Corpus Christi Air Monitoring and Surveillance Camera Installation and Operation Project

Quarterly Report for the Period

July 1, 2009 through September 30, 2009

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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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, 2009 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 40, 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

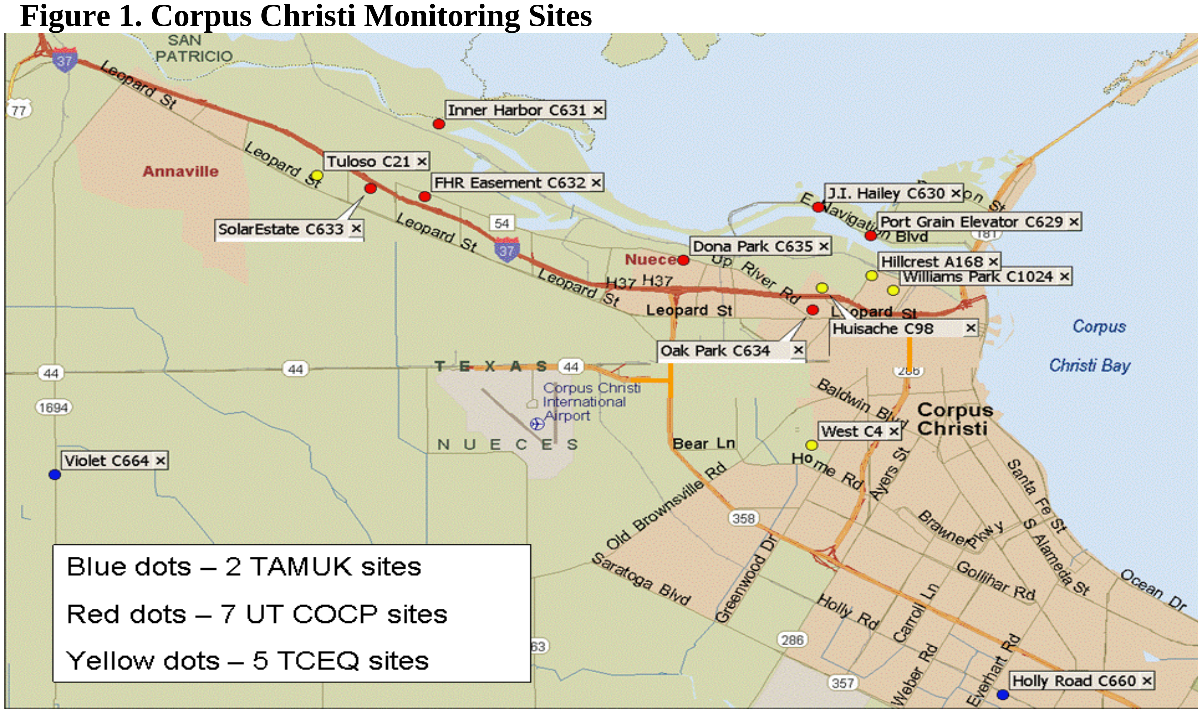

Table 1. Schedule of Air Monitoring Sites, Locations and Major Instrumentation

TCEQ CAMS Nbs.	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 40. Specifically, the appendix contains the following elements:

- **Auto-GC Data 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. A summary appears in Appendix A, pages 11 through 14.
- **Benzene Trends at Auto-GC Sites** – Benzene concentrations continue to show a statistically significant downward trend. Tabulated results are in Appendix A, pages 15 through 18.
- **Solar Estates 1,3-Butadiene Concentrations –** Two 1,3-butadiene measurements made on September 27, 2009 represent the highest concentrations recorded to date for this chemical at Solar Estates. A discussion of this event and historical data appears in Appendix A, pages 19 though 25.

- **Changes in TNMHC Concentrations –** Concentrations of total nonmethane hydrocarbons have generally declined in Corpus Christi, and declined significantly at the Flint Hills Easement site. A discussion of the trends appears in Appendix A, pages 26 though 36.
- **Case Studies of Pollution Events –** Three canister samples were taken this quarter, all at the J. I. Haley site, and results are discussed in Appendix A, pages 37 through 39.

