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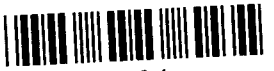
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EPA-450/3-74-037

DEVELOPMENT OF EMISSION FACTORS FOR FUGITIVE DUST SOURCES

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CHAPTER 7

BUILDING CONSTRUCTION EMISSIONS

Under a separate contract from EPA, PEDCo-Environmental conducted a field investigation of atmospheric dust emissions from construction activities in the Southwest. A preliminary report[7] on the findings was submitted to EPA during February 1973. This section provides a further analysis of the sampling data from two construction sites in order to develop an emission factor for this source category and to evaluate several factors which affect the emission rate.

The original analysis of fugitive dust emissions from construction activities was based upon limited data available at the time of report preparation, and as such the conclusions derived therefrom were considered only preliminary. This supplemental evaluation is based upon all the sampling data which were collected at two locations, namely, Paradise Valley in Phoenix, Arizona, and a construction area in Las Vegas, Nevada. The conclusions which are derived from this larger data base, while not significantly different from the initial findings, do point to a slightly lower emission factor from construction activities.

The Paradise Valley construction site was an 80-acre residential development with a shopping center. Because atmospheric dust emissions from the construction activity were generated by diffuse and variable operations, conventional high-volume samplers, operated for 24-hr periods, were used to measure emissions.

PARADISE VALLEY CONSTRUCTION STUDY

Figure 21 shows the locations of six sampling stations in relation to the construction site in Paradise Valley. Samples were collected periodically at these stations between 31 August and 22 October 1972. A daily record of construction activity at the site was maintained throughout this period.

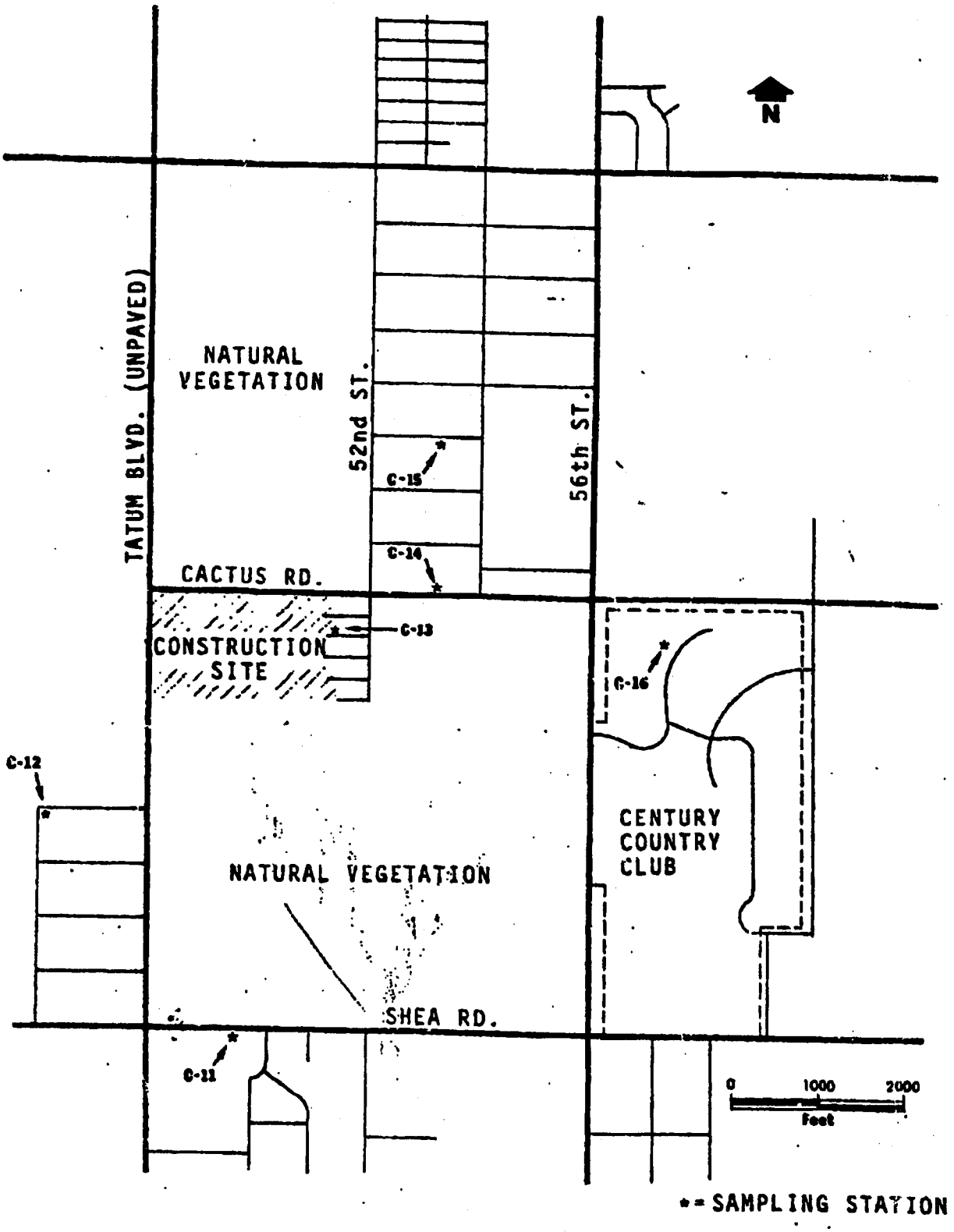

Figure 21. Paradise Valley construction site.

