

Within-Week Variability and Long-Term Trends in Traffic, Power Plant Emissions, and Ambient CO, NO_y and Ozone for the Charlotte Metropolitan Area

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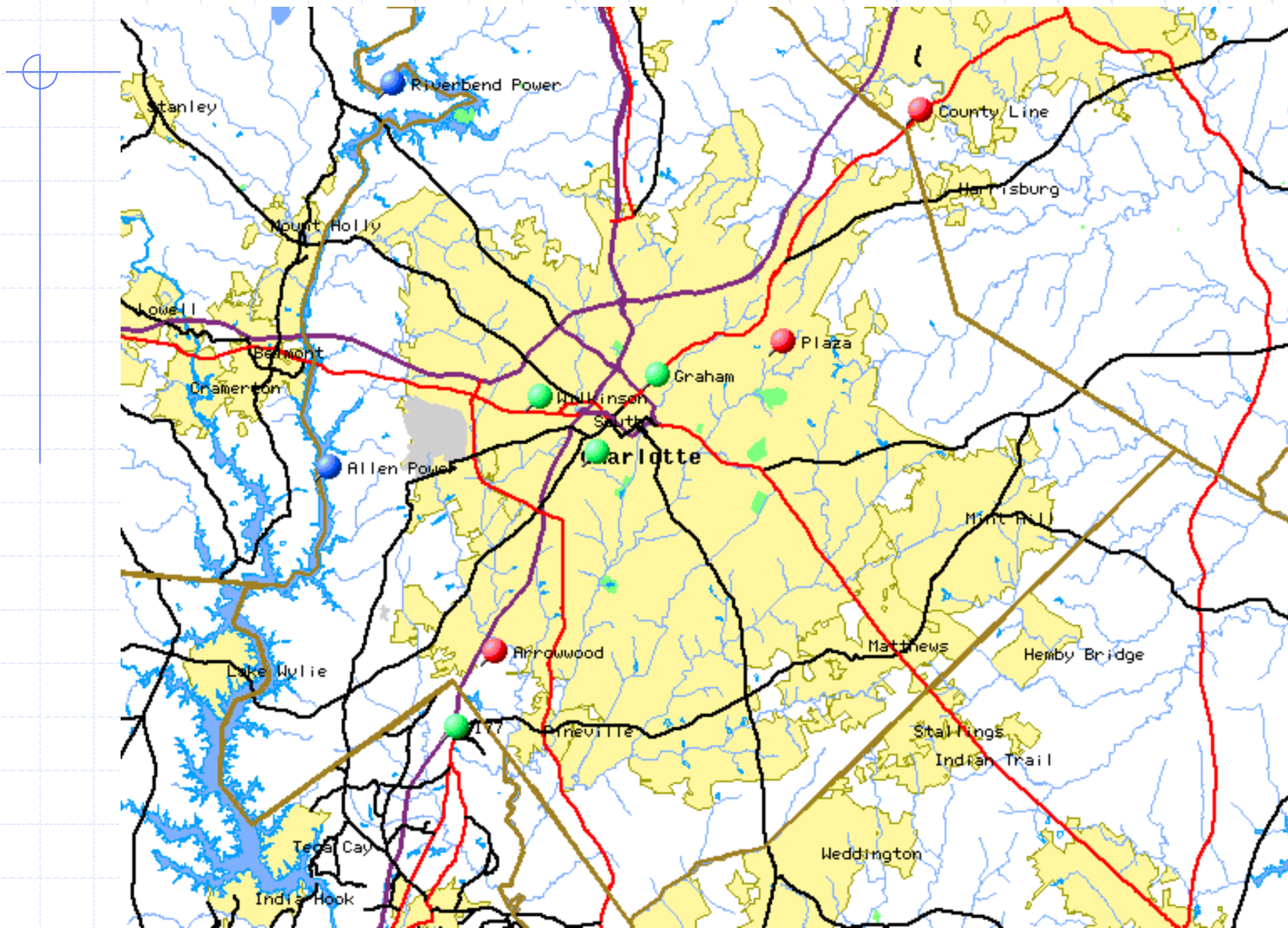
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Objectives

- ◆ Show Charlotte regional growth by traffic volumes and power plant emissions
- ◆ Characterize trends in NO_y , CO, Hydrocarbon, and Ozone monitoring data
- ◆ Understand how traffic and power plant emission fluctuations within each week affect pollutant levels

<u>Type of Data</u>	<u>Monitoring Site</u>	<u>Selected Data</u>
Traffic Counts	Interstate I-77	Jun-Aug, 1990-1997
	South Blvd, Wilkinson Blvd, Graham St.	May-Sep, 1990-1997 (8-9 AM, 6-7 PM, daily)
Mecklenburg County Ambient Air Monitors	Plaza, County Line	O₃: May-Sep, '90-00 CO: May-Sep, '93-00 NO_y: May-Sep, '95-00 Hydrocarbons, '95-99
	Arrowwood	O₃: May-Sep, '90-00
Power Plant Emission Monitors (CEM)	Riverbend, Allen Marshall, Buck	NO_x: May-Sep, '96-00

Traffic Locations, Monitoring Sites, & Power Plants



Regional NO_x Sources

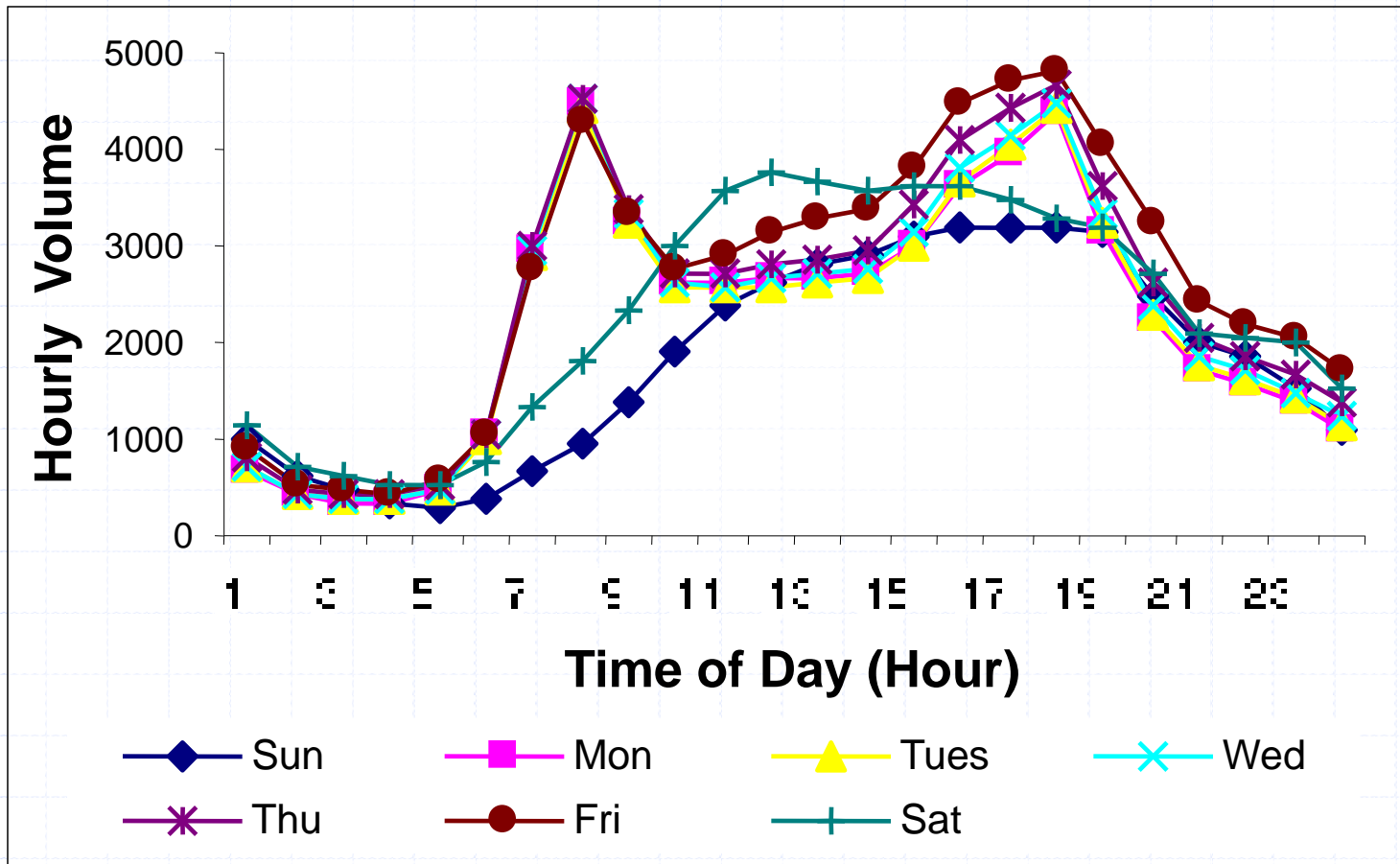
- ◆ 1997 Gaston County Power Plant Emissions
 - 12,930 tons (Allen)
 - 3,780 tons (Riverbend)

