Redwood Landfill: Fugitive LFG Emission Rate

A	B	C	D	E	F	G	H	I	J
	Percent Methane in LFG	Percent Carbon Dioxide in LFG	Methane Generation Rate (cubic meters/yr)	Carbon Dioxide Generation (cubic meters/yr)	Total LFG Generation (cubic meters/yr)	Total LFG Generation (cubic meters/min)	Percent LFG Collected	LFG Collected (cubic meters/min)	Fugitive LFG Emitted (cubic meters/min)
			LAAER	D*C/B	D+E	F/(365*24*60)		G*H/100	G-I
Baseline	51.55	48.45	1.28E+07	1.20E+07	2.47E+07	47.06	75	35.29	11.76
Peak	51.55	48.45	2.06E+07	1.93E+07	3.99E+07	75.88	75	56.91	18.97
Increase									7.21

Redwood Landfill Health Risk Screening: Landfill Gas Fugitive Emissions

	B	C	D	E	F	G	H	I	J	K	L
Compound	CAS No.	MW	OEHHA Acute REL (ug/m3)	OEHHA Chronic REL (ug/m3)	OEHHA Cancer URF ((ug/m3)-1)	Conc. in LFG Corrected for Sample Dilution (ppbv)	Conc. in LFG Corrected for Sample Dilution (ug/m3)	Fugitive LFG Emission Rate (m3/min)	Fugitive Air Emissions (g/min)	Fugitive Air Emissions (g/s)	Fugitive Air Emissions (lb/yr)
			ATHS	ATHS	ATHS		C*G/24.16	LFG Table	H*I/1E+6	J/60	K*69525.3
1,1,1-Trichloroethane	71-55-6	133.41	68000	1000		69	381	7.21	2.75E-03	4.58E-05	3.2
1,1,2,2-Tetrachloroethane	79-34-5	167.85			5.80E-05	69	479	7.21	3.45E-03	5.76E-05	4.0
1,1-Dichloroethane	75-34-3	98.97			1.60E-06	144	590	7.21	4.25E-03	7.08E-05	4.9
1,1-Dichloroethene	75-35-4	96.94		32		150	602	7.21	4.34E-03	7.23E-05	5.0
1,2-Dichloroethane	107-06-2	98.96		95	2.20E-05	69	283	7.21	2.04E-03	3.39E-05	2.4
1,4-Dichlorobenzene	106-46-7	147.00		800	1.10E-05	400	2434	7.21	1.75E-02	2.92E-04	20.3
2-Propanol	67-63-0	60.10	3200	7000		5052	12567	7.21	9.06E-02	1.51E-03	104.9
Acrylonitrile	107-13-1	53.06		2	2.90E-04	278	611	7.21	4.40E-03	7.33E-05	5.1
Benzene	71-43-2	78.10	1300	60	2.90E-05	340	1099	7.21	7.92E-03	1.32E-04	9.2
Carbon disulfide	75-15-0	76.10	6200	700		200	630	7.21	4.54E-03	7.57E-05	5.3
Carbon monoxide	63-08-0	28.01	23000			141000	163469	7.21	1.18E+00	1.96E-02	1365.0
Carbon tetrachloride	56-23-5	153.84	1900	2.4	4.20E-05	69	439	7.21	3.17E-03	5.28E-05	3.7
Chlorobenzene	108-90-7	112.56		70		76	354	7.21	2.55E-03	4.25E-05	3.0
Chlorodifluoromethane	75-45-6	86.47		50000		1300	4653	7.21	3.35E-02	5.59E-04	38.9
Chloroethane	75-00-3	64.50		30000		300	801	7.21	5.77E-03	9.62E-05	6.7
Chloroform	67-66-3	119.40	150	300	5.30E-06	69	341	7.21	2.46E-03	4.10E-05	2.8
Ethylbenzene	100-41-4	106.20		2000		2062	9064	7.21	6.53E-02	1.09E-03	75.7
Ethylene dibromide	106-93-4	187.88		4.6	7.10E-05	69	537	7.21	3.87E-03	6.44E-05	4.5
Freon 11	75-69-4	137.40		700		140	796	7.21	5.74E-03	9.56E-05	6.6
Freon 12	75-43-4	102.92		700		660	2812	7.21	2.03E-02	3.38E-04	23.5
Hexane	110-54-3	86.20		7000		880	3140	7.21	2.26E-02	3.77E-04	26.2
Hydrogen sulfide	7783-06	34.08	42	10		137000	193252	7.21	1.39E+00	2.32E-02	1613.7
m,p,o-Xylene	108-38-3	106.20	22000	700		7900	34726	7.21	2.50E-01	4.17E-03	290.0
Mercury (total)	7439-97-6	200.61	1.8	0.09		0.29	2.42	7.21	1.75E-05	2.91E-07	0.0
Methyl ethyl ketone	78-93-3	72.11	13000	1000		7526	22463	7.21	1.62E-01	2.70E-03	187.6
Methylene chloride	75-09-2	84.90	14000	400	1.00E-06	320	1125	7.21	8.10E-03	1.35E-04	9.4
Tetrachloroethylene	127-18-4	165.80	20000	35	5.90E-06	450	3088	7.21	2.23E-02	3.71E-04	25.8
Toluene	108-88-3	92.10	37000	300		10206	38906	7.21	2.80E-01	4.67E-03	324.9
Trichloroethylene	79-01-6	131.40		600	2.00E-06	247	1343	7.21	9.68E-03	1.61E-04	11.2
Vinyl chloride	75-01-4	62.50	185000	26	7.80E-05	880	2276	7.21	1.64E-02	2.73E-04	19.0

