Corpus Christi Air Monitoring and Surveillance Camera Installation and Operation Project

Quarterly Report for the Period

July 1, 2006 through September 30, 2006

Submitted to

Judge Janis Graham Jack
US District Court for the Southern District of Texas
Corpus Christi, Texas

Ms. Kathleen Aisling
US Environmental Protection Agency, Region 6
Dallas, Texas

Ms. Susan Clewis
Texas Commission on Environmental Quality, Region 14
Corpus Christi, Texas

Submitted by

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I. Introduction

On October 1, 2003, the US District Court for the Southern District of Texas issued an order to the Clerk of the Court to distribute funds in the amount of $6,700,000, plus interest accrued, to The University of Texas at Austin (University) to implement the court ordered condition of probation (COCP) project *Corpus Christi Air Monitoring and Surveillance Camera Installation and Operation* (Project). This quarterly report has been prepared pursuant to the requirements of the project and is being submitted to the US District Court, the US Environmental Protection Agency (EPA), and the Texas Commission on Environmental Quality (TCEQ).

II. Project Progress Report

The focus of work during the quarter ending September 30, 2006 has been directed to the following activities.

A. Operations and Maintenance Phase of the Project

A detailed description of some data analyses appear in Appendix A, page 6, and a summary of these analyses appears in this section.

The COCP consists of a network of seven (7) air monitoring stations with air monitoring instruments and surveillance camera equipment as shown in Table 1, page 2.

Table 1. Schedule of Air Monitoring Sites, Locations and Major Instrumentation

TCEQ CAMS Nos.	Latitude	Longitude	Description of Site Location	Monitoring Equipment				
				Auto GC	TNMHC	H2S & SO2	Met Station	Camera
634	27.798889º North	97.433889º West	Oak Park Recreation Center	Yes			Yes	
629	27.817500º North	97.419722º West	Grain Elevator @ Port of Corpus Christi		Yes	Yes	Yes	
630	27.824444º North	97.432500º West	J. I. Hailey Site @ Port of Corpus Christi		Yes	Yes	Yes	
635	27.811389º North	97.465556º West	TCEQ Monitoring Site C199 @ Dona Park		Yes	Yes	Yes	Yes
631	27.845278º North	97.525556º West	Port of Corpus Christi on West End of CC Inner Harbor		Yes	Yes	Yes	
632	27.827222º North	97.528889º West	Off Up River Road on Flint Hills Resources Easement		Yes	Yes	Yes	
633	27.908333º North	97.542222º West	Solar Estates Park at end of Sunshine Road	Yes		Yes	Yes	Yes

Legend

Auto GC	automated gas chromatograph
TNMHC	total non-methane hydrocarbon analyzer
H_2S	hydrogen sulfide analyzer
SO_2	sulfur dioxide analyzer
Met Station	meteorology station consisting of measurement instruments for wind speed, wind direction, ambient air temperature and relative humidity
Camera	surveillance camera

Summary of Data Findings from Monitoring Sites

As noted in Table 1, the monitoring network provides measurements of a variety of air pollutants, including hydrocarbons, sulfur dioxide and hydrogen sulfide. Provided below are brief comparisons of the air pollutants concentrations observed during this quarter to concentrations observed in previous periods. More details are available in Appendix A

Auto-GC Data and Effects Screening Level Summary Oct. 2005-Sept. 2006
Appendix A, pages 7 – 9, contain a comparison between hourly average concentrations of hydrocarbons measured, using the automated gas chromatographs, at two residential neighborhood sites (Oak Park and Solar Estates). The concentrations are compared to health effects screening levels (ESLs) established by the Texas Commission on Environmental Quality (TCEQ). The data provided in Appendix A are for the most recent rolling four-quarter (annual) period (10/1/05-9/30/06) and for the third quarter of 2006. With the exception of benzene, concentrations measured by the auto-GCs have been below the ESLs.

Year-to-Year Comparisons Auto-GC Concentrations.
Appendix A, pages 9-16, contain a comparison between concentrations measured using the two auto-GCs in 2005 and 2006. The data are summarized in a manner that compares the same months from different years, since it has been shown that regional wind patterns vary in a similar manner from year-to-year by season. Overall, concentrations are somewhat lower in 2006 than in 2005. In a few cases, particular species had larger changes than others, which may point to actual emission source changes or other causes.

Benzene Measurements at Auto-GCs
Several hourly benzene observations have been higher than the ESL concentration of 25 parts per billion volume (ppbV) which is based on a one-hour average. In addition to the ESL based on one-hour averaged concentrations, the TCEQ determines an ESL based on annual average concentrations. The annual average ESL is 1 ppbV. The long-term annual mean benzene concentration at Solar Estates has held steady around one-third the level of the annual ESL concentration, and the long-term annual mean at Oak Park is three-quarters of the annual ESL. In Appendix A, pages 16-26, there appears a more detailed examination of the benzene concentrations collected with the two auto-GCs.

Sulfur Species Summary
Neither hydrogen sulfide (H_2S) nor sulfur dioxide (SO_2) concentrations exceeded TCEQ screening thresholds at the project sites over the Oct. 2005-Sept. 2006 period. The TCEQ Huisache CAMS 98 site detected H_2S concentrations over the TCEQ residential screening threshold on Jan. 17, 2006.

B. Scheduled Meetings of the Volunteer Advisory Board
During the quarter ending September 30, 2006, the Advisory Board did not meet.

During this quarter the three (3) new members were appointed to the Advisory Board filling the vacancies that resulted from the resignations of existing Board members. The new Board members attended their first meeting of the Advisory Board shortly after the close of this quarter.

A roster of the Volunteer Advisory Board is attached to this report as Appendix B, page 27.

C. Project Management and Planning
Project Management and Planning during this period has focused on four (4) major activities.

1. **Project Schedule**
   Operations and maintenance of the seven monitoring sites reporting data via the TCEQ LEADS System is on-going. The data can be accessed and reviewed at the project website (http://www.utexas.edu/research/ceer/ccaqp/)

2. **Communication**
   The status of the Project has been communicated through the website, which is operational with portions under continual development, and at meetings of the Advisory Board.

3. **Budget Monitoring**
   Budget monitoring during the period has focused on project costs for Phase II - Sites Operation and Maintenance costs.
   Financial reports for the quarter are included at Appendix C, page 29.

4. **Other Contributions**
   A TCEQ Supplemental Environmental Project (SEP), resulting from an enforcement action against CITGO Refining and Chemicals Company, L.P. (Docket No. 2001-1469-AIR-E), was completed during this reporting period. The SEP Award authorized two (2) tasks. Task One funded the operation of the Corpus Christi Air Monitoring and Surveillance Camera Installation and Operation Program for approximately one year. Task Two funded the development and implementation of an interactive web-based application (the Trajectory Analysis Tool) to generate and display both forward and backward trajectories of air parcels in the Corpus Christi area.

   On June 14, 2006, TCEQ approved funding for a new Supplemental Environmental Project (SEP) as a result of an enforcement action against El Paso Merchant Energy Petroleum Company (Docket No. 2001-1023-AIR-E.) This SEP will fund enhancements to the automated trajectory tool, additional canister analysis at five of the seven sites, installation of wind direction filter software and a software upgrade to minimize data loss resulting from electrical power interruptions. Activities under this SEP Award were ongoing during this reporting period.

III. Financial Report

As required , the following financial summary information is provided. Details supporting this financial summary are included in Appendix C, page 29.

A. Total Amount of COCP Funds and Other Funds Received Under the Project

The COCP funds received through September 30, 2006 totals $7,147,390.82. This total includes interest earned through September 30, 2006.

B. Detailed List of the Actual Expenditures Paid from COCP Funds

Expenditures of COCP funds during this quarter totaled $150,019.70. The detailed breakdown of the actual expenditures is included in Appendix C, page 30. The activities for which these expenditures were used are detailed in Section II of this report.

C. Total Interest Earned on COCP Funds During the Quarter

The interest earned during this quarter totaled $40,927.39. A report providing detailed calculations of the interest earned on the COCP funds during each month of the quarter is included in Appendix C, page 30.

D. Balance as of September 30, 2006, in the COCP Account

The balance in the COCP account, including interest earned totals $4,730,801.44.

E. Expected Expenditures for the Funds Remaining in the COCP Account

The expected expenditures for the funds remaining totals $4,730,801.44.

Quarterly Report Distribution List:

U.S. District Court
- Ms. Shirley Johnson, Assistant Deputy Chief USPO
- Mr. James Martinez, Supervising USPO

Texas Commission on Environmental Quality
- Ms. Sharon Blue, Litigation Division – Headquarters
- Mr. David Brymer, Laboratory and Mobile Monitoring – Headquarters
- Ms. Susan Clewis, Director – Region 14
- Mr. David Turner, Air Monitoring Section – Region 14
- Mr. David Kennebeck, Field Operations – Region 14

Environmental Protection Agency
- Ms. Kathleen Aisling, Environmental Engineer, Air Enforcement Section, Dallas Regional Office

Members of the Advisory Board

APPENDIX A

Data Analysis for Corpus Christi Quarterly Report
July 2006 - September 2006

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Center for Energy & Environmental Resources
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Auto-GC Effects Screening Level Summary

Shown in Table 1 are a summary of a TCEQ Web page on Effects Screening Levels (ESLs) accessed at http://www.tceq.state.tx.us/implementation/tox/esl/ESLMain.html on Nov. 19, 2006. The TCEQ establishes ESLs to evaluate potential for effects to occur as a result of exposure to concentrations of constituents in the air. The ESLs are based on data concerning health effects, potential for odors to be a nuisance, effects on vegetation, and corrosive effects, but ESLs are not ambient air standards. If predicted or measured airborne levels of a constituent do not exceed the ESL, adverse health or welfare effects are not expected. If ambient levels of constituents in air exceed the ESL, it does not necessarily indicate a problem but rather triggers a review in more depth.

Tables 1 – 4, pages 7, 8and 9 summarize the both the 3rd quarter of 2006 and the most recent rolling four-quarter (annual) period (10/1/05-9/30/06). The table shows the arithmetic mean of all observations, the annual ESL, the 90th and 99th percentiles for observed values, the maximum measured value, the odor ESL (if one exists), and the one-hour ESL. Note that not all data have been validated and are thus subject to change. All values in the following tables are in ppbV units. A few hourly benzene observations have been higher than the one-hour ESL. The long-term annual mean at Solar Estates has held steady around one third the level of the ESL, and the long term annual mean at Oak Park is approximately three quarters of the ESL.

Table 1 Oak Park (C634) Third quarter, 2006 Auto-GC Summary, ppbV units

Species	mean	p90	p99	max	Annual ESL	Odor ESL	1-hour ESL
Ethane	4.88	12.70	44.40	80.40			10000
Ethylene	0.68	1.45	7.60	19.35			1022
Propane	4.22	11.23	48.17	107.40	1000		10000
Propylene	0.91	1.37	17.47	118.20			68120
n_Hexane	0.40	0.97	4.72	13.57	50		500
Isobutane	1.61	4.08	23.00	42.20	800	2042	8000
13_Butadiene	0.04	0.08	0.28	2.28	5		50
1_Butene	0.11	0.13	2.50	7.10	740	69	7400
c_2_Butene	0.10	0.10	2.30	6.73	740	600	7400
t_2_Butene	0.14	0.13	2.95	9.25	740	600	7400
o_Xylene	0.08	0.20	0.71	1.54	100	1795	1000
Isopentane	1.97	4.36	25.22	78.04	120		1200
1_Pentene	0.05	0.10	0.58	1.54	800	30	8000
c_2_Pentene	0.05	0.10	0.76	2.14	800	30	8000
t_2_Pentene	0.10	0.16	1.40	3.92	800	30	8000
Benzene	0.52	0.88	9.27	51.15	1		25
Cyclohexane	0.14	0.40	1.82	5.17	100	415	1000
n_Pentane	1.21	2.52	16.18	77.14	120		1200
Toluene	0.52	1.33	4.10	11.71	50		500
n_Butane	2.00	4.88	27.15	67.85	800		8000
p_Xylene_m_Xylene	0.23	0.53	2.33	4.70	100	480	1000
Ethyl_Benzene	0.06	0.15	0.58	1.63	100	461	1000
Isopropyl_Benzene_Cumene	0.02	0.02	0.29	1.38	50	100	500
124_Trimethylbenzene	0.09	0.20	0.68	1.92	25		250

Table 2 Oak Park (C634) Rolling 1-year (Oct 05-Sep 06) Auto-GC Summary, ppbV units

