



# MARAMA Workshop on Weight of Evidence Demonstrations for Ozone SIPs

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## **Pennsylvania Approach**

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# Pennsylvania WOE Approach

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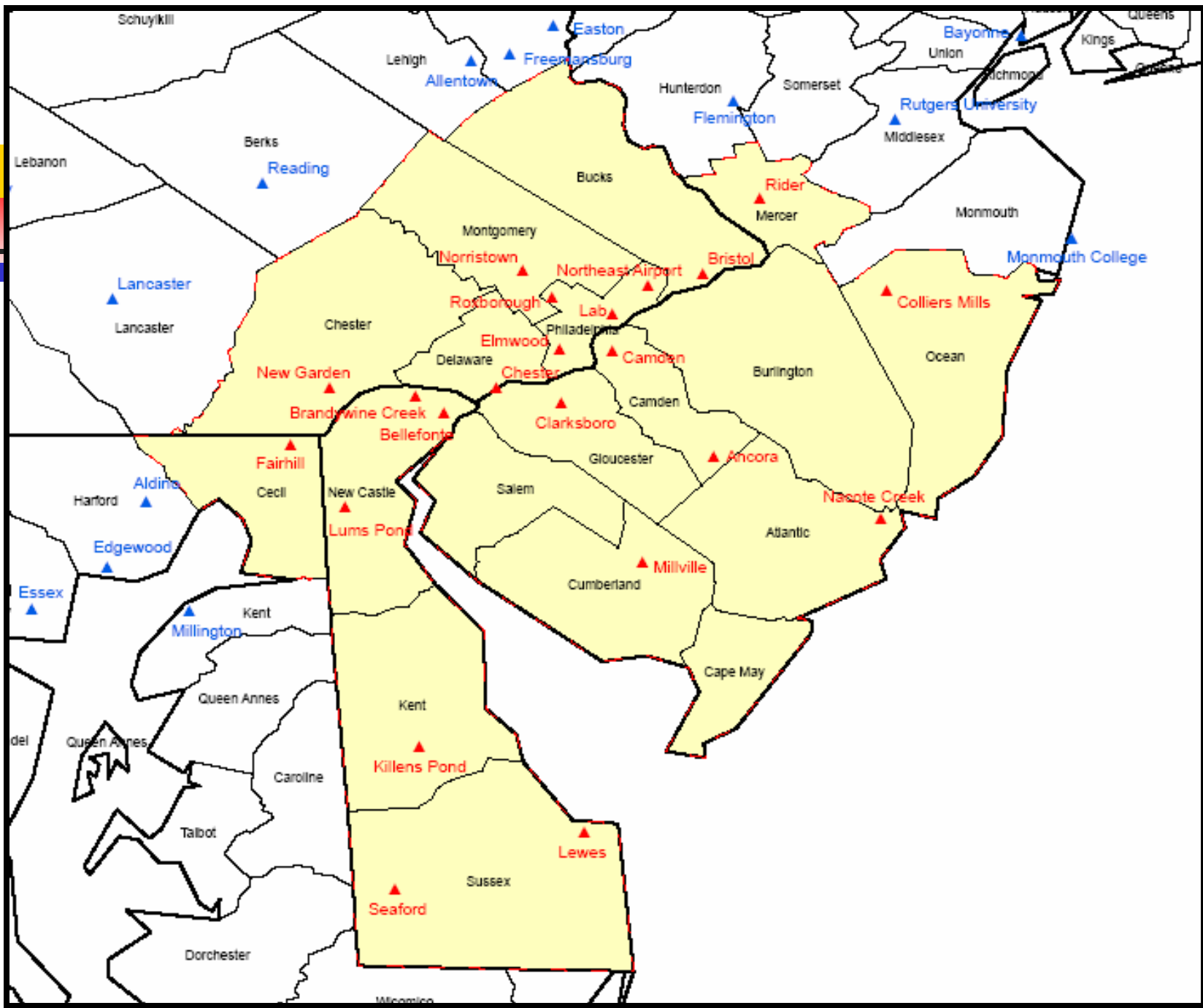
- Trends
  - Design Values
  - Severity
- Status
- Possible WOE Approaches
  - Alt Baseline Design Values
  - Variability of RRFs
  - Analysis of Transport



## (Long-Term) Trends Continued

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- Can we see the affect of major control programs on eight-hour ozone design values in the Philadelphia nonattainment area?



