



# DFW Modeling

## 2009 Future Case Modeling (Preliminary Results)

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# Run 2009 Future Case

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- Project Baseline Emissions Inventory into Future
  - Apply expected growth
  - Apply mandated controls
- Run CAMx for Future Case
  - Calculate Relative Response Factors
  - Calculate Future Design Values
- Estimate Control Requirements
  - Run Matrix of NO<sub>x</sub> and VOC Controls
  - Plot Response Curves



# 2009 Emissions and Reductions

Emissions (tpd)	NO <sub>x</sub>	VOC
DFW 9-County	423 tpd	343 tpd
Texas	3,301	2,237
Domain	36,481	26,633

Reductions from 1999 Baseline	NO <sub>x</sub>	VOC
DFW 9-County	-43%	-19%
Texas	-38%	-10%
Domain	-39%	-25%

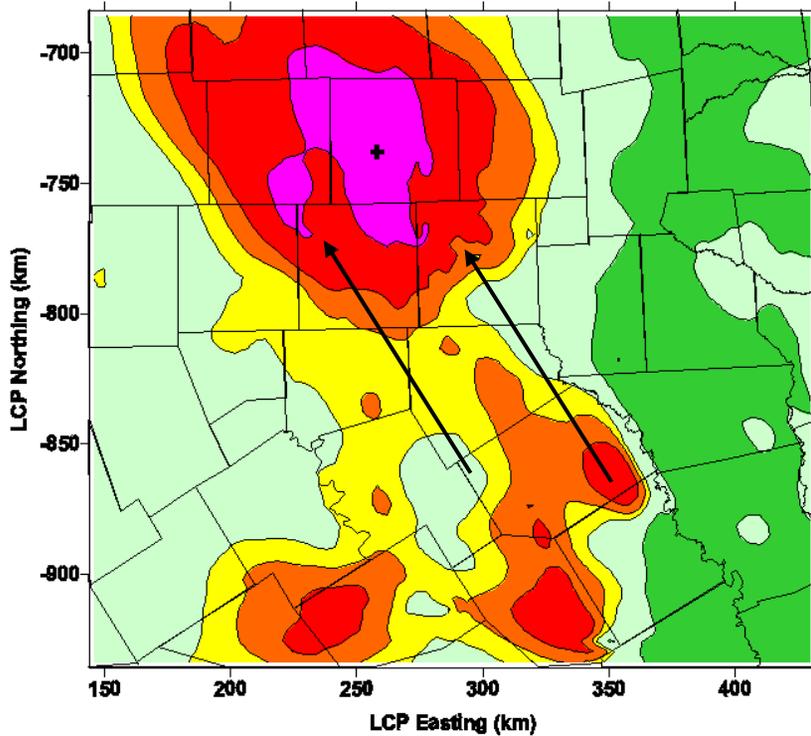


# Baseline vs Future Ozone

## Tuesday, August 17, 1999

### Baseline Run 44

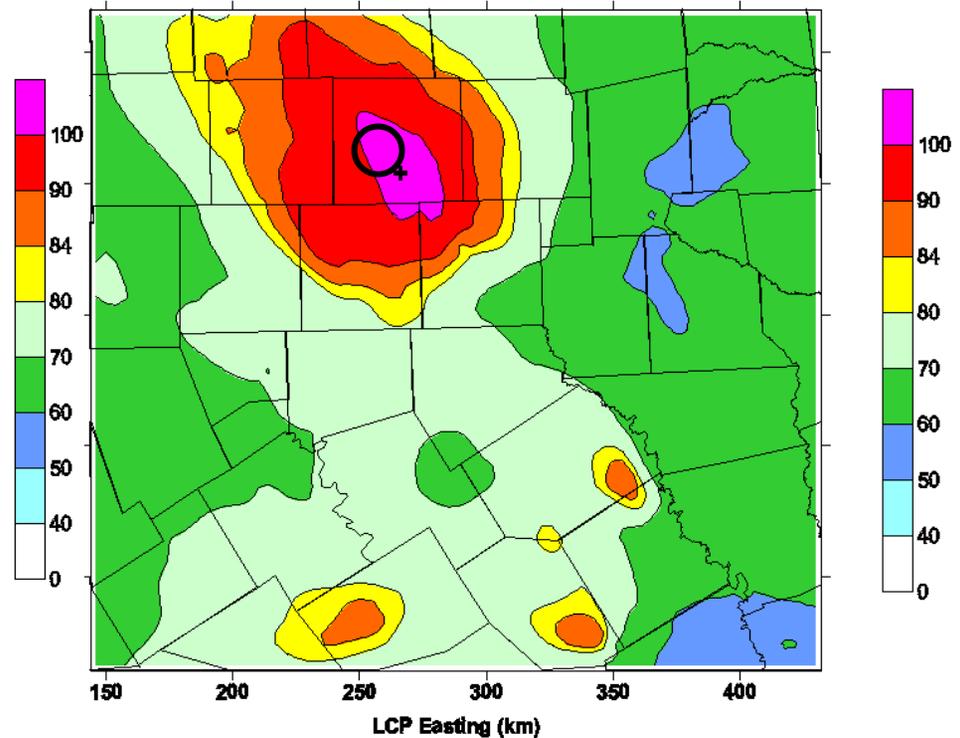
+ max = 108 PPB



Daily Max 8hr O3 (ppb)  
DFW Baseline Run 44. 04km.  
August 17, 1999

### Run 44.fy2009.ao

+ max = 107 PPB



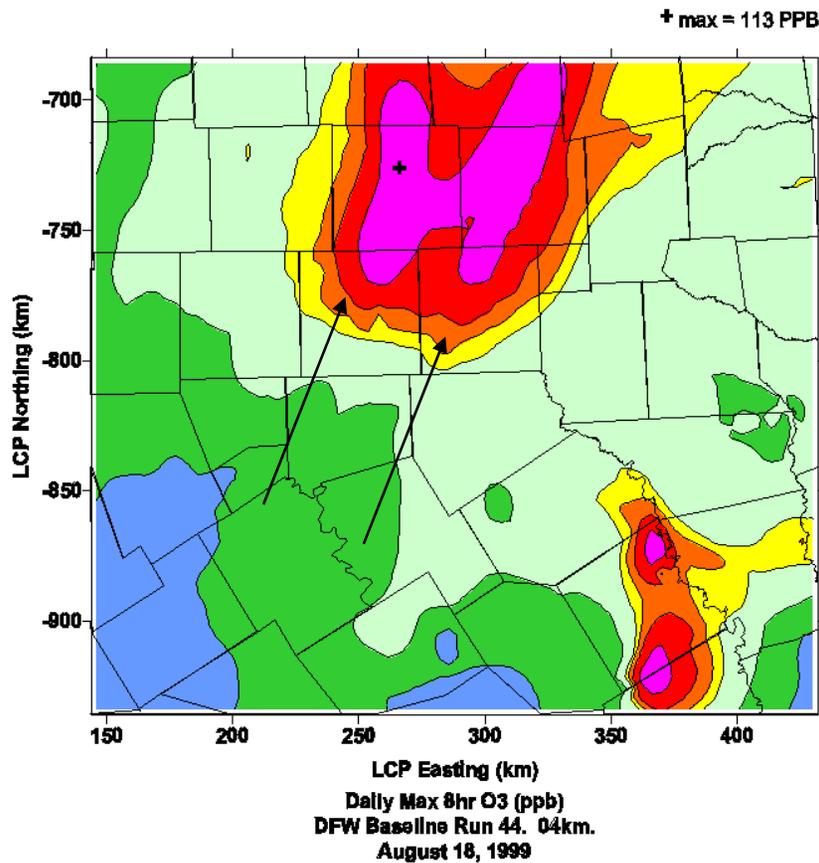
Daily Max 8hr O3 (ppb)  
DFW Baseline for FY2009. Run 44.fy2009.a0 04km  
August 17, 1999 for FY2009