B. No Advisory Board meeting was held during this reporting period.

C. 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 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, meetings of the Project's Advisory Board and presentations to local community organizations.

3. **Budget Monitoring**
   Budget monitoring during the period has focused on projects costs for Phase II – Sites Operation and Maintenance costs. Financial reports for the quarter are included in Appendix B, pages 41 and 42.

4. **Other Contributions**
   There were no other contributions made to the project during this quarter.

III. Financial Report

As required, the following financial summary information is provided. Details supporting this financial summary are included in Appendix B, pages 41 and 42.

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

The COCP funds received through September 30, 2009 totals $7,487,843.63. This total includes interest earned through September 30, 2009.

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

Expenditures of COCP funds during this quarter totaled $210,116.91. The detailed breakdown of the actual expenditures is included in Appendix B, page 42. The activities for which these expenditures were used are detailed in Section II, on page 2 of this report.

C. <u>Total Interest Earned on COCP Funds During the Quarter</u>
The interest earned during this quarter totaled $18,417.34. A report providing detailed calculations of the interest earned on the COCP funds during each month of the quarter is included in Appendix B, pages 41and 42.

D. <u>Balance as of September 30, 2009, in the COCP Account</u>
The balance in the COCP account, including interest earned totals $2,448,783.05.

E.   <u>Expected Expenditures for the Funds Remaining in the COCP Account</u>
The projected expenditures for the funds remaining totals $2,448,783.05.

Quarterly Report Distribution List:

U.S. District Court
- Mr. Joseph Jasek, Assistant Deputy Chief USPO
- Mr. James Martinez, Supervising USPO

Texas Commission on Environmental Quality
- Ms. Sharon Blue, Litigation Division – Headquarters
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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 1, 2009 through September 30, 2009

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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 for the period July 1 through September 30, 2009. 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) in two residential areas;
- updated benzene trends at two auto-GC sites;
- a discussion about 1,3-Butadiene concentrations at the Solar Estates site;
- a discussion about TNMHC concentrations in Corpus Christi, with special focus on the Flint Hills Resources Easement site;
- three case studies of pollution events at the J. I. Haley site.

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

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/comm_exec/forms_pubs/pubs/rg/rg-442.html (Accessed October, 2009). 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 utilize 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 October 2009).

The current ESLs for benzene are 55.5 ppbV for short term and 1.4 ppbV for long term exposure. TCEQ has recommended 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 at a given time or annual quarter 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, on pages 13 and 14, summarize data from the third quarter of 2009. These tables are available to TCEQ staff at http://rhone.tceq.state.tx.us/cgi-bin/agc_summary.pl (accessed October 2009). The tables show the average concentrations over the quarter, and the maximum one-hour and 24-hour average concentrations for 27 hydrocarbon species of interest for the period of interest. 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 ESLs or Reference Values during the third quarter of 2009.

In each table, 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 rows for ***benzene*** are bold-faced and italicized in Tables 2 and 3, on pages 13 and 14 respectively, owing to the concern that the values for this species tend to be closer to the reference and screening values than do other species. The current benzene Reference Value used in toxicological evaluations to screen for areas of concern is 180 ppbV. As was noted earlier, the current short-term benzene ESL, which is only used for permitting purposes, is 55 ppbV. The annual ESL for benzene, which is used for both permitting and toxicological evaluations to screen for areas of concern, is 1.4 ppbV.

The cell containing the maximum 1-hour concentration for ***1,3-butadiene*** at Solar Estates in Table 3, on page 14, is also bold-faced and italicized. As will be discussed in a later section in this report, the 35.73 ppbV concentration is the highest concentration for this species measured to date at Solar Estates. The ESL used for toxicological evaluations is 230 ppbV for odor and 510 ppbV for toxicity, so this measured value alone would not trigger an alert. Nevertheless, because this species is an air toxic compound and a highly reactive ozone precursor, some investigation into the event is discussed on pages 19 through 25.