Test Results

An examination of the particulate concentrations ob[illegible] the sampling locations revealed that Station C-12 usually recorde[illegible] values which were not representative of either normal ba[illegible] trations or concentrations expected to be contributed from the [illegible] tion activity. An on-site examination earlier had revealed that this sampling location was far from an ideal exposure and therefore data obtained from this location were not used for evaluation purposes.

Station C-16 was located farthest from the construction site. Since it was seldom downwind from the site, it did not show an impact from construction activity. Consequently, data obtained from this location was also judged unsuitable for evaluation purposes.

Suspended dust concentrations measured at Stations C-11, C-13, C-14 and C-15, grouped according to wind directions, are listed in Table 35. This breakdown facilitated proper documentation of concentrations at background and downwind stations and subsequent evaluation of the contribution from the construction activity.

A cursory examination of pollution roses presented in Figure 22 indicates that the effect of the construction activity was reflected at sampling Stations C-13, C-14 and C-15 when they were downwind from the construction site. This occurred during periods when the wind was from the southwest quadrant, the predominant wind direction during the sampling period. Under these conditions, Station C-11 served as the background station. It had an average concentration of 130 $\mu g/m^3$.

Station C-13, located just east of the construction site, recorded an average concentration of about 260 $\mu g/m^3$. During the periods of southerly, southwesterly and westerly winds, this station recorded its highest concentrations. This definitely reflects the contribution from the construction site to the concentration at this location.

Station C-14, located northeast of the construction site, also reflects higher concentrations. The average concentration recorded at this site was about 225 $\mu g/m^3$. This was as expected in view of its relative distance from the construction site compared to C-13, but is definitely indicative of contribution from the construction activity.

It is also important to note that the respective ordinate lengths of the pollution rose for this station were smaller than those at Station C-13, a trend which has been exhibited at Station C-15 as well. Apparently there were no localized activities downwind from the construction site impacting on these sampling stations; the effect of the construction activity was

Table 35. SUSPENDED PARTICULATE CONCENTRATIONS ($\mu g/m^3$)
(Paradise Valley: 31 August - 22 October 1972)

Station	Wind Direction							
	N	NE	E	SE	S	SW	W	NW
C-11	219		137	105	203	347	152	28
			130	256	212	152	95	138
			160	155			163	102
				136			185	42
				129			170	114
	—		—	—	—	—	—	73
Average	219		142	156	208	250	153	03
C-13	254		236	130	353	461	212	168
			166	492	389	487	375	123
			285	349				47
				239				49
	—		—	201	—	—	—	12?
Average	254		229	282	371	474	294	103
C-14	593		296	176	370	324	280	23
			161	296	258	368	251	166
			131	171			336	194
				187			312	49
	—		—	192	—	—	70	126
Average	593		190	204	346	346	250	112
C-15	105		117	163	328	363	169	65
			130	374	292	365	141	118
				198			240	24
				114			415	57
	—		—	94	—	—	—	78
Average	105		124	189	310	364	241	68

