Virginia Department of Environmental Quality

VURAM

Virginia Unified Risk Assessment Model

VERSION: 3.1

Residential Quantitative Risk Assessment Report

Total Hazard Index/Risk for All Media

Program: RCRA Corrective Action

Site Name: ASTSWMO 2020

Non-Cancer Adult	Non-Cancer Child	Cancer
Total: 1.66E+03	**Total: 1.66E+03**	**Total: 2.75E-02**
Exceeds Hazard Index!	***Exceeds Hazard Index!***	***Exceeds Cumulative Risk!***

Risk Based Performance Criteria

Default Hazard Index	Default Cumulative Risk-All Chemicals
1	1.00E-04

All Report Pages are Required for Risk Assessment Submission

DETAILED REPORT FOLLOWS

Risk Based Performance Criteria

Default Hazard Index	Default Risk for Indidvidual Chemical	Default Cumulative Risk (All Chemicals)
1	1.00E-06	1.00E-04

Soil

Analyte: Benzene

CAS: 71-43-2

Concentration mg/kg :	1.00E+02
RfDo (mg/kg-day):	4.00E-03
RfCi (mg/m3):	3.00E-02
SFO (mg/kg-day)-1:	5.50E-02
IUR (µg/m3)-1:	7.80E-06
Mutagen:	
VOC:	Y

Calculated Hazard Index/Risk

Non-Cancer Adult		Non-Cancer Child		Cancer	
Ingestion:	3.00E-02	Ingestion:	3.20E-01	Ingestion:	7.91E-06
Dermal:		Dermal:		Dermal:	
Inhalation:	9.03E-01	Inhalation:	9.03E-01	Inhalation:	7.85E-05
Total:	**9.33E-01**	**Total:**	**1.22E+00**	**Total:**	**8.64E-05**
% Contribution to Media Hazard/Risk	4.08%		4.80%		44.91%

Exceeds Hazard! Exceeds Risk!	mg/kg	*Non-Cancer Adult*	*Non-Cancer Child*	*Cancer*
Recommended Acceptable Concentration		*N/A*	*8.18E+01*	*1.16E+00*

Analyte: Trichloroethylene

CAS: 79-01-6

Concentration mg/kg :	1.00E+02
RfDo (mg/kg-day):	5.00E-04
RfCi (mg/m3):	2.00E-03
SFO (mg/kg-day)-1:	4.60E-02
IUR (µg/m3)-1:	4.10E-06
Mutagen:	Y
VOC:	Y

Calculated Hazard Index/Risk

Non-Cancer Adult		Non-Cancer Child		Cancer	
Ingestion:	2.40E-01	Ingestion:	2.56E+00	Ingestion:	1.14E-05
Dermal:		Dermal:		Dermal:	
Inhalation:	2.17E+01	Inhalation:	2.17E+01	Inhalation:	9.46E-05
Total:	**2.19E+01**	**Total:**	**2.43E+01**	**Total:**	**1.06E-04**
% Contribution to Media Hazard/Risk	95.92%		95.20%		55.09%

Exceeds Hazard! Exceeds Risk!	mg/kg	*Non-Cancer Adult*	*Non-Cancer Child*	*Cancer*
Recommended Acceptable Concentration		*4.56E+00*	*4.12E+00*	*9.44E-01*

Total Calculated Hazard Index/Risk For Media: Soil

Non-Cancer Adult		Non-Cancer Child		Cancer	
Ingestion:	2.70E-01	Ingestion:	2.88E+00	Ingestion:	1.93E-05
Dermal:	0.00E+00	Dermal:	0.00E+00	Dermal:	0.00E+00
Inhalation:	2.26E+01	Inhalation:	2.26E+01	Inhalation:	1.73E-04
Total:	**2.29E+01**	**Total:**	**2.55E+01**	**Total:**	**1.92E-04**

Risk Based Performance Criteria

Default Hazard Index	Default Risk for Indidvidual Chemical	Default Cumulative Risk (All Chemicals)
1	1.00E-06	1.00E-04

Air

Analyte: Benzene

CAS: 71-43-2

Concentration ug/m3:	3.00E+00
RfDo (mg/kg-day):	4.00E-03
RfCi (mg/m3):	3.00E-02
SFO (mg/kg-day)-1:	5.50E-02
IUR (µg/m3)-1:	7.80E-06
Mutagen:	
VOC:	Y