- ◆ 1996 Mecklenburg County Emissions
 - 17,295 tons (mobile sources)
 - 687 tons (stationary sources)

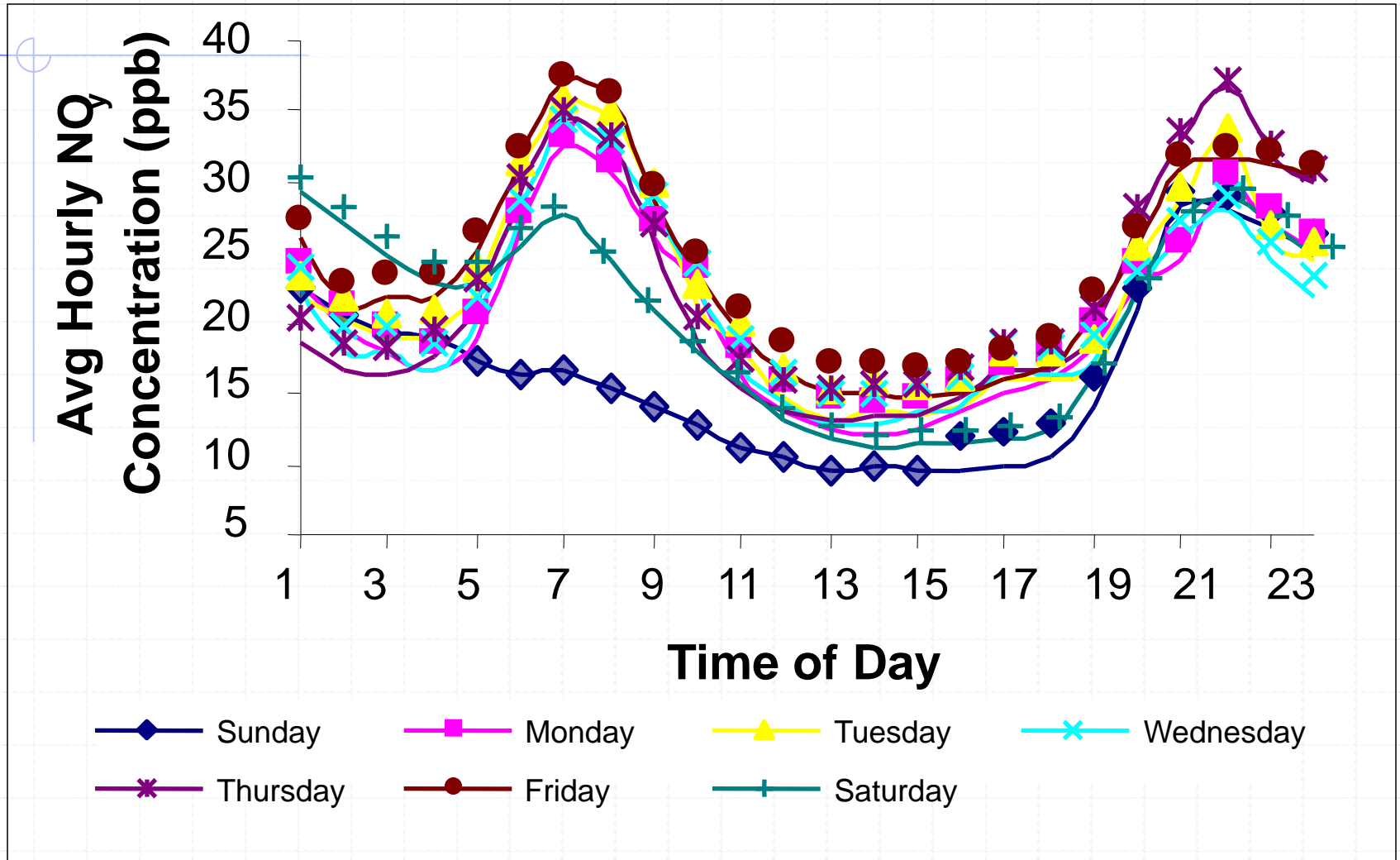
Traffic Sites

Roadway	Tachograph Loc.	Data Available
Interstate 77	SC Welcome Center Between Exits 88 & 90	June-August 1990-1997 (Hourly data)
South Blvd (Hwy 521)	Between Poindexter & Marsh @ Pepsi Plant	May-Sept 1990-1998, (7-8AM, 5-6PM, Daily)
Wilkinson Blvd (Hwy 29&74)	Remount Rd Intersection	May-Sept 1990-1998, (7-8AM, 5-6PM, Daily)
Graham St.	Past Railroad Tracks @ 12th St.	May-Sept 1990-1998, (7-8AM, 5-6PM, Daily)