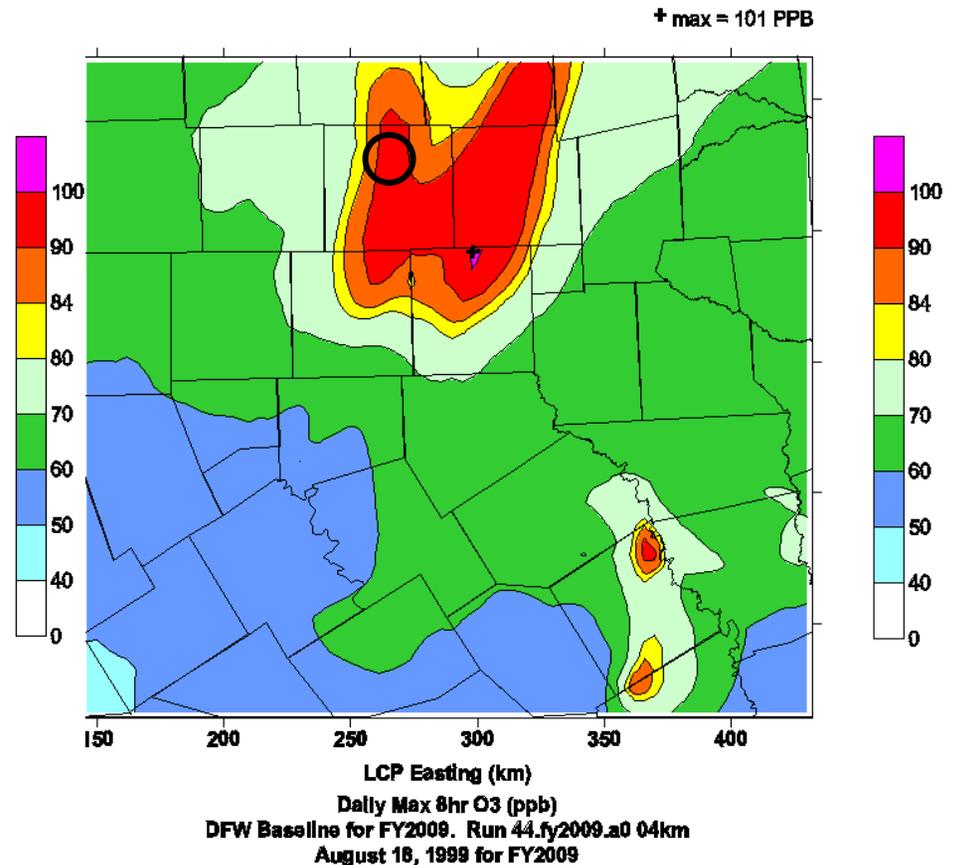
# Baseline vs Future Ozone

## Wednesday, August 18, 1999

### Baseline Run 44



### Run 44.fy2009.ao



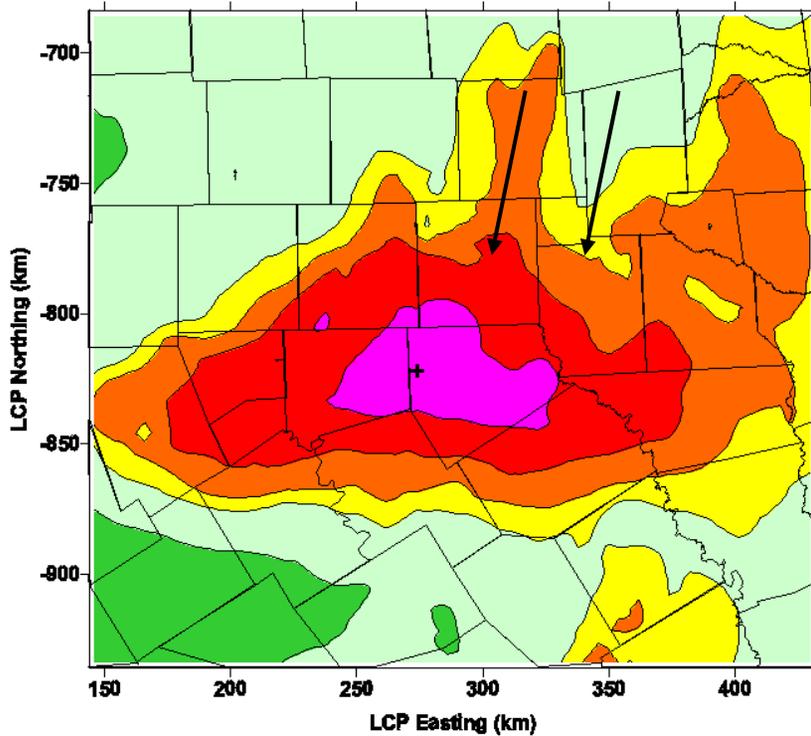


# Baseline vs Future Ozone

## Thursday, August 19, 1999

### Baseline Run 44

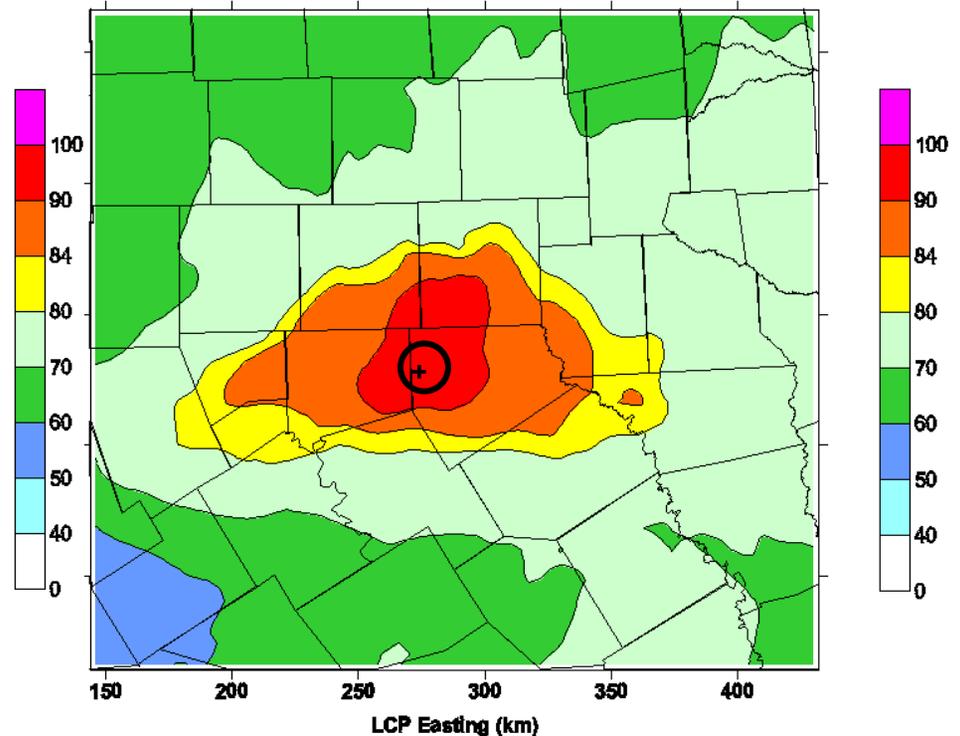
+ max = 112 PPB



Daily Max 8hr O3 (ppb)  
DFW Baseline Run 44. 04km.  
August 19, 1999

### Run 44.fy2009.ao

+ max = 99 PPB



Daily Max 8hr O3 (ppb)  
DFW Baseline for FY2009. Run 44.fy2009.ao 04km  
August 19, 1999 for FY2009

