2012 DFW Modeling Update

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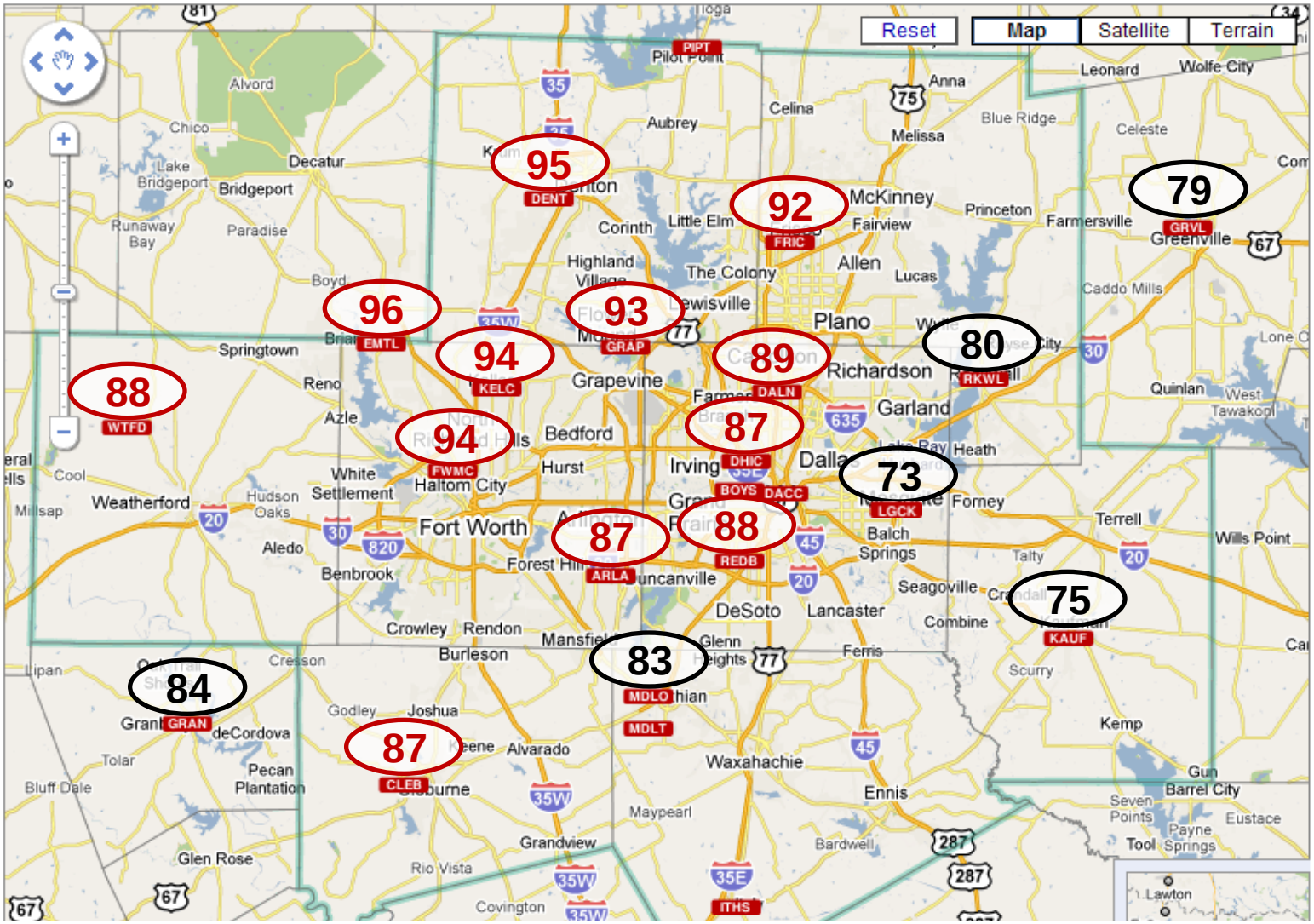
DFW Photochemical Modeling Technical Committee
October 1, 2010