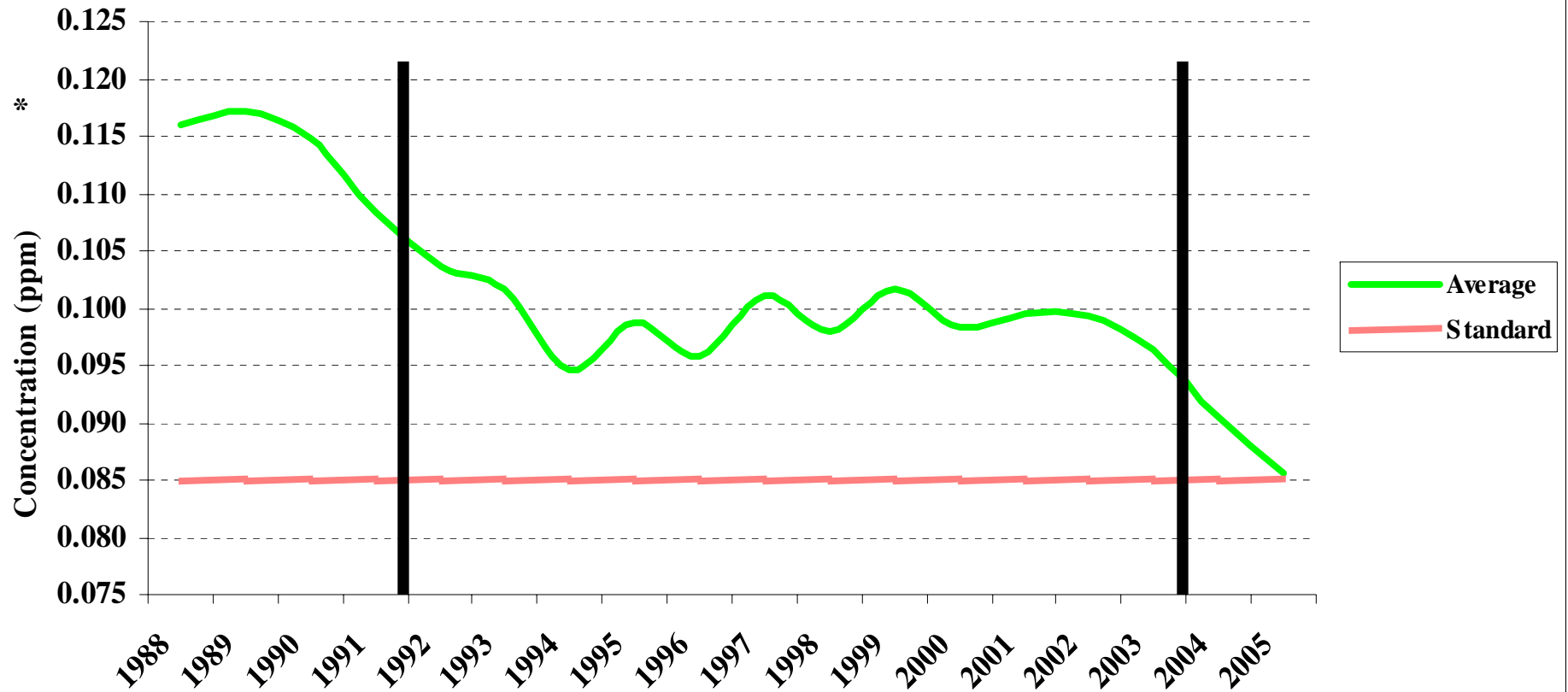


# Philadelphia Trends

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- Gauge Effects of Major Control Programs
  - RVP (VOC Control)
    - Enforced 1992 Ozone Season
    - Pre-RVP Era (1986-91)
  - NO<sub>x</sub> SIP Call (NO<sub>x</sub> Controls)
    - Effective Inside OTR 2003 Ozone Season, Outside OTR 2004 Ozone Season
    - NO<sub>x</sub> SIP Call Era 2004-06
  - Post-RVP/Pre NO<sub>x</sub> SIP Call Era 1992-2003

