

Evaluation of 2008 Ozone Season

***Presented To:
SETPMC Meeting
April 28, 2009***

***Presented By:
Steve Smith
Houston Regional Monitoring***



**Can the lower number of 2008
observed ozone exceedance days,
in HGB, be attributed to unusual
circumstances?**



Premise

Some have suggested - The fewer number of observed ozone exceedance days in Houston in 2008 were in a large part due to:

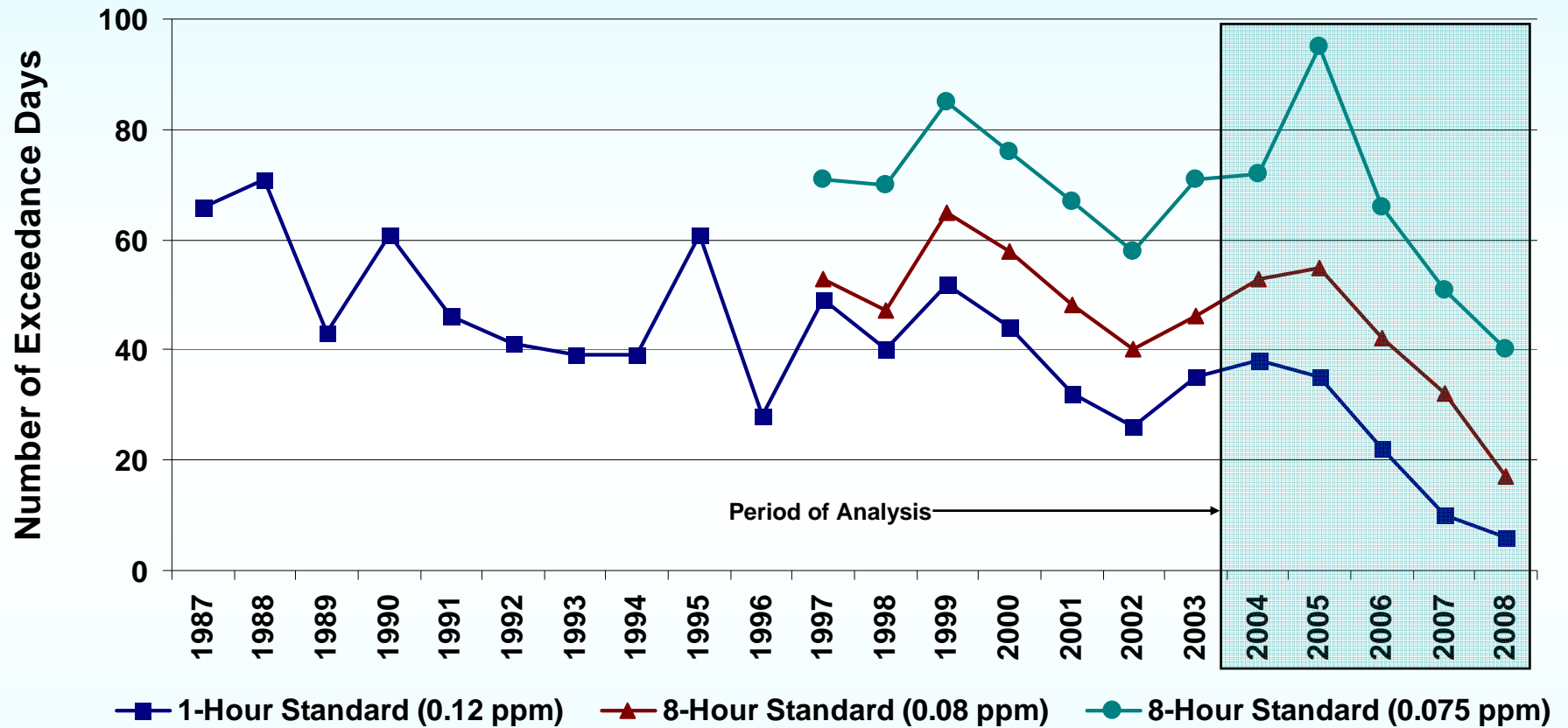
- **Unusual meteorology for region (leading to fewer stagnation days),**
- **Hurricane Ike (e.g., post Ike industrial emission patterns, and the temporary loss of ozone measurement data for network).**

HRM Response

- ◆ **Examine Ozone Monitoring data gaps (i.e., pre-Ike, Ike, post-Ike)**
- ◆ **Conduct a preliminary analysis of day-time resultant wind speed averages (09:00 to 16:00) for the period March through November for last five ozone seasons at Wallisville PAMS monitor**
- ◆ **Examine daily wind speed data to determine if there is a significant reduction in the number days conducive for ozone stagnation based on:**
 - **Changes in overall summary statistics including:**
 - » Daily wind speed average (by year);
 - » Daily wind speed median (by year);
 - » Daily wind speed inter-quartile averages (by-year);
 - » Daily wind speed maximums; and
 - » Daily wind speed minimums
 - **The resultant daily average wind speed frequency distributions (by year)**
- ◆ **Examine monthly ozone exceedance day trends in HGB over last 5-year period to see if the trends differ both month to month and pre-Ike, Ike and post-Ike**



