSL) of 400 mg/kg and an industrial soil screening level (ISL) of 1,000 mg/kg per USEPA Region III policy (USEPA 1989b). The maximum detected lead concentrations in surface water are compared to the USEPA's action level (AL) of 15 µg/L for lead in residential and public drinking water (USEPA 2002b). The AL is for lead in public drinking water supplies, which is not applicable to surface water unless it is used as a drinking water source. However, no other human health criteria for lead in surface water are available. As a result, the AL for lead in drinking water is used for screening and comparison purposes.

2.1.3 Analytes Exceeding Risk-Based Screening Levels

The occurrence, distribution, and selection of analytes in each medium are represented in medium-specific tables following the USEPA's Risk Assessment Guidance for Superfund (RAGS) D format (USEPA 2002a). The tables are scenario-specific and present the minimum and maximum detected concentrations, the location of the maximum detected concentrations, as well as the frequency of detection (FOD) for each chemical detected. Analytes that exceed screening criteria are presented in bold type.

2.1.4 Background Comparison Results

Inorganic chemicals detected at concentrations exceeding the Region III RBCs and ADIs are compared to background data contained in the APG Installation Restoration Program (IRP) Reference Sampling and Analysis Program (RSAP) Soil, Sediment, and Surface Water Reference Data Report (ICF KE 1995a,b). Inorganic chemicals detected at concentrations exceeding risk-based screening levels, but within reference levels, are evaluated quantitatively as COPCs in the HHRA in accordance with USEPA guidance (USEPA 2002c). In addition, inorganic COPCs are evaluated qualitatively in comparison to the reference data in the uncertainty assessment of the HHRA.

2.2 EXPOSURE ASSESSMENT

The second step of the HHRA process is the exposure assessment. In the exposure assessment, the human population, or groups of individuals potentially exposed to site media (i.e., potential human receptors) are identified. Pathways applicable to potential receptors at the site are identified from the many potential pathways of exposure. The COPCs in site media are converted into systemic doses, taking into account rates of contact (e.g., ingestion rates) and absorption rates of different COPCs. The magnitude, frequency, and duration of these exposures are then integrated to obtain estimates of daily doses over a specified period of time (e.g., lifetime, activity-specific duration).

Actual pathways and receptors that are assessed for quantitative evaluation are medium-specific. An exposure pathway describes a mechanism by which a population or individual may be exposed to chemicals present at a site. A completed exposure pathway requires the following four components:

- A source and mechanism of chemical release to the environment
- An environmental transport medium for the released chemical
- A point of potential human contact with the contaminated medium
- A human exposure route at the point of exposure

All four components must exist for an exposure pathway to be complete and for exposure to occur. Incomplete exposure pathways do not result in actual human exposure and are not included in the exposure assessment and resulting risk characterization.

2.2.1 Conceptual Site Models

A conceptual site model has been developed to show potential sources of contamination, routes of migration, and receptors evaluated in this HHRA. Pathways begin from potential sources and progress through the environment through various fate and transport processes to potential human receptors. Figure 6 presents the conceptual model. Table 2-1 also details the selection of exposure pathways for each potential receptor. The rationale for the selection of receptors and pathways of concern in the conceptual site models is discussed below.

Based on site use and designation, receptors are evaluated for the Maxwell Point Investigation Area as discussed in the Approach Document (EA 2005). Potential receptors considered include adolescent trespasser, maintenance worker, commercial worker, construction worker, and resident adult and child. Potential receptors may be exposed to selected media. Media evaluated for the Maxwell Point investigation area include: surface soil, total soil (surface and subsurface

soil combined), surface water, sediment, and groundwater. Surface soil samples were collected from 0 to 2 ft bgs, and subsurface soil samples were collected greater than 2 ft bgs. Soil sample locations were located with no bias towards any particular area of the site, as well as from locations placed specifically to characterize potential contaminant sources. Surface water and sediment sample locations within the Gunpowder River were located equal distance around the perimeter of the site. In addition, some sediment sample locations are located within the on-site wetlands. Groundwater samples were collected from monitoring wells installed for the RI effort. Monitoring well installation is further detailed in the *Maxwell Point Investigation Area Well Installation Report* (GP 2006).

2.2.2 Receptors of Concern

When conducting an exposure assessment, USEPA (1989a, 1991a,b) guidance requires that plausible exposure under both current and future land-use be evaluated in the HHRA. Accordingly, potential receptors are identified for both current and future use scenarios. The HHRA evaluates the risk to a range of onsite human receptor populations that are either currently or are reasonably anticipated to visit the site. The following receptors are evaluated for both areas of the Maxwell Point Investigation Area.

2.2.2.1 Current Use Receptors

Under the current land use scenario, receptors include the adolescent trespasser and maintenance worker. Current use receptors are also considered potential future use receptors. These receptors are described in more detail in the following paragraphs.

Adolescent Trespasser –

Under current land use, trespassers are a possibility for the Maxwell Point Investigation Area. Exposure pathways and parameters are the same regardless of current or future land use. An adult trespasser is not considered in this HHRA because the adolescent trespasser represents a more conservative exposure scenario. It is assumed that these receptors are exposed to contaminated surface soil, surface water, and sediment while onsite. Specific exposure pathways for an adolescent trespasser include:

- inhalation of fugitive dust from surface soil;
- dermal contact with surface soil, surface water, and sediment; and
- incidental ingestion of surface soil, surface water, and sediment.

The adolescent age group of 7 to16 years old is used to span 10 years after the 0-6 years of childhood and is considered under both the current and potential future land use scenarios.

Maintenance Worker –

Maintenance workers are a possibility at the Maxwell Point investigation area. A maintenance worker is assumed to perform maintenance type activities, which include site inspections, general maintenance of buildings and property, and minimal digging. Specific exposure pathways for a maintenance worker include:

- inhalation of particulates from surface soil;
- dermal contact with surface soil, surface water, and sediment; and
- incidental ingestion of surface soil, surface water, and sediment.

The maintenance worker is assumed to be an adult and is considered under both the current and potential future land use scenarios.

2.2.2.2 Future Use Receptors

It is probable that future land use for the Maxwell Point investigation area will include industrial scenarios with resulting commercial, maintenance, and construction workers, as well as, trespasser receptors. A residential future land use for the Maxwell Point investigation area is an unlikely scenario. However, residential receptors are presented in this HHRA as a conservative evaluation and in the event future land use changes.

Commercial Worker –

Future land use scenarios could include the development of the Maxwell Point investigation area for industrial use. This receptor may result from the future construction of office space, warehouses, miscellaneous buildings, or research areas that would be occupied by full-time employees. Commercial workers are assumed to mainly work within enclosed building areas and occasionally visit other areas of the investigation area. The presence of commercial workers within office spaces or other buildings would require construction to occur within the site. As a result, surface soil and subsurface soil would be mixed during construction activities. This would result in a total soil media. Specific exposure pathways for a commercial worker include:

- incidental ingestion of total soil;
- dermal contact with total soil; and
- inhalation of fugitive dust from total soil.

The commercial worker is assumed to be an adult and is considered under future land use scenarios.

Construction Worker –

Future land use scenarios could include the development of the Maxwell Point investigation area for industrial use. As a result, the construction worker would be present during development. As a result of construction activities, the construction worker would be exposed to media both on the surface and at depths. Within the Maxwell Point Investigation Area, groundwater is encountered from 8 ft below ground surface (bgs) to 23 ft bgs. While is unlikely that construction would extend to an 8 ft or deep depth, the construction is evaluated for exposure to the groundwater media as a conservative measure. Specific exposure pathways for a construction worker include:

- inhalation of fugitive dust from total soil;
- dermal contact with total soil;
- incidental ingestion of total soil;
- incidental ingestion of groundwater while digging; and
- dermal contact with groundwater while digging.

The construction worker is assumed to be an adult and is considered under the potential future land use scenarios.

Resident –

The development of the Maxwell Point Investigation Area for residential use is an unlikely future scenario. However, the resident is considered in this HHRA as a conservative measure and in case future land use changes in the future. Any residences within the Maxwell Point Investigation Area will require extensive development and construction activities. As a result, soil within the investigation area would be mixed resulting in a total soil exposure. It is assumed that any residences would use groundwater as a tap water source, even though a public water supply is available. In addition, residents could be exposed to volatiles that infiltrate into buildings from groundwater. Modeling this exposure pathway requires use of USEPA's Johnson and Ettinger model (USEPA 2003a). The Maxwell Point Investigation Area is surrounded by Gunpowder River, and wetland areas are present on-site. As a result, the resident could be exposed to surface water and sediment within these areas during recreational activities. Specific exposure pathways for a resident include:

- inhalation of fugitive dust from total soil;
- dermal contact with total soil, surface water, and sediment;
- incidental ingestion of total soil, surface water, and sediment;

- ingestion of and dermal contact with groundwater when used as tap water;
- inhalation of VOCs from groundwater while showering (adult only); and
- inhalation of VOCs from groundwater through vapor intrusion.

Two age groups are considered for the residential scenario, including an adult and a child. The age group for the child is assumed at 0 to 6 years. The adult age group is considered an individual greater than 6 years of age. Both the adult and child residential receptors are considered only under future land use scenarios.

2.2.3 Selection of Exposure Point Concentrations

Exposure point concentrations (EPCs) are derived to quantify concentrations of analytes. In this HHRA, EPCs are derived as representative of a RME scenario and are used in the quantification of potential risk. To determine the RME EPC, statistical analyses of the COPC concentrations are performed. Samples used in the HHRA are presented in Appendix A.

Reported concentrations, as discussed in Section 2.1.1, are used to calculate the 95th percentile upper confidence limit on the mean (95UCLM) for COPCs in each medium (USEPA 1989a). The 95UCLM will be determined based on the USEPA ProUCL program (USEPA 2007b). The first step in estimation of an EPC is to determine how medium-specific environmental data for a COPC is distributed (i.e., normal, log-normal, non-parametric, etc.). The second step is to calculate the 95UCLM using a methodology appropriate for the distribution, sample size and variance of each COPC data set. The ProUCL program calculates both the data distribution and the 95UCLM. Outputs from this program are provided for each COPC in each medium in Appendix B. In cases where the 95UCLM values exceed the maximum detected concentration, the maximum detected concentration is used as the EPC (USEPA 2007b).

2.2.4 Exposure Intake Equations

The next step in the exposure assessment is to estimate COPC intakes for each pathway considered in the assessment. In the exposure assessment, two different measures of intake are provided, depending on the nature of the effect being evaluated. When evaluating longer-term (i.e., subchronic and chronic) exposures to chemicals that produce adverse non-carcinogenic effects, intakes are averaged over the period of exposure (i.e., the averaging time [AT]) (USEPA 1989a). This measure of intake is referred to as the average daily intake (ADI) and is a less than lifetime exposure. For chemicals that produce carcinogenic effects, intakes are averaged over an entire lifetime and are referred to as the lifetime average daily intake (LADI) (USEPA 1989a).

The generic equation to calculate intakes is given below:

$$(L)ADI = \frac{EPC \times IF \times EF \times ED \times RAF}{BW \times AT} \times CF \qquad \text{(Equation 1)}$$

where:

(L)ADI	=	(Lifetime) Average daily intake (mg/kg-day)
EPC	=	Concentration in a specific medium (mg/kg or ug/L)
IF	=	Intake factor[1] (mg/day or L/day)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
RAF	=	Relative absorption factor (unitless)
BW	=	Body weight (kg)
AT	=	Averaging time (days)
CF	=	Conversion Factor (10^{-6} kg/mg or 0.001 L/cm^3)

2.3 TOXICITY ASSESSMENT

Toxicity assessment is the third step of the HHRA process. The toxicity assessment considers the types of potential adverse health effects associated with exposures to COPCs; the relationship between the magnitude of exposure and potential adverse effects; and related uncertainties, such as the weight of evidence of a particular COPC's carcinogenicity in humans. USEPA guidance (USEPA 1989a) specifies that the assessment be accomplished in two steps: hazard identification and dose-response assessment. Hazard identification is the process of determining whether studies claim that exposure to a COPC may cause the incidence of an adverse effect. USEPA specifies the dose-response assessment, which involves: (1) USEPA's quantitative evaluation of the existing toxicity information, and (2) USEPA's characterization of the relationship between the dose of the COPC administered or received, and the incidence of potentially adverse health effects in the exposed population. From this quantitative dose-response relationship, specific toxicity values are derived by USEPA that can be used to estimate the incidence of potentially adverse effects occurring in humans at different exposure levels (USEPA 1989a). These USEPA-derived toxicity values are called RfDs for non-carcinogens and SFs for potential carcinogens. Compounds lacking values, for which surrogates cannot be

[1] The intake factor is the product of all intake variables that, when multiplied by the concentration of the chemical of potential concern in a specific medium, results in an estimate of the chemical intake in mg/kg-day for that population and exposure pathway. Intake factors may include ingestion rate, inhalation rate, body surface area exposed to soil or water, dermal permeability constants, and soil adherence factors.

substituted, are not assessed quantitatively. Qualitative analysis of these compounds is provided in the Uncertainties Section.

In accordance with RAGS A (USEPA 1989a), toxicological profiles for COPCs are provided in Appendix C. The toxicological profiles present a short description of the toxic effects of the COPC. The toxicological profile also indicates the effects associated with exposure to the COPC, and the concentration at which adverse effects are expected.

Toxicity values are selected in keeping with appropriate exposure duration and USEPA guidance (USEPA 1989a and 2003b). Tier 1 values are found using the Integrated Risk Information System (IRIS) for established, current values (USEPA 2009). When toxicity values are not available from IRIS, Tier 2 values are then examined.

Tier 2 values are USEPA's Provisional Peer Reviewed Toxicity Values (PPRTVs), which are developed by the Office of Research and Development, the National Center for Environmental Assessment (NCEA), and the Superfund Health Risk Technical Support Center on a chemical-specific basis when requested by the Superfund program.

Tier 3, other toxicity values, are considered when Tier 1 or Tier 2 toxicity values are not available. These toxicity values are taken from additional USEPA and non-USEPA sources and are chosen based on the most current and best peer-reviewed source available. Health Effects Assessment Summary Tables (HEAST) (USEPA 1997b), the California EPA Office of Environmental Health Hazard Assessment (OEHHA) Toxicity Criteria Database (CalEPA 2009), and the Agency for Toxic Substances and Disease Registry (ATSDR) Minimal Risk Levels (MRLs) (ATSDR 2008) are the Tier 3 sources utilized for this HHRA.

Toxicity values used for exposures that involve dermal contact with chemicals typically require adjustment of the oral toxicity values (oral RfDs or SFs). This adjustment accounts for the difference between the daily intake dose through dermal contact as opposed to ingestion. Most toxicity values are based on the actual administered dose and must be corrected for the percent of chemical-specific absorption that occurs across the gastrointestinal tract prior to their use in dermal contact risk assessment (USEPA 1989a, 2004). The chemical-specific parameters utilized in assessing dermal exposure, gastrointestinal dermal absorption factor (GIABS) and the dermal absorption factor (ABS), are selected based on latest USEPA dermal guidance (USEPA 2004). Additional chemical-specific parameters not provided in the latest USEPA guidance is taken from the *Toxicity and Chemical-Specific Factors Database* (USDOE 2009), which is updated regularly.

2.3.1 Toxicity Assessment for Non-Carcinogens

The methodology used by USEPA for deriving non-cancer reference values for non-carcinogens and site-specific considerations for modifying or using these concentrations are discussed in detail in USEPA guidance (USEPA 2009). Non-carcinogens are typically judged to have a threshold daily dose below which deleterious or harmful effects are unlikely to occur. This concentration is called the no-observed-adverse-effect-level (NOAEL), and may be derived from either animal laboratory experiments or human epidemiology investigations (usually workplace studies). In developing a toxicity value or human NOAEL for non-carcinogens (i.e., an RfD), the regulatory approach is to (1) identify the critical toxic effect associated with chemical exposure (i.e., the most sensitive adverse effect); (2) identify the threshold dose in either an animal or human study; and (3) modify this dose to account for interspecies variability (where appropriate), differences in individual sensitivity (within-species variability), and other uncertainty and modifying factors.

Uncertainty factors (UFs) are intended to account for specific types of uncertainty inherent in extrapolation from the available data. The modifying factor (MF) accounts for the confidence in the scientific studies from which toxicity values are derived, according to such parameters as study quality and study reproducibility. The UFs are generally 10-fold, default factors used in operationally deriving the RfD and RfC from experimental data. UFs less than 10 can be used. A UF of 3 can be used in place of one-half power ($10^{0.5}$) when appropriate. The UFs are intended to account for (1) variation in susceptibility among the members of the human population (i.e., inter-individual or intraspecies variability); (2) uncertainty in extrapolating animal data to humans (i.e., interspecies uncertainty); (3) uncertainty in extrapolating from data obtained in a study with less-than-lifetime exposure (i.e., extrapolating from subchronic to chronic exposure); (4) uncertainty in extrapolating from a lowest-observed-adverse-effect-level (LOAEL) rather than from a NOAEL; and (5) uncertainty associated with extrapolation when the database is incomplete. The maximum UF for the derivation of the RfC is 3,000. The theoretical maximum UF for the derivation of the RfD is 10,000. However, the USEPA has recently begun limiting the total uncertainty factors applied to 3,000.

A MF ranging from 0 to 10 is included to reflect a qualitative professional assessment of additional uncertainties in the critical study and in the entire database not addressed by the uncertainty factors. The default value for the MF is 1. The USEPA discontinued the use of the modifying factor in 2004. However, toxicity values for some chemicals, derived before 2004, still contain a modifying factor. The use of these factors is a conservative approach for protection of human health and is likely to overestimate the toxic potency associated with chemical exposure. The RfDs and RfCs provided in this HHRA take into account the associated

uncertainty/modifying factors identified by the USEPA. To calculate the RfD/RfC, the appropriate NOAEL is divided by the product of all the applicable UFs and the MF. This is expressed as:

$$RfD = NOAEL / (UF_1 \times UF_2 \ldots \times MF) \qquad \text{(Equation 2)}$$

The resulting RfD is expressed in units of milligrams of chemical per kilogram of body weight per day (mg/kg-bw/day).

2.3.2 Toxicity Assessment for Carcinogenicity

Unlike non-carcinogens, carcinogens are generally assumed to have no threshold. There is presumed to be no level of exposure below which carcinogenic effects will not manifest themselves. This "non-threshold" concept supports the idea that there are small, finite probabilities of inducing a carcinogenic response associated with every level of exposure to a potential carcinogen. USEPA uses a two-part evaluation for carcinogenic effects. This evaluation includes the assignment of a weight-of-evidence classification and the quantification of a cancer toxic potency concentration. Quantification is expressed as an SF or an inhalation unit risk (IUR), which reflects the dose-response data for the carcinogenic endpoint(s) (USEPA 2009).

The weight-of-evidence classification system assigns a letter or alphanumeric (A through E) to each potential carcinogen that reflects an assessment of its potential to be a human carcinogen.[2] The weight-of-evidence classification is based on a thorough scientific examination of the body of available data. Only compounds that have a weight-of-evidence classification of C or above are considered to have carcinogenic potential in this risk assessment.

The SF and the IUR is the upper 95th percentile confidence limit of the probability of response per unit daily intake of a chemical over a lifetime. Typically, the SF and IUR is used to estimate the upper-bound lifetime probability of a person developing cancer from exposure to a given concentration of a carcinogen. SFs and IURs are generally based on experimental animal data, unless suitable epidemiological studies are available. Because of the difficulty in detecting and measuring carcinogenic endpoints at low exposure concentrations, SFs and IURs are typically

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[2] A = a known human carcinogen; B1 = a probable human carcinogen, based on sufficient animal data and limited human data; B2 = a probable human carcinogen based on sufficient animal data and inadequate or no human data; C = a possible human carcinogen; D = not classifiable as to human carcinogenicity; and E = evidence of non-carcinogenicity for humans.

developed by using a model to fit the available high-dose, experimental animal data, and then extrapolating downward to the low-dose range to which humans are typically exposed. USEPA recommends the linear multistage model to derive an SF and IUR. The model is conservative and provides an upper bound estimate of excess lifetime cancer risk.

2.3.3 Special Chemicals – Lead

According to the USEPA, lead is classified as a B2, probable human carcinogen. However, the USEPA has not identified a toxicity value for use in quantifying carcinogenic risks. In the absence of any USEPA-published toxicity values for lead, it is currently not possible to perform a quantitative risk estimate for lead exposures using standard USEPA methodology.

Blood lead levels are the indicator of excess lead exposure in humans. Modeled blood level results are compared to the established cutoff value or acceptable blood-lead threshold of 10 μg lead/dL. This blood level is considered protective of human health for children. Where lead is a residential scenario COPC in soil, lead risks for potential future residents are evaluated using U.S. EPA's Integrated Exposure Uptake Biokinetic Model (IEUBK) Lead Model (USEPA 2007b) using an average lead concentration in soil where lead is a COPC. Where lead is an industrial scenario COPC in soil, lead is modeled using *Recommendations of the Technical Review Workgroup (TRW) for Lead, An Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil* (USEPA 2003a).

Both the IEUBK Lead Model and the Adult Exposure to Lead Model are used to model blood lead levels for exposure to lead in soil and groundwater. When lead is considered a COPC in surface water and sediment, a qualitative assessment will be made because the aforementioned lead models are not designed to account for lead in surface water or sediment.

2.4 RISK CHARACTERIZATION

Risk characterization is the fourth step of the HHRA process. In this step, the toxicity values are combined with the estimated chemical intakes for the receptor populations to quantitatively estimate both carcinogenic risks and non-carcinogenic hazards. Effects are estimated for each receptor of concern.

2.4.1 Hazard Index for Non-Carcinogenic Effects

The potential human health risks associated with exposures to non-carcinogenic COPCs are estimated by comparing the ADI with the chemical-specific RfD, as per USEPA Guidance (USEPA 1989a).

An HQ is derived for each COPC, as shown in the equation below:

$$HQ = \frac{ADI}{RfD} \qquad \text{(Equation 3)}$$

where:

HQ	=	Hazard Quotient; ratio of average daily intake level to acceptable daily intake level (unitless)
ADI	=	Estimated non-carcinogenic average daily intake (mg/kg-day)
RfD	=	Reference dose (mg/kg-day)

If the average daily dose exceeds the RfD, the HQ will exceed a ratio of one (1.0) and there may be concern that potential adverse systemic health effects will be observed in the exposed populations. If the ADI does not exceed the RfD, the HQ will not exceed 1.0 and there will be no concern that potential adverse systemic health effects will be observed in the exposed populations. However, if the sum of several HQs exceeds 1.0, and the COPCs affect the same target organ, there may be concern that potential adverse systemic health effects will be observed in the exposed populations. In general, the greater the value of the HQ above 1.0, the greater the level of concern. However, the HQ does not represent a statistical probability that an adverse health effect will occur.

For consideration of exposures to more than one chemical causing systemic toxicity via several different pathways, the individual HQs are summed to provide an overall hazard index (HI). If the HI is less than 1.0, then no adverse health effects are likely to be associated with exposures at the site. However, if the total HI is greater than 1.0, separate endpoint-specific HIs may be calculated based on toxic endpoint of concern or target organ (e.g., HQs for neurotoxins are summed separately from HQs for renal toxins). Only if an endpoint-specific HI is greater than 1.0 is there reason for concern about potential health effects for that endpoint.

2.4.2 Carcinogenic Risks

Carcinogenic risk is estimated as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to a potential carcinogen. The numerical estimate of excess lifetime cancer risk is calculated by multiplying the LADI by the risk per unit dose (SF).

This is shown in the following equation:

$$Risk = LADI \times SF \qquad \text{(Equation 4)}$$

where:

Risk	=	Unitless probability of an exposed individual developing cancer
LADI	=	Lifetime cancer average daily intake (mg/kg-day)
SF	=	Cancer slope factor $(mg/kg\text{-}day)^{-1}$

Because the SF is the statistical 95th percent upper-bound confidence limit on the dose-response slope, this method provides a conservative, upper-bound estimate of risk.

It should be noted that the interpretation of the significance of the cancer risk estimate is based on the appropriate public policy. USEPA in the NCP (40 CFR Part 300) (USEPA 1990) states that:

> *"...For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 10^{-4} and 10^{-6}."*

2.4.3 Lead

Infants and young children are the most vulnerable populations exposed to lead and have been the focus of USEPA's risk assessment efforts. The relatively high vulnerability of infants and children results from a combination of factors: (1) an apparent intrinsic sensitivity of developing organs to lead; (2) behavioral characteristics that increase contact with lead from soil and dust (e.g., mouthing behavior); (3) various physiologic factors resulting in a greater deposition of airborne lead in the respiratory tract and greater absorption efficiency from the gastrointestinal tract in children than in adults; and (4) transplacental transfer of lead that establishes a lead burden in the fetus, thus increasing the risk associated with additional exposure during infancy and childhood.

For resident children, the risks associated with lead are estimated using the USEPA's IEUBK Model. The IEUBK Model is used to estimate blood lead concentrations resulting from exposure to environmental sources. The IEUBK Model is a three-stage method for estimating total blood lead levels. First, the intake of lead from each source is assessed. Second, the uptake of lead from each source is determined. Finally, the relationship between the uptake of lead and blood lead concentration is applied using the "Integrated Metabolic Model for Humans of All Ages," as revised by Harley and Kneip (1985).

The Harley and Kneip model incorporates total uptake of lead derived from all exposures and the distribution of lead to the four body compartments (blood, bone, liver, and kidney) in which 95 percent of the lead is found. The model is based on the distribution and equilibrium of stable lead and a naturally occurring radioactive lead isotope in the bodies of infant and child baboons

and in humans during continuous lead exposure. The model was validated through data collected from lead smelter sites, experimental data on blood lead concentrations in infants, and studies of lead accumulation in bones under controlled conditions in adults (USEPA 1989b). The model predicts a linear increase in blood lead levels with increasing lead uptake. However, above a blood lead concentration of 30 μg/dL, the relationship is not linear (USEPA 1989b). Therefore, this model may only be applied for moderately low lead uptakes.

The USEPA has created a software program of the IEUBK Model, for predicting blood lead levels in children 0-84 months. The most current software is IEUBKwin32v1.0.264 (USEPA 2007b). The IEUBK Model is used in this risk assessment for estimating blood lead levels in children where lead is considered a COPC in soil. Standard default values used as input parameters for the model are described in USEPA guidance (USEPA 2002d). The model output is a probability distribution function describing the percentage of children predicted to have blood-lead levels exceeding 10 μg/dL. To achieve a specific level of protectiveness, the USEPA has established a limit to exposure to soil lead levels such that a typical (or hypothetical) child would have an estimated risk of no more than 5 percent exceeding the 10 ug/L blood lead level (USEPA 1994). The 10 ug/dL blood lead level is based upon analyses by the Centers for Disease Control (CDC) and the USEPA that reveal blood lead levels of 10 ug/L and higher result in health effects in children (USEPA 1994). More specific information on this model is contained in USEPA's *Guidance Manual for the IEUBK Model for Lead in Children*, December 1994.

For estimating blood-lead levels in site workers, the USEPA TRW for Lead has developed a model to predict blood-lead levels in adult workers (USEPA 2003a). This model is run to assess potential workers under a commercial setting. Model default parameters are used to predict blood lead impacts for female workers and their potential children (embryonic) due to site exposure.

3. MAXWELL POINT INVESTIGATION AREA, BUILDING E7340/7350 TEST SITE RISK ASSESSMENT

3.1 SITE DESCRIPTION

The Maxwell Point Investigation Area, Building E7340/7350 Test Site data grouping includes the Building E7340/7350 Test Site and the Building E7332 Test Site. This data grouping encompasses the eastern portion of the investigation area. A detailed site history for these areas is provided in Section 1.1.

3.2 SAMPLES INCLUDED IN THE HHRA FOR MAXWELL POINT INVESTIGATION AREA – BUILDING E7340/7350 TEST SITE

Surface soil, total soil (surface and subsurface soil combined), surface water, and sediment are evaluated in the HHRA for the Building E7340/7350 Test Site grouping. Groundwater is evaluated in Section 5 of this HHRA. The soil sample locations are shown in Figure 3, and the surface water and sediment sample locations are shown in Figure 4. Details about sample locations, sampling methods, and analytical methods can be found in the documents listed in Section 1.3.

3.3 HAZARD ASSESSMENT – MAXWELL POINT INVESTIGATION AREA – BUILDING E7340/7350 TEST SITE

Based on current and potential future use, screening is conducted to determine COPCs for residential and industrial exposure scenarios. The specific receptors and pathways evaluated for the Building E7340/7350 Test Site grouping are presented in Table 2-1.

3.3.1 Analytes Exceeding Risk-Based Screening Levels

The occurrence, distribution, and selection of analytes at the site are represented in Tables 3-2.1 through 3-2.7 following the RAGS D format. The tables are scenario-specific and present the minimum and maximum detected concentrations, the location of the maximum detected concentrations, as well as, frequency of detection for each chemical detected. Analytes that exceed the screening criteria are presented in bold type.

3.3.1.1 <u>COPCs in Surface Soil</u>

A total of nine COPCs in surface soil (Table 3-2.1) are identified based on the residential soil RBC risk-based screen: aluminum, antimony, arsenic, chromium, iron, lead, manganese, vanadium, and zinc.

Only one COPC in surface soil (Table 3-2.2) is identified based on the industrial soil RBC risk-based screen: arsenic.

3.3.1.2 COPCs in Total Soil

A total of ten COPCs in total soil (Table 3-2.3) are identified based on the residential soil RBC risk-based screen: aluminum, antimony, arsenic, cadmium, chromium, iron, lead, manganese, vanadium, and zinc.

Only one COPC in total soil (Table 3-2.4) is identified based on the industrial soil RBC risk-based screen: arsenic.

3.3.1.3 COPCs in Sediment

To account for sediment exposures, the soil RBCs are increased by a factor of ten (EA 2005). One sediment COPC (Table 3-2.5) is identified based on the residential soil RBC risk-based screening: arsenic.

No sediment COPCs (Table 3-2.6) are identified based on the industrial soil RBC risk-based screening.

3.3.1.4 COPCs in Surface Water

To account for surface water exposures, the tap water RBCs are increased by a factor of ten (EA 2005). Two surface water COPCs (Table 3-2.7) are identified based on the comparison to tap water RBCs: iron and thallium.

3.4 EXPOSURE ASSESSMENT – MAXWELL POINT INVESTIGATION AREA – BUILDING E7340/7350 TEST SITE

EPCs are calculated in accordance with Section 2.2.2. Calculations for the EPCs are provided for each COPC in each medium in Appendix B. The results are summarized in Tables 3-3.1 through 3-3.7, including the rationale for EPC selection.

Receptors evaluated for the Building E7340/7350 Test Site data grouping include current adolescent trespasser, current maintenance worker, future resident adult and child, future commercial worker, and future construction worker. Potential exposure pathways are presented in Table 2-1. A conceptual site model presenting pathways that are considered is provided in Figure 6.

Exposure parameters and equations for each receptor and pathway are presented in medium-specific Tables 3-4.1 through 3-4.14; groundwater is evaluated separately and presented in Section 5 of this document. The exposure pathways and parameters included in this HHRA are based on those presented in the Approach Document (EA 2005).

3.5 TOXICITY ASSESSMENT – MAXWELL POINT INVESTIGATION AREA – BUILDING E7340/7350 TEST SITE

USEPA-derived toxicity values for evaluating potential chronic non-carcinogenic effects for COPCs are summarized in Tables 3-5.1 and 3-5.2. Toxicity information presented in these tables includes the following USEPA-provided/derived information: chronic or subchronic RfD values for exposures via the oral and inhalation pathway; reported target organs, uncertainty, and modifying factors specific to the USEPA-derived RfD; and the scientific source of the information. Table 3-5.3 presents relative chemical-specific parameters utilized in calculating dermal exposure for COPCs.

USEPA-derived toxicity values for evaluating potential carcinogenic effects for COPCs are summarized in Tables 3-6.1 and 3-6.2. Toxicity information presented in these tables includes the following USEPA-provided/derived information: a chemical-specific SF (cancer potency factor) for exposures via the oral and inhalation pathway; USEPA's weight-of-evidence cancer classification; and the source of the information.

3.6 RISK CHARACTERIZATION – MAXWELL POINT INVESTIGATION AREA – BUILDING E7340/7350 TEST SITE

The methodologies used to estimate carcinogenic risks and chronic and subchronic risks for non-carcinogens are described further in Section 2.3. Calculations are presented by receptor in Tables 3-7.1 through 3-7.6. Table 3-7.7 presents the estimation of COPC air concentrations of particulate from soil.

Estimates of cumulative risks across all pathways for non-carcinogenic and carcinogenic effects for all receptors are presented in Tables 3-9.1 through 3-9.5. A risk assessment summary is presented in Tables 3-10.1 through 3-10.5. COPCs are only identified on Tables 3-10.1 through 3-10.5 if cumulative carcinogenic risks are greater than the lower bound of the USEPA's "acceptable risk range" (i.e., 10^{-6}) or cumulative non-carcinogenic risks are greater than 1.0. Only COPCs with carcinogenic risks greater than 10^{-6} or non-carcinogenic risks greater than 0.1 are shown on these tables.

3.6.1 Adolescent Trespasser Results

The current adolescent trespasser receptor is evaluated for COPC exposure in surface soil, surface water, and sediment at Building E7340/7350. The exposure scenario calculations are presented in Table 3-7.1. The carcinogenic and non-carcinogenic risk assessment results for the adolescent trespasser are summarized in Table 3-9.1.

Non-Carcinogenic Results

The total non-carcinogenic HI for the adolescent trespasser is 0.05, which is below the acceptable threshold of 1.0 (Table 3-9.1). The total non-carcinogenic HI for exposure to surface soil is 0.02, for exposure to surface water is 0.02, and for exposure to sediment is 0.01. Therefore, there are no non-carcinogenic concerns for the adolescent trespasser at the Building E7340/7350 Test Site.

Carcinogenic Results

The cumulative carcinogenic risk for the adolescent trespasser is 8.4×10^{-7}, which is below the USEPA's "acceptable risk range" of 10^{-4} to 10^{-6} (Table 3-9.1). The carcinogenic risk for exposure to surface soil is 3.0×10^{-7}, for exposure to surface water is zero (due to no carcinogenic COPCs in surface water), and for exposure to sediment is 5.4×10^{-7}. Therefore, there are no carcinogenic risk concerns for the adolescent trespasser at the Building E7340/7350 Test Site.

3.6.2 Maintenance Worker Results

The maintenance worker receptor is evaluated for exposure to COPCs in surface soil and surface water at the Building E7340/7350 Test Site. The exposure scenario calculations are presented in Table 3-7.2. The maintenance worker exposure to sediment is not evaluated because there are no COPCs in sediment for the industrial exposure scenario. The carcinogenic and non-carcinogenic risk assessment results for the maintenance worker are summarized in Table 3-9.2.

Non-Carcinogenic Results

The total non-carcinogenic HI for the maintenance worker is 0.02, which is below the acceptable threshold of 1.0 (Table 3-9.2). The total non-carcinogenic HI for surface soil is 0.004 and for surface water is 0.01. Therefore, there are no non-carcinogenic concerns for the maintenance worker at the Building E7340/7350 Test Site.

Carcinogenic Results

The cumulative carcinogenic risk for the maintenance worker is 6.0×10^{-7}, which is below USEPA's "acceptable risk range" of 10^{-4} to 10^{-6} (Table 3-9.2). The carcinogenic risk for exposure to surface soil is 6.0×10^{-7}. There were no carcinogenic COPCs in surface water. Therefore, there are no carcinogenic risk concerns for the maintenance worker at the Building E7340/7350 Test Site.

3.6.3 Commercial Worker Results

The commercial worker receptor is evaluated for exposure to COPCs in total soil at the Building E7340/7350 Test Site. The exposure scenario calculations are presented in Table 3-7.3. The carcinogenic and non-carcinogenic risk assessment results for the commercial worker are summarized in Table 3-9.3.

Non-Carcinogenic Results

The total non-carcinogenic HI for the commercial worker is 0.02, which is below the acceptable threshold of 1.0 (Table 3-9.3). Therefore, there are no non-carcinogenic concerns for the commercial worker at the Building E7340/7350 Test Site.

Carcinogenic Results

The cumulative carcinogenic risk for the commercial worker is 2.9×10^{-6}, which is within USEPA's "acceptable risk range" of 10^{-4} to 10^{-6} (Table 3-9.3). Therefore, there are no carcinogenic risk concerns for the commercial worker at the Building E7340/7350 Test Site.

3.6.4 Construction Worker Results

The future construction worker receptor is evaluated for exposure to COPCs in total soil at the Building E7340/7350 Test Site. The exposure scenario calculations are presented in Table 3-7.4. The carcinogenic and non-carcinogenic risk assessment results for the construction worker are summarized in Table 3-9.4.

Non-Carcinogenic Results

The total non-carcinogenic HI for the construction worker is 0.1, which is below the acceptable threshold of 1.0 (Table 3-9.4). Therefore, there are no non-carcinogenic concerns for the construction worker at the Building E7340/7350 Test Site.

Carcinogenic Results

The cumulative carcinogenic risk for the construction worker is 8.4×10^{-7}, which is below USEPA's "acceptable risk range" of 10^{-4} to 10^{-6} (Table 3-9.4). Therefore, there are no carcinogenic risk concerns for the construction worker at the Building E7340/7350 Test Site.

3.6.5 Resident Adult and Child Results

The resident adult and child receptors are evaluated for exposure to COPCs in total soil, surface water, and sediment at the Building E7340/7350 Test Site. The exposure scenario calculations are presented in Table 3-7.5 for the resident adult and Table 3-7.6 for the resident child. The

carcinogenic and non-carcinogenic risk assessment results for resident adult and child are summarized in Table 3-9.5.

Non-Carcinogenic Results

The total non-carcinogenic HI for the resident child is 1.4, which slightly exceeds the acceptable threshold of 1.0 (Table 3-9.5). The total non-carcinogenic HI for exposure to total soil is 1.3, for exposure to surface water is 0.04, and for exposure to sediment is 0.01. A breakdown by target organ is presented on Table 3-10.5. No COPC has a chemical-specific HQ greater than 1.0. Furthermore, no target-organ specific HI exceeds 1.0. Therefore, there are no non-carcinogenic concerns for the resident child at the Building E7340/7350 Test Site.

The total non-carcinogenic HI for the resident adult is 0.2, which is below the acceptable threshold of 1.0 (Table 3-9.5). The total non-carcinogenic HI for exposure to total soil is 0.15, for exposure to surface water is 0.03, and for exposure to sediment is 0.001. Therefore, there are no non-carcinogenic concerns for the resident adult at the Building E7340/7350 Test Site.

Carcinogenic Results

The total lifetime carcinogenic risk for the resident (adult and child combined) exposure to total soil, surface water, and sediment is 2.1×10^{-5}. This carcinogenic risk is within the USEPA's "acceptable risk range" of 10^{-6} to 10^{-4}. The resident exposure to total soil, surface water, and sediment carcinogenic risk are 2.0×10^{-5}, zero (no carcinogenic COPCs), and 6.6×10^{-7}, respectively. Therefore, there are no carcinogenic risk concerns for the future resident at the Building E7340/7350 Test Site.

3.6.6 Lead Evaluation

Lead is a COPC in soil at Building E7340/7350 Test site based upon the maximum detected concentration of 801 mg/kg in surface soil. The maximum detected concentration exceeds the USEPA's screening level of 400 mg/kg; lead is only a COPC based on the residential screen. Therefore, the USEPA IEUBK model is run to evaluate the most conservative receptor, a resident child.

Three of twenty samples in surface exceed 400 mg/kg. The arithmetic mean for lead in surface soil is 156 mg/kg. Results of the lead modeling for resident children are presented in Table 3-8. Outputs of the IEUBK model are presented in Appendix D including probability density graphs. The model indicates acceptable residential blood lead levels for surface soil.

Three of twenty-two samples in total soil exceed 400 mg/kg (data are presented in Appendix A). The arithmetic mean for lead in total soil is 143 mg/kg. Results of the total soil lead modeling for resident children are presented in Table 3-8. Outputs of the IEUBK model are presented in Appendix D including probability density graphs. The model indicates acceptable residential blood lead levels for total soil.

3.6.7 Uncertainty in Background

A comparison of Building E7340/7350 Test Site data grouping detected maximum concentrations to Reference UPL values is presented in Tables 3-11.1 through 3-11.4.

Surface Soil Reference Comparisons

Table 3-11.1 compares the COPCs in surface soil to the Reference UPLs. Site concentrations of aluminum, antimony, and manganese are consistent with reference data and are potentially present at the site in soil at naturally occurring levels. Site concentrations of other inorganic COPCs are not consistent with reference data and may be site related.

Total Soil Reference Comparisons

Table 3-11.2 compares the COPCs in surface soil to the Reference UPLs. Site concentrations of aluminum, antimony, and manganese are consistent with reference data and are potentially present at the site in soil at naturally occurring levels. Site concentrations of other inorganic COPCs are not consistent with reference data and may be site related.

Surface Water Reference Comparisons

Table 3-11.3 compares the COPCs in surface water to the Reference UPLs. Site concentrations of thallium are consistent with reference data and are potentially present at the site in surface water at naturally occurring levels. Site concentrations of iron are not consistent with reference data and appear to be site related.

Sediment Reference Comparisons

Table 3-11.4 compares the COPCs in sediment to the Reference UPLs. Site concentrations of arsenic are consistent with reference data and are potentially present at the site in sediment at naturally occurring levels.

3.7 MAXWELL POINT INVESTIGATION AREA – BUILDING E7340/7350 TEST SITE HHRA CONCLUSIONS

The Building E7340/7350 Test Site data grouping HHRA evaluates potential cumulative risks for current adolescent trespasser, current maintenance worker, future construction worker, future

commercial worker, and future resident adult and child for exposure to surface soil, total soil, surface water, and sediment.

Non-carcinogenic hazards did not exceed 1.0 for any of the receptors evaluated, except for resident child. The total non-carcinogenic HI for the resident child is 1.4, which exceeds the acceptable threshold of 1.0. A breakdown by target organ indicates that no COPC has a chemical-specific HQ greater than 1.0. Furthermore, no target-organ specific HI exceeds 1.0. Therefore, there are no non-carcinogenic concerns for the resident child at the Building E7340/7350 Test Site.

Carcinogenic risks for all receptors evaluated are within or below the U.S. EPA's "acceptable risk range." An evaluation of lead in soil indicates that lead is not a site-wide concern. Therefore, the HHRA indicates no concerns for potential receptors exposure to surface soil, total soil, surface water, and sediment at the Building E7340/7350 Test Site.

4. MAXWELL POINT INVESTIGATION AREA, SMOKE GENERATOR DEBRIS AREA RISK ASSESSMENT

4.1 SITE DESCRIPTION

The Maxwell Point Investigation Area, Smoke Generator Debris Area data grouping includes the Smoke Generator Debris Area and the Building E7365/E7368 Test Site. This data grouping encompasses the western portion of the investigation area. A detailed site history for these areas is provided in Section 1.1.

4.2 SAMPLES INCLUDED IN THE HHRA FOR MAXWELL POINT INVESTIGATION AREA – SMOKE GENERATOR DEBRIS AREA

Surface soil, total soil (surface and subsurface soil (combined), surface water, and sediment are evaluated in the HHRA for the Smoke Generator Debris Area grouping. Groundwater is evaluated in Section 5 of this HHRA. The soil sample location are shown in Figure 3, and the surface water and sediment sample locations are shown in Figure 4. Details about sample locations, sampling methods, and analytical methods can be found in the documents listed in Section 1.3.

4.3 HAZARD ASSESSMENT – MAXWELL POINT INVESTIGATION AREA – SMOKE GENERATOR DEBRIS AREA

Based on current and potential future use, screening is conducted to determine COPCs for the residential and industrial exposure scenarios. The specific receptors and pathways evaluated for the Smoke Generator Debris Area grouping are presented in Table 2-1.

4.3.1 Analytes Exceeding Risk-Based Screening Levels

The occurrence, distribution, and selection of analytes at the site are represented in Tables 4-2.1 through 4-2.7 following the RAGS D format. The tables are scenario-specific and present the minimum and maximum detected concentrations, the location of the maximum detected concentrations, as well as frequency of detection for each chemical detected. Analytes that exceed screening criteria are presented in bold type.

4.3.1.1 <u>COPCs in Surface Soil</u>

A total of six COPCs in surface soil (Table 4-2.1) are identified based on the residential soil RBC risk-based screen: aluminum, arsenic, chromium, iron, manganese and vanadium.

One COPC in surface soil (Table 4-2.2) is identified based on the industrial soil RBC risk-based screen: arsenic.

4.3.1.2 COPCs in Total Soil

A total of six COPCs in total soil (Table 4-2.3) are identified based on the residential soil RBC risk-based screen: aluminum, arsenic, chromium, iron, manganese and vanadium.

One COPC in total soil (Table 4-2.4) is identified based on the industrial soil RBC risk-based screen: arsenic

4.3.1.3 COPCs in Sediment

No sediment COPCs (Table 4-2.5) are identified based on the residential soil RBC risk-based screening.

No sediment COPCs (Table 4-2.6) are identified based on the industrial soil RBC risk-based screening.

4.3.1.4 COPCs in Surface Water

To account for surface water exposures, the tap water RBCs are increased by a factor of ten (EA 2005). Only one surface water COPC (Table 4-2.7) is identified based on the comparison to tap water RBCs: 1,1,2,2-tetrachloroethane.

4.4 EXPOSURE ASSESSMENT – MAXWELL POINT INVESTIGATION AREA – SMOKE GENERATOR DEBRIS AREA

EPCs are calculated in accordance with Section 2.2.2. Calculations for the EPCs are provided for each COPC in each medium in Appendix B. The results are summarized in Tables 4-3.1 through 4-3.7, including the rationale for EPC selection.

Receptors evaluated for the Smoke Generator Debris Area data grouping include current adolescent trespasser, current maintenance worker, future commercial worker, future construction worker, and future resident adult and child. Potential exposure pathways are presented in Table 2-1. A conceptual site model presenting pathways that are considered is provided in Figure 6.

Exposure parameters and equations for each receptor and pathway are presented in medium-specific Tables 4-4.1 through 4-4.14. The exposure pathways and parameters included in this HHRA are based on those presented in the Approach Document (EA 2005).

4.5 TOXICITY ASSESSMENT – MAXWELL POINT INVESTIGATION AREA – SMOKE GENERATOR DEBRIS AREA

USEPA-derived toxicity values for evaluating potential chronic non-carcinogenic effects for COPCs are summarized in Tables 4-5.1 and 4-5.2. Toxicity information presented in these tables includes the following USEPA-provided/derived information: chronic or subchronic RfD values for exposures via the oral and inhalation pathway; reported target organs, uncertainty, and modifying factors specific to the USEPA-derived RfD; and the scientific source of the information. Table 4-5.3 presents relative chemical-specific parameters utilized in calculating dermal exposure for COPCs.

USEPA-derived toxicity values for evaluating potential carcinogenic effects for COPCs are summarized in Tables 4-6.1 and 4-6.2. Toxicity information presented in these tables includes the following USEPA-provided/derived information: a chemical-specific SF (cancer potency factor) for exposures via the oral and inhalation pathway; USEPA's weight-of-evidence cancer classification; and the source of the information.

4.6 RISK CHARACTERIZATION – MAXWELL POINT INVESTIGATION AREA – SMOKE GENERATOR DEBRIS AREA

The methodologies used to estimate carcinogenic risks and chronic and subchronic risks for non-carcinogens are described further in Section 2.3. Calculations are presented by receptor in Tables 4-7.1 through 4-7.6. Table 4-7.7 presents the estimation of air concentrations of particulate from soil.

Estimates of cumulative risks across all pathways for non-carcinogenic and carcinogenic effects for all receptors are presented in Tables 4-9.1 through 4-9.5. A risk assessment summary is presented in Tables 4-10.1 through 4-10.5. COPCs are only identified on Tables 4-10.1 through 4-10.5 if cumulative carcinogenic risks are greater than the lower bound of the USEPA's "acceptable risk range" (i.e., 10^{-6}) or cumulative non-carcinogenic hazards are greater than 1.0. Only COPCs with carcinogenic risks greater than 10^{-6} or non-carcinogenic risks greater than 0.1 are shown on these tables.

4.6.1 Adolescent Trespasser Results

The current adolescent trespasser receptor is evaluated for COPC exposure in surface soil, surface water, and sediment at the Smoke Generator Debris Area. The exposure scenario calculations are presented in Table 4-7.1. The carcinogenic and non-carcinogenic risk assessment results for the adolescent trespasser are summarized in Table 4-9.1.

Non-Carcinogenic Results

The total non-carcinogenic HI for the adolescent trespasser is 0.02, which is below the acceptable threshold of 1.0 (Table 4-9.1). The total non-carcinogenic HI for exposure to surface soil is 0.02 and exposure to surface water is 0.00008. There are no COPCs in sediment for the industrial receptor. Therefore, there are no non-carcinogenic concerns for the adolescent trespasser at the Smoke Generator Debris Area.

Carcinogenic Results

The cumulative carcinogenic risk for the adolescent trespasser is 2.3×10^{-7}, which is below USEPA's "acceptable risk range" of 10^{-4} to 10^{-6} (Table 4-9.1). The carcinogenic risk for exposure to surface soil is 2.2×10^{-7}, for exposure to surface water is $7.6\text{x}10^{-9}$. There are no COPCs in sediment for the industrial receptor. Therefore, there are no carcinogenic risk concerns for the adolescent trespasser at the Smoke Generator Debris Area.

4.6.2 Maintenance Worker Results

The maintenance worker receptor is evaluated for exposure to COPCs in surface soil and surface water at the Smoke Generator Debris Area. The exposure scenario calculations are presented in Table 4-7.2. The maintenance worker exposure to sediment is not evaluated because there are no COPCs in sediment for the industrial exposure scenario. The carcinogenic and non-carcinogenic risk assessment results for the maintenance worker are summarized in Table 4-9.2.

Non-Carcinogenic Results

The total non-carcinogenic HI for the operations/maintenance worker is 0.003, which is below the acceptable threshold of 1.0 (Table 4-9.2). The total non-carcinogenic HI for surface soil is 0.003 and surface water exposure is 0.00004. There are no COPCs in sediment for the industrial receptor. Therefore, there are no non-carcinogenic concerns for the maintenance worker at the Smoke Generator Debris Area.

Carcinogenic Results

The cumulative carcinogenic risk for the maintenance worker is 4.5×10^{-7}, which is below USEPA's "acceptable risk range" of 10^{-4} to 10^{-6} (Table 4-9.2). The carcinogenic risk for exposure to surface soil is 4.4×10^{-7} and for exposure to surface water is $1.1\text{x}10^{-8}$. Therefore, there are no carcinogenic risk concerns for the maintenance worker at the Smoke Generator Debris Area.

4.6.3 Commercial Worker Results

The commercial worker receptor is evaluated for exposure to COPCs in total soil at the Smoke Generator Debris Area. The exposure scenario calculations are presented in Table 4-7.3. The carcinogenic and non-carcinogenic risk assessment results for the commercial worker are summarized in Table 4-9.3.

Non-Carcinogenic Results

The total non-carcinogenic HI for the commercial worker is 0.01, which is below the acceptable threshold of 1.0 (Table 4-9.3). Therefore, there are no non-carcinogenic concerns for the commercial worker at the Smoke Generator Debris Area.

Carcinogenic Results

The cumulative carcinogenic risk for the commercial worker is 2.2×10^{-6}, which is within USEPA's "acceptable risk range" of 10^{-4} to 10^{-6} (Table 4-9.3). Therefore, there are no carcinogenic risk concerns for the commercial worker at the Smoke Generator Debris Area.

4.6.4 Construction Worker Results

The future construction worker receptor is evaluated for exposure to COPCs in total soil at the Smoke Generator Debris Area. The exposure scenario calculations are presented in Table 4-7.4. The carcinogenic and non-carcinogenic risk assessment results for the construction worker are summarized in Table 4-9.4

Non-Carcinogenic Results

The total non-carcinogenic HI for the construction worker is 0.1, which is below the acceptable threshold of 1.0 (Table 4-9.4). Therefore, there are no non-carcinogenic concerns for the construction worker at the Smoke Generator Debris Area.

Carcinogenic Results

The cumulative carcinogenic risk for the construction worker is 6.4×10^{-7}, which is below USEPA's "acceptable risk range" of 10^{-4} to 10^{-6} (Table 4-9.4). Therefore, there are no carcinogenic risk concerns for the construction worker at the Smoke Generator Debris Area.

4.6.5 Resident Adult and Child Results

The resident adult and child receptors are evaluated for exposure to COPCs in total soil, surface water, and sediment at the Smoke Generator Debris Area. The exposure scenario calculations are presented in Table 4-7.5 for the resident adult and Table 4-7.6 for the resident child. The

carcinogenic and non-carcinogenic risk assessment results for resident adult and child are summarized in Table 4-9.5.

Non-Carcinogenic Results

The total non-carcinogenic HI for the resident child is 1.3, which slightly exceeds the acceptable threshold of 1.0 (Table 4-9.5). The total non-carcinogenic HI for exposure to total soil is 1.3 and for exposure to surface water is 0.00005. There are no COPCs in sediment for the residential receptor. A breakdown by target organ is presented on Table 4-10.5; no target organ has a HI greater than 1.0. No COPC has a chemical-specific HQ greater than 1.0. Therefore, there are no non-carcinogenic concerns for the resident child at the Smoke Generator Debris Area.

The total non-carcinogenic HI for the resident adult is 0.2, which is below the acceptable threshold of 1.0. The total non-carcinogenic HI for exposure to surface soil is 0.15 and for exposure to surface water is 0.0002. There are no COPCS in sediment for the residential receptor. Therefore, there are no non-carcinogenic concerns for the resident adult at the Smoke Generator Debris Area.

Carcinogenic Results

The total lifetime carcinogenic risk for the resident (adult and child combined) exposure to surface soil, surface water, and sediment is 1.6×10^{-5}. This carcinogenic risk is within the USEPA's "acceptable risk range" of 10^{-6} to 10^{-4}. The resident exposure to total soil and surface water carcinogenic risk are 1.6×10^{-5} and 7.3×10^{-8}, respectively. Therefore, there are no carcinogenic risk concerns for the future resident at the Smoke Generator Debris Area.

4.6.6 Uncertainty in Background

Comparison of the Smoke Generator Debris Area data grouping detected maximum concentrations to Reference UPL values is presented in Tables 4-11.1 through 4-11.2.

Surface Soil Reference Comparisons

Table 4-11.1 compares the COPCs in surface soil to the Reference UPLs. Site concentrations of aluminum, arsenic, chromium, manganese and vanadium are consistent with reference data and are potentially present at the site in soil at naturally occurring levels. Site concentrations of iron are not consistent with reference data and may be site related.

Total Soil Reference Comparisons

Table 4-11.2 compares the COPCs in total soil to the Reference UPLs. Site concentrations of aluminum, arsenic, chromium, manganese and vanadium are consistent with reference data and

are potentially present at the site in soil at naturally occurring levels. Site concentrations of iron are not consistent with reference data and may be site related.

4.7 MAXWELL POINT INVESTIGATION AREA – SMOKE GENERATOR DEBRIS AREA HHRA CONCLUSIONS

The Smoke Generator Debris Area data grouping HHRA evaluates potential cumulative risks for current adolescent trespasser, current maintenance worker, future construction worker, future commercial worker, and future resident adult and child for exposure to surface soil, total soil, surface water, and sediment.

Non-carcinogenic hazards did not exceed 1.0 for the adolescent trespasser, maintenance worker, commercial worker, construction worker, and resident adult. The total non-carcinogenic HI for the resident child is 1.3, which slightly exceeds the acceptable threshold of 1.0. Non-carcinogenic hazards are primarily attributable to total soil. A breakdown by target organ indicates that no target organ has a HI greater than 1.0. No COPC has a chemical-specific HQ greater than 1.0. Therefore, there are no non-carcinogenic risk concerns for the resident child at the Smoke Generator Debris Area. Carcinogenic risks for all receptors evaluated are within or below the U.S. EPA's "acceptable risk range."

Therefore, the HHRA indicates no concerns for potential receptors exposure to surface soil, total soil, surface water, and sediment at the Smoke Generator Debris Area.

5. GROUNDWATER RISK ASSESSMENT

5.1 GROUNDWATER EVALUATION AREA DESCRIPTION

The Maxwell Point Investigation area was evaluated as a whole for the risk assessment of groundwater.

5.2 SAMPLES INCLUDED IN THE HHRA FOR MAXWELL POINT INVESTIGATION AREA – GROUNDWATER

A list of the monitoring well samples evaluated for the Maxwell Point investigation area is presented in Appendix A. The sample locations are depicted in Figure 5. Details about sample locations, sampling methods, and analytical methods can be found in the documents listed in Section 1.3. For the on-site monitoring well samples, groundwater was first encountered at a mean depth of 13.7 ft bgs. The minimum depth to first groundwater was 8 feet bgs, and the maximum depth to first groundwater was 23 feet bgs.

5.3 HAZARD ASSESSMENT – MAXWELL POINT INVESTIGATION AREA – GROUNDWATER

Based on current and potential future use, screening is conducted to determine COPCs for the residential and industrial exposure scenarios. The specific receptors and pathways evaluated for the Maxwell Point Investigation Area are presented in Table 2-1.

5.3.1 Analytes Exceeding Risk-Based Screening Levels

The occurrence, distribution, and selection of analytes at the site are represented in Table 5-2 following the RAGS D format. The table is scenario-specific and presents the minimum and maximum detected concentrations, the location of the maximum detected concentrations, as well as frequency of detection for each chemical detected. Analytes that exceed screening criteria are presented in bold type.

5.3.1.1 <u>COPCs in Groundwater</u>

Several COPCs in groundwater (Table 5-2) are identified based on the tap water RBC risk-based screen: nitrobenzene, dissolved arsenic, dissolved beryllium, dissolved cadmium, dissolved iron, dissolved manganese, dissolved nickel, dissolved thallium, dissolved vanadium, dissolved zinc, total aluminum, total arsenic, total beryllium, total cadmium, total chromium, total iron, total lead, total manganese, total nickel, total thallium, total vanadium, total zinc, naphthalene, DDD, delta-BHC, bis(2-ethylhexyl)phthalate, 1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane, 1,2-dichloroethane, 1,2-dichloroethene, benzene, chloroform, tetrachloroethene, trichloroethene, and vinyl chloride.

5.4 EXPOSURE ASSESSMENT – MAXWELL POINT INVESTIGATION AREA – GROUNDWATER

EPCs are calculated in accordance with Section 2.2.2. Calculations for the EPCs are provided for each COPC in Appendix B. The results are summarized in Table 5-3, including the rationale for EPC selection.

Receptors evaluated for the Maxwell Point Investigation Area groundwater include future construction worker, future commercial worker, and future resident adult and child. Potential exposure pathways are presented in Table 2-1. A conceptual site model presenting pathways that are considered is provided in Figure 6. Groundwater exposure is only considered for those receptors that may dig at depth on site, who may use groundwater as tap water source, or who may be exposed to VOCs through vapor intrusion. This assessment is quite conservative in that groundwater at the site would only be encountered when digging to 8 feet bgs or greater.

Exposure parameters and equations for each receptor and pathway are presented in medium-specific Tables 5-4.1 through 5-4.3. The exposure pathways and parameters included in this HHRA are based on those presented in the Approach Document (EA 2005).

Volatilization from groundwater to air when groundwater is used as tap water is evaluated for the resident adult as detailed in the Approach Document (EA 2005). The results of the volatilization while showering pathway are incorporated into the risk calculations additively with the ingestion of tap water and dermal contact with tap water pathways for the resident adult.

Volatilization from groundwater to ambient air is not quantitatively evaluated based on the depth to groundwater (mean of 13.7 feet bgs). This depth to groundwater indicates that contact with groundwater while digging is unlikely; further, in the inhalation pathway for ambient air is typically much less of a contributor to total risk than the dermal and ingestion pathways. It is therefore unlikely that volatilization of VOCs from groundwater to ambient air would pose a risk at the site. Volatilization from groundwater to indoor air is evaluated via the USEPA recommended Johnson and Ettinger model (USEPA 2002e). This modeling is presented in Appendix E.

5.5 TOXICITY ASSESSMENT – MAXWELL POINT INVESTIGATION AREA – GROUNDWATER

USEPA-derived toxicity values for evaluating potential chronic non-carcinogenic effects for groundwater COPCs are summarized in Tables 5-5.1 and 5-5.2. Toxicity information presented in these tables includes the following USEPA-provided/derived information: chronic or subchronic RfD values for exposures via the oral and inhalation pathway; reported target organs,

uncertainty, and modifying factors specific to the USEPA-derived RfD; and the scientific source of the information. Table 5-5.3 presents relative chemical-specific parameters utilized in calculating dermal exposure for groundwater COPCs.

USEPA-derived toxicity values for evaluating potential carcinogenic effects for groundwater COPCs are summarized in Tables 5-6.1 and 5-6.2. Toxicity information presented in these tables includes the following USEPA-provided/derived information: a chemical-specific SF (cancer potency factor) for exposures via the oral and inhalation pathway; USEPA's weight-of-evidence cancer classification; and the source of the information.

5.6 RISK CHARACTERIZATION – MAXWELL POINT INVESTIGATION AREA – GROUNDWATER

The methodologies used to estimate carcinogenic risks and chronic and subchronic risks for non-carcinogens are described further in Section 2.3. Calculations are presented by receptor in Tables 5-7.1 through 5-7.3.

Estimates of cumulative risks across all pathways for non-carcinogenic and carcinogenic effects are presented in Tables 5-9.1 for residents and Table 5-9.2 for the construction worker. A risk assessment summary is presented in Tables 5-10.1 and 5-10.2. COPCs are only identified on Tables 5-10.1 and 5-10.2 if cumulative carcinogenic risks are greater than the lower bound of the USEPA's "acceptable risk range" (i.e., 10^{-6}) or cumulative non-carcinogenic risks are greater than 1.0. Only COPCs with carcinogenic risks greater than 10^{-6} or non-carcinogenic risks greater than 0.1 are shown on these tables.

5.6.1 Resident Adult and Child Results

The resident adult and child receptors are evaluated for exposure to COPCs in groundwater at the Maxwell Point Investigation Area. The exposure scenario calculations are presented in Table 5-7.1 for the resident adult and Table 5-7.2 for the resident child. The carcinogenic and non-carcinogenic risk assessment results for resident adult and child are summarized in Table 5-9.1.

Non-Carcinogenic Results

The total non-carcinogenic HI for the resident child is 84, which is above the acceptable threshold of 1.0 (Table 5-9.1). Arsenic, beryllium, iron, manganese, nickel, thallium, bis(2-ethylhexyl)phthalate, benzene, and 1,1,2,2-tetrachloroethane have chemical-specific HQs greater than 1. A breakdown by target organ is presented on Table 5-10.1. The central nervous system, skin, liver and immune system all have HIs greater than 1. Therefore, there are potential non-carcinogenic concerns for the resident child use of groundwater as a tap water source.

The total non-carcinogenic HI for the resident adult is 25, which is above the acceptable threshold of 1.0. Arsenic, iron, thallium, benzene, and 1,1,2,2-tetrachloroethane have chemical-specific HQs greater than 1. A breakdown by target organ is presented on Table 5-10.1. The liver and immune system all have HIs greater than 1.0. Therefore, there are potential non-carcinogenic concerns for the resident adult use of groundwater as a tap water source.

Carcinogenic Results

The total lifetime carcinogenic risk for the resident (adult and child combined) exposure to groundwater is 4.7×10^{-3}. This carcinogenic risk is above the USEPA's "acceptable risk range" of 10^{-6} to 10^{-4}. The pathway-specific resident exposure to groundwater carcinogenic risks are 2.5×10^{-3} (ingestion), 2.0×10^{-4} (dermal), and 4.7×10^{-3} (adult inhalation while showering). Arsenic and 1,1,2,2-tetrachloroethane have carcinogenic risks above 10^{-3}, and bis(2-ethylhexyl)phthalate, benzene, tetrachloroethene, and vinyl chloride have carcinogenic risks above 10^{-4}. Therefore, there are potential carcinogenic risk concerns for future resident use of groundwater as a tap water source at the Maxwell Point Investigation Area groundwater.

5.6.2 Construction Worker Results

The future construction worker receptor is evaluated for exposure to COPCs in groundwater at the Maxwell Point Investigation Area. The exposure scenario calculations are presented in Table 5-7.3. The carcinogenic and non-carcinogenic risk assessment results for the construction worker are summarized in Table 5-9.2.

Non-Carcinogenic Results

The total non-carcinogenic HI for the construction worker is 2.8, which is above the acceptable threshold of 1.0 (Table 5-9.2). Benzene is the only COPC with a chemical-specific HQ greater than 1. A breakdown by target organ is presented on Table 5-10.2. The immune system is the only target organ with an HI greater than 1. Inhalation of volatiles in ambient air is not calculated for this receptor based on the relative low likelihood of this exposure and the low calculated risk for the ingestion and dermal pathways. Therefore, there are potential non-carcinogenic concerns for the construction worker contact with groundwater at the Maxwell Point Investigation Area.

Carcinogenic Results

The cumulative carcinogenic risk for the construction worker is 1.6×10^{-5}, which is within USEPA's "acceptable risk range" of 10^{-4} to 10^{-6} (Table 5-9.2). Inhalation of volatiles in ambient air is not calculated for this receptor based on the relative low likelihood of this exposure and the

low calculated risk for the ingestion and dermal pathways. Therefore, there are no carcinogenic risk concerns for the construction worker at the Maxwell Point Investigation Area.

5.6.3 Commercial Worker Results

Commercial workers are likely to contact groundwater through the future use of groundwater as tap water or through volatilization of VOCs from groundwater into indoor air. The latter is discussed below in Section 5.6.4 (Johnson and Ettinger Results). The use of groundwater as a tap water source is quantitatively evaluated for the future resident per the Approach Document (EA 2005). Potential risks for an adult ingestion of, dermal contact with, and showering in groundwater are calculated as above 10^{-4}. Based on the comparable exposure parameters of the commercial worker and the adult resident, the commercial worker results are likely on par with that of the resident, indicating potential concerns for the commercial worker.

5.6.4 Johnson and Ettinger Results

The USEPA recommended Johnson and Ettinger model is run to evaluate potential exposure to VOCs in groundwater that may volatilize into indoor air of buildings built on top of the groundwater plume. The model results are presented in Appendix E. The model is run for a conservative exposure scenario of 350 days per year for 30 years. Model results indicate that all carcinogenic VOC COPCs have risks within or below the acceptable risk range and all non-carcinogenic VOC COPCs have HIs less than 1. As this pathway is run for conservative exposure parameters indicative of residential exposure, there are also no concerns for other receptors (e.g., commercial worker) who may spend less time in a building above the groundwater plume. Therefore, there are no concerns for volatilization from groundwater into indoor air at Maxwell Point.

5.7 MAXWELL POINT INVESTIGATION AREA – GROUNDWATER HHRA CONCLUSIONS

The Maxwell Point Investigation Area groundwater HHRA evaluates potential cumulative risks for future construction worker, future commercial worker, and future resident adult and child.

Non-carcinogenic hazards for the construction worker are acceptable potential concern primarily due to benzene in the groundwater. There are no carcinogenic risk concerns for the construction worker exposure to groundwater. Non-carcinogenic hazards for the resident child and adult are calculated above 1.0. Arsenic, iron, thallium, benzene, and 1,1,2,2-tetrachloroethane have chemical-specific HQs greater than 1. In addition, The central nervous system, skin, liver and immune system all have HIs greater than 1. Carcinogenic risks for the resident receptor are above the USEPA's "acceptable risk range." Arsenic and 1,1,2,2-tetrachloroethane have carcinogenic risks above 10^{-3}, and bis(2-ethylhexyl)phthalate, benzene, tetrachloroethene, and

vinyl chloride have carcinogenic risks above 10^{-4}. Therefore, there are concerns for use of groundwater as a tap water source for residents or commercial workers at the Maxwell Point Investigation Area. Based on the USEPA recommended model, volatilization of COPCs in groundwater into site buildings is not of concern.

6. RISK ASSESSMENT UNCERTAINTY

6.1 UNCERTAINTIES IN THE HHRA

There are numerous uncertainties involved in the HHRA process. These are discussed briefly in the following sections.

6.1.1 Sampling and Analysis Uncertainties

The sampling plan can have a significant impact on the results obtained in calculating human health risks at a site. To the extent that samples are taken in areas that are expected to be contaminated (biased sampling), the EPC used in calculating risk exposures and risks is likely to overestimate the actual concentration encountered from random exposure across the site. This sampling bias will generally result in an overestimate of exposures and risks at a site. As the majority of the samples collected are biased toward potentially contaminated areas, the measured concentrations and calculated health risks would tend to be overestimated.

6.1.2 Uncertainties Analysis of Exposure Assessment

An analysis of uncertainties is an important aspect of the exposure assessment. It provides the risk assessor and reviewer with information relevant to the individual uncertainties associated with exposure factor assumptions and their potential impact on the final assessment. The exposure assessment assumes potential receptors that may reside, work, or trespass onto certain areas near Maxwell Point. Furthermore, assumptions are made about potential receptors exposure to site media. Potential receptors exposure to soil, surface water, and sediment at Maxwell Point are the greatest uncertainties. The area of the Maxwell Point site is approximately 36 acres with approximately 1.5 miles of shoreline. The Maxwell Point site is divided into two areas to more accurately model potential receptor exposure. However, it is unlikely that potential receptors to these areas would be exposed to the entire area. This may likely overestimate risks to receptors.

6.1.3 Uncertainties of Toxicity Assessment

There are numerous uncertainties associated with the toxicity assessment. These are generally due to the unavailability of data to thoroughly calculate the toxicity of COPCs. These uncertainties are described in more detail in the following sections.

6.1.3.1 <u>Uncertainties Associated With Non-Carcinogenic Effects</u>

Interspecies Extrapolation –

The majority of toxicological information comes from experiments with laboratory animals. Experimental animal data have been relied on by regulatory agencies to assess the hazards of chemical exposures to humans. Interspecies differences in chemical absorption, metabolism,

excretion, and toxic response are not well understood; therefore, conservative assumptions are applied to animal data when extrapolating to humans. These probably result in an overestimation of toxicity.

Intraspecies Extrapolation –
Differences in individual human susceptibilities to the effects of chemical exposures may be caused by such variables as genetic factors (e.g., glucose-6-phosphate dehydrogenase deficiency), lifestyle (e.g., cigarette smoking and alcohol consumption), age, hormonal status (e.g., pregnancy), and disease. To take into account the diversity of human populations and their differing susceptibilities to chemically induced injury or disease, a safety factor is used. USEPA uses a factor between 1 and 10. This uncertainty may lead to overestimates of human health effects at given doses.

Exposure Routes –
When experimental data available on one route of administration are different from the actual route of exposure that is of interest, route-to-route extrapolation must be performed before the risk can be assessed. Several criteria must be satisfied before route-to-route extrapolation can be undertaken. The most critical assumption is that a chemical injures the same organ(s) regardless of route, even though the injury can vary in degree. Another assumption is that the behavior of a substance in the body is similar by all routes of contact. This may not be the case when, for example, materials absorbed via the gastrointestinal tract pass through the liver prior to reaching the systemic circulation, whereas by inhalation the same chemical will reach other organs before the liver. However, when data are limited, these extrapolations are made and may result in overestimates of human toxicity.

6.1.3.2 Uncertainties Associated With Carcinogenic Effects

Interspecies Extrapolation –
The majority of toxicological information for carcinogenic assessments comes from experiments with laboratory animals. There is uncertainty about whether animal carcinogens are also carcinogenic in humans. While many chemical substances are carcinogenic in one or more animal species, only a very small number of chemical substances are known to be human carcinogens. The fact that some chemicals are carcinogenic in some animal species but not in others raises the possibility that not all animal carcinogens are human carcinogens. Regulatory agencies assume that humans are as sensitive to carcinogens as the most sensitive animal species. This policy decision, designed to prevent underestimation of risk, introduces the potential to overestimate carcinogenic risk.

High-Dose to Low-Dose Extrapolation –

Typical cancer bioassays provide limited low-dose data on responses in experimental animals for chemicals being assessed for carcinogenic or chronic effects. The usual dose regime involves three dose groups per assay. The first dose group is given the highest dose that can be tolerated, the second is exposed to one-half that dose, and the third group is unexposed (control group) (National Research Council [NRC] 1983). Because this dosing method does not reflect how animals would react to much lower doses of a chemical, a dose-response assessment normally requires extrapolation from high to low doses using mathematical modeling that incorporates to varying degrees information about physiologic processes in the body (NRC 1983).

A central problem with the low-dose extrapolation models is that they all too often fit the data from animal bioassays equally well, and it is not possible to determine their validity based on goodness of fit. Several models may fit experimental data equally well, but all may not be equally plausible biologically. The dose-response curves derived from different models diverge substantially in the dose range of interest (NRC 1983). Therefore, low-dose extrapolation is more than a curve-fitting process, and considerations of biological plausibility of the models must be taken into account before choosing the best model for a particular set of data.

6.1.4 Uncertainties in Risk Characterization

Uncertainties in the risk characterization can stem from the inherent uncertainties in the data evaluation, the exposure assessment process, including any modeling of exposure point concentrations in secondary media from primary media, and the toxicity assessment process. The individual uncertainties in these respective processes are addressed in previous sections.

7. HHRA CONCLUSIONS

A brief summary of the HHRA conclusions for the Maxwell Point Investigation Area is provided in the following sections.

7.1 MAXWELL POINT INVESTIGATION AREA – BUILDING E7340/7350 TEST SITE HHRA CONCLUSIONS

The Building E7340/7350 Test Site data grouping HHRA evaluates potential cumulative risks for current adolescent trespasser, current maintenance worker, future construction worker, future commercial worker, and future resident adult and child for exposure to surface soil, surface water, and sediment.

Non-carcinogenic hazards did not exceed 1.0 for any of the receptors evaluated, except for resident child. The total non-carcinogenic HI for the resident child is 1.4, which slightly exceeds the acceptable threshold of 1.0. A breakdown by target organ indicates that no COPC has a chemical-specific HQ greater than 1.0. Furthermore, no target-organ specific HI exceeds 1.0. Therefore, there are no non-carcinogenic concerns for the resident child at the Building E7340/7350 Test Site. Carcinogenic risks for all receptors evaluated are within or below the USEPA's "acceptable risk range." An evaluation of lead in soil indicates that lead is not a site-wide concern. Therefore, the HHRA indicates no concerns for potential receptors exposure to surface soil, total soil, surface water, and sediment at Maxwell Point Investigation Area, Building E7340/7350 Test Site.

7.2 MAXWELL POINT INVESTIGATION AREA – SMOKE GENERATOR DEBRIS AREA HHRA CONCLUSIONS

The Maxwell Point Investigation Area, Smoke Generator Debris Area data grouping HHRA evaluates potential cumulative risks for current adolescent trespasser, current maintenance worker, future construction worker, future commercial worker, and future resident adult and child for exposure to surface soil, total soil, surface water, and sediment.

Non-carcinogenic hazards did not exceed 1.0 for the adolescent trespasser, maintenance worker, commercial worker, construction worker, and resident adult. The total non-carcinogenic HI for the resident child is 1.3, which slightly exceeds the acceptable threshold of 1.0. The total non-carcinogenic HI is primarily due to exposure to total soil. A breakdown by target organ indicates that no target organ has a HI greater than 1.0. No COPC has a chemical-specific HQ greater than 1.0. Therefore, there are no non-carcinogenic concerns for the resident child at the Smoke Generator Debris Area.

Carcinogenic risks for all receptors evaluated are within or below the U.S. EPA's "acceptable risk range." Therefore, the HHRA indicates no concerns for potential receptors exposure to surface soil, total soil, surface water, and sediment at the Smoke Generator Debris Area.

7.3 MAXWELL POINT INVESTIGATION AREA – GROUNDWATER HHRA CONCLUSIONS

The Maxwell Point Investigation Area groundwater HHRA evaluates potential risks for future commercial worker, future construction worker and future resident adult and child for exposure to site groundwater.

Non-carcinogenic hazards for the construction worker are acceptable potential concern primarily due to benzene in the groundwater. There are no carcinogenic risk concerns for the construction worker exposure to groundwater. Non-carcinogenic hazards for the resident child and adult are calculated above 1.0. Arsenic, beryllium, iron, manganese, nickel, thallium, bis(2-ethylhexyl)phthalate, benzene, and 1,1,2,2-tetrachloroethane have chemical-specific HQs greater than 1. In addition, the central nervous system, skin, liver and immune system all have HIs greater than 1. Carcinogenic risks for the resident receptor are above the USEPA's "acceptable risk range." Arsenic and 1,1,2,2-tetrachloroethane have carcinogenic risks above 10^{-3}, and bis(2-ethylhexyl)phthalate, benzene, tetrachloroethene, and vinyl chloride have carcinogenic risks above 10^{-4}. Therefore, there are concerns for use of groundwater as a tap water source for residents or commercial workers at the Maxwell Point Investigation Area. Based on the USEPA recommended model, volatilization of COPCs in groundwater into site buildings is not of concern.

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FIGURES

Figure 1
Locations of Other Edgewood Areas Study Area and Maxwell Point Investigation Area (Aberdeen Proving Ground, Maryland)

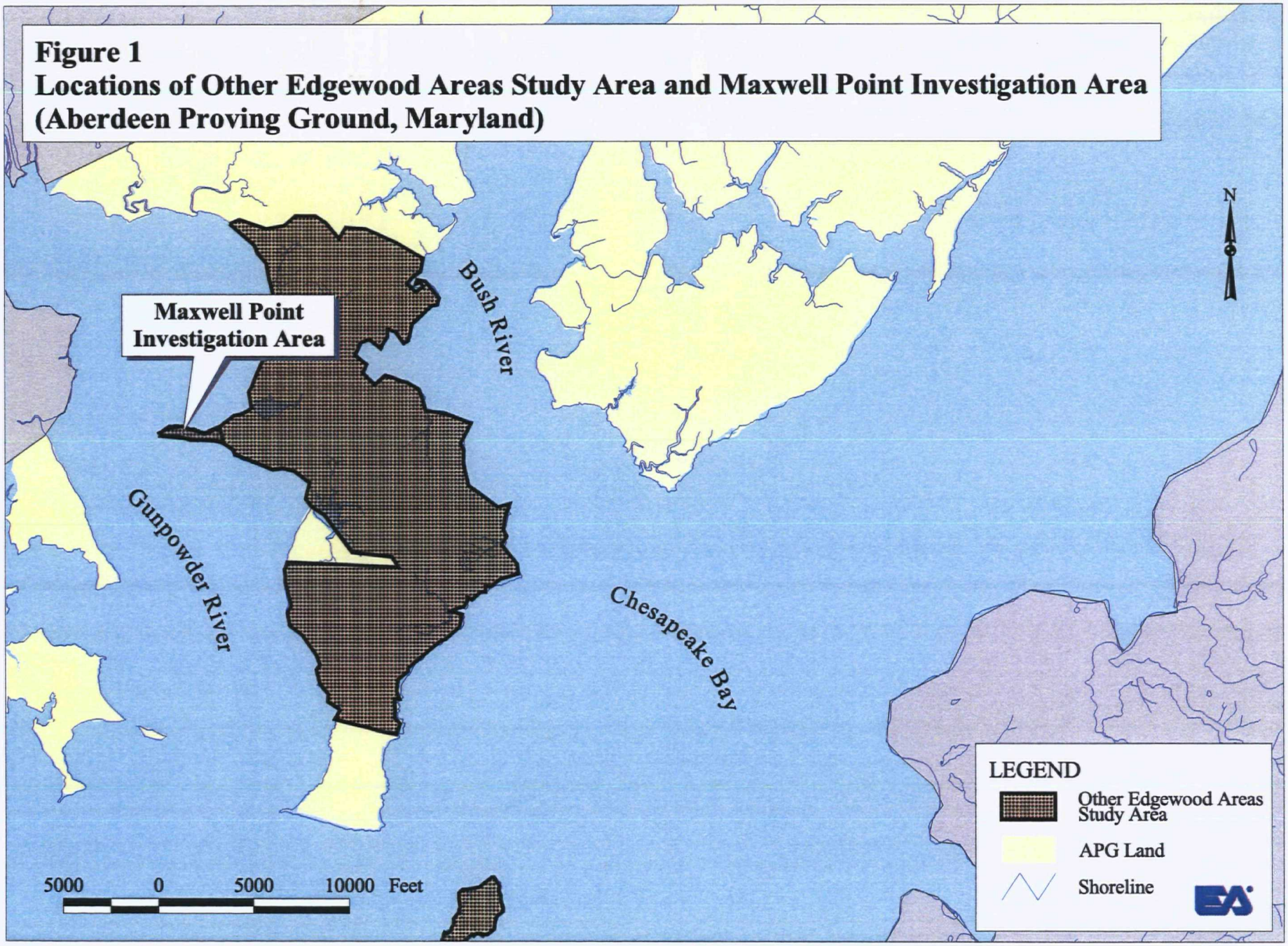


Figure 2
Site Features of Maxwell Point Investigation Area

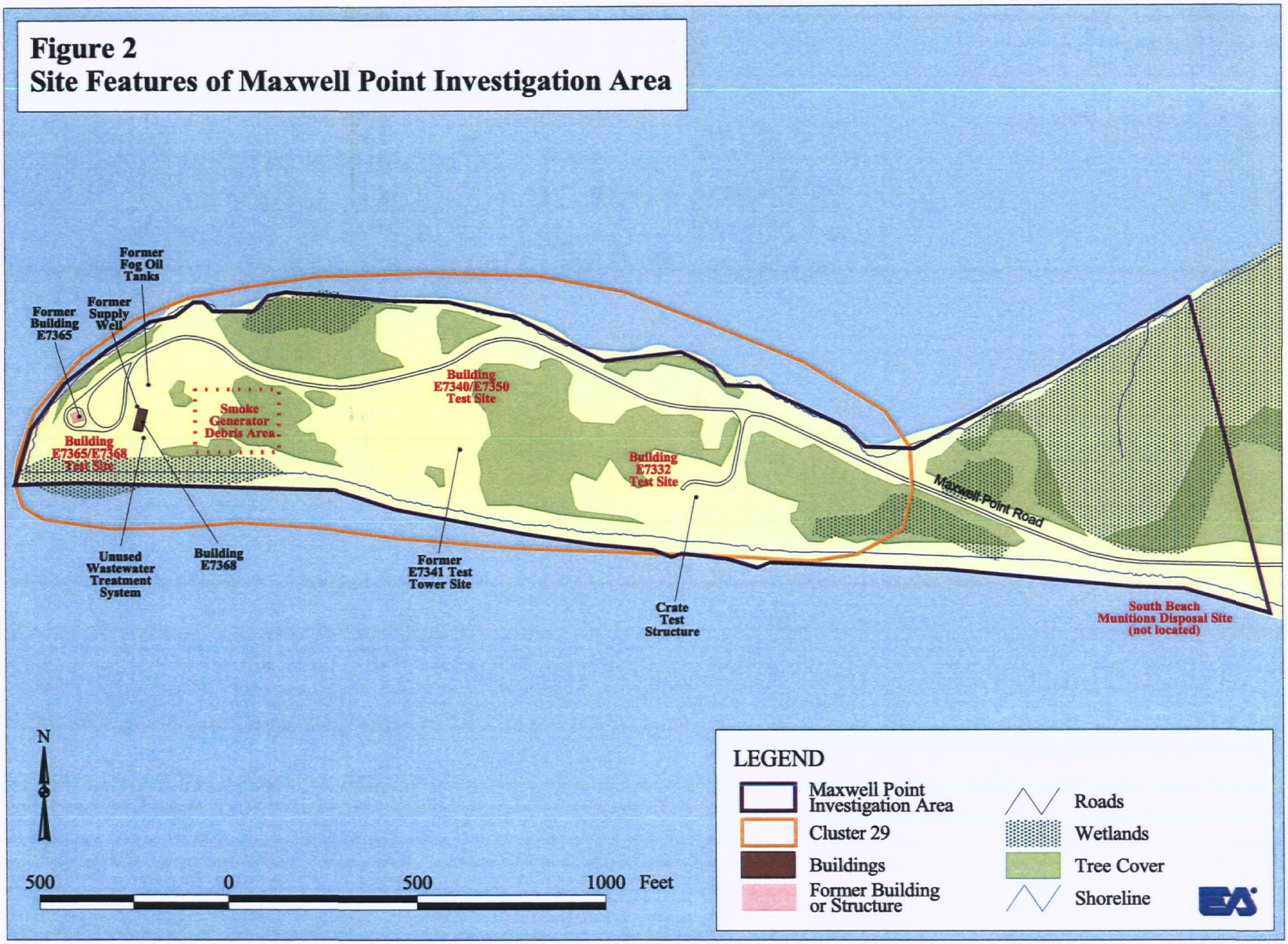


Figure 3
Soil Samples Used in Human Health Risk Assessment for Maxwell Point Investigation Area

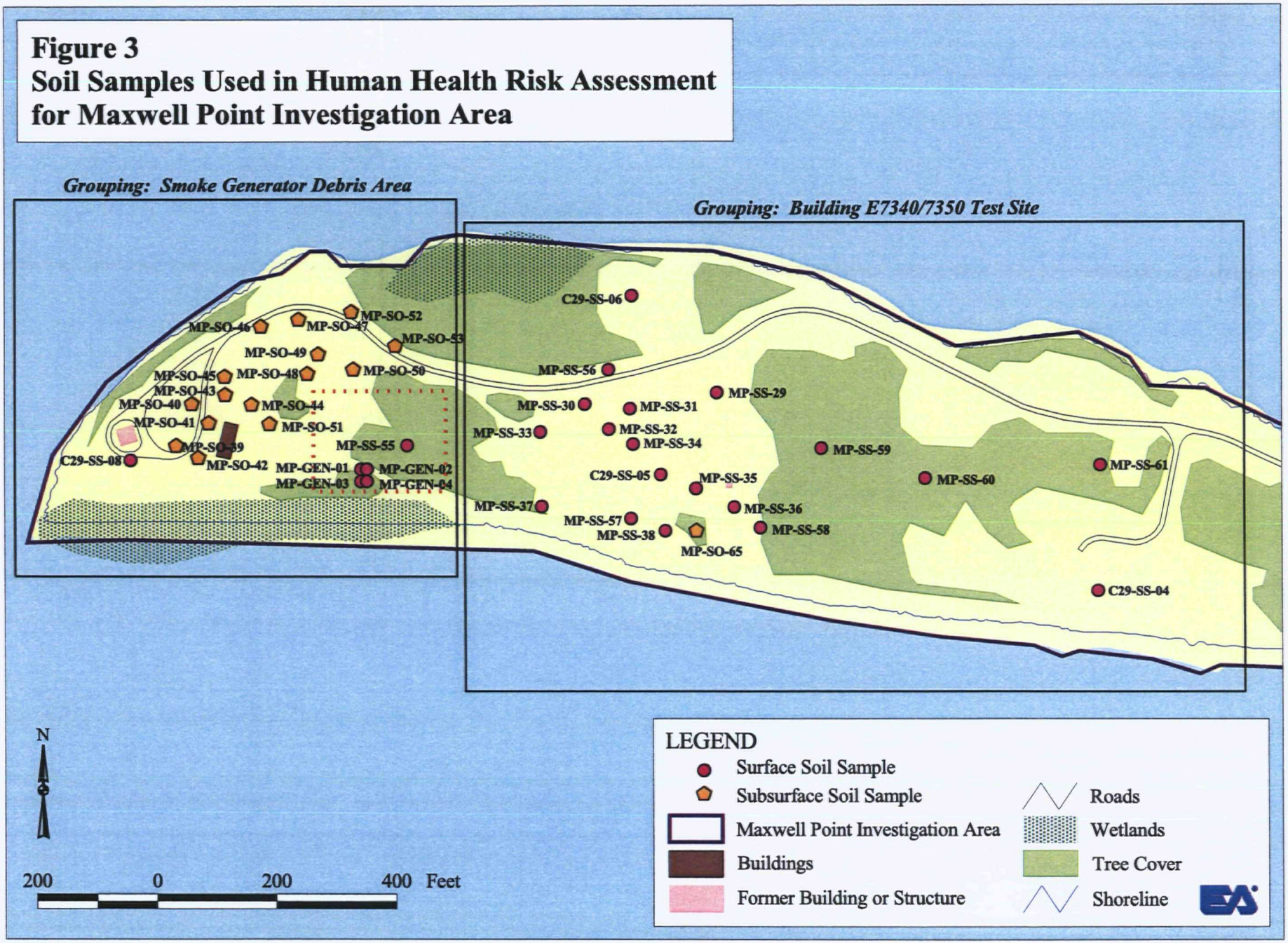


Figure 4
Sediment and Surface Water Samples Used in Human Health Risk Assessment for Maxwell Point Investigation Area

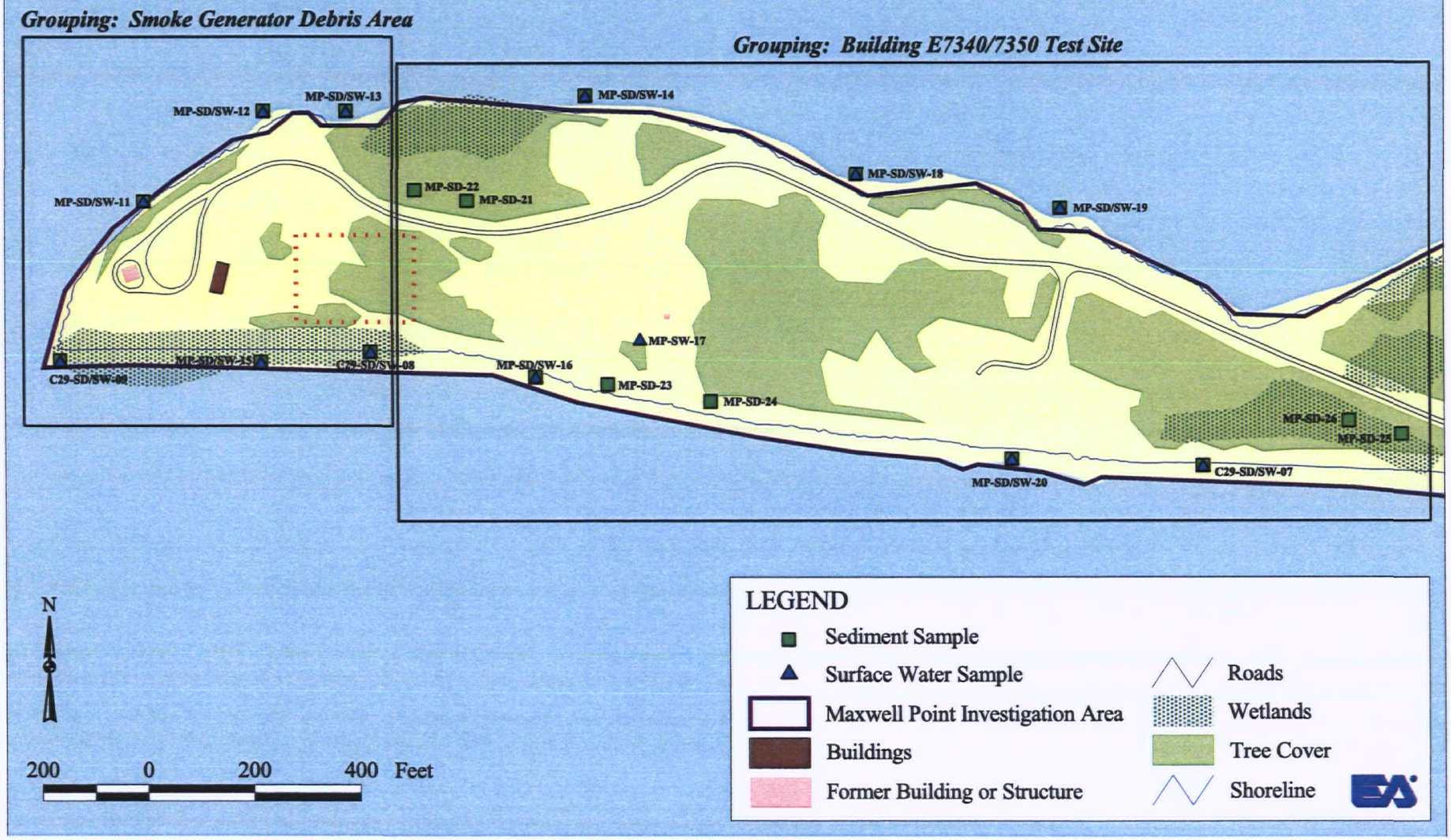
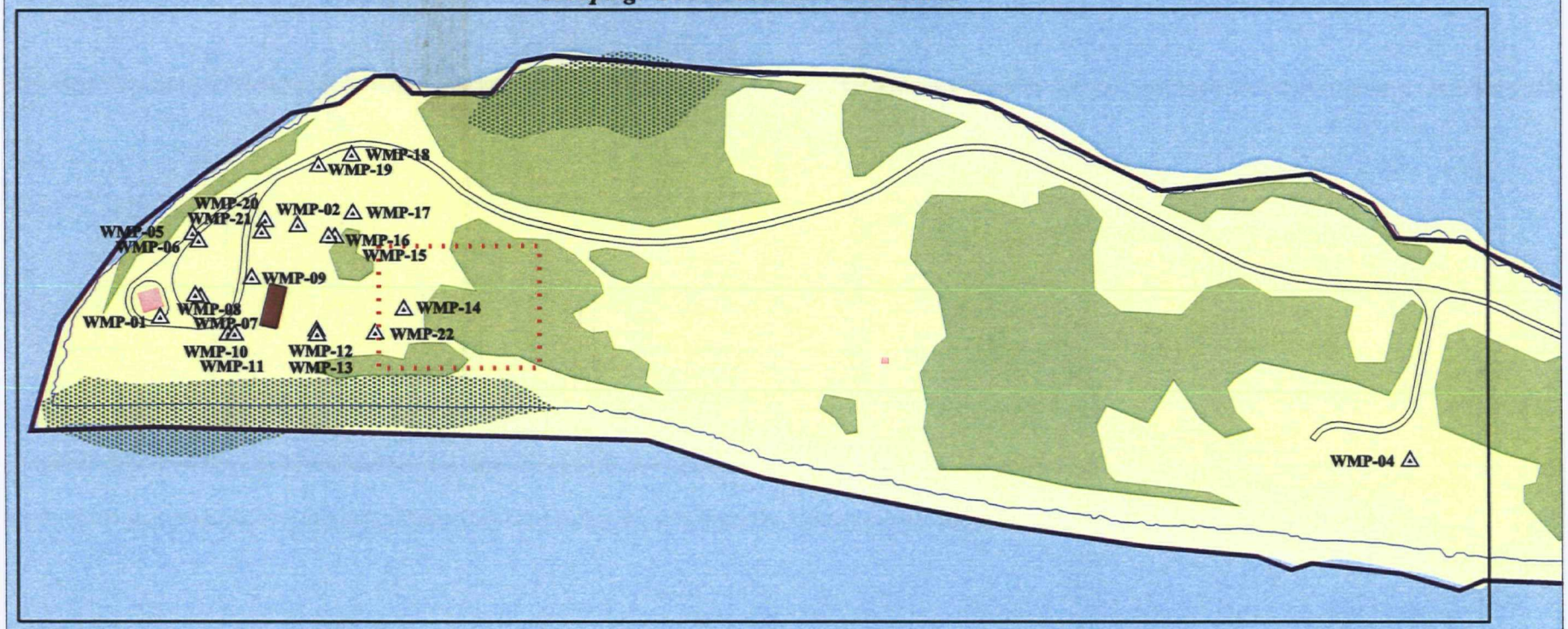


Figure 5
Groundwater Samples Used in Human Health Risk Assessment for Maxwell Point Investigation Area

Grouping: Smoke Generator Debris Area



N

200 0 200 400 Feet

LEGEND

- Groundwater Sample
- Maxwell Point Investigation Area
- Buildings
- Former Building or Structure
- Roads
- Wetlands
- Tree Cover
- Shoreline

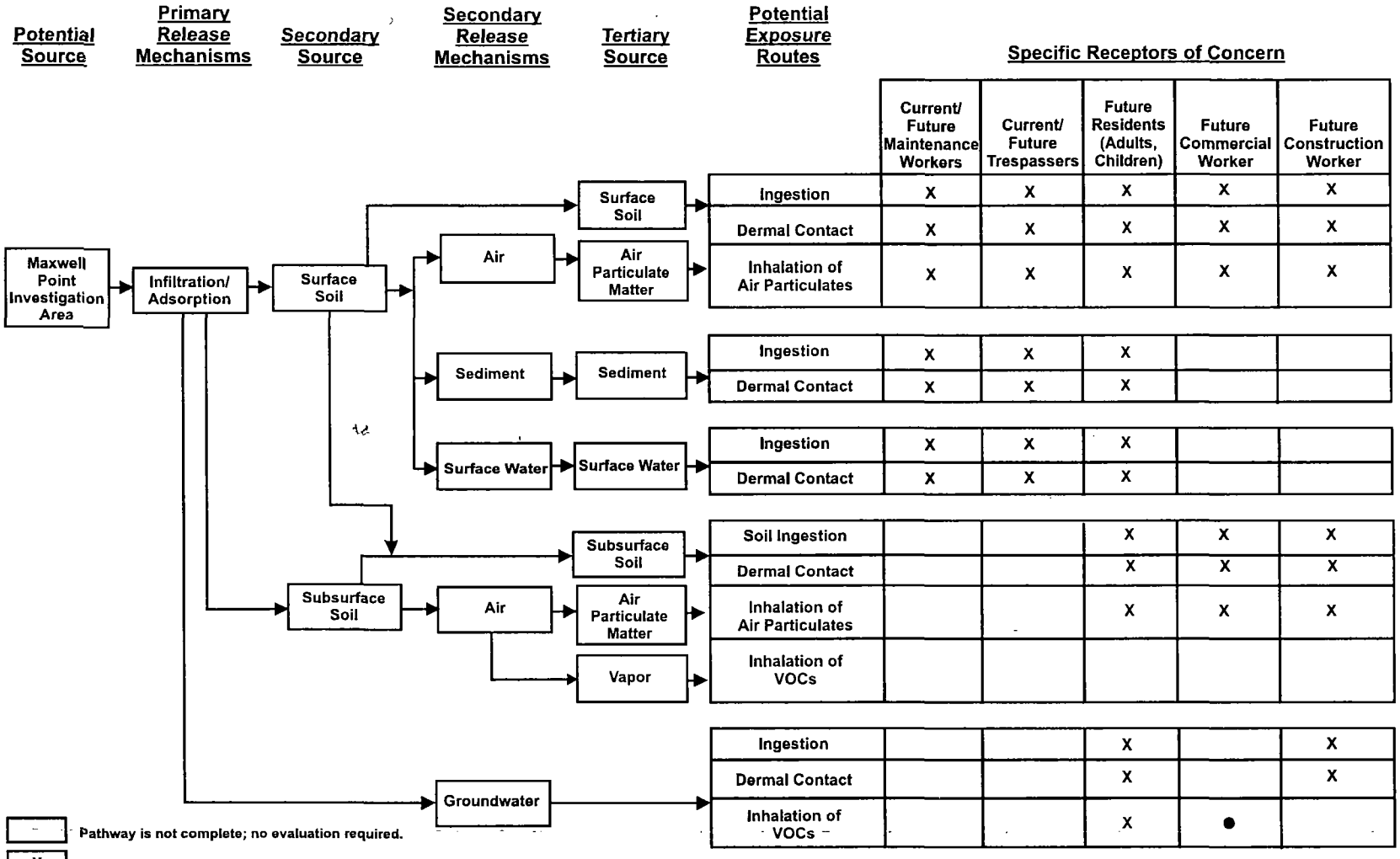


Figure 6. Human Health Conceptual Site Model: Maxwell Point Investigation Area.

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E 2-1
SELECTION OF EXPOSURE PATHWAYS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Soil	Surface Soil	Maxwell Point	Maintenance Worker	Adult	Ingestion	On-Site	Quant	Maintenance worker may contact surface soil while onsite.
						Dermal	On-Site	Quant	Maintenance worker may contact surface soil while onsite.
				Trespasser	Adolescent	Ingestion	On-Site	Quant	Trespassers may contact surface soil while onsite.
						Dermal	On-Site	Quant	Trespassers may contact surface soil while onsite.
	Air	Surface Soil Particulate	Maxwell Point	Maintenance Worker	Adult	Inhalation	On-Site	Quant	Maintenance worker may inhale particulates while onsite.
				Trespasser	Adolescent	Inhalation	On-Site	Quant	Trespassers may inhale particulate while onsite.
Future	Soil	Surface Soil	Maxwell Point	Maintenance Worker	Adult	Ingestion	On-Site	Quant	Maintenance worker may contact surface soil while onsite.
						Dermal	On-Site	Quant	Maintenance worker may contact surface soil while onsite.
				Trespasser	Adolescent	Ingestion	On-Site	Quant	Trespassers may contact surface soil while onsite.
						Dermal	On-Site	Quant	Trespassers may contact surface soil while onsite.
		Total Soil	Maxwell Point	Commercial Worker	Adult	Ingestion	On-Site	Quant	Commercial worker may contact total soil while onsite.
						Dermal	On-Site	Quant	Commercial worker may contact total soil while onsite.
				Construction Worker	Adult	Ingestion	On-Site	Quant	Construction worker may contact surface and subsurface soil during
						Dermal	On-Site	Quant	Construction worker may contact surface soil during construction.
				Resident	Adult	Ingestion	On-Site	Quant	Residents may contact surface and subsurface soil while onsite.
						Dermal	On-Site	Quant	Residents may contact surface and subsurface soil while onsite.
					Child	Ingestion	On-Site	Quant	Residents may contact surface and subsurface soil while onsite.
						Dermal	On-Site	Quant	Residents may contact surface and subsurface soil while onsite.
	Air	Surface Soil Particulate	Maxwell Point	Trespasser	Adolescent	Inhalation	On-Site	Quant	Trespassers may inhale particulate while onsite.
				Maintenance Worker	Adult	Inhalation	On-Site	Quant	Maintenance worker may inhale particulates while onsite.
		Total Soil Particulate	Maxwell Point	Commercial Worker	Adult	Inhalation	On-Site	Quant	Commercial worker may inhale particulates while onsite.
				Construction Worker	Adult	Inhalation	On-Site	Quant	Construction worker may inhale particulates during construction.
				Resident	Adult	Inhalation	On-Site	Quant	Residents may inhale particulates while onsite.
					Child	Inhalation	On-Site	Quant	Residents may inhale particulates while onsite.
	Surface Water	Surface Water	Maxwell Point	Maintenance Worker	Adult	Ingestion	On-Site	Quant	Maintenace worker may contact surface water during maintenace activities.
						Dermal	On-Site	Quant	Maintenace worker may contact surface water during maintenace activities.
				Trespasser	Adolescent	Ingestion	On-Site	Quant	Trespassers may contact surface water while onsite.
						Dermal	On-Site	Quant	Trespassers may contact surface water while onsite.
				Resident	Adult	Ingestion	On-Site	Quant	Residents may contact surface water while onsite.
						Dermal	On-Site	Quant	Residents may contact surface water while onsite.
					Child	Ingestion	On-Site	Quant	Residents may contact surface water while onsite.
						Dermal	On-Site	Quant	Residents may contact surface water while onsite.
	Sediment	Sediment	Maxwell Point	Maintenance Worker	Adult	Ingestion	On-Site	Quant	Maintenance workers may contact sediment while onsite.
						Dermal	On-Site	Quant	Maintenance workers may contact sediment while onsite.
				Trespasser	Adolescent	Ingestion	On-Site	Quant	Trespassers may contact sediment while onsite.
						Dermal	On-Site	Quant	Trespassers may contact sediment while onsite.
				Resident	Adult	Ingestion	On-Site	Quant	Residents may contact sediment while onsite.
						Dermal	On-Site	Quant	Residents may contact sediment while onsite.
					Child	Ingestion	On-Site	Quant	Residents may contact sediment while onsite.
						Dermal	On-Site	Quant	Residents may contact sediment while onsite.
	Groundwater	Groundwater	Maxwell Point	Construction Worker	Adult	Ingestion	On-Site	Quant	Hypothetical pathway to be considered for Maxwell Point.
						Dermal	On-Site	Quant	Hypothetical pathway to be considered for Maxwell Point.
				Resident	Adult	Ingestion	On-Site	Quant	Hypothetical pathway to be considered for Maxwell Point.
						Dermal	On-Site	Quant	Hypothetical pathway to be considered for Maxwell Point.
					Child	Ingestion	On-Site	Quant	Hypothetical pathway to be considered for Maxwell Point.
						Dermal	On-Site	Quant	Hypothetical pathway to be considered for Maxwell Point.
		Indoor Air	Maxwell Point	Commercial Worker	Adult	Inhalation of VOCs	On-Site	Qual	Hypothetical pathway to be considered for Maxwell Point.
				Resident	Adult	Inhalation of VOCs	On-Site	Quant	Hypothetical pathway to be considered for Maxwell Point.
					Child	Inhalation of VOCs	On-Site	Quant	Hypothetical pathway to be considered for Maxwell Point.

