2007 LOUISIANA AMBIENT AIR MONITORING NETWORK

ANNUAL REPORT

Louisiana Department of Environmental Quality
Office of Environmental Assessment
Air Quality Assessment Division
Air Analysis Section

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National Ambient Air Quality Standards (NAAQS)

In 1990, the Clean Air Act was amended to set National Ambient Air Quality Standards for pollutants considered harmful to health and the environment. This Act established two types of standards. Primary standards were established to protect public health, including "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility and damage to animals, crops, vegetation and buildings. NAAQS have been codified for six "criteria" pollutants in 40 Code of Federal Regulations (CFR) Part 50. These standards are summarized in Table 1.

When comparing data obtained at monitoring stations to standards, it is often useful to calculate a design value. Design values (DVs) are statistics that describe the air quality status of a given area relative to the NAAQS. Design values are especially helpful when the standard is exceedance-based (e.g. 1-hour ozone, 24-hour PM_{10}, etc.) because they are expressed as a concentration instead of an exceedance count, thereby allowing a direct comparison to the level of the standard. DVs are often based on multiple years of data, ensuring a stable indicator. They are also often used to classify nonattainment areas, and to assess progress towards meeting the standard. DVs are computed and published annually by EPA's Office of Air Quality Planning and Standards. They are reviewed in conjunction with the EPA Regional Offices.

Louisiana Ambient Air Monitoring Network Overview

The Louisiana Department of Environmental Quality's (LDEQ) Air Analysis section has operated State and Local Ambient Monitoring Stations (SLAMS), Photochemical Assessment Monitoring Stations (PAMS), and Special Purpose Monitoring Systems (SPMS) as a requirement of 40 CFR Part 58. These stations measure ambient air concentrations of criteria pollutants. Conformance of the network to Appendix D (Network Design Criteria) and Appendix E (Probe and Path Siting Criteria) is determined using an annual review of the air

quality surveillance system which states are required to provide in 40 CFR 58.20 (d). This review has several goals:

- Determine how well the network is achieving its required air monitoring objectives;
- Determine how well the network is meeting the needs of the data users;
- Determine how (if) the network should be modified to continue to meet its monitoring objective and data needs (through termination of existing stations, relocation of stations, or establishment of new stations); and
- Investigate ways to improve the network to ensure that it provides adequate, representative and useful air quality data.

The LDEQ currently operates:

- 24 ozone monitors,
- 17 Federal Reference Method (FRM) $PM_{2.5}$ samplers,
- 10 TEOM® $PM_{2.5}$ samplers,
- 2 $PM_{2.5}$ chemical speciation samplers,
- 12 nitrogen oxides monitors,
- 7 sulfur dioxide monitors,
- 1 carbon monoxide monitor, and
- 3 PM_{10} monitors.

Table 2 lists all parameters operated at stations and the monitor designation (SLAMS/PAMS/SPMS) throughout the state. Figure 1 shows the geographical location of these locations. Figure 2 provides a more detailed proximity of monitors located in the Capital Region, which is currently in non-attainment for ozone.

The Louisiana's ambient air monitoring network underwent minimal operational changes in 2007. The Chalmette Vista and Chalmette High School sites were put into service in May 2006. Data was not able to be used to determine applicability with NAAQS until 2007 because there was less than a 75% capture of data in 2006. Therefore, these monitors were not included in the 2006 annual report. Chalmette Vista monitors for sulfur dioxide, $PM_{2.5}$, and PM_{10}. Chalmette High School monitors for ozone and sulfur dioxide.

Under EPA's proposed National Core Network (NCore) design guidelines, the state of Louisiana is required to operate one NCore level 2 site. Louisiana has proposed the Capitol site. As a result, ambient level SO_2 and CO analyzers at the Capitol site were replaced by trace gas monitors in May to study ozone precursors.

The LDEQ will continue to work with the EPA regarding the upcoming PM_{coarse} standard as they finalize the requirements of the new standard. As of the end of 2007, the National Ambient Air Quality Standard (NAAQS) for PM_{coarse} has not been proposed.

Table 1. National Ambient Air Quality Standards

Pollutant	Primary Standards		Secondary Standards	
	Level	Averaging Time	Level	Averaging Time
Carbon Monoxide	9 ppm (10 mg/m^3)	8-hour[1]	None	
	35 ppm (40 mg/m^3)	1-hour[1]		
Lead	1.5 µg/m^3	Quarterly Average	Same as Primary	
Nitrogen Dioxide	0.053 ppm	Annual	Same as Primary	
	(100 µg/m^3)	(Arithmetic Mean)		
Particulate Matter (PM_{10})	150 µg/m^3	24-hour[2]	Same as Primary	
Particulate Matter ($PM_{2.5}$)	15.0 µg/m^3	Annual[3]	Same as Primary	
		(Arithmetic Mean)		
	35 µg/m^3	24-hour[4]	Same as Primary	
Ozone	0.085 ppm	8-hour[5]	Same as Primary	
	0.12 ppm	1-hour[6]	Same as Primary	
Sulfur Dioxide	0.03 ppm	Annual	0.5 ppm	3-hour[1]
		(Arithmetic Mean)	(1300 µg/m^3)	
	0.14 ppm	24-hour[1]		

Units of measure for the standards are parts per million (ppm) by volume, milligrams per cubic meter of air (mg/m^3), and micrograms per cubic meter of air (µg/m^3).

[1] Not to be exceeded more than once per year.

[2] Not to be exceeded more than once per year on average over 3 years.

[3] To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m3.

[4] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m3 (effective December 17, 2006).

[5] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.085 ppm.

[6] (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is $\leq$ 1.

(b) As of June 15, 2005 EPA revoked the 1-hour ozone standard in all areas except the 8-hour ozone nonattainment Early Action Compact (EAC) Areas.

Table 2. 2007 Louisiana Ambient Air Monitoring Sites

SITE NAME & ABBREVIATION ADDRESS AQS CODE	PARISH	O_3	NO_X	SO_2	CO	PM_{10}	$PM_{2.5}$ (FRM)	$PM_{2.5}$ (TEOM)
ALEXANDRIA (AL) 8105 Tom Bowman Dr. 220790002	Rapides						SPMS	
ALGIERS-ENTERGY (AE) 2456 Ernest 220710020	Orleans			SPMS[1]				
BAKER (BK) Highway 964, Groom Rd. 220331001	East Baton Rouge	SLAMS	SLAMS				SPMS	
BATON ROUGE-CAPITOL (BC) 1061-A Leesville Ave 220330009	East Baton Rouge	SLAMS	SLAMS	SLAMS	SLAMS		SLAMS (COL)	SPMS
BATON ROUGE-LSU (BR) East End Aster Lane 220330003	East Baton Rouge	SLAMS	SLAMS					
BAYOU PLAQUEMINE (BP) 65180 Belleview Road 220470009	Iberville	PAMS	PAMS				SPMS	
CARLYSS (CR) Hwy 27 & Hwy 108 220190002	Calcasieu	SLAMS						
CARVILLE (CV) Hwy 141, River Rd. 220470012	Iberville	SLAMS	SPMS					
CHALMETTE-HIGHSCHOOL (CH) 1100 E. Judge Perez Drive 220870009	St. Bernard	SPMS		SPMS				
CHALMETTE-VISTA (VC) 24 E. Chalmette Circle 220870007	St. Bernard			SPMS		SPMS	SPMS	SPMS
CITY PARK (NC) Florida & Orleans Ave 220710012	Orleans							SPMS
CONVENT (CT) La Hwy 44 @ Canatella 220930002	St. James	SLAMS						
DIXIE (DX) Haygood Road 220170001	Caddo	SLAMS						
DUTCHTOWN (DT) 11153 Kling Road 220050004	Ascension	SPMS	SPMS					
FRENCH SETTLEMENT (FS) 16627 Perrilloux Lane 220630002	Livingston	SPMS	SLAMS					SPMS
GARYVILLE (GV) E. Azaela St. 220950002	St. John the Baptist	SLAMS						
GEISMAR (GM) Highway 75 220470005	Iberville						SPMS	
GROSSE TETE (GT) 19145 Sydney Rd. 220470007	Iberville	SPMS	SPMS					
HAMMOND (HM) 21549 Old Covington Hwy 221050001	Tangipahoa						SPMS (COL)	

Table 2. 2007 Louisiana Ambient Air Monitoring Sites (cont.)

SITE NAME & ABBREVIATION ADDRESS AQS CODE	PARISH	O_3	NO_X	SO_2	CO	PM_{10}	$PM_{2.5}$ (FRM)	$PM_{2.5}$ (TEOM)
HAHNVILLE (HV) 1 River Park Drive 220890003	St. Charles	SLAMS						
HOUMA (HO) 4047 West Park Ave. 221090001	Terrebonne						SLAMS	
KENNER (KN) 100 West Temple Pl 220511001	Jefferson	SLAMS	SLAMS				SLAMS	SPMS
LAFAYETTE (LI) 121 E. Pont Des Mouton 220550006	Lafayette						SPMS	
LAFAYETTE-USGS (LY) 700 Cajundome Blvd. 220550007	Lafayette	SLAMS					SLAMS	
LAKE CHARLES-Lighthouse (LH) Lighthouse Lane Special 3 (no AQS #)	Calcasieu							
LAKE CHARLES-MCNEESE UNIV. (L6) Common & E. McNeese 220190010	Calcasieu						SLAMS	
MARRERO (MO) Patriot St. & Allo St. 2205112001	Jefferson						SLAMS	
MONROE (MR) 5296 Southwest Road 220730004	Ouachita	SLAMS		SLAMS			SLAMS	
NEW ROADS (NR) Highway 415 220770001	Pointe Coupee	SLAMS						
PORT ALLEN (PA) 3758 Highway 1 221210001	West Baton Rouge	SLAMS	SLAMS	SLAMS		SLAMS (COL)	SLAMS	SPMS
PRIDE (PE) 11245 Port Hudson 220330013	East Baton Rouge	PAMS	PAMS					SPMS
SHREVEPORT-AIRPORT (SA) 1425 Airport Drive 220150008	Bossier	SLAMS		SLAMS				SPMS
SHREVEPORT-CALUMET (SC) Midway Street 220170008	Caddo					SLAMS	SLAMS (COL)	
SOUTHERN UNIVERSITY (SU) Isabel Herson St. 220332002	East Baton Rouge			SPMS[1]				
THIBODAUX (TD) 194 Thoroughbred Park Dr. 220570004	Lafourche	SLAMS						SPMS
VINTON (VT) 2284 Paul Bellow Rd. 220190009	Calcasieu	SPMS					SPMS	
WESTLAKE (WL) 2646 John Stine Rd. 220190008	Calcasieu	SLAMS	SLAMS	SLAMS				SPMS

Table 2. 2007 Louisiana Ambient Air Monitoring Sites (cont.)

SUMMARY							
	O_3	NO_X	SO_2	CO	PM_{10}	$PM_{2.5}$ (FRM)	$PM_{2.5}$ (TEOM)
TOTAL	24	12	7	1	3	17	11
PAMS	2	2	0	0	0	0	0
SLAMS	17	7	5	1	2	9	0
SPMS	5	3	2	0	1	8	11
STN	0	0	0	0	0	0	0

PAMS - PHOTOCHEMICAL ASSESSMENT MONITORING STATIONS
SLAMS - STATE AND LOCAL AIR MONITORING STATIONS
SPMS - SPECIAL PURPOSE MONITORING STATIONS
STN - SPECIATION TRENDS NETWORK
COL - Site has co-located sensors for this parameter
1 - Data is not comparable to network assessment monitoring because it does not meet specific QA/QC requirements or uses a non-referenced method
2 - Site also monitors for chemical speciation of particulate matter

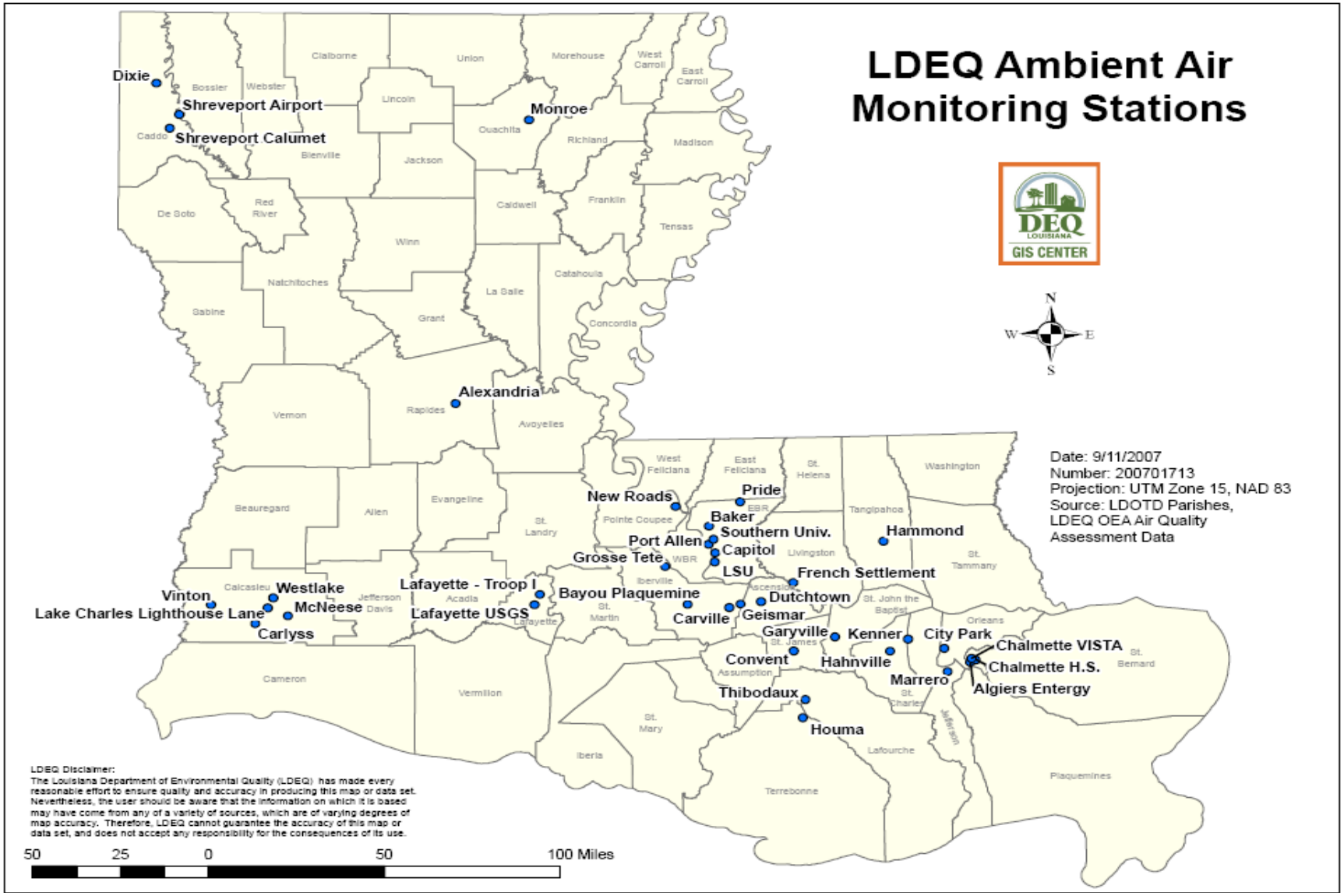

Figure 1. 2007 Louisiana Ambient Air Monitoring Sites

Figure 2. Monitoring Sites in the Capital Region

Pollutant Overview

Louisiana's Ambient Air Monitoring Network consists of ozone, nitrogen dioxide, sulfur dioxide, carbon monoxide, and PM_{10} and $PM_{2.5}$ monitors at thirty-seven locations throughout the state. Three additional sites (Algiers Entergy, Lighthouse, and Southern University) have special purpose monitors for projects that are not included in the network assessment. All standards are currently being met, aside from the five-parishes within the Capital Region that are in non-attainment of EPA's 8-hour ozone NAAQS. LDEQ operates and maintains 12 ozone monitors in and around these parishes. Evaluations have continued to demonstrate that the data gathered by LDEQ's monitoring network is well representative of the overall air quality.