Species	mean	p90	p99	max	Annual ESL	Odor ESL	1-hour ESL
Ethane	8.46	22.10	62.10	307.15			10000
Ethylene	1.02	2.35	9.20	73.05			1022
Propane	6.85	18.60	67.23	253.57	1000		10000
Propylene	1.09	2.60	13.70	118.20			68120
n_Hexane	0.62	1.63	7.15	35.05	50		500
Isobutane	2.74	7.30	26.48	95.38	800	2042	8000
13_Butadiene	0.05	0.10	0.33	7.95	5		50
1_Butene	0.16	0.30	2.50	7.10	740	69	7400
c_2_Butene	0.13	0.25	2.18	6.73	740	600	7400
t_2_Butene	0.18	0.30	2.90	9.25	740	600	7400
o_Xylene	0.10	0.23	0.76	27.31	100	1795	1000
Isopentane	2.83	7.26	29.94	106.78	120		1200
1_Pentene	0.05	0.12	0.50	3.52	800	30	8000
c_2_Pentene	0.05	0.12	0.50	2.34	800	30	8000
t_2_Pentene	0.10	0.22	0.94	5.04	800	30	8000
Benzene	0.74	1.62	10.03	**51.15**	1		**25**
Cyclohexane	0.27	0.78	2.85	36.87	100	415	1000
n_Pentane	1.84	4.26	24.84	172.44	120		1200
Toluene	0.75	1.67	6.89	69.30	50		500
n_Butane	3.70	10.40	35.35	129.15	800		8000
p_Xylene_m_Xylene	0.26	0.63	2.25	36.74	100	480	1000
Ethyl_Benzene	0.07	0.18	0.59	5.43	100	461	1000
Isopropyl_Benzene_Cumene	0.04	0.07	0.52	19.69	50	100	500
124_Trimethylbenzene	0.09	0.19	0.82	10.33	25		250

Table 3 Solar Estates (C633) Third quarter, 2006 Auto-GC Summary, ppbV units

Species	mean	p90	p99	max	Annual ESL	Odor ESL	1-hour ESL
Ethane	7.01	15.95	38.90	73.25			10000
Ethylene	0.41	1.00	2.90	6.40			1022
Propane	4.30	9.97	26.63	41.67	1000		10000
Propylene	0.31	0.53	1.93	51.13			68120
n_Hexane	0.40	0.93	2.45	8.80	50		500
Isobutane	1.60	3.83	10.35	19.23	800	2042	8000
13_Butadiene	0.12	0.08	1.53	19.90	5		50
1_Butene	0.04	0.08	0.23	0.78	740	69	7400
c_2_Butene	0.08	0.13	0.45	1.95	740	600	7400
t_2_Butene	0.22	0.30	0.50	1.40	740	600	7400
o_Xylene	0.06	0.14	0.39	2.91	100	1795	1000
Isopentane	1.55	3.84	8.90	20.64	120		1200
1_Pentene	0.03	0.06	0.22	0.92	800	30	8000
c_2_Pentene	0.02	0.06	0.26	0.98	800	30	8000
t_2_Pentene	0.05	0.10	0.48	1.88	800	30	8000
Benzene	0.32	0.78	2.28	8.78	1		25
Cyclohexane	0.26	0.67	2.00	5.50	100	415	1000
n_Pentane	0.97	2.40	5.40	13.38	120		1200
Toluene	0.36	0.86	1.96	3.67	50		500
n_Butane	1.94	4.73	11.00	24.68	800		8000
p_Xylene_m_Xylene	0.23	0.49	2.44	8.78	100	480	1000
Ethyl_Benzene	0.05	0.13	0.38	2.16	100	461	1000
Isopropyl_Benzene_Cumene	0.01	0.02	0.13	0.92	50	100	500
124_Trimethylbenzene	0.05	0.12	0.38	0.76	25		250

Table 4 Solar Estates C633 Rolling 1-year (Oct 05-Sep 06) Auto-GC Summary, ppbV units

Species	mean	p90	p99	max	Annual ESL	Odor ESL	1-hour ESL
Ethane	8.76	19.60	58.05	136.20			10000
Ethylene	0.42	1.00	2.60	8.55			1022
Propane	5.59	12.93	38.30	117.00	1000		10000
Propylene	0.46	0.97	4.50	51.13			68120
n_Hexane	0.42	0.97	2.67	35.77	50		500
Isobutane	2.29	4.93	15.15	54.35	800	2042	8000
13_Butadiene	0.08	0.08	0.70	34.80	5		50
1_Butene	0.05	0.10	0.40	4.25	740	69	7400
c_2_Butene	0.07	0.13	0.50	12.48	740	600	7400
t_2_Butene	0.17	0.28	0.65	7.20	740	600	7400
o_Xylene	0.06	0.14	0.41	2.91	100	1795	1000
Isopentane	1.90	4.44	11.86	55.86	120		1200
1_Pentene	0.02	0.06	0.20	0.92	800	30	8000
c_2_Pentene	0.02	0.04	0.20	0.98	800	30	8000
t_2_Pentene	0.04	0.08	0.46	1.88	800	30	8000
Benzene	0.33	0.75	2.23	**34.43**	1		**25**
Cyclohexane	0.26	0.65	1.88	9.05	100	415	1000
n_Pentane	1.12	2.64	7.24	36.58	120		1200
Toluene	0.39	0.89	2.20	33.56	50		500
n_Butane	2.87	6.93	21.25	70.60	800		8000
p_Xylene_m_Xylene	0.32	0.55	4.56	32.69	100	480	1000
Ethyl_Benzene	0.05	0.13	0.35	3.03	100	461	1000
Isopropyl_Benzene_Cumene	0.01	0.02	0.13	0.92	50	100	500
124_Trimethylbenzene	0.06	0.12	0.37	28.30	25		250

The list of months for which data validation has been completed appears in Figure 5, page 9. Note that site "32" is Oak Park, and site "33" is Solar Estates. The red cells in March and April 2006 indicate the site failed to meet the target 75 percent data completion in those months. This is a result of the data validation process. Three other long-running TCEQ auto-GCs (A=Clinton Dr., in Houston, D=Chamizal in El Paso, E=Hinton in Dallas) are shown to reflect the comparability in data recovery. Data validation fell behind owing to extraordinary factors in 2005 and those months have been given a lower priority than current months.

Figure 5 Auto-GC Data Validation as of 11/19/06

AutoGC Data Recovery Report

Percent Data Recovery Date Range: 10/2005 - 09/2006					
Date	**32**	**33**	**A**	**D**	**E**
Oct 2005			81	71	89
Nov 2005			69	95	67*
Dec 2005			80	84	99
Jan 2006	85	98	92	98	94
Feb 2006	92	96	92	96	93
Mar 2006	97	56	98	88	99
Apr 2006	91	72	86	97	45*
May 2006	99	83	88	94	60
Jun 2006	98	87	97	89	80
Jul 2006	96	65*	92	79	93
Aug 2006	75*	94	98	96	92
Sep 2006				90	92
Average	92	81	88	90	84
Date	**32**	**33**	**A**	**D**	**E**

* **PM was performed this month, t**

(A=Clinton Dr., in Houston, D=Chamizal in El Paso, E=Hinton in Dallas)

Comparison of Auto-GC Levels One Year Apart

The auto-GC data at the Oak Park CAMS 634 and Solar Estates CAMS 633 sites have been compiled to allow a comparison between measurements one year apart to assess differences that may be related to possible changes in emissions or to varying meteorology.

The current subcontractor began operating the sites in March 2005, so that month is a convenient starting point. Two comparison time periods are presented. First, in order to compare data in a comprehensive manner, the average and median values for each species were computed for March – October 2005 and for March – October 2006. Bracketing the data into these eight month periods generates averages that can be compared year-to-year using the same months. However, the highest concentrations for these two sites generally occur under northerly winds, which are more common during the months from September through March. This implies that the averages for the eight month periods are likely to be biased low with regard to estimating an annual mean. Thus, a second comparison is presented for September – October 2005 and September – October 2006. In both sets of comparisons, both mean and median statistics are assessed.

The overall result is that differences for the most part are relatively small. Using the eight month comparisons, about three quarters of the species at Solar Estates C634 were lower in 2006. TNMHC mass was about 20 percent lower in 2006. Most of the change in mass is attributable to declines in low-molecular weight alkanes. See Figure 6a, page 10 and Figure 6b, page 11. Species are graphed in decreasing concentration for 2005.

Figure 6a Higher concentration hydrocarbon species (ppbV)

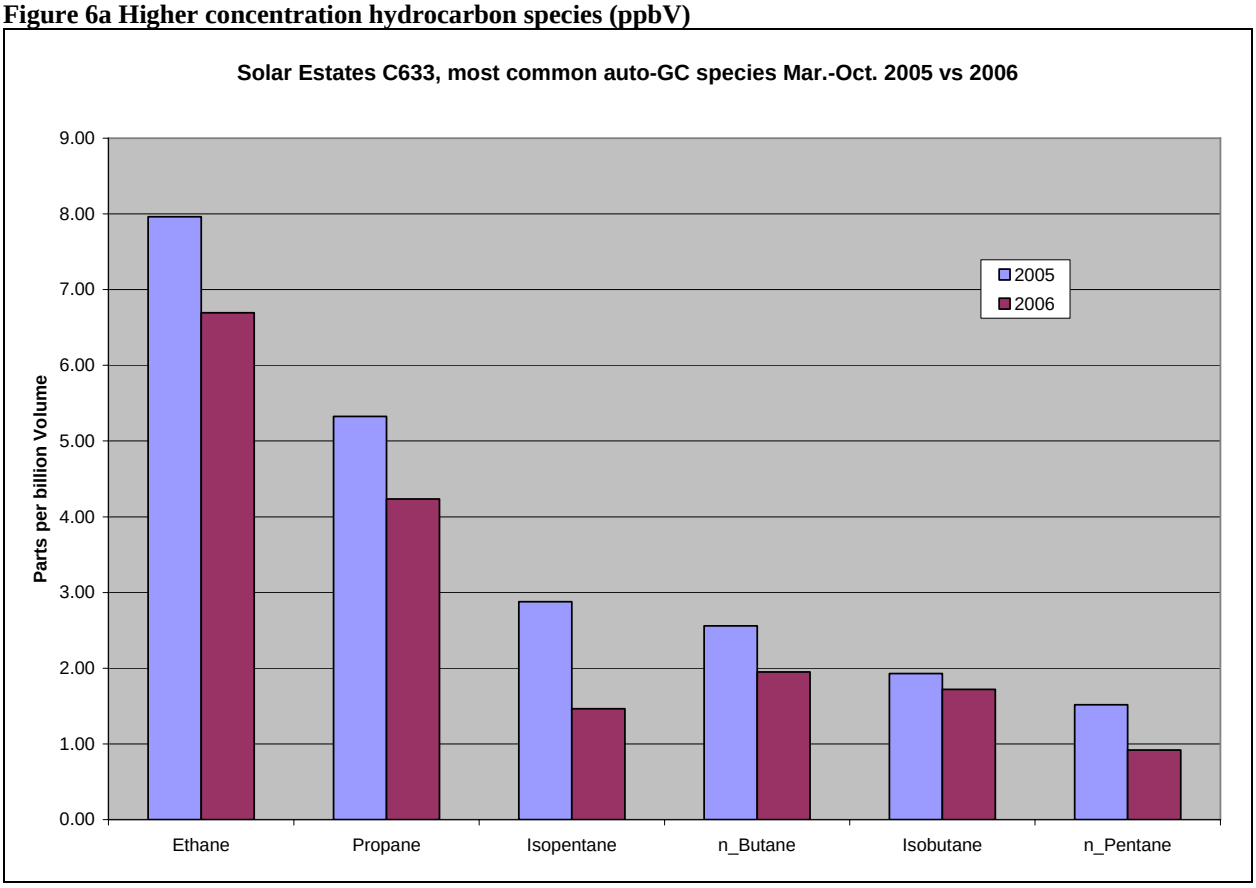
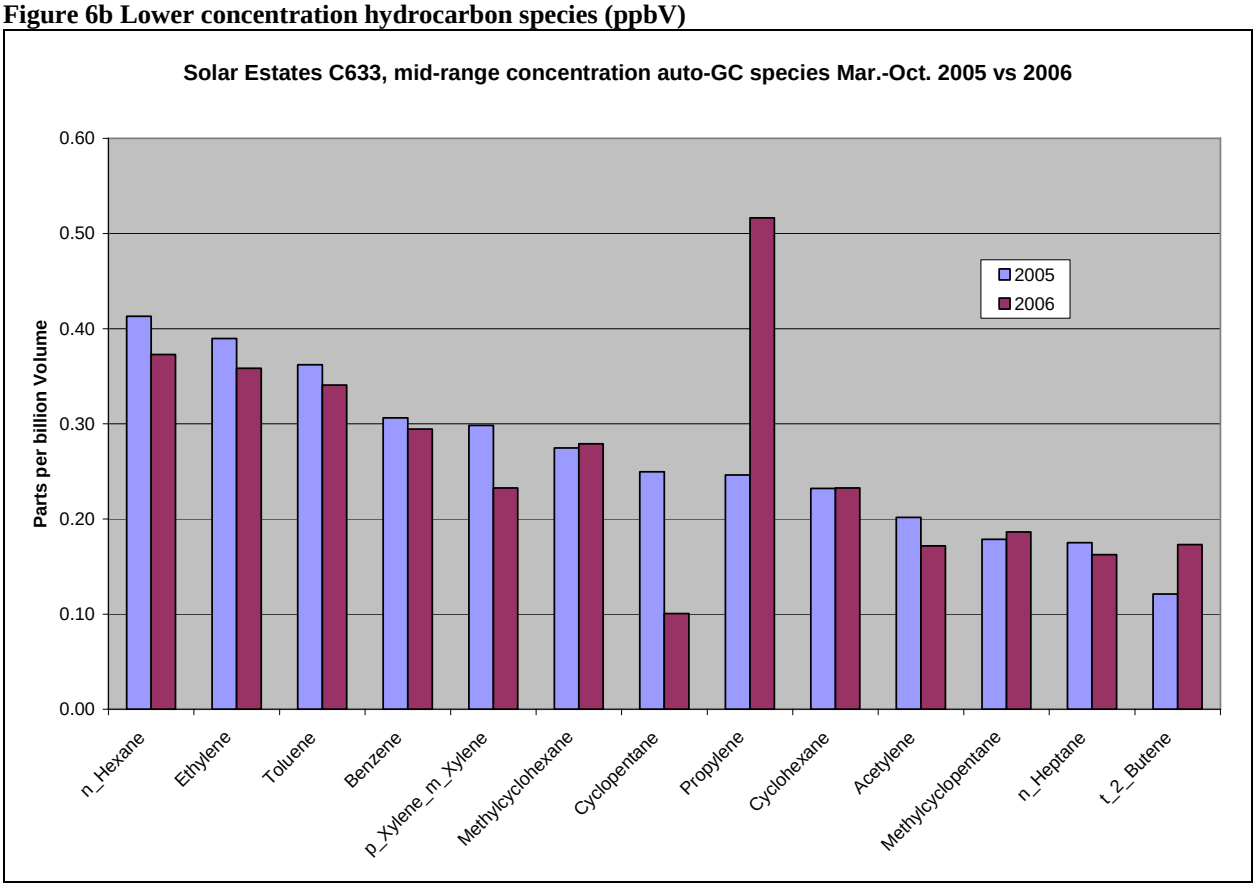