TABLES

TABLES

BUILDING E7340/7350 TEST SITE GROUPING

TABLE 3-2.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
MAXWELL POINT INVESTIGATION AREA
BUILDING E7340/7350 TEST SITE - SURFACE SOIL - RESIDENTIAL

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface soil
Exposure Point: Building E7340/7350 Test Site

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (5) Contaminant Deletion or Selection
							INORGANICS										
7429-90-5	Aluminum	1.64E+03	J	1.91E+04		mg/kg	MP-SS-32	20/20	2.05E+00 - 4.20E+00	1.91E+04	1.95E+04	7.80E+03	N	NA	NA	Yes	ASL
7440-36-0	Antimony	4.80E-01	B	3.50E+00	L	mg/kg	C29-SS-05	15/20	4.30E-01 - 8.80E-01	3.50E+00	5.00E+00	3.10E+00	N	NA	NA	Yes	ASL
7440-38-2	Arsenic	1.20E+00	B	1.31E+01		mg/kg	MP-SS-57	20/20	4.80E-01 - 1.00E+00	1.31E+01	7.60E+00	4.30E-01	C	NA	NA	Yes	ASL
7440-39-3	Barium	1.47E+01	B	4.78E+02		mg/kg	MP-SS-37	20/20	2.90E-02 - 9.00E-02	4.78E+02	1.11E+02	1.60E+03	N	NA	NA	No	BSL
7440-41-7	Beryllium	7.00E-02	B	9.30E-01		mg/kg	MP-SS-33	20/20	7.10E-03 - 5.00E-02	9.30E-01	1.90E+00	1.60E+01	N	NA	NA	No	BSL
7440-43-9	Cadmium	5.10E-02	B	5.00E+00		mg/kg	MP-SS-36	19/20	4.30E-02 - 8.10E-02	5.00E+00	1.40E+00	7.80E+00	N	NA	NA	No	BSL
7440-70-2	Calcium	1.13E+02	B	4.83E+03		mg/kg	MP-SS-37	20/20	2.60E+00 - 2.81E+01	4.83E+03	2.17E+03	NA		4.00E+06	ADI	No	NUT
7440-47-3	Chromium	2.90E+00	J	3.66E+01		mg/kg	MP-SS-32	20/20	1.00E-01 - 2.30E-01	3.66E+01	3.35E+01	2.30E+01	N	NA	NA	Yes	ASL
7440-48-4	Cobalt	9.60E-01	B	1.05E+01	J	mg/kg	MP-SS-57	20/20	7.50E-02 - 1.80E-01	1.05E+01	3.86E+01	NA		NA	NA	No	NSL
7440-50-8	Copper	2.70E+00	L	1.51E+02	J	mg/kg	MP-SS-36	20/20	1.30E-01 - 4.30E-01	1.51E+02	1.93E+01	3.10E+02	N	NA	NA	No	BSL
7439-89-6	Iron	3.38E+03	J	3.36E+04		mg/kg	MP-SS-32	20/20	2.60E+00 - 4.30E+00	3.36E+04	2.17E+04	5.50E+03	N	NA	NA	Yes	ASL
7439-92-1	Lead	4.80E+00		8.01E+02		mg/kg	MP-SS-37	20/20	2.40E-01 - 4.00E-01	8.01E+02	6.01E+01	NA		4.00E+02	RSL	Yes	ASL
7439-95-4	Magnesium	2.18E+02	B	7.96E+03		mg/kg	MP-SS-57	20/20	1.60E+00 - 6.00E+00	7.96E+03	3.04E+03	NA		8.00E+05	ADI	No	NUT
7439-96-5	Manganese	5.59E+01	L	7.78E+02		mg/kg	MP-SS-59	20/20	3.70E-02 - 9.00E-02	7.78E+02	1.98E+03	1.60E+02	N	NA	NA	Yes	ASL
7439-97-6	Mercury	2.00E-02	B	2.00E-01		mg/kg	MP-SS-56	20/20	1.00E-02 - 3.00E-02	2.00E-01	1.20E+00	7.80E-01	N	NA	NA	No	BSL
7440-02-0	Nickel	2.20E-00	B	8.83E+01		mg/kg	MP-SS-57	20/20	1.70E-01 - 2.80E-01	8.83E+01	2.65E+01	1.60E+02	N	NA	NA	No	BSL
7440-09-7	Potassium	5.15E+01	J	8.01E+02	J	mg/kg	MP-SS-57	20/20	2.30E+00 - 8.80E+00	8.01E+02	1.03E+03	NA		1.00E+06	ADI	No	NUT
7782-49-2	Selenium	5.40E-01	B	1.50E+00		mg/kg	MP-SS-34	13/20	3.30E-01 - 7.30E-01	1.50E+00	2.30E+00	3.90E+01	N	NA	NA	No	BSL
7440-22-4	Silver	3.80E-01	B	3.80E-01	B	mg/kg	C29-SS-05	1/20	1.10E-01 - 1.80E-01	3.80E-01	8.50E-01	3.90E+01	N	NA	NA	No	BSL
7440-23-5	Sodium	5.88E+01	B	3.72E+02	B	mg/kg	MP-SS-35	16/20	2.66E+01 - 1.28E+03	3.72E+02	6.58E+02	NA		1.00E+06	ADI	No	NUT
7440-62-2	Vanadium	4.60E-00	B	5.21E+01		mg/kg	MP-SS-32	20/20	1.40E-01 - 2.40E-01	5.21E+01	4.57E+01	7.80E+00	N	NA	NA	Yes	ASL
7440-66-6	Zinc	2.16E+01		3.67E+03		mg/kg	MP-SS-65	20/20	1.10E-01 - 9.20E+00	3.67E+03	8.19E+01	2.30E+03	N	NA	NA	Yes	ASL
							PESTICIDES/PCBS										
72-54-8	4,4'-DDD	2.20E-03	J	8.30E-03		mg/kg	C29-SS-05	2/9	3.50E-03 - 5.80E-03	8.30E-03	2.55E-02	2.70E+00	C	NA	NA	No	BSL
72-55-9	4,4'-DDE	2.40E-04	J	2.80E-02	J	mg/kg	MP-SS-60	9/9	3.50E-03 - 5.80E-03	2.80E-02	3.92E-01	1.90E+00	C	NA	NA	No	BSL
50-29-3	4,4'-DDT	4.80E-04	J	1.30E-01	J	mg/kg	C29-SS-05	8/9	3.50E-03 - 5.80E-03	1.30E-01	1.43E-01	1.90E+00	C	NA	NA	No	BSL
1031-07-8	Endosulfan sulfate	1.20E-03	J	1.20E-03	J	mg/kg	MP-SS-56	1/9	3.50E-03 - 5.80E-03	1.20E-03	NA	4.70E+01	N	NA	NA	No	BSL
							SEMI-VOLATILE ORGANIC COMPOUNDS										
117-81-7	bis(2-Ethylhexyl)phthalate	9.80E-02	J	9.80E-02	J	mg/kg	C29-SS-04	1/9	3.50E-01 - 5.70E-01	9.80E-02	NA	4.60E+01	C	NA	NA	No	BSL
84-66-2	Diethylphthalate	1.40E-01	J	6.80E-01	J	mg/kg	C29-SS-04	2/9	3.50E-01 - 5.70E-01	6.80E-01	2.60E-01	6.30E+03	N	NA	NA	No	BSL
118-74-1	Hexachlorobenzene	1.00E-01	J	1.00E-01	J	mg/kg	C29-SS-05	1/9	3.50E-01 - 5.70E-01	1.00E-01	NA	4.00E-01	C	NA	NA	No	BSL
							VOLATILE ORGANIC COMPOUNDS										
79-34-5	1,1,2,2-Tetrachloroethane	2.10E-02		2.10E-02		mg/kg	MP-SS-57	1/9	1.10E-02 - 1.70E-02	2.10E-02	NA	3.20E+00	C	NA	NA	No	BSL
108-88-3	Toluene	7.60E-03	J/J	1.30E-02		mg/kg	MP-SS-59	4/9	1.10E-02 - 1.70E-02	1.30E-02	NA	6.30E+02	N	NA	NA	No	BSL
79-01-6	Trichloroethene	1.30E-02	J	2.50E-02	J	mg/kg	MP-SS-59/MP-SS-58	4/9	1.10E-02 - 1.70E-02	2.50E-02	NA	1.60E+00	C	NA	NA	No	BSL

(1) Minimum/maximum detected concentration.
(2) Maximum concentration used as screening value
(3) Background values are 95% UPLs calculated using reference data from ICF KE 1995a,b. Background values are not included as part of the COPC selection process
(4) Screening Toxicity Value - Taken from USEPA Region III Risk-Based (RBCs) Table, USEPA, October 2003. For non-carcinogens, value shown is equal to 1/10 the residential soil RBC value. For carcinogens the value shown is equal to the residential soil RBC value
(5) Rationale Codes — Selection Reason: ASL = Above Screening Toxicity Level; Deletion Reason: BSL = Below Screening Toxicity Level; NSL = No Screening Level; NUT = Essential Nutrient

Surrogates used: Chromium VI for Chromium, Methylmercury for Mercury, and Endosulfan for Endosulfan sulfate.

Definitions:
ADI = Allowable Daily Intake (FDA)
mg/kg = milligrams per kilogram
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
C = Carcinogenic
COPC = Chemical of Potential Concern
N = Non-Carcinogenic
NA = Not Applicable
RSL = Residential Screening Level (USEPA Region III)

Data Qualifiers:
B = Value is less than the reporting limit (RL) but greater than the method detection limit (MDL).
J = Value is estimated.
L = Reported value may be biased low.

TABLE 3-2.2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
MAXWELL POINT INVESTIGATION AREA
BUILDING E7340/7350 TEST SITE - SURFACE SOIL - INDUSTRIAL

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface soil
Exposure Point: Building E7340/7350 Test Site

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (5) Contaminant Deletion or Selection
							INORGANICS										
7429-90-5	Aluminum	1.64E+03	J	1.91E+04		mg/kg	MP-SS-32	20/20	2.05E+00 - 4.20E+00	1.91E+04	1.95E+04	1.00E+05	N	NA	NA	No	BSL
7440-36-0	Antimony	4.80E-01	B	3.50E+00	L	mg/kg	C29-SS-05	15/20	4.30E-01 - 8.80E-01	3.50E+00	5.00E+00	4.10E+01	N	NA	NA	No	BSL
7440-38-2	Arsenic	1.20E+00	B	1.31E+01		mg/kg	MP-SS-57	20/20	4.80E-01 - 1.00E+00	1.31E+01	7.60E+00	1.90E+00	C	NA	NA	Yes	ASL
7440-39-3	Barium	1.47E+01	B	4.78E+02		mg/kg	MP-SS-37	20/20	2.90E-02 - 9.00E-02	4.78E+02	1.11E+02	2.00E+04	N	NA	NA	No	BSL
7440-41-7	Beryllium	7.00E-02	B	9.30E-01		mg/kg	MP-SS-33	20/20	7.10E-03 - 5.00E-02	9.30E-01	1.90E+00	2.00E+02	N	NA	NA	No	BSL
7440-43-9	Cadmium	5.10E-02	B	5.00E+00		mg/kg	MP-SS-36	19/20	4.30E-02 - 8.10E-02	5.00E+00	1.40E+00	1.00E+02	N	NA	NA	No	BSL
7440-70-2	Calcium	1.13E+02	B	4.83E+03		mg/kg	MP-SS-37	20/20	2.60E+00 - 2.81E+01	4.83E+03	2.17E+03	NA		4.00E+06	ADI	No	NUT
7440-47-3	Chromium	2.90E+00	J	3.66E+01		mg/kg	MP-SS-32	20/20	1.00E-01 - 2.30E-01	3.66E+01	3.35E+01	3.10E+02	N	NA	NA	No	BSL
7440-48-4	Cobalt	9.60E-01	B	1.05E+01	J	mg/kg	MP-SS-57	20/20	7.50E-02 - 1.50E-01	1.05E+01	3.86E+01	NA		NA	NA	No	NSL
7440-50-8	Copper	2.70E+00	L	1.51E+02	J	mg/kg	MP-SS-36	20/20	1.30E-01 - 4.30E-01	1.51E+02	1.93E+01	4.10E+03	N	NA	NA	No	BSL
7439-89-6	Iron	3.38E+03	J	3.36E+04		mg/kg	MP-SS-32	20/20	2.60E+00 - 4.30E+00	3.36E+04	2.17E+04	7.20E+04	N	NA	NA	No	BSL
7439-92-1	Lead	4.80E+00		8.01E+02		mg/kg	MP-SS-37	20/20	2.40E-01 - 4.00E-01	8.01E+02	6.01E+01	NA		1.00E+03	ISL	No	BSL
7439-95-4	Magnesium	2.18E+02	B	7.96E+03		mg/kg	MP-SS-57	20/20	1.60E+00 - 6.00E+00	7.96E+03	3.04E+03	NA		8.00E+05	ADI	No	NUT
7439-96-5	Manganese	5.59E+01	L	7.78E+02		mg/kg	MP-SS-59	20/20	3.70E-02 - 9.00E-02	7.78E+02	1.98E+03	2.00E+03	N	NA	NA	No	BSL
7439-97-6	Mercury	2.00E-02	B	2.00E-01		mg/kg	MP-SS-56	20/20	1.00E-02 - 3.00E-02	2.00E-01	1.20E+00	1.00E+01	N	NA	NA	No	BSL
7440-02-0	Nickel	2.20E+00	B	8.83E+01		mg/kg	MP-SS-57	20/20	1.70E-01 - 2.80E-01	8.83E+01	2.66E+01	2.00E+03	N	NA	NA	No	BSL
7440-09-7	Potassium	5.15E+01	J	8.01E+02	J	mg/kg	MP-SS-57	20/20	2.30E+00 - 8.80E+00	8.01E+02	1.03E+03	NA		1.00E+06	ADI	No	NUT
7782-49-2	Selenium	5.40E-01	B	1.50E+00		mg/kg	MP-SS-34	13/20	3.30E-01 - 7.30E-01	1.50E+00	2.30E+00	5.10E+02	N	NA	NA	No	BSL
7440-22-4	Silver	3.80E-01	B	3.80E-01	B	mg/kg	C29-SS-05	1/20	1.10E-01 - 1.60E-01	3.80E-01	8.50E-01	5.10E+02	N	NA	NA	No	BSL
7440-23-5	Sodium	5.18E+01	B	3.72E+02	B	mg/kg	MP-SS-35	16/20	2.66E+01 - 1.28E+03	3.72E+02	6.58E+02	NA		1.00E+06	ADI	No	NUT
7440-62-2	Vanadium	4.60E+00	B	5.21E+01		mg/kg	MP-SS-32	20/20	1.40E-01 - 2.40E-01	5.21E+01	4.57E+01	1.00E+02	N	NA	NA	No	BSL
7440-66-6	Zinc	2.16E+01		3.67E+03		mg/kg	MP-SS-65	20/20	1.10E-01 - 9.20E+00	3.67E+03	8.19E+01	3.10E+04	N	NA	NA	No	BSL
							PESTICIDES/PCBS										
72-54-8	4,4'-DDD	2.20E-03	J	8.30E-03		mg/kg	C29-SS-05	2/9	3.50E-03 - 5.80E-03	8.30E-03	2.55E-02	1.20E+01	C	NA	NA	No	BSL
72-55-9	4,4'-DDE	2.40E-04	J	2.80E-02		mg/kg	MP-SS-60	9/9	3.50E-03 - 5.80E-03	2.80E-02	3.92E-01	8.40E+00	C	NA	NA	No	BSL
50-29-3	4,4'-DDT	4.80E-04	J	1.30E-01	J	mg/kg	C29-SS-05	8/9	3.50E-03 - 5.80E-03	1.30E-01	1.43E-01	8.40E+00	C	NA	NA	No	BSL
1031-07-8	Endosulfan sulfate	1.20E-03	J	1.20E-03	J	mg/kg	MP-SS-56	1/9	3.50E-03 - 5.80E-03	1.20E-03	NA	6.10E+02	N	NA	NA	No	BSL
							SEMI-VOLATILE ORGANIC COMPOUNDS										
117-81-7	bis(2-Ethylhexyl)phthalate	9.80E-02	J	9.80E-02	J	mg/kg	C29-SS-04	1/9	3.50E-01 - 5.70E-01	9.80E-02	NA	2.00E+02	C	NA	NA	No	BSL
84-66-2	Diethylphthalate	1.40E-01	J	6.80E-01	J	mg/kg	C29-SS-04	2/9	3.50E-01 - 5.70E-01	6.80E-01	2.60E-01	8.20E+04	N	NA	NA	No	BSL
118-74-1	Hexachlorobenzene	1.00E-01	J	1.00E-01	J	mg/kg	C29-SS-05	1/9	3.50E-01 - 5.70E-01	1.00E-01	NA	1.80E+00	C	NA	NA	No	BSL
							VOLATILE ORGANIC COMPOUNDS										
79-34-5	1,1,2,2-Tetrachloroethane	2.10E-02		2.10E-02		mg/kg	MP-SS-57	1/9	1.10E-02 - 1.70E-02	2.10E-02	NA	1.40E+01	C	NA	NA	No	BSL
108-88-3	Toluene	7.60E-03	JJ	1.30E-02		mg/kg	MP-SS-59	4/9	1.10E-02 - 1.70E-02	1.30E-02	NA	8.20E+03	N	NA	NA	No	BSL
79-01-6	Trichloroethene	1.30E-02	J	2.50E-02	J	mg/kg	MP-SS-59/MP-SS-58	4/9	1.10E-02 - 1.70E-02	2.50E-02	NA	7.20E+00	C	NA	NA	No	BSL

(1) Minimum/maximum detected concentration.
(2) Maximum concentration used as screening value.
(3) Background values are 95% UPLs calculated using reference data from ICF KE 1995a,b. Background values are not included as part of the COPC selection process
(4) Screening Toxicity Value - Taken from USEPA Region III Risk-Based (RBCs) Table, USEPA, October 2007. For non-carcinogens, value shown is equal to 1/10 the industrial soil RBC value. For carcinogens the value shown is equal to the industrial soil RBC value.
(5) Rationale Codes

Selection Reason: ASL = Above Screening Toxicity Level
Deletion Reason: BSL = Below Screening Toxicity Level
NSL = No Screening Level
NUT = Essential Nutrient

Surrogates used: Chromium VI for Chromium, Methylmercury for Mercury, and Endosulfan for Endosulfan sulfate

Definitions:
ADI = Allowable Daily Intake (FDA)
mg/kg = milligrams per kilogram
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
C = Carcinogenic
COPC = Chemical of Potential Concern
N = Non-Carcinogenic
NA = Not Applicable
ISL = Industrial Screening Level (USEPA Region III)

Data Qualifiers:
B = Value is less than the reporting limit (RL) but greater than the method detection limit (MDL).
J = Value is estimated.
L = Reported value may be biased low

TABLE 3-2.3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
MAXWELL POINT INVESTIGATION AREA
BUILDING E7340/7350 TEST SITE - TOTAL SOIL - RESIDENTIAL

Scenario Timeframe: Current/Future
Medium: Total soil
Exposure Medium: Total soil
Exposure Point: Building E7340/7350 Test Site

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (5) Contaminant Deletion or Selection
							INORGANICS										
7429-90-5	Aluminum	1.64E+03	J	2.03E+04		mg/kg	MP-SO-65-02	22/22	2.05E+00 - 4.20E+00	2.03E+04	2.56E+04	7.80E+03	N	NA	NA	Yes	ASL
7440-36-0	Antimony	4.80E-01	B	3.50E+00	L	mg/kg	C29-SS-05	15/22	4.30E-01 - 8.90E-01	3.50E+00	5.00E+00	3.10E+00	N	NA	NA	Yes	ASL
7440-38-2	Arsenic	1.20E+00	B	1.31E+01		mg/kg	MP-SS-57	22/22	4.80E-01 - 1.00E+00	1.31E+01	7.60E+00	4.30E-01	C	NA	NA	Yes	ASL
7440-39-3	Barium	1.47E+01	B	4.78E+02		mg/kg	MP-SS-37	22/22	2.90E-02 - 9.10E-02	4.78E+02	1.07E+02	1.60E+03	N	NA	NA	No	BSL
7440-41-7	Beryllium	7.00E-02	B	9.30E-01		mg/kg	MP-SS-33	22/22	7.10E-03 - 5.00E-02	9.30E-01	1.90E+00	1.60E+01	N	NA	NA	No	BSL
7440-43-9	Cadmium	5.10E-02	B	5.00E+00		mg/kg	MP-SS-36	21/22	4.30E-02 - 8.20E-02	5.00E+00	1.40E+00	3.90E+00	N	NA	NA	Yes	ASL
7440-43-9	Cadmium	5.10E-02	B	5.00E+00		mg/kg	MP-SS-36	21/22	4.30E-02 - 8.20E-02	5.00E+00	1.40E+00	7.80E+00	N	NA	NA	No	BSL
7440-70-2	Calcium	1.13E+02	B	4.83E+03		mg/kg	MP-SS-37	22/22	2.60E+00 - 2.82E+01	4.83E+03	2.17E+03	NA		4.00E+06	ADI	No	NUT
7440-47-3	Chromium	2.90E+00	J	3.66E+01		mg/kg	MP-SS-32	22/22	1.00E-01 - 2.30E-01	3.66E+01	3.55E+01	2.30E+01	N	NA	NA	Yes	ASL
7440-48-4	Cobalt	9.60E-01	B	1.05E+01	J	mg/kg	MP-SS-57	22/22	7.50E-02 - 1.80E-01	1.05E+01	3.39E+01	NA		NA	NA	No	NSL
7440-50-8	Copper	2.30E+00	L	1.51E+02	J	mg/kg	MP-SS-36	22/22	1.30E-01 - 4.40E-01	1.51E+02	1.84E+01	3.10E+02	N	NA	NA	No	BSL
7439-89-6	Iron	3.38E+03	J	3.36E+04		mg/kg	MP-SS-32	22/22	2.60E+00 - 4.30E+00	3.36E+04	2.20E+04	5.50E+03	N	NA	NA	Yes	ASL
7439-92-1	Lead	4.80E+00		8.01E+02		mg/kg	MP-SS-37	22/22	2.40E-01 - 4.00E-01	8.01E+02	5.62E+01	NA		4.00E+02	RSL	Yes	ASL
7439-95-4	Magnesium	2.18E+02	B	7.96E+03		mg/kg	MP-SS-57	22/22	1.60E+00 - 6.00E+00	7.96E+03	3.20E+03	NA		6.00E+05	ADI	No	NUT
7439-96-5	Manganese	5.59E+01	L	7.78E+02		mg/kg	MP-SS-59	22/22	3.70E-02 - 9.00E-02	7.78E+02	1.60E+03	1.60E+02	N	NA	NA	Yes	ASL
7439-96-5	Manganese	5.59E+01	L	7.78E+02		mg/kg	MP-SS-59	22/22	3.70E-02 - 9.00E-02	7.78E+02	1.60E+03	1.10E+03	N	NA	NA	No	BSL
7439-97-6	Mercury	2.00E-02	B	2.00E-01		mg/kg	MP-SS-56	22/22	1.00E-02 - 3.00E-02	2.00E-01	1.20E+00	7.80E-01	N	NA	NA	No	BSL
7440-02-0	Nickel	2.20E+00	B	8.83E+01		mg/kg	MP-SS-57	22/22	1.70E-01 - 2.80E-01	8.83E+01	2.68E+01	1.60E+02	N	NA	NA	No	BSL
7440-09-7	Potassium	5.15E+01	J	1.05E+03		mg/kg	MP-SO-65-02	22/22	2.30E+00 - 8.90E+00	1.05E+03	1.70E+03	NA		1.00E+06	ADI	No	NUT
7782-49-2	Selenium	5.40E-01	B	1.50E+00		mg/kg	MP-SS-34	15/22	3.10E-01 - 7.30E-01	1.50E+00	2.30E+00	3.90E+01	N	NA	NA	No	BSL
7440-22-4	Silver	3.60E-01	B	3.50E-01	B	mg/kg	C29-SS-05	1/22	1.10E-01 - 1.80E-01	3.50E-01	8.50E-01	3.90E+01	N	NA	NA	No	BSL
7440-23-5	Sodium	5.18E+01	B	3.72E+02	B	mg/kg	MP-SS-35	18/22	2.66E+01 - 1.38E+03	3.72E+02	6.58E+02	NA		1.00E+06	ADI	No	NUT
7440-62-2	Vanadium	4.60E+00	B	5.21E+01		mg/kg	MP-SS-32	22/22	1.40E-01 - 2.40E-01	5.21E+01	4.66E+01	7.80E+00	N	NA	NA	Yes	ASL
7440-66-6	Zinc	2.16E+01		3.67E+03		mg/kg	MP-SS-65	22/22	1.10E-01 - 9.20E+00	3.67E+03	8.20E+01	2.30E+03	N	NA	NA	Yes	ASL
							PESTICIDES/PCBS										
72-54-8	4,4'-DDD	2.20E-03	J	8.30E-03		mg/kg	C29-SS-05	2/9	3.50E-03 - 5.80E-03	8.30E-03	2.55E-02	2.70E+00	C	NA	NA	No	BSL
72-55-9	4,4'-DDE	2.40E-04	J	2.80E-02		mg/kg	MP-SS-60	9/9	3.50E-03 - 5.80E-03	2.80E-02	3.92E-01	1.90E+00	C	NA	NA	No	BSL
50-29-3	4,4'-DDT	4.60E-04	J	1.30E-01	J	mg/kg	C29-SS-05	8/9	3.50E-03 - 5.80E-03	1.30E-01	1.43E-01	1.90E+00	C	NA	NA	No	BSL
1031-07-8	Endosulfan sulfate	1.20E-03	J	1.20E-03	J	mg/kg	MP-SS-56	1/9	3.50E-03 - 5.80E-03	1.20E-03	NA	4.70E+01	N	NA	NA	No	BSL
							SEMI-VOLATILE ORGANIC COMPOUNDS										
117-81-7	bis(2-Ethylhexyl)phthalate	9.80E-02	J	9.80E-02	J	mg/kg	C29-SS-04	1/9	3.50E-01 - 5.70E-01	9.80E-02	NA	4.60E+01	C	NA	NA	No	BSL
84-66-2	Diethylphthalate	1.40E-01	J	6.80E-01		mg/kg	C29-SS-04	2/9	3.50E-01 - 5.70E-01	6.80E-01	2.60E-01	6.30E+03	N	NA	NA	No	BSL
118-74-1	Hexachlorobenzene	1.00E-01	J	1.00E-01	J	mg/kg	C29-SS-05	1/9	3.50E-01 - 5.70E-01	1.00E-01	NA	4.00E-01	C	NA	NA	No	BSL
							VOLATILE ORGANIC COMPOUNDS										
79-34-5	1,1,2,2-Tetrachloroethane	2.10E-02		2.10E-02		mg/kg	MP-SS-57	1/9	1.10E-02 - 1.70E-02	2.10E-02	NA	3.20E+00	C	NA	NA	No	BSL
108-88-3	Toluene	7.60E-03	JJ	1.30E-02		mg/kg	MP-SS-59	4/9	1.10E-02 - 1.70E-02	1.30E-02	NA	6.30E+02	N	NA	NA	No	BSL
79-01-6	Trichloroethene	1.30E-02	JJ	2.50E-02	J	mg/kg	MP-SS-58/MP-SS-59	4/9	1.10E-02 - 1.70E-02	2.50E-02	NA	1.60E+00	C	NA	NA	No	BSL

(1) Minimum/maximum detected concentration.
(2) Maximum concentration used as screening value.
(3) Background values are 95% UPLs calculated using reference data from ICF KE 1995a,b. Background values are not included as part of the COPC selection process.
(4) Screening Toxicity Value - Taken from USEPA Region III Risk-Based (RBCs) Table, USEPA, October 2007. For non-carcinogens, value shown is equal to 1/10 the residential soil RBC value. For carcinogens the value shown is equal to the residential soil RBC value.
(5) Rationale Codes: Selection Reason: ASL = Above Screening Toxicity Level; Deletion Reason: BSL = Below Screening Toxicity Level; NSL = No Screening Level; NUT = Essential Nutrient

Surrogates used: Chromium VI for Chromium, Methylmercury for Mercury, and Endosulfan for Endosulfan sulfate.

Definitions:
ADI = Allowable Daily Intake (FDA)
mg/kg = milligrams per kilogram
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
C = Carcinogenic
COPC = Chemical of Potential Concern
N = Non-Carcinogenic
NA = Not Applicable
RSL = Residential Screening Level (USEPA Region III)

Data Qualifiers:
B = Value is less than the reporting limit (RL) but greater than the method detection limit (MDL).
J = Value is estimated.
L = Reported value may be biased low.

TABLE 3-2.4
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
MAXWELL POINT INVESTIGATION AREA
BUILDING E7340/7350 TEST SITE - TOTAL SOIL - INDUSTRIAL

Scenario Timeframe: Current/Future
Medium: Total soil
Exposure Medium: Total soil
Exposure Point: Building E7340/7350 Test Site

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (5) Contaminant Deletion or Selection
							INORGANICS										
7429-90-5	Aluminum	1.64E+03	J	2.03E+04		mg/kg	MP-SO-65-02	22/22	2.05E+00 - 4.20E+00	2.03E+04	2.56E+04	1.00E+05	N	NA	NA	No	BSL
7440-36-0	Antimony	4.80E-01	B	3.50E+00	L	mg/kg	C29-SS-05	15/22	4.30E-01 - 8.90E-01	3.50E+00	5.00E+00	4.10E+01	N	NA	NA	No	BSL
7440-38-2	Arsenic	1.20E+00	B	1.31E+01		mg/kg	MP-SS-57	22/22	4.80E-01 - 1.00E+00	1.31E+01	7.60E+00	1.90E+00	C	NA	NA	Yes	ASL
7440-39-3	Barium	1.47E-01	B	4.78E+02		mg/kg	MP-SS-37	22/22	2.90E-02 - 9.10E-02	4.78E+02	1.07E+02	2.00E+04	N	NA	NA	No	BSL
7440-41-7	Beryllium	7.00E-02	B	9.30E-01		mg/kg	MP-SS-33	22/22	7.10E-03 - 5.00E-02	9.30E-01	1.90E+00	2.00E+02	N	NA	NA	No	BSL
7440-43-9	Cadmium	5.10E-02	B	5.00E+00		mg/kg	MP-SS-36	21/22	4.30E-02 - 8.20E-02	5.00E+00	1.40E+00	5.10E+01	N	NA	NA	No	BSL
7440-43-9	Cadmium	5.10E-02	B	5.00E+00		mg/kg	MP-SS-36	21/22	4.30E-02 - 8.20E-02	5.00E+00	1.40E+00	1.00E+02	N	NA	NA	No	BSL
7440-70-2	Calcium	1.13E+02	B	4.83E+03		mg/kg	MP-SS-37	22/22	2.60E+00 - 2.82E+01	4.83E+03	2.17E+03	NA		4.00E+06	ADI	No	NUT
7440-47-3	Chromium	2.90E+00	J	3.66E+01		mg/kg	MP-SS-32	22/22	1.00E-01 - 2.30E-01	3.66E+01	3.55E+01	3.10E+02	N	NA	NA	No	BSL
7440-48-4	Cobalt	9.60E-01	B	1.05E+01	J	mg/kg	MP-SS-57	22/22	7.50E-02 - 1.80E-01	1.05E+01	3.39E+01	NA		NA	NA	No	NSL
7440-50-8	Copper	2.70E+00	L	1.51E+02	J	mg/kg	MP-SS-36	22/22	1.30E-01 - 4.40E-01	1.51E+02	1.84E+01	4.10E+03	N	NA	NA	No	BSL
7439-89-6	Iron	3.38E+03	J	3.36E+04		mg/kg	MP-SS-32	22/22	2.60E+00 - 4.30E+00	3.36E+04	2.20E+04	7.20E+04	N	NA	NA	No	BSL
7439-92-1	Lead	4.80E+00		8.01E+02		mg/kg	MP-SS-37	22/22	2.40E-01 - 4.00E-01	8.01E+02	5.62E+01	NA		1.00E+03	ISL	No	BSL
7439-95-4	Magnesium	2.18E+02	B	7.96E+03		mg/kg	MP-SS-57	22/22	1.60E+00 - 6.00E+00	7.96E+03	3.20E+03	NA		8.00E+05	ADI	No	NUT
7439-96-5	Manganese	5.59E-01	L	7.78E+02		mg/kg	MP-SS-59	22/22	3.70E-02 - 9.00E-02	7.78E+02	1.60E+03	2.00E+03	N	NA	NA	No	BSL
7439-96-5	Manganese	5.59E-01	L	7.78E+02		mg/kg	MP-SS-59	22/22	3.70E-02 - 9.00E-02	7.78E+02	1.60E+03	1.40E+04	N	NA	NA	No	BSL
7439-97-6	Mercury	2.00E-02	B	2.00E-01		mg/kg	MP-SS-56	22/22	1.00E-02 - 3.00E-02	2.00E-01	1.20E+00	1.00E+01	N	NA	NA	No	BSL
7440-02-0	Nickel	2.20E+00	B	8.83E+01		mg/kg	MP-SS-57	22/22	1.70E-01 - 2.80E-01	8.83E+01	2.68E+01	2.00E+03	N	NA	NA	No	BSL
7440-09-7	Potassium	5.15E+01	J	1.05E+03		mg/kg	MP-SO-65-02	22/22	2.30E+00 - 8.90E+00	1.05E+03	1.70E+03	NA		1.00E+06	ADI	No	NUT
7782-49-2	Selenium	5.40E+01	B	1.50E+00		mg/kg	MP-SS-34	15/22	3.10E-01 - 7.30E-01	1.50E+00	2.30E+00	5.10E+02	N	NA	NA	No	BSL
7440-22-4	Silver	3.80E-01	B	3.80E-01	B	mg/kg	C29-SS-05	1/22	1.10E-01 - 1.80E-01	3.80E-01	8.50E-01	5.10E+02	N	NA	NA	No	BSL
7440-23-5	Sodium	5.18E+01	B	3.72E+02	B	mg/kg	MP-SS-35	18/22	2.66E+01 - 1.28E+03	3.72E+02	6.58E+02	NA		1.00E+06	ADI	No	NUT
7440-62-2	Vanadium	4.60E+00	B	5.21E+01		mg/kg	MP-SS-32	22/22	1.40E-01 - 2.40E-01	5.21E+01	4.66E+01	1.00E+02	N	NA	NA	No	BSL
7440-66-6	Zinc	2.10E+01		3.67E+03		mg/kg	MP-SS-65	22/22	1.10E-01 - 9.20E+00	3.67E+03	8.20E+01	3.10E+04	N	NA	NA	No	BSL
							PESTICIDES/PCBS										
72-54-8	4,4'-DDD	2.20E-03	J	8.30E-03		mg/kg	C29-SS-05	2/9	3.50E-03 - 5.80E-03	8.30E-03	2.55E-02	1.20E+01	C	NA	NA	No	BSL
72-55-9	4,4'-DDE	2.40E-04	J	2.80E-02		mg/kg	MP-SS-60	9/9	3.50E-03 - 5.80E-03	2.80E-02	3.92E-01	8.40E+00	C	NA	NA	No	BSL
50-29-3	4,4'-DDT	4.80E-04	J	1.30E-01	J	mg/kg	C29-SS-05	8/9	3.50E-03 - 5.80E-03	1.30E-01	1.43E-01	8.40E+00	C	NA	NA	No	BSL
1031-07-8	Endosulfan sulfate	1.20E-03	J	1.20E-03	J	mg/kg	MP-SS-56	1/9	3.50E-03 - 5.80E-03	1.20E-03	NA	6.10E+02	N	NA	NA	No	BSL
							SEMI-VOLATILE ORGANIC COMPOUNDS										
117-81-7	bis(2-Ethylhexyl)phthalate	9.80E-02	J	9.80E-02	J	mg/kg	C29-SS-04	1/9	3.50E-01 - 5.70E-01	9.80E-02	NA	2.00E+02	C	NA	NA	No	BSL
84-66-2	Diethylphthalate	1.40E-01	J	6.80E-01		mg/kg	C29-SS-04	2/9	3.50E-01 - 5.70E-01	6.80E-01	2.60E-01	8.20E+04	N	NA	NA	No	BSL
118-74-1	Hexachlorobenzene	1.00E-01	J	1.00E-01	J	mg/kg	C29-SS-05	1/9	3.50E-01 - 5.70E-01	1.00E-01	NA	1.80E+00	C	NA	NA	No	BSL
							VOLATILE ORGANIC COMPOUNDS										
79-34-5	1,1,2,2-Tetrachloroethane	2.10E-02		2.10E-02		mg/kg	MP-SS-57	1/9	1.10E-02 - 1.70E-02	2.10E-02	NA	1.40E+01	C	NA	NA	No	BSL
108-88-3	Toluene	7.60E-03	JB	1.30E-02		mg/kg	MP-SS-59	4/9	1.10E-02 - 1.70E-02	1.30E-02	NA	8.20E+03	N	NA	NA	No	BSL
79-01-6	Trichloroethene	1.30E-02	JL	2.50E-02	J	mg/kg	MP-SS-58/MP-SS-59	4/9	1.10E-02 - 1.70E-02	2.50E-02	NA	7.20E+00	C	NA	NA	No	BSL

(1) Minimum/maximum detected concentration.
(2) Maximum concentration used as screening value
(3) Background values are 95% UPLs calculated using reference data from ICF KI, 1995a,b. Background values are not included as part of the COPC selection process.
(4) Screening Toxicity Value - Taken from USEPA Region III Risk-Based (RBC's) Table, USEPA, October 2007. For non-carcinogens, value shown is equal to 1/10 the industrial soil RBC value. For carcinogens the value shown is equal to the industrial soil RBC value
(5) Rationale Codes — Selection Reason: ASL = Above Screening Toxicity Level; Deletion Reason: BSL = Below Screening Toxicity Level; NSL = No Screening Level; NUT = Essential Nutrient

Surrogates used: Chromium VI for Chromium, Methylmercury for Mercury, and Endosulfan for Endosulfan sulfate.

Definitions:
ADI = Allowable Daily Intake (FDA)
mg/kg = milligrams per kilogram
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
C = Carcinogenic
COPC = Chemical of Potential Concern
N = Non-Carcinogenic
NA = Not Applicable
ISL = Industrial Screening Level (USEPA Region III)

Data Qualifiers:
B = Value is less than the reporting limit (RL) but greater than the method detection limit (MDL).
J = Value is estimated
L = Reported value may be biased low.

TABLE 3-2.5
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
MAXWELL POINT INVESTIGATION AREA
BUILDING E7340/7350 TEST SITE - SEDIMENT - RESIDENTIAL

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Building E7340/7350 Test Site

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (5) Contaminant Deletion or Selection
							EXPLOSIVES										
98-95-3	Nitrobenzene	3.60E-02	J	3.60E-02	J	mg/kg	MP-SD-18	1/12	9.90E-02 - 1.60E-01	3.60E-02	NA	3.90E+01	N	NA	NA	No	BSL
							INORGANICS										
7429-90-5	Aluminum	1.08E+03		1.03E+04		mg/kg	MP-SD-21	12/12	1.90E+00 - 5.80E+00	1.03E+04	3.19E+04	7.80E+04	N	NA	NA	No	BSL
7440-36-0	Antimony	2.10E-01	L	6.80E-01	B	mg/kg	MP-SD-16	8/12	2.00E-01 - 5.00E-01	6.80E-01	1.05E+01	3.10E+01	N	NA	NA	No	BSL
7440-38-2	**Arsenic**	**9.30E-01**	**B**	**4.80E+00**		**mg/kg**	**MP-SD-22**	**12/12**	**2.20E-01 - 8.90E-01**	**4.80E+00**	**1.46E+01**	**4.30E+00**	**C**	**NA**	**NA**	**Yes**	**ASL**
7440-39-3	Barium	3.95E+00	B/B	5.48E+01	/	mg/kg	MP-SD-21	12/12	1.20E-02 - 3.60E-02	5.48E+01	1.07E+02	1.60E+04	N	NA	NA	No	BSL
7440-41-7	Beryllium	3.00E-02	B	8.85E-01	/	mg/kg	MP-SD-21	11/12	8.50E-03 - 2.00E-02	8.85E-01	2.59E+00	1.60E+02	N	NA	NA	No	BSL
7440-43-9	Cadmium	2.80E-01	B	1.50E+00		mg/kg	MP-SD-23	2/12	2.00E-02 - 7.10E-02	1.50E+00	3.42E+00	7.80E+01	N	NA	NA	No	BSL
7440-70-2	Calcium	4.31E+01	B/B	4.93E+02		mg/kg	MP-SD-23	12/12	3.80E+00 - 7.40E+00	4.93E+02	9.59E+03	NA		4.00E+06	ADI	No	NUT
7440-47-3	Chromium	2.60E+00	*	1.56E+01	/	mg/kg	MP-SD-21	12/12	5.00E-02 - 1.20E-01	1.56E+01	1.17E+02	2.30E+02	N	NA	NA	No	BSL
7440-48-4	Cobalt	7.30E-01	J	9.35E+00	/	mg/kg	MP-SD-21	12/12	6.10E-02 - 1.60E-01	9.35E+00	3.51E+01	NA		NA	NA	No	NSL
7440-50-8	Copper	1.40E+00	J	6.37E+01		mg/kg	MP-SD-23	12/12	9.60E-02 - 1.60E-01	6.37E+01	7.87E+01	3.10E+03	N	NA	NA	No	BSL
7439-89-6	Iron	2.88E+03	*	1.93E+04		mg/kg	MP-SD-24	12/12	1.60E+00 - 3.80E+00	1.93E+04	5.43E+04	5.50E+04	N	NA	NA	No	BSL
7439-92-1	Lead	3.65E+00	K/K	8.69E+01		mg/kg	MP-SD-26	12/12	1.40E-01 - 3.40E-01	8.69E+01	9.50E+01	NA		4.00E+02	RSL	No	BSL
7439-95-4	Magnesium	1.37E+02	B/B	1.41E+03		mg/kg	MP-SD-26	12/12	8.50E-01 - 8.50E+00	1.41E+03	6.51E+03	NA		8.00E+05	ADI	No	NUT
7439-96-5	Manganese	2.22E+01	*	7.13E+02	/	mg/kg	MP-SD-21	12/12	1.10E-02 - 8.90E-02	7.13E+02	1.59E+03	1.10E+04	N	NA	NA	No	BSL
7439-97-6	Mercury	2.00E-02	L/B	1.50E-01	L/L	mg/kg	MP-SD-21	6/12	9.70E-03 - 2.00E-02	1.50E-01	3.98E-01	7.80E+00	N	NA	NA	No	BSL
7440-02-0	Nickel	1.30E+00	B/B	1.08E+01	/	mg/kg	MP-SD-21	12/12	9.30E-02 - 2.50E-01	1.08E+01	7.01E+01	1.60E+03	N	NA	NA	No	BSL
7440-09-7	Potassium	8.26E+01	B/B	6.79E+02	B	mg/kg	MP-SD-14	12/12	6.40E-01 - 3.00E+00	6.79E+02	3.73E+03	NA		1.00E+06	ADI	No	NUT
7782-49-2	Selenium	4.50E-01	J	7.00E-01	J	mg/kg	MP-SD-22	5/12	3.70E-01 - 5.70E-01	7.00E-01	4.00E+00	3.90E+02	N	NA	NA	No	BSL
7440-23-5	Sodium	1.07E+02	B	3.61E+02	B	mg/kg	C29-SD-07	12/12	1.19E+01 - 5.65E+01	3.61E+02	6.31E+03	NA		1.00E+06	ADI	No	NUT
7440-62-2	Vanadium	4.40E+00	B	2.49E+01		mg/kg	MP-SD-22	12/12	3.70E-02 - 2.10E-01	2.49E+01	9.30E+01	7.80E+01	N	NA	NA	No	BSL
7440-66-6	Zinc	4.85E+00	J/J	8.05E+02	D	mg/kg	MP-SD-23	12/12	8.20E-02 - 8.90E-01	8.05E+02	2.84E+02	2.30E+04	N	NA	NA	No	BSL
							PAHS										
56-55-3	Benzo(a)anthracene	4.70E-02	J	4.70E-02	J	mg/kg	MP-SD-23	1/12	4.00E-01 - 5.40E-01	4.70E-02	5.50E-01	2.20E+00	C	NA	NA	No	BSL
50-32-8	Benzo(a)pyrene	6.90E-02	J	6.90E-02	J	mg/kg	MP-SD-23	1/12	4.00E-01 - 5.40E-01	6.90E-02	5.50E-01	2.20E-01	C	NA	NA	No	BSL
205-99-2	Benzo(b)fluoranthene	1.40E-01	J	1.40E-01	J	mg/kg	MP-SD-23	1/12	4.00E-01 - 5.40E-01	1.40E-01	5.50E-01	2.20E+00	C	NA	NA	No	BSL
191-24-2	Benzo(g,h,i)perylene	6.70E-02	J	6.70E-02	J	mg/kg	MP-SD-23	1/12	4.00E-01 - 5.40E-01	6.70E-02	5.50E-01	2.30E+03	N	NA	NA	No	BSL
207-08-9	Benzo(k)fluoranthene	1.50E-01	J	1.50E-01	J	mg/kg	MP-SD-23	1/12	4.00E-01 - 5.40E-01	1.50E-01	5.50E-01	2.20E+01	C	NA	NA	No	BSL
218-01-9	Chrysene	5.00E-02	J	5.00E-02	J	mg/kg	MP-SD-23	1/12	4.00E-01 - 5.40E-01	5.00E-02	5.50E-01	2.20E+02	C	NA	NA	No	BSL
53-70-3	Dibenzo(a,h)anthracene	6.60E-02	J	6.60E-02	J	mg/kg	MP-SD-23	1/12	4.00E-01 - 5.40E-01	6.60E-02	NA	2.20E-01	C	NA	NA	No	BSL
206-44-0	Fluoranthene	4.60E-02	J	4.60E-02	J	mg/kg	MP-SD-23	1/12	4.00E-01 - 5.40E-01	4.60E-02	6.00E-01	3.10E+03	N	NA	NA	No	BSL
193-39-5	Indeno(1,2,3-c,d)pyrene	6.70E-02	J	6.70E-02	J	mg/kg	MP-SD-23	1/12	4.00E-01 - 5.40E-01	6.70E-02	5.50E-01	2.20E+00	C	NA	NA	No	BSL
129-00-0	Pyrene	4.60E-02	J	4.60E-02	J	mg/kg	MP-SD-23	1/12	4.00E-01 - 5.40E-01	4.60E-02	5.50E-01	2.30E+03	N	NA	NA	No	BSL

TABLE 3-2.5.
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
MAXWELL POINT INVESTIGATION AREA
BUILDING E7340/7350 TEST SITE - SEDIMENT - RESIDENTIAL

Scenario Timeframe: Current Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Building E7340 7350 Test Site

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (5) Contaminant Deletion or Selection
							PESTICIDES/PCBS										
72-54-8	4,4'-DDD	2.20E-04	J	6.20E-04	J	mg/kg	C29-SD-07	3/12	4.00E-03 - 5.40E-03	6.20E-04	5.50E-02	2.70E+01	C	NA	NA	No	BSL
72-55-9	4,4'-DDE	1.80E-04	J	2.70E-03	J	mg/kg	MP-SD-22	9/12	3.80E-03 - 5.40E-03	2.70E-03	5.50E-02	1.90E+01	C	NA	NA	No	BSL
50-29-3	4,4'-DDT	1.80E-04	J	2.50E-03	J	mg/kg	MP-SD-22	5/12	4.00E-03 - 5.40E-03	2.50E-03	2.65E-01	1.90E+01	C	NA	NA	No	BSL
319-84-6	alpha-BHC	2.50E-04	J	3.40E-04	J	mg/kg	MP-SD-14	2/12	2.00E-03 - 2.70E-03	3.40E-04	NA	1.00E+00	C	NA	NA	No	BSL
319-85-7	beta-BHC	8.50E-04	J	8.50E-04	J	mg/kg	MP-SD-14	1/12	2.00E-03 - 2.70E-03	8.50E-04	NA	3.50E+00	C	NA	NA	No	BSL
319-86-8	delta-BHC	2.60E-03		2.60E-03		mg/kg	MP-SD-14	1/12	2.00E-03 - 2.70E-03	2.60E-03	NA	1.00E+00	C	NA	NA	No	BSL
60-57-1	Dieldrin	2.30E-04	J	3.90E-04	J	mg/kg	MP-SD-14	3/12	4.00E-03 - 5.40E-03	3.90E-04	NA	4.00E-01	C	NA	NA	No	BSL
959-98-8	Endosulfan I	3.30E-04	J	3.30E-04	J	mg/kg	MP-SD-14	1/12	2.00E-03 - 2.70E-03	3.30E-04	NA	4.70E+02	N	NA	NA	No	BSL
33213-65-9	Endosulfan II	1.30E-03	J	1.30E-03	J	mg/kg	MP-SD-14	1/12	4.00E-03 - 5.40E-03	1.30E-03	NA	4.70E+02	N	NA	NA	No	BSL
72-20-8	Endrin	2.30E-04	J	5.40E-03	JP	mg/kg	MP-SD-26	4/12	4.00E-03 - 5.40E-03	5.40E-03	NA	2.30E+01	N	NA	NA	No	BSL
53494-70-5	Endrin ketone	6.10E-04	J	6.10E-04	J	mg/kg	MP-SD-14	1/12	4.00E-03 - 5.40E-03	6.10E-04	NA	2.30E+01	N	NA	NA	No	BSL
58-89-9	gamma-BHC (Lindane)	5.10E-04	J	5.10E-04	J	mg/kg	MP-SD-14	1/12	2.00E-03 - 2.70E-03	5.10E-04	2.65E-02	4.90E+00	C	NA	NA	No	BSL
1024-57-3	Heptachlor epoxide	2.30E-04	J	2.30E-04	J	mg/kg	MP-SD-14	1/12	2.00E-03 - 2.70E-03	2.30E-04	NA	7.00E-01	C	NA	NA	No	BSL
72-43-5	Methoxychlor	1.00E-03	J	1.00E-03	J	mg/kg	MP-SD-14	1/12	2.00E-02 - 2.70E-02	1.00E-03	NA	3.90E+02	N	NA	NA	No	BSL
							SEMI-VOLATILE ORGANIC COMPOUNDS										
100-02-7	4-Nitrophenol	5.10E-02	J	5.10E-02	J	mg/kg	MP-SD-23	1/12	9.80E-01 - 1.40E+00	5.10E-02	NA	NA		NA	NA	No	NSL
117-81-7	bis(2-Ethylhexyl)phthalate	4.90E-02	J	9.40E-02	J	mg/kg	MP-SD-16	2/12	3.80E-01 - 5.40E-01	9.40E-02	9.30E+00	4.60E+02	C	NA	NA	No	BSL
84-66-2	Diethylphthalate	4.80E-02	J	6.30E-02	J	mg/kg	MP-SD-19	2/12	4.00E-01 - 5.40E-01	6.30E-02	5.50E-01	6.30E+04	N	NA	NA	No	BSL
117-84-0	di-n-Octylphthalate	6.50E-02	J	6.50E-02	J	mg/kg	MP-SD-23	1/12	4.00E-01 - 5.40E-01	6.50E-02	NA	NA		NA	NA	No	NSL
							VOLATILE ORGANIC COMPOUNDS										
67-64-1	Acetone	2.10E-02	J	2.10E-02	J	mg/kg	C29-SD-07	1/12	1.20E-02 - 1.60E-02	2.10E-02	NA	7.00E+04	N	NA	NA	No	BSL
100-42-5	Styrene	4.50E-03	J	4.50E-03	J	mg/kg	MP-SD-24	1/12	1.20E-02 - 1.60E-02	4.50E-03	NA	1.60E+04	N	NA	NA	No	BSL
108-88-3	Toluene	1.60E-03	JJ	5.30E-03	J	mg/kg	MP-SD-19	3/12	1.20E-02 - 1.60E-02	5.30E-03	NA	6.30E+03	N	NA	NA	No	BSL

(1) Minimum maximum detected concentration
(2) Maximum concentration used as screening value.
(3) Background values are 95% UPLs calculated using reference data from ICF KE 1995a,b Background values are not included as part of the COPC selection process.

(4) Screening Toxicity Value - Taken from USEPA Region III Risk-Based (RBCs) Table, USEPA, October 2007. For non-carcinogens, value shown is equal to 1/10 the residential soil RBC value For carcinogens the value shown is equal to the residential soil RBC value To account for sediment exposures, the resulting values have been increased by a factor of ten.
(5) Rationale Codes
Selection Reason: ASL = Above Screening Toxicity Level
Deletion Reason: BSL = Below Screening Toxicity Level
NSL = No Screening Level
NUT = Essential Nutrient

Surrogates used Chromium VI for Chromium, Methylmercury for Mercury, Pyrene for Benzo(g,h,i)perylene, Alpha-BHC for delta-BHC, Endosulfan for Endosulfan I and Endosulfan II, and Endrin for Endrin ketone

Definitions:
ADI = Allowable Daily Intake (FDA)
AL = Action Level (USEPA 1996b)
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

C = Carcinogenic
COPC = Chemical of Potential Concern
N = Non-Carcinogenic
NA = Not Applicable
RSL = Residential Screening Level (USEPA Region III)
mg/kg = milligrams per kilogram

Data Qualifiers:
* = Duplicate analyses is not within control limits.
B = Value is less than the reporting limit (RL) but greater than the method detection limit (MDL).
D = This flag identifies all compounds in the analysis at a secondary dilution factor.
J = Value is estimated.
K = Reported value may be biased high
L = Reported value may be biased low.
P = there is greater than 25% difference for detected concentrations between the two GC columns

TABLE 3-2.6
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
MAXWELL POINT INVESTIGATION AREA
BUILDING E7340/7350 TEST SITE - SEDIMENT - INDUSTRIAL

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Building E7340/7350 Test Site

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (5) Contaminant Deletion or Selection
							EXPLOSIVES										
98-95-3	Nitrobenzene	3.60E-02	J	3.60E-02	J	mg/kg	MP-SD-18	1/12	9.90E-02 - 1.60E-01	3.60E-02	NA	5.10E+02	N	NA	NA	No	BSL
							INORGANICS										
7429-90-5	Aluminum	1.08E+03		1.03E+04		mg/kg	MP-SD-21	12/12	1.90E+00 - 5.80E+00	1.03E+04	3.19E+04	1.00E+06	N	NA	NA	No	BSL
7440-36-0	Antimony	2.10E-01	L	6.80E-01	B	mg/kg	MP-SD-16	8/12	2.00E-01 - 5.00E-01	6.80E-01	1.05E+01	4.10E+02	N	NA	NA	No	BSL
7440-38-2	Arsenic	9.30E-01	B	4.80E+00		mg/kg	MP-SD-22	12/12	2.20E-01 - 8.90E-01	4.80E+00	1.46E+01	1.90E+01	C	NA	NA	No	BSL
7440-39-3	Barium	3.95E+00	B/B	5.48E+01		mg/kg	MP-SD-21	12/12	1.20E-02 - 3.60E-02	5.48E+01	1.07E+02	2.00E+05	N	NA	NA	No	BSL
7440-41-7	Beryllium	3.00E-02	B	8.85E-01	/	mg/kg	MP-SD-21	11/12	8.50E-03 - 2.00E-02	8.85E-01	2.59E+00	2.00E+03	N	NA	NA	No	BSL
7440-43-9	Cadmium	2.80E-01	B	1.50E+00		mg/kg	MP-SD-23	2/12	2.00E-02 - 7.10E-02	1.50E+00	3.42E+00	5.10E+02	N	NA	NA	No	BSL
7440-70-2	Calcium	4.31E+01	B/B	4.93E+02		mg/kg	MP-SD-23	12/12	3.80E+00 - 7.40E+00	4.93E+02	9.59E+03	NA		4.00E+06	ADI	No	NUT
7440-47-3	Chromium	2.60E+00	*	1.56E+01	/	mg/kg	MP-SD-21	12/12	5.00E-02 - 1.20E-01	1.56E+01	1.17E+02	3.10E+03	N	NA	NA	No	BSL
7440-48-4	Cobalt	7.30E-01	J	9.35E+00	/	mg/kg	MP-SD-21	12/12	6.10E-02 - 1.60E-01	9.35E+00	3.51E+01	NA		NA	NA	No	NSL
7440-50-8	Copper	1.40E+00	J	6.37E+01		mg/kg	MP-SD-23	12/12	9.60E-02 - 1.60E-01	6.37E+01	7.87E+01	4.10E+04	N	NA	NA	No	BSL
7439-89-6	Iron	2.88E+03	*	1.93E+04		mg/kg	MP-SD-24	12/12	1.60E+00 - 3.80E+00	1.93E+04	5.43E+04	7.20E+05	N	NA	NA	No	BSL
7439-92-1	Lead	3.65E+00	K/K	8.69E+01		mg/kg	MP-SD-26	12/12	1.40E-01 - 3.40E-01	8.69E+01	9.50E+01	NA		1.00E+03	ISL	No	BSL
7439-95-4	Magnesium	1.37E+02	B/B	1.41E+03		mg/kg	MP-SD-26	12/12	8.50E-01 - 8.50E+00	1.41E+03	6.51E+03	NA		8.00E+05	ADI	No	NUT
7439-96-5	Manganese	2.22E+01	*	7.13E+02	/	mg/kg	MP-SD-21	12/12	1.10E-02 - 8.90E-02	7.13E+02	1.59E+03	1.40E+05	N	NA	NA	No	BSL
7439-97-6	Mercury	2.00E-02	L/B	1.50E-01	L/L	mg/kg	MP-SD-21	6/12	9.70E-03 - 2.00E-02	1.50E-01	3.98E-01	1.00E+02	N	NA	NA	No	BSL
7440-02-0	Nickel	1.30E+00	B/B	1.08E+01	/	mg/kg	MP-SD-21	12/12	9.30E-02 - 2.50E-01	1.08E+01	7.01E+01	2.00E+04	N	NA	NA	No	BSL
7440-09-7	Potassium	8.26E+01	B/B	6.79E+02	B	mg/kg	MP-SD-14	12/12	6.40E-01 - 3.00E+00	6.79E+02	3.73E+03	NA		1.00E+06	ADI	No	NUT
7782-49-2	Selenium	4.50E-01	J	7.00E-01	J	mg/kg	MP-SD-22	5/12	3.70E-01 - 5.70E-01	7.00E-01	4.00E+00	5.10E+03	N	NA	NA	No	BSL
7440-23-5	Sodium	1.07E+02	B	3.61E+02	B	mg/kg	C29-SD-07	12/12	1.19E+01 - 5.65E+01	3.61E+02	6.31E+03	NA		1.00E+06	ADI	No	NUT
7440-62-2	Vanadium	4.40E+00	B	2.49E+01		mg/kg	MP-SD-22	12/12	3.70E-02 - 2.10E-01	2.49E+01	9.30E+01	1.00E+03	N	NA	NA	No	BSL
7440-66-6	Zinc	4.85E+00	J/J	8.05E+02	D	mg/kg	MP-SD-23	12/12	8.20E-02 - 8.90E-01	8.05E+02	2.84E+02	3.10E+05	N	NA	NA	No	BSL
							PAHS										
56-55-3	Benzo(a)anthracene	4.70E-02	J	4.70E-02	J	mg/kg	MP-SD-23	1/12	4.00E-01 - 5.40E-01	4.70E-02	5.50E-01	3.90E+01	C	NA	NA	No	BSL
50-32-8	Benzo(a)pyrene	6.90E-02	J	6.90E-02	J	mg/kg	MP-SD-23	1/12	4.00E-01 - 5.40E-01	6.90E-02	5.50E-01	3.90E+00	C	NA	NA	No	BSL
205-99-2	Benzo(b)fluoranthene	1.40E-01	J	1.40E-01	J	mg/kg	MP-SD-23	1/12	4.00E-01 - 5.40E-01	1.40E-01	5.50E-01	3.90E+01	C	NA	NA	No	BSL
191-24-2	Benzo(g,h,i)perylene	6.70E-02	J	6.70E-02	J	mg/kg	MP-SD-23	1/12	4.00E-01 - 5.40E-01	6.70E-02	5.50E-01	3.10E+04	N	NA	NA	No	BSL
207-08-9	Benzo(k)fluoranthene	1.50E-01	J	1.50E-01	J	mg/kg	MP-SD-23	1/12	4.00E-01 - 5.40E-01	1.50E-01	5.50E-01	3.90E+02	C	NA	NA	No	BSL
218-01-9	Chrysene	5.00E-02	J	5.00E-02	J	mg/kg	MP-SD-23	1/12	4.00E-01 - 5.40E-01	5.00E-02	5.50E-01	3.90E+03	C	NA	NA	No	BSL
53-70-3	Dibenzo(a,h)anthracene	6.60E-02	J	6.60E-02	J	mg/kg	MP-SD-23	1/12	4.00E-01 - 5.40E-01	6.60E-02	NA	3.90E+00	C	NA	NA	No	BSL
206-44-0	Fluoranthene	4.60E-02	J	4.60E-02	J	mg/kg	MP-SD-23	1/12	4.00E-01 - 5.40E-01	4.60E-02	6.00E-01	4.10E+04	N	NA	NA	No	BSL
193-39-5	Indeno(1,2,3-c,d)pyrene	6.70E-02	J	6.70E-02	J	mg/kg	MP-SD-23	1/12	4.00E-01 - 5.40E-01	6.70E-02	5.50E-01	3.90E+01	C	NA	NA	No	BSL
129-00-0	Pyrene	4.60E-02	J	4.60E-02	J	mg/kg	MP-SD-23	1/12	4.00E-01 - 5.40E-01	4.60E-02	5.50E-01	3.10E+04	N	NA	NA	No	BSL

TABLE 3-2.6
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
MAXWELL POINT INVESTIGATION AREA
BUILDING E7340/7350 TEST SITE - SEDIMENT - INDUSTRIAL

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Building E7340/7350 Test Site

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (5) Contaminant Deletion or Selection
							PESTICIDES/PCBS										
72-54-8	4,4'-DDD	2.20E-04	J	6.20E-04	J	mg/kg	C29-SD-07	3/12	4.00E-03 - 5.40E-03	6.20E-04	5.50E-02	1.20E+02	C	NA	NA	No	BSL
72-55-9	4,4'-DDE	1.80E-04	J	2.70E-03	J	mg/kg	MP-SD-22	9/12	3.80E-03 - 5.40E-03	2.70E-03	5.50E-02	8.40E+01	C	NA	NA	No	BSL
50-29-3	4,4'-DDT	1.80E-04	J	2.50E-03	J	mg/kg	MP-SD-22	5/12	4.00E-03 - 5.40E-03	2.50E-03	2.65E-01	8.40E+01	C	NA	NA	No	BSL
319-84-6	alpha-BHC	2.50E-04	J	3.40E-04	J	mg/kg	MP-SD-14	2/12	2.00E-03 - 2.70E-03	3.40E-04	NA	4.50E+00	C	NA	NA	No	BSL
319-85-7	beta-BHC	8.50E-04	J	8.50E-04	J	mg/kg	MP-SD-14	1/12	2.00E-03 - 2.70E-03	8.50E-04	NA	1.60E+01	C	NA	NA	No	BSL
319-86-8	delta-BHC	2.60E-03		2.60E-03		mg/kg	MP-SD-14	1/12	2.00E-03 - 2.70E-03	2.60E-03	NA	4.50E+00	C	NA	NA	No	BSL
60-57-1	Dieldrin	2.30E-04	J	3.90E-04	J	mg/kg	MP-SD-14	3/12	4.00E-03 - 5.40E-03	3.90E-04	NA	1.80E+00	C	NA	NA	No	BSL
959-98-8	Endosulfan I	3.30E-04	J	3.30E-04	J	mg/kg	MP-SD-14	1/12	2.00E-03 - 2.70E-03	3.30E-04	NA	6.10E+03	N	NA	NA	No	BSL
33213-65-9	Endosulfan II	1.30E-03	J	1.30E-03	J	mg/kg	MP-SD-14	1/12	4.00E-03 - 5.40E-03	1.30E-03	NA	6.10E+03	N	NA	NA	No	BSL
72-20-8	Endrin	2.30E-04	J	5.40E-03	JP	mg/kg	MP-SD-26	4/12	4.00E-03 - 5.40E-03	5.40E-03	NA	3.10E+02	N	NA	NA	No	BSL
53494-70-5	Endrin ketone	6.10E-04	J	6.10E-04	J	mg/kg	MP-SD-14	1/12	4.00E-03 - 5.40E-03	6.10E-04	NA	3.10E+02	N	NA	NA	No	BSL
58-89-9	gamma-BHC (Lindane)	5.10E-04	J	5.10E-04	J	mg/kg	MP-SD-14	1/12	2.00E-03 - 2.70E-03	5.10E-04	2.65E-02	2.20E+01	C	NA	NA	No	BSL
1024-57-3	Heptachlor epoxide	2.30E-04	J	2.30E-04	J	mg/kg	MP-SD-14	1/12	2.00E-03 - 2.70E-03	2.30E-04	NA	3.10E+00	C	NA	NA	No	BSL
72-43-5	Methoxychlor	1.00E-03	J	1.00E-03	J	mg/kg	MP-SD-14	1/12	2.00E-02 - 2.70E-02	1.00E-03	NA	5.10E+03	N	NA	NA	No	BSL
							SEMI-VOLATILE ORGANIC COMPOUNDS										
100-02-7	4-Nitrophenol	5.10E-02	J	5.10E-02	J	mg/kg	MP-SD-23	1/12	9.80E-01 - 1.40E+00	5.10E-02	NA	NA		NA	NA	No	NSL
117-81-7	bis(2-Ethylhexyl)phthalate	4.90E-02	J	9.40E-02	J	mg/kg	MP-SD-16	2/12	3.80E-01 - 5.40E-01	9.40E-02	9.30E+00	2.00E+03	C	NA	NA	No	BSL
84-66-2	Diethylphthalate	4.80E-02	J	6.30E-02	J	mg/kg	MP-SD-19	2/12	4.00E-01 - 5.40E-01	6.30E-02	5.50E-01	8.20E+05	N	NA	NA	No	BSL
117-84-0	di-n-Octylphthalate	6.50E-02	J	6.50E-02	J	mg/kg	MP-SD-23	1/12	4.00E-01 - 5.40E-01	6.50E-02	NA	NA		NA	NA	No	NSL
							VOLATILE ORGANIC COMPOUNDS										
67-64-1	Acetone	2.10E-02	J	2.10E-02	J	mg/kg	C29-SD-07	1/12	1.20E-02 - 1.60E-02	2.10E-02	NA	9.20E+05	N	NA	NA	No	BSL
100-42-5	Styrene	4.50E-03	J	4.50E-03	J	mg/kg	MP-SD-24	1/12	1.20E-02 - 1.60E-02	4.50E-03	NA	2.00E+05	N	NA	NA	No	BSL
108-88-3	Toluene	1.60E-03	JJ	5.30E-03	J	mg/kg	MP-SD-19	3/12	1.20E-02 - 1.60E-02	5.30E-03	NA	8.20E+04	N	NA	NA	No	BSL

(1) Minimum/maximum detected concentration
(2) Maximum concentration used as screening value
(3) Background values are 95% UPLs calculated using reference data from ICF KE 1995a,b. Background values are not included as part of the COPC selection process

(4) Screening Toxicity Value - Taken from USEPA Region III Risk-Based (RBCs) Table, USEPA, October 2007. For non-carcinogens, value shown is equal to 1/10 the industrial soil RBC value. For carcinogens the value shown is equal to the industrial soil RBC value. To account for sediment exposures, the resulting values have been increased by a factor of ten.
(5) Rationale Codes: Selection Reason: ASL = Above Screening Toxicity Level; Deletion Reason: BSL = Below Screening Toxicity Level; NSL = No Screening Level; NUT = Essential Nutrient

Surrogates used: Chromium VI for Chromium, Methylmercury for Mercury, Pyrene for Benzo(g,h,i)perylene, Alpha-BHC for delta-BHC, Endosulfan for Endosulfan I and Endosulfan II, and Endrin for Endrin ketone.

Definitions:
ADI = Allowable Daily Intake (FDA)
AL = Action Level (USEPA 1996b)
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

C = Carcinogenic
COPC = Chemical of Potential Concern
N = Non-Carcinogenic
NA = Not Applicable
ISL = Industrial Screening Level (USEPA Region III)
mg/kg = milligrams per kilogram

Data Qualifiers:
* = Duplicate analyses is not within control limits.
B = Value is less than the reporting limit (RL) but greater than the method detection limit (MDL).
D = This flag identifies all compounds in the analysis at a secondary dilution factor.
J = Value is estimated.
K = Reported value may be biased high.
L = Reported value may be biased low.

TABLE 3-2.7
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
MAXWELL POINT INVESTIGATION AREA
BUILDING E7340/7350 TEST SITE - SURFACE WATER

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Building E7340/7350 Test Site

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (5) Contaminant Deletion or Selection
							INORGANICS-TOTAL										
7429-90-5	Aluminum	1.07E+02	B	2.79E+03		ug/L	C29-SW-07-R1	13/13	1.51E+01 - 3.57E+01	2.79E+03	3.72E+03	3.70E+04	N	NA	NA	No	BSL
7440-36-0	Antimony	2.90E+00	B	3.00E+00	B	ug/L	MP-SW-14-R2	2/13	2.30E+00 - 3.10E+00	3.00E+00	2.50E+01	1.50E+01	N	NA	NA	No	BSL
7440-39-3	Barium	1.07E+01	B	2.20E+02		ug/L	MP-SW-17-R1	13/13	2.00E-01 - 3.00E-01	2.20E+02	9.89E+01	7.30E+03	N	NA	NA	No	BSL
7440-70-2	Calcium	1.24E+04	J	4.94E+04		ug/L	C29-SW-07-R1	13/13	2.80E+01 - 4.60E+01	4.94E+04	8.49E+04	NA		4.00E+05	ADI	No	NUT
7440-47-3	Chromium	8.10E-01	B	3.80E+00	B	ug/L	C29-SW-07-R1	7/13	5.00E-01 - 7.00E-01	3.80E+00	1.42E+01	1.10E+02	N	NA	NA	No	BSL
7440-48-4	Cobalt	9.80E-01	B	2.40E+00	B	ug/L	C29-SW-07-R1	4/13	5.00E-01 - 1.00E+00	2.40E+00	2.50E+01	NA		NA	NA	No	NSL
7440-50-8	Copper	9.40E-01	B	6.40E+00	B	ug/L	C29-SW-07-R1	10/13	7.00E-01 - 9.00E-01	6.40E+00	1.25E+01	1.50E+03	N	NA	NA	No	BSL
7439-89-6	**Iron**	**1.83E+02**	**B**	**4.22E+04**		**ug/L**	**MP-SW-17-R1**	**13/13**	**1.72E+01 - 2.83E+01**	**4.22E+04**	**5.86E+03**	**2.60E+04**	**N**	**NA**	**NA**	**Yes**	**ASL**
7439-92-1	Lead	1.60E+00	LL	6.60E+00		ug/L	MP-SW-20-R1	5/13	1.30E+00 - 1.90E+00	6.60E+00	1.97E+01	NA		1.50E+01	AL	No	BSL
7439-95-4	Magnesium	8.57E+03		1.28E+05		ug/L	C29-SW-07-R1	13/13	1.80E+01 - 5.30E+01	1.28E+05	2.29E+05	NA		8.10E+04	ADI	No	NUT
7439-96-5	Manganese	2.21E+01	K	4.11E+02		ug/L	MP-SW-17-R1	13/13	2.00E-01 - 5.00E-01	4.11E+02	4.81E+03	7.30E+02	N	NA	NA	No	BSL
7439-97-6	Mercury	1.20E-01	B	1.50E-01	B	ug/L	MP-SW-16-R2	2/13	1.00E-01 - 1.00E-01	1.50E-01	6.60E-01	3.70E+00	N	NA	NA	No	BSL
7440-02-0	Nickel	1.60E+00	B/B/B	5.50E+00	B	ug/L	C29-SW-07-R1	11/13	9.00E-01 - 1.40E+00	5.50E+00	2.37E+01	7.30E+02	N	NA	NA	No	BSL
7440-09-7	Potassium	3.36E+03	B	4.50E+04		ug/L	C29-SW-07-R1	13/13	1.30E+01 - 1.86E+01	4.50E+04	1.06E+05	NA		1.00E+05	ADI	No	NUT
7440-22-4	Silver	2.60E+00	B	2.60E+00	B	ug/L	MP-SW-19-R1	1/13	6.00E-01 - 1.20E+00	2.60E+00	5.00E+00	1.80E+02	N	NA	NA	No	BSL
7440-23-5	Sodium	6.78E+03	B	1.00E+06		ug/L	C29-SW-07-R1	13/13	1.16E+02 - 1.02E+03	1.00E+06	2.01E+06	NA		1.00E+05	ADI	No	NUT
7440-28-0	**Thallium**	**3.60E+00**	**K**	**4.50E+00**	**B**	**ug/L**	**MP-SW-20-R1**	**2/13**	**3.10E+00 - 5.80E+00**	**4.50E+00**	**6.25E+00**	**2.60E+00**	**N**	**NA**	**NA**	**Yes**	**ASL**
7440-62-2	Vanadium	1.00E+00	B	6.40E+00	B	ug/L	C29-SW-07-R1	12/13	7.00E-01 - 1.30E+00	6.40E+00	2.50E+01	3.70E+01	N	NA	NA	No	BSL
7440-66-6	Zinc	3.00E+00	B	3.19E+01	B	ug/L	MP-SW-17-R1	13/13	6.00E-01 - 1.90E+00	3.19E+01	7.80E+01	1.10E+04	N	NA	NA	No	BSL
							SEMI-VOLATILE ORGANIC COMPOUNDS										
117-81-7	bis(2-Ethylhexyl)phthalate	1.00E+00	J	1.40E+00	J	ug/L	MP-SW-18-R2	2/13	1.00E+01 - 1.00E+01	1.40E+00	NA	4.80E+01	C	NA	NA	No	BSL
84-66-2	Diethylphthalate	1.50E+00	J	1.50E+00	J	ug/L	MP-SW-16-R1	1/13	1.00E+01 - 1.00E+01	1.50E+00	NA	2.90E+04	N	NA	NA	No	BSL

TABLE 3-2.7
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
MAXWELL POINT INVESTIGATION AREA
BUILDING E7340/7350 TEST SITE - SURFACE WATER

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Building E7340/7350 Test Site

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (5) Contaminant Deletion or Selection
VOLATILE ORGANIC COMPOUNDS																
1634-04-4	Methyl tert-butyl ether	1.40E+00	J	5.90E+00	J	ug/L	MP-SW-18-R1	2/6	1.00E+01 - 1.00E+01	5.90E+00	NA	2.60E+01 C	NA	NA	No	BSL
108-88-3	Toluene	2.60E+00	J	2.60E+00	J	ug/L	MP-SW-17-R1	1/13	1.00E+01 - 1.00E+01	2.60E+00	NA	2.30E+03 N	NA	NA	No	BSL

(1) Minimum/maximum detected concentration
(2) Maximum concentration used as screening value
(3) Background values are 95% UPLs calculated using reference data from ICF KE 1995a,b. Background values are not included as part of the COPC selection process

(4) Screening Toxicity Value - Taken from USEPA Region III Risk-Based (RBCs) Table, USEPA, October 2007. For non-carcinogens, value shown is equal to 1/10 the tap water RBC value. For carcinogens the value shown is equal to the tap water RBC value. To account for surface water exposures, the resulting values have been increased by a factor of ten.
(5) Rationale Codes

Selection Reason: ASL = Above Screening Toxicity Level
Deletion Reason: BSL = Below Screening Toxicity Level
NSL = No Screening Level
NUT = Essential Nutrient

Surrogates used: Chromium VI for Chromium, and Methylmercury for Mercury.

Definitions:
ADI = Allowable Daily Intake (FDA)
AL = Action Level (USEPA 2002)
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

C = Carcinogenic
COPC = Chemical of Potential Concern
N = Non-Carcinogenic
NA = Not Applicable
ug/L = micrograms per liter

Data Qualifiers:
B = Value is less than the reporting limit (RL) but greater than the method detection limit (MDL).
J = Value is estimated.
K = Reported value may be biased high.
L = Reported value may be biased low.

TABLE 3-3.1
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
MAXWELL POINT INVESTIGATION AREA
BUILDING E7340/7350 TEST SITE - SURFACE SOIL - RESIDENTIAL

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: Building E7340/7350 Test Site

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
INORGANICS									
Aluminum	mg/kg	9.28E+03	1.32E+04	1.91E+04	L		1.20E+04	95 UCLM-C	Regional Guidance
Antimony	mg/kg	1.56E+00	1.65E+00	3.50E+00	L	mg/kg	1.65E+00	95 UCLM-KMt	Regional Guidance
Arsenic	mg/kg	5.18E+00	8.22E+00	1.31E+01		mg/kg	8.22E+00	95 UCLM-C	Regional Guidance
Chromium	mg/kg	1.88E+01	2.19E+01	3.66E+01		mg/kg	2.19E+01	95 UCLM-N	Regional Guidance
Iron	mg/kg	1.54E+04	1.81E+04	3.36E+04		mg/kg	1.81E+04	95 UCLM-N	Regional Guidance
Lead	mg/kg	1.56E+02	3.80E+02	8.01E+02		mg/kg	1.56E+02	Mean	USEPA 1994
Manganese	mg/kg	3.31E+02	4.17E+02	7.78E+02		mg/kg	4.17E+02	95 UCLM-N	Regional Guidance
Vanadium	mg/kg	2.47E+01	2.86E+01	5.21E+01		mg/kg	2.86E+01	95 UCLM-N	Regional Guidance
Zinc	mg/kg	6.87E+02	1.94E+03	3.67E+03		mg/kg	1.94E+03	95 UCLM-CL	Regional Guidance

Notes:
Statistics calculated by the USEPA program ProUCL 4.0. ProUCL outputs are presented in Appendix B.
95 UCLM-C indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Chebyshev test.
95 UCLM-CL indicates that the 95 percent upper confidence limit on the mean is based on the Chebyshev test for lognormal distribution.
95 UCLM-KMt indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Kaplan-Meier (KM) student's t-test.
95 UCLM-N indicates that the 95 percent upper confidence limit on the mean is based on the student's t-test for normal distributions.
95 UCLM-NP indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric standard bootstrap test.
USEPA 1994 = The arithmetic mean is used per USEPA lead model guidance (USEPA 1994).

Definitions:
95 UCLM = 95 percent upper confidence limit of the mean
EPC = exposure point concentration
NA = not applicable
mg/kg = milligrams per kilogram
USEPA = United States Environmental Protection Agency

TABLE 3-3.2
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
MAXWELL POINT INVESTIGATION AREA
BUILDING E7340/7350 TEST SITE - SURFACE SOIL - INDUSTRIAL

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: Building E7340/7350 Test Site

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
INORGANICS									
Arsenic	mg/kg	5.18E+00	8.22E+00	1.31E+01		mg/kg	8.22E+00	95 UCLM-C	Regional Guidance

Notes:
Statistics calculated by the USEPA program ProUCL 4.0. ProUCL outputs are presented in Appendix B.
95 UCLM-KMt indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Kaplan-Meier (KM) student's t-test.
95 UCLM-N indicates that the 95 percent upper confidence limit on the mean is based on the student's t-test for normal distributions.

Definitions:
95 UCLM = 95 percent upper confidence limit of the mean
EPC = exposure point concentration
NA = not applicable
mg/kg = milligrams per kilogram
USEPA = United States Environmental Protection Agency

TABLE 3-3.3
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
MAXWELL POINT INVESTIGATION AREA
BUILDING E7340/7350 TEST SITE - TOTAL SOIL - RESIDENTIAL

Scenario Timeframe: Current/Future
Medium: Total soil
Exposure Medium: Total soil
Exposure Point: Building E7340/7350 Test Site

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
INORGANICS									
Aluminum	mg/kg	1.02E+04	1.20E+04	2.03E+04	J		1.20E+04	95 UCLM-N	Regional Guidance
Antimony	mg/kg	1.56E+00	1.59E+00	3.50E+00	L	mg/kg	1.59E+00	95 UCLM-KMp	Regional Guidance
Arsenic	mg/kg	5.08E+00	7.86E+00	1.31E+01		mg/kg	7.86E+00	95 UCLM-C	Regional Guidance
Cadmium	mg/kg	8.59E-01	1.86E+00	5.00E+00		mg/kg	1.86E+00	95 UCLM-KMC	Regional Guidance
Chromium	mg/kg	1.95E+01	2.23E+01	3.66E+01		mg/kg	2.23E+01	95 UCLM-N	Regional Guidance
Iron	mg/kg	1.61E+04	1.87E+04	3.36E+04		mg/kg	1.87E+04	95 UCLM-N	Regional Guidance
Lead	mg/kg	1.43E+02	3.42E+02	8.01E+02		mg/kg	1.43E+02	Mean	USEPA 1994
Manganese	mg/kg	3.16E+02	3.96E+02	7.78E+02		mg/kg	3.96E+02	95 UCLM-N	Regional Guidance
Vanadium	mg/kg	2.60E+01	2.98E+01	5.21E+01		mg/kg	2.98E+01	95 UCLM-N	Regional Guidance
Zinc	mg/kg	6.98E+02	1.21E+03	3.67E+03		mg/kg	1.21E+03	95 UCLM-G	Regional Guidance

Notes:

Statistics calculated by the USEPA program ProUCL 4.0. ProUCL outputs are presented in Appendix B.

95 UCLM-C indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Chebyshev test.

95 UCLM-G indicates that the 95 percent upper confidence limit on the mean is based on the approximate or adjusted gamma distribution.

95 UCLM-KMC indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Kaplan-Meier (KM) Chebyshev test.

95 UCLM-KMp indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Kaplan-Meier (KM) percentile boostrap test.

95 UCLM-N indicates that the 95 percent upper confidence limit on the mean is based on the student's t-test for normal distributions.

USEPA 1994 = The arithmetic mean is used per USEPA lead model guidance (USEPA 1994).

Definitions:

95 UCLM = 95 percent upper confidence limit of the mean

EPC = exposure point concentration

NA = not applicable

mg/kg = milligrams per kilogram

USEPA = United States Environmental Protection Agency

TABLE 3-3.4
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
MAXWELL POINT INVESTIGATION AREA
BUILDING E7340/7350 TEST SITE - TOTAL SOIL - INDUSTRIAL

Scenario Timeframe: Current/Future
Medium: Total soil
Exposure Medium: Total soil
Exposure Point: Building E7340/7350 Test Site

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
INORGANICS									
Arsenic	mg/kg	5.08E+00	7.86E+00	1.31E+01		mg/kg	7.86E+00	95 UCLM-C	Regional Guidance

Notes:
Statistics calculated by the USEPA program ProUCL 4.0. ProUCL outputs are presented in Appendix B.
95 UCLM-C indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Chebyshev test.

Definitions:
95 UCLM = 95 percent upper confidence limit of the mean
EPC = exposure point concentration
NA = not applicable
mg/kg = milligrams per kilogram
USEPA = United States Environmental Protection Agency

TABLE 3-3.5
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
MAXWELL POINT INVESTIGATION AREA
BUILDING E7340/7350 TEST SITE - SEDIMENT - RESIDENTIAL

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Building E7340/7350 Test Site

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
INORGANICS									
Arsenic	mg/kg	2.42E+00	3.05E+00	4.80E+00		mg/kg	3.05E+00	95 UCLM-N	Regional Guidance

Notes:
Statistics calculated by the USEPA program ProUCL 4.0. ProUCL outputs are presented in Appendix B.
95 UCLM-N indicates that the 95 percent upper confidence limit on the mean is based on the student's t-test for normal distributions.

Definitions:
95 UCLM = 95 percent upper confidence limit of the mean
EPC = exposure point concentration
NA = not applicable
mg/kg = milligrams per kilogram
USEPA = United States Environmental Protection Agency

TABLE 3-3.6
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
MAXWELL POINT INVESTIGATION AREA
BUILDING E7340/7350 TEST SITE - SEDIMENT - INDUSTRIAL

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Building E7340/7350 Test Site

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
No COPCs									

TABLE 3-3.7
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
MAXWELL POINT INVESTIGATION AREA
BUILDING E7340/7350 TEST SITE - SURFACE WATER

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Building E7340/7350 Test Site

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
INORGANICS-TOTAL									
Iron	ug/L	4.15E+03	3.58E+04	4.22E+04		ug/L	3.58E+04	95 UCLM-C	Regional Guidance
Thallium	ug/L	NA	NA	4.50E+00	B	ug/L	4.50E+00	Maximum	Low %Detects

Notes:
Statistics calculated by the USEPA program ProUCL 4.0. ProUCL outputs are presented in Appendix B.
95 UCLM-C indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Chebyshev test.
Low %Detects indicates low percentage of detects.
N < 4 indicates that the number of samples is less than 4, so the maximum detected value was used.

Definitions:
95 UCLM = 95 percent upper confidence limit of the mean
EPC = exposure point concentration
NA = not applicable
mg/kg = milligrams per kilogram
USEPA = United States Environmental Protection Agency

TABLE 3-4.1
VALUES USED FOR RESIDENT ADULT DAILY SOIL INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil, Air
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	Chemical-Specific	Chemical-Specific	Chronic Daily Intake (CDI) (mg/kg/day) =
	CR	Ingestion Rate	mg/day	100	U.S. EPA 1991a,b	CS x CR x EF x ED x CF / (BW x AT)
	EF	Exposure Frequency	day/yr	350	U.S. EPA 1991a,b	
	ED-NC	Exposure Duration - Noncancer	yr	30	U.S. EPA 1991a,b	
	ED-C	Exposure Duration-Cancer	yr	24	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	10,950	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Dermal	CS	Chemical Concentration in Soil	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	5,700	U.S. EPA 2004	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	0.07	U.S. EPA 1997a, 2004	
	ABS	Dermal Absorption Fraction	unitless	Chemical-Specific	U.S. EPA 2004a	
	EF	Exposure Frequency	event/yr	350	U.S. EPA 1991a,b	
	ED-NC	Exposure Duration - Noncancer	yr	30	U.S. EPA 1991a,b	
	ED-C	Exposure Duration - Cancer	yr	24	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	10,950	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Inhalation	CA	Chemical Concentration in Air	mg/m^3	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	IR	Inhalation Rate	m^3/hr	0.83	U.S. EPA 1997a	CA x IR x ET x EF x ED / (BW x AT)
	ET	Exposure Time	hr/day	24	BPJ	
	EF	Exposure Frequency	day/yr	350	U.S. EPA 1991a,b	
	ED-NC	Exposure Duration - Noncancer	yr	30	U.S. EPA 1991a,b	
	ED-C	Exposure Duration - Cancer	yr	24	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1989a	
	AT-NC	Averaging time - Noncancer	days	10,950	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgment

TABLE 3-4.2
VALUES USED FOR RESIDENT CHILD DAILY SOIL INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil, Air
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	mg/day	200	U.S. EPA 1991a,b	CS x CR x EF x ED x CF / (BW x AT)
	EF	Exposure Frequency	day/yr	350	U.S. EPA 1991a,b	
	ED	Exposure Duration	yr	6	U.S. EPA 1991a,b	
	BW	Body Weight	kg	15	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	2,190	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Dermal	CS	Chemical Concentration in Soil	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	2,800	U.S. EPA 2004	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	0.2	U.S. EPA 2004	
	ABS	Dermal Absorption Fraction	unitless	Chemical-Specific	U.S. EPA 2004	
	EF	Exposure Frequency	event/yr	350	U.S. EPA 1991a,b	
	ED	Exposure Duration	yr	6	U.S. EPA 1991a,b	
	BW	Body Weight	kg	15	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	2,190	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Inhalation	CA	Chemical Concentration in Air	mg/m^3	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	IR	Inhalation Rate	m^3/hr	0.35	U.S. EPA 1997a	CA x IR x ET x EF x ED / (BW x AT)
	ET	Exposure Time	hr/day	24	BPJ	
	EF	Exposure Frequency	day/yr	350	U.S. EPA 1991a,b	
	ED	Exposure Duration	yr	6	U.S. EPA 1991a,b	
	BW	Body Weight	kg	15	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	2,190	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgment

TABLE 3-4.3
VALUES USED FOR ADOLESCENT TRESPASSER DAILY SURFACE SOIL INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Current
Medium: Soil
Exposure Medium: Surface Soil, Air
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	mg/day	50	BPJ (1)	CS x CR x EF x ED x CF / (BW x AT)
	EF	Exposure Frequency	day/yr	52	BPJ (3)	
	ED	Exposure Duration	yr	8	BPJ (3)	
	BW	Body Weight	kg	45	U.S. EPA 1997a	
	AT-NC	Averaging time - Noncancer	days	2,920	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Dermal	CS	Chemical Concentration in Soil	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	2,900	U.S. EPA 2004 (2)	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	0.20	U.S. EPA 2004 (2)	
	ABS	Dermal Absorption Fraction	unitless	Chemical-Specific	U.S. EPA 2004 (2)	
	EF	Exposure Frequency	event/yr	52	BPJ (3)	
	ED	Exposure Duration	yr	8	BPJ (3)	
	BW	Body Weight	kg	45	U.S. EPA 1997a	
	AT-NC	Averaging time - Noncancer	days	2,920	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Inhalation	CA	Chemical Concentration in Air	mg/m^3	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	IR	Inhalation Rate	m^3/hr	0.63	U.S. EPA 1997a	CA x IR x ET x EF x ED / (BW x AT)
	ET	Exposure Time	hr/day	4	BPJ (3)	
	EF	Exposure Frequency	day/yr	52	BPJ (3)	
	ED	Exposure Duration	yr	8	BPJ (3)	
	BW	Body Weight	kg	45	U.S. EPA 1997a	
	AT-NC	Averaging time - Noncancer	days	2,920	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgment
(1) The incidental soil ingestion rate is assumed to be half that of a resident.
(2) Assumes exposure similar to that of resident child.
(3) The exposure frequency is based on best professional judgment, assuming that the trespasser would visit the site approximately 2 days/week for 6 months of the year for 4 hours per day. The exposure duration is based on the age range evaluated (8 - 16 years of age).

TABLE 3-4.4
VALUES USED FOR CONSTRUCTION WORKER DAILY SOIL INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil, Air
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	mg/day	480	U.S. EPA 1991a,b	CS x CR x EF x ED x CF / (BW x AT)
	EF	Exposure Frequency	day/yr	250	U.S. EPA 1991a,b	
	ED	Exposure Duration	yr	1	BPJ (1)	
	BW	Body Weight	kg	70	U.S. EPA 1989a	
	AT-NC	Averaging time - Noncancer	days	365	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Dermal	CS	Chemical Concentration in Soil	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	3,300	U.S. EPA 2004	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	0.3	U.S. EPA 2004	
	ABS	Dermal Absorption Fraction	unitless	Chemical-Specific	U.S. EPA 2004	
	EF	Exposure Frequency	event/yr	250	U.S. EPA 1991 a,b	
	ED	Exposure Duration	yr	1	BPJ (1)	
	BW	Body Weight	kg	70	U.S. EPA 1989a	
	AT-NC	Averaging time - Noncancer	days	365	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Inhalation	CA	Chemical Concentration in Air	mg/m^3	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	IR	Inhalation Rate	m^3/hr	4.8	U.S. EPA 1997a	CA x IR x ET x EF x ED / (BW x AT)
	ET	Exposure Time	hr/day	8	U.S. EPA 1991a,b	
	EF	Exposure Frequency	day/yr	250	U.S. EPA 1991a,b	
	ED	Exposure Duration	yr	1	BPJ (1)	
	BW	Body Weight	kg	70	U.S. EPA 1989a	
	AT-NC	Averaging time - Noncancer	days	365	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgment
(1) Construction events are assumed to extend for up to one year total in duration.

TABLE 3-4.5
VALUES USED FOR COMMERCIAL WORKER DAILY SOIL INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil, Air
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Commercial Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	mg/day	50	U.S. EPA 1991a,b	CS x CR x EF x ED x CF / (BW x AT)
	EF	Exposure Frequency	day/yr	250	U.S. EPA 1991a,b	
	ED	Exposure Duration	yr	25	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1989a	
	AT-NC	Averaging time - Noncancer	days	9,125	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Dermal	CS	Chemical Concentration in Soil	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	3,300	U.S. EPA 2004	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	0.2	U.S. EPA 2004	
	ABS	Dermal Absorption Fraction	unitless	Chemical-Specific	U.S. EPA 2004	
	EF	Exposure Frequency	event/yr	250	U.S. EPA 1991a,b	
	ED	Exposure Duration	yr	25	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1989a	
	AT-NC	Averaging time - Noncancer	days	9,125	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Inhalation	CA	Chemical Concentration in Air	mg/m^3	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	IR	Inhalation Rate	m^3/hr	0.833	U.S. EPA 1997a	CA x IR x ET x EF x ED / (BW x AT)
	ET	Exposure Time	hr/day	8	BPJ	
	EF	Exposure Frequency	day/yr	250	U.S. EPA 1991a,b	
	ED	Exposure Duration	yr	25	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1989a	
	AT-NC	Averaging time - Noncancer	days	9,125	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgement

TABLE 3-4.6
VALUES USED FOR MAINTENANCE WORKER DAILY SURFACE SOIL INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Current
Medium: Soil
Exposure Medium: Surface Soil, Air
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	mg/day	50	U.S. EPA 1991a,b	CS x CR x EF x ED x CF / (BW x AT)
	EF	Exposure Frequency	day/yr	50	BPJ (1)	
	ED	Exposure Duration	yr	25	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1989a	
	AT-NC	Averaging time - Noncancer	days	9,125	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0.E-06	U.S. EPA 1989a	
Dermal	CS	Chemical Concentration in Soil	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	3,300	U.S. EPA 2004	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	0.2	U.S. EPA 2004	
	ABS	Dermal Absorption Fraction	unitless	Chemical-Specific	U.S. EPA 2004	
	EF	Exposure Frequency	event/yr	50	BPJ (1)	
	ED	Exposure Duration	yr	25	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1989a	
	AT-NC	Averaging time - Noncancer	days	9,125	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.E-06	U.S. EPA 1989a	
Inhalation	CA	Chemical Concentration in Air	mg/m^3	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	IR	Inhalation Rate	m^3/hr	2.5	U.S. EPA 1997a	CA x IR x ET x EF x ED / (BW x AT)
	ET	Exposure Time	hr/day	8	U.S. EPA 1991a,b	
	EF	Exposure Frequency	day/yr	50	BPJ (1)	
	ED	Exposure Duration	yr	25	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1989a	
	AT-NC	Averaging time - Noncancer	days	9,125	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgment
(1) Assumes the maintenance worker performs maintenance and groundskeeping activities 1 day/week for the entire year, with 2 weeks vacation.

TABLE 3-4.7
VALUES USED FOR RESIDENT ADULT DAILY SURFACE WATER INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CW	Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	L/hr	0.05	U.S. EPA 1989a	CW x CR x ET x EF x ED / (BW x AT)
	ET	Exposure Time	hr/day	2	BPJ (2)	
	EF	Exposure Frequency	day/yr	52	BPJ (2)	
	ED-NC	Exposure Duration - Noncancer	yr	30	U.S. EPA 1991a,b	
	ED-C	Exposure Duration - Cancer	yr	24	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1991a,b	
	AT-NC	Averaging time-Noncancer	days	10,950	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
Dermal	CW	Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2	18,000	U.S. EPA 2004	CW x SA x PC x ET x EF x ED x CF / (BW x AT)
	PC	Permeability Coefficient	cm/hr	Chemical-Specific	Chemical-Specific	
	ET	Exposure Time	hr/day	2	BPJ (2)	
	EF	Exposure Frequency	day/yr	52	BPJ (2)	
	ED-NC	Exposure Duration - Noncancer	yr	30	U.S. EPA 1991a,b	
	ED-C	Exposure Duration - Cancer	yr	24	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	10,950	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	L/cm^3	0.001	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgment
(1) The incidental ingestion rate of surface water is assumed to be 0.05 L/hr.
(2) The event frequency and exposure frequency are based on best professional judgment assuming that the adult would wade in the area for 2 days per week for 6 months per year for up to 2 hours per day.

TABLE 3-4.8
VALUES USED FOR RESIDENT CHILD DAILY SURFACE WATER INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CW	Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	L/hr	0.01	BPJ (1)	CW x CR x ET x EF x ED / (BW x AT)
	ET	Exposure Time	hr/day	2	BPJ (2)	
	EF	Exposure Frequency	day/yr	52	BPJ (2)	
	ED	Exposure Duration	yr	6	U.S. EPA 1991a,b	
	BW	Body Weight	kg	15	U.S. EPA 1991a,b	
	AT-NC	Averaging time-Noncancer	days	2,190	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
Dermal	CW	Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2	6,600	U.S. EPA 2004	CW x SA x PC x ET x EF x ED x CF / (BW x AT)
	PC	Permeability Coefficient	cm/hr	Chemical-Specific	Chemical-Specific	
	ET	Exposure Time	hr/day	2	BPJ (2)	
	EF	Exposure Frequency	day/yr	52	BPJ (2)	
	ED	Exposure Duration	yr	6	U.S. EPA 1991a,b	
	BW	Body Weight	kg	15	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	2,190	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	L/cm^3	0.001	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgment
(1) The incidental ingestion rate of surface water is assumed to be 0.01 L/hr.
(2) The event frequency and exposure frequency are based on best professional judgment assuming that the child would wade in the area for 2 days per week for 6 months per year for up to 2 hours per day.

TABLE 3-4.9
VALUES USED FOR ADOLESCENT TRESPASSER DAILY SURFACE WATER INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Trespasser
Receptor Age: Adolescent - Wading

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CW	Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	L/hr	0.05	BPJ (1)	CW x CR x ET x EF x ED / (BW x AT)
	ET	Exposure Time	hr/day	1	BPJ (2)	
	EF	Exposure Frequency	day/yr	52	BPJ (2)	
	ED	Exposure Duration	yr	8	BPJ (2)	
	BW	Body Weight	kg	45	U.S. EPA 1997a	
	AT-NC	Averaging time-Noncancer	days	2,920	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
Dermal	CW	Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2	6,600	BPJ (3)	CW x SA x PC x ET x EF x ED x CF / (BW x AT)
	PC	Permeability Coefficient	cm/hr	Chemical-Specific	Chemical-Specific	
	ET	Exposure Time	hr/day	1	BPJ (2)	
	EF	Exposure Frequency	day/yr	52	BPJ (2)	
	ED	Exposure Duration	yr	8	BPJ (2)	
	BW	Body Weight	kg	45	U.S. EPA 1997a	
	AT-NC	Averaging time - Noncancer	days	2,920	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	L/cm^3	0.001	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgment
(1) The incidental ingestion rate of surface water is assumed to be 0.05 L/hr.
(2) The event frequency and exposure frequency are based on best professional judgment assuming that the trespasser would contact surface water 2 days per year for 6 months per year for 1 hour per day. The exposure duration is based on the age range evaluated (8 - 16 years of age).
(3) Assumes exposure similar to that of resident child.

TABLE 3-4.10
VALUES USED FOR MAINTENANCE WORKER DAILY SURFACE WATER INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Curent
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CW	Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	L/hr	0.05	BPJ (1)	CW x CR x ET x EF x ED / (BW x AT)
	ET	Exposure Time	hr/day	1	BPJ (2)	
	EF	Exposure Frequency	day/yr	50	BPJ (3)	
	ED	Exposure Duration	yr	25	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1991a,b	
	AT-NC	Averaging time-Noncancer	days	9,125	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
Dermal	CW	Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2	3,300	U.S. EPA 2004	CW x SA x PC x ET x EF x ED x CF / (BW x AT)
	PC	Permeability Coefficient	cm/hr	Chemical-Specific	Chemical-Specific	
	ET	Exposure Time	hr/day	1	BPJ (2)	
	EF	Exposure Frequency	day/yr	50	BPJ (3)	
	ED	Exposure Duration	yr	25	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	9,125	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	L/cm^3	0.001	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgment
(1) The incidental ingestion rate of surface water is assumed to be 0.05 L/hr.
(2) It is assumed that the maintenance worker will contact surface water 1 hour per day, each day he is at the site.
(3) Assumes the maintenance worker performs maintenance and groundskeeping activities 1 day/week for the entire year, with 2 weeks vacation.

TABLE 3-4.11
VALUES USED FOR RESIDENT ADULT DAILY SEDIMENT INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CS	Chemical Concentration in Sediment	Chemical-Specific	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	mg/day	50	BPJ (1)	CS x CR x EF x ED x CF / (BW x AT)
	EF	Exposure Frequency	day/yr	52	BPJ (2)	
	ED-NC	Exposure Duration - Noncancer	yr	30	U.S. EPA 1991a,b	
	ED-C	Exposure Duration - Cancer	yr	24	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	10,950	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Dermal	CS	Chemical Concentration in Sediment	Chemical-Specific	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	5,700	U.S. EPA 2004	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	0.07	U.S. EPA 1997a, 2004	
	ABS	Dermal Absorption Fraction	unitless	Chemical-Specific	U.S. EPA 2004	
	EF	Exposure Frequency	event/yr	52	BPJ (2)	
	ED-NC	Exposure Duration - Noncancer	days	30	U.S. EPA 1991a,b	
	ED-C	Exposure Duration - Cancer	yr	24	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	10,950	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgment
(1) The incidental sediment ingestion rate is assumed to be half that of soil.
(2) Assumes an exposure frequency of 2 days per week for 6 months per year to sediment.

