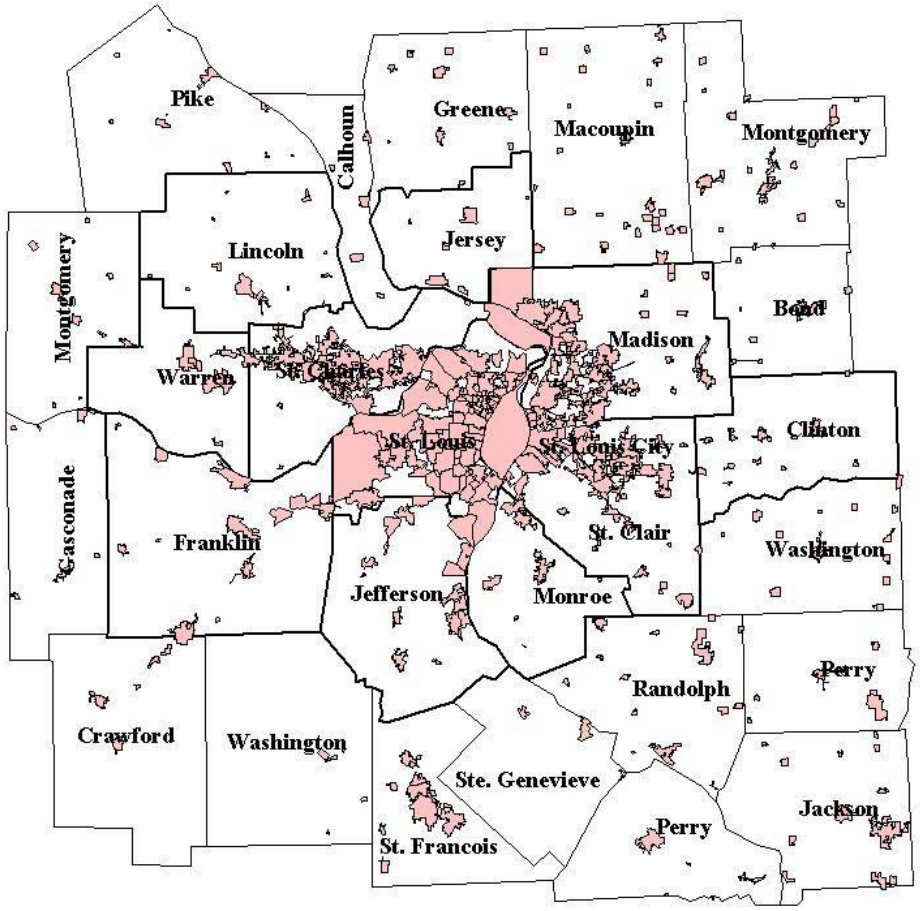
DEGREE URBANIZATION IN THE ST LOUIS AREA



Urban Areas

Missouri Department of Natural Resources
Air and Land Protection Division
Air Pollution Control Program
Cartography by Donald Cripe, January 2003

Table 2.5-2. Population Projections by County for the St. Louis Area

	1990	1995	2000	2000 Actual	2005	2010	2015	2020	% Growth 2000-2020
MISSOURI									
St. Louis	993,529	1,003,356	1,003,268	1,016,315	996,268	986,265	977,159	969,774	-3.3%
St. Louis City	396,685	360,720	322,734	348,189	286,109	251,773	220,366	191,908	-40.5%
St. Charles	212,907	246,339	281,816	283,883	315,618	348,587	381,032	411,984	46.2%
Jefferson	171,380	185,475	200,159	198,099	214,120	227,729	240,738	252,463	26.1%
Franklin	80,603	87,296	94,339	93,807	100,937	107,200	113,067	118,279	25.4%
St. Francois	48,904	53,092	56,673	55,641	59,831	62,753	65,324	67,530	19.2%
Lincoln	28,892	32,743	37,183	38,944	41,650	46,235	50,838	55,260	48.6%
Warren	19,534	22,354	25,219	24,525	28,043	30,864	33,656	36,273	43.8%
Washington	20,380	21,910	23,272	23,344	24,486	25,611	26,601	27,448	17.9%
Crawford	19,173	21,241	23,186	22,804	25,081	26,864	28,479	29,943	29.1%
Pike	15,969	16,145	16,760	18,351	16,809	16,829	16,783	16,677	-0.5%
Ste. Genevieve	16,037	16,597	17,317	17,842	17,977	18,591	19,153	19,610	13.2%
Gasconade	14,006	14,415	15,022	15,342	15,634	16,264	16,911	17,491	16.4%
Montgomery	11,355	11,606	11,933	12,136	12,269	12,592	12,876	13,095	9.7%
ILLINOIS									
Madison	249,238	256,246	260,445	258,941	265,765	270,355	275,224	284,362	9.2%
St. Clair	262,852	266,038	280,070	256,082	289,841	299,642	307,460	315,727	12.7%
Clinton	33,944	35,309	36,086	35,535	36,574	37,147	38,010	39,032	8.2%
Monroe	22,422	24,789	26,938	27,619	29,105	31,140	33,106	35,545	32.0%
Jersey	20,539	22,032	22,930	21,668	23,845	24,772	26,070	28,082	22.5%