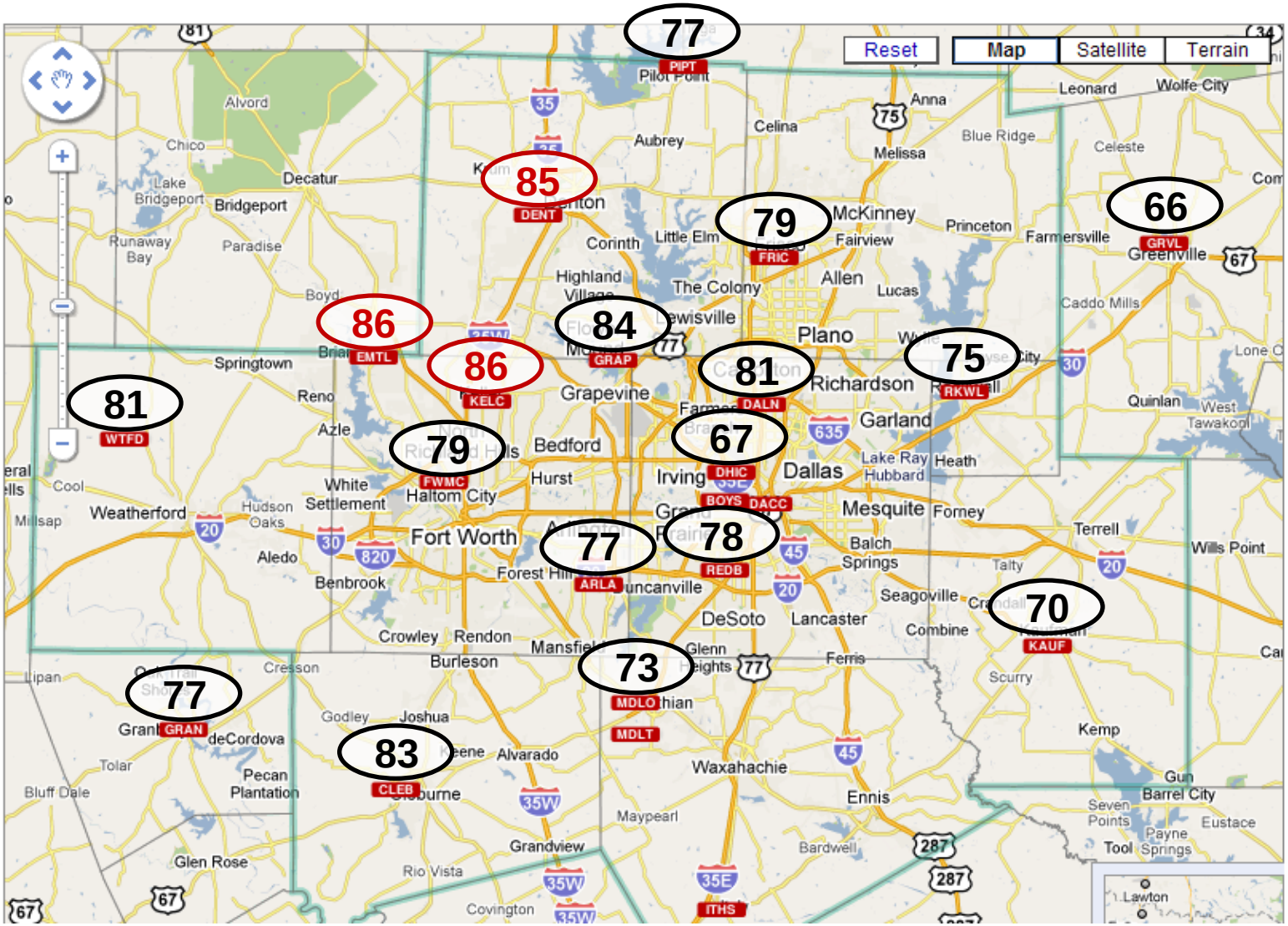
2006 Design Values

30 days ≥ 85 ppb



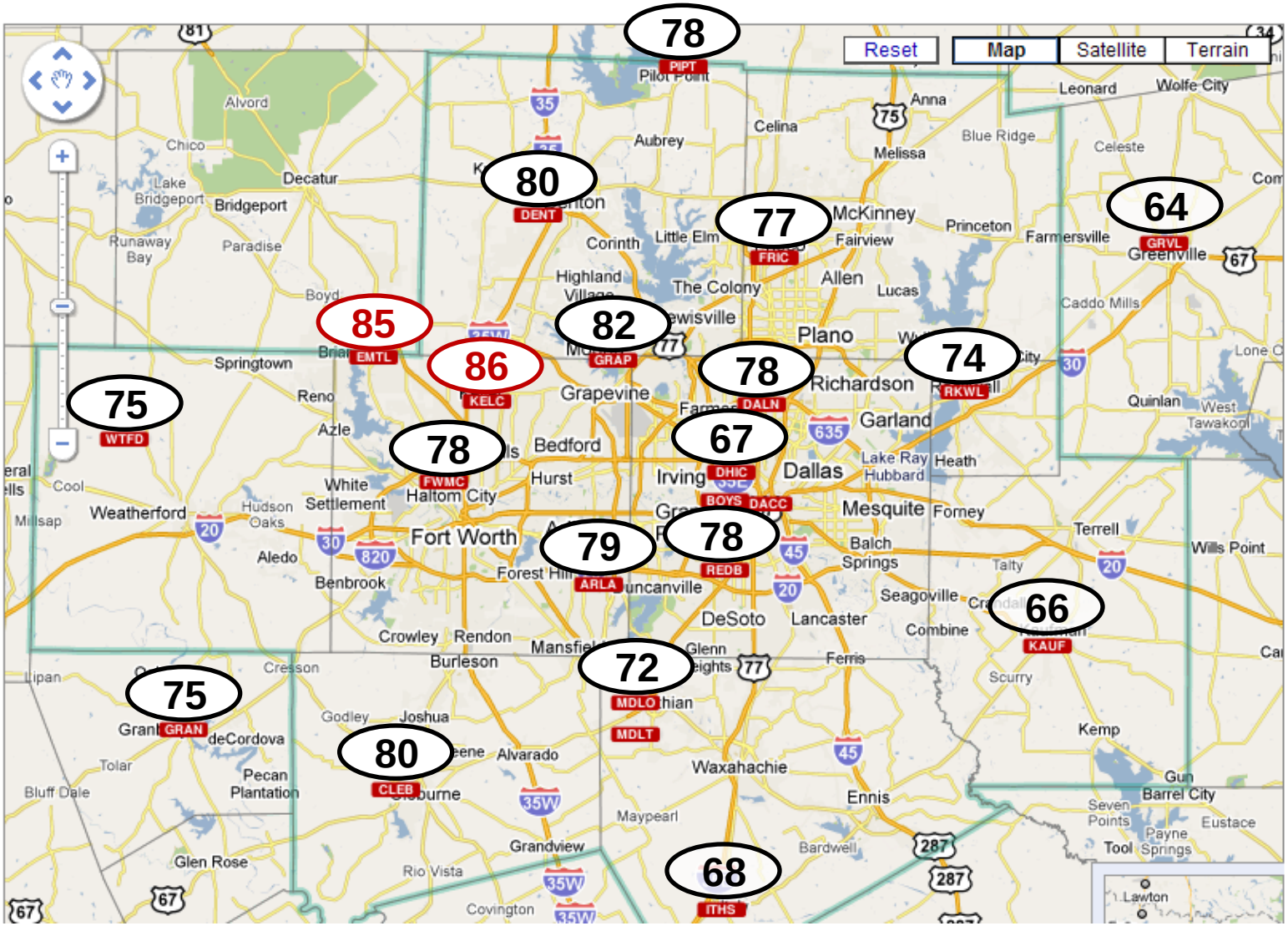
2009 Design Values

12 days ≥ 85 ppb



2010 Design Values*

8 days ≥ 85 ppb



*2010 Design values as of September 30, 2010 and are subject to change

2010 Fourth High Eight-Hour Ozone Concentrations

DFW Monitor	Current 2010 Design Value (ppb) +	Current 2010 4th High (ppb) +	2010 4th High to Exceed 84 ppb Standard (ppb)+
Keller C17	**86**	**85**	80
Eagle Mountain Lake C75	**85**	80	79
Grapevine Fairway C70/A301/X182	82	83	92
Denton Airport South C56/A163	80	74	89
Cleburne Airport C77/C682	80	78	92
Arlington Municipal Airport C61	79	79	97
Pilot Point C1032	78	78	97
Ft. Worth Northwest C13/AH302	78	80	99
Dallas North No.2 C63/C679	78	71	91
Dallas Executive Airport C402	78	78	99
Frisco C31/C680	77	74	97
Parker County C76	75	70	98
Granbury C73/C681	75	77	105
Rockwall Heath C69	74	73	104
Midlothian OFW C52/A137	72	72	111
Italy C1044/A323	68	63	113
Kaufman C71/A304/X071	66	63	118
Dallas Hinton St. C401/C60/AH161	67	75	129
Greenville C1006/A198	64	64	125