Redwood Landfill Health Risk Screening: Landfill Gas Fugitive Emissions

M	N	O	P	Q
Compound	Max. Modeled Annual Avg. Chi/Q (ug/m3 per g/s)	Max Annual Avg. Ambient Concentration (ug/m3)	Max. Chronic HI	Max. Lifetime Cancer Risk
	ISCST3	K*N	O/E	O*F
1,1,1-Trichloroethane	3.578	1.64E-04	1.64E-07	
1,1,2,2-Tetrachloroethane	3.578	2.06E-04		1.19E-08
1,1-Dichloroethane	3.578	2.53E-04		4.06E-10
1,1-Dichloroethene	3.578	2.59E-04	8.08E-06	
1,2-Dichloroethane	3.578	1.21E-04	1.28E-06	2.67E-09
1,4-Dichlorobenzene	3.578	1.05E-03	1.31E-06	1.15E-08
2-Propanol	3.578	5.40E-03	7.72E-07	
Acrylonitrile	3.578	2.62E-04	1.31E-04	7.61E-08
Benzene	3.578	4.72E-04	7.87E-06	1.37E-08
Carbon disulfide	3.578	2.71E-04	3.87E-07	
Carbon monoxide	3.578	7.02E-02		
Carbon tetrachloride	3.578	1.89E-04	7.87E-05	7.93E-09
Chlorobenzene	3.578	1.52E-04	2.17E-06	
Chlorodifluoromethane	3.578	2.00E-03	4.00E-08	
Chloroethane	3.578	3.44E-04	1.15E-08	
Chloroform	3.578	1.47E-04	4.88E-07	7.77E-10
Ethylbenzene	3.578	3.90E-03	1.95E-06	
Ethylene dibromide	3.578	2.31E-04	5.01E-05	1.64E-08
Freon 11	3.578	3.42E-04	4.89E-07	
Freon 12	3.578	1.21E-03	1.73E-06	
Hexane	3.578	1.35E-03	1.93E-07	
Hydrogen sulfide	3.578	8.30E-02	8.30E-03	
m,p,o-Xylene	3.578	1.49E-02	2.13E-05	
Mercury (total)	3.578	1.04E-06	1.16E-05	
Methyl ethyl ketone	3.578	9.65E-03	9.65E-06	
Methylene chloride	3.578	4.83E-04	1.21E-06	4.83E-10
Tetrachloroethylene	3.578	1.33E-03	3.79E-05	7.83E-09
Toluene	3.578	1.67E-02	5.57E-05	
Trichloroethylene	3.578	5.77E-04	9.62E-07	1.15E-09
Vinyl chloride	3.578	9.78E-04	3.76E-05	7.63E-08
		Totals:	8.77E-03	2.27E-07

Redwood Landfill Health Risk Screening: Disposal of VOC Contaminated Soil

	B	C	D	E	F	G	H	I	J
Compound	CAS No.	MW	OEHHA Chronic REL (ug/m3)	OEHHA Cancer URF ((ug/m3)-1)	Max. Conc (ppmw)	Soil Disposal (tons/yr)	Total VOC in Soil (lb/yr)	Emissions (lb/yr)	Emissions (g/s)
			ATHS	ATHS			F*G*2000/1E6	H*0.50	I*453.6/31536000
1,1-Dichloroethylene	75-35-4	96.95	70		0.7	6240	8.7	4.4	6.28E-05
1,2-Dichloroethane	107-06-2	98.96	95	2.20E-05	0.5	6240	6.2	3.1	4.49E-05
1,4-Dichlorobenzene	106-46-7	147.00	800	1.10E-05	7.5	6240	93.6	46.8	6.73E-04
Benzene	71-43-2	78.10	60	2.90E-05	0.5	6240	6.2	3.1	4.49E-05
Carbon tetrachloride	56-23-5	153.84	2.4	4.20E-05	0.5	6240	6.2	3.1	4.49E-05
Chlorobenzene	108-90-7	112.56	70		100	6240	1248	624	8.98E-03
Chloroform	67-66-3	119.40	300	5.30E-06	6.0	6240	74.9	37.4	5.39E-04
Methyl ethyl ketone	78-93-3	72.11	1000		100	6240	1248	624	8.98E-03
Tetrachloroethylene	127-18-4	165.80	35	5.90E-06	0.7	6240	8.7	4.4	6.28E-05
Trichloroethylene	79-01-6	131.40	600	2.00E-06	0.5	6240	6.2	3.1	4.49E-05
Vinyl chloride	75-01-4	62.50	26	7.80E-05	0.2	6240	2.5	1.2	1.80E-05

Redwood Landfill Health Risk Screening: Use of Metals Contaminated Soil as Cover

	B	C	D	E	F	G	H
Compound	OEHHA Chronic REL (ug/m3)	Non-Inhalation Chronic REL (HI per ug/m3)	OEHHA Cancer URF ((ug/m3)-1)	Conc in Soil (ppmw)	PM10 Emissions (tons/yr)	Toxic Metal Emissions (lb/yr)	Toxic Metal Emissions (g/s)
	ATHS	HRA	ATHS			E*F*2000/1E6	G*1.44E-5
Arsenic	3.00E-02	8.86	7.28E-03	500	0.242	2.42E-01	3.48E-06
Asbestos			5.70E-07	1	0.242	4.84E-04	6.96E-09
Beryllium	4.80E-03	1.33	2.40E-03	75	0.242	3.63E-02	5.22E-07
Cadmium	2.00E-02	5.42	4.20E-03	100	0.242	4.84E-02	6.96E-07
Chromium +6	2.00E-01	0.16	1.51E-01	500	0.242	2.42E-01	3.48E-06
Nickel	2.00E+01		2.60E-04	2000	0.242	9.68E-01	1.39E-05
Copper	2.40E+00			2500	0.242	1.21E+00	1.74E-05
Lead	1.50E+00		3.46E-05	350	0.242	1.69E-01	2.44E-06
Mercury	9.00E-02	10.50		20	0.242	9.68E-03	1.39E-07
Selenium	5.00E-01			100	0.242	4.84E-02	6.96E-07
Zinc	3.50E+01			5000	0.242	2.42E+00	3.48E-05

Asbestos unit risk factor includes 100 fibers/0.003 ug conversion.
HRA = Non-inhalation risk factors derived using ARB's HRA Program for default pathways.