Figure 3 shows statewide criteria pollutants concentrations as a percentage of the NAAQS for 2007. As in previous years, only ozone values have exceeded standards during 2007. The highest ozone value was

recorded at LSU with a design value of 89 ppb. Grosse Tete, New Roads, and Carville also exceeded the NAAQS with design values of 86 ppb, 86 ppb, and 85 ppb respectively.

The 24-hour max design values for $PM_{2.5}$ reached 87% of the standard in 2007. The highest value statewide (31 $\mu g/m^3$) occurred at the Shreveport site. The highest three-year average design value was 13.7 $\mu g/m^3$, which was recorded at the Port Allen site. This value also remained below the NAAQS of 15$\mu g/m^3$.

Statewide sulfur dioxide values have shown a sharp increase in concentrations. This is primarily due to the addition of the Chalmette Vista monitor which recorded the highest 24-hour max design value. The 112 ppm design value recorded at Chalmette Vista represented 80% of the standard. Prior to the addition of this monitor, Port Allen usually recorded the highest statewide reading.

Pollutants other than ozone and particulate matter remained considerably below their respective standards for 2007. For more detailed information please refer to each pollutant's individual section in the following pages.

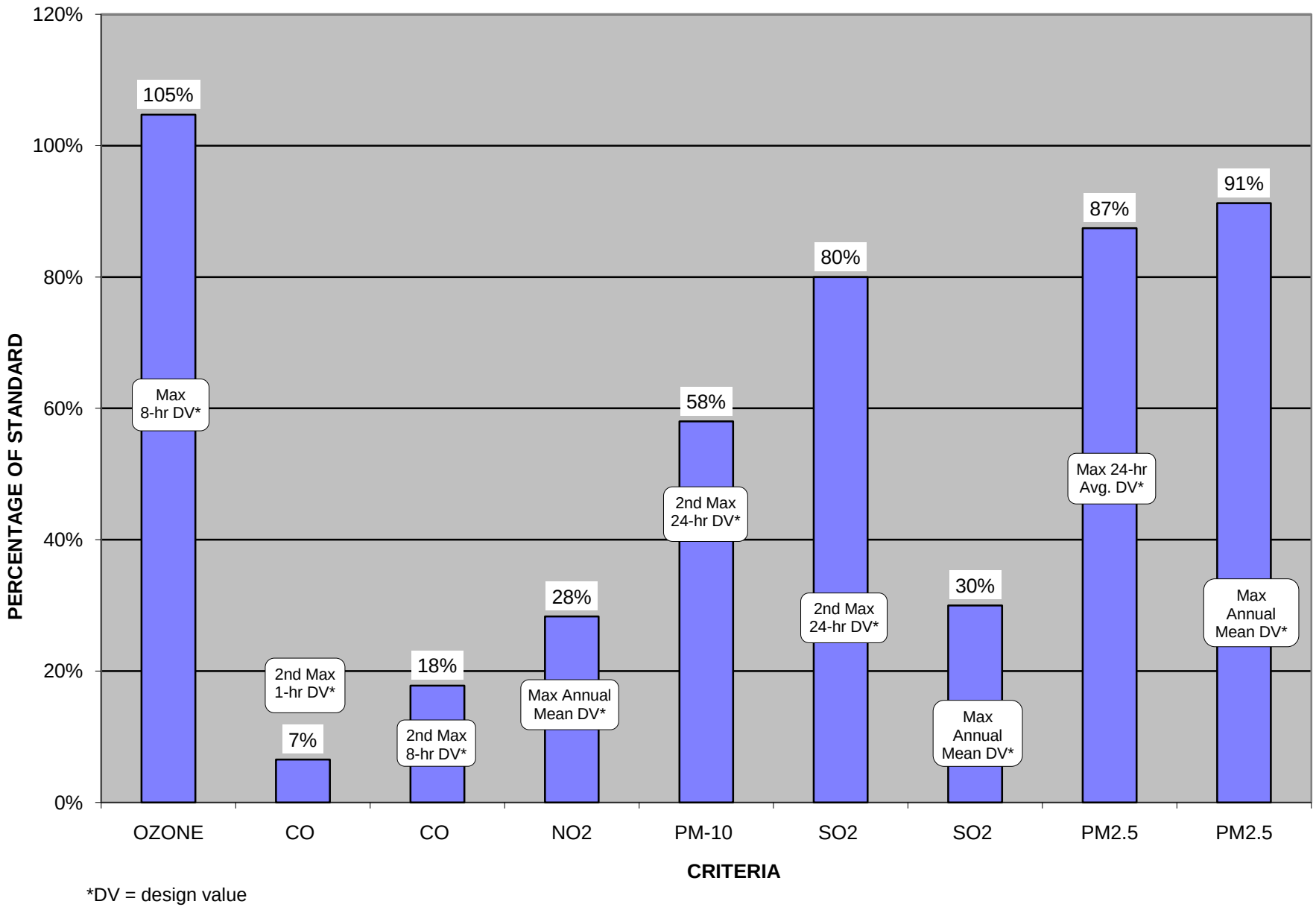

Figure 3. Percentage of Standards Reached

Ozone

Table 3. Louisiana Ozone Monitoring Stations		
Capital Region*	**Southeast Region**	**Southwest Region**
Carville	Chalmette High School	Vinton
LSU	Kenner	Carlyss
French Settlement	Hahnville	Westlake
Grosse Tete	Thibodaux	
Dutchtown	Garyville	
Capitol		**North Region**
Bayou Plaquemine	**Acadian Region**	Shreveport Airport
Baker	Lafayette-USGS	Dixie
Pride		Monroe
Port Allen		
New Roads		
Convent		

***See Figure 1 for the definitions of the regions and the cities they include**

Ozone is the criteria pollutant of most concern in Louisiana. It is formed when pollutants such as Nitrogen Dioxide (NO_2) and Volatile Organic Carbon (VOC) are emitted and chemically react in the presence of sunlight. Ozone irritates the respiratory system and may adversely affect people with asthma and lung diseases. EPA expressed concern over the effect of long-term ozone exposure and replaced the 1-hour standard with the more restrictive 8-hour standard. The ozone 8-hour standard became effective June 15, 2004. Ozone is currently being monitored at 24 sites throughout Louisiana. Most of these monitors are located in the Capital Region since it is the only region in non-attainment of the ozone 8-hour standard. It has been designated as marginal. The parishes that have been designated as non-attainment are Ascension, East Baton Rouge, Iberville, Livingston, and West Baton Rouge. Table 3 lists where ozone monitors are located.

The number of days the ozone concentration was above the NAAQS for each of the sites in the monitoring network can be found in Figure 4. Figures 5 through 9 show the 8-hour NAAQS exceedances for each region. As seen in Figure 6, only four sites exceeded the 8-hour design value in 2007. The area's highest 8-hour design value was 89 ppb at LSU. Although the three-year design value for New Roads was above the standard, values have decreased. New Roads only had one 8-hour exceedance in 2007.

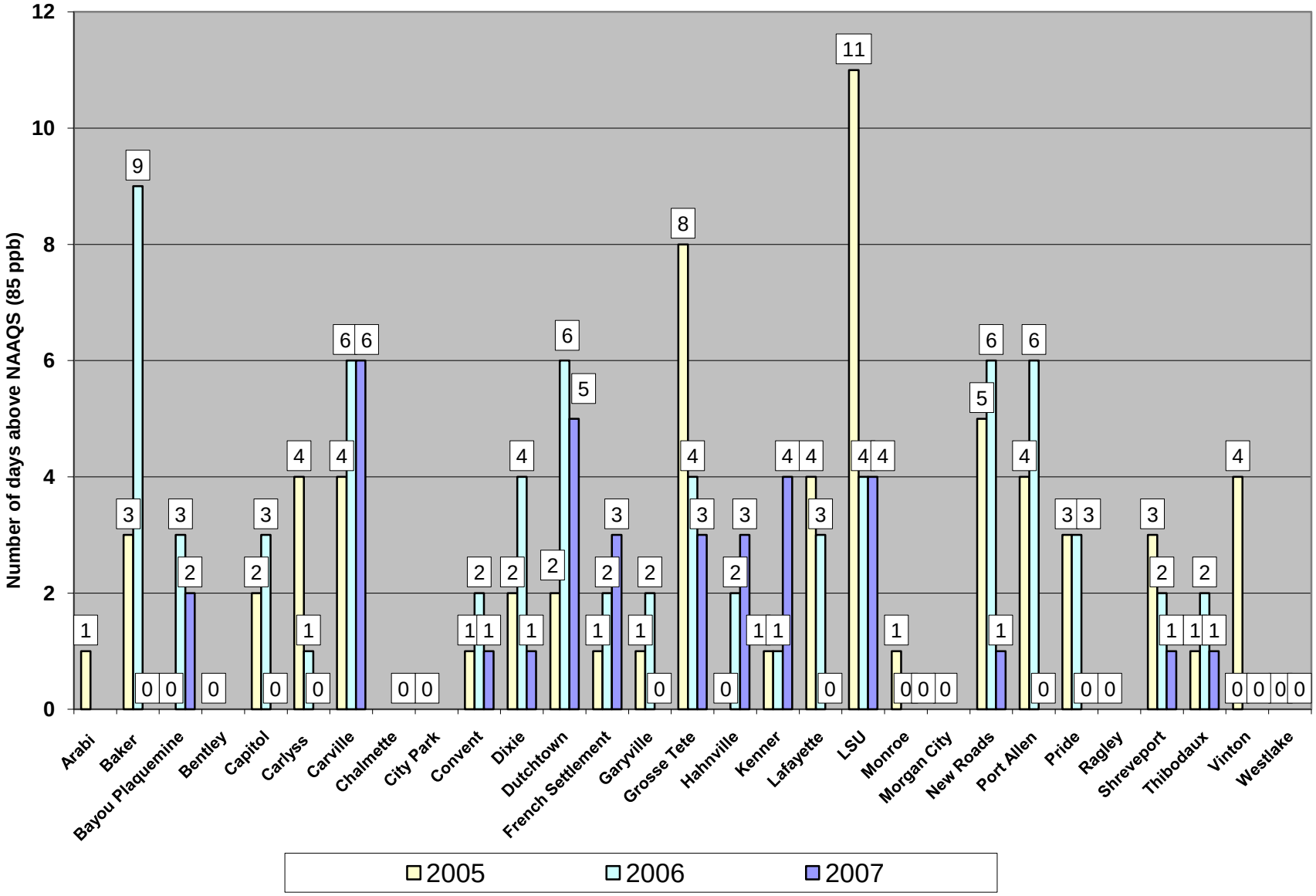

Figure 4. Ozone 8-Hour Average Trends Summary (Number of Days above NAAQS)