Days When Houston Area Monitors Exceeded EPA Ozone Air Quality Standard

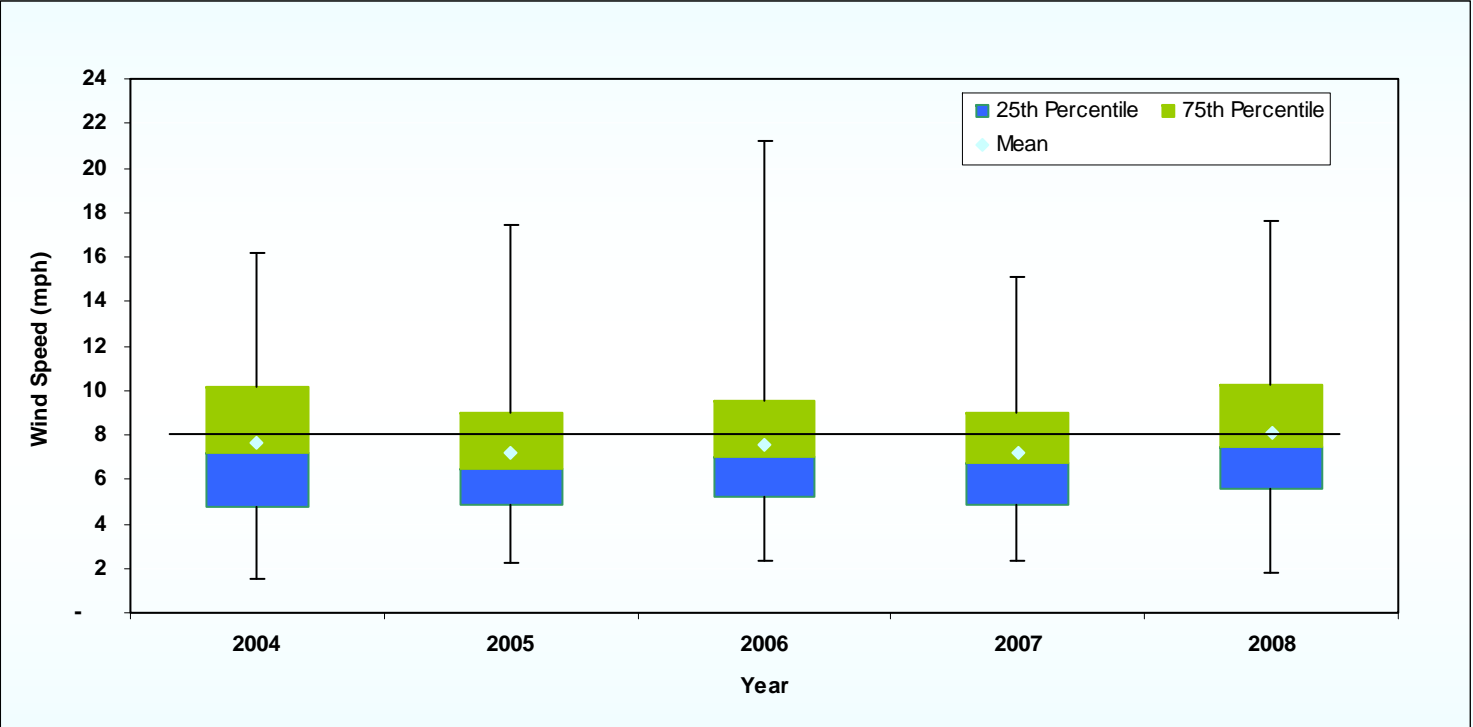


Steady Reduction In Number of Ozone Exceedance Days
Increased Number Of Monitors In 2003 to 2004 Resulted In Increased Opportunity To Exceed



Summary Statistics for Resultant Wind Speed Daily Averages (0900 – 1600) at Wallisville PAMS

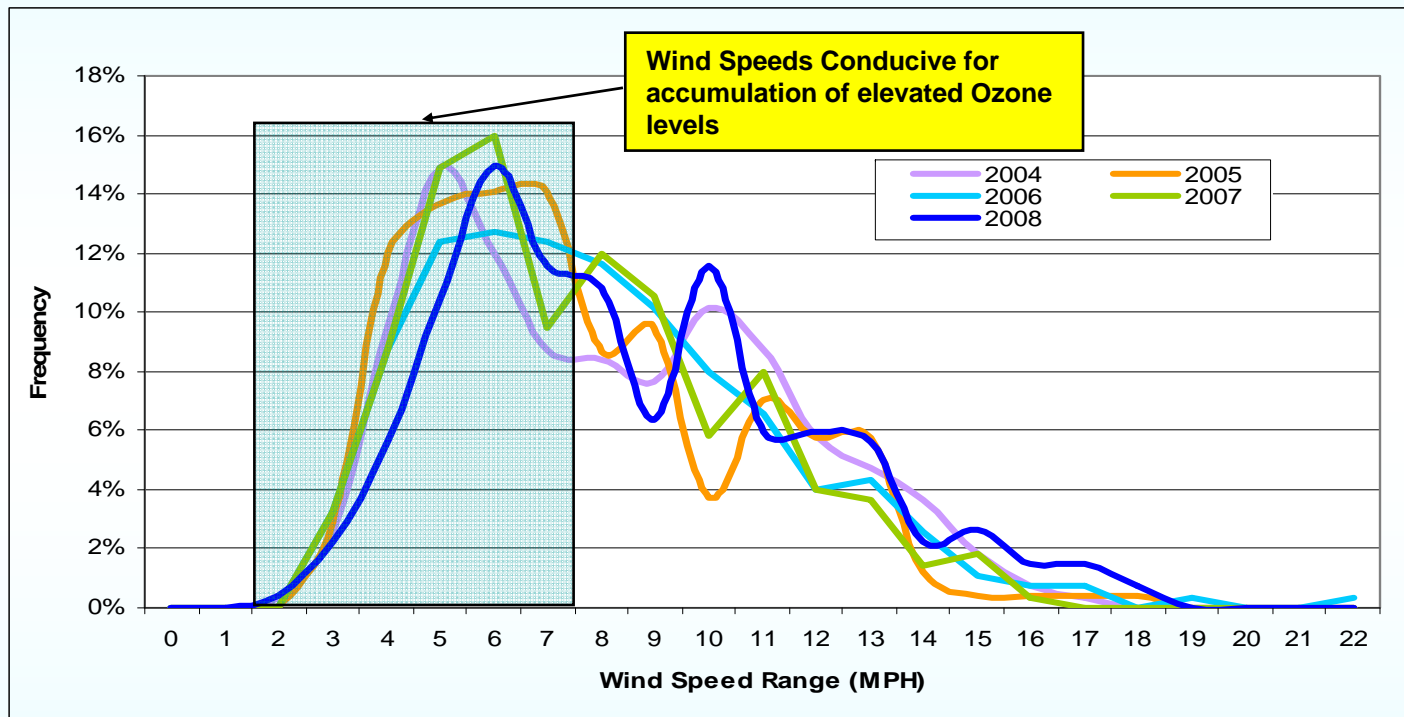
Monitoring Site for Period March through November



