

Appendix F: CLEA Output for Benzo(a)pyrene

CONTAMINATED LAND EXPOSURE ASSESSMENT MODEL 2002

Prepared by the Centre for Research into the Built Environment, for the Environment Agency (1993 - 2002)

Summary of Results

Contaminant : BENZO(A)PYRENE
Soil Concentration (mg/Kg): 8.563E-1
Health Criteria Value: Index Dose
 (mg/Kg bw / day): 2E-5
Background (mg/day): Not Applicable

User Name: Super User
Report Date: 19/09/2005
Simulation Date: 19/09/2005

Chemical Type : Organic / Non-Threshold
Details: New Simulation

Model Parameters

Entry Route: Oral
Applied Dose Data To: All Routes
No. of Iterations: 5000
Scenario Type : Residential
Receptor Used : Female height / weight database
Averaging Method : Elapsed exposure time
Dermal Uptake Routine : US EPA Model (1992)
Plant Uptake Routine : Briggs-Ryan
Building Type : Ground Bearing Slab
Flow Type: Pressure Driven Flow In Winter

Age Class: 1 To 6
Soil Type : Sandy
Soil PH : 8
Soil Organic Matter (%) : 5
Molecular Weight (g) : 252.3
Air Diffusivity (m² / s) : 5E-6

Exposure Routes Analysis

- Route 1 : Soil ingestion pathway
- Route 2 : Ingestion of indoor dust
- Route 3 : Consumption of contaminated homegrown garden vegetables pathway
- Route 4 : Ingestion of soil attached to vegetables pathway
- Route 5 : Outdoor exposure to soil through skin contact pathway
- Route 6 : Indoor exposure to dust through skin contact pathway
- Route 7 : Outdoor inhalation of fugitive dust pathway
- Route 8 : Indoor inhalation of fugitive dust pathway
- Route 9 : Outdoor inhalation of soil vapour pathway
- Route 10 : Indoor inhalation of soil vapour pathway

Average Contribution of Each Exposure Route to ADE

Exposure route	Contributions for each exposure route			
	Mean (%)	Standard Dev (%)	Minimum (%)	Maximum (%)
1	39.3	11.3	9.8	85.7
3	11.3	5.3	1.3	42.4
4	3.7	1.2	0.6	12.4
5	14.8	3.2	3.7	25.3
6	31.0	6.8	7.7	53.1
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0

CONTAMINATED LAND EXPOSURE ASSESSMENT MODEL 2002

Prepared by the Centre for Research into the Built Environment, for the Environment Agency (1993 - 2002)

Summary of Results

Contaminant : BENZO(A)PYRENE
Report Date: 19/09/2005
Simulation Date: 19/09/2005

Total Average Daily Exposure (mg/Kg bodyweight / day) Ratio of ADE/TDI at 95th percentile : 1.000

Ageclass	Percentiles			
	99 th	95 th	90 th	50 th
1	6.47E-6	3.94E-6	3.09E-6	1.57E-6
2	1.30E-5	8.63E-6	7.20E-6	4.35E-6
3	1.60E-5	1.20E-5	1.03E-5	6.82E-6
4	1.99E-5	1.50E-5	1.32E-5	9.21E-6
5	2.28E-5	1.77E-5	1.59E-5	1.14E-5
6	2.50E-5	2.00E-5	1.82E-5	1.36E-5

CONTAMINATED LAND EXPOSURE ASSESSMENT MODEL 2002

Prepared by the Centre for Research into the Built Environment, for the Environment Agency (1993 - 2002)

Summary of Results

User Name: Super User **Report Date:** 19/09/2005
Contaminant: BENZO(A)PYRENE **Simulation Date:** 19/09/2005
Soil Concentration (mg/Kg): 9.576E-1 **Chemical Type:** Organic / Non-Threshold
Health Criteria Value: Index Dose **Details:** New Simulation
(mg/Kg bw / day): 2E-5
Background (mg/day): Not Applicable