Missouri information developed by the Office of Admininstration, Division of Budget and Planning, May 1999
Illinois information developed by the Census Data and Users Service, Illinois State University, 1998

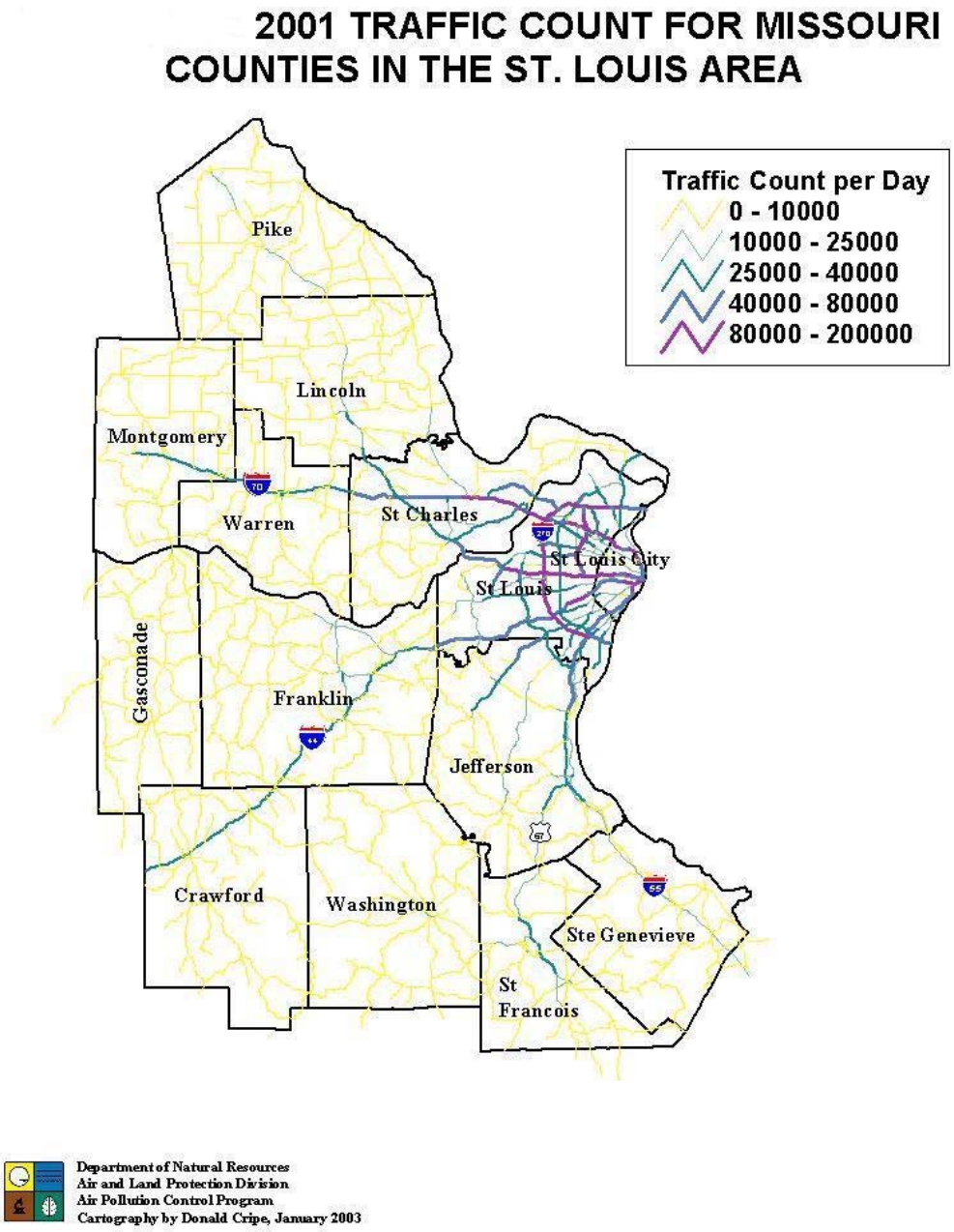


Figure 2.5-3. Traffic count for Missouri Counties in the St. Louis area.