TABLE 3-4.12
VALUES USED FOR RESIDENT CHILD DAILY SEDIMENT INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CS	Chemical Concentration in Sediment	Chemical-Specific	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	mg/day	100	BPJ (1)	CS x CR x EF x ED x CF / (BW x AT)
	EF	Exposure Frequency	day/yr	52	BPJ (2)	
	ED	Exposure Duration	yr	6	U.S. EPA 1991a,b	
	BW	Body Weight	kg	15	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	2,190	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Dermal	CS	Chemical Concentration in Sediment	Chemical-Specific	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	2,800	U.S. EPA 2004	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	0.3	U.S. EPA 2004	
	ABS	Dermal Absorption Fraction	unitless	Chemical-Specific	U.S. EPA 2004	
	EF	Exposure Frequency	event/yr	52	BPJ (2)	
	ED	Exposure Duration	yr	6	U.S. EPA 1991a,b	
	BW	Body Weight	kg	15	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	2,190	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgment
(1) The incidental sediment ingestion rate is assumed to be half that of soil.
(2) Based on the age range of the child, exposure frequency to sediment is assumed at 2 days per week for 6 months per year.

TABLE 3-4.13
VALUES USED FOR ADOLESCENT TRESPASSER DAILY SEDIMENT INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CS	Chemical Concentration in Sediment	Chemical-Specific	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	mg/day	50	BPJ (1)	CS x CR x EF x ED x CF / (BW x AT)
	EF	Exposure Frequency	day/yr	52	BPJ (2)	
	ED-C	Exposure Duration - Cancer	yr	8	BPJ (2)	
	BW	Body Weight	kg	45	U.S. EPA 1997a	
	AT-NC	Averaging time - Noncancer	days	2,920	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Dermal	CS	Chemical Concentration in Sediment	Chemical-Specific	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	2,800	BPJ (3)	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	3.3	BPJ (3)	
	ABS	Dermal Absorption Fraction	unitless	Chemical-Specific	U.S. EPA 2004a	
	EF	Exposure Frequency	event/yr	52	BPJ (2)	
	ED-C	Exposure Duration - Cancer	yr	8	BPJ (2)	
	BW	Body Weight	kg	45	U.S. EPA 1997a	
	AT-NC	Averaging time - Noncancer	days	2,920	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgment
(1) The incidental soil ingestion rate is assumed to be half that of a resident.
(2) The exposure frequency is based on best professional judgment, assuming that the trespasser would visit the site approximately 2 days/week for 6 months of the year. The exposure duration is based on the age range evaluated (8 - 16 years of age).
(3) Assumes children playing in wet soil.

TABLE 3-4.14
VALUES USED FOR MAINTENANCE WORKER DAILY SEDIMENT INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CS	Chemical Concentration in Sediment	Chemical-Specific	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	mg/day	25	BPJ (1)	CS x CR x EF x ED x CF / (BW x AT)
	EF	Exposure Frequency	day/yr	50	BPJ (2)	
	ED-C	Exposure Duration - Cancer	yr	25	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	9,125	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Dermal	CS	Chemical Concentration in Sediment	Chemical-Specific	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	3,300	U.S. EPA 2004	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	0.20	U.S. EPA 2004	
	ABS	Dermal Absorption Fraction	unitless	Chemical-Specific	U.S. EPA 2004	
	EF	Exposure Frequency	event/yr	50	BPJ (2)	
	ED-C	Exposure Duration - Cancer	yr	25	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	9,125	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgment
(1) The incidental sediment ingestion rate is assumed to be half that of soil.
(2) Assumes the maintenance worker performs maintenance and groundskeeping activities 1 day/week for the entire year, with 2 weeks vacation.

TABLE 3-5.1
NON-CANCER TOXICITY DATA - ORAL/DERMAL
BUILDING E7340/7350 TEST SITE
MAXWELL POINT - OTHER EDGEWOOD AREA

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value (mg/kg-day)	Oral to Dermal Adjustment Factor (GI ABS) (1)	Adjusted Dermal RfD (2) (mg/kg bw-day)	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (mm/dd/yy)
Inorganics								
ALUMINUM	Chronic	1.00E+00	1	1.00E+00	Central Nervous System	100/1	PPRTV	7/26/2001
ANTIMONY	Chronic	4.00E-04	0.15	6.00E-05	Blood glucose and cholesterol	1000/1	IRIS	6/29/2009
ARSENIC	Chronic	3.00E-04	1	3.00E-04	Skin	3/1	IRIS	6/29/2009
CADMIUM	Chronic	5.00E-04	0.025	1.25E-05	Kidneys	10/1	IRIS	6/29/2009
CHROMIUM, TOTAL	Chronic	3.00E-03	0.025	7.50E-05	None	300/3	IRIS	6/29/2009
IRON	NA	7.00E-01	1	7.00E-01	None	NA/NA	PPRTV	7/29/2008
MANGANESE	Chronic	4.60E-02	0.04	1.84E-03	Central Nervous System	1/3	IRIS	6/29/2009
THALLIUM	Chronic	6.50E-05	1	6.50E-05	None	3000/1	IRIS	6/29/2009
VANADIUM	Chronic	5.00E-03	0.026	1.30E-04	Hair	100/1	IRIS	6/29/2009
ZINC	Chronic	3.00E-01	1	3.00E-01	Blood	3/1	IRIS	6/29/2009

NA = Not Applicable

(1) Taken from USEPA 2004 Guidance.

(2) Dermal toxicological values adjusted from oral values using USEPA 2004 recommended chemical-specific gastrointestinal absorption factors (GI ABS). RfDs are multiplied by the GI ABS.

(3) IRIS - Integrated Risk Information System. For IRIS values, the date IRIS was searched is provided.
HEAST - Health Effects Assessment Summary Tables. For HEAST values, the date of HEAST is provided.
EPA-NCEA - National Center for Environmental Assessment. For EPA-NCEA values, the date of the article provided by EPA-NCEA is provided.

TABLE 3-5.2
NON-CANCER TOXICITY DATA - INHALATION
BUILDING E7340/7350 TEST SITE
MAXWELL POINT - OTHER EDGEWOOD AREA

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation (RfC) (mg/m^3)	Adjusted Inhalation (RfD) (mg/kg-day)	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ	Dates (1) (mm/dd/yy)
Inorganics							
ALUMINUM	Chronic	5.00E-03	1.00E-03	Respiratory System	300/1	PPRTV	7/26/2001
ANTIMONY	NA	NA	NA	NA	NA	IRIS	6/29/2009
ARSENIC	Chronic	1.50E-05	4.29E-06	Cardiovascular System	30/1	CalEPA	12/2008
CADMIUM	Chronic	1.00E-05	2.86E-06	Kidneys	9/1	ATSDR	09/2008
CHROMIUM, TOTAL	Chronic	1.00E-04	2.86E-05	Lungs and Blood	300/1	IRIS	6/29/2009
IRON	NA	NA	NA	NA	NA	PPRTV	7/29/2008
MANGANESE	Chronic	5.00E-05	1.43E-05	Central Nervous System	1000/1	IRIS	6/29/2009
THALLIUM	NA	NA	NA	NA	NA	IRIS	6/29/2009
VANADIUM	NA	NA	NA	NA	NA	IRIS	6/29/2009
ZINC	NA	NA	NA	NA	NA	IRIS	6/29/2009

NA = Not Applicable

(1) IRIS - Integrated Risk Information System. For IRIS values, the date IRIS was searched is provided.
HEAST - Health Effects Assessment Summary Tables. For HEAST values, the date of HEAST is provided.
EPA-NCEA - National Center for Environmental Assessment. For EPA-NCEA values, the date of the article provided by EPA-NCEA is provided.

TABLE 3-5.3
CHEMICAL-SPECIFIC PARAMETERS
BUILDING E7340/7350 TEST SITE
MAXWELL POINT - OTHER EDGEWOOD AREA

Chemical of Potential Concern	Absorption Factor	Reference	GI ABS	Reference	Permeability Constant (cm/hr)	Reference
Inorganics						
ALUMINUM	NA	U.S. EPA, 2004	1	U.S. EPA, 2004	1.00E-03	U.S. EPA, 2004
ANTIMONY	NA	U.S. EPA, 2004	0.15	U.S. EPA, 2004	1.00E-03	U.S. EPA, 2004
ARSENIC	0.03	U.S. EPA, 2004	1	U.S. EPA, 2004	1.00E-03	U.S. EPA, 2004
CADMIUM	0.001	U.S. EPA, 2004	0.025	U.S. EPA, 2004	1.00E-03	U.S. EPA, 2004
CHROMIUM VI	NA	U.S. EPA, 2004	0.025	U.S. EPA, 2004	2.00E-03	U.S. EPA, 2004
IRON	NA	U.S. EPA, 2004	1	U.S. EPA, 2004	1.00E-03	U.S. EPA, 2004
MANGANESE	NA	U.S. EPA, 2004	0.04	U.S. EPA, 2004	1.00E-03	U.S. EPA, 2004
THALLIUM	NA	U.S. EPA, 2004	1	U.S. EPA, 2004	1.00E-03	U.S. EPA, 2004
VANADIUM	NA	U.S. EPA, 2004	0.026	U.S. EPA, 2004	1.00E-03	U.S. EPA, 2004
ZINC	NA	U.S. EPA, 2004	1	U.S. EPA, 2004	6.00E-04	U.S. EPA, 2004

NA = Data not available.
GI ABS = Gastrointestional Absorption factors
U.S. EPA, 2004 = U.S. Environmental Protection Agency, 2004. *Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).* Final Guidance.

TABLE 3-6.1
CANCER TOXICITY DATA - ORAL/DERMAL
BUILDING E7340/7350 TEST SITE
MAXWELL POINT - OTHER EDGEWOOD AREA

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral Absorption Efficiency for Dermal (GI ABS)(1)	Absorbed Cancer Slope Factor for Dermal (2)	Units	Weight of Evidence/Cancer Guideline Description	Source	Date (3) (mm/dd/yy)
Inorganics							
ALUMINUM	NA	1	NA	per (mg/kg-day)	D	PPRTV	7/26/2001
ANTIMONY	NA	0.15	NA	per (mg/kg-day)	NA	IRIS	6/29/2009
ARSENIC	1.50E+00	1	1.50E+00	per (mg/kg-day)	A	IRIS	6/29/2009
CADMIUM	NA	0.025	NA	per (mg/kg-day)	B1	IRIS	6/29/2009
CHROMIUM, TOTAL	NA	0.025	NA	per (mg/kg-day)	D	IRIS	6/29/2009
IRON	NA	1	NA	per (mg/kg-day)	NA	PPRTV	7/29/2008
MANGANESE	NA	0.04	NA	per (mg/kg-day)	D	IRIS	6/29/2009
THALLIUM	NA	1	NA	per (mg/kg-day)	D	IRIS	6/29/2009
VANADIUM	NA	0.026	NA	per (mg/kg-day)	NA	IRIS	6/29/2009
ZINC	NA	1	NA	per (mg/kg-day)	D	IRIS	6/29/2009

NA = Not Applicable
(1) Taken from USEPA 2004 Guidance.
(2) Dermal Toxicological values adjusted from oral values using USEPA 2004 recommended chemical-specific gastrointestinal absorption factors (GI ABS). CSFs are divided by the GI ABS.
(3) IRIS - Integrated Risk Information System. For IRIS values, the date IRIS was searched is provided.
HEAST - Health Effects Assessment Summary Tables. For HEAST values, the date of HEAST is provided.
EPA-NCEA - National Center for Environmental Assessment. For EPA-NCEA values, the date of the article provided by EPA-NCEA is provided.
PPRTV - Provisional Peer Reviewed Toxicity Value
CAL EPA - California Environmental Protection Agency

Weight of Evidence: A - Human carcinogen
B1 - Probable human carcinogen - indicate that limited human data are available
B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen
D - Not classifiable as a human carcinogen
E - Evidence of noncarcinogenicity

TABLE 3-6.2
CANCER TOXICITY DATA - INHALATION
BUILDING E7340/7350 TEST SITE
MAXWELL POINT - OTHER EDGEWOOD AREA

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor		Weight of Evidence/Cancer Guideline Description	Unit Risk - Inhalation CSF	
	Value	Units	Value	Units		Source	Date (1)
Inorganics							
ALUMINUM	NA	1/ug/m3	NA	per (mg/kg-day)	D	PPRTV	7/26/2001
ANTIMONY	NA	1/ug/m3	NA	per (mg/kg-day)	NA	IRIS	6/29/2009
ARSENIC	4.30E-03	1/ug/m3	1.51E+01	per (mg/kg-day)	A	IRIS	6/29/2009
CADMIUM	1.80E-03	1/ug/m3	6.30E+00	per (mg/kg-day)	B1	IRIS	6/29/2009
CHROMIUM, TOTAL	1.20E-02	1/ug/m3	4.10E+01	per (mg/kg-day)	A	IRIS	6/29/2009
IRON	NA	1/ug/m3	NA	per (mg/kg-day)	NA	PPRTV	7/29/2008
MANGANESE	NA	1/ug/m3	NA	per (mg/kg-day)	D	IRIS	6/29/2009
THALLIUM	NA	1/ug/m3	NA	per (mg/kg-day)	D	IRIS	6/29/2009
VANADIUM	NA	1/ug/m3	NA	per (mg/kg-day)	NA	IRIS	6/29/2009
ZINC	NA	1/ug/m3	NA	per (mg/kg-day)	D	IRIS	6/29/2009

NA = Not Applicable

(1) IRIS - Integrated Risk Information System. For IRIS values, the date IRIS was searched is provided.
HEAST - Health Effects Assessment Summary Tables. For HEAST values, the date of HEAST is provided.
EPA-NCEA - National Center for Environmental Assessment. For EPA-NCEA values, the date of the article provided by EPA-NCEA is provided.
PPRTV - Provisional Peer Reviewed Toxicity Value
CAL EPA - California Environmental Protection Agency

Weight of Evidence: A - Human carcinogen
B1 - Probable human carcinogen - indicate that limited human data are available
B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
C - Possible human carcinogen
D - Not classifiable as a human carcinogen
E - Evidence of noncarcinogenicity

TABLE 3-7.1

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

BUILDING E7340/7350 TEST SITE

MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Current Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Maxwell Point Bldg E7340 7350 Test Site	Ingestion	**Inorganics**												
				ARSENIC	3.05E+00	(mg/kg)	5.52E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	8.28E-08	4.83E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.61E-03
			Exp. Route Total								8.28E-08					1.61E-03
			Dermal[1]	**Inorganics**												
				ARSENIC	3.05E+00	(mg/kg)	3.06E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	4.59E-07	2.68E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	8.92E-03
			Exp. Route Total								4.59E-07					8.92E-03
		Exposure Point Total									5.42E-07					1.05E-02
	Exposure Medium Total										5.42E-07					1.05E-02
Sediment Total											5.42E-07					1.05E-02
Surface Water	Surface Water	Maxwell Point Bldg E7340-7350 Test Site	Ingestion	**Inorganics**												
				IRON	3.58E+01	(mg/L)	6.47E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	5.66E-03	(mg/kg-day)	7.00E-01	(mg/kg-day)	8.09E-03
				THALLIUM	4.50E-03	(mg/L)	8.14E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	7.12E-07	(mg/kg-day)	6.50E-05	(mg/kg-day)	1.10E-02
			Exp. Route Total								0.00E+00					1.90E-02
			Dermal	**Inorganics**												
				IRON	3.58E+01	(mg/L)	8.54E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	7.48E-04	(mg/kg-day)	7.00E-01	(mg/kg-day)	1.07E-03
				THALLIUM	4.50E-03	(mg/L)	1.07E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	9.40E-08	(mg/kg-day)	6.50E-05	(mg/kg-day)	1.45E-03
			Exp. Route Total								0.00E+00					2.51E-03
		Exposure Point Total									0.00E+00					2.16E-02
	Exposure Medium Total										0.00E+00					2.16E-02
Surface Water Total											0.00E+00					2.16E-02

TABLE 3-7.1

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

BUILDING E7340/7350 TEST SITE

MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe Current Future
Receptor Population Trespasser
Receptor Age Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Surface Soil	Maxwell Point Bldg E7340/7350 Test Site	Ingestion	**Inorganics**												
				ALUMINUM	1.20E+04	(mg/kg)	2.17E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.90E-03	(mg/kg-day)	1.00E+00	(mg/kg-day)	1.90E-03
				ANTIMONY	1.65E+00	(mg/kg)	2.98E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	2.61E-07	(mg/kg-day)	4.00E-04	(mg/kg-day)	6.53E-04
				ARSENIC	8.22E+00	(mg/kg)	1.49E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	2.23E-07	1.30E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	4.34E-03
				CHROMIUM, TOTAL	2.19E+01	(mg/kg)	3.96E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	3.47E-06	(mg/kg-day)	3.00E-03	(mg/kg-day)	1.16E-03
				IRON	1.81E+04	(mg/kg)	3.27E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	2.87E-03	(mg/kg-day)	7.00E-01	(mg/kg-day)	4.09E-03
				MANGANESE	4.17E+02	(mg/kg)	7.54E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	6.60E-05	(mg/kg-day)	4.60E-02	(mg/kg-day)	1.43E-03
				VANADIUM	2.86E+01	(mg/kg)	5.17E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	4.53E-06	(mg/kg-day)	5.00E-03	(mg/kg-day)	9.05E-04
				ZINC	1.94E+03	(mg/kg)	3.51E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	3.07E-04	(mg/kg-day)	3.00E-01	(mg/kg-day)	1.02E-03
			Exp. Route Total								**2.23E-07**					**1.55E-02**
			Dermal[1]	**Inorganics**												
				ALUMINUM	1.20E+04	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	1.00E+00	(mg/kg-day)	--
				ANTIMONY	1.65E+00	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	6.00E-05	(mg/kg-day)	--
				ARSENIC	8.22E+00	(mg/kg)	5.18E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	7.76E-08	4.53E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.51E-03
				CHROMIUM, TOTAL	2.19E+01	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	7.50E-05	(mg/kg-day)	--
				IRON	1.81E+04	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	7.00E-01	(mg/kg-day)	--
				MANGANESE	4.17E+02	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	1.84E-03	(mg/kg-day)	--
				VANADIUM	2.86E+01	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	1.30E-04	(mg/kg-day)	--
				ZINC	1.94E+03	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	3.00E-01	(mg/kg-day)	--
			Exp. Route Total								**7.76E-08**					**1.51E-03**
		Exposure Point Total									**3.01E-07**					**1.70E-02**
	Exposure Medium Total										**3.01E-07**					**1.70E-02**
	Air	Maxwell Point Bldg E7340/7350 Test Site	Inhalation	**Inorganics**												
				ALUMINUM	9.09E-06	(mg/m^3)	8.29E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	7.25E-08	(mg/kg-day)	1.00E-03	(mg/kg-day)	7.25E-05
				ANTIMONY	1.25E-09	(mg/m^3)	1.14E-12	(mg/kg-day)	NA	per (mg/kg-day)	--	9.97E-12	(mg/kg-day)	NA	(mg/kg-day)	--
				ARSENIC	6.23E-09	(mg/m^3)	5.68E-12	(mg/kg-day)	1.51E+01	per (mg/kg-day)	8.57E-11	4.97E-11	(mg/kg-day)	4.29E-06	(mg/kg-day)	1.16E-05
				CHROMIUM, TOTAL	1.66E-08	(mg/m^3)	1.51E-11	(mg/kg-day)	4.10E+01	per (mg/kg-day)	6.20E-10	1.32E-10	(mg/kg-day)	2.86E-05	(mg/kg-day)	4.63E-06
				IRON	1.37E-05	(mg/m^3)	1.25E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	1.09E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				MANGANESE	3.16E-07	(mg/m^3)	2.88E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	2.52E-09	(mg/kg-day)	1.43E-05	(mg/kg-day)	1.76E-04
				VANADIUM	2.17E-08	(mg/m^3)	1.98E-11	(mg/kg-day)	NA	per (mg/kg-day)	--	1.73E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				ZINC	1.47E-06	(mg/m^3)	1.34E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	1.17E-08	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**7.06E-10**					**2.65E-04**
		Exposure Point Total									**7.06E-10**					**2.65E-04**
	Exposure Medium Total										**7.06E-10**					**2.65E-04**
Soil Total											**3.01E-07**					**1.73E-02**
										Total of Receptor Risks Across All Media	**8.43E-07**				Total of Receptor Hazards Across All Media	**4.94E-02**

1) Dermal intake value is "NA" due to no published dermal absorption fraction for COPC. Please see USEPA 2004 guidance and Table 3-5.3.
EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 3-7.2

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

BUILDING E7340/7350 TEST SITE

MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Current Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		R/D/R/C		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Maxwell Point Bldg E7340/7350 Test Site	Ingestion	**Inorganics**												
				IRON	3.58E+01	(mg/L)	1.25E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	3.50E-03	(mg/kg-day)	7.00E-01	(mg/kg-day)	5.00E-03
				THALLIUM	4.50E-03	(mg/L)	1.57E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	4.40E-07	(mg/kg-day)	6.50E-05	(mg/kg-day)	6.77E-03
			Exp. Route Total								0.00E+00					1.18E-02
			Dermal	**Inorganics**												
				IRON	3.58E+01	(mg/L)	8.25E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	2.31E-04	(mg/kg-day)	7.00E-01	(mg/kg-day)	3.30E-04
				THALLIUM	4.50E-03	(mg/L)	1.04E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	2.91E-08	(mg/kg-day)	6.50E-05	(mg/kg-day)	4.47E-04
			Exp. Route Total								0.00E+00					7.77E-04
		Exposure Point Total									0.00E+00					1.26E-02
	Exposure Medium Total										0.00E+00					1.26E-02
Surface Water Total											0.00E+00					1.26E-02
Soil	Surface Soil	Maxwell Point Bldg E7340/7350 Test Site	Ingestion	**Inorganics**												
				ARSENIC	8.22E+00	(mg/kg)	2.87E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	4.31E-07	8.04E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	2.68E-03
			Exp. Route Total								4.31E-07					2.68E-03
			Dermal[1]	**Inorganics**												
				ARSENIC	8.22E+00	(mg/kg)	1.14E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.71E-07	3.19E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.06E-03
			Exp. Route Total								1.71E-07					1.06E-03
		Exposure Point Total									6.02E-07					3.74E-03
	Exposure Medium Total										6.02E-07					3.74E-03
	Air	Maxwell Point Bldg E7340/7350 Test Site	Inhalation	**Inorganics**												
				ARSENIC	6.23E-09	(mg/m^3)	8.70E-11	(mg/kg-day)	1.51E+01	per (mg/kg-day)	1.31E-09	2.44E-10	(mg/kg-day)	4.29E-06	(mg/kg-day)	5.69E-05
			Exp. Route Total								1.31E-09					5.69E-05
		Exposure Point Total									1.31E-09					5.69E-05
	Exposure Medium Total										1.31E-09					5.69E-05
Soil Total											6.03E-07					3.80E-03
										Total of Receptor Risks Across All Media	6.03E-07				Total of Receptor Hazards Across All Media	1.64E-02

1) Dermal intake value is "NA" due to no published dermal absorption fraction for COPC. Please see USEPA 2004 guidance and Table 3-5.3.
EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 3-7.3

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

BUILDING E7340/7350 TEST SITE

MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Future
Receptor Population: Commercial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Total Soil	Maxwell Point Bldg E7340/7350 Test Site	Ingestion	**Inorganics** ARSENIC	7.86E+00	(mg/kg)	1.37E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	2.06E-06	3.85E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.28E-02
			Exp. Route Total								2.06E-06					1.28E-02
			Dermal[1]	**Inorganics** ARSENIC	7.86E+00	(mg/kg)	5.44E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	8.16E-07	1.52E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	5.08E-03
			Exp. Route Total								8.16E-07					5.08E-03
		Exposure Point Total									2.88E-06					1.79E-02
	Exposure Medium Total										2.88E-06					1.79E-02
	Air	Maxwell Point Bldg E7340/7350 Test Site	Inhalation	**Inorganics** ARSENIC	5.95E-09	(mg/m^3)	1.39E-10	(mg/kg-day)	1.51E+01	per (mg/kg-day)	2.09E-09	3.88E-10	(mg/kg-day)	4.29E-06	(mg/kg-day)	9.06E-05
			Exp. Route Total								2.09E-09					9.06E-05
		Exposure Point Total									2.09E-09					9.06E-05
	Exposure Medium Total										2.09E-09					9.06E-05
Soil Total											2.88E-06					1.80E-02
										Total of Receptor Risks Across All Media	2.88E-06				Total of Receptor Hazards Across All Media	1.80E-02

1) Dermal intake value is "NA" due to no published dermal absorption fraction for COPC. Please see USEPA 2004 guidance and Table 3-5.3.
EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 3-7.4

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

BUILDING E7340/7350 TEST SITE

MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Total Soil	Maxwell Point Bldg E7340/7350 Test Site	Ingestion	**Inorganics** ARSENIC	7.86E+00	(mg/kg)	5.27E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	7.91E-07	3.69E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.23E-01
			Exp. Route Total								7.91E-07					1.23E-01
			Dermal[1]	**Inorganics** ARSENIC	7.86E+00	(mg/kg)	3.26E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	4.89E-08	2.28E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	7.61E-03
			Exp. Route Total								4.89E-08					7.61E-03
		Exposure Point Total									8.40E-07					1.31E-01
	Exposure Medium Total										8.40E-07					1.31E-01
	Air	Maxwell Point Bldg E7340/7350 Test Site	Inhalation	**Inorganics** ARSENIC	5.95E-09	(mg/m^3)	3.20E-11	(mg/kg-day)	1.51E+01	per (mg/kg-day)	4.83E-10	2.24E-09	(mg/kg-day)	4.29E-06	(mg/kg-day)	5.22E-04
			Exp. Route Total								4.83E-10					5.22E-04
		Exposure Point Total									4.83E-10					5.22E-04
	Exposure Medium Total										4.83E-10					5.22E-04
Soil Total											8.40E-07					1.31E-01
										Total of Receptor Risks Across All Media	8.40E-07				Total of Receptor Hazards Across All Media	1.31E-01

1) Dermal intake value is "NA" due to no published dermal absorption fraction for COPC. Please see USEPA 2004 guidance and Table 3-5.3.
EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 3-7.5

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

BUILDING E7340/7350 TEST SITE

MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Maxwell Point Bldg E7340 7350 Test Site	Ingestion	**Inorganics**												
				ARSENIC	3.05E+00	(mg/kg)	1.06E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.60E-07	3.10E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.03E-03
			Exp. Route Total								1.60E-07					1.03E-03
			Dermal[1]	**Inorganics**												
				ARSENIC	3.05E+00	(mg/kg)	2.55E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	3.82E-08	7.43E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	2.48E-04
			Exp. Route Total								3.82E-08					2.48E-04
		Exposure Point Total									1.98E-07					1.28E-03
	Exposure Medium Total										1.98E-07					1.28E-03
Sediment Total											1.98E-07					1.28E-03
Surface Water	Surface Water	Maxwell Point Bldg E7340 7350 Test Site	Ingestion	**Inorganics**												
				IRON	3.58E+01	(mg/L)	2.50E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	7.28E-03	(mg/kg-day)	7.00E-01	(mg/kg-day)	1.04E-02
				THALLIUM	4.50E-03	(mg/L)	3.14E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	9.16E-07	(mg/kg-day)	6.50E-05	(mg/kg-day)	1.41E-02
			Exp. Route Total								0.00E+00					2.45E-02
			Dermal	**Inorganics**												
				IRON	3.58E+01	(mg/L)	8.99E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	2.62E-03	(mg/kg-day)	7.00E-01	(mg/kg-day)	3.74E-03
				THALLIUM	4.50E-03	(mg/L)	1.13E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	3.30E-07	(mg/kg-day)	6.50E-05	(mg/kg-day)	5.07E-03
			Exp. Route Total								0.00E+00					8.82E-03
		Exposure Point Total									0.00E+00					3.33E-02
	Exposure Medium Total										0.00E+00					3.33E-02
Surface Water Total											0.00E+00					3.33E-02

TABLE 3-7.5

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

BUILDING E7340/7350 TEST SITE

MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Total Soil	Maxwell Point Bldg E7340/7350 Test Site	Ingestion	**Inorganics**												
				ALUMINUM	1.20E+04	(mg/kg)	5.64E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	1.64E-02	(mg/kg-day)	1.00E+00	(mg/kg-day)	1.64E-02
				ANTIMONY	1.59E+00	(mg/kg)	7.47E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	2.18E-06	(mg/kg-day)	4.00E-04	(mg/kg-day)	5.45E-03
				ARSENIC	7.86E+00	(mg/kg)	3.69E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	5.54E-06	1.08E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.59E-02
				CADMIUM	1.86E+00	(mg/kg)	8.74E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	2.55E-06	(mg/kg-day)	5.00E-04	(mg/kg-day)	5.10E-03
				CHROMIUM, TOTAL	2.23E+01	(mg/kg)	1.05E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	3.05E-05	(mg/kg-day)	3.00E-03	(mg/kg-day)	1.02E-02
				IRON	1.87E+04	(mg/kg)	8.78E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	2.56E-02	(mg/kg-day)	7.00E-01	(mg/kg-day)	3.66E-02
				MANGANESE	3.96E+02	(mg/kg)	1.86E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	5.42E-04	(mg/kg-day)	4.60E-02	(mg/kg-day)	1.18E-02
				VANADIUM	2.98E+01	(mg/kg)	1.40E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	4.08E-05	(mg/kg-day)	5.00E-03	(mg/kg-day)	8.16E-03
				ZINC	1.21E+03	(mg/kg)	5.68E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.66E-03	(mg/kg-day)	3.00E-01	(mg/kg-day)	5.53E-03
			Exp. Route Total								5.54E-06					1.35E-01
			Dermal[1]	**Inorganics**												
				ALUMINUM	1.20E+04	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	1.00E+00	(mg/kg-day)	--
				ANTIMONY	1.59E+00	(mg/kg)	0.00E+00	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	6.00E-05	(mg/kg-day)	--
				ARSENIC	7.86E+00	(mg/kg)	4.42E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	6.63E-07	1.29E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	4.30E-03
				CADMIUM	1.86E+00	(mg/kg)	3.49E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	1.02E-08	(mg/kg-day)	1.25E-05	(mg/kg-day)	8.13E-04
				CHROMIUM, TOTAL	2.23E+01	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	7.50E-05	(mg/kg-day)	--
				IRON	1.87E+04	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	7.00E-01	(mg/kg-day)	--
				MANGANESE	3.96E+02	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	1.84E-03	(mg/kg-day)	--
				VANADIUM	2.98E+01	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	1.30E-04	(mg/kg-day)	--
				ZINC	1.21E+03	(mg/kg)	0.00E+00	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	3.00E-01	(mg/kg-day)	--
			Exp. Route Total								6.63E-07					5.11E-03
		Exposure Point Total									6.20E-06					1.40E-01
	Exposure Medium Total										6.20E-06					1.40E-01
	Air	Maxwell Point Bldg E7340/7350 Test Site	Inhalation	**Inorganics**												
				ALUMINUM	9.09E-06	(mg/m^3)	8.54E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	2.49E-06	(mg/kg-day)	1.00E-03	(mg/kg-day)	2.49E-03
				ANTIMONY	1.20E-09	(mg/m^3)	1.13E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	3.30E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				ARSENIC	5.95E-09	(mg/m^3)	5.59E-10	(mg/kg-day)	1.51E+01	per (mg/kg-day)	8.44E-09	1.63E-09	(mg/kg-day)	4.29E-06	(mg/kg-day)	3.81E-04
				CADMIUM	1.41E-09	(mg/m^3)	1.32E-10	(mg/kg-day)	6.30E+00	per (mg/kg-day)	8.34E-10	3.86E-10	(mg/kg-day)	2.86E-06	(mg/kg-day)	1.35E-04
				CHROMIUM, TOTAL	1.69E-08	(mg/m^3)	1.59E-09	(mg/kg-day)	4.10E+01	per (mg/kg-day)	6.50E-08	4.63E-09	(mg/kg-day)	2.86E-05	(mg/kg-day)	1.62E-04
				IRON	1.42E-05	(mg/m^3)	1.33E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	3.88E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				MANGANESE	3.00E-07	(mg/m^3)	2.82E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	8.22E-08	(mg/kg-day)	1.43E-05	(mg/kg-day)	5.75E-03
				VANADIUM	2.26E-08	(mg/m^3)	2.12E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	6.18E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				ZINC	9.17E-07	(mg/m^3)	8.61E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	2.51E-07	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								7.43E-08					8.91E-03
		Exposure Point Total									7.43E-08					8.91E-03
	Exposure Medium Total										7.43E-08					8.91E-03
Soil Total											6.27E-06					1.49E-01
										Total of Receptor Risks Across All Media	6.47E-06				Total of Receptor Hazards Across All Media	1.84E-01

1) Dermal intake value is "NA" due to no published dermal absorption fraction for COPC. Please see USEPA 2004 guidance and Table 3-5.3.

EPC = Exposure Point Concentration

CSF = Cancer Slope Factor

RfD = Reference Dose

RfC = Reference Concentration

TABLE 3-7 6

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

BUILDING E7340/7350 TEST SITE

MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Maxwell Point Bldg E7340 7350 Test Site	Ingestion	**Inorganics**												
				ARSENIC	3.05E+00	(mg/kg)	2 48E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	3.72E-07	2.90E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	9 66E-03
			Exp. Route Total								3.72E-07					9.66E-03
			Dermal[1]	**Inorganics**												
				ARSENIC	3.05E+00	(mg/kg)	6 26E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	9.39E-08	7.30E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	2.43E-03
			Exp. Route Total								9.39E-08					2.43E-03
		Exposure Point Total									4.66E-07					1.21E-02
	Exposure Medium Total										4.66E-07					1.21E-02
Sediment Total											4.66E-07					1.21E-02
Surface Water	Surface Water	Maxwell Point Bldg E7340 7350 Test Site	Ingestion	**Inorganics**												
				IRON	3.58E+01	(mg/L)	5.82E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	6.80E-03	(mg/kg-day)	7.00E-01	(mg/kg-day)	9.71E-03
				THALLIUM	4 50E-03	(mg/L)	7.33E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	8.55E-07	(mg/kg-day)	6.50E-05	(mg/kg-day)	1.32E-02
			Exp. Route Total								0.00E+00					2.29E-02
			Dermal	**Inorganics**												
				IRON	3.58E+01	(mg/L)	3.84E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	4.49E-03	(mg/kg-day)	7.00E-01	(mg/kg-day)	6.41E-03
				THALLIUM	4.50E-03	(mg/L)	4 84E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	5.64E-07	(mg/kg-day)	6.50E-05	(mg/kg-day)	8.68E-03
			Exp. Route Total								0.00E+00					1.51E-02
		Exposure Point Total									0.00E+00					3.79E-02
	Exposure Medium Total										0.00E+00					3.79E-02
Surface Water Total											0.00E+00					3.79E-02

TABLE 3-7 6

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

BUILDING E7340/7350 TEST SITE

MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Total Soil	Maxwell Point Bldg E7340 7350 Test Site	Ingestion	**Inorganics**												
				ALUMINUM	1.20E+04	(mg/kg)	1.32E-02	(mg/kg-day)	NA	per (mg/kg-day)	--	1.53E-01	(mg/kg-day)	1.00E+00	(mg/kg-day)	1.53E-01
				ANTIMONY	1.59E+00	(mg/kg)	1.74E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	2.03E-05	(mg/kg-day)	4.00E-04	(mg/kg-day)	5.08E-02
				ARSENIC	7.86E+00	(mg/kg)	8.61E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.29E-05	1.00E-04	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.35E-01
				CADMIUM	1.86E+00	(mg/kg)	2.04E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	2.38E-05	(mg/kg-day)	5.00E-04	(mg/kg-day)	4.76E-02
				CHROMIUM, TOTAL	2.23E+01	(mg/kg)	2.44E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	2.85E-04	(mg/kg-day)	3.00E-03	(mg/kg-day)	9.50E-02
				IRON	1.87E+04	(mg/kg)	2.05E-02	(mg/kg-day)	NA	per (mg/kg-day)	--	2.39E-01	(mg/kg-day)	7.00E-01	(mg/kg-day)	3.42E-01
				MANGANESE	3.96E+02	(mg/kg)	4.34E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	5.06E-03	(mg/kg-day)	4.60E-02	(mg/kg-day)	1.10E-01
				VANADIUM	2.98E+01	(mg/kg)	3.27E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	3.81E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	7.62E-02
				ZINC	1.21E+03	(mg/kg)	1.33E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	1.55E-02	(mg/kg-day)	3.00E-01	(mg/kg-day)	5.16E-02
			Exp. Route Total								1.29E-05					1.26E+00
			Dermal[1]	**Inorganics**												
				ALUMINUM	1.20E+04	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	1.00E+00	(mg/kg-day)	--
				ANTIMONY	1.59E+00	(mg/kg)	0.00E+00	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	6.00E-05	(mg/kg-day)	--
				ARSENIC	7.86E+00	(mg/kg)	7.24E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.09E-06	8.44E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	2.81E-02
				CADMIUM	1.86E+00	(mg/kg)	5.71E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	6.66E-08	(mg/kg-day)	1.25E-05	(mg/kg-day)	5.33E-03
				CHROMIUM, TOTAL	2.23E+01	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	7.50E-05	(mg/kg-day)	--
				IRON	1.87E+04	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	7.00E-01	(mg/kg-day)	--
				MANGANESE	3.96E+02	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	1.84E-03	(mg/kg-day)	--
				VANADIUM	2.98E+01	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	1.30E-04	(mg/kg-day)	--
				ZINC	1.21E+03	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	3.00E-01	(mg/kg-day)	--
			Exp. Route Total								1.09E-06					3.35E-02
		Exposure Point Total									1.40E-05					1.29E+00
	Exposure Medium Total										1.40E-05					1.29E+00
	Air	Maxwell Point Bldg E7340 7350 Test Site	Inhalation	**Inorganics**												
				ALUMINUM	9.09E-06	(mg/m^3)	4.18E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	4.88E-06	(mg/kg-day)	1.00E-03	(mg/kg-day)	4.88E-03
				ANTIMONY	1.20E-09	(mg/m^3)	5.54E-11	(mg/kg-day)	NA	per (mg/kg-day)	--	6.47E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				ARSENIC	5.95E-09	(mg/m^3)	2.74E-10	(mg/kg-day)	1.51E+01	per (mg/kg-day)	4.14E-09	3.20E-09	(mg/kg-day)	4.29E-06	(mg/kg-day)	7.46E-04
				CADMIUM	1.41E-09	(mg/m^3)	6.49E-11	(mg/kg-day)	6.30E+00	per (mg/kg-day)	4.09E-10	7.57E-10	(mg/kg-day)	2.86E-06	(mg/kg-day)	2.65E-04
				CHROMIUM, TOTAL	1.69E-08	(mg/m^3)	7.78E-10	(mg/kg-day)	4.10E+01	per (mg/kg-day)	3.19E-08	9.07E-09	(mg/kg-day)	2.86E-05	(mg/kg-day)	3.18E-04
				IRON	1.42E-05	(mg/m^3)	6.52E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	7.61E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				MANGANESE	3.00E-07	(mg/m^3)	1.38E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	1.61E-07	(mg/kg-day)	1.43E-05	(mg/kg-day)	1.13E-02
				VANADIUM	2.26E-08	(mg/m^3)	1.04E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	1.21E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				ZINC	9.17E-07	(mg/m^3)	4.22E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	4.92E-07	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								3.64E-08					1.75E-02
		Exposure Point Total									3.64E-08					1.75E-02
	Exposure Medium Total										3.64E-08					1.75E-02
Soil Total											1.40E-05					1.31E+00
										Total of Receptor Risks Across All Media	1.45E-05				Total of Receptor Hazards Across All Media	1.36E+00

1) Dermal intake value is "NA" due to no published dermal absorption fraction for COPC. Please see USEPA 2004 guidance and Table 3-5.3.
EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 3-7.7

CALCULATIONS OF AIR CONCENTRATIONS DUE TO DUST ENTRAINMENT FROM SURFACE SOIL

BUILDING E7340/7350 TEST SITE

MAXWELL POINT - OTHER EDGEWOOD AREA

Model Equations:

Particulate Emmision Factor	PEF = Q/C x [(3,600 s/h)/(.36 x (1- V) x (Um/Ut)^3 x F(x))] =	1.32E+09
Air Concentration	Cair = Csoil/PEF	m^3/kg

Model Constants:

Q/C	9.08E+01	g/m^2-s per kg/m^3	Inverse Mean Concentration at Center of 0.05 square, U.S. EPA 1996a
V	5.00E-01	unitless	Default, U.S. EPA 1996a
Um	4.69E+00	m/s	Mean annual wind speed, EPA, 1996a
Ut	1.13E+01	m/s	Equivalent threshold value of windspeed at 7 m, EPA, 1996a
F(x)	1.94E-01	unitless	Default, U.S. EPA 1996a

Reference for the model: USEPA Soil Screening Guidance: Technical Background Document. Office of Emergency and Remedial Response. U.S. EPA, 1996a.

Chemical	Csoil, Surface Soil	Csoil, Total Soil	Cair, Surface Soil Particulate	Cair, Total Soil Particulate
	RME EPC	RME EPC	RME EPC	RME EPC
	mg/kg	mg/kg	mg/m^3	mg/m^3
Inorganics				
ALUMINUM	1.20E+04	1.20E+04	9.09E-06	9.09E-06
ANTIMONY	1.65E+00	1.59E+00	1.25E-09	1.20E-09
ARSENIC	8.22E+00	7.86E+00	6.23E-09	5.95E-09
CADMIUM	NA	1.86E+00	NA	1.41E-09
CHROMIUM, TOTAL	2.19E+01	2.23E+01	1.66E-08	1.69E-08
IRON	1.81E+04	1.87E+04	1.37E-05	1.42E-05
MANGANESE	4.17E+02	3.96E+02	3.16E-07	3.00E-07
VANADIUM	2.86E+01	2.98E+01	2.17E-08	2.26E-08
ZINC	1.94E+03	1.21E+03	1.47E-06	9.17E-07

TABLE 3-8
SUMMARY OF RESIDENT CHILD LEAD MODELING
BUILDING E7340/7350 TEST SITE
MAXWELL POINT - OTHER EDGEWOOD AREA

IEUBK MODEL SUMMARY					
Medium	Mean Concentration	Units	Mean (ug/dL)	% Below(1)	% Above(1)
Surface Soil	156	mg/kg	3.02	99.46	0.54
Total Soil	143	mg/kg	1.60	99.58	0.42

(1) Compared to the blood-level threshold of 10 ug/dL. Exceeds threshold if % Above is greater than 5.

TABLE 3-9.1

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

BUILDING E7340/7350 TEST SITE

MAXWELL POINT - OTHER EDGEWOOD AREA

Location: Other Edgewood Area

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Soil	Surface Soil	Maxwell Point	**Inorganics**					**Inorganics**					
		Bldg E7340/7350	ALUMINUM	--	--	--	NA	ALUMINUM	Central Nervous System	1.9E-03	--	7.3E-05	2.0E-03
		Test Site	ANTIMONY	--	--	--	NA	ANTIMONY	Blood glucose and cholesterol	6.5E-04	--	--	6.5E-04
			ARSENIC	2.2E-07	7.8E-08	8.6E-11	3.0E-07	ARSENIC	Skin	4.3E-03	1.5E-03	1.2E-05	5.9E-03
			CHROMIUM, TOTAL	--	--	6.2E-10	6.2E-10	CHROMIUM, TOTAL	None	1.2E-03	--	4.6E-06	1.2E-03
			IRON	--	--	--	NA	IRON	None	4.1E-03	--	--	4.1E-03
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	1.4E-03	--	1.8E-04	1.6E-03
			VANADIUM	--	--	--	NA	VANADIUM	Hair	9.1E-04	--	--	9.1E-04
			ZINC	--	--	--	NA	ZINC	Blood	1.0E-03	--	--	1.0E-03
			(Total)	2.2E-07	7.8E-08	7.1E-10	3.0E-07		(Total)	1.6E-02	1.5E-03	2.7E-04	1.7E-02
						Total Risk Across Surface Soil	**3.0E-07**					**Total Hazard Index Across Surface Soil**	**1.7E-02**
Surface Water	Surface Water	Maxwell Point	**Inorganics**					**Inorganics**					
		Bldg E7340/7350	IRON	--	--	--	NA	IRON	None	8.1E-03	1.1E-03	--	9.2E-03
		Test Site	THALLIUM	--	--	--	NA	THALLIUM	None	1.1E-02	1.4E-03	--	1.2E-02
			(Total)	---	---	---	---		(Total)	1.9E-02	2.5E-03	---	2.2E-02
						Total Risk Across Surface Water	---					**Total Hazard Index Across Surface Water**	**2.2E-02**
Sediment	Sediment	Maxwell Point	**Inorganics**					**Inorganics**					
		Bldg E7340/7350	ARSENIC	8.3E-08	4.6E-07	--	5.4E-07	ARSENIC	Skin	1.6E-03	8.9E-03	--	1.1E-02
		Test Site	(Total)	8.3E-08	4.6E-07	---	5.4E-07		(Total)	1.6E-03	8.9E-03	---	1.1E-02
						Total Risk Across Sediment	**5.4E-07**					**Total Hazard Index Across Sediment**	**1.1E-02**
						Total Risk Across All Media and All Exposure Routes	**8.4E-07**					**Total Hazard Index Across All Media and All Exposure Routes**	**4.9E-02**

TABLE 3-9.2

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

BUILDING E7340/7350 TEST SITE

MAXWELL POINT - OTHER EDGEWOOD AREA

Location: Other Edgewood Area
Scenario Timeframe: Current/Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Soil	Surface Soil	Maxwell Point Bldg E7340/7350 Test Site	**Inorganics**					**Inorganics**					
			ARSENIC	4.3E-07	1.7E-07	1.3E-09	6.0E-07	ARSENIC	Skin	2.7E-03	1.1E-03	5.7E-05	3.8E-03
			(Total)	4.3E-07	1.7E-07	1.3E-09	6.0E-07		(Total)	2.7E-03	1.1E-03	5.7E-05	3.8E-03
						Total Risk Across Surface Soil	6.0E-07					**Total Hazard Index Across Surface Soil**	3.8E-03
Surface Water	Surface Water	Maxwell Point Bldg E7340/7350 Test Site	**Inorganics**					**Inorganics**					
			IRON	--	--	--	NA	IRON	None	5.0E-03	3.3E-04	--	5.3E-03
			THALLIUM	--	--	--	NA	THALLIUM	None	6.8E-03	4.5E-04	--	7.2E-03
			(Total)	---	---	---	---		(Total)	1.2E-02	7.8E-04	---	1.3E-02
						Total Risk Across Surface Water	---					**Total Hazard Index Across Surface Water**	1.3E-02
Sediment	Sediment	Maxwell Point Bldg E7340/7350 Test Site	**Inorganics**					**Inorganics**					
			ARSENIC	0.0E+00	0.0E+00	--	NA	ARSENIC	Skin	0.0E+00	0.0E+00	--	NA
			(Total)	---	---	---	---		(Total)	---	---	---	---
						Total Risk Across Sediment	---					**Total Hazard Index Across Sediment**	---
						Total Risk Across All Media and All Exposure Routes	6.0E-07					**Total Hazard Index Across All Media and All Exposure Routes**	1.6E-02

TABLE 3-9.3

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

BUILDING E7340/7350 TEST SITE

MAXWELL POINT - OTHER EDGEWOOD AREA

Location: Other Edgewood Area
Scenario Timeframe: Future
Receptor Population: Commercial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Soil	Total Soil	Maxwell Point Bldg E7340/7350 Test Site	**Inorganics**					**Inorganics**					
			ARSENIC	2.1E-06	8.2E-07	2.1E-09	2.9E-06	ARSENIC	Skin	1.3E-02	5.1E-03	9.1E-05	1.8E-02
			(Total)	2.1E-06	8.2E-07	2.1E-09	2.9E-06		(Total)	1.3E-02	5.1E-03	9.1E-05	1.8E-02
				Total Risk Across Total Soil			2.9E-06			**Total Hazard Index Across Total Soil**			1.8E-02
			Total Risk Across All Media and All Exposure Routes				2.9E-06		**Total Hazard Index Across All Media and All Exposure Routes**				1.8E-02

TABLE 3-9.4

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

BUILDING E7340/7350 TEST SITE

MAXWELL POINT - OTHER EDGEWOOD AREA

Location: Other Edgewood Area
Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Soil	Total Soil	Maxwell Point Bldg E7340/7350 Test Site	**Inorganics**					**Inorganics**					
			ARSENIC	7.9E-07	4.9E-08	4.8E-10	8.4E-07	ARSENIC	Skin	1.2E-01	7.6E-03	5.2E-04	1.3E-01
			(Total)	7.9E-07	4.9E-08	4.8E-10	8.4E-07		(Total)	1.2E-01	7.6E-03	5.2E-04	1.3E-01
				Total Risk Across Total Soil			***8.4E-07***			***Total Hazard Index Across Surface Soil***			***1.3E-01***
			Total Risk Across All Media and All Exposure Routes				**8.4E-07**		**Total Hazard Index Across All Media and All Exposure Routes**				**1.3E-01**

TABLE 3-9.5

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

BUILDING E7340/7350 TEST SITE

MAXWELL POINT - OTHER EDGEWOOD AREA

Location: Other Edgewood Area
Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Soil	Total Soil Child	Maxwell Point Bldg E7340/7350 Test Site	**Inorganics**					**Inorganics**					
			ALUMINUM	--	--	--	NA	ALUMINUM	Central Nervous System	1.5E-01	--	4.9E-03	1.6E-01
			ANTIMONY	--	--	--	NA	ANTIMONY	Blood glucose and cholesterol	5.1E-02	--	--	5.1E-02
			ARSENIC	1.3E-05	1.1E-06	4.1E-09	1.4E-05	ARSENIC	Skin	3.3E-01	2.8E-02	7.5E-04	3.6E-01
			CADMIUM	--	--	4.1E-10	4.1E-10	CADMIUM	Kidneys	4.8E-02	5.3E-03	2.6E-04	5.3E-02
			CHROMIUM, TOTAL	--	--	3.2E-08	3.2E-08	CHROMIUM, TOTAL	None	9.5E-02	--	3.2E-04	9.5E-02
			IRON	--	--	--	NA	IRON	None	3.4E-01	--	--	3.4E-01
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	1.1E-01	--	1.1E-02	1.2E-01
			VANADIUM	--	--	--	NA	VANADIUM	Hair	7.6E-02	--	--	7.6E-02
			ZINC	--	--	--	NA	ZINC	Blood	5.2E-02	--	--	5.2E-02
			(Total for Child)	1.3E-05	1.1E-06	3.6E-08	1.4E-05		(Total for Child)	1.3E+00	3.3E-02	1.7E-02	1.3E+00
	Total Soil Adult	Maxwell Point Bldg E7340/7350 Test Site	**Inorganics**					**Inorganics**					
			ALUMINUM	--	--	--	NA	ALUMINUM	Central Nervous System	1.6E-02	--	2.5E-03	1.9E-02
			ANTIMONY	--	--	--	NA	ANTIMONY	Blood glucose and cholesterol	5.4E-03	--	--	5.4E-03
			ARSENIC	5.5E-06	6.6E-07	8.4E-09	6.2E-06	ARSENIC	Skin	3.6E-02	4.3E-03	3.8E-04	4.1E-02
			CADMIUM	--	--	8.3E-10	8.3E-10	CADMIUM	Kidneys	5.1E-03	8.1E-04	1.4E-04	6.0E-03
			CHROMIUM, TOTAL	--	--	6.5E-08	6.5E-08	CHROMIUM, TOTAL	None	1.0E-02	--	1.6E-04	1.0E-02
			IRON	--	--	--	NA	IRON	None	3.7E-02	--	--	3.7E-02
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	1.2E-02	--	5.7E-03	1.8E-02
			VANADIUM	--	--	--	NA	VANADIUM	Hair	8.2E-03	--	--	8.2E-03
			ZINC	--	--	--	NA	ZINC	Blood	5.5E-03	--	--	5.5E-03
			(Total for Adult)	5.5E-06	6.6E-07	7.4E-08	6.3E-06		(Total for Adult)	1.4E-01	5.1E-03	8.9E-03	1.5E-01
	Total Soil Adult + Child	Maxwell Point Bldg E7340/7350 Test Site	**Inorganics**										
			ALUMINUM	NA	NA	NA	NA						
			ANTIMONY	NA	NA	NA	NA						
			ARSENIC	1.8E-05	1.7E-06	1.3E-08	2.0E-05						
			CADMIUM	NA	NA	1.2E-09	1.2E-09						
			CHROMIUM, TOTAL	NA	NA	9.7E-08	9.7E-08						
			IRON	NA	NA	NA	NA						
			MANGANESE	NA	NA	NA	NA						
			VANADIUM	NA	NA	NA	NA						
			ZINC	NA	NA	NA	NA						
			(Total for Child + Adult)	1.8E-05	1.7E-06	1.1E-07	2.0E-05						
				Total Risk Across Total Soil			2.0E-05					**Total Hazard Index Across Total Soil (Child)**	1.3E+00
												Total Hazard Index Across Total Soil (Adult)	1.5E-01

TABLE 3-9.5

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

BUILDING E7340/7350 TEST SITE

MAXWELL POINT - OTHER EDGEWOOD AREA

Location: Other Edgewood Area
Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Maxwell Point	**Inorganics**					**Inorganics**					
	Child	Bldg E7340/7350	IRON	--	--	--	NA	IRON	None	9.7E-03	6.4E-03	--	1.6E-02
		Test Site	THALLIUM	--	--	--	NA	THALLIUM	None	1.3E-02	8.7E-03	--	2.2E-02
			(Total for Child)	---	---	---	---		(Total for Child)	2.3E-02	1.5E-02	---	3.8E-02
	Surface Water	Maxwell Point	**Inorganics**					**Inorganics**					NA
	Adult	Bldg E7340/7350	IRON	--	--	--	NA	IRON	None	1.0E-02	3.7E-03	--	1.4E-02
		Test Site	THALLIUM	--	--	--	NA	THALLIUM	None	1.4E-02	5.1E-03	--	1.9E-02
			(Total for Adult)	---	---	---	---		(Total for Adult)	2.4E-02	8.8E-03	---	3.3E-02
	Surface Water	Maxwell Point	**Inorganics**										
	Adult + Child	Bldg E7340/7350	IRON	NA	NA	NA	NA						
		Test Site	THALLIUM	NA	NA	NA	NA						
			(Total for Child + Adult)	---	---	---	---		**Total Hazard Index Across Surface Water (Child)**				**3.8E-02**
			Total Risk Across Surface Water (Adult + Child)				**---**		**Total Hazard Index Across Surface Water (Adult)**				**3.3E-02**
Sediment	Sediment	Maxwell Point	**Inorganics**					**Inorganics**					
	Child	Bldg E7340/7350	ARSENIC	3.7E-07	9.4E-08	--	4.7E-07	ARSENIC	Skin	9.7E-03	2.4E-03	--	1.2E-02
		Test Site	(Total for Child)	3.7E-07	9.4E-08	---	4.7E-07		(Total for Child)	9.7E-03	2.4E-03	---	1.2E-02
	Sediment	Maxwell Point	**Inorganics**					**Inorganics**					
	Adult	Bldg E7340/7350	ARSENIC	1.6E-07	3.82E-08	--	2.0E-07	ARSENIC	Skin	1.0E-03	2.48E-04	--	1.3E-03
		Test Site	(Total for Adult)	1.6E-07	3.8E-08	---	2.0E-07		(Total for Adult)	1.0E-03	2.5E-04	---	1.3E-03
	Sediment	Maxwell Point	**Inorganics**										
	Adult + Child	Bldg E7340/7350	ARSENIC	5.3E-07	1.3E-07	NA	6.6E-07						
		Test Site	(Total for Child + Adult)	5.3E-07	1.3E-07	---	6.6E-07		**Total Hazard Index Across Sediment (Child)**				**1.2E-02**
			Total Risk Across Sediment (Adult + Child)				**6.6E-07**		**Total Hazard Index Across Sediment (Adult)**				**1.3E-03**
			Total Risk Across All Media and All Exposure Routes				**2.1E-05**		**Total Hazard Index Across All Media and All Exposure Routes (Child)**				**1.4E+00**
									Total Hazard Index Across All Media and All Exposure Routes (Adult)				**1.8E-01**

TABLE 3-10.1

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

BUILDING E7340/7350 TEST SITE

MAXWELL POINT - OTHER EDGEWOOD AREA

Location: Other Edgewood Area

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
					Total Risk Across Surface Soil		---			Total Hazard Index Across Surface Soil			1.2E-05
					Total Risk Across Surface Water		---			Total Hazard Index Across Surface Water			---
					Total Risk Across Sediment		---			Total Hazard Index Across Sediment			---
					Total Risk Across All Media and All Exposure Routes		---			Total Hazard Index Across All Media and All Exposure Routes			---

TABLE 3-10.2

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

BUILDING E7340/7350 TEST SITE

MAXWELL POINT - OTHER EDGEWOOD AREA

Location: Other Edgewood Area

Scenario Timeframe: Current/Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
					Total Risk Across Surface Soil		---			Total Hazard Index Across Surface Soil			5.7E-05
					Total Risk Across Surface Water		---			Total Hazard Index Across Surface Water			---
					Total Risk Across Sediment		---			Total Hazard Index Across Sediment			---
					Total Risk Across All Media and All Exposure Routes		---			Total Hazard Index Across All Media and All Exposure Routes			---

TABLE 3-10.3

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

BUILDING E7340/7350 TEST SITE

MAXWELL POINT - OTHER EDGEWOOD AREA

Location: Other Edgewood Area

Scenario Timeframe: Future
Receptor Population: Commercial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Soil	Total Soil	Maxwell Point Bldg E7340/7350 Test Site	**Inorganics**					**Inorganics**					
			ARSENIC	2.1E-06	8.2E-07	2.1E-09	2.9E-06	ARSENIC	Skin	--	--	9.1E-05	9.1E-05
			(Total)	2.1E-06	8.2E-07	2.1E-09	2.9E-06		(Total)	---	---	9.1E-05	9.1E-05
				Total Risk Across Total Soil			2.9E-06			**Total Hazard Index Across Surface Soil**			9.1E-05
			Total Risk Across All Media and All Exposure Routes				2.9E-06		**Total Hazard Index Across All Media and All Exposure Routes**				---

TABLE 3-10.4
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BUILDING E7340/7350 TEST SITE
MAXWELL POINT - OTHER EDGEWOOD AREA

Location: Other Edgewood Area
Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
				Total Risk Across Total Soil			---			Total Hazard Index Across Surface Soil			---
			Total Risk Across All Media and All Exposure Routes				---		Total Hazard Index Across All Media and All Exposure Routes				---

TABLE 3-10.5
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BUILDING E7340/7350 TEST SITE
MAXWELL POINT - OTHER EDGEWOOD AREA

Location: Other Edgewood Area
Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Soil	Total Soil Child	Maxwell Point Bldg E7340/7350 Test Site	**Inorganics**					**Inorganics**					
			ALUMINUM	--	--	--	NA	ALUMINUM	Central Nervous System	1.5E-01	--	4.9E-03	1.6E-01
			ARSENIC	1.3E-05	1.1E-06	4.1E-09	1.4E-05	ARSENIC	Skin	3.3E-01	2.8E-02	7.5E-04	3.6E-01
			IRON	--	--	--	NA	IRON	None	3.4E-01	--	--	3.4E-01
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	1.1E-01	--	1.1E-02	1.2E-01
			(Total for Child)	1.3E-05	1.1E-06	4.1E-09	1.4E-05		(Total for Child)	9.4E-01	2.8E-02	1.7E-02	9.9E-01
	Total Soil Adult	Maxwell Point Bldg E7340/7350 Test Site	**Inorganics**					**Inorganics**					
			ARSENIC	5.5E-06	6.6E-07	8.4E-09	6.2E-06	ARSENIC	Skin	--	--	3.8E-04	3.8E-04
			(Total for Adult)	5.5E-06	6.6E-07	8.4E-09	6.2E-06		(Total for Adult)	---	---	3.8E-04	3.8E-04
	Total Soil Adult + Child	Maxwell Point Bldg E7340/7350 Test Site	**Inorganics**										
			ARSENIC	1.8E-05	1.7E-06	1.3E-08	2.0E-05						
			(Total for Child + Adult)	1.8E-05	1.7E-06	1.3E-08	2.0E-05						

Total Risk Across Total Soil	2.0E-05	**Total Hazard Index Across Total Soil (Child)**	9.9E-01
		Total Hazard Index Across Total Soil (Adult)	3.8E-04
		Total Hazard Index Across Surface Water (Child)	---
Total Risk Across Surface Water (Adult + Child)	---	**Total Hazard Index Across Surface Water (Adult)**	---
		Total Hazard Index Across Sediment (Child)	---
Total Risk Across Sediment (Adult + Child)	---	**Total Hazard Index Across Sediment (Adult)**	---
Total Risk Across All Media and All Exposure Routes	2.0E-05	**Total Hazard Index Across All Media and All Exposure Routes (Child)**	9.9E-01
		Total Hazard Index Across All Media and All Exposure Routes (Adult)	---

Total Hazard Index Central Nervous System (Child)	2.8E-01
Total Hazard Index Skin (Child)	3.6E-01
Total Hazard Index Iron (Child)	3.4E-01

TABLE 3-11.1
COMPARISON TO REFERENCE DATA UPLS - SURFACE SOIL
BUILDING E7340/7350 TEST SITE
MAXWELL POINT - OTHER EDGEWOOD AREA

Chemical of Potential Concern	Units	N	FOD	Distribution	Minimum	Maximum	Reference UPL	Site Detected Maximum	Consistent with Reference Data?
Inorganics									
ALUMINUM	MG/KG	44	100%	LOGNORMAL	1.06E+03	2.56E+04	1.95E+04	1.91E+04	yes
ANTIMONY	MG/KG	44	2%	NONPARAMETRIC	4.80E-01	5.00E+00	5.00E+00	3.50E+00	yes
ARSENIC	MG/KG	41	98%	NONPARAMETRIC	1.25E-01	7.60E+00	7.60E+00	1.31E+01	no
CHROMIUM	MG/KG	44	100%	LOGNORMAL	3.40E+00	7.08E+01	3.35E+01	3.66E+01	no
IRON	MG/KG	44	100%	NORMAL	2.17E+03	2.49E+04	2.17E+04	3.36E+04	no
LEAD	MG/KG	44	100%	LOGNORMAL	5.49E+00	1.17E+02	6.01E+01	8.01E+02	no
MANGANESE	MG/KG	44	100%	LOGNORMAL	4.95E+00	3.15E+03	1.98E+03	7.78E+02	yes
VANADIUM	MG/KG	44	100%	LOGNORMAL	9.80E+00	5.92E+01	4.57E+01	5.21E+01	no
ZINC	MG/KG	44	100%	LOGNORMAL	4.20E+00	2.42E+02	8.19E+01	3.67E+03	no

FOD = frequency of detection
NA = not applicable

TABLE 3-11.2
COMPARISON TO REFERENCE DATA UPLS - TOTAL SOIL
BUILDING E7340/7350 TEST SITE
MAXWELL POINT - OTHER EDGEWOOD AREA

Chemical of Potential Concern	Units	N	FOD	Distribution	Minimum	Maximum	Reference UPL	Site Detected Maximum	Consistent with Reference Data?
Inorganics									
ALUMINUM	MG/KG	55	100%	NONPARAMETRIC	1.06E+03	2.56E+04	2.56E+04	2.03E+04	yes
ANTIMONY	MG/KG	44	2%	NONPARAMETRIC	4.80E-01	5.00E+00	5.00E+00	3.50E+00	yes
ARSENIC	MG/KG	52	98%	NONPARAMETRIC	1.25E-01	7.60E+00	7.60E+00	1.31E+01	no
CADMIUM	MG/KG	38	3%	NONPARAMETRIC	2.05E-01	1.40E+00	1.40E+00	5.00E+00	no
CHROMIUM	MG/KG	55	100%	LOGNORMAL	3.40E+00	7.08E+01	3.55E+01	3.66E+01	no
IRON	MG/KG	55	100%	NORMAL	2.17E+03	2.49E+04	2.20E+04	3.36E+04	no
LEAD	MG/KG	55	100%	LOGNORMAL	5.49E+00	1.17E+02	5.62E+01	8.01E+01	no
MANGANESE	MG/KG	55	100%	LOGNORMAL	4.95E+00	3.15E+03	1.60E+03	7.78E+02	yes
VANADIUM	MG/KG	55	100%	LOGNORMAL	9.80E+00	5.92E+01	4.66E+01	5.21E+01	no
ZINC	MG/KG	55	100%	LOGNORMAL	4.20E+00	2.42E+02	8.20E+01	3.67E+03	no

FOD = frequency of detection
NA = not applicable
UPL = upper prediction limit

TABLE 3-11.3
COMPARISON REFERENCE DATA UPLS - SURFACE WATER
BUILDING E7340/7350 TEST SITE
MAXWELL POINT - OTHER EDGEWOOD AREA

Chemical of Potential Concern	Units	N	FOD	Distribution	Minimum	Maximum	Reference UPL	Site Detected Maximum	Consistent with Reference Data?
Inorganics									
IRON	UG/L	106	100%	LOGNORMAL	9.48E+01	2.67E+04	5.86E+03	4.22E+04	no
THALLIUM	UG/L	106	3%	NONPARAMETRIC	1.25E+00	6.25E+00	6.25E+00	4.50E+00	yes

FOD = frequency of detection
UPL = upper prediction limit

TABLE 3-11.4
COMPARISON TO REFERENCE DATA UPLS - SEDIMENT
BUILDING E7340/7350 TEST SITE
MAXWELL POINT - OTHER EDGEWOOD AREA

Chemical of Potential Concern	Units	N	FOD	Distribution	Minimum	Maximum	Reference UPL	Site Detected Maximum	Consistent with Reference Data?
Inorganics									
ARSENIC	MG/KG	40	95%	LOGNORMAL	1.10E+00	3.48E+01	1.46E+01	4.80E+00	yes

FOD = frequency of detection
NA = not applicable

TABLES

SMOKE GENERATOR DEBRIS AREA GROUPING

TABLE 4-2.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
MAXWELL POINT INVESTIGATION AREA
SMOKE GENERATOR DEBRIS AREA - SURFACE SOIL - RESIDENTIAL

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface soil
Exposure Point: Smoke Generator Debris Area

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (5) Contaminant Deletion or Selection
							INORGANICS									
7429-90-5	Aluminum	4.32E+03	J	1.75E+04		mg/kg	MP-GEN-01	6/6	3.80E+00 - 7.40E+00	1.75E+04	1.95E+04	7.80E+03 N	NA	NA	Yes	ASL
7440-36-0	Antimony	5.30E-01	B	1.30E+00	JN/JN	mg/kg	MP-GEN-03/MP-GEN-04	4/6	4.50E-01 - 6.20E-01	1.30E+00	5.00E+00	3.10E+00 N	NA	NA	No	BSL
7440-38-2	Arsenic	3.90E+00		6.40E+00		mg/kg	MP-GEN-01	6/6	5.80E-01 - 8.00E-01	6.40E+00	7.60E+00	4.30E-01 C	NA	NA	Yes	ASL
7440-39-3	Barium	6.60E+01		1.16E+02		mg/kg	MP-SS-55	6/6	3.20E-02 - 7.00E-02	1.16E+02	1.11E+02	1.60E+03 N	NA	NA	No	BSL
7440-41-7	Beryllium	3.40E-01	B	9.40E-01	J	mg/kg	MP-SS-55	6/6	1.60E-02 - 4.40E-02	9.40E-01	1.90E+00	1.60E+01 N	NA	NA	No	BSL
7440-43-9	Cadmium	3.70E-01	J/J	2.60E+00		mg/kg	MP-GEN-04	6/6	6.50E-02 - 7.30E-02	2.60E+00	1.40E+00	7.80E+00 N	NA	NA	No	BSL
7440-70-2	Calcium	7.77E+02	J	4.63E+03	J	mg/kg	C29-SS-08	6/6	4.60E+00 - 6.90E+00	4.63E+03	2.17E+03	NA	4.00E+06	ADI	No	NUT
7440-47-3	Chromium	1.77E+01		3.20E+01	J	mg/kg	C29-SS-08	6/6	9.70E-02 - 1.50E-01	3.20E+01	3.35E+01	2.30E+01 N	NA	NA	Yes	ASL
7440-48-4	Cobalt	4.40E+00	B	8.70E+00	J	mg/kg	MP-SS-55	6/6	8.70E-02 - 1.80E-01	8.70E+00	3.86E+01	NA	NA	NA	No	NSL
7440-50-8	Copper	1.39E+01		7.43E+01	L	mg/kg	C29-SS-08	6/6	1.30E-01 - 1.80E-01	7.43E+01	1.93E+01	3.10E+02 N	NA	NA	No	BSL
7439-89-6	Iron	1.66E+04		2.98E+04		mg/kg	MP-GEN-04	6/6	2.60E+00 - 3.90E+00	2.98E+04	2.17E+04	5.50E+03 N	NA	NA	Yes	ASL
7439-92-1	Lead	1.83E+01		9.31E+01		mg/kg	C29-SS-08	6/6	2.90E-01 - 3.70E-01	9.31E+01	6.01E+01	NA	4.00E+02	RSL	No	BSL
7439-95-4	Magnesium	1.64E+03		6.19E+03	*	mg/kg	C29-SS-08	6/6	2.30E+00 - 5.80E+00	6.19E+03	3.04E+03	NA	8.00E+05	ADI	No	NUT
7439-96-5	Manganese	1.45E+02	N	4.28E+02	L	mg/kg	C29-SS-08	6/6	3.20E-02 - 9.00E-02	4.28E+02	1.98E+03	1.60E+02 N	NA	NA	Yes	ASL
7439-97-6	Mercury	3.10E-02	J	6.10E-02		mg/kg	MP-GEN-03	5/6	1.60E-02 - 2.00E-02	6.10E-02	1.20E+00	7.80E-01 N	NA	NA	No	BSL
7440-02-0	Nickel	1.35E+01		7.44E+01	*	mg/kg	C29-SS-08	6/6	1.90E-01 - 2.20E-01	7.44E+01	2.68E+01	1.60E+02 N	NA	NA	No	BSL
7440-09-7	Potassium	2.30E+02	J	1.02E+03		mg/kg	MP-GEN-01/MP-GEN-02	6/6	2.70E+00 - 4.40E+00	1.02E+03	1.03E+03	NA	1.00E+06	ADI	No	NUT
7782-49-2	Selenium	4.90E-01	J	1.10E+00		mg/kg	MP-GEN-03	4/6	4.20E-01 - 6.90E-01	1.10E+00	2.30E+00	3.90E+01 N	NA	NA	No	BSL
7440-22-4	Silver	1.70E-01	J	2.60E-01	B	mg/kg	C29-SS-08	2/6	1.10E-01 - 1.60E-01	2.60E-01	8.50E-01	3.90E+01 N	NA	NA	No	BSL
7440-23-5	Sodium	7.78E+01	J	1.82E+02	B	mg/kg	C29-SS-08	4/6	3.77E+01 - 2.85E+02	1.82E+02	6.58E+02	NA	1.00E+06	ADI	No	NUT
7440-62-2	Vanadium	1.96E+01		4.09E+01		mg/kg	MP-GEN-01	6/6	1.60E-01 - 2.00E-01	4.09E+01	4.57E+01	7.80E+00 N	NA	NA	Yes	ASL
7440-66-6	Zinc	9.06E+01		9.77E+02	D	mg/kg	MP-GEN-03	6/6	9.70E-02 - 5.50E-01	9.77E+02	8.19E+01	2.30E+03 N	NA	NA	No	BSL
							PESTICIDES/PCBS									
72-54-8	4,4'-DDD	1.00E-03	J	8.90E-03	J	mg/kg	C29-SS-08	2/2	4.10E-03 - 4.30E-03	8.90E-03	2.55E-02	2.70E+00 C	NA	NA	No	BSL
72-55-9	4,4'-DDE	2.20E-02		2.80E-02	J	mg/kg	C29-SS-08	2/2	4.10E-03 - 4.30E-03	2.80E-02	3.92E-01	1.90E+00 C	NA	NA	No	BSL
50-29-3	4,4'-DDT	1.30E-02		3.60E-02	J	mg/kg	C29-SS-08	2/2	4.10E-03 - 4.30E-03	3.60E-02	1.43E-01	1.90E+00 C	NA	NA	No	BSL
5103-71-9	alpha-Chlordane	4.10E-04	J	4.10E-04	J	mg/kg	MP-SS-55	1/2	2.10E-03 - 2.20E-03	4.10E-04	NA	1.80E+00 C	NA	NA	No	BSL
60-57-1	Dieldrin	2.60E-03	J	2.60E-03	J	mg/kg	C29-SS-08	1/2	4.10E-03 - 4.30E-03	2.60E-03	NA	4.00E-02 C	NA	NA	No	BSL
							SEMI-VOLATILE ORGANIC COMPOUNDS									
117-81-7	bis(2-Ethylhexyl)phthalate	9.30E-02	J	9.30E-02	J	mg/kg	C29-SS-08	1/2	4.10E-01 - 4.40E-01	9.30E-02	NA	4.60E+01 C	NA	NA	No	BSL

(1) Minimum/maximum detected concentration
(2) Maximum concentration used as screening value
(3) Background values are 95% UPLs calculated using reference data from ICF KE 1995a,b. Background values are not included as part of the COPC selection process.
(4) Screening Toxicity Value - Taken from USEPA Region III Risk-Based (RBC's) Table, USEPA, October 2007. For non-carcinogens, value shown is equal to 1/10 the residential soil RBC value. For carcinogens the value shown is equal to the residential soil RBC value.
(5) Rationale Codes — Selection Reason: ASL = Above Screening Toxicity Level; Deletion Reason: BSL = Below Screening Toxicity Level; NUT = Essential Nutrient; NSL = No Screening Level

Surrogates used, Chromium VI for Chromium, Methylmercury for Mercury, and Chlordane for alpha-Chlordane.

Definitions:
ADI = Allowable Daily Intake (FDA)
mg/kg = milligrams per kilogram
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
C = Carcinogenic
COPC = Chemical of Potential Concern
N = Non-Carcinogenic
NA = Not Applicable
RSL = Residential Screening Level (USEPA Region III)

Data Qualifiers:
* = Duplicate analyses is not within control limits.
B = Value is less than the reporting limit (RL) but greater than the method detection limit (MDL).
D = This flag identifies all compounds in the analysis at a secondary dilution factor.
J = Value is estimated.
L = Reported value may be biased low.
N = Spiked recovery is not within control limits.

TABLE 4-2.2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
MAXWELL POINT INVESTIGATION AREA
SMOKE GENERATOR DEBRIS AREA - SURFACE SOIL - INDUSTRIAL

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface soil
Exposure Point: Smoke Generator Debris Area

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (5) Contaminant Deletion or Selection
							INORGANICS										
7429-90-5	Aluminum	4.32E+03	J	1.75E+04		mg/kg	MP-GEN-01	6/6	3.80E+00 - 7.40E+00	1.75E+04	1.95E+04	1.00E+05		NA	NA	No	BSL
7440-36-0	Antimony	5.30E-01	B	1.30E+00	JN/JN	mg/kg	MP-GEN-03/MP-GEN-04	4/6	4.50E-01 - 6.20E-01	1.30E+00	5.00E+00	4.10E+01	N	NA	NA	No	BSL
7440-38-2	Arsenic	3.90E+00		6.40E+00		mg/kg	MP-GEN-01	6/6	5.80E-01 - 8.00E-01	6.40E+00	7.60E+00	1.90E+00	C	NA	NA	Yes	ASL
7440-39-3	Barium	6.60E+01		1.16E+02		mg/kg	MP-SS-55	6/6	3.20E-02 - 7.00E-02	1.16E+02	1.11E+02	2.00E+04	N	NA	NA	No	BSL
7440-41-7	Beryllium	3.40E-01	B	9.40E-01	J	mg/kg	MP-SS-55	6/6	1.60E-02 - 4.40E-02	9.40E-01	1.90E+00	2.00E+02	N	NA	NA	No	BSL
7440-43-9	Cadmium	3.70E-01	J/J	2.60E+00		mg/kg	MP-GEN-04	6/6	6.50E-02 - 7.30E-02	2.60E+00	1.40E+00	1.00E+02	N	NA	NA	No	BSL
7440-70-2	Calcium	7.77E+02	J	4.63E+03	J	mg/kg	C29-SS-08	6/6	4.60E+00 - 6.90E+00	4.63E+03	2.17E+03	NA		4.00E+06	ADI	No	NUT
7440-47-3	Chromium	1.77E+01		3.20E+01	J	mg/kg	C29-SS-08	6/6	9.70E-02 - 1.50E-01	3.20E+01	3.35E+01	3.10E+02	N	NA	NA	No	BSL
7440-48-4	Cobalt	4.40E+00	B	8.70E+00	J	mg/kg	MP-SS-55	6/6	8.70E-02 - 1.80E-01	8.70E+00	3.86E+01	NA		NA	NA	No	NSL
7440-50-8	Copper	1.39E+01		7.43E+01	L	mg/kg	C29-SS-08	6/6	1.30E-01 - 1.80E-01	7.43E+01	1.93E+01	4.10E+03	N	NA	NA	No	BSL
7439-89-6	Iron	1.66E+04		2.98E+04		mg/kg	MP-GEN-04	6/6	2.60E+00 - 3.90E+00	2.98E+04	2.17E+04	7.20E+04	N	NA	NA	No	BSL
7439-92-1	Lead	1.83E+01		9.31E+01		mg/kg	C29-SS-08	6/6	2.90E-01 - 3.70E-01	9.31E+01	6.01E+01	NA		1.00E+03	ISL	No	BSL
7439-95-4	Magnesium	1.64E+03		6.19E+03	*	mg/kg	C29-SS-08	6/6	2.30E+00 - 5.80E+00	6.19E+03	3.04E+03	NA		8.00E+05	ADI	No	NUT
7439-96-5	Manganese	1.45E+02	N	4.28E+02	L	mg/kg	C29-SS-08	6/6	3.20E-02 - 9.00E-02	4.28E+02	1.98E+03	2.00E+03	N	NA	NA	No	BSL
7439-97-6	Mercury	3.10E-02	J	6.10E-02		mg/kg	MP-GEN-03	5/6	1.60E-02 - 2.00E-02	6.10E-02	1.20E+00	1.00E+01	N	NA	NA	No	BSL
7440-02-0	Nickel	1.35E+01		7.44E+01	*	mg/kg	C29-SS-08	6/6	1.90E-01 - 2.20E-01	7.44E+01	2.68E+01	2.00E+03	N	NA	NA	No	BSL
7440-09-7	Potassium	2.30E+02	J	1.02E+03		mg/kg	MP-GEN-01/MP-GEN-02	6/6	2.70E+00 - 4.40E+00	1.02E+03	1.03E+03	NA		1.00E+06	ADI	No	NUT
7782-49-2	Selenium	4.90E-01	J	1.10E+00		mg/kg	MP-GEN-03	4/6	4.20E-01 - 6.90E-01	1.10E+00	2.30E+00	5.10E+02	N	NA	NA	No	BSL
7440-22-4	Silver	1.70E-01	J	2.60E-01	B	mg/kg	C29-SS-08	2/6	1.10E-01 - 1.60E-01	2.60E-01	8.50E-01	5.10E+02	N	NA	NA	No	BSL
7440-23-5	Sodium	7.78E+01	J	1.82E+02	B	mg/kg	C29-SS-08	4/6	3.77E+01 - 2.85E+02	1.82E+02	6.58E+02	NA		1.00E+06	ADI	No	NUT
7440-62-2	Vanadium	1.96E+01		4.09E+01		mg/kg	MP-GEN-01	6/6	1.60E-01 - 2.00E-01	4.09E+01	4.57E+01	1.00E+02	N	NA	NA	No	BSL
7440-66-6	Zinc	9.06E+01		9.77E+02	D	mg/kg	MP-GEN-03	6/6	9.70E-02 - 5.50E-01	9.77E+02	8.19E+01	3.10E+04	N	NA	NA	No	BSL
							PESTICIDES/PCBS										
72-54-8	4,4'-DDD	1.00E-03	J	8.90E-03	J	mg/kg	C29-SS-08	2/2	4.10E-03 - 4.30E-03	8.90E-03	2.55E-02	1.20E+01	C	NA	NA	No	BSL
72-55-9	4,4'-DDE	2.20E-02		2.80E-02	J	mg/kg	C29-SS-08	2/2	4.10E-03 - 4.30E-03	2.80E-02	3.92E-01	8.40E+00	C	NA	NA	No	BSL
50-29-3	4,4'-DDT	1.30E-02		3.60E-02	J	mg/kg	C29-SS-08	2/2	4.10E-03 - 4.30E-03	3.60E-02	1.43E-01	8.40E+00	C	NA	NA	No	BSL
5103-71-9	alpha-Chlordane	4.10E-04	J	4.10E-04	J	mg/kg	MP-SS-55	1/2	2.10E-03 - 2.20E-03	4.10E-04	NA	8.20E+00	C	NA	NA	No	BSL
60-57-1	Dieldrin	2.60E-03	J	2.60E-03	J	mg/kg	C29-SS-08	1/2	4.10E-03 - 4.30E-03	2.60E-03	NA	1.80E-01	C	NA	NA	No	BSL
							SEMI-VOLATILE ORGANIC COMPOUNDS										
117-81-7	bis(2-Ethylhexyl)phthalate	9.30E-02	J	9.30E-02	J	mg/kg	C29-SS-08	1/2	4.10E-01 - 4.40E-01	9.30E-02	NA	2.00E+02	C	NA	NA	No	BSL

(1) Minimum/maximum detected concentration
(2) Maximum concentration used as screening value.
(3) Background values are 95% UPLs calculated using reference data from ICF KE 1995a,b. Background values are not included as part of the COPC selection process
(4) Screening Toxicity Value - Taken from USEPA Region III Risk-Based (RBCs) Table, USEPA, October 2007. For non-carcinogens, value shown is equal to 1/10 the industrial soil RBC value. For carcinogens the value shown is equal to the industrial soil RBC value
(5) Rationale Codes — Selection Reason: ASL = Above Screening Toxicity Level; Deletion Reason: BSL = Below Screening Toxicity Level; NUT = Essential Nutrient; NSL = No Screening Level

Surrogates used: Chromium VI for Chromium, Methylmercury for Mercury, and Chlordane for alpha-Chlordane

Definitions:
ADI = Allowable Daily Intake (FDA)
mg/kg = milligrams per kilogram
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
C = Carcinogenic
COPC = Chemical of Potential Concern
N = Non-Carcinogenic
NA = Not Applicable
ISL = Industrial Screening Level (USEPA Region III)

Data Qualifiers:
* = Duplicate analyses is not within control limits.
B = Value is less than the reporting limit (RL) but greater than the method detection limit (MDL).
D = This flag identifies all compounds in the analysis at a secondary dilution factor.
J = Value is estimated.
L = Reported value may be biased low.
N = Spiked recovery is not within control limits.

TABLE 4-2.3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
MAXWELL POINT INVESTIGATION AREA
SMOKE GENERATOR DEBRIS AREA - TOTAL SOIL - RESIDENTIAL

Scenario Timeframe: Current/Future
Medium: Total soil
Exposure Medium: Total soil
Exposure Point: Smoke Generator Debris Area

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (5) Contaminant Deletion or Selection
INORGANICS																	
7429-90-5	Aluminum	4.32E+03	J	1.75E+04		mg/kg	MP-GEN-01	6/6	3.80E+00 - 7.40E+00	1.75E+04	2.56E+04	7.80E+03	N	NA	NA	Yes	ASL
7440-36-0	Antimony	5.30E-01	B	1.30E+00	JN/JN	mg/kg	MP-GEN-04/MP-GEN-03	4/6	4.50E-01 - 6.20E-01	1.30E+00	5.00E+00	3.10E+00	N	NA	NA	No	BSL
7440-38-2	Arsenic	3.90E+00		6.40E+00		mg/kg	MP-GEN-01	6/6	5.80E-01 - 8.00E-01	6.40E+00	7.60E+00	4.30E-01	C	NA	NA	Yes	ASL
7440-39-3	Barium	6.60E+01		1.16E+02		mg/kg	MP-SS-55	6/6	3.20E-02 - 2.00E-02	1.16E+02	1.07E+02	1.60E+03	N	NA	NA	No	BSL
7440-41-7	Beryllium	3.40E-01	B	9.40E-01	J	mg/kg	MP-SS-55	6/6	1.60E-02 - 4.40E-02	9.40E-01	1.90E+00	1.60E+01	N	NA	NA	No	BSL
7440-43-9	Cadmium	3.30E-01	J J	2.60E+00		mg/kg	MP-GEN-04	6/6	6.50E-02 - 7.30E-02	2.60E+00	1.40E+00	7.80E+00	N	NA	NA	No	BSL
7440-70-2	Calcium	2.77E+02	J	4.61E+03	J	mg/kg	C29-SS-08	6/6	4.60E+00 - 6.90E+00	4.61E+03	2.17E+03	NA		4.00E+06	ADI	No	NUT
7440-47-3	Chromium	1.77E+01		3.20E+01	J	mg/kg	C29-SS-08	6/6	9.70E-02 - 1.50E-01	3.20E+01	3.55E+01	2.30E+01	N	NA	NA	Yes	ASL
7440-48-4	Cobalt	4.40E+00	B	8.70E+00	J	mg/kg	MP-SS-55	6/6	8.70E-02 - 1.80E-01	8.70E+00	3.39E+01	NA		NA	NA	No	NSL
7440-50-8	Copper	1.39E+01		7.43E+01	L	mg/kg	C29-SS-08	6/6	1.30E-01 - 1.80E-01	7.43E+01	1.84E+01	3.10E+02	N	NA	NA	No	BSL
7439-89-6	Iron	1.66E+04		2.98E+04		mg/kg	MP-GEN-04	6/6	2.60E+00 - 3.90E+00	2.98E+04	2.20E+04	5.50E+03	N	NA	NA	Yes	ASL
7439-92-1	Lead	1.81E+01		9.31E+01		mg/kg	C29-SS-08	6/6	2.90E-01 - 3.70E-01	9.31E+01	5.62E+01	NA		4.00E+02	RSL	No	BSL
7439-95-4	Magnesium	1.64E+03		6.19E+03	*	mg/kg	C29-SS-08	6/6	2.30E+00 - 5.80E+00	6.19E+03	3.04E+03	NA		8.00E+05	ADI	No	NUT
7439-96-5	Manganese	1.45E+02	N	4.28E+02	L	mg/kg	C29-SS-08	6/6	3.20E-02 - 9.00E-02	4.28E+02	1.60E+03	1.60E+02	N	NA	NA	Yes	ASL
7439-97-6	Mercury	3.10E-02	J	6.10E-02		mg/kg	MP-GEN-03	5/6	1.60E-02 - 2.00E-02	6.10E-02	1.20E+00	7.80E-01	N	NA	NA	No	BSL
7440-02-0	Nickel	1.13E+01		7.44E+01	*	mg/kg	C29-SS-08	6/6	1.90E-01 - 2.20E-01	7.44E+01	2.68E+01	1.60E+02	N	NA	NA	No	BSL
7440-09-7	Potassium	2.30E+02	J	1.02E+03		mg/kg	MP-GEN-01/MP-GEN-02	6/6	2.70E+00 - 4.40E+00	1.02E+03	1.70E+03	NA		1.00E+06	ADI	No	NUT
7782-49-2	Selenium	4.90E-01	J	1.10E+00		mg/kg	MP-GEN-03	4/6	4.20E-01 - 6.90E-01	1.10E+00	2.30E+00	3.90E+01	N	NA	NA	No	BSL
7440-22-4	Silver	1.70E-01	J	2.60E-01	B	mg/kg	C29-SS-08	2/6	1.10E-01 - 1.60E-01	2.60E-01	8.50E-01	3.90E+01	N	NA	NA	No	BSL
7440-23-5	Sodium	7.78E+01	J	1.82E+02	B	mg/kg	C29-SS-08	4/6	3.77E+01 - 2.85E+02	1.82E+02	6.58E+02	NA		1.00E+06	ADI	No	NUT
7440-62-2	Vanadium	1.96E+01		4.09E+01		mg/kg	MP-GEN-01	6/6	1.40E-01 - 2.00E-01	4.09E+01	4.66E+01	7.80E+00	N	NA	NA	Yes	ASL
7440-66-6	Zinc	9.06E+01		9.77E+02	D	mg/kg	MP-GEN-03	6/6	9.70E-02 - 5.50E-01	9.77E+02	8.20E+01	2.30E+03	N	NA	NA	No	BSL
PESTICIDES/PCBS																	
72-54-8	4,4-DDD	1.00E-03	J	8.90E-03	J	mg/kg	C29-SS-08	2/2	4.10E-03 - 4.30E-03	8.90E-03	2.55E-02	2.70E+00	C	NA	NA	No	BSL
72-55-9	4,4-DDE	2.20E-02		2.80E-02	J	mg/kg	C29-SS-08	2/2	4.10E-03 - 4.30E-03	2.80E-02	3.92E-01	1.90E+00	C	NA	NA	No	BSL
50-29-3	4,4-DDT	1.30E-02		3.60E-02	J	mg/kg	C29-SS-08	2/2	4.10E-03 - 4.30E-03	3.60E-02	1.43E-01	1.90E+00	C	NA	NA	No	BSL
5103-71-9	alpha-Chlordane	4.10E-04	J	4.10E-04	J	mg/kg	MP-SS-55	1/2	2.10E-03 - 2.20E-03	4.10E-04	NA	1.80E+00	C	NA	NA	No	BSL
60-57-1	Dieldrin	2.60E-03	J	2.60E-03	J	mg/kg	C29-SS-08	1/2	4.10E-03 - 4.30E-03	2.60E-03	NA	4.00E-02	C	NA	NA	No	BSL
SEMI-VOLATILE ORGANIC COMPOUNDS																	
117-81-7	bis(2-Ethylhexyl)phthalate	9.30E-02	J	9.30E-02	J	mg/kg	C29-SS-08	1/2	4.10E-01 - 4.40E-01	9.30E-02	NA	4.60E+01	C	NA	NA	No	BSL
VOLATILE ORGANIC COMPOUNDS																	
79-34-5	1,1,2,2-Tetrachloroethane	2.10E-03	J	1.60E-01		mg/kg	MP-SO-44-12	7/23	1.20E-02 - 6.30E-02	1.60E-01	NA	3.20E+00	C	NA	NA	No	BSL
79-00-5	1,1,2-Trichloroethane	1.90E-03	J	3.60E-03	J	mg/kg	MP-SO-44-12	3/23	1.20E-02 - 6.30E-02	3.60E-03	NA	1.10E+01	C	NA	NA	No	BSL
540-59-0	1,2-Dichloroethene	3.50E-03	J	4.00E-02	J	mg/kg	MP-SO-43-01	2/23	1.20E-02 - 6.30E-02	4.00E-02	NA	7.00E+01	N	NA	NA	No	BSL
78-93-3	2-Butanone	3.60E-03	J	1.00E-01		mg/kg	MP-SO-43-01	6/23	1.20E-02 - 6.30E-02	1.00E-01	NA	4.70E+03	N	NA	NA	No	BSL
71-43-2	Benzene	2.70E-03	J	2.10E-02		mg/kg	MP-SO-44-12	3/23	1.20E-02 - 6.30E-02	2.10E-02	NA	1.20E+01	C	NA	NA	No	BSL
56-23-5	Carbon tetrachloride	1.10E-01		1.10E-01		mg/kg	MP-SO-45	1/23	1.20E-02 - 6.30E-02	1.10E-01	NA	4.90E+00	C	NA	NA	No	BSL
67-66-3	Chloroform	4.20E-03	J	2.00E-01		mg/kg	MP-SO-45	3/23	1.20E-02 - 6.30E-02	2.00E-01	NA	7.80E+01	N	NA	NA	No	BSL
100-41-4	Ethylbenzene	1.30E-03	J	5.90E-02		mg/kg	MP-SO-43-09	5/23	1.20E-02 - 6.30E-02	5.90E-02	NA	7.80E+02	N	NA	NA	No	BSL
127-18-4	Tetrachloroethene	1.30E-03	J	1.00E-02	J	mg/kg	MP-SO-43-09	3/23	1.20E-02 - 6.30E-02	1.00E-02	NA	1.20E+00	C	NA	NA	No	BSL
108-88-3	Toluene	2.40E-03	J	3.30E-02		mg/kg	MP-SO-48	16/23	1.20E-02 - 6.30E-02	3.30E-02	NA	6.30E+02	N	NA	NA	No	BSL
79-01-6	Trichloroethene	1.70E-03	J	1.10E-02	J	mg/kg	MP-SO-44-12	5/23	1.20E-02 - 6.30E-02	1.10E-02	NA	1.60E+00	C	NA	NA	No	BSL
1330-20-7	Xylenes (total)	4.30E-03	J	1.50E-01		mg/kg	MP-SO-43-09	7/23	1.20E-02 - 6.30E-02	1.50E-01	NA	1.60E+03	N	NA	NA	No	BSL

(1) Minimum/maximum detected concentration
(2) Maximum concentration used as screening value
(3) Background values are 95% UPLs calculated using reference data from KTC KF 1995a,b. Background values are not included as part of the COPC selection process.
(4) Screening Toxicity Value - Taken from USEPA Region III Risk-Based (RBC) Table, USEPA October 2007. For non-carcinogens, value shown is equal to 1/10 the residential soil RBC value. For carcinogens the value shown is equal to the residential soil RBC value.
(5) Rationale Codes — Selection Reason: ASL = Above Screening Toxicity Level; Deletion Reason: BSL = Below Screening Toxicity Level; NUT = Essential Nutrient; NSL = No Screening Level

Surrogates used: Chromium VI for Chromium; Methylmercury for Mercury; and Chlordane for alpha-Chlordane.

Definitions:
ADI = Allowable Daily Intake (FDA)
mg/kg = milligrams per kilogram
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
C = Carcinogenic
COPC = Chemical of Potential Concern
N = Non-Carcinogenic
NA = Not Applicable
RSL = Residential Screening Level (USEPA Region III)

Data Qualifiers:
* = Duplicate analysis is not within control limits
B = Value is less than the reporting limit (RL) but greater than the method detection limit (MDL).
D = This flag identifies all compounds in the analysis at a secondary dilution factor.
J = Value is estimated.
K = Reported value may be biased high.
L = Reported value may be biased low
N = Spiked recovery is not within control limits

TABLE 4-2.4
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
MAXWELL POINT INVESTIGATION AREA
SMOKE GENERATOR DEBRIS AREA - TOTAL SOIL - INDUSTRIAL

Scenario Timeframe: Current/Future
Medium: Total soil
Exposure Medium: Total soil
Exposure Point: Smoke Generator Debris Area

CAS Number	Chemical	Maximum (1) Concentration	Maximum Qualifier	Maximum (2) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (3) Used for Screening	Background (4) Value	Screening (5) Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (6) Contaminant Deletion or Selection
							INORGANICS										
7429-90-5	Aluminum	4.32E+03	J	1.75E+04		mg/kg	MP-GEN-01	6/6	3.80E+00 - 7.40E+00	1.75E+04	2.56E+04	1.00E+05	N	NA	NA	No	BSL
7440-36-0	Antimony	5.10E-01	B	1.30E+00	JN/JN	mg/kg	MP-GEN-04/MP-GEN-03	4/6	4.50E-01 - 6.20E-01	1.30E+00	5.00E+00	4.10E+01	N	NA	NA	No	BSL
7440-38-2	Arsenic	3.90E+00		6.40E+00		mg/kg	MP-GEN-01	6/6	5.80E-01 - 8.00E-01	6.40E+00	7.60E+00	1.90E+00	C	NA	NA	Yes	ASL
7440-39-3	Barium	6.60E+01		1.16E+02		mg/kg	MP-SS-55	6/6	3.20E-02 - 7.00E-02	1.16E+02	1.07E+02	2.00E+04	N	NA	NA	No	BSL
7440-41-7	Beryllium	3.40E-01	B	9.40E-01	J	mg/kg	MP-SS-55	6/6	1.60E-02 - 4.40E-02	9.40E-01	1.90E+00	2.00E+02	N	NA	NA	No	BSL
7440-43-9	Cadmium	3.70E-01	JN	2.60E+00		mg/kg	MP-GEN-04	6/6	6.50E-02 - 7.30E-02	2.60E+00	1.40E+00	1.00E+02	N	NA	NA	No	BSL
7440-70-2	Calcium	7.77E+02	J	4.63E+03	J	mg/kg	C29-SS-08	6/6	4.60E+00 - 6.90E+00	4.63E+03	2.17E+03	NA		4.00E+06	ADI	No	NUT
7440-47-3	Chromium	4.77E+01		3.20E+01	J	mg/kg	C29-SS-08	6/6	9.70E-02 - 1.50E-01	3.20E+01	3.55E+01	3.10E+02	N	NA	NA	No	BSL
7440-48-4	Cobalt	4.40E+00	B	8.70E+00	J	mg/kg	MP-SS-55	6/6	8.70E-02 - 1.80E-01	8.70E+00	3.39E+01	NA		NA	NA	No	NSL
7440-50-8	Copper	1.39E+01		7.43E+01	L	mg/kg	C29-SS-08	6/6	1.30E-01 - 1.80E-01	7.43E+01	1.84E+01	4.10E+03	N	NA	NA	No	BSL
7439-89-6	Iron	1.66E+04		2.98E+04		mg/kg	MP-GEN-04	6/6	2.60E+00 - 3.90E+00	2.98E+04	2.20E+04	7.20E+04	N	NA	NA	No	BSL
7439-92-1	Lead	1.83E+01		9.31E+01		mg/kg	C29-SS-08	6/6	2.90E-01 - 3.70E-01	9.31E+01	5.62E+01	NA		1.00E+03	ISL	No	BSL
7439-95-4	Magnesium	1.64E+03		6.19E+03	*	mg/kg	C29-SS-08	6/6	2.30E+00 - 5.80E+00	6.19E+03	3.04E+03	NA		8.00E+05	ADI	No	NUT
7439-96-5	Manganese	4.45E+02	N	4.28E+02	L	mg/kg	C29-SS-08	6/6	3.20E-02 - 9.00E-02	4.28E+02	1.60E+03	2.00E+03	N	NA	NA	No	BSL
7439-97-6	Mercury	3.10E-02	J	6.10E-02		mg/kg	MP-GEN-03	5/6	1.60E-02 - 2.00E-02	6.10E-02	1.20E+00	1.00E+01	N	NA	NA	No	BSL
7440-02-0	Nickel	1.35E+01		7.44E+01	*	mg/kg	C29-SS-08	6/6	1.90E-01 - 2.20E-01	7.44E+01	2.68E+01	2.00E+03	N	NA	NA	No	BSL
7440-09-7	Potassium	2.30E+02	J	1.02E+03		mg/kg	MP-GEN-01/MP-GEN-02	6/6	2.70E+00 - 4.40E+00	1.02E+03	1.70E+03	NA		1.00E+06	ADI	No	NUT
7782-49-2	Selenium	4.90E-01	J	1.10E+00		mg/kg	MP-GEN-03	4/6	4.20E-01 - 6.90E-01	1.10E+00	2.30E+00	5.10E+02	N	NA	NA	No	BSL
7440-22-4	Silver	1.70E-01	J	2.60E-01	B	mg/kg	C29-SS-08	2/6	1.10E-01 - 1.60E-01	2.60E-01	8.50E-01	5.10E+02	N	NA	NA	No	BSL
7440-23-5	Sodium	7.58E+01	J	1.82E+02	B	mg/kg	C29-SS-08	4/6	3.77E+01 - 2.85E+02	1.82E+02	6.58E+02	NA		1.00E+06	ADI	No	NUT
7440-62-2	Vanadium	1.96E+01		4.09E+01		mg/kg	MP-GEN-01	6/6	1.60E-01 - 2.00E-01	4.09E+01	4.66E+01	1.00E+02	N	NA	NA	No	BSL
7440-66-6	Zinc	9.06E+01		9.77E+02	D	mg/kg	MP-GEN-03	6/6	9.70E-02 - 5.50E-01	9.77E+02	8.20E+01	3.10E+04	N	NA	NA	No	BSL
							PESTICIDES/PCBS										
72-54-8	4,4'-DDD	1.00E-03	J	8.90E-03	J	mg/kg	C29-SS-08	2/2	4.10E-03 - 4.30E-03	8.90E-03	2.55E-02	1.20E+01	C	NA	NA	No	BSL
72-55-9	4,4'-DDE	2.20E-02		2.80E-02	J	mg/kg	C29-SS-08	2/2	4.10E-03 - 4.30E-03	2.80E-02	3.92E-01	8.40E+00	C	NA	NA	No	BSL
50-29-3	4,4'-DDT	1.30E-02		3.60E-02	J	mg/kg	C29-SS-08	2/2	4.10E-03 - 4.30E-03	3.60E-02	1.43E-01	8.40E+00	C	NA	NA	No	BSL
5103-71-9	alpha-Chlordane	4.10E-04	J	4.10E-04	J	mg/kg	MP-SS-55	1/2	2.10E-03 - 2.20E-03	4.10E-04	NA	8.20E+00	C	NA	NA	No	BSL
60-57-1	Dieldrin	2.60E-03	J	2.60E-03	J	mg/kg	C29-SS-08	1/2	4.10E-03 - 4.30E-03	2.60E-03	NA	1.80E-01	C	NA	NA	No	BSL
							SEMI-VOLATILE ORGANIC COMPOUNDS										
117-81-7	Bis(2-Ethylhexyl)phthalate	9.30E-02	J	9.30E-02	J	mg/kg	C29-SS-08	1/2	4.10E-01 - 4.40E-01	9.30E-02	NA	2.00E+02	C	NA	NA	No	BSL
							VOLATILE ORGANIC COMPOUNDS										
79-34-5	1,1,2,2-Tetrachloroethane	2.10E-03	J	1.60E-01		mg/kg	MP-SO-44-12	7/23	1.20E-02 - 6.30E-02	1.60E-01	NA	1.40E+01	C	NA	NA	No	BSL
79-00-5	1,1,2-Trichloroethane	1.90E-03	J	3.60E-03	J	mg/kg	MP-SO-44-12	3/23	1.20E-02 - 6.30E-02	3.60E-03	NA	5.00E+01	C	NA	NA	No	BSL
540-59-0	1,2-Dichloroethene	3.50E-03	J	4.00E-02	J	mg/kg	MP-SO-43-01	2/23	1.20E-02 - 6.30E-02	4.00E-02	NA	9.20E+02	N	NA	NA	No	BSL
78-93-3	2-Butanone	3.60E-03	J	1.00E-01		mg/kg	MP-SO-43-01	6/23	1.20E-02 - 6.30E-02	1.00E-01	NA	6.10E+04	N	NA	NA	No	BSL
71-43-2	Benzene	2.70E-03	J	2.10E-02		mg/kg	MP-SO-44-12	3/23	1.20E-02 - 6.30E-02	2.10E-02	NA	5.20E+01	C	NA	NA	No	BSL
56-23-5	Carbon tetrachloride	1.10E-01		1.10E-01		mg/kg	MP-SO-45	1/23	1.20E-02 - 6.30E-02	1.10E-01	NA	2.20E+01	C	NA	NA	No	BSL
67-66-3	Chloroform	4.20E-03	J	2.00E-01		mg/kg	MP-SO-45	3/23	1.20E-02 - 6.30E-02	2.00E-01	NA	1.00E+03	N	NA	NA	No	BSL
100-41-4	Ethylbenzene	1.30E-03	J	5.90E-02		mg/kg	MP-SO-43-09	5/23	1.20E-02 - 6.30E-02	5.90E-02	NA	1.00E+04	N	NA	NA	No	BSL
127-18-4	Tetrachloroethene	1.50E-03	J	1.00E-02	J	mg/kg	MP-SO-43-09	3/23	1.20E-02 - 6.30E-02	1.00E-02	NA	5.30E+00	C	NA	NA	No	BSL
108-88-3	Toluene	2.40E-03	J	3.30E-02		mg/kg	MP-SO-48	16/23	1.20E-02 - 6.30E-02	3.30E-02	NA	8.20E+03	N	NA	NA	No	BSL
79-01-6	Trichloroethene	1.50E-03	J	1.10E-02	J	mg/kg	MP-SO-44-12	5/23	1.20E-02 - 6.30E-02	1.10E-02	NA	7.20E+00	C	NA	NA	No	BSL
1330-20-7	Xylenes (total)	4.30E-03	J	1.50E-01		mg/kg	MP-SO-43-09	7/23	1.20E-02 - 6.30E-02	1.50E-01	NA	2.00E+04	N	NA	NA	No	BSL

(1) Maximum maximum detected concentration.
(2) Maximum concentration used as screening value
(3) Background values are 95th UPL calculated using reference data from KCF-KE 1995a,b. Background values are not included as part of the COPC selection process.
(4) Screening Toxicity Value - Taken from USEPA Region III Risk-Based (RBCs) Table, USEPA, October 2007. For non-carcinogens, value shown is equal to 1/10 the industrial soil RBC value. For carcinogens the value shown is equal to the industrial soil RBC value.
(5) Rationale Codes — Selection Reason: ASL = Above Screening Toxicity Level; Deletion Reason: BSL = Below Screening Toxicity Level; NUT = Essential Nutrient; NSL = No Screening Level
Surrogates used: Chromium VI for Chromium, Methylmercury for Mercury, and Chlordane for alpha-Chlordane.

