

June 26, 2008

TECHNICAL REVIEW MEMORANDUM

To: City of Los Angeles, Bureau of Sanitation

From: Shari Libicki, Ph.D., ENVIRON International Corporation
Julia C. Lester, Ph.D., ENVIRON International Corporation
Justine Harrison, P.E., ENVIRON International Corporation

Subject: Air Quality Analysis (Transportation), 1989 Offsite Sludge Transportation and Disposal Program Final Environmental Impact Report Addendum, City of Los Angeles, Green Acres Farm

At the request of the City of Los Angeles (City), ENVIRON International Corporation (ENVIRON) has conducted an air quality analysis of the biosolids transport impacts generated from the two actions the City took in February 2000, consisting of (1) purchasing the 4,688-acre Green Acres Farm in western Kern County, where the City has been land applying its biosolids since the mid-1990s, and (2) amending its pre-existing biosolids contract with Responsible Biosolids Management, Inc. (RBM), which sets forth minimum, average, and maximum biosolids transport amounts. This air quality analysis focuses on the emissions generated from biosolids transport activities; emissions generated from land application activities are assessed in a separate technical memorandum.

Comparison to Emissions Projected in the 1989 Program EIR

The City's 1989 Offsite Sludge Transportation and Disposal Program Final Environmental Impact Report (1989 Program EIR) assessed air emissions from biosolids transport by assuming there would be 193 daily truck trips traveling a round-trip distance of 480 miles, yielding a total of 92,640 vehicle miles traveled (VMT) on a daily basis (1989 Program EIR, page 3.2-20). As air emissions are calculated by multiplying the VMT by the applicable air emissions factor, the actual air emissions associated with biosolids transport to Green Acres Farm are significantly less than the projections in the 1989 Program EIR, for two principal reasons. First, actual daily VMT is a fraction of the 92,640 daily VMT assumed in the 1989 Program EIR. As explained in the City's accompanying Addendum, actual daily VMT for 2000-2007 – which is calculated by multiplying the average number of daily truck trips (25.58) by the distance from the City's wastewater treatment facilities to Green Acres Farm (240 miles round-trip) – is approximately 6,140. All other things being equal, emissions from current truck trips would be significantly less than emissions calculated in the 1989 Program EIR since daily VMT is less than 1/10th that assumed in the 1989 Program EIR. In addition to the effect of lower VMT, current trucks are cleaner than those analyzed in the 1989 Program EIR due to substantial improvements in truck engine and emission control systems.

Assessment of Change of Emissions Compared to 1999 Conditions

To assess the significance of the air emissions resulting from the City's actions in February 2000 to purchase Green Acres Farm and to amend its pre-existing biosolids contract, ENVIRON evaluated the change in emissions from 1999 conditions (before the City's February 2000 actions) to the current conditions. ENVIRON considered the change in daily emissions in the South Coast Air Quality Management District (SCAQMD) and the change in annual emissions in the San Joaquin Valley Air Quality Management District (SJVAPCD), consistent with those agencies' published significance criteria. (Biosolids transport trucks travel in both jurisdictions).

1999 emissions were calculated using historical average vehicle trip information. Two different scenarios were analyzed to assess the change in emissions from 1999:

Scenario 1: Current emissions based on 2000-2007 average truck trips

Emissions were calculated by multiplying the appropriate emission factors by the change in VMT between the average number of truckloads per day in 1999 and the average number of truckloads per day, based on truck trip data, between 2000 and 2007. The average number of truckloads was calculated by dividing the annual number of truckloads by the number of days in a year.

Scenario 2: Current emissions based on maximum contract allowance

Emissions were calculated by multiplying the appropriate emission factors by the change in VMT between the average number of truckloads per day in 1999 and the maximum number of truckloads per day, which was calculated by using the RBM maximum contract amount of 800 wet tons per day. The average wet tons per truckload were estimated to be 26.18, using the data provided by the City showing the annual total wet tons and the corresponding annual loads.

The comparisons described above resulted in a total change in VMT of 1,666 miles per day for Scenario 1 and 2,861 miles per day for Scenario 2. These results are presented in Attachment A, Table A-1.

Emission Factors

ENVIRON used emission factors from the California Air Resources Board's (CARB's) EMFAC2007¹ emission model. EMFAC2007 can be used to estimate emissions from historical fleet mixes and allows for distinction of emissions between the various air basins and air districts, including the SCAQMD and the SJVAPCD. Since information on the actual in-use 1999 truck fleet is no longer available, ENVIRON used the EMFAC2007 historical fleet mix in 1999 (SCAQMD, SJVAPCD fleets and their average) in its calculations of 1999 emissions. The EMFAC2007 emission factors are primarily a function of fleet characteristics and speeds traveled. Since it could not be determined if the fleet used was more consistent with the SCAQMD or SJVAPCD default fleet mix, the average of the individual district-specific EMFAC2007 emission factors were used.

