Cottonwood Hills Recycling & Disposal Facility
Emission Totals for 2013 Air Emissions Report (in tons per year) Using Title V Permit Values

														Anthropogenic		Biogenic
	SO2	NOx	NMOC	CO	Ammonia **	PM	PM10	PM2.5	HAPs *	Methylene Chloride	1,1,1-TCA	H2S	Methane	CH4	N2O	Total CO2
Landfill	-	-	2.46	-	-	-	-	-	0.508	0.058	0.0031	3.16	413.78	-	-	-
Open Flare	16.87	26.44	2.62	143.94	-	7.256	7.256	7.256	0.105	0.005	0.003	-	-	0.60	0.12	18127.69
Roads	-	-	-	-	-	3.08	0.83	0.13	-	-	-	-	-	-	-	-
Solidification			0.054			0.296	0.296	0.296						-	-	-
Stockpile/ Cover					-	0.037	0.017	0.005						-	-	-
Rock Crushing Engine	0.05	0.79	0.06	0.170	-	0.06	0.06	0.06	-	-	-	-	-	-	-	-
Rock Crushing Process	-	-	-	-	-	0.015	0.015	0.015	-	-	-	-	-	-	-	-
Tub Grinder	0.000	0.000	0.000	0.000	-	0.000	0.000	0.000	0.000	-	-	-	-	-	-	-
Totals	16.92	27.23	5.20	144.11		10.74	8.47	0.500	0.613	0.063	0.006	3.16	413.78	0.60	0.12	18127.69

NOTES:
** Methylene Chloride, 1,1,1-TCA and methane are reported separately*
*** Ammonia assumed to be insignificant since leachate is insignificant.*

Cottonwood Hills RDF
2013 Annual Air Emissions Report
Open Flare Data

						SO2 Emissions		NOX Emissions		VOM Emissions		CO Emissions		PM Emissions	
						SO2 (lb/hr) per 1000 scfm = 3.786		NOX (lb/hr) for 3000 scfm flare = 6.45		VOM (lb/hr) for 3000 scfm flare = 0.64		CO (lb/hr) for 3000 scfm flare = 35.11		PM (lb/hr) for 3000 scfm flare = 1.77	
Month	D	Run Hours	mscf	% Methane	mmBtu/hr	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
December 12		716.2													
January	31	744.0	40.367	47.3%	17.382	3.42	1.27	6.45	2.40	0.64	0.24	35.1	13.06	1.77	0.658
February	28	672.0	41.448	47.7%	17.983	3.89	1.31	6.45	2.17	0.64	0.22	35.1	11.80	1.77	0.595
March	31	706.9	45.519	50.4%	20.861	4.06	1.44	6.45	2.28	0.64	0.23	35.1	12.41	1.77	0.626
April	30	639.2	44.726	49.6%	20.171	4.42	1.41	6.45	2.06	0.64	0.20	35.1	11.22	1.77	0.566
May	31	642.3	45.595	51.7%	21.425	4.48	1.44	6.45	2.07	0.64	0.21	35.1	11.28	1.77	0.568
June	30	545.9	44.114	54.8%	22.002	5.10	1.39	6.45	1.76	0.64	0.17	35.1	9.58	1.77	0.483
July	31	727.4	56.160	49.2%	25.112	4.87	1.77	6.45	2.35	0.64	0.23	35.1	12.77	1.77	0.644
August	31	721.3	40.569	47.7%	17.595	3.55	1.28	6.45	2.33	0.64	0.23	35.1	12.66	1.77	0.638
September	30	686.5	34.410	53.9%	16.870	3.16	1.09	6.45	2.21	0.64	0.22	35.1	12.05	1.77	0.608
October	31	671.1	36.732	55.9%	18.664	3.45	1.16	6.45	2.16	0.64	0.21	35.1	11.78	1.77	0.594
November	30	699.8	44.824	55.5%	22.628	4.04	1.41	6.45	2.26	0.64	0.22	35.1	12.29	1.77	0.619
December	31	743.0	60.147	50.2%	27.478	5.11	1.90	6.45	2.40	0.64	0.24	35.1	13.04	1.77	0.658
TOTALS	365	8199.4	534.609	51.50%	250.426	4.13	16.87	6.45	26.44	0.64	2.62	35.1	143.94	1.77	7.256

