03.01-8/23/02-01582

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

August 23, 2002

Commander, Atlantic Division
Naval Facilities Engineering Command
Environmental Quality Division
Code: 1823
Norfolk, Virginia 23511-6287
Attn: Mr. Dominic O'Connor

SUBJECT: Review of Draft Site 11 ID 2
Allegany Ballistics Laboratory, Rocket Center, West Virginia

Dear Mr. O'Connor:

The EPA has reviewed the draft Interim Deliverable 2 for the Human Health Risk Assessment (HHRA) Site 11, Allegany Ballistics Laboratory. The following comments are provided for consideration.

1 In general several of the Tables need slight changes. Various reference dose, slope factor, unit risk, and toxicity values as indicated in the attached Tables need to be changed.

If you have any questions concerning any of these comments, please have your toxicologist call Nancy Rios-Jafolla at (215) 814-3324 or me (215) 814-3364.

Sincerely,

Bruce W. Beach

Bruce W. Beach
Remedial Project Manager

cc: Tom Bass, WV DEP (attachment)
Steve Glennie, CH2M Hill (attachment)
Lou Williams, NAVSEA (no attachment)
John Aubert, NAVSEA (no attachment)
David McBride, NAVSEA (no attachment)

Nancy Rios-Jafolla
07/18/02 02:37 PM

To: Bruce Beach/R3/USEPA/US@EPA
cc:
Subject: ABL-Site 11 ID2 HHRA

I have reviewed the subject document for toxicological accuracy and completeness. I have written my comments on the tables. See attachment (interoffice mail).

Please let me know if you need further clarification of my comments.

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

Site 11, Allegany Ballistics Laboratory

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	~~Subsurface Soil~~ Soil	Soil	Direct Contact	Industrial Worker	Adult	Dermal Absorption	On-Site	Quant	Site workers could contact soil while conducting maintenance activities
						Ingestion	On-Site	Quant	Site workers could contact soil while conducting maintenance activities.
				Resident	Adult	Dermal Absorption	On-Site	Quant	Residents may contact soil, if the site is used for future residential development.
						Ingestion	On-Site	Quant	Residents may contact soil, if the site is used for future residential development.
					Child	Dermal Absorption	On-Site	Quant	Residents may contact soil, if the site is used for future residential development.
						Ingestion	On-Site	Quant	Residents may contact soil, if the site is used for future residential development.
					Child/Adult	Dermal Absorption	On-Site	Quant	Residents may contact soil, if the site is used for future residential development. This is for cancer risk only.
						Ingestion	On-Site	Quant	Residents may contact soil, if the site is used for future residential development. This is for cancer risk only.
				Construction Worker	Adult	Dermal Absorption	On-Site	Quant	Exposure to soil during construction activities.
						Ingestion	On-Site	Quant	Exposure to soil during construction activities.
	Surface Soil	Air	Airborne Particulates from Site 11 Soil	Industrial Worker	Adult	Inhalation	On-Site	Quant	Site workers may inhale dust particulates from soil while conducting maintenance activities.
				Resident	Adult	Inhalation	On-Site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
					Child	Inhalation	On-Site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
					Child/Adult	Inhalation	On-Site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation. This is for cancer risk only.
				Construction Worker	Adult	Inhalation	On-Site	Quant	Construction workers may inhale fugitive dust from soil during excavation activities.
		Air	Volatile Emissions from Site 11 Soil	Industrial Worker	Adult	Inhalation	On-Site	Quant	Site workers may inhale volatile emissions from soil while conducting maintenance activities.
				Resident	Adult	Inhalation	On-Site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation
					Child	Inhalation	On-Site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
					Child/Adult	Inhalation	On-Site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation. This is for cancer risk only.
				Construction Worker	Adult	Inhalation	On-Site	Quant	Construction workers may inhale vapors from soil during excavation activities.
		Groundwater	Shallow Aquifer - Tap Water	Resident	Adult	Ingestion	On-site	Qual	Constituents selected in this scenario will be discussed qualitatively.
					Child	Dermal Absorption	On-site	Qual	Constituents selected in this scenario will be discussed qualitatively.
						Ingestion	On-site	Qual	Constituents selected in this scenario will be discussed qualitatively.
					Child/Adult	Ingestion	On-site	Qual	Constituents selected in this scenario will be discussed qualitatively.
			Shallow Aquifer - Water in Excavation Pit	Construction Worker	Adult	Ingestion	On-site	Qual	Constituents selected in this scenario will be discussed qualitatively.
						Dermal Absorption	On-site	Qual	Constituents selected in this scenario will be discussed qualitatively.

Quant: will be quantitatively evaluated.

None: Not considered to be a complete pathway, therefore, not evaluated.