Figure 6b Lower concentration hydrocarbon species (ppbV)



Differences were less prominent in the eight month summaries at Oak Park C633, where only 61 percent of the species had a decline in mean, and only 33 percent had a decline in median concentration. TNMHC mass was about 15 percent lower in 2006. See Figure 7a, page 12 and Figure 7b, page 13.

Figure 7a Higher concentration hydrocarbon species at Oak Park 2005 vs 2006 (ppbV)

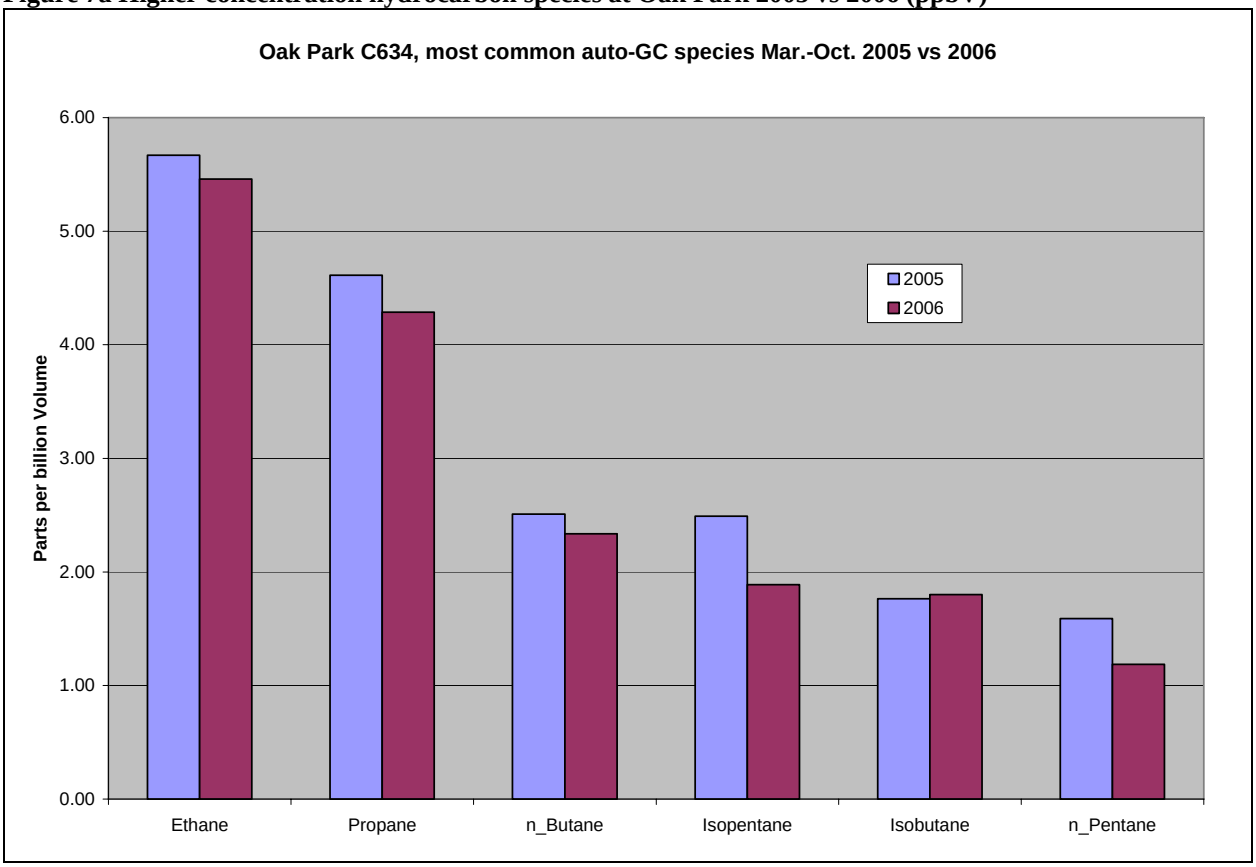
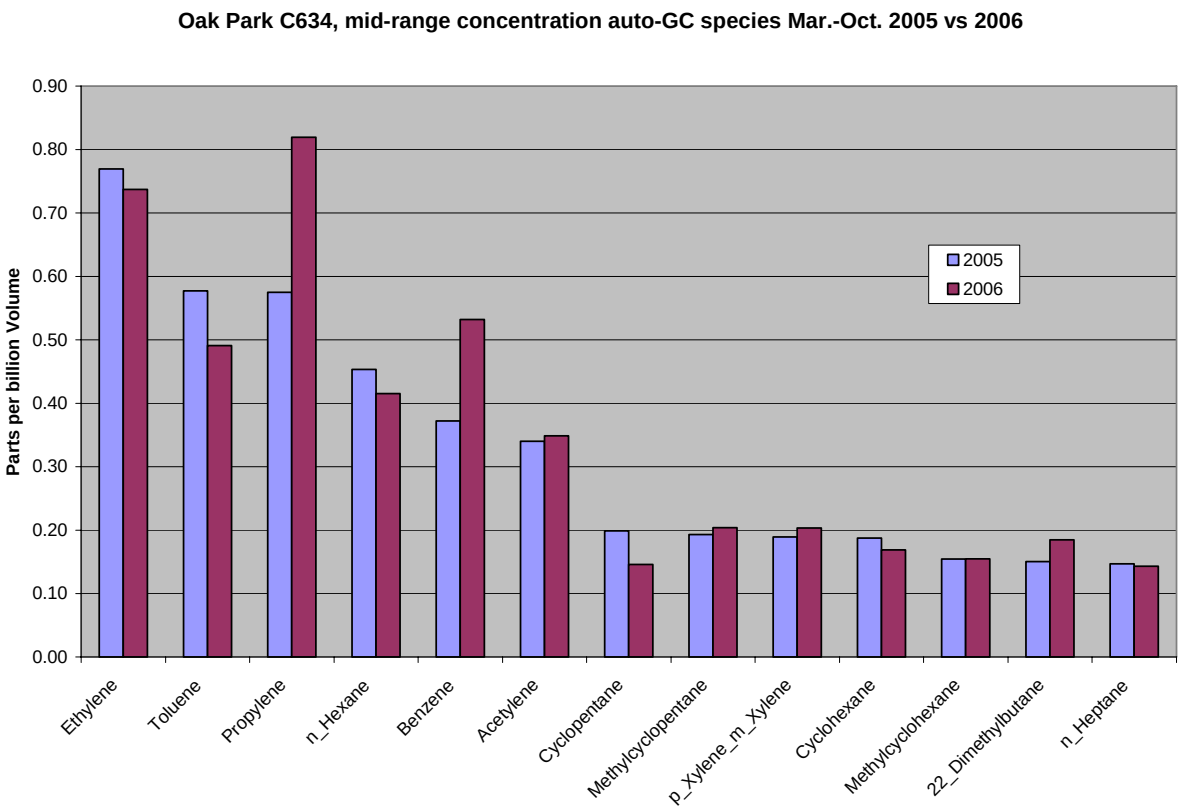


Figure 7b Lower concentration hydrocarbon species at Oak Park 2005 vs 2006 (ppbV)



For the months of September and October, which generally see more northerly winds, the results are less prominent. At Solar Estates C633, TNMHC mean and median mass are only slightly down (4 percent in mass), and only about one third of individual species are lower in 2006 than in 2005. Benzene shows a slight increase. See Figures 8a and 8b, page 14.

Figure 8a Higher concentration hydrocarbon species at Solar Estates Fall 2005 vs Fall 2006