Only a Modest Increase in Day-time Average Wind Speeds in 2008 as Compared to the 4 Previous Years

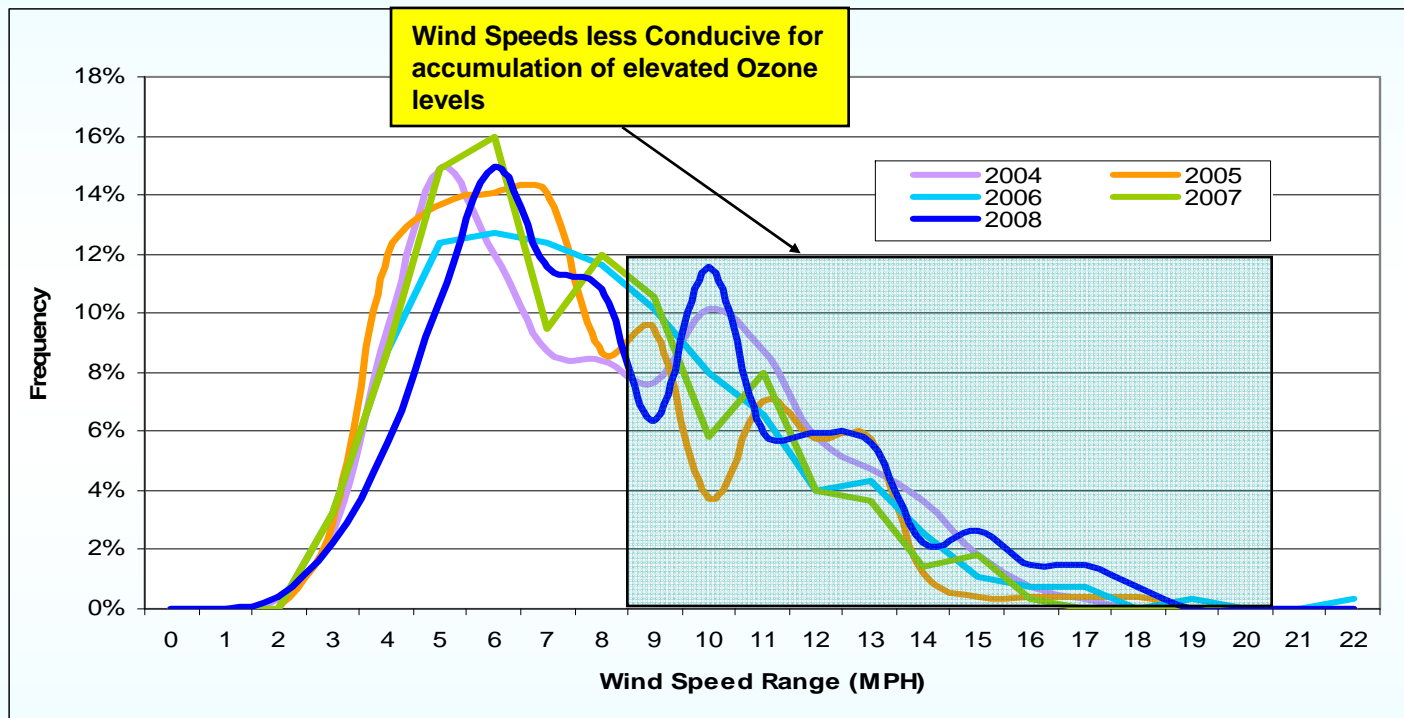


Frequency Distribution of Day-time Average Wind Speeds for Hours 0900 – 1600 for Period March – November at Wallisville PAMS Monitoring Site



In 2008 the Frequency of Day-time Average Winds between 2-7 mph was slightly less than the 4 previous years, Potentially Owing to fewer Ozone Stagnation Days

Frequency Distribution of Day-time Average Wind Speeds for Hours 0900 – 1600 for Period March – November at Wallisville PAMS Monitoring Site