EXAMPLE CALCULATIONS

mmBtu = Flow (scfm) x 60 min/hr x % methane x 909.6 btu/cft (@ 14.7 psia and 60F) / 1000000Btu/mmBtu
lbs/hr = mmBtu/hr x Permitted Pollutant Factor (lb/mmBtu) x Run Hours / (Days/mo x 24hrs/day)
tpy = lbs/hr / 2000 lbs/ton x 8760 hrs/yr

Percent Throughputs

Dec-Feb	*26.1%*	*Mar-May*	*24.3%*
Jun-Aug	*24.4%*	*Sep-Nov*	*25.2%*

PM10	7.256 tpy	1.770 lbs/hr	*Assumed to be same as*
PM2.5	7.256 tpy	1.770 lbs/hr	*TSP per AP-42, Table 2.4.4*

Sulfur: Average Cs for reporting year was 380 ppm

380	ppm H2S	64	mol. Wt. SO2 x	60,000	scfh x	1 T x	=	
1,000,000		385.4	scf/lb-mole			2000 lbs	3.786	lbs/hour per 1000 scfm

Annual	*Rate/hr =*	*534.609 mscf /*	*8199.4 hrs =*	*0.0652009 MCF/hr or*	*1.4646808*	*MCF/day*
Peak Ozone	*Rate/hr =*	*140.843 mscf /*	*1994.6 hrs =*	*0.0706108 MCF/hr or*	*1.5308981*	*MCF/day*

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Cottonwood Hills RDF Open Flare Data
2013 Annual Air Emissions Report

Anthropogenic GHG				Biogenic GHG					
CH4 Emissions		N2O Emissions		Combustion CO2		Pass-Through CO2		Total CO2	
CH4 (lb/mmBtu)=	7.05E-03	N2O (lb/mmBtu)=	1.39E-03	CO2 (lb/mmBtu)=	114.79	Based on % CO2		Combustion+Pass-Through	
lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
0.123	0.05	0.024	0.01	1,995.37	742.28	3,314.18	1,232.88	5,309.55	1,975.15
0.127	0.04	0.025	0.01	2,064.36	693.62	3,741.73	1,257.22	5,806.09	1,950.85
0.147	0.05	0.029	0.01	2,394.67	846.36	3,706.14	1,309.87	6,100.81	2,156.23
0.142	0.05	0.028	0.01	2,315.46	740.06	0.00	0.00	2,315.46	740.06
0.151	0.05	0.030	0.01	2,459.43	789.89	3,980.16	1,278.30	6,439.60	2,068.18
0.155	0.04	0.031	0.01	2,525.74	689.40	4,233.72	1,155.59	6,759.45	1,844.99
0.177	0.06	0.035	0.01	2,882.75	1,048.50	0.00	0.00	2,882.75	1,048.50
0.124	0.04	0.024	0.01	2,019.74	728.42	3,413.38	1,231.04	5,433.12	1,959.46
0.119	0.04	0.023	0.01	1,936.58	664.70	2,680.42	920.01	4,617.00	1,584.71
0.132	0.04	0.026	0.01	2,142.46	718.87	0.00	0.00	2,142.46	718.87
0.160	0.06	0.031	0.01	2,597.57	908.93	0.00	0.00	2,597.57	908.93
0.194	0.07	0.038	0.01	3,154.27	1,171.76	0.00	0.00	3,154.27	1,171.76
1.767	0.60	0.348	0.12	28,747.29	9,742.78	3,668.19	8,384.91	32,415.48	18,127.69

Cottonwood Hills RDF
2013 Annual Air Emissions Report
Waste Acceptance

Year	Waste Receipts gcy	Waste Receipts bcy	Waste Receipts (ton)	Waste Receipts (Mg)
2000	11,253	5,627	4,220	3,828
2001	759,749	379,875	284,906	258,465
2002	837,003	418,501	313,876	284,746
2003	1,282,080	641,040	384,624	348,929
2004	1,443,807	721,904	433,142	392,944
2005	1,497,231	748,616	449,169	407,484
2006	1,850,556	925,278	555,167	503,644
2007	1,600,248	800,124	480,074	435,521
2008	1,327,855	663,928	398,357	361,387
2009	1,651,631	825,816	495,489	449,505
2010	1,542,690	771,345	462,807	419,856
2011	1,710,919	855,460	513,276	465,641
2012	1,696,343	848,171	508,903	461,674
2013	1,514,265	757,132	454,279	412,120
Total			5,738,290	5,205,742

Note: 1 Mg = 1.1023 ton

Cottonwood Hills RDF
2013 Annual Air Emissions Report
LANDFILL GAS EMISSION RATE CALCULATIONS Using Title V Permit Values

The equation below was used to create Table 2 on the following page.

