TEXAS
Area Designations for the 2008 Ozone National Ambient Air Quality Standards

The table below identifies the areas and associated counties or parts of counties in Texas that EPA intends to designate as nonattainment for the 2008 ozone national ambient air quality standards (2008 NAAQS). In accordance with section 107(d) of the Clean Air Act, EPA must designate an area "nonattainment" if it is violating the 2008 ozone NAAQS or if it is contributing to a violation of the 2008 ozone NAAQS in a nearby area. The technical analyses supporting the boundaries for the individual nonattainment areas are provided below.

Intended Nonattainment Areas in Texas

Area	Texas' Recommended Nonattainment Counties	EPA's Intended Nonattainment Counties
Dallas-Fort Worth, TX	Collin Dallas Denton Ellis Johnson Kaufman Parker Rockwall Tarrant	Collin Dallas Denton Ellis Hood Johnson Kaufman Parker Rockwall Tarrant Wise
Houston-Galveston-Brazoria, TX	Brazoria Chambers Fort Bend Galveston Harris Liberty Montgomery Waller	Brazoria Chambers Fort Bend Galveston Harris Liberty Matagorda Montgomery Waller

EPA intends to designate the remaining counties in Texas that are not listed in the table above as "unclassifiable/attainment" for the 2008 ozone NAAQS.

The analysis below provides the basis for intended nonattainment area boundaries. It relies on our analysis of whether and which monitors are violating the 2008 ozone NAAQS, based on certified air quality monitoring data from 2008-2010 and an evaluation of whether nearby areas are contributing to such violations. EPA has evaluated contributions from nearby areas based on a weight of evidence analysis considering the factors identified below. EPA issued guidance on December 4, 2008 that

identified these factors as ones EPA would consider in determining nonattainment area boundaries and recommended that states consider these factors in making their designations recommendations to EPA.[1]

1. Air quality data (including the design value calculated for each Federal Reference Method (FRM) or Federal Equivalent Method (FEM)[2] monitor in the area);
2. Emissions and emissions-related data (including location of sources and population, amount of emissions and emissions controls, and urban growth patterns);
3. Meteorology (weather/transport patterns);
4. Geography and topography (mountain ranges or other basin boundaries);
5. Jurisdictional boundaries (e.g., counties, air districts, existing nonattainment areas, Indian country, metropolitan planning organizations (MPOs))

Ground-level ozone generally is not emitted directly into the air, but is created by chemical reactions between oxides of nitrogen (NOx) and volatile organic compounds (VOC) in the presence of sunlight. Because NOx and VOC emissions from a broad range of sources over a wide area typically contribute to violations of the ozone standards, EPA believes it is important to consider whether there are contributing emissions from a broad geographic area. Accordingly, EPA chose to examine the 5 factors with respect to the larger of the Combined Statistical Area (CSA) or Core Based Statistical Area (CBSA) associated with the violating monitor(s).[3] All data and information used by EPA in this evaluation are the latest available to EPA and/or provided to EPA by states or tribes.

In EPA's designations guidance for the 2008 ozone NAAQS EPA recommended examining CSA/CBSAs because certain factors used to establish CSAs and CBSAs are similar to the factors EPA is using in this technical analysis to determine if a nearby area is contributing to a violation of the 2008 ozone NAAQS. Congress required a similar approach in 1990 for areas classified as serious or above for the 1-hour ozone standard and EPA used the same basic approach in the designation process for the 1997 ozone NAAQS. Where a violating monitor is not located in a CSA or CBSA, EPA's guidance recommended using the boundary of the county containing the violating monitor as the starting point for considering the nonattainment area's boundary.

Technical Analysis for Dallas-Fort Worth

Figure 1 is a map of the Dallas-Fort Worth intended nonattainment area. The map provides other relevant information including the locations and design values of air quality monitors, county and other jurisdictional boundaries, relevant statistical area boundaries, the nonattainment area boundary for 1997 ozone NAAQS, and major transportation arteries.

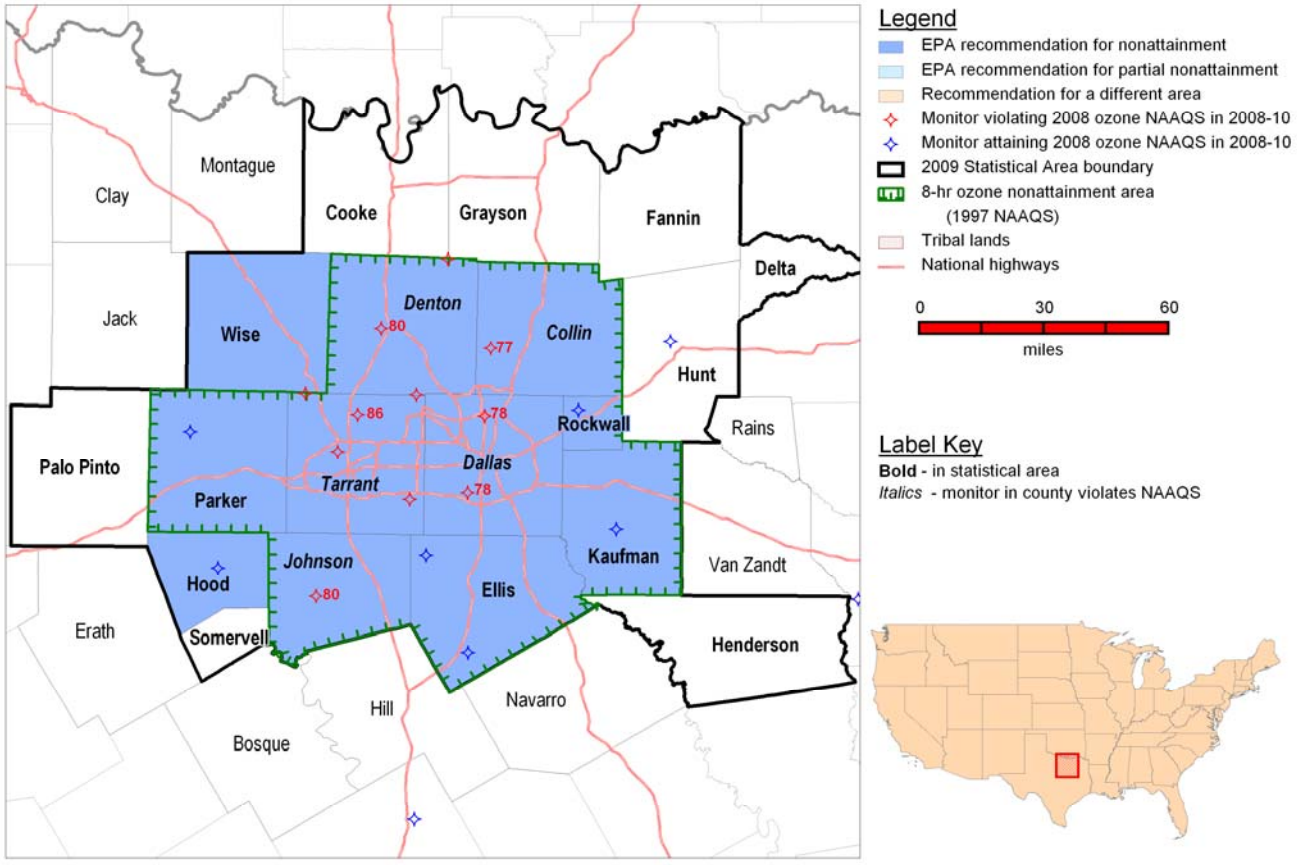
Figure 1. Dallas-Fort Worth Intended Nonattainment Area

[1] The December 4, 2008 guidance memorandum "Area Designations for the 2008 Revised Ozone National Ambient Air Quality Standards" refers to 9 factors. In this technical support document we have grouped the emissions-related factors together under the heading of "Emissions and Emissions-Related Data," which results in 5 categories of factors.

[2] FRM monitors utilize a chemi-luminescent technique to measure ozone, while many FEM monitors use a technique involving ultraviolet photometry. FEM methods began to be developed in the late 1970's/early1980's and are now the most widely utilized methods for monitoring ozone levels. Refer to 40 CFR Part 53 for a more detailed description of FEM and FRM methods. http://www.epa.gov/ttnamti1/files/ambient/criteria/reference-equivalent-methods-list.pdf

[3] Lists of CBSAs and CSAs and their geographic components are provided at www.census.gov/population/www/metroareas/metrodef.html. The lists are periodically updated by the Office of Management and Budget. EPA used the most recent update, based on 2008 population estimates, issued on December 1, 2009 (OMB Bulletin No. 10-02).

Dallas-Fort Worth, TX



For purposes of the 1997 8-hour ozone NAAQS, portions of this area were designated nonattainment. The boundary for the nonattainment area for the 1997 ozone NAAQS included the entire counties of Collin, Dallas, Denton, Ellis, Johnson, Kaufman, Parker, Rockwell, and Tarrant.

In March 2009,[4] Texas recommended that the same counties be designated as nonattainment for the 2008 ozone NAAQS based on air quality data from 2006-2008. Texas provided an update to the original recommendation in October 2011[5] based on air quality data from 2008-2010. The State's recommendations are based on data from FEM monitors sited and operated in accordance with 40 CFR Part 58.

After considering these recommendations and based on EPA's technical analysis described below, EPA intends to designate 11 counties in Texas (identified in Table 1 below) as "nonattainment" for the 2008 ozone NAAQS as part of the Dallas/Fort Worth nonattainment area.

Table 1. Texas's Recommended and EPA's Intended Designated Nonattainment Counties for Dallas/Fort Worth.

[4] Initial 2008 ozone NAAQS designation recommendation letter from Governor Perry to Acting Regional Administrator Starfield, dated March 10, 2009.

[5] Updated 2008 ozone NAAQS designation recommendation letter from Governor Perry to Regional Administrator Armendariz, dated October 31, 2011.

Dallas-Fort Worth Area	State-Recommended Nonattainment Counties	EPA Intended Nonattainment Counties
Texas	Collin Dallas Denton Ellis Johnson Kaufman Parker Rockwall Tarrant	Collin Dallas Denton Ellis Hood Johnson Kaufman Parker Rockwall Tarrant Wise

Factor Assessment

Factor 1: Air Quality Data

For this factor, we considered 8-hour ozone design values (in ppm) for air quality monitors in counties in the Dallas-Fort Worth area based on data for the 2008-2010 period (i.e., the 2010 design value, or DV), which are the most recent years with fully-certified air quality data. A monitor's DV is the metric or statistic that indicates whether that monitor attains a specified air quality standard. The 2008 ozone NAAQS are met at a monitor when the annual fourth-highest daily maximum 8-hour average concentration, averaged over 3 years is 0.075 ppm or less. A DV is only valid if minimum data completeness criteria are met. See 40 CFR part 50 Appendix P. Where several monitors are located in a county (or a designated nonattainment area or maintenance area), the DV for the county or area is determined by the monitor with the highest level.

The 2010 DVs for the ozone NAAQS for counties in Dallas-Fort Worth and nearby surrounding area are shown in Table 2.

Table 2. Air Quality Data.

County	State Recommended Nonattainment?	2008-2010 Design Value (ppb)
Collin County, TX	Yes	77
Cooke, TX	No	--
Dallas County, TX	Yes	78
Delta, TX	No	--
Denton County, TX	Yes	80
Ellis County, TX	Yes	72
Fannin, TX	No	--
Grayson, TX	No	--
Henderson, TX	No	--
Hood County, TX	No	75
Hunt, TX	No	64
Johnson County, TX	Yes	80
Kaufman County, TX	Yes	67
Palo Pinto, TX	No	--
Parker County, TX	Yes	75
Rockwall County, TX	Yes	74
Somervell, TX	No	--
Tarrant County, TX	Yes	86
Wise County, TX	No	--

Air quality monitors in Collin, Dallas, Denton, Johnson, and Tarrant Counties indicate a violation of the 2008 ozone NAAQS, therefore these counties are included in the nonattainment area. A county (or partial county) must also be designated nonattainment if it contributes to a violation in a nearby area. Each county without a violating monitor that is located near a county with a violating monitor has been evaluated, as discussed below, based on the five factors and other relevant information to determine whether it contributes to the nearby violation.

Factor 2: Emissions and Emissions-Related Data

EPA evaluated emissions of ozone precursors (NO_x and VOC) and other emissions-related data that provide information on areas contributing to violating monitors.

Emissions Data

EPA evaluated county-level emission data for NO_x and VOC derived from the 2008 National Emissions Inventory (NEI), version 1.5. This is the most recently available NEI. (See http://www.epa.gov/ttn/chief/net/2008inventory.html). Significant emissions levels in a nearby area indicate the potential for the area to contribute to observed violations. We will also consider any additional information we receive on changes to emissions levels that are not reflected in recent inventories. These changes include emissions reductions due to permanent and enforceable emissions controls that will be in place before final designations are issued and emissions increases due to new sources.

Table 3 shows emissions of NO_x and VOC (given in tons per year or tpy) for violating and nearby counties that we considered for inclusion in the Dallas-Fort Worth CSA.

Table 3. Total 2008 NO_x and VOC Emissions from 2008 NEI.

County	State Recommended Nonattainment?	NO_x (tpy)	VOC (tpy)
Collin, TX	Yes	10,322	14,503
Cooke, TX	No	3,853	5,790
Dallas, TX	Yes	51,023	63,473
Delta, TX	No	1,016	462
Denton, TX	Yes	17,421	24,932
Ellis, TX	Yes	15,768	6,543
Fannin, TX	No	2,165	1,207
Grayson, TX	No	5,919	7,401
Henderson, TX	No	3,573	6,067
Hood, TX	No	5,515	9,547
Hunt, TX	No	3,688	3,765
Johnson, TX	Yes	31,769	10,163
Kaufman, TX	Yes	5,868	3,510
Palo Pinto, TX	No	3,348	7,464
Parker, TX	Yes	9,550	11,708
Rockwall, TX	Yes	1,859	2,047
Somervell, TX	No	698	921
Tarrant, TX	Yes	56,408	49,021
Wise, TX	No	11,911	23,657
	Area-wide:	241,674	252,181

Subsequent to development of the 2008 NEI, the Texas Commission on Environmental Quality (TCEQ) prepared an emissions inventory of NOx and VOC emissions resulting from Barnett Shale oil and gas production, transmission, processing, and related activities during calendar year 2009.[6] Table 4 below presents an updated Barnett Shale Area Special Inventory of NOX and VOC emissions from oil and gas production activities for the counties in the Dallas-Fort Worth CSA. EPA also considered the additional contribution of NOx and VOC emissions from Barnett Shale area oil and gas production activities in its evaluation of emissions for the Dallas-Fort Worth CSA counties.

Table 4. TCEQ 2009 Barnett Shale Area Special Inventory.