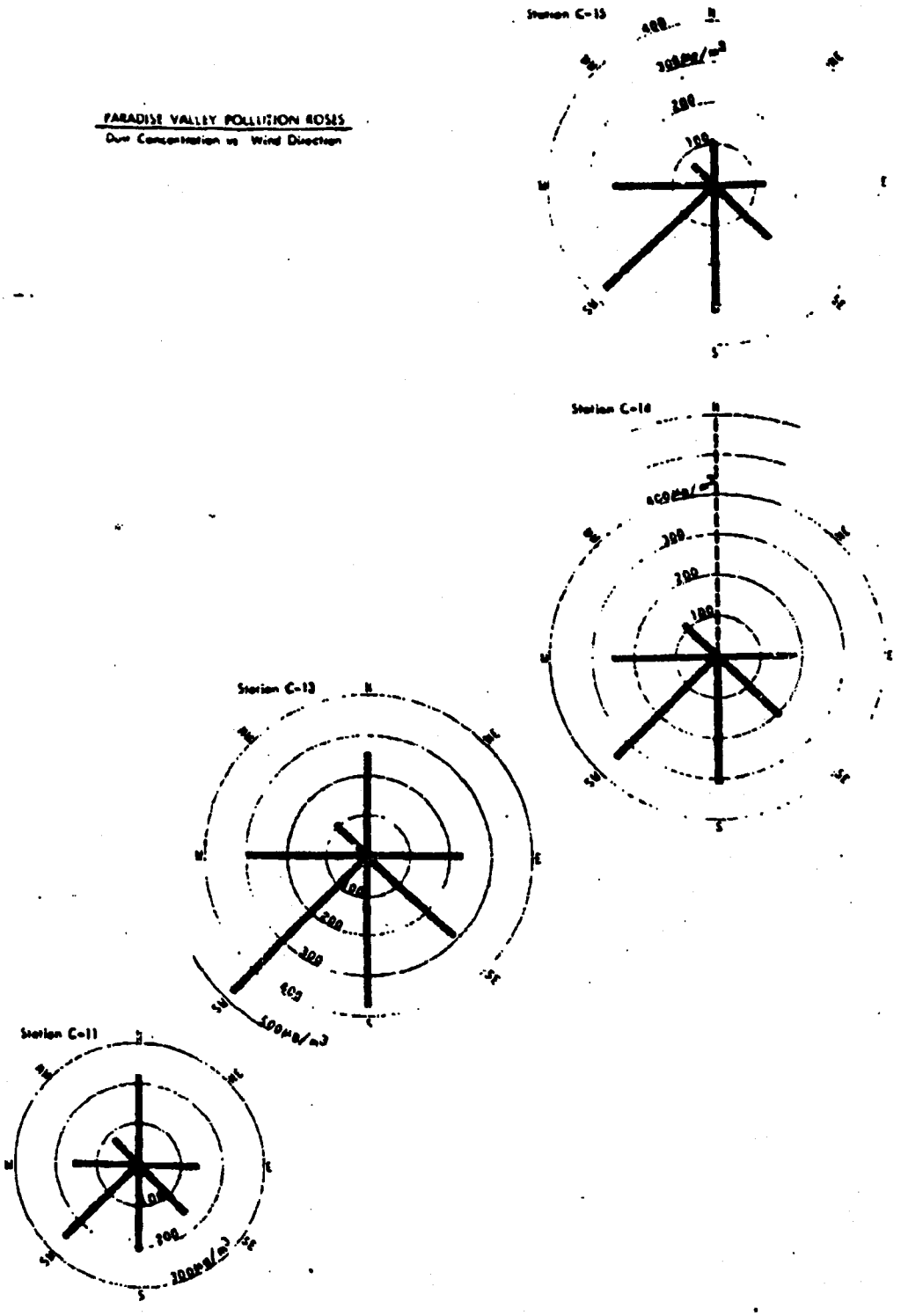

Figure 22. Pollution Roses - Paradise Valley Construction Site.

felt at all these stations, but to a progressively lesser degree depending on the distance away from the construction site.

Calculated Emission Factors

Since the wind was predominantly from the southwest quadrant during the sampling study and since the stations were aligned in that direction from the site, it was possible to determine the construction site source strength values using dispersion equation calculations. The procedure is outlined below.

For a particular wind direction of interest:

I. (a) Determine the average concentrations recorded at downwind stations (in this case, Stations C-13, C-14 and C-15).
(b) Determine the average concentration recorded at background station (in this case, Station C-11).
(c) Determine the source strength using dispersion equations.

II. (a) Determine the average concentration recorded at one of the downwind stations. For this purpose, it is desirable to use the closest station downwind from the construction site, since the distance of plume travel will be short and as such the cumulative effects of local terrain features will be small.
(b) Determine the average concentration recorded at background station.
(c) Determine the source strength using dispersion equations.

If the source strength values obtained in steps I(c) and II(c) above are approximately the same, and if similar values are obtained for S, SW, and W winds, it can be concluded that this estimation technique provides reproducible results and is descriptive of the actual emission rates.

The calculations for the three wind directions are presented in Appendix B and summarized in Table 36.

It is evident from these results that the source strength values calculated for the southwesterly winds are comparable and closer to each other than the other two pairs of values. This is probably because the sampling stations are lined up best for the southwesterly winds. Consequently, it may be concluded that the values of 1.37 and 1.41 tons/acre/month are closer to the actual emissions from the construction site. A value of 1.4 tons/acre/month will be used for the average dust emission factor.

Table 36. CALCULATED EMISSION FACTORS
(Paradise Valley Construction Site)

Wind Direction	Q, Emissions (tons/acre/month)	
	Based on C-13 Only	Based on Average of C-13, C-14 and C-15
Southwest	1.37	1.41
South	1.13	1.51
West	0.42	0.65

Correction for Activity Level

An activity log was maintained during the sampling period on daily activity level at the Paradise Valley construction site. Information obtained on the activity level was grouped into one of three categories--no activity, light to moderate activity, and heavy activity. Granted that such categorization was based more upon subjective evaluation rather than quantifiable parameters, it was hoped that such an analysis might yield a significant difference in respective fugitive dust emission rates.

Table 37 presents the measured particulate concentrations at the four sampling stations subdivided by activity level. The average concentrations for the various levels of activities do indicate a correlation between emission rate and activity level, as shown in Table 38.

Quantification of emissions associated with the level of activity should not be determined using just the above breakdown, since this breakdown includes data collection from all wind directions. Therefore, a further breakdown was made to separate the data collected when the wind was from the southwest quadrant (W, SW and S winds). This data analysis is shown in Table 39.

It is evident from Table 39 that there is not sufficient data to quantify the source emissions associated with each activity level. For the "no activity" category, there are insufficient data with, at best, one value. The comparison is further complicated by the fact that emissions were reduced during some of the sampling periods by application of water on the construction site.

For these reasons, it was not possible to quantify emissions associated with activity level. However, from the above two tables and from an examination of individual readings, it can generally be concluded that:

1. Light to moderate activity does not produce significantly higher emissions than no activity; and
2. Watering does not always show reduced emissions. This may be explained by the fact that watering is applied only on days that are extremely dusty or when heavy activity is expected.

LAS VEGAS CONSTRUCTION STUDY

Figure 23 shows the locations of five sampling stations in relation to the construction site in Las Vegas. The sampling program was conducted during the period between 21 August and 22 October 1972.