Calculated Hazard Index/Risk

Non-Cancer Adult		Non-Cancer Child		Cancer	
Ingestion:		Ingestion:		Ingestion:	
Dermal:		Dermal:		Dermal:	
Inhalation:	9.59E-02	Inhalation:	9.59E-02	Inhalation:	8.33E-06
Total:	**9.59E-02**	**Total:**	**9.59E-02**	**Total:**	**8.33E-06**
% Contribution to Media Hazard/Risk	6.25%		6.25%		57.06%

	ug/m3 *Non-Cancer Adult*	*Non-Cancer Child*	*Cancer*
Exceeds Risk!			
Recommended Acceptable Concentration	*N/A*	*N/A*	*3.60E-01*

Analyte: Trichloroethylene

CAS: 79-01-6

Concentration ug/m3:	3.00E+00
RfDo (mg/kg-day):	5.00E-04
RfCi (mg/m3):	2.00E-03
SFO (mg/kg-day)-1:	4.60E-02
IUR (µg/m3)-1:	4.10E-06
Mutagen:	Y
VOC:	Y

Calculated Hazard Index/Risk

Non-Cancer Adult		Non-Cancer Child		Cancer	
Ingestion:		Ingestion:		Ingestion:	
Dermal:		Dermal:		Dermal:	
Inhalation:	1.44E+00	Inhalation:	1.44E+00	Inhalation:	6.27E-06
Total:	**1.44E+00**	**Total:**	**1.44E+00**	**Total:**	**6.27E-06**
% Contribution to Media Hazard/Risk	93.75%		93.75%		42.94%

	ug/m3 *Non-Cancer Adult*	*Non-Cancer Child*	*Cancer*
Exceeds Hazard! Exceeds Risk!			
Recommended Acceptable Concentration	*2.09E+00*	*2.09E+00*	*4.78E-01*

Total Calculated Hazard Index/Risk For Media: Air

Non-Cancer Adult		Non-Cancer Child		Cancer	
Ingestion:	0.00E+00	Ingestion:	0.00E+00	Ingestion:	0.00E+00
Dermal:	0.00E+00	Dermal:	0.00E+00	Dermal:	0.00E+00
Inhalation:	1.53E+00	Inhalation:	1.53E+00	Inhalation:	1.46E-05
Total:	**1.53E+00**	**Total:**	**1.53E+00**	**Total:**	**1.46E-05**

Risk Based Performance Criteria

Default Hazard Index	Default Risk for Indidvidual Chemical	Default Cumulative Risk (All Chemicals)
1	1.00E-06	1.00E-04

Food

Analyte: Benzene

CAS: 71-43-2

Concentration mg/kg :	
RfDo (mg/kg-day):	4.00E-03
RfCi (mg/m3):	3.00E-02
SFO (mg/kg-day)-1:	5.50E-02
IUR (µg/m3)-1:	7.80E-06
Mutagen:	
VOC:	Y

Calculated Hazard Index/Risk

Non-Cancer Adult		Non-Cancer Child		Cancer	
Ingestion:	1.82E+02	Ingestion:	1.82E+02	Ingestion:	1.48E-02
Dermal:		Dermal:		Dermal:	
Inhalation:		Inhalation:		Inhalation:	
Total:	**1.82E+02**	**Total:**	**1.82E+02**	**Total:**	**1.48E-02**
% Contribution to Media Hazard/Risk	11.11%		11.11%		54.46%

Exceeds Hazard! Exceeds Risk!	mg/kg *Non-Cancer Adult*	*Non-Cancer Child*	*Cancer*
Recommended Acceptable Concentration	*See Detailed Food Report*	*See Detailed Food Report*	*See Detailed Food Report*

Analyte: Trichloroethylene

CAS: 79-01-6

Concentration mg/kg :	
RfDo (mg/kg-day):	5.00E-04
RfCi (mg/m3):	2.00E-03
SFO (mg/kg-day)-1:	4.60E-02
IUR (µg/m3)-1:	4.10E-06
Mutagen:	Y
VOC:	Y

Calculated Hazard Index/Risk

Non-Cancer Adult		Non-Cancer Child		Cancer	
Ingestion:	1.45E+03	Ingestion:	1.45E+03	Ingestion:	1.24E-02
Dermal:		Dermal:		Dermal:	
Inhalation:		Inhalation:		Inhalation:	
Total:	**1.45E+03**	**Total:**	**1.45E+03**	**Total:**	**1.24E-02**
% Contribution to Media Hazard/Risk	88.89%		88.89%		45.54%

