APPENDIX D

TECHINICAL SUPPORT DOCUMENT

MODELING TO SUPOPRT THE BATON ROUGE, LOUISIANA 8-HOUR OZONE STATE IMPLEMENTATION PLAN

ENVIRON International Corporation

TECHNICAL SUPPORT DOCUMENT

Modeling to Support the Baton Rouge, Louisiana 8-Hour Ozone State Implementation Plan

Prepared for

Louisiana Department of Environmental Quality
Office of Environmental Assessment
Air Quality Assessment Division
602 North Fifth Street
Baton Rouge, Louisiana 70802

Prepared by

ENVIRON International Corporation
773 San Marin Drive, Suite 2115
Novato, CA 94998

Eastern Research Group, Inc.
8950 Cal Center Drive, Suite 348
Sacramento, CA 95826

11 March 2009

TABLE OF CONTENTS

Page

APPENDICES

TABLES

FIGURES

EXECUTIVE SUMMARY

Photochemical modeling was conducted to support the development of the Louisiana State Implementation Plan (SIP) for the Baton Rouge 1997 8-hour ozone non-attainment area (BRNAA). The study described herein developed the photochemical modeling and analysis tools and related data bases needed to reliably simulate the complex interplay between meteorology, emissions, and ambient photochemistry during a recent 8-hour ozone exceedance episode in the BRNAA, to project those conditions to a future attainment year, and to evaluate emissions reduction strategies for inclusion in the BRNAA 8-hour ozone SIP. The BRNAA is classified as a "moderate" nonattainment area.

This study included episodic emissions (EPS3[1]), meteorological (MM5[2]), and ozone (CAMx[3]) simulations over June 2006 using a nested 36/12/4 km grid system, with the 4-km grid focused on Louisiana and the immediate Gulf coast area. Significant effort was directed towards the development of updated 2006 state-wide emission inventories for the state of Louisiana, as well as development of emission projections to 2009. The BRNAA onroad mobile source inventory was aligned with the local network modeling used to establish conformity emission budgets. A major effort was also undertaken to identify, resolve, and develop approaches to consider the impacts of Hurricane Katrina on the 2006 and 2009 Louisiana emission inventories. Fortunately, data have recently surfaced on economic and population impacts from a variety of sources; we attempted to use as much of that information as possible. Efforts also included the collection of more broad-based future year modifications, economic impacts, shut-downs, control technologies, and control penetration time lines. Emissions outside of Louisiana were leveraged from concurrent 2006 regional modeling work being conducted by the Texas Commission on Environmental Quality (TCEQ) as part of the Houston, Texas SIP.

The overall technical approach was established in modeling protocol documents developed previously (LDEQ, 2006; ENVIRON, 2007a) following the latest modeling guidance published by the EPA related to 8-hour ozone attainment demonstrations (EPA, 2007). The guidance covers many aspects of the recommended modeling approach, including model selection, episode selection, air quality application and performance evaluation, and future year projection methodology. For the 8-hour ozone standard, EPA recommends using the Modeled Attainment Test (MAT), which uses modeling results in a relative sense to project current ozone design values (DV) to the attainment year. Projections are made for specific ozone monitoring sites, as well as "un-monitored" areas covering the nonattainment and downwind areas.

The weight of evidence assembled from the modeling analyses and projection methodologies described herein demonstrates that the 8-hour ozone standard of 85 ppb will be attained in the Baton Rouge area by 2009. The Baton Rouge modeling approach evolved over the course of two years, with significant input from LDEQ, EPA Region 6, and industrial stakeholder representatives. The techniques and data developed have been well-vetted by an open, on-going process managed by LDEQ. Reviewers may identify additional issues with the approach,

[1] Emissions Processing System, version 3 (ENVIRON, 2007b)
[2] Fifth Generation Mesoscale Model (Grell et al., 1994)
[3] Comprehensive Air quality Model with Extensions (ENVIRON, 2008).

datasets, and assumptions, but we regard this work as striking the best balance between technical rigor and available schedule/resources while adhering to the intent of the EPA modeling guidance.

ES.1 METEOROLOGICAL MODELING

The MM5 meteorological modeling of June 2006 was conducted for the LDEQ by a staff member of EPA Region 7 while on temporary assignment to the EPA's Office of Air Quality Planning and Standards[4]. EPA ran a single MM5 simulation, configuring its physics and FDDA algorithms according to the best performing of four different MM5 runs of the May 2005 BRNAA ozone episode (May 2005 modeling was supported by a local industrial stakeholder group), as reported by Alpine Geophysics (AG[5]). The basic MM5 physics configuration was based on extensive TCEQ modeling of the Texas Gulf Coast over the past several years as part of the TexAQS II field study program. A brief model performance evaluation of EPA's June 2006 MM5 run was conducted by AG, with specific emphasis on characterizing quantitative bias and error statistics for winds, temperature, and humidity in southeast Louisiana. The performance evaluation allowed us to discern the representativeness of the simulated meteorological fields over southeast Louisiana and to qualitatively review modeling uncertainties.

MM5 performed generally well in replicating the diurnal variations and synoptic trends of winds in southeast Louisiana, although the model tended to over predict morning minima and afternoon peak winds. This likely had ramifications for photochemical model performance as the morning build-up of precursor pollutants under stagnant conditions was likely over-ventilated. Simulated surface wind directions, while acceptable, were not as good as typically achieved in many other MM5 applications. This could be related to diurnal forcings associated with daily sea breeze penetration into southeast Louisiana, which in turn likely affected the dispersion patterns of the BRNAA ozone plume. In contrast, temperature and humidity performance over southeast Louisiana was remarkably good relative to the other recent episodic SIP modeling efforts. Temperatures specifically showed a very good replication of the full diurnal range as well as the modulation of the temperature wave under various synoptic regimes. MM5 tends to do very well for humidity, especially in warm humid climates such as the summertime Gulf Coast. Statistical parameters were at or well within established meteorological performance benchmarks (Table ES-1).

ES.2 EMISSIONS PROCESSING

This study placed a major emphasis on developing emissions estimates within the state of Louisiana, with particular focus on the BRNAA. Emissions processing employed EPS3 to convert the emission inventory into the hourly, chemically speciated, and gridded formats needed by CAMx. Other emission modeling tools were used to estimate emissions from specific categories, such as GloBEIS[6] (for biogenics) and NMIM/MOBILE6[7] (for onroad and nonroad

[4] Mr. Bret Anderson conducted the June 2006 MM5 modeling for this study.

[5] Alpine Geophysics, LLC, is a modeling contractor for the Baton Rouge 8-Hour Ozone SIP Coalition, a local industrial stakeholder group.

[6] The Global Biosphere Emissions and Interactions System (Yarwood et al., 2003).

Table ES-1. MM5 model performance statistics averaged over the entire June 2006 episode, compared against the Ad Hoc performance benchmarks, and against results from 60 recent meteorological modeling studies across the U.S.

Parameter/Statistic	Episode Mean	Ad-Hoc Benchmark	60 Met Modeling Studies Across U.S.		
			Mean	Lower Std Deviation	Upper Std Deviation
Scalar-mean observed wind speed (m/s)	2.10				
Scalar-mean predicted wind speed (m/s)	2.64				
Standard deviation observed wind speed (m/s)	1.23				
Standard deviation predicted wind speed (m/s)	1.32				
Wind speed RMSE (m/s)	1.48	2.0	2.11	1.60	2.62
Mean observed wind direction (deg)	92				
Mean predicted wind direction (deg)	123				
Std deviation observed wind direction (deg)	50				
Std deviation predicted wind direction (deg)	47				
Mean wind direction difference (deg)	31	30	25	0	50
Temperature bias (C)	-0.39	±0.5	-0.10	-0.82	0.62
Temperature gross error (C)	0.95	2.0	2.00	1.55	2.45
Humidity bias (g/kg)	0.23	±1.0	-0.12	-1.04	0.80
Humidity gross error (g/kg)	1.62	2.0	1.78	0.00	3.58

mobile sources). The EPS3 setup was built upon 2005/2009 regional ozone modeling inventory processing developed by the TCEQ; statewide emissions outside of Louisiana were taken from the TCEQ inventories for both base and future years. Emissions in Louisiana were updated for the 2006 modeling episode based on available information provided by the LDEQ, Louisiana Department of Transportation and Development (DOTD), and the Capitol Region Planning Commission (CRPC). The 2006 update considered the significant impacts of Hurricane Katrina on population, economic, and traffic patterns. Day- and hour-specific NO_x emissions for electric generating units throughout the modeling domain were extracted from the EPA acid-rain database and were supplemented with data provided by LDEQ. Offshore emissions were developed from data available from the U.S. Minerals Management Service (MMS).

Louisiana emissions estimates for 2009 were based on projections developed from numerous sources. New point facilities were introduced, some facilities were removed because they have since shut down, and emissions from existing facilities were grown according to information provided by LDEQ. Area and nonroad sources were projected according to economic and population information. Projections of mobile sources included changes in fleet age and traffic volumes according to the latest registration data and transportation demand modeling. Offshore emissions and biogenic emissions were held constant from the 2006 Base Year.

Mobile source emissions were estimated with an incrementally increasing level of detail for the state of Louisiana and the BRNAA. June 2006 and 2009 onroad emissions in the state of Louisiana were developed using EPA's NMIM model, while emissions within the nonattainment area were developed based on parish-specific inputs provided by several state agencies. Specifically, two different nonattainment area onroad inventories were generated for each modeling year: (1) an initial inventory based on parish-level monitored HPMS[8] vehicle miles traveled (VMT) and MOBILE6 inputs; and (2) a final inventory based on link-level VMT derived from a transportation demand model and parish-level MOBILE6 inputs.

[7] The EPA's National Mobile Inventory Model; the EPA's onroad mobile emissions factor model.
[8] Highway Performance Monitoring System

EPS3 was used to generate model-ready hourly point, area, nonroad mobile, and onroad mobile emissions of Carbon Bond 2005 (CB05) compounds on the 36/12/4-km grid system for a representative weekday, Friday, Saturday and Sunday (daily for acid rain point sources). Biogenic emissions were developed separately using the GloBEIS model, which estimated hourly emission rates on all grids for each day of the June 2006 modeling episode. Speciation to CB05 compounds was performed by applying standard source-specific profiles derived from the EPA SPECIATE database. These profiles were assigned to each of the source categories contained in the raw emissions inventory files using default EPS3 cross-references. The same speciation was used for both 2006 and 2009. Temporal allocation for most source categories was similarly applied using default EPS3 seasonal, monthly, day-of-week, and hourly profiles and cross-references as necessary for the various inventory components. For most source categories, these temporal assignments were used for both 2006 and 2009. Spatial allocation to the 36-km modeling domain utilized the TCEQ's EPS3 gridding files; however, spatial surrogate data for the 4- and 12-km modeling grids were developed specifically for this project from EPA population and landuse/landcover distributions, as well as the traffic network data in the Baton Rouge area. The resulting surrogates were assigned to each of the source categories contained in the raw emissions inventory files using default EPS3 cross-references. For most source categories, these spatial surrogates were used for both 2006 and 2009.

The 2006 base year emissions within the 5-Parish Baton Rouge area are summarized in Table ES-2. Note that the onroad emissions shown are from the initial monitored VMT approach (not the modeled link-level VMT approach). Also note that reported biogenic emissions were derived from gridded emissions (i.e. each cell only represents one parish that covers a majority of the cell area) and the biogenic VOC are reported as Total organics (TOG). The 2009 future year emissions within the 5-Parish Baton Rouge area are similarly summarized in Table ES-3.

Table ES-2. June 2006 typical weekday emissions (tons/day, TDP) within the BRNAA.

FIPS	Parish	Area	Nonroad	Onroad	Point	Biogenics
NOx (TPD)						
22005	Ascension	2.8	8.0	4.5	20.7	0.2
22033	East Baton Rouge	5.5	12.0	12.6	26.2	0.4
22047	Iberville	2.2	6.1	3.2	22.8	0.7
22063	Livingston	0.9	1.3	6.0	0.2	0.3
22121	West Baton Rouge	1.2	7.9	3.0	3.5	0.9
VOC (TPD)						
22005	Ascension	20.3	1.6	2.9	7.8	10.2
22033	East Baton Rouge	32.0	6.0	8.8	15.4	25.6
22047	Iberville	17.5	1.8	1.3	7.1	28.9
22063	Livingston	5.0	3.6	3.2	1.1	82.7
22121	West Baton Rouge	3.9	2.1	1.4	1.7	16.1
CO (TPD)						
22005	Ascension	15.2	20.1	32.6	9.8	2.5
22033	East Baton Rouge	7.1	103.6	105.3	29.7	3.9
22047	Iberville	18.0	11.3	15.6	7.4	7.1
22063	Livingston	12.2	19.4	36.7	1.6	14.3
22121	West Baton Rouge	6.3	17.0	17.8	6.4	3.5

Table ES-3. June 2009 typical weekday emissions (tons/day) within the 5-Parish BRNAA.

FIPS	Parish	Area	Nonroad	Onroad	Point	Biogenics
NOx (TPD)						
22005	Ascension	3.0	7.1	3.6	22.6	0.2
22033	East Baton Rouge	5.7	11.1	11.2	27.0	0.4
22047	Iberville	2.3	5.5	2.6	25.3	0.7
22063	Livingston	1.0	1.2	5.2	0.2	0.3
22121	West Baton Rouge	1.2	7.1	2.5	3.6	0.9
VOC (TPD)						
22005	Ascension	21.9	1.4	2.5	11.3	10.2
22033	East Baton Rouge	33.3	5.1	8.3	17.4	25.6
22047	Iberville	17.9	1.5	1.1	7.4	28.9
22063	Livingston	5.4	3.3	2.9	1.1	82.7
22121	West Baton Rouge	4.1	2.0	1.3	1.8	16.1
CO (TPD)						
22005	Ascension	16.1	20.1	28.2	9.8	2.5
22033	East Baton Rouge	7.4	107.3	98.6	29.2	3.9
22047	Iberville	17.9	11.0	13.4	7.3	7.1
22063	Livingston	13.5	20.0	33.3	1.6	14.3
22121	West Baton Rouge	6.3	17.6	15.6	6.4	3.5

ES.3 BASE YEAR PHOTOCHEMICAL MODELING

The CAMx photochemical model was used to simulate ozone levels in BRNAA during the period of May 26 to July 1, 2006 (i.e., the Base Year). Standard CAMx pre-processing tools were used to develop meteorological, emissions, initial/boundary conditions, and photochemical inputs for each day of the episode. Predictions of ozone, as well as nitrogen oxide (NOx) and volative organic compound (VOC) precursors, were compared to measurements recorded at up to ten Air Quality System (AQS) monitoring sites and four Photochemical Assessment Monitoring Stations (PAMS) within the BRNAA. The process to establish reliable CAMx 8-hour ozone modeling consists of a multi-step cycle of model testing, ultimately culminating in a modeling application demonstrated to exhibit minimal bias and error and shows that it can be used reliably to perform the 8-hour ozone attainment demonstration. EPA guidance for 8-hour ozone modeling de-emphasizes reliance on statistical performance "goals" to define a properly working model, and stresses performing corroborative and confirmatory analysis to assure that the model is working correctly. Therefore, over a dozen CAMx "developmental" runs were conducted and evaluated in an effort to improve model performance and to characterize ozone sensitivity to changes in various model inputs. These runs included modifications to certain emissions, meteorological, and boundary condition inputs, as well as the use of the Plume-in-Grid (PiG) sub-model. The runs are listed below along with a brief statement of their results:

- **Run 1**: initial run with preliminary 2006 base year emissions, with parish level HPMS-based BRNAA onroad emissions inventory
  - Large and consistent ozone under predictions, many exceedance days outside EPA 1-hour acceptance criteria

- **Run 2**: improved base year emissions, with parish level HPMS-based BRNAA onroad emissions inventory
  - Improved ozone performance, on some days dramatically, several exceedance days still outside EPA criteria
- **Run 3**: replaced O'Brien vertical diffusivity approach with CMAQ[9] approach and 1 m^2/s minimum diffusivity (Kv), otherwise same as Run 2
  - Further improved ozone performance from Run 2, only two exceedance days (June 3 and 15) outside EPA criteria
- **Run 4**: replacd O'Brien diffusivity approach with CMAQ approach and 0.1 m^2/s minimum Kv, otherwise same as Run 2
  - Overall best run between Runs 3 and 4 – Run 4 replicates overnight ozone better than in Run 3
- **Run 5**: applied the PiG submodel to large NOx point sources throughout the modeling domain, otherwise same as Run 2
  - Negligible impact on peak or overall ozone performance
- **Run 6**: replaced boundary conditions with June-averaged space/time varying fields extracted from 2002 VISTAS[10]/GEOS-CHEM[11] simulation, continued use of PiG, otherwise same as Run 4
  - Minor improvements in performance overall – statistically the best performing simulation of the first 6 runs
- **Run 7**: replaced boundary conditions with June 2006 day-specific space/time varying fields extracted from 2006 RPO[12]/MOZART[13] simulation, continued use of PiG, otherwise same as Run 4
  - Minor degradations in performance overall relative to Run 4, revisited in Run 10a with an improved data extraction process
- **Run 8**: increased VOC via simple scaling of point source emissions in two parishes, otherwise same as Run 7
  - Negligible impact on ozone performance, although VOC:NOx performance improved to very near measured levels
- **Run 10a**: replaced boundary conditions with improved June 2006 day-specific space/time varying fields extracted from 2006 RPO/MOZART simulation, otherwise same as Run 6
  - Minor positive and negative differences in ozone
- **Run 12**: modified input vertical diffusivity fields to set minimum diffusivity values in the lowest ~100 m according to landuse classifications (urban is associated with the largest increase to 1 m^2/s to account for roughness and heat input effects at night), otherwise same as Run 6
  - Little impact on ozone, but large reductions in nighttime and early morning NOx concentrations, dramatically improving NOx statistical performance

[9] EPA's Community Multi-scale Air Quality Model.
[10] Visibility Improvement State and Tribal Association of the Southeast.
[11] Harvard University's global chemistry model.
[12] Regional Planning Organizations (i.e., CENRAP, VISTAS).
[13] National Center for Atmospheric Research's global chemistry model.

- **Run 13**: used the modified vertical diffusivity fields of Run 12 and the MOZART day-specific boundary conditions in Run 10a, otherwise same as Run 6
  - Similar results as Run 12
  - Used as final 2006 CAMx Base Case simulation (with HPMS-based BRNAA onroad emissions inventory)
- **Run 14**: added fugitive PAR (paraffin) emissions to account for potential impacts from barges, otherwise same as Run 13
  - Negligible impacts to ozone, mixed results for PAR, mixed results for VOC:NOx
- **Run 15**: introduced an updated BRNAA onroad emissions inventory based on modeled link-level activity data, otherwise same as Run 13
  - Similar results as Run 13
  - Used as final 2006 CAMx Base Case simulation (with link-level BRNAA onroad emissions inventory)

Of the exceedance days occurring during the June 2006 modeling episode, CAMx performed well in replicating daily peak and overall ozone, far exceeding older EPA bias and gross error benchmarks (e.g., Figures ES-1 through ES-3). However, peak ozone tended to be under predicted on most days by several ppb, and two high ozone dates (June 1 and June 15) continued to perform poorly for all CAMx runs. The problem on June 15 was rooted to a poor simulation of a weather system that approached Baton Rouge from the northwest, drawing high southerly winds over Louisiana that tended to over-ventilate ozone and precursors. Furthermore, ozone observations in southeastern Louisiana on this day showed moderate ozone levels in the 70 ppb range while CAMx generated only clean values in the 40 ppb range (Figure ES-4).

As for ozone precursors, NOx (Figure ES-5) tended to be over predicted, especially in the urban center. NOx tended to be under predicted at some rural sites, likely due to some local source(s) that the grid model could not resolve. VOC indicated a mix of some over and under predictions at the four PAMS sites, but in general performance in replicating CB05 aggregated species was very good (e.g., Figure ES-6). VOC:NOx ratios were mostly under predicted, again suggesting too much NOx (Figure ES-7). Modifications to vertical diffusivities helped to reduce the NOx over prediction problem, with no major impact on ozone concentrations.

Indications from infrared imaging over the past few years have suggested that barges, which are often moored for extended periods along the Mississippi River within Baton Rouge, could be the source of fugitive VOC emissions, especially when their hatches are left open. One CAMx run investigated the potential impact of these additional emissions by adding ~100 TPD of the CB05 species “PAR” (light single-bond paraffin compounds) at specific sites along the river that correspond to loading platforms associated with local refineries. While there were negligible impacts to ozone, results for PAR were mixed; certain days were better simulated at some PAMS sites, but on average PAR was over predicted. Given the large uncertainties in these emissions, and the fact that the model was performing well without this component, it was decided that barge fugitive VOC emissions were currently not sufficiently quantifiable in magnitude, space, and time for SIP modeling.

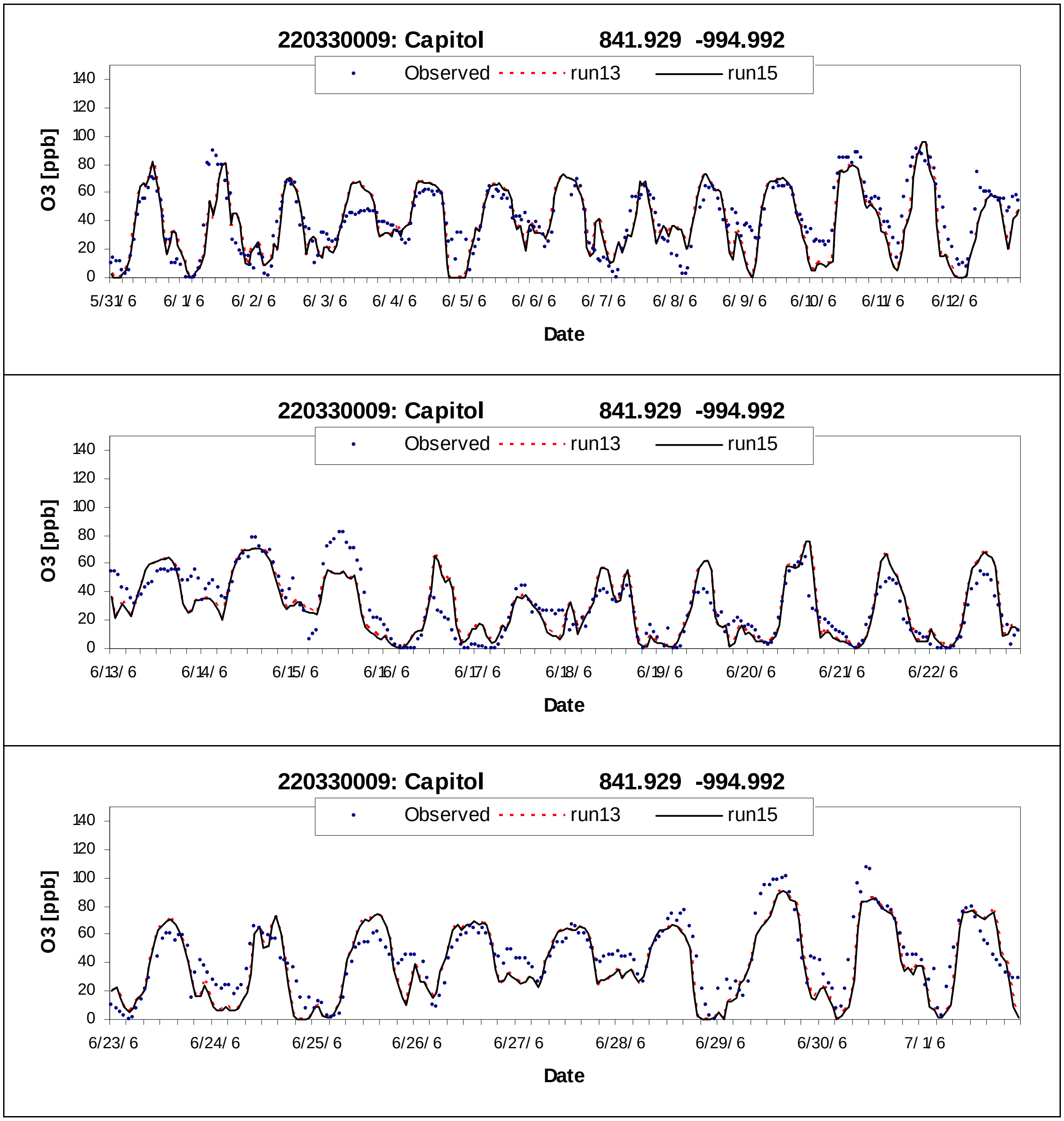


Figure ES-1. Time series of observed and predicted (Run 13 and 15) hourly ozone at Capitol.

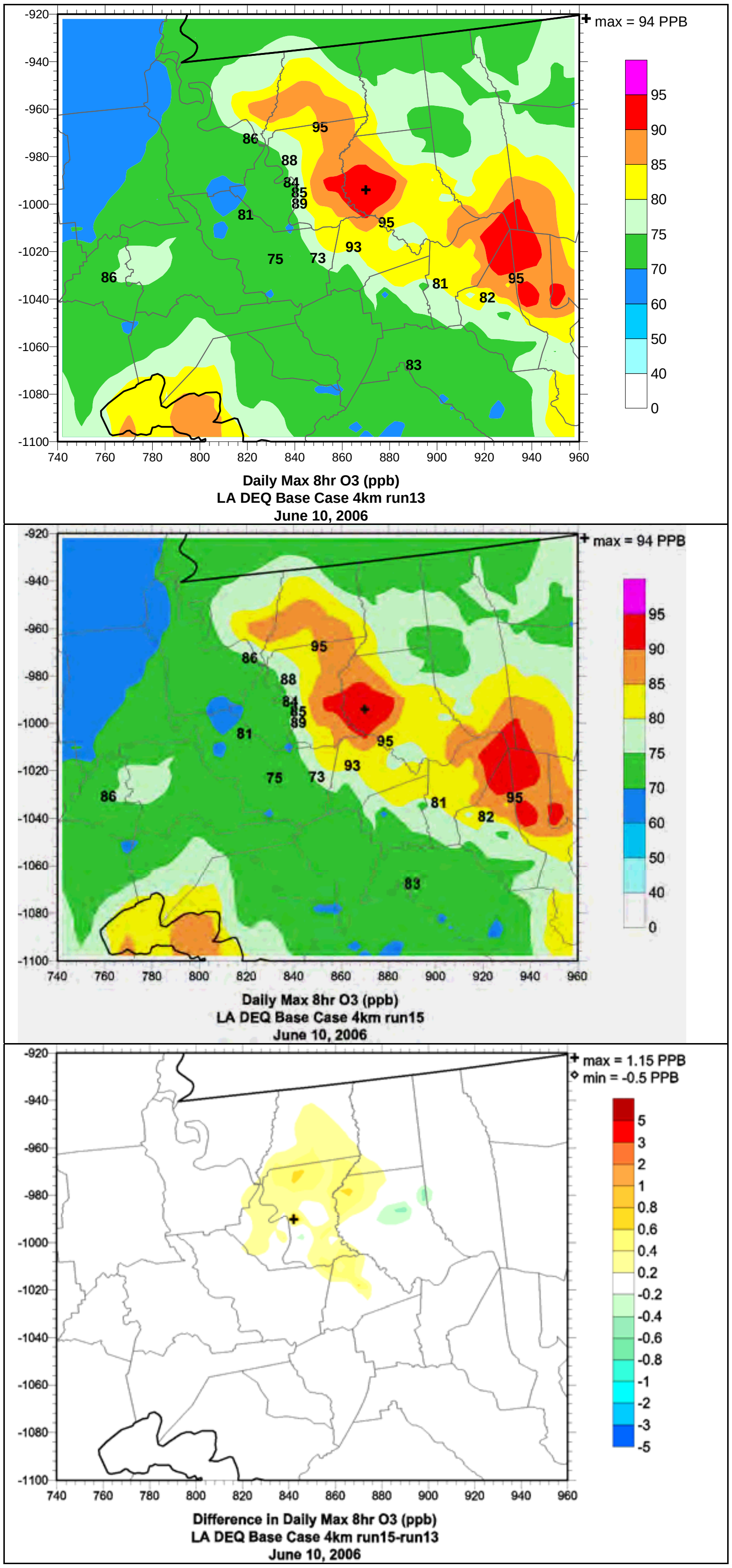


Figure ES-2. Spatial plots of daily maximum 8-hour ozone on June 10 from Run 13 (top), Run 15 (middle), and corresponding differences (bottom).

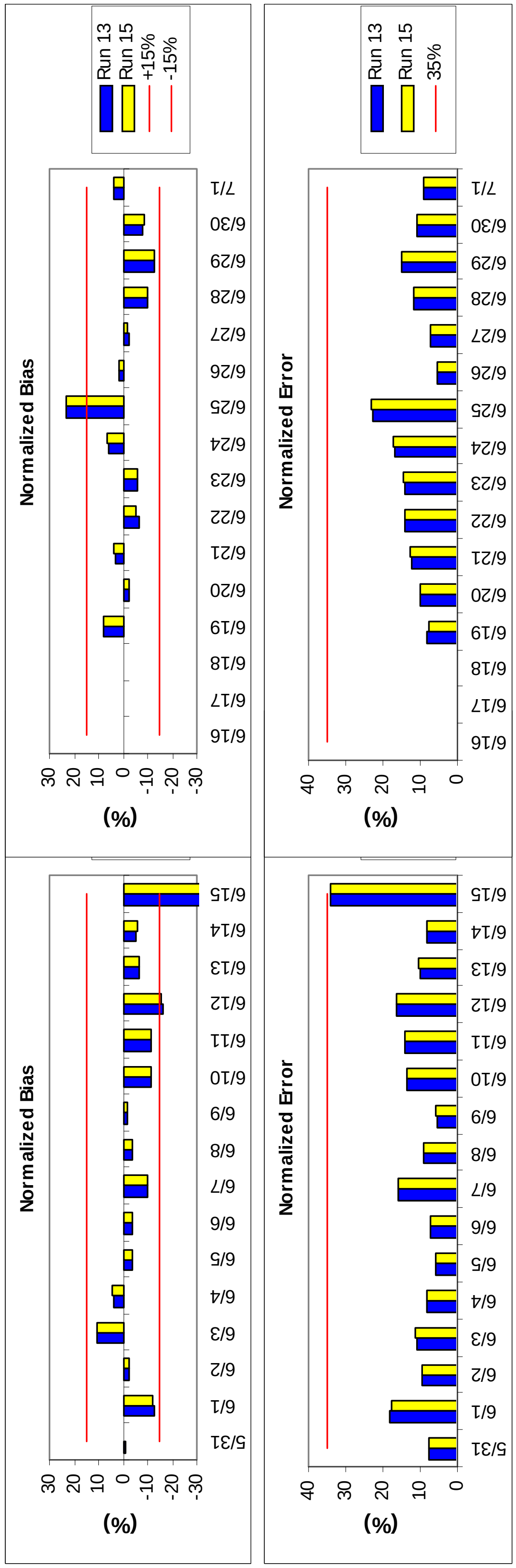


Figure ES-3. CAMx Runs 13 and 15 model performance statistics for 1-hour ozone over 60 ppb.

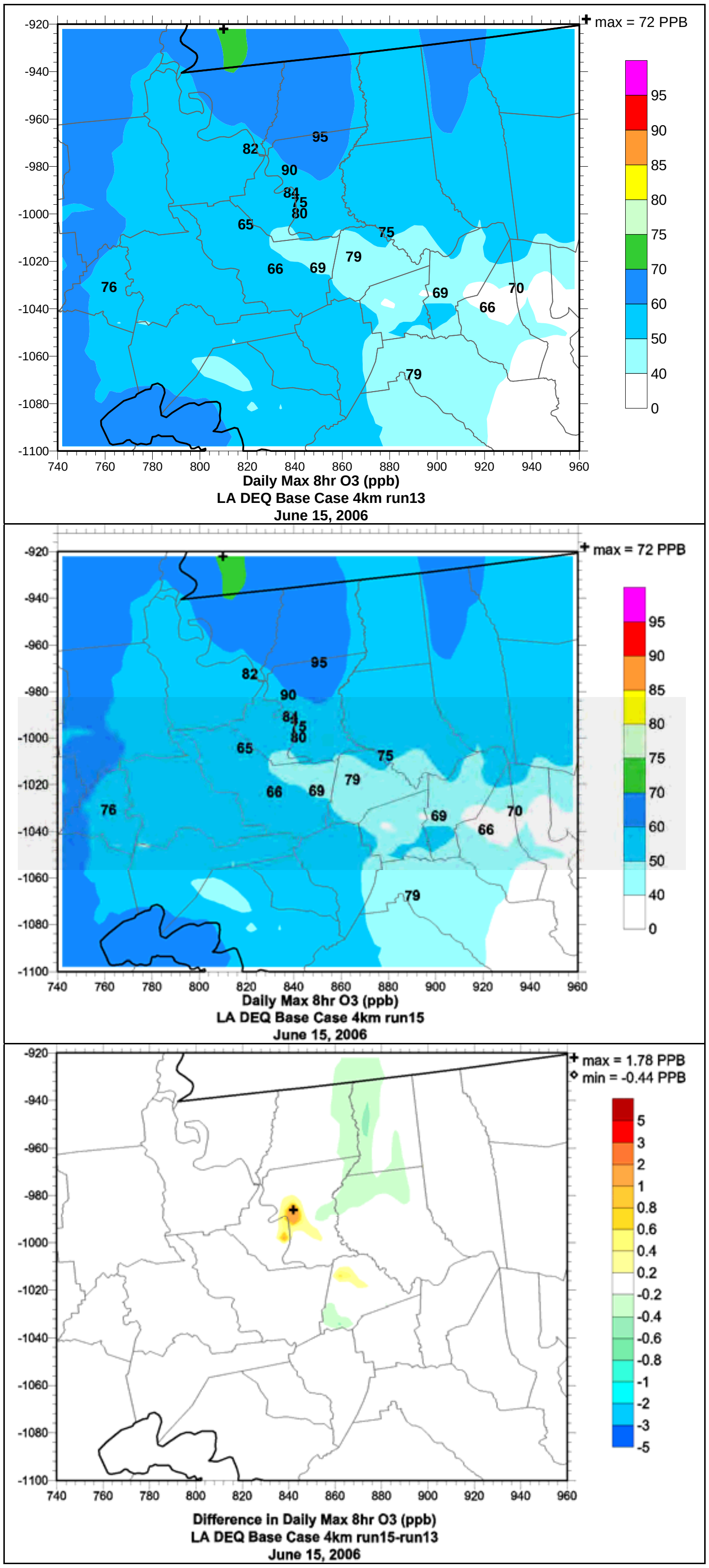


Figure ES-4. Spatial plots of daily maximum 8-hour ozone on June 15 from Run 13 (top), Run 15 (middle), and corresponding differences (bottom).

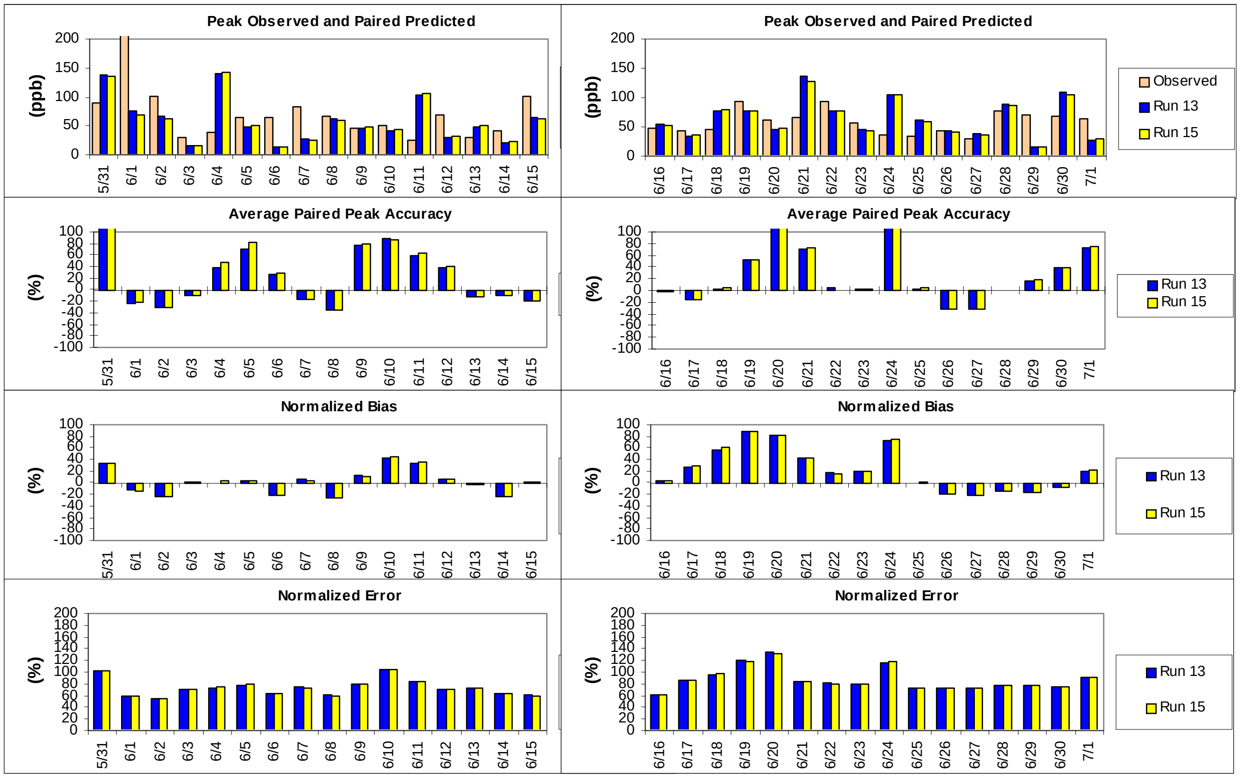


Figure ES-5. Peak (top two panels) and overall (bottom two panels) statistical model performance for 1-hour NOx from CAMx Run 13 and 15.

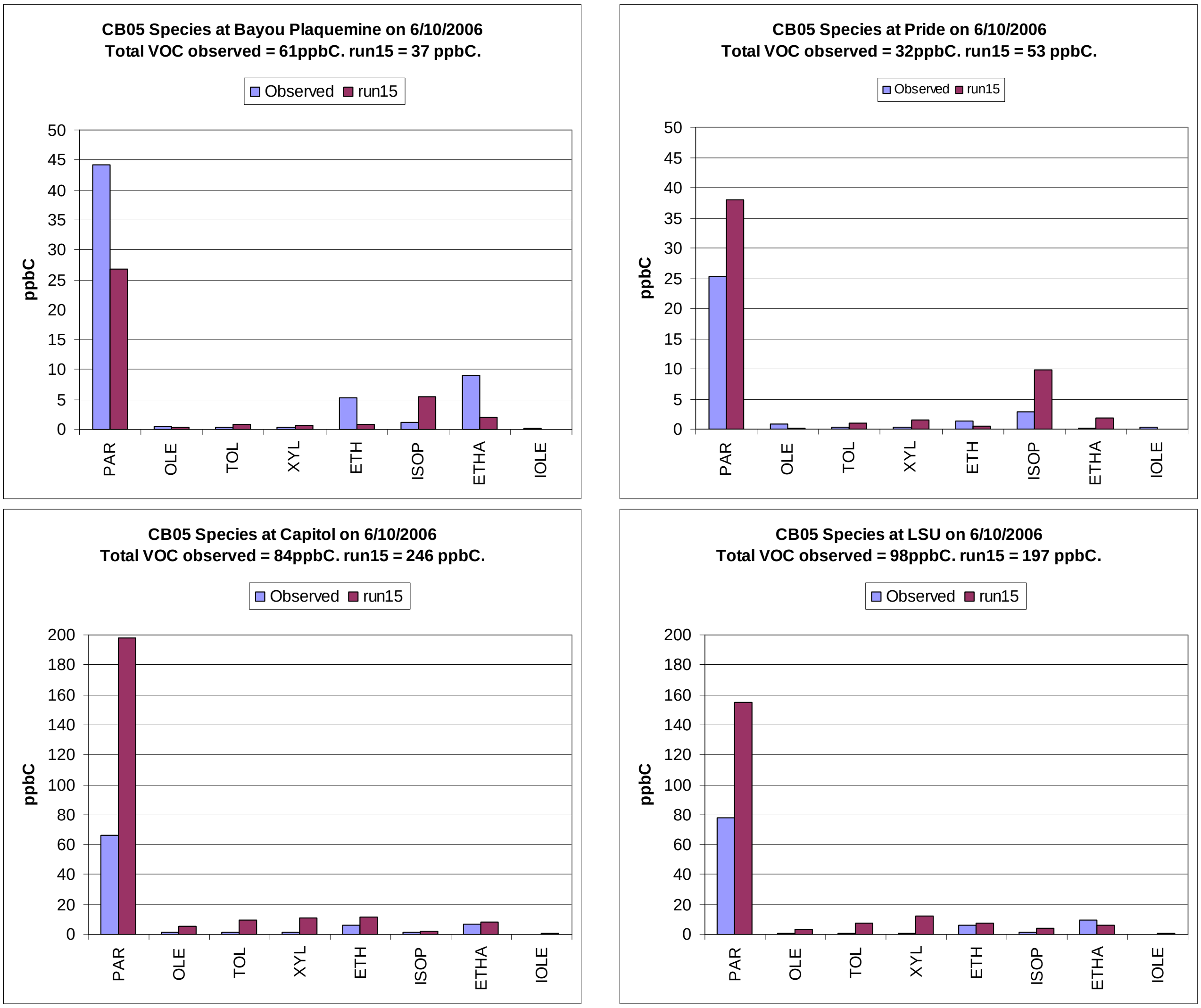


Figure ES-6. CB05 VOC comparisons between PAMS-derived measurements and CAMx Run 15 for 6-9 AM, June 10.

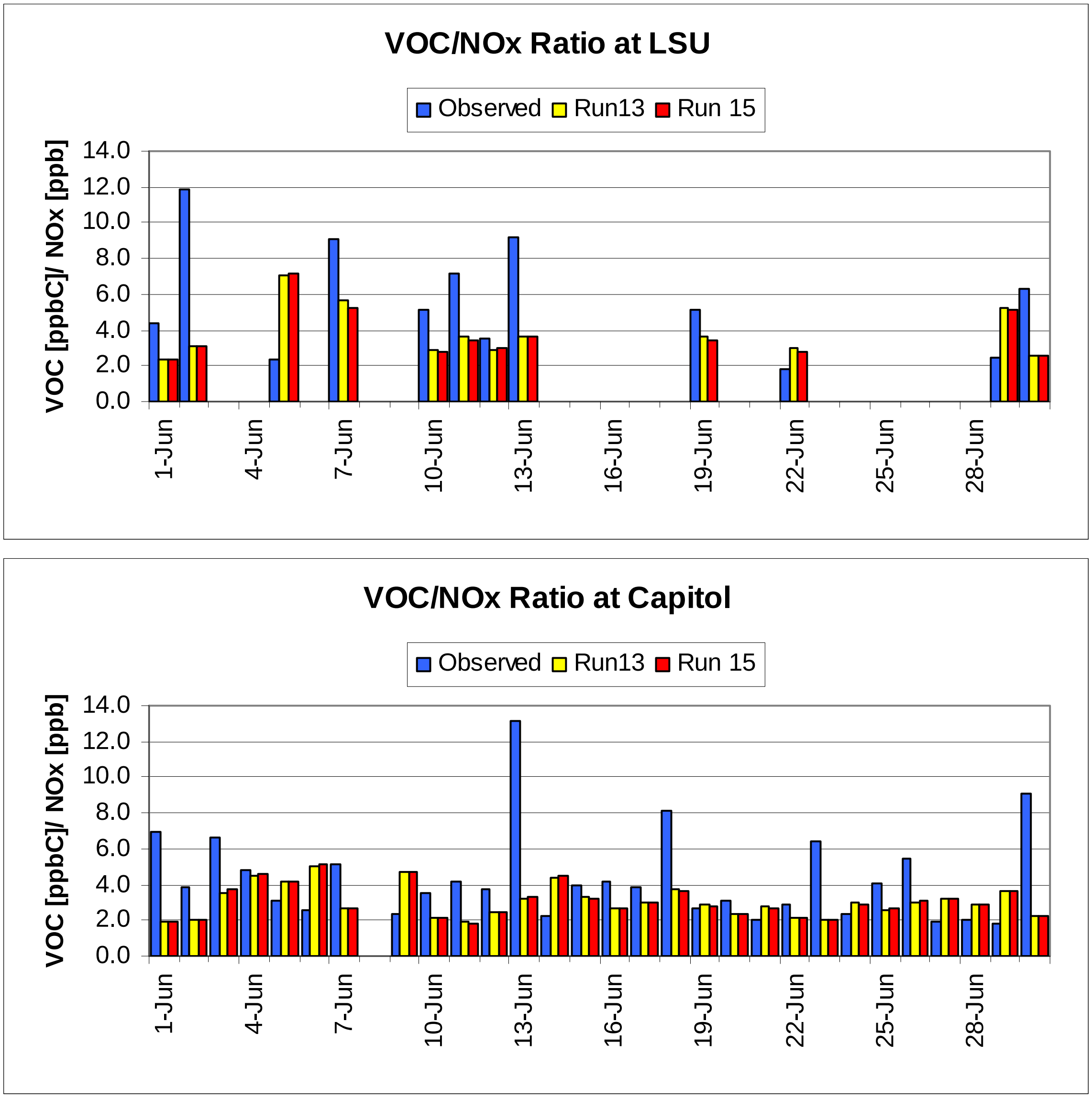


Figure ES-7. VOC:NOx ratio comparisons between measurements and Run 13 and 15 predictions at urban PAMS sites.

ES.4 FUTURE YEAR PHOTOCHEMICAL MODELING

CAMx was run for 2009 using the best 2006 Base Year configuration, except that the emissions were exchanged with the 2009 Future Year emission projections. Daily 8-hour ozone concentrations were extracted from the CAMx output files for both 2006 Base Year and 2009 Future Year simulations. These modeled concentrations were supplied to the EPA MATS tool, which tabulated the change in daily maximum 8-hour ozone at each site, determined the relative response factors (RRF) averaged over the high ozone days, and used the RRFs to project the 2009 DV from the observation-based 2006 DV at each site.

In the case where CAMx was provided BRNAA onroad mobile emissions estimated from parish-level monitored VMT data, the 2009 future year DV projection was below the 85 ppb standard at all sites (Table ES-4). The maximum 2009 projection continued to occur at LSU (84.4 to 84.9 ppb, depending on the configuration of MATS). It was necessary for MATS to use as few as 5-10 days of 2006 Base Year simulated peak 8-hour ozone in the mid-70's ppb for the RRF calculation. This requirement shows the following tendencies: (1) design values at many sites in the base year were below the 85 ppb standard; and (2) many days were under predicted by CAMx.

Table ES-4. Run 13 2009 future year DV projection for a 7×7 array extraction. See text for explanation of columns.

ID	Name	2006 DV	2009 DV	RRF	Min ppb	# days
220050004	Dutchtown	83.0	81.5	0.9831	76	11
220330003	LSU	86.7	84.9	0.9795	77	11
220330009	Capitol	78.0	76.2	0.9780	77	10
220330013	Pride	79.7	77.2	0.9697	70	10
220331001	Baker	83.3	81.8	0.9824	74	10
220470007	Grosse Tete	83.0	81.3	0.9796	78	10
220470009	Bayou Plaquemine	79.7	78.1	0.9806	78	10
220470012	Carville	83.7	82.2	0.9825	77	11
220630002	French Settlement	78.7	76.1	0.9676	71	12
221210001	Port Allen	82.0	80.2	0.9783	75	12

In the case where CAMx was provided BRNAA onroad mobile emissions estimated from transportation demand model activity, the 2009 future year DV projection was also below the 85 ppb standard at all sites (Table ES-5). The maximum 2009 projection continued to occur at LSU (84.4 to 84.9 ppb), nearly identical the 2009 DV projections using the original onroad emissions. The MATS un-monitored area DV projections in a sub-area of the 4-km modeling grid encompassing the BRNAA showed that no areas were above the 85 ppb 8-hour standard, with the peak 8-hour DV at 82.8 ppb.

Table ES-5. Run 15 2009 future year DV projection for a 7×7 array extraction. See text for explanation of columns.

ID	Name	2006 DV	2009 DV	RRF	Min ppb	# days
220050004	Dutchtown	83.0	81.6	0.9841	75	12
220330003	LSU	86.7	84.9	0.9794	77	11
220330009	Capitol	78.0	76.2	0.9776	77	10
220330013	Pride	79.7	77.2	0.9689	70	10
220331001	Baker	83.3	81.7	0.9812	74	10
220470007	Grosse Tete	83.0	81.4	0.9808	78	10
220470009	Bayou Plaquemine	79.7	78.1	0.9815	78	10
220470012	Carville	83.7	82.2	0.9828	77	11
220630002	French Settlement	78.7	76.1	0.9677	71	11
221210001	Port Allen	82.0	80.1	0.9779	76	10

EPA Region 6 specifically requested that the June 2006 BRNAA 8-hour ozone attainment demonstration modeling be used in some fashion to show maintenance of the old 1-hour ozone standard of 124 ppb. EPA's suggested approach was to use the June 2006/09 CAMx modeling in a relative sense (using relative response factors) rather than to use the model results in an absolute sense, as was formerly done in the 1990's. Therefore, in this study, we followed the current 8-hour DV projection approach by utilizing the EPA MATS tool. LDEQ provided 2006 1-hour DVs at each of the nonattainment area monitors in the BRNAA. These DVs were taken to be the fourth highest 1-hour ozone measured at each site during the period 2004 through 2006. The CAMx simulated 1-hour daily maximum ozone at each of these monitor locations over the entire June 2006 modeling episode was extracted to a MATS input file.

The approach was to configure MATS to consider modeled days at or above 125 ppb at each site, and then to reduce by 1 ppb until at least 5 days were found in the 2006 Base Year results. Once the appropriate 1-hour ozone level and number of days were found for a particular site, MATS then calculated the average RRF from the days above that ozone level and applied the RRF to that site's DV. We also used MATS to perform the unmonitored area analysis this way, similar to 8-hour ozone. The June 2006 episode was not particularly useful for 1-hour ozone modeling, given that only 1 day at 1 site was above the 1-hour standard and only 20 site-days were above 100 ppb (with a range of 1 to 4 days per site). Furthermore, CAMx tended to under predict daily maximum ozone throughout the period, so even fewer days above 100 ppb were available from the CAMx results from which to develop RRFs. All but two sites met the 5 day minimum in the mid-90s ppb; it was necessary to reduce the 1-hour peak threshold to 82 ppb to achieve 5 days at Pride.

The resulting 1-hour DV projections were all well below the old 124 ppb standard, with a maximum value at Baker of 121 ppb (Table ES-6). In all cases, the RRF's show 1-2% (1-2 ppb) reductions. The MATS un-monitored area DV projections over the BRNAA showed that no areas were above the 124 ppb 1-hour standard, with the peak 1-hour DV at 118.8 ppb.

Table ES-6. 2009 future year 1-hour DV projection for a 7×7 grid array extraction. Minimum number of days above threshold is 5, minimum threshold is 82 ppb.

ID	Name	2006 DV	2009 DV	RRF	Min ppb	# days
220050004	Dutchtown	112	110.4	0.9863	93	5
220330003	LSU	120	118.8	0.9908	97	5
220330009	Capitol	102	101.0	0.9908	97	5
220330013	Pride	112	109.6	0.9794	82	5
220331001	Baker	123	121.2	0.9858	94	5
220470007	Grosse Tete	111	109.0	0.9825	93	6
220470009	Bayou Plaquemine	107	106.2	0.9931	94	5
220470012	Carville	118	117.9	0.9993	95	5
220630002	French Settlement	97	95.1	0.9806	88	5
221210001	Port Allen	118	116.3	0.9858	96	5

1. INTRODUCTION

This technical support document describes the modeling analyses conducted to support the development of the Louisiana State Implementation Plan (SIP) for the Baton Rouge 1997 8-hour ozone nonattainment area. The modeling program was directed by the Louisiana Department of Environmental Quality (LDEQ), Office of Environmental Assessment, Air Quality Assessment Division. Several accepted modeling platforms were applied to address episodic meteorological, emissions, and air quality during the month of June 2006. The modeled attainment demonstration must show that the 8-hour ozone design value is reduced below the 1997 8-hour ozone National Ambient Air Quality Standard (NAAQS) of 85 ppb by the end of 2009. While significant effort was directed towards the development of updated state-wide emission inventories for the State of Louisiana, this modeling has also leveraged the databases developed by the Central Regional Air Partnership (CENRAP) and the Texas Commission on Environmental Quality (TCEQ) as a source of regional emission inventories and boundary conditions. Modeling protocol documents were developed previously (LDEQ, 2006; ENVIRON, 2007a) following the latest modeling guidance published by the U.S. Environmental Protection Agency (EPA) related to 8-hour ozone attainment demonstrations (EPA, 2007).

1.1 BACKGROUND

The goal of the modeling study reported herein was to develop the photochemical modeling and analysis tools and related data bases needed to reliably simulate the complex interplay between meteorology, emissions, and ambient photochemistry during a historical 8-hour ozone exceedance episode in the Baton Rouge area, to project those conditions to a future attainment year, and to evaluate emissions reduction strategies for inclusion in the Baton Rouge 1997 8-hour ozone SIP.

Based on measured ozone data from 2001-2003, the EPA designated the five parishes comprising greater Baton Rouge (East Baton Rouge, West Baton Rouge, Livingston, Ascension, and Iberville) as a Marginal 8-hour ozone nonattainment area. EPA does not require a modeled attainment demonstration for Marginal nonattainment areas. Baton Rouge experienced high ozone conditions as late as 2006 and therefore did not attain the 1997 8-hour ozone standard by the Marginal attainment date of June 15, 2007. Baton Rouge was reclassified as a Moderate nonattainment area with an attainment date of June 15, 2010.

The LDEQ is the lead agency in the development of the Baton Rouge 1997 8-hour ozone SIP. EPA Region 6 in Dallas, Texas is the local regional EPA office that will take the lead in the approval process for the Baton Rouge 8-hour ozone SIP. The LDEQ contracted with ENVIRON International Corporation and Eastern Research Group, Inc. to assist in the 1997 8-hour ozone attainment modeling demonstration.

1.2 OVERVIEW OF APPROACH

The Baton Rouge 8-Hour Ozone Modeling Study included episodic emissions, meteorological and ozone simulations during June 2006 using a nested 36/12/4 km grid system, with the 4-km grid focused on Louisiana and the immediate Gulf coast area. The modeling tools, domain definition, modeling episode, processing techniques, performance evaluation approach, and future year projection approach was established in the Modeling Protocol and its addendum (LDEQ, 2006; ENVIRON, 2007a) and follows EPA recommendations and guidance (EPA, 2007).

1.2.1 Episode Selection

EPA guidance on 8-hour ozone modeling identifies specific criteria to consider when selecting one or more episodes for use in demonstrating attainment of the 1997 8-hour ozone National Ambient Air Quality Standard (NAAQS). This guidance builds off the 1-hour ozone modeling guidance (EPA, 1991) in selecting multiple episodes representing diverse meteorological conditions that result in ozone exceedances in the region under study:

- A variety of meteorological conditions should be covered that produce 8-hour ozone exceedances in the Baton Rouge 5-Parish area;
- To the extent possible, the modeling data base should include days for which extensive data bases (i.e. beyond routine aerometric and emissions monitoring) are available; and
- Sufficient days should be available such that relative response factors (RRFs) can be based on several (i.e., $\geq$ 10) days with at least 5 days being the absolute minimum; it is preferable that the model generates peak 8-hour ozone concentrations near the monitor of 85 ppb or higher, with a 70 ppb absolute minimum.

EPA also lists several "other considerations" to bear in mind when choosing potential 8-hour ozone episodes including:

- Choose periods which have already been modeled;
- Choose periods from the years upon which the current Design Values are based;
- Include weekend days among those chosen; and
- Choose modeling periods that meet as many episode selection criteria as possible in the maximum number of nonattainment areas as possible.

The Modeling Protocol and its addendum present an analysis of ozone air quality data from 2000 through 2006. The primary objective of the episode selection process was to select periods that span the range of conditions that produce 8-hour ozone exceedances in Baton Rouge, include sufficient number of days at the key ozone monitors to conduct a robust attainment demonstration, while minimizing the number of episodes modeled due to resource limitations.

Starting with 15 candidate episodes from 2000 through 2005, the top seven were ranked for appropriateness using criteria in EPA's guidance and other criteria (LDEQ, 2006). In-depth analysis of the seven highest ranked episodes was conducted to find the optimal subset for 8-

hour ozone modeling of Baton Rouge, and included tabulating peak ozone values, number of exceedance days/monitors, and prevailing meteorology. In particular, a conceptual model was developed for each of the candidate episodes to explain the conditions that set up each 8-hour exceedance day. The May 22-28, 2005 period was the top-ranked episode from LDEQ (2006) review. This episode has since been extensively modeled and analyzed by the Baton Rouge 8-Hour Ozone SIP Coalition, a local industrial stakeholder group.

A high ozone period spanning May 31 through July 1, 2006 was subsequently added to the episode selection analysis a year later (ENVIRON, 2007a); this June episode included two well-defined groups of high ozone days in Baton Rouge. The number of high ozone days was stratified and compared to the previous seven top-ranked episodes, and meteorology was analyzed using HYSPLIT back trajectories to identify the number of local vs. regional high ozone days and likely ozone transport routes. Daily peak 8-hour ozone concentrations measured at each of the Baton Rouge monitoring sites over this period are displayed in Table 1-1. The locations of these sites are displayed in Figure 1-1. Eight-hour ozone exceedance days during this period included:

June 1-2 (Thursday, Friday)
June 6-11 (Tuesday – Sunday)
June 14-15 (Wednesday, Thursday)
June 29-30 (Thursday, Friday).

The two-day event on June 29-30 was a particularly widespread event and exhibited some of the highest recorded ozone of the period. June 2006 was found to be the best episode available for ozone modeling for several reasons: (1) it was the most recent episode occurring in Baton Rouge; (2) it contained many high 8-hour ozone days at all Baton Rouge monitors; (3) it spanned a wide range of meteorology, including build-up and clean-out days; and (4) it coincides with a parallel TCEQ ozone attainment modeling effort for Houston, from which regional emissions data were obtained. An additional set of 5 days was added before May 31 to allow the model to "spin-up" from initial conditions, resulting in the simulation of May 26 through July 1, inclusive.

Table 1-1. Daily peak 8-hour ozone concentrations at Baton Rouge monitors from May 29 through July 3, 2006. Days highlighted in red are 8-hour exceedances (≥85 ppb), orange days range 80-84 ppb, yellow days range 75-79 ppb, and green days range 70-74 ppb.

2006	5-29	30	31	6-1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	7-1	2	3
Baker	43	36	69	72	64	51	60	63	66	62	63	66	88	97	63	64	75	90	31	38	44	48	61	47	70	56	63	55	63	62	73	92	98	74	44	37
B Plaquemine	28	37	61	66	74	57	72	77	81	56	77	89	75	72	77	65	75	66	21	29	38	25	42	34	34	46	53	57	68	69	71	92	89	64	37	33
Capital	39	29	60	77	58	47	60	59	56	58	60	64	85	84	61	54	70	76	25	34	39	34	51	41	45	57	57	55	61	59	69	95	91	68	40	35
Carville	30	37	62	79	79	59	69	73	85	65	86	74	73	85	68	71	76	68	26	39	41	29	51	36	39	58	65	65	80	74	81	94	90	63	37	34
Dutchtown	33	44	66	88	88	51	62	69	84	80	79	76	92	78	61	61	73	79	31	49	45	34	56	42	50	79	78	57	70	76	82	87	88	61	36	44
F Settlement	45	56	74	75	67	51	63	66	69	90	66	73	94	76	60	62	74	75	31	50	47	39	67	51	46	73	62	55	68	71	79	80	79	71	37	42
Grosse Tete	33	39	67	64	61	57	70	73	80	65	75	78	81	78	70	65	81	66	30	25	34	28	48	34	35	48	54	59	67	64	68	87	92	76	43	38
LSU	41	33	67	80	69	53	69	71	80	66	74	72	88	85	70	65	76	80	29	36	40	36	53	44	48	56	57	60	72	70	77	97	99	74	43	43
Port Allen	45	33	65	77	61	39	48	63	67	57	60	63	84	92	61	61	85	84	31	35	41	34	60	46	52	53	57	57	64	62	71	99	102	73	43	37
Pride	36	41	74	61	57	54	61	66	64	75	68	70	95	80	70	70	71	94	27	46	47	54	59	68	50	53	53	55	66	62	68	80	83	74	38	35

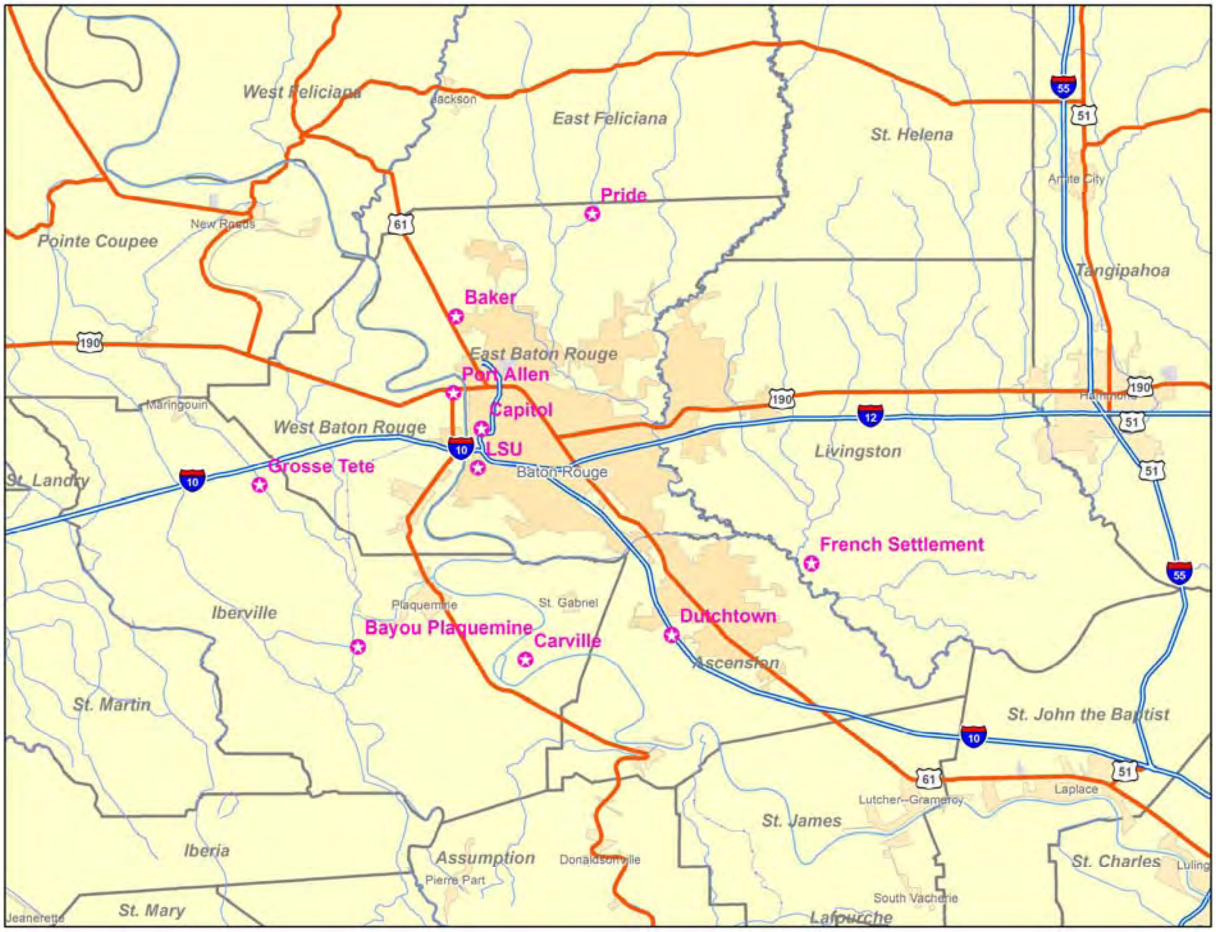


Figure 1-1. Map of the greater Baton Rouge area showing the location of ozone monitoring sites during June 2006.

1.2.2 Model Selection

This section introduces the meteorological, emissions and air quality models used in the Baton Rouge 8-hour ozone modeling. The specific input datasets and science configurations for each modeling system are identified and discussed later in this report. The configuration of each modeling platform was selected according to the culmination of the urban/regional ozone modeling performed in the central U.S. as part of CENRAP and other recent SIP efforts. EPA guidance (EPA, 2007) is not prescriptive regarding the choice of modeling system, in that it does not include a list of specific recommended modeling platforms. However, it states that the chosen models must be well-vetted, possess a track record of acceptable performance, and include the necessary physics, chemistry, and capabilities to address the particular issues at hand.

Based on previous modeling activities conducted in Louisiana and neighboring states, LDEQ selected the following platforms to address Baton Rouge 8-hour ozone:

- MM5: The Fifth-generation Pennsylvania State University/National Center for Atmospheric Research (PSU/NCAR) Mesoscale Meteorological Model (MM5) is a nonhydrostatic, prognostic meteorological model routinely used for urban- and regional-scale photochemical, fine particulate and regional haze regulatory modeling studies.

- EPS3: Version 3 of the Emissions Processing System (EPS3) generates hourly gridded speciated emission inputs of mobile, nonroad, area, point, fire and biogenic emission sources for photochemical grid models.
- CAMx: The Comprehensive Air quality Model with extensions (CAMx) is a "One-Atmosphere" photochemical grid model capable of addressing ozone, particulate matter (PM), visibility and acid deposition at urban to regional scales, and includes two-way grid nesting and a subgrid-scale Plume-in-Grid (PiG) sub-model.

The MM5/EPS3/CAMx modeling system has been employed to support many recent 8-hour ozone Early Action Compacts (EAC) and SIPs in nearby states.

All mathematical models possess inherent limitations owing to the necessary simplifications and approximations made in formulating the governing equations, implementing them for numerical solution on fast computers, and in supplying them with input data sets and parameters that are themselves approximations of the full state of the atmosphere and emissions processes. In the sub-sections that follow for each model, we list the more important limitations of the various modeling systems that were employed in the Baton Rouge modeling. None of the current limitations identified in MM5, EPS3 and CAMx render any of these models inappropriate for their use in this study, and are in fact common to all current models available for this type of application. However, such limitations need to be recognized and accounted for in the interpretation of the modeling results

Furthermore, each of the modeling system components has significant data base requirements. These data needs fall into two categories: those required for model setup and operation, and those required for model evaluation testing. In the sub-sections that follow, we also identify the main input data base requirements for the meteorological, emissions, and air quality models.

1.2.2.1 MM5 Meteorological Model

The non-hydrostatic MM5 model (Dudhia, 1993; Grell et al., 1994) is a three-dimensional, limited-area, primitive equation, prognostic meteorological model that has been used widely in regional air quality model applications (Seaman, 2000). Over the past decade, researchers at PSU, NCAR, and EPA have collaborated in the refinement and extension of the current version of the MM5 system, version 3.6. Originally developed in the 1970s at PSU and first documented by Anthes and Warner (1978), the MM5 modeling system maintains its status as a state-of-the-science model through enhancements provided by a broad user community (e.g., Xiu and Pleim, 2000). The MM5 modeling system is routinely employed in forecasting projects as well as refined investigations of severe weather. Utilization of MM5 within air quality applications is also a common practice; in recent years, the MM5 modeling system has been successfully applied in continental scale annual simulations for the years 1996, and 2001 through 2006. The MM5 enjoys a far richer application history in regulatory modeling studies compared with other models. Furthermore, in comparisons with other models of similar complexity in over 60 regional scale air quality application studies since 1995, it has generally been found that MM5 tends to produce better photochemical model inputs than alternative models (Emery et al., 2001).

Due to its ongoing scientific development worldwide, extensive historical applications, broad user community support, public availability, and established performance record compared with other applications-oriented prognostic models, LDEQ selected the MM5 as the preferred meteorological model.

However, there are numerous limitations in the MM5, and one of the most important is its sensitivity to the large number of options for coupling of the surface energy budget model (land surface model, or LSM) with the planetary boundary layer (PBL) model. First, the LSM-PBL couple frequently predicts spotty areas with very low mixing heights that can appear as "holes" in the PBL fields that do not appear physically realistic and may affect air quality modeling. Effects are often much worse in the western U.S. Second, the land surface models, while representing the current state-of-the-science approach for surface heat budgets and momentum fluxes, are by necessity a broad-brush representation of soil and vegetation characteristics and are subject to the fidelity and resolution of current land cover and soil type databases. All of the land surface models employed in MM5 have a history of generating damped diurnal temperature waves (high temperatures at night, low temperatures during the day). Third, MM5 has been shown to generate too much convective warm-season precipitation, in both spatial coverage and intensity, which can have significant negative impacts on local wind, temperature, and PBL performance. Fourth, there is a stochastic component of real world meteorology that is not captured by MM5. For example, for some pollutant episodes stagnation is an important attribute that MM5 fails to simulate well as it tries to organize the flow fields. This often leads to an over prediction bias in wind speeds, and poor performance for wind direction under stagnant conditions. Finally, the MM5 model is showing its age, even though it represents approximately 20 years of development by various researchers. The many limitations in MM5 have spawned the development of a new meteorological model, the Weather Research Forecast (WRF) model, which is scheduled to ultimately replace MM5.

The databases required to set up, exercise, and evaluate MM5 for the June 2006 period consist of various fixed and variable inputs.

- High-resolution topographic (terrain elevation) fields available from USGS and NCAR;
- High-resolution vegetation type and land use fields available from USGS and NCAR;
- Large-scale observational analyses of winds, temperature, and humidity on standard pressure levels, and surface and soil temperature, available from NCAR and derived from the National Center for Environmental Prediction (NCEP) Eta Data Analysis System (EDAS) (40 km resolution);
- Surface and upper-air meteorological measurement data from the standard National Weather Service reporting network available from NCAR.

Section 2 discusses the data input requirements and data sources in detail.

1.2.2.2 EPS3 Emissions Processing System

As with most "emissions models", EPS is principally an emission processing system, and not a true emissions modeling system from which emissions estimates are simulated from "first principles." This means that its purpose is to provide an efficient, modern tool for converting pre-existing emissions inventory data into the formatted emission files required by an air quality simulation model. EPS3 consists of a series of FORTRAN modules that perform the intensive data manipulations required to incorporate spatial, temporal, and chemical resolution into an emissions inventory used for photochemical modeling.

The EPS 2.0 prototype was originally developed at ICF Consulting/Systems Applications International for the EPA (EPA, 1990), and was designed to provide emission modelers with a cohesive set of FORTRAN programs that allowed flexibility in processing, minimal setup requirements, ease of use, and informative output reports to enhance quality assurance and support technical reports. The processing is flexible because the steps of temporal projection, controls, chemical speciation, temporal allocation, and spatial allocation are separated into independent programs that share a consistent internal file format that allows emissions data to be passed from one module to another. The flexibility of EPS provides the users with both a "turn-the-crank" system for generating modeling inventories, and a means for the discriminating user to implement detailed, locally available data such as source-specific speciation, temporal information, and episode specific emissions. It provides for processing large sets of similarly formatted data (large national datasets) or processing individual sources separately (a single production facility reviewing control strategies). EPS supports area, mobile (both on-road and off-road), point, and biogenic source emissions processing. The results from these processing categories are merged together at a final stage of processing.

In 2004, EPS was redesigned and improved by ENVIRON for TCEQ in support of their SIP efforts (ENVIRON, 2007b). The primary purposes of the EPS3 redesign were to: (a) generalize the output report routines and allow user selections of output tables, (b) optimize the code structure to eliminate outdated and unused functions, (c) define an easy method for user-specified criteria and model species, (d) increase the field sizes for character identifiers to support the National Emissions Inventory Input Format (NIF) data, (e) enhance the spatial allocation routines to allow for secondary and tertiary surrogates to be defined and used in cases where the primary surrogate assignments would result in a loss of total emissions, and (f) provide a single module to merge elevated point source files and support plume-in-grid (PiG) treatment of point sources. Since the user can now specify the emission inventory criteria pollutants as well as the modeling lumped compounds, any chemical mechanism can be used in EPS3 as long as the appropriate input data are supplied.

The EPS3 modeling system was recommended as the emissions model for the Baton Rouge 1997 8-hour ozone modeling study for several reasons, the most notable of which are:

- EPS3 is a mature, thoroughly-tested emissions modeling system having been employed by a wide variety of governmental, commercial, academic, and private users in numerous regions throughout the U.S. and abroad.
- The LDEQ has considerable experience with EPS, particularly its intermediate version, EPS2.5.
- EPS3 is used by the TCEQ for their ozone modeling, the databases from which have been leveraged for this project.
- All of the required emissions data sets needed to construct EPS3 input files for Baton Rouge are readily available from LDEQ, TCEQ, CENRAP, and EPA.

All emissions modeling systems have uncertainties and limitations. Foremost among these are the initial emissions estimates provided as input to the emissions models. However, even with exact emission estimates as inputs (an unlikely event) the emissions models still have numerous limitations just because of the large volume of data that needs to be characterized and processed and the limited amount of data available to make the characterization:

> Spatial Allocation: Emission processors use surrogate information to spatially distribute county-level emissions. For example agricultural land use category would be used to spatially distribute agricultural equipment emissions, while population may be used for a variety of home related emissions (e.g., home heating, aerosol sprays, etc.). The accuracy of these surrogate distributions varies by source category.

> Temporal Allocation: The allocation of annual average emissions to months, day-of-week, and across the diurnal cycle use typical distributions by source category. The accuracy of these temporal allocations varies by source type within broader categories (e.g., heavy-duty diesel vs. light duty gas within the on-road category).

> Chemical Speciation: Emission models need to chemically speciate the VOC emissions into the photochemical mechanism (e.g., CB05) used in the photochemical grid model based on industrial and source-category codes. There are actually a limited number of speciation profiles, since individual source tests have not been conducted for all different types of sources; consequently speciation profiles are assigned to "similar" sources that have source profile measurements.

> Emission Projections: Projecting emissions introduces probably the largest layer of uncertainty. Emission projections include growing emissions from a current (e.g., 2006) to future (e.g., 2009) year and then applying appropriate controls. Both of these steps are characterized by potentially huge limitations. For example, the fact that Baton Rouge population approximately doubled in mid-2005 in the aftermath of hurricane Katrina was not forecast in any past growth scenarios.

The databases required to set up and operate EPS3 for the June 2006 Baton Rouge ozone episode were as follows:

- Area source emissions in AMS format;
- Nonroad source emissions in AMS format;
- Stationary point source emissions in AFS format;
- Day/hour-specific CEM emissions in AFS format;
- On-road link-level motor vehicle emissions in LBASE format (from VMT, vehicle type, age, and speed distribution, and MOBILE6 emission factor data by facility type);
- On-road county-level motor vehicle emissions in AMS format (from VMT, vehicle type, age, and speed distribution, and MOBILE6 emission factor data by facility type);
- Temporal allocation, spatial allocation, and chemical speciation profiles and cross reference files.

Section 3 discusses the data input requirements and data sources in detail.

1.2.2.3 CAMx Photochemical Transport Model

CAMx is a publicly available (www.camx.com) three-dimensional multi-scale photochemical grid model that is developed and maintained by ENVIRON International Corporation (ENVIRON, 2008). The model is an ideal platform to treat a variety of air quality issues including ozone, particulate matter (PM), visibility, acid deposition, and air toxics. The flexible CAMx framework has also made it a convenient and robust host model for the implementation of a variety of mass balance and sensitivity analysis techniques including Process Analysis (IRR, IPR, and CPA), Decoupled Direct Method (DDM), and the Ozone/PM Source Apportionment Technology (OSAT/PSAT). Designed originally to address multiscale ozone issues from the urban- to regional-scale, CAMx has been widely used in recent years by a variety regulatory agencies for 1-hour and 8-hour ozone SIP modeling studies. Some of the the key attributes of the CAMx model for simulating gas-phase chemistry include the following:

- Two-way grid nesting that supports multiple levels of fully interactive grid nesting (e.g., 36/12/4/ km);
- CB4, CB05, or SAPRC99 chemical mechanisms;
- Subgrid-scale Plume-in-Grid (PiG) algorithm to treat the near-source plume dynamics and chemistry from large NOx and VOC point source plumes;
- Ability to interface with a variety of meteorological models including the MM5, WRF and RAMS prognostic hydrostatic meteorological models and the CALMET diagnostic meteorological model (others also compatible);
- The Ozone Source Apportionment Technology (OSAT) that identifies the ozone contribution due to geographic source regions and source categories (e.g., mobile, point, biogenic, etc.); and
- The Decoupled Direct Method (DDM) sensitivity method is implemented for emissions and IC/BC to obtain first-order sensitivity coefficients for all gas-phase species.
- The Process Analysis (PA) tool that tracks all physical and detailed chemical processes within the model to assist the user in assessing important physio-chemical pathways.

TCEQ relies on CAMx almost exclusively as their air quality model of choice for SIP applications in Texas, and other regulatory agencies including the EPA have relied on the model to support regional regulatory decision making (e.g., CAIR, Heavy Duty Diesel Rule, NOx SIP Call, etc.). Furthermore, CAMx has been used in most 8-hour ozone SIP modeling to date (e.g., Oklahoma, Missouri, New Mexico, Denver, San Antonio, Austin and East Texas 1997 8-hour ozone EAC SIPs). The operation and output formats of CAMx mirror the older Urban Airshed Model (e.g., UAM-V), with which LDEQ has prior experience.

Like all air quality models, there are a number of conceptual, physical, chemical, computational and operational challenges that CAMx model developers and the user community face to one extent or another. The biggest source of uncertainty in any air quality model hinges on the quality of the input meteorological and emission fields. Within these models themselves, a major limitation is the treatment of vertical turbulent mixing, and there are many alternative means for estimating the time and space variations in the vertical diffusion rates. CAMx usually exhibits a high degree of sensitivity to this input parameter. In terms of ozone chemistry, the highly non-linear interactions among NOx, VOC, and the role of intermediate radicals that drive oxidant chemistry are difficult to evaluate from the concentration output fields alone. For this reason, CAMx includes the Process Analysis tool to assist users in analyzing the significant oxidant pathways in different chemical regimes as a function of space and time. The treatment of clouds and wet deposition is an area of needed research, although this is more significant for PM chemistry than for ozone. The largest limitation for PM modeling is the current state of knowledge of the highly complex chemistry of secondary organic aerosol; much more research is needed in order to develop comprehensive and accurate organic aerosol chemistry algorithms. A practical limitation of CAMx is the computational requirements, including the need of significant disk space.

The databases required to set up and operate CAMx for the June 2006 Baton Rouge ozone episode are as follows:

- Three-dimensional hourly meteorological fields generated by MM5 via the MM5CAMx interface tool (or other meteorological models such as WRF, RAMS, or CALMET);
- Landuse distribution fields;
- Three-dimensional hourly emissions generated by EPS3 (or other emission models such as SMOKE);
- Initial conditions and boundary conditions (IC/BC);
- Photolysis rates inputs, including UV albedo, haze opacity, and total atmospheric ozone column fields.

Section 4 discusses the data input requirements and data sources in detail.

1.2.3 Modeling Domain

The emissions and air quality modeling domain consists of a two-way interactive nested grid system employing three grids with 36, 12, and 4 km grid cell size (resolution). The domain described here is specific to the grids employed for EPS3 and CAMx modeling; similar but more expansive grids were employed for MM5 meteorological modeling, as described in Section 2.

The 36 km eastern U.S. horizontal domain is identical to that used by the TCEQ and ODEQ in their current 8-hour ozone SIP modeling. The Baton Rouge CAMx/EPS3 12 km modeling domain is defined to include the Gulf States and most of the Ohio River Valley source region. The 4 km modeling domain has been expanded since the original protocol (ENVIRON, 2007a) to cover most of Louisiana and the immediate Gulf of Mexico coastline, and includes the Houston-Galveston and Beaumont-Port Arthur areas in Texas eastward across Mobile Bay to about Pensacola, Florida. Figure 1-2 displays the nested 36/12/4 km domains used in the Baton Rouge 8-hour ozone modeling analysis. These grids are based on a Lambert Conformal Projection (LCP) using the same projection as adopted for Texas. The LCP is defined by the projection parameters listed in Table 1-2. Table 1-3 lists the number of rows and columns and the definition of the X and Y origins (i.e., the southwest corners) for the 36/12/4 km domains used by EPS3 and CAMx.

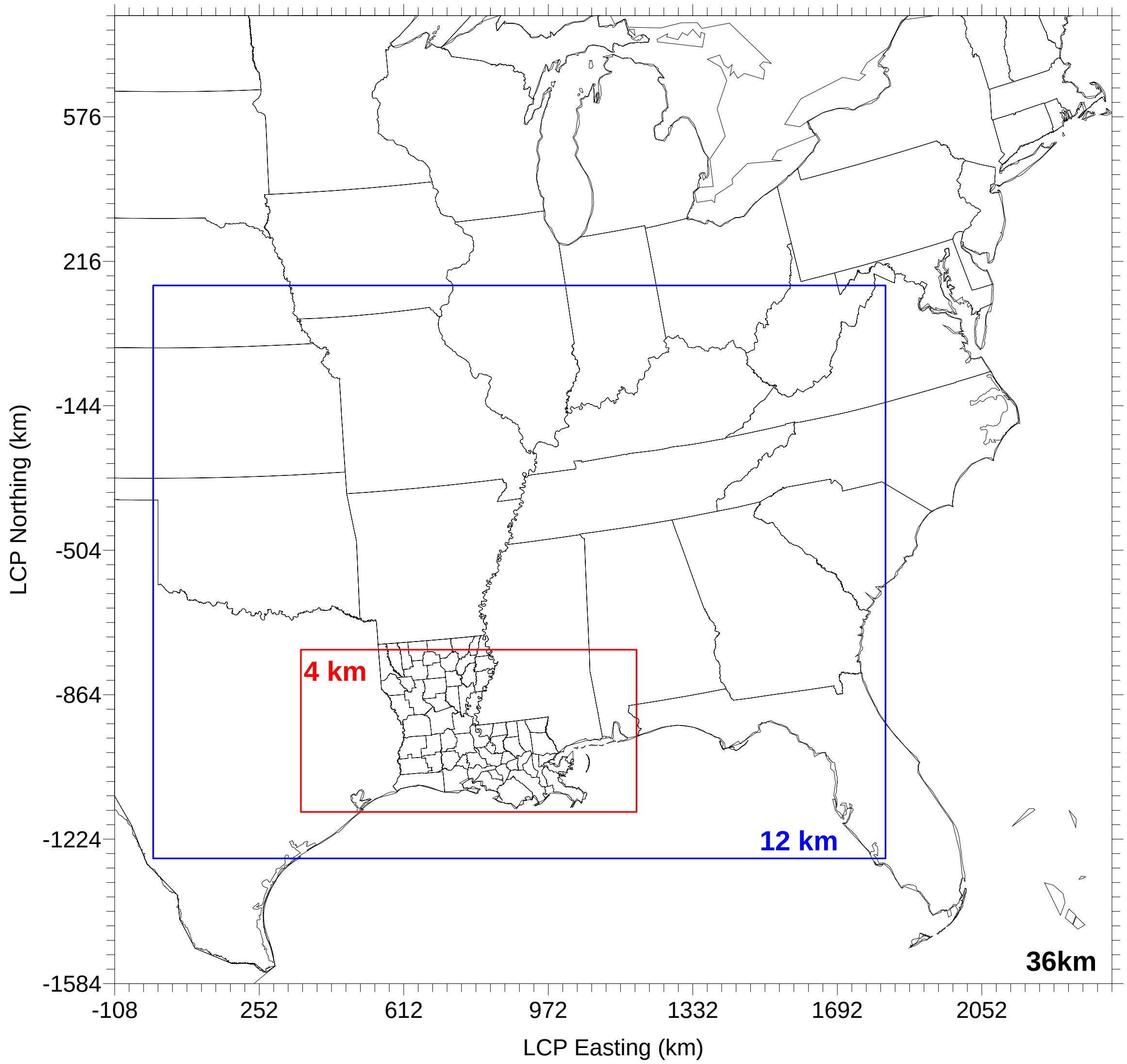


Figure 1-2a. EPS3 and CAMx nested 36/12/4 km modeling domains for the Baton Rouge 8-hour ozone modeling study.

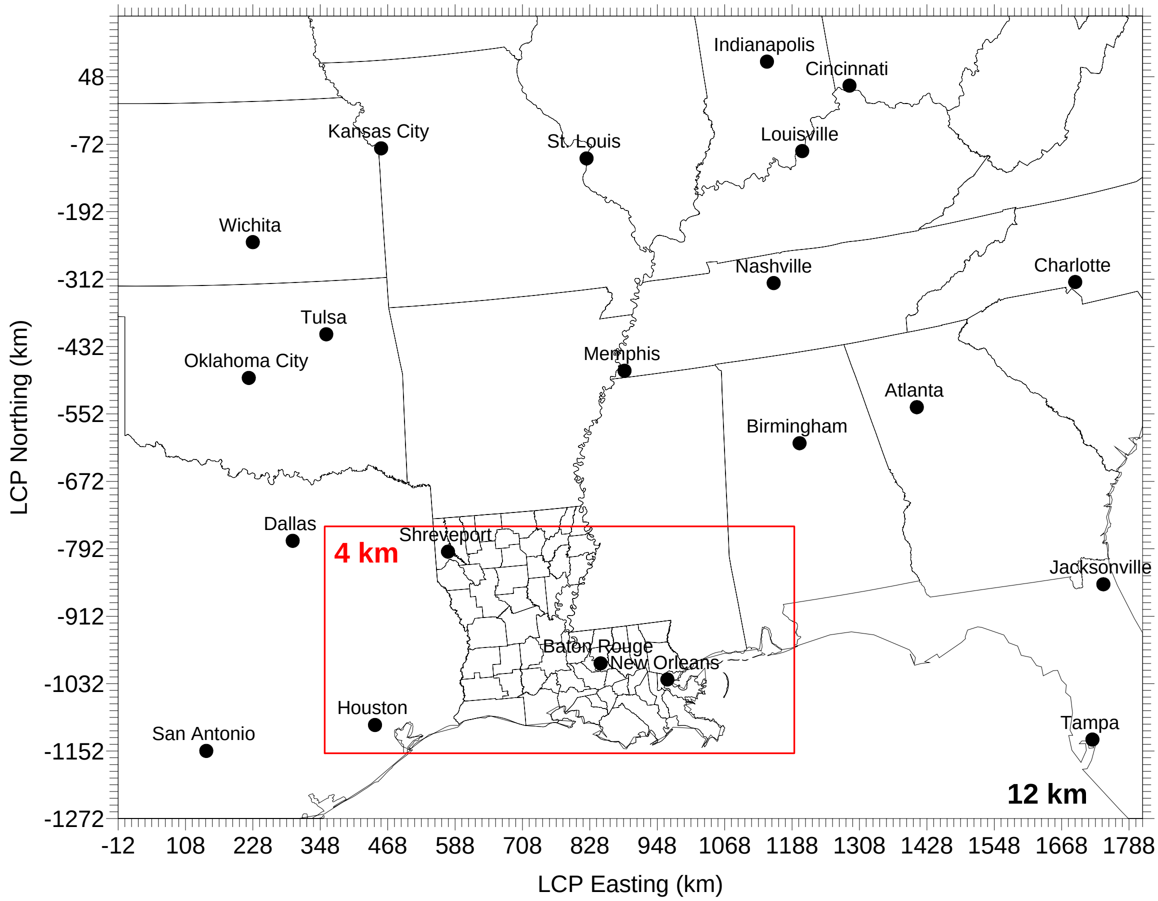


Figure 1-2b. EPS3 and CAMx nested 12/4 km modeling domains for the Baton Rouge 8-hour ozone modeling study.

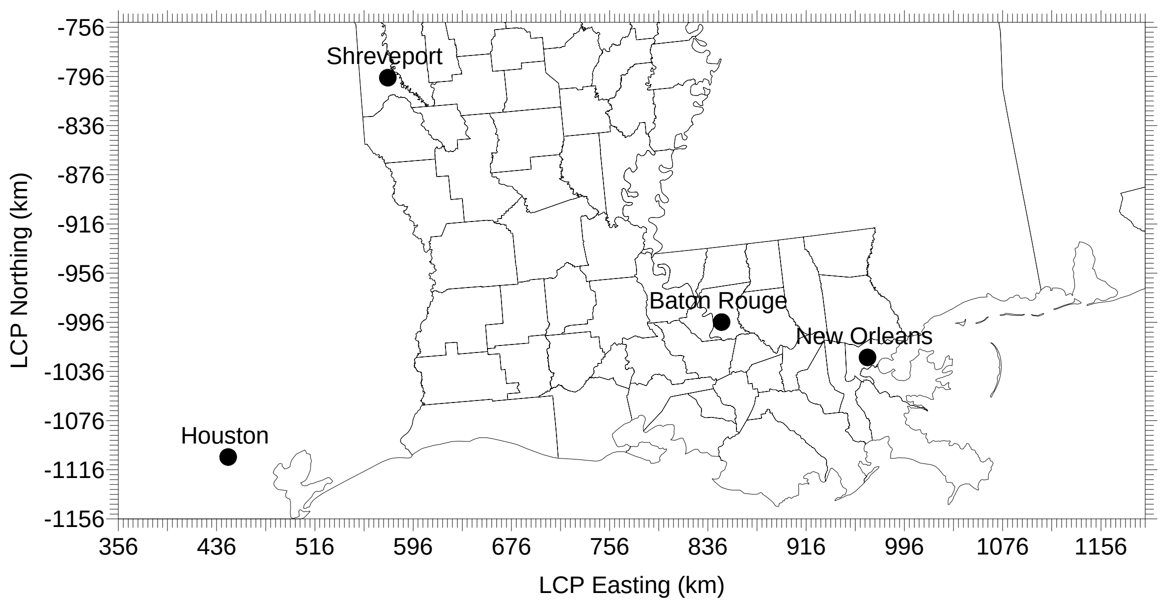


Figure 1-2c. Nested 4-km Louisiana modeling domain for the Baton Rouge 8-hour ozone modeling study.

Table 1-2. Lambert Conformal Projection (LCP) definition for the Baton Rouge 36/12/4 km modeling grid.

Parameter	Value
Projection	Lambert-Conformal
1st True Latitude	30 degrees N
2nd True Latitude	60 degrees N
Central Longitude	100 degrees W
Central Latitude	40 degrees N

Table 1-3. Grid definitions for EPS3 and CAMx.

Grid	Columns	Rows	X origin (km)	Y origin (km)
36 km grid	69	67	-108.0	-1584.0
12 km grid	152	119	-12.0	-1272.0
4 km grid	209	101	356.0	-1156.0

The CAMx air quality and EPS3 emissions 36/12/4 km modeling domains were aligned within the MM5 domains used to generate meteorological fields for the air quality modeling. The MM5 modeling domains were offset (larger) from the CAMx/EPS3 modeling domains by at least 5-6 grid cells in each direction. Because there is a possibility of meteorological noise effects resulting from boundary conditions coming into dynamic balance with MM5's algorithms, larger MM5 domains are designed to sequester such errors from the air quality simulation. EPA guidance (EPA, 2007) suggests a buffer region of at least 5 grid cells along each boundary.

Figure 1-3 displays the manner in which the high-resolution MM5 vertical layer structure was mapped to the CAMx layer structure. The MM5 model employs a terrain-following coordinate system defined by pressure, using multiple layers that extend from the surface to 100 mb (approximately 15 km AGL). A layer averaging scheme is adopted for CAMx simulations to reduce the air quality computational time. The effects of layer averaging were evaluated by the Regional Planning Organizations (RPO) in their modeling of regional haze rules, and found to have a relatively minor effect on the model performance metrics when 19-layer air quality model simulations were compared to ambient monitoring data (Morris et al., 2004). For the Baton Rouge ozone modeling, 20 vertical layers were used.

MM5 Layers	sigma	height (m)	CAMx Layers	Depth (m)
43	0.000	15676		
42	0.010	15229		
41	**0.025**	**14606**	**20**	**2227**
40	0.045	13850		
39	0.065	13162		
38	**0.090**	**12379**	**19**	**2203**
37	0.115	11667		
36	0.145	10888		
35	**0.175**	**10176**	**18**	**2282**
34	0.210	9416		
33	0.250	8622		
32	**0.290**	**7894**	**17**	**1812**
31	0.330	7222		
30	0.370	6597		
29	**0.405**	**6083**	**16**	**1752**
28	0.440	5596		
27	0.475	5133		
26	0.510	4692		
25	**0.540**	**4330**	**15**	**1011**
24	0.570	3982		
23	0.600	3645		
22	**0.630**	**3320**	**14**	**620**
21	0.660	3005		
20	**0.690**	**2700**	**13**	**583**
19	0.720	2405		
18	**0.750**	**2117**	**12**	**461**
17	0.775	1884		
16	**0.800**	**1657**	**11**	**440**
15	0.825	1434		
14	**0.850**	**1216**	**10**	**255**
13	0.865	1088		
12	**0.880**	**961**	**9**	**249**
11	0.895	836		
10	**0.910**	**712**	**8**	**163**
9	0.920	631		
8	**0.930**	**550**	**7**	**160**
7	0.940	469		
6	**0.950**	**390**	**6**	**79**
5	**0.960**	**310**	**5**	**79**
4	**0.970**	**232**	**4**	**78**
3	**0.980**	**154**	**3**	**77**
2	**0.990**	**77**	**2**	**46**
1	**0.996**	**31**	**1**	**31**
0	1.000	0		

Figure 1-3. Vertical layer definition for MM5 simulations (left most columns), and approach for reducing CAMx layers by collapsing multiple MM5 layers (right columns).

1.2.4 Summary of Modeling Procedure

Below we provide an overview of the Baton Rouge modeling approach; more detail is provided in subsequent sections of this report. Before summarizing the modeling approach it is useful to first review EPA guidance for episodic 8-hour ozone attainment demonstration modeling.

1.2.4.1 EPA Guidance for Attainment Demonstrations Modeling

In 2007, EPA released a final single guidance document for using models to demonstrate attainment of 8-hour ozone and $PM_{2.5}$ NAAQS and progress toward visibility improvements at Class I areas (EPA, 2007). The guidance covers many aspects of the recommended modeling approach, including model selection, episode selection, air quality application and performance evaluation, and future year projection methodology. For the 8-hour ozone standard, EPA recommends using the Modeled Attainment Test (MAT), which uses modeling results in a relative sense to project current ozone design values (DV) to the attainment year.

The MAT process involves running an appropriate photochemical model to adequately replicate conditions that occurred over one or several historical episodes using emissions from that period (i.e., the “base” case), and then re-running the model for the same episode(s) using projected emissions in the attainment year (i.e., the “future” case). For each monitoring site, the base case simulated daily peak 8-hour ozone is averaged over all days above a given concentration (e.g., 85 ppb) and the simulated future case daily peak 8-hour ozone is averaged over the same days. The ratio of the future case average to the base case average is referred to as the “relative response factor” (RRF) for the given site. The RRF is applied to the site’s current year DV to yield a future year DV projection. EPA recommends at least 10 days be used in the RRF calculation for each monitoring site. If the base case modeling does not yield 10 days at a particular monitor, then the target concentration is lowered from 85 ppb until 10 days are found, with an absolute minimum of 70 ppb and 5 days. EPA also recommends an “un-monitored” analysis for the remainder of the nonattainment area. This entails a similar RRF scaling of DVs, but in this case the DVs at each monitor are interpolated to the modeling grid and RRFs are determined for each grid cell. EPA has developed the Model Attainment Test Software (MATS) tool to automate and simplify the DV projection methodology.

1.2.4.2 Summary of Baton Rouge Attainment Demonstration Modeling

One criterion in selecting modeling periods for an attainment demonstration is the availability of appropriate databases. This was a major reason why the Baton Rouge modeling relied heavily on the CENRAP and more recent TCEQ modeling efforts to provide regional emissions and other supporting datasets. All of the EPA criteria for ozone episode selection were directly considered in this process together with many other pragmatic considerations (e.g., timing of new emissions, aerometric, and traffic network datasets by EPA, states, and local agencies).

The Baton Rouge ozone modeling procedure is summarized as follows:

- Perform MM5 meteorological modeling on the 36/12/4-km nested meteorological domain and extract results to the 36/12/4-km EPS3/CAMx domain;
- Obtain TCEQ regional EPS3 emission databases for the 2006 Base Case and 2009 Future Year;
- Develop 2006 and 2009 emissions for the State of Louisiana, accounting for local population, economic, industrial, and transportation impacts from Hurricane Katrina;
- Perform EPS3 emissions processing on the 36/12/4-km EPS3/CAMx modeling domain for the 2006 Base Case and 2009 Future Year scenario:
- Perform 2006 CAMx Base Case photochemical simulations:
    - Develop CAMx domain inputs (e.g., boundary conditions from the 2006 TCEQ 36-km CAMx application, photolysis inputs, etc.);
- Conduct a CAMx model performance evaluation, sensitivity and uncertainty analysis:

- Run CAMx with 2009 Future Year emissions;
  - Use the same CAMx domain inputs from the 2006 Base Case;
- Project 2009 8-hour ozone DVs using the EPA MATS tool, for both monitored and un-monitored areas.

The issue of model performance goals for 8-hour ozone concentrations is an area of ongoing research and debate. For 1-hour ozone modeling, EPA established performance goals for unpaired peak performance, mean normalized bias (MNB) and mean normalized gross error (MNGE) of <±20%, <±15% and <35%, respectively (EPA, 1991). The current EPA modeling guidance continues to recommend quantifying statistical performance (in a much broader manner), but also stresses performing corroborative and confirmatory analysis to assure that the model is working correctly (EPA, 2007). In evaluating the ozone and precursor model performance for the Baton Rouge 8-hour ozone episodes, many performance measures and displays were used to elucidate model performance and to maximize the probability of uncovering potential problems that can be corrected in the final runs.

Rarely does the first simulation satisfactorily meet all (or even most) model performance expectations. Indeed, our experience has been that initial simulations that "look very good" usually do so as the result of compensating errors. The norm is to engage in a logical, documented process of model performance improvement wherein a variety of diagnostic probing tools and sensitivity testing methods are used to identify, analyze, and then attempt to remove the causes of inadequate model performance. This is invariably one of the most technically challenging and time consuming phase of a modeling study. The CAMx model base case simulations presented some performance challenges that necessitated focused diagnostic and sensitivity testing in order for them to be resolved. Section 4 describes the types of diagnostic and sensitivity testing methods that were employed in assessing model performance.

Future-year modeling for ozone was performed for 2009. The Baton Rouge area was originally designated a Marginal 1997 8-hour ozone nonattainment area but did not attain the standard in 2006. The attainment date for Moderate areas is June 15, 2010, and modeling must show DV projections below the standard by the end of 2009. The 2006 Base Year emissions were projected to 2009, assuming growth and current "on-the-book" (OTB) controls. Modeled ozone concentration fields were provided to the EPA MATS tool to project 2006 8-hour ozone DVs to the 2009 attainment year for both monitored and un-monitored areas. Section 5 of this report provides details on the 8-hour ozone attainment demonstration modeling approach and results.

2. METEOROLOGICAL MODELING

This section describes the application and performance evaluation of the Fifth Generation Mesoscale Model (MM5) in simulating meteorological conditions during the June 2006 ozone episode on a set of nested telescoping grids that cover Louisiana, the Gulf Coast region, and most of the eastern U.S. The performance evaluation allowed us to discern the representativeness of the simulated meteorological fields over southeast Louisiana and to qualitatively review modeling uncertainties as part of the effort to develop the Baton Rouge 1997 8-hour ozone SIP.

The MM5 meteorological modeling of June 2006 was conducted for the LDEQ by a staff member of EPA Region 7 while on temporary assignment to the EPA Office of Air Quality Planning and Standards (B. Anderson, personal communication). EPA ran a single MM5 simulation, configuring its physics and Four Dimensional Data Assimilation (FDDA) algorithms according to the best performing of four different MM5 runs of the May 2005 Baton Rouge ozone episode as reported by Alpine Geophysics (AG, 2008)[1]. AG's basic MM5 physics configuration was in turn based on extensive TCEQ modeling of the Texas Gulf Coast over the past several years as part of the TexAQS II program. Furthermore, AG conducted a brief model performance evaluation of EPA's June 2006 MM5 run, with specific emphasis on characterizing quantitative bias and error statistics for winds, temperature, and humidity in southeast Louisiana. This section summarizes the material developed and presented by AG (2008).

2.1 METHODOLOGY

The methodology for this evaluation was very straightforward. The MM5 model was applied over the entire June 2006 episode (May 26 through July 3). The model results for wind, temperature, and water vapor mixing ratio (humidity), were compared against available surface meteorological measurement data from several airports throughout southeast Louisiana. Observed winds, temperatures, and humidity used in this analysis were taken from the National Oceanic and Atmospheric Administration (NOAA) Techniques Development Lab (TDL) Surface Hourly Observation dataset extracted from archives maintained at NCAR.

2.1.1 Model Configuration and Application

A summary of the MM5 input data preparation procedures used for the June 2006 meteorological modeling exercise is presented below.

Model Selection: The latest publicly available non-hydrostatic version of MM5 (version 3.7.4) was used for this modeling study. Preprocessor programs of the MM5 modeling system including TERRAIN, REGRID, LITTLE_r, INTERPF, and NESTDOWN were used to develop model inputs.

[1] Alpine Geophysics, LLC, is a modeling contractor for the Baton Rouge 8-Hour Ozone SIP Coalition, a local industrial stakeholder group.

Horizontal Domain Definition: Computational grids for the MM5 simulations are presented in Figure 2-1. The outer 36 km domain (D01) covers the entire U.S. and was selected to maximize the Eta Data Analysis System (EDAS) region, from which initial/boundary conditions and FDDA inputs were developed. The 12 km nested grid domain (D02) covers the south-central U.S, while the 4 km nested grid domain (D03) covers Louisiana and neighboring Gulf Coast areas. The map projection was set consistent with the CAMx modeling grid: Lambert Conformal with projection pole at 40°N, 100°W and true latitudes of 30°N and 60°N. The 12 and 4 km MM5 grids were configured to cover and extend beyond the respective CAMx grids to avoid introducing meteorological boundary artifacts and noise into the air quality modeling grids.

Vertical Domain Definition: The MM5 modeling was based on 43 vertical layers with an approximate 30 meter surface layer. The MM5 vertical domain is presented in both normalized pressure ("sigma") and height coordinates in Figure 1-3 (Section 1).

Topographic Inputs: Topographic information for the MM5 was developed using the NCAR and the United States Geological Survey (USGS) terrain databases. The grid was based on the 2 min (~4 km) Geophysical Data Center global data. Terrain data were interpolated to the model grid using a Cressman-type objective analysis scheme via the TERRAIN pre-processor. To avoid interpolating elevated terrain over water bodies, after the terrain databases were interpolated onto the MM5 grid, the NCAR graphic water body database was used to correct elevations over water bodies.

Vegetation Type and Land Use Inputs: Vegetation type and land use information were developed using the most recently released PSU/NCAR databases provided with the MM5 distribution. Standard MM5 surface characteristics inputs corresponding to each land use category were employed. Vegetative cover was processed using the TERRAIN pre-processor.

Initial/Boundary Conditions: EDAS fields were used to construct initial conditions at midnight Coordinated Universal Time (UTC, 00Z) May 26 and 3-hourly boundary conditions for the 36-km grid using the REGRID pre-processor. The 36 km EDAS fields were then enhanced with standard surface and upper-air observational data using the LITTLE_r pre-processor to include local variations that were lost in the EDAS 40 km analyses.

FDDA Data Assimilation: This simulation used a combination of analysis and observational nudging. Analysis nudging inputs were derived from continental-scale EDAS fields of wind, temperature, and humidity at 40 km resolution, interpolated to the 36 and 12 km MM5 grids using the REGRID pre-processor. The 36 and 12 km EDAS fields were then enhanced with standard surface and upper-air observational data using the LITTLE_r pre-processor to include local variations that were lost in the EDAS 40 km analyses. Analysis nudging was performed only on the 36 and 12 km MM5 grids; winds were nudged for all layers, while temperature and humidity were nudged only for model layers above the PBL. Observation nudging of surface winds was performed only on the 4 km grid using the NOAA TDL surface observation database (NCAR DS472.0). Analysis and observational nudging employed standard/default nudging strengths recommended by NCAR.

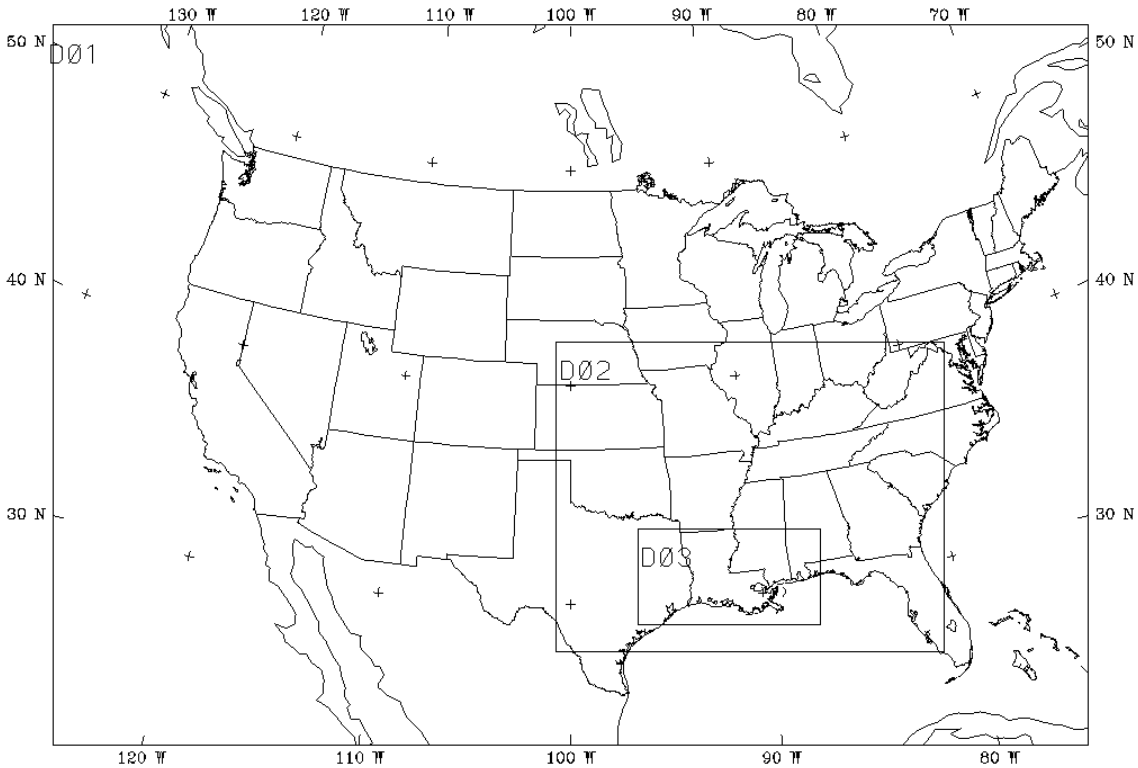


Figure 2-1. Depiction of the MM5 36/12/4 km nested grid system used for the Baton Rouge ozone SIP modeling.

Physics Options: The MM5 model physics options were as follows:

> Mellor-Yamada TKE PBL Scheme
> NOAH Land Surface Scheme
> Simple Ice Resolved Cloud Scheme
> Grell Sub-Grid Cumulus Parameterization on 36 and 12 km grids only
> RRTM Atmospheric Radiation Scheme

Application Methodology: MM5 was executed in 5-day blocks initialized at 00Z every 5 days with a 10 second time step. Model results were output every 60 minutes and output files were split at 24 hour intervals. Twelve hours of spin-up were included in each 5-day block before the data was used in this evaluation.

2.1.2 Evaluation Approach

The model evaluation approach was based on a quantitative analysis of bias and error statistics. The statistical approach examined model bias and error for wind speed, direction, temperature, and humidity. As noted in the specific parameter evaluations, each parameter is compared to performance benchmarks to determine meteorological representativeness for the current SIP study. A detailed model evaluation over monthly time scales and regional spatial scales is very difficult to summarize in a single document; therefore we rely on statistics to characterize how well a model replicated conditions over the entire spatio-temporal scale. The question then reduces to: "what represents acceptable vs. unacceptable statistical performance for this episode and location?"

Emery et al. (2001) derived and proposed a set of daily performance "benchmarks" for typical meteorological model performance. These standards were based upon the evaluation of about 30 meteorological simulations (using MM5, RAMS and other models) since 1993 in support of air quality applications as reported by Tesche et al. (2001) and other studies. The purpose of these benchmarks was not to give a passing or failing grade to any one particular meteorological model application, but rather to put its results into the proper context of other models and meteorological data sets. Since 2001, the benchmarks have been promoted by the EPA-sponsored National Ad Hoc Meteorological Modeling Group[2] and have been consistently relied upon to evaluate MM5 performance in many regulatory modeling projects throughout the U.S. The benchmarks for each variable are:

- Wind speed bias: ±0.5 m/s
- Wind speed RMSE[3]: 2.0 m/s
- Wind speed IoA[4]: 0.6
- Wind direction bias: ±10 degrees
- Wind direction gross error: 30 degrees
- Temperature bias: ±0.5 K
- Temperature gross error: 2.0 K
- Temperature IoA: 0.8
- Mixing ratio bias: ±1.0 g/kg
- Mixing ratio gross error: 2.0 g/kg
- Mixing ratio IoA: 0.6

Being outside one or more of these ranges does not mean the meteorological data fields for a particular parameter are unacceptable. However, such a result indicates that caution should be exercised in the use of such variables, and in interpreting subsequent air quality modeling based on those meteorological fields. Note that recently participants of the National Ad Hoc Meteorological Modeling Group have questioned the value of the Index of Agreement (IoA) metric as a reliable measure of model performance, and have suggested that it should be de-emphasized. Within the context of the Baton Rouge 8-hour ozone SIP modeling, if wind, temperature and humidity bias and error statistics are reasonably near their respective benchmarks, the meteorology was considered representative.

---

[2] The Ad Hoc Meteorological Modeling Group was assembled by EPA and the Lake Michigan Air Directors Consortium (LADCo) in 2000 as an annual forum to address meteorological modeling issues specifically in the context of supporting air quality modeling programs.

[3] Root mean square error

[4] Index of agreement

2.2 SUMMARY OF PERFORMANCE

AG (2008) conducted a brief model performance evaluation of EPA's June 2006 MM5 run; their results are summarized here. The performance review concentrated on winds, temperature and humidity statistics, relative to the performance benchmarks of Emery et al. (2001), as determined from observational airport data (DS472) at various sites throughout southeast Louisiana and southwestern Mississippi (Figure 2-2). MM5 results for this analysis were taken from the 4 km MM5 modeling grid.

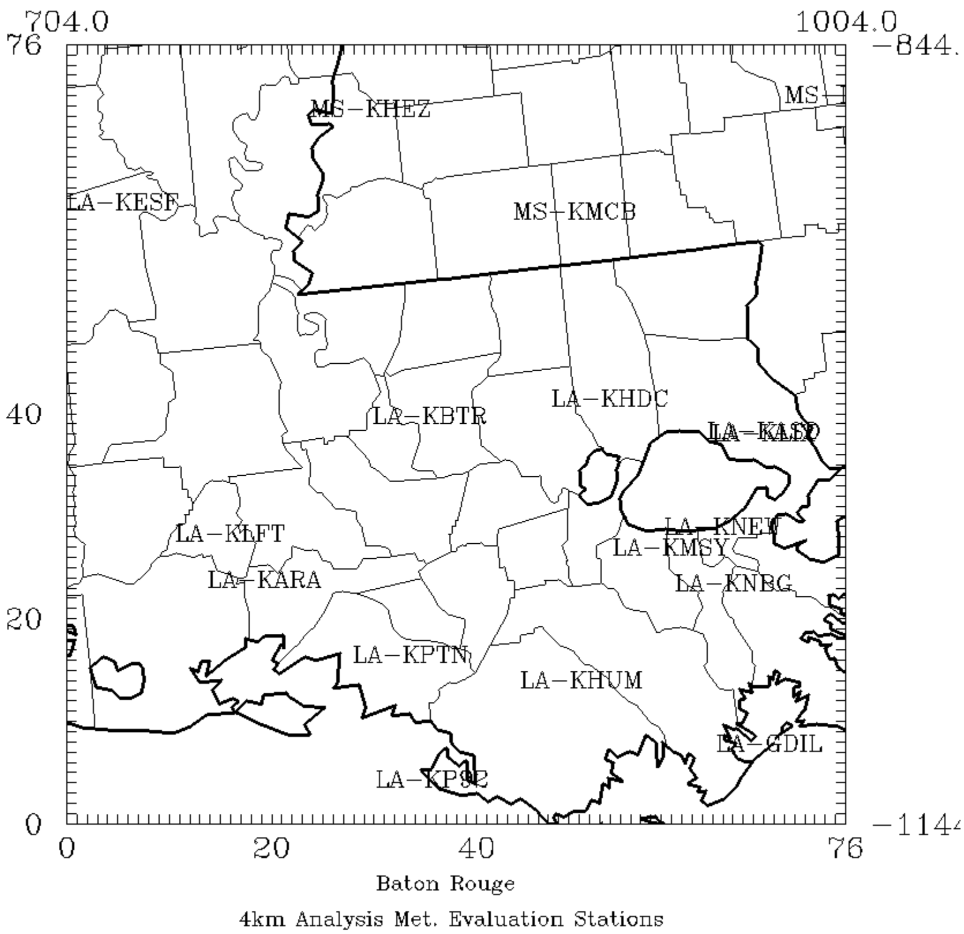


Figure 2-2. Location of airport meteorological observation sites in Louisiana and Mississippi used in the June 2006 MM5 model performance evaluation; sites are denoted using 4-character surface airways designations.

Time series of observed and predicted hourly wind speed, temperature, and humidity averaged over all sites shown in Figure 2-2 are displayed for the entire June 2006 episode in Figures 2-3 through 2-5. Various performance statistics are listed in Table 2-1 along with the Ad Hoc Group benchmarks and the range of certain parameters from 60 recent meteorological modeling studies across the U.S. in support of air quality modeling.

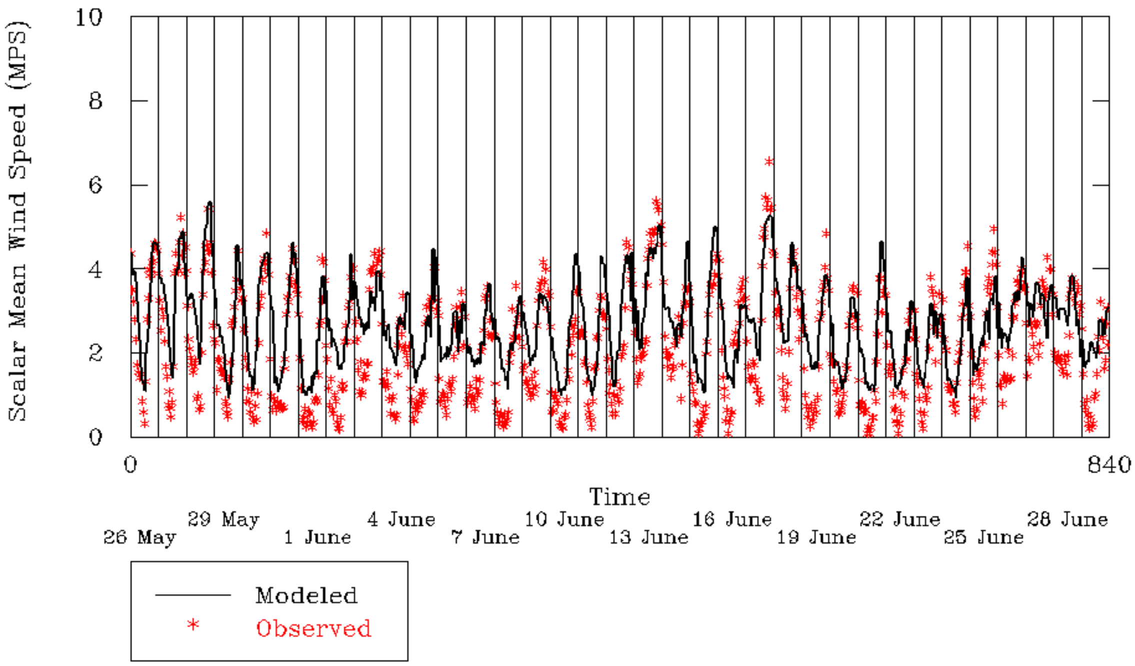


Figure 2-3. Time series of hourly modeled and observed scalar wind speed, averaged over all observation sites shown in Figure 2-2.

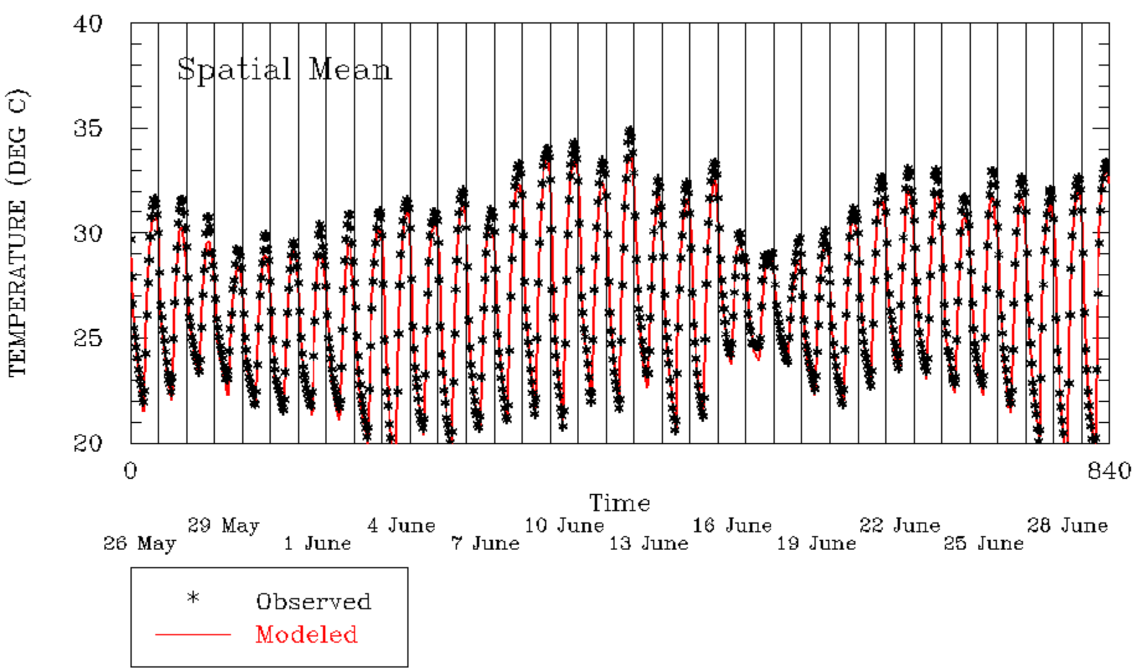


Figure 2-4. Time series of hourly modeled and observed temperature, averaged over all observation sites shown in Figure 2-2.

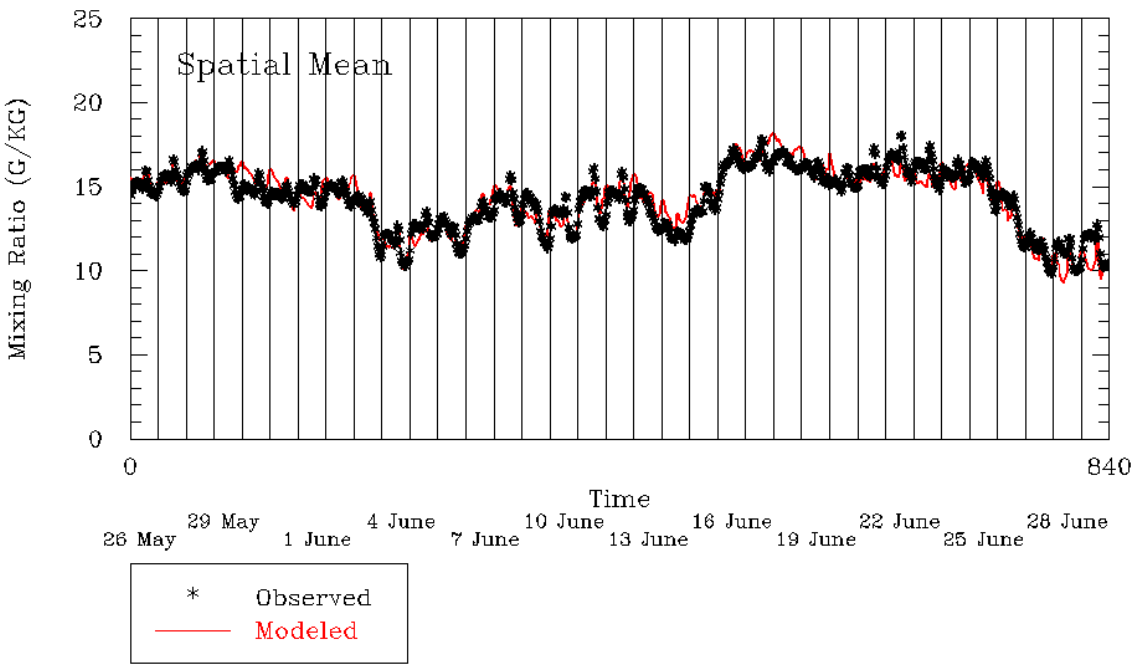


Figure 2-5. Time series of hourly modeled and observed humidity, averaged over all observation sites shown in Figure 2-2.

Table 2-1. MM5 model performance statistics averaged over the entire June 2006 episode, compared against the Ad Hoc performance benchmarks, and against results from 60 recent meteorological modeling studies across the US.

Parameter/Statistic	Episode Mean	Ad-Hoc Benchmark	60 Met Modeling Studies Across US		
			Mean	Lower Std Dev	Upper Std Dev
Scalar-mean observed wind speed (m/s)	2.10				
Scalar-mean predicted wind speed (m/s)	2.64				
Std deviation observed wind speed (m/s)	1.23				
Std deviation predicted wind speed (m/s)	1.32				
Wind speed RMSE (m/s)	1.48	2.0	2.11	1.60	2.62
Mean observed wind direction (deg)	92				
Mean predicted wind direction (deg)	123				
Std deviation observed wind direction (deg)	50				
Std deviation predicted wind direction (deg)	47				
Mean wind direction difference (deg)	31	30	25	0	50
Temperature bias (C)	-0.39	±0.5	-0.10	-0.82	0.62
Temperature gross error (C)	0.95	2.0	2.00	1.55	2.45
Humidity bias (g/kg)	0.23	±1.0	-0.12	-1.04	0.80
Humidity gross error (g/kg)	1.62	2.0	1.78	0.00	3.58

The hourly wind speed time series show that MM5 captures the diurnal variations and synoptic trends well, although the model tends to over predict morning minima and afternoon peak winds. The largest differences are associated with the morning stagnation, where MM5 does not reach below 1 m/s averaged over the observation sites, while the mean observations decrease to near zero on most days. This likely has ramifications for photochemical model performance as the morning build-up of precursor pollutants under these stagnant conditions could be overly ventilated by the MM5 winds.

In contrast, the temperature and humidity time series over southeast Louisiana are remarkable and suggest one of the best MM5 replications of observed conditions we have ever seen in our extensive modeling experience. Temperatures specifically show a very good replication of the full diurnal range as well as the modulation of the temperature wave under various synoptic regimes. One of the most common traits of MM5 is its tendency to either over or under predict the diurnal temperature range on a daily basis, which is attributed to improper surface temperatures generated by the land surface model and associated vertical mixing generated by the PBL model. Humidity is also well-replicated, although MM5 tends to do very well for this parameter, especially in warm humid climates such as the summertime Gulf Coast.

The statistical summary in Table 2-1 supports the time series evidence that the EPA's June 2006 MM5 simulation performed well in simulating observed conditions. All parameters presented by AG (2008) are at or well within the Ad Hoc Group's performance benchmarks. For additional context, AG compared certain performance statistics to the mean and lower/upper standard deviation range from 60 recent meteorological modeling applications conducted across the U.S. in support of air quality modeling programs. These 60 model applications include the original 30 that Emery et al. (2001) evaluated to develop the benchmarks, and mostly consist of MM5 runs (but do include other models) over a large range of temporal scales (several days to annual) and spatial scales (local SIPs to regional/continental applications). Again, statistical results for the June 2006 modeling are often much better than the mean performance of the 60 applications, and well within the standard deviation range.

AG (2008) further stated that the statistical results for surface temperature, humidity, wind speed and wind direction were slightly better than the best results obtained by AG among their four May 2005 MM5 applications. In summary, the temperature and humidity performance for the EPA June 2006 MM5 modeling is more accurate and precise than the Ad Hoc benchmarks and is consistent with other SIP modeling studies. For surface wind speeds, MM5 results are more accurate than the Ad Hoc RMSE benchmark and more accurate than most other SIP modeling studies. For surface wind directions, MM5 was consistent with the benchmark. In both the 2006 and 2005 Baton Rouge MM5 applications reported by AG (2008), correct simulation of the surface wind directions was a bigger problem than in many of the other applications. This could be related to diurnal forcings associated with daily sea breeze penetration into southeast Louisiana; this in turn could affect the dispersion patterns of the Baton Rouge ozone plume. It is important to note that potentially significant local wind simulation problems may exist in the MM5 results that are not well elucidated with standard operational evaluation statistical and graphical summaries.

3. EMISSIONS MODELING

A key component of an ozone modeling study is the underlying emissions inventory. Spatially and temporally resolved estimates of VOC, NO_x, CO and other chemicals from sources such as industries, electric generating units (EGUs), onroad motor vehicles, and biogenics are critical inputs to an air quality model. This section documents the development of the 2006 Base Year and 2009 Future Year emissions inventories and the CAMx-ready emission inputs for the 4-km, 12-km, and 36-km modeling domains (Figure 1-2).

Emphasis was placed on developing emissions estimates within the state of Louisiana, with particular focus on the Baton Rouge Nonattainment Area (BRNAA). The Emissions Processing System, version 3 (EPS3), was employed to convert the emissions inventory into the hourly, chemically speciated, and gridded formats needed by CAMx. Other emissions modeling tools were used to estimate emissions from specific categories, such as GloBEIS (for biogenics) and NMIM/MOBILE6 (for on-road and non-road mobile sources).

EPS3 requires emissions inventory files and ancillary data (cross-reference files, spatial surrogates, temporal and speciation profiles) as input. For this work, the EPS3 setup was built upon 2006/2009 regional ozone modeling inventory processing developed by the TCEQ. Emissions in Louisiana were updated for the 2006 modeling episode based on available information provided by the LDEQ, Louisiana Department of Transportation and Development (LDOTD), and the Capitol Region Planning Commission (CRPC). The 2006 update considered the significant impacts of Hurricane Katrina on population and economics, as well as traffic patterns. Day- and hour-specific NO_x emissions for EGUs throughout the modeling domain were extracted from the EPA acid-rain database and were supplemented with data provided by LDEQ. Off-shore emissions were developed from data available from the U.S. Minerals Management Service (MMS). Biogenic emissions were estimated using GloBEIS for all three modeling grids for each hour of each day of the June 2006 episode.

Emissions estimates for 2009 were based on projections developed from numerous sources. The TCEQ 2009 inventory was used for all sources outside of Louisiana. Within Louisiana, new point facilities were introduced, some facilities were removed because they have since shut down, and emissions from existing facilities were grown according to information provided by LDEQ. Area and non-road sources were projected according to economic and population information. Projections of mobile sources included changes in fleet age and traffic volumes. Offshore emissions and biogenic emissions were held constant from the 2006 Base Year.

3.1 EMISSIONS PROCESSING BY SOURCE CATEGORY

The emissions development effort focused on the state of Louisiana while relying on existing TCEQ inventories for the remainder of the modeling domain. TCEQ has been conducting ozone modeling of the Houston-Galveston area for a period in June 2006 (TCEQ, 2008a). The 2006 EPS3 emissions inventory data files are available on TCEQ's FTP site (TCEQ, 2008b); ENVIRON last downloaded these data for this project in April 2008. TCEQ also recently completed 2009 ozone modeling for the Dallas 8-hour ozone SIP (TCEQ, 2008c). Most of the 2009 EPS3 emissions inventory data files were provided directly to ENVIRON by TCEQ's staff, while emissions outside of Texas are available on TCEQ's FTP site (TCEQ, 2008b); ENVIRON last downloaded these data for this project in May 2008. At that time, ENVIRON contacted TCEQ's staff to check for updates and acquire ancillary inputs and EPS3 message log files for quality assurance.