Redwood Landfill Health Risk Screening: Stockpiles of Metals Contaminated Soil

	J	K	L	M
Compound	Max. Modeled Annual Avg. Chi/Q (ug/m3 per g/s)	Max Annual Avg. Ambient Concentration (ug/m3)	Max. Chronic HI	Max. Lifetime Cancer Risk
	ISCST3	H*J	(K/B)+(K*C)	K*D
Arsenic	1.171	4.38E-07	1.85E-05	3.19E-09
Asbestos	1.171	8.76E-10		4.99E-16
Beryllium	1.171	6.57E-08	1.38E-05	1.58E-10
Cadmium	1.171	8.76E-08	4.85E-06	3.68E-10
Chromium +6	1.171	4.38E-07	2.26E-06	6.63E-08
Nickel	1.171	1.75E-06	8.76E-08	4.55E-10
Copper	1.171	2.19E-06	9.12E-07	0.00E+00
Lead	1.171	3.07E-07	2.04E-07	1.06E-11
Mercury	1.171	1.75E-08	3.79E-07	0.00E+00
Selenium	1.171	8.76E-08	1.75E-07	0.00E+00
Zinc	1.171	4.38E-06	1.25E-07	0.00E+00
		Totals:	4.12E-05	7.04E-08

Redwood Landfill Health Risk Screening: Stockpiles of Metals Contaminated Soil

	B	C	D	E	F	G	H
Compound	OEHHA Chronic REL (ug/m3)	Non-Inhalation Chronic REL (HI per ug/m3)	OEHHA Cancer URF ((ug/m3)-1)	Conc in Soil (ppmw)	PM10 Emissions (tons/yr)	Toxic Metal Emissions (lb/yr)	Toxic Metal Emissions (g/s)
	ATHS	HRA	ATHS			E*F*2000/1E6	G*1.44E-5
Arsenic	3.00E-02	8.86	7.28E-03	500	0.026	2.60E-02	3.74E-07
Asbestos			5.70E-07	1	0.026	5.20E-05	7.48E-10
Beryllium	4.80E-03	1.33	2.40E-03	75	0.026	3.90E-03	5.61E-08
Cadmium	2.00E-02	5.42	4.20E-03	100	0.026	5.20E-03	7.48E-08
Chromium +6	2.00E-01	0.16	1.51E-01	500	0.026	2.60E-02	3.74E-07
Nickel	2.00E+01		2.60E-04	2000	0.026	1.04E-01	1.50E-06
Copper	2.40E+00			2500	0.026	1.30E-01	1.87E-06
Lead	1.50E+00		3.46E-05	350	0.026	1.82E-02	2.62E-07
Mercury	9.00E-02	10.50		20	0.026	1.04E-03	1.50E-08
Selenium	5.00E-01			100	0.026	5.20E-03	7.48E-08
Zinc	3.50E+01			5000	0.026	2.60E-01	3.74E-06

Asbestos unit risk factor includes 100 fibers/0.003 ug conversion.
HRA = Non-inhalation risk factors derived using ARB's HRA Program for default pathways.

Redwood Landfill Health Risk Screening: Using VOC Laden Soil as Cover

	L	M	N	O
Compound	Max. Modeled Annual Avg. Chi/Q (ug/m3 per g/s)	Max Annual Avg. Ambient Concentration (ug/m3)	Max. Chronic HI	Max. Lifetime Cancer Risk
	ISCST3	J*L	M/D	M*E
1,1-Dichloroethylene	1.670	1.77E-03	2.53E-05	0.00E+00
1,2-Dichloroethane	1.670	1.26E-03	1.33E-05	2.78E-08
1,4-Dichlorobenzene	1.670	1.90E-02	2.37E-05	2.09E-07
Benzene	1.670	1.26E-03	2.11E-05	3.67E-08
Carbon tetrachloride	1.670	1.26E-03	5.27E-04	5.31E-08
Chlorobenzene	1.670	1.26E-01	1.81E-03	
Chloroform	1.670	1.52E-02	5.06E-05	8.04E-08
Methyl ethyl ketone	1.670	1.26E-01	1.26E-04	
Tetrachloroethylene	1.670	1.77E-03	5.06E-05	1.04E-08
Trichloroethylene	1.670	1.26E-03	2.11E-06	2.53E-09
Vinyl chloride	1.670	5.06E-04	1.95E-05	3.95E-08
		Totals:	2.67E-03	4.59E-07