Definitions:
ADI = Allowable Daily Intake (FDA)
AL = Action Level (USEPA 1996b)
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
C = Carcinogenic
COPC = Chemical of Potential Concern
N = Non-Carcinogenic
NA = Not Applicable
ISL = Industrial Screening Level (USEPA Region III)
mg/kg = milligrams per kilogram

Data Qualifiers:
* = Duplicate analyses is not within control limits.
B = Value is less than the reporting limit (RL) but greater than the method detection limit (MDL).
D = This flag identifies all compounds in the analysis at a secondary dilution factor.
J = Value is estimated.
K = Reported value may be biased high
L = Reported value may be biased low.
N = Spiked recovery is not within control limits.

TABLE 4-2.5
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
MAXWELL POINT INVESTIGATION AREA
SMOKE GENERATOR DEBRIS AREA - SEDIMENT - RESIDENTIAL

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Smoke Generator Debris Area

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (5) Contaminant Deletion or Selection
							EXPLOSIVES										
98-95-3	Nitrobenzene	4.90E-02	J	4.90E-02	J	mg/kg	MP-SD-12	1/6	1.00E-01 - 1.60E-01	4.90E-02	NA	3.90E+01	N	NA	NA	No	BSL
							INORGANICS										
7429-90-5	Aluminum	3.29E+02	*	5.50E+03		mg/kg	MP-SD-11	6/6	2.30E+00 - 8.10E+00	5.50E+03	3.19E+04	7.80E+04	N	NA	NA	No	BSL
7440-36-0	Antimony	4.60E-01	B	4.60E-01	B	mg/kg	MP-SD-13	1/6	3.80E-01 - 7.00E-01	4.60E-01	1.05E+01	3.10E+01	N	NA	NA	No	BSL
7440-38-2	Arsenic	9.00E-01	B	4.10E+00		mg/kg	MP-SD-13	4/6	7.50E-01 - 9.30E-01	4.10E+00	1.46E+01	4.30E+00	C	NA	NA	No	BSL
7440-39-3	Barium	4.20E+00	B	1.80E+01	B	mg/kg	MP-SD-11	6/6	3.00E-02 - 5.00E-02	1.80E+01	1.07E+02	1.60E+04	N	NA	NA	No	BSL
7440-41-7	Beryllium	1.10E-01	B	1.50E+00		mg/kg	MP-SD-12	4/6	1.20E-02 - 2.00E-02	1.50E+00	2.59E+00	1.60E+02	N	NA	NA	No	BSL
7440-70-2	Calcium	5.78E+01	B	1.18E+03	J	mg/kg	C29-SD-09	6/6	4.20E+00 - 1.04E+01	1.18E+03	9.59E+03	NA		4.00E+06	ADI	No	NUT
7440-47-3	Chromium	1.80E+00	B	1.80E+01	*	mg/kg	MP-SD-13	6/6	1.00E-01 - 1.30E-01	1.80E+01	1.17E+02	2.30E+02	N	NA	NA	No	BSL
7440-48-4	Cobalt	2.60E-01	B	6.80E+00	B	mg/kg	MP-SD-13	6/6	1.10E-01 - 2.30E-01	6.80E+00	3.51E+01	NA		NA	NA	No	NSL
7440-50-8	Copper	1.40E+00	J	9.80E+00	J	mg/kg	MP-SD-11	6/6	1.10E-01 - 2.00E-01	9.80E+00	7.87E+01	3.10E+03	N	NA	NA	No	BSL
7439-89-6	Iron	1.97E+03	*	1.69E+04	*	mg/kg	MP-SD-13	6/6	3.20E+00 - 5.40E+00	1.69E+04	5.43E+04	5.50E+04	N	NA	NA	No	BSL
7439-92-1	Lead	3.10E+00	K	5.67E+01	K	mg/kg	MP-SD-11	6/6	2.60E-01 - 3.40E-01	5.67E+01	9.50E+01	NA		4.00E+02	RSL	No	BSL
7439-95-4	Magnesium	1.39E+02	B	8.70E+02		mg/kg	MP-SD-11	6/6	2.70E+00 - 1.20E+01	8.70E+02	6.51E+03	NA		8.00E+05	ADI	No	NUT
7439-96-5	Manganese	2.15E+01		2.56E+02		mg/kg	MP-SD-13	6/6	4.00E-02 - 9.00E-02	2.56E+02	1.59E+03	1.60E+03	N	NA	NA	No	BSL
7439-97-6	Mercury	3.00E-02	B	3.00E-02	B	mg/kg	MP-SD-11	1/6	1.70E-02 - 2.00E-02	3.00E-02	3.98E-01	7.80E+00	N	NA	NA	No	BSL
7440-02-0	Nickel	5.40E-01	B	5.40E+00	B	mg/kg	MP-SD-13	6/6	2.00E-01 - 2.50E-01	5.40E+00	7.01E+01	1.60E+03	N	NA	NA	No	BSL
7440-09-7	Potassium	3.75E+01	B	3.38E+02	B	mg/kg	MP-SD-11	6/6	2.60E+00 - 4.20E+00	3.38E+02	3.73E+03	NA		1.00E+06	ADI	No	NUT
7782-49-2	Selenium	5.50E-01	K	5.50E-01	K	mg/kg	MP-SD-13	1/6	4.70E-01 - 5.80E-01	5.50E-01	4.00E+00	3.90E+02	N	NA	NA	No	BSL
7440-23-5	Sodium	1.74E+02	B	4.29E+02	B	mg/kg	C29-SD-08	6/6	2.95E+01 - 6.78E+01	4.29E+02	6.31E+03	NA		1.00E+06	ADI	No	NUT
7440-62-2	Vanadium	1.40E+00	B	2.59E+01		mg/kg	MP-SD-13	6/6	1.10E-01 - 2.90E-01	2.59E+01	9.30E+01	7.80E+01	N	NA	NA	No	BSL
7440-66-6	Zinc	1.07E+01	J	3.27E+01		mg/kg	C29-SD-09	6/6	9.00E-02 - 2.70E-01	3.27E+01	2.84E+02	2.30E+04	N	NA	NA	No	BSL
							PESTICIDES/PCBS										
72-54-8	4,4'-DDD	2.60E-04	J	3.60E-03	J	mg/kg	MP-SD-11	4/6	2.00E-03 - 4.30E-03	3.60E-03	5.50E-02	2.70E+01	C	NA	NA	No	BSL
72-55-9	4,4'-DDE	3.70E-04	J	2.20E-02		mg/kg	MP-SD-11	5/6	2.00E-03 - 4.30E-03	2.20E-02	5.50E-02	1.90E+01	C	NA	NA	No	BSL
50-29-3	4,4'-DDT	8.00E-04	J	6.40E-02		mg/kg	MP-SD-11	4/6	2.00E-03 - 4.30E-03	6.40E-02	2.65E-01	1.90E+01	C	NA	NA	No	BSL
33213-65-9	Endosulfan II	2.50E-04	J	2.50E-04	J	mg/kg	MP-SD-13	1/6	4.00E-03 - 4.30E-03	2.50E-04		4.70E+02	N	NA	NA	No	BSL
							SEMI-VOLATILE ORGANIC COMPOUNDS										
84-66-2	Diethylphthalate	2.40E-01	J	2.40E-01	J	mg/kg	C29-SD-09	1/6	4.00E-01 - 4.30E-01	2.40E-01	5.50E-01	6.30E+04	N	NA	NA	No	BSL
108-95-2	Phenol	5.00E-02	J	5.00E-02	J	mg/kg	MP-SD-12	1/6	4.00E-01 - 4.30E-01	5.00E-02	NA	2.30E+04	N	NA	NA	No	BSL
							VOLATILE ORGANIC COMPOUNDS										
67-64-1	Acetone	1.20E-02	J	2.40E-02	J	mg/kg	C29-SD-08	2/6	1.20E-02 - 1.30E-02	2.40E-02	NA	7.00E+04	N	NA	NA	No	BSL
127-18-4	Tetrachloroethene	6.00E-03	J	6.00E-03	J	mg/kg	C29-SD-09	1/6	1.20E-02 - 1.30E-02	6.00E-03	NA	1.20E+01	C	NA	NA	No	BSL

(1) Minimum/maximum detected concentration.
(2) Maximum concentration used as screening value
(3) Background values are 95% UPLs calculated using reference data from ICF KE 1995a,b. Background values are not included as part of the COPC selection process
(4) Screening Toxicity Value - Taken from USEPA Region III Risk-Based (RBC s) Table, USEPA, October 2007. For non-carcinogens, value shown is equal to 1/10 the residential soil RBC value. For carcinogens the value shown is equal to the residential soil RBC value. To account for sediment exposures, the resulting values have been increased by a factor of ten.
(5) Rationale Codes — Selection Reason: ASL = Above Screening Toxicity Level; Deletion Reason: BSL = Below Screening Toxicity Level; NUT = Essential Nutrient; NSL = No Screening Level

Surrogates used: Chromium VI for Chromium, Methylmercury for Mercury, and Endosulfan for Endosulfan II.

Definitions:
ADI = Allowable Daily Intake (FDA)
mg/kg = milligrams per kilogram
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
C = Carcinogenic
COPC = Chemical of Potential Concern
N = Non-Carcinogenic
NA = Not Applicable
RSL = Residential Screening Level (USEPA Region III)

Data Qualifiers:
* = Duplicate analyses is not within control limits.
B = Value is less than the reporting limit (RL) but greater than the method detection limit (MDL).
J = Value is estimated.
K = Reported value may be biased high.

TABLE 4-2.6
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
MAXWELL POINT INVESTIGATION AREA
SMOKE GENERATOR DEBRIS AREA - SEDIMENT - INDUSTRIAL

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Smoke Generator Debris Area

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (5) Contaminant Deletion or Selection
							EXPLOSIVES										
98-95-3	Nitrobenzene	4.90E-02	J	4.90E-02	J	mg/kg	MP-SD-12	1/6	1.00E-01 - 1.60E-01	4.90E-02	NA	5.10E+02	N	NA	NA	No	BSL
							INORGANICS										
7429-90-5	Aluminum	3.29E-02	*	5.50E+03		mg/kg	MP-SD-11	6/6	2.30E+00 - 8.10E+00	5.50E+03	3.19E+04	1.00E+06	N	NA	NA	No	BSL
7440-36-0	Antimony	4.60E-01	B	4.60E-01	B	mg/kg	MP-SD-13	1/6	3.80E-01 - 7.00E-01	4.60E-01	1.05E+01	4.10E+02	N	NA	NA	No	BSL
7440-38-2	Arsenic	9.00E-01	B	4.10E+00		mg/kg	MP-SD-13	4/6	7.50E-01 - 9.30E-01	4.10E+00	1.46E+01	1.90E+01	C	NA	NA	No	BSL
7440-39-3	Barium	4.20E+00	B	1.80E+01	B	mg/kg	MP-SD-11	6/6	3.00E-02 - 5.00E-02	1.80E+01	1.07E+02	2.00E+05	N	NA	NA	No	BSL
7440-41-7	Beryllium	1.10E-01	B	1.50E+00		mg/kg	MP-SD-12	4/6	1.20E-02 - 2.00E-02	1.50E+00	2.59E+00	2.00E+03	N	NA	NA	No	BSL
7440-70-2	Calcium	5.78E+01	B	1.18E+03	J	mg/kg	C29-SD-09	6/6	4.20E+00 - 1.04E+01	1.18E+03	9.59E+03	NA		4.00E+06	ADI	No	NUT
7440-47-3	Chromium	1.80E+00	B	1.80E+01	*	mg/kg	MP-SD-13	6/6	1.00E-01 - 1.30E-01	1.80E+01	1.17E+02	3.10E+03	N	NA	NA	No	BSL
7440-48-4	Cobalt	2.60E-01	B	6.80E+00	B	mg/kg	MP-SD-13	6/6	1.10E-01 - 2.30E-01	6.80E+00	3.51E+01	NA		NA	NA	No	NSL
7440-50-8	Copper	1.40E+00	J	9.80E+00	J	mg/kg	MP-SD-11	6/6	1.10E-01 - 2.00E-01	9.80E+00	7.87E+01	4.10E+04	N	NA	NA	No	BSL
7439-89-6	Iron	1.97E+03	*	1.69E+04	*	mg/kg	MP-SD-13	6/6	3.20E+00 - 5.40E+00	1.69E+04	5.43E+04	7.20E+05	N	NA	NA	No	BSL
7439-92-1	Lead	3.10E+00	K	5.67E+01	K	mg/kg	MP-SD-11	6/6	2.60E-01 - 3.40E-01	5.67E+01	9.50E+01	NA		1.00E+03	ISL	No	BSL
7439-95-4	Magnesium	1.39E+02	B	8.70E+02		mg/kg	MP-SD-11	6/6	2.70E+00 - 1.20E+01	8.70E+02	6.51E+03	NA		8.00E+05	ADI	No	NUT
7439-96-5	Manganese	2.15E+01		2.56E+02		mg/kg	MP-SD-13	6/6	4.00E-02 - 9.00E-02	2.56E+02	1.59E+03	2.00E+04	N	NA	NA	No	BSL
7439-97-6	Mercury	3.00E-02	B	3.00E-02	B	mg/kg	MP-SD-11	1/6	1.70E-02 - 2.00E-02	3.00E-02	3.98E-01	1.00E+02	N	NA	NA	No	BSL
7440-02-0	Nickel	5.40E-01	B	5.40E+00	B	mg/kg	MP-SD-13	6/6	2.00E-01 - 2.50E-01	5.40E+00	7.01E+01	2.00E+04	N	NA	NA	No	BSL
7440-09-7	Potassium	3.75E+01	B	3.38E+02	B	mg/kg	MP-SD-11	6/6	2.60E+00 - 4.20E+00	3.38E+02	3.73E+03	NA		1.00E+06	ADI	No	NUT
7782-49-2	Selenium	5.50E-01	K	5.50E-01	K	mg/kg	MP-SD-13	1/6	4.70E-01 - 5.80E-01	5.50E-01	4.00E+00	5.10E+03	N	NA	NA	No	BSL
7440-23-5	Sodium	1.74E+02	B	4.29E+02	B	mg/kg	C29-SD-08	6/6	2.95E+01 - 6.78E+01	4.29E+02	6.31E+03	NA		1.00E+06	ADI	No	NUT
7440-62-2	Vanadium	1.40E+00	B	2.59E+01		mg/kg	MP-SD-13	6/6	1.10E-01 - 2.90E-01	2.59E+01	9.30E+01	1.00E+03	N	NA	NA	No	BSL
7440-66-6	Zinc	1.07E+01	J	3.27E+01		mg/kg	C29-SD-09	6/6	9.00E-02 - 2.70E-01	3.27E+01	2.84E+02	3.10E+05	N	NA	NA	No	BSL
							PESTICIDES/PCBS										
72-54-8	4,4'-DDD	2.60E-04	J	3.60E-03	J	mg/kg	MP-SD-11	4/6	2.00E-03 - 4.30E-03	3.60E-03	5.50E-02	1.20E+02	C	NA	NA	No	BSL
72-55-9	4,4'-DDE	3.70E-04	J	2.20E-02		mg/kg	MP-SD-11	5/6	2.00E-03 - 4.30E-03	2.20E-02	5.50E-02	8.40E+01	C	NA	NA	No	BSL
50-29-3	4,4'-DDT	8.00E-04	J	6.40E-02		mg/kg	MP-SD-11	4/6	2.00E-03 - 4.30E-03	6.40E-02	2.65E-01	8.40E+01	C	NA	NA	No	BSL
33213-65-9	Endosulfan II	2.50E-04	J	2.50E-04	J	mg/kg	MP-SD-13	1/6	4.00E-03 - 4.30E-03	2.50E-04		6.10E+03	N	NA	NA	No	BSL
							SEMI-VOLATILE ORGANIC COMPOUNDS										
84-66-2	Diethylphthalate	2.40E-01	J	2.40E-01	J	mg/kg	C29-SD-09	1/6	4.00E-01 - 4.30E-01	2.40E-01	5.50E-01	8.20E+05	N	NA	NA	No	BSL
108-95-2	Phenol	5.00E-02	J	5.00E-02	J	mg/kg	MP-SD-12	1/6	4.00E-01 - 4.30E-01	5.00E-02	NA	3.10E+05	N	NA	NA	No	BSL
							VOLATILE ORGANIC COMPOUNDS										
67-64-1	Acetone	1.20E-02	J	2.40E-02	J	mg/kg	C29-SD-08	2/6	1.20E-02 - 1.30E-02	2.40E-02	NA	9.20E+05	N	NA	NA	No	BSL
127-18-4	Tetrachloroethene	6.00E-03	J	6.00E-03	J	mg/kg	C29-SD-09	1/6	1.20E-02 - 1.30E-02	6.00E-03	NA	5.30E+01	C	NA	NA	No	BSL

(1) Minimum/maximum detected concentration
(2) Maximum concentration used as screening value
(3) Background values are 95% UPLs calculated using reference data from ICF KE 1995a,b. Background values are not included as part of the COPC selection process.
(4) Screening Toxicity Value - Taken from USEPA Region III Risk-Based (RBC's) Table, USEPA, October 2007. For non-carcinogens, value shown is equal to 1/10 the industrial soil RBC value. For carcinogens the value shown is equal to the industrial soil RBC value. To account for sediment exposures, the resulting values have been increased by a factor of ten.
(5) Rationale Codes
Selection Reason: ASL = Above Screening Toxicity Level
Deletion Reason: BSL = Below Screening Toxicity Level
NUT = Essential Nutrient
NSL = No Screening Level

Surrogates used: Chromium VI for Chromium, Methylmercury for Mercury, and Endosulfan for Endosulfan II

Definitions:
ADI = Allowable Daily Intake (FDA)
mg/kg = milligrams per kilogram
ARAR/TBC = Applicable or Relevant and Appropriate Requirements/To Be Considered
C = Carcinogenic
COPC = Chemical of Potential Concern
N = Non-Carcinogenic
NA = Not Applicable
ISL = Industrial Screening Level (USEPA Region III)

Data Qualifiers:
* = Duplicate analyses is not within control limits.
B = Value is less than the reporting limit (RL) but greater than the method detection limit (MDL).
J = Value is estimated.
K = Reported value may be biased high.

TABLE 4-2.7
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
MAXWELL POINT INVESTIGATION AREA
SMOKE GENERATOR DEBRIS AREA - SURFACE WATER

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Smoke Generator Debris Area

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (5) Contaminant Deletion or Selection
							INORGANICS-TOTAL										
7429-90-5	Aluminum	1.33E+02	K/K	4.00E+03	/	ug/L	C29-SW-08-R1	12/12	1.51E+01 - 3.57E+01	4.00E+03	3.72E+03	3.70E+04	N	NA	NA	No	BSL
7440-36-0	Antimony	2.60E+00	B	2.60E+00	B	ug/L	MP-SW-13-R2	1/12	2.30E+00 - 3.10E+00	2.60E+00	2.50E+01	1.50E+01	N	NA	NA	No	BSL
7440-39-3	Barium	1.21E+01	B	4.75E+01	B/B	ug/L	C29-SW-08-R1	12/12	2.00E-01 - 3.00E-01	4.75E+01	9.89E+01	7.30E+03	N	NA	NA	No	BSL
7440-41-7	Beryllium	2.00E-01	B	2.00E-01	B	ug/L	C29-SW-08-R1	1/12	8.00E-02 - 2.00E-01	2.00E-01	2.50E+00	7.30E+01	N	NA	NA	No	BSL
7440-70-2	Calcium	1.31E+04		5.20E+04	/	ug/L	C29-SW-08-R1	12/12	2.80E+01 - 4.60E+01	5.20E+04	8.49E+04	NA		4.00E+05	ADI	No	NUT
7440-47-3	Chromium	5.60E-01	B	5.80E+00	B	ug/L	MP-SW-13-R1	9/12	5.00E-01 - 7.00E-01	5.80E+00	1.42E+01	1.10E+02	N	NA	NA	No	BSL
7440-48-4	Cobalt	7.30E-01	B	2.45E+00	B/B	ug/L	C29-SW-08-R1	6/12	5.00E-01 - 1.00E+00	2.45E+00	2.50E+01	NA		NA	NA	No	NSL
7440-50-8	Copper	1.00E+00	B	8.15E+00	B/B	ug/L	C29-SW-08-R1	10/12	7.00E-01 - 9.00E-01	8.15E+00	1.25E+01	1.50E+03	N	NA	NA	No	BSL
7439-89-6	Iron	1.23E+02	B/	4.43E+03	/	ug/L	C29-SW-08-R1	12/12	1.72E+01 - 2.83E+01	4.43E+03	5.86E+03	2.60E+04	N	NA	NA	No	BSL
7439-92-1	Lead	1.60E+00	L	7.25E+00	/	ug/L	C29-SW-08-R1	5/12	1.30E+00 - 1.90E+00	7.25E+00	1.97E+01	NA		1.50E+01	AL	No	BSL
7439-95-4	Magnesium	9.87E+03		1.35E+05	/	ug/L	C29-SW-08-R1	12/12	1.80E+01 - 5.30E+01	1.35E+05	2.29E+05	NA		8.10E+04	ADI	No	NUT
7439-96-5	Manganese	3.07E+01		3.10E+02		ug/L	MP-SW-15-R1	12/12	2.00E-01 - 5.00E-01	3.10E+02	4.81E+03	7.30E+02	N	NA	NA	No	BSL
7439-97-6	Mercury	1.00E-01	B	1.00E-01	B	ug/L	MP-SW-11-R2	1/12	1.00E-01 - 1.00E-01	1.00E-01	6.60E-01	3.70E+00	N	NA	NA	No	BSL
7440-02-0	Nickel	1.70E+00	B/B	6.95E+00	B/B	ug/L	C29-SW-08-R1	9/12	9.00E-01 - 1.40E+00	6.95E+00	2.37E+01	7.30E+02	N	NA	NA	No	BSL
7440-09-7	Potassium	4.16E+03	B	4.74E+04	/	ug/L	C29-SW-08-R1	12/12	1.30E+01 - 1.86E+01	4.74E+04	1.06E+05	NA		1.00E+05	ADI	No	NUT
7782-49-2	Selenium	2.40E+00	B	2.40E+00	B	ug/L	C29-SW-08-R2	1/12	2.30E+00 - 3.20E+00	2.40E+00	7.10E+00	1.80E+02	N	NA	NA	No	BSL
7440-22-4	Silver	9.35E-01	B/B	9.35E-01	B/B	ug/L	C29-SW-09-R1	1/12	6.00E-01 - 1.20E+00	9.35E-01	5.00E+00	1.80E+02	N	NA	NA	No	BSL
7440-23-5	Sodium	4.37E+04	B	1.04E+06	/	ug/L	C29-SW-08-R1	12/12	1.16E+02 - 1.02E+03	1.04E+06	2.01E+06	NA		1.00E+05	ADI	No	NUT
7440-62-2	Vanadium	1.15E+00	B/B	1.17E+01	B	ug/L	MP-SW-13-R1	10/12	7.00E-01 - 1.30E+00	1.17E+01	2.50E-01	3.70E+01	N	NA	NA	No	BSL
7440-66-6	Zinc	3.20E+00	B	4.16E+01	B	ug/L	MP-SW-15-R1	12/12	6.00E-01 - 1.90E+00	4.16E+01	7.80E+01	1.10E+04	N	NA	NA	No	BSL
							PESTICIDES/PCBS										
72-54-8	4,4'-DDD	9.40E-03	J	7.20E-02	J	ug/L	MP-SW-12-R1	2/12	1.00E-01 - 1.00E-01	7.20E-02	NA	2.80E+00	C	NA	NA	No	BSL
72-55-9	4,4'-DDE	2.80E-03	J	1.10E-02	J	ug/L	MP-SW-12-R1	2/12	1.00E-01 - 1.00E-01	1.10E-02	NA	2.00E+00	C	NA	NA	No	BSL
50-29-3	4,4'-DDT	3.50E-03	J	3.50E-03	J	ug/L	MP-SW-13-R1	1/12	1.00E-01 - 1.00E-01	3.50E-03	NA	2.00E+00	C	NA	NA	No	BSL
							SEMI-VOLATILE ORGANIC COMPOUNDS										
117-81-7	Bis(2-Ethylhexyl)phthalate	1.20E+00	J	2.00E+00	J	ug/L	C29-SW-09-R1	3/12	1.00E+01 - 1.00E+01	2.00E+00	NA	4.80E+01	C	NA	NA	No	BSL
84-66-2	Diethylphthalate	1.40E-01		5.30E+01		ug/L	MP-SW-15-R1	3/12	1.00E+01 - 1.00E+01	5.30E+01	NA	2.90E+04	N	NA	NA	No	BSL
							VOLATILE ORGANIC COMPOUNDS										
79-34-5	1,1,2,2-Tetrachloroethane	1.10E+00	J	1.10E+00	J	ug/L	MP-SW-11-R1	1/12	1.00E+01 - 1.00E+01	1.10E+00	NA	5.30E-01	C	NA	NA	Yes	ASL
67-64-1	Acetone	4.00E+00	J	4.00E+00	J	ug/L	C29-SW-08-R1	1/12	1.00E+01 - 1.00E+01	4.00E+00	NA	5.50E+03	N	NA	NA	No	BSL
1634-04-4	Methyl tert-butyl ether	4.30E+00	J	4.30E+00	J	ug/L	MP-SW-12-R1	1/4	1.00E+01 - 1.00E+01	4.30E+00	NA	2.60E+01	C	NA	NA	No	BSL

(1) Minimum/maximum detected concentration.
(2) Maximum concentration used as screening value.
(3) Background values are 95% UPLs calculated using reference data from ICF KE 1995a,b. Background values are not included as part of the COPC selection process.
(4) Screening Toxicity Value - Taken from USEPA Region III Risk-Based (RBCs) Table, USEPA, October 2007. For non-carcinogens, value shown is equal to 1/10 the tap water RBC value. For carcinogens the value shown is equal to the tap water RBC value. To account for surface water exposures, the resulting values have been increased by a factor of ten.
(5) Rationale Codes

Selection Reason: ASL = Above Screening Toxicity Level
Deletion Reason: BSL = Below Screening Toxicity Level
NUT = Essential Nutrient
NSL = No Screening Level

Surrogates used: Chromium VI for Chromium, and Methylmercury for Mercury

Definitions:
ADI = Allowable Daily Intake (FDA)
AL = Action Level (USEPA 1996b)
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
C = Carcinogenic
COPC = Chemical of Potential Concern
N = Non-Carcinogenic
NA = Not Applicable
ug/L = micrograms per liter

Data Qualifiers:
B = Value is less than the reporting limit (RL) but greater than the method detection limit (MDL).
J = Value is estimated.
K = Reported value may be biased high.
L = Reported value may be biased low.

TABLE 4-3.1
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
MAXWELL POINT INVESTIGATION AREA
SMOKE GENERATOR DEBRIS AREA - SURFACE SOIL - RESIDENTIAL

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: Smoke Generator Debris Area

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
INORGANICS									
Aluminum	mg/kg	1.41E+04	2.33E+04	1.75E+04		mg/kg	1.75E+04	Maximum	UCLM>Maximum
Arsenic	mg/kg	5.33E+00	6.01E+00	6.40E+00		mg/kg	6.01E+00	95%UCLM-N	Regional Guidance
Chromium	mg/kg	2.65E+01	3.05E+01	3.20E+01	J	mg/kg	3.05E+01	95%UCLM-N	Regional Guidance
Iron	mg/kg	2.24E+04	2.66E+04	2.98E+04		mg/kg	2.66E+04	95%UCLM-N	Regional Guidance
Manganese	mg/kg	2.44E+02	3.91E+02	4.28E+02	L	mg/kg	3.91E+02	95%UCLM-G	Regional Guidance
Vanadium	mg/kg	3.44E+01	4.17E+01	4.09E+01		mg/kg	4.09E+01	Maximum	UCLM>Maximum

Notes:
Statistics calculated by the USEPA program ProUCL 4.0. ProUCL outputs are presented in Appendix B.
95%UCLM-G indicates that the 95 percent upper confidence limit on the mean is based on the approximate or adjusted gamma distribution.
95%UCLM-N indicates that the 95 percent upper confidence limit on the mean is based on the student's t-test for normal distributions.
UCLM>Maximum indicates that the recommended 95 UCLM exceeds the maximum detected value, therefore the maximum detected value is used.

Definitions:
95 UCLM = 95 percent upper confidence limit of the mean
EPC = exposure point concentration
NA = not applicable
mg/kg = milligrams per kilogram
USEPA = United States Environmental Protection Agency

TABLE 4-3.2
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
MAXWELL POINT INVESTIGATION AREA
SMOKE GENERATOR DEBRIS AREA - SURFACE SOIL - INDUSTRIAL

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: Smoke Generator Debris Area

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
INORGANICS									
Arsenic	mg/kg	5.33E+00	6.01E+00	6.40E+00		mg/kg	6.01E+00	95%UCLM-N	Regional Guidance

Notes:
Statistics calculated by the USEPA program ProUCL 4.0. ProUCL outputs are presented in Appendix B.
95%UCLM-N indicates that the 95 percent upper confidence limit on the mean is based on the student's t-test for normal distributions.

Definitions:
95 UCLM = 95 percent upper confidence limit of the mean
EPC = exposure point concentration
NA = not applicable
mg/kg = milligrams per kilogram
USEPA = United States Environmental Protection Agency

TABLE 4-3.3
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
MAXWELL POINT INVESTIGATION AREA
SMOKE GENERATOR DEBRIS AREA - TOTAL SOIL - RESIDENTIAL

Scenario Timeframe: Current/Future
Medium: Total soil
Exposure Medium: Total soil
Exposure Point: Smoke Generator Debris Area

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
INORGANICS									
Aluminum	mg/kg	1.41E+04	2.33E+04	1.75E+04		mg/kg	1.75E+04	Maximum	UCLM>Maximum
Arsenic	mg/kg	5.33E+00	6.01E+00	6.40E+00		mg/kg	6.01E+00	95%UCLM-N	Regional Guidance
Chromium	mg/kg	2.65E+01	3.05E+01	3.20E+01	J	mg/kg	3.05E+01	95%UCLM-N	Regional Guidance
Iron	mg/kg	2.24E+04	2.66E+04	2.98E+04		mg/kg	2.66E+04	95%UCLM-N	Regional Guidance
Manganese	mg/kg	2.44E+02	3.91E+02	4.28E+02	L	mg/kg	3.91E+02	95%UCLM-G	Regional Guidance
Vanadium	mg/kg	3.44E+01	4.17E+01	4.09E+01		mg/kg	4.09E+01	Maximum	UCLM>Maximum

Notes:
Statistics calculated by the USEPA program ProUCL 4.0. ProUCL outputs are presented in Appendix B.
95%UCLM-G indicates that the 95 percent upper confidence limit on the mean is based on the approximate or adjusted gamma distribution.
95%UCLM-N indicates that the 95 percent upper confidence limit on the mean is based on the student's t-test for normal distributions.
UCLM>Maximum indicates that the recommended 95 UCLM exceeds the maximum detected value, therefore the maximum detected value is used.

Definitions:
95 UCLM = 95 percent upper confidence limit of the mean
EPC = exposure point concentration
NA = not applicable
mg/kg = milligrams per kilogram
USEPA = United States Environmental Protection Agency

TABLE 4-3.4
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
MAXWELL POINT INVESTIGATION AREA
SMOKE GENERATOR DEBRIS AREA - TOTAL SOIL - INDUSTRIAL

Scenario Timeframe: Current/Future
Medium: Total soil
Exposure Medium: Total soil
Exposure Point: Smoke Generator Debris Area

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
INORGANICS									
Arsenic	mg/kg	5.33E+00	6.01E+00	6.40E+00		mg/kg	6.01E+00	95%UCLM-N	Regional Guidance

Notes:

Statistics calculated by the USEPA program ProUCL 4.0. ProUCL outputs are presented in Appendix B.

95%UCLM-N indicates that the 95 percent upper confidence limit on the mean is based on the student's t-test for normal distributions.

Definitions:

95 UCLM = 95 percent upper confidence limit of the mean

EPC = exposure point concentration

NA = not applicable

mg/kg = milligrams per kilogram

USEPA = United States Environmental Protection Agency

TABLE 4-3.5
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
MAXWELL POINT INVESTIGATION AREA
SMOKE GENERATOR DEBRIS AREA - SEDIMENT - RESIDENTIAL

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Smoke Generator Debris Area

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
No COPCs									

TABLE 4-3.6
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
MAXWELL POINT INVESTIGATION AREA
SMOKE GENERATOR DEBRIS AREA - SEDIMENT - INDUSTRIAL

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Smoke Generator Debris Area

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
No COPCs									

TABLE 4-3.7
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
MAXWELL POINT INVESTIGATION AREA
SMOKE GENERATOR DEBRIS AREA - SURFACE WATER

Scenario Timeframe: Current/Future
Medium: Surface water
Exposure Medium: Surface water

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
VOLATILE ORGANIC COMPOUNDS									
1,1,2,2-Tetrachloroethane	ug/L	NA	NA	1.10E+00	J	ug/L	1.10E+00	Maximum	Low %

Notes:
Statistics calculated by the USEPA program ProUCL 4.0. ProUCL outputs are presented in Appendix B.
Low %Detects indicates low percentage of detects.
NA = Not Applicable

Definitions:
95 UCLM = 95 percent upper confidence limit of the mean
EPC = exposure point concentration
NA = not applicable
mg/kg = milligrams per kilogram
USEPA = United States Environmental Protection Agency

TABLE 4-4.1
VALUES USED FOR RESIDENT ADULT DAILY SOIL INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil, Air
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	Chemical-Specific	Chemical-Specific	Chronic Daily Intake (CDI) (mg/kg/day) =
	CR	Ingestion Rate	mg/day	100	U.S. EPA 1991a,b	CS x CR x EF x ED x CF / (BW x AT)
	EF	Exposure Frequency	day/yr	350	U.S. EPA 1991a,b	
	ED-NC	Exposure Duration - Noncancer	yr	30	U.S. EPA 1991a,b	
	ED-C	Exposure Duration-Cancer	yr	24	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	10,950	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Dermal	CS	Chemical Concentration in Soil	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	5,700	U.S. EPA 2004	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	0.07	U.S. EPA 1997a, 2004	
	ABS	Dermal Absorption Fraction	unitless	Chemical-Specific	U.S. EPA 2004	
	EF	Exposure Frequency	event/yr	350	U.S. EPA 1991a,b	
	ED-NC	Exposure Duration - Noncancer	yr	30	U.S. EPA 1991a,b	
	ED-C	Exposure Duration - Cancer	yr	24	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	10,950	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Inhalation	CA	Chemical Concentration in Air	mg/m^3	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	IR	Inhalation Rate	m^3/hr	0.83	U.S. EPA 1997a	CA x IR x ET x EF x ED / (BW x AT)
	ET	Exposure Time	hr/day	24	BPJ	
	EF	Exposure Frequency	day/yr	350	U.S. EPA 1991a,b	
	ED-NC	Exposure Duration - Noncancer	yr	30	U.S. EPA 1991a,b	
	ED-C	Exposure Duration - Cancer	yr	24	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1989a	
	AT-NC	Averaging time - Noncancer	days	10,950	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgment

TABLE 4-4.2
VALUES USED FOR RESIDENT CHILD DAILY SOIL INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil, Air
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	mg/day	200	U.S. EPA 1991a,b	CS x CR x EF x ED x CF / (BW x AT)
	EF	Exposure Frequency	day/yr	350	U.S. EPA 1991a,b	
	ED	Exposure Duration	yr	6	U.S. EPA 1991a,b	
	BW	Body Weight	kg	15	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	2,190	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Dermal	CS	Chemical Concentration in Soil	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	2,800	U.S. EPA 2004	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	0.2	U.S. EPA 2004	
	ABS	Dermal Absorption Fraction	unitless	Chemical-Specific	U.S. EPA 2004	
	EF	Exposure Frequency	event/yr	350	U.S. EPA 1991a,b	
	ED	Exposure Duration	yr	6	U.S. EPA 1991a,b	
	BW	Body Weight	kg	15	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	2,190	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Inhalation	CA	Chemical Concentration in Air	mg/m^3	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	IR	Inhalation Rate	m^3/hr	0.35	U.S. EPA 1997a	CA x IR x ET x EF x ED / (BW x AT)
	ET	Exposure Time	hr/day	24	BPJ	
	EF	Exposure Frequency	day/yr	350	U.S. EPA 1991a,b	
	ED	Exposure Duration	yr	6	U.S. EPA 1991a,b	
	BW	Body Weight	kg	15	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	2,190	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgment

TABLE 4-4.3
VALUES USED FOR ADOLESCENT TRESPASSER DAILY SURFACE SOIL INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Current
Medium: Soil
Exposure Medium: Surface Soil, Air
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	mg/day	50	BPJ (1)	CS x CR x EF x ED x CF / (BW x AT)
	EF	Exposure Frequency	day/yr	52	BPJ (3)	
	ED	Exposure Duration	yr	8	BPJ (3)	
	BW	Body Weight	kg	45	U.S. EPA 1997a	
	AT-NC	Averaging time - Noncancer	days	2,920	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Dermal	CS	Chemical Concentration in Soil	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	2,900	U.S. EPA 2004 (2)	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	0.20	U.S. EPA 2004 (2)	
	ABS	Dermal Absorption Fraction	unitless	Chemical-Specific	U.S. EPA 2004 (2)	
	EF	Exposure Frequency	event/yr	52	BPJ (3)	
	ED	Exposure Duration	yr	8	BPJ (3)	
	BW	Body Weight	kg	45	U.S. EPA 1997a	
	AT-NC	Averaging time - Noncancer	days	2,920	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Inhalation	CA	Chemical Concentration in Air	mg/m^3	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	IR	Inhalation Rate	m^3/hr	0.63	U.S. EPA 1997a	CA x IR x ET x EF x ED / (BW x AT)
	ET	Exposure Time	hr/day	4	BPJ (3)	
	EF	Exposure Frequency	day/yr	52	BPJ (3)	
	ED	Exposure Duration	yr	8	BPJ (3)	
	BW	Body Weight	kg	45	U.S. EPA 1997a	
	AT-NC	Averaging time - Noncancer	days	2,920	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgment
(1) The incidental soil ingestion rate is assumed to be half that of a resident.
(2) Assumes exposure similar to that of resident child.
(3) The exposure frequency is based on best professional judgment, assuming that the trespasser would visit the site approximately 2 days/week for 6 months of the year for 4 hours per day. The exposure duration is based on the age range evaluated (8 - 16 years of age).

TABLE 4-4.4
VALUES USED FOR CONSTRUCTION WORKER DAILY SOIL INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil, Air
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	mg/day	480	U.S. EPA 1991a,b	CS x CR x EF x ED x CF / (BW x AT)
	EF	Exposure Frequency	day/yr	250	U.S. EPA 1991a,b	
	ED	Exposure Duration	yr	1	BPJ (1)	
	BW	Body Weight	kg	70	U.S. EPA 1989a	
	AT-NC	Averaging time - Noncancer	days	365	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Dermal	CS	Chemical Concentration in Soil	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	3,300	U.S. EPA 2004	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	0.3	U.S. EPA 2004	
	ABS	Dermal Absorption Fraction	unitless	Chemical-Specific	U.S. EPA 2004	
	EF	Exposure Frequency	event/yr	250	U.S. EPA 1991a,b	
	ED	Exposure Duration	yr	1	BPJ (1)	
	BW	Body Weight	kg	70	U.S. EPA 1989a	
	AT-NC	Averaging time - Noncancer	days	365	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Inhalation	CA	Chemical Concentration in Air	mg/m^3	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	IR	Inhalation Rate	m^3/hr	4.8	U.S. EPA 1997a	CA x IR x ET x EF x ED / (BW x AT)
	ET	Exposure Time	hr/day	8	U.S. EPA 1991a,b	
	EF	Exposure Frequency	day/yr	250	U.S. EPA 1991a,b	
	ED	Exposure Duration	yr	1	BPJ (1)	
	BW	Body Weight	kg	70	U.S. EPA 1989a	
	AT-NC	Averaging time - Noncancer	days	365	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgment
(1) Construction events are assumed to extend for up to one year total in duration.

TABLE 4-4.5
VALUES USED FOR COMMERCIAL WORKER DAILY SOIL INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil, Air
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Commercial Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	mg/day	50	U.S. EPA 1991a,b	CS x CR x EF x ED x CF / (BW x AT)
	EF	Exposure Frequency	day/yr	250	U.S. EPA 1991a,b	
	ED	Exposure Duration	yr	25	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1989a	
	AT-NC	Averaging time - Noncancer	days	9,125	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Dermal	CS	Chemical Concentration in Soil	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	3,300	U.S. EPA 2004	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	0.2	U.S. EPA 2004	
	ABS	Dermal Absorption Fraction	unitless	Chemical-Specific	U.S. EPA 2004	
	EF	Exposure Frequency	event/yr	250	U.S. EPA 1991a,b	
	ED	Exposure Duration	yr	25	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1989a	
	AT-NC	Averaging time - Noncancer	days	9,125	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Inhalation	CA	Chemical Concentration in Air	mg/m^3	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	IR	Inhalation Rate	m^3/hr	0.833	U.S. EPA 1997a	CA x IR x ET x EF x ED / (BW x AT)
	ET	Exposure Time	hr/day	8	BPJ	
	EF	Exposure Frequency	day/yr	250	U.S. EPA 1991a,b	
	ED	Exposure Duration	yr	25	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1989a	
	AT-NC	Averaging time - Noncancer	days	9,125	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgement

TABLE 4-4.6
VALUES USED FOR MAINTENANCE WORKER DAILY SURFACE SOIL INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Current
Medium: Soil
Exposure Medium: Surface Soil, Air
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	mg/day	50	U.S. EPA 1991a,b	CS x CR x EF x ED x CF / (BW x AT)
	EF	Exposure Frequency	day/yr	50	BPJ (1)	
	ED	Exposure Duration	yr	25	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1989a	
	AT-NC	Averaging time - Noncancer	days	9,125	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0.E-06	U.S. EPA 1989a	
Dermal	CS	Chemical Concentration in Soil	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	3,300	U.S. EPA 2004	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	0.2	U.S. EPA 2004	
	ABS	Dermal Absorption Fraction	unitless	Chemical-Specific	U.S. EPA 2004	
	EF	Exposure Frequency	event/yr	50	BPJ (1)	
	ED	Exposure Duration	yr	25	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1989a	
	AT-NC	Averaging time - Noncancer	days	9,125	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.E-06	U.S. EPA 1989a	
Inhalation	CA	Chemical Concentration in Air	mg/m^3	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	IR	Inhalation Rate	m^3/hr	2.5	U.S. EPA 1997a	CA x IR x ET x EF x ED / (BW x AT)
	ET	Exposure Time	hr/day	8	U.S. EPA 1991a,b	
	EF	Exposure Frequency	day/yr	50	BPJ (1)	
	ED	Exposure Duration	yr	25	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1989a	
	AT-NC	Averaging time - Noncancer	days	9,125	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgment
(1) Assumes the maintenance worker performs maintenance and groundskeeping activities 1 day/week for the entire year, with 2 weeks vacation.

TABLE 4-4.7
VALUES USED FOR RESIDENT ADULT DAILY SURFACE WATER INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CW	Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	L/hr	0.05	U.S. EPA 1989a (1)	CW x CR x ET x EF x ED / (BW x AT)
	ET	Exposure Time	hr/day	2	BPJ (2)	
	EF	Exposure Frequency	day/yr	52	BPJ (2)	
	ED-NC	Exposure Duration - Noncancer	yr	30	U.S. EPA 1991a,b	
	ED-C	Exposure Duration - Cancer	yr	24	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1991a,b	
	AT-NC	Averaging time-Noncancer	days	10,950	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
Dermal	CW	Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2	18,000	U.S. EPA 2004a	CW x SA x PC x ET x EF x ED x CF / (BW x AT)
	PC	Permeability Coefficient	cm/hr	Chemical-Specific	Chemical-Specific	
	ET	Exposure Time	hr/day	2	BPJ (2)	
	EF	Exposure Frequency	day/yr	52	BPJ (2)	
	ED-NC	Exposure Duration - Noncancer	yr	30	U.S. EPA 1991a,b	
	ED-C	Exposure Duration - Cancer	yr	24	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	10,950	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	L/cm^3	0.001	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgment
(1) The incidental ingestion rate of surface water is assumed to be 0.05 L/hr.
(2) The event frequency and exposure frequency are based on best professional judgment assuming that the adult would wade in the area for 2 days per week for 6 months per year for up to 2 hours per day.

TABLE 4-4.8
VALUES USED FOR RESIDENT CHILD DAILY SURFACE WATER INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CW	Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	L/hr	0.01	BPJ (1)	CW x CR x ET x EF x ED / (BW x AT)
	ET	Exposure Time	hr/day	2	BPJ (2)	
	EF	Exposure Frequency	day/yr	52	BPJ (2)	
	ED	Exposure Duration	yr	6	U.S. EPA 1991a,b	
	BW	Body Weight	kg	15	U.S. EPA 1991a,b	
	AT-NC	Averaging time-Noncancer	days	2,190	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
Dermal	CW	Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2	6,600	U.S. EPA 2004a	CW x SA x PC x ET x EF x ED x CF / (BW x AT)
	PC	Permeability Coefficient	cm/hr	Chemical-Specific	Chemical-Specific	
	ET	Exposure Time	hr/day	2	BPJ (2)	
	EF	Exposure Frequency	day/yr	52	BPJ (2)	
	ED	Exposure Duration	yr	6	U.S. EPA 1991a,b	
	BW	Body Weight	kg	15	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	2,190	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	L/cm^3	0.001	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgment
(1) The incidental ingestion rate of surface water is assumed to be 0.01 L/hr.
(2) The event frequency and exposure frequency are based on best professional judgment assuming that the child would wade in the area for 2 days per week for 6 months per year for up to 2 hours per day.

TABLE 4-4.9
VALUES USED FOR ADOLESCENT TRESPASSER DAILY SURFACE WATER INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Trespasser
Receptor Age: Adolescent - Wading

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CW	Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	L/hr	0.05	U.S. EPA 1989a (1)	CW x CR x ET x EF x ED / (BW x AT)
	ET	Exposure Time	hr/day	1	BPJ (2)	
	EF	Exposure Frequency	day/yr	52	BPJ (2)	
	ED	Exposure Duration	yr	8	BPJ (2)	
	BW	Body Weight	kg	45	U.S. EPA 1997a	
	AT-NC	Averaging time-Noncancer	days	2,920	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
Dermal	CW	Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2	6,600	BPJ (3)	CW x SA x PC x ET x EF x ED x CF / (BW x AT)
	PC	Permeability Coefficient	cm/hr	Chemical-Specific	Chemical-Specific	
	ET	Exposure Time	hr/day	1	BPJ (2)	
	EF	Exposure Frequency	day/yr	52	BPJ (2)	
	ED	Exposure Duration	yr	8	BPJ (2)	
	BW	Body Weight	kg	45	U.S. EPA 1997a	
	AT-NC	Averaging time - Noncancer	days	2,920	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	L/cm^3	0.001	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgment
(1) The incidental ingestion rate of surface water is assumed to be 0.05 L/hr.
(2) The event frequency and exposure frequency are based on best professional judgment assuming that the trespasser would contact surface water 2 days per year for 6 months per year for 1 hour per day. The exposure duration is based on the age range evaluated (8 - 16 years of age).
(3) Assumes exposure similar to that of resident child.

TABLE 4-4.10
VALUES USED FOR MAINTENANCE WORKER DAILY SURFACE WATER INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Curent
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CW	Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	L/hr.	0.05	U.S. EPA 1989a (1)	CW x CR x ET x EF x ED / (BW x AT)
	ET	Exposure Time	hr/day	1	BPJ (2)	
	EF	Exposure Frequency	day/yr	50	BPJ (3)	
	ED	Exposure Duration	yr	25	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1991a,b	
	AT-NC	Averaging time-Noncancer	days	9,125	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
Dermal	CW	Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2	3,300	U.S. EPA 2004a	CW x SA x PC x ET x EF x ED x CF / (BW x AT)
	PC	Permeability Coefficient	cm/hr	Chemical-Specific	Chemical-Specific	
	ET	Exposure Time	hr/day	1	BPJ (2)	
	EF	Exposure Frequency	day/yr	50	BPJ (3)	
	ED	Exposure Duration	yr	25	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	9,125	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	L/cm^3	0.001	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgment
(1) The incidental ingestion rate of surface water is assumed to be 0.05 L/hr.
(2) It is assumed that the maintenance worker will contact surface water 1 hour per day, each day he is at the site.
(3) Assumes the maintenance worker performs maintenance and groundskeeping activities 1 day/week for the entire year, with 2 weeks vacation.

TABLE 4-4.11
VALUES USED FOR RESIDENT ADULT DAILY SEDIMENT INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CS	Chemical Concentration in Sediment	Chemical-Specific	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	mg/day	50	BPJ (1)	CS x CR x EF x ED x CF / (BW x AT)
	EF	Exposure Frequency	day/yr	52	BPJ (2)	
	ED-NC	Exposure Duration - Noncancer	yr	30	U.S. EPA 1991a,b	
	ED-C	Exposure Duration - Cancer	yr	24	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	10,950	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Dermal	CS	Chemical Concentration in Sediment	Chemical-Specific	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	5,700	U.S. EPA 2004	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	0.07	U.S. EPA 1997a, 2004	
	ABS	Dermal Absorption Fraction	unitless	Chemical-Specific	U.S. EPA 2004	
	EF	Exposure Frequency	event/yr	52	BPJ (2)	
	ED-NC	Exposure Duration - Noncancer	days	30	U.S. EPA 1991a,b	
	ED-C	Exposure Duration - Cancer	yr	24	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	10,950	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgment
(1) The incidental sediment ingestion rate is assumed to be half that of soil.
(2) Assumes an exposure frequency of 2 days per week for 6 months per year to sediment.

TABLE 4-4.12
VALUES USED FOR RESIDENT CHILD DAILY SEDIMENT INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CS	Chemical Concentration in Sediment	Chemical-Specific	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	mg/day	100	BPJ (1)	CS x CR x EF x ED x CF / (BW x AT)
	EF	Exposure Frequency	day/yr	52	BPJ (2)	
	ED	Exposure Duration	yr	6	U.S. EPA 1991a,b	
	BW	Body Weight	kg	15	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	2,190	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Dermal	CS	Chemical Concentration in Sediment	Chemical-Specific	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	2,800	U.S. EPA 2004	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	0.3	U.S. EPA 2004	
	ABS	Dermal Absorption Fraction	unitless	Chemical-Specific	U.S. EPA 2004	
	EF	Exposure Frequency	event/yr	52	BPJ (2)	
	ED	Exposure Duration	yr	6	U.S. EPA 1991a,b	
	BW	Body Weight	kg	15	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	2,190	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgment
(1) The incidental sediment ingestion rate is assumed to be half that of soil.
(2) Based on the age range of the child, exposure frequency to sediment is assumed at 2 days per week for 6 months per year.

TABLE 4-4.13
VALUES USED FOR ADOLESCENT TRESPASSER DAILY SEDIMENT INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CS	Chemical Concentration in Sediment	Chemical-Specific	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	mg/day	50	BPJ (1)	CS x CR x EF x ED x CF / (BW x AT)
	EF	Exposure Frequency	day/yr	52	BPJ (2)	
	ED-C	Exposure Duration - Cancer	yr	8	BPJ (2)	
	BW	Body Weight	kg	45	U.S. EPA 1997a	
	AT-NC	Averaging time - Noncancer	days	2,920	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Dermal	CS	Chemical Concentration in Sediment	Chemical-Specific	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	2,800	BPJ (3)	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	3.3	BPJ (3)	
	ABS	Dermal Absorption Fraction	unitless	Chemical-Specific	U.S. EPA 2004	
	EF	Exposure Frequency	event/yr	52	BPJ (2)	
	ED-C	Exposure Duration - Cancer	yr	8	BPJ (2)	
	BW	Body Weight	kg	45	U.S. EPA 1997a	
	AT-NC	Averaging time - Noncancer	days	2,920	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgment
(1) The incidental soil ingestion rate is assumed to be half that of a resident.
(2) The exposure frequency is based on best professional judgment, assuming that the trespasser would visit the site approximately 2 days/week for 6 months of the year. The exposure duration is based on the age range evaluated (8 - 16 years of age).
(3) Assumes children playing in wet soil.

TABLE 4-4.14
VALUES USED FOR MAINTENANCE WORKER DAILY SEDIMENT INTAKE EQUATIONS
MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Maxwell Point, Other Edgewood Area
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CS	Chemical Concentration in Sediment	Chemical-Specific	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	mg/day	25	BPJ (1)	CS x CR x EF x ED x CF / (BW x AT)
	EF	Exposure Frequency	day/yr	50	BPJ (2)	
	ED-C	Exposure Duration - Cancer	yr	25	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	9,125	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	
Dermal	CS	Chemical Concentration in Sediment	Chemical-Specific	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	3,300	U.S. EPA 2004	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	0.20	U.S. EPA 2004	
	ABS	Dermal Absorption Fraction	unitless	Chemical-Specific	U.S. EPA 2004	
	EF	Exposure Frequency	event/yr	50	BPJ (2)	
	ED-C	Exposure Duration - Cancer	yr	25	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1991a,b	
	AT-NC	Averaging time - Noncancer	days	9,125	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgment
(1) The incidental sediment ingestion rate is assumed to be half that of soil.
(2) Assumes the maintenance worker performs maintenance and groundskeeping activities 1 day/week for the entire year, with 2 weeks vacation.

TABLE 4-5.1
NON-CANCER TOXICITY DATA - ORAL/DERMAL
SMOKE GENERATOR DEBRIS AREA
MAXWELL POINT - OTHER EDGEWOOD AREA

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value (mg/kg-day)	Oral to Dermal Adjustment Factor (GI ABS) (1)	Adjusted Dermal RfD (2) (mg/kg bw-day)	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (mm/dd/yy)
Inorganics								
ALUMINUM	Chronic	1.00E+00	1	1.00E+00	Central Nervous System	100/1	PPRTV	7/26/2001
ARSENIC	Chronic	3.00E-04	1	3.00E-04	Skin	3/1	IRIS	6/5/2008
CHROMIUM, TOTAL	Chronic	3.00E-03	0.025	7.50E-05	None	300/3	IRIS	6/5/2008
IRON	NA	7.00E-01	1	7.00E-01	None	NA/NA	PPRTV	7/29/2008
MANGANESE	Chronic	4.60E-02	0.04	1.84E-03	Central Nervous System	1/3	IRIS	6/5/2008
VANADIUM	Chronic	5.00E-03	0.026	1.30E-04	Hair	100/1	IRIS	6/5/2008
Volatiles								
1,1,2,2-TETRACHLOROETHANE	Chronic	4.00E-03	1	4.00E-03	Liver	300/1	PPRTV	

NA = Not Applicable

(1) Taken from USEPA 2004 Guidance.

(2) Dermal toxicological values adjusted from oral values using USEPA 2004 recommended chemical-specific gastrointestinal absorption factors (GI ABS). RfDs are multiplied by the GI ABS.

(3) IRIS - Integrated Risk Information System. For IRIS values, the date IRIS was searched is provided.
HEAST - Health Effects Assessment Summary Tables. For HEAST values, the date of HEAST is provided.
EPA-NCEA - National Center for Environmental Assessment. For EPA-NCEA values, the date of the article provided by EPA-NCEA is provided.

TABLE 4-5.2
NON-CANCER TOXICITY DATA - INHALATION
SMOKE GENERATOR DEBRIS AREA
MAXWELL POINT - OTHER EDGEWOOD AREA

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation (RfC) (mg/m^3)	Adjusted Inhalation (RfD) (mg/kg-day)	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ	Dates (1) (mm/dd/yy)
Inorganics							
ALUMINUM	Chronic	5.00E-03	1.00E-03	Respiratory System	300/1	PPRTV	7/26/2001
ARSENIC	NA	NA	NA	NA	NA	IRIS	6/5/2008
CHROMIUM, TOTAL	Chronic	1.00E-04	3.00E-05	Lungs and Blood	300/1	IRIS	6/5/2008
IRON	NA	NA	NA	NA	NA	PPRTV	7/29/2008
MANGANESE	Chronic	5.00E-05	1.43E-05	Central Nervous System	1000/1	IRIS	6/5/2008
VANADIUM	NA	NA	NA	NA	NA	IRIS	6/5/2008
Volatiles							
1,1,2,2-TETRACHLOROETHANE	NA	NA	NA	NA	NA	IRIS	6/5/2008

NA = Not Applicable

(1) IRIS - Integrated Risk Information System. For IRIS values, the date IRIS was searched is provided.
HEAST - Health Effects Assessment Summary Tables. For HEAST values, the date of HEAST is provided.
EPA-NCEA - National Center for Environmental Assessment. For EPA-NCEA values, the date of the article provided by EPA-NCEA is provided.

TABLE 4-5.3
CHEMICAL-SPECIFIC PARAMETERS
SMOKE GENERATOR DEBRIS AREA
MAXWELL POINT - OTHER EDGEWOOD AREA

Chemical of Potential Concern	Absorption Factor	Reference	GI ABS	Reference	Permeability Constant (cm/hr)	Reference
Inorganics						
ALUMINUM	NA	U.S. EPA, 2004	1	U.S. EPA, 2004	1.00E-03	U.S. EPA, 2004
ARSENIC	0.03	U.S. EPA, 2004	1	U.S. EPA, 2004	1.00E-03	U.S. EPA, 2004
CHROMIUM VI	NA	U.S. EPA, 2004	0.025	U.S. EPA, 2004	2.00E-03	U.S. EPA, 2004
IRON	NA	U.S. EPA, 2004	1	U.S. EPA, 2004	1.00E-03	U.S. EPA, 2004
MANGANESE	NA	U.S. EPA, 2004	0.04	U.S. EPA, 2004	1.00E-03	U.S. EPA, 2004
VANADIUM	NA	U.S. EPA, 2004	0.026	U.S. EPA, 2004	1.00E-03	U.S. EPA, 2004
Volatiles						
1,1,2,2-TETRACHLOROETHANE	NA	U.S. EPA, 2004	1	U.S. EPA, 2004	6.90E-03	U.S. EPA, 2004

NA = Data not available.
GI ABS = Gastrointestional Absorption factors
U.S. EPA, 2004a = U.S. Environmental Protection Agency, 2004. *Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).* Final Guidance.

TABLE 4-6.1
CANCER TOXICITY DATA - ORAL/DERMAL
SMOKE GENERATOR DEBRIS AREA
MAXWELL POINT - OTHER EDGEWOOD AREA

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral Absorption Efficiency for Dermal (GI ABS)(1)	Absorbed Cancer Slope Factor for Dermal (2)	Units	Weight of Evidence/Cancer Guideline Description	Source	Date (3) (mm/dd/yy)
Inorganics							
ALUMINUM	NA	1	NA	per (mg/kg-day)	D	PPRTV	7/26/2001
ARSENIC	1.50E+00	1	1.50E+00	per (mg/kg-day)	A	IRIS	6/5/2008
CHROMIUM, TOTAL	NA	0.025	NA	per (mg/kg-day)	D	IRIS	6/5/2008
IRON	NA	1	NA	per (mg/kg-day)	NA	PPRTV	7/29/2008
MANGANESE	NA	0.04	NA	per (mg/kg-day)	D	IRIS	6/5/2008
VANADIUM	NA	0.026	NA	per (mg/kg-day)	NA	IRIS	6/5/2008
Volatiles							
1,1,2,2-TETRACHLOROETHANE	2.00E-01	1	2.00E-01	per (mg/kg-day)	C	IRIS	6/5/2008

NA = Not Applicable
(1) Taken from USEPA 2004 Guidance.
(2) Dermal Toxicological values adjusted from oral values using USEPA 2004 recommended chemical-specific gastrointestinal absorption factors (GI ABS). CSFs are divided by the GI ABS.
(3) IRIS - Integrated Risk Information System. For IRIS values, the date IRIS was searched is provided.
HEAST - Health Effects Assessment Summary Tables. For HEAST values, the date of HEAST is provided.
EPA-NCEA - National Center for Environmental Assessment. For EPA-NCEA values, the date of the article provided by EPA-NCEA is provided.
PPRTV - Provisional Peer Reviewed Toxicity Value
CAL EPA - California Environmental Protection Agency

Weight of Evidence: A - Human carcinogen
B1 - Probable human carcinogen - indicate that limited human data are available
B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen
D - Not classifiable as a human carcinogen
E - Evidence of noncarcinogenicity

TABLE 4-6.2
CANCER TOXICITY DATA - INHALATION
SMOKE GENERATOR DEBRIS AREA
MAXWELL POINT - OTHER EDGEWOOD AREA

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor		Weight of Evidence/Cancer Guideline Description	Unit Risk - Inhalation CSF	
	Value	Units	Value	Units		Source	Date [1]
Inorganics							
ALUMINUM	NA	1/ug/m3	NA	per (mg/kg-day)	D	PPRTV	7/26/2001
ARSENIC	4.30E-03	1/ug/m3	1.51E+01	per (mg/kg-day)	A	IRIS	6/5/2008
CHROMIUM, TOTAL	1.20E-02	1/ug/m3	4.10E+01	per (mg/kg-day)	A	IRIS	6/5/2008
IRON	NA	1/ug/m3	NA	per (mg/kg-day)	NA	PPRTV	7/29/2008
MANGANESE	NA	1/ug/m3	NA	per (mg/kg-day)	D	IRIS	6/5/2008
VANADIUM	NA	1/ug/m3	NA	per (mg/kg-day)	NA	IRIS	6/5/2008
Volatiles							
1,1,2,2-TETRACHLOROETHANE	5.80E-05	1/ug/m3	2.00E-01	per (mg/kg-day)	C	IRIS	6/5/2008

NA = Not Applicable

(1) IRIS - Integrated Risk Information System. For IRIS values, the date IRIS was searched is provided.
HEAST - Health Effects Assessment Summary Tables. For HEAST values, the date of HEAST is provided.
EPA-NCEA - National Center for Environmental Assessment. For EPA-NCEA values, the date of the article provided by EPA-NCEA is provided.
PPRTV - Provisional Peer Reviewed Toxicity Value
CAL EPA - California Environmental Protection Agency

Weight of Evidence: A - Human carcinogen
B1 - Probable human carcinogen - indicate that limited human data are available
B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
C - Possible human carcinogen
D - Not classifiable as a human carcinogen
E - Evidence of noncarcinogenicity

TABLE 4-7.1

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SMOKE GENERATOR DEBRIS AREA

MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Current Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Maxwell Point Smoke Generator Debris Area	Ingestion	**Volatiles**												
				1,1,2,2-TETRACHLOROETHANE	1.10E-03	(mg/L)	1.99E-08	(mg/kg-day)	2.00E-01	per (mg/kg-day)	3.98E-09	1.74E-07	(mg/kg-day)	4.00E-03	(mg/kg-day)	4.35E-05
			Exp. Route Total								3.98E-09					4.35E-05
			Dermal	**Volatiles**												
				1,1,2,2-TETRACHLOROETHANE	1.10E-03	(mg/L)	1.81E-08	(mg/kg-day)	2.00E-01	per (mg/kg-day)	3.62E-09	1.59E-07	(mg/kg-day)	4.00E-03	(mg/kg-day)	3.96E-05
			Exp. Route Total								3.62E-09					3.96E-05
		Exposure Point Total									7.60E-09					8.32E-05
	Exposure Medium Total										7.60E-09					8.32E-05
Surface Water Total											7.60E-09					8.32E-05
Soil	Surface Soil	Maxwell Point Smoke Generator Debris Area	Ingestion	**Inorganics**												
				ALUMINUM	1.75E+04	(mg/kg)	3.17E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	2.77E-03	(mg/kg-day)	1.00E+00	(mg/kg-day)	2.77E-03
				ARSENIC	6.01E+00	(mg/kg)	1.09E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.63E-07	9.51E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.17E-03
				CHROMIUM, TOTAL	3.05E+01	(mg/kg)	5.52E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	4.83E-06	(mg/kg-day)	3.00E-03	(mg/kg-day)	1.61E-03
				IRON	2.66E+04	(mg/kg)	4.81E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	4.21E-03	(mg/kg-day)	7.00E-01	(mg/kg-day)	6.02E-03
				MANGANESE	3.91E+02	(mg/kg)	7.07E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	6.19E-05	(mg/kg-day)	4.60E-02	(mg/kg-day)	1.35E-03
				VANADIUM	4.09E+01	(mg/kg)	7.40E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	6.47E-06	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.29E-03
			Exp. Route Total								1.63E-07					1.62E-02
			Dermal[1]	**Inorganics**												
				ALUMINUM	1.75E+04	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	1.00E+00	(mg/kg-day)	--
				ARSENIC	6.01E+00	(mg/kg)	3.78E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	5.68E-08	3.31E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.10E-03
				CHROMIUM, TOTAL	3.05E+01	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	7.50E-05	(mg/kg-day)	--
				IRON	2.66E+04	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	7.00E-01	(mg/kg-day)	--
				MANGANESE	3.91E+02	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	1.84E-03	(mg/kg-day)	--
				VANADIUM	4.09E+01	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	1.30E-04	(mg/kg-day)	--
			Exp. Route Total								5.68E-08					1.10E-03
		Exposure Point Total									2.20E-07					1.73E-02
	Exposure Medium Total										2.20E-07					1.73E-02
	Air	Maxwell Point Smoke Generator Debris Area	Inhalation	**Inorganics**												
				ALUMINUM	1.33E-05	(mg/m^3)	1.21E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	1.06E-07	(mg/kg-day)	1.00E-03	(mg/kg-day)	1.06E-04
				ARSENIC	4.55E-09	(mg/m^3)	4.15E-12	(mg/kg-day)	1.51E+01	per (mg/kg-day)	6.27E-11	3.63E-11	(mg/kg-day)	NA	(mg/kg-day)	--
				CHROMIUM, TOTAL	2.31E-08	(mg/m^3)	2.11E-11	(mg/kg-day)	4.10E+01	per (mg/kg-day)	8.64E-10	1.84E-10	(mg/kg-day)	3.00E-05	(mg/kg-day)	6.14E-06
				IRON	2.02E-05	(mg/m^3)	1.84E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	1.61E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				MANGANESE	2.96E-07	(mg/m^3)	2.70E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	2.36E-09	(mg/kg-day)	1.43E-05	(mg/kg-day)	1.65E-04
				VANADIUM	3.10E-08	(mg/m^3)	2.83E-11	(mg/kg-day)	NA	per (mg/kg-day)	--	2.47E-10	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								9.26E-10					2.77E-04
		Exposure Point Total									9.26E-10					2.77E-04
	Exposure Medium Total										9.26E-10					2.77E-04
Soil Total											2.21E-07					1.76E-02
										Total of Receptor Risks Across All Media	2.28E-07				Total of Receptor Hazards Across All Media	1.77E-02

1) Dermal intake value is "NA" due to no published dermal absorption fraction for COPC. Please see USEPA 2004 guidance and Table 4-5.5.
EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 4-7 2

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SMOKE GENERATOR DEBRIS AREA

MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Current Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Maxwell Point Smoke Generator Debris Area	Ingestion	**Volatiles** 1,1,2,2-TETRACHLOROETHANE	1.10E-03	(mg/L)	3.84E-08	(mg/kg-day)	2.00E-01	per (mg/kg-day)	7.69E-09	1.08E-07	(mg/kg-day)	4.00E-03	(mg/kg-day)	2.69E-05
			Exp. Route Total								7.69E-09					2.69E-05
			Dermal	**Volatiles** 1,1,2,2-TETRACHLOROETHANE	1.10E-03	(mg/L)	1.75E-08	(mg/kg-day)	2.00E-01	per (mg/kg-day)	3.50E-09	4.90E-08	(mg/kg-day)	4.00E-03	(mg/kg-day)	1.23E-05
			Exp. Route Total								3.50E-09					1.23E-05
		Exposure Point Total									1.12E-08					3.92E-05
	Exposure Medium Total										1.12E-08					3.92E-05
Surface Water Total											1.12E-08					3.92E-05
Soil	Surface Soil	Maxwell Point Smoke Generator Debris Area	Ingestion	**Inorganics** ARSENIC	6.01E+00	(mg/kg)	2.10E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	3.15E-07	5.88E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.96E-03
			Exp. Route Total								3.15E-07					1.96E-03
			Dermal[1]	**Inorganics** ARSENIC	6.01E+00	(mg/kg)	8.32E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.25E-07	2.33E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	7.76E-04
			Exp. Route Total								1.25E-07					7.76E-04
		Exposure Point Total									4.40E-07					2.74E-03
	Exposure Medium Total										4.40E-07					2.74E-03
	Air	Maxwell Point Smoke Generator Debris Area	Inhalation	**Inorganics** ARSENIC	4.55E-09	(mg/m^3)	6.36E-11	(mg/kg-day)	1.51E+01	per (mg/kg-day)	9.61E-10	1.78E-10	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								9.61E-10					0.00E+00
		Exposure Point Total									9.61E-10					0.00E+00
	Exposure Medium Total										9.61E-10					0.00E+00
Soil Total											4.41E-07					2.74E-03
										Total of Receptor Risks Across All Media	4.52E-07				Total of Receptor Hazards Across All Media	2.78E-03

1) Dermal intake value is "NA" due to no published dermal absorption fraction for COPC. Please see USEPA 2004 guidance and Table 4-5 3.
EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 4-7.3

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SMOKE GENERATOR DEBRIS AREA

MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Future
Receptor Population: Commercial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Total Soil	Maxwell Point Smoke Generator Debris Area	Ingestion	Inorganics ARSENIC	6.01E+00	(mg/kg)	1.05E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.58E-06	2.94E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	9.80E-03
			Exp. Route Total								**1.58E-06**					**9.80E-03**
			Dermal[1]	Inorganics ARSENIC	6.01E+00	(mg/kg)	4.16E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	6.24E-07	1.16E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.88E-03
			Exp. Route Total								**6.24E-07**					**3.88E-03**
		Exposure Point Total									**2.20E-06**					**1.37E-02**
	Exposure Medium Total										**2.20E-06**					**1.37E-02**
	Air	Maxwell Point Smoke Generator Debris Area	Inhalation	Inorganics ARSENIC	4.55E-09	(mg/m^3)	1.06E-10	(mg/kg-day)	1.51E+01	per (mg/kg-day)	1.60E-09	2.97E-10	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**1.60E-09**					**0.00E+00**
		Exposure Point Total									**1.60E-09**					**0.00E+00**
	Exposure Medium Total										**1.60E-09**					**0.00E+00**
Soil Total											**2.20E-06**					**1.37E-02**
										Total of Receptor Risks Across All Media	**2.20E-06**				Total of Receptor Hazards Across All Media	**1.37E-02**

1) Dermal intake value is "NA" due to no published dermal absorption fraction for COPC. Please see USEPA 2004 guidance and Table 4-5.3.
EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 4-7.4

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SMOKE GENERATOR DEBRIS AREA

MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil	Total Soil	Maxwell Point Smoke Generator Debris Area	Ingestion	**Inorganics**												
				ARSENIC	6.01E+00	(mg/kg)	4.03E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	6.05E-07	2.82E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	9.41E-02
			Exp. Route Total								6.05E-07					9.41E-02
			Dermal[1]	**Inorganics**												
				ARSENIC	6.01E+00	(mg/kg)	2.50E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	3.74E-08	1.75E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	5.82E-03
			Exp. Route Total								3.74E-08					5.82E-03
		Exposure Point Total									6.42E-07					9.99E-02
	Exposure Medium Total										6.42E-07					9.99E-02
	Air	Maxwell Point Smoke Generator Debris Area	Inhalation	**Inorganics**												
				ARSENIC	4.55E-09	(mg/m^3)	2.44E-11	(mg/kg-day)	1.51E+01	per (mg/kg-day)	3.69E-10	1.71E-09	(mg/kg-day)	NA	(mg/kg-day)	–
			Exp. Route Total								3.69E-10					–
		Exposure Point Total									3.69E-10					–
	Exposure Medium Total										3.69E-10					–
Soil Total											6.43E-07					9.99E-02
										Total of Receptor Risks Across All Media	6.43E-07				Total of Receptor Hazards Across All Media	9.99E-02

1) Dermal intake value is "NA" due to no published dermal absorption fraction for COPC. Please see USEPA 2004 guidance and Table 4-5.3.
EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 4-7.5

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SMOKE GENERATOR DEBRIS AREA

MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Maxwell Point Smoke Generator Debris Area	Ingestion	**Volatiles**												
				1,1,2,2-TETRACHLOROETHANE	1.10E-03	(mg/L)	7.68E-08	(mg/kg-day)	2.00E-01	per (mg/kg-day)	1.54E-08	2.24E-07	(mg/kg-day)	4.00E-03	(mg/kg-day)	5.60E-05
			Exp. Route Total								1.54E-08					5.60E-05
			Dermal	**Volatiles**												
				1,1,2,2-TETRACHLOROETHANE	1.10E-03	(mg/L)	1.91E-07	(mg/kg-day)	2.00E-01	per (mg/kg-day)	3.81E-08	5.56E-07	(mg/kg-day)	4.00E-03	(mg/kg-day)	1.39E-04
			Exp. Route Total								3.81E-08					1.39E-04
		Exposure Point Total									5.35E-08					1.95E-04
	Exposure Medium Total										5.35E-08					1.95E-04
Surface Water Total											5.35E-08					1.95E-04
Soil	Total Soil	Maxwell Point Smoke Generator Debris Area	Ingestion	**Inorganics**												
				ALUMINUM	1.75E+04	(mg/kg)	8.22E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	2.40E-02	(mg/kg-day)	1.00E+00	(mg/kg-day)	2.40E-02
				ARSENIC	6.01E+00	(mg/kg)	2.82E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	4.23E-06	8.23E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	2.74E-02
				CHROMIUM, TOTAL	3.05E+01	(mg/kg)	1.43E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	4.18E-05	(mg/kg-day)	3.00E-03	(mg/kg-day)	1.39E-02
				IRON	2.66E+04	(mg/kg)	1.25E-02	(mg/kg-day)	NA	per (mg/kg-day)	--	3.64E-02	(mg/kg-day)	7.00E-01	(mg/kg-day)	5.21E-02
				MANGANESE	3.91E+02	(mg/kg)	1.84E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	5.36E-04	(mg/kg-day)	4.60E-02	(mg/kg-day)	1.16E-02
				VANADIUM	4.09E+01	(mg/kg)	1.92E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	5.60E-05	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.12E-02
			Exp. Route Total								4.23E-06					1.40E-01
			Dermal[1]	**Inorganics**												
				ALUMINUM	1.75E+04	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	1.00E+00	(mg/kg-day)	--
				ARSENIC	6.01E+00	(mg/kg)	3.38E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	5.07E-07	9.85E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.28E-03
				CHROMIUM, TOTAL	3.05E+01	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	7.50E-05	(mg/kg-day)	--
				IRON	2.66E+04	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	7.00E-01	(mg/kg-day)	--
				MANGANESE	3.91E+02	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	1.84E-03	(mg/kg-day)	--
				VANADIUM	4.09E+01	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	1.30E-04	(mg/kg-day)	--
			Exp. Route Total								5.07E-07					3.28E-03
		Exposure Point Total									4.74E-06					1.44E-01
	Exposure Medium Total										4.74E-06					1.44E-01
	Air	Maxwell Point Smoke Generator Debris Area	Inhalation	**Inorganics**												
				ALUMINUM	1.33E-05	(mg/m^3)	1.24E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	3.63E-06	(mg/kg-day)	1.00E-03	(mg/kg-day)	3.63E-03
				ARSENIC	4.55E-09	(mg/m^3)	4.28E-10	(mg/kg-day)	1.51E+01	per (mg/kg-day)	6.46E-09	1.25E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				CHROMIUM, TOTAL	2.31E-08	(mg/m^3)	2.17E-09	(mg/kg-day)	4.10E+01	per (mg/kg-day)	8.90E-08	6.33E-09	(mg/kg-day)	3.00E-05	(mg/kg-day)	2.11E-04
				IRON	2.02E-05	(mg/m^3)	1.89E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	5.52E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				MANGANESE	2.96E-07	(mg/m^3)	2.78E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	8.11E-08	(mg/kg-day)	1.43E-05	(mg/kg-day)	5.67E-03
				VANADIUM	3.10E-08	(mg/m^3)	2.91E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	8.49E-09	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								9.54E-08					9.51E-03
		Exposure Point Total									9.54E-08					9.51E-03
	Exposure Medium Total										9.54E-08					9.51E-03
Soil Total											4.84E-06					1.53E-01
										Total of Receptor Risks Across All Media	4.89E-06				Total of Receptor Hazards Across All Media	1.53E-01

1) Dermal intake value is "NA" due to no published dermal absorption fraction for COPC. Please see USEPA 2004 guidance and Table 4-5.3.
EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 4-7.6

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

SMOKE GENERATOR DEBRIS AREA

MAXWELL POINT - OTHER EDGEWOOD AREA

Scenario Timeframe Future
Receptor Population Resident
Receptor Age Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		R/D/R/C		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Maxwell Point Smoke Generator Debris Area	Ingestion	**Volatiles**												
				1,1,2,2-TETRACHLOROETHANE	1.10E-03	(mg/L)	1.79E-08	(mg/kg-day)	2.00E-01	per (mg/kg-day)	3.58E-09	2.09E-07	(mg/kg-day)	4.00E-03	(mg/kg-day)	5.22E-05
			Exp. Route Total								3.58E-09					5.22E-05
			Dermal	**Volatiles**												
				1,1,2,2-TETRACHLOROETHANE	1.10E-03	(mg/L)	8.16E-08	(mg/kg-day)	2.00E-01	per (mg/kg-day)	1.63E-08	9.52E-07	(mg/kg-day)	4.00E-03	(mg/kg-day)	3.81E-09
			Exp. Route Total								1.63E-08					3.81E-09
		Exposure Point Total									1.99E-08					5.22E-05
	Exposure Medium Total										1.99E-08					5.22E-05
Surface Water Total											1.99E-08					5.22E-05
Soil	Total Soil	Maxwell Point Smoke Generator Debris Area	Ingestion	**Inorganics**												
				ALUMINUM	1.75E+04	(mg/kg)	1.92E-02	(mg/kg-day)	NA	per (mg/kg-day)	--	2.24E-01	(mg/kg-day)	1.00E+00	(mg/kg-day)	2.24E-01
				ARSENIC	6.01E+00	(mg/kg)	6.59E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	9.88E-06	7.68E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	2.56E-01
				CHROMIUM, TOTAL	3.05E+01	(mg/kg)	3.34E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	3.90E-04	(mg/kg-day)	3.00E-03	(mg/kg-day)	1.30E-01
				IRON	2.66E+04	(mg/kg)	2.92E-02	(mg/kg-day)	NA	per (mg/kg-day)	--	3.40E-01	(mg/kg-day)	7.00E-01	(mg/kg-day)	4.86E-01
				MANGANESE	3.91E+02	(mg/kg)	4.28E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	5.00E-03	(mg/kg-day)	4.60E-02	(mg/kg-day)	1.09E-01
				VANADIUM	4.09E+01	(mg/kg)	4.48E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	5.23E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.05E-01
			Exp. Route Total								9.88E-06					1.31E+00
			Dermal[1]	**Inorganics**												
				ALUMINUM	1.75E+04	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	1.00E+00	(mg/kg-day)	--
				ARSENIC	6.01E+00	(mg/kg)	5.53E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	8.30E-07	6.45E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	2.15E-02
				CHROMIUM, TOTAL	3.05E+01	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	7.50E-05	(mg/kg-day)	--
				IRON	2.66E+04	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	7.00E-01	(mg/kg-day)	--
				MANGANESE	3.91E+02	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	1.84E-03	(mg/kg-day)	--
				VANADIUM	4.09E+01	(mg/kg)	NA	(mg/kg-day)	NA	per (mg/kg-day)	--	NA	(mg/kg-day)	1.30E-04	(mg/kg-day)	--
			Exp. Route Total								8.30E-07					2.15E-02
		Exposure Point Total									1.07E-05					1.33E+00
	Exposure Medium Total										1.07E-05					1.33E+00
	Air	Maxwell Point Smoke Generator Debris Area	Inhalation	**Inorganics**												
				ALUMINUM	1.33E-05	(mg/m^3)	6.10E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	7.12E-06	(mg/kg-day)	1.00E-03	(mg/kg-day)	7.12E-03
				ARSENIC	4.55E-09	(mg/m^3)	2.10E-10	(mg/kg-day)	1.51E+01	per (mg/kg-day)	3.16E-09	2.44E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				CHROMIUM, TOTAL	2.31E-08	(mg/m^3)	1.06E-09	(mg/kg-day)	4.10E+01	per (mg/kg-day)	4.36E-08	1.24E-08	(mg/kg-day)	3.00E-05	(mg/kg-day)	4.14E-04
				IRON	2.02E-05	(mg/m^3)	9.28E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.08E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				MANGANESE	2.96E-07	(mg/m^3)	1.36E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	1.59E-07	(mg/kg-day)	1.43E-05	(mg/kg-day)	1.11E-02
				VANADIUM	3.10E-08	(mg/m^3)	1.43E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	1.66E-08	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								4.68E-08					1.87E-02
		Exposure Point Total									4.68E-08					1.87E-02
	Exposure Medium Total										4.68E-08					1.87E-02
Soil Total											1.08E-05					1.35E+00
										Total of Receptor Risks Across All Media	1.08E-05				Total of Receptor Hazards Across All Media	1.35E+00

1) Dermal intake value is "NA" due to no published dermal absorption fraction for COPC. Please see USEPA 2004 guidance and Table 4-5.3

EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 4-7.7

CALCULATIONS OF AIR CONCENTRATIONS DUE TO DUST ENTRAINMENT FROM SURFACE SOIL

SMOKE GENERATOR DEBRIS AREA

MAXWELL POINT - OTHER EDGEWOOD AREA

Model Equations:

Particulate Emmision Factor	PEF = Q/C x [(3,600 s/h)/(.36 x (1- V) x (Um/Ut)^3 x F(x))] =	1.32E+09
Air Concentration	Cair = Csoil/PEF	m^3/kg

Model Constants:

Q/C	9.08E+01	g/m^2-s per kg/m^3	Inverse Mean Concentration at Center of 0.05 square, U.S. EPA 1996a
V	5.00E-01	unitless	Default, U.S. EPA 1996a
Um	4.69E+00	m/s	Mean annual wind speed, EPA, 1996a
Ut	1.13E+01	m/s	Equivalent threshold value of windspeed at 7 m, EPA, 1996a
F(x)	1.94E-01	unitless	Default, U.S. EPA 1996a

Reference for the model: USEPA Soil Screening Guidance: Technical Background Document. Office of Emergency and Remedial Response. U.S. EPA, 1996a.

Chemical	Csoil, Surface Soil RME EPC mg/kg	Csoil, Total Soil RME EPC mg/kg	Cair, Surface Soil Particulate RME EPC mg/m^3	Cair, Total Soil Particulate RME EPC mg/m^3
Inorganics				
ALUMINUM	1.75E+04	1.75E+04	1.33E-05	1.33E-05
ARSENIC	6.01E+00	6.01E+00	4.55E-09	4.55E-09
CHROMIUM, TOTAL	3.05E+01	3.05E+01	2.31E-08	2.31E-08
IRON	2.66E+04	2.66E+04	2.02E-05	2.02E-05
MANGANESE	3.91E+02	3.91E+02	2.96E-07	2.96E-07
VANADIUM	4.09E+01	4.09E+01	3.10E-08	3.10E-08

TABLE 4-9.1

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

SMOKE GENERATOR DEBRIS AREA

MAXWELL POINT - OTHER EDGEWOOD AREA

Location Other Edgewood Area

Scenario Timeframe: Current/Future
Receptor Population Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Soil	Surface Soil	Maxwell Point	**Inorganics**					**Inorganics**					
		Smoke Generator	ALUMINUM	--	--	--	NA	ALUMINUM	Central Nervous System	2.8E-03	--	1.1E-04	2.9E-03
		Debris Area	ARSENIC	1.6E-07	5.7E-08	6.3E-11	2.2E-07	ARSENIC	Skin	3.2E-03	1.1E-03	--	4.3E-03
			CHROMIUM, TOTAL	--	--	8.6E-10	8.6E-10	CHROMIUM, TOTAL	None	1.6E-03	--	6.1E-06	1.6E-03
			IRON	--	--	--	NA	IRON	None	6.0E-03	--	--	6.0E-03
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	1.3E-03	--	1.7E-04	1.5E-03
			VANADIUM	--	--	--	NA	VANADIUM	Hair	1.3E-03	--	--	1.3E-03
			(Total)	1.6E-07	5.7E-08	9.3E-10	2.2E-07		(Total)	1.6E-02	1.1E-03	2.8E-04	1.8E-02
						Total Risk Across Surface Soil	**2.2E-07**					**Total Hazard Index Across Surface Soil**	**1.8E-02**
Surface Water	Surface Water	Maxwell Point	**Volatiles**					**Volatiles**					
		Smoke Generator	1,1,2,2-TETRACHLOROETHANE	4.0E-09	3.6E-09	--	7.6E-09	1,1,2,2-TETRACHLOROETHANE	Liver	4.4E-05	4.0E-05	--	8.3E-05
		Debris Area	(Total)	4.0E-09	3.6E-09	---	7.6E-09		(Total)	4.4E-05	4.0E-05	---	8.3E-05
						Total Risk Across Surface Water	**7.6E-09**					**Total Hazard Index Across Surface Water**	**8.3E-05**
						Total Risk Across All Media and All Exposure Routes	**2.3E-07**					**Total Hazard Index Across All Media and All Exposure Routes**	**1.8E-02**

TABLE 4-9.2

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

SMOKE GENERATOR DEBRIS AREA

MAXWELL POINT - OTHER EDGEWOOD AREA

Location: Other Edgewood Area
Scenario Timeframe: Current/Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Soil	Surface Soil	Maxwell Point	**Inorganics**					**Inorganics**					
		Smoke Generator	ARSENIC	3.2E-07	1.2E-07	9.6E-10	4.4E-07	ARSENIC	Skin	2.0E-03	7.8E-04	--	2.7E-03
		Debris Area	(Total)	3.2E-07	1.2E-07	9.6E-10	4.4E-07		(Total)	2.0E-03	7.8E-04	---	2.7E-03
					Total Risk Across Surface Soil		**4.4E-07**				**Total Hazard Index Across Surface Soil**		**2.7E-03**
Surface Water	Surface Water	Maxwell Point	**Volatiles**					**Volatiles**					
		Smoke Generator	1,1,2,2-TETRACHLOROETHANE	7.7E-09	3.5E-09	--	1.1E-08	1,1,2,2-TETRACHLOROETHANE	Liver	2.7E-05	1.2E-05	--	3.9E-05
		Debris Area	(Total)	7.7E-09	3.5E-09	---	1.1E-08		(Total)	2.7E-05	1.2E-05	---	3.9E-05
						Total Risk Across Surface Water	**1.1E-08**				**Total Hazard Index Across Surface Water**		**3.9E-05**
						Total Risk Across All Media and All Exposure Routes	**4.5E-07**					**Total Hazard Index Across All Media and All Exposure Routes**	**2.8E-03**

TABLE 4-9.3

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

SMOKE GENERATOR DEBRIS AREA

MAXWELL POINT - OTHER EDGEWOOD AREA

Location: Other Edgewood Area

Scenario Timeframe: Future
Receptor Population: Commercial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Soil	Total Soil	Maxwell Point Smoke Generator Debris Area	**Inorganics**					**Inorganics**					
			ARSENIC	1.6E-06	6.2E-07	1.6E-09	2.2E-06	ARSENIC	Skin	9.8E-03	3.9E-03	--	1.4E-02
			(Total)	1.6E-06	6.2E-07	1.6E-09	2.2E-06		(Total)	9.8E-03	3.9E-03	--	1.4E-02
				Total Risk Across Total Soil			**2.2E-06**			**Total Hazard Index Across Total Soil**			**1.4E-02**
			Total Risk Across All Media and All Exposure Routes				**2.2E-06**		**Total Hazard Index Across All Media and All Exposure Routes**				**1.4E-02**

TABLE 4-9.4

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

SMOKE GENERATOR DEBRIS AREA

MAXWELL POINT - OTHER EDGEWOOD AREA

Location: Other Edgewood Area
Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Soil	Total Soil	Maxwell Point Smoke Generator Debris Area	**Inorganics**					**Inorganics**					
			ARSENIC	6.0E-07	3.7E-08	3.7E-10	6.4E-07	ARSENIC	Skin	9.4E-02	5.8E-03	--	1.0E-01
			(Total)	6.0E-07	3.7E-08	3.7E-10	6.4E-07		(Total)	9.4E-02	5.8E-03	--	1.0E-01
				Total Risk Across Total Soil			**6.4E-07**			**Total Hazard Index Across Total Soil**			**1.0E-01**
			Total Risk Across All Media and All Exposure Routes				**6.4E-07**		**Total Hazard Index Across All Media and All Exposure Routes**				**1.0E-01**

TABLE 4-9.5

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

SMOKE GENERATOR DEBRIS AREA

MAXWELL POINT - OTHER EDGEWOOD AREA

Location: Other Edgewood Area
Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Soil	Total Soil Child	Maxwell Point Smoke Generator Debris Area	**Inorganics**					**Inorganics**					
			ALUMINUM	--	--	--	NA	ALUMINUM	Central Nervous System	2.2E-01	--	7.1E-03	2.3E-01
			ARSENIC	9.9E-06	8.3E-07	3.2E-09	1.1E-05	ARSENIC	Skin	2.6E-01	2.2E-02	--	2.8E-01
			CHROMIUM, TOTAL	--	--	4.4E-08	4.4E-08	CHROMIUM, TOTAL	None	1.3E-01	--	4.1E-04	1.3E-01
			IRON	--	--	--	NA	IRON	None	4.9E-01	--	--	4.9E-01
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	1.1E-01	--	1.1E-02	1.2E-01
			VANADIUM	--	--	--	NA	VANADIUM	Hair	1.0E-01	--	--	1.0E-01
			(Total for Child)	9.9E-06	8.3E-07	4.7E-08	1.1E-05		(Total for Child)	1.3E+00	2.2E-02	1.9E-02	1.3E+00
	Total Soil Adult	Maxwell Point Smoke Generator Debris Area	**Inorganics**					**Inorganics**					
			ALUMINUM	--	--	--	NA	ALUMINUM	Central Nervous System	2.4E-02	--	3.6E-03	2.8E-02
			ARSENIC	4.2E-06	5.1E-07	6.5E-09	4.7E-06	ARSENIC	Skin	2.7E-02	3.3E-03	--	3.1E-02
			CHROMIUM, TOTAL	--	--	8.9E-08	8.9E-08	CHROMIUM, TOTAL	None	1.4E-02	--	2.1E-04	1.4E-02
			IRON	--	--	--	NA	IRON	None	5.2E-02	--	--	5.2E-02
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	1.2E-02	--	5.7E-03	1.7E-02
			VANADIUM	--	--	--	NA	VANADIUM	Hair	1.1E-02	--	--	1.1E-02
			(Total for Adult)	4.2E-06	5.1E-07	9.5E-08	4.8E-06		(Total for Adult)	1.4E-01	3.3E-03	9.5E-03	1.5E-01
	Total Soil Adult + Child	Maxwell Point Smoke Generator Debris Area	**Inorganics**										
			ALUMINUM	NA	NA	NA	NA						
			ARSENIC	1.4E-05	1.3E-06	9.6E-09	1.5E-05						
			CHROMIUM, TOTAL	NA	NA	1.3E-07	1.3E-07						
			IRON	NA	NA	NA	NA						
			MANGANESE	NA	NA	NA	NA						
			VANADIUM	NA	NA	NA	NA						
			(Total for Child + Adult)	1.4E-05	1.3E-06	1.4E-07	1.6E-05		**Total Hazard Index Across Total Soil (Child)**				**1.3E+00**
			Total Risk Across Total Soil				**1.6E-05**		**Total Hazard Index Across Total Soil (Adult)**				**1.5E-01**
Surface Water	Surface Water Child	Maxwell Point Smoke Generator Debris Area	**Volatiles**					**Volatiles**					
			1,1,2,2-TETRACHLOROETHANE	3.6E-09	1.6E-08	--	2.0E-08	1,1,2,2-TETRACHLOROETHANE	Liver	5.2E-05	3.8E-09	--	5.2E-05
			(Total for Child)	3.6E-09	1.6E-08	--	2.0E-08		(Total for Child)	5.2E-05	3.8E-09	--	5.2E-05
	Surface Water Adult	Maxwell Point Smoke Generator Debris Area	**Volatiles**					**Volatiles**					
			1,1,2,2-TETRACHLOROETHANE	1.5E-08	3.8E-08	--	5.3E-08	1,1,2,2-TETRACHLOROETHANE	Liver	5.6E-05	1.4E-04	--	1.9E-04
			(Total for Adult)	1.5E-08	3.8E-08	--	5.3E-08		(Total for Adult)	5.6E-05	1.4E-04	--	1.9E-04
	Surface Water Adult + Child	Maxwell Point Smoke Generator Debris Area	**Volatiles**										
			1,1,2,2-TETRACHLOROETHANE	1.9E-08	5.4E-08	NA	7.3E-08						
			(Total for Child + Adult)	1.9E-08	5.4E-08	--	7.3E-08		**Total Hazard Index Across Surface Water (Child)**				**5.2E-05**
			Total Risk Across Surface Water (Adult + Child)				**7.3E-08**		**Total Hazard Index Across Surface Water (Adult)**				**1.9E-04**
			Total Risk Across All Media and All Exposure Routes				**1.6E-05**		**Total Hazard Index Across All Media and All Exposure Routes (Child)**				**1.3E+00**
									Total Hazard Index Across All Media and All Exposure Routes (Adult)				**1.5E-01**

TABLE 4-10.1

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

SMOKE GENERATOR DEBRIS AREA

MAXWELL POINT - OTHER EDGEWOOD AREA

Location: Other Edgewood Area

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
					Total Risk Across Surface Soil		---			Total Hazard Index Across Surface Soil			---
						Total Risk Across Surface Water	---			Total Hazard Index Across Surface Water			---
						Total Risk Across All Media and All Exposure Routes	---			Total Hazard Index Across All Media and All Exposure Routes			---

TABLE 4-10.2

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

SMOKE GENERATOR DEBRIS AREA

MAXWELL POINT - OTHER EDGEWOOD AREA

Location: Other Edgewood Area

Scenario Timeframe: Current/Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
					Total Risk Across Surface Soil		---			Total Hazard Index Across Surface Soil			---
						Total Risk Across Surface Water	---			Total Hazard Index Across Surface Water			---
						Total Risk Across All Media and All Exposure Routes	---			Total Hazard Index Across All Media and All Exposure Routes			---

TABLE 4-10.3

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

SMOKE GENERATOR DEBRIS AREA

MAXWELL POINT - OTHER EDGEWOOD AREA

Location: Other Edgewood Area

Scenario Timeframe: Future
Receptor Population: Commercial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Soil	Total Soil	Maxwell Point Smoke Generator Debris Area	**Inorganics**					**Inorganics**					
			ARSENIC	1.6E-06	6.2E-07	1.6E-09	2.2E-06	ARSENIC	Skin	--	--	--	NA
			(Total)	1.6E-06	6.2E-07	1.6E-09	2.2E-06		(Total)	---	---	---	---
				Total Risk Across Total Soil			**2.2E-06**			**Total Hazard Index Across Total Soil**			**—**
			Total Risk Across All Media and All Exposure Routes				**2.2E-06**		**Total Hazard Index Across All Media and All Exposure Routes**				**—**

TABLE 4-10.4

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

SMOKE GENERATOR DEBRIS AREA

MAXWELL POINT - OTHER EDGEWOOD AREA

Location: Other Edgewood Area

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
				Total Risk Across Total Soil			—			Total Hazard Index Across Total Soil			NA
Total Risk Across All Media and All Exposure Routes							—	Total Hazard Index Across All Media and All Exposure Routes					0.0E+00

TABLE 4-10.5
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
SMOKE GENERATOR DEBRIS AREA
MAXWELL POINT - OTHER EDGEWOOD AREA

Location: Other Edgewood Area
Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Soil	Total Soil Child	Maxwell Point Smoke Generator Debris Area	**Inorganics**					**Inorganics**					
			ALUMINUM	--	--	--	NA	ALUMINUM	Central Nervous System	2.2E-01	--	7.1E-03	2.3E-01
			ARSENIC	9.9E-06	8.3E-07	3.2E-09	1.1E-05	ARSENIC	Skin	2.6E-01	2.2E-02	--	2.8E-01
			CHROMIUM, TOTAL	--	--	--	NA	CHROMIUM, TOTAL	None	1.3E-01	--	4.1E-04	1.3E-01
			IRON	--	--	--	NA	IRON	None	4.9E-01	--	--	4.9E-01
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	1.1E-01	--	1.1E-02	1.2E-01
			VANADIUM	--	--	--	NA	VANADIUM	Hair	1.0E-01	--	--	1.0E-01
			(Total for Child)	9.9E-06	8.3E-07	3.2E-09	1.1E-05		(Total for Child)	1.3E+00	2.2E-02	1.9E-02	1.3E+00
	Total Soil Adult	Maxwell Point Smoke Generator Debris Area	**Inorganics**					**Inorganics**					
			ARSENIC	4.2E-06	5.1E-07	6.5E-09	4.7E-06	ARSENIC	Skin	--	--	--	NA
			(Total for Adult)	4.2E-06	5.1E-07	6.5E-09	4.7E-06		(Total for Adult)	---	---	---	---
	Total Soil Adult + Child	Maxwell Point Smoke Generator Debris Area	**Inorganics**										
			ARSENIC	1.4E-05	1.3E-06	9.6E-09	1.5E-05						
			(Total for Child + Adult)	1.4E-05	1.3E-06	9.6E-09	1.5E-05						
						Total Risk Across Total Soil	**1.5E-05**					**Total Hazard Index Across Total Soil (Child)**	**1.3E+00**
												Total Hazard Index Across Total Soil (Adult)	---
						Total Risk Across Surface Water (Adult + Child)	—					**Total Hazard Index Across Surface Water (Adult)**	--
						Total Risk Across All Media and All Exposure Routes	**1.5E-05**					**Total Hazard Index Across All Media and All Exposure Routes (Child)**	**1.3E+00**
												Total Hazard Index Across All Media and All Exposure Routes (Adult)	---

Total Hazard Index for CNS (Child)	**3.5E-01**
Total Hazard Index for Skin (Child)	**2.8E-01**
Total Hazard Index for Chromium (Child)	**1.3E-01**
Total Hazard Index for Iron (Child)	**4.9E-01**
Total Hazard Index for Hair (Child)	**1.0E-01**

TABLE 4-11.1
COMPARISON TO REFERENCE DATA UPLS - SURFACE SOIL
SMOKE GENERATOR DEBRIS AREA
MAXWELL POINT - OTHER EDGEWOOD AREA

Chemical of Potential Concern	Units	N	FOD	Distribution	Minimum	Maximum	Reference UPL	Site Detected Maximum	Consistent with Reference Data?
Inorganics									
ALUMINUM	MG/KG	44	100%	LOGNORMAL	1.06E+03	2.56E+04	1.95E+04	1.75E+04	yes
ARSENIC	MG/KG	41	98%	NONPARAMETRIC	1.25E-01	7.60E+00	7.60E+00	6.40E+00	yes
CHROMIUM	MG/KG	44	100%	LOGNORMAL	3.40E+00	7.08E+01	3.35E+01	3.20E+01	yes
IRON	MG/KG	44	100%	NORMAL	2.17E+03	2.49E+04	2.17E+04	2.98E+04	no
MANGANESE	MG/KG	44	100%	LOGNORMAL	4.95E+00	3.15E+03	1.98E+03	4.28E+02	yes
VANADIUM	MG/KG	44	100%	LOGNORMAL	9.80E+00	5.92E+01	4.57E+01	4.09E+01	yes

FOD = frequency of detection
NA = not applicable

TABLE 4-11.2
COMPARISON TO REFERENCE DATA UPLS - TOTAL SOIL
SMOKE GENERATOR DEBRIS AREA
MAXWELL POINT - OTHER EDGEWOOD AREA

Chemical of Potential Concern	Units	N	FOD	Distribution	Minimum	Maximum	Reference UPL	Site Detected Maximum	Consistent with Reference Data?
Inorganics									
ALUMINUM	MG/KG	55	100%	NONPARAMETRIC	1.06E+03	2.56E+04	2.56E+04	1.75E+04	yes
ARSENIC	MG/KG	52	98%	NONPARAMETRIC	1.25E-01	7.60E+00	7.60E+00	6.40E+00	yes
CHROMIUM	MG/KG	55	100%	LOGNORMAL	3.40E+00	7.08E+01	3.55E+01	3.20E+01	yes
IRON	MG/KG	55	100%	NORMAL	2.17E+03	2.49E+04	2.20E+04	2.98E+04	no
MANGANESE	MG/KG	55	100%	LOGNORMAL	4.95E+00	3.15E+03	1.60E+03	4.28E+02	yes
VANADIUM	MG/KG	55	100%	LOGNORMAL	9.80E+00	5.92E+01	4.66E+01	4.09E+01	yes