Table 2.5-3. Place of Residence/Employment Matrix by County for the St. Louis Area

Residence	Employment (Missouri)														
	Crawford	Franklin	Gasconade	Jefferson	Lincoln	Montgomery	Pike	St. Charles	St. Francois	St. Louis	St. L. City	Ste. Genevieve	Warren	Washington	Missouri Total
MISSOURI															
St. Louis	24	1,752	46	5,463	116	27	11	12,859	89	358,742	105,207	30	180	33	484,579
St. Louis City	17	291	0	1,181	12	0	0	1,439	32	50,997	82,480	0	45	0	136,494
St. Charles	7	555	15	380	729	38	85	70,058	6	62,353	10,930	0	722	0	145,878
Jefferson	3	1,013	5	34,331	35	4	0	1,291	410	42,181	15,947	123	24	130	95,497
Franklin	451	27,161	750	780	15	11	0	766	0	11,842	2,253	3	343	17	44,392
St. Francois	7	79	0	1,496	0	0	1	81	15,798	1,473	896	341	0	504	20,676
Lincoln	0	40	0	23	8,314	45	229	5,529	0	2,738	702	0	465	0	18,085
Warren	13	879	24	18	185	204	2	2,967	6	1,972	311	0	5,176	7	11,764
Washington	94	573	0	799	11	0	0	27	1,235	869	418	18	0	4,123	8,167
Crawford	5,371	1,728	208	60	0	0	0	65	13	733	206	0	0	76	8,460
Pike	0	0	0	5	474	40	5,167	294	0	146	106	0	61	0	6,293
Ste. Genevieve	0	15	0	679	0	0	0	43	896	620	366	4,922	0	22	7,563
Gasconade	52	1,103	4,337	4	6	109	0	46	0	427	107	0	77	0	6,268
Montgomery	2	155	306	0	73	3,007	16	362	0	231	29	0	569	0	4,750
ILLINOIS															
Madison	0	136	8	288	11	0	9	1,051	0	16,780	14,499	10	7	0	32,799
St. Clair	0	130	0	304	3	0	0	640	13	12,582	18,251	0	10	0	31,933
Clinton	0	11	0	25	0	0	0	49	3	529	1,097	0	0	0	1,714
Monroe	0	23	0	205	0	0	0	84	0	3,333	2,376	32	0	0	6,053
Jersey	0	0	0	28	0	0	0	125	0	1,111	404	0	0	0	1,668
TOTAL	6,041	35,644	5,699	46,069	9,984	3,485	5,520	97,776	18,501	569,659	256,585	5,479	7,679	4,912	1,073,033
TOTAL WORKFORCE	6,674	36,230	6,386	46,679	10,231	3,826	6,604	98,677	20,350	580,137	262,981	6,154	7,828	5,107	1,097,864

2.6 METEOROLOGY

2.6.1 Association of $PM_{2.5}$ with Meteorological Conditions

As discussed in Section 2.3, there is a widespread regional background of about 10-11 $\mu g/m^3$ of $PM_{2.5}$ and an additional 4-6 $\mu g/m^3$ of $PM_{2.5}$ in the St. Louis urban area on an annual average basis. Therefore, some understanding of regional as well as local meteorology, along with the speciation results presented in Section 2.3, is useful in understanding regional and local contributions to the $PM_{2.5}$ concentration in the St. Louis area.

The air monitoring results presented in Sections 2.1, 2.2, and 2.3, as well as a review of earlier Midwestern $PM_{2.5}$ measurement results (Lake Michigan Air Directors Consortium, $PM_{2.5}$ in the Upper Midwest, June 2, 2003), do not show large seasonal differences in concentrations, but summer and winter concentrations are slightly higher than spring and fall. The higher summer concentrations occur in both urban and rural areas, suggesting widespread source contributions, whereas higher winter concentrations generally occur mainly in urban areas, suggesting a stronger influence of local sources during winter. This observation, in combination with the speciation results presented in Section 2.3, suggest that sulfate, which is higher in summertime, is largely from widespread regional sources, while organic and elemental carbon and nitrate, which are higher in fall and winter, may result from more localized urban sources. Specific sampling sites (Granite City and VFW) appear to show local source contributions in addition to the widespread regional contribution.

