Appendix 23

Human Health Risk Assessment

Screening Tables

Table 23.1 Human Health Screening for Chemicals in SoilHuman Health and Ecological Risk AssessmentFormer Northwest Point Military Site, Northwest Point, NLStantec Project No. 121410105

Constituent	Maximun	n Concentration in Surface Soil (mg/kg) (Sample ID)	Selected Soil Quality Guidelines - Residential/ Parkland (mg/kg)		Selected Soil Quality Guidelines - Residential/ Parkland (mg/kg) Max > Guideline (or was a substance with no guideline detected)?		Is EPC> Screening Guideline (or was a substance with no guideline detected)?	Is element major mineral forming element or nutrient of low inherent toxicity?	Carried forward in HHRA?
BTEX/TPH									
Benzene	5	SF-TP1	390	1	NO	-	-	-	NO
Toluene	8.4	WG-TP11	12000	1	NO	-	-	-	NO ¹⁰
Ethylbenzene	22	SF-TP31	7000	1	NO	-	-	-	NO ¹⁰
Xylenes	39	SF-TP31	120000	1	NO	-	-	-	NO ¹⁰
TPH	31,000	09-TP22BS2	5300	1	YES	7751	YES	NO	YES
PAHs									
Non-Carcinogenic									
1-Methylnaphthalene	5.9	09-MW27DSS1	72	2	NO	-	-	-	NO
2-Methylnaphthalene	10	09-MW27DSS1	12		NO	-	-	-	NO
Acenaphthene	42	09-MW27DSS1	5300	3	NO	-	-	-	NO
Acenaphthylene	0.4	09-MW27DSS1	7.8	2	NO	-	-	-	NO
Anthracene	57	09-MW27DSS1	24000	3	NO	-	-	-	NO
Fluoranthene	230	09-MW27DSS1	3500	3	NO	-	-	-	NO
Fluorene	31	09-MW27DSS1	2700	3	NO	-	-	-	NO
Naphthalene	36	09-MW27DSS1	1800	3	NO	-	-	-	NO
Perylene	33.4	LD-TP4	7.8	2,4	YES	4.3	NO	NO	NO
Pyrene	180	09-MW27DSS1	2100	3	NO	-	-	-	NO
Carcinogenic									
Benz[a]anthracene	90	09-MW27DSS1	N/A			-	-	-	
Benzo[a]pyrene	81	09-MW27DSS1	N/A			-	-	-	
Benzo[b]fluoranthene	71	09-MW27DSS1	N/A			-	-	-	
Benzo[k]fluoranthene	71	09-MW27DSS1	N/A			-	-	-	
Benzo[g,h,i]perylene	38	09-MW27DSS1	N/A		VES	-	-	-	VES
Chrysene	94	09-MW27DSS1	N/A		123	-	-	-	125
Dibenz[a,h]anthracene	13	LD-TP1	N/A			-	-	-	
Indeno[1,2,3-cd]pyrene	72	LD-TP1	N/A			-	-	-	
Phenanthrene	210	09-MW27DSS1	7.8		J				
Benzo(a)pyrene (TPE)	126	calculated	5.3	5,6		35	YES	NO	
Other									
PCBs	3.1	09-SS33	22	3	NO	-	-	-	NO

Table 23.1 Human Health Screening for Chemicals in SoilHuman Health and Ecological Risk AssessmentFormer Northwest Point Military Site, Northwest Point, NLStantec Project No. 121410105

Constituent	Maximum	Concentration in Surface Soil (mg/kg) (Sample ID)	Selected Soil Quality Guidelines - Residential/ Parkland (mg/kg) Max > Guideline (or was a substance with no guideline detected)?		EPC	Is EPC> Screening Guideline (or was a substance with no guideline detected)?	Is element major mineral forming element or nutrient of low inherent toxicity?	Carried forward in HHRA?
Inorganics								
Aluminium	26,900	LD-TP7	15,400 ⁷	YES	6464	NO	YES	NO ⁸
Antimony	2	09-SS44	7.5 ²	NO	-	-	-	NO
Arsenic	0.4	SF-TP6	12 ⁵	NO	-	-	-	NO
Barium	250	LD-TP1	3,800 ²	NO	-	-	-	NO
Beryllium	0.6	LD-TP7, LD-TP8	38 ²	NO	-	-	-	NO
Bismuth	0.4	SF-TP6	N/A	NO	-	-	-	NO
Boron	8	09-TP66BS1	3,200 ⁷	NO	-	-	-	NO
Cadmium	5.9	WG-TP12	14 ⁵	NO	-	-	-	NO
Chromium (Total)	46	LD-TP7	220 ⁵	NO	-	-	-	NO
Cobalt	40	EG-TP3	22 ²	YES	11.3	NO	NO	NO
Copper	302	LD-TP1	1,100 ⁵	NO	-	-	-	NO
Iron	39,600	LD-TP1	11,000 ⁷	YES	11412	YES	YES	NO ⁸
Lead	210	09-SS55	140 ⁵	YES	32	NO	NO	NO
Lithium	8	09-MW27DSS1	32 ⁷	NO	-	-	-	NO
Manganese	443	LD-TP7	360 ⁷	YES	114	NO	NO	NO
Mercury	0.2	09-SS10	6.6 ⁵	NO	-	-	-	NO
Molybdenum	7	LD-TP1	110 ²	NO	-	-	-	NO
Nickel	29	LD-TP7	330 ²	NO	-	-	-	NO
Rubidium	19	09-MW27DSS1	N/A	YES	7.7	YES	NO	NO ⁹
Selenium	<2	-	80 ⁵	NO	-	-	-	NO
Silver	<5	-	77 2	NO	-	-	-	NO
Strontium	971	P-TP22	9,400 ⁷	NO	-	-	-	NO
Thallium	0.1	09-SS15, 09-SS25	1 ³	NO	-	-	-	NO
Tin	20	09-SS33	9,400 ⁷	NO	-	-	-	NO
Uranium	1.9	09-SS55	23 5	NO	-	-	-	NO
Vanadium	61	LD-TP7	39 ²	YES	17.9	NO	NO	NO
Zinc	163	LD-TP1	5,600 ²	NO	-	-	-	NO

Notes:

1. Atlantic PIRI (2007) PSSL for residential sites with non-potable groundwater, coarse grained soil and fuel oil or lube oil impacts (Soil Ingestion)

2. Ontario Ministry of Environment (OMOE) Rationale for the Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario, Soil Components for Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition, Residential Land Use, soil contact human-health guideline (OMOE, 2009)

3. Alberta Tier I Surface Soil Guidelines for Residential Land Use (AENV, 2009) - Direct soil contact human health guidelines

4. There are no applicable guidelines for perylene or phenanthrene; therefore, the most stringent of the non-carcinogenic PAH guidelines (Acenaphthylene) has been selected for comparison purposes.

5. CCME (2009) Soil Quality Guidelines for the Protection of Environmental and Human Health - Residential land use, non-potable groundwater, direct contact human-health guidelines (note: where no CCME human health guideline exists, AENV, then OMOE, then US EPA have been consulted).

6. As per current CCME guidance, the carcinogenic PAHs are assumed to act cumulatively and; therefore, the entire group is carried forward and is assessed based on a Total Potency Equivalents (TPE) basis, relative to 7. US EPA (Oak Ridge National Laboratory) Regional Screening Levels for Chemical Contaminants at Superfund Sites (May 2010). Residential land use. As per current Health Canada guidance, concentrations of noncarcinogens have been multiplied by 0.2.

8. Iron and Aluminum are considered to be elements of low inherant toxicity.

9. There are no applicable guidelines (*i.e.*, CCME, OMOE, US EPA) for rubidium or bismuth. Both are typically associated with seawater spray. Seawater spray is not expected at the site. Concentrations of rubidium and bismuth were not detected; therefore they are not considered to be a concern.

10. Toluene, ethylbenzene and xylenes did not exceed screening guidelines however they were included into the TPH fractionnation results within the HHRA.

ND = not detected above laboratory detection limits

N/A = no human-health-based guideline available

ProUCL Output

Potential UCL to Use

Manganese

General Statistics

Number of Valid Observations 87

Raw Statistics

Minimum 19 Maximum 443 Mean 100.2 Median 75 SD 88.87 Coefficient of Variation 0.887 Skewness 2.484

Relevant UCL Statistics

Normal Distribution Test Lilliefors Test Statistic 0.216 Lilliefors Critical Value 0.095

Data not Normal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 116 95% UCLs (Adjusted for Skewness) 95% Adjusted-CLT UCL 118.6 95% Modified-t UCL 116.4

Gamma Distribution Test

k star (bias corrected) 1.989 Theta Star 50.36 MLE of Mean 100.2 MLE of Standard Deviation 71.02 nu star 346.1 Approximate Chi Square Value (.05) 304 Adjusted Level of Significance 0.0472 Adjusted Chi Square Value 303.4

Anderson-Darling Test Statistic 1.982 Anderson-Darling 5% Critical Value 0.764 Kolmogorov-Smirnov Test Statistic 0.115 Kolmogorov-Smimov 5% Critical Value 0.0971 Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution 95% Approximate Gamma UCL 114 95% Adjusted Gamma UCL 114.3

Potential UCL to Use

Use 95% Chebyshev (Mean, Sd) UCL 11412

Number of Distinct Observations 56

Log-transformed Statistics Minimum of Log Data 2.944 Maximum of Log Data 6.094 Mean of log Data 4.344 SD of log Data 0.696

Lognormal Distribution Test Lilliefors Test Statistic 0.0666

Lilliefors Test Statistic 0.066 Lilliefors Critical Value 0.095 Data appear Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL 114

95% Chebyshev (MVUE) UCL 132.8 97.5% Chebyshev (MVUE) UCL 148 99% Chebyshev (MVUE) UCL 177.8

Data Distribution Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

- 95% CLT UCL 115.8 95% Jackknife UCL 116 95% Standard Bootstrap UCL 115.8 95% Bootstrap-t UCL 120.8 95% Hall's Bootstrap UCL 119.6 95% Percentile Bootstrap UCL 117 95% BCA Bootstrap UCL 118.4 95% Chebyshev(Mean, Sd) UCL 141.7 97.5% Chebyshev(Mean, Sd) UCL 159.7
- 99% Chebyshev(Mean, Sd) UCL 195

Use 95% H-UCL 114

General UCL Statistics for Data Sets with Non-Detects

User Selected Options	
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Perylene

	General Statistics		
Number of Valid Data	31	Number of Detected Data	14
Number of Distinct Detected Data	13	Number of Non-Detect Data	17
		Percent Non-Detects	54.84%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.006	Minimum Detected	-5.116
Maximum Detected	33.4	Maximum Detected	3.509
Mean of Detected	4.584	Mean of Detected	-1.277
SD of Detected	10.25	SD of Detected	2.752
Minimum Non-Detect	0.005	Minimum Non-Detect	-5.298
Maximum Non-Detect	0.005	Maximum Non-Detect	-5.298

UCL Statistics		
	Lognormal Distribution Test with Detected Values Only	
0.512	Shapiro Wilk Test Statistic	0.931
0.874	5% Shapiro Wilk Critical Value	0.874

576 Shapiro Wilk Chucal Value	0.0
Data appear Lognormal at 5% Significance Level	

Assuming Lognormal Distribution

	DL/2 Substitution Method
-3.862	Mean
2.995	SD
35.34	95% H-Stat (DL/2) UCL
	Log ROS Method
-5.803	Mean in Log Scale
5.046	SD in Log Scale
2.071	Mean in Original Scale
7.133	SD in Original Scale
4.245	95% t UCL
4.341	95% Percentile Bootstrap UCL
5.402	95% BCA Bootstrap UCL
3280970	95% H-UCL

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

Assuming Normal Distribution		
DL/2 Substitution Method		
Mean		
SD		
95% DL/2 (t) UCL		

Maximum Likelihood Estimate(MLE) Method MLE yields a negative mean

Data Distribution Test with Detected Values Only

Data Follow Appr. Gamma Distribution at 5% Significance Level

Gamma Distribution Test with Detected Values Only

k star (bias corrected) 0.247 Theta Star 18.59

> nu star 6.904

2.072 7.133 4.246

N/A

Nonparametric Statistics	0.989	A-D Test Statistic
Kaplan-Meier (KM) Method	0.851	5% A-D Critical Value
Mean	0.851	K-S Test Statistic
SD	0.25	5% K-S Critical Value
SE of Mean	Level	Data follow Appr. Gamma Distribution at 5% Significance
95% KM (t) UCL		
95% KM (z) UCL		Assuming Gamma Distribution
95% KM (jackknife) UCL		Gamma ROS Statistics using Extrapolated Data
95% KM (bootstrap t) UCL	0.000001	Minimum
95% KM (BCA) UCL	33.4	Maximum
95% KM (Percentile Bootstrap) UCL	2.07	Mean
95% KM (Chebyshev) UCL	0.000001	Median
97.5% KM (Chebyshev) UCL	7.134	SD
99% KM (Chebyshev) UCL	0.105	k star
	19.73	Theta star
Potential UCLs to Use	6.505	Nu star
95% KM (t) UCL	1.903	AppChi2

2.074

7.017

1.308

4.293

4.225

4.242

23.94

4.54

4.28

7.774

10.24

15.09

4.293

Note: DL/2 is not a recommended method.

95% Gamma Approximate UCL

95% Adjusted Gamma UCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). For additional Insight, the user may want to consult a statistician.