Model Parameters

Entry Route: Oral
Applied Dose Data To: All Routes
No. of Iterations: 5000
Scenario Type: Residential
Receptor Used: Female height / weight database **Age Class:** 1 To 6
Averaging Method: Elapsed exposure time **Soil Type:** Sandy
Dermal Uptake Routine: US EPA Model (1992) **Soil PH:** 8
Plant Uptake Routine: Briggs-Ryan **Soil Organic Matter (%):** 5
Building Type: Ground Bearing Slab **Molecular Weight (g):** 252.3
Flow Type: Pressure Driven Flow In Winter **Air Diffusivity (m2 /s):** 5E-6

Exposure Routes Analysis

- Route 1 : Soil ingestion pathway
- Route 2 : Ingestion of indoor dust
- Route 5 : Outdoor exposure to soil through skin contact pathway
- Route 6 : Indoor exposure to dust through skin contact pathway
- Route 7 : Outdoor inhalation of fugitive dust pathway
- Route 8 : Indoor inhalation of fugitive dust pathway
- Route 9 : Outdoor inhalation of soil vapour pathway
- Route 10 : Indoor inhalation of soil vapour pathway

Average Contribution of Each Exposure Route to ADE

Exposure route	Contributions for each exposure route			
	Mean (%)	Standard Dev (%)	Minimum (%)	Maximum (%)
1	45.9	11.8	16.7	87.8
5	17.4	3.8	3.9	26.8
6	36.7	8.0	8.3	56.4
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0

CONTAMINATED LAND EXPOSURE ASSESSMENT MODEL 2002

Prepared by the Centre for Research into the Built Environment, for the Environment Agency (1993 - 2002)

Summary of Results

Contaminant: BENZO(A)PYRENE **Report Date:** 19/09/2005
Simulation Date: 19/09/2005

Total Average Daily Exposure (mg/Kg bodyweight / day) **Ratio of ADE/TDI at 95th percentile :** 1.013

Ageclass	Percentiles			
	99 th	95 th	90 th	50 th
1	7.03E-6	4.10E-6	3.13E-6	1.45E-6
2	1.34E-5	8.92E-6	7.42E-6	4.12E-6
3	1.71E-5	1.23E-5	1.05E-5	6.55E-6
4	2.07E-5	1.51E-5	1.32E-5	8.82E-6
5	2.32E-5	1.78E-5	1.59E-5	1.10E-5
6	2.58E-5	2.03E-5	1.83E-5	1.31E-5

CONTAMINATED LAND EXPOSURE ASSESSMENT MODEL 2002

Prepared by the Centre for Research into the Built Environment, for the Environment Agency (1993 - 2002)

Summary of Results

Contaminant : BENZO(A)PYRENE
Soil Concentration (mg/Kg): 9.006 **Chemical Type :** Organic / Non-Threshold
Health Criteria Value: Index Dose **Details:** New Simulation
 (mg/Kg bw / day): 2E-5
Background (mg/day): Not Applicable

User Name: Super User **Report Date:** 19/09/2005
Simulation Date: 19/09/2005

Model Parameters

Entry Route: Oral
Applied Dose Data To: All Routes
No. of Iterations: 5000
Scenario Type : Commercial / Industrial
Receptor Used : Female height / weight database **Age Class:** 17 To 17
Averaging Method : Elapsed exposure time **Soil Type :** Sandy
Dermal Uptake Routine : US EPA Model (1992) **Soil PH :** 8
Plant Uptake Routine : Briggs-Ryan **Soil Organic Matter (%) :** 5
Building Type : Ground Bearing Slab **Molecular Weight (g) :** 252.3
Flow Type: Pressure Driven Flow In Winter **Air Diffusivity (m2 /s) :** 5E-6

Exposure Routes Analysis

- Route 1 : Soil ingestion pathway
- Route 2 : Ingestion of indoor dust
- Route 5 : Outdoor exposure to soil through skin contact pathway
- Route 6 : Indoor exposure to dust through skin contact pathway
- Route 7 : Outdoor inhalation of fugitive dust pathway
- Route 8 : Indoor inhalation of fugitive dust pathway
- Route 9 : Outdoor inhalation of soil vapour pathway
- Route 10 : Indoor inhalation of soil vapour pathway

Average Contribution of Each Exposure Route to ADE

Exposure route	Contributions for each exposure route			
	Mean (%)	Standard Dev (%)	Minimum (%)	Maximum (%)
1	34.5	15.0	11.2	98.0
5	32.5	7.4	0.9	44.0
6	33.0	7.5	0.9	44.7
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.1	0.0	0.0	0.2