FOD = frequency of detection
NA = not applicable
UPL = upper prediction limit

TABLES

GROUNDWATER GROUPING

TABLE 5-2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
MAXWELL POINT INVESTIGATION AREA
GROUNDWATER EVALUATION

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Smoke Generator Debris Area

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (5) Contaminant Deletion or Selection
							AGENT DEGRADATION PRODUCTS										
95-16-9	Benzothiazole	9.10E-01		9.10E-01		ug/L	WMP-05-R1	1/42	5.00E-01 - 1.30E+00	9.10E-01	NA	NA		NA	NA	No	NSL
13590-71-1	Methylphosphonic acid	5.00E+01		5.00E+01		ug/L	WMP-06-R1	1/42	0.00E+00 - 2.50E+02	5.00E+01	NA	NA		NA	NA	No	NSL
							EXPLOSIVES										
98-95-3	Nitrobenzene	1.03E+00	/	6.50E+00	J	ug/L	WMP-05-R1	3/42	0.00E+00 - 1.00E+01	6.50E+00	NA	3.50E-01	N	NA	NA	Yes	ASL
							INORGANICS-DISSOLVED										
7429-90-5	Aluminum	1.81E+01	J	2.87E+03	J	ug/L	WMP-08-R2	25/42	1.71E+01 - 3.57E+01	2.87E+03	8.79E+02	3.70E+03	N	NA	NA	No	BSL
7440-38-2	Arsenic	2.50E+00	J/J	2.19E+02	K	ug/L	WMP-13-R2	17/42	2.30E+00 - 4.10E+00	2.19E+02	1.11E+01	4.50E-02	C	NA	NA	Yes	ASL
7440-39-3	Barium	9.00E+00	B	2.57E+02		ug/L	WMP-11-R2	42/42	0.00E+00 - 2.00E-01	2.57E+02	1.50E+02	7.30E+02	N	NA	NA	No	BSL
7440-41-7	Beryllium	2.30E-01	B/B	6.12E+01		ug/L	WMP-11-R1	21/42	0.00E+00 - 3.00E-01	6.12E+01	1.10E+00	7.30E+00	N	NA	NA	Yes	ASL
7440-43-9	Cadmium	3.00E-01	J	4.00E+00	J	ug/L	WMP-21-R2	11/42	0.00E+00 - 4.00E-01	4.00E+00	3.18E+01	1.80E+00	N	NA	NA	Yes	ASL
7440-70-2	Calcium	3.18E+03	B	9.28E+04		ug/L	WMP-06-R1	42/42	1.56E+01 - 4.60E+01	9.28E+04	2.10E+04	NA		4.00E+05	ADI	No	NUT
7440-47-3	Chromium	8.40E-01	B	4.60E+00	J	ug/L	WMP-15-R2	7/42	5.00E-01 - 1.50E+00	4.60E+00	NA	1.10E+01	N	NA	NA	No	BSL
7440-48-4	Cobalt	2.00E+00	B	1.14E+03		ug/L	WMP-08-R1	40/42	4.00E-01 - 1.40E+00	1.14E+03	1.89E+01	NA		NA	NA	No	NSL
7440-50-8	Copper	1.20E+00	B	5.07E+01		ug/L	WMP-08-R1	20/42	8.00E-01 - 1.20E+00	5.07E+01	2.41E+02	1.50E+02	N	NA	NA	No	BSL
7439-89-6	Iron	1.38E+02		2.01E+05		ug/L	WMP-21-R2	42/42	1.42E+01 - 2.39E+01	2.01E+05	4.52E+04	2.60E+03	N	NA	NA	Yes	ASL
7439-92-1	Lead	1.30E+00	J	6.30E+00		ug/L	WMP-08-R1	12/42	1.00E+00 - 1.70E+00	6.30E+00	1.50E+00	NA		1.50E+01	AL	No	BSL
7439-95-4	Magnesium	1.72E+03	J	2.65E+05		ug/L	WMP-06-R1	42/42	1.08E+01 - 5.30E+01	2.65E+05	1.09E+04	NA		8.10E+04	ADI	No	NUT
7439-96-5	Manganese	5.70E+01		3.13E+03		ug/L	WMP-01-R2	42/42	2.00E-01 - 1.00E+00	3.13E+03	5.28E+02	7.30E+01	N	NA	NA	Yes	ASL
7439-97-6	Mercury	1.30E-01	J/J	1.30E-01	J/J	ug/L	WMP-17-R2/WMP-22-R2	2/42	0.00E+00 - 1.00E-01	1.30E-01	1.00E-01	3.70E-01	N	NA	NA	No	BSL
7440-02-0	Nickel	1.40E+00	J	1.28E+03		ug/L	WMP-08-R1	38/42	9.00E-01 - 1.00E+00	1.28E+03	2.46E+01	7.30E+01	N	NA	NA	Yes	ASL
7440-09-7	Potassium	6.65E+02	J	6.27E+04	D	ug/L	WMP-06-R1	42/42	9.00E+00 - 1.57E+02	6.27E+04	4.83E+03	NA		1.00E+05	ADI	No	NUT
7782-49-2	Selenium	2.30E+00	K	5.90E+00		ug/L	WMP-21-R2	3/42	2.00E+00 - 3.10E+00	5.90E+00	NA	1.80E+01	N	NA	NA	No	BSL
7440-23-5	Sodium	5.25E+03		2.04E+06	D	ug/L	WMP-06-R1	42/42	1.73E+02 - 8.65E+02	2.04E+06	3.32E+04	NA		1.00E+05	ADI	No	NUT
7440-28-0	Thallium	3.30E+00	J	6.20E+00	J	ug/L	WMP-21-R2	7/42	3.00E+00 - 3.80E+00	6.20E+00	NA	2.60E-01	N	NA	NA	Yes	ASL
7440-62-2	Vanadium	8.70E-01	J	1.14E+01	J	ug/L	WMP-19-R2	5/42	0.00E+00 - 2.00E+00	1.14E+01	NA	3.70E+00	N	NA	NA	Yes	ASL
7440-66-6	Zinc	2.00E+00	B	2.90E+03		ug/L	WMP-11-R1	42/42	8.00E-01 - 2.00E+00	2.90E+03	6.87E+01	1.10E+03	N	NA	NA	Yes	ASL
							INORGANICS-TOTAL										
7429-90-5	Aluminum	4.69E+01	B	8.09E+03	K	ug/L	WMP-18-R2	42/42	1.71E+01 - 3.57E+01	8.09E+03	8.79E+02	3.70E+03	N	NA	NA	Yes	ASL
7440-38-2	Arsenic	2.30E+00	J	2.22E+02	K	ug/L	WMP-13-R2	19/42	2.30E+00 - 4.10E+00	2.22E+02	1.11E+01	4.50E-02	C	NA	NA	Yes	ASL
7440-39-3	Barium	1.52E+01	J	2.58E+02		ug/L	WMP-11-R2	42/42	0.00E+00 - 2.00E-01	2.58E+02	1.50E+02	7.30E+02	N	NA	NA	No	BSL
7440-41-7	Beryllium	1.90E-01	B	6.23E+01		ug/L	WMP-11-R1	24/42	0.00E+00 - 3.00E-01	6.23E+01	1.10E+00	7.30E+00	N	NA	NA	Yes	ASL
7440-43-9	Cadmium	3.60E-01	B	4.30E+00	J	ug/L	WMP-21-R2	10/42	0.00E+00 - 4.00E-01	4.30E+00	3.18E+01	1.80E+00	N	NA	NA	Yes	ASL
7440-70-2	Calcium	3.21E+03	B	9.45E+04		ug/L	WMP-06-R1	42/42	1.56E+01 - 4.60E+01	9.45E+04	2.10E+04	NA		4.00E+05	ADI	No	NUT
7440-47-3	Chromium	8.00E-01	J	2.78E+01		ug/L	WMP-18-R2	33/42	5.00E-01 - 1.50E+00	2.78E+01	NA	1.10E+01	N	NA	NA	Yes	ASL
7440-48-4	Cobalt	1.30E+00	B	1.16E+03		ug/L	WMP-08-R1	42/42	4.00E-01 - 1.40E+00	1.16E+03	1.89E+01	NA		NA	NA	No	NSL
7440-50-8	Copper	9.20E-01	B	7.59E+01		ug/L	WMP-08-R1	37/42	8.00E-01 - 1.20E+00	7.59E+01	2.41E+02	1.50E+02	N	NA	NA	No	BSL
7439-89-6	Iron	1.70E+02		1.99E+05		ug/L	WMP-21-R2	42/42	1.42E+01 - 2.39E+01	1.99E+05	4.52E+04	2.60E+03	N	NA	NA	Yes	ASL
7439-92-1	Lead	1.70E+00	J/J/B/B	1.60E+01		ug/L	WMP-05-R1	23/42	1.00E+00 - 1.70E+00	1.60E+01	1.50E+00	NA		1.50E+01	AL	Yes	ASL
7439-95-4	Magnesium	1.76E+03	J	2.70E+05		ug/L	WMP-06-R1	42/42	1.08E+01 - 5.30E+01	2.70E+05	1.09E+04	NA		8.10E+04	ADI	No	NUT
7439-96-5	Manganese	6.45E+01		3.27E+03		ug/L	WMP-01-R2	42/42	2.00E-01 - 1.00E+00	3.27E+03	5.28E+02	7.30E+01	N	NA	NA	Yes	ASL
7439-97-6	Mercury	1.00E-01	J	1.25E-01	J/J	ug/L	WMP-17-R2	2/42	0.00E+00 - 1.00E-01	1.25E-01	1.00E-01	3.70E-01	N	NA	NA	No	BSL
7440-02-0	Nickel	2.10E+00	J	1.30E+03		ug/L	WMP-08-R1	41/42	9.00E-01 - 1.00E+00	1.30E+03	2.46E+01	7.30E+01	N	NA	NA	Yes	ASL
7440-09-7	Potassium	7.09E+02	J	6.42E+04	D	ug/L	WMP-06-R1	42/42	9.00E+00 - 1.57E+02	6.42E+04	4.83E+03	NA		1.00E+05	ADI	No	NUT
7782-49-2	Selenium	2.30E+00	K	3.70E+00	J	ug/L	WMP-21-R2	3/42	2.00E+00 - 3.10E+00	3.70E+00	NA	1.80E+01	N	NA	NA	No	BSL
7440-23-5	Sodium	5.13E+03		2.08E+06	D	ug/L	WMP-06-R1	42/42	1.73E+02 - 8.65E+02	2.08E+06	3.32E+04	NA		1.00E+05	ADI	No	NUT
7440-28-0	Thallium	3.30E+00	J	5.65E+00	L/L	ug/L	WMP-21-R1	8/42	3.00E+00 - 3.80E+00	5.65E+00	NA	2.60E-01	N	NA	NA	Yes	ASL
7440-62-2	Vanadium	1.10E+00	J	4.60E+01	J	ug/L	WMP-18-R2	24/42	0.00E+00 - 2.00E+00	4.60E+01	NA	3.70E+00	N	NA	NA	Yes	ASL
7440-66-6	Zinc	5.80E+00	B	2.92E+03		ug/L	WMP-11-R1	42/42	8.00E-01 - 2.00E+00	2.92E+03	6.87E+01	1.10E+03	N	NA	NA	Yes	ASL

TABLE 5-2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
MAXWELL POINT INVESTIGATION AREA
GROUNDWATER EVALUATION

Scenario Timeframe: Current-Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Smoke Generator Debris Area

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (5) Contaminant Deletion or Selection
							PAHS										
91-20-3	Naphthalene	2.00E+00	J	2.00E+00	J	ug/L	WMP-02-R2	1/42	1.00E+01 - 1.30E+01	2.00E+00	NA	6.50E-01	N	NA	NA	Yes	ASL
							PESTICIDES/PCBS										
72-54-8	4,4'-DDD	7.00E-03	J	2.30E+00	J	ug/L	WMP-20-R2	11/42	0.00E+00 - 2.00E-01	2.30E+00	NA	2.80E-01	C	NA	NA	Yes	ASL
72-55-9	4,4'-DDE	7.15E-03	J/JP	2.20E-02	J	ug/L	WMP-20-R2	4/42	0.00E+00 - 1.30E-01	2.20E-02	NA	2.00E-01	C	NA	NA	No	BSL
50-29-3	4,4'-DDT	9.00E-03	J	1.60E-01		ug/L	WMP-07-R2	3/42	0.00E+00 - 1.30E-01	1.60E-01	NA	2.00E-01	C	NA	NA	No	BSL
319-86-8	delta-BHC	2.20E-02	J	2.20E-02	J	ug/L	WMP-02-R1	1/42	0.00E+00 - 6.30E-02	2.20E-02	NA	1.10E-02	C	NA	NA	Yes	ASL
							SEMI-VOLATILE ORGANIC COMPOUNDS										
121-71-1	3-Hydroxyacetophenone	1.70E+00	J	4.70E+00	J	ug/L	WMP-06-R1	4/36	1.00E+01 - 1.30E+01	4.70E+00	NA	NA		NA	NA	No	BSL
59-50-7	4-Chloro-3-methylphenol	1.10E+00	J	2.80E+00	J	ug/L	WMP-06-R1	5/42	1.00E+01 - 1.30E+01	2.80E+00	NA	1.80E+02	N	NA	NA	No	BSL
99-93-4	4-Hydroxyacetophenone	1.90E+00	J	1.90E+00	J	ug/L	WMP-06-R1	1/36	1.00E+01 - 1.30E+01	1.90E+00	NA	NA		NA	NA	No	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	1.40E+00	J	6.70E+01		ug/L	WMP-02-R2	2/42	1.00E+01 - 1.30E+01	6.70E+01	NA	4.80E+00	C	NA	NA	Yes	ASL
108-95-2	Phenol	3.05E+00	J/J	2.12E+01	J/	ug/L	WMP-05-R2	6/42	1.00E+01 - 1.30E+01	2.12E+01	NA	1.10E+03	N	NA	NA	No	BSL
							VOLATILE ORGANIC COMPOUNDS										
79-34-5	1,1,2,2-Tetrachloroethane	2.00E+00	J	1.20E+03	J	ug/L	WMP-20-R2	19/42	1.00E+01 - 5.00E+02	1.20E+03	NA	5.30E-02	C	NA	NA	Yes	ASL
79-00-5	1,1,2-Trichloroethane	1.70E+00	J/J	3.75E+01	/	ug/L	WMP-05-R2	13/42	1.00E+01 - 1.00E+01	3.75E+01	NA	1.90E-01	C	NA	NA	Yes	ASL
75-35-4	1,1-Dichloroethene	1.20E+00	J	4.60E+00	J/J	ug/L	WMP-09-R1/WMP-09-R2	7/42	1.00E+01 - 1.00E+01	4.60E+00	NA	3.50E+01	N	NA	NA	No	BSL
107-06-2	1,2-Dichloroethane	2.00E+00	J	3.60E+01	J	ug/L	WMP-05-R1	6/42	1.00E+01 - 1.00E+01	3.60E+01	NA	1.20E-01	C	NA	NA	Yes	ASL
540-59-0	1,2-Dichloroethene	3.00E+00	J	1.60E+02		ug/L	WMP-07-R2	16/42	1.00E+01 - 1.00E+01	1.60E+02	NA	5.50E+00	N	NA	NA	Yes	ASL
71-43-2	Benzene	1.10E+00	J	2.15E+03	L/E	ug/L	WMP-05-R2	18/42	1.00E+01 - 5.00E+02	2.15E+03	NA	3.40E-01	C	NA	NA	Yes	ASL
75-15-0	Carbon disulfide	1.20E+00	J	1.20E+00	J	ug/L	WMP-09-R1	1/42	1.00E+01 - 1.00E+01	1.20E+00	NA	1.00E+02	N	NA	NA	No	BSL
67-66-3	Chloroform	2.50E+00	J	4.80E+01	/	ug/L	WMP-20-R1	12/42	1.00E+01 - 1.00E+01	4.80E+01	NA	1.50E-01	C	NA	NA	Yes	ASL
100-41-4	Ethylbenzene	3.00E+00	J	3.00E+00	J	ug/L	WMP-02-R2	1/42	1.00E+01 - 1.00E+01	3.00E+00	NA	1.30E+02	N	NA	NA	No	BSL
127-18-4	Tetrachloroethene	2.00E+00	J/J	1.10E+01	/	ug/L	WMP-05-R2	9/42	1.00E+01 - 1.00E+01	1.10E+01	NA	1.00E-01	C	NA	NA	Yes	ASL
108-88-3	Toluene	1.00E+01		1.00E+01		ug/L	WMP-02-R2	1/42	1.00E+01 - 1.00E+01	1.00E+01	NA	2.30E+02	N	NA	NA	No	BSL
79-01-6	Trichloroethene	1.00E+00	J	1.70E+02	J	ug/L	WMP-05-R1	18/42	1.00E+01 - 1.00E+01	1.70E+02	NA	2.60E-02	C	NA	NA	Yes	ASL
75-01-4	Vinyl chloride	2.65E+00	J/J	7.60E+00	J	ug/L	WMP-09-R1	5/42	1.00E+01 - 1.00E+01	7.60E+00	NA	1.50E-02	C	NA	NA	Yes	ASL
1330-20-7	Xylenes (total)	1.80E+00	J	1.30E+01		ug/L	WMP-02-R2	5/42	1.00E+01 - 1.00E+01	1.30E+01	NA	2.10E+01	N	NA	NA	No	BSL

(1) Minimum/maximum detected concentration
(2) Maximum concentration used as screening value
(3) Background values are 95% UPLs calculated using reference data from ICF KE 1995a,b. Background values are not included as part of the COPC selection process.
(4) Screening Toxicity Value - Taken from USEPA Region III Risk-Based (RBCs) Table, USEPA, October 2007. For non-carcinogens, value shown is equal to 1/10 the tap water RBC value. For carcinogens the value shown is equal to the tap water RBC value.
(5) Rationale Codes
Selection Reason: ASL = Above Screening Toxicity Level
Deletion Reason: BSL = Below Screening Toxicity Level
NUT = Essential Nutrient
NSL = No Screening Level

Surrogates used: Chromium VI for Chromium, Methylmercury for Mercury, Alpha-BHC for delta-BHC, 3-Methylphenol for 4-Chloro-3-methylphenol.

Definitions:
ADI = Allowable Daily Intake (FDA)
AL = Action Level (USEPA 2002b)
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
C = Carcinogenic
COPC = Chemical of Potential Concern
N = Non-Carcinogenic
NA = Not Applicable
ug/L = micrograms per liter

Data Qualifiers:
B = Value is less than the reporting limit (RL) but greater than the method detection limit (MDL).
E = Reported value is estimated because of presence of interference.
J = Value is estimated.
K = Reported value may be biased high.
L = Reported value may be biased low.
D = This flag identifies all compounds in the analysis at a secondary dilution factor.

TABLE 5-3
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
MAXWELL POINT INVESTIGATION AREA
GROUNDWATER EVALUATION

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Maxwell Point Investigation Area

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
EXPLOSIVES									
Nitrobenzene	ug/L	3.04E+00	1.45E+00	6.50E+00	J	ug/L	1.45E+00	95 UCLM-KMt	Regional Guidance
INORGANICS-DISSOLVED									
Arsenic	ug/L	5.31E+01	3.75E+01	2.19E+02	K	ug/L	3.75E+01	95 UCLM-KMt	Regional Guidance
Beryllium	ug/L	9.17E+00	1.84E+01	6.12E+01		ug/L	1.84E+01	95 UCLM-KMC	Regional Guidance
Cadmium	ug/L	7.93E-01	5.44E-01	4.00E+00	J	ug/L	5.44E-01	95 UCLM-KMNP	Regional Guidance
Iron	ug/L	4.15E+04	5.62E+04	2.01E+05		ug/L	5.62E+04	95 UCLM-G	Regional Guidance
Manganese	ug/L	1.10E+03	1.52E+03	3.13E+03		ug/L	1.52E+03	95 UCLM-KMC	Regional Guidance
Nickel	ug/L	1.43E+02	4.34E+02	1.28E+03		ug/L	4.34E+02	95 UCLM-KMC	Regional Guidance
Thallium	ug/L	4.76E+00	4.70E+00	6.20E+00	J	ug/L	4.70E+00	95 UCLM-KMNp	Regional Guidance
Vanadium	ug/L	4.55E+00	4.36E+00	1.14E+01	J	ug/L	4.36E+00	95 UCLM-KMNp	Regional Guidance
Zinc	ug/L	2.96E+02	1.50E+03	2.90E+03		ug/L	1.50E+03	95 UCLM-C	Regional Guidance
INORGANICS-TOTAL									
Aluminum	ug/L	1.10E+03	1.52E+03	8.09E+03	K	ug/L	1.52E+03	95 UCLM-G	Regional Guidance
Arsenic	ug/L	4.88E+01	6.08E+01	2.22E+02	K	ug/L	6.08E+01	95 UCLM-KMC	Regional Guidance
Beryllium	ug/L	8.20E+00	1.85E+01	6.23E+01		ug/L	1.85E+01	95 UCLM-KMC	Regional Guidance
Cadmium	ug/L	9.22E-01	6.35E-01	4.30E+00	J	ug/L	6.35E-01	95 UCLM-KMNP	Regional Guidance
Chromium	ug/L	4.41E+00	5.09E+00	2.78E+01		ug/L	5.09E+00	95 UCLM-BCA	Regional Guidance
Iron	ug/L	4.26E+04	5.69E+04	1.99E+05		ug/L	5.69E+04	95 UCLM-G	Regional Guidance
Lead	ug/L	3.58E+00	3.41E+00	1.60E+01		ug/L	3.58E+00	Mean	USEPA 1994
Manganese	ug/L	1.13E+03	1.56E+03	3.27E+03		ug/L	1.56E+03	95 UCLM-KMC	Regional Guidance
Nickel	ug/L	1.35E+02	4.36E+02	1.30E+03		ug/L	4.36E+02	95 UCLM-KMC	Regional Guidance
Thallium	ug/L	4.38E+00	4.02E+00	5.65E+00	L/L	ug/L	4.02E+00	95 UCLM-KMNp	Regional Guidance
Vanadium	ug/L	6.09E+00	6.10E+00	4.60E+01	J	ug/L	6.10E+00	95 UCLM-KMNP	Regional Guidance
Zinc	ug/L	3.00E+02	1.50E+03	2.92E+03		ug/L	1.50E+03	95 UCLM-C	Regional Guidance
PAHS									
Naphthalene	ug/L	NA	NA	2.00E+00	J	ug/L	2.00E+00	Maximum	Low %
PESTICIDES/PCBS									
4,4'-DDD	ug/L	4.33E-01	2.46E-01	2.30E+00	J	ug/L	2.46E-01	95 UCLM-KMt	Regional Guidance
delta-BHC	ug/L	NA	NA	2.20E-02	J	ug/L	2.20E-02	Maximum	Low %

TABLE 5-3
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
MAXWELL POINT INVESTIGATION AREA
GROUNDWATER EVALUATION

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Maxwell Point Investigation Area

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
SEMI-VOLATILE ORGANIC COMPOUNDS									
bis(2-Ethylhexyl)phthalate	ug/L	NA	NA	6.70E+01		ug/L	6.70E+01	Maximum	Low %
VOLATILE ORGANIC COMPOUNDS									
1,1,2,2-Tetrachloroethane	ug/L	4.13E+02	2.88E+02	1.20E+03	J	ug/L	2.88E+02	95 UCLM-KMt	Regional Guidance
1,1,2-Trichloroethane	ug/L	1.00E+01	8.80E+00	3.75E+01	/	ug/L	8.80E+00	95 UCLM-KMt	Regional Guidance
1,2-Dichloroethane	ug/L	9.70E+00	6.94E+00	3.60E+01	J	ug/L	6.94E+00	95 UCLM-KMt	Regional Guidance
1,2-Dichloroethene	ug/L	5.85E+01	3.71E+01	1.60E+02		ug/L	3.71E+01	95 UCLM-KMt	Regional Guidance
Benzene	ug/L	4.84E+02	3.45E+02	2.15E+03	E/L	ug/L	3.45E+02	95 UCLM-KMt	Regional Guidance
Chloroform	ug/L	1.92E+01	1.31E+01	4.80E+01	/	ug/L	1.31E+01	95 UCLM-KMt	Regional Guidance
Tetrachloroethene	ug/L	5.82E+00	6.86E+00	1.10E+01	/	ug/L	6.86E+00	95 UCLM-KMt	Regional Guidance
Trichloroethene	ug/L	5.73E+01	3.79E+01	1.70E+02	J	ug/L	3.79E+01	95 UCLM-KMt	Regional Guidance
Vinyl chloride	ug/L	5.79E+00	6.71E+00	7.60E+00	J	ug/L	6.71E+00	95 UCLM-KMt	Regional Guidance

Notes:

Statistics calculated by the USEPA program ProUCL 4.0. ProUCL outputs are presented in Appendix B.

95 UCLM-BCA indicates that the 95 percent upper confidence limit on the mean is based on the Kaplan-Meier (KM) Bias-Corrected Accelerated (BCA) percentile bootstrap test.

95 UCLM-C indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Chebyshev test.

95 UCLM-G indicates that the 95 percent upper confidence limit on the mean is based on the approximate or adjusted gamma distribution.

95 UCLM-KMNP indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Kaplan-Meier (KM) standard bootstrap test.

95 UCLM-KMp indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Kaplan-Meier (KM) percentile boostrap test.

95 UCLM-KMt indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Kaplan-Meier (KM) student's t-test.

Low %Detects indicates low percentage of detects.

UCLM>Maximum indicates that the recommended 95 UCLM exceeds the maximum detected value, therefore the maximum detected value is used.

USEPA 1994 = The arithmetic mean is used per USEPA lead model guidance (USEPA 1994).

N < 4 indicates that the number of samples is less than 4, so the maximum detected value was used.

Definitions:

95 UCLM = 95 percent upper confidence limit of the mean

EPC = exposure point concentration

NA = not applicable

mg/kg = milligrams per kilogram

USEPA = United States Environmental Protection Agency

TABLE 5-4.1
VALUES USED FOR RESIDENT ADULT DAILY TOTAL GROUNDWATER INTAKE EQUATIONS
GROUNDWATER EVALUATION

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Tap Water
Exposure Point: Maxwell Point
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CW	Chemical Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	L/day	2	U.S. EPA 1991a,b	CW x CR x EF X ED / (BW X AT)
	EF	Exposure Frequency	day/yr	350	U.S. EPA 1991a,b	
	ED-NC	Exposure Duration - Noncancer	yr	30	U.S. EPA 1991a,b	
	ED-C	Exposure Duration - Cancer	yr	24	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1989a	
	AT-NC	Averaging time - Noncancer	days	10,950	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
Dermal	CW	Chemical Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2	18,000	U.S. EPA 2004	CW x SA x PC x ET x EF x ED x CF / (BW x AT)
	PC	Permeability Coefficient	cm/hr	Chemical-Specific	Chemical-Specific	
	ET	Event Time	hr/day	0.58	U.S. EPA 2004	
	EF	Exposure Frequency	day/yr	350	U.S. EPA 1991a,b	
	ED-NC	Exposure Duration - Noncancer	days	30	U.S. EPA 1991a,b	
	ED-C	Exposure Duration - Cancer	yr	24	U.S. EPA 1991a,b	
	BW	Body Weight	kg	70	U.S. EPA 1989a	
	AT-NC	Averaging time - Noncancer	days	10,950	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	L/cm^3	0.001	U.S. EPA 1989a	
Inhalation	(1)	(1)	(1)	(1)	(1)	Foster and Chrostowski Model

Note : BPJ = Best Professional Judgment
(1) Refer to Tables 5-7.4 through 3-7.5 for details on the methodology and parameters used to calculate modeled intake values for the Foster and Chrostowski Shower Model.

TABLE 5-4.2
VALUES USED FOR RESIDENT CHILD DAILY TOTAL GROUNDWATER INTAKE EQUATIONS
GROUNDWATER EVALUATION

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Tap Water
Exposure Point: Maxwell Point
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CW	Chemical Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	L/day	1.5	U.S. EPA 1997a	CW x CR x EF X ED / (BW X AT)
	EF	Exposure Frequency	day/yr	350	U.S. EPA 1991a,b	
	ED	Exposure Duration	yr	6	U.S. EPA 1991a,b	
	BW	Body Weight	kg	15	U.S. EPA 1989a	
	AT-NC	Averaging time - Noncancer	days	2,190	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
Dermal	CW	Chemical Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2	6,600	U.S. EPA 2004	CW x SA x PC x ET x EF x ED x CF / (BW x AT)
	PC	Permeability Coefficient	cm/hr	Chemical-Specific	Chemical-Specific	
	ET	Event Time	hr/day	1	U.S. EPA 2004	
	EF	Exposure Frequency	day/yr	350	U.S. EPA 1991a,b	
	ED	Exposure Duration	yr	6	U.S. EPA 1991a,b	
	BW	Body Weight	kg	15	U.S. EPA 1989a	
	AT-NC	Averaging time - Noncancer	days	2,190	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	L/cm^3	0.001	U.S. EPA 1989a	

TABLE 5-4.3
VALUES USED FOR CONSTRUCTION WORKER DAILY GROUNDWATER INTAKE EQUATIONS
GROUNDWATER EVALUATION

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Maxwell Point
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CW	Chemical Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	L/day	0.20	U.S. EPA 1989a (1)	CW x CR x EF X ED / (BW X AT)
	EF	Exposure Frequency	day/yr	50	BPJ (2)	
	ED-C	Exposure Duration	yr	1	BPJ (3)	
	BW	Body Weight	kg	70	U.S. EPA 1989a	
	AT-NC	Averaging time - Noncancer	days	365	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
Dermal	CW	Chemical Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2	5,700	U.S. EPA 1997a	CW x SA x PC x ET x EF x ED x CF / (BW x AT)
	PC	Permeability Coefficient	cm/hr	Chemical-Specific	Chemical-Specific	
	ET	Event Time	hr/day	4	BPJ (4)	
	EF	Exposure Frequency	day/yr	50	BPJ (2)	
	ED-C	Exposure Duration	yr	1	BPJ (3)	
	BW	Body Weight	kg	70	U.S. EPA 1989a	
	AT-NC	Averaging time - Noncancer	days	365	U.S. EPA 1989a	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989a	
	CF	Conversion Factor	L/cm^3	0.001	U.S. EPA 1989a	

Note : BPJ = Best Professional Judgment
(1) Incidental ingestion of groundwater is assumed equal to the incidential ingestion rate of surface water, which is 0.5 L/hr at a 4 hour exposure time.
(2) Construction workers are assumed to contact groundwater only 50 days out of the year.
(3) Construction events are assumed to extend for up to one year total in duration.
(4) Construction events are assumed to contact groundwater for half of their time on the site per day.

TABLE 5-5.1
NON-CANCER TOXICITY DATA - ORAL/DERMAL
MAXWELL POINT - OTHER EDGEWOOD AREA
GROUNDWATER EVALUATION

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value (mg/kg-day)	Oral to Dermal Adjustment Factor (GI ABS) (1)	Adjusted Dermal RfD (2) (mg/kg bw-day)	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (mm/dd/yy)
Inorganics								
ALUMINUM	Chronic	1.00E+00	1	1.00E+00	Central Nervous System	100/1	PPRTV	7/26/2001
ARSENIC	Chronic	3.00E-04	1	3.00E-04	Skin	3/1	IRIS	6/29/2009
BERYLLIUM	Chronic	2.00E-03	0.007	1.40E-05	Intestines	300/1	IRIS	6/29/2009
CADMIUM	Chronic	5.00E-04	0.025	1.25E-05	Kidneys	10/1	IRIS	6/29/2009
CHROMIUM, TOTAL	Chronic	3.00E-03	0.025	7.50E-05	None	300/3	IRIS	6/29/2009
IRON	NA	3.00E-01	1	3.00E-01	None	NA/NA	PPRTV	7/29/2008
MANGANESE	Chronic	4.60E-02	0.04	1.84E-03	Central Nervous System	1/3	IRIS	6/29/2009
NICKEL	Chronic	2.00E-02	0.04	8.00E-04	None	300/1	IRIS	6/29/2009
THALLIUM	Chronic	6.50E-05	1	6.50E-05	None	3000/1	IRIS	6/29/2009
VANADIUM	Chronic	5.00E-03	0.026	1.30E-04	Hair	100/1	IRIS	6/29/2009
ZINC	Chronic	3.00E-01	1	3.00E-01	Blood	3/1	IRIS	6/29/2009
PAHs								
NAPHTHALENE	Chronic	2.00E-02	1	2.00E-02	None	3000/1	IRIS	6/29/2009
Pesticides/PCBs								
DELTA-BHC	Chronic	8.00E-03	1	8.00E-03	Liver	100/1	ATSDR	09/05
4,4'-DDD	NA	NA	1	NA	NA	NA/NA	IRIS	6/29/2009
Semivolatiles								
BIS(2-ETHYLHEXYL)PHTHALATE	Chronic	2.00E-02	1	2.00E-02	Liver	1000/1	IRIS	6/29/2009
NITROBENZENE	Chronic	2.00E-03	1	2.00E-03	Kidney	1000/1	IRIS	6/29/2009
Volatiles								
BENZENE	Chronic	4.00E-03	1	4.00E-03	Immune System	300/1	IRIS	6/29/2009
CHLOROFORM	Chronic	1.00E-02	1	1.00E-02	Liver	100/1	IRIS	6/29/2009
1,2-DICHLOROETHANE	Chronic	2.00E-02	1	2.00E-02	Kidneys	3000/1	PPRTV	
1,2-DICHLOROETHENE	Chronic	9.00E-03	1	9.00E-03	Liver	NA/NA	IRIS	6/29/2009
1,1,2,2-TETRACHLOROETHANE	Chronic	4.00E-03	1	4.00E-03	Liver	300/1	PPRTV	
TETRACHLOROETHENE	Chronic	1.00E-02	1	1.00E-02	Liver	1000/1	IRIS	6/29/2009
1,1,2-TRICHLOROETHANE	Chronic	4.00E-03	1	4.00E-03	Liver	1000/1	IRIS	6/29/2009
TRICHLOROETHENE	NA	NA	1	NA	NA	NA/NA	IRIS	6/29/2009
VINYL CHLORIDE	Chronic	3.00E-03	1	3.00E-03	Liver	30/1	IRIS	6/29/2009

NA = Not Applicable

(1) Taken from USEPA 2004a Guidance.

(2) Dermal toxicological values adjusted from oral values using USEPA 2004a recommended chemical-specific gastrointestinal absorption factors (GI ABS). RfDs are multiplied by the GI ABS.

(3) IRIS - Integrated Risk Information System. For IRIS values, the date IRIS was searched is provided.
HEAST - Health Effects Assessment Summary Tables. For HEAST values, the date of HEAST is provided.
EPA-NCEA - National Center for Environmental Assessment. For EPA-NCEA values, the date of the article provided by EPA-NCEA is provided.

TABLE 5-5.2
NON-CANCER TOXICITY DATA - INHALATION
MAXWELL POINT - OTHER EDGEWOOD AREA
GROUNDWATER EVALUATION

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation (RfC) (mg/m^3)	Adjusted Inhalation (RfD) (mg/kg-day)	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ	Dates (1) (mm/dd/yy)
Inorganics							
ALUMINUM	Chronic	5.00E-03	1.00E-03	Central Nervous System	300/1	PPRTV	7/26/2001
ARSENIC	Chronic	1.50E-05	4.29E-06	Cardiovascular System	30/1	CalEPA	12/2008
BERYLLIUM	Chronic	2.00E-05	5.70E-06	Lungs	10/1	IRIS	6/29/2009
CADMIUM	Chronic	1.00E-05	5.75E-05	Kidneys	9/1	ATSDR	09/2008
CHROMIUM, TOTAL	Chronic	1.00E-04	3.00E-05	Lungs and Blood	300/1	IRIS	6/29/2009
IRON	NA	NA	NA	NA	NA	PPRTV	7/29/2008
MANGANESE	Chronic	5.00E-05	1.43E-05	Central Nervous System	1000/1	IRIS	6/29/2009
NICKEL	Chronic	9.00E-05	2.57E-05	Respiratory System	30/1	ATSDR	09/2005
THALLIUM	NA	NA	NA	NA	NA	NA	6/29/2009
VANADIUM	NA	NA	NA	NA	NA	IRIS	6/29/2009
ZINC	NA	NA	NA	NA	NA	IRIS	6/29/2009
PAHs							
NAPHTHALENE	Chronic	3.00E-03	9.00E-04	Respiratory System	3000/1	IRIS	6/29/2009
Pesticides/PCBs							
DELTA-BHC	NA	NA	NA	NA	NA	IRIS	6/29/2009
4,4'-DDD	NA	NA	NA	NA	NA	IRIS	6/29/2009
Semivolatiles							
BIS(2-ETHYLHEXYL)PHTHALATE	NA	NA	NA	NA	NA	IRIS	6/29/2009
NITROBENZENE	Chronic	9.00E-03	2.57E-03	Lungs	30/1	IRIS	6/29/2009
Volatiles							
BENZENE	Chronic	8.20E+00	8.57E-03	Immune System	300/1	IRIS	6/29/2009
CHLOROFORM	Chronic	9.80E-02	2.80E-02	Liver	30/1	ATSDR	09/1997
1,2-DICHLOROETHANE	Chronic	2.40E+00	6.86E-01	Liver	90/1	ATSDR	09/2001
1,2-DICHLOROETHENE	NA	NA	NA	NA	NA	IRIS	6/29/2009
1,1,2,2-TETRACHLOROETHANE	NA	NA	NA	NA	NA	IRIS	6/29/2009
TETRACHLOROETHENE	Chronic	2.70E-01	7.71E-02	Central Nervous System	100/1	ATSDR	09/1997
1,1,2-TRICHLOROETHANE	NA	NA	NA	NA	NA	IRIS	6/29/2009
TRICHLOROETHENE	NA	NA	NA	NA	NA/NA	IRIS	6/29/2009
VINYL CHLORIDE	Chronic	1.00E-01	2.86E-02	Liver	30/1	IRIS	6/29/2009

NA = Not Applicable

(1) IRIS - Integrated Risk Information System. For IRIS values, the date IRIS was searched is provided.
HEAST - Health Effects Assessment Summary Tables. For HEAST values, the date of HEAST is provided.
EPA-NCEA - National Center for Environmental Assessment. For EPA-NCEA values, the date of the article provided by EPA-NCEA is provided.

TABLE 5-5.3
CHEMICAL-SPECIFIC PARAMETERS
MAXWELL POINT - OTHER EDGEWOOD AREA
GROUNDWATER EVALUATION

Chemical of Potential Concern	Absorption Factor	Reference	GI ABS	Reference	Permeability Constant (cm/hr)	Reference
Inorganics						
ALUMINUM	NA	U.S. EPA, 2004	1	U.S. EPA, 2004	1.00E-03	U.S. EPA, 2004
ARSENIC	0.03	U.S. EPA, 2004	1	U.S. EPA, 2004	1.00E-03	U.S. EPA, 2004
BERYLLIUM	NA	U.S. EPA, 2004	0.007	U.S. EPA, 2004	1.00E-03	U.S. EPA, 2004
CADMIUM	0.001	U.S. EPA, 2004	0.025	U.S. EPA, 2004	1.00E-03	U.S. EPA, 2004
CHROMIUM VI	NA	U.S. EPA, 2004	0.025	U.S. EPA, 2004	2.00E-03	U.S. EPA, 2004
IRON	NA	U.S. EPA, 2004	1	U.S. EPA, 2004	1.00E-03	U.S. EPA, 2004
MANGANESE	NA	U.S. EPA, 2004	0.04	U.S. EPA, 2004	1.00E-03	U.S. EPA, 2004
NICKEL	NA	U.S. EPA, 2004	0.04	U.S. EPA, 2004	2.00E-04	U.S. EPA, 2004
THALLIUM	NA	U.S. EPA, 2004	1	U.S. EPA, 2004	1.00E-03	U.S. EPA, 2004
VANADIUM	NA	U.S. EPA, 2004	0.026	U.S. EPA, 2004	1.00E-03	U.S. EPA, 2004
ZINC	NA	U.S. EPA, 2004	1	U.S. EPA, 2004	6.00E-04	U.S. EPA, 2004
PAHs						
NAPHTHALENE	0.13	U.S. EPA, 2004	1	U.S. EPA, 2004	1.20E+00	U.S. EPA, 2004
Pesticides/PCBs						
DELTA-BHC	0.1	U.S. EPA, 2004	1	U.S. EPA, 2004	2.79E-02	On-line Database(1)
4,4'-DDD	0.03	U.S. EPA, 2004	1	U.S. EPA, 2004	5.00E+00	U.S. EPA, 2004
Semivolatiles						
BIS(2-ETHYLHEXYL)PHTHALATE	0.1	U.S. EPA, 2004	1	U.S. EPA, 2004	1.97E+00	U.S. EPA, 2004
NITROBENZENE	0.1	U.S. EPA, 2004	1	U.S. EPA, 2004	6.96E-03	On-line Database(1)
Volatiles						
BENZENE	NA	U.S. EPA, 2004	1	U.S. EPA, 2004	3.70E-01	U.S. EPA, 2004
CHLOROFORM	NA	U.S. EPA, 2004	1	U.S. EPA, 2004	1.70E-01	U.S. EPA, 2004
1,2-DICHLOROETHANE	NA	U.S. EPA, 2004	1	U.S. EPA, 2004	1.00E-01	U.S. EPA, 2004
1,2-DICHLOROETHENE	NA	U.S. EPA, 2004	1	U.S. EPA, 2004	1.90E-01	U.S. EPA, 2004
1,1,2,2-TETRACHLOROETHANE	NA	U.S. EPA, 2004	1	U.S. EPA, 2004	1.70E-01	U.S. EPA, 2004
TETRACHLOROETHENE	NA	U.S. EPA, 2004	1	U.S. EPA, 2004	8.40E-01	U.S. EPA, 2004
1,1,2-TRICHLOROETHANE	NA	U.S. EPA, 2004	1	U.S. EPA, 2004	1.60E-01	U.S. EPA, 2004
TRICHLOROETHENE	NA	U.S. EPA, 2004	1	U.S. EPA, 2004	2.90E-01	U.S. EPA, 2004
VINYL CHLORIDE	NA	U.S. EPA, 2004	1	U.S. EPA, 2004	1.40E-01	U.S. EPA, 2004

NA = Data not available.
GI ABS = Gastrointestional Absorption factors
(1) Toxicity and Chemical-Specific Factors Database. Http://risk.lsd.ornl.gov/cgi-bin/tox. June 2009.
U.S. EPA, 2004 = U.S. Environmental Protection Agency, 2004. *Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).* Final Guidance.

TABLE 5-6.1
CANCER TOXICITY DATA - ORAL/DERMAL
MAXWELL POINT - OTHER EDGEWOOD AREA
GROUNDWATER EVALUATION

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral Absorption Efficiency for Dermal (GI ABS)(1)	Absorbed Cancer Slope Factor for Dermal (2)	Units	Weight of Evidence/Cancer Guideline Description	Source	Date (3) (mm/dd/yy)
Inorganics							
ALUMINUM	NA	1	NA	per (mg/kg-day)	D	PPRTV	7/26/2001
ARSENIC	1.50E+00	1	1.50E+00	per (mg/kg-day)	A	IRIS	6/29/2009
BERYLLIUM	NA	NA	NA	per (mg/kg-day)	B1	IRIS	6/29/2009
CADMIUM	NA	0.025	NA	per (mg/kg-day)	B1	IRIS	6/29/2009
CHROMIUM, TOTAL	NA	0.025	NA	per (mg/kg-day)	D	IRIS	6/29/2009
IRON	NA	1	NA	per (mg/kg-day)	NA	PPRTV	7/29/2008
MANGANESE	NA	0.04	NA	per (mg/kg-day)	D	IRIS	6/29/2009
NICKEL	NA	0.04	NA	per (mg/kg-day)	NA	IRIS	6/29/2009
THALLIUM	NA	1	NA	per (mg/kg-day)	D	IRIS	6/29/2009
VANADIUM	NA	0.026	NA	per (mg/kg-day)	NA	IRIS	6/29/2009
ZINC	NA	1	NA	per (mg/kg-day)	D	IRIS	6/29/2009
PAHs							
NAPHTHALENE	NA	1	NA	per (mg/kg-day)	C	IRIS	6/29/2009
Pesticides/PCBs							
DELTA-BHC	6.30E+00	1	6.30E+00	per (mg/kg-day)	B2	IRIS	6/29/2009
4,4'-DDD	2.40E-01	1	2.40E-01	per (mg/kg-day)	B2	IRIS	6/29/2009
Semivolatiles							
BIS(2-ETHYLHEXYL)PHTHALATE	1.40E-02	1	1.40E-02	per (mg/kg-day)	B2	IRIS	6/29/2009
NITROBENZENE	NA	1	NA	per (mg/kg-day)	D	IRIS	6/29/2009
Volatiles							
BENZENE	5.50E-02	1	5.50E-02	per (mg/kg-day)	A	IRIS	6/29/2009
CHLOROFORM	3.10E-02	1	3.10E-02	per (mg/kg-day)	B2	IRIS	6/29/2009
1,2-DICHLOROETHANE	9.10E-02	1	9.10E-02	per (mg/kg-day)	B2	IRIS	6/29/2009
1,2-DICHLOROETHENE	NA	1	NA	per (mg/kg-day)	D	IRIS	6/29/2009
1,1,2,2-TETRACHLOROETHANE	2.00E-01	1	2.00E-01	per (mg/kg-day)	C	IRIS	6/29/2009
TETRACHLOROETHENE	5.40E-01	1	5.40E-01	per (mg/kg-day)	B2	CalEPA	2002
1,1,2-TRICHLOROETHANE	5.70E-02	1	5.70E-02	per (mg/kg-day)	C	IRIS	6/29/2009
TRICHLOROETHENE	1.30E-02	1	1.30E-02	per (mg/kg-day)	B2	CalEPA	2002
VINYL CHLORIDE	7.20E-01	1	7.20E-01	per (mg/kg-day)	A	IRIS	6/29/2009

NA = Not Applicable
(1) Taken from USEPA 2004 Guidance.
(2) Dermal Toxicological values adjusted from oral values using USEPA 2004 recommended chemical-specific gastrointestinal absorption factors (GI ABS). CSFs are divided by the GI ABS.
(3) IRIS - Integrated Risk Information System. For IRIS values, the date IRIS was searched is provided.
HEAST - Health Effects Assessment Summary Tables. For HEAST values, the date of HEAST is provided.
EPA-NCEA - National Center for Environmental Assessment. For EPA-NCEA values, the date of the article provided by EPA-NCEA is provided.
PPRTV - Provisional Peer Reviewed Toxicity Value
CAL EPA - California Environmental Protection Agency

Weight of Evidence: A - Human carcinogen
B1 - Probable human carcinogen - indicate that limited human data are available
B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen
D - Not classifiable as a human carcinogen
E - Evidence of noncarcinogenicity

TABLE 5-6.2
CANCER TOXICITY DATA - INHALATION
MAXWELL POINT - OTHER EDGEWOOD AREA
GROUNDWATER EVALUATION

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor		Weight of Evidence/Cancer Guideline Description	Unit Risk - Inhalation CSF	
	Value	Units	Value	Units		Source	Date (1)
Inorganics							
ALUMINUM	NA	1/ug/m3	NA	per (mg/kg-day)	D	PPRTV	7/26/2001
ARSENIC	4.30E-03	1/ug/m3	1.51E+01	per (mg/kg-day)	A	IRIS	6/29/2009
CADMIUM	1.80E-03	1/ug/m3	6.30E+00	per (mg/kg-day)	B1	IRIS	6/29/2009
CHROMIUM, TOTAL	1.20E-02	1/ug/m3	4.10E+01	per (mg/kg-day)	A	IRIS	6/29/2009
IRON	NA	1/ug/m3	NA	per (mg/kg-day)	NA	PPRTV	7/29/2008
MANGANESE	NA	1/ug/m3	NA	per (mg/kg-day)	D	IRIS	6/29/2009
NICKEL	NA	1/ug/m3	NA	per (mg/kg-day)	NA	IRIS	6/29/2009
THALLIUM	NA	1/ug/m3	NA	per (mg/kg-day)	D	IRIS	6/29/2009
VANADIUM	NA	1/ug/m3	NA	per (mg/kg-day)	NA	IRIS	6/29/2009
ZINC	NA	1/ug/m3	NA	per (mg/kg-day)	D	IRIS	6/29/2009
PAHs							
NAPHTHALENE	3.40E-05	1/ug/m3	1.19E-01	per (mg/kg-day)	C	CalEPA	2002
Pesticides/PCBs							
DELTA-BHC	1.80E-03	1/ug/m3	6.30E+00	per (mg/kg-day)	B2	IRIS	6/29/2009
4,4'-DDD	6.90E-05	1/ug/m3	2.42E-01	per (mg/kg-day)	B2	CalEPA	2002
Semivolatiles							
BIS(2-ETHYLHEXYL)PHTHALATE	2.40E-06	1/ug/m3	1.40E-02	per (mg/kg-day)	NA	CalEPA	2002
NITROBENZENE	NA	1/ug/m3	NA	per (mg/kg-day)	D	IRIS	6/29/2009
Volatiles							
BENZENE	2.20E-06	1/ug/m3	2.73E-02	per (mg/kg-day)	A	IRIS	6/29/2009
CHLOROFORM	2.30E-05	1/ug/m3	8.05E-02	per (mg/kg-day)	B2	IRIS	6/29/2009
1,2-DICHLOROETHANE	2.60E-05	1/ug/m3	9.10E-02	per (mg/kg-day)	B2	IRIS	6/29/2009
1,2-DICHLOROETHENE	NA	1/ug/m3	NA	per (mg/kg-day)	D	IRIS	6/29/2009
1,1,2,2-TETRACHLOROETHANE	5.80E-05	1/ug/m3	2.03E-01	per (mg/kg-day)	C	IRIS	6/29/2009
TETRACHLOROETHENE	5.90E-06	1/ug/m3	2.07E-02	per (mg/kg-day)	B2	CalEPA	2002
1,1,2-TRICHLOROETHANE	1.60E-05	1/ug/m3	5.60E-02	per (mg/kg-day)	C	IRIS	6/29/2009
TRICHLOROETHENE	2.00E-06	1/ug/m3	7.00E-03	per (mg/kg-day)	B2	CalEPA	2002
VINYL CHLORIDE	4.40E-06	1/ug/m3	1.54E-02	per (mg/kg-day)	A	IRIS	6/29/2009

NA = Not Applicable

(1) IRIS - Integrated Risk Information System. For IRIS values, the date IRIS was searched is provided.
HEAST - Health Effects Assessment Summary Tables. For HEAST values, the date of HEAST is provided.
EPA-NCEA - National Center for Environmental Assessment. For EPA-NCEA values, the date of the article provided by EPA-NCEA is provided.
PPRTV - Provisional Peer Reviewed Toxicity Value
CAL EPA - California Environmental Protection Agency

Weight of Evidence: A - Human carcinogen
B1 - Probable human carcinogen - indicate that limited human data are available
B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
C - Possible human carcinogen
D - Not classifiable as a human carcinogen
E - Evidence of noncarcinogenicity

TABLE 5-7.1

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

MAXWELL POINT - OTHER EDGEWOOD AREA
GROUNDWATER EVALUATION

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Tap Water	Ingestion	**Inorganics**												
				ARSENIC	3.75E-02	(mg/L)	3.52E-04	(mg/kg-day)	1.50E+00	per (mg/kg-day)	5.28E-04	1.03E-03	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.42E+00
				BERYLLIUM	1.84E-02	(mg/L)	1.73E-04	(mg/kg-day)	NA	per (mg/kg-day)	–	5.04E-04	(mg/kg-day)	2.00E-03	(mg/kg-day)	2.52E-01
				CADMIUM	5.44E-04	(mg/L)	5.11E-06	(mg/kg-day)	NA	per (mg/kg-day)	–	1.49E-05	(mg/kg-day)	5.00E-04	(mg/kg-day)	2.98E-02
				IRON	5.62E+01	(mg/L)	5.28E-01	(mg/kg-day)	NA	per (mg/kg-day)	–	1.54E+00	(mg/kg-day)	3.00E-01	(mg/kg-day)	5.13E+00
				MANGANESE	1.52E+00	(mg/L)	1.43E-02	(mg/kg-day)	NA	per (mg/kg-day)	–	4.16E-02	(mg/kg-day)	4.60E-02	(mg/kg-day)	9.05E-01
				NICKEL	4.34E-01	(mg/L)	4.08E-03	(mg/kg-day)	NA	per (mg/kg-day)	–	1.19E-02	(mg/kg-day)	2.00E-02	(mg/kg-day)	5.95E-01
				THALLIUM	4.70E-03	(mg/L)	4.41E-05	(mg/kg-day)	NA	per (mg/kg-day)	–	1.29E-04	(mg/kg-day)	6.50E-05	(mg/kg-day)	1.98E+00
				VANADIUM	4.36E-03	(mg/L)	4.10E-05	(mg/kg-day)	NA	per (mg/kg-day)	–	1.19E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	2.39E-02
				ZINC	1.50E+00	(mg/L)	1.41E-02	(mg/kg-day)	NA	per (mg/kg-day)	–	4.11E-02	(mg/kg-day)	3.00E-01	(mg/kg-day)	1.37E-01
				PAHs												
				NAPHTHALENE	2.00E-03	(mg/L)	1.88E-05	(mg/kg-day)	NA	per (mg/kg-day)	–	5.48E-05	(mg/kg-day)	2.00E-02	(mg/kg-day)	2.74E-03
				Pesticides/PCBs												
				DELTA-BHC	2.20E-05	(mg/L)	2.07E-07	(mg/kg-day)	6.30E+00	per (mg/kg-day)	1.30E-06	6.03E-07	(mg/kg-day)	8.00E-03	(mg/kg-day)	7.53E-05
				4,4'-DDD	2.46E-04	(mg/L)	2.31E-06	(mg/kg-day)	2.40E-01	per (mg/kg-day)	5.55E-07	6.74E-06	(mg/kg-day)	NA	(mg/kg-day)	–
				Semivolatiles												
				BIS(2-ETHYLHEXYL)PHTHALATE	6.70E-02	(mg/L)	6.29E-04	(mg/kg-day)	1.40E-02	per (mg/kg-day)	8.81E-06	1.84E-03	(mg/kg-day)	2.00E-02	(mg/kg-day)	9.18E-02
				NITROBENZENE	1.45E-03	(mg/L)	1.36E-05	(mg/kg-day)	NA	per (mg/kg-day)	–	3.97E-05	(mg/kg-day)	2.00E-03	(mg/kg-day)	1.99E-02
				Volatiles												
				BENZENE	3.45E-01	(mg/L)	3.24E-03	(mg/kg-day)	5.50E-02	per (mg/kg-day)	1.78E-04	9.45E-03	(mg/kg-day)	4.00E-03	(mg/kg-day)	2.36E+00
				CHLOROFORM	1.31E-02	(mg/L)	1.23E-04	(mg/kg-day)	3.10E-02	per (mg/kg-day)	3.81E-06	3.59E-04	(mg/kg-day)	1.00E-02	(mg/kg-day)	3.59E-02
				1,2-DICHLOROETHANE	6.94E-03	(mg/L)	6.52E-05	(mg/kg-day)	9.10E-02	per (mg/kg-day)	5.93E-06	1.90E-04	(mg/kg-day)	2.00E-02	(mg/kg-day)	9.51E-03
				1,2-DICHLOROETHENE	3.71E-02	(mg/L)	3.48E-04	(mg/kg-day)	NA	per (mg/kg-day)	–	1.02E-03	(mg/kg-day)	9.00E-03	(mg/kg-day)	1.13E-01
				1,1,2,2-TETRACHLOROETHANE	2.88E-01	(mg/L)	2.71E-03	(mg/kg-day)	2.00E-01	per (mg/kg-day)	5.41E-04	7.89E-03	(mg/kg-day)	4.00E-03	(mg/kg-day)	1.97E+00
				TETRACHLOROETHENE	6.86E-03	(mg/L)	6.44E-05	(mg/kg-day)	5.40E-01	per (mg/kg-day)	3.48E-05	1.88E-04	(mg/kg-day)	1.00E-02	(mg/kg-day)	1.88E-02
				1,1,2-TRICHLOROETHANE	8.80E-03	(mg/L)	8.27E-05	(mg/kg-day)	5.70E-02	per (mg/kg-day)	4.71E-06	2.41E-04	(mg/kg-day)	4.00E-03	(mg/kg-day)	6.03E-02
				TRICHLOROETHENE	3.79E-02	(mg/L)	3.56E-04	(mg/kg-day)	1.30E-02	per (mg/kg-day)	4.63E-06	1.04E-03	(mg/kg-day)	NA	(mg/kg-day)	–
				VINYL CHLORIDE	6.71E-03	(mg/L)	6.30E-05	(mg/kg-day)	7.20E-01	per (mg/kg-day)	4.54E-05	1.84E-04	(mg/kg-day)	3.00E-03	(mg/kg-day)	6.13E-02
			Exp. Route Total								1.36E-03					1.72E+01
			Dermal	**Inorganics**												
				ARSENIC	3.75E-02	(mg/L)	1.84E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	2.76E-06	5.36E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.79E-02
				BERYLLIUM	1.84E-02	(mg/L)	9.02E-07	(mg/kg-day)	NA	per (mg/kg-day)	–	2.63E-06	(mg/kg-day)	1.40E-05	(mg/kg-day)	1.88E-01
				CADMIUM	5.44E-04	(mg/L)	2.67E-08	(mg/kg-day)	NA	per (mg/kg-day)	–	7.78E-08	(mg/kg-day)	1.25E-05	(mg/kg-day)	6.22E-03
				IRON	5.62E+01	(mg/L)	2.76E-03	(mg/kg-day)	NA	per (mg/kg-day)	–	8.04E-03	(mg/kg-day)	3.00E-01	(mg/kg-day)	2.68E-02
				MANGANESE	1.52E+00	(mg/L)	7.45E-05	(mg/kg-day)	NA	per (mg/kg-day)	–	2.17E-04	(mg/kg-day)	1.84E-03	(mg/kg-day)	1.18E-01
				NICKEL	4.34E-01	(mg/L)	4.26E-06	(mg/kg-day)	NA	per (mg/kg-day)	–	1.24E-05	(mg/kg-day)	8.00E-04	(mg/kg-day)	1.55E-02
				THALLIUM	4.70E-03	(mg/L)	2.30E-07	(mg/kg-day)	NA	per (mg/kg-day)	–	6.72E-07	(mg/kg-day)	6.50E-05	(mg/kg-day)	1.03E-02
				VANADIUM	4.36E-03	(mg/L)	2.14E-07	(mg/kg-day)	NA	per (mg/kg-day)	–	6.24E-07	(mg/kg-day)	1.30E-04	(mg/kg-day)	4.80E-03
				ZINC	1.50E+00	(mg/L)	4.41E-05	(mg/kg-day)	NA	per (mg/kg-day)	–	1.29E-04	(mg/kg-day)	3.00E-01	(mg/kg-day)	4.29E-04
				PAHs												
				NAPHTHALENE	2.00E-03	(mg/L)	1.18E-04	(mg/kg-day)	NA	per (mg/kg-day)	–	3.43E-04	(mg/kg-day)	2.00E-02	(mg/kg-day)	1.72E-02
				Pesticides/PCBs												
				DELTA-BHC	2.20E-05	(mg/L)	3.01E-08	(mg/kg-day)	6.30E+00	per (mg/kg-day)	1.90E-07	8.78E-08	(mg/kg-day)	8.00E-03	(mg/kg-day)	1.10E-05
				4,4'-DDD	2.46E-04	(mg/L)	6.03E-05	(mg/kg-day)	2.40E-01	per (mg/kg-day)	1.45E-05	1.76E-04	(mg/kg-day)	NA	(mg/kg-day)	–
				Semivolatiles												
				BIS(2-ETHYLHEXYL)PHTHALATE	6.70E-02	(mg/L)	6.47E-03	(mg/kg-day)	1.40E-02	per (mg/kg-day)	9.06E-05	1.89E-02	(mg/kg-day)	2.00E-02	(mg/kg-day)	9.44E-01
				NITROBENZENE	1.45E-03	(mg/L)	4.95E-07	(mg/kg-day)	NA	per (mg/kg-day)	–	1.44E-06	(mg/kg-day)	2.00E-03	(mg/kg-day)	7.22E-04
				Volatiles												
				BENZENE	3.45E-01	(mg/L)	6.26E-03	(mg/kg-day)	5.50E-02	per (mg/kg-day)	3.44E-04	1.83E-02	(mg/kg-day)	4.00E-03	(mg/kg-day)	4.56E+00
				CHLOROFORM	1.31E-02	(mg/L)	1.09E-04	(mg/kg-day)	3.10E-02	per (mg/kg-day)	3.39E-06	3.18E-04	(mg/kg-day)	1.00E-02	(mg/kg-day)	3.18E-02
				1,2-DICHLOROETHANE	6.94E-03	(mg/L)	3.40E-05	(mg/kg-day)	9.10E-02	per (mg/kg-day)	3.10E-06	9.93E-05	(mg/kg-day)	2.00E-02	(mg/kg-day)	4.96E-03
				1,2-DICHLOROETHENE	3.71E-02	(mg/L)	3.46E-04	(mg/kg-day)	NA	per (mg/kg-day)	–	1.01E-03	(mg/kg-day)	9.00E-03	(mg/kg-day)	1.12E-01
				1,1,2,2-TETRACHLOROETHANE	2.88E-01	(mg/L)	2.40E-03	(mg/kg-day)	2.00E-01	per (mg/kg-day)	4.80E-04	7.00E-03	(mg/kg-day)	4.00E-03	(mg/kg-day)	1.75E+00
				TETRACHLOROETHENE	6.86E-03	(mg/L)	2.83E-04	(mg/kg-day)	5.40E-01	per (mg/kg-day)	1.53E-04	8.24E-04	(mg/kg-day)	1.00E-02	(mg/kg-day)	8.24E-02
				1,1,2-TRICHLOROETHANE	8.80E-03	(mg/L)	6.00E-05	(mg/kg-day)	5.70E-02	per (mg/kg-day)	3.94E-06	2.01E-04	(mg/kg-day)	4.00E-03	(mg/kg-day)	5.03E-02
				TRICHLOROETHENE	3.79E-02	(mg/L)	5.39E-04	(mg/kg-day)	1.30E-02	per (mg/kg-day)	7.01E-06	1.57E-03	(mg/kg-day)	NA	(mg/kg-day)	–
				VINYL CHLORIDE	6.71E-03	(mg/L)	4.61E-05	(mg/kg-day)	7.20E-01	per (mg/kg-day)	3.32E-05	1.34E-04	(mg/kg-day)	3.00E-03	(mg/kg-day)	4.48E-02
			Exp. Route Total								1.14E-03					7.99E+00
		Exposure Point Total									2.49E-03					2.52E+01
	Exposure Medium Total										2.49E-03					2.52E+01

TABLE 5-7.1

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

MAXWELL POINT - OTHER EDGEWOOD AREA
GROUNDWATER EVALUATION

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
	Air	Shower Head	Inhalation	**Volatiles**												
				BENZENE	1.63E-02	(mg/kg/shower)	1.79E-03	(mg/kg-day)	2.73E-02	per (mg/kg-day)	4.88E-05	1.79E-03	(mg/kg-day)	8.57E-03	(mg/kg-day)	2.09E-01
				CHLOROFORM	5.21E-04	(mg/kg/shower)	5.71E-05	(mg/kg-day)	8.05E-02	per (mg/kg-day)	4.60E-06	5.71E-05	(mg/kg-day)	2.80E-02	(mg/kg-day)	2.04E-03
				1,2-DICHLOROETHANE	2.62E-04	(mg/kg/shower)	2.87E-05	(mg/kg-day)	9.10E-02	per (mg/kg-day)	2.61E-06	2.87E-05	(mg/kg-day)	6.86E-01	(mg/kg-day)	4.19E-05
				1,2-DICHLOROETHENE	1.60E-03	(mg/kg/shower)	1.76E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.76E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				1,1,2,2-TETRACHLOROETHANE	6.74E-03	(mg/kg/shower)	7.39E-04	(mg/kg-day)	2.03E-01	per (mg/kg-day)	1.50E-04	6.46E-03	(mg/kg-day)	NA	(mg/kg-day)	--
				TETRACHLOROETHENE	2.48E-04	(mg/kg/shower)	2.71E-05	(mg/kg-day)	2.07E-02	per (mg/kg-day)	5.60E-07	2.37E-04	(mg/kg-day)	7.71E-02	(mg/kg-day)	3.08E-03
				1,1,2-TRICHLOROETHANE	2.91E-04	(mg/kg/shower)	3.19E-05	(mg/kg-day)	5.60E-02	per (mg/kg-day)	1.79E-06	2.79E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				TRICHLOROETHENE	1.51E-03	(mg/kg/shower)	1.65E-04	(mg/kg-day)	7.00E-03	per (mg/kg-day)	1.15E-06	1.44E-03	(mg/kg-day)	NA	(mg/kg-day)	--
				VINYL CHLORIDE	3.51E-04	(mg/kg/shower)	3.85E-05	(mg/kg-day)	1.54E-02	per (mg/kg-day)	5.92E-07	3.85E-05	(mg/kg-day)	2.86E-02	(mg/kg-day)	1.35E-03
			Exp. Route Total								2.10E-04					2.15E-01
		Exposure Point Total									2.10E-04					2.15E-01
	Exposure Medium Total										2.10E-04					2.15E-01
Groundwater Total											2.70E-03					2.54E+01
										Total of Receptor Risks Across All Media	2.70E-03				Total of Receptor Hazards Across All Media	2.54E+01

EPC - Exposure Point Concentration
CSF - Cancer Slope Factor
RfD - Reference Dose
RfC - Reference Concentration

2

CALCULATION OF CHEMICAL C[illegible]RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

MAXWELL POINT - OTHER EDGEWOOD AREA

GROUNDWATER EVALUATION

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
				Inorganics												
Groundwater	Groundwater	Tap Water	Ingestion	ARSENIC	3.75E-02	(mg/L)	3.08E-04	(mg/kg-day)	1.50E+00	per (mg/kg-day)	4.62E-04	3.60E-03	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.20E+01
				BERYLLIUM	1.84E-02	(mg/L)	1.51E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.76E-03	(mg/kg-day)	2.00E-03	(mg/kg-day)	8.82E-01
				CADMIUM	5.44E-04	(mg/L)	4.47E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	5.22E-05	(mg/kg-day)	5.00E-04	(mg/kg-day)	1.04E-01
				IRON	5.62E+01	(mg/L)	4.62E-01	(mg/kg-day)	NA	per (mg/kg-day)	--	5.39E+00	(mg/kg-day)	3.00E-01	(mg/kg-day)	1.80E+01
				MANGANESE	1.52E+00	(mg/L)	1.25E-02	(mg/kg-day)	NA	per (mg/kg-day)	--	1.46E-01	(mg/kg-day)	4.60E-02	(mg/kg-day)	3.17E+00
				NICKEL	4.34E-01	(mg/L)	3.57E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	4.16E-02	(mg/kg-day)	2.00E-02	(mg/kg-day)	2.08E+00
				THALLIUM	4.70E-03	(mg/L)	3.86E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	4.51E-04	(mg/kg-day)	6.50E-05	(mg/kg-day)	6.93E+00
				VANADIUM	4.36E-03	(mg/L)	3.58E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	4.18E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	8.36E-02
				ZINC	1.50E+00	(mg/L)	1.23E-02	(mg/kg-day)	NA	per (mg/kg-day)	--	1.44E-01	(mg/kg-day)	3.00E-01	(mg/kg-day)	4.79E-01
				PAHs												
				NAPHTHALENE	2.00E-03	(mg/L)	1.64E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.92E-04	(mg/kg-day)	2.00E-02	(mg/kg-day)	9.59E-03
				Pesticides/PCBs												
				DELTA-BHC	2.20E-05	(mg/L)	1.81E-07	(mg/kg-day)	6.30E+00	per (mg/kg-day)	1.14E-06	2.11E-06	(mg/kg-day)	8.00E-03	(mg/kg-day)	2.64E-04
				4,4'-DDD	2.46E-04	(mg/L)	2.02E-06	(mg/kg-day)	2.40E-01	per (mg/kg-day)	4.85E-07	2.36E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				Semivolatiles												
				BIS(2-ETHYLHEXYL)PHTHALATE	6.70E-02	(mg/L)	5.51E-04	(mg/kg-day)	1.40E-02	per (mg/kg-day)	7.71E-06	6.42E-03	(mg/kg-day)	2.00E-02	(mg/kg-day)	3.21E-01
				NITROBENZENE	1.45E-03	(mg/L)	1.19E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.39E-04	(mg/kg-day)	2.00E-03	(mg/kg-day)	6.95E-02
				Volatiles												
				BENZENE	3.45E-01	(mg/L)	2.84E-03	(mg/kg-day)	5.50E-02	per (mg/kg-day)	1.56E-04	3.31E-02	(mg/kg-day)	4.00E-03	(mg/kg-day)	8.27E+00
				CHLOROFORM	1.31E-02	(mg/L)	1.08E-04	(mg/kg-day)	3.10E-02	per (mg/kg-day)	3.34E-06	1.26E-03	(mg/kg-day)	1.00E-02	(mg/kg-day)	1.26E-01
				1,2-DICHLOROETHANE	6.94E-03	(mg/L)	5.70E-05	(mg/kg-day)	9.10E-02	per (mg/kg-day)	5.19E-06	6.65E-04	(mg/kg-day)	2.00E-02	(mg/kg-day)	3.33E-02
				1,2-DICHLOROETHENE	3.71E-02	(mg/L)	3.05E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	3.56E-03	(mg/kg-day)	9.00E-03	(mg/kg-day)	3.95E-01
				1,1,2,2-TETRACHLOROETHANE	2.88E-01	(mg/L)	2.37E-03	(mg/kg-day)	2.00E-01	per (mg/kg-day)	4.73E-04	2.76E-02	(mg/kg-day)	4.00E-03	(mg/kg-day)	6.90E+00
				TETRACHLOROETHENE	6.86E-03	(mg/L)	5.64E-05	(mg/kg-day)	5.40E-01	per (mg/kg-day)	3.04E-05	6.58E-04	(mg/kg-day)	1.00E-02	(mg/kg-day)	6.58E-02
				1,1,2-TRICHLOROETHANE	8.80E-03	(mg/L)	7.23E-05	(mg/kg-day)	5.70E-02	per (mg/kg-day)	4.12E-06	8.44E-04	(mg/kg-day)	4.00E-03	(mg/kg-day)	2.11E-01
				TRICHLOROETHENE	3.79E-02	(mg/L)	3.12E-04	(mg/kg-day)	1.30E-02	per (mg/kg-day)	4.05E-06	3.61E-03	(mg/kg-day)	NA	(mg/kg-day)	--
				VINYL CHLORIDE	6.71E-03	(mg/L)	5.52E-05	(mg/kg-day)	7.20E-01	per (mg/kg-day)	3.97E-05	6.43E-04	(mg/kg-day)	3.00E-03	(mg/kg-day)	2.14E-01
			Exp. Route Total								1.19E-03					6.03E+01
			Dermal	**Inorganics**												
				ARSENIC	3.75E-02	(mg/L)	1.36E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	2.03E-06	1.58E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	5.27E-02
				BERYLLIUM	1.84E-02	(mg/L)	6.65E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	7.76E-06	(mg/kg-day)	1.40E-05	(mg/kg-day)	5.55E-01
				CADMIUM	5.44E-04	(mg/L)	1.97E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	2.30E-07	(mg/kg-day)	1.25E-05	(mg/kg-day)	1.84E-02
				IRON	5.62E+01	(mg/L)	2.03E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	2.37E-02	(mg/kg-day)	3.00E-01	(mg/kg-day)	7.90E-02
				MANGANESE	1.52E+00	(mg/L)	5.50E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	6.41E-04	(mg/kg-day)	1.84E-03	(mg/kg-day)	3.49E-01
				NICKEL	4.34E-01	(mg/L)	3.14E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	3.66E-05	(mg/kg-day)	8.00E-04	(mg/kg-day)	4.58E-02
				THALLIUM	4.70E-03	(mg/L)	1.70E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.98E-06	(mg/kg-day)	6.50E-05	(mg/kg-day)	3.05E-02
				VANADIUM	4.36E-03	(mg/L)	1.58E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.84E-06	(mg/kg-day)	1.30E-04	(mg/kg-day)	1.42E-02
				ZINC	1.50E+00	(mg/L)	3.25E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	3.80E-04	(mg/kg-day)	3.00E-01	(mg/kg-day)	1.27E-03
				PAHs												
				NAPHTHALENE	2.00E-03	(mg/L)	8.68E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.01E-03	(mg/kg-day)	2.00E-02	(mg/kg-day)	5.06E-02
				Pesticides/PCBs												
				DELTA-BHC	2.20E-05	(mg/L)	2.22E-08	(mg/kg-day)	6.30E+00	per (mg/kg-day)	1.40E-07	2.59E-07	(mg/kg-day)	8.00E-03	(mg/kg-day)	3.24E-05
				4,4'-DDD	2.46E-04	(mg/L)	4.45E-05	(mg/kg-day)	2.40E-01	per (mg/kg-day)	1.07E-05	5.19E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				Semivolatiles												
				BIS(2-ETHYLHEXYL)PHTHALATE	6.70E-02	(mg/L)	4.77E-03	(mg/kg-day)	1.40E-02	per (mg/kg-day)	6.68E-05	5.57E-02	(mg/kg-day)	2.00E-02	(mg/kg-day)	2.78E+00
				NITROBENZENE	1.45E-03	(mg/L)	3.65E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	4.26E-06	(mg/kg-day)	2.00E-03	(mg/kg-day)	2.13E-03
				Volatiles												
				BENZENE	3.45E-01	(mg/L)	4.62E-03	(mg/kg-day)	5.50E-02	per (mg/kg-day)	2.54E-04	5.39E-02	(mg/kg-day)	4.00E-03	(mg/kg-day)	1.35E+01
				CHLOROFORM	1.31E-02	(mg/L)	8.05E-05	(mg/kg-day)	3.10E-02	per (mg/kg-day)	2.50E-06	9.40E-04	(mg/kg-day)	1.00E-02	(mg/kg-day)	9.40E-02
				1,2-DICHLOROETHANE	6.94E-03	(mg/L)	2.51E-05	(mg/kg-day)	9.10E-02	per (mg/kg-day)	2.28E-06	2.93E-04	(mg/kg-day)	2.00E-02	(mg/kg-day)	1.46E-02
				1,2-DICHLOROETHENE	3.71E-02	(mg/L)	2.55E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	2.97E-03	(mg/kg-day)	9.00E-03	(mg/kg-day)	3.30E-01
				1,1,2,2-TETRACHLOROETHANE	2.88E-01	(mg/L)	1.77E-03	(mg/kg-day)	2.00E-01	per (mg/kg-day)	3.54E-04	2.07E-02	(mg/kg-day)	4.00E-03	(mg/kg-day)	5.16E+00
				TETRACHLOROETHENE	6.86E-03	(mg/L)	2.08E-04	(mg/kg-day)	5.40E-01	per (mg/kg-day)	1.13E-04	2.43E-03	(mg/kg-day)	1.00E-02	(mg/kg-day)	2.43E-01
				1,1,2-TRICHLOROETHANE	8.80E-03	(mg/L)	5.09E-05	(mg/kg-day)	5.70E-02	per (mg/kg-day)	2.90E-06	5.94E-04	(mg/kg-day)	4.00E-03	(mg/kg-day)	1.49E-01
				TRICHLOROETHENE	3.79E-02	(mg/L)	3.97E-04	(mg/kg-day)	1.30E-02	per (mg/kg-day)	5.17E-06	4.64E-03	(mg/kg-day)	NA	(mg/kg-day)	--
				VINYL CHLORIDE	6.71E-03	(mg/L)	3.40E-05	(mg/kg-day)	7.20E-01	per (mg/kg-day)	2.45E-05	3.96E-04	(mg/kg-day)	3.00E-03	(mg/kg-day)	1.32E-01
			Exp. Route Total								8.38E-04					2.36E+01
		Exposure Point Total									2.03E-03					8.39E+01
	Exposure Medium Total										2.03E-03					8.39E+01
Groundwater Total											2.03E-03					8.39E+01
										Total of Receptor Risks Across All Media	2.03E-03				Total of Receptor Hazards Across All Media	8.39E+01

EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 5-7.3
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
MAXWELL POINT - OTHER EDGEWOOD AREA
GROUNDWATER EVALUATION

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Maxwell Point	Ingestion	**Inorganics**												
				ALUMINUM	1.52E+00	(mg/L)	8.50E-06	(mg/kg-day)	NA	per (mg/kg-day)	–	5.95E-04	(mg/kg-day)	1.00E+00	(mg/kg-day)	5.95E-04
				ARSENIC	6.08E-02	(mg/L)	3.40E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	5.10E-07	2.38E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	7.93E-02
				BERYLLIUM	1.85E-02	(mg/L)	1.03E-07	(mg/kg-day)	NA	per (mg/kg-day)	–	7.24E-06	(mg/kg-day)	2.00E-03	(mg/kg-day)	3.62E-03
				CADMIUM	6.35E-04	(mg/L)	3.55E-09	(mg/kg-day)	NA	per (mg/kg-day)	–	2.49E-07	(mg/kg-day)	5.00E-04	(mg/kg-day)	4.97E-04
				CHROMIUM, TOTAL	5.09E-03	(mg/L)	2.85E-08	(mg/kg-day)	NA	per (mg/kg-day)	–	1.99E-06	(mg/kg-day)	3.00E-03	(mg/kg-day)	6.64E-04
				IRON	5.69E+01	(mg/L)	3.18E-04	(mg/kg-day)	NA	per (mg/kg-day)	–	2.23E-02	(mg/kg-day)	3.00E-01	(mg/kg-day)	7.42E-02
				MANGANESE	1.56E+00	(mg/L)	8.72E-06	(mg/kg-day)	NA	per (mg/kg-day)	–	6.11E-04	(mg/kg-day)	4.60E-02	(mg/kg-day)	1.33E-02
				NICKEL	4.36E-01	(mg/L)	2.44E-06	(mg/kg-day)	NA	per (mg/kg-day)	–	1.71E-04	(mg/kg-day)	2.00E-02	(mg/kg-day)	8.53E-03
				THALLIUM	4.02E-03	(mg/L)	2.25E-08	(mg/kg-day)	NA	per (mg/kg-day)	–	1.57E-06	(mg/kg-day)	6.50E-05	(mg/kg-day)	2.42E-02
				VANADIUM	6.10E-03	(mg/L)	3.41E-08	(mg/kg-day)	NA	per (mg/kg-day)	–	2.39E-06	(mg/kg-day)	5.00E-03	(mg/kg-day)	4.77E-04
				ZINC	1.50E+00	(mg/L)	8.39E-06	(mg/kg-day)	NA	per (mg/kg-day)	–	5.87E-04	(mg/kg-day)	3.00E-01	(mg/kg-day)	1.96E-03
				PAHs												
				NAPHTHALENE	2.00E-03	(mg/L)	1.12E-08	(mg/kg-day)	NA	per (mg/kg-day)	–	7.83E-07	(mg/kg-day)	2.00E-02	(mg/kg-day)	3.91E-05
				Pesticides/PCBs												
				DELTA-BHC	2.20E-05	(mg/L)	1.23E-10	(mg/kg-day)	6.30E+00	per (mg/kg-day)	7.75E-10	8.61E-09	(mg/kg-day)	8.00E-03	(mg/kg-day)	1.08E-06
				4,4'-DDD	2.46E-04	(mg/L)	1.38E-09	(mg/kg-day)	2.40E-01	per (mg/kg-day)	3.30E-10	9.63E-08	(mg/kg-day)	NA	(mg/kg-day)	–
				Semivolatiles												
				BIS(2-ETHYLHEXYL)PHTHALATE	6.70E-02	(mg/L)	3.75E-07	(mg/kg-day)	1.40E-02	per (mg/kg-day)	5.24E-09	2.62E-05	(mg/kg-day)	2.00E-02	(mg/kg-day)	1.31E-03
				NITROBENZENE	1.45E-03	(mg/L)	8.11E-09	(mg/kg-day)	NA	per (mg/kg-day)	–	5.68E-07	(mg/kg-day)	2.00E-03	(mg/kg-day)	2.84E-04
				Volatiles												
				BENZENE	3.45E-01	(mg/L)	1.93E-06	(mg/kg-day)	5.50E-02	per (mg/kg-day)	1.06E-07	1.35E-04	(mg/kg-day)	4.00E-03	(mg/kg-day)	3.38E-02
				CHLOROFORM	1.31E-02	(mg/L)	7.32E-08	(mg/kg-day)	3.10E-02	per (mg/kg-day)	2.27E-09	5.13E-06	(mg/kg-day)	1.00E-02	(mg/kg-day)	5.13E-04
				1,2-DICHLOROETHANE	6.94E-03	(mg/L)	3.88E-08	(mg/kg-day)	9.10E-02	per (mg/kg-day)	3.53E-09	2.72E-06	(mg/kg-day)	2.00E-02	(mg/kg-day)	1.36E-04
				1,2-DICHLOROETHENE	3.71E-02	(mg/L)	2.07E-07	(mg/kg-day)	NA	per (mg/kg-day)	–	1.45E-05	(mg/kg-day)	9.00E-03	(mg/kg-day)	1.61E-03
				1,1,2,2-TETRACHLOROETHANE	2.88E-01	(mg/L)	1.61E-06	(mg/kg-day)	2.00E-01	per (mg/kg-day)	3.22E-07	1.13E-04	(mg/kg-day)	4.00E-03	(mg/kg-day)	2.82E-02
				TETRACHLOROETHENE	6.86E-03	(mg/L)	3.84E-08	(mg/kg-day)	5.40E-01	per (mg/kg-day)	2.07E-08	2.68E-06	(mg/kg-day)	1.00E-02	(mg/kg-day)	2.68E-04
				1,1,2-TRICHLOROETHANE	8.80E-03	(mg/L)	4.92E-08	(mg/kg-day)	5.70E-02	per (mg/kg-day)	2.80E-09	3.44E-06	(mg/kg-day)	4.00E-03	(mg/kg-day)	8.61E-04
				TRICHLOROETHENE	3.79E-02	(mg/L)	2.12E-07	(mg/kg-day)	1.30E-02	per (mg/kg-day)	2.75E-09	1.48E-05	(mg/kg-day)	NA	(mg/kg-day)	–
				VINYL CHLORIDE	6.71E-03	(mg/L)	3.75E-08	(mg/kg-day)	7.20E-01	per (mg/kg-day)	2.70E-08	2.63E-06	(mg/kg-day)	3.00E-03	(mg/kg-day)	8.75E-04
			Exp. Route Total								1.00E-06					2.75E-01
			Dermal[1]	**Inorganics**												
				ALUMINUM	1.52E+00	(mg/L)	9.69E-07	(mg/kg-day)	NA	per (mg/kg-day)	–	6.78E-05	(mg/kg-day)	1.00E+00	(mg/kg-day)	6.78E-05
				ARSENIC	6.08E-02	(mg/L)	3.88E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	5.81E-08	2.71E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	9.04E-03
				BERYLLIUM	1.85E-02	(mg/L)	1.18E-08	(mg/kg-day)	NA	per (mg/kg-day)	–	8.25E-07	(mg/kg-day)	1.40E-05	(mg/kg-day)	5.90E-02
				CADMIUM	6.35E-04	(mg/L)	4.05E-10	(mg/kg-day)	NA	per (mg/kg-day)	–	2.83E-08	(mg/kg-day)	1.25E-05	(mg/kg-day)	2.27E-03
				CHROMIUM, TOTAL	5.09E-03	(mg/L)	6.49E-09	(mg/kg-day)	NA	per (mg/kg-day)	–	4.54E-07	(mg/kg-day)	7.50E-05	(mg/kg-day)	6.06E-03
				IRON	5.69E+01	(mg/L)	3.63E-05	(mg/kg-day)	NA	per (mg/kg-day)	–	2.54E-03	(mg/kg-day)	3.00E-01	(mg/kg-day)	8.46E-03
				MANGANESE	1.56E+00	(mg/L)	9.94E-07	(mg/kg-day)	NA	per (mg/kg-day)	–	6.96E-05	(mg/kg-day)	1.84E-03	(mg/kg-day)	3.78E-02
				NICKEL	4.36E-01	(mg/L)	5.56E-08	(mg/kg-day)	NA	per (mg/kg-day)	–	3.89E-06	(mg/kg-day)	8.00E-04	(mg/kg-day)	4.86E-03
				THALLIUM	4.02E-03	(mg/L)	2.56E-09	(mg/kg-day)	NA	per (mg/kg-day)	–	1.79E-07	(mg/kg-day)	6.50E-05	(mg/kg-day)	2.76E-03
				VANADIUM	6.10E-03	(mg/L)	3.89E-09	(mg/kg-day)	NA	per (mg/kg-day)	–	2.72E-07	(mg/kg-day)	1.30E-04	(mg/kg-day)	2.09E-03
				ZINC	1.50E+00	(mg/L)	5.74E-07	(mg/kg-day)	NA	per (mg/kg-day)	–	4.02E-05	(mg/kg-day)	3.00E-01	(mg/kg-day)	1.34E-04
				PAHs												
				NAPHTHALENE	2.00E-03	(mg/L)	1.53E-06	(mg/kg-day)	NA	per (mg/kg-day)	–	1.07E-04	(mg/kg-day)	2.00E-02	(mg/kg-day)	5.35E-03
				Pesticides/PCBs												
				DELTA-BHC	2.20E-05	(mg/L)	3.91E-10	(mg/kg-day)	6.30E+00	per (mg/kg-day)	2.46E-09	2.74E-08	(mg/kg-day)	8.00E-03	(mg/kg-day)	3.42E-06
				4,4'-DDD	2.46E-04	(mg/L)	7.84E-07	(mg/kg-day)	2.40E-01	per (mg/kg-day)	1.88E-07	5.49E-05	(mg/kg-day)	NA	(mg/kg-day)	–
				Semivolatiles												
				BIS(2-ETHYLHEXYL)PHTHALATE	6.70E-02	(mg/L)	8.41E-05	(mg/kg-day)	1.40E-02	per (mg/kg-day)	1.18E-06	5.89E-03	(mg/kg-day)	2.00E-02	(mg/kg-day)	2.94E-01
				NITROBENZENE	1.45E-03	(mg/L)	6.43E-09	(mg/kg-day)	NA	per (mg/kg-day)	–	4.50E-07	(mg/kg-day)	2.00E-03	(mg/kg-day)	2.25E-04
				Volatiles												
				BENZENE	3.45E-01	(mg/L)	8.14E-05	(mg/kg-day)	5.50E-02	per (mg/kg-day)	4.48E-06	5.70E-03	(mg/kg-day)	4.00E-03	(mg/kg-day)	1.42E+00
				CHLOROFORM	1.31E-02	(mg/L)	1.42E-06	(mg/kg-day)	3.10E-02	per (mg/kg-day)	4.40E-08	9.94E-05	(mg/kg-day)	1.00E-02	(mg/kg-day)	9.94E-03
				1,2-DICHLOROETHANE	6.94E-03	(mg/L)	4.42E-07	(mg/kg-day)	9.10E-02	per (mg/kg-day)	4.03E-08	3.10E-05	(mg/kg-day)	2.00E-02	(mg/kg-day)	1.55E-03
				1,2-DICHLOROETHENE	3.71E-02	(mg/L)	4.49E-06	(mg/kg-day)	NA	per (mg/kg-day)	–	3.15E-04	(mg/kg-day)	9.00E-03	(mg/kg-day)	3.49E-02
				1,1,2,2-TETRACHLOROETHANE	2.88E-01	(mg/L)	3.12E-05	(mg/kg-day)	2.00E-01	per (mg/kg-day)	6.24E-06	2.18E-03	(mg/kg-day)	4.00E-03	(mg/kg-day)	5.46E-01
				TETRACHLOROETHENE	6.86E-03	(mg/L)	3.67E-06	(mg/kg-day)	5.40E-01	per (mg/kg-day)	1.98E-06	2.57E-04	(mg/kg-day)	1.00E-02	(mg/kg-day)	2.57E-02
				1,1,2-TRICHLOROETHANE	8.80E-03	(mg/L)	8.97E-07	(mg/kg-day)	5.70E-02	per (mg/kg-day)	5.12E-08	6.28E-05	(mg/kg-day)	4.00E-03	(mg/kg-day)	1.57E-02
				TRICHLOROETHENE	3.79E-02	(mg/L)	7.01E-06	(mg/kg-day)	1.30E-02	per (mg/kg-day)	9.11E-08	4.90E-04	(mg/kg-day)	NA	(mg/kg-day)	–
				VINYL CHLORIDE	6.71E-03	(mg/L)	5.99E-07	(mg/kg-day)	7.20E-01	per (mg/kg-day)	4.31E-07	4.19E-05	(mg/kg-day)	3.00E-03	(mg/kg-day)	1.40E-02
			Exp. Route Total								1.48E-05					2.50E+00
		Exposure Point Total									1.58E-05					2.78E+00
	Exposure Medium Total										1.58E-05					2.78E+00
Groundwater Total											1.58E-05					2.78E+00
										Total of Receptor Risks Across All Media	1.58E-05				Total of Receptor Hazards Across All Media	2.78E+00

EPC - Exposure Point Concentration
CSF - Cancer Slope Factor
RfD - Reference Dose
RfC - Reference Concentration

TABLE 5-7.4
INPUTS FOR ADULT RESIDENT SHOWER MODEL
GROUNDWATER EVALUATION

Parameters in the Model	Units	Value
Liquid Phase t.c. CO2	cm/h	20
Gas Phase t.c. H2O	cm/h	3000
Water Viscosity at 20C	cp	1.002
Water Viscosity at 45C	cp	0.596
Shower Temp	K	318
Droplet Diameter	mm	1
Drop Time	s	2
Shower Flow Rate	L/min	20
Shower Stall Volume	m^3	6.00E+00
Shower Duration	min	1.20E+01
Air Exchange Rate	min^{-1}	0.0166667
Body Weight	kg	70
RT	atm-m^3/mol	2.40E-02
Duration in Shower Room	min	2.00E+01
Ventillation Rate	L/min	1.40E+01

TABLE 5-7.5
CHEMICAL PHYSICAL PARAMETERS FOR ADULT RESIDENT SHOWER MODEL
MAXWELL POINT - OTHER EDGEWOOD AREA
GROUNDWATER EVALUATION

Chemical	Henry's Law	Molecular Weight	Gas Phase Transfer Coefficient	Liquid Phase Transfer Coefficient	Overall Mass Transfer Coefficient	Adjusted Overall Mass Transfer Coefficient
	atm-m3/mol-K	g/mol	cm/hr	cm/hr	cm/hr	cm/hr
BENZENE	5.60E-03	7.81E+01	1.44E+03	1.50E+01	1.44E+01	1.94E+01
CHLOROFORM	3.70E-03	1.19E+02	1.16E+03	1.21E+01	1.14E+01	1.54E+01
1,2-DICHLOROETHANE	9.80E-04	9.90E+01	1.28E+03	1.33E+01	1.06E+01	1.44E+01
1,2-DICHLOROETHENE	4.10E-03	9.69E+01	1.29E+03	1.35E+01	1.27E+01	1.72E+01
1,1,2,2-TETRACHLOROETHANE	3.50E-04	1.68E+02	9.82E+02	1.02E+01	5.97E+00	8.07E+00
TETRACHLOROETHENE	1.80E-02	1.70E+02	9.76E+02	1.02E+01	1.00E+01	1.36E+01
1,1,2-TRICHLOROETHANE	9.10E-04	1.33E+02	1.10E+03	1.15E+01	9.01E+00	1.22E+01
TRICHLOROETHENE	1.00E-02	1.30E+02	1.12E+03	1.16E+01	1.14E+01	1.53E+01
VINYL CHLORIDE	2.70E-02	6.25E+01	1.61E+03	1.68E+01	1.66E+01	2.25E+01

Henry's Law and Molecular Weight information from www.epa.gov/region09/waste/sfund/prg/s5_02.htm

TABLE 5-7.6
ESTIMATES OF EXPOSURE POINT CONCENTRATIONS FOR ADULT RESIDENT
SHOWER MODEL
MAXWELL POINT - OTHER EDGEWOOD AREA
GROUNDWATER EVALUATION

Chemical	RME Groundwater Concentration ug/L	Concentration Leaving Shower Droplet ug/L	Indoor VOC Generation Rate ug/m3-min	Inhalation Exposure Per Shower mg/kg/shower
BENZENE	3.45E+02	1.64E+02	5.48E+02	1.63E-02
CHLOROFORM	1.31E+01	5.25E+00	1.75E+01	5.21E-04
1,2-DICHLOROETHANE	6.94E+00	2.64E+00	8.80E+00	2.62E-04
1,2-DICHLOROETHENE	3.71E+01	1.62E+01	5.39E+01	1.60E-03
1,1,2,2-TETRACHLOROETHANE	2.88E+02	6.79E+01	2.26E+02	6.74E-03
TETRACHLOROETHENE	6.86E+00	2.49E+00	8.31E+00	2.48E-04
1,1,2-TRICHLOROETHANE	8.80E+00	2.93E+00	9.78E+00	2.91E-04
TRICHLOROETHENE	3.79E+01	1.52E+01	5.06E+01	1.51E-03
VINYL CHLORIDE	6.71E+00	3.54E+00	1.18E+01	3.51E-04

TABLE 5-9.1

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

MAXWELL POINT - OTHER EDGEWOOD AREA

GROUNDWATER EVALUATION

Location: Maxwell Point
Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Tap Water	**Inorganics**					**Inorganics**					
	Child		ARSENIC	4.6E-04	2.0E-06	--	4.6E-04	ARSENIC	Skin	1.2E+01	5.3E-02	--	1.2E+01
			BERYLLIUM	--	--	--	NA	BERYLLIUM	Intestines	8.8E-01	5.5E-01	--	1.4E+00
			CADMIUM	--	--	--	NA	CADMIUM	Kidneys	1.0E-01	1.8E-02	--	1.2E-01
			IRON	--	--	--	NA	IRON	None	1.8E+01	7.9E-02	--	1.8E+01
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	3.2E+00	3.5E-01	--	3.5E+00
			NICKEL	--	--	--	NA	NICKEL	None	2.1E+00	4.6E-02	--	2.1E+00
			THALLIUM	--	--	--	NA	THALLIUM	None	6.9E+00	3.1E-02	--	7.0E+00
			VANADIUM	--	--	--	NA	VANADIUM	Hair	8.4E-02	1.4E-02	--	9.8E-02
			ZINC	--	--	--	NA	ZINC	Blood	4.8E-01	1.3E-03	--	4.8E-01
			PAHs					**PAHs**					
			NAPHTHALENE	--	--	--	NA	NAPHTHALENE	None	9.6E-03	5.1E-02	--	6.0E-02
			Pesticides/PCBs			--		**Pesticides/PCBs**					
			DELTA-BHC	1.1E-06	1.4E-07	--	1.3E-06	DELTA-BHC	Liver	2.6E-04	3.2E-05	--	3.0E-04
			4,4'-DDD	4.9E-07	1.1E-05	--	1.1E-05	4,4'-DDD	NA	--	--	--	NA
			Semivolatiles			--		**Semivolatiles**					
			BIS(2-ETHYLHEXYL)PHTHALATE	7.7E-06	6.7E-05	--	7.5E-05	BIS(2-ETHYLHEXYL)PHTHALATE	Liver	3.2E-01	2.8E+00	--	3.1E+00
			NITROBENZENE	--	--	--	NA	NITROBENZENE	Kidney	7.0E-02	2.1E-03	--	7.2E-02
			Volatiles			--		**Volatiles**					
			BENZENE	1.6E-04	2.5E-04	--	4.1E-04	BENZENE	Immune System	8.3E+00	1.3E+01	--	2.2E+01
			CHLOROFORM	3.3E-06	2.5E-06	--	5.8E-06	CHLOROFORM	Liver	1.3E-01	9.4E-02	--	2.2E-01
			1,2-DICHLOROETHANE	5.2E-06	2.3E-06	--	7.5E-06	1,2-DICHLOROETHANE	Kidneys	3.3E-02	1.5E-02	--	4.8E-02
			1,2-DICHLOROETHENE	--	--	--	NA	1,2-DICHLOROETHENE	Liver	4.0E-01	3.3E-01	--	7.3E-01
			1,1,2,2-TETRACHLOROETHANE	4.7E-04	3.5E-04	--	8.3E-04	1,1,2,2-TETRACHLOROETHANE	Liver	6.9E+00	5.2E+00	--	1.2E+01
			TETRACHLOROETHENE	3.0E-05	1.1E-04	--	1.4E-04	TETRACHLOROETHENE	Liver	6.6E-02	2.4E-01	--	3.1E-01
			1,1,2-TRICHLOROETHANE	4.1E-06	2.9E-06	--	7.0E-06	1,1,2-TRICHLOROETHANE	Liver	2.1E-01	1.5E-01	--	3.6E-01
			TRICHLOROETHENE	4.0E-06	5.2E-06	--	9.2E-06	TRICHLOROETHENE	NA	--	--	--	NA
			VINYL CHLORIDE	4.0E-05	2.4E-05	--	6.4E-05	VINYL CHLORIDE	Liver	2.1E-01	1.3E-01	--	3.5E-01
			(Total for Child)	1.2E-03	8.4E-04	---	2.0E-03		(Total for Child)	6.0E+01	2.4E+01	---	8.4E+01

TABLE 5-9.1

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

MAXWELL POINT - OTHER EDGEWOOD AREA

GROUNDWATER EVALUATION

Location: Maxwell Point

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
	Groundwater	Tap Water	**Inorganics**					**Inorganics**					
	Adult		ARSENIC	5.3E-04	2.76E-06	--	5.3E-04	ARSENIC	Skin	3.4E+00	1.79E-02	--	3.4E+00
			BERYLLIUM	--	--	--	NA	BERYLLIUM	Intestines	2.5E-01	1.88E-01	--	4.4E-01
			CADMIUM	--	--	--	NA	CADMIUM	Kidneys	3.0E-02	6.22E-03	--	3.6E-02
			IRON	--	--	--	NA	IRON	None	5.1E+00	2.68E-02	--	5.2E+00
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	9.1E-01	1.18E-01	--	1.0E+00
			NICKEL	--	--	--	NA	NICKEL	None	5.9E-01	1.55E-02	--	6.1E-01
			THALLIUM	--	--	--	NA	THALLIUM	None	2.0E+00	1.03E-02	--	2.0E+00
			VANADIUM	--	--	--	NA	VANADIUM	Hair	2.4E-02	4.80E-03	--	2.9E-02
			ZINC	--	--	--	NA	ZINC	Blood	1.4E-01	4.29E-04	--	1.4E-01
			PAHs					**PAHs**					
			NAPHTHALENE	--	--	--	NA	NAPHTHALENE	None	2.7E-03	1.72E-02	--	2.0E-02
			Pesticides/PCBs					**Pesticides/PCBs**					
			DELTA-BHC	1.3E-06	1.90E-07	--	1.5E-06	DELTA-BHC	Liver	7.5E-05	1.10E-05	--	8.6E-05
			4,4'-DDD	5.5E-07	1.45E-05	--	1.5E-05	4,4'-DDD	NA	--	--	--	NA
			Semivolatiles				NA	**Semivolatiles**					
			BIS(2-ETHYLHEXYL)PHTHALATE	8.8E-06	9.06E-05	--	9.9E-05	BIS(2-ETHYLHEXYL)PHTHALATE	Liver	9.2E-02	9.44E-01	--	1.0E+00
			NITROBENZENE	--	--	--	NA	NITROBENZENE	Kidney	2.0E-02	7.22E-04	--	2.1E-02
			Volatiles					**Volatiles**					
			BENZENE	1.8E-04	3.44E-04	4.9E-05	5.7E-04	BENZENE	Immune System	2.4E+00	4.56E+00	2.1E-01	7.1E+00
			CHLOROFORM	3.8E-06	3.39E-06	4.6E-06	1.2E-05	CHLOROFORM	Liver	3.6E-02	3.18E-02	2.0E-03	7.0E-02
			1,2-DICHLOROETHANE	5.9E-06	3.10E-06	2.6E-06	1.2E-05	1,2-DICHLOROETHANE	Kidneys	9.5E-03	4.96E-03	4.2E-05	1.5E-02
			1,2-DICHLOROETHENE	--	--	--	NA	1,2-DICHLOROETHENE	Liver	1.1E-01	1.12E-01	--	2.2E-01
			1,1,2,2-TETRACHLOROETHANE	5.4E-04	4.80E-04	1.5E-04	1.2E-03	1,1,2,2-TETRACHLOROETHANE	Liver	2.0E+00	1.75E+00	--	3.7E+00
			TETRACHLOROETHENE	3.5E-05	1.53E-04	5.6E-07	1.9E-04	TETRACHLOROETHENE	Liver	1.9E-02	8.24E-02	3.1E-03	1.0E-01
			1,1,2-TRICHLOROETHANE	4.7E-06	3.94E-06	1.8E-06	1.0E-05	1,1,2-TRICHLOROETHANE	Liver	6.0E-02	5.03E-02	--	1.1E-01
			TRICHLOROETHENE	4.6E-06	7.01E-06	1.2E-06	1.3E-05	TRICHLOROETHENE	NA	--	--	--	NA
			VINYL CHLORIDE	4.5E-05	3.32E-05	5.9E-07	7.9E-05	VINYL CHLORIDE	Liver	6.1E-02	4.48E-02	1.3E-03	1.1E-01
			(Total for Adult)	1.4E-03	1.1E-03	2.1E-04	2.7E-03		(Total for Adult)	1.7E+01	8.0E+00	2.2E-01	2.5E+01

TABLE 5-9.1

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

MAXWELL POINT - OTHER EDGEWOOD AREA

GROUNDWATER EVALUATION

Location: Maxwell Point

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
	Groundwater	Tap Water	**Inorganics**										
	Adult + Child		ARSENIC	9.9E-04	4.8E-06	NA	1.0E-03						
			BARIUM	NA	NA	NA	NA						
			IRON	NA	NA	NA	NA						
			MANGANESE	NA	NA	NA	NA						
			NICKEL	NA	NA	NA	NA						
			THALLIUM	NA	NA	NA	NA						
			VANADIUM	NA	NA	NA	NA						
			ZINC	NA	NA	NA	NA						
			PAHs										
			NAPHTHALENE	NA	NA	NA	NA						
			Pesticides/PCBs										
			DELTA-BHC	2.4E-06	3.3E-07	NA	2.8E-06						
			4,4'-DDD	1.0E-06	2.5E-05	NA	2.6E-05						
			Semivolatiles										
			BIS(2-ETHYLHEXYL)PHTHALATE	1.7E-05	1.6E-04	NA	1.7E-04						
			NITROBENZENE	NA	NA	NA	NA						
			Volatiles										
			BENZENE	3.3E-04	6.0E-04	4.9E-05	9.8E-04						
			CHLOROFORM	7.2E-06	5.9E-06	4.6E-06	1.8E-05						
			1,2-DICHLOROETHANE	1.1E-05	5.4E-06	2.6E-06	1.9E-05						
			1,2-DICHLOROETHENE	NA	NA	NA	NA						
			1,1,2,2-TETRACHLOROETHANE	1.0E-03	8.3E-04	1.5E-04	2.0E-03						
			TETRACHLOROETHENE	6.5E-05	2.7E-04	5.6E-07	3.3E-04						
			1,1,2-TRICHLOROETHANE	8.8E-06	6.8E-06	1.8E-06	1.7E-05						
			TRICHLOROETHENE	8.7E-06	1.2E-05	1.2E-06	2.2E-05						
			VINYL CHLORIDE	8.5E-05	5.8E-05	5.9E-07	1.4E-04						
			(Total for Child + Adult)	2.5E-03	2.0E-03	2.1E-04	4.7E-03					Total Hazard Index Across Groundwater (Child)	8.4E+01
			Total Risk Across Groundwater (Adult + Child)				4.7E-03					Total Hazard Index Across Groundwater (Adult)	2.5E+01
			Total Risk Across All Media and All Exposure Routes				4.7E-03					Total Hazard Index Across All Media and All Exposure Routes (Child)	8.4E+01
												Total Hazard Index Across All Media and All Exposure Routes (Adult)	2.5E+01

TABLE 5-9.2
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
MAXWELL POINT - OTHER EDGEWOOD AREA
GROUNDWATER EVALUATION