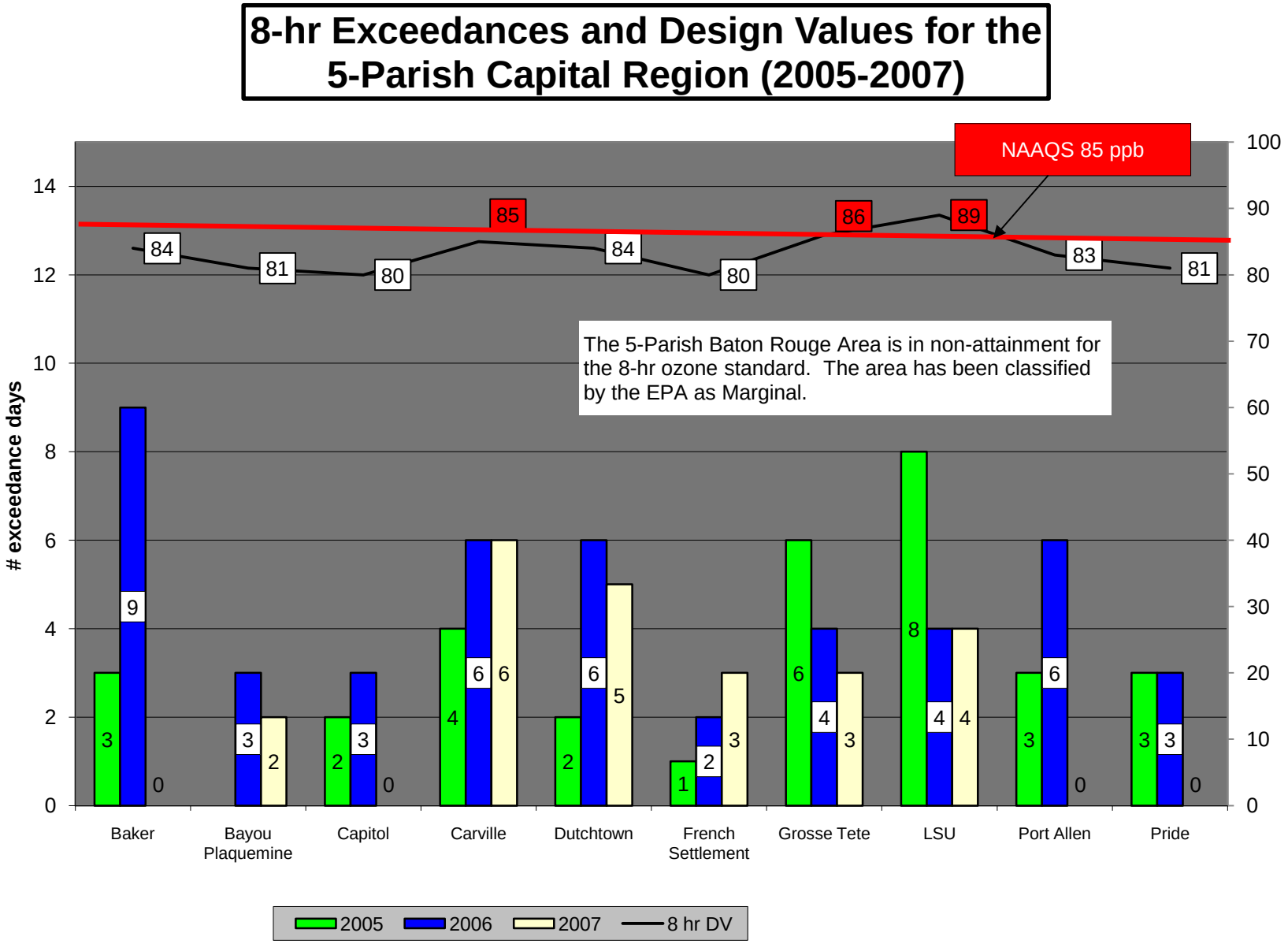

Figure 5. 8-Hour Exceedances and Design Value for Capital Region

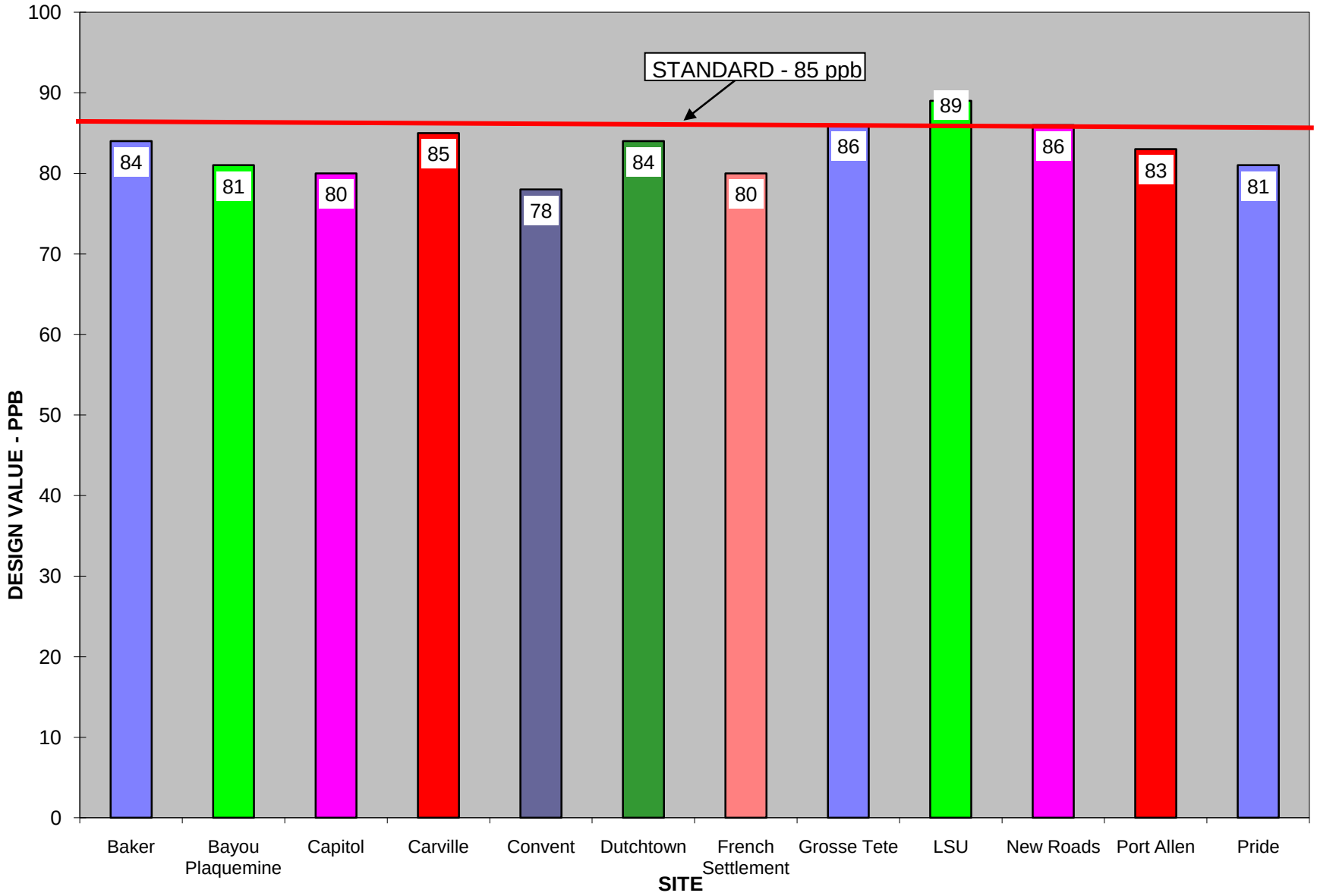

Figure 6. 8-Hour Average (2005-2007) of 4th Max - Capital Region

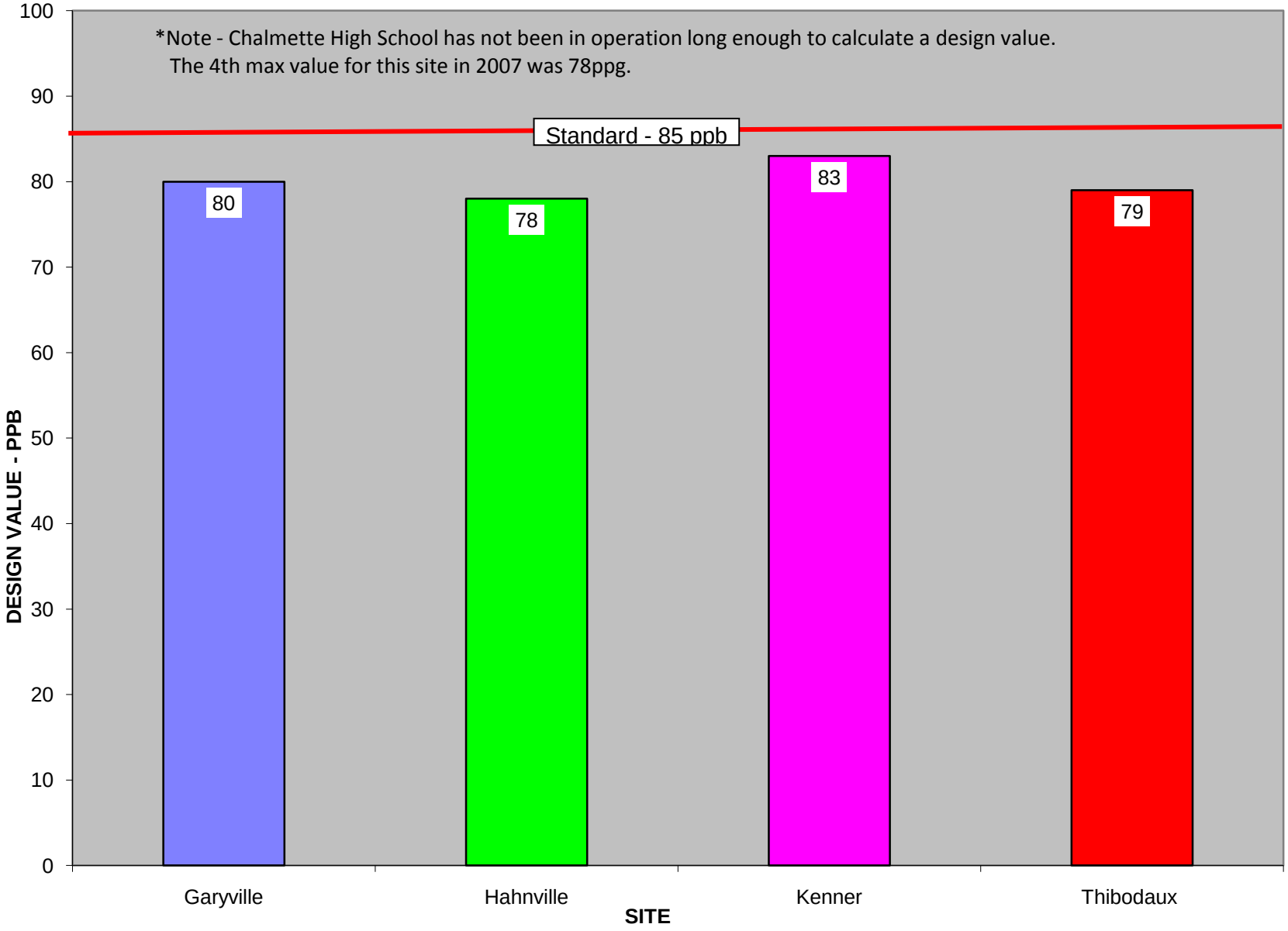

Figure 7. 8-Hour Average (2005-2007) of 4th Max - Southeast Region

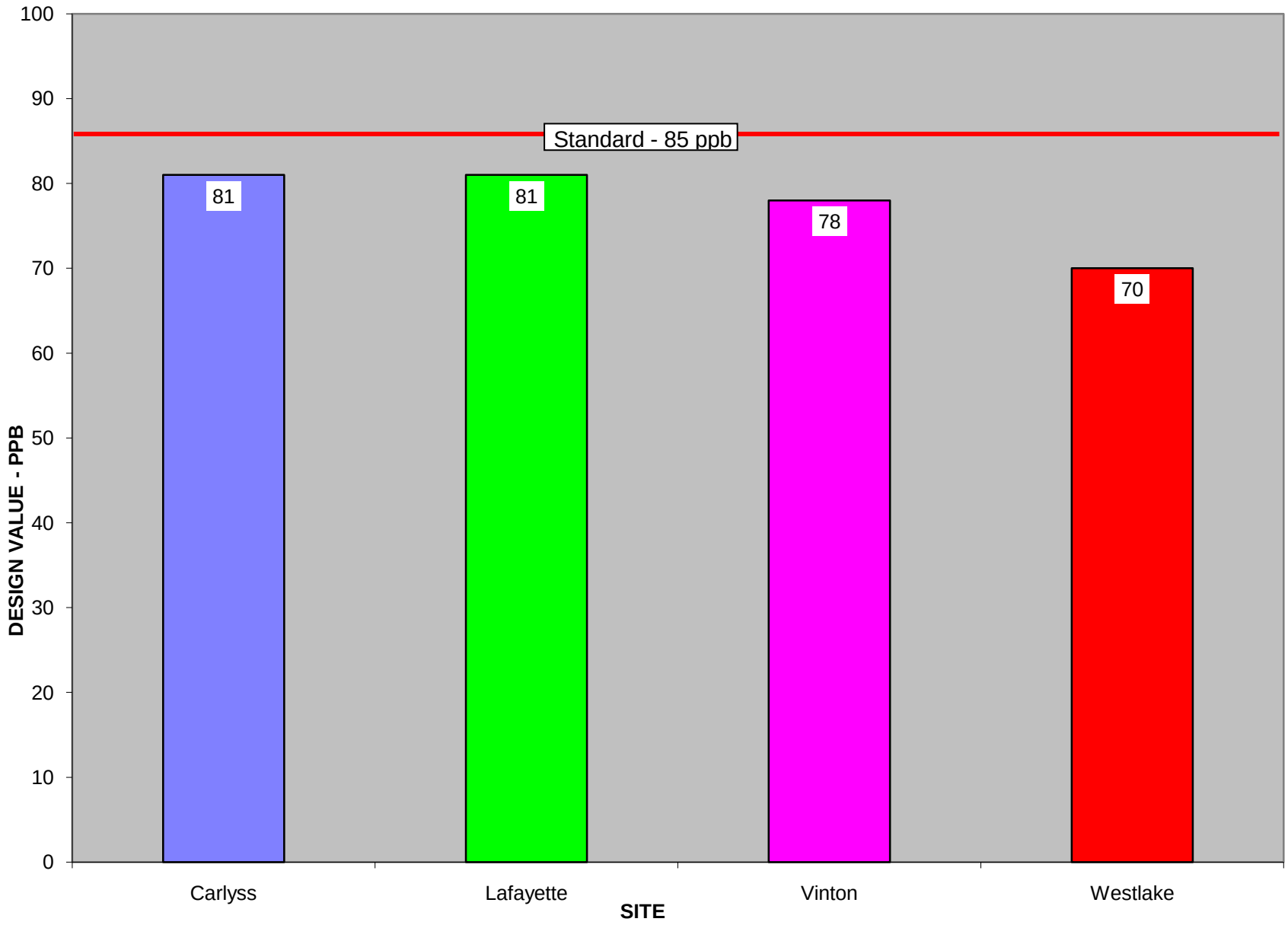

Figure 8. 8-Hour Average (2005-2007) of 4th Max - Southwest Region

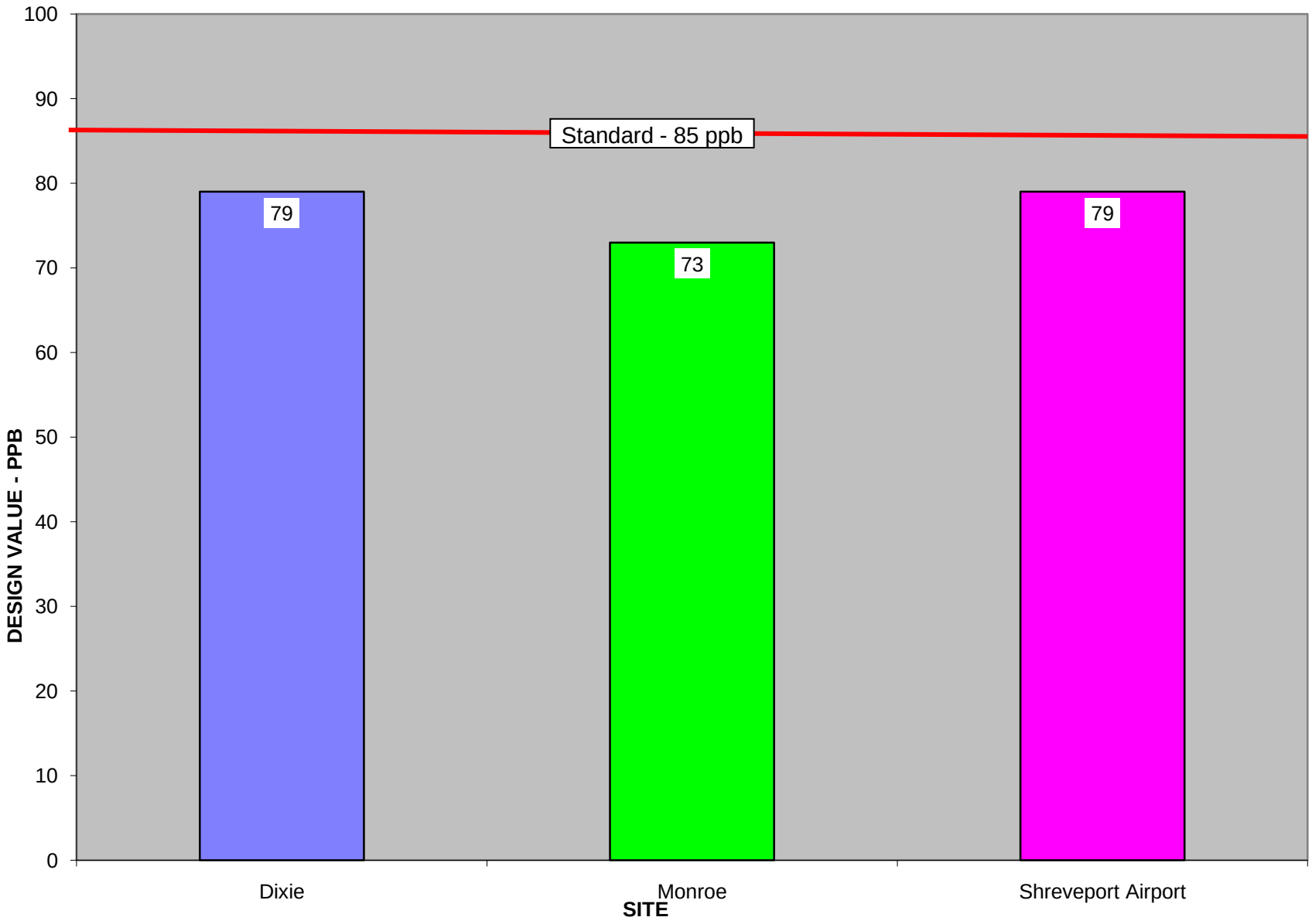

Figure 9. 8-Hour Average (2005-2007) of 4th Max - North Regions

Nitrogen Dioxide

Table 4. Louisiana Nitrogen Dioxide Monitoring Stations	
Capital Region Bayou Plaquemine Baker Capitol Carville Dutchtown French Settlement LSU Grosse Tete Port Allen Pride	**Southeast Region** Kenner **Southwest Region** Westlake

NO_2 is a prime precursor reactant for ozone. NO_2 reacts with VOC in the presence of sunlight to form photochemical oxidants. Nitrogen oxides are formed when fuels (natural and man-made) are burned. In order to make the best observations of concentrations of this pollutant, monitors are needed in areas with large mobile and stationary sources.