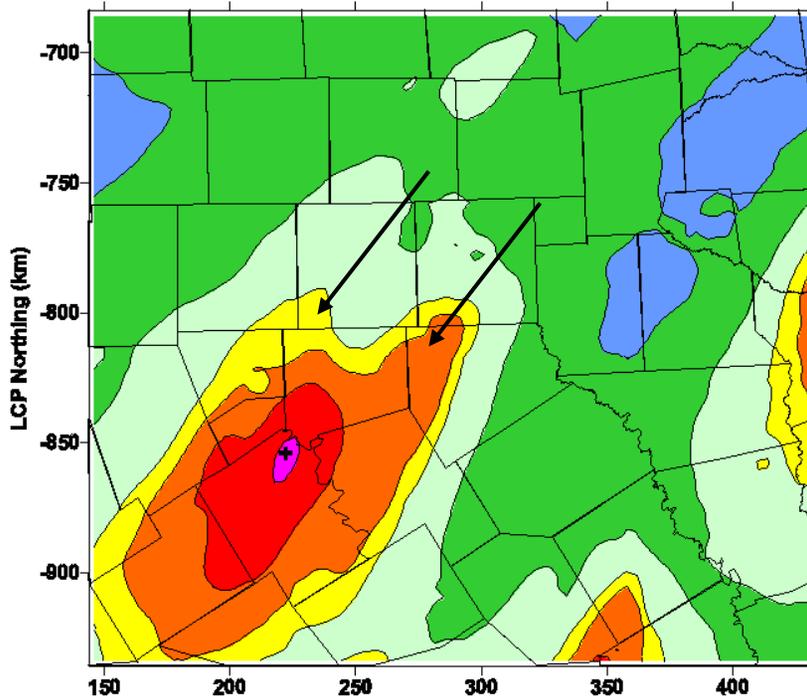


# Baseline vs Future Ozone

## Friday, August 20, 1999

### Baseline Run 44

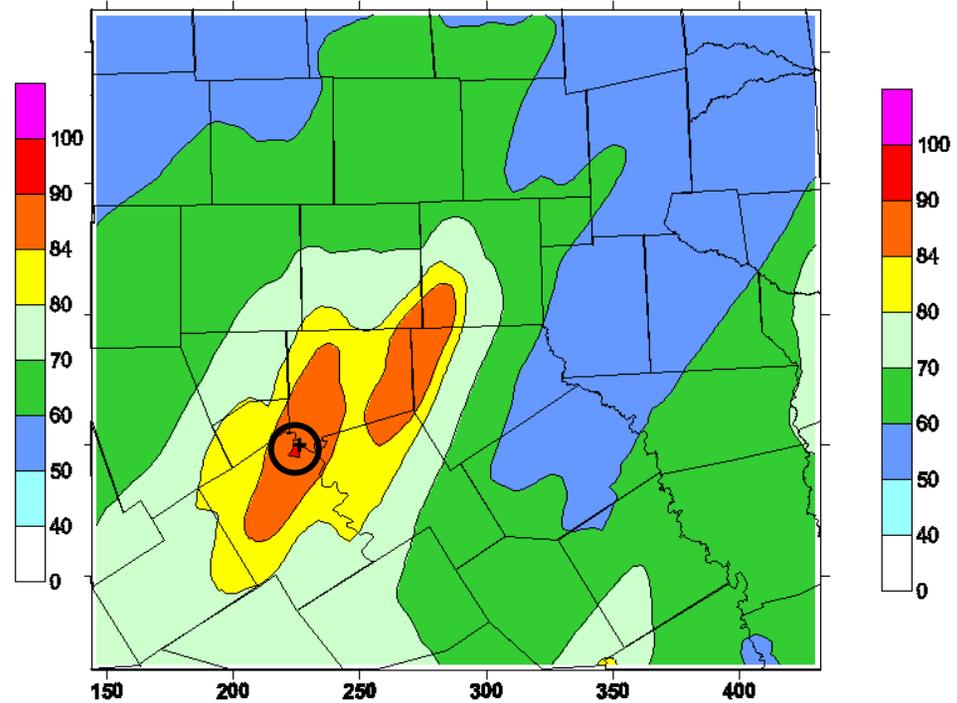
+ max = 101 PPB



LCP Easting (km)  
Daily Max 8hr O3 (ppb)  
DFW Baseline Run 44. 04km.  
August 20, 1999

### Run 44.fy2009.ao

+ max = 90 PPB



LCP Easting (km)  
Daily Max 8hr O3 (ppb)  
DFW Baseline for FY2009. Run 44.fy2009.ao 04km  
August 20, 1999 for FY2009