Table 2. Oak Park auto-GC data summary 3rd quarter 2009

Species- ppbV units	Num Ambient Samples	Mean	Peak 1-Hour Value	Peak 24-Hour Value
Ethane	1898	3.37	95.52	19.54
Ethylene	1898	0.38	17.59	2.01
Propane	1898	1.88	60.39	13.39
Propylene	1898	0.25	51.15	2.94
Isobutane	1898	0.71	15.82	5.73
n-Butane	1898	1.02	37.45	8.07
t-2-Butene	1898	0.04	0.98	0.16
1-Butene	1898	0.03	0.68	0.13
c-2-Butene	1898	0.03	1.15	0.13
Isopentane	1898	1.26	63.38	7.63
n-Pentane	1887	0.78	56.30	6.08
1,3-Butadiene	1887	0.04	6.35	0.37
t-2-Pentene	1887	0.06	2.55	0.28
1-Pentene	1887	0.03	1.36	0.16
c-2-Pentene	1887	0.03	1.34	0.14
n-Hexane	1898	0.23	22.61	1.55
Benzene	***1898***	***0.28***	***9.50***	***1.86***
Cyclohexane	1897	0.11	4.38	0.79
Toluene	1898	0.37	8.48	1.72
Ethyl Benzene	1898	0.03	0.76	0.12
p-Xylene + m-Xylene	1898	0.11	2.77	0.36
o-Xylene	1898	0.04	0.61	0.14
Isopropyl Benzene - Cumene	1898	0.01	0.47	0.10
1,3,5-Trimethylbenzene	1898	0.01	0.31	0.04
1,2,4-Trimethylbenzene	1898	0.05	0.72	0.13
n-Decane	1898	0.02	0.57	0.09
1,2,3-Trimethylbenzene	1898	0.02	0.25	0.06

Table 3. Solar Estates auto-GC data summary 3rd quarter 2009

Species – ppbV units	Num Ambient Samples	Mean	Peak 1-Hour Value	Peak 24-Hour Value
Ethane	1859	4.56	84.03	12.38
Ethylene	1859	0.19	4.20	0.92
Propane	1859	2.71	59.15	7.60
Propylene	1859	0.19	13.21	1.31
Isobutane	1859	0.99	24.26	2.96
n-Butane	1859	1.15	22.88	3.17
t-2-Butene	1859	0.04	2.75	0.20
1-Butene	1859	0.03	12.28	0.77
c-2-Butene	1859	0.03	1.73	0.20
Isopentane	1859	0.81	20.76	2.23
n-Pentane	1859	0.49	6.06	1.43
1,3-Butadiene	1858	0.11	***35.73***	3.77
t-2-Pentene	1858	0.02	0.95	0.09
1-Pentene	1858	0.02	0.58	0.08
c-2-Pentene	1858	0.01	0.49	0.04
n-Hexane	1848	0.17	2.57	0.56
Benzene	***1859***	***0.12***	***2.08***	***0.37***
Cyclohexane	1859	0.11	1.92	0.36
Toluene	1859	0.18	2.79	0.56
Ethyl Benzene	1859	0.02	0.57	0.09
p-Xylene + m-Xylene	1859	0.09	2.61	0.38
o-Xylene	1859	0.03	0.91	0.11
Isopropyl Benzene - Cumene	1859	0.00	0.26	0.04
1,3,5-Trimethylbenzene	1859	0.01	0.88	0.10
1,2,4-Trimethylbenzene	1859	0.04	1.17	0.16
n-Decane	1859	0.03	2.60	0.29
1,2,3-Trimethylbenzene	1859	0.02	0.53	0.07

2. Benzene Trends at Auto-GC Sites

The project now has five years of quarterly data for the third quarter. Tables 4 and 5, on page 16, show the history of quarterly means and maxima for benzene at Oak Park CAMS 634 and Solar Estates CAMS 633, from 2005 to 2009. The two tables show the number of samples, the mean concentration for the quarter, and the quarterly maximum one-hour and midnight-to-midnight 24-hour average concentrations in ppbV units for each period. The third quarter summaries are in bold font. The quarterly mean values are graphed in Figures 2 and 3, on page 17.