EPS3 was set up to process criteria pollutant emissions into the CAMx configuration using the Carbon Bond version 5 (CB05) chemical mechanism. Emissions for the following model species were generated:

Criteria Pollutants	CB05 species
• Nitrogen oxides (NOx)	nitric oxide (NO)
	nitrogen dioxide (NO_2)
• Volatile organic compounds (VOC)	paraffins (PAR)
	olefins (OLE, IOLE)
	ethene (ETH)
	ethane (ETHA)
	toluene (TOL)
	xylene (XYL)
	isoprene (ISOP)
	terpene (TERP)
	formaldehyde (FORM)
	higher aldehydes (ALD2, ALDX)
• Carbon monoxide (CO):	CO

Speciation to CB05 compounds was performed by applying standard source-specific profiles derived from the EPA SPECIATE database. These profiles were assigned to each of the source categories contained in the raw emissions inventory files using default EPS3 cross-references. The same speciation was used for both 2006 and 2009.

Temporal allocation for most source categories was similarly applied using default EPS3 seasonal, monthly, day-of-week, and hourly profiles and cross-references as necessary for the various inventory components. For most source categories, these temporal assignments were used for both 2006 and 2009.

Spatial allocation to the 36-km modeling domain utilized the TCEQ's EPS3 gridding files, since LDEQ (2006) established the identical grid for Baton Rouge modeling. However, spatial surrogate data for the 4- and 12-km modeling grids were developed specifically for this project from population and landuse/landcover distributions provided by the EPA (2006a). National/ continental surrogate fields have been prepared by the EPA on a 4-km and a 12-km Lambert Conformal projection grid covering the entire North American continent. These data were processed using ArcGIS software to the LDEQ 12/4-km modeling grids. The resulting surrogates were assigned to each of the source categories contained in the raw emissions inventory files using default EPS3 cross-references. For most source categories, these spatial surrogates were used for both 2006 and 2009.

EPS3 generated model-ready hourly point, area, nonroad mobile, and onroad mobile emissions of CB05 compounds on the 36/12/4-km grid system for a representative weekday, Friday, Saturday and Sunday (daily for acid rain point sources). Biogenic emissions were developed separately using the GloBEIS model, which estimated hourly emission rates on all grids for each day of the June 2006 modeling episode. The remainder of this sub-section details the emissions processing by source category.

3.1.1 Point Source Emissions

3.1.1.1 2006 Base Year

The 2006 point source database was obtained from the TCEQ (2008b); this database was used for all states in the modeling domain except Louisiana. The LDEQ provided the Louisiana state-wide 2006 annual point source inventory. Day-specific, hourly EGU emissions were obtained from the EPA's Clean Air Markets Division's (CAMD) online database (EPA, 2008). The database contains continuous emissions monitoring (CEM) datasets for NO_x, sulfur dioxide (SO_2), and heat input, but does not include any VOC or CO emissions.

Hourly CEM NOx data were obtained from CAMD for Louisiana sources during the May 22 - July 1, 2006 episode. These sources were identified in the LDEQ inventory; emissions from these sources were removed from the LDEQ inventory and replaced with hourly CEM data. VOC:NO_x and CO:NO_x ratios from the removed 2006 LDEQ point source data were applied to the 2006 CEM data to generate VOC and CO emission estimates.

During the quality assurance process, it was determined that stack velocities for 980 records in the 2006 LDEQ inventory were not reasonable because they were supersonic (i.e., greater than 344 m/s). These records were sent to LDEQ for review. A total of 28 records were resolved with appropriate stack velocities, and the remaining records were assigned a default stack velocity (i.e., 0.5 m/s).

Point sources not included in CAMD (i.e., non-acid rain facilities) report annual emissions. These sources were temporally allocated to month, day of week, and hours, according to source category code (SCC) using default EPS3 profiles and cross-reference files. All point source emissions were speciated to CB05 compounds using default EPS3 profiles and cross-reference files. All acid rain point sources were treated as potentially elevated sources. Non-acid rain point emissions were handled as elevated sources wherever possible (i.e., given sufficient stack information). Point source emissions were located in the CAMx grid system according to their reported coordinates.

3.1.1.2 2009 Future Year

Point sources outside of Louisiana were based entirely upon the 2009 TCEQ inventory (TCEQ, 2008b). The 2006 LDEQ point source inventory was used as the starting point for Louisiana, but did not include CEM data from CAMD. Because it was not appropriate or technically correct to project the 2006 actual daily/hourly emissions to 2009, the original 2006 point source inventory was used (i.e., without CEM data replacements). After the 2006 point source inventory was reverted back to its initial condition, the first adjustment that was made was to add new facilities and delete closed facilities.

A total of 109 emission records located at 6 facilities were identified as being closed subsequent to the June 2006 episode (Oubre, 2008a); these records were deleted. These facilities included the following facilities:

- Alma Plantation LLC Ltd – Alma Facility (18 records)
- Bayou Sorrel Commingling Facility (2 records)
- Georgia-Pacific Consumer Operations LLC – Port Hudson Operations (6 records)
- Union Carbide Corp – Cypress Polypropylene Plant (47 records)
- Union Carbide Corp – St. Charles Operations (12 records)
- Weyerhaeuser – Red River Mill (24 records)

A total of 365 emission records located at 20 facilities were identified as new subsequent to the June 2006 episode (Oubre, 2008a); these records were added. These facilities included the following facilities:

- Amerada Hess Corporation – Sea Robin Gas Processing Plant (3 records)
- Basell USA (12 records)
- Bobcat Gas Storage Co – Bobcat Compressor Station (42 records)
- Boise Building Solutions Manufacturing LLC – Florien Plywood Plant (6 records)
- Calumet (23 records)
- Cameron LNG Terminal (27 records)
- Chenier/Sabine Pass LNG Terminal (90 records)
- CLECO – Rodemacher Power Station (6 records)
- Georgia-Pacific Consumer Operations LLC – Port Hudson Operations (3 records)
- Goat Hill Compressor Station (31 records)
- Judge Digby Gas Plant (6 records)
- Louisiana Generating LLC – Big Cajun II Power Plant (3 records)
- Marathon Petroleum Co LLC – LA Refining Division – Garyville Refinery (35 records)
- Martco Limited Partnership – Oakdale OSB Facility (16 records)
- Midcontinent Express Pipeline, LLC – Perryville Compressor Station (12 records)
- Port Hudson Central Tank Battery (3 records)
- Shintech – Plaquemine/SPPs (22 records)
- Trunkline Gas Company, LLC – Kaplan Compressor Station (13 records)
- Union Carbide Corp – St. Charles Operations (3 records)
- Weyerhaeuser – Red River Mill (9 records)

After adding new facilities and deleting closed facilities, another adjustment was made to account for banked emission credits. Although the precise time that a banked emission credit would be used in the future cannot be known, it was assumed (as a worst case scenario) that all banked emission credits would be used during the 2009 scenario. Banked emission credits from 25 facilities were added to the 2006 inventory (Oubre, 2008b); the emissions were located at each facility's front gate.

- BASF Corp – Geismar Site;
- CF Industries Inc – Donaldsonville Nitrogen Complex;
- Criterion Catalysts & Technologies LP – HPA Port Allen Plant;
- Crosstex LIG Liquids LLC – Plaquemine Gas Plant;
- Crosstex Processing Services LLC – Riverside Fractionation;
- ExxonMobil Chemical Co – Baton Rouge Plastics Plant;
- ExxonMobil Refining & Supply Co – Baton Rouge Refinery;
- Formosa Plastics Corp Louisiana – Baton Rouge Plant;
- Georgia Gulf Chemicals & Vinyls LLC – Plaquemine Division;
- Georgia-Pacific Consumer Operations LLC – Port Hudson Operations;
- Hexion Specialty Chemicals Inc – Formaldehyde Plant;
- Honeywell International Inc – Geismar Complex;
- Lion Copolymer Geismar LLC – Geismar Facility;
- Olduvai Gorge, LLC;
- OxyChem – Geismar Plant;
- PCS Nitrogen Fertilizer LP – Nitrate Group – Geismar Agricultural Nitrogen & Phosphate Plant;
- Rubicon LLC – Geismar Plant;
- Shell Chemical Co – Geismar Plant;
- Shintech Louisiana LLC – Plaquemine PVC Plant;
- Terra Mississippi Nitrogen Inc – Donaldsonville Facility;
- The Dow Chemical Co – Louisiana Operations;
- TOTAL Petrochemicals USA Inc – Cos-Mar Co;
- Westlake Vinyls Co LP;
- Weyerhaeuser – Holden Wood Products;
- Williams Olefins LLC – Hydrocarbon Barge Loading – Honeywell Dock.

Following the incorporation of newly opened facilities, the deletion of recently closed facilities, and the addition of banked emissions credits, the point source emissions inventory was ready to be projected to 2009. In general, all records in the point source emissions inventory were grown from 2006 to 2009 using EPA's Economic Growth and Analysis System (EGAS), Version 5 model (EPA, 2006b). However, there were two exceptions to this methodology.

The first exception was the application of NO_x allocated reductions under the Clean Air Interstate Rule (CAIR) to 36 power plant facilities in Louisiana. The appropriate NO_x allocated reductions were provided by LDEQ staff (Oubre, 2008c). Although the U.S. Court of Appeals for the District of Columbia Circuit struck down the provisions of CAIR on July 11, 2008, they were temporarily reinstated on December 23, 2008 until EPA crafts a replacement. All mandated reductions due to CAIR were incorporated into the 2009 inventory projections for modeling purposes.

The second exception was that growth factors for all point sources located in the BRNAA were set to 1.000 (i.e., no growth). This represents the reality that expansion of operations and activities within the BRNAA requires emission offsets that are at a ratio that is greater than one. This assumption is reflected by the downward trend seen in point source emissions in the BRNAA from 2006 to 2007 (Oubre, 2008d). The CAIR allocated reductions for power plant facilities took precedence over the "no growth" in the BRNAA.

The 2009 Future Year point source inventory reported annual emissions. All sources were temporally allocated to month, day of week, and hours, and speciated to CB05 compounds, according to SCC using default EPS3 profiles and cross-reference files. All point emissions were handled as elevated sources wherever possible (i.e., given sufficient stack information). Point source emissions were located in the CAMx grid system according to their reported coordinates.

3.1.2 Area Source Emissions

3.1.2.1 2006 Base Year

This category comprises stationary sources that are not identified as individual points and are distributed over a large spatial extent (i.e. parish). The 2006 TCEQ regional area source inventory (TCEQ, 2008b) was used for all states in the modeling domain except Louisiana. Area source emissions from the 2002 National Emissions Inventory (NEI) were used as the starting point for the 2006 Louisiana area emissions.

Louisiana area emissions were first projected to the year 2005 using EGAS Version 5 in default mode. SCC-level growth factors were developed for 2005 using a 2002 base year. All growth factors were at the state-level because the default mode does not contain underlying economic data at the parish-level. Parish-level growth factors can be developed in EGAS by importing parish-level economic data; however, this was not done due to schedule and resource constraints. As a quality-assurance step, the 2005 projected emissions showed good agreement with the 2005 TCEQ inventory for Louisiana.

EGAS was not used to develop growth factors for 2006, since it does not address sudden and/or localized economic dislocations, such as the landfall of Hurricane Katrina in August 2005. The hurricane and subsequent flooding in New Orleans and other areas in southeast Louisiana caused significant population shifts and economic disruption. Some of these effects have since dissipated, while some are more permanent; however, conditions during the June 2006 episode could be characterized as being in a state of flux. Several different types of data were investigated in an attempt to characterize the rapidly changing conditions in Louisiana in the aftermath of Hurricane Katrina. The following data were used to develop growth factors from mid-2005 to June 2006, and were applied for the source categories listed.

- Parish-level census data (July 1, 2005 and July 1, 2006) (U.S. Census, 2007) – used to project residential fuel combustion, architectural surface coating, other special surface coatings, consumer products, open burning, wastewater, and structure fires.

- Parish-level employment data (May 2005 and June 2006) (BLS, 2008) – used to project autobody refinishing, industrial surface coating, degreasing, dry cleaning, graphic arts, and various other industrial/commercial source categories.
- State-level fuel data (2005 and 2006) (EIA, 2007) – used to project industrial and commercial fuel combustion.
- Vehicle Miles Traveled (VMT) data (2005 and 2006) compiled for the onroad emissions estimates (see below) – used to project petroleum distribution.
- Agricultural acreage data (2005 and 2006) (NASS, 2007) – used to project pesticide application and some types of agricultural burning.

The growth factors for a particular area source category were estimated by taking the ratio of the relevant 2006 data value over the relevant 2005 data value. If the 2005 value was zero, then the growth factor was assumed to be 1.000 (i.e., no growth). In addition, there were a number of source categories for which a 1.000 growth factor was thought to be appropriate. These categories included traffic markings; asphalt application; on-site incineration; treatment, storage, or disposal facilities (TSDF); and some types of agricultural burning.

The June 2006 area source inventory reported average day emissions. All sources were temporally allocated to day of week and hours, speciated to CB05 compounds, and allocated to the CAMx grid system according to SCC using default EPS3 profiles and cross-reference files.

3.1.2.2 <u>2009 Future Year</u>

The 2009 TCEQ regional area source inventory (TCEQ, 2008b) was used for all states in the modeling domain except Louisiana. Area source emissions for the state of Louisiana were projected to the 2009 Future Year based upon the 2006 inventory. Although there are a considerable number of future year surrogate projections available for projecting area source emissions in Louisiana, most of them do not consider the sudden localized economic dislocation and significant population shifts caused by Hurricane Katrina and the subsequent flooding. Some of the effects have since dissipated, while some are more long-lasting. However, two sources of business and population projections have recently been identified.

An annual source of employment projections was released by the Division of Economic Development and Forecasting at Louisiana State University (Scott et al., 2007). The *Louisiana Economic Outlook* 2008 and 2009 employment projections were estimated for the eight Metropolitan Statistical Areas (MSAs) (i.e., Alexandria, Baton Rouge, Houma, Lafayette, Lake Charles, Monroe, New Orleans, and Shreveport-Bossier); aggregated employment projections were also estimated for the 35 rural parishes not located in the eight MSAs. These employment projections were used to estimate growth factors for many of the area source categories; exceptions that used other projection surrogates are described below. Because the *Louisiana Economic Outlook* document has been released for the past 26 years, its employment projections should be considered to be reasonably reliable.

All population projections currently available from the U.S. Census Bureau and the state of Louisiana have not been adjusted for the effects of Hurricane Katrina. However, a Louisiana State University demographer has recently developed parish-level population projections that account for post-Katrina demographic shifts (Blanchard, 2008). Growth factors based upon these population projections were used to project the following population-based area source categories: residential fuel combustion, architectural surface coating, consumer solvents, open burning, structural fires, and wastewater treatment. Area source categories associated with the storage and transport of petroleum products were projected forward based upon 2009 parish-level VMT projections (described below).

There were a number of source categories for which a 1.000 growth factor was thought to be appropriate (i.e., agricultural burning, pesticide application, asphalt application, on-site incineration, TSDFs, and traffic markings). These categories were also held constant while projecting from 2006 to 2009.

The June 2009 area source inventory reported average day emissions. All sources were temporally allocated to day of week and hours, speciated to CB05 compounds, and allocated to the CAMx grid system according to SCC using default EPS3 profiles and cross-reference files.

3.1.3 Offshore Source Emissions

Offshore point and area source emissions include emissions in the Gulf of Mexico that are primarily associated with oil and gas drilling platforms. These emissions were obtained from the 2005 Gulfwide Emission Inventory developed by the Minerals Management Service (MMS) (MMS, 2008a).

Due to aftereffects of Hurricane Katrina, a set of growth factors were developed to project the 2005 offshore emissions to the year 2006. The growth factors were based upon average daily production numbers for May 2005 and June 2006 (MMS, 2008b). The factors were for oil operations, gas operations, and general operations (not specifically oil or gas). The general operations factors were calculated as the average of the oil and gas factors. The factors were developed for two areas: (1) the Western Planning Area (Lake Jackson District), and (2) the Central and Eastern Planning Areas (the remaining districts). Note that there were no significant sources in the Eastern Planning Area, so the Eastern Planning Area and the Central Planning Area were aggregated together.

The MMS daily oil and natural gas production levels were initially developed in November 1947 and have been reported through July 2008 (MMS, 2008b). There is a long lag time required for verification (i.e., years) and so the reported production quantities are basically preliminary cumulative totals that might adjust from time to time until they are finalized. In particular, data from April 2008 to July 2008 appear to be very preliminary. Examination of the production quantities from June 2006 to March 2008 does not provide any conclusive trends. There are considerable short-term fluctuations, but no distinguishable upward or downward trend over the 21 month period. This trend uncertainty is exacerbated due to the lagging data in the more recent months. Given this considerable uncertainty, a growth factor of 1.000 (i.e., no growth) was assigned to the MMS offshore sources.

Both the offshore area and point emissions were distributed evenly across days and months of the year. Diurnal profiles were obtained from the 2005 Gulfwide Emission Inventory Study document (Wilson et al., 2007). Emissions were speciated to CB05 compounds. Point sources were located in the CAMx grid system according to their coordinates. Area emissions were allocated to the modeling grid using GIS lease block shape files provided by MMS along with the offshore inventory (http://www.gomr.mms.gov). Specifically, spatial surrogates were developed by overlaying the MMS GIS coverages onto the modeling grid cells over the Gulf. The ratio of grid cell area to lease block area was then calculated and applied to lease block emission totals to obtain the fraction of emissions to allocate to each modeling grid cell.

3.1.4 Non-Road Mobile Source Emissions

3.1.4.1 2006 Base Year

The 2006 TCEQ regional nonroad source inventory (TCEQ, 2008b) was used for all states in the modeling domain except Louisiana, with a few exceptions as noted below. The EPA's National Mobile Inventory Model (NMIM) model was used to generate Louisiana statewide parish-level offroad equipment emissions estimates for June 2006. NMIM is a tool developed by EPA for estimating onroad and nonroad emissions by county for the entire U.S. to support NEI updates. NMIM incorporates EPA's final NONROAD2005 model, which estimates monthly average day emissions from off-road equipment in the following categories:

- Agricultural equipment, such as tractors, combines, and balers;
- Airport ground support, such as terminal tractors and supply vehicles;
- Construction equipment, such as graders and back hoes;
- Industrial and commercial equipment, such as fork lifts and sweepers;
- Residential and commercial lawn and garden equipment, such as leaf blowers;
- Logging equipment, such as shredders and large chain saws;
- Recreational equipment, such as off-road motorbikes and ATVs; and
- Recreational marine vessels, such as power boats.

NONROAD and NMIM do not include emissions estimates for railroad locomotives, aircraft, and marine vessels (excluding maintenance equipment). Louisiana emissions for locomotives and aircraft were derived from the 2006 TCEQ inventory, which were ultimately derived from the 2002 NEI. As discussed below, marine shipping emissions for the entire modeling domain were developed from CENRAP inventories.

The NONROAD model incorporates the effects of equipment emissions certification standards through a dynamic age distribution calculation. The national nonroad emissions standards included in the model are applicable to:

- Diesel engines;
- Small gasoline engines (handheld and non-handheld equipment <25 hp);
- Recreational marine gasoline engines; and
- Recreational and commercial marine diesel engines.

For national or state-level emissions estimation, the corresponding engine population is determined and then multiplied by the average power, activity, and emission factors. For parish-level estimates, equipment population by parish must first be estimated in the model by geographically allocating the correct state engine population through the use of econometric or physical indicators, such as construction valuation or water surface area.

State-wide parish-level nonroad emissions by SCC were developed for a June 2006 average day. Using EPS3, the emissions were spatially allocated, speciated, and temporally allocated (day of week and hourly) using default SCC-specific profiles and cross-reference files.

3.1.4.1.1 *NMIM Inputs*

Nonroad equipment emissions generated in NMIM are developed based on inputs specified in the county database. NMIM runs the EPA MOBILE6 model to generate emission factors. NMIM uses a county database which specifies MOBILE6 inputs and VMT by county; version NCD20060725 provided by EPA was used in this project. The NMIM county database also incorporates future year fuel characteristics based on refinery modeling of anticipated fuel changes developed by the EPA, local fleet characteristics files submitted to the EPA, and 20 year average monthly temperature and humidity data for each county (EPA, 2005) as well as limited VMT estimates. For this project, the parish database was updated to reflect Louisiana specific data where available. Per input from LDEQ, it was assumed that no oxygenates were used in any Louisiana gasoline in 2006. LDEQ also provided parish-specific Reid Vapor Pressure (RVP) requirements as shown in Appendix A. No effects from Hurricane Katrina were incorporated into the NMIM county database due to the lack of reliable data for these source categories.

3.1.4.1.2 *Marine shipping*

Marine shipping emissions include docking/berthing and underway activities. The docking/berthing emissions are distributed among major ports and the underway are spatially allocated based on position of vessels. Louisiana marine emissions in the TCEQ inventory appeared to be very high and were heavily concentrated in the middle of state. LDEQ suggested that the emissions were misplaced and the magnitude was too high. These problems were not observed in the latest 2002 base inventory developed by CENRAP, as reported by Alpine Geophysics for their work on the May 2005 Baton Rouge episode. After verifying that indeed these problems were not evident in the latest 2002 CENRAP marine inventory, the CENRAP marine emissions were projected to the 2006 base years and used to replace the original marine inventory obtained from TCEQ for all states in the Baton Rouge modeling domain.

3.1.4.2 2009 Future Year

The 2009 TCEQ regional nonroad source inventory (TCEQ, 2008b) was used for all states in the modeling domain except Louisiana, with a few exceptions as noted below. The EPA's NMIM model was used to generate Louisiana statewide parish-level off-road equipment emissions estimates for June 2009. Updates to fuel properties were made in the parish database as described above for 2006. Other nonroad categories not included in NMIM, including railroad locomotives and aircraft (excluding maintenance equipment and marine shipping), were derived from the 2009 TCEQ inventory.

State-wide parish-level 2009 nonroad emissions by SCC were developed for a June 2006 average day. Using EPS3, the emissions were spatially allocated, speciated, and temporally allocated (day of week and hourly) using default SCC-specific profiles and cross-reference files.

3.1.4.2.1 *Marine shipping Emissions*

As seen in the 2006 TCEQ inventory, Louisiana marine emissions appeared to be very high and were heavily concentrated in the middle of state. These problems were not observed in the latest 2009 future year inventory developed by VISTAS, as reported by Alpine Geophysics. Moreover, the 2009 VISTAS emissions were in-line with the latest 2002 CENRAP marine inventory, as reported by Alpine Geophysics for their work on the May 2005 Baton Rouge episode. After verifying that indeed these problems were not evident in the latest 2009 VISTAS marine inventory, that inventory was used to replace the original 2009 marine inventory obtained from TCEQ for all states in the Baton Rouge modeling domain.

3.1.5 On-Road Mobile Source Emissions

Significant effort was expended on developing the Baton Rouge onroad mobile source emissions inventory. Mobile source emissions were estimated with an incrementally increasing level of detail as the focus moves from regional (multi-state) scales to the BRNAA. As with the processing of other major source categories discussed previously, the 2006 and 2009 TCEQ regional onroad source inventories (TCEQ, 2008b) were used for all states in the modeling domain except Louisiana.

June 2006 and 2009 onroad emissions in the state of Louisiana were developed following several methodologies. Statewide emissions outside of the five-parish BRNAA were developed using EPA's NMIM model, while emissions within the nonattainment area were developed based on parish-specific inputs provided by several state agencies. Specifically, two different nonattainment area onroad inventories were generated for each modeling year: (1) an initial inventory based on parish-level measured Highway Performance Monitoring System (HPMS) vehicle miles traveled (VMT) and MOBILE6 inputs; and (2) a final inventory based on link-level VMT derived from a transportation demand model (TDM) and parish-level MOBILE6 inputs. The sub-sections that follow describe the various approaches applied within the state of Louisiana.

3.1.5.1 Baton Rouge Nonattainment Area

3.1.5.1.1 *Parish-Level HPMS Approach*

Onroad emissions were initially developed for the 5-parish BRNAA by combining emission factors generated by the latest version of EPA's MOBILE6 model with parish-level VMT derived from HPMS data. MOBILE6 inputs were provided by LDEQ for 2005 and updated for 2006 and 2009 as shown in Appendix A.

Annual average daily HPMS VMT and monthly activity allocation data for 2006 and 2009 were obtained from LDOTD. The VMT data were stratified by parish and HPMS roadway type as typically used in regional level modeling inventories. Monthly activity allocations were statewide by roadway type.

The MOBILE6 model estimates emission factors (g/mile) by vehicle class, which are then multiplied by appropriate VMT estimates to estimate on-road parish-level emissions of criteria pollutants (NO_x, CO, and VOC). Version 6.2, which is the latest publicly released version (February 2004) and available at http://www.epa.gov/otaq/m6.htm, was used in this work and contains updated CO emission factors for light-duty vehicles certified to the National Low Emission Vehicle (NLEV) and Tier 2 standards.

The MOBILE6 model includes the effects of all currently promulgated Federal motor vehicle control programs:

- Tier 1 light-duty vehicle standards, beginning with the 1994 model year;
- National Low Emission Vehicle (NLEV) standards for light-duty vehicles, beginning with model year 2001;
- Tier 2 light-duty vehicle standards, beginning with model year 2004;
- Heavy-duty vehicle standards, beginning with model year 2004; and
- Heavy-duty vehicle standards (with low sulfur diesel), beginning with model year 2007.

LDEQ specified all of the MOBILE6 inputs appropriate to the nonattainment area for 2006. It was assumed that no oxygenates were used in any Louisiana gasoline in 2006, and would not be used in 2009. RVP for 2006 was specified by parish as shown in Appendix A; the same values were used in 2009. Vehicle inspection and maintenance programs were limited to the five parishes within the BRNAA (Appendix A) and used for both 2006 and 2009. The statewide 2006 and 2009 anti-tampering program inputs were set in MOBILE6 as shown below:

```
ANTI-TAMP PROG :  00 80 95 22222 21111111 1 11 072. 22222222
```

Registration distribution is important for onroad vehicles emissions modeling as it is the input used by MOBILE6 to derive by vehicle class age distribution. Age distribution determines what fraction of a vehicle class's age distribution are subject to which emissions standards, with newer vehicles generally meeting more stringent standards. Parish-level registration data were available for the nonattainment area in 2006. These data were averaged over the 5 parishes to yield a single nonattainment area vehicle age/type profile to account for the daily blending of the on-road fleet during the course of a typical day; the final registration distributions utilized in emissions modeling are shown in Appendix A. The same values were used for 2009.

Using the VMT and emission factors described above, June 2006 average day NNA parish-level onroad mobile emissions by SCC (roadway type) were processed to EPS3 AMS file formats for further processing with EPS3. The EPS3 processing step for on-road emissions is described later in this sub-section.

3.1.5.1.2 *Link-Level TDM Approach*

Final onroad emissions for the 5-parish Baton Rouge area were developed from link-level TDM activity data for areas within the geographical boundaries of the TDM network. It is noted that the TDM covers East Baton Rouge Parish in its entirety, and only parts of Ascension, Livingston, West Baton Rouge, and Iberville parishes. For areas outside the TDM network, but within the 5-parish BRNAA, parish-level TDM activity was reconciled with parish-level HPMS activity to estimate the fraction of VMT for the appropriate portions of each parish. TDM activity data was processed and combined with MOBILE6 emission factors, to develop criteria pollutant emission rates for input to EPS3. Inputs for MOBILE6 were provided by LDEQ as described in the sub-section above; the one exception was 5-parish registration data, for which a revised 2006 registration data file was provided by LDEQ.

3.1.5.1.2.1 Onroad Emissions Within the Network Region

Link-Level Emissions

Link-level emissions were calculated from hourly VMT and speed on each link and an appropriate gram/mile MOBILE6 emission factor. The disaggregation of the link activity data (i.e., traffic volumes and speed) into hourly day-of-week volumes by vehicle class on each link was completed by AECOM (formerly Urbitran Associates). ENVIRON generated the MOBILE6 emission factors and created the link-level emissions files in EPS3 “LBASE” format for gridding and speciation through EPS3.

The 2006 and 2009 link-level activity data used in this project were generated from the TransCAD TDM provided by the CRPC. The typical day TDM data were post-processed by AECOM into hourly values for an average June weekday, Saturday and Sunday. The hourly disaggregation of activity was performed using AECOM’s PPSUITE post-processing software, which has been used consistently in the past for CRPC air quality conformity analysis. Due to a lack of local information from LDOTD, EPA default day-of-week factors were applied to generate the weekday, Saturday, and Sunday activity.

The TDM activity data included the eight MOBILE5 vehicle class splits (LDGV, LDGT1, LDGT2, HDGV, LDDV, LDDT, HDDV, and MC), volumes, and speeds for June 2006 and 2009. In addition to the activity data, AECOM also provided the link characteristic data, including link length, roadway classification, area type, parish, and end node coordinates in latitude/longitude.

Using Microsoft Access, ENVIRON extracted the hourly volumes by vehicle type and combined them with speeds and the link characteristic data. The node coordinates were converted to the

EPS3/CAMx Lambert Conformal projection, which were then combined with the other data to create a single comma-delimited activity file. The roadway types in the AECOM activity data were the same as HPMS roadway types. They were mapped to the four MOBILE6 roadway types as shown in Table 3-1.

Table 3-1. Mapping of TDM roadway type to MOBILE6 roadway type.

Activity Data Roadway Type Code	Description	MOBILE6 Roadway Type
Rural		
01	Principal Arterial – Interstate	Freeway
02	Principal Arterial – Other	Arterial
06	Minor Arterial	Arterial
07	Major Collector	Arterial
08	Minor Collector	Local
09	Local System	Local
Urban		
11	Principal Arterial – Interstate	Freeway
12	Principal Arterial – Other Freeway or Expressway	Freeway
14	Principal Arterial – Other	Arterial
16	Minor Arterial	Arterial
17	Collector	Local
19	Local System	Local

Lookup tables of hourly emission factors (for the eight MOBILE5 vehicle classes) were created by running MOBILE6 for each of the different MOBILE6 roadway types (arterial, freeway, local, and ramp). MOBILE6 was run for a range of speeds incremented by 5 mph from 7.5 mph to 62.5 mph for freeways and arterials. For locals and ramps, the MOBILE6 speed was fixed at 34.6 mph and 12.9 mph, respectively, so a range of speeds was not used for these two roadway types. The MOBILE6 minimum and maximum temperature was set to the June climatological values of 72.3 and 94.8 degrees Fahrenheit, respectively (as defined in the NMIM model used to derive nonroad and onroad emissions for the remainder of Louisiana).

A Linux perl script was developed that calculated hourly VMT on each link as the product of the volume times the link length. These hourly link-level VMT were multiplied by the corresponding MOBILE6 emission factor for that hour, speed bin, roadway type, and vehicle class. The perl script formatted the emissions as LBASE files for gridding and speciation by EPS3.

Off-Network Local Emissions

CRPC provided local and collector VMT for the geographic region covered by the TDM network (which included partial parishes) separately from the link data. These VMT totals for local and collector roadways were representative of the total VMT from these two roadway classes in the region covered by the TDM network, which were not being accurately captured by the TDM itself (as determined by CRPC). To implement the correct total off-network VMT in the Baton Rouge area, ENVIRON dropped all TDM local and collector VMT and used the CRPC local VMT. AECOM provided the local VMT by Parish for a June weekday, Saturday, and Sunday.

Hourly temporal profiles were calculated for the off-network volumes from the hourly fractions of daily link-level total volume by roadway type. The vehicle class splits were similarly calculated based on the link data for each hour for local and collector roads. These temporal profiles were applied to the partial-parish total VMT and matched with an appropriate MOBILE6 emission factor. Off-network emissions were processed as an area source in EPS3 AMS format, which was gridded using a secondary roads surrogate.

The gridding of the off-network local emissions was accomplished by creating gridded surrogates for the region covered by the TDM network only, ensuring that those emissions would be geographically placed in that area. This enabled parishes partially covered by the TDM network to be split in two, the section inside the network and the section outside.

3.1.5.1.2.2 Onroad Emissions Outside the Network Region

To estimate onroad emissions in the portions of the four parishes not geographically covered by the TDM network (Ascension, Iberville, Livingston, and West Baton Rouge), VMT for these areas was estimated by subtracting the TDM network VMT from the parish-total HPMS VMT. East Baton Rouge was covered completely by the TDM network, and so was not included in this analysis. The parish-total HPMS VMT represented an average June day as described earlier. The TDM network VMT represented a June average weekday, Saturday, and Sunday. Therefore, in order to perform the subtraction, we first calculated an averaged June day TDM VMT for each parish as follows: (5×weekday VMT + Saturday VMT + Sunday VMT)/7.

Ideally the differences between parish-level HPMS and TDM VMT among the twelve roadway types should be positive. However, due to roadway type classification differences between the two datasets, it was not possible to obtain positive VMT outside the TDM network for each of the twelve individual roadway types. Instead, VMT was totaled among major and minor roadway groups, where the major road grouping included classes 01, 02, 11, and 12 from Table 1-1, and the minor grouping included the remaining classes. Multiplicative reduction factors to be applied to the HPMS VMT were calculated for these major and minor road groups. All differences were positive by major/minor roadway type with the exception of Ascension Parish in 2009. In this lone case, a single VMT reduction factor was created based on the parish total VMT over all roadway types.

Tables 3-2 and 3-3 display the June 2006 and 2009 HPMS and TDM VMT totals (including the supplemental off-network local and collector VMT) and the HPMS reduction factors calculated for the area outside the TDM. Note that although East Baton Rouge was not included in the calculation of VMT outside the network, the VMT totals were calculated for comparison purposes. The East Baton Rouge total network VMT (plus supplemental local and collector VMT) compares very well with the average day HPMS VMT for both 2006 and 2009, with total parish differences of only 1.64 and 2.2%.

Table 3-2. June 2006 VMT (mi/day) in parishes extending outside the TDM network.

Parish	Road Group	HPMS VMT	Average Day Network VMT	% Difference	HPMS Adjustment Factors	Total % Difference
Ascension	MAJOR	1,110,780	904,156	18.60	0.186	
Ascension	Minor	2,026,649	1,463,314	27.80	0.278	24.54
East Baton Rouge	MAJOR	3,113,162	2,824,945	9.26	0.000	
East Baton Rouge	Minor	7,017,327	7,471,344	-6.47	0.000	-1.64
Iberville	MAJOR	749,045	0	100.00	1.000	
Iberville	Minor	727,717	112,335	84.56	0.846	92.39
Livingston	MAJOR	1,360,544	867,388	36.25	0.362	
Livingston	Minor	2,147,995	1,607,004	25.19	0.252	29.48
West Baton Rouge	MAJOR	837,399	476,090	43.15	0.431	
West Baton Rouge	Minor	845,829	427,995	49.40	0.494	46.29

Table 3-3. June 2009 VMT (mi/day) in parishes extending outside the TDM network.

Parish	Road Group	HPMS VMT	Average Day Network VMT	% Difference	HPMS Adjustment Factors	Total % Difference
Ascension	MAJOR	1,098,208	1,123,763	-2.33	-0.023**	
Ascension	Minor	2,213,470	1,758,425	20.56	0.206**	12.97
East Baton Rouge	MAJOR	3,352,207	3,259,004	2.78	0.000	
East Baton Rouge	Minor	8,046,941	8,391,266	-4.28	0.000	-2.20
Iberville	MAJOR	785,483	0	100.00	1.000	
Iberville	Minor	766,793	138,829	81.89	0.819	91.06
Livingston	MAJOR	1,476,158	937,623	36.48	0.365	
Livingston	Minor	2,411,023	1,843,668	23.53	0.235	28.45
West Baton Rouge	MAJOR	848,281	570,559	32.74	0.327	
West Baton Rouge	Minor	938,043	524,564	44.08	0.441	38.69

** The actual June 2009 HPMS adjustment factor for Ascension Parish was based on parish total VMT rather than the major/minor roadway split. This actual factor for Ascension is 0.130.

3.1.5.1.3 *Baton Rouge Nonattainment Area VMT and Emissions Comparison*

This sub-section presents summary tables showing the changes in 2006 and 2009 VMT and criteria pollutant emissions between the initial HPMS estimates and the revised TDM estimates in each of the five parishes in the BRNAA. Table 3-4 shows the 2006 VMT comparison, including the HPMS-based estimates, and the three components of the revised estimates (link network, off network, and outside network) as well as the total revised VMT. Table 3-5 shows the same for 2009. Table 3-6 shows the relative change between 2006 and 2009 for each of the components. Note that in developing these tables, it was determined that the 2006 HPMS-based VMT was never adjusted from annual day to June day, thus explaining the bigger VMT differences between the original and revised approach in 2006 than in 2009.

Table 3-4. 2006 VMT (mi/day) comparison between the initial parish-level HPMS and the revised TDM-based estimates (by component).

FIPS	Parish	HPMS* (Original)	Network (LBASE)	Off Network	Outside Network	Total Revised	Change
22005	Ascension	2,971,921	1,793,397	574,072	770,669	3,138,139	6%
22033	East Baton Rouge	9,465,568	8,745,812	1,550,477	0	10,296,290	9%
22047	Iberville	1,410,105	60,345	51,990	1,364,427	1,476,762	5%
22063	Livingston	3,336,144	1,587,754	886,638	1,034,148	3,508,540	5%
22121	West Baton Rouge	1,573,172	819,008	85,077	779,143	1,683,229	7%
						Average change:	7%

* Annual VMT: June adjustment was not applied

Table 3-5. 2009 VMT (mi/day) comparison between the initial parish-level HPMS and the revised TDM-based estimates (by component).

FIPS	Parish	HPMS (Original)	Network (LBASE)	Off Network	Outside Network	Total Revised	Change
22005	Ascension	3,311,678	2,182,094	700,093	429,490	3,311,678	0%
22033	East Baton Rouge	11,399,148	9,924,846	1,725,425	0	11,650,270	2%
22047	Iberville	1,552,276	71,320	67,509	1,413,447	1,552,276	0%
22063	Livingston	3,887,181	1,785,210	996,081	1,105,891	3,887,181	0%
22121	West Baton Rouge	1,786,324	978,136	116,986	691,201	1,786,324	0%
						Average change:	**1%**

Table 3-6. Change between 2006 and 2009 VMT (mi/day) for the original parish-level HPMS and the revised TDM-based estimates (by component).

FIPS	Parish	HPMS (Original)	Network (LBASE)	Off Network	Outside Network	Total Revised
22005	Ascension	11%	22%	22%	-44%	6%
22033	East Baton Rouge	20%	13%	11%		13%
22047	Iberville	10%	18%	30%	4%	5%
22063	Livingston	17%	12%	12%	7%	11%
22121	West Baton Rouge	14%	19%	38%	-11%	6%
	Average change:	**17%**		**Average change:**		**10%**

Table 3-7 shows the 2006 criteria emissions comparison, including the HPMS-based estimates, and the three components of the revised estimates (link network, off network, and outside network) as well as the total revised emissions. Table 3-8 shows the same for 2009. Table 3-9 shows the relative change between 2006 and 2009 for the entire 5-parish area for the HPMS and TDM approaches. Again, the 2006 to 2009 emissions reductions in the original approach are slightly higher than the revised approach, likely due to the lack of June average day scaling of the VMT in the former case.

Table 3-7. 2006 criteria pollutant emissions (TPD) comparison between the initial and revised TDM-based estimates (by component).

FIPS	Parish	Original	Network (LBASE)	Off Network	Outside Network	Total Revised	Change
NOx (TPD)						-2%	
22005	Ascension	5.1	0.6	3.2	1.2	5.0	-0.8%
22033	East Baton Rouge	14.3	1.5	13.0	0.0	14.5	1.4%
22047	Iberville	3.5	0.1	0.1	3.5	3.6	4.2%
22063	Livingston	6.7	0.9	2.8	2.2	5.9	-12.2%
22121	West Baton Rouge	3.3	0.1	1.4	1.6	3.1	-7.3%
TOG (TPD)						17%	
22005	Ascension	3.2	1.0	1.8	0.9	3.7	13.2%
22033	East Baton Rouge	10.0	2.7	9.3	0.0	11.9	19.3%
22047	Iberville	1.5	0.1	0.1	1.4	1.6	6.4%
22063	Livingston	3.5	1.5	1.7	1.1	4.3	21.4%
22121	West Baton Rouge	1.6	0.1	0.8	0.8	1.8	9.9%
CO (TPD)						-5%	
22005	Ascension	36.7	5.6	20.3	9.5	35.3	-4.0%
22033	East Baton Rouge	120.0	15.0	94.7	0.0	109.8	-8.5%
22047	Iberville	17.1	0.5	0.6	16.6	17.8	3.8%
22063	Livingston	40.8	8.6	18.0	12.8	39.4	-3.5%
22121	West Baton Rouge	19.8	0.8	9.0	9.8	19.6	-0.7%

Table 3-8. 2009 criteria pollutant emissions (TPD) comparison between the original and revised TDM-based estimates (by component).

FIPS	Parish	Original	Network (LBASE)	Off Network	Outside Network	Total Revised	Change
NOx (TPD)						1%	
22005	Ascension	3.8	0.5	2.9	0.5	4.0	4.3%
22033	East Baton Rouge	11.8	1.3	11.0	0.0	12.3	3.9%
22047	Iberville	2.6	0.0	0.1	2.7	2.8	7.8%
22063	Livingston	5.3	0.7	2.3	1.8	4.8	-9.1%
22121	West Baton Rouge	2.5	0.1	1.2	1.0	2.3	-7.6%
TOG (TPD)						17%	
22005	Ascension	2.6	0.9	1.7	0.4	3.0	12.6%
22033	East Baton Rouge	8.8	2.2	8.2	0.0	10.4	18.2%
22047	Iberville	1.2	0.1	0.1	1.1	1.3	10.2%
22063	Livingston	3.0	1.2	1.5	0.9	3.6	20.2%
22121	West Baton Rouge	1.3	0.1	0.8	0.6	1.5	11.0%
CO (TPD)						-4%	
22005	Ascension	29.6	5.2	19.2	4.1	28.6	-3.2%
22033	East Baton Rouge	104.4	12.9	83.6	0.0	96.5	-7.6%
22047	Iberville	13.5	0.5	0.6	13.4	14.5	7.3%
22063	Livingston	34.2	7.5	15.8	10.6	33.9	-0.8%
22121	West Baton Rouge	16.1	0.9	8.4	6.7	16.0	-0.9%

Table 3-9. Change in criteria pollutant emissions (TPD) between 2006 and 2009 for the original and revised TDM-based estimates.

Criteria Pollutant	Year	Original	Revised
NOx	2006 (TPD)	32.9	32.1
	2009 (TPD)	26.0	26.2
	Change	-21%	-18%
TOG	2006 (TPD)	19.8	23.2
	2009 (TPD)	16.9	19.7
	Change (%)	-15%	-15%
CO	2006 (TPD)	234.5	221.9
	2009 (TPD)	197.8	189.5
	Change (%)	-16%	-15%

3.1.5.2 Outside Baton Rouge Nonattainment Area

NMIM uses a county database that specifies MOBILE6 and VMT inputs by county; version NCD20060725 provided by the EPA was used in this project. NMIM runs MOBILE6 to generate emission factors and internally applies VMT estimates to these emission factors to generate monthly average day emissions by county and vehicle class. The NMIM county database incorporates future year fuel characteristics based on refinery modeling of anticipated fuel changes developed by the EPA, local fleet characteristics files submitted to the EPA, and 20 year average temperature and humidity data for each county (EPA, 2005) as well as limited VMT estimates. For this project, the county database was updated to reflect Louisiana-specific data where available. This included fuel specifications, 2006 and 2009 VMT, registration data, and inspection/maintenance information as described above (see also Appendix A).

For Louisiana parishes outside the BRNAA, two sets of registration distribution data were available for emissions modeling: 2005 statewide data and 2006 data for the five-parish BRNAA. From 2005 to 2006 it was felt that there was likely significant change in the geographical distribution of vehicles, and vehicle profiles within the parishes – especially for the area directly affected by Hurricane Katrina. Given the lack of a complete data set for 2006 outside of the five-parish BRNAA, one aggregated registration distribution for all parishes outside of the five parish nonattainment area was utilized based on 2005 registration distribution data. Registration distributions utilized in the 2006 emissions modeling are shown in Appendix A; the same distributions were used for 2009.

3.1.5.3 EPS3 Processing of On-Road Emissions

Using the information described above, Louisiana onroad emissions by SCC were developed for June 2006 and 2009. The onroad SCCs include vehicle type, road type and process (evaporative or exhaust) information. Using EPS3, the emissions were allocated to the modeling grid using surrogate factors. For link-level emissions (in LBASE input format), the locations of the link end-point coordinates were used directly to place emissions in the appropriate grid cells. For local (off-network) roads within the Baton Rouge network, and for all roads outside the network, emissions were processed to the grid in the form of area sources (in AMS input format) using TIGER roadway and EPA landuse/landcover data assigned by road type (Table 3-10). The emissions were then speciated to the individual chemical species using default CB05 chemical profiles classified by vehicle type and process. The parish-level emissions were estimated for a typical June day, and EPS3 was used to temporally distribute the emissions to day of week (weekday, Saturday and Sunday) and to each hour of the day using the EPA's default SCC-specific temporal profiles. The Baton Rouge network emissions were calculated hourly for a June weekday, Saturday, and Sunday; therefore no additional EPS3 temporal allocation was needed. Onroad emissions outside of Louisiana were based on the TCEQ inventory, and were processed directly using TCEQ EPS3 files.

Table 3-10. Spatial surrogates assigned to each roadway class for gridding of parish-level on-road mobile source emissions.

Name	Road Class Code	Primary Surrogate	Secondary Surrogate	Tertiary Surrogate
Rural Interstate	110	Rural Primary roads	All Roadways	Rural Primary roads
Rural Principal Arterial	130	Rural Primary roads	All Roadways	Rural Primary roads
Rural Minor Arterial	150	Rural Primary roads	All Roadways	Rural Primary roads
Rural Major Collector	170	Rural Secondary roads	All Roadways	Total Population
Rural Minor Collector	190	Rural Secondary roads	All Roadways	Total Population
Rural Local	210	Rural Population	Total Population	Rural Population
Urban Interstate	230	Urban Primary roads	All Roadways	Total Population
Urban Freeway	250	Urban Primary roads	All Roadways	Total Population
Urban Principal Arterial	270	Urban Primary roads	All Roadways	Total Population
Urban Minor Arterial	290	Urban Primary roads	All Roadways	Total Population
Urban Collector	310	Urban Secondary roads	All Roadways	Urban Secondary roads
Urban Local	330	Urban Population	Total Population	Urban Population

3.1.6 Biogenic Emissions

The Global Biosphere Emissions and Interactions System (GloBEIS) model was used to prepare gridded, hourly, speciated biogenic emissions inventories suitable for input to the CAMx (Yarwood, et al., 2003). GloBEIS runs in Microsoft ACCESS on Windows-based computers. Emissions rates are a function of landcover and environmental conditions. The inputs to GloBEIS model are:

- Landuse/Landcover (LULC): The LULC data were taken from the Biogenic Emissions Landcover Database (BELD3) version 3.1 developed by the EPA (EPA, 2006c). This database combines data at 1-km pixel resolution, covering the entire 48 conterminous U.S. states as well as Mexico and Canada. The data are available in sections, or tiles. To encompass the entire proposed modeling grid, the BELD3 data for tiles 9 and 10 were used for the 4-km domain, with addition of tile 15 and 16 for 12-km domain. ARC/Info was used to determine which BELD3 pixels were contained within the modeling domain, and then a FORTRAN program was used to build the LULC data for each GloBEIS grid cell.
- Surface Temperature Data: Gridded, hourly temperature fields were extracted from MM5 predictions for the entire June 2006 episode.
- Photosynthetically active radiation (PAR): The PAR data represents the spectral range of solar radiation that is used by plants for the photosynthesis process. The data were downloaded from the University of Maryland (UMD; 2006) and a FORTRAN program

was used to reformat the data. Some of the PAR data were missing. As part of the QA process, the PAR data were inspected, and the missing data were replaced by interpolating the missing data between hours.

Biogenic emissions were modeled for each episode day, using the daily meteorology provided by MM5 on each grid.

3.2 EMISSIONS SUMMARY

3.2.1 2006 Base Year

The 2006 base year emissions within the 5-Parish BRNAA are summarized in Table 3-11. Note that the onroad emissions shown are from the initial HPMS approach. Also note that reported biogenic emissions were derived from gridded emissions (i.e. each cell only represents one parish that covers a majority of the cell area) and the biogenic VOC are reported as Total organics (TOG). Emissions by state within the 36-km modeling domain are summarized in Table 3-12b. The 36-km summary reports VOC as TOG.

Figures 3-1 through 3-4 present NOx and VOC emission density plots by major source category for a representative weekday in the 2006 modeling episode.

Table 3-11. 2006 typical weekday emissions (tons/day) within the 5-Parish Baton Rouge area.

FIPS	Parish	Area	Nonroad	Onroad	Point	Biogenics
NOx (TPD)						
22005	Ascension	2.8	8.0	4.5	20.7	0.2
22033	East Baton Rouge	5.5	12.0	12.6	26.2	0.4
22047	Iberville	2.2	6.1	3.2	22.8	0.7
22063	Livingston	0.9	1.3	6.0	0.2	0.3
22121	West Baton Rouge	1.2	7.9	3.0	3.5	0.9
VOC (TPD)						
22005	Ascension	20.3	1.6	2.9	7.8	10.2
22033	East Baton Rouge	32.0	6.0	8.8	15.4	25.6
22047	Iberville	17.5	1.8	1.3	7.1	28.9
22063	Livingston	5.0	3.6	3.2	1.1	82.7
22121	West Baton Rouge	3.9	2.1	1.4	1.7	16.1
CO (TPD)						
22005	Ascension	15.2	20.1	32.6	9.8	2.5
22033	East Baton Rouge	7.1	103.6	105.3	29.7	3.9
22047	Iberville	18.0	11.3	15.6	7.4	7.1
22063	Livingston	12.2	19.4	36.7	1.6	14.3
22121	West Baton Rouge	6.3	17.0	17.8	6.4	3.5

Table 3-12. 2006 typical weekday emissions by state (tons/day) within the 36k domain.

NOx Emissions					
State	**Area**	**Nonroad**	**Onroad**	**Point**	**Biogenic**
Alabama	37	178	299	982	44
Arkansas	54	186	166	247	72
Connecticut	13	82	122	158	1
Delaware	7	48	45	50	3
District of Columbia	2	11	16	2	n/a
Florida	76	525	916	999	66
Georgia	91	272	587	376	116
Illinois	68	560	548	1,291	631
Indiana	61	270	383	641	354
Iowa	29	190	213	594	789
Kansas	107	250	153	740	588
Kentucky	37	289	272	393	100
Louisiana	75	324	263	536	73
Maine	2	6	25	7	0
Maryland	41	133	222	425	27
Massachusetts	52	145	210	201	2
Michigan	66	293	580	910	180
Minnesota	123	275	325	588	501
Mississippi	23	245	215	334	144
Missouri	69	368	370	399	382
Nebraska	30	218	106	320	729
New Hampshire	22	31	66	26	2
New Jersey	25	187	294	300	8
New York	164	357	509	423	58
North Carolina	35	257	442	768	102
North Dakota	71	109	27	232	173
Ohio	61	414	589	1,691	280
Oklahoma	238	147	243	572	241
Pennsylvania	79	270	531	691	113
Rhode Island	2	16	29	11	5
South Carolina	49	133	265	249	72
South Dakota	10	137	39	50	413
Tennessee	40	255	450	343	136
Texas	579	607	1,344	1,030	1,186
Vermont	3	10	24	3	6
Virginia	126	208	390	390	66
West Virginia	32	91	110	1,017	27
Wisconsin	30	223	297	353	313
Total	2,627	8,320	11,685	18,344	8,004

Table 3-12 (continued). 2006 typical weekday emissions by state (tons/day) within the 36k domain.

TOG Emissions					
State	Area	Nonroad	Onroad	Point	Biogenic
Alabama	486	237	192	155	7,766
Arkansas	280	162	105	116	7,275
Connecticut	208	140	83	41	19
Delaware	27	34	22	26	36
District of Columbia	11	8	10	0	n/a
Florida	1,294	948	691	167	6,811
Georgia	845	312	344	109	10,429
Illinois	751	356	287	614	1,821
Indiana	507	224	246	193	996
Iowa	193	163	161	126	1,571
Kansas	327	102	98	80	849
Kentucky	259	176	154	142	1,981
Louisiana	353	283	174	209	3,671
Maine	17	13	12	3	7
Maryland	234	235	123	27	417
Massachusetts	309	258	115	29	71
Michigan	560	524	349	165	3,651
Minnesota	216	340	203	105	4,169
Mississippi	348	163	133	139	9,499
Missouri	369	346	221	124	11,157
Nebraska	86	69	60	23	1,517
New Hampshire	62	74	36	7	119
New Jersey	294	345	176	66	249
New York	1,078	662	359	21	1,112
North Carolina	513	389	257	212	5,360
North Dakota	14	25	14	3	415
Ohio	713	404	372	103	1,526
Oklahoma	504	158	158	162	5,594
Pennsylvania	680	384	317	125	3,266
Rhode Island	29	32	26	17	119
South Carolina	363	197	163	122	6,548
South Dakota	29	44	20	7	1,086
Tennessee	349	249	258	261	6,228
Texas	3,985	296	488	490	13,050
Vermont	17	17	18	1	143
Virginia	402	291	238	193	6,967
West Virginia	138	86	68	61	3,306
Wisconsin	363	317	154	106	5,626
Total	17,215	9,061	6,903	4,549	134,425

Table 3-12 (concluded). 2006 typical weekday emissions by state (tons/day) within the 36k domain.

CO Emissions					
State	**Area**	**Nonroad**	**Onroad**	**Point**	**Biogenic**
Alabama	324	1,665	1,972	632	873
Arkansas	438	1,043	1,153	118	798
Connecticut	29	1,233	849	93	9
Delaware	8	322	239	43	4
District of Columbia	2	83	92	1	n/a
Florida	198	7,877	6,401	478	1,812
Georgia	418	3,191	3,530	480	1,421
Illinois	101	4,332	2,962	580	168
Indiana	119	2,575	2,408	1,317	130
Iowa	64	1,481	1,803	179	147
Kansas	2,250	1,135	1,009	311	157
Kentucky	148	1,265	1,589	464	280
Louisiana	338	1,756	1,786	355	654
Maine	4	129	134	5	3
Maryland	220	2,151	1,407	377	48
Massachusetts	91	2,446	1,242	85	38
Michigan	177	4,875	3,675	360	616
Minnesota	133	2,035	2,094	99	485
Mississippi	145	951	1,321	209	1,139
Missouri	224	2,846	2,360	443	808
Nebraska	98	682	604	67	179
New Hampshire	36	580	389	9	60
New Jersey	27	3,118	1,820	116	41
New York	310	6,032	3,474	131	329
North Carolina	314	3,651	2,660	244	652
North Dakota	36	226	173	50	58
Ohio	198	4,919	3,749	919	291
Oklahoma	975	1,382	1,578	243	540
Pennsylvania	345	4,082	3,215	449	490
Rhode Island	6	336	252	7	55
South Carolina	145	1,655	1,768	214	804
South Dakota	13	354	222	3	146
Tennessee	186	1,997	2,514	415	610
Texas	1,054	3,022	5,911	1,164	2,035
Vermont	27	179	183	4	78
Virginia	325	2,659	2,647	270	666
West Virginia	123	601	734	347	408
Wisconsin	89	2,553	1,750	164	705
Total	9,736	81,415	71,671	11,446	17,738

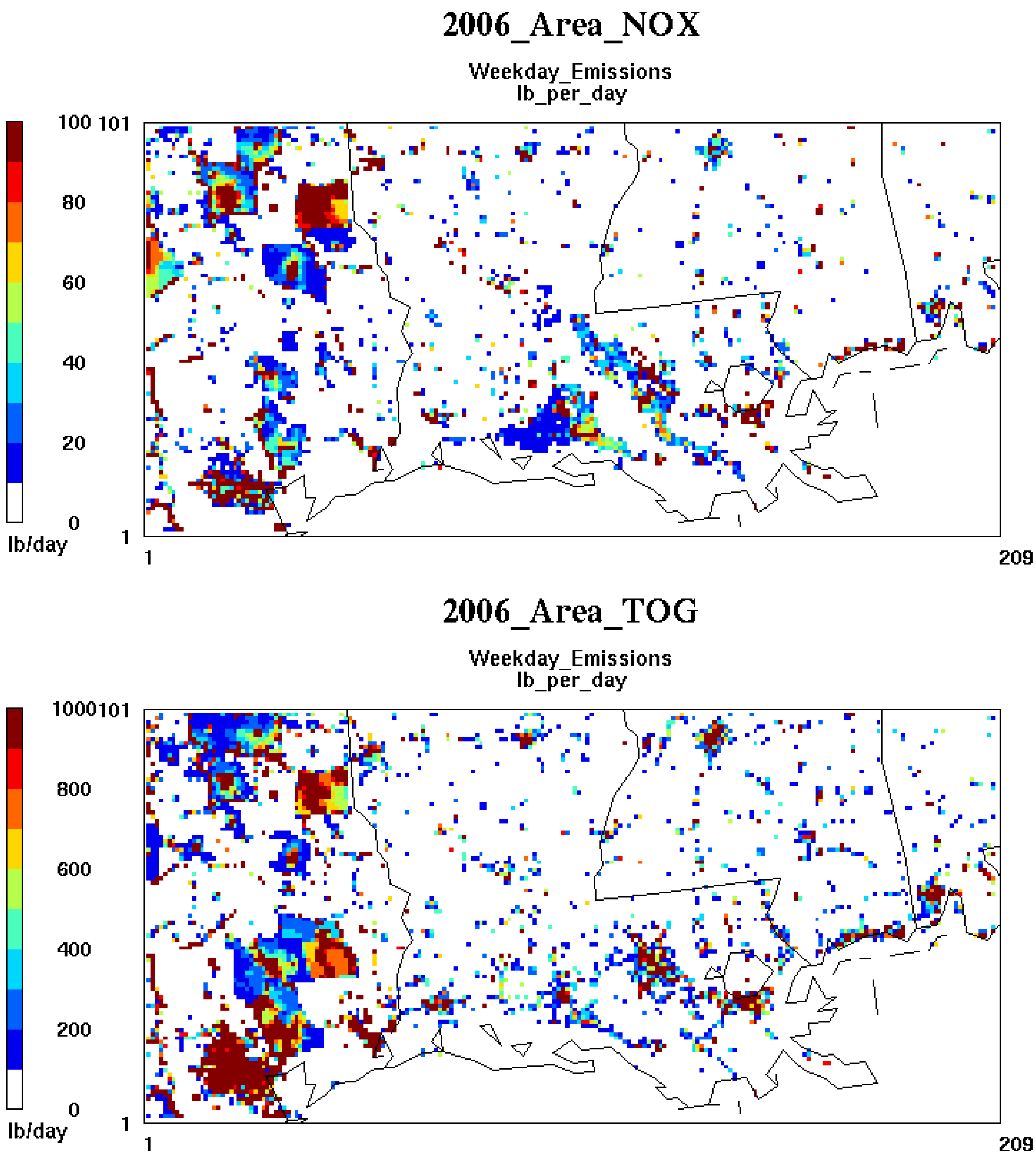


Figure 3-1. Daily area source emissions (lb/day) for a typical weekday in 2006. NOx is shown in the top panel, TOG is shown in the bottom panel.

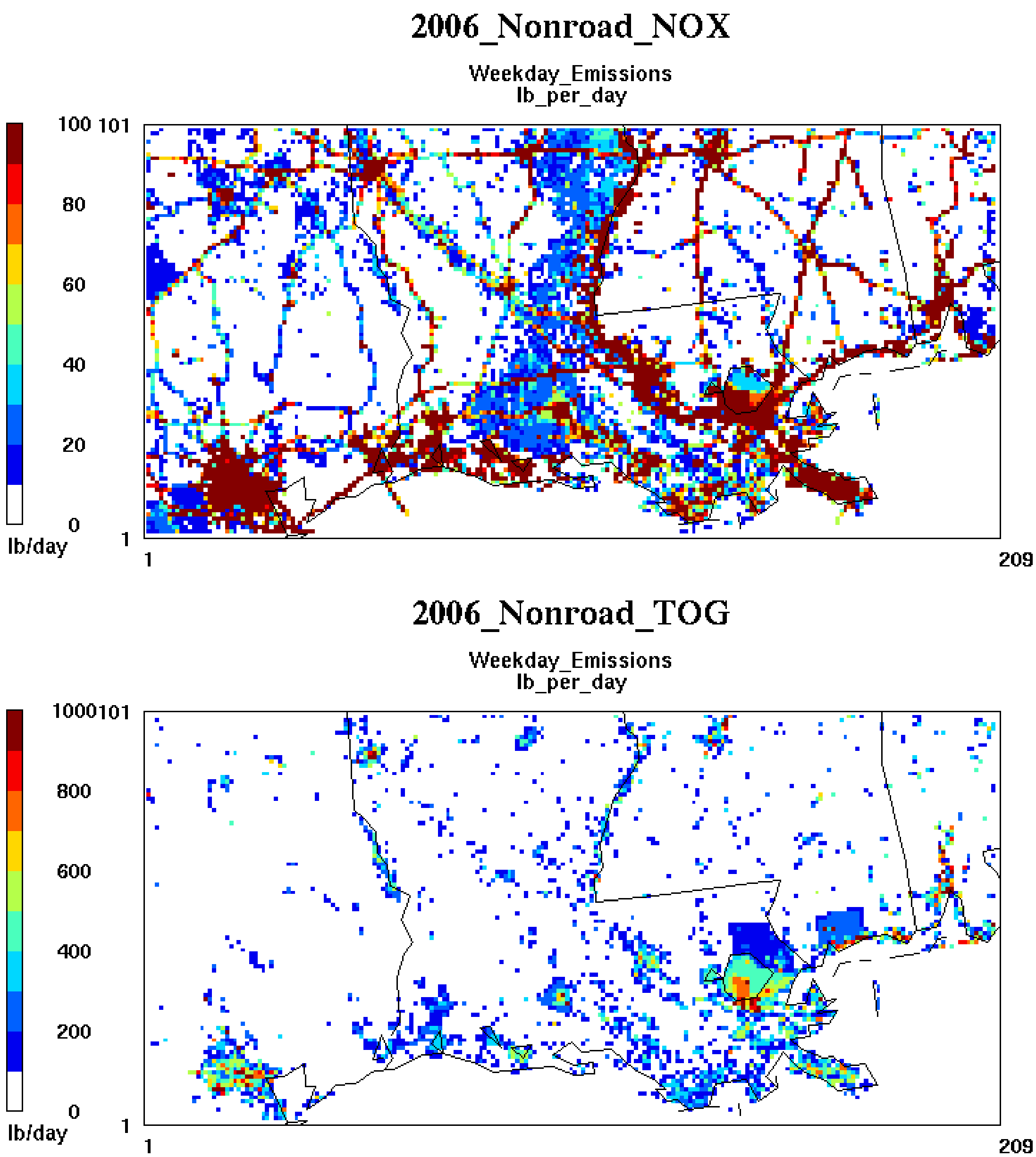


Figure 3-2. Daily non-road source emissions (lb/day) for a typical weekday in 2006. NOx is shown in the top panel, TOG is shown in the bottom panel.

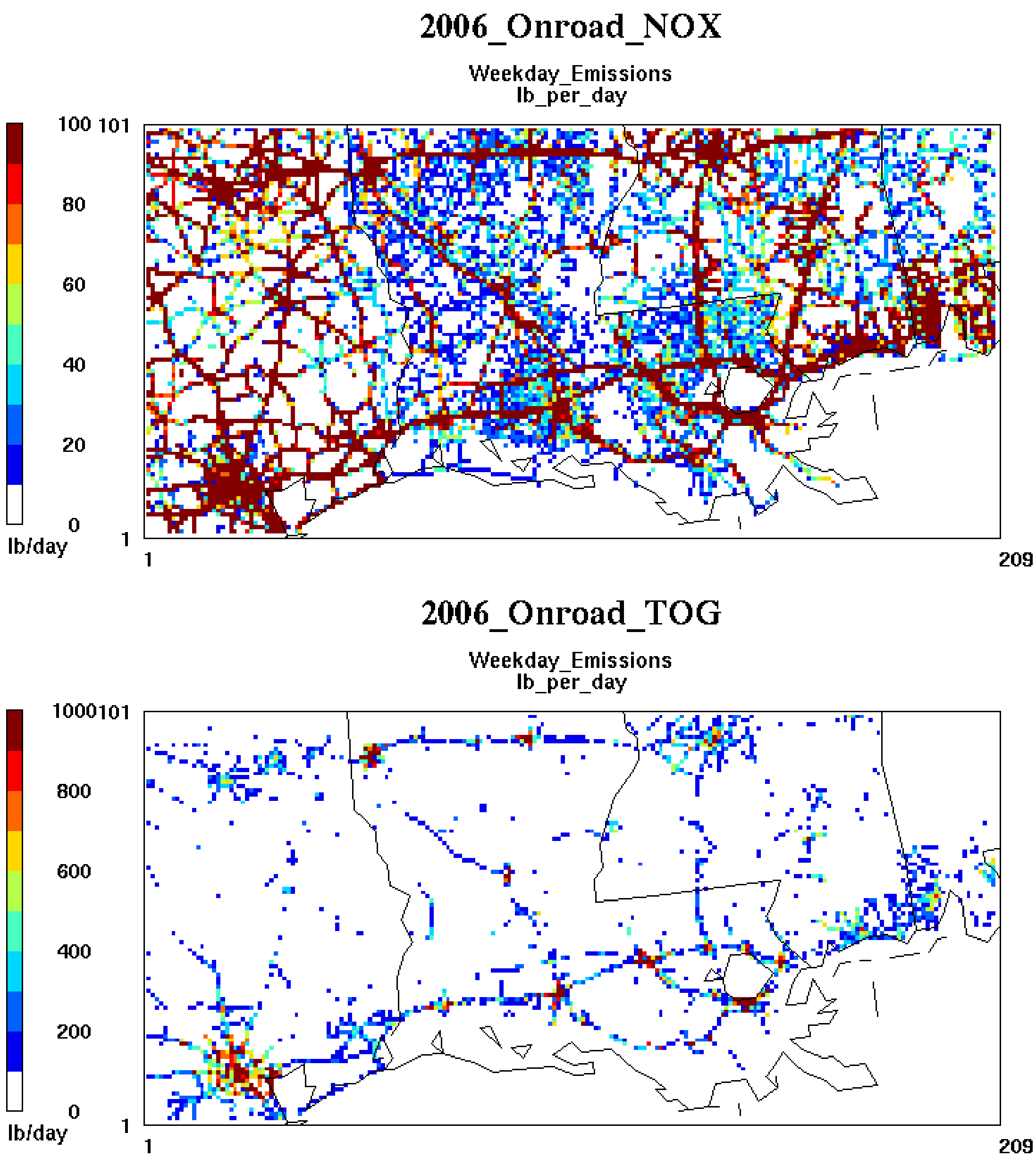


Figure 3-3. Daily on-road source emissions (lb/day) for a typical weekday in 2006. NOx is shown in the top panel, TOG is shown in the bottom panel.

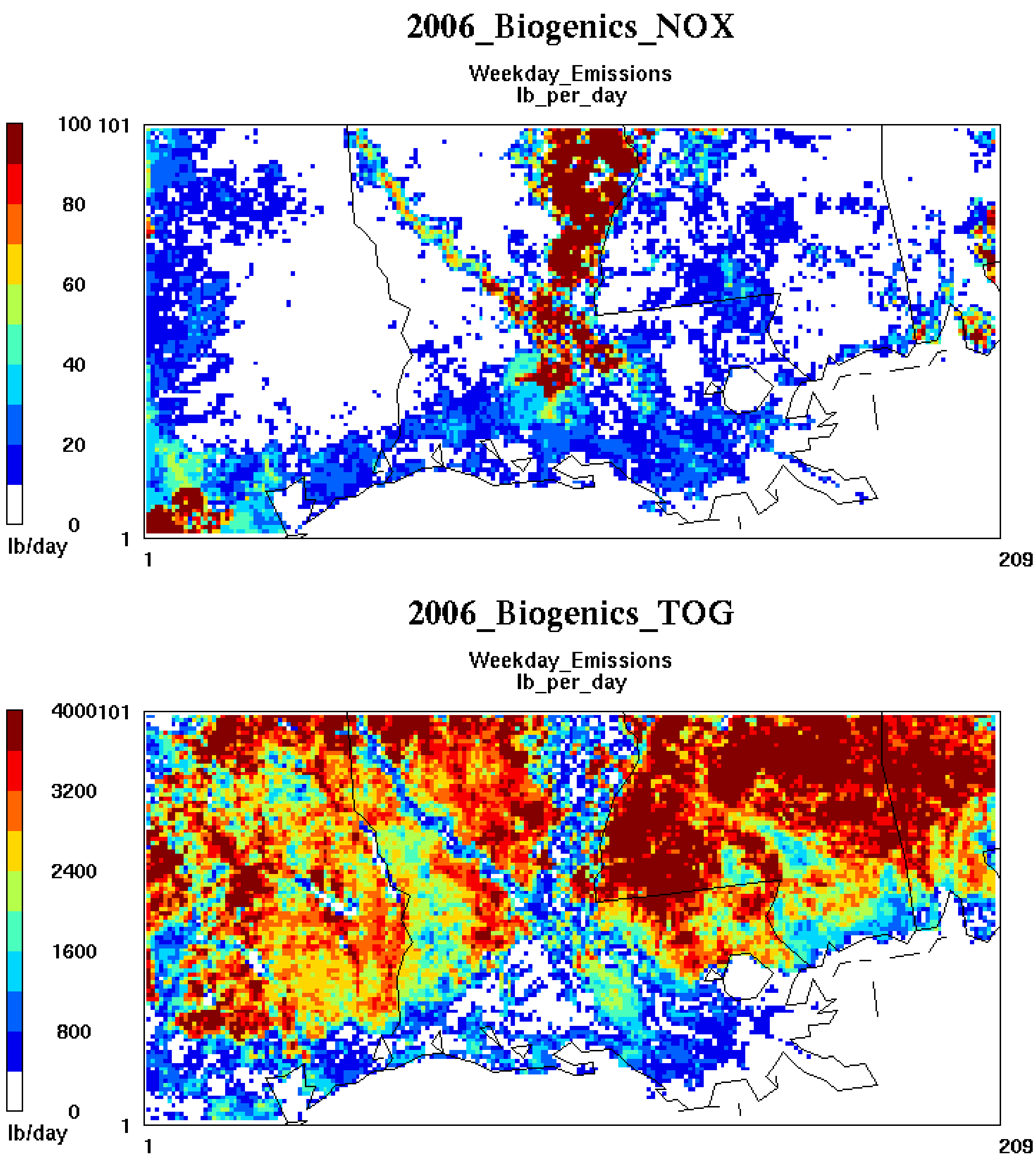


Figure 3-4. Daily biogenic source emissions (lb/day) for a typical weekday in 2006. NOx is shown in the top panel, TOG is shown in the bottom panel.

3.2.2 2009 Future Year

The 2009 future year emissions within the 5-Parish Baton Rouge area are summarized in Table 3-13. Note that the onroad emissions shown are from the initial HPMS approach. Also note that biogenic emissions were held constant from 2006. Emissions by state within the 36-km modeling domain are summarized in Table 3-14. The 36-km summary reports VOC as TOG as well.

Figures 3-5 through 3-7 present 2009 NOx and VOC emission density plots by major source category for a representative weekday in June. Biogenic emissions are not shown as they are carried over from 2006.

Table 3-13. June 2009 typical weekday emissions (tons/day) within the 5-Parish Baton Rouge area.

FIPS	Parish	Area	Nonroad	Onroad	Point	Biogenics
NOx (TPD)						
22005	Ascension	3.0	7.1	3.6	22.6	0.2
22033	East Baton Rouge	5.7	11.1	11.2	27.0	0.4
22047	Iberville	2.3	5.5	2.6	25.3	0.7
22063	Livingston	1.0	1.2	5.2	0.2	0.3
22121	West Baton Rouge	1.2	7.1	2.5	3.6	0.9
VOC (TPD)						
22005	Ascension	21.9	1.4	2.5	11.3	10.2
22033	East Baton Rouge	33.3	5.1	8.3	17.4	25.6
22047	Iberville	17.9	1.5	1.1	7.4	28.9
22063	Livingston	5.4	3.3	2.9	1.1	82.7
22121	West Baton Rouge	4.1	2.0	1.3	1.8	16.1
CO (TPD)						
22005	Ascension	16.1	20.1	28.2	9.8	2.5
22033	East Baton Rouge	7.4	107.3	98.6	29.2	3.9
22047	Iberville	17.9	11.0	13.4	7.3	7.1
22063	Livingston	13.5	20.0	33.3	1.6	14.3
22121	West Baton Rouge	6.3	17.6	15.6	6.4	3.5

Table 3-14. 2009 typical weekday (June) emissions by state (tons/day) within the 36k domain.

NOx Emissions					
State	**Area**	**Nonroad**	**Onroad**	**Point**	**Biogenic**
Alabama	34	139	243	498	44
Arkansas	114	157	135	312	72
Connecticut	38	57	105	34	1
Delaware	14	21	35	39	3
District of Columbia	8	8	12	2	n/a
Florida	97	431	742	417	66
Georgia	87	223	477	526	116
Illinois	126	570	433	590	631
Indiana	132	294	311	657	354
Iowa	93	328	176	238	789
Kansas	44	235	123	567	588
Kentucky	228	259	217	437	100
Louisiana	79	305	198	573	73
Maine	7	8	21	5	0
Maryland	56	100	174	111	27
Massachusetts	77	200	156	117	2
Michigan	154	311	465	573	180
Minnesota	64	296	264	247	501
Mississippi	13	209	173	468	144
Missouri	102	328	299	365	382
Nebraska	43	191	84	212	729
New Hampshire	14	25	55	13	2
New Jersey	115	141	247	91	8
New York	178	359	408	262	58
North Carolina	48	214	356	306	102
North Dakota	30	104	20	141	173
Ohio	187	418	463	526	280
Oklahoma	94	134	194	655	241
Pennsylvania	165	229	442	634	113
Rhode Island	16	13	23	7	5
South Carolina	59	112	215	223	72
South Dakota	15	130	30	46	413
Tennessee	78	229	365	315	136
Texas	565	581	957	1,088	1,186
Vermont	9	9	21	1	6
Virginia	135	204	312	338	66
West Virginia	42	83	90	327	27
Wisconsin	86	228	236	310	313
Total	3,442	7,882	9,275	12,271	8,004

Table 3-14 (continued). 2009 typical weekday (June) emissions by state (tons/day) within the 36k domain.

TOG Emissions					
State	**Area**	**Nonroad**	**Onroad**	**Point**	**Biogenic**
Alabama	336	133	161	145	7,766
Arkansas	270	99	88	83	7,275
Connecticut	122	80	69	11	19
Delaware	33	30	18	10	36
District Of Columbia	28	3	8	0	n/a
Florida	874	480	569	116	6,811
Georgia	519	182	290	108	10,429
Illinois	771	274	236	255	1,821
Indiana	616	157	207	205	996
Iowa	337	112	141	23	1,571
Kansas	221	70	81	63	849
Kentucky	303	107	129	183	1,981
Louisiana	369	254	137	226	3,671
Maine	33	11	10	3	7
Maryland	170	124	104	20	417
Massachusetts	296	158	91	27	71
Michigan	696	339	289	150	3,651
Minnesota	376	161	172	65	4,169
Mississippi	287	96	110	174	9,499
Missouri	387	206	186	99	11,157
Nebraska	177	47	50	23	1,517
New Hampshire	71	45	30	5	119
New Jersey	369	192	147	78	249
New York	948	387	293	18	1,112
North Carolina	605	226	215	195	5,360
North Dakota	67	18	11	1	415
Ohio	772	327	301	105	1,526
Oklahoma	368	90	130	67	5,594
Pennsylvania	655	243	259	117	3,266
Rhode Island	109	18	23	5	119
South Carolina	383	106	137	86	6,548
South Dakota	87	29	16	3	1,086
Tennessee	545	147	221	272	6,228
Texas	1,770	254	402	585	13,050
Vermont	34	12	15	3	143
Virginia	400	167	202	133	6,967
West Virginia	133	60	57	50	3,306
Wisconsin	406	192	124	103	5,626
Total	14,943	5,636	5,730	3,814	134,425

Table 3-14 (concluded). 2009 typical weekday (June) emissions by state (tons/day) within the 36k domain.

CO Emissions					
State	Area	Nonroad	Onroad	Point	Biogenic
Alabama	119	1,524	1,728	552	873
Arkansas	78	929	1,001	389	798
Connecticut	63	1,311	742	34	9
Delaware	30	359	206	60	4
District of Columbia	6	63	76	1	n/a
Florida	253	7,525	5,477	444	1,812
Georgia	258	2,971	3,066	755	1,421
Illinois	251	4,622	2,573	397	168
Indiana	401	2,669	2,145	1,376	130
Iowa	132	1,543	1,610	46	147
Kansas	91	1,210	871	327	157
Kentucky	255	1,180	1,391	354	280
Louisiana	344	1,774	1,444	410	654
Maine	21	167	120	4	3
Maryland	166	2,094	1,209	376	48
Massachusetts	168	2,622	1,051	56	38
Michigan	380	4,823	3,208	295	616
Minnesota	146	1,897	1,892	73	485
Mississippi	76	883	1,158	243	1,139
Missouri	185	2,748	2,042	378	808
Nebraska	28	728	524	36	179
New Hampshire	60	567	342	13	60
New Jersey	196	3,158	1,566	50	41
New York	656	6,200	3,056	162	329
North Carolina	303	3,401	2,289	263	652
North Dakota	18	236	130	30	58
Ohio	337	5,322	3,203	784	291
Oklahoma	70	1,229	1,358	310	540
Pennsylvania	508	4,259	2,743	385	490
Rhode Island	22	329	226	6	55
South Carolina	170	1,500	1,539	216	804
South Dakota	22	347	190	1	146
Tennessee	209	1,865	2,188	429	610
Texas	926	4,017	4,692	1,543	2,035
Vermont	29	211	161	1	78
Virginia	307	2,526	2,348	252	666
West Virginia	121	574	648	393	408
Wisconsin	359	2,532	1,549	173	705
Total	7,767	81,915	61,763	11,619	17,738

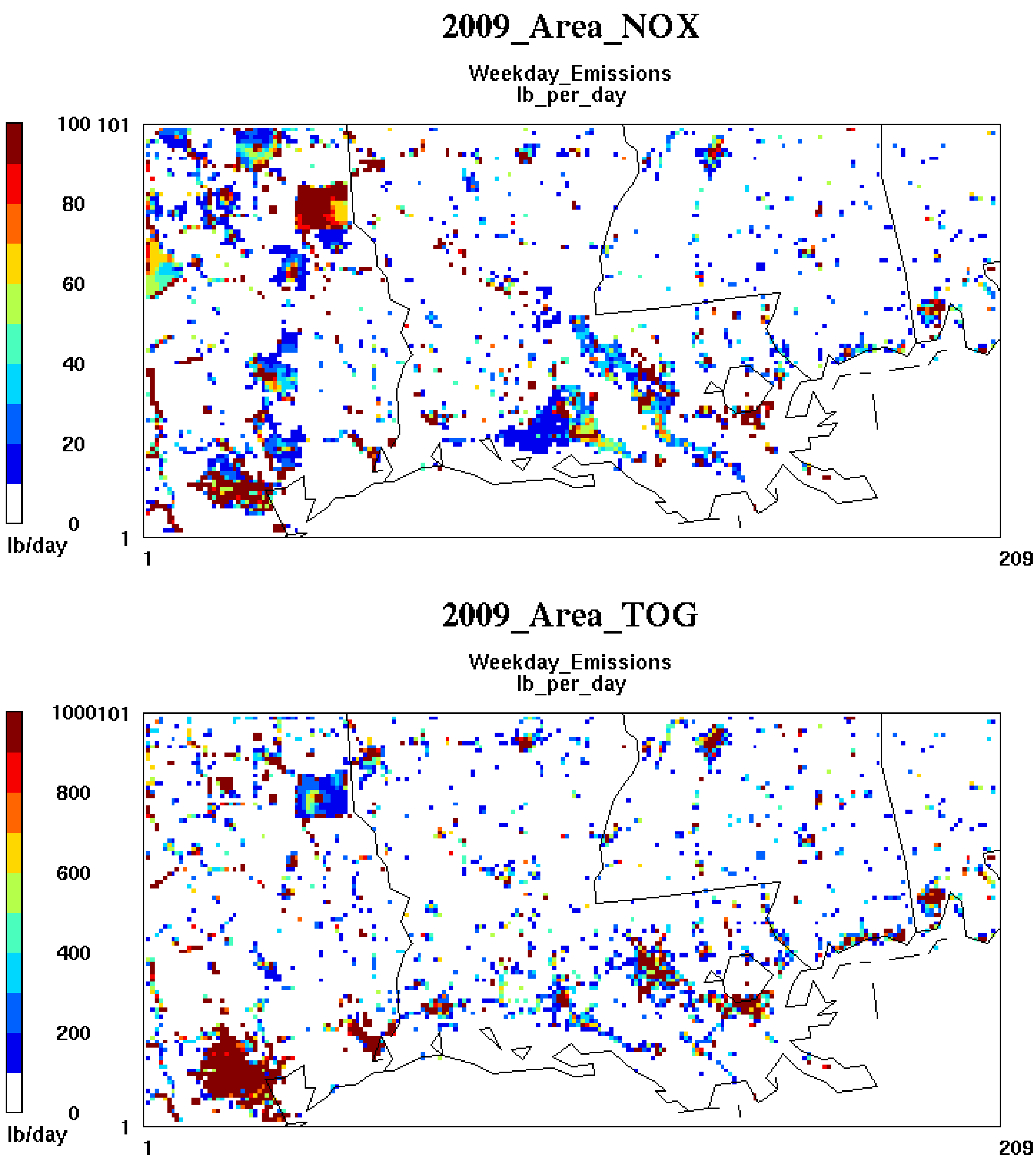


Figure 3-5. Daily area source emissions (lb/day) for a typical weekday in 2009. NOx is shown in the top panel; TOG is shown in the bottom panel.

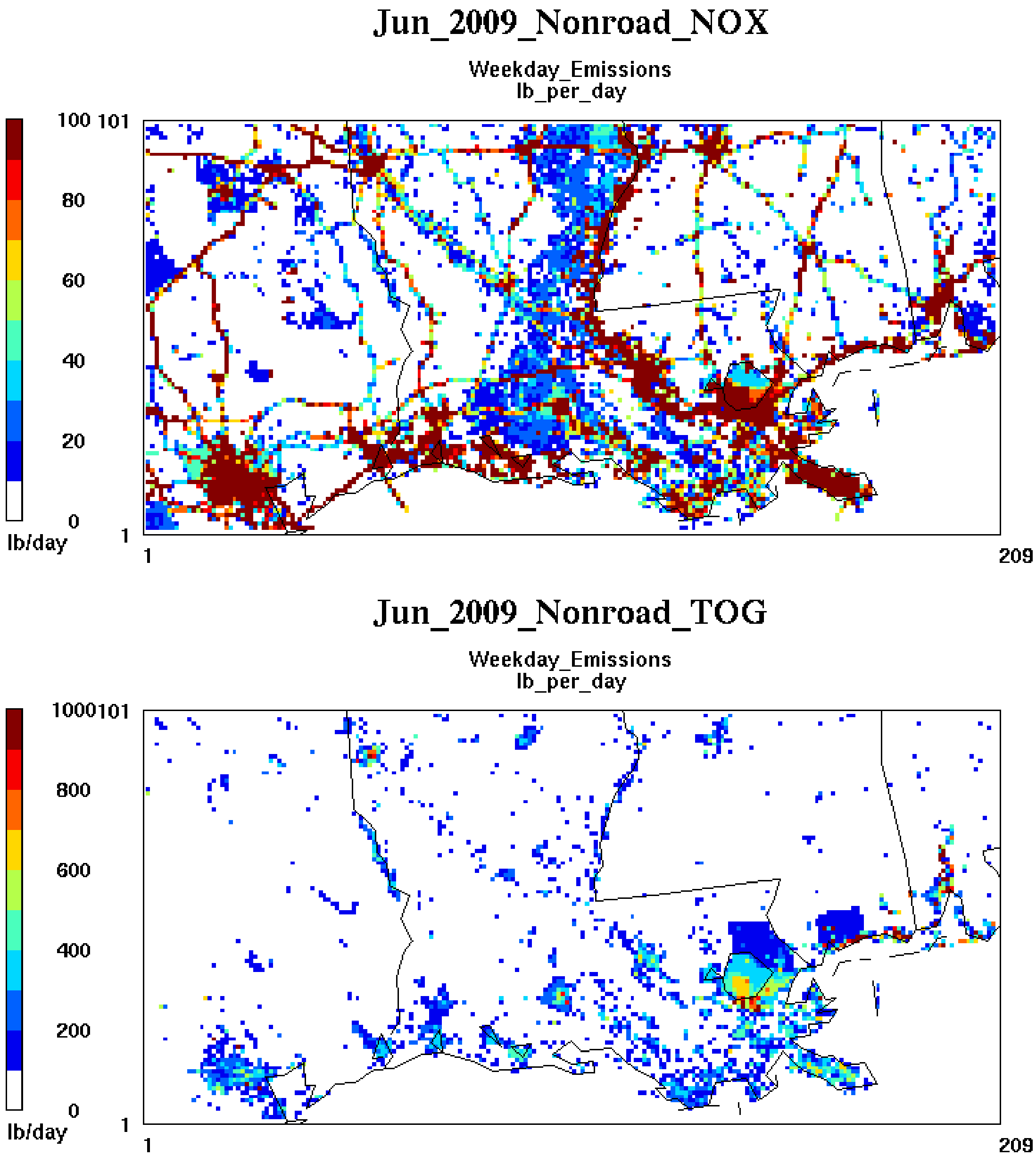


Figure 3-6. Daily non-road source emissions (lb/day) for a typical weekday in 2009. NOx is shown in the top panel; TOG is shown in the bottom panel.

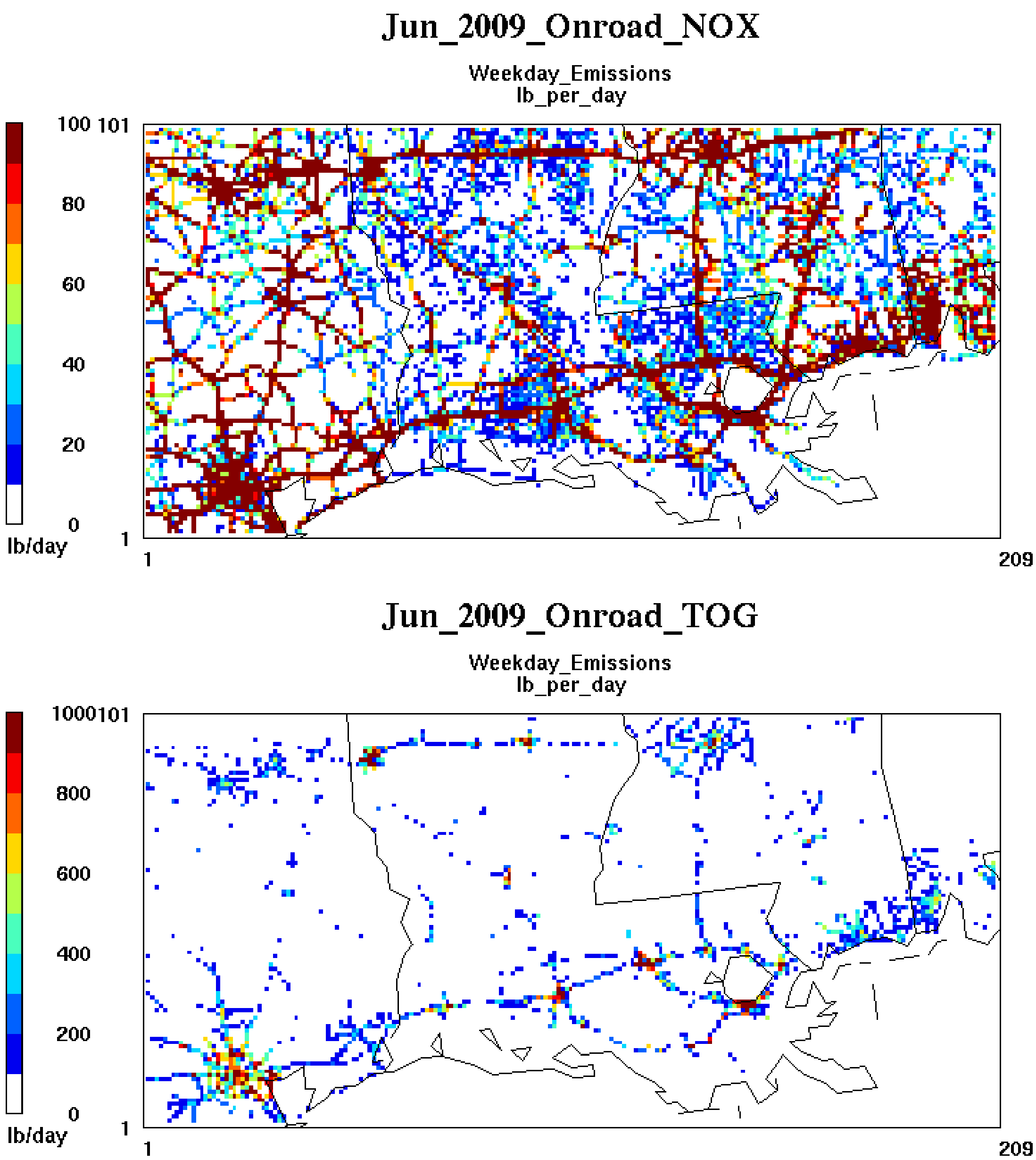


Figure 3-7. Daily on-road source emissions (lb/day) for a typical weekday in 2009. NOx is shown in the top panel; TOG is shown in the bottom panel.

4. BASE YEAR PHOTOCHEMICAL MODELING

The Comprehensive Air quality Model with extensions (CAMx) was used to simulate ozone levels in Baton Rouge during the period of May 26 to July 1, 2006. The methodology described in this section comprised the base year component of the wider modeling program designed to provide the technical underpinnings of the BRNAA 1997 8-hour ozone SIP. The base year modeling was conducted according to the approach described in the Baton Rouge 8-hour ozone Modeling Protocol and its Addendum (LDEQ, 2006; ENVIRON 2007) and follows the modeling guidance established by the U.S. Environmental Protection Agency (EPA, 2007).

All ozone simulations were run on the nested grid domains shown in Figures 1-2 and 1-3 using the latest public-release version of CAMx (v4.51; ENVIRON, 2008; www.camx.com). The Carbon Bond 2005 (CB05) photochemical mechanism was used throughout. Predictions of ozone, as well as NOx and VOC precursors, were compared to measurements recorded at up to ten monitoring sites within the BRNAA. A multitude of CAMx "developmental" runs were conducted and evaluated in an effort to improve model performance and to characterize ozone sensitivity to changes in various model inputs.

The daily maximum 8-hour ozone concentrations for each date and monitoring site in the Baton Rouge area are listed in Table 1-1; a map of monitoring locations is shown in Figure 1-1.

4.1 MODEL APPLICATION AND PERFORMANCE EVALUATION

4.1.1 Overview and Context

In general terms, the process to establish reliable CAMx 8-hour ozone modeling for the BRNAA consists of the following cycle:

- Exercise the modeling system for the base case, attempting to replicate the time and space behavior of the observed 1-hour and 8-hour ozone concentration fields as well as concentrations of precursor and product species;
- Evaluate the model's fidelity in simulating ozone and precursor/product species using a two-step process consisting of:
  - (a) An initial "screening model performance evaluation" (SMPE) process;
  - (b) A "refined model performance evaluation" (RMPE) consisting of progressively more stressful testing procedures involving multiple species;
- Identify sources of error and/or compensating biases, through evaluation of pre-processor models (MM5, EPS3), air quality model inputs, concentrations aloft, mass budgets and conservation, process analysis, etc;
- Through a documented process of diagnostic and sensitivity investigation, pinpoint and correct the performance problems via model refinement, additional data collection and/or analysis, or theoretical considerations;

- Re-run the model for the base case and re-evaluate performance until adequate, justifiable performance is achieved, or time and/or resources are expended, or the episode is declared unsuited for further use based on documented performance problems.

To the extent possible, these steps were undertaken by the modeling team, culminating in a modeling application demonstrated to exhibit sufficiently minimal bias and error that it can be used reliably to perform the 8-hour ozone attainment demonstration. Below we briefly summarize the steps that were taken in constructing and evaluating the CAMx 2006 Base Case.

The modeling team selected the final model configurations for the CAMx base case simulations based on results from an initial configuration and the following factors:

- Model performance obtained using the initial model configurations and input data;
- Model performance for Base Case sensitivity tests;
- The modeling team's knowledge of the CAMx model configurations and associated attributes;
- Experience performing sensitivity tests and model performance evaluation for a multitude of other local and regional applications;
- Comments from EPA and other participants.

The objective in identifying optimum model configurations is to obtain the best performance for the right reasons consistent with sound science and EPA guidance. Sometimes, decisions must be made that trade off better/poorer model performance for one pollutant against another. These factors were considered and potential issues discussed among the LDEQ modeling team, EPA and others.

A model performance evaluation (MPE) is the process of testing a model's ability to accurately estimate observed atmospheric properties over a range of synoptic and geophysical conditions. When conducted thoughtfully and thoroughly, the process focuses and directs the continuing cycle of model development, data collection, model testing, diagnostic analysis, refinement, and re-testing. We begin by establishing a framework for assessing whether the EPS3/MM5/CAMx modeling system perform with sufficient reliability to justify their use in developing 8-hour ozone control strategies for the BRNAA. The models' reliability was assessed given consideration to the following principals:

> <u>The Model Should be Viewed as a System</u>: When we refer to evaluating a "model", we mean this in the broad sense. This includes not only the CAMx photochemical model, but its various components: companion preprocessor models (i.e., EPS3 and MM5), the supporting aerometric and emissions data base, and any other related analytical and numerical procedures used to produce modeling results. A principal emphasis in the model testing process is to identify and correct flawed model components.
>
> <u>Model Acceptance is a Continuing Process of Non-Rejection</u>: Overreliance on explicit or implied model "acceptance" criteria should be avoided, including EPA's ozone performance goals (EPA, 1991). Models should be accepted gradually as a consequence of successive non-rejections. Over time, confidence in a model builds as it is exercised in

a number of different applications involving stressful performance testing without encountering major or fatal flaws that cause the model to be rejected.

Criteria for Judging Model Performance Must Remain Flexible: The criteria for judging the acceptability of model performance should remain flexible, recognizing the challenging requirement of the Baton Rouge region. Efforts to improve photochemical model performance, where necessary and warranted (i.e., to reduce the discrepancies between model estimates and observations), should be based on sound scientific principles. A "curve-fitting" or "tuning" activity is to be avoided.

Previous Experience Used as a Guide: Previous photochemical modeling experience serves as a primary guide for judging model acceptability. Interpretation of the CAMx modeling results for each episode, against the backdrop of previous modeling experience, aids in identifying potential performance problems and suggest whether the model should be tested further or rejected.

Initial screening of the CAMx Base Case ozone predictions (i.e., the SMPE) was performed in an attempt to identify flawed model simulations and to implement improvements to the model input files in a logical, defensible manner. The screening SMPE employed appropriate ozone performance statistics and plots. Once the initial screening of the CAMx ozone results did not reveal obvious flaws, additional refined model performance assessments were carried out. The RMPE included evaluation of NOx, VOC, and other key parameters (e.g., VOC:NOx ratios, etc.). Based on these results, additional model diagnostic and sensitivity runs were considered to identify, correct (if possible), and document the noted problems.

Diagnostic analysis and testing included a limited number of model sensitivity simulations to help elucidate model performance and response to changes in key inputs. These tests provide evidence as to whether the model is responding as expected relative to local understanding of the conditions leading to high ozone (i.e., conceptual models). Emission sensitivity tests were particularly relevant as they provide: (1) a reality check that the model is responding as expected; (2) information on which emission source components are important; and (3) initial quantification of potential impacts of controls.

4.1.2 Evaluation Datasets

A variety of chemical concentration measurements are available for the Baton Rouge area. These were used to the fullest extent possible in the evaluation of the CAMx simulations. Available air quality data available for the evaluation are summarized as follows:

AQS Data: Hourly-averaged concentration measurements were recorded at ten sites in the BRNAA (Figure 1-1) and were available in the national AQS database. Typical surface measurements include ground-level (i.e., 2 to 10 m) ozone, NO_2, NOx and CO.

PAMS Data: Four Photochemical Assessment Monitoring Sites (PAMS) were operating in the BRNAA during the June 2006 period. These PAMS sites are co-located with the Capitol, LSU, Pride and Bayou Plaquemine AQS sites (Figure 1-1). PAMS sites collect ozone, speciated VOC, NOx and other parameters.

4.1.3 Qualitative and Quantitative Evaluation Products

CAMx Base Case predictions for each simulation were compared to measured concentrations from the ten AQS sites in an attempt to quantify model performance. The following types of quantitative and qualitative (i.e., graphical) products were generated:

- 1-hour ozone and NOx time series plots;
- Isopleth plots of daily maximum simulated 8-hour ozone with observations overlaid;
- 8-hour ozone scatter and quantile-quantile plots with associated regression lines;
- Daily normalized bias and error (1-hour NOx, 1-hour and 8-hour ozone);
- Daily paired and unpaired accuracy (1-hour NOx, 1-hour and 8-hour ozone).

Additionally, morning average (6-9 AM) speciated VOC concentrations were compared to PAMS data (aggregated to CB05 compounds) for all available days of the June 2006 episode. This was done to evaluate fresh VOC emissions associated with the morning commute hours before significant chemistry and mixing impacted the measurements and simulation. Both the absolute concentrations on a species-by-species basis, and the relative distribution among all CB05 species were evaluated as a check of the emissions inventory speciation profiles. VOC:NOx ratios were generated for the same periods to evaluate daily ozone-forming potential and to assess precursor performance and potential issues with the local emissions inventory.

In evaluating ozone and precursor model performance for the BRNAA 8-hour ozone episodes, the performance measures and displays described above were used to elucidate model performance and maximize the probability of uncovering potential problems that were corrected in the final runs.

4.1.3.1 <u>Ozone Performance Goals and Criteria</u>

The issue of model performance goals for 8-hour ozone concentrations is an area of ongoing research and debate. For 1-hour ozone modeling, EPA (1991) established performance goals for unpaired peak performance, mean normalized bias, and mean normalized gross error of <±20%, <±15% and <35%, respectively. EPA (2007) 8-hour ozone modeling guidance de-emphasizes reliance on these goals to define a properly working model, and stresses performing corroborative and confirmatory analysis to assure that the model is working correctly. No such quantitative goals have been suggested for ozone precursors.

4.2 CAMx MODEL CONFIGURATION

4.2.1 Meteorological Inputs

As described in Section 2, MM5 modeling of the June 2006 episode was performed by a staff member of EPA Region 7, based on similar modeling of the May 2005 episode performed by Alpine Geophysics, LLC for their work with the Baton Rouge industry stakeholder group. The MM5 configuration was similar to the TCEQ's MM5 modeling for Houston, and included enhanced sea surface temperature data. MM5 was run in 6-day blocks with an overlapping period between blocks to account for model spin-up.

Version 4.6 of the MM5CAMx interface pre-processor program extracted data from the MM5 outputs and created CAMx-ready meteorology files for each of the three domains from May 26 to July 2, 2006. The program time shifted the data from UTC to CST, and mapped the 43 MM5 vertical layers to the 20 layers to be used in CAMx. MM5CAMx also includes the ability to interpolate data from the native map projections used by the meteorological model to any projection to be specified for the air quality model. In this case, the same map projection was used in both MM5 and CAMx, but each of the three CAMx domains were smaller than (inset within) the larger MM5 grids to remove any potential numerical artifacts or noise that are commonly generated near the MM5 grid boundaries.

CAMx requires meteorological input data for the parameters described in Table 4-1. All of these input data are derived from the MM5 results. MM5CAMx performs several functions:

1. Extracts data from the MM5 grids to the corresponding CAMx grids; in this study, the extraction includes a simple one-to-one mapping from the MM5 Lambert Conformal grid to the CAMx Lambert Conformal grid, with appropriate windowing to remove the extra row/columns in the MM5 grids;
2. Performs mass-weighted vertical aggregation of data for CAMx layers that span multiple MM5 layers – in this project 43 MM5 layers were aggregated to 20 CAMx layers spanning the depth between the surface and ~15 km MSL;
3. Applies diagnostic analysis techniques to derive key variables required by CAMx that are not directly output by MM5 (e.g., vertical diffusion coefficients and some cloud information).

Table 4-1. CAMx meteorological input data requirements.

CAMx Input Parameter	Description
Layer interface height (m)	3-D gridded hourly time-varying layer heights
Winds (m/s)	3-D gridded hourly wind vectors (u,v)
Temperature (K)	3-D gridded hourly temperature 2-D gridded surface temperature
Pressure (mb)	3-D gridded hourly pressure
Vertical Diffusivity (m^2/s)	3-D gridded hourly vertical exchange coefficients
Water Vapor (ppm)	3-D gridded hourly water vapor mixing ratio
Cloud Cover	3-D gridded hourly cloud and precip water contents
Landuse Distribution	2-D gridded static landuse/landcover distribution

The MM5CAMx program has been written to carefully preserve the consistency of the predicted wind, temperature and pressure fields output by MM5. This is the key to preparing mass-consistent inputs for CAMx, and therefore for obtaining high quality performance from CAMx.

Vertical diffusivities (Kv) are an important input to the CAMx simulation since they determine the rate and depth of mixing in the planetary boundary layer (PBL) and above. The MM5CAMx program offers up to three options to determine Kv fields from MM5 meteorological parameters, depending on the physics options set in MM5. Given the configuration of MM5 used for the

Baton Rouge modeling, all three Kv options were available in MM5CAMx for this project: the CMAQ method, the turbulent kinetic energy (TKE) method, and the O'Brien (1970) profile method. The O'Brien and CMAQ approaches were both used in the developmental CAMx simulations and compared to gauge model sensitivity to the Kv inputs (as described in sub-sections below). These two options were chosen because they tend to represent the opposite ends of the spectrum in terms of daytime mixing rates and PBL depth, whereas the TKE approach usually falls between the two.

4.2.2 Landuse Inputs

CAMx landuse files contain the fractional land cover distribution from 11 classifications in each grid cell of each domain. The landuse distribution is used to define surface albedo and to determine dry deposition rates of all gas and PM species carried by the model. The LDEQ 36-km landuse file was taken from the TCEQ 36-km CAMx runs since both share the same domain. The 12-km and 4-km landuse data were extracted from a national MM5 landuse/landcover file at 4 km resolution that ENVIRON has developed and archived in-house. The MM5 data are based on the standard USGS 24-classification database that is archived at NCAR and processed using the MM5 TERRAIN pre-processor. A GIS application was used to grid the 4-km USGS data to the specific map projection and grids used for the LDEQ modeling, and to map the 24 classifications to fractional coverages of the 11 CAMx landuse types for each grid cell. Note that the landuse file generated by the MM5CAMx pre-processor was not used, since the land cover fields output by MM5 only reflect dominant land cover type for each grid cell, and thus do not provide information on fractional coverages of multiple types. For illustrative purposes, the dominant landuse classification in each grid cell in the 4-km domain is shown in Figure 4-1.

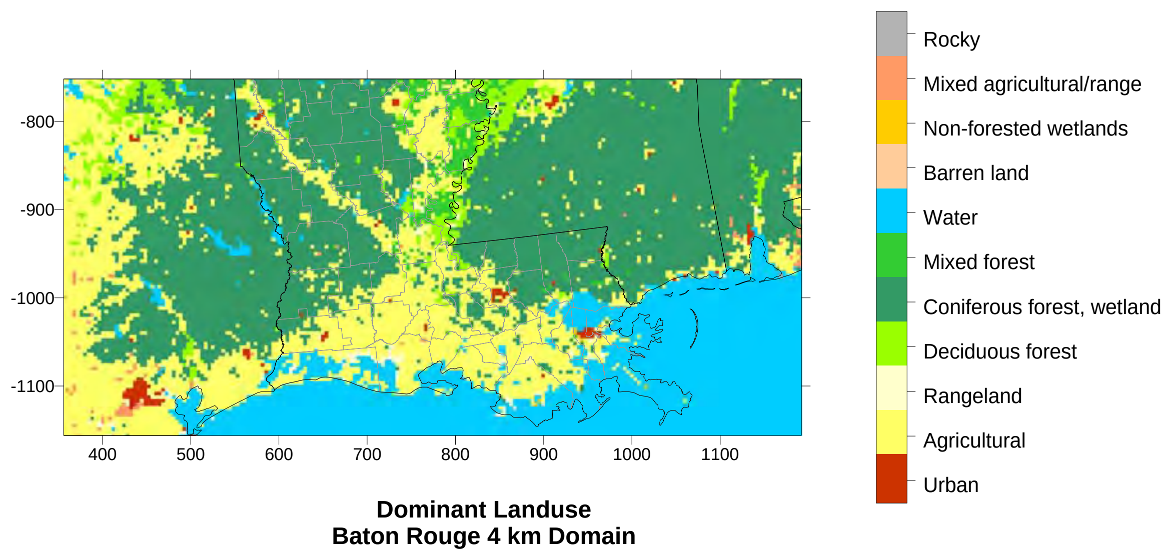


Figure 4-1. Dominant landuse classification in the 4 km domain.

4.2.3 Photolysis Rates and Related Inputs

CAMx requires an input file that contains the spatial and temporal distribution of ultra-violet (UV) surface albedo, total atmospheric haze turbidity, and total atmospheric ozone column. These parameters are used to define the variations of photolysis rates across the domain and throughout the duration of the simulation. The albedo/haze/ozone (AHO) file was generated using the CAMx AHOMAP pre-processor, Version 3. Within AHOMAP, the UV albedo is assigned according to the definition of landuse distribution generated for the three LDEQ domains. Haze turbidity is set to a constant value representing typical rural background levels (CAMx ozone is not particularly sensitive to this parameter). Total integrated ozone column is processed from satellite-derived Ozone Monitoring Instrument (OMI) data downloaded from http://jwocky.gsfc.nasa.gov. AHO data were categorized into 5 bins each for albedo and ozone, and 3 bins for haze.

The Total Ultraviolet (TUV, v4.0_1.camx) radiative transfer model was used to create a lookup table of photolysis rates to be used in CAMx. Rates were computed for different solar zenith angles and altitudes for the CB05 chemical mechanism using all combinations of the albedo, haze, and ozone column categories produced from the AHOMAP program. Altitudes ranged from ground level to 10 km. Monthly files were produced. The middle of June was specified to estimate the sun-earth distance. TUV outputs a clear-sky photolysis look up table that is directly input to CAMx; the table defines photolysis rates for several CB05 photolytic reactions over a range of solar zenith angles, altitudes, ozone column, surface UV albedo, and haze turbidity. CAMx internally adjusts the photolysis rates for cloud cover according to the cloud inputs provided to CAMx (from MM5 via MM5CAMx).

4.2.4 Initial and Boundary Conditions

The initial conditions and boundary conditions for the 36 km domain were originally taken from older time- and space-constant files developed by the TCEQ. In this case, two levels of concentrations were used to represent the boundaries – moderate and clean conditions. The lowest 11 layers (up to ~1.7 km) represented the mixed layer, where moderate conditions were assigned to the boundaries over land, and clean conditions were assigned over the Gulf and Atlantic, as shown in Figure 4-2. Above the mixed layer and at the top boundary, all areas were considered clean. Initial conditions were set to the moderate category throughout the mixed layer, and to clean conditions aloft. Table 4-2 lists the concentrations assigned to the two groups. Note that it was necessary in this project to convert certain CB4 concentrations to CB05 equivalents. Early developmental CAMx runs used these simple TCEQ-based initial/boundary conditions.

Table 4-2. Concentrations [ppb] used to define the original CAMx initial and boundary conditions.

Species	Moderate Continental Air		Clean Ocean Air	
	CB4	CB05	CB4	CB05
O3	40	40	40	40
CO	200	200	100	100
NO	0.1	0.1	0.1	0.1
NO2	1	1	1.0	1.0
HNO3	3	3	1.0	1.0
HNO2	0.001	0.001	0.001	0.001
ALD2	0.555	0.444	0.05	0.04
ALDX		0.111		0.01
ETH	0.51	0.51	0.15	0.15
HCHO	2.1	2.1	0.05	0.05
OLE	0.3	0.3	0.05	0.05
PAR	14.9	14.0	7.6	7.0
ETHA		1.5		1.2
TOL	0.18	0.18	0.0786	0.0786
XYL	0.0975	0.0975	0.0688	0.0688
ISOP	0.1	0.1	0.001	0.001
PAN	0.1	0.1	0.1	0.1
H2O2	3.0	3.0	1.0	1.0
MEOH	0.001	0.001	0.001	0.001
ETOH	0.001	0.001	0.001	0.001

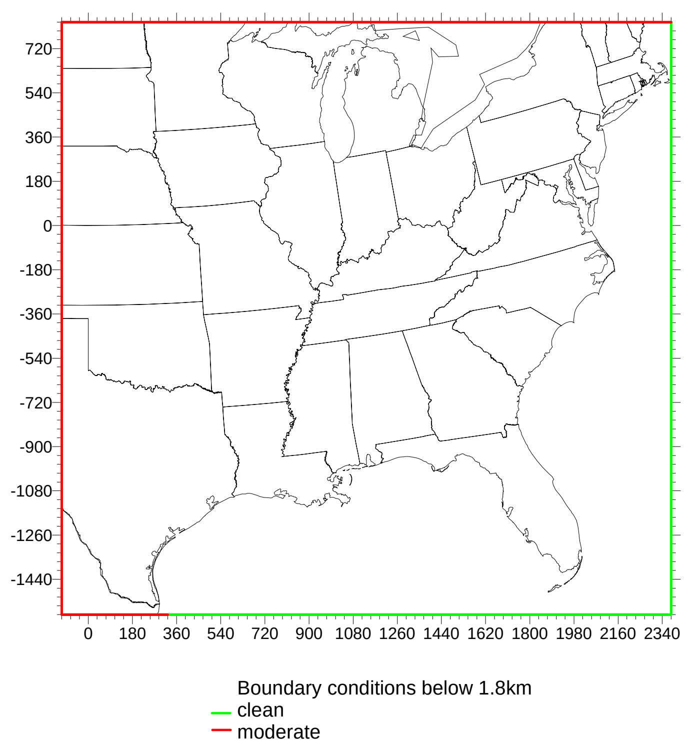


Figure 4-2. Assignment of original TCEQ boundary conditions to segments of the lateral boundary of the 36-km grid in the mixed layer.

As part of their work for the Baton Rouge stakeholder group, Alpine Geophysics developed June-averaged, spatially- and diurnally-variant boundary conditions extracted from the 2002 CMAQ VISTAS simulation on the 36-km unified Regional Planning Organization (RPO) grid. The CMAQ VISTAS run in turn used boundary conditions extracted from the Harvard GEOS-CHEM global model. The boundary conditions extracted by Alpine Geophysics contained 19 vertical layers, so it was necessary to re-map them to the 20-layer Baton Rouge grid (Figure 1-3). These alternative 2002 June-averaged GEOS-CHEM based boundary conditions were tested in this project as part of the developmental CAMx runs described later in this section.

Final boundary conditions were derived from 2006 date-specific spatially-varying boundary conditions extracted from a 2006 TCEQ CAMx run on the RPO grid using boundary conditions extracted from NCAR's MOZART global model. These MOZART-based boundary conditions were introduced later in the course of the developmental CAMx runs, and ultimately chosen for the final CAMx simulations of the June 2006 base case since they represented date-specific concentrations for the entirety of June 2006.

4.2.5 Model Options

CAMx does not possess many run-time options that need to be set for a specific simulation. Most options and capabilities are defined or provided to the model through the various input files. The CAMx configuration for the developmental and final simulations is listed below:

- Time zone: CST (central standard time)
- I/O frequency: 1 hour
- Map projection: Lambert conformal (projection parameters shown in Table 1-2)
- Nesting: 2-way fully interactive 36/12/4-km computational grids (grid definitions shown in Table 1-3)
- Chemistry mechanism: CB05 gas-phase only (without PM)
- Chemistry solver: CMC (Chemical Mechanism Compiler)
- Advection solver: PPM (Piecewise Parabolic Method)
- Plume-in-Grid model: Invoked for some developmental runs and all final runs
- Probing Tools: None
- Dry deposition: On
- Wet deposition: On
- 3-D output: Off (2-D surface output only)
- PiG sampling grids: Off

4.3 SUMMARY OF MODEL RUNS

Over a dozen ozone simulations were performed with CAMx v4.51 for the June 2006 Baton Rouge modeling episode. Each of the developmental runs progressively added improvements or alternative inputs in an attempt to improve model performance and to understand model sensitivity to the modifications. The runs are listed below along with a brief statement of their results:

- **Run 1**: initial run with preliminary 2006 base year emissions, with parish level HPMS-based Baton Rouge on-road emissions inventory
  - Large and consistent ozone under predictions, many exceedance days outside EPA 1-hour acceptance criteria
- **Run 2**: improved base year emissions, with parish level HPMS-based Baton Rouge on-road emissions inventory
  - Improved ozone performance, on some days dramatically, several exceedance days still outside EPA criteria
- **Run 3**: replaced O'Brien diffusivity approach with CMAQ approach and 1 m^2/s minimum Kv, otherwise same as Run 2
  - Further improved ozone performance from Run 2, only two exceedance days (June 3 and 15) outside EPA criteria
- **Run 4**: replaced O'Brien diffusivity approach with CMAQ approach and 0.1 m^2/s minimum Kv, otherwise same as Run 2
  - Overall best run between Runs 3 and 4 – Run 4 replicates overnight ozone better than in Run 3
- **Run 5**: applied the PiG sub-model to large NOx point sources throughout the modeling domain, otherwise same as Run 2
  - Negligible impact on peak or overall ozone performance
- **Run 6**: replaced boundary conditions with June-averaged space/time varying fields extracted from 2002 VISTAS/GEOS-CHEM simulation, continued use of PiG, otherwise same as Run 4
  - Minor improvements in performance overall – statistically the best performing simulation of the first 6 runs
- **Run 7**: replaced boundary conditions with June 2006 day-specific space/time varying fields extracted from 2006 RPO/MOZART simulation, continued use of PiG, otherwise same as Run 4
  - Minor degradations in performance overall relative to Run 4, revisited in Run 10a with an improved data extraction process
- **Run 8**: increased VOC via simple scaling of point source emissions in two parishes, otherwise same as Run 7
  - Negligible impact on ozone performance, although VOC:NOx performance improved to very near measured levels

- **Run 10a**: replaced boundary conditions with improved June 2006 day-specific space/time varying fields extracted from 2006 RPO/MOZART simulation, otherwise same as Run 6
  - Minor positive and negative differences in ozone
- **Run 12**: modified input vertical diffusivity fields to set minimum diffusivity values in the lowest ~100 m according to landuse classifications (urban is associated with the largest increase to 1 m^2/s to account for roughness and heat input effects at night), otherwise same as Run 6
  - Little impact on ozone, but large reductions in nighttime and early morning NOx concentrations, dramatically improving NOx statistical performance
- **Run 13**: used the modified vertical diffusivity fields of Run 12 and the MOZART day-specific boundary conditions in Run 10a, otherwise same as Run 6
  - Similar results as Run 12
  - Used as final 2006 CAMx Base Case simulation (with HPMS-based Baton Rouge on-road emissions inventory)
- **Run 14**: added fugitive PAR emissions to account for potential impacts from barges, otherwise same as Run 13
  - Negligible impacts to ozone, mixed results for PAR, mixed results for VOC:NOx
- **Run 15**: introduced an updated Baton Rouge on-road emissions inventory based on link-level activity data from TDM output, otherwise same as Run 13
  - Similar results as Run 13
  - Used as final 2006 CAMx Base Case simulation (with link-level Baton Rouge on-road emissions inventory)

Of the exceedance days occurring during this modeling episode, two dates continued to perform poorly for all CAMx runs listed above: June 1 and June 15. The problem on June 15 is rooted to a poor simulation of a weather event that approached Baton Rouge from the northwest, drawing high southerly winds over Louisiana that tended to over-ventilate ozone and precursors. Furthermore, ozone observations in southeastern Louisiana on this day showed moderate ozone levels in the 70s ppb while CAMx generated only clean values in the 40s ppb.

NOx and VOC precursor performance was evaluated for Run 6 and Run 8. Overall NOx was over predicted, especially in the urban center, but this was most likely due to inadequate vertical diffusion at night and early morning. VOC indicated a mix of some over and under predictions at the four PAMS sites, but in general performance in replicating CB05 aggregated species was rather good. VOC:NOx ratios were mostly under predicted, again suggesting too much NOx. The VOC increases in Run 8 helped to improve the VOC:NOx ratio, leading to over predictions in both VOC and NOx by consistent levels at Capitol and LSU. The final modification to vertical diffusivities in Run 12 helped to reduce the NOx over prediction problem, with no major impact on ozone concentrations.

The final 2006 CAMx Base Case runs (Run 13) using the original parish-level HPMS-based Baton Rouge onroad emissions inventory included a modified vertical diffusivity field that set higher minimum values as a function of landuse (to account for urban heat island and roughness effects), as well as alternative boundary conditions extracted from 2006 NCAR MOZART global chemistry model output. Run 13 yielded consistent model performance for ozone relative to earlier simulations, with perhaps a tendency for slightly better agreement with observations overall. However, the biggest model performance improvements were seen for NOx, in which early morning buildup of NOx due to the combination of stagnant, stable conditions and morning commute activity was substantially reduced due to the change in diffusivity inputs. This was an expected result. Little impact from the alternative boundary conditions was seen. VOC performance was also consistent with earlier runs.

Concern was raised by LDEQ that the emissions inventory was possibly lacking a significant quantity of low-reactivity VOC emissions, which emanate from a large number of barges that carry various liquid fuels and other chemical products. Indications from infrared imaging over the past few years suggests that these barges, which are often moored for extended periods along the Mississippi River within the BRNAA, can release significant fugitive emissions, especially when their hatches are left open. CAMx Run 14 investigated the potential impact of these additional emissions by adding ~100 TPD of the CB05 species "PAR" (light single-bond paraffin compounds) at specific sites along the river that correspond to loading platforms associated with local refineries. While there were negligible impacts to ozone, results for PAR were mixed; certain days were better simulated at some PAMS sites, but on average PAR was over predicted. Given the large uncertainties in these emissions, and the fact that the model was performing well without this component, it was decided that barge fugitive VOC emissions were currently not sufficiently quantifiable in magnitude, space, and time for SIP modeling.

Run 15 was based on the configuration established in Run 13, but utilized the revised Baton Rouge link-level onroad emissions described in Section 3. Despite the very different and much more detailed processing of these emission estimates, Run 15 resulted in very similar ozone, NOx, and VOC performance relative to Run 13. Nevertheless, Run 15 was established as the final CAMx 2006 Base Case simulation from which to develop 2009 Future Year design value projections for the 8-hour ozone attainment demonstration.

Additional details on the results from both the final 2006 Base Year CAMx Runs 13 and 15 are described in sub-section 4.4 below. Details on all of the developmental CAMx Runs 1 through 14 are provided in Appendix B.

4.4 FINAL CAMx BASE YEAR MODELING

This section presents a review of model performance for CAMx "Run 13" and "Run 15" of the June 2006 base year, on which the 2009 future year runs were based. Results of these two runs are compared to show the precursor and ozone impacts of the revised onroad emissions. Run 13 used the initial HPMS-based Baton Rouge onroad emissions inventory, and included modified vertical diffusivity inputs to improve the characterization of daily mixing, as well as the use of day-specific boundary conditions derived from NCAR MOZART global model results. Run 15, on the other hand, was identical in most respects to Run 13 except that it used the final link-level Baton Rouge onroad emissions inventory.

Simulated ozone was statistically gauged against available measurements at all ten BRNAA monitors; additionally, time series of simulated and observed 1-hour ozone time series and spatial maps of daily maximum 8–hour ozone were evaluated. Simulated NOx and VOC precursor performance was also gauged against available measurements in the BRNAA area.

Hourly NOx measurements were available from all ten sites that measure ozone, while 3-hour PAMS VOC canister data were available from four sites (Pride, Capitol, LSU, and Bayou Plaquemine). Capitol was the only PAMS site for which samples were available on a daily basis, while data from other sites were available every few days.

4.4.1 Ozone Performance

Time series of observed and predicted 1-hour ozone are shown in Figure 4-3 for each monitor. Each time series was split into 10-day intervals for better clarity. On June 15, which was an exceedance date at two monitors, ozone tended to be greatly under predicted, possibly due to onshore winds that were simulated by MM5 to be too strong in advance of an approaching frontal system. The next day, when the observed daily maximum 8-hour ozone averaged 50 ppb lower, CAMx not only over estimated these values, but it predicted concentrations higher than on June 15. Performance in replicating hourly ozone at these ten monitors was similar among three groups:

- Port Allen, Capitol, LSU, and Carville: Performance was rather good overall, but CAMx missed the afternoon peaks on some of the highest ozone days;
- Pride, Grosse Tete, Bayou Plaquemine, and French Settlement: Performance was good for most daily peaks, but CAMx missed the near zero ozone each night, possibly due to an inability to resolve titration from local NOx sources;
- Baker and Dutchtown: CAMx missed the peaks on most of the highest peak days, and missed about half of the nocturnal minima, possibly due to a misalignment of a NOx plume, which could be attributed to wind errors.

Note that both Run 13 and 15 predicted very similar ozone patterns, with maximum differences between 0 and a few ppb.

Figure 4-4 shows spatial maps of daily maximum 8-hour ozone on the five dates with the highest observed 8-hour ozone – June 10, 11, 15, 29, and 30. The daily maximum observed 8-hour ozone values are overlaid at site locations. The patterns are practically identical between Runs 13 and 15. Most days show a local BRNAA ozone cloud, except on June 15 when the model was far too clean throughout southeastern Louisiana. Note that observations to the south of BRNAA ranged in the 60-70s ppb, while CAMx generated ozone of approximately 30 ppb less. Simulated daily peak 8-hour ozone on other days agree with the observed spatial pattern but the model generally exhibited an under prediction bias.

Model performance statistics were evaluated for 1-hour and 8-hour ozone at the ten BRNAA monitors. Daily statistics are displayed in the form of bar charts. The left and right sides show daily statistics from the first and last half of the episode, respectively. In Figure 4-5, the top plot compares three values: the daily highest observed 1-hour ozone among all sites in the BRNAA and the co-located predicted daily maximum 1-hour ozone from Runs 13 and 15. Three days exceeded the old 1-hour standard (June 2, 7, and 30). While the model follows the general trend of high ozone in the early and later portions of June, with a clean-out period separating them (June 16-21), it falls short in replicating all of the highest peak 1-hour ozone days. Some of the under predictions are as large as 30-40 ppb. The different onroad mobile source inventories in Runs 13 and 15 make little difference in the model results.

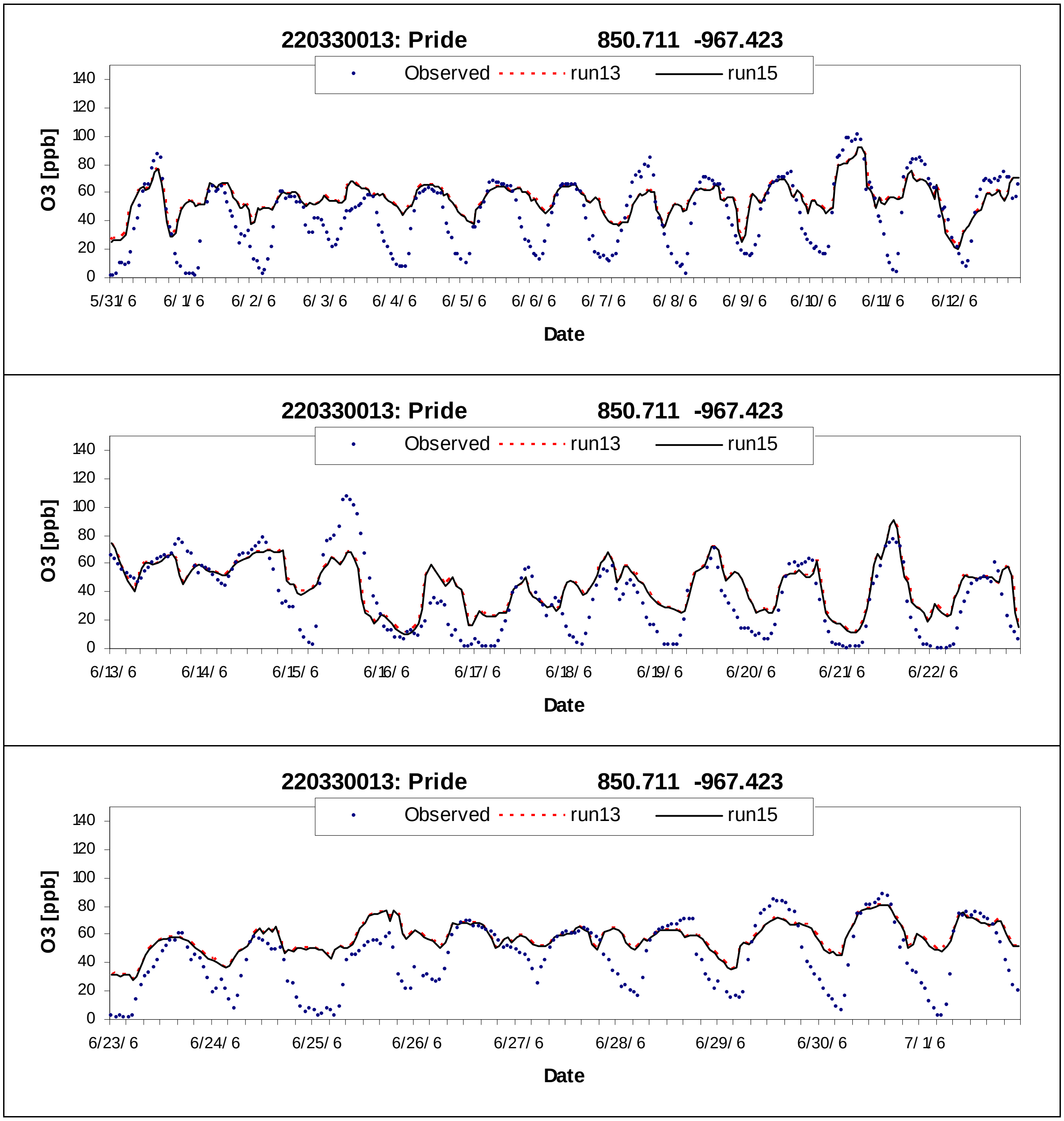


Figure 4-3. Time series of observed and predicted (Runs 13 and 15) hourly ozone at Pride.

