Corpus Christi Air Monitoring and Surveillance Camera Installation and Operation Project

Quarterly Report for the Period

July 1, 2008 through September 30, 2008

Submitted to

The Honorable 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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November 21, 2008

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 (UT Austin) 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, 2008 has been directed to the following activities.

A. Operations and Maintenance Phase of the Project

A detailed description of the data analyses for this quarter appears in Appendix A, pages 6 through 29, and a summary of these analyses appear in this section.

The Project consists of a network of seven (7) air monitoring stations with air monitoring instruments and surveillance camera equipment. A map showing locations of COCP Project monitoring sites along with TCEQ sites and sites operated by Texas A&M at Kingsville (TAMUK) appears in Figure 1, below. Table 1, page 3, identifies the location and instrumentation found at each of the COCP Project sites. TCEQ and TAMUK sites provide some additional data used in analyses.

Figure 1. Corpus Christi Monitoring Sites

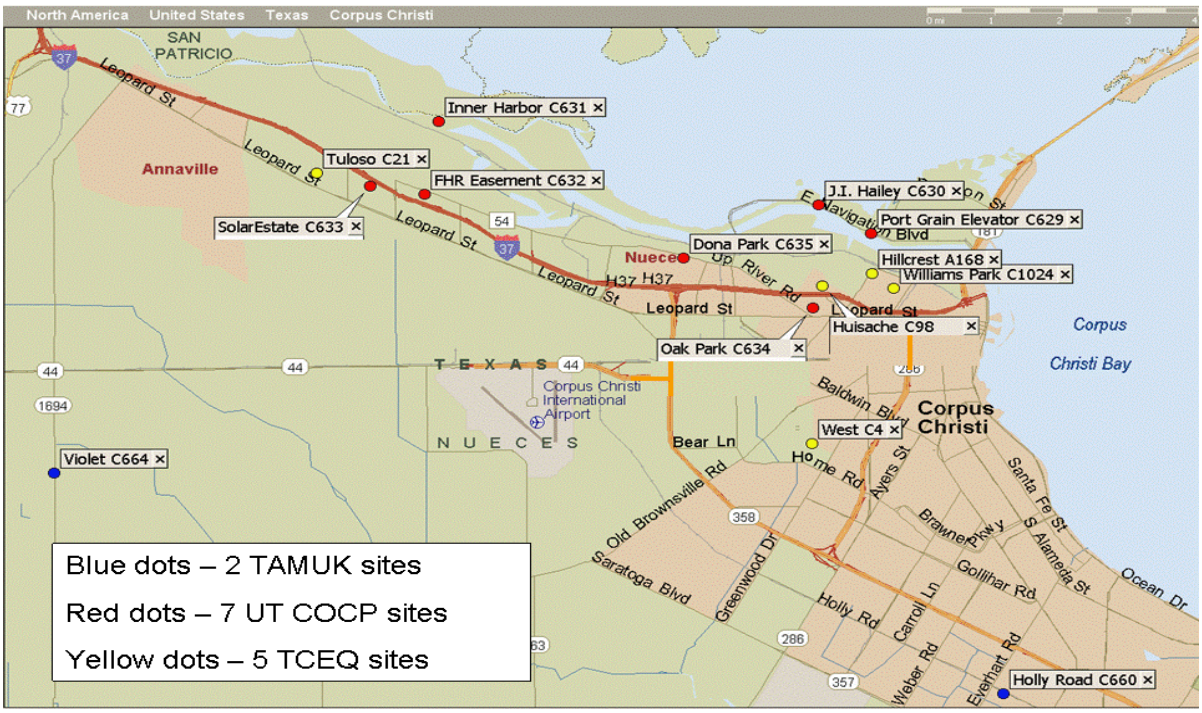

Table 1. Schedule of Air Monitoring Sites, Locations and Major Instrumentation

TCEQ CAMS Nos.	Description of Site Location	Monitoring Equipment				
		Auto GC	TNMHC(T) & Canister(C)	H2S & SO2	Met Station	Camera
634	Oak Park Recreation Center	Yes	T		Yes	
629	Grain Elevator @ Port of Corpus Christi		T&C	Yes	Yes	
630	J. I. Hailey Site @ Port of Corpus Christi		T&C	Yes	Yes	
635	TCEQ Monitoring Site C199 @ Dona Park		T&C	Yes	Yes	Yes
631	Port of Corpus Christi on West End of CC Inner Harbor		T&C	Yes	Yes	
632	Off Up River Road on Flint Hills Resources Easement		T&C	Yes	Yes	
633	Solar Estates Park at end of Sunshine Road	Yes	T	Yes	Yes	Yes

Legend

Auto GC	automated gas chromatograph
TNMHC	total non-methane hydrocarbon analyzer (all except 634 & 633 also have canister hydrocarbon samplers)
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

A discussion of data findings for the quarter appears in Appendix A, pages 6 though 29. Specifically, the appendix contains the following elements:

- **Auto-GC Effects Screening Level Summary -** In examining the third quarter's hourly auto-GC data from Oak Park and Solar Estates, no measurements were found to have exceeded a short-term Reference Value or ESL. Also, the quarterly averages of all species were below the respective annual ESLs, as were the rolling averages over the past four quarters. A summary appears in Appendix A, page12.

- **Analysis of Two Monitored Air Pollution Events** – A pair of short case studies are provided as examples of the use of the data. These events are discussed further in Appendix A, pages 13 though 16.

- **Benzene Trend at Oak Park** – As was discussed last quarter, benzene concentrations appear to be lower than in earlier years. A close look is taken at benzene concentrations at Oak Park in concert with wind speeds and directions,

leading to a hypothesis that upwind emissions may have declined. See pages 17 through 28 in Appendix A.

B. Project Management and Planning

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

1. **Air Monitoring Operations**
   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 and Reporting**
   The status of the Project has been communicated through the website, which is operational with portions under continual development, quarterly and annual reports, and at meetings of the Project's 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 in Appendix C, page 40.

4. **Other Contributions**
   There were no other contributions awarded 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 31.

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

The COCP funds received through September 30, 2008 totals $7,413,031.36. This total includes interest earned through September 30, 2008.

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

Expenditures of COCP funds during this quarter totaled $248,191.99. The detailed breakdown of the actual expenditures is included in Appendix C, page 31. The activities for which these expenditures were used are detailed in Section II, beginning on page 2 of this report.

C. Total Interest Earned on COCP Funds During the Quarter

The interest earned during this quarter totaled $24,198.45. 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 31.

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D. Balance as of June 30, 2008, in the COCP Account

The balance in the COCP account, including interest earned totals $3,310,065.64.

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

The projected expenditures for the funds remaining totals $3,310,065.64.

Quarterly Report Distribution List:

U.S. District Court

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Environmental Protection Agency

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

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APPENDIX A

Data Analysis for Corpus Christi Quarterly Report

July 1, 2008 through September 30, 2008

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Data Analysis for Corpus Christi Quarterly Report

This technical report describes recent results of monitoring and analysis of data under the Corpus Christi Air Quality Project over the period from July 1 through September 30, 2008. The monitoring network is shown in Figure 1, page 2, and is described in Table 1 below. This report contains the following elements:

- a summary of hourly speciated hydrocarbon concentrations measured by automated gas chromatographs (auto-GCs);
- a case study of the use of data to assess air pollution events;
- a report on changes in benzene concentrations at Oak Park.

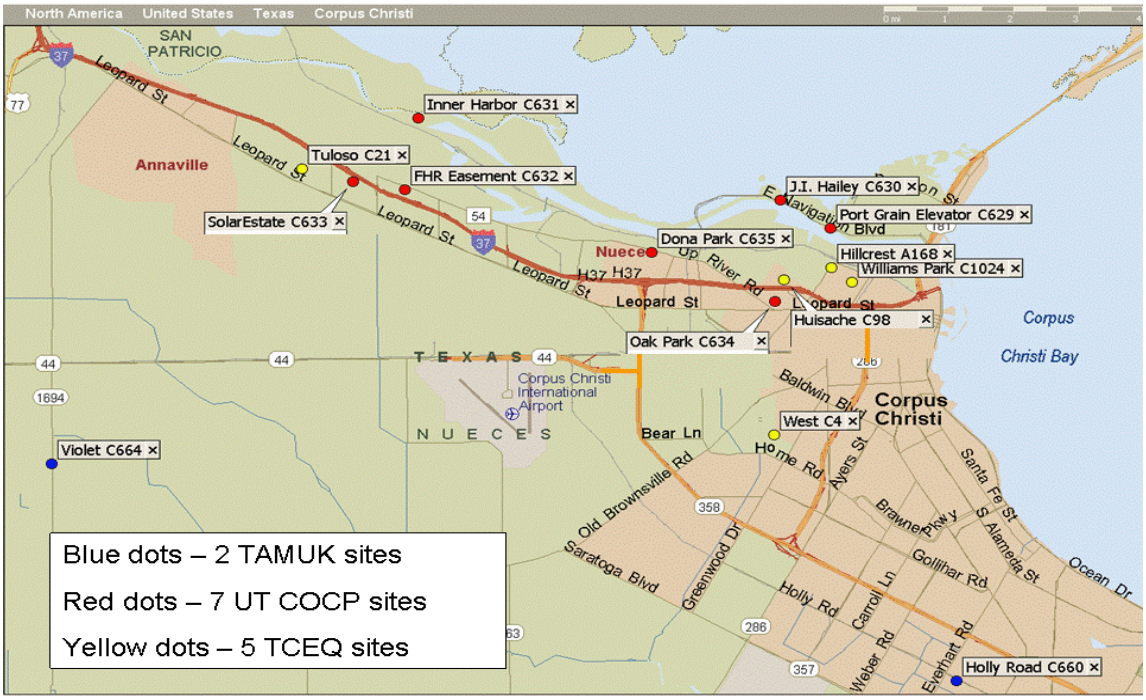
Table 1. Schedule of Air Monitoring Sites, Locations and Major Instrumentation

TCEQ CAMS#	Description of Site Location	Monitoring Equipment				
		Auto GC	TNMHC (T) / Canister (C)	H_2S & SO_2	Met Station	Camera
634	Oak Park Recreation Center (**OAK**)	Yes	T		Yes	
629	Grain Elevator @ Port of Corpus Christi (**CCG**)		T&C	Yes	Yes	
630	J. I. Hailey Site @ Port of Corpus Christi (**JIH**)		T&C	Yes	Yes	
635	TCEQ Monitoring Site C199 @ Dona Park (**DPK**)		T&C	Yes	Yes	Yes
631	Port of Corpus Christi on West End of CC Inner Harbor (**WEH**)		T&C	Yes	Yes	
632	Off Up River Road on Flint Hills Resources Easement (**FHR**)		T&C	Yes	Yes	
633	Solar Estates Park at end of Sunshine Road (**SOE**)	Yes	T	Yes	Yes	Yes

Legend

Auto GC	automated gas chromatograph
TNMHC	total non-methane hydrocarbon analyzer (all except 633 & 634 also have canister hydrocarbon samplers)
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

Figure 2. Corpus Christi Monitoring Sites



Glossary of terms

- **Pollutant concentrations** – Concentrations of most gaseous pollutants are expressed in units denoting their "mixing ratio" in air; i.e., the ratio of the number molecules of the pollutant to the total number of molecules per unit volume of air. Because concentrations for all gases other than molecular oxygen, nitrogen, and argon are very low, the mixing ratios are usually scaled to express a concentration in terms of "parts per million" (ppm) or "parts per billion" (ppb). Sometimes the units are explicitly expressed as ppm-volume (ppmV) or ppb-volume (ppbV) where 1 ppmV indicates that one molecule in one million molecules of ambient air is the compound of interest and 1 ppbV indicates that one molecule in one billion molecules of ambient air is the compound of interest. In general, air pollution standards and health effects screening levels are expressed in ppmV or ppbV units. Because hydrocarbon species may have a chemical reactivity related to the number of carbon atoms in the molecule, mixing ratios for these species are often expressed in ppb-carbon (ppbV times the number of carbon atoms in the molecule), to reflect the ratio of carbon atoms in that species to the total number of molecules in the volume. This is relevant to our measurement of auto-GC species and TNMHC, which are reported in ppbC units. For the purpose of relating hydrocarbons to health effects, this report notes hydrocarbon concentrations in converted ppbV units. However, because TNMHC is a composite of all species with different numbers of carbons, it cannot be converted to ppbV. Pollutant concentration measurements are time-stamped based on the start time of the sample, in Central Standard Time (CST), with sample duration noted.