In order to assess the overall trend in benzene, one must take into account the seasonal variability. A regression line could be fit to the data in Figures 2 or 3, but no valid assumptions could be made as the statistical significance of a trend because the residuals would still reflect the presence of the seasonal effect and thus not satisfy the independence assumption in regression. One way to try to overcome this is to assess each quarter relative to the mean value for that quarter of the year. For example, the equation below computes a seasonally adjusted (SA) quarterly mean for the second quarter of 2005:

$$2Q05_{SA} = 2Q05 - \text{mean}(2Q05, 2Q06, 2Q07, 2Q08).$$

Other quarterly differences can be calculated in the same manner. Figure 4, on page 18, shows the results of graphing the difference of each quarterly mean and the average for that quarter using data from 2Q05 through 1Q09 (four observations for each quarter) at Oak Park. The x-axis in Figure 4 is renumbered to use the numeric count of quarters since 2Q05, so 1 = 2Q05, 2 = 3Q05, … 18 = 3Q09. Figure 5, on page 18, shows the same data treatment for Solar Estates. A more rigorous examination of the regression residuals for these two data sets suggests that the assumptions of independence are still not met despite the seasonal adjustment. However, the regression line has a better fit to the seasonally adjusted data in terms of percent of variation explained by the line, i.e., R^2 is higher for the seasonally adjusted trend. To a limited extent the results allow one to estimate an average change per quarter for each site. For Oak Park there is an approximate average reduction of 0.02 ppbV per quarter since 2005, and at Solar Estates there is an approximate average reduction of 0.01 ppbV per quarter.

Table 4. Oak Park auto-GC data summary benzene by quarter

Quarter	Num Obs	Mean ppbV	Max 1hr ppbV	Max 24hr ppbV
2Q05	1,935	0.20	11.39	1.28
3Q05	**1,792**	**0.30**	**26.54**	**3.70**
4Q05	1,972	1.30	48.17	5.52
1Q06	1,795	0.81	46.03	6.92
2Q06	1,913	0.31	19.99	3.27
3Q06	**1,771**	**0.52**	**51.15**	**7.78**
4Q06	1,915	1.14	26.32	5.65
1Q07	1,954	1.04	120.16	8.95
2Q07	1,956	0.32	16.57	3.74
3Q07	**1,818**	**0.42**	**26.37**	**2.08**
4Q07	1,900	0.68	38.15	6.41
1Q08	1,878	0.46	20.93	1.86
2Q08	1,948	0.14	3.72	0.79
3Q08	**1,732**	**0.23**	**5.88**	**1.30**
4Q08	1,892	0.63	16.31	2.97
1Q09	1,950	0.43	7.13	1.69
2Q09	1,953	0.17	11.68	1.40
3Q09	**1,898**	**0.28**	**9.50**	**1.86**

Table 5. Solar Estates auto-GC data summary benzene by quarter

Quarter	Num Obs	Mean ppbV	Max 1hr ppbV	Max 24hr ppbV
2Q05	1,619	0.25	3.46	0.73
3Q05	**1,304**	**0.27**	**4.19**	**1.19**
4Q05	1,727	0.41	9.63	1.24
1Q06	1,534	0.34	5.43	1.07
2Q06	1,489	0.18	4.97	0.84
3Q06	**1,707**	**0.32**	**8.79**	**1.11**
4Q06	1,872	0.58	11.66	2.50
1Q07	1,847	0.43	6.29	1.80
2Q07	1,307	0.23	3.14	0.92
3Q07	**1,670**	**0.25**	**7.41**	**1.07**
4Q07	1,847	0.37	6.94	1.06
1Q08	1,937	0.26	3.80	0.65
2Q08	1,781	0.13	5.31	0.63
3Q08	**1,886**	**0.17**	**1.77**	**0.61**
4Q08	1,987	0.31	4.69	1.07
1Q09	1,912	0.25	4.02	0.65
2Q09	1,959	0.14	2.89	0.48
3Q09	**1,859**	**0.12**	**2.08**	**0.37**