This air quality analysis quantifies emissions generated within the SCAQMD jurisdiction and the SJVAPCD jurisdiction separately, for comparison to the published significance thresholds specific for each air district. Accordingly, the VMTs are separated between the VMTs in the SCAQMD's jurisdiction (approximately 160 miles per 240-mile roundtrip) and the VMTs in the SJVAPCD's jurisdiction (approximately 80 miles per 240-mile roundtrip). As noted previously, the average 1999 emission factors were applied to the district-specific VMT activity data to calculate emissions in each district.

For emissions estimates for current conditions, the actual truck fleet was known from an assessment prepared by the City to evaluate the difference in emissions resulting from

¹ EMFAC2007 at http://www.arb.ca.gov/msei/onroad/latest_version.htm.

transporting biosolids to alternative locations.² Thus for current conditions, emissions were calculated using fleet-specific emission factors from EMFAC2007.

For both the 1999 and current conditions, ENVIRON used the emission factors from AP-42 to estimate the particulate matter emissions from roadway dust entrainment. The emission factor is derived from a variety of variables, including road surface silt loading and the average weight of the vehicles.

A summary of the emission factors used in this analysis can be found in Attachment A, Table A-2.

Conclusions

The air quality analysis results are presented in Attachment A, Table A-2. Of the scenarios evaluated in Attachment A, Table A-2, the most conservative scenario is Scenario 2 (current year, maximum contract allowance VMT). The results from Scenario 2 are presented in Table 1 below.

**Table 1. Change in Emissions from 1999 to the Current Year
(Scenario 2, maximum contract allowance VMT)**

Pollutant	Change in Emissions in SCAQMD (lb/day)	Change in Emissions in SJVAPCD (tpy)	Does the change exceed the SCAQMD significance thresholds?	Does the change exceed the SJVAPCD significance thresholds?
Carbon Monoxide	-41	-3.7	No (550 lbs/day)	N/A
Nitrogen Oxides	-22	-2.0	No (55 lbs/day)	No (10 tpy)
Reactive Organic Gases	-9.2	-0.83	No (55 lbs/day)	No (10 tpy)
Particulate Matter less than 10 microns in diameter	89	8.1	No (150 lbs/day)	N/A
Diesel Particulate Matter	-4.4	-0.41	N/A	N/A
Particulate Matter less than 2.5 microns in diameter	9.4	0.86	No (55 lbs/day)	N/A

Current carbon monoxide (CO), nitrogen oxides (NO_x), reactive organic gases (ROG), and diesel particulate matter (DPM) emissions are less than in 1999, due to the relatively small increase in VMT versus the relatively large decrease in emission factors (i.e., the current fleet is cleaner than the 1999 fleet). The increase in particulate matter less than 2.5 microns in diameter (PM_{2.5}) emissions resulting from the actions taken by the City in February 2000 are considerably lower than the applicable significance thresholds. Finally, the increase in particulate matter less than 10 microns in diameter (PM₁₀) of 86 lbs/day in the South Coast Air Basin is below the applicable significance threshold of 150 lbs/day. The primary source of the increase in PM₁₀ emissions from 1999 to the

² *Assessment of Air Emissions of Transporting Biosolids for Beneficial Reuse to Alternative Locations in Response to Kern County Land Application Ban*, City of Los Angeles, Bureau of Sanitation, September 2006.

current fleet is PM_{10} from dust entrainment, while the PM_{10} emissions resulting from engine combustion actually decrease from 1999 to the current fleet due to cleaner engines.

A T T A C H M E N T A

Analysis Tables

**Table A-1. Evaluation of Average and Maximum Differences in Miles Traveled
City of Los Angeles – Green Acres EIR Review**

Truckload Total Miles Traveled: 240 miles/roundtrip
Miles Traveled in SCAB: 160 miles/roundtrip
Miles Traveled in SJVAB: 80 miles/roundtrip

	Truckloads per day	Miles Traveled per day	Wet Tons per truckload	Source	Change in Miles/day	SCAQMD Miles/day	SJVAPCD Miles/day
Average Scenario:							
1999 (Historical Average)	18.64	4,475	26.51	COLA Data	1,666	1,110	555
Current (2000-2007 Historical Average)	25.58	6,140	26.18	COLA Data			
Maximum Scenario versus Average Scenario:							
1999 (Historical Average)	18.64	4,475	26.51	COLA Data	2,861	1,907	954
Current (Contract Maximum)	30.56	7,335	26.18	COLA Data; 800 WTPD Contract Amount			

**Table A-2. Truck Emission Estimates
1999 Fleet versus Current Fleet Emission Factors
City of Los Angeles – Green Acres EIR Review**