County	State Recommended Nonattainment?	NO_x (tpy)	VOC (tpy)
Collin, TX	Yes		
Cooke, TX	No	76	490
Dallas, TX	Yes	0	5
Delta, TX	No		
Denton, TX	Yes	429	3,523
Ellis, TX	Yes	120	49
Fannin, TX	No		
Grayson, TX	No		
Henderson, TX	No		
Hood, TX	No	6,903	2,113

[6] http://www.tceq.texas.gov/airquality/point-source-ei/psei.html#barnett2. Reference Barnett Shale Area Special Inventory, Phase Two.

County	State Recommended Nonattainment?	NO_x (tpy)	VOC (tpy)
Hunt, TX	No		
Johnson, TX	Yes	1,101	1,614
Kaufman, TX	Yes		
Palo Pinto, TX	No	1,226	833
Parker, TX	Yes	743	2,420
Rockwall, TX	Yes		
Somervell, TX	No	1,119	221
Tarrant, TX	Yes	415	1,083
Wise, TX	No	2,520	6,032
	Area-wide:	14,652	18,383

The counties in the Dallas-Fort Worth CSA with the highest emissions of NOx and VOC are Collin, Dallas, Denton, Ellis, Johnson, Parker, Tarrant, and Wise. Together, these counties account for 84 percent of the 2008 NEI NOx emissions and 81 percent of the 2008 NEI VOC emissions of the entire area.

Hood and Wise Counties also have comparatively high emissions of NOx and VOC. Based on just the 2008 NEI data, Wise County's emissions of VOC at 23,657 tpy are the 4th highest in the 19-county CSA, and Hood County's 5,515 tpy of VOC emissions are the 8th highest in the 19-county CSA. Wise and Hood Counties also have comparatively high NOx emissions, which are 6th and 11th highest, respectively, in the CSA.

Population density and degree of urbanization

EPA evaluated the population and vehicle use characteristics and trends of the area as indicators of the probable location and magnitude of non-point source emissions. These include ozone-creating emissions from on-road and off-road vehicles and engines, consumer products, residential fuel combustion, and consumer services. Areas of dense population or commercial development are an indicator of area source and mobile source NO_x and VOC emissions that may contribute to ozone formation that contributes to nonattainment in the area. Rapid population or VMT growth (see below) in a county on the urban perimeter signifies increasing integration with the core urban area, and indicates that it may be appropriate to include the area associated with area source and mobile source emissions as part of the nonattainment area. Table 5 shows the population, population density, and population growth information for each county in the area.

Table 5. Population and Growth.

County	State Recommended Nonattainment?	2010 Population	2010 Population Density (1000 pop/sq mi)	Absolute change in population (2000-2010)	Population % change (2000-2010)
Collin, TX	Yes	782,341	0.88	282,143	18.5
Cooke, TX	No	38,734	0.04	1,979	0.4
Dallas, TX	Yes	2,368,139	2.6	142,691	2.2
Delta, TX	No	5,231	0.02	-106	-0.2
Denton, TX	Yes	662,614	0.69	223,647	18.7
Ellis, TX	Yes	149,610	0.16	37,228	13.5
Fannin, TX	No	33,915	0.04	2,575	3.8
Grayson, TX	No	120,877	0.12	9,891	4.6
Henderson, TX	No	78,532	0.08	4,990	0.09

County	State Recommended Nonattainment?	2010 Population	2010 Population Density (1000 pop/sq mi)	Absolute change in population (2000-2010)	Population % change (2000-2010)
Hood, TX	No	51,182	0.12	9,719	9.2
Hunt, TX	No	86,129	0.10	9,199	5.7
Johnson, TX	Yes	150,934	0.21	22,967	4.9
Kaufman, TX	Yes	103,350	0.13	31,268	17.6
Palo Pinto, TX	No	28,111	0.03	1,028	3.1
Parker, TX	Yes	116,927	0.13	27,690	15.4
Rockwall, TX	Yes	78,337	0.53	34,457	25.7
Somervell, TX	No	8,490	0.04	1,660	14.4
Tarrant. TX	Yes	1,809,034	2.01	354,603	12.2
Wise, TX	No	59,127	0.06	9,727	5.9
	Area-wide:	6,731,614	0.46	1,207,356	21.9

Sources: U.S. Census Bureau population estimates for 2010 as of August 4, 2011 (http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_10_PL_GCTPL2.STO5&prodType=table)

The Dallas-Fort Worth area is a large metropolitan area with a total population approaching 7 million people. For the purposes of determining the boundary of the intended 2008 ozone nonattainment area, EPA evaluated 22 counties in the greater Dallas-Fort Worth area with a total population of 6,731,614 people and an average population density of 460 people per square mile.

Dallas and Tarrant Counties have by far the highest and most dense populations. Dallas County has approximately 2.4 million people and a population density of 2,600 people per square mile, and Tarrant County has approximately 1.8 million people and a population density of 2,001 people per square mile. Two other counties, Collin and Denton are also densely populated; each has more than 500,000 people and a population density exceeding 500 people per square mile.

There are an additional eight counties in this area with populations exceeding 50,000 people and/or population densities exceeding 100 people per square mile. These counties include: Ellis, Grayson, Hood, Johnson, Kaufman, Parker, and Rockwall. These counties are characterized by population counts that range between approximately 60,000 and 150,000 people and population densities that range from 120 to 530 people per square mile.

Ten of the counties in this area experienced population growth between 2000 and 2010 in excess of approximately 10,000 people. Of these, the population of four of these counties grew by more than 100,000 people during the past decade: Collin County (+282,143 people), Dallas County (+142,000 people), Denton County (+223,647 people), and Tarrant County (+354,603 people). Six additional counties experienced population growth that ranged from approximately 10,000 to 40,000 people: Ellis, Johnson, Kaufman, Parker, Rockwall, and Wise Counties.

A final population and growth metric evaluated by EPA was the percent change in population during the period from 2000 to 2010. During this decade, eight of the 22 counties experienced a percent change in population that exceeded 10 percent: Collin (+18.5%), Denton (+18.7%), Ellis (+13.5%), Kaufman (+17.6%), Parker (+15.4%), Rockwall (+25.7%), Somervell (+14.4%), and Tarrant (+12.2%) Counties.

The attachment to this document contains Figure 3, Dallas-Fort Worth Ozone and Ozone Precursor Monitoring Network, and Figure 5, Population Density Change Percentage Between 2000 and 2010 Census for Dallas-Fort Worth Ozone and Ozone Precursor Monitoring Network, which present graphical information on population density and growth for the Dallas-Fort Worth area.

Traffic and commuting patterns

EPA evaluated the commuting patterns of residents in the area, as well as the total Vehicle Miles Traveled (VMT) for each county. In combination with the population/population density data and the location of main transportation arteries (see above), this information helps identify the probable location of non-point source emissions. A county with high VMT and/or a high number of commuters is generally an integral part of an urban area and indicates the presence of motor vehicle emissions that may contribute to ozone formation that contributes to nonattainment in the area. Rapid population or VMT growth in a county on the urban perimeter signifies increasing integration with the core urban area, and indicates that the associated area source and mobile source emissions may be appropriate to include in the nonattainment area. Table 6 shows traffic and commuting pattern data, including total 2008 VMT and 10-year VMT growth for each county.

Table 6. Traffic and Commuting Patterns.

County	State Recommended Nonattainment?	2008 VMT* (million miles)	% Change in VMT (2002 – 2008)
Collin, TX	Yes	6,198	+33
Cooke, TX	No	636	+16
Dallas, TX	Yes	26,625	+14
Delta, TX	No	72	-4
Denton, TX	Yes	5,507	+27
Ellis, TX	Yes	1,893	+49
Fannin, TX	No	334	+9
Grayson, TX	No	1,364	+3
Henderson, TX	No	768	+30
Hood, TX	No	443	+46
Hunt, TX	No	1,046	+26
Johnson, TX	Yes	1,432	+47
Kaufman, TX	Yes	1,548	+38
Palo Pinto, TX	No	397	+3
Parker, TX	Yes	1,280	+41
Rockwall, TX	Yes	676	+15
Somervell, TX	No	121	+27
Tarrant. TX	Yes	16,741	+17
Wise, TX	No	969	+16
	Area-wide:	68,050	----

* MOBILE model VMTs are those inputs into the NEI version 1.5.

Total VMT is an important metric as an indicator of potential contribution to ground level ozone concentrations. Commuters in the Dallas-Fort Worth area traveled a total of approximately 68 billion miles during calendar year 2008. Four counties in the Dallas-Fort Worth area, Collin, Dallas, Denton, and Tarrant Counties, all have total VMT for calendar year 2008 in excess of 5 billion miles. Dallas and Tarrant Counties have particularly high total VMT counts at approximately 27 and 18 billion miles, respectively. An additional seven counties have 2008 VMT counts in the range of approximately 1 – 2 billion miles; these counties are: Ellis, Grayson, Hunt, Johnson, Kaufman, Parker, and Wise Counties.

Most of the counties in the Dallas-Fort Worth area have experienced high growth in VMT for the period from 2002 – 2008. The growth in VMT for 16 of these counties exceeds 14 percent, and for 10 of those counties the growth rate exceeded 25 percent. Four counties in particular have very high VMT growth

for this period: Ellis County (+49%), Johnson County (+47%), Kaufman County (+38%), and Parker County (+41%).

Factor 3: Meteorology (weather/transport patterns)

EPA evaluated available meteorological data to help determine how meteorological conditions, such as weather, transport patterns and stagnation conditions, would affect the fate and transport of precursor emissions contributing to ozone formation.

The attachment to this document contains Figure 3, Dallas-Fort Worth Ozone and Ozone Precursor Monitoring Network, including locations of major stationary sources, and locations of ambient monitors with their design values.

EPA has performed 24-Hour wind back trajectories (which is an analysis of meteorological patterns) specifically on days when a number of the monitors in the Dallas-Fort Worth area have exceeded the 2008 NAAQS. These analyses were conducted to better understand the area's meteorological transport conditions using the National Oceanic and Atmospheric Administration Hybrid Single Particle Lagrangian Integrated Trajectory Model (NOAA HYSPLIT). The HYSPLIT model yields a centerline of where the air mass came from that makes up the air mass at a specific location and time.

The HYSPLIT trajectories for 2008-2010 exceedance days at the Keller monitor in Tarrant County were conducted, and the resulting trajectories were overlaid on Figure 3 in the attachments as Figure 5. We also focused on this monitor and a number of other monitors in the Dallas-Fort Worth area, including the Eagle Mountain Lake monitor in Tarrant County and the Parker County monitor. The Keller and Eagle Mountain Lake monitors have recorded some of the highest ozone levels in the region, and inclusion of the Parker County monitor represents a good cross-section of the monitors in the Dallas-Fort Worth area that have had exceedances in the 2006-2010 period. Since the 2008-2010 data for the Keller monitor is only for three years, we evaluated additional years to better understand the meteorological transport conditions that exist during ozone exceedances. Normally when we are developing a conceptual model understanding of what yields ozone exceedances in an area we will evaluate 5 to 10 years worth of meteorological data. Therefore we decided to evaluate all days that had ozone exceedances at a number of monitors that give a representative data set for the 2006-2010 period.

There are 3 additional figures in the attachment that include a zoom view for the Eagle Mountain Lake monitor and a large and a zoom view for the Parker County monitor. These figures are labeled Figures 6a through 6c. These HYSLPIT trajectories are 24-Hour back trajectories for each of these monitors on days when they had exceedances of the 75 ppb standard. Evaluation of the back trajectories for the Keller, Eagle Mountain Lake, and Parker County monitors indicates that the areas upwind of the monitors prior to an ozone exceedance includes the all nine counties included in the Dallas-Fort Worth nonattainment area for the 1997 8-hour standard and also Wise and Hood Counties. We note that there are some trajectories that pass over Hood County and continue to the Parker County monitor without traversing over the core Dallas-Fort Worth area. The back trajectories for the Eagle Mountain Lake and Parker County monitors further support that air that is transported from Hood and Wise counties ends up in the area of the monitor when ozone exceedances are observed.

Overall, examination of the 24-hour back trajectories on high ozone days at select monitors in the existing Dallas-Fort Worth area indicates that air that originates or passes through the existing 9-county

1997 nonattainment area and Hood and Wise counties prior to ozone exceedances being observed at existing monitors.

Factor 4: Geography/topography (mountain ranges or other air basin boundaries)

The geography/topography analysis evaluates the physical features of the land that might affect the air shed and, therefore, the distribution of ozone over the area. The Dallas/Fort Worth area does not have any geographical or topographical barriers significantly limiting air pollution transport within its air shed. Therefore, this factor did not play a significant role in this evaluation.

Factor 5: Jurisdictional boundaries

Once we identified the general areas we anticipated we would recommend should be included in the nonattainment area, we then considered existing jurisdictional boundaries for the purposes of providing a clearly defined legal boundary and to help identify the areas appropriate for carrying out the air quality planning and enforcement functions for nonattainment areas. Examples of jurisdictional boundaries include existing/prior nonattainment area boundaries for ozone or other urban-scale pollutants, county lines, air district boundaries, township boundaries, areas covered by a metropolitan planning organization, state lines, Reservation boundaries, and urban growth boundaries. Where existing jurisdictional boundaries were not adequate or appropriate to describe the nonattainment area, other clearly defined and permanent landmarks or geographic coordinates were considered.

The Dallas-Fort Worth area has previously established nonattainment boundaries associated with the 1-hour and 1997 8-hour ozone NAAQS. Texas has recommended the boundary for the 2008 ozone NAAQS be the same as that for the 1997 ozone NAAQS.

Conclusion

Based on the assessment of factors described above, EPA has preliminarily concluded that the following counties should be included as part of the Dallas-Fort Worth nonattainment area because they are have air quality monitors that indicate a violation of the 2008 ozone NAAQS, or because they are contributing to a violation in a nearby area: Collin, Dallas, Denton, Ellis, Hood, Johnson, Kaufman, Parker, Rockwell, Tarrant, and Wise Counties. These are the same counties that were included in the Dallas-Fort Worth nonattainment area for the 1997 ozone NAAQS, with the addition of Hood and Wise Counties.

The air quality monitors in Collin, Dallas, Denton, Johnson, and Tarrant Counties indicate violations of the 2008 ozone NAAQS based on the 2010 DVs, therefore these counties are included in the nonattainment area.

Ellis, Hood, Kaufman, Parker, Rockwell, and Wise Counties are nearby counties that do not have monitors indicating ambient ozone concentrations in excess of 75 ppb, but EPA has concluded that these areas contribute to observed violations of the 2008 ozone standard in nearby counties, through emissions from point sources and other, non-point sources (e.g., vehicles and other small area sources).

Collin, Dallas, Denton, Ellis, Hood, Johnson, Parker, Tarrant, and Wise Counties have among the highest NOx and VOC emissions in the area. Each of these counties either has a monitor indicating a violation of the 2008 ozone NAAQS or is adjacent to one or more such counties.

Collin, Dallas, Denton, Ellis, Grayson, Hood, Johnson, Kaufman, Parker, Rockwall, Somervell, Tarrant, and Wise Counties ranked comparatively high for factors related to population statistics, and Collin, Dallas, Denton, Ellis, Johnson, Kaufman, Parker, Rockwall, Tarrant, and Wise Counties ranked comparatively high for factors related to traffic and commuting patterns.