Figure 2. Oak Park auto-GC mean benzene by quarter, ppbV units, 2Q05 – 3Q09

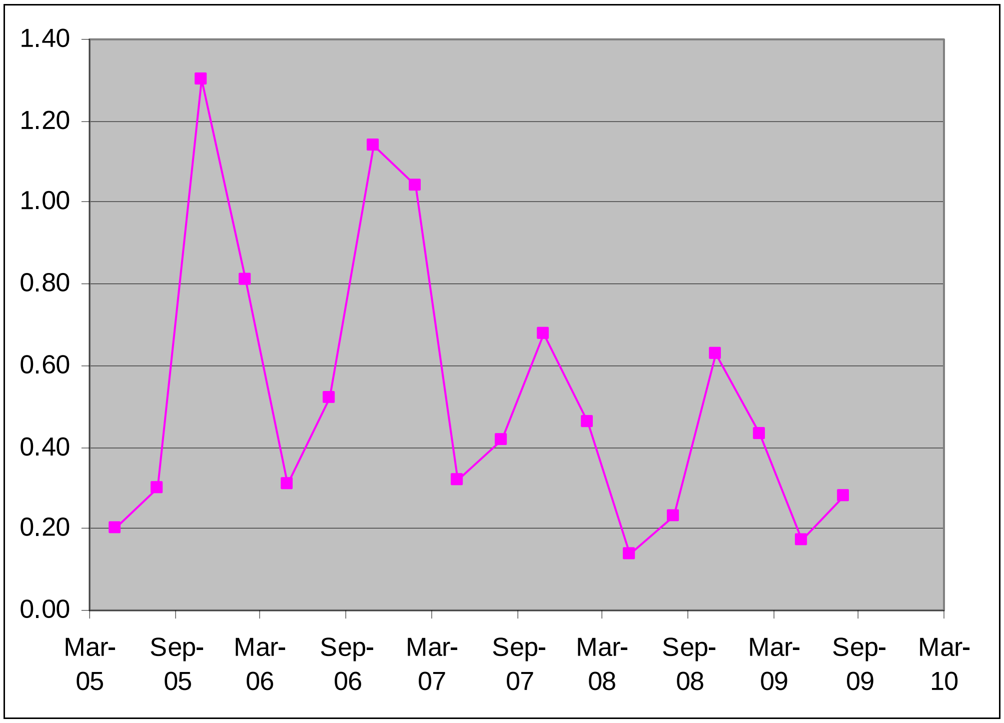


Figure 3. Solar Estates auto-GC mean benzene by quarter, ppbV units, 2Q05 – 3Q09