A study of summertime $PM_{2.5}$ concentrations and meteorological conditions in midwestern cities, including St. Louis (Steven G. Brown, letter to Michael Koerber, Lake Michigan Air Directors Consortium re. $PM_{2.5}$ Forecasting – Synoptic Typing, September 18, 2003, Sonoma Technology, Inc.), makes the following observations:

- Generally, higher summertime $PM_{2.5}$ concentrations (above 30 $\mu g/m^3$) occur with southerly flow, calm winds, or the presence of a surface high or stationary front. Persistence in the 500 millibar meteorological regime appears to lead to increased $PM_{2.5}$ concentrations,

- Low summertime concentrations (generally below 20 $\mu g/m^3$) most often occur when a front passes through, when a surface low is present, or when there is northerly or westerly flow,

- Easterly flow can produce a wide range of concentrations,

- An upper-level ridge or flat flow generally produces higher summertime $PM_{2.5}$ concentrations (above 30 $\mu g/m^3$), while a trough or zonal flow produces lower concentrations (generally below 20 $\mu g/m^3$),

- Inversion height and strength do not appear to be as important in summer as in winter. In summer, inversions often dissipate in the morning. An exception is St. Louis, where a strong or moderate inversion was present for nearly all days with $PM_{2.5}$ concentrations above 40 $\mu g/m^3$.

2.6.2 Wind Roses

Figure 2.4-1 shows a wind rose for wind measurements at the Lambert-St. Louis International Airport for the years 2001 to 2005. Each lobe on the wind rose represents wind from one of 16 compass points. The length of each lobe represents the percentage of time that the wind is from a particular direction. The various shadings show the percentage of time that wind from a particular direction is in a particular range of wind speed. The dominant feature of this wind rose is the high frequency of wind from the south. Other notable features are the frequency of wind from the west to northwest, and the relative lack of wind from the northeast.

Figures 2.4-2 to 5 show wind roses for the same location for the first, second, third, and fourth calendar quarters for the years 2001 to 2005. The first quarter wind rose shows the dominant southern wind but also a strong component from the west to northwest. The second quarter wind rose shows a very stronger southern component. The third quarter is similar to the first quarter wind rose, showing strong southern and west to northwest component. The fourth quarter wind rose shows southern and northern components that are relatively similar in strength.