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

Site 11, Allegany Ballistics Laboratory

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD: Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)
Aluminum	Chronic	1.0E+00	mg/kg-day	27%	2.7E-01	mg/kg-day	CNS	100	NCEA	8/26/96
	Subchronic	N/A								
Antimony	Chronic	4.0E-04	mg/kg-day	10%	4.0E-05	mg/kg-day	Blood	1000	IRIS	3/21/02
	Subchronic	4.0E-04	mg/kg-day	10%	4.0E-05	mg/kg-day	Blood	1000	HEAST	7/8/98
Arsenic	Chronic	3.0E-04	mg/kg-day	95%	2.9E-04	mg/kg-day	Skin/Vascular	3	IRIS	3/21/02
	Subchronic	3.0E-04	mg/kg-day	95%	2.9E-04	mg/kg-day	Skin/Vascular	3	HEAST	7/8/98
Barium	Chronic	7.0E-02	mg/kg-day	100%	7.0E-02	mg/kg-day	Kidney	3	IRIS	3/21/02
	Subchronic	7.0E-02	mg/kg-day	100%	7.0E-02	mg/kg-day	Cardiovascular	3	HEAST	7/8/98
Beryllium	Chronic	2.0E-03	mg/kg-day	1%	2.0E-05	mg/kg-day	GI	300	IRIS	3/21/02
	Subchronic	5.0E-03	mg/kg-day	1%	5.0E-05	mg/kg-day	GI	100	HEAST	7/8/98
Cadmium (Water)	Chronic	5.0E-04	mg/kg-day	5%	2.5E-05	mg/kg-day	Kidney	10	IRIS	3/21/02
	Subchronic	N/A								
Chromium (hexavalent)	Chronic	3.0E-03	mg/kg-day	1%	3.0E-05	mg/kg-day	NOAEL	300/3	IRIS	6/17/98
	Subchronic	2.0E-02	mg/kg-day	1%	2.0E-04	mg/kg-day	NOAEL	100	HEAST	7/8/98
Cobalt	Chronic	2.0E-02	mg/kg-day	30%	6.0E-03	mg/kg-day	Sensitizer	N/A	NCEA	5/24/01
	Subchronic	N/A								
Copper	Chronic	4.0E-02	mg/kg-day	60%	2.4E-02	mg/kg-day	Gastrointestinal	N/A	HEAST	7/8/98
	Subchronic	4.0E-02	mg/kg-day	60%	2.4E-02	mg/kg-day	Gastrointestinal	N/A	HEAST	7/8/98
Iron	Chronic	6.0E-01	mg/kg-day	20%	1.2E-01	mg/kg-day	Gastrointestinal	1	NCEA	3/19/02
	Subchronic	N/A								
Manganese (nonfood)	Chronic	2.0E-02	mg/kg-day	35%	7.0E-03	mg/kg-day	CNS	1	IRIS	3/21/02
	Subchronic	N/A								
Nickel	Chronic	2.0E-02	mg/kg-day	10%	2.0E-03	mg/kg-day	Whole body	300	IRIS	3/21/02
	Subchronic	2.0E-02	mg/kg-day	10%	2.0E-03	mg/kg-day	Whole body	300	HEAST	7/8/98
Silver	Chronic	5.0E-03	mg/kg-day	NA			Skin	3	IRIS	3/21/02
	Subchronic	5.0E-03	mg/kg-day	NA			Skin	3	HEAST	7/8/98
Thallium	Chronic	7.0E-05	mg/kg-day	100%	7.0E-05	mg/kg-day	Liver & Blood		O	
	Subchronic	N/A								
Vanadium	Chronic	7.0E-03	mg/kg-day	2%	1.4E-04	mg/kg-day	NOAEL	100	HEAST	7/8/98
	Subchronic	7.0E-03	mg/kg-day	2%	1.4E-04	mg/kg-day	NOAEL	100	HEAST	7/8/98
1,4-Dichlorobenzene	Chronic	3.0E-02	mg/kg-day	80%	2.4E-02	mg/kg-day	Liver	1000	E	4/29/97
	Subchronic	N/A								
1,1-Dichloroethene	Chronic	9.0E-03	mg/kg-day	80%	7.2E-03	mg/kg-day	Liver	1000	IRIS	3/21/02
	Subchronic	9.0E-03	mg/kg-day	80%	7.2E-03	mg/kg-day	Liver	1000	HEAST	7/8/98
cis-1,2-Dichloroethene	Chronic	1.0E-02	mg/kg-day	100%	1.0E-02	mg/kg-day	Blood	3000	HEAST	7/8/98
	Subchronic	1.0E-01	mg/kg-day	100%	1.0E-01	mg/kg-day	Blood	300	HEAST	7/8/98
1,2-Dichloropropane	Chronic	N/A								
	Subchronic	N/A								
Chlorobenzene	Chronic	2.0E-02	mg/kg-day	80%	1.6E-02	mg/kg-day	Liver	1000	IRIS	3/21/02
	Subchronic	N/A								
Tetrachloroethene	Chronic	1.0E-02	mg/kg-day	100%	1.0E-02	mg/kg-day	Liver	1000	IRIS	3/21/02
	Subchronic	1.0E-01	mg/kg-day	100%	1.0E-01	mg/kg-day	Liver	100	HEAST	2/28/00

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

Site 11, Allegany Ballistics Laboratory

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)
Trichloroethene	Chronic Subchronic	6.0E-03 N/A	mg/kg-day	100%	6.0E-03	mg/kg-day mg/kg-day	Liver, Kidney		NCEA	
Vinyl chloride (lifetime from birth)	Chronic Subchronic	3.0E-03 N/A	mg/kg-day	100%	3.0E-03	mg/kg-day	Liver	30/1	IRIS	3/21/02
Vinyl chloride (lifetime from adult)	Chronic Subchronic	3.0E-03 N/A	mg/kg-day	100%	3.0E-03	mg/kg-day	Liver	30/1	IRIS	3/21/02

N/A = Not Applicable or Not Available. IRIS indicates that calculations of dermal risks may not be appropriate for this chemical.

(1) Refer to RAGS, Part A. Source is EPA Region III *Oral Absorption Values for Oral-to-Dermal Extrapolation*, April 8, 1999.

For constituents not available in the Region III document the following general values were used: VOCs - 80%, Pesticides/PCBs - 50%, dioxins/furans - 50%, and metals - 20%.

ATSDR = Agency for Toxic Substances and Disease Registry

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

(2) Provide equation for derivation in text.

(3) For IRIS values, provide the date IRIS was searched.

For HEAST values, provide the date of HEAST.

For NCEA values, provide the date of the article provided by NCEA.