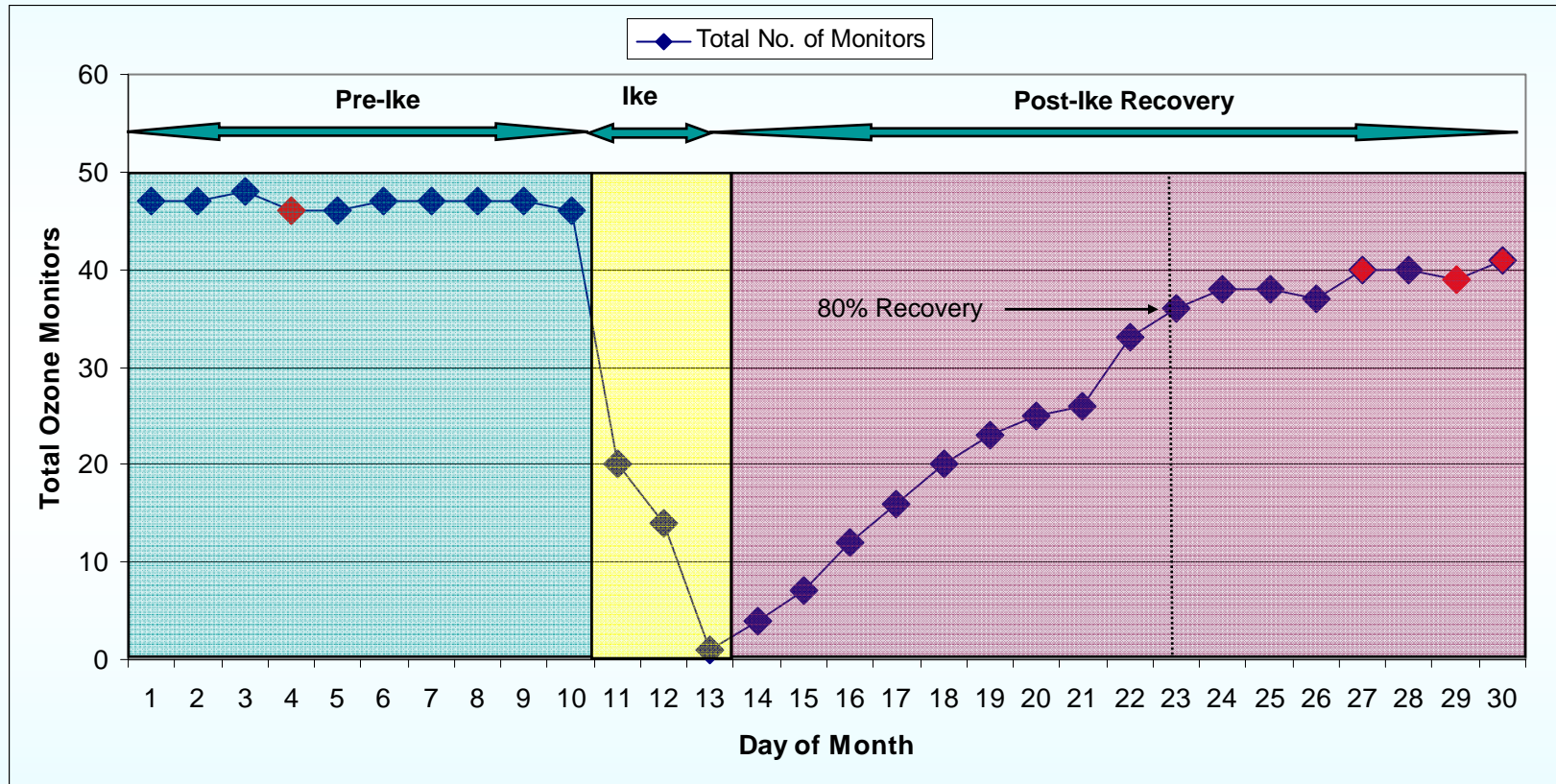
In 2008 the Frequency of Day-time Average Winds between 9- 20 mph was slightly higher than the 4 previous years, Potentially Owing to fewer Ozone Stagnation Days

What Impact Did Hurricane Ike Have HGB Ozone Monitoring Network?



Available Ozone Monitors in HGB During September 2008

(Red Diamond Signifies Exceedance of 0.08 ppm-v Ozone Standard)



80 % of Ozone Monitors were Operational Within 10 Days of Hurricane Ike

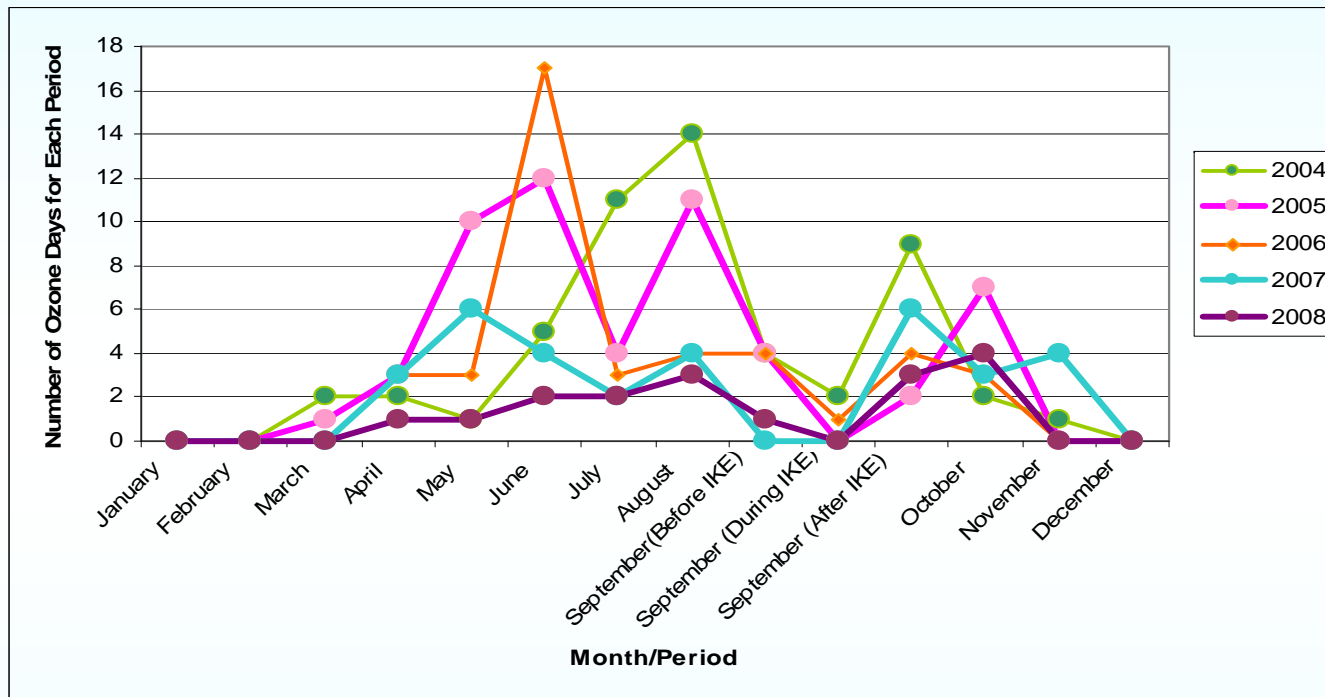


***What Impact Did hurricane Ike Have on
the Number of Observed Ozone
Exceedance Days in Houston?***



The Number of Ozone Exceedance Days in HGB for Each Month/Period for 2004 - 2008

(NAAQS = 0.08 ppm-v)