Location: Maxwell Point
Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Maxwell Point	**Inorganics**					**Inorganics**					
			ALUMINUM	--	--	--	NA	ALUMINUM	Central Nervous System	5.9E-04	6.8E-05	--	6.6E-04
			ARSENIC	5.1E-07	5.8E-08	--	5.7E-07	ARSENIC	Skin	7.9E-02	9.0E-03	--	8.8E-02
			BERYLLIUM	--	--	--	NA	BERYLLIUM	Intestines	3.6E-03	5.9E-02	--	6.3E-02
			CADMIUM	--	--	--	NA	CADMIUM	Kidneys	5.0E-04	2.3E-03	--	2.8E-03
			CHROMIUM, TOTAL	--	--	--	NA	CHROMIUM, TOTAL	None	6.6E-04	6.1E-03	--	6.7E-03
			IRON	--	--	--	NA	IRON	None	7.4E-02	8.5E-03	--	8.3E-02
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	1.3E-02	3.8E-02	--	5.1E-02
			NICKEL	--	--	--	NA	NICKEL	None	8.5E-03	4.9E-03	--	1.3E-02
			THALLIUM	--	--	--	NA	THALLIUM	None	2.4E-02	2.8E-03	--	2.7E-02
			VANADIUM	--	--	--	NA	VANADIUM	Hair	4.8E-04	2.1E-03	--	2.6E-03
			ZINC	--	--	--	NA	ZINC	Blood	2.0E-03	1.3E-04	--	2.1E-03
			PAHs					**PAHs**					
			NAPHTHALENE	--	--	--	NA	NAPHTHALENE	None	3.9E-05	5.4E-03	--	5.4E-03
			Pesticides/PCBs					**Pesticides/PCBs**					
			DELTA-BHC	7.7E-10	2.5E-09	--	3.2E-09	DELTA-BHC	Liver	1.1E-06	3.4E-06	--	4.5E-06
			4,4'-DDD	3.3E-10	1.9E-07	--	1.9E-07	4,4'-DDD	NA	--	--	--	NA
			Semivolatiles					**Semivolatiles**					
			BIS(2-ETHYLHEXYL)PHTHALATE	5.2E-09	1.2E-06	--	1.2E-06	BIS(2-ETHYLHEXYL)PHTHALATE	Liver	1.3E-03	2.9E-01	--	3.0E-01
			NITROBENZENE	--	--	--	NA	NITROBENZENE	Kidney	2.8E-04	2.3E-04	--	5.1E-04
			Volatiles			--		**Volatiles**					
			BENZENE	1.1E-07	4.5E-06	--	4.6E-06	BENZENE	Immune System	3.4E-02	1.4E+00	--	1.5E+00
			CHLOROFORM	2.3E-09	4.4E-08	--	4.6E-08	CHLOROFORM	Liver	5.1E-04	9.9E-03	--	1.0E-02
			1,2-DICHLOROETHANE	3.5E-09	4.0E-08	--	4.4E-08	1,2-DICHLOROETHANE	Kidneys	1.4E-04	1.5E-03	--	1.7E-03
			1,2-DICHLOROETHENE	--	--	--	NA	1,2-DICHLOROETHENE	Liver	1.6E-03	3.5E-02	--	3.7E-02
			1,1,2,2-TETRACHLOROETHANE	3.2E-07	6.2E-06	--	6.6E-06	1,1,2,2-TETRACHLOROETHANE	Liver	2.8E-02	5.5E-01	--	5.7E-01
			TETRACHLOROETHENE	2.1E-08	2.0E-06	--	2.0E-06	TETRACHLOROETHENE	Liver	2.7E-04	2.6E-02	--	2.6E-02
			1,1,2-TRICHLOROETHANE	2.8E-09	5.1E-08	--	5.4E-08	1,1,2-TRICHLOROETHANE	Liver	8.6E-04	1.6E-02	--	1.7E-02
			TRICHLOROETHENE	2.8E-09	9.1E-08	--	9.4E-08	TRICHLOROETHENE	NA	--	--	--	NA
			VINYL CHLORIDE	2.7E-08	4.3E-07	--	4.6E-07	VINYL CHLORIDE	Liver	8.8E-04	1.4E-02	--	1.5E-02
			(Total)	1.0E-06	1.5E-05	--	1.6E-05		(Total)	2.8E-01	2.5E+00	--	2.8E+00
				Total Risk Across Groundwater			**1.6E-05**			**Total Hazard Index Across Groundwater**			**2.8E+00**
			Total Risk Across All Media and All Exposure Routes				**1.6E-05**		**Total Hazard Index Across All Media and All Exposure Routes**				**2.8E+00**

TABLE 5-10.1
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
MAXWELL POINT - OTHER EDGEWOOD AREA
GROUNDWATER EVALUATION

Location Other Edgewood Area
Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Tap Water	**Inorganics**					**Inorganics**					
	Child		ARSENIC	4.6E-04	2.0E-06	--	4.6E-04	ARSENIC	Skin	1.2E+01	5.3E-02	--	1.2E+01
			BERYLLIUM	--	--	--	NA	BERYLLIUM	Intestines	8.8E-01	5.5E-01	--	1.4E+00
			CADMIUM	--	--	--	NA	CADMIUM	Kidneys	1.0E-01	1.8E-02	--	1.2E-01
			IRON	--	--	--	NA	IRON	None	1.8E+01	7.9E-02	--	1.8E+01
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	3.2E+00	3.5E-01	--	3.5E+00
			NICKEL	--	--	--	NA	NICKEL	None	2.1E+00	4.6E-02	--	2.1E+00
			THALLIUM	--	--	--	NA	THALLIUM	None	6.9E+00	3.1E-02	--	7.0E+00
			ZINC	--	--	--	NA	ZINC	Blood	4.8E-01	1.3E-03	--	4.8E-01
			PAHs					**PAHs**					
			Pesticides/PCBs			--		**Pesticides/PCBs**					
			DELTA-BHC	1.1E-06	1.4E-07	--	1.3E-06	DELTA-BHC	Liver	--	--	--	NA
			4,4'-DDD	4.9E-07	1.1E-05	--	1.1E-05	4,4'-DDD	NA	--	--	--	NA
			Semivolatiles			--		**Semivolatiles**					
			BIS(2-ETHYLHEXYL)PHTHALATE	7.7E-06	6.7E-05	--	7.5E-05	BIS(2-ETHYLHEXYL)PHTHALATE	Liver	3.2E-01	2.8E+00	--	3.1E+00
			Volatiles			--		**Volatiles**					
			BENZENE	1.6E-04	2.5E-04	--	4.1E-04	BENZENE	Immune System	8.3E+00	1.3E+01	--	2.2E+01
			CHLOROFORM	3.3E-06	2.5E-06	--	5.8E-06	CHLOROFORM	Liver	1.3E-01	9.4E-02	--	2.2E-01
			1,2-DICHLOROETHANE	5.2E-06	2.3E-06	--	7.5E-06	1,2-DICHLOROETHANE	Kidneys	--	--	--	NA
			1,2-DICHLOROETHENE	--	--	--	NA	1,2-DICHLOROETHENE	Liver	4.0E-01	3.3E-01	--	7.3E-01
			1,1,2,2-TETRACHLOROETHANE	4.7E-04	3.5E-04	--	8.3E-04	1,1,2,2-TETRACHLOROETHANE	Liver	6.9E+00	5.2E+00	--	1.2E+01
			TETRACHLOROETHENE	3.0E-05	1.1E-04	--	1.4E-04	TETRACHLOROETHENE	Liver	6.6E-02	2.4E-01	--	3.1E-01
			1,1,2-TRICHLOROETHANE	4.1E-06	2.9E-06	--	7.0E-06	1,1,2-TRICHLOROETHANE	Liver	2.1E-01	1.5E-01	--	3.6E-01
			TRICHLOROETHENE	4.0E-06	5.2E-06	--	9.2E-06	TRICHLOROETHENE	NA	--	--	--	NA
			VINYL CHLORIDE	4.0E-05	2.4E-05	--	6.4E-05	VINYL CHLORIDE	Liver	2.1E-01	1.3E-01	--	3.5E-01
			(Total for Child)	1.2E-03	8.4E-04	---	2.0E-03		(Total for Child)	6.0E+01	2.3E+01	---	8.4E+01

TABLE 5-10.1
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
MAXWELL POINT - OTHER EDGEWOOD AREA
GROUNDWATER EVALUATION

Location: Other Edgewood Area
Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
	Groundwater	Tap Water	**Inorganics**					**Inorganics**					
	Adult		ARSENIC	5.3E-04	2.76E-06	--	5.3E-04	ARSENIC	Skin	3.4E+00	1.79E-02	--	3.4E+00
			BERYLLIUM	--	--	--	NA	BERYLLIUM	Intestines	2.5E-01	1.88E-01	--	4.4E-01
			IRON	--	--	--	NA	IRON	None	5.1E+00	2.68E-02	--	5.2E+00
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	9.1E-01	1.18E-01	--	1.0E+00
			NICKEL	--	--	--	NA	NICKEL	None	5.9E-01	1.55E-02	--	6.1E-01
			THALLIUM	--	--	--	NA	THALLIUM	None	2.0E+00	1.03E-02	--	2.0E+00
			ZINC	--	--	--	NA	ZINC	Blood	1.4E-01	4.29E-04	--	1.4E-01
			Pesticides/PCBs					**Pesticides/PCBs**					
			DELTA-BHC	1.3E-06	1.90E-07	--	1.5E-06	DELTA-BHC	Liver	--	--	--	NA
			4,4'-DDD	5.5E-07	1.45E-05	--	1.5E-05	4,4'-DDD	NA	--	--	--	NA
			Semivolatiles					**Semivolatiles**					
			BIS(2-ETHYLHEXYL)PHTHALATE	8.8E-06	9.06E-05	--	9.9E-05	BIS(2-ETHYLHEXYL)PHTHALATE	Liver	9.2E-02	9.44E-01	--	1.0E+00
			Volatiles					**Volatiles**					
			BENZENE	1.8E-04	3.44E-04	4.9E-05	5.7E-04	BENZENE	Immune System	2.4E+00	4.56E+00	2.1E-01	7.1E+00
			CHLOROFORM	3.8E-06	3.39E-06	4.6E-06	1.2E-05	CHLOROFORM	Liver	--	--	2.0E-03	2.0E-03
			1,2-DICHLOROETHANE	5.9E-06	3.10E-06	2.6E-06	1.2E-05	1,2-DICHLOROETHANE	Kidneys	--	--	4.2E-05	4.2E-05
			1,2-DICHLOROETHENE	--	--	--	NA	1,2-DICHLOROETHENE	Liver	1.1E-01	1.12E-01	--	2.2E-01
			1,1,2,2-TETRACHLOROETHANE	5.4E-04	4.80E-04	1.5E-04	1.2E-03	1,1,2,2-TETRACHLOROETHANE	Liver	2.0E+00	1.75E+00	--	3.7E+00
			TETRACHLOROETHENE	3.5E-05	1.53E-04	5.6E-07	1.9E-04	TETRACHLOROETHENE	Liver	1.9E-02	8.24E-02	3.1E-03	1.0E-01
			1,1,2-TRICHLOROETHANE	4.7E-06	3.94E-06	1.8E-06	1.0E-05	1,1,2-TRICHLOROETHANE	Liver	6.0E-02	5.03E-02	--	1.1E-01
			TRICHLOROETHENE	4.6E-06	7.01E-06	1.2E-06	1.3E-05	TRICHLOROETHENE	NA	--	--	--	NA
			VINYL CHLORIDE	4.5E-05	3.32E-05	5.9E-07	7.9E-05	VINYL CHLORIDE	Liver	6.1E-02	4.48E-02	1.3E-03	1.1E-01
			(Total for Adult)	1.4E-03	1.1E-03	2.1E-04	2.7E-03		(Total for Adult)	1.7E+01	7.9E+00	2.2E-01	2.5E+01

TABLE 5-10.1
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
MAXWELL POINT - OTHER EDGEWOOD AREA
GROUNDWATER EVALUATION

Location: Other Edgewood Area
Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
	Groundwater	Tap Water	**Inorganics**										
	Adult + Child		ARSENIC	9.9E-04	4.8E-06	NA	1.0E-03						
			Pesticides/PCBs										
			DELTA-BHC	2.4E-06	3.3E-07	NA	2.8E-06						
			4,4'-DDD	1.0E-06	2.5E-05	NA	2.6E-05						
			Semivolatiles										
			BIS(2-ETHYLHEXYL)PHTHALATE	1.7E-05	1.6E-04	NA	1.7E-04						
			Volatiles										
			BENZENE	3.3E-04	6.0E-04	4.9E-05	9.8E-04						
			CHLOROFORM	7.2E-06	5.9E-06	4.6E-06	1.8E-05						
			1,2-DICHLOROETHANE	1.1E-05	5.4E-06	2.6E-06	1.9E-05						
			1,1,2,2-TETRACHLOROETHANE	1.0E-03	8.3E-04	1.5E-04	2.0E-03						
			TETRACHLOROETHENE	6.5E-05	2.7E-04	5.6E-07	3.3E-04						
			1,1,2-TRICHLOROETHANE	8.8E-06	6.8E-06	1.8E-06	1.7E-05						
			TRICHLOROETHENE	8.7E-06	1.2E-05	1.2E-06	2.2E-05						
			VINYL CHLORIDE	8.5E-05	5.8E-05	5.9E-07	1.4E-04						
			(Total for Child + Adult)	2.5E-03	2.0E-03	2.1E-04	4.7E-03						
							Total Risk Across Groundwater (Adult + Child)						**Total Hazard Index Across Groundwater (Child)** 8.4E+01
							4.7E-03						**Total Hazard Index Across Groundwater (Adult)** 2.5E+01
							Total Risk Across All Media and All Exposure Routes 4.7E-03						**Total Hazard Index Across All Media and All Exposure Routes (Child)** 8.4E+01
													Total Hazard Index Across All Media and All Exposure Routes (Adult) 2.5E+01

Total Hazard Index Across for CNS (Child)	3.5E+00
Total Hazard Index Across for Skin (Child)	1.2E+01
Total Hazard Index Across for Liver (Child)	1.7E+01
Total Hazard Index Across for Kidney (Child)	1.2E-01
Total Hazard Index Across for Blood (Child)	4.8E-01
Total Hazard Index Across for Immune System (Child)	2.2E+01

Total Hazard Index Across for CNS (Adult)	1.0E+00
Total Hazard Index Across for Liver (Adult)	5.3E+00
Total Hazard Index Across for Immune System (Adult)	7.1E+00
Total Hazard Index Across for Blood (Adult)	1.4E-01

TABLE 5-10.2
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
MAXWELL POINT - OTHER EDGEWOOD AREA
GROUNDWATER EVALUATION

Location: Other Edgewood Area
Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Maxwell Point	**Semivolatiles**					**Semivolatiles**					
			BIS(2-ETHYLHEXYL)PHTHALATE	5.2E-09	1.2E-06	--	1.2E-06	BIS(2-ETHYLHEXYL)PHTHALATE	NA	1.3E-03	2.9E-01	--	3.0E-01
			Volatiles					**Volatiles**					
			BENZENE	1.1E-07	4.5E-06	--	4.6E-06	BENZENE	Immune System	3.4E-02	1.4E+00	--	1.5E+00
			1,1,2,2-TETRACHLOROETHANE	3.2E-07	6.2E-06	--	6.6E-06	1,1,2,2-TETRACHLOROETHANE	Liver	2.8E-02	5.5E-01	--	5.7E-01
			TETRACHLOROETHENE	2.1E-08	2.0E-06	--	2.0E-06	TETRACHLOROETHENE	Liver	--	--	--	NA
			(Total)	4.5E-07	1.4E-05	---	1.4E-05		(Total)	6.3E-02	2.3E+00	---	2.3E+00
							Total Risk Across Groundwater						Total Hazard Index Across Groundwater
							1.4E-05						2.3E+00
							Total Risk Across All Media and All Exposure Routes						Total Hazard Index Across All Media and All Exposure Routes
							1.4E-05						2.3E+00

Total Hazard Index for Immune System	1.5E+00
Total Hazard Index for Liver	5.7E-01

TABLE 5-11
COMPARISON TO REFERENCE DATA UPLS - GROUNDWATER
MAXWELL POINT - OTHER EDGEWOOD AREA
GROUNDWATER EVALUATION

Chemical of Potential Concern	Units	N	FOD	Distribution	Minimum	Maximum	Reference UPL	Site Detected Maximum	Consistent with Reference Data?
Inorganics (Dissolved)									
ARSENIC	UG/L	28	11%	NONPARAMETRIC	1.00E+00	1.11E+01	1.11E+01	2.19E+02	no
BERYLLIUM	UG/L	28	32%	NONPARAMETRIC	1.00E-01	1.10E+00	1.10E+00	6.12E+01	no
CADMIUM	UG/L	28	4%	NONPARAMETRIC	2.50E+00	3.18E+01	3.18E+01	4.00E+00	yes
IRON	UG/L	21	86%	LOGNORMAL	5.00E+00	2.97E+04	4.52E+04	2.01E+05	no
MANGANESE	UG/L	28	100%	LOGNORMAL	3.20E+00	8.66E+02	5.28E+02	3.13E+03	no
NICKEL	UG/L	28	21%	NONPARAMETRIC	7.50E+00	2.46E+01	2.46E+01	1.28E+03	no
THALLIUM	UG/L	NA	NA	NA	NA	NA	NA	6.20E+00	no
VANADIUM	UG/L	NA	NA	NA	NA	NA	NA	1.14E+01	no
ZINC	UG/L	21	90%	NORMAL	2.50E+00	7.40E+01	6.87E+01	2.90E+03	no
Inorganics (Total)									
ALUMINUM	UG/L	28	50%	NONPARAMETRIC	2.50E+01	8.79E+02	8.79E+02	8.09E+03	no
ARSENIC	UG/L	28	11%	NONPARAMETRIC	1.00E+00	1.11E+01	1.11E+01	2.22E+02	no
BERYLLIUM	UG/L	28	32%	NONPARAMETRIC	1.00E-01	1.10E+00	1.10E+00	6.23E+01	no
CADMIUM	UG/L	28	4%	NONPARAMETRIC	2.50E+00	3.18E+01	3.18E+01	4.30E+00	yes
CHROMIUM	UG/L	NA	NA	NA	NA	NA	NA	2.78E+01	no
IRON	UG/L	21	86%	LOGNORMAL	5.00E+00	2.97E+04	4.52E+04	1.99E+05	no
LEAD	UG/L	11	9%	NONPARAMETRIC	7.50E-01	1.50E+00	1.50E+00	1.60E+01	no
MANGANESE	UG/L	28	100%	LOGNORMAL	3.20E+00	8.66E+02	5.28E+02	3.27E+03	no
NICKEL	UG/L	28	21%	NONPARAMETRIC	7.50E+00	2.46E+01	2.46E+01	1.30E+03	no
THALLIUM	UG/L	NA	NA	NA	NA	NA	NA	5.65E+00	no
VANADIUM	UG/L	NA	NA	NA	NA	NA	NA	4.60E+01	no
ZINC	UG/L	21	90%	NORMAL	2.50E+00	7.40E+01	6.87E+01	2.92E+03	no

FOD = frequency of detection
NA = not applicable
UPL = upper prediction limit

APPENDIX A

APPENDIX A

DATA USED IN THE HHRA

APPENDIX A
SAMPLES USED IN HHRA
MAXWELL POINT

AREA	MATRIX	SAMPLE NAME	DATE SAMPLED
Building E7340/7350 Test Site	SB	MP-SO-65-02	9/3/2004
Building E7340/7350 Test Site	SB	MP-SO-65-03	9/3/2004
Building E7340/7350 Test Site	SD	C29-SD-07	3/9/2000
Building E7340/7350 Test Site	SD	MP-SD-14	10/8/2003
Building E7340/7350 Test Site	SD	MP-SD-16	10/9/2003
Building E7340/7350 Test Site	SD	MP-SD-18	10/8/2003
Building E7340/7350 Test Site	SD	MP-SD-19	10/8/2003
Building E7340/7350 Test Site	SD	MP-SD-20	10/9/2003
Building E7340/7350 Test Site	SD	MP-SD-21	2/7/2008
Building E7340/7350 Test Site	SD	MP-SD-22	2/7/2008
Building E7340/7350 Test Site	SD	MP-SD-23	2/7/2008
Building E7340/7350 Test Site	SD	MP-SD-24	2/7/2008
Building E7340/7350 Test Site	SD	MP-SD-25	2/7/2008
Building E7340/7350 Test Site	SD	MP-SD-26	2/7/2008
Building E7340/7350 Test Site	SS	C29-SS-04	11/11/1999
Building E7340/7350 Test Site	SS	C29-SS-05	11/11/1999
Building E7340/7350 Test Site	SS	C29-SS-06	11/11/1999
Building E7340/7350 Test Site	SS	MP-SS-29	3/19/2004
Building E7340/7350 Test Site	SS	MP-SS-30	3/19/2004
Building E7340/7350 Test Site	SS	MP-SS-31	3/19/2004
Building E7340/7350 Test Site	SS	MP-SS-32	3/19/2004
Building E7340/7350 Test Site	SS	MP-SS-33	3/19/2004
Building E7340/7350 Test Site	SS	MP-SS-34	3/19/2004
Building E7340/7350 Test Site	SS	MP-SS-35	3/19/2004
Building E7340/7350 Test Site	SS	MP-SS-36	3/19/2004
Building E7340/7350 Test Site	SS	MP-SS-37	3/19/2004
Building E7340/7350 Test Site	SS	MP-SS-38	3/19/2004
Building E7340/7350 Test Site	SS	MP-SS-56	12/13/2005
Building E7340/7350 Test Site	SS	MP-SS-57	12/13/2005
Building E7340/7350 Test Site	SS	MP-SS-58	12/13/2005
Building E7340/7350 Test Site	SS	MP-SS-59	12/13/2005
Building E7340/7350 Test Site	SS	MP-SS-60	12/13/2005
Building E7340/7350 Test Site	SS	MP-SS-61	12/13/2005
Building E7340/7350 Test Site	SS	MP-SS-65	9/3/2004
Building E7340/7350 Test Site	SW	C29-SW-07-R1	12/8/1999
Building E7340/7350 Test Site	SW	C29-SW-07-R2	3/9/2000
Building E7340/7350 Test Site	SW	MP-SW-14-R1	6/5/2003
Building E7340/7350 Test Site	SW	MP-SW-14-R2	10/8/2003
Building E7340/7350 Test Site	SW	MP-SW-16-R1	6/5/2003
Building E7340/7350 Test Site	SW	MP-SW-16-R2	10/9/2003
Building E7340/7350 Test Site	SW	MP-SW-17-R1	6/5/2003
Building E7340/7350 Test Site	SW	MP-SW-18-R1	6/5/2003
Building E7340/7350 Test Site	SW	MP-SW-18-R2	10/8/2003
Building E7340/7350 Test Site	SW	MP-SW-19-R1	6/5/2003
Building E7340/7350 Test Site	SW	MP-SW-19-R2	10/8/2003

APPENDIX A
SAMPLES USED IN HHRA
MAXWELL POINT

AREA	MATRIX	SAMPLE NAME	DATE SAMPLED
Building E7340/7350 Test Site	SW	MP-SW-20-R1	6/5/2003
Building E7340/7350 Test Site	SW	MP-SW-20-R2	10/9/2003
Smoke Generator Debris Area	GW	WMP-01-R1	2/15/2000
Smoke Generator Debris Area	GW	WMP-01-R2	5/16/2000
Smoke Generator Debris Area	GW	WMP-02-R1	2/15/2000
Smoke Generator Debris Area	GW	WMP-02-R2	5/16/2000
Smoke Generator Debris Area	GW	WMP-04-R1	2/15/2000
Smoke Generator Debris Area	GW	WMP-04-R2	5/16/2000
Smoke Generator Debris Area	GW	WMP-05-R1	10/18/2005
Smoke Generator Debris Area	GW	WMP-05-R2	1/12/2006
Smoke Generator Debris Area	GW	WMP-06-R1	10/25/2005
Smoke Generator Debris Area	GW	WMP-06-R2	1/11/2006
Smoke Generator Debris Area	GW	WMP-07-R1	10/17/2005
Smoke Generator Debris Area	GW	WMP-07-R2	1/11/2006
Smoke Generator Debris Area	GW	WMP-08-R1	10/17/2005
Smoke Generator Debris Area	GW	WMP-08-R2	1/12/2006
Smoke Generator Debris Area	GW	WMP-09-R1	10/20/2005
Smoke Generator Debris Area	GW	WMP-09-R2	1/10/2006
Smoke Generator Debris Area	GW	WMP-10-R1	10/17/2005
Smoke Generator Debris Area	GW	WMP-10-R2	1/10/2006
Smoke Generator Debris Area	GW	WMP-11-R1	10/17/2005
Smoke Generator Debris Area	GW	WMP-11-R2	1/10/2006
Smoke Generator Debris Area	GW	WMP-12-R1	10/20/2005
Smoke Generator Debris Area	GW	WMP-12-R2	1/17/2006
Smoke Generator Debris Area	GW	WMP-13-R1	10/20/2005
Smoke Generator Debris Area	GW	WMP-13-R2	1/17/2006
Smoke Generator Debris Area	GW	WMP-14-R1	10/19/2005
Smoke Generator Debris Area	GW	WMP-14-R2	1/13/2006
Smoke Generator Debris Area	GW	WMP-15-R1	10/19/2005
Smoke Generator Debris Area	GW	WMP-15-R2	1/17/2006
Smoke Generator Debris Area	GW	WMP-16-R1	10/19/2005
Smoke Generator Debris Area	GW	WMP-16-R2	1/17/2006
Smoke Generator Debris Area	GW	WMP-17-R1	10/18/2005
Smoke Generator Debris Area	GW	WMP-17-R2	1/18/2006
Smoke Generator Debris Area	GW	WMP-18-R1	10/18/2005
Smoke Generator Debris Area	GW	WMP-18-R2	1/13/2006
Smoke Generator Debris Area	GW	WMP-19-R1	10/18/2005
Smoke Generator Debris Area	GW	WMP-19-R2	1/19/2006
Smoke Generator Debris Area	GW	WMP-20-R1	10/24/2005
Smoke Generator Debris Area	GW	WMP-20-R2	1/10/2006
Smoke Generator Debris Area	GW	WMP-21-R1	10/18/2005
Smoke Generator Debris Area	GW	WMP-21-R2	1/10/2006
Smoke Generator Debris Area	GW	WMP-22-R1	10/20/2005
Smoke Generator Debris Area	GW	WMP-22-R2	1/19/2006
Smoke Generator Debris Area	SB	MP-SO-39	8/22/2003

APPENDIX A
SAMPLES USED IN HHRA
MAXWELL POINT

AREA	MATRIX	SAMPLE NAME	DATE SAMPLED
Smoke Generator Debris Area	SB	MP-SO-40	8/22/2003
Smoke Generator Debris Area	SB	MP-SO-41	9/2/2003
Smoke Generator Debris Area	SB	MP-SO-42	9/2/2003
Smoke Generator Debris Area	SB	MP-SO-43-01	9/2/2003
Smoke Generator Debris Area	SB	MP-SO-43-09	9/2/2003
Smoke Generator Debris Area	SB	MP-SO-43-11	9/2/2003
Smoke Generator Debris Area	SB	MP-SO-44-08	9/3/2003
Smoke Generator Debris Area	SB	MP-SO-44-10	9/3/2003
Smoke Generator Debris Area	SB	MP-SO-44-12	9/3/2003
Smoke Generator Debris Area	SB	MP-SO-45	9/4/2003
Smoke Generator Debris Area	SB	MP-SO-46-02	9/3/2003
Smoke Generator Debris Area	SB	MP-SO-46-10	9/3/2003
Smoke Generator Debris Area	SB	MP-SO-47	8/26/2003
Smoke Generator Debris Area	SB	MP-SO-48	9/3/2003
Smoke Generator Debris Area	SB	MP-SO-49	8/26/2003
Smoke Generator Debris Area	SB	MP-SO-50	9/3/2003
Smoke Generator Debris Area	SB	MP-SO-51	9/3/2003
Smoke Generator Debris Area	SB	MP-SO-52	8/26/2003
Smoke Generator Debris Area	SB	MP-SO-53-08	9/3/2003
Smoke Generator Debris Area	SB	MP-SO-53-10	9/3/2003
Smoke Generator Debris Area	SD	C29-SD-08	3/9/2000
Smoke Generator Debris Area	SD	C29-SD-09	3/8/2000
Smoke Generator Debris Area	SD	MP-SD-11	10/8/2003
Smoke Generator Debris Area	SD	MP-SD-12	10/8/2003
Smoke Generator Debris Area	SD	MP-SD-13	10/8/2003
Smoke Generator Debris Area	SD	MP-SD-15	10/9/2003
Smoke Generator Debris Area	SS	C29-SS-08	11/11/1999
Smoke Generator Debris Area	SS	MP-GEN-01	7/8/2005
Smoke Generator Debris Area	SS	MP-GEN-02	7/8/2005
Smoke Generator Debris Area	SS	MP-GEN-03	7/8/2005
Smoke Generator Debris Area	SS	MP-GEN-04	7/8/2005
Smoke Generator Debris Area	SS	MP-SS-55	12/13/2005
Smoke Generator Debris Area	SW	C29-SW-08-R1	12/8/1999
Smoke Generator Debris Area	SW	C29-SW-08-R2	3/9/2000
Smoke Generator Debris Area	SW	C29-SW-09-R1	12/9/1999
Smoke Generator Debris Area	SW	C29-SW-09-R2	3/8/2000
Smoke Generator Debris Area	SW	MP-SW-11-R1	6/5/2003
Smoke Generator Debris Area	SW	MP-SW-11-R2	10/8/2003
Smoke Generator Debris Area	SW	MP-SW-12-R1	6/5/2003
Smoke Generator Debris Area	SW	MP-SW-12-R2	10/8/2003
Smoke Generator Debris Area	SW	MP-SW-13-R1	6/5/2003
Smoke Generator Debris Area	SW	MP-SW-13-R2	10/8/2003
Smoke Generator Debris Area	SW	MP-SW-15-R1	6/5/2003
Smoke Generator Debris Area	SW	MP-SW-15-R2	10/9/2003

APPENDIX B

APPENDIX B

PROUCL OUTPUTS

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_BUILDING-TS_N_ZINC.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

TS_Zinc

General Statistics

Number of Valid Samples 22

Number of Unique Samples 22

Raw Statistics

Minimum	21.6
Maximum	3670
Mean	698.3
Median	258.5
SD	1020
Coefficient of Variation	1.461
Skewness	2.041

Log-transformed Statistics

Minimum of Log Data	3.073
Maximum of Log Data	8.208
Mean of log Data	5.517
SD of log Data	1.549

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.684
Shapiro Wilk Critical Value	0.911

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.93
Shapiro Wilk Critical Value	0.911

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	1072

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	1157
95% Modified-t UCL	1088

Assuming Lognormal Distribution

95% H-UCL	2580
95% Chebyshev (MVUE) UCL	2050
97.5% Chebyshev (MVUE) UCL	2615
99% Chebyshev (MVUE) UCL	3725

Gamma Distribution Test

k star (bias corrected)	0.548
Theta Star	1275
nu star	24.1
Approximate Chi Square Value (.05)	13.93
Adjusted Level of Significance	0.0386
Adjusted Chi Square Value	13.35
Anderson-Darling Test Statistic	0.896
Anderson-Darling 5% Critical Value	0.796
Kolmogorov-Smirnov Test Statistic	0.19
Kolmogorov-Smirnov 5% Critical Value	0.195

Data follow Appr. Gamma Distribution at 5% Significance Level

Data Distribution

Data Follow Appr. Gamma Distribution at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	1208
95% Adjusted Gamma UCL	1261

Nonparametric Statistics

95% CLT UCL	1056
95% Jackknife UCL	1072
95% Standard Bootstrap UCL	1050
95% Bootstrap-t UCL	1347
95% Hall's Bootstrap UCL	1246
95% Percentile Bootstrap UCL	1066
95% BCA Bootstrap UCL	1173
95% Chebyshev(Mean, Sd) UCL	1646
97.5% Chebyshev(Mean, Sd) UCL	2056
99% Chebyshev(Mean, Sd) UCL	2862

Potential UCL to Use

Use 95% Approximate Gamma UCL 1208

BUILDING E7340/7350 TEST SITE-SD-ARSENIC-UCL STATS

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_BUILDING E73407350 TEST SITE-S.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SD_Arsenic

General Statistics

Number of Valid Samples	12	Number of Unique Samples	12

Raw Statistics

Minimum	0.93
Maximum	4.8
Mean	2.415
Median	2.2
SD	1.216
Coefficient of Variation	0.503
Skewness	0.588

Log-transformed Statistics

Minimum of Log Data	-0.0726
Maximum of Log Data	1.569
Mean of log Data	0.76
SD of log Data	0.525

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.932
Shapiro Wilk Critical Value	0.859

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	3.045

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	3.056
95% Modified-t UCL	3.055

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.955
Shapiro Wilk Critical Value	0.859

Data appear Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL	3.462
95% Chebyshev (MVUE) UCL	4.066
97.5% Chebyshev (MVUE) UCL	4.777
99% Chebyshev (MVUE) UCL	6.173

Gamma Distribution Test

k star (bias corrected)	3.249
Theta Star	0.743
nu star	77.98
Approximate Chi Square Value (.05)	58.64
Adjusted Level of Significance	0.029
Adjusted Chi Square Value	56.08
Anderson-Darling Test Statistic	0.308
Anderson-Darling 5% Critical Value	0.735
Kolmogorov-Smirnov Test Statistic	0.16
Kolmogorov-Smirnov 5% Critical Value	0.246

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	3.212
95% Adjusted Gamma UCL	3.358

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	2.992
95% Jackknife UCL	3.045
95% Standard Bootstrap UCL	2.97
95% Bootstrap-t UCL	3.134
95% Hall's Bootstrap UCL	3.059
95% Percentile Bootstrap UCL	2.975
95% BCA Bootstrap UCL	3.013
95% Chebyshev(Mean, Sd) UCL	3.945
97.5% Chebyshev(Mean, Sd) UCL	4.607
99% Chebyshev(Mean, Sd) UCL	5.907

Potential UCL to Use

Use 95% Student's-t UCL 3.045

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_BUILDING-SS_N_ALUMINUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_Aluminum

General Statistics

Number of Valid Samples	20	Number of Unique Samples	18

Raw Statistics		Log-transformed Statistics	
Minimum	1640	Minimum of Log Data	7.402
Maximum	19100	Maximum of Log Data	9.857
Mean	9283	Mean of log Data	9.003
Median	10100	SD of log Data	0.61
SD	3974		
Coefficient of Variation	0.428		
Skewness	-0.0378		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.901	Shapiro Wilk Test Statistic	0.784
Shapiro Wilk Critical Value	0.905	Shapiro Wilk Critical Value	0.905
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	10820	95% H-UCL	13141
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	15729
95% Adjusted-CLT UCL	10737	97.5% Chebyshev (MVUE) UCL	18348
95% Modified-t UCL	10818	99% Chebyshev (MVUE) UCL	23491

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	3.353	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	2768		
nu star	134.1		
Approximate Chi Square Value (.05)	108.4	**Nonparametric Statistics**	
Adjusted Level of Significance	0.038	95% CLT UCL	10745
Adjusted Chi Square Value	106.5	95% Jackknife UCL	10820
		95% Standard Bootstrap UCL	10710
Anderson-Darling Test Statistic	1.623	95% Bootstrap-t UCL	10781
Anderson-Darling 5% Critical Value	0.746	95% Hall's Bootstrap UCL	10881
Kolmogorov-Smirnov Test Statistic	0.266	95% Percentile Bootstrap UCL	10688
Kolmogorov-Smirnov 5% Critical Value	0.195	95% BCA Bootstrap UCL	10683
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	13156
		97.5% Chebyshev(Mean, Sd) UCL	14832
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	18124
95% Approximate Gamma UCL	11490		
95% Adjusted Gamma UCL	11687		

Potential UCL to Use		
	Use 95% Chebyshev (Mean, Sd) UCL	13156

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_BUILDING-SS_N_ANTIMONY.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_Antimony

General Statistics

Number of Valid Samples	20	Number of Detected Data	15
Number of Unique Samples	15	Number of Non-Detect Data	5
		Percent Non-Detects	25.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.48	Minimum Detected	-0.734
Maximum Detected	3.5	Maximum Detected	1.253
Mean of Detected	1.561	Mean of Detected	0.287
SD of Detected	0.893	SD of Detected	0.595
Minimum Non-Detect	0.59	Minimum Non-Detect	-0.528
Maximum Non-Detect	0.88	Maximum Non-Detect	-0.128

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	9
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	11
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	45.00%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.927	Shapiro Wilk Test Statistic	0.966
5% Shapiro Wilk Critical Value	0.881	5% Shapiro Wilk Critical Value	0.881
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.259	Mean	-0 0501
SD	0.937	SD	0.79
95% DL/2 (t) UCL	1.621	95% H-Stat (DL/2) UCL	2.082
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	1.02	Mean in Log Scale	0.0218
SD	1.218	SD in Log Scale	0.698
95% MLE (t) UCL	1.491	Mean in Original Scale	1.287
95% MLE (Tiku) UCL	1.572	SD in Original Scale	0.908
		95% Percentile Bootstrap UCL	1 614
		95% BCA Bootstrap UCL	1.667

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	2.687	Data appear Normal at 5% Significance Level
Theta Star	0.581	
nu star	80.62	
A-D Test Statistic	0.265	
5% A-D Critical Value	0.743	
K-S Test Statistic	0.743	
5% K-S Critical Value	0.223	
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	0.48	Mean	1.299
Maximum	3.5	SD	0.875
Mean	1.355	SE of Mean	0.203
Median	1.003	95% KM (t) UCL	1.65
SD	0.856	95% KM (z) UCL	1.633
k star	2.589	95% KM (jackknife) UCL	1.629
Theta star	0.524	95% KM (bootstrap t) UCL	1.7
Nu star	103.6	95% KM (BCA) UCL	1.693
AppChi2	81.07	95% KM (Percentile Bootstrap) UCL	1.65
95% Gamma Approximate UCL	1.731	95% KM (Chebyshev) UCL	2.183
95% Adjusted Gamma UCL	1.766	97.5% KM (Chebyshev) UCL	2.565
		99% KM (Chebyshev) UCL	3 316
		Potential UCLs to Use	
		95% KM (t) UCL	1.65
		95% KM (Percentile Bootstrap) UCL	1.65

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_BUILDING-SS_N_ARSENIC.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_Arsenic

General Statistics

Number of Valid Samples	20	Number of Unique Samples	15

Raw Statistics		Log-transformed Statistics	
Minimum	1.2	Minimum of Log Data	0.182
Maximum	13.1	Maximum of Log Data	2.573
Mean	5.18	Mean of log Data	1.501
Median	4.25	SD of log Data	0.545
SD	3.119		
Coefficient of Variation	0.602		
Skewness	1.643		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.766	Shapiro Wilk Test Statistic	0.904
Shapiro Wilk Critical Value	0.905	Shapiro Wilk Critical Value	0.905
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	6.386	95% H-UCL	6.718
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	8.017
95% Adjusted-CLT UCL	6.601	97.5% Chebyshev (MVUE) UCL	9.254
95% Modified-t UCL	6.429	99% Chebyshev (MVUE) UCL	11.68

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	3.123	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	1.659		
nu star	124.9		
Approximate Chi Square Value (.05)	100.1	**Nonparametric Statistics**	
Adjusted Level of Significance	0.038	95% CLT UCL	6.327
Adjusted Chi Square Value	98.36	95% Jackknife UCL	6.386
		95% Standard Bootstrap UCL	6.3
Anderson-Darling Test Statistic	1.226	95% Bootstrap-t UCL	6.822
Anderson-Darling 5% Critical Value	0.746	95% Hall's Bootstrap UCL	6.545
Kolmogorov-Smirnov Test Statistic	0.252	95% Percentile Bootstrap UCL	6.37
Kolmogorov-Smirnov 5% Critical Value	0.195	95% BCA Bootstrap UCL	6.575
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	8.22
		97.5% Chebyshev(Mean, Sd) UCL	9.535
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	12.12
95% Approximate Gamma UCL	6.464		
95% Adjusted Gamma UCL	6.579		

Potential UCL to Use	Use 95% Chebyshev (Mean, Sd) UCL 8.22

General UCL Statistics for Data Sets with Non-Detects

User Selected Options	
From File	C:\temp\Maxwell Point\ProUCL\inp_BUILDING-SS_N_CADMIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_Cadmium

General Statistics

Number of Valid Samples	20	Number of Detected Data	19
Number of Unique Samples	18	Number of Non-Detect Data	1
		Percent Non-Detects	5.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.051	Minimum Detected	-2.976
Maximum Detected	5	Maximum Detected	1.609
Mean of Detected	0.938	Mean of Detected	-0.733
SD of Detected	1.16	SD of Detected	1.278
Minimum Non-Detect	0.059	Minimum Non-Detect	-2.83
Maximum Non-Detect	0.059	Maximum Non-Detect	-2.83

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.709	Shapiro Wilk Test Statistic	0.963
5% Shapiro Wilk Critical Value	0.901	5% Shapiro Wilk Critical Value	0.901
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.893	Mean	-0.873
SD	1.147	SD	1.392
95% DL/2 (t) UCL	1.336	95% H-Stat (DL/2) UCL	3.072
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.821	Mean in Log Scale	-0.86
SD	1.205	SD in Log Scale	1.367
95% MLE (t) UCL	1.287	Mean in Original Scale	0.893
95% MLE (Tiku) UCL	1.265	SD in Original Scale	1.146
		95% Percentile Bootstrap UCL	1.344
		95% BCA Bootstrap UCL	1.496

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.773	Data appear Gamma Distributed at 5% Significance Level
Theta Star	1.213	
nu star	29.39	
A-D Test Statistic	0.331	Nonparametric Statistics
5% A-D Critical Value	0.774	Kaplan-Meier (KM) Method
K-S Test Statistic	0.774	Mean 0.894
5% K-S Critical Value	0.205	SD 1.117
Data appear Gamma Distributed at 5% Significance Level		SE of Mean 0.257
		95% KM (t) UCL 1.337
Assuming Gamma Distribution		95% KM (z) UCL 1.316
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 1.336
Minimum	0	95% KM (bootstrap t) UCL 1.652
Maximum	5	95% KM (BCA) UCL 1.368
Mean	0.891	95% KM (Percentile Bootstrap) UCL 1.336
Median	0.54	95% KM (Chebyshev) UCL 2.012
SD	1.148	97.5% KM (Chebyshev) UCL 2.496
k star	0.378	99% KM (Chebyshev) UCL 3.447
Theta star	2.355	
Nu star	15.13	Potential UCLs to Use
AppChi2	7.355	95% KM (Chebyshev) UCL 2.012
95% Gamma Approximate UCL	1.834	
95% Adjusted Gamma UCL	1.946	

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_BUILDING-SS_N_CHROMIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_Chromium

General Statistics

Number of Valid Samples	20	Number of Unique Samples	19

Raw Statistics		Log-transformed Statistics	
Minimum	2.9	Minimum of Log Data	1.065
Maximum	36.6	Maximum of Log Data	3.6
Mean	18.84	Mean of log Data	2.833
Median	16.95	SD of log Data	0.524
SD	7.853		
Coefficient of Variation	0.417		
Skewness	0.669		

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.926
Shapiro Wilk Critical Value	0.905

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.822
Shapiro Wilk Critical Value	0.905

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	21.87

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	22.01
95% Modified-t UCL	21.92

Assuming Lognormal Distribution

95% H-UCL	24.87
95% Chebyshev (MVUE) UCL	29.63
97.5% Chebyshev (MVUE) UCL	34.08
99% Chebyshev (MVUE) UCL	42.82

Gamma Distribution Test

k star (bias corrected)	4.286
Theta Star	4.395
nu star	171.4
Approximate Chi Square Value (.05)	142.2
Adjusted Level of Significance	0.038
Adjusted Chi Square Value	140.1
Anderson-Darling Test Statistic	0.68
Anderson-Darling 5% Critical Value	0.745
Kolmogorov-Smirnov Test Statistic	0.181
Kolmogorov-Smirnov 5% Critical Value	0.194

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	22.72
95% Adjusted Gamma UCL	23.06

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	21.73
95% Jackknife UCL	21.87
95% Standard Bootstrap UCL	21.62
95% Bootstrap-t UCL	22.27
95% Hall's Bootstrap UCL	22.65
95% Percentile Bootstrap UCL	21.75
95% BCA Bootstrap UCL	21.95
95% Chebyshev(Mean, Sd) UCL	26.49
97.5% Chebyshev(Mean, Sd) UCL	29.8
99% Chebyshev(Mean, Sd) UCL	36.31

Potential UCL to Use

Use 95% Student's-t UCL 21.87

BUILDING-SS-IRON-UCL STATS

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_BUILDING-SS_N_IRON.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_Iron

General Statistics

Number of Valid Samples	20	Number of Unique Samples	20

Raw Statistics

Minimum	3380
Maximum	33600
Mean	15390
Median	14150
SD	7136
Coefficient of Variation	0.464
Skewness	0.822

Log-transformed Statistics

Minimum of Log Data	8.126
Maximum of Log Data	10.42
Mean of log Data	9.527
SD of log Data	0.524

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.936
Shapiro Wilk Critical Value	0.905

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.921
Shapiro Wilk Critical Value	0.905

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	18149

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	18328
95% Modified-t UCL	18198

Assuming Lognormal Distribution

95% H-UCL	20092
95% Chebyshev (MVUE) UCL	23934
97.5% Chebyshev (MVUE) UCL	27528
99% Chebyshev (MVUE) UCL	34587

Gamma Distribution Test

k star (bias corrected)	3.888
Theta Star	3958
nu star	155.5
Approximate Chi Square Value (.05)	127.7
Adjusted Level of Significance	0.038
Adjusted Chi Square Value	125.7
Anderson-Darling Test Statistic	0.461
Anderson-Darling 5% Critical Value	0.745
Kolmogorov-Smirnov Test Statistic	0.133
Kolmogorov-Smirnov 5% Critical Value	0.195

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	18744
95% Adjusted Gamma UCL	19041

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	18015
95% Jackknife UCL	18149
95% Standard Bootstrap UCL	17972
95% Bootstrap-t UCL	18524
95% Hall's Bootstrap UCL	18768
95% Percentile Bootstrap UCL	18078
95% BCA Bootstrap UCL	18195
95% Chebyshev(Mean, Sd) UCL	22345
97.5% Chebyshev(Mean, Sd) UCL	25355
99% Chebyshev(Mean, Sd) UCL	31266

Potential UCL to Use

Use 95% Student's-t UCL 18149

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_BUILDING-SS_N_LEAD.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_Lead

General Statistics

Number of Valid Samples 20

Number of Unique Samples 20

Raw Statistics

Minimum	4.8
Maximum	801
Mean	156.4
Median	60.85
SD	223.7
Coefficient of Variation	1.43
Skewness	2.094

Log-transformed Statistics

Minimum of Log Data	1.569
Maximum of Log Data	6.686
Mean of log Data	4.277
SD of log Data	1.288

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.648
Shapiro Wilk Critical Value	0.905

Data not Normal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	242.9

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	263.7
95% Modified-t UCL	246.8

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.962
Shapiro Wilk Critical Value	0.905

Data appear Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL	403.5
95% Chebyshev (MVUE) UCL	380.1
97.5% Chebyshev (MVUE) UCL	477.9
99% Chebyshev (MVUE) UCL	669.9

Gamma Distribution Test

k star (bias corrected)	0.687
Theta Star	227.6
nu star	27.49
Approximate Chi Square Value (.05)	16.53
Adjusted Level of Significance	0.038
Adjusted Chi Square Value	15.86
Anderson-Darling Test Statistic	0.995
Anderson-Darling 5% Critical Value	0.779
Kolmogorov-Smirnov Test Statistic	0.208
Kolmogorov-Smirnov 5% Critical Value	0.201

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	260.1
95% Adjusted Gamma UCL	271.1

Data Distribution

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	238.7
95% Jackknife UCL	242.9
95% Standard Bootstrap UCL	236.9
95% Bootstrap-t UCL	306.4
95% Hall's Bootstrap UCL	247.6
95% Percentile Bootstrap UCL	242
95% BCA Bootstrap UCL	266.1
95% Chebyshev(Mean, Sd) UCL	374.4
97.5% Chebyshev(Mean, Sd) UCL	468.8
99% Chebyshev(Mean, Sd) UCL	654.1

Potential UCL to Use

Use 95% Chebyshev (MVUE) UCL 380.1

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_BUILDING-SS_N_MANGANESE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_Manganese

General Statistics

Number of Valid Samples	20	Number of Unique Samples	20

Raw Statistics

Minimum	55.9
Maximum	778
Mean	330.9
Median	346
SD	223.4
Coefficient of Variation	0.675
Skewness	0.526

Log-transformed Statistics

Minimum of Log Data	4.024
Maximum of Log Data	6.657
Mean of log Data	5.517
SD of log Data	0.849

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.927
Shapiro Wilk Critical Value	0.905

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.913
Shapiro Wilk Critical Value	0.905

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	417.3

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	419.4
95% Modified-t UCL	418.3

Assuming Lognormal Distribution

95% H-UCL	568.8
95% Chebyshev (MVUE) UCL	664
97.5% Chebyshev (MVUE) UCL	800.5
99% Chebyshev (MVUE) UCL	1068

Gamma Distribution Test

k star (bias corrected)	1.655
Theta Star	200
nu star	66.18
Approximate Chi Square Value (.05)	48.46
Adjusted Level of Significance	0.038
Adjusted Chi Square Value	47.27
Anderson-Darling Test Statistic	0.433
Anderson-Darling 5% Critical Value	0.753
Kolmogorov-Smirnov Test Statistic	0.164
Kolmogorov-Smirnov 5% Critical Value	0.196

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	451.9
95% Adjusted Gamma UCL	463.4

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	413.1
95% Jackknife UCL	417.3
95% Standard Bootstrap UCL	411.9
95% Bootstrap-t UCL	426.9
95% Hall's Bootstrap UCL	420.7
95% Percentile Bootstrap UCL	412
95% BCA Bootstrap UCL	416.8
95% Chebyshev(Mean, Sd) UCL	548.7
97.5% Chebyshev(Mean, Sd) UCL	642.9
99% Chebyshev(Mean, Sd) UCL	827.9

Potential UCL to Use

Use 95% Student's-t UCL 417.3

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_BUILDING-SS_N_VANADIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_Vanadium

General Statistics

Number of Valid Samples 20

Number of Unique Samples 19

Raw Statistics

Minimum	4.6
Maximum	52.1
Mean	24.71
Median	23.95
SD	10.09
Coefficient of Variation	0.408
Skewness	0.657

Log-transformed Statistics

Minimum of Log Data	1.526
Maximum of Log Data	3.953
Mean of log Data	3.108
SD of log Data	0.509

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.931
Shapiro Wilk Critical Value	0.905

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.847
Shapiro Wilk Critical Value	0.905

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	28.61

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	28.77
95% Modified-t UCL	28.67

Assuming Lognormal Distribution

95% H-UCL	32.2
95% Chebyshev (MVUE) UCL	38.3
97.5% Chebyshev (MVUE) UCL	43.94
99% Chebyshev (MVUE) UCL	55.01

Gamma Distribution Test

k star (bias corrected)	4.439
Theta Star	5.566
nu star	177.6
Approximate Chi Square Value (.05)	147.7
Adjusted Level of Significance	0.038
Adjusted Chi Square Value	145.6
Anderson-Darling Test Statistic	0.832
Anderson-Darling 5% Critical Value	0.745
Kolmogorov-Smirnov Test Statistic	0.216
Kolmogorov-Smirnov 5% Critical Value	0.194

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	29.69
95% Adjusted Gamma UCL	30.13

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	28.42
95% Jackknife UCL	28.61
95% Standard Bootstrap UCL	28.35
95% Bootstrap-t UCL	29.14
95% Hall's Bootstrap UCL	30.11
95% Percentile Bootstrap UCL	28.38
95% BCA Bootstrap UCL	28.63
95% Chebyshev(Mean, Sd) UCL	34.54
97.5% Chebyshev(Mean, Sd) UCL	38.8
99% Chebyshev(Mean, Sd) UCL	47.16

Potential UCL to Use

Use 95% Student's-t UCL 28.61

BUILDING-SS-ZINC-UCL STATS

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_BUILDING-SS_N_ZINC.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_Zinc

General Statistics

Number of Valid Samples	20	Number of Unique Samples	20

Raw Statistics

Minimum	21.6
Maximum	3670
Mean	686.7
Median	131
SD	1072
Coefficient of Variation	1.561
Skewness	2.001

Log-transformed Statistics

Minimum of Log Data	3.073
Maximum of Log Data	8.208
Mean of log Data	5.399
SD of log Data	1.578

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.66
Shapiro Wilk Critical Value	0.905

Data not Normal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	1101

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	1195
95% Modified-t UCL	1119

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.919
Shapiro Wilk Critical Value	0.905

Data appear Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL	2718
95% Chebyshev (MVUE) UCL	1942
97.5% Chebyshev (MVUE) UCL	2487
99% Chebyshev (MVUE) UCL	3559

Gamma Distribution Test

k star (bias corrected)	0.503
Theta Star	1366
nu star	20.11
Approximate Chi Square Value (.05)	10.93
Adjusted Level of Significance	0.038
Adjusted Chi Square Value	10.4
Anderson-Darling Test Statistic	1.102
Anderson-Darling 5% Critical Value	0.798
Kolmogorov-Smirnov Test Statistic	0.213
Kolmogorov-Smirnov 5% Critical Value	0.204

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	1263
95% Adjusted Gamma UCL	1328

Data Distribution

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	1081
95% Jackknife UCL	1101
95% Standard Bootstrap UCL	1070
95% Bootstrap-t UCL	1466
95% Hall's Bootstrap UCL	1224
95% Percentile Bootstrap UCL	1092
95% BCA Bootstrap UCL	1210
95% Chebyshev(Mean, Sd) UCL	1731
97.5% Chebyshev(Mean, Sd) UCL	2183
99% Chebyshev(Mean, Sd) UCL	3071

Potential UCL to Use

Use 95% Chebyshev (MVUE) UCL 1942

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_BUILDING-SW_T_IRON.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_Iron

General Statistics

Number of Valid Samples	13	Number of Unique Samples	13

Raw Statistics		Log-transformed Statistics	
Minimum	183	Minimum of Log Data	5.209
Maximum	42200	Maximum of Log Data	10.65
Mean	4147	Mean of log Data	6.942
Median	722	SD of log Data	1.31
SD	11461		
Coefficient of Variation	2.764		
Skewness	3.575		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.362	Shapiro Wilk Test Statistic	0.785
Shapiro Wilk Critical Value	0.866	Shapiro Wilk Critical Value	0.866
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	9812	95% H-UCL	8929
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	6034
95% Adjusted-CLT UCL	12744	97.5% Chebyshev (MVUE) UCL	7695
95% Modified-t UCL	10338	99% Chebyshev (MVUE) UCL	10957

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.407	**Data do not follow a Discernable Distribution (0.05)**
Theta Star	10177	
nu star	10.59	
Approximate Chi Square Value (.05)	4.316	**Nonparametric Statistics**
Adjusted Level of Significance	0.0301	95% CLT UCL 9376
Adjusted Chi Square Value	3.762	95% Jackknife UCL 9812
		95% Standard Bootstrap UCL 9184
Anderson-Darling Test Statistic	2.427	95% Bootstrap-t UCL 102036
Anderson-Darling 5% Critical Value	0.797	95% Hall's Bootstrap UCL 52876
Kolmogorov-Smirnov Test Statistic	0.352	95% Percentile Bootstrap UCL 10414
Kolmogorov-Smirnov 5% Critical Value	*0.251*	95% BCA Bootstrap UCL 13696
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 18003
		97.5% Chebyshev(Mean, Sd) UCL 23998
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 35775
95% Approximate Gamma UCL	10178	
95% Adjusted Gamma UCL	11677	

Potential UCL to Use		
		Use 99% Chebyshev (Mean, Sd) UCL 35775

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_BUILDING-TS_N_ALUMINUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

TS_Aluminum

General Statistics

Number of Valid Samples	22	Number of Unique Samples	20

Raw Statistics

Minimum	1640
Maximum	20300
Mean	10194
Median	10100
SD	4803
Coefficient of Variation	0.471
Skewness	0.326

Log-transformed Statistics

Minimum of Log Data	7.402
Maximum of Log Data	9.918
Mean of log Data	9.081
SD of log Data	0.633

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.915
Shapiro Wilk Critical Value	0.911

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.827
Shapiro Wilk Critical Value	0.911

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	11956

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	11954
95% Modified-t UCL	11968

Assuming Lognormal Distribution

95% H-UCL	14376
95% Chebyshev (MVUE) UCL	17248
97.5% Chebyshev (MVUE) UCL	20115
99% Chebyshev (MVUE) UCL	25745

Gamma Distribution Test

k star (bias corrected)	3.075
Theta Star	3315
nu star	135.3
Approximate Chi Square Value (.05)	109.4
Adjusted Level of Significance	0.0386
Adjusted Chi Square Value	107.7
Anderson-Darling Test Statistic	1.207
Anderson-Darling 5% Critical Value	0.748
Kolmogorov-Smirnov Test Statistic	0.228
Kolmogorov-Smirnov 5% Critical Value	0.186

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	12604
95% Adjusted Gamma UCL	12807

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	11878
95% Jackknife UCL	11956
95% Standard Bootstrap UCL	11848
95% Bootstrap-t UCL	11993
95% Hall's Bootstrap UCL	12193
95% Percentile Bootstrap UCL	11852
95% BCA Bootstrap UCL	11917
95% Chebyshev(Mean, Sd) UCL	14657
97.5% Chebyshev(Mean, Sd) UCL	16589
99% Chebyshev(Mean, Sd) UCL	20383

Potential UCL to Use

Use 95% Student's-t UCL 11956

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_BUILDING-TS_N_ANTIMONY.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

TS_Antimony

General Statistics

Number of Valid Samples	22	Number of Detected Data	15
Number of Unique Samples	15	Number of Non-Detect Data	7
		Percent Non-Detects	31.82%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.48	Minimum Detected	-0.734
Maximum Detected	3.5	Maximum Detected	1.253
Mean of Detected	1.561	Mean of Detected	0.287
SD of Detected	0.893	SD of Detected	0.595
Minimum Non-Detect	0.59	Minimum Non-Detect	-0.528
Maximum Non-Detect	0.89	Maximum Non-Detect	-0.117

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	11
Number treated as Detected	11
Single DL Non-Detect Percentage	50.00%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.927	Shapiro Wilk Test Statistic	0.966
5% Shapiro Wilk Critical Value	0.881	5% Shapiro Wilk Critical Value	0.881
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.183	Mean	-0.122
SD	0.924	SD	0.787
95% DL/2 (t) UCL	1.522	95% H-Stat (DL/2) UCL	1.91
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.881	Mean in Log Scale	-0.0411
SD	1.27	SD in Log Scale	0.696
95% MLE (t) UCL	1.347	Mean in Original Scale	1.217
95% MLE (Tiku) UCL	1.455	SD in Original Scale	0.894
		95% Percentile Bootstrap UCL	1.544
		95% BCA Bootstrap UCL	1.576

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	2.687	Data appear Normal at 5% Significance Level
Theta Star	0.581	
nu star	80.62	
A-D Test Statistic	0.265	
5% A-D Critical Value	0.743	
K-S Test Statistic	0.743	
5% K-S Critical Value	0.223	
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	0.48	Mean	1.234
Maximum	3.5	SD	0.861
Mean	1.383	SE of Mean	0.19
Median	1.185	95% KM (t) UCL	1.561
SD	0.791	95% KM (z) UCL	1.547
k star	3.239	95% KM (jackknife) UCL	1.537
Theta star	0.427	95% KM (bootstrap t) UCL	1.627
Nu star	142.5	95% KM (BCA) UCL	1.625
AppChi2	115.9	95% KM (Percentile Bootstrap) UCL	1.585
95% Gamma Approximate UCL	1.7	95% KM (Chebyshev) UCL	2.063
95% Adjusted Gamma UCL	1.726	97.5% KM (Chebyshev) UCL	2.423
		99% KM (Chebyshev) UCL	3.128
		Potential UCLs to Use	
		95% KM (t) UCL	1.561
		95% KM (Percentile Bootstrap) UCL	1.585

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_BUILDING-TS_N_ARSENIC.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

TS_Arsenic

General Statistics

Number of Valid Samples	22	Number of Unique Samples	15

Raw Statistics		Log-transformed Statistics	
Minimum	1.2	Minimum of Log Data	0.182
Maximum	13.1	Maximum of Log Data	2.573
Mean	5.082	Mean of log Data	1.493
Median	4.25	SD of log Data	0.519
SD	2.985		
Coefficient of Variation	0.587		
Skewness	1.781		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.742	Shapiro Wilk Test Statistic	0.884
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	6.177	95% H-UCL	6.386
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	7.597
95% Adjusted-CLT UCL	6.387	97.5% Chebyshev (MVUE) UCL	8.697
95% Modified-t UCL	6.217	99% Chebyshev (MVUE) UCL	10.86

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	3.412	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	1.489		
nu star	150.1		
Approximate Chi Square Value (.05)	122.8	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0386	95% CLT UCL	6.129
Adjusted Chi Square Value	121	95% Jackknife UCL	6.177
		95% Standard Bootstrap UCL	6.107
Anderson-Darling Test Statistic	1.54	95% Bootstrap-t UCL	6.624
Anderson-Darling 5% Critical Value	0.747	95% Hall's Bootstrap UCL	6.415
Kolmogorov-Smirnov Test Statistic	0.266	95% Percentile Bootstrap UCL	6.155
Kolmogorov-Smirnov 5% Critical Value	0.186	95% BCA Bootstrap UCL	6.368
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	7.856
		97.5% Chebyshev(Mean, Sd) UCL	9.056
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	11.41
95% Approximate Gamma UCL	6.212		
95% Adjusted Gamma UCL	6.307		

Potential UCL to Use	Use 95% Chebyshev (Mean, Sd) UCL	7.856

General UCL Statistics for Data Sets with Non-Detects

User Selected Options	
From File	C:\temp\Maxwell Point\ProUCL\inp_BUILDING-TS_N_CADMIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

TS_Cadmium

General Statistics

Number of Valid Samples	22	Number of Detected Data	21
Number of Unique Samples	18	Number of Non-Detect Data	1
		Percent Non-Detects	4.55%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.051	Minimum Detected	-2.976
Maximum Detected	5	Maximum Detected	1.609
Mean of Detected	0.859	Mean of Detected	-0.873
SD of Detected	1.128	SD of Detected	1.291
Minimum Non-Detect	0.059	Minimum Non-Detect	-2.83
Maximum Non-Detect	0.059	Maximum Non-Detect	-2.83

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.686	Shapiro Wilk Test Statistic	0.953
5% Shapiro Wilk Critical Value	0.908	5% Shapiro Wilk Critical Value	0.908
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.821	Mean	-0.994
SD	1.115	SD	1.381
95% DL/2 (t) UCL	1.23	95% H-Stat (DL/2) UCL	2.465
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.758	Mean in Log Scale	-0.991
SD	1.165	SD in Log Scale	1.375
95% MLE (t) UCL	1.185	Mean in Original Scale	0.822
95% MLE (Tiku) UCL	1.161	SD in Original Scale	1.115
		95% Percentile Bootstrap UCL	1.235
		95% BCA Bootstrap UCL	1.403

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.734	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	1.17		
nu star	30.85		
A-D Test Statistic	0.536	Nonparametric Statistics	
5% A-D Critical Value	0.779	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.779	Mean	0.822
5% K-S Critical Value	0.196	SD	1.089
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.238
		95% KM (t) UCL	1.232
Assuming Gamma Distribution		95% KM (z) UCL	1.214
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1.23
Minimum	0	95% KM (bootstrap t) UCL	1.535
Maximum	5	95% KM (BCA) UCL	1.255
Mean	0.82	95% KM (Percentile Bootstrap) UCL	1.236
Median	0.38	95% KM (Chebyshev) UCL	1.859
SD	1.116	97.5% KM (Chebyshev) UCL	2.308
k star	0.388	99% KM (Chebyshev) UCL	3.189
Theta star	2.111		
Nu star	17.09	Potential UCLs to Use	
AppChi2	8.739	95% KM (Chebyshev) UCL	1.859
95% Gamma Approximate UCL	1.604		
95% Adjusted Gamma UCL	1.69		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_BUILDING-TS_N_CHROMIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

TS_Chromium

General Statistics

Number of Valid Samples	22	Number of Unique Samples	21

Raw Statistics

Minimum	2.9
Maximum	36.6
Mean	19.45
Median	17.3
SD	7.772
Coefficient of Variation	0.4
Skewness	0.456

Log-transformed Statistics

Minimum of Log Data	1.065
Maximum of Log Data	3.6
Mean of log Data	2.869
SD of log Data	0.514

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.95
Shapiro Wilk Critical Value	0.911

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	22.3

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	22.35
95% Modified-t UCL	22.33

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.824
Shapiro Wilk Critical Value	0.911

Data not Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL	25.15
95% Chebyshev (MVUE) UCL	29.91
97.5% Chebyshev (MVUE) UCL	34.2
99% Chebyshev (MVUE) UCL	42.64

Gamma Distribution Test

k star (bias corrected)	4.55
Theta Star	4.275
nu star	200.2
Approximate Chi Square Value (.05)	168.5
Adjusted Level of Significance	0.0386
Adjusted Chi Square Value	166.3
Anderson-Darling Test Statistic	0.586
Anderson-Darling 5% Critical Value	0.746
Kolmogorov-Smirnov Test Statistic	0.165
Kolmogorov-Smirnov 5% Critical Value	0.186

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	23.12
95% Adjusted Gamma UCL	23.42

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	22.18
95% Jackknife UCL	22.3
95% Standard Bootstrap UCL	22.13
95% Bootstrap-t UCL	22.59
95% Hall's Bootstrap UCL	22.65
95% Percentile Bootstrap UCL	22.18
95% BCA Bootstrap UCL	22.41
95% Chebyshev(Mean, Sd) UCL	26.67
97.5% Chebyshev(Mean, Sd) UCL	29.8
99% Chebyshev(Mean, Sd) UCL	35.94

Potential UCL to Use

Use 95% Student's-t UCL 22.3

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_BUILDING-TS_N_IRON.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

TS_Iron

General Statistics

Number of Valid Samples 22

Number of Unique Samples 22

Raw Statistics

Minimum	3380
Maximum	33600
Mean	16082
Median	14300
SD	7192
Coefficient of Variation	0.447
Skewness	0.568

Log-transformed Statistics

Minimum of Log Data	8.126
Maximum of Log Data	10.42
Mean of log Data	9.574
SD of log Data	0.522

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.956
Shapiro Wilk Critical Value	0.911

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.919
Shapiro Wilk Critical Value	0.911

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	18720

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	18803
95% Modified-t UCL	18751

Assuming Lognormal Distribution

95% H-UCL	20697
95% Chebyshev (MVUE) UCL	24630
97.5% Chebyshev (MVUE) UCL	28207
99% Chebyshev (MVUE) UCL	35234

Gamma Distribution Test

k star (bias corrected)	4.027
Theta Star	3994
nu star	177.2
Approximate Chi Square Value (.05)	147.4
Adjusted Level of Significance	0.0386
Adjusted Chi Square Value	145.4
Anderson-Darling Test Statistic	0.399
Anderson-Darling 5% Critical Value	0.747
Kolmogorov-Smirnov Test Statistic	0.118
Kolmogorov-Smirnov 5% Critical Value	0.186

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	19332
95% Adjusted Gamma UCL	19601

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	18604
95% Jackknife UCL	18720
95% Standard Bootstrap UCL	18547
95% Bootstrap-t UCL	18948
95% Hall's Bootstrap UCL	19060
95% Percentile Bootstrap UCL	18605
95% BCA Bootstrap UCL	18697
95% Chebyshev(Mean, Sd) UCL	22766
97.5% Chebyshev(Mean, Sd) UCL	25658
99% Chebyshev(Mean, Sd) UCL	31339

Potential UCL to Use

Use 95% Student's-t UCL 18720

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_BUILDING-TS_N_LEAD.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

TS_Lead

General Statistics

Number of Valid Samples	22	Number of Unique Samples	22

Raw Statistics

Minimum	4.8
Maximum	801
Mean	143.3
Median	58.35
SD	216.9
Coefficient of Variation	1.513
Skewness	2.225

Log-transformed Statistics

Minimum of Log Data	1.569
Maximum of Log Data	6.686
Mean of log Data	4.119
SD of log Data	1.328

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.628
Shapiro Wilk Critical Value	0.911

Data not Normal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	222.9

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	242.9
95% Modified-t UCL	226.6

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.97
Shapiro Wilk Critical Value	0.911

Data appear Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL	356.5
95% Chebyshev (MVUE) UCL	341.7
97.5% Chebyshev (MVUE) UCL	429.6
99% Chebyshev (MVUE) UCL	602.1

Gamma Distribution Test

k star (bias corrected)	0.646
Theta Star	222
nu star	28.41
Approximate Chi Square Value (.05)	17.24
Adjusted Level of Significance	0.0386
Adjusted Chi Square Value	16.6
Anderson-Darling Test Statistic	1.011
Anderson-Darling 5% Critical Value	0.786
Kolmogorov-Smirnov Test Statistic	0.202
Kolmogorov-Smirnov 5% Critical Value	0.193

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	236.1
95% Adjusted Gamma UCL	245.4

Data Distribution

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	219.4
95% Jackknife UCL	222.9
95% Standard Bootstrap UCL	217.6
95% Bootstrap-t UCL	278.4
95% Hall's Bootstrap UCL	231
95% Percentile Bootstrap UCL	224.4
95% BCA Bootstrap UCL	245.2
95% Chebyshev(Mean, Sd) UCL	344.9
97.5% Chebyshev(Mean, Sd) UCL	432.2
99% Chebyshev(Mean, Sd) UCL	603.5

Potential UCL to Use

Use 95% Chebyshev (MVUE) UCL 341.7

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_BUILDING-TS_N_MANGANESE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

TS_Manganese

General Statistics

Number of Valid Samples	22	Number of Unique Samples	22

Raw Statistics		Log-transformed Statistics	
Minimum	55.9	Minimum of Log Data	4.024
Maximum	778	Maximum of Log Data	6.657
Mean	315.6	Mean of log Data	5.477
Median	269.5	SD of log Data	0.821
SD	218.4		
Coefficient of Variation	0.692		
Skewness	0.682		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.915	Shapiro Wilk Test Statistic	0.934
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	395.7	95% H-UCL	507.3
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	601.8
95% Adjusted-CLT UCL	399.4	97.5% Chebyshev (MVUE) UCL	720.1
95% Modified-t UCL	396.9	99% Chebyshev (MVUE) UCL	952.6

Gamma Distribution Test		Data Distribution
k star (bias corrected)	1.715	**Data appear Normal at 5% Significance Level**
Theta Star	184.1	
nu star	75.45	
Approximate Chi Square Value (.05)	56.44	**Nonparametric Statistics**
Adjusted Level of Significance	0.0386	95% CLT UCL 392.2
Adjusted Chi Square Value	55.21	95% Jackknife UCL 395.7
		95% Standard Bootstrap UCL 390.1
Anderson-Darling Test Statistic	0.39	95% Bootstrap-t UCL 405
Anderson-Darling 5% Critical Value	0.756	95% Hall's Bootstrap UCL 401.4
Kolmogorov-Smirnov Test Statistic	0.141	95% Percentile Bootstrap UCL 391.5
Kolmogorov-Smirnov 5% Critical Value	0.188	95% BCA Bootstrap UCL 399.6
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 518.6
		97.5% Chebyshev(Mean, Sd) UCL 606.4
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 779
95% Approximate Gamma UCL	421.9	
95% Adjusted Gamma UCL	431.3	

Potential UCL to Use	Use 95% Student's-t UCL 395.7

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_BUILDING-TS_N_VANADIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

TS_Vanadium

General Statistics

Number of Valid Samples	22	Number of Unique Samples	20

Raw Statistics

Minimum	4.6
Maximum	52.1
Mean	25.98
Median	24.2
SD	10.5
Coefficient of Variation	0.404
Skewness	0.411

Log-transformed Statistics

Minimum of Log Data	1.526
Maximum of Log Data	3.953
Mean of log Data	3.157
SD of log Data	0.511

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.959
Shapiro Wilk Critical Value	0.911

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.859
Shapiro Wilk Critical Value	0.911

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	29.84

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	29.88
95% Modified-t UCL	29.87

Assuming Lognormal Distribution

95% H-UCL	33.45
95% Chebyshev (MVUE) UCL	39.75
97.5% Chebyshev (MVUE) UCL	45.43
99% Chebyshev (MVUE) UCL	56.6

Gamma Distribution Test

k star (bias corrected)	4.475
Theta Star	5.807
nu star	196.9
Approximate Chi Square Value (.05)	165.4
Adjusted Level of Significance	0.0386
Adjusted Chi Square Value	163.3
Anderson-Darling Test Statistic	0.673
Anderson-Darling 5% Critical Value	0.746
Kolmogorov-Smirnov Test Statistic	0.194
Kolmogorov-Smirnov 5% Critical Value	0.186

Data follow Appr. Gamma Distribution at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	30.93
95% Adjusted Gamma UCL	31.33

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	29.67
95% Jackknife UCL	29.84
95% Standard Bootstrap UCL	29.59
95% Bootstrap-t UCL	30.22
95% Hall's Bootstrap UCL	30.48
95% Percentile Bootstrap UCL	29.66
95% BCA Bootstrap UCL	29.72
95% Chebyshev(Mean, Sd) UCL	35.74
97.5% Chebyshev(Mean, Sd) UCL	39.96
99% Chebyshev(Mean, Sd) UCL	48.26

Potential UCL to Use

Use 95% Student's-t UCL 29.84

SMOKE-TS-ALUMINUM-UCL STATS

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SMOKE-TS_N_ALUMINUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

TS_Aluminum

General Statistics

Number of Valid Samples	6	Number of Unique Samples	6

Raw Statistics		Log-transformed Statistics	
Minimum	4320	Minimum of Log Data	8.371
Maximum	17500	Maximum of Log Data	9.77
Mean	14087	Mean of log Data	9.457
Median	16600	SD of log Data	0.549
SD	5169		
Coefficient of Variation	0.367		
Skewness	-1.811		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.737	Shapiro Wilk Test Statistic	0.662
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	18339	95% H-UCL	29841
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	28592
95% Adjusted-CLT UCL	15891	97.5% Chebyshev (MVUE) UCL	34699
95% Modified-t UCL	18079	99% Chebyshev (MVUE) UCL	46695

Gamma Distribution Test		Data Distribution
k star (bias corrected)	2.8	Data do not follow a Discernable Distribution (0.05)
Theta Star	5030	
nu star	33.6	
Approximate Chi Square Value (.05)	21.35	Nonparametric Statistics
Adjusted Level of Significance	0.0122	95% CLT UCL 17557
Adjusted Chi Square Value	17.91	95% Jackknife UCL 18339
		95% Standard Bootstrap UCL 17249
Anderson-Darling Test Statistic	0.996	95% Bootstrap-t UCL 16813
Anderson-Darling 5% Critical Value	0.698	95% Hall's Bootstrap UCL 16150
Kolmogorov-Smirnov Test Statistic	0.365	95% Percentile Bootstrap UCL 16967
Kolmogorov-Smirnov 5% Critical Value	0.333	95% BCA Bootstrap UCL 16317
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 23284
		97.5% Chebyshev(Mean, Sd) UCL 27264
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 35082
95% Approximate Gamma UCL	22174	
95% Adjusted Gamma UCL	26432	

Potential UCL to Use	Use 95% Chebyshev (Mean, Sd) UCL 23284

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options	
From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_D_ARSENIC.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_Arsenic

General Statistics

Number of Valid Samples	42	Number of Detected Data	17
Number of Unique Samples	16	Number of Non-Detect Data	25
		Percent Non-Detects	59.52%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	2.5	Minimum Detected	0.916
Maximum Detected	219	Maximum Detected	5.389
Mean of Detected	53.12	Mean of Detected	2.91
SD of Detected	78.09	SD of Detected	1.535
Minimum Non-Detect	2.3	Minimum Non-Detect	0.833
Maximum Non-Detect	4.1	Maximum Non-Detect	1.411

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	27
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	15
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	64.29%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.654	*Shapiro Wilk Test Statistic*	0.915
5% Shapiro Wilk Critical Value	0.892	5% Shapiro Wilk Critical Value	0.892
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	22.38	Mean	1.402
SD	55.12	SD	1.59
95% DL/2 (t) UCL	36.7	95% H-Stat (DL/2) UCL	31.74
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	0.262
		SD in Log Scale	2.645
		Mean in Original Scale	21.77
		SD in Original Scale	55.36
		95% Percentile Bootstrap UCL	36.49
		95% BCA Bootstrap UCL	41.75

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.52	Data Follow Appr. Gamma Distribution at 5% Significance Level	
Theta Star	102.1		
nu star	17.69		
A-D Test Statistic	0.99	Nonparametric Statistics	
5% A-D Critical Value	0.791	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.791	Mean	22.99
5% K-S Critical Value	0.22	SD	54.23
Data follow Appr. Gamma Distribution at 5% Significance Level		SE of Mean	8.625
		95% KM (t) UCL	37.5
Assuming Gamma Distribution		95% KM (z) UCL	37.17
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	37.24
Minimum	2.5	95% KM (bootstrap t) UCL	43.53
Maximum	219	95% KM (BCA) UCL	38.88
Mean	53.21	95% KM (Percentile Bootstrap) UCL	37.33
Median	52.46	95% KM (Chebyshev) UCL	60.58
SD	48.89	97.5% KM (Chebyshev) UCL	76.85
k star	1.222	99% KM (Chebyshev) UCL	108.8
Theta star	43.53		
Nu star	102.7	Potential UCLs to Use	
AppChi2	80.3	95% KM (t) UCL	37.5
95% Gamma Approximate UCL	68.04		
95% Adjusted Gamma UCL	68.64		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options	
From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_D_BERYLLIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_Beryllium

General Statistics

Number of Valid Samples	42	Number of Detected Data	21
Number of Unique Samples	19	Number of Non-Detect Data	21
		Percent Non-Detects	50.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.23	Minimum Detected	-1.47
Maximum Detected	61.2	Maximum Detected	4.114
Mean of Detected	9.174	Mean of Detected	0.281
SD of Detected	18.94	SD of Detected	1.901
Minimum Non-Detect	0.1	Minimum Non-Detect	-2.303
Maximum Non-Detect	0.3	Maximum Non-Detect	-1.204

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	24
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	18
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	57.14%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.529	Shapiro Wilk Test Statistic	0.805
5% Shapiro Wilk Critical Value	0.908	5% Shapiro Wilk Critical Value	0.908
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	4.65	Mean	-0.918
SD	14	SD	1.815
95% DL/2 (t) UCL	8.286	95% H-Stat (DL/2) UCL	5.51
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-2.087
		SD in Log Scale	2.956
		Mean in Original Scale	4.602
		SD in Original Scale	14.02
		95% Percentile Bootstrap UCL	8.287
		95% BCA Bootstrap UCL	9.726

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.33	Data do not follow a Discernable Distribution (0.05)
Theta Star	27.81	
nu star	13.86	
A-D Test Statistic	2.681	Nonparametric Statistics
5% A-D Critical Value	0.836	Kaplan-Meier (KM) Method
K-S Test Statistic	0.836	Mean 4.704
5% K-S Critical Value	0.204	SD 13.82
Data not Gamma Distributed at 5% Significance Level		SE of Mean 2.185
		95% KM (t) UCL 8.38
Assuming Gamma Distribution		95% KM (z) UCL 8.297
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 8.335
Minimum	0.23	95% KM (bootstrap t) UCL 15.09
Maximum	61.2	95% KM (BCA) UCL 8.848
Mean	9.16	95% KM (Percentile Bootstrap) UCL 8.47
Median	6.842	95% KM (Chebyshev) UCL 14.23
SD	13.41	97.5% KM (Chebyshev) UCL 18.35
k star	0.592	99% KM (Chebyshev) UCL 26.44
Theta star	15.47	
Nu star	49.75	Potential UCLs to Use
AppChi2	34.56	97.5% KM (Chebyshev) UCL 18.35
95% Gamma Approximate UCL	13.19	
95% Adjusted Gamma UCL	13.36	

Note: DL/2 is not a recommended method

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_D_CADMIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_Cadmium

General Statistics

Number of Valid Samples	84	Number of Detected Data	22
Number of Unique Samples	10	Number of Non-Detect Data	62
		Percent Non-Detects	73.81%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.3	Minimum Detected	-1.204
Maximum Detected	4	Maximum Detected	1.386
Mean of Detected	0.793	Mean of Detected	-0.613
SD of Detected	1.052	SD of Detected	0.73
Minimum Non-Detect	0.3	Minimum Non-Detect	-1.204
Maximum Non-Detect	0.4	Maximum Non-Detect	-0.916

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	72
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	12
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	85.71%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.467	Lilliefors Test Statistic	0.731
5% Lilliefors Critical Value	0.911	5% Lilliefors Critical Value	0.911
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.321	Mean	-1.547
SD	0.6	SD	0.672
95% DL/2 (t) UCL	0.43	95% H-Stat (DL/2) UCL	0.312
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-2.405
		SD in Log Scale	1.426
		Mean in Original Scale	0.26
		SD in Original Scale	0.62
		95% Percentile Bootstrap UCL	0.379
		95% BCA Bootstrap UCL	0.425

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	1.289	Data do not follow a Discernable Distribution (0.05)
Theta Star	0.615	
nu star	56.73	
A-D Test Statistic	3.099	Nonparametric Statistics
5% A-D Critical Value	0.76	Kaplan-Meier (KM) Method
K-S Test Statistic	0.76	Mean 0.429
5% K-S Critical Value	0.189	SD 0.569
Data not Gamma Distributed at 5% Significance Level		SE of Mean 0.0635
		95% KM (t) UCL 0.535
Assuming Gamma Distribution		95% KM (z) UCL 0.534
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 0.533
Minimum	0	95% KM (bootstrap t) UCL 0.923
Maximum	4.301	95% KM (BCA) UCL 0.554
Mean	1.874	95% KM (Percentile Bootstrap) UCL 0.544
Median	1.692	95% KM (Chebyshev) UCL 0.706
SD	1.394	97.5% KM (Chebyshev) UCL 0.826
k star	0.562	99% KM (Chebyshev) UCL 1.061
Theta star	3.335	
Nu star	94.39	Potential UCLs to Use
AppChi2	72.98	95% KM (t) UCL 0.535
95% Gamma Approximate UCL	2.423	95% KM (% Bootstrap) UCL 0.544
95% Adjusted Gamma UCL	2.434	

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_D_IRON.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_Iron

General Statistics

Number of Valid Samples 42

Number of Unique Samples 40

Raw Statistics

Minimum	138
Maximum	201000
Mean	41454
Median	28200
SD	43382
Coefficient of Variation	1.047
Skewness	2.165

Log-transformed Statistics

Minimum of Log Data	4.927
Maximum of Log Data	12.21
Mean of log Data	9.958
SD of log Data	1.518

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.753
Shapiro Wilk Critical Value	0.942

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.854
Shapiro Wilk Critical Value	0.942

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	52719

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	54854
95% Modified-t UCL	53092

Assuming Lognormal Distribution

95% H-UCL	136027
95% Chebyshev (MVUE) UCL	148129
97.5% Chebyshev (MVUE) UCL	184834
99% Chebyshev (MVUE) UCL	256933

Gamma Distribution Test

k star (bias corrected)	0.824
Theta Star	50296
nu star	69.23
Approximate Chi Square Value (.05)	51.08
Adjusted Level of Significance	0.0443
Adjusted Chi Square Value	50.52
Anderson-Darling Test Statistic	0.5
Anderson-Darling 5% Critical Value	0.784
Kolmogorov-Smirnov Test Statistic	0.109
Kolmogorov-Smirnov 5% Critical Value	0.141

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	56186
95% Adjusted Gamma UCL	56804

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	52465
95% Jackknife UCL	52719
95% Standard Bootstrap UCL	52332
95% Bootstrap-t UCL	56869
95% Hall's Bootstrap UCL	59618
95% Percentile Bootstrap UCL	53148
95% BCA Bootstrap UCL	54862
95% Chebyshev(Mean, Sd) UCL	70633
97.5% Chebyshev(Mean, Sd) UCL	83258
99% Chebyshev(Mean, Sd) UCL	108059

Potential UCL to Use

Use 95% Approximate Gamma UCL 56186

SG-GW-MANGANESE-UCL STATS

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_D_MANGANESE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_Manganese

General Statistics

Number of Valid Samples	84	Number of Unique Samples	41

Raw Statistics

Minimum	57
Maximum	3130
Mean	1104
Median	697
SD	873.4
Coefficient of Variation	0.791
Skewness	1.057

Log-transformed Statistics

Minimum of Log Data	4.043
Maximum of Log Data	8.049
Mean of log Data	6.691
SD of log Data	0.84

Relevant UCL Statistics

Normal Distribution Test

Lilliefors Test Statistic	0.206
Lilliefors Critical Value	0.0967

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic	0.113
Lilliefors Critical Value	0.0967

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	1263

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	1273
95% Modified-t UCL	1264

Assuming Lognormal Distribution

95% H-UCL	1388
95% Chebyshev (MVUE) UCL	1659
97.5% Chebyshev (MVUE) UCL	1884
99% Chebyshev (MVUE) UCL	2326

Gamma Distribution Test

k star (bias corrected)	1.676
Theta Star	658.6
nu star	281.6
Approximate Chi Square Value (.05)	243.8
Adjusted Level of Significance	0.0471
Adjusted Chi Square Value	243.2
Anderson-Darling Test Statistic	2.338
Anderson-Darling 5% Critical Value	0.768
Kolmogorov-Smirnov Test Statistic	0.158
Kolmogorov-Smirnov 5% Critical Value	0.0991

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	1276
95% Adjusted Gamma UCL	1279

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	1261
95% Jackknife UCL	1263
95% Standard Bootstrap UCL	1263
95% Bootstrap-t UCL	1277
95% Hall's Bootstrap UCL	1270
95% Percentile Bootstrap UCL	1265
95% BCA Bootstrap UCL	1273
95% Chebyshev(Mean, Sd) UCL	1519
97.5% Chebyshev(Mean, Sd) UCL	1699
99% Chebyshev(Mean, Sd) UCL	2052

Potential UCL to Use

Use 95% Chebyshev (Mean, Sd) UCL 1519

General UCL Statistics for Data Sets with Non-Detects

User Selected Options	
From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_D_NICKEL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_Nickel

General Statistics

Number of Valid Samples	42	Number of Detected Data	38
Number of Unique Samples	38	Number of Non-Detect Data	4
		Percent Non-Detects	9.52%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.4	Minimum Detected	0.336
Maximum Detected	1280	Maximum Detected	7.155
Mean of Detected	143.2	Mean of Detected	3.276
SD of Detected	329.3	SD of Detected	1.791
Minimum Non-Detect	0.9	Minimum Non-Detect	-0.105
Maximum Non-Detect	1	Maximum Non-Detect	0

Note. Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	4
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	38
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	9.52%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.459	Shapiro Wilk Test Statistic	0.948
5% Shapiro Wilk Critical Value	0.938	5% Shapiro Wilk Critical Value	0.938
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	129.6	Mean	2.895
SD	315.6	SD	2.075
95% DL/2 (t) UCL	211.6	95% H-Stat (DL/2) UCL	527.4
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	107.7	Mean in Log Scale	2.883
SD	332.6	SD in Log Scale	2.1
95% MLE (t) UCL	194.1	Mean in Original Scale	129.6
95% MLE (Tiku) UCL	187.4	SD in Original Scale	315.6
		95% Percentile Bootstrap UCL	215.3
		95% BCA Bootstrap UCL	236.1

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.378	Data appear Lognormal at 5% Significance Level	
Theta Star	379		
nu star	28.72		
A-D Test Statistic	2.85	Nonparametric Statistics	
5% A-D Critical Value	0.837	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.837	Mean	129.7
5% K-S Critical Value	0.154	SD	311.8
Data not Gamma Distributed at 5% Significance Level		SE of Mean	48.76
		95% KM (t) UCL	211.7
Assuming Gamma Distribution		95% KM (z) UCL	209.9
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	211.6
Minimum	0	95% KM (bootstrap t) UCL	259
Maximum	1280	95% KM (BCA) UCL	218.1
Mean	129.5	95% KM (Percentile Bootstrap) UCL	214.7
Median	20.2	95% KM (Chebyshev) UCL	342.2
SD	315.7	97.5% KM (Chebyshev) UCL	434.2
k star	0.194	99% KM (Chebyshev) UCL	614.9
Theta star	669.5		
Nu star	16.25	Potential UCLs to Use	
AppChi2	8.142	97.5% KM (Chebyshev) UCL	434.2
95% Gamma Approximate UCL	258.6		
95% Adjusted Gamma UCL	265.3		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_D_THALLIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_Thallium

General Statistics

Number of Valid Samples	42	Number of Detected Data	7
Number of Unique Samples	7	Number of Non-Detect Data	35
		Percent Non-Detects	83.33%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	3.3	Minimum Detected	1.194
Maximum Detected	6.2	Maximum Detected	1.825
Mean of Detected	4.757	Mean of Detected	1.536
SD of Detected	1.091	SD of Detected	0.24
Minimum Non-Detect	3.1	Minimum Non-Detect	1.131
Maximum Non-Detect	3.8	Maximum Non-Detect	1.335

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	37
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	5
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	88.10%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.949	Shapiro Wilk Test Statistic	0.931
5% Shapiro Wilk Critical Value	0.803	5% Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2.192	Mean	0.685
SD	1.239	SD	0.401
95% DL/2 (t) UCL	2.513	95% H-Stat (DL/2) UCL	2.429
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.646	Mean in Log Scale	0.667
SD	2.715	SD in Log Scale	0.543
95% MLE (t) UCL	1.351	Mean in Original Scale	2.262
95% MLE (Tiku) UCL	3.21	SD in Original Scale	1.347
		95% Percentile Bootstrap UCL	2.605
		95% BCA Bootstrap UCL	2.661

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	12.16	Data appear Normal at 5% Significance Level
Theta Star	0.391	
nu star	170.2	
A-D Test Statistic	0.275	Nonparametric Statistics
5% A-D Critical Value	0.707	Kaplan-Meier (KM) Method
K-S Test Statistic	0.707	Mean -3.543
5% K-S Critical Value	0.311	SD 0.682
Data appear Gamma Distributed at 5% Significance Level		SE of Mean 0.114
		95% KM (t) UCL 3.735
Assuming Gamma Distribution		95% KM (z) UCL 3.73
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 3.718
Minimum	2.952	95% KM (bootstrap t) UCL 3.739
Maximum	7.485	95% KM (BCA) UCL 4.91
Mean	5.69	95% KM (Percentile Bootstrap) UCL 4.7
Median	5.894	95% KM (Chebyshev) UCL 4.039
SD	1.271	97.5% KM (Chebyshev) UCL 4.253
k star	16.62	99% KM (Chebyshev) UCL 4.674
Theta star	0.342	
Nu star	1396	Potential UCLs to Use
AppChi2	1310	95% KM (t) UCL 3.735
95% Gamma Approximate UCL	6.062	95% KM (Percentile Bootstrap) UCL 4.7
95% Adjusted Gamma UCL	6.076	

Note: DL/2 is not a recommended method

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_D_VANADIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_Vanadium

General Statistics

Number of Valid Samples	42	Number of Detected Data	5
Number of Unique Samples	5	Number of Non-Detect Data	37
		Percent Non-Detects	88.10%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.87	Minimum Detected	-0.139
Maximum Detected	11.4	Maximum Detected	2.434
Mean of Detected	4.554	Mean of Detected	1.19
SD of Detected	4.061	SD of Detected	0.941
Minimum Non-Detect	0.5	Minimum Non-Detect	-0.693
Maximum Non-Detect	2	Maximum Non-Detect	0.693

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	38
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	4
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	90.48%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.843	Shapiro Wilk Test Statistic	0.972
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.059	Mean	-0.395
SD	1.829	SD	0.759
95% DL/2 (t) UCL	1.534	95% H-Stat (DL/2) UCL	1.18
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-3.076
		SD in Log Scale	2.334
		Mean in Original Scale	0.618
		SD in Original Scale	1.941
		95% Percentile Bootstrap UCL	1.161
		95% BCA Bootstrap UCL	1.467

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.805	Data appear Normal at 5% Significance Level	
Theta Star	5.655		
nu star	8.052		
A-D Test Statistic	0.261	Nonparametric Statistics	
5% A-D Critical Value	0.686	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.686	Mean	1.309
5% K-S Critical Value	0.361	SD	1.73
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.298
		95% KM (t) UCL	1.811
Assuming Gamma Distribution		95% KM (z) UCL	1.8
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	2.235
Minimum	0.87	95% KM (bootstrap t) UCL	2.002
Maximum	11.4	95% KM (BCA) UCL	4.533
Mean	3.827	95% KM (Percentile Bootstrap) UCL	4.357
Median	3.822	95% KM (Chebyshev) UCL	2.61
SD	1.788	97.5% KM (Chebyshev) UCL	3.173
k star	4.603	99% KM (Chebyshev) UCL	4.279
Theta star	0.831		
Nu star	386.7	Potential UCLs to Use	
AppChi2	342.1	95% KM (t) UCL	1.811
95% Gamma Approximate UCL	4.325	95% KM (Percentile Bootstrap) UCL	4.357
95% Adjusted Gamma UCL	4.344		

Note. DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_D_ZINC.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_Zinc

General Statistics

Number of Valid Samples	42	Number of Unique Samples	41

Raw Statistics

Minimum	2
Maximum	2900
Mean	296.2
Median	21.9
SD	780.8
Coefficient of Variation	2.636
Skewness	2.837

Log-transformed Statistics

Minimum of Log Data	0.693
Maximum of Log Data	7.972
Mean of log Data	3.448
SD of log Data	1.892

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.405
Shapiro Wilk Critical Value	0.942

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.848
Shapiro Wilk Critical Value	0.942

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	498.9

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	550.7
95% Modified-t UCL	507.7

Assuming Lognormal Distribution

95% H-UCL	530.3
95% Chebyshev (MVUE) UCL	470.8
97.5% Chebyshev (MVUE) UCL	601.4
99% Chebyshev (MVUE) UCL	857.8

Gamma Distribution Test

k star (bias corrected)	0.3
Theta Star	986
nu star	25.23
Approximate Chi Square Value (.05)	14.79
Adjusted Level of Significance	0.0443
Adjusted Chi Square Value	14.5
Anderson-Darling Test Statistic	5.525
Anderson-Darling 5% Critical Value	0.858
Kolmogorov-Smirnov Test Statistic	0.312
Kolmogorov-Smirnov 5% Critical Value	0.148

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	505.3
95% Adjusted Gamma UCL	515.3

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	494.4
95% Jackknife UCL	498.9
95% Standard Bootstrap UCL	490.1
95% Bootstrap-t UCL	641.3
95% Hall's Bootstrap UCL	449.2
95% Percentile Bootstrap UCL	498
95% BCA Bootstrap UCL	556.7
95% Chebyshev(Mean, Sd) UCL	821.3
97.5% Chebyshev(Mean, Sd) UCL	1049
99% Chebyshev(Mean, Sd) UCL	1495

Potential UCL to Use

Use 99% Chebyshev (Mean, Sd) UCL 1495

General UCL Statistics for Data Sets with Non-Detects

User Selected Options	
From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_N_12-DICHLOROETHANE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_1,2-Dichloroethane

General Statistics

Number of Valid Samples	42	Number of Detected Data	6
Number of Unique Samples	6	Number of Non-Detect Data	36
		Percent Non-Detects	85.71%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	2	Minimum Detected	0.693
Maximum Detected	36	Maximum Detected	3.584
Mean of Detected	9.7	Mean of Detected	1.787
SD of Detected	12.96	SD of Detected	0.96
Minimum Non-Detect	10	Minimum Non-Detect	2.303
Maximum Non-Detect	10	Maximum Non-Detect	2.303

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.597	Shapiro Wilk Test Statistic	0.833
5% Shapiro Wilk Critical Value	0.788	5% Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	5.671	Mean	1.635
SD	4.821	SD	0.341
95% DL/2 (t) UCL	6.923	95% H-Stat (DL/2) UCL	6 823
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	1.515
		SD in Log Scale	0.747
		Mean in Original Scale	6.096
		SD in Original Scale	5.948
		95% Percentile Bootstrap UCL	7.752
		95% BCA Bootstrap UCL	8.236

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.696	Data appear Lognormal at 5% Significance Level	
Theta Star	13.94		
nu star	8.348		
A-D Test Statistic	0.893	Nonparametric Statistics	
5% A-D Critical Value	0 713	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.713	Mean	5.191
5% K-S Critical Value	0.34	SD	4 994
Data not Gamma Distributed at 5% Significance Level		SE of Mean	1.04
		95% KM (t) UCL	6.941
Assuming Gamma Distribution		95% KM (z) UCL	6.902
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	6.954
Minimum	0	95% KM (bootstrap t) UCL	7.776
Maximum	36	95% KM (BCA) UCL	6.952
Mean	8 547	95% KM (Percentile Bootstrap) UCL	6.905
Median	7.734	95% KM (Chebyshev) UCL	9.723
SD	6 918	97 5% KM (Chebyshev) UCL	11.68
k star	0.249	99% KM (Chebyshev) UCL	15.54
Theta star	34 39		
Nu star	20.88	Potential UCLs to Use	
AppChi2	11 5	95% KM (t) UCL	6 941
95% Gamma Approximate UCL	15.52	95% KM (% Bootstrap) UCL	6.905
95% Adjusted Gamma UCL	15 86		

Note: DL/2 is not a recommended method

General UCL Statistics for Data Sets with Non-Detects

User Selected Options	
From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_N_12-DICHLOROETHENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_1,2-Dichloroethene

General Statistics

Number of Valid Samples	42	Number of Detected Data	16
Number of Unique Samples	15	Number of Non-Detect Data	26
		Percent Non-Detects	61.90%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	3	Minimum Detected	1.099
Maximum Detected	160	Maximum Detected	5.075
Mean of Detected	58.49	Mean of Detected	3.517
SD of Detected	52.28	SD of Detected	1.25
Minimum Non-Detect	10	Minimum Non-Detect	2.303
Maximum Non-Detect	10	Maximum Non-Detect	2.303

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.876	Shapiro Wilk Test Statistic	0.924
5% Shapiro Wilk Critical Value	0.887	5% Shapiro Wilk Critical Value	0.887
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	25.38	Mean	2.336
SD	41.12	SD	1.205
95% DL/2 (t) UCL	36.05	95% H-Stat (DL/2) UCL	36.83
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	2.405
		SD in Log Scale	1.387
		Mean in Original Scale	27.29
		SD in Original Scale	40.47
		95% Percentile Bootstrap UCL	37.83
		95% BCA Bootstrap UCL	39.76

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.888	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	65.87		
nu star	28.41		
A-D Test Statistic	0.333	Nonparametric Statistics	
5% A-D Critical Value	0.763	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.763	Mean	26.2
5% K-S Critical Value	0.221	SD	40.27
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	6.472
		95% KM (t) UCL	37.09
Assuming Gamma Distribution		95% KM (z) UCL	36.84
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	36.94
Minimum	3	95% KM (bootstrap t) UCL	40.64
Maximum	160	95% KM (BCA) UCL	38.25
Mean	61.23	95% KM (Percentile Bootstrap) UCL	37.42
Median	60.98	95% KM (Chebyshev) UCL	54.41
SD	32.09	97.5% KM (Chebyshev) UCL	66.61
k star	2.33	99% KM (Chebyshev) UCL	90.59
Theta star	26.28		
Nu star	195.7	Potential UCLs to Use	
AppChi2	164.3	95% KM (t) UCL	37.09
95% Gamma Approximate UCL	72.92		
95% Adjusted Gamma UCL	73.37		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_N_44-DDD.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_4,4'-DDD

General Statistics

Number of Valid Samples	42	Number of Detected Data	11
Number of Unique Samples	11	Number of Non-Detect Data	31
		Percent Non-Detects	73.81%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.007	Minimum Detected	-4.962
Maximum Detected	2.3	Maximum Detected	0.833
Mean of Detected	0.433	Mean of Detected	-2.176
SD of Detected	0.712	SD of Detected	1.829
Minimum Non-Detect	0.1	Minimum Non-Detect	-2.303
Maximum Non-Detect	0.13	Maximum Non-Detect	-2.04

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	37
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	5
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	88.10%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.667	Shapiro Wilk Test Statistic	0.959
5% Shapiro Wilk Critical Value	0.85	5% Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.152	Mean	-2.752
SD	0.39	SD	0.97
95% DL/2 (t) UCL	0.253	95% H-Stat (DL/2) UCL	0.181
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-3.186
		SD in Log Scale	1.47
		Mean in Original Scale	0.15
		SD in Original Scale	0.393
		95% Percentile Bootstrap UCL	0.259
		95% BCA Bootstrap UCL	0.311
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.408	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	1.06		
nu star	8.98		
A-D Test Statistic	0.542	Nonparametric Statistics	
5% A-D Critical Value	0.785	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.785	Mean	0.139
5% K-S Critical Value	0.27	SD	0.389
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0633
		95% KM (t) UCL	0.246
Assuming Gamma Distribution		95% KM (z) UCL	0.243
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.242
Minimum	0	95% KM (bootstrap t) UCL	0.493
Maximum	2.3	95% KM (BCA) UCL	0.255
Mean	0.36	95% KM (Percentile Bootstrap) UCL	0.252
Median	0.349	95% KM (Chebyshev) UCL	0.415
SD	0.401	97.5% KM (Chebyshev) UCL	0.535
k star	0.257	99% KM (Chebyshev) UCL	0.769
Theta star	1.403		
Nu star	21.56	Potential UCLs to Use	
AppChi2	12.01	95% KM (t) UCL	0.246
95% Gamma Approximate UCL	0.647		
95% Adjusted Gamma UCL	0.661		

Note: DL/2 is not a recommended method

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_N_112-TRICHLOROETHANE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_1,1,2-Trichloroethane

General Statistics

Number of Valid Samples	42	Number of Detected Data	13
Number of Unique Samples	11	Number of Non-Detect Data	29
		Percent Non-Detects	69.05%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.7	Minimum Detected	0.531
Maximum Detected	37.5	Maximum Detected	3.624
Mean of Detected	10.04	Mean of Detected	1.892
SD of Detected	9.667	SD of Detected	0.998
Minimum Non-Detect	10	Minimum Non-Detect	2.303
Maximum Non-Detect	10	Maximum Non-Detect	2.303

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.783	Shapiro Wilk Test Statistic	0.908
5% Shapiro Wilk Critical Value	0.866	5% Shapiro Wilk Critical Value	0.866
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	6.561	Mean	1.697
SD	5.737	SD	0.556
95% DL/2 (t) UCL	8.051	95% H-Stat (DL/2) UCL	9.326
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	1.453
		SD in Log Scale	0.839
		Mean in Original Scale	6.092
		SD in Original Scale	6.284
		95% Percentile Bootstrap UCL	7.763
		95% BCA Bootstrap UCL	8.315