RESP = Respiratory System

CNS = Central Nervous System

NOAEL = No adverse effect level

TABLE 5.2

NON-CANCER TOXICITY DATA -- INHALATION

Site 11, Allegany Ballistics Laboratory

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfD (1)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ (2)	Dates (3) (MM/DD/YY)
cis-1,2-Dichloroethene	Chronic	N/A							
	Subchronic	N/A							
1,2-Dichloropropane	Chronic	3.99E-03	mg/m^3	1.14E-03	mg/kg-day	Nasal Mucosa	300	IRIS	
	Subchronic	1.30E-02	mg/m^3	3.70E-03	mg/kg-day	Nasal Mucosa	100	HEAST	2/28/00
Chlorobenzene	Chronic	5.95E-02	mg/m^3	1.70E-02	mg/kg-day	Liver		A	
	Subchronic	N/A							
Tetrachloroethene	Chronic	4.90E-01	mg/m^3	1.40E-01	mg/kg-day	Liver		NCEA	
	Subchronic	N/A							
Trichloroethene	Chronic	N/A		1.05E-02	NCEA				
	Subchronic	N/A							
Vinyl chloride (lifetime from birth)	Chronic	1.00E-01	mg/m^3	2.80E-02	mg/kg-day	Liver	30/1	IRIS	3/21/02
	Subchronic	N/A							
Vinyl chloride (lifetime from adult)	Chronic	1.00E-01	mg/m^3	2.80E-02	mg/kg-day	Liver	30/1	IRIS	3/21/02
	Subchronic	N/A							

N/A = Not Applicable

(1) Provide equation used for derivation in text.

(2) HEAST, Alternative Methods used as source of barium values.

Chromium and cadmium values were withdrawn from HEAST, but available in Region III RBC Table.

(3) For IRIS values, provide the date IRIS was searched.

For HEAST values, provide the date of HEAST.

For NCEA values, provide the date of the article provided by NCEA.

ATSDR = Agency for Toxic Substances and Disease Registry

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

HEAST(3) = Health Effects Assessment Summary Tables, Alternate Methods

HEAST(4)= Health Effects Assessment Summary Tables, Withdrawn

NCEA = National Center for Environmental Assessment

TABLE 6.1

CANCER TOXICITY DATA -- ORAL/DERMAL

Site 11, Allegany Ballistics Laboratory

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor	Adjusted Dermal Cancer Slope Factor (1)	Units	EPA Carcinogen Group	Source	Date (2) (MM/DD/YY)
Arsenic	1.5E+00	95%	1.6E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	3/21/02
1,1-Dichloroethene	6.0E-01	80%	7.5E-01	$(mg/kg\text{-}day)^{-1}$	C	IRIS	3/21/02
cis-1,2-Dichloroethene	N/A						
1,4-Dichlorobenzene	2.4E-02	80%	3.0E-02	$(mg/kg\text{-}day)^{-1}$	C	HEAST	7/8/98
1,2-Dichloropropane	6.8E-02	80%	8.5E-02	$(mg/kg\text{-}day)^{-1}$	B2	HEAST	2/29/00
Tetrachloroethene	5.2E-02	100%	5.2E-02	$(mg/kg\text{-}day)^{-1}$		NCEA	
Trichloroethene	1.1E-02	100%	1.1E-02	$(mg/kg\text{-}day)^{-1}$		NCEA	
Vinyl chloride (lifetime from birth)	1.4E+00	100%	1.4E+00	(mg/kg-day)	A	IRIS	3/21/2002
Vinyl chloride (lifetime from adult)	7.2E-01	100%	7.2E-01	$(mg/kg\text{-}day)^{-1}$	A	IRIS	3/21/2002

N/A-Not available

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

U = Under review.

EPA Carcinogen Group:

A - Human carcinogen

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen

E - Evidence of noncarcinogenicity

(1) Refer to RAGS, Part A. Source is EPA Region III *Oral Absorption Values for Oral-to-Dermal Extrapolation*, April 8, 1999.

Dermal carcinogenicity should not be assessed for the carcinogenic PAHs, as these chemicals may act directly at the point of contact.

For constituents not available in the Region III document the following general values were used: VOCs - 80%, Pesticides/PCBs - 50%, dioxins/furans - 50%, and metals - 20%.

(2) For IRIS values, provide the date IRIS was searched.

For HEAST values, provide the date of HEAST.

For NCEA values, provide article date provided by NCEA.

TABLE 6.2

CANCER TOXICITY DATA -- INHALATION

Site 11, Allegany Ballistics Laboratory

Chemical of Potential Concern	Unit Risk	Units	Adjustment (1)	Inhalation Cancer Slope Factor	Units	Weight of Evidence/ Cancer Guidance Description	Source	Date (2) (MM/DD/YY)
Arsenic	4.0E-03	(ug/m3) $^{-1}$	3500	1.5E+01	(mg/kg-day) $^{-1}$	A	IRIS	3/21/02
Beryllium	2.4E-03	(ug/m3) $^{-1}$	3500	8.4E+00	(mg/kg-day) $^{-1}$	B1	IRIS	3/21/02
Cadmium	1.8E-03	(ug/m3) $^{-1}$	3500	6.3E+00	(mg/kg-day) $^{-1}$	B1	IRIS	3/21/02
Chromium	1.2E-02	(ug/m3) $^{-1}$	3500	4.1E+01	(mg/kg-day) $^{-1}$	A	HEAST	6/13/98
1,1-Dichloroethene	5.0E-05	(ug/m3) $^{-1}$	3500	1.75E-01	(mg/kg-day) $^{-1}$	C	IRIS	3/21/02
cis-1,2-Dichloroethene	N/A							
1,4-Dichlorobenzene	6.3E-06	(ug/m3) $^{-1}$	3500	2.2E-02	(mg/kg-day) $^{-1}$	C	E	1998
1,2-Dichloropropane	N/A							
Tetrachloroethene	5.7E-07	(ug/m3) $^{-1}$	3500	2.0E-03	(mg/kg-day) $^{-1}$		NCEA	
Trichloroethene	1.7E-06	(ug/m3) $^{-1}$	3500	6.0E-03	(mg/kg-day) $^{-1}$		NCEA	
Vinyl chloride (lifetime from birt	8.6E-06	(ug/m3) $^{-1}$	3500	3.0E-02	(mg/kg-day) $^{-1}$	A	IRIS	3/21/2002
Vinyl chloride (lifetime from adu	4.4E-06	(ug/m3) $^{-1}$	3500	1.5E-02	(mg/kg-day) $^{-1}$	A	IRIS	3/21/2002