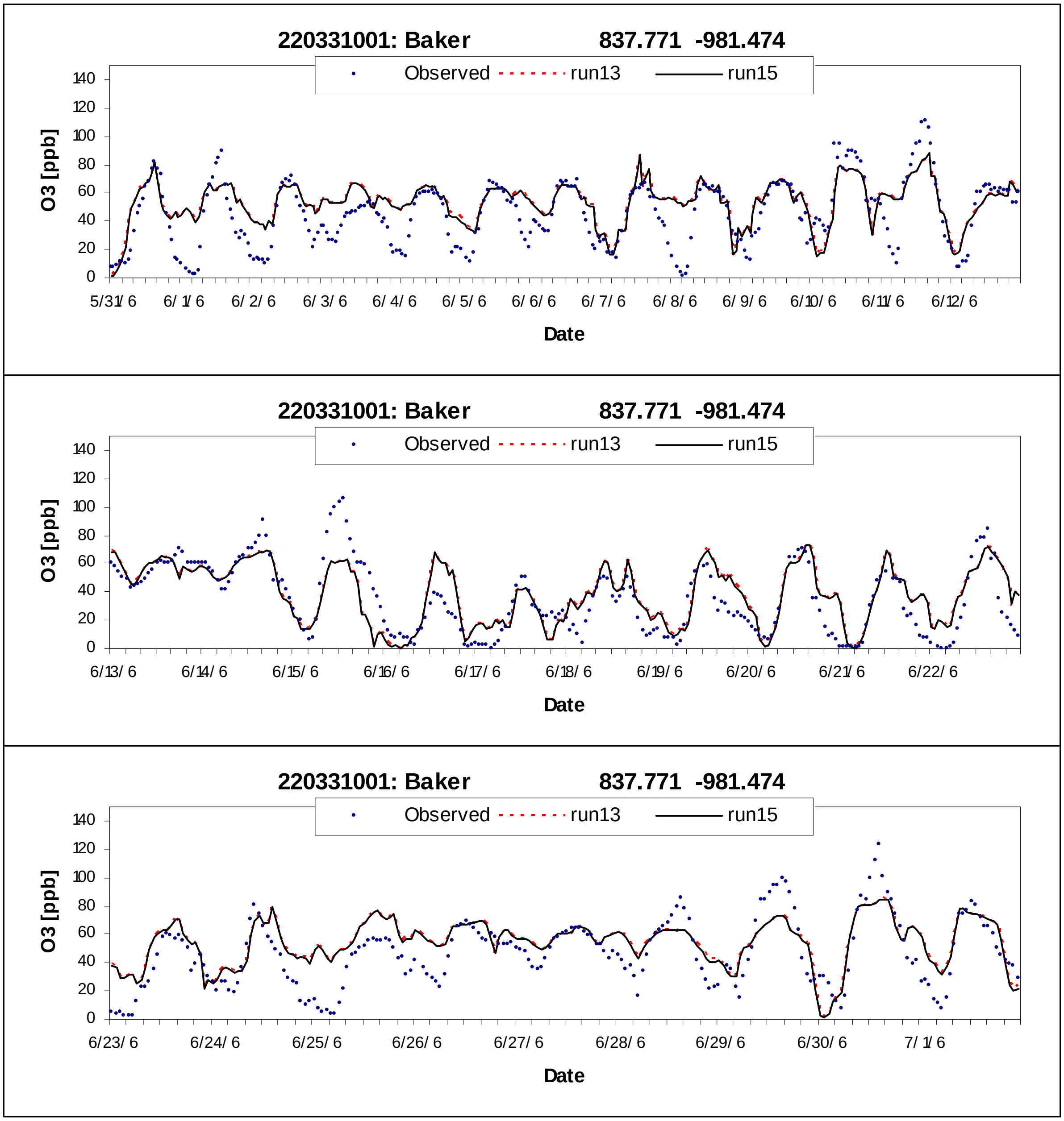


Figure 4-3 (continued). Time series of observed and predicted (Run 13 and 15) hourly ozone at Baker.

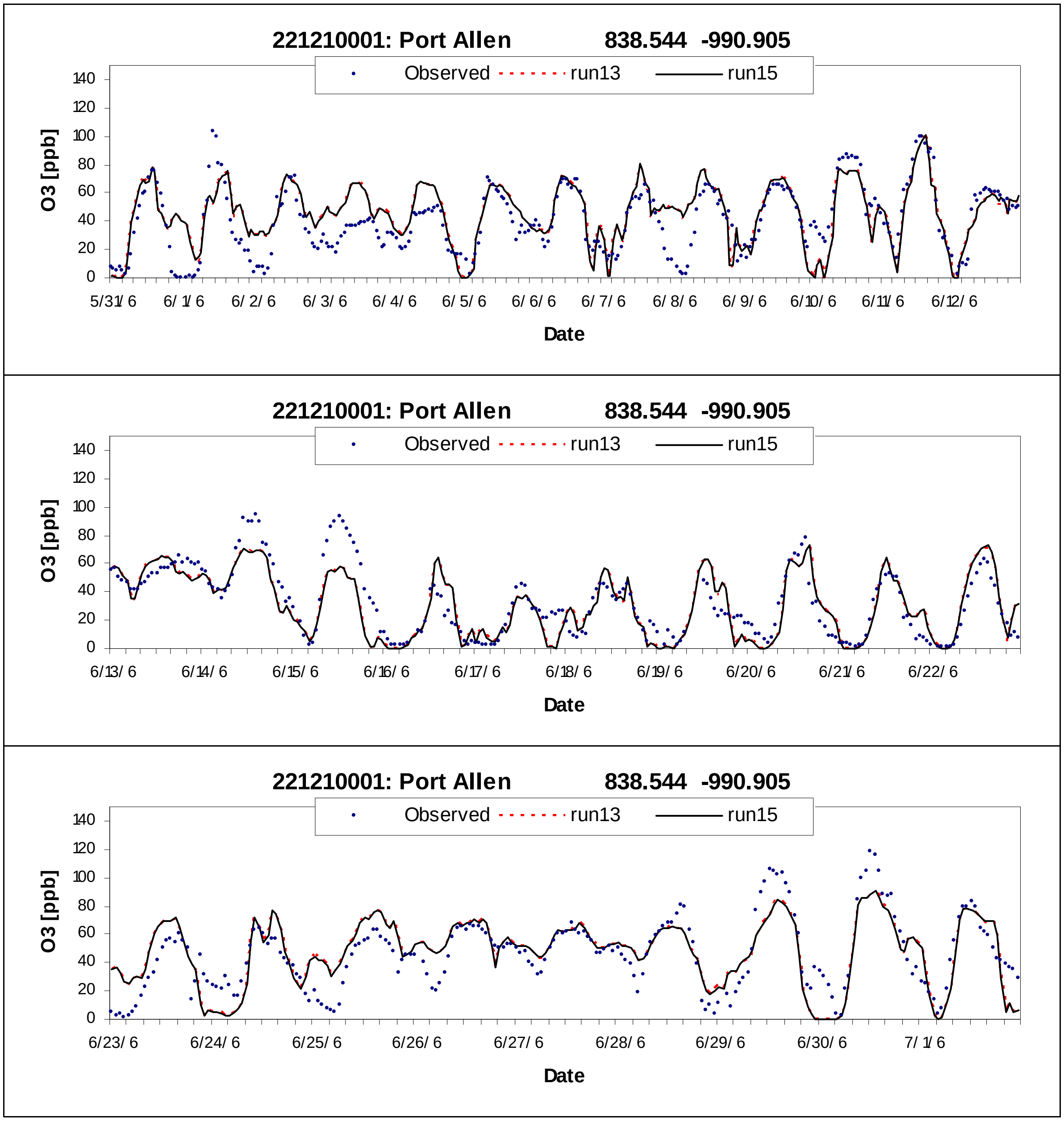


Figure 4-3 (continued). Time series of observed and predicted (Run 13 and 15) hourly ozone at Port Allen.

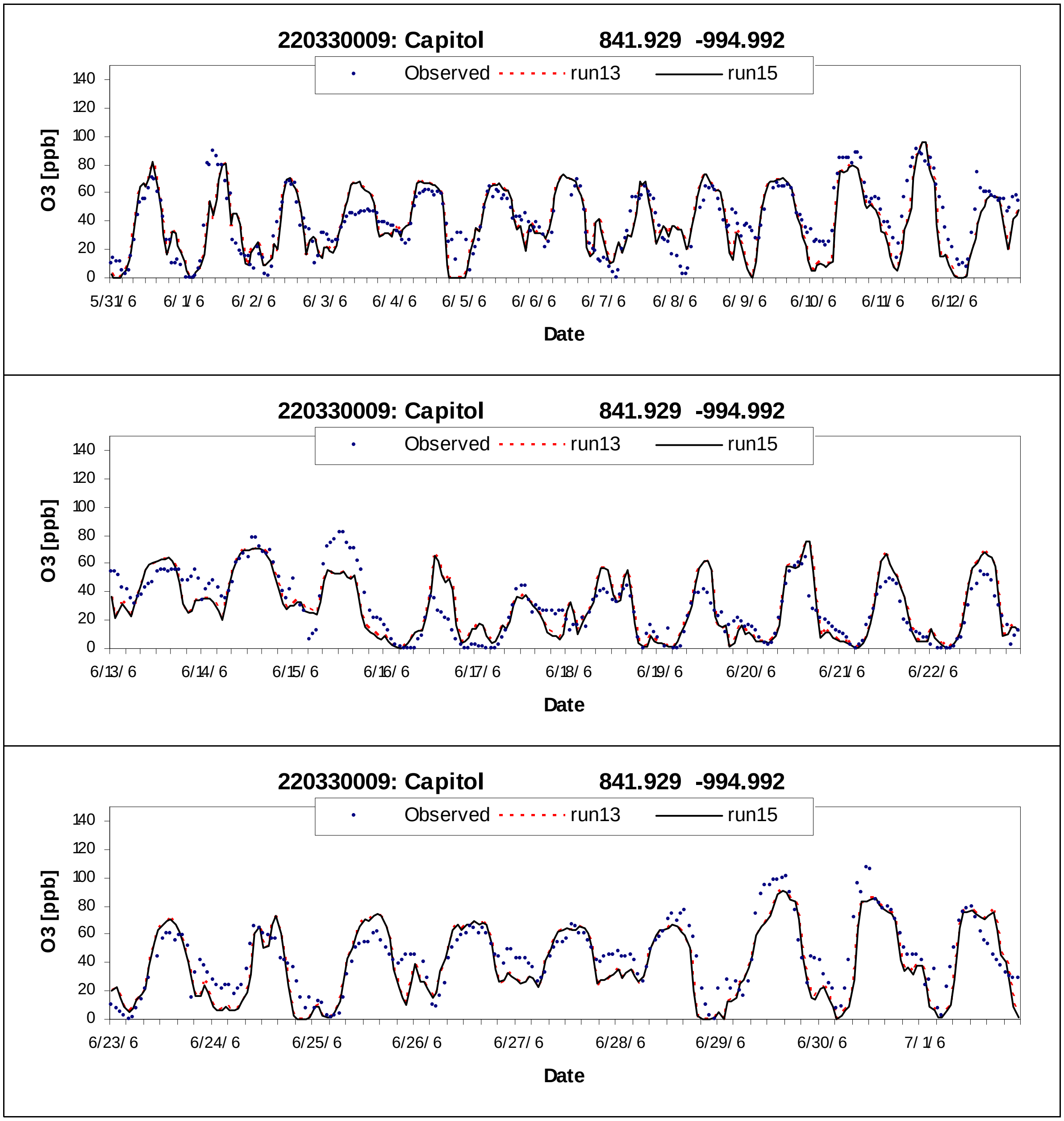


Figure 4-3 (continued). Time series of observed and predicted (Run 13 and 15) hourly ozone at Capitol.

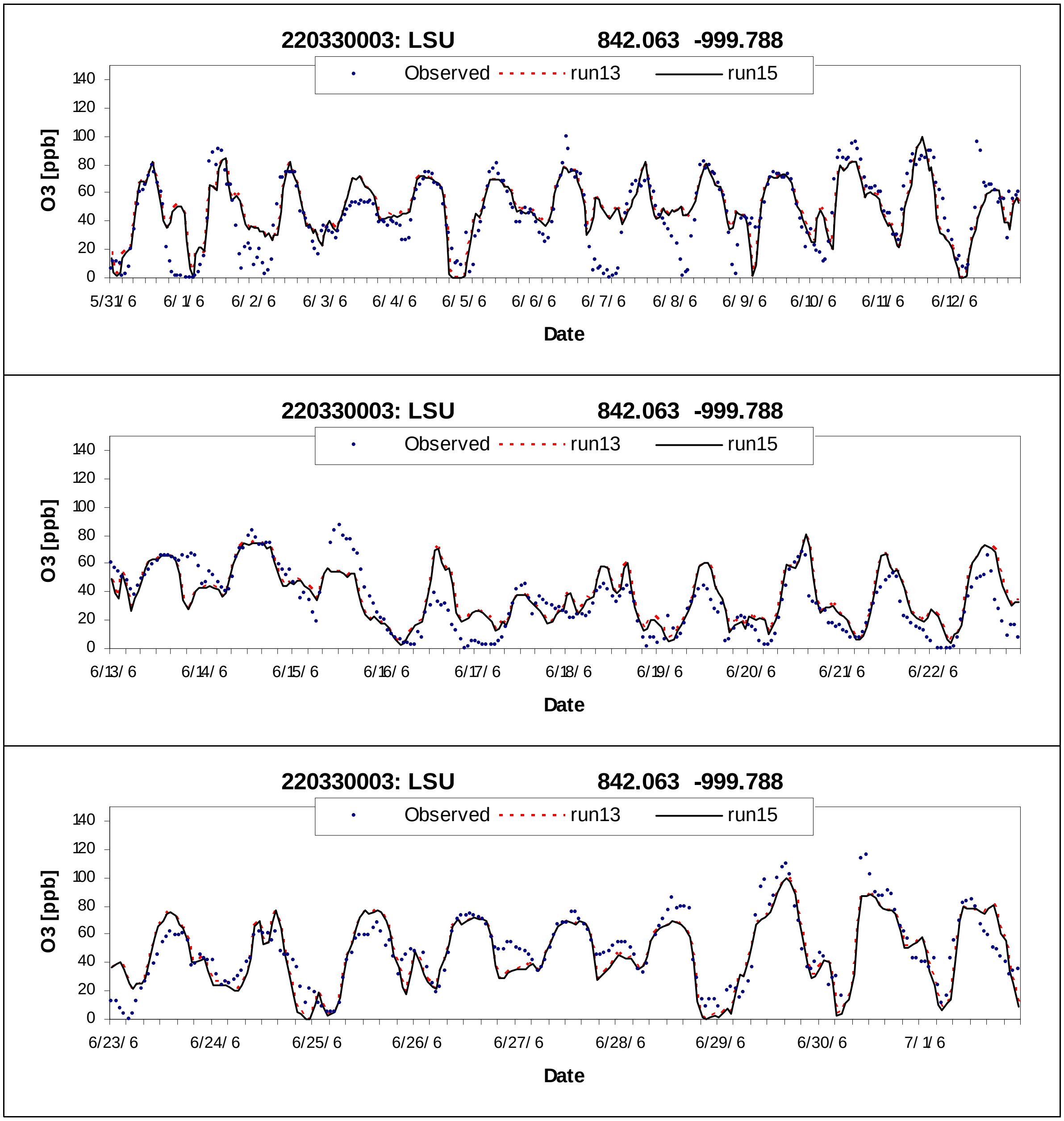


Figure 4-3 (continued). Time series of observed and predicted (Run 13 and 15) hourly ozone at LSU.

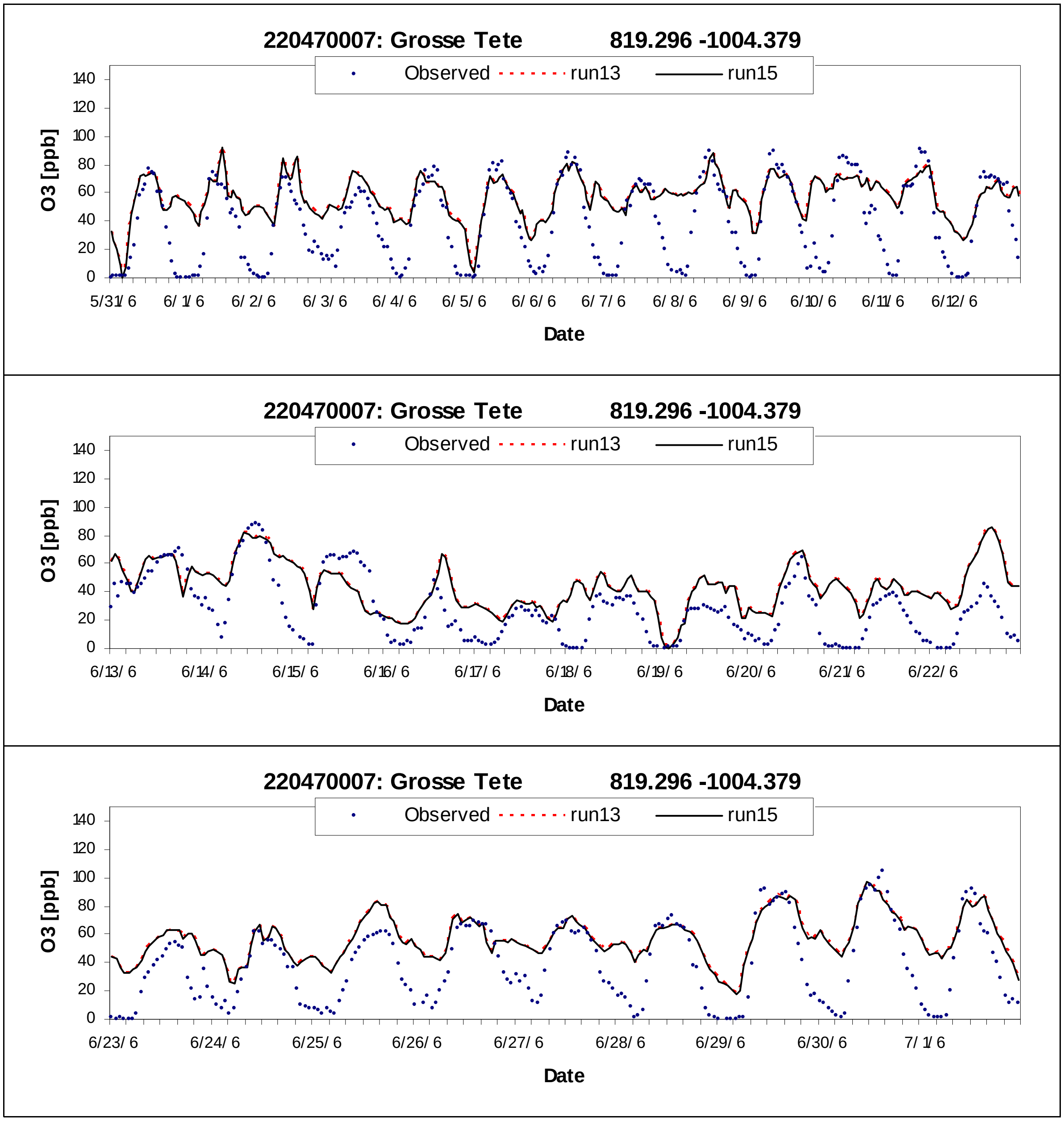


Figure 4-3 (continued). Time series of observed and predicted (Run 13 and 15) hourly ozone at Grosse Tete.

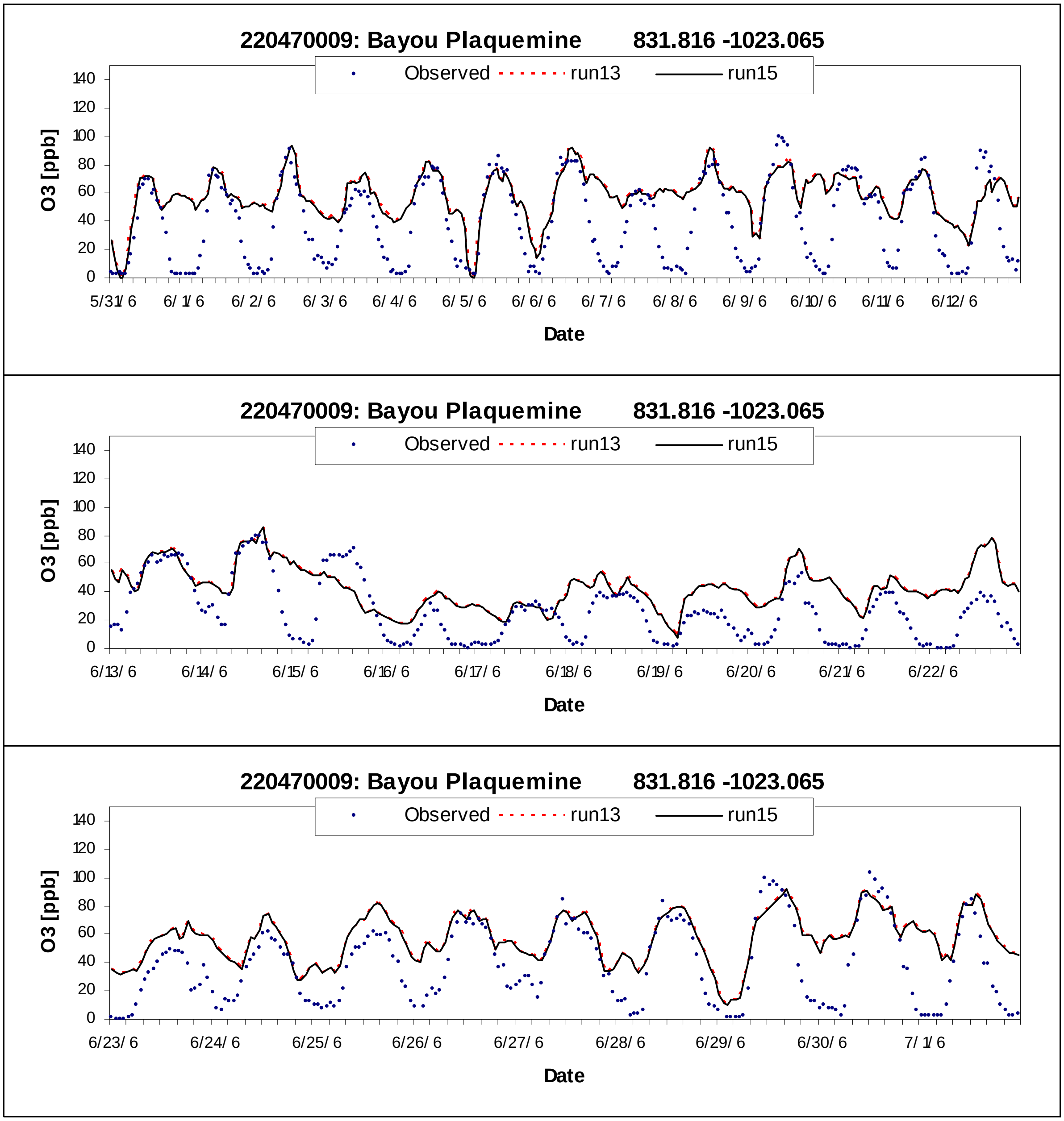


Figure 4-3 (continued). Time series of observed and predicted (Run 13 and 15) hourly ozone at Bayou Plaquemine.

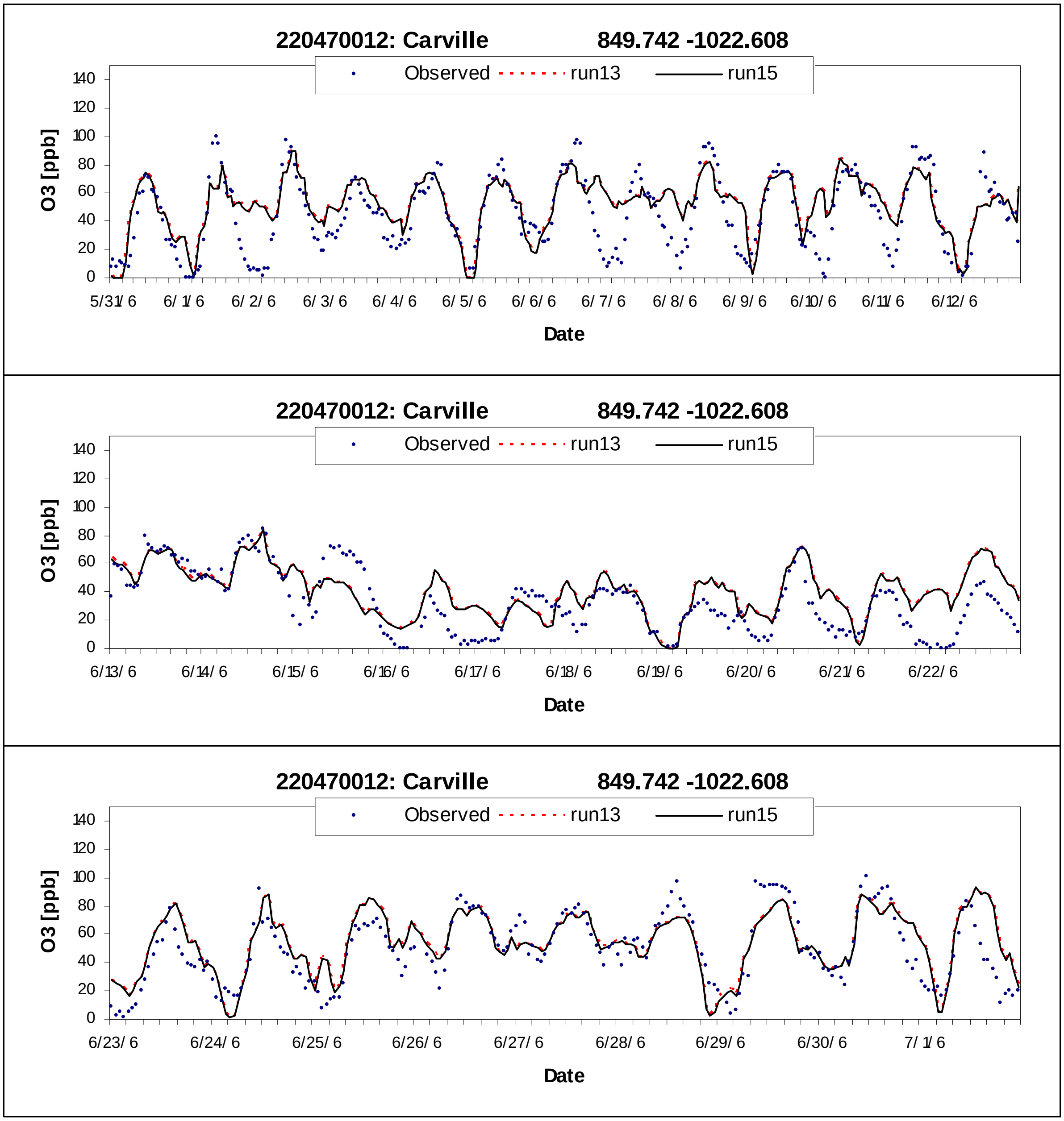


Figure 4-3 (continued). Time series of observed and predicted (Run 13 and 15) hourly ozone at Carville.

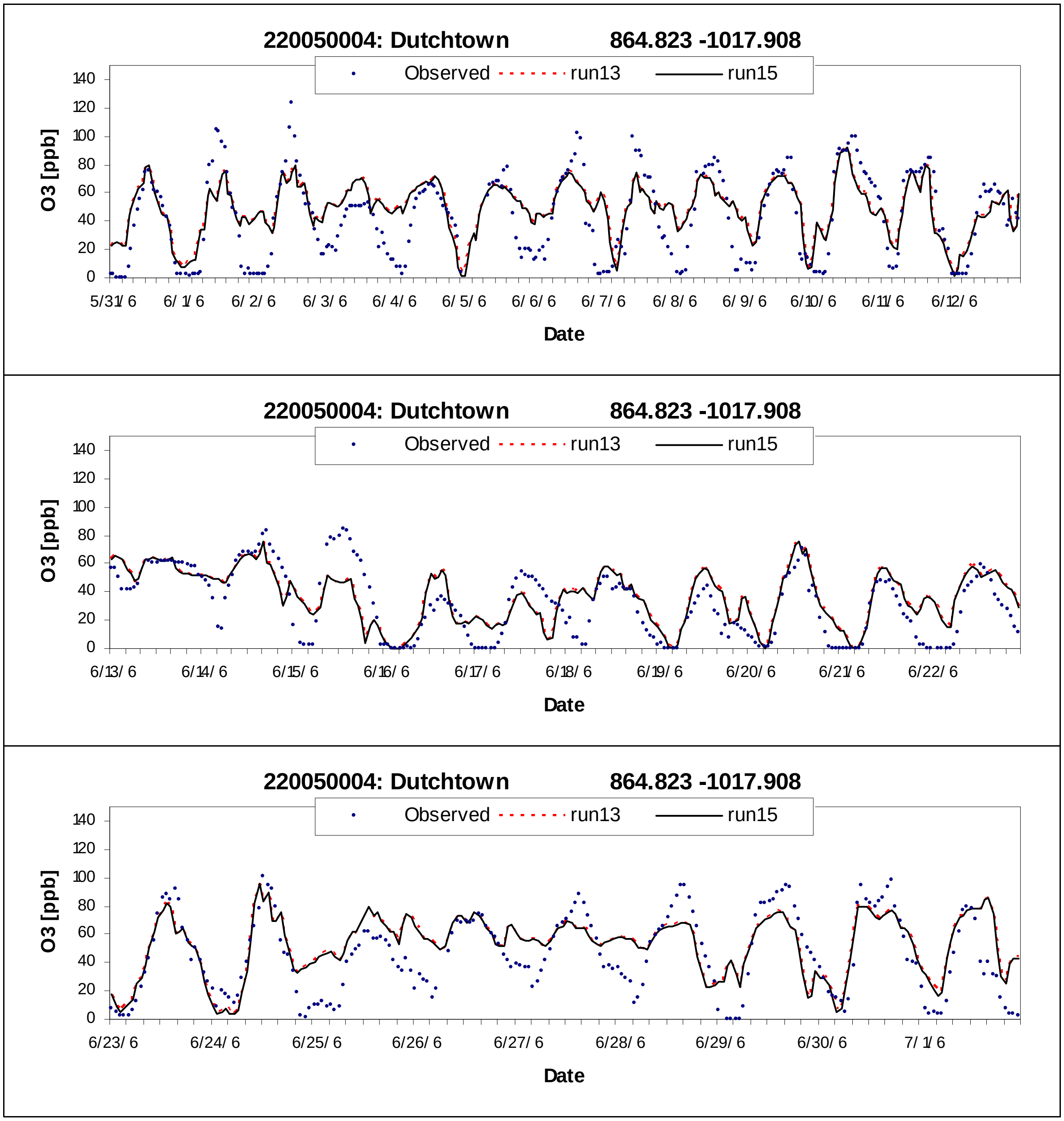


Figure 4-3 (continued). Time series of observed and predicted (Run 13 and 15) hourly ozone at Dutchtown.

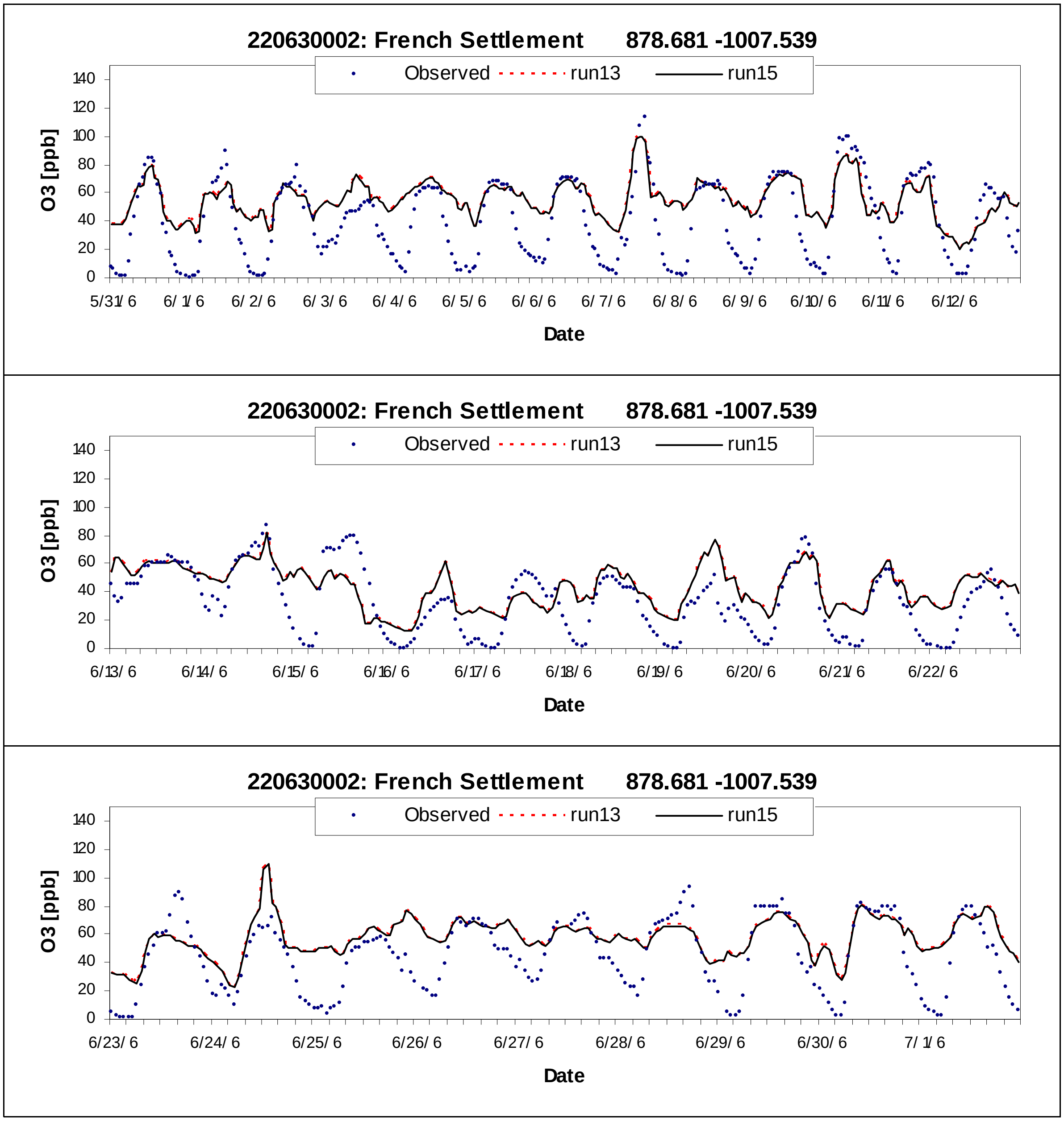


Figure 4-3 (concluded). Time series of observed and predicted (Run 13 and 15) hourly ozone at French Settlement.

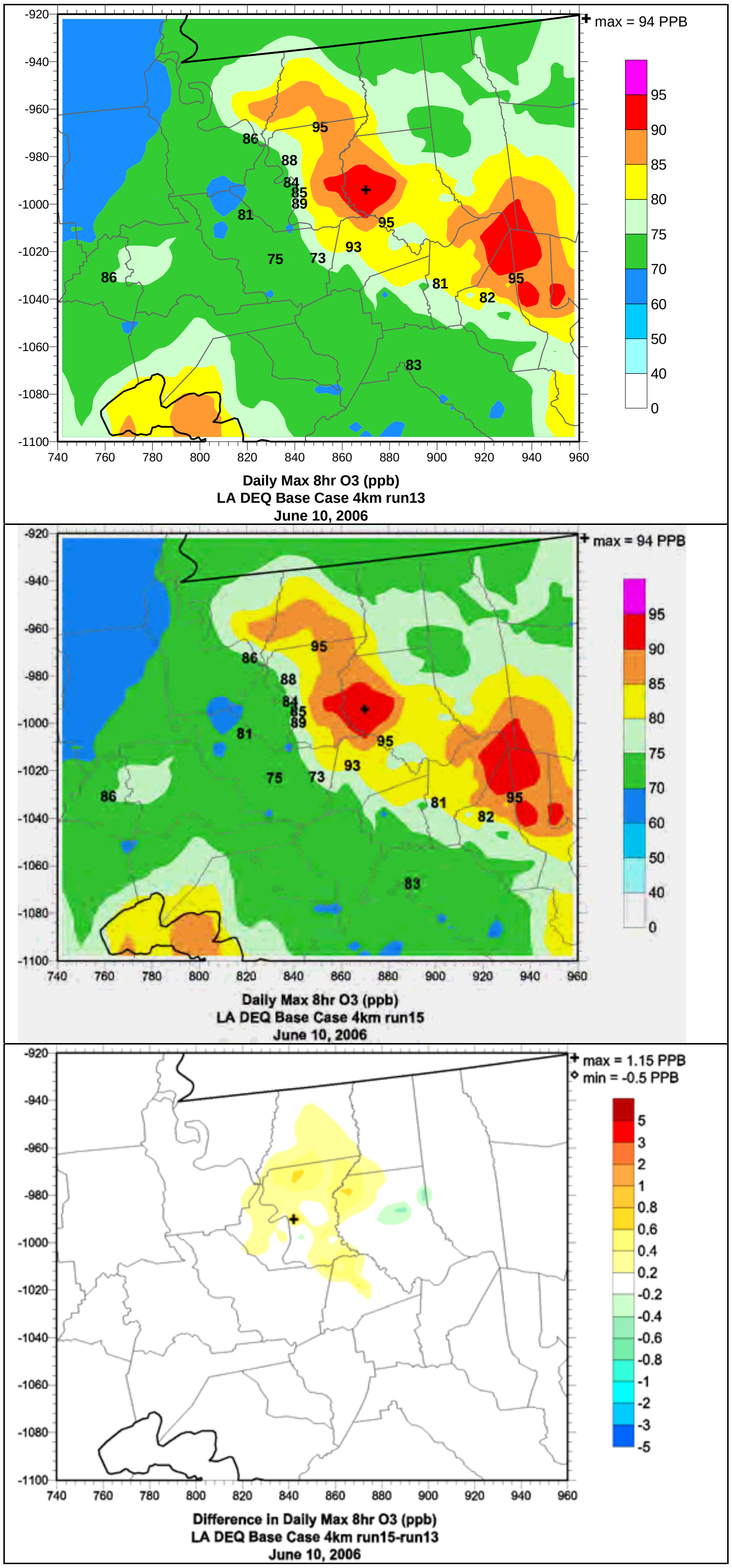


Figure 4-4a. Spatial plots of daily maximum 8-hour ozone on June 10 from Run 13 (top), Run 15 (middle), and corresponding differences (bottom).

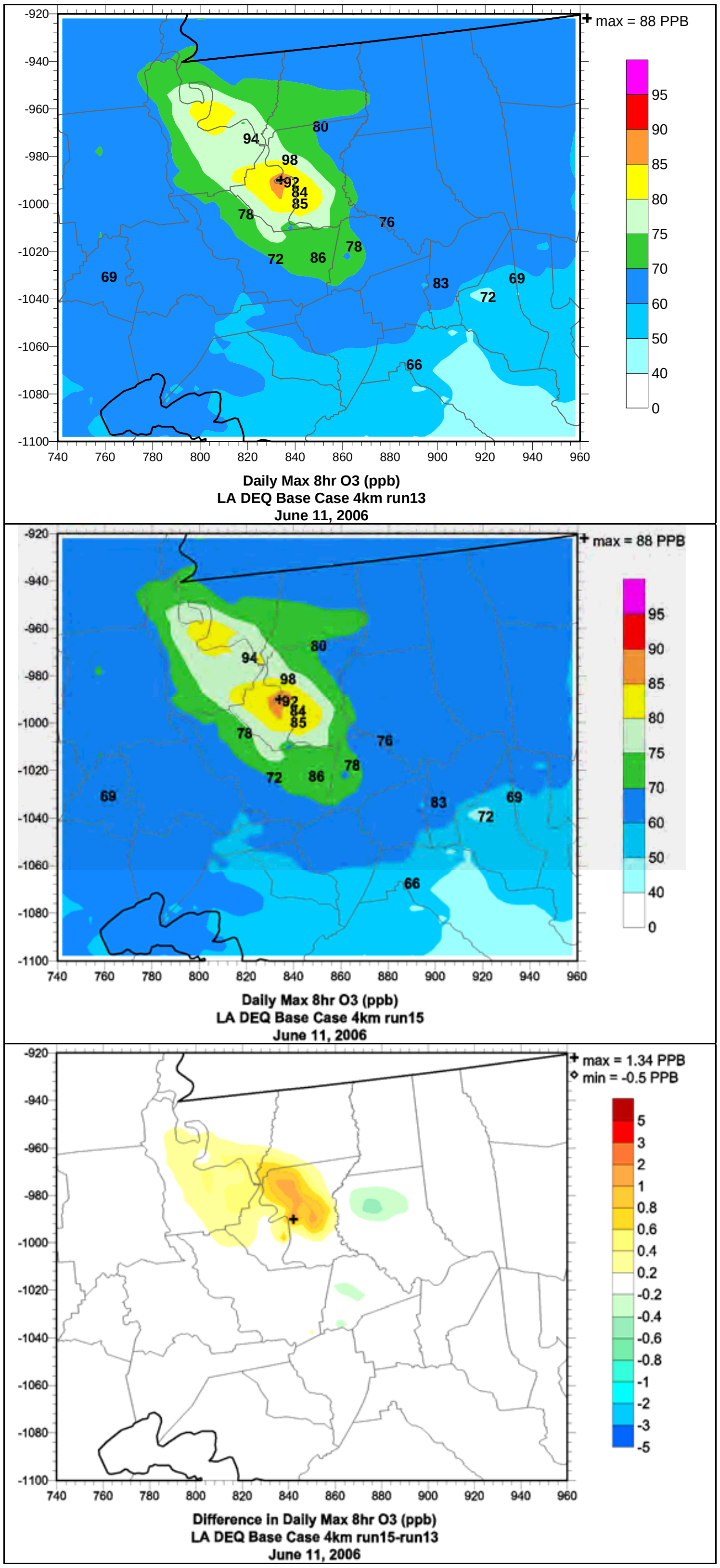


Figure 4-4b. Spatial plots of daily maximum 8-hour ozone on June 11 from Run 13 (top), Run 15 (middle), and corresponding differences (bottom).

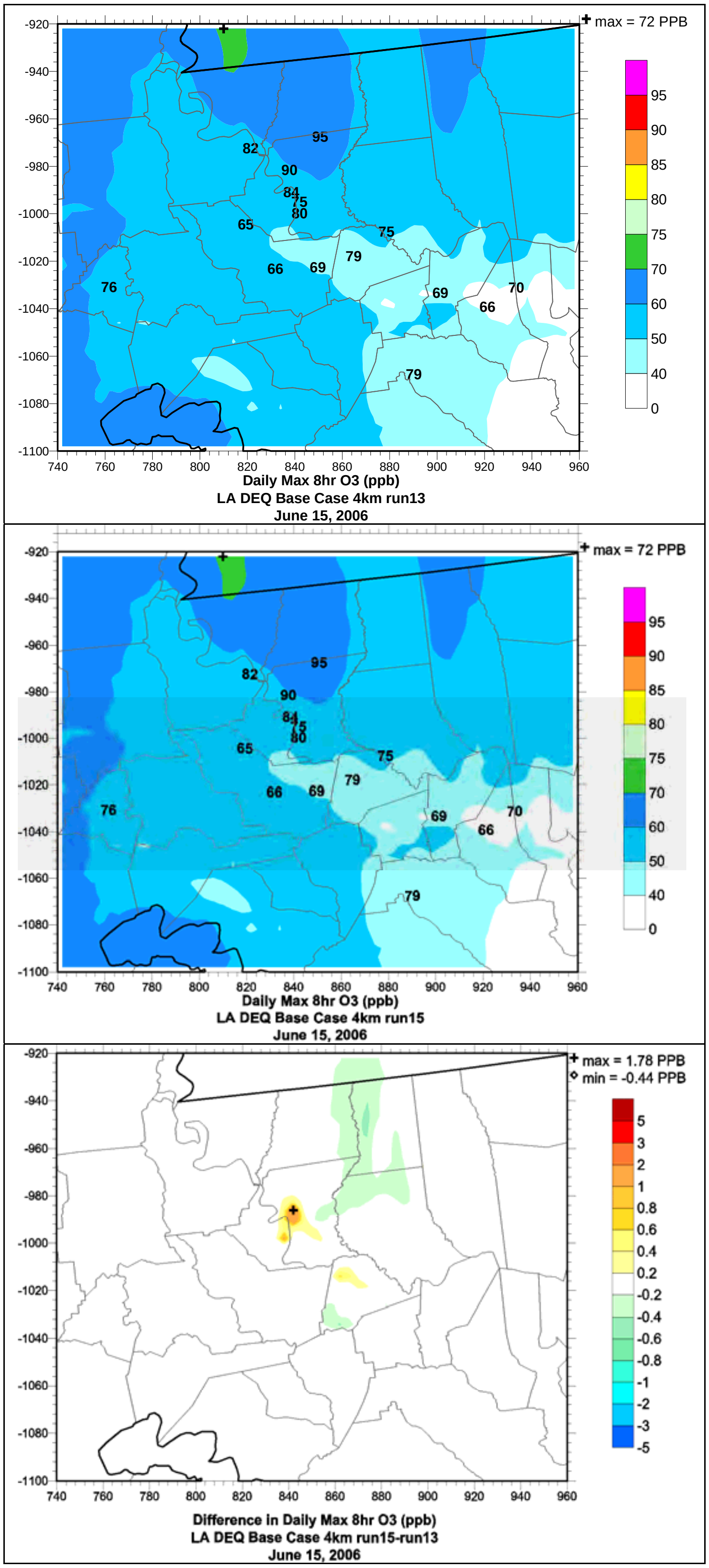


Figure 4-4c. Spatial plots of daily maximum 8-hour ozone on June 15 from Run 13 (top), Run 15 (middle), and corresponding differences (bottom).

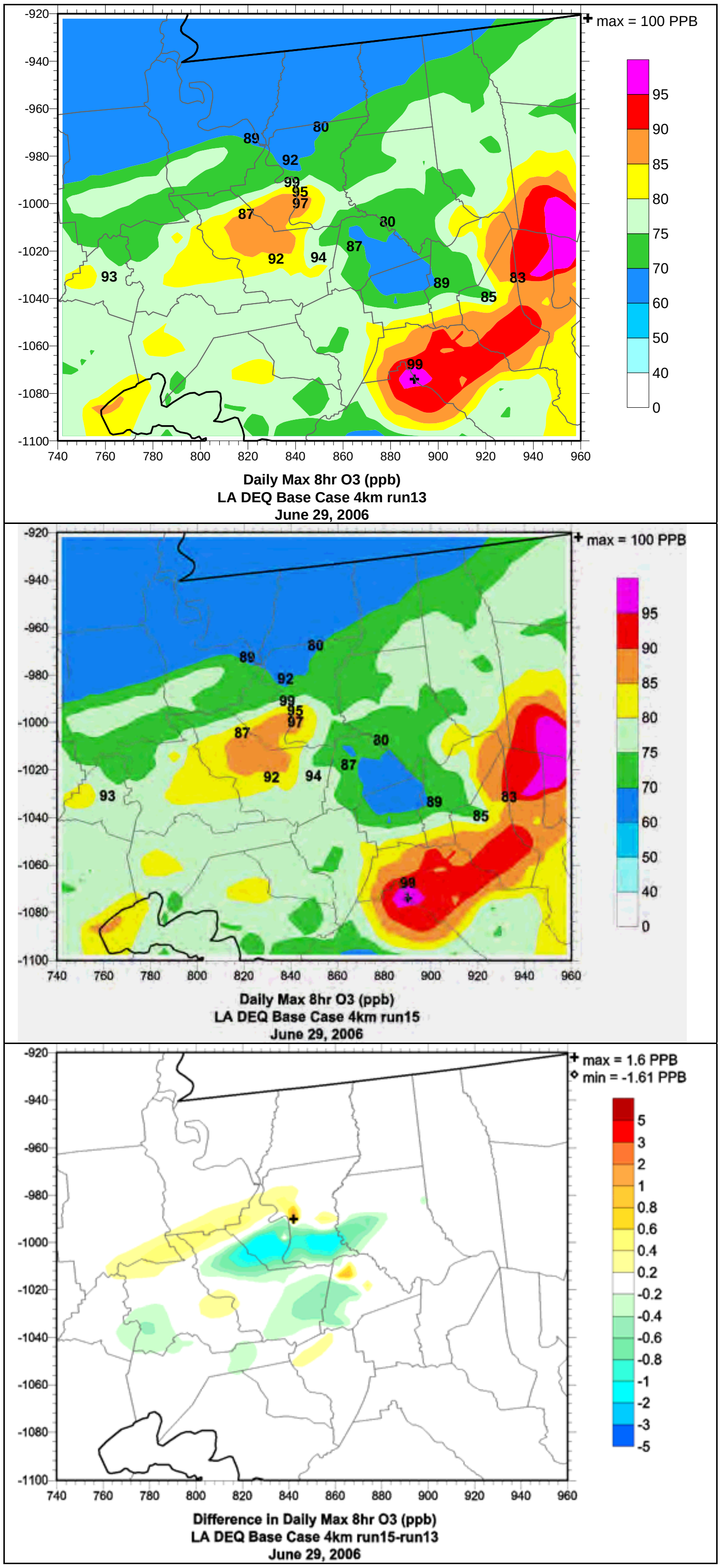


Figure 4-4d. Spatial plots of daily maximum 8-hour ozone on June 29 from Run 13 (top), Run 15 (middle), and corresponding differences (bottom).

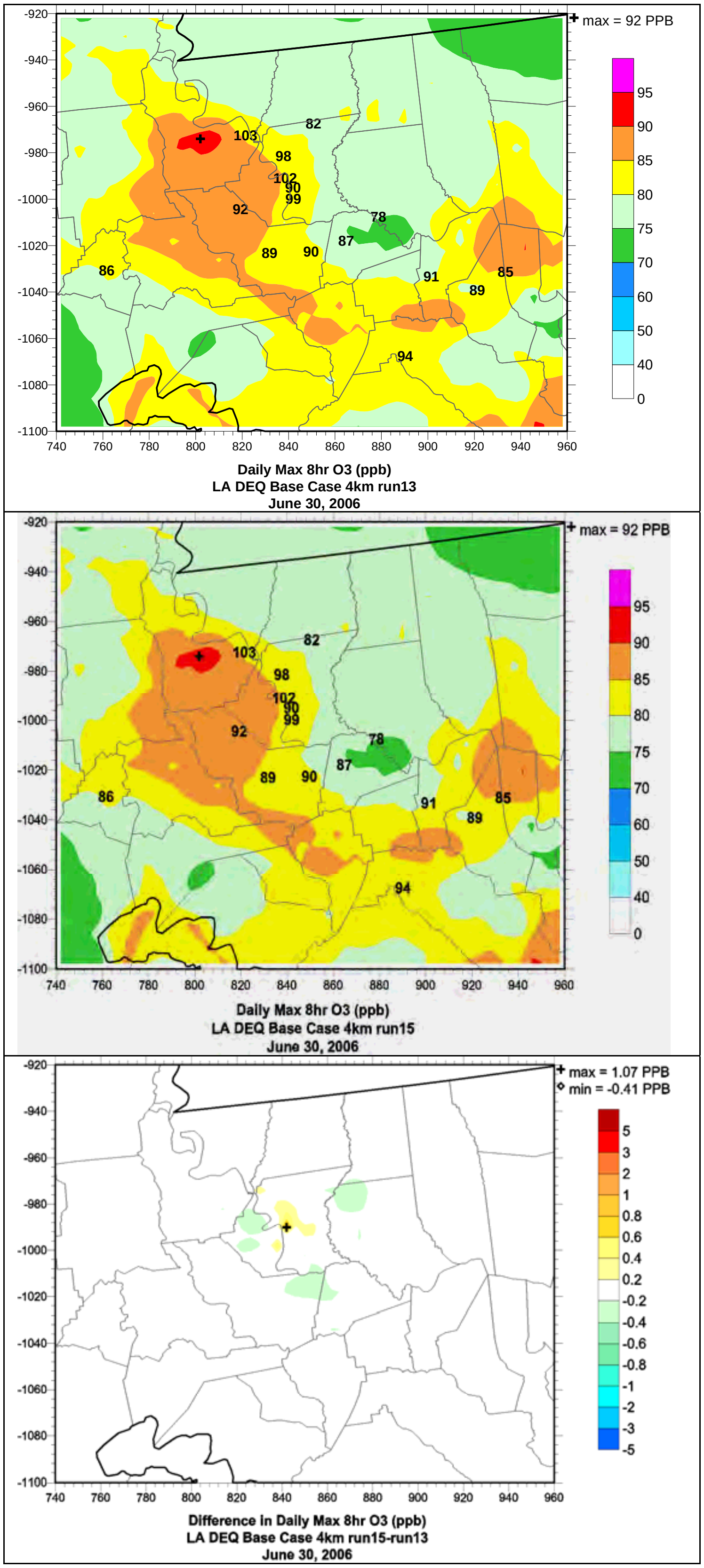


Figure 4-4e. Spatial plots of daily maximum 8-hour ozone on June 30 from Run 13 (top), Run 15 (middle), and corresponding differences (bottom).

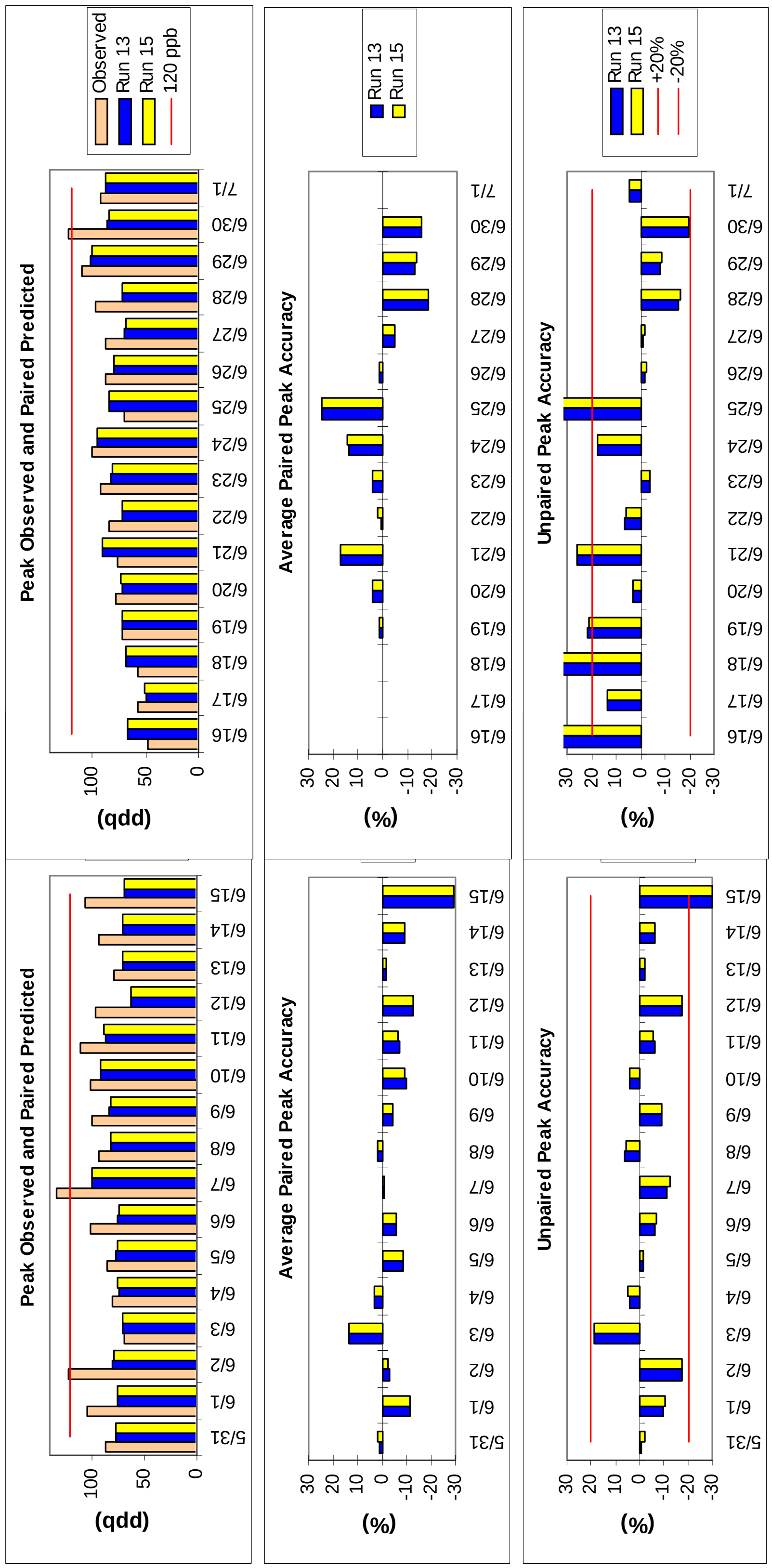


Figure 4-5. CAMx Runs 13 and 15 model performance statistics for peak 1-hour ozone.

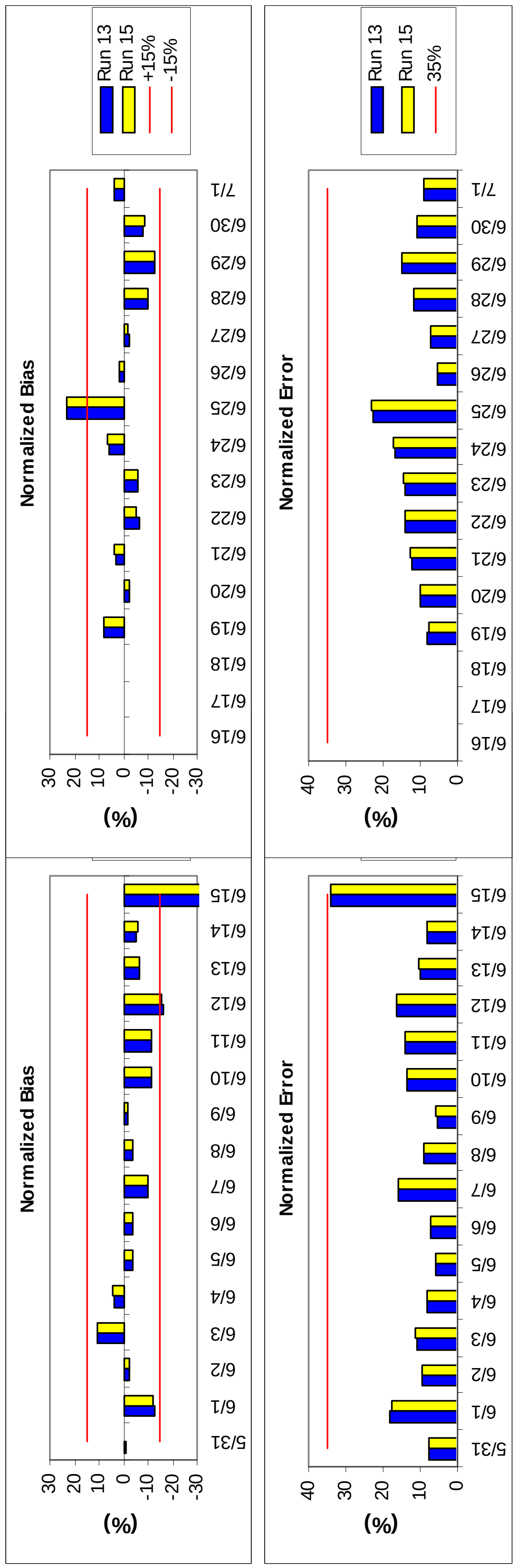


Figure 4-6. CAMx Runs 13 and 15 model performance statistics for 1-hour ozone over 60 ppb.

The average paired peak accuracy (middle plot in Figure 4-5) compares the daily peak 1-hour observations averaged over the ten monitors with the average of their co-located predicted peaks, and is expressed as a relative difference. In general the model tends to under predict high ozone days over all sites, and to over predict the low ozone days. However, the site-average paired peak performance remains within 20% on the high ozone days. The unpaired peak accuracy (bottom plot in Figure 4-5) compares the peak observed 1-hour ozone among all sites to the predicted daily maximum within 50 km of the peak observation, and is expressed as a relative difference. This plot displays each date's accuracy against the historical EPA 1-hour ozone performance goal of ±20 %. Results are similar to the average paired peak accuracy (under predicted high ozone days, over predicted low ozone days) with the highest ozone days within the old performance goal except for June 15 (as noted in the other statistics and in the time series). The accuracy exceeded 20% on many dates following June 16 when the observed peak 8-hour ozone was very low; these dates are not as important as the high ozone dates. The similarity among the unpaired and paired peak performance on high ozone days suggests that the predicted ozone field is rather uniform (agreeing with the spatial plots), as no higher ozone was found out to 50 km from each site.

Figure 4-6 shows two additional statistics that compare the normalized bias and error over all hours and sites, excluding prediction-observation pairings during hours when the observed 1-hour ozone was less than 60 ppb. Since 1-hour ozone remained below 60 ppb at all sites throughout the day on June 16-18, no statistics were calculated. The historical EPA 1-hour model performance goals for normalized bias and error are ±15 % and 35 %, respectively. Runs 13 and 15 met the normalized bias goal on all of the high ozone dates except June 15. Both runs met the goal for normalized error on all dates with remarkably low values in the 5-15% range on most days. Again, little difference is seen in performance statistics between the two runs.

Model performance statistics comparing 8-hour ozone in Runs 13 and 15 are shown in Figures 4-7 and 4-8. Note that the 8-hour statistics for overall bias and gross error were determined for all ozone hours above 40 ppb (as opposed to 60 ppb for the 1-hour statistics) to increase the sample size. Note that this difference resulted in a larger range of 8-hour ozone bias and error statistics. Otherwise, results are very similar to conclusions reached from the 1-hour statistics. CAMx met the historical performance goals for all days with peak ozone over 85 ppb, except for June 15.

Figure 4-9 displays scatter and quantile-quantile (Q-Q) plots of the daily maximum 8-hour ozone from all dates and all ten sites in the BRNAA. Results from both Run 13 and 15 are shown. The blue points represent each predicted and observed pairing as a standard scatter diagram. The pink circles show separately ranked predicted vs. observed Q-Q points at every fifth percentile; the quantiles remain within the desired EPA goals for concentrations above 45 ppb, denoted by the dashed red lines, although the plot shows an under prediction tendency for quantiles above about 70 ppb. Figure 4-10 shows a similar scatter and Q-Q plots, alternatively plotting predictions in the 7x7 grid area surrounding each monitoring site that best match each observation, as recommended in EPA guidance. The co-located predictions show more scatter compared to using the best match predicted value. Almost the entire Q-Q range (above ~30 ppb) in the best match case is well within the EPA guidance envelope, and aligns very well along the 1:1 line.

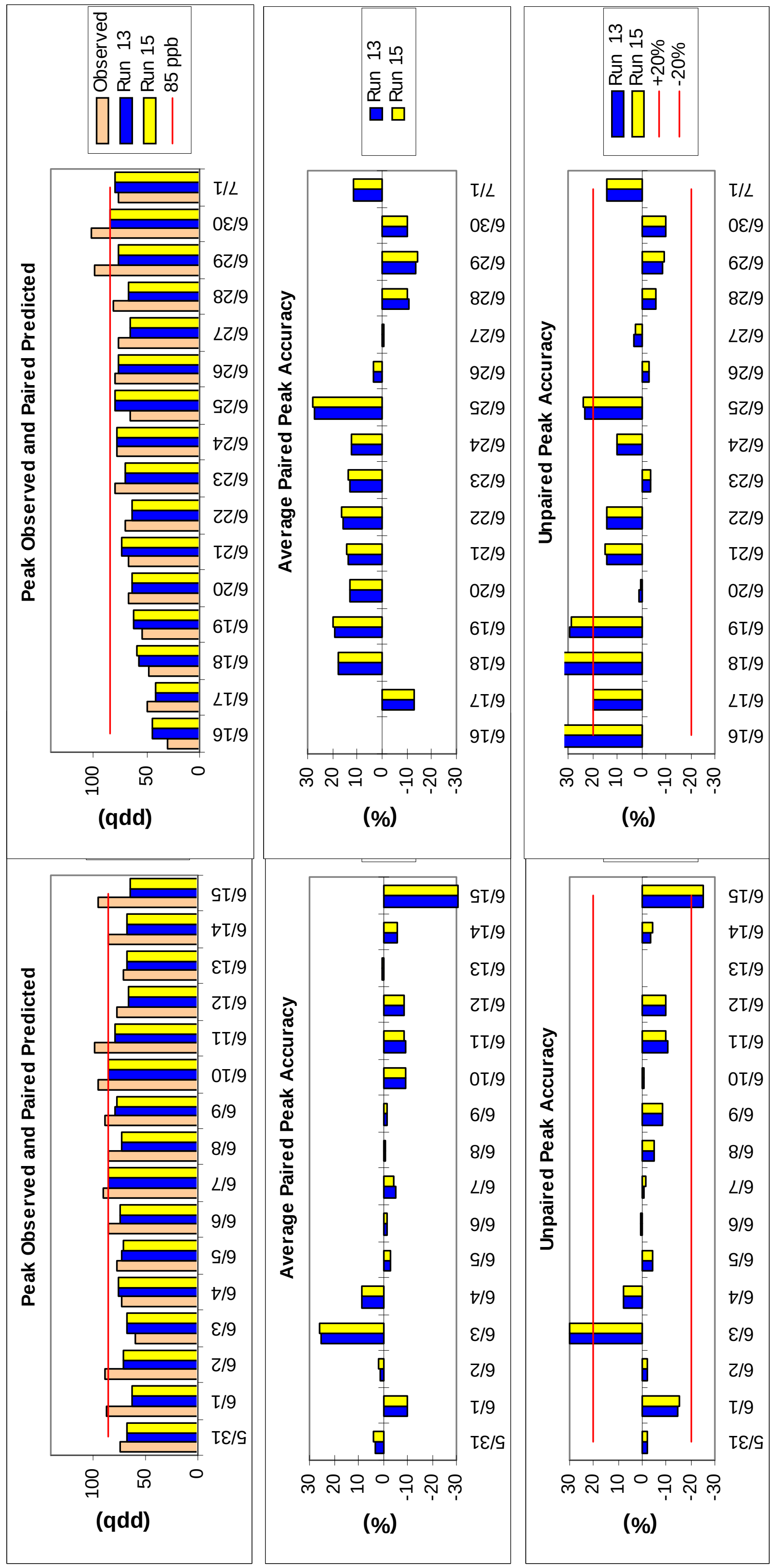


Figure 4-7. CAMx Runs 13 and 15 model performance statistics for peak 8-hour ozone.

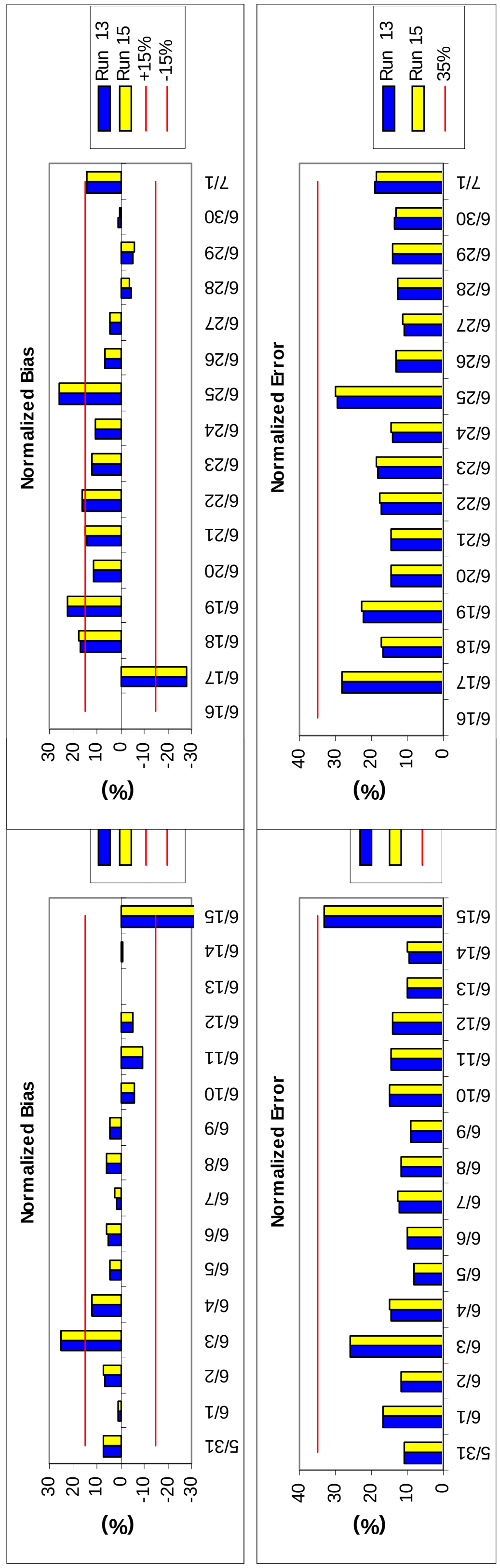


Figure 4-8. CAMx Runs 13 and 15 model performance statistics for 8-hour ozone over 40 ppb.

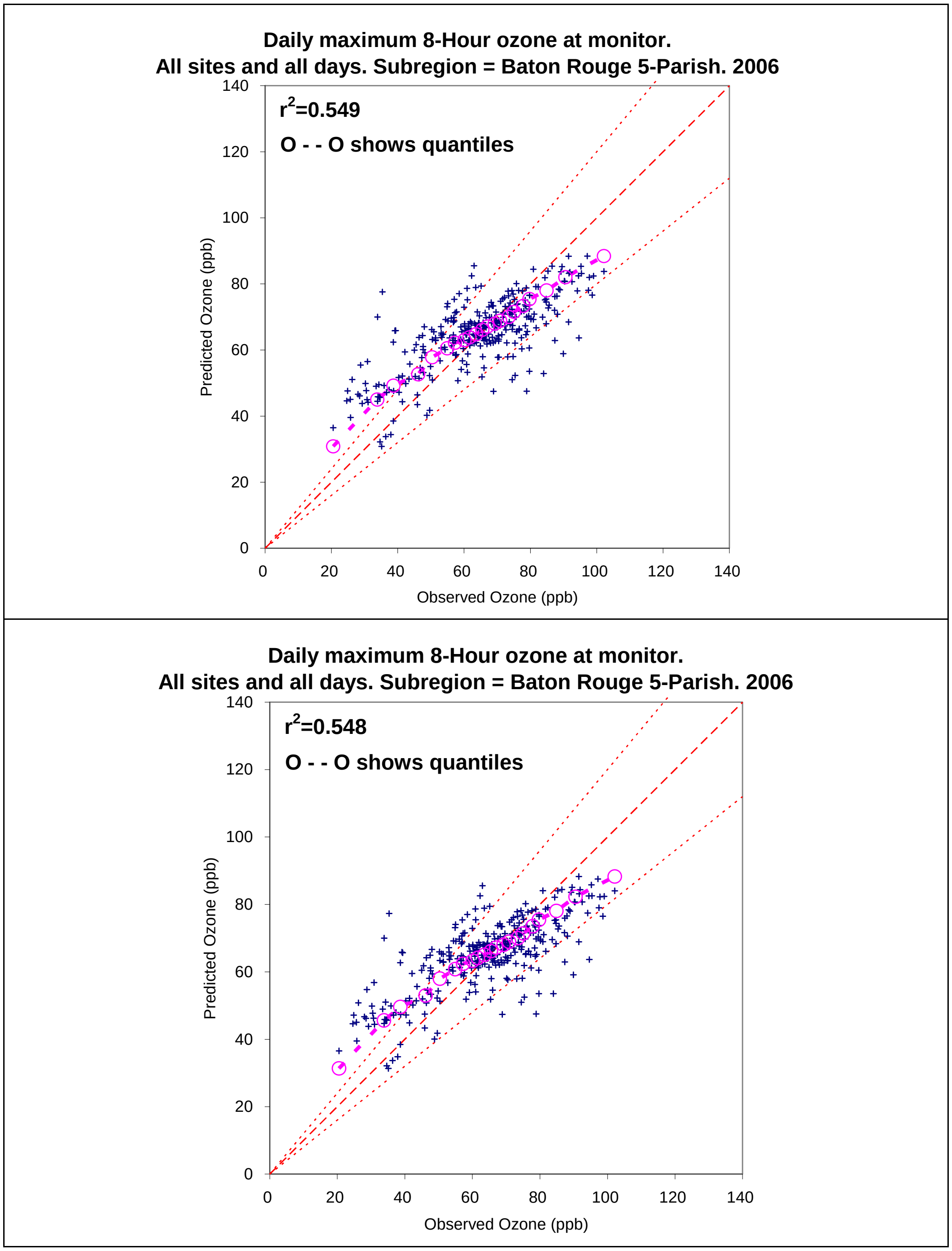
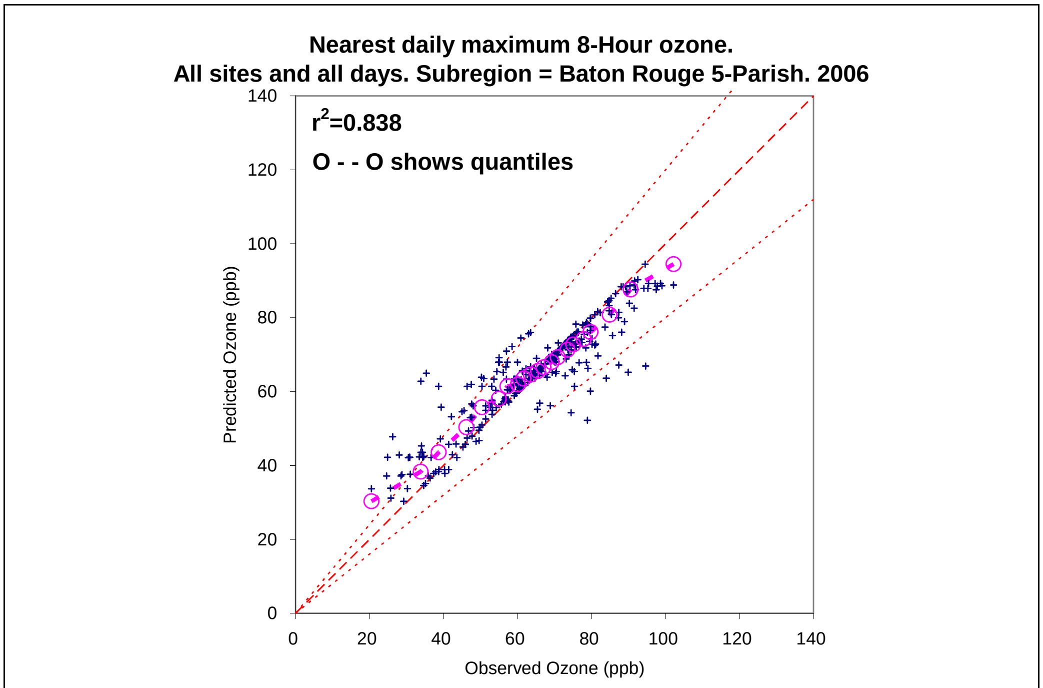


Figure 4-9. Scatter and quantile (Q-Q) plots of Run 13 (top) and Run 15 (bottom) daily maximum 8-hour ozone when comparing co-located predictions and observations.



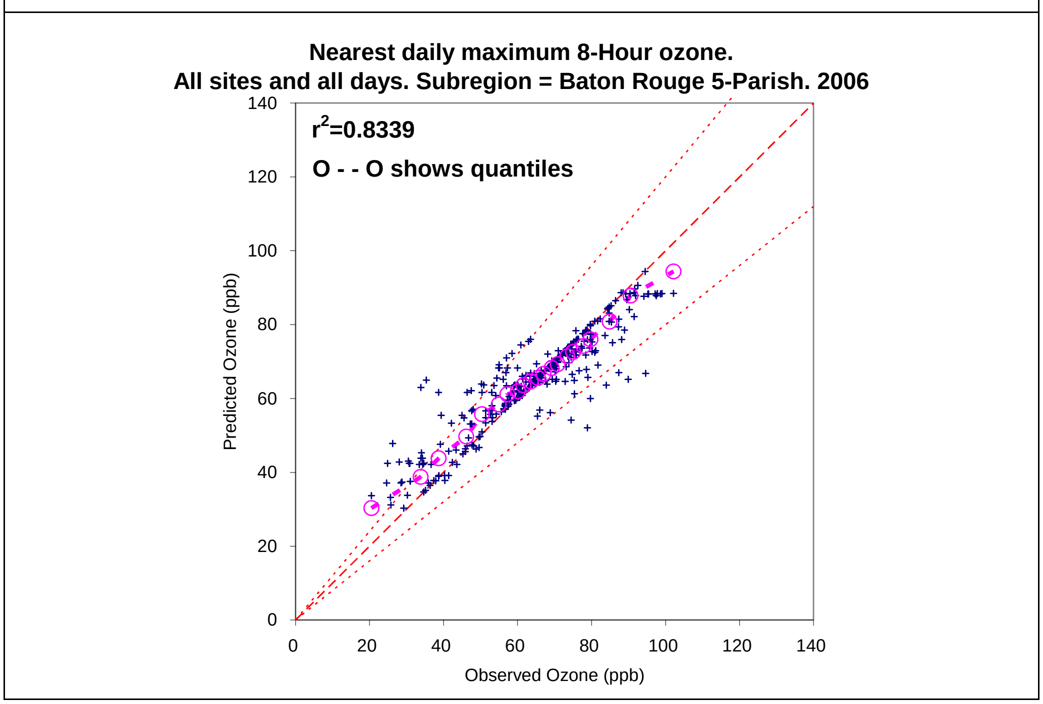


Figure 4-10. Scatter and quantile (Q-Q) plots of Run 13 (top) and Run 15 (bottom) daily maximum 8-hour ozone when comparing best-match predictions (in the 7x7 cell area surrounding each monitor) and observations.

4.4.2 NOx Performance

Figure 4-11 displays 1-hour time series of measured NOx and Run 13 and 15 predicted NOx at the four co-located PAMS sites (Pride, Capitol, LSU, and Bayou Plaquemine). The more rural sites (Pride and Bayou Plaquemine) are characterized by much lower NOx levels compared to the urban sites (Capitol and LSU), and CAMx matched that pattern. At the rural sites, CAMx captured diurnal trends very well, but often under predicted NOx for the vast majority of the episode, which indicates: (1) an under estimation of NOx emissions; (2) an inability for CAMx to adequately resolve local NOx emissions at 4-km resolution; and/or (3) over-stated dilution via mixing processes. The grid resolution issue (2) is the most likely explanation for the under predictions, because this aligns with the over predictions of nocturnal ozone seen in the rural site time series in Figure 4-3. Concentrated local NOx emissions as observed in Figure 4-11 at Pride would titrate ozone to near zero levels overnight. The mixing issue (3) is addressed in sensitivity tests (Appendix B), and as is illustrated below, was deemed to be too weak rather than too strong.

At urban sites, NOx is simulated rather well during most of the period, although CAMx tended to over predict the highest concentrations in the early morning commute hours. On the few days in which the peak NOx was under predicted, observations were on par with many of the CAMx over predictions on other days (meaning that the CAMx over predictions were not implausible); on such days it is likely that errors in wind direction cause the model to miss those peaks. Note that both Runs 13 and 15 utilized increased morning mixing (derived from Run 12 – see Appendix B), which was successful in dramatically reducing the morning NOx over predictions seen in previous runs. There is not much difference observed between the two runs using different onroad mobile emissions.

Figure 4-12 displays bar charts of daily 1-hour NOx performance over all 10 sites for Runs 13 and 15, similar to the ozone statistics described earlier. There are no benchmarks adopted to define adequate NOx performance. The top two plots in Figure 4-12 characterize 1-hour peak NOx, while the bottom two plots show bias and gross error over all sites and hours. Both CAMx Runs 13 and 15 performed very well in characterizing domain-peak NOx, but again tended to over predict peak NOx averaged over all sites (likely dominated by the urban over predictions). During the highest ozone periods, bias and gross error remained within ±20% and 80%, respectively. Again, practically identical results were achieved with the revised onroad MV emissions.

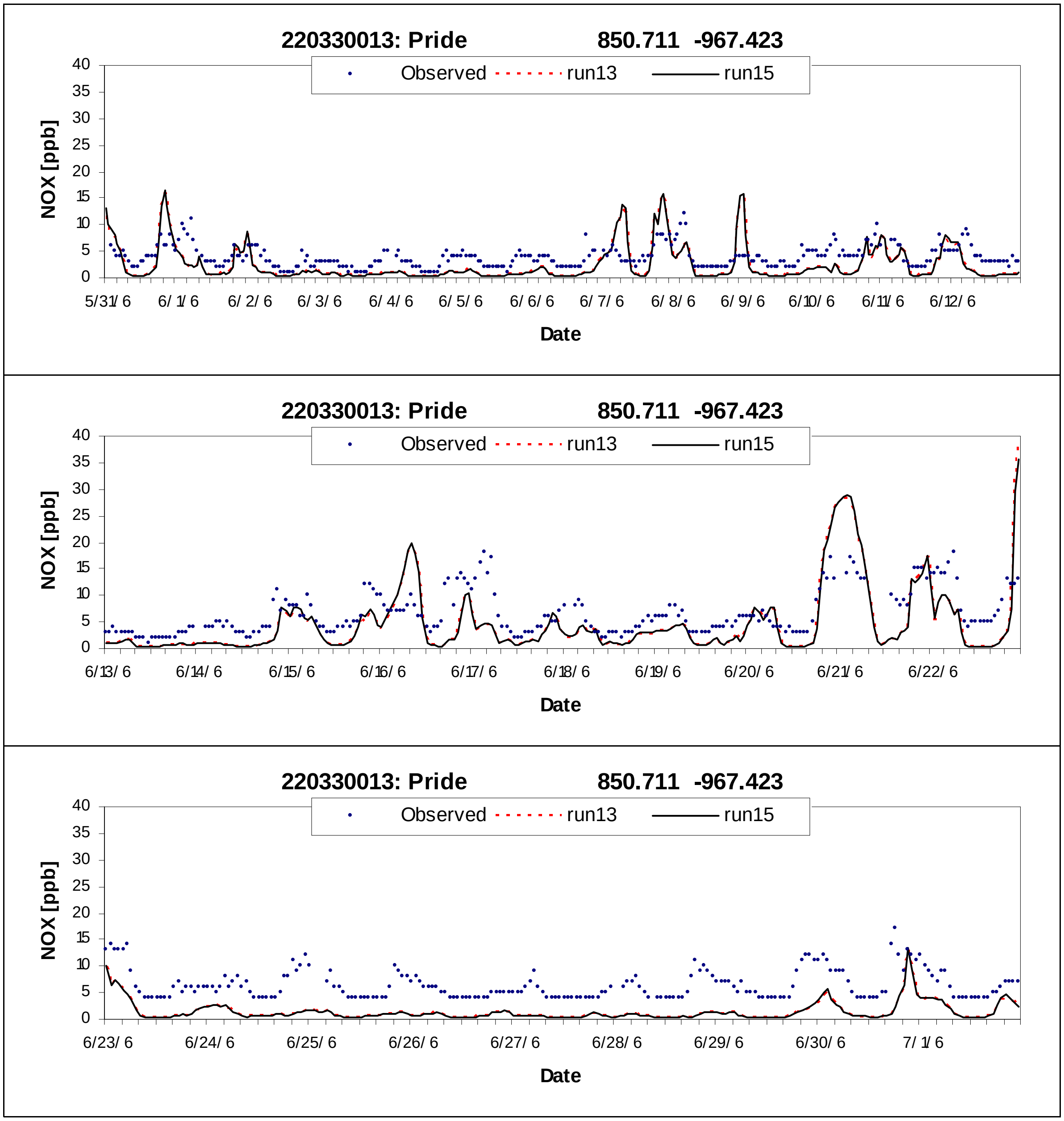


Figure 4-11. Time series of observed and predicted (Runs 13 and 15) hourly NOx at Pride.

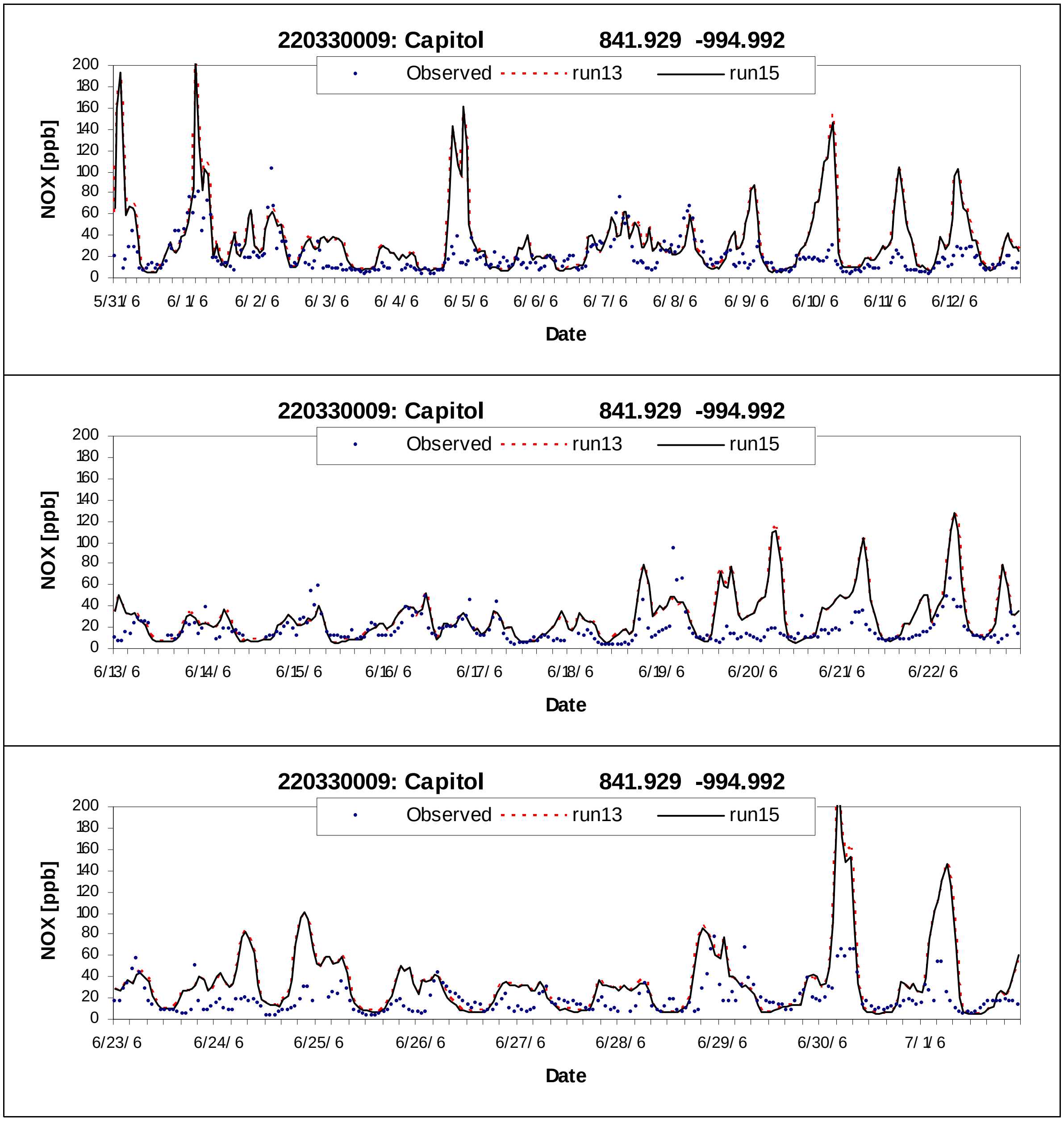


Figure 4-11 (continued). Time series of observed and predicted (Run 13 and 15) hourly NOx at Capitol.

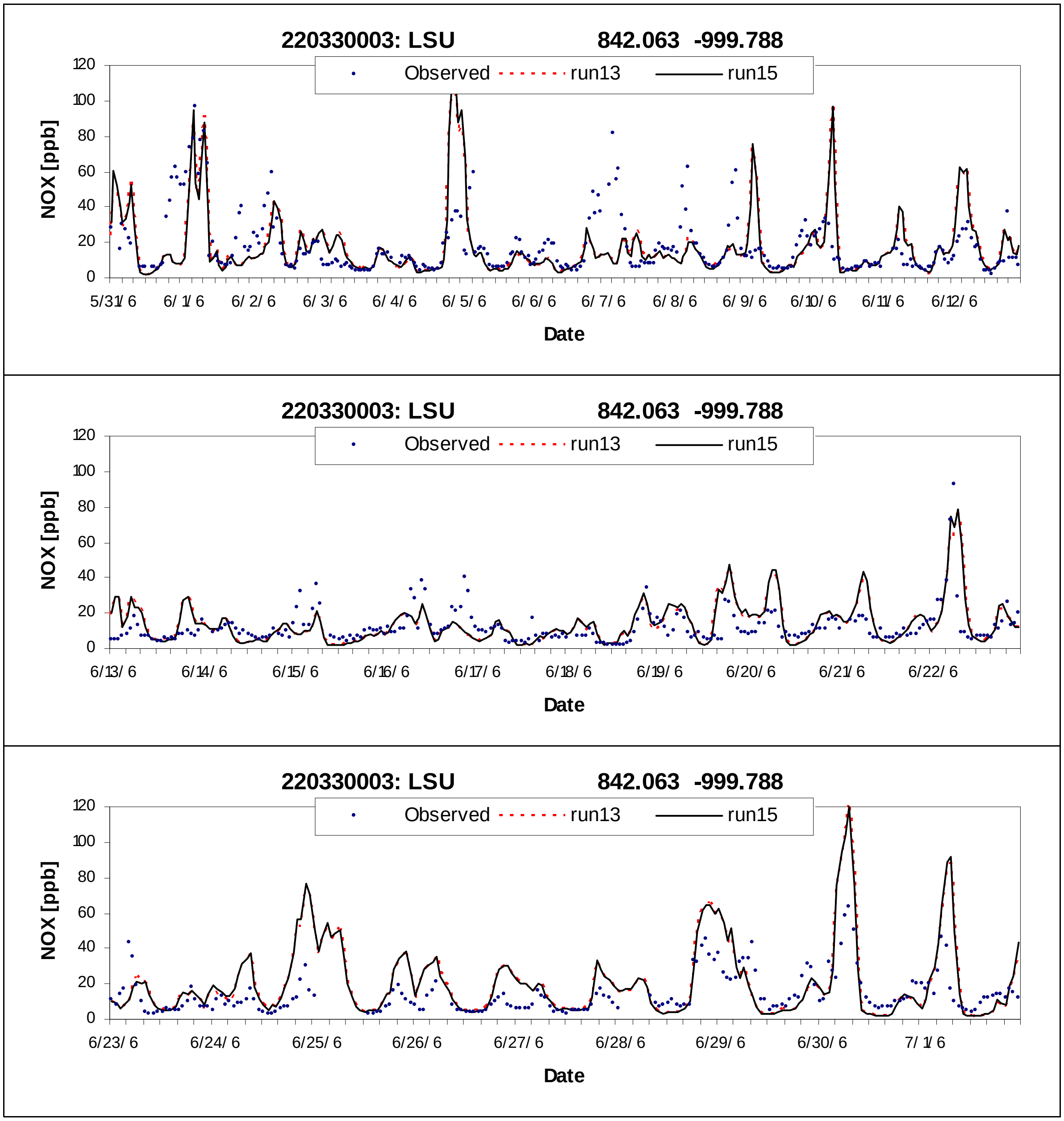


Figure 4-11 (continued). Time series of observed and predicted (Run 13 and 15) hourly NOx at LSU.

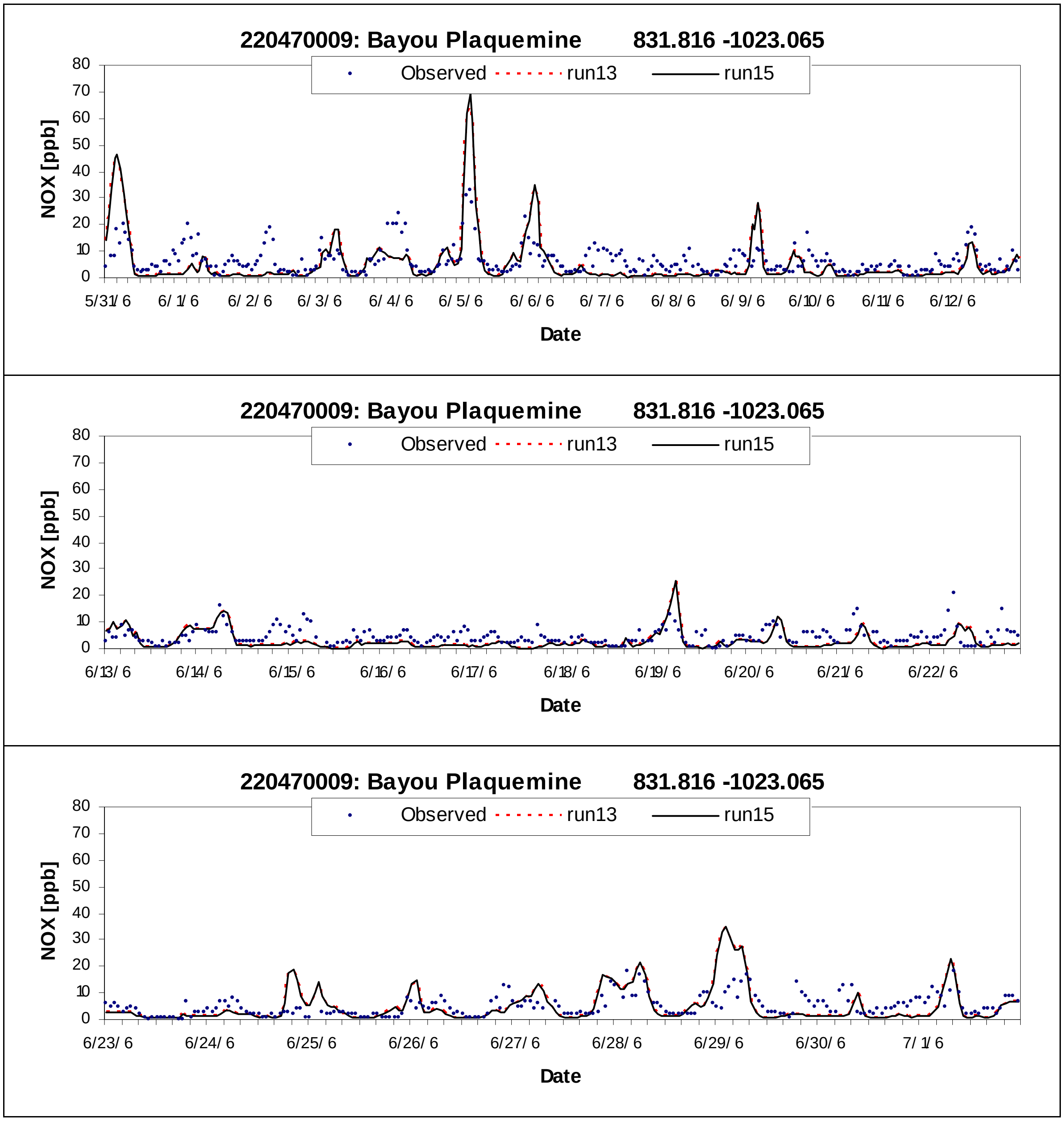


Figure 4-11 (concluded). Time series of observed and predicted (Run 13 and 15) hourly NOx at Bayou Plaquemine.

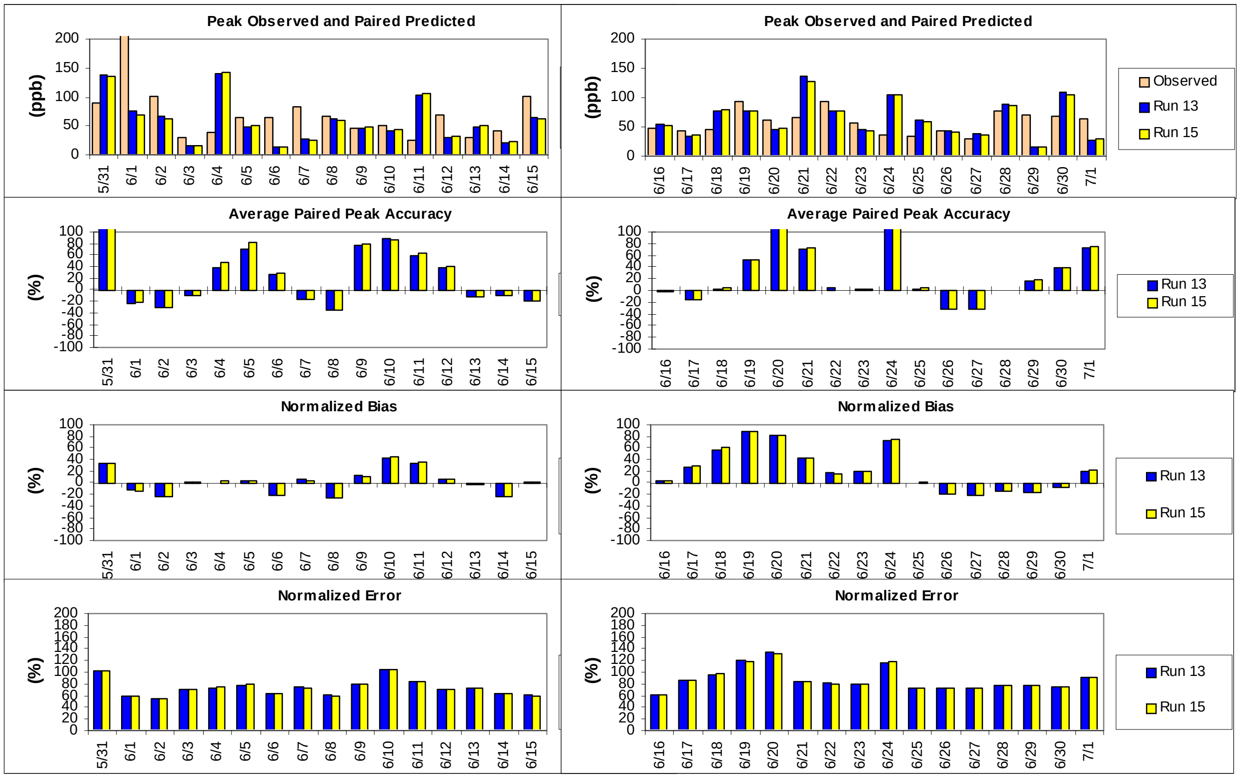


Figure 4-12. Peak (top two panels) and overall (bottom two panels) statistical model performance for 1-hour NOx from CAMx Run 13 and 15.

4.4.3 VOC Performance

The PAMS data included 56 non-methane organic compounds (NMOC) reported in units of ppb carbon (ppbC). The data included isoprene, but not specifically terpene; furthermore, the data did not include alcohols (methanol or ethanol) or carbonyls (e.g., formaldehyde). The 56 NMOC concentrations were aggregated to 8 CB05 VOC compounds using weight fractions developed by EPA. The evaluation of VOC and VOC:NOx performance centered on the analysis of the 6-9 AM period as a way to gauge the accuracy of the emission inventory. This period, which occurs before daytime mixing takes place along with the rapid growth of the surface boundary layer and the onset of significant photochemistry, reflects the heavy contribution from mobile sources during peak commute hours.

Figure 4-13 displays 6-9 AM comparisons of observed and Run 15 predicted CB05 VOC species for those compounds that were available from PAMS measurements. The days shown are the highest ozone days of the period (consistent with the ozone analyses described earlier): June 10, 11, 15, 29, and 30. Data from all four PAMS sites were available on June 10, while only data from Capitol and LSU were available for the other days.

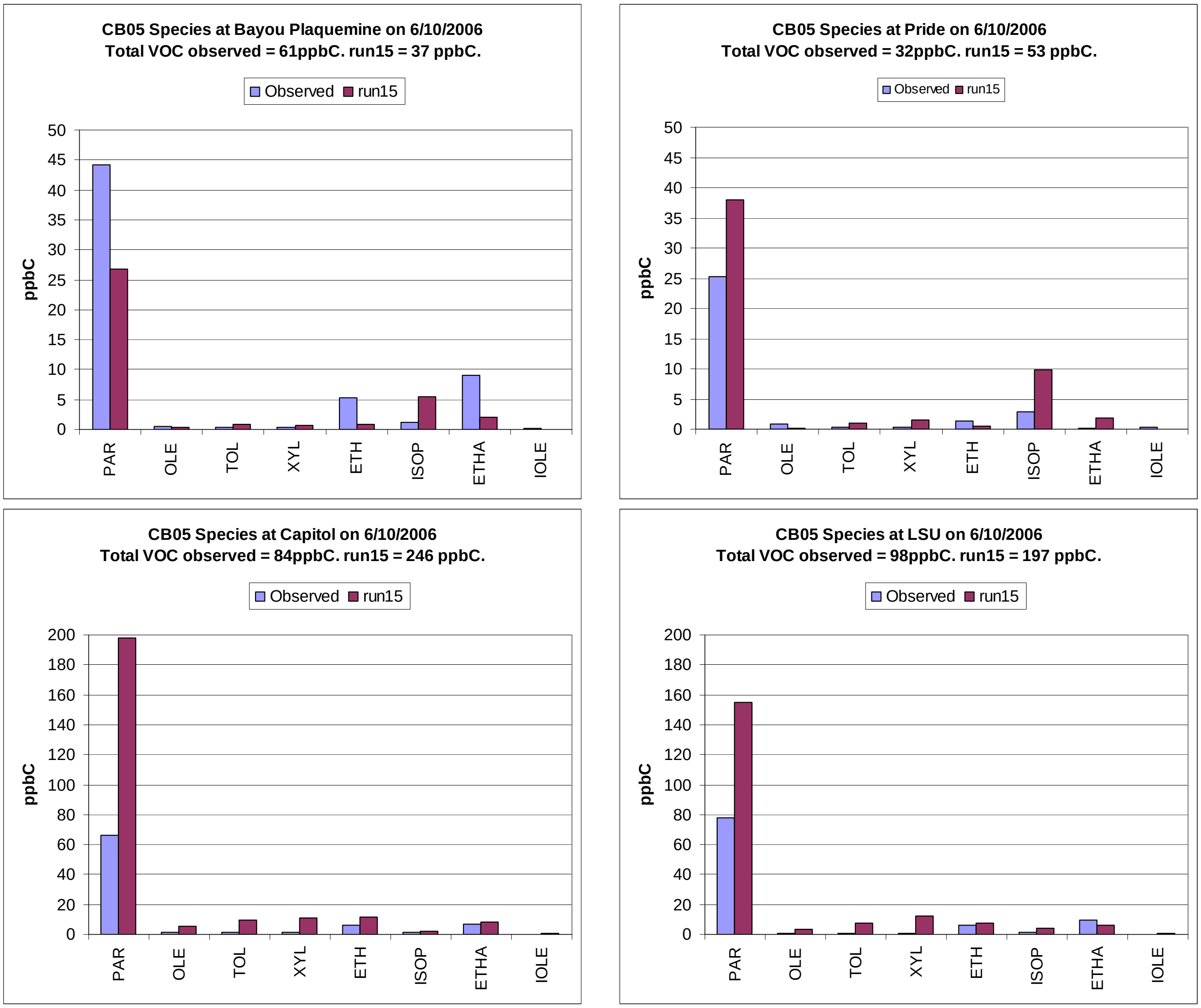


Figure 4-13a. CB05 VOC comparisons between PAMS-derived measurements and CAMx Run 15 for 6-9 AM, June 10.

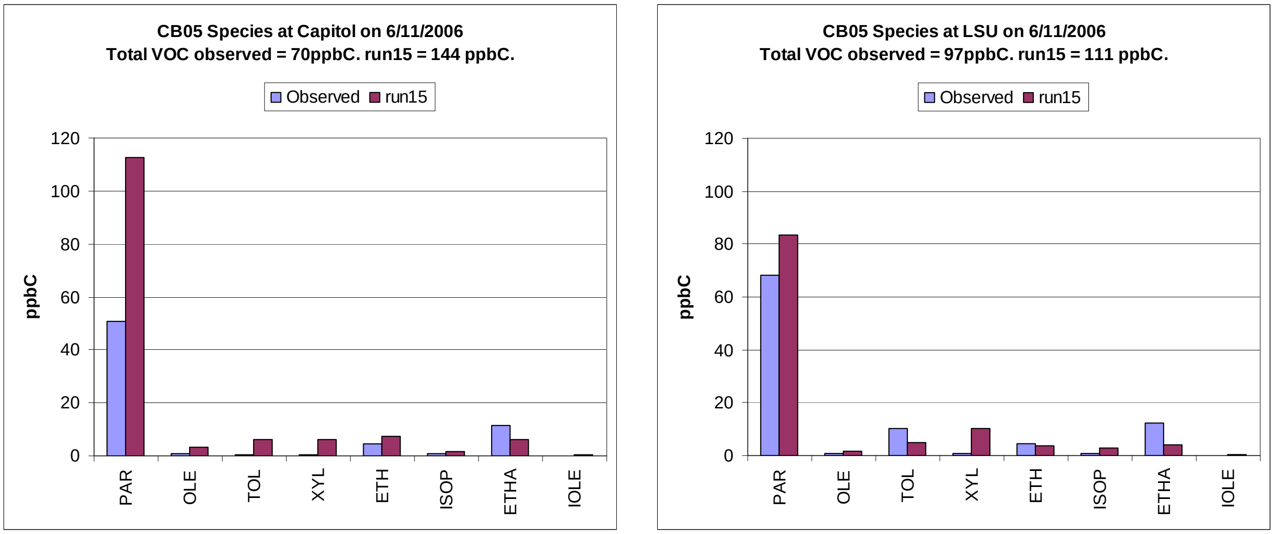


Figure 4-13b. CB05 VOC comparisons between PAMS-derived measurements and CAMx Run 15 for 6-9 AM, June 11.

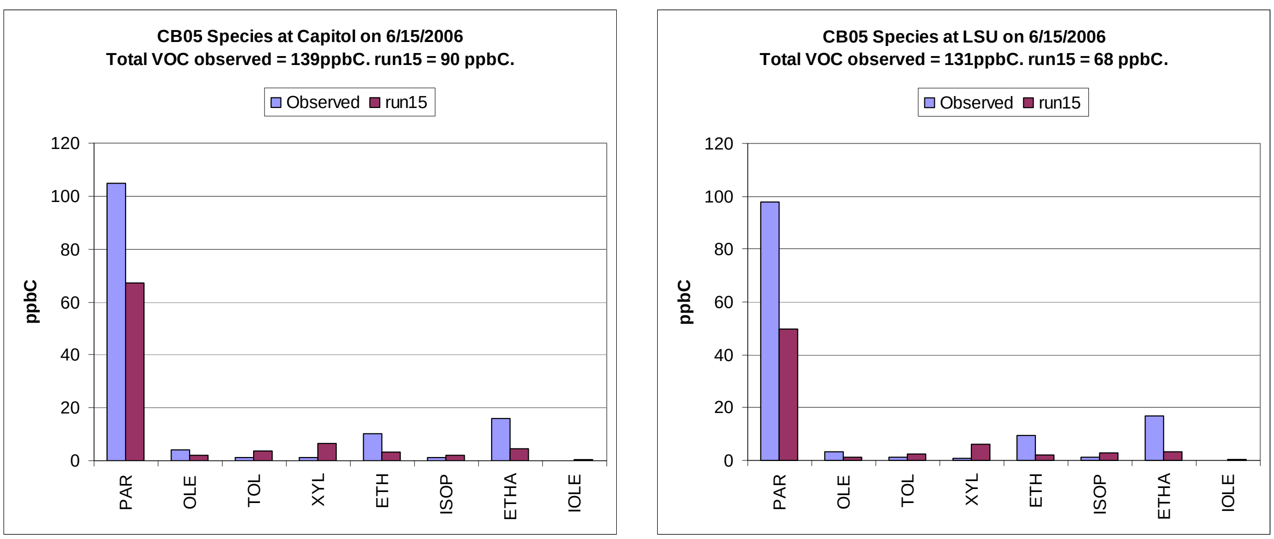
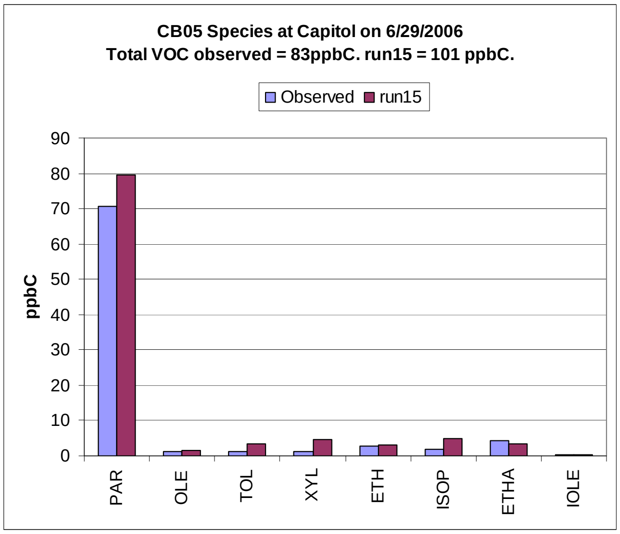


Figure 4-13c. CB05 VOC comparisons between PAMS-derived measurements and CAMx Run 15 for 6-9 AM, June 15.



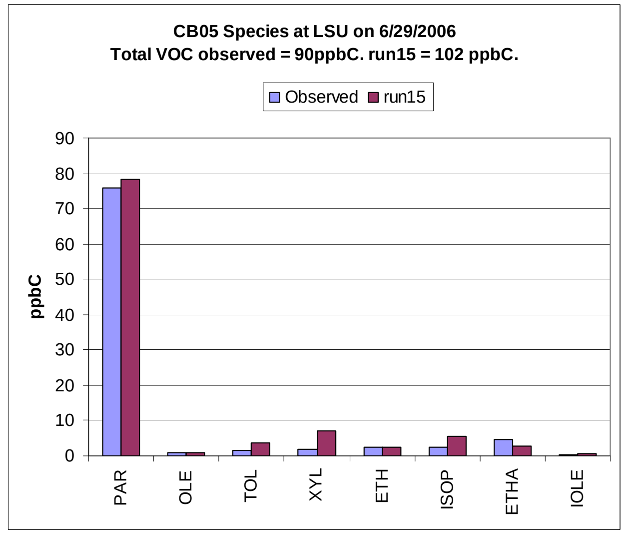
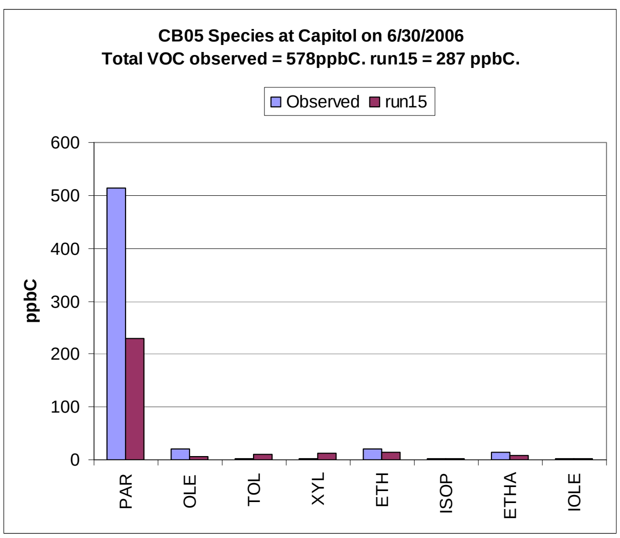


Figure 4-13d. CB05 VOC comparisons between PAMS-derived measurements and CAMx Run 15 for 6-9 AM, June 29.



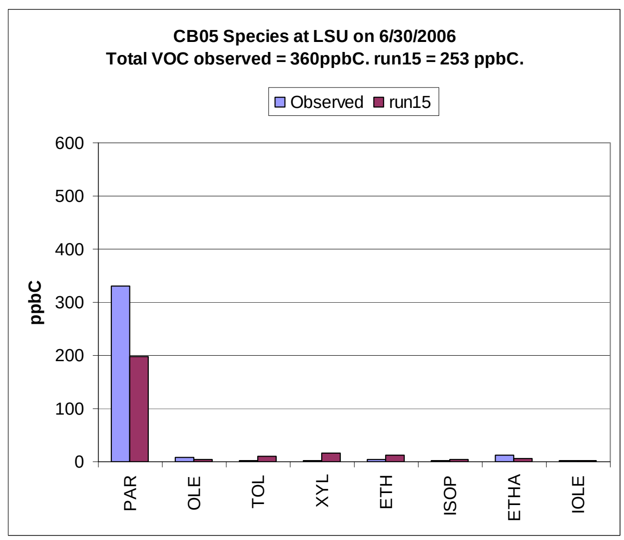


Figure 4-13e. CB05 VOC comparisons between PAMS-derived measurements and CAMx Run 15 for 6-9 AM, June 30.

As is typical of VOC performance, the CB05 species "PAR" (light single-bond paraffins) is dominant in both the measurements and the predictions at all sites, with much less carbon mass associated with the other species. It is important to realize, however, that small errors for certain species other than PAR (i.e., toluene, xylene, and isoprene) can play more significant roles for net reactivity and radical yields than the larger errors seen for the much less reactive PAR. The model shows a mix of under and over predictions among the sites for all days, but generally the urban core sites (Capitol and LSU) exhibit over predictions for PAR, and often other species to a lesser extent. The exceptions are June 15 and 30, when much larger (by factors of 2-5) than usual VOC concentrations were measured at Capitol and LSU. The cause of these high events is not obvious, but they may be associated with intermittent emissions that are not well characterized in the modeling inventory.

Based on past experience with this type of analysis, these VOC results are rather good. It is important to keep in mind that VOC emissions, especially from evaporative, fugitive, or flaring sources, are highly variable in space and time, and such variability cannot be characterized in seasonal or annual emission inventories, and are thus not carried through in the modeling. Given that industrial and marine fugitive sources may contribute to the actual Baton Rouge VOC emissions on an hourly to daily basis, overall model performance for VOCs as shown in these plots is quite acceptable.

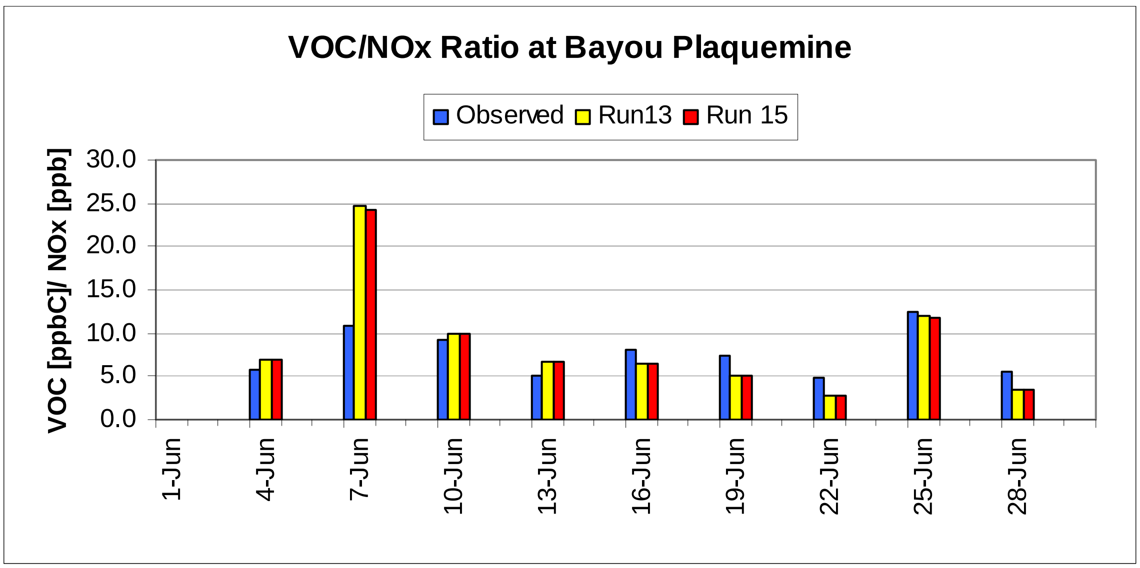
The relative mix of NOx and VOC precursors is a more important metric to assess the net ozone formation potential than the concentrations of individual species alone. The most common approach to measure this formation potential is by the ratio of morning VOC to NOx emissions, or ambient concentrations before the photochemistry begins.

VOC:NOx ratios below about 5 indicate a NOx-rich, VOC-limited chemical regime where the abundance of NOx (1) removes ozone directly due to freshly emitted NO ($NO + O_3 \rightarrow NO_2 + O_2$), and (2) inhibits the formation of ozone by increasing the contribution from radical termination reactions that remove oxidants rather than propagating them through the ozone cycle. Urban areas are often VOC-limited due to abundant NOx emissions from onroad sources. It is important to note that NOx reductions under such regimes will tend to increase ozone locally by reducing ozone destruction/inhibition (often referred to as a "NOx-disbenefit"). However, ozone responds proportionally to VOC changes in these regimes, although weakly until the VOC:NOx ratio increases above about 5.

VOC:NOx ratios above about 12 indicate a VOC-rich, NOx-limited chemical regime in which ozone is sensitive to the amount of NOx to initiate and propagate radicals. While changes in VOC lead to minimal changes in ozone, NOx changes lead to proportional changes in ozone. VOC:NOx ratios between 5 and 12 represent the area of most efficient ozone potential, where an optimum balance exists between NOx and VOC. In such cases, ozone responds well to changes in either or both VOC and NOx.

Figure 4-14 shows the measured and Run 13 and 15 simulated VOC:NOx ratios for each of the four PAMS sites on days in which VOC measurements were available. The first two panels show Bayou Plaquemine and Pride, the two rural sites, while the urban sites, Capitol and LSU, are shown in the second two panels. All sites show conditions that tend to be NOx-rich and VOC-lean. Note that the measurements show some large day-to-day variations at three sites, but surprisingly very low and consistent VOC:NOx at Pride. This again shows that ozone at Pride was impacted by high NOx emissions relative to VOCs, thus explaining the nocturnal ozone patterns there that the model could not capture with its much higher proportion of VOC (somewhat over predicted; Figure 4-13) relative to NOx (under predicted; Figure 4-11). Performance for VOC:NOx ratio is probably best at Bayou Plaquemine. The large over prediction of the ratio on June 7 was due to a very large under prediction of NOx, which may have been caused by wind errors that improperly positioned a local NOx plume.

At the urban sites, observed VOC:NOx tended to remain well below 10 despite some inter-daily departures. As expected, the simulated ratios were more consistent day-to-day, especially at the urban sites (Capitol and LSU), due to consistent daily emission inputs. The biggest under predictions of the ratio on ozone exceedance days resulted from a mix of VOC under predictions on some days, and/or large NOx over predictions on others. In general, the model performed well in replicating the typical VOC:NOx ratio at Bayou Plaquemine and Capitol, and to a lesser extent at LSU, with only a few days when large deviations from measurements occurred. The VOC:NOx ratio comparisons for Runs 13 and 15 show nearly identical performance.



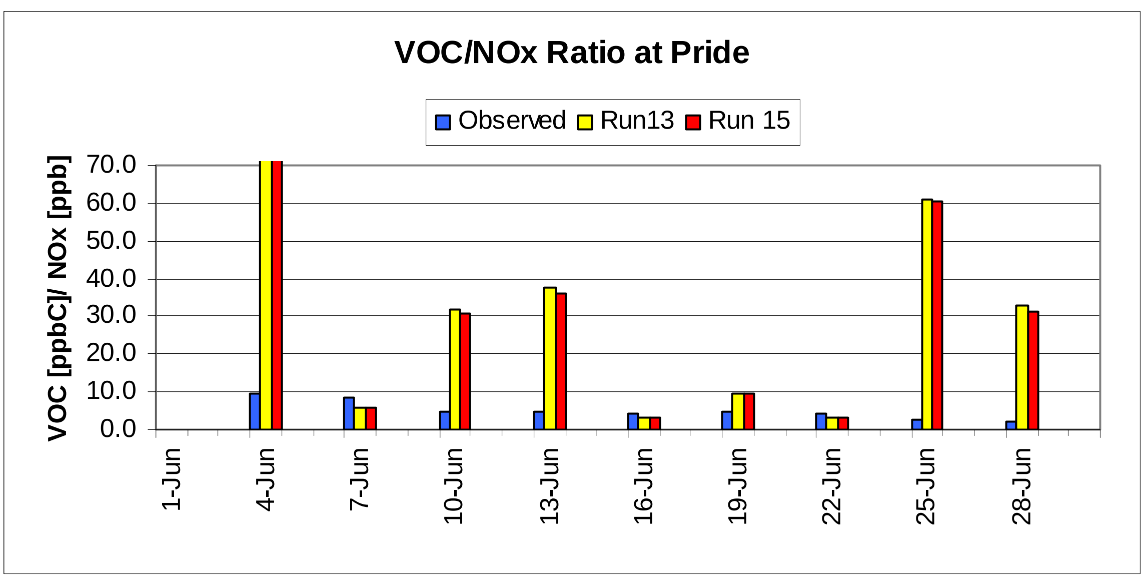
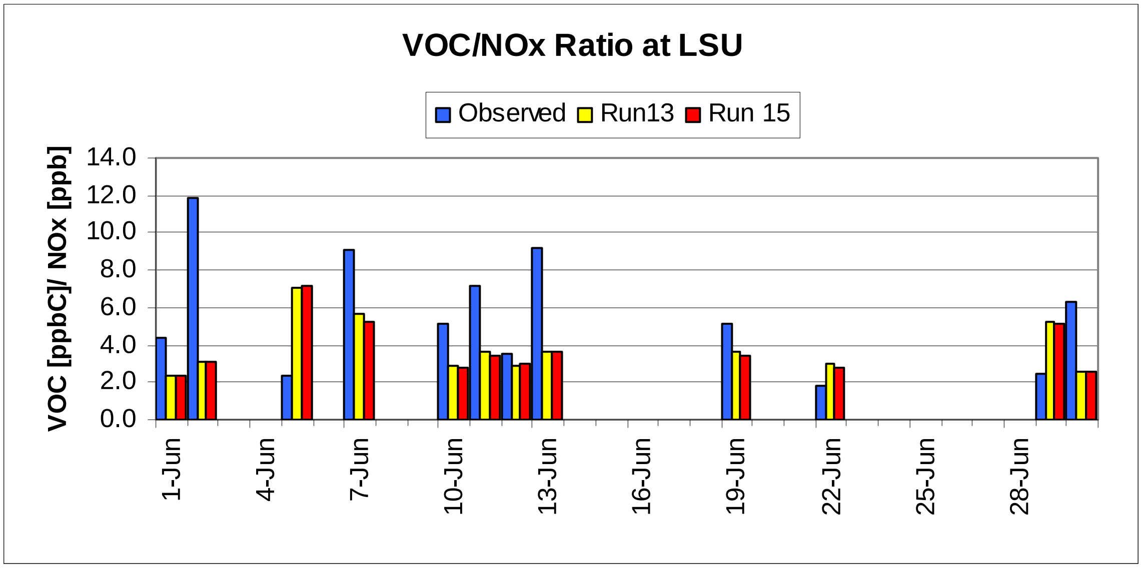


Figure 4-14. VOC:NOx ratio comparisons between measurements and Run 13 and 15 predictions at non-urban PAMS sites.



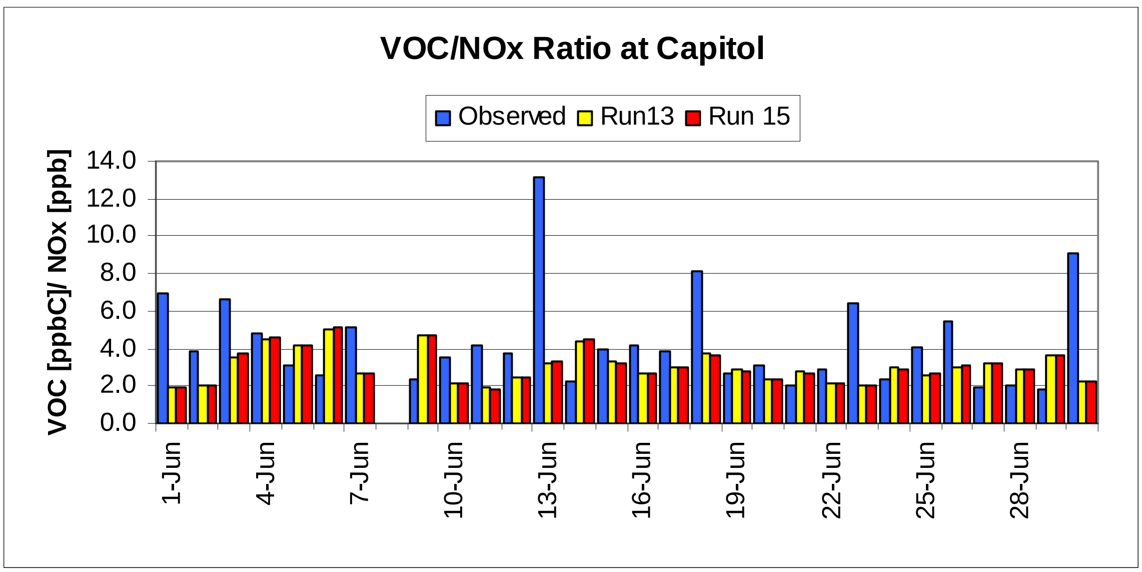


Figure 4-14 (concluded). VOC:NOx ratio comparisons between measurements and Run 13 and 15 predictions at urban PAMS sites.

5. FUTURE YEAR OZONE PROJECTION

CAMx was run using the 2006 Base Year configurations from Runs 13 and 15, except that the emissions were exchanged with the 2009 Future Year emission projections described in Section 3. Daily 8-hour ozone concentrations were extracted from the CAMx output files for both 2006 Base Year and 2009 Future Year simulations. These modeled concentrations were supplied to the EPA MATS tool, which tabulated the change in daily maximum 8-hour ozone at each site, determined the relative response factors (RRFs) averaged over the high ozone days, and used the RRFs to project the 2009 DV from the observation-based 2006 DV at each site. The steps in this procedure are outlined below.

5.1 SUMMARY OF MATS TECHNIQUE

The approach used by MATS to project base year DVs is outlined in EPA guidance (EPA, 2007). It begins by defining the base year average DV; in this case, our base year is 2006. The base year average DV is determined from a 3-year average of annual DVs centered on the base year, which are in turn each calculated from the 3-year average of the 4th highest 8-hour ozone occurring at each site each year. As shown below, this results in a base-year-weighted average of the annual 4th highest 8-hour ozone at each site:

2006 DV: average of 4th highest 8-hour ozone at site X between 2004-2006
2007 DV: average of 4th highest 8-hour ozone at site X between 2005-2007
2008 DV: average of 4th highest 8-hour ozone at site X between 2006-2008

2006 average DV: = (2006 DV + 2007 DV + 2008 DV)/3
= 1×(2004 4th highest)/9 +
2×(2005 4th highest)/9 +
3×(2006 4th highest)/9 +
2×(2007 4th highest)/9 +
1×(2008 4th highest)/9

Model results are then used to calculate RRFs for each site. These RRFs are applied directly to the 2006 average DV to project a 2009 DV for each site. Hence, model results are not used in an absolute sense to determine attainment in 2009, but rather used in an episode-averaged relative sense to scale the observation-based average DV.

MATS provides the option to define how the daily peak 8-hour ozone is chosen from the model grid output to represent simulated ozone at each monitor location. Options are provided to search a 1×1, 3×3, 5×5, or 7×7 array of grid cells centered on the monitor. EPA guidance states that a larger array of grid cells should be used with finer resolution grids, from 1×1 for 36-km grids, to 3×3 for 12-km grids, to 7×7 for 4-km grids. Further, MATS allows the user to choose whether an average over the array is extracted, or the maximum value among all cells in the array is extracted.

MATS then determines the number of days over the modeling episode for which simulated peak 8-hour ozone in the base year is above a critical threshold for the RRF calculation at each site (i.e., for each i×i model output array). It begins by finding the number of days above 85 ppb, and checks that at least 10 days meet this criterion. If 10 days are not found for a given site, then MATS lowers the critical value by 1 ppb successively until 10 days are found. The lower limit is 70 ppb; if 10 days are still not found, then MATS reduces the number of days successively until a minimum of 5 days are found. If at 70 ppb the minimum 5 days are not found, then an RRF is not calculated for that site. If at some point the minimum criteria for peak 8-hour concentration and number of days are met, then the RRF calculation proceeds.

For a given site, the RRF is calculated simply as the ratio of the mean future year peak 8-hour simulated ozone, averaged over the days above the minimum threshold, to the mean base year peak 8-hour simulated ozone over the same days. This RRF is applied to the base year average DV, resulting in a future year DV projection.

5.2 2009 DV PROJECTION RESULTS

5.2.1 Results Using Parish-Level Mobile Emissions (Run 13)

Table 5-1 displays the 2009 projected DV for all 10 sites in the Baton Rouge 8-hour ozone nonattainment area. Table 5-1(a) shows the results for a 7×7 array extraction; following tables are determined for 5×5 and 3×3 array extractions. In all cases, the maximum simulated peak 8-hour ozone among the cells in each array were extracted for each site (this is the EPA/MATS default), as opposed to the averaging option. The 2006 average DV is shown to exceed the 85 ppb 8-hour ozone standard at one site (LSU), while all other sites are below the standard.

All tables show that the 2009 future year DV projection is below the 85 ppb standard at all sites. The maximum 2009 projection continues to occur at LSU (84.9 ppb for 7×7 array), and lowers with smaller monitor-arrays (to 84.4 ppb for 3×3 array). Note also that the minimum ozone threshold and number of days for the RRF calculation is reduced substantially as smaller monitor-arrays are used. Typically the minimum threshold is in the 70 ppb range, with just over 10 days meeting those critical values. This tendency to reduce the minimum ozone threshold shows the following tendencies: (1) many sites in the base year are below the 85 ppb standard; and (2) many days are under predicted by CAMx.

Spatial plots of daily maximum 8-hour ozone differences between the 2009 future year and the base year run (Run 13) are shown in Figures 5-1 through 5-5 for the same five high ozone dates shown earlier (June 10, 11, 15, 29, and 30). The 2009 DV projections calculated from these CAMx simulations using MATS show that all 10 sites in the nonattainment area will reach the 85 ppb 8-hour ozone standard in 2009. The typical RRF determined by various MATS configurations was shown to be 0.96-0.98, leading to a net reduction of 1-3 ppb in the 2006 average 8-hour ozone DV.