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.088	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	9.233		
nu star	28.28		
A-D Test Statistic	0.436	Nonparametric Statistics	
5% A-D Critical Value	0.752	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.752	Mean	6.479
5% K-S Critical Value	0.242	SD	6.307
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	1.381
		95% KM (t) UCL	8.802
Assuming Gamma Distribution		95% KM (z) UCL	8.75
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	8.891
Minimum	1.7	95% KM (bootstrap t) UCL	9.388
Maximum	37.5	95% KM (BCA) UCL	8.897
Mean	9.165	95% KM (Percentile Bootstrap) UCL	8.835
Median	8.857	95% KM (Chebyshev) UCL	12.5
SD	5.599	97.5% KM (Chebyshev) UCL	15.1
k star	3.161	99% KM (Chebyshev) UCL	20.22
Theta star	2.899		
Nu star	265.5	Potential UCLs to Use	
AppChi2	228.8	95% KM (t) UCL	8.802
95% Gamma Approximate UCL	10.64		
95% Adjusted Gamma UCL	10.69		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_N_1122-TETRACHLOROETHA.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_1,1,2,2-Tetrachloroethane

General Statistics

Number of Valid Samples	42	Number of Detected Data	19
Number of Unique Samples	17	Number of Non-Detect Data	23
		Percent Non-Detects	54.76%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	2	Minimum Detected	0.693
Maximum Detected	1200	Maximum Detected	7.09
Mean of Detected	412.5	Mean of Detected	4.673
SD of Detected	477.4	SD of Detected	2.154
Minimum Non-Detect	10	Minimum Non-Detect	2.303
Maximum Non-Detect	10	Maximum Non-Detect	2.303

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.772	Shapiro Wilk Test Statistic	0.901
5% Shapiro Wilk Critical Value	0.901	5% Shapiro Wilk Critical Value	0.901
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	189.4	Mean	2.995
SD	377.1	SD	2.102
95% DL/2 (t) UCL	287.3	95% H-Stat (DL/2) UCL	693.6
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	2.658
		SD in Log Scale	2.64
		Mean in Original Scale	190.3
		SD in Original Scale	376.7
		95% Percentile Bootstrap UCL	287.7
		95% BCA Bootstrap UCL	305.4

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.435	Data appear Gamma Distributed at 5% Significance Level
Theta Star	948.8	
nu star	16.52	
A-D Test Statistic	0.667	
5% A-D Critical Value	0.808	
K-S Test Statistic	0.808	
5% K-S Critical Value	0.211	
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	2	Mean	188.4
Maximum	1825	SD	373
Mean	559.7	SE of Mean	59.14
Median	364.9	95% KM (t) UCL	288
SD	521.6	95% KM (z) UCL	285.7
k star	0.692	95% KM (jackknife) UCL	286.5
Theta star	809.1	95% KM (bootstrap t) UCL	314.2
Nu star	58.11	95% KM (BCA) UCL	289.1
AppChi2	41.59	95% KM (Percentile Bootstrap) UCL	287.2
95% Gamma Approximate UCL	782.1	95% KM (Chebyshev) UCL	446.2
95% Adjusted Gamma UCL	791.6	97.5% KM (Chebyshev) UCL	557.8
		99% KM (Chebyshev) UCL	776.9
		Potential UCLs to Use	
		95% KM (t) UCL	288

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options	
From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_N_BENZENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_Benzene

General Statistics

Number of Valid Samples	42	Number of Detected Data	18
Number of Unique Samples	17	Number of Non-Detect Data	24
		Percent Non-Detects	57.14%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.1	Minimum Detected	0.0953
Maximum Detected	2150	Maximum Detected	7.673
Mean of Detected	483.7	Mean of Detected	4.17
SD of Detected	702.9	SD of Detected	2.568
Minimum Non-Detect	10	Minimum Non-Detect	2.303
Maximum Non-Detect	10	Maximum Non-Detect	2.303

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.72	Shapiro Wilk Test Statistic	0.919
5% Shapiro Wilk Critical Value	0.897	5% Shapiro Wilk Critical Value	0.897
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	210.1	Mean	2.707
SD	512.2	SD	2.093
95% DL/2 (t) UCL	343.1	95% H-Stat (DL/2) UCL	547.7
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	2.471
		SD in Log Scale	2.6
		Mean in Original Scale	212.8
		SD in Original Scale	511.2
		95% Percentile Bootstrap UCL	346.8
		95% BCA Bootstrap UCL	380.2

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.317	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	1524		
nu star	11.43		
A-D Test Statistic	0.787	Nonparametric Statistics	
5% A-D Critical Value	0.834	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.834	Mean	209.6
5% K-S Critical Value	0.22	SD	506.3
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	80.39
		95% KM (t) UCL	344.9
Assuming Gamma Distribution		95% KM (z) UCL	341.8
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	342.7
Minimum	1.1	95% KM (bootstrap t) UCL	410.1
Maximum	2150	95% KM (BCA) UCL	344
Mean	437	95% KM (Percentile Bootstrap) UCL	345.4
Median	406.5	95% KM (Chebyshev) UCL	560
SD	468.7	97.5% KM (Chebyshev) UCL	711.6
k star	0.616	99% KM (Chebyshev) UCL	1009
Theta star	709.7		
Nu star	51.73	Potential UCLs to Use	
AppChi2	36.21	95% KM (t) UCL	344.9
95% Gamma Approximate UCL	624.3		
95% Adjusted Gamma UCL	632.4		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_N_CHLOROFORM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_Chloroform

General Statistics

Number of Valid Samples	42	Number of Detected Data	12
Number of Unique Samples	12	Number of Non-Detect Data	30
		Percent Non-Detects	71.43%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	2.5	Minimum Detected	0.916
Maximum Detected	48	Maximum Detected	3.871
Mean of Detected	19.24	Mean of Detected	2.627
SD of Detected	15.82	SD of Detected	0.888
Minimum Non-Detect	10	Minimum Non-Detect	2.303
Maximum Non-Detect	10	Maximum Non-Detect	2.303

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.838	Shapiro Wilk Test Statistic	0.961
5% Shapiro Wilk Critical Value	0.859	5% Shapiro Wilk Critical Value	0.859
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	9.069	Mean	1.9
SD	10.47	SD	0.654
95% DL/2 (t) UCL	11.79	95% H-Stat (DL/2) UCL	10.86
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	1.872
		SD in Log Scale	0.869
		Mean in Original Scale	9.65
		SD in Original Scale	10.63
		95% Percentile Bootstrap UCL	12.52
		95% BCA Bootstrap UCL	13.13

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	1.301	Data appear Gamma Distributed at 5% Significance Level
Theta Star	14.8	
nu star	31.21	
A-D Test Statistic	0.333	Nonparametric Statistics
5% A-D Critical Value	0.744	Kaplan-Meier (KM) Method
K-S Test Statistic	0.744	Mean 9.855
5% K-S Critical Value	0.249	SD 10.24
Data appear Gamma Distributed at 5% Significance Level		SE of Mean 1.903
		95% KM (t) UCL 13.06
Assuming Gamma Distribution		95% KM (z) UCL 12.99
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 13.24
Minimum	2.5	95% KM (bootstrap t) UCL 14.17
Maximum	48	95% KM (BCA) UCL 13.25
Mean	17.27	95% KM (Percentile Bootstrap) UCL 13.19
Median	15.87	95% KM (Chebyshev) UCL 18.15
SD	8.724	97.5% KM (Chebyshev) UCL 21.74
k star	4.372	99% KM (Chebyshev) UCL 28.79
Theta star	3.95	
Nu star	367.3	Potential UCLs to Use
AppChi2	323.9	95% KM (t) UCL 13.06
95% Gamma Approximate UCL	19.59	
95% Adjusted Gamma UCL	19.67	

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_N_NITROBENZENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_Nitrobenzene

General Statistics

Number of Valid Samples	42	Number of Detected Data	3
Number of Unique Samples	3	Number of Non-Detect Data	39
		Percent Non-Detects	92.86%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.025	Minimum Detected	0.0247
Maximum Detected	6.5	Maximum Detected	1.872
Mean of Detected	3.042	Mean of Detected	0.789
SD of Detected	3.009	SD of Detected	0.964
Minimum Non-Detect	0.06	Minimum Non-Detect	-2.813
Maximum Non-Detect	10	Maximum Non-Detect	2.303

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	42
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.828	Shapiro Wilk Test Statistic	0.918
5% Shapiro Wilk Critical Value	0.767	5% Shapiro Wilk Critical Value	0.767
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.408	Mean	-2.421
SD	1.252	SD	1.329
95% DL/2 (t) UCL	0.733	95% H-Stat (DL/2) UCL	0.403
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-6.123
		SD in Log Scale	2.929
		Mean in Original Scale	0.227
		SD in Original Scale	1.033
		95% Percentile Bootstrap UCL	0.518
		95% BCA Bootstrap UCL	0.804

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	N/A	Data appear Normal at 5% Significance Level
Theta Star	N/A	
nu star	N/A	
A-D Test Statistic	0.407	Nonparametric Statistics
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method
K-S Test Statistic	N/A	Mean 1.173
5% K-S Critical Value	N/A	SD 0.847
Data not Gamma Distributed at 5% Significance Level		SE of Mean 0.162
		95% KM (t) UCL 1.445
Assuming Gamma Distribution		95% KM (z) UCL 1.439
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 1.571
Minimum	N/A	95% KM (bootstrap t) UCL 2.065
Maximum	N/A	95% KM (BCA) UCL 6.5
Mean	N/A	95% KM (Percentile Bootstrap) UCL N/A
Median	N/A	95% KM (Chebyshev) UCL 1.879
SD	N/A	97.5% KM (Chebyshev) UCL 2.184
k star	N/A	99% KM (Chebyshev) UCL 2.785
Theta star	N/A	
Nu star	N/A	Potential UCLs to Use
AppChi2	N/A	95% KM (t) UCL 1.445
95% Gamma Approximate UCL	N/A	95% KM (Percentile Bootstrap) UCL N/A
95% Adjusted Gamma UCL	N/A	

Note: DL/2 is not a recommended method

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_N_TETRACHLOROETHENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_Tetrachloroethene

General Statistics

Number of Valid Samples	42	Number of Detected Data	9
Number of Unique Samples	8	Number of Non-Detect Data	33
		Percent Non-Detects	78.57%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	2	Minimum Detected	0.693
Maximum Detected	11	Maximum Detected	2.398
Mean of Detected	5.822	Mean of Detected	1.595
SD of Detected	3.151	SD of Detected	0.654
Minimum Non-Detect	10	Minimum Non-Detect	2.303
Maximum Non-Detect	10	Maximum Non-Detect	2.303

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.912	Shapiro Wilk Test Statistic	0.856
5% Shapiro Wilk Critical Value	0.829	5% Shapiro Wilk Critical Value	0.829
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	5.176	Mean	1.606
SD	1.433	SD	0.289
95% DL/2 (t) UCL	5.548	95% H-Stat (DL/2) UCL	6.845
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	1.48
		SD in Log Scale	0.524
		Mean in Original Scale	4.991
		SD in Original Scale	2.502
		95% Percentile Bootstrap UCL	5.626
		95% BCA Bootstrap UCL	5.635

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	2.176	Data appear Normal at 5% Significance Level
Theta Star	2.675	
nu star	39.17	
A-D Test Statistic	0.572	
5% A-D Critical Value	0.727	
K-S Test Statistic	0.727	
5% K-S Critical Value	0.281	
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	2	Mean	5.314
Maximum	11	SD	2.608
Mean	5.898	SE of Mean	0.92
Median	5.995	95% KM (t) UCL	6.862
SD	1.45	95% KM (z) UCL	6.827
k star	12.35	95% KM (jackknife) UCL	6.957
Theta star	0.478	95% KM (bootstrap t) UCL	6.914
Nu star	1037	95% KM (BCA) UCL	6.802
AppChi2	963.3	95% KM (Percentile Bootstrap) UCL	6.821
95% Gamma Approximate UCL	6.349	95% KM (Chebyshev) UCL	9.325
95% Adjusted Gamma UCL	6.366	97.5% KM (Chebyshev) UCL	11.06
		99% KM (Chebyshev) UCL	14.47
		Potential UCLs to Use	
		95% KM (t) UCL	6.862
		95% KM (Percentile Bootstrap) UCL	6.821

Note: DL/2 is not a recommended method

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_N_TRICHLOROETHENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_Trichloroethene

General Statistics

Number of Valid Samples	42	Number of Detected Data	18
Number of Unique Samples	18	Number of Non-Detect Data	24
		Percent Non-Detects	57.14%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1	Minimum Detected	0
Maximum Detected	170	Maximum Detected	5.136
Mean of Detected	57.31	Mean of Detected	3.338
SD of Detected	53.9	SD of Detected	1.536
Minimum Non-Detect	10	Minimum Non-Detect	2.303
Maximum Non-Detect	10	Maximum Non-Detect	2.303

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.864	Shapiro Wilk Test Statistic	0.886
5% Shapiro Wilk Critical Value	0.897	5% Shapiro Wilk Critical Value	0.897
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	27.42	Mean	2.35
SD	43.49	SD	1.315
95% DL/2 (t) UCL	38.71	95% H-Stat (DL/2) UCL	50.52
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	1.996
		SD in Log Scale	1.776
		Mean in Original Scale	27.16
		SD in Original Scale	43.73
		95% Percentile Bootstrap UCL	39
		95% BCA Bootstrap UCL	40.13

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.729	Data appear Gamma Distributed at 5% Significance Level
Theta Star	78.56	
nu star	26.26	
A-D Test Statistic	0.437	Nonparametric Statistics
5% A-D Critical Value	0.774	Kaplan-Meier (KM) Method
K-S Test Statistic	0.774	Mean 26.22
5% K-S Critical Value	0.211	SD 43.62
Data appear Gamma Distributed at 5% Significance Level		SE of Mean 6.945
		95% KM (t) UCL 37.91
Assuming Gamma Distribution		95% KM (z) UCL 37.64
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 37.74
Minimum	1	95% KM (bootstrap t) UCL 41
Maximum	170	95% KM (BCA) UCL 39.33
Mean	65.24	95% KM (Percentile Bootstrap) UCL 38.71
Median	58.49	95% KM (Chebyshev) UCL 56.49
SD	39.81	97.5% KM (Chebyshev) UCL 69.59
k star	1.503	99% KM (Chebyshev) UCL 95.32
Theta star	43.41	
Nu star	126.3	Potential UCLs to Use
AppChi2	101.3	95% KM (t) UCL 37.91
95% Gamma Approximate UCL	81.31	
95% Adjusted Gamma UCL	81.95	

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_N_VINYL CHLORIDE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_Vinyl chloride

General Statistics

Number of Valid Samples	84	Number of Detected Data	10
Number of Unique Samples	5	Number of Non-Detect Data	74
		Percent Non-Detects	88.10%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	2.65	Minimum Detected	0.975
Maximum Detected	7.6	Maximum Detected	2.028
Mean of Detected	5.79	Mean of Detected	1.698
SD of Detected	1.754	SD of Detected	0.391
Minimum Non-Detect	10	Minimum Non-Detect	2.303
Maximum Non-Detect	10	Maximum Non-Detect	2.303

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.776	Lilliefors Test Statistic	0.696
5% Lilliefors Critical Value	0.842	5% Lilliefors Critical Value	0.842
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		*DL/2 Substitution Method*	
Mean	5.094	Mean	1.62
SD	0.632	SD	0.132
95% DL/2 (t) UCL	5.209	95% H-Stat (DL/2) UCL	5.729
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	1.698
		SD in Log Scale	0.375
		Mean in Original Scale	5.848
		SD in Original Scale	2.177
		95% Percentile Bootstrap UCL	6.25
		95% BCA Bootstrap UCL	6.257

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	6.219	Data do not follow a Discernable Distribution (0.05)
Theta Star	0.931	
nu star	124.4	
A-D Test Statistic	1.388	Nonparametric Statistics
5% A-D Critical Value	0.726	Kaplan-Meier (KM) Method
K-S Test Statistic	0.726	Mean 5.79
5% K-S Critical Value	0.267	SD 1.664
Data not Gamma Distributed at 5% Significance Level		SE of Mean 0.555
		95% KM (t) UCL 6.713
Assuming Gamma Distribution		95% KM (z) UCL 6.703
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 6.757
Minimum	0.173	95% KM (bootstrap t) UCL 6.589
Maximum	7.958	95% KM (BCA) UCL 6.62
Mean	5.685	95% KM (Percentile Bootstrap) UCL 6.638
Median	6.175	95% KM (Chebyshev) UCL 8.208
SD	1.829	97.5% KM (Chebyshev) UCL 9.255
k star	5.242	99% KM (Chebyshev) UCL 11.31
Theta star	1.085	
Nu star	880.7	Potential UCLs to Use
AppChi2	812.8	95% KM (t) UCL 6.713
95% Gamma Approximate UCL	6.16	95% KM (% Bootstrap) UCL 6.638
95% Adjusted Gamma UCL	6.169	

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options	
From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_T_ARSENIC.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_Arsenic

General Statistics

Number of Valid Samples	42	Number of Detected Data	19
Number of Unique Samples	18	Number of Non-Detect Data	23
		Percent Non-Detects	54.76%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	2.3	Minimum Detected	0.833
Maximum Detected	222	Maximum Detected	5.403
Mean of Detected	48.82	Mean of Detected	2.818
SD of Detected	74.76	SD of Detected	1.518
Minimum Non-Detect	2.3	Minimum Non-Detect	0.833
Maximum Non-Detect	4.1	Maximum Non-Detect	1.411

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	27
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	15
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	64.29%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0 635	Shapiro Wilk Test Statistic	0.919
5% Shapiro Wilk Critical Value	0.901	5% Shapiro Wilk Critical Value	0.901
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	22.91	Mean	1.49
SD	54.97	SD	1.589
95% DL/2 (t) UCL	37.19	95% H-Stat (DL/2) UCL	35.07
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	0.752
		SD in Log Scale	2.336
		Mean in Original Scale	22.49
		SD in Original Scale	55.14
		95% Percentile Bootstrap UCL	37.19
		95% BCA Bootstrap UCL	41.95

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0 524	Data appear Lognormal at 5% Significance Level	
Theta Star	93.21		
nu star	19.9		
A-D Test Statistic	1.096	Nonparametric Statistics	
5% A-D Critical Value	0.795	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.795	Mean	23.38
5% K-S Critical Value	0.209	SD	54.13
Data not Gamma Distributed at 5% Significance Level		SE of Mean	8.581
		95% KM (t) UCL	37.82
Assuming Gamma Distribution		95% KM (z) UCL	37.49
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	37.44
Minimum	2.3	95% KM (bootstrap t) UCL	45.72
Maximum	222	95% KM (BCA) UCL	39.87
Mean	49.24	95% KM (Percentile Bootstrap) UCL	37.82
Median	48.1	95% KM (Chebyshev) UCL	60.78
SD	49.94	97 5% KM (Chebyshev) UCL	76.97
k star	1.085	99% KM (Chebyshev) UCL	108.8
Theta star	45.37		
Nu star	91.16	Potential UCLs to Use	
AppChi2	70 15	95% KM (Chebyshev) UCL	60.78
95% Gamma Approximate UCL	63.99		
95% Adjusted Gamma UCL	64.6		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options	
From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_T_BERYLLIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_Beryllium

General Statistics

Number of Valid Samples	42	Number of Detected Data	24
Number of Unique Samples	22	Number of Non-Detect Data	18
		Percent Non-Detects	42.86%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.19	Minimum Detected	-1.661
Maximum Detected	62.3	Maximum Detected	4.132
Mean of Detected	8.199	Mean of Detected	0.178
SD of Detected	18.08	SD of Detected	1.818
Minimum Non-Detect	0.1	Minimum Non-Detect	-2.303
Maximum Non-Detect	0.3	Maximum Non-Detect	-1.204

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	21
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	21
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	50.00%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.497	Shapiro Wilk Test Statistic	0.807
5% Shapiro Wilk Critical Value	0.916	5% Shapiro Wilk Critical Value	0.916
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	4.742	Mean	-0.776
SD	14.13	SD	1.77
95% DL/2 (t) UCL	8.412	95% H-Stat (DL/2) UCL	5.682
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-1.534
		SD in Log Scale	2.567
		Mean in Original Scale	4.704
		SD in Original Scale	14.15
		95% Percentile Bootstrap UCL	8.552
		95% BCA Bootstrap UCL	9.859

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.333	Data do not follow a Discernable Distribution (0.05)	
Theta Star	24.59		
nu star	16		
A-D Test Statistic	3.287	Nonparametric Statistics	
5% A-D Critical Value	0.84	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.84	Mean	4.77
5% K-S Critical Value	0.192	SD	13.95
Data not Gamma Distributed at 5% Significance Level		SE of Mean	2.199
		95% KM (t) UCL	8.471
Assuming Gamma Distribution		95% KM (z) UCL	8.387
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	8.431
Minimum	0	95% KM (bootstrap t) UCL	12.25
Maximum	62.3	95% KM (BCA) UCL	8.611
Mean	6.374	95% KM (Percentile Bootstrap) UCL	8.587
Median	0.43	95% KM (Chebyshev) UCL	14.36
SD	14.44	97.5% KM (Chebyshev) UCL	18.51
k star	0.124	99% KM (Chebyshev) UCL	26.65
Theta star	51.47		
Nu star	10.4	Potential UCLs to Use	
AppChi2	4.195	97.5% KM (Chebyshev) UCL	18.51
95% Gamma Approximate UCL	15.81		
95% Adjusted Gamma UCL	16.35		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options	
From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_T_CADMIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_Cadmium

General Statistics

Number of Valid Samples	84	Number of Detected Data	20
Number of Unique Samples	9	Number of Non-Detect Data	64
		Percent Non-Detects	76.19%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.36	Minimum Detected	-1.022
Maximum Detected	4.3	Maximum Detected	1.459
Mean of Detected	0.922	Mean of Detected	-0.428
SD of Detected	1.165	SD of Detected	0.689
Minimum Non-Detect	0.3	Minimum Non-Detect	-1.204
Maximum Non-Detect	0.4	Maximum Non-Detect	-0.916

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	66
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	18
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	78.57%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.453	Lilliefors Test Statistic	0.652
5% Lilliefors Critical Value	0.905	5% Lilliefors Critical Value	0.905
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.336	Mean	-1.534
SD	0.647	SD	0.707
95% DL/2 (t) UCL	0.454	95% H-Stat (DL/2) UCL	0.324
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-2.229
		SD in Log Scale	1.369
		Mean in Original Scale	0.288
		SD in Original Scale	0.664
		95% Percentile Bootstrap UCL	0.42
		95% BCA Bootstrap UCL	0.479

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	1.384	Data do not follow a Discernable Distribution (0.05)
Theta Star	0.666	
nu star	55.37	
A-D Test Statistic	3.75	Nonparametric Statistics
5% A-D Critical Value	0.757	Kaplan-Meier (KM) Method
K-S Test Statistic	0.757	Mean 0.494
5% K-S Critical Value	0.197	SD 0.603
Data not Gamma Distributed at 5% Significance Level		SE of Mean 0.0676
		95% KM (t) UCL 0.606
Assuming Gamma Distribution		95% KM (z) UCL 0.605
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 0.604
Minimum	0	95% KM (bootstrap t) UCL 1.062
Maximum	4.95	95% KM (BCA) UCL 0.669
Mean	2.261	95% KM (Percentile Bootstrap) UCL 0.635
Median	2.211	95% KM (Chebyshev) UCL 0.788
SD	1.574	97.5% KM (Chebyshev) UCL 0.916
k star	0.709	99% KM (Chebyshev) UCL 1.166
Theta star	3.19	
Nu star	119.1	Potential UCLs to Use
AppChi2	94.86	95% KM (t) UCL 0.606
95% Gamma Approximate UCL	2.837	95% KM (% Bootstrap) UCL 0.635
95% Adjusted Gamma UCL	2.848	

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_T_CHROMIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_Chromium

General Statistics

Number of Valid Samples	42	Number of Detected Data	33
Number of Unique Samples	30	Number of Non-Detect Data	9
		Percent Non-Detects	21.43%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.8	Minimum Detected	-0.223
Maximum Detected	27.8	Maximum Detected	3.325
Mean of Detected	4.406	Mean of Detected	1.043
SD of Detected	5.522	SD of Detected	0.88
Minimum Non-Detect	0.7	Minimum Non-Detect	-0.357
Maximum Non-Detect	1.5	Maximum Non-Detect	0.405

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	18
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	24
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	42.86%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.614	Shapiro Wilk Test Statistic	0.943
5% Shapiro Wilk Critical Value	0.931	5% Shapiro Wilk Critical Value	0.931
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	3.568	Mean	0.655
SD	5.143	SD	1.093
95% DL/2 (t) UCL	4.904	95% H-Stat (DL/2) UCL	5.55
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	1.36	Mean in Log Scale	0.65
SD	7.265	SD in Log Scale	1.108
95% MLE (t) UCL	3.247	Mean in Original Scale	3.571
95% MLE (Tiku) UCL	3.536	SD in Original Scale	5.142
		95% Percentile Bootstrap UCL	4.973
		95% BCA Bootstrap UCL	5.418

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	1.18	Data appear Lognormal at 5% Significance Level
Theta Star	3.734	
nu star	77.89	
A-D Test Statistic	1.26	
5% A-D Critical Value	0.77	
K-S Test Statistic	0.77	
5% K-S Critical Value	0.157	
Data not Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	0	Mean	3.647
Maximum	27.8	SD	5.035
Mean	3.581	SE of Mean	0.789
Median	1.9	95% KM (t) UCL	4.975
SD	5.16	95% KM (z) UCL	4.945
k star	0.213	95% KM (jackknife) UCL	4.962
Theta star	16.8	95% KM (bootstrap t) UCL	6.26
Nu star	17.91	95% KM (BCA) UCL	5.088
AppChi2	9.326	95% KM (Percentile Bootstrap) UCL	5.028
95% Gamma Approximate UCL	6.878	95% KM (Chebyshev) UCL	7.086
95% Adjusted Gamma UCL	7.045	97.5% KM (Chebyshev) UCL	8.575
		99% KM (Chebyshev) UCL	11.5
		Potential UCLs to Use	
		95% KM (BCA) UCL	5.088

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_T_IRON.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_Iron

General Statistics

Number of Valid Samples	42	Number of Unique Samples	40

Raw Statistics

Minimum	170
Maximum	199000
Mean	42620
Median	29700
SD	42945
Coefficient of Variation	1.008
Skewness	2.088

Log-transformed Statistics

Minimum of Log Data	5.136
Maximum of Log Data	12.2
Mean of log Data	10.05
SD of log Data	1.41

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.764
Shapiro Wilk Critical Value	0.942

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.862
Shapiro Wilk Critical Value	0.942

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	53772

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	55801
95% Modified-t UCL	54128

Assuming Lognormal Distribution

95% H-UCL	117845
95% Chebyshev (MVUE) UCL	133344
97.5% Chebyshev (MVUE) UCL	165018
99% Chebyshev (MVUE) UCL	227236

Gamma Distribution Test

k star (bias corrected)	0.905
Theta Star	47084
nu star	76.04
Approximate Chi Square Value (.05)	56.95
Adjusted Level of Significance	0.0443
Adjusted Chi Square Value	56.36
Anderson-Darling Test Statistic	0.421
Anderson-Darling 5% Critical Value	0.78
Kolmogorov-Smirnov Test Statistic	0.0913
Kolmogorov-Smirnov 5% Critical Value	0.141

Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	53520
95% Jackknife UCL	53772
95% Standard Bootstrap UCL	53340
95% Bootstrap-t UCL	57701
95% Hall's Bootstrap UCL	58916
95% Percentile Bootstrap UCL	53837
95% BCA Bootstrap UCL	55853
95% Chebyshev(Mean, Sd) UCL	71504
97.5% Chebyshev(Mean, Sd) UCL	84003
99% Chebyshev(Mean, Sd) UCL	108553

Assuming Gamma Distribution

95% Approximate Gamma UCL	56903
95% Adjusted Gamma UCL	57496

Potential UCL to Use

Use 95% Approximate Gamma UCL 56903

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_T_IRON.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_Iron

General Statistics

Number of Valid Samples	42	Number of Unique Samples	40

Raw Statistics

Minimum	170
Maximum	199000
Mean	42620
Median	29700
SD	42945
Coefficient of Variation	1.008
Skewness	2.088

Log-transformed Statistics

Minimum of Log Data	5.136
Maximum of Log Data	12.2
Mean of log Data	10.05
SD of log Data	1.41

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.764
Shapiro Wilk Critical Value	0.942

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.862
Shapiro Wilk Critical Value	0.942

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	53772

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	55801
95% Modified-t UCL	54128

Assuming Lognormal Distribution

95% H-UCL	117845
95% Chebyshev (MVUE) UCL	133344
97.5% Chebyshev (MVUE) UCL	165018
99% Chebyshev (MVUE) UCL	227236

Gamma Distribution Test

k star (bias corrected)	0.905
Theta Star	47084
nu star	76.04
Approximate Chi Square Value (.05)	56.95
Adjusted Level of Significance	0.0443
Adjusted Chi Square Value	56.36
Anderson-Darling Test Statistic	0.421
Anderson-Darling 5% Critical Value	0.78
Kolmogorov-Smirnov Test Statistic	0.0913
Kolmogorov-Smirnov 5% Critical Value	0.141

Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	56903
95% Adjusted Gamma UCL	57496

Nonparametric Statistics

95% CLT UCL	53520
95% Jackknife UCL	53772
95% Standard Bootstrap UCL	53340
95% Bootstrap-t UCL	57701
95% Hall's Bootstrap UCL	58916
95% Percentile Bootstrap UCL	53837
95% BCA Bootstrap UCL	55853
95% Chebyshev(Mean, Sd) UCL	71504
97.5% Chebyshev(Mean, Sd) UCL	84003
99% Chebyshev(Mean, Sd) UCL	108553

Potential UCL to Use

Use 95% Approximate Gamma UCL 56903

General UCL Statistics for Data Sets with Non-Detects

User Selected Options	
From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_T_LEAD.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_Lead

General Statistics

Number of Valid Samples	42	Number of Detected Data	23
Number of Unique Samples	19	Number of Non-Detect Data	19
		Percent Non-Detects	45.24%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.7	Minimum Detected	0.531
Maximum Detected	16	Maximum Detected	2.773
Mean of Detected	3.576	Mean of Detected	1.074
SD of Detected	3.152	SD of Detected	0.57
Minimum Non-Detect	1.2	Minimum Non-Detect	0.182
Maximum Non-Detect	1.7	Maximum Non-Detect	0.531

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	19
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	23
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	45.24%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.598	Shapiro Wilk Test Statistic	0.852
5% Shapiro Wilk Critical Value	0.914	5% Shapiro Wilk Critical Value	0.914
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2.318	Mean	0.48
SD	2.702	SD	0.787
95% DL/2 (t) UCL	3.019	95% H-Stat (DL/2) UCL	2.865
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	1.327	Mean in Log Scale	0.402
SD	3.704	SD in Log Scale	0.903
95% MLE (t) UCL	2.289	Mean in Original Scale	2.283
95% MLE (Tiku) UCL	2.466	SD in Original Scale	2.727
		95% Percentile Bootstrap UCL	3.051
		95% BCA Bootstrap UCL	3.281

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	2.33	Data do not follow a Discernable Distribution (0.05)
Theta Star	1.534	
nu star	107.2	
A-D Test Statistic	1.572	Nonparametric Statistics
5% A-D Critical Value	0.752	Kaplan-Meier (KM) Method
K-S Test Statistic	0.752	Mean 2.727
5% K-S Critical Value	0.183	SD 2.465
Data not Gamma Distributed at 5% Significance Level		SE of Mean 0.389
		95% KM (t) UCL 3.382
Assuming Gamma Distribution		95% KM (z) UCL 3.367
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 3.375
Minimum	0	95% KM (bootstrap t) UCL 4.226
Maximum	16	95% KM (BCA) UCL 3.439
Mean	3.336	95% KM (Percentile Bootstrap) UCL 3.414
Median	2.92	95% KM (Chebyshev) UCL 4.423
SD	2.555	97.5% KM (Chebyshev) UCL 5.156
k star	0.821	99% KM (Chebyshev) UCL 6.597
Theta star	4.062	
Nu star	68.97	Potential UCLs to Use
AppChi2	50.85	95% KM (t) UCL 3.382
95% Gamma Approximate UCL	4.524	95% KM (% Bootstrap) UCL 3.414
95% Adjusted Gamma UCL	4.574	

Note: DL/2 is not a recommended method

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_T_MANGANESE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_Manganese

General Statistics

Number of Valid Samples	84	Number of Unique Samples	42

Raw Statistics

Minimum	64.5
Maximum	3270
Mean	1130
Median	698
SD	902.4
Coefficient of Variation	0.799
Skewness	1.077

Log-transformed Statistics

Minimum of Log Data	4.167
Maximum of Log Data	8.093
Mean of log Data	6.713
SD of log Data	0.835

Relevant UCL Statistics

Normal Distribution Test

Lilliefors Test Statistic	0.204
Lilliefors Critical Value	0.0967

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic	0.113
Lilliefors Critical Value	0.0967

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	1294

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	1304
95% Modified-t UCL	1296

Assuming Lognormal Distribution

95% H-UCL	1411
95% Chebyshev (MVUE) UCL	1686
97.5% Chebyshev (MVUE) UCL	1913
99% Chebyshev (MVUE) UCL	2360

Gamma Distribution Test

k star (bias corrected)	1.669
Theta Star	677.1
nu star	280.4
Approximate Chi Square Value (.05)	242.6
Adjusted Level of Significance	0.0471
Adjusted Chi Square Value	242
Anderson-Darling Test Statistic	2.471
Anderson-Darling 5% Critical Value	0.768
Kolmogorov-Smirnov Test Statistic	0.157
Kolmogorov-Smirnov 5% Critical Value	0.0991

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	1306
95% Adjusted Gamma UCL	1309

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	1292
95% Jackknife UCL	1294
95% Standard Bootstrap UCL	1291
95% Bootstrap-t UCL	1306
95% Hall's Bootstrap UCL	1299
95% Percentile Bootstrap UCL	1296
95% BCA Bootstrap UCL	1302
95% Chebyshev(Mean, Sd) UCL	1559
97.5% Chebyshev(Mean, Sd) UCL	1745
99% Chebyshev(Mean, Sd) UCL	2110

Potential UCL to Use

Use 95% Chebyshev (Mean, Sd) UCL 1559

General UCL Statistics for Data Sets with Non-Detects

User Selected Options	
From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_T_NICKEL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_Nickel

General Statistics

Number of Valid Samples	42	Number of Detected Data	41
Number of Unique Samples	41	Number of Non-Detect Data	1
		Percent Non-Detects	2.38%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	2.1	Minimum Detected	0.742
Maximum Detected	1300	Maximum Detected	7.17
Mean of Detected	134.7	Mean of Detected	3.246
SD of Detected	319	SD of Detected	1.73
Minimum Non-Detect	1	Minimum Non-Detect	0
Maximum Non-Detect	1	Maximum Non-Detect	0

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.446	Shapiro Wilk Test Statistic	0.935
5% Shapiro Wilk Critical Value	0.941	5% Shapiro Wilk Critical Value	0.941
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	131.5	Mean	3.153
SD	315.8	SD	1.814
95% DL/2 (t) UCL	213.5	95% H-Stat (DL/2) UCL	317.1
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	126.5	Mean in Log Scale	3.141
SD	316.9	SD in Log Scale	1.839
95% MLE (t) UCL	208.7	Mean in Original Scale	131.5
95% MLE (Tiku) UCL	200	SD in Original Scale	315.8
		95% Percentile Bootstrap UCL	218.3
		95% BCA Bootstrap UCL	242.9
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.385	Data do not follow a Discernable Distribution (0.05)	
Theta Star	350.1		
nu star	31.55		
A-D Test Statistic	3.287	Nonparametric Statistics	
5% A-D Critical Value	0.836	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.836	Mean	131.5
5% K-S Critical Value	0.148	SD	312
Data not Gamma Distributed at 5% Significance Level		SE of Mean	48.74
		95% KM (t) UCL	213.6
Assuming Gamma Distribution		95% KM (z) UCL	211.7
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	213.5
Minimum	0	95% KM (bootstrap t) UCL	296.3
Maximum	1300	95% KM (BCA) UCL	218.4
Mean	131.5	95% KM (Percentile Bootstrap) UCL	216.5
Median	20.65	95% KM (Chebyshev) UCL	344
SD	315.8	97.5% KM (Chebyshev) UCL	435.9
k star	0.305	99% KM (Chebyshev) UCL	616.5
Theta star	431.5		
Nu star	25.6	Potential UCLs to Use	
AppChi2	15.07	97.5% KM (Chebyshev) UCL	435.9
95% Gamma Approximate UCL	223.4		
95% Adjusted Gamma UCL	227.7		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_T_THALLIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_Thallium

General Statistics

Number of Valid Samples	42	Number of Detected Data	8
Number of Unique Samples	8	Number of Non-Detect Data	34
		Percent Non-Detects	80.95%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	3.3	Minimum Detected	1.194
Maximum Detected	5.65	Maximum Detected	1.732
Mean of Detected	4.381	Mean of Detected	1.462
SD of Detected	0.831	SD of Detected	0.19
Minimum Non-Detect	3.1	Minimum Non-Detect	1.131
Maximum Non-Detect	3.8	Maximum Non-Detect	1.335

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	36
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	6
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	85.71%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.961	Shapiro Wilk Test Statistic	0.969
5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2.206	Mean	0.703
SD	1.127	SD	0.386
95% DL/2 (t) UCL	2.499	95% H-Stat (DL/2) UCL	2.443
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	2.03	Mean in Log Scale	0.815
SD	1.67	SD in Log Scale	0.426
95% MLE (t) UCL	2.463	Mean in Original Scale	2.475
95% MLE (Tiku) UCL	3.397	SD in Original Scale	1.129
		95% Percentile Bootstrap UCL	2.764
		95% BCA Bootstrap UCL	2.791

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	20.06	Data appear Normal at 5% Significance Level	
Theta Star	0.218		
nu star	321		
A-D Test Statistic	0.191	Nonparametric Statistics	
5% A-D Critical Value	0.716	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.716	Mean	3.507
5% K-S Critical Value	0.294	SD	0.544
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0897
		95% KM (t) UCL	3.658
Assuming Gamma Distribution		95% KM (z) UCL	3.654
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	3.704
Minimum	2.706	95% KM (bootstrap t) UCL	3.68
Maximum	5.857	95% KM (BCA) UCL	4.227
Mean	4.697	95% KM (Percentile Bootstrap) UCL	4.02
Median	4.851	95% KM (Chebyshev) UCL	3.898
SD	0.836	97.5% KM (Chebyshev) UCL	4.067
k star	27.15	99% KM (Chebyshev) UCL	4.399
Theta star	0.173		
Nu star	2280	Potential UCLs to Use	
AppChi2	2171	95% KM (t) UCL	3.658
95% Gamma Approximate UCL	4.935	95% KM (Percentile Bootstrap) UCL	4.02
95% Adjusted Gamma UCL	4.943		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options	
From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_T_VANADIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_Vanadium

General Statistics

Number of Valid Samples	42	Number of Detected Data	24
Number of Unique Samples	19	Number of Non-Detect Data	18
		Percent Non-Detects	42.86%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.1	Minimum Detected	0.0953
Maximum Detected	46	Maximum Detected	3.829
Mean of Detected	6.092	Mean of Detected	1.302
SD of Detected	9.368	SD of Detected	0.888
Minimum Non-Detect	0.5	Minimum Non-Detect	-0.693
Maximum Non-Detect	2	Maximum Non-Detect	0.693

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	25
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	17
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	59.52%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.502	Shapiro Wilk Test Statistic	0.904
5% Shapiro Wilk Critical Value	0.916	5% Shapiro Wilk Critical Value	0.916
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	3.726	Mean	0.462
SD	7.543	SD	1.225
95% DL/2 (t) UCL	5.685	95% H-Stat (DL/2) UCL	5.727
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	0.383
		SD in Log Scale	1.316
		Mean in Original Scale	3.694
		SD in Original Scale	7.557
		95% Percentile Bootstrap UCL	5.802
		95% BCA Bootstrap UCL	6.911

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.015	Data do not follow a Discernable Distribution (0.05)	
Theta Star	6.001		
nu star	48.72		
A-D Test Statistic	1.74	Nonparametric Statistics	
5% A-D Critical Value	0.769	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.769	Mean	3.961
5% K-S Critical Value	0.183	SD	7.356
Data not Gamma Distributed at 5% Significance Level		SE of Mean	1.16
		95% KM (t) UCL	5.912
Assuming Gamma Distribution		95% KM (z) UCL	5.868
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	5.795
Minimum	1.1	95% KM (bootstrap t) UCL	9.364
Maximum	46	95% KM (BCA) UCL	6.481
Mean	5.828	95% KM (Percentile Bootstrap) UCL	6.095
Median	4.496	95% KM (Chebyshev) UCL	9.015
SD	7.047	97.5% KM (Chebyshev) UCL	11.2
k star	1.727	99% KM (Chebyshev) UCL	15.5
Theta star	3.375		
Nu star	145	Potential UCLs to Use	
AppChi2	118.2	95% KM (t) UCL	5.912
95% Gamma Approximate UCL	7.151	95% KM (% Bootstrap) UCL	6.095
95% Adjusted Gamma UCL	7.204		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-GW_T_ZINC.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

GW_Zinc

General Statistics

Number of Valid Samples	42	Number of Unique Samples	39

Raw Statistics

Minimum	5.8
Maximum	2920
Mean	300.4
Median	24.85
SD	779.5
Coefficient of Variation	2.594
Skewness	2.832

Log-transformed Statistics

Minimum of Log Data	1.758
Maximum of Log Data	7.979
Mean of log Data	3.688
SD of log Data	1.721

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.407
Shapiro Wilk Critical Value	0.942

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.793
Shapiro Wilk Critical Value	0.942

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	502.9

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	554.4
95% Modified-t UCL	511.6

Assuming Lognormal Distribution

95% H-UCL	422.5
95% Chebyshev (MVUE) UCL	417.8
97.5% Chebyshev (MVUE) UCL	528.5
99% Chebyshev (MVUE) UCL	745.9

Gamma Distribution Test

k star (bias corrected)	0.327
Theta Star	917.5
nu star	27.51
Approximate Chi Square Value (.05)	16.54
Adjusted Level of Significance	0.0443
Adjusted Chi Square Value	16.24
Anderson-Darling Test Statistic	6.159
Anderson-Darling 5% Critical Value	0.851
Kolmogorov-Smirnov Test Statistic	0.304
Kolmogorov-Smirnov 5% Critical Value	0.147

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	499.5
95% Adjusted Gamma UCL	508.9

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	498.3
95% Jackknife UCL	502.9
95% Standard Bootstrap UCL	495.6
95% Bootstrap-t UCL	651.4
95% Hall's Bootstrap UCL	453.3
95% Percentile Bootstrap UCL	500.7
95% BCA Bootstrap UCL	561.1
95% Chebyshev(Mean, Sd) UCL	824.7
97.5% Chebyshev(Mean, Sd) UCL	1052
99% Chebyshev(Mean, Sd) UCL	1497

Potential UCL to Use

Use 99% Chebyshev (Mean, Sd) UCL	1497

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-SS_N_ARSENIC.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_Arsenic

General Statistics

Number of Valid Samples 6

Number of Unique Samples 6

Raw Statistics

Minimum	3.9
Maximum	6.4
Mean	5.333
Median	5.45
SD	0.826
Coefficient of Variation	0.155
Skewness	-0.899

Log-transformed Statistics

Minimum of Log Data	1.361
Maximum of Log Data	1.856
Mean of log Data	1.663
SD of log Data	0.166

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.933
Shapiro Wilk Critical Value	0.788

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.894
Shapiro Wilk Critical Value	0.788

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	6.013

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	5.756
95% Modified-t UCL	5.992

Assuming Lognormal Distribution

95% H-UCL	6.227
95% Chebyshev (MVUE) UCL	6.914
97.5% Chebyshev (MVUE) UCL	7.596
99% Chebyshev (MVUE) UCL	8.937

Gamma Distribution Test

k star (bias corrected)	23.01
Theta Star	0.232
nu star	276.2
Approximate Chi Square Value (.05)	238.7
Adjusted Level of Significance	0.0122
Adjusted Chi Square Value	226
Anderson-Darling Test Statistic	0.396
Anderson-Darling 5% Critical Value	0.697
Kolmogorov-Smirnov Test Statistic	0.234
Kolmogorov-Smirnov 5% Critical Value	0.332

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	6.171
95% Adjusted Gamma UCL	6.517

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	5.888
95% Jackknife UCL	6.013
95% Standard Bootstrap UCL	5.834
95% Bootstrap-t UCL	5.853
95% Hall's Bootstrap UCL	5.819
95% Percentile Bootstrap UCL	5.8
95% BCA Bootstrap UCL	5.733
95% Chebyshev(Mean, Sd) UCL	6.804
97.5% Chebyshev(Mean, Sd) UCL	7.44
99% Chebyshev(Mean, Sd) UCL	8.69

Potential UCL to Use

Use 95% Student's-t UCL 6.013

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-SS_N_CHROMIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_Chromium

General Statistics

Number of Valid Samples 6

Number of Unique Samples 6

Raw Statistics

Minimum	17.7
Maximum	32
Mean	26.5
Median	27.1
SD	4.825
Coefficient of Variation	0.182
Skewness	-1.321

Log-transformed Statistics

Minimum of Log Data	2.874
Maximum of Log Data	3.466
Mean of log Data	3.261
SD of log Data	0.204

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.893
Shapiro Wilk Critical Value	0.788

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.835
Shapiro Wilk Critical Value	0.788

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	30.47

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	28.6
95% Modified-t UCL	30.29

Assuming Lognormal Distribution

95% H-UCL	32.26
95% Chebyshev (MVUE) UCL	36.17
97.5% Chebyshev (MVUE) UCL	40.34
99% Chebyshev (MVUE) UCL	48.53

Gamma Distribution Test

k star (bias corrected)	15.77
Theta Star	1.68
nu star	189.2
Approximate Chi Square Value (.05)	158.4
Adjusted Level of Significance	0.0122
Adjusted Chi Square Value	148 2
Anderson-Darling Test Statistic	0.523
Anderson-Darling 5% Critical Value	0.697
Kolmogorov-Smirnov Test Statistic	0.306
Kolmogorov-Smirnov 5% Critical Value	0.332

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	31.66
95% Adjusted Gamma UCL	33.84

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	29.74
95% Jackknife UCL	30.47
95% Standard Bootstrap UCL	29.47
95% Bootstrap-t UCL	29.39
95% Hall's Bootstrap UCL	28.93
95% Percentile Bootstrap UCL	29.22
95% BCA Bootstrap UCL	28.83
95% Chebyshev(Mean, Sd) UCL	35.09
97.5% Chebyshev(Mean, Sd) UCL	38.8
99% Chebyshev(Mean, Sd) UCL	46.1

Potential UCL to Use

Use 95% Student's-t UCL 30.47

SG-SS-IRON-UCL STATS

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-SS_N_IRON.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_Iron

General Statistics

Number of Valid Samples	6	Number of Unique Samples	6

Raw Statistics		Log-transformed Statistics	
Minimum	16600	Minimum of Log Data	9.717
Maximum	29800	Maximum of Log Data	10.3
Mean	22367	Mean of log Data	9.993
Median	23100	SD of log Data	0.232
SD	5097		
Coefficient of Variation	0.228		
Skewness	0.157		

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.925
Shapiro Wilk Critical Value	0.788

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.912
Shapiro Wilk Critical Value	0.788

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	26559

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	25931
95% Modified-t UCL	26581

Assuming Lognormal Distribution

95% H-UCL	28076
95% Chebyshev (MVUE) UCL	31607
97.5% Chebyshev (MVUE) UCL	35603
99% Chebyshev (MVUE) UCL	43452

Gamma Distribution Test

k star (bias corrected)	11.49
Theta Star	1947
nu star	137.9
Approximate Chi Square Value (.05)	111.7
Adjusted Level of Significance	0.0122
Adjusted Chi Square Value	103.2
Anderson-Darling Test Statistic	0.348
Anderson-Darling 5% Critical Value	0.697
Kolmogorov-Smirnov Test Statistic	0.224
Kolmogorov-Smirnov 5% Critical Value	0.332

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	27597
95% Adjusted Gamma UCL	29869

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	25789
95% Jackknife UCL	26559
95% Standard Bootstrap UCL	25517
95% Bootstrap-t UCL	26388
95% Hall's Bootstrap UCL	25661
95% Percentile Bootstrap UCL	25467
95% BCA Bootstrap UCL	25433
95% Chebyshev(Mean, Sd) UCL	31436
97.5% Chebyshev(Mean, Sd) UCL	35360
99% Chebyshev(Mean, Sd) UCL	43069

Potential UCL to Use

Use 95% Student's-t UCL 26559

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-SS_N_MANGANESE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_Manganese

General Statistics

Number of Valid Samples	6	Number of Unique Samples	6

Raw Statistics		Log-transformed Statistics	
Minimum	145	Minimum of Log Data	4.977
Maximum	428	Maximum of Log Data	6.059
Mean	243.5	Mean of log Data	5.391
Median	179	SD of log Data	0.485
SD	127.1		
Coefficient of Variation	0.522		
Skewness	0.95		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.775	Shapiro Wilk Test Statistic	0.808
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	348	95% H-UCL	440.7
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	450.4
95% Adjusted-CLT UCL	350.3	97.5% Chebyshev (MVUE) UCL	540.6
95% Modified-t UCL	351.4	99% Chebyshev (MVUE) UCL	717.9

Gamma Distribution Test		Data Distribution
k star (bias corrected)	2.597	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	93.77	
nu star	31.16	
Approximate Chi Square Value (.05)	19.41	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 328.8
Adjusted Chi Square Value	16.15	95% Jackknife UCL 348
		95% Standard Bootstrap UCL 321.7
Anderson-Darling Test Statistic	0.695	95% Bootstrap-t UCL 754.5
Anderson-Darling 5% Critical Value	0.698	95% Hall's Bootstrap UCL 1081
Kolmogorov-Smirnov Test Statistic	0.302	95% Percentile Bootstrap UCL 326.5
Kolmogorov-Smirnov 5% Critical Value	0.333	95% BCA Bootstrap UCL 334.2
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 469.7
		97.5% Chebyshev(Mean, Sd) UCL 567.5
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 759.7
95% Approximate Gamma UCL	391	
95% Adjusted Gamma UCL	469.8	

Potential UCL to Use		
	Use 95% Approximate Gamma UCL	391

SG-SS-VANADIUM-UCL STATS

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-SS_N_VANADIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_Vanadium

General Statistics

Number of Valid Samples	6	Number of Unique Samples	6

Raw Statistics		Log-transformed Statistics	
Minimum	19.6	Minimum of Log Data	2.976
Maximum	40.9	Maximum of Log Data	3.711
Mean	34.35	Mean of log Data	3.502
Median	39.35	SD of log Data	0.303
SD	8.923		
Coefficient of Variation	0.26		
Skewness	-1.228		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.764	Shapiro Wilk Test Statistic	0.749
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	41.69	95% H-UCL	47.23
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	53.03
95% Adjusted-CLT UCL	38.39	97.5% Chebyshev (MVUE) UCL	61.07
95% Modified-t UCL	41.39	99% Chebyshev (MVUE) UCL	76.84

Gamma Distribution Test		Data Distribution
k star (bias corrected)	7.439	Data do not follow a Discernable Distribution (0.05)
Theta Star	4.618	
nu star	89.26	
Approximate Chi Square Value (.05)	68.48	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 40.34
Adjusted Chi Square Value	61.94	95% Jackknife UCL 41.69
		95% Standard Bootstrap UCL 39.77
Anderson-Darling Test Statistic	0.843	95% Bootstrap-t UCL 39.86
Anderson-Darling 5% Critical Value	0.698	95% Hall's Bootstrap UCL 38.17
Kolmogorov-Smirnov Test Statistic	0.387	95% Percentile Bootstrap UCL 39.78
Kolmogorov-Smirnov 5% Critical Value	0.332	95% BCA Bootstrap UCL 38.25
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 50.23
		97.5% Chebyshev(Mean, Sd) UCL 57.1
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 70.6
95% Approximate Gamma UCL	44.77	
95% Adjusted Gamma UCL	49.5	

Potential UCL to Use	Use 95% Student's-t UCL 41.69
	or 95% Modified-t UCL 41.39

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-TS_N_ARSENIC.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

TS_Arsenic

General Statistics

Number of Valid Samples 6

Number of Unique Samples 6

Raw Statistics

Minimum	3.9
Maximum	6.4
Mean	5.333
Median	5.45
SD	0.826
Coefficient of Variation	0.155
Skewness	-0.899

Log-transformed Statistics

Minimum of Log Data	1.361
Maximum of Log Data	1.856
Mean of log Data	1.663
SD of log Data	0.166

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.933
Shapiro Wilk Critical Value	0.788

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.894
Shapiro Wilk Critical Value	0.788

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	6.013

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	5.756
95% Modified-t UCL	5.992

Assuming Lognormal Distribution

95% H-UCL	6.227
95% Chebyshev (MVUE) UCL	6.914
97.5% Chebyshev (MVUE) UCL	7.596
99% Chebyshev (MVUE) UCL	8.937

Gamma Distribution Test

k star (bias corrected)	23.01
Theta Star	0.232
nu star	276.2
Approximate Chi Square Value (.05)	238.7
Adjusted Level of Significance	0.0122
Adjusted Chi Square Value	226
Anderson-Darling Test Statistic	0.396
Anderson-Darling 5% Critical Value	0.697
Kolmogorov-Smirnov Test Statistic	0.234
Kolmogorov-Smirnov 5% Critical Value	0.332

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	6.171
95% Adjusted Gamma UCL	6.517

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	5.888
95% Jackknife UCL	6.013
95% Standard Bootstrap UCL	5.841
95% Bootstrap-t UCL	5.84
95% Hall's Bootstrap UCL	5.806
95% Percentile Bootstrap UCL	5.817
95% BCA Bootstrap UCL	5.75
95% Chebyshev(Mean, Sd) UCL	6.804
97.5% Chebyshev(Mean, Sd) UCL	7.44
99% Chebyshev(Mean, Sd) UCL	8.69

Potential UCL to Use

Use 95% Student's-t UCL 6.013

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-TS_N_CHROMIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

TS_Chromium

General Statistics

Number of Valid Samples 6

Number of Unique Samples 6

Raw Statistics

Minimum	17.7
Maximum	32
Mean	26.5
Median	27.1
SD	4.825
Coefficient of Variation	0.182
Skewness	-1.321

Log-transformed Statistics

Minimum of Log Data	2.874
Maximum of Log Data	3.466
Mean of log Data	3.261
SD of log Data	0.204

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.893
Shapiro Wilk Critical Value	0.788

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	30.47

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	28.6
95% Modified-t UCL	30.29

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.835
Shapiro Wilk Critical Value	0.788

Data appear Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL	32.26
95% Chebyshev (MVUE) UCL	36.17
97.5% Chebyshev (MVUE) UCL	40.34
99% Chebyshev (MVUE) UCL	48.53

Gamma Distribution Test

k star (bias corrected)	15.77
Theta Star	1.68
nu star	189.2
Approximate Chi Square Value (.05)	158.4
Adjusted Level of Significance	0.0122
Adjusted Chi Square Value	148.2
Anderson-Darling Test Statistic	0.523
Anderson-Darling 5% Critical Value	0.697
Kolmogorov-Smirnov Test Statistic	0.306
Kolmogorov-Smirnov 5% Critical Value	0.332

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	31.66
95% Adjusted Gamma UCL	33.84

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	29.74
95% Jackknife UCL	30.47
95% Standard Bootstrap UCL	29.49
95% Bootstrap-t UCL	29.37
95% Hall's Bootstrap UCL	28.98
95% Percentile Bootstrap UCL	29.22
95% BCA Bootstrap UCL	28.75
95% Chebyshev(Mean, Sd) UCL	35.09
97.5% Chebyshev(Mean, Sd) UCL	38.8
99% Chebyshev(Mean, Sd) UCL	46.1

Potential UCL to Use

Use 95% Student's-t UCL 30.47

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-TS_N_IRON.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

TS_Iron

General Statistics

Number of Valid Samples	6	Number of Unique Samples	6

Raw Statistics

Minimum	16600
Maximum	29800
Mean	22367
Median	23100
SD	5097
Coefficient of Variation	0.228
Skewness	0.157

Log-transformed Statistics

Minimum of Log Data	9.717
Maximum of Log Data	10.3
Mean of log Data	9.993
SD of log Data	0.232

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.925
Shapiro Wilk Critical Value	0.788

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	26559

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	25931
95% Modified-t UCL	26581

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.912
Shapiro Wilk Critical Value	0.788

Data appear Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL	28076
95% Chebyshev (MVUE) UCL	31607
97.5% Chebyshev (MVUE) UCL	35603
99% Chebyshev (MVUE) UCL	43452

Gamma Distribution Test

k star (bias corrected)	11.49
Theta Star	1947
nu star	137.9
Approximate Chi Square Value (.05)	111.7
Adjusted Level of Significance	0.0122
Adjusted Chi Square Value	103.2
Anderson-Darling Test Statistic	0.348
Anderson-Darling 5% Critical Value	0.697
Kolmogorov-Smirnov Test Statistic	0.224
Kolmogorov-Smirnov 5% Critical Value	0.332

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	27597
95% Adjusted Gamma UCL	29869

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	25789
95% Jackknife UCL	26559
95% Standard Bootstrap UCL	25487
95% Bootstrap-t UCL	26388
95% Hall's Bootstrap UCL	25661
95% Percentile Bootstrap UCL	25467
95% BCA Bootstrap UCL	25467
95% Chebyshev(Mean, Sd) UCL	31436
97.5% Chebyshev(Mean, Sd) UCL	35360
99% Chebyshev(Mean, Sd) UCL	43069

Potential UCL to Use

Use 95% Student's-t UCL 26559

SG-TS-MANGANESE-UCL STATS

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-TS_N_MANGANESE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

TS_Manganese

General Statistics

Number of Valid Samples 6

Number of Unique Samples 6

Raw Statistics

Minimum	145
Maximum	428
Mean	243.5
Median	179
SD	127.1
Coefficient of Variation	0.522
Skewness	0.95

Log-transformed Statistics

Minimum of Log Data	4.977
Maximum of Log Data	6.059
Mean of log Data	5.391
SD of log Data	0.485

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.775
Shapiro Wilk Critical Value	0.788

Data not Normal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	348

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	350.3
95% Modified-t UCL	351.4

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.808
Shapiro Wilk Critical Value	0.788

Data appear Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL	440.7
95% Chebyshev (MVUE) UCL	450.4
97.5% Chebyshev (MVUE) UCL	540.6
99% Chebyshev (MVUE) UCL	717.9

Gamma Distribution Test

k star (bias corrected)	2.597
Theta Star	93.77
nu star	31.16
Approximate Chi Square Value (.05)	19.41
Adjusted Level of Significance	0.0122
Adjusted Chi Square Value	16.15
Anderson-Darling Test Statistic	0.695
Anderson-Darling 5% Critical Value	0.698
Kolmogorov-Smirnov Test Statistic	0.302
Kolmogorov-Smirnov 5% Critical Value	0.333

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	391
95% Adjusted Gamma UCL	469.8

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	328.8
95% Jackknife UCL	348
95% Standard Bootstrap UCL	321
95% Bootstrap-t UCL	711.4
95% Hall's Bootstrap UCL	1094
95% Percentile Bootstrap UCL	326.7
95% BCA Bootstrap UCL	334
95% Chebyshev(Mean, Sd) UCL	469.7
97.5% Chebyshev(Mean, Sd) UCL	567.5
99% Chebyshev(Mean, Sd) UCL	759.7

Potential UCL to Use

Use 95% Approximate Gamma UCL 391

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SG-TS_N_VANADIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

TS_Vanadium

General Statistics

Number of Valid Samples 6

Number of Unique Samples 6

Raw Statistics

Minimum	19.6
Maximum	40.9
Mean	34.35
Median	39.35
SD	8.923
Coefficient of Variation	0.26
Skewness	-1.228

Log-transformed Statistics

Minimum of Log Data	2.976
Maximum of Log Data	3.711
Mean of log Data	3.502
SD of log Data	0.303

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.764
Shapiro Wilk Critical Value	0.788

Data not Normal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	41.69

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	38.39
95% Modified-t UCL	41.39

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.749
Shapiro Wilk Critical Value	0.788

Data not Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL	47.23
95% Chebyshev (MVUE) UCL	53.03
97.5% Chebyshev (MVUE) UCL	61.07
99% Chebyshev (MVUE) UCL	76.84

Gamma Distribution Test

k star (bias corrected)	7.439
Theta Star	4.618
nu star	89.26
Approximate Chi Square Value (.05)	68.48
Adjusted Level of Significance	0.0122
Adjusted Chi Square Value	61.94
Anderson-Darling Test Statistic	0.843
Anderson-Darling 5% Critical Value	0.698
Kolmogorov-Smirnov Test Statistic	0.387
Kolmogorov-Smirnov 5% Critical Value	0.332

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	44.77
95% Adjusted Gamma UCL	49.5

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	40.34
95% Jackknife UCL	41.69
95% Standard Bootstrap UCL	39.8
95% Bootstrap-t UCL	39.98
95% Hall's Bootstrap UCL	38.17
95% Percentile Bootstrap UCL	39.83
95% BCA Bootstrap UCL	39.35
95% Chebyshev(Mean, Sd) UCL	50.23
97.5% Chebyshev(Mean, Sd) UCL	57.1
99% Chebyshev(Mean, Sd) UCL	70.6

Potential UCL to Use

Use 95% Student's-t UCL	41.69
or 95% Modified-t UCL	41.39

Recommended UCL exceeds the maximum observation

SMOKE-SS-ALUMINUM-UCL STATS

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Maxwell Point\ProUCL\inp_SMOKE-SS_N_ALUMINUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_Aluminum

General Statistics

Number of Valid Samples 6

Number of Unique Samples 6

Raw Statistics

Minimum	4320
Maximum	17500
Mean	14087
Median	16600
SD	5169
Coefficient of Variation	0.367
Skewness	-1.811

Log-transformed Statistics

Minimum of Log Data	8.371
Maximum of Log Data	9.77
Mean of log Data	9.457
SD of log Data	0.549

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.737
Shapiro Wilk Critical Value	0.788

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.662
Shapiro Wilk Critical Value	0.788

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	18339

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	15891
95% Modified-t UCL	18079

Assuming Lognormal Distribution

95% H-UCL	29841
95% Chebyshev (MVUE) UCL	28592
97.5% Chebyshev (MVUE) UCL	34699
99% Chebyshev (MVUE) UCL	46695

Gamma Distribution Test

k star (bias corrected)	2.8
Theta Star	5030
nu star	33.6
Approximate Chi Square Value (.05)	21.35
Adjusted Level of Significance	0.0122
Adjusted Chi Square Value	17.91
Anderson-Darling Test Statistic	0.996
Anderson-Darling 5% Critical Value	0.698
Kolmogorov-Smirnov Test Statistic	0.365
Kolmogorov-Smirnov 5% Critical Value	0.333

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	22174
95% Adjusted Gamma UCL	26432

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	17557
95% Jackknife UCL	18339
95% Standard Bootstrap UCL	17272
95% Bootstrap-t UCL	16916
95% Hall's Bootstrap UCL	16247
95% Percentile Bootstrap UCL	16967
95% BCA Bootstrap UCL	16317
95% Chebyshev(Mean, Sd) UCL	23284
97.5% Chebyshev(Mean, Sd) UCL	27264
99% Chebyshev(Mean, Sd) UCL	35082

Potential UCL to Use

Use 95% Chebyshev (Mean, Sd) UCL 23284

Recommended UCL exceeds the maximum observation

APPENDIX C

APPENDIX C

TOXICOLOGICAL PROFILES

APPENDIX C
TOXICITY PROFILES
CHEMICALS OF POTENTIAL CONCERN

ALUMINUM

Aluminum (Al, CAS Registry No. 7429-90-5) has a wide variety of uses in the building, construction, photographic, and food packaging industries, and many other uses in the manufacture of steel, aircraft, automobiles, printing inks, dental alloys, medications, explosives, incendiaries, and fireworks.

Aluminum is a metal, light in weight and silvery-white in appearance. Aluminum is used for cans, pots and pans, airplanes, siding and roofing, and foil. Aluminum is often mixed with small amounts of other metals to form aluminum alloys, which are stronger and harder.

Cancer

Several studies of workers in aluminum reduction facilities showed excessive deaths from lung, pancreatic, lymphatic, brain, or bladder cancers, but they were confounded by simultaneous exposures to tobacco smoke or PAHs from coal tars. (ATSDR, 2008). An inhalation study by Kobayashi et al. (1968) was too seriously flawed in design and reporting to produce reliable information.

Noncarcinogenic Toxicity

Health effects research in humans and animals has shown that elevated levels of aluminum in the body may be toxic, particularly to the central nervous, skeletal and hematological systems. Much of aluminum toxicity depends on variations in absorption and chemical form of the aluminum complexes, their oxidation states, and interactions with dietary constituents. The toxicity of aluminum can be divided into three major categories: (1) the effect of aluminum compounds in the gastrointestinal tract following ingestion, (2) the effect in the lungs following inhalation, and (3) systemic toxicity of aluminum (ATSDR 2008). Aluminum compounds can alter absorption of other elements (i.e., fluoride, calcium, iron, cholesterol, phosphorus) in the gastrointestinal tract and alter gastrointestinal tract mobility by inhibition of acetylcholine-induced contractions.

Inhalation of aluminum dusts can lead to the development of pulmonary fibrosis, producing both restrictive and obstructive pulmonary disease. One of the greatest health concerns is aluminum's proposed association with three forms of chronic encephalopathy in humans: senile dementia of the Alzheimer type, amyotrophic lateral sclerosis, and Parkinsonism-dementia (Ganrot, 1986), but there is no evidence that aluminum plays a role in the development of these diseases. A progressive fatal neurologic syndrome (characterized first by a speech disorder, followed by dementia, convulsions, and myoclonus) has been noted in patients on long-term intermittent hemodialysis treatment for chronic renal failure, and may be due to aluminum intoxication. Aluminum content of brain, muscle, and bone tissues is increased in these patients. Sources of

the excess aluminum may be from oral aluminum hydroxide commonly given to these patients or from aluminum in dialysis fluid derived from tap water used to prepare the dialysate fluid.

Neurotoxicity

The neurotoxicity of aluminum is well documented in rabbits and cats, causing in these animals a range of behavioral abnormalities and brain neurofibrillary degenerative changes at high doses injected parenterally or intracranially; hamsters and monkeys were found to be much less sensitive (Ganrot 1986, Lione 1985). Subchronic studies in rats and mice have demonstrated in the test animals such neurobehavioral deficits as impaired operant learning, changes in grip strength and startle response, and impaired motor coordination (Bernuzzi et al. 1989; Donald et al. 1989; Golub et al. 1989, 1992, 1995; Muller et al. 1990). Florence et al (1994) fed aluminum to rats for 6 months and found histopathological changes (vacuolation of cell bodies, swelling of astrocytic processes) of unknown functional significance in the rat brain as a result. These changes have not been causally related to neurobehavioral deficits.

Neurodevelopmental Toxicity

Minimal neurotoxicity was observed in the offspring of mice exposed to aluminum lactate (Golub et al. 1995). Groups of 16 pregnant Swiss-Webster mice were fed 25 (control group), 500, or 1000 mg Al/kg with aluminum lactate throughout gestation and lactation (Donald et al. 1989). No treatment-related changes were observed in maternal survival, body weight, food intake, toxic signs or neurobehaviour. However, a battery of neurobehavioral tests performed on pups showed that a significant ($p=0.007$) number of pups in the high-dose group had impaired vertical-screen climb performance. In the low-dose group, given the equivalent of 100 milligrams per kilogram per day (mg/kg-day), a decrease in forelimb grip strength and an increase in the amount of foot splay were observed.

Colomina et al. (1992) studied the influence of lactate on the potential developmental toxicity of aluminum. Groups of 11-13 Swiss albino CD_1 mice were administered 57.5 mg Al/kg bw-day as aluminum hydroxide, aluminum lactate, or aluminum hydroxide together with lactic acid (570 mg/kg-day) by gavage on gestation days 6-15. Other groups were treated only with the same amount of lactic acid or distilled water (controls). Maternal weight gain was significantly lower in the aluminum lactate-treated mice--and significantly less food was consumed by this group--than in controls. In the offspring of these females, fetal body weight was also significantly reduced and accompanied by increased incidence of cleft palate, dorsal hyperkyphosis, and delayed parietal ossification. These developmental effects were not seen in any of the pups of the control groups or the aluminum hydroxide dosing groups. A flaw in this study was the lack of accounting for aluminum in the diet of the test animals, since commercial grain-based mouse feeds contain 200-1200 ppm aluminum and varying amounts of other trace metals (Golub et al. 1992).

Colomina et al. (1994) also administered doses of 0 or 104 mg Al/kg bw-day as aluminum hydroxide on days 6-15 of gestation to female Swiss mice. Again, dietary aluminum was not reported. A NOAEL of 104 mg Al/kg-day was reported in this study, which examined maternal body or organ weight, and the per litter number of implantations, resorptions, dead fetuses, sex

ratio and fetal body weight, as well as their percentage of positive postimplantation loss. The study found no significant differences between test groups and controls. Thus, from the two Colomina studies, it can be concluded that aluminum lactate appears to be a more potent developmental toxicant in mice than the less water-soluble aluminum hydroxide (ATSDR 2008).

Toxicokinetics

Aluminum occurs normally in human body tissue, with the highest concentration (half of the normal body burden of 30-50 mg) found in bone, and about one-fourth found in the lungs (Ganrot 1986). Animal experiments have shown that it can also accumulate in the brain (especially the hippocampus), liver, heart and other muscle tissue, and the kidneys. Retention in these organs and tissues apparently increases with age and with the length of the exposure period (ATSDR 2008). The urinary aluminum half-life in workers exposed via inhalation for less than a year was 9 days; in those exposed for more than 10 years, the urinary half-life was 6 months (Sjogren et al. 1988). Both human and animal evidence indicates that absorption through the gastrointestinal tract is low after ingestion of aluminum, but is enhanced by vitamin D and parathyroid hormone and is affected in various ways by other ions (ATSDR 2008). Evidence also suggests that aluminum does not easily transfer from the blood to the brain except under conditions of high blood aluminum concentrations (ATSDR 2008).

An acute oral study found a three-fold increase in urinary levels of aluminum in patients after ingestion of aluminum hydroxide (Gorsky et al. 1979), implying absorption. In three volunteers, urinary levels of aluminum rapidly increased following an 8-hour inhalation exposure to aluminum dust from 3 μg/L to 14-414 μg/L (Sjogren et al. 1985).

Several animal inhalation studies detected aluminum in the lungs after exposure; however, other tissue, urine, and plasma levels were not assessed to definitively establish absorption (ATSDR 2008).

Metabolism

Because aluminum is an element, it is always found attached to other chemicals, and these attachments can change within the body. The free ion (Al^{+3}) is easily bound to other substances and structures. Once in the blood, the free ion competes with other ions to bind mainly with transferrin in the plasma, but it also binds to bone tissue in metabolically active areas of the bone (Ganrot 1986). Uptake by organs and tissues from transferrin is relatively slow. Most ingested aluminum is unabsorbed and eliminated in the feces. The kidney is the major route of excretion following inhalation, and the major route for any aluminum absorbed via ingestion (ATSDR 2008).

Toxicity Values

The available systemic toxicity data on elemental aluminum have been found to be inadequate for quantitative risk assessment (USEPA 2008). A chronic oral RfD (1 mg/kg-day) value was obtained from EPA's Environmental Criteria and Assessment Office, Cincinnati, based on a LOAEL of 100 mg/kg-day (Donald et al. 1989, Golub et al. 1995) for neurotoxicity, with

application of an uncertainty factor of 100 (3 for use of a minimal LOAEL, 10 for species extrapolation, and 3 for human variability).

An inhalation reference dose of $1x10^{-3}$ has been established from EPA's Environmental Criteria and Assessment Office, Cincinnati. EPA (USEPA 2008) has not established SFs for aluminum.

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ANTIMONY

Antimony (Sb, CAS registry number 7440-36-0) is an element typically used in metal alloys, rubber, matches, ceramics, pigments, paints, lacquers, and textiles. Some trivalent organic antimony compounds are used to treat parasitic diseases, such as *Schistosomiasis* (ATSDR 1992).

Cancer

Antimony is currently not classified with regard to its potential for carcinogenicity (USEPA 2008). Lung tumors have been observed in rats exposed via inhalation to 4.2 or 36 mg/m^3 antimony as antimony trioxide (Groth et al. 1986; Watt 1980, 1983) or to 17.48 mg/m^3 antimony as antimony trisulfide for 1 year (Groth et al. 1986; Wong et al. 1979). An increased incidence of lung tumors was not observed, however, in rats exposed via inhalation to 3.76 mg antimony/m^3 as antimony trioxide for 1 year (Bio/dynamics 1989) or in pigs exposed to 4.2 mg antimony/m^3 as antimony trioxide for 1 year (Watt 1983). The carcinogenic potential of antimony compounds in rodents may be related to particle size and rates of deposition and clearance from the respiratory tract. Oral exposure to 0.35 mg/kg-day of potassium antimony tartrate over a lifetime did not induce cancer in rats (Schroeder et al. 1970) or mice (Kanisawa and Schroeder 1969). No data are available to evaluate the potential carcinogenicity of antimony compounds via dermal exposure.

Mutagenicity

No *in vivo* genotoxic studies have been conducted with antimony compounds. *In vitro* studies have yielded mixed results with antimony compounds giving positive results for DNA damage in bacterial tests (Kanematasu et al. 1980) and for chromosomal aberrations and breakage in mammalian cell assays (Tu and Sivak 1984; Paton and Allison 1972), and negative results for gene mutation and chromosomal transformation in mammalian cell assays (Tu and Sivak 1984).

Systemic Toxicity

Adverse health effects have been observed in humans and animals following oral exposure to a variety of antimony compounds (ATSDR 1992). Oral administration of a single dose of an organic antimony compound resulted in death in rats (Bradley and Frederick 1941) which was attributable to myocardial failure. Mortality was not observed in rats following a single dose of inorganic antimony (Fleming 1982; Myers et al. 1978; Smyth and Thompson 1945), suggesting that inorganic antimony compounds are less toxic than organic antimony compounds. Chronic ingestion by rats of 0.35 mg/kg-day of potassium antimony tartrate in drinking water has resulted in increased mortality and altered blood chemistry (Schroeder et al. 1970). Other studies with potassium antimony tartrate have not demonstrated any effects on longevity (Schroeder et al. 1968; Kanisawa and Schroeder 1969).

Antimony compounds are frequently used in medicine as anti-parasitical agents. Therapeutic administration of antimony-containing compounds has produced cardiac effects, liver toxicity, pulmonary congestion, skin reactions, vomiting, diarrhea, gastric discomfort and ulcers in treated

humans (ATSDR 1992). Acute exposure to an antimony-containing therapeutic agent administered via intramuscular injection resulted in the death of an adult and a child (Rugemalila 1980); however, it is not clear whether these deaths were attributable solely or in part to antimony administration.

The respiratory tract is a target organ in both humans and animals following inhalation exposure to antimony. High occupational inhalation exposure to antimony dusts has resulted in respiratory tract irritation, pneumoconiosis, and impaired pulmonary function in workers (Cooper et al. 1968; Potkonjak and Pavlovich 1983). These workers, however, were also exposed to other toxic compounds, including arsenic oxide, iron oxide, hydrogen chloride, and hydrogen sulfide, and thus it is not possible to attribute the observed adverse effects solely or in part to antimony exposure. Dermatosis and ocular irritation have also been reported in humans following exposure to airborne antimony (Potkonjak and Vishnijich 1983).

Animal studies have shown that lung fibrosis and lipoid pneumonia may occur as a result of chronic inhalation exposure to antimony trisulfide or antimony trioxide (ATSDR 1992). Other symptoms include: changes in blood pressure and EKG readings; gastrointestinal effects such as vomiting, diarrhea, gastric discomfort and ulcers; and liver toxicity.

Exposure to airborne antimony has been reported to cause dermatosis and ocular conjunctivitis in humans which may result from dermal contact with the antimony aerosol (ATSDR 1992). Alopecia was noted in rats exposed to airborne antimony trioxide at doses of 0.92 mg/m^3 or above (Bio/dynamics 1985); however, it was not clear whether this effect was due to dermal contact or to a systemic effect resulting from airborne exposure.

Toxicokinetics

Data from animal studies indicate that absorption of antimony compounds from the respiratory tract is a function of particle size (ATSDR 1992). A greater deposition of antimony tartrate in the upper respiratory tract was observed with a particle size of 1.6 um mean mass aerodynamic diameter (MMAD) compared with exposure to particles of 0.7 or 0.3 um MMAD (Felicetti et al. 1974a; Thomas et al. 1973). Absorption and lung clearance rates also varied with particle size (Thomas et al. 1973). No information is available on differences in absorption rates via inhalation among antimony compounds (ATSDR 1992).

In animals, antimony is slowly absorbed from the gastrointestinal tract at rates ranging from 2 percent to 7 percent for antimony tartrate and antimony trichloride (Felicetti et al. 1974b; Gerber et al. 1982). It has been suggested that gastrointestinal absorption of antimony salts in humans is probably less than 10 percent (ATSDR 1992). Although quantitative information on differences in absorption among antimony compounds is not available, the International Commission on Radiological Protection (ICRP 1981) has recommended that 10 percent for antimony tartrate, and 1 percent for all other forms of antimony, be used as reference values for gastrointestinal human absorption.

Distribution in animals of trivalent antimony absorbed via inhalation tends to result in concentration in red blood cells and liver, while pentavalent antimony concentrates in the plasma

(Goyer 1991). Other target organs of distribution include the thyroid gland, skeleton and fur (Felicetti et al. 1974b). Following oral absorption, the major sites of accumulation of antimony compounds are the liver, kidney, bone, lung, spleen, and thyroid (Sunagawa 1981). Accumulation in these organs, however, is not dose-related, suggesting that decreased absorption occurs at higher antimony concentrations.

Metabolism

Antimony does not undergo biotransformation. Its metabolism appears to consist mainly of covalent interactions with sulfhydryl groups and phosphate, and reversible binding interactions with endogenous ligands such as proteins (ATSDR 1992). The toxicologic significance of these interactions is not known (ATSDR 1992).

Excretion appears to occur mainly in the urine in humans occupationally exposed to airborne antimony trioxide (Ludersdorf et al. 1987). In animals, antimony is excreted via the urine and feces. If antimony is administered parenterally, the urine/feces ratio of antimony excretion depends on the valence form of the compound: for trivalent antimony injection, urine is the predominant medium of excretion, whereas for pentavalent antimony injection, excretion in the feces predominates (Edel et al. 1983; Felicetti et al. 1974b). With regard to oral exposure, animal studies have shown that ingested antimony is not well absorbed from the gastrointestinal tract and that fecal excretion is the primary route of excretion (Felicetti et al. 1974b; Gerber et al. 1982). It is likely that this route is also predominant for humans who ingest antimony compounds.

Toxicity Values

USEPA (USEPA 2008) has established an oral reference dose of 4×10^{-4} mg/kg-day for antimony compounds, based on a chronic study in which rats were administered 0.350 mg/kg potassium antimony tartrate daily in drinking water (Schroeder et al. 1970). Significantly shortened life spans, altered cholesterol levels, and–in males–decreased blood glucose levels were critical effects. A decrease in mean heart weight of males was also noted. Since there was only one dose group, a NOAEL could not be determined. The oral RfD was calculated using an uncertainty factor of 1000 (10 for interspecies conversion, 10 for intrahuman sensitivity, and 10 for the failure to determine a NOAEL) (USEPA 2000).

USEPA has not calculated an inhalation reference concentration or cancer slope factors for this compound. (USEPA 2008).

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ARSENIC

Arsenic (As, MW 74.9, CAS registry number 7440-38-2) is an ubiquitous metalloid present in the environment from natural and anthropogenic sources. Arsenic is a natural component of the earth's crust. It originates from natural sources such as volcanoes and erosion from mineral deposits, but also from human activities such as chemical production and use, coal combustion, and waste disposal. Arsenic can exist in several different valence states and in many different inorganic and organic forms. The form of arsenic with the greatest commercial importance is inorganic arsenic trioxide (As_2O_3), which is produced from flue dust collected during the smelting of copper and lead. There has been no commercial production of As_2O_3 in the United States since 1985, although it is imported for industrial use.

Arsenic is one of the most widely studied toxicants. Analysis of the toxic effects of arsenic is complicated by the fact that arsenic can exist in several different inorganic and organic compounds. Most cases of human toxicity have been associated with exposure to inorganic arsenic (ATSDR 2007). While As_2O_3 is the most common inorganic arsenical in air, a variety of inorganic trivalent arsenites or pentavalent arsenates occur in water, soil, and food (ATSDR 2007). Trivalent arsenites are somewhat more toxic than pentavalent arsenates (USEPA 2008); however, the difference in relative potency is small. An additional complexity in the analysis of arsenic toxicity is that there are no suitable animal models for carcinogenicity.

Carcinogenicity

USEPA has classified arsenic as a human carcinogen (Category A), based on observations of increased lung cancer mortality in populations exposed mainly via inhalation and observations of increased skin cancer incidence and increased mortality from multiple internal organ cancers in populations consuming drinking water containing high concentrations of arsenic (USEPA 2008).

Evidence from a large number of occupational epidemiologic studies indicates that high-dose inhalation exposure to inorganic arsenic is associated with an increase in lung cancer. Most studies involve workers exposed primarily to arsenic trioxide dust in air at copper smelters (e.g., Enterline et al.1987; Enterline and Marsh 1982; Axelson et al.1978), but increased incidence of lung cancer has also been observed at chemical plants where exposure was primarily to arsenate (Ott et al.1974; Sobel et al.1988). Although several studies suggest that residents living near smelters or arsenical chemicals may also have increased risk of lung cancer (Pershagen 1985; Brown et al.1984), the increases are small and may not be biologically significant (e.g., Frost et al.1987).

Several human studies provide sufficient exposure data to permit quantification of cancer risk (Tseng et al.1968; Tseng 1977). In general, the data indicate that there is an approximately linear increase in relative risk as a function of increasing cumulative exposure (USEPA 2008). Animal studies do not show evidence of a carcinogenic effect from inhalation exposure of arsenic (USEPA 2008); however, two intratracheal instillation studies in hamsters have demonstrated that both arsenite and arsenate can increase the incidence of lung adenomas and/or carcinomas (Ishinishi et al.1983; Pershagen and Bjorklund 1985).

One of the most reliable epidemiological studies that provide dose-response data is the investigation by Tseng et al. (1968). In this study, the quantitative risk of skin cancer from exposure to inorganic arsenic by ingestion was examined. In this investigation, 40,421 people in Taiwan were exposed to arsenic in drinking water at levels ranging from 100 to 1,800 ug/L. The control population consisted of 7,500 people who were exposed to undetectable levels up to 17 ug/L arsenic in drinking water. Results showed an age- and dose-dependent increase in the incidence of skin cancer in the exposed population, while there were no arsenic-related skin cancers detected in the control population. USEPA used this study to calculate a unit risk of $5x10^{-5}$ based on lifetime exposure to water containing 1 ug/L arsenic.

Mutagenicity

Arsenic has been tested in a range of prokaryotic and eukaryotic systems. In general, arsenic is either inactive or extremely weak as an inducer of gene mutations *in vitro*; however, it is clastogenic and induces sister chromatid exchanges in a variety of cell types, including human cells (USEPA 1988). Arsenic does not appear to induce chromosome aberrations *in vivo* in experimental animals; however, it may do so in humans (NRC 1977). Several studies also suggest that arsenic may affect DNA by the inhibition of DNA repair processes or by base-pair substitution (USEPA 1988).

Toxicity

Epidemiologic Data in Humans

Workers exposed to arsenic dusts in air may experience irritation to the mucus membrane of the nose and throat, which may lead to laryngitis, bronchitis, or rhinitis (Morton and Caron 1989). Very high exposures may cause perforation of the nasal septum (Pinto and McGill 1953). These effects, including perforation, were usually mild and did not result either in impaired respiration or illness. Several studies revealed that inhalation of high levels of arsenic dust or fumes led to nausea, vomiting, and diarrhea in workers (Beckett et al. 1986; Bolla-Wilson and Bleecker 1987; Morton and Caron 1989). Neurological injury may occur in humans after inhalation of inorganic arsenic, including peripheral neuropathy of sensory and motor neurons (numbness, loss of reflexes, muscle weakness) (Feldman et al. 1979; Landau et al. 1977). Hallucinations, agitation, emotional lability, and memory loss may also result (Beckett et al. 1986; Morton and Caron 1989). Adverse neurological effects tend to diminish, but may persist past exposure period (Beckett et al. 1986).

Developmental effects of arsenic exposure have been implicated in the unborn fetuses of pregnant women living near a copper-smelting plant in Bulgaria (Tabacova 1986). Fatal defects (e.g., small forebrains and underdeveloped earpits) occurred at a rate of 3.6 per 1,000 live births, which is three times the national rate. From a cohort of about 15,000 women living near the plant, increased placental concentration of arsenic, elevated lipid peroxides, and decreased GSH in maternal and cord blood were found. This suggested that arsenic was responsible for the oxidative damage in the pathogenesis of prenatal birth defects. The hypothesis was tested in an experimental *in vitro* mouse embryo model.

Systemic Toxicity

Chronic exposure of experimental animals to arsenic has been described by several studies. Tissues, which are adversely affected by arsenic exposure, include the gastrointestinal, cardiovascular, hematopoietic, renal, nervous, and respiratory systems.

In a chronic toxicity study (Byron et al. 1967), beagle dogs (6/group) were fed sodium arsenate or sodium arsenite at doses equivalent to 5, 25, 50, or 125 ppm arsenic in the diet, corresponding to an average daily dose of 0.2, 1.0, 2.1, or 5.2 mg As/kg-day with an assumed body weight of 12 kg for each dog. Four out of six dogs fed the highest dose of As died within 9 months. The main effects were anorexia and listlessness, with weight loss of 44-61 percent from the beginning of the study. Moderate anemia and atrophy of numerous tissues were revealed after hematologic and histologic examinations. A chronic NOAEL of 2.1 mg As/kg-day was identified in dogs since there was no difference between controls and dogs fed 50 ppm As^{3+} or As^{5+} in their diet.

In a 1-year study involving rhesus monkeys were exposed to As^{5+} (in the form of $2Na_3(PO_4AsO_4VO_4)$ "NaF" $18H_2O$) in milk at doses of 2.8 mg/kg-day (3-day and 8-week old monkeys) and 5.7 mg/kg-day (8-weeks old) (Heywood and Sortwell 1979). Effects seen in one monkey dosed with 2.8 mg As/kg-day beginning at 3 days of life included sudden weakness, dehydration along with bronchopneumonia, hemorrhage, edema, and necrosis in the brain. Another animal from the highest dose of arsenic had acute inflammation of the small intestine and moderate regression of the thymus. Surviving animals had normal EEGs and normal levels of neurological function. There was no evidence of delayed toxicity in surviving animals.

Male weanling Sprague-Dawley rats (10/group) were exposed to 0 or 50 ug/mL sodium arsenate for 320 days in drinking water (Carmignani et al. 1983). Histological examination revealed that the liver and kidneys accumulated significant levels of arsenic at 25.2 and 43.0 mg/kg, respectively, and swollen hepatocytes were noted near the centrilobular veins of the liver. Focal changes in the glomerulus and tubules were seen in the kidneys. No changes were noted in the myocardium, gastrocnemius, arterial vessels, lungs, brain, or sciatic nerves. Sympathetic hyperactivity, hypersensitivity, or both were induced by arsenic, and the authors speculated that these findings might explain the cardiovascular effects in people chronically exposed to arsenic.

CD male and female mice were fed 5 mg As^{3+}/L sodium arsenite in their drinking water, which corresponds to 0.35 mg/kg-day, in a special environment designed to minimize exposure to trace metals (Schroeder and Balassa 1967). After 180 days, growth rate and body weights were not affected, but a decrease in body weight in males was apparent after 360 and 540 days. There was also a decrease in survival rates at 18 months in males and 21 months in females, with a median life span that was reduced by 74 and 76 days in males and females, respectively.

Developmental Toxicity

High levels of arsenic can cause developmental effects in animals. Slight decreases in fetal weight resulted after mice were exposed to 2 mg As/m^3 as As_2O_3 on days 9-12 of gestation. Higher levels of arsenic (20 mg/m^3) produced skeletal malformations and an increase in fetal deaths (Nagymajtenyi et al. 1985). Other studies have reported an increase in fetal mortality from 2-68 mg As/kg-day sodium arsenite (Baxley et al. 1981; Hood and Harrison 1982). Baxley et al. (1981) exposed pregnant CD-1 mice to single oral doses of 1, 20, 40, or 45 mg/kg sodium arsenate by gavage on days 8-15 of gestation. The frequency of dead or resorbed fetuses was significantly elevated in animals exposed to 40 or 45 mg/kg on days 10, 12, 13, 14, or 15 of gestation. Hood and Harrison (1982) exposed pregnant hamsters to a single gavage dose of 25 mg/kg sodium arsenite on days 8, 11, or 12 of gestation, or 20 mg/kg on days 9 or 10. Prenatal mortality was significantly elevated in animals dosed with 25 mg/kg on gestational days 8 or 12. Small increases in the percentage of fetuses that were malformed were noted in treated groups, although these were not significant. Similarly, Hood and Harrison (1982) performed a similar experiment in hamsters dosed by a single intraperitoneal amount of 5 mg/kg sodium arsenite on days 8, 11, or 12, or 2.5 mg/kg on days 9 or 10 of gestation. Again, prenatal mortality was elevated, and although there were small increases in malformations, they were not significant. Hood and Harrison concluded that arsenite is significantly less toxic when administered orally than intraperitoneally. Intraperitoneal injections of 45 mg/kg sodium arsenite on days 6-12 of gestation in pregnant Swiss-Webster mice resulted in the following fetal malformations: exencephaly, micrognathia, protruding tongue, agnathia, open eye, exophthalmos, anophthalmia, missing pinna, cleft lip, hydrocephalus, umbilical hernia, eventration, ectrodactyly, micromelia, limb and tail malformations, and skeletal defects. Similar adverse effects were seen in exposed Wistar rat fetuses (Beaudoin 1974), golden hamsters (Willhite 1981; Carpenter 1987).

Fetal mortality was increased and malformation resulted in experimental animals exposed to organic forms of arsenic. Albino CD rats and CD-1 mice given repeated doses DMA, a metabolite of arsenic, during gestation had significantly elevated fetal mortality and showed developmental effects: skeletal anomalies (delayed ossification and supernumerary ribs), malformed palate, cleft lip, reduced fetal weight (Rogers et al. 1981).

Reproductive Toxicity

In a three-generation reproductive toxicity study in Charles River mice given sodium arsenate in drinking water at an average dose of 0.35 mg As^{3+}/kg-day, no significant effects were detected, although a trend toward a decreased number of pups per litter and slightly altered male:female sex ratios were observed (from 1.03 to 1.30 in the F_2 generation, and from 1.00 to 1.71 in the F_3 generation (Schroeder and Mitchener 1971).

In another study, male and female Harlan/ICR Swiss mice dosed 3 times per week for 10 weeks with 0, 11.9, or 119 mg/kg-day MMA, a metabolite of As, prior to mating and during gestation produced fewer litters than normal (Prukop and Savage 1986). None of the animals receiving the highest dose of MMA produced litters, and only 50 percent of the animals dosed with 11.9 mg/kg-day MMA produced litters, compared with 80-100 percent in controls. This was attributed to decreased fertility of the male mice.

Other Systemic Effects

No studies have been located that discuss other systemic effects of exposure to arsenic in experimental animals.

Toxicokinetics

Most of the existing data on the toxicokinetics of arsenic is on the inorganic form. Both arsenate and arsenite are well absorbed by both the oral and inhalation routes.

Arsenic in air exists as particulate matter, and absorption by inhalation involves deposition of the particles onto the surface of the lungs and absorption of arsenic from the deposited material. Deposition was estimated to be about 40 percent and absorption was 75-85 percent in lung cancer patients exposed to arsenic in cigarette smoke (Holland et al. 1959), making the percentage of inhaled arsenic 30-34 percent. Animal studies on As (i.e., sodium arsenite, sodium arsenate, and arsenic trioxide) via intratracheal instillation suggest that nearly all of the deposited material is absorbed, because clearance of the compounds from the lungs was rapid and nearly complete (60-90 percent cleared within 1 day) (Marafante and Vahter 1987; Rhoads and Sanders 1985). In contrast, insoluble forms of As (i.e., arsenic sulfide and lead arsenate) cleared more slowly, suggesting that the rate of absorption is lower for the insoluble forms of arsenic (ATSDR 2007).

Absorption of arsenates and arsenites across the gastrointestinal tract is nearly complete. Measurements of human fecal excretions given oral doses of arsenite reported that less than 5 percent was recovered, indicating that absorption was about 95 percent (Bettley and O'Shea 1975). Again, ingestion of less insoluble forms of arsenic such as arsenic triselenide did not lead to a high percentage of absorption across the gastrointestinal tract (Mappes 1977). The data on dermal absorption of inorganic arsenic are limited and not quantitative.

Once absorbed, arsenic is distributed throughout the body to the liver, kidney, skeleton, gastrointestinal tract, and other tissues. Autopsies of people exposed to background levels of arsenic have revealed that arsenic is present in all tissues of the human body at approximately comparable concentrations (Liebscher and Smith 1968). Absorbed arsenic can also cross the placenta and be distributed to fetuses (Hood et al. 1987, 1988). The metabolites of both inorganic and organic arsenic appeared to be distributed equally in all body tissue following oral exposure (Takahashi et al. 1988; Yamauchi and Yamamura 1984, 1985; Stevens et al. 1977; Yamauchi et al. 1988).

A review by Thompson (1993) indicates that several *in vivo* and *in vitro* studies have elucidated the metabolic and detoxification pathway for arsenic in mammals (Vahter 1981; Vahter and Envall 1983; Hirata et al. 1988; Marafante and Vahter 1987; Takahashi et al. 1988; Maiorino and Aposhian 1985; Marafante et al. 1985; Vahter and Marafante 1983), including humans (Buchet et al. 1981a,b; Crecelius 1977; Lovell and Farmer 1985; Smith et al. 1977; Tam et al. 1979; Vahter 1986). Analysis of urinary excretion products from humans and animals revealed increased levels of inorganic As^{3+}, As^{5+}, methylarsonic acid (MMA), and dimethylarsonic acid (DMA). The metabolism of inorganic arsenic involve two processes: oxidation/reduction of

As^{5+} and As^{3+} species and methylation. Specifically, inorganic arsenic is converted via methylation in the liver to MMA and to DMA, which is the principal metabolite. Both MMA and DMA form conjugates with glutathione or glutathione derivatives and are excreted in urine. Since methylation is enzyme-dependent, saturation kinetics appears to determine the toxicity, or carcinogenicity, of arsenic in humans. At low doses, arsenic can be effectively detoxified, whereas at higher doses the detoxification pathway may become increasingly saturated, thereby increasing the possibility of macromolecular binding, resulting in pathological changes which could include tumors (Cheng et al. 1992; Smith et al. 1992). Data on the point at which saturation is reached is unclear.

Toxicity Values

Data by Tseng (1977) and Tseng et al. (1968) from a population epidemiology study in Taiwan were used to derive an ingestion RfD of 0.0003 mg/kg-day (USEPA 2008). The critical effects were considered to be hyperpigmentation, keratosis, and possible vascular complications. Since hyperpigmentation and keratosis of the skin are lesions that can progress to skin neoplasms, this toxic endpoint is considered to be appropriate for RfD derivation. The NOAEL is derived by multiplying the average concentration in drinking water by 4.5 L/day (because of the hot climate, typical daily drinking estimates are approximately doubled for this study population), adding in the contribution of arsenic in food, and dividing exposure by average body weight for Taiwanese adults (Abernathy et al. 1989). The RfD of 0.0003 mg/kg-day incorporates an additional uncertainty factor of 3 for the lack of data concerning the potential toxicity of arsenic. The inhalation RfC for arsenic is derived by the California Environmental Protection Agency (CalEPA) of $1.5x10^{-5}$ mg/m^3 based on effects to development, the cardiovascular system, and the nervous system (CalEPA 2008). The RfC is based upon a LOAEL of 0.23 ug $As/m^3$with an uncertainty factor of 30.

Considerable scientific controversy has surrounded the derivation of an estimated SF for arsenic by ingestion, principally drinking water. Based on a study in Taiwan (Tseng 1977; Tseng et al. 1968), USEPA has developed a drinking water unit risk of $5x10^{-5}$ $(ug/L)^{-1}$, which was used to generate an oral slope factor of 1.5 $(mg/kg\text{-}day)^{-1}$ (USEPA 2008). The SF for ingestion was adopted in this risk assessment for skin contact, as a default condition. The inhalation SF is based on the geometric means of several occupational epidemiologic studies in which a significant increase in the incidence of lung cancer occurred among workers exposed to high concentrations of airborne arsenic. The inhalation SF is $4.3x10^{-3}$ $(ug/m^3)^{-1}$, or $1.5x10^{-2}$ $(ug/kg\text{-}day)^{-1}$ (USEPA 2008).

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Delta-HEXACHLOROCYCLOHEXANE (delta BHC)

Alpha-, beta-, gamma-, delta-hexachlorocyclohexane (all $C_6H_6Cl_6$; CAS Registry Nos. 319-84-6, 319-85-7, 58-89-9, and 319-86-8) and the three other isomers of BHC are separated by fractional crystallization from organic solvents. Formerly used as an insecticide, technical BHC (which contained several of the isomers) is no longer produced in the U.S., and only the *gamma* isomer (lindane) is allowed in commercial use here as a dust, powder, liquid, or concentrate for insecticides, and as a lotion, cream, or shampoo ingredient to control head lice and scabies. Isomers of BHC have been found in the soil and water at hazardous waste sites, with the *gamma* isomer persisting in air for up to 17 weeks. Decomposition products include carbon monoxide and hydrochloric acid (HSDB, 2008).

Cancer

USEPA has not classified these compounds as to their carcinogenicity (USEPA 2008). Hoshizaki et al.(1970) reported the case of a Japanese sanitation employee with acute leukemia associated with occupational exposure to BHC and DDT.

Mutagenicity

Mutagenicity studies have not been found.

Systemic Toxicity

In the past, pesticide manufacturing workers breathing toxic amounts of *delta*-BHC have experienced headaches, dizziness, blood disorders, and possible changes in the levels of sex hormones in the blood. Repeated high exposures can lead to seizures. All BHC isomers produce liver and kidney effects.

delta-BHC fed to male DD mice and Wistar rats at concentrations of 100-1000 ppm for 24 weeks did not produce noticeable neoplastic or nonneoplastic effects in the livers of a small number of animals (Ito et al., 1973a,b, 1975; Nagasaki et al., 1972). On the other hand, a 600-ppm mixture of *delta*- and *epsilon*-BHC in the diet of ICR-JCL mice for 26 weeks produced an increased incidence of benign and malignant hepatomas (Goto et al., 1972).

Toxicity Values

The oral RfD for *gamma*-BHC is 3×10^{-4} mg/kg bw/day, calculated from a NOAEL of 0.33 mg.kg-d in female rats in a subchronic study. Organs affected above that level were the liver and kidneys (Zoecon Corp. 1983, as cited in USEPA 2008). The oral RfD for *alpha*-BHC is 8×10^{-3} mg/kg-bw/day based upon effects to the liver (ATSDR 2005).

The USEPA has classified *alpha* and *gamma*-BHC a weight of evidence B2, *beta*-BHC has a weight of evidence C (USEPA 2008). The USEPA has assigned a slope factor of 6.3 per

(mg/kg-day)$^{-1}$ for *alpha*, 1.8 per (mg/kg-day)$^{-1}$ for *beta* and technical-BHC (USEPA 2008). A slope factor for *gamma*-BHC, assigned by the CalEPA, is 1.1 per (mg/kg-day)$^{-1}$ (CalEPA 2009).

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BENZENE

Benzene (C_6H_6, CAS Registry Number 71-43-2) is a volatile, colorless, liquid aromatic hydrocarbon with a characteristic odor. Environmental benzene is primarily created anthropogenically, although a small amount arises from natural events (i.e., forest fires and volcanoes). Benzene is obtained primarily from petroleum, with coal being a minor secondary source. As a result of its anti-knock characteristics, it is an important component of unleaded gasoline. Benzene is also used commercially as a solvent, in the manufacture of plastics, and as an intermediate in the manufacture of a wide range of chemical products. Due to its adverse health effects in humans, however, its use as a solvent has been greatly reduced.

Carcinogenicity

Benzene has been classified as a known human carcinogen (category A) by EPA, based on several occupational epidemiology studies showing an increased incidence of nonlymphocytic leukemia associated with high workplace exposures (USEPA 2008). Supporting evidence comes from rodent studies in which benzene induced tumors in multiple species at multiple sites when administered either by inhalation or by gavage (USEPA 2008). While some studies have implicated other types of leukemia and possibly lymphoma with exposure to high concentrations of benzene, the evidence is strongest and most consistent for acute myeloid leukemia (AML) and variants of that condition (Goldstein 1988).

Mutagenicity

Benzene is not mutagenic in *in vitro* studies in bacterial (*Salmonella* and yeast) or mammalian (mouse lymphoma cells) bioassays (USEPA 2008). Administered *in vivo*, however, benzene induces chromosomal aberrations in bone marrow cells of rabbits (Kissling and Speck 1973), mice (Meyne and Legator 1980), and rats (Anderson and Richardson 1979). Several investigators have also reported positive results for benzene in the mouse micronucleus assay at high doses (ATSDR 2007). Workers exposed occupationally to high doses of benzene have shown increases in the number of chromosomal aberrations in bone marrow cells and in peripheral lymphocytes (IARC 1982).

Systemic Toxicity

The major systemic effect of high-dose, chronic exposure to benzene is hematotoxicity. Benzene exerts its toxic effects in the bone marrow, producing deficiencies of blood cells such as pancytopenia (significant decreases in all major types of blood cells, C erythrocytes, leukocytes and platelets) and aplastic anemia (which can progress to acute nonlymphocytic leukemia). Deficiencies in various types of blood cells lead to other disorders such as hemorrhagic conditions from a lack of platelets, susceptibility to infection from lack of leukocytes, and increased cardiac output from lack of erythrocytes.

Neurological abnormalities have been observed in humans with previous chronic occupational exposure to benzene (air concentrations reached 210 ppm or higher) (Baslo and Aksoy 1982). The abnormalities included distal nephropathy in patients with pre-existing aplastic anemia.

Animal responses to benzene exposure vary and may depend on factors such as species, strain, duration of exposure, and pattern of exposure (e.g., intermittent versus continuous). Relatively high concentrations of benzene may induce fetal growth retardation or an increase in skeletal abnormalities when pregnant mice and rats are exposed via inhalation (ATSDR 2007). Fetotoxicity in animals may be a function of maternal toxicity (Tatrai et al. 1980).

Toxicokinetics

Benzene is readily absorbed through the lungs and about 30 to 50 percent is excreted unchanged in exhaled air. The 40 to 50 percent that is retained is taken up preferentially by fatty and nervous tissues, broken down into metabolites by the liver, and excreted in urine (IARC 1974). In addition, significant amounts of benzene may enter the body through the skin. When ingested, it is absorbed through the gastrointestinal tract.