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

U = Under review.

N/A = Not Available

(1) Adjustment Factor applied to Unit Risk to calculate Inhalation Slope Factor = 70kg x 1/20m3/day x 1000ug/mg

(2) For IRIS values, provide the date IRIS was searched.
For HEAST values, provide the date of HEAST.
For NCEA values, provide the date of the article provided by NCEA.
For RBC values, provide the date of last change in the Tables.

EPA Group:

A - Human carcinogen

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen

E - Evidence of noncarcinogenicity

See comments on tox values and new RBC table and make appropriate changes to table

Table 2.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 11, Allegany Ballistics Laboratory

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Alluvial Aquifer - Tap Water

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
71-55-6	1,1,1-Trichloroethane	84		220		UG/L	AS11-11GW06-R04	3/27	1 - 10	220	N/A	317 N	200	PMCL	NO	BSL
75-34-3	1,1-Dichloroethane	1.07		1.07		UG/L	AS11-11GW06-R02	1/27	1 - 1	1.07	N/A	79.8 N	N/A	N/A	NO	BSL
75-35-4	1,1-Dichloroethene	6.61		21		UG/L	AS11-11GW06-R04	3/27	1 - 10	21	N/A	0.0436 C	7	PMCL	YES	ASL
95-50-1	1,2-Dichlorobenzene	1.22		1.23		UG/L	AS11-11GW08P-R03	2/27	1 - 1	1.23	N/A	27 N	600	PMCL	NO	BSL
78-87-5	1,2-Dichloropropane	1.5		1.5		UG/L	AS11-11GW08-R02	1/27	1 - 1	1.5	N/A	0.155 C	5	PMCL	YES	ASL
106-46-7	1,4-Dichlorobenzene	2.93		3.6		UG/L	AS11-11GW08P-R03	2/27	1 - 1	3.6	N/A	0.473 C	75	75	YES	ASL
67-64-1	Acetone	2.68	L	2.68	L	UG/L	AS11-11GW04-R02	1/18	1 - 5	2.68	N/A	60.8 N	N/A	N/A	NO	BSL
75-15-0	Carbon disulfide	1.27		1.27		UG/L	AS11-11GW05-R04	1/27	1 - 1	1.27	N/A	104 N	N/A	N/A	NO	BSL
108-90-7	Chlorobenzene	5.91		70.2		UG/L	AS11-11GW08P-R03	6/27	1 - 5	70.2	N/A	18.6 N	100	PMCL	YES	ASL
75-09-2	Methylene chloride	1.88	J	2.15		UG/L	AS11-11GW08P-R03	4/27	1 - 2	2.15	1.71	4.10 C	N/A	N/A	NO	BSL
127-18-4	Tetrachloroethene	1.1		11		UG/L	AS11-11GW07-R04	9/27	1 - 1	11	N/A	1.07 C	5	PMCL	YES	ASL
79-01-6	Trichloroethene	0.682	J	190		UG/L	AS11-11GW06-R04	12/27	1 - 10	190	N/A	1.55 C	5	PMCL	YES	ASL
75-01-4	Vinyl chloride	1.8		5.11		UG/L	AS11-11GW02-R04	2/27	1 - 1	5.11	N/A	0.015 C	2	PMCL	YES	ASL
156-59-2	cis-1,2-Dichloroethene	0.355	J	8.96		UG/L	AS11-11GW02-R04	7/27	1 - 1	8.96	N/A	6.08 N	70	PMCL	YES	ASL
156-60-5	trans-1,2-Dichloroethene	1.07		3.7		UG/L	AS11-11GW02-R04	2/27	1 - 1	3.7	N/A	12.2 N	100	PMCL	NO	BSL
91-20-3	Naphthalene	2	J	2	J	UG/L	AS11-11GW05-R02	1/27	10 - 10	2	N/A	0.651 N	N/A	N/A	YES	ASL
117-81-7	bis(2-Ethylhexyl)phthalate	1	J	4	J	UG/L	AS11-11GW08-R05	6/27	10 - 10	4	1	4.78 C	6	PMCL	NO	BSL
76-44-8	Heptachlor	0.11		0.11		UG/L	AS11-11GW08P-R03	1/26	0.05 - 0.05	0.11	N/A	0.0149 C	0.4	PMCL	YES	ASL
319-84-6	alpha BHC	0.13		0.13		UG/L	AS11-11GW08P-R03	1/26	0.05 - 0.05	0.13	N/A	0.0108 C	0.2	PMCL	YES	ASL
7429-90-5	Aluminum	39.2	J	5,050		UG/L	AS11-11GW07-R04	5/23	200 - 200	5050	N/A	3,650 N	50-200	SMCL	YES	ASL
7440-36-0	Antimony	2.9	J	5.3	J	UG/L	AS11-11GW05-R02	2/23	60 - 60	5.3	N/A	1.46 N	6	PMCL	YES	ASL
7440-39-3	Barium	39.8	J	194	J	UG/L	AS11-11GW07-R04	22/23	200 - 200	194	36.2	256 N	2000	PMCL	NO	BSL
7440-41-7	Beryllium	1.1	J	1.1	J	UG/L	AS11-11GW07-R04	1/23	5 - 5	1.1	N/A	7.3 N	4	PMCL	NO	BSL
7440-43-9	Cadmium	0.37	J	0.37	J	UG/L	AS11-11GW07-R03	1/23	5 - 5	0.37	N/A	1.83 N	5	PMCL	NO	BSL
7440-70-2	Calcium	71,700		309,000	J	UG/L	AS11-11GW07-R04	23/23	5000 - 5000	309000	41300	NA	N/A	N/A	NO	BSL
7440-48-4	Cobalt	4.5	J	11	J	UG/L	AS11-11GW03-R02	4/23	50 - 50	11	N/A	73 N	N/A	N/A	NO	BSL
7440-50-8	Copper	10.1	J	39.3		UG/L	AS11-11GW06-R02	9/23	25 - 25	39.3	29.9	146 N	1000	SMCL	NO	BSL
7439-89-6	Iron	13.1	J	16,600		UG/L	AS11-11GW08-R02	9/23	100 - 100	16600	N/A	2,200 N	300	SMCL	YES	ASL
7439-92-1	Lead	10.1		10.1		UG/L	AS11-11GW07-R04	1/23	3 - 3	10.1	N/A	15	15	AL	NO	BSL
7439-95-4	Magnesium	12,200		44,600		UG/L	AS11-11GW07-R03	23/23	5000 - 5000	44600	6630	NA	N/A	N/A	NO	BSL
7439-96-5	Manganese	29.4		3,030		UG/L	AS11-11GW08-R02	8/23	15 - 15	3030	N/A	73 N	50	SMCL	YES	ASL
7439-97-6	Mercury	0.14	J	0.21	J	UG/L	AS11-11GW03-R05	2/23	0.3 - 0.3	0.21	N/A	1.10 N	2	PMCL	NO	BSL
7440-02-0	Nickel	8.4	J	28.5	J	UG/L	AS11-11GW07-R04	5/23	40 - 40	28.5	9.3	73 N	N/A	N/A	NO	BSL
7440-09-7	Potassium	940	J	2,590	J	UG/L	AS11-11GW07-R04	22/23	5000 - 5000	2590	1080	NA	N/A	N/A	NO	BSL