7.076

7.616

General UCL Statistics for Full Data Sets

User Selected Options
From File P:\Jobs_BidJobs\JW Numbers\1044857\Risk Assessment\HHRA\Metals for ProUCL.wst
Full Precision OFF
Confidence Coefficient 95%

Number of Bootstrap Operations 2000

Aluminum

General Statistics

Number of Valid Observations 87

Raw Statistics

Minimum 1100 Maximum 26900 Mean 4523 Median 3360 SD 4154 Coefficient of Variation 0.919 Skewness 3.404

Number of Distinct Observations 52

Log-transformed Statistics

Minimum of Log Data 7.003 Maximum of Log Data 10.2 Mean of log Data 8.193 SD of log Data 0.606

Relevant UCL Statistics

Normal Distribution Test

Lilliefors Test Statistic 0.26 Lilliefors Critical Value 0.095

Data not Normal at 5% Significance Level

Assuming Normal Distribution 95% Student's-t UCL 5263

95% UCLs (Adjusted for Skewness) 95% Adjusted-CLT UCL 5429 95% Modified-t UCL 5290

Gamma Distribution Test

k star (bias corrected) 2.315 Theta Star 1954 MLE of Mean 4523 MLE of Standard Deviation 2972 nu star 402.8 Approximate Chi Square Value (.05) 357.3 Adjusted Level of Significance 0.0472 Adjusted Chi Square Value 356.5

Anderson-Darling Test Statistic 3.365 Anderson-Darling 5% Critical Value 0.762 Kolmogorov-Smirnov Test Statistic 0.151 Kolmogorov-Smirnov 5% Critical Value 0.0969 Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Lognormal Distribution Test

Lilliefors Test Statistic 0.0975 Lilliefors Critical Value 0.095 Data not Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL 4927 95% Chebyshev (MVUE) UCL 5661 97.5% Chebyshev (MVUE) UCL 6235 99% Chebyshev (MVUE) UCL 7362

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL 5255 95% Jackknife UCL 5263 95% Standard Bootstrap UCL 5232 95% Bootstrap-t UCL 5632 95% Hall's Bootstrap UCL 5498 95% Percentile Bootstrap UCL 5475 95% Chebyshev(Mean, Sd) UCL 6464 97.5% Chebyshev(Mean, Sd) UCL 7304 99% Chebyshev(Mean, Sd) UCL 8954 95% Approximate Gamma UCL 5099 95% Adjusted Gamma UCL 5109

Potential UCL to Use

Iron

General Statistics

Number of Valid Observations 85

Raw Statistics

Minimum 2000 Maximum 39600 Mean 7967 Median 6000 SD 7286 Coefficient of Variation 0.914 Skewness 3.128

Use 95% Chebyshev (Mean, Sd) UCL 6464

Number of Distinct Observations 63

Log-transformed Statistics

Minimum of Log Data 7.601 Maximum of Log Data 10.59 Mean of log Data 8.76 SD of log Data 0.603

Relevant UCL Statistics

Normal Distribution Test

Lilliefors Test Statistic 0.277 Lilliefors Critical Value 0.0961 Data not Normal at 5% Significance Level

Assuming Normal Distribution 95% Student's-t UCL 9281 95% UCLs (Adjusted for Skewness) 95% Adjusted-CLT UCL 9553 95% Modified-t UCL 9326

Gamma Distribution Test

k star (bias corrected) 2.319 Theta Star 3435 MLE of Mean 7967 MLE of Standard Deviation 5232 nu star 394.2 Approximate Chi Square Value (.05) 349.2 Adjusted Level of Significance 0.0472 Adjusted Chi Square Value 348.5

Anderson-Darling Test Statistic 4,16 Anderson-Darling 5% Critical Value 0.762 Kolmogorov-Smirnov Test Statistic 0.183 Koimogorov-Smirnov 5% Critical Value 0.098 Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 8994 95% Adjusted Gamma UCL 9013 Lognormal Distribution Test

Lilliefors Test Statistic 0.124 Lilliefors Critical Value 0.0961 Data not Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL 8667 95% Chebyshev (MVUE) UCL 9965 97.5% Chebyshev (MVUE) UCL 10978 99% Chebyshev (MVUE) UCL 12967

Data Distribution

Data do not follow a Discemable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL 9267 95% Jackknife UCL 9281 95% Standard Bootstrap UCL 9257 95% Bootstrap-t UCL 9720

95% Haii's Bootstrap UCL 9591

95% Percentile Bootstrap UCL 9347

95% BCA Bootstrap UCL 9586

95% Chebyshev(Mean, Sd) UCL 11412

97.5% Chebyshev(Mean, Sd) UCL 12902 99% Chebyshev(Mean, Sd) UCL 15830

 General UCL Statistics for Data Sets with Non-Detects

 User Selected Options
 P:\Jobs_BidJobs\JW Numbers\1044857\Risk Assessment\HHRA\Metals for ProUCL.wst

 From File
 P:\Jobs_BidJobs\JW Numbers\1044857\Risk Assessment\HHRA\Metals for ProUCL.wst

 Full Precision
 OFF

 Confidence Coefficient
 95%

 Number of Bootstrap Operations
 2000

Lead

	General Statistics		
Number of Valid Data	87	Number of Detected Data	72
Number of Distinct Detected Data	54	Number of Non-Detect Data	15
		Percent Non-Detects	17.24%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.6	Minimum Detected	-0.511
Maximum Detected	210	Maximum Detected	5.347
Mean of Detected	19.04	Mean of Detected	1.885
SD of Detected	37.56	SD of Detected	1.401
Minimum Non-Detect	5	Minimum Non-Detect	1.609
Maximum Non-Detect	5	Maximum Non-Detect	1.609

UCL Statistics

0.312

0.104

16.19

34.7

22.37

N/A

Lognormal Distribution Test with	Detected Values Only
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Lilliefors Test Statistic	0.0742
5% Lilliefors Critical Value	0.104
Data appear Lognormal at 5% Significance Level	

Assuming Lognormal Distribution

	DL/2 Substitution Method	
	Mean	1.718
	SD	1.325
	95% H-Stat (DL/2) UCL	19.82
	Log ROS Method	
	Mean in Log Scale	1.662
	SD in Log Scale	1.399
	Mean in Original Scale	16.15
	SD in Original Scale	34.72
:	95% Percentile Bootstrap UCL	22.72
	95% BCA Bootstrap UCL	24.57

Data Distribution Test with Detected Values Only Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Gamma Distribution Test with Detected Values Only k star (bias corrected) 0.569 Theta Star 33.44 nu star 81.97 A-D Test Statistic 3.196 5% A-D Critical Value 0.809

Normal Distribution Test with Detected Values Only

Data not Normal at 5% Significance Level

Assuming Normal Distribution

Maximum Likelihood Estimate(MLE) Method

MLE yields a negative mean

Lilliefors Test Statistic

5% Lilliefors Critical Value

DL/2 Substitution Method

95% DL/2 (t) UCL

Mean

SD

K-S Test Statistic	0.809	Mean	16.1
5% K-S Critical Value	0.111	SD	34.54
Data not Gamma Distributed at 5% Significance Level		SE of Mean	3.73
		95% KM (t) UCL	22.3
Assuming Gamma Distribution		95% KM (z) UCL	22.24
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	22.3
Minimum	1E-09	95% KM (bootstrap t) UCL	25.49
Maximum	210	95% KM (BCA) UCL	23.2
Mean	16.63	95% KM (Percentile Bootstrap) UCL	22.25
Median	5.7	95% KM (Chebyshev) UCL	32.36
SD	34.67	97.5% KM (Chebyshev) UCL	39.39
k star	0.239	99% KM (Chebyshev) UCL	53.21
Theta star	69.67		
Nu star	41.54	Potential UCLs to Use	
AppChi2	27.76	95% KM (Chebyshev) UCL	32.36
95% Gamma Approximate UCL	24.88		

Note: DL/2 is not a recommended method.

95% Adjusted Gamma UCL

Mean of Detected

Minimum Non-Detect Maximum Non-Detect

SD of Detected

Rubidium

(General Statistics		
Number of Valid Data	67	Number of Detected Data	58
Number of Distinct Detected Data	13	Number of Non-Detect Data	9
		Percent Non-Detects	13.43%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	2	Minimum Detected	0.693
Maximum Detected	19	Maximum Detected	2.944

25.05

6.31 3.743

2

2

Maximum Detected 2	.944
Mean of Detected 1	.669
SD of Detected 0	.605
Minimum Non-Detect 0	.693
Maximum Non-Detect 0	.693

	UCL Statisti	cs	
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.174	Lilliefors Test Statistic	0.189
5% Lilliefors Critical Value	0.116	5% Lilliefors Critical Value	0.116
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	5.597	Mean	1.445
SD	3.928	SD	0.803
95% DL/2 (t) UCL	6.398	95% H-Stat (DL/2) UCL	6.099
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	5.413	Mean in Log Scale	1.485
SD	4.199	SD in Log Scale	0.737

Mean in Original Scale5.65SD in Original Scale3.86895% Percentile Bootstrap UCL6.4795% BCA Bootstrap UCL6.452

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	5.731
SD	3.752
SE of Mean	0.462
95% KM (t) UCL	6.503
95% KM (z) UCL	6.492
95% KM (jackknife) UCL	6.502
95% KM (bootstrap t) UCL	6.55
95% KM (BCA) UCL	6.493
95% KM (Percentile Bootstrap) UCL	6.493
95% KM (Chebyshev) UCL	7.747
97.5% KM (Chebyshev) UCL	8.619
99% KM (Chebyshev) UCL	10.33
Potential UCLs to Use	

95% KM (Chebyshev) UCL 7.747

95% MLE (t) UCL 6.269 95% MLE (Tiku) UCL 6.258

Gamma Distri	bution Test	with Detected	Values Only
--------------	-------------	---------------	-------------

k star (bias corrected)	2.893
Theta Star	2.182
nu star	335.5
A-D Test Statistic	1.298
5% A-D Critical Value	0.758
K-S Test Statistic	0.758
5% K-S Critical Value	0.118
Data not Gamma Distributed at 5% Significance Level	

Assuming Gamma Distribution

	Gamma ROS Statistics using Extrapolated Data
1E-09	Minimum
19	Maximum
5.589	Mean
5	Median
3.95	SD
0.516	k star
10.82	Theta star
69.21	Nu star
51.06	AppChi2
7.576	95% Gamma Approximate UCL
7.627	95% Adjusted Gamma UCL

Note: DL/2 is not a recommended method.

General UCL Statistics for Fuli Data Sets **User Selected Options** From File WorkSheet.wst Full Precision OFF Confidence Coefficient 95% Number of Bootstrap Operations 2000

Chromium

General Statistics

Number of Valid Observations 87

Raw Statistics

Minimum 3 Maximum 46 Mean 10.26 Median 8 SD 7.538 Std. Error of Mean 0.808 Coefficient of Variation 0.734 Skewness 2.777 Number of Distinct Observations 22

Log-transformed Statistics

Minimum of Log Data 1.099 Maximum of Log Data 3.829 Mean of log Data 2.15 SD of log Data 0.569

Relevant UCL Statistics

Normal Distribution Test Liliefors Test Statistic 0,187 Lilliefors Critical Value 0.095 Data not Normal at 5% Significance Level

Assuming Normai Distribution 95% Student's-t UCL 11.61 95% UCLs (Adjusted for Skewness) 95% Adjusted-CLT UCL (Chen-1995) 11.85 95% Modified-t UCL (Johnson-1978) 11.65

Gamma Distribution Test k star (blas corrected) 2.865 Theta Star 3.583 MLE of Mean 10.26 MLE of Standard Deviation 6.064 nu star 498.5 Approximate Chi Square Value (.05) 447.7 Adjusted Level of Significance 0.0472 Adjusted Chi Square Value 446.9

Anderson-Darling Test Statistic 1.794 Anderson-Darling 5% Critical Value 0.759 Kolmogorov-Smirnov Test Statistic 0.13 Koimogorov-Smirnov 5% Critical Value 0.0966 Data not Gamma Distributed at 5% Significance Level

Lognormal Distribution Test Lilliefors Test Statistic 0.0878 Lilliefors Critical Value 0.095 Data appear Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL 11.33 95% Chebyshev (MVUE) UCL 12.94 97.5% Chebyshev (MVUE) UCL 14.17 99% Chebyshev (MVUE) UCL 16.61

Data Distribution Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 11.59 95% Jackknife UCL 11.61 95% Standard Bootstrap UCL 11.57 95% Bootstrap-t UCL 12.06 95% Hali's Bootstrap UCL 12.02 95% Percentile Bootstrap UCL 11.61 95% BCA Bootstrap UCL 11.92 95% Chebyshev(Mean, Sd) UCL 13.79 97.5% Chebyshev(Mean, Sd) UCL 15.31

95% Approximate Gamma UCL 11.43 95% Adjusted Gamma UCL 11.45

Potential UCL to Use

Use 95% H-UCL 11.33

ProUCL computes and outputs H-statistic based UCLs for historical reasons only. H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide. It is therefore recommended to avoid the use of H-statistic based 95% UCLs. Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and laci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Vanadium

General Statistics

Relevant UCL Statistics

Number of Valid Observations 87

Raw Statistics

Normal Distribution Test

Data not Normal at 5% Significance Level

Minimum 5 Maximum 61 Mean 16.14 Median 14 SD 10.01 Std, Error of Mean 1.073 Coefficient of Variation 0.62 Skewness 2.48

Lilliefors Test Statistic 0.208

Lilliefors Critical Value 0.095

Lognormal Distribution Test

Lilliefors Test Statistic 0.0929 Lilliefors Critical Value 0.095 Data appear Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% H-UCL 17.59 95% Chebyshev (MVUE) UCL 19.79 97.5% Chebyshev (MVUE) UCL 21.46

99% Chebyshev (MVUE) UCL 24.75

Data Distribution Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 17.9

Assuming Normai Distribution 95% Student's-t UCL 17.92

95% UCLs (Adjusted for Skewness) 95% Adjusted-CLT UCL (Chen-1995) 18.21 95% Modified-t UCL (Johnson-1978) 17.97

Gamma Distribution Test

k star (bias corrected) 3.768 Theta Star 4.283 MLE of Mean 16.14 MLE of Standard Deviation 8.313 nu star 655.7 Approximate Chi Square Value (.05) 597.3 Adjusted Level of Significance 0.0472

Number of Distinct Observations 28

Log-transformed Statistics

Minimum of Log Data 1.609 Maximum of Log Data 4.111 Mean of log Data 2.647 SD of log Data 0.494

Assuming Gamma Distribution

99% Chebyshev(Mean, Sd) UCL 18.31

95% Jackknife UCL 17.92 95% Standard Bootstrap UCL 17.92 95% Bootstrap-t UCL 18.65 95% Hall's Bootstrap UCL 18.36 95% Percentile Bootstrap UCL 18.02 95% BCA Bootstrap UCL 18.21 95% Chebyshev(Mean, Sd) UCL 20.82 97.5% Chebyshev(Mean, Sd) UCL 22.84 99% Chebyshev(Mean, Sd) UCL 26.82

Adjusted Chi Square Value 596.3

Anderson-Darling Test Statistic 1.864 Anderson-Darling 5% Critical Value 0.756 Kolmogorov-Smirnov Test Statistic 0.131 Kolmogorov-Smirnov 5% Critical Value 0.0963 Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 17.72 95% Adjusted Gamma UCL 17.74

Potential UCL to Use

Use 95% Student's-t UCL 17.92 or 95% Modified-t UCL 17.97 or 95% H-UCL 17.59

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.

H-statistic often results in unstable (both high and iow) values of UCL95 as shown in examples in the Technical Guide. It is therefore recommended to avoid the use of H-statistic based 95% UCLs.

Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

General UCL Statistics for Data Sets with Non-Detects User Selected Options From File P:\Jobs_BidJobs\JW Numbers\1044857\Risk Assessment\HHRA\tph FOR pROucl.wst Full Precision OFF Confidence Coefficient 95% Number of Bootstrap Operations 2000

τph

	General Sta	tistics	
Number of Valid Data	143	Number of Detected Data	85
Number of Distinct Detected Data	73	Number of Non-Detect Data	58
		Percent Non-Detects	40.56%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.2	Minimum Detected	-1.609
Maximum Detected	31000	Maximum Detected	10.34
Mean of Detected	6842	Mean of Detected	7.348
SD of Detected	8031	SD of Detected	2.544
Minimum Non-Detect	0.022	Minimum Non-Detect	-3.817
Maximum Non-Detect	20	Maximum Non-Detect	2.996
Note: Data have multiple DLs - Use of KM Method is recommen	nded	Number treated as Non-Detect	64
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	79
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	44.76%
	UCL Statis	atics	
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	,
Lilliefors Test Statistic	0.21	Lilliefors Test Statistic	0.12
5% Lilliefors Critical Value	0.0961	5% Lilliefors Critical Value	0.0961
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormai Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	4068	Mean	3.913
SD	7037	SD	4.778
95% DL/2 (t) UCL	5042	95% H-Stat (DL/2) UCL	9011686
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	250.7	Mean in Log Scale	5.166
SD	10815	SD in Log Scale	3.454
95% MLE (t) UCL	1748	Mean in Original Scale	4074
95% MLE (Tiku) UCL	2004	SD in Original Scale	7033
		95% Percentile Bootstrap UCL	5043
		95% BCA Bootstrap UCL	5135

Data Distribution Test with Detected Values Only Data do not follow a Discernable Distribution (0.05)

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.43
Theta Star	15912
nu star	73.1

Nonparam	stric Statistics	
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Kaplan-Meier (KM) Method	
Mean	4067
SD	7013
SE of Mean	589.9
95% KM (t) UCL	5044
95% KM (z) UCL	5037
95% KM (jackknife) UCL	5041
95% KM (bootstrap t) UCL	5128
95% KM (BCA) UCL	5006
95% KM (Percentile Bootstrap) UCL	5065
95% KM (Chebyshev) UCL	6638
97.5% KM (Chebyshev) UCL	7751
99% KM (Chebyshev) UCL	9936

Potential UCLs to Use

97.5% KM (Chebyshev) UCL 7751

A-D Test Statistic 0.862 5% A-D Critical Value 0.834 K-S Test Statistic 0.834 5% K-S Critical Value 0.103

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

	Gamma ROS Statistics using Extrapolated Data
1E-09	Minimum
31000	Maximum
5127	Mean
1952	Median
6744	SD
0.243	k star
21072	Theta star
69.59	Nu star
51.38	AppChi2
6943	95% Gamma Approximate UCL
6965	95% Adjusted Gamma UCL

Note: DL/2 is not a recommended method.

General UCL Statistics for Full Data Sets
User Selected Options
From File WorkSheet.wst
Full Precision OFF
Confidence Coefficient 95%
Number of Bootstrap Operations 2000

BAPTPE

General Statistics

Number of Valid Observations 42

Raw Statistics

Minimum 0.004 Maximum 120.9 Mean 5.071 Median 0.041 SD 19.54 Coefficient of Variation 3.852 Skewness 5.447 Number of Distinct Observations 29

Log-transformed Statistics

Minimum of Log Data -5.521 Maximum of Log Data 4.795 Mean of log Data -2.651 SD of log Data 2.845

Relevant UCL Statistics

Normal Distribution Test Shapiro Wilk Test Statistic 0.299 Shapiro Wilk Critical Value 0.942

Data not Normal at 5% Significance Level

Assuming Normal Distribution 95% Student's-t UCL 10.14 95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL 12.74 95% Modified-t UCL 10.57

Gamma Distribution Test

k star (bias corrected) 0.179 Theta Star 28.33 MLE of Mean 5.071 MLE of Standard Deviation 11.99 nu star 15.03 Approximate Chi Square Value (.05) 7.285 Adjusted Level of Significance 0.0443 Adjusted Chi Square Value 7.093

Anderson-Darling Test Statistic 5.722 Anderson-Darling 5% Critical Value 0.919 Kolmogorov-Smirnov Test Statistic 0.328 Kolmogorov-Smirnov 5% Critical Value 0.152 Data not Gemma Distributed at 5% Significance Level

Assuming Gamma Distribution

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.824 Shapiro Wilk Critical Value 0.942 Data not Lognormal at 5% Significance Level

Assuming Lognormai Distribution

95% H-UCL 35.63 95% Chebyshev (MVUE) UCL 10.6 97.5% Chebyshev (MVUE) UCL 14 99% Chebyshev (MVUE) UCL 20.7

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL 10.03 95% Jackknife UCL 10.14 95% Standard Bootstrap UCL 9.735 95% Bootstrap-t UCL 23.57 95% Hall's Bootstrap UCL 26.36 95% Percentile Bootstrap UCL 10.31 95% BCA Bootstrap UCL 13.61 95% Chebyshev(Mean, Sd) UCL 18.21 97.5% Chebyshev(Mean, Sd) UCL 23.9 99% Chebyshev(Mean, Sd) UCL 35.06 95% Approximate Gamma UCL 10.47 95% Adjusted Gamma UCL 10.75

Potential UCL to Use

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C

Use 99% Chebyshev (Mean, Sd) UCL 35.06

Gamma Distribution Test with Detected Values On	Data Distribution Test with Detected Values Only		
k star (bias corrected)	0.304	Data appear Normal at 5% Significance Level	
Theta Star	533.1		
nu star	2.435		
A-D Test Statistic	0.414	Nonparametric Statistics	
5% A-D Critical Value	0.679	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.679	Mean	30.04
5% K-S Critical Value	0.409	SD	85.81
Data appear Gamma Distributed at 5% Significance L	evel	SE of Mean	18.72
		95% KM (t) UCL	61.93
Assuming Gamma Distribution		95% KM (z) UCL	60.84
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	56.14
Minimum	0.000001	95% KM (bootstrap t) UCL	70.54
Maximum	440	95% KM (BCA) UCL	440
Mean	23.18	95% KM (Percentile Bootstrap) UCL	207.9
Median	0.000001	95% KM (Chebyshev) UCL	111.7
SD	89.2	97.5% KM (Chebyshev) UCL	147
k star	0.0771	99% KM (Che by shev) UCL	216.3
Theta star	300.6		
Nu star	4.317	Potential UCLs to Use	
AppChi2	0.851	95% KM (t) UCL	61.93
95% Gamma Approximate UCL	117.6	95% KM (Percentile Bootstrap) UCL	207.9
95% Adjusted Gamma UCL	N/A		
Note: DL/2 is not a recommended method.			

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). For additional insight, the user may want to consult a statistician.

General Statistic	S	
28	Number of Detected Data	22
21	Number of Non-Detect Data	6
	Percent Non-Detects	21.43%
	Log-transformed Statistics	
26	Minimum Detected	3.258
5189	Maximum Detected	8.554
810.4	Mean of Detected	5.584
1335	SD of Detected	1.557
15	Minimum Non-Detect	2.708
15	Maximum Non-Detect	2.708
UCL Statistics	I ornormal Distribution Test with Detected Values Only	v
	General Statistic 28 21 26 5189 810.4 1335 15 15 UCL Statistics	General Statistics 28 Number of Detected Data 21 Number of Non-Detect Data 21 Number of Non-Detect Data Percent Non-Detects Percent Non-Detects 26 Minimum Detected 5189 Maximum Detected 810.4 Mean of Detected 1335 SD of Detected 15 Minimum Non-Detect 15 Maximum Non-Detect 15 Maximum Non-Detect UCL Statistics Lognormal Distribution Test with Detected Values Onf

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.628	Shapiro Wilk Test Statistic	0.955
5% Shapiro Wilk Critical Value	0.911	5% Shapiro Wilk Critical Value	0.911
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	638.4	Mean	4.819
SD	1224	SD	2.027
95% DL/2 (t) UCL	1032	95% H-Stat (DL/2) UCL	4474
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	427.3	Mean in Log Scale	4.791
SD	1416	SD in Log Scale	2.097
95% MLE (t) UCL	883.1	Mean in Original Scale	638.5
95% MLE (Tiku) UCL	877.7	SD in Original Scale	1224
		95% t UCL	1033
		95% Percentile Bootstrap UCL	1033
		95% BCA Bootstrap UCL	1177

Data	Distri	bution T	est with	Dete	cted V	aiues Only	
		^	Distant.			01-10-	

95% H UCL

5527

22 6

Data Follow Appr. Gamma Distribution at 5% Significance Level

	Nonparametric Statistics
	Kaplan-Meier (KM) Method
642.3	Mean
1200	SD
232.1	SE of Mean
1038	95% KM (t) UCL
1024	95% KM (z) UCL

Gamma Distribution Test with Detected Values Oni	у
k star (bias corrected)	0.514
Theta Star	1576
nu star	22.63
A-D Test Statistic	0.913
5% A-D Critical Value	0.799
K-S Test Statistic	0.799
5% K-S Critical Value	0.195
Data follow Appr. Gamma Distribution at 5% Significance	e Level

Assuming Gamma Distribution

F2

Statistics using Extrapolated Data		95% KM (jackknife) UCL	1035
Minimum	0.000001	95% KM (bootstrap t) UCL	1419
Maximum	5189	95% KM (BCA) UCL	1091
Mean	636.8	95% KM (Percentile Bootstrap) UCL	1058
Median	120	95% KM (Chebyshev) UCL	1654
SD	1225	97.5% KM (Chebyshev) UCL	2092
k star	0.16	99% KM (Che bys hev) UCL	2952
Theta star	3982		
Nu star	8.956	Potential UCLs to Use	
AppChi2	3.3	95% KM (Chebyshev) UCL	1654
95% Gamma Approximate UCL	1728		
95% Adjusted Gamma UCI	1845		

Gamma ROS

Minimum	0.000001
Maximum	5189
Mean	636.8
Median	120
SD	1225
k star	0.16
Theta star	3982
Nu star	8.956
AppChi2	3.3
95% Gamma Approximate UCL	1728
95% Adjusted Gamma UCL	1845

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Malchle, and Lee (2006). For additional insight, the user may want to consult a statistician.

	General Stati	stics	
Number of Valid Data	28	Number of Detected Data	26
Number of Distinct Detected Data	26	Number of Non-Detect Data	2
		Percent Non-Detects	7.14%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	19	Minimum Detected	2.944
Maximum Detected	4107	Maximum Detected	8.32
Mean of Detected	844.7	Mean of Detected	5.887
SD of Detected	1062	SD of Detected	1.427
Minimum Non-Detect	15	Minimum Non-Detect	2.708
Maximum Non-Detect	15	Maximum Non-Detect	2.708
	UCL Statist	ics	
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	,
Shapiro Wilk Test Statistic	0.757	Shapiro Wilk Test Statistic	0.96
5% Shapiro Wilk Critical Value	0.92	5% Shapiro Wilk Critical Value	0.92
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	784.9	Mean	5.611
SD	1045	SD	1.708
95% DL/2 (t) UCL	1121	95% H-Stat (DL/2) UCL	3641

Mean	739.1
SD	1083
95% MLE (t) UCL	1088
95% MLE (Tiku) UCL	1067

Data Distribution	n Test with	Detected	Vaiues	Oniy	

Log ROS Method

Mean in Log Scale

Mean in Original Scale

95% Percentile Bootstrap UCL

95% BCA Bootstrap UCL

Kaplan-Meier (KM) Method

SD in Original Scale

SD in Log Scale

95% t UCL

95% H UCL

Mean

SE of Mean

95% KM (t) UCL

95% KM (z) UCL

SD

5.646

1.636

785.2

1045

1122

1122

1171

3081

785.7

1026

197.7

1122

1111

Data Follow Appr. Gamma Distribution at 5% Significance Level

Nonparametric Statistics

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	0.652
Theta Star	1295
nu star	33.93
A-D Test Statistic	0.876
5% A-D Critical Value	0.788
K-S Test Statistic	0.788
5% K-S Critical Value	0.179
Data follow Appr. Gamma Distribution at 5% Significance Le	evel

Assuming Gamma Distribution

F3

using Extrapolated Data		95% KM (jackknife) UCL	1121
Minimum	0.000001	95% KM (bootstrap t) UCL	1201
Maximum	4107	95% KM (BCA) UCL	1090
Mean	784.3	95% KM (Percentile Bootstrap) UCL	1111
Median	245	95% KM (Chebyshev) UCL	1647
SD	1046	97.5% KM (Chebyshev) UCL	2020
k star	0.304	99% KM (Chebyshev) UCL	2753
Theta star	2583		
Nu star	17	Potential UCLs to Use	
AppChi2	8.674	95% KM (Chebyshev) UCL	1647
mma Approximate UCL	1537		

Gamma ROS Statistics using Extrapolated Data

0.000001
4107
784.3
245
1046
0.304
2583
17
8.674
1537
1605

Note: DL/2 is not a recommended method.

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Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). For additional insight, the user may want to consult a statistician.

General UCL Statistics for Data Sets with Non-Detects

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	General Statistics		
Number of Valid Data	21	Number of Detected Data	13
Number of Distinct Detected Data	12	Number of Non-Detect Data	8
		Percent Non-Detects	38.10%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.06	Minimum Detected	-2.813
Maximum Detected	210	Maximum Detected	5.347
Mean of Detected	42.49	Mean of Detected	0.929
SD of Detected	77.36	SD of Detected	3.066
Minimum Non-Detect	0.05	Minimum Non-Detect	-2.996
Maximum Non-Detect	0.05	Maximum Non-Detect	-2.996

	UCL Statistics		
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.602	Shapiro Wilk Test Statistic	0.884
5% Shapiro Wilk Critical Value	0.866	5% Shapiro Wilk Critical Value	0.866

Snapiro vviik Test Statistic	
5% Shapiro Wilk Critical Value	
Data appear Lognormal at 5% Significance Level	

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean	-0.83
SD	3.304
95% H-Stat (DL/2) UCL	12088
Log ROS Method	
Mean in Log Scale	-2.088
SD in Log Scale	4.797
Mean in Original Scale	26.3
SD in Original Scale	63.54
95% t UCL	50.22
95% Percentile Bootstrap UCL	50.49
95% BCA Bootstrap UCL	61.26
95% H UCL	237800000

5% Shapiro Wilk Critical Value Data not Normal at 5% Significance Level Assuming Normal Distribution **DL/2 Substitution Method**

Mean	26.31
SD	63.54
95% DL/2 (t) UCL	50.23
Maximum Likelihood Estimate(MLE) Method	
Mean	0.377
SD	85.5
95% MLE (t) UCL	32.56
95% MLE (Tiku) UCL	36

Data Distribution Test with Detected Values Only Data appear Gamma Distributed at 5% Significance Level

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.245
Theta Star	173.6
nu star	6.365

	Nonparametric Statistics	0.781	A-D Test Statistic
	Kaplan-Meier (KM) Method	0.848	5% A-D Critical Value
26.33	Mean	0.848	K-S Test Statistic
62	SD	0.259	5% K-S Critical Value
14.08	SE of Mean	evel	Data appear Gamma Distributed at 5% Significance Le
50.61	95% KM (t) UCL		
49.49	95% KM (z) UCL		Assuming Gamma Distribution
50.22	95% KM (jackknife) UCL		Gamma ROS Statistics using Extrapolated Data
101	95% KM (bootstrap t) UCL	0.000001	Minimum
50.5	95% KM (BCA) UCL	210	Maximum
51.73	95% KM (Percentile Bootstrap) UCL	26.3	Mean
87.71	95% KM (Chebyshev) UCL	0.12	Median
114.3	97.5% KM (Chebyshev) UCL	63.54	SD
166.4	99% KM (Chebyshev) UCL	0.119	k star
		221	Theta star
	Potential UCLs to Use	4.999	Nu star
50.5	95% KM (BCA) UCL	1.152	AppChi2
		114.2	95% Gamma Approximate UCL
		129.1	95% Adjusted Gamma UCL

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). For additional insight, the user may want to consult a statistician.