- **Auto-GC** - The automated gas chromatograph collects a sample for 40 minutes, and then automatically analyzes it for some 47 hydrocarbon species. These include benzene and 1,3-butadiene, which are air toxics, various butene species that have relatively low odor thresholds, and a range of gasoline and vehicle exhaust components. Auto-GCs operate at Solar Estates CAMS 633 and Oak Park CAMS 634.

- **Total non-methane hydrocarbons** (TNMHC) – TNMHC represent a large fraction of the total volatile organic compounds released into the air by human and natural processes. TNMHC is an unspeciated total of all hydrocarbons, and individual species must be resolved by other means, such as with canisters or auto-GCs. However, the time resolution of the TNMHC instrument is much shorter than the auto-GC, and results are available much faster than with canisters. TNMHC analyzers operate at all seven UT/CEER sites.

- **Canister** – Stainless steel canisters are filled with air samples when an independent sensor detects that elevated (see below) levels of hydrocarbons (TNMHC) are present. Samples are taken for various lengths of time (generally 20 minutes) to try to capture the chemical make-up of the air. In most cases, the first time on any day that the monitored TNMHC concentration exceeds 2000 ppbC at a site for a continuous period of 15 minutes or more, the system will trigger and a sample will be collected. Samples are sent to UT Austin and are analyzed in a lab to resolve some 60 hydrocarbon and12 chlorinated species. Canister samplers have operated at all seven UT/CEER sites, but currently only at five (CAMS 629,630,631,632, and 635).

- **Effects Screening Levels (ESLs) and Reference Values (ReVs) –** The definitions and details about the use of ESLs and ReVs appear in the "RG-442" regulations guidance document *Guidelines to Develop Effects Screening Levels, Reference Values, and Unit Risk Factors*, found at http://www.tceq.state.tx.us/files/rg-442.pdf_4006501.pdf (Accessed January, 2008). Extracts from this document appear below:

  > *1.1 Legal Authority and Regulatory Use:* The Texas Clean Air Act (Chapter 382 of the Texas Health and Safety Code (THSC)) authorizes the TCEQ to prevent and remedy conditions of air pollution. Section 382.003 of the THSC defines air pollution as
  >
  > *the presence in the atmosphere of one or more air contaminants or combination of air contaminants in such concentration and of such duration that:*
  > - *are or may tend to be injurious to or to adversely affect human health or welfare, animal life, vegetation, or property; or*
  > - *interfere with the normal use and enjoyment of animal life, vegetation, or property.*
  >
  > Sections 382.0518 and 382.085 of the THSC specifically mandate the TCEQ to conduct air permit reviews of all new and modified facilities to ensure that the operation of a proposed facility will not cause or contribute to a condition of air pollution. Air permit reviews typically involve evaluations of best available control technology and predicted air concentrations related to proposed emissions from the new or modified facility. In the review of proposed emissions, federal/state standards and chemical-specific **Effects Screening Levels** (ESLs) are used, respectively, for criteria and non-criteria pollutants. Because of the comprehensiveness of the language in the THSC, ESLs are developed for as many air contaminants as possible, even for chemicals with limited toxicity data.

> Air contaminants may cause both direct and indirect effects. Direct effects are those that result from direct inhalation and dermal exposures to chemicals in air. Deposition of contaminants on soil and water—and subsequent uptake by plants and animals—may cause indirect effects in humans who consume those plants and animals. However, the THSC authorizes the prevention and remedy of air pollution based on effects and interference from contaminants *present in the atmosphere*, i.e., direct effects. Therefore, during the air permitting process, the TCEQ does not set air emission limits to restrict, or perform analysis to determine, the impacts emissions may have, by themselves or in combination with other contaminants or pathways, after being deposited on land or water or incorporated into the food chain. However, indirect effects are assessed during cleanup efforts under the Risk Reduction and Texas Risk Reduction Program Rules, described below.
>
> The TCEQ also relies upon this authority to evaluate air monitoring data. Texas has the largest ambient air toxics monitoring network in the country, receiving monitoring data for up to 186 air toxics at approximately 57 different locations throughout the state. **Reference Values** (ReVs) and **Unit Risk Factors** (URFs) are used to evaluate measured air toxics concentrations for their potential to cause health and welfare effects, as well as to help the agency prioritize its resources in the areas of permitting, compliance, and enforcement.
>
> *Sec. 1.7 Use of ESLs, ReVs, and URFs in TCEQ Program Areas:* The TS [Toxicology Section] develops ESLs, ReVs, and URFs to provide toxicological support to multiple program areas within the TCEQ… In the air permit review process, the TS utilizes short- and long-term ESLs to evaluate proposed emissions for their potential to adversely affect human health and welfare. For evaluation of ambient air monitoring results, acute and chronic ReVs and URFs are used to assess the potential for exposure to the measured concentrations to cause human health effects. To assess potential welfare effects for monitoring results, the TS uses odor- and vegetation-based ESLs.

The TCEQ Toxicology Section is continuing long-term analysis of these thresholds and persons may subscribe to an e-mail listserv for updates at the Web site http://www.tceq.state.tx.us/implementation/tox/esl/ESLMain.html (accessed January 2008).

The current ESLs for benzene are 55.5 ppbV for short term and 1.4 ppbV for long term exposure. TCEQ has recommending using the ReV for short term assessments of benzene concentrations. This number is 180 ppbV. Thus, only when individual auto-GC one-hour values or canister 20-minute values for benzene exceed 180 ppbV will a short-term "exceedance" for benzene be noted.

- **Elevated Concentrations –** In the event that measured pollutant concentrations are above a set threshold they are referred to as "elevated concentrations." The values for these thresholds are summarized by pollutant below. As a precursor to reviewing the data, the reader should understand the term "*statistical significance*". In the event that a concentration is higher than one would typically measure over, say, the course of a week, then one might conclude that a specific transient assignable cause may have been the pollution source, because experience shows the probability of such a measurement occurring under normal operating conditions is small. Such an event may be labeled "statistically significant" at level 0.01, meaning the observed event is rare enough that it is not expected to happen more often than once in 100 trials. This does not necessarily imply the occurrence of a violation of a health-based standard. A discussion of "elevated concentrations" and "statistical significance by pollutant type follows:

- For H_2S or SO_2, any measured concentration greater than the level of the state residential standards, which are 80 ppb for H_2S and 400 ppb for SO_2, is considered "elevated." Note that the concentrations need not persist long enough to constitute an exceedance of the standard to be so regarded. In addition, any closely spaced values that are statistically significantly (at 0.01 level) greater than the long-run average concentration for a period of one hour or more will be considered "elevated" because of their unusual appearance, as opposed to possible health consequence. The rationale for doing so is that unusually high concentrations at a monitor may suggest the existence of unmonitored concentrations closer to the source area that are potentially above the state's standards.
- For TNMHC, any measured concentration greater then the canister triggering threshold of 2000 ppbC is considered "elevated." Note that the concentrations need not persist long enough to trigger a canister (900 seconds).
- For benzene and other air toxics in canister samples or auto-GC measurements, any concentration above the ReV is considered "elevated." Note that 20-minute canister samples and 40-minute auto-GC measurements are both compared with the ReV or ESL, whichever is deemed appropriate by the TCEQ.
- Some hydrocarbon species measured in canister samples or by the auto-GC generally appear in the air in very low concentrations close to the method detection level. Similar to the case above with H_2S and SO_2, any values that are statistically significantly (at 0.01 level) greater than the long-run average concentration will be considered "elevated" because of their unusual appearance, as opposed to possible health consequence. The rationale for doing so is that unusually high concentrations at a monitor may suggest an unusual emission event in the area upwind of the monitoring site.

1. Auto-GC Data Summaries in Residential Areas

In this section the results of semi-continuous sampling for hydrocarbons at the two auto-GC sites – Solar Estates C633 and Oak Park C634 – are presented. These two sites are located in residential areas generally downwind of industrial emissions under northerly winds. In examining aggregated data one observes similar patterns of hydrocarbons at the two sites, with concentrations averaging higher at Oak Park than at Solar Estates.

Tables 2 and 3, pages 13 and 14, summarize data from the third quarter of 2008. Similarly, Tables 4 and 5, pages 15 and 16, summarize four quarters of data from October 1, 2007 – September 30, 2008. These tables are available to TCEQ staff at http://rhone.tceq.state.tx.us/cgi-bin/agc_summary.pl (accessed October 2008). The tables show the average and maximum one-hour concentrations for 27 hydrocarbon species of interest for the period of interest and counts of how many measurements were made above an ESL or Reference Value (zero in this quarter). Note that not all data have been validated and are thus subject to change. All concentration values in the tables are in ppbV units. No concentrations or averages of concentrations were greater than effects screening levels or reference values during the third quarter of 2008 or over the most recent four-quarter period. In each table, "Total Samples Possible" is calculated from the total number of hours between the starting date/time and the ending date/time and may not represent the actual time the instrument was operational. The "Num Ambient Samples" column includes all ambient samples, including those that are not flagged as validated. The "Mean" is calculated as a weighted average of daily averages and takes into account the number of samples flagged ambient for each day. The "Over Annual" column is an indication of whether or not the calculated mean is over the established annual effect screening level and may not correspond to an actual annual exceedance.

The use of a short-term ESL to evaluate hourly benzene concentrations has been replaced with comparisons to a Reference Value. The current benzene Reference Value is 180 ppbV. The current short-term benzene ESL, which is only used for permitting purposes, is 55 ppbV. The annual ESL for benzene is 1.4 ppbV.