Need Raw data for results to 95 UCL

Table 3.1

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 11, Allegany Ballistics Laboratory

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Alluvial Aquifer-Tap Water

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
1,1-Dichloroethene	UG/L	3.27	6.16	21.0		UG/L	8.27	95% UCL-T	W-Test (4)	8.27	95% UCL-T	W-Test (4)
1,2-Dichloropropane	UG/L	0.567	0.684	1.50		UG/L	0.684	95% UCL-N	W-Test (4)	0.684	95% UCL-N	W-Test (4)
1,4-Dichlorobenzene	UG/L	0.869	1.31	3.60		UG/L	1.31	95% UCL-N	W-Test (4)	1.31	95% UCL-N	W-Test (4)
Chlorobenzene	UG/L	11.2	21.8	70.2		UG/L	70.2	Max	W-Test (4,2)	70.2	Max	W-Test (4,2)
Tetrachloroethene	UG/L	2.72	4.12	11.0		UG/L	7.3	95% UCL-T	W-Test (4)	7.3	95% UCL-T	W-Test (4)
Trichloroethene	UG/L	28.2	55.1	190		UG/L	190	Max	W-Test (4,2)	190	Max	W-Test (4,2)
Vinyl chloride	UG/L	0.894	1.45	5.11		UG/L	1.18	95% UCL-T	W-Test (4)	1.18	95% UCL-T	W-Test (4)
cis-1,2-Dichloroethene	UG/L	1.44	2.45	8.96		UG/L	2.35	95% UCL-T	W-Test (4)	2.35	95% UCL-T	W-Test (4)
Heptachlor	UG/L	0.0311	0.0418	0.110		UG/L	0.0418	95% UCL-N	W-Test (4)	0.0418	95% UCL-N	W-Test (4)
alpha-BHC	UG/L	0.0325	0.0458	0.130		UG/L	0.0458	95% UCL-N	W-Test (4)	0.0458	95% UCL-N	W-Test (4)
Aluminum	UG/L	12,272	25,841	5,050		UG/L	589.62	95% UCL-T	W-Test (4)	589.62	95% UCL-T	W-Test (4)
Iron	UG/L	25,094	50,800	16,600		UG/L	16,600	Max	W-Test (4,2)	16600	Max	W-Test (4,2)
Manganese	UG/L	4,354	9,914	3,030		UG/L	3,030	Max	W-Test (1,2)	3030	Max	W-Test (1,2)
Thallium	UG/L	4.48	7.21	6.20	UL	UG/L	3.35	95% UCL-T	W-Test (4)	3.35	95% UCL-T	W-Test (4)

EPC based on worst wells which include AS11-11GW02-R02, AS11-11GW02-R03,AS11-11GW02-R04,AS11-11GW02-R05,AS11-11GW06-R02, AS11-11GW06-R03,AS11-11GW06-R04,AS11-11GW06-R05,AS11-11GW07-R02,AS11-11GW07-R03,AS11-11GW07-R04,AS11-11GW07-R05, AS11-11GW08-R02,AS11-11GW08-R03,AS11-11GW08P-R03,AS11-11GW08-R05.

Dissolved inorganic data for groundwater used because residents would be exposed to the groundwater that has been filtered.