Exceeds Hazard! Exceeds Risk!	mg/kg *Non-Cancer Adult*	*Non-Cancer Child*	*Cancer*
Recommended Acceptable Concentration	*See Detailed Food Report*	*See Detailed Food Report*	*See Detailed Food Report*

Total Calculated Hazard Index/Risk For Media: Food

Non-Cancer Adult		Non-Cancer Child		Cancer	
Ingestion:	1.63E+03	Ingestion:	1.63E+03	Ingestion:	2.72E-02
Dermal:	0.00E+00	Dermal:	0.00E+00	Dermal:	0.00E+00
Inhalation:	0.00E+00	Inhalation:	0.00E+00	Inhalation:	0.00E+00
Total:	**1.63E+03**	**Total:**	**1.63E+03**	**Total:**	**2.72E-02**

Risk Based Performance Criteria

Default Hazard Index	Default Risk for Indidvidual Chemical	Default Cumulative Risk (All Chemicals)
1	1.00E-06	1.00E-04

Total Hazard Index/Risk for All Media

Non-Cancer Adult		Non-Cancer Child		Cancer	
Ingestion:	1.63E+03	Ingestion:	1.64E+03	Ingestion:	2.73E-02
Dermal:	0.00E+00	Dermal:	0.00E+00	Dermal:	0.00E+00
Inhalation:	2.41E+01	Inhalation:	2.41E+01	Inhalation:	1.88E-04
Total:	**1.66E+03**	**Total:**	**1.66E+03**	**Total:**	**2.75E-02**
Exceeds Hazard Index!		***Exceeds Hazard Index!***		***Exceeds Cumulative Risk!***	

Risk Based Performance Criteria

Default Hazard Index	Default Risk for Indidvidual Chemical	Default Cumulative Risk (All Chemicals)
1	1.00E-06	1.00E-04

Detailed Residential Food Report

Analyte: Benzene

CAS: 71-43-2

Concentrations	(mg/kg)
Meat/Dairy:	100
Eggs:	100
Fish/Shellfish:	100
Fruits/Vegetables:	100

Calculated Hazard/Risk Values

Non-Cancer		Cancer	
Meat/Dairy:	8.39E+01	Meat/Dairy:	6.86E-03
Eggs:	4.49E+01	Eggs:	3.67E-03
Fish/Shellfish:	1.62E+01	Fish/Shellfish:	1.32E-03
Fruits/Vegetables:	3.66E+01	Fruits/Vegetables:	2.99E-03
Total:	**1.82E+02**	**Total:**	**1.48E-02**
% Contribution to Media Risk	*11.11%*		*54.46%*

Recommended Acceptable Concentrations		*Meat/Dairy*	*Eggs*	*Fish/Shellfish*	*Fruits/Vegetables*
Exceeds Hazard!	*Non-Cancer*	*1.19E+00*	*2.22E+00*	*6.18E+00*	*2.74E+00*
Exceeds Risk!	*Cancer*	*1.46E-02*	*2.72E-02*	*7.56E-02*	*3.35E-02*

Analyte: Trichloroethylene

CAS: 79-01-6

Concentrations	(mg/kg)
Meat/Dairy:	100
Eggs:	100
Fish/Shellfish:	100
Fruits/Vegetables:	100

Calculated Hazard/Risk Values

Non-Cancer		Cancer	
Meat/Dairy:	6.71E+02	Meat/Dairy:	5.73E-03
Eggs:	3.60E+02	Eggs:	3.07E-03
Fish/Shellfish:	1.29E+02	Fish/Shellfish:	1.11E-03
Fruits/Vegetables:	2.92E+02	Fruits/Vegetables:	2.50E-03
Total:	**1.45E+03**	**Total:**	**1.24E-02**
% Contribution to Media Risk	*88.89%*		*45.54%*

Recommended Acceptable Concentrations		*Meat/Dairy*	*Eggs*	*Fish/Shellfish*	*Fruits/Vegetables*
Exceeds Hazard!	*Non-Cancer*	*1.49E-01*	*2.78E-01*	*7.72E-01*	*3.42E-01*
Exceeds Risk!	*Cancer*	*1.74E-02*	*3.26E-02*	*9.04E-02*	*4.00E-02*

Total Hazard/Risk For Media: Detailed Food

Non-Cancer		Cancer	
Meat and Dairy:	7.55E+02	Meat and Dairy:	1.26E-02
Eggs:	4.05E+02	Eggs:	6.74E-03
Fish and Shellfish:	1.46E+02	Fish and Shellfish:	2.43E-03
Fruits and Vegetables:	3.29E+02	Fruits and Vegetables:	5.49E-03
Total:	**1.63E+03**	**Total:**	**2.72E-02**