# Future Case Design Values

## New 2009 Results vs Old 2010 Runs

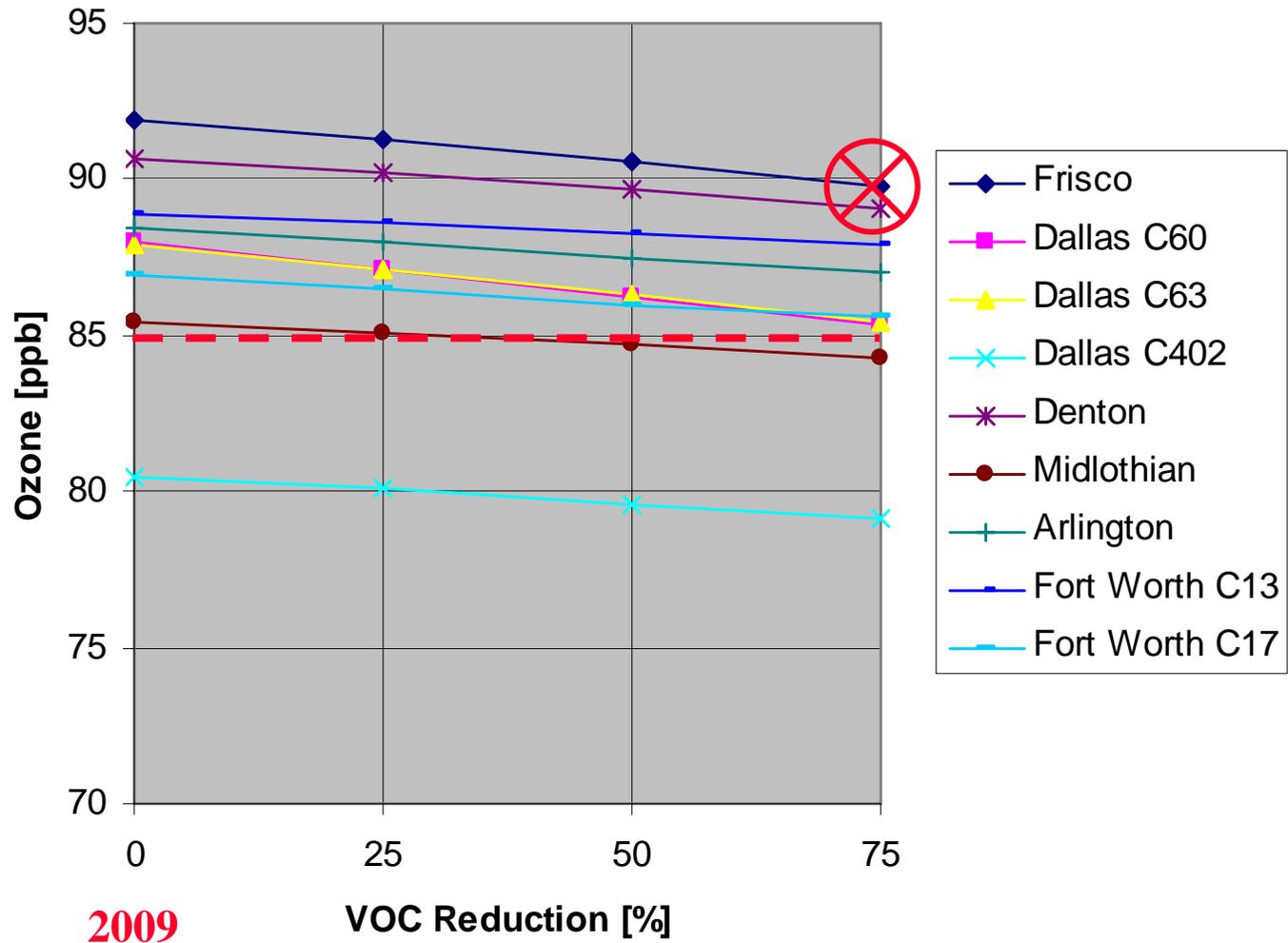
Monitor	FY 2010*1	FY2009*2	FY2009 – 2010
Frisco C31	90.8	91.9	+1.1
Dallas C60	88.2	88.0	-0.2
Dallas C63	87.6	87.9	+0.3
Dallas C402	80.9	80.5	-0.4
Denton C56	88.6	90.7	+2.1
Midlothian C94	84.5	85.4	+0.9
Arlington C57	87.6	88.4	+0.8
Fort Worth C13	87.5	88.9	+1.4
Fort Worth C17	85.3	86.9	+1.6