EPA's meteorological assessment when ozone exceedances of the 2008 ozone standard have been monitored within the greater Dallas-Fort Worth area supports the consideration of inclusion of the existing 9-county nonattainment area (Dallas, Tarrant, Collin, Denton, Ellis, Johnson, Parker, Rockwall, and Kaufman counties) and Hood and Wise counties.

Collin County: Recommended for inclusion by Texas and has a violating monitor, so should be included.

Dallas County: Recommended for inclusion by Texas and has a violating monitor, so should be included.

Denton County: Recommended for inclusion by Texas and has a violating monitor, so should be included.

Ellis County: Recommended for inclusion by Texas; has 2008 NEI emissions of 15,768 tons of NOx and 6,543 tons of VOC; there are 160 people per square mile; has a 2010 population of 149,610 with a growth rate of 13.5 percent between 2000 and 2010; total VMT is 1.9 billion miles. Winds are often from the south so emissions from Ellis County often contribute to violations other counties. In addition, the number of commuters and growth rate indicate that Ellis County should be included in the nonattainment area.

Hood County: Has 2008 NEI emissions of 5,515 tons of NOx and 9,547 tons of VOC, with TCEQ 2009 Barnett Shale Special Inventory emissions of 6,903 tons of NOx and 2,113 tons of VOC; there are 120 people per square mile; has a 2010 population of 51,182 with a growth rate of 9.2 percent between 2000 and 2010; total VMT is 443 million miles. Emissions from this county have grown considerably, due primarily to oil and gas development. Back trajectories show that at times Hood County emissions contribute to observed violations in other counties. This, in conjunction with high growth in population, indicates this county should be included in the nonattainment area.

Johnson County: Recommended for inclusion by Texas and has a violating monitor, so should be included.

Kaufman County: Recommended for inclusion by Texas; has 2008 NEI emissions of 5,868 tons of NOx and 3,510 tons of VOC; there are 130 people per square mile; has a 2010 population of 103,350 with a growth rate of 17.6 percent between 2000 and 2010; total VMT is 1.5 billion miles. Winds are often from the east so emissions from Kaufman County often contribute to violations other counties. In addition, the VMT and growth rate indicate that Kaufman County should be included in the nonattainment area.

Parker County: Recommended for inclusion by Texas; has 2008 NEI emissions of 9,550 tons of NOx and 11,708 tons of VOC; there are 130 people per square mile; has a 2010 population of 116,927 with a growth rate of 15.4 percent between 2000 and 2010; total VMT is 1.3 billion miles. The comparatively high emissions and population growth rate all indicate that Parker County should be included in the nonattainment area. In addition, at times back trajectories indicate that emissions from Parker County contribute to observed violations in the area.

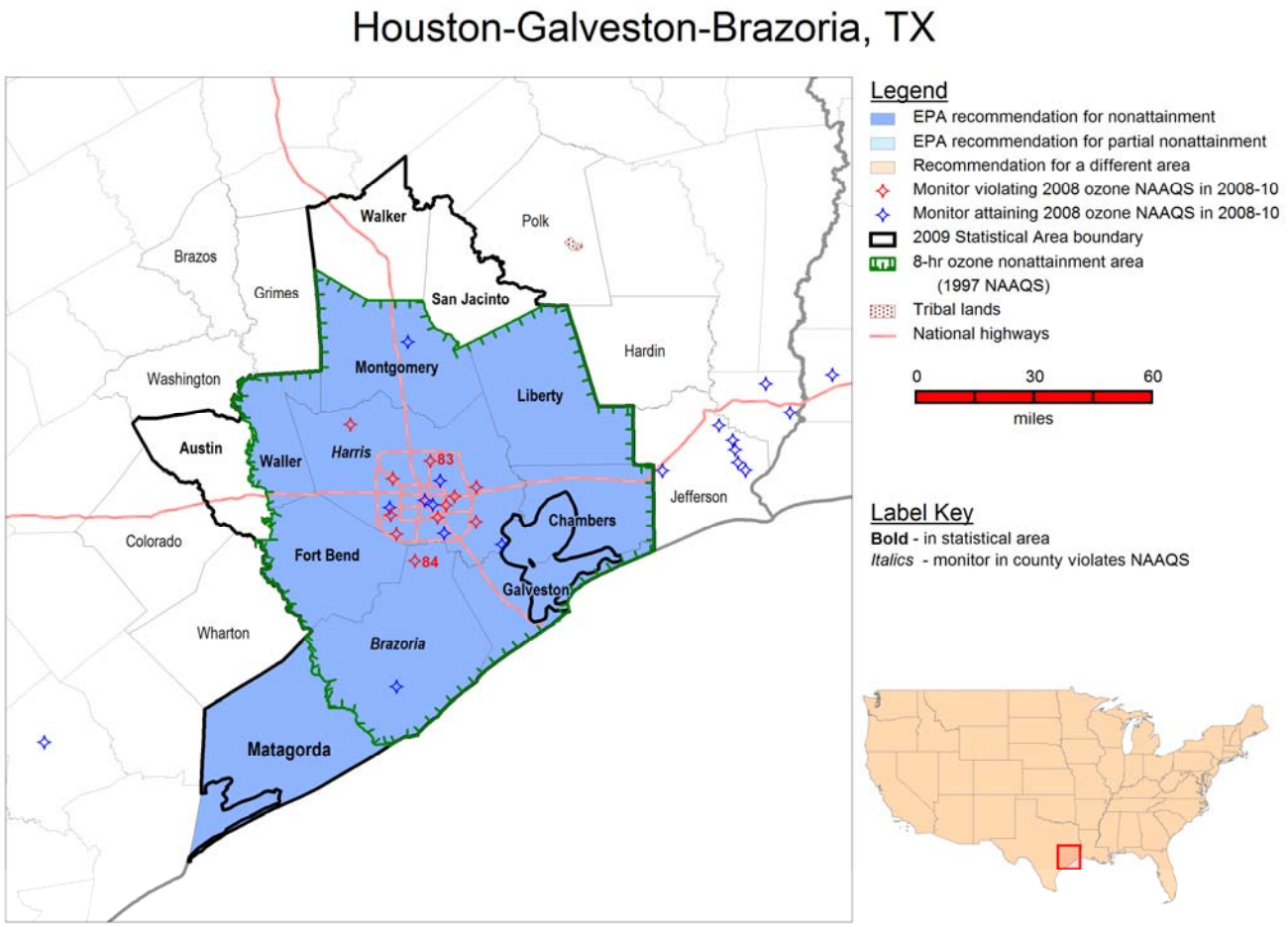
Rockwall County: Recommended for inclusion by Texas; has 2008 NEI emissions of 1,859 tons of NOx and 2,047 tons of VOC; there are 530 people per square mile; has a 2010 population of 78,337 with a growth rate of 25.7 percent between 2000 and 2010; total VMT is 676 million miles. While a small county, its population density and emissions indicate that this county should be included in the nonattainment area.

Tarrant County: Recommended for inclusion by Texas and has a violating monitor, so should be included.

Wise County: Has 2008 NEI emissions of 11,911 tons of NOx and 23,657 tons of VOC; there are 60 people per square mile; has a 2010 population of 59,127 with a growth rate of 5.9 percent between 2000 and 2010; total VMT is 969 million. The close proximity of these comparatively high emissions to violating monitors indicates that this county should be included in the nonattainment area. The high growth in these emissions is due in large part to growth in emissions from Barnett Shale gas production development, but also due to growth in population. Examination of back trajectories indicates that at times emissions from Wise County contribute to observed violations in the area.

Technical Analysis for Houston-Galveston-Brazoria

Figure 2 is a map of the Houston-Galveston-Brazoria intended nonattainment area. The map provides other relevant information including the locations and design values of air quality monitors, county and other jurisdictional boundaries, relevant statistical area boundaries, the nonattainment area boundary for 1997 ozone NAAQS, and major transportation arteries. For purposes of the technical analysis, EPA evaluated all 12 twelve counties that comprise the Houston-Baytown-Huntsville CSA: Austin, Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Matagorda, Montgomery, San Jacinto, Walker, and Waller Counties.



For purposes of the 1997 8-hour ozone NAAQS, this area was designated nonattainment. The boundary for the nonattainment area for the 1997 ozone NAAQS included the entire counties of Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller.

In March 2009,[7] Texas recommended these same eight counties, Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller, be designated as nonattainment for the 2008

[7] Initial 2008 ozone NAAQS designation recommendation letter from Governor Perry to Acting Regional Administrator Starfield, dated March 10, 2009.

ozone NAAQS based on air quality data from 2006-2008. Texas provided an update to the original recommendation in October 2011[8] based on air quality data from 2008-2010. The recommendations from the State are based on data from FEM monitors sited and operated in accordance with 40 CFR Part 58.

After considering these recommendations and based on EPA's technical analysis described below, EPA intends to designate 9 counties in Texas (identified in Table 7 below) as "nonattainment" for the 2008 ozone NAAQS as part of the Houston nonattainment area.

Table 7. Texas's Recommended and EPA's Intended Designated Nonattainment Counties for Houston-Galveston-Brazoria.

Houston-Galveston-Brazoria	State-Recommended Nonattainment Counties	EPA Intended Nonattainment Counties
Texas	Brazoria Chambers Fort Bend Galveston Harris Liberty Montgomery Waller	Brazoria Chambers Fort Bend Galveston Harris Liberty Matagorda Montgomery Waller

Factor Assessment

Factor 1: Air Quality Data

For this factor, we considered 8-hour ozone design values (in ppm) for air quality monitors in counties in the Houston-Baytown-Huntsville CSA based on data for the 2008-2010 period (i.e., the 2010 design value, or DV), which are the most recent years with fully-certified air quality data. A monitor's DV is the metric or statistic that indicates whether that monitor attains a specified air quality standard. The 2008 ozone NAAQS are met at a monitor when the annual fourth-highest daily maximum 8-hour average concentration, averaged over 3 years is 0.075 ppm or less. A DV is only valid if minimum data completeness criteria are met. See 40 CFR part 50 Appendix P. Where several monitors are located in a county (or a designated nonattainment area or maintenance area), the DV for the county or area is determined by the monitor with the highest level.

The 2010 DVs for the ozone NAAQS for counties in the Houston and nearby surrounding area are shown in Table 8.

[8] Updated 2008 ozone NAAQS designation recommendation letter from Governor Perry to Administrator Jackson, dated October 31, 2011.

Table 8. Air Quality Data.

County	State Recommended Nonattainment?	2008-2010 Design Value (ppb)
Austin, TX	No	--
Brazoria, TX	Yes	84
Chambers, TX	Yes	--
Fort Bend, TX	Yes	--
Galveston, TX	Yes	75
Harris, TX	Yes	83
Liberty, TX	Yes	--
Matagorda, TX	No	--
Montgomery, TX	Yes	71
San Jacinto, TX	No	--
Walker, TX	No	--
Waller, TX	Yes	--

Ambient monitors in Brazoria and Harris Counties indicate a violation of the 2008 ozone NAAQS; therefore these counties are included in the nonattainment area. A county (or partial county) must also be designated nonattainment if it contributes to a violation in a nearby area. Each county without a violating monitor that is located near a county with a violating monitor has been evaluated, as discussed below, based on the five factors and other relevant information to determine whether it contributes to the nearby violation.

Factor 2: Emissions and Emissions-Related Data

EPA evaluated emissions of ozone precursors (NO_x and VOC) and other emissions-related data that provide information on areas contributing to violating monitors.

Emissions Data

EPA evaluated county-level emission data for NO_x and VOC derived from the 2008 National Emissions Inventory (NEI), version 1.5. This is the most recently available NEI. (See http://www.epa.gov/ttn/chief/net/2008inventory.html). Significant emissions levels in a nearby area indicate the potential for the area to contribute to observed violations. We will also consider any additional information we receive on changes to emissions levels that are not reflected in recent inventories. These changes include emissions reductions due to permanent and enforceable emissions controls that will be in place before final designations are issued and emissions increases due to new sources.

Table 9 shows emissions of NO_x and VOC (given in tons per year or tpy) for violating and nearby counties that we considered for inclusion in the Houston area.

Table 9. Total 2008 NO_x and VOC Emissions.

County	State Recommended Nonattainment?	NO_x (tpy)	VOC (tpy)
Austin, TX	No	3,829	3,422
Brazoria, TX	Yes	21,894	26,294
Chambers, TX	Yes	4,517	8,119
Fort Bend, TX	Yes	12,786	15,803
Galveston, TX	Yes	32,170	26,867
Harris, TX	Yes	165,610	135,931
Liberty, TX	Yes	3,345	24,137
Matagorda, TX	No	7,007	19,362
Montgomery, TX	Yes	8,434	14,012
San Jacinto, TX	No	1,361	6,064
Walker, TX	No	3,375	2,690
Waller, TX	Yes	2,080	3,993
	Area-wide:	266,408	286,694

An area's total emissions of ozone precursors is one of the most important factors to consider in determining its contribution to observed violations of the ozone standard. The counties in the core Houston area with the highest emissions of NOx are Brazoria, Fort Bend, Galveston, Harris, Matagorda, and Montgomery. More than 7,000 tpy of NOx emissions originates from each of these six counties, and collectively they represent approximately 248,000 tpy of NOx, or 93 percent of the total NOx emissions for the Houston area. Harris County, in particular, is characterized by high NOx emissions; the 166,000 tpy of NOx originating from Harris County accounts for 62 percent of the total NOx inventory for the area. Significantly, each of these counties either has an air monitor that indicates a violation of the 2008 ozone NAAQS or is adjacent to such a county.

Likewise, the counties with the highest VOC emissions in this area are Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Matagorda, and Montgomery. More than 7,000 tpy of VOC emissions originates from each of these eight counties, and collectively they represent approximately 270,000 tpy of VOC, or 94 percent of the total VOC emissions for the Houston area. Harris County, in particular, is characterized by high VOC emissions; the 136,000 tpy of VOC originating from Harris County accounts for 47 percent of the total VOC inventory for the area. As with counties characterized by high NOx emissions, each of these counties either has an air monitor that indicates a violation of the 2008 ozone NAAQS or is adjacent to such a county.

Population density and degree of urbanization

EPA evaluated the population and vehicle use characteristics and trends of the area as indicators of the probable location and magnitude of non-point source emissions. These include ozone-creating emissions from on-road and off-road vehicles and engines, consumer products, residential fuel combustion, and consumer services. Areas of dense population or commercial development are an indicator of area source and mobile source NO_x and VOC emissions that may contribute to ozone formation that contributes to nonattainment in the area. Rapid population or VMT growth (see below) in a county on the urban perimeter signifies increasing integration with the core urban area, and indicates that it may be appropriate to include the area associated with area source and mobile source emissions as part of the nonattainment area. Table 10 shows the population, population density, and population growth information for each county in the area.

Table 10. Population and Growth.