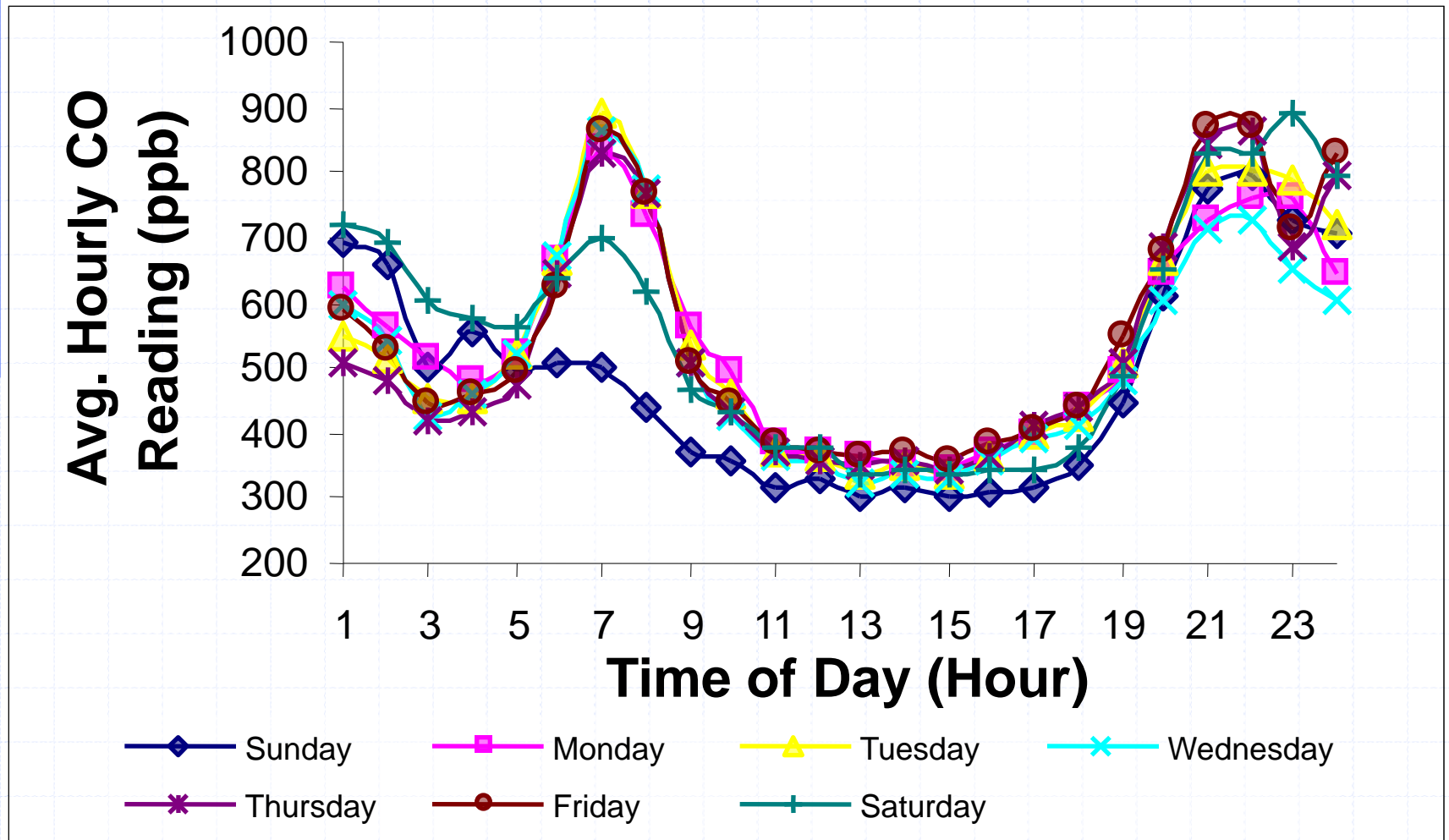
I-77 Traffic Volume vs. Time of Day



May-Sep '95-'98 Plaza Average Hourly NO_y

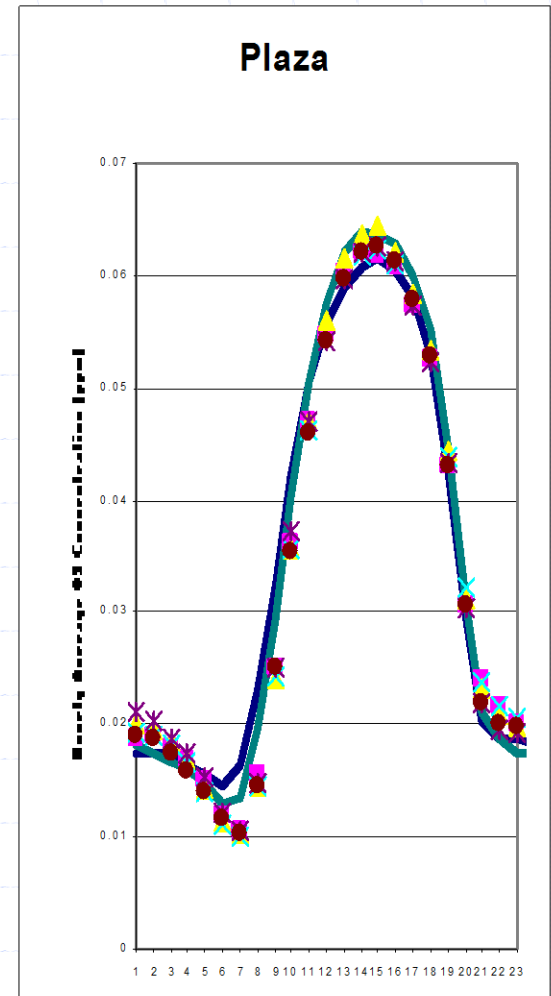
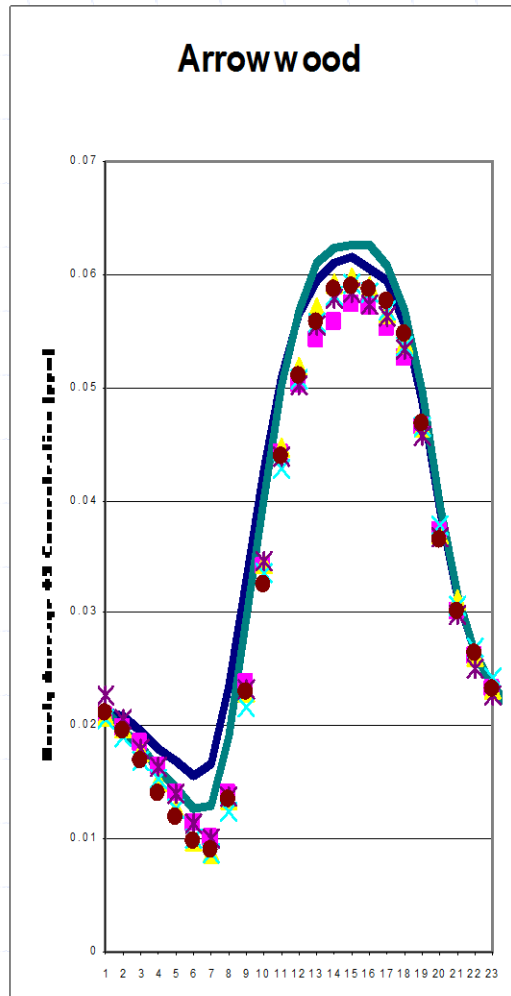
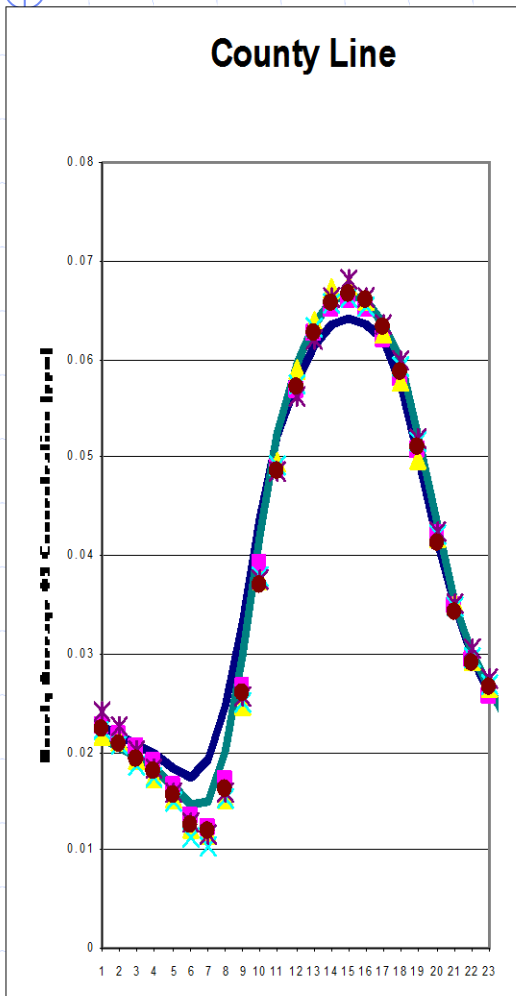