\*1 based on the run40 configuration

\*2 based on the run44 baseline configuration

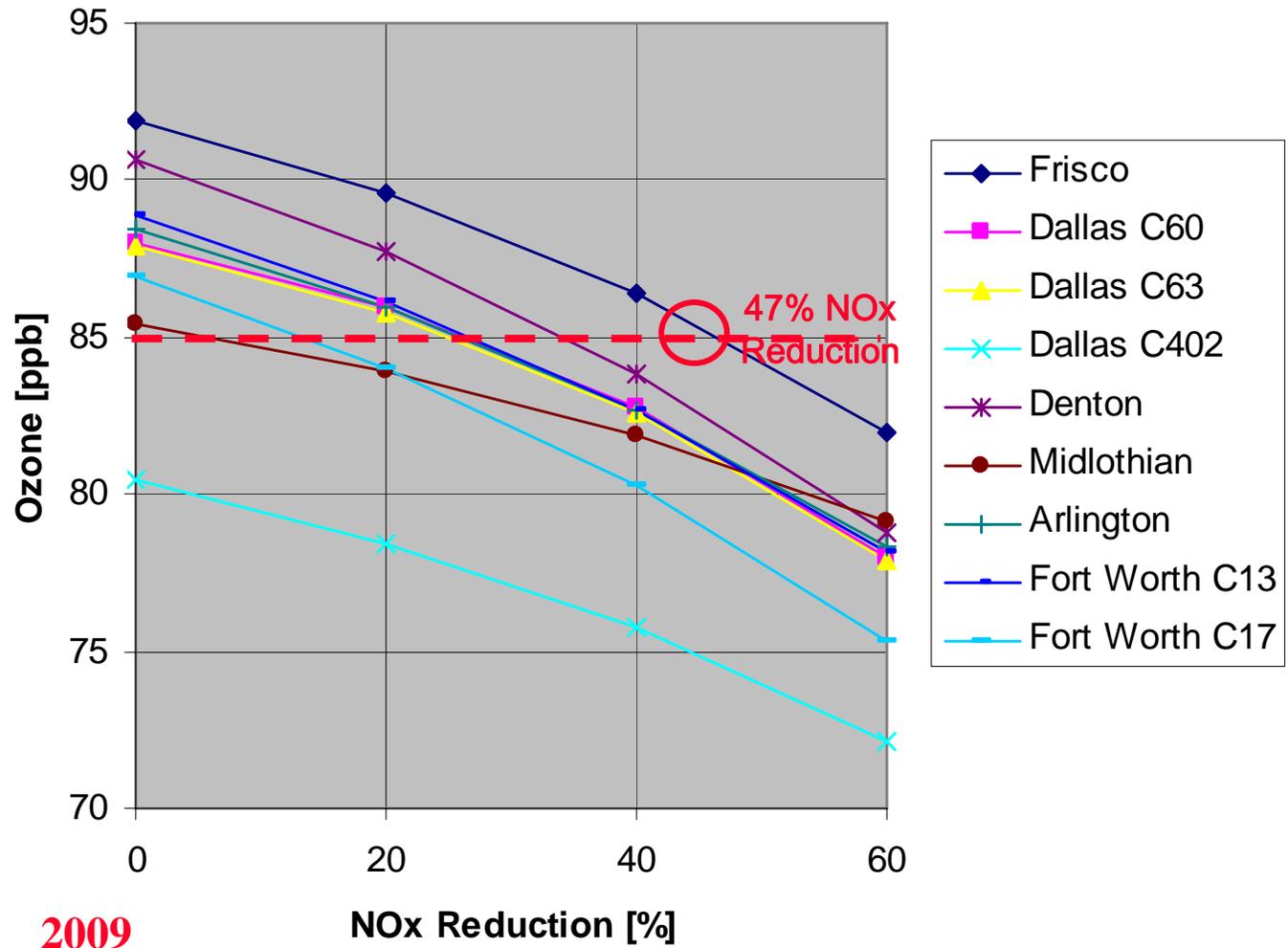


## DFW 2009 Design Value Scaled 8-Hour