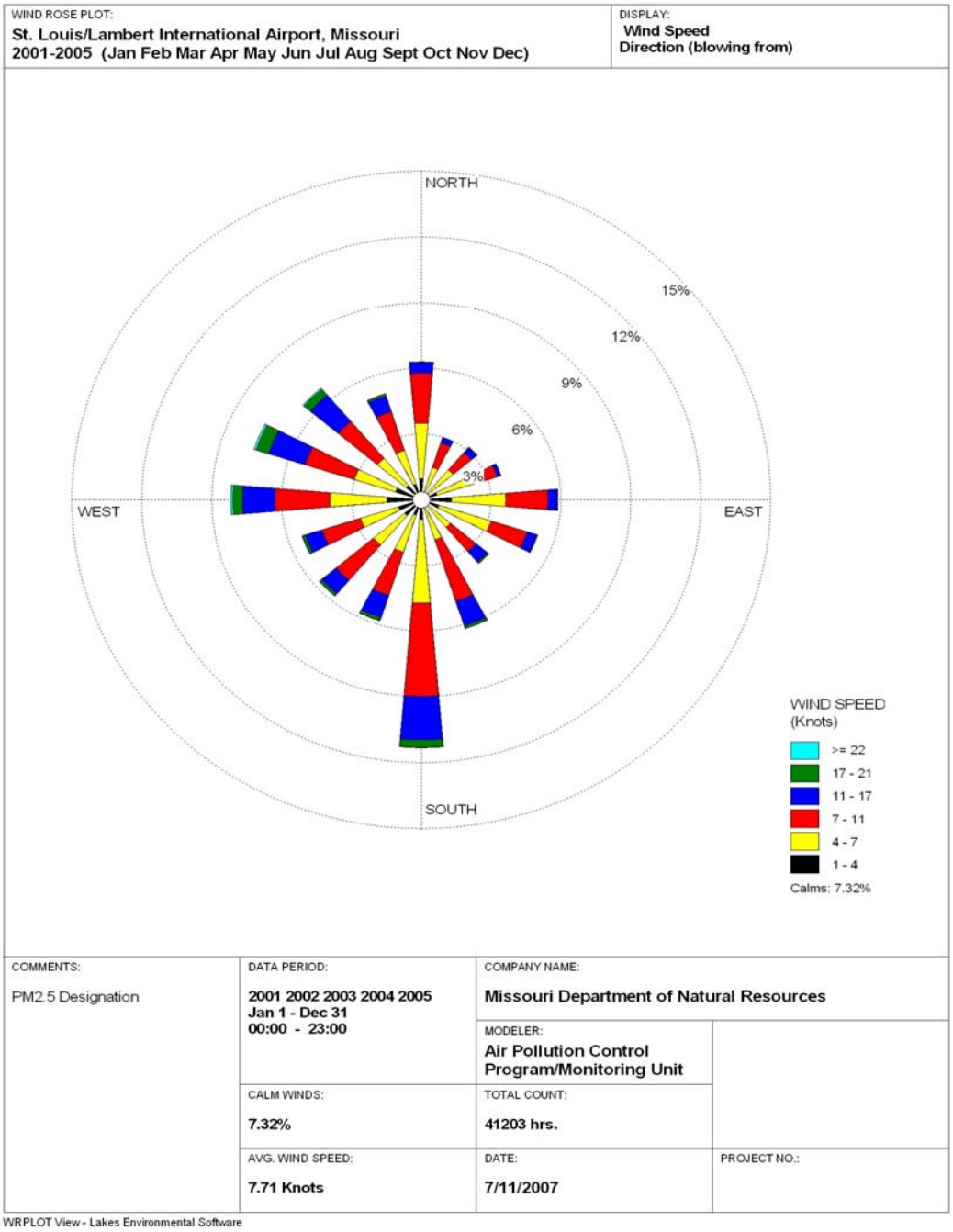


Figure 2.6-1. Wind rose for St. Louis, 2001-2005.