Data collected by the LDEQ in 2007 indicated that in general, NO_2 concentrations remained relatively low in comparison to the standard. The highest annual mean, recorded at Capitol site, was only 28% of the standard of 53 ppb in 2007. Figure 10 is a graph of the annual means values for each of the 12 monitoring locations listed in Table 4. Ten of these sites are located in the petroleum industry-rich corridor of Baton Rouge, one monitor is in the reestablishing populous of New Orleans and one monitor is located in Westlake.

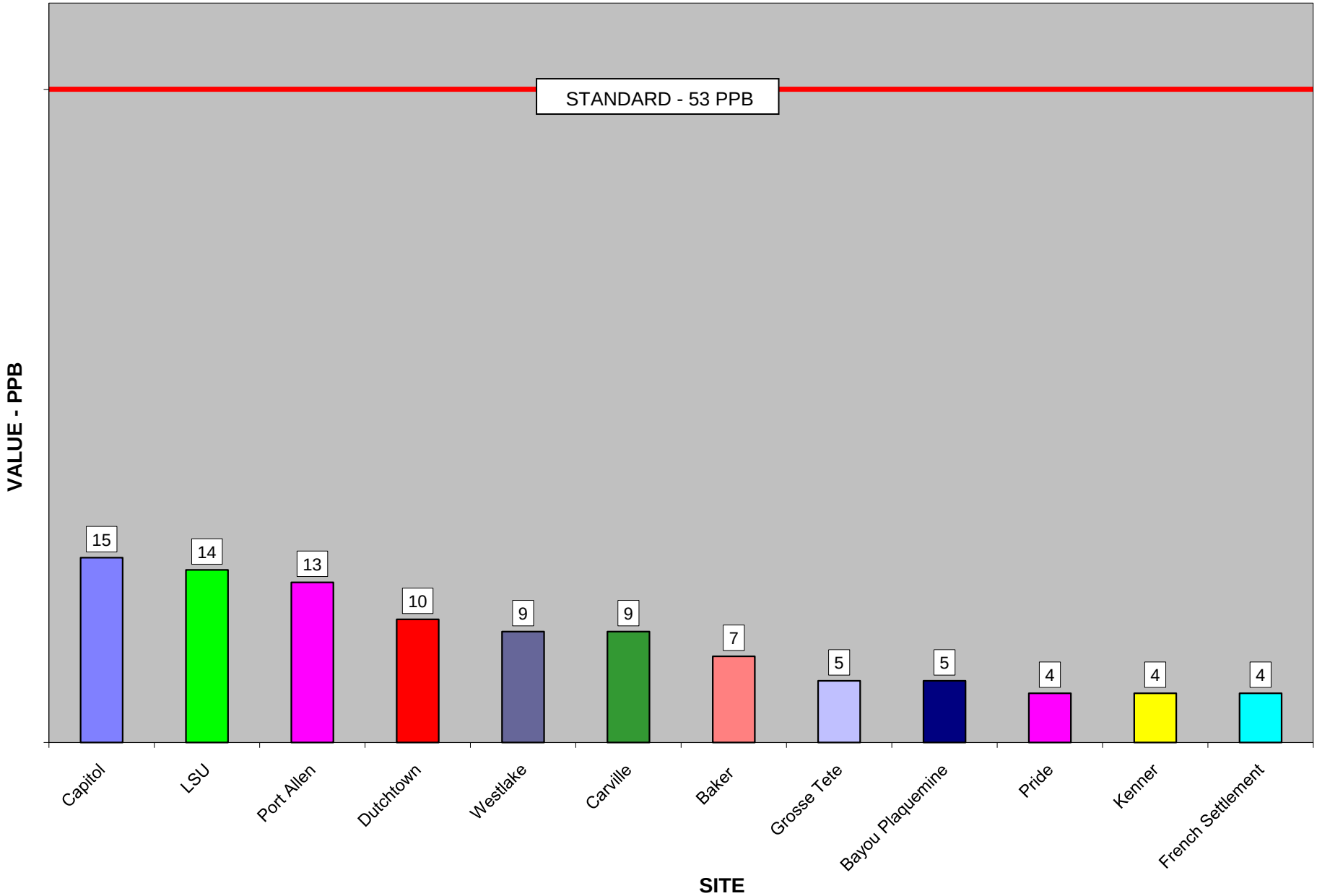

Figure 10. 2007 Nitrogen Dioxide Annual Means

Sulfur Dioxide

Table 4. Louisiana Sulfur Dioxide Monitoring Stations	
Capital Region Capitol Port Allen	**Southwest Region** Westlake
Southeast Region Chalmette High School Chalmette Vista	**North Region** Shreveport Airport Monroe

The burning of sulfur or any material containing sulfur produces sulfur dioxide (SO_2). The largest source of SO_2 is fossil-fuel combustion from electric power generation. SO_2 can form acids when they hydrolyze with water, and the acids can then have detrimental effects on the environment in the form of acid rain. In addition, SO_2 has been associated with human health problems, damage to plants and animals, smog and haze through the formation of acid mists, and corrosion of metals.

SO_2 monitoring sites have been stationed primarily in areas of high population or near potential SO_2 sources. Chalmette Vista and Chalmette High School sites were included in the Louisiana Monitoring Network in the 2007. One of the new sites, Chalmette Vista recorded the highest annual mean during this year of 9 ppb. Still, this value is only 30% of the 30 ppb NAAQS value. Figures 12 through 14 give the annual mean, 24-hour max, and historical statewide max values for the SO_2 monitoring. Figures 13 and 14 show that aside from values obtained from Chalmette Vista, sampling in Louisiana over the past years has indicated that the levels of SO_2 are insignificant when compared with the standard.