County	State Recommended Nonattainment?	2010 Population	2010 Population Density (1000 pop/sq mi)	Absolute change in population (2000-2010)	Population % change (2000-2010)
Austin, TX	No	28,417	0.04	4,675	20
Brazoria, TX	Yes	313,166	0.21	70,036	29
Chambers, TX	Yes	35,096	0.04	8,931	34
Fort Bend, TX	Yes	585,375	0.66	226,617	63
Galveston, TX	Yes	291,309	0.44	40,601	16
Harris, TX	Yes	4,092,459	2.30	678,528	20
Liberty, TX	Yes	75,643	0.06	5,083	7
Matagorda, TX	No	36,702	0.03	-1,244	-3
Montgomery, TX	Yes	455,746	0.42	158,405	53
San Jacinto, TX	No	26,384	0.04	3,932	18
Walker, TX	No	67,861	0.08	6,117	10
Waller, TX	Yes	43,205	0.08	10,367	32
	Area-wide:	6,051,363	0.51	1,212,048	25

Sources: U.S. Census Bureau population estimates for 2010 as of August 4, 2011 (http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_10_PL_GCTPL2.STO5&prodType=table)

The Houston area is a large metropolitan area with a total population of approximately 6 million people. For the purposes of determining the boundary of the intended 2008 ozone nonattainment area, EPA evaluated all 12 counties in the Houston-Baytown-Huntsville CSA, which has a total population of 6,051,363 people and an average population density of 510 people per square mile.

Five counties in the CSA, Brazoria, Fort Bend, Galveston, Harris, and Montgomery, are densely populated; each has approximately 300,000 or more people and a population density exceeding 200 people per square mile. These five counties account for 95 percent of the total population of the Houston area. Harris County stands out from the remaining counties in the region. Harris County has approximately 4.1 million people and a population density of 2,300 people per square mile. Fort Bend and Montgomery Counties have moderately high populations and population densities; the population of Fort Bend County is 585,000 with a density of 660 people per square mile, and the population of Montgomery County is 456,000 people with a density of 420 people per square mile. The remaining counties in the area are predominantly rural, with population densities at or below 80 people per square mile.

Four of the counties in this area experienced population growth between 2000 and 2010 in excess of 70,000 people, which represents 94 percent of the total population growth for the area. Of these, the population of two of these counties grew by more than 200,000 people during the past decade: Fort Bend County (+226,617 people) and Harris County (+678,528 people).

A final population and growth metric evaluated by EPA was the percent change in population during the period from 2000 to 2010. During this decade, all but two of the counties in the area experienced double-digit growth in percent change in population. The counties of Fort Bend and Montgomery had particularly high values for percent change in population, at 63 and 53 percent, respectively.

The attachments to this document contains Figure 6, Houston Ozone and Ozone Precursor Monitoring Network, and Figure 8, Population Density Change Percentage Between 2000 and 2010 Census for Houston Ozone and Ozone Precursor Monitoring Network, which present graphical information on population density and growth for the Houston area.

Traffic and commuting patterns

EPA evaluated the commuting patterns of residents in the area, as well as the total Vehicle Miles Traveled (VMT) for each county. In combination with the population/population density data and the location of main transportation arteries (see above), this information helps identify the probable location of non-point source emissions. A county with high VMT and/or a high number of commuters is generally an integral part of an urban area and indicates the presence of motor vehicle emissions that may contribute to ozone formation that contributes to nonattainment in the area. Rapid population or VMT growth in a county on the urban perimeter signifies increasing integration with the core urban area, and indicates that the associated area source and mobile source emissions may be appropriate to include in the nonattainment area. Table 11 shows traffic and commuting pattern data, including total 2008 VMT and 10-year VMT growth for each county.

Table 11. Traffic and Commuting Patterns.

County	State Recommended Nonattainment?	2008 VMT* (million miles)	% Change in VMT (2002 – 2008)
Austin, TX	No	542	+18
Brazoria, TX	Yes	2,263	+16
Chambers, TX	Yes	935	+23
Fort Bend, TX	Yes	3,339	+23
Galveston, TX	Yes	2,210	+10
Harris, TX	Yes	40,379	+23
Liberty, TX	Yes	865	+12
Matagorda, TX	No	343	-1
Montgomery, TX	Yes	3,982	+22
San Jacinto, TX	No	317	+13
Walker, TX	No	944	+11
Waller, TX	Yes	759	+16
	Area-wide:	56,878	-----

* MOBILE model VMTs are those inputs into the NEI version 1.5.

Total VMT is an important metric as an indicator of potential contribution to ground level ozone concentrations. Commuters in the Houston area traveled a total of approximately 57 billion miles during calendar year 2008. Five counties in the Houston area, Brazoria, Fort Bend, Galveston, Harris, and Montgomery Counties, all have total VMT for calendar year 2008 in excess of 2 billion miles. These five counties have a combined VMT of 52 billion miles, or 92 percent of the total VMT for the area. Harris County has a particularly high total VMT count at approximately 40 billion miles, which is 71 percent of the total VMT for the entire CMSA.

All but one of the counties in the Houston area have experienced high growth in VMT for the period from 2002 – 2008. The growth in VMT for 11 of these counties exceeds 10 percent, and for 4 of those counties the growth rate exceeded 20 percent. The counties with the highest percent change in VMT for this period are Chambers County (+23%), Fort Bend County (+23%), Harris County (+23%), and Montgomery County (+22%). Austin, Brazoria, and Waller Counties each experienced growth in VMT exceeding 15 percent.

Factor 3: Meteorology (weather/transport patterns)

EPA evaluated available meteorological data to help determine how meteorological conditions, such as weather, transport patterns and stagnation conditions, would affect the fate and transport of precursor emissions contributing to ozone formation. The Houston-Baytown-Huntsville area is considered a sub-tropical coastal climate with normal recirculation occurring due to the land-sea breeze oscillation. This land-sea breeze oscillation results in transport of air among numerous counties along the gulf coast region in the Houston-Baytown-Huntsville area and this phenomena leads to air transport of emissions to monitors in the Houston-Baytown-Huntsville area that have previously monitored exceedances of the 2008 ozone standard.

The attachment to this document contains Figure 7, Houston Ozone and Ozone Precursor Monitoring Network, including locations of major stationary sources, and locations of ambient monitors with their design values.

EPA has performed 24-Hour wind back trajectories (which is an analysis of meteorological patterns) specifically on days when a number of the monitors in the Houston-Baytown-Huntsville area have exceeded the 2008 NAAQS. These analyses were conducted to better understand the area's meteorological transport conditions using the National Oceanic and Atmospheric Administration Hybrid Single Particle Lagrangian Integrated Trajectory Model (NOAA HYSPLIT). The HYSPLIT model yields a centerline of where the air mass came from that makes up the air mass at a specific location and time.

The HYSPLIT trajectories for 2008-2010 exceedance days at the Manvel monitor in Brazoria County were conducted and the resulting trajectories were overlaid on Figure 7 in the attachments as Figure 9. We also focused on this monitor and a number of other monitors in the Houston-Baytown-Huntsville area, including the NW Harris County and Wallisville Road monitors in Harris County, and the Texas City monitor in Galveston County. These monitors have recorded some of the highest ozone levels in the region and represent a good cross-section of the monitors in the Houston-Baytown-Huntsville area that have had exceedances in the 2006-2010 period. Since the 2008-2010 data is only for three years we evaluated more years to better understand the meteorological transport conditions that exist during ozone exceedances. Normally when we are developing a conceptual model understanding of what yields ozone exceedances in an area we will evaluate 5 to 10 years worth of meteorological data. Therefore, we decided to evaluate all days that had ozone exceedances at a number of monitors that give a representative data set for the 2006-2010 period.

There are 8 figures in the attachment that include a large view and a zoom view for each of the four monitors (Manvel, NW Harris, Wallisville, and Texas City) labeled as Figures 10a through 10h. These HYSLPIT trajectories are 24-Hour back trajectories for each of these monitors on days when they had exceedances of the 75 ppb standard. Evaluation of the back trajectories for the Manvel and NW Harris indicates that the areas upwind of the monitor prior to an ozone exceedance includes the 8 existing counties in the Houston-Galveston-Brazoria nonattainment area for the 1997 8-hour standard and also Matagorda county. We note that there are some trajectories that pass over Matagorda County and continue to the monitor without traversing over the Houston Ship Channel. The back trajectories for the Wallisville and Texas City monitors further support that air that is transported from Matagorda county ends up in the area of the monitor when ozone exceedances are monitored.

Overall, examination of the 24-hour back trajectories on high ozone days at select monitors in the existing Houston-Galveston-Brazoria nonattainment area indicates that air originates or passes through the existing 8-county 1997 nonattainment area and Matagorda County prior to ozone exceedances being monitored at existing monitors.

Factor 4: Geography/topography (mountain ranges or other air basin boundaries)

The geography/topography analysis evaluates the physical features of the land that might affect the airshed and, therefore, the distribution of ozone over the area. The Houston area does not have any geographical or topographical barriers significantly limiting air pollution transport within its air shed. Therefore, this factor did not play a significant role in this evaluation.

Factor 5: Jurisdictional boundaries

Once we identified the general areas we anticipated we would recommend should be included in the nonattainment area, we then considered existing jurisdictional boundaries for the purposes of providing a clearly defined legal boundary and to help identify the areas appropriate for carrying out the air quality planning and enforcement functions for nonattainment areas. Examples of jurisdictional boundaries include existing/prior nonattainment area boundaries for ozone or other urban-scale pollutants, county lines, air district boundaries, township boundaries, areas covered by a metropolitan planning organization, state lines, Reservation boundaries, and urban growth boundaries. Where existing jurisdictional boundaries were not adequate or appropriate to describe the nonattainment area, other clearly defined and permanent landmarks or geographic coordinates were considered.

The Houston-Galveston-Brazoria area has previously established nonattainment boundaries associated with the 1-hour and 1997 8-hour ozone NAAQS. Texas has recommended that the boundary for the 2008 ozone NAAQS be the same as for the 1997 ozone NAAQS.

Conclusion

Based on the assessment of factors described above, EPA has preliminarily concluded that the following counties should be included as part of the Houston-Galveston-Brazoria nonattainment area because they are either violating the 2008 ozone NAAQS or contributing to a violation in a nearby area: Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Matagorda, Montgomery, and Waller Counties. These are the same counties that are included in the Houston-Galveston-Brazoria nonattainment area for the 1997 ozone NAAQS, with the addition of Matagorda County.

The air quality monitors in Brazoria and Harris Counties indicate violations of the 2008 ozone NAAQS based on the 2010 design values, therefore these counties are included in the nonattainment area.

Chambers, Fort Bend, Galveston, Liberty, Matagorda, Montgomery, and Waller Counties are nearby counties that do not have monitors indicating concentrations of ozone in excess of 75 ppb, but EPA has concluded that these areas contribute to the ozone concentrations in violation of the 2008 ozone NAAQS through emissions from point sources and other, non-point sources (e.g., vehicles and other small area sources).

The counties in the core Houston area with the highest emissions of NOx are Brazoria, Fort Bend, Galveston, Harris, Matagorda, and Montgomery. More than 7,000 tpy of NOx emissions originates from each of these six counties, and collectively they represent approximately 248,000 tpy of NOx, or 93 percent of the total NOx emissions for the Houston area. Likewise, the counties with the highest VOC emissions in this area are Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Matagorda, and Montgomery. More than 7,000 tpy of VOC emissions originates from each of these eight counties, and collectively they represent approximately 270,000 tpy of VOC, or 94 percent of the total VOC emissions for the Houston area.

Brazoria, Fort Bend, Galveston, Harris, and Montgomery Counties ranked comparatively high for factors related to population statistics, including total population, population density, and absolute and percent growth in population during the past decade.

Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery and Waller Counties ranked comparatively high for factors related to traffic and commuting patterns, such as total VMT and percent growth in VMT.

EPA's meteorological assessment when ozone exceedances of the 2008 ozone standard have been monitored within the greater Houston-Baytown-Huntsville area supports the consideration of inclusion of the existing 8-county nonattainment area (Harris, Galveston, Brazoria, Chambers, Fort Bend, Liberty, Montgomery, and Waller counties) and also Matagorda county.

Brazoria County: Recommended for inclusion by Texas and has a violating monitor, so should be included.

Chambers County: Recommended for inclusion by Texas; has 4,517 tons of NOx emissions and 8,119 tons of VOC emissions annually; there are 40 people per square mile; has a 2010 population of 35,096 with a growth rate of 34 percent between 2000 and 2010; total VMT is 935 million miles. The growth in population and VMT support the State's recommendation to include this county as part of the nonattainment area.

Fort Bend County: Recommended for inclusion by Texas; has 12,786 tons of NOx emissions and 15,803 tons of VOC emissions annually; there are 660 people per square mile; has a 2010 population of 585,375 with a growth rate of 63 percent between 2000 and 2010; total VMT is 3.3 billion miles. Its high ranking in emissions, population and commuting patterns all indicate it contributes to nonattainment and should be included in the Houston-Galveston-Brazoria nonattainment area.

Galveston County: Recommended for inclusion by Texas; has 32,170 tons of NOx emissions and 26,867 tons of VOC emissions annually; there are 440 people per square mile; has a 2010 population of 291,309 with a growth rate of 16 percent between 2000 and 2010; total VMT is 2.2 billion miles. Its high ranking in emissions, population and commuting patterns all indicate it contributes to nonattainment and should be included in the Houston-Galveston-Brazoria nonattainment area.

Harris County: Recommended for inclusion by Texas and has a violating monitor, so should be included.

Liberty County: Recommended for inclusion by Texas; has 3,345 tons of NOx emissions and 24,137 tons of VOC emissions annually; there are 60 people per square mile; has a 2010 population of 75,643 with a growth rate of 7 percent between 2000 and 2010; total VMT is 865 million miles. The growth in population and number and VMT indicate this county should be included in the Houston-Galveston-Brazoria nonattainment area.

Matagorda County: Has 7,007 tons of NOx emissions and 19,362 tons of VOC emissions annually; there are 30 people per square mile; has a 2010 population of 36,702 with a negative growth rate of 3 percent between 2000 and 2010; total VMT is 343 million miles. The high emissions in Matagorda argue that it should be included in the nonattainment area. Examination of back trajectories indicates these emissions could, at times, contribute to nonattainment in counties with violating monitors. Based on the combination of high emissions and examination of the meteorology through back trajectory analysis, EPA believes this county should be included in the Houston-Galveston-Brazoria nonattainment area.

Montgomery County: Recommended for inclusion by Texas; has 8,434 tons of NOx emissions and 14,012 tons of VOC emissions annually; there are 420 people per square mile; has a 2010 population of 455,746 with a growth rate of 53 percent between 2000 and 2010; total VMT is 4 billion miles. Its high ranking in emissions, population and commuting patterns all indicate it contributes to nonattainment and should be included in the Houston-Galveston-Brazoria nonattainment area.

Waller County: Recommended for inclusion by Texas; has 2,080 tons of NOx emissions and 3,993 tons of VOC emissions annually; there are 80 people per square mile; has a 2010 population of 43,205 with a growth rate of 32 percent between 2000 and 2010; total VMT is 759 million miles. The growth in population and VMT indicate this county should be included in the Houston-Galveston-Brazoria nonattainment area.