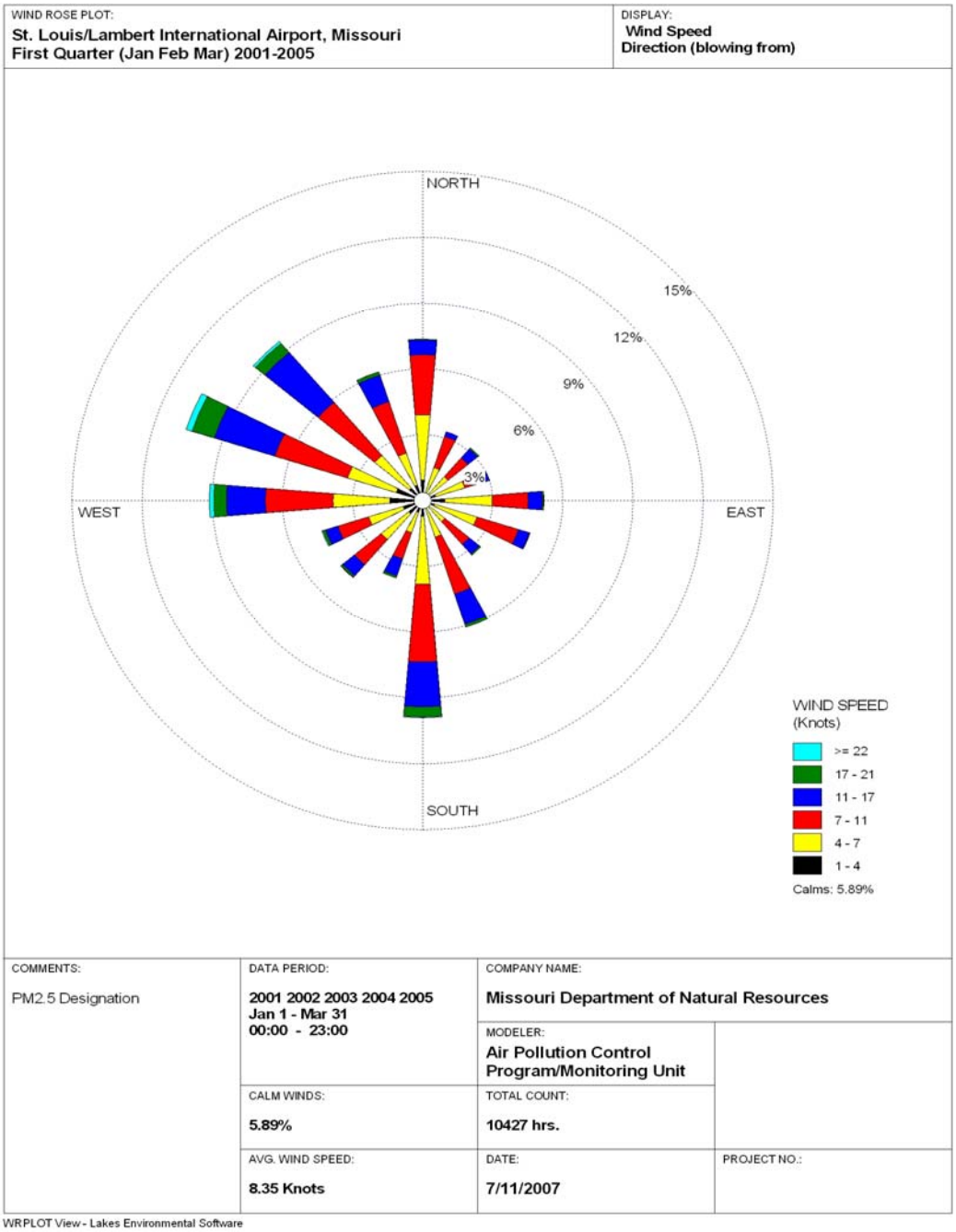


Figure 2.6-2. Wind rose for St. Louis, first quarter 2001-2005.