Table 2. Oak Park 3rd quarter 2008 Auto-GC species of interest

AutoGC Summary Statistics for 48_355_0035 -- Oak Park [32] Date Range: 3rd Quarter 2008 -- July 1, 2008 00:00 CST to October 1, 2008 00:00 CST Total Samples Possible: 2208 Sorted by: Elution order									
Species	**Param**	**Num Ambient Samples**	**Mean**	**Peak 1-Hour Value**	**Peak 24-Hour Value**	**Num Over 1-Hr**	**Num Over Veg**	**Num Over Odor**	**Over Annual**
Ethane	43202	1763	4.76	95.93	19.75	0	N/A	N/A	N/A
Ethylene	43203	1763	0.49	36.22	2.11	0	0	0	No
Propane	43204	1763	3.24	177.39	15.46	0	N/A	N/A	No
Propylene	43205	1763	0.33	12.09	1.29	0	N/A	N/A	N/A
Isobutane	43214	1763	1.33	50.34	5.69	0	N/A	0	No
n-Butane	43212	1763	1.88	92.77	10.35	0	N/A	N/A	No
t-2-Butene	43216	1763	0.07	1.40	0.21	0	N/A	0	N/A
1-Butene	43280	1763	0.04	2.86	0.24	0	N/A	0	N/A
c-2-Butene	43217	1763	0.04	2.64	0.22	0	N/A	0	N/A
Isopentane	43221	1763	1.80	145.05	10.70	0	N/A	N/A	No
n-Pentane	43220	1763	1.04	50.57	8.00	0	N/A	N/A	No
1,3-Butadiene	43218	1763	0.03	2.50	0.19	0	N/A	N/A	No
t-2-Pentene	43226	1763	0.06	7.69	0.40	0	N/A	0	N/A
1-Pentene	43224	1763	0.03	0.81	0.19	0	N/A	0	N/A
c-2-Pentene	43227	1763	0.03	4.09	0.24	0	N/A	0	N/A
n-Hexane	43231	1763	0.34	11.73	2.98	0	N/A	0	No
Benzene	45201	1763	0.21	5.88	1.30	0	N/A	0	No
Cyclohexane	43248	1763	0.16	15.42	1.65	0	N/A	0	No
Toluene	45202	1763	0.43	11.46	1.79	0	N/A	0	No
Ethyl Benzene	45203	1763	0.04	3.02	0.24	0	N/A	0	No
p-Xylene + m-Xylene	45109	1763	0.14	7.67	1.43	0	N/A	0	No
o-Xylene	45204	1763	0.05	3.17	0.26	0	N/A	0	No
Isopropyl Benzene - Cumene	45210	1763	0.02	1.54	0.25	0	N/A	0	No
1,3,5-Trimethylbenzene	45207	1763	0.02	2.05	0.15	0	N/A	N/A	No
1,2,4-Trimethylbenzene	45208	1763	0.06	6.41	0.90	0	N/A	N/A	No
n-Decane	43238	1763	0.02	2.23	0.18	0	N/A	N/A	No
1,2,3-Trimethylbenzene	45225	1763	0.02	1.97	0.16	0	N/A	N/A	No

Table 3. Solar Estates 3rd quarter 2008 Auto-GC species of interest

AutoGC Summary Statistics for 48_355_0041 -- Solar Estates [33] Date Range: 3rd Quarter 2008 -- July 1, 2008 00:00 CST to October 1, 2008 00:00 CST Total Samples Possible: 2208 Sorted by: Elution order									
Species	**Param**	**Num Ambient Samples**	**Mean**	**Peak 1-Hour Value**	**Peak 24-Hour Value**	**Num Over 1-Hr**	**Num Over Veg**	**Num Over Odor**	**Over Annual**
Ethane	43202	1885	5.82	80.04	17.53	0	N/A	N/A	N/A
Ethylene	43203	1885	0.30	8.52	1.13	0	0	0	No
Propane	43204	1885	3.15	50.82	9.66	0	N/A	N/A	No
Propylene	43205	1885	0.15	3.13	0.70	0	N/A	N/A	N/A
Isobutane	43214	1885	1.16	17.43	3.41	0	N/A	0	No
n-Butane	43212	1885	1.44	23.00	5.77	0	N/A	N/A	No
t-2-Butene	43216	1885	0.05	1.32	0.20	0	N/A	0	N/A
1-Butene	43280	1885	0.03	0.99	0.16	0	N/A	0	N/A
c-2-Butene	43217	1885	0.04	23.75	1.59	0	N/A	0	N/A
Isopentane	43221	1885	1.01	13.17	2.88	0	N/A	N/A	No
n-Pentane	43220	1885	0.59	10.77	1.66	0	N/A	N/A	No
1,3-Butadiene	43218	1885	0.03	3.49	0.23	0	N/A	N/A	No
t-2-Pentene	43226	1885	0.03	1.35	0.25	0	N/A	0	N/A
1-Pentene	43224	1885	0.02	0.43	0.09	0	N/A	0	N/A
c-2-Pentene	43227	1885	0.01	1.16	0.14	0	N/A	0	N/A
n-Hexane	43231	1880	0.21	2.77	0.61	0	N/A	0	No
Benzene	45201	1880	0.15	1.77	0.61	0	N/A	0	No
Cyclohexane	43248	1880	0.15	1.97	0.47	0	N/A	0	No
Toluene	45202	1880	0.23	3.33	0.92	0	N/A	0	No
Ethyl Benzene	45203	1880	0.02	0.36	0.10	0	N/A	0	No
p-Xylene + m-Xylene	45109	1880	0.14	4.28	0.78	0	N/A	0	No
o-Xylene	45204	1880	0.05	8.47	0.99	0	N/A	0	No
Isopropyl Benzene - Cumene	45210	1880	0.01	0.58	0.11	0	N/A	0	No
1,3,5-Trimethylbenzene	45207	1880	0.01	0.39	0.09	0	N/A	N/A	No
1,2,4-Trimethylbenzene	45208	1880	0.04	0.75	0.16	0	N/A	N/A	No
n-Decane	43238	1879	0.02	6.35	0.61	0	N/A	N/A	No
1,2,3-Trimethylbenzene	45225	1880	0.01	0.23	0.06	0	N/A	N/A	No

Table 4. Oak Park four-quarters October 2007-September 2008 Auto-GC species of interest

AutoGC Summary Statistics for 48_355_0035 -- Oak Park [32] Date Range: October 1, 2007 00:00 CST to October 1, 2008 00:00 CST Total Samples Possible: 8784 Sorted by: Elution order									
Species	**Param**	**Num Ambient Samples**	**Mean**	**Peak 1-Hour Value**	**Peak 24-Hour Value**	**Num Over 1-Hr**	**Num Over Veg**	**Num Over Odor**	**Over Annual**
Ethane	43202	7529	7.72	359.25	49.27	0	N/A	N/A	N/A
Ethylene	43203	7529	0.77	56.34	7.97	0	0	0	No
Propane	43204	7529	5.01	804.95	49.19	0	N/A	N/A	No
Propylene	43205	7529	0.51	44.49	6.70	0	N/A	N/A	N/A
Isobutane	43214	7529	2.21	377.81	23.36	0	N/A	0	No
n-Butane	43212	7529	3.51	656.97	67.92	0	N/A	N/A	No
t-2-Butene	43216	7529	0.15	44.58	2.87	0	N/A	0	N/A
1-Butene	43280	7529	0.08	2.86	0.48	0	N/A	0	N/A
c-2-Butene	43217	7529	0.10	7.88	2.18	0	N/A	0	N/A
Isopentane	43221	7528	2.80	354.39	121.16	0	N/A	N/A	No
n-Pentane	43220	7528	1.69	277.81	88.42	0	N/A	N/A	No
1,3-Butadiene	43218	7529	0.06	2.50	0.23	0	N/A	N/A	No
t-2-Pentene	43226	7529	0.08	7.69	0.41	0	N/A	0	N/A
1-Pentene	43224	7529	0.04	3.76	0.37	0	N/A	0	N/A
c-2-Pentene	43227	7529	0.03	4.09	0.24	0	N/A	0	N/A
n-Hexane	43231	7529	0.44	75.21	5.60	0	N/A	0	No
Benzene	45201	7529	0.37	38.15	6.41	0	N/A	0	No
Cyclohexane	43248	7529	0.19	32.99	2.25	0	N/A	0	No
Toluene	45202	7529	0.56	31.48	4.43	0	N/A	0	No
Ethyl Benzene	45203	7529	0.05	30.41	1.99	0	N/A	0	No
p-Xylene + m-Xylene	45109	7529	0.17	58.25	3.85	0	N/A	0	No
o-Xylene	45204	7529	0.06	29.82	1.85	0	N/A	0	No
Isopropyl Benzene - Cumene	45210	7529	0.03	16.29	1.04	0	N/A	0	No
1,3,5-Trimethylbenzene	45207	7529	0.02	20.88	1.35	0	N/A	N/A	No
1,2,4-Trimethylbenzene	45208	7529	0.06	22.29	1.46	0	N/A	N/A	No
n-Decane	43238	7529	0.02	26.12	1.69	0	N/A	N/A	No
1,2,3-Trimethylbenzene	45225	7529	0.02	19.53	1.26	0	N/A	N/A	No

Table 5. Solar Estates four quarters October 2007-September 2008 Auto-GC species of interest

AutoGC Summary Statistics for 48_355_0041 -- Solar Estates [33] Date Range: October 1, 2007 00:00 CST to October 1, 2008 00:00 CST Total Samples Possible: 8784 Sorted by: Elution order									
Species	**Param**	**Num Ambient Samples**	**Mean**	**Peak 1-Hour Value**	**Peak 24-Hour Value**	**Num Over 1-Hr**	**Num Over Veg**	**Num Over Odor**	**Over Annual**
Ethane	43202	7516	6.75	131.94	29.44	0	N/A	N/A	N/A
Ethylene	43203	7516	0.37	17.23	6.93	0	0	0	No
Propane	43204	7516	3.92	94.64	19.55	0	N/A	N/A	No
Propylene	43205	7516	0.17	19.78	1.61	0	N/A	N/A	N/A
Isobutane	43214	7516	1.38	47.64	8.25	0	N/A	0	No
n-Butane	43212	7516	2.14	95.36	15.23	0	N/A	N/A	No
t-2-Butene	43216	7516	0.07	2.29	0.52	0	N/A	0	N/A
1-Butene	43280	7516	0.04	2.49	0.34	0	N/A	0	N/A
c-2-Butene	43217	7516	0.04	23.75	1.59	0	N/A	0	N/A
Isopentane	43221	7516	1.25	104.74	7.55	0	N/A	N/A	No
n-Pentane	43220	7516	0.76	80.16	4.60	0	N/A	N/A	No
1,3-Butadiene	43218	7516	0.03	11.92	0.66	0	N/A	N/A	No
t-2-Pentene	43226	7516	0.03	1.67	0.30	0	N/A	0	N/A
1-Pentene	43224	7516	0.01	0.82	0.14	0	N/A	0	N/A
c-2-Pentene	43227	7516	0.01	1.16	0.14	0	N/A	0	N/A
n-Hexane	43231	7511	0.28	17.46	1.68	0	N/A	0	No
Benzene	45201	7511	0.22	11.48	0.98	0	N/A	0	No
Cyclohexane	43248	7511	0.19	14.00	1.20	0	N/A	0	No
Toluene	45202	7511	0.28	10.48	1.51	0	N/A	0	No
Ethyl Benzene	45203	7511	0.03	1.29	0.19	0	N/A	0	No
p-Xylene + m-Xylene	45109	7511	0.19	13.63	3.00	0	N/A	0	No
o-Xylene	45204	7511	0.05	8.47	0.99	0	N/A	0	No
Isopropyl Benzene - Cumene	45210	7511	0.01	3.19	0.44	0	N/A	0	No
1,3,5-Trimethylbenzene	45207	7511	0.02	0.72	0.26	0	N/A	N/A	No
1,2,4-Trimethylbenzene	45208	7511	0.05	5.67	0.45	0	N/A	N/A	No
n-Decane	43238	7510	0.05	6.35	3.12	0	N/A	N/A	No
1,2,3-Trimethylbenzene	45225	7511	0.02	0.52	0.19	0	N/A	N/A	No

2. Benzene Trend at Oak Park CAMS 634

A notable finding from last quarter's report was that benzene concentrations continue to be practically and statistically significantly lower at both auto-GC sites compared with past years. Tables 6 through 9 below show comparisons between second and third quarter averages for benzene at Oak Park CAMS 634 and Solar Estates CAMS 633 from 2005 to 2008.