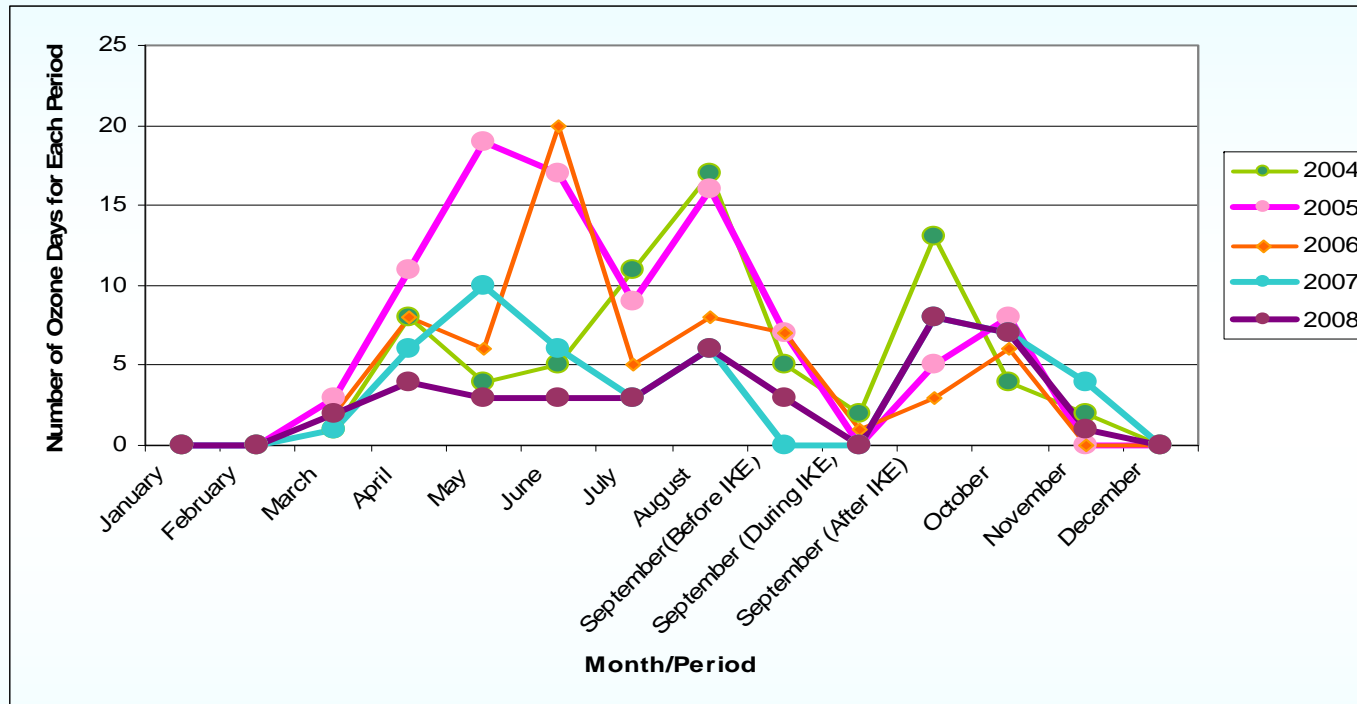


Based on historical data, the number of exceedances of the 0.08 ppm-v Ozone standard in the HGB during Hurricane Ike and post-Ike appear to be within accepted norms despite the temporary loss of Ozone monitoring data. At most from 1-3 additional exceedance days could have been unreported.



The Number of Ozone Exceedance Days in HGB for Each Month/Period for 2004 - 2008

(NAAQS = 0.075 ppm-v)



Based on historical data, the number of exceedances of the 0.075 ppm-v Ozone standard in the HGB both during Hurricane Ike and post-Ike also appears to be within accepted norms despite the temporary loss of Ozone monitoring data. At most from 1-3 additional exceedance days could have been unreported.

Observations and Conclusions

Some have suggested - The number of ozone exceedance days reported for 2008 in HGB may be low by as much as 50% due in part to:

- **Hurricane Ike and the substantial loss of ozone measurement data that occurred during Ike and post-Ike, and**
- **the reduction in industrial emissions (post-Ike) resulted in fewer observed ozone exceedance days during the intervening post-Ike period**

Observations and Conclusions

◆ Question:

- Did data gaps in ozone measurements lead to a serious under-reporting of ozone exceedance days?

◆ Response:

- While Hurricane Ike caused the temporary loss of ozone measurement in the HGB network,
 - » At no time was the ozone monitoring network completely down
 - » 80% of the monitors were back online within 10 days of Ike's passing; and
 - » Because of the density of ozone monitors in the network, it is doubtful if there were gaps in the ozone data record that would have resulted in a significant under-reporting of ozone exceedance days in the HGB

Observations and Conclusions

- ◆ An examination of ozone exceedance day trends by month over the past 5 years indicated
 - The total number of ozone exceedance days has declined steadily over each of the last 4 years, 2008 not withstanding
 - There were significant reductions in the number of ozone exceedance days reported by month leading up to September 2008
 - The highest number of ozone exceedance days for 2008 occurred in September (post-Ike)
 - The total number of ozone exceedance days observed both pre-Ike and post-Ike for September 2008 were consistent with previous years/months and particularly so in 2007
 - While it cannot be ruled out that the number of observed ozone exceedance days in 2008 were not under reported, it is reasonable to conclude that at most, the number of under-reported ozone exceedance days could range between 1 and 3

Observations and Conclusions

◆ Question:

- Were the number of ozone exceedance days both pre-Ike and post-Ike related to reduced industrial emissions?