May-Sep '93-'98 Plaza Average Hourly CO

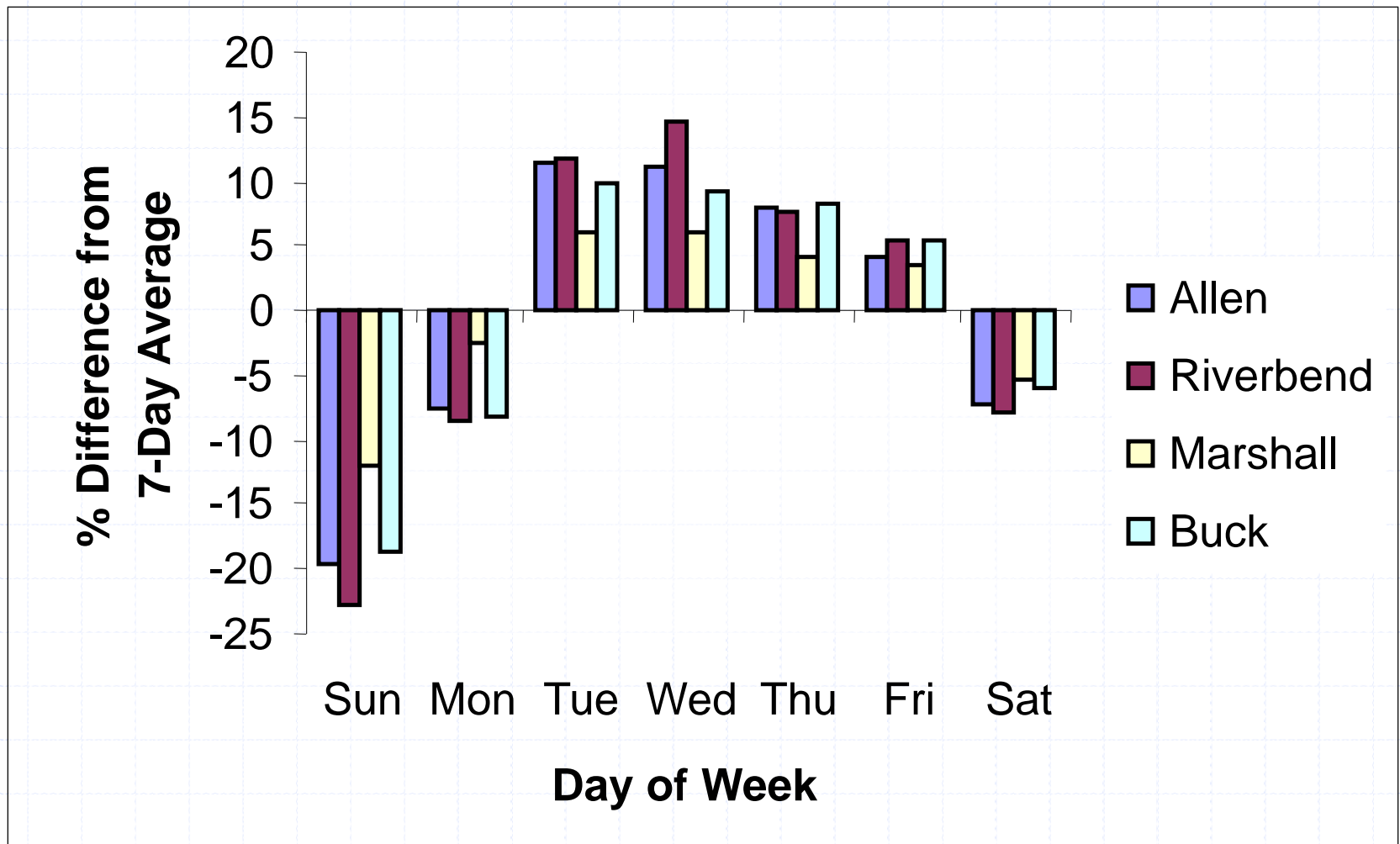


1990-1998 May-Sep Diurnal Charlotte Ozone Averages

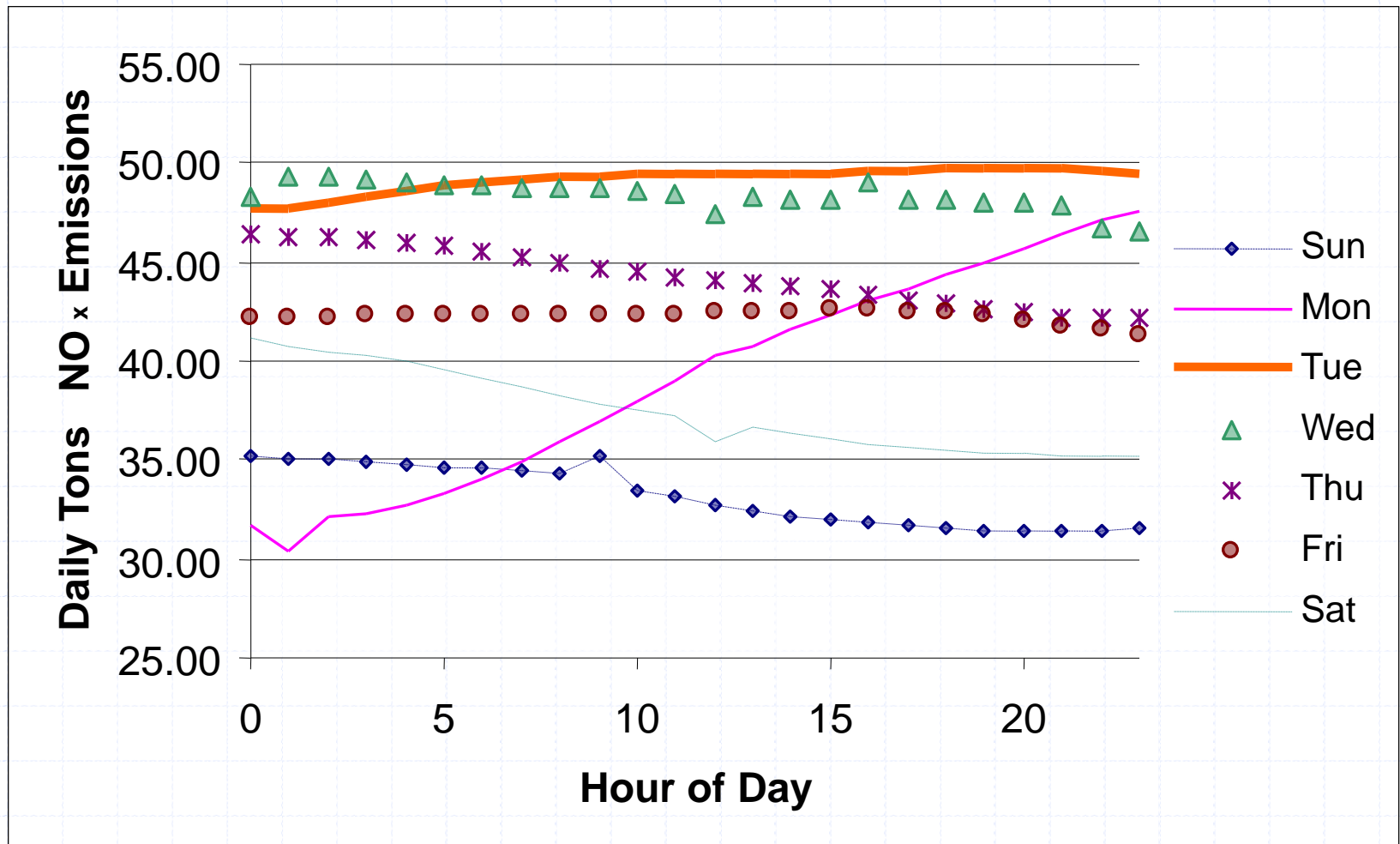
By Day of Week (*weekend days-lines, weekdays-markers*)



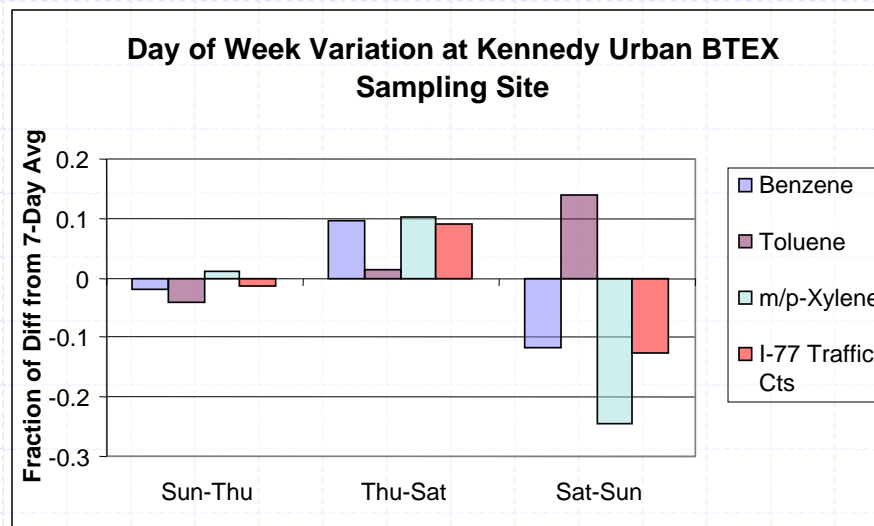
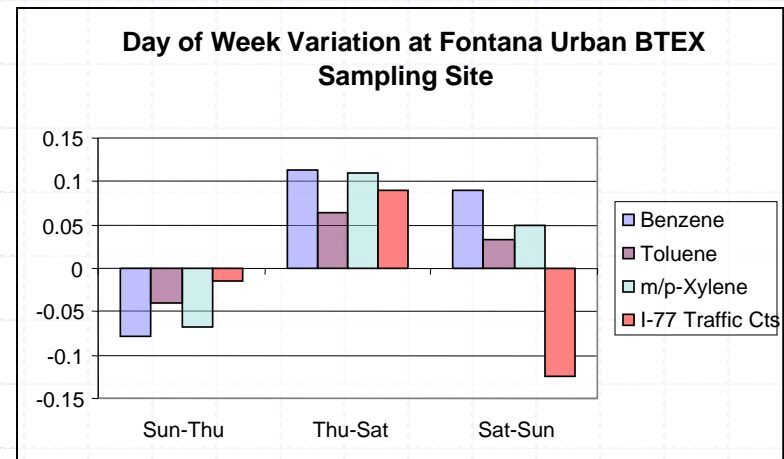
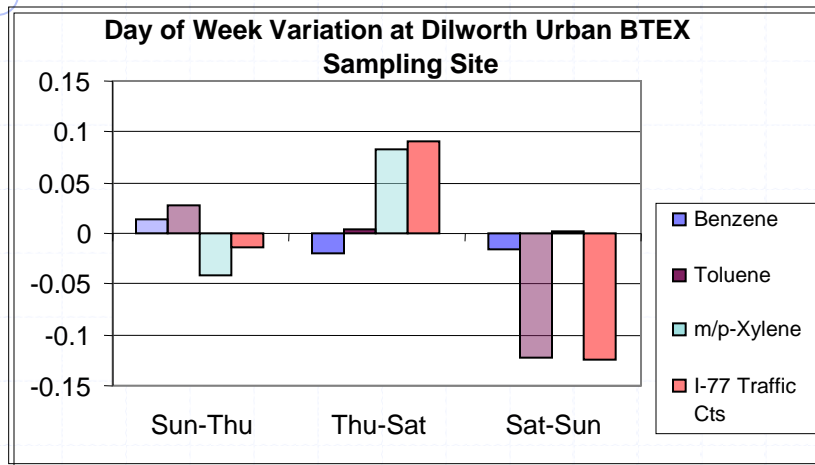
Day of Week NO_x Emissions from Four Coal-fired Plants near Charlotte