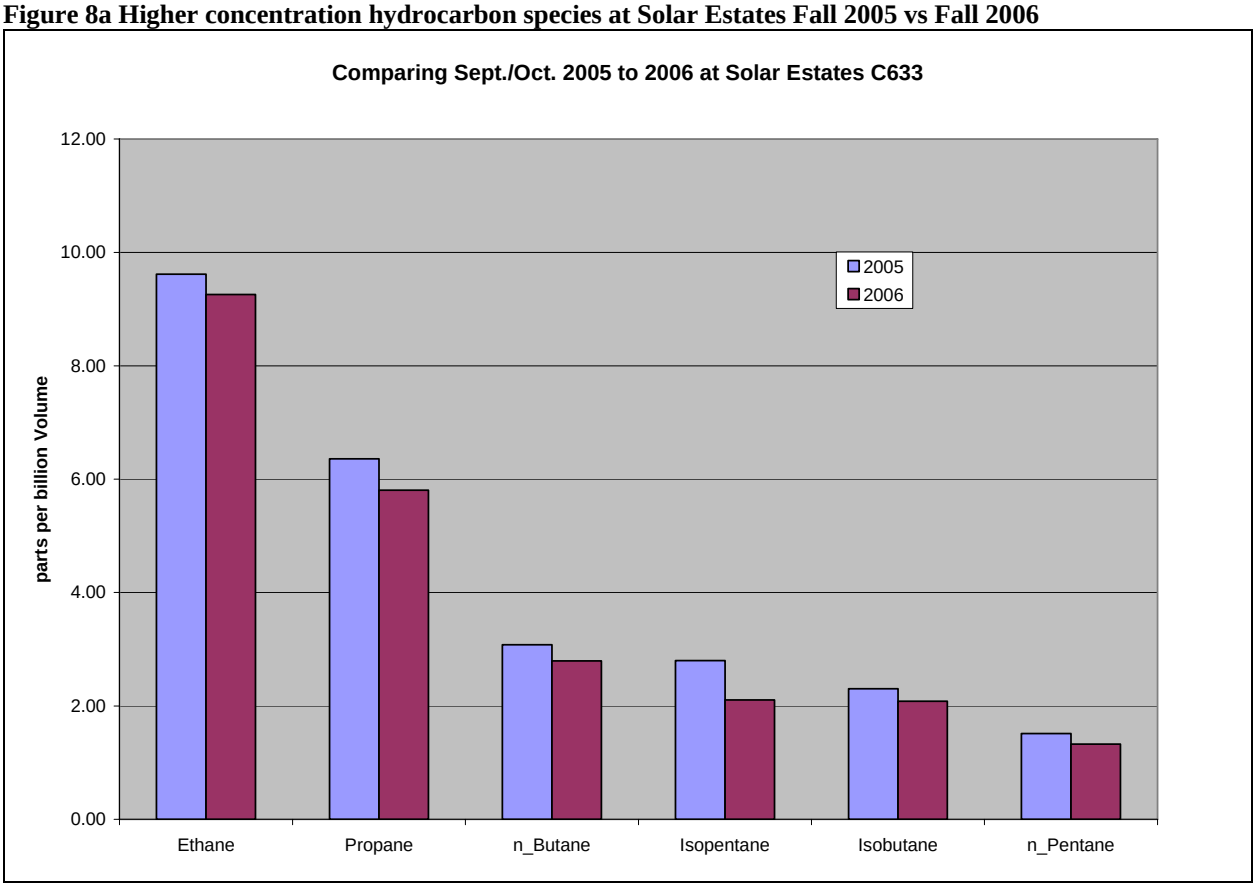
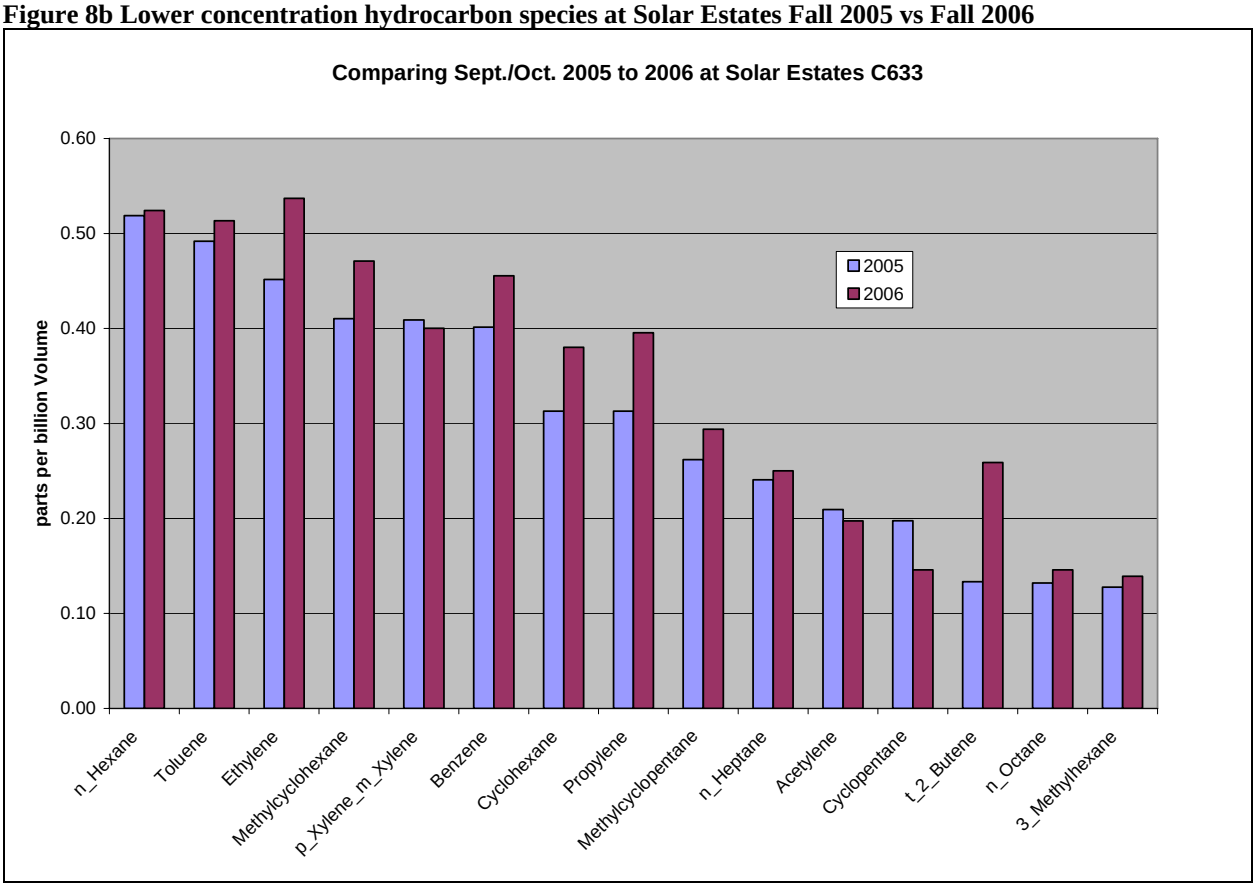


Figure 8b Lower concentration hydrocarbon species at Solar Estates Fall 2005 vs Fall 2006



At Oak Park C633 for September and October, about two thirds of species have lower means but only a quarter have lower medians, and mean TNMHC is down 13 percent, but median TMNHC is virtually unchanged. Benzene is up by 31 percent. See Figure 9a, page 15 and Figure 9b, page 16.

Figure 9a Higher concentration hydrocarbon species at Oak Park Fall 2005 vs Fall 2006

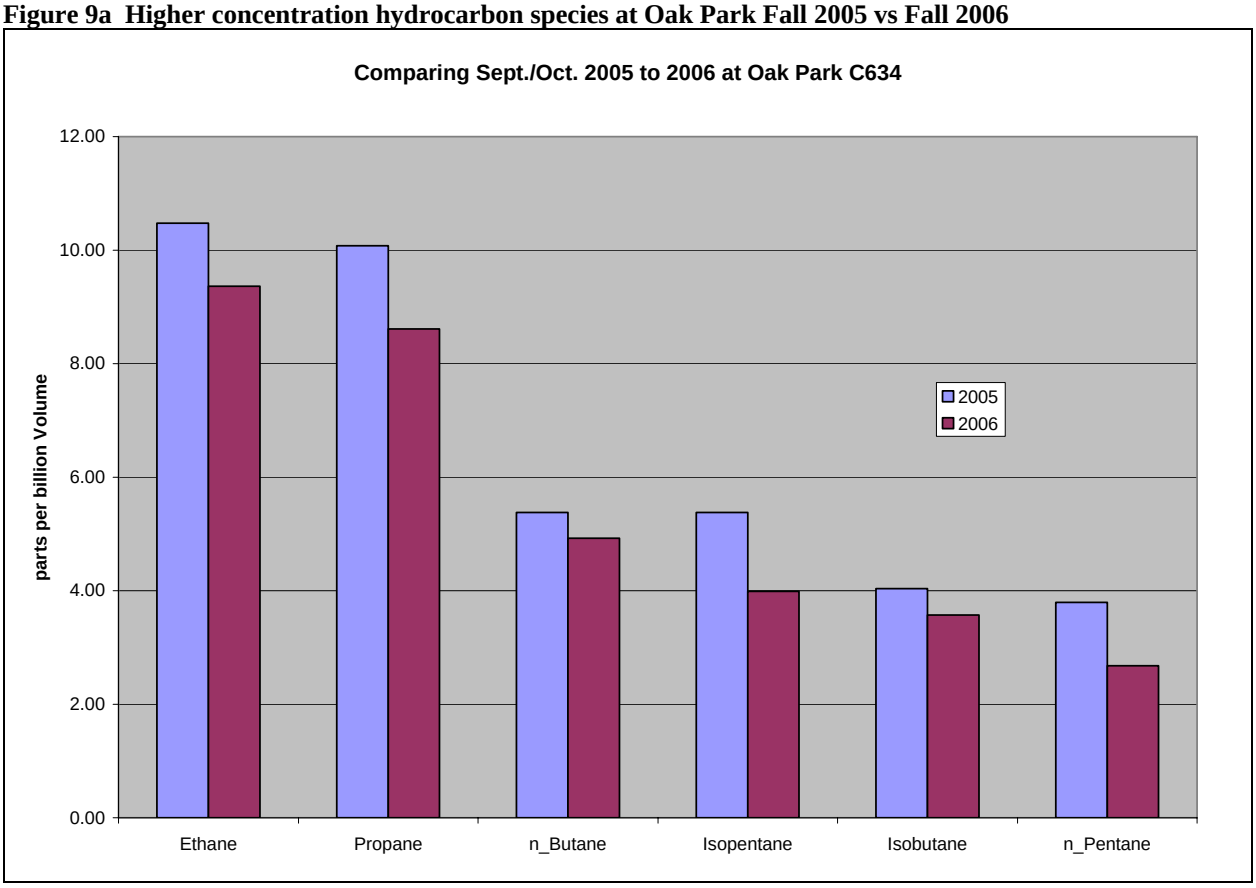
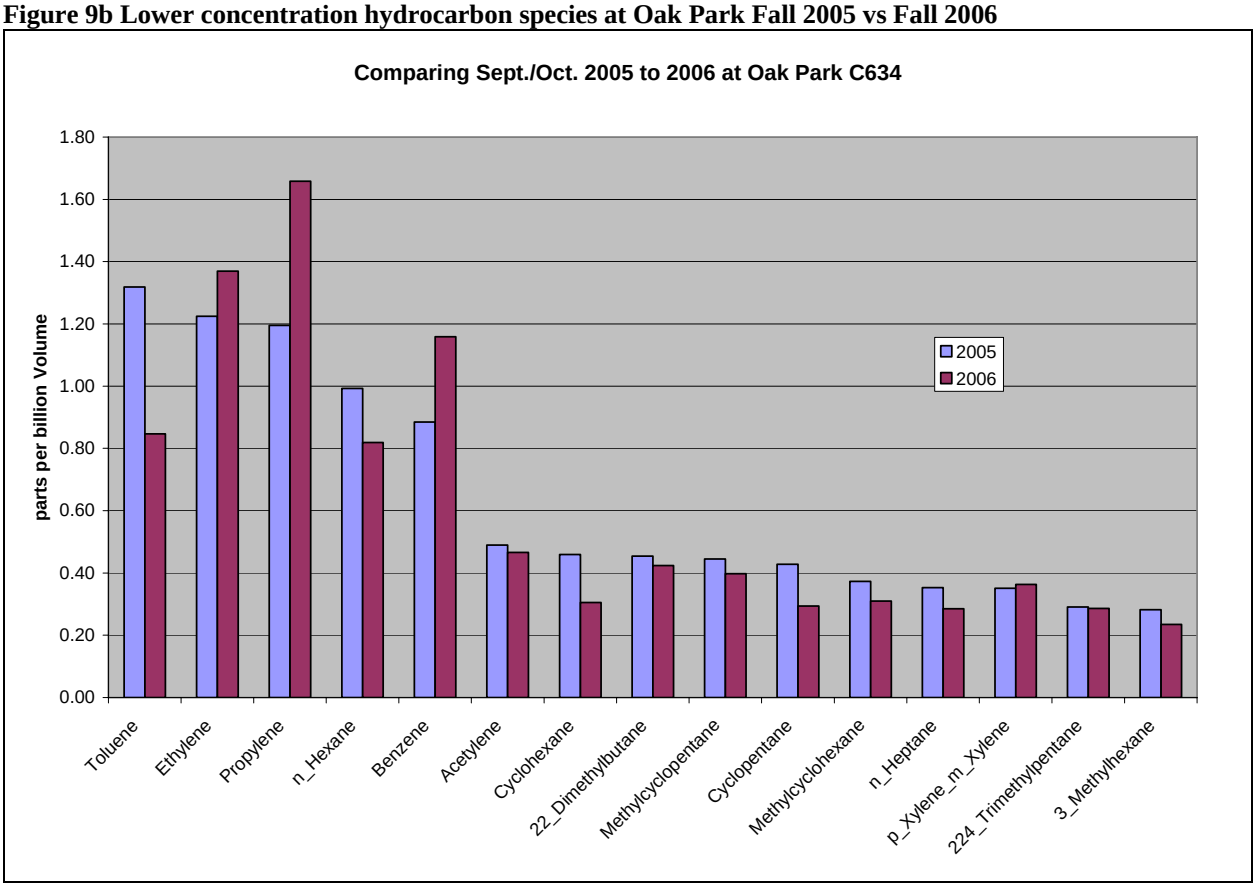


Figure 9b Lower concentration hydrocarbon species at Oak Park Fall 2005 vs Fall 2006



These are only the first steps to be taken in developing trend analyses. Subsequent work will be done to adjust the data for meteorological variation. In addition, as more past months of data are validated and more months of new data are collected, analyses will be repeated to more robustly assess trends.

Benzene Measured by Corpus Christi Auto-GCs

The auto-GC at Oak Park CAMS 634 (C634) has measured several one-hour benzene values higher than the TCEQ's one-hour ESL of 25 ppbV. The hourly observations of benzene plotted against date from March 2005 through October 2006 are shown in Figure 10, page 16, for Solar Estates C633 on the left and Oak Park C634 on the right. The graphs show that there are more measured concentrations above, say, 10 ppbV at Oak Park than at Solar Estates. Overall, the 12 month average from November 2005 through October 2006 is 0.74 ppbV at Oak Park and 0.32 ppbV at Solar Estates. For comparison, the annual ESL is 1.0 ppbV. Because these average values are small compared to the range of observations shown in Figure 10, page 16, it can be inferred that the vast majority of points are clustered relatively close to 0 in both graphs.