◆ Response:

- This is speculation and cannot be proved
- Anecdotal information:
 - » Significant non-working traffic signals resulted in significant increases in commute times
 - » If 1% of CenterPoint customers without power ran generators, then significant increase in area source NO_x and VOC
- An examination of ozone exceedance day trends over the past 5 years indicated the number of exceedance days in September 2008 was consistent with previous years, especially 2007

Observations and Conclusions

◆ Question:

- **Were the number of ozone exceedance days in 2008 influenced by unusual meteorological conditions that were less conducive for the accumulation of ozone?**

◆ Response:

- **A cursory analysis of day-time wind speed averages from March-November for the last 5 years at the Wallisville PAMS monitoring station indicated the following:**
 - » Overall there was a modest increase in the day-time wind speed averages that suggests there could have been fewer ozone stagnation days in 2008;
 - » An analysis of the frequency of day-time wind speed averages indicated that:
 - Overall there was a noticeable reduction in the frequency of day-time wind speeds in the 3 to 8 mph range (considered to be conducive for accumulation of elevated ozone levels);
 - Correspondingly there was an increase in the frequency of winds ranging from 9 to 20 mph that characterize conditions which are less conducive for elevated ozone accumulation;
 - The net impact of the increased frequency of elevated day-time wind speeds is unknown at this time, and could only be estimated through the use of advanced photochemical modeling;
 - Measured ozone exceedance day trends for 2009 should help to verify if the combination of meteorology, emission patterns, and impacts from Hurricane Ike resulted in the reduced number of observed ozone exceedance days for 2008.

Interpretation of the 8-Hour Primary and Secondary NAAQS for Ozone

Rule Supports Keeping 2008 Data



Interpretation of the 8-Hour Primary and Secondary NAAQS for Ozone

- ◆ In the effort to keep the 2008 clean year data we will need to demonstrate compliance with the following data capture criteria.
- ◆ **Appendix I to Part 50**
 - 2. Primary and Secondary Ambient Air Quality Standards for Ozone**
 - 2.1 Data Reporting and Handling Conventions**
 - » 2.1.2(b) An ozone monitoring day shall be counted as a valid day if valid 8-hour averages are available for at least 75% of possible hours in the day. In the event that less than 75% of the 8-hour averages are available, a day shall also be counted as a valid day if the daily maximum 8-hour average concentration for that day is greater than the level of the ambient standard.

Interpretation of the 8-Hour Primary and Secondary NAAQS for Ozone

Appendix I to Part 50

2. Primary and Secondary Ambient Air Quality Standards for Ozone

2.3 Comparisons with the Primary and Secondary Ozone Standards

- » 2.3(b) This comparison shall be based on three consecutive, complete calendar years of air quality monitoring data. This requirement is met for the three year period at a monitoring site if daily maximum 8-hour average concentrations are available for at least 90%, on average, of the days during the designated ozone monitoring season, with minimum data completeness in any one year of at least 75% of the designated sampling days. When computing whether the minimum data completeness requirements have been met, meteorological or ambient data may be sufficient to demonstrate that meteorological conditions on missing days were not conducive to concentrations above the level of the standard. Missing days assumed less than the level of the standard are counted for the purpose of meeting the data completeness requirement, subject to the approval of the appropriate Regional Administrator.

Interpretation of the 8-Hour Primary and Secondary NAAQS for Ozone

Appendix I to Part 50

2. Primary and Secondary Ambient Air Quality Standards for Ozone

2.3 Comparisons with the Primary and Secondary Ozone Standards

- » **2.3(c) Years with concentrations greater than the level of the standard shall not be ignored on the ground that they have less than complete data. Thus, in computing the 3-year average fourth maximum concentration, calendar years with less than 75% data completeness shall be included in the computation if the average annual fourth maximum 8-hour concentration is greater than the level of the standard.**

Interpretation of the 8-Hour Primary and Secondary NAAQS for Ozone

- ◆ Therefore, during the days before Ike and basically the two weeks after Ike there are a number of monitors that are missing days as outlined in 2.1.2(b) above. However, if the total number of days a specific monitor is offline for 2008 is less than 90 days, then the 75% uptime for the year meets the criteria in 2.3(b) above. If the cumulative data for 2006, 2007 and 2008 shows an average uptime of 90% then the three year average can be calculated and the data should be available for the attainment demonstration. For example, If you use 30 days for 2008 and 20 days each year for 2006 and 2007 as days offline, then you still meet the three average of 90% uptime.
- ◆ Finally, I see the exceptional events argument as a one-way street. You can exclude high data due to exceptional events, but I don't see excluding low data due to exceptional events.