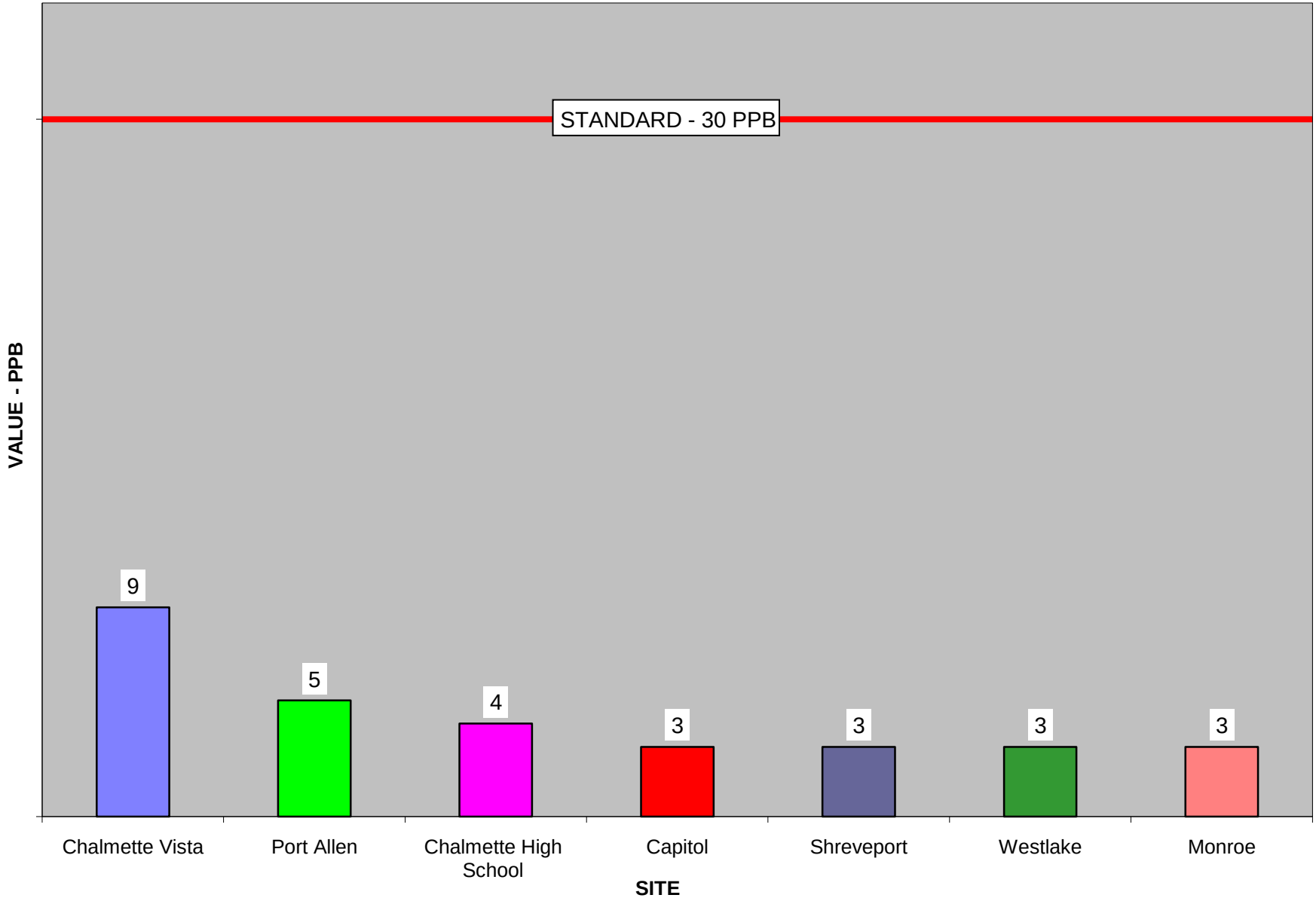

Figure 11. 2007 Sulfur Dioxide Annual Means

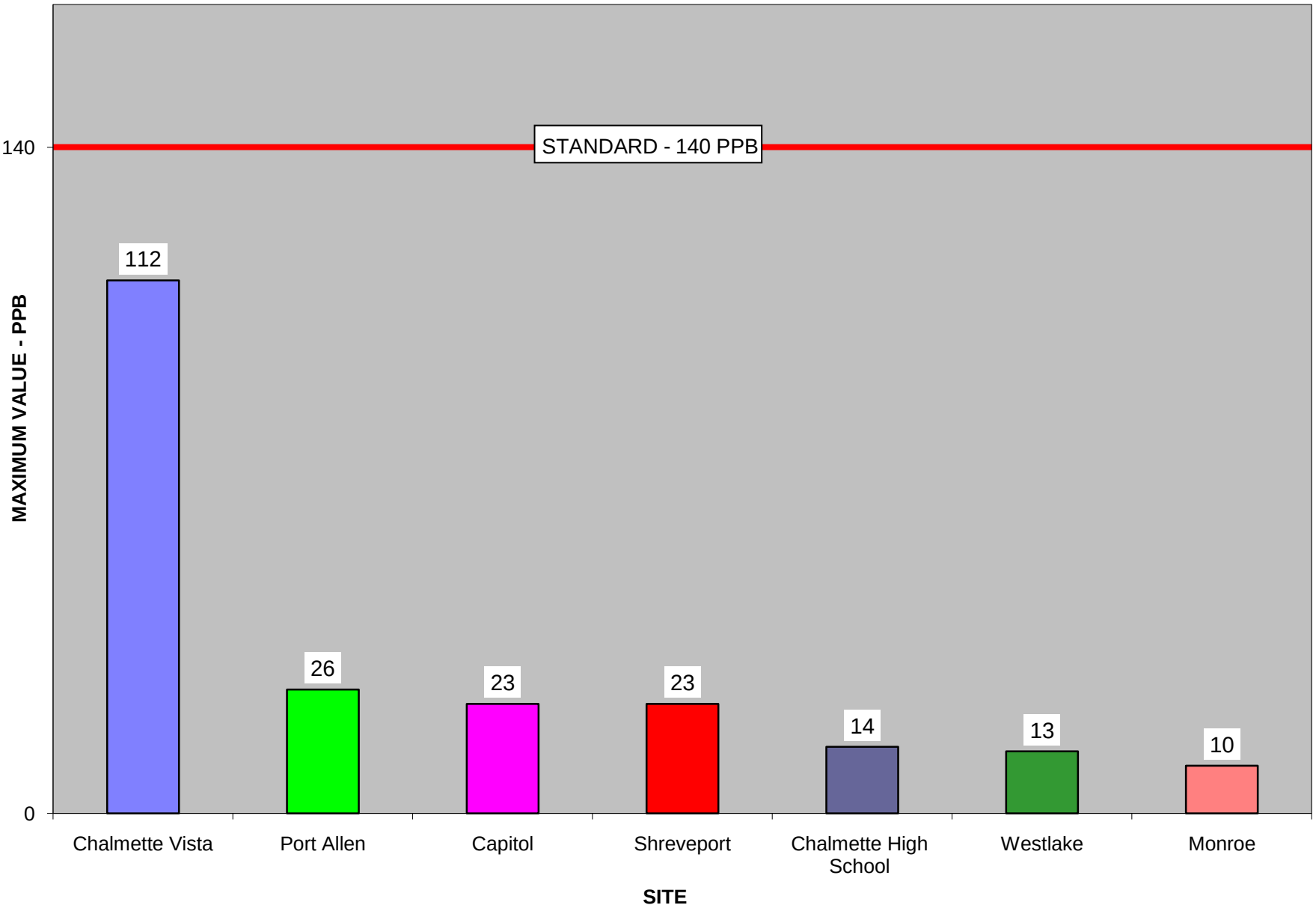

Figure 12. 2007 Maximum Sulfur Dioxide 24-Hour Values

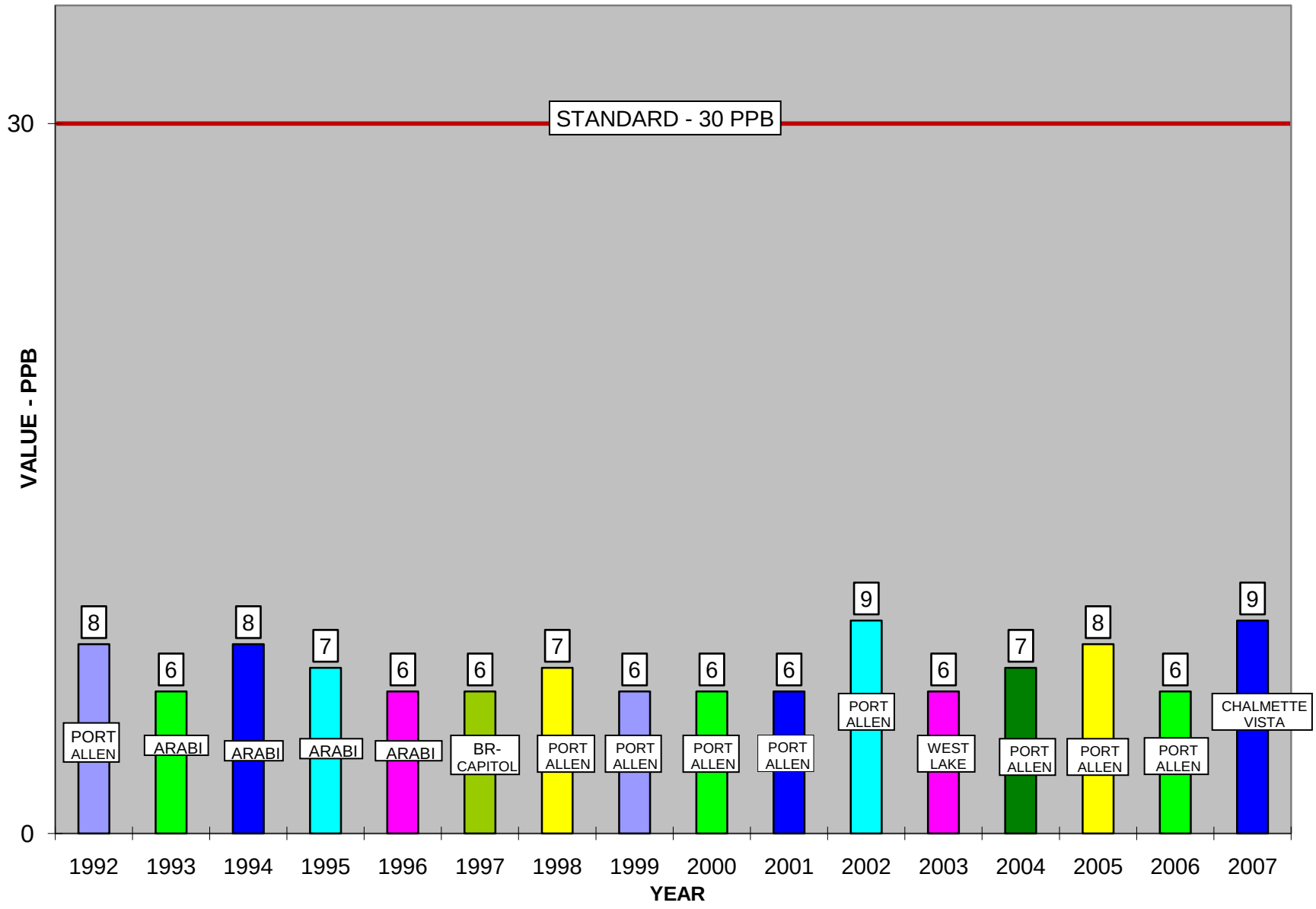

Figure 13. Maximum Annual Mean Sulfur Dioxide Concentrations by Year Statewide

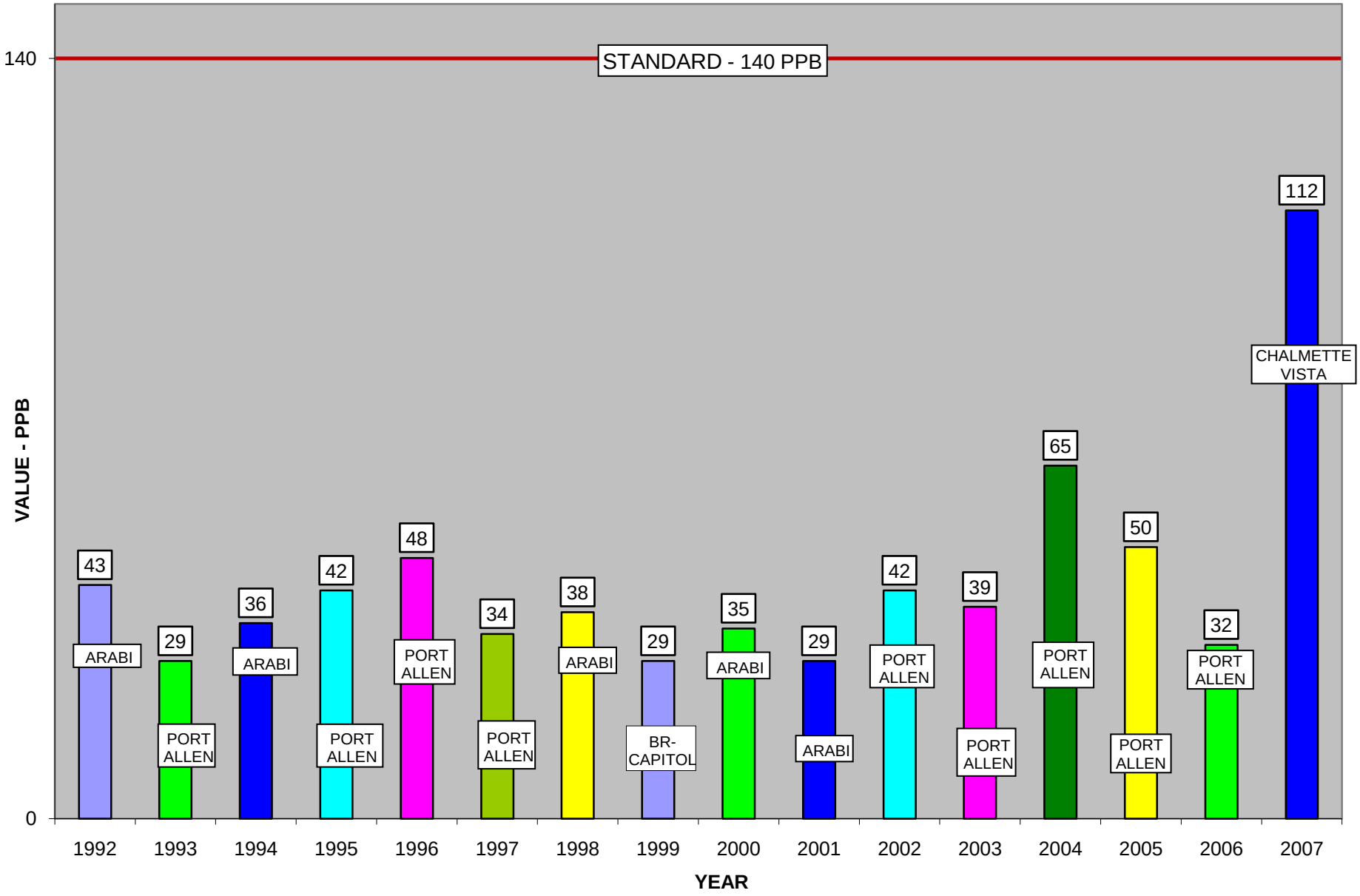

Figure 14. Maximum 24-Hour Sulfur Dioxide Concentrations by Year Statewide

Carbon Monoxide

Table 5. Louisiana Carbon Monoxide Monitoring Stations
Capital Region Capitol

Carbon monoxide (CO) is a colorless, odorless, tasteless gas that is caused by the incomplete combustion of any carbonaceous fuel. The main source of this pollutant is the transportation sector. The effects on humans range from slight headaches to nausea to death depending on the level of concentration and time of exposure.

The Capitol monitor in Baton Rouge constitutes the entire CO monitoring network. This location is the state's most populated city after the storm. The Capital site is located in the heart of the city, less that half a mile from a heavily traveled section of Interstate 110. LDEQ believes that carbon monoxide monitor placement within the state is adequate as indicated by the monitored values.

Louisiana has maintained CO levels below the NAAQS. The second maximum 2007 1-hour CO concentration was 7% of the standard, and the second maximum 8-hour CO concentration was 18% of the standard.