General UCL Statistics for Data Sets with Non-Detects

User Selected Option	5
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

As

	General Statistics		
Number of Valid Data	14	Number of Detected Data	13
Number of Distinct Detected Data	8	Number of Non-Detect Data	1
		Percent Non-Detects	7.14%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	3	Minimum Detected	1.099
Maximum Detected	33	Maximum Detected	3.497
Mean of Detected	10	Mean of Detected	1.947
SD of Detected	10.03	SD of Detected	0.827
Minimum Non-Detect	2	Minimum Non-Detect	0.693
Maximum Non-Detect	2	Maximum Non-Detect	0.693

UCL	Statistics	
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0.702

0.866

Shapiro Wilk Test Statistic	0.875
5% Shapiro Wilk Critical Value	0.866
Data appear Lognormal at 5% Significance Level	

DL/2 Substitution Method

95% H-Stat (DL/2) UCL

Log ROS Method

Mean in Log Scale

Mean in Original Scale

95% Percentile Bootstrap UCL

95% BCA Bootstrap UCL

SD in Original Scale

SD in Log Scale

95% t UCL

95% H UCL

Mean

SD

1.808

0.95

19.54

1.806

0.954

9.355

9.937

14.06

15.43

19.69

14

Assuming Lognormal Distribution

Assuming Normal Distribution	
DL/2 Substitution Method	
Mean	9.357
SD	9.935
95% DL/2 (t) UCL	14.06
Maximum Likelihood Estimate(MLE) Method	
Mean	9.004

Shapiro Wilk Test Statistic

5% Shapiro Wilk Critical Value

SD	10.04
95% MLE (t) UCL	13.76
95% MLE (Tiku) UCL	13.49

Data Distribution Test with Detected Values Only

Data Follow Appr. Gamma Distribution at 5% Significance Level

Gamma Distribution Test with Detected Values Only

Normal Distribution Test with Detected Values Only

Data not Normal at 5% Significance Level

k star (bias corrected)	1.246
Theta Star	8.028
nu star	32.39

A-D Test Statistic	0.883	Nonparametric Statistics	
5% A-D Critical Value	0.75	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.75	Mean	9.5
5% K-S Critical Value	0.241	SD	9.462
Data follow Appr. Gamma Distribution at 5% Significance	e Level	SE of Mean	2.632
		95% KM (t) UCL	14.16
Assuming Gamma Distribution		95% KM (z) UCL	13.83
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	14.15
Minimum	0.000001	95% KM (bootstrap t) UCL	21.7
Maximum	33	95% KM (BCA) UCL	14.14
Mean	9.286	95% KM (Percentile Bootstrap) UCL	13.79
Median	5	95% KM (Chebyshev) UCL	20.97
SD	10	97.5% KM (Chebyshev) UCL	25.94
k star	0.407	99% KM (Chebyshev) UCL	35.69
Theta star	22.8		
Nu star	11.4	Potential UCLs to Use	
AppChi2	4.836	95% KM (Chebyshev) UCL	20.97
95% Gamma Approximate UCL	21.89		

Note: DL/2 is not a recommended method.

95% Adjusted Gamma UCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). For additional insight, the user may want to consult a statistician.

24.72

Pro-Rating Tables

Table 23.2 Pro-Rated Soil TPH Fractionation Chemistry for RBCAFormer Northwest Point Military SiteStantec Project No. 121410105

				7,751
ТРН	EQL (mg/kg)	TP1BS3	Mass Fraction	EPC
TPH by Frac	ctionation			
Aromatics				
>C7-C8	0.025	-		8.4
>C8-C10	0.1	32	0.0027	82
>C10-C12	4	460	0.038	297
>C12-C16	15	1600	0.133	1033
>C16-C21	15	680	0.057	439
>C21-C32	15	60	0.005	39
Aliphatics				
>C6-C8	0.1	130	0.011	84
>C8-C10	0.4	970	0.081	627
>C10-C12	8	1600	0.133	1033
>C12-C16	15	4700	0.392	3036
>C16-C21	15	1500	0.125	969
>C21-C32	15	73	0.006	47
Modified TPH		12000	1.0	7695
Toluene	0.025	0.08	-	8.4
Ethylbenzene	0.025	2.5	-	22.4
Xylenes	0.050	5	-	38.7

Notes:

Aromatics >C7-C8 = toluene

Aromatics >C8-C10 = fraction range + ethylbenzene & xylenes Benzene, Toluene, Ethylbenzene and Xylene = maximum

Table 23.3 Pro-Rated Sediment TPH Fractionation Chemistry for RBCAFormer Northwest Point Military SiteStantec Project No. 121410105

				690
ТРН	EQL (mg/kg)	TP1BS3	Mass Fraction	EPC
TPH by Frac	ctionation			
Aromatics				
>C7-C8	0.025	-		0.015
>C8-C10	0.1	32	0.0027	2
>C10-C12	4	460	0.038	26
>C12-C16	15	1600	0.133	92
>C16-C21	15	680	0.057	39
>C21-C32	15	60	0.005	3
Aliphatics	Aliphatics			
>C6-C8	0.1	130	0.011	7
>C8-C10	0.4	970	0.081	56
>C10-C12	8	1600	0.133	92
>C12-C16	15	4700	0.392	270
>C16-C21	15	1500	0.125	86
>C21-C32	15	73	0.006	4
Modified TPH		12000	1.0	679
Toluene	0.025	0.08	-	0.015
Ethylbenzene	0.025	2.5	-	0.015
Xylenes	0.050	5	-	0.025

Notes:

Aromatics >C7-C8 = toluene

Aromatics >C8-C10 = fraction range + ethylbenzene & xylenes

Toluene, Ethylbenzene and Xylene = 1/2 EQL

Risk Assessment Results

RBCA Model Output - Petroleum Hydrocarbons in Soil

Exposure Path	way Flowchart	Site N Locati Comp	ame: Northwest Point on: Northwesy Point So I. By: Kelly Johnson	Job ID: 1044857 Date: 31-Mar-10		
Source Media	Transport Mechanisms		Exposure Media	On-site	Receptors	Off-site2
Affected Surficial Soils			Soil Dermal Contact and Ingestion	Residential	NA	NA
				None	None	None
	. [:]			None	NA	NA
			an an an an ann an an an an an an an an	None	None	None
			in a second seco	NA	NA	NA
SOURCE	TRANSPORT	TOR	Comman Main Sc	ds and Opt	tions	Help

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		RBCAS	SITE ASS	SESSM	ENT				Input Pa	arameter Summ	ary
Site Name: Northwest Point Site Location: Northwesy Point Soil					Completed By Date Complete	Kelly Johns ed: 31-Mar-10	on)	Job ID: 104	14857		1 OF 1
Exposure Parameters		Residential		Commerc	ial/Industrial	Surfac	e Parameters	General	Construction		(Inite)
	Adut	Age 1-4 yrs.	Age 5-11 yrs.	Adult	Construc.	A	Soil source zone area	NA	NA		(m^2)
AT _e Averaging time for carcinogens	(yr) 78					w	Length of source-zone area parallel to wind	NA	NA		(m)
AT Averaging time for non-carcinog	iens (yr) 25	4	7	25	1	W	Length of source-zone area parallel to GW flow	NA			(m)
BW Body weight (kg)	70.7	16,5	33	70.7	[U	Ambient air velocity in mixino zone	NA			(m(s)
ED Exposure duration (yr)	25	4	7	25	1	ð _{air}	Air mixing zone height	NA			(m)
Averaging time for vapour flux (vr) 25			25	1	P.	Areal particulate emission rate	NA			(0/00)2/0)
EF Exposure frequency (days/yr)	78			78	78		Thickness of affected surface soils	NA			(g)(m)
EFp Exposure frequency for dermal	exposure 78			78		<u> </u>					(11)
IR., Indestion rate of water (L/day)	15	0.6	0.9	15	1	Surfac	e Soil Column Parameters	Value			()]=3+5
IR. Ingestion rate of soil (mg/day)	20	80	20	20	100	h	Capillary zone thickness	NA NA		•	(m)
SA Skin surface area (demail) (cm*	3400	3000	5000	3400	3400	cap	Vadose zone thickness				(11)
M Soil to skip adherence factor							Soil bulk density	616			(11)
ET Suimming exposure time /br/au	(not) 1				1	1	Eraclian amonia anthan	NA NA			(g/cm/3)
EV Summing exposure the unity	antahud 10		4.7		1	10G	Childred estable	NA NA			Θ
Event requency (event requency (event)	ents/yr) 12	12	12		1	97	Son total porosity	NA			(-)
Water ingestion while swimming	g (L/hr) 0.05	0.5	0.5			K _{re}	Vertical hydraulic conductivity	NA			(cm/s)
SA _{svim} Skin surface area for swimming	(cm^2) 2300	0 4400	8100		1	×,	Vapour permeability	NA			(m^2)
IR _{feb} Ingestion rate of fish (kg/yr)	0.05				1	Lgw	Depth to groundwater	NA			(m)
Flish Contaminated fish fraction (unit	less) 1					14	Depth to top of affected soils	NA			(m)
						Losso	Depth to base of affected soils	NA			(m)
Complete Exposure Pathways and Rece	ptors On-si	le Off-site 1	Off-site 2			Lauba	Thickness of affected soils	NA			(m)
Groundwater:						рH	Spil/groupdwater pH	NA			63
Groundwater Indestion	None	None	None					capillany	wadoca	foundation	
Spil Leaching to Groundwater Ingestion	Non	None	None			А.	Volumetric water content	NA	NA	NA	1
the Etdening to Erobildidici higobildi						e	Volumetric air content	NA	NA	NA	0
Applicable Surface Water Execute Reuter						_ ·*	Toronicula di dononi		11/	116	0
Appricable Surface Water Exposure Robies	••										
Swamping			NA NA			Surrou	ng Parameters	Residential	Commercial		(Units)
Fish Consumption			NA			L.	Building volume/area ratio	NA	NA		(m)
Aquatic Life Protection			NA			As	Foundation area	NA	NA		(m^2)
						Xerk	Foundation perimeter	NA	NA		(m)
Soil:						ER	Building air exchange rate	NA	NA		(1/s)
Direct Ingestion and Dermal Contact	Reside	ntial				Lenk	Foundation thickness	NA	NA		(m)
						Zerk	Depth to bottom of foundation slab	NA	NA		(m)
Outdoor Air;						n	Foundation crack fraction	NA	NA		6
Particulates from Surface Soils	Non	e None	None			dP	Indoor/outdoor differential pressure	NA	NA		(a/cm/s^2)
Volatilization from Soils	Non	None	None			Q.	Convective air flow through slab	NA	NA		(m^3(s)
Volatilization from Groundwater	Non	e None	None								(4.b)
						Group	durater Barameters	Value			41.4.5
Indoor Air:						3	Groundwater mixing zone death	* A100			(Units)
Valatilization from Subsurface Soils	Non					*'gw	Not aroundwriter information solo	NIA			(11)
Volatilization from Groundwater	Non	5					Crouedweler Dereuvelneitu	NAC NA			(cm/yr)
Velanazation non Globiowater	1 1000	-				V 94	Groundwater Datcy velocity	INA.			(cm/s)
						g~	Groundwater seepage velocity	NA.			(cm/s)
Receptor Distance from Source Media	On-si	te Off-site 1	Off-site 2	(Units)	4	K,	Saturated hydraulic conductivity	NA			(cm/s)
Groundwater receptor: Distance downgra	adient NA	NA	NA	(m)	1	1 1	Groundwater gradient	NA.			(-)
Lateral distance off centreline	NA	NA	NA	(m)		S,,	Width of groundwater source zone	NA			(m)
Vertical distance below top of water-be	aring unit NA	NA	NA	(m)	1	S,	Depth of groundwater source zone	NA			(m)
Soil leaching to groundwater receptor: Di	ist, downgradient NA	NA	NA	(m)		Got	Effective porosity in water-bearing unit	NA			6
Lateral distance off centreline	NA	NA	NA	(m)	1	facant	Fraction organic carbon in water-bearing unit	NA			6
Vertical distance below top of water-be	aring unit NA	NA	NA	(m)		pH.,	Groundwater oH	NA			6
Outdoor air inhalation recentor: downwin	nd distance NA	NA	NA	(m)		san	Biodencadation considered?	NA			
				(11)		1	procedimention considered:				
Torget Health Rick Values	La disud	uni Cumulativa	r			L		:			
TD Tamet Dial (dags ASC'			4								
TRab Target Risk (class A&B carcino)	gens) 1.0E	5 1.02-5	1			transp	port Parameters	Ott-site 1	Off-site 2	Off-site 1 Off-site 2	(Units)
IRc Target Risk (class C carcinogen	1,0E-	5				Latera	i Groundwater Transport	Groundw	ater Ingestion	Soil Leaching to GW	
THU Target Hazard Quotient (non-ca	rcinogenic risk) 1.0E4	0 1.02+0	1			a,	Longitudinal dispersivity	NA	NA	NA NA	(m)
						αγ	Transverse dispersivity	NA	NA	NA NA	(m)
Modelling Options						α	Vertical dispersivity	NA	NA	NA NA	(m)
RBCA tier	Tier 2 of	3				Latera	al Outdoor Air Transport	Soil to Out	door Air Inhal.	GW to Outdoor Air Inhal.	
RBCA tier Calculation option	Tier 2 o Individu	3 al & Cumulative Risk	s			Latera C.	al Outdoor Air Transport Transverse dispersion coefficient	Soil to Out NA	idoor Air Inhal. NA	GW to Outdoor Air Inhal. NA NA	(ന)
RBCA tier Calculation option Outdoor air volatilization model	Tier 2 o Individu NA	3 al & Cumulative Risk	s			Latera Cy	al Outdoor Air Transport Transverse dispersion coefficient Vertical dispersion coefficient	<u>Soil to Ou</u> NA NA	idoor Air inhal. NA N∆	<u>GW to Outdoor Air Inhal.</u> NA NA NA NA	(m) (m)
RBCA tier Calculation option Outdoor air volatilization model Indoor air volatilization model	Tier 2 o Individu NA NA	3 al & Cumulative Risk	s			Latera Cy Cz	Il Outdoor Air Transport Transverse dispersion coefficient Vertical dispersion coefficient Air dispersion factor	Soil to Ou NA NA NA	idoor <u>Air Inhal.</u> NA NA NA	GW to Outdoor Air Inhal, NA NA NA NA	(m) (m)
RBCA tier Calculation option Outdoor air volatilization model Indoor air volatilization model Soil leaching model	Tier 2 o Individu NA NA	3 al & Cumulative Risk	s			Latera Cy Cz ADF	I Outdoor Air Transport Transverse dispersion coefficient Vertical dispersion coefficient Air dispersion factor	<u>Soil to Our</u> NA NA NA	idoor Air Inhal. NA NA NA	<u>GW to Outdoor Air Inhal.</u> NA NA NA NA NA NA	(m) (m) (-)
RBCA tier Calculation option Outdoor air volatilization model Indoor air volatilization model Soil teaching model	Tier 2 ol Individu NA NA NA	3 al & Cumulative Risk	s			Latera Gy Gz ADF	Il Outdoor Air Transport Transverse dispersion coefficient Vertical dispersion coefficient Air dispersion factor	<u>Soil to Qu</u> NA NA NA	idoor Air Inhal. NA NA NA	GW to Outdoor Air Inhal, NA NA NA NA NA NA	(m) (m) (-)
RBCA tier Calculation option Outdoor air volatilization model Indoor air volatilization model Soil leaching model Use soil attenuation model (SAM) for lea	Tier 2 o Individu NA NA NA NA	3 al & Cumulative Risk	s			Latera Cy Cz ADF	It Outdoor Air Transport Transverse dispersion coefficient Vertical dispersion coefficient Air dispersion factor e Water Parameters	Soil to Our NA NA NA	Idoor Air Inhal. NA NA NA Off-site 2	<u>GW to Outdoor Air Inhal</u> NA NA NA NA NA NA	(m) (m) (-) (Units)
RBCA tier Calculation option Outdoor air volatilization model Indoor air volatilization model Soil teaching model Use soil attenuation model (SAM) for lea Air dilution factor	Tier 2 o Individu NA NA NA NA NA	3 al & Cumulative Risk	s			Latera Cy Cz ADF Surfac Qsw	II Outdoor Air Transport Transverse dispersion coefficient Vertical dispersion coefficient Air dispersion factor the Water Parameters Surface water flowrate	Soil to Out NA NA NA	Idoor Air Inhal. NA NA NA Off-site 2 NA	GW to Outdoor Air Inhal, NA NA NA NA NA NA	(m) (m) (-) (Units) (m*3/s)
RECA tier Calculation option Outdoor air volatilization model Indoor air volatilization model Soil leaching model Use soil attenuation model (SAM) for lea Air diution factor Groundwater dilution-attenuation factor	Tier 2 o Individu NA NA NA NA NA	3 al & Cumulative Risk	s			Latera Gy Gz ADF Surfac Q _{sw} W _{pi}	II Outdoor Air Transport Transverse dispersion coefficient Vertical dispersion coefficient Air dispersion factor te Water Parameters Surface water flowrate Width of GW plume at SW discharge	Soil to Qu NA NA NA NA	Idoor Air Inhal. NA NA NA Off-site 2 NA NA	GW to Outdoor Air Inhal, NA NA NA NA NA NA	(m) (m) (-) (Units) (m^3/s) (m)
RBCA tier Calculation option Outdoor air volatilization model Indoor air volatilization model Soil teaching model Use soil attenuation model (SAM) for lea Air dilution factor Groundwater dilution-attenuation factor	Tier 2 o Individu NA NA NA NA NA NA	3 al & Cumulative Risk	S			Latera Gy Gz ADF Surfac Q _{sw} W _{pi} ô _p	Il Outdoor Air Transport Transverse dispersion coefficient Vertical dispersion coefficient Air dispersion factor See Water Parameters Surface water flowrate Width of GW plume at SW discharge Thickness of GW plume at SW discharge	Soil to Qu NA NA NA	idoor Air Inhal. NA NA NA Off-site 2 NA NA NA	GW to Outdoor Air Inhai, NA NA NA NA NA NA	(m) (m) (-) (Units) (m^3/s) (m) (m)