Redwood Landfill Health Risk Screening: Using VOC Laden Soil as Cover

	B	C	D	E	F	G	H	I	J
Compound	CAS No.	MW	OEHHA Chronic REL (ug/m3)	OEHHA Cancer URF ((ug/m3)-1)	Max. Conc (ppmw)	Soil Disposal (tons/yr)	Total VOC in Soil (lb/yr)	Emissions (lb/yr)	Emissions (g/s)
			ATHS	ATHS			F*G*2000/1E6	H*0.50	I*453.6/31536000
1,1-Dichloroethylene	75-35-4	96.95	70		0.7	105300	147.4	73.7	1.06E-03
1,2-Dichloroethane	107-06-2	98.96	95	2.20E-05	0.5	105300	105.3	52.7	7.57E-04
1,4-Dichlorobenzene	106-46-7	147.00	800	1.10E-05	7.5	105300	1579.5	789.8	1.14E-02
Benzene	71-43-2	78.10	60	2.90E-05	0.5	105300	105.3	52.7	7.57E-04
Carbon tetrachloride	56-23-5	153.84	2.4	4.20E-05	0.5	105300	105.3	52.7	7.57E-04
Chlorobenzene	108-90-7	112.56	70		50.0	105300	10530.0	5265.0	7.57E-02
Chloroform	67-66-3	119.40	300	5.30E-06	6.0	105300	1263.6	631.8	9.09E-03
Methyl ethyl ketone	78-93-3	72.11	1000		50.0	105300	10530.0	5265.0	7.57E-02
Tetrachloroethylene	127-18-4	165.80	35	5.90E-06	0.7	105300	147.4	73.7	1.06E-03
Trichloroethylene	79-01-6	131.40	600	2.00E-06	0.5	105300	105.3	52.7	7.57E-04
Vinyl chloride	75-01-4	62.50	26	7.80E-05	0.2	105300	42.1	21.1	3.03E-04

Redwood Landfill Health Risk Screening: Handling and Storage of VOC Laden Soil

	L	M	N	O
Compound	Max. Modeled Annual Avg. Chi/Q (ug/m3 per g/s)	Max Annual Avg. Ambient Concentration (ug/m3)	Max. Chronic HI	Max. Lifetime Cancer Risk
	ISCST3	J*L	M/D	M*E
1,1-Dichloroethylene	1.171	1.24E-03	1.77E-05	0.00E+00
1,2-Dichloroethane	1.171	8.87E-04	9.33E-06	1.95E-08
1,4-Dichlorobenzene	1.171	1.33E-02	1.66E-05	1.46E-07
Benzene	1.171	8.87E-04	1.48E-05	2.57E-08
Carbon tetrachloride	1.171	8.87E-04	3.69E-04	3.72E-08
Chlorobenzene	1.171	8.87E-02	1.27E-03	
Chloroform	1.171	1.06E-02	3.55E-05	5.64E-08
Methyl ethyl ketone	1.171	8.87E-02	8.87E-05	
Tetrachloroethylene	1.171	1.24E-03	3.55E-05	7.32E-09
Trichloroethylene	1.171	8.87E-04	1.48E-06	1.77E-09
Vinyl chloride	1.171	3.55E-04	1.36E-05	2.77E-08
		Totals:	1.87E-03	3.22E-07

Redwood Landfill Health Risk Screening: Handling and Storage of VOC Laden Soil

	B	C	D	E	F	G	H	I	J
Compound	CAS No.	MW	OEHHA Chronic REL (ug/m3)	OEHHA Cancer URF ((ug/m3)-1)	Max. Conc in Soil (ppmw)	Soil Disposal (tons/yr)	Total Contaminant in Soil (lb/yr)	Emissions (lb/yr)	Emissions (g/s)
			ATHS	ATHS			F*G*2000/1E6	H*0.50	I*453.6/31536000
1,1-Dichloroethylene	75-35-4	96.95	70		0.7	105300	147.4	73.7	1.06E-03
1,2-Dichloroethane	107-06-2	98.96	95	2.20E-05	0.5	105300	105.3	52.7	7.57E-04
1,4-Dichlorobenzene	106-46-7	147.00	800	1.10E-05	7.5	105300	1579.5	789.8	1.14E-02
Benzene	71-43-2	78.10	60	2.90E-05	0.5	105300	105.3	52.7	7.57E-04
Carbon tetrachloride	56-23-5	153.84	2.4	4.20E-05	0.5	105300	105.3	52.7	7.57E-04
Chlorobenzene	108-90-7	112.56	70		50.0	105300	10530.0	5265.0	7.57E-02
Chloroform	67-66-3	119.40	300	5.30E-06	6.0	105300	1263.6	631.8	9.09E-03
Methyl ethyl ketone	78-93-3	72.11	1000		50.0	105300	10530.0	5265.0	7.57E-02
Tetrachloroethylene	127-18-4	165.80	35	5.90E-06	0.7	105300	147.4	73.7	1.06E-03
Trichloroethylene	79-01-6	131.40	600	2.00E-06	0.5	105300	105.3	52.7	7.57E-04
Vinyl chloride	75-01-4	62.50	26	7.80E-05	0.2	105300	42.1	21.1	3.03E-04

Redwood Landfill Health Risk Screening: Disposal of VOC Contaminated Soil

	L	M	N	O
Compound	Max. Modeled Annual Avg. Chi/Q (ug/m3 per g/s)	Max Annual Avg. Ambient Concentration (ug/m3)	Max. Chronic HI	Max. Lifetime Cancer Risk
	ISCST3	J*L	M/D	M*E
1,1-Dichloroethylene	1.670	1.05E-04	1.50E-06	
1,2-Dichloroethane	1.670	7.49E-05	7.89E-07	1.65E-09
1,4-Dichlorobenzene	1.670	1.12E-03	1.41E-06	1.24E-08
Benzene	1.670	7.49E-05	1.25E-06	2.17E-09
Carbon tetrachloride	1.670	7.49E-05	3.12E-05	3.15E-09
Chlorobenzene	1.670	1.50E-02	2.14E-04	
Chloroform	1.670	8.99E-04	3.00E-06	4.77E-09
Methyl ethyl ketone	1.670	1.50E-02	1.50E-05	
Tetrachloroethylene	1.670	1.05E-04	3.00E-06	6.19E-10
Trichloroethylene	1.670	7.49E-05	1.25E-07	1.50E-10
Vinyl chloride	1.670	3.00E-05	1.15E-06	2.34E-09
		Totals:	2.73E-04	2.72E-08