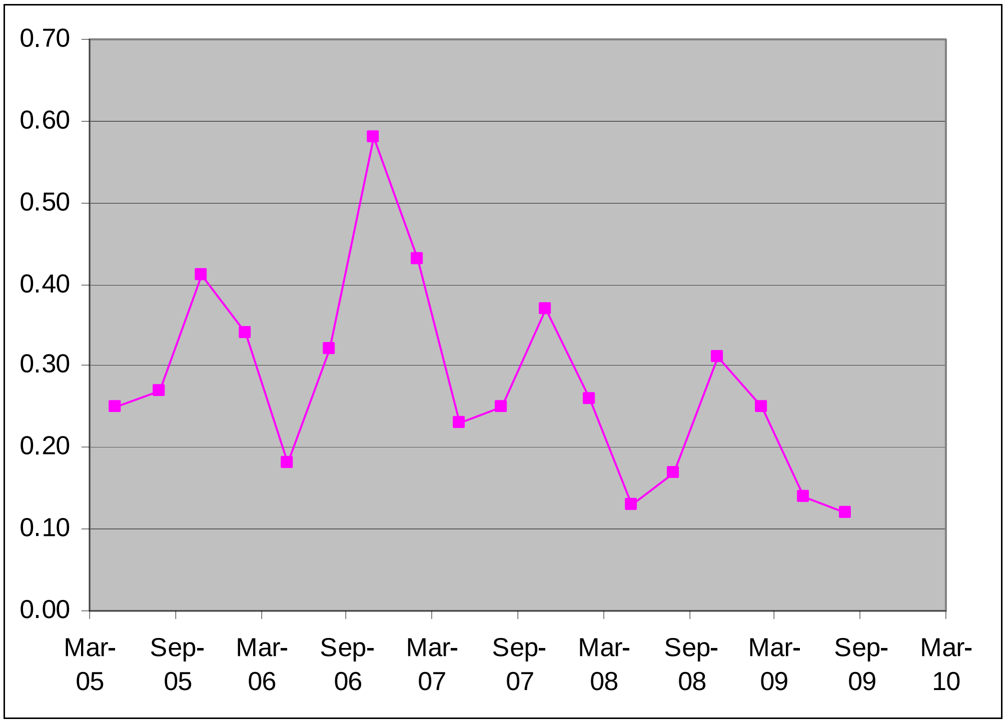


Figure 4. Oak Park auto-GC seasonally-adjusted mean benzene by quarter, ppbV units, 2Q05 – 3Q09

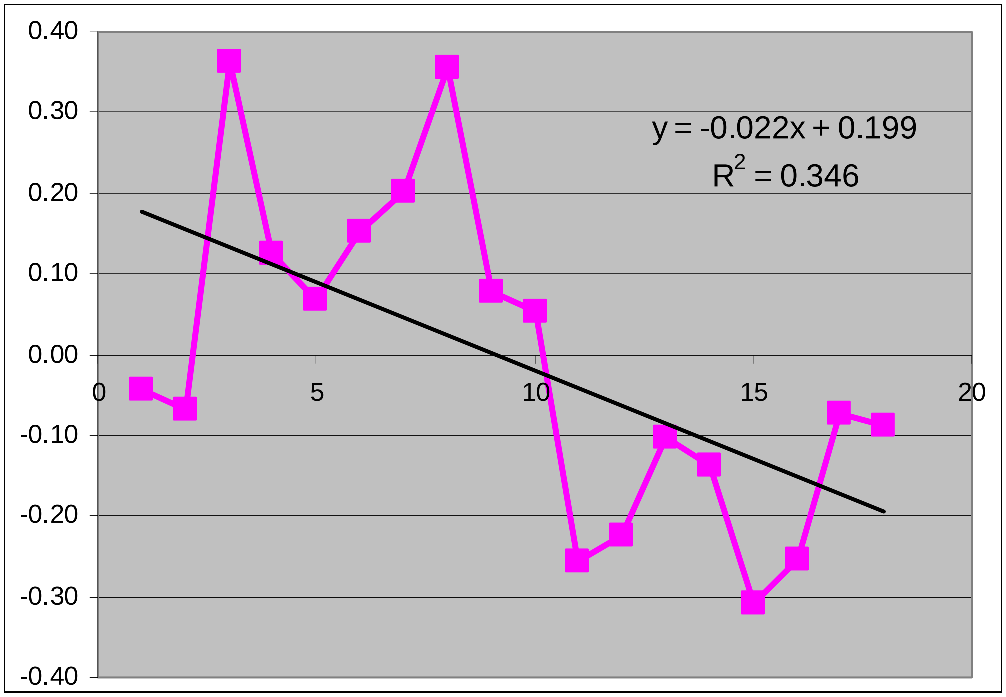
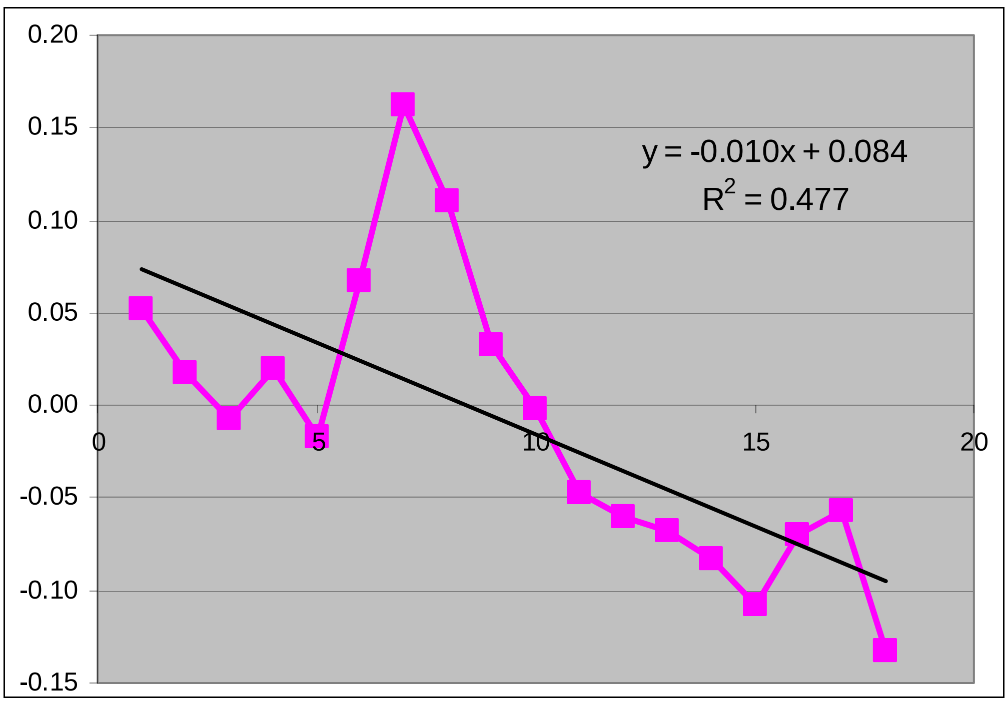