RBCA SITE ASSESSMENT

User-Specified COC Data

REPRESENTATIVE COC CONCENTRATIONS IN SOURCE MEDIA

		Representa	tive COC Concentration				
CONSTITUENT	Gro	undwater	Soils (0 - 3 m)				
	value (mg/L)	note	value (mg/kg)	note			
TPH - Aliph >C06-C08			8.4E+1	EPC			
TPH - Aliph >C08-C10			6.3E+2	EPC			
TPH - Aliph >C10-C12			1.0E+3	EPC			
TPH - Aliph >C12-C16			3.0E+3	EPC			
TPH - Aliph >C16-C21			9.7E+2	EPC			
TPH - Aliph >C21-C34			4.7E+1	EPC			
TPH - Arom >C07-C08			8.4E+0	EPC			
TPH - Arom >C08-C10			8.2E+1	EPC			
TPH - Arom >C10-C12			3.0E+2	EPC			
TPH - Arom >C12-C16			1.0E+3	EPC			
TPH - Arom >C16-C21			4.4E+2	EPC			
TPH - Arom >C21-C35			3.9E+1	EPC			
Site Name: Northwest Point			Date Completed: 31-N	/lar-10			

Site Location: Northwesy Point Soil Completed By: Kelly Johnson

Job ID: 1044857

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	RBCA SITI	EASSESSMENT				
Site Name: Northwest Point	Site Location: Northwesy Point Soil	Completed By: Kelly	Johnson	Date Completed: 31-	Mar-10 1 0	
	TIER 2 EXPOSURE CONCENT	RATION AND INT	AKE CALCULATION	I		
SOIL EXPOSURE PATHWAY		(CHECKED IF PAT	HWAY IS ACTIVE)			
SURFACE SOILS OR SEDIMENTS:						
ON-SITE INGESTION AND DERMAL CONTACT	1) Source/Exposure Medium	2) Expos (IR+SAxMxRAF)xEF	sure Multiplier xED/(BWxAT) (kg/kg/day)	3) Average Daily Intake Ra y) (mg/kg/day) (1) x (2)		
Constituents of Concern	Surface Soil Conc. (mg/kg)	Residential	Construction Worker	Residential	Construction Worker	
TPH - Aliph >C06-C08	8.4E+1	3.0E-6		2.5E-4		
TPH - Aliph >C08-C10	6.3E+2	3.0E-6		1.9E-3		
TPH - Aliph >C10-C12	1.0E+3	3.0E-6		3.1E-3		
TPH - Aliph >C12-C16	3.0E+3	3.0E-6		9.0E-3		
TPH - Aliph >C16-C21	9.7E+2	3.0E-6		2.9E-3		
TPH - Aliph >C21-C34	4.7E+1	3.0E-6		1.4E-4		
TPH - Arom >C07-C08	8.4E+0	3.0E-6		2.5E-5		
TPH - Arom >C08-C10	8.2E+1	3.0E-6		2.4E-4		
TPH - Arom >C10-C12	3.0E+2	3.0E-6		8.8E-4		
TPH - Arom >C12-C16	1.0E+3	3.0E-6		3.1E-3		
TPH - Arom >C16-C21	4.4E+2	3.0E-6		1.3E-3		
TPH - Arom >C21-C35	3.9E+1	3.0E-6		1.2E-4		

NOTE: RAF = Relative absorption factor (-)	AT = Averaging time (days)	ED = Exposure duration (yrs)	IR = Soil ingestion rate (mg/day)
M = Adherence factor (mg/cm ²)	BW = Body weight (kg)	EF = Exposure frequencey (days/yr)	SA = Skin exposure area (cm^2/day)
Site Name: Northwest Point		Date Completed: 31-Ma	ar-10
Site Location: Northwesy Point Soil		Job ID: 1044857	
Completed By: Kelly Johnson			

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RBCA SITE ASSESSMENT

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SOIL EXPOSURE PATHWAY	(CHECKED IF PATHWAY IS ACTIVE)										
				TOXIC EFFEC	TS						
		4) Total Toxicant Inta	ke Rate (mg/kg/da	y)	(5)	Oral	(6) Individual CO	Hazard Quotient			
	(a) via Ingestion	(b) via Dermal Contact	(c) via Ingestion	(d) via Dermal Contact	Reference Do	se (mg/kg-day)	(4a)/(5a) + (4b)/(5b)	(4c)/(5a) + (4d)/(5b			
Constituents of Concern	Resid	lential	Construc	tion Worker	(a) Oral	(b) Dermal	Residential	Construction Worker			
TPH - Aliph >C06-C08	8.7E-5	1.6E-4			5.0E+0	5.0E+0*	5.0E-5				
TPH - Aliph >C08-C10	6.5E-4	1.2E-3			1.0E-1	1.0E-1*	1.9E-2				
TPH - Aliph >C10-C12	1.1E~3	2.0E-3			1.0E-1	1.0E-1*	3.1E-2				
TPH - Aliph >C12-C16	3.1E-3	5.9E-3			1.0E-1	1.0E-1*	9.0E-2				
TPH - Aliph >C16-C21	1.0E-3	1.9E-3			2.0E+0	2.0E+0*	1.4E-3				
TPH - Aliph >C21-C34	4.9E-5	9.1E-5			2.0E+0	2.0E+0*	7.0E-5				
TPH - Arom >C07-C08	8.7E-6	1.6E-5			2.0E-1	2.0E-1*	1.3E-4				
TPH - Arom >C08-C10	8.5E-5	1.6E-4			4.0E-2	4.0E-2*	6.1E-3				
TPH - Arom >C10-C12	3.1E-4	5.8E-4			4.0E-2	4.0E-2*	2.2E-2				
TPH - Arom >C12-C16	1.1E-3	2.0E-3			4.0E-2	4.0E-2*	7.7E-2				
TPH - Arom >C16-C21	4.5E-4	8.5E-4			3.0E~2	3.0E-2*	4.4E-2				
TPH - Arom >C21-C35	4.0E-5	7.6E-5			3.0E-2	3.0E-2*	3.9E-3				
	 No dermal reference of 	lose availableoral referen	nce dose used,								
				Total Pat	thway Haza	rd Index =	2.9E-1				

Site Name: Northwest Point Site Location: Northwesy Point Soil Completed By: Kelly Johnson

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Date Completed: 31-Mar-10 Job ID: 1044857

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Site Name: No	orthwest Point		Completed By:	Kelly Johnson			Job ID: 1	044857							
Site Location:	Northwesy Point Soil		Date Completed	d: 31-Mar-10											1 OF 1
			Target	Risk (Class A & B):	1.0E-5	Source Depletion Option: No									
SOIL (0-3 m) SSTL VALUES		Та	Target Risk (Class C): 1.0E-5 Timo to Future Exposure: 0 years											
			Targe	Target Hazard Quotient: 1.0E+0											
						SSTL Results For	Complete Exp	osure Pathways ("	X" if Complete)					·	
			So	il Leaching to Gro	undwater	Sail Vol. to	T.	Soil Volatili	zation and Surfac	e	Surface S	oil Ingestion and		T	During cos
		D	Ingestic	on / Discharge to S	Surface Water	r Indoor Air Soil Particulates to Outdoor Air A Dermal Contact Applicable SSTL				SSTL	Required CRF				
CONSTITUEN	ITS OF CONCERN	Concentration	(0 m)	Un-site 1 (0 m)	(0 m)	(0 m)	On-s	te (0 m)	Off-sate1 (0 mn)	Off-sate 2 (0 m)	On-sit	e (0 m)	SSTL	Exceeded ?	Only if "yes"
CAS No.	Name	(mg/kg)	None	None	None	None	None	Construction Worker	None	None	Residential	Construction Worker	(mg/kg)	"ns" if yes	left
106-08-0	TPH - Aliph >C06-C08	8.4E+1	NA	NA	NA	NA	NA	NA	NA	NA	1,0E+6	NA	1.0E+6	0	<1
108-10-0	TPH - Aliph >C08-C10	6.3E+2	NA	NA	NA	NA	NA	NA	NA	NA	3.0E+4	NA	3.0E+4		<1
110-12-0	TPH - Aliph >C10-C12	1.0E+3	NA	NA	NA	NA	NA	NA	NA	NA	3.4E+4	NA	3.4E+4		<1
112-16-0	TPH - Aliph >C12-C16	3.0E+3	NA	NA	NA	NA	NA	NA	NA	NA	3.4E+4	NA	3.4E+4		<1
116-21-0	TPH - Aliph >C16-C21	9.7E+2	NA	NA	NA	NA	NA	NA	NA	NA	6,7E+5	NA	6.7E+5		<1
121-34-0	TPH - Aliph >C21-C34	4.7E+1	NA	NA	NA	NA	NA	NA	NA	NA	6.7E+5	NA	6.7E+5		<1
207-08-0	TPH - Arom >C07-C08	8.4E+0	NA	NA	NA	NA	NA	NA	NA	NA	6.6E+4	NA	6.6E+4		<1
208-10-0	TPH - Arom >C08-C10	8.2E+1	NA	NA	NA	NA	NA	NA	NA	NA	1.0E+4	NA	1.0E+4		<1
210-12-0	TPH - Arom >C10-C12	3.0E+2	NA	NA	NA	NA	NA	NA	NA	NA	1.3E+4	NA	1.3E+4		<1
212-16-0	TPH - Arom >C12-C16	1.0E+3	NA	NA	NA	NA	NA	NA	NA	NA	1.3E+4	NA	1.3E+4	0	<1
216-21-0	TPH - Arom >C16-C21	4.4E+2	NA	NA	NA	NA	NA	NA	NA	NA	1.0E+4	NA	1.0E+4		<1
221-35-0	TPH - Arom >C21-C35	3.9E+1	NA	NA	NA	NA	NA	NA	NA	NA	1.0E+4	NA	1.0E+4		<1

*>" indicates risk-based target concentration greater than constituent residual saturation value. NA = Not applicable. NC = Not calculated,

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Site Name: N Site Location	lorthwest Point I: Northwesy Point Soil		and a sure of starting		Completed By: Kelly Date Completed: 31	Johnson Mar-10		Job ID: 1044857		SSTE WORKSheet	
SSTL VA	LUES FOR TPH		Target Hazard	Index: 1.0E+0			Source Depletion Option: No				
		<u> </u>	Mass F	ractions	Representative	Concentrations	Calculated Concentration Limits Applicable SSTL Value				
CONSTITUE	NTS OF CONCERN	Γ	Soil	Groundwater	Soil	Groundwater	Residual Soil Concentration	Solubility	Soils (0 - 3 m)	Groundwater	
CAS No.	Name		(~)	(-)	(mg/kg)	(mg/L)	(mg/kg)	(ma/L)	(ma/ka)	(mg/j)	
106-08-0	TPH - Aliph >C06-C08		1.1E-2		8.4E+1		1.5E+2		1.0E+6	(
108-10-0	TPH - Aliph >C08-C10		8,1E-2		6.3E+2		7.4E+1		3.0E+4	1	
110-12-0	TPH - Aliph >C10-C12		1.3E-1		1.0E+3		4.3E+1		3.4E+4	1	
112-16-0	TPH - Aliph >C12-C16		3.9E-1		3.0E+3		1.9E+1		3.4E+4		
116-21-0	TPH - Aliph >C16-C21		1.3E-1		9.7E+2	1	7.9E+0		6.7E+5	~	
121-34-0	TPH - Aliph >C21-C34		6.1E-3		4.7E+1	1	1.3E+5		6,7E+5		
207-08-0	TPH - Arom >C07-C08		1.1E-3		8.4E+0	······	7.1E+2		6.6E+4		
208-10-0	TPH - Arom >C08-C10		1.1E-2		8.2E+1		5.2E+2		1.0E+4		
210-12-0	TPH - Arom >C10-C12		3.9E-2	1	3.0E+2		3.2E+2		1.3E+4		
212-16-0	TPH - Arom >C12-C16	1	1.3E-1	1	1.0E+3		1.5E+2		1.3E+4	+	
216-21-0	TPH - Arom >C16-C21		5.7E-2		4.4E+2		5.2E+1		1.0E+4	+	
221-35-0	TPH - Arom >C21-C35		5.1E-3	1	3.9E+1	1	4.2E+0		1.0E+4	+	
				·		,	۲ــــــــــــــــــــــــــــــــــــ				
		Total	1.0E+0	0.0E+0	7.7E+3	0.0E+0	•	Total TPH SSTL	2,6E+4		

">" indicates risk-based target concentration greater than constituent residual saturation value. NC = Not calculated.

