

US EPA ARCHIVE DOCUMENT



RE: Garvey - Appendix U Risk Assessment
Robb, Christopher to: Brian Zurbuchen

07/19/2012 11:03 AM

From: [REDACTED] >
To: Brian Zurbuchen/SUPR/R7/USEPA/US@EPA,

Hi Brian,

Attached is the PDF file you requested. This file includes Tables 5.1 through 5.28. Tables 5.17 and 5.18 have been appended to include the calculation detail that you reference below. In addition, this set includes the revised 5.26, which previously had hidden column.

Please let me know if you have questions about this or need anything else. Thanks.

[REDACTED] P.E.

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From: Brian Zurbuchen [mailto:Zurbuchen.Brian@epamail.epa.gov]

Sent: Wednesday, July 18, 2012 3:32 PM

To: [REDACTED]

Subject: Garvey - Appendix U Risk Assessment

[REDACTED]

Table 5.28 summarizes risks for a future on-property age-adjusted resident. The table presents estimates for ingestion and dermal risk from exposure to irrigation water. However, I am unable to locate the risk calculation detail for the irrigation water in Tables 5.1 - 5.18. Table 5.15 provides the calculations for the current off-property resident, but the one for on-property is nowhere to be found. Please locate and send me a full copy of the risk assessment Tables 5.1 - 5.28, plus the new table. Send them as a single pdf attached to an e-mail.

Note that the summary table 5.27 does include the future on-property resident exposure to groundwater used in irrigation, so I think HGL has the calculation table from which these values were drawn.

Brian

Consider the Environment before printing this email.

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attachments. Section 5 Tables - July 2012.pdf

TABLE 5.2
CALCULATION OF NON-CANCER HAZARDS
Subslab Soil Gas, Current/Future Indoor Industrial Worker
Garvey Elevator Superfund Site
Hastings, NE

Scenario Timeframe: Current and Future
Medium: Subslab Soil Gas
Exposure Medium: Soil Gas
Exposure Point: Air
Receptor Population: Indoor (Industrial) Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Inhalation	Chloroform	9.3E-03	mg/m ³	2.1E-03	mg/m ³	9.8E-02	mg/m ³	0.02
	Tetrachloroethene	1.4E-01	mg/m ³	3.2E-02	mg/m ³	2.7E-01	mg/m ³	0.1
Inhalation Route Total								0.1
Total of Receptor Hazards Across All Media								0.1

Table 5.3
CALCULATION OF CANCER RISKS
Sublab Soil Gas, Current/Future Indoor Industrial Worker
Garvey Elevator Superfund Site
Hastings, NE

Scenario Timeframe: Current and Future
 Medium: Subslab Soil Gas
 Exposure Medium: Soil Gas
 Exposure Point: Air
 Receptor Population: Indoor (Industrial) Worker
 Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Inhalation	Chloroform	9.30E-03	mg/m ³	7.6E-04	mg/m ³	2.3E-02	(mg/m ³) ⁻¹	1.7E-05
	Tetrachloroethene	1.40E-01	mg/m ³	1.1E-02	mg/m ³	5.9E-03	(mg/m ³) ⁻¹	6.7E-05
Inhalation Route Total								8.E-05
Total of Receptor Hazards Across All Media								8.E-05

Table 5.4
CALCULATION OF CANCER RISKS
Sediment, Current/Future Outdoor Industrial Worker
Garvey Elevator Superfund Site
Hastings, NE

Scenario Timeframe: Current and Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site Sediment
Receptor Population: Outdoor (Industrial) Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Benzo(a)pyrene	2.3E-01	mg/kg	7.2E-08	mg/kg-day	7.3E+00	(mg/kg-day) ⁻¹	5.3E-07
	Benzo(b)fluoranthene	2.3E-01	mg/kg	7.2E-08	mg/kg-day	7.3E-01	(mg/kg-day) ⁻¹	5.3E-08
Ingestion Route Total								6.E-07
Dermal Absorption	Benzo(a)pyrene	2.3E-01	mg/kg	6.2E-08	mg/kg-day	7.3E+00	(mg/kg-day) ⁻¹	4.5E-07
	Benzo(b)fluoranthene	2.3E-01	mg/kg	6.2E-08	mg/kg-day	7.3E-01	(mg/kg-day) ⁻¹	4.5E-08
Dermal Absorption Route Total								5.E-07
Inhalation	Benzo(a)pyrene	1.7E-10	mg/m ³	1.2E-11	mg/m ³	1.1E+00	(mg/m ³) ⁻¹	1.4E-11
	Benzo(b)fluoranthene	1.7E-10	mg/m ³	1.2E-11	mg/m ³	1.1E-01	(mg/m ³) ⁻¹	1.4E-12
Inhalation Route Total								2.E-11
Total of Receptor Hazards Across All Media								1.E-06

Table 5.5
CALCULATION OF CANCER RISKS
Sediment, Future Construction Worker
Garvey Elevator Superfund Site
Hastings, NE