Table 37. ACTIVITY LEVEL VS PARTICULATE CONCENTRATION ($\mu g/m^3$)
(Paradise Valley)

	No Activity				Light/Moderate Activity				Heavy Activity			
Station	Date	Wind Dir.	Wind Speed	Concentration	Date	Wind Dir.	Wind Speed	Concentration	Date	Wind Dir.	Wind Speed	Concentration
C-11	9-30-72	W	5	185	9-20-72	W	2	95	8-31-72	SW	9	347
	9-2-72	SE	7	105	9-28-72	W	2	163	9-6-72	SW	3	152
	9-24-72	E	2	160	10-6-72	W	2	170	9-12-72	SW	6	152
	10-4-72	NW	2	28	10-2-72	SE	3	136	9-4-72	S	6	203*
	10-8-72	NW	2	138	9-18-72	E	2	137	9-14-72	S	7	212
	10-18-72	NW	3	42	9-22-72	E	2.5	130	9-8-72	SE	6	256
	10-22-72	NW	2	73	10-10-72	NW	2	102*	9-26-72	SE	1.5	155
	9-10-72	D.I.	8	97	10-20-72	NW	2	114*	10-16-72	SE	3	129
	10-14-72	D.I.	Calm	95					10-12-72	W	2	219
Avg.				103				131				203
C-13	9-2-72	SE	7	130	9-20-72	W	2	212	9-6-72	SW	3	461
	9-24-72	E	2	285	9-28-72	W	2	175	9-12-72	SW	6	427
	10-8-72	NW	2	168	10-2-72	SE	3	259	9-4-72	S	6	353*
	10-18-72	NW	3	47	9-18-72	E	2	236	9-14-72	S	7	389
	10-22-72	NW	2	127	9-22-72	E	2.5	166	9-8-72	SE	6	452
	9-10-72	D.I.	8	147	10-10-72	NW	2	125*	9-26-72	SE	1.5	349
	10-14-72	D.I.	Calm	186	10-20-72	NW	2	99*	10-16-72	SE	3	201
									10-12-72	W	2	254
Avg.				156				207				373
C-14	9-30-72	W	5	312	9-20-72	W	2	291	8-31-72	SW	9	324
	9-2-72	SE	7	176	9-28-72	W	2	336	9-6-72	SW	3	280
	9-24-72	E	2	113	10-6-72	W	2	70	9-12-72	SW	6	368
	10-4-72	NW	2	23	10-2-72	SE	3	187	9-4-72	S	6	370*
	10-8-72	NW	2	166	9-18-72	E	2	296	9-14-72	S	7	258
	10-18-72	NW	3	49	9-22-72	E	2.5	161	9-8-72	SE	6	296
	10-22-72	NW	2	126	10-10-72	NW	2	194*	9-26-72	SE	1.5	171
	9-10-72	D.I.	8	117					10-16-72	SE	3	192
	10-14-72	D.I.	Calm	285					10-12-72	W	2	593
Avg.				143				214				317
C-15	9-30-72	W	5	415	9-20-72	W	2	141	8-31-72	SW	9	363
	9-2-72	SE	7	163	9-28-72	W	2	240	9-6-72	SW	3	169
	10-8-72	NW	2	65	10-2-72	SE	3	114	9-12-72	SW	6	365
	10-18-72	NW	3	24	9-18-72	E	2	117	9-4-72	S	6	328*
	10-22-72	NW	2	76	9-22-72	E	2.5	130	9-14-72	S	7	292
	9-10-72	D.I.	8	103	10-10-72	NW	2	118*	9-8-72	SE	6	374
	10-14-72	D.I.	Calm	121	10-20-72	NW	2	57*	9-24-72	SE	1.5	198
									10-16-72	SE	3	94
									10-12-72	W	2	105
Average				138				131				284

* Indicates no watering applied
D.I. means direction indeterminate

Table 38. DUST CONCENTRATION VS ACTIVITY LEVEL

	Average Concentration ($\mu g/m^3$)		
Station	No Activity	Light to Moderate Activity	Heavy Activity
C-11	103	131	203
C-13	156	207	373
C-14	143	214	317
C-15	138	131	254
Average	135	171	287

Table 39. ACTIVITY LEVEL VS CONCENTRATION ($\mu g/m^3$) FOR W, SW AND S WINDS

Station	No Activity	Light to Moderate Activity	Heavy Activity
C-11	185	95	347
		163	152
		170	152
			203
			212
Average	185	143	213
C-13		212	461
		375	487
			353
			389
Average	--	294	423
C-14	312	251	324
		336	280
		70	368
			370
Average	312	219	336
C-15	415	141	363
		240	169
			365
			328
			292
Average	415	191	303

