How PAMS data is being used in the South Central U.S. to address ozone pollution problems

- Presented November 7, 2006, at the National Air Monitoring Conference, Las Vegas, Nevada

- Mark Sather, U.S. EPA Region 6, Air Quality Analysis Section, 1445 Ross Avenue, Dallas, TX 75202 (sather.mark@epa.gov; 214-665-8353)

- Jim Hazlett, Louisiana Department of Environmental Quality, Air Analysis Section, P.O. Box 4314, Baton Rouge, LA 70821

- John Jolly, Texas Commission on Environmental Quality, P.O. Box 13087, Austin, TX 78711

Introduction

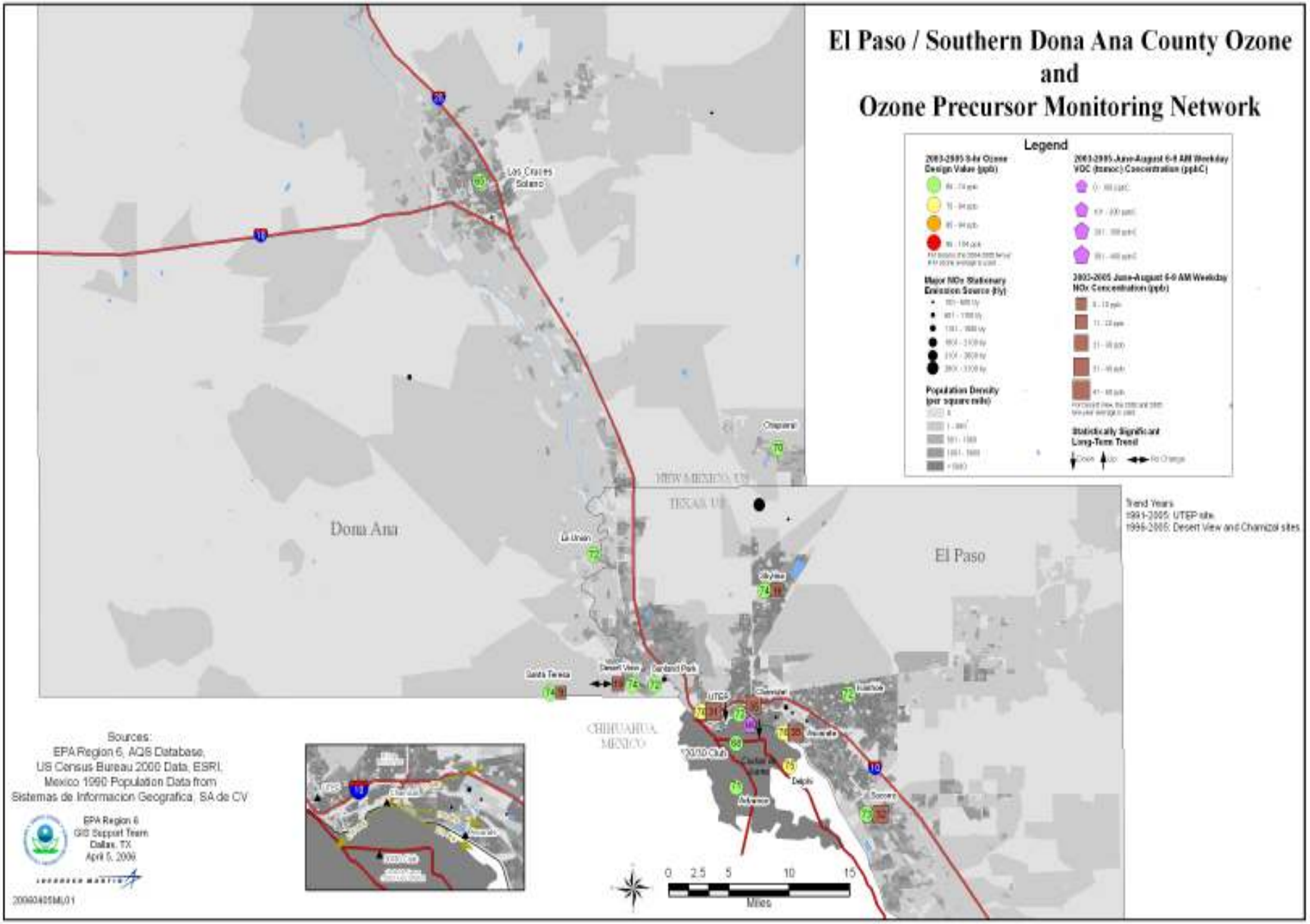
- **The 1990 Clean Air Act Amendments required enhanced monitoring (PAMS) for ozone and precursors in the worst 1-hour ozone nonattainment areas (serious, severe, and extreme).**
- **Four of these areas are in the South Central U.S.: Baton Rouge, Louisiana, and Dallas-Fort Worth and El Paso, Texas (all 3 serious), and Houston, Texas (severe).**
- **Old 1-hour ozone NAAQS revoked on June 15, 2005, but new 8-hour ozone NAAQS continued PAMS monitoring requirements for these areas.**
- **Most PAMS networks in U.S. fully operational by 1996.**
- **Now that enough VOC data has been collected by the PAMS networks, detailed trends analyses of this data can be done.**
- **The results of these analyses should prove useful to air quality managers, planners and modelers, helping assess the effectiveness of ozone control strategies.**

Analytical Methods

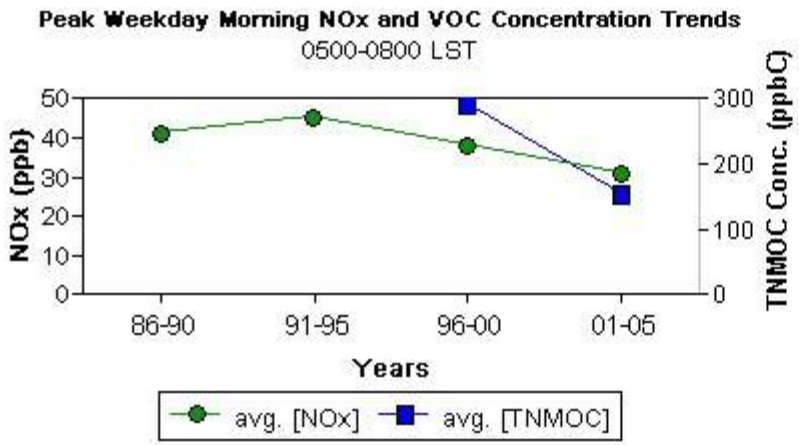
- Data trends analyzed from 1986-2005 (detailed VOC data trends from 1996-2005).
- Ozone, NO_x, VOC, Met. Data downloaded from U.S. EPA's AQS database, summary statistics run on data for weekday morning peak hours during June-August.
- Two ozone trend indicators: (1) 8-hour ozone design value time series; (2) Percentage of afternoon hours over the 8-hour ozone NAAQS.
- Compare the 5-year block periods 1986-1990, 1991-1995, 1996-2000, and 2001-2005 in order to smooth out the effects of annual meteorology, local emission source effects and variability in monitor precision and accuracy and data completeness.

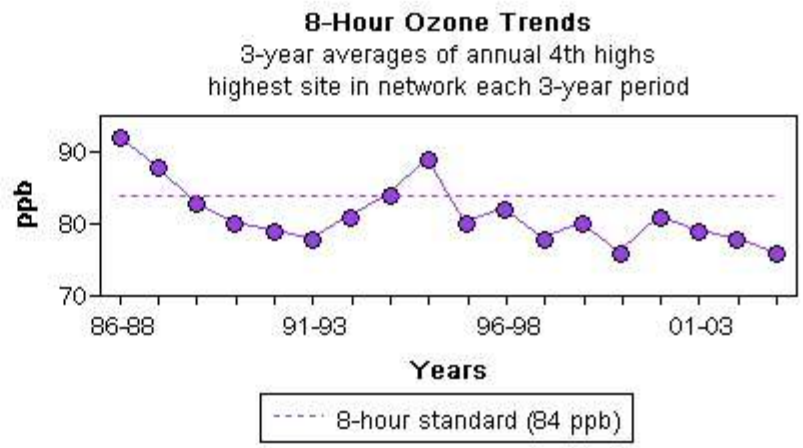
El Paso

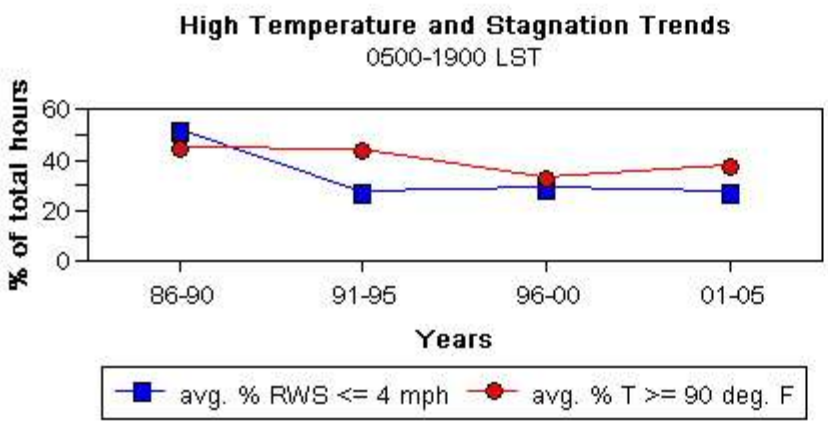
El Paso / Southern Dona Ana County Ozone and Ozone Precursor Monitoring Network

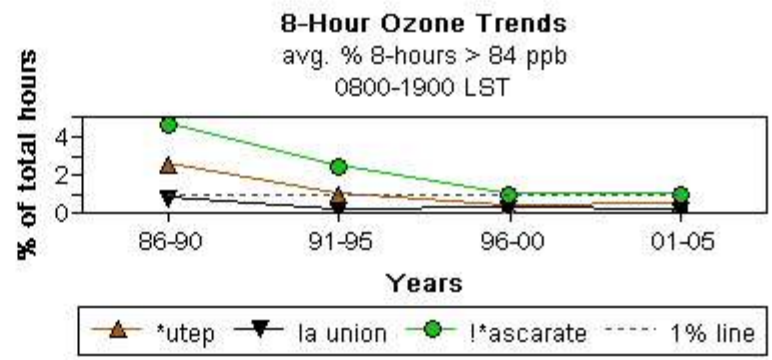


El Paso Long-term Ozone/NO_x/VOC/Meteorological Data Trends
June-August







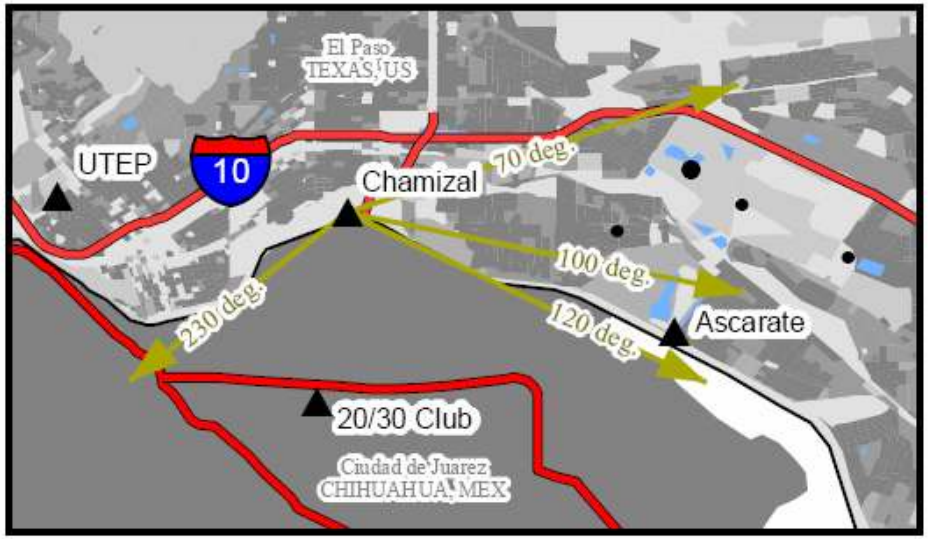


!=highest ozone concentration site in network for 1986-1988
*=highest ozone concentration site in network for 2003-2005

long-term met. and nox data from utep site
96-05 hourly voc auto-gc data from chamizal site
T = temperature, RWS = resultant wind speed