Figure 10 Time series of benzene at Solar (C633) and Oak Park (C634), ppbV units on y-axis

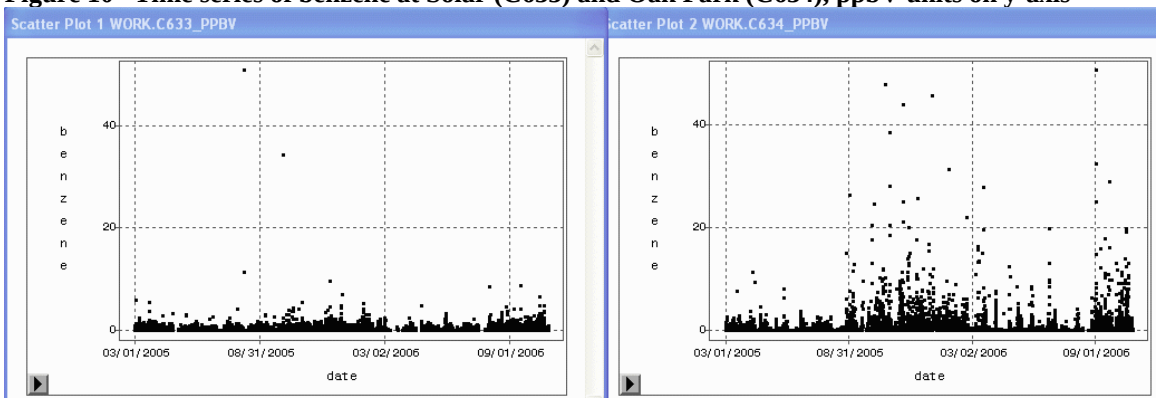


Figure 10, page 16, also suggests that at Oak Park the highest concentrations appear in the late and early parts of the year, as one can infer by noting the values above 20 ppbV between 8/31/2005 and 3/01/2005, and after 9/01/2006. (The tick marks are 183 days apart.) In Figure 11, page 17, the hourly observations are summarized into monthly mean and median statistics and are plotted against a "month/year" variable on the x-axis, with Solar Estates C633 on the left and Oak Park C634 on the right. (The tick marks are two months apart, covering 20 months from March 2005 – October 2006.) The peak average for Solar Estates to date is December 2005 for both the mean (0.5 ppbV) and median (0.35 ppbV), and the peak average for Oak Park is nearly tied between November and December 2005 (around 1.4 ppbV), with the median peak in December 2005 (0.7 ppbV).

Figure 11 Mean (red) and median (pink) benzene by month in ppbV units at Solar (C633) and Oak Park (C634)

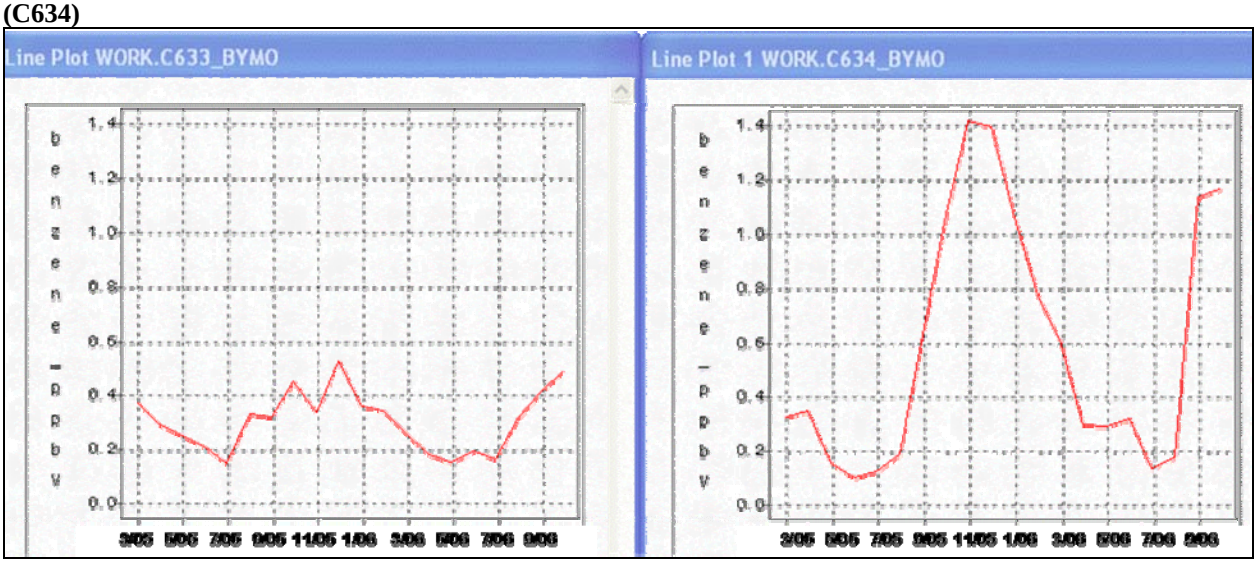


Figure 11, page 17, also shows that for Oak Park the mean concentrations by month in later 2006 months are generally higher compared to 2005. In Table 5, page 17, a side-by-side comparison of monthly means and medians appears for March through October. The larger of the pair for each month and statistic (mean or median) is bolded. At Solar Estates, there are small deviations on the order of 0.0-0.2 ppbV difference from month to month as far as which of the two years had higher mean or higher median. However, at Oak Park, September 2006 was 0.5 ppbV higher in mean concentration compared to a year earlier. The mean and median track each other at Solar Estates in Figure 11, page 17, but during the winter months a large gap grows between the mean and median at Oak Park, suggesting that many large outliers are affecting the mean. September may be especially susceptible to random changes in mean concentration for the following reason: a historical review of the wind direction pattern in Corpus Christi shows that in mid-September the area winds move from being predominantly southeasterly to more frequently northerly. A later or earlier onset of this change-over could have a large effect on how industrial emissions affect the monitor. A preliminary look at the wind direction data shows that about 7.5 percent of the September 2005 winds were northerly, but 17.1 percent of the September 2006 winds were northerly. Thus, all else equal, one would expect somewhat higher hydrocarbon measurements in September 2006 than September 2005.

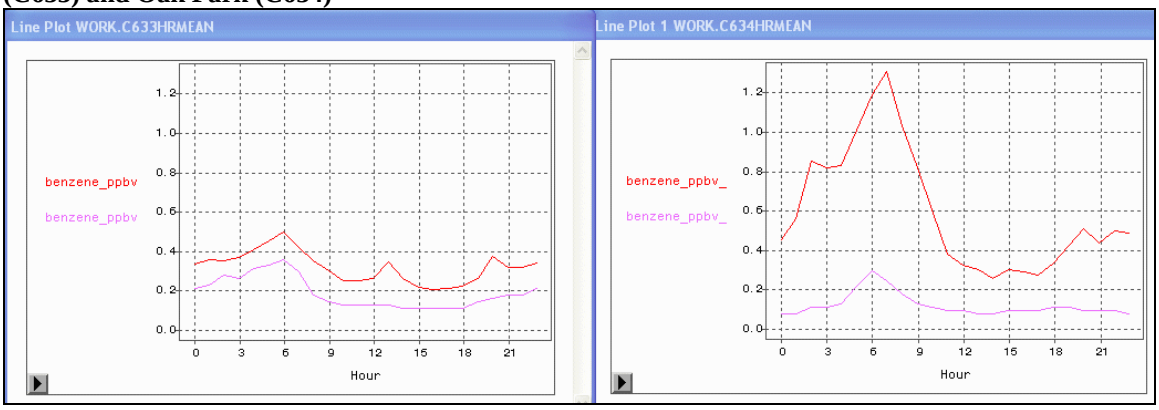
Table 5 Mean and median statistics for benzene in ppbV units by month and year

Solar Estates C633					Oak Park C634				
	mean		median			mean		median	
	2005	2006	2005	2006		2005	2006	2005	2006
March	**0.38**	0.26	**0.26**	0.11	March	0.33	**0.62**	**0.18**	0.10
April	**0.30**	0.19	**0.20**	0.07	April	**0.35**	0.30	**0.13**	0.08
May	**0.25**	0.16	**0.13**	0.08	May	0.16	**0.30**	0.07	**0.08**
June	**0.22**	0.20	**0.12**	0.10	June	0.11	**0.33**	0.03	**0.08**
July	0.15	**0.17**	0.05	**0.08**	July	0.13	**0.14**	0.05	0.05
August	**0.34**	0.32	0.13	0.13	August	**0.19**	0.18	0.05	0.05
Sept.	0.32	**0.42**	0.23	**0.27**	Sept.	0.63	**1.15**	0.12	**0.18**
Oct.	0.46	**0.49**	0.27	**0.30**	Oct.	1.08	**1.17**	**0.25**	0.22

Figure 12, page 18, shows the typical behavior of benzene over the course of a 24-hour period, with Solar Estates C633 on the left and Oak Park C634 on the right. (Tick marks are 3 hours apart.) These graphs were made by

calculating the mean and median hourly values by hour of the day (using Central Standard Time). The graphs show that in the middle of the day, the two sites both have mean concentrations around 0.3 ppbV and median concentrations around 0.1 ppbV, but evening and morning concentrations are much higher at Oak Park. This may be due to higher emissions affecting Oak Park, but there may also be effects from the monitor being sited closer to Corpus Christi Bay and the fact that nighttime inversions may be shallower there, trapping pollutants close to the ground.

Figure 12 Mean (red) and median (pink) benzene concentration in ppbV units by hour of the day at Solar (C633) and Oak Park (C634)



As was noted earlier, the explanation for higher concentrations at Solar Estates and Oak Park in the late/early parts of the year is that this is the period with more frequent northerly winds. There appear to be two source areas to the north affecting Oak Park compared to one affecting Solar Estates, which may play a role in more frequent higher concentrations at Oak Park. To assess the effects of wind direction on concentration measurements, the hourly data for the auto-GCs and coincident/collocated wind speed and direction resultant hourly data have been merged. In Figure 13, page 18, the mean and median benzene concentrations are graphed as a function of wind direction, where winds have been grouped into ten degree bins. Solar Estates' highest values are associated with sources centered near 50 degrees clockwise from north or roughly northeast (NE). Concentrations from this directions average close to 0.9 ppbV. Oak Park's highest values are associated with winds from around 20 degrees or roughly north-northeast (NNE), averaging 5 ppbV, with a second peak at 330 degrees or northwest (NW), averaging 2.8 ppbV. Aerial photographs of the areas around the two monitoring sites from the www.maps.google.com Web-site are shown in Figures 14 (Solar) and 15 (Oak Park), page 19. On each photo there are cones representing a 20 degree-wide upwind area centered on the key directions identified above.

Figure 13 Mean (red) and median (pink) benzene concentration in ppbV units by 10 deg. wind direction bin at Solar (C633) and Oak Park (C634)

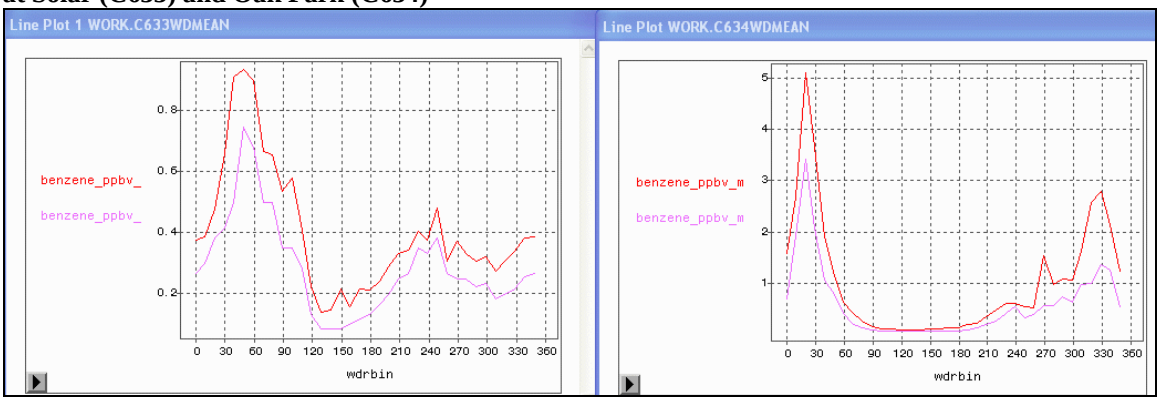


Figure 14 Aerial map at Solar with cone pointing to NE, peak general direction for benzene