+ current as of 9/30/2010

Modeling in SIP Development
The Big Picture

Base Case	Day-specific emissions; replicate what actually happened
Baseline Case	Typical emissions; used in Relative Response Factor (RRF) to predict future design values
Future Base Case	Apply future growth + on-the-books controls to estimate future ozone
Control Strategy Testing	Determine control strategies that will effectively reduce ozone
SIP	Document modeling procedures

Example Eight-Hour Ozone Future Design Value Calculation

Baseline Design Value (ppb) * Relative Response Factor = Future Design Value (ppb)

OBSERVED

MODELED

Weighted Design Value Average

2004	2005	**2006**		
	2005	2006	**2007**	
		2006	2007	**2008**

Future Year Model Response / Baseline Model Response

4th Highs

					DV
87	103	98			96
	103	98	84		95
		98	84	85	89

Example RRF

2006 Baseline Design Value Example

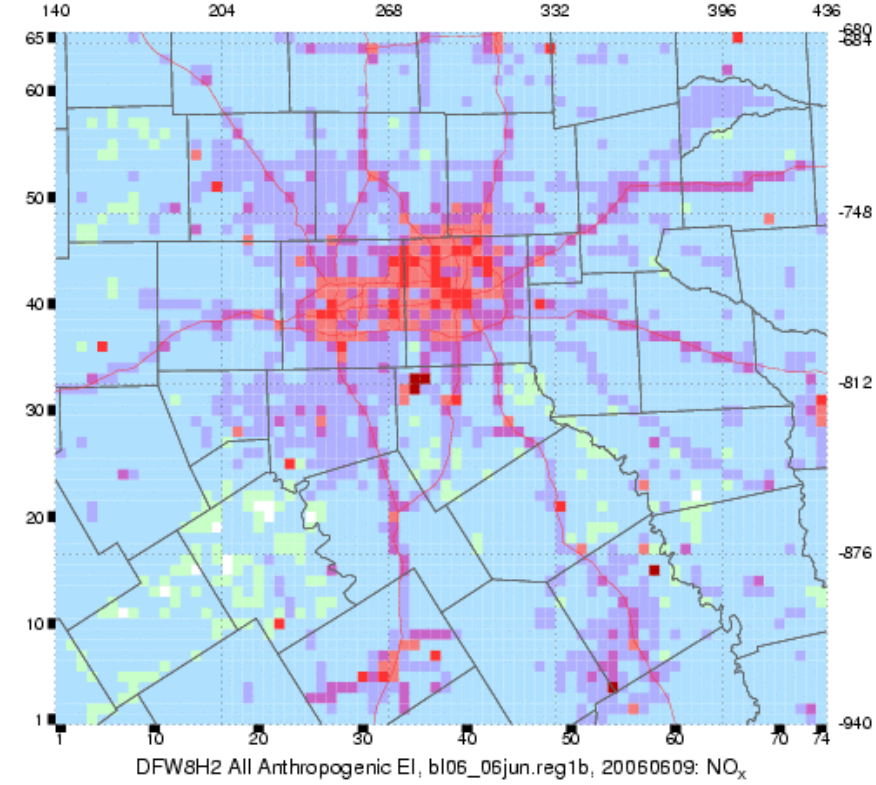
93.3 (DV_B) * 0.91 (RRF) = 84.~~9~~ (DV_F)

2006 Baseline

Category	2006 NOx Tons/day	%	2006 VOC Tons/day	%
On-road Mobile	234	52%	120	25%
Area w/o Oil/Gas	16	4%	210	44%
Elevated Points	45	10%	8	2%
Low-level Points	5	1%	28	6%
Non-Road	85	19%	63	13%
Off-Road	40	9%	6	1%
Oil & Gas Production	10	2%	40	8%
Oil & Gas Drilling	18	4%	1	0%
9-County Total	453		476	