Redwood Landfill Health Risk Screening: Use of Metals Contaminated Soil as Cover

	J	K	L	M
Compound	Max. Modeled Annual Avg. Chi/Q (ug/m3 per g/s)	Max Annual Avg. Ambient Concentration (ug/m3)	Max. Chronic HI	Max. Lifetime Cancer Risk
	ISCST3	H*J	(K/B)+(K*C)	K*D
Arsenic	1.670	5.81E-06	2.45E-04	4.23E-08
Asbestos	1.670	1.16E-08		6.63E-15
Beryllium	1.670	8.72E-07	1.83E-04	2.09E-09
Cadmium	1.670	1.16E-06	6.44E-05	4.88E-09
Chromium +6	1.670	5.81E-06	3.00E-05	8.80E-07
Nickel	1.670	2.33E-05	1.16E-06	6.05E-09
Copper	1.670	2.91E-05	1.21E-05	0.00E+00
Lead	1.670	4.07E-06	2.71E-06	1.41E-10
Mercury	1.670	2.33E-07	5.02E-06	0.00E+00
Selenium	1.670	1.16E-06	2.33E-06	0.00E+00
Zinc	1.670	5.81E-05	1.66E-06	0.00E+00
		Totals:	5.47E-04	9.35E-07

Redwood Landfill: Tub Grinder Diesel Engine

	B	C	D	E	F	G	H	I	J
	Diesel PM Emissions (lb/yr)	Diesel PM Emissions (g/s)	Max Annual Avg. Chi/Q (ug/m3 per g/s)	Max. Annual Avg. Ambient Diesel PM Conc. (ug/m3)	OEHHA Diesel PM Unit Risk Factor (ug/m3)-1	OEHHA Diesel PM Chronic REL (ug/m3)	Exposure Factor	Max. Cancer Risk	Max. Non-cancer HI
		B*1.44E-5	ISCST3	C*D	ATHS	ATHS		E*F*H	E/G
	332	4.78E-03	0.655	0.0031	3.00E-04	5	1	9.38E-07	6.26E-04

Engine	Max. Fuel Use (gal/hr)	PM Emissions (lb/gal)	PM Emissions (lb/hr)	Annual Fuel Use (gal/yr)	Annual PM Emissions (lb/yr)
			B*C		C*E
S-40	27.3	1.66E-02	0.45	20000	332

Redwood Landfill Health Risk Screening: Leachate Vaporator

M	N	O	R	S	U	V
Compound	Vaporator Destruction Efficiency (Percent)	Abated Vaporator Emissions (g/s)	Max. Modeled Annual Avg. Chi/Q (ug/m3 per g/s)	Max Annual Avg. Ambient Concentration (ug/m3)	Max. Chronic HI	Max. Lifetime Cancer Risk
		K*(100-N)/100	ISCST3	O*R	S/E	S*F
Toluene	80.0	6.13E-04	1.718	5.27E-03	1.76E-05	
Trichloroethylene	80.0	2.12E-05	1.718	1.82E-04	3.03E-07	3.64E-10
Vinyl chloride	80.0	3.59E-05	1.718	3.08E-04	1.19E-05	2.40E-08
Acetaldehyde	0.0	2.61E-07	1.718	4.49E-07	4.99E-08	1.21E-12
Formaldehyde	0.0	2.99E-05	1.718	5.13E-05	1.71E-05	3.08E-10
Hydrogen Bromide	0.0	1.00E-06	1.718	1.72E-06	7.16E-08	
Hydrogen Chloride	0.0	2.46E-06	1.718	4.22E-06	4.69E-07	
Hydrogen Fluoride	0.0	3.75E-07	1.718	6.44E-07	1.09E-07	
Napthalene	0.0	1.32E-05	1.718	2.26E-05	2.51E-06	
				Totals:	2.78E-03	7.19E-08