Table 6. Summary of 2nd Q benzene at Oak Park 2005-2008, ppbv units

AutoGC Statistics for Benzene at Oak Park 2nd Quarter 2005, 2006, 2007, 2008				
Quarter	Num Ambient Samples	Mean	Peak 1-Hour Value	Peak 24-Hour Value
2Q05	1935	0.20	11.39	1.28
2Q06	1913	0.31	19.99	3.27
2Q07	1957	0.32	16.57	3.74
2Q08	1962	0.14	3.72	0.79

Table 7. Summary of 2nd Q benzene at Solar Estates 2005-2008, ppbv units

AutoGC Statistics for Benzene at Solar 2nd Quarter 2005, 2006, 2007, 2008				
Quarter	Num Ambient Samples	Mean	Peak 1-Hour Value	Peak 24-Hour Value
2Q05	1619	0.25	3.46	0.73
2Q06	1489	0.18	4.97	0.84
2Q07	1330	0.22	3.14	0.92
2Q08	1839	0.13	5.31	0.63

Table 8. Summary of 3rd Q benzene at Oak Park 2005-2008, ppbv units

AutoGC Statistics for Benzene at Oak Park 3nd Quarter 2005, 2006, 2007, 2008				
Quarter	Num Ambient Samples	Mean ppbv	Peak 1-Hr ppbv	Peak 24-Hr ppbv
3Q05	1792	0.30	26.54	3.70
3Q06	1771	0.52	51.15	7.78
3Q07	1832	0.41	26.37	2.09
3Q08	1763	0.21	5.88	1.30

Table 9. Summary of 3rd Q benzene at Solar Estates 2005-2008, ppbv units

AutoGC Statistics for Benzene at Solar Estates 3nd Quarter 2005, 2006, 2007, 2008				
Quarter	Num Ambient Samples	Mean ppbv	Peak 1-Hr ppbv	Peak 24-Hr ppbv
3Q05	1304	0.27	4.19	1.19
3Q06	1707	0.32	8.79	1.11
3Q07	1667	0.25	7.41	1.07
3Q08	1880	0.15	1.77	0.61

It has been shown in past reports that changes in the distribution of surface winds from season to season helps to account for higher pollutant concentrations in the first and fourth quarters of each year compared to the second and third quarters. To test the possibility that varying wind patterns from year to year may be affecting benzene concentration changes, a detailed examination of the relationship of benzene concentrations and winds has been performed. In Figures 3 – 28 beginning on the following page and continuing to page 23, a hybrid variable labeled "met-adjusted benzene" (defined later in this section) for Oak Park CAMS 634 is plotted against wind direction side-by-side with a graph depicting the frequency distribution of hourly wind directions. for Oak Park CAMS 634 was selected for this analysis because higher benzene concentrations are measured there compared with Solar Estates. One pair of graphs for each annual quarter from July 2005 through September 2008 is shown. The met-adjusted benzene graphs show the 1.4 ppbV long-term ESL for benzene for reference.

The figures for wind direction (WD) frequency distribution for Oak Park CAMS 634 for 2nd Q data (Figures 9, 17, 25) can be characterized as having a sharply-peaked distribution centered near 130 degrees, pointing back to the Gulf of Mexico. The figures for WD frequency distribution for Oak Park CAMS 634 for 3rd Q data (Figures 11, 19, 27) can be characterized as having a flattened-peak distribution piled between 70 and 230 degrees. WD frequency distributions for the 1st and 4th Q data in the other odd-numbered figures show wider distributions for wind directions, with more northerly winds in these quarters.

The figures for met-adjusted benzene for Oak Park CAMS 634 were created by first multiplying all individual hourly benzene concentrations by the coincident hourly wind speed, and then dividing the result by 6.56 miles per hour, which is the historical average wind speed measured at this site. This approach has the effect of removing the effects of wind speed, i.e., given a constant upwind emission rate, light winds and stagnant conditions cause higher concentrations to build up, while faster winds promote faster dilution and dispersion and thus lower concentrations. Dividing by the average wind speed puts the "adjusted-benzene" value back into ppbV units with population statistics (e.g., mean and variance) similar to the original data. These data were binned into 20-degree wind direction bins with the resulting graphed points smoothed using a spline fit. The graphs strongly suggest that, adjusting for winds, the concentrations of benzene associated with the northeast wind directions are lower at Oak Park since mid 2007 through 2008 than in 2005 and 2006.

Figure 3. Oak Park "adj. benzene" by WD 3rdQ 05

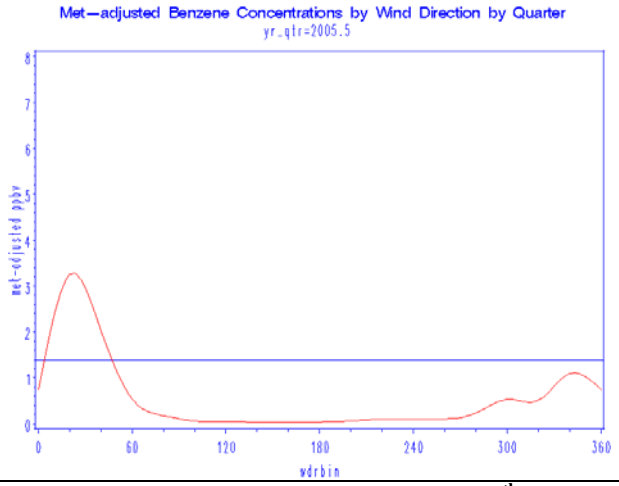


Figure 4. Oak Park wind direction distrib. 3rd Q05

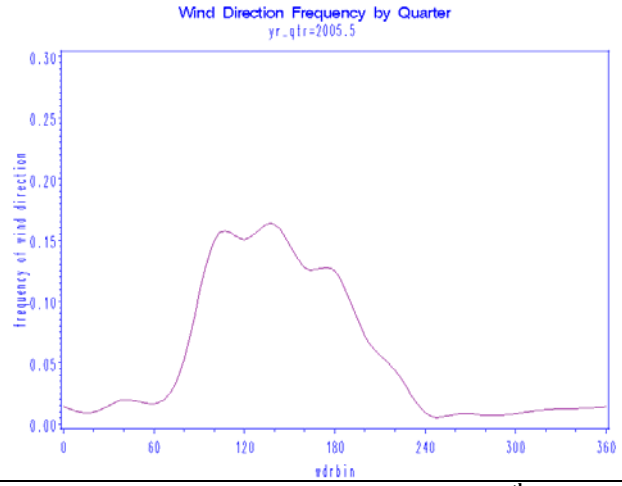


Figure 5. Oak Park "adj. benzene" by WD 4th Q 05

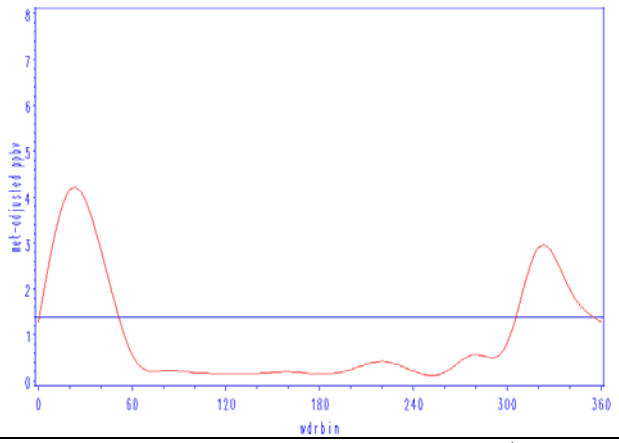


Figure 6. Oak Park wind direction distrib. 4th Q05

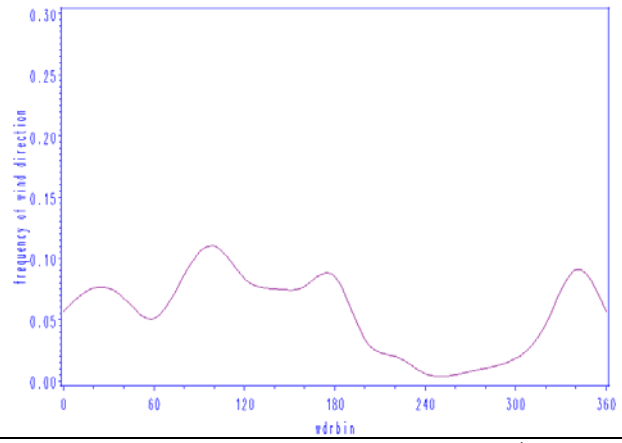


Figure 7. Oak Park "adj. benzene" by WD 1st Q 06

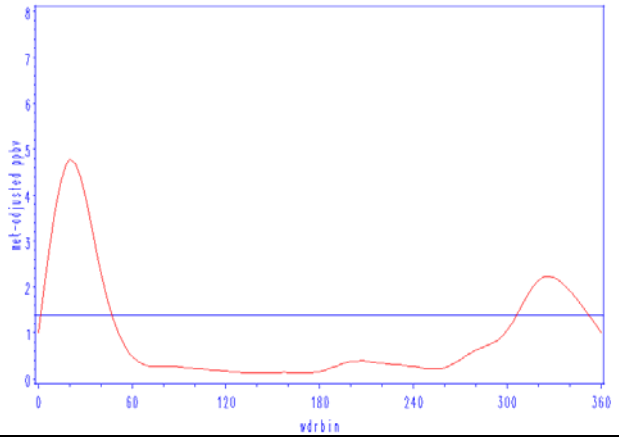
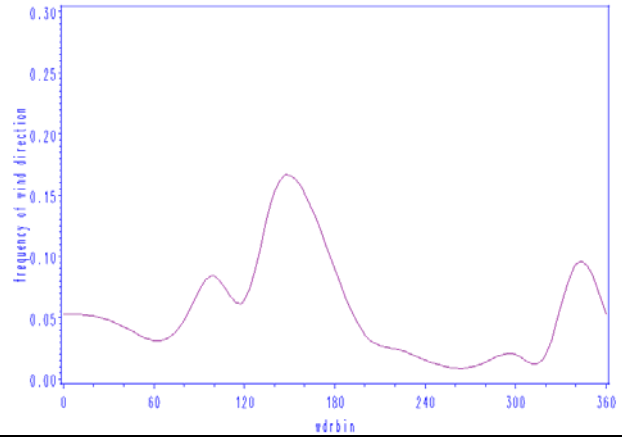