Figure 5. Solar Estates auto-GC seasonally-adjusted mean benzene by quarter, ppbV units, 2Q05 – 3Q09



3. Solar Estates 1,3-Butadiene Concentrations

The compound 1,3-butadiene is an air toxic and ozone precursor generally found in very low concentrations in urban air owing to presence in vehicle exhaust. Some industrial areas have had problems with 1,3-butadiene emissions from industrial facilities serious enough that TCEQ would limit new permits and require additional monitoring.

On September 27, 2009 the Solar Estates auto-GC measured the highest concentration for a one-hour value (35.7 ppbV) and for the 24-hour average (3.77 ppbV) for 1,3-butadiene measured in the Corpus Christi network to date. These data have not been validated by the site operator yet. The short-term ESLs used for toxicological evaluations are 230 ppbV for odor and 510 ppbV for toxicity, so the measured values alone would not trigger an alert. The long-term health ESL is 9.1 ppbV. Table 6, below, summarizes the long-term mean 1,3-butadiene concentration since the start of monitoring in March 2005 along with the one-hour and 24-hour maxima to date.

Table 6. Long term statistics (March 2006 – October 2009) for 1,3-butadiene at two auto-GCs, ppbV units, health ESLs used for comparison to ambient measurements

Site	Num 1-hr Samples	Mean	Long-term Health ESL	Peak 1-hr Value	Peak 24-hr Value	Short-term Health ESLs
Oak Park	34,602	0.048	9.1	11.16	1.01	230/510
Solar Estates	32,648	0.057	9.1	35.73	3.77	230/510

For more detailed information on 1,3-butadiene as an air toxic, see the documentation maintained by the Toxicology Section at the TCEQ by accessing the Web site http://tceq.com/assets/public/implementation/tox/dsd/final/butadiene,_1-3-_106-99-0_final.pdf .