Redwood Landfill Health Risk Screening: Leachate Vaporator

	B	C	D	E	F	G	H	I	J	K	L
Compound	CAS No.	MW	OEHHA Acute REL (ug/m3)	OEHHA Chronic REL (ug/m3)	OEHHA Cancer URF ((ug/m3)-1)	Conc. in LFG (ppbv)	Conc. in LFG (ug/m3)	Vaporator LFG Combusted (cfm)	Vaporator LFG Combusted (m3/s)	Unabated Vaporator Emissions (g/s)	Vaporator Emissions (lb/yr)
			ATHS	ATHS	ATHS		C*G/24.16		I*0.000472	H*J/1E6	K*69525.3
1,1,1-Trichloroethane	71-55-6	133.41	68000	1000		69	381	167	7.88E-02	3.00E-05	2.1
1,1,2,2-Tetrachloroethane	79-34-5	167.85			5.80E-05	69	479	167	7.88E-02	3.78E-05	2.6
1,1-Dichloroethane	75-34-3	98.97			1.60E-06	144	590	167	7.88E-02	4.65E-05	3.2
1,1-Dichloroethene	75-35-4	96.94		32		150	602	167	7.88E-02	4.74E-05	3.3
1,2-Dichloroethane	107-06-2	98.96		95	2.20E-05	69	283	167	7.88E-02	2.23E-05	1.5
1,4-Dichlorobenzene	106-46-7	147.00		800	1.10E-05	400	2434	167	7.88E-02	1.92E-04	13.3
2-Propanol	67-63-0	60.10	3200	7000		5052	12567	167	7.88E-02	9.90E-04	68.9
Acrylonitrile	107-13-1	53.06		2	2.90E-04	278	611	167	7.88E-02	4.81E-05	3.3
Benzene	71-43-2	78.10	1300	60	2.90E-05	340	1099	167	7.88E-02	8.66E-05	6.0
Carbon disulfide	75-15-0	76.10	6200	700		200	630.0	167	7.88E-02	4.97E-05	3.5
Carbon monoxide	63-08-0	28.01	23000			141000	163469	167	7.88E-02	1.29E-02	895.8
Carbon tetrachloride	56-23-5	153.84	1900	2.4	4.20E-05	69.0	439	167	7.88E-02	3.46E-05	2.4
Chlorobenzene	108-90-7	112.56		70		76	354	167	7.88E-02	2.79E-05	1.9
Chlorodifluoromethane	75-45-6	86.47		50000		1300	4653	167	7.88E-02	3.67E-04	25.5
Chloroethane	75-00-3	64.50		30000		300	801	167	7.88E-02	6.31E-05	4.4
Chloroform	67-66-3	119.40	150	300	5.30E-06	69	341	167	7.88E-02	2.69E-05	1.9
Ethylbenzene	100-41-4	106.20		2000		2062	9064	167	7.88E-02	7.14E-04	49.7
Ethylene dibromide	106-93-4	187.88		4.6	7.10E-05	69	537	167	7.88E-02	4.23E-05	2.9
Freon 11	75-69-4	137.40		700		140	796	167	7.88E-02	6.28E-05	4.4
Freon 12	75-43-4	102.92		700		660	2812	167	7.88E-02	2.22E-04	15.4
Hexane	110-54-3	86.20		7000		880	3140	167	7.88E-02	2.47E-04	17.2
Hydrogen sulfide	7783-06	34.08	42	10		137000	193252	167	7.88E-02	1.52E-02	1059.0
m,p,o-Xylene	108-38-3	106.20	22000	700		7900	34726	167	7.88E-02	2.74E-03	190.3
Mercury (total)	7439-97-6	200.61	1.8	0.09		0.29	2.42	167	7.88E-02	1.91E-07	0.0
Methyl ethyl ketone	78-93-3	72.11	13000	1000		7526	22463	167	7.88E-02	1.77E-03	123.1
Methylene chloride	75-09-2	84.90	14000	400	1.00E-06	320	1125	167	7.88E-02	8.86E-05	6.2
Tetrachloroethylene	127-18-4	165.80	20000	35	5.90E-06	450	3088	167	7.88E-02	2.43E-04	16.9
(continued)											

Redwood Landfill Health Risk Screening: LFG-Fueled Engines

	B	C	D	E	F	G	H	I	J	K
Compound	CAS No.	OEHHA Acute REL (ug/m3)	OEHHA Chronic REL (ug/m3)	OEHHA Cancer URF ((ug/m3)-1)	Air Emissions (lb/yr)	Air Emissions (g/s)	Max. Modeled Annual Avg. Chi/Q (ug/m3 per g/s)	Max Annual Avg. Ambient Concentration (ug/m3)	Max. Chronic HI	Max. Lifetime Cancer Risk
		ATHS	ATHS	ATHS		F*1.44E-5	ISCST3	G*H	I/D	I*E
1,1,2,2-Tetrachloroethane	79-34-5			5.80E-05	5.10E+00	7.34E-05	1.104	8.10E-05		4.70E-09
1,2-Dichloroethane	107-06-2		95	2.20E-05	3.00E+00	4.31E-05	1.104	4.76E-05	5.01E-07	1.05E-09
1,4-Dichlorobenzene	106-46-7		800	1.10E-05	2.56E+01	3.68E-04	1.104	4.07E-04	5.08E-07	4.47E-09
1,1,2-Trichloroethane	79-00-5			1.60E-05	4.00E+00	5.75E-05	1.104	6.35E-05		1.02E-09
1,3-Butadiene	106-99-0		20	1.70E-04	6.60E+00	9.49E-05	1.104	1.05E-04	5.24E-06	1.78E-08
Acrylonitrile	107-13-1		2	2.90E-04	6.40E+00	9.21E-05	1.104	1.02E-04	5.08E-05	2.95E-08
Benzene	71-43-2	1300	60	2.90E-05	1.96E+01	2.82E-04	1.104	3.11E-04	5.19E-06	9.03E-09
Carbon tetrachloride	56-23-5	1900	2.4	4.20E-05	4.60E+00	6.62E-05	1.104	7.30E-05	3.04E-05	3.07E-09
1,4-Dioxane	123-91-1	3000	3.0	2.30E-05	1.07E+01	1.54E-04	1.104	1.70E-04	5.66E-05	3.91E-09
Ethylene dibromide	106-93-4		4.6	7.10E-05	5.70E+00	8.20E-05	1.104	9.05E-05	1.97E-05	6.43E-09
Formaldehyde	50-00-0	94	3.0	6.00E-06	8.71E+02	1.25E-02	1.104	1.38E-02	4.61E-03	8.30E-08
Hydrogen chloride	7647-01-0	21000	9		1.64E+03	2.36E-02	1.104	2.60E-02	2.89E-03	
Hydrogen sulfide	7783-06	42	10		2.03E+03	2.93E-02	1.104	3.23E-02	3.23E-03	
Tetrachloroethylene	127-18-4	20000	35	5.90E-06	3.26E+01	4.69E-04	1.104	5.18E-04	1.48E-05	3.05E-09
Vinyl chloride	75-01-4	185000	26	7.80E-05	2.40E+01	3.45E-04	1.104	3.81E-04	1.47E-05	2.97E-08
								Totals:	1.09E-02	1.97E-07