Pollutant	SCAQMD EF, Run Year 1999 ^{1, 2} (pounds/mile)	SJVAPCD EF, Run Year 1999 ^{1, 2} (pounds/mile)	Average EF, Run Year 1999 (pounds/mile)	SCAQMD EF, Current Fleet ^{2, 3} (pounds/mile)	SJVAPCD EF, Current Fleet ^{2, 3} (pounds/mile)	Average Current Fleet EF (pounds/mile)	Scenario 1 (Current, average - 1999, average)		Scenario 2 (Current, contract maximum - 1999, average)		SCAQMD Significance Thresholds (lbs/day)	SJVAPCD Significance Thresholds (tpy)
							Change in SCAQMD Emissions (pounds/day)	Change in SJVAPCD Emissions (tpy)	Change in SCAQMD Emissions (pounds/day)	Change in SJVAPCD Emissions (tpy)		
CO	0.019421277	0.018438189	0.018929733	0.003327407	0.003198042	0.003262724	-43.11	-3.93	-40.51	-3.70	550	--
NO _x	0.048385816	0.048592554	0.048489185	0.025239076	0.025117706	0.025178391	-41.58	-3.79	-21.52	-1.96	55	10
ROG	0.004309220	0.004106888	0.004208054	0.000682689	0.000709313	0.000696001	-9.70	-0.89	-9.15	-0.83	55	10
SO _x	0.000348936	0.000370995	0.000359966	0.000354619	0.000362047	0.000358333	0.39	0.04	0.68	0.06	150	--
PM ₁₀ ⁴	0.003287943	0.003154754	0.003221349	0.001225142	0.000997129	0.001111135	-5.06	-0.46	-4.18	-0.38	--	--
PM ₁₀ ⁵	0.048780432	0.048780432	0.048780432	0.048780432	0.048780432	0.048780432	54.17	4.94	93.03	8.49	--	--
Total PM ₁₀	--	--	--	--	--	--	49.11	4.48	88.85	8.11	150	--
DPM ⁶	0.003146099	0.003012064	0.003079082	0.001088245	0.000851064	0.000969655	-5.22	-0.48	-4.44	-0.41	--	--
PM _{2.5} ⁴	0.002941844	0.002820080	0.002880962	0.001047680	0.000826181	0.000936930	-4.76	-0.43	-4.01	-0.37	--	--
PM _{2.5} ⁵	0.007027565	0.007027565	0.007027565	0.007027565	0.007027565	0.007027565	7.80	0.71	13.40	1.22	--	--
Total PM _{2.5}	--	--	--	--	--	--	3.05	0.28	9.39	0.86	55	--

Notes:

- ¹ EMFAC2007 (version 2.3) Emission Factors for On-Road Heavy-Heavy-Duty Diesel Trucks; Projects in the SJVAPCD and SCAQMD; Run Year 1999
- ² Emission Factor includes emissions from heavy-heavy-duty diesel trucks (33,001 to 60,000 pounds), including start, running and idling exhaust. In addition, ROG emission factors account for diurnal, hot soak, running and resting emissions, and the PM10 & PM2.5 emission factors account for tire and break wear.
- ³ Current truck fleet from *Assessment of Air Emissions of Transporting Biosolids for Beneficial Reuse to Alternative Locations in Response to Kern County Land Application Ban*, prepared by Solid Resources Support Services Division, Bureau of Sanitation, September 2006; used emission factors from CARB's Carl Moyer Program Guidelines, Part IV, Appendices, November 17, 2005; represents emissions from actual truck fleet mix in 2006. Used EMFAC2007 to estimate emission rates for each model year truck in current fleet and took average to estimate fleet-wide emission rate.
- ⁴ EMFAC2007 Emission Factors: PM₁₀ & PM_{2.5} emission factors account for tire and break wear. Conservatively assumed all PM₁₀ is PM_{2.5} for current fleet emission factors
- ⁵ Emission Factors from AP-42, Chapter 13.2.1 (Paved Roads)
 $E = k * (sL/2)^{0.65} * (W/3)^{1.5} - C$, variables are from AP-42, Chapter 13.2.1 and URBEMIS2007
- ⁶ EMFAC2007 Emission Factors: DPM emission factor includes only the exhaust portion of PM₁₀ emissions.

k, PM _{2.5} (particle size multiplier)	0.0024 lb/VMT	
k, PM ₁₀ (particle size multiplier)	0.016 lb/VMT	
sL (road surface silt loading)	0.1 g/m ²	
W (average weight of the vehicles)	23.25 tons	(average range of vehicle class weight)
C, PM _{2.5} (emission factor for 1980s vehicle fleet exhaust)	0.00036 lb/VMT	
C, PM ₁₀ (emission factor for 1980s vehicle fleet exhaust)	0.00047 lb/VMT	