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site Sediment
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Benzo(a)pyrene	2.3E-01	mg/kg	1.1E-08	mg/kg-day	7.3E+00	(mg/kg-day) ⁻¹	7.7E-08
Exposure Route Total								8.E-08
Dermal Absorption	Benzo(a)pyrene	2.3E-01	mg/kg	4.1E-09	mg/kg-day	7.3E+00	(mg/kg-day) ⁻¹	3.0E-08
Exposure Route Total								3.E-08
Inhalation	Benzo(a)pyrene	3.0E-07	mg/m ³	9.7E-10	mg/m ³	1.1E+00	(mg/m ³) ⁻¹	1.1E-09
Exposure Route Total								1.E-09
Total of Receptor Hazards Across All Media								1.E-07

Table 5.6
CALCULATION OF CANCER RISKS
Sediment, Future On-Property Age-Adjusted Resident
Garvey Elevator Superfund Site
Hastings, NE

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site sediment
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion								
	Benzo(a)pyrene	2.3E-01	mg/kg	See Table for Mutagenic Risks				1.E-05
	Benzo(b)fluoranthene	2.3E-01	mg/kg	See Table for Mutagenic Risks				1.E-06
Ingestion Route Total								1.E-05
Dermal Absorption			mg/kg					4.E-06
	Benzo(a)pyrene	2.3E-01		See Table for Mutagenic Risks				
	Benzo(b)fluoranthene	2.3E-01		See Table for Mutagenic Risks				
	Dermal Absorption Route Total				5.E-06			
Inhalation								
	Benzo(a)pyrene	1.7E-10	mg/m ³	See Table for Mutagenic Risks				2.E-10
	Benzo(b)fluoranthene	1.7E-10	mg/m ³	See Table for Mutagenic Risks				2.E-11
Inhalation Route Total								2.E-10
Total of Receptor Hazards Across All Media								2.E-05

Table 5.6a
CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS
Garvey Elevator Superfund Site
Hastings, NE

Scenario Timeframe: Future
 Receptor Population: Resident
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Benzo(a)pyrene	Ingestion									1.1E-05
	Age 0 - 2 years	2.3E-01	mg/kg	8.4E-08	mg/kg-day	7.3E+00	(mg/kg-day) ⁻¹	10	6.1E-06	
	Age 2 - 6 years	2.3E-01	mg/kg	1.7E-07	mg/kg-day	7.3E+00	(mg/kg-day) ⁻¹	3	3.7E-06	
	Age 6 - 16 years	2.3E-01	mg/kg	4.5E-08	mg/kg-day	7.3E+00	(mg/kg-day) ⁻¹	3	9.9E-07	
	Age 16 - 30 years	2.3E-01	mg/kg	6.3E-08	mg/kg-day	7.3E+00	(mg/kg-day) ⁻¹	1	4.6E-07	
	Dermal Absorption									4.3E-06
	Age 0 - 2 years	2.3E-01	mg/kg	3.1E-08	mg/kg-day	7.3E+00	(mg/kg-day) ⁻¹	10	2.2E-06	
	Age 2 - 6 years	2.3E-01	mg/kg	6.1E-08	mg/kg-day	7.3E+00	(mg/kg-day) ⁻¹	3	1.3E-06	
	Age 6 - 16 years	2.3E-01	mg/kg	2.3E-08	mg/kg-day	7.3E+00	(mg/kg-day) ⁻¹	3	5.1E-07	
	Age 16 - 30 years	2.3E-01	mg/kg	3.3E-08	mg/kg-day	7.3E+00	(mg/kg-day) ⁻¹	1	2.4E-07	
	Inhalation									1.9E-10
	Age 0 - 2 years	1.7E-10	mg/m3	4.6E-12	mg/m3	1.1E+00	(mg/m3) ⁻¹	10	5.1E-11	
Benzo(b)fluoranthene	Age 2 - 6 years	1.7E-10	mg/m3	9.3E-12	mg/m3	1.1E+00	(mg/m3) ⁻¹	3	3.1E-11	
	Age 6 - 16 years	1.7E-10	mg/m3	2.3E-11	mg/m3	1.1E+00	(mg/m3) ⁻¹	3	7.6E-11	
	Age 16 - 30 years	1.7E-10	mg/m3	3.2E-11	mg/m3	1.1E+00	(mg/m3) ⁻¹	1	3.6E-11	
	Ingestion									1.1E-06
	Age 0 - 2 years	2.3E-01	mg/kg	8.4E-08	mg/kg-day	7.3E-01	(mg/kg-day) ⁻¹	10	6.1E-07	
	Age 2 - 6 years	2.3E-01	mg/kg	1.7E-07	mg/kg-day	7.3E-01	(mg/kg-day) ⁻¹	3	3.7E-07	
	Age 6 - 16 years	2.3E-01	mg/kg	4.5E-08	mg/kg-day	7.3E-01	(mg/kg-day) ⁻¹	3	9.9E-08	
	Age 16 - 30 years	2.3E-01	mg/kg	6.3E-08	mg/kg-day	7.3E-01	(mg/kg-day) ⁻¹	1	4.6E-08	
	Dermal Absorption									4.3E-07
	Age 0 - 2 years	2.3E-01	mg/kg	3.1E-08	mg/kg-day	7.3E-01	(mg/kg-day) ⁻¹	10	2.2E-07	
	Age 2 - 6 years	2.3E-01	mg/kg	6.1E-08	mg/kg-day	7.3E-01	(mg/kg-day) ⁻¹	3	1.3E-07	
	Age 6 - 16 years	2.3E-01	mg/kg	2.3E-08	mg/kg-day	7.3E-01	(mg/kg-day) ⁻¹	3	5.1E-08	
	Age 16 - 30 years	2.3E-01	mg/kg	3.3E-08	mg/kg-day	7.3E-01	(mg/kg-day) ⁻¹	1	2.4E-08	
	Inhalation									1.9E-11
	Age 0 - 2 years	1.7E-10	mg/m3	4.6E-12	mg/m3	1.1E-01	(mg/m3) ⁻¹	10	5.1E-12	
	Age 2 - 6 years	1.7E-10	mg/m3	9.3E-12	mg/m3	1.1E-01	(mg/m3) ⁻¹	3	3.1E-12	
	Age 6 - 16 years	1.7E-10	mg/m3	2.3E-11	mg/m3	1.1E-01	(mg/m3) ⁻¹			