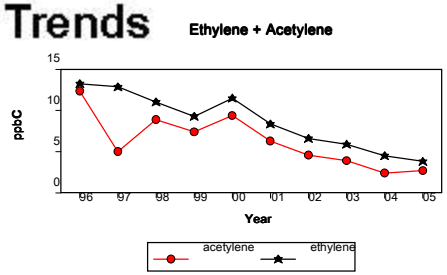
Wind Direction Sector Analysis

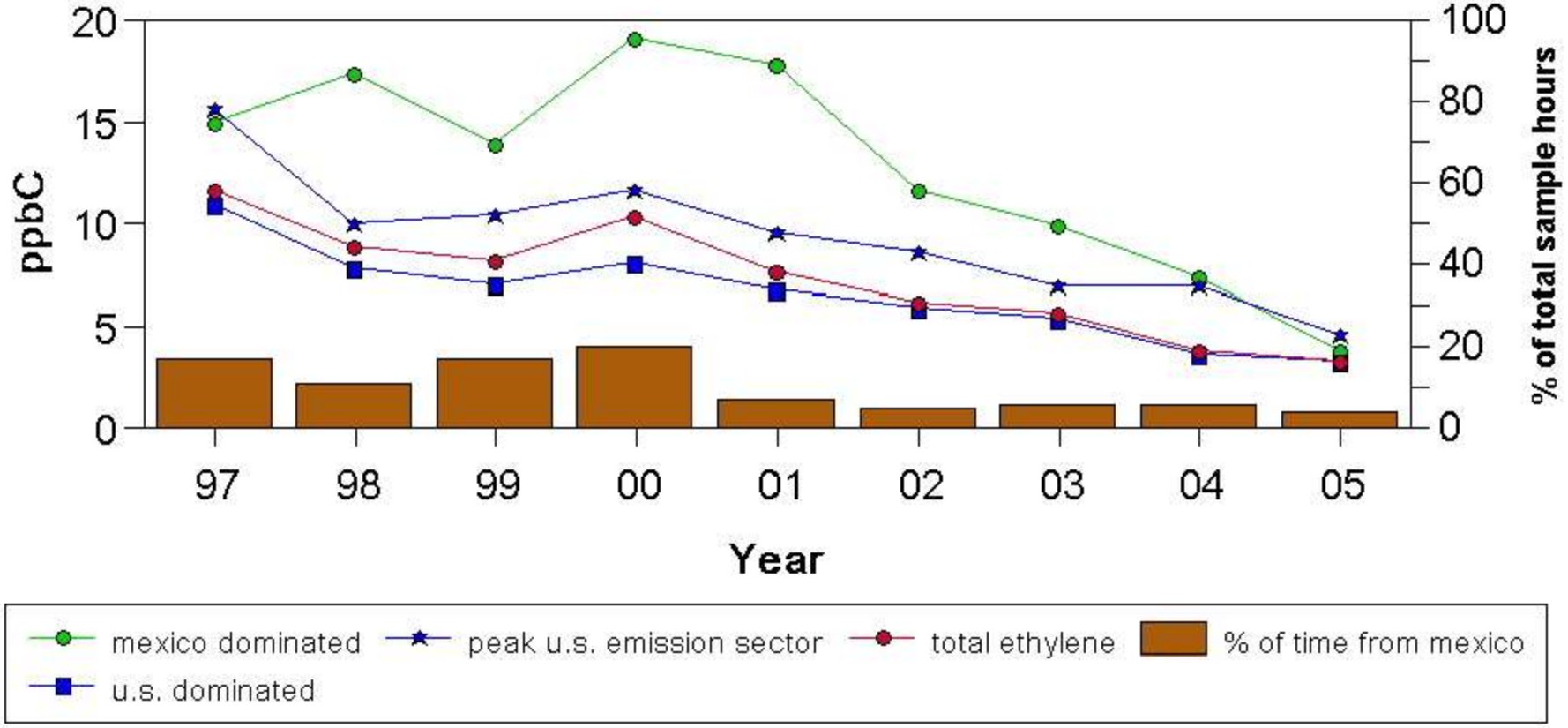
- Only looked at resultant wind speeds > 2.4 mph
- The measurement precision of wind speed/direction not reliable below this speed



El Paso Chamizal PAMS Site Ethylene Concentration Trends

June-August Weekday 0500-0800 LST Arithmetic Means

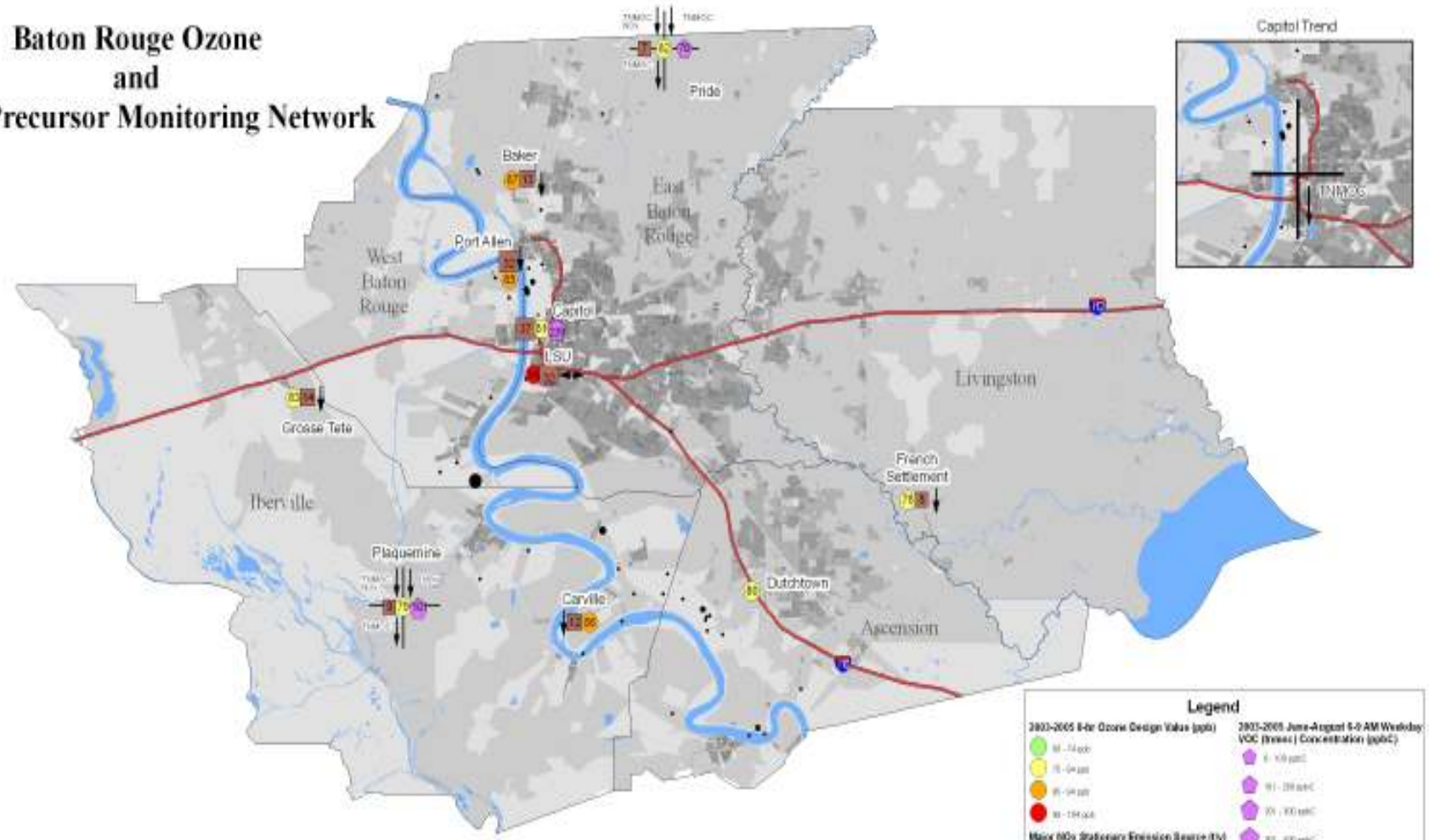




mexico dominated = resultant wind directions between 120 compass degrees and 230 compass degrees
peak u.s. emission sector = area of mobile/industrial emissions from 70-100 compass degrees
hourly resultant wind speeds > 2.4 mph

Baton Rouge

Baton Rouge Ozone and Ozone Precursor Monitoring Network



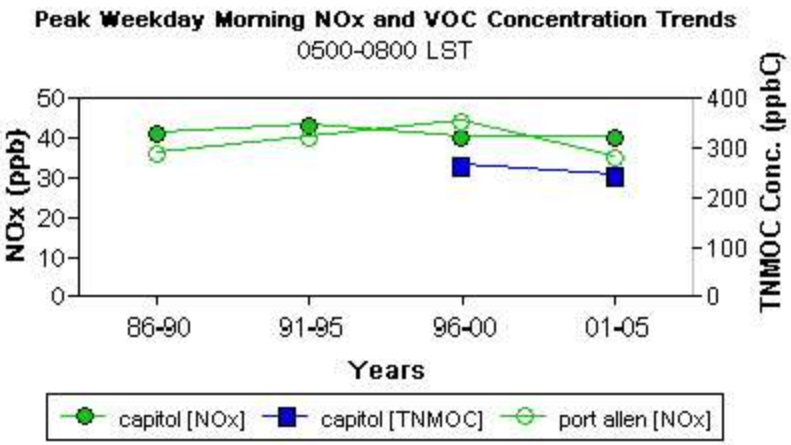
Sources:
EPA Region 6, AQS Database
Census Bureau 2000 Data

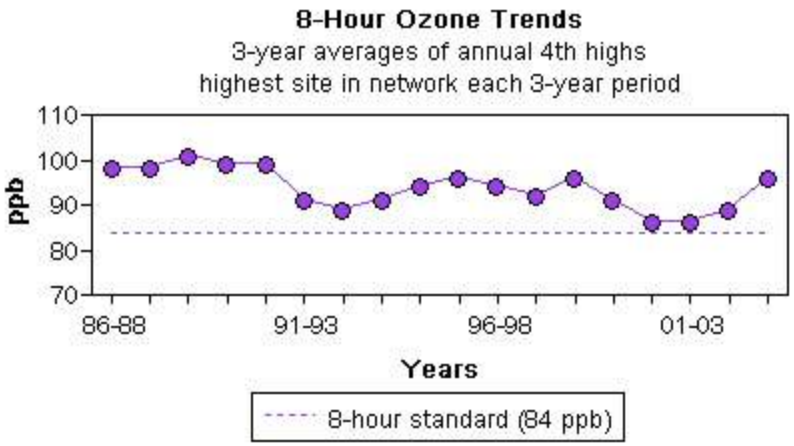
EPA Region 6
GIS Support Team
Dallas, TX
April 5, 2006