Table 5-1a. Run 13 2009 future year DV projection for a 7×7 array extraction. See text for explanation of columns.

ID	Name	2006 DV	2009 DV	RRF	Min ppb	# days
220050004	Dutchtown	83.0	81.5	0.9831	76	11
220330003	LSU	86.7	84.9	0.9795	77	11
220330009	Capitol	78.0	76.2	0.9780	77	10
220330013	Pride	79.7	77.2	0.9697	70	10
220331001	Baker	83.3	81.8	0.9824	74	10
220470007	Grosse Tete	83.0	81.3	0.9796	78	10
220470009	Bayou Plaquemine	79.7	78.1	0.9806	78	10
220470012	Carville	83.7	82.2	0.9825	77	11
220630002	French Settlement	78.7	76.1	0.9676	71	12
221210001	Port Allen	82.0	80.2	0.9783	75	12

Table 5-1b. Run 13 2009 future year DV projection for a 5×5 array extraction. See text for explanation of columns.

ID	Name	2006 DV	2009 DV	RRF	Min ppb	# days
220050004	Dutchtown	83.0	81.4	0.9814	74	11
220330003	LSU	86.7	84.7	0.9775	75	12
220330009	Capitol	78.0	76.2	0.9775	75	11
220330013	Pride	79.7	77.0	0.9669	70	9
220331001	Baker	83.3	81.5	0.9785	72	10
220470007	Grosse Tete	83.0	81.3	0.9801	77	10
220470009	Bayou Plaquemine	79.7	78.2	0.9815	77	12
220470012	Carville	83.7	82.2	0.9827	77	10
220630002	French Settlement	78.7	76.0	0.9663	71	10
221210001	Port Allen	82.0	80.0	0.9767	73	11

Table 5-1c. Run 13 2009 future year DV projection for a 3×3 array extraction. See text for explanation of columns.

ID	Name	2006 DV	2009 DV	RRF	Min ppb	# days
220050004	Dutchtown	83.0	81.2	0.9784	72	12
220330003	LSU	86.7	84.4	0.9746	73	10
220330009	Capitol	78.0	76.0	0.9753	70	13
220330013	Pride	79.7	77.0	0.9670	70	7
220331001	Baker	83.3	81.5	0.9786	70	9
220470007	Grosse Tete	83.0	81.5	0.9825	75	10
220470009	Bayou Plaquemine	79.7	78.0	0.9797	77	10
220470012	Carville	83.7	82.0	0.9806	74	11
220630002	French Settlement	78.7	76.2	0.9687	70	9
221210001	Port Allen	82.0	80.2	0.9782	71	11

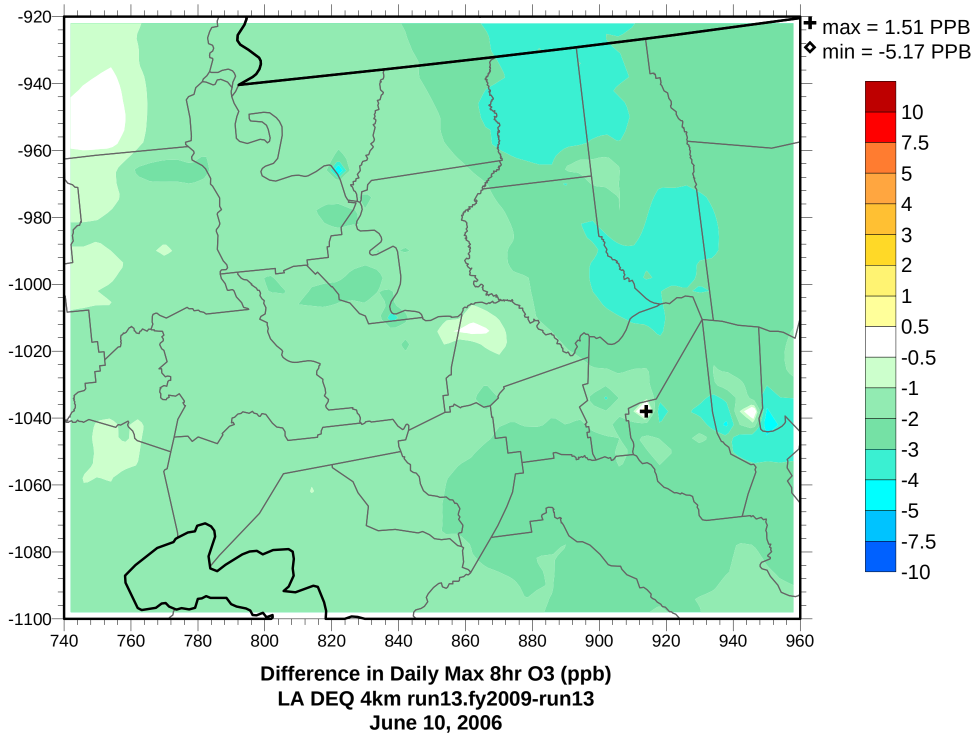


Figure 5-1. Difference in simulated daily maximum 8-hour ozone on June 10 between the 2009 Future Year and 2006 Base Year (Run 13).

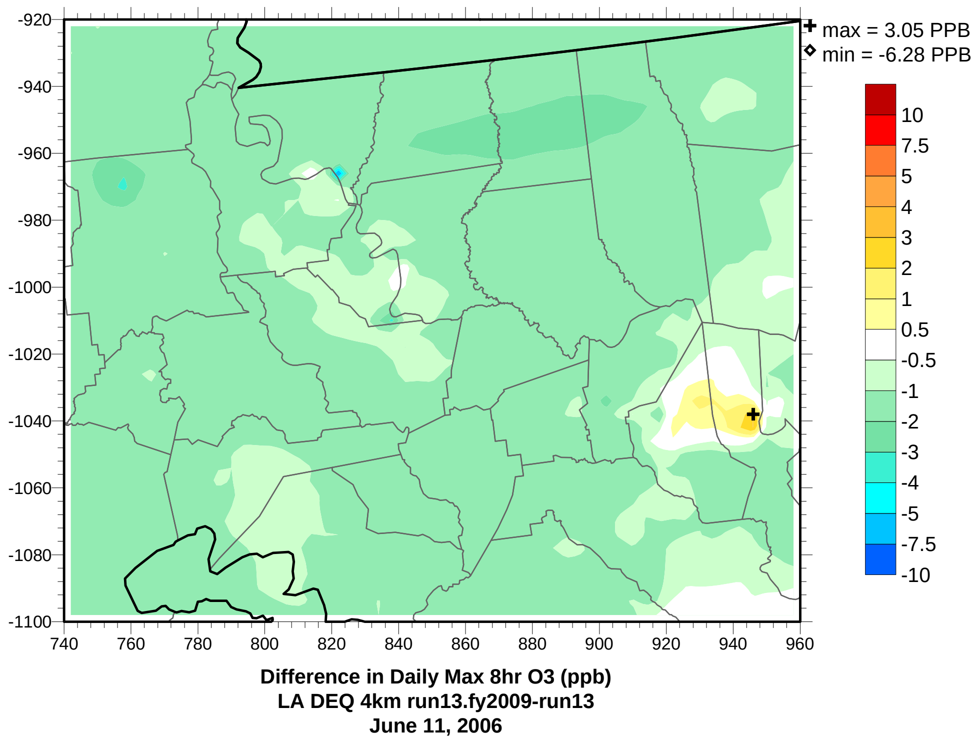


Figure 5-2. Difference in simulated daily maximum 8-hour ozone on June 11 between the 2009 Future Year and 2006 Base Year (Run 13).

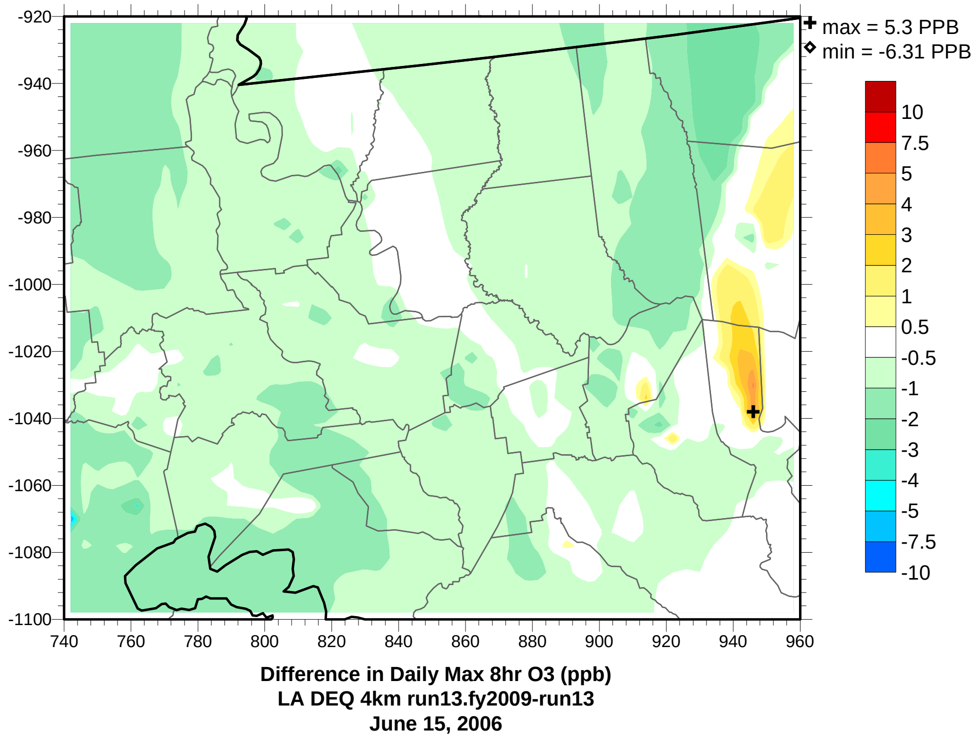


Figure 5-3. Difference in simulated daily maximum 8-hour ozone on June 15 between the 2009 Future Year and 2006 Base Year (Run 13).

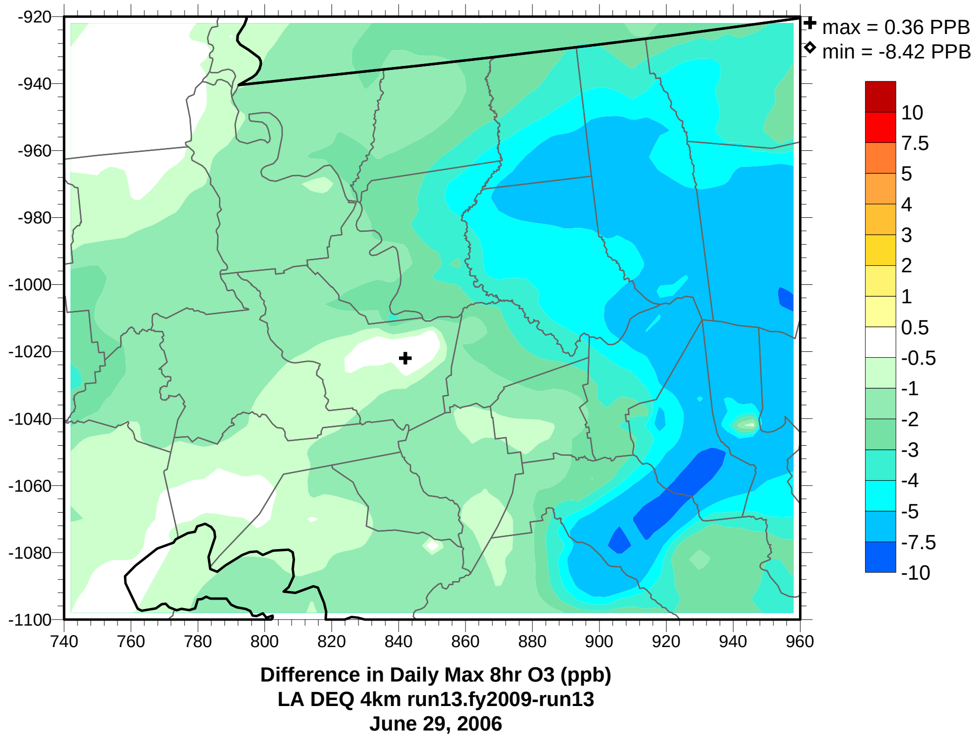


Figure 5-4. Difference in simulated daily maximum 8-hour ozone on June 29 between the 2009 Future Year and 2006 Base Year (Run 13).

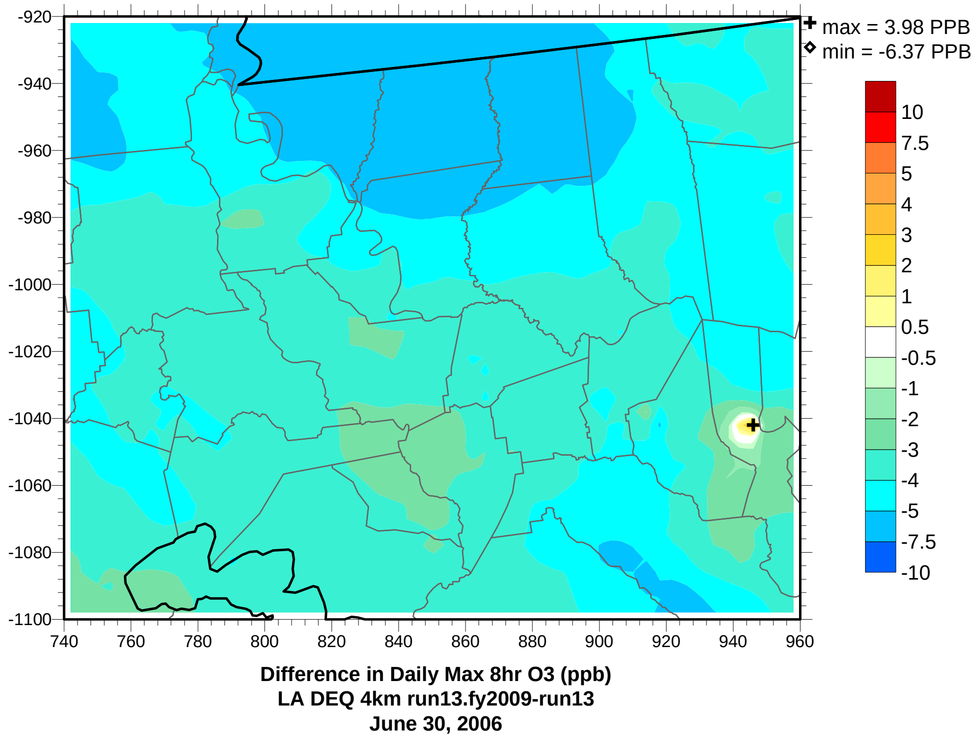


Figure 5-5. Difference in simulated daily maximum 8-hour ozone on June 30 between the 2009 Future Year and 2006 Base Year (Run 13).

5.2.2 Results Using Link-Level Mobile Emissions (Run 15)

Table 5-2 displays the 2009 projected DV for all 10 sites in the Baton Rouge 8-hour ozone nonattainment area. Table 5-2(a) shows the results for a 7×7 array extraction; following tables are determined for 5×5 and 3×3 array extractions. In all cases, the maximum simulated peak 8-hour ozone among the cells in each array were extracted for each site (this is the EPA/MATS default), as opposed to the averaging option.

All tables show that the 2009 future year DV projection is below the 85 ppb standard at all sites. The maximum 2009 projection continues to occur at LSU (84.9 ppb for 7×7 array), and lowers with smaller monitor-arrays (to 84.4 ppb for 3×3 array). Note also that the minimum ozone threshold and number of days for the RRF calculation is reduced substantially as smaller monitor-arrays are used. Typically the minimum threshold is in the 70 ppb range, with just over 10 days meeting those critical values. These future year results are nearly identical the 2009 DV projections using Run 13.

Figure 5-6 shows the MATS un-monitored area DV projections in a sub-area of the 4-km modeling grid encompassing the 5-parish nonattainment area. In this case MATS was run using the 7×7 grid extraction. No areas are above the 85 ppb 8-hour standard, and the peak 8-hour DV is 82.8 ppb in the figure. A wide area of ozone between 80-85 ppb exists to the south through northwest of Baton Rouge.

Table 5-2a. Run 15 2009 future year DV projection for a 7×7 array extraction. See text for explanation of columns.

ID	Name	2006 DV	2009 DV	RRF	Min ppb	# days
220050004	Dutchtown	83.0	81.6	0.9841	75	12
220330003	LSU	86.7	84.9	0.9794	77	11
220330009	Capitol	78.0	76.2	0.9776	77	10
220330013	Pride	79.7	77.2	0.9689	70	10
220331001	Baker	83.3	81.7	0.9812	74	10
220470007	Grosse Tete	83.0	81.4	0.9808	78	10
220470009	Bayou Plaquemine	79.7	78.1	0.9815	78	10
220470012	Carville	83.7	82.2	0.9828	77	11
220630002	French Settlement	78.7	76.1	0.9677	71	11
221210001	Port Allen	82.0	80.1	0.9779	76	10

Table 5-2b. Run 15 2009 future year DV projection for a 5×5 array extraction. See text for explanation of columns.

ID	Name	2006 DV	2009 DV	RRF	Min ppb	# days
220050004	Dutchtown	83.0	81.5	0.9821	74	11
220330003	LSU	86.7	84.7	0.9771	76	10
220330009	Capitol	78.0	76.2	0.9771	75	10
220330013	Pride	79.7	77.0	0.9670	70	9
220331001	Baker	83.3	81.5	0.9795	72	12
220470007	Grosse Tete	83.0	81.4	0.9811	77	10
220470009	Bayou Plaquemine	79.7	78.2	0.9823	77	12
220470012	Carville	83.7	82.2	0.9828	76	12
220630002	French Settlement	78.7	76.0	0.9667	71	10
221210001	Port Allen	82.0	80.0	0.9761	73	11

Table 5-2c. Run 15 2009 future year DV projection for a 3×3 array extraction. See text for explanation of columns.

ID	Name	2006 DV	2009 DV	RRF	Min ppb	# days
220050004	Dutchtown	83.0	81.2	0.9787	72	10
220330003	LSU	86.7	84.4	0.9743	73	10
220330009	Capitol	78.0	75.8	0.9730	70	13
220330013	Pride	79.7	77.0	0.9668	70	7
220331001	Baker	83.3	81.4	0.9776	70	9
220470007	Grosse Tete	83.0	81.5	0.9826	76	10
220470009	Bayou Plaquemine	79.7	78.1	0.9803	77	10
220470012	Carville	83.7	82.0	0.9800	74	11
220630002	French Settlement	78.7	76.2	0.9689	70	9
221210001	Port Allen	82.0	80.3	0.9802	72	10

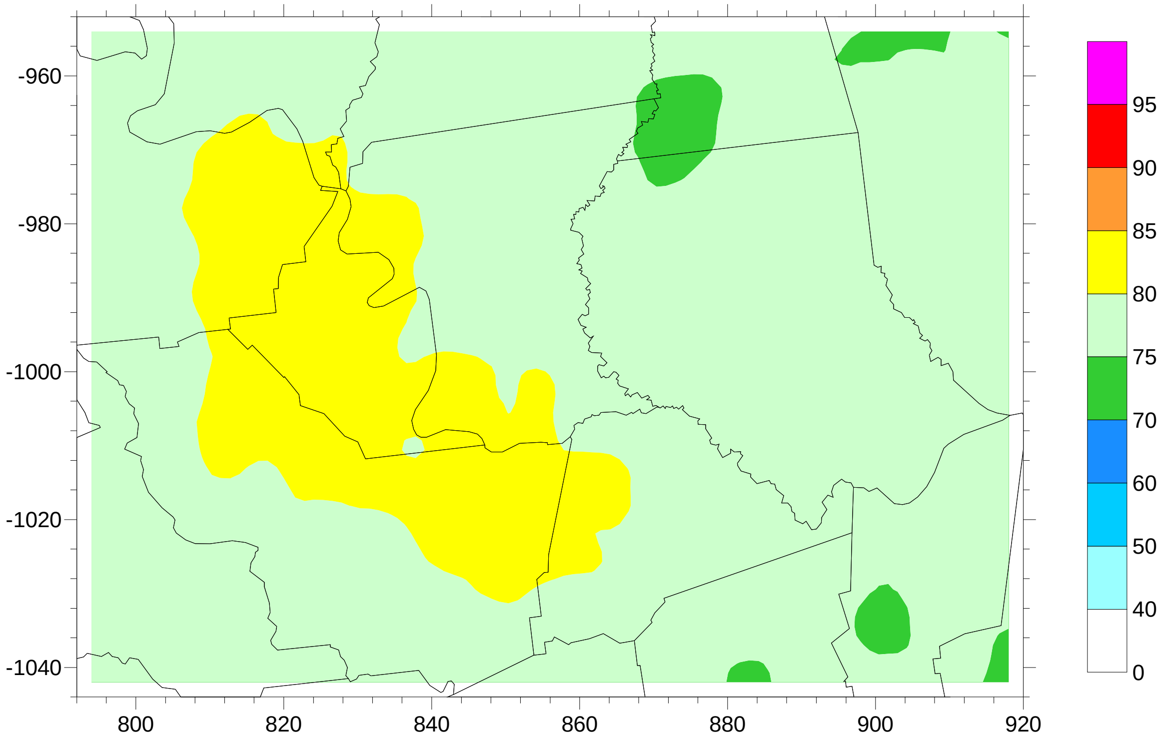


Figure 5-6. MATS-derived 2009 8-hour ozone DV projection for un-monitored areas in the portion of the 4-km modeling grid containing the 5-parish Baton Rouge Nonattainment Area. Results are from Run 15 2009 simulation.

Spatial plots of daily maximum 8-hour ozone differences between the 2009 future year and the base year run (Run 15) are shown in Figures 5-7 through 5-11 for the same five high ozone dates shown earlier (June 10, 11, 15, 29, and 30). The patterns are very similar to those shown for Run 13 (Figures 5-1 through 5-5), with only minor differences.

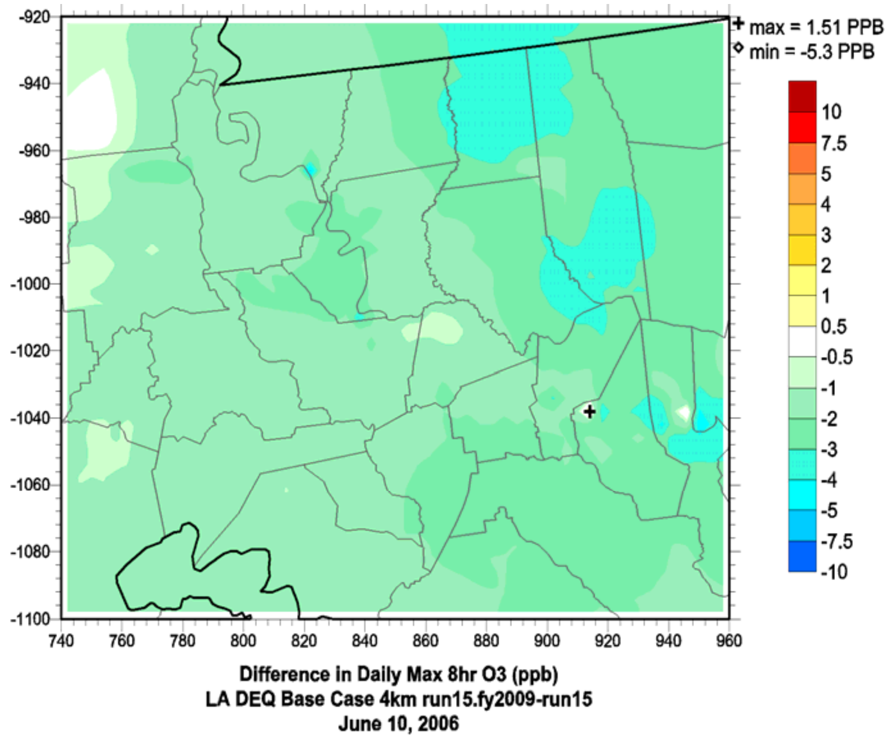


Figure 5-7. Difference in simulated daily maximum 8-hour ozone on June 10 between the 2009 Future Year and 2006 Base Year (Run 15).

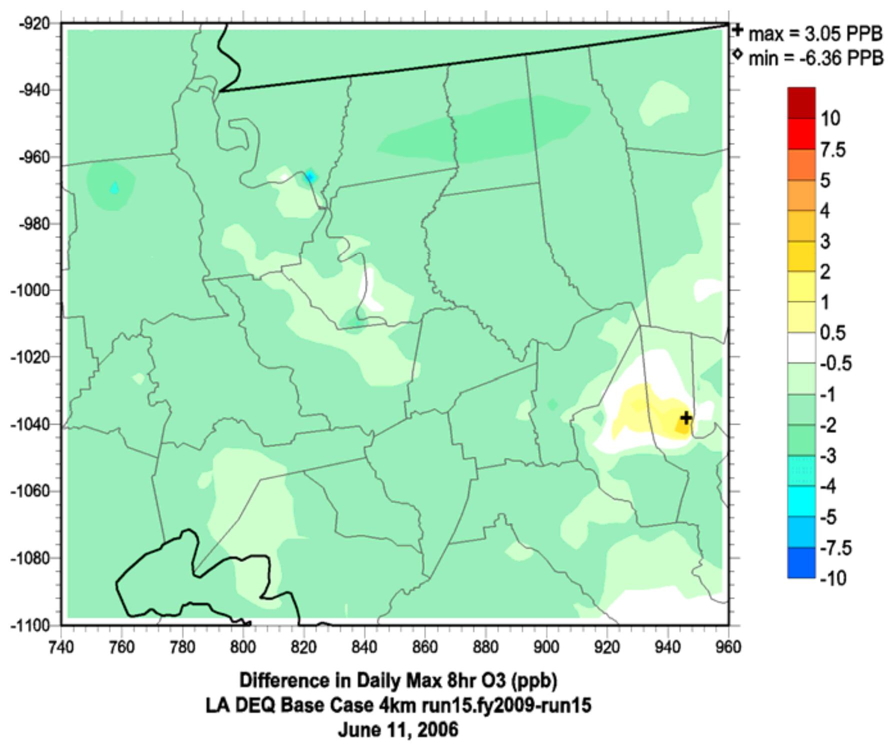


Figure 5-8. Difference in simulated daily maximum 8-hour ozone on June 11 between the 2009 Future Year and 2006 Base Year (Run 15).

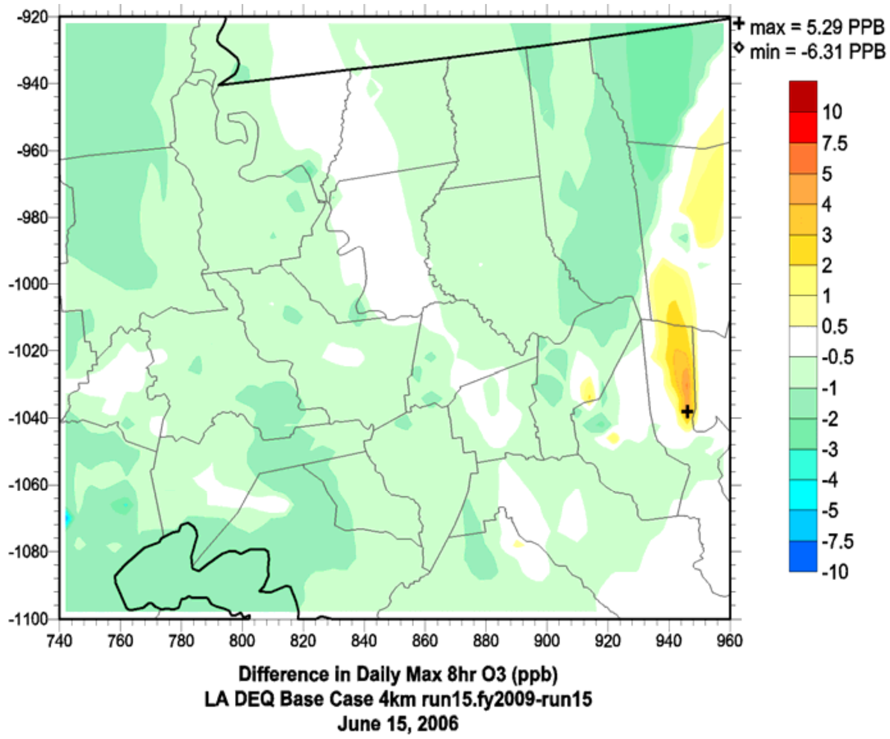


Figure 5-9. Difference in simulated daily maximum 8-hour ozone on June 15 between the 2009 Future Year and 2006 Base Year (Run 15).

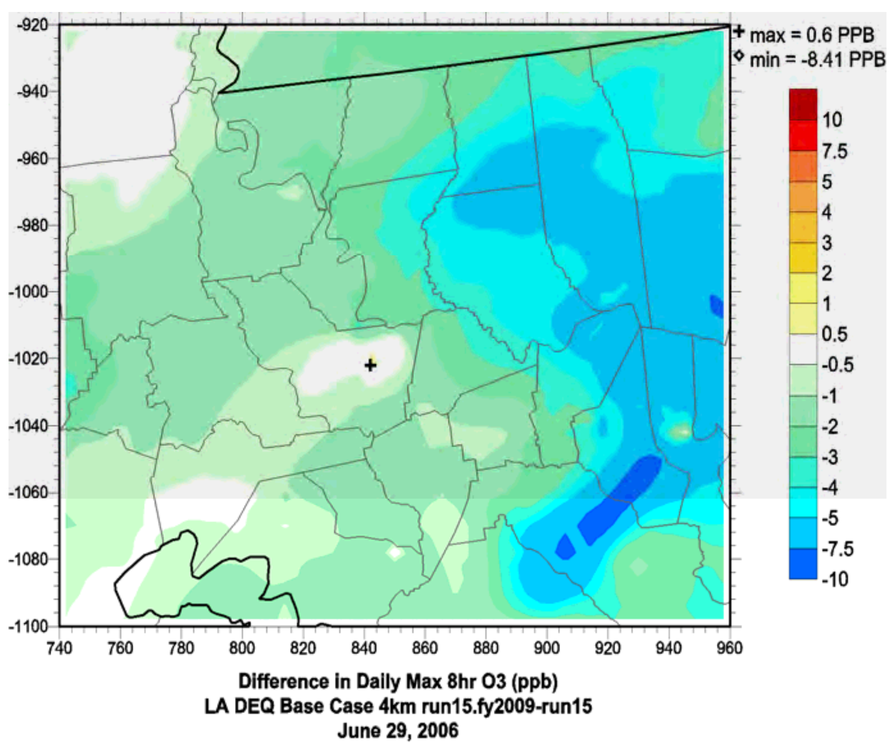


Figure 5-10. Difference in simulated daily maximum 8-hour ozone on June 29 between the 2009 Future Year and 2006 Base Year (Run 15).

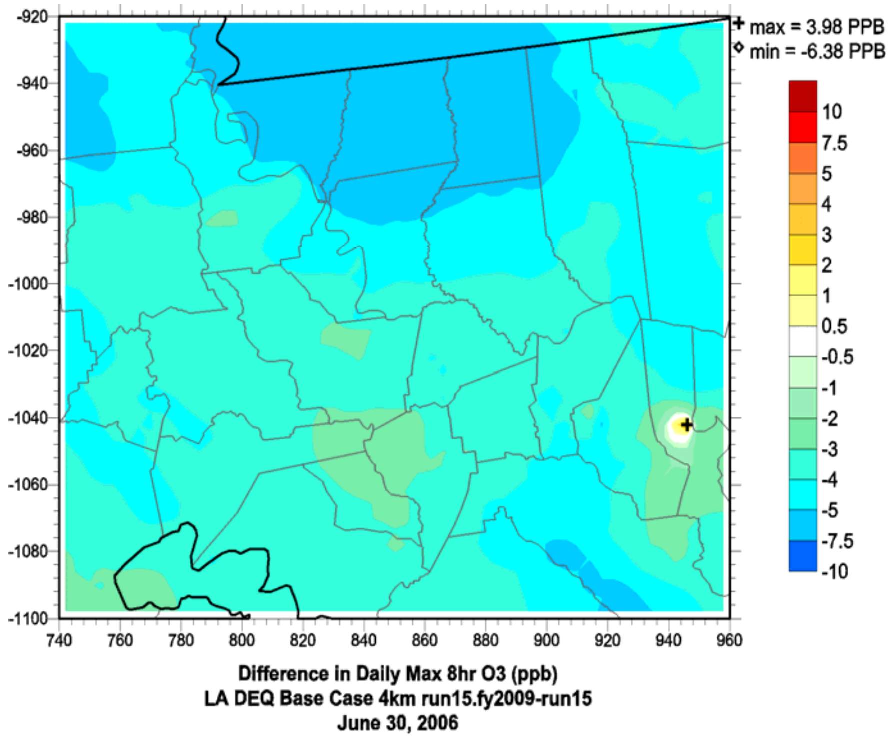


Figure 5-11. Difference in simulated daily maximum 8-hour ozone on June 30 between the 2009 Future Year and 2006 Base Year (Run 15).

5.3 SUPPLEMENTARY 1-HOUR OZONE ATTAINMENT DEMONSTRATION

This sub-section describes a simple 1-hour ozone attainment projection developed from the results of CAMx 2006 Base Year and 2009 Future Year photochemical modeling for the June 2006 BRNAA 8-hour ozone episode. The EPA Model Attainment Test Software (MATS) tool was used to conduct the 1-hour ozone projections using CAMx results and the measured 2006 1-hour design values.

EPA Region 6 requested that LDEQ estimate 1-hour ozone design values (DV) in 2009 based on the latest round of Baton Rouge ozone modeling using CAMx during the period of May 26 to July 1, 2006. The specific CAMx scenario used for the 1-hour demonstration was “Run 15”, which utilized revised Baton Rouge link-level onroad motor vehicle emissions, as described in Sections 3 and 4. The 2009 results from CAMx Run 15 were also used in MATS for the 8-hour ozone attainment demonstration, as described earlier in this section.

EPA Region 6 specifically requested that the June 2006 Baton Rouge 8-hour ozone attainment demonstration modeling be used in some fashion to show maintenance of the old 1-hour ozone standard of 124 ppb. EPA’s suggested approach was to use the June 2006/09 CAMx modeling in a relative sense (using relative response factors, or RRFs) rather than to use the model results in an absolute sense, as was formerly done in the 1990’s. The case for using model results in a relative fashion was first recommended by EPA in their older 1-hour guidance (EPA, 1999).

Additional exposure-like metrics, such as ppb-hours or ppb-cells above a given threshold, were not performed. Given the under prediction tendency of the model over the June 2006 episode, and the fact that only 1 day was observed over the 1-hour standard, such an analysis with absolute model output would have yielded little useful information.

Therefore, in this study we followed the current 8-hour DV projection approach by utilizing the EPA MATS tool. LDEQ provided 2006 1-hour DVs at each of the nonattainment area monitors in Baton Rouge. These DVs were taken to be the fourth highest 1-hour ozone measured at each site during the period 2004 through 2006. The CAMx simulated 1-hour daily maximum ozone at each of these monitor locations over the entire June 2006 modeling episode was extracted to a MATS input file.

The initial approach was to configure MATS to consider modeled days above 125 ppb at each site, and then to reduce by 1 ppb until at least 10 days are found, or a minimum floor is reached (100 ppb) with at least 5 days. Once the appropriate 1-hour ozone level and number of days were found for a particular site, MATS then calculated the average RRF from the days above that ozone level and applied the RRF to that site's DV. We also used MATS to perform the unmonitored area analysis this way, similar to 8-hour ozone.

Figure 5-12 shows the number of days for each monitoring site in which observed daily maximum 1-hour ozone concentrations were above three different levels (80, 90, and 100 ppb). This episode was not particularly useful for 1-hour ozone modeling, given that only 1 day at 1 site was above the 1-hour standard and only 20 site-days were above 100 ppb (with a range of 1 to 4 days per site). Furthermore, CAMx tended to under predict daily maximum ozone throughout the period, so even less days above 100 ppb were available from the CAMx results from which to develop RRFs. It was therefore necessary to lower the minimum daily threshold in MATS to 82 ppb to pick up at least 5 days of modeling results at all sites.

Table 5-3 shows the first run of MATS using the 2004-2006 1-hour DVs provided by LDEQ, the 2006 and 2009 CAMx Run 15 results for daily peak 1-hour ozone, and the following MATS configuration:

- Minimum 1-hour daily peak predicted ozone threshold = 82 ppb;
- Minimum number of days above the minimum threshold = 10;
- Minimum number of days at the minimum threshold = 5.

Note that at all sites, MATS needed to reduce the minimum daily peak 1-hour ozone threshold to below 90 ppb to achieve 10 days of 1-hour peak predicted daily ozone for the RRF calculation, and as low as 82 ppb to achieve 5 days at Pride. The 1-hour ozone DV reductions are all roughly 1-2%, or about 2 ppb.

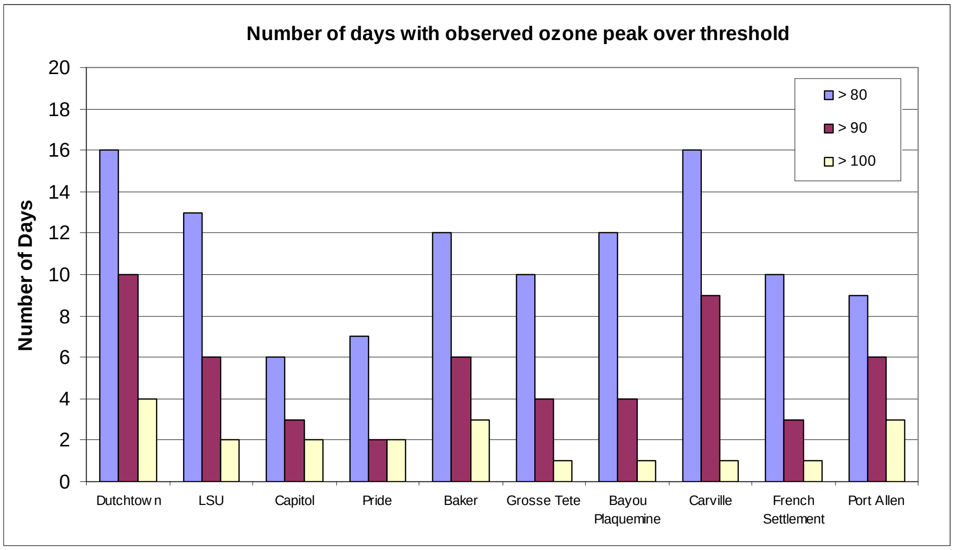


Figure 5-12. Number of days in which Baton Rouge ozone monitoring sites recorded daily peak 1-hour ozone above 80, 90, and 100 ppb over the June 2006 episode.

Table 5-3. 2009 future year 1-hour DV projection for a 7×7 grid array extraction. Minimum number of days above threshold is 10, minimum threshold is 82 ppb, minimum number of days at threshold is 5.

ID	Name	2006 DV	2009 DV	RRF	Min ppb	# days
220050004	Dutchtown	112	110.6	0.9879	85	10
220330003	LSU	120	118.2	0.9857	89	10
220330009	Capitol	102	100.4	0.9852	89	10
220330013	Pride	112	109.6	0.9794	82	5
220331001	Baker	123	121.4	0.9873	86	11
220470007	Grosse Tete	111	109.4	0.9864	88	10
220470009	Bayou Plaquemine	107	105.5	0.9865	86	10
220470012	Carville	118	116.5	0.9874	88	10
220630002	French Settlement	97	94.7	0.9771	82	8
221210001	Port Allen	118	116.4	0.9868	86	11

Table 5-4 presents the same results for an alternative configuration of MATS in which the minimum number of days above the minimum ozone threshold was set to 5, while all other parameters were set similarly to those in Table 5-4. In this case, MATS did not need to lower the minimum ozone threshold as far, and all but two sites met the 5 day minimum in the mid-90s ppb. The resulting DV projections are very similar, however, and differ only by a few tenths of a ppb from the values shown in Table 5-4. In all cases, the RRF's show 1-2% (1-3 ppb) reductions.

Figure 5-13 shows the MATS un-monitored area DV projections in a sub-area of the 4-km modeling grid encompassing the 5-parish nonattainment area. No areas are above the 124 ppb 1-hour standard, and the peak 1-hour DV is 118.8 ppb in the figure. A wide area of ozone between 110-120 ppb exists to the south through west through north of Baton Rouge.

Table 5-4. 2009 future year 1-hour DV projection for a 7×7 grid array extraction. Minimum number of days above threshold is 5, minimum threshold is 82 ppb, minimum number of days at threshold is 5.

ID	Name	2006 DV	2009 DV	RRF	Min ppb	# days
220050004	Dutchtown	112	110.4	0.9863	93	5
220330003	LSU	120	118.8	0.9908	97	5
220330009	Capitol	102	101.0	0.9908	97	5
220330013	Pride	112	109.6	0.9794	82	5
220331001	Baker	123	121.2	0.9858	94	5
220470007	Grosse Tete	111	109.0	0.9825	93	6
220470009	Bayou Plaquemine	107	106.2	0.9931	94	5
220470012	Carville	118	117.9	0.9993	95	5
220630002	French Settlement	97	95.1	0.9806	88	5
221210001	Port Allen	118	116.3	0.9858	96	5

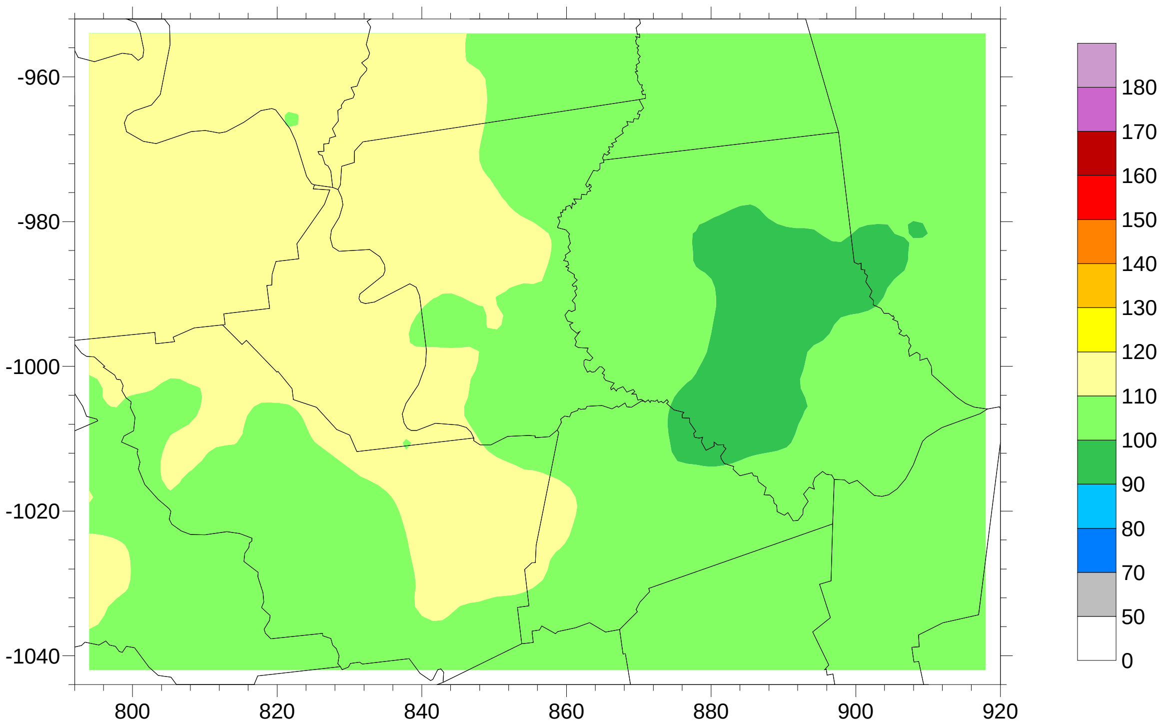


Figure 5-13. MATS-derived 2009 1-hour ozone DV projection for un-monitored areas in the portion of the 4-km modeling grid containing the 5-parish Baton Rouge Nonattainment Area. Results are from the Run 15 2009 simulation.

6. CONCLUSION

Photochemical modeling was conducted to support the development of the Louisiana SIP for the 8-hour ozone BRNAA. The study described herein developed the photochemical modeling and analysis tools and related data bases needed to reliably simulate the complex interplay between meteorology, emissions, and ambient photochemistry during a recent 8-hour ozone exceedance episode in the BRNAA, to project those conditions to a future attainment year, and to evaluate emissions reduction strategies for inclusion in the BRNAA 8-hour ozone SIP. The BRNAA is classified as a “moderate” nonattainment area.

This study included episodic emissions (EPS3), meteorological (MM5) and ozone (CAMx) simulations over June 2006 using a nested 36/12/4 km grid system, with the 4-km grid focused on Louisiana and the immediate Gulf coast area. Significant effort was directed towards the development of updated 2006 state-wide emission inventories for the state of Louisiana, as well as development of emission projections to 2009. Emissions outside of Louisiana were leveraged from concurrent 2006 regional modeling work being conducted by the TCEQ as part of the Houston, Texas SIP.

The overall technical approach was established in modeling protocol documents developed previously (LDEQ, 2006; ENVIRON, 2007a) following the latest modeling guidance published by the EPA related to 8-hour ozone attainment demonstrations (EPA, 2007). The guidance covers many aspects of the recommended modeling approach, including model selection, episode selection, air quality application and performance evaluation, and future year projection methodology. For the 8-hour ozone standard, EPA recommends using the Modeled Attainment Test (MAT), which uses modeling results in a relative sense to project current ozone design values (DV) to the attainment year. Projections are made for specific ozone monitoring sites, as well as “un-monitored” areas covering the nonattainment and downwind areas.

The MM5 meteorological modeling of June 2006 was conducted for the LDEQ by EPA Region 7. EPA ran a single MM5 simulation, configuring its physics and FDDA algorithms according to the best performing of four different MM5 runs of the May 2005 BRNAA ozone episode (May 2005 modeling was supported by a local industrial stakeholder group). The basic MM5 physics configuration was based on extensive TCEQ modeling of the Texas Gulf Coast over the past several years as part of the TexAQS II program. A brief model performance evaluation of EPA’s June 2006 MM5 run was conducted separately, with specific emphasis on characterizing quantitative bias and error statistics for winds, temperature, and humidity in southeast Louisiana. The performance evaluation allowed us to discern the representativeness of the simulated meteorological fields over southeast Louisiana and to qualitatively review modeling uncertainties.

MM5 performed generally well in replicating the diurnal variations and synoptic trends of winds in southeast Louisiana, although the model tended to over predict morning minima and afternoon peak winds. This likely had ramifications for photochemical model performance as the morning build-up of precursor pollutants under stagnant conditions was likely over-ventilated. Simulated surface wind directions, while acceptable, were not as good as typically achieved in many other MM5 applications. This could be related to diurnal forcings associated with daily sea breeze penetration into southeast Louisiana, which in turn likely affected the dispersion patterns of the

BRNAA ozone plume. In contrast, temperature and humidity performance over southeast Louisiana was remarkably good relative to the other recent episodic SIP modeling efforts. Temperatures specifically showed a very good replication of the full diurnal range as well as the modulation of the temperature wave under various synoptic regimes. MM5 tends to do very well for humidity, especially in warm humid climates such as the summertime Gulf Coast. Statistical parameters were at or well within established meteorological performance benchmarks.

This study placed a major emphasis on developing emissions estimates within the state of Louisiana, with particular focus on the BRNAA. Emissions processing employed EPS3 to convert the emission inventory into the hourly, chemically speciated, and gridded formats needed by CAMx. Other emission modeling tools were used to estimate emissions from specific categories, such as GloBEIS (for biogenics) and NMIM/MOBILE6 (for onroad and nonroad mobile sources). The EPS3 setup was built upon 2005/2009 regional ozone modeling inventory processing developed by the TCEQ; statewide emissions outside of Louisiana were taken from the TCEQ inventories for both base and future years. Emissions in Louisiana were updated for the 2006 modeling episode based on available information provided by the LDEQ, LDOTD, and the CRPC. The 2006 update considered the significant impacts of Hurricane Katrina on population, economic, and traffic patterns. Day- and hour-specific NO_x emissions for electric generating units throughout the modeling domain were extracted from the EPA acid-rain database and were supplemented with data provided by LDEQ. Offshore emissions were developed from data available from the MMS.

Louisiana emissions estimates for 2009 were based on projections developed from numerous sources. New point facilities were introduced, some facilities were removed because they have since shut down, and emissions from existing facilities were grown according to information provided by LDEQ. Area and nonroad sources were projected according to economic and population information. Projections of mobile sources included changes in fleet age and traffic volumes according to the latest registration data and transportation demand modeling. Offshore emissions and biogenic emissions were held constant from the 2006 Base Year.

Mobile source emissions were estimated with an incrementally increasing level of detail for the state of Louisiana and the BRNAA. June 2006 and 2009 onroad emissions in the state of Louisiana were developed using EPA's NMIM model, while emissions within the nonattainment area were developed based on parish-specific inputs provided by several state agencies. Specifically, two different nonattainment area onroad inventories were generated for each modeling year: (1) an initial inventory based on parish-level measured VMT and MOBILE6 inputs; and (2) a final inventory based on link-level VMT derived from a transportation demand model and parish-level MOBILE6 inputs.

EPS3 was used to generate model-ready hourly point, area, nonroad mobile, and onroad mobile emissions of CB05 compounds on the 36/12/4-km grid system for a representative weekday, Friday, Saturday and Sunday (daily for acid rain point sources). Biogenic emissions were developed separately using the GloBEIS model, which estimated hourly emission rates on all grids for each day of the June 2006 modeling episode. Speciation to CB05 compounds was performed by applying standard source-specific profiles derived from the EPA SPECIATE database. These profiles were assigned to each of the source categories contained in the raw emissions inventory files using default EPS3 cross-references. The same speciation was used for both 2006 and 2009. Temporal allocation for most source categories was similarly applied using default EPS3 seasonal, monthly, day-of-week, and hourly profiles and cross-references as necessary for the various inventory components. For most source categories, these temporal assignments were used for both 2006 and 2009. Spatial allocation to the 36-km modeling domain utilized the TCEQ's EPS3 gridding files; however, spatial surrogate data for the 4- and 12-km modeling grids were developed specifically for this project from EPA population and landuse/landcover distributions, as well as the traffic network data in the Baton Rouge area. The resulting surrogates were assigned to each of the source categories contained in the raw emissions inventory files using default EPS3 cross-references. For most source categories, these spatial surrogates were used for both 2006 and 2009.

The CAMx photochemical model was used to simulate ozone levels in the BRNAA during the period of May 26 to July 1, 2006 (i.e., the Base Year). Standard CAMx pre-processing tools were used to develop meteorological, emissions, initial/boundary conditions, and photochemical inputs for each day of the episode. Predictions of ozone, as well as NOx and VOC precursors, were compared to measurements recorded at up to ten AQS and PAMS monitoring sites within the BRNAA. The process to establish reliable CAMx 8-hour ozone modeling consists of a multi-step cycle of model testing, ultimately culminating in a modeling application demonstrated to exhibit minimal bias and error and shows that it can be used reliably to perform the 8-hour ozone attainment demonstration. EPA guidance for 8-hour ozone modeling de-emphasizes reliance on statistical performance "goals" to define a properly working model, and stresses performing corroborative and confirmatory analysis to assure that the model is working correctly. Therefore, a multitude of CAMx "developmental" runs were conducted and evaluated in an effort to improve model performance and to characterize ozone sensitivity to changes in various model inputs. These runs included modifications to certain emissions, meteorological, and boundary condition inputs, as well as the use of the Plume-in-Grid sub-model.

Of the exceedance days occurring during the June 2006 modeling episode, CAMx performed well in replicating daily peak and overall ozone, far exceeding older EPA bias and gross error benchmarks. However, peak ozone tended to be under predicted on most days by several ppb, and two high ozone dates (June 1 and June 15) continued to perform poorly for all CAMx runs. The problem on June 15 was rooted to a poor simulation of a weather system that approached Baton Rouge from the northwest, drawing high southerly winds over Louisiana that tended to over-ventilate ozone and precursors. Furthermore, ozone observations in southeastern Louisiana on this day showed moderate ozone levels in the 70 ppb range while CAMx generated only clean values in the 40 ppb range.

As for ozone precursors, NOx tended to be over predicted, especially in the urban center. NOx tended to be under predicted at some rural sites, likely due to some local source(s) that the grid model could not resolve. VOC indicated a mix of some over and under predictions at the four PAMS sites, but in general performance in replicating CB05 aggregated species was very good. VOC:NOx ratios were mostly under predicted, again suggesting too much NOx. Modifications to vertical diffusivities helped to reduce the NOx over prediction problem, with no major impact on ozone concentrations.

Indications from infrared imaging over the past few years have suggested that barges, which are often moored for extended periods along the Mississippi River within Baton Rouge, could be the source of fugitive VOC emissions, especially when their hatches are left open. One CAMx run investigated the potential impact of these additional emissions by adding ~100 TPD of the CB05 species "PAR" (light single-bond paraffin compounds) at specific sites along the river that correspond to loading platforms associated with local refineries. While there were negligible impacts to ozone, results for PAR were mixed; certain days were better simulated at some PAMS sites, but on average PAR was over predicted. Given the large uncertainties in these emissions, and the fact that the model was performing well without this component, it was decided that barge fugitive VOC emissions were currently not sufficiently quantifiable in magnitude, space, and time for SIP modeling.

CAMx was run for 2009 using the best 2006 Base Year configuration, except that the emissions were exchanged with the 2009 Future Year emission projections. Daily 8-hour ozone concentrations were extracted from the CAMx output files for both 2006 Base Year and 2009 Future Year simulations. These modeled concentrations were supplied to the EPA MATS tool, which tabulated the change in daily maximum 8-hour ozone at each site, determined the relative response factors averaged over the high ozone days, and used the RRFs to project the 2009 DV from the observation-based 2006 DV at each site.

In the case where CAMx was provided BRNAA onroad mobile emissions estimated from parish-level HPMS VMT data, the 2009 future year DV projection was below the 85 ppb standard at all sites. The maximum 2009 projection continued to occur at LSU (84.4 to 84.9 ppb, depending on the configuration of MATS). It was necessary for MATS to use as few as 5-10 days of 2006 Base Year simulated peak 8-hour ozone in the mid-70's ppb for the RRF calculation. This requirement shows the following tendencies: (1) design values at many sites in the base year were below the 85 ppb standard; and (2) many days were under predicted by CAMx.

In the case where CAMx was provided BRNAA onroad mobile emissions estimated from transportation demand model activity, the 2009 future year DV projection was also below the 85 ppb standard at all sites. The maximum 2009 projection continued to occur at LSU (84.4 to 84.9 ppb), nearly identical the 2009 DV projections using the original onroad emissions. The MATS un-monitored area DV projections in a sub-area of the 4-km modeling grid encompassing the 5-parish nonattainment area showed that no areas were above the 85 ppb 8-hour standard, with the peak 8-hour DV at 82.8 ppb.

EPA Region 6 specifically requested that the June 2006 BRNAA 8-hour ozone attainment demonstration modeling be used in some fashion to show maintenance of the old 1-hour ozone standard of 124 ppb. EPA's suggested approach was to use the June 2006/09 CAMx modeling in a relative sense (using relative response factors) rather than to use the model results in an absolute sense, as was formerly done in the 1990's. Therefore, in this study, we followed the current 8-hour DV projection approach by utilizing the EPA MATS tool. LDEQ provided 2006 1-hour DVs at each of the nonattainment area monitors in the BRNAA. These DVs were taken to be the fourth highest 1-hour ozone measured at each site during the period 2004 through 2006. The CAMx simulated 1-hour daily maximum ozone at each of these monitor locations over the entire June 2006 modeling episode was extracted to a MATS input file.

The approach was to configure MATS to consider modeled days at or above 125 ppb at each site, and then to reduce by 1 ppb until at least 5 days were found in the 2006 Base Year results. Once the appropriate 1-hour ozone level and number of days were found for a particular site, MATS then calculated the average RRF from the days above that ozone level and applied the RRF to that site's DV. We also used MATS to perform the unmonitored area analysis this way, similar to 8-hour ozone. The June 2006 episode was not particularly useful for 1-hour ozone modeling, given that only 1 day at 1 site was above the 1-hour standard and only 20 site-days were above 100 ppb (with a range of 1 to 4 days per site). Furthermore, CAMx tended to under predict daily maximum ozone throughout the period, so even fewer days above 100 ppb were available from the CAMx results from which to develop RRFs. All but two sites met the 5 day minimum in the mid-90s ppb; it was necessary to reduce the 1-hour peak threshold to 82 ppb to achieve 5 days at Pride.

The resulting 1-hour DV projections were all well below the old 124 ppb standard, with a maximum value at Baker of 121 ppb. In all cases, the RRF's show 1-2% (1-2 ppb) reductions. The MATS un-monitored area DV projections over the 5-parish nonattainment area showed that no areas were above the 124 ppb 1-hour standard, with the peak 1-hour DV at 118.8 ppb.

The weight of evidence assembled from the modeling analyses and projection methodologies described herein demonstrates that the 8-hour ozone standard of 85 ppb will be attained in the Baton Rouge area by 2009. The technical approach developed under this study followed EPA recommendations (EPA, 2007). Significant resources were expended to align the BRNAA onroad mobile source inventory with the local network modeling used to establish conformity emission budgets. A major effort was also undertaken to identify, resolve, and develop approaches to consider the impacts of Hurricane Katrina on the 2006 and 2009 Louisiana emission inventories. Fortunately, data have recently surfaced on economic and population impacts from a variety of sources; we attempted to use as much of that information as possible. Efforts also included the collection of more broad-based future year modifications, economic impacts, shut-downs, control technologies, and control penetration time lines.

The Baton Rouge modeling approach evolved over the course of two years, with significant input from LDEQ, EPA Region 6, and industrial stakeholder representatives. The techniques and data developed have been well-vetted by an open, on-going process managed by LDEQ. Reviewers may identify additional issues with the approach, datasets, and assumptions, but we regard this work as striking the best balance between technical rigor and available schedule/resources while adhering to the intent of the EPA modeling guidance.

7. REFERENCES

AG. 2008. "Comparison of MM5 Performance Results for the May-June 2005 and 2006 Baton Rouge Ozone Episodes." Presentation prepared for the Baton Rouge Ozone Task Force, prepared by T. W. Tesche and Dennis McNally, Alpine Geophysics, LLC, Ft. Wright, KY (9 May 2008).

Anthes, R.A. and T.T. Warner. 1978. "The Development of Mesoscale Models Suitable for Air Pollution and Other Mesometeorological Studies." *Mon. Wea. Rev.*, **106**, 1045-1078.

Blanchard, T.C. 2008. "2009 parish-level population projections." Provided by the Department of Sociology, Louisiana State University, Baton Rouge, Louisiana (October 6, 2008).

BLS. 2008. *Quarterly Census of Employment and Wages.* Prepared by the Bureau of Labor Statistics. http://www.bls.gov/cew/home.htm

Dudhia, J. 1993. "A Non-hydrostatic Version of the Penn State/NCAR Mesoscale Model: Validation Tests and Simulation of an Atlantic Cyclone and Cold Front." *Mon. Wea. Rev.*, **121**, 1493-1513.

EIA. 2007. *Annual Energy Review.* Prepared by the Energy Information Administration. http://www.eia.doe.gov/emeu/aer/consump.html

Emery, C., E. Tai, and G. Yarwood. 2001. "Enhanced Meteorological Modeling and Performance Evaluation for Two Texas Episodes." Prepared for the Texas Natural Resources Conservation Commission, by ENVIRON, International Corp, Novato, CA.

ENVIRON. 2007a. "Modeling Protocol Addendum: Procedures for Modeling 8-Hour Ozone Concentrations in the Baton Rouge 5-Parish Area." Prepared by ENVIRON International Corporation and the Louisiana Department of Environmental Quality, Office of Environmental Assessment, Air Quality Assessment Division, Baton Rouge, Louisiana (December 14, 2007).

ENVIRON. 2007b. "User's Guide: Emissions Processor, Version 3." Prepared by ENVIRON International Corporation, Novato, CA (August 2008).

ENVIRON. 2008. "User's Guide, Comprehensive Air quality Model with Extensions (CAMx), v4.50." Prepared by ENVIRON International Corporation, Novato, CA (May 2008). www.camx.com

EPA. 1990. "Users Guide for the Urban Airshed Model, Volume IV: User's Manual for the Emissions Preprocessor System, Version 2.0, Part A: Core Fortran System." U.S. Environmental Protection Agency, Research Triangle Part, NC.

EPA. 1991. "Guidance for Regulatory Application of the Urban Airshed Model (UAM)." Prepared by the U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, N.C.

EPA. 1999. "Draft Guidance on the Use of Models and Other Analyses in Attainment Demonstrations for the 8-hr Ozone NAAQS." Prepared by the U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, N.C.

EPA. 2005. *National Mobile Inventory Model (NMIM), A Consolidated Emissions Modeling System for MOBILE6 and NONROAD.* Prepared by the U.S. Environmental Protection Agency, Assessment and Standards Division, Office of Transportation and Air Quality. (EPA420-R-05-024, December, 2005).

EPA. 2006a. Emissions Modeling Clearinghouse, Related Spatial Allocation Files – "New Surrogates." Prepared by the U.S. Environmental Protection Agency. www.epa.gov/ttn/chief/emch/spatial/newsurrogate.html

EPA. 2006b. *Economic Growth and Analysis System: EGAS 5.0 User Manual and Documentation.* Prepared by the U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC (January 2006). http://www.epa.gov/ttnecas1/egas5.htm

EPA. 2006c. *Biogenic Emissions Sources.* Prepared by the U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC. http://www.epa.gov/ttn/chief/emch/biogenic/index.html

EPA. 2007. "Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze." Prepared by the U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Analysis Division, Air Quality Modeling Group, Research Triangle Park, NC (EPA -454/B-07-002, April 2007).

EPA. 2008. Clean Air Markets – Data and Maps. Prepared by the U.S. Environmental Protection Agency, Clean Air Markets Division. http://camddataandmaps.epa.gov/gdm/index.cfm?fuseaction=emissions.wizard

Grell, G. A., J. Dudhia, and D. R. Stauffer. 1994. "A Description of the Fifth Generation Penn State/NCAR Mesoscale Model (MM5)." NCAR Technical Note (NCAR TN-398-STR).

LDEQ. 2006. "Draft Modeling Protocol: Procedures for Modeling 8-Hour Ozone Concentrations in the Baton Rouge 5-Parish Area." Prepared by ENVIRON International Corporation and the Louisiana Department of Environmental Quality, Office of Environmental Assessment, Air Quality Assessment Division, Baton Rouge, Louisiana (September 15, 2006).

MMS. 2008a. *Gulfwide Emission Inventory*. Prepared by the Minerals Management Service. http://www.gomr.mms.gov/homepg/regulate/environ/airquality/gulfwide_emission_inventory/2005GulfwideEmissionInventory.html

MMS. 2008b. *Monthly Production by Planning Areas with Daily Production Rates.* Prepared by the Minerals Management Service. http://www.gomr.mms.gov/homepg/pubinfo/repcat/product/pdf/4115.pdf

Morris, R.E., G. Mansell, B. Koo, G. Tonnesen, M. Omary and Z. Wang. 2004. "Modeling Protocol for the CENRAP 2002 Annual Emissions and Air Quality Modeling (Draft 2.0)." Prepared for Central Regional Air Planning Association (CENRAP) (December 8, 2004).

NASS. 2007. *Agricultural Statistics Data Base.* Prepared by the National Agricultural Statistics Service. http://www.nass.usda.gov/Data_and_Statistics/Quick_Stats/index.asp

O'Brien, J. 1970. "A Note on the Vertical Structure of the Eddy Exchange Coefficient in the Planetary Boundary Layer." *J. Atmos. Sci.*, **27**, 8, 1213-1215.

Oubre, M. 2008a. New and closed facility record data. Provided by the Louisiana Department of Environmental Quality, Baton Rouge, Louisiana (July 10, 2008).

Oubre, M. 2008b. Banked emission credit data. Provided by the Louisiana Department of Environmental Quality, Baton Rouge, Louisiana (July 23, 2008).

Oubre, M. 2008c. Facility permit limits. Provided by the Louisiana Department of Environmental Quality, Baton Rouge, Louisiana (December 3, 2008).

Oubre, M. 2008d. Personal communication regarding point source emissions in the Baton Rouge non-attainment area. Louisiana Department of Environmental Quality, Baton Rouge, Louisiana (September 17, 2008).

Scott, L.C., J.A. Richardson, M.D. Terrell, and M.J. Neathery. 2007. *The Louisiana Economic Outlook: 2008 and 2009.* Division of Economic Development and Forecasting, Louisiana State University, Baton Rouge, Louisiana (October 2008).

Seaman, N.L. 2000. "Meteorological Modeling for Air Quality Assessments." *Atmos. Environ.*, **34**, 12-14, 2231-2260.

TCEQ. 2008a. TCEQ HGB8h2 modeling database. Provided by the Texas Commission on Environmental Quality. http://www.tceq.state.tx.us/implementation/air/airmod/data/hgb8h2/hgb8h2.html

TCEQ. 2008b. TCEQ HGB8h2 emissions database. Provided by the Texas Commission on Environmental Quality. ftp://ftp.tceq.state.tx.us/pub/OEPAA/TAD/Modeling/HGB8H2/ei

TCEQ. 2008c. TCEQ DFW modeling database. Provided by the Texas Commission on Environmental Quality. http://www.tceq.state.tx.us/implementation/air/airmod/data/dfw1.html

Teche, T.W., D.E. McNally, C.A. Emery, E. Tai. 2001. "Evaluation of the MM5 Model Over the Midwestern U.S. for Three Oxidant Episodes." Prepared for the Kansas City Ozone Technical Workgroup, by Alpine Geophysics, LLC, Ft. Wright, KY, and ENVIRON International Corp, Novato, CA.

UMD. 2006. "GEWEX Continental Scale International Project (GCIP) and GEWEX Americas Prediction Project (GAPP) Surface Radiation Budget (SRB) Data." Prepared by the University of Maryland. www.atmos.umd.edu/~srb/gcip/cgi-bin/historic.cgi?auth=no&parameter=pa

U.S. Census. 2007. "Annual Estimates of the Population for Counties: April 1, 2000 to July 1, 2007." http://www.census.gov/popest/counties/CO-EST2007-01.html

Wilson, D., R. Billings, R. Oommen, and R. Chang. 2007. "Year 2005 Gulfwide Emission Inventory Study." Prepared for the U.S. Department of the Interior by Eastern Research Group, Inc., Morrisville, NC. http://www.gomr.mms.gov/PI/PDFImages/ESPIS/4/4276.pdf

Xiu, A. and J.E. Pleim. 2000. "Development of a land surface model. Part I: application in a mesoscale meteorology model." *J. App. Met.*, **40**, 192-209.

Yarwood, G., G. Wilson, S. Shepard, A. Guenther. 2003. "User's Guide to the Global Biosphere Emissions and Interactions System (GloBEIS3); Version 3.1." Prepared by ENVIRON International Corporation, Novato, CA and National Center for Atmospheric Research, Boulder, CO. (November, 2003). www.globeis.com/data/user_globeis31_05nov03.pdf

APPENDIX A

MOBILE6 Inputs

A. MOBILE6 INPUTS

A.1 BATON ROUGE MAY 2005 MOBILE6 MODEL INPUTS

```
* Baton Rouge 5-Parish Non-attainment Area (90% design speeds); 2005
*******************  Header Section  **************************
MOBILE6 INPUT FILE :
POLLUTANTS         : HC CO NOX
SPREADSHEET        :
RUN DATA
*******************  Run Section  *****************************
>Year 2005 - Conventional gas modeled for the Baton Rouge NAA
NO REFUELING       :
MIN/MAX TEMP       : 63.9 84.4
ABSOLUTE HUMIDITY  : 123.44
FUEL RVP           : 7.8
REG DIST           : BRGAGG.REG
I/M DESC FILE      : BR0506im.d
ANTI-TAMP PROG     : 00 80 95 22222 21111111 1 11 072. 22222222
*******************  Scenario Section  ************************
SCENARIO REC       : Rural interstate, 63.0
CALENDAR YEAR      : 2005
EVALUATION MONTH   : 7
ALTITUDE           : 1
AVERAGE SPEED      : 63.0 Non-Ramp 100.0 0.0 0.0 0.0
VMT FRACTIONS      :
0.599  0.038  0.127  0.014  0.007  0.068  0.007  0.005
0.004  0.015  0.017  0.019  0.069  0.003  0.002  0.006
*******************  Scenario Section  ************************
SCENARIO REC       : Rural principal arterial, 58.5
CALENDAR YEAR      : 2005
EVALUATION MONTH   : 7
ALTITUDE           : 1
AVERAGE SPEED      : 58.5 Arterial 0.0 100.0 0.0 0.0
VMT FRACTIONS      :
0.652  0.048  0.160  0.016  0.008  0.036  0.004  0.003
0.002  0.008  0.009  0.010  0.037  0.002  0.001  0.004
*******************  Scenario Section  ************************
SCENARIO REC       : Rural minor arterial, 49.5
CALENDAR YEAR      : 2005
EVALUATION MONTH   : 7
ALTITUDE           : 1
AVERAGE SPEED      : 49.5 Arterial 0.0 100.0 0.0 0.0
VMT FRACTIONS      :
0.672  0.046  0.155  0.017  0.008  0.032  0.003  0.002
0.002  0.007  0.008  0.009  0.032  0.002  0.001  0.004
*******************  Scenario Section  ************************
SCENARIO REC       : Rural major collector, 45.0
CALENDAR YEAR      : 2005
EVALUATION MONTH   : 7
ALTITUDE           : 1
AVERAGE SPEED      : 45.0 Arterial 0.0 100.0 0.0 0.0
VMT FRACTIONS      :
0.667  0.054  0.178  0.017  0.008  0.023  0.002  0.002
0.001  0.005  0.006  0.007  0.024  0.001  0.001  0.004
*******************  Scenario Section  ************************
```

```
SCENARIO REC         : Rural minor collector, 36.0
CALENDAR YEAR        : 2005
EVALUATION MONTH     : 7
ALTITUDE             : 1
AVERAGE SPEED        : 36.0 Arterial 0.0 100.0 0.0 0.0
VMT FRACTIONS        :
0.639  0.056  0.186  0.009  0.004  0.027  0.003  0.002
0.002  0.006  0.007  0.008  0.027  0.001  0.001  0.022
*******************  Scenario Section  ************************
SCENARIO REC         : Rural local, 27.0
CALENDAR YEAR        : 2005
EVALUATION MONTH     : 7
ALTITUDE             : 1
VMT BY FACILITY      : localvmt.d
VMT FRACTIONS        :
0.654  0.057  0.189  0.003  0.002  0.024  0.002  0.002
0.001  0.005  0.006  0.007  0.025  0.001  0.001  0.021
*******************  Scenario Section  ************************
SCENARIO REC         : Urban interstate, 58.5
CALENDAR YEAR        : 2005
EVALUATION MONTH     : 7
ALTITUDE             : 1
AVERAGE SPEED        : 58.5 Non-Ramp 100.0 0.0 0.0 0.0
VMT FRACTIONS        :
0.720  0.037  0.122  0.019  0.009  0.030  0.003  0.002
0.002  0.006  0.008  0.008  0.030  0.001  0.001  0.002
*******************  Scenario Section  ************************
SCENARIO REC         : Urban other expressway, 58.5
CALENDAR YEAR        : 2005
EVALUATION MONTH     : 7
ALTITUDE             : 1
AVERAGE SPEED        : 58.5 Non-Ramp 100.0 0.0 0.0 0.0
VMT FRACTIONS        :
0.764  0.034  0.112  0.018  0.008  0.020  0.002  0.002
0.001  0.004  0.005  0.006  0.021  0.001  0.000  0.002
*******************  Scenario Section  ************************
SCENARIO REC         : Urban principal arterial, 49.5
CALENDAR YEAR        : 2005
EVALUATION MONTH     : 7
ALTITUDE             : 1
AVERAGE SPEED        : 49.5 Arterial 0.0 100.0 0.0 0.0
VMT FRACTIONS        :
0.766  0.034  0.113  0.018  0.008  0.018  0.002  0.001
0.001  0.004  0.005  0.005  0.018  0.001  0.000  0.006
*******************  Scenario Section  ************************
SCENARIO REC         : Urban minor arterial, 45.0
CALENDAR YEAR        : 2005
EVALUATION MONTH     : 7
ALTITUDE             : 1
AVERAGE SPEED        : 45.0 Arterial 0.0 100.0 0.0 0.0
VMT FRACTIONS        :
0.773  0.040  0.131  0.009  0.004  0.013  0.001  0.001
0.001  0.003  0.003  0.004  0.014  0.001  0.000  0.002
*******************  Scenario Section  ************************
SCENARIO REC         : Urban collector, 36.0
CALENDAR YEAR        : 2005
EVALUATION MONTH     : 7
ALTITUDE             : 1
```

```
AVERAGE SPEED       : 36.0 Arterial 0.0 100.0 0.0 0.0
VMT FRACTIONS       :
0.772  0.037  0.125  0.007  0.003  0.013  0.001  0.001
0.001  0.003  0.003  0.004  0.013  0.001  0.000  0.016
*******************  Scenario Section  ************************
SCENARIO REC        : Urban local, 27.0
CALENDAR YEAR       : 2005
EVALUATION MONTH    : 7
ALTITUDE            : 1
VMT BY FACILITY     : localvmt.d
VMT FRACTIONS       :
0.797  0.037  0.122  0.003  0.001  0.008  0.001  0.001
0.000  0.002  0.002  0.002  0.009  0.000  0.000  0.015

END OF RUN
```

A.2 BATON ROUGE JUNE 2006 MOBILE6 MODEL INPUTS

```
* Baton Rouge 5-Parish Non-attainment Area (90% design speeds); 2006
*******************  Header Section  **************************
MOBILE6 INPUT FILE :
POLLUTANTS         : HC CO NOX
SPREADSHEET        :
RUN DATA
*******************  Run Section  *****************************
>Year 2006 - Conventional gas modeled for the Baton Rouge NAA
NO REFUELING       :
MIN/MAX TEMP       : 69.7 89.5
ABSOLUTE HUMIDITY  : 123.44
FUEL RVP           : 7.8
REG DIST           : 06BRGAGG.REG
I/M DESC FILE      : BR0506im.d
ANTI-TAMP PROG     : 00 80 95 22222 21111111 1 11 072. 22222222
*******************  Scenario Section  ************************
SCENARIO REC       : Rural interstate, 63.0
CALENDAR YEAR      : 2006
EVALUATION MONTH   : 7
ALTITUDE           : 1
AVERAGE SPEED      : 63.0 Non-Ramp 100.0 0.0 0.0 0.0
VMT FRACTIONS      :
0.599  0.038  0.127  0.014  0.007  0.068  0.007  0.005
0.004  0.015  0.017  0.019  0.069  0.003  0.002  0.006
*******************  Scenario Section  ************************
SCENARIO REC       : Rural principal arterial, 58.5
CALENDAR YEAR      : 2006
EVALUATION MONTH   : 7
ALTITUDE           : 1
AVERAGE SPEED      : 58.5 Arterial 0.0 100.0 0.0 0.0
VMT FRACTIONS      :
0.652  0.048  0.160  0.016  0.008  0.036  0.004  0.003
0.002  0.008  0.009  0.010  0.037  0.002  0.001  0.004
*******************  Scenario Section  ************************
SCENARIO REC       : Rural minor arterial, 49.5
CALENDAR YEAR      : 2006
EVALUATION MONTH   : 7
ALTITUDE           : 1
AVERAGE SPEED      : 49.5 Arterial 0.0 100.0 0.0 0.0
VMT FRACTIONS      :
0.672  0.046  0.155  0.017  0.008  0.032  0.003  0.002
0.002  0.007  0.008  0.009  0.032  0.002  0.001  0.004
*******************  Scenario Section  ************************
SCENARIO REC       : Rural major collector, 45.0
CALENDAR YEAR      : 2006
EVALUATION MONTH   : 7
ALTITUDE           : 1
AVERAGE SPEED      : 45.0 Arterial 0.0 100.0 0.0 0.0
VMT FRACTIONS      :
0.667  0.054  0.178  0.017  0.008  0.023  0.002  0.002
0.001  0.005  0.006  0.007  0.024  0.001  0.001  0.004
*******************  Scenario Section  ************************
SCENARIO REC       : Rural minor collector, 36.0
CALENDAR YEAR      : 2006
EVALUATION MONTH   : 7
ALTITUDE           : 1
```

```
AVERAGE SPEED       : 36.0 Arterial 0.0 100.0 0.0 0.0
VMT FRACTIONS       :
0.639  0.056  0.186  0.009  0.004  0.027  0.003  0.002
0.002  0.006  0.007  0.008  0.027  0.001  0.001  0.022
*******************  Scenario Section  ************************
SCENARIO REC        : Rural local, 27.0
CALENDAR YEAR       : 2006
EVALUATION MONTH    : 7
ALTITUDE            : 1
VMT BY FACILITY     : localvmt.d
VMT FRACTIONS       :
0.654  0.057  0.189  0.003  0.002  0.024  0.002  0.002
0.001  0.005  0.006  0.007  0.025  0.001  0.001  0.021
*******************  Scenario Section  ************************
SCENARIO REC        : Urban interstate, 58.5
CALENDAR YEAR       : 2006
EVALUATION MONTH    : 7
ALTITUDE            : 1
AVERAGE SPEED       : 58.5 Non-Ramp 100.0 0.0 0.0 0.0
VMT FRACTIONS       :
0.720  0.037  0.122  0.019  0.009  0.030  0.003  0.002
0.002  0.006  0.008  0.008  0.030  0.001  0.001  0.002
*******************  Scenario Section  ************************
SCENARIO REC        : Urban other expressway, 58.5
CALENDAR YEAR       : 2006
EVALUATION MONTH    : 7
ALTITUDE            : 1
AVERAGE SPEED       : 58.5 Non-Ramp 100.0 0.0 0.0 0.0
VMT FRACTIONS       :
0.764  0.034  0.112  0.018  0.008  0.020  0.002  0.002
0.001  0.004  0.005  0.006  0.021  0.001  0.000  0.002
*******************  Scenario Section  ************************
SCENARIO REC        : Urban principal arterial, 49.5
CALENDAR YEAR       : 2006
EVALUATION MONTH    : 7
ALTITUDE            : 1
AVERAGE SPEED       : 49.5 Arterial 0.0 100.0 0.0 0.0
VMT FRACTIONS       :
0.766  0.034  0.113  0.018  0.008  0.018  0.002  0.001
0.001  0.004  0.005  0.005  0.018  0.001  0.000  0.006
*******************  Scenario Section  ************************
SCENARIO REC        : Urban minor arterial, 45.0
CALENDAR YEAR       : 2006
EVALUATION MONTH    : 7
ALTITUDE            : 1
AVERAGE SPEED       : 45.0 Arterial 0.0 100.0 0.0 0.0
VMT FRACTIONS       :
0.773  0.040  0.131  0.009  0.004  0.013  0.001  0.001
0.001  0.003  0.003  0.004  0.014  0.001  0.000  0.002
*******************  Scenario Section  ************************
SCENARIO REC        : Urban collector, 36.0
CALENDAR YEAR       : 2006
EVALUATION MONTH    : 7
ALTITUDE            : 1
AVERAGE SPEED       : 36.0 Arterial 0.0 100.0 0.0 0.0
VMT FRACTIONS       :
0.772  0.037  0.125  0.007  0.003  0.013  0.001  0.001
0.001  0.003  0.003  0.004  0.013  0.001  0.000  0.016
```

```
*******************  Scenario Section  ***********************
SCENARIO REC       : Urban local, 27.0
CALENDAR YEAR      : 2006
EVALUATION MONTH   : 7
ALTITUDE           : 1
VMT BY FACILITY    : localvmt.d
VMT FRACTIONS      :
0.797  0.037  0.122  0.003  0.001  0.008  0.001  0.001
0.000  0.002  0.002  0.002  0.009  0.000  0.000  0.015

END OF RUN
```

A.3 LOUISIANA PARISH 2005 AND 2006 RVP ESTIMATES

Parish	2005 RVP	2006 RVP	Parish	2005 RVP	2006 RVP
ACADIA	9	9	MADISON	9	9
ALLEN	9	9	MOREHOUSE	9	9
ASCENSION	7.8	7.8	NATCHITOCHES	9	9
ASSUMPTION	9	9	ORLEANS	7.8	7.8
AVOYELLES	9	9	OUACHITA	9	9
BEAUREGARD	7.8	7.8	PLAQUEMINES	9	9
BIENVILLE	9	9	POINTE COUPEE	7.8	7.8
BOSSIER	9	9	RAPIDES	9	9
CADDO	9	9	RED RIVER	9	9
CALCASIEU	7.8	7.8	RICHLAND	9	9
CALDWELL	9	9	SABINE	9	9
CAMERON	9	9	ST. BERNARD	7.8	7.8
CATAHOULA	9	9	ST. CHARLES	7.8	7.8
CLAIBORNE	9	9	ST. HELENA	9	9
CONCORDIA	9	9	ST. JAMES	7.8	7.8
DESOTO	9	9	ST. JOHN BAPTIST	9	9
EAST BATON ROUGE	7.8	7.8	ST. LANDRY	9	9
EAST CARROLL	9	9	ST. MARTIN	9	9
EAST FELICIANA	9	9	ST. MARY	7.8	7.8
EVANGELINE	9	9	ST. TAMMANY	9	9
FRANKLIN	9	9	TANGIPAHOA	9	9
GRANT	7.8	7.8	TENSAS	9	9
IBERIA	9	9	TERREBONNE	9	9
IBERVILLE	7.8	7.8	UNION	9	9
JACKSON	9	9	VERMILION	9	9
JEFFERSON	7.8	7.8	VERNON	9	9
JEFFERSON DAVIS	9	9	WASHINGTON	9	9
LAFAYETTE	7.8	7.8	WEBSTER	9	9
LAFOURCHE	7.8	7.8	WEST BATON ROUGE	7.8	7.8
LA SALLE	9	9	WEST CARROLL	9	9
LINCOLN	9	9	WEST FELICIANA	9	9
LIVINGSTON	7.8	7.8	WINN	9	9

A.4 BATON ROUGE INSPECTION AND MAINTENANCE PROGRAM

```
* 2005 I/M and ATP for Baton Rouge Non-attainment Area
* I/M program On Board Diagnostics (exhaust)
*
I/M PROGRAM         : 1 2002 2050 1 TRC OBD I/M
I/M MODEL YEARS     : 1 1996 2050
I/M VEHICLES        : 1 22222 21111111 1
I/M STRINGENCY      : 1 20.0
I/M EFFECTIVENESS   : 0.75 0.75 0.75
I/M COMPLIANCE      : 1 96.0
I/M WAIVER RATES    : 1 0.0 0.0
I/M GRACE PERIOD    : 1 2

*
* Baton Rouge I/M programs (evaporative)
*
I/M PROGRAM         : 2 2000 2001 1 TRC GC
I/M MODEL YEARS     : 2 1980 2001
I/M VEHICLES        : 2 22222 21111111 1
I/M COMPLIANCE      : 2 96.0
*
I/M PROGRAM         : 3 2002 2006 1 TRC GC
I/M MODEL YEARS     : 3 1980 2006
I/M VEHICLES        : 3 11111 21111111 1
I/M COMPLIANCE      : 3 96.0
*
I/M PROGRAM         : 4 2002 2050 1 TRC EVAP OBD & GC
I/M MODEL YEARS     : 4 1996 2050
I/M VEHICLES        : 4 22222 11111111 1
I/M STRINGENCY      : 4 20.0
I/M COMPLIANCE      : 4 96.0
I/M GRACE PERIOD    : 1 2
*
I/M PROGRAM         : 5 2007 2050 1 TRC EVAP OBD & GC
I/M MODEL YEARS     : 5 2007 2050
I/M VEHICLES        : 5 11111 21111111 1
I/M STRINGENCY      : 5 20.0
I/M COMPLIANCE      : 5 96.0
I/M GRACE PERIOD    : 1 2
```

A.5 LOUISIANA REGISTRATION DISTRIBUTIONS

Louisiana statewide outside of five parish non-attainment area

```
REG DIST
 1 0.0564 0.0662 0.0652 0.0690 0.0671 0.0748 0.0671 0.0602 0.0617 0.0579
   0.0627 0.0496 0.0435 0.0382 0.0335 0.0278 0.0227 0.0178 0.0119 0.0105
   0.0096 0.0077 0.0051 0.0036 0.0102
 2 0.0491 0.0575 0.0584 0.0670 0.0587 0.0626 0.0519 0.0565 0.0595 0.0456
   0.0530 0.0481 0.0423 0.0346 0.0355 0.0293 0.0284 0.0254 0.0189 0.0204
   0.0163 0.0141 0.0090 0.0090 0.0491
 3 0.0491 0.0575 0.0584 0.0670 0.0587 0.0626 0.0519 0.0565 0.0595 0.0456
   0.0530 0.0481 0.0423 0.0346 0.0355 0.0293 0.0284 0.0254 0.0189 0.0204
   0.0163 0.0141 0.0090 0.0090 0.0491
 4 0.0742 0.1152 0.1100 0.1045 0.0957 0.0751 0.0799 0.0425 0.0461 0.0457
   0.0459 0.0389 0.0245 0.0205 0.0151 0.0136 0.0108 0.0079 0.0044 0.0054
   0.0055 0.0049 0.0028 0.0019 0.0089
 5 0.0742 0.1152 0.1100 0.1045 0.0957 0.0751 0.0799 0.0425 0.0461 0.0457
   0.0459 0.0389 0.0245 0.0205 0.0151 0.0136 0.0108 0.0079 0.0044 0.0054
   0.0055 0.0049 0.0028 0.0019 0.0089
 6 0.0407 0.0872 0.0958 0.0836 0.0965 0.0787 0.0778 0.0316 0.0596 0.0448
   0.0467 0.0341 0.0296 0.0239 0.0222 0.0196 0.0215 0.0135 0.0080 0.0143
   0.0137 0.0120 0.0060 0.0070 0.0316
 7 0.0548 0.0883 0.0977 0.0872 0.1141 0.0803 0.1162 0.0313 0.0442 0.0362
   0.0334 0.0276 0.0177 0.0145 0.0120 0.0190 0.0170 0.0125 0.0115 0.0112
   0.0145 0.0117 0.0076 0.0070 0.0322
16 0.0842 0.0971 0.1648 0.1500 0.0872 0.0641 0.0551 0.0464 0.0384 0.0362
   0.0252 0.0214 0.0217 0.0123 0.0101 0.0089 0.0089 0.0091 0.0081 0.0143
   0.0119 0.0097 0.0084 0.0067 0.0000
```

2005 Baton Rouge five parish non-attainment area

```
REG DIST
 1 0.0509 0.0662 0.0676 0.0736 0.0689 0.0793 0.0708 0.0639 0.0640 0.0599
   0.0615 0.0491 0.0419 0.0367 0.0315 0.0255 0.0200 0.0153 0.0108 0.0092
   0.0084 0.0072 0.0049 0.0033 0.0094
 2 0.0458 0.0613 0.0616 0.0707 0.0620 0.0685 0.0585 0.0590 0.0602 0.0493
   0.0522 0.0464 0.0402 0.0326 0.0331 0.0281 0.0279 0.0226 0.0174 0.0179
   0.0144 0.0139 0.0082 0.0076 0.0408
 3 0.0458 0.0613 0.0616 0.0707 0.0620 0.0685 0.0585 0.0590 0.0602 0.0493
   0.0522 0.0464 0.0402 0.0326 0.0331 0.0281 0.0279 0.0226 0.0174 0.0179
   0.0144 0.0139 0.0082 0.0076 0.0408
 4 0.0692 0.1130 0.1106 0.1067 0.1006 0.0785 0.0851 0.0458 0.0467 0.0466
   0.0454 0.0390 0.0249 0.0183 0.0134 0.0130 0.0091 0.0064 0.0040 0.0044
   0.0041 0.0039 0.0027 0.0015 0.0071
 5 0.0692 0.1130 0.1106 0.1067 0.1006 0.0785 0.0851 0.0458 0.0467 0.0466
   0.0454 0.0390 0.0249 0.0183 0.0134 0.0130 0.0091 0.0064 0.0040 0.0044
   0.0041 0.0039 0.0027 0.0015 0.0071
 6 0.0425 0.0903 0.1010 0.0852 0.1027 0.0816 0.0888 0.0353 0.0596 0.0456
   0.0455 0.0308 0.0284 0.0207 0.0214 0.0173 0.0185 0.0099 0.0064 0.0113
   0.0100 0.0083 0.0052 0.0061 0.0275
 7 0.0507 0.0883 0.0979 0.0733 0.1114 0.0831 0.1156 0.0365 0.0465 0.0451
   0.0312 0.0238 0.0147 0.0170 0.0132 0.0195 0.0181 0.0110 0.0110 0.0113
   0.0152 0.0112 0.0093 0.0082 0.0370
16 0.0683 0.0891 0.1475 0.1426 0.0941 0.0734 0.0639 0.0481 0.0399 0.0330
   0.0223 0.0256 0.0246 0.0155 0.0104 0.0112 0.0101 0.0099 0.0141 0.0134
   0.0156 0.0110 0.0081 0.0084 0.0000
```

2006 Baton Rouge five parish non-attainment area

```
 1 0.0550 0.0733 0.0645 0.0678 0.0703 0.0666 0.0750 0.0675 0.0598 0.0597
   0.0542 0.0548 0.0437 0.0371 0.0316 0.0260 0.0213 0.0163 0.0121 0.0086
   0.0073 0.0067 0.0058 0.0039 0.0111
 2 0.0547 0.0630 0.0607 0.0631 0.0670 0.0608 0.0661 0.0556 0.0553 0.0575
   0.0460 0.0483 0.0408 0.0356 0.0293 0.0293 0.0241 0.0242 0.0202 0.0150
   0.0157 0.0123 0.0120 0.0068 0.0366
 3 0.0547 0.0630 0.0607 0.0631 0.0670 0.0608 0.0661 0.0556 0.0553 0.0575
   0.0460 0.0483 0.0408 0.0356 0.0293 0.0293 0.0241 0.0242 0.0202 0.0150
   0.0157 0.0123 0.0120 0.0068 0.0366
 4 0.0702 0.0891 0.1051 0.1049 0.0936 0.0925 0.0719 0.0770 0.0401 0.0421
   0.0416 0.0407 0.0337 0.0217 0.0160 0.0114 0.0110 0.0075 0.0052 0.0032
   0.0035 0.0032 0.0032 0.0020 0.0095
 5 0.0702 0.0891 0.1051 0.1049 0.0936 0.0925 0.0719 0.0770 0.0401 0.0421
   0.0416 0.0407 0.0337 0.0217 0.0160 0.0114 0.0110 0.0075 0.0052 0.0032
   0.0035 0.0032 0.0032 0.0020 0.0095
 6 0.0585 0.0805 0.0841 0.0980 0.0794 0.0969 0.0766 0.0841 0.0323 0.0531
   0.0420 0.0376 0.0255 0.0245 0.0184 0.0177 0.0147 0.0158 0.0088 0.0059
   0.0098 0.0078 0.0074 0.0038 0.0169
 7 0.0582 0.0781 0.0680 0.0801 0.0599 0.0835 0.0626 0.1013 0.0364 0.0357
   0.0428 0.0303 0.0192 0.0145 0.0178 0.0141 0.0212 0.0195 0.0141 0.0135
   0.0141 0.0199 0.0155 0.0141 0.0655
16 0.0747 0.0907 0.0800 0.1294 0.1093 0.0925 0.0740 0.0664 0.0484 0.0359
   0.0308 0.0223 0.0235 0.0180 0.0123 0.0078 0.0083 0.0085 0.0063 0.0092
   0.0127 0.0126 0.0102 0.0083 0.0082
```

APPENDIX B

Developmental CAMx Runs

APPENDIX B. DEVELOPMENTAL CAMx RUNS

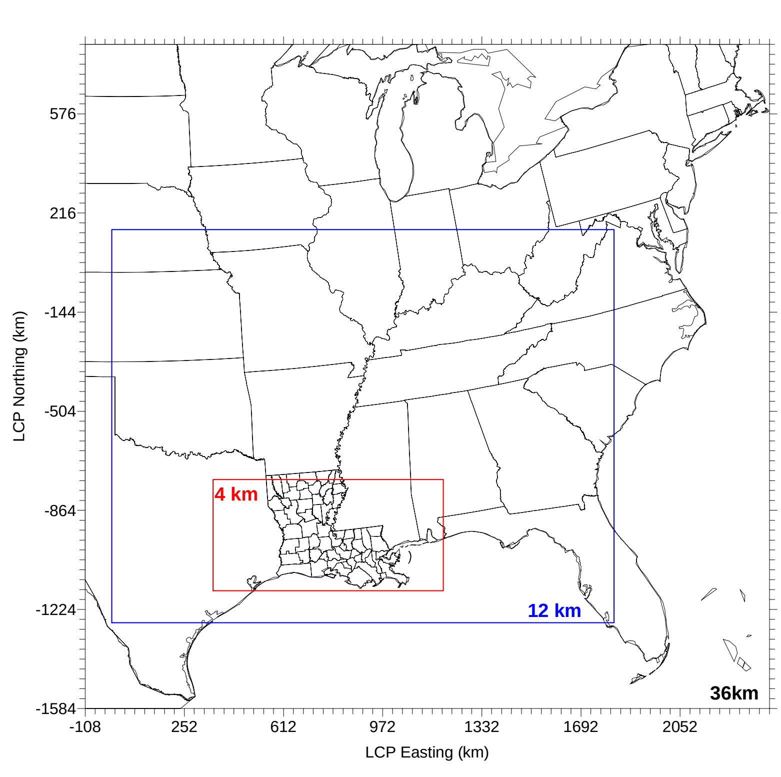
The Comprehensive Air quality Model with extensions (CAMx) was used to simulate ozone levels in Baton Rouge during the period of May 26 to July 1, 2006. This modeling comprised the base year component of a wider modeling program designed to provide the technical underpinnings of the Baton Rouge 8-hour ozone State Implementation Plan (SIP). Model input fields of emissions, meteorology, initial/boundary conditions, and photochemical parameters are documented in Sections 2, 3, and 4 of the main report. The base year modeling was conducted according to the approach described in the Baton Rouge 8-hour ozone Modeling Protocol (LDEQ, 2006) and follows the modeling guidance established by the U.S. Environmental Protection Agency (EPA, 2007). The suitability of the June 2006 ozone period was evaluated for photochemical modeling, as documented in the Modeling Protocol Addendum (ENVIRON, 2007).

All ozone simulations were run on the nested grid domains shown in Figure B-1 (ENVIRON, 2007) using the latest public-release version of CAMx (v4.51; ENVIRON, 2008; www.camx.com). The Carbon Bond 2005 (CB05) photochemical mechanism was used throughout. Predictions of ozone, as well as NOx and VOC precursors, were compared to measurements recorded at up to ten monitoring sites within the Baton Rouge 5-Parish area. About a dozen individual CAMx runs were conducted and evaluated in an effort to improve model performance and to characterize ozone sensitivity to changes in various model inputs. The 2006 Base Year developmental simulations are documented here; results from the final Base Year simulations are discussed in Section 4 of the main report.

The daily maximum 8-hour ozone concentrations for each date and monitoring site in the Baton Rouge area are listed in Table B-1; a map of monitoring locations is shown in Figure B-2. Values in Table B-1 are color-coded to aid in identifying elevated ozone days. In general, moderate to high levels of ozone were measured during the first half of June 2006. Ozone levels were much lower during the 10 days between June 16-25, when the daily maximum 8-hour ozone from all sites averaged 41 ppb. June 16 represents the first of several clean-out days following the passage of a frontal system from the north; this period was characterized by cooler and cloudy conditions. Ozone exceeded 85 ppb at almost all sites on June 29 and 30, when the highest 8-hour ozone for the entire month occurred at most locations.

B.1 CAMx RUN 1

The first CAMx simulation (Run 1) used preliminary 2006 base year emissions that were later found to contain a few errors associated with marine shipping and a several local point sources. No point sources were selected for the Plume-in-Grid (PiG) module in this run. This run employed a standard set of vertical mixing coefficient inputs (also known as “diffusivity”) that were calculated according to the O’Brien profile method available in the MM5CAMx interface program. Diffusivities specify the degree of time- and space-variable boundary layer mixing due to turbulence. Boundary conditions consisted of two profiles – clean and moderate. Lateral boundaries in the mixed layer (lowest 11 layers) were assigned moderate concentrations over land, and clean conditions over the Gulf and Atlantic. Aloft, all boundaries were set to clean conditions.



MM5 Layers	sigma	height (m)	CAMx Layers	Depth (m)
43	0.000	15676		
42	0.010	15229		
41	**0.025**	**14606**	**20**	**2227**
40	0.045	13850		
39	0.065	13162		
38	**0.090**	**12379**	**19**	**2203**
37	0.115	11667		
36	0.145	10888		
35	**0.175**	**10176**	**18**	**2282**
34	0.210	9416		
33	0.250	8622		
32	**0.290**	**7894**	**17**	**1812**
31	0.330	7222		
30	0.370	6597		
29	**0.405**	**6083**	**16**	**1752**
28	0.440	5596		
27	0.475	5133		
26	0.510	4692		
25	**0.540**	**4330**	**15**	**1011**
24	0.570	3982		
23	0.600	3645		
22	**0.630**	**3320**	**14**	**620**
21	0.660	3005		
20	**0.690**	**2700**	**13**	**583**
19	0.720	2405		
18	**0.750**	**2117**	**12**	**461**
17	0.775	1884		
16	**0.800**	**1657**	**11**	**440**
15	0.825	1434		
14	**0.850**	**1216**	**10**	**255**
13	0.865	1088		
12	**0.880**	**961**	**9**	**249**
11	0.895	836		
10	**0.910**	**712**	**8**	**163**
9	0.920	631		
8	**0.930**	**550**	**7**	**160**
7	0.940	469		
6	**0.950**	**390**	**6**	**79**
5	**0.960**	**310**	**5**	**79**
4	**0.970**	**232**	**4**	**78**
3	**0.980**	**154**	**3**	**77**
2	**0.990**	**77**	**2**	**46**
1	**0.996**	**31**	**1**	**31**
0	1.000	0		

Figure B-1. Configuration of the nested 36/12/4-km modeling grids (left) and vertical grid structure (right) used for all CAMx simulations reported here (ENVIRON, 2007).

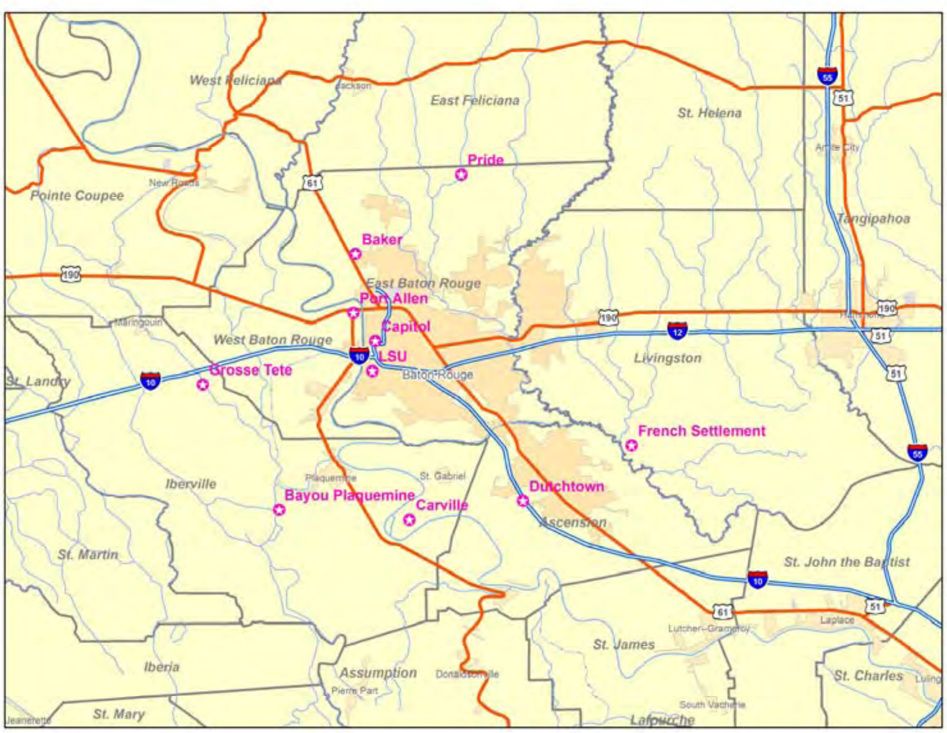


Figure B-2. Ozone monitoring sites in the Baton Rouge 5-Parish Area.

Table B-1. Daily maximum 8-hour ozone at 10 monitoring sites in the 5-Parish Baton Rouge area. Ozone values at or over 85 ppb are highlighted in red. Orange boxes represent ozone from 80 to 84 ppb. Yellow and green boxes represent ozone in the upper and lower 70s ppb, respectively.

2006	5-29	30	31	6-1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	7-1	2	3
Baker	43	36	69	72	64	51	60	63	66	62	63	66	88	97	63	64	75	90	31	38	44	48	61	47	70	56	63	55	63	62	73	92	98	74	44	37
B Plaquemine	28	37	61	66	74	57	72	77	81	56	77	89	75	72	77	65	75	66	21	29	38	25	42	34	34	46	53	57	68	69	71	92	89	64	37	33
Capital	39	29	60	77	58	47	60	59	56	58	60	64	85	84	61	54	70	76	25	34	39	34	51	41	45	57	57	55	61	59	69	95	91	68	40	35
Carville	30	37	62	79	79	59	69	73	85	65	86	74	73	85	68	71	76	68	26	39	41	29	51	36	39	58	65	65	80	74	81	94	90	63	37	34
Dutchtown	33	44	66	88	88	51	62	69	84	80	79	76	92	78	61	61	73	79	31	49	45	34	56	42	50	79	78	57	70	76	82	87	88	61	36	44
F Settlement	45	56	74	75	67	51	63	66	69	90	66	73	94	76	60	62	74	75	31	50	47	39	67	51	46	73	62	55	68	71	79	80	79	71	37	42
Grosse Tete	33	39	67	64	61	57	70	73	80	65	75	78	81	78	70	65	81	66	30	25	34	28	48	34	35	48	54	59	67	64	68	87	92	76	43	38
LSU	41	33	67	80	69	53	69	71	80	66	74	72	88	85	70	65	76	80	29	36	40	36	53	44	48	56	57	60	72	70	77	97	99	74	43	43
Port Allen	45	33	65	77	61	39	48	63	67	57	60	63	84	92	61	61	85	84	31	35	41	34	60	46	52	53	57	57	64	62	71	99	102	73	43	37
Pride	36	41	74	61	57	54	61	66	64	75	68	70	95	80	70	70	71	94	27	46	47	54	59	68	50	53	53	55	66	62	68	80	83	74	38	35

Model performance was evaluated for 8-hour ozone at the ten Baton Rouge 5-Parish monitors. Daily statistics displayed in the form of bar charts are presented in Figure B-3. The top plot compares two values: the highest observed 8-hour ozone among all sites in the Baton Rouge 5-Parish area and the co-located daily maximum 8-hour ozone from Run 1. CAMx under estimated the peak observation on all dates when at least one site exceeded 85 ppb.

The unpaired peak accuracy (second plot) compares the peak observed 8-hour ozone among all sites to the predicted daily maximum within 50 km of the peak observation, and is expressed as a relative difference. This plot displays each date's accuracy against the historical EPA 1-hour ozone performance goal of ±20 %. On all dates when the peak observed was greater than 85 ppb, Run 1 met its performance goal. This suggests that if the co-located predicted ozone peak was well under predicted, as shown in the first statistic, Run 1 predicted a peak comparable in magnitude to the peak observation "nearby". The accuracy exceeded 20% on many dates following June 16, when the observed peak 8-hour ozone was very low; these dates are not as important as the high ozone dates.

The average paired peak accuracy (third plot) compares the daily peak 8-hour observations averaged over the ten monitors with the average of their co-located predicted peaks. Run 1 shows a marked under prediction problem for co-located peak ozone on the high ozone dates.

The last two statistics compare the normalized bias and error over all hours and sites, excluding prediction-observation pairings during hours when the observed 8-hour ozone was less than 40 ppb. Since 8-hour ozone remained below 40 ppb at all sites throughout the day on June 16, no statistics were calculated. The historical EPA 1-hour model performance goals for normalized bias and error are ±15 % and 35 %, respectively. Run 1 did not meet the normalized bias goal on most of the ozone exceedance dates as ozone was under predicted. Run 1 met the goal for normalized error on all dates except June 15 and 25 (the latter is an inconsequential non-exceedance day).

Figure B-4 displays scatter and quantile-quantile (Q-Q) plots of the daily maximum 8-hour ozone from all dates and all ten sites in the Baton Rouge area. The top plot compares the observed to the co-located predicted 8-hour ozone; the bottom is similar but uses the closest predicted match to the observation from the 7 by 7 grid cells surrounding each monitor, as per EPA guidance (EPA, 2007). The blue points represent each predicted and observed pairing as a standard scatter diagram. The pink circles show separately ranked predicted vs. observed quantiles at every fifth percentile; both methods place all quantiles within the desired goals, denoted by the dashed red lines, although the co-located method does show most quantiles are predicting less than observed. As one would expect, the co-located points show more scatter compared to using the best match predicted value.

Time series of observed and predicted 1-hour ozone are shown in Figure B-5 for each monitor. Each time series was split into 10-day intervals for better clarity. Areas shaded in grey represent the minimum-to-maximum simulated ozone range over the 3 by 3 4-km grid cells surrounding each monitor. Narrow bands of grey indicate more uniform ozone concentrations in the area; wider bands suggest large ozone gradients around the monitor. The time series revealed a few issues with the first run. Ozone at two sites in central Baton Rouge – LSU and Capitol – was under predicted on all dates. Large ozone gradients with much higher ozone in the surrounding cells were found around both sites, suggesting ozone minima in the urban core due to too much

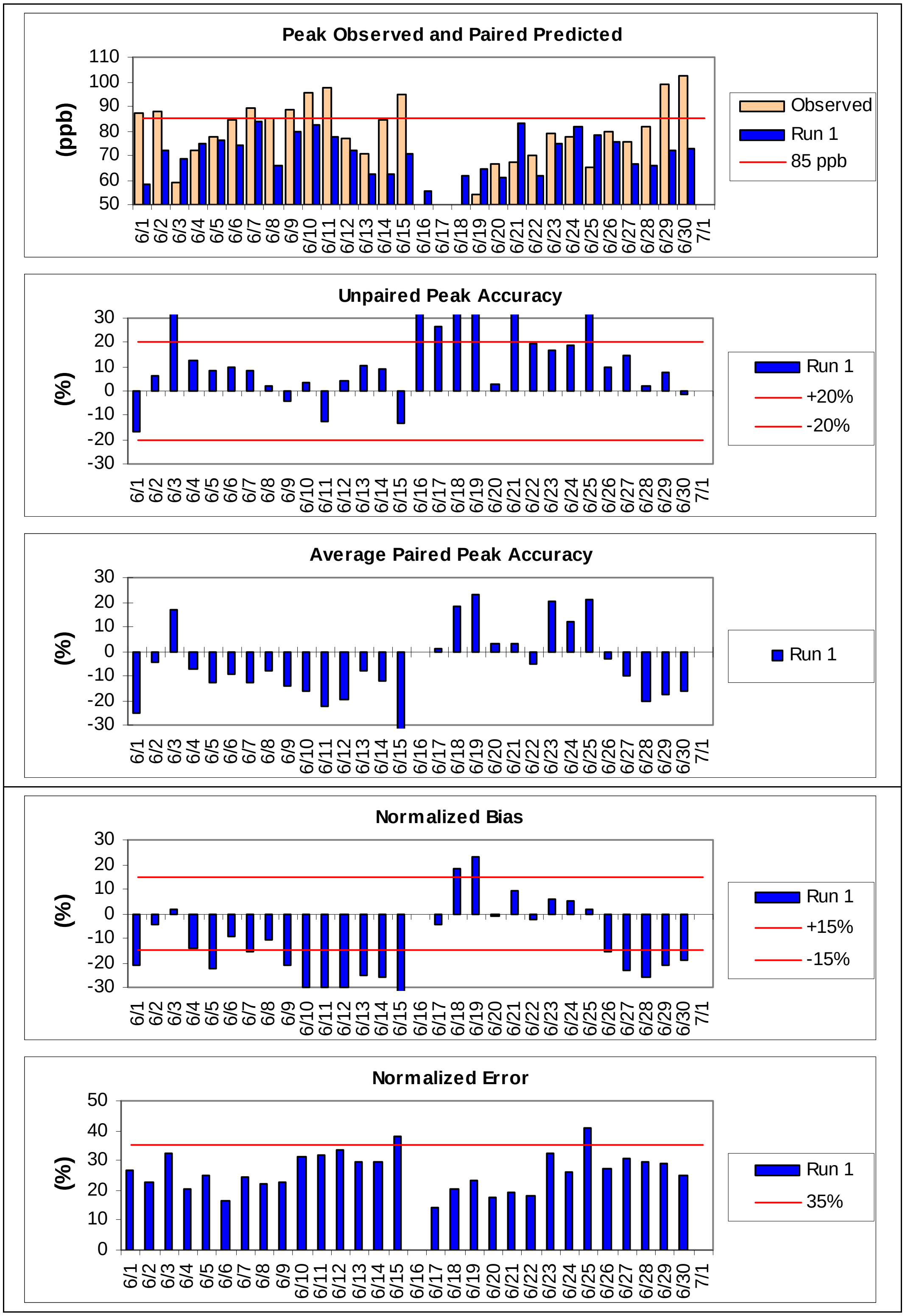


Figure B-3. CAMx Run 1 model performance statistics for 8-hour ozone.

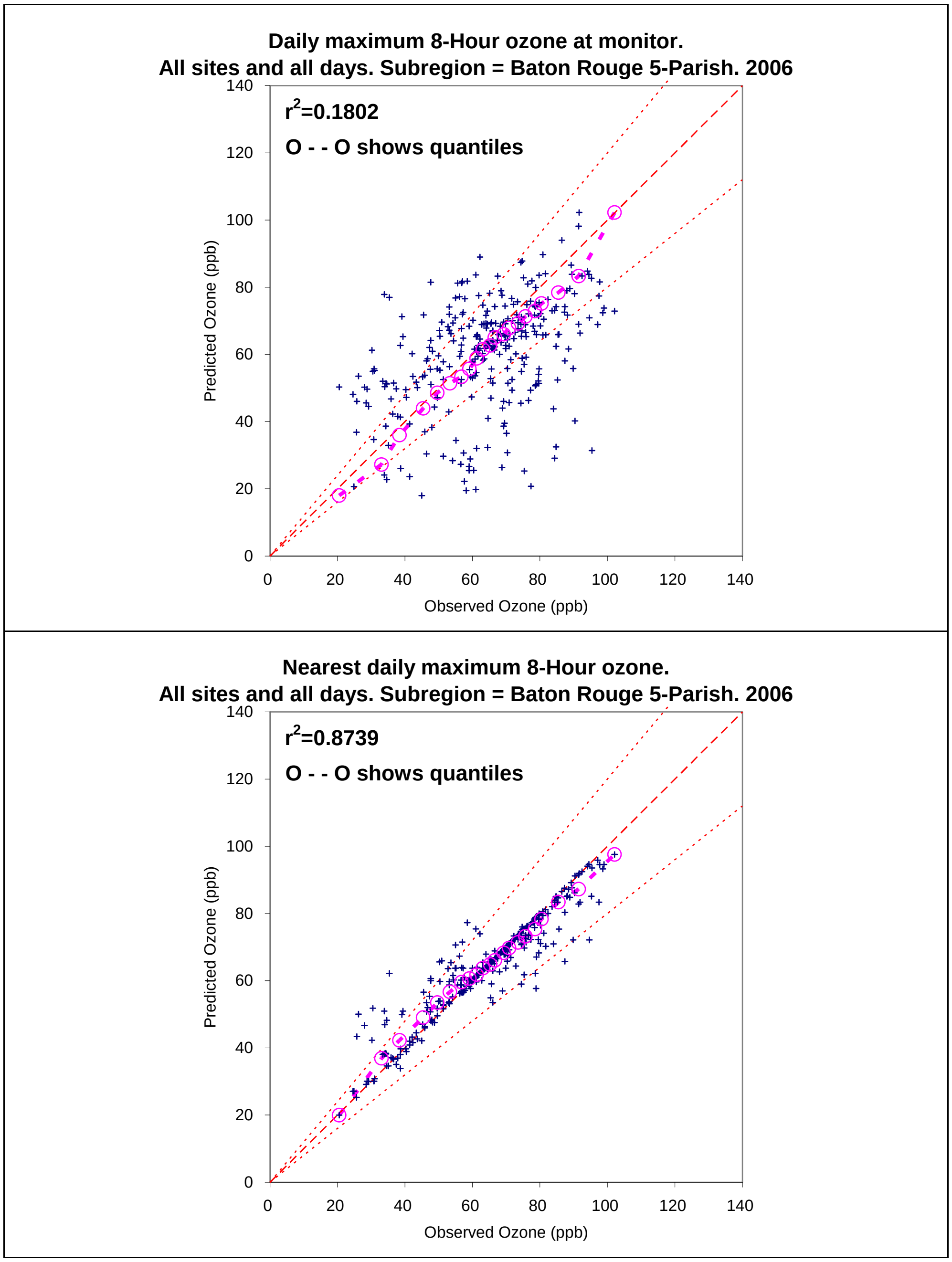


Figure B-4. Scatter and quantile (Q-Q) plots of Run 1 daily maximum 8-hour ozone when co-located (top) and when using the best match value within 7 by 7 grid cells (bottom).

NOx destroying ozone and/or inhibiting its formation. On June 15, which was an exceedance date at two monitors, ozone tended to be greatly under predicted, possibly due to onshore winds that were simulated by MM5 to be too strong in advance of an approaching frontal system. The next day, when the daily maximum 8-hour ozone averaged 50 ppb lower, Run 1 not only over estimated these values, but it predicted concentrations higher than on June 15. During the entire period with low observed ozone (June 16 – 22), Run 1 tended to over predict ozone.

Spatial maps of daily maximum 8-hour ozone on the five dates with the highest observed 8-hour ozone – June 10, 11, 15, 29, and 30 – are shown in Figure B-6. The left-most plot displays the entire 4 km domain; the center plot focuses on Baton Rouge. The daily maximum observed 8-hour ozone values are overlaid at site locations. The right-most plot displays three-dimensional back trajectories from the NOAA Hysplit Model (http://www.arl.noaa.gov/ready/hysplit4.html). All trajectories ended at 3 PM CST over Baton Rouge at three elevations – 100m, 1000m, and 3000m – and were back-tracked for 48 hours based on Eta Data Analysis System (EDAS) wind fields.

On each of these dates, Run 1 predicted an ozone minimum directly over the Baton Rouge city center, verifying the low predicted ozone and large ozone gradients at LSU and Capitol seen in the time series. On June 10, Run 1 predicted a domain peak of 99 ppb very close to the highest observed peak of 95 ppb at French Settlement. The 100 m back trajectory showed an air mass recirculation pattern over Baton Rouge from two days ago, when ozone exceedances were measured. On June 11, Run 1 under estimated the daily maximum 8-hour ozone at all Baton Rouge sites. Run 1 predicted the entire Baton Rouge 5 Parish Area to be under 85 ppb, despite the observed 97 ppb peak at Baker. Back trajectories showed stagnant air masses coming from the southeast of Baton Rouge on this date.

June 15 exhibited very large under predictions as Run 1 simulated the daily maximum ozone near Pride to be in the lower 70s when the observed peak was 94 ppb. Back trajectories at all three heights indicated stronger southerly winds, in agreement with the simulated plumes of ozone traversing south to north on the 4 km domain. However, the simulated southerly winds were probably too strong on this date.

On June 29, CAMx predicted 8-hour ozone exceeding 95 ppb over much of Iberville Parish. The magnitude of predicted ozone was very good, however the location of the maximum cloud was too far west. Back trajectories show the air mass becoming more stagnant as it approaches Baton Rouge from the east. The predicted daily maximum 8-hour ozone on June 30 was similar to the 29^{th}, except the area over 95 ppb moved slightly north. Again, the peak was too far to the west as the Baton Rouge urban core was under predicted. A stagnant air mass existed over Baton Rouge on this date, as indicated by the 100m back trajectory.

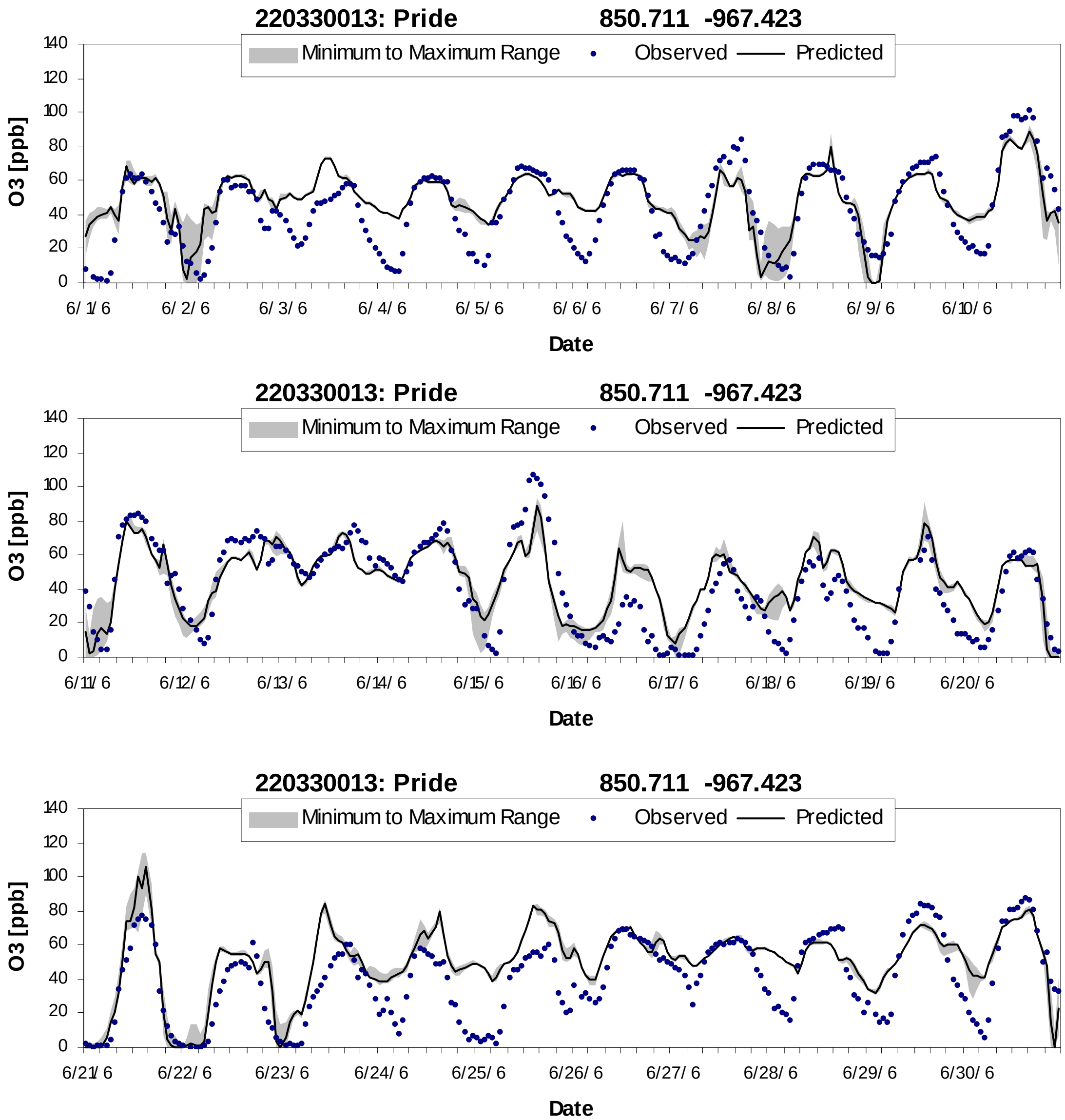


Figure B-5. Time series of observed and Run 1 hourly ozone at Pride.

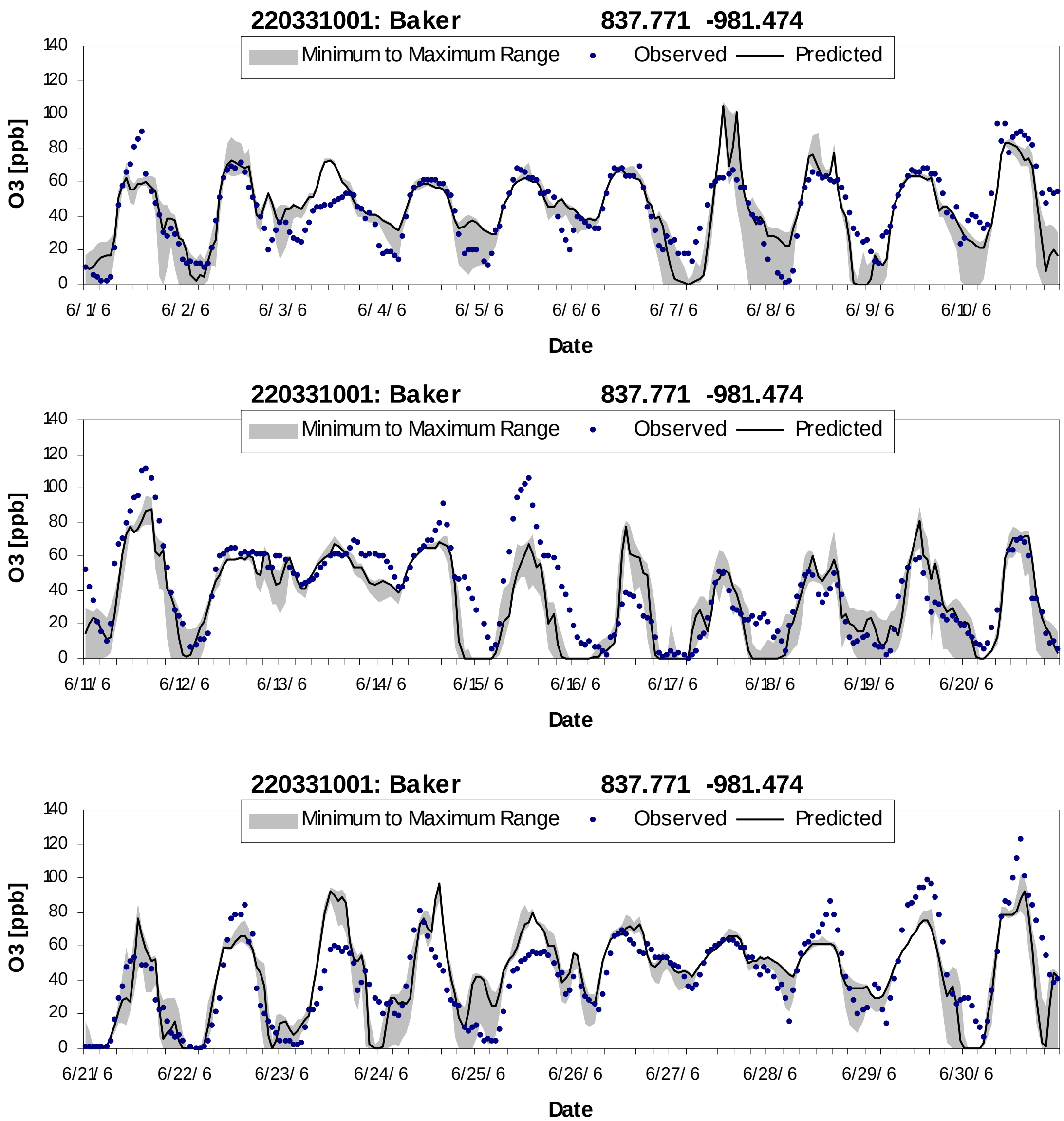


Figure B-5 (continued). Time series of observed and Run 1 hourly ozone at Baker.

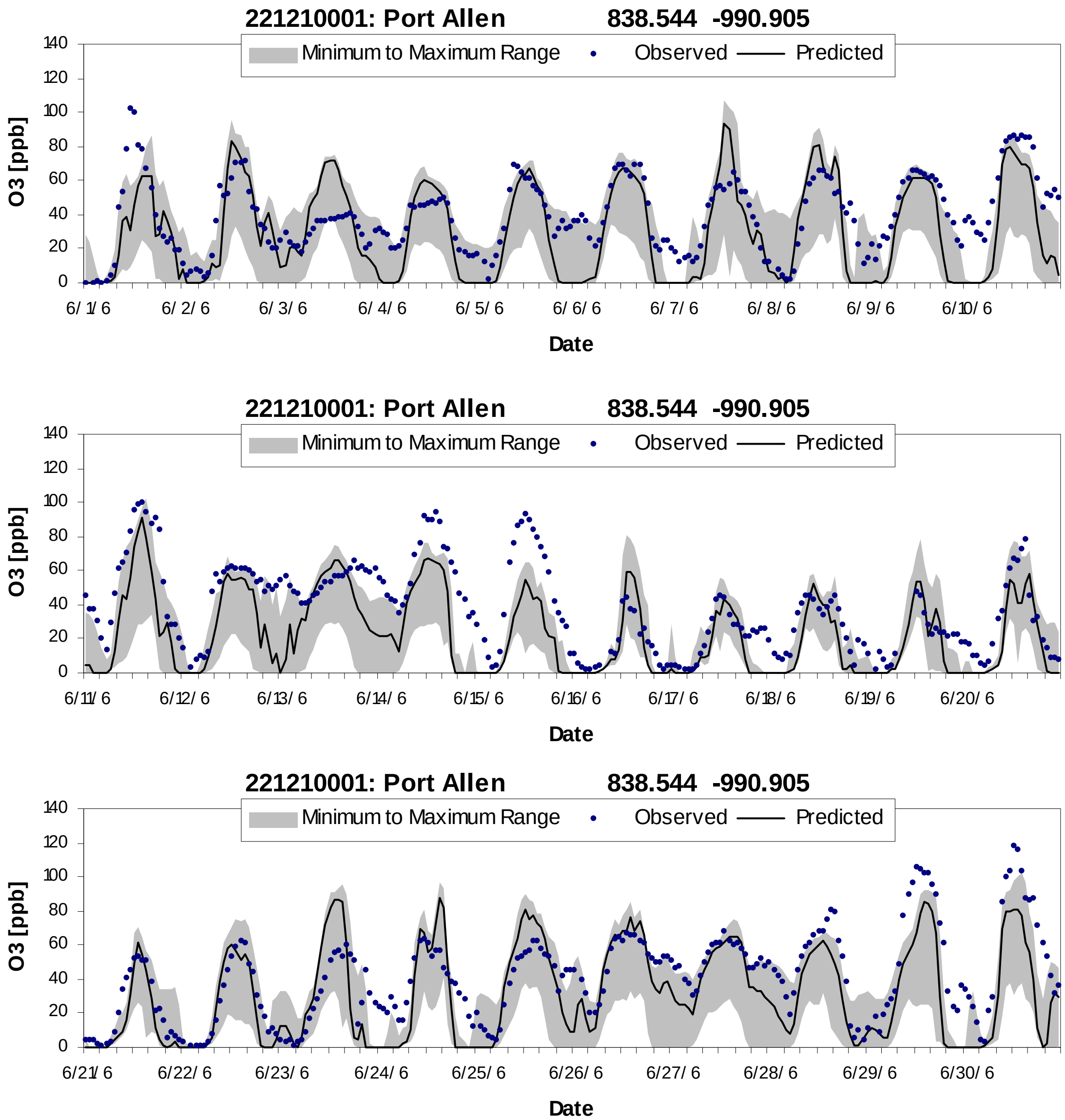


Figure B-5 (continued). Time series of observed and Run 1 hourly ozone at Port Allen.