Figure 8. Oak Park wind direction distrib. 1st Q06



WD="*Wdrbin*"=Wind direction, 0 = North, 60 = East-northeast, 120 = East-southeast, 180 = South, 240 = West-southwest, 300 = West-northwest, and 360 = North

Figure 9. Oak Park "adj. benzene" by WD 2nd Q 06

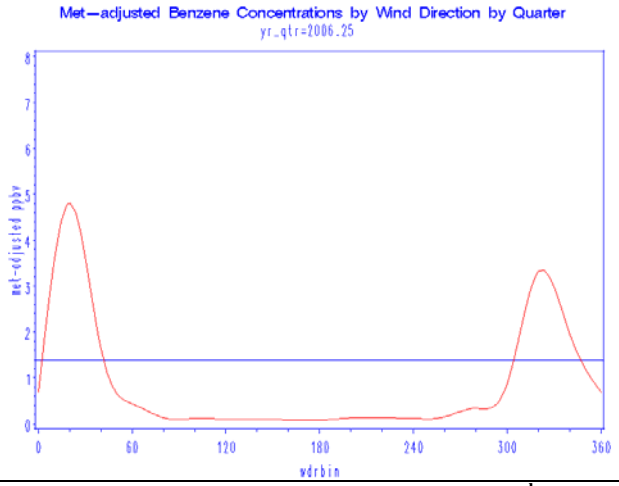


Figure 10. Oak Park wind direction distrib. 2nd Q06

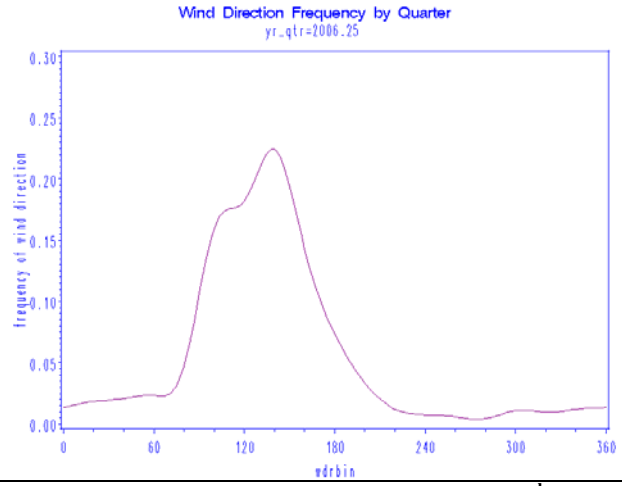


Figure 11. Oak Park "adj. benzene" by WD 3rd Q 06

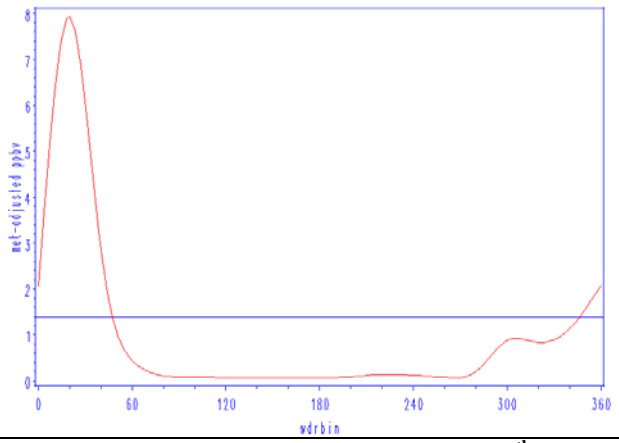


Figure 12. Oak Park wind direction distrib. 3rd Q06

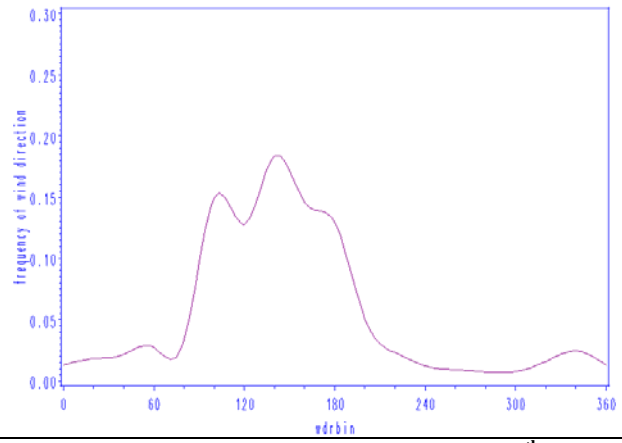


Figure 13. Oak Park "adj. benzene" by WD 4th Q 06

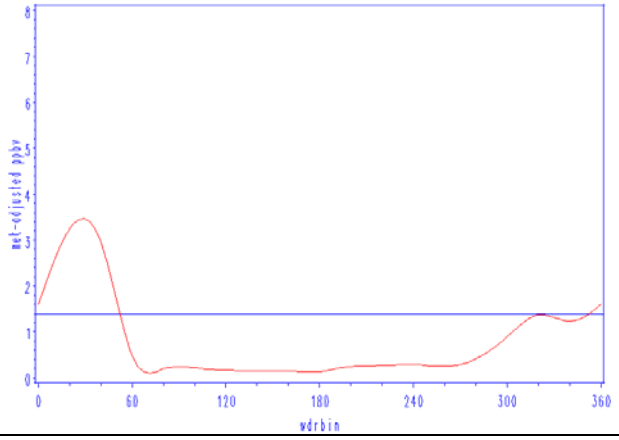
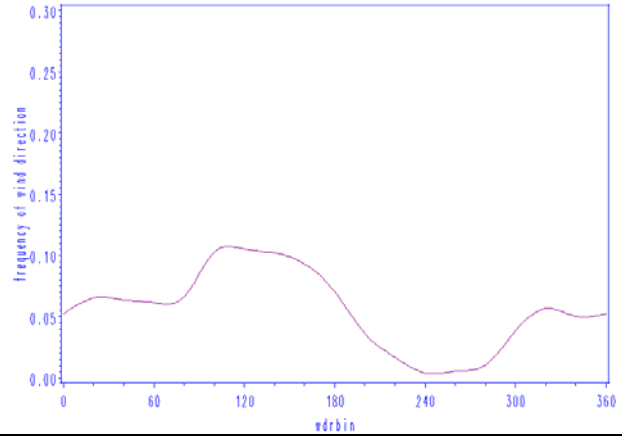


Figure 14. Oak Park wind direction distrib. 4th Q06



"*Wdrbin*"=Wind direction, 0 = North, 60 = East-northeast, 120 = East-southeast, 180 = South, 240 = West-southwest, 300 = West-northwest, and 360 = North