Ozone. VOC Reductions. Aug 13-22, 1999





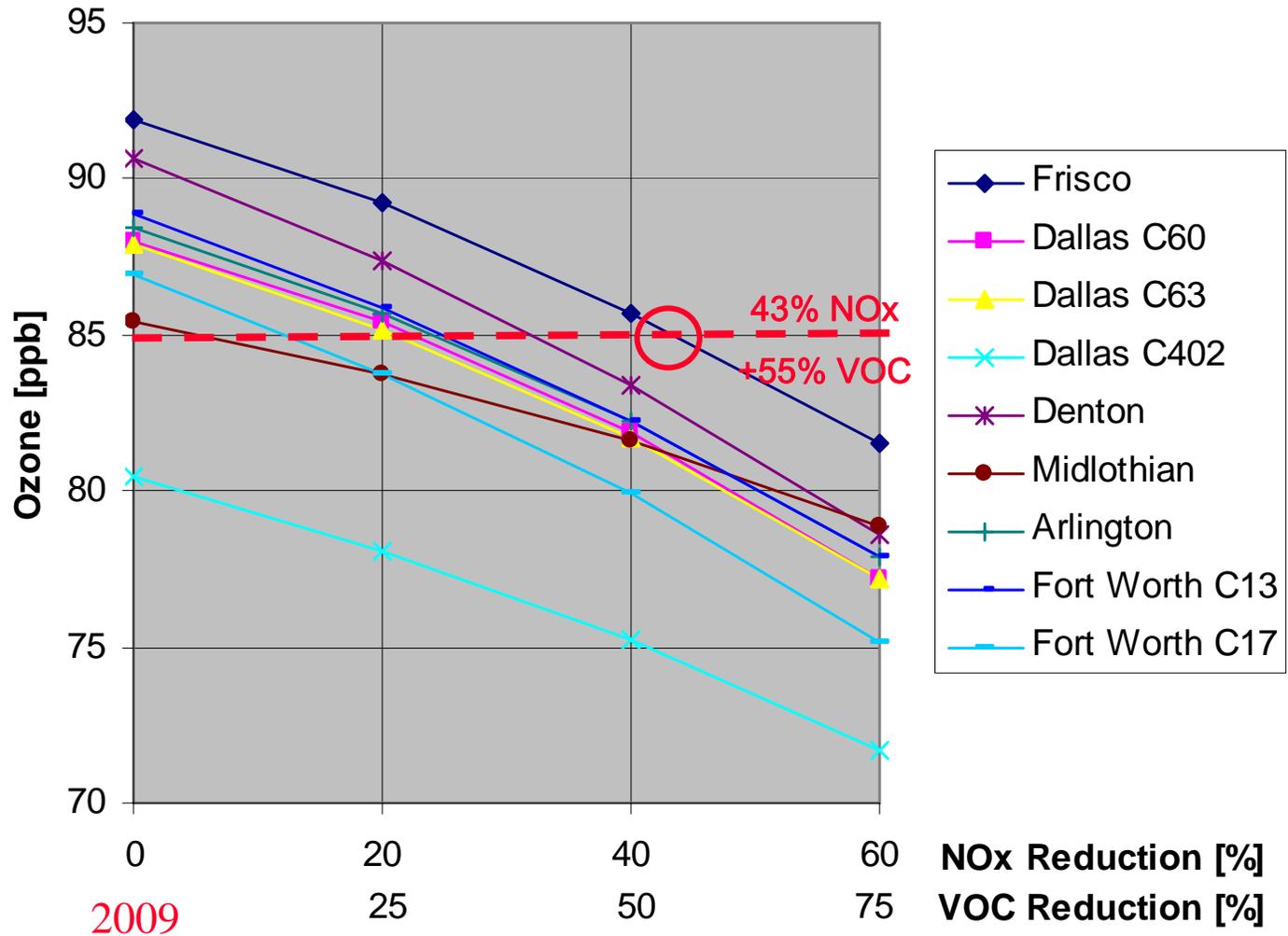
## DFW 2009 Design Value Scaled 8-Hour Ozone. NOx Reductions. Aug 13-22, 1999