TABLE 5.7
CALCULATION OF NON-CANCER HAZARD
Subslab Soil Gas, Future On-Property Child Resident
Garvey Elevator Superfund Site
Hastings, NE

Scenario Timeframe: Future
Medium: Subslab Soil Gas
Exposure Medium: Soil Gas
Exposure Point: Indoor Air
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Inhalation	Chloroform	9.30E-03	mg/m ³	8.9E-03	mg/m ³	9.8E-02	mg/m ³	0.09
	Tetrachloroethene	1.40E-01	mg/m ³	1.3E-01	mg/m ³	2.7E-01	mg/m ³	0.5
	Trichloroethene	4.00E-03	mg/m ³	3.8E-03	mg/m ³	NV	mg/m ³	NV
Inhalation Route Total								0.6
Total of Receptor Hazards Across All Media								0.6

TABLE 5.8
CALCULATION OF NON-CANCER HAZARD
Subslab Soil Gas, Future On-Property Adult Resident
Garvey Elevator Superfund Site
Hastings, NE

Scenario Timeframe: Future
Medium: Subslab Soil Gas
Exposure Medium: Soil Gas
Exposure Point: Indoor Air
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Inhalation	Chloroform	9.30E-03	mg/m ³	8.9E-03	mg/m ³	9.8E-02	mg/m ³	0.09
	Tetrachloroethene	1.40E-01	mg/m ³	1.3E-01	mg/m ³	2.7E-01	mg/m ³	0.5
	Trichloroethene	4.00E-03	mg/m ³	3.8E-03	mg/m ³	NV	mg/m ³	NV
Inhalation Route Total								0.6
Total of Receptor Hazards Across All Media								0.6

Table 5.9
CALCULATION OF CANCER RISKS
Subslab Soil Gas, Future On-Property Age-Adjusted Resident
Garvey Elevator Superfund Site
Hastings, NE

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Cancer Risk
				Value	Units	Value	Units	
Inhalation	Chloroform	9.3E-03	mg/m3	3.8E-03	mg/m3	2.3E-02	(mg/m ³) ⁻¹	8.8E-05
	Tetrachloroethene	1.4E-01	mg/m3	5.8E-02	mg/m3	5.9E-03	(mg/m ³) ⁻¹	3.4E-04
	Trichloroethene	4.0E-03	mg/m3	1.6E-03	mg/m3	2.0E-03	(mg/m ³) ⁻¹	3.3E-06
Inhalation Route Total								4.E-04

Table 5.10
CALCULATION OF CANCER RISKS
Sediment, Current/Future Trespasser
Garvey Elevator Superfund Site
Hastings, NE

Scenario Timeframe: Current and Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site sediment
Receptor Population: Site Trespasser
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Benzo(a)pyrene	2.3E-01	mg/kg	4.7E-09	mg/kg-day	2.2E+01	(mg/kg-day) ⁻¹	1.0E-07
	Benzo(b)fluoranthene	2.3E-01	mg/kg	4.7E-09	mg/kg-day	2.2E+00	(mg/kg-day) ⁻¹	1.0E-08
Ingestion Route Total								1.E-07
Dermal Absorption	Benzo(a)pyrene	2.3E-01	mg/kg	4.0E-09	mg/kg-day	2.2E+01	(mg/kg-day) ⁻¹	8.7E-08
	Benzo(b)fluoranthene	2.3E-01	mg/kg	4.0E-09	mg/kg-day	2.2E+00	(mg/kg-day) ⁻¹	8.7E-09
Dermal Absorption Route Total								1.E-07
Inhalation	Benzo(a)pyrene	1.7E-10	mg/m ³	1.3E-13	mg/m ³	3.3E+00	(mg/m ³) ⁻¹	4.3E-13
	Benzo(b)fluoranthene	1.7E-10	mg/m ³	1.3E-13	mg/m ³	3.3E-01	(mg/m ³) ⁻¹	4.3E-14
Inhalation Route Total								5.E-13
Total of Receptor Hazards Across All Media								2.E-07

Table 5.11
CALCULATION OF NON-CANCER HAZARDS
Groundwater, Current Off-Property Child Resident
Garvey Elevator Superfund Site
Hastings, NE