Friday, June 9

2006 Anthropogenic NO_x



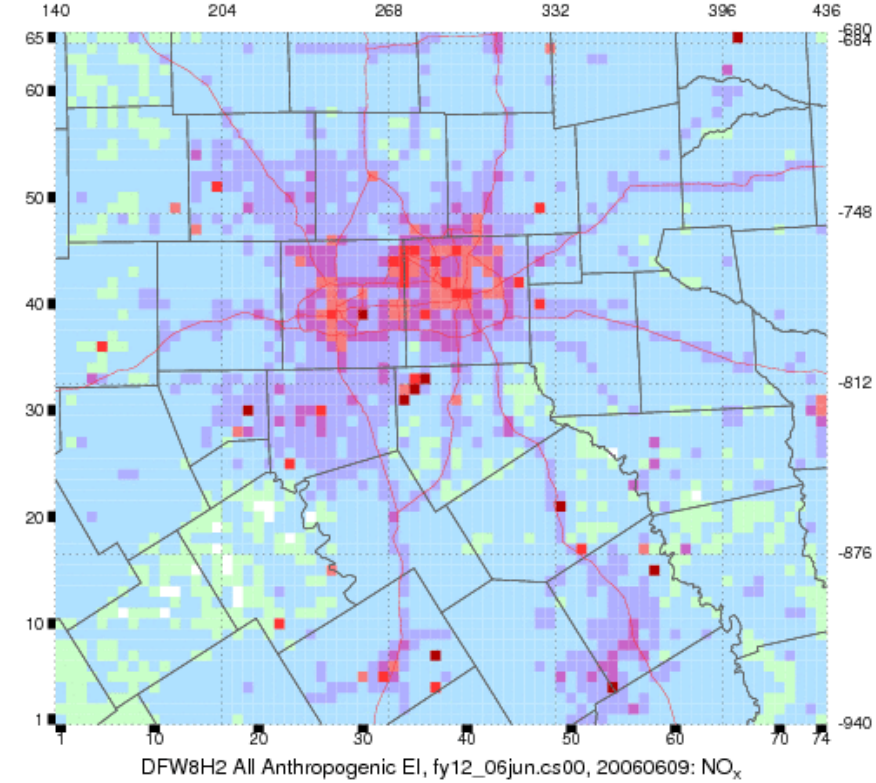
2012 Future Baseline

Category	2012 NO_X Tons/day	%	2012 VOC Tons/day	%
On-road Mobile	131	37%	93	20%
Area w/o Oil/Gas	18	5%	237	51%
Elevated Points	64	18%	7	2%
Low-level Points	1	0%	24	5%
Non-Road	66	18%	45	10%
Off-Road	37	11%	6	2%
Oil & Gas Production*	21	6%	48	10%
Oil & Gas Drilling*	20	6%	1	0%
9-County Total	358		461	

Friday, June 9

*** Texas Oil & Gas Production and Drilling are 2008 placeholder values.**

2012 Anthropogenic NO_X



Preliminary 2012 Modeling Inputs: Elevated Point Source NO_X Emissions

Midlothian Cement Kilns			
2006	2008	2012 Kiln Cap	2012 Modeled
22.0	18.4	17.6	**17.6**
Electric Generating Units			
2006	2008	2012 CAIR Cap	2012 Modeled
9.1	9.8	16.5	**30.2**

- Values shown are tpd
- 2006 and 2008 EGU emissions are the average monitored third quarter data from the Acid Rain Database
- 2008 point source emissions would generally be grown for future emissions but for cement kilns and EGUs, caps apply.

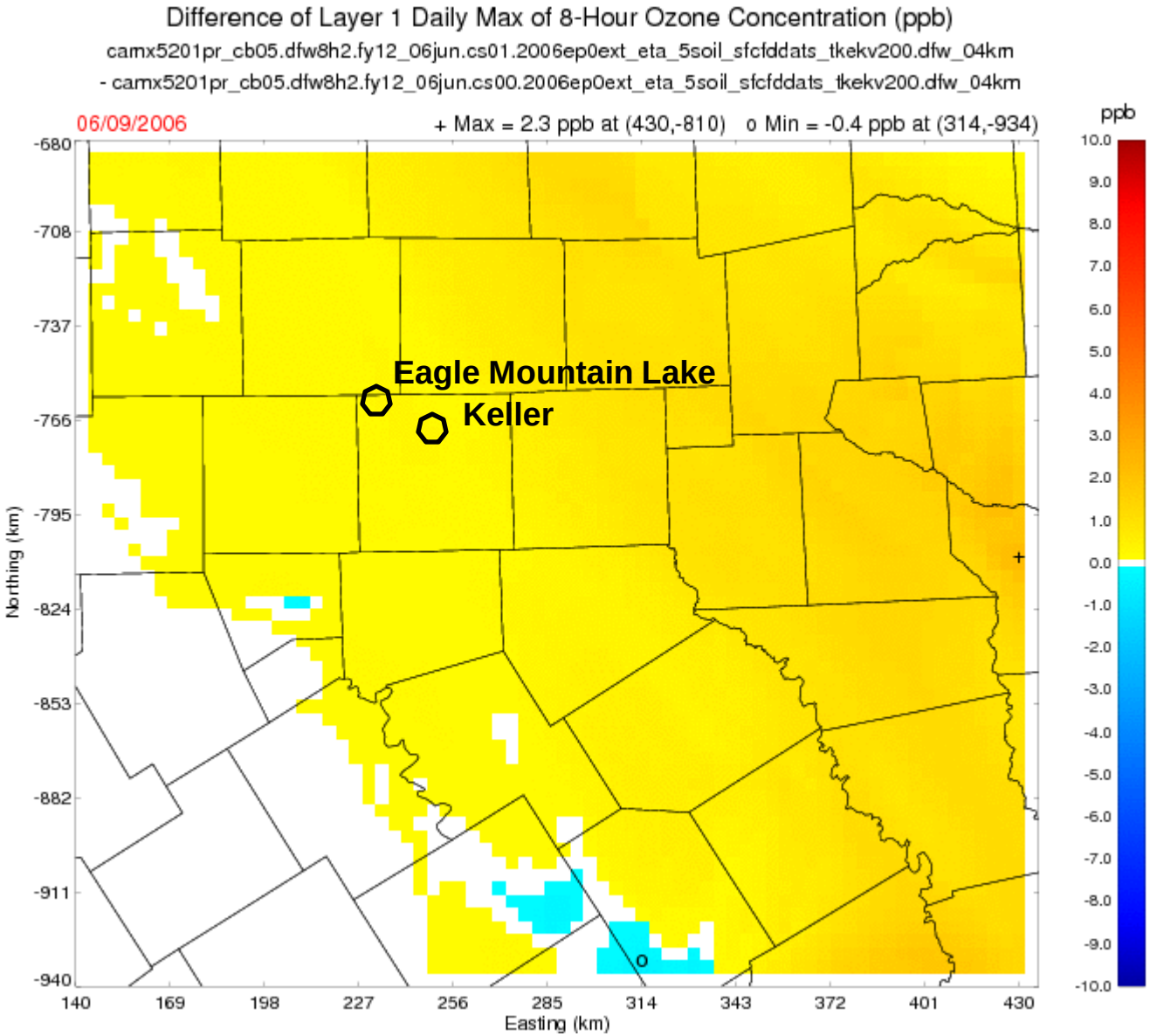
- 2012 Modeled EGUs includes the unit-specific seasonal factor, accounting for higher NO_X emissions due to demand during the ozone season, whereas CAIR is an annual cap
- The seasonal factor for DFW units results in higher emissions than the CAIR cap due to the use of peaking units during the summer