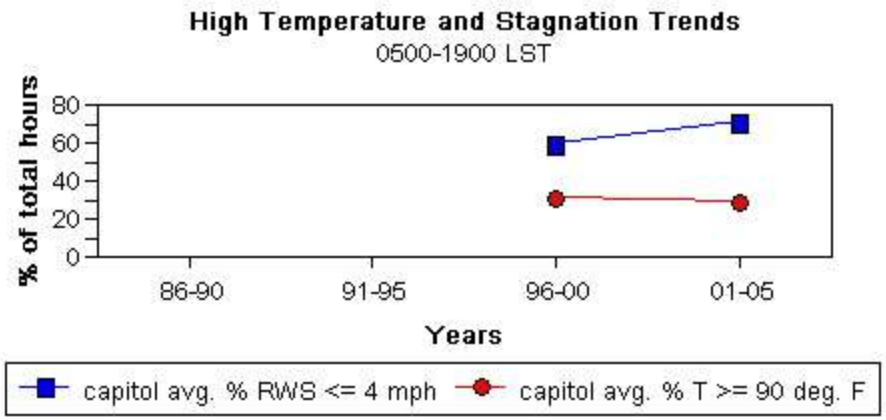
Trend Years
All trend sites: 1996-2005

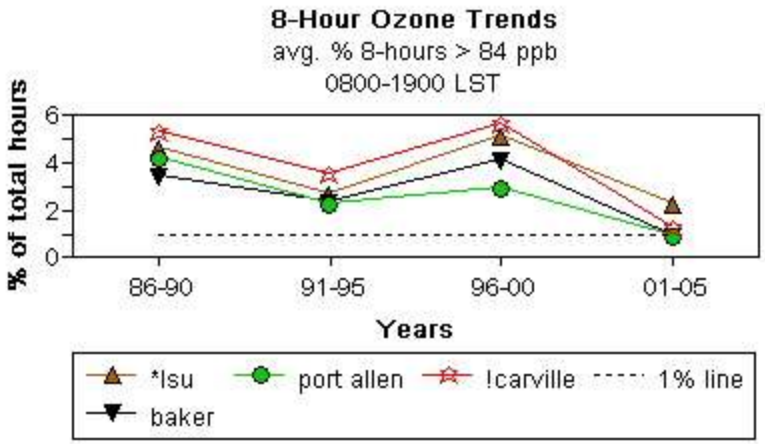
20060405ML04

Baton Rouge Long-term Ozone/NOx/VOC/Meteorological Data Trends
June-August



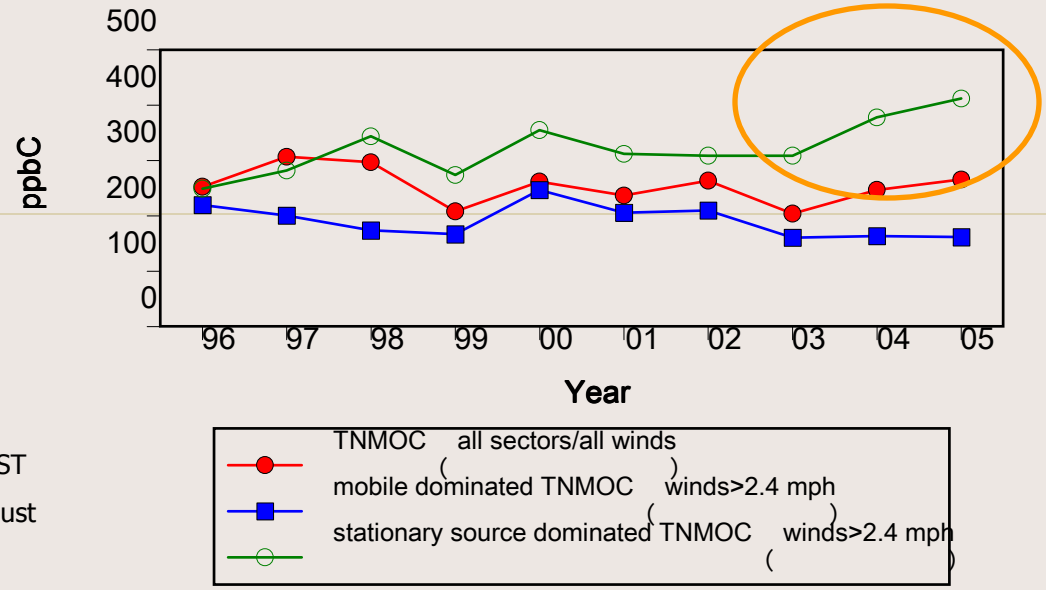






T=temperature, RWS=resultant wind speed
!=highest ozone concentration site in network for 1986-1988
*=highest ozone concentration site in network for 2003-2005