CONTAMINATED LAND EXPOSURE ASSESSMENT MODEL 2002

Prepared by the Centre for Research into the Built Environment, for the Environment Agency (1993 - 2002)

Summary of Results

Contaminant : BENZO(A)PYRENE
Report Date: 19/09/2005
Simulation Date: 19/09/2005

Total Average Daily Exposure (mg/Kg bodyweight / day) **Ratio of ADE/TDI at 95th percentile :** 1.000

Ageclass	Percentiles			
	99 th	95 th	90 th	50 th
17	2.36E-5	2.00E-5	1.80E-5	1.11E-5

CONTAMINATED LAND EXPOSURE ASSESSMENT MODEL 2002

Prepared by the Centre for Research into the Built Environment, for the Environment Agency (1993 - 2002)

Contaminant BENZO(A)PYRENE

Report Date: 19/09/2005

Simulation Date: 19/09/2005

Oral Settings

Tolerable Daily Intake (mg.kg-1.bw.day-1)	N/A
Index Dose (mg.kg-1.bw.day-1)	2E-5
Adult Background Value (mg.day-1)	N/A

Inhalation Settings

Tolerable Daily Intake (mg.kg-1.bw.day-1)	N/A
Index Dose (mg.kg-1.bw.day-1)	N/A
Adult Background Value (mg.day-1)	N/A

Dermal Settings

Tolerable Daily Intake (mg.kg-1.bw.day-1)	N/A
Index Dose (mg.kg-1.bw.day-1)	N/A
Adult Background Value (mg.day-1)	N/A

Miscellaneous Settings

Skin Permeability (cm.hr-1)	0.108
Air Diffusion Coefficient (m2.s-1)	5E-6
Water Diffusion Coefficient (m2.s-1)	5E-10
Water Solubility (mg.l-1)	0.0038
Experimental Organic Carbon Distribution Coefficient (l.kg-1)	1140000
Experimental Octanol-Water Partition Coefficient (log, dimensionless)	6.06
Relative Molecular Weight (g.mol-1)	252.3
Vapour Pressure at 20°C (Pa)	7E-7
Henry's Constant (Pa.m3.mol-1)	0.157
Henry's Constant (Dimensionless)	6.46E-5
Experimental Soil Water Distribution Coefficient (l.kg-1)	N/A

CONTAMINATED LAND EXPOSURE ASSESSMENT MODEL 2002

Prepared by the Centre for Research into the Built Environment, for the Environment Agency (1993 - 2002)

Summary of Results

Contaminant :	PHENOL	User Name: Super User	Report Date: 21/09/2005
Soil Concentration (mg/Kg):	782.565	Simulation Date: 21/09/2005	
Health Criteria Value:	TDI	Chemical Type : Organic / Threshold	
(mg/Kg bw / day):	0.7	Details: New Simulation	
Background (mg/day):	0.64		

Model Parameters

Entry Route:	Oral	Mean Daily Intakes:	
Applied Dose Data To:	All Routes	Oral:	0.64
No. of Iterations:	5000	Dermal:	N/A
Scenario Type :	Residential	Inhalation:	N/A
Receptor Used :	Female height / weight database	Age Class:	1 To 6
Averaging Method :	Elapsed exposure time	Soil Type :	Sandy
Dermal Uptake Routine :	US EPA Model (1992)	Soil PH :	8
Plant Uptake Routine :	Briggs-Ryan	Soil Organic Matter (%):	5
Building Type :	Ground Bearing Slab	Molecular Weight (g) :	94.11
Flow Type:	Pressure Driven Flow In Winter	Air Diffusivity (m ² /s) :	8.9E-6

Exposure Routes Analysis

- Route 1 : Soil ingestion pathway
- Route 2 : Ingestion of indoor dust
- Route 3 : Consumption of contaminated homegrown garden vegetables pathway
- Route 4 : Ingestion of soil attached to vegetables pathway
- Route 5 : Outdoor exposure to soil through skin contact pathway
- Route 6 : Indoor exposure to dust through skin contact pathway
- Route 7 : Outdoor inhalation of fugitive dust pathway
- Route 8 : Indoor inhalation of fugitive dust pathway
- Route 9 : Outdoor inhalation of soil vapour pathway
- Route 10 : Indoor inhalation of soil vapour pathway