Risk Assessment Results

RBCA Model Output - Petroleum Hydrocarbons in Sediment

Exposure	Pathway Flowchart	Site Loca Con	Name: Northwest Point ation: Northwest Point apl. By: Kelly Johnson		J	ob ID: 1044857 Date: 31-Mar-10
Source Media	Transport Mechanis	ms	Exposure Media	On-site	Receptors Off-site1	Off-site2
Affected Surficial Soils			➤ Soil Dermal Contact and Ingestion	Residential	NA	NA
		·····	- Constant de la constant	None	None	None
]	ala kultur ortekkedi t	None	NA	NA
-			aan aa ah ah ah ah ah Ah ah ah ah ah ah ah ah ah Ah ah ah ah ah ah ah ah Ah ah	None	None	None
			an chan an chuir an An aisteachtaí an Ainmeir ann a bhli Ainmeir ann a bhli	NA	NA	NA
SOURCE		ECEPTOR	Comman	ids and Op	tions	
<u> </u>			Main So	creen Pr	int Sheet	Help

RBCA Tool Kit for Atlantic Canada, Version 2.1

Site Name: Northwest Point					Com
Site Location: Northwest Point			:		Date
Exposure Parameters		Residential		Commerc	ial/ind
	Aduit	Age 1-4 yrs.	Age 5-11 yrs.	Adult	<u>Cc</u>
AT _c Averaging time for carcinogens (yr)	-) -) -(-)	,	7	25	
AT _n Averaging time for non-carcinogens (y	n) 25 70.7	16.5	22	70.7	
BW Body weight (kg)	70.7	10.5	33	25	
ED Exposure datation (yr)	25	-		25	
FE Exposure frequency (days/w)	39			39	
EFp Exposure frequency for dermal exposu	ire 39			39	
IR., Incestion rate of water (L/day)	1.5	0.6	0.9	1.5	
IR, incestion rate of soil (mg/day)	20	80	20	20	
SA Skin surface area (dermal) (cm*2)	3400	3000	5000	3400	
M Soil to skin adherence factor	0.1			;	
ET _{swim} Swimming exposure time (hr/event)	1				
EV _{svim} Swimming event frequency (events/yr) 12	12	12		
IR _{swim} Water ingestion while swimming (L/hr)	0.05	0.5	0.5		
SA _{pvim} Skin surface area for swimming (cm ²) 23000	4400	8100		
IR _{fish} Ingestion rate of fish (kg/yr)	0.05				
Flish Contaminated fish fraction (unitless)	1			<u></u>	
Complete Exposure Pathways and Receptors	On-site	Off-site 1	Off-site 2		
Groundwater;					
Groundwater Ingestion	None	None	None	1	
Soil Leaching to Groundwater Ingestion	None	None	None		
Applicable Surface water Exposure Routes:			NA	i i	
Swimming Sich Consumption			NA		
Acustic 1 ife Protection			NA		
Aquallo Ene l'Integalori					
Soil: Direct Ingestion and Dermal Contact	Residentia				
Outdoor Air:					
Particulates from Surface Soils	None	None	None	[
Volatilization from Solis	None	None	None		
Volanizatori innin Groundwater	ivone	Nulle	Home		
Indoor Air:					
Volatilization from Subsurface Soils	None				
Volatilization from Groundwater	None]	
Pacantos Distance from Source Media	On-site	Off-site 1	Off-site 2	(Units)	-
Groundwater receptor: Distance downgradient	NA NA	NA	NA	(៣)	-
Lateral distance off centreline	NA	NA	NA	(m)	
Vertical distance below top of water-bearing	unit NA	NA	NA	(m)	I
Soil leaching to groundwater receptor: Dist. do	wngradient NA	NA	NA	(m)	
Lateral distance off centreline	NA	NA	NA	(m)	
Vertical distance below top of water-bearing	unit NA	NA	NA	(m)	
Outdoor air inhalation receptor, downwind dis	tance NA	NA	NA	(m)	
Zarand Una the Olah Mahara	مدينة 1 افرين (Cumulative	7		
TP Tamet Disk (alors A&P comissions)	1 05.4	1 06.4	-		
TR Tamet Rick (class Add carcinogens)	105.5		1		
THQ Target Hazard Quotient (non-carcinol	genič risk) 1.0E+0	1.05+0	1		
			-	_	
Modelling Options]	
RBCA tier	Tier 2 or 3				
Calculation option	Individual i	& Cumulative Risk	. S	1	
Outdoor air volatilization model	NA			1	
Indoor sir volatilization model	NA			1	
Soil leaching model	NA				
Use soil attenuation model (SAM) for leachatt	NA NA				
An unution factor	NA NA			1	