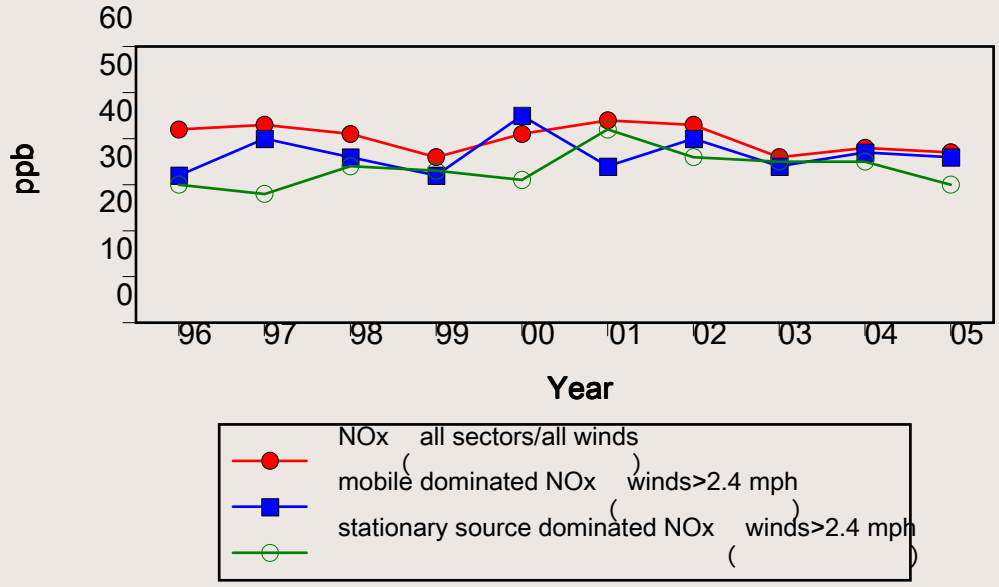
Mean Morning TNMOC Concentrations



5-8 AM LST

June-August

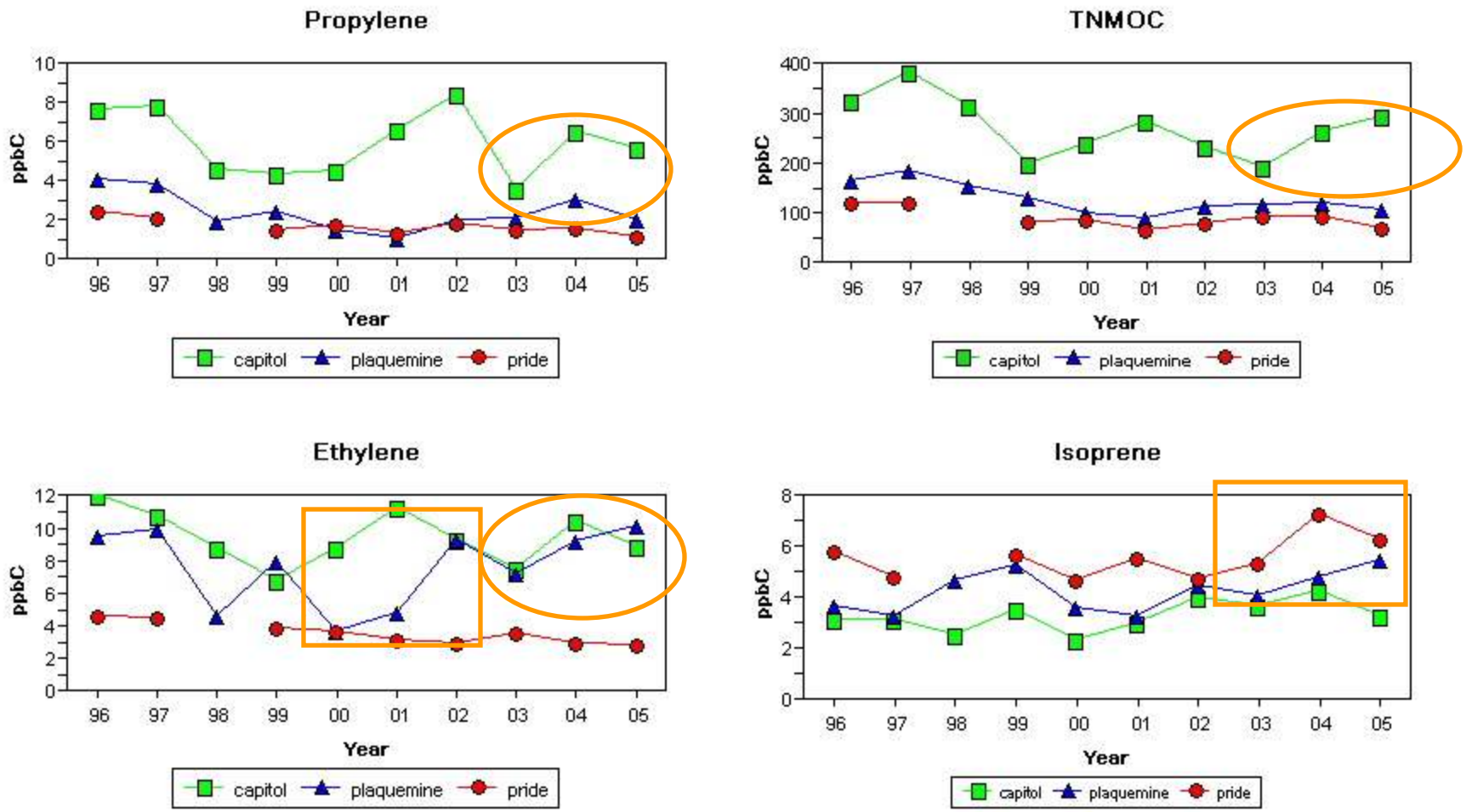
Mean Morning NOx Concentrations

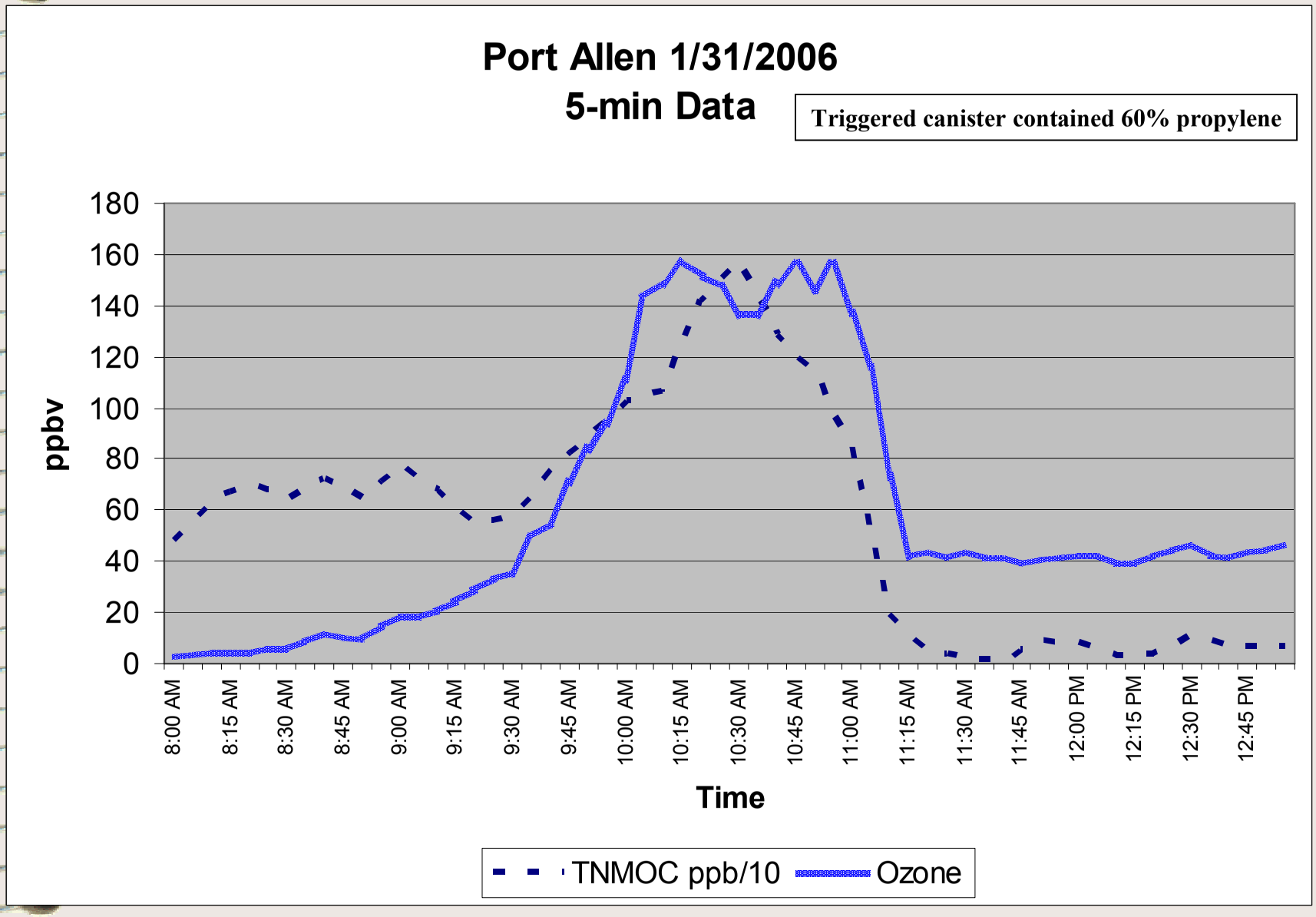


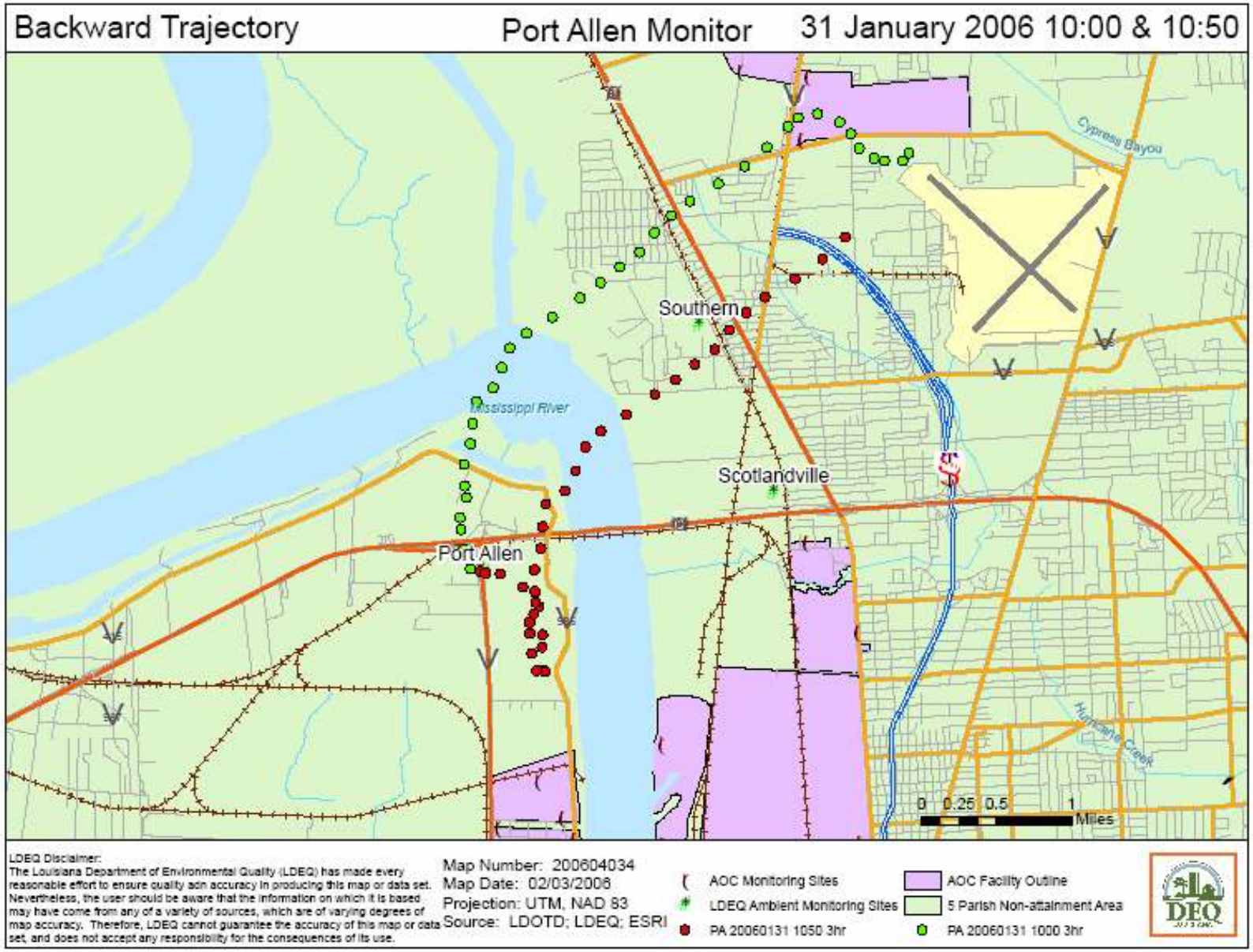
Baton Rouge All 3 PAMS Site Highly Reactive VOC Trends

June-August Weekday Morning (3-9 AM LST) Arithmetic Means; >= 75% data capture

1996-2005

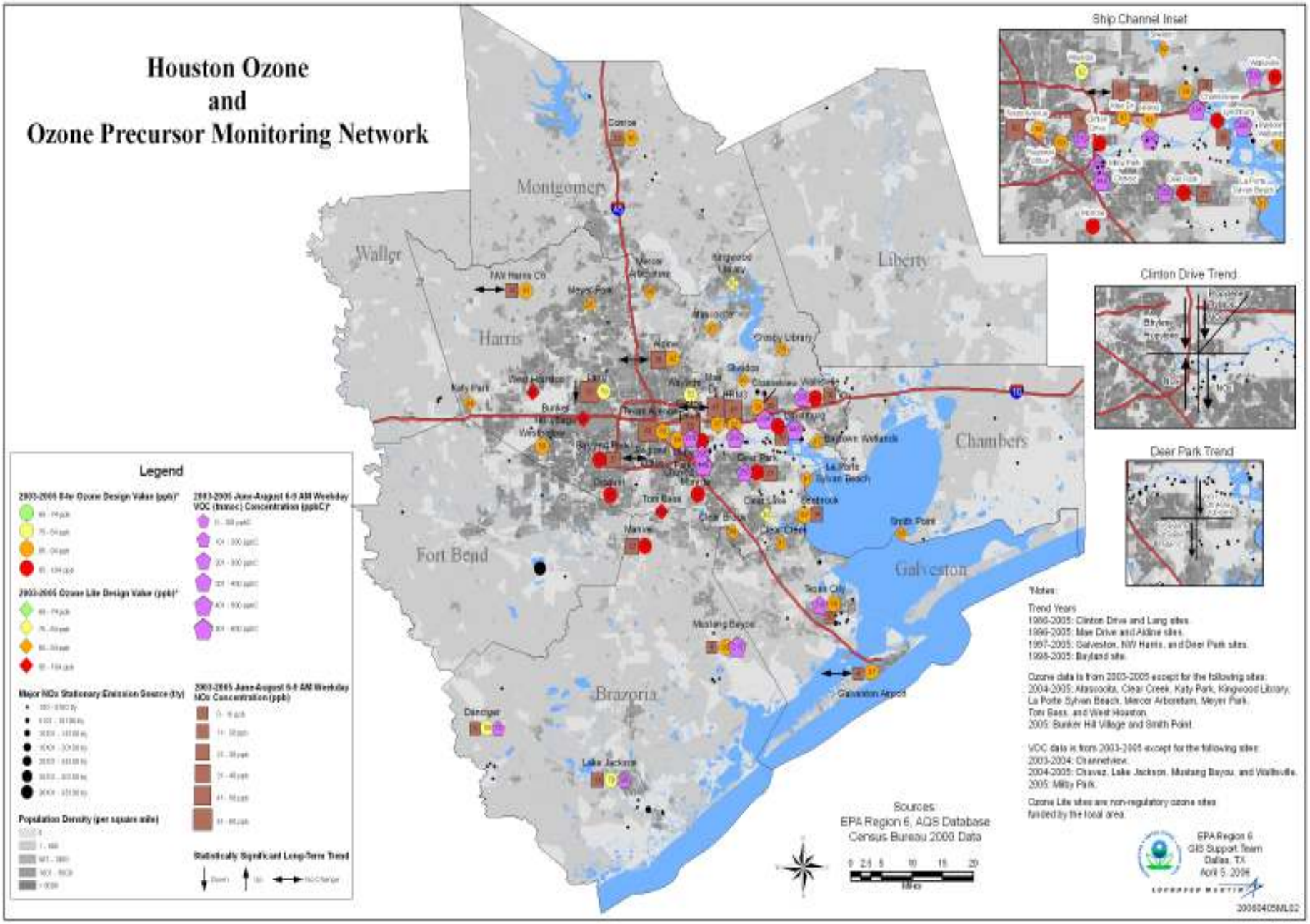



Port Allen 1/31/2006
5-min Data
Triggered canister contained 60% propylene
ppbv
180
160
140
120
100
80
60
40
20
0
8:00 AM
8:15 AM
8:30 AM
8:45 AM
9:00 AM
9:15 AM
9:30 AM
9:45 AM
10:00 AM
10:15 AM
10:30 AM
10:45 AM
11:00 AM
11:15 AM
11:30 AM
11:45 AM
12:00 PM
12:15 PM
12:30 PM
12:45 PM
Time
TNMOC ppb/10
Ozone