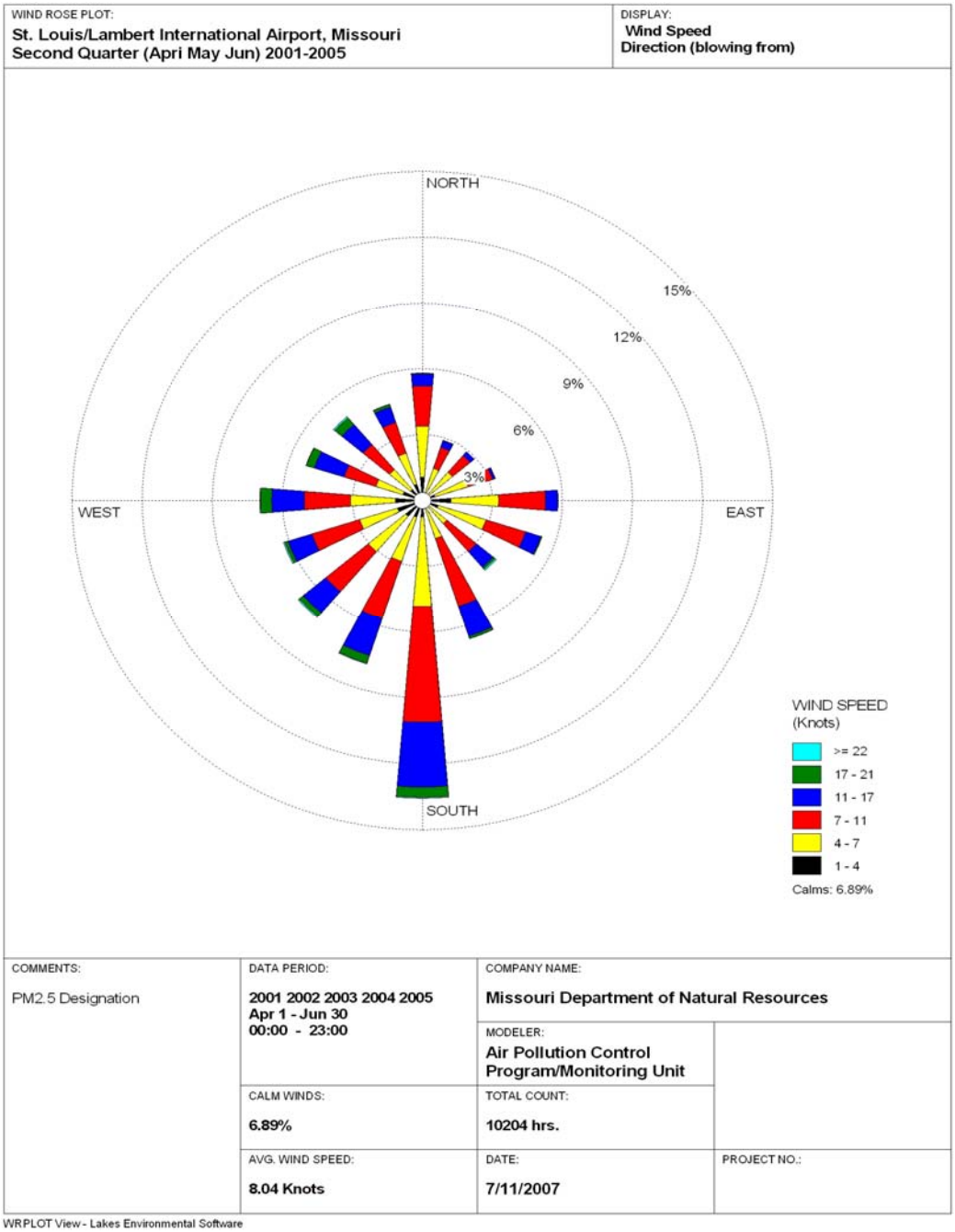


Figure 2.6-3. Wind rose for St. Louis, second quarter 2001-2005.

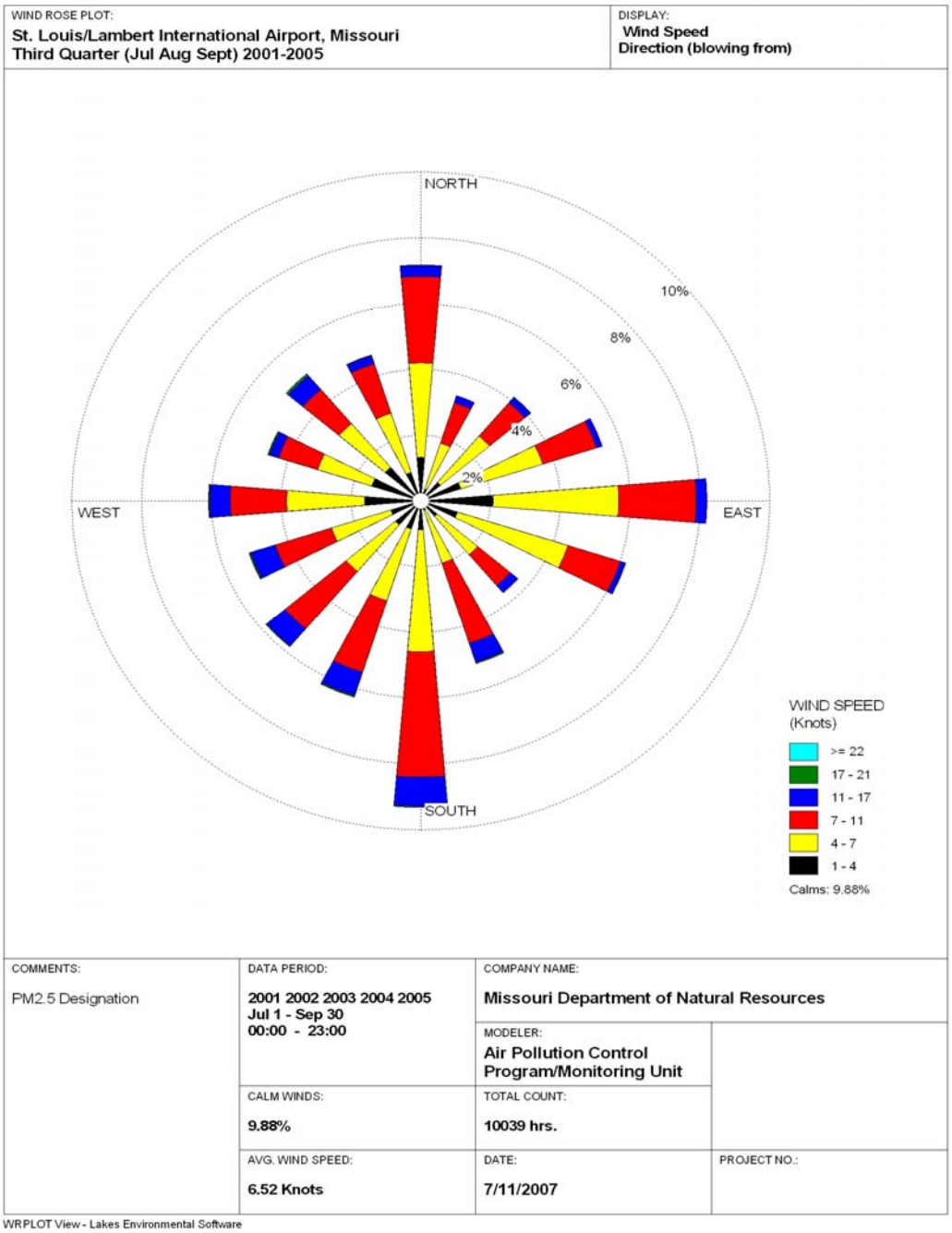


Figure 2.6-4. Wind rose for St. Louis, third quarter 2001-2005.