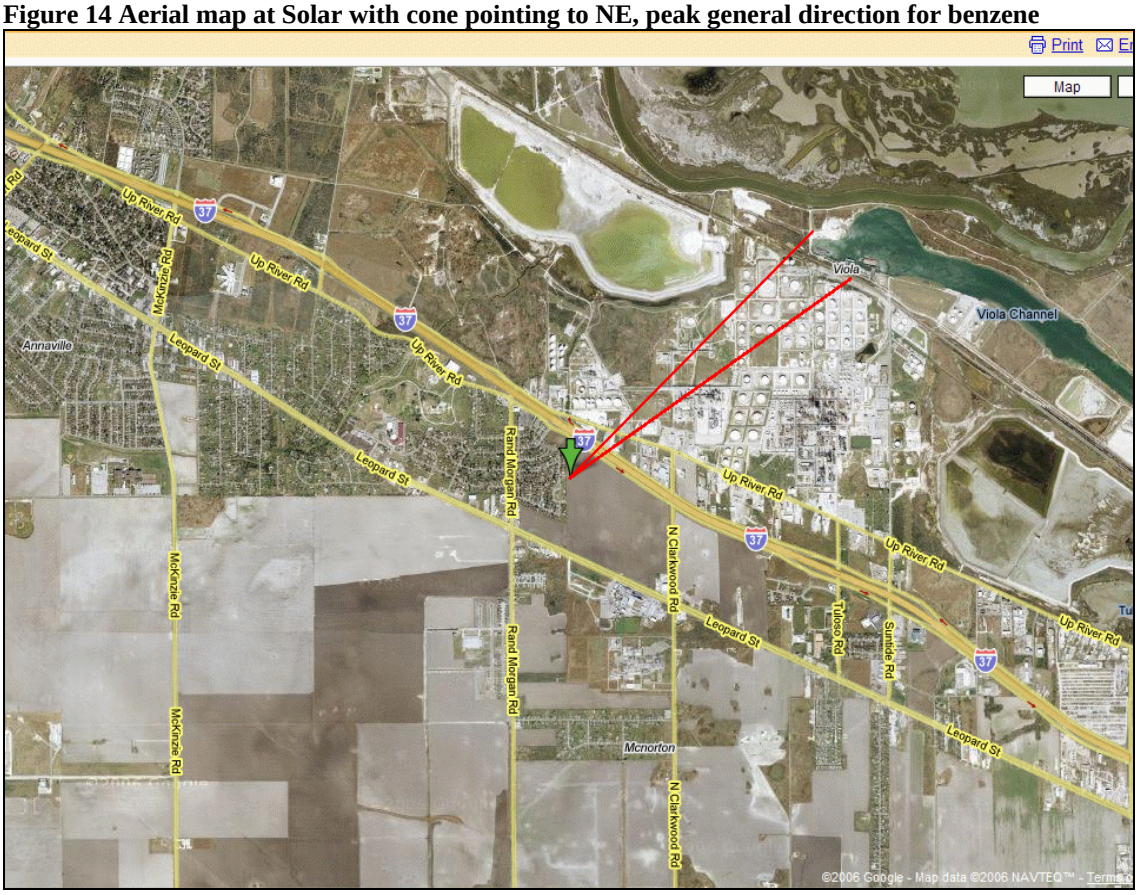
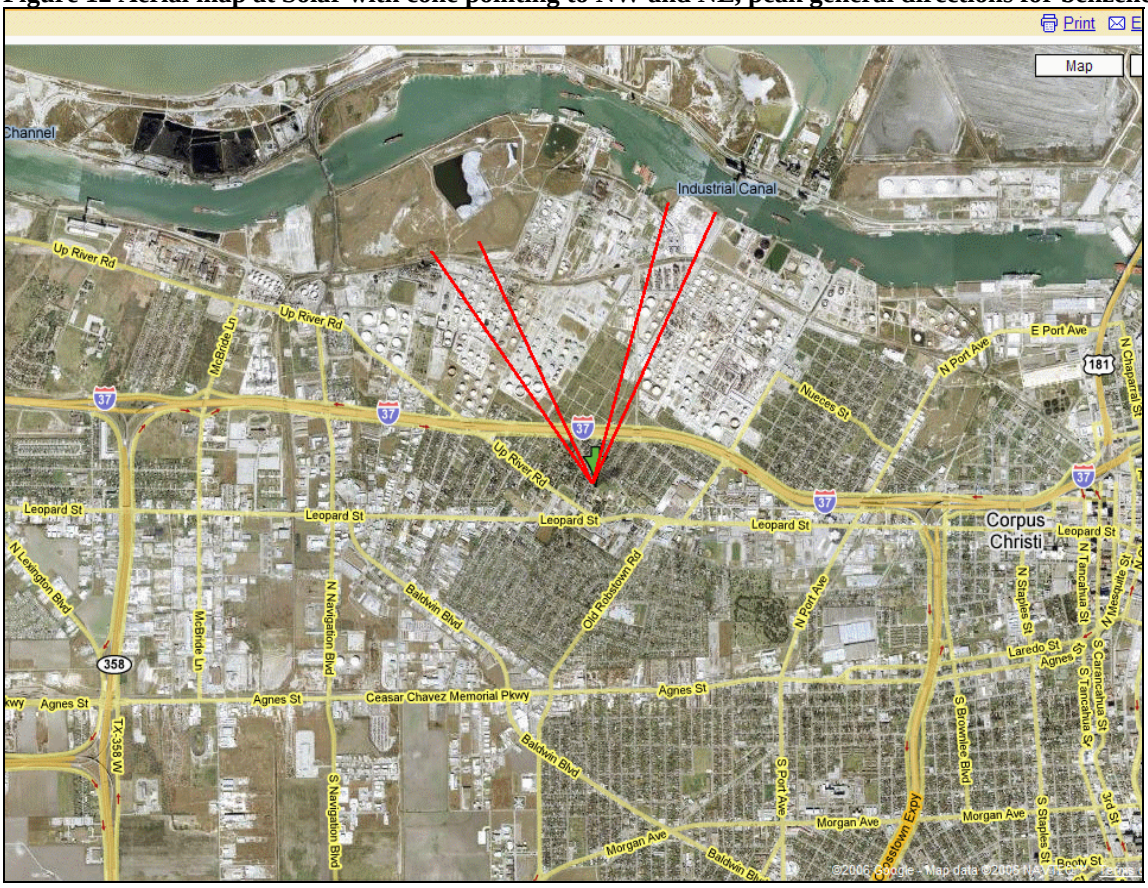
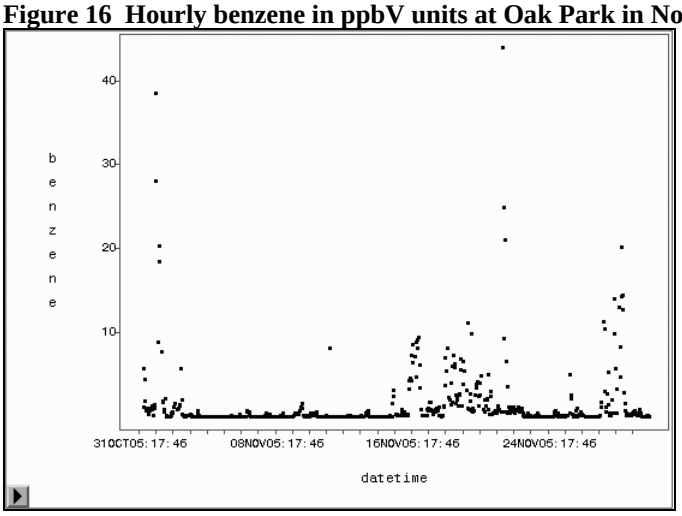


Figure 12 Aerial map at Solar with cone pointing to NW and NE, peak general directions for benzene



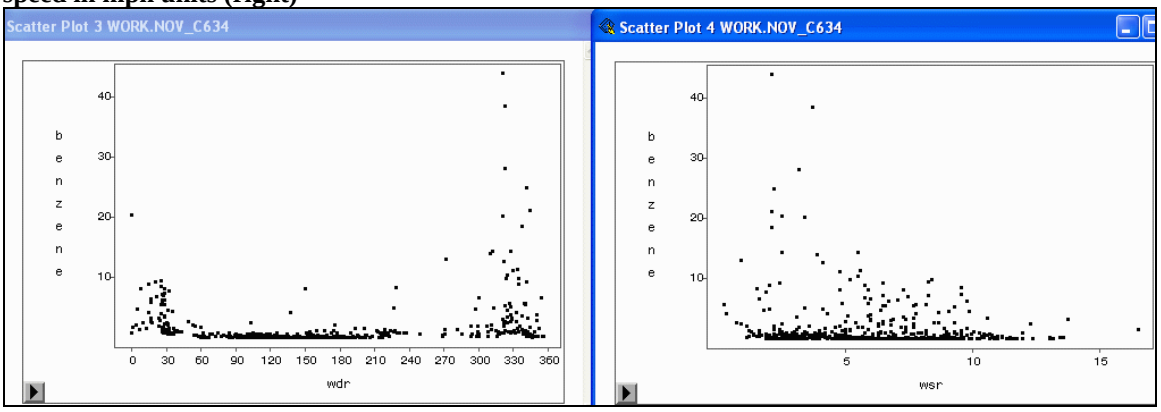
As was noted above, the highest monthly average benzene was recorded at Oak Park in November 2005, with a mean of 1.4 ppbV. The time series for this month alone appears in Figure 16, page 20. (Tick marks are every 24 hours.)

Figure 16 Hourly benzene in ppbV units at Oak Park in November 2005



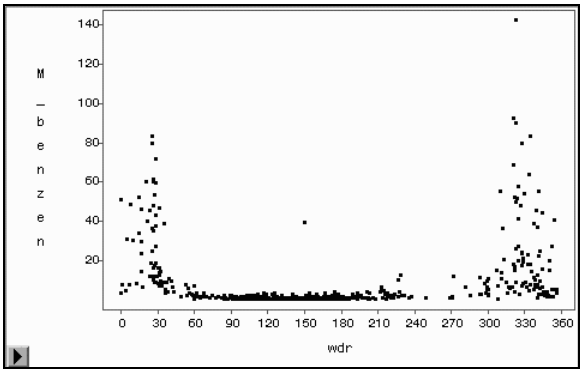
In this shorter time scale, with only some 600+ observations, one can more easily study the actual observations instead of summary statistics. In Figure 17, page 20, the scatterplots for benzene at Oak Park in November 2005 and coincident/collocated wind direction (wdr) on the left and wind speed (wsr, in miles per hour) on the right. Again, one observes the two modes in direction: one near 20 degrees and one near 330 degrees appear. In this month the highest levels are associated with the 330 degree direction, whereas in Figure 13, the 20 degree direction had the higher mean and median. One also observes that the highest concentrations are associated with low-speed winds.

Figure 17 Hourly Nov. 2005 Oak Park benzene in ppbV units vs wind direction in degrees (left) and wind speed in mph units (right)



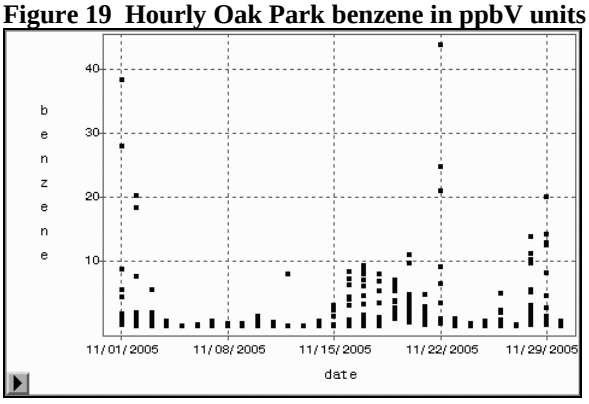
Often, in air quality research, pollutant concentrations are multiplied by the wind speed to partially correct for the dispersion and diffusion that normally occurs as a puff of polluted air moves along in the wind. In doing so, one is making a "first order correction" in trying to estimate what the upwind magnitude of emissions may have been. In applying this simple step to the November 2005 Oak Park data and graphing the product against wind direction, the graph in Figure 18, page 21, is produced. Interestingly, the higher wind speeds were apparently more associated with the NNE winds, because the observations of the product of speed times concentration from the NNE seem to be more on a par with the NW observations. This may suggest that the two source areas, if at similar upwind distances, may be closer in terms of emissions for this month than the concentrations suggest.

Figure 18 Product of benzene concentration times coincident wind speed vs wind direction, Nov. 2005 benzene at Oak Park



In Figure 19, page 21, the time series for November 2005 is simplified to graph all observations from a given day at the same point on the x-axis. Suppose one defines "elevated" benzene to be any concentration above 7 ppbV, which is ten times the current annual average concentration. Figure 19 page 21, allows one to easily identify days with prolonged elevated concentration, or series of such days. Thus, it appears that November 1-2, November 17-22, and November 28-29 all had periods of elevated benzene. Using the University of Texas Center for Energy and Environmental Resources Web-based back-trajectory tool, one can estimate the approximate potential upwind source areas.