# Philadelphia Eight-Hour Ozone Nonattainment Area Design Values 1988-2005



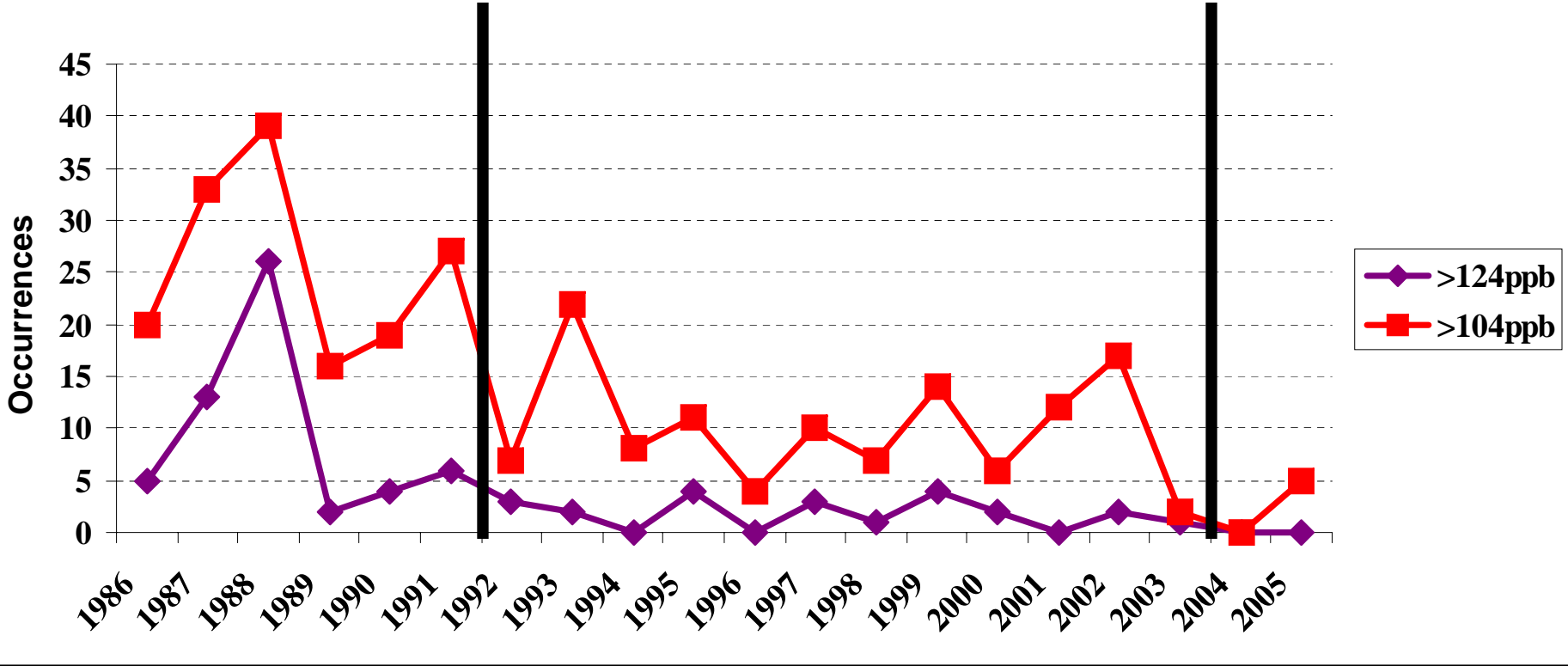
Pre-RVP

Post-RVP/Pre NO<sub>x</sub> SIP Call

Post-NO<sub>x</sub> SIP Call

# Philadelphia Ozone Severity

Eight-Hour Concentrations



Pre-RVP

Post-RVP/Pre NO<sub>x</sub> SIP Call

Post-NO<sub>x</sub> SIP Call



# Pennsylvania WOE Approach

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- Status
- Possible WOE Approaches
  - Alt Baseline Design Values
  - Variability of RRFs
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# Philadelphia Status: OTC Modeling/Design Value