Preliminary 2012 Future Baseline Run Notes

- 2012 Haynesville Shale EI
  - From Environ's Northeast Texas Air Care (NETAC) work
  - Louisiana sources added
    - 48 tpd NO_X from Drilling Rigs
  - Texas sources already in inventory
- Texas Oil/Gas is a 2008 placeholder
  - Production/Drilling is from TexAER
  - Improved inventories are being developed based on latest oil/gas production
  - East Texas Combustion Rule compliance
- Airports and ships have been updated

2012 Haynesville Impact on DFW

- Difference between a 2012 run with and without Louisiana Haynesville drilling rigs
- The observed 0-2 ppb increase is similar to Environ's 2005 modeling for NETAC



Preliminary 2012 Future Design Values (in ppb)

Monitor	2006 Baseline Design Value	RRF	2012 Future Design Value
Denton	93.33	0.83	77
Eagle Mountain Lake	93.33	0.86	**80**
Keller	91.00	0.85	77
Grapevine Fairway	90.67	0.85	76
Fort Worth Northwest	89.33	0.85	75
Frisco	87.67	0.85	74
Parker County	87.67	0.85	74
Dallas North	85.00	0.83	70
Dallas Exec Airport	85.00	0.83	70
Cleburne	85.00	0.83	70
Arlington	83.33	0.85	70
Dallas Hinton	81.67	0.83	67
Pilot Point	81.00	0.83	67
Midlothian Tower	80.50	0.83	67
Rockwall Heath	77.67	0.82	63
Midlothian OFW	75.00	0.83	62
Kaufman	74.67	0.83	61
Granbury	83.00	0.87	72
Greenville	75.00	0.81	60

FY2012 cs01

Remember notes from previous slides…

DFW Area Design Value Comparisons

DFW Monitor	2006 Design Value (ppb)	Current 2010 Design Value (ppb)+	Current 2010 4th High (ppb) +	2012 Future Design Value (ppb)*
Keller C17	**94**	**86**	**85**	77
Eagle Mountain Lake C75	**96**	**85**	80	80
Grapevine Fairway C70/A301/X182	**93**	82	83	76
Denton Airport South C56/A163	**95**	80	74	77
Cleburne Airport C77/C682	**87**	80	78	70
Arlington Municipal Airport C61	**87**	79	79	70
Pilot Point C1032	-	78	78	67
Ft. Worth Northwest C13/AH302	**94**	78	80	75
Dallas North No.2 C63/C679	**89**	78	71	70
Dallas Executive Airport C402	**88**	78	78	70
Frisco C31/C680	**92**	77	74	74
Parker County C76	**88**	75	70	74
Granbury C73/C681	84	75	77	72
Rockwall Heath C69	80	74	73	63
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Italy C1044/A323	-	68	63	-
Kaufman C71/A304/X071	75	66	63	61
Dallas Hinton St. C401/C60/AH161	**87**	67	75	67
Greenville C1006/A198	79	64	64	60

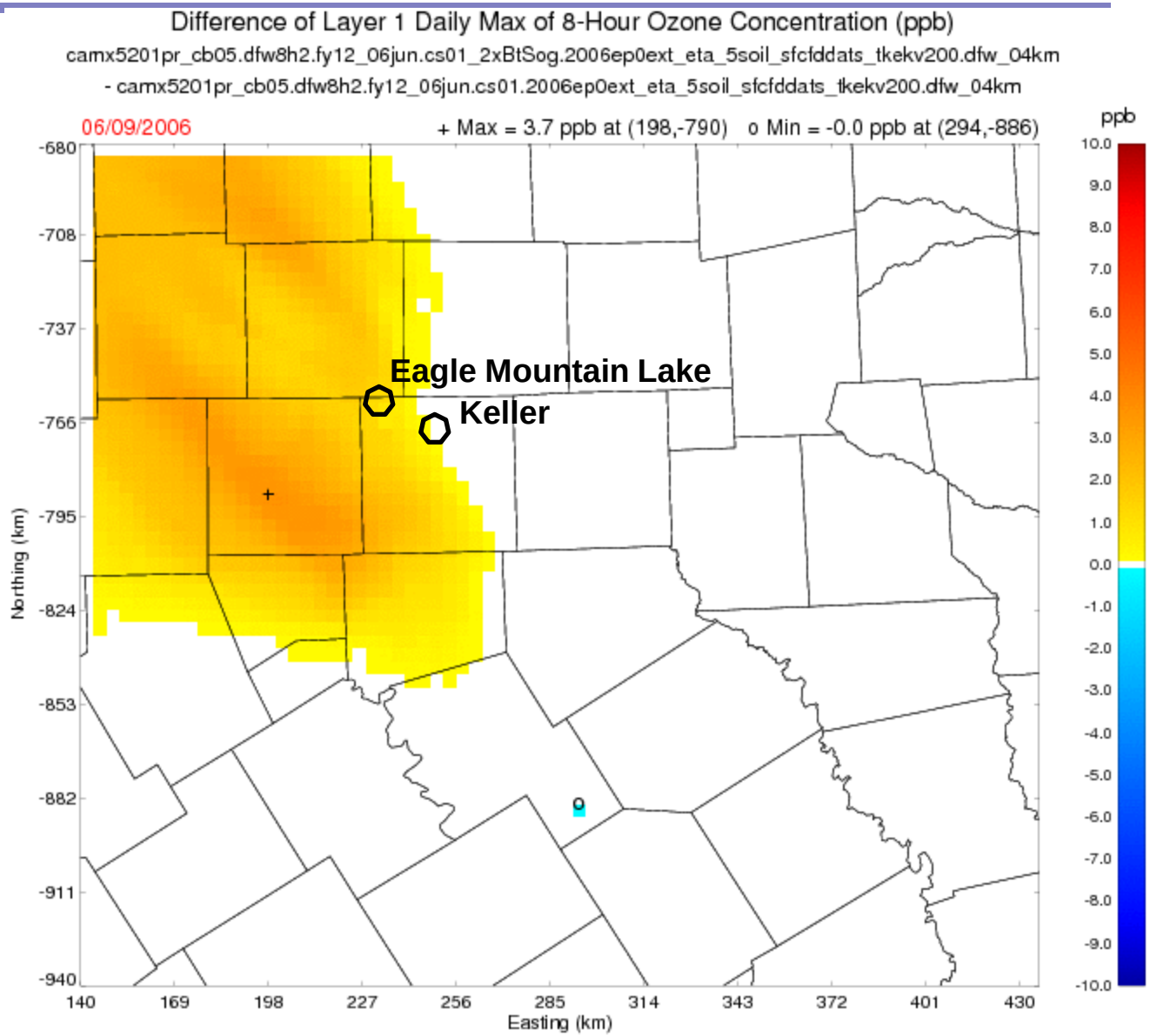
+ current as of 9/30/2010

* 2012 Future Design Values are preliminary and expected to change

FY2012 cs01

2012 Barnett Shale Sensitivities

- Doubled Barnett Shale emissions (+42 tpd NO_X in 9-county area)
- Drill Rigs and Production included
- Increases in ozone observed on western side of domain on most high ozone days