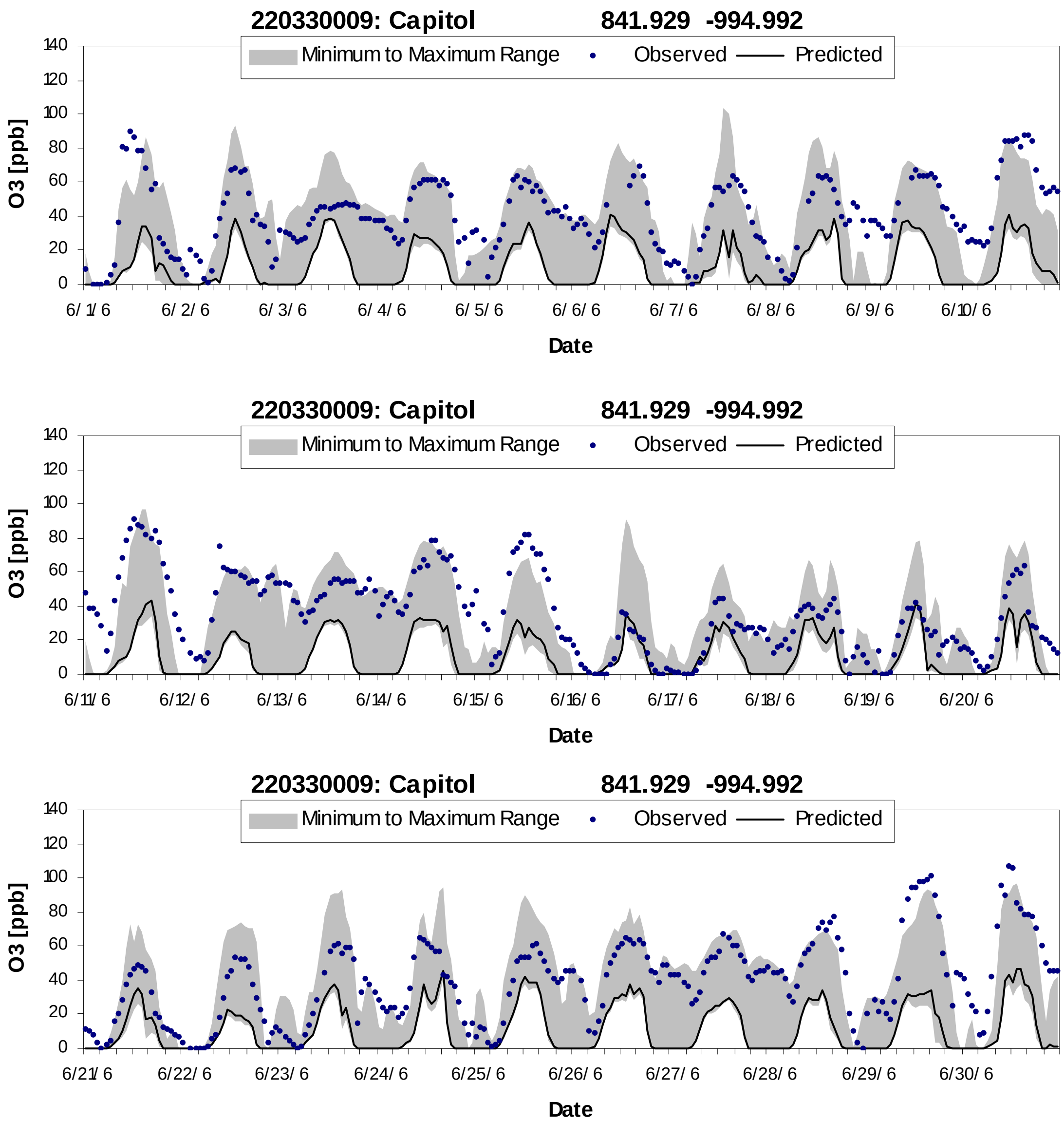
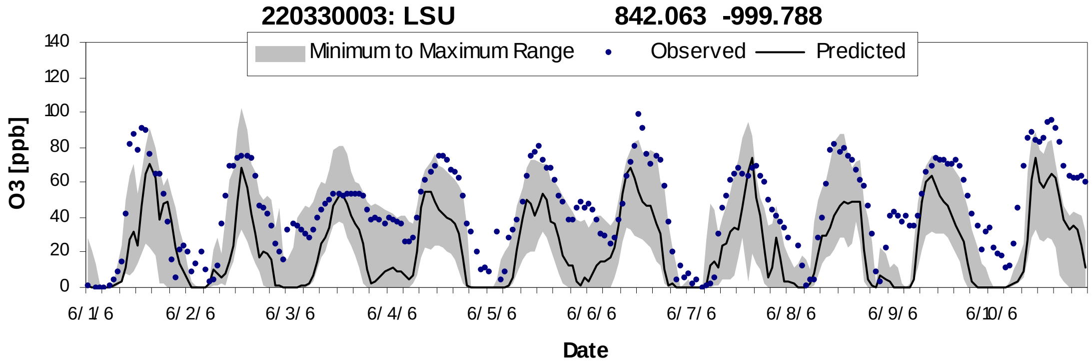
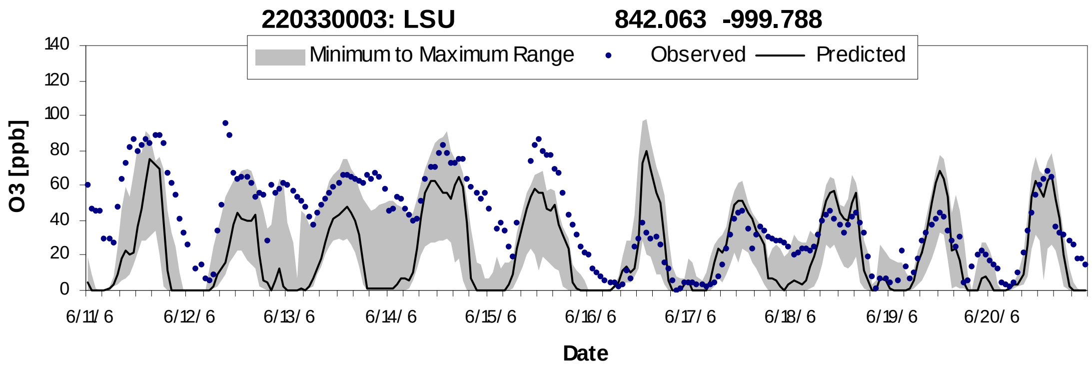


Figure B-5 (continued). Time series of observed and Run 1 hourly ozone at Capitol.





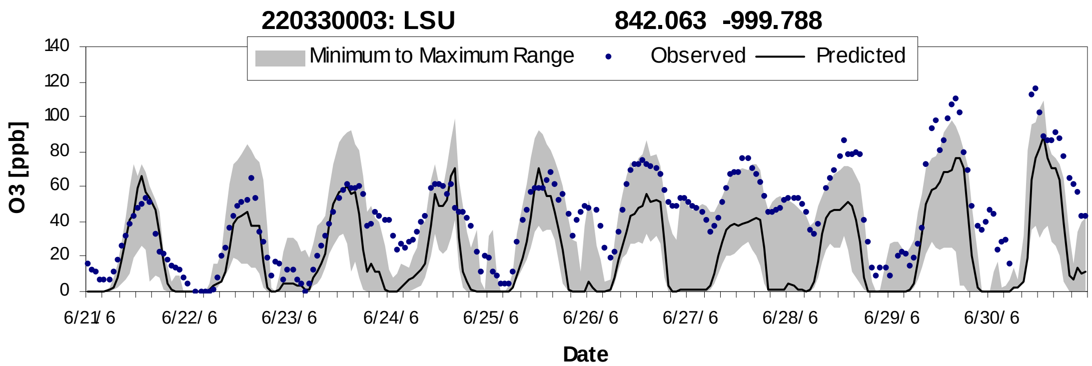


Figure B-5 (continued). Time series of observed and Run 1 hourly ozone at LSU.

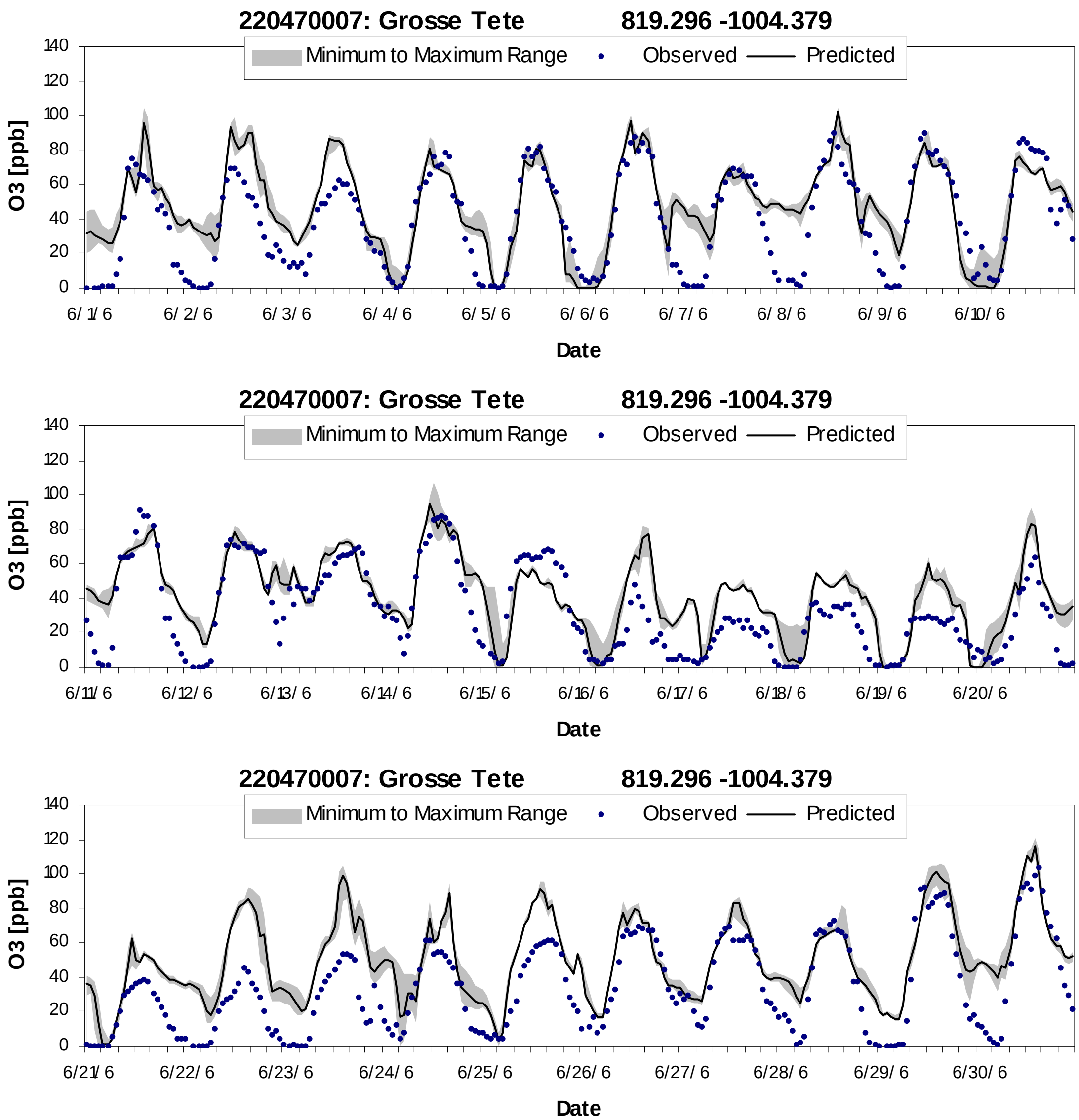


Figure B-5 (continued). Time series of observed and Run 1 hourly ozone at Grosse Tete.

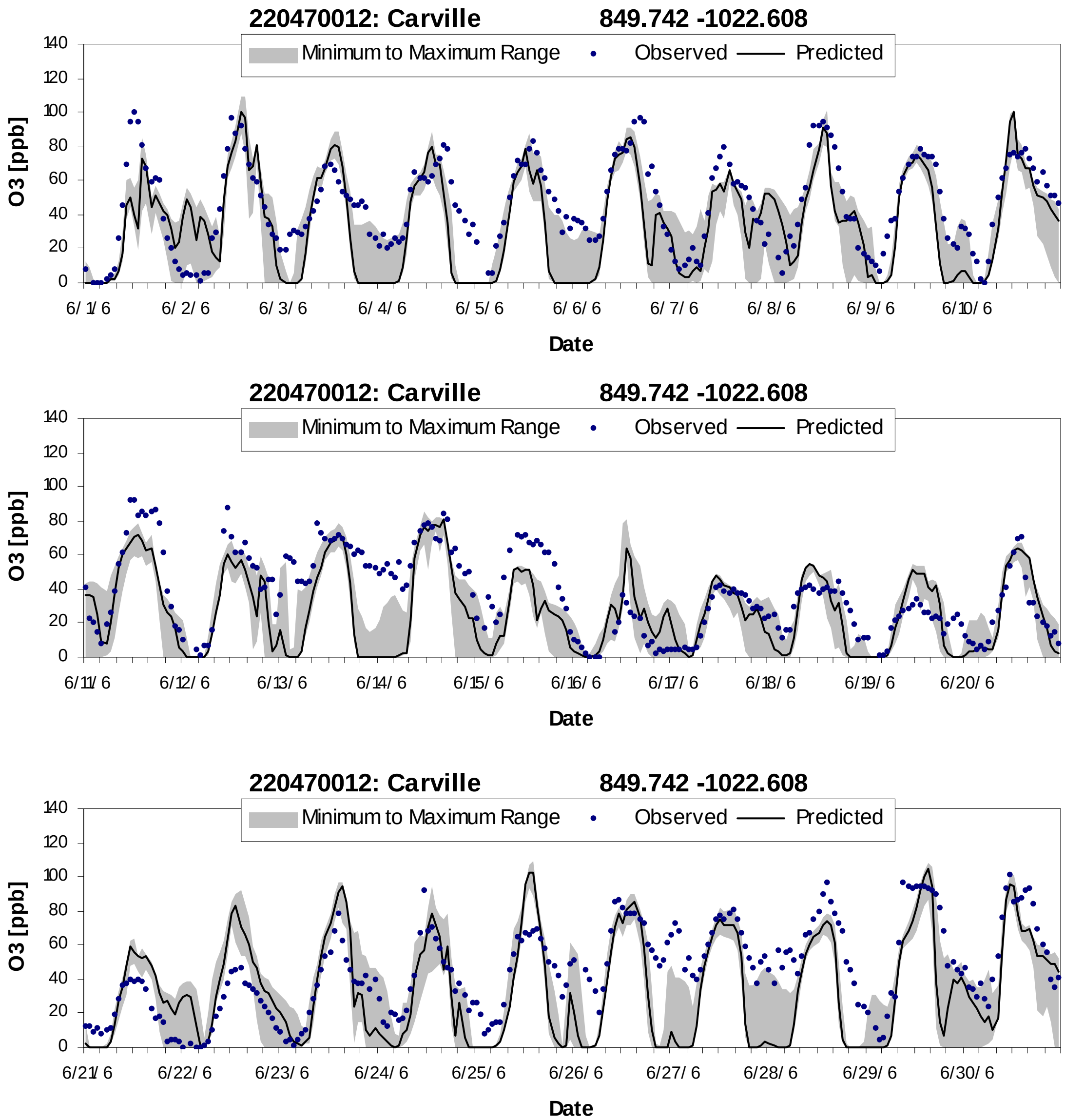


Figure B-5 (continued). Time series of observed and Run 1 hourly ozone at Carville.

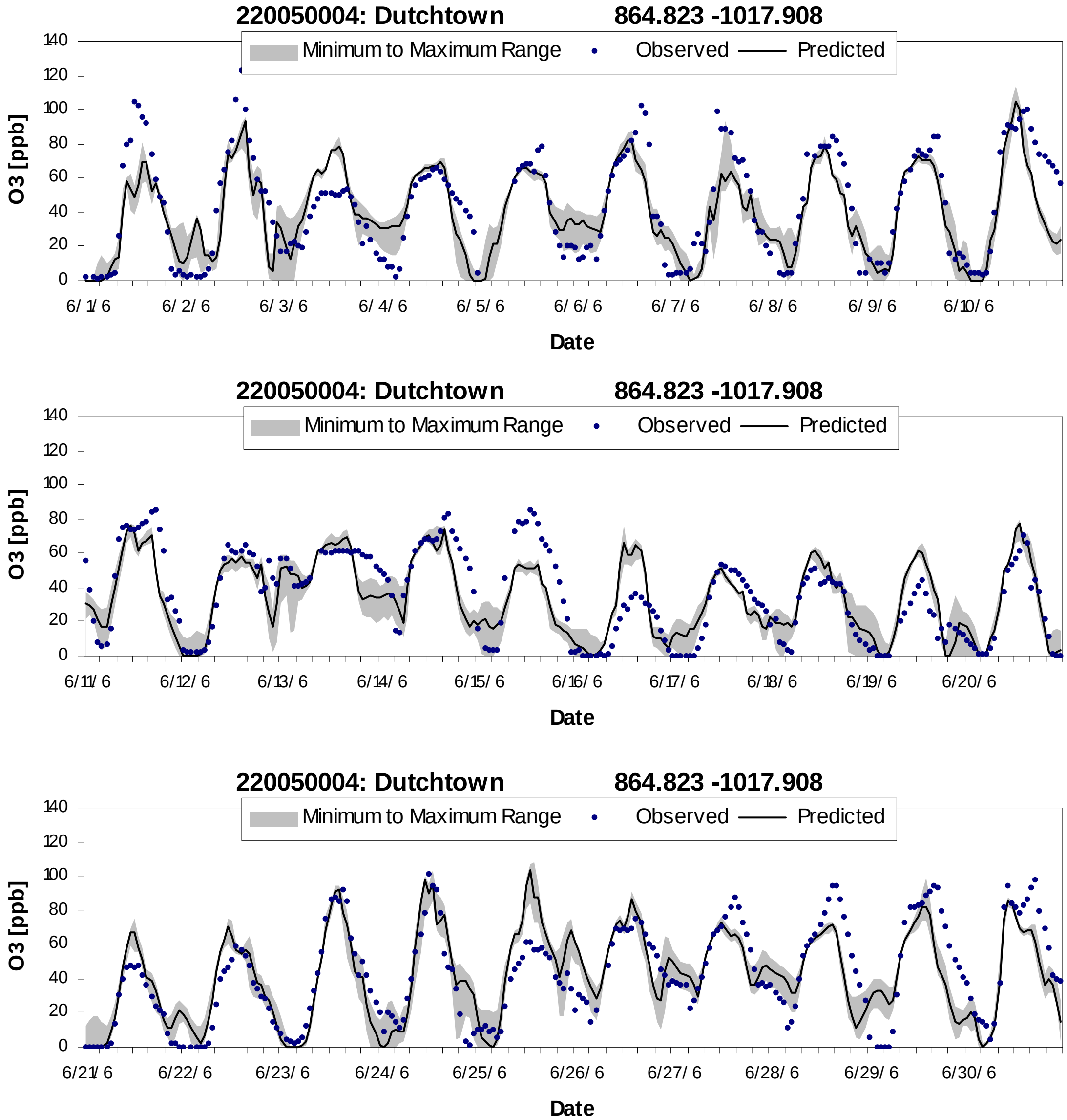


Figure B-5 (continued). Time series of observed and Run 1 hourly ozone at Dutchtown.

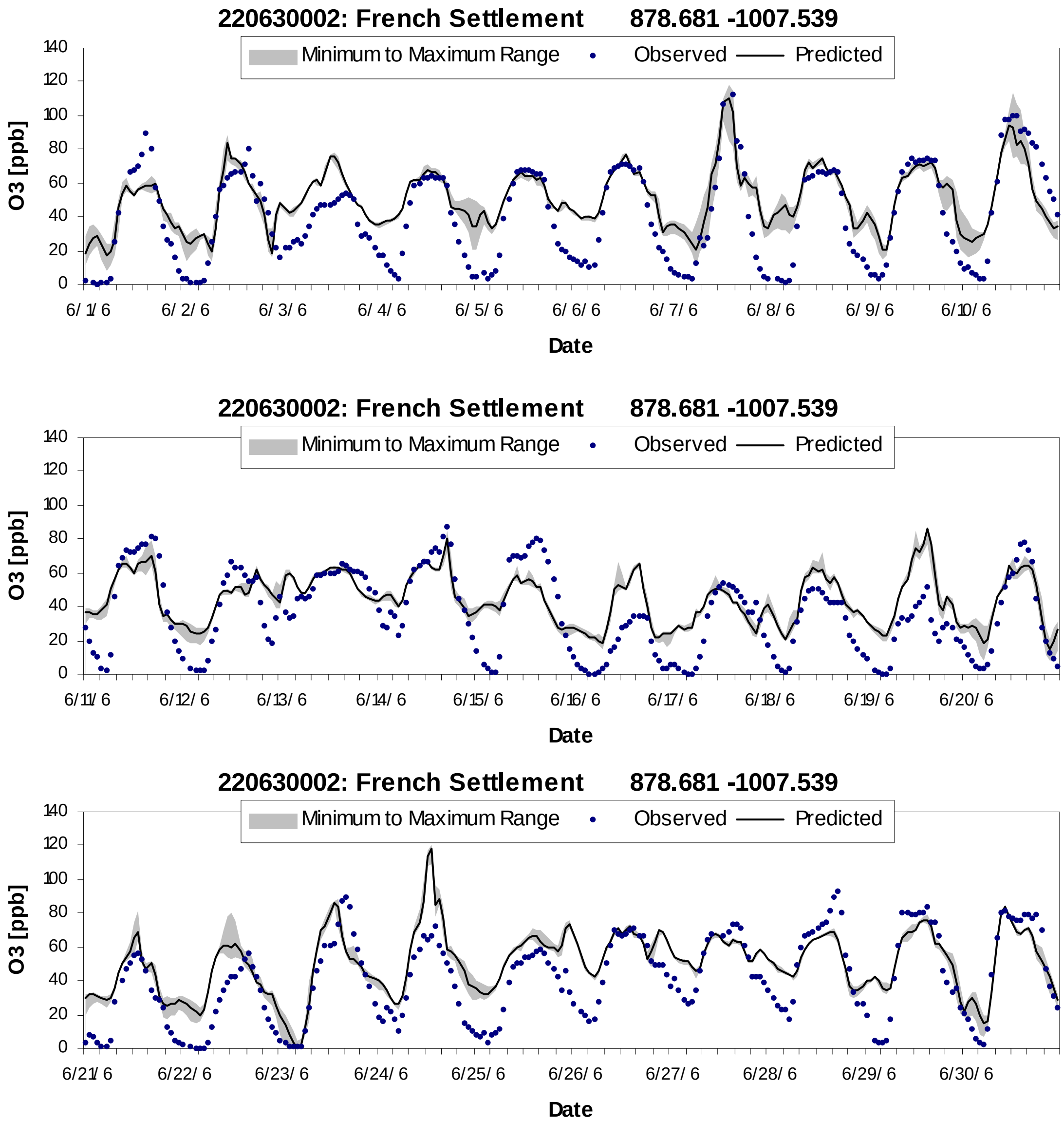


Figure B-5 (continued). Time series of observed and Run 1 hourly ozone at French Settlement.

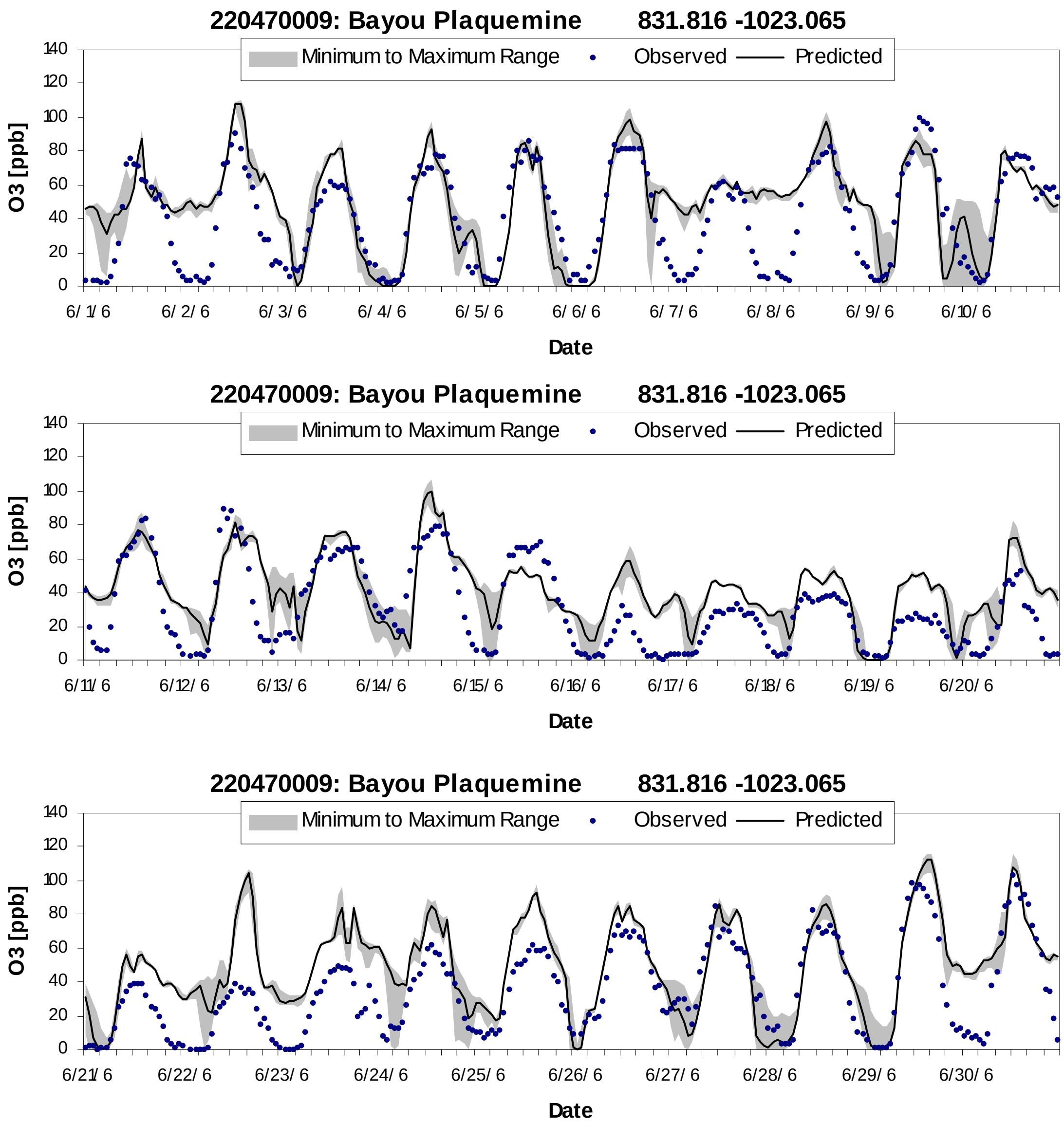


Figure B-5 (concluded). Time series of observed and Run 1 hourly ozone at Bayou Plaquemine.

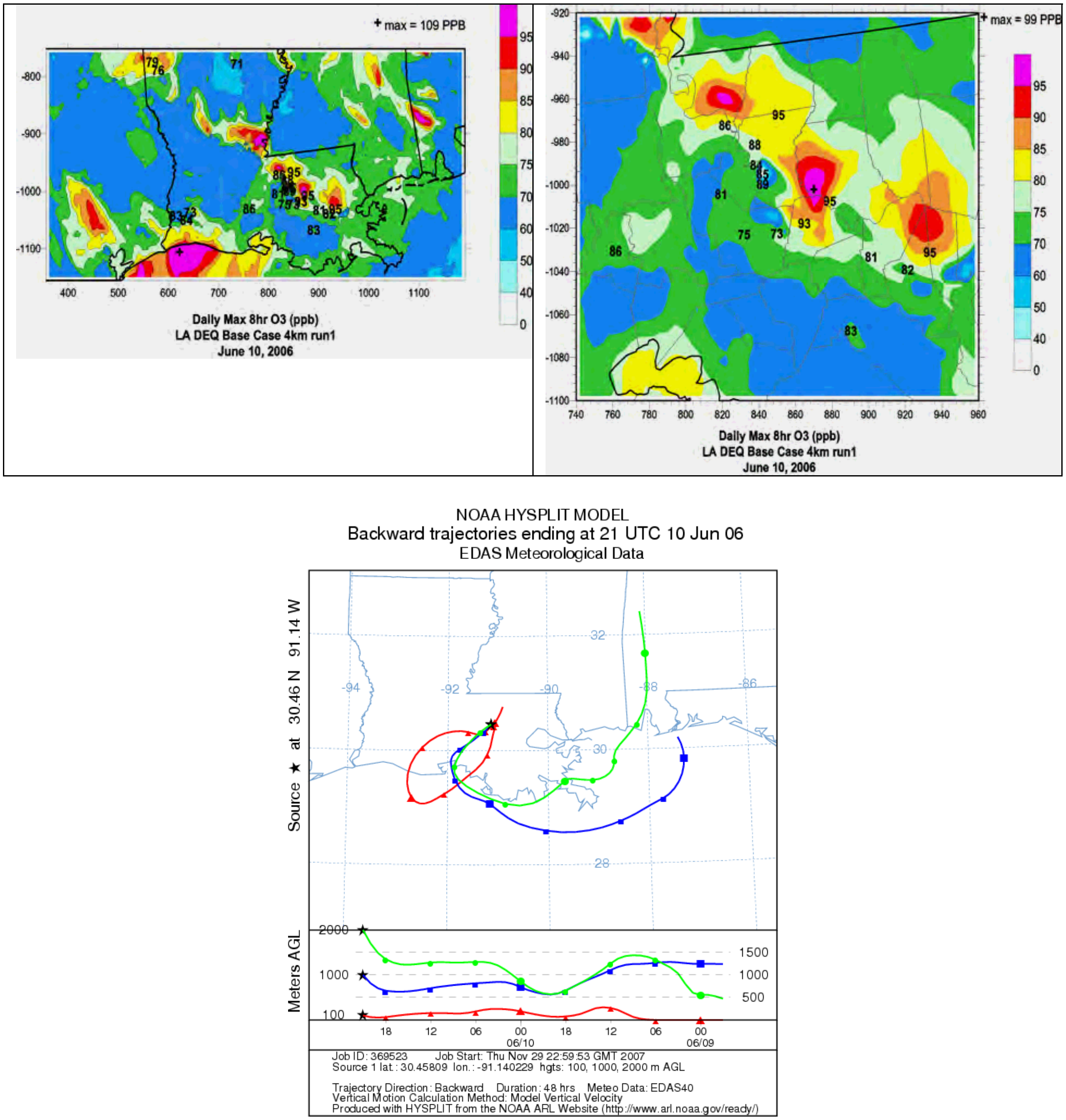
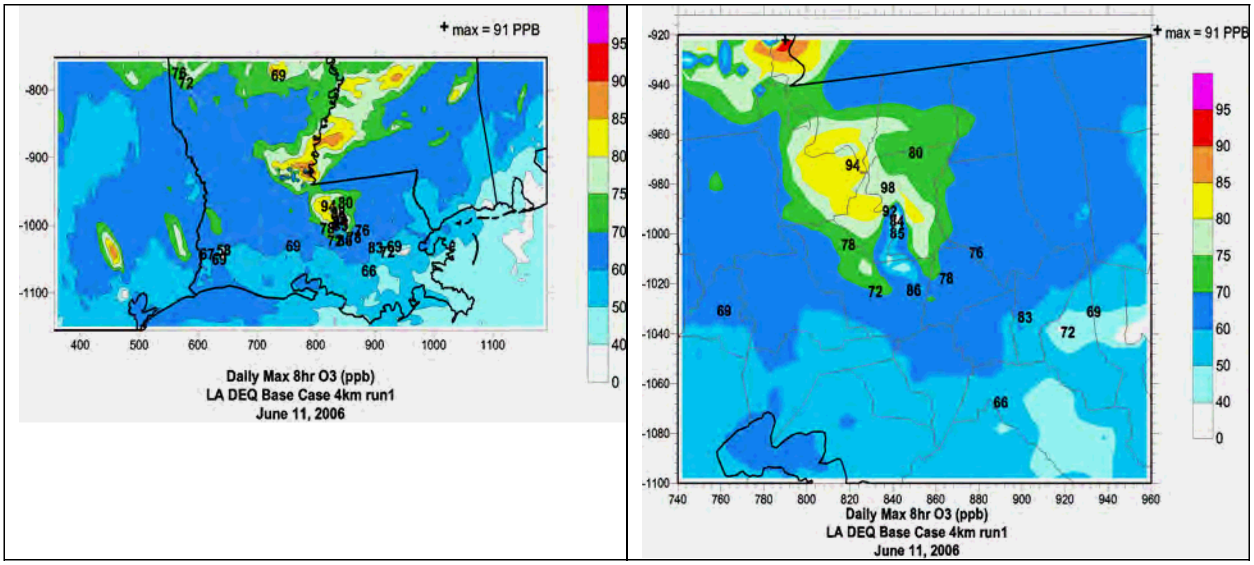


Figure B-6. Spatial maps of the daily maximum 8-hour ozone on June 10 in the 4 km domain (left), over Baton Rouge (middle), and EDAS 48-hour back trajectories ending at Baton Rouge at three elevations (bottom).



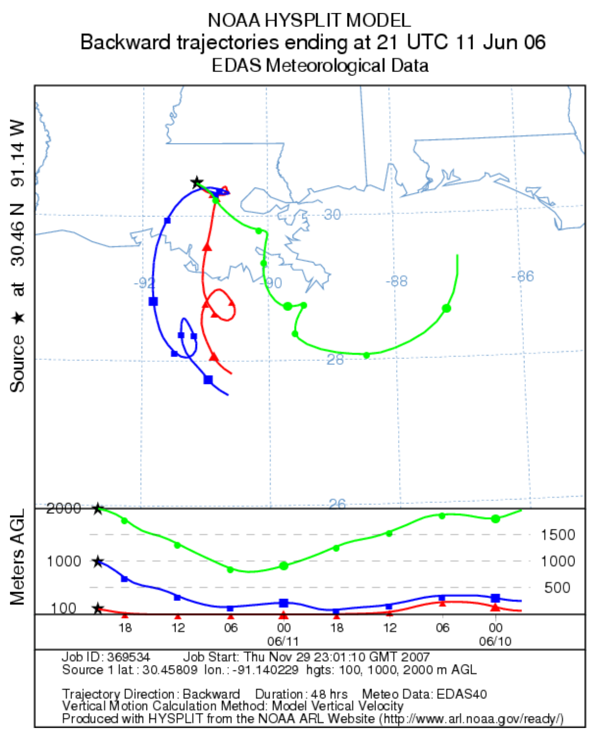


Figure B-6 (continued). Spatial maps of the daily maximum 8-hour ozone on June 11 in the 4 km domain (left), over Baton Rouge (middle), and EDAS 48-hour back trajectories ending at Baton Rouge at three elevations (bottom).

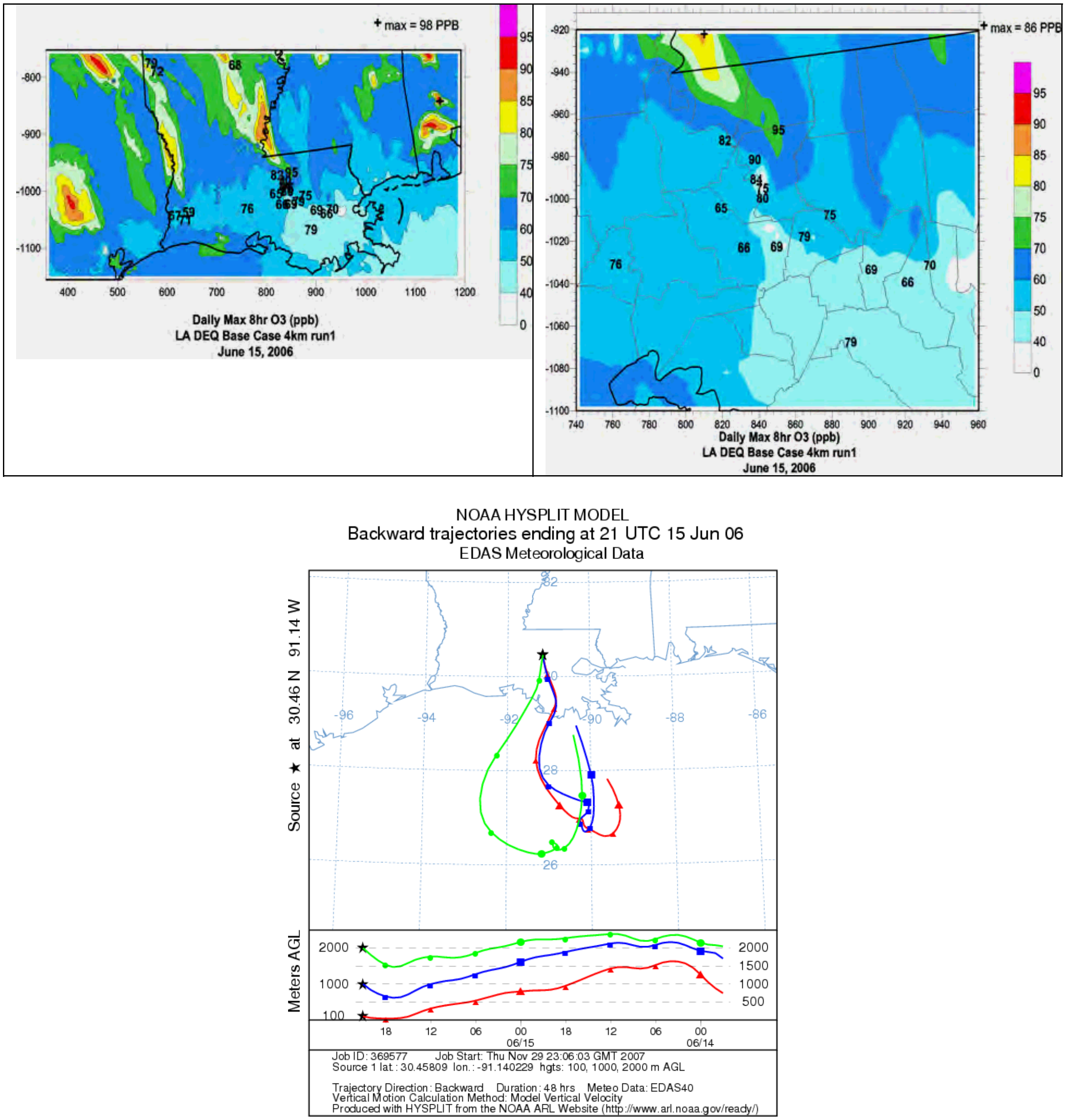


Figure B-6 (continued). Spatial maps of the daily maximum 8-hour ozone on June 15 in the 4 km domain (left), over Baton Rouge (middle), and EDAS 48-hour back trajectories ending at Baton Rouge at three elevations (bottom).

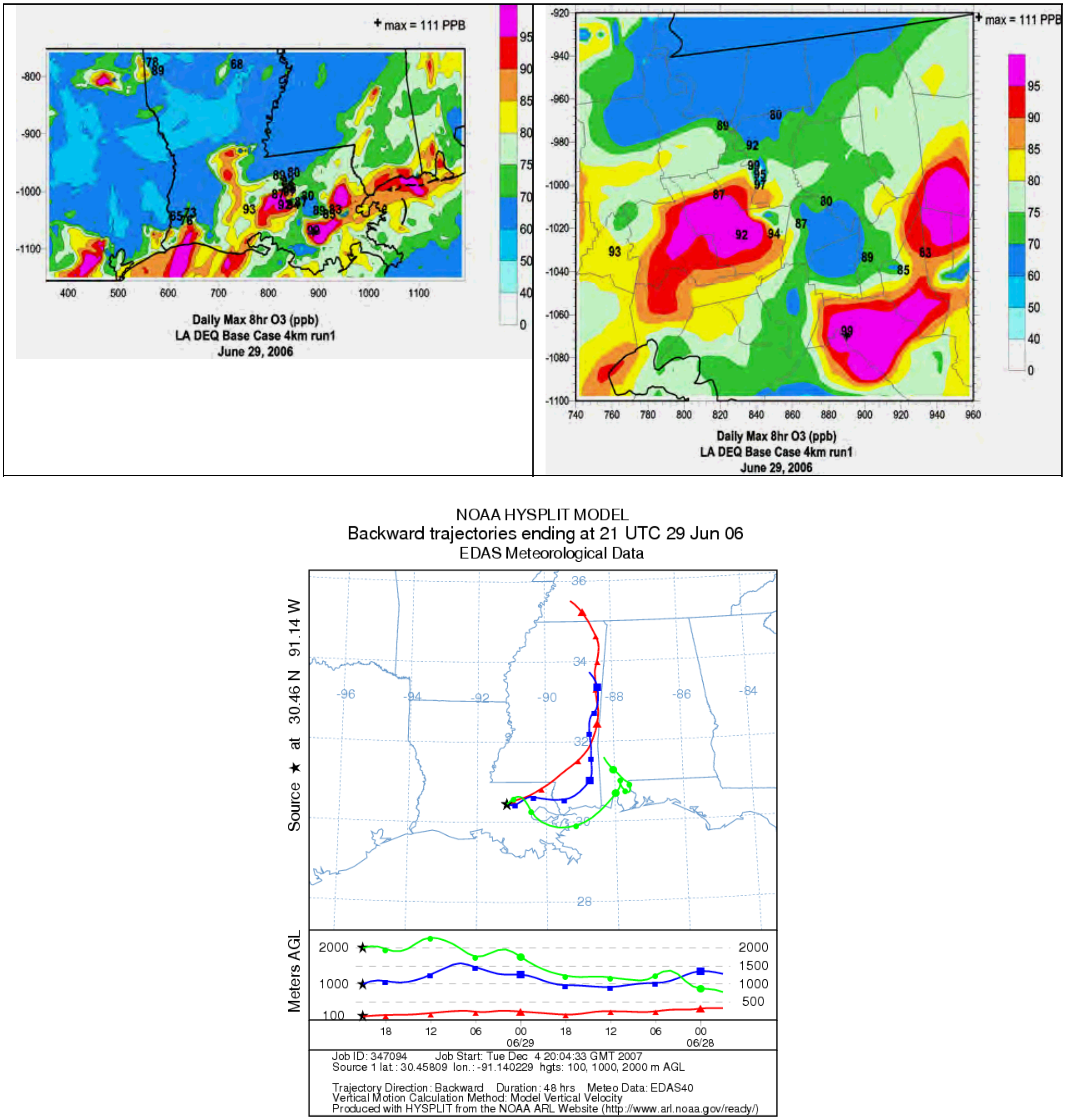


Figure B-6 (continued). Spatial maps of the daily maximum 8-hour ozone on June 29 in the 4 km domain (left), over Baton Rouge (middle), and EDAS 48-hour back trajectories ending at Baton Rouge at three elevations (bottom).

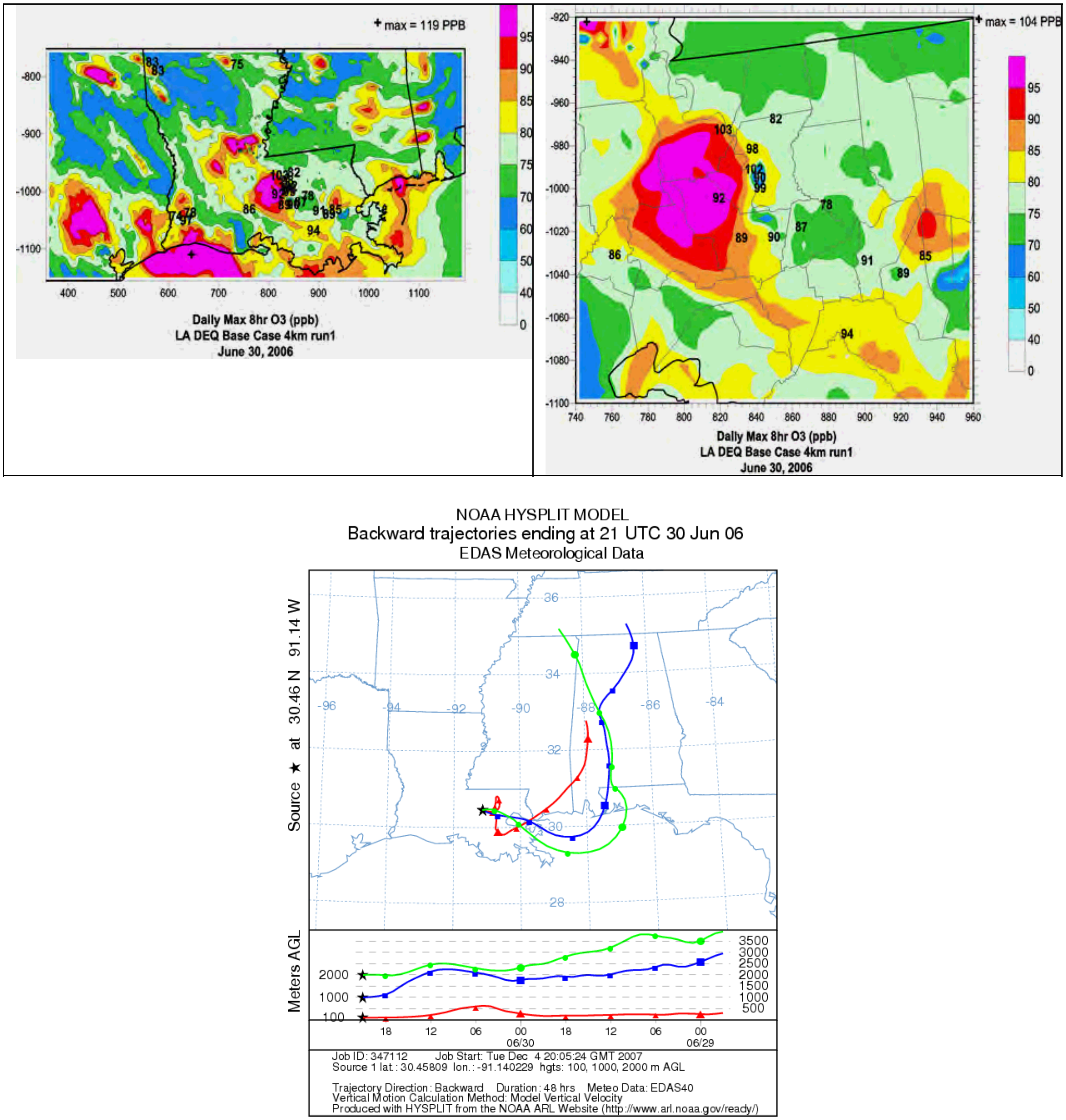


Figure B-6 (concluded). Spatial maps of the daily maximum 8-hour ozone on June 30 in the 4 km domain (left), over Baton Rouge (middle), and EDAS 48-hour back trajectories ending at Baton Rouge at three elevations (bottom).

B.2 CAMx RUN 2

Run 2 incorporated emission updates, but was otherwise identical to Run 1. Run 2 added three point sources that had been missing in the Run 1 inventory and addressed reconciliation issues with three other CEM point sources in Louisiana. The faulty spatial allocation of non-road marine/port emissions was also corrected.

Model performance statistics of 8-hour ozone from Run 2 are compared to Run 1 in Figures B-7 and B-8. The left and right sides show daily statistics from the first and last half of the episode, respectively. The statistics comparing the Baton Rouge peak observed 8-hour ozone to both the co-located and unpaired predictions had mixed results (Figure B-7). The co-located peak performance showed only marginal differences on most days (<5 ppb). The unpaired peak accuracy was generally better in Run 2 for over predicted days in Run 1, yet worse for under predicted days in Run 1, suggesting an overall shift to lower peak ozone. All exceedance dates were within the ±20% unpaired peak performance goal. When comparing the average peak performance over all ten sites to their co-located predicted values, Run 2 performed better than in Run 1 on all high ozone dates. Performance was worse on the low ozone dates in mid June.

When all sites and hours over 40 ppb are compared (Figure B-8), the normalized bias and error were much improved on all of the high ozone dates. Fifteen dates in Run 1, most which were high ozone dates, exceeded the -15 % normalized bias threshold; the corrections in Run 2 helped 10 of these dates to meet the performance goal, while improvements were shown on the other five dates. Normalized error met the performance goals on all dates in Run 2 as the error dropped an average of 10 percentage points from Run 1 to Run 2 on the high ozone dates.

Figure B-9 shows scatter and Q-Q plots from Runs 1 and 2. Only the co-located pairings are displayed (not the best match pairings). Although Run 2 predicts more ozone when the observed levels are low, the scatter plot is much tighter than in Run 1, resulting in a coefficient of determination (correlation squared) almost twice as high (0.35 in Run 2 vs. 0.18 in Run 1).

Time series of 1-hour ozone from Runs 1 and 2 are displayed in Figure B-10. The three sites that showed the greatest differences between the two runs are displayed – Capitol, LSU, and Carville. The emissions updates in Run 2 definitely improved performance in the urban core. Capitol and LSU had much higher daytime peaks in Run 2 compared to the under predicted values in Run 1. Carville's daytime peaks were similar between Runs 1 and 2, but its nighttime lows were higher in Run 2, which are more in line with the observations. Run 1 had nearly depleted all ozone at night on all dates.

Spatial plots of the daily maximum 8-hour ozone in southeast Louisiana are shown in Figure B-11 for the five dates with the highest observed ozone. The domain peak was lower in Run 2 than in Run 1 on all dates, but the ozone minimum in the Baton Rouge urban center was much higher. June 11 exemplifies this: at Capitol, the observed daily maximum 8-hour ozone was 84 ppb, while Run 1 simulated less than 40 ppb over Capitol and Run 2 predicted an 8-hour ozone in the 70s with a domain peak of 83 ppb nearby.

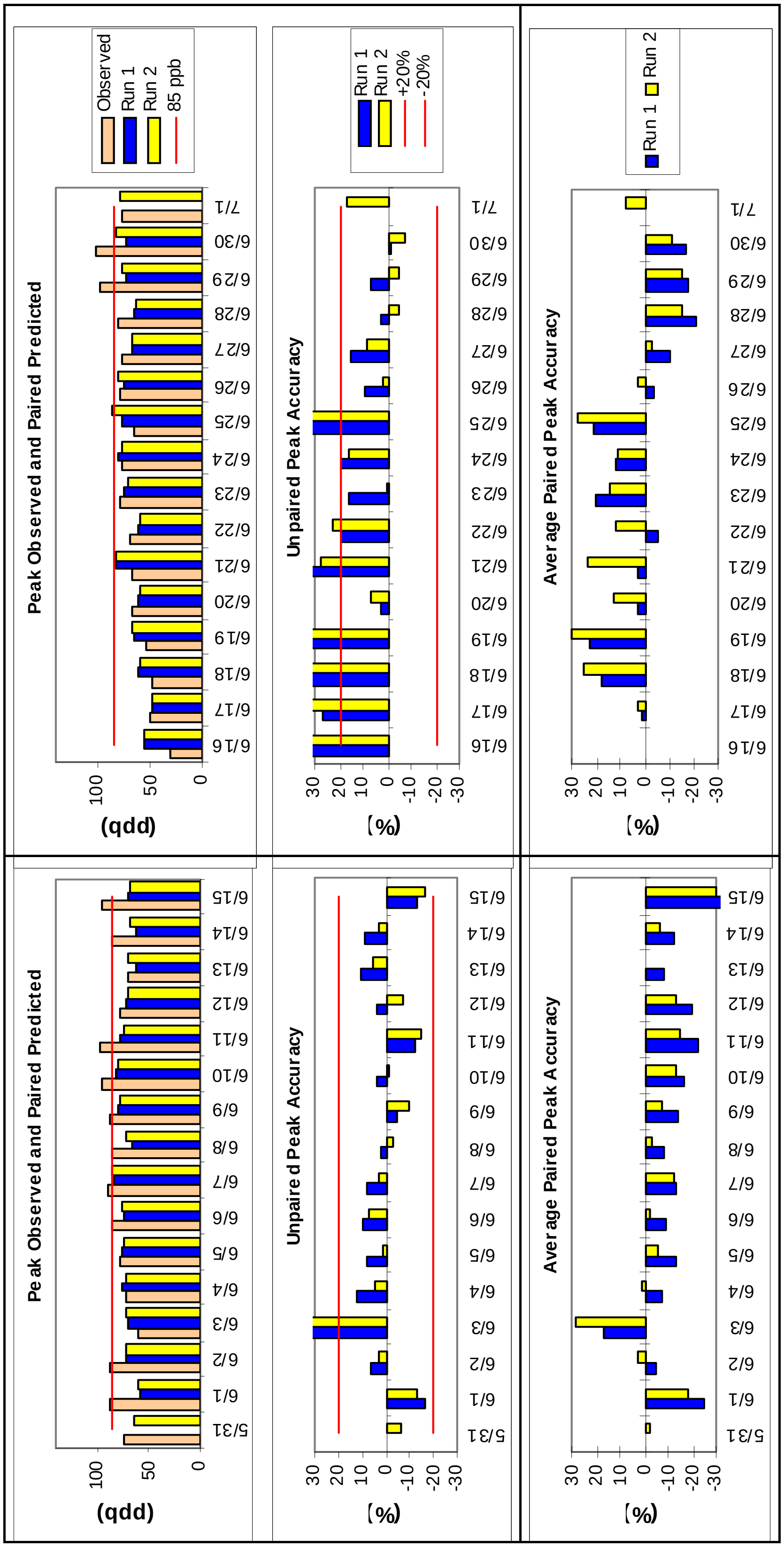


Figure B-7. CAMx Run 1 and 2 model performance statistics for peak 8-hour ozone.

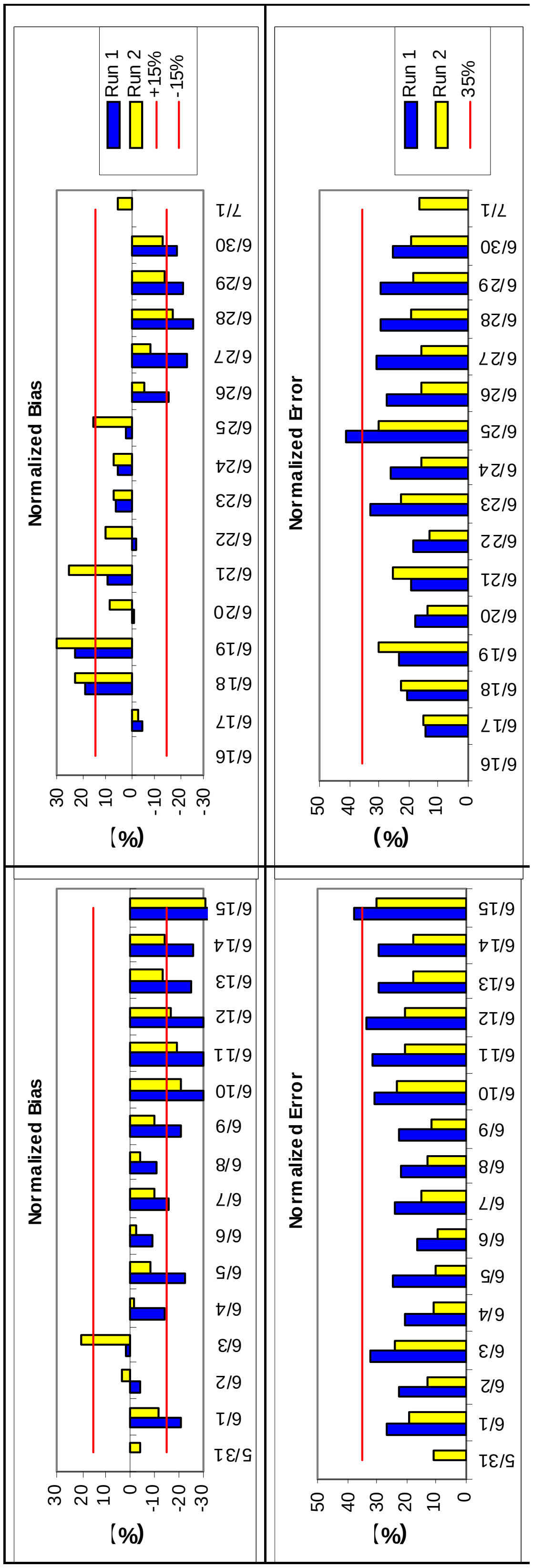
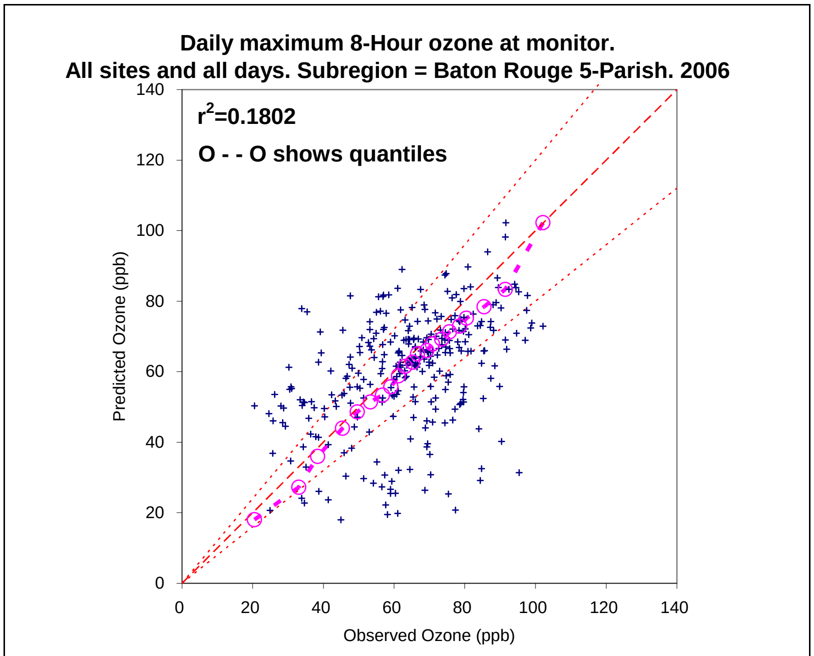


Figure B-8. CAMx Run 1 and 2 model performance statistics for 8-hour ozone over 40 ppb.



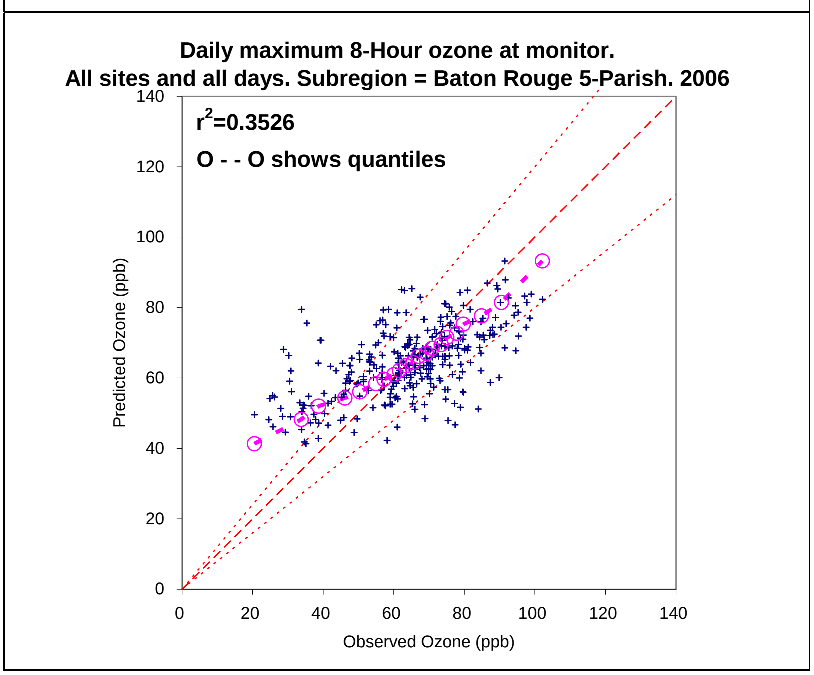


Figure B-9. Scatter and quantile (Q-Q) plots of Run 1 (top) and Run 2 (bottom) daily maximum 8-hour ozone when comparing co-located predictions and observations.

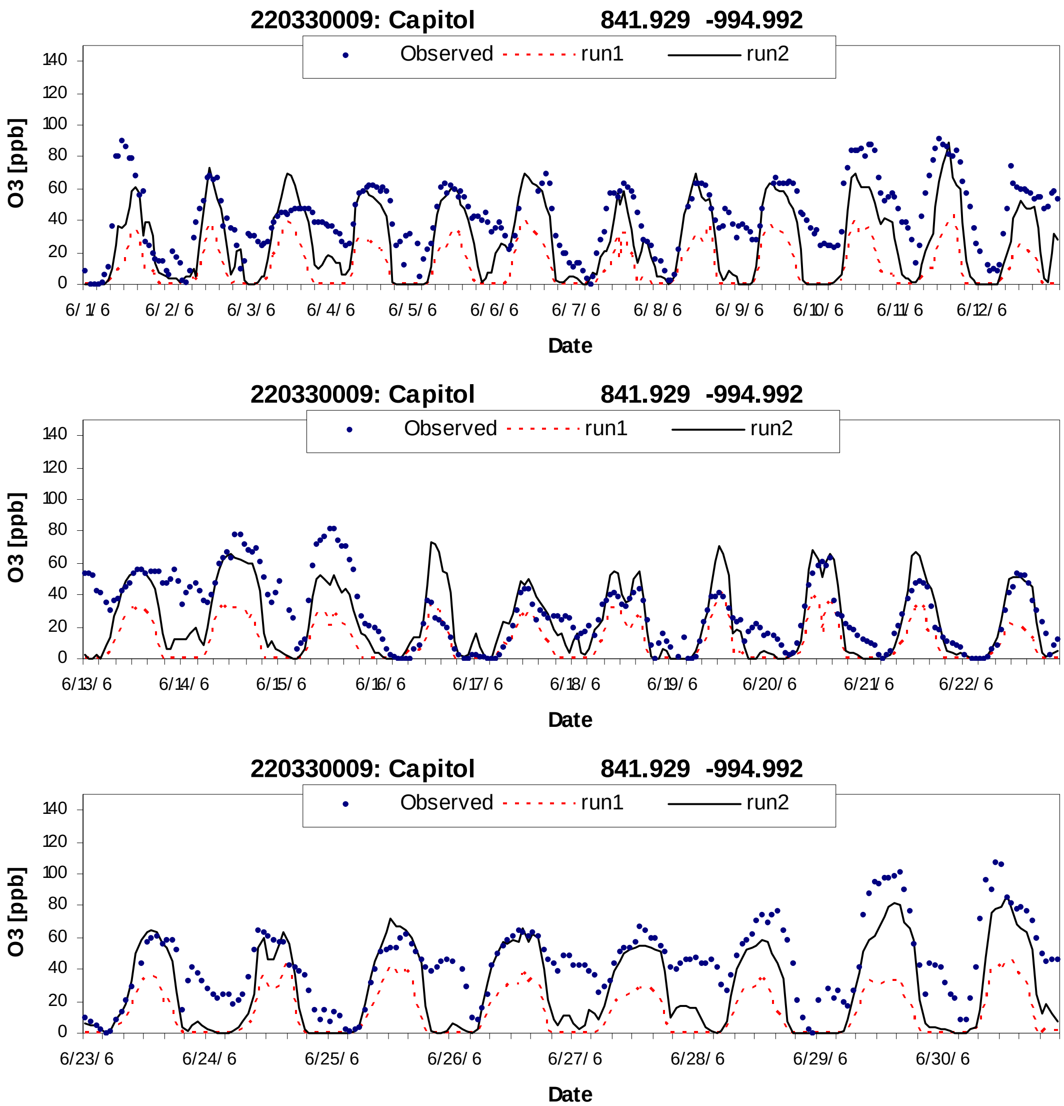


Figure B-10. Time series of observed, Run 1, and Run 2 hourly ozone at Capitol.

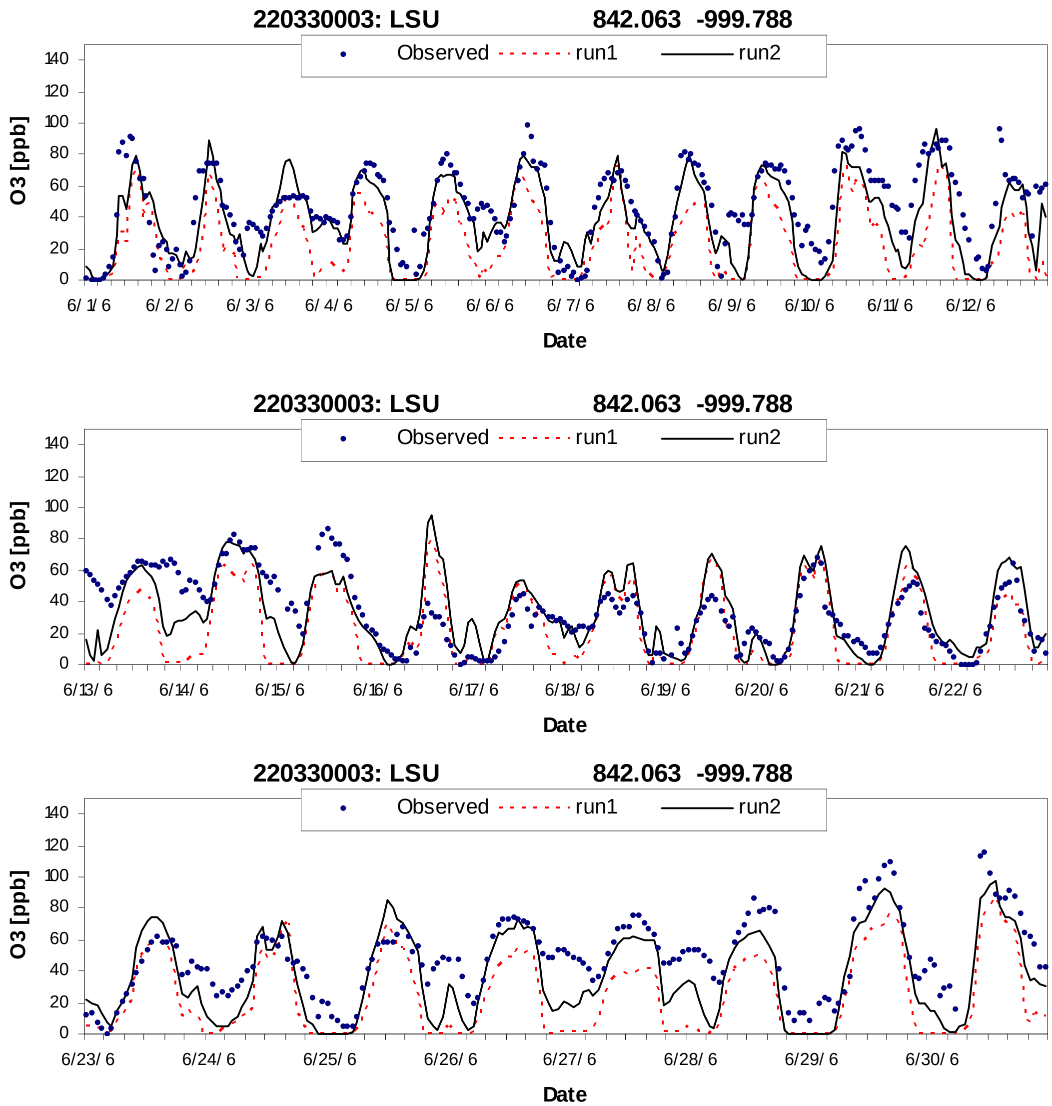


Figure B-10 (continued). Time series of observed, Run 1, and Run 2 hourly ozone at LSU.

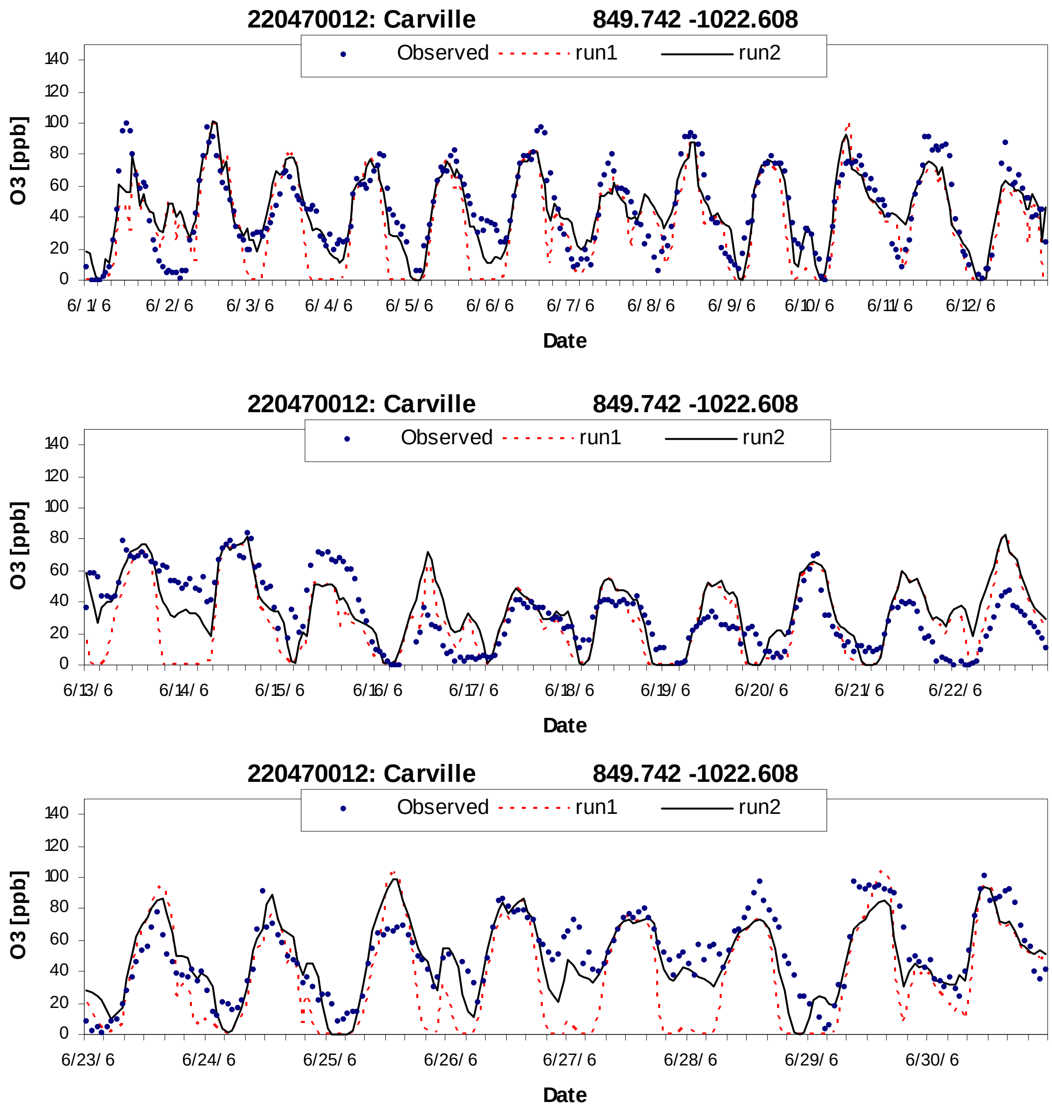


Figure B-10 (concluded). Time series of observed, Run 1, and Run 2 hourly ozone at Carville.

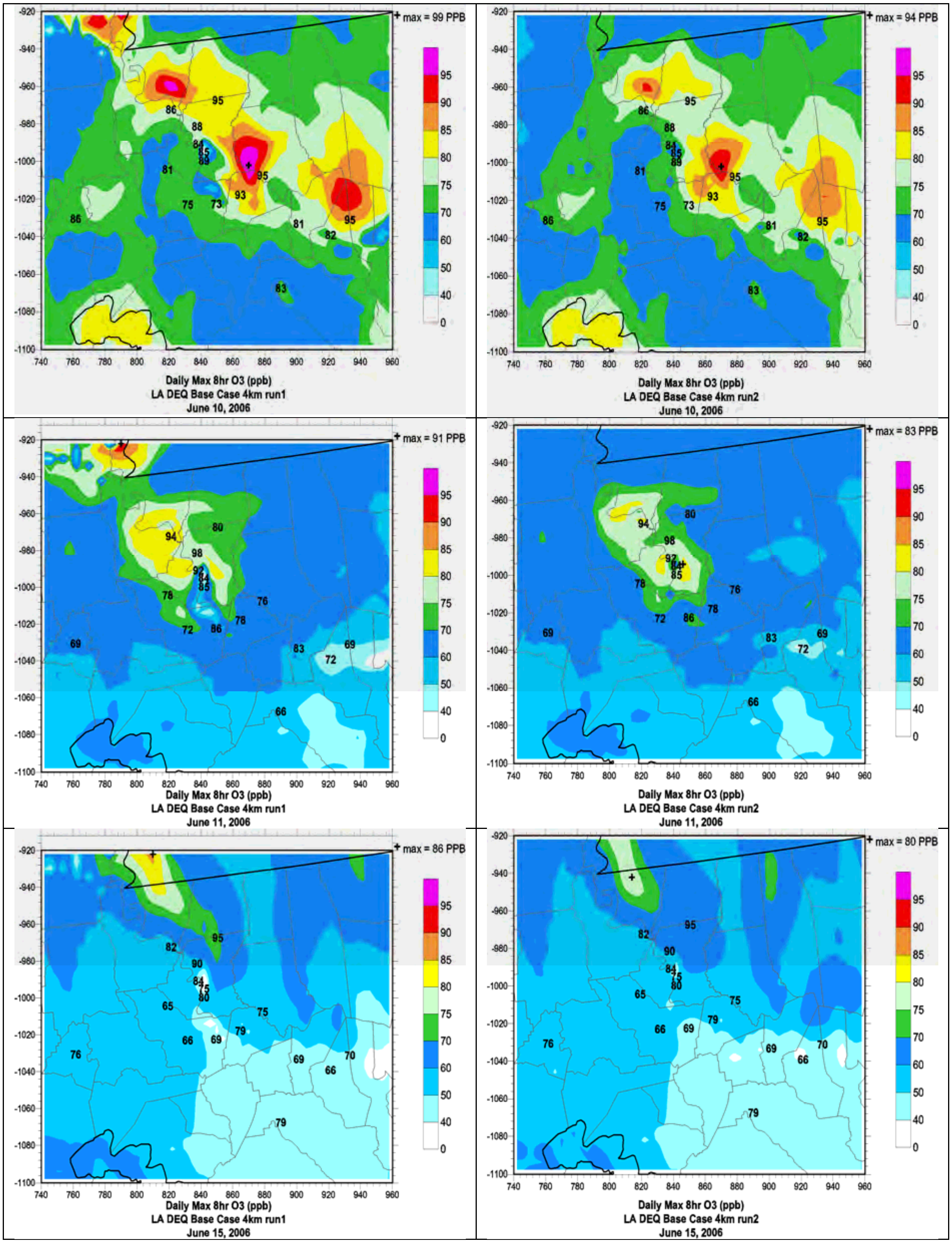


Figure B-11. Spatial plots of daily maximum 8-hour ozone from Run 1 (left) and Run 2 (right) for June 10, 11, and 15.

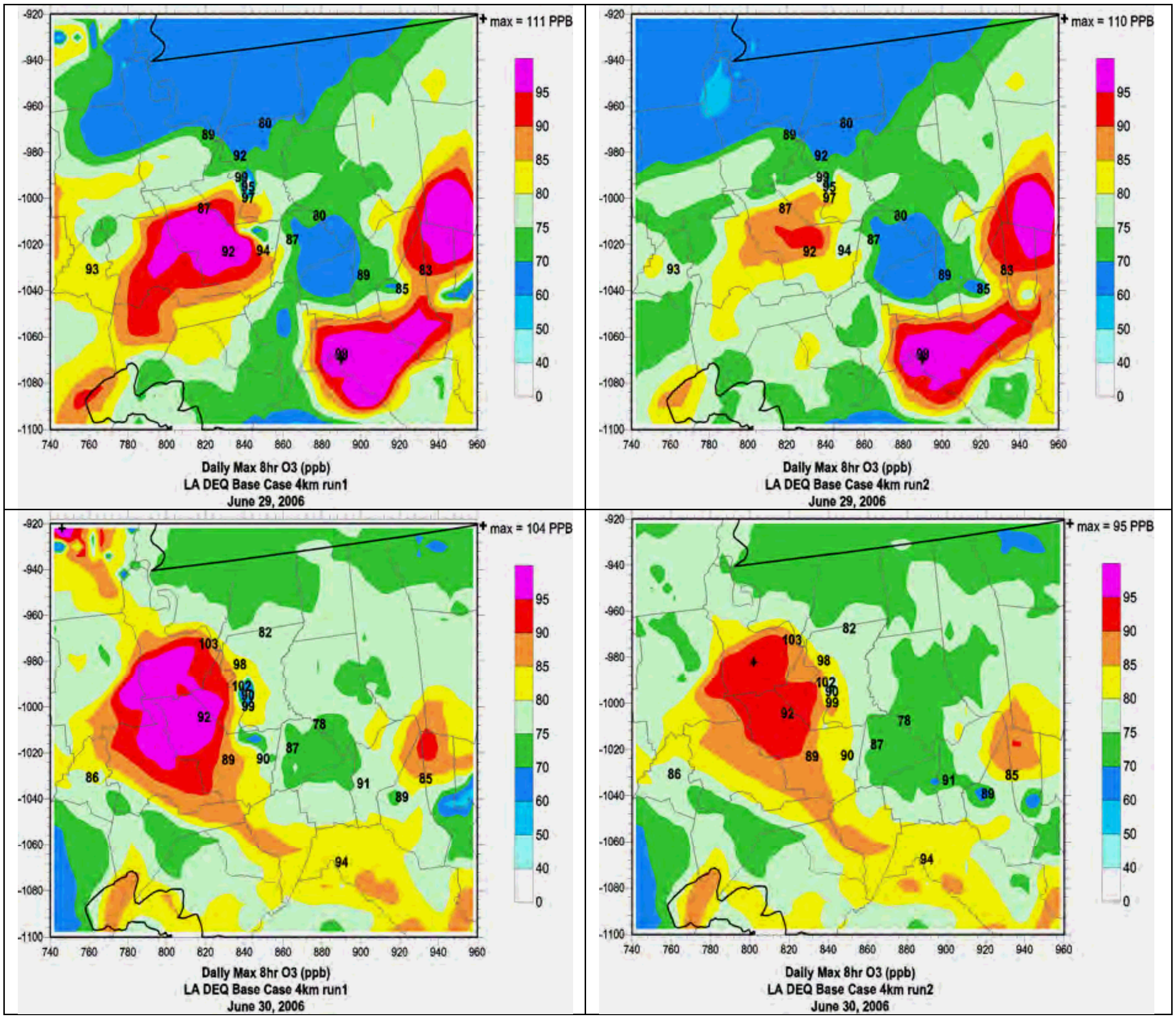


Figure B-11 (concluded). Spatial plots of daily maximum 8-hour ozone from Run 1 (left) and Run 2 (right) for June 29 and 30.

B.3 CAMx RUNS 3 AND 4

Sensitivity tests were performed with different vertical diffusivity inputs, since this is often found to be one of the most important input parameters affecting model performance. Two runs – Run 3 and Run 4 – were configured exactly the same as Run 2 except for the alternative vertical diffusivity input fields. Diffusivities in Run 2 were based on the O'Brien profile methodology with a minimum diffusivity floor set to 0.1 m^2/s. Runs 3 and 4 used the CMAQ approach (an option in the MM5CAMx interface program) with minima set to 1.0 and 0.1 m^2/s, respectively.

Figure B-12 displays vertical profiles of the vertical diffusivity over Capitol from the three runs on the afternoon of June 11. The CMAQ profiles have much higher vertical diffusivities in the boundary layer than the O'Brien approach, which in turn leads to more rapid and complete vertical mixing. This is a common trait among these diffusivity methods.

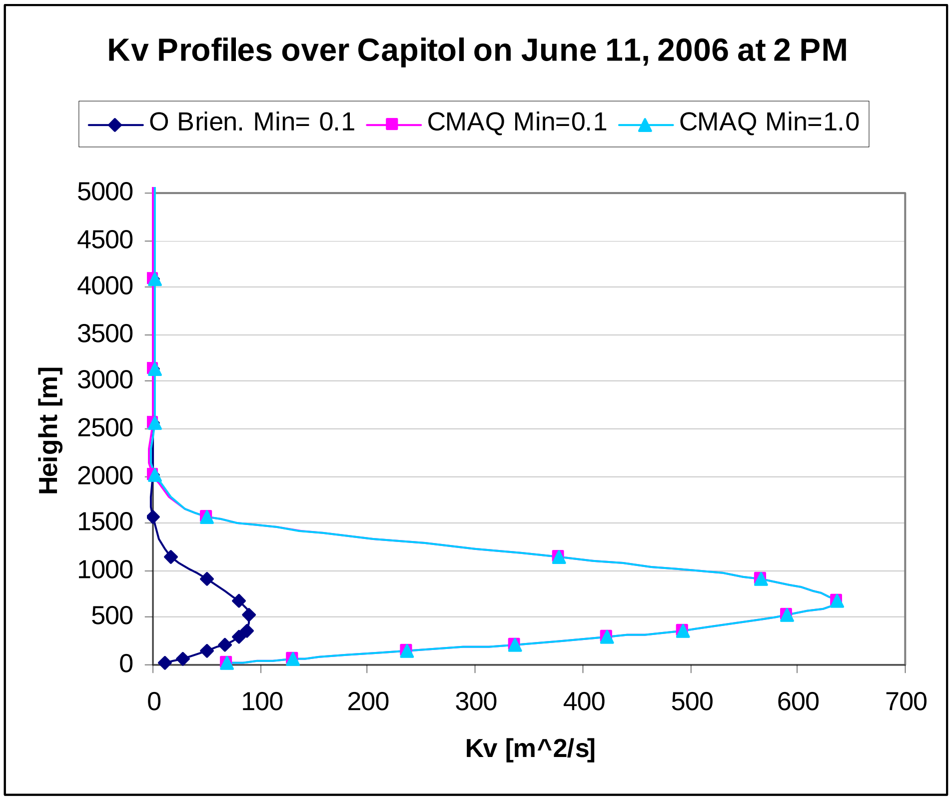


Figure B-12. Profiles of vertical diffusivities (Kv) used in CAMx Runs 1-4.

Model performance statistics for 8-hour ozone compare the impacts of the different vertical diffusivities (Figure B-13 and B-14). Again, the top plot showing the co-located peak ozone among all sites each day shows little impact from these tests. However, the runs with the CMAQ diffusivities (Runs 3 and 4) produced lower peak ozone through more vigorous mixing and thus shifted the unpaired peak accuracies downward on most dates. The use of CMAQ vertical diffusivities over the O'Brien profile improved the average paired peak accuracy on most high ozone dates.

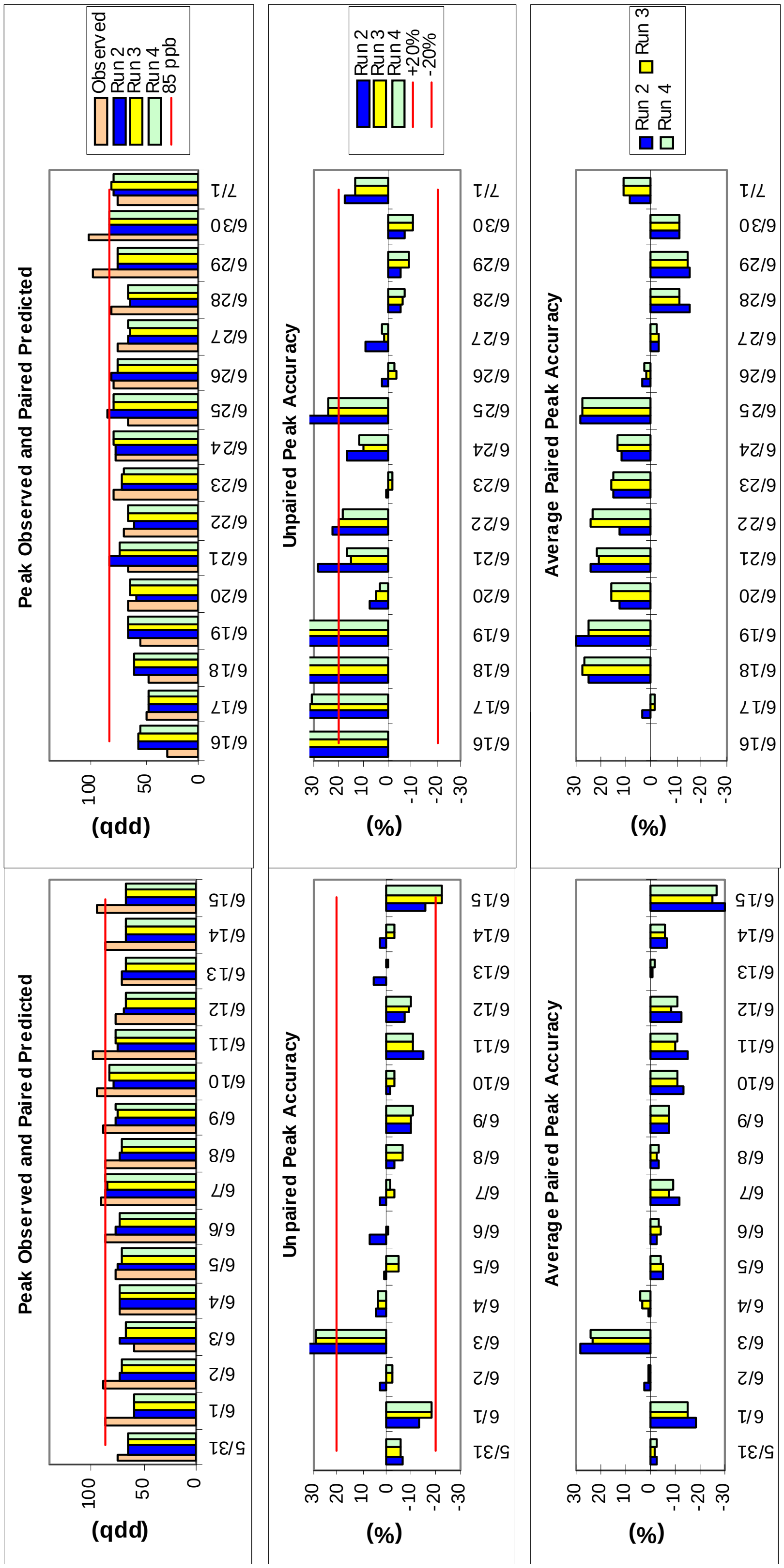


Figure B-13. CAMx Runs 2-4 model performance statistics for peak 8-hour ozone.

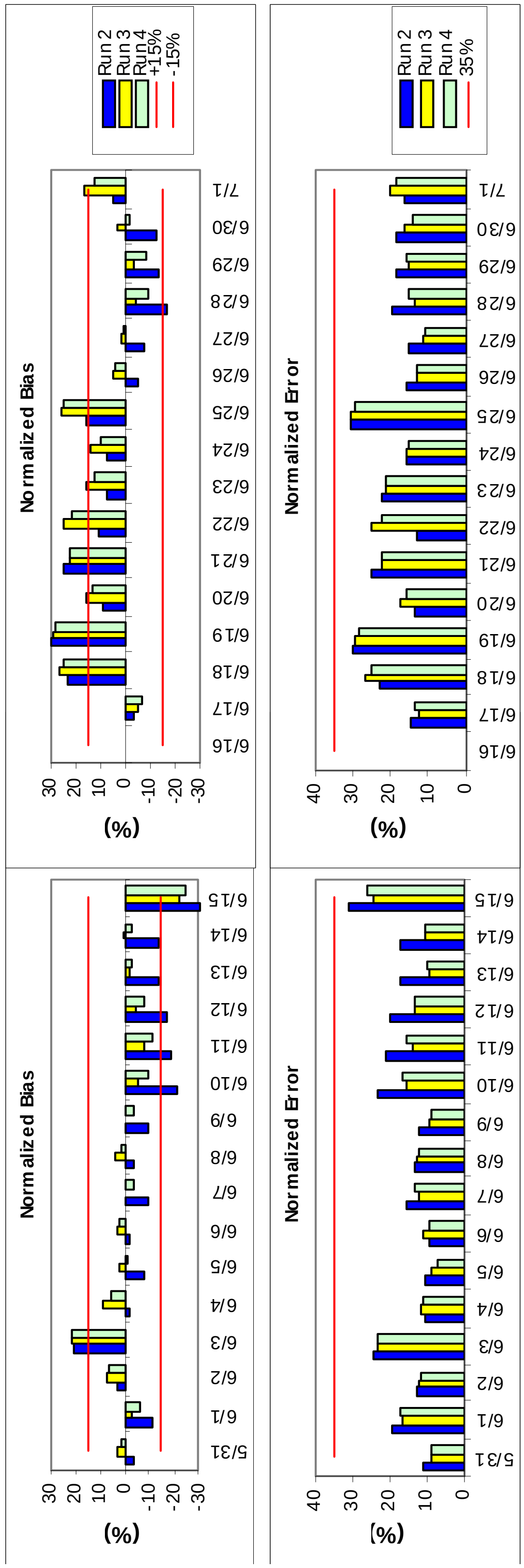


Figure B-14. CAMx Runs 2-4 model performance statistics for 8-hour ozone over 40 ppb.

During the high ozone periods of June 10-15 and June 28-30, normalized bias was much better in Runs 3 and 4 than in Run 2. On these dates, normalized bias exceeded the -15 % performance goal on 5 dates in Run 2; Runs 3 and 4 reduced this number to one – each on June 15. When comparing the two runs using the CMAQ diffusivities, Run 3 (1.0 m^2/s minimum) had better normalized bias than Run 4 (0.1 m^2/s minimum) on each of these dates, but exceeded the +15 % performance goal on July 1 when the other two runs met the goal. Normalized error achieved the 35% performance goal on all dates in all three runs. The use of the CMAQ diffusivities improved the normalized error on all high ozone dates. Normalized error performance between the CMAQ diffusivity runs exhibit mixed results.

Scatter and Q-Q plots from all three runs (Figure B-15) reveal under predicted high ozone values and over predicted low ozone values. Runs 3 and 4 had fewer predicted-observed pairings that fell outside the under predicted goal line when compared to Run 2. This helped increase the coefficient of determination from 0.35 in Run 2 to 0.46 and 0.45 in Runs 3 and 4, respectively.

The runs employing the CMAQ diffusivities performed much better on the high ozone dates than with the O'Brien approach. Run 3 may have had the best statistics on these dates, but time series showed that it predicted nighttime ozone that was often too high at a few sites. Figure B-16 shows time series of hourly ozone at two sites – Grosse Tete and Carville – from June 23 to July 1 to illustrate the differences in nighttime ozone between Runs 2 through 4. Run 2 (O'Brien, 0.1 m^2/s minimum) predicted the lowest ozone at night and was the closest to the observed nighttime values. Run 3 (CMAQ, 1.0 m^2/s minimum), denoted by the red dashes, predicted nighttime ozone that was often higher than Run 2 or Run 4 and much higher than observations, due to enhanced nighttime vertical mixing. Run 4 (CMAQ, 0.1 m^2/s minimum), shown in blue, tended to be in between.

Since the normalized bias and error do not take into account pairings when the observed 8-hour ozone is less than 40 ppb, most of these nighttime pairings are excluded from the statistics. Therefore, the CMAQ diffusivities with a 0.1 m^2/s minimum (Run 4), which had comparable statistics to Run 3 but with better performing nighttime ozone, was chosen to be the best performing among Runs 2 through 4.

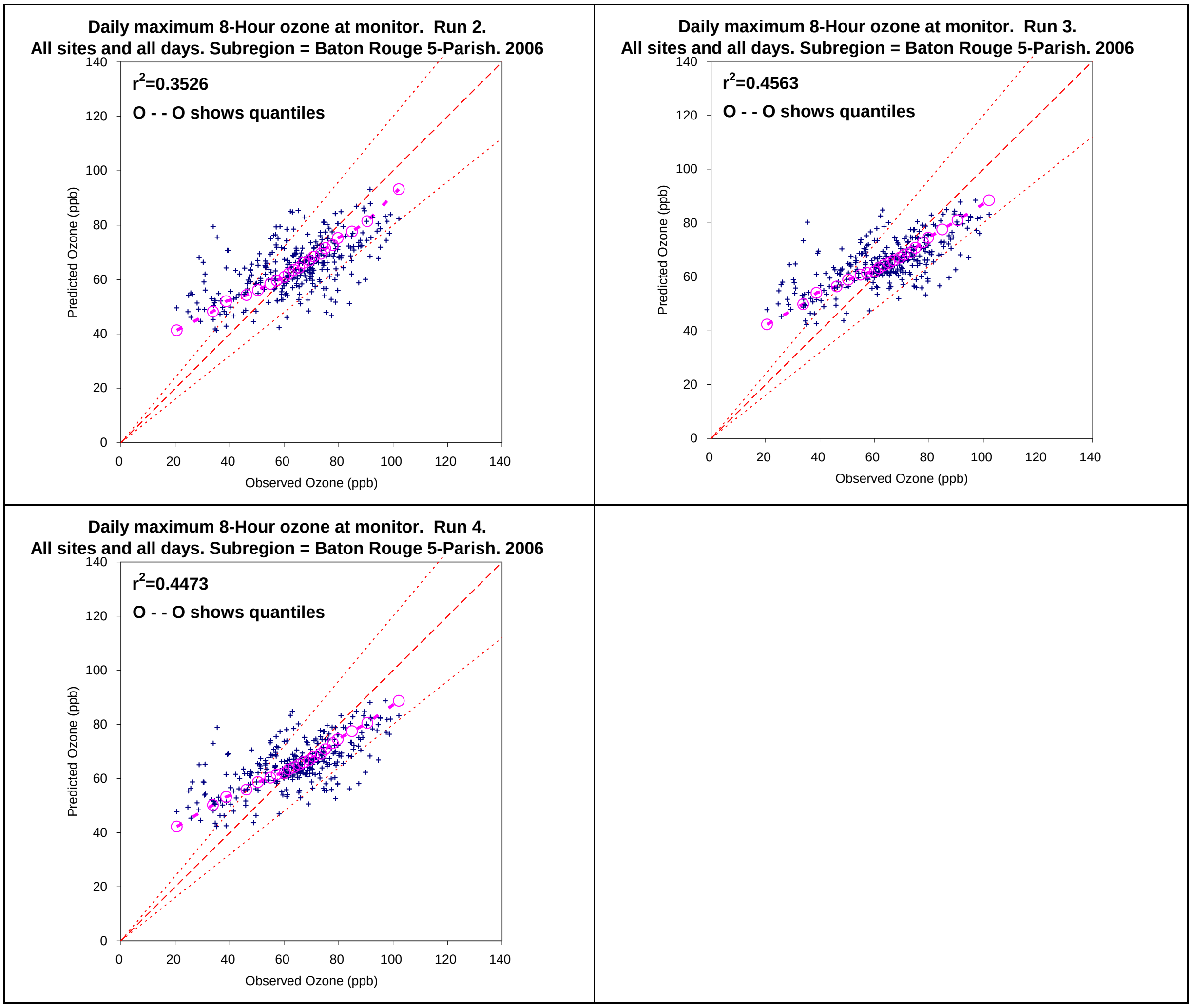


Figure B-15. Scatter and quantile (Q-Q) plots of Run 2 (top left), Run 3 (top right), and Run 4 (bottom left) daily maximum 8-hour ozone when comparing co-located predictions and observations.

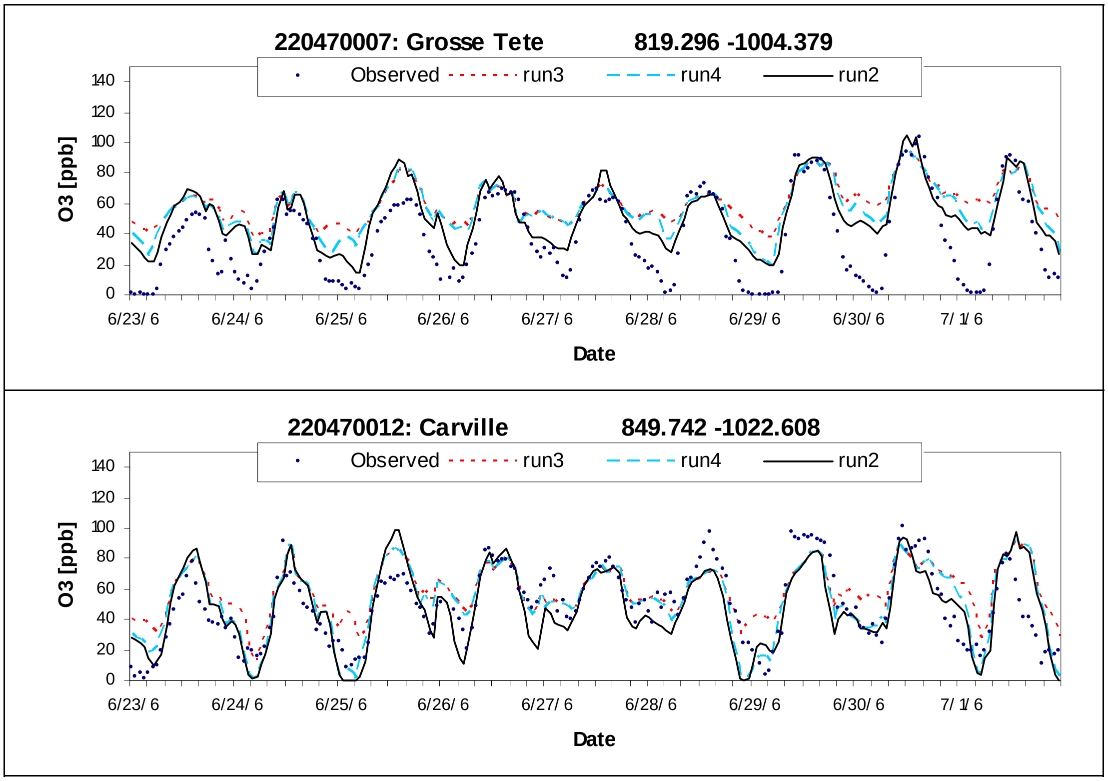


Figure B-16. Time series of 1-hour ozone comparing Runs 2, 3, and 4.

B.4 CAMx RUN 5

Run 5 introduced the CAMx Plume in Grid (PiG) sub-model to examine its impacts on ozone in the Baton Rouge area. This run was similar to Run 2 in every other respect. The PiG treats point source emissions in a Lagrangian puff model until the puffs become large enough to be integrated into a grid cell. Point sources in Louisiana emitting at least 2 TPD NOx on any date during the episode were flagged for PiG. The threshold was increased outside the state; to 5 TPD in Mississippi and to 20 TPD everywhere else. A total of 262 points were flagged for PiG. Figure B-17 shows the location of the PiG point sources and their proximity to the ozone monitoring sites.

Spatial plots of daily maximum 8-hour ozone from Run 5 on the five dates with the highest observed 8-hour ozone are shown in the left column of Figure B-18. The right column displays differences in the daily maximum between Runs 2 and 5, thereby showing the impacts from using the PiG submodel. On each of these five dates, the PiG had very little impact over the Baton Rouge 5-Parish area, where all differences were less than 1 ppb. One PiG point source in East Baton Rouge Parish, which emitted up to 3.3 TPD NOx, had fractional changes locally; the three co-located point sources in Pointe Coupee Parish, each emitting as much as 11-15 TPD NOx, had greater impacts using PiG, but on these five dates, their plumes were never oriented towards the Baton Rouge area. Model performance statistics were mostly unchanged between Runs 2 and 5 (not shown).

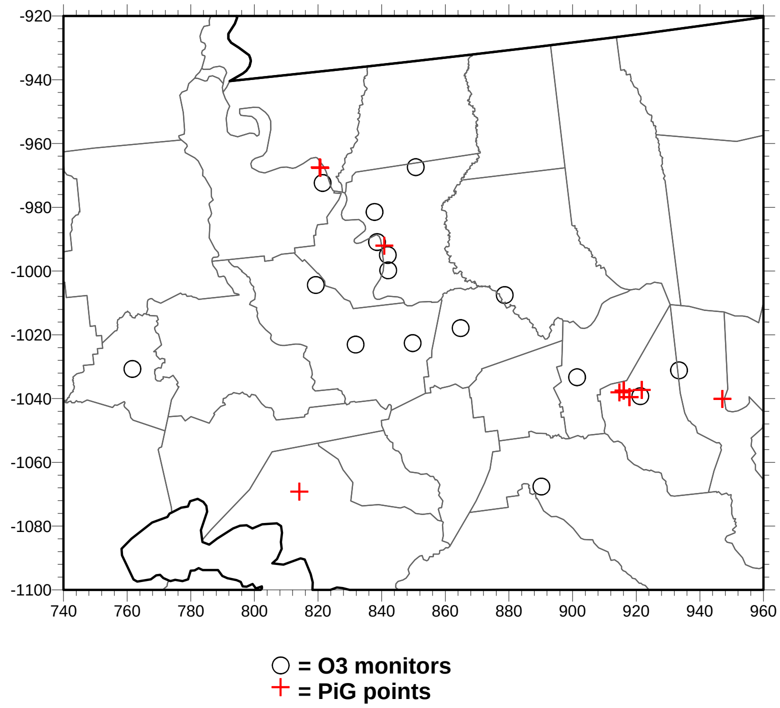


Figure B-17 Location of PiG point sources in central Louisiana.

B.5 CAMx RUNS 6 AND 7

Runs 1 through 5 all used boundary conditions that had been developed and used by the TCEQ for their past modeling work, where the lateral boundaries over land, up through the boundary layer, were assigned a set of moderate background concentrations, and all other boundaries were set to clean conditions (see Section 4.2). Two CAMx runs evaluated impacts on 8-hour ozone from employing alternative sets of lateral boundary conditions. Run 6 applied June-averaged, spatially and diurnally-variant boundary conditions obtained from Alpine Geophysics (developed for their modeling of the May 2005 Baton Rouge episode), which were in turn taken from the 2002 CMAQ VISTAS simulation on the 36-km unified Regional Planning Organization (RPO) grid using boundary conditions extracted from the Harvard GEOS-CHEM global model. The boundary conditions extracted by Alpine Geophysics contained 19 vertical layers, so it was necessary to re-map them to the 20-layer Baton Rouge nested grid system. Run 7 applied June 2006 date-specific spatially-varying boundary conditions extracted from a 2006 run of the RPO grid using boundary conditions extracted from NCAR's MOZART global model. Both Runs 6 and 7 were configured with the best performing options thus far; namely, vertical diffusivities based on the CMAQ approach (with 0.1 m^2/s minimum) from Run 4. The PiG sub-model was also retained for these simulations.

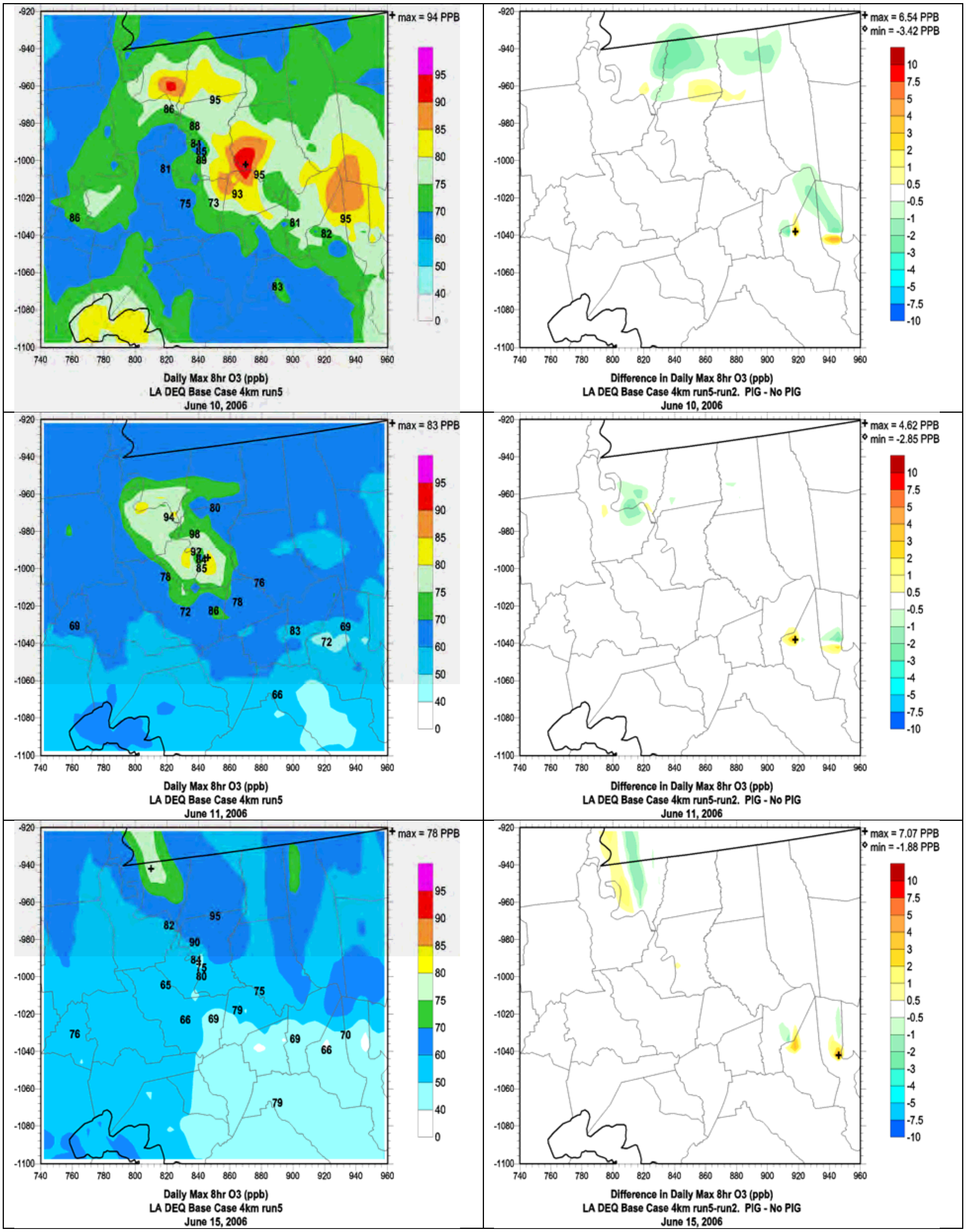


Figure B-18. Spatial plots of the daily maximum 8-hour ozone in Run 5 (left) and its differences from Run 2 (right).

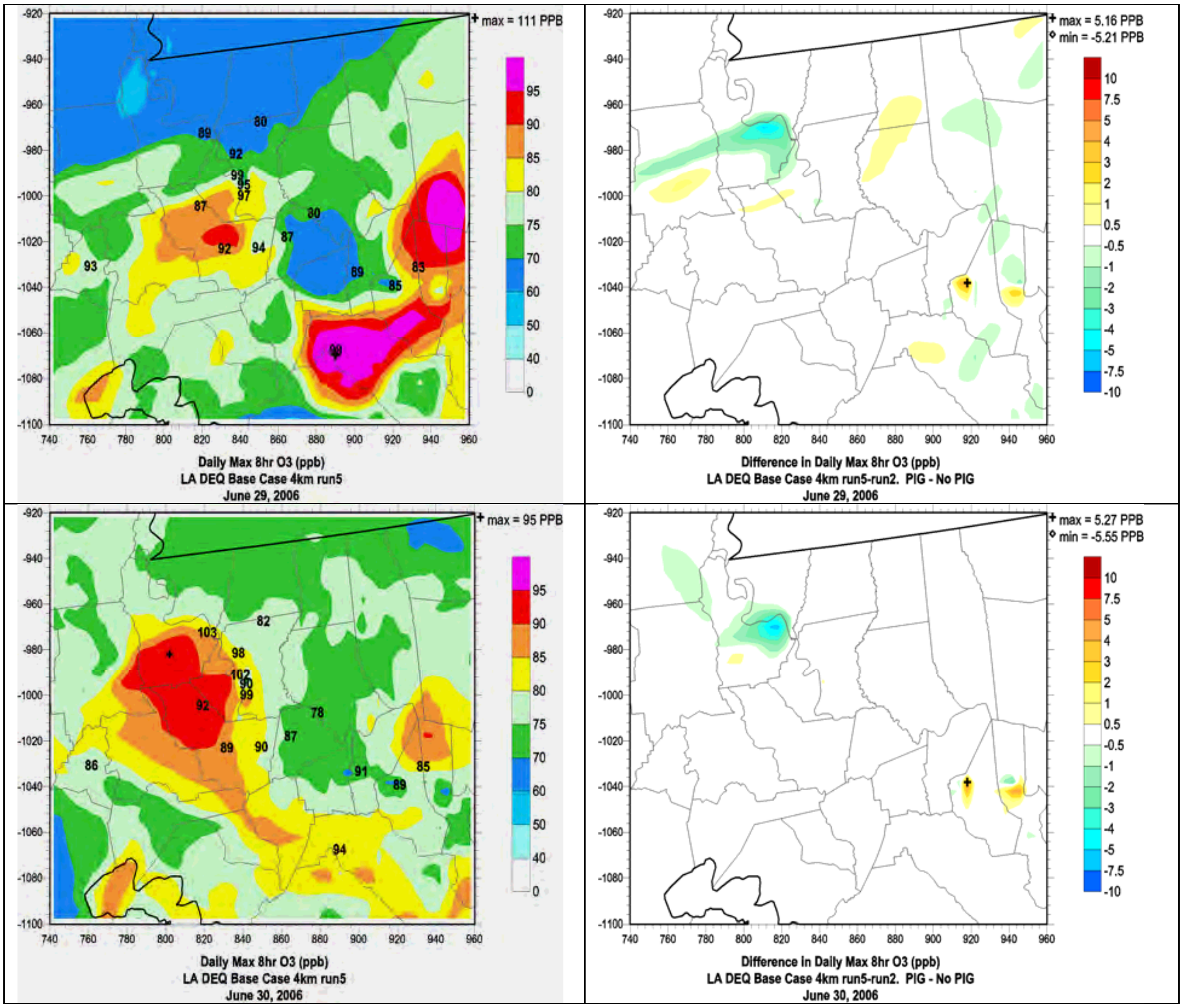


Figure B-18 (concluded). Spatial plots of the daily maximum 8-hour ozone in Run 5 (left) and its differences from Run 2 (right).

Model performance statistics comparing 8-hour ozone in Runs 4, 6, and 7 are shown in Figure B-19 and B-20. Run 7 predicted lower daily maximum 8-hour ozone values than the other two runs on almost every date, which were reflected by the more negative (and less positive) unpaired and average paired peak accuracy statistics (Figure B-19). Run 7 peak accuracy was the worst among the three runs on the high ozone dates, while Run 6 was slightly better than Run 4. Runs 4 and 6 were mixed in performance for normalized bias; both performed better than Run 7 on the high ozone dates (Figure B-20). Run 7 exhibited a downward shift in normalized bias relative to the other runs on all dates. On June 11 and 28, Run 7 exceeded the -15 % performance goal when Runs 4 and 6 met the goal. Conversely, on four low ozone dates (June 3, 18, 21, and 22), Run 4 exceeded the +15% threshold while Run 7 met the goal on each of these dates and Run 6 met the goal on the latter two dates. Normalized error was highest in Run 7 on the high ozone dates. Runs 4 and 6 both performed better than Run 7 as all dates met the 35% performance goal. Run 6 exhibited much lower error than Run 4 on the low ozone dates except for June 17. Ozone on June 15 continued to be well under predicted in all three runs.

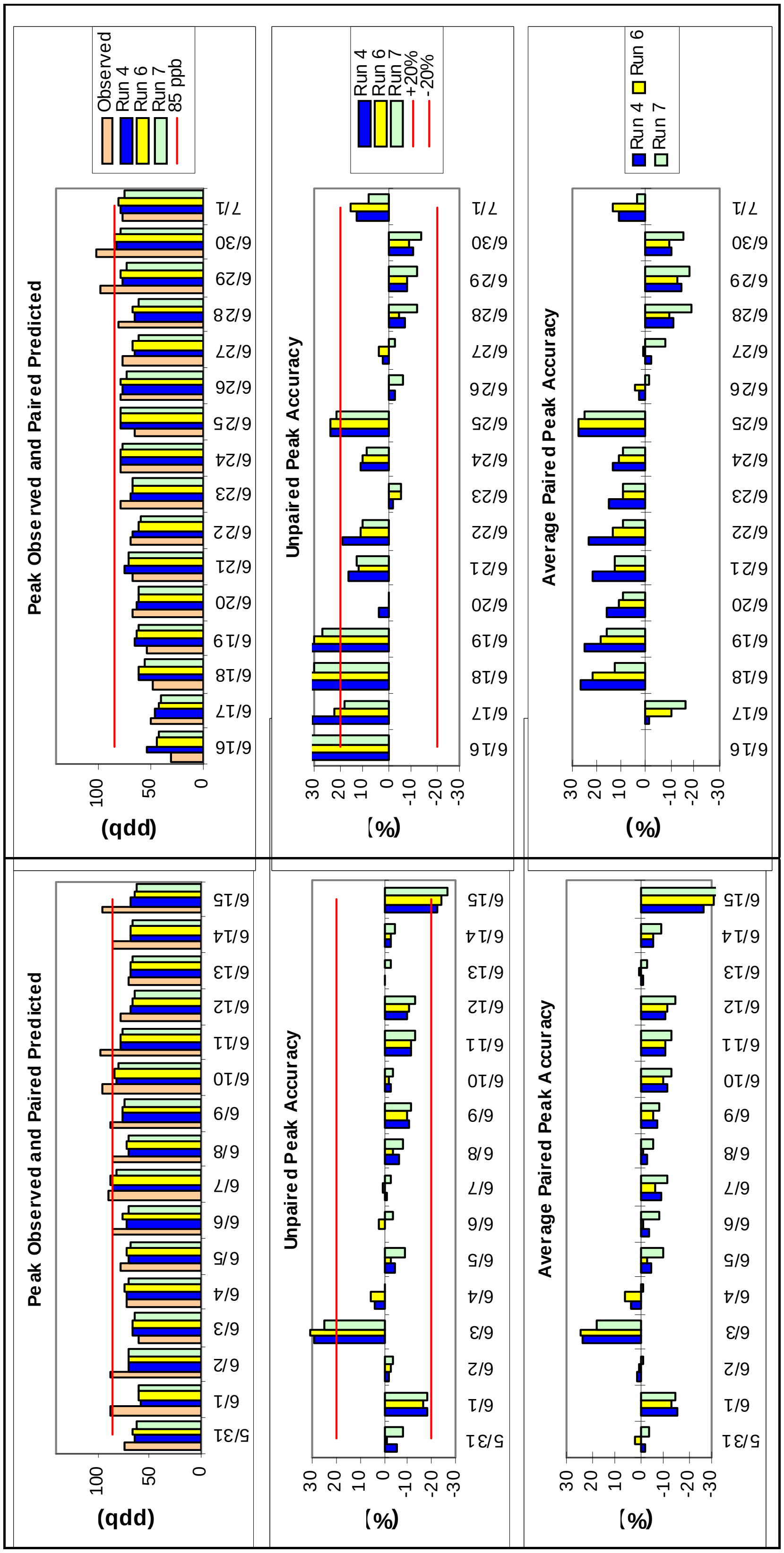


Figure B-19. CAMx Runs 4, 6, and 7 model performance statistics for peak 8-hour ozone.

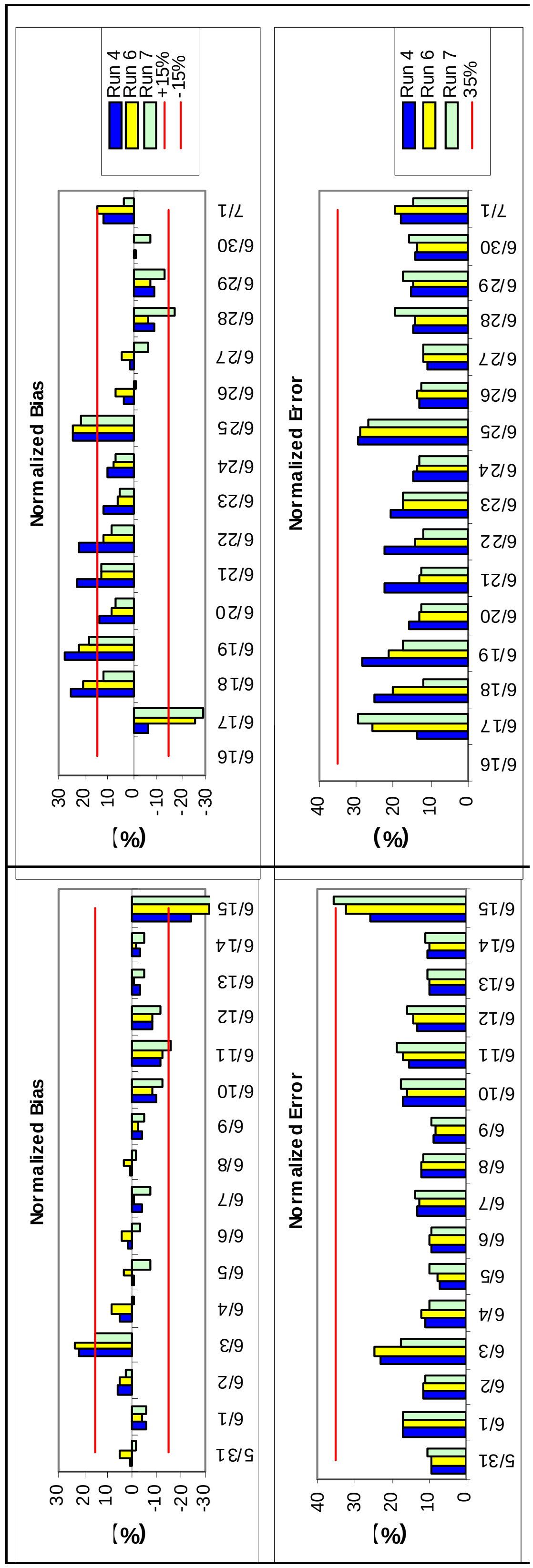


Figure B-20. CAMx Runs 4, 6, and 7 model performance statistics for 8-hour ozone over 40 ppb.

Scatter and Q-Q plots of the daily maximum 8-hour ozone are shown in Figure B-21 from Run 4, 6, and 7. Run 4 under predicted the high ozone and over predicted the low ozone. Run 6 showed a similar trend but did not over predict as much for low ozone pairings. Run 7 predicted lower ozone than Run 4 and 6, regardless of the magnitude of the observed ozone; its quantiles were worse for high ozone and better for low ozone. Run 6 had the highest coefficient of determination among the three runs at 0.55, compared to the 0.44 and 0.51 from Run 4 and 7, respectively.

Figure B-22 displays spatial plots of the daily maximum 8-hour ozone from Runs 4, 6, and 7 going from left to right. Differences from Run 4 are shown below each corresponding run. Each of the five high-ozone dates is included. The daily maximum 8-hour ozone was lower in Run 7 compared to Run 4 almost everywhere in the domain on all five of these dates, verifying the more negative values in the peak accuracy and normalized bias statistics. Run 6 had mixed results, showing widespread increases compared to Run 4 on June 10, 29, and 30, and mixed results on June 11 and 15.

Among the three sets of boundary conditions, those used by TCEQ (Run 4) and Alpine Geophysics (Run 6) produced comparable results on the high ozone dates. Since Run 6 produced better statistics than Run 4 on the low ozone dates, Run 6 was deemed the best run to date. Boundary conditions extracted from the RPO domain using MOZART boundary conditions (Run 7) produced too little ozone on the high ozone dates. We had since realized that MOZART boundary conditions were not properly extracted for the LDEQ 36-km grid, and so this case was revisited in Run 10a.

B.5.1 Ozone Precursor Performance

Simulated NOx and VOC precursor performance was gauged against available measurements in the Baton Rouge area for the best performing simulation (Run 6). Hourly NOx measurements were available from all 10 sites that measure ozone, while 3-hour PAMS VOC canister data were available from four sites (Pride, Capitol, LSU, and Bayou Plaquemine). Capitol was the only PAMS site for which samples were available on a daily basis, while data from other sites were available every few days. The PAMS data included 56 non-methane organic compounds (NMOC) reported in units of ppb carbon (ppbC). The data included isoprene, but not specifically terpene; furthermore, the data did not include alcohols (methanol or ethanol) or carbonyls (e.g., formaldehyde). The 56 NMOC concentrations were aggregated to 8 CB05 VOC compounds using weight fractions developed by EPA. The evaluation of VOC and VOC:NOx performance centered on the analysis of the 6-9 AM period as a way to gauge the accuracy of the emission inventory. We chose this period because it reflects the heavy contribution from mobile sources during peak commute hours, while preceding the growth of the surface boundary layer (VOC loss due to mixing) and the onset of significant photochemistry (loss due to chemistry).

B.5.1.1 NOx Performance

Figure B-23 displays 1-hour time series of measured and Run 6 predicted NOx at four representative sites. Performance at Pride suggests that some of the highest observed concentrations occurring over the period are well replicated in Run 6, but generally the daily

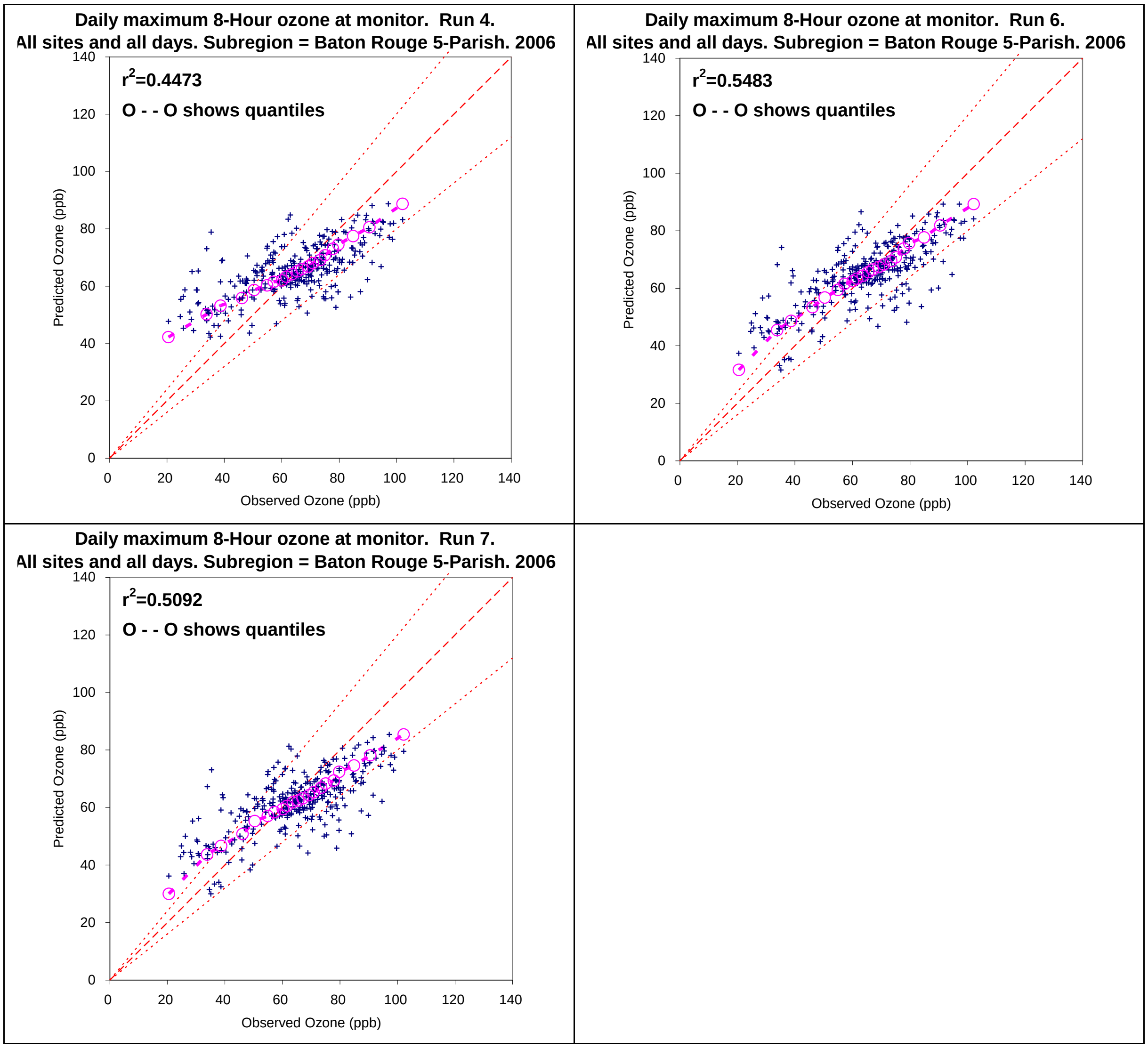


Figure B-21. Scatter and quantile (Q-Q) plots of Run 4 (top left), Run 6 (top right), and Run 7 (bottom left) daily maximum 8-hour ozone when comparing co-located predictions and observations.

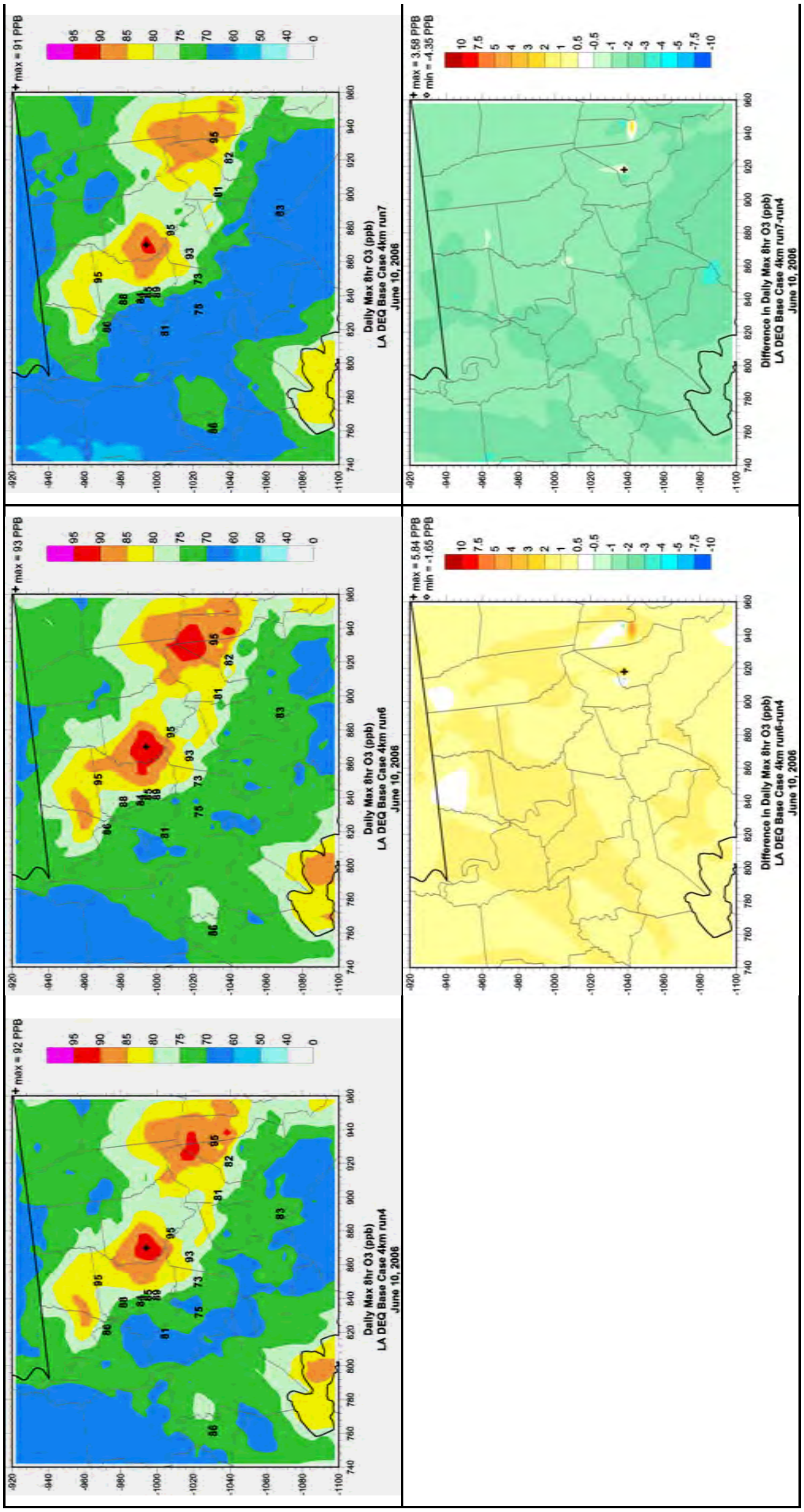


Figure B-22. Spatial plots of daily maximum 8-hour ozone on June 10 from Run 4 (top left), Run 6 (top middle), Run 7 (top right), and corresponding differences from the daily maximum of Run 4 (bottom).