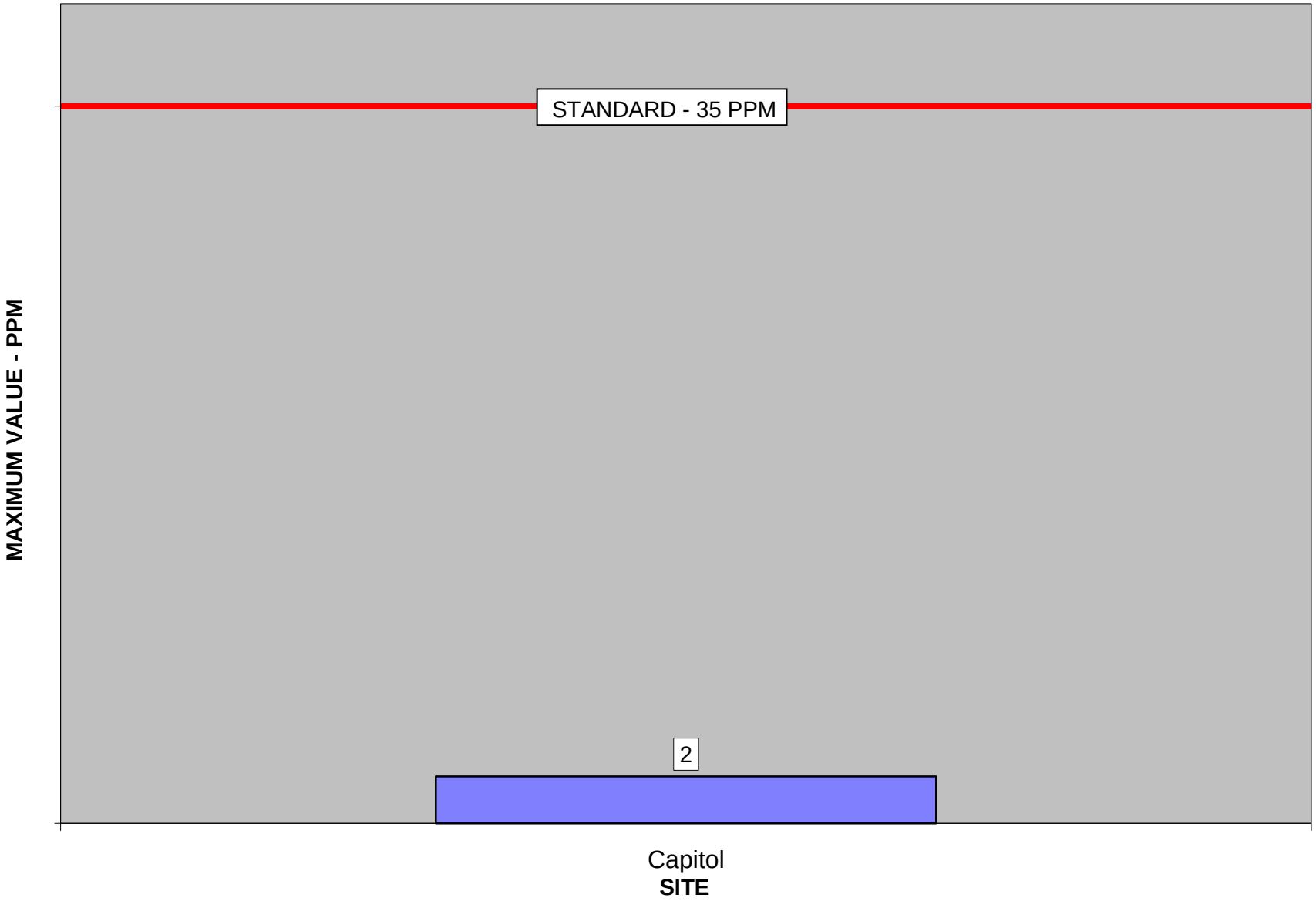

Figure 15. 2007 Second Maximum 1-Hour Carbon Monoxide Values

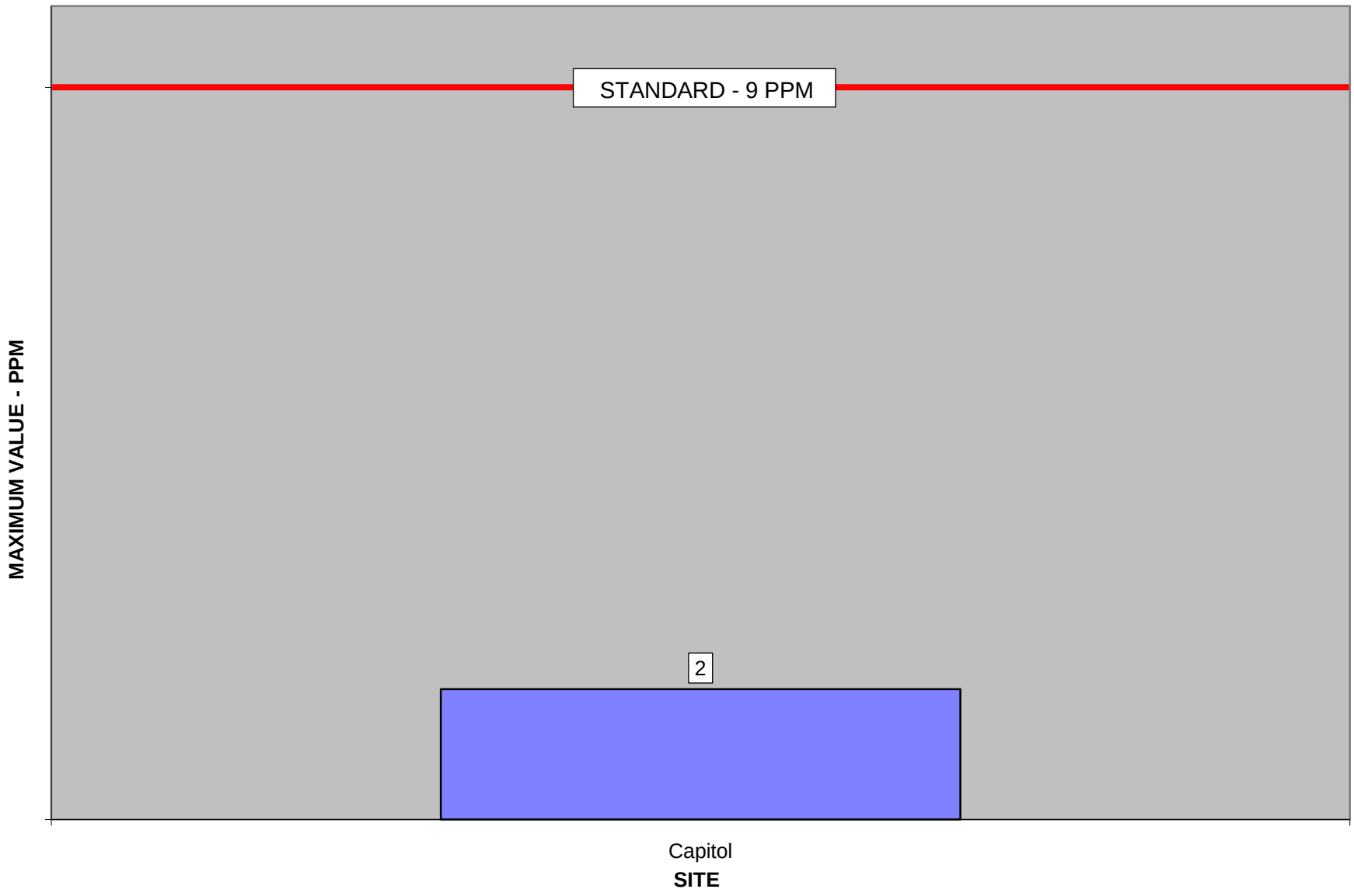

Figure 16. 2007 Second Maximum 8-Hour Carbon Monoxide Values

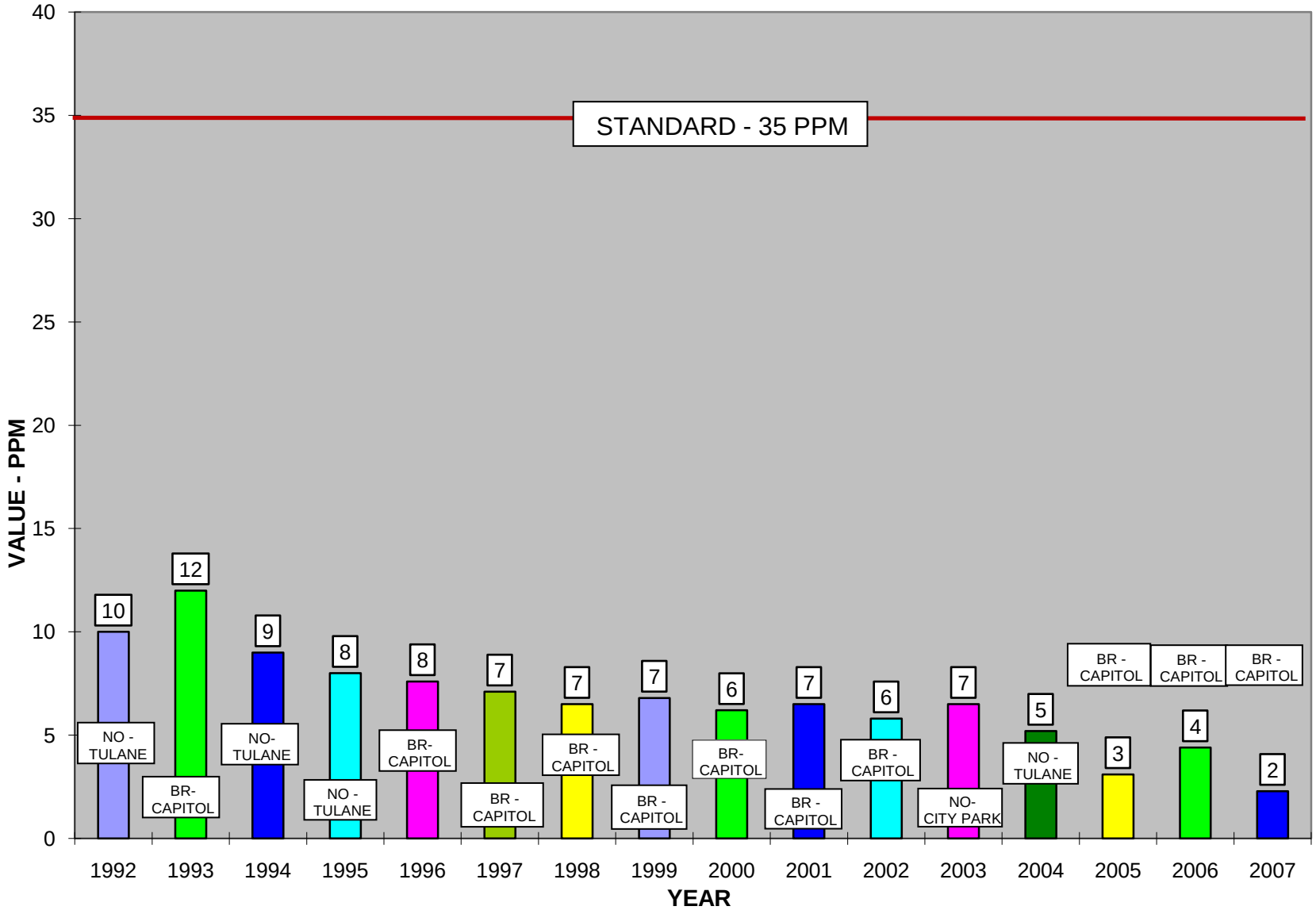

Figure 17. Second Maximum 1-Hour Carbon Monoxide Concentrations by Year Statewide

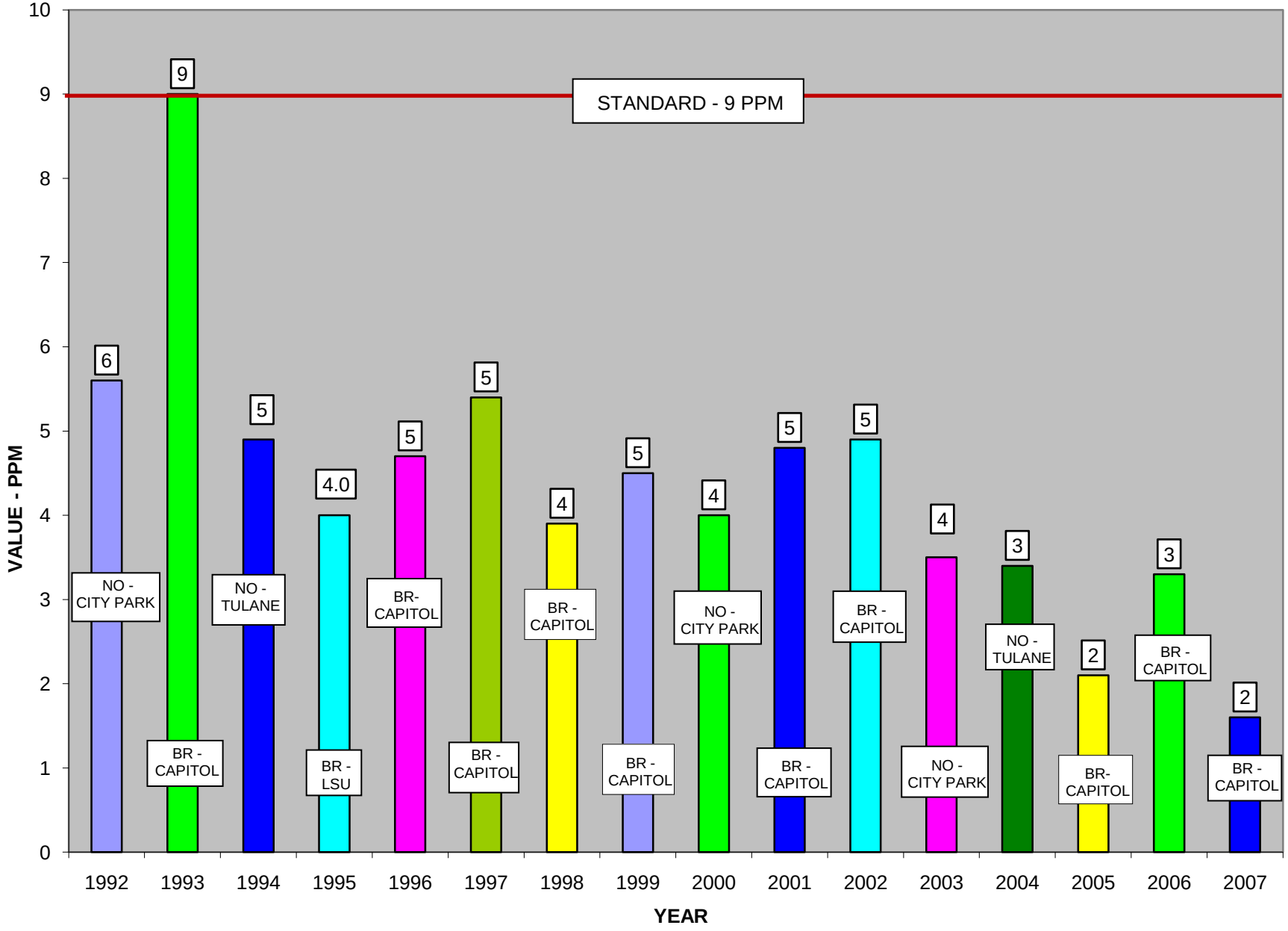

Figure 18. Second Maximum 8-Hour Carbon Monoxide Concentrations by Year Statewide

Particulate Matter (PM_{10} and $PM_{2.5}$)

Particulate matter or particulates are very-small-diameter solids or liquids that remain suspended in gases and can be discharged into the atmosphere. Louisiana currently monitors for two different types of particulates, PM_{10} and $PM_{2.5}$. PM_{10} is particulate matter of 10 microns in diameter or smaller, while $PM_{2.5}$ (or PM-fine) particles are approximately 2.5 microns or smaller. Industrial particulates are produced by many processes including crushing and grinding ores, loading dry materials in bulk, combustion processes, and from gas conversion reactions in the atmosphere. Particulates can also be produced by natural events such as forest fires. There are many different sources of these particulates and the sampling must be in-depth and widespread to ensure good coverage and accurate results.

PM_{10}

Table 7. Louisiana PM_{10} Monitoring Stations

Capital Region*	**Southeast Region**	**North Region**
Port Allen	Chalmette Vista	Shreveport Calumet

Chalmette Vista began collecting data to be incorporated into the PM_{10} monitoring network in May 2006. Table 7 gives the locations of the three PM_{10} monitoring stations that monitor particulate year round. As seen in Figure 19, the highest 24-hour PM_{10} reading in 2007 was 87 $\mu g/m^3$ at the Chalmette Vista site. This value is only 58% of the NAAQS of 150$\mu g/m^3$. In 2006 EPA revoked the annual mean standard of 50 $\mu g/m^3$ due to lack of evidence linking health risks from long-term exposure to coarse particles.

$PM_{2.5}$

Table 8. Louisiana $PM_{2.5}$ Monitoring Stations		
Capital Region Baker Bayou Plaquemine Capitol French Settlement Geismar Hammond Port Allen Pride	**Southeast Region** City Park Chalmette Vista Houma Kenner Marrero Thibodaux **Northeast Region** Alexandria	**Acadiana Region** Lafayette Lafayette USGS **Southwest Region** Lake Charles-McNeese Vinton Westlake **North Region** Monroe Shreveport Airport Shreveport Calumet

The Louisiana $PM_{2.5}$ Monitoring Network consists of 23 sampling sites throughout the state. Seventeen sites are furnished with Federal Reference Method (FRM) monitors – Rupprecht & Patashnick (R&P) model 2025 sequential air samplers. Three of these sites have collocated FRM monitors. Ten sites have continuous sampling monitors (R&P TEOM® model 1400 AB), with Chalmette being the newest location added in May 2006. All $PM_{2.5}$ monitoring stations locations are given in Table 8. The type of monitor located at each station can be determined from Table 2.

It should be noted that TEOM® monitors are not approved for use in Federal Reference Methods. Therefore, the readings obtained from these monitors are compared to FRM monitors and are used as indicator values only. The values may not be directly compared to the NAAQS for particulate matter.

The $PM_{2.5}$ monitoring information is summarized in Figures 20 to 25 for 2007. The highest three year annual mean for $PM_{2.5}$ was 13.7 $\mu g/m^3$ recorded at the Port Allen site. The highest 24-hour reading in the state was at 31 $\mu g/m^3$recorded at the Monroe site.

No samplers in the state indicated an annual mean or 24-hour value above the NAAQS in 2007. All FRM and TEOM® sites showed a cyclical trend in concentrations during the past three years with this year's values being lower than last at every site.

As seen in Figure 25, three sites have both FRM and TEOM® samplers collocated at one site. The annual mean of the TEOM® for samplers at both the Kenner and Capitol sites were slightly elevated, but within two percent difference in comparison to Federal Reference samplers. However, Port Allen site values had nearly a 15% difference between the FRM and TEOM® samplers for the same time period. This value represents the greatest difference seen between FRM and TEOM® samplers over a four-year period. Values obtained from collocated FRM and TEOM® samplers at these three locations over a four-year period show that readings are very inconsistent between samplers and no trend can be established based on the data gathered.

Chemical Speciation

Speciation monitors, URG 400 and URG 450, are in operation at the Capitol site in Baton Rouge and at the Shreveport airport site. These monitors are operated for information purposes only to help determine the source and types of contaminants. There is no standard for chemical constituents of particulates. The majority of the mass collected in 2007 was composed of sulfur and organic compounds. Specific percentages are given in Figures 26 and 27.