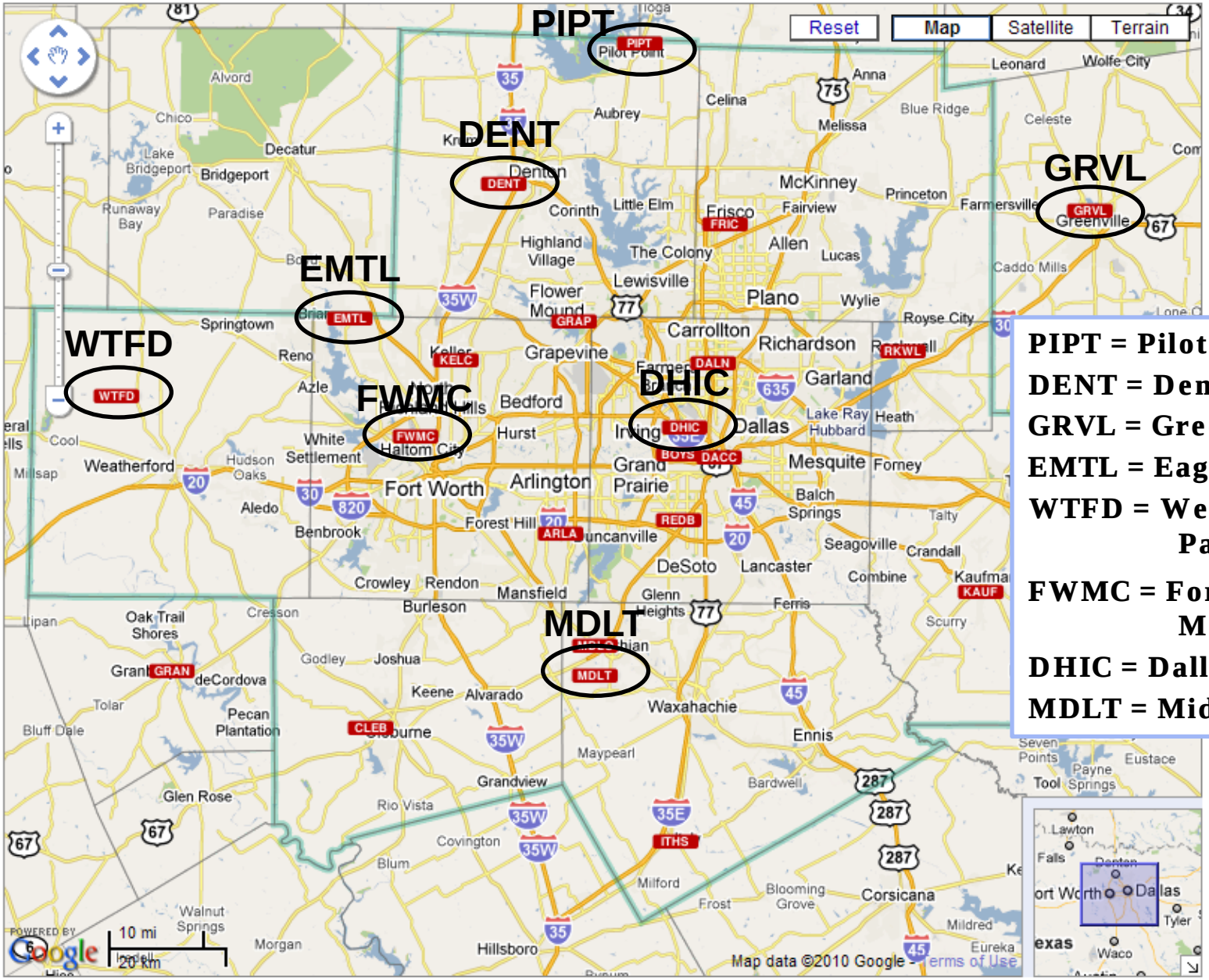
2012 Barnett Shale Sensitivities

Monitor	2012 Future Design Value (cs01)	2012 2x Barnett Shale	± ppb
Denton	77.1	77.5	0.4
Eagle Mountain Lake	80.0	81.7	1.7
Keller	77.1	77.7	0.7
Grapevine Fairway	76.7	76.9	0.2
Fort Worth Northwest	75.9	76.8	0.9
Frisco	74.1	74.2	0.2
Parker County	74.6	76.8	2.2
Dallas North	70.8	70.9	0.1
Dallas Exec Airport	70.9	71.0	0.1
Cleburne	70.9	71.6	0.7
Arlington	70.6	70.9	0.3
Dallas Hinton	67.6	67.7	0.0
Pilot Point	67.4	67.6	0.2
Midlothian Tower	67.0	67.2	0.2
Rockwall Heath	63.7	63.7	0.0
Midlothian OFW	62.5	62.7	0.2
Kaufman	61.6	61.6	0.0
Granbury	72.1	73.6	1.5
Greenville	60.4	60.4	0.0

Anthropogenic Precursor Culpability Assessment (APCA)

- APCA keeps track of the origin of the NO_X and VOC precursors creating the ozone
- Ozone can then be "apportioned" to specific anthropogenic sources
- Source groups and source regions are defined
  - DFW, non-DFW, non-Texas
- Emission source groups include, for example:
  - Initial and boundary conditions
  - On-road mobile and non-/off-road mobile
  - Area
  - Barnett Shale
  - Elevated Points