Metabolism

The toxicokinetics of benzene suggest that its metabolism is complex and that toxicity and carcinogenicity may occur only after it has been biotransformed to possibly synergistic reactive metabolites (Stevens et al. 1994, Medinski et al. 1996, Lee et al. 1996, Rothman 1997). Benzene is broken down into its major metabolites (phenol, hydroquinone, and catechol) by cytochrome P4502E1 in the liver and excreted in the urine via glucuronide or sulfate conjugation (Henderson et al. 1989). It appears that catechol and phenol are formed by two distinctly different metabolic pathways. Hydroquinone is thought to result from a second passage of phenol through the mixed function oxidases.

Other putative toxic metabolites include (1) benzoquinone, resulting from the oxidation of hydroquinone (formed by the oxidation of phenol), and (2) muconic dialdehyde (also referred to as *trans, trans*-muconaldehyde), resulting from ring opening of either benzene epoxide or a nonreactive metabolic intermediate, benzene glycol, in the presence of NADPH. Muconic dialdehyde is a known hematotoxin (Latriano et al. 1986), and the percent of this metabolite formed *in vivo* increases nonlinearly with increasing dose.

Biotransformation of benzene is essential for benzene-induced bone marrow damage. There is disagreement as to whether benzene is activated in the marrow or activated elsewhere and transported to the marrow. When several of the metabolites of benzene were compared with the parent compound in hematotoxicity studies, the metabolites were less toxic than benzene. Tunek et al. (1981) suggested that perhaps the metabolites tested may conjugate strongly in the liver and possibly other organs, and may not reach the bone marrow in amounts sufficient to produce the expected hematotoxicity.

Toxicity Values

An oral RfD of 4×10^{-3} mg/kg-day is calculated for benzene based upon a decreased lymphocyte count and an uncertainty factor of 300 (USEPA 2008). An inhalation RfC of 0.03 mg/m^3 is

calculated based upon the benchmark concentration of 8.2 mg/m^3 and an uncertainty factor of 300 (USEPA 2008).

The USEPA has assigned benzene the weight of evidence level "A" An oral slope factor ranging from 1.5×10^{-2} to 5.5×10^{-2} per (mg/kg)/day has been extrapolated by USEPA (USEPA 2008) from the results of human occupational studies of workers who showed an increased incidence of leukemia after inhalation exposure. Expected differences in absorption by the two exposure routes were taken into account. USEPA estimates that an air unit risk ranging from 2.2×10^{-6} to 7.8×10^{-6} is the increase in risk to an individual exposed for a lifetime to 1 $\mu g/m^3$ benzene in air (USEPA 2008).

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BIS(2-ETHYLHEXYL)PHTHALATE

Potential targets of bis(2-ethylhexyl) phthalate [di(2-ethylhexyl)phthalate, or DEHP] toxicity include the liver (altered morphology, physiology, and biochemistry), gastrointestinal tract, cardiac, hematological, renal, and reproductive systems. With oral administration of di(2-ethylhexyl)phthalate for subchronic exposure durations of 2 weeks to 1 year, animal LOAELs ranging from 50 to 2000 mg/kg/day have been observed; the lowest reported animal NOAEL is 5 mg/kg/day for liver toxicity (ATSDR 2002). With chronic oral exposures, typical animal LOAELs and NOAELs range from 10 to 2000 mg/kg/day, depending on the species, the route of administration, target organ toxicity, and duration of exposure (ATSDR 2002). Phthalate esters are reported to induce hepatic peroxisome proliferation in rodents, although the relevance of these cellular changes to target organ disease or injury is not certain.

USEPA considers di(2-ethylhexyl)phthalate to be a probable human carcinogen, based on the results of an NTP (1982) cancer bioassay. Male and female rats and mice were exposed to di(2-ethylhexyl)phthalate in their diet for 2 years. No clinical signs of toxicity were observed in either rats or mice. However, a statistically significant increase in the incidence of hepatocellular carcinomas and in the combined incidences of hepatocellular carcinomas and adenomas was observed in female rats and both sexes of mice.

Toxicity values

USEPA (USEPA 2008) has established a oral chronic RfD for di(2-ethylhexyl)phthalate of 0.02 mg/kg/day, based on the finding of increased relative liver weights in guinea pigs exposed to di(2-ethylhexyl)phthalate in the diet for one year (Carpenter *et al.* 1953). The LOAEL in this study was 19 mg/kg/day (equivalent to 0.04% of the diet), and uncertainty factors totaling 1000 (species-to-species extrapolation (10-fold), variability among human subpopulations (10-fold), and the use of subchronic data to derive a chronic toxicity value (10-fold) were applied. The subchronic oral RfD is 0.2 mg/kg/day. USEPA has not derived inhalation RfCs for DEHP.

USEPA (USEPA 2008) has calculated an oral SF for bis(2-ethylhexyl)phthalate of 1.4×10^{-2} $(mg/kg\text{-}d)^{-1}$. The oral SF is based on the increased incidence of combined hepatocellular carcinoma and adenoma in male mice from the NTP (1982) feeding study, using standard food consumption rates for rodents. An inhalation RfC of 2.4×10^{-6} per $(ug/m^3)^{-1}$ has been calculated by the CalEPA based upon the same study used for the oral SF (CalEPA 2009).

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CADMIUM

Cadmium (Cd, CAS Registry No. 7440-43-9) is not known definitively as an essential element, but there is limited evidence suggesting an essential role in experimental animals (Schwarz 1977), and some enzymes can accommodate cadmium in place of zinc (Vallee and Ulmer 1972). Because of its chemical and atomic similarities to zinc, cadmium may be cycle through homeostatic mechanisms that maintain a physiologically-balanced supply of zinc.

Cancer

The carcinogenic potential of cadmium appears to be dependent on the route of administration. In Wistar rats, cadmium inhalation produces lung tumors (Takenaka et al. 1983), while intratracheal instillation of cadmium oxide did not produce lung tumors in Fischer 344 rats, and instead produced mammary tumors in males and tumors at distant sites (Sanders and Mahaffey 1984). Injection site tumors and distant site tumors (for example, testicular) have been reported by a number of authors as a consequence of intramuscular or subcutaneous administration of cadmium metal and chloride, sulfate, oxide and sulfide compounds of cadmium to rats and mice, but not following ingestion (USEPA 1985; Kazantzis 1984; Takenaka et al. 1983). Human carcinogenicity is not as well defined, however. A 2-fold excess risk of lung cancer was observed in cadmium smelter workers and was not attributable to co-occurrence of arsenic or to smoking (Thun et al. 1985), which are confounding aspects of several other studies (Varner 1983; Sorahan and Waterhouse 1983; Armstrong and Kazantzis 1983). Further limited evidence for carcinogenicity is provided in four studies of workers exposed to cadmium dust or fumes that exhibited a statistically significant positive association with prostate cancer (Kipling and Waterhouse 1967; Lemen et al. 1976; Holden 1980; Sorahan and Waterhouse 1983), but the total number of cases was small in each study (USEPA 2008). EPA has classified cadmium as a probable oral human carcinogen (Class B1) and a Class A carcinogen for inhalation risks based on limited but consistent evidence from these human studies and sufficient evidence in rats and mice by inhalation and injection. (USEPA 2008). Insufficient data were available to derive an oral cancer slope factor, however an inhalation cancer slope factor of 6.3 has been established (USEPA 2008).

Mutagenicity

Mutagenicity tests in bacteria and yeast have provided inconclusive results. Positive responses occurred in mutation assays in Chinese hamster cells (Dom and V79 lines) and in mouse lymphoma cells (Casto 1976; Ochi and Ohsawa 1983; 0berly et al. 1982), but conflicting results were obtained in chromosomal aberration assays in human lymphocytes either obtained from exposed workers or treated *in vitro*. In both *in vivo* and *in vitro* tests, cadmium appears to interfere with spindle formation and to result in aneuploidy in germ cells of mice and hamsters (Shimada et al. 1976; Watanabe et al. 1979; Gilliavod and Leonard 1975).

Systemic Toxicity

As one of the most widely-studied toxicants, effects following cadmium exposure via the oral route are well known in animals and humans. With a variety of experimental durations (from

>14 d to >1 yr), adverse effects from cadmium may be expressed in virtually every organ or physiological system: respiratory, cardiovascular, hematological, musculoskeletal, hepatic, renal, immunological, neurological, developmental, or reproductive (ATSDR 2008). Chronic cadmium ingestion also results in the painfully degenerative "itai-itai" disease, affecting the skeletal system, and has been implicated in development of hypertension in exposed individuals. In general for exposures of 15 d to 1 yr, most of the animal LOAELs and NOAELs for adverse effects occur at daily ingestion of arsenic ranging from 0.014 to mg Cd kg^{-1} d^{-1}. For exposures of one year or longer, animal LOAELs and NOAELs range from 0.014 to 57 mg Cd kg^{-1} d^{-1}, while human LOAELs are reported at 0.001 to 0.0021 mg Cd kg^{-1} d^{-1} for renal effects resultant to lifetime exposures (Nogawa et al. 1989; Shiwen et al. 1990).

Chronic inhalation of cadmium produces multiple effects, such as emphysema, liver damage, anemia, proteinuria, and renal tubular damage (Goyer 1986; Lee and White 1980; Friberg et al. 1974) and affects various other organs and organ systems. LOAELs and NOAELs for experimental animals following subchronic or chronic inhalation exposures to cadmium typically range from 0.02 to 6.5 mg Cd m^3. LOAELs and NOAELs for renal effects in humans chronically exposed to cadmium-containing vapors have been reported in the range of 0.017 to 0.033 mg Cd m^3 (ATSDR 2008), while exposure at equivalent levels is carcinogenic to rats (Oldiges et al. 1989; Takenaka et al. 1983).

Toxicokinetics

Absorption of cadmium compounds through the skin is negligible. Only about 5 percent of ingested cadmium is absorbed from the gastrointestinal tract, although a low intake of calcium or iron can increase absorption to as high as 20%. From the respiratory tract, absorption is more complete, and is greater for small particles and fumes than for large particle dust. Cigarette smokers absorb 10-40 percent of inhaled cadmium. After absorption, cadmium binds to blood cells and albumin, which distribute it. Blood cadmium reaches equilibrium within a year of exposure, while the total body burden continues to increase over decades. About 50 percent of the total body burden is found in the liver and kidneys. The elimination half-life of cadmium is 16 to 33 years. Accumulations in the liver remain high, but once kidney damage occurs, excretion of cadmium via the urine greatly increases. Cadmium crosses the placental barrier in rodents.

Toxicity Values

USEPA has established oral RfDs of 0.0005 mg/kg-d for cadmium in drinking water and 0.001 mg/kg-d for cadmium in food (USEPA 2008). For both exposure media, the critical effect was significant proteinuria in human subjects chronically exposed to cadmium. Both reference doses were also based on an aggregate uncertainty factor of 10, to account for variability among humans to the toxicity of this chemical in the absence of specific data on sensitive individuals. The RfD is based on the highest level of cadmium in the human renal cortex not associated with significant proteinuria, with modeled exposures adjusted to allow for absorption differences arising from differing cadmium sources (USEPA 2008). An inhalation RfC for cadmium of $1x10^{-5}$ mg/m^3 is determined based upon the ATSDR Minimal Risk Levels (MRLs) (ATSDR 2008). This MRL is based on the 95% lower confidence limit of the urinary cadmium level

associated with a 10% extra risk of low molecular weight proteinuria ($UCDL_{10}$) estimated from a meta-analysis of environmental exposure data. An air concentration that would result in this urinary cadmium level (0.5 μg/g creatinine), assuming a dietary cadmium intake of 0.3 μg/kg/day, was estimated using biokinetic models. The estimated air concentration of 0.1 μg Cd/m3 was divided by an uncertainty factor of 3 for human variability and a modifying factor of 3 (ATSDR 2008).

An inhalation RfC of 1.8×10^{-3} per $(ug/m^3)^{-1}$ is determined by the USEPA based upon tumors in the lung from inhalation exposure in the work place (USEPA 2008).

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CHLOROFORM

Chloroform ($CHCl_3$; CAS Registry No. 67-66-3) is a colorless, heavy liquid with a pleasant, non-irritating, etheric odor. It has been used in the past in the manufacture of the refrigerant HCFC-22 (monochlorodifluoromethane); as a raw material for polytetrafluoroethylene plastics; as a solvent for fats, oils, alkaloids, and waxes; as a cleansing agent; as an insecticidal fumigant for stored grain; as an ingredient in toothpaste, cough syrup, linaments; in human and veterinary medicine; and in the rubber industry.

Cancer

Chloroform is classified as a probable human carcinogen (Category B2), based on increased incidence of several tumor types in rats and three strains of mice, but inadequate human data (EPA 2008).

Mutagenicity

The majority of tests for genotoxicity of chloroform (including covalent binding to DNA, mutation in Salmonella, a Drosophila sex-linked recessive test, tests for DNA damage, a micronucleus test, and transformation of BHK cells) have been negative; however, it did cause mitotic recombination in Saccharomyces (Callen et al., 1980) and sister chromatid exchange in cultured human lymphocytes and in mouse bone marrow cells exposed in vivo (Morimoto and Koizumi 1983) (EPA 2008).

Systemic Toxicity

Adverse effects resulting from chloroform ingestion have been widely studied. Effects of subchronic and chronic exposure to chloroform range from mortality through various systemic (respiratory, cardiovascular, gastrointestinal, hematological, musculoskeletal, hepatic, and renal systems), immunological, neurological, developmental, reproductive, and carcinogenic effects (ATSDR 1997). Typical animal LOAELs and NOAELs for these varied systems range from 30 to 600 mg/kg-day chloroform for subchronic and chronic exposure durations (ATSDR 1997). Cancer in laboratory animals is reported from various studies to occur with ingestion of approximately 60 to 200 mg/kg-day chloroform for 78 to 180 weeks (ATSDR 1997).

Chloroform was first recognized for its ability to depress central nervous system function, hence its use as a general anesthetic (Simpson 1847). Much as with oral exposure, inhalation exposure to chloroform may bring about death, systemic effects (respiratory, gastrointestinal, hematological, hepatic, renal), neurological effects, and cancer. Human and laboratory animal LOAELs and NOAELs for systemic or neurological toxicity occur largely in the range of 10 to 100 ppm exposures (ATSDR 1997).

Neither ATSDR (1997) nor USEPA (USEPA 2008) have reviewed, in their toxicological assessments of chloroform, studies relating subchronic or chronic dermal exposure to chloroform with adverse health effects in rodents or humans. Acute exposure NOAELs for hepatic, dermal,

or renal effects in rabbits are observed with topical application of solutions containing 1000 to 4000 mg chloroform per kilogram body weight (ATSDR 1997).

Toxicity Values

USEPA has established an oral RfD of 0.01 mg chloroform ingested per kilogram body weight per day, based on formation of fatty cysts in the liver of chronically-exposed dogs (Heywood et al. 1979) (USEPA 2008). This RfD is based upon a LOAEL of 15 mg/kg-day, adjusted to 12.9 mg/kg-day to reflect a 7-day per week dosing schedule, and an aggregate uncertainty factor of 1000. The uncertainty factor incorporates use of a LOAEL, interspecies conversion, and human sensitivity (10-fold each). An inhalation RfC of 0.098mg/m^3 has been a established based upon the ATSDR MRL (ATSDR 1997). The MRL is based on a NOAEL of 3 ppm for hepatic effects in mice (Larson et al. 1994).

The USEPA has classified chloroform as a B2 carcinogen (USEPA 2008). The CalEPA has calculated an oral slope factor for chloroform of 0.031 $(mg/kg\text{-}day)^{-1}$ (CalEPA 2009). The slope factor calculation was based on kidney tumors rats and mice (Jorgenson et al. 1985 and NCI 1976).

USEPA has calculated an inhalation unit risk concentration (risk per unit concentration of chloroform in the air) of 2.3×10^{-5} $(\mu g/m^3)^{-1}$, which is the geometric mean of separate male and female slope factors (USEPA 2008). The critical study (NCI 1976) for this derivation reported hepatocellular carcinoma in female $B6C3F_1$ mice and kidney tumors in male rats administered chloroform by gavage. Studies by Roe et al. (1979) are generally supportive of the risk estimate.

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CHROMIUM

Chromium (Cr, MW 52.0, CAS registry number 7440-47-3) is a metal that is found in varying oxidative states ranging from chromium(-II) to chromium(+VI). Cr^{2+} is the most commonly occurring natural form of the metal. Cr^{6+}, which originates strictly from anthropogenic sources, is of greatest toxicological significance. Chromium is produced from the reduction of chromite ore using carbon. Chromium in various forms is used in the metallurgic industry (alloys including stainless steel), the ceramics industry (granular chromite), and the chemical industry (pigments, plating, leather treatment, wood preservatives).

Carcinogenicity

Hexavalent chromium (Cr^{6+}) is classified as a human carcinogen by the EPA (category A), based on the demonstration by epidemiologic studies of an increase in the incidence of lung cancer in chromium-exposed workers (USEPA 2008). There are a sufficient number of these studies to establish a dose-response relationship between chromium exposure and human lung cancer. These findings, however, may be confounded by the smoking habits of workers. In calculating the dose-response relationship, it was assumed by both the author of the studies (Mancuso 1975) and EPA (1995a) that the smoking rate among workers was similar to that of white males in the general U.S. population. However, several other epidemiologic studies on the distribution of smoking among human population groups suggest that the smoking rate may be higher among industrial workers than in the general population (USEPA 2008). Chromium workers are exposed to both trivalent and hexavalent chromium; however, only hexavalent chromium has been found to be carcinogenic in animal studies and only hexavalent chromium is considered to be a human carcinogen (USEPA 2008). When assessing carcinogenicity among workers, it has been assumed that the ratio of trivalent to hexavalent chromium is 6:1 (USEPA 2008).

Animal carcinogenicity studies with Cr^{6+} have supported the human evidence of carcinogenicity, producing the following tumors types: intramuscular injection site tumors in rats and mice; intrapleural implant site tumors for various hexavalent compounds in rats; intrabronchial implantation site tumors for various hexavalent compounds in rats; and subcutaneous injection site sarcomas in rats (USEPA 2008).

Mutagenicity

In general, hexavalent chromium is mutagenic in bacterial and yeast assays and in Chinese hamster ovary cells, whereas trivalent chromium is not (USEPA 2008). Chromosomal effects, unscheduled DNA synthesis and transformation of cell lines have been induced by exposure to various chromium compounds (Raffetto et al. 1977; Casto et al. 1979; Levis et al. 1978).

Systemic Toxicity

Other than localized pre-neoplastic histopathological changes in the lung, chromium does not appear to induce systemic toxicity. A 1-year drinking-water study in rats (MacKenzie et al. 1958) showed no systemic effects related to chromium exposure. Similarly, no toxicologically significant effects were observed in a 4-year study with dogs (Anwar et al. 1961), or in a group

of humans who drank water for 3 years from a private well containing chromium concentrations of 1 mg/L (USEPA 2008).

No studies have been documented examining the possible developmental or reproductive effects resulting from ingestion of chromium.

Toxicokinetics

Absorption of inhaled chromium compounds depends on several factors, including physical and chemical properties of the particles, such as oxidation state, size, and solubility, and the activity of alveolar macrophages (ATSDR 2008). The identification of chromium in urine and serum of humans occupationally exposed to soluble trivalent or hexavalent compounds in air indicates that chromium can be absorbed from the lungs (Randall and Gibson 1987); hexavalent chromium compounds appear to be more readily absorbed from the lungs than trivalent compounds, due in part to differences in the capacity to penetrate biological membranes. Chromium is also absorbed through the gastrointestinal tract, but at a much lower rate than through the lungs (ATSDR 2008). The absorption efficiency depends on the dietary intake (Anderson 1986). Both trivalent and pentavalent chromium can penetrate human skin to some extent (Samitz and Shrager 1966).

Metabolically, trivalent chromium compounds are essential to normal glucose, protein, and fat metabolism (Anderson 1986). In the lung, hexavalent chromium can be reduced to trivalent chromium by ascorbate. This reduction results in a shorter residence time of chromium in the lungs and constitutes the first defense against oxidizing reagents in the lung (Suzuki and Fukuda 1990). When ascorbate is depleted from the lungs, hexavalent chromium can also be reduced by glutathione, although this is a slower process than reduction by ascorbate (Suzuki and Fukuda 1990). Uptake and reduction of chromium compounds by pulmonary macrophages also occurs and appears to constitute a second line of defense against the pulmonary toxicity of hexavalent chromium compounds (Petrilli et al. 1986). The reduction of hexavalent chromium to trivalent chromium in cell extracts made from human pulmonary alveolar macrophages significantly reduces the mutagenic potency of chromium when it is tested in the Ames *Salmonella* assay (Petrilli et al. 1986).

Hexavalent chromium may also be reduced to trivalent chromium by ascorbate in the gastrointestinal tract when exposure is oral (Samitz 1970). Reduction of hexavalent chromium may also result in the formation of pentavalent chromium (ATSDR 2008). This reaction involves a one-electron transfer from the microsomal cytochrome P-450 system. Pentavalent chromium complexes are characterized as labile, reactive, and persistent; these characteristics make them likely candidates for interaction with cellular DNA (Jennette 1982).

Toxicity Values

Hexavalent chromium appears to exhibit no significant adverse systemic toxicity via ingestion. A 1-year drinking water study in rats showed no evidence of toxicity over the duration of the study (MacKenzie et al. 1958). The NOAEL for hexavalent chromium in the MacKenzie et al. (1958) study was calculated to be 2.5 mg/kg-day. USEPA used an uncertainty factor of 300 (10

for interspecies extrapolation, 10 for intrahuman variability, and 3 for a less than lifetime study), yielding an oral RfD of 0.003 mg/kg-day. This RfD is limited to the soluble salts of (metallic) hexavalent chromium (potassium dichromate, sodium dichromate, potassium chromate, and sodium chromate).

Epidemiologic studies of occupational inhalation exposure to hexavalent chromium indicate adverse respiratory effects ranging from irritation of the nasal mucosa to perforation of the septum, depending on exposure concentration. USEPA has determined an RfC of 1×10^{-4} mg/m^3 for inhaled hexavalent chromium particulates, based on a study by Lindberg and Hedenstierna (1983), which showed evidence of respiratory effects at occupational exposure levels of 2 ug/m^3 hexavalent chromium (USEPA 2008). No adverse effects were observed at 1 ug/m^3 (0.14 ug/kg-day).

Chromium-exposed workers were exposed to both valence forms of chromium. Trivalent chromium is an essential nutrient (NRC 1989), and only hexavalent chromium seems to have the ability to cause cancer in humans. The ratio of trivalent chromium to hexavalent chromium in occupational environments is considered to be 6:1 (Mancuso 1975). SFs from various studies range from 0.035 to 0.13 $(ug/m^3)^{-1}$ (Langard et al. 1980; Axelsson et al. 1980; Pokrovskaya and Shabynina 1973). These studies assume that the smoking habits of chromate workers are similar to those of the general white male population and thus may overestimate risk, because the proportion of smokers is typically higher for industrial workers than for the general population (USEPA 2008). Alternatively, the assumption of a 6:1 ratio between trivalent chromium and hexavalent chromium may underestimate risk, if this ratio is incorrect. Using Mancuso's data, USEPA's inhalation unit risk for cancer is 1.2×10^{-2} $(ug/m^3)^{-1}$ (= 0.04 $[ug/kg\text{-}day]^{-1}$).

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4,4'-DDD

DDD (tetrachlorodiphenylethane or TDE), CAS Number 72-54-8 is a breakdown, or daughter product of 4,4'-DDT, an organochlorine pesticide that is one of a class of insecticides known as chlorinated ethane derivatives. During the 1940s to the 1960s, the organochlorine insecticides were used extensively in agriculture, soil, and structure insect control, as well as in malaria control programs. However, due to their long-term persistence in the environment and their tendency to accumulate in biologic as well as nonbiologic media, the organochlorine insecticides were replaced by the organophosphate insecticides for many uses in the early 1950s (Klaassen, Amdur, and Doull 1986).

In general, the organochlorine insecticides are considered to be less acutely toxic, but have greater potential for chronic toxicity, than the organophosphate and organocarbamate insecticides. The oral LD50 in male rats for a number of organochlorines ranges from 18 mg/kg for endrin to 5,000 to 7,000 mg/kg for methoxychlor, while the dermal LD50 ranges from 18 mg/kg for endrin to 2,510 mg/kg for DDT (Klaassen, Amdur, and Doull 1986). Acute hazard potential may be ranked approximately from highest to lowest as endrin, aldrin, dieldrin, chlordane, toxaphene, kepone, heptachlor, DDT, and methyoxychlor.

There is a growing body of evidence which suggests that environmental chemicals, including many of the organochlorine insecticides, can disrupt the endocrine system by exhibiting estrogenic function, causing a cascade of biological effects. Endocrine disrupters interfere with the role of natural hormones in the body. DDT is considered to be estrogenic. Observed effects in animal studies have included disruption of female and male reproductive functions, including disruption of normal sexual differentiation, ovarian function, sperm production, and pregnancy as well as effects on the thyroid gland (USEPA 1997). Rats given DDT exhibited estrogenic effects. A contaminant of DDT (o,p'-DDT) was shown to compete with estradiol for binding the estrogen receptors in rat uterine cytosol and estrogen receptors in mammary tumors (Klaassen, Amdur, and Doull 1986). Depressed sperm counts may accompany excessive absorption of organochlorines (Klaassen, Amdur, and Doull 1986). The USEPA has not assigned an RfD for DDD (USEPA 2008)

The carcinogenicity of DDD has been demonstrated in animal studies (USEPA 2008) resulting in a B2 cancer designation, probable human carcinogen. The USEPA has recommended a cancer slope factor of 0.24 $mg/kg/day^{-1}$ (USEPA 2008). An inhalation unit risk of 6.9×10^{-5} per $(ug/m^3)^{-1}$ has been derived by the CalEPA (CalEPA 2009).

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1,2-DICHLOROETHENE MIXED ISOMERS

cis-1,2-Dichloroethene, or cis-1,2-DCE ($C_2H_2Cl_2$, CAS Registry No. 156-59-2), is a colorless, volatile liquid with a slightly acrid, ether-like odor. trans-1,2-DCE ($C_2H_2Cl_2$, CAS Registry No. 156-60-5) is also a light, colorless liquid with a sweetish odor. In commerce, the two isomers are often found combined as mixed 1,2-DCE, which is used in perfumes, dyes, gums and waxes, oils, lacquers, thermoplastics, phenols, and camphor as a direct solvent; as an intermediate for chlorinated compounds; and as a fermentation-retarding agent. Mixed 1,2-DCE has been used in the extraction process for caffeine, fat, and natural rubber; as a dry-cleaning solvent; in food packaging adhesives and germicidal fumigants; and as a veterinary and human anesthetic (ACGIH 1991-1992).

The greater part of 1,2-DCE is excreted directly from the lungs after inhalation. Once absorbed, the remainder distributes rapidly to tissues based on their lipid content and individual tissue/blood partition coefficients, with highest concentrations appearing in the fat, brain, and blood. Peak blood levels occur soon after inhalation exposure ceases (Sullivan and Krieger 1992). In rats, both isomers (cis- and trans-) are transformed to the same metabolites, dichloroacetic acid and dichloroethanol (Anonymous 1984).

Toxicity Values

USEPA has derived an RfD for cis-1,2-dichloroethene of 0.01 mg/kg-day by applying to the NOAEL of 32 mg/kg-day an uncertainty factor of 3000 (10 for use of a subchronic study, 10 to extrapolate from rats to humans, 10 to protect sensitive individuals and 3 for database limitations, including lack of reproductive or developmental studies) (USEPA 2002). The USEPA has also derived an RfD for trans-1,2-dichloroethene of 0.02 mg/kg-day based upon a NOAEL of 17 mg/kg-day from a drinking water study (USEPA 2008).

USEPA has not established an RfC for 1,2-DCE, and has given it the carcinogenicity classification D (not classifiable as to human carcinogenicity (USEPA 2008), based on a lack of human and animal data and generally negative results in mutagenicity tests.

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IRON

Iron (Fe, CAS registry number 7439-89-6) is the fourth most abundant element in the earth's crust and the second most abundant metal. It comprises approximately 5 percent of the continental crust. Its concentration in ground water ranges from 0.5 mg/L to 10 mg/L; its concentration in soil is between 0.7 and 4.2 percent (NRC 1979). In the late 1970s, world production of iron was over 500 million metric tons, with the U.S. producing roughly 20 percent of the world total (NRC 1979). Since iron is an essential nutrient, some amount of iron is needed in the diet.

Carcinogenicity

Iron has not been reported to be mutagenic (NRC 1979). It has not been classified with respect to carcinogenicity, given the paucity of animal cancer bioassays and human cancer studies. Iron overload may be associated with carcinoma of the liver; however the data are poor and inconclusive (NRC 1979).

The acute effects of iron toxicity in humans are well characterized and consist of gastrointestinal, cardiovascular, metabolic, neurological and hepatic alterations (Bothwell et al. 1979; Banner and Tong 1986; Engle et al. 1987; and Mann et al. 1989, all as cited in USEPA 1993). Acute effects are based mostly on observations of children who accidentally ingest therapeutic iron supplements; they are rarely, if ever, associated with ingestion of naturally occurring or other commercially produced substances (NRC 1979). Gastrointestinal toxicity is characterized by vomiting, diarrhea, and abdominal pain, caused by the direct caustic effect of iron on the mucosa of the stomach and small intestine. Gastrointestinal toxicity can progress to gastric/intestinal hemorrhage and/or necrosis and, in rare cases, to stenosis in the stomach outlet and small intestine. Cardiovascular iron toxicity is marked by severe hemodynamic alterations and can lead to shock and cardiac failure; neurological toxicity ranges from lethargy to coma. Although a rare occurrence, hepatic toxicity from iron can range from cloudy swelling of hepatocytes to necrosis. The average human lethal dose is 200B250-mg/kg body weight (NRC 1979). Thus, the average adult male would have to ingest 14 grams of elemental iron for it to be lethal; the average 2 year old, 3 grams (NRC 1979).

Chronic iron toxicity has been noted in individuals with various genetic and/or metabolic disorders, including hemochromatosis (massive iron overload together with cirrhosis and/or other tissue damage due to iron), thalassemia, and sideroblastic anemia, as well as in individuals who receive frequent blood transfusions (Jacobs 1977, and Bothwell et al. 1979, both as cited in USEPA 1993). Excessive intake of iron attributed to consumption of home-brewed Kaffir beer has resulted in chronic hemochromatosis among the South African Bantu population (NRC 1979; and Bothwell and Bradlow 1960; and Bothwell et al. 1964, both as cited in USEPA 1993). Pathologic findings associated with hemochromatosis include: 1) fibrosis in heavily siderotic organs, particularly the liver, 2) cirrhosis, 3) testicular atrophy, and 4) osteoporosis (NRC 1979).

Though chronic iron toxicity can occur in individuals with genetic/metabolic disorders, it is debatable whether a chronic overload via ingestion is possible in individuals with a normal ability to control iron absorption. Using values obtained from the second National Health and

Nutrition Examination Survey (NHANES II), Looker et al. (1988, as cited in USEPA 1993) compared dietary iron intake with biochemical indices of iron status. NHANES II consisted of a 1976B1980 sample of the U.S. population aged 6 months to 74 years. Observed intake levels of 0.15B0.27 mg/kg-day iron were found to be both great enough to prevent iron deficiency and insufficient to cause the toxic effects of iron overload (Elinder 1986; Cook 1991; Hillman and Finch 1985, all as cited in USEPA 1993). Lauffer (1991, as cited in USEPA 1993) and Sullivan (1992, as cited in USEPA 1993) suggest that iron overload elevates the risk of acute myocardial infarction by promoting oxidation of low-density lipoprotein (LDL). A 1992 Finnish study of 1,931 randomly selected men aged 42B60 years by Salonen et al. lends support to this theory in that it found that high serum ferritin concentration and high dietary iron intake were risk factors for myocardial infarction.

Animal studies attempting to model hemochromatosis have been mostly negative, as have animal studies involving parenteral administration of iron (Bothwell et al. 1979, as cited in USEPA 1993; and NRC 1979).

Ingestion of iron supplements during pregnancy has not been correlated to adverse developmental effects in humans, although some women ingesting large quantities of iron (>1.2 gram) during pregnancy experienced nausea, vomiting, hematoemesis, abdominal pain, and/or diarrhea (NAS 1989, as cited in USEPA 1993). No teratogenic effects have been associated with iron (NRC 1979).

No treatment-related teratogenic or embryotoxic effects were observed in rats given 2.7 mg/kg-day iron on gestation days 6-15 or rats/mice given 24-76 mg/kg-day iron for 6 days (Nolen et al. 1972; Tadokoro et al. 1979, as cited in USEPA 1993).

This essential nutrient is found primarily in the form of hemoglobin in the body. The concentration of iron in the body at any given point is regulated largely through changes in the amount of iron absorbed by the gastrointestinal mucosa. The following factors influence the absorption of iron: 1) body stores, 2) the amount and nature of iron in ingested food, and 3) dietary factors that may increase or decrease the availability of iron for absorption (NRC 1979). Although the body is generally effective in regulating iron levels, it is incapable of excreting large amounts of iron following excessive accumulation resulting from acute or chronic ingestion of high levels of iron (NAS 1989, as cited in USEPA 1993).

Toxicity Values

The USEPA has identified an oral RfD of 0.7 mg/kg-day based upon effects to the digestive system (USEPA 2007).

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LEAD

Lead (Pb; CAS Registry No. 7439-92-1) and lead compounds are present in the environment both naturally and as a result of anthropogenic activities. Lead compounds have many industrial applications, such as in the plates of electric batteries and accumulators; as compounding agents in rubber manufacturing; as ingredients in paints, glazes, glass, and pigments; and in the chemical industry. Exposures to lead dust may occur during the manufacture of these product, or during mining, smelting, and refining; and exposures to lead fumes may occur during such high-temperature operations as welding or spray-coating of metals with molten lead, or through waste incineration. Lead may occur naturally in drinking water and unnaturally in water delivered through lead pipes to residents of older homes in soft-water areas. Inadequately glazed earthenware or china may contain lead that leaches out on contact with heated or acidic foods. It occurs in the house dust of older homes that were once painted with lead paint. The level of exposure resulting from contact is highly variable. Children with pica for paint chips or for soil may have elevated blood lead levels ranging from marginal to high enough to cause clinical illness.

The majority of the toxic effects of lead have been observed in humans. Effects of lead on humans are typically discussed in terms of their correlating absorbed internal body dose, expressed as a blood lead level (ug/dL). In many instances, internal doses are actually the result of multiple routes of exposure.

Carcinogenicity

Lead at very high doses has been shown to cause some tumors in animals (Azar *et al.* 1973; Koller *et al.* 1985; Van Esch and Kroes 1969). However, epidemiology studies, despite large exposures among workers, have failed to indicate that lead may cause cancer in humans (Kang *et al.* 1980; Cooper *et al.* 1985; Selevan *et al.* 1985; Baker *et al.* 1980). USEPA has classified lead as a Category B2 carcinogen, due to sufficient evidence from animal bioassays (renal tumors in rats ingesting lead for a lifetime) but inadequate evidence in humans (USEPA 2008). The data are considered inadequate to develop a slope factor for lead. Lead appears to be more potent as a systemic toxicant to the hemopoietic and neurologic systems than as a cancer-causing agent.

Mutagenicity

According to USEPA, "Lead acetate induces cell transformation in Syrian hamster embryo cells (DiPaolo et al. 1978) and also enhances the incidence of simian adenovirus induction. Lead oxide showed similar enhanced adenovirus induction (Casto et al. 1979). Under certain conditions lead compounds are capable of inducing chromosomal aberrations in vivo and in tissue cultures. Grandjean et al. (1983) showed a relationship between SCE and lead exposure in exposed workers. Lead has been shown, in a number of DNA structure and function assays, to affect the molecular processes associated with the regulation of gene expression" (USEPA 2008).

Systemic Toxicity

The predominant systems affected by chronic lead inhalation or ingestion by humans are the hematologic, neurologic, cardiovascular, and renal systems (ATSDR 2007). The basis for lead toxicity is its ability to bind to ligating groups in physiologically critical biomolecules, which may then disrupt their function by competing with essential metal ions for binding sites, inhibiting enzyme activity, and altering ion transport (Calabrese and Kenyon 1991). Toxic hematologic effects include inhibition of several enzymes involved in heme synthesis, with resultant depression of hemoglobin synthesis and anemia. The primary cardiovascular effect is elevation of blood pressure, a dose-dependent effect that also lacks any apparent threshold (Harlan 1988). Neurologic effects typically manifest themselves as neurobehavioral effects and alterations of the peripheral nervous system. Consequences can include weakness in the limbs (Zimmerman-Tansella et al. 1983), fatigue (Hänninen et al. 1979; Baker et al. 1979), loss of memory function (Hänninen et al., 1979), significant impairment in learning capacity (Wang et al. 1989; Rummo et al. 1979; Ernhart et al. 1981), limb tremors (Baker et al. 1979), and encephalopathy at higher blood levels (Rummo et al. 1979). High blood lead levels have also been correlated with nephropathy, gastrointestinal effects, and electrocardiographic abnormalities (ATSDR 2007).

Exposure to environmental lead levels which translate to relatively low blood lead levels has been shown to have adverse effects upon several physiological parameters. These include the alteration of several of the enzymes involved in the synthesis of the heme moiety, an essential component of substances like hemoglobin (the oxygen transporter in red blood cells), cytochromes P-450 (major xenobiotic detoxification mechanisms) and respiratory cytochromes (major source of metabolic energy reserves). In addition, neurologic effects upon behavior, memory, learning capacity, and emotion have been established. Increases in blood pressure in the middle-aged have also been observed. These effects manifest themselves at all measured blood lead levels, with no known threshold in humans. However, animal studies have been performed to evaluate the toxic endpoints of low level lead exposure, and doses at which there are no or minimal apparent effects have been achieved. The existence of neurologic impairments from serum levels of lead below 10 μg/dL is currently being debated in the scientific community. Because infants and young children appear to be particularly sensitive to the neurologic effects of lead, no threshold dose has been established for either oral or inhalation exposure.

Toxicokinetics

The absorption rate of deposited lead depends on various factors, particularly on the physicochemical form of lead in particles. No evidence of lead accumulation in the lungs exists (Friberg et al. 1986). About 90% of lead particles in ambient air that are deposited in the lungs are small enough to be retained and are absorbed through alveoli into the bloodstream. Larger particles are cleared from the repiratory tract and swallowed. (Doull et al. 1986).

Absorbed lead is transported by blood to various organs and tissues, particularly the liver and kidney. It is then gradually redistributed to form an exchangeable compartment between blood and soft tissues and a storage compartment in bone, teeth, and hair. In humans subjects with low lead exposure, about 90% of the total body burden is found in bone. Lead in bone builds up

throughout life. In soft tissues it stabilizes early in adult life and may decrease with age. Lead circulating in the blood is mainly bound to erythrocytes where its concentration is about 16 times higher than in plasma. Lead also has an affinity for cell membranes and mitochondria, but not for lysosomes. (Friberg et al. 1986; Gilman et al. 1985).

Placental transfer of lead has been demonstrated. There is fairly good correlation between lead concentrations in the blood of mothers and newborn infants, and the distribution in fetal tissues is similar to the distribution in the adult (Friberg et al. 1986; Doull et al. 1986).

Metabolism

About 90% of ingested lead is unabsorbed and eliminated through feces. Absorbed lead is excreted primarily in urine (about 76%); about 16% is eliminated through gastrointestinal secretions, and less than 8% through hair, nails, and sweat. The rate of biliary excretion in man is not known. The mechanism of excretion appears to be essentially glomerular filtration. Lead is also excreted in human milk in concentrations up to 12 μg/L.

Lead excretion varies considerably among animal species. The main route of excretion is via the urine in baboons; but in rats and sheep, biliary and transmucosal excretion may be higher than urinary excretion (Friberg et al. 1986).

Toxicity Values

The derivation of a toxicity value for an allowable lifetime exposure hinges upon the concept of a threshold under which the critical toxic effect will not be manifested during the average person's lifetime and over which the critical effect, as well as additional toxic effects, may occur. However, certain toxic effects have been observed to occur at any measured blood levels of lead.

No lead toxicity values have been formally adopted by regulatory agencies. There are two major complicating factors in assigning a toxicity value to lead and predicting subsequent risks associated from exposure. These factors include the complex nature of the kinetic modeling of lead distribution within the human body, and the lack of a threshold level for certain adverse health effects. Inherent in reaching any conclusion with respect to the toxic effects of lead, or any compound, is a knowledge of the internal levels of exposure as well as the relationship between the exposure level and the critical or toxic endpoint. Once lead is internalized, it distributes among blood, soft tissue, and bone. The complication arises due to the fact that lead in bone, while remaining complexed there for very long time periods (decades), can be redistributed throughout the body, thus giving additive exposures beyond the initial exposure. In this way, a cumulative toxic effect can occur, which may not have initially been expressed.

A blood lead level of 10 μg/dL has been identified as a level at which toxic effects in humans can be manifested (e.g., decreased intelligence, impaired neurobehavioral development, elevated blood pressure) (CDC 1991).

Currently, lead is not regulated as a carcinogen because it appears to be more potent as a toxicant to the hemopoietic system by inhibiting heme synthesis.

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MANGANESE

Manganese (Mn; CAS Registry No. 7439-96-5) is a pinkish gray, lustrous and brittle metal that is used in rock crushers and in the manufacture of ceramics, matches, glass, dyes, welding rods. It is a component of steel and metal alloys. (ATSDR 2008).

Cancer

USEPA considers manganese to be unclassifiable as a human carcinogen (Category D), based on an absence of human carcinogenicity data, inadequate evidence of carcinogenicity in animals, and inadequate genotoxicity data (USEPA 2008).

Mutagenicity

Few genotoxicity assays of manganese have been conducted. No studies were located regarding genotoxic effects in humans (ATSDR 2008). Treatment of male rats with manganese at repeated oral doses of 0.014 mg/kg-day manganese for 80 days did not produce any significant chromosomal damage in bone marrow or sperm cells (Dikshith and Chandra 1978). Results of *in vitro* genotoxicity assays have been mixed. The available data indicate that manganese may have genotoxic potential, but they are not sufficient to evaluate the genotoxic risk of manganese to humans (ATSDR 2008).

Systemic Toxicity

Humans exert an efficient homeostatic control over manganese so that body burdens are kept constant with variations in diet. Manganese is an essential element, being required for normal human growth and maintenance of health. Children may be less susceptible to manganese intoxication and may require slightly higher levels of manganese than do adults (USEPA 2008).

The World Health Organization (WHO 1973) reviewed several investigations of adult diets and reported the average daily consumption of manganese to range from 2.0 to 8.8 mg/day. Higher manganese intakes are associated with diets high in whole-grain cereals, nuts, green leafy vegetables, and tea. Depending on individual diets, a normal intake may be well over 10 mg Mn/day, especially from a vegetarian diet. While the actual intake is higher, the bioavailability of manganese from a vegetarian diet is lower, thereby decreasing the actual absorbed dose. From manganese balance studies, the WHO concluded that 2-3 mg/day is adequate for adults and that 8-9 mg/day is "perfectly safe" (WHO 1973).

An epidemiologic study of manganese in drinking water was performed by Kondakis et al. (1989). Three areas in northwest Greece were chosen for this study, with manganese concentrations in natural well water of 3.6-14.6 ug/L in area A, 81.6-252.6 ug/L in area B, and 1,600-2,300 ug/L in area C. The total population of the 3 areas being studied ranged from 3,200 to 4,350 people. Although the amount of manganese in the diet was not reported, the authors indicated that most of the food was purchased from markets. The individuals chosen were submitted to a neurologic examination, the score of which represents a composite of the presence and severity of 33 symptoms (e.g., weakness/fatigue, gait disturbances, tremors, dystonia).

Whole blood and hair manganese concentrations were also determined. The authors indicate that the difference in mean scores for area C versus A was significantly increased for both sexes combined. In a subsequent analysis, logistic regression indicated that there is a significant difference between areas A and C, even when both age and sex are taken into account (Kondakis 1990). The NOAEL identified in this epidemiological study was 0.005 mg/kg-day (USEPA 2008).

The major toxic effects of inhaled manganese are primarily neurological. A syndrome called "manganism" has been observed only in workers exposed to chronic, high levels of manganese. It is characterized by preliminary general weakness, anorexia and muscle pain, with psychological signs such as apathy and dullness, as well as impotence. Advanced stages include difficulty in walking, muscle tremor, and behavioral disturbances. This syndrome has not been observed for low level, chronic or sporadic exposures, nor has it been observed in studies with animals (ATSDR 2008).

Roels et al. (1992) conducted a cross-sectional study of 92 male workers exposed to manganese dioxide (MnO_2) dust in a Belgian alkaline battery plant. A control group of 101 male workers was matched for age, height, weight, work schedule, coffee and alcohol consumption, and smoking; educational level was slightly higher in the control group. The manganese-exposed group had been exposed to MnO_2 for an average of 5.3 years (range: 0.2-17.7 years). The geometric means of the workers' TWA airborne manganese concentrations, as determined by personal sampler monitoring at the breathing zone, were 0.215 mg/m^3 for respirable dust and 0.948 mg/m^3 for total dust. The authors noted that the personal monitoring data were representative of the usual exposure of the workers because work practices had not changed during the last 15 years of the operation of the plant.

Geometric mean concentrations of blood manganese (MnB) (0.81 ug/dL) and urinary manganese (MnU) (0.84 ug/g creatinine) were significantly higher in the Mn-exposed group than in the control group, but on an individual basis no significant correlation was found between either MnB or MnU and various external exposure parameters. A self-administered questionnaire focused on occupational and medical history, neurological complaints, and respiratory symptoms. Responses to the questionnaire indicated no significant differences between groups in either respiratory or neurological symptoms, nor were spirometric, hormonal, or calcium metabolism measurements significantly different for the two groups (Roels et al 1992).

Of particular note, manganese workers performed worse than controls on several measures of neurobehavioral function. Visual reaction time was consistently and significantly slower in the manganese-exposed workers measured in four 2-minute periods, with more pronounced slowing over the total 8-minute period and significantly greater variability in reaction times for the exposed group. Abnormal values for mean reaction times (defined as greater than or equal to the 95th percentile of the control group) also were significantly more prevalent in the exposed group during three of four 2-minute intervals of the 8-minute testing period. Five measures of eye-hand coordination (precision, percent precision, imprecision, percent imprecision, and uncertainty) reflected more erratic control of fine hand-forearm movement in the exposed group than in the controls, with mean scores on all five measures being highly significantly different for the two groups. There was also a significantly greater prevalence of abnormal values for

these five measures in the manganese-exposed group. The hole tremormeter test of hand steadiness indicated a consistently greater amount of tremor in the exposed workers, with performance for two of the five hole sizes showing statistically significant impairment (Roels et al. 1992).

A LOAEL may be derived from the Roels et al. (1992) study by using the IRD concentration of MnO_2, expressed as mg/m^3 years (based on 8-hour TWA occupational exposures for various job classifications, multiplied by individual work histories in years). Dividing the geometric mean IRD concentration (0.793 mg/m^3 years) by the average duration of the workers' exposure to MnO_2 (5.3 years) yields a LOAEL of 0.15 mg/m^3. Adjusted for continuous exposure, the LOAEL is 0.05 mg/m^3.

Roels et al. (1987) conducted a cross-sectional study in 141 male workers exposed to MnO_2, manganese tetroxide (Mn_3O_4), and various manganese salts (sulfate, carbonate, and nitrate). A matched group of 104 male workers was selected as a control group. The two groups were matched for socioeconomic status and background environmental factors; in addition, both groups had comparable work-load and work-shift characteristics. Significant differences in mean scores between manganese-exposed and reference subjects were found for objective measures of visual reaction time, eye-hand coordination, hand steadiness, and audio-verbal short-term memory. The prevalence of abnormal scores on eye-hand coordination and hand steadiness tests showed a dose-response relationship with blood manganese levels; short-term memory scores were related to years of manganese exposure but not to blood manganese levels. The prevalence of subjective symptoms was greater in the exposed group than in controls for 20 of 25 items on the questionnaire, with four items being statistically significant: fatigue, tinnitus, trembling of fingers, and irritability. Based upon the findings of impaired neurobehavioral function in workers whose average Mn exposure was estimated by the geometric mean TWA of total airborne manganese dust at the time of the study, a LOAEL of 0.97 mg/m^3 was identified, which, when adjusted for continuous exposure, is equivalent to a LOAEL of 0.34 mg/m^3. This LOAEL is based on total manganese dust of mixed forms, whereas the LOAEL from Roels et al. (1992) study is based on the measured respirable dust fraction of MnO_2 only.

Minimal information regarding manganese and the dermal exposure route could be located. It is generally regarded that manganese uptake across intact skin is very limited, as is the case for most inorganic forms of metal ions (ATSDR 2008).

Toxicokinetics

Exposure to manganese mainly occurs via ingestion and inhalation. The extent to which manganese is absorbed across the intestine is approximated at 3-5 percent, and does not appear to be substantially influenced by the carrier medium (i.e., water versus food). Similar extents of absorption have been noted in animals as well, with typical amounts equal to 2.5-5.5 percent. Manganese distributes to various tissues following ingestion, and serves as a normal tissue constituent. Tissue levels may be somewhat higher in animal tissues than in their human tissue counterparts. Manganese which is inhaled, typically in particle form, is absorbed to some unknown extent across the lungs, and a certain percentage of inhaled manganese particles are subsequently swallowed and ingested as well (ATSDR 2008).

Metabolism

Manganese is not known to be metabolized or biotransformed, and behavior within the body would be essentially limited to absorption, distribution, potential sequestration, and excretion. The valence state of manganese is thought to undergo changes within the body (alterations in oxidation state), which may influence its ability to form complexes or serve as a co-factor for certain proteins (ATSDR 2008).

Toxicity Values

The information used to determine the RfD for manganese in food was taken from many large populations consuming normal diets over an extended period of time with no adverse health effects (WHO 1973; NRC 1989; Schroeder et al. 1966). A NOAEL of 0.14 mg/kg-day (corresponding to 10 mg/day for a 70 kg adult) is based on a composite of data from all three references. The Food and Nutrition Board of the National Research Council (NRC 1989) determined an "adequate and safe" intake of manganese to be 2-5 mg/day for adults. This level was chosen because it includes an "extra margin of safety" from the level of 10 mg/day, which the NRC considered to be safe for an occasional intake. To evaluate exposure to manganese in all other exposure pathways besides diet, the USEPA recommends modifying the oral RfD by a factor of 3 (USEPA 2008).

The inhalation RfC for manganese is based on a LOAEL of 0.05 mg/m^3 as determined by Roels et al. (1992) (USEPA 2008). An uncertainty factor of 1,000 reflects factors of 10 to protect sensitive individuals, 10 for use of a LOAEL, and 10 for database limitations reflecting both the less than chronic periods of exposure and the lack of developmental data, as well as potential but unquantified differences in the toxicity of different forms of manganese. Thus, the RfC is $5x10^{-5}$ mg/m^3, which is equivalent to an inhalation RfD of $1.4x10^{-5}$ mg/kg-day. No cancer slope factors can be calculated for manganese at this time because of a lack of data.

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NAPHTHALENE

Naphthalene ($C_{10}H_8$, CAS Registry No. 91-20-3) is a white crystalline solid that is sometimes powdered or flaked. It has the odor of moth balls and is used as an ingredient of some moth repellants and toilet bowl cleaners. It is also a combustion product of crude oil, gasoline, diesel fuel (and thus a constituent of vehicle emissions) and tobacco. Melted naphthalene is corrosive to some forms of plastics, rubber, and coatings.

Cancer

Naphthalene has been tested in studies capable of detecting the ability to cause cancer; however, all but one study showed no such evidence. In the 2-year NTP study of chronic toxicity and carcinogenicity (NTP 1992), a statistically elevated incidence of lung alveolar/bronchiolar adenomas at the high dose level was observed in female mice at the highest dose tested. This study provides weak, possibly questionable, evidence of carcinogenicity, because (a) only one sex showed the tumorigenic effect; (b) only one tumor type (benign) was observed; (c) no dose-response existed, since the tumors were present only in the group receiving the highest dose; and (d) the strain of mice used in the study typically exhibits high spontaneous rates of lung adenomas.

EPA has reclassified the potential carcinogenicity of naphthalene to Group C, based on inadequate human carcinogenicity data and limited evidence of carcinogenicity in animals via the inhalation route (USEPA 2008).

Systemic Toxicity

Several studies have been reported on the subchronic and chronic toxicity of naphthalene. At high inhalation and oral doses, naphthalene can produce injury. Cataracts were diagnosed in 8 of 29 chemical plant workers occupationally exposed to high doses of naphthalene for 5 years (Ghetto and Mariani 1956). In addition, skin contact with naphthalene can result in irritation or severe dermatitis in sensitized humans (Manahan 1989).

Naphthalene ingestion has resulted in abdominal pain, nausea, vomiting, diarrhea, urine darkening, bladder irritation, jaundice, anemia, and hyperthermia (Gerarde 1960). Daily oral administration of 1 g/kg to rabbits produced degenerative changes in the lens of the eye; within 2 weeks the whole lens became cataractous (Potts 1986). A review of the literature on cataract formation in rodents and rabbits resulting from naphthalene administration demonstrates that metabolic pathways of naphthalene differ among strains of rats, mice, and rabbits, and only some strains are susceptible to cataract formation from naphthalene ingested at high doses (Van Heyningen and Pirie 1976). Hemolytic anemia was observed in dogs given oral doses of 3-9 g of naphthalene (Zuelzer and Apt 1949), and the effect was reversible within 50 days after cessation of exposure.

The inhalation of high acute doses of naphthalene by humans has caused headache, confusion, eye irritation, nausea, profuse perspiration with vomiting, optic neuritis, hematuria, and edema (Gerarde 1960). In a 2-year study (NTP 1992), chronic exposure of mice to naphthalene at

airborne concentrations of 10 or 30 ppm resulted in chronic inflammation of the lung and nose, metaplasia of the olfactory epithelium, and hyperplasia of the respiratory epithelium. In this study, a statistically significant increase in lung adenomas occurred in females of the highest dose group compared to controls.

Toxicity Values

The oral RfD for naphthalene is 0.02 mg/kg-day (USEPA 2008), based on an unpublished subchronic study (Battelle 1980), in which rats were administered naphthalene by gavage five days/week for 13 weeks. A NOAEL of 100 mg/kg-day was identified, based on decreased mean body weights in males at the two highest doses tested. There were no changes in either food or water consumption. The NOAEL was converted to an equivalent daily dose of 72 mg/kg-day, and the chronic RfD was calculated using an uncertainty factor of 3,000 to account for intra- and inter-species variability and for the use of a subchronic study. An inhalation RfC of 0.003 mg/m^3 was derived based upon a LOAEL of 9.3 mg/m^3 in a mouse inhalation study (NTP 1992).

An inhalation unit risk of 3.4×10^{-5} per $(ug/m^3)^{-1}$ is derived by the CalEPA based upon male rat nasal respiratory epithelial adenoma and nasal olfactory epithelial neuroblastoma incidence data (NTP 2000).

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NICKEL

A natural element of the earth's crust, nickel (Ni; CAS Registry No. 7440-02-0) can exist in a wide variety of different oxidative states (-I to +IV). The most commonly encountered form of nickel is as the divalent cation (Ni^{2+}), and raw nickel is typically extracted from nickel-sulfide-bearing ore bodies. Domestic production of nickel from ores ceased in 1986, however recycled nickel continues to be an important source for industry. Nickel is used commercially in the production of various metal alloys and, as nickel salts, in electroplating, ceramics, and pigments.

No evidence clearly defines a biochemical function for nickel in higher animals or humans; however, because nickel is essential for several animals, plants, and microorganisms, nickel may be an essential micronutrient for humans also (Nielsen 1994).

Cancer

Nickel refinery dust and one of its major constituents, nickel subsulfide, have been classified as human carcinogens (Category A) by EPA (USEPA 2008). Epidemiologic studies have shown that occupational exposure to nickel via inhalation of nickel refinery dust is associated with an increased incidence of lung and nasal tumors in exposed workers (Chovil et al. 1981; Doll et al. 1977). In a reanalysis of most of the epidemiology studies in nickel workers (Doll 1990), respiratory cancers were found to be associated primarily with exposure to soluble nickel compounds at concentrations greater than 1 mg Ni/m^3 and with exposure to less soluble compounds at concentrations greater than or equal to 10 mg Ni/m^3 (primarily oxide and sulfidic compounds). No evidence was found that metallic nickel causes respiratory cancer (Doll 1990).

Only nickel subsulfide has been conclusively shown to cause cancer in rodents with chronic inhalation exposure (ATSDR 2005). In an inhalation study in rats, nickel subsulfide induced benign and malignant pulmonary tumors (Ottolenghi et al. 1974). No significant increases in lung tumors occurred in rats in inhalation studies with metallic nickel (Hueper and Payne 1962; Kim et al. 1969).

Adequate carcinogenicity studies on inhalation exposure to other nickel compounds are not available. However, nickel subsulfide, metallic nickel powder, and nickel oxide induced benign and malignant lung tumors in rats after repeated intratracheal instillation (Pott et al. 1987).

Mutagenicity

Nickel and nickel compounds show equivocal results when tested in bacterial mutagenicity assays; however, genotoxic tests using mammalian cells gave positive findings (Costa et al. 1982; Costa 1989). Nickel induced cellular transformation; it also interacted with DNA resulting in crosslinks and strand breaks (Robinson and Costa 1982). Overall, available *in vitro* and *in vivo* genotoxicity data indicate that nickel is genotoxic (ATSDR 2005).

Systemic Toxicity

The most common effect of nickel in the human population is contact dermatitis resulting from dermal exposure. Drinking water contaminated with nickel has caused dizziness, fatigue, headache, nausea, cramps, diarrhea, and vomiting (Sunderman et al. 1988).

Animal studies have shown that chronic exposure to high concentrations of nickel oxide gradually induce progressive pneumoconiosis in rats (Wehner et al. 1975). Localized inflammatory response, accompanied by mild fibrosis, has also been observed in rabbits after high dose inhalation exposure to nickel graphite dust (Friberg 1950). Nickel subsulfide induced pulmonary fibrosis in rats.

Nickel is absorbed to much lesser degree through the skin than via the gastrointestinal tract. In general, no more than 1% of a dose would be expected to penetrate the skin. Dermal exposure to nickel is a known cause of acute and chronic dermatitis in humans (Dooms-Goossens et al. 1980).

Toxicity Values

USEPA (USEPA 2008) has not established an oral RfD for nickel refinery dust or for nickel subsulfide; however for soluble nickel salts, an oral RfD of 2×10^{-2} mg/kg-d has been calculated, based on decreased body and organ weights observed in a two-year feeding study in the rat (Ambrose, et al. 1976). This RfD was derived using an aggregate uncertainty factor of 300 to account for interspecies extrapolation, human variability, and inadequacies in the reproductive studies. An inhalation RfC is derived from the ATSDR MRL of 9×10^{-5} mg/m^3 based upon effects to the respiratory system (ATSDR 2005).

USEPA has calculated an inhalation unit risk of 2.4×10^{-4}/μg/m^3 for nickel refinery dust, based on consistent data from four epidemiologic studies, and 4.8×10^{-4}/μg/m^3 for the subsulfide, based on the same studies. USEPA has not evaluated soluble salts of nickel, as a class of compounds, for potential human carcinogenicity. An inhalation unit risk of 2.6×10^{-4} per (ug/m^3)$^{-1}$ is derived by the CalEPA based upon Ontario nickel refinery plant worker lung cancer mortality data (CalEPA 2009).

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THALLIUM

Thallium (Tl, CAS Registry Number 7440-28-0) is a metallic element used as a catalyst, in alloys, optical lenses, electronics, jewelry, thermometers, pigments, and in scintillation counters; historically, the element was also used as a depilatory, a rodenticide, and an insecticide (Hammond and Beliles, 1980). In nature, thallium is a trace compound in many minerals, such as potassium, copper, gold, zinc, cadmium, and rubidium. Man-made thallium pollution sources are gaseous emissions from cement factories, coal-burning power plants, and metal sewers, and wastewater from ore-processing plants.

Carcinogenicity

No studies were located by ATSDR (1992) during the Agency's review of the toxicological literature regarding the carcinogenic effects of thallium in humans or animals via inhalation, oral, or dermal exposure routes.

Mutagenicity

No studies were located by ATSDR (1992) regarding the genotoxic effects of thallium in humans. However, thallium was genotoxic in mammalian cell and bacterial test systems: thallium induced dominant lethal mutations in male rats in vivo (Zasukhina et al., 1983), damaged rat embryo DNA in vitro (Zasukhina et al., 1981, 1983), enhanced viral-induced transformations of Syrian hamster embryo cells (Casto et al., 1979), and caused damage to bacterial DNA (Kanematsu et al., 1980).

Systemic Toxicity

From its historical uses as a depilatory or in pesticide formulations, a variety of cases of thallium intoxication have been recorded. Thallium is highly toxic, and its acute toxicity is characterized by gastrointestinal irritation, acute ascending paralysis, and psychic disturbances (Hammond and Beliles, 1980).

Thallium poisoning by the oral route causes a whole roster of acute effects (including nausea, vomiting, metallic taste, anorexia, mouth dryness, soreness of the gums, rhinorrhea, conjunctivitis, diarrhea, abdominal pain, peripheral neuropathy, etc.) that are reportedly duplicated under chronic exposure scenarios, along with changes in blood chemistry, hair loss, and damage to liver, kidney, intestines, and testes (Haley and Berndt, 1987). In several subchronic studies with laboratory animals where quantitative exposure information was known, oral exposures to thallium were associated with mortality and systemic effects in the respiratory, cardiovascular, gastrointestinal, hepatic, renal, dermal, ocular, neurological, and reproductive systems; NOAELS typically occurred at oral doses of 0.2 mg/kg bw per day of thallium (ATSDR, 1992).

Few data exist concerning the inhalation toxicity of thallium to humans or animals, and no data concerning dermal exposures were located by ATSDR (1992) during the Agency's review of the

toxicological literature. The inhalation data are insufficient either to attribute or to rule out effects of thallium exposure.

Toxicokinetics

Toxicokinetic studies of thallium are largely absent. The element may be absorbed via the gastrointestinal tract, and limited evidence suggests that the absorption may be complete (Barclay et al., 1953; Lie et al., 1960). Absorption through the skin may also occur (Hammond and Beliles, 1980). The element appears to distribute throughout the body, with limited evidence suggesting preferential accumulation in the kidney (Downs et al., 1960; Manzo et al., 1983), and to a lesser extent in the intestines, thyroid, testes, pancreas, skin, bone and spleen (Hammond and Beliles, 1980). The element has an estimated biological half-time of 3.3 days (Lie et al., 1960), although EPA (1980) estimates an excretion half-time of 21.7 days. Elimination was 32 percent in the feces and 21 percent in the urine by 8 days after gavage dosing of rats with 10 mg thallium (as $TlSO_4$)/kg bw (Lehman and Favari, 1985).

Toxicity Values

The oral RfD for Thallium is derived from the IRIS oral RfD for Thallium Sulfate by factoring out the molecular weight (MW) of the sulfate ion. Thallium Sulfate (Tl2S04) has a molecular weight of 504.82. The two atoms of Thallium contribute 81% of the MW. Thallium Sulfate's oral RfD of $8x10^{-5}$ mg/kg-day multiplied by 81% gives a Thallium oral RfD of $6.48x10^{-5}$ mg/kg-day (USEPA 2008).

USEPA has not calculated an inhalation RfC. No cancer slope factors have been derived. The lack of carcinogenicity information puts thallium carbonate into cancer classification Group D (unclassifiable as to carcinogenicity) (USEPA 2008).

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1,1,2,2-TETRACHLOROETHANE

1,1,2,2-Tetrachloroethane (CAS Registry No. 79-34-5) is a colorless, synthetic liquid with a sweetish odor resembling that of chloroform. It does not burn easily. It is currently used as a chemical intermediate in the manufacture of chlorinated hydrocarbons.

Mutagenicity

1,1,2,2-Tetrachloroethane is mutagenic for the Salmonella typhimurium missense mutants TA1530 and TA1535 and selectively inhibits growth of E. coli polA (ATSDR 2008).

Systemic Toxicity

In a bioassay undertaken by NCI (ATSDR 2008) 50 each male and female Osborne- Mendel rats and B6C3F1 mice were gavaged with technical grade (90% pure) 1,1,2,2,-tetrachloroethane in corn oil, 5 days/week. Treatment was over 78 weeks, followed by observation periods of 32 weeks for the rats and 12 weeks for the mice. The high and low average doses (incorporating varying dosage levels throughout the treatment period) were, respectively, 108 and 62 mg/kg/day for male rats, 76 and 43 mg/kg/day for female rats, and 282 and 142 mg/kg/day for mice of both sexes. Control groups consisted of 20 animals/sex and species. Vehicle controls received corn oil at the same rate as the high-dose animals; untreated controls were not intubated. Ten of the high-dose female rats died within the first 5 weeks of the study, but the association between increased dosage and elevated mortality was not statistically significant for male rats. Significantly increased mortality was also evident in the high-dose mice of both sexes. No statistically significant incidence of neoplasms was observed in rats. A highly significant dose-related increase in the incidence of hepatocellular carcinomas was observed in both male and female mice.

Toxicity Values

An oral RfD of 0.004 mg/kg-day is derived by the USEPA. USEPA has classified 1,1,2,2-tetrachloroethane as a class C, possible human carcinogen with a SF of 0.2 per mg/kg-day. An inhalation unit risk of 5.8×10^{-5} per ug/m^3 is derived by the USEPA (USEPA 2008). Both the oral SF and the inhalation unit risk are based upon hepatocellular carcinoma in B6C3F1 mice (NCI 1978).

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TRICHLOROETHENE

Trichloroethene (trichloroethylene, C_2HCl_3, CAS Registry No. 79-01-6) is a colorless, nonflammable liquid with a sweetish odor resembling that of chloroform. It reacts violently with nitric acid and strong alkalies. All commercial grades of trichloroethene contain stabilizers to prevent autooxidation to phosgene or carbon monoxide gases. Most of the U.S. production of trichloroethene is used in vapor degreasing of fabricated metals, in the manufacture of polyvinyl chloride plastics, as a heat-transfer medium, in adhesives and paint strippers, and as a carrier solvent in textile dying and finishing (ACGIH 1991-1994).

The rate of pulmonary uptake doubles with exercise. Organs affected by excessive exposure to trichloroethene are the central nervous system, liver, kidney, heart, lung, and skin. In human volunteers, 50% of the dose is metabolized to trichloroethanol, 30% to minor metabolites primarily in the urine, and 8.4% appeared in feces, sweat, and saliva by the third day. Mice metabolize two and three times more trichloroethene than rats, depending on dose; and there is also considerable variability among individual humans in trichloroethylene metabolism (ACGIH 1991-1994).

Workers exposed to trichloroethene complain of headache, abnormal fatigue, gastric disturbance, irritability, anxiety, ocular and upper respiratory tract irritation, and alcohol intolerance; although no changes in performance tests occurred in one study, significant reductions in complex reaction time, memory, and perception were manifested in another. No children with congenital defects were born to women occupationally exposed over a 13-year period (Tola et al. 1980). In six epidemiologic studies, no evidence has surfaced to suggest that occupational trichloroethene exposure increases the incidence of cancer in humans (Axelson et al. 1978; Novotna et al. 1979; Spirtas et al. 1991; Stewart et al. 1991; Paddle 1983; Shindell and Ulrich 1985).

Noncarcinogenic toxicity values have been withdrawn (USEPA 2008) therefore these risks have not been quantified. The CalEPA has developed an oral SF of 0.013 per mg/kg/day and inhalation unit risk of $2x10^{-6}$ per ug/m^3, which has been used (CalEPA 2009).

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VANADIUM

Vanadium (V; Chemical Abstracts Service [CAS] registry number 7440-66-6) is a gray-to-lustrous-white elemental metal (pliable solid or powder) used primarily as an alloying agent in metals; as an ingredient in pesticides, dyes, and pigments; and as an industrial catalyst. Vanadium undergoes violent reactions in the presence of bromine trifluoride, chlorine, lithium, or oxidants; powdered vanadium explodes with chlorine even at 0°C. While functional roles for vanadium in humans have yet to be confirmed, evidence supports the concept that vanadium is an essential micronutrient for animals (French and Jones 1992).

Carcinogenicity

No studies regarding the carcinogenic effects of vanadium or vanadium compounds in humans or animals were located by ATSDR (1992) during that Agency's initial review of the toxicological literature. The International Agency for Research on Cancer reported negative experimental evidence of the carcinogenicity of metallic vanadium, vanadyl ions, and trivalent vanadium 2,4-pentanedione (Boffetta 1993). Leonard and Gerber (1994) noted the lack of data for a carcinogenic determination, but mentioned that vanadium is mitogenic with the concomitant potential for associated carcinogenicity (e.g., Ames and Gold 1990). In a study by Bishayee et al. (1997), ammonium vanadate appeared to modulate several factors associated with erythropoiesis under carcinogenic challenge by diethylnitrosamine. On the other hand, recent evidence indicates that vanadium is a tumor promoter when it is able to transactivate AP-1-dependent gene expression. With vanadium, AP-1 transactivation is dependent on the generation of O_2- and H_2O_2, but not OH (Ding et al. 1999).

Mutagenicity

In vitro genotoxicity assays have shown that vanadium or vanadium compounds are generally positive in bacterial (Kada et al. 1980; Kanematsu et al. 1980), yeast (Sora et al. 1986), rodent (Smith 1983), and human cell (Birnboim 1988; Hanauske et al. 1987) studies. However, there are no *in vivo* assays which have assessed the genotoxicity of vanadium compounds (as reported by ATSDR 1992). In 1994 Leonard and Gerber concluded that vanadium compounds are not clastogenic, but can be weakly mutagenic. In a Syrian hamster embryo assay (Kerckaert et al. 1996), vanadium pentoxide was negative with a 24-hr exposure, but positive with a 7-day exposure. This pattern of response (24-hr SHE negative/7-day SHE positive) has been seen with other chemicals which have tumor promotion-like characteristics.

Systemic Toxicity

Study volunteers were fed capsules containing 0.47-1.3 mg V (as ammonium vanadyl tartrate) per kilogram of body weight for a duration of 3 months. No hematological, hepatic, or renal effects were found. Subjects reported intestinal cramping and diarrhea (Dimond et al. 1963); but without concurrent experimental controls, the reported effects are not necessarily directly attributable to vanadium (ATSDR 1992).

The major effects in humans from exposure to vanadium vapors, aerosols, and dusts are irritant in nature, as observed from a variety of occupational epidemiological studies, case reports, and clinical studies. In general, irritation to the respiratory tract occurs at lower concentrations than to skin or eyes (Calabrese and Kenyon 1991). Workers exposed to vanadium compound dust have reported dry mouth, rhinitis, epistaxis, tracheitis, metallic taste, green tongue, and irritated eyes. One of the primary acute effects of vanadium exposure is peripheral vasoconstriction of lungs, spleen, kidneys, and intestines. Prolonged exposure can cause cardiac arrythmias and bradycardia.

Rodent mortality (LD_{50}) occurred at doses of approximately 30-40 mg V (as $NaVO_3$) kg^{-1} (Llobet and Domingo 1984), but chronic dietary exposures at 4.1 mg V (as $VOSO_4$) were not lethal (Schroeder and Balassa 1967; Schroeder et al. 1970). A three-month exposure to $NaVO_3$ in drinking water produced mononuclear cell infiltration in rat lungs, primarily in the perivascular region (Domingo et al. 1985). Cardiovascular effects in rodents have also been reported (Susic and Kentera 1986).

Exposure of male white rats (n=11 per exposure group) to a 70-day continuous fumigation with 0, 0.002, or 0.27 mg V (as V_2O_5) m^{-3} produced significant systemic effects in the high-exposure group that were not observed in the low-exposure group (Pazynich 1966). Effects included alterations in motor chronaxy, decreased oxyhemoglobin content, effects on leukocyte nuclei, and pathological conditions in several organ systems (lungs, liver, kidneys, and heart). ATSDR (1992) summarizes a variety of inhalation exposure studies, but presents quantitative exposure information only for acute studies; subchronic or chronic studies were apparently too deficient in detail to provide the Agency with quantitative toxicological information, and the effects presented in the studies are only cursorily discussed.

The effects of dermal exposure to vanadium or vanadium compounds appear to be largely unstudied. Dermal absorption and skin irritation were reported following the application to rabbit skin of a 20 percent solution of sodium metavanadate (Stokinger 1967); human skin absorption, however, may be very low (USEPA 1977), as evidenced by a lack of skin penetration during an *in vitro* study using radiolabelled vanadium (Roshchin et al. 1980).

Toxicokinetics

For the general populace, exposures to vanadium compounds occur largely through food, while industrial workers are more commonly exposed to vanadium-containing dusts, fumes, and aerosols.

Vanadium is absorbed from a variety of foods with a relatively low efficiency, but in sufficient quantities to be stored at detectable levels in many body tissue (French and Jones 1992). Generally, less than 5 percent of the ingested dose is absorbed through the gastrointestinal tract (Byrne and Kosta 1978; Curran et al. 1959; Nielsen 1994), while airborne vanadium is absorbed very efficiently by the lungs (Boyd and Kustin 1985). The ICRP (1960) indicated that approximately 25 percent of soluble vanadium compounds may be absorbed via the respiratory tract. Although the body burden of vanadium is typically very small (French and Jones 1992), the element distributes throughout the body with preferential accumulation usually observed in

the liver, kidney, and bone (Byrne and Kosta 1978; Nechay et al. 1986; Mongold et al 1990). Blood is the medium for the distribution of vanadium, of which about 95 percent is bound to transferrin as the vanadyl ion (V^{+4} as VO^{+2}) (Patterson et al. 1986). Because of the low level of absorption via the gastrointestinal tract, the majority of ingested vanadium is excreted via the feces; absorbed vanadium is excreted primarily in the urine (IPCS 1988).

Metabolism

As an elemental molecule, vanadium *per se* is unmetabolizable, however, metabolic incorporations of vanadium have been studied. In the biological tissues, vanadium occurs largely as interconversions between two oxidation states: tetravalent vanadyl (V^{+4}) or pentavalent vanadate (V^{+5}) (ATSDR 1992). Within the organism, the role of vanadium has yet to be definitively understood, although the following effects occur under conditions of vanadium deficiency: increased abortion and perinatal death rates, decrease milk production, hepatic lipid and phospholipid changes, growth impairment (of bone, tooth, and cartilage), nutritional edema, thyroid metabolism changes, and depressed overall growth (French and Jones 1992). The widely varying pharmacological actions of vanadium have been poorly understood and are receiving increasing attention, particularly with respect to insulinomimetic properties (French and Jones 1992).

Toxicity Values

A 1953 chronic oral study in rats by Stokinger et al. was used by USEPA to determine an oral RfD for vanadium pentoxide (USEPA 2008). An unspecified number of rats were dosed via the diet with 17.85 or 178.5 ppm vanadium pentoxide for 2.5 years. Vanadium toxicity was evaluated by examining growth rate, survival and hair cystine content. The only significant effect was decreased hair cystine at the higher dose, and USEPA extrapolated from a no-adverse-effect level of 17.85 ppm, converted to 0.89 mg/kg/day, to calculate a reference dose of 9×10^{-3}, or 0.009 mg/kg-day. An uncertainty factor of 100 was used (10 for interspecies extrapolation and 10 to allow for sensitive subpopulations); confidence in this RfD is low because of the lack of details reported in the study and the lack of available data on vanadium pentoxide. The oral RfD toxicity value for Vanadium is derived from the IRIS oral RfD for Vanadium Pentoxide by factoring out the MW of the oxide ion. Vanadium Pentoxide has a molecular weight of 181.88. The two atoms of Vanadium contribute 56% of the MW. Vanadium Pentoxide's oral RfD of $9x10^{-3}$ mg/kg-day is multiplied by 56% and results in a Vanadium oral RfD of $5.04x10^{-3}$ mg/kg-day.

USEPA has not provided an inhalation RfC for vanadium or any of its compounds in the IRIS record. USEPA has not classified vanadium as to its carcinogenic potential (USEPA 2008). No oral or inhalation slope factors exist (USEPA 2008).

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ZINC

Zinc (Zn) is a nutritionally essential trace element that also plays various industrial roles in galvanizing processes; paint formulations; and rubber, glass, or paper production. Because it does not rust, zinc provides a protective coating on other metals; it is also used in alloys such as bronze and brass to make electrical equipment, and with copper to make U.S. coins. Zinc salts are used in ceramics, textiles, batteries, and also in the pharmaceutical industry as a solubilizing agent in many drugs. Zinc is ubiquitous in the environment and in foods; it is released to the environment from such anthropogenic activities as mining, steel production, burning of coal and wastes, and from its own purification processes. Zinc is deleterious to human health in too little or too great quantities.

Systemic Toxicity

The toxic effects observed in humans following oral exposure to zinc as zinc oxide included abdominal pain, vomiting, anemia (ATSDR 2005), decreased HDL cholesterol (Chandra 1984; Hooper et al. 1980), and pancreatic damage (Chobanian 1981; Murphy 1970) at a dose greater than 10 times the recommended dietary allowance for zinc. High doses of Zn in humans cause decreased levels of hemoglobin and hematocrit, and similar effects were observed in other experimental animals species (ATSDR 2005). Ulceration of the forestomach and intestinal bleeding were reported for mice dosed with 1,110 mg Zn/kg-day and ferrets dosed with 390 mg/kg-day (Maita et al. 1981, Straube et al. 1980).

As a dietary requirement, oral exposure to zinc has been well-studied in animals and humans. With a variety of experimental durations (from >14 days to >1 year), adverse effects from zinc excess include mortality, gastrointestinal, hematological, musculoskeletal, hepatic, renal, immunological, and developmental changes (ATSDR 2005). In general, most of the animal NOAELS for these effects occur at daily ingestion of zinc ranging from 10 to 100 mg/kg, although dog NOAELs of 2 mg/kg-day for gastrointestinal and musculo-skeletal toxicity were obtained by Anderson and Danylchuk (1979) in a 9-month study of dogs given zinc in drinking water. For the same types of adverse effects, the typical range of human LOAELs and NOAELs is from 1 to 5 mg/kg-day, although Kynast and Saling (1986) report a NOAEL of 0.09 mg/kg-day for developmental effects in humans administered daily doses of zinc aspartate in capsules for 11 weeks duration.

Toxicity Values

USEPA has established an oral reference dose (RfD) of 0.3 mg zinc (as a soluble salt) ingested per kilogram body weight per day, based on a decrease in erythrocytic superoxide dismutase content in adult human females after 10 weeks of zinc exposure (Yadrick et al. 1989). This RfDis based upon a dietary supplement LOAEL dosage of approximately 60 mg/kg, converted to 1 mg/kg-day, and by applying an aggregate uncertainty factor of 3. The uncertainty factor accounts for the use of a minimal LOAEL from a moderate-duration study of the most sensitive humans and consideration of a substance that is an essential dietary nutrient (USEPA 2008).

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VINYL CHLORIDE

Vinyl chloride, or chloroethylene (C_2H_3Cl, CAS Registry No. 75-01-4), is a colorless gas or liquid with a sweet odor. In the presence of moisture, it corrodes iron and steel. Formerly used as a refrigerant, aerosol propellant, drug and cosmetic ingredient, and extraction solvent, vinyl chloride is currently used in the manufacture of numerous products in building and construction and the automotive industry (in electrical wiring insulation and cables, piping, floor tiles, and industrial and household equipment); it is used in medical supplies, and is depended upon heavily by the rubber, paper, plastics, and glass industries.

No information is available on the potential human health effects associated with subchronic or chronic oral exposure to vinyl chloride. However, several studies have focused on the potential toxic effects in laboratory animals following subchronic or chronic oral exposure. These studies have identified hematotoxicity and hepatotoxicity as potential toxicity endpoints in animals following oral exposure. Two- to 3-year feeding studies in rats have identified NOAELs for hematotoxicity (hypercoagulation) in the range of 1.7-5.6 mg/kg/day and LOAELs for hepatotoxicity (cellular alteration) in the range of 0.018-1.8 mg/kg/day (Til et al. 1983, Feron et al. 1981).

No information is available on the potential human health effects associated with subchronic inhalation exposure to vinyl chloride. However, a large number of studies involving work-place exposures have focused on health effects associated with chronic inhalation exposure. These studies have identified a wide range of potential toxicity endpoints in humans resulting from inhalation exposure, including hepatotoxicity, respiratory toxicity, hematotoxicity, immunotoxicity, cardiovascular toxicity, dermal toxicity, musculoskeletal toxicity, neurotoxicity, and reproductive toxicity. However, these studies are all compromised by a failure to accurately report the vinyl chloride levels that workers were exposed to.

Many of the findings obtained from the human studies described above have been supported by animal studies. Three- to 12-month studies involving rats and mice have identified LOAELs for hepatotoxicity (hepatocellular hypertrophy with compression of sinusoids, fatty degeneration, increased liver weight, increased lipid droplets in and hyperplasia of hepatocytes) in the range of 10-3000 ppm (Wisniewska-Knypl et al. 1980, Torkelson et al. 1961, Bi et al. 1985, Schaffner 1978, Hehir et al. 1981). NOAELs for respiratory toxicity have been identified through 2 to 5 month rat and mouse studies as lying between 50 and 500 ppm (Hehir et al. 1981). NOAELs for hematotoxicity between 200 and 1000 ppm have been identified through rat and mouse studies of 2 to 6 months (Torkelson et al. 1961, Sharma and Gehring 1979). A LOAEL for immunotoxicity (increased spontaneous lymphocyte proliferation) of 10 ppm was identified in a 2 month mouse study (Sharma and Gehring 1979). Separate 3 and 6 month rat studies have identified 10 ppm as a NOAEL and LOAEL, respectively, for cardiovascular toxicity (increased heart weight) (Bi et al. 1985).

Three- to 12-month rat studies have identified NOAELs for male reproductive toxicity (testicular necrosis, decreased spermatogenesis, reduced male fertility, decreased testicular weight) of 10 and 50 ppm (Sokal et al. 1980, Short et al. 1977, Bi et al. 1985).

Because vinyl chloride has a relatively low boiling point (-13.4 deg. C), dermal exposure under the majority of environmental conditions is not likely to be significant since volatilization will occur before significant dermal uptake takes place. Therefore, no studies of toxicity in either humans or animals following subchronic or chronic dermal exposure to vinyl chloride have been completed.

Vinyl chloride is classified by EPA as a known human carcinogen (Group A) (USEPA 2001). No human studies investigating a link between oral exposure to vinyl chloride and an excess incidence of cancer have been conducted. However, rat studies have identified cancer effect levels (CELs), or the dosing level at which significant increases in cancer rates over controls occur, for hepatic tumors in rats following oral exposure to vinyl chloride in the range of 1.7-1.8 mg/kg/day (Feron et al. 1981, Til et al. 1983).

Human epidemiological studies focusing on workers have identified a wide range of possible cancers linked to chronic inhalation of vinyl chloride including cancers of the liver, brain, lung, and blood. However, these studies all lack detailed exposure data. Inhalation rat, mouse, and hamster studies have identified CELs for hepatic tumors between of 1 and 500 ppm (Hong et al. 1981, Drew et al. 1983, Lee et al. 1978, Maltoni et al. 1981, Bi et al. 1985). Drew et al. (1983) identified a CEL of 50 ppm for peritoneal cancer in a mouse study. CELs between 50 and 100 ppm were identified for lung cancer through mouse studies (Adkins et al. 1986, Suzuki 1982, Drew et al. 1983, Lee et al. 1978). CELs for mammary gland cancer of between 5 and 50 ppm were identified through rat and mouse studies (Hong et al. 1981, Maltoni et al. 1981).

Toxicity values USEPA has established a oral slope factor for vinyl chloride of 1.5 mg/kg/day based on a rat feeding study (Feron, Hendriksen, Speek et al. 1981) that identified an increased incidence of lung and liver tumors (HEAST, 1994).

USEPA has established an unverified inhalation slope factor for vinyl chloride of 3.2×10^{-2} mg/kg/day based on an rat inhalation study (Maltoni 1981) that identified an increased incidence of liver tumors (HEAST, 1994).

USEPA (2008) has provided an oral RfD of 0.003 mg/kg/day based on a rat hepatic endpoint, which has been used in this risk assessment.

Both in vivo and in vitro genotoxicity assays have been conducted using vinyl chloride. In vivo studies have identified chromosomal aberrations in rats (Anderson and Richardson 1981), chromosomal aberrations in human lymphocyte (Hansteen et al 1978, Kucerova et al. 1979, Purchase et al. 1978, Ducatman et al. 1975, Anderson et al. 1980, Fucic et al. 1990, Funes-Cravioto et al. 1975, Hrivnak et al. 1990) sister chromatid exchange in human lymphocytes (Kucerova et al. 1979), and DNA alkylation in rats and mice (Laib et al. 1989, Gwinner et al. 1983, Singer et al. 1987, Bolt et al. 1986, Ciroussel et al. 1990, Eberle et al. 1989, Osterman-Golkar et al. 1977, Walles et al. 1988, Green and Hathway 1978). In vitro assays have identified reverse mutation in Salmonella typhimurium (Rannug et al. 1974, Bartsch et al. 1975, 1976, Andrews et al. 1976, Simmon et al. 1977, Elmore et al. 1976, Poncelet et al. 1980, de Meester et al. 1980, Victorin and Stahlberg 1988, McCann et al. 1975, Rannug et al. 1976), reverse mutation in Escherichia coli (Jacobsen et al. 1989), forward mutation in Schizo saccharomyces

pombe (Loprieno et al. 1977) and Chinese hamster ovary cells (Huberman et al. 1975), RNA alkylation in rat liver microsomes (Laib and Bolt 1977), and inhibition of DNA synthesis in QT6 (avian cells) (Kandala et al. 1990).

Human studies have demonstrated that 42% of vinyl chloride is retained when administered through inhalation (Krajewski et al. 1980). Animal study data supports the contention that vinyl chloride is rapidly absorbed following inhalation, however, animal data is not complete enough to allow a quantitative estimate of the amount retained. Animal data has shown that vinyl chloride levels in animal blood fall rapidly once exposure ceases (Withey 1976). No study data is available characterizing the rate of uptake for vinyl chloride in humans following oral exposure, however animal studies have shown that vinyl chloride when administered through this route, is readily absorbed (Withey 1976). Human studies investigating the rate of absorption following dermal exposure are not available and animal studies have shown that dermal uptake of vinyl chloride vapor (the state that vinyl chloride is most likely to be encountered in environmentally) is insignificant relative to other exposure routes (Hefner et al. 1975).

Following inhalation exposure, animal studies have shown that vinyl chloride is rapidly distributed to a large number of organ and tissue types throughout the body. However, vinyl chloride is not stored in these organs/tissues for extended periods because of its rapid metabolism and excretion (Buchter et al. 1977). Vinyl chloride is distributed to the following tissues/organs in rats 72 hours after inhalation exposure (in order of decreasing concentration): liver, kidney, skin, lung, muscle, carcass, plasma, fat (Watanabe et al. 1976). Placental transfer of vinyl chloride to fetal blood and amniotic fluid is rapid in rats (Ungvary et al. 1978). 72 hours after oral administration to rats, the highest concentrations of vinyl chloride were found in the liver with lesser concentrations found in the skin, plasma, muscle, lung, fat, and carcass (Watanabe et al. 1976).

One study was identified that examined the metabolism of vinyl chloride in humans following inhalation exposure. In this study, analysis of liver specimens showed electrophilic vinyl chloride metabolites resulting from cytochrome P-450 activity to be mutagenic to Salmonella typhimurium (Sabadie et al. 1980). Extensive experimentation using laboratory animals has focused on the metabolism of vinyl chloride following inhalation. These studies have demonstrated that vinyl chloride metabolism following inhalation exposure is a dose-dependent saturable process (Hefner et al. 1975) that probably involves primarily a mixed-function oxidase pathway (Bolt et al. 1977). Animal studies suggest that the metabolism of vinyl chloride following oral exposure is similar to that identified for inhalation exposure (ATSDR 1990). No animal or human studies were identified that examined the metabolic properties for vinyl chloride following oral dermal exposure.

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APPENDIX D

APPENDIX D

LEAD MODELING OUTPUTS

LEAD MODEL FOR WINDOWS Version 1.0

==========

Model Version: 1.0 Build 264
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research

==========

The time step used in this model run: 1 - Every 4 Hours (6 times a day).

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc (ug Pb/m^3)
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

****** Diet ******

Age	Diet Intake(ug/day)
.5-1	5.530
1-2	5.780
2-3	6.490
3-4	6.240
4-5	6.010
5-6	6.340
6-7	7.000

****** Drinking Water ******

Water Consumption:

Age	Water (L/day)
.5-1	0.200
1-2	0.500
2-3	0.520
3-4	0.530
4-5	0.550
5-6	0.580
6-7	0.590

Drinking Water Concentration: 4.000 ug Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 119.200 ug/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
.5-1	156.000	119.200
1-2	156.000	119.200
2-3	156.000	119.200
3-4	156.000	119.200
4-5	156.000	119.200
5-6	156.000	119.200
6-7	156.000	119.200

****** Alternate Intake ******

Age	Alternate (ug Pb/day)
.5-1	0.000
1-2	0.000
2-3	0.000
3-4	0.000
4-5	0.000
5-6	0.000
6-7	0.000

****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 2.500 ug Pb/dL

****
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
****

Year	Air (ug/day)	Diet (ug/day)	Alternate (ug/day)	Water (ug/day)
.5-1	0.021	2.577	0.000	0.373
1-2	0.034	2.677	0.000	0.926
2-3	0.062	3.031	0.000	0.971
3-4	0.067	2.944	0.000	1.000
4-5	0.067	2.879	0.000	1.054
5-6	0.093	3.054	0.000	1.117
6-7	0.093	3.380	0.000	1.139

Year	Soil+Dust (ug/day)	Total (ug/day)	Blood (ug/dL)
.5-1	3.226	6.197	3.4
1-2	5.094	8.732	3.6
2-3	5.136	9.201	3.4
3-4	5.188	9.199	3.2
4-5	3.902	7.901	2.8
5-6	3.531	7.796	2.4
6-7	3.343	7.955	2.3

LEAD MODEL FOR WINDOWS Version 1.0

==========

Model Version: 1.0 Build 264
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research

==========

The time step used in this model run: 1 - Every 4 Hours (6 times a day).

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc (ug Pb/m^3)
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

****** Diet ******

Age	Diet Intake(ug/day)
.5-1	5.530
1-2	5.780
2-3	6.490
3-4	6.240
4-5	6.010
5-6	6.340
6-7	7.000

****** Drinking Water ******

Water Consumption:

Age	Water (L/day)
.5-1	0.200
1-2	0.500
2-3	0.520
3-4	0.530
4-5	0.550
5-6	0.580
6-7	0.590

Drinking Water Concentration: 4.000 ug Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 110.100 ug/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
.5-1	143.000	110.100
1-2	143.000	110.100
2-3	143.000	110.100
3-4	143.000	110.100
4-5	143.000	110.100
5-6	143.000	110.100
6-7	143.000	110.100

****** Alternate Intake ******

Age	Alternate (ug Pb/day)
.5-1	0.000
1-2	0.000
2-3	0.000
3-4	0.000
4-5	0.000
5-6	0.000
6-7	0.000

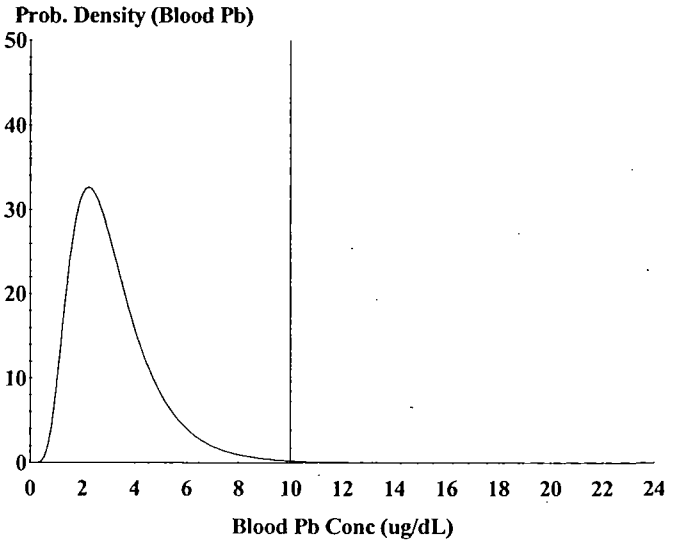
****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 2.500 ug Pb/dL

****
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
****

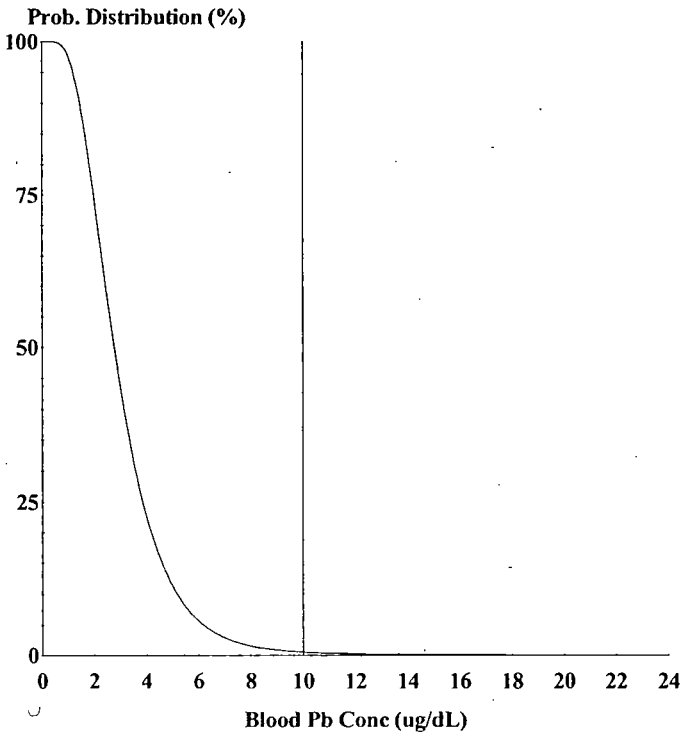
Year	Air (ug/day)	Diet (ug/day)	Alternate (ug/day)	Water (ug/day)
.5-1	0.021	2.584	0.000	0.374
1-2	0.034	2.686	0.000	0.930
2-3	0.062	3.040	0.000	0.974
3-4	0.067	2.951	0.000	1.003
4-5	0.067	2.884	0.000	1.056
5-6	0.093	3.058	0.000	1.119
6-7	0.093	3.384	0.000	1.141

Year	Soil+Dust (ug/day)	Total (ug/day)	Blood (ug/dL)
.5-1	2.977	5.956	3.2
1-2	4.702	8.353	3.5
2-3	4.739	8.815	3.3
3-4	4.785	8.806	3.1
4-5	3.596	7.602	2.7
5-6	3.253	7.523	2.4
6-7	3.079	7.697	2.2



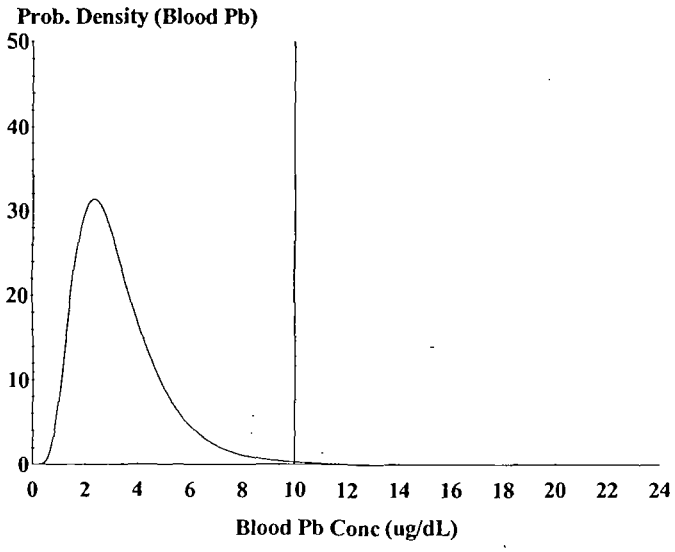
Cutoff = 10.000 ug/dl
Geo Mean = 2.901
GSD = 1.600
% Above = 0.423
% Below = 99.577

Age Range = 0 to 84 months
Time Step = Every 4 Hours
Run Mode = Research
Comment = Maxwell Point Total Soil



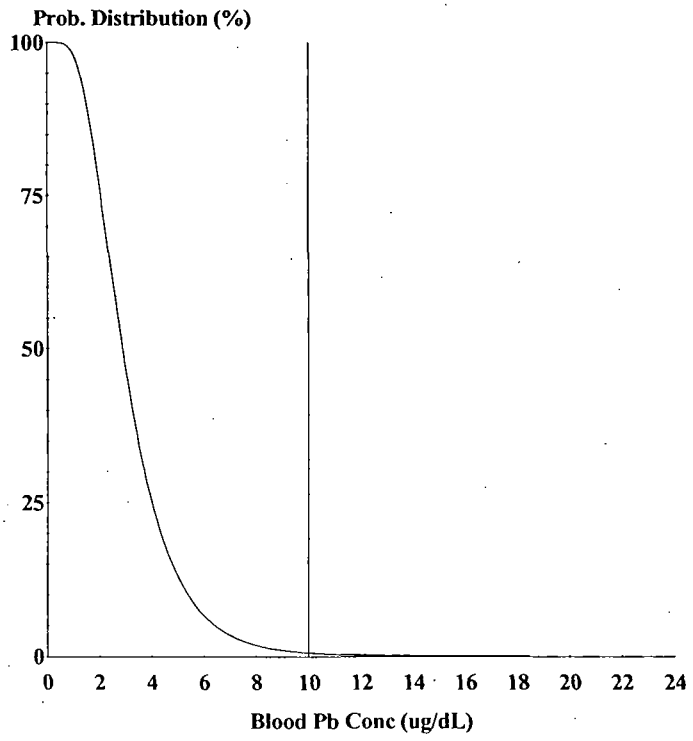
Cutoff = 10.000 ug/dl
Geo Mean = 2.901
GSD = 1.600
% Above = 0.423

Age Range = 0 to 84 months
Time Step = Every 4 Hours
Run Mode = Research
Comment = Maxwell Point Total Soil



Cutoff = 10.000 ug/dl
Geo Mean = 3.018
GSD = 1.600
% Above = 0.541
% Below = 99.459

Age Range = 0 to 84 months
Time Step = Every 4 Hours
Run Mode = Research
Comment = Maxwell Point Surface Soil



Cutoff = 10.000 ug/dl
Geo Mean = 3.018
GSD = 1.600
% Above = 0.541

Age Range = 0 to 84 months
Time Step = Every 4 Hours
Run Mode = Research

APPENDIX E

APPENDIX E

JOHNSON AND ETTINGER MODELING

DAT[illegible]RY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
71432	1.41E+03	Benzene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)
200	418	SIC	10

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
L			1.5	0.43	0.3

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350
Used to calculate risk-based groundwater concentration.					

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	1.75E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1.5E-06	NA

MESSAGE SUMMARY BELOW:

END

DATA ENTRY SHEET

GW-SCREEN
Version 2.3; 03/01

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
.79345	1.06E+03	1,1,2,2-Tetrachloroethane

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)
200	418	SIC	10

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone soil dry bulk density, ρ_b^v (g/cm^3)	ENTER Vadose zone soil total porosity, n^v (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^v (cm^3/cm^3)
L			1.5	0.43	0.3

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350
Used to calculate risk-based groundwater concentration.					

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	2.97E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1.3E-06	NA

MESSAGE SUMMARY BELOW:

END

DATA ENTRY SHEET

GW-SCREEN
Version 2.3; 03/01

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
75014	7.20E+00	Vinyl chloride (chloroethene)

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)
200	418	SIC	10

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone soil dry bulk density, ρ_b^v (g/cm^3)	ENTER Vadose zone soil total porosity, n^v (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^v (cm^3/cm^3)
L			1.5	0.43	0.3

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350

Used to calculate risk-based groundwater concentration.

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (μg/L)	Indoor exposure groundwater conc., noncarcinogen (μg/L)	Risk-based indoor exposure groundwater conc., (μg/L)	Pure component water solubility, S (μg/L)	Final indoor exposure groundwater conc., (μg/L)
NA	NA	NA	2.76E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
7.2E-09	3.8E-05

MESSAGE SUMMARY BELOW:

END

DATA ENTRY SHEET

GW-SCREEN
Version 2.3; 03/01

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
79005	1.42E+01	1,1,2-Trichloroethane

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)
200	418	SIC	10

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone soil dry bulk density, ρ_b^v (g/cm^3)	ENTER Vadose zone soil total porosity, n^v (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^v (cm^3/cm^3)
L			1.5	0.43	0.3

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350
Used to calculate risk-based groundwater concentration.					

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	4.42E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1.2E-08	NA

MESSAGE SUMMARY BELOW:

END

DATA E[illegible]Y SHEET

GW-SCREEN
Version 2.3; 03/01

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
107062	1.12E+01	1,2-Dichloroethane

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
200	418	SIC	10

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	**ENTER** User-defined vadose zone soil vapor permeability, k_v (cm^2)	**ENTER** Vadose zone soil dry bulk density, ρ_b^v (g/cm^3)	**ENTER** Vadose zone soil total porosity, n^v (unitless)	**ENTER** Vadose zone soil water-filled porosity, θ_w^v (cm^3/cm^3)
L		.	1.5	0.43	0.3

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**ENTER** Averaging time for carcinogens, AT_C (yrs)	**ENTER** Averaging time for noncarcinogens, AT_{NC} (yrs)	**ENTER** Exposure duration, ED (yrs)	**ENTER** Exposure frequency, EF (days/yr)
1 0E-06	1	70	30	30	350
Used to calculate risk-based groundwater concentration.					

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	8.52E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1.7E-08	NA

MESSAGE SUMMARY BELOW:

END

DAT[illegible]Y SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
156592	7.56E+01	cis-1,2-Dichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)
200	418	SIC	10

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone soil dry bulk density, ρ_b^v (g/cm^3)	ENTER Vadose zone soil total porosity, n^v (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^v (cm^3/cm^3)
L			1.5	0.43	0.3

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350

Used to calculate risk-based groundwater concentration.

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	3.50E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	7.1E-04

MESSAGE SUMMARY BELOW:

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

END

DATA[illegible]Y SHEET

GW-SCREEN
Version 2.3; 03/01

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_w (µg/L)	Chemical
67663	2.33E+01	Chloroform

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)
200	418	SIC	10

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
L			1.5	0.43	0.3

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350
Used to calculate risk-based groundwater concentration.					

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	7.92E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
6.8E-08	NA

MESSAGE SUMMARY BELOW:

END

DATA E[illegible]Y SHEET

GW-SCREEN
Version 2.3; 03/01

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
127184	8.10E+00	Tetrachloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)
200	418	SIC	10

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
L			1.5	0.43	0.3

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350

Used to calculate risk-based groundwater concentration.

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	2.00E+05	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
6.9E-10	NA

MESSAGE SUMMARY BELOW:

END

DATA ENTRY SHEET

GW-SCREEN
Version 2.3; 03/01

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
79016	8.95E+01	Trichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)
200	418	SIC	10

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone soil dry bulk density, ρ_b^v (g/cm^3)	ENTER Vadose zone soil total porosity, n^v (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^v (cm^3/cm^3)
L			1.5	0.43	0.3

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350

Used to calculate risk-based groundwater concentration.

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	1.10E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
2.3E-08	NA

MESSAGE SUMMARY BELOW:

END