Risk Based Performance Criteria

Default Hazard Index	Default Risk for Indidvidual Chemical	Default Cumulative Risk (All Chemicals)
1	1.00E-06	1.00E-04

Residential Exposure Default Values

Symbol	Description	Value	Units
AF0-02	Soil Adherence Factor - age segment 0-2	0.2	(mg/cm2)
AF02-06	Soil Adherence Factor - age segment 2-6	0.2	(mg/cm2)
AF06-16	Soil Adherence Factor - age segment 6-16	0.07	(mg/cm2)
AF16-26	Soil Adherence Factor - age segment 16-26	0.07	(mg/cm2)
AFres-a	Resident Soil Adherence Factor - adult	0.07	(mg/cm2)
AFres-c	Resident Soil Adherence Factor - child	0.2	(mg/cm2)
ATr	Resident Averaging Time	365	(days/yr)
ATres	Resident Averaging Time: 365 x LT	25550	(days)
ATres-a	Resident Averaging Time - adult: 365 x EDres	9490	(days)
ATres-c	Resident Averaging Time - child: 365 x EDres-c	2190	(days)
BW0-02	Body Weight - age segment 0-2	15	(kg)
BW02-06	Body Weight - age segment 2-6	15	(kg)
BW06-16	Body Weight - age segment 6-16	80	(kg)
BW16-26	Body Weight - age segment 16-26	80	(kg)
BWres-a	Resident Body Weight - adult	80	(kg)
BWres-c	Resident Body Weight - child	15	(kg)
DFSMres-adj	Resident Soil Mutagenic Dermal Contact Factor - age adjusted	428260	(mg/kg)
DFSres-adj	Resident Soil Dermal Contact Factor - age adjusted	103390	(mg/kg)
DFWMres-adj	Resident Groundwater Mutagenic Dermal Contact Factor - age adjusted	8191633.33333333	(cm2-event/kg)
DFWres-adj	Resident Groundwater Dermal Contact Factor - age adjusted	2610650	(cm2-event/kg)
ED0-02	Exposure Duration - age segment 0-2	2	(yrs)
ED02-06	Exposure Duration - age segment 2-6	4	(yrs)
ED06-16	Exposure Duration -age segment 6-16	10	(yrs)

Risk Based Performance Criteria

Default Hazard Index	Default Risk for Indidvidual Chemical	Default Cumulative Risk (All Chemicals)
1	1.00E-06	1.00E-04

ED16-26	Exposure Duration -age segment 16-26	10	(yrs)
EDres	Resident Total Exposure Duration	26	(yrs)
EDres-a	Resident Exposure Duration - adult	20	(yrs)
EDres-c	Resident Exposure Duration - child	6	(yrs)
EFres	Resident Exposure Frequency	350	(days/yr)
EFres0-02	Resident Exposure Frequency - age segment 0-2	350	(days/yr)
EFres02-06	Resident Exposure Frequency - age segment 2-6	350	(days/yr)
EFres06-16	Resident Exposure Frequency - age segment 6-16	350	(days/yr)
EFres16-26	Resident Exposure Frequency - age segment 16-26	350	(days/yr)
EFres-a	Resident Exposure Frequency - adult	350	(days/yr)
EFres-c	Resident Exposure Frequency - child	350	(days/yr)
ETevent-res(0-02)	Resident Water Exposure Time - age segment 0-2	0.54	(hrs/event)
ETevent-res(02-06)	Resident Water Exposure Time - age segment 2-6	0.54	(hrs/event)
ETevent-res(06-16)	Resident Water Exposure Time - age segment 6-16	0.71	(hrs/event)
ETevent-res(16-26)	Resident Water Exposure Time - age segment 16-26	0.71	(hrs/event)
ETevent-res-a	Resident Groundwater Exposure Time -adult	0.71	(hrs/event)
ETevent-res-adj	Resident Water Exposure Time -age adjusted	0.670769230769231	(hrs/event)
ETevent-res-c	Resident Groundwater Exposure Time - child	0.54	(hrs/event)
ETevent-res-madj	Resident Water Exposure Time - mutagen age adjusted	0.670769230769231	(hrs/event)
ETrai	Resident Air Inhalation Exposure Time	24	(hrs/day)
ETres	Resident Soil Exposure Time	24	(hrs/day)
ETres0-02	Resident Exposure Time - age segment 0-2	24	(hrs/day)
ETres02-06	Resident Exposure Time - age segment 2-6	24	(hrs/day)
ETres06-16	Resident Exposure Time - age segment 6-16	24	(hrs/day)
ETres16-26	Resident Exposure Time - age segment 16-26	24	(hrs/day)
ETres-a	Resident Exposure Time - adult	24	(hrs/day)