Figure 19 Hourly Oak Park benzene in ppbV units plotted by day for Nov. 2005



In the next several pages, the one-hour back-trajectories from Oak Park on November 22, 2005 from midnight through 3 PM CST are shown in Figures 20-23, pages 21-25 respectively. They show the air flow changing hour by hour from westerly (00-06 CST) to northerly (07-14 CST) to easterly (15 CST). The hours with elevated benzene were 06, 07, 08, 09, 10 CST. The back-trajectory for 06 CST is at the top of the hour, and at 07 CST the winds had transitioned to the north. The sample was taken between 06 and 07, air samples having been time-tagged with the sample start time. The average wind direction during that hour was 322 degrees. Thus, the westerly trajectory labeled 06 CST and a northerly trajectory labeled 07 CST are consistent with an elevated benzene sample time tagged 06 CST. The air during this period appeared to have passed over the 330 degree NW direction identified earlier, consistent with the Valero East plant as a possible source. According to the TCEQ database on air emission events, however, there were no recoded events on Nov. 22.

The speciation of the samples taken on that day provides a visual of how the air looked different during the elevated benzene hours. The sample compositions are shown in Figure 24, page 26. Benzene appears in red. Hours 13 and 14 CST also have a strong benzene component under northerly winds, although the concentration was lower by that time. At hour 15 CST and later, winds had shifted to be easterly and later to be southeasterly.