Figure 15. Oak Park "adj. benzene" by WD 1st Q 07

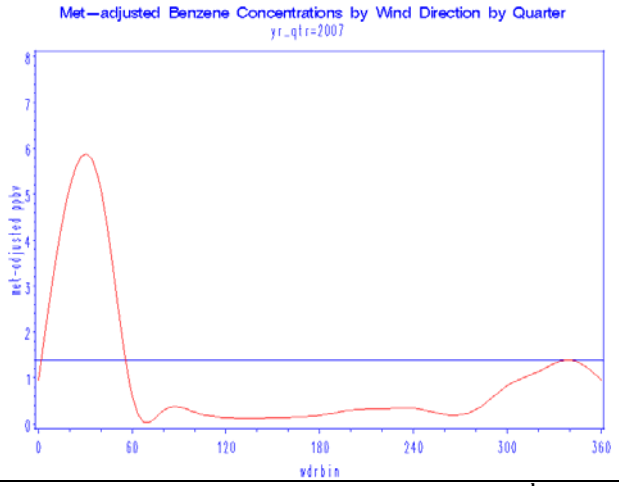


Figure 16. Oak Park wind direction distrib. 1st Q07

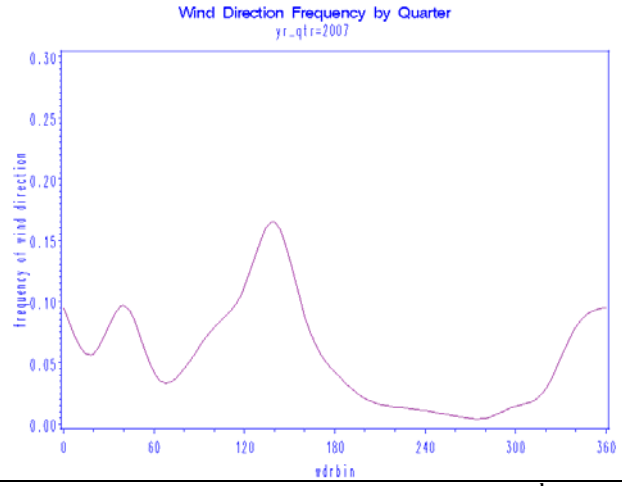


Figure 17. Oak Park "adj. benzene" by WD 2nd Q 07

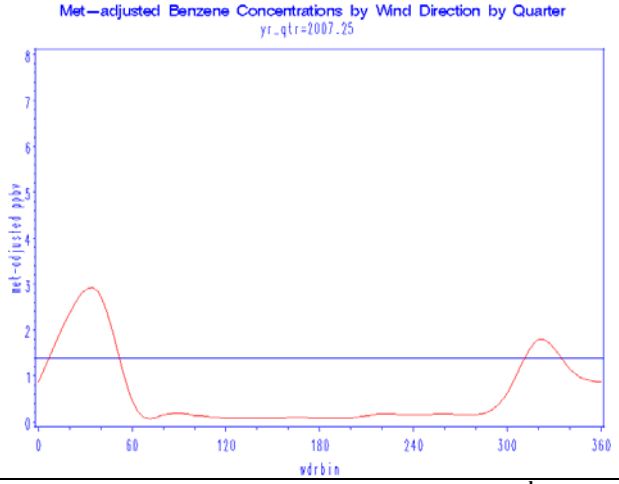


Figure 18. Oak Park wind direction distrib. 2nd Q07

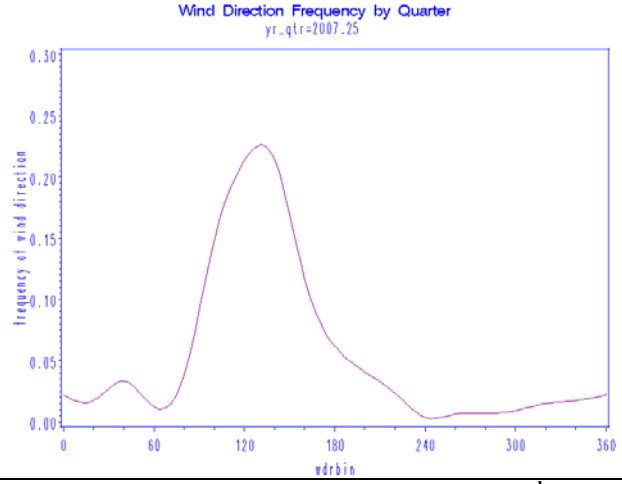


Figure 19. Oak Park "adj. benzene" by WD 3rd Q 07

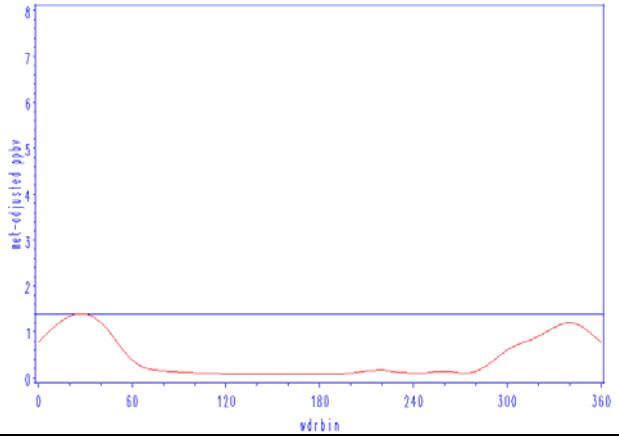
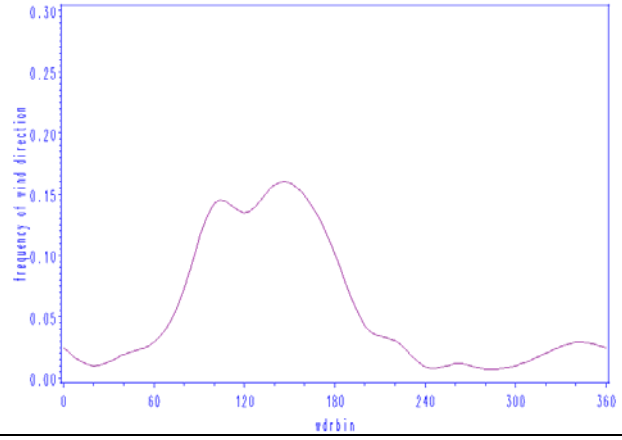


Figure 20. Oak Park wind direction distrib. 3rd Q07



"*Wdrbin*"=Wind direction, 0 = North, 60 = East-northeast, 120 = East-southeast, 180 = South, 240 = West-southwest, 300 = West-northwest, and 360 = North

Figure 21. Oak Park "adj. benzene" by WD 4th Q 07

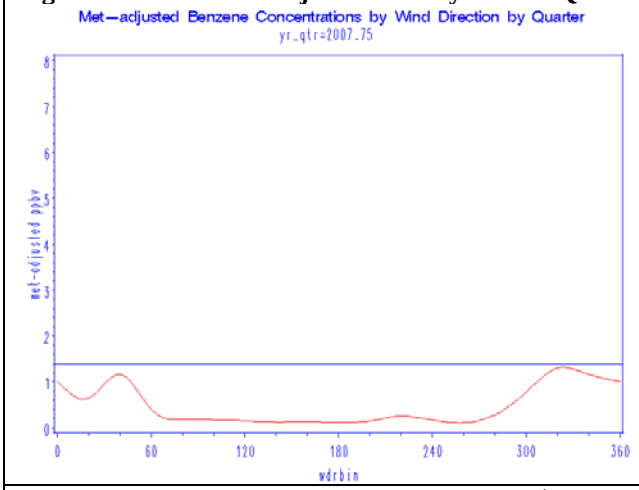


Figure 22. Oak Park wind direction distrib. 4th Q07

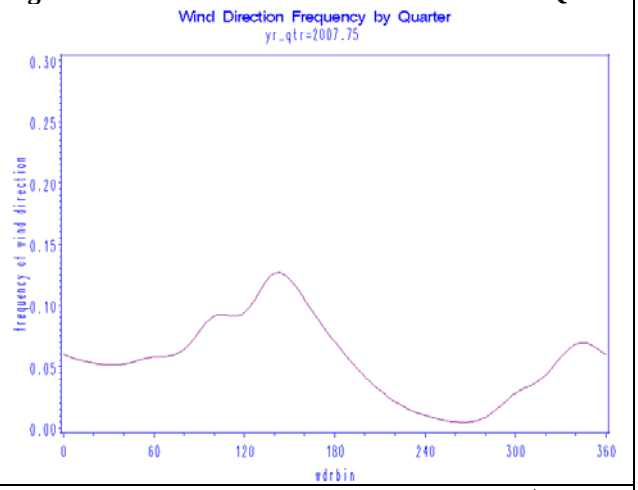


Figure 23. Oak Park "adj. benzene" by WD 1st Q 08

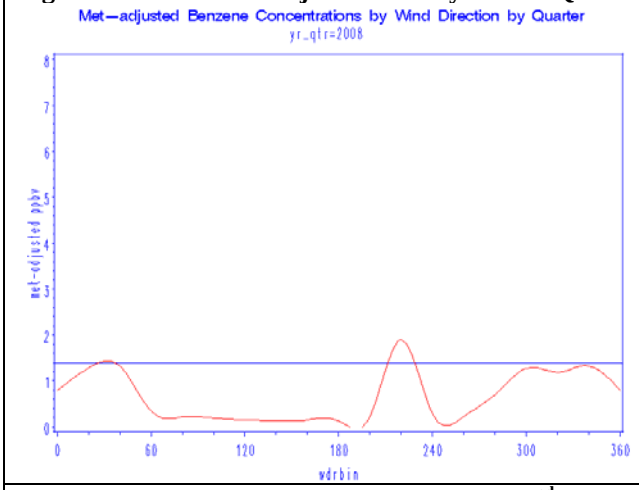


Figure 24. Oak Park wind direction distrib. 1st Q08

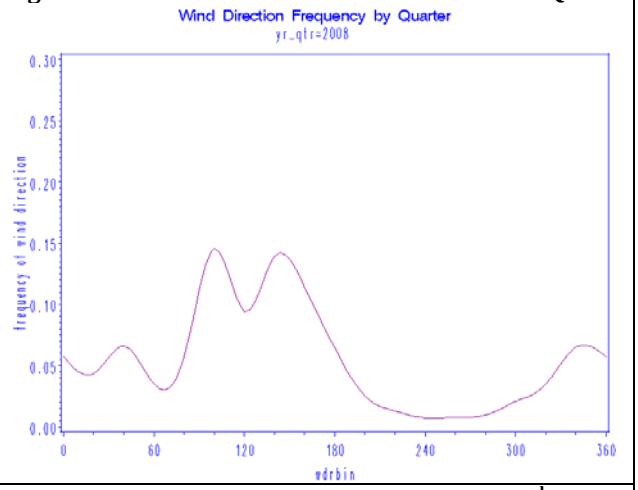


Figure 25. Oak Park "adj. benzene" by WD 2nd Q 08

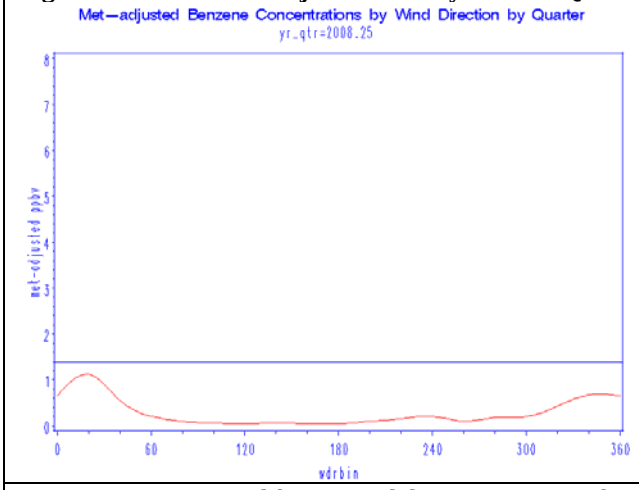
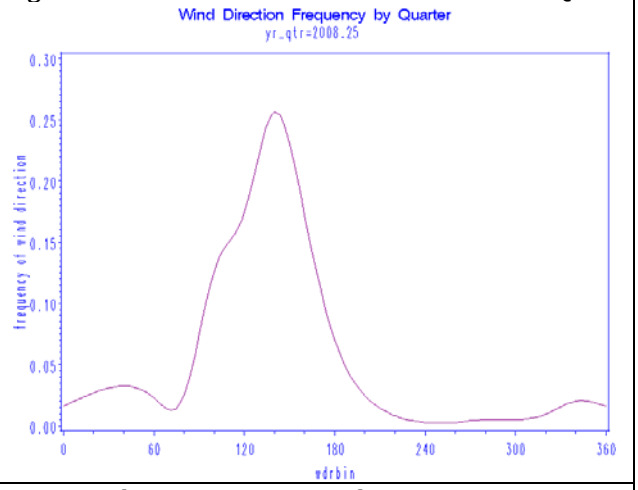


Figure 26. Oak Park wind direction distrib. 2nd Q08



"*Wdrbin*"=Wind direction, 0 = North, 60 = East-northeast, 120 = East-southeast, 180 = South, 240 = West-southwest, 300 = West-northwest, and 360 = North

Figure 27. Oak Park "adj. benzene" by WD 3rd Q 08

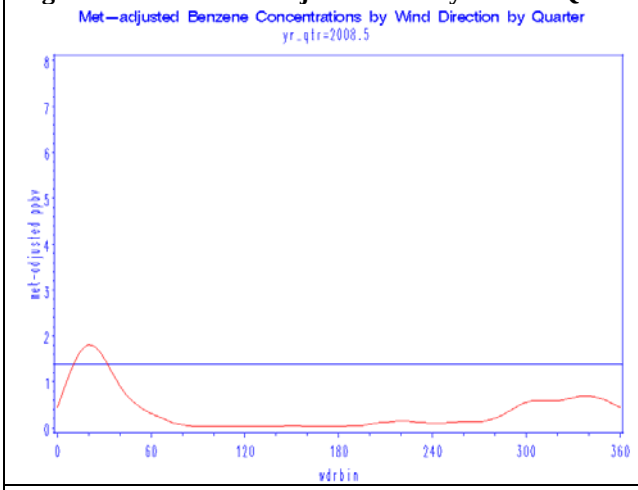
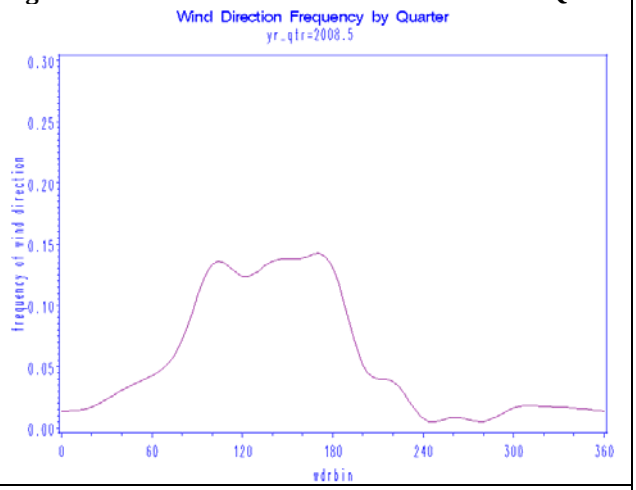


Figure 28. Oak Park wind direction distrib. 3rd Q08



"*Wdrbin*"=Wind direction, 0 = North, 60 = East-northeast, 120 = East-southeast, 180 = South, 240 = West-southwest, 300 = West-northwest, and 360 = North

3. Pollution Event Case Studies

Aug. 22 and Sept 28-30, 2008 at Oak Park

As part of the Neighborhood Toxics Project, a considerable amount of work has been done on the data collected in Corpus Christi both over the three year life of this project and the longer time period over which the TCEQ has collected data. Because of the relatively dense population around the Oak Park station and the fact that benzene and TNMHC concentrations are generally higher there than at Solar Estates, two cases were selected from this site for case study analysis this quarter.