2009



## DFW 2009 Design Value Scaled 8-Hour Ozone. NOx and VOC Reductions. Aug 13-22, 1999





# 2009 Response Curves

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- Not Much Has Changed from 2010 modeling
  - Frisco is still the highest monitor
  - The Future Design Value at Frisco is now 91.5 ppb
  - Denton Monitor is #2, has similar response curve
- NO<sub>x</sub> reductions are still more effective than VOCs
  - Combination of NO<sub>x</sub>+VOC slightly better
- Reductions Required to show attainment at Frisco
  - NO<sub>x</sub> Reductions Alone = 47%
  - Combination: NO<sub>x</sub>+VOC = 43% NO<sub>x</sub> + 55% VOC



# DFW Modeling

## How Much Will It Take to Bring Dallas into Attainment?

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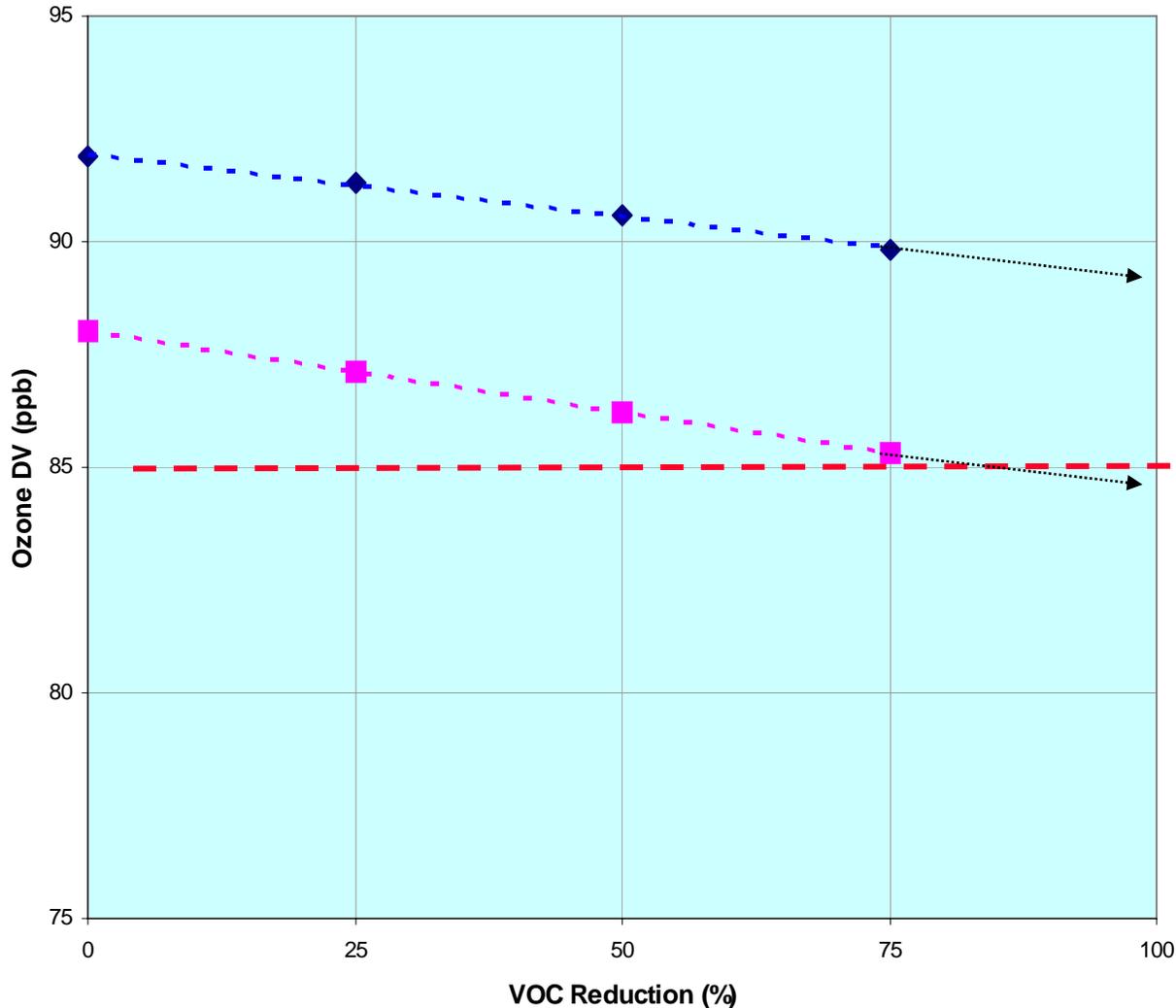
# How Much Reduction Do We Need?

Ozone Precursor	Reduction Required (%)	9-County Emissions Inventory	Reduction Required (Tons)
VOC	---	343 Tons	---
NO <sub>x</sub>	47%	423 Tons	198.8 Tons
NO <sub>x</sub> + VOC	43%	423 Tons	181.9 Tons
	55%	343 Tons	188.7 Tons