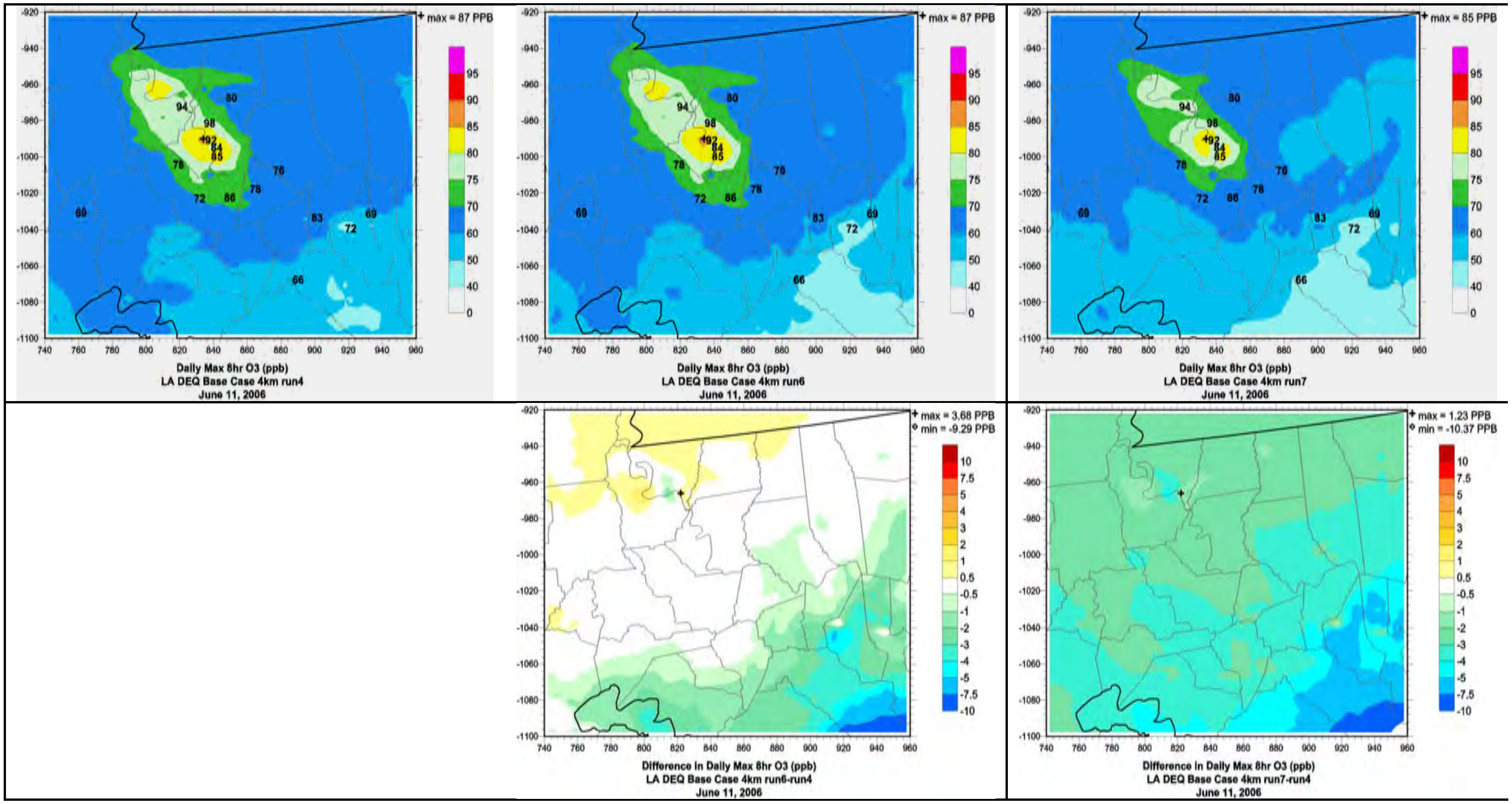


Figure B-22 (continued). Spatial plots of daily maximum 8-hour ozone on June 11 from Run 4 (top left), Run 6 (top middle), Run 7 (top right), and corresponding differences from the daily maximum of Run 4 (bottom).

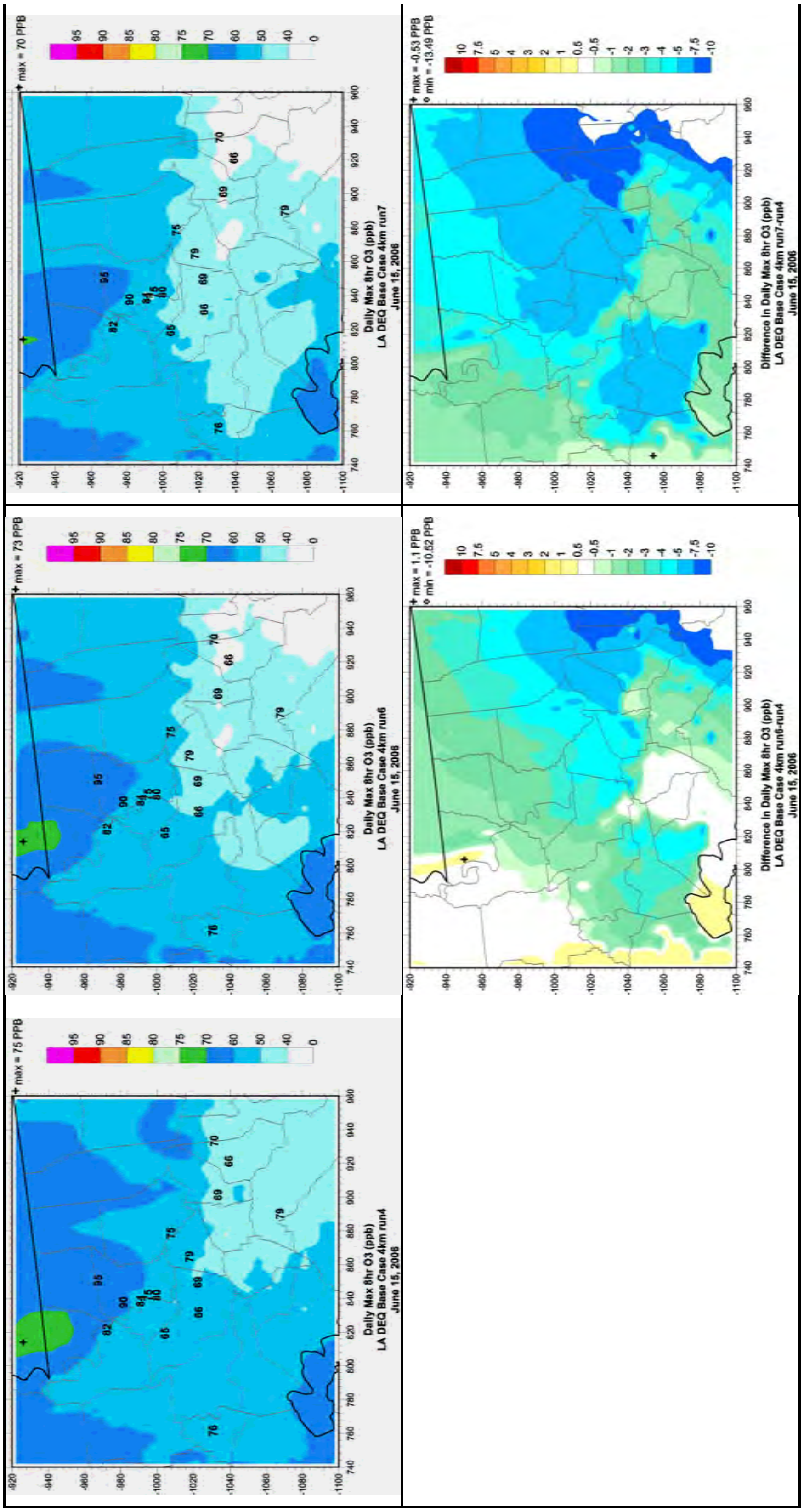


Figure B-22 (continued). Spatial plots of daily maximum 8-hour ozone on June 15 from Run 4 (top left), Run 6 (top middle), Run 7 (top right), and corresponding differences from the daily maximum of Run 4 (bottom).

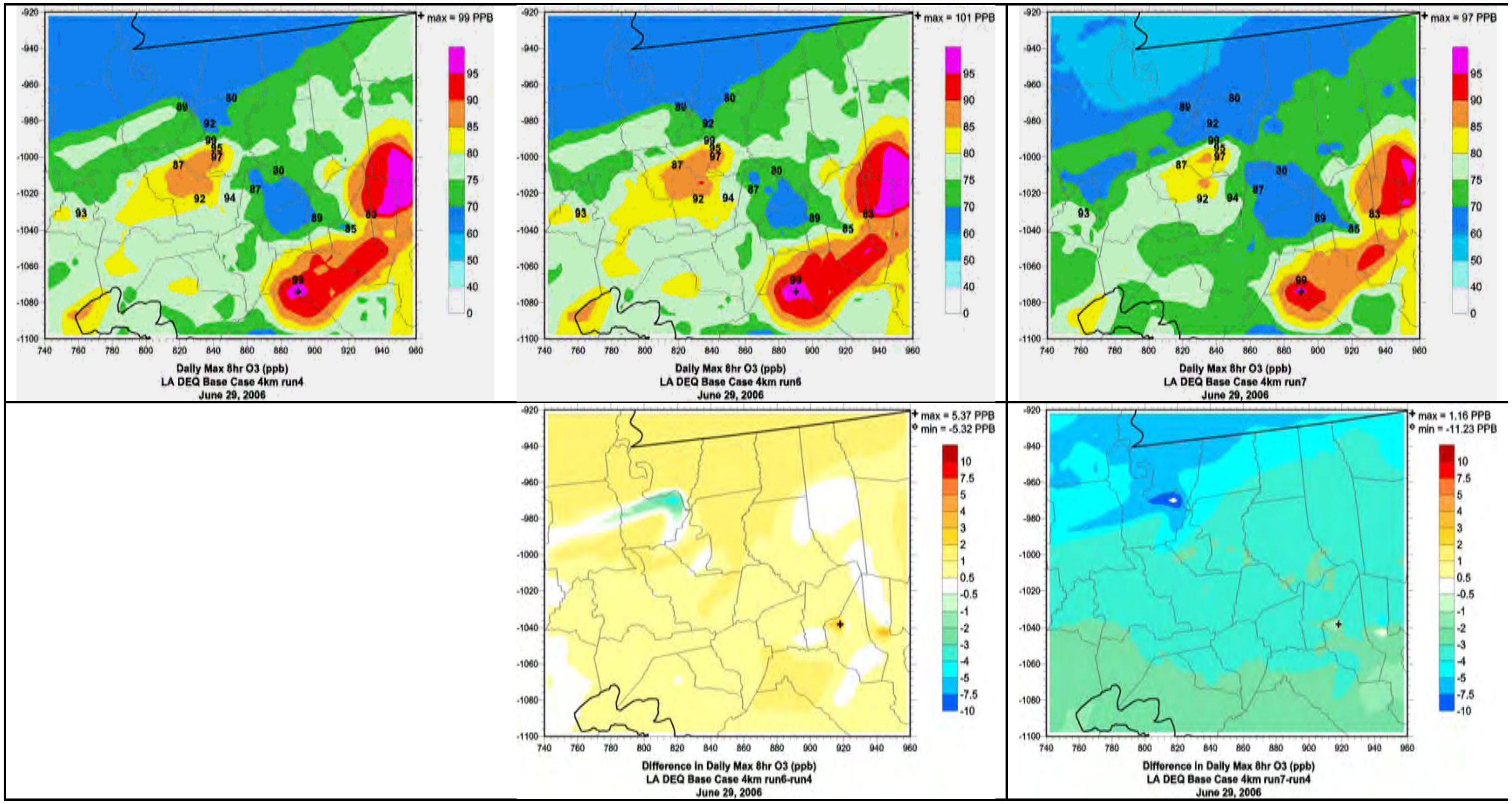


Figure B-22 (continued). Spatial plots of daily maximum 8-hour ozone on June 29 from Run 4 (top left), Run 6 (top middle), Run 7 (top right), and corresponding differences from the daily maximum of Run 4 (bottom).

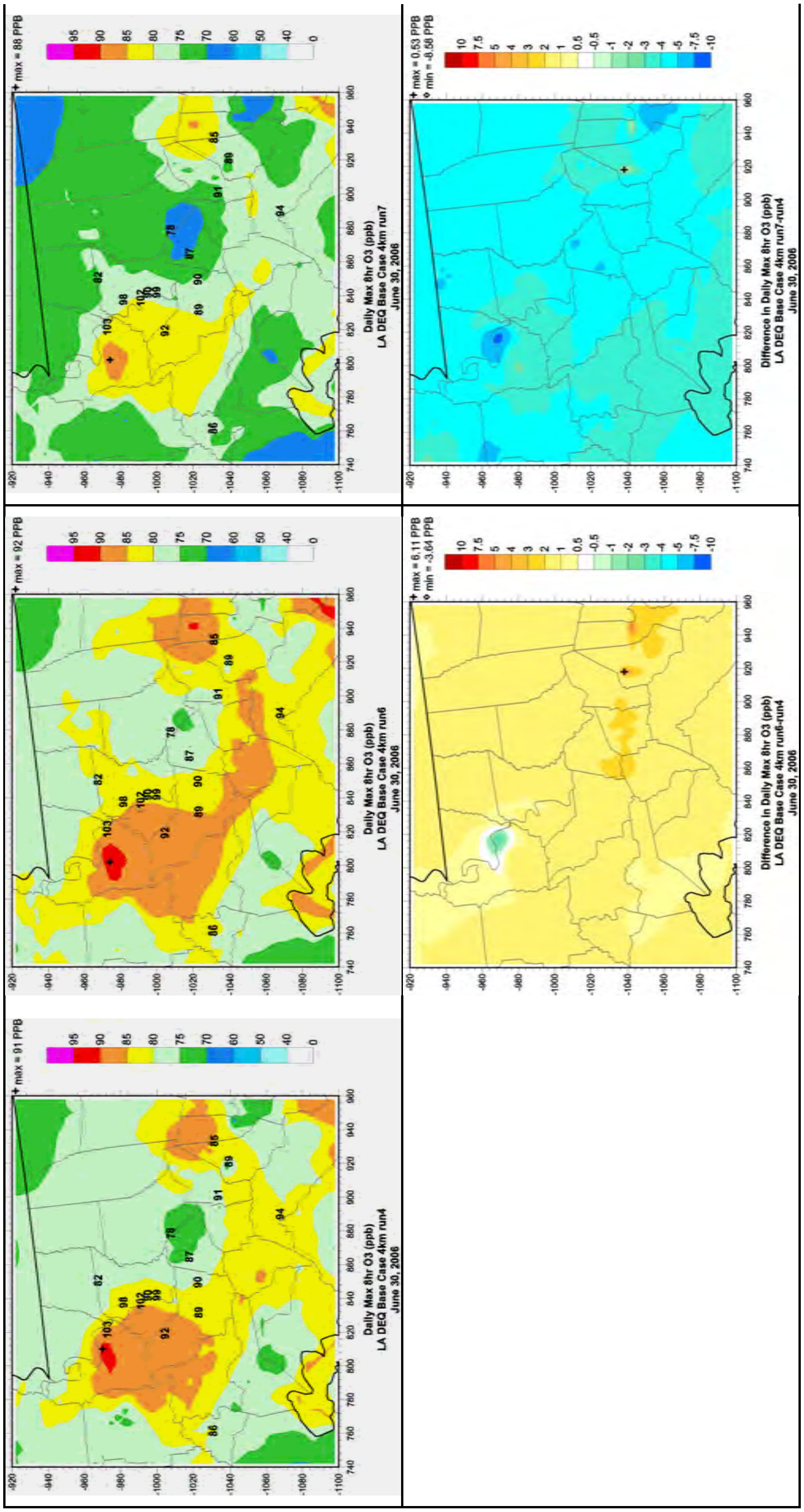


Figure B-22 (concluded). Spatial plots of daily maximum 8-hour ozone on June 30 from Run 4 (top left), Run 6 (top middle), Run 7 (top right), and corresponding differences from the daily maximum of Run 4 (bottom).

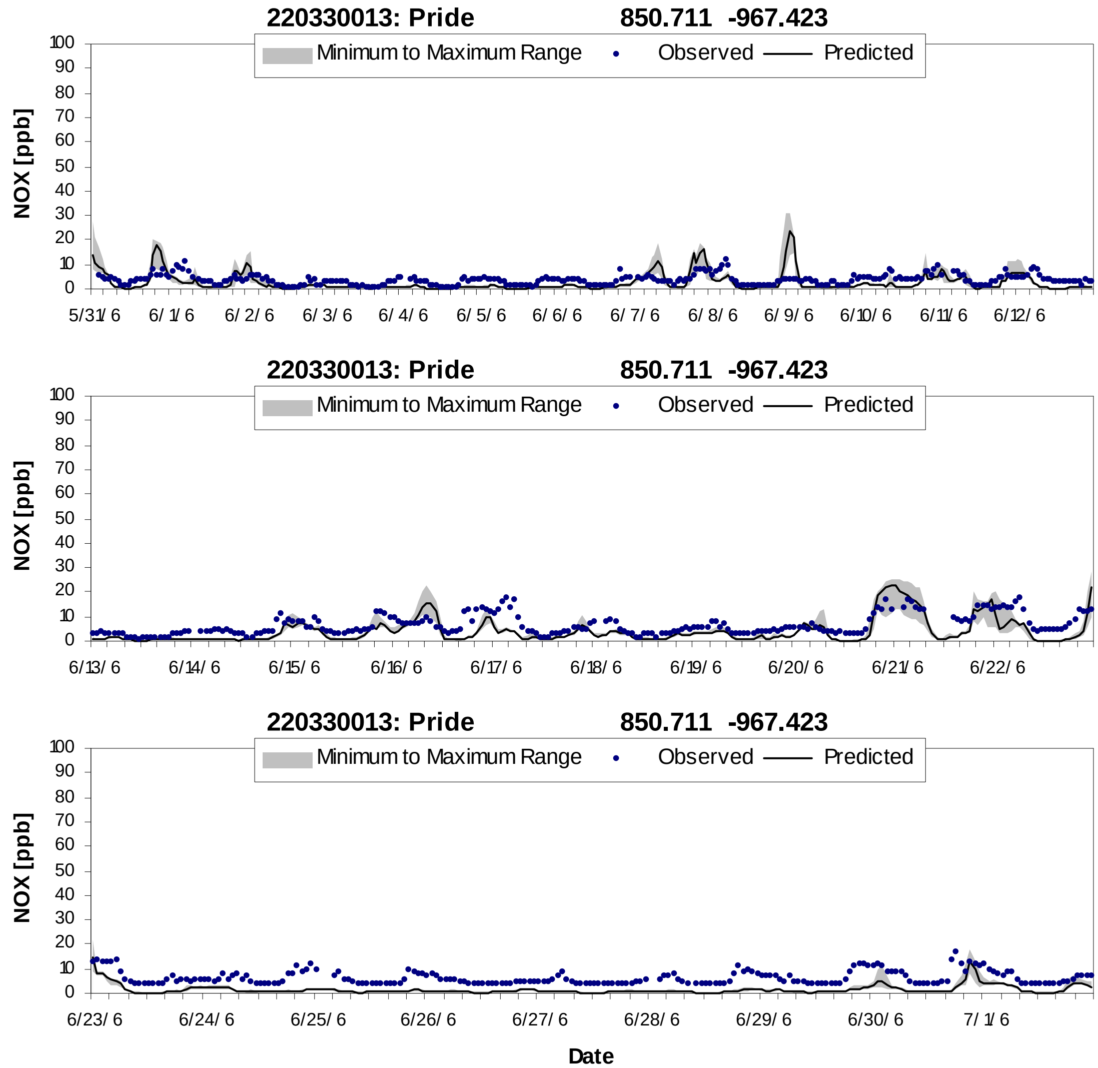


Figure B-23. Time series of observed and Run 6 hourly NOx at Pride.

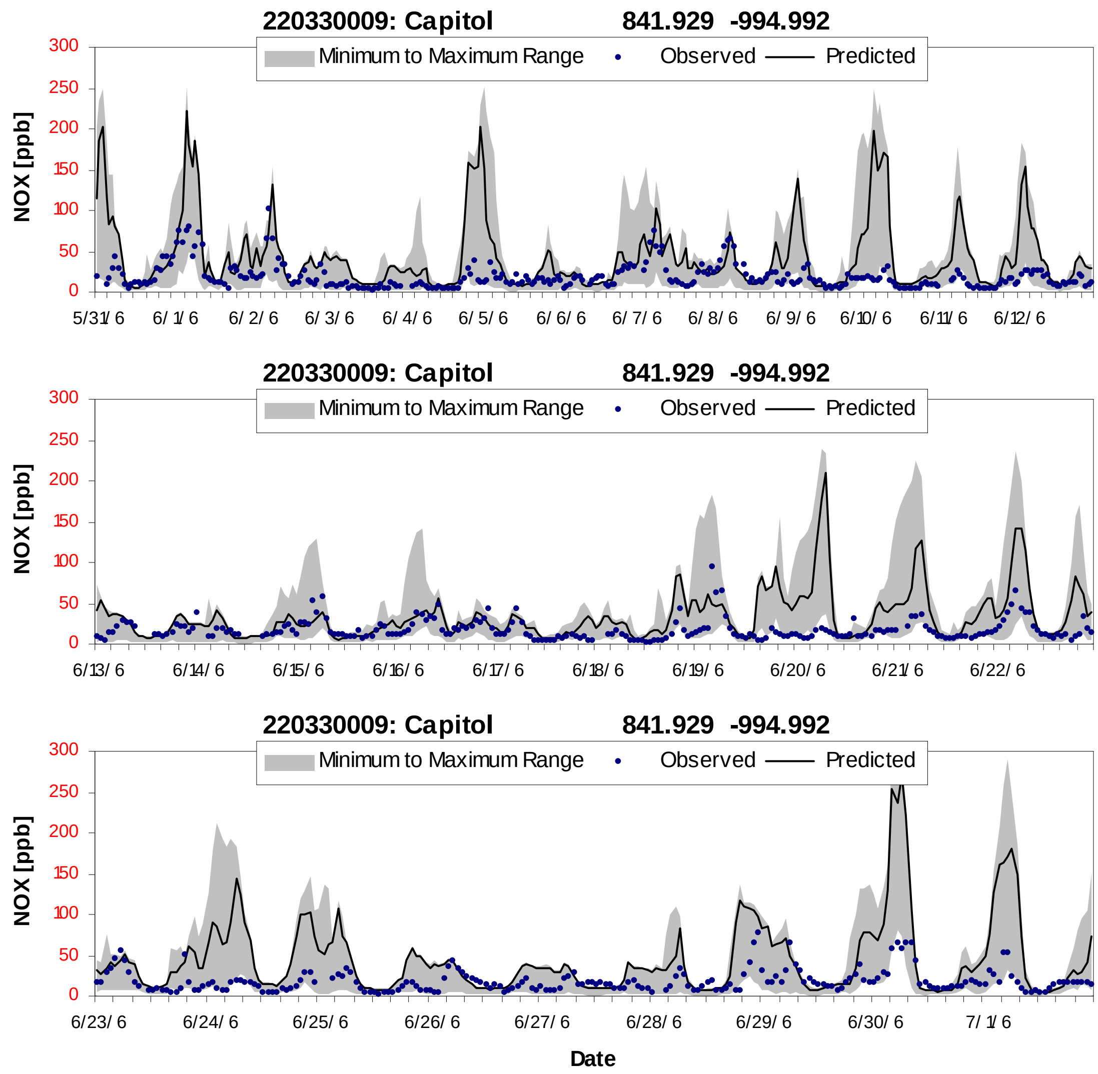


Figure B-23 (continued). Time series of observed and Run 6 hourly NOx at Capitol.

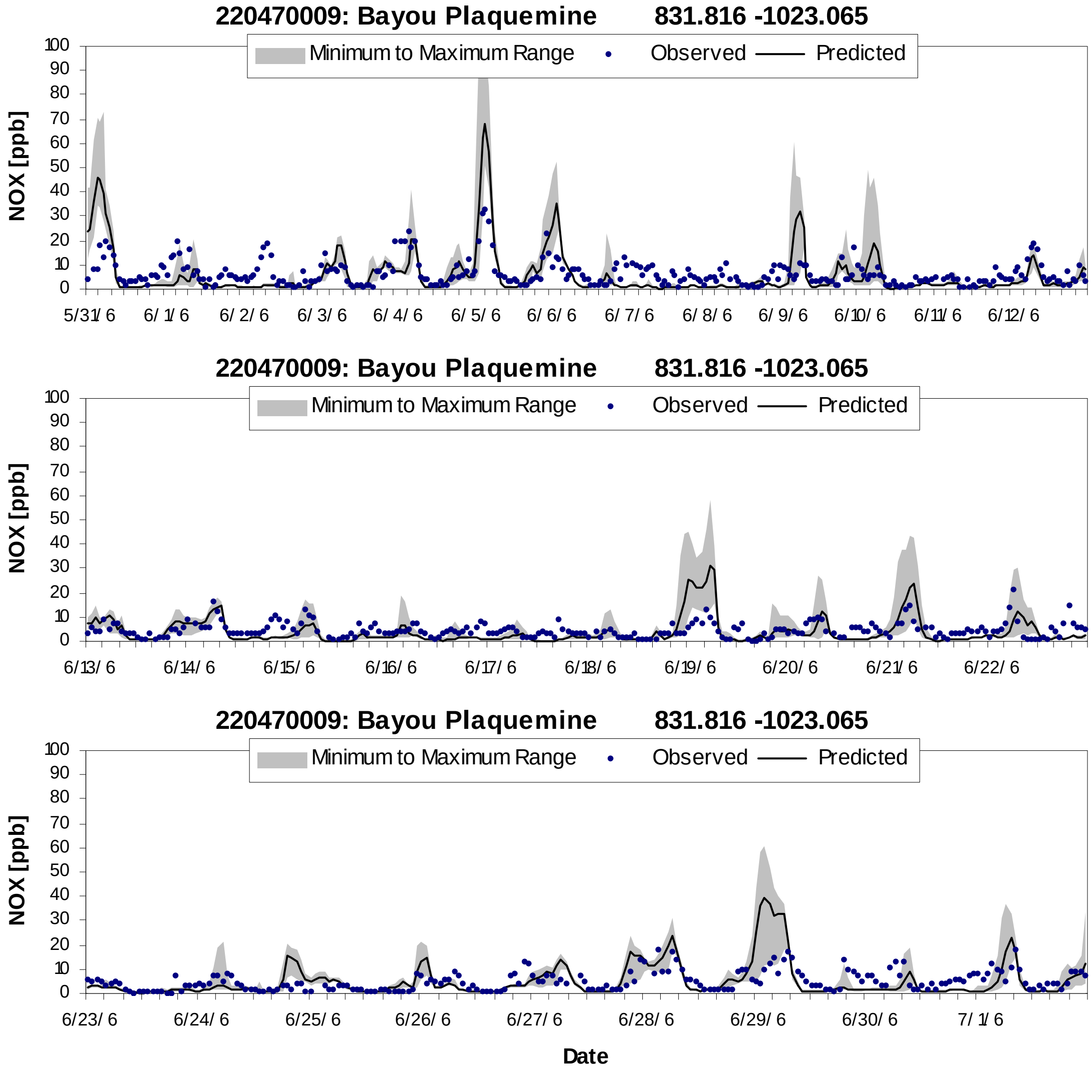


Figure 2-23 (continued). Time series of observed and Run 6 hourly NOx at Bayou Plaquemine.

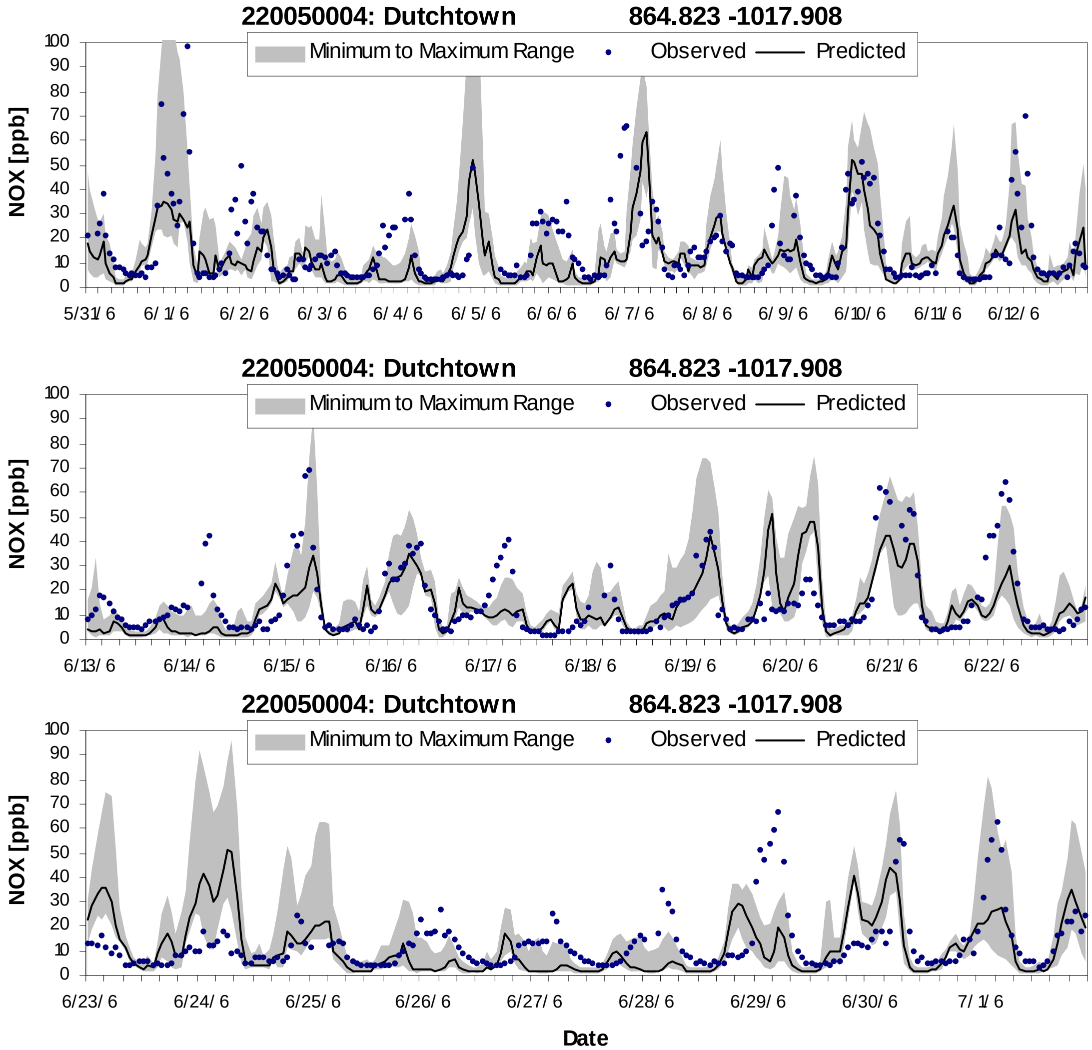


Figure B-23 (concluded). Time series of observed and Run 6 hourly NOx at Dutchtown.

average NOx is under predicted. The central urban site at Capitol exhibits the opposite, where most of the nighttime and early morning NOx peaks are greatly over predicted. The midday values at Capitol are generally well simulated, which further suggests a correct amount of daytime mixing. Perhaps some of the best NOx performance is seen for the two sites to the south of Baton Rouge (Bayou Plaquemine and Dutchtown) because the model captures the midday and peak nighttime values rather well on most days at these sites.

Figure B-24 displays bar charts of daily 1-hour NOx performance over all 10 sites, similar to the ozone statistics described earlier. In terms of daily peaks, the model performs well for the daily maximum over all sites, but in general tends to over predict the peaks over all sites. The NOx over prediction is worst for high ozone days, which suggests a meteorological influence since day-specific emissions were not used in these simulations (except for a few local EGU sources subject to the acid rain reporting requirements and biogenics). On such days, it is likely that a higher degree of stability suppresses mixing and stagnates the airflow; this explains the higher morning NOx concentrations as well as the buildup of observed and simulated ozone. Based on overall statistics (normalized bias and error), the model tends to over predict NOx on a consistent basis.

Our analysis suggested that much of the NOx over prediction problem is driven by only a few sites in the central urban area and is dominated by the nighttime/morning peaks. On high ozone days, the peaks are over predicted by roughly 100%, while more generally NOx is over predicted by 30-50%. We have seen similar behavior in other modeling exercises throughout the U.S., and it is usually related to suppressed early morning mixing. This can be ameliorated by applying a diffusivity "patch" that sets a minimum diffusivity in the lowest 100 m as a function of landuse type. The biggest effect is for urban areas to account for increased mechanical turbulence due to urban roughness and for increased buoyant turbulence due to urban heat input. Little to no modifications are made in rural areas (e.g., cropland, water surfaces). This patch was applied in Run 12.

B.5.1.2 VOC Performance

Figure B-25 displays 6-9 AM comparisons of observed and Run 6 predicted CB05 VOC species for those compounds that were available from PAMS measurements. The days shown are the highest ozone days of the period (consistent with the ozone analyses described earlier): June 10, 11, 15, 29, and 30. Data from all four PAMS sites were available on June 10, while only data from Capitol and LSU were available for the other days.

As is typical of VOC performance, the CB05 species "PAR" (light single-bond paraffins) is dominant in both the measurements and the predictions at all sites, with much less carbon mass associated with the other species. It is important to realize, however, that small errors for certain species other than PAR (i.e., toluene, xylene, isoprene) can play more significant roles for net reactivity and radical yields than the larger errors seen for the much less reactive PAR. The model shows a mix of under and over predictions among the sites for all days, but generally the urban core sites (Capitol and LSU) exhibit over predictions for PAR and often other species to a lesser extent. Based on past experience with this type of analysis, these VOC results are rather good. It is important to keep in mind that VOC emissions, especially from evaporative, fugitive, or flaring sources, are highly variable in space and time, and such variability cannot be

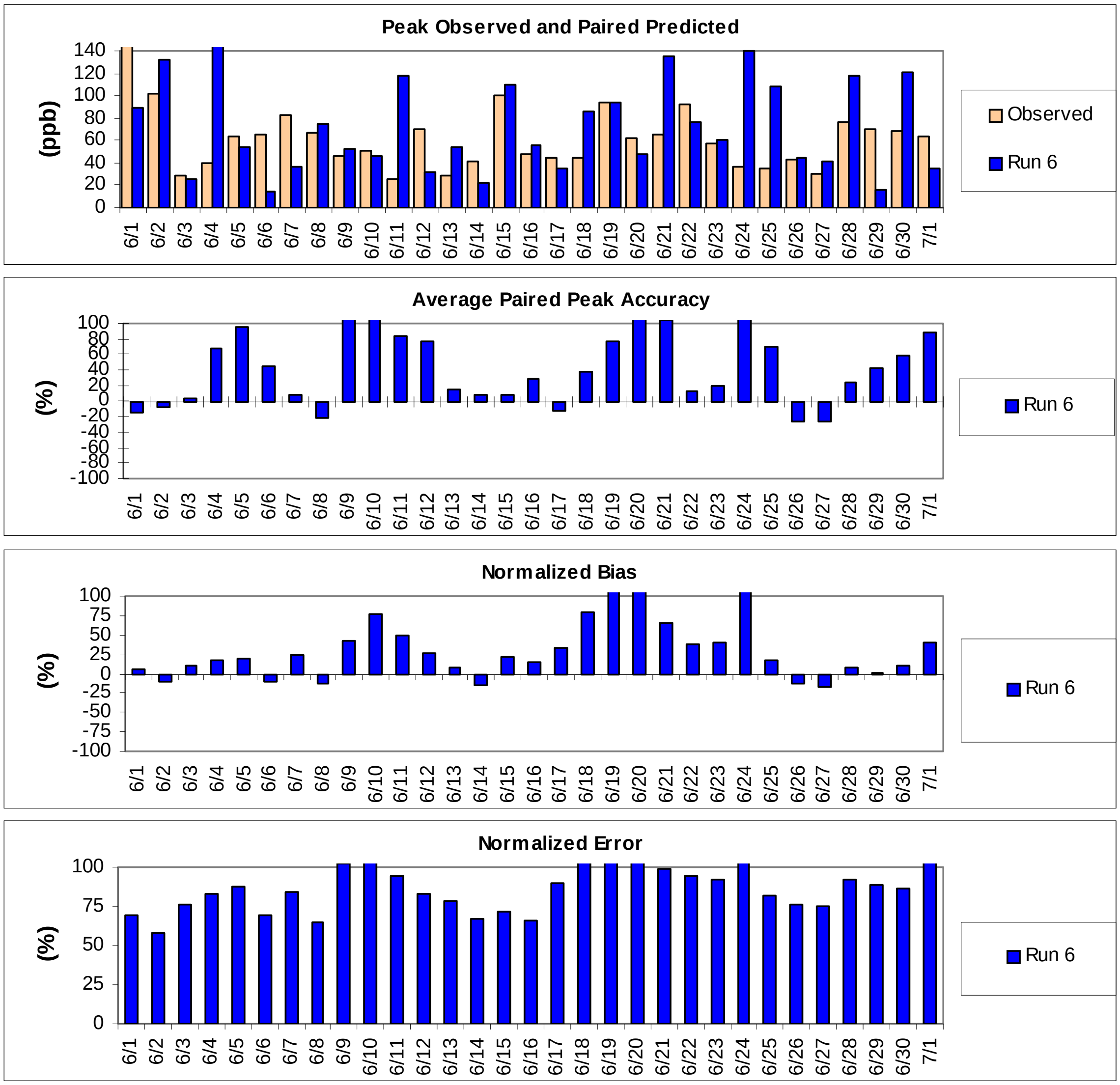


Figure B-24. Peak (top two panels) and overall (bottom two panels) statistical model performance for 1-hour NOx from CAMx Run 6.

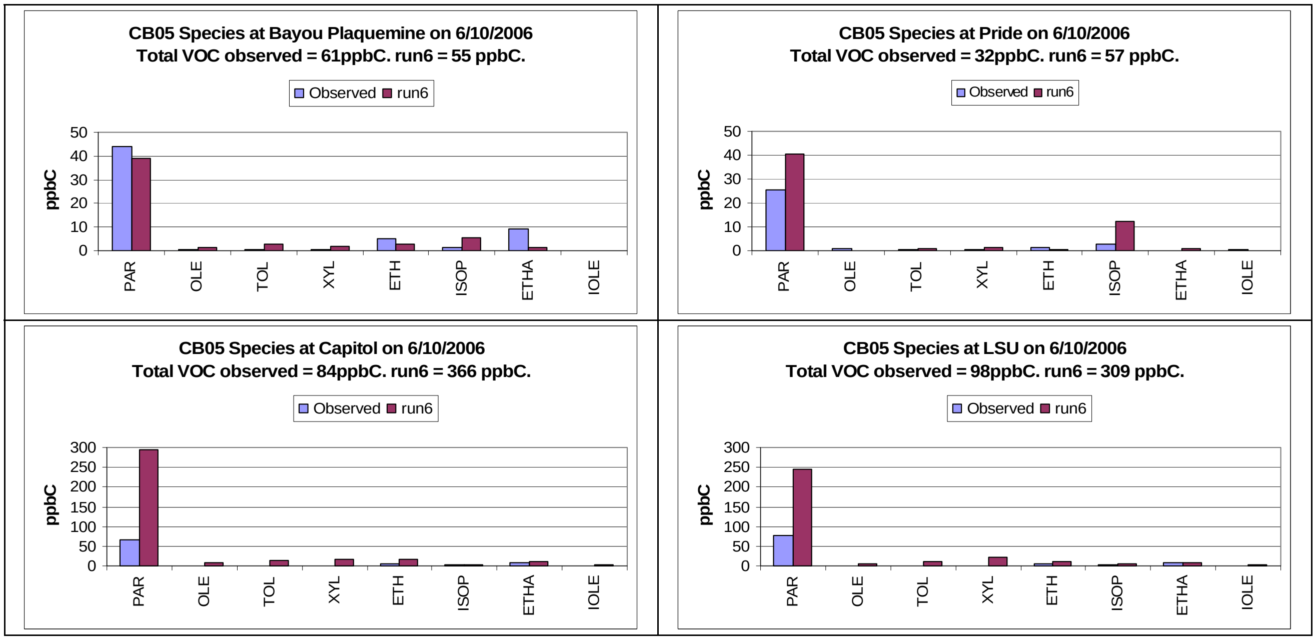


Figure B-25 (a). CB05 VOC comparisons between PAMS-derived measurements and CAMx Run 6 for 6-9 AM, June 10.

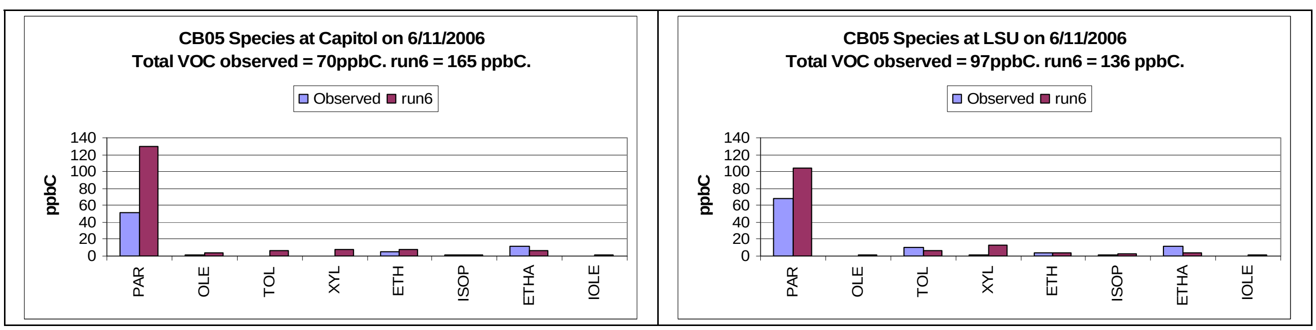


Figure B-25 (b). CB05 VOC comparisons between PAMS-derived measurements and CAMx Run 6 for 6-9 AM, June 11.

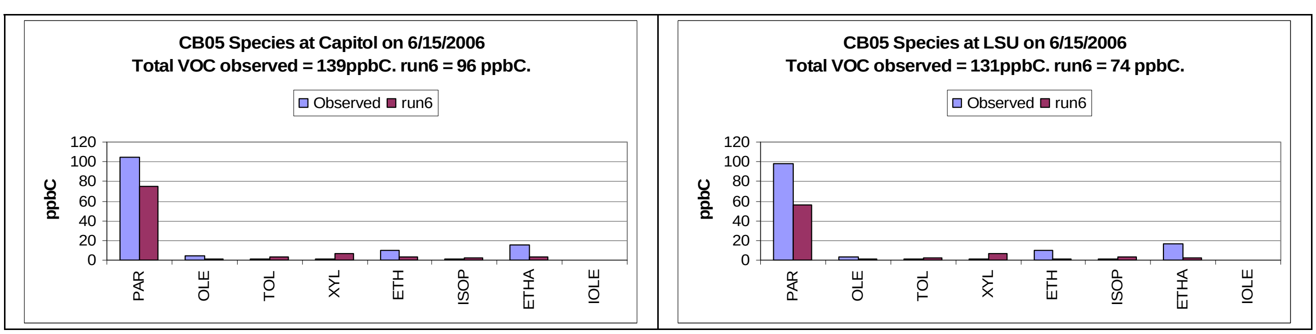


Figure B-25 (c). CB05 VOC comparisons between PAMS-derived measurements and CAMx Run 6 for 6-9 AM, June 15.

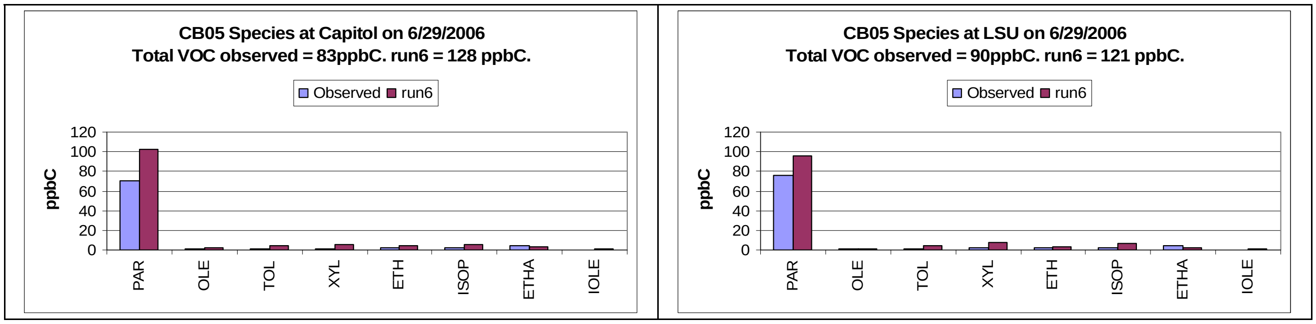


Figure B-25 (d). CB05 VOC comparisons between PAMS-derived measurements and CAMx Run 6 for 6-9 AM, June 29.

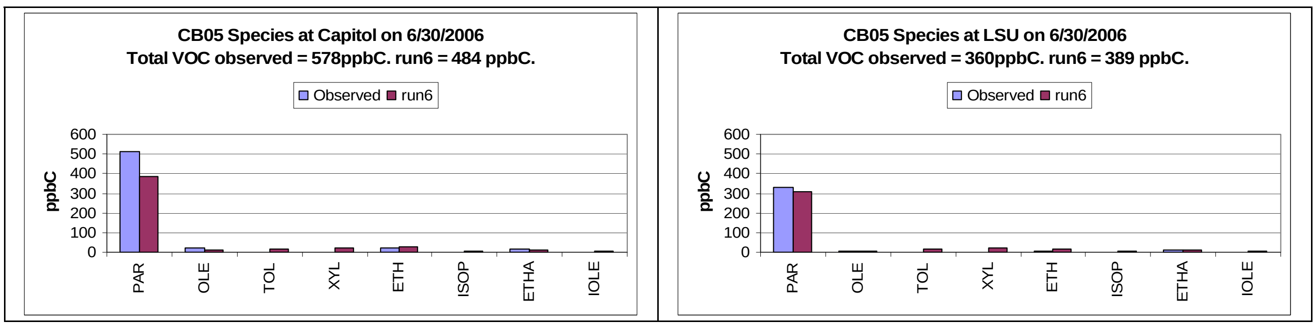


Figure B-25 (e). CB05 VOC comparisons between PAMS-derived measurements and CAMx Run 6 for 6-9 AM, June 30.

characterized in seasonal or annual emission inventories and thus are not carried through in the modeling. Given the strong evidence that industrial fugitive sources contribute largely to the actual Baton Rouge VOC emissions on a daily basis, model performance is very promising in this regard.

B.5.1.3 Evaluation of VOC:NOx Ratios

The relative mix of NOx and VOC precursors is a more important metric to assess the net ozone formation potential than the concentrations of individual species alone. The most common approach to measure this formation potential is by the ratio of morning VOC to NOx emissions or ambient concentrations before the photochemistry begins.

VOC:NOx ratios below about 5 indicate a NOx-rich, VOC-limited chemical regime where the abundance of NOx (1) removes ozone directly due to freshly emitted NO ($NO + O_3 \rightarrow NO_2 + O_2$) and (2) inhibits the formation of ozone by increasing the contribution from radical termination reactions that remove oxidants rather than propagating them through the ozone cycle. Urban areas are often VOC-limited due to abundant NOx emissions from on-road sources. It is important to note that NOx reductions under such regimes will tend to increase ozone locally by reducing ozone destruction/inhibition (often referred to as a "NOx-disbenefit").

However, ozone responds proportionally to VOC changes although weakly until the VOC:NOx ratio increases above about 5.

VOC:NOx ratios above about 12 indicate a VOC-rich, NOx-limited chemical regime in which ozone is sensitive to the amount of NOx to initiate and propagate radicals. While changes in VOC lead to minimal changes in ozone, NOx changes lead to proportional changes in ozone. VOC:NOx ratios between 5 and 12 represent the area of most efficient ozone potential, where an optimum balance exists between NOx and VOC. In such cases, ozone responds well to changes in either or both VOC and NOx.

Figure B-26 shows the measured and Run 6 simulated VOC:NOx ratios for each of the four PAMS sites on days in which VOC measurements were available. Note that the measurements show some large day-to-day variation, but generally these ratios are well below 10. As expected, the simulated ratios are more consistent day-to-day, especially at the urban sites (Capitol and LSU), due to consistent daily emission inputs. Pride is the outlier among these plots, where the model dramatically over predicts VOC:NOx. Inspection of those data indicate that NOx is under predicted (as seen in Figure B-23), while VOC are over predicted by ~50% on average. The reason for the VOC over prediction is unknown and is rather suspect given the more rural setting of the Pride site.

In general, the model does rather well in replicating the typical VOC:NOx ratio, with only a few days when large deviations occur. At Bayou Plaquemine, the large over prediction of the ratio on June 7 is due to a very large under prediction of NOx (1.5 vs. 9 ppb), which may be due to an improper location of a local NOx plume in the model. At Capitol and LSU, the VOC:NOx ratio is under predicted by about 30% on average. The biggest under predictions of the ratio on ozone exceedance days result from a mix of VOC under predictions on some days, and large NOx over predictions on others.

B.6 CAMx RUN 8

In Run 8, the point source VOC emissions used in all runs to this point were tripled in West Baton Rouge and East Baton Rouge Parishes from 17 TPD to 51 TPD. The purpose of this was to determine the effect on model performance of a VOC emissions shortfall from local sources in the Baton Rouge urban area. The magnitude of this increase was estimated by LDEQ staff. Run 8 was configured similarly to Run 7 to evaluate the ozone sensitivity; it utilized CMAQ vertical diffusivity inputs with a minimum set to 0.1 m^2/s, the PiG submodel, and boundary conditions extracted from a June 2006 RPO run using MOZART boundary conditions. As previously discussed, the latter was not the best set of boundary conditions to use.

Spatial plots depicting the daily maximum ozone sensitivity to the VOC increase relative to Run 7 on the five dates with high ozone are shown in Figure B-27. Note that the color scale was altered in order to see the differences. June 11 was most sensitive to the VOC increase among all dates in the episode, as the daily maximum 8-hour ozone increased 4 ppb locally near the Baton Rouge core. Model performance statistics for Run 8 were little changed from Run 7 since the ozone increases on most dates were rather small and localized.

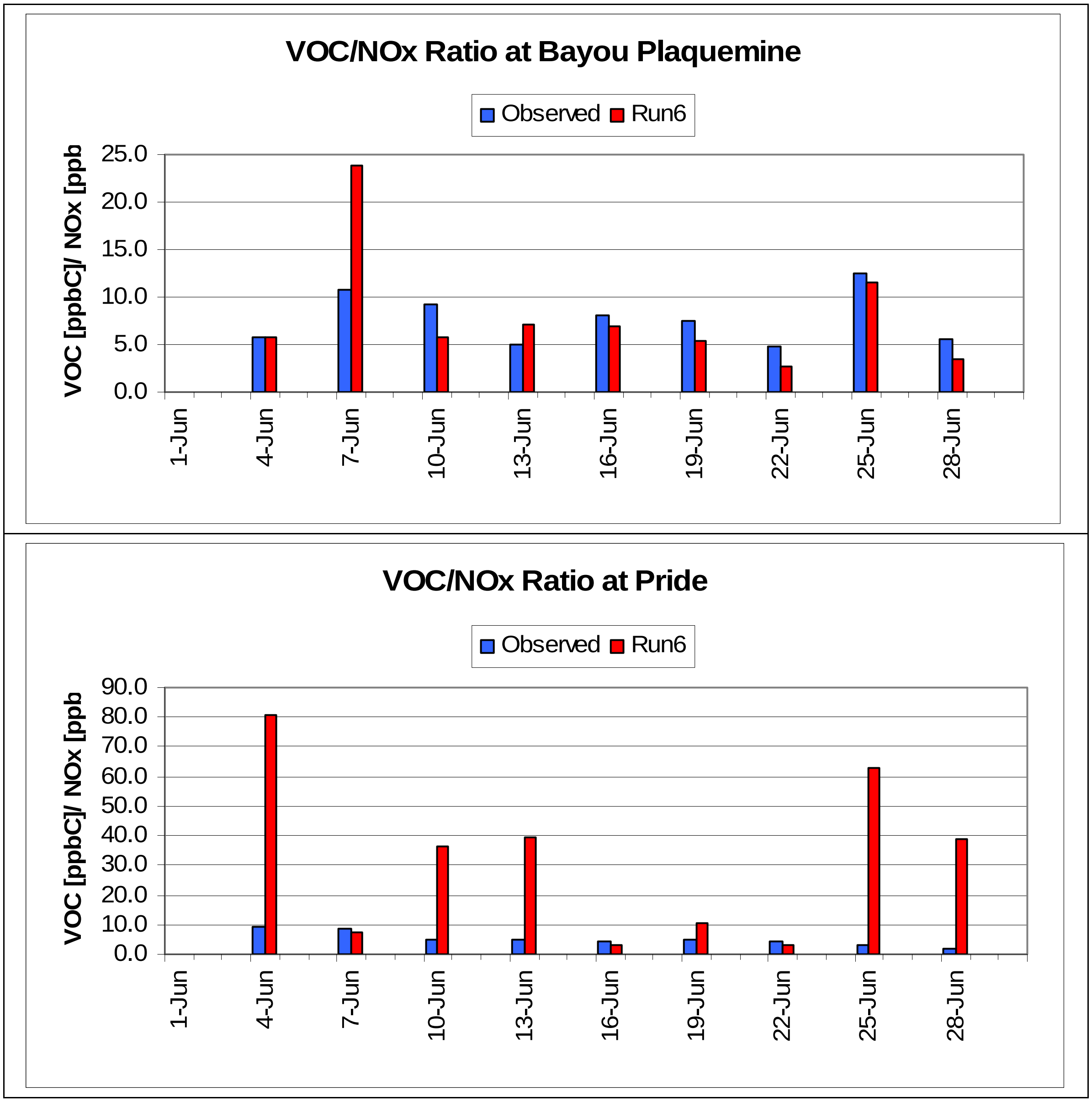
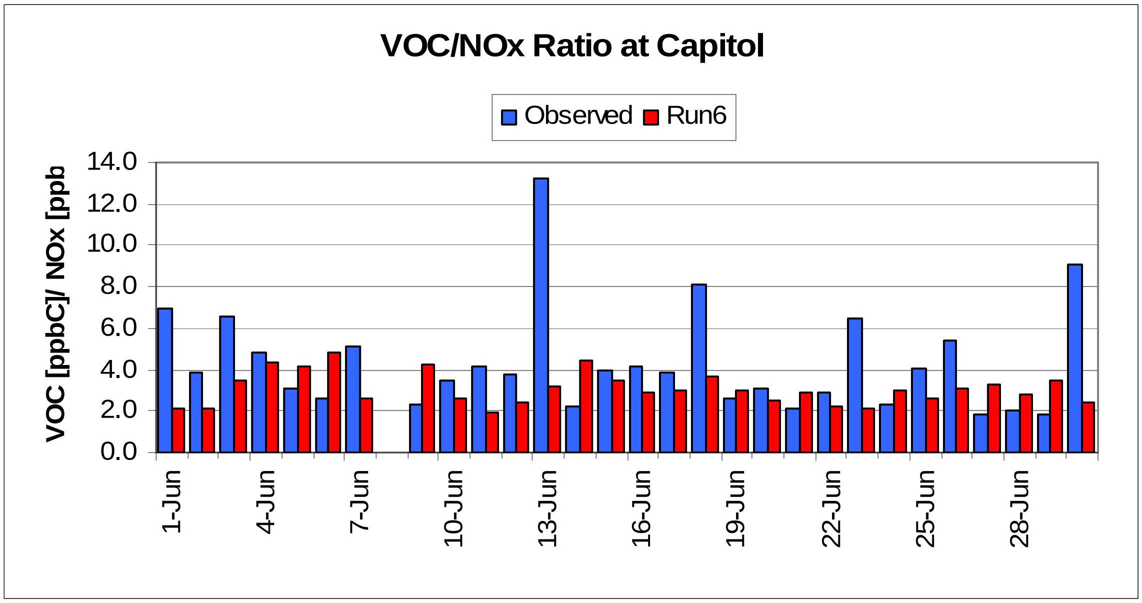


Figure B-26. VOC:NOx ratio comparisons between measurements and Run 6 predictions at non-urban PAMS sites.



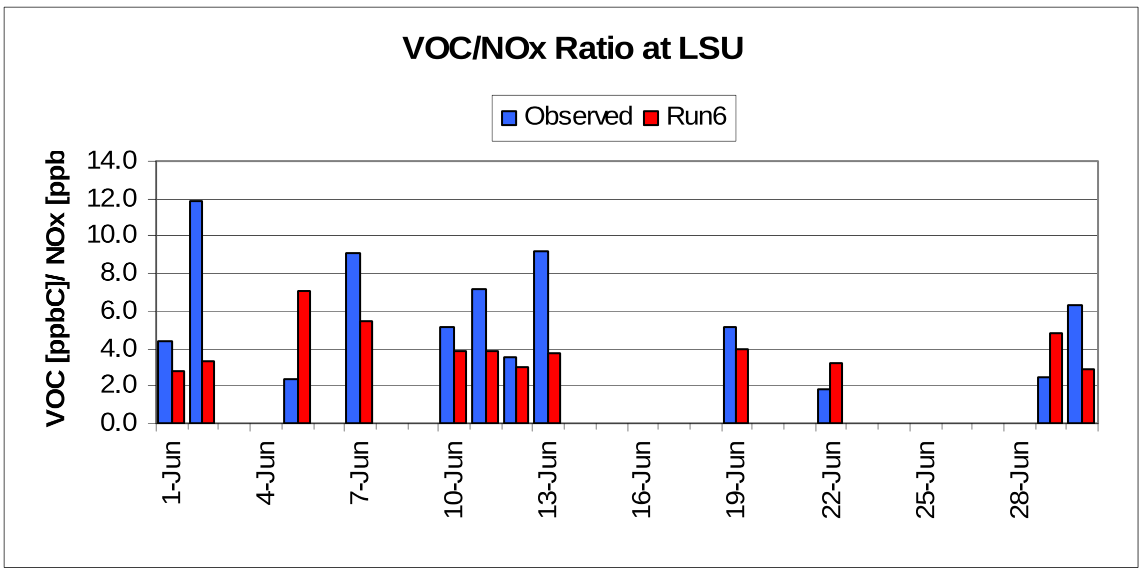


Figure B-26 (concluded). VOC:NOx ratio comparisons between measurements and Run 6 predictions at urban PAMS sites.

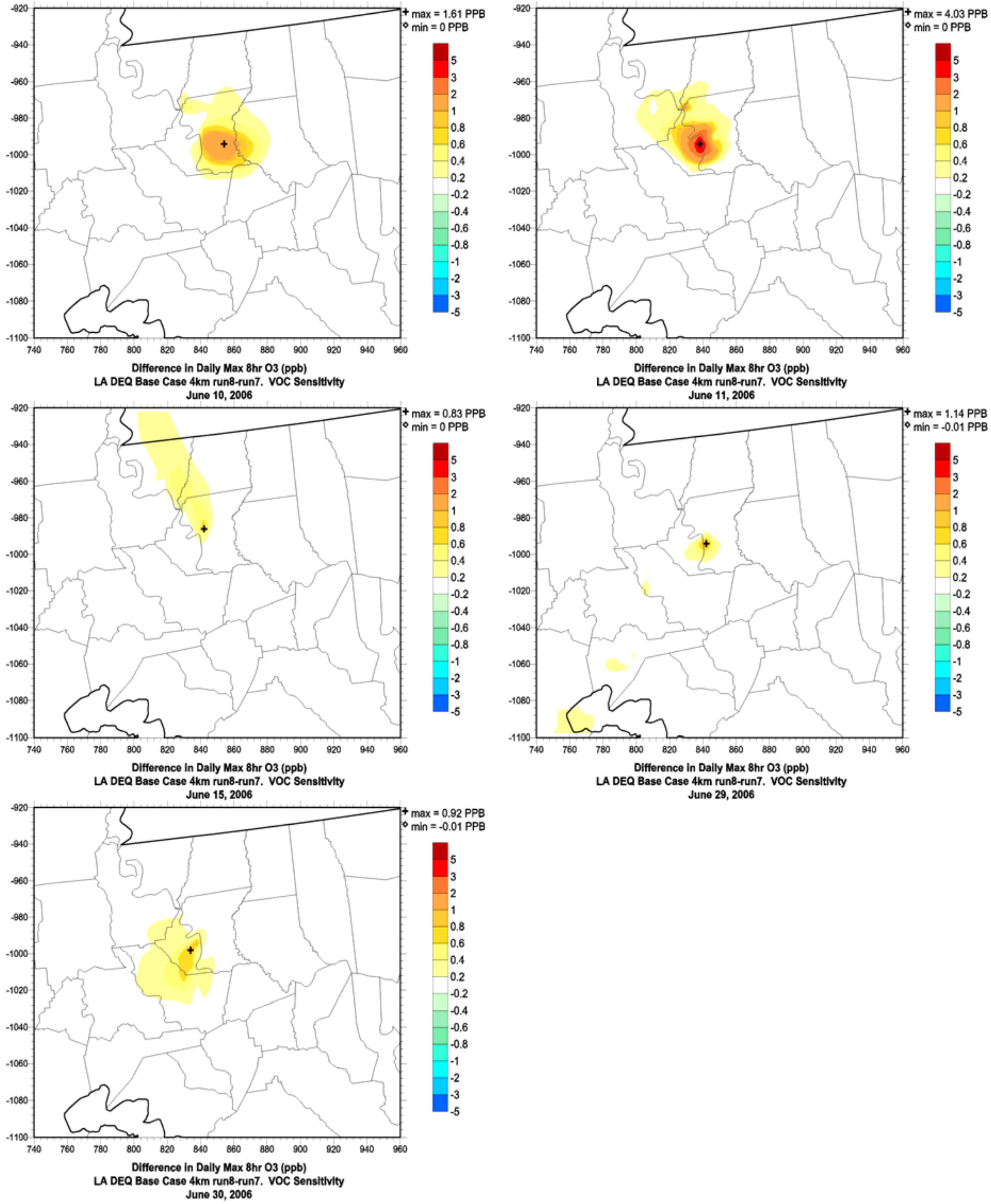


Figure B-27. Spatial plots of daily maximum 8-hour ozone sensitivity to VOC increases in West Baton Rouge and East Baton Rouge Parishes (Run 8 – Run 7).

Table B-2 summarizes the VOC, NOx, and VOC:NOx performance from Run 6 at the four PAMS sites for days in which VOC data were available. Table B-3 shows the same summary for Run 8 – note the differences appropriately occur for VOC values at Capitol and LSU in the latter case. Run 8 results in improved performance for the VOC:NOx ratio but not necessarily for VOC alone. Since Run 8 involved a simple scaling up of pre-existing point source emissions, the species profiles, locations, and quantities are likely not reflective of an actual VOC shortfall. Furthermore, Run 8 tends to align the NOx over predictions with VOC over predictions (as seen by the improved VOC:NOx ratio), which together should be improved by the diffusivity patch that we carried out in Run 10a (increased diffusion will equally reduce all precursors). In other words, adding additional VOC in some manner, especially close to urban Baton Rouge, appears to be beneficial for precursor performance and thus the characterization of ozone chemistry.

Table B-2. Summary of Run 6 performance for VOC, NOx, and VOC:NOx ratio for dates in which PAMS VOC data are available at each site.

	VOC (ppbC)			NOx (ppb)			VOC:NOx	
Site	Obs	Run 6	Error	Obs	Run 6	Error	Obs	Run 6
Bayou Plaquemine	56	45	-18%	8.7	7.8	-10%	7.7	8.0
Pride	28	41	47%	5.3	2.5	-53%	5.2	31
LSU	176	156	-11%	23	37	57%	5.7	4.0
Capitol	132	169	28%	30	62	109%	4.3	3.1

Table B-3. Summary of Run 8 performance for VOC, NOx, and VOC:NOx ratio for dates in which PAMS VOC data are available at each site.

	VOC (ppbC)			NOx (ppb)			VOC:NOx	
Site	Obs	Run 6	Error	Obs	Run 6	Error	Obs	Run 6
Bayou Plaquemine	56	48	-14%	8.7	7.9	-9%	7.7	7.8
Pride	28	43	53%	5.3	2.6	-51%	5.2	29
LSU	176	239	36%	23	37	58%	5.7	5.5
Capitol	132	305	131%	30	62	109%	4.3	5.3

B.7 CAMx RUNS 10A AND 12

Two additional sensitivity tests were undertaken with CAMx:

- Run 10a: Use revised 2006 day-specific boundary conditions derived from NCAR MOZART global model results (similar to Run 6);
- Run 12: Apply a vertical diffusivity "patch" as suggested from the ozone precursor results of Run 6.

While previously considered in Run 7, the revised MOZART-based boundary conditions in Run 10a were re-generated from a 2006 simulation on the RPO 36-km grid by improving the extraction methodology to the LDEQ 36-km grid. These boundary conditions are specific to each day in June 2006 and are provided at 6 hourly intervals. The CAMx configuration was otherwise similar to Run 6, which used boundary conditions based on the 2002 GOES-CHEM results.

Figure B-28 and B-29 compare performance statistics between Run 10a and Run 6 on each day of the modeling episode for 1-hour peak ozone and overall 1-hour bias and gross error over 40 ppb. Generally, there is not much difference between the two runs, similar to the results between Runs 6 and 7. Run 10a shows some minimal improvements and degradations day-to day relative to Run 6. Figure B-30 shows a comparison of 8-hour quantile plots among Run 6 and Run 10a, which again shows minimal difference. Spatial plots of differences in daily maximum 8-hour ozone on the high ozone days show widespread but small differences in ozone throughout southeast Lousiana constrained within ±2 ppb (Figure B-31). As these plots show, there was very minor sensitivity to boundary conditions, and no significant differences in 1-hour ozone time series (not shown). The statistics indicate minor mixed performance differences between the two approaches for defining the boundary conditions (MOZART and GEOS-CHEM). Therefore, the revised MOZART-based boundary conditions were used for all remaining CAMx Base Year simulations.

In Run 12, a vertical diffusivity "patch" was applied to the input diffusivity fields to increase the minimum diffusivity as a function of landuse (otherwise identical to Run 6). This approach has been historically used in many other CAMx modeling exercises throughout the U.S., and is similar to an option now available in the CMAQ MCIP pre-processor. The purpose of this patch is to slightly increase nocturnal and morning mixing that is commonly under-stated by MM5, thus reducing the heavy buildup of precursor emissions that can occur in urban areas, leading to ozone inhibition in the pre-noon hours. The diffusivity "patch" sets a minimum diffusivity in the lowest 100 m as a function of landuse type. The biggest effect is for urban areas to account for increased mechanical turbulence due to urban roughness and for increased buoyant turbulence due to urban heat input. Little to no modifications are applied in rural areas (e.g., cropland, water surfaces).

Figure B-32 and B-33 show the daily 1-hour ozone performance statistics, while Figure B-34 shows 8-hour quantile plot comparisons with Run 6. The peak ozone statistics show very little change, but somewhat larger differences occur for the overall bias and gross error statistics. There is a tendency for Run 12 to generate more ozone, as shown by the daily increase in bias (more positive on over-predicted days, less negative on under-predicted days); this result was expected given the effect of the diffusivity patch to reduce morning NOx in the central urban area and thus decrease its inhibition on ozone formation in the NOx-rich areas. Time series of 1-hour ozone for Runs 6 and 12 (Figure B-35) at the two sites expected to be most influenced by the diffusivity patch show the largest differences in over-night and early morning periods, as expected, with practically zero impacts on daily peak ozone. The Run 12 statistical results do not substantially change the characterization of day-to-day model performance, nor do they alter the quantile results.

From a spatial perspective, the diffusivity patch results in some of the largest ozone impacts of any run performed up to this point, although the largest changes are well removed from Baton Rouge (Figure B-36). On the high ozone days shown, ozone changes relative to Run 6 are mostly positive over wide areas of the domain, averaging about 1 ppb, but reaching up to 10 ppb on June 15.

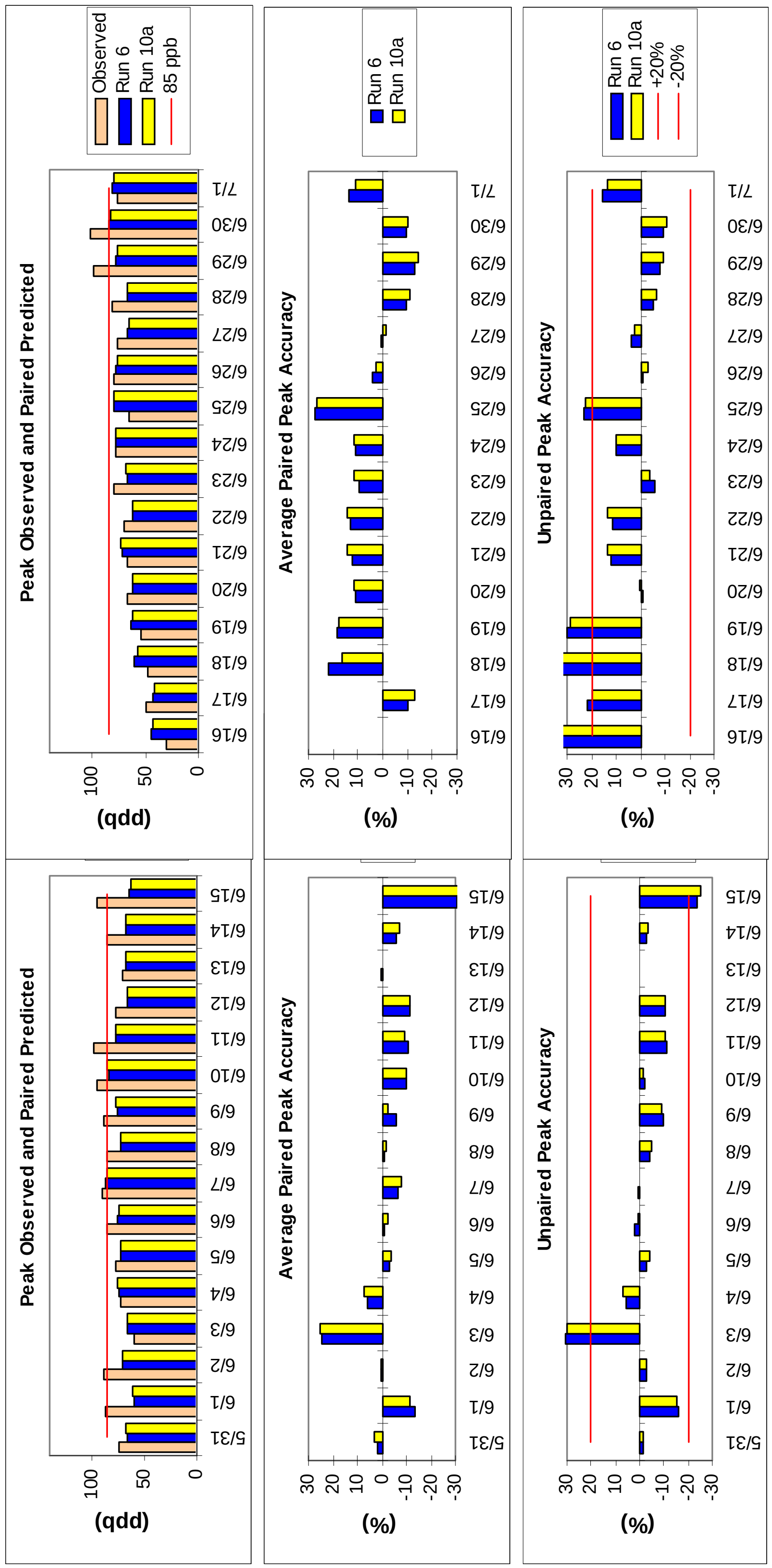


Figure B-28. CAMx Runs 6 and 10a model performance statistics for peak 1-hour ozone.

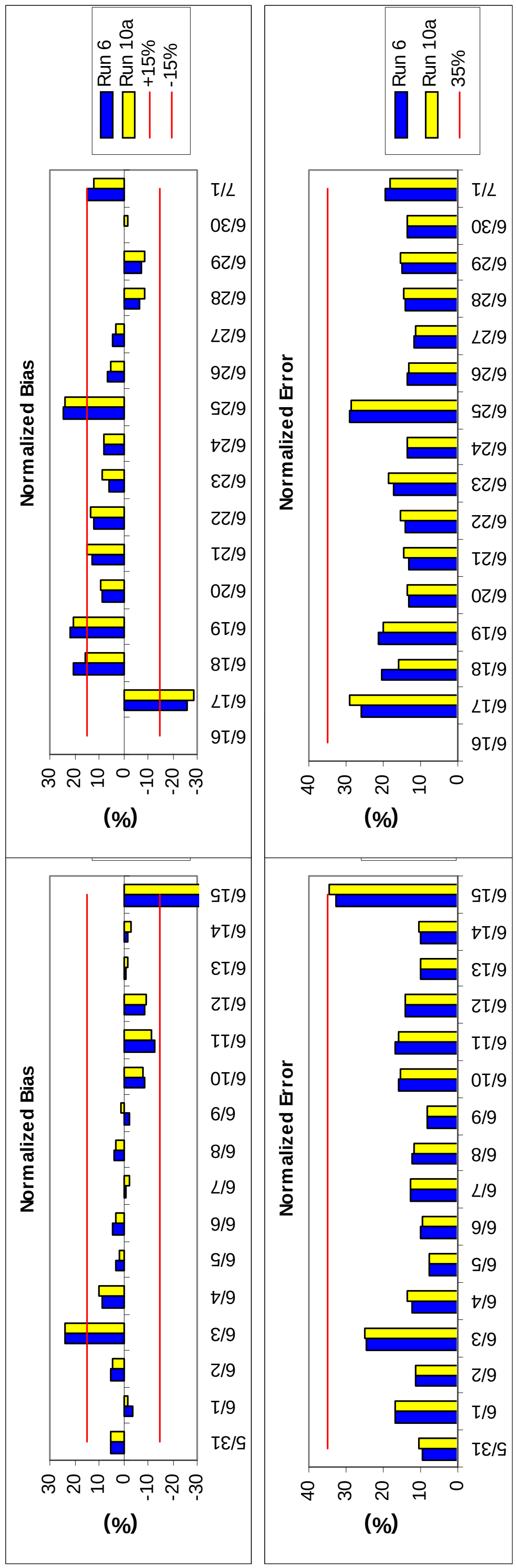


Figure B-29. CAMx Runs 6 and 10a model performance statistics for 1-hour ozone over 40 ppb.

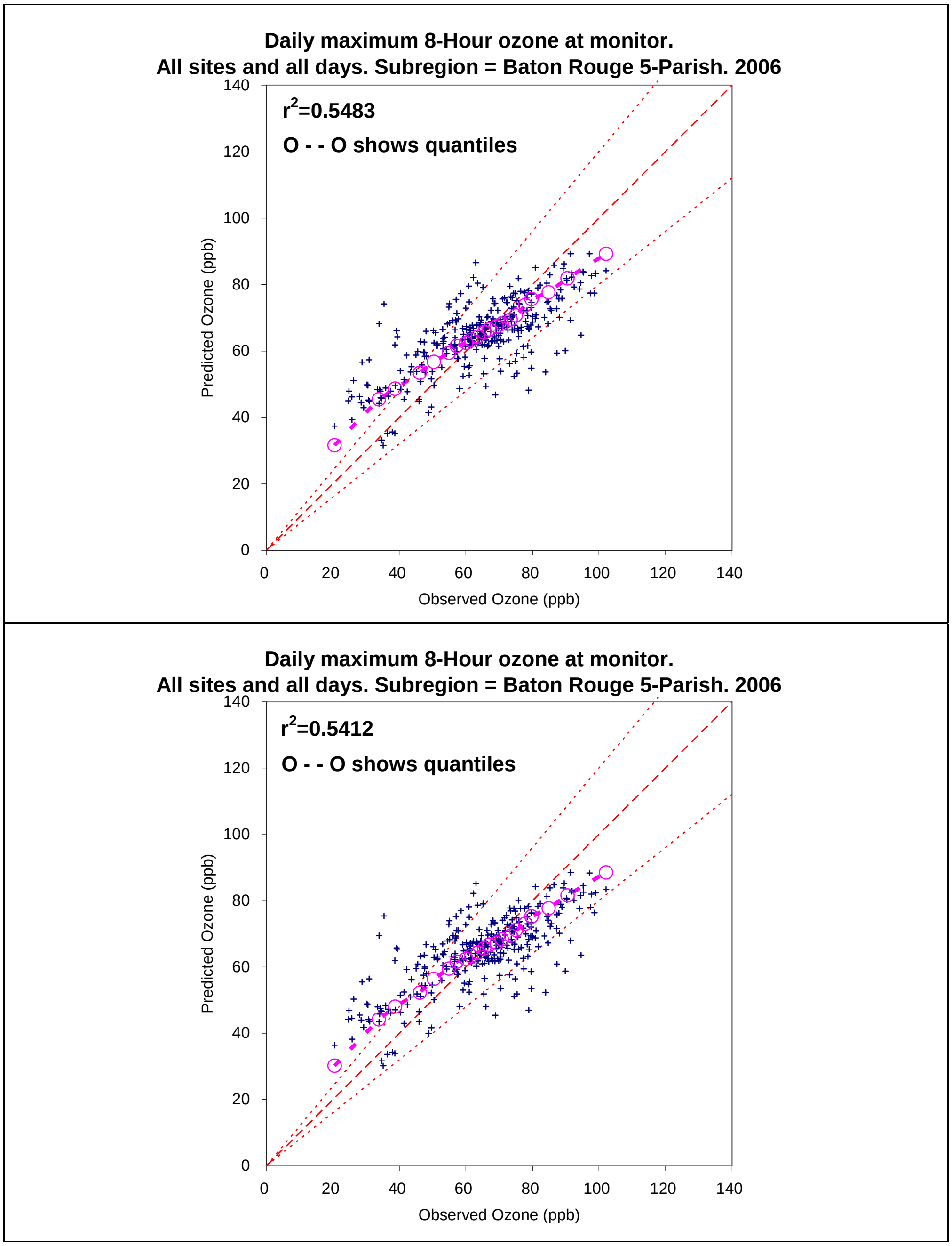


Figure B-30. Scatter and quantile (Q-Q) plots of Run 6 (top) and Run 10a (bottom) daily maximum 8-hour ozone when comparing co-located predictions and observations.

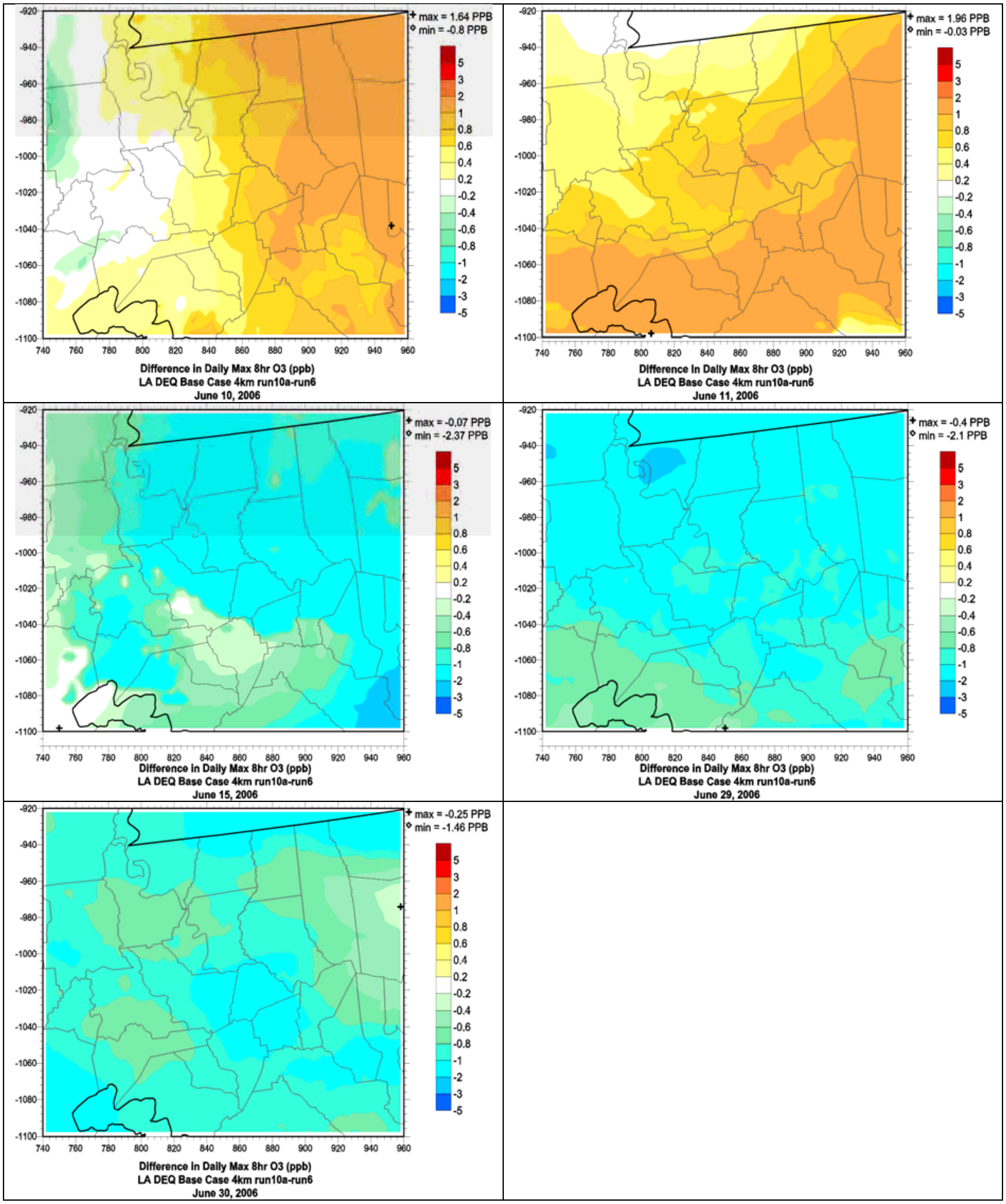


Figure B-31. Spatial plots of daily maximum 8-hour ozone sensitivity to the Run 10a boundary conditions relative to Run 6 (Run 10a – Run 6).

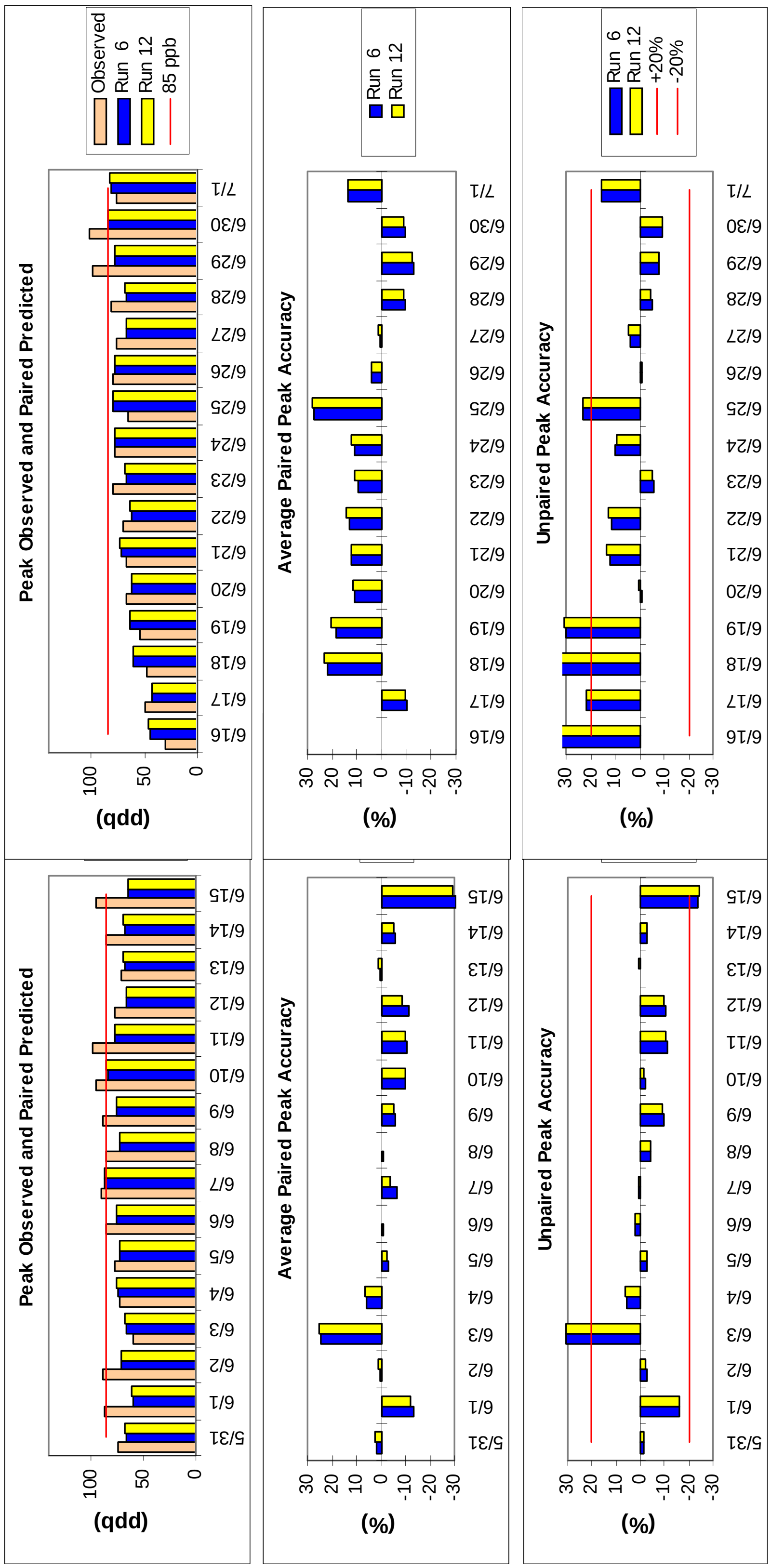


Figure B-32. CAMx Runs 6 and 12 model performance statistics for peak 1-hour ozone.

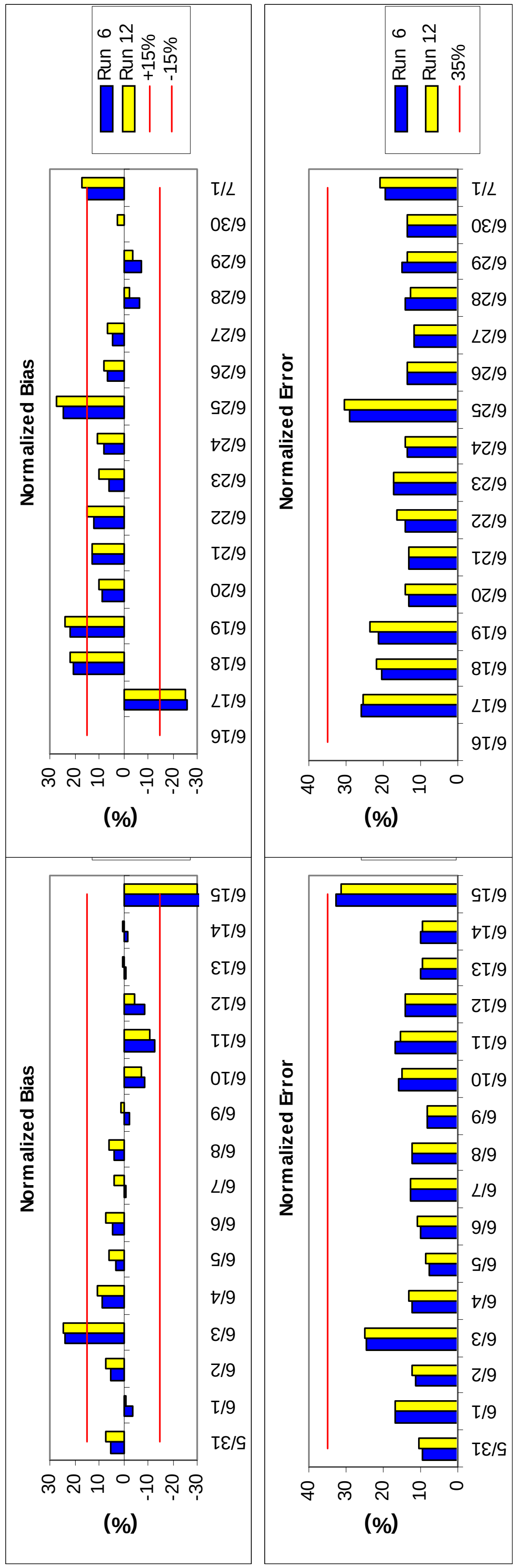


Figure B-33. CAMx Runs 6 and 12 model performance statistics for 1-hour ozone over 40 ppb.

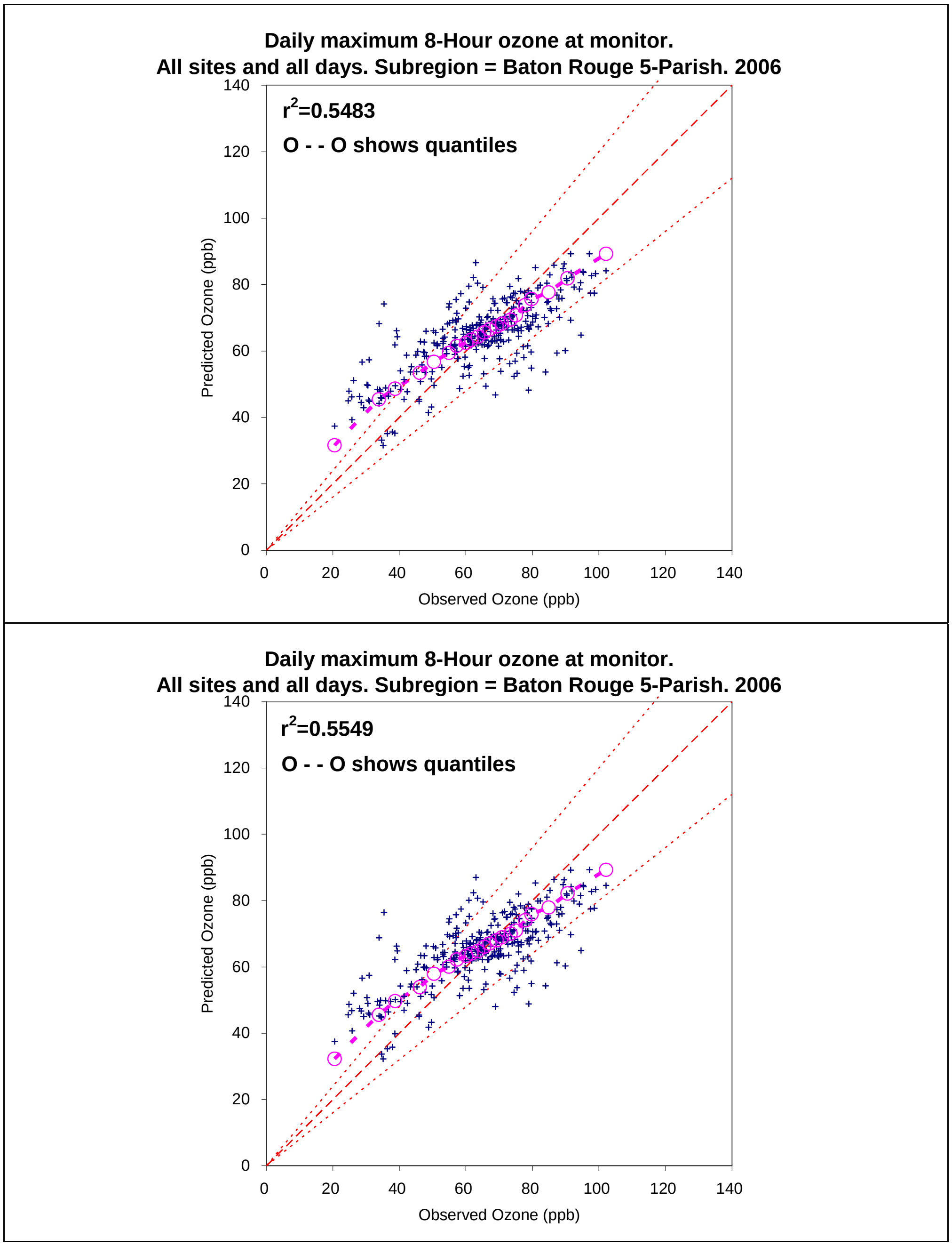


Figure B-34. Scatter and quantile (Q-Q) plots of Run 6 (top) and Run 12 (bottom) daily maximum 8-hour ozone when comparing co-located predictions and observations.

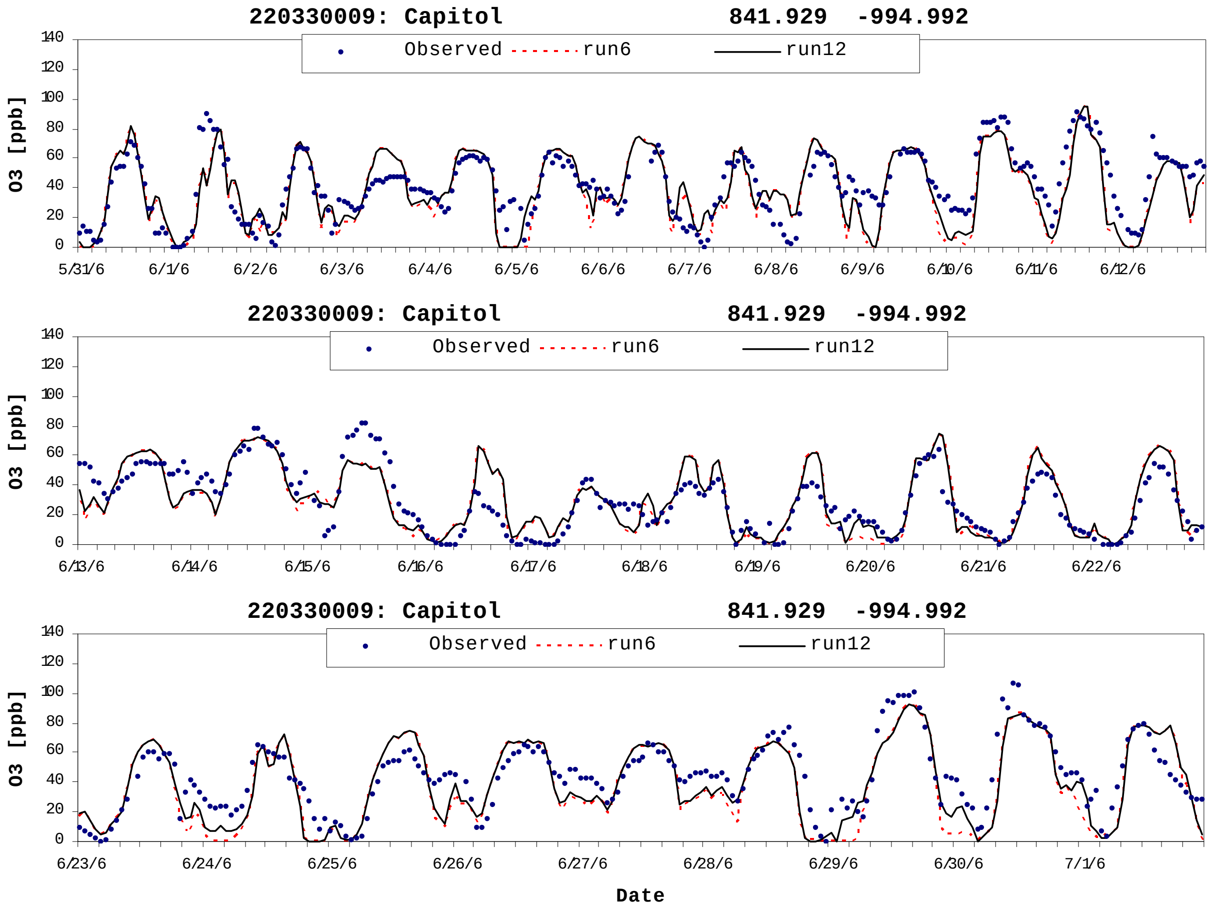


Figure B-35 (a). Time series of observed and Run 6 and 12 hourly ozone at Capitol.

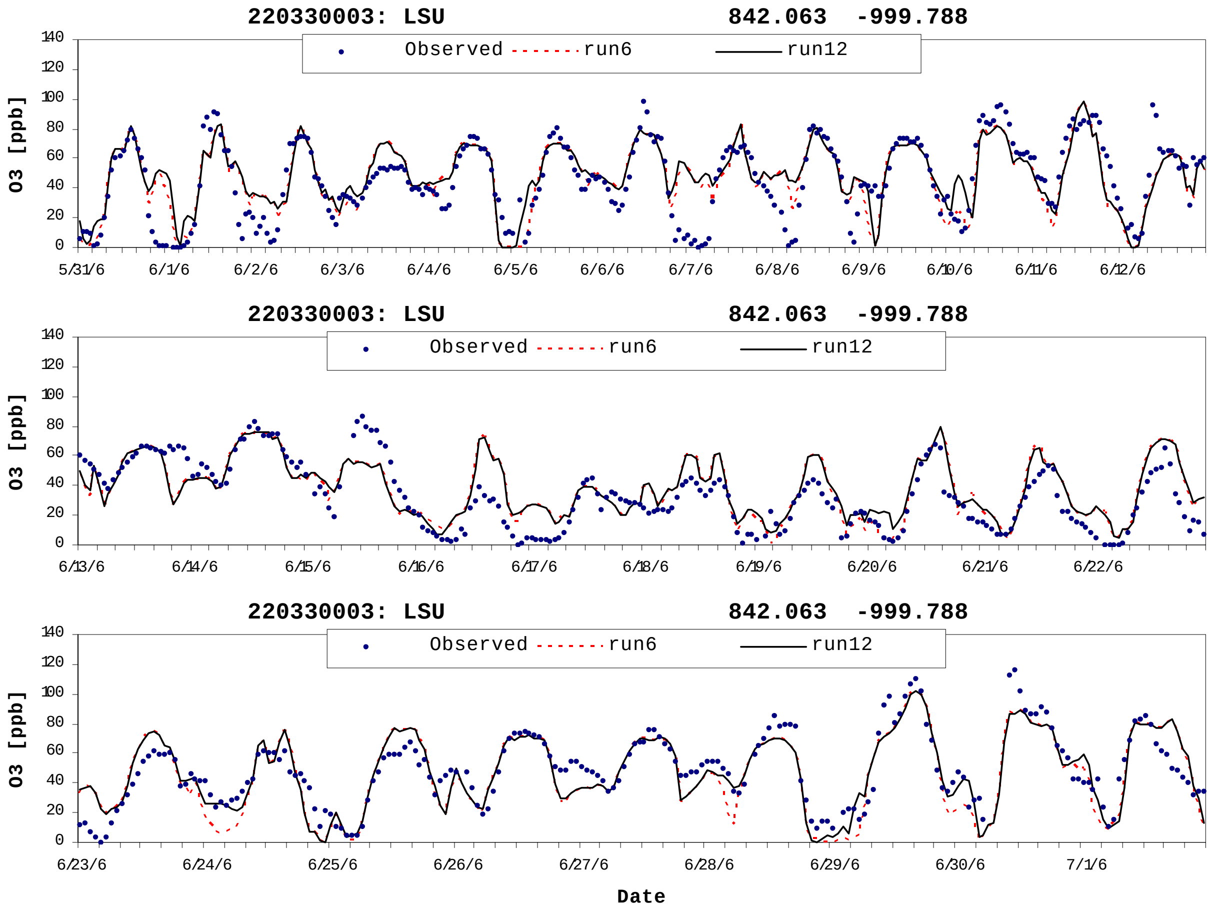


Figure B-35 (b). Time series of observed and Run 6 and 12 hourly ozone at LSU.

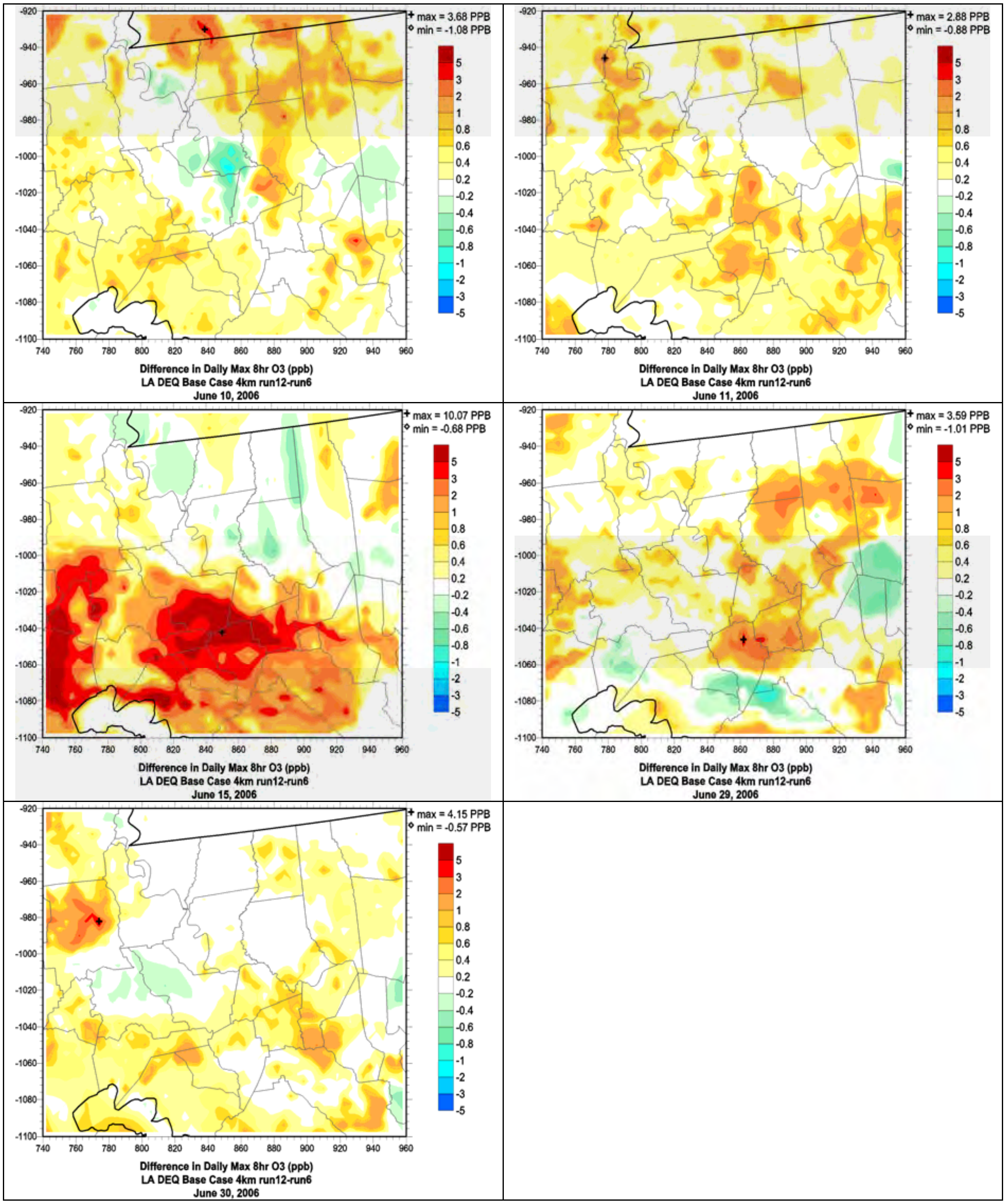


Figure B-36. Spatial plots of daily maximum 8-hour ozone sensitivity to the Run 12 vertical diffusivity patch relative to Run 6 (Run 12 – Run 6).

The effect of the diffusivity patch is most obvious in the 1-hour NOx performance statistics and the concentration time series at Capitol (Figures B-37 and B-38, respectively). Peak and overall NOx over predictions are reduced markedly, especially on the low ozone days when the NOx was particularly high. As shown by the NOx time series at Capitol, the site impacted most by the patch, large over predictions on certain days persist despite the reductions brought about by the change in diffusivity. Based on these results, the diffusivity patch was adopted for all remaining Base Year CAMx runs.

B.8 CAMx RUN 13

Given the better NOx performance in Run 12, and the use of day-specific boundary conditions using MOZART-based results in Run 10a (with little impact on ozone), it was decided that both of these modifications would be retained for subsequent 2006 Base Year simulations. These modifications were combined in Run 13, which was otherwise configured consistent with Run 6.

Model performance statistics comparing 1-hour ozone in Runs 6 and 13 are shown in Figures B-39 and B-40. Overall, there is little change to 1-hour ozone statistical performance; Run 13 tends to perform better on most high ozone days. Based on previous independent runs with alternative diffusivity inputs and boundary conditions (Runs 10a and 12), most of the Run 13 differences are attributed to the change to the vertical diffusivity inputs.

Scatter and Q-Q plots of the daily maximum 8-hour ozone are shown in Figure B-41 from Run 6 and 13. Very little difference is noted in these statistics between these two runs. Figure B-42 displays spatial plots of the daily maximum 8-hour ozone from Runs 6 and 13 for each of the five high-ozone dates, along with the differences between these two runs. Generally, small increases in ozone are seen in the early period, while mixed impacts are seen for June 15 and for the end of the month. While the change in vertical diffusivity was seen to have the largest impact on statistical results (which address all hours of the day), the differences in peak 8-hour ozone spatial distributions are attributed more to the change in boundary conditions.

Figure B-43 displays 1-hour time series of measured and Runs 6 and 13 predicted NOx at four representative sites. The largest impacts are seen at Capitol (and similarly at LSU, not shown), which is located in central Baton Rouge. This is a location where the largest changes in nocturnal vertical diffusivity occur and where the highest NOx emissions are located. Other sites outside of central Baton Rouge do not show large impacts, mostly because of little to zero change in rural vertical diffusivity. The performance for NOx at Bayou Plaquemine and Pride remains relatively good.

Figure B-44 displays bar charts of daily 1-hour NOx performance over all 10 sites, similar to the ozone statistics described earlier, for Runs 6 and 13. In terms of daily peaks, the model performs better with the change to minimum vertical diffusivity but in general continues to tend toward over predictions. The over prediction is worst for high ozone days, which suggests a meteorological influence since day-specific emissions were not used in these simulations (except for a few local EGU sources subject to the acid rain reporting requirements and biogenics). Based on overall statistics (normalized bias and error), model performance tends toward improvement using the alternative diffusivity inputs.

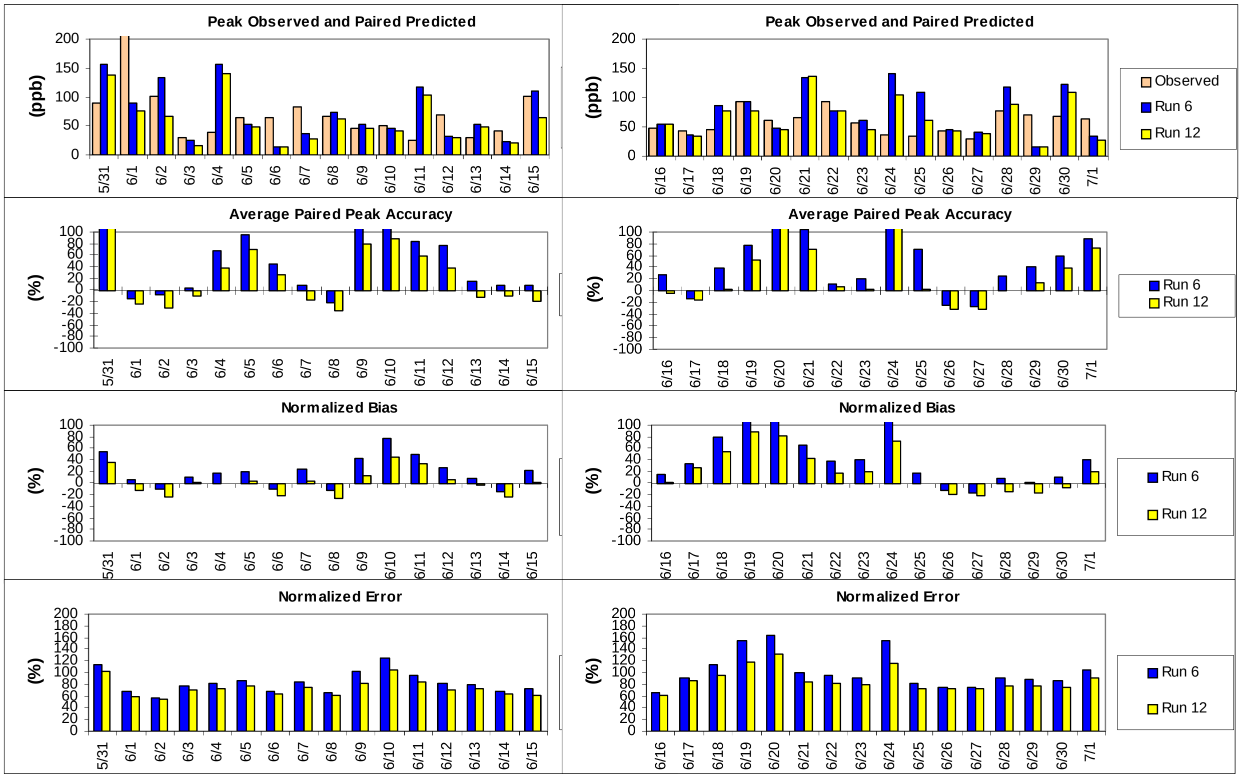


Figure B-37. Peak (top two panels) and overall (bottom two panels) statistical model performance for 1-hour NOx among all 10 AQS sites from CAMx Runs 6 and 12.

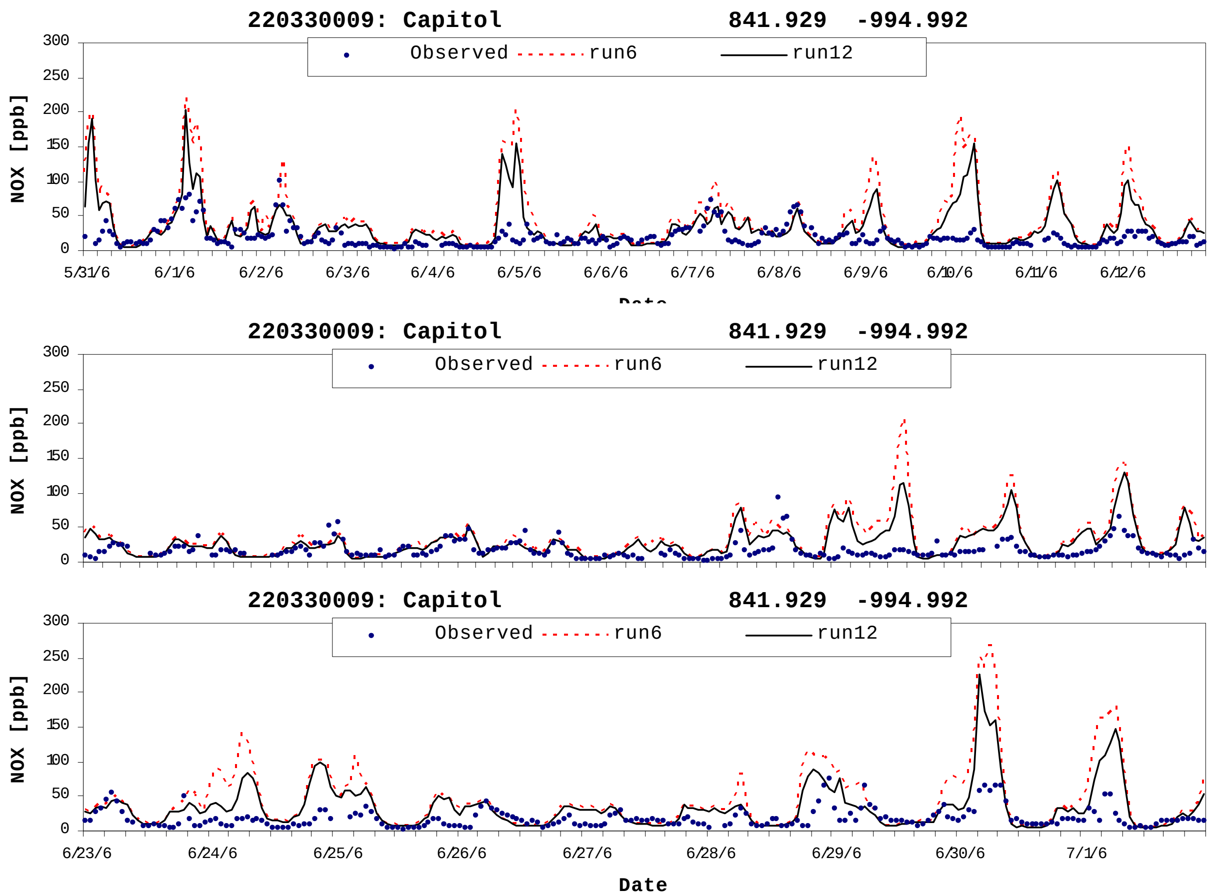


Figure B-38. Time series of observed and Run 6 and 12 hourly NOx at Capitol.

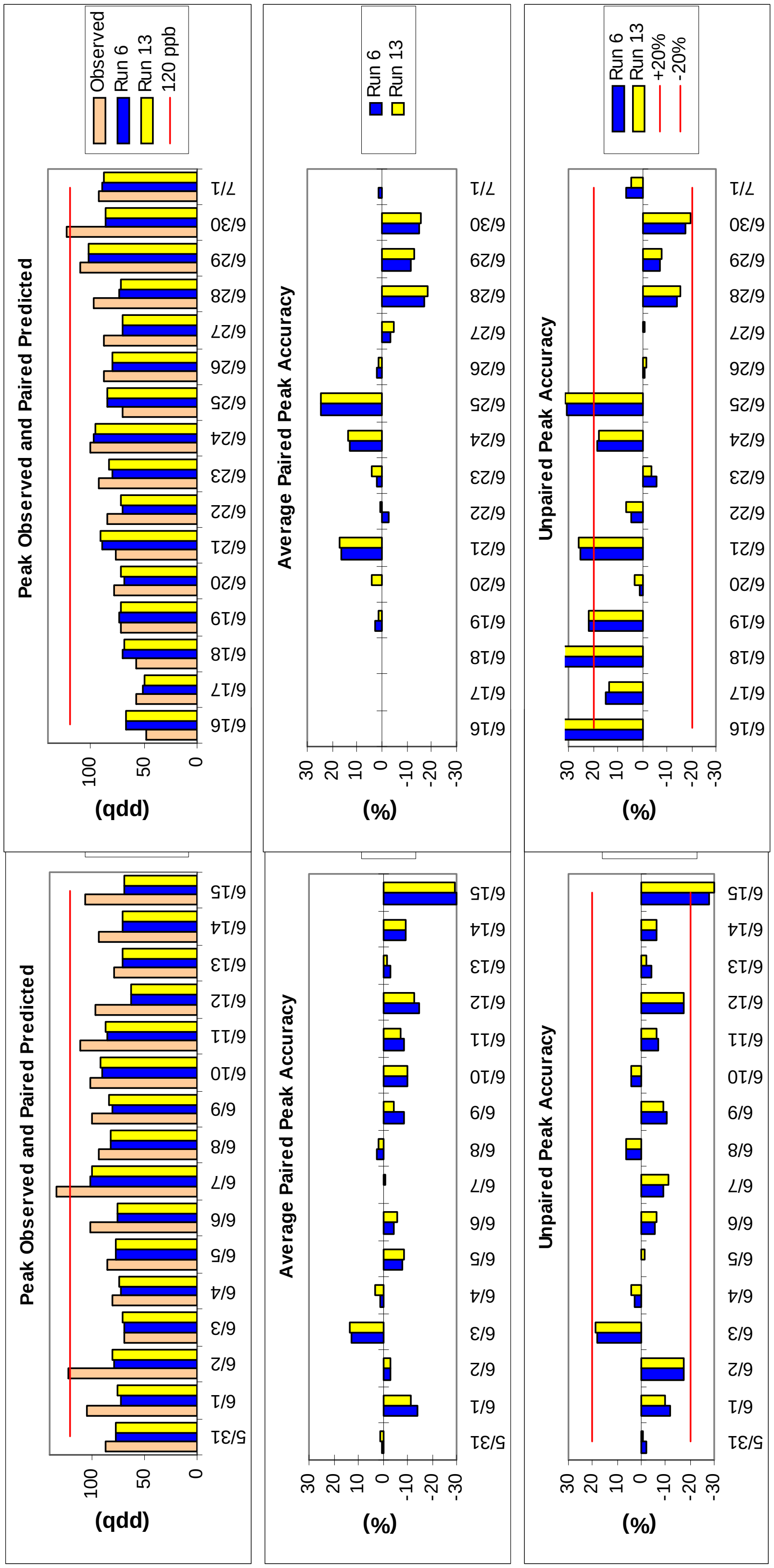


Figure B-39. CAMx Runs 6 and 13 model performance statistics for peak 1-hour ozone.

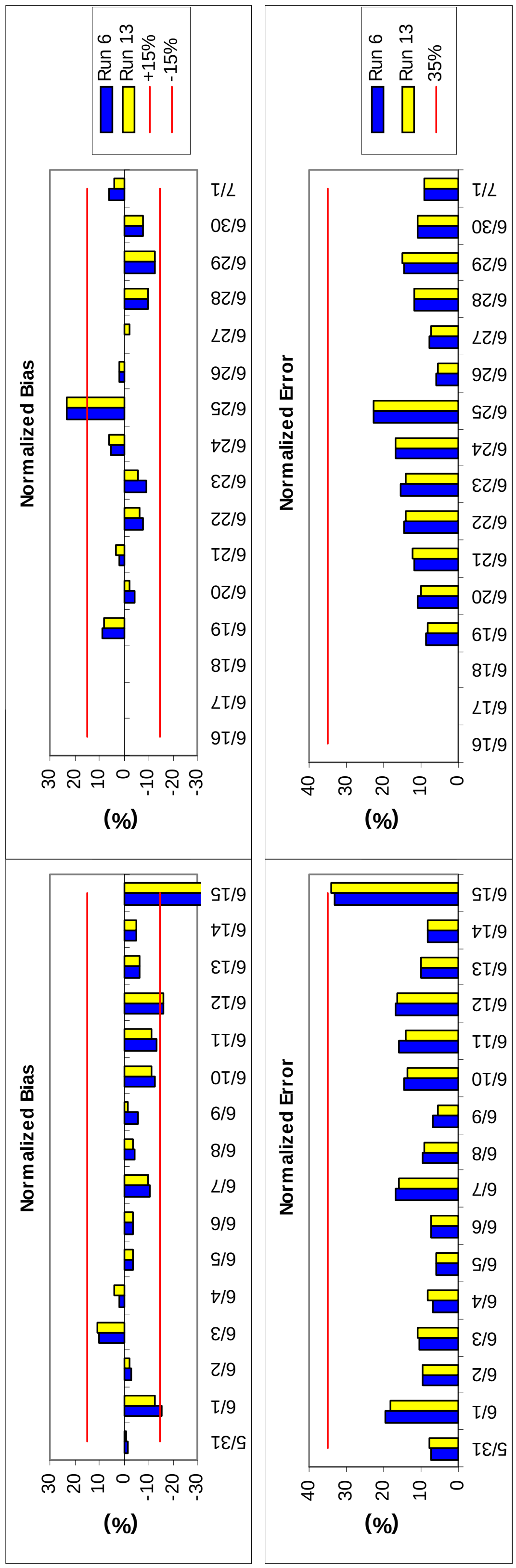


Figure B-40. CAMx Runs 6 and 13 model performance statistics for 1-hour ozone over 40 ppb.

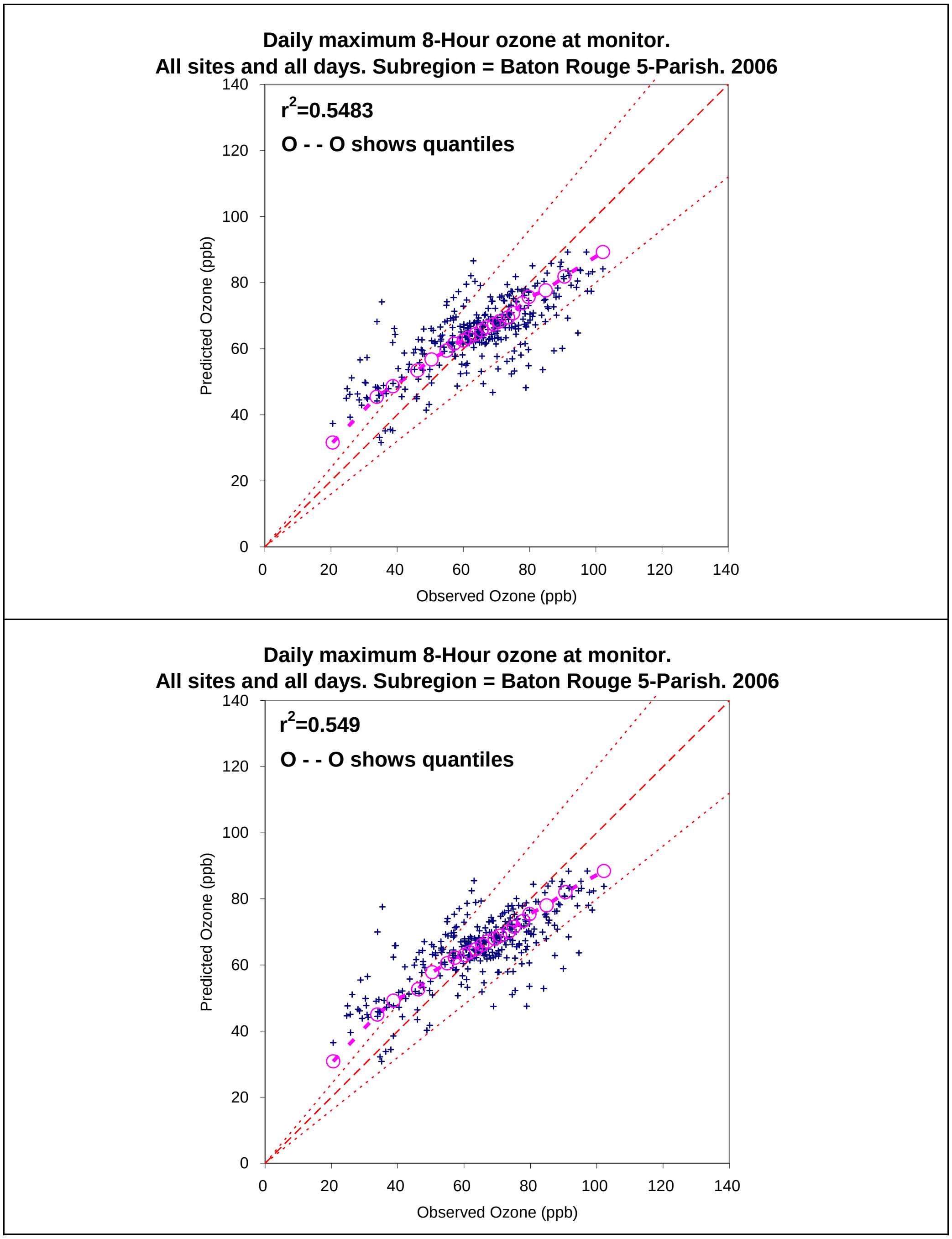


Figure B-41. Scatter and quantile (Q-Q) plots of Run 6 (top) and Run 13 (bottom) daily maximum 8-hour ozone when comparing co-located predictions and observations.

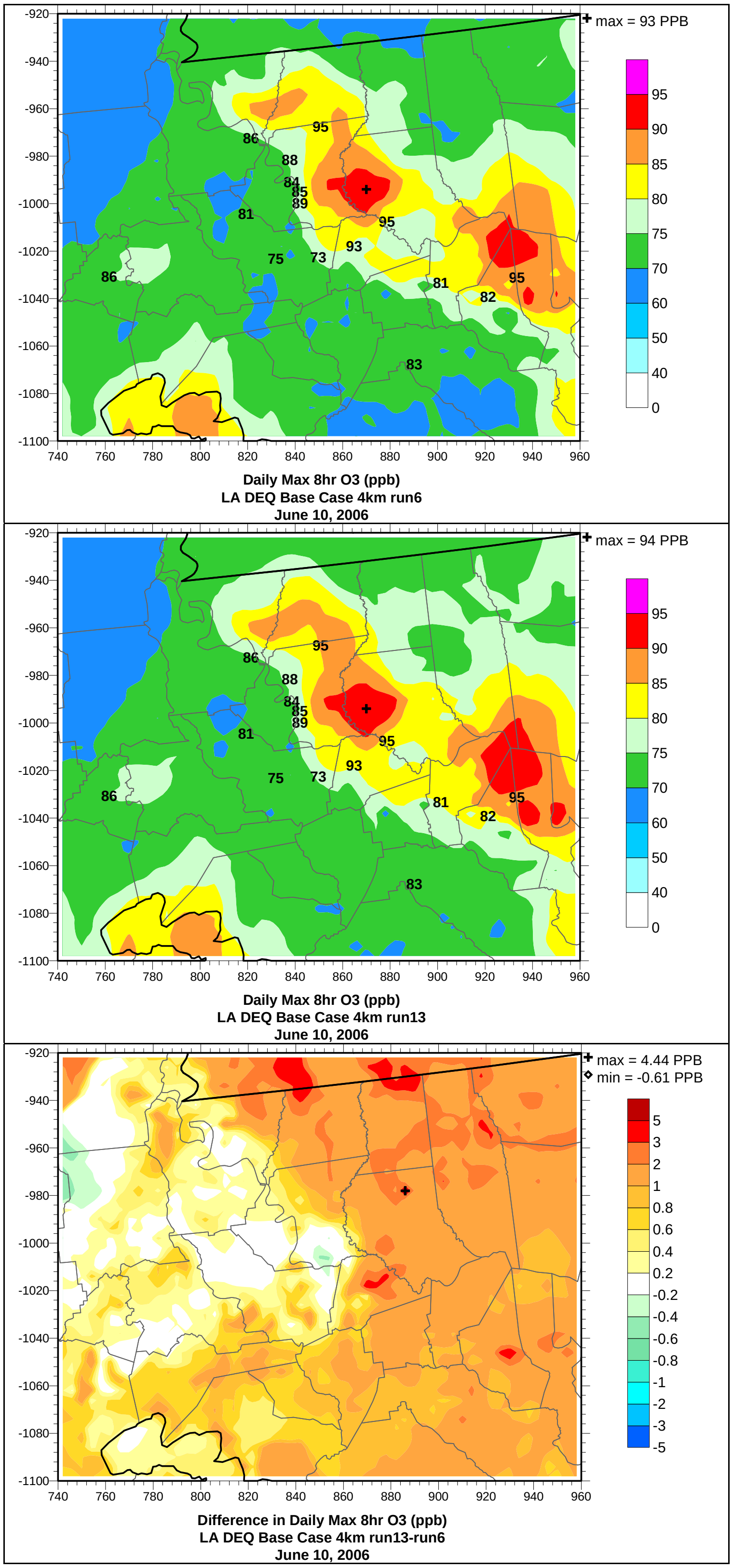


Figure B-42 (a). Spatial plots of daily maximum 8-hour ozone on June 10 from Run 6 (top), Run 13 (middle), and corresponding differences (bottom).