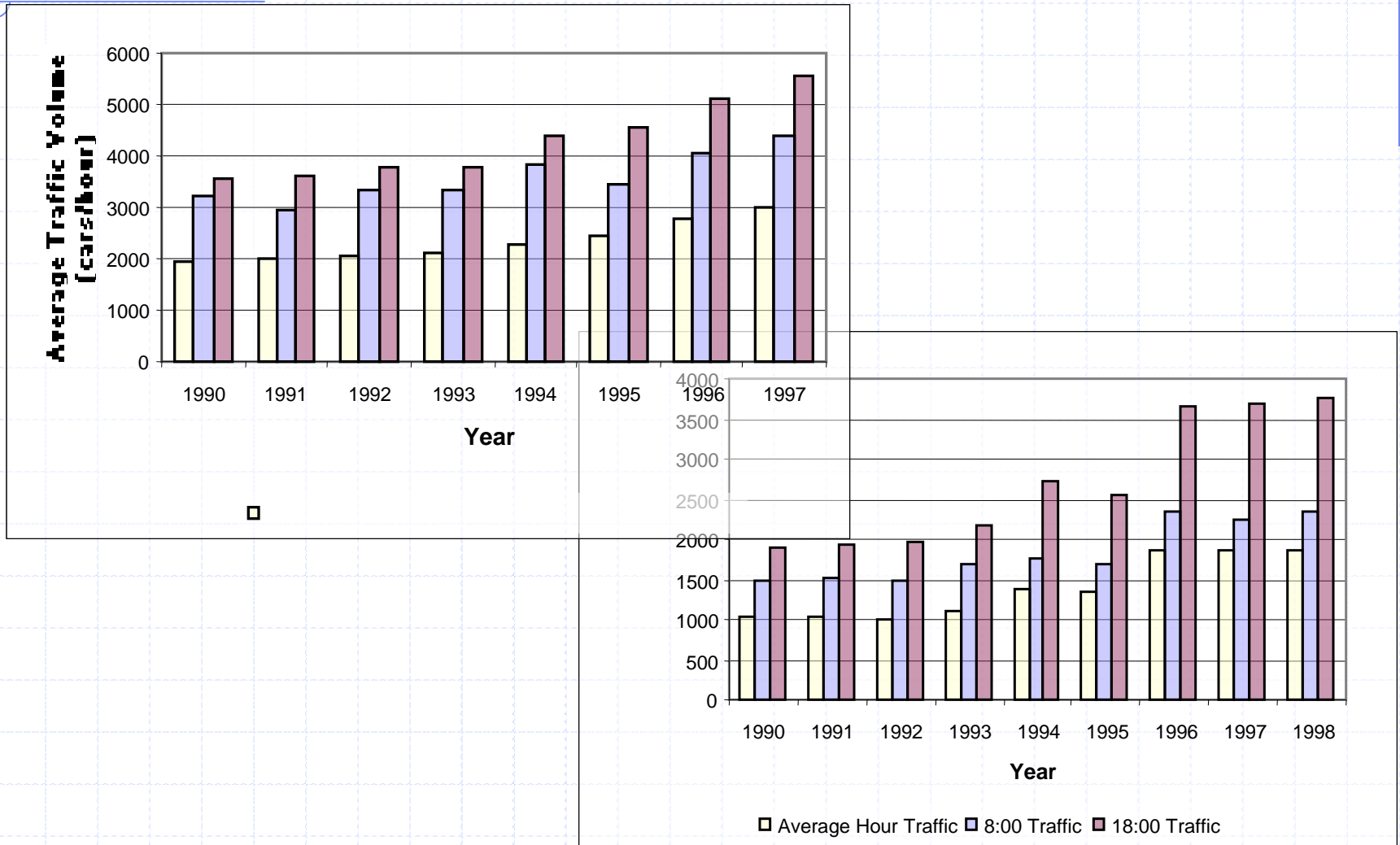
Coal-fired Power Plant Hourly NO_x Emissions by Day of Week for a Recent Season



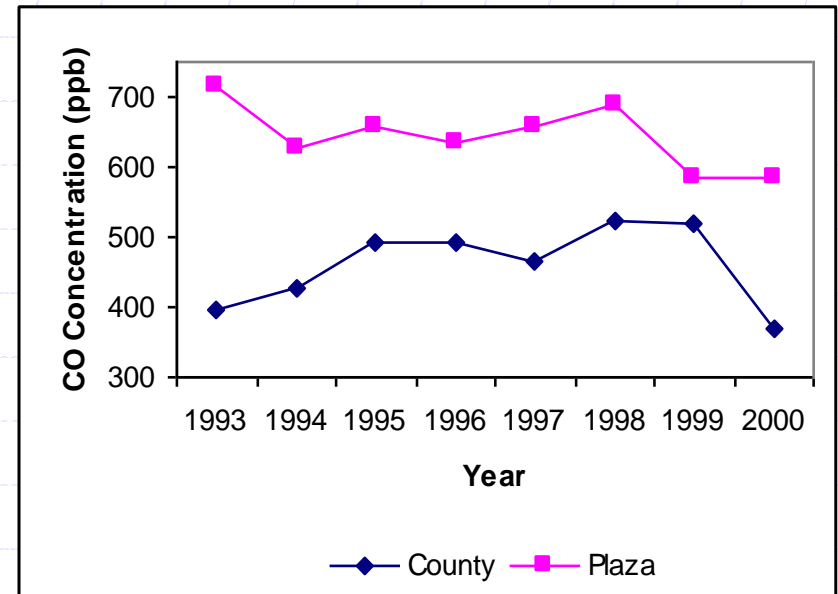
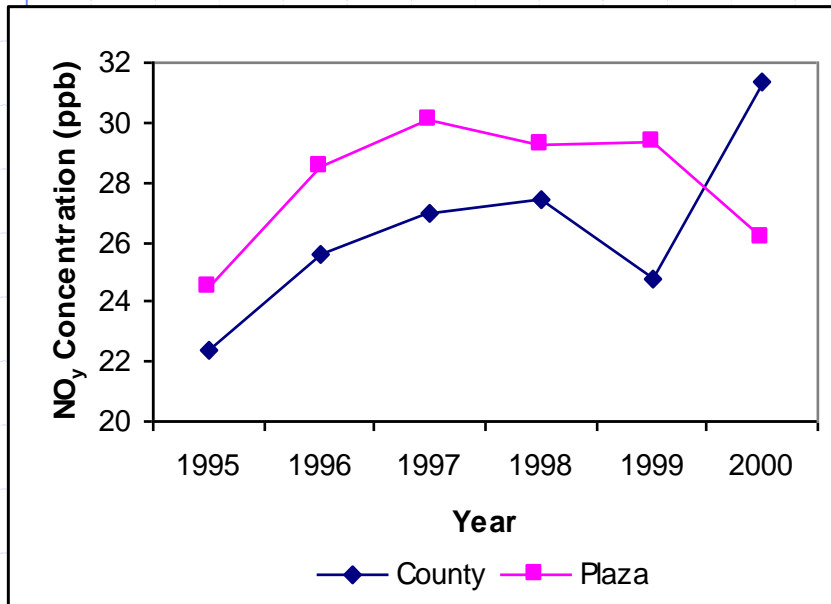
Day of Week Variation in Average Noon to Noon BTEX Levels in Charlotte Aug-Sep '96 and May-Aug '97



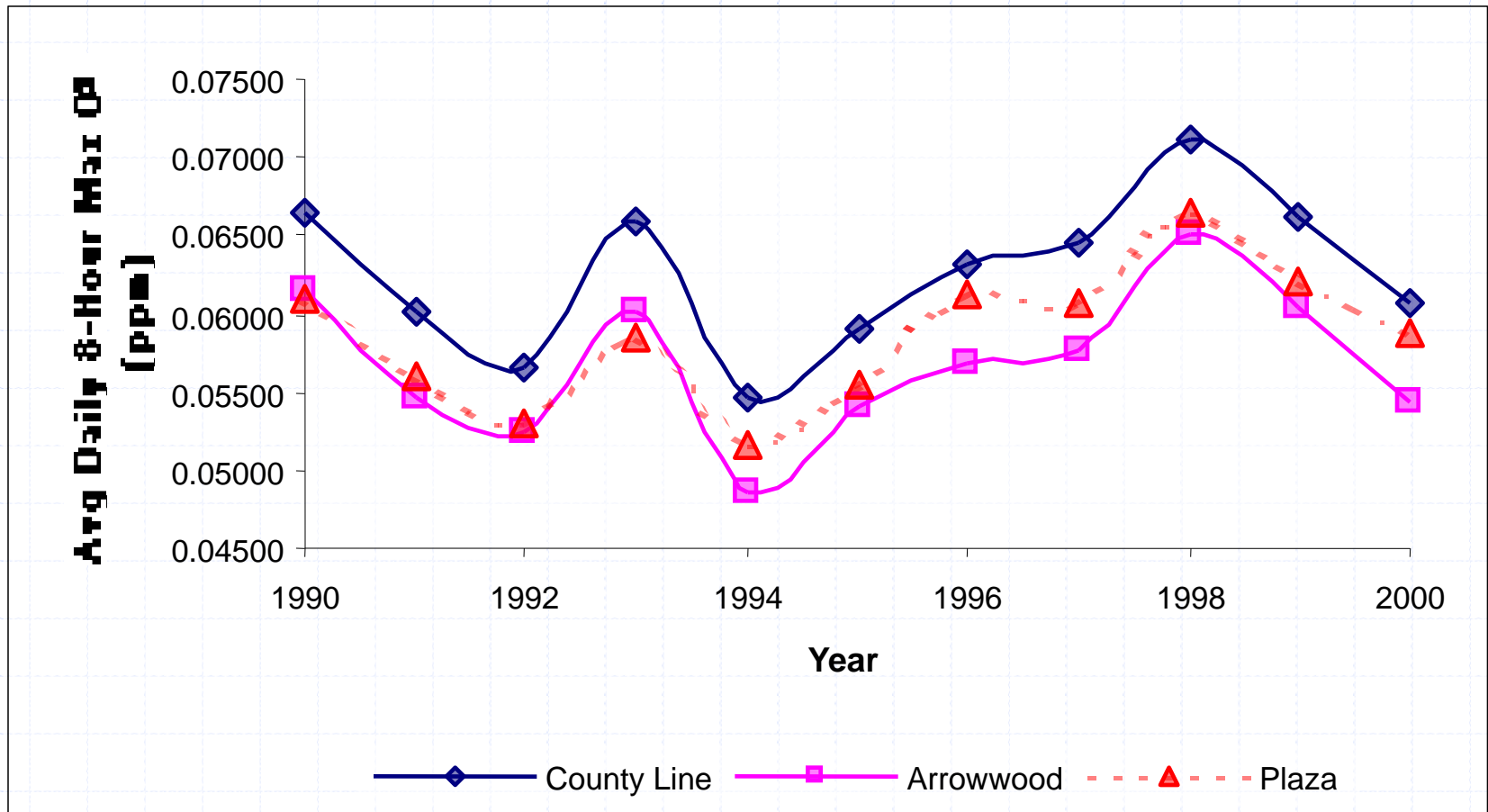
Traffic Growth for I-77 and South Blvd Locations