ATTACHMENTS

Figure 3. Dallas-Fort Worth Ozone and Ozone Precursor Monitoring Network, with Population Density.

Figure 4. Population Density Change Percentage Between 2000 and 2010 Census for Dallas-Fort Worth Ozone and Ozone Precursor Monitoring Network.

Figure 5. Overlay of 24-hour HYSPLIT back trajectories of all 75 ppb exceedances at the Keller monitor for the 2008-2010 period.

Figure 6a. NOAA HYSPLIT MODEL 24-Hour Back Trajectory Eagle Mtn. Lake Exceedances (2006-10) (zoom view).

Figure 6b. NOAA HYSPLIT MODEL 24-Hour Back Trajectory Parker County Exceedances (2006-10).

Figure 6c. NOAA HYSPLIT MODEL 24-Hour Back Trajectory Parker County Exceedances (2006-10) (zoom view).

Figure 7. Houston Ozone and Ozone Precursor Monitoring Network, with Population Density.

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Figure 9. Overlay of 24-hour HYSPLIT back trajectories of all 75 ppb exceedances at the Manvel monitor for the 2008-2010 period.

Figure 10a. NOAA HYSPLIT MODEL 24-Hour Back Trajectory Manvel Exceedances (2006-10).

Figure 10b. NOAA HYSPLIT MODEL 24-Hour Back Trajectory Manvel Exceedances (2006-10) (zoom view).

Figure 10c. NOAA HYSPLIT MODEL 24-Hour Back Trajectory NW Harris Exceedances (2006-10).

Figure 10d. NOAA HYSPLIT MODEL 24-Hour Back Trajectory NW Harris Exceedances (2006-10) (zoom view).

Figure 10e. NOAA HYSPLIT MODEL 24-Hour Back Trajectory Wallisville Exceedances (2006-10).

Figure 10f. NOAA HYSPLIT MODEL 24-Hour Back Trajectory Wallisville Exceedances (2006-10) (zoom view).

Figure 10g. NOAA HYSPLIT MODEL 24-Hour Back Trajectory Texas City Exceedances (2006-10).

Figure 10h. NOAA HYSPLIT MODEL 24-Hour Back Trajectory Texas City Exceedances (2006-10) (zoom view).

Figure 3. Dallas-Fort Worth Ozone and Ozone Precursor Monitoring Network, with Population Density

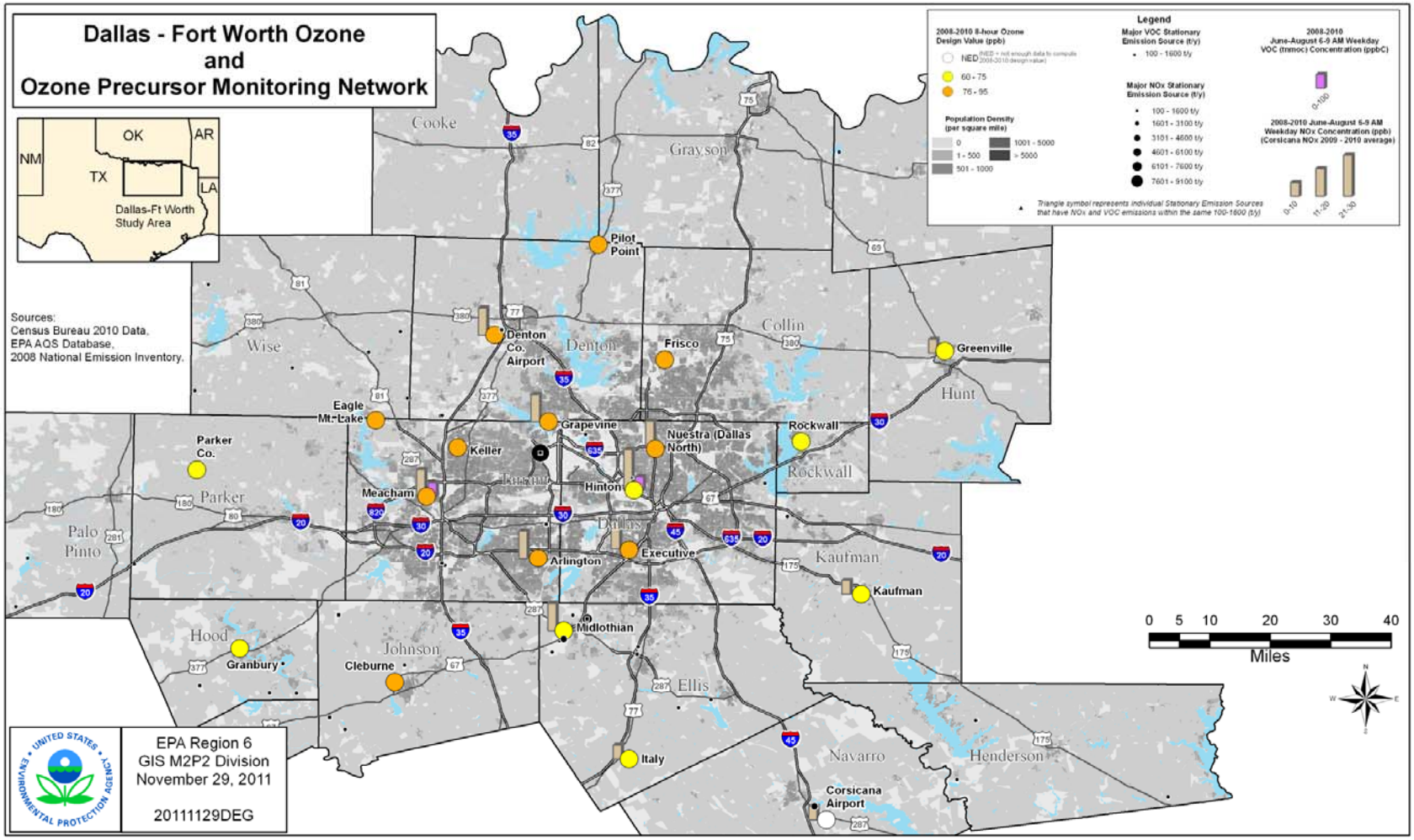


Figure 4. Population Density Change Percentage Between 2000 and 2010 Census for Dallas-Fort Worth Ozone and Ozone Precursor Monitoring Network

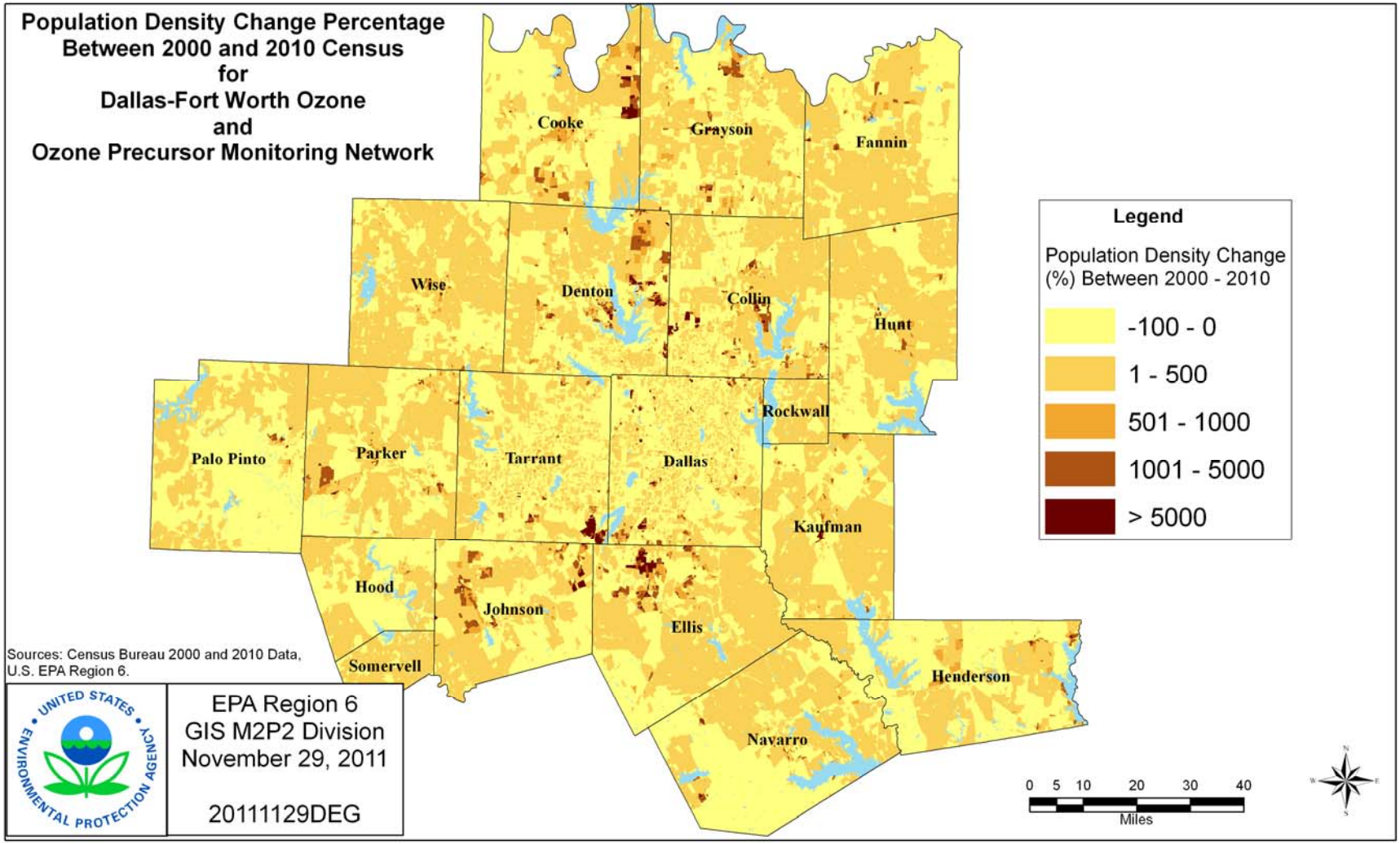


Figure 5. Overlay of 24-hour HYSPLIT back trajectories of all 75 ppb exceedances at the Keller monitor for the 2008-2010 period

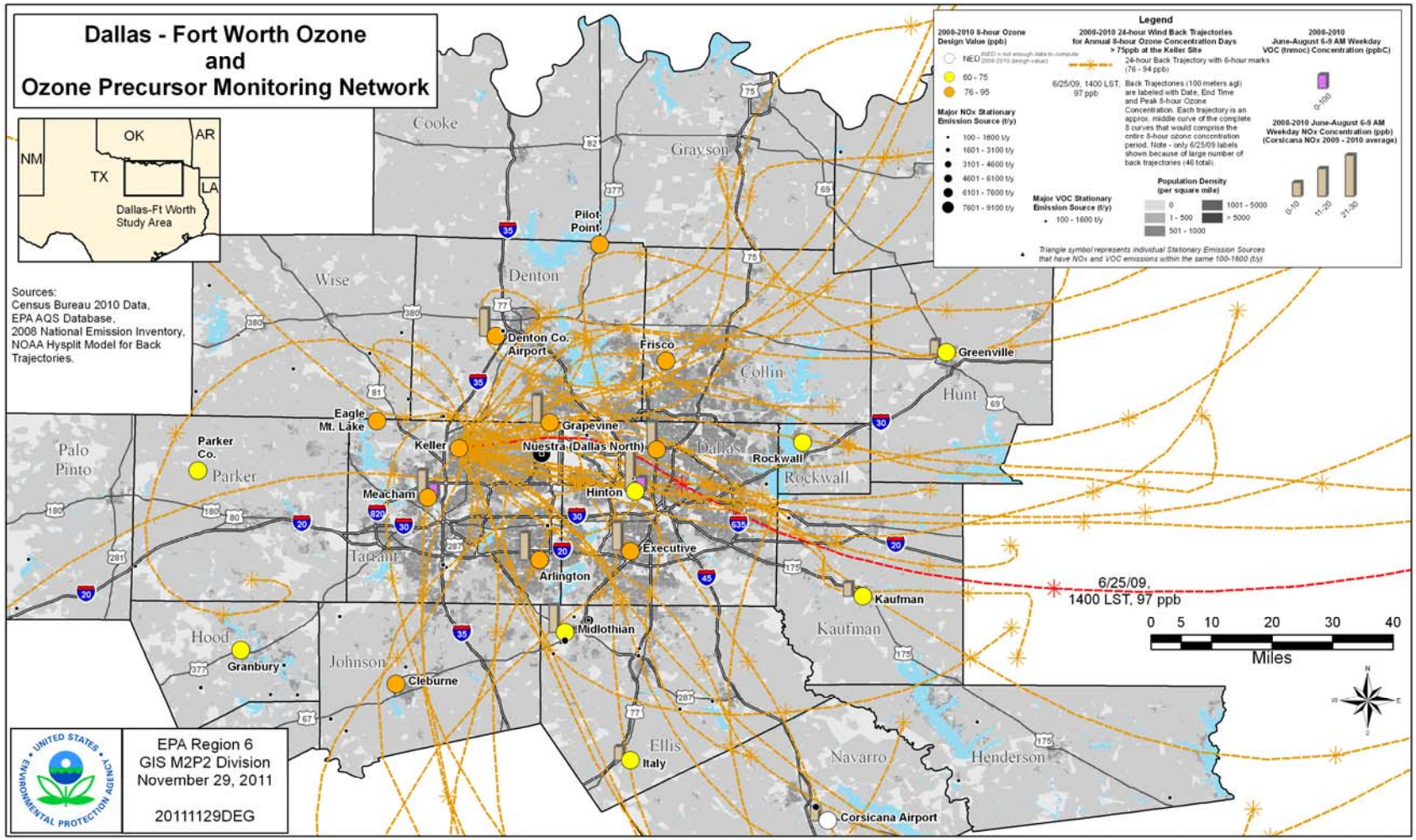


Figure 6a. NOAA HYSPLIT MODEL 24-Hour Back Trajectory Eagle Mtn. Lake Exceedances (2006-10) (zoom view).