Scenario Timeframe: Current
 Receptor Population: Off-Property Resident
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Non-cancer Risk Calculations					
					Value	Units	Intake		RfD / RfC		Hazard Quotient	
							Value	Units	Value	Units		
Groundwater	Water	Tap	Ingestion	1,2-Dichloroethane	3.0E-03	mg/L	1.9E-04	mg/kg-day	2.0E-02	mg/kg-day	0.01	
				Carbon Tetrachloride	9.6E-01	mg/L	6.1E-02	mg/kg-day	4.0E-03	mg/kg-day	15	
				Chloroform	1.4E-01	mg/L	8.9E-03	mg/kg-day	1.0E-02	mg/kg-day	0.9	
				Exp. Route Total						16		
			Groundwater	Water	Bath	Dermal contact	1,2-Dichloroethane	3.0E-03	mg/L	9.4E-06	mg/kg-day	2.0E-02
Carbon Tetrachloride	9.6E-01	mg/L					1.6E-02	mg/kg-day	4.0E-03	mg/kg-day	4	
Chloroform	1.4E-01	mg/L					7.9E-04	mg/kg-day	1.0E-02	mg/kg-day	0.08	
Exp. Route Total							4					
Inhalation	1,2-Dichloroethane	3.0E-03				mg/L	1.1E-03	mg/m³	2.4E+00	mg/m³	0.0004	
	Carbon Tetrachloride	9.6E-01				mg/L	3.5E-01	mg/m³	1.0E-01	mg/m³	3	
	Chloroform	1.4E-01				mg/L	5.0E-02	mg/m³	9.8E-02	mg/m³	0.5	
			Exp. Route Total						4			
	Exposure Medium Total										24	

Table 5.12
CALCULATION OF NON-CANCER HAZARDS
Groundwater, Current Off-Property Adult Resident
Garvey Elevator Superfund Site
Hastings, NE

Scenario Timeframe: Current
 Receptor Population: Off-Property Resident
 Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Non-cancer Risk Calculations				
					Value	Units	Intake		RfD / RfC		Hazard Quotient
							Value	Units	Value	Units	
Groundwater	Water	Tap	Ingestion	1,2-Dichloroethane	3.0E-03	mg/L	6.6E-05	mg/kg-day	2.0E-02	mg/kg-day	0.003
				Carbon Tetrachloride	9.6E-01	mg/L	2.1E-02	mg/kg-day	4.0E-03	mg/kg-day	5
				Chloroform	1.4E-01	mg/L	3.1E-03	mg/kg-day	1.0E-02	mg/kg-day	0.3
			Exp. Route Total							6	
Groundwater	Water	Shower	Dermal contact	1,2-Dichloroethane	3.0E-03	mg/L	4.4E-06	mg/kg-day	2.0E-02	mg/kg-day	0.0002
				Carbon Tetrachloride	9.6E-01	mg/L	7.4E-03	mg/kg-day	4.0E-03	mg/kg-day	2
				Chloroform	1.4E-01	mg/L	3.7E-04	mg/kg-day	1.0E-02	mg/kg-day	0.04
			Exp. Route Total							2	
			Inhalation	1,2-Dichloroethane	3.0E-03	mg/L	1.1E-03	mg/m ³	2.4E+00	mg/m ³	0.0004
				Carbon Tetrachloride	9.6E-01	mg/L	3.5E-01	mg/m ³	1.0E-01	mg/m ³	3
				Chloroform	1.4E-01	mg/L	5.0E-02	mg/m ³	9.8E-02	mg/m ³	0.5
			Exp. Route Total							4	
	Exposure Medium Total									11	

Table 5.13
CALCULATION OF CANCER RISKS
Groundwater, Current Off-Property Age-Adjusted Resident
Garvey Elevator Superfund Site
Hastings, NE

Scenario Timeframe: Current
 Receptor Population: Off-Property Resident
 Receptor Age: Age-Adjusted Adult/Child Combined

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					
					Value	Units	Intake		CSF/Unit Risk		Cancer Risk	
							Value	Units	Value	Units		
Groundwater	Water	Tap	Ingestion	1,2-Dichloroethane	3.0E-03	mg/L	4.5E-05	mg/kg-day	9.1E-02	(mg/kg-day) ⁻¹	4.E-06	
				Carbon Tetrachloride	9.6E-01	mg/L	1.4E-02	mg/kg-day	7.0E-02	(mg/kg-day) ⁻¹	1.E-03	
				Chloroform	1.4E-01	mg/L	2.1E-03	mg/kg-day	3.1E-02	(mg/kg-day) ⁻¹	6.E-05	
			Exp. Route Total						1E-03			
Groundwater	Water	Shower	Dermal contact	1,2-Dichloroethane	3.0E-03	mg/L	2.2E-06	mg/kg-day	9.1E-02	(mg/kg-day) ⁻¹	2.E-07	
				Carbon Tetrachloride	9.6E-01	mg/L	4.2E-03	mg/kg-day	7.0E-02	(mg/kg-day) ⁻¹	3.E-04	
				Chloroform	1.4E-01	mg/L	1.9E-04	mg/kg-day	3.1E-02	(mg/kg-day) ⁻¹	6.E-06	
			Exp. Route Total						3.E-04			
			Inhalation	1,2-Dichloroethane	3.0E-03	mg/L	4.6E-04	mg/m ³	2.6E-05	(ug/m ³) ⁻¹	1E-08	
				Carbon Tetrachloride	9.6E-01	mg/L	1.5E-01	mg/m ³	6.0E-06	(ug/m ³) ⁻¹	9E-07	
				Chloroform	1.4E-01	mg/L	2.2E-02	mg/m ³	2.3E-05	(ug/m ³) ⁻¹	5E-07	
Exp. Route Total						1E-06						
	Exposure Medium Total					1.E-03						