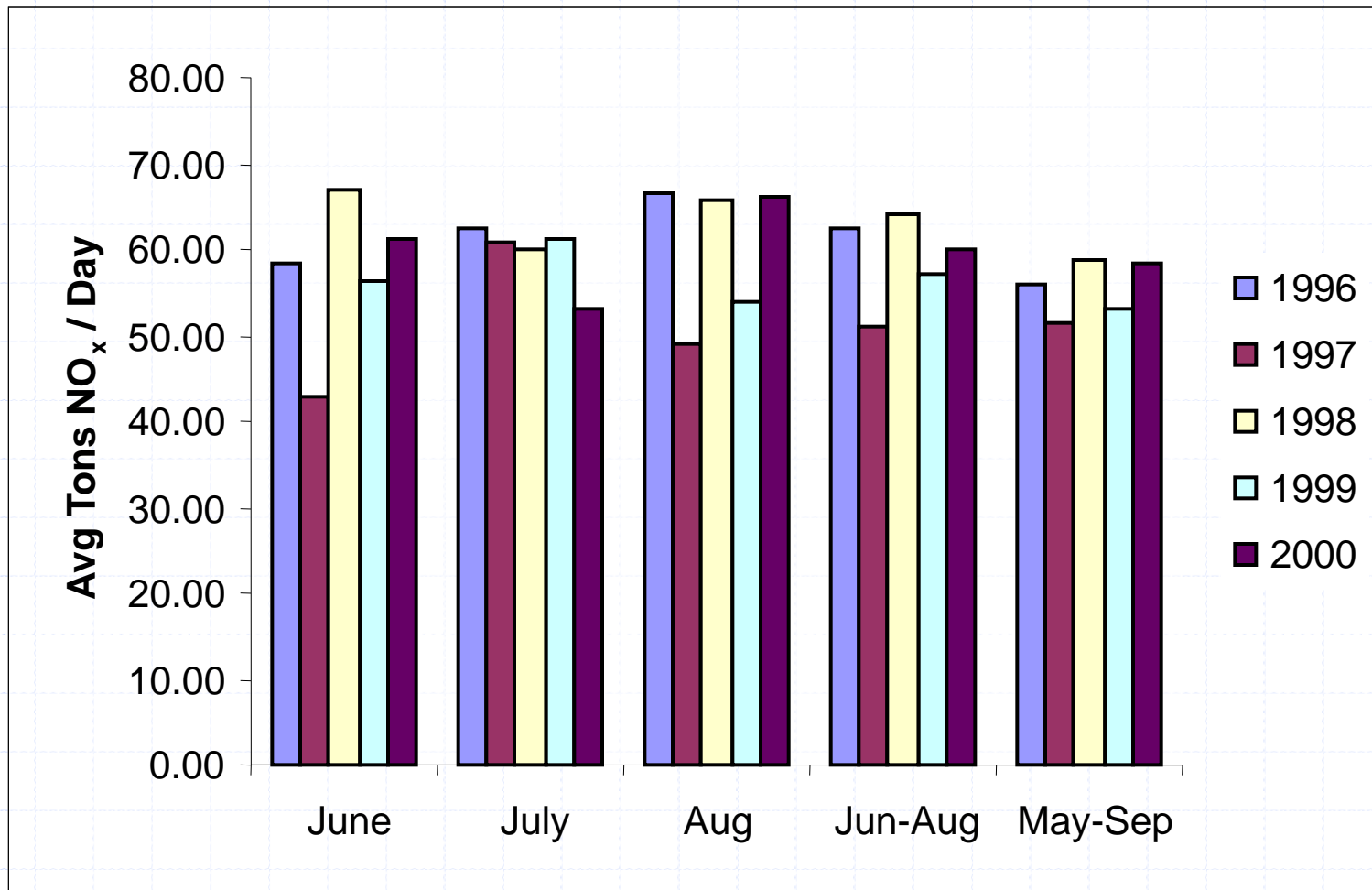
7-9 AM Yearly NO_y and CO Trends at County Line and Plaza (Gar '00) Sites