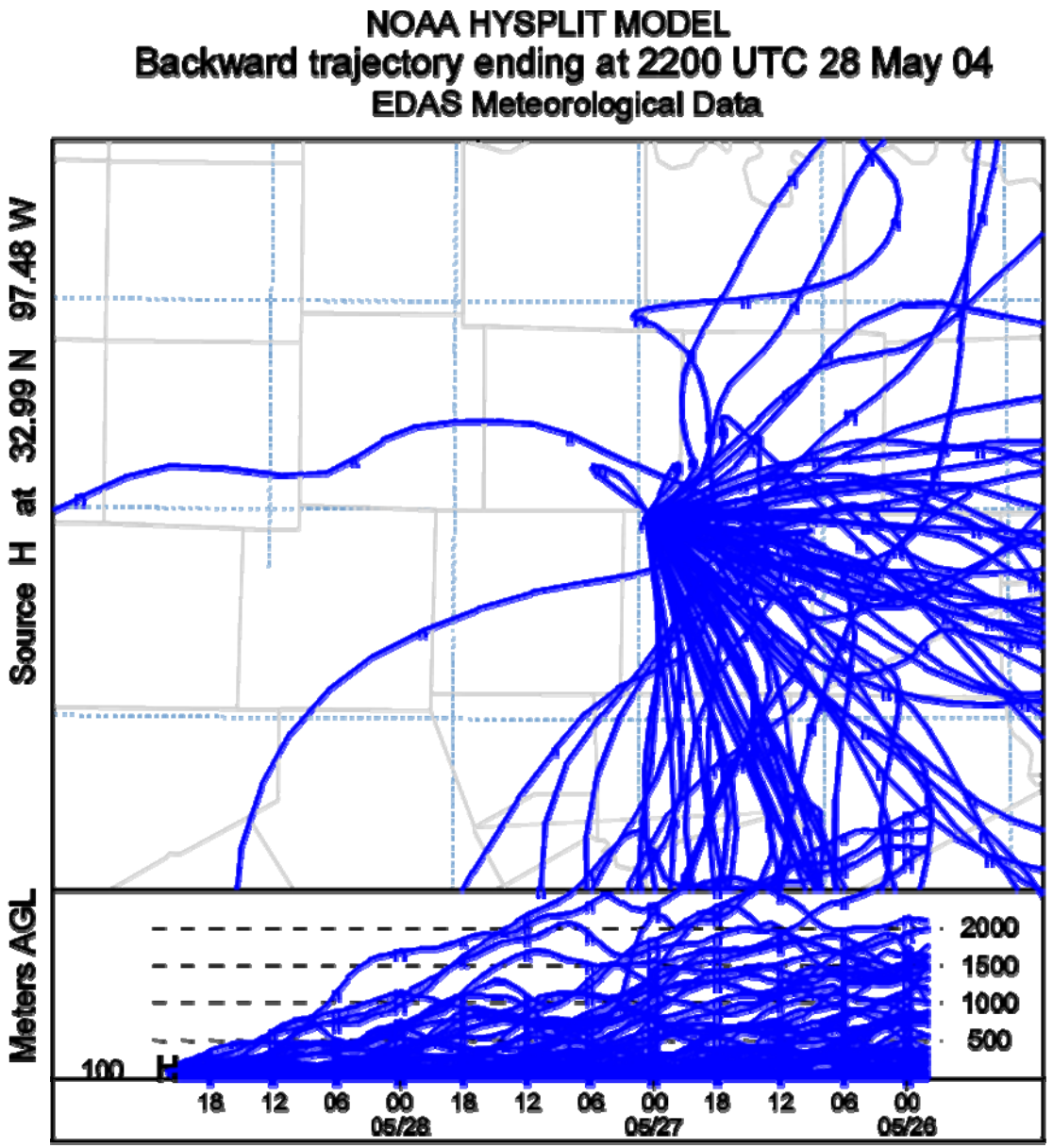


Figure 6b. NOAA HYSPLIT MODEL 24-Hour Back Trajectory Parker County Exceedances (2006-10).

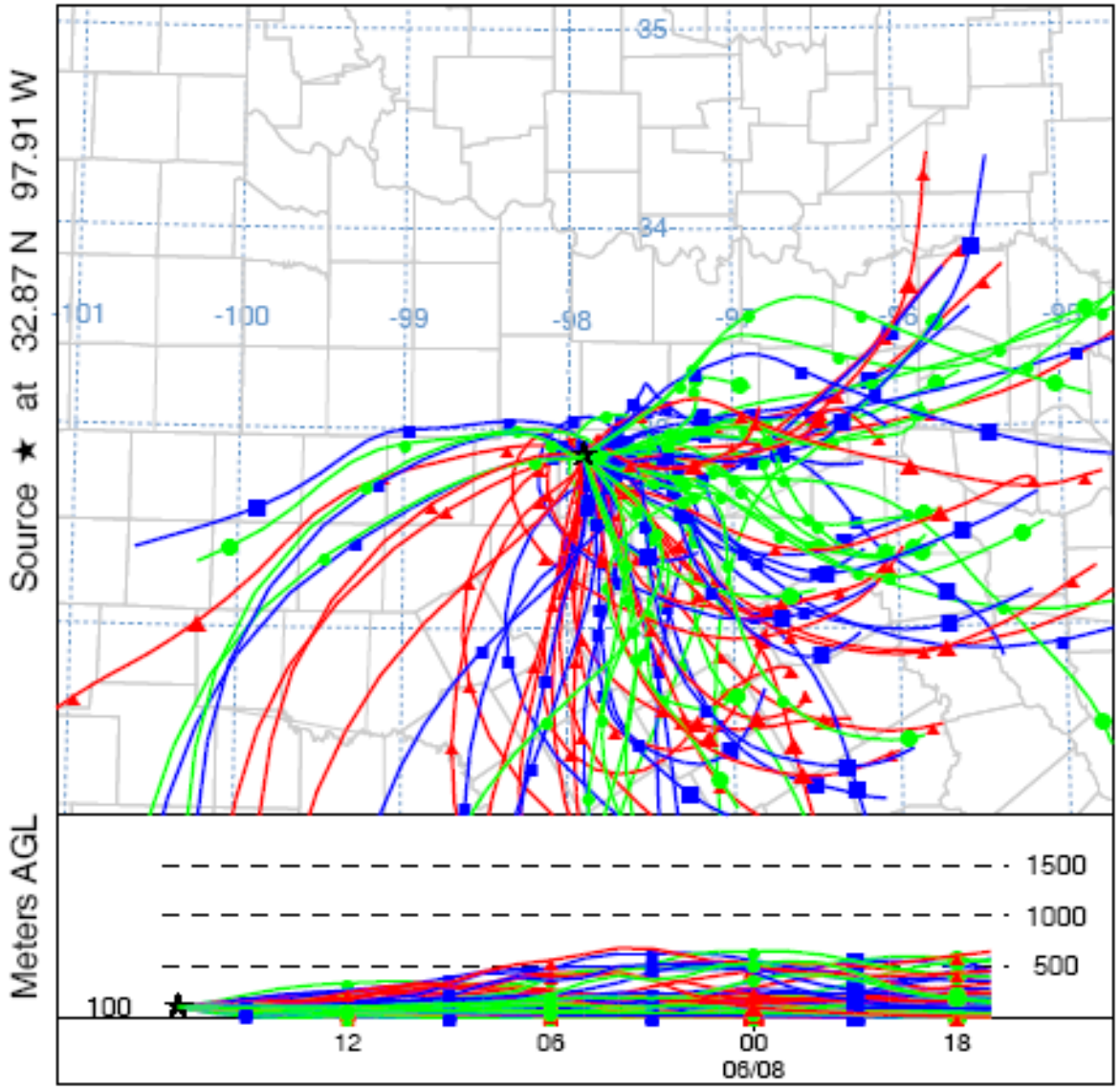


Figure 6c. NOAA HYSPLIT MODEL 24-Hour Back Trajectory Parker County Exceedances (2006-10) (zoom view).

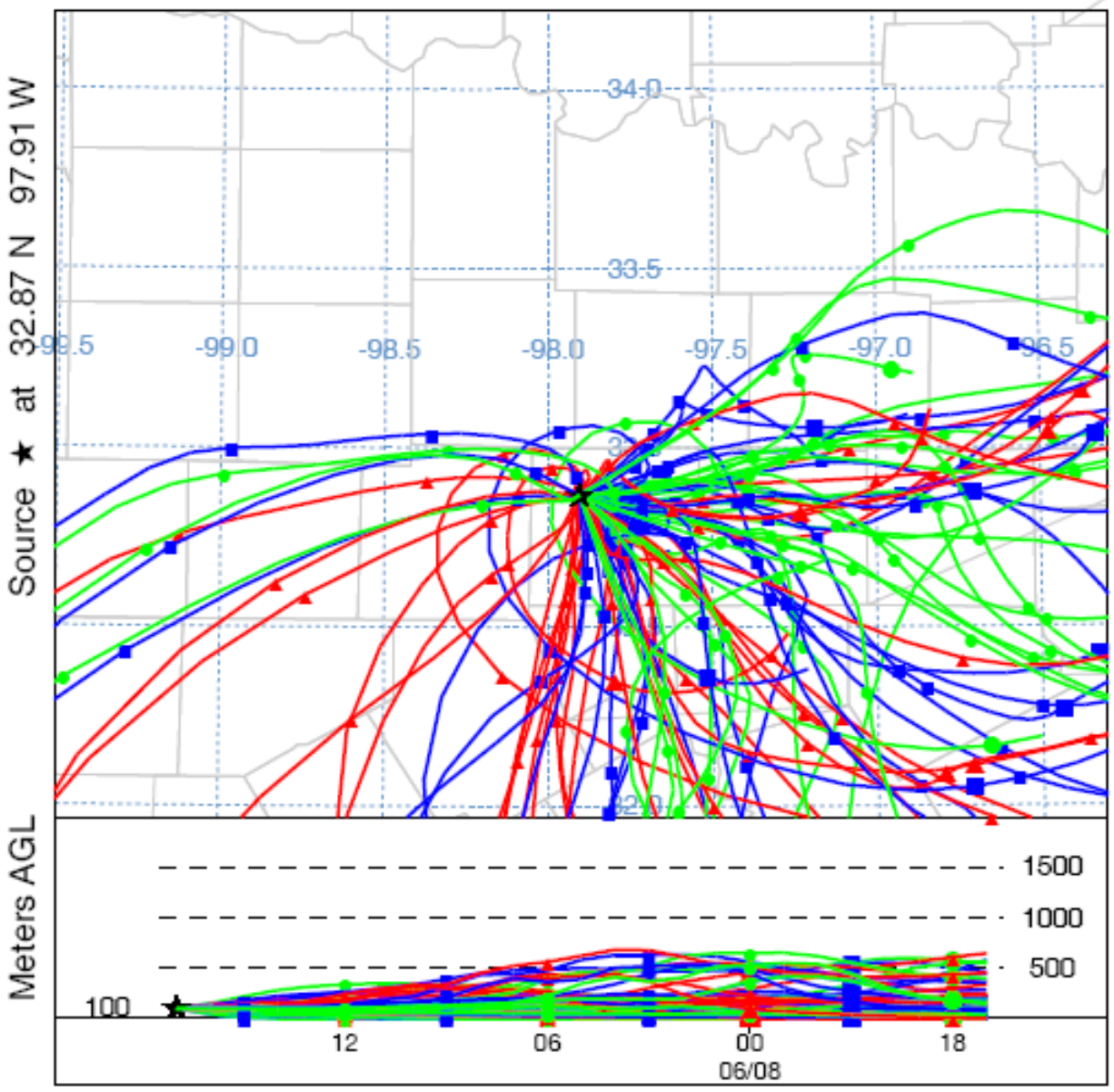


Figure 7. Houston Ozone and Ozone Precursor Monitoring Network, with Population Density

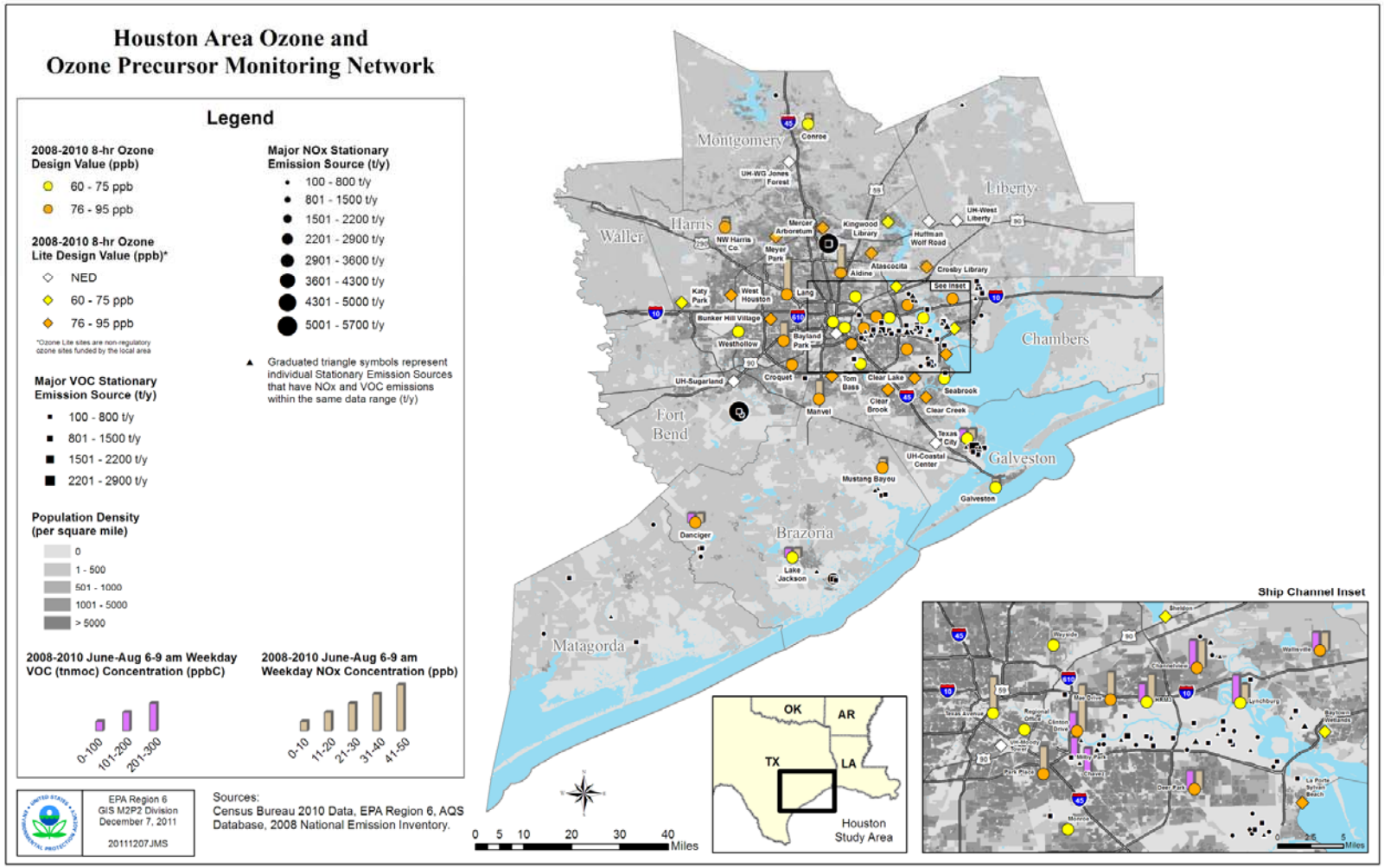


Figure 8. Population Density Change Percentage Between 2000 and 2010 Census for Houston Ozone and Ozone Precursor Monitoring Network