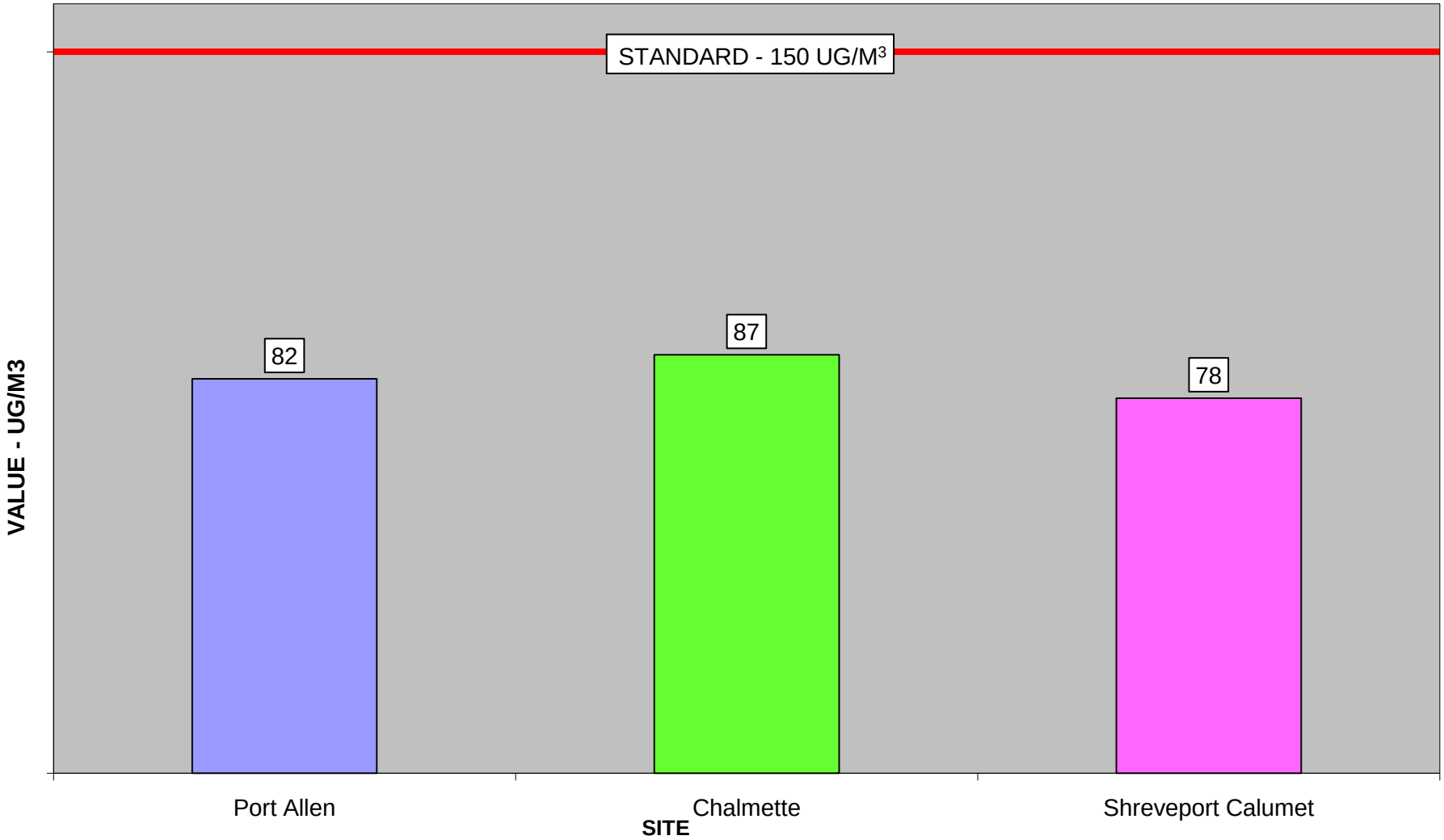

Figure 19. 2007 Maximum PM_{10} 24-Hour Concentrations

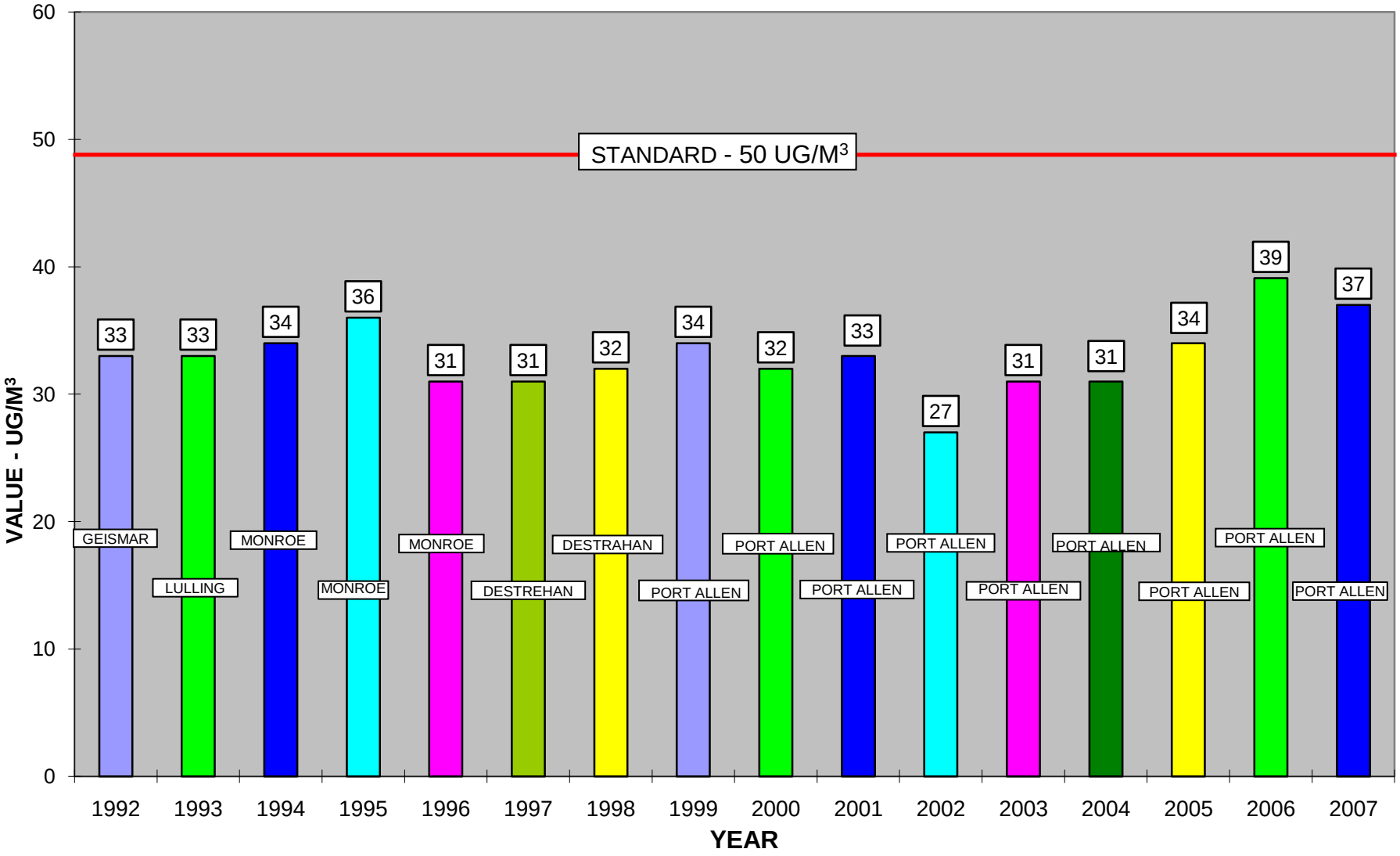

Figure 20. Maximum 24-Hour PM10 Concentrations by Year Statewide

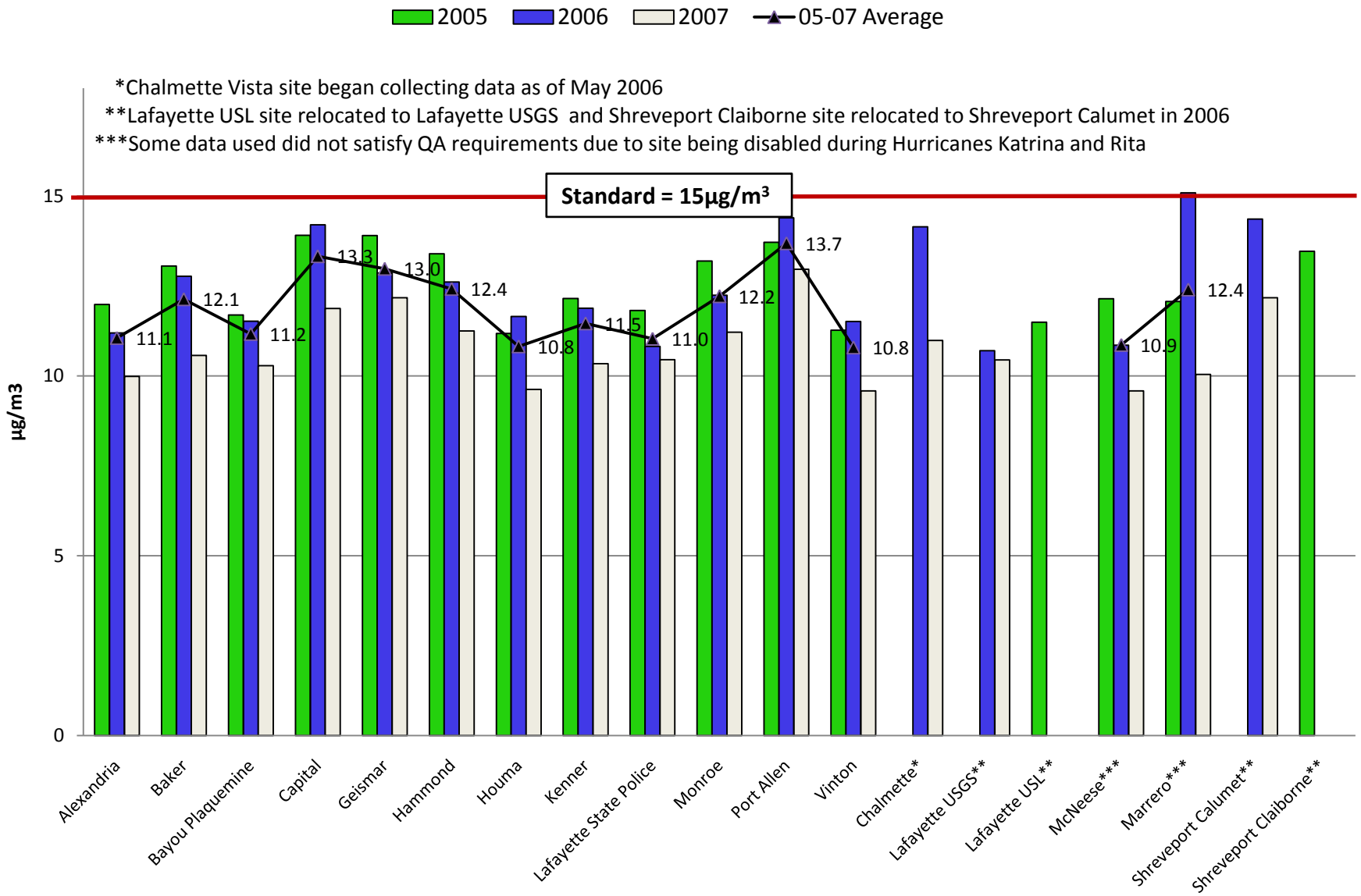

Figure 21. Louisiana $PM_{2.5}$ Annual Mean (2005-2007)

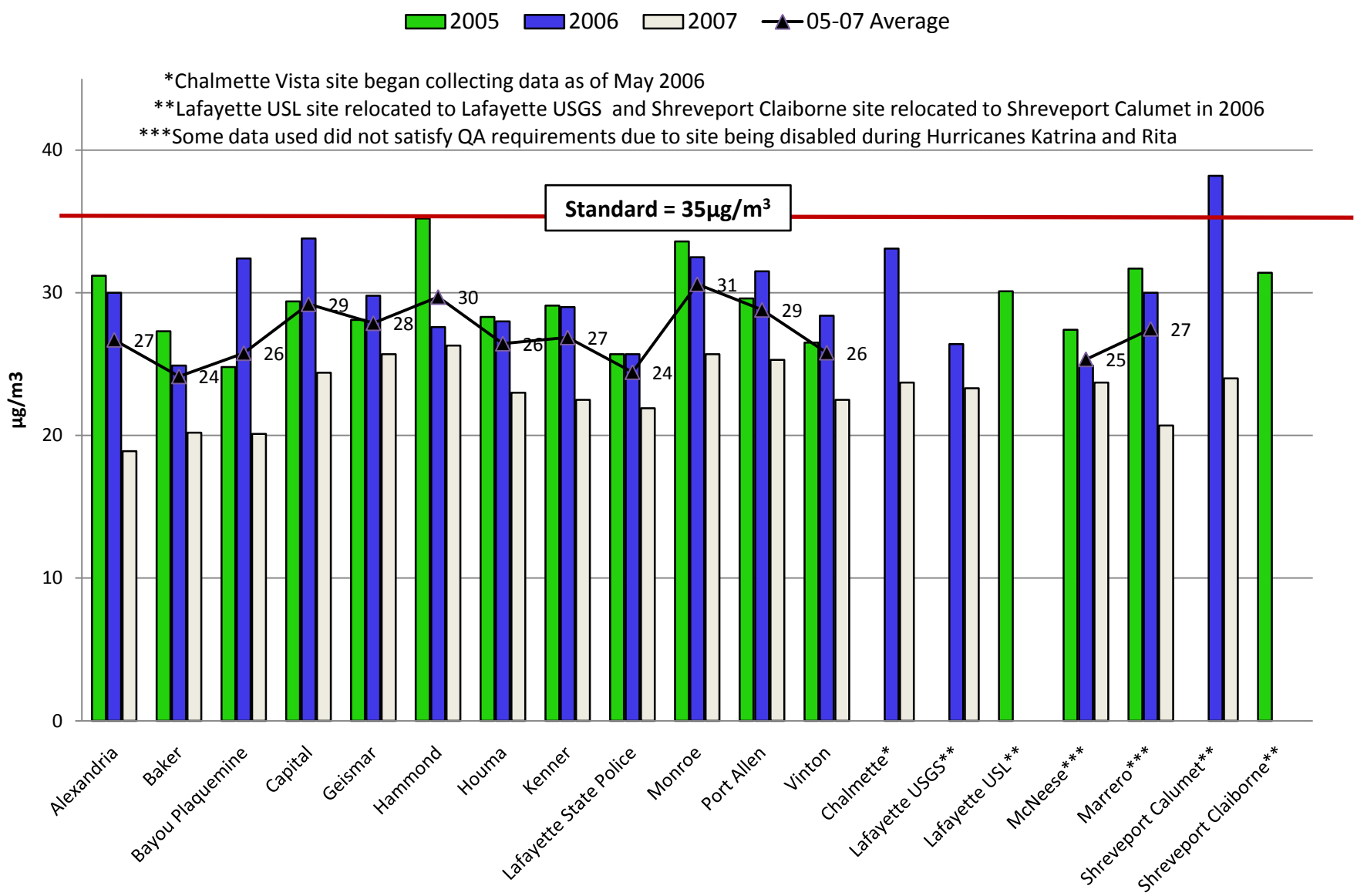

Figure 22. $PM_{2.5}$ 24-Hour Value (2005-2007)