Backup Slides

NOx trend

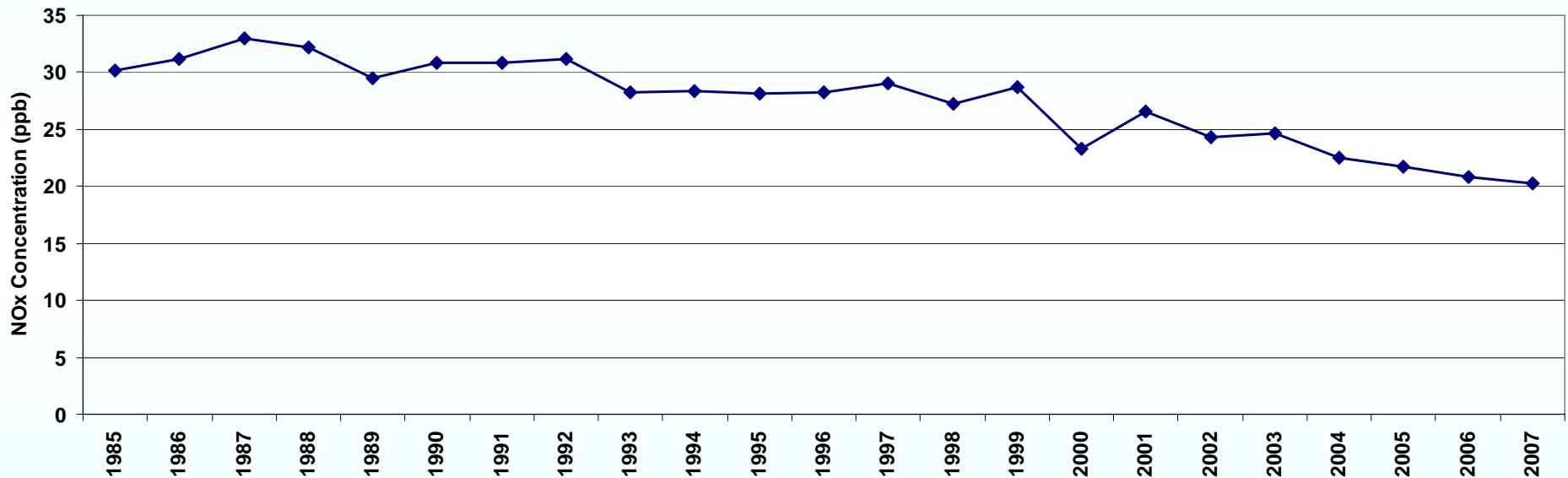
HRVOC trend

Ozone Conducive Day Trends



Annual Average NO_x Concentration at HRM and Core Houston Area Monitors

Crawford/Texas Ave, Clinton, Lang, Aldine

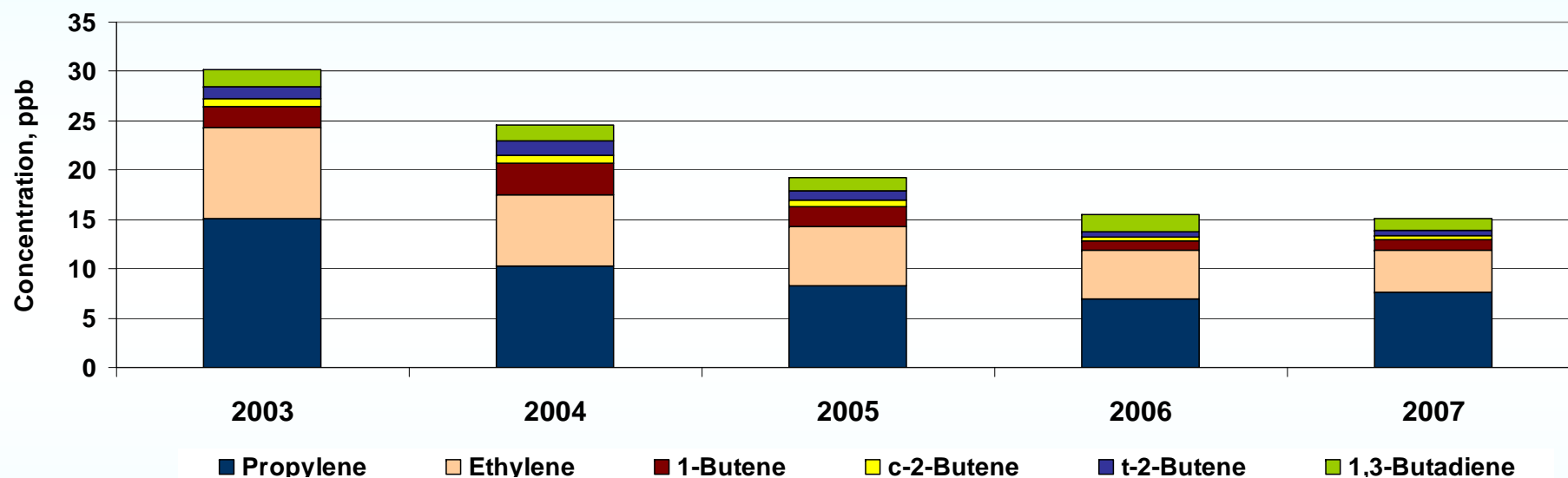


33% Reduction In Monitored NO_x Since 1985



HRVOC Average Concentrations

Ship Channel PAMS-GC Sites - June-November



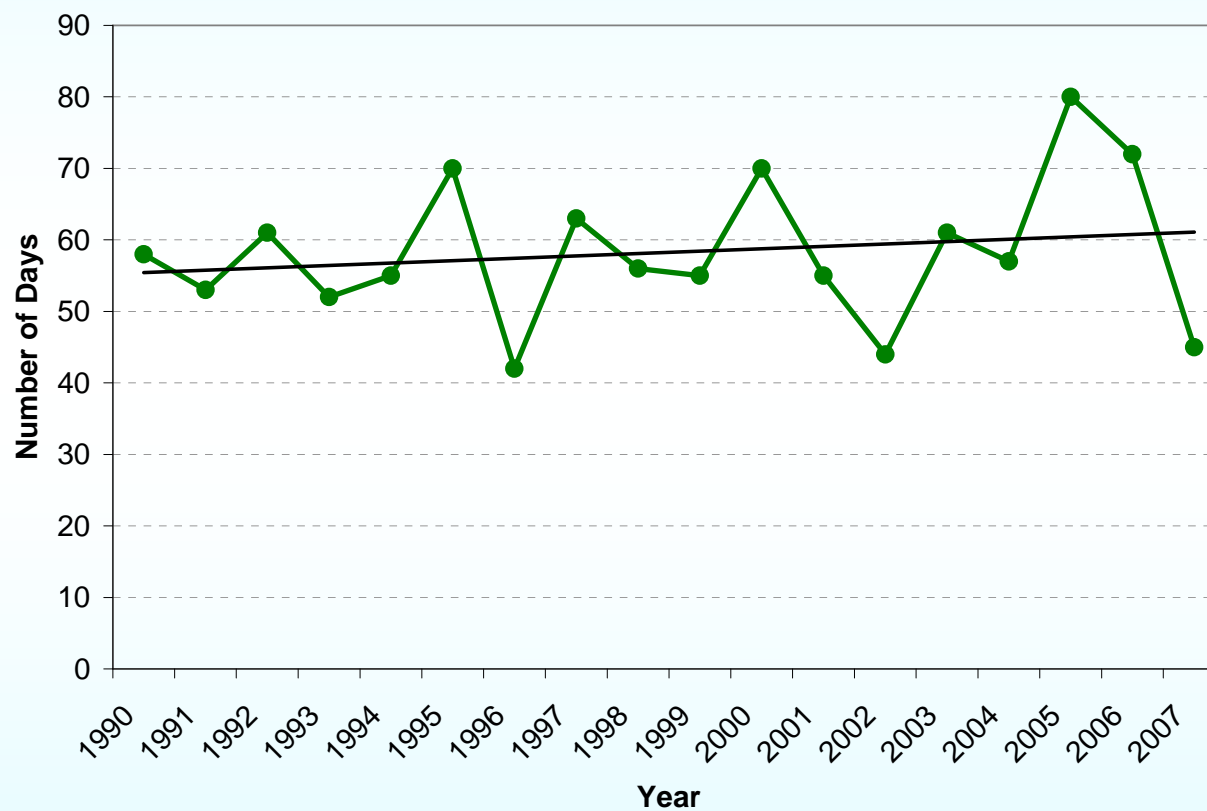