Figure 20 Back-trajectories from Oak Park hours 00-03 CST on 11/22/05

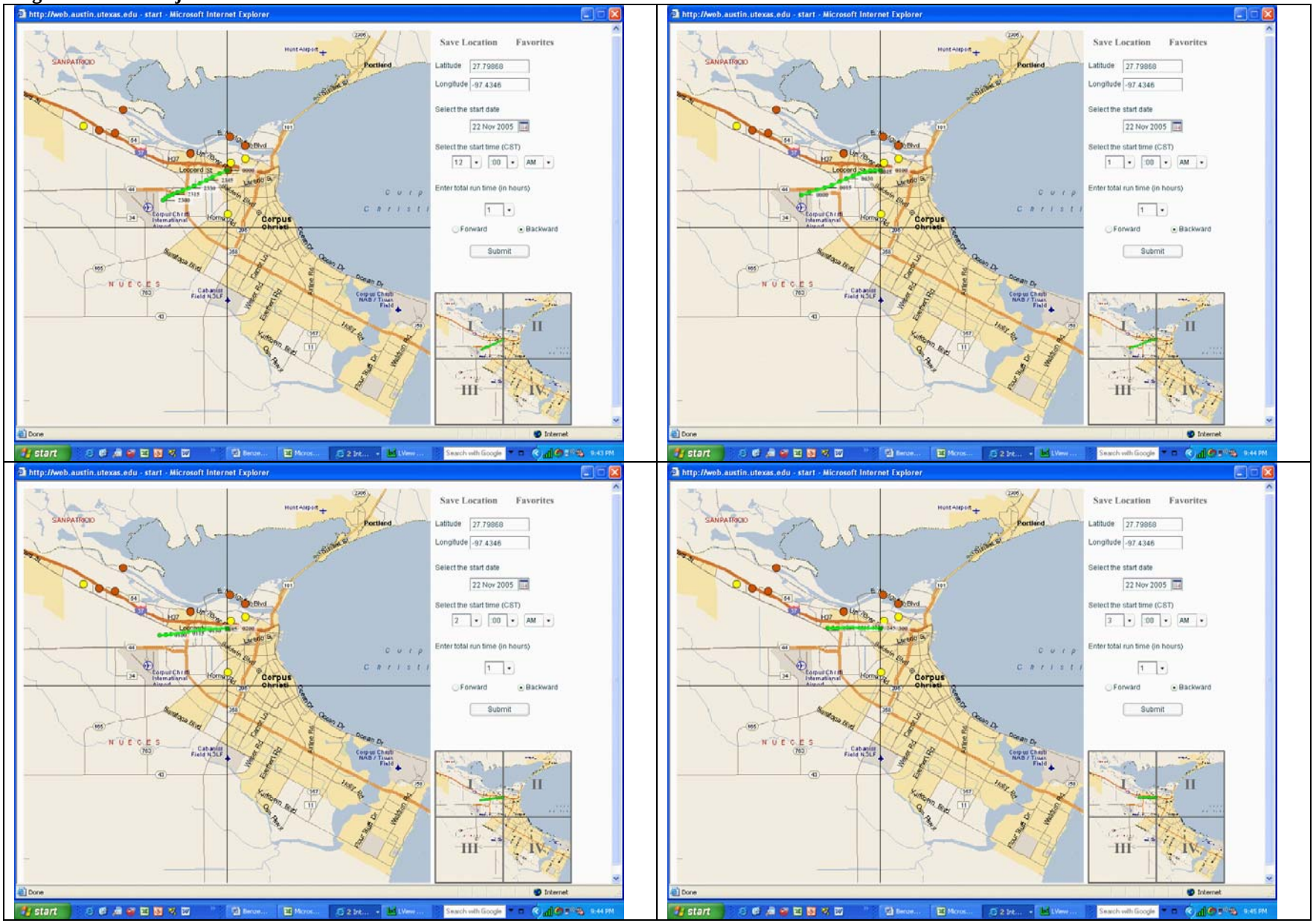


Figure 21 Back-trajectories from Oak Park hours 04-07 CST on 11/22/05

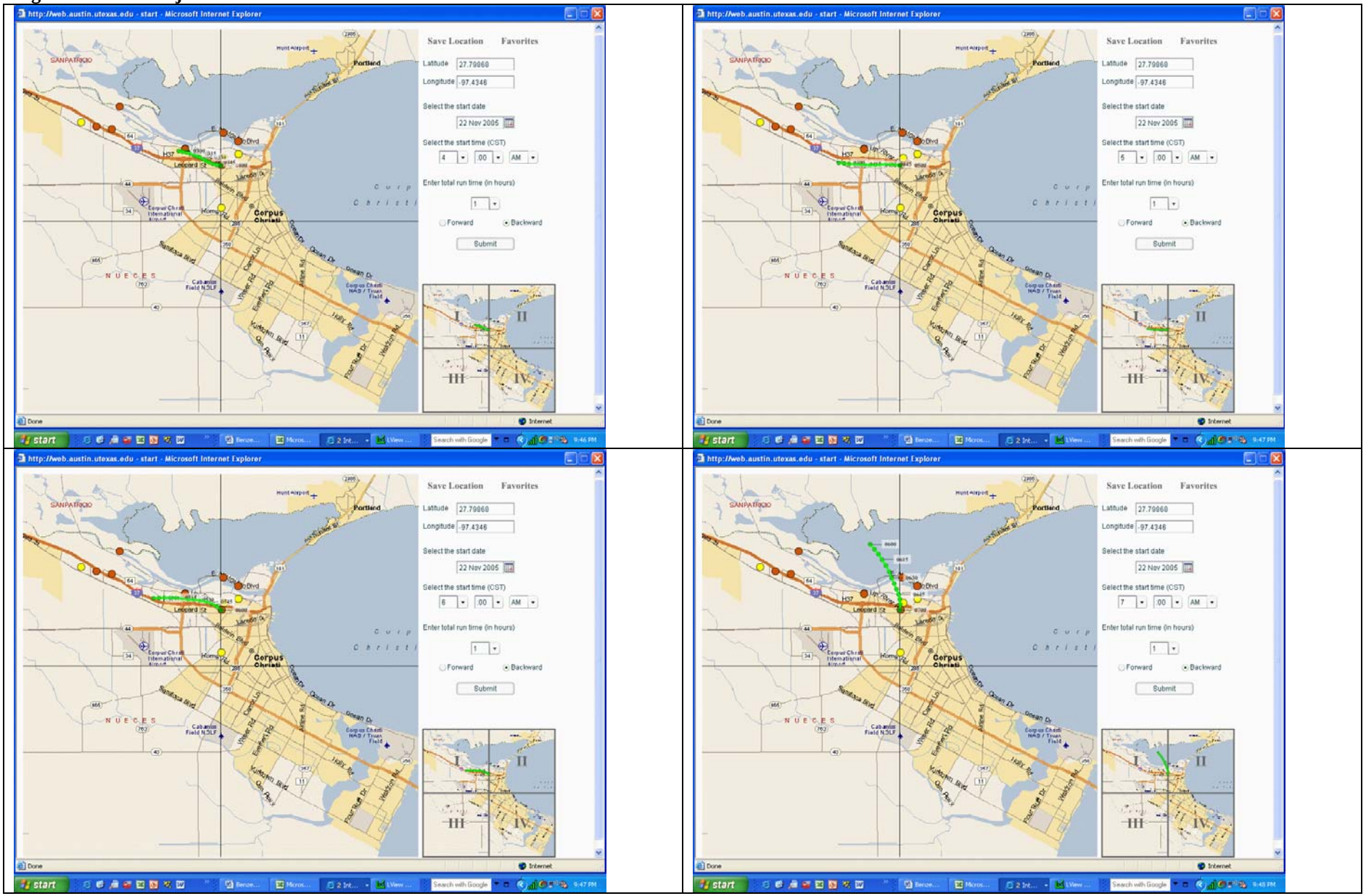


Figure 22 Back-trajectories from Oak Park hours 08-11 CST on 11/22/05

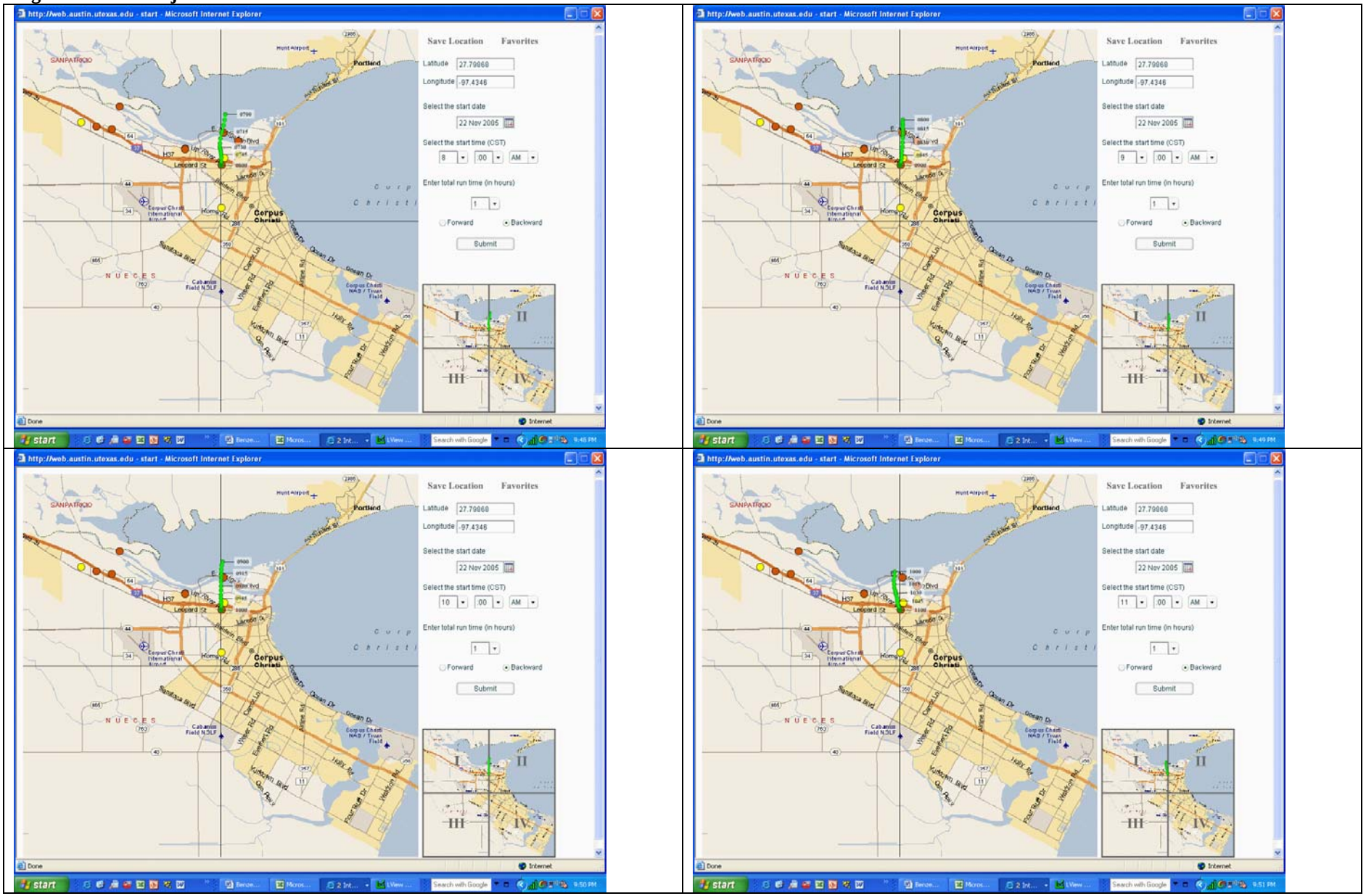


Figure 23 Back-trajectories from Oak Park hours 12-15 CST on 11/22/05

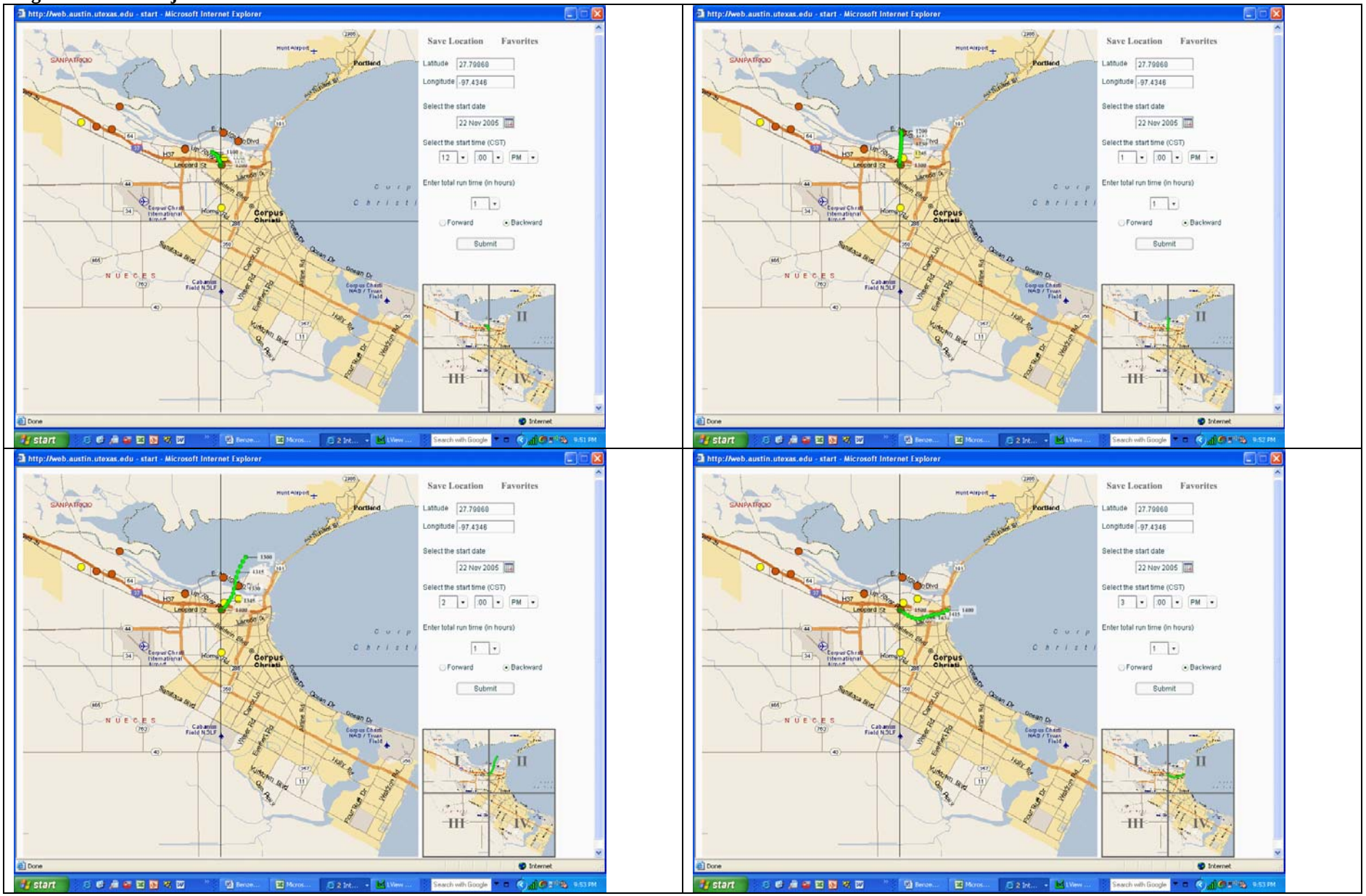
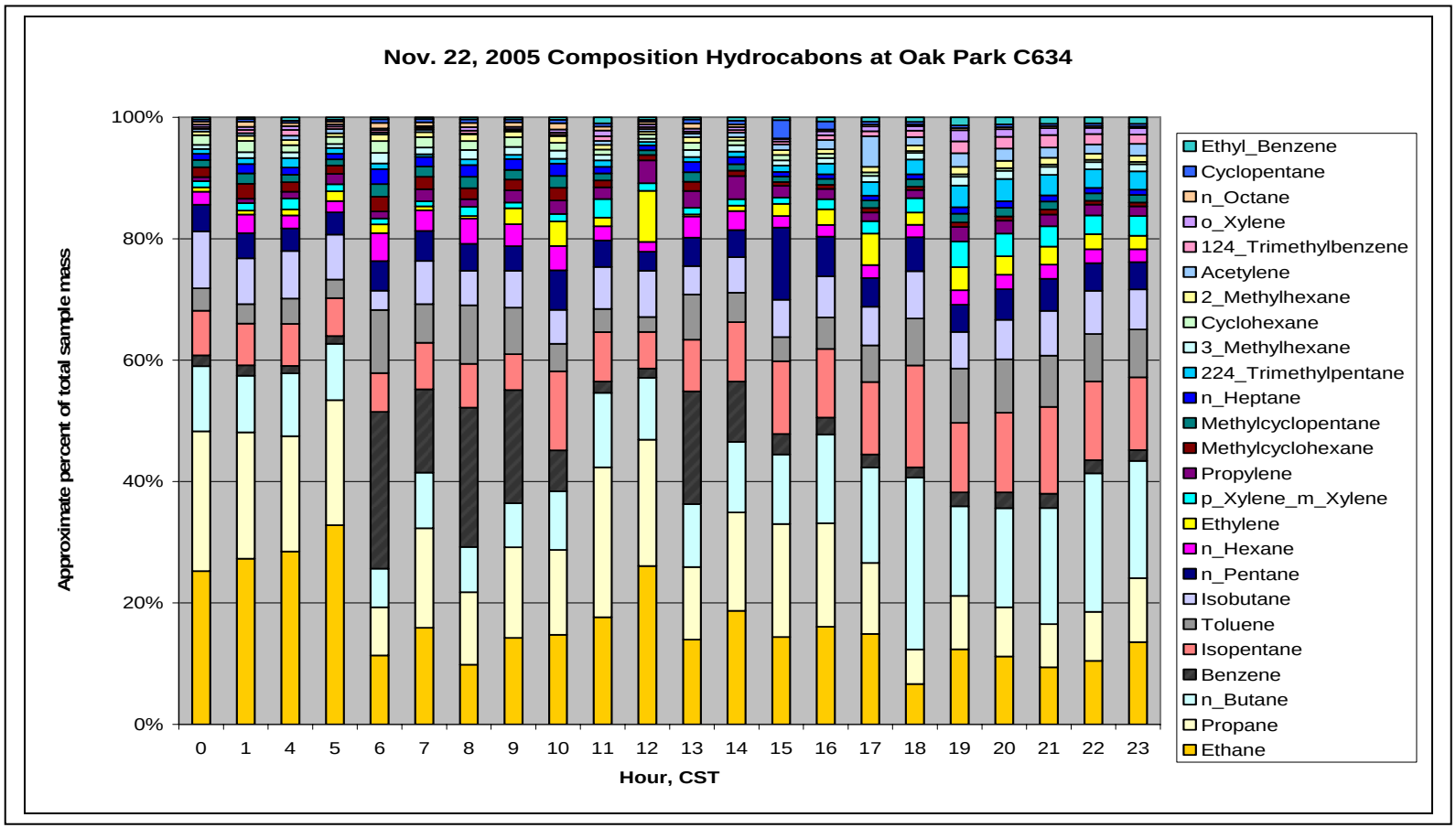


Figure 24 Composition of hourly samples – Benzene in stripes. Hours 2, 3 missing – daily quality assurance ru



APPENDIX B

Volunteer Advisory Board Members

CORPUS CHRISTI AIR MONITORING AND SURVEILLANCE CAMERA INSTALLATION AND OPERATIONS PROJECT

ADVISORY BOARD MEMBERS

Last Name	First Name	Affiliation/Organization	Area of Representation on the Board
ARNOLD	Gretchen (Ms.)	CC Pollution Prevention Partnership Texas A&M University	At-Large – Local Air Quality Issues *BOARD SPOKESPERSON*
BARNARD	Ron (Mr.)	Environmental Specialist City of Corpus Christi	Near Non-Attainment Area Liaison – Instrumentation / Local Air Quality Issues *BOARD SPOKESPERSON*
BILLIOT	Eugene (Dr.)	Asst. Professor Analytical Chemistry Texas A&M University	Technical Support to the Board / Instrumentation
BURGIN, Jr.	William (M.D.)	Physician – Corpus Christi-Nueces County Public Health District	Local Public Health / Local Air Quality Issues
JARMON	Joyce (Ms.)	Corpus Christi Community Council	At-Large – Community Representation
KNESEK	Charlotte (Ms.)	Corpus Christi Community Advisory Committee and Coastal Bend Emergency Planning Commission	At-Large – Community Representation
KOST	Glen (Dr.)	Public Health Awareness Group	At-Large- Community Representation
SUTER	Pat (Ms.)	Coastal Bend Sierra Club	Local Advocacy Group / Local Air Quality Issues

I. Ex-Officio Members

AISLING	Kathleen (Ms.)	Environmental Protection Agency (EPA) Region 6 - Dallas
BRYMER	David (Mr.)	Texas Commission on Environmental Quality (TCEQ) – Headquarters - Austin
ROZACKY	Ken (Mr.)	Texas Commission on Environmental Quality (TCEQ) – Headquarters - Austin
TURNER	David (Mr.)	Texas Commission on Environmental Quality (TCEQ) – Region 14 - CC
CLEWIS	Susan (MS.)	Texas Commission on Environmental Quality (TCEQ) – Region 14 - CC

APPENDIX C

Financial Report of Expenditures
Financial Report of Interest Earned

Corpus Christi Air Monitoring and Surveillance Camera Installation and Operation Project

Accounting Report for the Quarter
07/01/06-09/30/06

A. Total Amount of COCP Funds and Other Funds Received Under This Proposal

Total Grant Amount:	$6,761,718.02
Total Interest Earned:	$385,672.80
Total Funds Received:	**$7,147,390.82**

B. Summary of Expenditures Paid by COCP Funds

		Year 3 Budget	Year 3 Adjustments	Adjusted Budget	Prior Activity	Current Activity 7/01/06-9/30/06	Encumbrances	Remaining Balance 9/30/2006
Salaries-Prof	**12**	$240,935.00	(24,806.37)	$216,128.63	($111,714.70)	($51,662.99)	$0.00	$52,750.94
Salaries-CEER	**15**	$4,800.00	14,806.37	$19,606.37	($13,443.54)	($6,039.37)	($25.24)	$98.22
Fringe	**14**	$47,984.00	0.00	$47,984.00	($24,708.00)	($10,523.92)	($917.02)	$11,835.06
Supplies	**47/68**	$10,000.00	50,474.00	$60,474.00	($22,220.00)	($3,590.00)	$0.00	$34,664.00
Other	**50**	$126,044.00	(39,200.00)	$86,844.00	($43,558.96)	($11,516.51)	($7,247.08)	$24,521.45
Subcontract	**62-64**	$1,827,563.00	138,130.00	$1,965,693.00	($1,761,597.97)	($47,119.12)	$0.00	$156,975.91
Travel	**75**	$2,000.00	300.00	$2,300.00	($1,520.16)	$0.00	($0.06)	$779.78
Equipment	**80**	$45,000.00	(45,000.00)	$0.00	$0.00	$0.00	$0.00	$0.00
Indirect Costs	**90**	$345,649.00	14,206.00	$359,855.00	($287,806.35)	($19,567.79)	$0.00	$52,480.86
TOTALS		**$2,649,975.00**	**108,910.00**	**$2,758,885.00**	**($2,266,569.68)**	**($150,019.70)**	**($8,189.40)**	**$334,106.22**

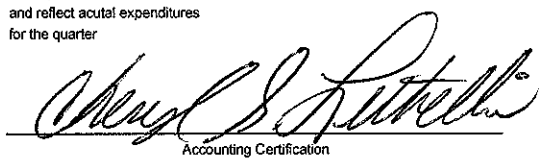
C. Interest Earned by COCP Funds as of 9/30/06

Prior Interest Earned:	$344,745.41
Interest Earned This Quarter:	$40,927.39
Total Interest Earned to Date:	**$385,672.80**

D. Balance of COCP Funds as of 9/30/06

Total Grant Amount:	$6,761,718.02	
Total Interest Earned:	$385,672.80	
Total Expenditures:	($2,416,589.38)	
Remaining Balance:	**$4,730,801.44**	*includes interest

I certify that the numbers are accurate
and reflect acutal expenditures
for the quarter



Accounting Certification