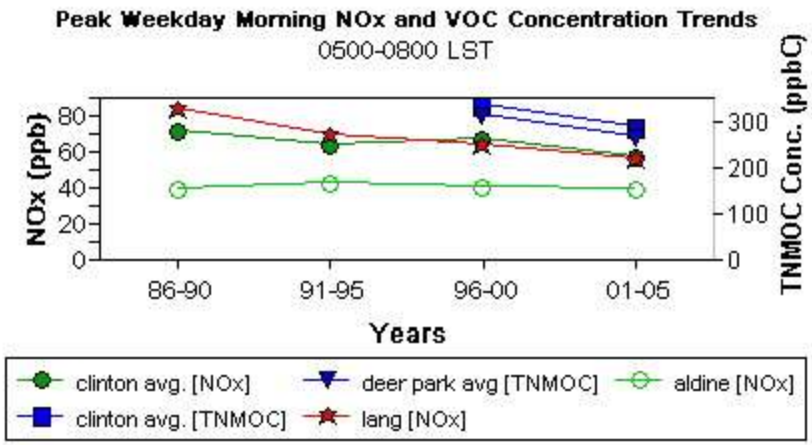

Backward Trajectory
Port Allen Monitor
31 January 2006 10:00 & 10:50
Southern
Scotlandville
Port Allen
Mississippi River
Cypress Bayou
Hurricane Creek
0 0.25 0.5 1
Miles
LDEQ Disclaimer:
The Louisiana Department of Environmental Quality (LDEQ) has made every reasonable effort to ensure quality adn accuracy in producing this map or data set. Nevertheless, the user should be aware that the information on which it is based may have come from any of a variety of sources, which are of varying degrees of map accuracy. Therefore, LDEQ cannot guarantee the accuracy of this map or data set, and does not accept any responsibility for the consequences of its use.
Map Number: 200604034
Map Date: 02/03/2006
Projection: UTM, NAD 83
Source: LDOTD; LDEQ; ESRI
AOC Monitoring Sites
LDEQ Ambient Monitoring Sites
PA 20060131 1050 3hr
AOC Facility Outline
5 Parish Non-attainment Area
PA 20060131 1000 3hr
DEQ

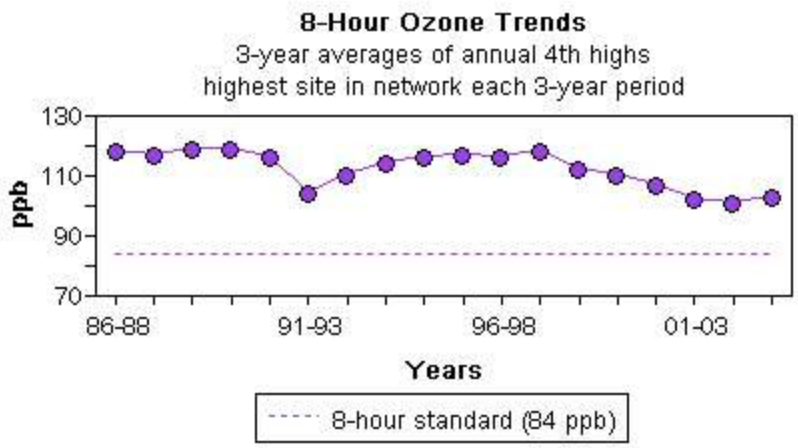
Houston

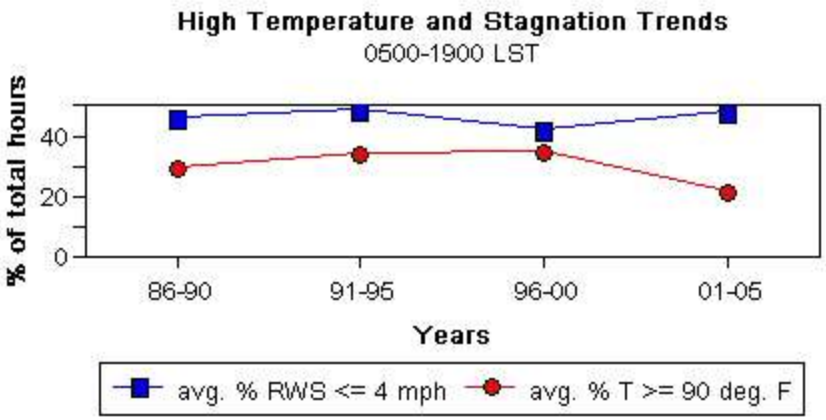
Houston Ozone and Ozone Precursor Monitoring Network

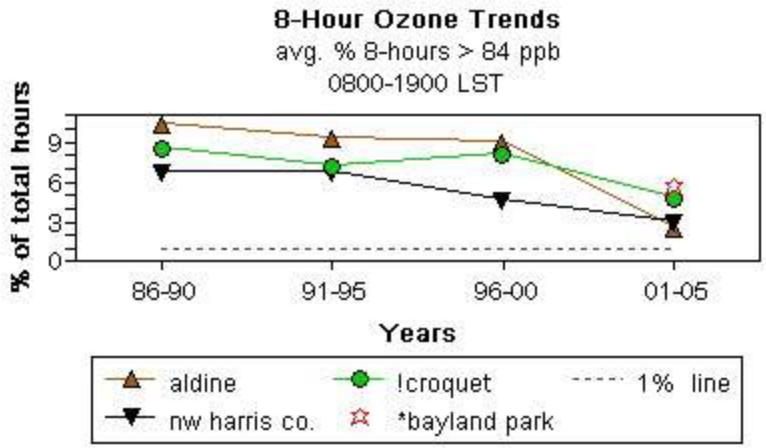


Houston Long-term Ozone/NOx/VOC/Meteorological Data Trends
June-August







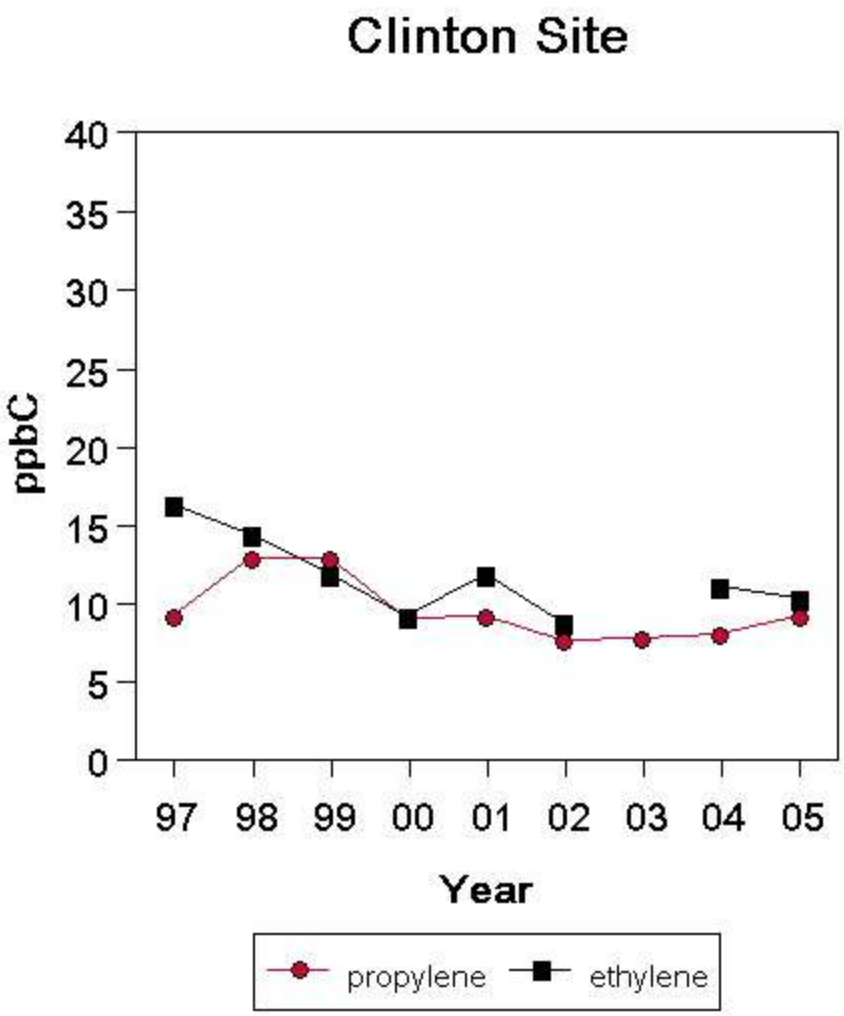


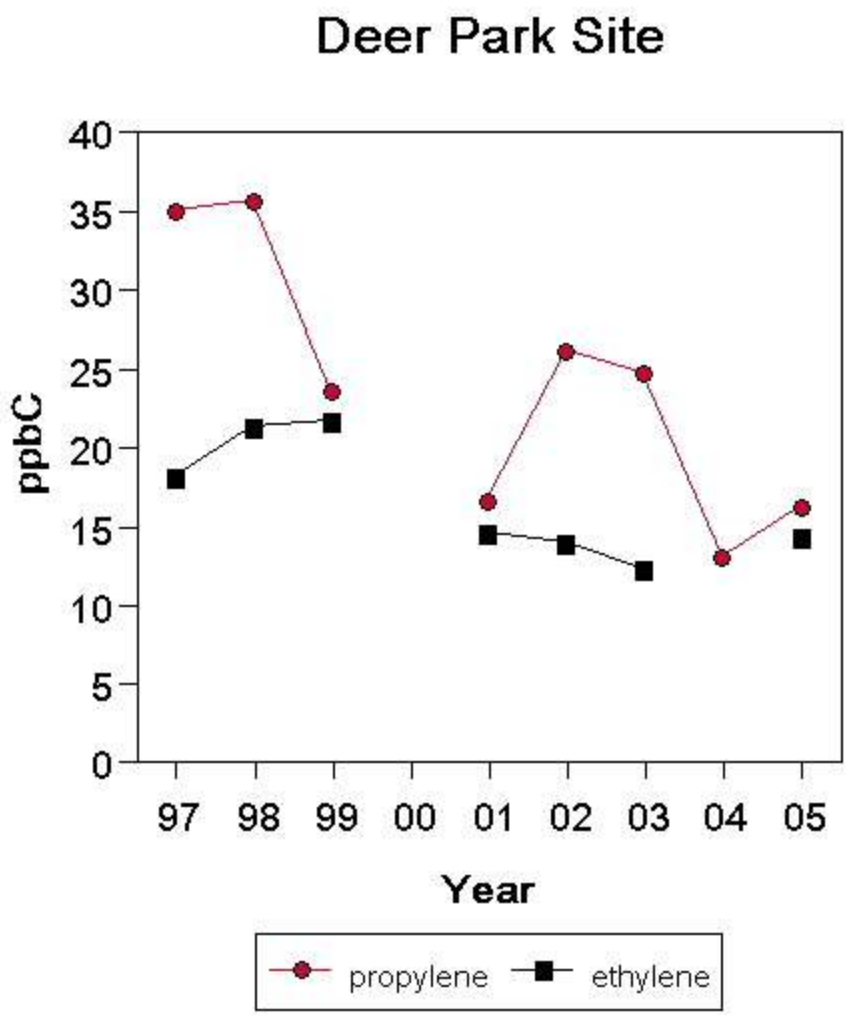
T and RWS data from aldine site
!=highest ozone concentration site in network for 1986-1988
*=highest ozone concentration site in network for 2003-2005