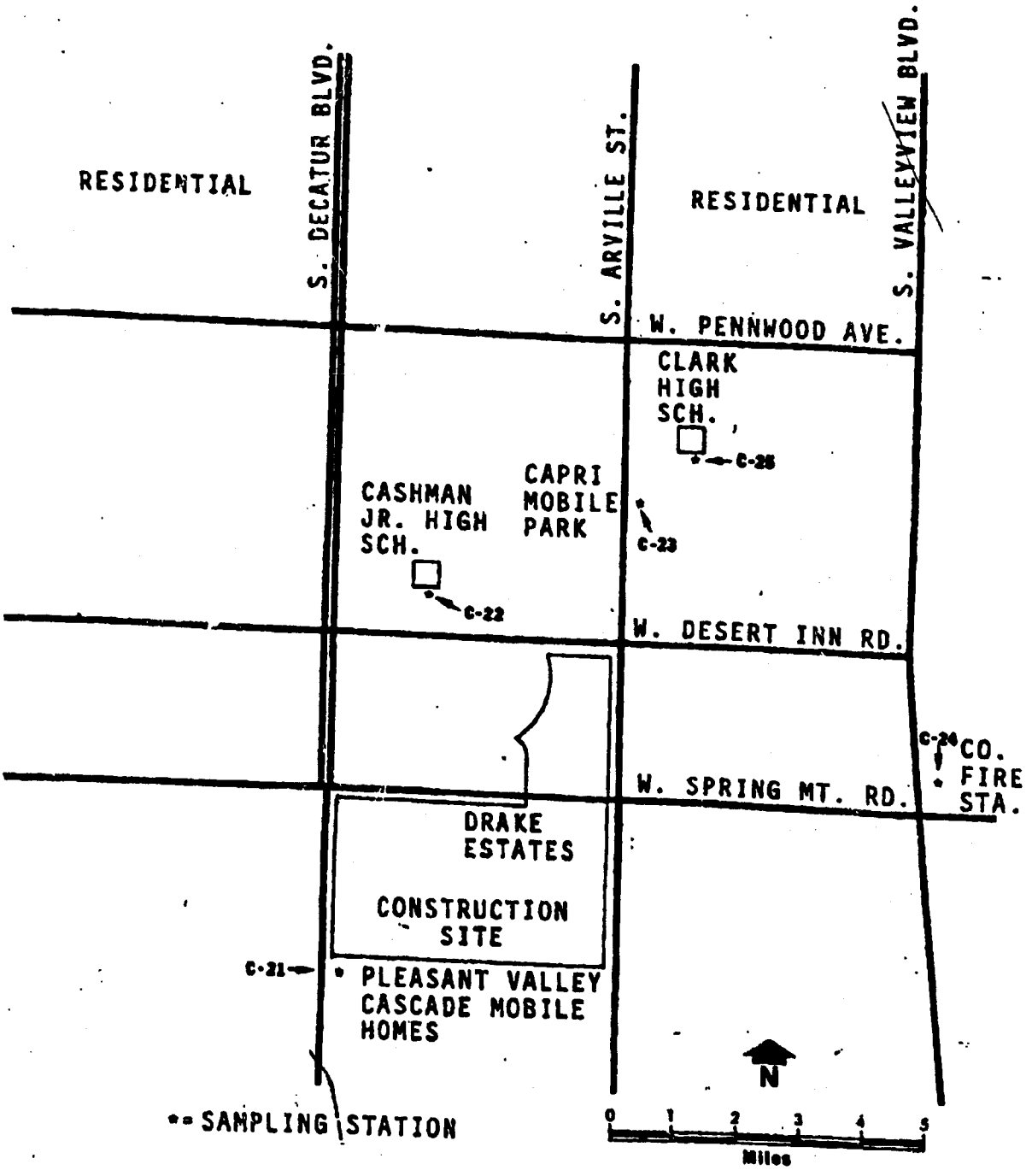

Figure 23. Las Vegas construction site.

Test Results

Data collected during this sampling program have been grouped according to wind direction and are shown in Table 40, and in Figure 24 in the form of pollution roses for each sampling station.

An examination of tabulated data and the pollution roses developed therefrom indicates that Station C-21, which was located just south of the construction site (see Figure 23), recorded higher particulate concentrations during northerly winds than during the periods when the wind was from other directions. Therefore, it was concluded that the only local activity which contributed particulate emissions to this station was the construction activity under study.

Station C-22, which was located north of the construction site, recorded higher concentrations during southerly and southwesterly winds, which may be attributed to the construction activity. However, this sampling station also recorded high concentrations during northerly and westerly winds. With winds from those directions, the effect of the construction site should not be felt at this sampling station, thus strongly indicating that there were other localized activities in the vicinity of this station which contributed to higher concentration.

Data collected at Station C-23, which was located northeast of the construction site, also indicate possible contribution from localized activities other than the construction activity. This is evident from the higher concentrations recorded during northerly, northeast, southeast and perhaps westerly winds also. Higher concentrations recorded during southwesterly winds may be attributed to construction activity but can possibly be attributed to localized activities immediately west of the sampling station.

Station C-24 might have had interference from localized activities as evidenced by higher readings during northerly winds. The interfering source(s) could be the same located north of this station, which contributed to higher concentration at C-23 during southeasterly winds.

Station C-25, which was located on the premises of Clark High School, recorded concentrations comparable to expected ambient concentrations.