Table 5.14
CALCULATION OF NON-CANCER HAZARDS
Groundwater, Current Off-Property Adult Farmer
Garvey Elevator Superfund Site
Hastings, NE

Scenario Timeframe: Current
 Receptor Population: Off-Property Resident
 Receptor Age: Adult Farmer

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Non-cancer Risk Calculations				
					Value	Units	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units	
Groundwater	Water	Tap	Ingestion	1,2-Dichloroethane	3.0E-03	mg/L	3.3E-07	mg/kg-day	2.0E-02	mg/kg-day	0.00002
				Carbon Tetrachloride	9.6E-01	mg/L	1.1E-04	mg/kg-day	4.0E-03	mg/kg-day	0.026
				Chloroform	1.4E-01	mg/L	1.5E-05	mg/kg-day	1.0E-02	mg/kg-day	0.0015
			Exp. Route Total								0.028
Groundwater	Water	Irrigation	Dermal contact	1,2-Dichloroethane	3.0E-03	mg/L	6.2E-09	mg/kg-day	2.0E-02	mg/kg-day	0.0000003
				Carbon Tetrachloride	9.6E-01	mg/L	1.1E-05	mg/kg-day	4.0E-03	mg/kg-day	0.0027
				Chloroform	1.4E-01	mg/L	5.4E-07	mg/kg-day	1.0E-02	mg/kg-day	0.000054
			Exp. Route Total								0.0028
	Exposure Medium Total										0.031

Table 5.15
CALCULATION OF CANCER RISKS
Groundwater, Current Off-Property Adult Farmer
Garvey Elevator Superfund Site
Hastings, NE

Scenario Timeframe: Current
 Receptor Population: Off-Site Resident
 Receptor Age: Adult Farmer

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					
					Value	Units	Intake		CSF/Unit Risk		Cancer Risk	
							Value	Units	Value	Units		
Groundwater	Water	Tap	Ingestion	1,2-Dichloroethane	3.0E-03	mg/L	3.3E-07	mg/kg-day	9.1E-02	(mg/kg-day) ⁻¹	3.E-08	
				Carbon Tetrachloride	9.6E-01	mg/L	1.1E-04	mg/kg-day	7.0E-02	(mg/kg-day) ⁻¹	7.E-06	
				Chloroform	1.4E-01	mg/L	1.5E-05	mg/kg-day	3.1E-02	(mg/kg-day) ⁻¹	5.E-07	
				Exp. Route Total						7.9E-06		
			Groundwater	Water	Irrigation	Dermal contact	1,2-Dichloroethane	3.0E-03	mg/L	6.2E-09	mg/kg-day	9.1E-02
Carbon Tetrachloride	9.6E-01	mg/L					1.1E-05	mg/kg-day	7.0E-02	(mg/kg-day) ⁻¹	8.E-07	
Chloroform	1.4E-01	mg/L					5.4E-07	mg/kg-day	3.1E-02	(mg/kg-day) ⁻¹	2.E-08	
Exp. Route Total							8.E-07					
Exposure Medium Total						9.E-06						

Table 5.16
CALCULATION OF NON-CANCER HAZARDS
Groundwater, Future On-Property Child Resident
Garvey Elevator Superfund Site
Hastings, NE

Scenario Timeframe: Future
 Receptor Population: On-Property Resident
 Receptor Age: Child

Table 5.17
CALCULATION OF NON-CANCER HAZARDS
Groundwater, Future On-Property Adult Resident
Garvey Elevator Superfund Site
Hastings, NE