APCA Receptors



PIPT = Pilot Point

DENT = Denton Airport

GRVL = Greenville

EMTL = Eagle Mtn. Lake

WTFD = Weatherford Parker County

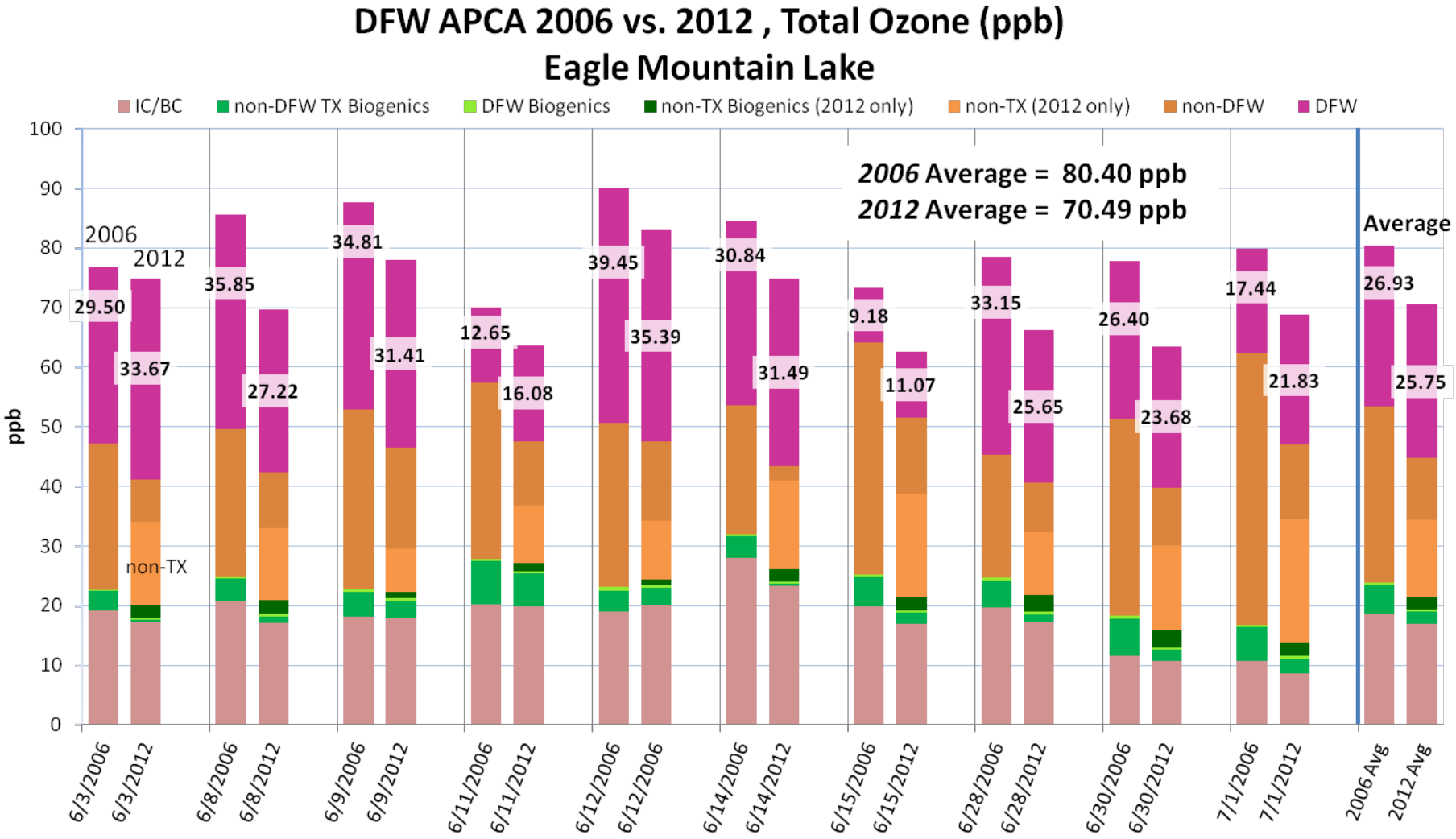
FWMC = Fort Worth NW Meacham Field

DHIC = Dallas Hinton

MDLT = Midlothian Tower

2006 vs. 2012 APCA Results

*** 2012 results have 2x Barnett Shale emissions**



2006 vs. 2012 APCA Results

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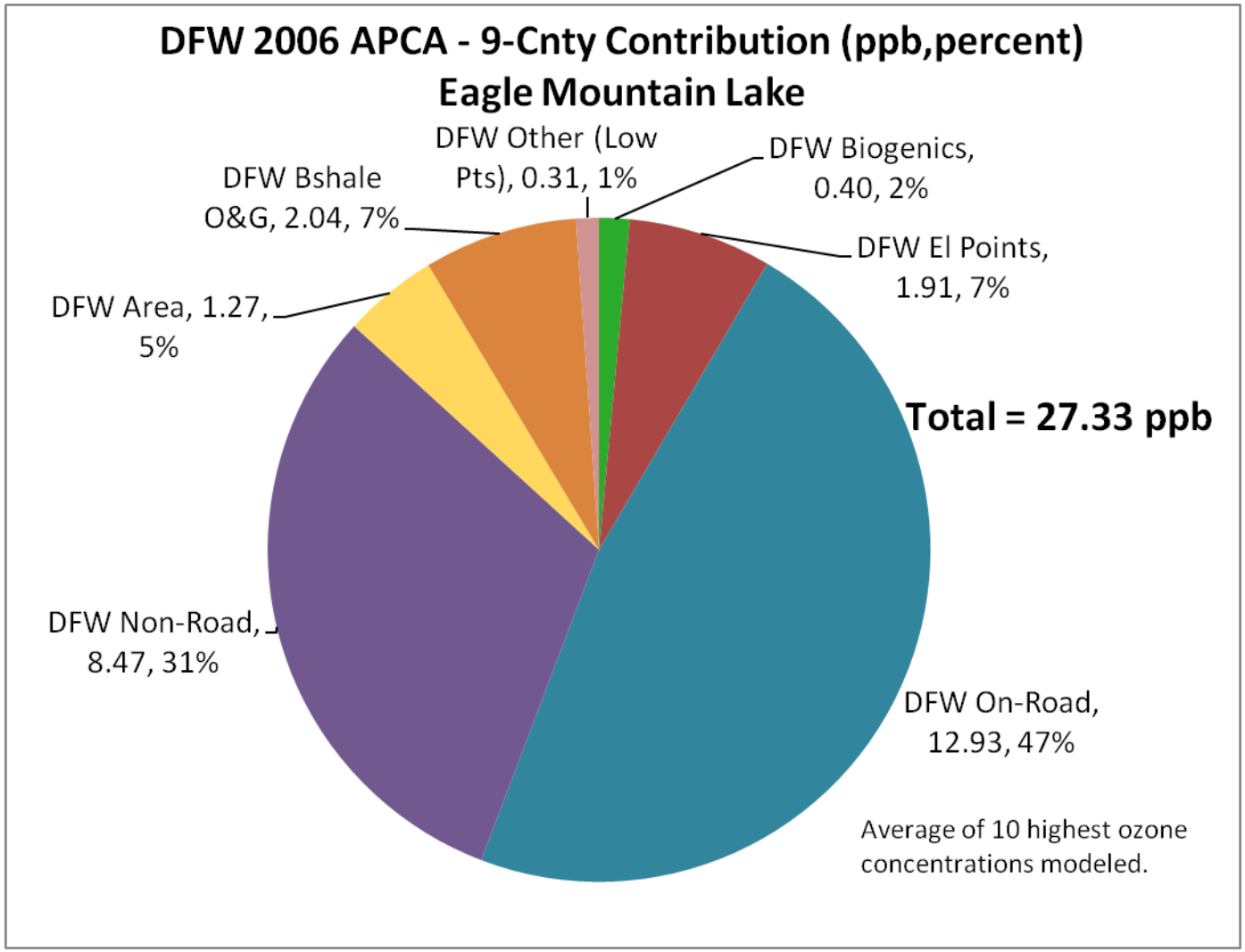

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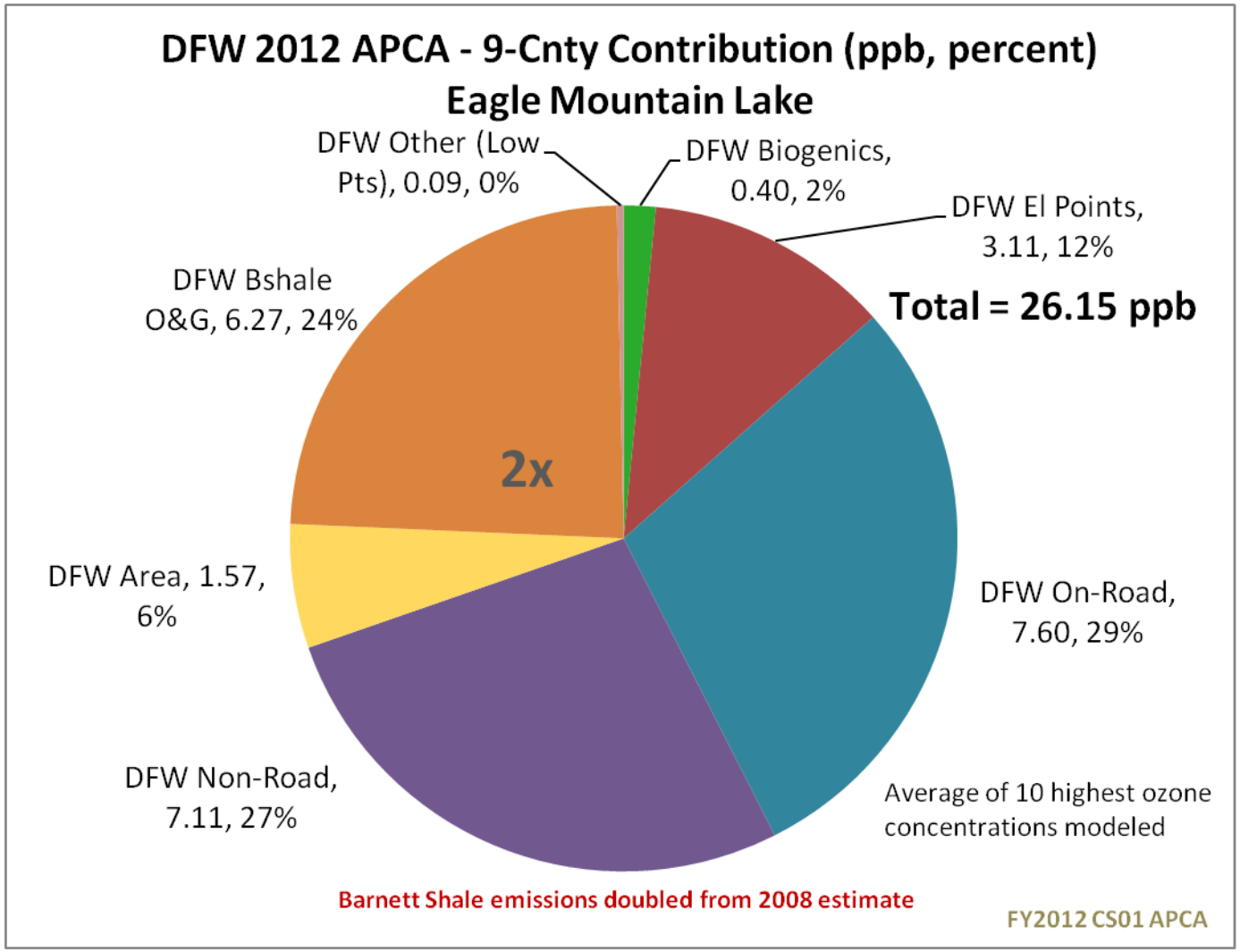

Next Modeling Steps

- Update Texas Oil and Gas 2006/2012 inventories
  - Update Barnett Shale emissions
  - Incorporate all of East Texas Combustion Rule
  - Geographic surrogates
- Additional tests of model response
  - 1999 Retrospective Analysis
  - Weekend/Weekday Effect

Questions?

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The Air Modeling & Data Analysis Section contributed to these results.

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air modeling data analysis