From the above analysis, it appears that all the sampling data collected at these stations cannot be used to evaluate the effect of the construction site activity because of possible interferences at some stations from other localized activities, even though the predominant wind as determined from the collected meteorological data was from the southwest and the locations of the sampling stations appear to be

Table 40. LAS VEGAS SITE - SAMPLE VALUES (pR/m^3)
SAMPLING PERIOD - 21 AUGUST - 22 OCTOBER 1972

Station	N	NE	E	SE	S	SW	W	NW
C-21	48	48		60	49	66	83	
	717	143		68		83		
	204	18		73		147		
	255			49		19		
						100		
						196		
						122		
						46		
						37		
						34		
						41		
						42		
						45		
Average	306	70		63	49	75	83	
C-22	46	56		64	122	38	102	
	314	97		69		125		
	152	44		52		127		
	71			80		126		
						151		
						79		
						220		
						135		
						80		
						99		
						132		
						94		
						104		
						263		
Average	146	66		66	122	127	102	
C-25		47		77		57	74	
				67		74		
				61		54		
						73		
						115		
						83		
						33		
						46		
						27		
						57		
						32		
						85		
Average		47		68		61	74	
C-23	102	109		89	85	228	127	
	336	205		196		300		
	112			142		238		
	133			164		236		
				188		128		
						194		
						104		
						127		
						148		
						69		
						139		
						71		
						37		
						68		
						76		
Average	171	157		156	85	144	127	
C-24	73	39		56	75	173	99	
	206	74		94		97		
	64	79		86		84		
	88			52		97		
				89		115		
						230		
						114		
						47		
						106		
						128		
						72		
						54		
						57		
						128		
Average	108	67		75	75	107	99	

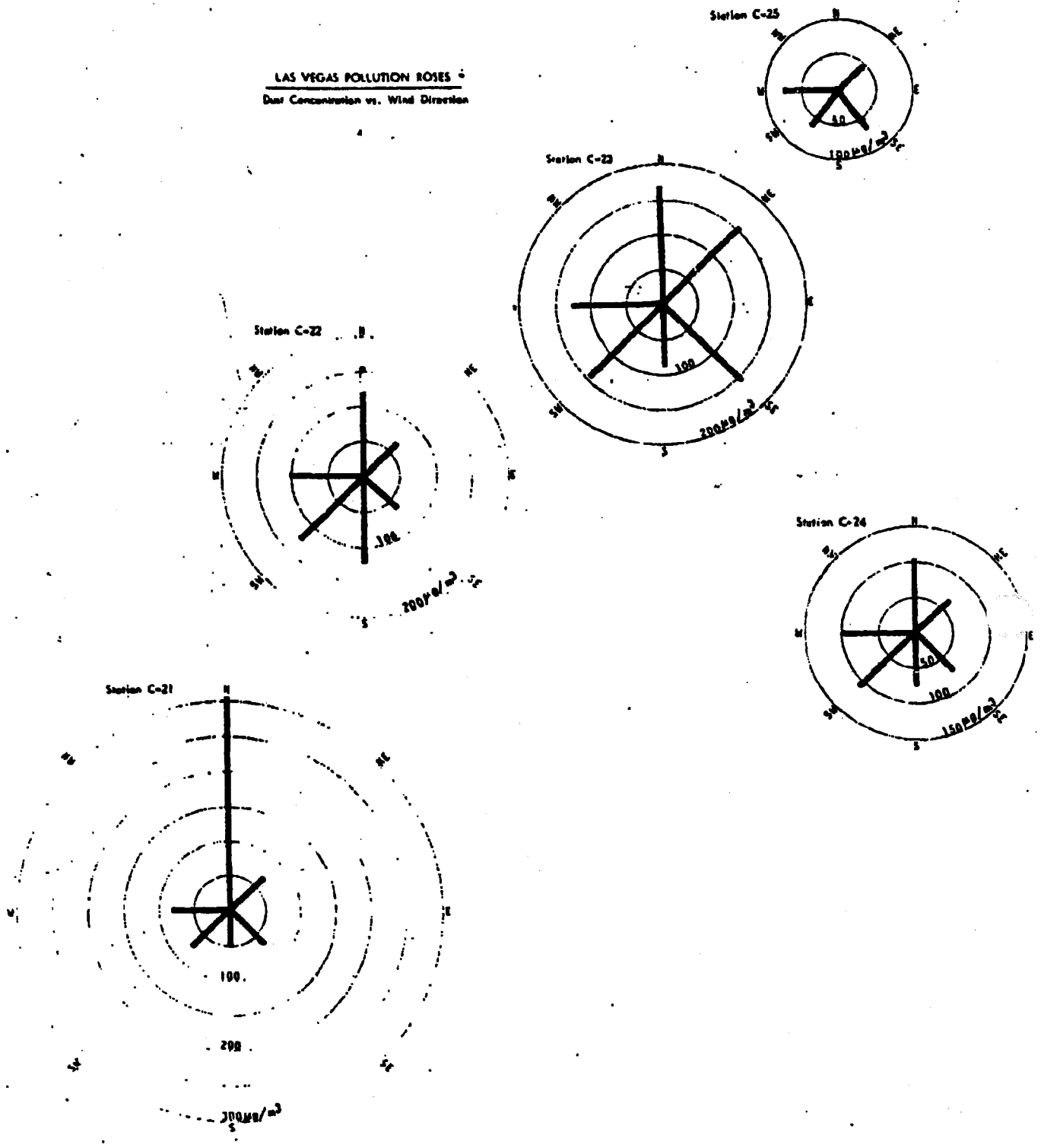

Figure 24. Pollution Roses - Las Vegas Construction Site.

lined up best for this wind. On the other hand, it would appear that for northerly winds, all the sampling data collected can be used to estimate the contribution from the construction site with Station C-21 serving as downwind station and Stations C-22, C-23 and C-25 serving as background stations. It should be mentioned that for this wind, even though the background stations' readings might reflect interferences from other sources, the contribution of the construction site will be superimposed upon these readings and will be reflected at Station C-21.