Scenario Timeframe: Future
Receptor Population: On-Property Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Non-cancer Risk Calculations				
					Value	Units	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units	
Groundwater	Water	Tap	Ingestion	Benzene	4.0E-03	mg/L	8.8E-05	mg/kg-day	4.0E-03	mg/kg-day	0.02
				Carbon Tetrachloride	1.3E+00	mg/L	2.8E-02	mg/kg-day	4.0E-03	mg/kg-day	7
				Chloroform	1.8E-02	mg/L	3.9E-04	mg/kg-day	1.0E-02	mg/kg-day	0.04
				Trichloroethene	7.3E-03	mg/L	1.6E-04	mg/kg-day	3.0E-04	mg/kg-day	0.5
			Exp. Route Total								8
		Bath	Dermal contact	Benzene	4.0E-03	mg/L	1.8E-05	mg/kg-day	4.0E-03	mg/kg-day	0.005
				Carbon Tetrachloride	1.3E+00	mg/L	1.0E-02	mg/kg-day	4.0E-03	mg/kg-day	3
				Chloroform	1.8E-02	mg/L	4.7E-05	mg/kg-day	1.0E-02	mg/kg-day	0.005
				Trichloroethene	7.3E-03	mg/L	3.6E-05	mg/kg-day	3.0E-04	mg/kg-day	0.1
			Exp. Route Total								3
			Inhalation	Benzene	4.0E-03	mg/L	1.4E-03	mg/m ³	3.0E-02	mg/m ³	0.05
				Carbon Tetrachloride	1.3E+00	mg/L	4.7E-01	mg/m ³	1.0E-01	mg/m ³	5
				Chloroform	1.8E-02	mg/L	6.5E-03	mg/m ³	9.8E-02	mg/m ³	0.07
				Trichloroethene	7.3E-03	mg/L	2.6E-03	mg/m ³	NA	mg/m ³	NA
			Exp. Route Total								5
		Irrigation	Ingestion	Benzene	4.0E-03	mg/L	4.4E-07	mg/kg-day	4.0E-03	mg/kg-day	0.0001
				Carbon Tetrachloride	1.3E+00	mg/L	1.4E-04	mg/kg-day	4.0E-03	mg/kg-day	0.04
				Chloroform	1.8E-02	mg/L	2.0E-06	mg/kg-day	1.0E-02	mg/kg-day	0.0002
				Trichloroethene	7.3E-03	mg/L	8.0E-07	mg/kg-day	3.0E-04	mg/kg-day	0.003
			Exp. Route Total								0.04
			Dermal contact	Benzene	4.0E-03	mg/L	2.6E-08	mg/kg-day	4.0E-03	mg/kg-day	0.00006
				Carbon Tetrachloride	1.3E+00	mg/L	1.5E-05	mg/kg-day	4.0E-03	mg/kg-day	0.004
				Chloroform	1.8E-02	mg/L	6.9E-08	mg/kg-day	1.0E-02	mg/kg-day	0.00007
				Trichloroethene	7.3E-03	mg/L	5.3E-08	mg/kg-day	3.0E-04	mg/kg-day	0.0002
			Exp. Route Total								0.004
Exposure Medium Total											15

TABLE 5.19
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
Current/Future Indoor Industrial Worker
Garvey Elevator Superfund Site
Hastings, NE

Scenario Timeframe: Current and Future
Receptor Population: Indoor Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Site Sediment	Benzo(a)pyrene	3.E-07	--	--	3.E-07	Benzo(a)pyrene	NA	NV	--	--	NV
			Benzo(b)fluoranthene	3.E-08	--	--	3.E-08	Benzo(b)fluoranthene	NA	NV	--	--	NV
			Chemical Total	3.E-07	--	--	3.E-07	Chemical Total	--	NV	--	--	NV
			Exposure Medium Total			3.E-07				NV			
	Air	Volatile and Fugitive Dust Emissions	Benzo(a)pyrene	--	2.E-11	--	2.E-11	Benzo(a)pyrene	NA	--	NV	--	NV
			Benzo(b)fluoranthene	--	2.E-12	--	2.E-12	Benzo(b)fluoranthene	NA	--	NV	--	NV
			Chemical Total	--	1.7E-11	--	2.E-11	Chemical Total	--	--	NV	--	NV
			Exposure Medium Total			2.E-11				NV			
	Soil Gas	Vapor Intrusion	Chloroform	--	2.E-05	--	2.E-05	Chloroform	NA	--	0.02	--	0.02
			Tetrachloroethene	--	7.E-05	--	7.E-05	Tetrachloroethene	NA	--	0.1	--	0.1
			Chemical Total	--	8.E-05	--	8.E-05	Chemical Total	--	--	0.1	--	0.1
			Exposure Medium Total			8.E-05				0.1			
Soil and Sediment Total						9.E-05				0.1			

Total Risk Across All Media 9.E-05

Total Hazard Index Across All Media 0.1

TABLE 5.20
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
Current/Future Outdoor Industrial Worker
Garvey Elevator Superfund Site
Hastings, NE

Scenario Timeframe: Current and Future
 Receptor Population: Outdoor Industrial Worker
 Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Site Sediment	Benzo(a)pyrene	5.E-07	--	5.E-07	1.E-06	Benzo(a)pyrene	NA	NV	--	NV	NV
			Benzo(b)fluoranthene	5.E-08	--	5.E-08	1.E-07	Benzo(b)fluoranthene	NA	NV	--	NV	NV
			Chemical Total	6.E-07	--	5.E-07	1.E-06	Chemical Total	--	NV	--	NV	NV
			Exposure Medium Total						1.E-06				
	Air	Volatile and Fugitive Dust Emissions	Benzo(a)pyrene	--	1.E-11	--	1.E-11	Benzo(a)pyrene	NA	--	NV	--	NV
			Benzo(b)fluoranthene	--	1.E-12	--	1.E-12	Benzo(b)fluoranthene	NA	--	NV	--	NV
			Chemical Total	--	1.5E-11	--	2.E-11	Chemical Total	--	--	NV	--	NV
			Exposure Medium Total						2.E-11				
	Sediment Total						1.E-06					NV	

Total Risk Across All Media

1.E-06

Total Hazard Index Across All Media

NV

TABLE 5.21
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
Future Construction Worker
Garvey Elevator Superfund Site
Hastings, NE