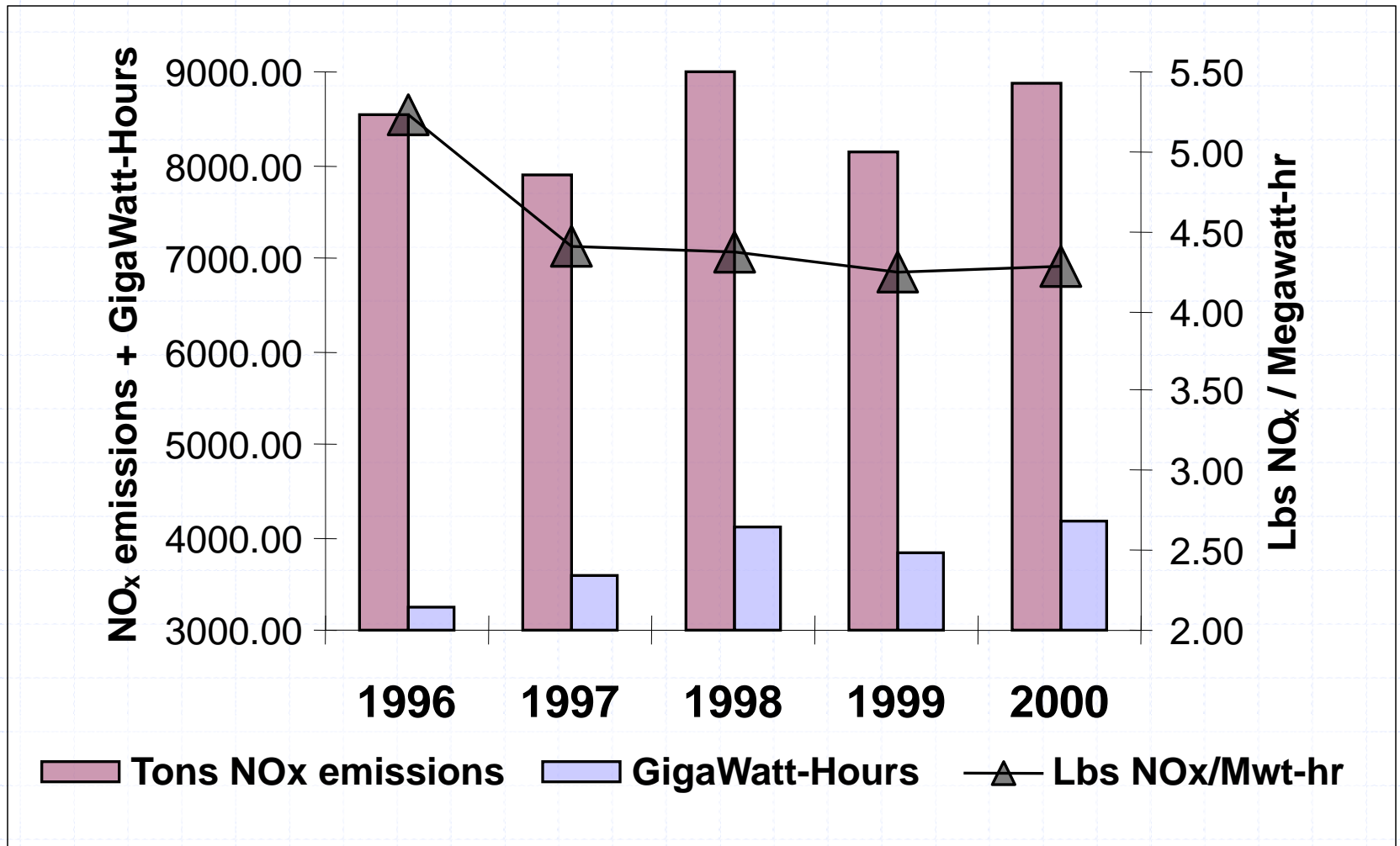
May-Sep Mecklenburg County Ozone Trends



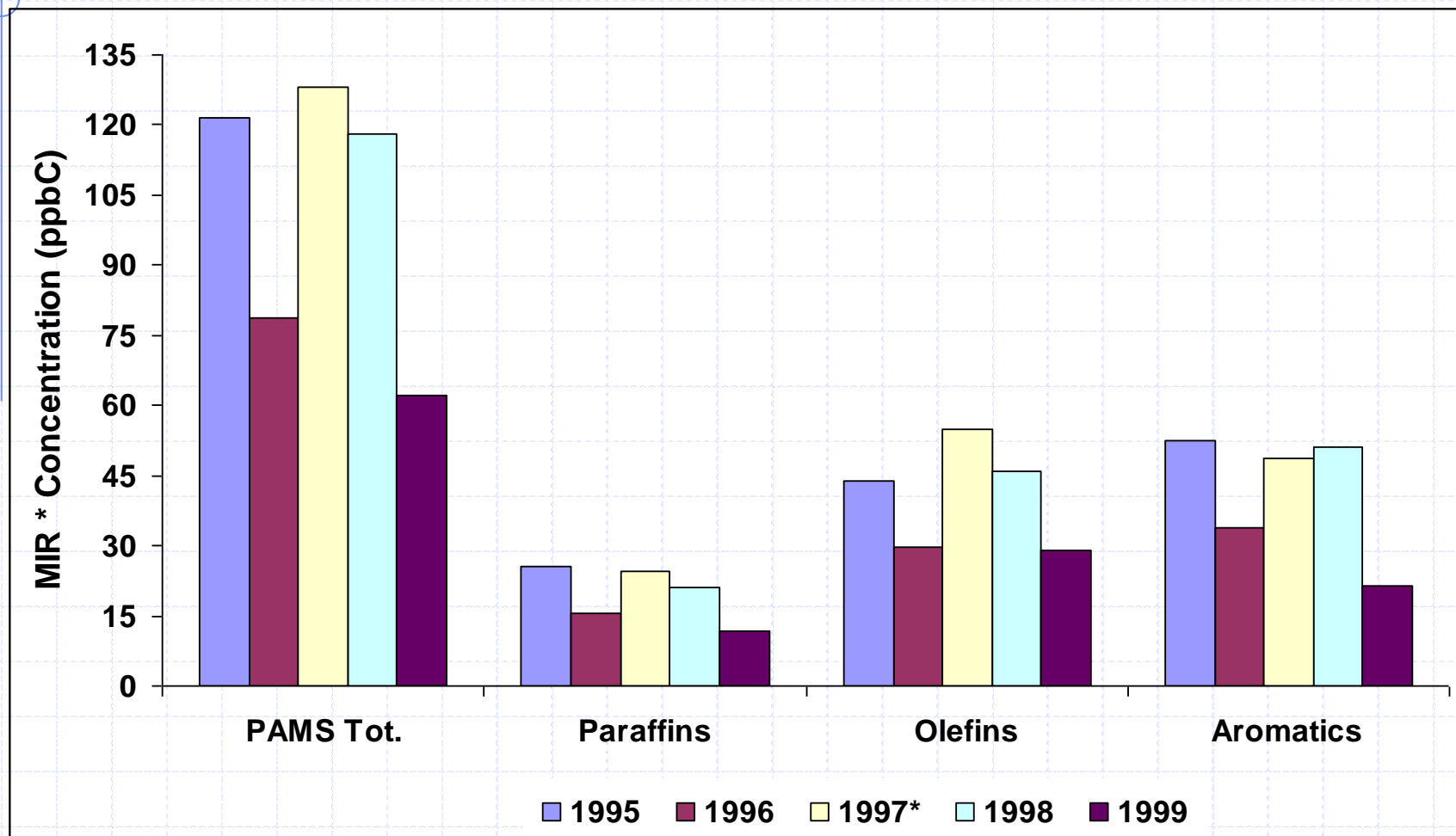
NO_x Emission Trends from the two Coal-fired Power Plants, Allen and Riverbend, near Charlotte



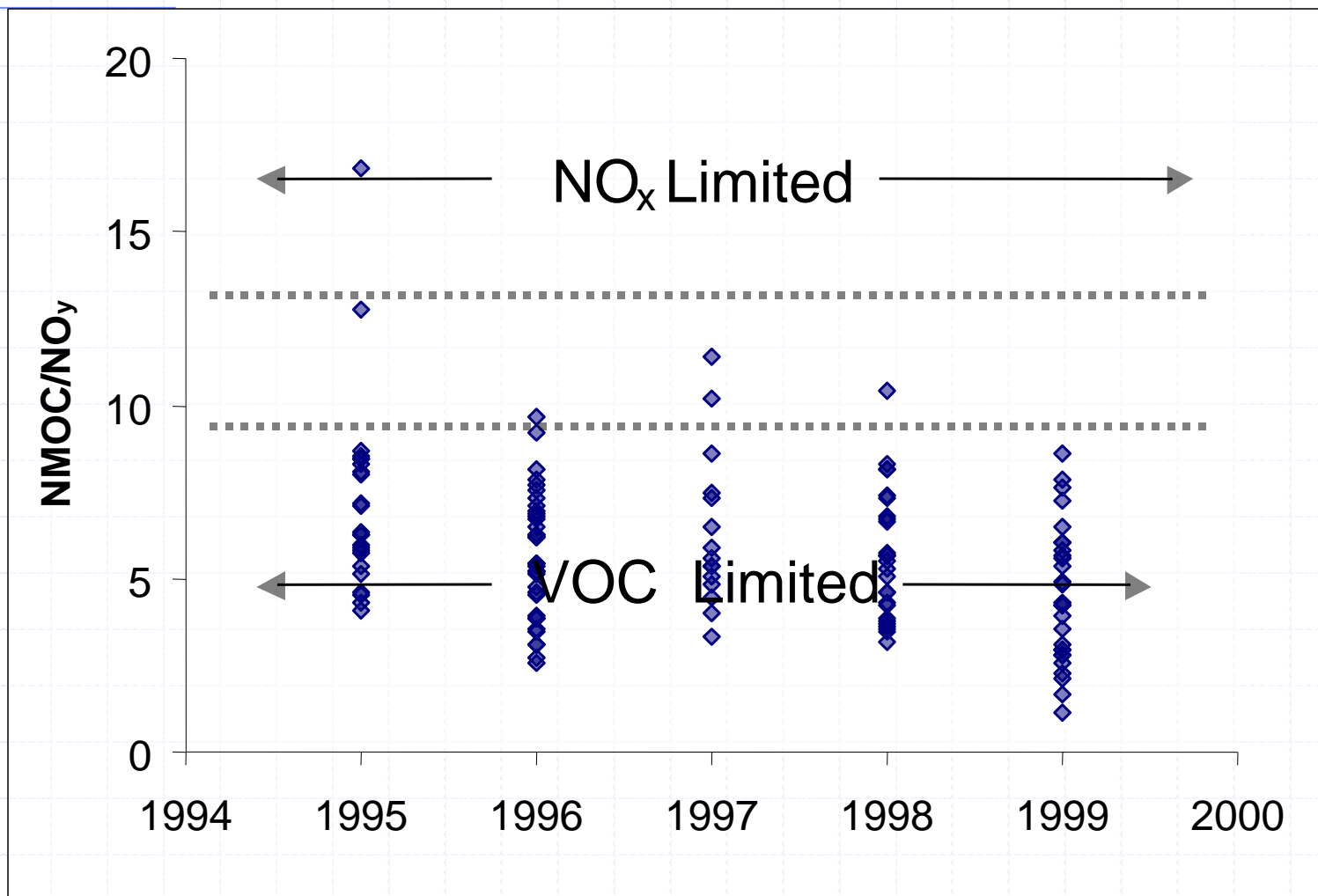
Long-term Trends for Allen & RB NO_x Emissions, Power, and Emissions per Unit of Power