**50% Reduction In Monitored HRVOC
Since PAMS Monitoring Began In 2003**

Note: Data for Wallisville Road in 2005 and 2006 are not complete.

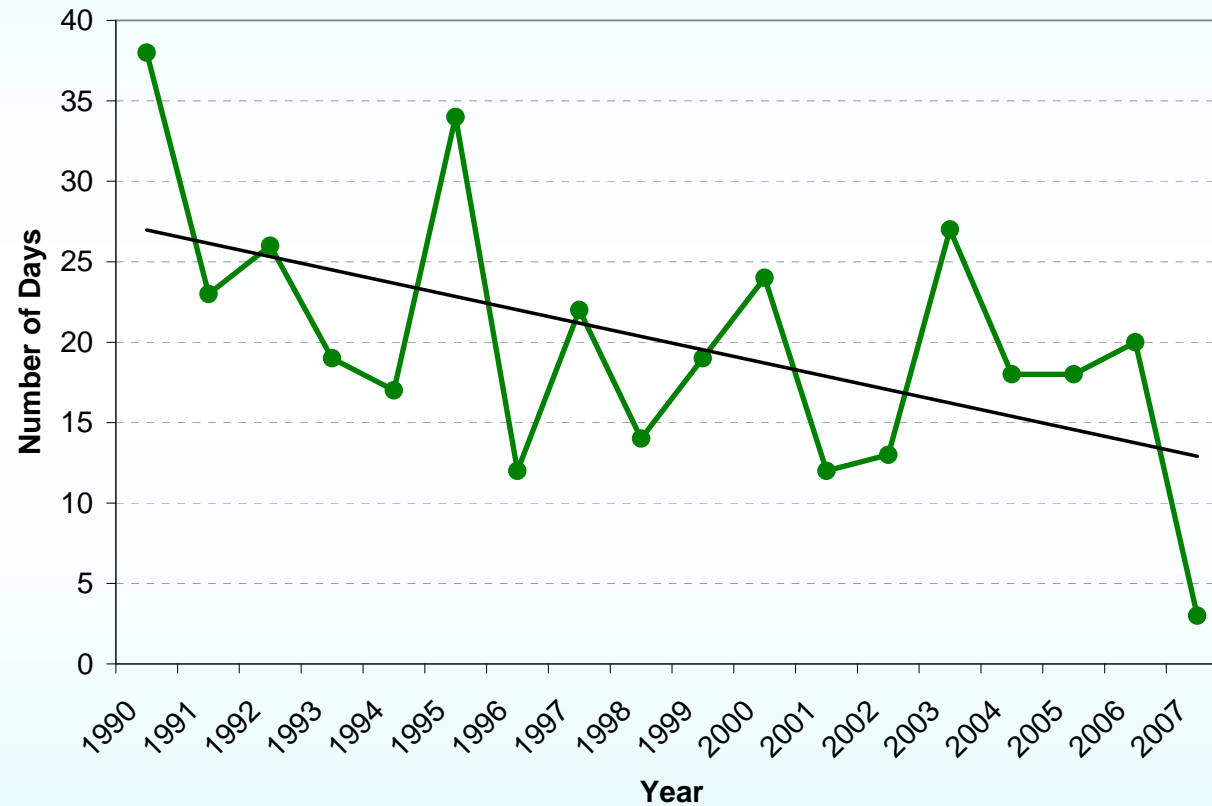
Houston Regional Monitoring



8-Hour Ozone-Conducive Days (Updated through 09/30/07)



Ozone-Conducive Days with 8-Hour Exceedances in the HRM Network (updated through 09/30/07)



Percentage of Ozone-Conducive Days w 8-Hr Exceedances in the HRM Network (updated through 09/30/07)