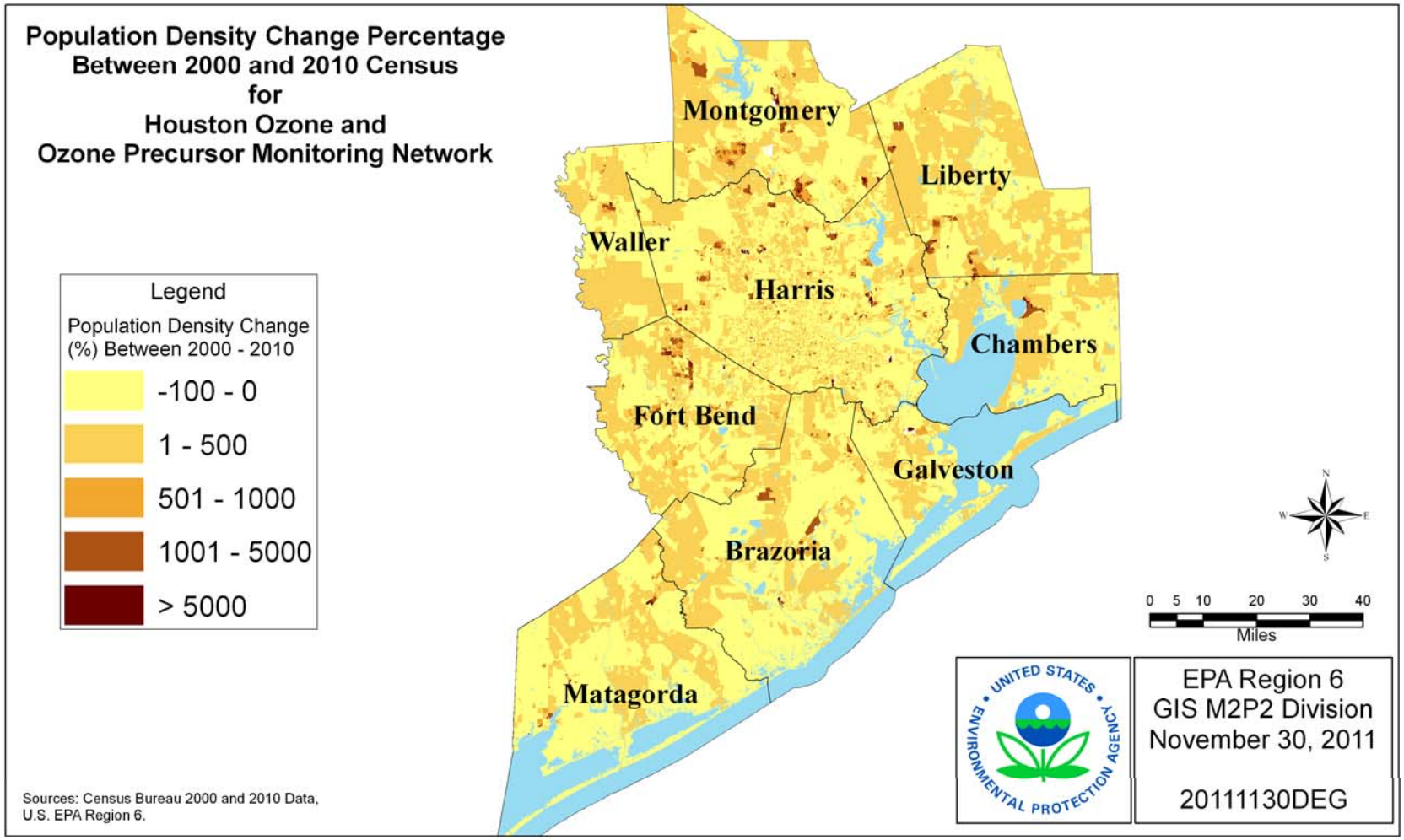


Figure 9. Overlay of 24-hour HYSPLIT back trajectories of all 75 ppb exceedances at the Manvel monitor for the 2008-2010 period

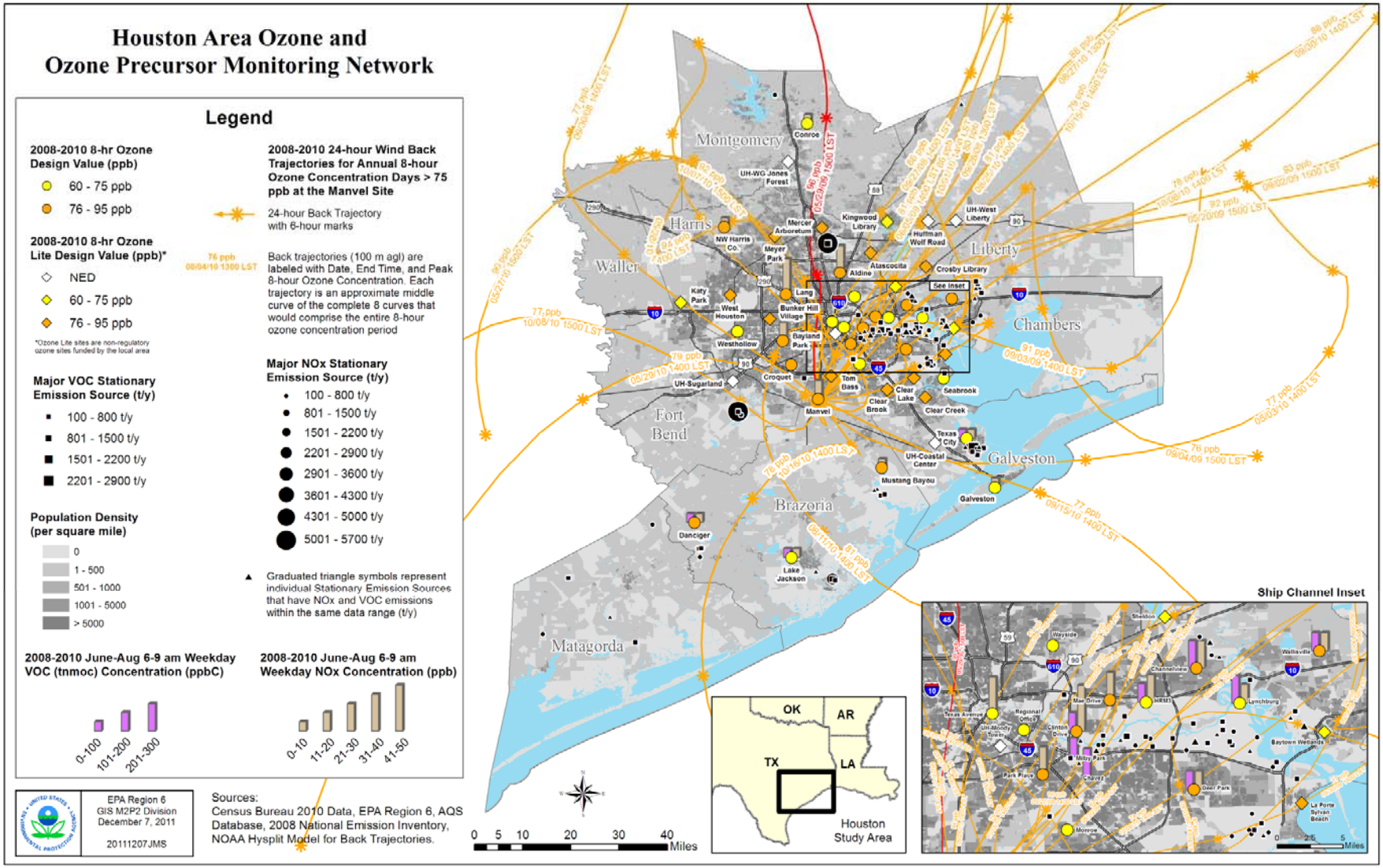


Figure 10a. NOAA HYSPLIT MODEL 24-Hour Back Trajectory Manvel Exceedances (2006-10).

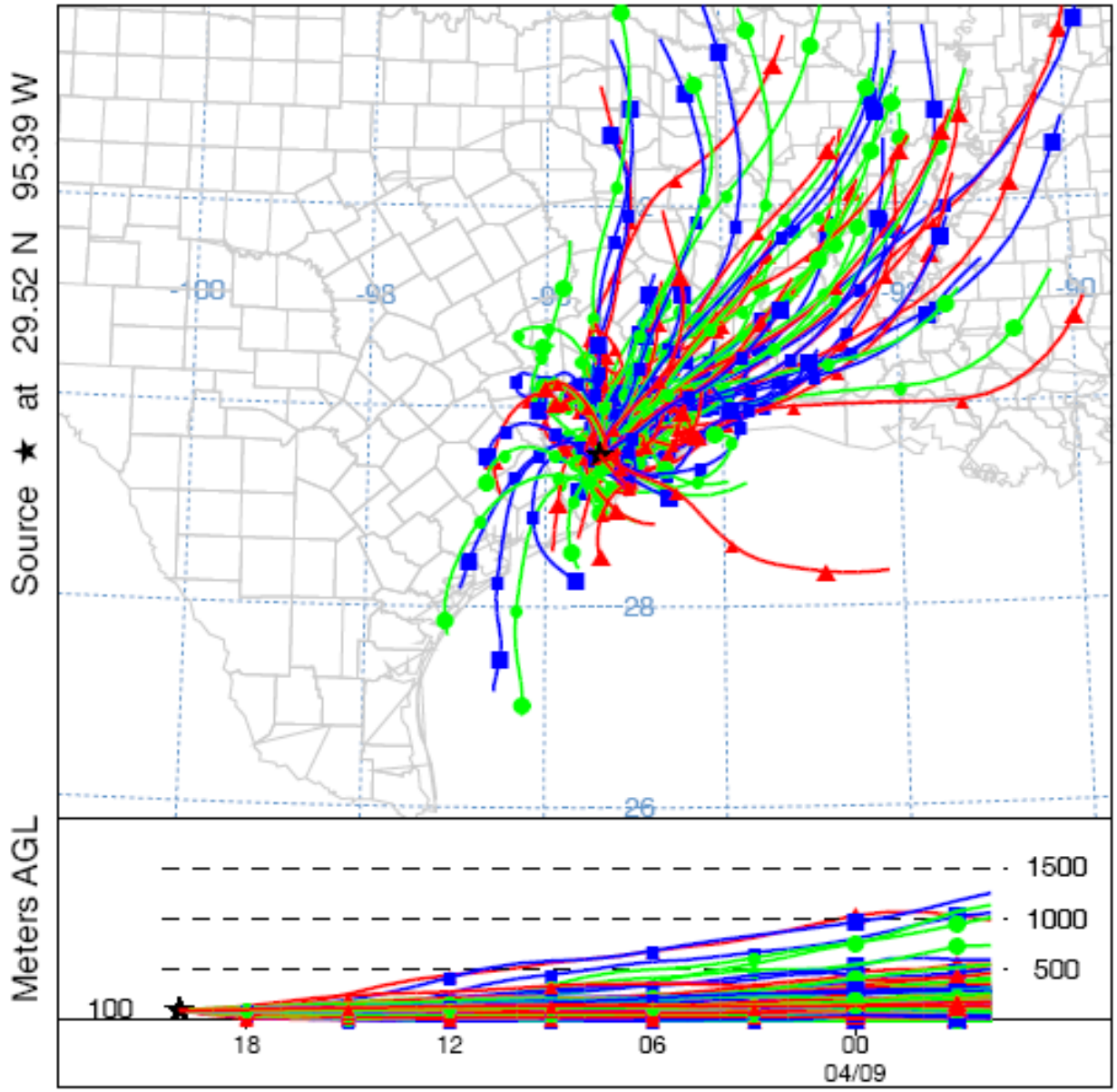


Figure 10b. NOAA HYSPLIT MODEL 24-Hour Back Trajectory Manvel Exceedances (2006-10) (zoom view).

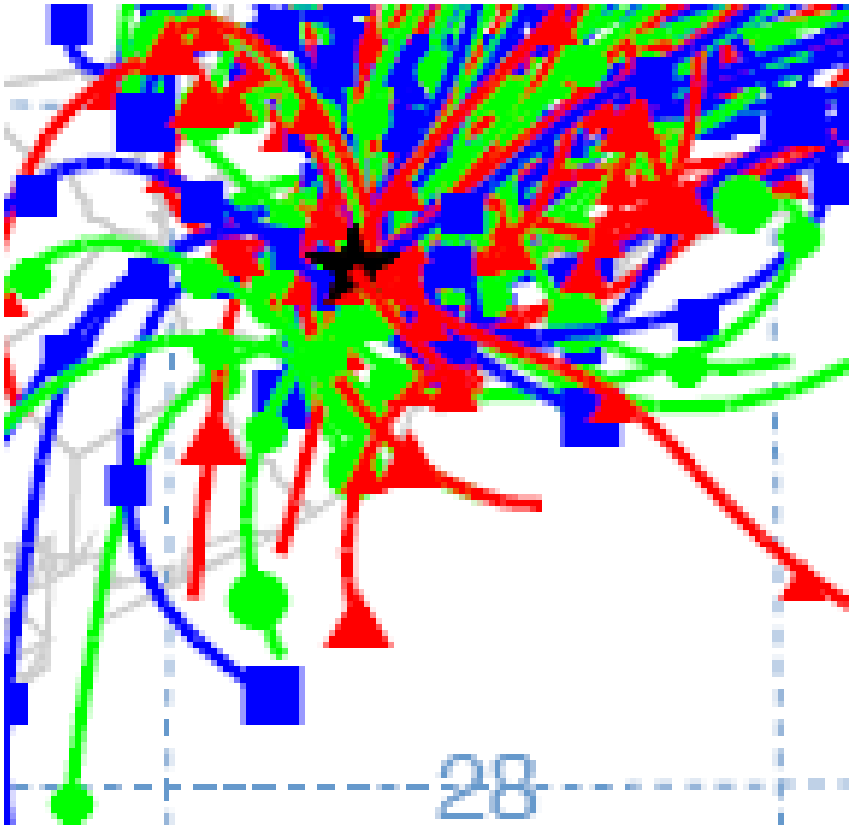


Figure 10c. NOAA HYSPLIT MODEL 24-Hour Back Trajectory NWHarris Exceedances (2006-10).