- More, if the reductions are taken outside the 9-county area



# Future Case VOC Response Curve 2009 Run44.fy2009.a0

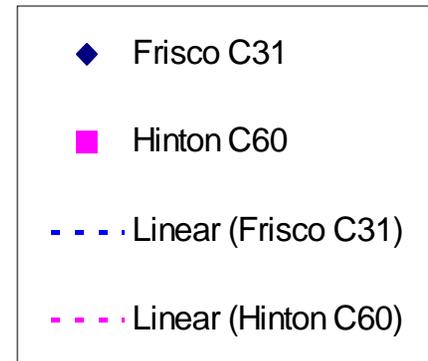


## Rural, Downwind Monitor

### Frisco VOC Equation

$$y = -0.028x + 91.95$$

$$R^2 = 0.9959$$



## Urban Core Monitor

### Hinton VOC Equation

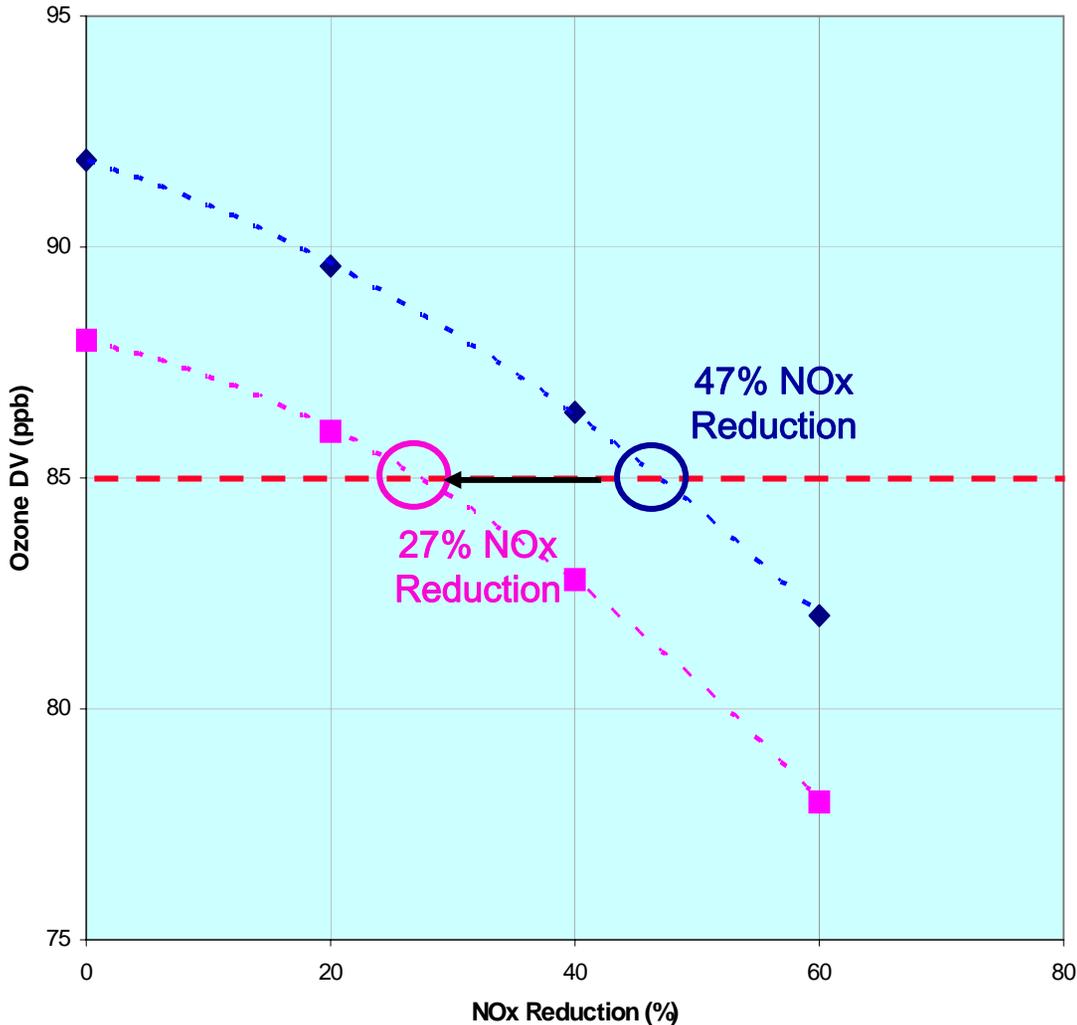
$$y = -0.036x + 88$$

$$R^2 = 1$$

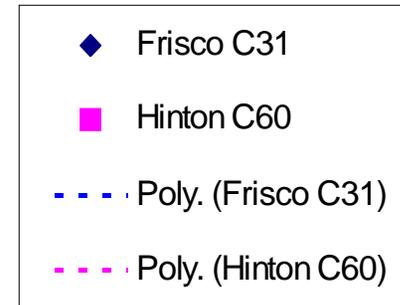


# Future Case NOx Response Curve

## 2009 Run44.fy2009.a0



**Rural, Downwind Monitor**  
**Frisco NOx Equation**  
 $y = -0.0013x^2 - 0.0858x + 91.885$   
 $R^2 = 0.9999$



**Urban Core Monitor**  
**Hinton NOx Equation**  
 $y = -0.0018x^2 - 0.061x + 87.98$   
 $R^2 = 0.9999$



# DFW Response Curve Math

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- The 2009 EI has 423 tons of NO<sub>x</sub> and 343 tons of VOC
- The NO<sub>x</sub> Equation is:  $y = -0.0013x^2 - 0.0858x + 91.885$ 
  - So a 10% NO<sub>x</sub> Reduction reduces ozone by .988 ppb
- The VOC Equation is:  $y = -0.028x + 91.95$ 
  - A 10% VOC reduction reduces ozone by .280 ppb
- Reducing Ozone by 1 ppb will take about:
  - 42.8 tons of NO<sub>x</sub> or
  - 122.5 tons of VOC
- So, On a ton for ton basis, NO<sub>x</sub> reductions are about three times as effective as VOC reductions