The first case is atypical because although it was associated with a common wind direction found to accompany many alerts (northeast), this email alert was triggered mid-day at 2:10 p.m. CST. (emrs_medium_alert_48355003543102_20080822_1410) The alert appears below:

> The following alert has been received in the Corpus Christi Area:
>
> emrs_medium_alert_48355003543102_20080822_1410.txt
>
> TNMOC MEDIUM trigger at site Oak Park C634
> 2653.53 >= 2000.00 ppbC (no previous trigger)
> WD = 62 degrees
> WS = 4.2 mph
> time of trigger 14:10 (CST) 2008.08.22
> 20:10 (UTC) 2008.08.22

As has been reported in the past, the vast majority of alerts are triggered at night or during the early morning. The graph of the data from the hour corresponding to the alert appears on page 25 in Figure 29. Note that ethane and propane are not included, as the concentrations of these species are generally higher than others, but they were at their daily maxima during this hour. The associated surface back-trajectory appears in Figure 30 on page 26. This back-trajectory is just to the east of the most frequent back-trajectory pattern associated with elevated TNMHC at Oak Park and points back in the general direction of the CITGO Refinery.

According to the Corpus Christi Caller-Times news archives[1], the area was experiencing severe weather on August 22, with one inch of rain reported at the airport and flooding in several parts of town. The CITGO Refinery reported an emission event – associated with severe weather – beginning at 1:03 p.m. CDT at an electrostatic precipitator, resulting in the release of carbon monoxide and dust. No volatile organic compounds are shown as being released in this report. The report is contained in the TCEQ Emission Event Database[2] under report number 113011.

[1] http://www.caller.com/news/2008/aug/22/weather/ Accessed October 2008
[2] http://www11.tceq.state.tx.us/oce/eer/index.cfm Accessed October 2008

Figure 29. Aug. 22, 2008 2pm CST, alert-associated auto-GC concentrations in ppbv units at Oak Park

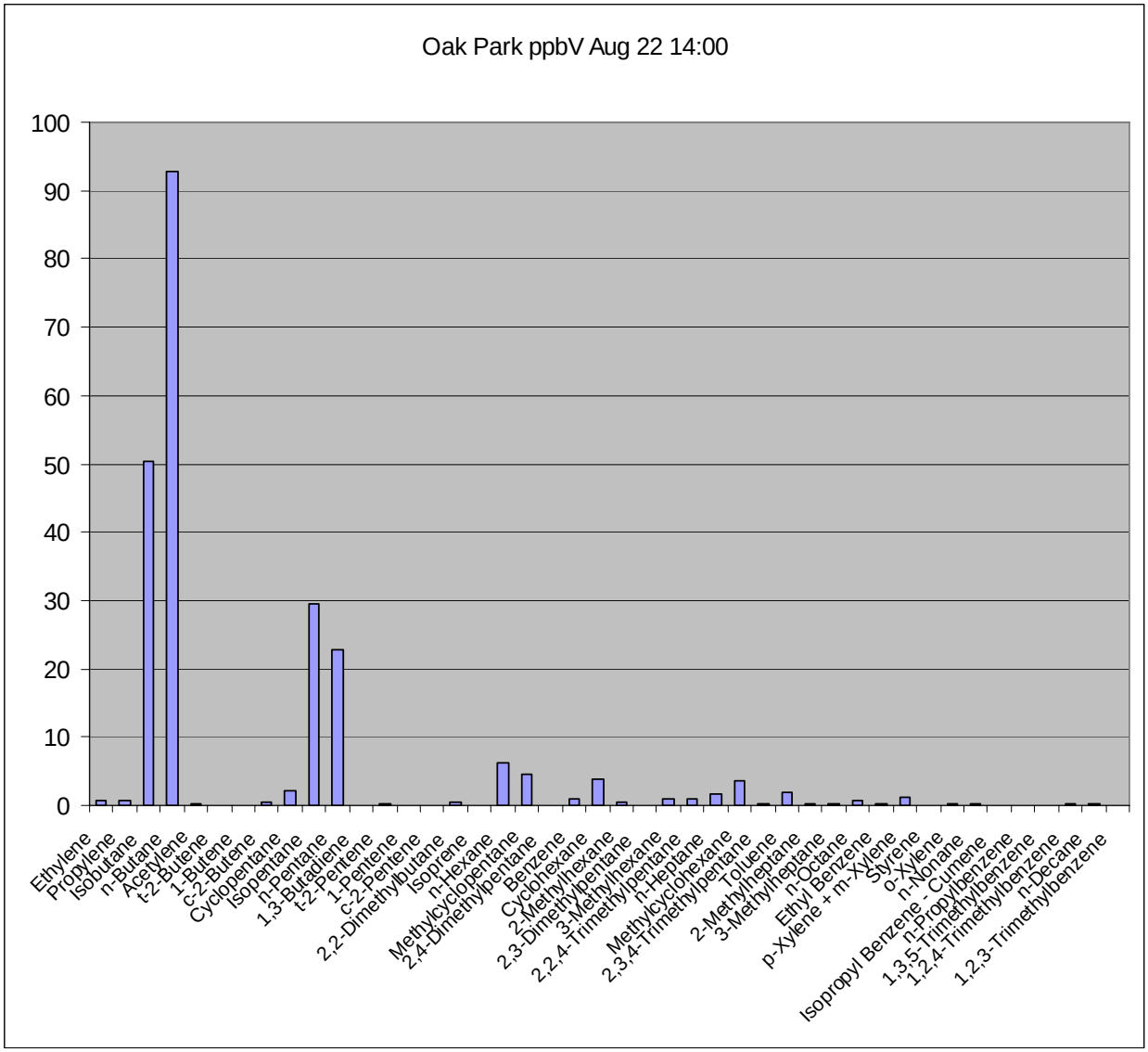
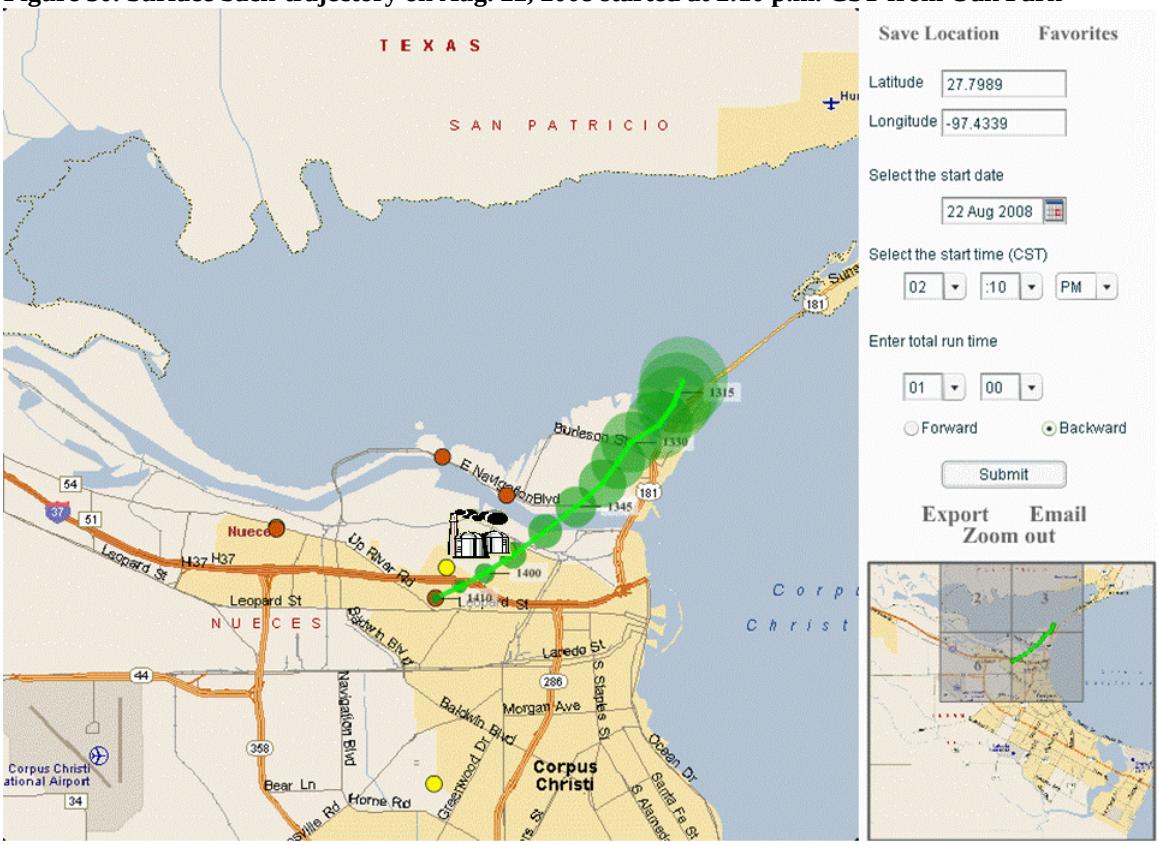


Figure 30. Surface back-trajectory on Aug. 22, 2008 started at 2:10 p.m. CST from Oak Park



The second case is fairly typical in that the alert occurred in the early morning, but the back-trajectory corresponds to what has come to be considered the second-most significant source affecting Oak Park, that being the Valero East Refinery.