Houston HRVOC Concentration Trends

June-August Weekday 0500-0800 LST Arithmetic Means

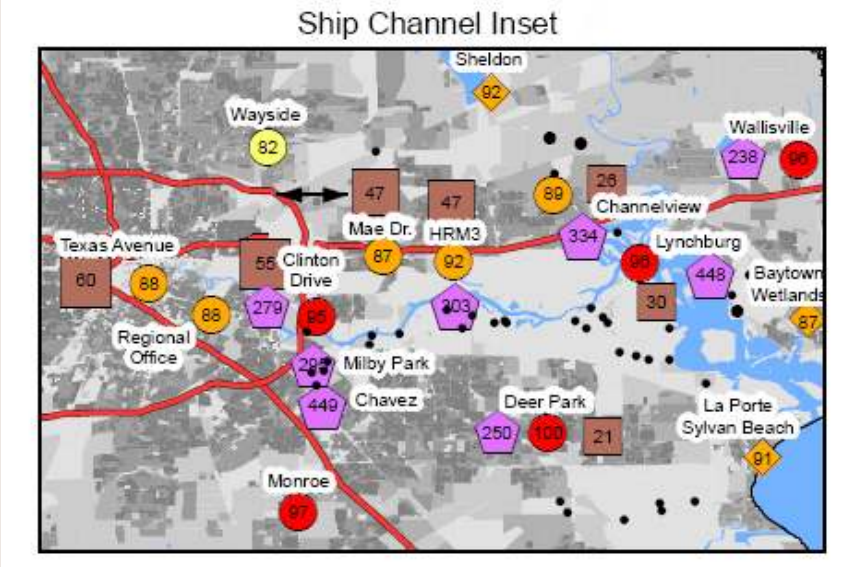
70% minimum data capture for each year



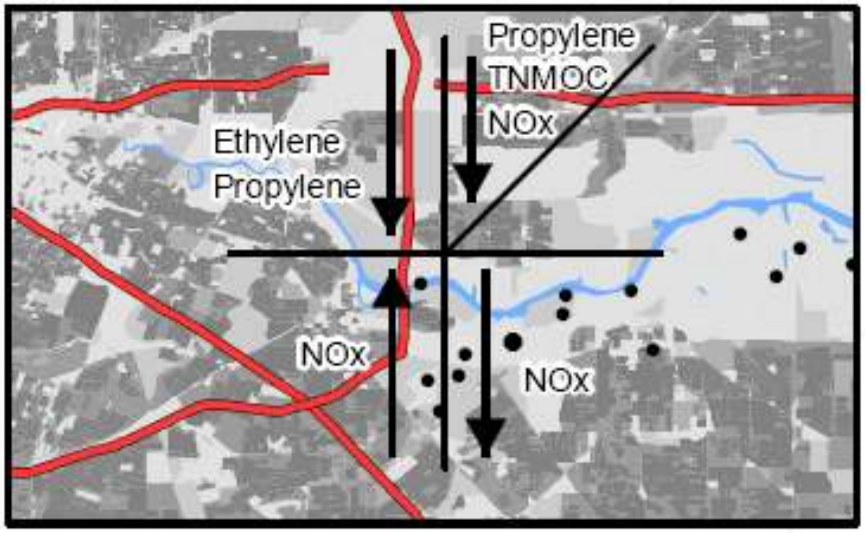


Wind Direction Sector Analysis

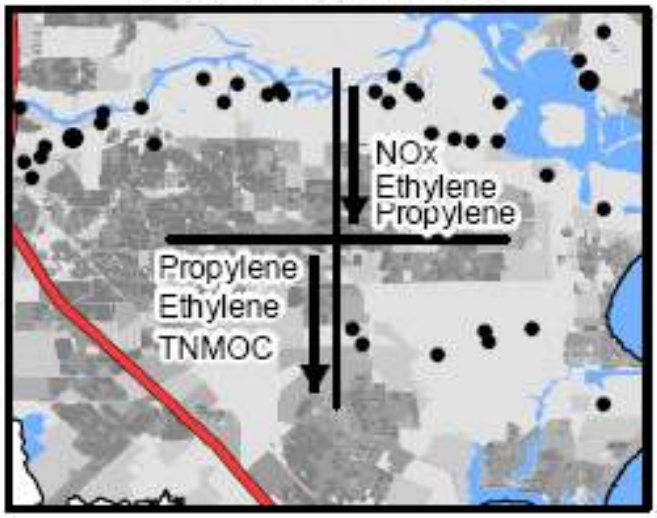
- Only looked at resultant wind speeds > 2.4 mph
- The measurement precision of wind speed/direction not reliable below this speed