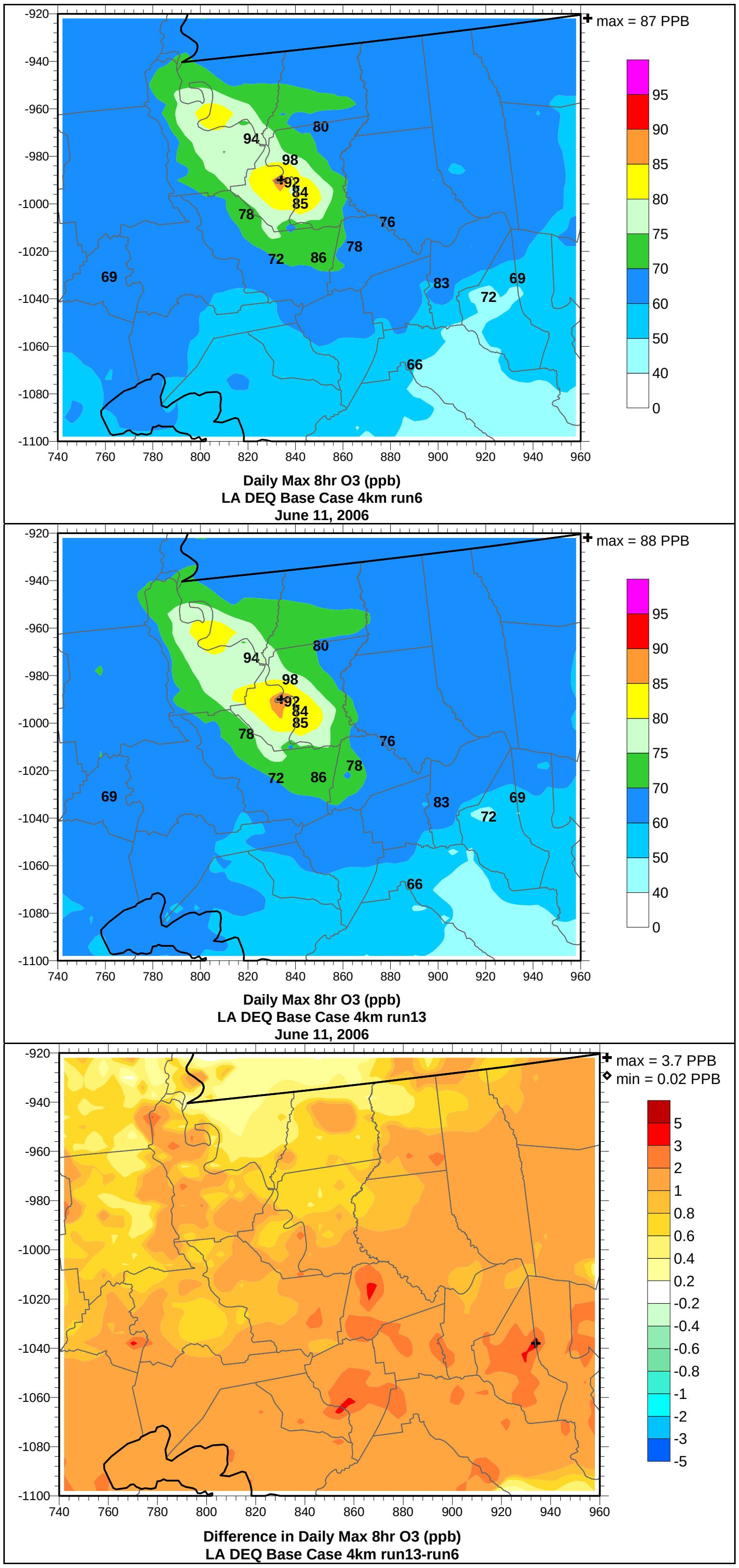


Figure B-42 (b). Spatial plots of daily maximum 8-hour ozone on June 11 from Run 6 (top), Run 13 (middle), and corresponding differences (bottom).

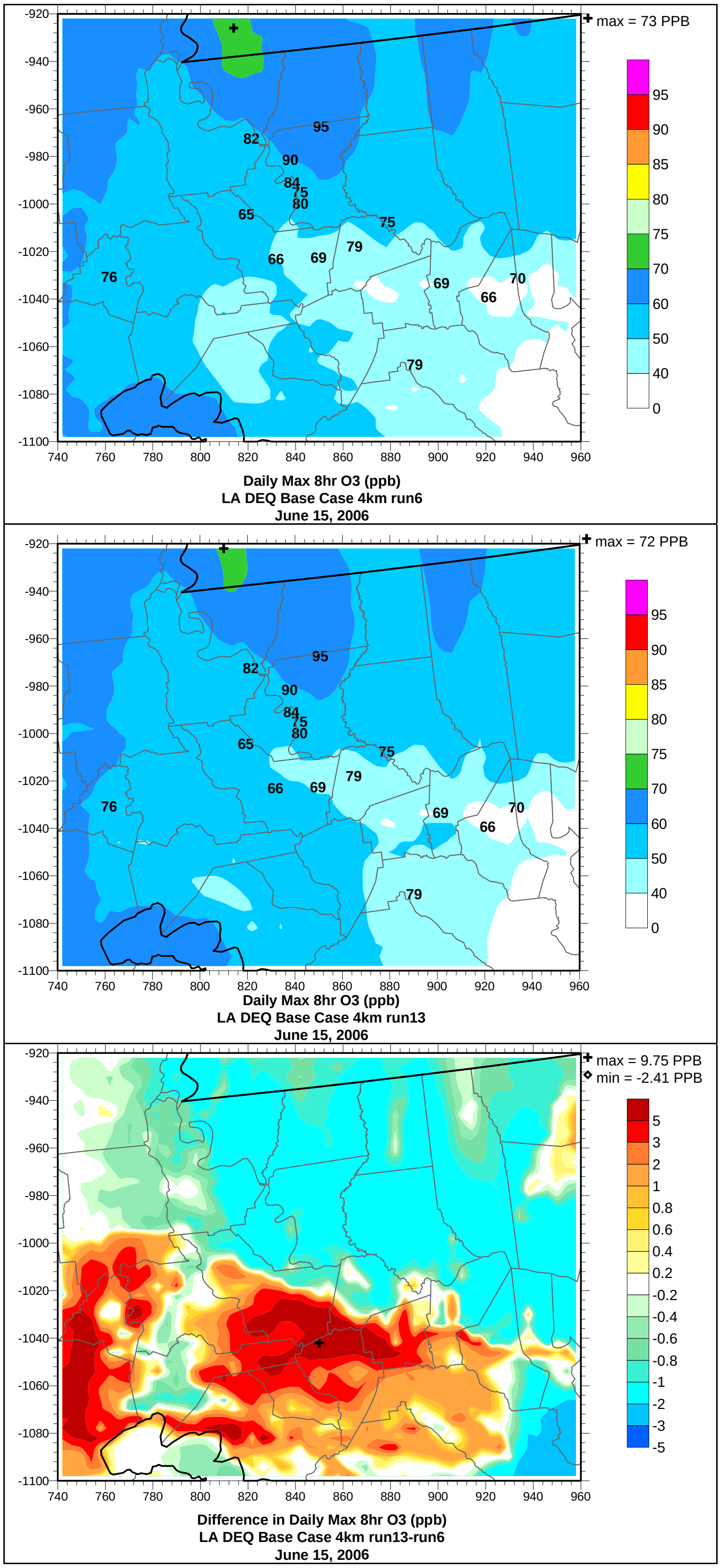


Figure B-42 (c). Spatial plots of daily maximum 8-hour ozone on June 15 from Run 6 (top), Run 13 (middle), and corresponding differences (bottom).

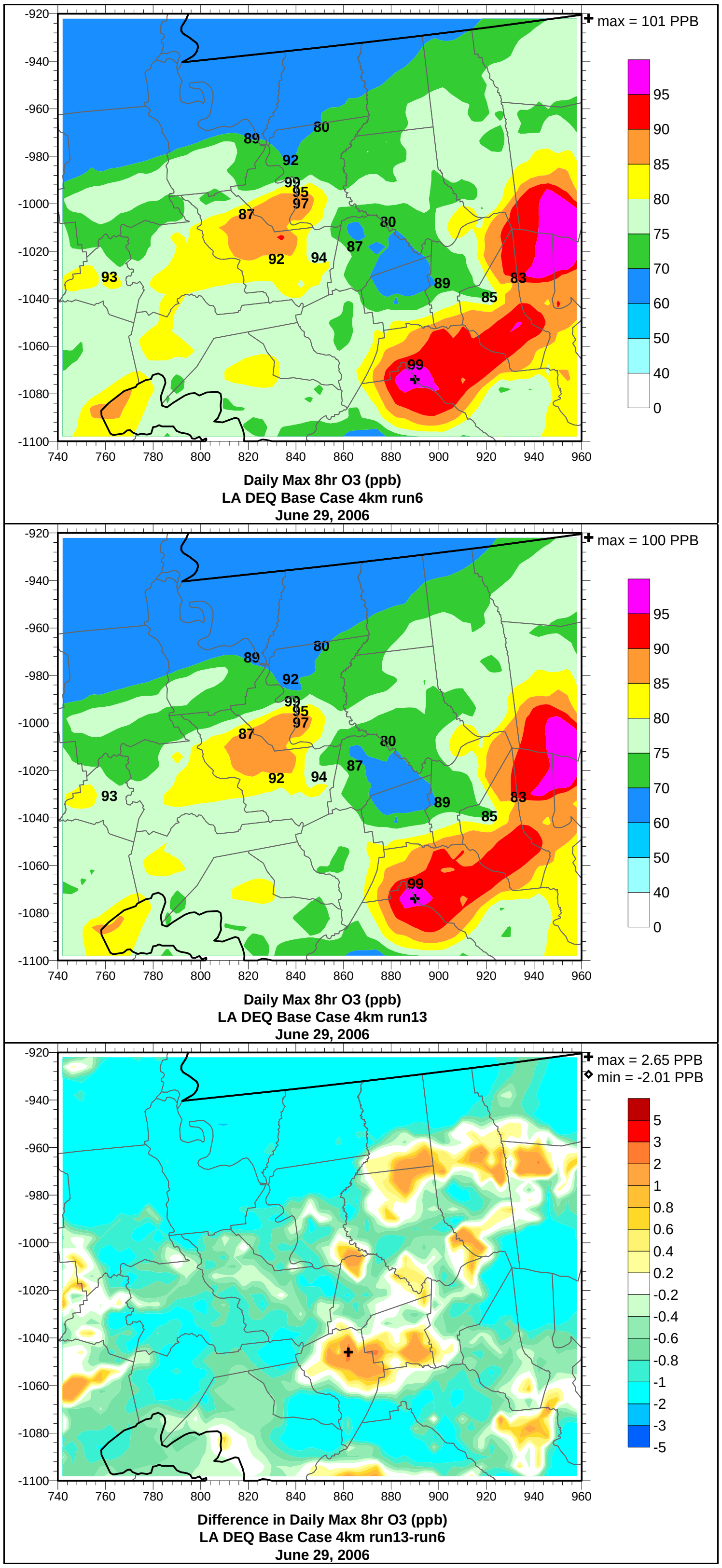


Figure B-42 (d). Spatial plots of daily maximum 8-hour ozone on June 29 from Run 6 (top), Run 13 (middle), and corresponding differences (bottom).

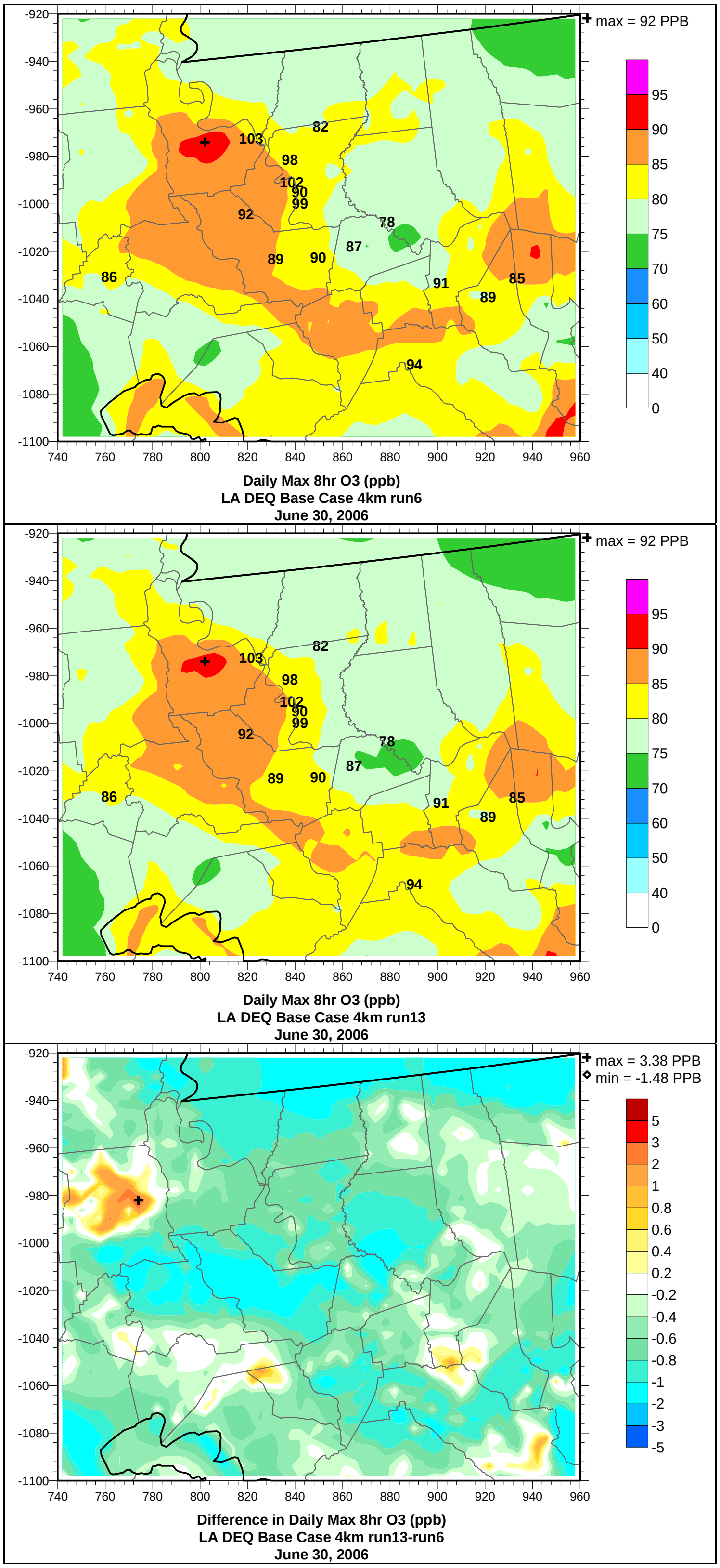


Figure B-42 (e). Spatial plots of daily maximum 8-hour ozone on June 30 from Run 6 (top), Run 13 (middle), and corresponding differences (bottom).

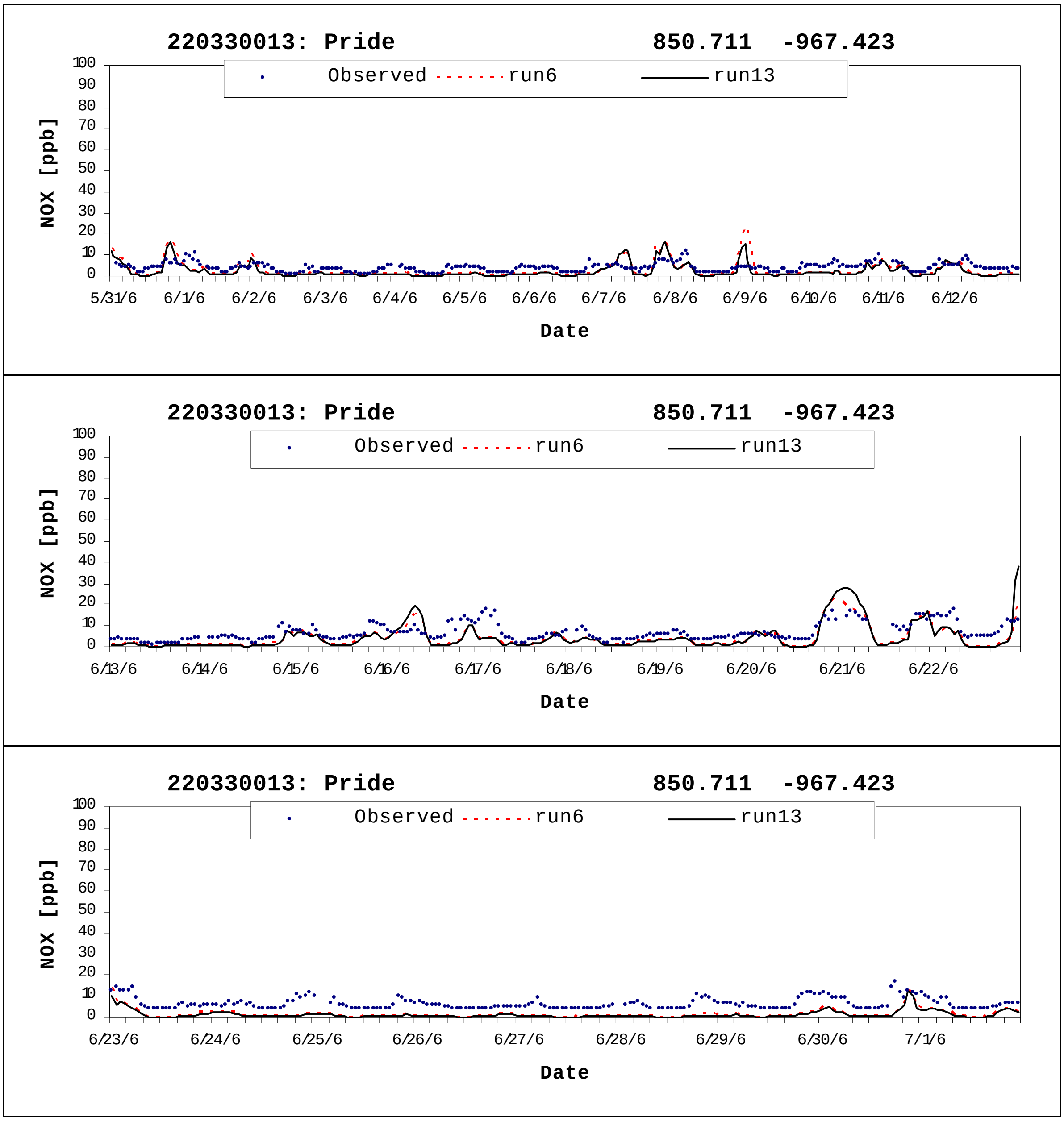


Figure B-43. Time series of observed and Run 6 and 13 hourly NOx at Pride.

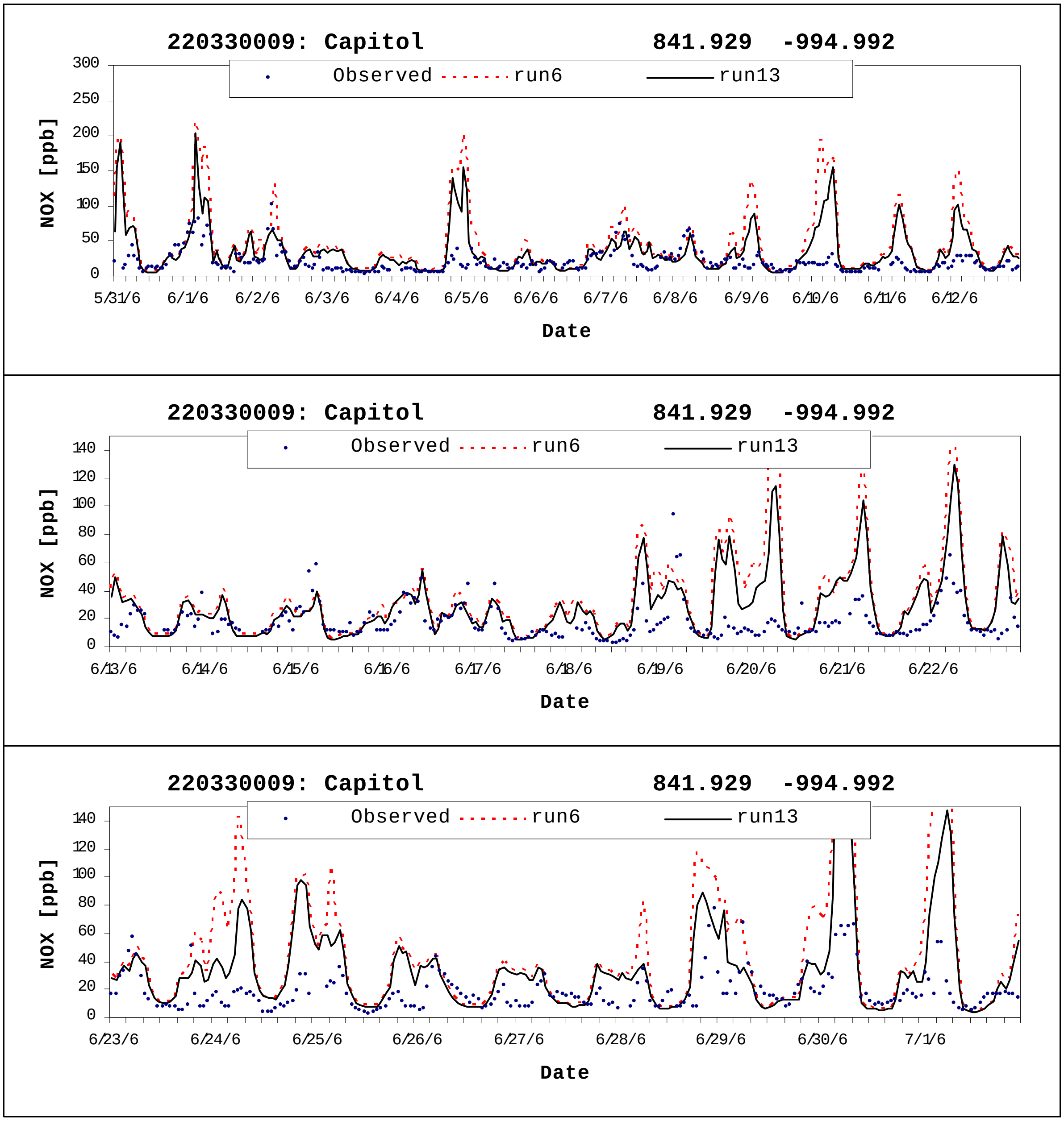


Figure B-43 (continued). Time series of observed and Run 6 and 13 hourly NOx at Capitol.

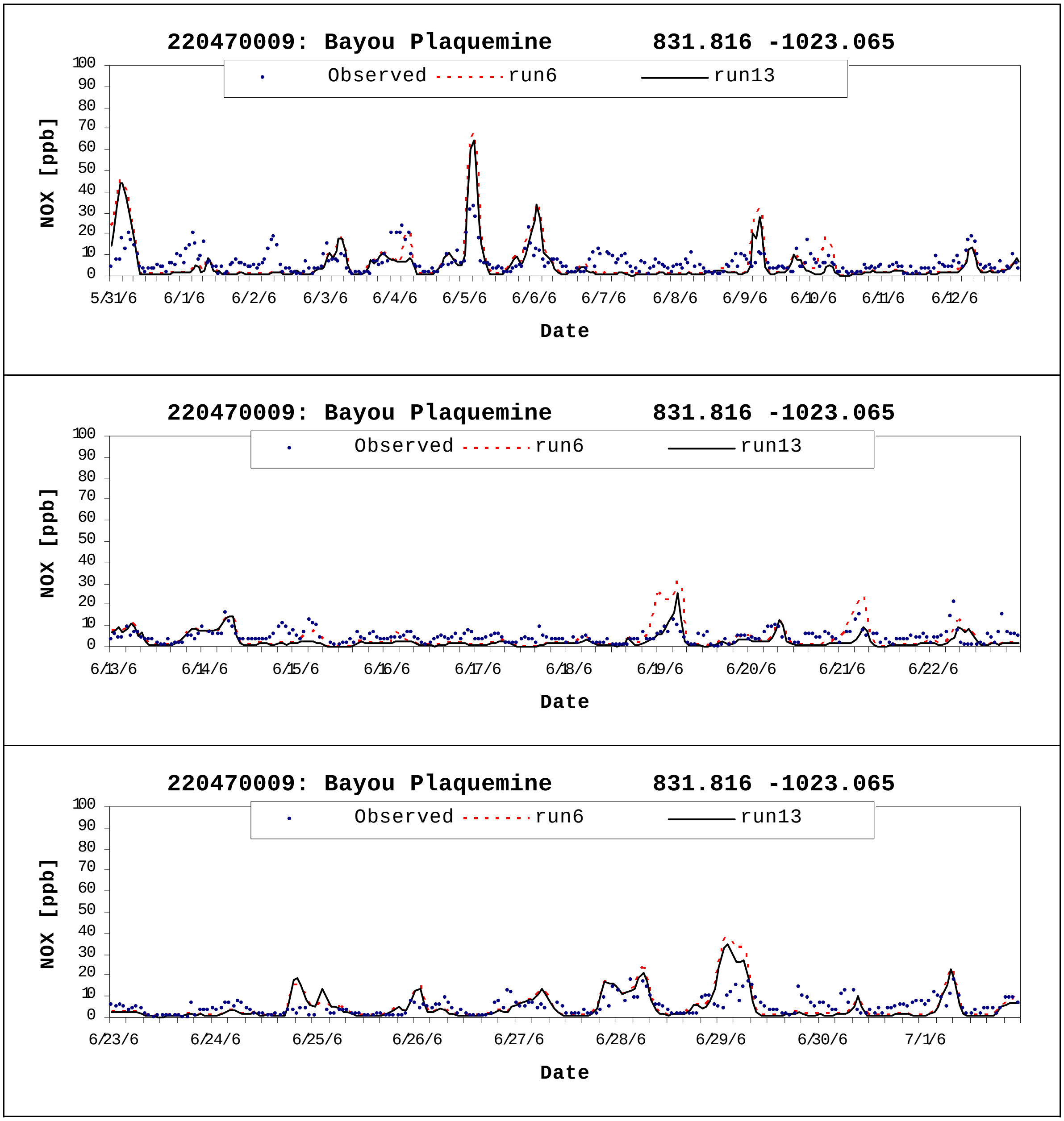


Figure B-43 (continued). Time series of observed and Run 6 and 13 hourly NOx at Bayou Plaquemine.

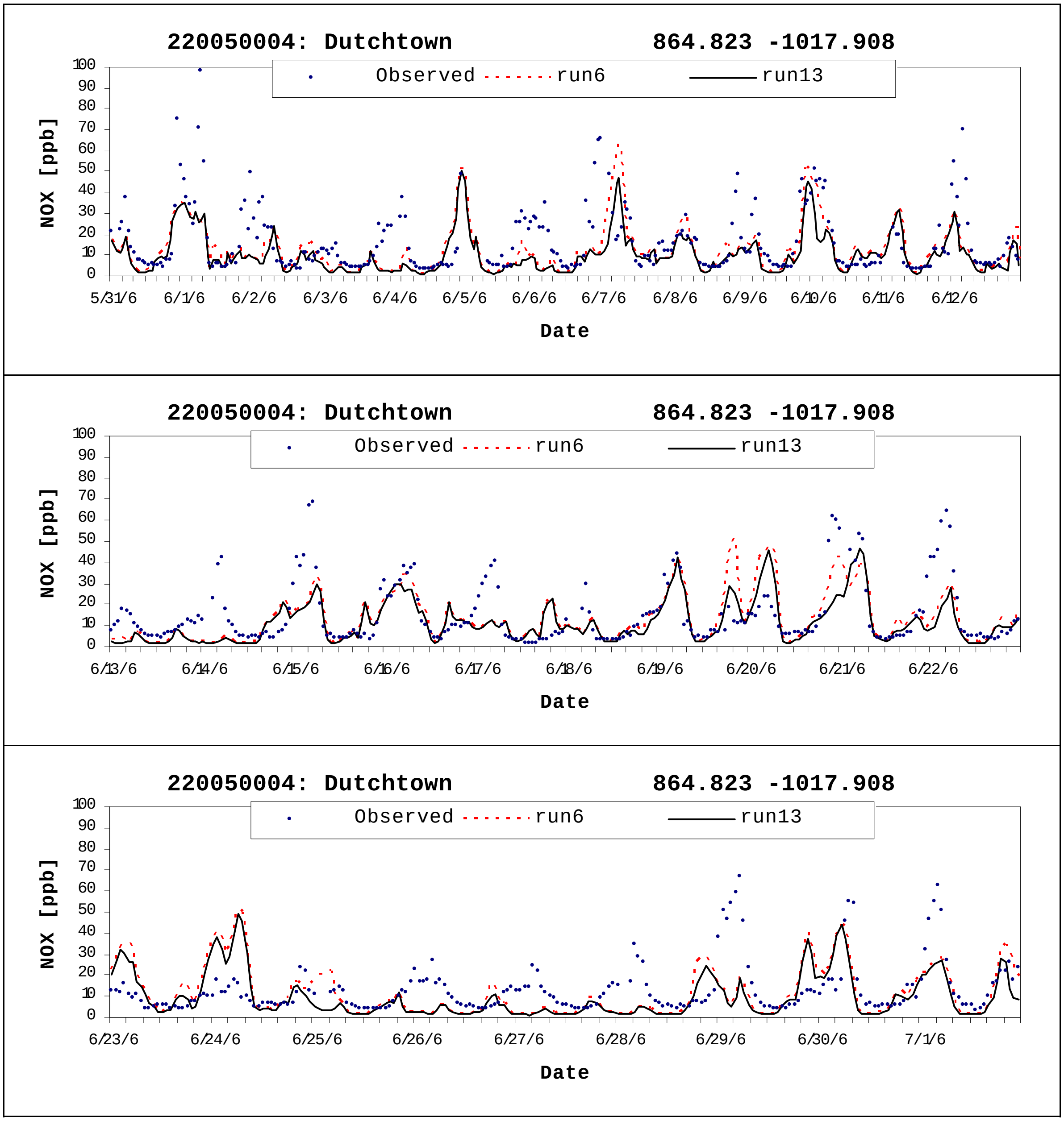


Figure B-43 (concluded). Time series of observed and Run 6 and 13 hourly NOx at Dutchtown.

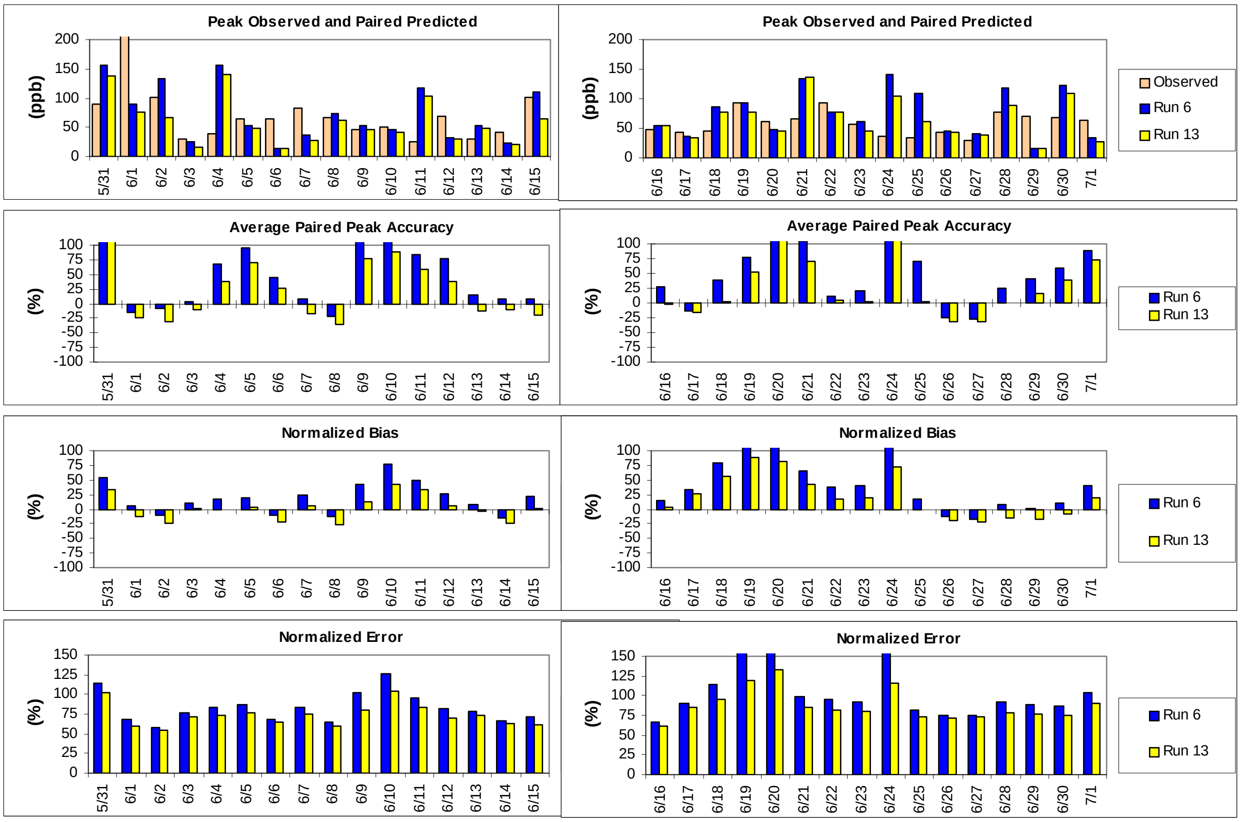


Figure B-44. Peak (top two panels) and overall (bottom two panels) statistical model performance for 1-hour NOx from CAMx Run 6 and 13.

B.9 CAMx RUN 14

Concern was raised by LDEQ that the emissions inventory was possibly lacking a significant quantity of low-reactivity VOC emissions, which emanate from a large number of barges that carry various liquid fuels and other chemical products. Evidence from infrared imaging over the past few years suggests that these barges, which are often moored for extended periods along the Mississippi River within and near Baton Rouge, can release significant fugitive emissions, especially when their hatches are left open. CAMx Run 14 investigated the possible impact of these additional emissions by adding ~100 TPD of the CB05 species "PAR" (light single-bond paraffin compounds) at specific sites along the river that correspond to loading platforms associated with local refineries.

Specifically, Run 14 added 5 TPD of PAR at 19 sites specified by LDEQ and the locations of which are shown in Figure B-45. Otherwise, the model simulation was configured identically to Run 13. Daily 8-hour peak and overall ozone statistics are shown in Figures B-46 and B-47 for Runs 13 and 14, while quantile plots for both runs are shown in Figure B-48. All statistical results show a negligible impact on ozone model performance. Spatial plots of differences in daily maximum 8-hour ozone on the high ozone days (Figure B-49) also show little impact from adding additional PAR emissions. Mostly positive ozone increments were generated (as expected) but the differences remained well within 1 ppb on these days.

More noticeable results were found for VOC:NOx ratio (Figure B-50). At the Capitol and LSU sites, which were impacted by the local additional barge emissions given their proximity to the Mississippi River, the additional PAR emissions increased the VOC:NOx ratio on a daily basis by 25-50% from the Run 13 values of 2 to 5. However, this change was not significant enough to alter the overall chemical regime in these urban areas (NOx-rich, VOC-lean), or to deviate from most of the daily observed conditions. Note that the additional PAR emissions were not enough to increase the VOC:NOx ratio on particular peak days. As expected, no change in VOC:NOx was evident at the more remote sites at Pride and Bayou Plaquemine.

There remains a large uncertainty in the proper location, magnitude, and timing of these types of fugitive emissions. PAMS data suggest that if certain days are influenced by rogue sources of VOC, they are highly intermittent on hourly to daily time scales. Additional field measurement efforts and research are needed to characterize such fugitive sources; indeed the possibility remains that certain day-specific VOC peaks in the PAMS data could be caused by other sources not yet identified or adequately characterized. Run 14 added an interesting sensitivity to the developmental CAMx runs, however the model generally performed well without these emissions. Given the large uncertainties and the fact that simulated ozone was not particularly sensitive to a significant addition of PAR in this manner, it was decided that barge fugitive VOC emissions were currently not sufficiently quantifiable in magnitude, space, and time for SIP modeling.

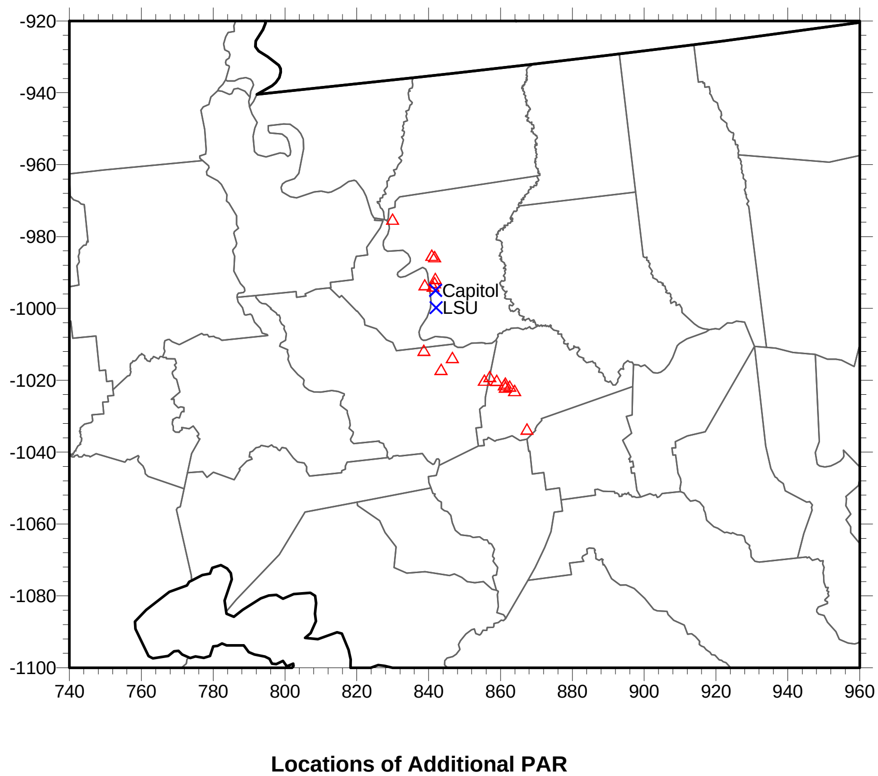


Figure B-45. Locations (triangles) where additional CB05 PAR emissions were added to account for fugitive barge VOC emissions.

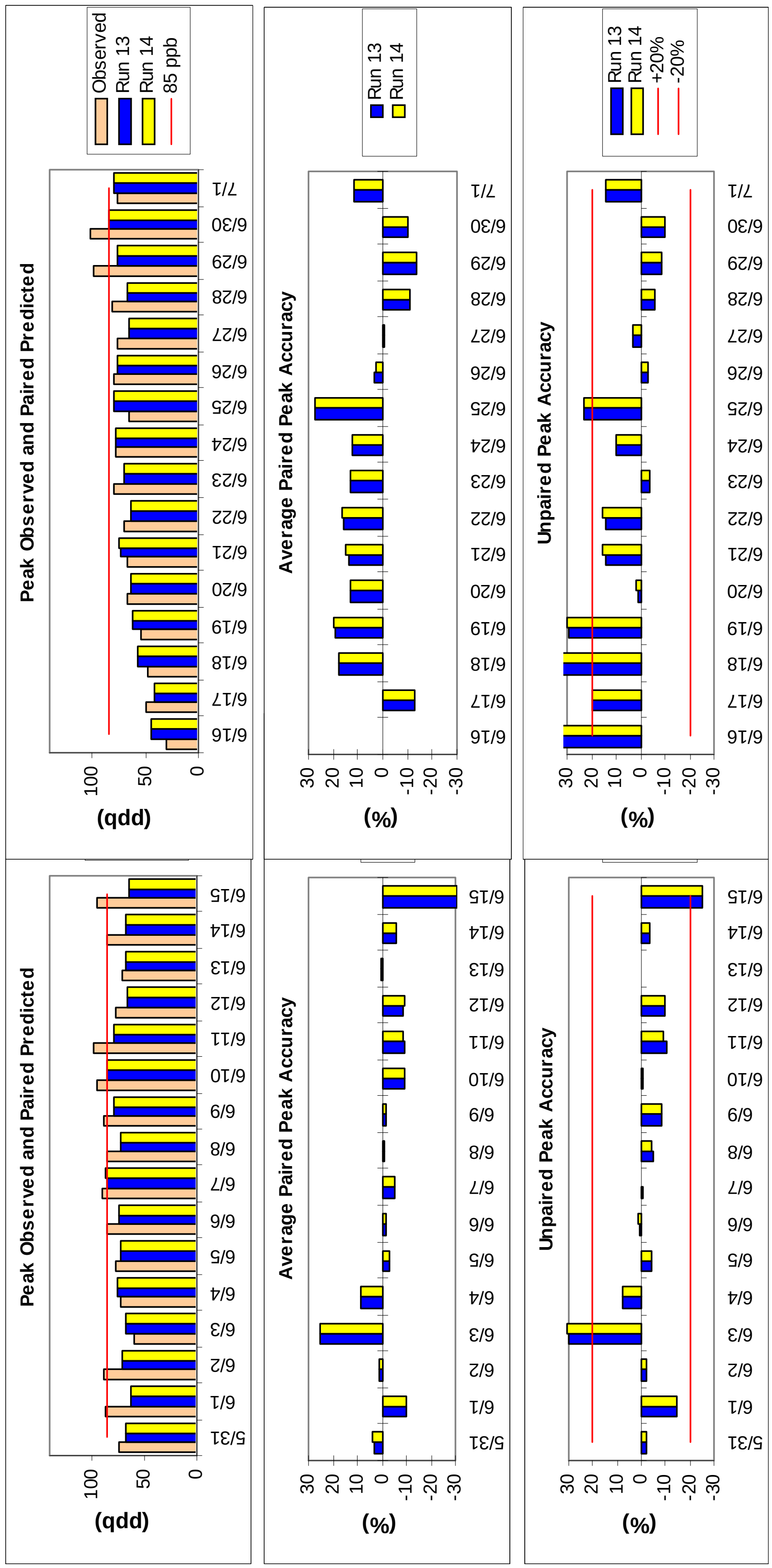


Figure B-46. CAMx Runs 13 and 14 model performance statistics for peak 8-hour ozone.

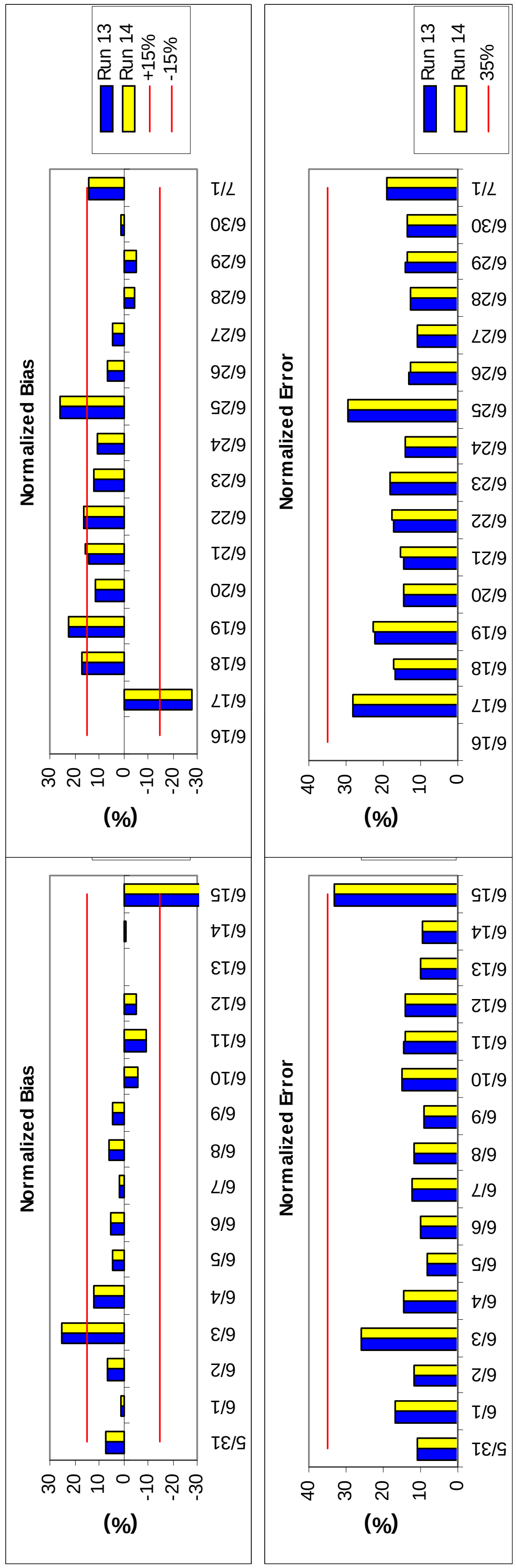


Figure B-47. CAMx Runs 13 and 14 model performance statistics for 8-hour ozone over 40 ppb.

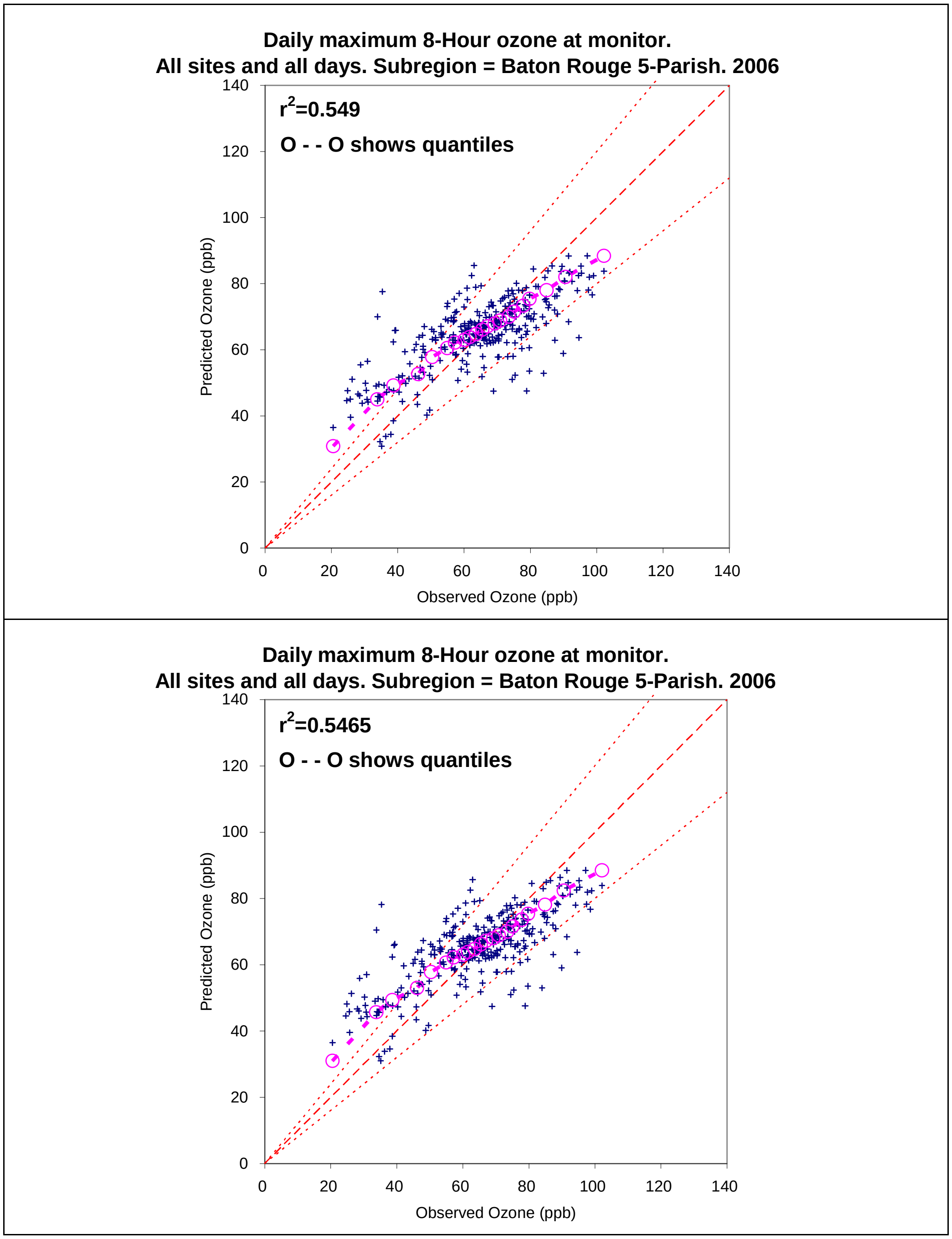


Figure B-48. Scatter and quantile (Q-Q) plots of Run 13 (top) and Run 14 (bottom) daily maximum 8-hour ozone when comparing co-located predictions and observations.

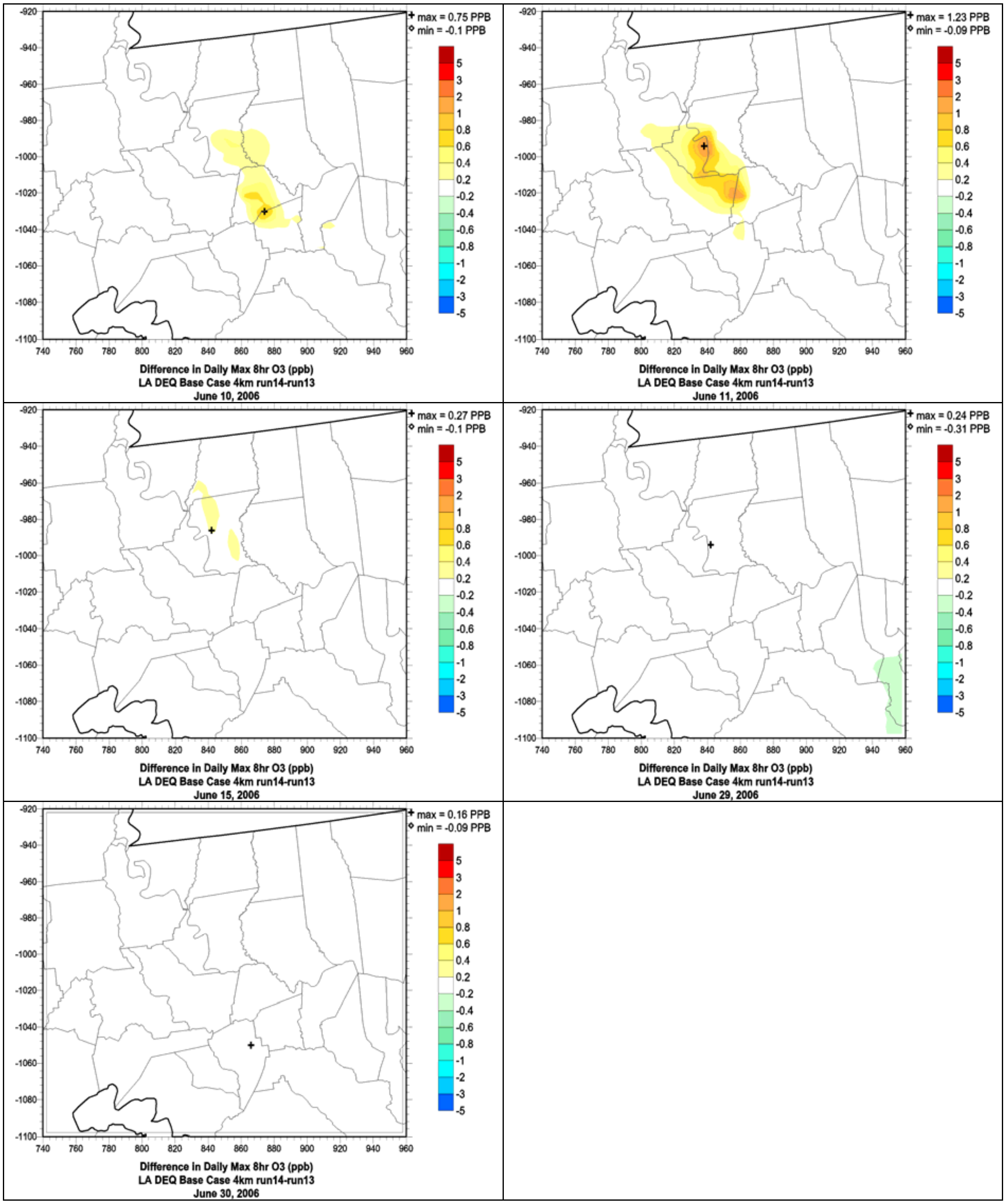
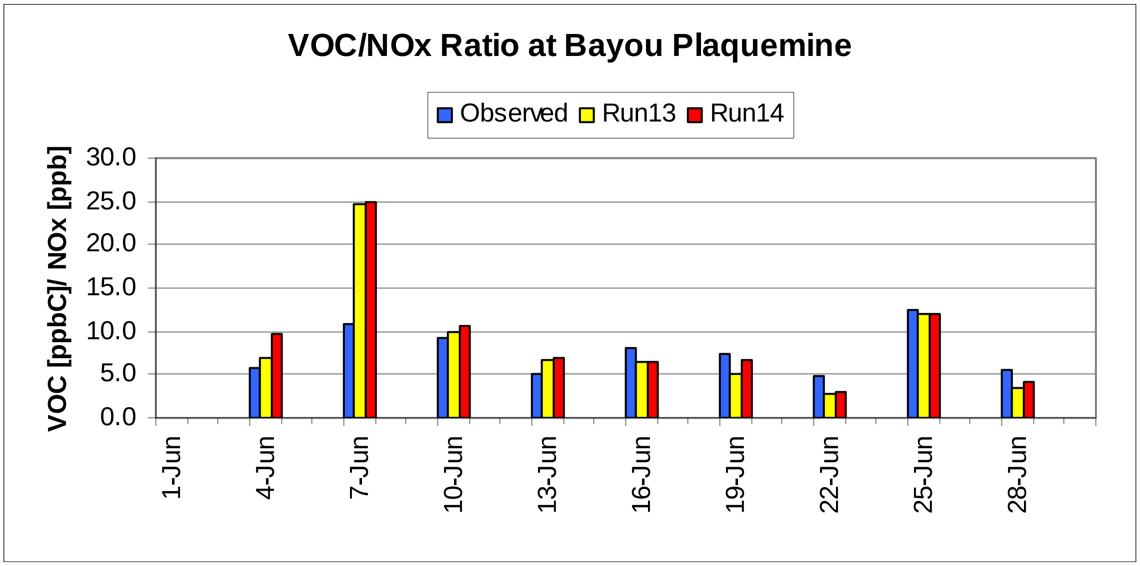


Figure B-49. Spatial plots of daily maximum 8-hour ozone sensitivity to the Run 14 VOC emissions increase relative to Run 13 (Run 14 – Run 13).



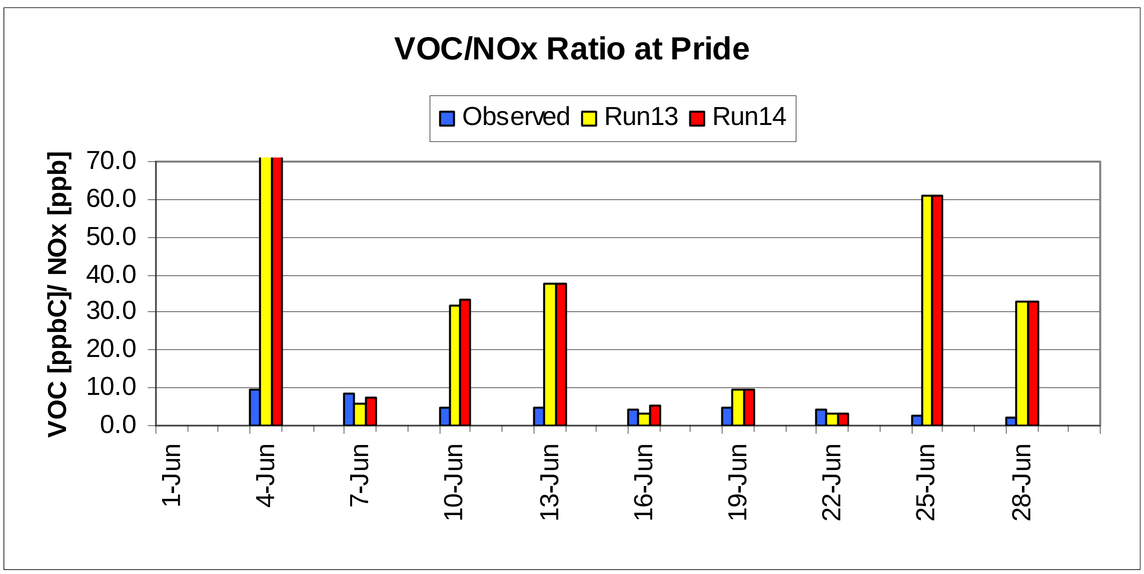


Figure B-50. VOC:NOx ratio comparisons between measurements and Run 13 and 14 predictions at non-urban PAMS sites.

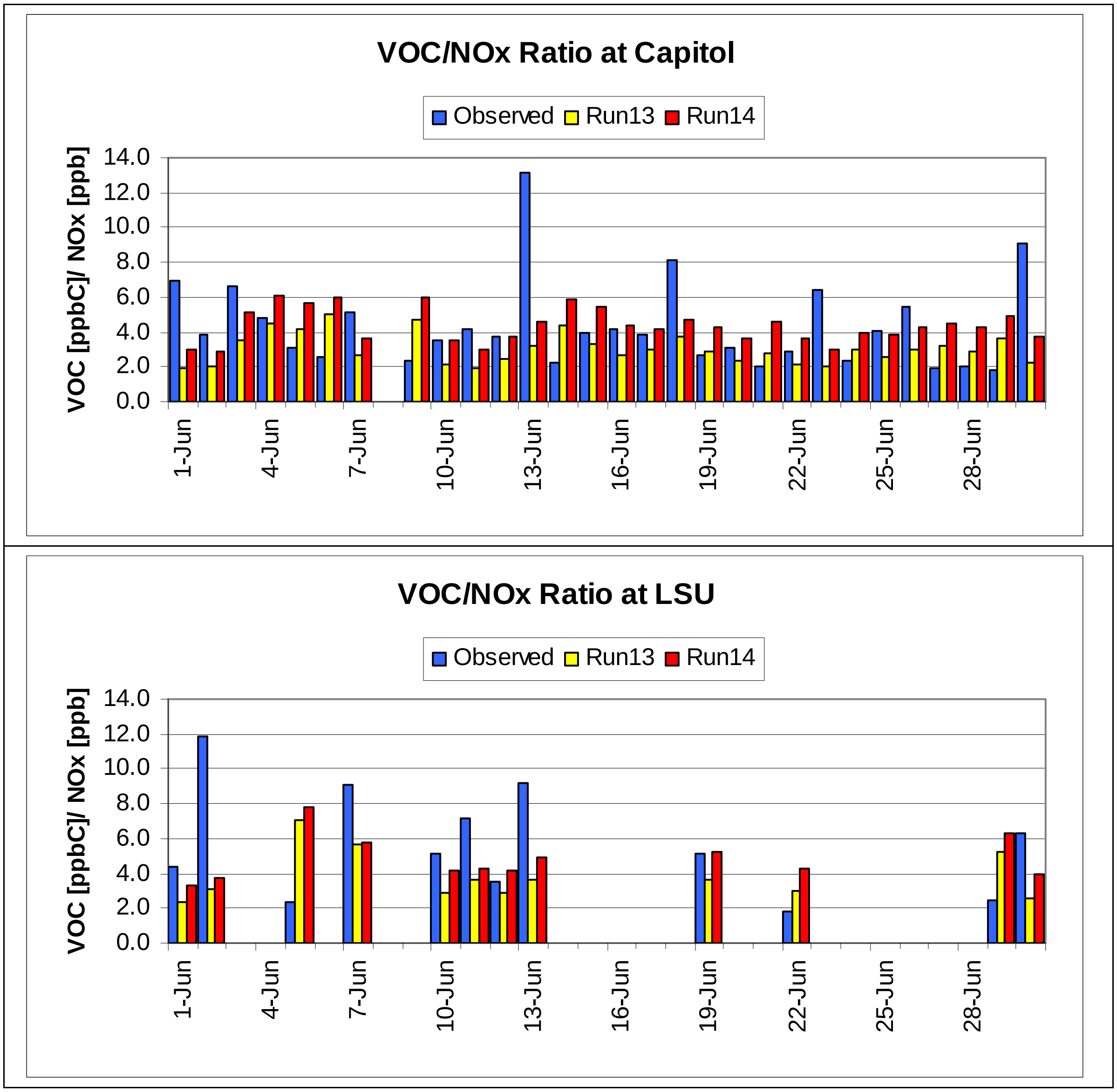


Figure B-50 (concluded). VOC:NOx ratio comparisons between measurements and Run 13 and 14 predictions at urban PAMS sites.

STATE IMPLEMENTATION PLAN (SIP)

FOR THE CONTROL OF OZONE AIR POLLUTION

MOBILE6 MOTOR VEHICLE EMISSIONS BUDGETS

FOR THE BATON ROUGE 8-HOUR OZONE NONATTAINMENT AREA

LOUISIANA DEPARTMENT OF ENVIRONMENTAL QUALITY

OFFICE OF ENVIRONMENTAL ASSESSMENT

P.O. BOX 4314

BATON ROUGE, LOUISIANA 70821-4314

JULY 2009

TABLE OF CONTENTS

FIGURES AND TABLES

APPENDIXES

1.0 BACKGROUND

The five parishes comprising the Baton Rouge metropolitan area: Ascension, East Baton Rouge, Iberville, Livingston, and West Baton Rouge, are currently designated by EPA as a “moderate” 8-hour ozone nonattainment area (Figure 1). The federal transportation conformity regulations (40 CFR part 93), *Criteria and Procedures for Determining Conformity to State and Federal Implementation Plans of Transportation Plans, Programs, and Projects Funded Under Title 23 U.S.C. or the Federal Transit Act*, requires Metropolitan Planning Organizations (MPOs) and state Departments of Transportation (DOTs) to make conformity determinations for Metropolitan Transportation Plans (MTPs) and Transportation Improvement Programs (TIPs) before they are adopted, approved, and accepted in nonattainment and air quality maintenance areas.

In accordance with the federal conformity regulations (as amended through January 2008), the Baton Rouge MPO, the Capital Region Planning Commission (CRPC), and the Louisiana Department of Transportation and Development (LDOTD), in cooperation with the Federal Highway Administration (FHWA) and the Louisiana Department of Environmental Quality (LDEQ), must prepare a conformity determination not less than every four years or as regionally significant projects are added to or removed from the MTP. The updated MTP consists of a "financially constrained plan that demonstrates the availability of funding necessary to implement the transportation improvements.”

In order to demonstrate attainment and maintenance of the National Ambient Air Quality Standard (NAAQS) for ozone, the Clean Air Act Amendments of 1990 (CAAA) require that each state submit a State Implementation Plan (SIP) to the U.S. Environmental Protection Agency (EPA). For the Baton Rouge ozone nonattainment area, the most current applicable air quality SIP that is deemed adequate for transportation conformity purposes will establish the motor vehicle emissions budget (MVEB) for future projects. The purpose of this report is to establish the MVEB for the Baton Rouge nonattainment area using the latest available information and EPA’s mobile source emission factor model, MOBILE6.

1.1 Interagency Consultation Process

In compiling the necessary information for establishing the attainment year (2009) MVEB, LDEQ employed the interagency consultation process outlined in Louisiana’s transportation conformity regulations (LAC 33:III.Chapter 14). For consultation purposes relative to transportation-related SIPs, the five parish Baton Rouge nonattainment area (BRNAA) is represented by the following agencies:

- Louisiana Division Office of the Federal Highway Administration (FHWA)
- Louisiana Department of Transportation and Development (LDOTD)
- Capital Region Planning Commission (CRPC)
- Louisiana Department of Environmental Quality (LDEQ)
- United States Environmental Protection Agency (US EPA), Region 6

FHWA is primarily responsible for ensuring that metropolitan transportation plans (MTPs) and transportation improvement programs (TIPs) conform to applicable SIPs in nonattainment and maintenance areas. LDOTD's Office of Planning and Programming provides a wide variety of statistical data relative to Louisiana's transportation infrastructure. The CRPC serves officially as the Baton Rouge metropolitan planning organization (MPO) and produces MTPs and TIPs for the urbanized portion of the nonattainment area. LDEQ's Air Quality Assessment Division is responsible for producing a SIP that ensures compliance with all applicable CAAA requirements. The EPA apprised LDEQ of the latest issues and providing guidance as needed.

2.0 METHODOLOGY

At the request of LDEQ, interagency consultation meetings were held to discuss and agree upon an appropriate methodology to produce the MOBILE6-based emissions budgets for the BRNAA. The consensus derived at these meetings resulted in the following agreements:

- Use MOBILE6 to produce NOx and VOC emission factors to be used in calculating the MVEBs for the Baton Rouge NAA.
- For the urbanized metropolitan area (the MPO area), model the amended FY 2009 – FY 2013 Transportation Improvement Program (Appendix E) using the TRANPLAN travel demand model with post-processed emissions output (Appendix F).
- For the rural "doughnut" area, use the same 2009 HPMS-based vehicle miles traveled (VMT) data and modeling assumptions as were used in the attainment demonstration and 1997 8-Hour Ozone SIP.

Modeling protocols and other details relative to these generalized tasks are discussed below.

2.1 Nonattainment Area Modeling Domain

The BRAA, currently classified as a moderate nonattainment area, consists of the following five parishes:

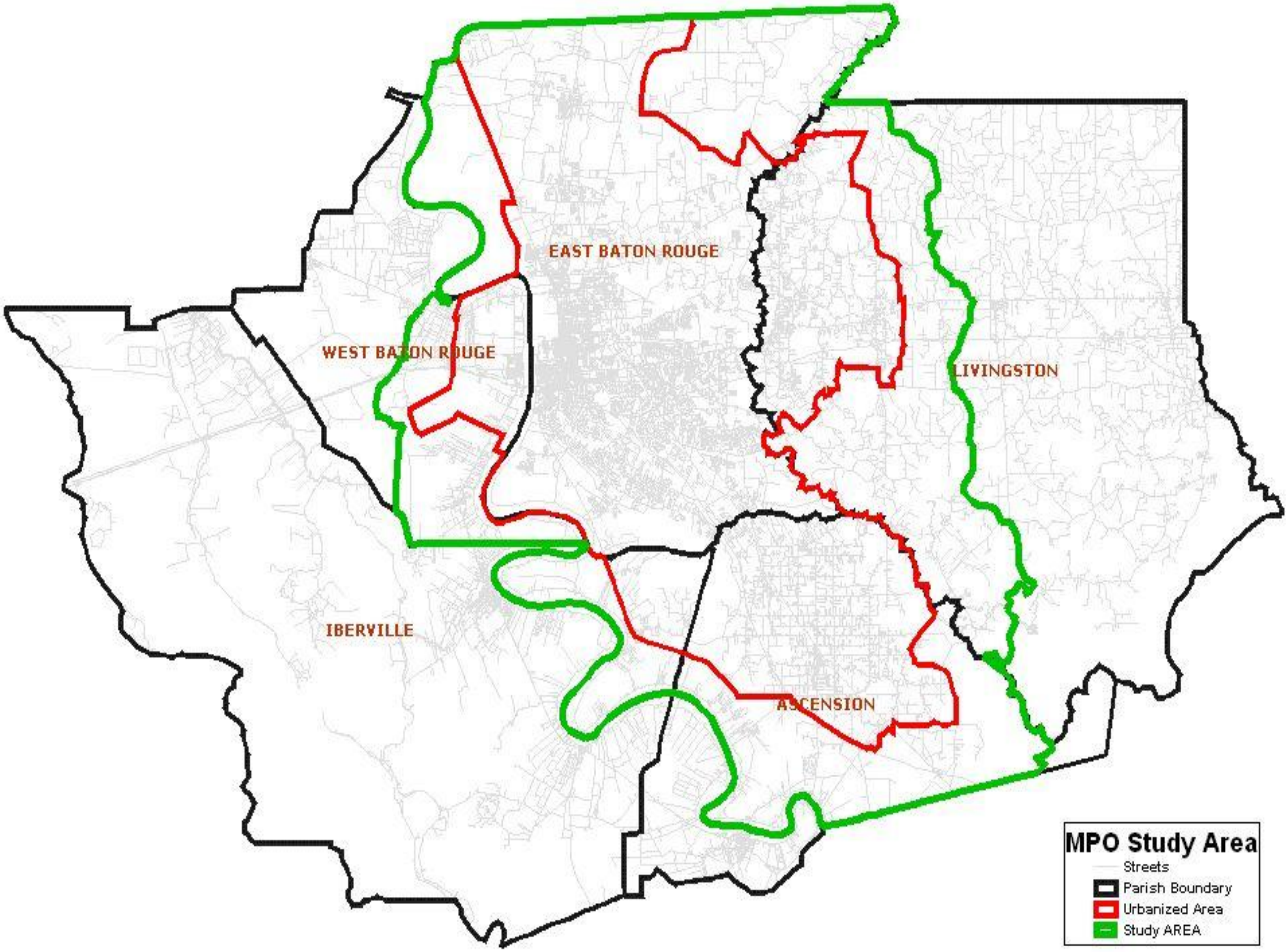
- Ascension Parish
- East Baton Rouge Parish
- Iberville Parish
- Livingston Parish
- West Baton Rouge Parish

The Baton Rouge metropolitan planning area is largely confined to East Baton Rouge Parish, but in recent years it has been expanded into Ascension and Livingston parishes. This metropolitan planning area (typically referred to as the “MPO area”) and the remainder of the nonattainment area (called the “doughnut area”) are depicted in Figure 1.

2.2 MOBILE6 Modeling Protocol

In order to produce MOBILE6 emission factors for use in developing the 2009 MVEB, LDEQ utilized specific procedures and modeling assumptions as described below. To ensure consistency with the CAMx attainment modeling, all procedures and assumptions are equivalent to those used in the 1997 8-Hour ozone attainment demonstration.

Figure 1: The Nonattainment Area Modeling Domain



2.2.1 Model Assumptions Common to the MPO Area and the "Doughnut Area"

The following area-specific model input assumptions are common to the urbanized and rural portions of the nonattainment area:

- Fuel volatility: Summertime gasoline Reid vapor pressure (RVP) value of 7.8 psi.
- Ambient air temperature: Average minimum and maximum summertime temperatures of 72.3°F and 94.8°F.
- Humidity: Average absolute humidity of 123.4 grains per pound.
- Vehicle registration distributions by age: Reflecting the age of the vehicle fleet by vehicle type (Appendix B).
- VMT mix: The percentage of VMT allocated to each of the sixteen (16) composite vehicle types by roadway classification (Appendix B).

It should be noted that for the modeling exercise, refueling-loss emissions are "zeroed out" since these emissions are routinely inventoried and modeled as area-source emissions.

2.2.2 VMT Mix and Vehicle Registration Distributions

The VMT mix data was updated by DOTD in January 2008 and provided to LDEQ in November 2008. Similarly, the vehicle registration distributions data was updated by LDEQ in January 2008 with the latest 2006 data. These updates help to increase the accuracy of on-road emissions estimates. Appendix B contains the newest VMT mix and vehicle registration distributions data.

2.2.3 Vehicle Inspection and Maintenance (I/M) Program

The required vehicle I/M program in the BRNAA in 2009 consists of the following three program components:

- An emissions control system anti-tampering program (ATP)
- A gas cap pressure test
- On-board diagnostic (OBD) testing

The MOBILE6 parameters for the BRNAA I/M program are as follows:

1. Vehicle anti-tampering program
    a. Start year: 2000
    b. Annual test and repair program
    c. Compliance rate: 72%
    d. Model years covered: 1980-1995
2. Vehicle gas cap pressure test
    a. Vehicle types covered: LDGV, LDGT1, LDGT2, LDGT3, LDGT4, HDGV2B
        1) Start year: 2000
        2) End year: 2001
        3) Annual test and repair program
        4) Compliance rate: 96%
        5) Model years covered: 1980-2001
    b. Vehicle type covered: HDGV2B
        1) Start year: 2002
        2) End year: 2006
        3) Annual test and repair program
        4) Compliance rate: 96%
        5) Model years covered: 1980-2006
    c. Vehicle type covered: LDGV, LDGT1, LDGT2, LDGT3, LDGT4
        1) Start year: 2002
        2) Annual test and repair program
        3) Compliance rate: 96%
        4) Model years covered: 1996-2050
    d. Vehicle type covered: HDGV2B
        1) Start year: 2007
        2) Annual test and repair program
        3) Compliance rate: 96%
        4) Model years covered: 2007-2050
3. Vehicle On-board diagnostics testing
    a. Start year: 2002
    b. Annual test and repair program
    c. Compliance rate: 96%
    d. Model years covered: 1996-2050
    e. Vehicle types covered: LDGV, LDGT1, LDGT2, LDGT3, LDGT4, HDGV2B

2.3 Metropolitan Planning Area Modeling

To estimate the emissions for the Baton Rouge MPO area, CRPC used an enhanced modeling technique that utilizes travel demand model (TDM) output combined with post-processing of VMT, vehicle speeds, and emissions. The travel demand forecasting model currently in use by CRPC is called TRANPLAN. The TRANPLAN model uses the spatial layout of the area's existing urban highway network, and based on a wide variety of demographic data, it is used to predict daily/hourly VMT and average vehicle speeds by facility class for future year scenarios.

After modeling the 2009 analysis year with TRANPLAN, the network file produced is post-processed with Post Processor for Air Quality (PPAQ, a component of PPSUITE™) modeling software. This software was recently modified for use with MOBILE6 and uses a standard MOBILE input file to produce detailed emissions summaries. In addition to the emissions output, the PPAQ software produces an output file that refines the TRANPLAN VMT and vehicle speed data by distributing the data over four user-supplied daily time periods (morning and evening peak separated by two off-peak periods).

Using the Baton Rouge specific modeling parameters described above, a MOBILE6 file was run with PPAQ to produce emissions summaries for the 2009 Transportation Improvement Program (Appendix E) network file. Appendix F contains all PPAQ input and output files from this run as well as the summary totals.

2.4 "Doughnut Area" Modeling

In contrast to the metropolitan area's enhanced modeling techniques and procedures, modeling performed for the "doughnut area" is more simplified, yet provides a reasonable estimate of the remaining emissions in the BRNAA. For this portion of the BRNAA, the LDOTD provides average daily VMT projections adjusted for the summer ozone season. LDOTD personnel in the Office of Planning and Programming, Data Collection and Analysis Sections, are responsible for compiling Highway Performance Monitoring System (HPMS) VMT by roadway functional class and parish.

LDOTD provided to LDEQ the necessary VMT estimates and projections used to prepare periodic emission inventories, various SIP revision inventories, motor vehicle emissions budgets for conformity purposes, etc. Appendix C contains the HPMS-based VMT data projection, stratified by roadway class, that were provided to LDEQ for the development of the 2009 emissions projections in the non-urbanized portion of the BRNAA. In addition to the VMT projections, LDOTD recommends the modeling of a single average vehicle speed for each of the twelve (12) roadway classes that is equivalent to 90 percent of the roadway design value speeds. These speeds are shown in the scenario records of the MOBILE6 input files in Appendix A. Emissions estimates derived from this simplified modeling approach are summarized by parish in Appendix D

3.0 MVEBS FOR VOLATILE ORGANIC COMPOUNDS AND NITROGEN OXIDES FOR THE BATON ROUGE OZONE NONATTAINMENT AREA

After modeling all appropriate parameters with the MOBILE6 model, the next step required to produce the MVEBs is to multiply the vehicle emission factors (g/mi VOC and g/mi NOx) by the MPO- and "doughnut area" daily VMT (mi/day) and sum the total. The resulting emissions (g/day) are then converted to U.S tons per day (tpd). Taken from the emissions summaries in Appendix D, the 2009 mobile source emissions inventories for Baton Rouge are summarized in Table 3-1 and the MVEBs for VOC and NOx are noted at the bottom of the table.

Table 3-1

2009 Motor Vehicle Emissions Budgets (tpd) for the Baton Rouge
5-Parish Ozone Nonattainment Area

Scenario Year	2009	2009
Pollutant	VOC	NOx
HPMS-based Network Emissions	2.59	6.29
PPAQ Emissions for the MPO Area	16.05	19.84
Motor Vehicle Emissions Budgets	**18.64**	**26.13**

Appendix A

MOBILE6 Input and Output Files

* Baton Rouge 5-Parish Non-attainment Area (90% design speeds)

* Using new 2006 VRD

* This run is for MVEB 2009 project

******************* Header Section *************************

MOBILE6 INPUT FILE :

POLLUTANTS : HC NOX

RUN DATA

******************* Run Section ****************************

>Year 2009 - Conventional gas modeled for the Baton Rouge NAA

NO REFUELING :

MIN/MAX TEMP : 72.3 94.8

ABSOLUTE HUMIDITY : 123.44

FUEL RVP : 7.8

REG DIST : RegBTR06.rg

I/M DESC FILE : BR0506im.d

ANTI-TAMP PROG : 00 80 95 22222 21111111 1 11 072. 22222222

******************* Scenario Section ***********************

SCENARIO REC : Rural interstate, 63.0

CALENDAR YEAR : 2009

EVALUATION MONTH : 7

ALTITUDE : 1

AVERAGE SPEED : 63.0 Non-Ramp 100.0 0.0 0.0 0.0

VMT FRACTIONS :

0.600 0.036 0.119 0.014 0.006 0.070 0.007 0.006

0.004 0.016 0.018 0.020 0.072 0.004 0.002 0.006

****************** Scenario Section ***********************

SCENARIO REC : Rural principal arterial, 58.5

CALENDAR YEAR : 2009

EVALUATION MONTH : 7

ALTITUDE : 1

AVERAGE SPEED : 58.5 Arterial 0.0 100.0 0.0 0.0

VMT FRACTIONS :

0.653 0.045 0.151 0.017 0.008 0.039 0.004 0.003

0.002 0.009 0.010 0.011 0.040 0.002 0.001 0.005

****************** Scenario Section ***********************

SCENARIO REC : Rural minor arterial, 49.5

CALENDAR YEAR : 2009

EVALUATION MONTH : 7

ALTITUDE : 1

AVERAGE SPEED : 49.5 Arterial 0.0 100.0 0.0 0.0

VMT FRACTIONS :

0.672 0.044 0.147 0.017 0.008 0.035 0.003 0.003

0.002 0.008 0.009 0.010 0.035 0.002 0.001 0.004

****************** Scenario Section ***********************

SCENARIO REC : Rural major collector, 45.0

CALENDAR YEAR : 2009

EVALUATION MONTH : 7

ALTITUDE : 1

AVERAGE SPEED : 45.0 Arterial 0.0 100.0 0.0 0.0

VMT FRACTIONS :

0.667 0.050 0.166 0.019 0.009 0.027 0.003 0.002

0.002 0.006 0.007 0.008 0.028 0.001 0.001 0.004

****************** Scenario Section **********************

SCENARIO REC : Rural minor collector, 36.0

CALENDAR YEAR : 2009

EVALUATION MONTH : 7

ALTITUDE : 1

AVERAGE SPEED : 36.0 Arterial 0.0 100.0 0.0 0.0

VMT FRACTIONS :

0.639 0.050 0.166 0.019 0.009 0.030 0.003 0.002

0.002 0.007 0.008 0.009 0.031 0.002 0.001 0.022

****************** Scenario Section **********************

SCENARIO REC : Rural local, 27.0

CALENDAR YEAR : 2009

EVALUATION MONTH : 7

ALTITUDE : 1

VMT BY FACILITY : localvmt.d

VMT FRACTIONS :

0.654 0.057 0.189 0.003 0.002 0.024 0.002 0.002

0.001 0.005 0.006 0.007 0.025 0.001 0.001 0.021

****************** Scenario Section **********************

SCENARIO REC : Urban interstate, 58.5

CALENDAR YEAR : 2009

EVALUATION MONTH : 7

ALTITUDE : 1

AVERAGE SPEED : 58.5 Non-Ramp 100.0 0.0 0.0 0.0

VMT FRACTIONS :

0.733 0.036 0.119 0.014 0.006 0.029 0.003 0.002

0.002 0.006 0.008 0.008 0.030 0.001 0.001 0.002

******************* Scenario Section ************************

SCENARIO REC : Urban other expressway, 58.5

CALENDAR YEAR : 2009

EVALUATION MONTH : 7

ALTITUDE : 1

AVERAGE SPEED : 58.5 Non-Ramp 100.0 0.0 0.0 0.0

VMT FRACTIONS :

0.707 0.042 0.139 0.016 0.008 0.028 0.003 0.002

0.002 0.006 0.007 0.008 0.028 0.001 0.001 0.002

******************* Scenario Section ************************

SCENARIO REC : Urban principal arterial, 49.5

CALENDAR YEAR : 2009

EVALUATION MONTH : 7

ALTITUDE : 1

AVERAGE SPEED : 49.5 Arterial 0.0 100.0 0.0 0.0

VMT FRACTIONS :

0.767 0.034 0.113 0.013 0.006 0.020 0.002 0.002

0.001 0.004 0.005 0.006 0.020 0.001 0.000 0.006

****************** Scenario Section ***********************

SCENARIO REC   : Urban minor arterial, 45.0

CALENDAR YEAR   : 2009

EVALUATION MONTH : 7

ALTITUDE   : 1

AVERAGE SPEED   : 45.0 Arterial 0.0 100.0 0.0 0.0

VMT FRACTIONS   :

0.773 0.036 0.120 0.014 0.006 0.016 0.002 0.001

0.001 0.003 0.004 0.005 0.016 0.001 0.000 0.002

****************** Scenario Section ***********************

SCENARIO REC   : Urban collector, 36.0

CALENDAR YEAR   : 2009

EVALUATION MONTH : 7

ALTITUDE   : 1

AVERAGE SPEED   : 36.0 Arterial 0.0 100.0 0.0 0.0

VMT FRACTIONS   :

0.773 0.034 0.114 0.013 0.006 0.014 0.001 0.001

0.001 0.003 0.004 0.004 0.015 0.001 0.000 0.016

****************** Scenario Section ***********************

SCENARIO REC   : Urban local, 27.0

CALENDAR YEAR   : 2009

EVALUATION MONTH : 7

ALTITUDE   : 1

VMT BY FACILITY : localvmt.d

VMT FRACTIONS :

0.796 0.037 0.122 0.003 0.001 0.008 0.001 0.001

0.000 0.002 0.002 0.003 0.009 0.000 0.000 0.015

END OF RUN

****

* MOBILE6.2.03 (24-Sep-2003) *

* Input file: 5PMVEB09.IN (file 1, run 1). *

****

*Year 2009 - Conventional gas modeled for the Baton Rouge NAA

M603 Comment:

User has disabled the calculation of REFUELING emissions.

* Reading Registration Distributions from the following external

* data file: REGBTR06.RG

M 49 Warning:

1.00 MYR sum not = 1. (will normalize)

M 49 Warning:

1.00 MYR sum not = 1. (will normalize)

M 49 Warning:

1.00 MYR sum not = 1. (will normalize)

M 49 Warning:

1.00 MYR sum not = 1. (will normalize)

M 49 Warning:

1.00 MYR sum not = 1. (will normalize)

* Reading I/M program description records from the following external

* data file: BR0506IM.D

* #

* Rural interstate, 63.0

* File 1, Run 1, Scenario 1.

* #

M581 Warning:

The user supplied freeway average speed of 63.0

will be used for all hours of the day. 100% of VMT

has been assigned to the freeway roadway type for

all hours of the day and all vehicle types.

M615 Comment:

User supplied VMT mix.

*** I/M credits for Tech1&2 vehicles were read from the following external

data file: TECH12.D

M 48 Warning:

there are no sales for vehicle class HDGV8b

Calendar Year: 2009

Month: July

Altitude: Low

Minimum Temperature: 72.3 (F)

Maximum Temperature: 94.8 (F)

Absolute Humidity: 123. grains/lb

Nominal Fuel RVP: 7.8 psi

Weathered RVP: 7.4 psi

Fuel Sulfur Content: 30. ppm

Exhaust I/M Program: Yes

Evap I/M Program: Yes

ATP Program: Yes

Reformulated Gas: No

Vehicle Type: LDGV LDGT12 LDGT34 LDGT HDGV LDDV LDDT HDDV
MC All Veh

GVWR: <6000 >6000 (All)

------ ------ ------ ------ ------ ------ ------ ------ ------ ------

VMT Distribution: 0.5995 0.1550 0.0197 0.0643 0.0005 0.0003 0.1547
0.0060 1.0000

Composite Emission Factors (g/mi):

Composite VOC : 0.600 0.778 0.447 0.741 0.476 0.183 0.283 0.266 3.12
0.580

Composite NOX : 0.494 0.691 0.708 0.693 3.022 0.802 0.994 12.140 1.31
2.498

----

* #

* Rural principal arterial, 58.5

* File 1, Run 1, Scenario 2.

* #

M583 Warning:

The user supplied arterial average speed of 58.5

will be used for all hours of the day. 100% of VMT

has been assigned to the arterial/collector roadway

type for all hours of the day and all vehicle types.

M615 Comment:

User supplied VMT mix.

M 48 Warning:

there are no sales for vehicle class HDGV8b

Calendar Year: 2009

Month: July

Altitude: Low

Minimum Temperature: 72.3 (F)

Maximum Temperature: 94.8 (F)

Absolute Humidity: 123. grains/lb

Nominal Fuel RVP: 7.8 psi

Weathered RVP: 7.4 psi

Fuel Sulfur Content: 30. ppm

Exhaust I/M Program: Yes

Evap I/M Program: Yes

ATP Program: Yes

Reformulated Gas: No

Vehicle Type: LDGV LDGT12 LDGT34 LDGT HDGV LDDV LDDT HDDV
MC All Veh

GVWR: <6000 >6000 (All)

------ ------ ------ ------ ------ ------ ------ ------ ------ ------

VMT Distribution: 0.6524 0.1960 0.0246 0.0357 0.0006 0.0004 0.0853
0.0050 1.0000

Composite Emission Factors (g/mi):

Composite VOC : 0.610 0.789 0.454 0.752 0.477 0.183 0.284 0.268 2.80
0.618

Composite NOX : 0.487 0.680 0.702 0.682 2.927 0.676 0.838 9.575 1.21
1.396

----

* #

* Rural minor arterial, 49.5

* File 1, Run 1, Scenario 3.

* #

M583 Warning:

The user supplied arterial average speed of 49.5

will be used for all hours of the day. 100% of VMT

has been assigned to the arterial/collector roadway

type for all hours of the day and all vehicle types.

M615 Comment:

User supplied VMT mix.

M 48 Warning:

there are no sales for vehicle class HDGV8b

Calendar Year: 2009

Month: July

Altitude: Low

Minimum Temperature: 72.3 (F)

Maximum Temperature: 94.8 (F)

Absolute Humidity: 123. grains/lb

Nominal Fuel RVP: 7.8 psi

Weathered RVP: 7.4 psi

Fuel Sulfur Content: 30. ppm

Exhaust I/M Program: Yes

Evap I/M Program: Yes

ATP Program: Yes

Reformulated Gas: No

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
GVWR:		<6000	>6000	(All)						
	------	------	------	------	------	------	------	------	------	------
VMT Distribution:	0.6714	0.1910	0.0246		0.0320	0.0006	0.0004	0.0760	0.0040	1.0000

Composite Emission Factors (g/mi):

Composite VOC : 0.635 0.818 0.469 0.778 0.511 0.190 0.294 0.286 2.55
0.643

Composite NOX : 0.475 0.658 0.679 0.660 2.760 0.524 0.648 7.429 1.02
1.118

----

* #

* Rural major collector, 45.0

* File 1, Run 1, Scenario 4.

* #

M583 Warning:

The user supplied arterial average speed of 45.0

will be used for all hours of the day. 100% of VMT

has been assigned to the arterial/collector roadway

type for all hours of the day and all vehicle types.

M615 Comment:

User supplied VMT mix.

M 48 Warning:

there are no sales for vehicle class HDGV8b

Calendar Year: 2009

Month: July

Altitude: Low

Minimum Temperature: 72.3 (F)

Maximum Temperature: 94.8 (F)

Absolute Humidity: 123. grains/lb

Nominal Fuel RVP: 7.8 psi

Weathered RVP: 7.4 psi

Fuel Sulfur Content: 30. ppm

Exhaust I/M Program: Yes

Evap I/M Program: Yes

ATP Program: Yes

Reformulated Gas: No

Vehicle Type: LDGV   LDGT12   LDGT34   LDGT   HDGV   LDDV   LDDT   HDDV
MC   All Veh

GVWR: <6000   >6000   (All)

------   ------   ------   ------   ------   ------   ------   ------   ------   ------

VMT Distribution: 0.6664   0.2160   0.0276   0.0250   0.0006   0.0004   0.0600
0.0040   1.0000

Composite Emission Factors (g/mi):

Composite VOC :   0.652   0.835   0.479   0.795   0.533   0.196   0.305   0.303   2.56
0.670

Composite NOX :   0.469   0.647   0.669   0.649   2.666   0.482   0.595   6.833   0.97
0.952

----

* #

* Rural minor collector, 36.0

* File 1, Run 1, Scenario 5.

* #

M583 Warning:

The user supplied arterial average speed of 36.0

will be used for all hours of the day. 100% of VMT

has been assigned to the arterial/collector roadway

type for all hours of the day and all vehicle types.

M615 Comment:

User supplied VMT mix.

M 48 Warning:

there are no sales for vehicle class HDGV8b

Calendar Year: 2009

Month: July

Altitude: Low

Minimum Temperature: 72.3 (F)

Maximum Temperature: 94.8 (F)

Absolute Humidity: 123. grains/lb

Nominal Fuel RVP: 7.8 psi

Weathered RVP: 7.4 psi

Fuel Sulfur Content: 30. ppm

Exhaust I/M Program: Yes

Evap I/M Program: Yes

ATP Program: Yes

Reformulated Gas: No

Vehicle Type: LDGV LDGT12 LDGT34 LDGT HDGV LDDV LDDT HDDV
MC All Veh

GVWR: <6000 >6000 (All)

------ ------ ------ ------ ------ ------ ------ ------ ------ ------

VMT Distribution: 0.6384 0.2160 0.0276 0.0277 0.0006 0.0004 0.0673
0.0220 1.0000

Composite Emission Factors (g/mi):

Composite VOC : 0.691 0.870 0.499 0.828 0.617 0.217 0.340 0.363 2.70
0.744

Composite NOX : 0.460 0.629 0.652 0.631 2.510 0.446 0.550 6.352 0.94
0.966

----

* #

* Rural local, 27.0

* File 1, Run 1, Scenario 6.

* #

* Reading Hourly Roadway VMT distribution from the following external

* data file: LOCALVMT.D

Reading User Supplied ROADWAY VMT Factors

M615 Comment:

User supplied VMT mix.

M 48 Warning:

there are no sales for vehicle class HDGV8b

Calendar Year: 2009

Month: July

Altitude: Low

Minimum Temperature: 72.3 (F)

Maximum Temperature: 94.8 (F)

Absolute Humidity: 123. grains/lb

Nominal Fuel RVP: 7.8 psi

Weathered RVP: 7.4 psi

Fuel Sulfur Content: 30. ppm

Exhaust I/M Program: Yes

Evap I/M Program: Yes

ATP Program: Yes

Reformulated Gas: No

Vehicle Type: LDGV LDGT12 LDGT34 LDGT HDGV LDDV LDDT HDDV
MC All Veh

GVWR: <6000 >6000 (All)

------ ------ ------ ------ ------ ------ ------ ------ ------ ------

VMT Distribution: 0.6534 0.2460 0.0049 0.0216 0.0006 0.0001 0.0524 0.0210 1.0000

Composite Emission Factors (g/mi):

Composite VOC : 1.079 1.267 0.780 1.257 1.346 0.367 0.878 0.787 3.99 1.175

Composite NOX : 0.493 0.631 0.684 0.632 2.036 0.595 0.967 7.989 0.76 0.960

----

* #

* Urban interstate, 58.5

* File 1, Run 1, Scenario 7.

* #

M581 Warning:

The user supplied freeway average speed of 58.5

will be used for all hours of the day. 100% of VMT

has been assigned to the freeway roadway type for

all hours of the day and all vehicle types.

M615 Comment:

User supplied VMT mix.

M 48 Warning:

there are no sales for vehicle class HDGV8b

Calendar Year: 2009

Month: July

Altitude: Low

Minimum Temperature: 72.3 (F)

Maximum Temperature: 94.8 (F)

Absolute Humidity: 123. grains/lb

Nominal Fuel RVP: 7.8 psi

Weathered RVP: 7.4 psi

Fuel Sulfur Content: 30. ppm

Exhaust I/M Program: Yes

Evap I/M Program: Yes

ATP Program: Yes

Reformulated Gas: No

Vehicle Type: LDGV LDGT12 LDGT34 LDGT HDGV LDDV LDDT HDDV
MC All Veh

GVWR: <6000 >6000 (All)

------ ------ ------ ------ ------ ------ ------ ------ ------ ------

VMT Distribution: 0.7323 0.1550 0.0197 0.0266 0.0007 0.0003 0.0634
0.0020 1.0000

Composite Emission Factors (g/mi):

Composite VOC : 0.610 0.789 0.453 0.751 0.475 0.183 0.284 0.268 2.80
0.613

Composite NOX : 0.487 0.680 0.696 0.681 2.920 0.676 0.838 10.394 1.21
1.216

----

* #

* Urban other expressway, 58.5

* File 1, Run 1, Scenario 8.

* #

M581 Warning:

The user supplied freeway average speed of 58.5

will be used for all hours of the day. 100% of VMT

has been assigned to the freeway roadway type for

all hours of the day and all vehicle types.

M615 Comment:

User supplied VMT mix.

M 48 Warning:

there are no sales for vehicle class HDGV8b

Calendar Year: 2009

Month: July

Altitude: Low

Minimum Temperature: 72.3 (F)

Maximum Temperature: 94.8 (F)

Absolute Humidity: 123. grains/lb

Nominal Fuel RVP: 7.8 psi

Weathered RVP: 7.4 psi

Fuel Sulfur Content: 30. ppm

Exhaust I/M Program: Yes

Evap I/M Program: Yes

ATP Program: Yes

Reformulated Gas: No

Vehicle Type: LDGV LDGT12 LDGT34 LDGT HDGV LDDV LDDT HDDV
MC All Veh

GVWR: <6000 >6000 (All)

------ ------ ------ ------ ------ ------ ------ ------ ------ ------

VMT Distribution: 0.7064 0.1810 0.0236 0.0257 0.0006 0.0004 0.0603
0.0020 1.0000

Composite Emission Factors (g/mi):

Composite VOC : 0.610 0.789 0.454 0.750 0.476 0.183 0.283 0.266 2.80
0.618

Composite NOX : 0.487 0.680 0.705 0.683 2.921 0.676 0.836 10.347 1.21
1.186

----

* #

* Urban principal arterial, 49.5

* File 1, Run 1, Scenario 9.

* #

M583 Warning:

The user supplied arterial average speed of 49.5

will be used for all hours of the day. 100% of VMT

has been assigned to the arterial/collector roadway

type for all hours of the day and all vehicle types.

M615 Comment:

User supplied VMT mix.

M 48 Warning:

there are no sales for vehicle class HDGV8b

Calendar Year: 2009

Month: July

Altitude: Low

Minimum Temperature: 72.3 (F)

Maximum Temperature: 94.8 (F)

Absolute Humidity: 123. grains/lb

Nominal Fuel RVP: 7.8 psi

Weathered RVP: 7.4 psi

Fuel Sulfur Content: 30. ppm

Exhaust I/M Program: Yes

Evap I/M Program: Yes

ATP Program: Yes

Reformulated Gas: No

Vehicle Type: LDGV   LDGT12   LDGT34   LDGT   HDGV   LDDV   LDDT   HDDV
MC   All Veh

GVWR: <6000   >6000   (All)

------   ------   ------   ------   ------   ------   ------   ------   ------   ------

VMT Distribution: 0.7663   0.1470   0.0187   0.0182   0.0007   0.0003   0.0428
0.0060   1.0000

Composite Emission Factors (g/mi):

Composite VOC :   0.635   0.818   0.469   0.779   0.504   0.190   0.295   0.286   2.55
0.653

Composite NOX :   0.475   0.657   0.678   0.660   2.747   0.524   0.648   7.332   1.02
0.844

----

* #

* Urban minor arterial, 45.0

* File 1, Run 1, Scenario 10.

* #

M583 Warning:

The user supplied arterial average speed of 45.0

will be used for all hours of the day. 100% of VMT

has been assigned to the arterial/collector roadway

type for all hours of the day and all vehicle types.

M615 Comment:

User supplied VMT mix.

M 48 Warning:

there are no sales for vehicle class HDGV8b

Calendar Year: 2009

Month: July

Altitude: Low

Minimum Temperature: 72.3 (F)

Maximum Temperature: 94.8 (F)

Absolute Humidity: 123. grains/lb

Nominal Fuel RVP: 7.8 psi

Weathered RVP: 7.4 psi

Fuel Sulfur Content: 30. ppm

Exhaust I/M Program: Yes

Evap I/M Program: Yes

ATP Program: Yes

Reformulated Gas: No

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
GVWR:		<6000	>6000	(All)						
	------	------	------	------	------	------	------	------	------	------
VMT Distribution:	0.7723	0.1560	0.0197		0.0146	0.0007	0.0003	0.0344	0.0020	1.0000

Composite Emission Factors (g/mi):

Composite VOC : 0.652 0.835 0.478 0.795 0.528 0.196 0.306 0.305 2.56 0.667

Composite NOX : 0.469 0.647 0.664 0.649 2.666 0.482 0.596 6.766 0.97 0.750

----

* #

* Urban collector, 36.0

* File 1, Run 1, Scenario 11.

* #

M583 Warning:

The user supplied arterial average speed of 36.0

will be used for all hours of the day. 100% of VMT

has been assigned to the arterial/collector roadway

type for all hours of the day and all vehicle types.

M615 Comment:

User supplied VMT mix.

M 48 Warning:

there are no sales for vehicle class HDGV8b

Calendar Year: 2009

Month: July

Altitude: Low

Minimum Temperature: 72.3 (F)

Maximum Temperature: 94.8 (F)

Absolute Humidity: 123. grains/lb

Nominal Fuel RVP: 7.8 psi

Weathered RVP: 7.4 psi

Fuel Sulfur Content: 30. ppm

Exhaust I/M Program: Yes

Evap I/M Program: Yes

ATP Program: Yes

Reformulated Gas: No

Vehicle Type: LDGV   LDGT12   LDGT34   LDGT   HDGV   LDDV   LDDT   HDDV
MC   All Veh

GVWR: <6000   >6000   (All)

------   ------   ------   ------   ------   ------   ------   ------   ------   ------

VMT Distribution: 0.7723   0.1480   0.0187   0.0128   0.0007   0.0003   0.0312
0.0160   1.0000

Composite Emission Factors (g/mi):

Composite VOC :   0.691   0.871   0.499   0.829   0.618   0.217   0.341   0.368   2.70
0.734

Composite NOX :   0.460   0.629   0.650   0.632   2.512   0.446   0.551   6.341   0.94
0.706

----

* #

* Urban local, 27.0

* File 1, Run 1, Scenario 12.

* #

* Reading Hourly Roadway VMT distribution from the following external

* data file: LOCALVMT.D

Reading User Supplied ROADWAY VMT Factors

M615 Comment:

User supplied VMT mix.

M 48 Warning:

there are no sales for vehicle class HDGV8b

Calendar Year: 2009

Month: July

Altitude: Low

Minimum Temperature: 72.3 (F)

Maximum Temperature: 94.8 (F)

Absolute Humidity: 123. grains/lb

Nominal Fuel RVP: 7.8 psi

Weathered RVP: 7.4 psi

Fuel Sulfur Content: 30. ppm

Exhaust I/M Program: Yes

Evap I/M Program: Yes

ATP Program: Yes

Reformulated Gas: No

Vehicle Type: LDGV LDGT12 LDGT34 LDGT HDGV LDDV LDDT HDDV
MC All Veh

GVWR: <6000 >6000 (All)

------ ------ ------ ------ ------ ------ ------ ------ ------ ------

VMT Distribution: 0.7953 0.1590 0.0039 0.0072 0.0007 0.0001 0.0188
0.0150 1.0000

Composite Emission Factors (g/mi):

Composite VOC : 1.079 1.267 0.770 1.255 1.323 0.367 0.819 0.782 3.99
1.147

Composite NOX : 0.493 0.631 0.645 0.631 2.016 0.595 0.919 7.764 0.76
0.667

Appendix B

VMT Mix and Vehicle Registration Distributions

Baton Rouge 2009 MOBILE6 VMT Fractions by Functional Class

FC 01/ RURAL INTERSTATE	0.6	0.036	0.119	0.014	0.006	0.07	0.007	0.006
	0.004	0.016	0.018	0.02	0.072	0.004	0.002	0.006
FC 02/ RURAL PRINCIPAL ARTERIAL	0.653	0.045	0.151	0.017	0.008	0.039	0.004	0.003
	0.002	0.009	0.01	0.011	0.04	0.002	0.001	0.005
FC 06/ RURAL MINOR ARTERIAL	0.672	0.044	0.147	0.017	0.008	0.035	0.003	0.003
	0.002	0.008	0.009	0.01	0.035	0.002	0.001	0.004
FC 07/ RURAL MAJOR COLLECTOR	0.667	0.05	0.166	0.019	0.009	0.027	0.003	0.002
	0.002	0.006	0.007	0.008	0.028	0.001	0.001	0.004
FC 08/ RURAL MINOR COLLECTOR	0.639	0.05	0.166	0.019	0.009	0.03	0.003	0.002
	0.002	0.007	0.008	0.009	0.031	0.002	0.001	0.022
FC 09/ RURAL LOCAL	0.654	0.057	0.189	0.003	0.002	0.024	0.002	0.002
	0.001	0.005	0.006	0.007	0.025	0.001	0.001	0.021
FC 11/ URBAN INTERSTATE	0.733	0.036	0.119	0.014	0.006	0.029	0.003	0.002
	0.002	0.006	0.008	0.008	0.03	0.001	0.001	0.002
FC12/ URBAN PRINCIPAL ARTERIAL, FRWY.	0.707	0.042	0.139	0.016	0.008	0.028	0.003	0.002
	0.002	0.006	0.007	0.008	0.028	0.001	0.001	0.002
FC 14/ URBAN PRINCIPAL ARTERIAL, OTHER	0.767	0.034	0.113	0.013	0.006	0.02	0.002	0.002
	0.001	0.004	0.005	0.006	0.02	0.001	0	0.006
FC 16/ URBAN MINOR ARTERIAL	0.773	0.036	0.12	0.014	0.006	0.016	0.002	0.001
	0.001	0.003	0.004	0.005	0.016	0.001	0	0.002
FC17/ URBAN COLLECTOR	0.773	0.034	0.114	0.013	0.006	0.014	0.001	0.001
	0.001	0.003	0.004	0.004	0.015	0.001	0	0.016
FC19/ URBAN LOCAL	0.796	0.037	0.122	0.003	0.001	0.008	0.001	0.001
	0	0.002	0.002	0.003	0.009	0	0	0.015

* MOBILE6 Input -- Registration Data

* CY2006 -- BTR 5 Parishes for 2009

*

* The file RegBTR06.rg contains the Baton Rogue MPO area (5-parish) MOBILE6

* values for the distribution of vehicles by age for July of any calendar year.

* The original data were provided by LaDEQ. There are sixteeen (16)

* sets of values representing 16 combined gasoline/diesel vehicle class

* distributions. These distributions are split for gasoline and diesel

* using the separate input (or default) values for diesel sales fractions.

* Each distribution contains 25 values which represent the fraction of

* all vehicles in that class (gasoline and diesel) of that age in July.

* The first number is for age 1 (calendar year minus model year plus one)

* and the last number is for age 25. The last age includes all vehicles

* of age 25 or older. The first number in each distribution is an integer

* which indicates which of the 16 vehicle classes are represented by the

* distribution. The sixteen vehicle classes are:

*

* 1 LDV Light-Duty Vehicles (Passenger Cars)

* 2 LDT1 Light-Duty Trucks 1 (0-6,000 lbs. GVWR, 0-3750 lbs. LVW)

* 3 LDT2 Light Duty Trucks 2 (0-6,001 lbs. GVWR, 3751-5750 lbs. LVW)

* 4 LDT3 Light Duty Trucks 3 (6,001-8500 lbs. GVWR, 0-3750 lbs. LVW)

* 5 LDT4 Light Duty Trucks 4 (6,001-8500 lbs. GVWR, 3751-5750 lbs. LVW)

* 6 HDV2B Class 2b Heavy Duty Vehicles (8501-10,000 lbs. GVWR)

* 7 HDV3 Class 3 Heavy Duty Vehicles (10,001-14,000 lbs. GVWR)

* 8 HDV4   Class 4 Heavy Duty Vehicles (14,001-16,000 lbs. GVWR)

* 9 HDV5   Class 5 Heavy Duty Vehicles (16,001-19,500 lbs. GVWR)

* 10 HDV6   Class 6 Heavy Duty Vehicles (19,501-26,000 lbs. GVWR)

* 11 HDV7   Class 7 Heavy Duty Vehicles (26,001-33,000 lbs. GVWR)

* 12 HDV8A Class 8a Heavy Duty Vehicles (33,001-60,000 lbs. GVWR)

* 13 HDV8B Class 8b Heavy Duty Vehicles (>60,000 lbs. GVWR)

* 14 HDBS   School Busses

* 15 HDBT   Transit and Urban Busses

* 16 MC   Motorcycles (All)

*

* LaDEQ privided the data for the vehicle types 1 through 7, as well as 13.

* For vehicle types 8 through 12, Mobile 6 default values were used.

* The 25 age values are arranged in two rows of 10 values followed by a row

* with the last 5 values. Comments (such as this one) are indicated by

* an asterisk in the first column. Empty rows are ignored. Values are

* read "free format," meaning any number may appear in any row with as

* many characters as needed (including a decimal) as long as 25 values

* follow the initial integer value separated by a space.

*

* If all 16 vehicle classes do not need to be altered from the default

* values, then only the vehicle classes that need to be changed need to

* be included in this file. The order in which the vehicle classes are

* read does not matter, however each vehicle class set must contain 25

* values and be in the proper age order.

*

REG DIST

* LDV

1 0.0550 0.0733 0.0645 0.0678 0.0703 0.0666 0.0750 0.0675 0.0598 0.0597

0.0542 0.0548 0.0437 0.0371 0.0316 0.0260 0.0213 0.0163 0.0121 0.0086

0.0073 0.0067 0.0058 0.0039 0.0111

* LDT1

2 0.0547 0.0630 0.0607 0.0631 0.0670 0.0608 0.0661 0.0556 0.0553 0.0575

0.0460 0.0483 0.0408 0.0356 0.0293 0.0293 0.0241 0.0242 0.0202 0.0150

0.0157 0.0123 0.0120 0.0068 0.0366

* LDT2

3 0.0547 0.0630 0.0607 0.0631 0.0670 0.0608 0.0661 0.0556 0.0553 0.0575

0.0460 0.0483 0.0408 0.0356 0.0293 0.0293 0.0241 0.0242 0.0202 0.0150

0.0157 0.0123 0.0120 0.0068 0.0366

* LDT3

4 0.0702 0.0891 0.1051 0.1049 0.0936 0.0925 0.0719 0.0770 0.0401 0.0421

0.0416 0.0407 0.0337 0.0217 0.0160 0.0114 0.0110 0.0075 0.0052 0.0032

0.0035 0.0032 0.0032 0.0020 0.0095

* LDT4

5 0.0702 0.0891 0.1051 0.1049 0.0936 0.0925 0.0719 0.0770 0.0401 0.0421

0.0416 0.0407 0.0337 0.0217 0.0160 0.0114 0.0110 0.0075 0.0052 0.0032

0.0035 0.0032 0.0032 0.0020 0.0095

* HDV2B

6 0.0585 0.0805 0.0841 0.0980 0.0794 0.0969 0.0766 0.0841 0.0323 0.0531

0.0420 0.0376 0.0255 0.0245 0.0184 0.0177 0.0147 0.0158 0.0088 0.0059

0.0098 0.0078 0.0074 0.0038 0.0169

* HDV3

7 0.0582 0.0781 0.0680 0.0801 0.0599 0.0835 0.0626 0.1013 0.0364 0.0357

0.0428 0.0303 0.0192 0.0145 0.0178 0.0141 0.0212 0.0195 0.0141 0.0135

0.0141 0.0199 0.0155 0.0141 0.0655

* Motorcycles

16 0.0747 0.0907 0.0800 0.1294 0.1093 0.0925 0.0740 0.0664 0.0484 0.0359

0.0308 0.0223 0.0235 0.0180 0.0123 0.0078 0.0083 0.0085 0.0063 0.0092

0.0127 0.0126 0.0102 0.0083 0.0082

Appendix C

2009 HPMS-based Daily VMT by Functional Class

in the 5-Parish Nonattainment Area

PUBLIC ROADS OUTSIDE THE TRAVEL DEMAND MODEL
2009 AVERAGE DAILY VEHICLE MILES TRAVELED, ADJUSTED for JULY

RURAL							
PARISH	INTERSTATE	OTHER PRINCIPAL ARTERIAL	MINOR ARTERIAL	MAJOR COLLECTOR	MINOR COLLECTOR	LOCAL	TOTAL
Ascension	0	0	68,398	0	18,612	16,835	103,845
East Baton Rouge	0	0	0	0	0	0	0
Iberville	661,347	141,531	0	127,312	45,414	94,917	1,070,522
Livingston	681,196	0	0	333,527	30,572	182,895	1,228,191
West Baton Rouge	214,300	170,676	0	58,018	35,952	59,682	538,628

URBAN							
PARISH	INTERSTATE	OTHER FREEWAYS AND EXPRESSWAYS	OTHER PRINCIPAL ARTERIAL	MINOR ARTERIAL	COLLECTOR	LOCAL	TOTAL
Ascension	0	0	0	81,404	34,332	12,682	128,418
East Baton Rouge	0	0	0	0	0	0	0
Iberville	0	0	101,773	28,830	116,635	30,165	277,403
Livingston	0	0	0	0	50,647	12,126	62,772
West Baton Rouge	0	0	0	0	0	0	0

Appendix D

2009 Emissions Summary by Parish for the “Doughnut Area”

BATON ROUGE 5-PARISH OZONE NONATTAINMENT AREA

2009 MOBILE EMISSIONS FOR HPMS-BASED DONUT AREA
ASCENSION PARISH
PEAK OZONE SEASON, OBD AND GAS CAP I/M, RVP 7.8

ROAD CLASS	SPEED (MPH)	VOC (G/MI)	NOX (G/MI)	VMT (MI/DAY)	VOC (TPD)	NOX (TPD)
01	63.0	0.580	2.498	0	0.00	0.00
02	58.5	0.618	1.396	0	0.00	0.00
06	49.5	0.643	1.118	68,398	0.05	0.08
07	45.0	0.670	0.952	0	0.00	0.00
08	36.0	0.744	0.966	18,612	0.02	0.02
09	27.0	1.175	0.960	16,835	0.02	0.02
11	58.5	0.613	1.216	0	0.00	0.00
12	58.5	0.618	1.186	0	0.00	0.00
14	49.5	0.653	0.844	0	0.00	0.00
16	45.0	0.667	0.750	81,404	0.06	0.07
17	36.0	0.734	0.706	34,332	0.03	0.03
19	27.0	1.147	0.667	12,682	0.02	0.01
			TOTALS	232,263	0.19	0.23

2009 MOBILE EMISSIONS FOR HPMS-BASED DONUT AREA
EAST BATON ROUGE
PARISH
PEAK OZONE SEASON, OBD AND GAS CAP I/M, RVP 7.8

ROAD CLASS	SPEED (MPH)	VOC (G/MI)	NOX (G/MI)	VMT (MI/DAY)	VOC (TPD)	NOX (TPD)
01	63.0	0.580	2.498	0	0.00	0.00
02	58.5	0.618	1.396	0	0.00	0.00
06	49.5	0.643	1.118	0	0.00	0.00
07	45.0	0.670	0.952	0	0.00	0.00
08	36.0	0.744	0.966	0	0.00	0.00
09	27.0	1.175	0.960	0	0.00	0.00
11	58.5	0.613	1.216	0	0.00	0.00
12	58.5	0.618	1.186	0	0.00	0.00
14	49.5	0.653	0.844	0	0.00	0.00
16	45.0	0.667	0.750	0	0.00	0.00
17	36.0	0.734	0.706	0	0.00	0.00
19	27.0	1.147	0.667	0	0.00	0.00
			TOTALS	0	0.00	0.00

2009 MOBILE EMISSIONS FOR HPMS-BASED DONUT AREA
IBERVILLE PARISH
PEAK OZONE SEASON, OBD AND GAS CAP I/M, RVP 7.8

ROAD CLASS	SPEED (MPH)	VOC (G/MI)	NOX (G/MI)	VMT (MI/DAY)	VOC (TPD)	NOX (TPD)
01	63.0	0.580	2.498	661,347	0.42	1.82
02	58.5	0.618	1.396	141,531	0.10	0.22
06	49.5	0.643	1.118	0	0.00	0.00
07	45.0	0.670	0.952	127,312	0.09	0.13
08	36.0	0.744	0.966	45,414	0.04	0.05
09	27.0	1.175	0.960	94,917	0.12	0.10
11	58.5	0.613	1.216	0	0.00	0.00
12	58.5	0.618	1.186	0	0.00	0.00
14	49.5	0.653	0.844	101,773	0.07	0.09
16	45.0	0.667	0.750	28,830	0.02	0.02
17	36.0	0.734	0.706	116,635	0.09	0.09
19	27.0	1.147	0.667	30,165	0.04	0.02
			TOTALS	1,347,925	1.00	2.55

2009 MOBILE EMISSIONS FOR HPMS-BASED DONUT AREA
LIVINGSTON PARISH
PEAK OZONE SEASON, OBD AND GAS CAP I/M, RVP 7.8

ROAD CLASS	SPEED (MPH)	VOC (G/MI)	NOX (G/MI)	VMT (MI/DAY)	VOC (TPD)	NOX (TPD)
01	63.0	0.580	2.498	681,196	0.44	1.88
02	58.5	0.618	1.396	0	0.00	0.00
06	49.5	0.643	1.118	0	0.00	0.00
07	45.0	0.670	0.952	333,527	0.25	0.35
08	36.0	0.744	0.966	30,572	0.03	0.03
09	27.0	1.175	0.960	182,895	0.24	0.19
11	58.5	0.613	1.216	0	0.00	0.00
12	58.5	0.618	1.186	0	0.00	0.00
14	49.5	0.653	0.844	0	0.00	0.00
16	45.0	0.667	0.750	0	0.00	0.00
17	36.0	0.734	0.706	50,647	0.04	0.04
19	27.0	1.147	0.667	12,126	0.02	0.01
			TOTALS	1,290,963	1.00	2.50

2009 MOBILE EMISSIONS FOR HPMS-BASED DONUT AREA
WEST BATON ROUGE PARISH
PEAK OZONE SEASON, OBD AND GAS CAP I/M, RVP 7.8

ROAD CLASS	SPEED (MPH)	VOC (G/MI)	NOX (G/MI)	VMT (MI/DAY)	VOC (TPD)	NOX (TPD)
01	63.0	0.580	2.498	214,300	0.14	0.59
02	58.5	0.618	1.396	170,676	0.12	0.26
06	49.5	0.643	1.118	0	0.00	0.00
07	45.0	0.670	0.952	58,018	0.04	0.06
08	36.0	0.744	0.966	35,952	0.03	0.04
09	27.0	1.175	0.960	59,682	0.08	0.06
11	58.5	0.613	1.216	0	0.00	0.00
12	58.5	0.618	1.186	0	0.00	0.00
14	49.5	0.653	0.844	0	0.00	0.00
16	45.0	0.667	0.750	0	0.00	0.00
17	36.0	0.734	0.706	0	0.00	0.00
19	27.0	1.147	0.667	0	0.00	0.00
			TOTALS	538,628	0.40	1.02
			5-Parish HPMS-based Donut Area Totals:	3,409,778	2.59	6.29

ROADWAY FUNCTIONAL CLASS (FC) CODE

01 - RURAL PRINCIPAL ARTERIAL, INTERSTATE
02 - RURAL PRINCIPAL ARTERIAL, OTHER
06 - RURAL MINOR ARTERIAL
07 - RURAL MAJOR COLLECTOR
08 - RURAL MINOR COLLECTOR
09 - RURAL LOCAL ROAD

11 - URBAN PRINCIPAL ARTERIAL, INTERSTATE
12 - URBAN PRINCIPAL ARTERIAL, FREEWAY
14 - URBAN PRINCIPAL ARTERIAL, OTHER
16 - URBAN MINOR ARTERIAL
17 - URBAN COLLECTOR
19 - URBAN LOCAL ROAD

Appendix E

Transportation Improvement Program

FY2009- FY2013

Joint Certification of the Metropolitan Transportation Planning Process for the Baton Rouge Urbanized Area

The State of Louisiana and the Capital Region Planning Commission (CRPC) for the Baton Rouge Urbanized Area hereby certify that the transportation planning process is addressing the major issues facing the Baton Rouge urbanized area and is being conducted in accordance with all applicable requirements of:

1. *Section 134 of Title 23, U.S.C., Section 8 of the Federal Transit Act (49 U.S. C. app. 1607) and part 450 of 23 CFR*;
2. *Section 174 and 176 [c] and [d] of the Clean Air Act (42 U.S.C. 7504, 7506 [c] and [d]);*
3. *Title VI of the Civil Rights Act of 1964* and the *Title VI* Assurance executed under *23 U.S.C. 324 and 29 U.S.C. 794;*
4. *Section 1003 [b] of the Intermodal Surface Transportation Efficiency Act of 1991 (Pub. L. 102-240)* regarding the involvement of disadvantaged business enterprises in the FHWA and the FTA funded planning projects *(Section 105 [f], Pub. L. 97-424, 96 Stat. 2100; 49 CFR Part 23*); and
5. The provisions of the *Americans with Disabilities Act of 1990 (Pub. L. 101-336, 104 Stat. 327*, as amended) and U.S. DOT regulations "Transportation for Individuals with Disabilities" (*49 CFR Parts 27, 37, and 38*).

William D. Ankner, Ph.D., Secretary
Louisiana Department of Transportation and Development

Melvin 'Kip' Holden (Mayor-President – East Baton Rouge Parish), Chairman
Transportation Policy Committee for the Baton Rouge Urbanized Area

2007-2011
Record of Adoption

Number	Date	Description of Change
1	9/5/06 - 1/16/07	Public Comment Period
2	1/16/07	Annual Update
3	2/19/08	Annual Update

The preparation of this document was financed through grants from and disseminated under the sponsorship of the Federal Transit Administration and the Federal Highway Administration (U.S. Department of Transportation). The United States government assumes no liability for its contents or use thereof.

Priority Project Funding Description

SAFETEA-LU Legislation provides special funds for projects referred to as Priority projects. These are more traditionally referred to as Demonstration projects. Fifteen such projects included in SAFETEA-LU are located in the Baton Rouge area TMA. These projects are listed in the table of projects following this set of narratives.

SAFETEA-LU is prescriptive in the availability and timing of the funds allocated to the category of Priority projects. Twenty percent of the funds were available for expenditure in 2005 and 2006. Funding amounts available for expenditure in 2007, 2008 and 2009 are 20% in each year. The table below listed the Priority projects, the amount of funds available in each year for each project, as well as the totals funds for each project. The second table contains the same basic information, but shows the cumulative amounts for each of the five years of the SAFETEA-LU time period. This second table is highly instructive since it shows the limits of the funds available in each year. For example, in the case of the Perkins road widening, it highlights the fact that though the total funds needed for construction were required in 2007, only 60% of these funds would be available by that time. This disjoint in the timing between funding needs and availability will trigger the use of advance construction as a means to resolve this conflict.

SAFETEA-LU Yearly Estimates of Priority Projects in Baton Rouge MPO Area

S.No	Project Description	Proposed Improvement	2005 20%	2006 20%	2007 20%	2008 20%	2009 20%	Total
1	Essen Ln @ I 12	Phase 2	4,800	4,800	4,800	4,800	4,800	24,000
2	Perkins Rd	Widening						
3	Central Thruway	New Road						
4	O'Neal Lane	Widening						
5	Burbank Drive	Widening						
6	Essen Park Ext	New Road						
7	LA 408	Study						
8	LA 22	Plan, Design & Construct	400	400	400	400	400	2,000
9	LA 1/ I-10 Connector	Study	200	200	200	200	200	1,000
10	I 12 @ LA 16	Interchange	2,080	2,080	2,080	2,080	2,080	10,400
11	LA 42	Improvements	1,600	1,600	1,600	1,600	1,600	8,000
12	LA 73	Widening						
13	Baton Rouge Loop	Study	100	100	100	100	100	500
14	Baton Rouge ITS	ITS Implementation	200	200	200	200	200	1,000
15	CATS - Baton Rouge BRT	Study	600	600	600	600	600	3,000
Totals			**$9,980**	**$9,980**	**$9,980**	**$9,980**	**$9,980**	**$49,900**

SAFETEA-LU Cumulative Estimates of Priority Projects in Baton Rouge MPO Area

S.No	Project Description	Proposed Improvement	Priority Funds	2005 20%	2006 40%	2007 60%	2008 80%	2009 100%
1	Essen Ln @ I 12	Phase 2	24,000	4,800	9,600	14,400	19,200	24,000
2	Perkins Rd	Widening						
3	Central thruway	New Road						
4	O'Neal Lane	Widening						
5	Burbank Drive	Widening						
6	Essen park Ext	New Road						
7	LA 408	Study						
8	LA 22	Plan, Design & Construct	2,000	400	800	1,200	1,600	2,000
9	LA 1/ I-10 Connector	Study	1,000	200	400	600	800	1,000
10	I 12 @ LA 16	Interchange	10,400	2,080	4,160	6,240	8,320	10,400
11	LA 42	Improvements	8,000	1,600	3,200	4,800	6,400	8,000
12	LA 73	Widening						
13	Baton Rouge Loop	Study	500	100	200	300	400	500
14	Baton Rouge ITS	ITS Implementation	1,000	200	400	600	800	1,000
15	CATS - Baton Rouge BRT	Study	3,000	600	1,200	1,800	2,400	3,000
Totals			**$49,900**	**$9,980**	**$19,960**	**$29,940**	**$39,920**	**$49,900**

1. Introduction

The Baton Rouge Metropolitan Area is a large, complex area consisting of over 600,000 people generating over 1.7 million vehicle trips per day. Situated on the Mississippi River, the metropolitan area encompasses the urban portions of East Baton Rouge Parish, West Baton Rouge Parish, Ascension Parish, Livingston Parish and Iberville Parish. This area contains the municipalities of Baton Rouge, Baker, Zachary, Port Allen, Brusly, Addis, Gonzales, Denham Springs, Walker, French Settlement, Port Vincent and St. Gabriel

Based on 23 CFR Part 450 regulations in SAFETEA-LU, the Baton Rouge Metropolitan Area planning area boundaries were reviewed. The previously designated urbanized area (UZA) was modified to comply with these regulations.

The *Federal Highway Act of 1962* required the implementation of a comprehensive Transportation Plan for all major cities within the United States. This plan was to be updated on a regular basis. The original Comprehensive Transportation Plan for Baton Rouge (PLAN) was completed in 1960 utilizing a mainframe computer model, PLANPAC. More recently the TRANPLAN system of travel forecasting models has been used in the development of updates to the PLAN.

The most recent update of the PLAN was completed in January 2006. This PLAN was prepared according to provisions that were stipulated in the *Transportation Equity Act of the 21st Century (TEA21)*, legislated by Congress in 1998. These TEA21 provisions reauthorized federal highway, transit, safety, research and motor carrier programs for the six-year period 1998-2003. This bill will significantly influenced funding levels of transportation programs. TEA21 like ISTEA empowered much of the responsibility of urban planning to the metropolitan areas and also emphasized that a wide range of planning, financial, air quality, and cooperative processes to be undertaken in the preparation of this document.

On August 10, 2005, the president signed into law the *Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU).* This transportation bill authorizes the Federal surface transportation programs for highways, highway safety, and transit for the 5-year period 2005-2009. SAFETEA-LU builds on the firm foundation of the two previous landmark bills that brought surface transportation into the 21st century – the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and the Transportation Equity Act for the 21st century (TEA-21).

Metropolitan Areas are required to amend the Transportation Improvement Program (TIP). The purpose of the TIP is to incorporate the SAFETEA-LU provisions into the planning process and document the transportation projects and programs in the long range plan that is planned for the metropolitan area over the next four years (FY 2006-FY 2009). This document must be prepared according to procedures contained in *Section 450.324 of the US DOT, FHWA Metropolitan Planning Regulations of October 28, 1993.*

2. The Baton Rouge Metropolitan Area TIP

2.1 TIP Development Process

2.1.1 Financial Constraint

The projects contained in the Transportation Improvement Program (TIP) (FY 2006-FY 2009) are derived from the area's overall 25-year transportation plan. Both the TIP and MTP have been financially constrained to reflect realistic and available levels of project funding.

Projects shown in the TIP for advancement were fully discussed with the MPO Transportation Policy Committee members and the Louisiana Department of Transportation and Development prior to placement in the TIP. Only projects that were mutually agreed upon with LA DOTD as to overall merit and funding availability were selected for TIP and State TIP inclusion.

Based on the financial data obtained from LA DOTD, the Baton Rouge Metropolitan Area has averaged about $35 million annually in Federal and State funding, exclusive of Interstate funds. A computerized record of all authorized jobs covering an 18-year period was obtained from LA DOTD and factored to present day value using the Consumer Price Index (CPI).

The funding level for this TIP (FY 2006 – FY 2009) increased due to the new SAFETEA-LU legislation. SAFETEA-LU provided a total of $244.1 billion in guaranteed surface transportation spending. Of this amount, Louisiana was to receive on an average $580 million per year for highways – a 30.3% increase over the $445 million per year received through TEA21. SAFETEA-LU also provided $45.3 billion for mass transit programs over five years.

In addition, SAFETEA-LU provided $24.2 billion for state demonstration (high priority) projects, which was approximately 9.9 % of the guaranteed spending. The Baton Rouge MPO area received over $49.9 million for fifteen projects. A certain percentage was allowed to be spent each year, as prescribed by SAFETEA-LU.

Appendix A provides the public with a list of all the projects let to contract in FY 2005 and FY 2006. To date, only minor delays have occurred in the implementation of major improvement projects.

Those projects identified for National Highway System (NHS) funding are part of LA DOTD's priority program and have been included by the CRPC acting in its capacity as MPO for the Baton Rouge Metropolitan Area. The NHS funds shown in the TIP are directed toward improving the traffic problems on Airline Highway and I-10. Projects shown for ">200K" funding are also financially constrained, reflecting the annual attributable amount, approximately $8.0 million plus 20% local (non-federal match).

Transit related projects are identified annually in the *Federal Register* or through state and local legislative appropriations for the urbanized area and the Capital Area Transit System (CATS) self-generated funds. The State funding is through the Parish Transportation Fund including General and Transit Portions and the State Sales tax Rebate. Local funds are appropriated through the City-Parish of East Baton Rouge General Fund.

The total expenses for transit in 2004 will be approximately $9.6 million for the Baton Rouge urbanized area with $4.1 million from FTA and CMAQ federal funds. Matching funds for transit projects comes from both the City-Parish and CATS for formula and non-formula *(Section 3 Discretionary*) federal funds. Formula and non-formula *(Section 3* Discretionary) federal funds for transit projects are matched by both the City-Parish and CATS. Discretionary funds are only programmed if these projects are in a high priority area such as bus replacement or service expansion needs, park and ride lot development, and other actions due to the ozone air quality non-attainment status of Baton Rouge.

In summary, the projects contained in the TIP reflect a single agreed upon program of projects that were developed jointly with the local transit operators and the Louisiana Department of Transportation and Development. The Baton Rouge Metropolitan Area has placed high priority on projects intended to improve the overall economic competitiveness of the region, particularly projects which enhance the overall movement of goods.

2.1.2 Emphasis Areas

The TIP reflects increased attention to highway safety to be in compliant with the new SAFETEA-LU regulations. These projects would create a positive agenda for increased safety on highways by increasing the funds for infrastructure safety and strategic highway safety planning. Other target specific programs such as Bike / Pedestrians, older drivers, work zones etc. further focuses on safety.

The TIP also reflects highway maintenance, including "set asides" for regular overlay and rehabilitation, work. The majority of the projects identified in the TIP involve reconstruction (without capacity expansion) and widening of seriously deteriorating Interstate and Principal Arterial such as I-10, I-12, and Airline Highway.

Heavy emphasis is also being placed on the following: 1) replacing and upgrading the region's traffic signal system with more reliable equipment, 2) a new local commitment to improved maintenance, and 3) improved communications capabilities for controlling traffic flow across parish boundaries.

Another feature being implemented is the potential for limited (and affordable) applications of more advanced surveillance and information technologies to advise drivers of major bottleneck and high accident locations.

An ITS planning grant was approved and an ITS Early Development Plan (EDP) for the Baton Rouge Metropolitan

Area was prepared. LA DOTD has contracted for design and construction of the ITS field equipment. Several of the ITS projects for field equipment and communication have been implemented. Others are still under design and/or construction. The Regional ITS Architecture is currently being updated.
In addition to basic signing, lighting, and signal replacement projects, a Motorist Assistance Patrol (MAP) has been placed on I-10 and I-12 to reduce traffic delay by responding to disabled vehicles or breakdowns.

Transit project priorities include the service expansion of the CATS system through purchase of vans, a park and ride lot program in suburban areas, construction and operation of a transportation management control center, purchase of GPS/GIS equipment, and ADA related equipment.

2.1.3 Prioritization of Projects

A draft of the TIP document is prepared annually by CRPC in close consultation and cooperation with LA DOTD. This document is widely distributed for public review and comment and is presented to the region's multi-parish Technical Advisory Committee for review, comment, and concurrence. In addition to local planning and public works professionals, the Technical Advisory Committee consists of representatives from all modal agencies, including the port, airport, and public transit in the area. A copy of CRPC's Technical Advisory Committee membership is found in Appendix B.

Projects contained in the TIP are organized in accordance with the federal fiscal year, which begins October 1, 2006. The TIP covers: FY 2006-2007, 2007-2008, and 2008-2009. The projects in 2009-2010 are exclusively shown for information purposes only.