Average Contribution of Each Exposure Route to ADE

Exposure route	Contributions for each exposure route			
	Mean (%)	Standard Dev (%)	Minimum (%)	Maximum (%)
1	1.3	0.7	0.2	7.8
3	93.1	1.6	81.1	98.3
4	0.1	0.0	0.0	0.3
5	0.9	0.3	0.2	2.7
6	1.9	0.7	0.3	5.8
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	2.8	0.8	0.8	7.2

CONTAMINATED LAND EXPOSURE ASSESSMENT MODEL 2002

Prepared by the Centre for Research into the Built Environment, for the Environment Agency (1993 - 2002)

Summary of Results

Contaminant :	PHENOL	Report Date: 21/09/2005	Simulation Date: 21/09/2005
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Total Average Daily Exposure (mg/Kg bodyweight / day)

Ratio of ADE/TDI at 95th percentile : **0.987**

Ageclass	Percentiles			
	99 th	95 th	90 th	50 th
1	2.56E-1	1.81E-1	1.50E-1	7.25E-2
2	4.14E-1	3.17E-1	2.75E-1	1.56E-1
3	5.66E-1	4.41E-1	3.89E-1	2.44E-1
4	6.99E-1	5.55E-1	4.99E-1	3.29E-1
5	7.56E-1	6.24E-1	5.57E-1	3.85E-1
6	8.19E-1	6.91E-1	6.22E-1	4.39E-1

CONTAMINATED LAND EXPOSURE ASSESSMENT MODEL 2002

Prepared by the Centre for Research into the Built Environment For the Environment Agency 1993 - 2000.

Table	Record	Field	Initial Value	New Value	User	Date
	Reason					
Chemical	PHENOL from Phenol TOX report	DHLC	-999	1.63E-5		16/08/2005
Chemical	PHENOL from Phenol TOX report	KOC	-999	28.8		16/08/2005
Chemical	PHENOL WORKS WITH POSITIVE VALUES	LogKOW	-1.46	1.46		16/08/2005
Chemical	PHENOL from Phenol TOX report	OralBA	-999	0.64		16/08/2005
Chemical	PHENOL from Phenol TOX report	OralTDI	-999	0.7		16/08/2005
Chemical	PHENOL from Phenol TOX report	VapourPA	-999	46.84		16/08/2005

CONTAMINATED LAND EXPOSURE ASSESSMENT MODEL 2002

Prepared by the Centre for Research into the Built Environment, for the Environment Agency (1993 - 2002)

Contaminant PHENOL

Report Date: 21/09/2005

Simulation Date: 21/09/2005

Oral Settings

Tolerable Daily Intake (mg.kg-1.bw.day-1) 0.7
 Index Dose (mg.kg-1.bw.day-1) N/A
 Adult Background Value (mg.day-1) 0.64

Inhalation Settings

Tolerable Daily Intake (mg.kg-1.bw.day-1) N/A
 Index Dose (mg.kg-1.bw.day-1) N/A
 Adult Background Value (mg.day-1) N/A

Dermal Settings

Tolerable Daily Intake (mg.kg-1.bw.day-1) N/A
 Index Dose (mg.kg-1.bw.day-1) N/A
 Adult Background Value (mg.day-1) N/A

Miscellaneous Settings

Skin Permeability (cm.hr-1) 0.008
 Air Diffusion Coefficient (m2.s-1) 8.9E-6
 Water Diffusion Coefficient (m2.s-1) 5E-10
 Water Solubility (mg.l-1) 93000
 Experimental Organic Carbon Distribution Coefficient (l.kg-1) 28.8
 Experimental Octanol-Water Partition Coefficient (log, dimensionless) 1.46
 Relative Molecular Weight (g.mol-1) 94.11
 Vapour Pressure at 20°C (Pa) 46.84
 Henry's Constant (Pa.m3.mol-1) 0.045
 Henry's Constant (Dimensionless) 1.63E-5
 Experimental Soil Water Distribution Coefficient (l.kg-1) N/A