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);

TABLE 4.2

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, Allegany Ballistics Laboratory

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Alluvial Aquifer-Tap Water
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Water	µg/L	see Table ----		see Table ----		Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-W	Ingestion Rate of Water	L/day	1.29	EPA, 1997a, [2]	0.74	EPA, 1997a, [2]	CW x IR-W x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1993	
	CF3	Conversion Factor 3	mg/µg	0.001	- -	0.001	- -	
	BW	Body Weight	kg	16.6	EPA, 1997a, [3]	16.6	EPA, 1997a, [3]	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	~~2,190~~ 730	EPA, 1989	
Dermal Absorption	CW	Chemical Concentration in Water	µg/l	see Table ...	see Table ...	see Table ...	see Table ...	CDI (mg/kg-day) =
	DAevent	Dermally Absorbed Dose per Event	mg/cm^2-event	calculated	EPA, 1992	calculated	EPA, 1992	DAevent x SA x EF x ED x 1/BW x 1/AT
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	Inorganics: DAevent (mg/cm2-event) =
	PC	Permeability Constant	cm/hr	chem specific	EPA, 1992	chem specific	EPA, 1992	PC x CW x ET x CF1 x CF2
	t	Lag Time	hours	chem specific	EPA, 1992	chem specific	EPA, 1992	
	ET	Exposure Time	hr/day	0.33	EPA, 1992	0.17	EPA, 1997a	Organics :
	CF2	Conversion Factor 2	l/cm^3	0.001	- -	0.001	- -	ET<t*: DAevent (mg/cm2-event) =
	SA	Skin Surface Area Available for Contact	cm^2	7,213	EPA, 1997a,[1]	7,213	EPA, 1997a,[1]	2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	x CF1 x CF2
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1993	
	BW	Body Weight	kg	16.6	EPA, 1997a, [3]	16.6	EPA, 1997a, [3]	ET>t*: DAevent (mg/cm2-event) =
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B))
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	~~2,190~~ 730	EPA, 1989	x CF1 x CF2

This exposure scenario is also applicable to residents exposure to bedrock aquifer-tap water at Site 11.

(1) Surface area is the average of child surface area for ages 1-6 years.

(2) RME Ingestion Rate is the 90th percentile drinking water intake rates of age group 1-10 years; CT ingestion rate is the mean drinking water intake rates of age group 1-10 years, Table 3-6, EFH 1997.

(3) Body weight is the average of mean weight of boys and girls for ages 1-6 years, Table 7-3, EFH 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997a: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 1997b: Risk Assessment Guidance for Superfund. Vol.1: Supplemental guidance, Dermal Risk Assessment Guidance. Interim Guidance. NCEA-W-0364.

TABLE 4.7

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, Allegany Ballistics Laboratory

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Direct Contact
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table —		see Table —	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	6.6	EPA, 1997	
	CF3	Conversion Factor 3	kg/mg	0.000001	--	0.000001	--	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	2,409	EPA, 1997	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table —		see Table —	--	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	3,300	EPA, 1997, [1]	2,000	EPA, 1997, [1]	CS x SA x SSAF x NOE x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-event	0.16	EPA, 1997, (2)	0.16	EPA, 1997, (2)	ED x 1/BW x 1/AT
	NOE	Number of Events	events/day	1	[3]	1	[3]	
	DABS	Dermal Absorption Factor Solids	–	chem specific	EPA, 1995	chem specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	6.6	EPA, 1997	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	2,409	EPA, 1997	

(1) RME SA includes head, hands, forearms, and lower legs. CT surface area includes head and hands.

(2) SSAF is based on the average of maximum adherence factor for utility workers no.1 and 2. Calculations are presented in Table 4.7.A.

(3) Professional judgement assuming 1 event/day.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and inorganics value of 1%.

why are the CT different than RME? Same form but with CT calc.

Note: A for RME, (1) and (2) should all be the same. Just no adherence factor

See New Dermal Guid 2001

Workbook: Tab4_Site11_ABL.XLS
Worksheet: t4.7

3/30/02

Table 4.7.A
Calculation of Soil to Skin Adherence Factor
Site 11, Allegany Balistics Laboratory

Body Part (cm^2/s)	50th% Total SA (cm^2)		Average 50th% Total SA Combined Male & Female	Adherence Factor per Body Part (mg/cm^2)		Soil to Skin Adherence Factor (SSAF)
	Male	Female		Average Utility Workers No.1 and 2	Adherence Factor * SA	($mg\text{-}cm^2/event$)
Head	1300	1110	1205	0.3	361.5	
Hands	990	817	903.5	0.295	266.5325	0.16
Forearms	1310	1035	1172.5	0.25	293.125	
Lower Legs	2560	2180	2370	N/A	N/A	
Total			5651		921	

Assumed forearm-to-arm ratio is 0.45 to account for only mean surface area of arms available for females. EFH Table 6-4.
Assumed face-to-head ratio is 3 to account for only mean adherence factor of face available. EFH Table 6-12

see Dermal Guidance 2001 for proper calc.