NMOC equation from 40 CFR 60.754 (a)(1)(i) used to estimate Annual NMOC Emission Rate:

$$Mnmoc\ (Mg/yr) = \sum_{i=1}^{n} 2\,k\,Lo\,M_i\,[e^{(-kti)}\,(Cnmoc)\,(3.6 \times 10^{-9})]$$

Where

Mnmoc =	total NMOC emission rate from the landfill in megagrams per year (Mg/yr)
k =	methane generation rate constant, year $^{-1}$
Lo =	methane generation potential, cubic meters per megagram solid waste (m^3/Mg)
M_i =	mass of solid waste in the ith section, Mg
Cnmoc =	concentration of NMOC, parts per million by volume as hexane
3.6×10^{-9}=	conversion factor

NMOC Equation Constants

k =	0.023 yr^{-1}
Lo =	139.6 m^3/Mg solid waste
Cnmoc =	595 ppmv as hexane NMOC concentration (from NSPS Subpart WWW, 40 CFR 60.754(a)(1))

NMOC emission rate from RATE TABLE on following page...

Year for emission calculation = **2013**

NMOC emissions for 2013 = 57.60 Mg/yr = 63.49 ton/yr

Conversion of NMOC emission rate to Landfill Gas Rate

Maximum Annual Landfill Gas Rate:

57.60 Mg NMOC/yr * 10^6 g/Mg * g-mole/86.17 g * 24.45 l/g-mole * 1 m^3/1000 l* 10^6 m³/595 m³ NMOC = 27,468,710 m³/yr

Daily Gas Rate:

27,468,710 m³/yr * 35.31 ft³/m³ * 1 yr/365 days = 2,657,320 ft³/day

Gas Constant for 25 C and 760 mmHg

62.36 l-mmHg/g-mole-K x 298 K ÷ 760 mmHg = 24.45 l/g-mole

Example Emission Calculation for NMOC

Conversion from ppm_v to mg/m^3

NMOC concentration as hexane = 595 ppm_v

595 m^3 NMOC (as hexane)/10^6 m^3 LFG *1000 liters/m^3 * mole/24.45 liters * 86.17 g/mole *1000 mg/g

= 2096.98 mg/m^3 NMOC as hexane

NMOC Emissions Calculation

NMOC emissions = 2,096.98 mg/m^3 LFG * 27,468,710 m^3 LFG/yr * 1 Mg/10^9 mg * 1.1023 ton/Mg

NMOC emissions = 63.49 tons/yr NMOC as hexane

Collection Efficiency= 0.75 %

Cover Factor= 0.15

Controlled NMOC Emissions = 2.455 tons/yr NMOC as hexane

Cottonwood Hills RDF
2013 Annual Air Emissions Report
Cover Factor/ NMOC Emissions Calculations

LANDFILL:	Cottonwood	Enter the name of the landfill.
UNIT:	Active Units	Enter the name of the unit (if any)
CURRENT ACRE	63.6	Enter the footprint acreage.

COVER TYPE	COVER FACTOR	ACREAGE		
Active area	0.6265	10	0.0985	Enter the average size of the active face. The cover factor is based on 50% air and 50% daily cover.
Intermediate	0.1110	29.3	0.0511	Enter the acreage with 12" soil (or other like material).
Final Cover A	0.0305	0	0.0000	Enter the acreage with 2 feet clay and 6 inches top soil.
Final Cover B	0.0295	0	0.0000	Enter the acreage with 3 feet clay and 6 inches top soil.
Final Cover C	0.0132	24.3	0.0050	Enter the acreage with 3 feet clay, 2.5 feet protective soil and 6 inches top soil.
Final Cover D	0.0000	0	0.0000	Enter the acreage with 3 feet clay, 40 ml HDPE, 2.5 feet protective soil and 6 inches top soil.
		63.6	Total Liner Acreage Constructed	
COVER ATTENUATION FACTOR (CAF) =			0.1547	This is the cover attenuation factor for the specified unit.