)					10
Surface	e Parameters	Genera ³	Construction			/linite
Surrac	Coll course tone area	MA	NA NA		· · · · · · · · · · · · · · · · · · ·	(mAn)
ж 107	Son source zone drea parallal la vind	NA NA	NA		į	(m)
VV Inv	Lengin of source-zone area paratiento wind	INA I	INA			(m)
W gry	Length of source-zone area parallel to GW flow	NA			1	(m)
Uar	Ambient air velocity in mixing zone	NA				(m/s)
ð _{aie}	Air mixing zone height	NA			į	(m)
P _a	Areal particulate emission rate	NA				(g/cm^2
í. <u></u>	Thickness of affected surface soils	NA				(m)
Surfac	e Soil Column Parameters	Value				(Units
h _{cap}	Capillary zone thickness	NA				(m)
h,	Vadose zone thickness	NA				(m)
P s	Soil bulk density	NA				(g/cm^
for	Fraction organic carbon	NA				(-)
07	Soil total porosity	NA				(-)
к <u>`</u>	Vertical hydraulic conductivity	: NA				(cm/s
k	Vanour permeability	NA				(m^?)
г. ₄	Don'th to crowndwaler	MA				100
եցու	Dephi to groundwater	NA NA				(m) (m)
L.,	Lepin to top of affected soils	NA				(m)
Lbase	Depth to base of affected soils	NA				(m)
Luopa	Thickness of affected soils	NA				(m)
рН	Spil/groundwater pH	NA				(-)
	- ,	capillary	vadose	foundation	i	•••
A	Volumetric water content	NA	NA	MA		(.)
₩ ₩	Volumetric pir content	NA	NA	NA.		(7)
v.,	voumente da comena		714	(IA		(-)
Build	ng Paramatare	Residential	Commercial			(Up#r
Builde	Building volume(area ratio	NA	NA			(m)
	Concerns volumerates ratio		N			4117
Ab	Foundation area	NA	NA		l.	(៣^2
Xerk	Foundation perimeter	: NA	NA			(ጠ)
ER	Building air exchange rate	NA	NA			(1/\$)
L.m	Foundation thickness	NA	NA			(m)
Z.,	Depth to bottom of foundation slab	NA	NA			(m)
-crk	Equadation crack fraction	NA	NA			611
р 1 лр		:			-	(-)
aP C	Indoor/oudoor differential pressure	: NA	NA.			(grom/s
<u> </u>	CONVECTIVE SIL NOW HITOUGH SISD	NA NA	MA	·		(nr:\3/
Ground	ndwater Parameters	Value				(iloit-
- 01000	Groundwater mixing zone depth	NA				(m)
	Not anoundwater infiltration rate	MA				formin
-977	iver grounowater initiation rate					(cm/y
-9** i		NA NA				(cm/s
եր հ հ	Groundwater Darcy velocity					
اب اب Ugw	Groundwater Darcy velocity Groundwater seepage velocity	NA				(cm/s
ابو اب Ugw Vgw	Groundwater Darcy velocity Groundwater seepage velocity Saturated hydrautic conductivity	NA NA				(cm/s (cm/s
ار ار ال ال ال ال ال ال ال ال ال ال ال ال ال	Groundwater parcy velocity Groundwater seepage velocity Saturated hydraulic conductivity Groundwater gradient	NA NA NA				(cm/s (cm/s
پور ار ار ار ار ار ار ار ار ار ار ار ار ار	Groundwater Darcy Velocity Groundwater seepage velocity Saturated hydrautic conductivity Groundwater gradient	NA NA NA				(cm/s (cm/s (-)
اب Ugw Vgw K, i S,	Groundwater Darcy Velocity Groundwater Seepage velocity Saturated hydrautic conductivity Groundwater gradient Width of groundwater source zone	NA NA NA				(cm/s (cm/s (-) (m)
l, Ugw K, i S, Sd	Groundwater Darcy Velocity Groundwater seepage velocity Saturated hydraulic conductivity Groundwater gradient Width of groundwater source zone Depth of groundwater source zone	NA NA NA NA				(cm/s (cm/s (-) (m) (m)
I, Ugw Vgw K, Sα θort	Groundwater Darcy Velocity Saturated hydraulic conductivity Groundwater gradient Width of groundwater source zone Depth of groundwater source zone Effective porosity in water-bearing unit	NA NA NA NA NA				(cm/s (cm/s (-) (m) (m) (-)
I, Ugw K, i S _d θ _{off} f _{oc-tal}	Groundwater Darcy Velocity Groundwater Seepage velocity Saturated hydrautic conductivity Groundwater gradient Width of groundwater source zone Depth of groundwater source zone Effective porosity in water-bearing unit Fraction organic carbon in water-bearing unit	NA NA NA NA NA NA				(cm/s (cm/s (-) (m) (m) (-) (-)
I _g U _g V _{gw} K _s i S _w θ _{off} f _{oc-sal}	Groundwater Satery Velocity Saturated hydraulic conductivity Groundwater gradient Width of groundwater source zone Depth of groundwater source zone Effective porosity in water-bearing unit Fraction organic carbon in water-bearing unit Groundwater pH	NA NA NA NA NA NA NA				(cm/s (cm/s (-) (m) (m) (-) (-) (-)
I _t U _{gw} V _{gw} K _s i S _w S _d θ _{off} f _{oc-sat}	Groundwater Darcy Velocity Saturated hydraulic conductivity Groundwater gradient Width of groundwater source zone Depth of groundwater source zone Effective porosity in water-bearing unit Fraction organic carbon in water-bearing unit Groundwater pH Biodegradation considered?	NA NA NA NA NA NA NA				(cm/s (cm/s (-) (m) (m) (-) (-) (-)
It Ugw Vgw K S S θorf foc-sat PH _{3.3} t	Groundwater Darcy Velocity Groundwater scepage velocity Saturated hydraulic conductivity Groundwater gradient Width of groundwater source zone Depth of groundwater source zone Effective porosity in water-bearing unit Fraction organic carbon in water-bearing unit Groundwater pH Biodegradation considered?	NA NA NA NA NA NA NA				(cm/s (cm/s (-) (m) (m) (-) (-)
l, Ugw Vgw Ks i Sσ θort foc-2at ρHsat	Groundwater Darcy Velocity Groundwater seepage velocity Saturated hydrautic conductivity Groundwater gradient Width of groundwater source zone Depth of groundwater source zone Effective porosity in water-bearing unit Fraction organic carbon in water-bearing unit Groundwater pH Biodegradation considered?	NA NA NA NA NA NA NA	Off.cite 2	Off.cite 4	Officia 2	(cm/s (cm/s (-) (m) (m) (-) (-) (-)
I Ugw Vgw Ks i Sσ θort foc-23t PHsst	Groundwater Darcy Velocity Groundwater Seepage velocity Saturated hydrautic conductivity Groundwater gradient Width of groundwater source zone Depth of groundwater source zone Effective porosity in water-bearing unit Fraction organic carbon in water-bearing unit Groundwater pH Biodegradation considered?	NA NA NA NA NA NA NA Off-site 1	Off-site 2	Off-site 1	Off-site 2	(cm/s (cm/s (-) (m) (m) (-) (-) (-)
I Ugw Vgw Ks i Sw Sd θort foc-sat pH ₃₃ t	Groundwater Satery Velocity Groundwater scepage velocity Saturated hydraulic conductivity Groundwater gradient Width of groundwater source zone Depth of groundwater source zone Effective porosity in water-bearing unit Fraction organic carbon in water-bearing unit Groundwater pH Biodegradation considered? sport Parameters al Groundwater Transport Located into deinceritier	NA NA NA NA NA NA NA Off-site 1 <u>Groundw</u>	Off-site 2 ater ingestion	Off-site 1 Soil Lead	Off-site 2	(cm/s (cm/s (-) (m) (m) (-) (-) (-) (-)
Ugw Vgw Ks i Sw Sd θort foc-2at pHsst Trans Later αx	Groundwater Darcy Velocity Groundwater scepage velocity Saturated hydraulic conductivity Groundwater gradient Width of groundwater source zone Depth of groundwater source zone Effective porosity in water-bearing unit Fraction organic carbon in water-bearing unit Groundwater pH Biodegradation considered? Sport Parameters at Groundwater Transport Longitudinat dispersivity	NA NA NA NA NA NA NA <u>NA</u> <u>Off-site 1</u> <u>Groundwr</u>	Off-site 2 ater Ingestion NA	Off-site 1 Soil Lead NA	Off-site 2 hing to GW NA	(cm/s (cm/s (-) (m) (-) (-) (-) (-) (-)
$\begin{array}{c} I \\ I \\ U_{5^{\prime\prime\prime}} \\ V_{9^{\prime\prime\prime}} \\ K_{s} \\ i \\ S_{w} \\ S_{d} \\ \theta_{off} \\ f_{oc-2s^{1}} \\ \rho H_{sat} \\ \end{array}$	Groundwater Sarey Velocity Groundwater seepage velocity Saturated hydraulic conductivity Groundwater gradient Width of groundwater source zone Depth of groundwater source zone Effective porosity in water-bearing unit Fraction organic carbon in water-bearing unit Groundwater pH Biodegradation considered?	NA NA NA NA NA NA Off-site 1 <u>Groundwr</u> NA	Off-site 2 ater logestion NA NA	Off-site 1 Soil Lead NA NA	Off-site 2 hing to <u>GW</u> NA NA	(cm/s (cm/s (-) (m) (m) (-) (-) (-) (-) (-) (-) (-) (-) (-) (-
I Ugw Vgw K i Sw Sd θof foc-sat pH _{3at} Trans Later α _y α _z	Groundwater Darcy Vertical Groundwater Seepage velocity Saturated hydraulic conductivity Groundwater gradient Width of groundwater source zone Depth of groundwater source zone Effective porosity in water-bearing unit Fraction organic carbon in water-bearing unit Groundwater pH Biodegradation considered?	NA NA NA NA NA NA Off-site 1 <u>Groundw</u> NA NA	Off-site 2 ater logestion NA NA NA	Off-site 1 Soil Lead NA NA NA	Off-site 2 hing to GW NA NA NA	(cm/s (cm/s (c)) (m) (m) (-) (-) (-) (-) (-) (-) (-) (-) (-) (-
$\begin{array}{c} & & \\$	Groundwater Sarey Velocity Groundwater seepage velocity Saturated hydraulic conductivity Groundwater gradient Width of groundwater source zone Depth of groundwater source zone Effective porosity in water-bearing unit Fraction organic carbon in water-bearing unit Groundwater pH Biodegradation considered? port Parameters af Groundwater Transport Longitudinal dispersivity Vertical dispersivity Vertical dispersivity I doudoor Af Transport	NA NA NA NA NA NA NA NA NA Soli to Out	Off-site 2 ater Ingestion NA NA NA door Air Inhal	Off-site 1 Soil Leact NA NA NA QW to Outd	Off-site 2 hing to GW NA NA NA oor Air Inhal	(cm/s (cm/s (-) (m) (m) (-) (-) (-) (-) (m) (m) (m)
I_{i} U_{gw} V_{gw} K_{s} i S_{w} S_{d} θ_{off} f_{oc-2ai} pH_{sat} $Trans$ $Later$ a_{x} a_{y} a_{z} $Later$ c	Groundwater Darcy Verticity Groundwater scepage velocity Saturated hydraulic conductivity Groundwater gradient Width of groundwater source zone Depth of groundwater source zone Effective porosity in water-bearing unit Fraction organic carbon in water-bearing unit Groundwater pH Biodegradation considered?	NA NA NA NA NA NA NA Off-site 1 <u>Groundw:</u> NA NA NA NA	Off-site 2 ater Ingestion NA NA NA NA NA NA	Off-site 1 Soil Lead NA NA NA GW to Outd	Off-site 2 hing to GW NA NA NA NA Ogr Ajr Ishal. NA	(cm/s (cm/s (-) (m) (m) (-) (-) (-) (-) (-) (-) (-) (-) (-) (-
$\begin{tabular}{c} & \mathbf{J}_{gw} & \mathbf{J}_{gw} \\ & \mathbf{U}_{gw} & \mathbf{K}_{g} \\ & \mathbf{i} & \mathbf{S}_{w} \\ & \mathbf{S}_{w} & \mathbf{S}_{d} \\ & \boldsymbol{\theta}_{off} & \mathbf{f}_{oc-sst} \\ & \boldsymbol{\theta}_{off} & \mathbf{f}_{oc-sst} \\ & \boldsymbol{\theta}_{off} & \mathbf{f}_{oc-sst} \\ & \boldsymbol{\theta}_{sst} & \mathbf{Trans} \\ & \mathbf{Later} \\ & \boldsymbol{\alpha}_{x} \\ & \boldsymbol{\alpha}_{z} \\ & \boldsymbol{\lambda}_{ater} \\ & \boldsymbol{\alpha}_{y} \\ & \boldsymbol{\lambda}_{ater} \\ & \boldsymbol{\alpha}_{y} \\ & \boldsymbol{\lambda}_{ater} \\ & \boldsymbol{\theta}_{y} \\ & \boldsymbol{\lambda}_{st} \\ & \lambda$	Groundwater Darcy Verduzy Groundwater Seepage velocity Saturated hydraulic conductivity Groundwater gradient Width of groundwater source zone Depth of groundwater source zone Effective porosity in water-bearing unit Fraction organic carbon in water-bearing unit Groundwater pH Biodegradation considered?	NA NA NA NA NA NA NA Solito Out Solito Out NA NA	Off-site 2 ater Ingestion NA NA door Air Inhal, NA	Off-site 1 Soil Lead NA NA SW to Outd NA	Off-site 2 ning to GW NA NA NA oor Air Inhal NA	(cm/s (cm/s (c) (m) (m) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c
$\begin{tabular}{c} & & & & \\ I_{i} & & & \\ U_{gw} & V_{gw} & \\ & & & \\ K_{s} & & & \\ S_{w} & & \\ S_{w} & & \\ S_{w} & \\ S_{w} & \\ S_{w} & \\ S_{w} & \\ f_{occut} & \\ f_{oc$	Groundwater Sarey Velocity Groundwater seepage velocity Saturated hydraulic conductivity Groundwater gradient Width of groundwater source zone Depth of groundwater source zone Effective porosity in water-bearing unit Fraction organic carbon in water-bearing unit Groundwater pH Biodegradation considered? Sport Parameters at Groundwater Transport Longitudinal dispersivity Vertical dispersivity Vertical dispersivity Vertical dispersion coefficient Vertical dispersion coefficient	NA NA NA NA NA NA NA Off-site 1 <u>Groundwy</u> NA NA NA NA NA NA NA	Off-site 2 ater Ingestion NA NA NA door Air Inhal, NA NA	Off-site 1 Soil Lead NA NA NA <u>GW to Outd</u> NA NA	Off-site 2 hing to GW NA NA NA Sor Afr Ishal NA NA	(cm/s (cm/s (m)) (m) (m) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c
I_{i} U_{gw} V_{gw} K_{s} i S_{of} θ_{off} f_{oc-sat} f_{oc-sat} $Trans$ $Later$ α_{x} α_{y} $Later$ c_{y} ADF	Groundwater Saregy Verdusy Groundwater Saepage velocity Saturated hydraulic conductivity Groundwater gradient Width of groundwater source zone Depth of groundwater source zone Effective porosity in water-bearing unit Fraction organic carbon in water-bearing unit Groundwater pH Biodegradation considered? iport Parameters Groundwater Transport Longitudinal dispersivity Transverse dispersivity Vertical dispersivity Vertical dispersion coefficient Vertical dispersion coefficient Vertical dispersion coefficient Air dispersion factor	NA NA NA NA NA NA NA Off-site 1 <u>Groundw</u> NA NA NA NA NA NA	Off-site 2 ater loggstion NA NA NA door Air Inhai, NA NA NA	Off-site 1 Soil Lead NA NA NA <u>GW to Qutd</u> NA NA NA	Off-site 2 hing to GW NA NA NA OOT AJT Inbal NA NA NA	(cm/s (cm/s (cm/s (m) (m) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c
I_{i} U_{gw} V_{gw} K_{s} S_{d} θ_{off} f_{oc-sol} f_{oc-sol} $Trans$ $Later$ a_{x} a_{z} $Later$ c_{y} ADF	Groundwater Darcy Vertical Groundwater Seepage velocity Saturated hydraulic conductivity Groundwater gradient Width of groundwater source zone Effective porosity in water-bearing unit Fraction organic carbon in water-bearing unit Groundwater pH Biodegradation considered? Port Parameters at Groundwater Transport Longitudinat dispersivity Transverse dispersivity Vertical dispersivity Vertical dispersion coefficient Vertical dispersion coefficient Vertical dispersion coefficient Air dispersion factor	NA NA NA NA NA NA NA NA Soil to Qut NA NA NA NA NA NA	Off-site 2 ater Ingestion NA NA door Air Inhal, NA NA NA	Off-site 1 Soil Lead NA NA QW to Outd NA NA NA NA	Off-site 2 hing to GW NA NA NA SO Air Inhal NA NA NA	(cm/s (cm/s (cm/s (m) (m) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c
$\label{eq:constraint} \begin{array}{c} \mathbf{y}_{0} \\ \mathbf{y}_{0} \\ \mathbf{y}_{0} \\ \mathbf{y}_{0} \\ \mathbf{y}_{0} \\ \mathbf{x}_{0} \\ \mathbf{x}$	Groundwater Sarey Velocity Groundwater seepage velocity Saturated hydraulic conductivity Groundwater gradient Width of groundwater source zone Depth of groundwater source zone Effective porosity in water-bearing unit Fraction organic carbon in water-bearing unit Groundwater pH Biodegradation considered? Sport Parameters at Groundwater Transport Longitudinal dispersivity Vertical dispersivity Vertical dispersion coefficient Vertical dispersion coefficient Vertical dispersion coefficient Vertical dispersion coefficient Air dispersion factor Ce Water Parameters	NA NA NA NA NA NA NA Off-site 1 <u>Groundwr</u> NA NA NA NA NA NA NA NA	Off-site 2 ater Ingestion NA NA MA MA NA NA NA NA Cff-site 2	Off-site 1 Soil Least NA NA NA <u>GW to Outd</u> NA NA NA NA	Off-site 2 NA NA NA NA Sor Air Ishal NA NA NA	(cm/s (cm/s (cm/s (m) (m) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c
$\label{eq:constraint} \begin{array}{c} \mathbf{w}_{\mathbf{r}} \\ \mathbf{w}_{\mathbf{r}} \\ \mathbf{v}_{\mathbf{r}} \\ \mathbf$	Groundwater Sarey Verdocity Groundwater scepage velocity Saturated hydraulic conductivity Groundwater gradient Width of groundwater source zone Effective porosity in water-bearing unit Fraction organic carbon in water-bearing unit Groundwater pH Biodegradation considered? port Parameters Groundwater Transport Longitudinal dispersivity Vertical dispersivity Vertical dispersion coefficient Vertical dispersion coefficient Vertical dispersion coefficient Vertical dispersion coefficient Air dispersion factor Cee Water Parameters Surface water flowrate	NA NA NA NA NA NA NA NA Soil to Out NA NA NA NA NA	Off-site 2 ater Ingestion NA NA NA NA NA NA NA Off-site 2 NA	Off-site 1 Soil Lead NA NA NA <u>GW to Qutd</u> NA NA NA	Off-site 2 hing to GW NA NA NA NA NA NA NA	(cm/s (cm/s (cm/s ()) (m) (m) (c) () (c) (c) (c) (c) (c) (c) (c) (c)
$\label{eq:constraint} \begin{array}{c} \mathbf{y}_{g} \\ \mathbf{i} \\ \mathbf{U}_{gw} \\ \mathbf{V}_{gw} \\ \mathbf{K}_{g} \\ \mathbf{S}_{g} \\ \mathbf{\theta}_{eff} \\ \mathbf{f}_{scal} \\ \mathbf{f}_{sc$	Groundwater Sarey Velocity Groundwater seepage velocity Saturated hydraulic conductivity Groundwater gradient Width of groundwater source zone Depth of groundwater source zone Effective porosity in water-bearing unit Fraction organic carbon in water-bearing unit Groundwater pH Biodegradation considered? port Parameters at Groundwater Transport Longitudinal dispersivity Vertical dispersivity Vertical dispersivity Vertical dispersion coefficient Vertical dispersion for the	NA NA NA NA NA NA NA NA Solito Out NA NA NA NA NA NA	Off-site 2 ater Ingestion NA NA NA NA NA NA Off-site 2 NA NA	Off-site 1 Soil Lead NA NA SW to Outd NA NA NA NA	Off-site 2 NA NA NA NA OOT Air Inhal NA NA NA	(cm/s (cm/s (cm/s (m) (m) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c
$\label{eq:constraint} \begin{array}{c} \mathbf{w}_{p} \\ \mathbf{w}_{p} \\ \mathbf{v}_{gw} \\ \mathbf{w}_{gw} \end{array}$	Groundwater Satery Verdocity Groundwater scepage velocity Saturated hydraulic conductivity Groundwater gradient Width of groundwater source zone Effective porosity in water-bearing unit Fraction organic carbon in water-bearing unit Groundwater pH Biodegradation considered? iport Parameters al Groundwater Transport Longitudinal dispersivity Vertical dispersivity Vertical dispersion coefficient Vertical dispersion coefficient Vertical dispersion coefficient Vertical dispersion coefficient Vertical dispersion coefficient Air dispersion factor cee Water Parameters Surface water flowrate Width of GW plume at SW discharge Thickness of GW plume at SW discharge	NA NA NA NA NA NA NA NA NA NA Soilto Out NA NA NA NA	Off-site 2 ate: lagestion NA NA NA NA NA NA Off-site 2 NA NA NA	Off-site 1 Soil Lead NA NA NA NA NA NA NA	Off-site 2 hing to GW NA NA NA NA NA NA NA NA	(cm/s (cm/s (cm/s ()) (m) (m) () () () () () () () () () () () () ()

Input Parameter Summary

RBCA SITE ASSESSMENT

User-Specified COC Data

REPRESENTATIVE COC CONCENTRATIONS IN SOURCE MEDIA

		Representa	tive COC Concentration			
CONSTITUENT	Gro	undwater	Soils (0 - 3 m)			
	value (mg/L)	note	value (mg/kg)	note		
TPH - Aliph >C06-C08			7.0E+0	EPC		
TPH - Aliph >C08-C10			5.6E+1	EPC		
TPH - Aliph >C10-C12			9.2E+1	EPC		
TPH - Aliph >C12-C16			2.7E+2	EPC		
TPH - Aliph >C16-C21			8.6E+1	EPC		
TPH - Aliph >C21-C34			4.0E+0	EPC		
TPH - Arom >C07-C08			1.5E-2	EPC		
TPH - Arom >C08-C10			2.0E+0	EPC		
TPH - Arom >C10-C12			2.6E+1	EPC		
TPH - Arom >C12-C16			9.2E+1	EPC		
TPH - Arom >C16-C21			3.9E+1	EPC		
TPH - Arom >C21-C35			3.0E+0	EPC		

Site Name: Northwest Point Site Location: Northwest Point Completed By: Kelly Johnson Date Completed: 31-Mar-10 Job ID: 1044857