Computed Emission Factors

With the knowledge that the sampling stations originally were located to reflect only the contribution from the construction activity, a check on the validity of the collected data was made using the following methodology. The collected data have been separated out for the desired wind directional analysis and are given in Table 41.

I. For southwesterly wind

(a) Determine average concentration recorded at Stations C-22 and C-23 and assume this value to reflect particulate contribution from the construction site.
(b) Determine the average concentration at background station (Station C-21).
(c) Determine source emission strength of the construction activity using dispersion calculations (calculations similar to the ones performed earlier).

II. For northerly wind

(a) Determine average concentration recorded at Station C-21 and assume this to reflect contribution from the construction site.
(b) Determine average concentration at background Stations C-22 and C-23.
(c) Determine source emission strength using dispersion calculations.

If the source strength values obtained in steps I(c) and II(c) are comparable to each other, then we can assume that the effect of localized sources were negligible during southwesterly winds and the apparent distortion of pollution rose might be due to the micrometeorology of the study area. On the other hand, if these values are not comparable, then we can assume that the localized sources did have an effect in the recorded concentrations at some of these stations. In this case, the value determined in step II(c) for northerly wind can be considered to be representative of

Table 41. MEASURED CONCENTRATIONS DURING N, NE, S AND SW WINDS
($\mu g/m^3$)

Date	C-21	C-22	C-23	C-25	C-24	Wind Direc.	Speed
8-21-72	48	46	102	-	73	N	8
8-23-72	717	314	336	-	206		9
8-25-72	204	152	112	-	64		8
8-27-72	255	71	133	-	88		6
	Avg=306	Avg=146	Avg=71		Avg=108		Avg=7.8 mph
			Avg=142				
9-2-72	48	56	109	-	39	NE	7
9-4-72	143	97	-	-	74		9
9-18-72	18	46	205	47	79		8
	Avg=70	Avg=66	Avg=157		Avg=64		Avg=8.0 mph
			Avg=84				
10-8-72	49	122	85	46	75	S	11
8-29-72	66	38	228	-	173	SW	8
9-10-72	147	-	236	-	97		12
9-22-72	19	127	236	57	84		8
9-24-72	-	126	128	74	-		8
9-26-72	-	151	194	54	97		11
9-30-72	100	79	104	73	115		6
10-2-72	196	220	127	115	230		9
10-4-72	122	135	148	83	114		7
10-6-72	46	80	69	33	47		6
10-10-72	37	99	139	27	106		9
10-12-72	34	132	-	-	128		5
10-16-72	41	94	71	57	72		5
10-18-72	42	104	37	32	54		5
10-20-72	45	263	68	85	57		5
10-22-72	-	-	76	-	128		8
	Avg-75	Avg=127	Avg=130	Avg=63	Avg=107		Avg=7.5 mph
			Avg=107				

emissions from the construction site since there are no interferences surrounding Station C-21.

The results of the calculation exercise as outlined in steps I and II are given in Table 42.

It is apparent from Table 42 that the source emission strength values derived for southwesterly and northerly winds are not comparable to each other. Since the northerly wind direction apparently had the least interference from other emission sources, a "Q" value of approximately 1.0 tons/acre/month should be representative of the actual emission rate from this site.

Correction for Activity Level

An attempt was made to correlate the data obtained from the sampling program with the activity level at the construction site. The data were broken down into three categories of activity level (namely, no activity, light to moderate activity, and heavy activity) for each sampling station, as shown in Table 43. Within each category, further breakdown was made by grouping the data into different sectors of wind directions, and analyzing for any correlation which existed between the measured concentrations and the activity level. As can be seen from the summaries in Table 44, it is not possible to derive any meaningful correlation factors or to quantify the source emission strengths associated with each activity level.

The reasons for lack of any correlation are suspected to be the same as those for the Paradise Valley data: (a) the categorization of activity at the construction site into three groups was based upon subjective rather than definite emission quantifying parameters; and (b) apparent localized emissions surrounding some of the sampling locations in this study area possibly have rendered the data unsuitable for this type of analysis. It is of interest to note that the data collected during periods of northerly and northeasterly winds reflect a trend between expected concentration and activity level. However, these data are insufficient to quantify the emissions.

Table 42. RESULTS OF DISPERSION CALCULATIONS

Wind Direction	Receptor Station(s)	Background Station(s)	Stability Class	Q = Emission Strength g/sec	ton/year	ton/acre/month
Southwesterly	C-22, C-23	C-21	C	20.9	730	0.61
Southwesterly	C-22 only	C-21	C	20.3	703	0.59
Northerly	C-21	C-22, C-23	C	32.8	1,150	0.96

Table 43. LAS VEGAS CONSTRUCTION STUDY ACTIVITY LEVEL VS CONCENTRATION ($\mu g/m^3$)