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Site Sediment	Benzo(a)pyrene	8 E-08	--	3 E-08	1 E-07	Benzo(a)pyrene	NA	NV	--	NV	NV
			Chemical Total	8 E-08	--	3 E-08	1 E-07	Chemical Total	--	NV	--	NV	NV
			Exposure Medium Total				1 E-07					NV	
	Air	Volatile and Fugitive Dust Emissions	Benzo(a)pyrene	--	1 E-09	--	1 E-09	Benzo(a)pyrene	NA	--	NV	--	NV
			Chemical Total	--	1 E-09	--	1 E-09	Chemical Total	--	NV	--	NV	
			Exposure Medium Total				1 E-09					NV	
	Sediment Total						1 E-07					NV	

Total Risk Across All Media

1 E-07

Total Hazard Index Across All Media

NV

TABLE 5.22
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
Current/Future Trespasser
Garvey Elevator Superfund Site
Hastings, NE

Scenario Timeframe: Current and Future
 Receptor Population: Site Trespasser
 Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Sediment	Site Sediment	Benzo(a)pyrene	1.E-07	--	9.E-08	2.E-07	Benzo(a)pyrene	NA	NV	--	NV	NV
			Benzo(b)fluoranthene	1.E-08	--	9.E-09	2.E-08	Benzo(b)fluoranthene	NA	NV	--	NV	NV
			Chemical Total	1.E-07	--	1.E-07	2.E-07	Chemical Total	--	NV	--	NV	NV
			Exposure Medium Total				2.E-07					NV	
	Air	Volatile and Fugitive Dust Emissions	Benzo(a)pyrene	--	4.E-13	--	4.E-13	Benzo(a)pyrene	NA	--	NV	--	NV
			Benzo(b)fluoranthene	--	4.E-14	--	4.E-14	Benzo(b)fluoranthene	NA	--	NV	--	NV
			Chemical Total	--	5.E-13	--	5.E-13	Chemical Total	--	--	NV	--	NV
			Exposure Medium Total				5.E-13					NV	
	Soil Total				2.E-07					NV			

Total Risk Across All Media 2.E-07

Total Hazard Index Across All Media NV

Table 5.23
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
Current Off-Property Child Resident
Garvey Elevator Superfund Site
Hastings, NE

Scenario Timeframe: Current
Receptor Population: Off-Property Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap	1,2-Dichloroethane	NA	0.01	0.0004	0.0005	0.01
			Carbon Tetrachloride	Liver	15	3	4	23
			Chloroform	Liver	0.9	0.5	0.08	1
			Total		16	4	4	24
Total Hazard Index Across All Media and All Exposure Routes								24

Total Liver HI = 24

Table 5.24
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR POTENTIAL COPCs
Current Off-Property Adult Resident
Garvey Elevator Superfund Site
Hastings, NE

Scenario Timeframe: Current
 Receptor Population: Off-Property Resident
 Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap	1,2-Dichloroethane	NA	0.003	0.0004	0.0002	0.004
			Carbon Tetrachloride	Liver	5	3	2	11
			Chloroform	Liver	0.3	0.5	0.04	0.9
			Total		6	4	2	11
Groundwater	Groundwater	Irrigation	1,2-Dichloroethane	NA	0.00002	--	0.0000003	0.00002
			Carbon Tetrachloride	Liver	0.026	--	0.0027	0.029
			Chloroform	Liver	0.0015	--	0.000054	0.0016
			Total		0.028	--	0.0028	0.031
Total Hazard Index Across All Media and All Exposure Routes								11

Total Liver HI = 11

Table 5.25
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
Current Off-Property Age-Adjusted Resident
Garvey Elevator Superfund Site
Hastings, NE

Scenario Timeframe: Current Receptor Population: Off-Property Resident Receptor Age: Age-adjusted

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap	1,2-Dichloroethane	4.E-06	1.E-08	2.E-07	4.E-06
			Carbon Tetrachloride	1.E-03	9.E-07	3.E-04	1.E-03
			Chloroform	6.E-05	5.E-07	6.E-06	7.E-05
			Total	1.E-03	1.E-06	3.E-04	1.E-03
Groundwater	Groundwater	Irrigation	1,2-Dichloroethane	3.E-08	--	6.E-10	3.E-08
			Carbon Tetrachloride	7.E-06	--	8.E-07	8.E-06
			Chloroform	5.E-07	--	2.E-08	5.E-07
			Total	8.E-06	--	8.E-07	9.E-06
Total Risk Across All Media and All Exposure Routes							1.E-03

TABLE 5.26
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
Future On-Property Child Resident
Garvey Elevator Superfund Site
Hastings, NE

Scenario Timeframe: Future
 Receptor Population: Resident
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient					
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total	
Sediment	Sediment	Site Soil	Benzo(a)pyrene	NA	NV	--	NV	NV	
			Benzo(b)fluoranthene	NA	NV	--	NV	NV	
			Chemical Total		NV	--	NV	NV	
			Exposure Medium Total					NV	
	Air	Volatile and Fugitive Dust Emissions	Benzo(a)pyrene	NA	--	NV	--	NV	
			Benzo(b)fluoranthene	NA	--	NV	--	NV	
			Chemical Total		--	NV	--	NV	
			Exposure Medium Total					NV	
	Subslab Soil Gas	Vapor Intrusion	Vapor Intrusion	Chloroform	NA	--	0.09	--	0.09
				Tetrachloroethene	NA	--	0.5	--	0.5
				Trichloroethene	NA	--	NV	--	NV
				Chemical Total		--	0.6	--	0.6
Exposure Medium Total					0.6				
Soil and Sediment Total					0.6				
Groundwater	Potable Water Well	Potable Water Well, Inhalation While Showering	Benzene	Lymphocytes	0.06	0.05	0.01	0.1	
			Carbon Tetrachloride	Liver	21	5	5	31	
			Chloroform	Liver	0.1	0.07	0.01	0.2	
			Trichloroethene	NA	2	NA	0.3	2	
			Chemical Total		23	5	6	33	
Groundwater Total					33				
Total Across All Media					34				