Redwood Landfill Health Risk Screening: Landfill Gas Flare Emissions

M	N	O	R	S	U	V
Compound	Flare Destruction Efficiency (Percent)	Increase in Abated Flare Emissions (g/s)	Max. Modeled Annual Avg. Chi/Q (ug/m3 per g/s)	Max Annual Avg. Ambient Concentration (ug/m3)	Max. Chronic HI	Max. Lifetime Cancer Risk
		K*(100-N)/100	ISCST3	O*R	S/E	S*F
Toluene	80.0	5.51E-03	0.298	8.21E-03	2.74E-05	
Trichloroethylene	80.0	1.90E-04	0.298	2.83E-04	4.72E-07	5.67E-10
Vinyl chloride	80.0	3.22E-04	0.298	4.80E-04	1.85E-05	3.75E-08
Acetaldehyde	0.0	2.35E-06	0.298	6.99E-07	7.77E-08	1.89E-12
Formaldehyde	0.0	2.68E-04	0.298	7.99E-05	2.66E-05	4.80E-10
Hydrogen Bromide	0.0	8.99E-06	0.298	2.68E-06	1.12E-07	
Hydrogen Chloride	0.0	2.21E-05	0.298	6.57E-06	7.30E-07	
Hydrogen Fluoride	0.0	3.37E-06	0.298	1.00E-06	1.70E-07	
Napthalene	0.0	1.18E-04	0.298	3.52E-05	3.91E-06	
				Totals:	4.34E-03	1.12E-07

Redwood Landfill Health Risk Screening: Landfill Gas Flare Emissions

M	N	O	P	Q	R	S
Compound	Flare Destruction Efficiency (Percent)	Increase in Abated Flare Emissions (g/s)	Max. Modeled Annual Avg. Chi/Q (ug/m3 per g/s)	Max Annual Avg. Ambient Concentration (ug/m3)	Max. Chronic HI	Max. Lifetime Cancer Risk
		K*(100-N)/100	ISCST3	Q*P	Q/E	Q*F
1,1,1-Trichloroethane	80.0	5.39E-05	0.298	8.04E-05	8.04E-08	
1,1,2,2-Tetrachloroethane	80.0	6.79E-05	0.298	1.01E-04		5.87E-09
1,1-Dichloroethane	80.0	8.35E-05	0.298	1.24E-04		1.99E-10
1,1-Dichloroethene	80.0	8.52E-05	0.298	1.27E-04	3.97E-06	
1,2-Dichloroethane	80.0	4.00E-05	0.298	5.96E-05	6.28E-07	1.31E-09
1,4-Dichlorobenzene	80.0	3.45E-04	0.298	5.13E-04	6.42E-07	5.65E-09
2-Propanol	80.0	1.78E-03	0.298	2.65E-03	3.79E-07	
Acrylonitrile	80.0	8.64E-05	0.298	1.29E-04	6.44E-05	3.74E-08
Benzene	80.0	1.56E-04	0.298	2.32E-04	3.86E-06	6.72E-09
Carbon disulfide	80.0	8.92E-05	0.298	1.33E-04	1.90E-07	
Carbon monoxide	80.0	2.31E-02	0.298	3.45E-02		
Carbon tetrachloride	80.0	6.22E-05	0.298	9.27E-05	3.86E-05	3.89E-09
Chlorobenzene	80.0	5.01E-05	0.298	7.47E-05	1.07E-06	
Chlorodifluoromethane	80.0	6.59E-04	0.298	9.82E-04	1.96E-08	
Chloroethane	80.0	1.13E-04	0.298	1.69E-04	5.63E-09	
Chloroform	80.0	4.83E-05	0.298	7.19E-05	2.40E-07	3.81E-10
Ethylbenzene	80.0	1.28E-03	0.298	1.91E-03	9.56E-07	
Ethylene dibromide	80.0	7.60E-05	0.298	1.13E-04	2.46E-05	8.04E-09
Freon 11	80.0	1.13E-04	0.298	1.68E-04	2.40E-07	
Freon 12	80.0	3.98E-04	0.298	5.93E-04	8.47E-07	
Hexane	80.0	4.45E-04	0.298	6.62E-04	9.46E-08	
Hydrogen sulfide	80.0	2.74E-02	0.298	4.08E-02	4.08E-03	
m,p,o-Xylene	80.0	4.92E-03	0.298	7.33E-03	1.05E-05	
Mercury (total)	80.0	3.43E-07	0.298	5.11E-07	5.68E-06	
Methyl ethyl ketone	80.0	3.18E-03	0.298	4.74E-03	4.74E-06	
Methylene chloride	80.0	1.59E-04	0.298	2.37E-04	5.93E-07	2.37E-10
Tetrachloroethylene	80.0	4.37E-04	0.298	6.51E-04	1.86E-05	3.84E-09
(continued)						