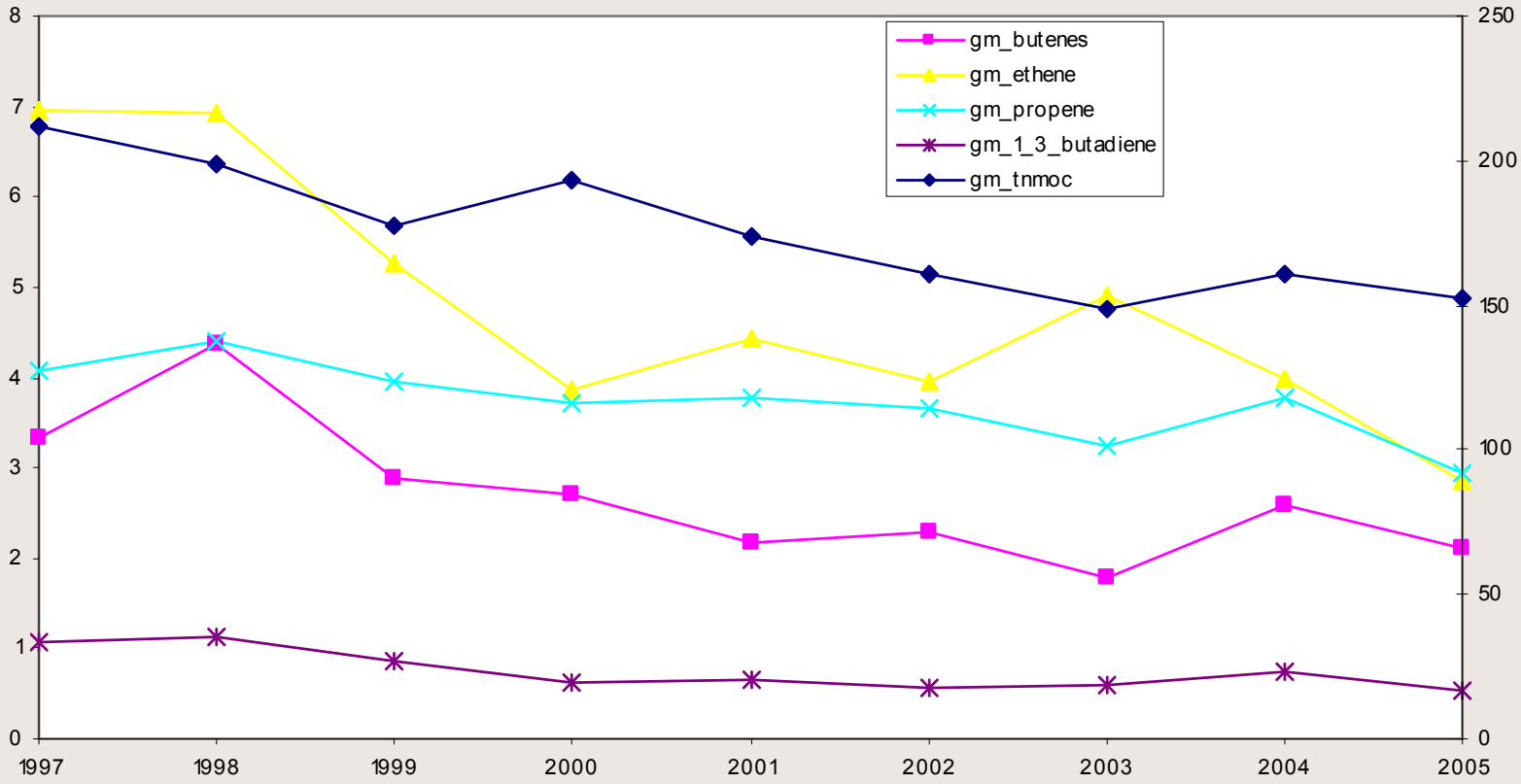
Clinton Drive Trend



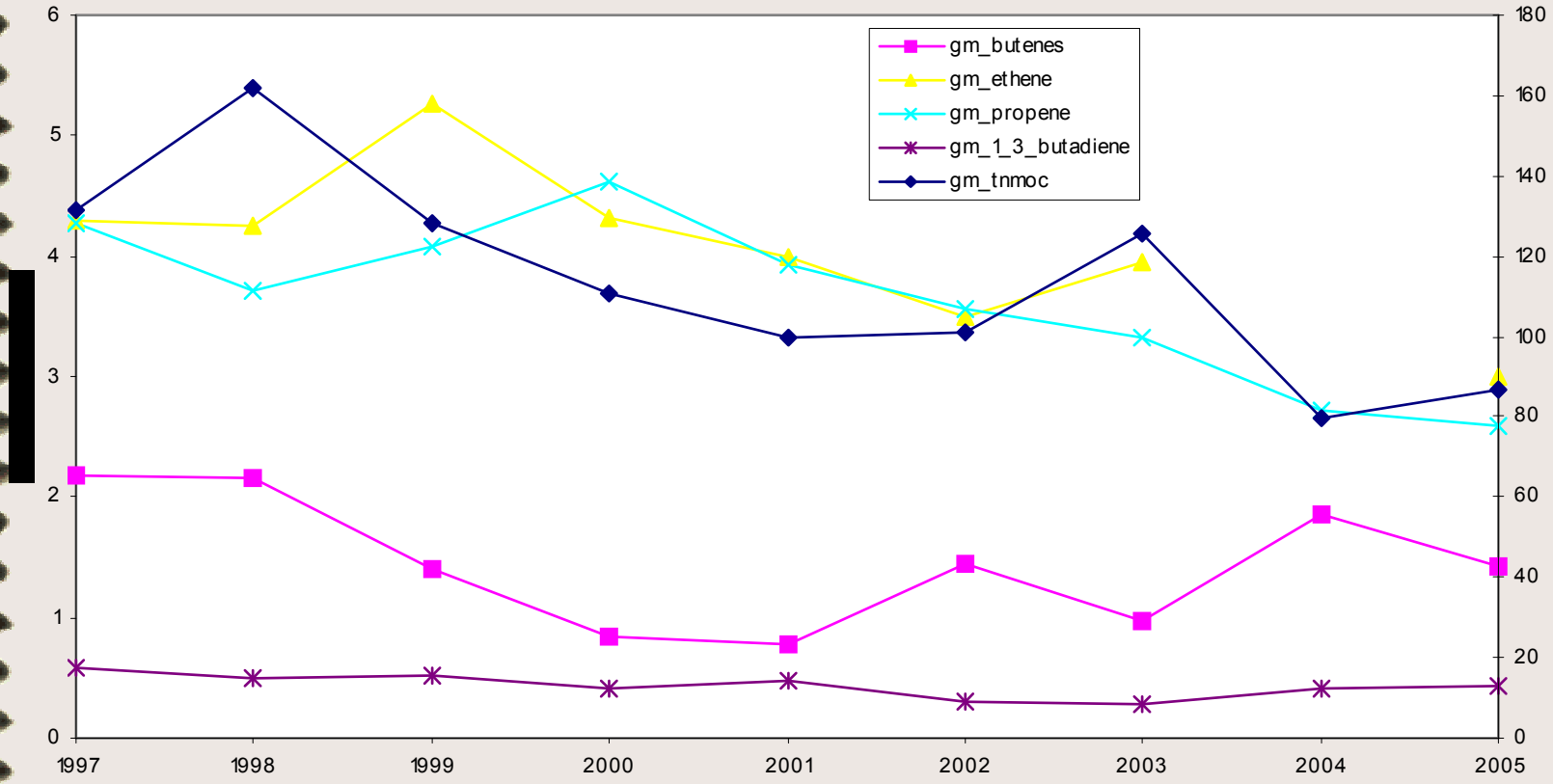
Deer Park Trend

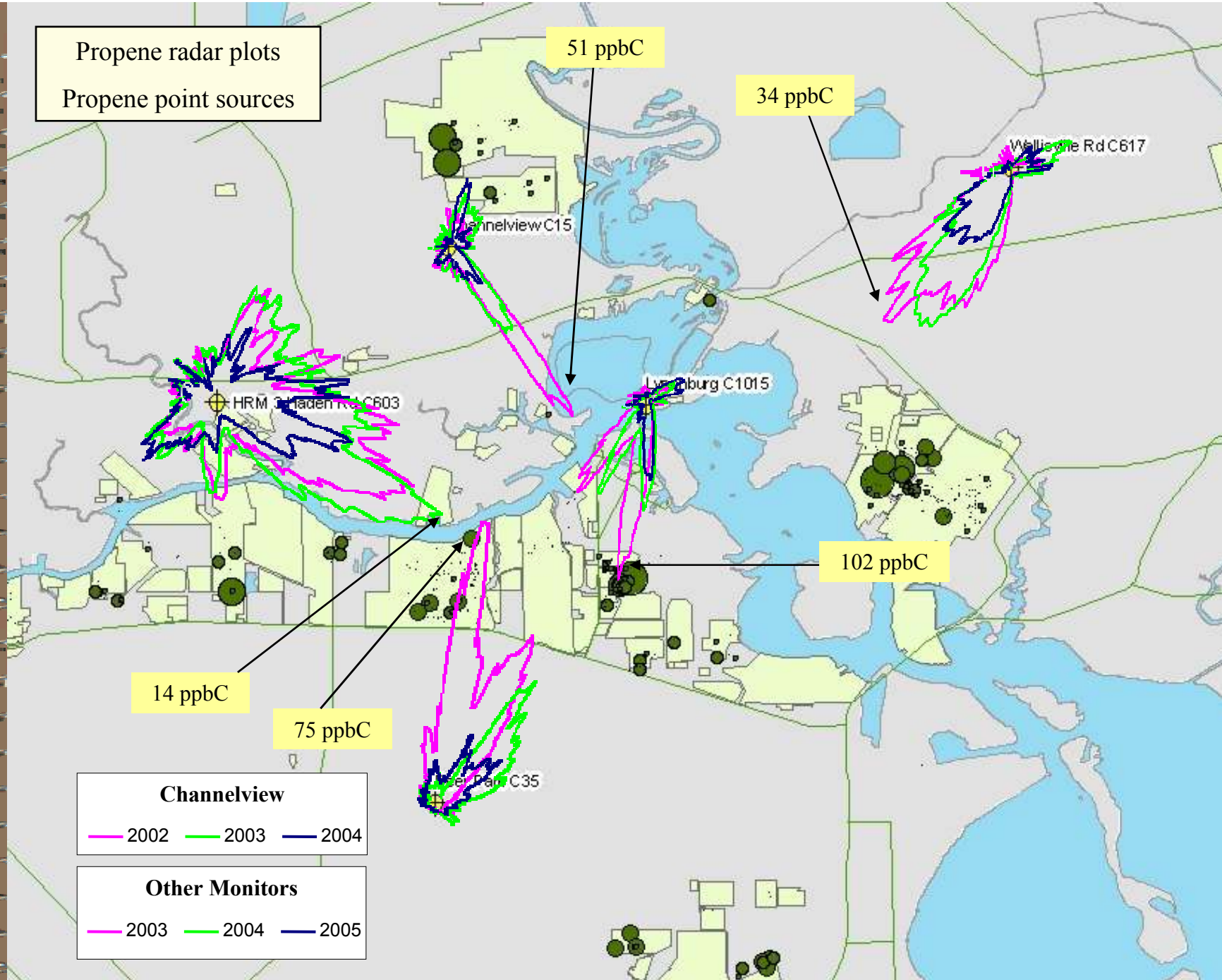


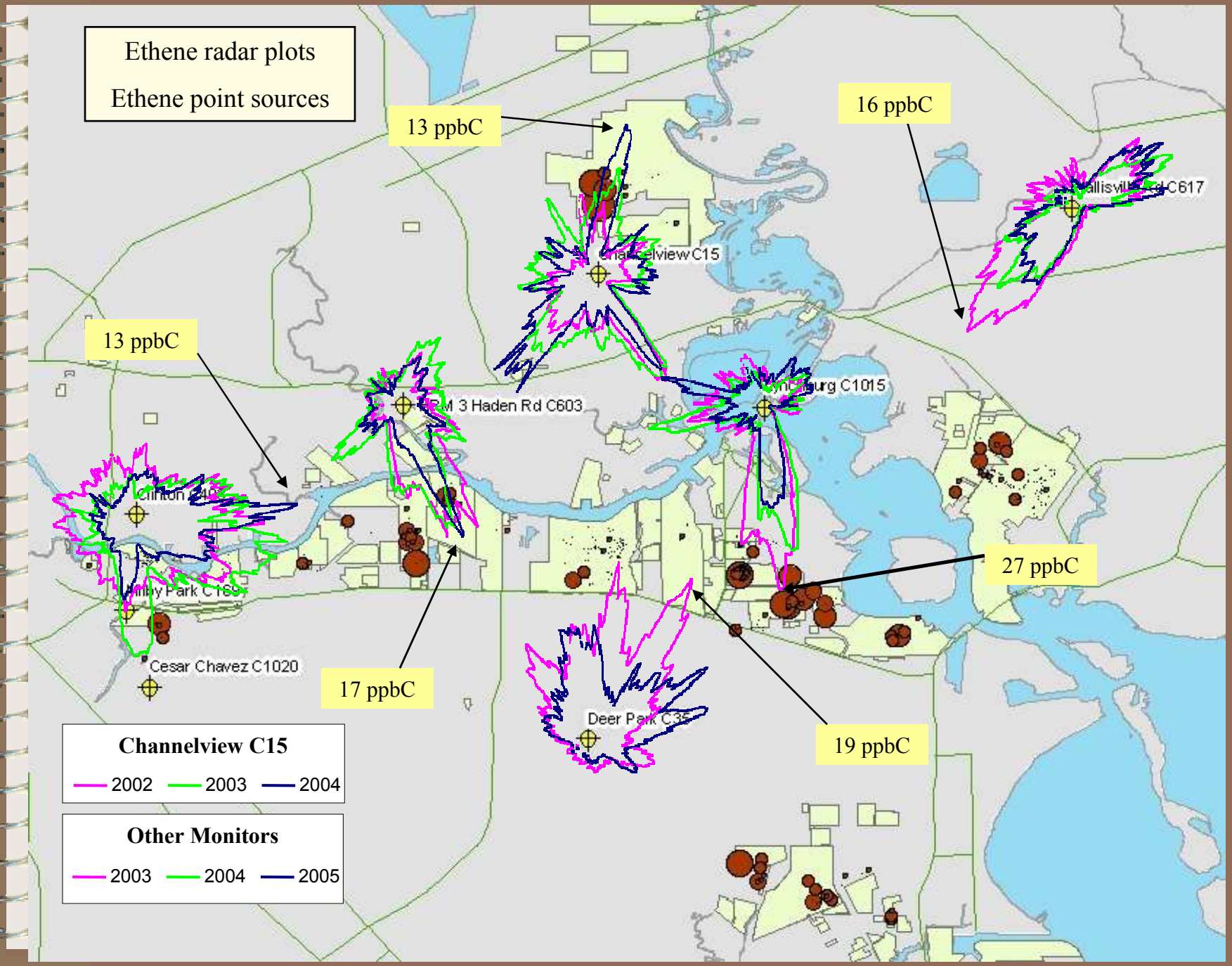
Geometric Mean HRVOCs and TNMOC at Clinton, 1997 - 2005



Geometric Mean HRVOCs and TNMOC at Deer Park, 1997 - 2005

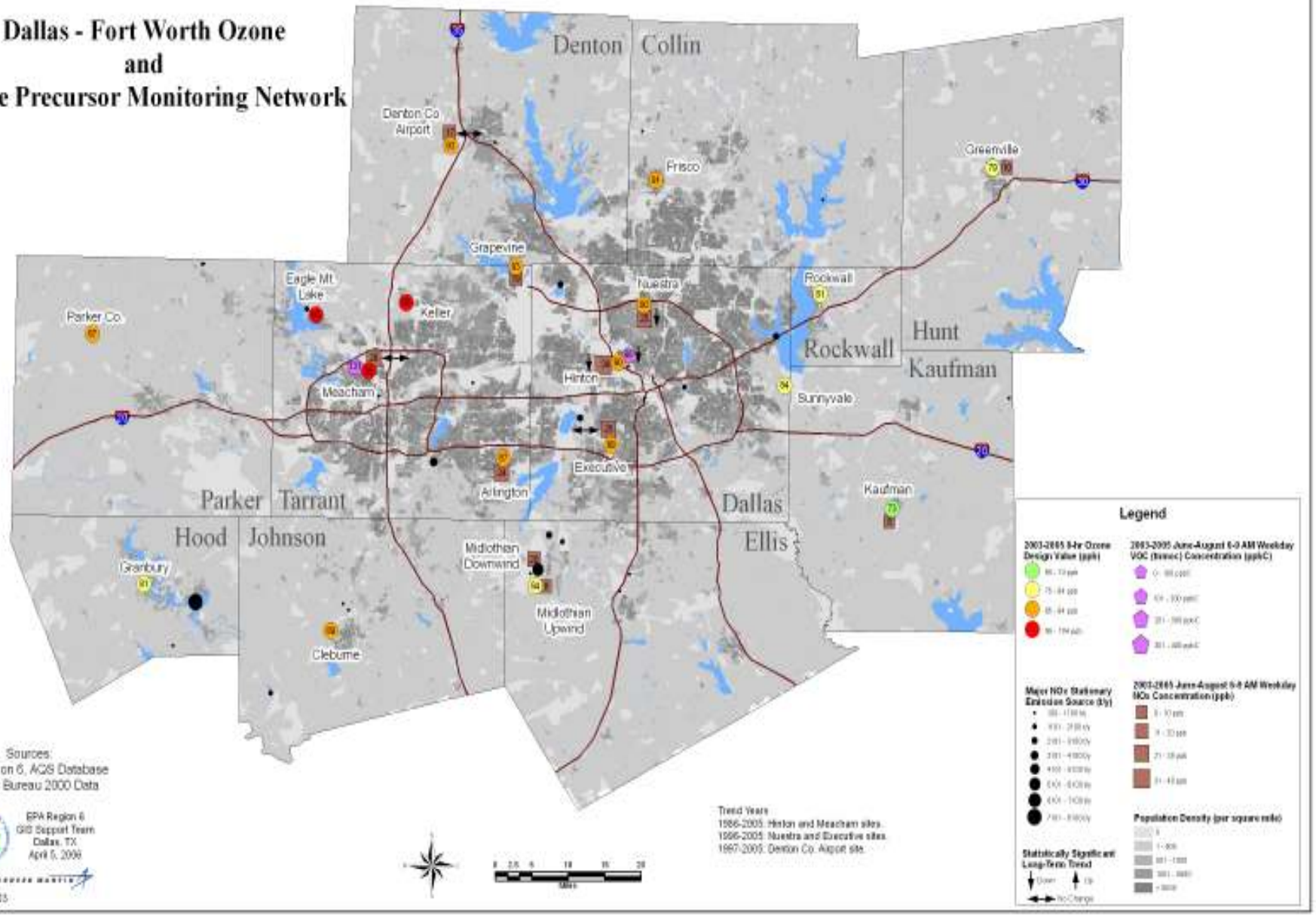



Propene radar plots
Propene point sources
51 ppbC
34 ppbC
102 ppbC
14 ppbC
75 ppbC
Channelview
2002
2003
2004
Other Monitors
2003
2004
2005