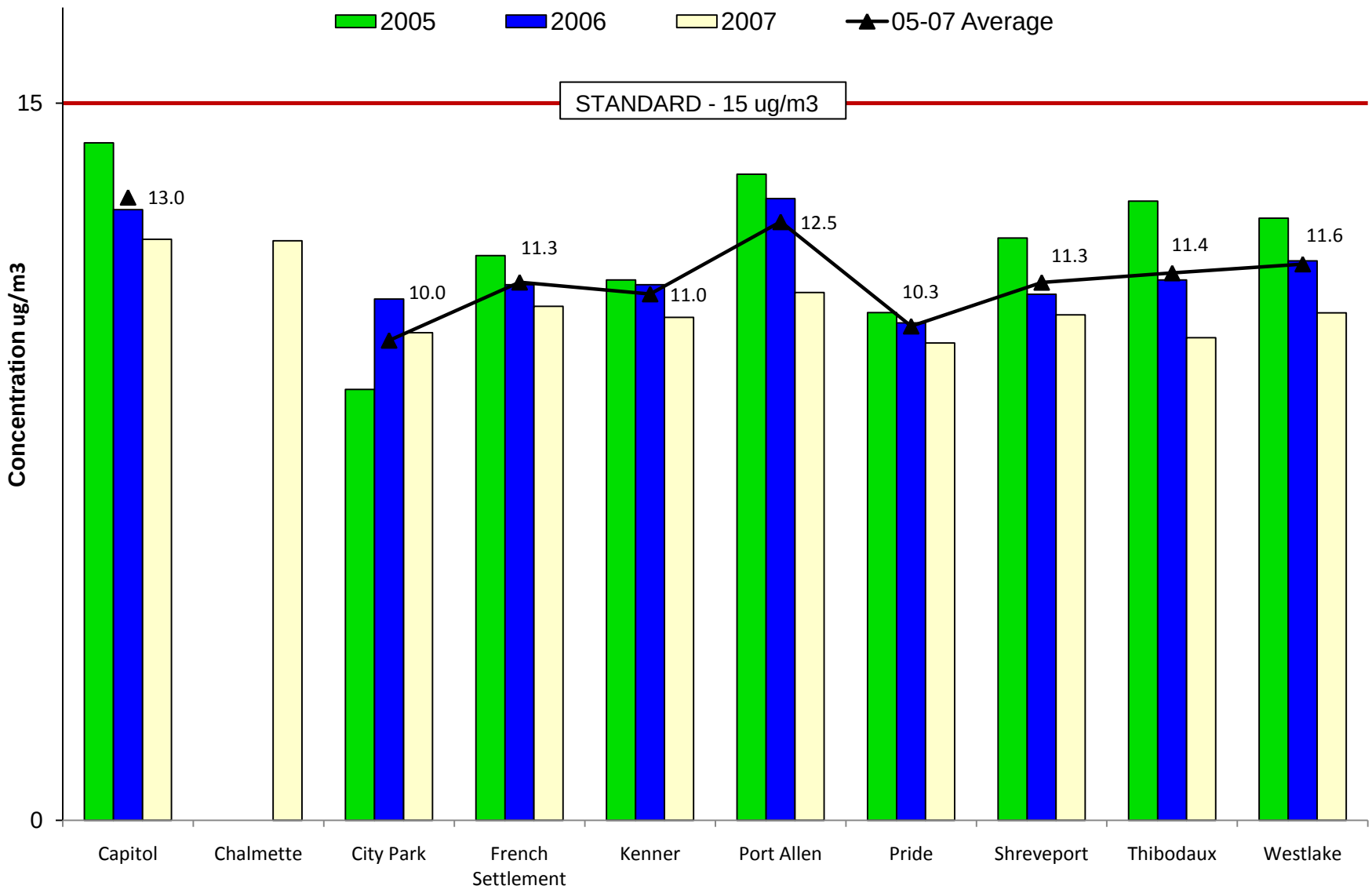

Figure 23. Louisiana $PM_{2.5}$ TEOM® Annual Mean (2005-2007)

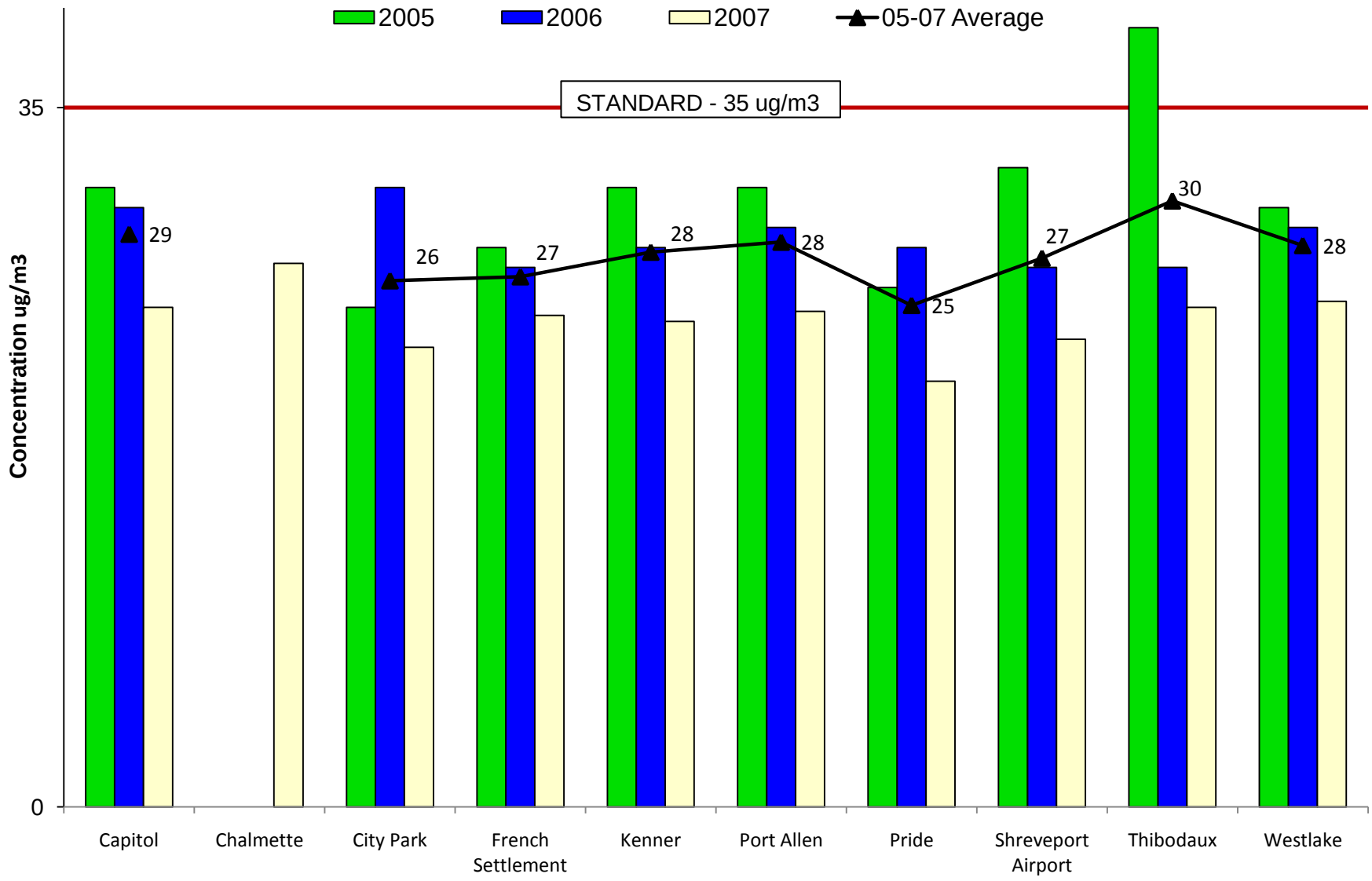

Figure 24. Louisiana $PM_{2.5}$ TEOM® 24-Hour Value (2005-2007)

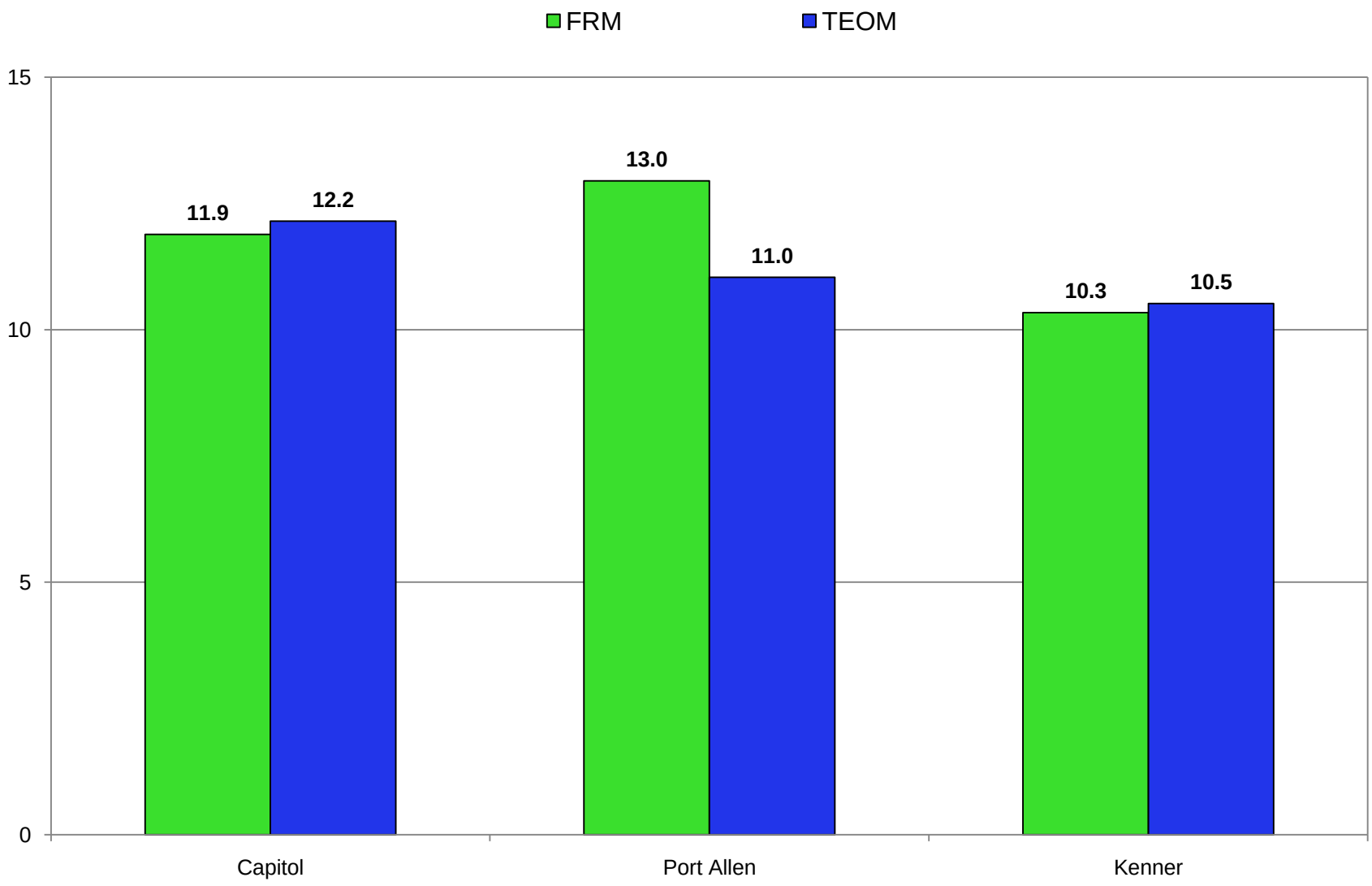

Figure 25. $PM_{2.5}$ Annual Mean Comparison of TEOM® Vs. FRM

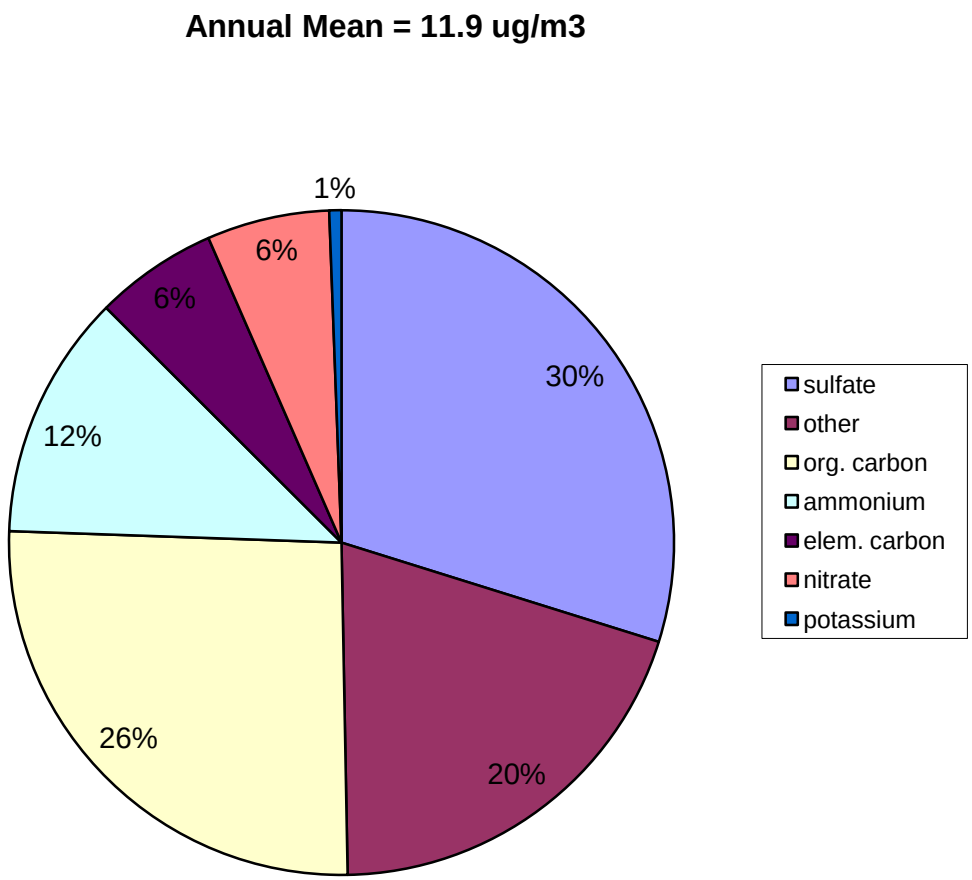

Figure 26. $PM_{2.5}$ Chemical Speciation Annual Mean - Capitol Site

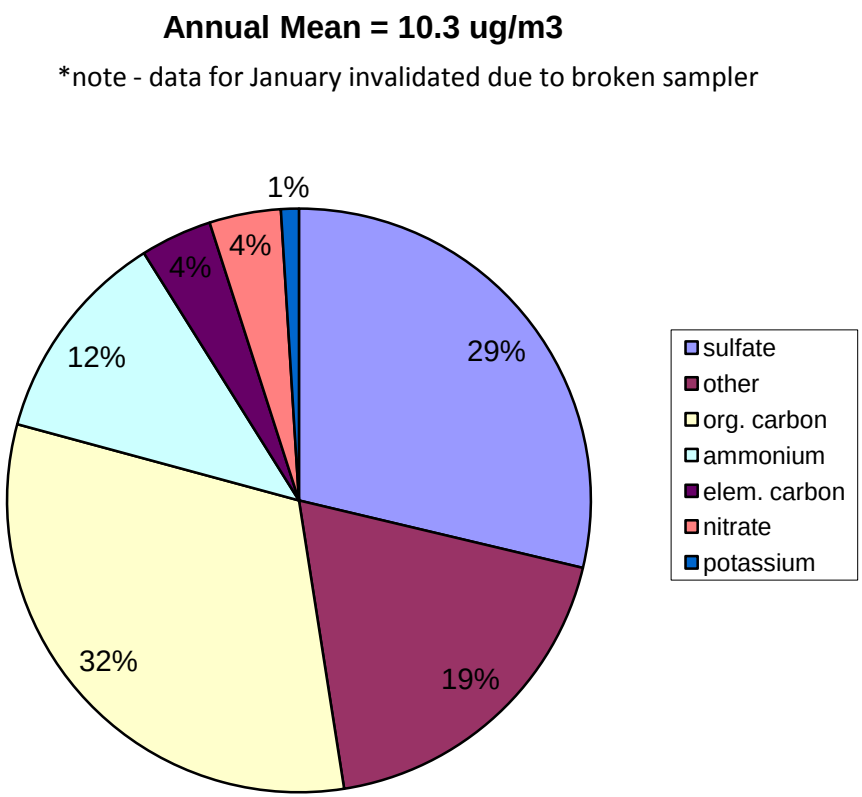

Figure 27. $PM_{2.5}$ Chemical Speciation Annual Mean - Shreveport Site