> The following alert has been received in the Corpus Christi Area:
>
> emrs_medium_alert_48355003543102_20080930_0450.txt
>
> TNMOC MEDIUM trigger at site Oak Park C634
> 2111.16 >= 2000.00 ppbC (no previous trigger)
> WD = 304 degrees
> WS = 3.1 mph
> time of trigger 4:50 (CST) 2008.09.30
> 10:50 (UTC) 2008.09.30

The graph of the data from the hour corresponding to the alert appears on page 27 in Figure 31. Note that ethane and propane are not included, as the concentrations of these species are generally higher than others, but they were at their daily maxima during this hour. The associated surface back-trajectory appears in Figure 32 on page 28.

No emission events are reported in the TCEQ emissions events database for this date in Corpus Christi.

Figure 31. September 30, 2008 5 am CST, alert-associated auto-GC concentrations in ppbv units at Oak Park

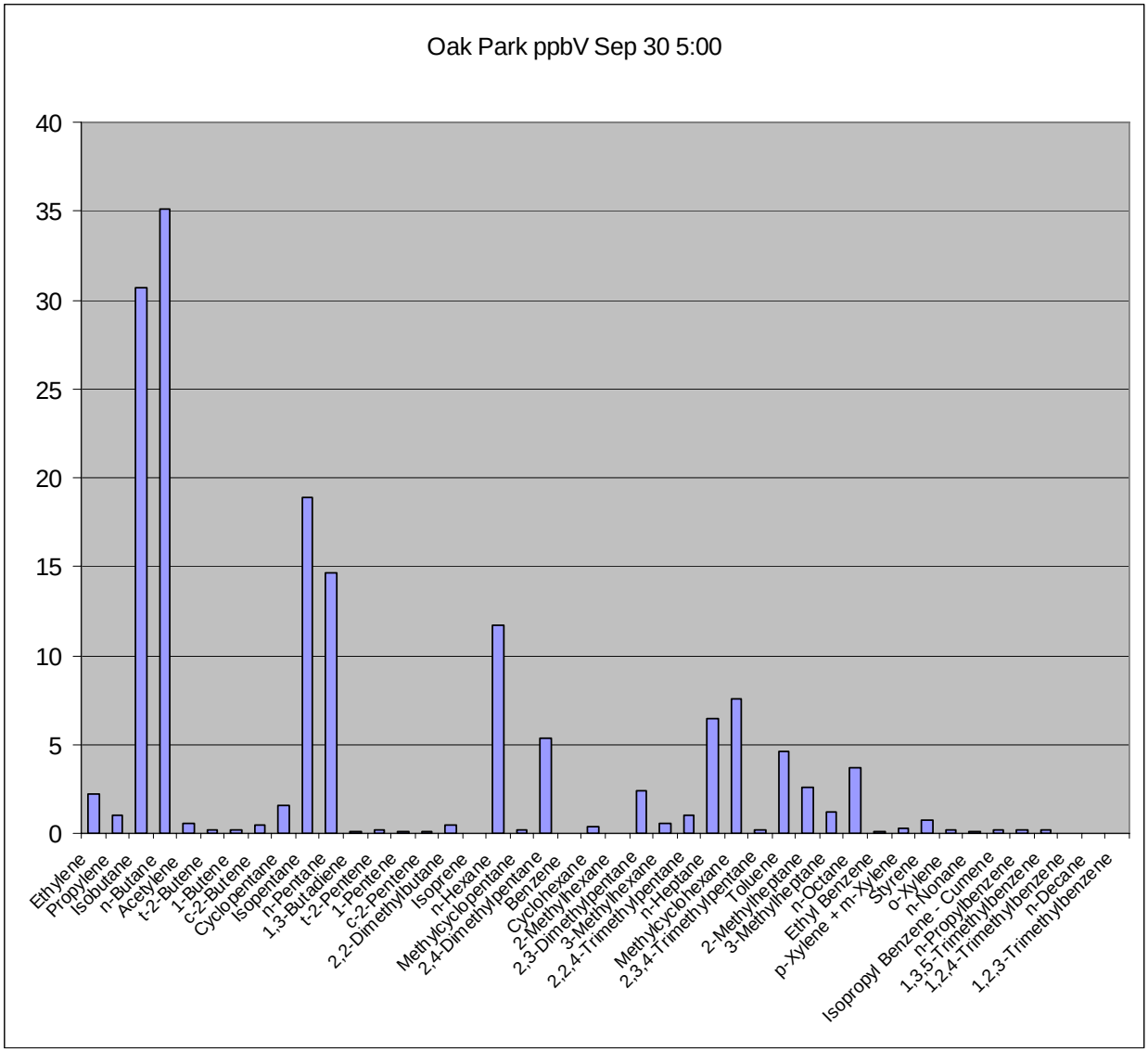
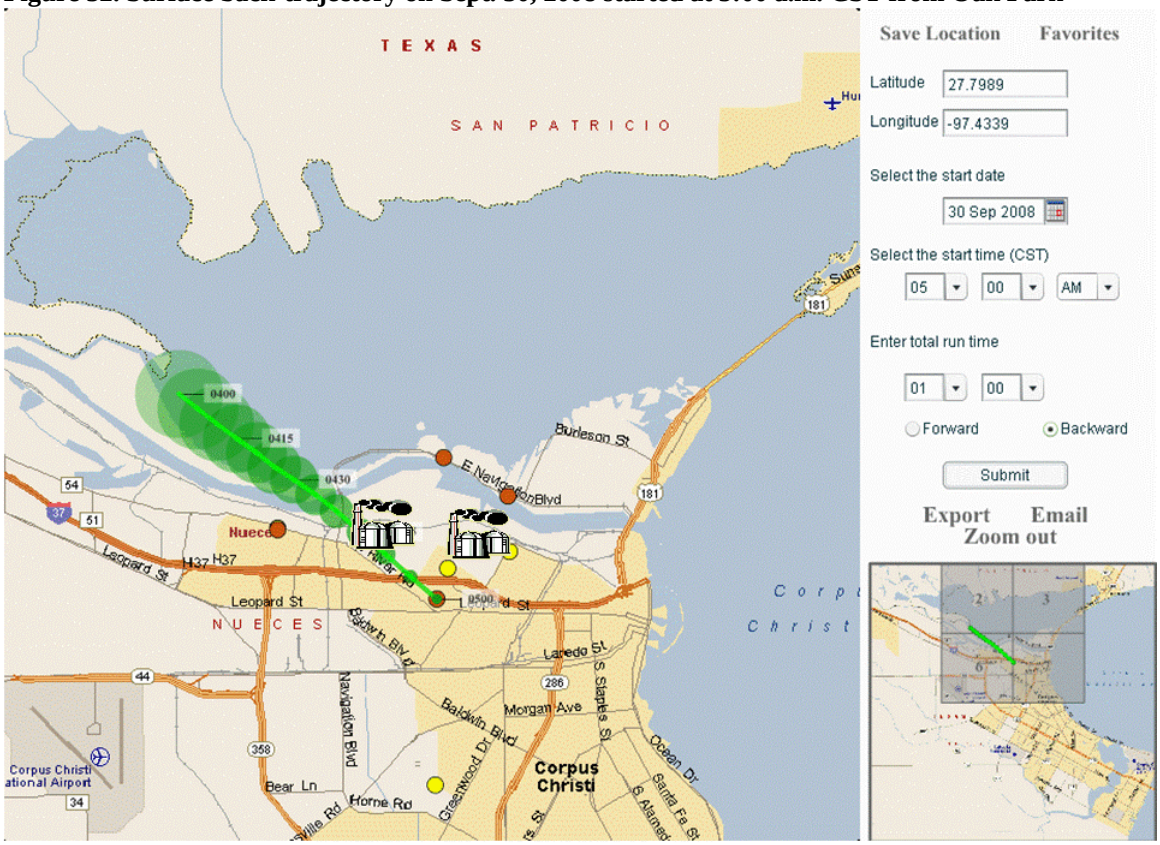


Figure 32. Surface back-trajectory on Sept. 30, 2008 started at 5:00 a.m. CST from Oak Park



Conclusions from the Third Quarter 2008 Data

In this quarter's report, several findings have been made:

- Periodic air pollution events continue to be measured on a routine basis, but values of hydrocarbons above the reference values and effects screening levels are rarely observed. No measurements exceeded ESLs or Reference Values.
- Benzene concentrations in residential areas were statistically significantly lower this quarter compared to the same quarter in past years of monitoring.

Further analyses will be provided upon request.

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
07/01/08 - 09/30/08

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

Total Grant Amount:	$6,761,718.02
Total Interest Earned:	**$651,313.34**
Total Funds Received:	**$7,413,031.36**

B. Summary of Expenditures Paid by COCP Funds

		Year 3 Budget	Year 4 Budget	Year 5 Adjustments	Yrs 1-5 Adjusted Budget	Prior Activity	Current Activity 07/01/08 - 09/30/08	Encumbrances	Remaining Balance 9/30/2008
Salaries-Prof	**12**	$216,128.63	$160,652.00	286,279.40	$663,060.03	($590,362.98)	($56,702.07)	$0.00	$15,994.98
Salaries-CEER	**15**	$19,606.37	$15,636.00	33,123.00	$68,365.37	($58,556.76)	($9,710.13)	$0.00	$98.48
Fringe	**14**	$47,984.00	$38,783.00	58,333.00	$145,100.00	($130,241.66)	($12,286.53)	$0.00	$2,571.81
Other/C-Analysis	**47/68**	$60,474.00	$73,500.00	(8,656.40)	$125,317.60	($30,310.00)	($1,900.00)	$0.00	$93,107.60
Supplies	**50**	$86,844.00	$33,500.00	68,676.00	$189,020.00	($181,372.16)	($14,476.01)	($29,934.72)	-$36,762.89
	51		$20,300.00	8,000.00	$28,300.00	($15,440.00)	($180.00)	($132.27)	$12,547.73
Subcontract	**62-64**	$1,965,693.00	$314,022.00	296,734.00	$2,576,449.00	($2,367,387.83)	($115,776.31)	$0.00	$93,284.86
Travel	**75**	$2,300.00	$2,000.00	7,719.00	$12,019.00	($11,832.17)	($2,646.80)	($0.03)	-$2,460.00
Equipment	**80**	$0.00	$0.00	0.00	$0.00	$0.00		$0.00	$0.00
Indirect Costs	**90**	$359,855.00	$98,759.00	112,531.00	$571,145.00	($469,270.17)	($34,514.14)	$0.00	$67,360.69
TOTALS		**$2,758,885.00**	**757,152.00**	**862,739.00**	**$4,378,776.00**	**($3,854,773.73)**	**($248,191.99)**	**($30,067.02)**	**$245,743.26**

C. Interest Earned by COCP Funds as of 09/30/08

Prior Interest Earned:	$627,114.89
Interest Earned This Quarter:	$24,198.45
Total Interest Earned to Date:	**$651,313.34**

D. Balance of COCP Funds as of 09/30/08

Total Grant Amount:	$6,761,718.02
Total Interest Earned:	$651,313.34
Current Q. Expenses	($248,191.99)
Total Expenditures:	($3,854,773.73)
Remaining Balance:	**$3,310,065.64**

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

Accounting Certification