Redwood Landfill Health Risk Screening: Landfill Gas Flare Emissions

	B	C	D	E	F	G	H	I	J	K	L
Compound	CAS No.	MW	OEHHA Acute REL (ug/m3)	OEHHA Chronic REL (ug/m3)	OEHHA Cancer URF ((ug/m3)-1)	Conc. in LFG Corrected for Sample Dilution (ppbv)	Conc. in LFG Corrected for Sample Dilution (ug/m3)	Increase in Flared LFG (cfm)	Increase in Flared LFG (m3/s)	Increase in Unabated Flare Emissions (g/s)	Increase in Unabated Flare Emissions (lb/yr)
			ATHS	ATHS	ATHS		C*G/24.16		I*0.000472	H*J/1E6	K*69525.3
Toluene	108-88-3	92.10	37000	300		10206	38906	1500	7.08E-01	2.75E-02	1914.9
Trichloroethylene	79-01-6	131.40		600	2.00E-06	247	1343	1500	7.08E-01	9.51E-04	66.1
Vinyl chloride	75-01-4	62.50	185000	26	7.80E-05	880	2276	1500	7.08E-01	1.61E-03	112.0
Acetaldehyde	75-07-0	44.06		9	2.70E-06	2	3	1500	7.08E-01	2.35E-06	0.2
Formaldehyde	50-00-0	30.03	94	3	6.00E-06	305	379	1500	7.08E-01	2.68E-04	18.6
Hydrogen Bromide	10035-10-6	81.00		24		4	13	1500	7.08E-01	8.99E-06	0.6
Hydrogen Chloride	7647-01-0	36.46	21000	9		21	31	1500	7.08E-01	2.21E-05	1.5
Hydrogen Fluoride	7664-39-3	20.01	240	5.9		6	5	1500	7.08E-01	3.37E-06	0.2
Napthalene	91-20-3	128.16		9		31	167	1500	7.08E-01	1.18E-04	8.2

Redwood Landfill Health Risk Screening: Landfill Gas Flare Emissions

	B	C	D	E	F	G	H	I	J	K	L
Compound	CAS No.	MW	OEHHA Acute REL (ug/m3)	OEHHA Chronic REL (ug/m3)	OEHHA Cancer URF ((ug/m3)-1)	Conc. in LFG Corrected for Sample Dilution (ppbv)	Conc. in LFG Corrected for Sample Dilution (ug/m3)	Increase in Flared LFG (cfm)	Increase in Flared LFG (m3/s)	Increase in Unabated Flare Emissions (g/s)	Increase in Unabated Flare Emissions (lb/yr)
			ATHS	ATHS	ATHS		C*G/24.16		I*0.000472	H*J/1E6	K*69525.3
1,1,1-Trichloroethane	71-55-6	133.41	68000	1000		69	381	1500	7.08E-01	2.70E-04	18.8
1,1,2,2-Tetrachloroethane	79-34-5	167.85			5.80E-05	69	479	1500	7.08E-01	3.39E-04	23.6
1,1-Dichloroethane	75-34-3	98.97			1.60E-06	144	590	1500	7.08E-01	4.18E-04	29.0
1,1-Dichloroethene	75-35-4	96.94		32		150	602	1500	7.08E-01	4.26E-04	29.6
1,2-Dichloroethane	107-06-2	98.96		95	2.20E-05	69	283	1500	7.08E-01	2.00E-04	13.9
1,4-Dichlorobenzene	106-46-7	147.00		800	1.10E-05	400	2434	1500	7.08E-01	1.72E-03	119.8
2-Propanol	67-63-0	60.10	3200	7000		5052	12567	1500	7.08E-01	8.90E-03	618.5
Acrylonitrile	107-13-1	53.06		2	2.90E-04	278	611	1500	7.08E-01	4.32E-04	30.1
Benzene	71-43-2	78.10	1300	60	2.90E-05	340	1099	1500	7.08E-01	7.78E-04	54.1
Carbon disulfide	75-15-0	76.10	6200	700		200	630.0	1500	7.08E-01	4.46E-04	31.0
Carbon monoxide	63-08-0	28.01	23000			141000	163469	1500	7.08E-01	1.16E-01	8045.7
Carbon tetrachloride	56-23-5	153.84	1900	2.4	4.20E-05	69.0	439	1500	7.08E-01	3.11E-04	21.6
Chlorobenzene	108-90-7	112.56		70		76	354	1500	7.08E-01	2.51E-04	17.4
Chlorodifluoromethane	75-45-6	86.47		50000		1300	4653	1500	7.08E-01	3.29E-03	229.0
Chloroethane	75-00-3	64.50		30000		300	801	1500	7.08E-01	5.67E-04	39.4
Chloroform	67-66-3	119.40	150	300	5.30E-06	69	341	1500	7.08E-01	2.41E-04	16.8
Ethylbenzene	100-41-4	106.20		2000		2062	9064	1500	7.08E-01	6.42E-03	446.1
Ethylene dibromide	106-93-4	187.88		4.6	7.10E-05	69	537	1500	7.08E-01	3.80E-04	26.4
Freon 11	75-69-4	137.40		700		140	796	1500	7.08E-01	5.64E-04	39.2
Freon 12	75-43-4	102.92		700		660	2812	1500	7.08E-01	1.99E-03	138.4
Hexane	110-54-3	86.20		7000		880	3140	1500	7.08E-01	2.22E-03	154.5
Hydrogen sulfide	7783-06	34.08	42	10		137000	193252	1500	7.08E-01	1.37E-01	9511.6
m,p,o-Xylene	108-38-3	106.20	22000	700		7900	34726	1500	7.08E-01	2.46E-02	1709.2
Mercury (total)	7439-97-6	200.61	1.8	0.09		0.29	2.42	1500	7.08E-01	1.72E-06	0.1
Methyl ethyl ketone	78-93-3	72.11	13000	1000		7526	22463	1500	7.08E-01	1.59E-02	1105.6
Methylene chloride	75-09-2	84.90	14000	400	1.00E-06	320	1125	1500	7.08E-01	7.96E-04	55.3
Tetrachloroethylene	127-18-4	165.80	20000	35	5.90E-06	450	3088	1500	7.08E-01	2.19E-03	152.0
(continued)											

APPENDIX B

ANNUAL AVERAGE DILUTION FACTORS

MAXIMUM RISK SCENARIO
PETALUMA METEOROLOGICAL DATA