Total Hazard Index Across All Media **34**

Total Liver HI = **31**

Total Lymphocytes HI = **0.12**

TABLE 5.27
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
Future On-Property Adult Resident
Garvey Elevator Superfund Site
Hastings, NE

Scenario Timeframe: Future
 Receptor Population: Resident
 Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient					
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil	Site Soil	Benzo(a)pyrene	NA	NV	--	NV	NV	
			Benzo(b)fluoranthene	NA	NV	--	NV	NV	
			Chemical Total	--	NV	--	NV	NV	
	Exposure Medium Total							NV	
	Air	Volatile and Fugitive Dust Emissions	Benzo(a)pyrene	NA	--	NV	--	NV	
			Benzo(b)fluoranthene	NA	--	NV	--	NV	
			Chemical Total	--	--	NV	--	NV	
	Exposure Medium Total							NV	
	Soil Total							NV	
	Subslab Soil Gas								
Groundwater	Vapor Intrusion	Vapor Intrusion	Chloroform	NA	--	0.09	--	0.09	
			Tetrachloroethene	NA	--	0.5	--	0.5	
			Trichloroethene	NA	--	NV	--	NV	
			Chemical Total	--	--	0.6	--	0.6	
	Exposure Medium Total							0.6	
	Soil and Sediment Total							0.6	
	Groundwater	Potable Water Well, Inhalation While Showering	Benzene	Lymphocytes	0.02	0.05	0.005	0.07	
			Carbon Tetrachloride	Liver	7	5	3	14	
			Chloroform	Liver	0.04	0.07	0.005	0.1	
			Trichloroethene	NA	0.5	NA	0.1	0.7	
			Chemical Total		8	5	3	15	
	Groundwater	Irrigation	Benzene	Liver	0.0001	--	0.000006	0.0001	
			Carbon Tetrachloride	Liver	0.04	--	0.004	0.04	
			Chloroform	Kidneys	0.0002	--	0.000007	0.0002	
			Trichloroethene	NA	0.003	--	0.0002	0.003	
			Chemical Total		0.04	--	0.004	0.04	
Groundwater Total								15	
Total Across All Media								16	

Total Hazard Index Across All Media

16

Total Liver HI =

14

Total Kidneys HI =

0.00020

Total Lymphocytes HI =

0.07

TABLE 5.28
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
Future On-Property Age-Adjusted Resident
Garvey Elevator Superfund Site
Hastings, NE

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Age-adjusted Resident

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					
				Ingestion	Inhalation	Dermal	Exposure Routes Total		
Sediment	Sediment	Site Sediment							
			Benzo(a)pyrene	1.E-05	--	4.E-06	2.E-05		
			Benzo(b)fluoranthene	1.E-06	--	4.E-07	2.E-06		
			Chemical Total	1.E-05	--	5.E-06	2.E-05		
	Exposure Medium Total						2.E-05		
	Air	Volatile and Fugitive Dust Emissions							
			Benzo(a)pyrene	--	2.E-10	--	2.E-10		
			Benzo(b)fluoranthene	--	2.E-11	--	2.E-11		
			Chemical Total	--	2.1E-10	--	2.E-10		
	Exposure Medium Total						2.E-10		
Subslab Soil Gas	Air	Vapor Intrusion	Chloroform	--	9.E-05	--	9.E-05		
			Tetrachloroethene	--	3.E-04	--	3.E-04		
			Trichloroethene	--	3.E-06	--	3.E-06		
			Chemical Total	--	4.E-04	--	4.E-04		
	Exposure Medium Total						4.E-04		
Soil and Sediment Total							4.E-04		
Groundwater	Groundwater	Potable Water Well, Inhalation While Showering	Benzene	3.E-06	5.E-09	5.E-07	4.E-06		
			Carbon Tetrachloride	1.E-03	1.E-06	4.E-04	2.E-03		
			Chloroform	8.E-06	6.E-08	7.E-07	9.E-06		
			Trichloroethene	6.E-07	2.E-09	1.E-07	8.E-07		
			Chemical Total	1.E-03	1.E-06	4.E-04	2.E-03		
Groundwater	Groundwater	Irrigation	Benzene	2E-08	--	1.E-09	3.E-08		
			Carbon Tetrachloride	1E-05	--	1.E-06	1.E-05		
			Chloroform	6E-08	--	2.E-09	6.E-08		
			Trichloroethene	5E-09	--	3.E-10	5.E-09		
			Chemical Total	1.E-05	--	1.E-06	1.E-05		
Groundwater Total							2.E-03		
Total Risk Across All Media							2.E-03		

Total Risk Across All Media 2.E-03