LANDFILL GAS COLLECTION SYSTEM

CAPTURE EFFICIENCY (CE): 0.75 Gas Collection System and Open Flare began operating in Feb 2008

CONTROL EQUIPMENT EFFICIENCY (CEE): 0.98 Gas Collection System and Open Flare began operating in Feb 2008

Cottonwood Hills RDF
2013 Annual Air Emissions Report
TOTAL HAP EMISSION ESTIMATES Using Title V Permit Values

Modeled Landfill Gas Rate	27,468,710 m³/yr
Gas Collection Efficiency:	75%
Cover Factor:	0.15

Hourly Rate
0.1107 mcf/hr

HAP/ VOC Compounds	Median ppmv	Molecular Weight	Mass Concentration (mg/m³)	Uncontrolled Potential Emissions (Mg/yr)	Uncontrolled Potential Emissions (tons/yr)	After Controls ton/yr	After Controls lb/hr
1,1,1-Trichloroethane **(methyl chloroform)*	0.48	133.42	2.62	0.07	0.08	**0.0031**	0.0007
1,1,2,2-Tetrachloroethane*	1.11	167.85	7.62	0.21	0.23	0.0089	0.0020
1,1-Dichloroethane (ethylidene dichloride)*	2.35	98.95	9.51	0.26	0.29	0.0111	0.0025
1,1-Dichloroethene (vinylidene chloride)*	0.20	96.94	0.79	0.02	0.02	0.0009	0.0002
1,2-Dichloroethane (ethylene dichloride)*	0.41	98.96	1.66	0.05	0.05	0.0019	0.0004
1,2-Dichloropropane (propylene dichloride)*	0.18	112.98	0.83	0.02	0.03	0.0010	0.0002
Acrylonitrile*	6.33	53.06	13.74	0.38	0.42	0.0161	0.0037
Benzene* (AP-42 no co-disposal default)	1.91	78.11	6.10	0.17	0.18	0.0071	0.0016
Carbon disulfide*	0.58	76.13	1.81	0.05	0.05	0.0021	0.0005
Carbon tetrachloride*	0.004	153.84	0.03	0.001	0.001	0.0000	0.0000
Carbonyl sulfide*	0.49	60.07	1.20	0.03	0.04	0.0014	0.0003
Chlorobenzene*	0.25	112.56	1.15	0.03	0.03	0.0013	0.0003
Chloroethane (ethyl chloride)*	1.25	64.52	3.30	0.09	0.10	0.0039	0.0009
Chloroform*	0.03	119.39	0.15	0.004	0.004	0.0002	0.0000
Chloromethane (methyl chloride)*	1.21	50.49	2.50	0.07	0.08	0.0029	0.0007
Dichloromethane **(methylene chloride)*	14.3	84.94	49.68	1.36	1.50	**0.0582**	0.0133
Ethylbenzene*	4.61	106.16	20.02	0.55	0.61	0.0234	0.0054
Hexane*	6.57	86.18	23.16	0.64	0.70	0.0271	0.0062
Mercury (total)*	2.92E-04	200.61	0.002	0.0001	0.0001	0.0000	0.0000
Methyl ethyl ketone*	7.09	72.11	20.91	0.57	0.63	0.0245	0.0056
Methyl isobutyl ketone*	1.87	100.16	7.66	0.21	0.23	0.0090	0.0020
Perchloroethylene **(tetrachloroethene)*	3.73	165.83	25.30	0.69	0.77	0.0296	0.0068
Toluene* (AP-42 no co-disposal default)	39.30	92.13	148.09	4.07	4.48	0.1734	0.0396
Trichloroethene*	2.82	131.38	15.15	0.42	0.46	0.0177	0.0041
Vinyl chloride*	7.34	62.50	18.76	0.52	0.57	0.0220	0.0050
Xylene*	12.1	106.16	52.54	1.44	1.59	0.0615	0.0140
Total HAPs					**13.149**	**0.508**	**0.116**
Total Non-VOM Haps (1,1,1 TCA + dichloromethane + PCE)					**10.800**	**0.418**	**0.095**