Site Name: Northwest Point	Site Location: Northwest Point	Completed By: Kelly	Johnson C	Date Completed: 31-Mar-10		
	TIER 2 EXPOSURE CONCENT	RATION AND INT	AKE CALCULATION			
SOIL EXPOSURE PATHWAY		(CHECKED IF PAT	HWAY IS ACTIVE)			
SURFACE SOILS OR SEDIMENTS:						
ON-SITE INGESTION AND DERMAL CONTACT	1) Source/Exposure Medium	2) Expos (IR+SAxMxRAF)xEF	sure Multiplier xED/(BWxAT) (kg/kg/day)	3) Average Daily Intake Rate (mg/kg/day) (1) x (2)		
Constituents of Concern	Surface Soil Conc. (mg/kg)	Residential	Construction Worker	Residential	Construction Worke	
TPH - Aliph >C06-C08	7.0E+0	1.5E-6		1.0E-5		
TPH - Aliph >C08-C10	5.6E+1	1.5E-6		8.3E-5		
TPH - Aliph >C10-C12	9.2E+1	1.5E-6		1.4E-4		
TPH - Aliph >C12-C16	2.7E+2	1.5E-6		4.0E-4		
TPH - Aliph >C16-C21	8.6E+1	1.5E-6		1.3E-4		
TPH - Aliph >C21-C34	4.0E+0	1.5E-6		6.0E-6		
TPH - Arom >C07-C08	1.5E-2	1.5E-6		2.2E-8		
TPH - Arom >C08-C10	2.0E+0	1.5E-6		3.0E-6		
TPH - Arom >C10-C12	2.6E+1	1.5E-6		3.9E-5		
TPH - Arom >C12-C16	9.2E+1	1.5E-6		1.4E-4		
TPH - Arom >C16-C21	3.9E+1	1.5E-6		5.8E-5		
TPH - Arom >C21-C35	3.0E+0	1.5E-6		4.5E-6		

NOTE: RAF = Relative absorption factor (-)	AT = Averaging time (days)	ED = Exposure duration (yrs)	IR = Soil ingestion rate (mg/day)
M = Adherence factor (mg/cm ²)	BW = Body weight (kg)	EF = Exposure frequencey (days/yr)	SA = Skin exposure area (cm^2/day)
Site Name: Northwest Point		Date Completed: 31-	Mar-10
Site Location: Northwest Point		Job ID: 1044857	
Completed By: Kelly Johnson			

RBCA SITE ASSESSMENT

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SOIL EXPOSURE PATHWAY		Image: Checked IF Pathway Is active) TOXIC EFFECTS												
		(4) Total Toxicant Inta	ke Rate (mg/kg/da	iy)	(5)	Orai	(6) Individual CO	C Hazard Quotient						
	(a) via Ingestion	(b) via Dermal Contact	(c) via Ingestion	(d) via Dermal Contact	Reference Do	se (mg/kg-day)	(4a)/(5a) + (4b)/(5b)	(4c)/(5a) + (4d)/(5b)						
Constituents of Concern	Resi	dential	Construc	tion Worker	(a) Oral	(b) Dermal	Residential	Construction Worker						
TPH - Aliph >C06-C08	3.6E-6	6.8E-6			5.0E+0	5.0E+0*	2.1E-6							
TPH - Aliph >C08-C10	2.9E-5	5.4E-5			1.0E-1	1.0E-1*	8.3E-4							
TPH - Aliph >C10-C12	4.8E-5	8.9E-5			1.0E-1	1.0E-1*	1.4E-3							
TPH - Aliph >C12-C16	1.4E-4	2.6E-4			1.0E-1	1.0E-1*	4.0E-3							
TPH - Aliph >C16-C21	4.5E-5	8.4E-5			2.0E+0	2.0E+0*	6.4E-5							
TPH - Aliph >C21-C34	2.1E-6	3.9E-6			2.0E+0	2.0E+0*	3.0E-6							
TPH - Arom >C07-C08	7.8E-9	1.5E-8			2.0E-1	2.0E-1*	1.1E-7							
TPH - Arom >C08-C10	1.0E-6	1.9E-6			4.0E-2	4.0E-2*	7.4E-5							
TPH - Arom >C10-C12	1.3E-5	2.5E-5			4.0E-2	4.0E-2*	9.7E-4							
TPH - Arom >C12-C16	4.8E-5	8.9E-5			4.0E-2	4.0E-2*	3.4E-3							
TPH - Arom >C16-C21	2.0E-5	3.8E-5			3.0E-2	3.0E-2*	1.9E-3							
TPH - Arom >C21-C35	1.6E-6	2.9E-6			3.0E-2	3.0E-2*	1.5E-4							
	* No dermal reference	dose availableoral referer	nce dose used.											
				Total Pat	thway Haza	rd Index =	1.3E-2							

Site Location: Northwest Point Completed By: Kelly Johnson

Job ID: 1044857

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						RBCA SITE A	SSESSME	INT								
Site Name: I	Vorthwest Point		Completed By:	Kelly Johnson			Job ID: 1	1044857								
Site Location	n: Northwest Point		1 OF -													
			Targe	t Risk (Class A & B):	1.0E-5	Source Depletion Option: No										
SOIL	(0 - 3 m) SSTL VALUES		Т	arget Risk (Class C):	1.0E-5						Time to	Future Exposure:	0 years			
			Tar	get Hazard Quotient:	1.05+0											
						SSTL Results For	Complete Exp	oosure Pathways (*	X ⁻ if Complete)							
			s	oil Leaching to Gro	undwater	Soil Vol. to		Soil Volatili	zation and Surface		X Surface Se	il Ingestion and	Applicable	1722	Required CRF	
		Representative	On-site	Off-site 1 (0	Off-site 2	On-site	l	Soli Panico	Off-site 1 (0	-site 1 (0) Off-site 2 Our site (0 and 2 SSTL			Exceeded ?			
CONSTITUE	INTS OF CONCERN	Concentration	(fm 0)	m)	(0 m)	(0 m)	One	sie (o m)	m)	(0 m)	011-54	Construction			Only if "yes"	
CAS No.	Name	(mg/kg)	None	None	None	None	None	Worker	None	None	Residential	Worker	(mg/kg)	"≊" if yes	ien	
106-08-0	TPH - Aliph >C06-C08	7.0E+0	NA	NA	NA	NA	NA	NA	NA	NA	1.0E+6	NA	1.0E+6		<1	
108-10-0	TPH - Aliph >C08-C10	5,6E+1	NA	NA	NA	NA	NA	NA	NA	NA	6.0E+4	NA	6.0E+4		<1	
110-12-0	TPH - Aliph >C10-C12	9.2E+1	NA	NA	NA	NA	NA	NA	NA	NA	6.7E+4	NA	6.7E+4		<1	
112-16-0	TPH - Aliph >C12-C16	2.7E+2	NA	NA	NA	NA	NA	NA	NA	NA	6.7E+4	NA	6.7E+4		<1	
116-21-0	TPH - Aliph >C16-C21	8.6E+1	NA	NA	NA	NA	NA	NA	NA	NA	1.0E+6	NA	1.0E+6		<1	
121-34-0	TPH - Aliph >C21-C34	4.0E+0	NA	NA	NA	NA	NA	NA	NA	NA	1.0E+6	NA	1.0E+6		<1	
207-08-0	TPH - Arom >C07-C08	1.5E-2	NA	NA	NA	NA	NA	NA	NA	NA	1.3E+5	NA	1.3E+5		<1	
208-10-0	TPH - Arom >C08-C10	2.0E+0	NA	NA	NA	NA	NA	NA	NA	NA	2.1E+4	NA	2.1E+4		<1	
210-12-0	TPH - Arom >C10-C12	2.6E+1	NA	NA	NA	NA	NA	NA	NA	NA	2.7E+4	NA	2.7E+4		<1	
212-16-0	TPH - Arom >C12-C16	9.2E+1	NA	NA	NA	NA	NA	NA	NA	NA	2.7E+4	NA	2.7E+4		<1	
216-21-0	TPH - Arom >C16-C21	3.9E+1	NA	NA	NA	NA	NA	NA	NA	NA	2.0E+4	NA	2.0E+4		<1	
221-35-0	TPH - Arom >C21-C35	3.0E+0	NA	NA	NA	NA	NA	NA	NA	NA	2.0E+4	NA	2.0E+4		<1	

">" indicates risk-based target concentration greater than constituent residual saturation value. NA = Not applicable. NC = Not calculated.

RBCA Tool Kit for Atlantic Canada, Version 2.1

				RBCA SITE ASS	ESSMENT				TPH Criteria	SSTL Worksheet
Site Name: N	orthwest Point			(Completed By: Kelly	Johnson		Job ID: 1044857		
Site Location:	Northwest Point			Į	Date Completed: 31-	-Mar-10				<u> </u>
		Т	arget Hazard I	ndex; 1.0E+0			Sou	arce Depletion Option: No	>	
SSTL VAL	UES FOR TPH						Tim	e to Future Exposure: 0 y	/ears	
			Mass F	ractions	Representative	Concentrations	Calculated Conc	entration Limits	Appilcable	SSTL Values
CONSTITUE	NTS OF CONCERN		Soil	Groundwater	Soil	Groundwater	Residual Soil Concentration	Solubility	Soils (0 - 3 m)	Groundwater
CAS No.	Name		(-)	(-)	(mg/kg)	(mg/L)	(mg/kg)	(mg/L)	(mg/kg)	(mg/L)
106-08-0	TPH - Aliph >C06-C08		1.0E-2		7.0E+0		1.5E+2		1.0E+6	
108-10-0	TPH - Aliph >C08-C10		8.3E-2		5.6E+1		7.4E+1		6.0E+4	
110-12-0	TPH - Aliph >C10-C12		1.4E-1		9.2E+1		4.3E+1		6.7E+4	
112-16-0	TPH - Aliph >C12-C16		4.0E-1		2.7E+2		1.9E+1		6.7E+4	
116-21-0	TPH - Aliph >C16-C21		1,3E-1		8.6E+1		7.9E+0		1.0E+6	
121-34-0	TPH - Aliph >C21-C34		5.9E-3		4.0E+0		1.3E+5		1.0E+6	
207-08-0	TPH - Arom >C07-C08		2.2E-5	1	1.5E-2		7.1E+2		1.3E+5	
208-10-0	TPH - Arom >C08-C10		3.0E-3	1	2.0E+0		5.2E+2		2.1E+4	
210-12-0	TPH - Arom >C10-C12		3.8E-2		2.6E+1		3.2E+2		2.7E+4	
212-16-0	TPH - Arom >C12-C16		1,4E-1	1	9.2E+1		1.5E+2		2.7E+4	
216-21-0	TPH - Arom >C16-C21		5.8E-2		3.9E+1		5.2E+1		2.0E+4	
221-35-0	TPH - Arom >C21-C35		4.4E-3		3.0E+0		4.2E+0		2.0E+4	
		Total	1.00+0	0.0E+0	6.8E+2	0.0E+0	1	Total TPH SSTL	5.2E+4	T

">" indicates risk-based target concentration greater than constituent residual saturation value. NC = Not calculated.

Risk Assessment Results

Carcinogenic PAHs

Site-Specific Target Levels for Human Health (Non-Threshold Substances) - Northwest Point Lifetime Northwest Point - Soil Exposure Pathways

Receptor:	Lifetime		Northwest Point								
				т	Dyle				Т		
	SSTL Lifetime = -	(AF _{out} x SIR	adi x ET ing x SF _o) -	+ (AF lung x IR soil	ix ET _{derm} x SF _o)	+ BSC					
		. 5-1					,		1		
	II CB Lifetime =	C _s x [(AF _{gut} x S	SIR _{adj} x ET _{ing} x SF	b) + (AF _{lung} x IR							
					LE]			
Compound	d SE	SF.	BSC	۸F .	۵F.	ΔF	SSTL - Lifetime	FPC	II CB	I	
Compound	(ma/ka-d) ⁻¹	(ma/ka-d) ⁻¹	(ma/ka)	Gut gut	lung יה	Skin	(ma/ka)	(mg/kg)	(unitless)		
B(a)P TPE	2.3	0.137	0	1	1	0.148	23.2	35	1.5E-05		
	-		-				- I L	1		I	
	Time on site:										
F	Hours per day (inhalation)	24									
	Days per Week	3									
	Weeks per Year	26									
	Years Exposed	80	Health Canada (20	109a)							
	Life Expectancy	80	Health Canada (20	109a)							
Parameter	Definition (units)						Default Value	<u>Reference</u>			
SF _o =	oral slope factor [1/(mg/kg-day)]				chemical specific	Health Canada (2	.009b)		
SF _i =	inhalation slope fa	ctor [1/(mg/kg	-day)]				chemical specific	Health Canada (2	:009b)		
C _s =	concentration in se	oil (mg/kg)					site specific	calculated Exposi	ure Point Concer	tration (EPC)	
TR =	target risk						1.00E-05	Health Canada (2	:009a)		
BSC =	background soil co	oncentration					chemical specific	:			
AF _{gut} =	absorption factor f	or gut (unitless	5)				chemical specific	Assumed			
AF _{lung} =	absorption factor f	for lung (unitles	is)				chemical specific	Assumed			
AF skin =	absorption factor s	skin (unitless)					chemical specific	Health Canada (2	:009b)		
SIR _{adj} =	soil ingestion rate	(kg soil-yr/kg b	w-day)				4.69E-05	Health Canada (2	009a) - Lifetime		
IR _{soil adj} =	soil inhalation rate	e (kg soil -yr/kg	bw-day) = CRP (kę	g/m ³) x IR _{air} (m ³	air-yr/kg bw-day)	0	5.42E-06	calculated			
SDR _{adj} =	soil dermal contac	t rate (kg soil- y	r/kg bw-day) = (SA _h	ands X M hands) +	(SA _{body} x M _{body}) x	10 ⁻⁶ (kg/mg)	1.54E-04	calculated			
ET _{ing} =	exposure term for	soil ingestion	oathway (unitless)				0.214	Site Specific [24	Hours per Day, 3	Days per Week,	26 Weeks per Year]
ET inh =	exposure term for	soil inhalation	pathway (unitless)				0.214	Site Specific [24	Hours per Day, 3	Days per Week,	26 Weeks per Year]
ET _{derm} =	exposure term for	soil dermal co	ntact pathway (unit	less)			0.214	Site Specific [24	Hours per Day, 3	Days per Week,	26 Weeks per Year]
CRP =	concentration of re	espirable partic	les (kg/m ³)				2.50E-07	Health Canada (2	009a) - Unpavec	roads with vehic	le traffic
IR _{air adj} =	daily inhalation rat	e (m ³ air-yr/kg	bw-day)				21.7	' Health Canada (2	009a) - Lifetime		
SA hands adj =	skin surface area	- hands (cm ² -y	r/kg bw-day)				1125	Health Canada (2	009a) - Lifetime		
SA body adj =	skin surface area	- arms (cm ² -yr/	'kg bw-day)				4181	Health Canada (2	009a) - Lifetime		
M _{hands} =	soil to skin adhere	nce factor - ha	nds (mg/cm ²)				0.1	Health Canada (2	009a) - Lifetime		
M _{body} =	soil to skin adhere	nce factor - re	st of body (mg/cm ²)			0.01	Health Canada (2	009a) - Lifetime		