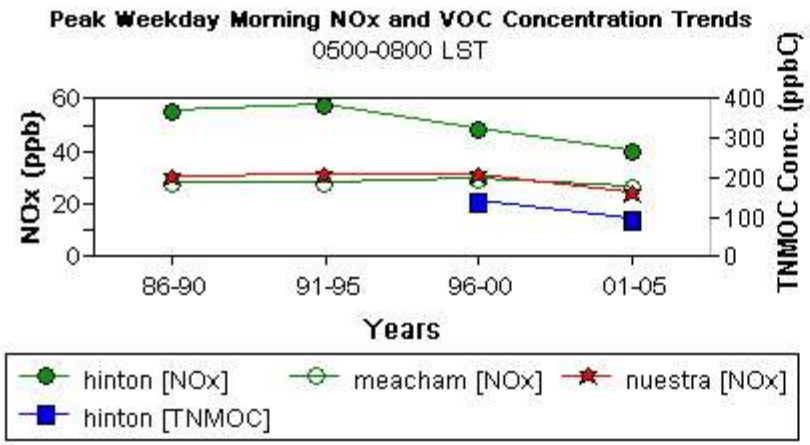

Ethene radar plots
Ethene point sources
13 ppbC
16 ppbC
13 ppbC
27 ppbC
17 ppbC
19 ppbC
Channelview C15
Cesar Chavez C1020
Deer Park C35
Channelview C15
Channelview C15
2002
2003
2004
Other Monitors
2003
2004
2005

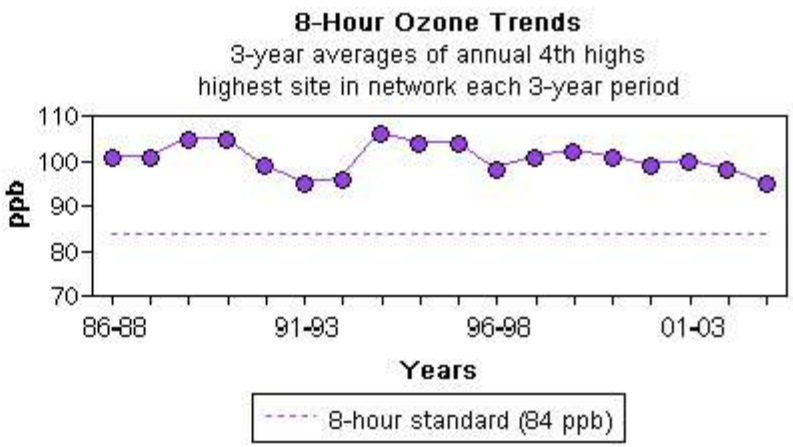
Dallas-Fort Worth

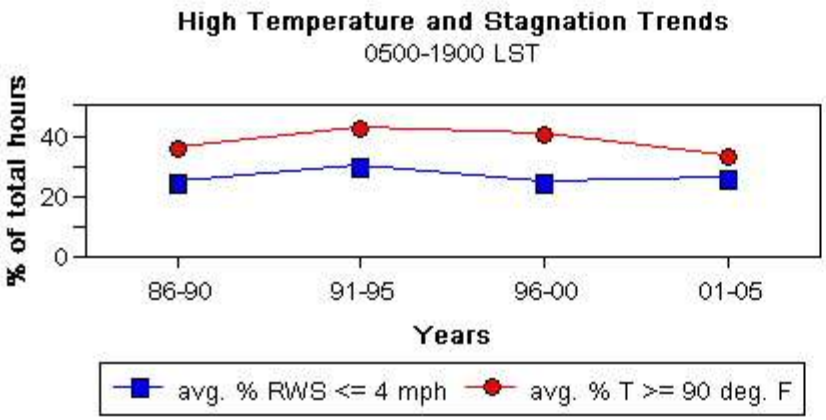
Dallas - Fort Worth Ozone and Ozone Precursor Monitoring Network

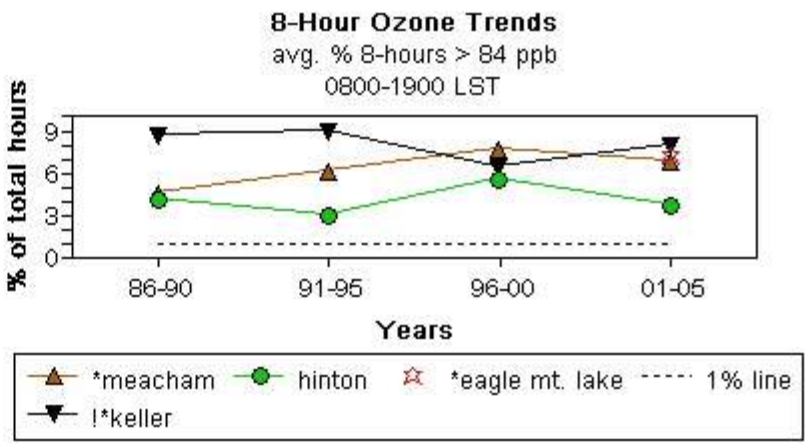


DFW Long-term Ozone/NOx/VOC/Meteorological Data Trends
June-August







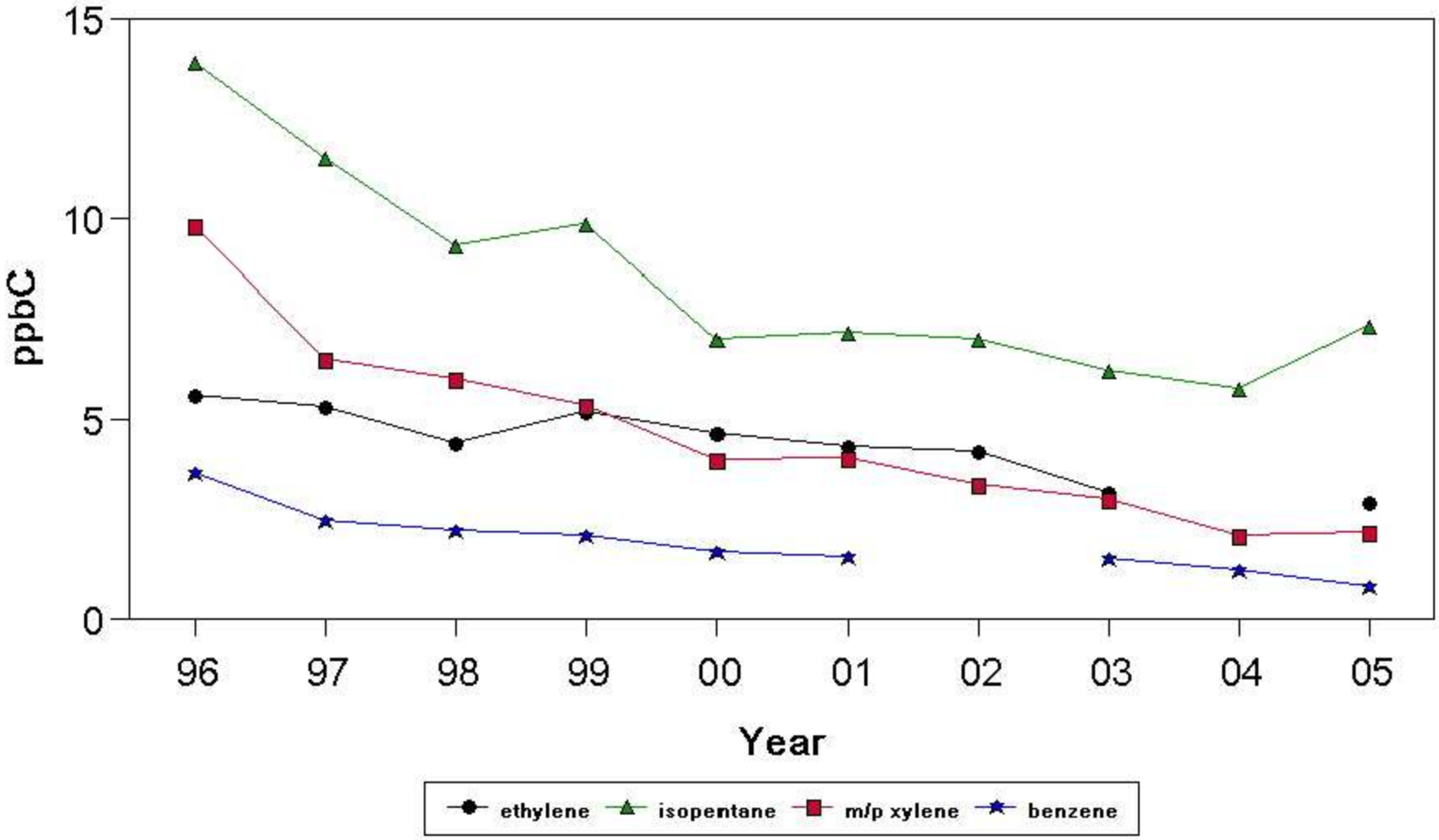


long-term met. data from meacham site
!=highest ozone concentration site in network for 1986-1988
*=highest ozone concentration site in network for 2003-2005

Dallas Hinton Site VOC Concentration Trends

June-August Weekday 0500-0800 LST Arithmetic Means

75% minimum data capture per year



Conclusions

- The Good News: (1) All 4 areas have monitored decreases in ozone and NOx/VOC precursors over the past 20 years and (2) El Paso is monitoring attainment for the 8-hour ozone NAAQS.

- The Continuing Challenges:
- (1) Baton Rouge: Progress made over past 20 years in lowering ozone concentrations, but concentrations of the HRVOC ethylene and propylene have increased recently.

Conclusions (cont.)

- (2) Ozone and precursor concentrations have dropped in Houston, but meteorology was also very favorable (wetter and cooler than normal) over past 5 years; Further reductions of VOC and NOx will be needed in Houston not only to attain the 8-hour standard, but to offset the likely return of warmer, drier summers.

- (3) The DFW area similarly will need continued precursor reductions to counter the effects of substantial population growth in the area.