Wherever possible, construction let dates are shown to advise local officials and the public as to when construction is likely to begin. The CRPC works very closely with LA DOTD staff to establish realistic project priorities, based on where the project actually rests in the implementation pipeline. Meetings are held at least quarterly with LA DOTD to monitor the actual status of the TIP projects and scheduled letting dates. This periodic review has helped the area to establish firm project priorities rather than "paper" priorities. This review takes into account important factors such as the status of environmental clearances, survey work, preliminary plans, rights-of-way, utilities, advance check prints and final plan preparation. When taken together, these criteria establish the relevant let date and, therefore, the priority order for implementation of TIP projects.

The cost of the project, type of funding, and the availability of proposed funding are also taken into account in priority setting. The above project level information is made available to the Technical Advisory Committee, or the general public upon request, and project work status is utilized extensively in establishing the priority program. The draft TIP is also presented to the Transportation Policy Committee for review, input, and adoption along with any citizen's comments received, prior to finalization of priorities.

2.1.4 Relationship of TIP to Financially Constrained Long-Range Transportation Plan

Projects contained in the Baton Rouge TIP have evolved through the area's planning process. This analysis process is based on the eight planning factors contained in the *SAFETEA-LU*. These factors and the resulting analysis are utilized by the CRPC in the development of an integrated intermodal transportation plan and TIP for the Baton Rouge Metropolitan Area.

The TIP is also utilized as a management tool for implementing the area's long-range 25-year transportation plan. The projects contained in the TIP were determined through a consultative process with the state, local transit operators and the public. The status of each individual project in the overall state program was reviewed as to where it stood in the implementation pipeline and on its merits. Based on this review, selected projects were agreed to for advancement, some were eliminated, and other local priorities were added.

2.1.5 Relationship of TIP to Air-Quality Conformity

The Baton Rouge urbanized area is part of the five parishes designated by EPA as a marginal ozone non-attainment area. In order to demonstrate attainment and maintenance of the *National Ambient Air Quality Standard (NAAQS)* for ozone, the *Clear Air Act Amendments of 1990 (CAAA)* requires that each state submit a State Implementation Plan (SIP) to the U.S. Environment Protection Agency (EPA). The SIP is a legally binding control strategy implementation plan that defines the time frame and specific strategies through which ozone precursor emissions will be reduced and the ozone standard attained. The applicable documentation for Baton Rouge Air Quality Conformity is the SIP revision previously approved MVEBs with the latest revision of EPA's mobile source emissions model, MOBILE6. The emissions budget contained therein were deemed adequate for transportation conformity purposes by EPA (*Federal Register Notice of Adequacy*, 68 FR 43748, June 2, 2003). These MVEBs can be used to demonstrate the budget test requirements of the transportation conformity rule. The purpose of this report is to demonstrate that the *Baton Rouge Metropolitan Area Transportation Plan Update 2004* (PLAN) and *Transportation Improvement Program* (TIP) conform to the goals and objectives outlined in that control strategy SIP.

The Metropolitan Transportation Plan Update 2004 (MTP) and the TIP (same as Stage I of the PLAN) were adopted by the TPC of the Baton Rouge MPO on December 13, 2005. This TIP is the same as Stage 1 of the MTP except for projects that have been let to contract in FY 2005. The EPA and the FHWA approved the Conformity on December 13, 2005. This TIP is currently being amended in order to be SAFETEA-LU compliant before the implementation deadline of July 1, 2007.

2.1.6 Public and Business Community Involvement

Public hearings, public meetings, and newspaper advertisements and articles have been used to inform the public of important regional projects and to promote alternative transportation modes, including bus, light rail studies, vanpooling, and ridesharing programs. Public meeting notices on *the MTP*, *Conformity Analysis*, the TIP, and the UPWP are placed in *The Advocate* (the official journal of record) as required.

2.1.7 Distribution of Document for Public Review

Copies of the draft TIP, the *MTP*, the *Conformity Analysis*, and the UPWP were placed at the regional libraries and the governmental offices throughout the metropolitan area at least 30 days prior to adoption by the TPC for citizen review, input and comment. These documents are also posted on CRPC website to provide easy access to the public as required by the new SAFETEA-LU regulations. The public was also afforded the opportunity to express their comments directly to the meetings of the TAC, the TPC, and at a public hearing or in writing to the CRPC.

During the past year, meetings were held with numerous neighborhood and business organizations.

2.2 Funding Sources

2.2.1 Potential Funding Sources - Federal

The implementation of a financially constrained TIP for the Baton Rouge Metropolitan Area will necessarily involve several sources of funding. These sources include various programs at the local, State and Federal levels. Since many of the improvement projects are located on the State and Federal Highway System, substantial financial assistance could be obtained through funding programs of the LA DOTD and the Federal Highway Administration (FHWA). Several of these funding programs are listed below.

Innovative Financing/Advance Construction:

This TIP incorporates the concept of Innovative Financing/Advance Construction. Periodically, projects are shown in a construction phase where the available funds are insufficient to cover project costs. Under the provisions of Advance Construction we are able to use other funding sources, such as local resources, to start a project, and obtain federal reimbursement in a subsequent year, thereby allowing an otherwise prohibited project to proceed ahead of schedule.

ISTEA

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) provided total funding of $155 billion nationally for fiscal years 1992-1997. This legislation included several categories of funding, under which many of the projects in the financially constrained plan will be eligible for Federal funding assistance. These categories were:

Interstate Maintenance

This category provides financing to restore, resurface, and rehabilitate the Interstate system. Reconstruction is also eligible if it does not add capacity.

National Highway System (NHS)

This category covers all Interstate routes and a large percentage of urban principal arterials. The Federal/Local funding ratio for arterial routes is 80/20. The Interstate System, although a part of NHS, will retain its separate identity and will receive separate funding at a 90/10 ratio.

Surface Transportation Program (STP)

The STP is a block grant funding program with subcategories for States and Urban Areas. These funds can be used for any road (including NHS) that is not functionally classified as a local road or rural minor collector. The State portion can be used on roads within an urbanized area and the urban portion can only be used on roads within an urbanized area. The funding ratio is 80/20. Subcategories of the STP funds are:

STP greater than 200,000 population (STP>200K)
STP less than 5,000 population and (STP<5K)
STP Flexible (STP-FLEX)
STP Hazard Elimination (STP-HAZ)
STP Enhancement (STP-ENH)

Bridge Replacement and Rehabilitation Program (FBR)

These funds can be used to replace or repair any bridge on a public road. The funding ratio is 80/20.

Congestion Mitigation and Air Quality (CMAQ)

Urban areas that do not meet ambient air quality standards are designated as non-attainment areas by the U.S. Environmental Protection Agency (USEPA). These funds are apportioned to those urban areas for use on projects that contribute to the reduction of mobile source air pollution through reducing VMT, fuel consumption or other identifiable factors. The matching ratio for this program is 80/20 except for traffic signal systems, park & ride lots and ridesharing projects which are 100% federally funded.

The eligibility of specific projects under these funding categories will be based on the functional classification system mandated by ISTEA, This system has been prepared for the Baton Rouge Urbanized Area by LA DOTD in consultation with CRPC.

TEA21

The Transportation Equity Act for the 21st Century (1998) increased funding for guaranteed surface transportation spending. TEA21 provides $416 million per year for Louisiana highways and $180 million for state demonstration projects. LA DOTD received over $34 million for eight high priority projects in the Baton Rouge Metropolitan area. Based on the bill, the spending scenarios for these demonstration projects must be 11% in 1998, 15% in 1999, 18% in 2000 and 2001, and 19% in 2002 and 2003.

SAFETEA-LU

The Safe, Accountable, Flexible, Efficient Transportation Equity Act (2005) further increased funding for guaranteed surface transportation spending. SAFETEA-LU provides $580 million per year on an average for Louisiana highways, highway safety, and public transportation. LA DOTD received over $49.9 million for fifteen priority projects. Based on the bill, the spending scenarios for these demonstration projects must be 20% in each year from 2005-2009.

2.2.2 Potential Funding Sources - Local

Any costs not covered by Federal and State programs will be the responsibility of the local governmental jurisdictions. Local funding can come from a variety of sources including property taxes, sales taxes, user fees, special assessments and impact fees. Each of these potential sources is important and warrants further discussion.

Property Taxes

Property taxation has historically been the primary source of revenue for local units of government in the United States. More than 80 percent of all tax revenues at this level come from this tax. Property is not subject to Federal government taxation, and state governments have in recent years shown an increasing willingness to leave this important source of funding to local governments.

General Sales Taxes

The general sales tax is also an important revenue source for local governments. The most commonly known form of the general sales tax is the retail sales tax. The retail sales tax is imposed on a wide range of commodities, and the rate is usually a uniform percentage of the selling price. The current sales tax varies within the area; for Baton Rouge, the current rate is 9%. A vote to renew the current sales tax for capital improvements to the transportation system within the metropolitan planning area, won local voter approval in October 2001. On October 15, 2005, the half-cent sales tax was approved by the public and would extend the so-called "pot-hole" tax for additional 23 years until 2030. It is estimated that over the next 25 years, the tax will fund $784 million in projects administered by the City-Parish government of which $493 million will be spent on transportation improvement projects through out the parish.

User Fees

User fees are defined as fees which are collected from those who utilize a service or facility. These fees are collected for the purpose of paying for the cost of a facility, financing the cost of operations and/or generating revenue for other uses. Water and sewer services are the most commonly known public improvements for which a user fee is charged. This method of generating revenue to finance public improvements has also been employed to finance the cost of public parks, transit systems and solid waste facilities. The theory behind user fees is that those directly benefiting from a public improvement should pay for the cost of that public improvement.

Special Assessments

Special assessment is a method of generating funds for public improvements, whereby the cost of a public improvement is collected from those who directly benefit from the improvement. In many instances, new streets are financed by special assessment. The owners of property located adjacent to the new streets are assessed a portion of the cost of the new streets, based on the amount of footage they own adjacent to the new streets. Special assessments have also been used to generate funds for general improvements within special districts, such as central business districts. In some cases, these assessments are paid over a period of time, rather than as a lump sum payment.

Impact Fees

Development impact fees have been generally well received in other states and municipalities in the United States. New developments create increased traffic volumes on the streets around them. Development impact fees are a way of attempting to place a portion of the burden of funding improvements on developers who are creating or adding to the need for improvements. This type of fee has recently been implemented in Baton Rouge for the sewer connections associated with new homebuilding.

Bond Issues

Property tax and sales tax funds can be used on a pay-as-you go basis, or the revenues from them can be used to pay off general obligation or revenue bonds. These bonds are issued by local governments upon approval of the voting public.

2.3 Revenue Determination Procedure

The specific estimates of revenues were determined in consultation with LA DOTD staff in the Division of Planning and Programming; EBR-DPW director and other transportation engineers, and the Transportation Policy Committee of CRPC which represents all of the municipal mayors and parish officials in the Baton Rouge Transportation Management Area (TMA).

Historical information from LA DOTD indicates that, on average, approximately $32 million per annum has been made available for construction and maintenance of the transportation infrastructure within the Baton Rouge Metropolitan Area over the past six (6) years. This figure represents actual expenditures on improvements to the infrastructure. However, a recent ten year plan developed by LA DOTD indicates a forecast level of funding for the Baton Rouge area in the range of $30-35 million per annum. SAFETEA-LU further increased funding levels by over 30.3% for the next five years.

In the development of the PLAN, projects were allocated to appropriate funding programs to develop an estimated need by fund source for the PLAN. For the projects falling into the following categories, the revenue determinations were made by LA DOTD in consultation with CRPC: Interstate Maintenance (IM), National Highway System (NHS), Surface Transportation Program Hazard Elimination (HE), STP under 5,000 population (<5K), STP Enhancement, STP State Flexible, Federal Bridge, Demonstration, State Funds, and State Overlay.

For projects falling into the categories of STP (>200K URBAN), Congestion Mitigation and Air Quality (CMAQ), the revenue determinations were made by the EBR-DPW Director, CRPC staff, and CRPC Transportation Policy Committee. In the area of Transit projects, the Capital Area

Transit System (CATS) provided revenue determinations for this TIP.

Table 1 shows the funds programmed by source of funding for the TIP. It is important to note that in order to implement the high-cost projects, the costs should be averaged over the five-year duration of the TIP.

2.3.1 The Need for Additional Revenue

During the development of the PLAN, it was projected that adequate funds would not be available to implement all the programs and projects that were proposed for Baton Rouge. At this time there are a number of projects that have been proposed for which there is not sufficient available funding for implementation (For a full list, ref. "Unmet Needs" in the PLAN).

2.3.2 Summary of Total Funds Programmed By Funding Source For Each Fiscal Year (FY) of the TIP (FY 2008-2010)

Funding Source	FY 2007-2008 (000)	FY 2008-2009 (000)	FY 2009-2010 (000)	FY 2010-2011 (000)	**TOTAL FUNDS (000)**
INTERSTATE MAINTENANCE	$ 65,704	$ 31,294	$ 20,000	$ -	**$ 116,998**
NATIONAL HIGHWAY SYSTEM	8,207	30,000	-	-	**38,207**
STP (>200K URBAN)	11,310	200	7,400	9,000	**27,910**
STP (<5K)	-	-	-	-	**-**
STP-FLEX	33,624	34,384	16,726	2,500	**87,234**
STP HAZARD / STPENH	14,154	11,819	6,390	19,445	**51,808**
FEDERAL BRIDGE PROGRAM	2,520	93,480	23,900	1,340	**121,240**
DEMONSTRATION	1,988	6,576	-	-	**8,564**
STATE OVERLAY	-	-	-	-	**-**
STATE BOND	-	-	-	-	**-**
STATE CASH	65,918	2,185	-	-	**68,103**
CMAQ	12,700	10,980	13,550	1,850	**39,080**
CITY/OTHER/REIMB	80,318	189,590	43,173	-	**313,081**
TOTALS	**$ 296,443**	**$ 410,508**	**$ 131,139**	**$ 34,135**	**$ 872,225**

2.3.3 Availability of Local Funds

Many of the projects require local funds to be put up as a match for federal funds. CRPC has been informed that these local funds are available at both the state and city levels. This revenue is available from a variety of taxation and bond sources.

2.4 Transportation Control Measures (TCMs)

450.324 (g) (6) of the Metropolitan Planning Regulations requires non-attainment areas to identify Transportation Control Measures (TCMs) in the TIP. At this time TCMs are not required for the Baton Rouge TMA. However, several TCM projects are in various stages of development. The TIP contains TCM projects as follows with their funding source in parentheses:

1. Enhancement (STP-ENH),
2. A number of intersection improvements (CMAQ),
3. Traffic Signal Synchronization and Replacement (CMAQ),
4. Pavement Markings (STP>200K),
5. Park-and-Ride Lots (CMAQ),
6. Regional Ridesharing Programs (CMAQ),
7. Metropolitan Advanced Traffic Management Systems/Center (CMAQ).

2.4.1 Prioritizing TCMs

450.324 Section (d) requires TCMs to be prioritized in the TIP. To do this the TCMs described previously were evaluated for their Volatile Organic Compounds (VOC) emissions reduction potential together with the cost of implementing that TCM. This gives the cost per ton of reduction, or the ***cost-effectiveness*** of that TCM. Projects were then ranked by comparing the cost-effectiveness of each emissions reduction.

2.5 Structure of the TIP

The TIP is structured as follows: Projects are listed by funding category and the fiscal year in which various phases of that project are due to be implemented. The six broad phases used are:

1. Preliminary Engineering (PE)
2. Right-of-Way & Utilities (RW-U)
3. Clearing and Grubbing (C-G)
4. Construction (C)
5. Implementation (I)
6. Study

For this reason a project may show up more than once in the TIP as it goes into the next phase of implementation. Conversely, a project that appeared in a previous TIP for PE that is not due to construction until beyond the final year of the TIP, will not appear in the current TIP. This does not mean that project has “disappeared”.

Each project includes the following information:

- State Project Number,
- The name and description of the project,
- The Parish - East Baton Rouge (EBR), Livingston (LIV), and West Baton Rouge (WBR),
- The Phase - PE, RW-U, C-G, CON, I, or STUDY,
- The total cost and the estimated federal contribution,
- Funding Source,
- Letting Date, and
- The aim of the Proposed Improvement.
- The total cost and the estimated federal contribution,
- Funding Source,
- Letting Date, and
- The aim of the Proposed Improvement.

GLOSSARY OF TERMS

Area Source: Small stationary and non-transportation pollution sources that are too small and numerous to be included as point sources but may collectively contribute to air pollution.

CAAA: *Clean Air Act Amendments of 1990* - Legislation that identifies mobile sources as primary sources of certain pollutants and calls for stringent new requirements regarding the attainment of the NAAQS.

CO: Carbon Monoxide - A colorless, odorless gas that is a product of incomplete combustion of fossil fuels. It is harmful if breathed in concentrated doses, and may lead to nausea and even death**.**

CRPC: Capital Region Planning Commission - The Metropolitan Planning Organization (MPO) responsible for transportation planning activities within the Baton Rouge Metropolitan Area.

CATS: Capital Area Transit System – The agency responsible for transit operation within the Baton Rouge Metropolitan Area.

EBRDPW: East Baton Rouge Department of Public Works.

Emission Inventory: A complete list of sources and quantities of pollutants within a specified area and time interval.

EPA: *Environmental Protection Agency* - Federal agency created as part of the *Environmental Protection Act of 1970* that is responsible for enforcing, monitoring, and maintaining Federal environmental law.

FHWA: *Federal Highway Administration* - An agency of the U.S. Department of Transportation with jurisdiction over highways.

ISTEA: *Intermodal Surface Transportation Efficiency Act* - Major Federal legislation that implements broad changes in the transportation decision-making processes. ISTEA emphasizes diversity and balance of
modes together with preservation of existing systems. It imposes a series of environmental, social, and energy-related factors that must be addressed in the planning, programming, and selection of projects.

LADEQ: *Louisiana Department of Environmental Quality* - State of Louisiana agency that has jurisdiction over environmental regulations.

LA DOTD: *Louisiana Department of Transportation and Development* - State of Louisiana agency that has jurisdiction over transportation.

Metropolitan Area: An area with a population of at least 50,000 as defined by the Bureau of the Census.

Metropolitan Area Boundaries: The area represented by the existing urbanized area and the contiguous area forecasted to be urbanized in a twenty year horizon for the region. The area may include the entire metropolitan statistical area as designated by the Bureau of the Census or another area as agreed upon by the Governor and MPO. Unless agreed upon by the metropolitan organization and the Governor, the area must also include the area of non-attainment of the NAAQS as defined by the CAAA.

Mobile Source: Mobile sources include motor vehicles, aircraft, ocean-going vessels, and other transportation modes. The principle mobile source related pollutants are; carbon monoxide (CO), hydrocarbons (HC), oxides of nitrogen (NOx), and particulate matter less than ten microns in diameter (PM_{10}).

MPO: *Metropolitan Planning Organization* - An organization established by the Governor and units of local government that represents 75% of the affected population to carry out the transportation planning process required in Section 134 of Title 23 of the United States Code as amended by ISTEA of 1991.

NAAQS: *National Ambient Air Quality Standards* - Federal standards that set permissible concentrations and exposure limits for various pollutants.

Non-attainment Area: A geographic region of the country that has been designated by the EPA as not meeting the NAAQS for ozone, carbon monoxide, or particulate matter (<10 microns in diameter).

O_3: Ozone: A secondary pollutant formed when hydrocarbons and oxides of nitrogen combine in sunlight. It is a colorless gas with a sweet odor and is associated with respiratory problems in humans and animals.

PLAN: *Long Range Transportation Plan* - A document specifying transportation projects and programs to be implemented over the next twenty years. The PLAN must be financially constrained and satisfy air quality conformity determinations before formal approval and adoption is granted.

SIP*: State Implementation Plan* - A plan mandated by the *CAAA of 1990* that must contain procedures for areas classified as serious and above in non-attainment of ozone and carbon monoxide to monitor, control, maintain, and enforce compliance with the NAAQS.

SAFETEA-LU: *Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users* – A transportation bill that reauthorizes federal highway, transit, safety, research and motor carrier programs for five year period from 2005-2009. The bill was signed in to law on August 10, 2005 by the President.

TAC: *Transportation Advisory Committee* **-** A committee consisting of governmental, institutional, and providers of transportation in the Baton Rouge metropolitan area. Its purpose is to provide advice and recommendations regarding transportation issues in the area.

TEA21: *Transportation Equity Act for the 21st Century* – A transportation bill that reauthorizes federal highway, transit, safety, research and motor carrier programs for the six year period 1998-2003. The Senate and House of Representatives completed action on this legislation on May 22, 1998, and the President signed the bill into law June 9, 1998.

TIP: *Transportation Improvement Program* - A document specifying transportation projects to be programmed within the next three to five years. As with the PLAN, this program must be financially constrained and satisfy appropriate air quality conformity determinations.

TMA: *Transportation Management Area* - An urbanized area with a population of at least 200,000, or as designated by the U.S. Secretary of Transportation, that requires planning steps be performed including, but not limited to, the adoption of a Congestion Management System (CMS).

TPC: *Transportation Policy Committee* - The committee responsible for formally adopting local plans and programs in the metropolitan area.

TRANPLAN: A PC based network travel demand model used in the analysis and forecasting of travel in urban areas.

While every effort has been made to develop this document using the latest information available at the time, it is recognized that there are uncertainties in the development of projects, right-of-way acquisition, relocation of utilities, acquisition of permits, costs, funding availability, etc. Therefore, the Policy Committee has no objection to phases of projects moving within the TIP or STIP as necessitated by the situation, and gives its' approval to the MPO staff to make those necessary changes without action by the Policy Committee.

TRANSPORTATION IMPROVEMENT PROGRAM
BATON ROUGE METROPOLITAN AREA (2009-2013)
(Financially Constrained)
Highway Element

FY 2009 (10/1/08-9/30/09)

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
265-01-0043	ASC	LA 44	US 61 - LA 30	Signal Synchronizatior	C	$ 1,200	$ 1,200	CMAQ	FY09	
742-17-0008	EBR	Flannery Rc	Flannery Rd @ Florida Blvc	Intersection Improvemen	C	2,580	2,064	CMAQ	FY09	
414-01-0036	EBR	LA 30	Nicholson Dr @ Brightside Lr	Intersection Improvemen	PE,R/W,UTIL	1,150	920	CMAQ	FY 10	
742-17-MAP9	Regional	Regional	Flex to STPHAZ	City's Share of MAP FY 2009	C	350	280	CMAQ	FY09	
077-05-0043	Regional	Regional	Computer Signal Synchronization Ph V Pt A	Operations	R/W	200	200	CMAQ	FY 10	
	Regional	Regional	Computer Signal Synchronization Ph VI	Operations	PE	500	500	CMAQ	FY 11	
742-17-09TR	EBR	EBR	Flex to Transit	Operations	C	1,000	800	CMAQ	FY09	
742-17-ATM	EBR	EBR	Advanced Traffic Management Center	Operations	C	300	240	CMAQ	FY09	
				SUB TOTAL CMAQ		**$ 7,280**	**$ 6,204**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
454-02-0047	LIV	I-12	I-12 @ Pete's Highway	New Interchange	PE	$ 300	$ 240	DEMO	FY13	Authorized
	EBR	I-10	I-10 at Pecue Ln	New Interchange	R/W	$ 750	$ 600	DEMO	FY11	
742-17-0143	EBR	Central Thruway	French Town - Sullivan Rd	Embankment	C	3,066	2,453	DEMO	FY09	
				SUB TOTAL DEMO		**$ 4,116**	**$ 3,293**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Cometns
265-02-	ASC	LA 441	Bourgeois Canal Bridge	Bridge Replacement	RW,Util	$ 1,000	$ 800	FBRON	FY12	
270-02-0018	LIV	LA 441	Tickfaw River Bridge Near Starnes	Bridge Replacement	C	2,470	1,976	FBRON	FY09	
817-05	EBR	LA 410	Blackwater Bayou Bridge	Bridge Replacement	R/W UTIL	700	560	FBRON	FY12	
713-17-0040	EBR	Chaney Rd	Chaney Rd Bridge	Bridge Replacement	C	275	220	FBROFF	FY09	
				SUB TOTAL FBR		**$ 4,445**	**$ 3,556**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
450-08-0051	EBR	I- 10	LA 1 in Port Allen to I- 110	Interstate Signing	C	$ 4,229	$ 3,383	IM	FY09	
				SUB TOTAL IM		**$ 4,229**	**$ 3,383**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
019-02-0051	EBR	US 61	I-110 - LA964	Rubblize and Overlay	C	$ 12,396	$ 9,917	NHS	FY09	
				SUB TOTAL NHS		**$ 12,396**	**$ 9,917**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
817-41-0008	EBR	LA 3245 (O'Neal Ln)	I-12 - Florida Blvd	Widening	C	$ 12,140	$ 9,712	STPFLEX	FY09	480 STPENH
268-02-0018	LIV	LA 447	US 190 - LA 1019	C.P. Patch and Overlay	C	3,004	2,403	STPFLEX	FY09	
861-18-0005	WBR	LA 3091	LA 620 - LA 413	Fix Base and Overlay	C	1,746	1,397	NFA	FY09	
				SUB TOTAL STPFLEX		**$ 16,890**	**$ 13,512**			

TRANSPORTATION IMPROVEMENT PROGRAM
BATON ROUGE METROPOLITAN AREA (2009-2013)
(Financially Constrained)
Highway Element

FY 2009 (10/1/08-9/30/09)

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
742-17-0135	EBR	Millerville Rd	I-12 - S Harrells Ferry Rd (C&G)	Clearing For 5 Lanes	C&G	$ 341	$ 273	STP>200K	FY09	
				SUB TOTAL STP>200K		**$ 341**	**$ 273**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
744-32-0012	LIV	Varies	Livingston Sidewalk Program (Phase III)	Enhancement	C	$ 200	$ 160	STPENH	FY09	131 Other
				SUB TOTAL STPENH		**$ 200**	**$ 160**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
450-09-0026	WBR	I -10	I -10 Mississippi River Bridge	Bridge Rehab	C	$ 7,370	$ 5,896	STGEN	FY09	
861-03-0014	WBR	LA 983	LA 620 - E JCT LA 984	Asph Overlay	C	1,498	1,198	STGEN	FY09	
				SUB TOTAL STGEN		**$ 8,868**	**$ 7,094**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
253-03-0010	EBR	LA 64	EB Turn Lane @ Tucker Rd	Turn Lane	C	$ 450	$ 360	STCASH	FY 09	
256-06-0012	ASC	LA 44	LA 942 - St James Parish Line	Minor Overlay	C	419	335	STCASH	FY09	
258-01-0033	EBR	LA 427	Siegen Ln to Highland Rd	Enivronmental Impact Study of Widening	Study	100	80	STCASH	FY11	
700-17-0209	EBR	I-10	I- 10 Bridge to I-10/I-12 Split	Feasibility / Environmental Study	Study	2,000	1,600	STCASH	FY09	
Regional	Regional	Loop New Alignment	5 Parish Region	New Loop	EIS	2,250	2,250	STCASH	FY13	
861-18-0005	WBR	LA 3091	LA 620 - LA 413	Stabilize Base and Overlay	PE	175	140	STCASH	FY10	
				SUB TOTAL STCASH		**$ 5,394**	**$ 4,765**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
ARRA	EBR	I- 10	Seigen Ln to Highland Rd	Widen to 6 Lanes	C	$ 75,000	$ 75,000	ARRA	FY09	
				SUB TOTAL ARRA		**$ 75,000**	**$ 75,000**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
832-13-0015	LIV	LA 1026	LA 1026 @ US 190	Right Turn Lane	C	$ 200	$ 160	OTHER	FY09	
				SUB TOTAL OTHER		**$ 200**	**$ 160**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
TCSP	EBR	College Dr + Sherwood Forest	Signal Signalization	New Communications	C	$ 429	$ 343	TCSP	FY09	
				SUB TOTAL TCSP		**$ 429**	**$ 343**			

FY 2009 (10/1/08-9/30/09)

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
ARRA PROJECT	EBR	Central Thruway	Central Thruway Bridges Beaver Bayou 2+3	New Bridges	C	7,200	$ 5,760	ARRA	FY09	
ARRA PROJECT	EBR	Central Thruway	Central Thruway Embankment	Clearing and Embankment	C	3,100	$ 2,480	ARRA	FY09	
ARRA PROJECT	WBR	I-10	Partial Interchange	On - Off Ramps WB	C	4,000	3,200	ARRA	FY09	
ARRA PROJECT	ASC	LA 44	Conerview Rd at LA 44	Intersection Improvement	C	562	450	ARRA	FY09	
				SUB TOTAL ARRA		**$ 14,862**	**$ 11,890**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
ARRA BACKUP	EBR	Summa Av + Downtown Sts	Summa AV + Downtown STS	Concrete Rehabilitation	C	2,480	$ 1,984	ARRA	FY09	
ARRA BACKUP	EBR	Coursey Blvd	US 61 - Jones Creek Rd	Concrete Rehabilitation	C	1,645	$ 1,316	ARRA	FY09	
ARRA BACKUP	EBR	S Flannery Rd + Goodwood Blvc	S Flannery Rd + Goodwood Blvc	Asphalt Rehabilitatior	C	1,232	986	ARRA	FY09	
ARRA BACKUP	EBR	Broussard St	Glenmore Dr - Country Club Dr	Asphalt Rehabilitation	C	492	394	ARRA	FY09	
ARRA BACKUP	EBR	Northwest Parish	Various Roads	Asphalt Rehabilitation	C	3,181	$ 2,545	ARRA	FY09	
ARRA BACKUP	WBR	LA 1	I-10 - US 190	Concrete Rehabilitation	C	4,000	$ 3,200	ARRA	FY09	
ARRA BACKUP	WBR	LA 1	LA 1 at Emily Dr	Intersection Improvemen	C	200	160	ARRA	FY09	
ARRA BACKUP	ASC	LA 44	LA 44 at Neal St	Intersection Improvement	C	1,152	921	ARRA	FY09	
ARRA BACKUP	ASC	LA 429	LA 73 - E Burnside Av	Mill and Overlay	C	3,350	$ 2,680	ARRA	FY09	
ARRA BACKUP	LIV	Eden Church RD	US 190 - LA 1026	Rehabilitation	C	3,350	2,680	ARRA	FY09	
ARRA BACKUP	LIV	Spring Ranch Rd + Satsuma Rd	Spring Ranch Rd + Satsuma Rd	Intersection - Interchange + Road Improve	C	1,451	1,161	ARRA	FY09	
				SUB TOTAL ARRA		**$ 22,533**	**$ 18,026**			

TRANSPORTATION IMPROVEMENT PROGRAM
BATON ROUGE METROPOLITAN AREA (2009-2013)
(Financially Constrained)
Highway Element

FY 2009 (10/1/08-9/30/09)

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
06-CS-TL-0034	EBR	Perkins Rd	Perkins Rd @ Stanford Av / Acadian Thruway	Intersection Improvements	C	$ 26,948	$ 26,948	City - Parish	FY09	
06-TL-HC-0032	EBR	Foster Dr	Foster Dr @ Government St	Intersection Improvements	C	8,677	8,677	City - Parish	FY09	
06-CS-HC-0033	EBR	Essen Ln	Essen Ln at I-10	Intersection Improvements	C	4,221	4,221	City - Parish	FY09	
07-CS-HC-0024	EBR	Pecue Ln	Pecue Ln Realignment at Perkins Rd	Jamestowne Devel. Intersection Only	C	3,071	3,071	City - Parish	FY09	
07-TL-HC-0025	EBR	US 61	Mt Pleasant Rd - Zachary Rd	Intersection Improvements	PE	163	163	City - Parish	FY11	
03-CS-CI-0020	EBR	Sullivan Rd	Central Thruway to 2,250' north of Wax Rd	Widen to 4 lanes	PE	2,578	2,578	City - Parish	FY10	
06-CS-HC-0025	EBR	Siegen Ln	Highland Rd to 650' south of Perkins Rd	Four Lane Curb and Gutter	C	17,586	17,586	City - Parish	FY09	
04-CS-CI-0019	EBR	Ford St	Plank Rd - Mickens Rd	Curb and Gutter, Sidewalk	PE	1,521	1,521	City - Parish	FY10	
06-CS-HC-0027	EBR	Brightside Dr	River Rd - Nicholson Dr	Three Lane until 500' Before Nicholson	C	12,968	12,968	City - Parish	FY09	
06-CS-HC-0023	EBR	O'Neal Ln Seg 1	S Harrells Ferry Rd to 1,250' South I-12	Widen to 4 lanes Sidewalks	C	18,473	18,473	City - Parish	FY09	
02-CS-HC-0004	EBR	O'Neal Ln	George O' Neal Rd - S Harrells Ferry Rd	Widening to 4/5 Lanes	UTIL	1,000	1,000	City - Parish	FY10	
02-CS-HC-0006	EBR	S Choctaw Rd	Flannery Rd at S Choctaw Rd	Intersection Improvements	C	3,072	3,072	City - Parish	FY09	
02-CS-HC-0002	EBR	S Harrell's Ferry Rd Seg 1	Sherwood Forest Blvd - Millerville Rd	Widen to 4 lanes	C	9,044	9,044	City - Parish	FY09	
06-CS-HS-0029	EBR	S Harrells Ferry Rd Seg 2	Millerville Rd - O'Neal Ln (Phase II)	Widen to 4/5 Lanes	C	21,620	21,620	City - Parish	FY09	
03-CS-HC-0021	EBR	Stumberg Extension	Airline Hwy - Jefferson Hwy	New 5 Lanes	PE	1,897	1,897	City - Parish	FY11	
06-CS-HC-0024	EBR	Staring Ln	Perkins Rd - Highland Rd	Widen to 4 Lanes	UTIL	1,000	1,000	City - Parish	FY10	
City-Parish	EBR	S Choctaw Rd	Flannery Rd - Central Thruway	Widen to 4 Lanes	PE	667	667	City - Parish	FY12	
02-CS-HC-0001	EBR	Comite Dr	Comite River - Plank Rd	Widen to 3 Lanes	C	7,460	7,460	City - Parish	FY09	
City-Parish	EBR	I-10	Pecue Ln at I-10	New Interchange w/ Road Improvements	PE	3,084	3,084	City - Parish	FY12	
City-Parish	EBR	Old Hammond Hwy Seg 1	Blvd de Provence - Millerville Rd	Widen to 4 Lanes	PE	1,300	1,300	City - Parish	FY13	
City-Parish	EBR	Old Hammond Hwy Seg 2	Millerville Rd - O'Neal Ln	Widen to 4 Lanes	PE	1,206	1,206	City - Parish	FY12	
742-17-0148	EBR	Central Thruway	Central Thruway Bridges Beaver Bayou 2+3	New Bridges	C	7,200	7,200	City - Parish	FY09	
				SUB TOTAL LOCAL		**$ 154,756**	**$ 154,756**			

FY 2009 (10/1/08-9/30/09)

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
			Federal Demonstration Projects	Various		$ 1,257	$ 1,006	DEMO	FY09	
			Federal Off-System Bridges	Bridge Replacement		500	400	FBR	FY09	
			Bridge Rail and Guard Rail	Bridge Rehabilitation		200	160	FBR	FY09	
			Bridge Painting	Bridge Maintenance		200	160	FBR	FY09	
			Federal Bridge Inspection Programs	Bridge Inspection		200	160	FBR	FY09	
			Eng, R/W, Util	CE Bridge Projects		1,000	800	FBR	FY09	
			Pavement Maintenance Projects	Maintenance		1,000	800	MAINT	FY09	
			Interstate Preventive Maintenance	Maintenance		1,000	800	IM	FY09	
			Interstate Maintenance	Maintenance		2,000	1,600	IM	FY09	
			Incidence Management	Incidence Management		500	400	NHS	FY09	
			Bridge Repair	Bridge Repair		200	160	STCASH	FY09	
			Federal Enhancement Projects	Enhancement		250	200	STPENH	FY09	
			Overlay	Overlay		2,000	1,600	STPFLEX	FY09	
			Hazardous Elimination Projects	Safety		500	400	STPHAZ	FY09	
			Railroad Crossing Improvements	Railroad Safety		500	400	STPRR	FY09	
				SUB TOTAL LINE ITEM		**$ 11,307**	**$ 9,046**			

TRANSPORTATION IMPROVEMENT PROGRAM
BATON ROUGE METROPOLITAN AREA (2009-2013)
(Financially Constrained)
Highway Element

FY 2010 (10/1/09-9/30/10)

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
077-02-0020	ASC	LA 73	LA 30 to US 61	Widen to 3 Lanes	C	$ 4,300	$ 3,440	CMAQ	FY10	STGEN - $15,000K
742-17-0153	EBR	Sherwood Forest Blvd	S Harrell's Ferry Rd @ Sherwood Forest Blvd	Intersection Improvement	C	1,800	1,440	CMAQ	FY10	STP>200K - $500
077-05-0043	Regional	Regional	Computer Signal Synchronization Ph V Pt A	Signal Synchronization	C	5,333	5,333	CMAQ	FY 10	
414-01-0036	EBR	LA 30	Nickolson Dr @ Brightside Ln	Intersection Improvement	C	1,500	1,200	CMAQ	FY10	
742-17-10TR	EBR	EBR	Flex to Transit	Operations	C	1,000	800	CMAQ	FY10	
742-17-MAP10	EBR	EBR	Transfer CMAQ funds to STPHAZ	City's Share of MAP	C	350	280	CMAQ	FY10	
742-17-ATM	EBR	EBR	Advanced Traffic Management Center	Operations	C	300	240	CMAQ	FY10	
267-02-B	ASC	LA 431	LA 431 @gold Place	Intersection Improvement	PE,RW,Util	170	136	CMAQ	FY 11	
	Regional	Regional	Computer Signal Synchronization Ph VI	Signal Synchronization	PE-R/W	500	500	CMAQ	FY 11	
				SUB TOTAL CMAQ		**$ 15,253**	**$ 13,369**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
260-01-0020	ASC	LA 42	Amite River Relief Bridge	Bridge Replacement	C	$ 1,300	$ 1,040	FBRON	FY10	
450-92-0055	EBR	I -110	Badley Rd Overpass	Bridge Recondition	C	1,213	970	FBRON	FY10	
450-10-0155	EBR/WBR	I -10	L & A Raliroad Overpass	Bridge Recondition	C	194	155	FBRON	FY10	
450-10-0156	EBR	I - 10	I -12 Ramp to I - 10	Bridge Rehab	C	151	121	FBRON	FY10	
713-52-0102	LIV	Lake Rd	Bridge Replacement	Bridge Replacement	C	1,400	1,120	FBROFF	FY10	
				SUB TOTAL FBR		**$ 4,258**	**$ 3,406**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
254-02-0051	EBR	LA 37	LA 37 at Central Thruway	New 2 Lanes (Concrete Pavement)	C	$ 1,850	$ 1,480	DEMO	FY 10	STP>200K - $5,600K
	EBR	I-10	I-10 at Pecue Ln	New Interchange	R/W	$ 750	$ 600	DEMO	FY11	
Regional	EBR	CATS	Bus Rapid Transit	Study	C	3,000	2,400	DEMO	FY 10	
737-17-0016	EBR	River Rd	River Rd Levee Shared Use Trail Ph 2	Levee Bike Path	C	2,200	1,760	DEMO	FY 10	
				SUB TOTAL DEMO		**$ 7,800**	**$ 6,240**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
077-30-0024	ASC	LA 429	LA 73 - LA 44	Mill and Overlay	C	$ 3,355	$ 2,684	STPFLEX	FY10	
250-01-0046	EBR	LA 19	LA 64 - E Feliciana Parish Line	Mill and Overlay	C	5,200	4,160	STPFLEX	FY10	
414-01-0041	EBR	LA 30	LA 73 - Skip Bertman Dr	Mill and Overlay	C	3,542	2,834	STPFLEX	FY10	
254-02-0052	EBR	LA 37	Sullivan Rd - LA 64	Mill and Overlay	C	2,520	2,016	STPFLEX	FY 11	
832-10-0018	LIV	LA 1024	LA 16 - LA 447	C.P., Patch and Overlay	C	3,264	2,611	STPFLEX	FY10	
				SUB TOTAL STPFLEX		**$ 17,881**	**$ 14,305**			

TRANSPORTATION IMPROVEMENT PROGRAM
BATON ROUGE METROPOLITAN AREA (2009-2013)
(Financially Constrained)
Highway Element

FY 2010 (10/1/09-9/30/10)

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
257-04-0025	EBR	LA 42	LA 42 @ West Lee Dr	Intersection Improvements	C	$ 279	$ 223	STPHAZ	FY10	
253-02-0025	EBR	LA 64	LA 19 to McHugh Rd	Center Turn Lane	R/W,UTIL	350	280	STPHAZ	FY11	
013-06-0051	LIV	US 190	US 190 at LA 1032	Intersection Improvements	R/W,UTIL	305	244	STPHAZ	FY11	
				SUB TOTAL STPHAZ		**$ 934**	**$ 747**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
742-17-0118	EBR	Sherwood Forest Blvd	Choctaw Dr - Greenwell Springs Rd	Widen to 5 lanes	R/W, UTIL	$ 3,300	$ 2,640	STP>200K	FY11	
742-17-0146	EBR	I-12	I-12 @ Sherwood Forest Blvd	Intersection Improvement	C&G	500	400	STP>200K	FY10	
742-06-0044	EBR	Millerville Rd	I-12- Harrells Ferry Rd	Widen to 5 lanes	C	4,600	3,680	STP>200K	FY10	
254-02-0051	EBR	LA 37	LA 37 @ Central Thruway	New 2 Lanes	C	5,600	4,480	STP>200K	FY10	1850 DEMO
742-17-0155	EBR	Jones Creek Rd	Tigerbend Rd - Coursey Blvd	Widen to 5 lanes	C&G	200	160	STP>200K	FY10	
				SUB TOTAL STP>200K		**$ 14,200**	**$ 11,360**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
077-02-0020	ASC	LA 73	US 61 - I-10	Widening	C	$ 15,000	$ 12,000	STGEN	FY10	CM $4,300
				SUB TOTAL STGEN		**$ 15,000**	**$ 12,000**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
803-12-0007	ASC	LA 934	LA 44 - LA 431	Mill and Overlay	C	$ 1,923	$ 1,538	NFA	FY10	
861-18-0005	WBR	LA 3091	LA 620 - LA 413	Stabilize Base and Overlay	C	1,746	1,397	NFA	FY10	
Regional	Regional	Loop New Alignment	5 Parish Region	New Loop	EIS	2,250	2,250	STCASH	FY13	
				SUB TOTAL STCASH		**$ 5,919**	**$ 5,185**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
744-03-0010	ASC	Bayou Francois	Bayou Francois SideWalk	New Sidewalks	C	$ 500	$ 500	ARRA	FY 10	
				SUB TOTAL ARRA		**$ 500**	**$ 500**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
008-01-0049	WBR	US 190	Upgrade Barrier Rails on US 190	Upgrade Barrier Rails on US 190	C	$ 500	$ 400	OTHER	FY10	
				SUB TOTAL OTHER		**$ 500**	**$ 400**			

FY 2010 (10/1/09-9/30/10)

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
03-CS-CI-0020	EBR	Sulllivan Rd	Central Thruway - 2,250' North of Wax Rd	Widen to 4 Lanes	C	$ 25,776	$ 25,776	City - Parish	FY10	
07-TL-HC-0025	EBR	US 61	Mt Pleasant Re - Zachary Rd	Intersection Improvements	R/W	500	500	City - Parish	FY11	
02-CS-HC-0004	EBR	O'Neal Ln	George O'Neal Rd - S Harrels Ferry Rd	Widening to 4/5 Lanes	C	5,712	5,712	City - Parish	FY10	
04-CS-CI-0019	EBR	Ford St	Plank Rd - Mickens Rd	Curb and Gutter, Sidewalks	C	15,209	15,209	City - Parish	FY10	
03-CS-HC-0021	EBR	Stumberg Extension	Airline Hwy - Jefferson Hwy	New 5 Lanes	R/W-UTIL	1,000	1,000	City - Parish	FY11	
City-Parish	EBR	S Choctaw Rd	Flannery Rd - Central Thruway	Widen to 4 Lanes	R/W	500	500	City - Parish	FY12	
City-Parish	EBR	I-10	Pecue Ln at I-10	New Interchange w/ Road Improvements	R/W	2,000	2,000	City - Parish	FY12	
City-Parish	EBR	Old Hammond Hwy Seg 1	Blvd de Provence - Millerville Rd	Widen to 4 Lanes	R/W	1,000	1,000	City - Parish	FY13	
City-Parish	EBR	Old Hammond Hwy Seg 2	Millerville Rd - O'Neal Ln	Widen to 4 Lanes	R/W	1,000	1,000	City - Parish	FY12	
06-CS-HC-0024	EBR	Staring Ln	Perkins Rd to Highland Rd	Widen to 4 Lanes	C	49,765	49,765	City - Parish	FY10	
				SUB TOTAL LOCAL		**$ 102,462**	**$ 102,462**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
			Federal Demonstration Projects	Various		$ 1,600	$ 1,280	DEMO	FY10	
			Federal Off-System Bridges	Bridge Replacement		500	400	FBR	FY10	
			Bridge Rail and Guard Rail	Bridge Rehabilitation		200	160	FBR	FY10	
			Bridge Painting	Bridge Maintenance		200	160	FBR	FY10	
			Federal Bridge Inspection Programs	Bridge Inspection		200	160	FBR	FY10	
			Eng, R/W, Util	CE Bridge Projects		1,000	800	FBR	FY10	
			Interstate Preventive Maintenance	Maintenance		1,000	800	IM	FY10	
			Pavement Maintenance Projects	Maintenance		1,000	800	MAINT	FY10	
			Interstate Maintenance	Maintenance		2,000	1,600	IM	FY10	
			Incidence Management	Incidence Management		500	400	NHS	FY10	
			Bridge Repair	Bridge Repair		200	160	STCASH	FY10	
			Federal Enhancement Projects	Enhancement		250	200	STPENH	FY10	
			Overlay	Overlay		2,000	1,600	STPFLEX	FY10	
			Hazardous Elimination Projects	Safety		500	400	STPHAZ	FY10	
			Railroad Crossing Improvements	Railroad Safety		500	400	STPRR	FY10	
				SUB TOTAL LINE ITEM		**$ 11,650**	**$ 9,320**			

TRANSPORTATION IMPROVEMENT PROGRAM
BATON ROUGE METROPOLITAN AREA (2009-2013)
(Financially Constrained)
Highway Element

FY 2011 (10/1/10-9/30/11)

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
267-02-B	ASC	LA 431	LA 431 @ Goldplace Rd (LA 931)	Intersection Improvement	C	$ 380	$ 304	CMAQ	FY11	
742-17-MAP10	Regional	Regional	Flex to STPHAZ	City's Share of MAP FY 2010	C	350	280	CMAQ	FY11	
742-17-11TR	Regional	Regional	Flex to Transit	Operations	C	1,000	800	CMAQ	FY11	
832-33-0008	LIV	Rushing Rd	Range Av - .5 miles west	Center Turn Lane	C	2,090	1,672	CMAQ	FY11	
742-17-ATM	EBR	Regional	Advanced Traffic Management Center	Operations	C	300	240	CMAQ	FY11	
742-17-0159	Regional	Regional	Computer Signal Synchronization Ph V pt B	Signal Synchronization	C	5,220	5,220	CMAQ	FY11	
077-04-0019	EBR	LA 73	Old Jefferson Hwy @ Antioch Av	Intersection Improvement	C	1,040	832	CMAQ	FY11	
				SUB TOTAL CMAQ		**$ 10,380**	**$ 9,348**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
	ASC	LA 22	LA 22 in Ascension Parish	Plan Design & Construct, Rdwy Improvemen	C	$ 200	$ 160	DEMO	FY11	
				SUB TOTAL DEMO		**$ 200**	**$160**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
742-17-0131	EBR	Jones Creek Rd	Tigerbend Rd - Coursey Blvd	Widen to 5 lanes	C	$ 7,200	$ 5,760	STP>200K	FY11	
				SUB TOTAL STP>200K		**$ 7,200**	**$ 5,760**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
260-01-OA26	ASC	LA 42	US 61 - LA 44	Widening and Improvements	C	$ 35,000	$ 28,000	STGEN	FY11	DEMO - 8.0 Mil
454-02-0025	LIV	I-12	O'Neal Ln - Pete's Hwy Overpass	Pavement Replacement & Widening	C	$ 100,000	$ 100,000	STGEN	FY11	
				SUB TOTAL STGEN		**$ 100,000**	**$ 100,000**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
265-02-	ASC	LA 44	Bourgeios Canal Bridge	Bridge Replacement	RW,UTIL	$ 1,000	$ 800	FBR ON	FY12	
414-01-0042	EBR	LA 30	No Name Stream near LSU	Bridge Replacement	RW, UTIL	700	560	FBRON	FY12	
713-17-0042	EBR	Elm Grove Garden Dr	Elm Grove Garden Dr Bridge	Brdige Rpelacement	C	850	680	FBROFF	FY11	
713-17-0043	EBR	Lanier Dr	Lanier Dr Bridge Over Roberts Canal	Bridge Replacement	C	1,200	960	FBROFF	FY 11	
713-17-0046	EBR	Carson, Nimitz Rd	Carson, Nimitz and Lovett Rds Bridges	Bridge Replacement	C	2,000	1,600	FBROFF	FY 11	
262-31-0016	LIV	LA 64	Amite River Bridge @ Magnolia Rd	Bridge Replacement	C	24,415	19,532	FBR	FY11	
817-05-	EBR	LA 410	Blackwater Bayou Bridge	Bridge Replacement	UTIL	200	160	FBRON	FY14	
007-10-0031	EBR	US 190	Mississippi River Bridge	Painting	C	35,250	28,200	FBR ON	FY11	FBRON - $35250K OTHER - $38,000K
				SUB TOTAL FBR		**$ 65,615**	**$ 52,492**			

FY 2011 (10/1/10-9/30/11)

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
255-02-0039	EBR	LA 408	LA 946 - LA 3034	Mill and Overlay	C	$ 3,600	$ 2,880	STPFLEX	FY11	
268-03-0004	LIV	LA 447	LA 1019 - LA 63	CP, Base & Olay S.B. ; Patch & Olay N.B.	C	4,649	3,719	STPFLEX	FY11	
				SUB TOTAL STPFLEX		**$ 8,249**	**$ 6,599**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
013-06-0051	LIV	US 190	US 190 at LA 1032	Intersection Improvement	C	$ 1,000	$ 800	STPHAZ	FY11	
454-03- A	LIV	I-12	I-12	Surface Improvement	C	900	720	STPHAZ	FY11	
013-06-0052	LIV	US 190	US 190 & LA 1026 (Roundabouts)	Roundabouts	C	1,200	960	STPHAZ	FY12	
253-02-0025	EBR	LA 64	LA 19 to McHugh Rd	Center Turn Lane	C	4,300	3,440	STPHAZ	FY11	
260-02-0037	LIV	LA 16	LA 16 @ LA 22	Realign Curve	R/W,UTIL	40	32	STPHAZ	FY12	
				SUB TOTAL STPHAZ		**$ 7,440**	**$ 5,952**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
03-CS-HC-0021	EBR	Stumberg Extension	Airline Highway to Jefferson Hwy	New 5 Lanes	C	$ 18,974	$ 18,974	City-Parish	FY11	
07-TL-HC-0025	EBR	US 61	Mt Pleasant Rd - Zachary Rd	Intersection Improvement	C	1,634	1,634	City-Parish	FY11	
City-Parish	EBR	S Choctaw Rd	Flannery Rd - Central Thruway	Widen to 4 Lanes	UTIL	300	300	City-Parish	FY12	
City-Parish	EBR	I-10	I-10 at Pecue Ln	New Interchange	C	15,000	15,000	DEMO	FY11	STCASH - $15,000
City-Parish	EBR	I-10	Pecue Ln at I-10	New Interchange w/ Road Improvements	UTIL	1,000	1,000	City-Parish	FY12	
City-Parish	EBR	Old Hammond Hwy Seg 1	Blvd de Provence - Millerville Rd	Widen to 4 Lanes	UTIL	1,000	1,000	City-Parish	FY13	
City-Parish	EBR	Old Hammond Hwy Seg 2	Millerville Rd - O'Neal Ln	Widen to 4 Lanes	UTIL	1,000	1,000	City-Parish	FY12	
				SUB TOTAL LOCAL		**$ 38,908**	**$ 38,908**			

FY 2011 (10/1/10-9/30/11)

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
			Federal Demonstration Projects	Various		$ 1,600	$ 1,280	DEMO	FY11	
			Federal Off-System Bridges	Bridge Replacement		500	400	FBR	FY11	
			Bridge Rail and Guard Rail	Bridge Rehabilitation		200	160	FBR	FY11	
			Bridge Painting	Bridge Maintenance		200	160	FBR	FY11	
			Pavement Maintenance Projects	Maintenance		1,000	800	MAINT	FY11	
			Federal Bridge Inspection Programs	Bridge Inspection		200	160	FBR	FY11	
			Eng, R/W, Util	CE Bridge Projects		1,000	800	FBR	FY11	
			Interstate Preventive Maintenance	Maintenance		1,000	800	IM	FY11	
			Interstate Maintenance	Maintenance		2,000	1,600	IM	FY11	
			Incidence Management	Incidence Management		500	400	NHS	FY11	
			Bridge Repair	Bridge Repair		200	160	STCASH	FY11	
			Federal Enhancement Projects	Enhancement		250	200	STPENH	FY11	
			Overlay	Overlay		2,000	1,600	STPFLEX	FY11	
			Hazardous Elimination Projects	Safety		500	400	STPHAZ	FY11	
			Railroad Crossing Improvements	Railroad Safety		500	400	STPRR	FY11	
				SUB TOTAL LINE ITEM		**$ 11,650**	**$ 9,320**			

FY 2012 (10/1/11-9/30/12)

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
832-01-0006	LIV	LA 1036	LA 442 - St Helena Parish Line	Cold Plane, Base, Drainage & Overlay	C	$ 5,500	$ 4,400	NFA	FY12	
				SUB TOTAL STCASH		**$ 5,500**	**$ 4,400**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
450-08-0057	WBR	I - 10	CSLM 0.00 - CSLM 12.70	NOVACHIP	C	$ 5,000	$ 4,000	IM	FY12	
				SUB TOTAL IM		**$ 5,000**	**$ 4,000**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
007-07-0055	ASC	US 61	LA 22 - LA 74	Mill and Overlay	C	$ 9,317	$ 7,454	STPFLEX	FY12	
258-32-0025	EBR	LA 3064	I- 10 - LA 73	Concrete Patching SB	C	1,382	1,106	STPFLEX	FY12	
				SUB TOTAL STPFLEX		**$ 10,699**	**$ 8,559**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
City-Parish	EBR	I-10	Pecue Ln at I-10	New Interchange w/ Road Improvement	C	$ 30,836	$ 30,836	City - Parish	FY12	
City-Parish	EBR	Old Hammond Hwy Seg 1	Blvd de Provence - Millerville Rd	Widen to 4 Lanes	UTIL	1,000	1,000	City-Parish	FY13	
City-Parish	EBR	Old Hammond Hwy Seg 2	Millerville Rd - O'Neal Ln	Widen to 4 Lanes	C	12,179	12,179	City-Parish	FY12	
City-Parish	EBR	S Choctaw Rd	Flannery Rd - Central Thruwa	Widen to 4 lanes	C	6,664	6,664	City - Parish	FY12	
				SUB TOTAL LOCAL		**$ 50,679**	**$50,679**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
260-02-0037	LIV	LA 16	LA 16 at LA 22	Realign Curve	C	$ 550	$ 440	STPHAZ	FY12	
				SUB TOTAL STPHAZ		**$ 550**	**$440**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
742-19-0118	EBR	Sherwood Forest	Choctaw - G reenwell Springs Rd	Widen to five Lanes	C	$ 9,000	$ 7,200	STP>200K	FY12	
				SUB TOTAL STP >200K		**$ 9,000**	**$ 7,200**			

TRANSPORTATION IMPROVEMENT PROGRAM
BATON ROUGE METROPOLITAN AREA (2009-2013)
(Financially Constrained)
Highway Element

FY 2012 (10/1/11-9/30/12)

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
			Federal Demonstration Projects	Various		$ 1,600	$ 1,280	DEMO	FY12	
			Federal Off-System Bridges	Bridge Replacement		500	400	FBR	FY12	
			Bridge Rail and Guard Rail	Bridge Rehabilitation		200	160	FBR	FY12	
			Bridge Painting	Bridge Maintenance		200	160	FBR	FY12	
			Eng, R/W, Util	CE Bridge Projects		1,000	800	FBR	FY12	
			Pavement Maintenance Projects	Maintenance		1,000	800	MAINT	FY12	
			Federal Bridge Inspection Programs	Bridge Inspection		200	160	FBR	FY12	
			Interstate Preventive Maintenance	Maintenance		1,000	800	IM	FY12	
			Interstate Maintenance	Maintenance		2,000	1,600	IM	FY12	
			Incidence Management	Incidence Management		500	400	NHS	FY12	
			Bridge Repair	Bridge Repair		200	160	STCASH	FY12	
			Federal Enhancement Projects	Enhancement		250	200	STPENH	FY12	
			Overlay	Overlay		2,000	1,600	STPFLEX	FY12	
			Hazardous Elimination Projects	Safety		500	400	STPHAZ	FY12	
			Railroad Crossing Improvements	Railroad Safety		500	400	STPRR	FY12	
				SUB TOTAL LINE ITEM		**$ 11,650**	**$ 9,320**			

FY 2013 (10/1/12-9/30/13)

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
265-02-	ASC	LA 44	Bourgeios Canal Bridge	Bridge Replacement	C	$ 1,541	$ 1,233	FBRON	FY13	
414-01-0042	EBR	LA 30	No name stream near LSU	Bridge Replacement	C	2,211	1,769	FBRON	FY13	
817-05-	EBR	LA 410	Blackwater Bayou Bridge	Bridge Replacement	C	2,379	1,903	FBRON	FY14	
050-07-0066	WBR	LA - 1	Port Allen Canal Bridge	Bridge Rehab	C	24,225	19,380	FBRON	FY13	
				SUB TOTAL FBR		**$ 30,356**	**$ 24,285**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
City-Parish	EBR	Old Hammond Seg 1	Blvd de Provence - Millerville Rd	Widen to 4 Lanes	C	$ 23,896	$ 23,896	City/Parish	FY13	
City-Parish	EBR	I-10	I-10 at Pecue Lr	New Interchange w/ Rd Improvement	C	30,836	30,836	City/Parish	FY13	
				SUB TOTAL LOCAL		**$ 54,732**	**$54,732**			

State Project Number	Parish	Route	Project Description	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
			Federal Demonstration Projects	Various		$ 1,600	$ 1,280	DEMO	FY13	
			Federal Off-System Bridges	Bridge Replacement		500	400	FBR	FY13	
			Bridge Rail and Guard Rail	Bridge Rehabilitation		200	160	FBR	FY13	
			Bridge Painting	Bridge Maintenance		200	160	FBR	FY13	
			Eng, R/W, Util	CE Bridge Projects		1,000	800	FBR	FY13	
			Pavement Maintenance Projects	Maintenance		1,000	800	MAINT	FY13	
			Federal Bridge Inspection Programs	Bridge Inspection		200	160	FBR	FY13	
			Interstate Preventive Maintenance	Maintenance		1,000	800	IM	FY13	
			Interstate Maintenance	Maintenance		2,000	1,600	IM	FY13	
			Incidence Management	Incidence Management		500	400	NHS	FY13	
			Bridge Repair	Bridge Repair		200	160	STCASH	FY13	
			Federal Enhancement Projects	Enhancement		250	200	STPENH	FY13	
			Overlay	Overlay		2,000	1,600	STPFLEX	FY13	
			Hazardous Elimination Projects	Safety		500	400	STPHAZ	FY13	
			Railroad Crossing Improvements	Railroad Safety		500	400	STPRR	FY13	
				SUB TOTAL LINE ITEM		**$ 11,650**	**$ 9,320**			

FY 2009 (10/1/08-9/30/09)

CAPITAL - Section 5307

State Project Number	Project Description	Parish	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
	Funding Transfer from Capital to Operating Assistance 100% Sec. 7025				200	200	7025 Law		100% Federal Funding- 7025 Law
	Project Administration				100	80	Section 5307		80% Federal / 20% local match
	Preventative Maintenance				4,250	3,400	Section 5307		80% Federal / 20% local match
	Education & Training				13	10	Section 5307		80% Federal / 20% local match
	Non FR-ADA				641	513	Section 5307		80% Federal / 20% local match
	Support Facilities and l Equipment				315	252	Section 5307		80% Federal / 20% local match
	Buses/ Vans & Support Vehicles				649	519	Section 5307		80% Federal / 20% local match
	Transit Enhancements				64	51	Section 5307		80% Federal / 20% local match
	Metropolitan Planning				125	100	Section 5307		80% Federal / 20% local match
			SUB TOTAL		**$ 6,356**	**$ 5,125**			

CAPITAL - ARRA

State Project Number	Project Description	Parish	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
	Buses/ Trolleys Alternative Fueled	EBR	ARRA		3,600	3,600	ARRA		ARRA Funding
	Radio/ Misc/ Equipment	EBR	ARRA		550	550	ARRA		ARRA Funding
	AVL/ GPS & Security System	EBR	ARRA		1,550	1,550	ARRA		ARRA Funding
	Support Vehicles	EBR	ARRA		330	330	ARRA		ARRA Funding
	Maintenance Equipment	EBR	ARRA		600	600	ARRA		ARRA Funding
			SUB TOTAL		**$ 6,630**	**$ 6,630**			

N.F. - NEW FREEDOM (Section 5317)

State Project Number	Project Description	Parish	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
	N.F. - New Freedom				1,164	582	Section 5317		50% Fed /50% local match - Includes carry forward from FY 06, 07, 08 & 09
			SUB TOTAL		**$ 1,164**	**$ 582**			

JARC - JOB ACCESS/ REVERSE COMMUTE (Section 5316)

State Project Number	Project Description	Parish	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
	JARC - Job Access/ Reverse Commute				2,592	1,296	Section 5316		50% Fed /50% local match - Includes carry forward from FY 06, 07, 08 & 09
			SUB TOTAL		**$ 2,592**	**$ 1,296**			

FY 2009 (10/1/08-9/30/09)

CAPITAL - CMAQ

State Project Number	Project Description	Parish	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
	30.09.45 - CMAQ Transit Operating and Improvements				1,000	800	CMAQ		80% Federal / 20% local match
			SUB TOTAL		**1,000**	**800**			

2009 Recap	FY 2009 Fed Share (000)
Section 5307 (Capital)	$ 5,125
ARRA (Capital)	$ 6,630
Section 5317 (New Freedom)	$ 582
Section 5316 (JARC)	$ 1,296
CMAQ	$ 800
Total	**$ 14,433**

FY 2010 (10/1/09-9/30/10)

CAPITAL - Section 5307

State Project Number	Project Description	Parish	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
	Funding Transfer from Capital to Operating Assistance 100% Sec. 7025				200	200	7025 Law		100% Federal Funding- 7025 Law
	Project Administration				100	80	Section 5307		80% Federal / 20% local match
	Preventative Maintenance				5,019	4,015	Section 5307		80% Federal / 20% local match
	Education & Training				13	10	Section 5307		80% Federal / 20% local match
	Non FR-ADA				641	513	Section 5307		80% Federal / 20% local match
	Support Facilities and l Equipment				315	252	Section 5307		80% Federal / 20% local match
	Buses/ Vans & Support Vehicles				625	519	Section 5307		80% Federal / 20% local match
	Transit Enhancements				64	51	Section 5307		80% Federal / 20% local match
	Metropolitan Planning				125	100	Section 5307		80% Federal / 20% local match
			SUB TOTAL		**$ 7,102**	**$ 5,740**			

CAPITAL - Section 5309 Discretionary

State Project Number	Project Description	Parish	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
	111-00 Bus Rolling Stock				-	-			
	11.16.02 Buses				500	400	Section 5309		
	11.16.15 Vans				125	100	Section 5309		
	113-01 Station/ Stops/ Terminals				125	100	Section 5309		
	11.33.03 DDD In Intermodal Terminal/ Signage				250	200	Section 5309		
	11.33.10 CTC/DDD Shelters/ Signage				125	100	Section 5309		
	44.23.02 BRT/ UPWP Planing				125	100	Section 5309		
	11.42.09 Surveillance/ Security				63	50	Section 5309		
	11.42.41 Bicycle Equipment				63	50	Section 5309		
	11.12 40 Spare Parts/ Assoc. Cap. Maint. Items				125	100	Section 5309		
	11.42.10 Fare Collection				400	320	Section 5309		
	11.75.91 Real Estate Acquisition				250	200	Section 5309		
	11.34.03 Rehab/ Renovation Intermodal/ Terminal				125	100	Section 5309		
	11.42.08/ .07 ADP Hardware/ Software				300	240	Section 5309		
			SUB TOTAL		**$ 2,576**	**$ 2,061**			

FY 2010 (10/1/09-9/30/10)

N.F. - New Freedom (Section 5317)

State Project Number	Project Description	Parish	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
	New Freedom				340	170	Section 5317		
			SUB TOTAL		**$ 340**	**$ 170**			

JARC - JOB ACCESS/REVERSE COMMUTE (Section 5316)

State Project Number	Project Description	Parish	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
	JARC - Job Access/Reverse Commute				800	400	Section 5316		Urban Funds
			SUB TOTAL		**$ 800**	**$ 400**			

CAPITAL - CMAQ

State Project Number	Project Description	Parish	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
	30.09.45 CMAQ Transit Operating and Improvements				1,000	800	CMAQ		
			SUB TOTAL		**$ 1,000**	**$ 800**			

Recap	FY 2010 Fed Share (000)
Section 5307 (Capital)	$ 5,740
Section 5309 (Capital Desc)	$ 2,061
Section 5317 New Freedom	$ 170
Section 5316 JARC	$ 400
CMAQ	$ 800
Total	**$ 9,171**

FY 2011 (10/1/10-9/30/11)

CAPITAL - Section 5307

State Project Number	Project Description	Parish	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
	Funding Transfer from Capital to Operating Assistance 100% Sec. 7025				200	200	7025 Law		100% Federal Funding- 7025 Law
	Project Administration				100	80	Section 5307		80% Federal / 20% local match
	Preventative Maintenance				5,019	4,015	Section 5307		80% Federal / 20% local match
	Education & Training				13	10	Section 5307		80% Federal / 20% local match
	Non FR-ADA				641	513	Section 5307		80% Federal / 20% local match
	Support Facilities and l Equipment				315	252	Section 5307		80% Federal / 20% local match
	Buses/ Vans & Support Vehicles				625	519	Section 5307		80% Federal / 20% local match
	Transit Enhancements				64	51	Section 5307		80% Federal / 20% local match
	Metropolitan Planning				125	100	Section 5307		80% Federal / 20% local match
			SUB TOTAL		**$ 7,102**	**$ 5,740**			

CAPITAL - Section 5309 Discretionary

State Project Number	Project Description	Parish	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
	111-00 Bus Rolling Stock								
	11.16.02 Buses				500	400	Section 5309		
	11.16.15 Vans				125	100	Section 5309		
	113-01 Station/ Stops/ Terminals				125	100	Section 5309		
	11.33.03 DDD In Intermodal Terminal/ Signage				250	200	Section 5309		
	11.33.10 CTC/DDD Shelters/ Signage				$ 125	100	Section 5309		
	44.23.02 BRT/ UPWP Planing				125	100	Section 5309		
	11.42.09 Surveillance/ Security				63	50	Section 5309		
	11.42.41 Bicycle Equipment				63	50	Section 5309		
	11.12 40 Spare Parts/ Assoc. Cap. Maint. Items				125	100	Section 5309		
	11.42.10 Fare Collection				400	320	Section 5309		
	11.75.91 Real Estate Acquisition				250	200	Section 5309		
	11.34.03 Rehab/ Renovation Intermodal/ Terminal				125	100	Section 5309		
	11.42.08/ .07 ADP Hardware/ Software				300	240	Section 5309		
			SUB TOTAL		**$ 2,576**	**$ 2,061**			

FY 2011 (10/1/10-9/30/11)

N.F. - New Freedom (Section 5317)

State Project Number	Project Description	Parish	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
	New Freedom				340	170	Section 5317		
			SUB TOTAL		**$ 340**	**$ 170**			

JOB ACCESS/REVERSE COMMUTE (Section 5316)

State Project Number	Project Description	Parish	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
	Job Access/Reverse Commute				1,000	500			Urban Funds
			SUB TOTAL		**$ 1,000**	**$ 500**			

CAPITAL - CMAQ

State Project Number	Project Description	Parish	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
	30.09.45 CMAQ Transit Operating and Improvements				1,000	800			Rural Funds
			SUB TOTAL		**$ 1,000**	**$ 800**			

Recap	FY 2011 Fed Share (000)
Section 5307 (Capital)	$ 5,740
Section 5309 (Capital Desc)	$ 2,061
Section 5317 New Freedom	$ 170
Section 5316 JARC	$ 500
CMAQ	$ 800
Total	**$9,271**

FY 2012 (10/1/11-9/30/12)

CAPITAL - Section 5307

State Project Number	Project Description	Parish	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
	Funding Transfer from Capital to Operating Assistance 100% Sec. 7025				200	200	7025 Law		100% Federal Funding- 7025 Law
	Project Administration				100	80	Section 5307		80% Federal / 20% local match
	Preventative Maintenance				5,019	4,015	Section 5307		80% Federal / 20% local match
	Education & Training				13	10	Section 5307		80% Federal / 20% local match
	Non FR-ADA				641	513	Section 5307		80% Federal / 20% local match
	Support Facilities and l Equipment				315	252	Section 5307		80% Federal / 20% local match
	Buses/ Vans & Support Vehicles				625	519	Section 5307		80% Federal / 20% local match
	Transit Enhancements				64	51	Section 5307		80% Federal / 20% local match
	Metropolitan Planning				125	100	Section 5307		80% Federal / 20% local match
			SUB TOTAL		**$ 7,102**	**$ 5,740**			

CAPITAL - Section 5309 Discretionary

State Project Number	Project Description	Parish	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
	111-00 Bus Rolling Stock								
	11.16.02 Buses				500	400	Section 5309		
	11.16.15 Vans				125	100	Section 5309		
	113-01 Station/ Stops/ Terminals				125	100	Section 5309		
	11.33.03 DDD In Intermodal Terminal/ Signage				250	200	Section 5309		
	11.33.10 CTC/DDD Shelters/ Signage				$ 125	100	Section 5309		
	44.23.02 BRT/ UPWP Planing				125	100	Section 5309		
	11.42.09 Surveillance/ Security				63	50	Section 5309		
	11.42.41 Bicycle Equipment				63	50	Section 5309		
	11.12 40 Spare Parts/ Assoc. Cap. Maint. Items				125	100	Section 5309		
	11.42.10 Fare Collection				400	320	Section 5309		
	11.75.91 Real Estate Acquisition				250	200	Section 5309		
	11.34.03 Rehab/ Renovation Intermodal/ Terminal				125	100	Section 5309		
	11.42.08/ .07 ADP Hardware/ Software				300	240	Section 5309		
			SUB TOTAL		**$ 2,576**	**$ 2,061**			

FY 2012 (10/1/11-9/30/12)

N.F. - NEW FREEDIN (Section 5317)

State Project Number	Project Description	Parish	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
	New Freedom				340	170	Section 5317		
			SUB TOTAL		**$ 340**	**$ 170**			

JARC - JOB ACCESS/REVERSE COMMUTE (Section 5316)

State Project Number	Project Description	Parish	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
	Job Access/Reverse Commute				1,000	500			Urban Funds
			SUB TOTAL		**$ 1,000**	**$ 500**			

CAPITAL - CMAQ

State Project Number	Project Description	Parish	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
	30.09.45 CMAQ Transit Operating and Improvements				1,000	800			Rural Funds
			SUB TOTAL		**$ 1,000**	**$ 800**			

Recap	FY 2012 Fed Share (000)
Section 5307 (Capital)	$ 5,740
Section 5309 (Capital Desc)	$ 2,061
Section 5317 New Freedom	$ 170
Section 5316 JARC	$ 500
CMAQ	$ 800
Total	**$9,271**

FY 2013 (10/1/12-9/30/13)

CAPITAL - Section 5307

State Project Number	Project Description	Parish	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
	Funding Transfer from Capital to Operating Assistance 100% Sec. 7025				200	200	7025 Law		100% Federal Funding- 7025 Law
	Project Administration				100	80	Section 5307		80% Federal / 20% local match
	Preventative Maintenance				5,019	4,015	Section 5307		80% Federal / 20% local match
	Education & Training				13	10	Section 5307		80% Federal / 20% local match
	Non FR-ADA				641	513	Section 5307		80% Federal / 20% local match
	Support Facilities and l Equipment				315	252	Section 5307		80% Federal / 20% local match
	Buses/ Vans & Support Vehicles				625	519	Section 5307		80% Federal / 20% local match
	Transit Enhancements				64	51	Section 5307		80% Federal / 20% local match
	Metropolitan Planning				125	100	Section 5307		80% Federal / 20% local match
			SUB TOTAL		**$ 7,102**	**$ 5,740**			

CAPITAL - Section 5309 Discretionary

State Project Number	Project Description	Parish	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
	111-00 Bus Rolling Stock								
	11.16.02 Buses				500	400	Section 5309		
	11.16.15 Vans				125	100	Section 5309		
	113-01 Station/ Stops/ Terminals				125	100	Section 5309		
	11.33.03 DDD In Intermodal Terminal/ Signage				250	200	Section 5309		
	11.33.10 CTC/DDD Shelters/ Signage				$ 125	100	Section 5309		
	44.23.02 BRT/ UPWP Planing				125	100	Section 5309		
	11.42.09 Surveillance/ Security				63	50	Section 5309		
	11.42.41 Bicycle Equipment				63	50	Section 5309		
	11.12 40 Spare Parts/ Assoc. Cap. Maint. Items				125	100	Section 5309		
	11.42.10 Fare Collection				400	320	Section 5309		
	11.75.91 Real Estate Acquisition				250	200	Section 5309		
	11.34.03 Rehab/ Renovation Intermodal/ Terminal				125	100	Section 5309		
	11.42.08/ .07 ADP Hardware/ Software				300	240	Section 5309		
			SUB TOTAL		**$ 2,576**	**$ 2,061**			

FY 2013 (10/1/12-9/30/13)

N.F. - NEW FREEDIN (Section 5317)

State Project Number	Project Description	Parish	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
	New Freedom				340	170	Section 5317		
			SUB TOTAL		**$ 340**	**$ 170**			

JARC - JOB ACCESS/REVERSE COMMUTE (Section 5316)

State Project Number	Project Description	Parish	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
	Job Access/Reverse Commute				1,000	500			Urban Funds
	Job Access/Reverse Commute								Rural Funds
			SUB TOTAL		**$ 1,000**	**$ 500**			

CAPITAL - CMAQ

State Project Number	Project Description	Parish	Proposed Improvement	Work Phase	Total Cost (000)	Federal Share (000)	Funding Source	Letting Date	Comments
	30.09.45 CMAQ Transit Operating and Improvements				1,000	800			Rural Funds
			SUB TOTAL		**$ 1,000**	**$ 800**			

Recap	FY 2013 Fed Share (000)
Section 5307 (Capital)	$ 5,740
Section 5309 (Capital Desc)	$ 2,061
Section 5317 New Freedom	$ 170
Section 5316 JARC	$ 500
CMAQ	$ 800
Total	**$9,271**

Appendix F

PPSuite Input and Output Files for Stage 1

of the Baton Rouge MTP (FY2009 – FY 2013)

```
*                            ***********
*  HPMS Reconciliation for Baton Rouge
*                            ***********
*
*  Collector and Local
*  APPLY POST-SPEED
*
*
*  Calculated from 2009 Base year network
*  and 2009 HPMS VMT totals as received from Huey Dugas
*  2009 HPMS derived from 2008 data with the growth factors
*  Run through PPNET v5.10
*
*  ALA February 6, 2009


*July

*POST-VMT ADJUSTMENTS

* PARISH        Fgroup  Amount
1       4       -235279
1       5       314620

2       4       -152575
2       5       159009

3       4       -18795
3       5       16711

4       4       -92838
4       5       132410

5       4       -12289
5       5       7625
```

```
*                              ***********
*  HPMS Reconciliation for Baton Rouge
*                              ***********
*
*  Freeway and Arterial
*  APPLY PRE-SPEED
*
*
*  Calculated from 2009 Base year network
*  and 2009 HPMS VMT totals as received from Huey Dugas
*  2009 HPMS derived from 2008 data with the growth factors
*  Run through PPNET v5.10
*
*  ALA February 6, 2009


*July

*PRE-VMT ADJUSTMENTS

* PARISH        Fgroup  Factor
1       1       1.20511
1       2       1.03372
1       3       0.92488

2       1       1.20511
2       2       1.03372
2       3       0.92488

3       1       1.20511
3       2       1.03372
3       3       0.92488

4       1       1.20511
4       2       1.03372
4       3       0.92488

5       1       0.92488
5       2       1.03372
5       3       0.92488
```

PEQUEST Version: 4.28 Run Time: 02/06/2009 08:44:20

PPSUITE Performance Evaluation and Emissions Analysis
PEQUEST Performance Queries for Surface Transportation

(Input) Setup File: C:\PPTEMP\$$NX005B.DRV
(Output) Report File: PEQUEST.OUT

```
  4  BEGIN PEQUEST
  6    NAMES FILE  C:\BRAQ\Common\BatNames2.dbf
  7    EMISSIONS DATABASE  =  C:\BRAQ\Run\09SumAQ\EMIS_09.dbf
  8    EMISSIONS VMTSPEED  =  C:\BRAQ\Run\09SumAQ\VMTS_09.dbf
 10    DEFINE TIMEGROUP
 11      TIMEAM    7 8 9
 12      TIMEMID   10 11 12 13 14 15
 13      TIMEPM    16 17 18
 14      TIMENITE  19 20 21 22 23 24    1 2 3 4 5 6
 15    END
 17    IGNORE INTERNAL POSTVMT
 18    NO LOS CALCS
 19    YES PERFORMANCE REPORTS
 20    NO GIS FILE
 23    LICENSE CODE ##PQST##
 28    DEFINE PERFORMANCE
 29      REPORTS = 101 102 103 104
 30      TITLE1    BRAQ Summer 2009 Air Quality
 31      RPTFORMAT   = PRINT
 32      EMSCOLUMNS  = SKIPPED
 33      EMSDATADIR  = C:\BRAQ\Run\09SumAQ\
 34      EMSRUNID    = 2009SUM
 35    END
 37    UNITS tons 2
 39  END PEQUEST
```

```
TITLES

Input Files:

  Network.............
  Names File..........C:\BRAQ\Common\BatNames2.dbf
  Exploded Linkfile...
  Exploded Approach...
  Exploded EventDelay.
  Exploded PersonFile.
  VmtVht Summary......
  Emissions Database..C:\BRAQ\Run\09SumAQ\EMIS_09.dbf
  Emissions VmtSpeed..C:\BRAQ\Run\09SumAQ\VMTS_09.dbf
  M5 Emissions........

Output/Input Files:

  Link Los............
  Node Los............
  Link Statistics.....
  Node Statistics.....

Licensed to: $$NULL$$
```

```
Include  PERFORMANCE REPORTS

  Requested Report(s) 101 102 103 104 written to PEQUEST.OUT

  Printing Series  1:  (  4 Reports)

       BRAQ Summer 2009 Air Quality


       Selecting Area,Subarea none
       Filter:
```

BRAQ Summer 2009 Air Quality

PERFORMANCE REPORT 101D: Summary Emissions by Area and Facility Group
Daily (Emission Rates obtained from)

Area	Facility	Daily VMT	Speed (mph)	Emissions (tons) HC	CO	NOX
1) East Baton Rouge	1) Interstates	3,395,976	44.3	2.43	0.00	4.61
	2) Major Arterials	4,416,559	33.7	3.47	0.00	4.16
	3) Minor Arterial	2,397,649	29.6	1.98	0.00	1.97
	4) Collectors	918,008	24.0	1.14	0.00	0.70
	5) Locals	734,879	22.0	0.91	0.00	0.54
	Subtotal	11,863,071	32.9	9.93	0.00	11.98
2) Livingston	1) Interstates	977,027	51.2	0.69	0.00	1.45
	2) Major Arterials	399,988	32.1	0.32	0.00	0.38
	3) Minor Arterial	473,111	27.0	0.40	0.00	0.40
	4) Collectors	595,317	23.9	0.73	0.00	0.58
	5) Locals	371,408	26.7	0.46	0.00	0.30
	Subtotal	2,816,851	32.0	2.60	0.00	3.10
3) West Baton Rouge	1) Interstates	368,489	53.0	0.26	0.00	0.52
	2) Major Arterials	622,461	37.2	0.47	0.00	0.64
	3) Minor Arterial	7,366	28.2	0.01	0.00	0.01
	4) Collectors	73,333	23.2	0.09	0.00	0.05
	5) Locals	39,033	25.6	0.05	0.00	0.03
	Subtotal	1,110,682	38.8	0.88	0.00	1.26
4) Ascension	1) Interstates	1,160,146	60.9	0.79	0.00	1.83
	2) Major Arterials	675,275	32.8	0.53	0.00	0.64
	3) Minor Arterial	418,526	28.6	0.35	0.00	0.38
	4) Collectors	362,235	23.1	0.45	0.00	0.30
	5) Locals	309,279	23.6	0.38	0.00	0.23
	Subtotal	2,925,461	35.2	2.50	0.00	3.38

5) Iberville	3) Minor Arterial	74,855	27.4	0.06	0.00	0.06
	4) Collectors	47,952	23.8	0.06	0.00	0.05
	5) Locals	17,810	29.1	0.02	0.00	0.02
	Subtotal	140,617	26.2	0.15	0.00	0.13

BRAQ Summer 2009 Air Quality

PERFORMANCE REPORT 101D: Summary Emissions by Area and Facility Group
Daily (Emission Rates obtained from)

Area	Facility	Daily VMT	Speed (mph)	Emissions (tons) HC	CO	NOX
Grand Total		18,856,682	33.4	16.05	0.00	19.84

Emissions File: C:\BRAQ\Run\09SumAQ\EMIS_09.DBF 08:44:20
02/06/2009

BRAQ Summer 2009 Air Quality

PERFORMANCE REPORT 102D: Summary Emissions by Area, Facility Group, and Time
Daily (Emission Rates obtained from)

Area	Facility	Time Period	Daily VMT	Speed (mph)	Emissions (tons) HC	CO	NOX
1) East Baton Rouge	1) Interstates	AM	759,261	31.7			
		Midday	1,036,820	54.2			
		PM	728,419	41.2			
		Night	871,476	55.0			
		DAILY	3,395,976	44.3	2.43	0.00	4.61
	2) Major Arterials	AM	820,951	32.5			
		Midday	1,459,233	33.9			
		PM	855,436	32.7			
		Night	1,280,939	34.9			
		DAILY	4,416,559	33.7	3.47	0.00	4.16
	3) Minor Arterial	AM	445,696	28.7			
		Midday	792,096	29.7			
		PM	464,463	28.8			
		Night	695,394	30.8			
		DAILY	2,397,649	29.6	1.98	0.00	1.97
	4) Collectors	AM	204,342	23.2			
		Midday	269,198	24.9			
		PM	219,406	23.1			
		Night	225,062	24.9			
		DAILY	918,008	24.0	1.14	0.00	0.70
	5) Locals	AM	163,499	21.7			
		Midday	227,525	22.1			
		PM	153,169	21.8			
		Night	190,686	22.2			
		DAILY	734,879	22.0	0.91	0.00	0.54
	Subtotal	AM	2,393,749	29.5			
		Midday	3,784,872	34.4			
		PM	2,420,893	31.7			

		DAILY	11,863,071	32.9	9.93	0.00	11.98
2) Livingston	1) Interstates	AM	218,102	40.0			
		Midday	298,629	61.8			
		PM	209,705	43.9			
		Night	250,591	62.0			

Emissions File: C:\BRAQ\Run\09SumAQ\EMIS_09.DBF 08:44:20
02/06/2009
VMT/Speed File: C:\BRAQ\Run\09SumAQ\VMTS_09.DBF

PERFORMANCE REPORT 102D: Summary Emissions by Area, Facility Group, and Time
Daily (Emission Rates obtained from)

Area	Facility	Time Period	Daily VMT	Speed (mph)	Emissions (tons) HC	CO	NOX
		DAILY	977,027	51.2	0.69	0.00	1.45
	2) Major Arterials	AM	74,359	30.7			
		Midday	132,150	32.7			
		PM	77,470	30.4			
		Night	116,009	33.7			
		DAILY	399,988	32.1	0.32	0.00	0.38
	3) Minor Arterial	AM	87,945	26.0			
		Midday	156,275	27.3			
		PM	91,649	25.9			
		Night	137,242	28.4			
		DAILY	473,111	27.0	0.40	0.00	0.40
	4) Collectors	AM	132,525	23.1			
		Midday	174,577	24.7			
		PM	142,265	22.9			
		Night	145,950	24.7			
		DAILY	595,317	23.9	0.73	0.00	0.58
	5) Locals	AM	82,621	26.7			
		Midday	115,021	26.7			
		PM	77,391	26.7			
		Night	96,375	26.7			
		DAILY	371,408	26.7	0.46	0.00	0.30
	Subtotal	AM	595,552	29.6			
		Midday	876,652	33.7			
		PM	598,480	30.0			
		Night	746,167	34.2			
		DAILY	2,816,851	32.0	2.60	0.00	3.10

3) West Baton Rouge	1) Interstates	AM	82,515	46.0			
		Midday	112,405	56.2			
		PM	79,063	52.3			
		Night	94,506	57.2			
		DAILY	368,489	53.0	0.26	0.00	0.52
	2) Major Arterials	AM	115,715	36.6			
		Midday	205,684	37.2			
		PM	120,581	36.6			

PERFORMANCE REPORT 102D: Summary Emissions by Area, Facility Group, and Time
Daily (Emission Rates obtained from)

Area	Facility	Time Period	Daily VMT	Speed (mph)	Emissions (tons) HC	CO	NOX
		Night	180,481	38.0			
		DAILY	622,461	37.2	0.47	0.00	0.64
	3) Minor Arterial	AM	1,369	27.9			
		Midday	2,435	28.3			
		PM	1,426	28.0			
		Night	2,136	28.5			
		DAILY	7,366	28.2	0.01	0.00	0.01
	4) Collectors	AM	16,329	23.0			
		Midday	21,505	23.4			
		PM	17,532	22.9			
		Night	17,967	23.5			
		DAILY	73,333	23.2	0.09	0.00	0.05
	5) Locals	AM	8,691	25.6			
		Midday	12,086	25.6			
		PM	8,130	25.6			
		Night	10,126	25.6			
		DAILY	39,033	25.6	0.05	0.00	0.03
	Subtotal	AM	224,619	37.1			
		Midday	354,115	39.3			
		PM	226,732	38.2			
		Night	305,216	40.0			
		DAILY	1,110,682	38.8	0.88	0.00	1.26
4) Ascension	1) Interstates	AM	260,130	59.4			
		Midday	353,520	61.4			
		PM	248,973	61.1			
		Night	297,523	61.4			
		DAILY	1,160,146	60.9	0.79	0.00	1.83

2) Major Arterials	AM	125,525	31.8			
	Midday	223,098	32.9			
	PM	130,808	32.2			
	Night	195,844	33.8			
	DAILY	675,275	32.8	0.53	0.00	0.64
3) Minor Arterial	AM	77,788	28.2			
	Midday	138,253	28.6			

PERFORMANCE REPORT 102D: Summary Emissions by Area, Facility Group, and Time
Daily (Emission Rates obtained from)

Area	Facility	Time Period	Daily VMT	Speed (mph)	Emissions (tons) HC	CO	NOX
		PM	81,051	28.3			
		Night	121,434	29.1			
		DAILY	418,526	28.6	0.35	0.00	0.38
	4) Collectors	AM	80,639	22.5			
		Midday	106,250	23.6			
		PM	86,560	22.4			
		Night	88,786	23.7			
		DAILY	362,235	23.1	0.45	0.00	0.30
	5) Locals	AM	68,813	23.5			
		Midday	95,760	23.7			
		PM	64,460	23.6			
		Night	80,246	23.7			
		DAILY	309,279	23.6	0.38	0.00	0.23
			-----------	-----	----------	----------	----------
	Subtotal	AM	612,895	34.8			
		Midday	916,881	35.4			
		PM	611,852	34.7			
		Night	783,833	35.7			
		DAILY	2,925,461	35.2	2.50	0.00	3.38
5) Iberville	3) Minor Arterial	AM	13,910	26.9			
		Midday	24,721	27.4			
		PM	14,499	26.9			
		Night	21,725	28.0			
		DAILY	74,855	27.4	0.06	0.00	0.06
	4) Collectors	AM	10,679	23.7			
		Midday	14,069	23.8			
		PM	11,451	23.7			

	Night	11,753	23.8			
	DAILY	47,952	23.8	0.06	0.00	0.05
5) Locals	AM	3,960	29.1			
	Midday	5,511	29.2			
	PM	3,707	29.2			
	Night	4,632	29.1			
	DAILY	17,810	29.1	0.02	0.00	0.02
		-----------	-----	----------	----------	----------

BRAQ Summer 2009 Air Quality

PERFORMANCE REPORT 102D: Summary Emissions by Area, Facility Group, and Time
Daily (Emission Rates obtained from)

Area	Facility	Time Period	Daily VMT	Speed (mph)	Emissions (tons) HC	CO	NOX
	Subtotal	AM	28,549	25.8			
		Midday	44,301	26.4			
		PM	29,657	25.8			
		Night	38,110	26.7			
		DAILY	140,617	26.2	0.15	0.00	0.13
			===========	=====	==========	==========	==========
	Region Total	AM	3,855,364	30.6			
		Midday	5,976,821	34.6			
		PM	3,887,614	32.1			
		Night	5,136,883	35.3			
		DAILY	18,856,682	33.4	16.05	0.00	19.84

Emissions File: C:\BRAQ\Run\09SumAQ\EMIS_09.DBF 08:44:20
02/06/2009
VMT/Speed File: C:\BRAQ\Run\09SumAQ\VMTS_09.DBF

BRAQ Summer 2009 Air Quality

PERFORMANCE REPORT 103D: Summary Emissions by Area and Detailed Vehicle Type
Daily (Emission Rates obtained from)

Area	Vehicle Type	Daily VMT	Speed (mph)	Emissions (tons) HC	CO	NOX
1) East Baton Rouge	1) LDGV	7,353,444	32.9	5.97	0.00	3.88
	2) LDGT1	718,338		0.71	0.00	0.39
	3) LDGT2	2,404,886		2.46	0.00	1.84
	4) LDGT3	400,764		0.22	0.00	0.26
	5) LDGT4	188,596		0.12	0.00	0.18
	6) HDGV2B	192,356		0.10	0.00	0.51
	7) HDGV3	6,224		0.00	0.00	0.02
	8) HDGV4	1,726		0.00	0.00	0.01
	9) HDGV5	6,827		0.01	0.00	0.03
	10) HDGV6	13,946		0.02	0.00	0.05
	11) HDGV7	5,656		0.01	0.00	0.02
	12) HDGV8A	19		0.00	0.00	0.00
	13) HDGV8B	0		0.00	0.00	0.00
	14) HDGB	1,548		0.01	0.00	0.01
	15) LDDV	6,731		0.00	0.00	0.00
	16) LDDT12	128		0.00	0.00	0.00
	17) LDDT34	8,790		0.00	0.00	0.01
	18) HDDV2B	58,678		0.01	0.00	0.18
	19) HDDV3	16,588		0.00	0.00	0.06
	20) HDDV4	13,484		0.00	0.00	0.06
	21) HDDV5	8,389		0.00	0.00	0.04
	22) HDDV6	39,302		0.01	0.00	0.24
	23) HDDV7	55,203		0.02	0.00	0.42
	24) HDDV8A	68,440		0.03	0.00	0.64
	25) HDDV8B	251,034		0.12	0.00	2.83
	26) HDDBT	7,606		0.00	0.00	0.12
	27) HDDBS	13,664		0.01	0.00	0.15
	28) MC	20,708		0.07	0.00	0.02
	Subtotal	11,863,075	32.9	9.93	0.00	11.98

2) Livingston	1) LDGV	1,723,326	32.0	1.53	0.00	0.93
	2) LDGT1	174,545		0.19	0.00	0.10
	3) LDGT2	584,345		0.66	0.00	0.45
	4) LDGT3	94,019		0.06	0.00	0.06
	5) LDGT4	44,245		0.03	0.00	0.04
	6) HDGV2B	47,097		0.03	0.00	0.12
	7) HDGV3	1,528		0.00	0.00	0.00
	8) HDGV4	423		0.00	0.00	0.00
	9) HDGV5	1,672		0.00	0.00	0.01
	10) HDGV6	3,414		0.01	0.00	0.01

PERFORMANCE REPORT 103D: Summary Emissions by Area and Detailed Vehicle Type
Daily (Emission Rates obtained from)

Area	Vehicle Type	Daily VMT	Speed (mph)	Emissions (tons) HC	CO	NOX
	11) HDGV7	1,385		0.00	0.00	0.01
	12) HDGV8A	2		0.00	0.00	0.00
	13) HDGV8B	0		0.00	0.00	0.00
	14) HDGB	379		0.00	0.00	0.00
	15) LDDV	1,579		0.00	0.00	0.00
	16) LDDT12	31		0.00	0.00	0.00
	17) LDDT34	2,062		0.00	0.00	0.00
	18) HDDV2B	14,366		0.00	0.00	0.05
	19) HDDV3	4,061		0.00	0.00	0.02
	20) HDDV4	3,303		0.00	0.00	0.02
	21) HDDV5	2,052		0.00	0.00	0.01
	22) HDDV6	9,625		0.00	0.00	0.07
	23) HDDV7	13,516		0.01	0.00	0.12
	24) HDDV8A	16,759		0.01	0.00	0.18
	25) HDDV8B	61,466		0.04	0.00	0.80
	26) HDDBT	1,863		0.00	0.00	0.03
	27) HDDBS	3,344		0.00	0.00	0.04
	28) MC	6,449		0.03	0.00	0.01
	Subtotal	2,816,856	32.0	2.60	0.00	3.10
3) West Baton Rouge	1) LDGV	668,796	38.8	0.51	0.00	0.35
	2) LDGT1	66,617		0.06	0.00	0.04
	3) LDGT2	223,018		0.22	0.00	0.17
	4) LDGT3	40,348		0.02	0.00	0.03
	5) LDGT4	18,986		0.01	0.00	0.02
	6) HDGV2B	22,563		0.01	0.00	0.06
	7) HDGV3	730		0.00	0.00	0.00
	8) HDGV4	202		0.00	0.00	0.00
	9) HDGV5	801		0.00	0.00	0.00
	10) HDGV6	1,636		0.00	0.00	0.01
	11) HDGV7	664		0.00	0.00	0.00
	12) HDGV8A	0		0.00	0.00	0.00
	13) HDGV8B	0		0.00	0.00	0.00

14)	HDGB	183	0.00	0.00	0.00
15)	LDDV	615	0.00	0.00	0.00
16)	LDDT12	10	0.00	0.00	0.00
17)	LDDT34	887	0.00	0.00	0.00
18)	HDDV2B	6,883	0.00	0.00	0.02
19)	HDDV3	1,943	0.00	0.00	0.01
20)	HDDV4	1,583	0.00	0.00	0.01
21)	HDDV5	982	0.00	0.00	0.00

PERFORMANCE REPORT 103D: Summary Emissions by Area and Detailed Vehicle Type
Daily (Emission Rates obtained from)

Area	Vehicle Type	Daily VMT	Speed (mph)	Emissions (tons) HC	CO	NOX
	22) HDDV6	4,612		0.00	0.00	0.03
	23) HDDV7	6,476		0.00	0.00	0.05
	24) HDDV8A	8,028		0.00	0.00	0.08
	25) HDDV8B	29,449		0.01	0.00	0.34
	26) HDDBT	895		0.00	0.00	0.01
	27) HDDBS	1,603		0.00	0.00	0.02
	28) MC	2,175		0.01	0.00	0.00
	Subtotal	1,110,685	38.8	0.88	0.00	1.26
4) Ascension	1) LDGV	1,807,166	35.2	1.50	0.00	0.97
	2) LDGT1	174,401		0.18	0.00	0.10
	3) LDGT2	583,867		0.61	0.00	0.45
	4) LDGT3	98,240		0.06	0.00	0.07
	5) LDGT4	46,231		0.03	0.00	0.04
	6) HDGV2B	52,034		0.03	0.00	0.14
	7) HDGV3	1,684		0.00	0.00	0.01
	8) HDGV4	467		0.00	0.00	0.00
	9) HDGV5	1,846		0.00	0.00	0.01
	10) HDGV6	3,774		0.01	0.00	0.01
	11) HDGV7	1,529		0.00	0.00	0.01
	12) HDGV8A	3		0.00	0.00	0.00
	13) HDGV8B	0		0.00	0.00	0.00
	14) HDGB	421		0.00	0.00	0.00
	15) LDDV	1,653		0.00	0.00	0.00
	16) LDDT12	29		0.00	0.00	0.00
	17) LDDT34	2,157		0.00	0.00	0.00
	18) HDDV2B	15,872		0.00	0.00	0.06
	19) HDDV3	4,489		0.00	0.00	0.02
	20) HDDV4	3,646		0.00	0.00	0.02
	21) HDDV5	2,268		0.00	0.00	0.01
	22) HDDV6	10,633		0.00	0.00	0.08

23)	HDDV7	14,932		0.01	0.00	0.14
24)	HDDV8A	18,515		0.01	0.00	0.21
25)	HDDV8B	67,908		0.03	0.00	0.93
26)	HDDBT	2,055		0.00	0.00	0.04
27)	HDDBS	3,697		0.00	0.00	0.05
28)	MC	5,942		0.02	0.00	0.01
		-----------	-------	------------	------------	------------
	Subtotal	2,925,459	35.2	2.50	0.00	3.38

Emissions File: C:\BRAQ\Run\09SumAQ\EMIS_09.DBF 08:44:20
02/06/2009
VMT/Speed File: C:\BRAQ\Run\09SumAQ\VMTS_09.DBF

BRAQ Summer 2009 Air Quality

PERFORMANCE REPORT 103D: Summary Emissions by Area and Detailed Vehicle Type
Daily (Emission Rates obtained from)

Area	Vehicle Type	Daily VMT	Speed (mph)	Emissions (tons) HC	CO	NOX
5) Iberville	1) LDGV	83,721	26.2	0.08	0.00	0.04
	2) LDGT1	9,690		0.01	0.00	0.01
	3) LDGT2	32,440		0.04	0.00	0.02
	4) LDGT3	4,618		0.00	0.00	0.00
	5) LDGT4	2,173		0.00	0.00	0.00
	6) HDGV2B	1,814		0.00	0.00	0.00
	7) HDGV3	58		0.00	0.00	0.00
	8) HDGV4	15		0.00	0.00	0.00
	9) HDGV5	65		0.00	0.00	0.00
	10) HDGV6	132		0.00	0.00	0.00
	11) HDGV7	54		0.00	0.00	0.00
	12) HDGV8A	0		0.00	0.00	0.00
	13) HDGV8B	0		0.00	0.00	0.00
	14) HDGB	13		0.00	0.00	0.00
	15) LDDV	76		0.00	0.00	0.00
	16) LDDT12	0		0.00	0.00	0.00
	17) LDDT34	102		0.00	0.00	0.00
	18) HDDV2B	552		0.00	0.00	0.00
	19) HDDV3	155		0.00	0.00	0.00
	20) HDDV4	126		0.00	0.00	0.00
	21) HDDV5	79		0.00	0.00	0.00
	22) HDDV6	370		0.00	0.00	0.00
	23) HDDV7	521		0.00	0.00	0.00
	24) HDDV8A	644		0.00	0.00	0.01
	25) HDDV8B	2,366		0.00	0.00	0.02
	26) HDDBT	72		0.00	0.00	0.00
	27) HDDBS	130		0.00	0.00	0.00
	28) MC	617		0.00	0.00	0.00
	Subtotal	140,603	26.2	0.14	0.00	0.13

Region Total	1) LDGV	11,636,453	33.4	9.60	0.00	6.17
	2) LDGT1	1,143,591		1.14	0.00	0.63
	3) LDGT2	3,828,556		3.99	0.00	2.93
	4) LDGT3	637,989		0.36	0.00	0.42
	5) LDGT4	300,231		0.19	0.00	0.28
	6) HDGV2B	315,864		0.17	0.00	0.85
	7) HDGV3	10,224		0.01	0.00	0.03
	8) HDGV4	2,833		0.01	0.00	0.01

Emissions File: C:\BRAQ\Run\09SumAQ\EMIS_09.DBF 08:44:20
02/06/2009
VMT/Speed File: C:\BRAQ\Run\09SumAQ\VMTS_09.DBF

BRAQ Summer 2009 Air Quality

PERFORMANCE REPORT 103D: Summary Emissions by Area and Detailed Vehicle Type
Daily (Emission Rates obtained from)

Area	Vehicle Type	Daily VMT	Speed (mph)	Emissions (tons) HC	CO	NOX
	9) HDGV5	11,211		0.02	0.00	0.04
	10) HDGV6	22,902		0.03	0.00	0.09
	11) HDGV7	9,288		0.01	0.00	0.04
	12) HDGV8A	24		0.00	0.00	0.00
	13) HDGV8B	0		0.00	0.00	0.00
	14) HDGB	2,544		0.01	0.00	0.02
	15) LDDV	10,654		0.00	0.00	0.01
	16) LDDT12	198		0.00	0.00	0.00
	17) LDDT34	13,998		0.01	0.00	0.01
	18) HDDV2B	96,351		0.02	0.00	0.31
	19) HDDV3	27,236		0.01	0.00	0.10
	20) HDDV4	22,142		0.01	0.00	0.11
	21) HDDV5	13,770		0.00	0.00	0.07
	22) HDDV6	64,542		0.02	0.00	0.42
	23) HDDV7	90,648		0.04	0.00	0.74
	24) HDDV8A	112,386		0.05	0.00	1.12
	25) HDDV8B	412,223		0.21	0.00	4.93
	26) HDDBT	12,491		0.00	0.00	0.21
	27) HDDBS	22,438		0.01	0.00	0.27
	28) MC	35,891		0.13	0.00	0.04
Grand Total		18,856,678	33.4	16.05	0.00	19.84

Emissions File: C:\BRAQ\Run\09SumAQ\EMIS_09.DBF 08:44:20
02/06/2009
VMT/Speed File: C:\BRAQ\Run\09SumAQ\VMTS_09.DBF

BRAQ Summer 2009 Air Quality

PERFORMANCE REPORT 104D: Summary Emissions by Area and Summary Vehicle Type
Daily (Emission Rates obtained from)

Area	Vehicle Type	Daily VMT	Speed (mph)	Emissions (tons) HC	CO	NOX
1) East Baton Rouge	1) Auto/MC	7,380,883	32.9	6.04	0.00	3.90
	2) Lt. Trk	3,721,502		3.51	0.00	2.67
	3) Hvy.Trk	737,872		0.35	0.00	5.12
	4) Bus	22,818		0.02	0.00	0.29
	Subtotal	11,863,075	32.9	9.93	0.00	11.98
2) Livingston	1) Auto/MC	1,731,354	32.0	1.55	0.00	0.93
	2) Lt. Trk	899,247		0.94	0.00	0.65
	3) Hvy.Trk	180,669		0.11	0.00	1.43
	4) Bus	5,586		0.00	0.00	0.08
	Subtotal	2,816,856	32.0	2.60	0.00	3.10
3) West Baton Rouge	1) Auto/MC	671,586	38.8	0.52	0.00	0.35
	2) Lt. Trk	349,866		0.32	0.00	0.25
	3) Hvy.Trk	86,552		0.04	0.00	0.62
	4) Bus	2,681		0.00	0.00	0.03
	Subtotal	1,110,685	38.8	0.88	0.00	1.26
4) Ascension	1) Auto/MC	1,814,761	35.2	1.53	0.00	0.98
	2) Lt. Trk	904,925		0.87	0.00	0.66
	3) Hvy.Trk	199,600		0.10	0.00	1.65
	4) Bus	6,173		0.00	0.00	0.09
	Subtotal	2,925,459	35.2	2.50	0.00	3.38
5) Iberville	1) Auto/MC	84,414	26.2	0.08	0.00	0.05
	2) Lt. Trk	49,023		0.06	0.00	0.03

3)	Hvy.Trk	6,951		0.01	0.00	0.04
4)	Bus	215		0.00	0.00	0.00
	Subtotal	140,603	26.2	0.14	0.00	0.13

Emissions File: C:\BRAQ\Run\09SumAQ\EMIS_09.DBF 08:44:20
02/06/2009
VMT/Speed File: C:\BRAQ\Run\09SumAQ\VMTS_09.DBF

BRAQ Summer 2009 Air Quality

PERFORMANCE REPORT 104D: Summary Emissions by Area and Summary Vehicle Type
Daily (Emission Rates obtained from)

Area	Vehicle Type	Daily VMT	Speed (mph)	Emissions (tons) HC	CO	NOX
Region Total	1) Auto/MC	11,682,998	33.4	9.73	0.00	6.21
	2) Lt. Trk	5,924,563		5.69	0.00	4.27
	3) Hvy.Trk	1,211,644		0.60	0.00	8.86
	4) Bus	37,473		0.03	0.00	0.50
Grand Total		18,856,678	33.4	16.05	0.00	19.84

Emissions File: C:\BRAQ\Run\09SumAQ\EMIS_09.DBF 08:44:20
02/06/2009
VMT/Speed File: C:\BRAQ\Run\09SumAQ\VMTS_09.DBF

Appendix G

Interagency Meetings Records

Interagency Consultation Meeting

Friday 13 February 2009 9:00 AM
Capital Region Planning Commission
333 North 19th Street
Baton Rouge, LA

AGENDA

- Review Modeling Emissions Results and Emissions Budget
- Review 2009 Conformity Document Format and Material
- Determine Schedule for Document Completion and Adoption and Submission
- Review History of Past I. A. Dates, Agendas and Notes
- Announce MPO Meeting Schedule for 2009 Conformity Document Advertisement and Adoption
- Other

MEETING RECORD

DATE 2 13 2009

AGENCY INTEREST NUMBER AND NAME: Capital Region Planning Commission

PURPOSE OF MEETING: Air Quality - Interagency Consultation

NAME	ORGANIZATION	TITLE	PHONE #	EMAIL ADDRESS
Huey P. Dugas	CRPC		383-5203	hdugas@brgov.com
Yashaswi Maheswarapu	CRPC		732-543-5072	ymaheswarapu@brgov.com
[illegible]	CRPC		480-452-7637	tma@brgov.com
DAN BROUSSARD	LA DOTD		225-379-1924	DanBroussard@dotd.la.gov
Dawn R. Sholmire	La DOTD		225-242-4570	dawnsholmire@dotd.la.gov
John Fu	La DOTD		225-379-1957	JohnFu@dotd.la.gov
Jamie Setze	FHWA		225-757-7623	jamie.setze@fhwa.dot.gov
Jim Orgeron	LDEQ		225-219-3505	james.orgeron@la.gov
Yasoob Zia	LDEQ		225-219-3513	yasoob.zia@la.gov.
Tien Nguyen	LDEQ		225-219-3583	Tien.Nguyen@LA.GOV

Time In: 9:00 am/pm

Time Out: am/pm

AGENDA

Interagency Consultation Meeting

Monday 2 February 2009 2:30 AM
CRPC Conference Room
333 N. 19th Street, Baton Rouge, LA

1. Review Long Range Transportation Plan Projects
2. Review 2006 Conformity Document Contents and Major Divisions
3. Assign Responsibilities for Document Sections to Individuals
4. Review 2009 Conformity Document Section Changes and Revisions and Updates
5. Establish Deadline for Completion of Section Updates, Changes, Consolidations and Deletions
6. Other

CRPC
Interagency Consultation Mtg
Monday, February 2, 2009
2:30 PM

Name	Organization	Phone
Huey P. Dugas	CRPC	383-5203
Tingting Ma	CRPC	480-452-7637
Jamie Setze	FHWA	(225) 757-7623
Dawn R. Sholmire	LaDOTD	225-242-4570
John Fu	LaDOTD	225-379-1957
DAN BROUSSARD	LA DOTD	225. 379. 1924

AIR QUALITY INTER-AGENCY CONSULTATION

1/16/09 CRPC 10:00

RJ GOEBEL	CRPC	
Yasoob Zia	DEQ	yasoob.zia@la.gov
Tien Nguyen	DEQ	
Jamie Setze	FHWA	
JIM ORGERON	LDEQ	
John Fu	DOTD	
DAN BROUSSARD	DOTD	
Huey Dugas	CRPC	hdugas@brgov.com
Chris Emery	Environ (CA)	

AGENDA

Interagency Consultation Meeting

Friday 9 January 2009 9:30 AM
CRPC Conference Room
333 N. 19th Street, Baton Rouge, LA

1. Discussion of Economic Stimulus Package Projects on Current Conformity Efforts

2. Review Time Schedule for Consultants to Complete 2009 Emissions Report

3. Discussion of Proposed Projects Affected by Current Conformity Analysis

4. Determine Time Schedule to Call MPO Committee Meeting to Adopt Conformity Report

5. Determine Milestones and Deadlines to Finalize SIP and Emissions Budget

6. Other

Interagency Consultation
CRPC
Friday 09 January 2009

Name	Organization	Phone
Henry Dugas	CRPC	383-5203
Dawn R. Sholmire	LaDOTD	242-4570
John Fu	LaDOTD	379-1957
Jamie Setze	FHWA	757-7623
Tien Nguyen	LDEQ	219-3583
Yasoob Zia	LDEQ	219-3569
RJ GOEBEL	CRPC	383-5203
DAN BROUSSARD	LA DOTD	379-1924

Interagency Consultation Meeting

Thursday 18 December 2008 2:00 PM
CRPC Conference Room
333 N. 19th Street, Baton Rouge, LA

AGENDA

1. Discussion of HMPS VMT data for 2013, 2022, and 2032 –Confirm group concurrence with using that data for our conformity analysis.

2. Discuss and agree on use of the "summer months" average adjustment - or use of the "July" month adjustment - of the HPMS VMT data for the conformity analysis - both inside the travel demand model area (Gary Davies uses July) and outside the travel demand model area (DOTD).

3. Discuss the "age of fleet" input to Mobile model - average for all 5 parishes, or do a separate input for each parish (DOTD is using the age of fleet for each parish, as received from DEQ). Gary Davies uses one file as received from DEQ dated 2005.

4. Review 2009 analysis results to date. It appears that we are over the budget - even taking into account the "off model credits" that we used last time.

5. Review 2013, 2022, and 2032 projects open to traffic - for the remainder of the conformity analysis.

Interagency Consultation Meeting

Capital Region Planning Commission
Thursday 18 December 2008
2:00 PM

Name	Organization	Phone
Huey P. Dugas	CRPC	383-5203
Jim Orgeron	~~CRPC~~ LDEQ	219-3556
Yasoob Zia	LDEQ	219-3569
L. P. Ledet	NSI	337 232-6111
Dawn R. Sholmire	LaDOTD	242-4570
John Fu	LADOTD	379-1957
DAN BROUSSARD	LA DOTD	379-1924

AGENDA

Interagency Consultation Meeting

Monday 24 November 2008 9:00 AM
Capital Region Planning Commission
Conference Room
333 N 19th Street, Baton Rouge, LA

1. Final Review of Networks for the Years: 2009, 2013, 2022 and 2032

2. Determine These Networks are Appropriate for the Travel Demand Forecasting Model Assignments

3. Discussion of Interagency Consultation Team Responsibilities and Assignments for the Future Work Effort on the 2009 Conformity Determination Document

4. Other

Interagency Consultation Meeting

Tuesday 18 November 2008 10:00 AM
DEQ Offices Room 519
Baton Rouge, LA

AGENDA ITEMS

Baton Rouge MPO Long Range Plan Update

2009 Modeling Results and Emissions Results

DOTD Non-Model Emissions Results

Regionally Significant Projects

Other

AGENDA

Interagency Consultation Meeting

Wednesday 29 October 2008 2:30 PM
CRPC Conference Room
333 N. 19th Street, Baton Rouge, LA

1. Establish Meeting as Declaratory to Start 2009 Conformity Analysis

2. Review Time Schedule to Complete 2009 Emissions Report

3. Discussion of One-Hour Standard Budget for 2009 Conformity Analysis

4. Update on Status of 8-Hour Budget Submission

5. Discussion of Mobile6B Input File Update

6. Review Years for 2009 Conformity Model Runs

6. Other

OFFICE OF ENVIRONMENTAL COMPLIANCE

MEETING RECORD

DATE 10 2008 28th

AGENCY INTEREST NUMBER
AND NAME: ____________________

PURPOSE OF MEETING: ____________________

NAME	ORGANIZATION	TITLE	PHONE #	EMAIL ADDRESS
Jamie Setze	FHWA	Engineer/Planner	(225) 757-7623	jamie.setze@fhwa.dot.g
Tren Nguyen	LDEQ	Engineering Support	225-219-3583	Tren.Nguyen@LA.G
Huey P. Dugas	CRPC	COP	225-383-5203	hdugas@brgov.com
L P Ledet	Neel-Schaffer	Sr Planner	337-232-6111	louis.ledet@neel-schaffer.
John Fu	DOTD	Engineer	(225)-379-1957	johnfu@dotd.gov/la.
Dawn R. Sholmire	DOTD	Planning Engineer	225-242-4570	dawnsholmire@dotd.la.g
Yasoob Zia	~~DOTD~~ DEQ	DCLB	225-219-3569	yasoob.zia@deq.la.g
DAN BROUSSARD	DOTD	STATEWIDE PLANNING	225.379.1924	DanBroussard@dotd.la.gov.
via telephone:				
Jeff Riley	EPA-Ft. Worth		214-665-8542	

Time In: ____________ am/pm
Time Out: ____________ am/pm

Interagency Consultation Meeting
Wednesday 29 October 2008
2:30 – 4:00 PM
DEQ Offices

Attendance:

Dawn R. Sholmire	DOTD
Yasoob Zia	DEQ
Huey P. Dugas	CRPC
Dan Broussard	DOTD
L. P. Ledet	Neel-Schaffer Consultants
Jamie Setze	FHWA Louisiana Division
Tien Nguyen	DEQ
John Fu	DOTD
Jeff Riley	US EPA Dallas, Texas Via Conference Call

General
A meeting was conducted on Wednesday 29 October 2008 at DEQ Offices, at 2:30 PM, in room 619. Those in attendance were as shown above. Jeff Riley with the US EPA Regional Office participated in the meeting via a telephone conference call.

Purpose
The purpose of the meeting was established as a "Declaratory" meeting, in order to initiate the conformity determination for air quality with reference to the Baton Rouge MPO Long Range Transportation Plan Update.

2009 Network Emissions
Members of the Interagency Consultation Committee expressed concern for the emissions produced by the Baton Rouge MPO network for the year 2009. H. Dugas confirmed that the 2009 network files for the year 2009 had been transmitted to Gary Davies. He further agreed to request the emissions results from the 2009 network as soon as possible, and to report the results to the Team members.

Emissions Budget Based on 1 Hour Standard
A discussion ensued regarding the continued use of the emissions budget based on the 1 hour standard for the conformity process being initiated. J. Riley agreed that budget based on the 1 hour standard was approved for use by the Baton Rouge MPO conformity process being initiated. It was further confirmed that the existing budget consisted of 18.82 tpd for VOC, and 30.00 tpd for NOx.

Emissions Budget Based on 8 Hour Standard
It was agreed that DEQ along with other parties to the Interagency Consultation Team would continue to work on the emissions budget for the Baton Rouge MPO, based on the 8 hour

standard. In addition it was observed that this budget setting process would take another 6 months to complete.

Files for VMT and Age of Fleet

It was reported that the file updates for VMT and Age of Fleet, were updated to reflect the latest planning assumptions.

Attainment Year

It was reported that the attainment year for the purposes of this conformity analysis is set as year 2009.

Years to Model

The issue of which years to model for the current Conformity Analysis was discussed. It was agreed that the years representing the Long Range Plan Update Stages would basically remain intack. One exception was the Stage I year of 2012. It will change to 2013. The other years of the Stages will remain as 2022, and 2032. The year 2013 emerges as a model year due to the TIP condition that it represent a five-year TIP. Year 2009 was already modeled and produced as an attainment year.

Regionally Significant Projects

A list of regionally significant projects will be developed. The impact on Stage I and perhaps Stage II will be determined.

Action Items

H. Dugas agreed that he would request an emissions report from G. Davies, to show the resulting emissions relative to VOC and NOx. At a future meeting, the issue of identification of regionally significant projects will be determined.

BATON ROUGE Interagency Consultation Meeting

Thursday, Oct. 16, 2008, 8:00 A.M.

Capital Region Planning Commission

333 N 19th Street
Conference Room

AGENDA

1. Years for modeling for Air Quality Conformity Analysis
2. Metropolitan Transportation Plan Update Amendments
3. Based on above, Neel-Schaffer Rerun Stages I, II and III
4. Schedule for completing No. 3 and submission to Gary Davies
5. Emissions Budget to Apply to Work Above
6. Work Schedule for This Effort

Attendance Roster

Interagency Cosultation Meeting Thursday Oct. 16, 2008 CRPC

Name	Organization	Email Address
Huey Dugas	CRPC	hdugas@brgov.com
[illegible] Ma	CRPC	tma@brgov.com
DAN BROUSSARD	LA DOTD	DanBroussard@dotd.la.gov
Dawn R. Sholmire	LA DOTD	dawnsholmire@dotd.la.gov
John Fu	LA DOTD	JohnFu@dotd.la.gov
L P Ledet	NSI	louis.ledet@neel-schaffer.com
Jamie Setze	FHWA	jamie.setze@fhwa.dot.gov
TOM RICHARDSON	CONSULTANT (DOTD)	TOMR2@COX.NET

Interagency Consultation Meeting
Capital Region Planning Commission
Thursday 07 August 2008
10:00 AM

1. Review 2006-2009 VMT File Developed by Tom Richardson
2. Conformity Analysis as Related to 2009 Network
3. Air Quality Analysis for I-12 Widening Project
4. DEQ and SIP Requirements, Schedule and Timeline
5. MPO Metropolitan Transportation Plan and Stage Years for A.Q. Analysis
6. MPO Committee Meeting Schedule and MTP Amendments
7. Other Business
8. Next Meeting

Interagency Consultation Meeting

Capital Region Planning Commission
Thursday, August 7, 2008
10:00 A.M.

Name	Agency / Phone
Huey P. Dugas	CRPC 383-5203
Tom Richardson	Consultant 756-2911
Jamie Setze	FHWA 757-7623
L P Ledet	Neel-Schaffer 337 232-6111
Gary LeBlanc	DOTD - 379-1421
Dawn R. Sholmire	DOTD - 242-4570
Dan Broussard	DOTD - 379.1924
Yusoob Zia	DEQ - 219-3569

DEVELOP EXISTING PLUS COMMITTED (E+C) TRANSIT AND HIGHWAY NETWORK

Highways

The Consultant Team defined the base year highway network as the system in place in 2004. The Team defined the committed projects as those which would improve traffic capacity and which were completed, were under construction or were let for bidding in the years 2005 – 2006. The Team also included in this group projects for which lettings were imminent (proposed for letting in the first six months of 2007). LA DOTD and the East Baton Rouge City-Parish Department of Public Works provided input in this regard. The Team presents the committed projects in **Table 31** and **Figure 34** following.

TABLE 31
COMMITTED STREET AND HIGHWAY PROJECTS

PARISH	ROUTE	LOCATION	IMPROVEMENT
ASC	US 61	S JCT LA42 – LA 427	RT TURN LANE
ASC	LA 73	LA 74 – I-10	WIDEN TO 3 LANES
ASC	LA 74	AT LA 73	INTERSECTION
ASC	LA 22	AT I-10	WIDEN TO 3 LANES
ASC	LA 22	AT I-10	INTERSECTION
ASC	LA 73	LA 73 @ LA 621@ I-10	INTERCHANGE
EBR	LA 427	LA 3064 – LA 3246	WIDEN TO 5 LANES
EBR	LA 3064	I-10 -- I-12	WIDEN TO 5 LANES
EBR	I-12	ESSEN LN -- I-12 EB	NEW ON-RAMP
EBR	US 61	AT SIEGEN LANE	INTERSECTION(CFI)
EBR	US 61	AT JEFFERSON HWY	INTERSECTION
EBR	US61	JEFF HWY -- FLORIDA BLVD	WIDEN TO 6 LANES
EBR	LA 19	AT GROOM ROAD	INTERSECTION
EBR	GROOM ROAD	AT LA 964	INTERSECTION
EBR	LA 19	LAVEY LN -- TWIN OAKS	WIDEN TO 5 LANES
EBR	I-10	AT PICARDY AVE	NEW INTERCHANGE
EBR	I-10	BLUEBONNET-SIEGEN	FRONTAGE RDS
EBR	I-10	BLUEBONNET-SIEGEN	NEW OFF-ON RAMPS
EBR	MILLERVILLE ROAD	I-12 -- LA 426	WIDEN TO 5 LANES
EBR	LA 426	AT MILLERVILLE RD	INTERSECTION
EBR	BARRINGER-FOREMAN	AT US 61	INTERSECTION
EBR	LA 426	US 61-BLVD PROVINCE	WIDEN TO 5 LANES
EBR	LA 426	AT SHARP RD	INTERSECTION

AGENDA

Interagency Consultation Meeting

Wednesday 30 April 2008 10:00 AM
Capital Region Planning Commission
Conference Room
333 N 19th Street, Baton Rouge, LA

1. Review Statewide HPMS and VMT data.

2. Establish Group Concurrence on Procedures, Methodology, Time Schedule, and Expected Results for Development of HPMS and VMT Data Files

3. Discussion EPA and LDEQ Rules and Regulations as Related to the Louisiana DEQ SIP Development

4. Other

AGENDA

Interagency Consultation Meeting

Tuesday 10 April 2008 2:30 PM
CRPC Conference Room
333 N. 19th Street, Baton Rouge, LA

1. Review I-12 Widening and Extension of Project Limits

2. Concurrence to Extend Project Limits from Pete's Hwy to Juban Rd Interchange

3. Discussion of Effort to Remodel I-12 Project with New Project Limits

4. Discussion and Concurrence to Amend TIP to Include I-12 Extension

Interagency Consultation Meeting
Tuesday 10 April 2008
2:30 – 4:00 PM
DOTD Offices

Attendance:

Dawn R. Sholmire	DOTD
Yasoob Zia	DEQ
Huey P. Dugas	CRPC
Dan Broussard	DOTD
L. P. Ledet	Neel-Schaffer Consultants
Jamie Setze	FHWA Louisiana Division
Jeff Riley	US EPA Dallas, Texas Via Conference Call

General
A meeting was conducted on Tuesday 10 April at DOTD Headquarters at 2:30 PM. Those in attendance were as shown above. Jeff Riley with the US EPA Regional Office participated in the meeting via a telephone conference call.

Purpose
The purpose of the meeting was to review the conditions dealing with the I-12 widening project, with special reference to 40CFR 43.122(g). That project is located in parts of East Baton Rouge and Livingston Parishes. The project limits are still undetermined, since the environmental and design phases had not yet started. The project has a budget of $100 million from state revenues, but still the project limits remain those as specified in the Conforming Metropolitan Transportation Plan (MTP), which describes the project as extending from O'Neal Lane in East Baton Rouge Parish to Pete's Highway in Livingston Parish.

Project Limit Review
The meeting discussion addressed the issue of extending the limits of the project widening to Juban Road Interchange. It was agreed that the movement of the project limits by that small a distance would have an insignificant effect on the current Conformity Analysis because there is currently no existing interchange at Pete's Highway.

Action Items

It was agreed that the Baton Rouge MPO will amend the current Conforming TIP to include the I-12 widening project from O'Neal Lane to the Juban Road Interchange. This information is based on the assumptions of a) no requirement of right-of-way, b) construction start in Fiscal Year 2008-2009, c) a source of funds specified as State Cash, d) no use of "advance construct" funding arrangement, but based on a "design-build" agreement, and e) all conditions in 40CFR93.122 (g) are met, so that no new Conformity Determination is required, as a result of the noted TIP Revision. Furthermore, the TIP Revision will be based on an analysis presented in a letter report documenting the basis for no new Conformity Determination.

It was further agreed that the Baton Rouge MPO would prepare minutes of the Interagency Consultation meeting, and transmit to FHWA with copies to all other participants. FHWA and DOTD are to review and comment on the minutes as necessary. And FHWA will forward the minutes to US EPA, Region 6 and to Louisiana DEQ.

TABLE 31, CONT'D.
COMMITTED STREET AND HIGHWAY PROJECTS

PARISH	ROUTE	LOCATION	IMPROVEMENT
EBR	LA 426	N HARRELL'S FERRY	NEW INTERSECTION
EBR	CENTRAL THRUWAY	FR. TOWN-SULLIVAN	NEW 4 LANE
EBR	SHERWOOD FOREST	SHERWOOD @ I-12	INTERCHANGE
EBR	LA 946	JONES BAY.-HOOPER	WIDEN TO 5 LANES
EBR	LA 946	LOVETT RD	INTERSECTION
EBR	GEORGE O'NEAL	JONES CREEK-ONEAL	WIDEN TO 5 LANES
EBR	NORTH BOULEVARD	N 22ND ST TO N 9TH ST	NEW RR OVERPASS
EBR	LOBDELL AVE	JEFF TO GOODWOOD	WIDEN TO 3 LANES
EBR	FLORIDA BLVD	AT OAK VILLA BLVD	INTERSECTION
EBR	JEFFERSON HWY	AT BARRINGER-FORE.	INTERSECTION
EBR	E PARKER ST	AT S STADIUM RD	INTERSECTION
EBR	COURSEY BLVD	AT S PARK AVE	INTERSECTION
EBR	HIGHLAND ROAD	AT KENILWORTH BLVD	INTERSECTION
EBR	MILLERVILLE RD	I-12 - HARRELLS FERRY	WIDEN TO 5 LANES
LIV	I-12	I-12 AT LA 1026	NEW INTERCHANGE
LIV	LA 1019	LA 1019 AT LA 16	INTERSECTION
LIV	I-12	I-12 AT LA 3002	INTERCHANGE
LIV	I-12	I-12 @ LA 447	INTERCHANGE
LIV	US 190	US 190 AT LA 1026 E	INTERSECTION
LIV	LA 16	LA 1025 TO WATSON	WIDEN TO FOUR LANES W / LT LANES

Inter Agency Meeting
4/10/08

Name	Agency	Phone
Dawn R. Sholmire	LaDOTD	242-4570
Yasoob Zia	LDEQ	219-3569
Huey P. Dugas	CRPC	383-5203
DAN BROUSSARD	LADOTD	379-1924
L. P. Ledet	Neel-Schaffer	337-232-6111
Jamie Setze	FHWA	(225) 757-7623

via conf. call - Jeff Riley (214) 665-8542

AGENDA

Interagency Consultation Meeting

Wednesday 12 March 2008 9:00 AM
Advanced Transportation Management Center
Conference Room
Harding Boulevard, Baton Rouge, LA

1. Review History of Air Quality Activities as Related to Transportation Planning in the Baton Rouge MPO Area

2. Presentation of Mechanics of Conformity Analysis for Air Quality in Relation to Transportation Modeling and Planning

3. Discussion EPA and LDEQ Rules and Regulations as Related to the Louisiana and Baton Rouge Air Quality efforts

4. Other

AGENDA

Interagency Consultation Meeting

Wednesday 30 January 2008 1:00 PM
CRPC Conference Room
333 N. 19th Street, Baton Rouge, LA

1. Review Long Range Transportation Plan Project Schedule
2. Review Projects "To Be Let" in Stage I period
3. Discussion of Project Under Construction and Completion Dates
4. Projects Reviewed for Completion Timing
    a. Perkins Road
    b. Central Thruway
    c. LA 16 (Range Avenue)
    d. Burbank Drive Phases I and II, and
    e. Veterans Boulevard
5. Other

AGENDA

Interagency Consultation Meeting

Thursday 10 January 2008 1:30 PM
CRPC Conference Room
333 N. 19th Street, Baton Rouge, LA

1. Discussion of Long Range Transportation Plan 2009 Network.

2. Review network for projects 'Let to Construction', status of on-going construction, and estimated completion dates.

3. Discussion of future meeting dates and times.

4. Other

AGENDA

Interagency Consultation Meeting

Monday 7 January 2008 3:00 PM
CRPC Conference Room
333 N. 19th Street, Baton Rouge, LA

1. Discussion of HMPS VMT data by Functional Classification for 2013, 2022, and 2032 –Confirm group concurrence with using that data for our conformity analysis.

2. Review 2009 analysis results to date. It appears that we are over the budget - even taking into account the "off model credits" that we used last time.

3. Review 2013, 2022, and 2032 projects open to traffic - for the remainder of the conformity analysis.

4. Other