Other Compounds	Median ppmv	Molecular Weight	Mass Concentration (mg/m³)	Uncontrolled Potential Emissions (Mg/yr)	Uncontrolled Potential Emissions (tons/yr)	After Controls ton/yr	After Controls lb/hr
Methane	540000.0	16.00	353374.23	9706.73	10699.73	**413.78**	94.47
NMOC (VOM)				57.60	63.49	**2.46**	0.56
Hydrogen Sulfide ***	300.0	34.00	417.18	11.46	12.63	**3.16**	0.72

** = Hazardous Air Pollutants listed in Title III of the 1990 Clean Air Act Amendments*
*** = Exempt VOC*
Information obtained from EPA AP-42 5th Edition Section 2.4 (11/98) on individual NMOC and HAP concentrations in Tables 2.4-1 and 2.4-2 and footnote c of table 2.4-2.
The control efficiency is based on an average 0% area coverage of gas extraction wells at the facility. There is no collection system in place
See cover_02.xls for cover factor determination.

Cottonwood Hills RDF
2013 Annual Air Emissions Report
Crusher Engine Data

		SO2 Emissions		NOX Emissions		VOM Emissions		CO Emissions		PM Emissions	
	Engine	SO2(lb/hr)=	0.32	NOX(lb/hr)=	4.9	VOM(lb/hr)=	0.39	CO(lb/hr)=	1.06	PM(lb/hr=)	0.35
Month	Run Hours	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
December 12	18										
January	35	0.320	0.006	4.900	0.086	0.390	0.007	1.060	0.019	0.350	0.006
February	42	0.320	0.007	4.900	0.103	0.390	0.008	1.060	0.022	0.350	0.007
March	12	0.320	0.002	4.900	0.029	0.390	0.002	1.060	0.006	0.350	0.002
April	51	0.320	0.008	4.900	0.125	0.390	0.010	1.060	0.027	0.350	0.009
May	14	0.320	0.002	4.900	0.034	0.390	0.003	1.060	0.007	0.350	0.002
June	6	0.320	0.001	4.900	0.015	0.390	0.001	1.060	0.003	0.350	0.001
July	10	0.320	0.002	4.900	0.025	0.390	0.002	1.060	0.005	0.350	0.002
August	1	0.320	0.000	4.900	0.002	0.390	0.000	1.060	0.001	0.350	0.000
September	0	0.320	0.000	4.900	0.000	0.390	0.000	1.060	0.000	0.350	0.000
October	36	0.320	0.006	4.900	0.088	0.390	0.007	1.060	0.019	0.350	0.006
November	81	0.320	0.013	4.900	0.198	0.390	0.016	1.060	0.043	0.350	0.014
December	33	0.320	0.005	4.900	0.081	0.390	0.006	1.060	0.017	0.350	0.006
TOTALS	321	0.320	0.051	4.900	0.786	0.390	0.063	1.060	0.170	0.350	0.056

EXAMPLE CALCULATIONS

Engine Size = 158 hp

tpy = Run Hours x Rate (lb/hr) /2000 lb/ton

lbs/hr = Run Hours / 24 hrs/day / # of days/month x Rate (lb/hr)

Emission Rates for SO2, NOX, VOM, CO and PM were taken from Section 7.3.6 and 7.2.12 of Cottonwood Title V Permit, 11/06/02

Percent Throughputs

Dec-Feb	*31.0%*	*Mar-May*	*25.2%*
Jun-Aug	*5.6%*	*Sep-Nov*	*38.2%*

		hrs/day
Annual Hours	321	1.23
Peak Ozone Hours	17	0.26

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Cottonwood Hills RDF
2013 Annual Air Emissions Report
Crusher Unit Throughput Data

		Uncontrolled		Controlled	90%
Month	Throughput tons	PM Emissions * tpy	PM Emissions * lbs/hr	PM Emissions * tpy	PM Emissions * lbs/hr
December 12	360				
January	700	0.02	0.90	0.002	0.09
February	840	0.02	0.90	0.002	0.09
March	240	0.01	0.90	0.001	0.09
April	1,020	0.02	0.90	0.002	0.09
May	280	0.01	0.90	0.001	0.09
June	120	0.00	0.90	0.000	0.09
July	200	0.00	0.00	0.000	0.00
August	20	0.00	0.90	0.000	0.09
September	0	0.00	#DIV/0!	0.000	#DIV/0!
October	720	0.02	0.90	0.002	0.09
November	1,620	0.04	0.90	0.004	0.09
December	660	0.01	0.90	0.001	0.09
TOTALS	6,420	0.15	0.90	0.015	0.09