Site Name	State	Draft Guidance		
		3 Year DV Avg	OTW/OTB V4	DV_2006
Colliers Mills	NJ	0.1057	<b>0.0920</b>	0.093
Bristol	PA	0.0990	<b>0.0889</b>	0.086
Clarksboro	NJ	0.0980	<b>0.0882</b>	0.086
Camden	NJ	0.0980	<b>0.0882</b>	0.084
NE Airport	PA	0.0967	<b>0.0873</b>	0.090
Ancora State Hospital	NJ	0.0997	<b>0.0870</b>	0.088
Rider College	NJ	0.0977	<b>0.0870</b>	0.087



# Alternative DV<sub>Base</sub> Method (Bristol, PA)

	2000	2001	2002	2003	2004	2005	2006
4th Max	0.099	0.104	0.111	0.087	0.082	0.089	0.087

Alternative Option: Average 4<sup>th</sup> Max for 2000-04

→ **0.0966 ppm**

$$(DVF)_{alt} = (RRF) (DVB)_{alt}$$

$$(DVF)_{alt} = (0.8976) (0.0966 \text{ ppm})$$

→ **0.0867 ppm (EPA → 0.0889 ppm)**



# Philadelphia WOE: Alternative Design Value

Site Name	State	Alternative DVB		
		5 Year Avg	OTW/OTB V4	DV_2006
Colliers Mills	NJ	0.1042	<b>0.0907</b>	0.093
Bristol	PA	0.0966	<b>0.0867</b>	0.086
Clarksboro	NJ	0.0964	<b>0.0868</b>	0.086
Camden	NJ	0.0940	0.0846	0.084
NE Airport	PA	0.0946	<b>0.0855</b>	0.090
Ancora State Hospital	NJ	0.0986	<b>0.0861</b>	0.088
Rider College	NJ	0.0956	<b>0.0852</b>	0.087



# Philadelphia WOE: Variability of RRF

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- Examine variability of Relative Reduction Factors (RRF) within the Philadelphia nonattainment area.
- Find the range of values then adjust the Base Design Value ( $DV_{\text{Base}}$ ). (Alternative  $DV_{\text{Base}}$ )





# Alternative RRF Method

	OTC RRF OTB/OTW V4
Max	0.9070
Min	0.8336
Median	0.8861
Mean	0.8829

$$(DVF)_{alt} = (RRF)_{min} (DVB)_{alt}$$

$$(DVF)_{alt} = (0.8336) (0.1042 \text{ ppm}) \text{ Colliers Mill, NJ}$$

$$\rightarrow 0.0868 \text{ ppm}$$



# Philadelphia WOE: Ozone Transport Analysis

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- Determine how well OTC modeling is replicating Methodist Hill (elevated site).
- Examine vertical RRFs (transport aloft).



# Philadelphia WOE: Ozone Transport Analysis

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Design Value			0.092	0.097	0.095	0.092	0.094	0.093	0.085	0.075	0.070
4th Max	0.082	0.091	0.104	0.098	0.085	0.095	0.104	0.080	0.071	0.074	0.066
Exceedances	3	7	22	20	4	15	27	3	0	0	0

**EPA Option: Average Design Value (2002, 2003, 2004)**

**→ 0.0907 ppm**

$$(DVF) = (RRF) (DVB)$$

$$(DVF)_{alt} = (0.8488) (0.0907 \text{ ppm})$$

**→ 0.0769 ppm**





# Philadelphia WOE: Ozone Transport Analysis

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## Methodist Hill Analysis Summary

- Model overestimating concentration by as much as 0.007 ppm (7 ppb).
- Methodist Hill is a regional transport site (measuring what is coming into the eastern OTR).
- Can argue model/methodology is overestimating ozone transport into the Philadelphia nonattainment area by as much as 7 ppb.