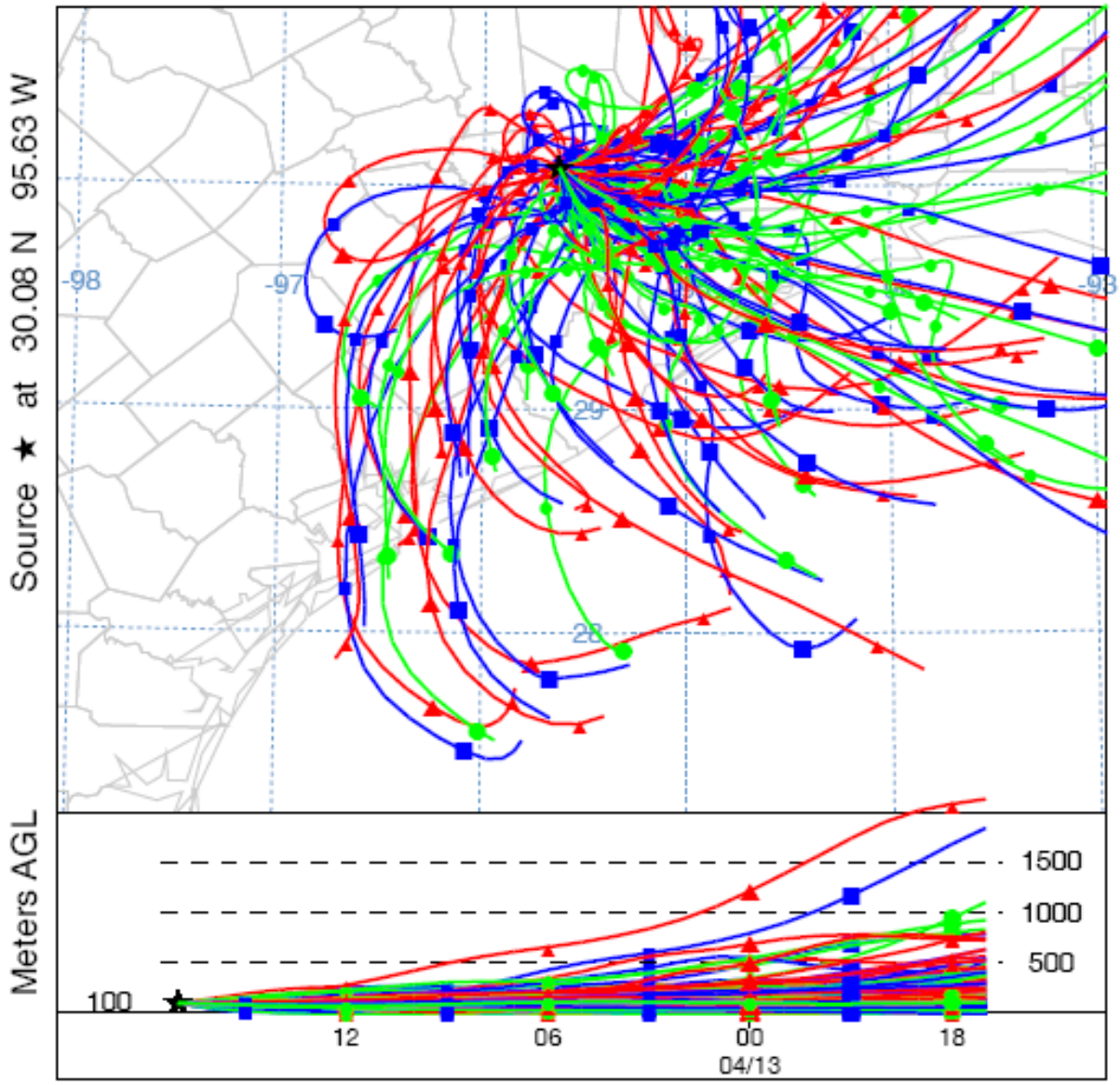


Figure 10d. NOAA HYSPLIT MODEL 24-Hour Back Trajectory NWHarris Exceedances (2006-10) (zoom view).

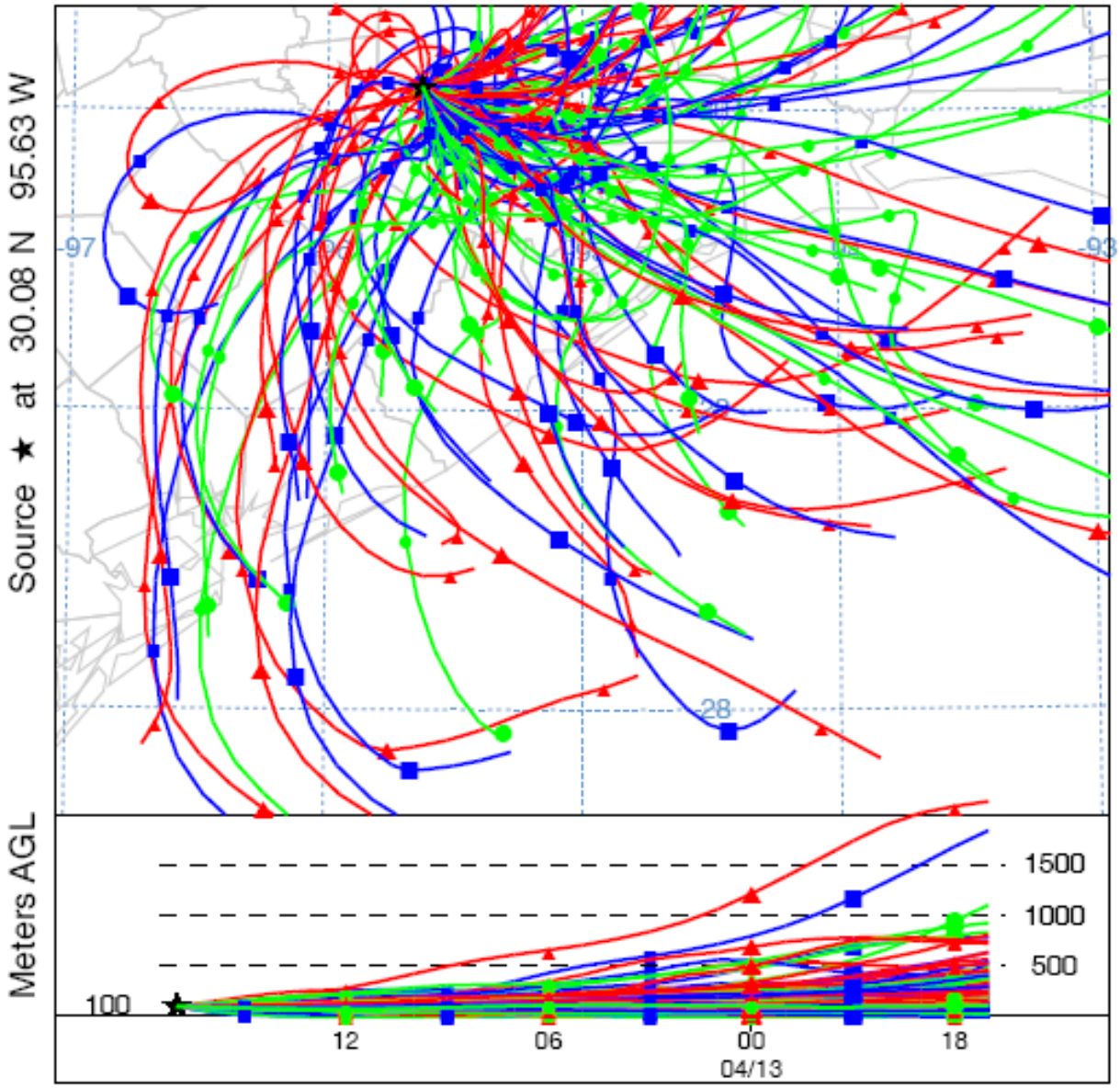


Figure 10e. NOAA HYSPLIT MODEL 24-Hour Back Trajectory Wallisville Exceedances (2006-10).

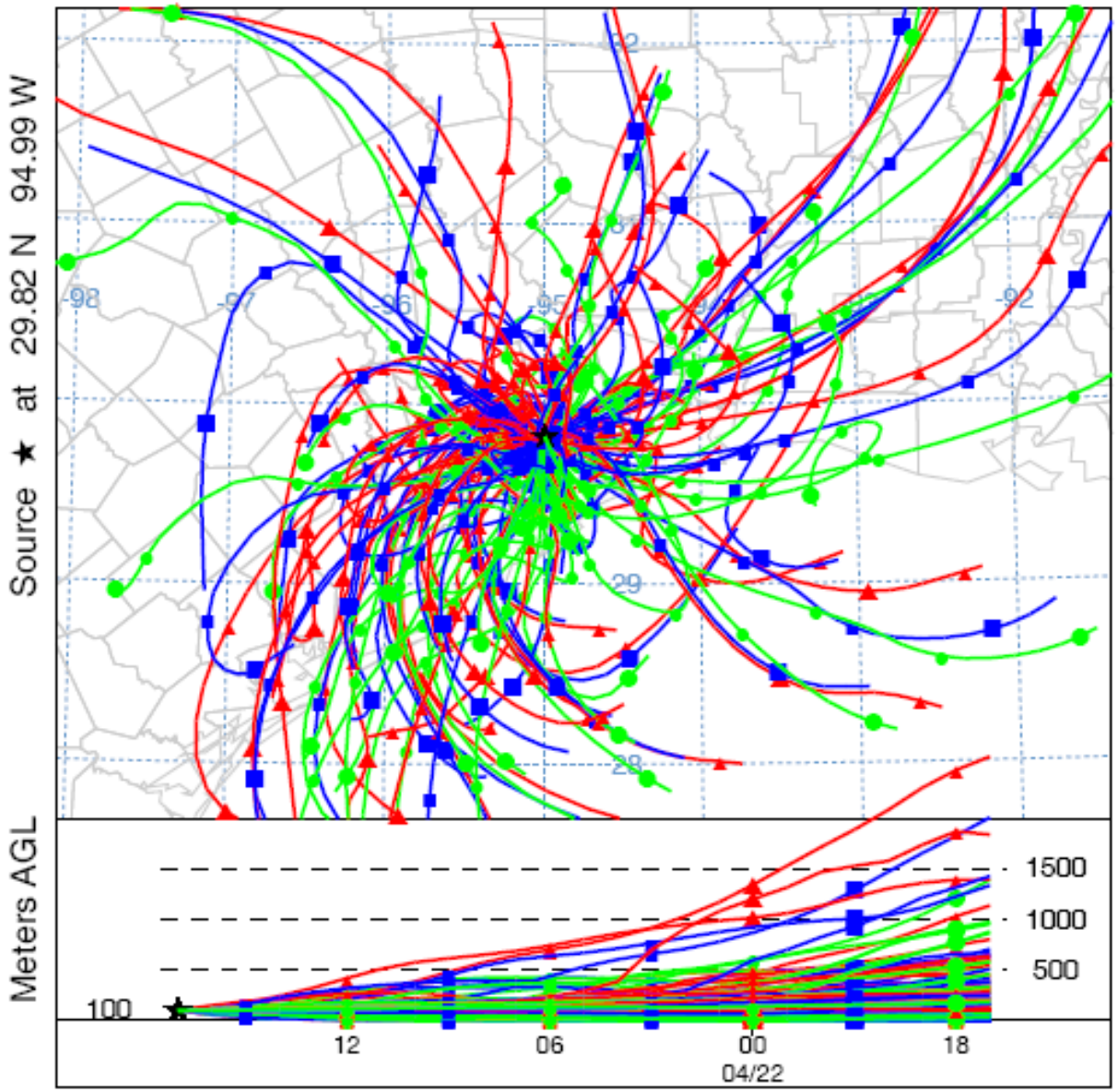
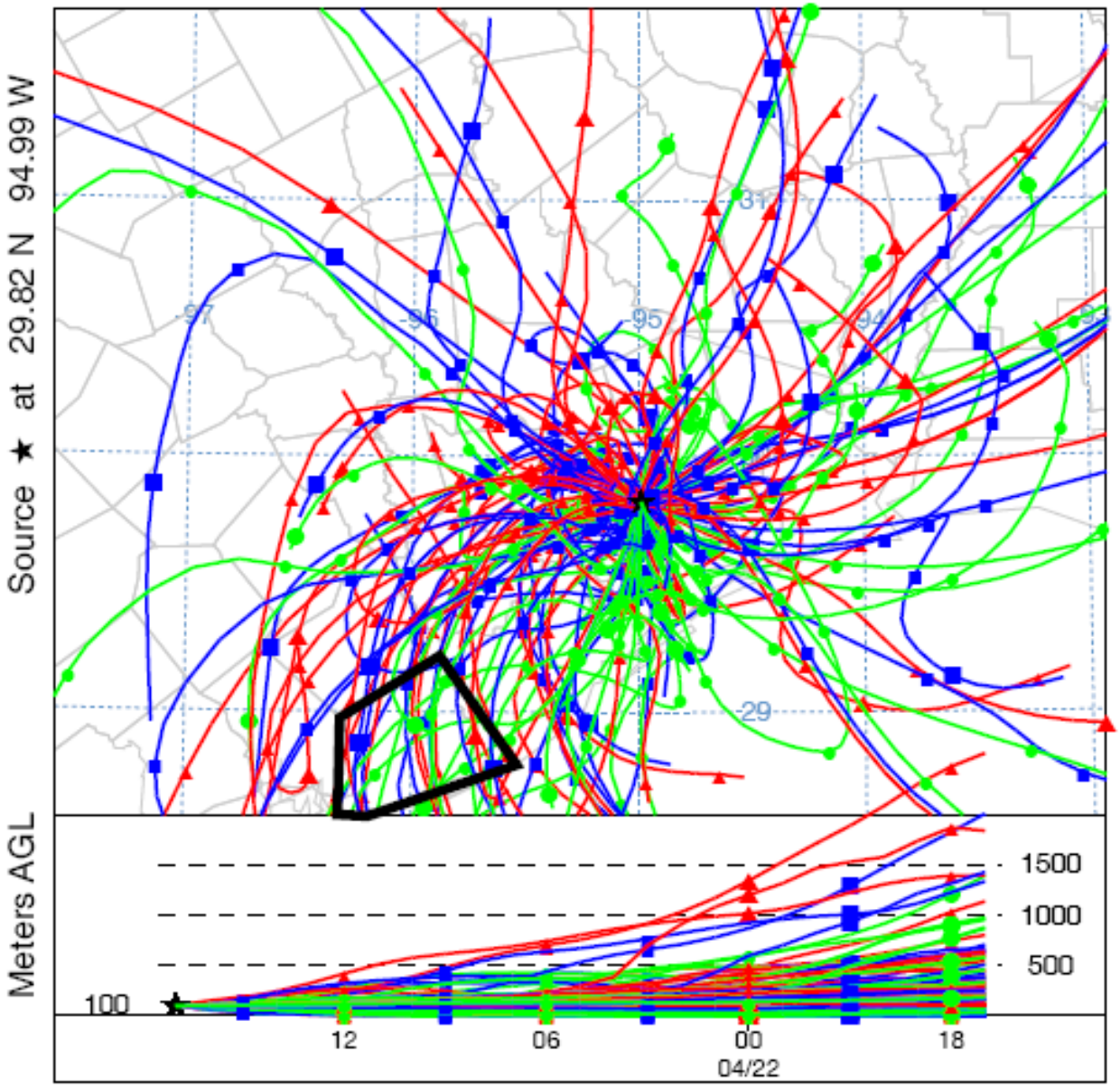


Figure 10f. NOAA HYSPLIT MODEL 24-Hour Back Trajectory Wallisville Exceedances (2006-10) (zoom view).



Black Polygon is the approximate boundaries of Matagorda County

Figure 10g. NOAA HYSPLIT MODEL 24-Hour Back Trajectory Texas City Exceedances (2006-10).