EXAMPLE CALCULATIONS
** PM Emissions assumed to be the same for TSP, PM10 & PM2.5*
tpy = PM Emissions Factor x Throughput (tons)/2000 lb/ton
PM Emissions Factor: 0.04522 lbs/Ton processed
Emission Factors for PM were taken from Condition 7.2.6 of Cottonwood Title V Permit, 11/06/02

Percent Throughputs

Dec-Feb	*31.0%*	*Mar-May*	*25.2%*
Jun-Aug	*5.6%*	*Sep-Nov*	*38.2%*

Processing Rates:

Annual	*20.0*	*tons/hr*
Jun-Aug	*20.0*	*tons/hr*

Cottonwood Hills RDF
2013 Annual Air Emissions Report
Solidification Process

Process Data		
Liquid Processed	98770	gal/yr
Density of Liquid	8.0	lb/gal
Dust Requirement	1	lb dust/lb liquid sludge
PM Emission Factor*	1.5	lb PM/ton dust

Emission Calculations:

Dust required = 98770 gallon/year x 8 lbs/gallon x 1 lb dust/lb liquid x 1 ton/2000 lb = **395 ton/yr**

PM Emissions = 395.08 ton/yr x 1.5 lb PM/lb dust x 1 ton/2000 lb = **0.2963 ton/yr**

PM10 Emissions = 395.08 ton/yr x 1.5 lb PM/lb dust x 1 ton/2000 lb = **0.2963 ton/yr**

PM2.5 Emissions = 395.08 ton/yr x 1.5 lb PM/lb dust x 1 ton/2000 lb = **0.2963 ton/yr**

Month	Gallons
January	0
February	0
March	0
April	0
May	22,850
June	75,920
July	0
August	0
September	0
October	0
November	0
December	0
TOTAL	98,770

Calculate emissions rate lbs/hour:

PM = 2.28 lbs/hr

Based on 1 hr/day 260 days per year

*Emission factor source: EPA's AP-42; 5th Edition; Chapter 11.17; Table 11.17-4. No data was available for PM-10 or PM-2.5 so the same emission factor as PM was assumed.

Limit of 3,500,000 gal/yr / 2080 hrs/yr = 1682.7 gal/hr process rate

VOM = 0.054 tons/yr

WM01221

Cottonwood Hills RDF
2013 Annual Air Emissions Report
Fugitive Roadway Emissions

Vehicle Type	AP-42 Data: Vehicle Wt. Unloaded (ton)	AP-42 Data: Vehicle Wt. Loaded (ton)	AP-42 Data: Mean Vehicle Weight (tons)	% of all Trucks	* Trucks/ Yr	Net Vehicle Weight (tons)	W: Mean Vehicle Weight (tons)
Transfer Trailer	16.5	38.5	27.5	50%	14,250	313,500	13.75
Front End Loader	19.3	28.8	24.05	13%	3,705	35,198	3.13
Rear End Loader	15.5	23	19.25	13%	3,705	27,788	2.50
Roll-Off Container	17.8	26.8	22.3	5%	1,425	12,825	1.12
Other	14	30.9	22.45	3%	855	14,450	0.67
T-Plate	3.8	5	4.4	0%	-	-	-
Private Truck	2.6	3.1	2.85	1%	285	143	0.03
Tractor Trailer	15.6	35.2	25.4	0%	-	-	-
Dump Trucks	12	17	14.5	0%	-	-	-
Volvo	26	38	32	15%	4,275	51,300	4.80
				100%	28,500	455,202	26.00
				actual tons in 2013 >>		454,279	

Spreadsheet Inputs:

s = surf. mat. silt content (unpaved) =	6.4 % (from Table 13.2.2-1)		
sL=paved road surface silt load (g/m2) =	7.4 g/m2 (Table 13.2.1-3)		
M = surface material moist. cont. =	0.2 % (default value)		
P = # of day/yr with precip. =	115 days		
UPR = Total length of unpaved roads =	2000 ft	0.38	miles
PR = Total length of paved roads =	0 ft	0.00	miles
VMT = Vehicle mile traveled			
W = fleet mean vehicle weight (tons)			
N = Number of days in the averaging period	365		
Control Efficiency	90% *(Per Title V Application 01040051 dated April 2001)*		