	No Activity			Light/Moderate Activity			Heavy Activity		
Station	Date	Wind Dir.	Concentration	Date	Wind Dir.	Concentration	Date	Wind Dir.	Concentration
C-21	8-27-72	N	255	8-25-72	N	204	8-21-72	N	48
	9-2-72	NE	48	9-8-72	NE	60	8-23-72	N	717
	9-4-72	NE	143	9-18-72	NE	18	9-12-72	SE	68
	9-16-72	SE	49	9-22-72	SW	19	9-14-72	SE	73
	10-8-72	S	49	10-4-72	SW	122	8-29-72	SW	66
	9-10-72	SW	147	10-6-72	SW	46	8-31-72	SW	83
	9-30-72	SW	100	10-10-72	SW	37	10-2-72	SW	196*
				10-12-72	SW	34	10-20-72	SW	45
				10-16-72	SW	41			
				10-18-72	SW	42			
				9-28-72	W	83*			
Avg.			113			64			162
C-22	8-27-72	N	71	8-25-72	N	152	8-21-72	N	46
	9-2-72	NE	56	9-18-72	NE	46	8-23-72	N	314
	9-4-72	NE	97	9-22-72	SW	127	9-12-72	SE	64
	9-16-72	SE	52	9-26-72	SW	151	9-14-72	SE	69
	10-8-72	S	49	10-4-72	SW	135	9-20-72	SE	80
	9-24-72	SW	126	10-6-72	SW	80	8-29-72	SW	38
	9-30-72	SW	79	10-10-72	SW	99	8-31-72	SW	125
				10-12-72	SW	132	10-2-72	SW	225*
				10-16-72	SW	94	10-20-74	SW	263
				10-18-72	SW	104			
				9-28-72	W	102*			
Avg.			76			111			136
C-23	8-27-72	N	133	8-25-72	N	112	8-21-72	N	102
	9-2-72	NE	109	9-18-72	NE	205	8-23-72	N	336
	9-16-72	SE	164	9-8-72	SE	89	9-12-72	SE	196
	10-8-72	S	85	9-22-72	SW	236	9-14-72	SE	142
	9-10-72	SW	238	9-26-72	SW	194	9-20-72	SE	188
	9-24-72	SW	128	10-4-72	SW	148	8-29-72	SW	238
	9-30-72	SW	104	10-6-72	SW	69	8-31-72	SW	300
	10-22-72	SW	76	10-10-72	SW	139	10-2-72	SW	127
				10-16-72	SW	71	10-20-72	SW	68
				10-18-72	SW	37			
				9-28-72	W	127*			
Avg.			130			130			187
C-24	8-27-72	N	88	9-18-72	NE	79	8-21-72	N	73
	9-2-72	NE	39	9-8-72	SE	56	8-23-72	N	206
	9-4-72	NE	74	9-22-72	SW	84	8-25-72	N	64
	9-16-72	SE	52	9-26-72	SW	97	9-12-72	SE	94
	10-8-72	S	75	10-4-72	SW	114	9-14-72	SE	86
	9-10-72	SW	97	10-6-72	SW	47	9-20-72	SE	89
	9-30-72	SW	115	10-10-72	SW	106	8-29-72	SW	173
	10-22-72	SW	128	10-12-72	SW	128	10-2-72	SW	230
				10-16-72	SW	72	10-20-72	SW	57
				10-18-72	SW	54			
				9-28-72	W	99*			
Avg.			84			85			119
C-25	10-8-72	S	46	9-18-72	NE	47	9-12-72	SE	77
	9-24-72	SW	74	9-22-72	SW	51	9-14-72	SE	67
	9-30-72	SW	73	9-26-72	SW	54	9-20-72	SE	61
				10-4-72	SW	83	10-2-72	SW	115
				10-6-72	SW	33	10-20-72	SW	85
				10-10-72	SW	27			
				10-16-72	SW	57			
				10-18-72	SW	32			
				9-28-72	W	74*			
Avg.			64			51			81

* indicates no watering applied.

Table 44. LAS VEGAS CONSTRUCTION STUDY ACTIVITY LEVEL VS CONCENTRATION

Station	Wind Direction	Average Concentration ($\mu g/m^3$)		
		No Activity	Light to Moderate Activity	Heavy Activity
C-21	All Directions	113	64	162
C-22		76	111	135
C-23		130	130	187
C-24		84	85	119
C-25		64	51	81
C-21	S, SW	99	49	97
C-22		84	115	162
C-23		126	128	181
C-24		104	88	153
C-25		64	48	100
C-21	N, NE	149	94	383
C-22		75	99	180
C-23		121	159	219
C-24		67	79	114
C-25		--	47	--

SUMMARY AND CONCLUSIONS

The estimated emission values from the two construction sites in Phoenix and Las Vegas were 1.4 and 1.0 tons/acre/month, respectively. Based on the same methodology, except for the division of data into individual wind directions, the preliminary data (first half of sampling period) had indicated the values to be 1.8 and 1.0. The observed difference in estimated emission rates between the two construction sites is attributed to differences in soil texture and to meteorological factors such as frequency of precipitation, atmospheric turbulence, etc.

For development of an emission factor for widespread use, these two numbers should certainly not be considered as representative of the full range of emission rates that might be encountered. To the contrary, both sampling locations were in the desert southwest, and are therefore probably much higher than emission rates from similar construction projects located in more moderate climates. The average of the two values, 1.2 tons/acre/month, is recommended for use as the high end of the range for this factor, i.e., appropriate for application in arid areas with watering for dust control.

Construction activity levels were shown to influence emission rates from the sites significantly. However, this variation could not be quantified. The final factor represents emission rates during the period of active construction, including some days with no activity, some with moderate activity, and some with heavy earth-moving equipment and considerable truck traffic. Substantial error may result if the factor is applied to a site during a period of extended inactivity.