TABLE 4.8

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, Allegany Ballistics Laboratory

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Direct Contact
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table ---		see Table ---	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	--	0.000001	--	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table ---		see Table ---	--	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	8,600	EPA, 1997, (1)	5,700	EPA, 1997, (1)	CS x SA x SSAF x NOE x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-event	0.05	EPA, 1997, (2)	0.05	EPA, 1997, (2)	ED x 1/BW x 1/AT
	NOE	Number of Events	events/day	1	[3]	1	[3]	
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 1995	chem specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

(1) Surface area based on resident wearing shorts, short sleeve shirt, and shoes. RME value is 95th percentile and CT value is 50th percentile.
(2) Soil to skin adherence factor is based on maximum adherence factor for gardeners no. 2. Calculations are presented in Table 4.8.A.
(3) Professional judgement assuming 1 event/day.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

Table 4.8.A
Calculation of Soil to Skin Adherence Factor
Site 11, Allegany Balistics Laboratory

Body Part (cm^2/s)	50th% Total SA (cm^2)		Average 50th% Total SA Combined Male & Female	Adherence Factor per Body Part (mg/cm^2)		Soil to Skin Adherence Factor (SSAF)
	Male	Female		Gardener No.2	Adherence Factor * SA	($mg\text{-}cm^2/event$)
Head	1300	1110	1205	0.047	56.635	0.05
Hands	990	817	903.5	0.18	162.63	
Forearms	1310	1035	1172.5	0.054	63.315	
Lower Legs	2560	2180	2370	0.022	N/A	
Total			5651		283	

Assumed forearm-to-arm ratio is 0.45 to account for only mean surface area of arms available for females. EFH Table 6-4.
Assumed face-to-head ratio is 3 to account for only mean adherence factor of face available. EFH Table 6-12

TABLE 4.9

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, Allegany Ballistics Laboratory

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Direct Contact
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table ---		see Table ---		Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	--	0.000001	--	
	BW	Body Weight	kg	16.6	EPA, 1997, [4]	16.6	EPA, 1997, [4]	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	~~2,190~~ 730	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table ---		see Table ---		CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	3,400	EPA, 1997, (1)	2,900	EPA, 1997, (1)	CS x SA x SSAF x NOE x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-event	0.13	EPA, 1997, (2)	0.13	EPA, 1997, (2)	ED x 1/BW x 1/AT
	NOE	Number of Events	events/day	1	[3]	1	[3]	
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 1995	chem specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1993	
	BW	Body Weight	kg	16.6	EPA, 1997, [4]	16.6	EPA, 1997, [4]	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	~~2,190~~ 730	EPA, 1989	

not clear see prev comments also see new revised Hand 2001

(1) Surface area based on resident wearing shorts and short sleever shirt. RME value is 95th percentile and CT value is 50th percentile.
(2) Soil to skin adherence factor is the average of the maximum adherence factor for daycare kids no. 1a, 1b, 2 and 3. Calculations are presented in Table 4.9.A.

(3) Professional judgement assuming 1 event/day.

(4) RME and CT body weight is the average of mean body weight of children ages 1 through 6, Table 7-3, EFH 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and inorganics value of 1%.

Table 4.9.A
Calculation of Soil to Skin Adherence Factor
Site 11, Allegany Balistics Laboratory

Age	50th% Total SA (cm^2)		Average 50th% Total SA	Mean Percentage of Total SA				Total SA of Body Parts	Adherence Factor per Body Part				Soil to Skin Adherence Factor
									Average of Daycare Kids No.1a, 1b, 2, 3				(SSAF)
	Male	Female	Combined Male & Female	Head	Hands	Forearms	Lower Legs	(cm2)	Head	Hands	Forearms	Lower Legs	(mg-cm2/event)
<1	6030	5790	5910	18.2	5.30	6.17	8.24	2240	N/A	0.09	0.023	0.019	0.13
1<2	6030	5790	5910	16.5	5.68	5.85	9.24	2203					
2<3	6030	5790	5910	14.2	5.30	5.31	9.28	2015					
3<4	6640	6490	6565	13.6	6.07	6.48	10.72	2421					
4<5	7310	7060	7185	13.8	5.7	6.30	11.12	2653					
5<6	7930	7790	7860	13.8	5.7	6.30	11.12	2902					
6<7	8860	8430	8545	13.1	4.71	5.90	10.84	2952					
7<8	9360	9170	9265	13.1	4.71	5.90	10.84	3201					
8<9	10000	10000	10000	13.1	4.71	5.90	10.84	3455					
9<10	10700	10600	10650	12.0	5.30	5.54	11.48	3855					
10<11	11800	11700	11750	12.0	5.30	5.54	11.48	4032					
11<12	12300	13000	12650	12.0	5.30	5.54	11.48	4341					
12<13	13400	14000	13700	8.74	5.39	6.17	12.20	4452					
13<14	14700	14800	14750	9.97	5.11	5.45	12.80	4915					
14<15	16100	15500	15800	9.97	5.11	5.45	12.80	5265					
15<16	17000	15700	16350	9.97	5.11	5.45	12.80	5449					
16<17	17600	16000	16800	7.98	5.68	5.90	13.44	5540					
17<18	18000	16300	17150	7.58	5.13	7.88	12.32	5643					
			Average of Ages 1-18	12.20	5.30	6.04	11.28						

Not clear

Assumed forearm-to-arm ratio is 0.45 to account for only mean surface area of arms available. EFH Table 6-8.
Assumed lower leg-to-leg ratio is 0.40 to account for only mean surface area of legs available. EFH Table 6-8.

TABLE 4.10

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, Allegany Ballistics Laboratory