Formulas for Emissions Factors:

Unpaved Road: E = k * [s/12]^a * [W/3]^b * [(365 - p)/365] (AP-42 Chapter 13.2.2, 12/03)

Constant	PM2.5	PM10	PM30(TSP)
k (lb/VMT)	0.23	1.5	4.9
a	0.9	0.9	0.7
b	0.45	0.45	0.45

Paved Road E = [(k * (sL/2)^0.65 * (W/3)^1.5)]* [1 - P/(4 * N)] (AP-42 Chapter 13.2.1, 12/03)

Constant	PM2.5	PM10	PM30(TSP)
k (lb/VMT)	0.004	0.016	0.082

Emission Calculations:

W = Fleet Mean Vehicle Weight = 26.00 tons *Sum of Mean Vehicle Wt x % Vehicles on Site*

	Vehicles	Miles	E (2.5)	E (10)	E (TSP)
Unpaved Roads	28,500	0.38	0.2364	1.5418	5.7114
Paved Roads	28,500	0.00	0.2200	0.8800	4.5102
Total (tons/yr) - Uncontrolled			1.28	8.32	30.83
Control Efficiency			90%	90%	90%
Total (tons/yr) - Controlled			0.13	0.83	3.08
Total (lb/hr) - Controlled			**0.098**	**0.640**	**2.371**

NOTES:

** Vehicle count calculated using actual waste volume data (tons) and AP-42 net vehicle wt. Distribution of vehicles types*

*** Factors for PM emissions from vehicle exhaust, break wear and tire wear are not subtracted out, since EPA MOBILE 6.2 is*

**** Hourly emission rate calculated assuming 2600 operating hrs/yr.*

42.08 *ton waste per VMT = waste tonnage / # vehicles / road length (miles)*

Cottonwood Hills RDF
2013 Annual Air Emissions Report
Fugitive Stockpile/Cover Emissions

Month	Operating Days	Waste Intake	Intake Rate (tons/day)	Soil Cover Density (lb/cy)	Refuse Density (lb/cy)	Percent Soil Volume	Cover Used (tons/day)	Fugitive Dust Emissions (tons) PM2.5	PM10	TSP
January	22	34,003	1,546	2,600	1,100	15%	548	0.000	0.001	0.003
February	20	31,201	1,560	2,600	1,100	15%	553	0.000	0.001	0.003
March	21	36,379	1,732	2,600	1,100	15%	614	0.000	0.001	0.003
April	22	42,650	1,939	2,600	1,100	15%	687	0.001	0.002	0.003
May	22	43,546	1,979	2,600	1,100	15%	702	0.001	0.002	0.004
June	20	39,471	1,974	2,600	1,100	15%	700	0.000	0.002	0.003
July	22	41,820	1,901	2,600	1,100	15%	674	0.000	0.002	0.003
August	22	40,718	1,851	2,600	1,100	15%	656	0.000	0.002	0.003
September	20	37,126	1,856	2,600	1,100	15%	658	0.000	0.001	0.003
October	23	40,462	1,759	2,600	1,100	15%	624	0.000	0.002	0.003
November	20	32,646	1,632	2,600	1,100	15%	579	0.000	0.001	0.003
December	21	34,257	1,631	2,600	1,100	15%	578	0.000	0.001	0.003
TOTALS	255	454,279	1,781	2,600	1,100	15%	632	**0.005**	**0.017**	**0.037**

Cover Used (tons/day) = Waste Disposal rate (tpd) x Soil Cover Density (lb/cy) / Refuse Density (lb/cy) x % Soil Volume

Formulas for Emissions Factors:
Aggregate Handling/Storage Piles (from AP-42 Chapter 13.2.4, 1/95):

E (lb/ton of material) = k x (0.0032) x [(U/5)^1.3 / (M/2)^1.4]

Constant	PM2.5	PM10	TSP	Comment
U (mph)	9.66	9.66	9.66	Wind speed for St. Louis, Mo. from Tanks 4.0 Model database
M (%)	12	12	12	Table 13.2.4-1; MSW Cover
k	0.11	0.35	0.74	
E (lb/ton)	**0.0001**	**0.0002**	**0.0005**	

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