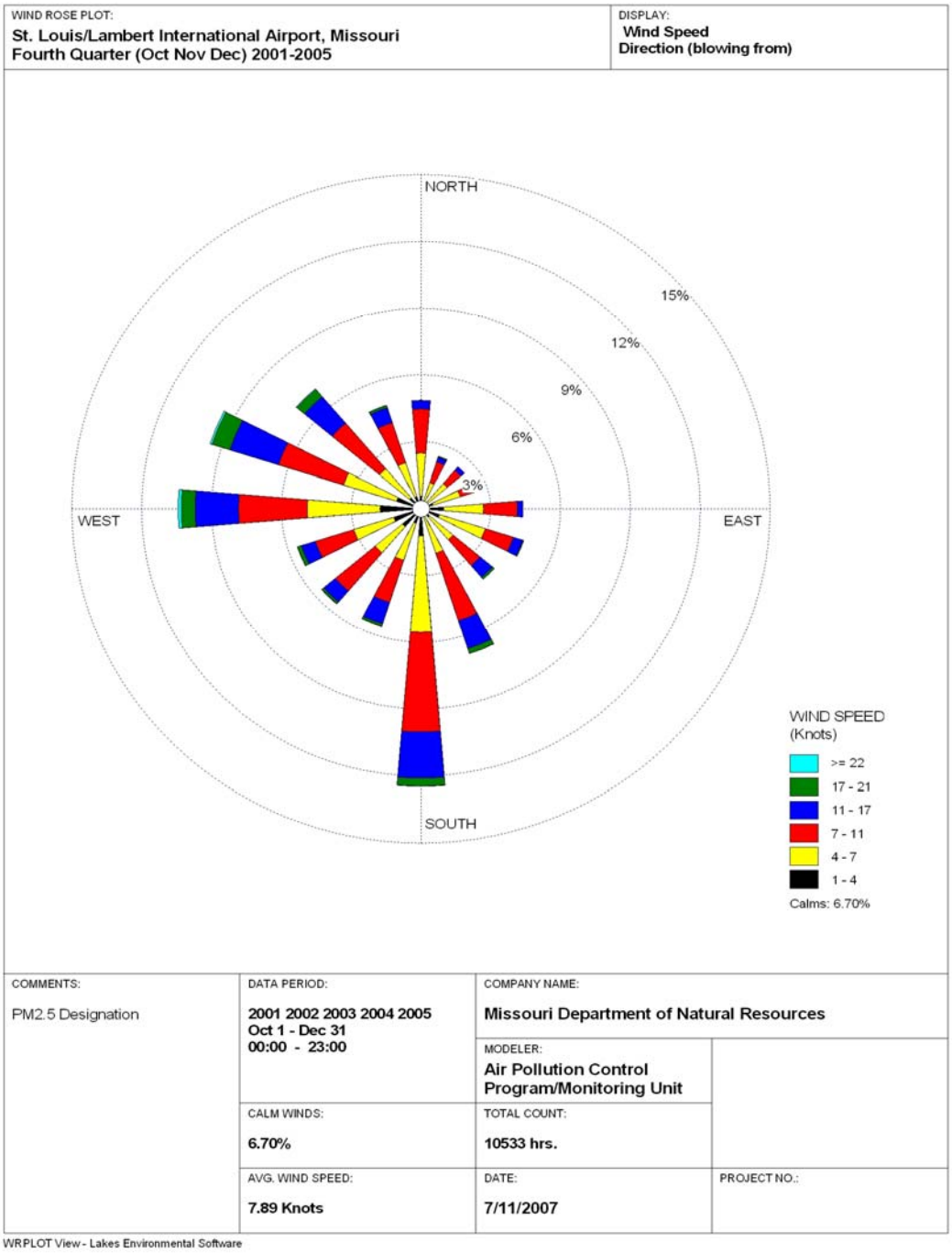


Figure 2.6-5. Wind rose for St. Louis, fourth quarter 2001-2005.