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Direct Contact
Receptor Population: Resident
Receptor Age: Adult/Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3	see Table 3	see Table 3	see Table 3	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S-Adj x EF x CF3 x 1/AT
	IR-S-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	EPA, 1993	
	IR-S-Adj	Ingestion Rate of Soil, Age-adjusted	mg-year/kg-day	106.57	calculated	18.48	calculated	IR-S-Adj (mg-year/kd-day) =
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	(ED-C x IR-S-C / BW-C) + (ED-A x IR-S-A / BW-A)
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	2	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	--	0.000001	--	
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	EPA, 1991	
	BW-C	Body Weight, Child	kg	16.6	EPA, 1997	16.6	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3	see Table 3	see Table 3	see Table 3	CDI (mg/kg-day) =
	SA-A	Skin Surface Area Available for Contact, Adult	cm^2	6,600	EPA, 1997a	5,700	EPA, 1997a	CS x DA-Adj x DABS x CF3 x EF x 1/AT
	SA-C	Skin Surface Area Available for Contact, Child	cm^2	3,400	EPA, 1997b	2,900	EPA, 1997b	
	SSAF-A	Soil to Skin Adherence Factor	mg/cm^2-day	0.05	EPA, 1997	0.05	EPA, 1997	DA-Adj (mg-year/kd-day) =
	SSAF-C	Soil to Skin Adherence Factor	mg/cm^2-day	0.13	EPA, 1997a	0.13	EPA, 1997a	[(ED-C x SA-C x SSAF-C / BW-C) +
	DA-Adj	Dermal Absorption, Age-adjusted	mg-year/kg-day	272.9	calculated	82.1	calculated	(ED-A x SA-A x SSAF-A / BW-A)]
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 1995	chem specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	2	EPA, 1993	
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	EPA, 1991	
	BW-C	Body Weight, Child	kg	16.6	EPA, 1997	16.6	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

see Tech. comments

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

TABLE 4.10

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, Allegany Ballistics Laboratory

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Direct Contact
Receptor Population: Resident
Receptor Age: Adult/Child

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997a: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 1997b: Risk Assessment Guidance for Superfund. Vol.1: Supplemental guidance, Dermal Risk Assessment Guidance. Interim Guidance. NCEA-W-0364.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.11

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, Allegany Ballistics Laboratory

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Direct Contact
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table ---		see Table ---	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	480	EPA, 1991	480	EPA, 1991	CS x IR-S x EF x ED x ET x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	days	365	EPA, 1991	365	EPA, 1991	
	ET	Exposure Time	hrs/day	8	[3]	8	[3]	
	CF3	Conversion Factor 3	kg/mg	0.000001	--	0.000001	--	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table ---		see Table ---	--	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,300	EPA, 1992, (1)	2,000	EPA, 1992, (1)	CS x SA x SSAF x NOE x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-event	0.06	EPA, 1997, (2)	0.06	EPA, 1997, (2)	x ET x ED x 1/BW x 1/AT
	NOE	Number of Events	events/day	1	[4]	1	[4]	
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 1995	chem specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	days	365	EPA, 1991	365	EPA, 1991	
	ET	Exposure Time	hrs/day	8	[3]	8	[3]	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

* Surface and subsurface soil

(1) RME SA includes head, hands, forearms, and lower legs. CT surface area includes head and hands.

(2) Soil to skin adherence factor is based on maximum adherence factor for construction workers. Calculations presented in Table 4.11.A.

(3) Professional judgement assuming 8 hrs per day exposure.

(4) Professional judgement assuming 1 event/day.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285 6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and inorganics value of 1%.

Table 4.11.A
Calculation of Soil to Skin Adherence Factor
Site 11, Allegany Balistics Laboratory

Body Part (cm^2/s)	50th% Total SA (cm^2)		Average 50th% Total SA Combined Male & Female	Adherence Factor per Body Part (mg/cm^2)		Soil to Skin Adherence Factor (SSAF)
	Male	Female		Construction Workers	Adherence Factor * SA	($mg\text{-}cm^2/event$)
Head	1300	1110	1205	0.029	34.945	0.06
Hands	990	817	903.5	0.24	216.84	
Forearms	1310	1035	1172.5	0.098	114.905	
Lower Legs	2560	2180	2370	0.066	N/A	
Total			5651		367	

Assumed forearm-to-arm ratio is 0.45 to account for only mean surface area of arms available for females. EFH Table 6-4.
Assumed face-to-head ratio is 3 to account for only mean adherence factor of face available. EFH Table 6-12

TABLE 4.14

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, Allegany Ballistics Laboratory

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Airborne Particulates from Site 11 Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table ----	- -	see Table ---	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	see Table ----	- -	see Table ---	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	m^3/kg	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	0.6	EPA, 1997,[2]	0.3	EPA, 1997,[2]	
	ET	Exposure Time	hr/day	24	(1)	24	(1)	CA (mg/m^3) = CS (1/PEF)
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1993	
	BW	Body Weight	kg	16.6	EPA, 1997, [3]	16.6	EPA, 1997, [3]	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	~~2,190~~ 730	EPA, 1989	

(1) Professional Judgement conservatively assumed all day.

(2) RME inhalation rate is the average of long-term exposure of children 1 through 5 years , CT inhalation rate is short-term exposure of a resting child per recommendation by EPA, Table 5-23.

(3) RME and CT body weight is the average of mean body weight of children ages 1 through 6, Table 7-3, EFH 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285 6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 2001: Region III, Risk-based Concentration Table.

TABLE 4.19

VALUES USED FOR DAILY INTAKE CALCULATIONS

Site 11, Allegany Ballistics Laboratory

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Volatile Emissions from Site 11 Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table ----	- -	see Table ---	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	see Table ----	- -	see Table ---	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	0.6	EPA, 1997,[2]	0.3	EPA, 1997,[2]	
	ET	Exposure Time	hr/day	24	(1)	24	(1)	CA (mg/m^3) = CS (1/VF)
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1993	
	BW	Body Weight	kg	16.6	EPA, 1997, [3]	16.6	EPA, 1997, [3]	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	~~2,190~~ 730	EPA, 1989	

(1) Professional Judgement conservatively assumed all day.

(2) RME inhalation rate is the average of long-term exposure of children 1 through 5 years , CT inhalation rate is short-term exposure of a resting child per recommendation by EPA, Table 5-23.

(3) RME and CT body weight is the average of mean body weight of children ages 1 through 6, Table 7-3, EFH 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 2001: Region III, Risk-based Concentration Table.