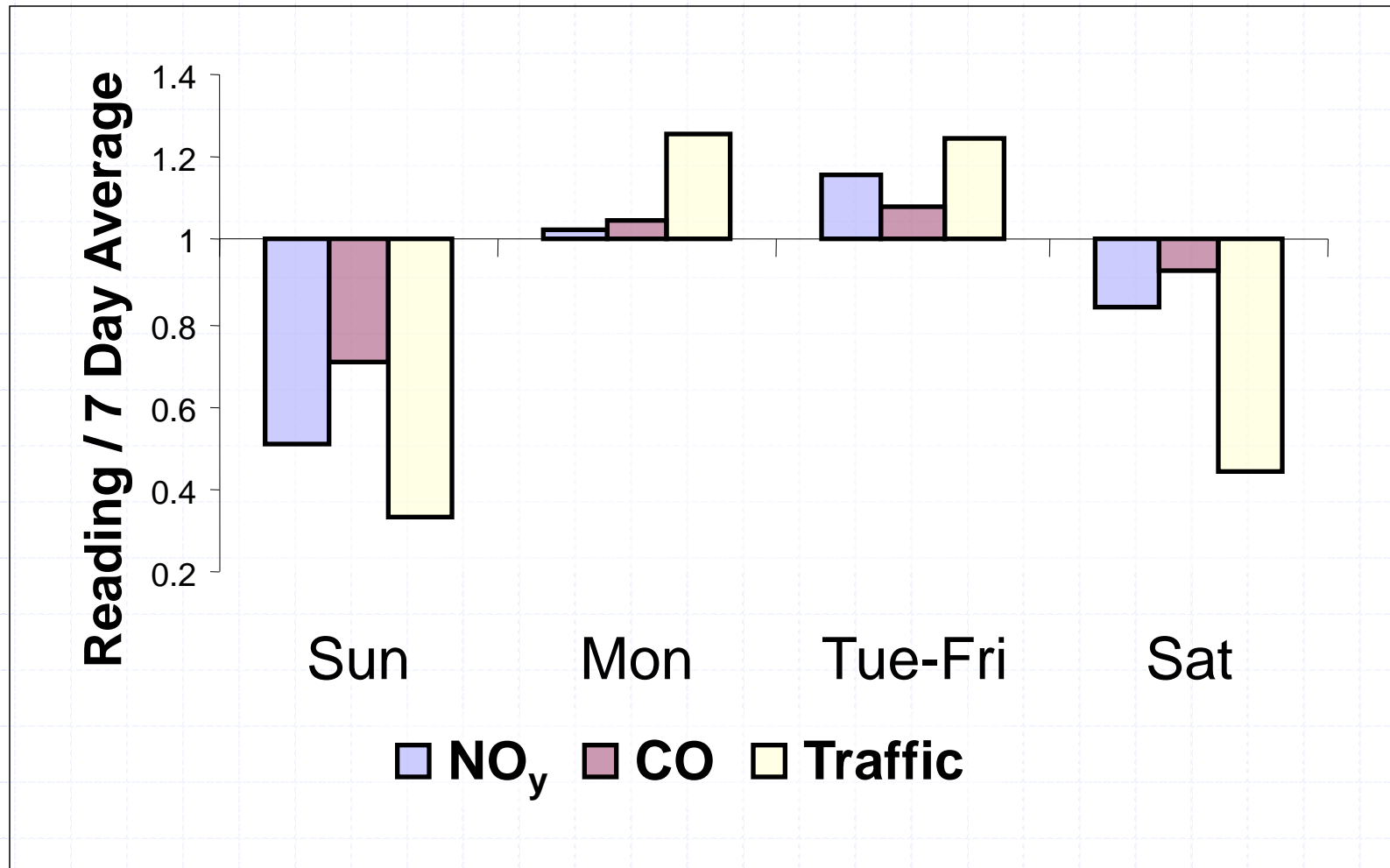
'95-'99 AM Hydrocarbon Reactivity-weighted Concentration Trends for the Plaza Site



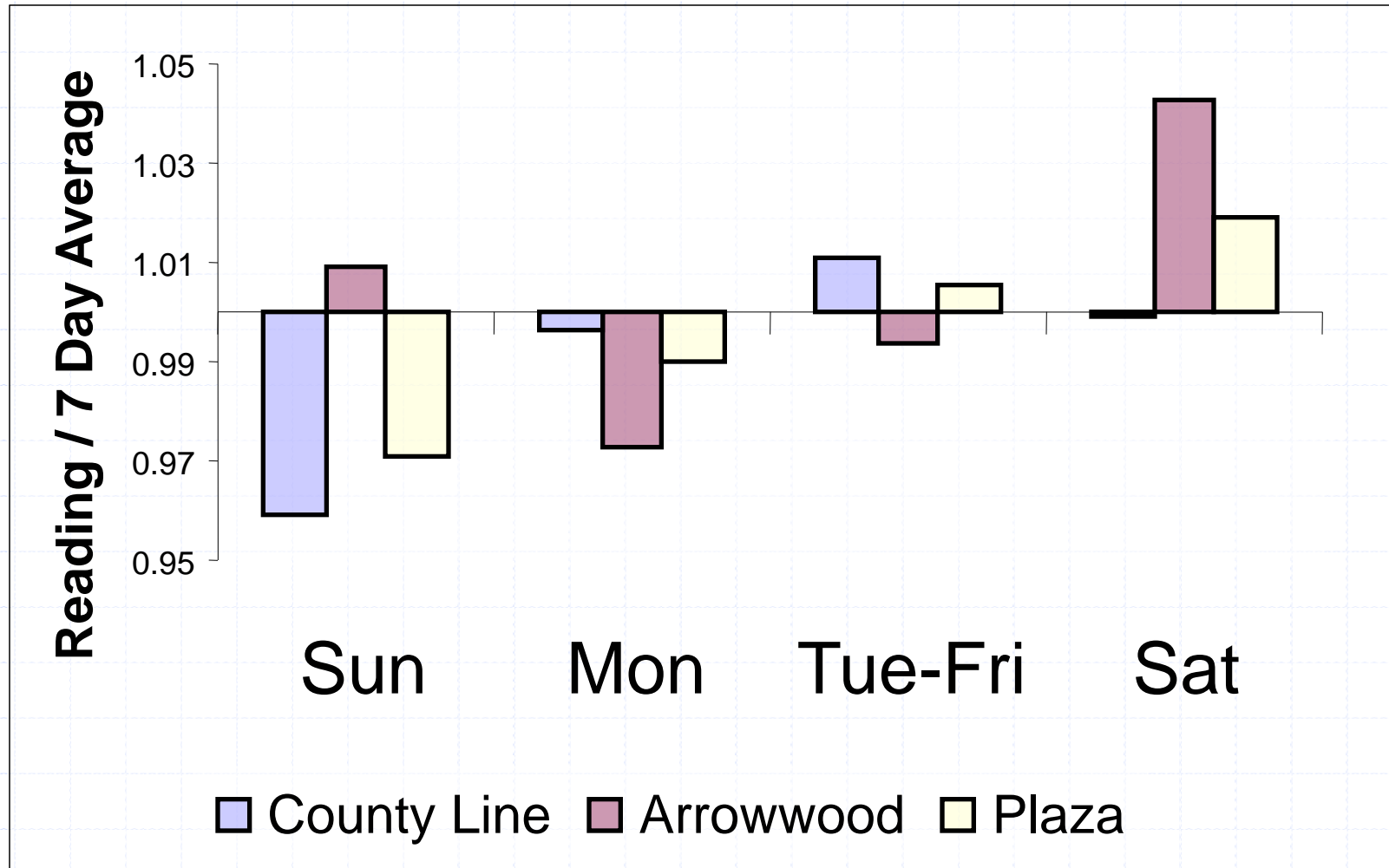
'95-'99 AM NMOC/NO_y Ratios for the Plaza Monitoring Site



7-8 AM Within Week Fluctuations for NO_y , CO and Traffic Data



May-Sep 1990-1998 Within Week Ozone Averages for the three Mecklenburg County Monitors



P-Values for Day of Week Comparisons of Traffic, Ambient Pollutants, and Power Plant NO_x Emissions

Days	Traffic	CO	NO_y	Ozone	Power NO_x
Su/Tu-Fr	0	0	0	0.3373	0
Mo/Tu-Fr	0.7488	0.9473	0.0381	0.3484	0.0023
Sa/Tu-Fr	0	0.0012	0	0.4683	0.0025

Conclusions

- ◆ AM CO and NO_y ambient concentrations correlate well with observed traffic patterns
 - Weekend AM levels much lower than weekdays
 - Monday AM CO comparable to other weekdays
 - Monday AM NO_y lower than other weekdays

- ◆ Within week power plant NO_x emissions
 - Tues-Fri 10% above 7-day average
 - Mon & Sat 7.5% below 7-day average
 - Sun 19% below 7-day average
 - Monday AM NO_x lowest in week; low Monday AM NO_y ambient levels may be due to this

Conclusions

- ◆ Total Power Plant NO_x emissions from Allen and Riverbend Power Plants are stable
 - From 1996-2000, power generated during May-Sep by the two Gaston Co. plants increased 27%.
 - From 1996-2000, NO_x emissions per unit of power decreased 20%.
 - From 1996-2000, total NO_x emissions from Allen and Riverbend increased 4%.

Conclusions

◆ Hydrocarbon Trends

- From 1997-1999, average AM Hydrocarbons levels at Plaza decreased
- The Charlotte metropolitan region appears to be a VOC-limited area
 - 1995-1999 Plaza AM VOC/NO_y ratios are primarily between four and eight.

◆ Ozone within week variation:

- Weekend ozone levels in Mecklenburg County are equivalent to weekday levels

Recommendations

For the city of Charlotte, implement ozone control measures that reduce ambient VOC levels

Replace the use of ozone action days with practices to be implemented throughout ozone season

Evaluate the use of total NO_x emissions budgets for all power plants in the Charlotte region

Acknowledgements

- ◆ North Carolina Division of Air Quality (Steve Few, Brian Timin)
- ◆ Winthrop University students (Gentry Ridgeway and Steve Hudson)
- ◆ City of Charlotte Department of Transportation (Charles Able)
- ◆ South Carolina Department of Transportation (Joe Boozer)
- ◆ Duke Energy (Buddy Davis and Kris Knudsen)