Risk Based Performance Criteria

Default Hazard Index	Default Risk for Indidvidual Chemical	Default Cumulative Risk (All Chemicals)
1	1.00E-06	1.00E-04

ETres-c	Resident Exposure Time - child	24	(hrs/day)
ETres-gwi	Resident Groundwater Inhalation Exposure Time	24	(hrs/day)
EVres-a	Resident Groundwater Events - adult	1	(events/day)
EVres-c	Resident Groundwater Events - child	1	(events/day)
IFSMres-adj	Resident Mutagenic Soil Ingestion Rate - age adjusted	166833.333333333	(mg/kg)
IFSres-adj	Resident Soil Ingestion Rate - age adjusted	36750	(mg/kg)
IFWMres-adj	Resident Mutagenic Drinking Groundwater Ingestion Rate - age adjusted	1019.9	(L/kg)
IFWres-adj	Resident Drinking Groundwater Ingestion Rate - age adjusted	327.95	(L/kg)
INHMres-ai-adj	Resident Air Inhalation Exposure Duration Mutagen - age adjusted	604800	(hrs)
INHMres-gw-adj	Resident Groundwater Inhalation Exposure Duration Mutagen - age adjusted	25200	(days)
INHMres-s-adj	Resident Soil Inhalation Exposure Duration Mutagen - age adjusted	25200	(days)
IREres-a	Resident Food Eggs Ingestion Rate - Virginia DEQ	150000	(mg/day)
IRFres-a	Resident Food Fish/Shellfish Ingestion Rate - Exposure Defaults Handbook	54000	(mg/day)
IRFVres-a	Resident Food Fruit/Vegetables Ingestion Rate - Exposure Defaults Handbook	122000	(mg/day)
IRMDres-a	Resident Food Meat/Dairy - Virginia DEQ	280000	(mg/day)
IRS0-02	Soil/Sediment Ingestion Rate - age segment 0-2	200	(mg/day)
IRS02-06	Soil/Sediment Ingestion Rate - age segment 2-6	200	(mg/day)
IRS06-16	Soil/Sediment Ingestion Rate - age segment 6-16	100	(mg/day)
IRS16-26	Soil/Sediment Ingestion Rate - age segment 16-26	100	(mg/day)
IRSres-a	Resident Soil Ingestion Rate - adult	100	(mg/day)
IRSres-c	Resident Soil Ingestion Rate - child	200	(mg/day)
IRW0-02	Drinking Water Ingestion Rate - age segment 0-2	0.78	(L/day)
IRW02-06	Drinking Water Ingestion Rate - age segment 2-6	0.78	(L/day)
IRW06-16	Drinking Water Ingestion Rate - age segment 6-16	2.5	(L/day)
IRW16-26	Drinking Water Ingestion Rate - age segment 16-26	2.5	(L/day)
IRWres-a	Resident Drinking Groundwater Ingestion Rate - adult	2.5	(L/day)

Risk Based Performance Criteria

Default Hazard Index	Default Risk for Indidvidual Chemical	Default Cumulative Risk (All Chemicals)
1	1.00E-06	1.00E-04

IRWres-c	Resident Drinking Groundwater Ingestion Rate - child	0.78	(L/day)
SAres-a	Resident Soil Surface Area - adult	6032	(cm2/day)
SAres-a	Resident Water Surface Area - adult	19652	(cm2)
SAres-c	Resident Water Surface Area - child	6365	(cm2)
SAres-c	Resident Soil Surface Area - child	2373	(cm2/day)
SAs0-02	Surface Area Soil/Sediment - age segment 0-2	2373	(cm2/day)
SAs02-06	Surface Area Soil/Sediment - age segment 2-6	2373	(cm2/day)
SAs06-16	Surface Area Soil/Sediment - age segment 6-16	6032	(cm2/day)
SAs16-26	Surface Area Soil/Sediment - age segment 16-26	6032	(cm2/day)
SAw0-02	Surface Area Water - age segment 0-2	6365	(cm2)
SAw02-06	Surface Area Water - age segment 2-6	6365	(cm2)
SAw06-16	Surface Area Water - age segment 6- 16	19652	(cm2)
SAw16-26	Surface Area Water - age segment 16- 26	19652	(cm2)

END OF REPORT