For more detailed information on 1,3-butadiene as a highly reactive volatile organic compound contributing to ozone formation, see http://www.tceq.state.tx.us/implementation/air/sip/hrvoc.html .

Concern about a 35.7 ppbV measurement at Solar Estates stems not from the measurement at that location, but from the fact that the closest major source is three miles away, and upwind in the direction toward the source concentrations would have been higher. The large industrial source upwind of Solar Estates is the Equistar plant on McKinzie Road. This plant is permitted for 1,3-butadiene emissions and has reported occasional upsets of this compound, although there is no upset report in the TCEQ online database for Equistar on or around September 27, 2009.

Figure 6, on page 20, shows the time series for 1,3-butadiene overnight on September 26 and in the morning on September 27, along with the wind direction values by hour. Note that hours shown on the x-axis are relative to midnight on September 27, so evening hours on September 26 are negative numbers counting back from midnight (e.g., 11 p.m. CST on September 26 = -1). Wind direction changed slowly overnight from southeast at 7 p.m. CST (-5 on x-axis) though south to west southwest at the time 1,3-butadiene concentrations peaked, and then moved back to the south. Wind speeds varied very little on the morning of September 27, ranging from 4 to 7 miles per hour from midnight through 8 a.m. CST. Speeds picked up under the southerly flow after 9 a.m. CST. To put the concentrations at Solar Estates on September 26- 27 into context, Figure 7, below, shows the 1,3-butadiene ppbV values compared to the short-term ESLs used in comparison to ambient data.

Figure 6. Time series for 1,3-butadiene in dark blue, wind direction in magenta, September 26 – 27, 2009 (-1=11 p.m. CST 9/26, 0=midnight CST 9/27, etc.)

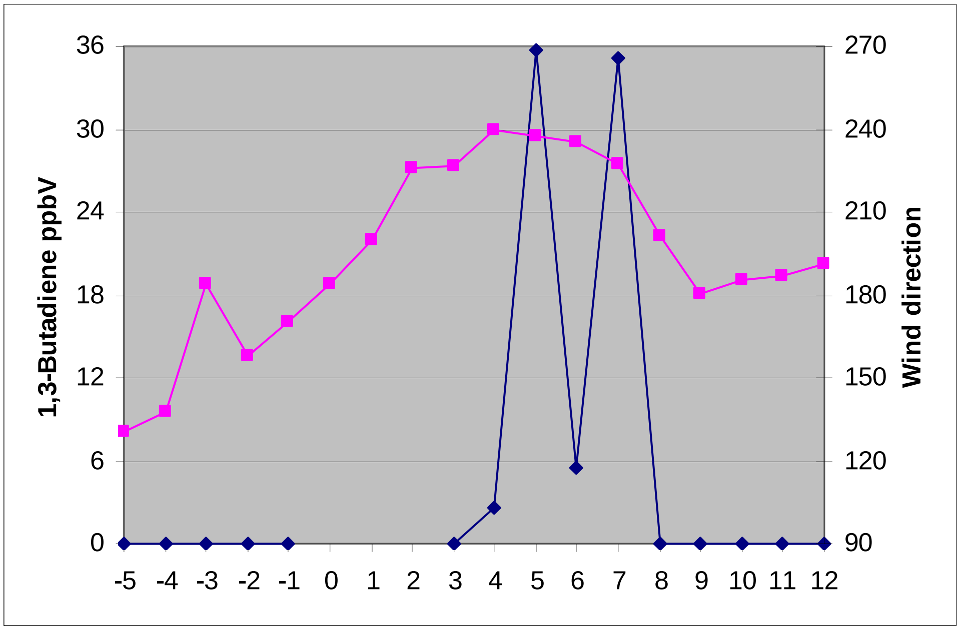
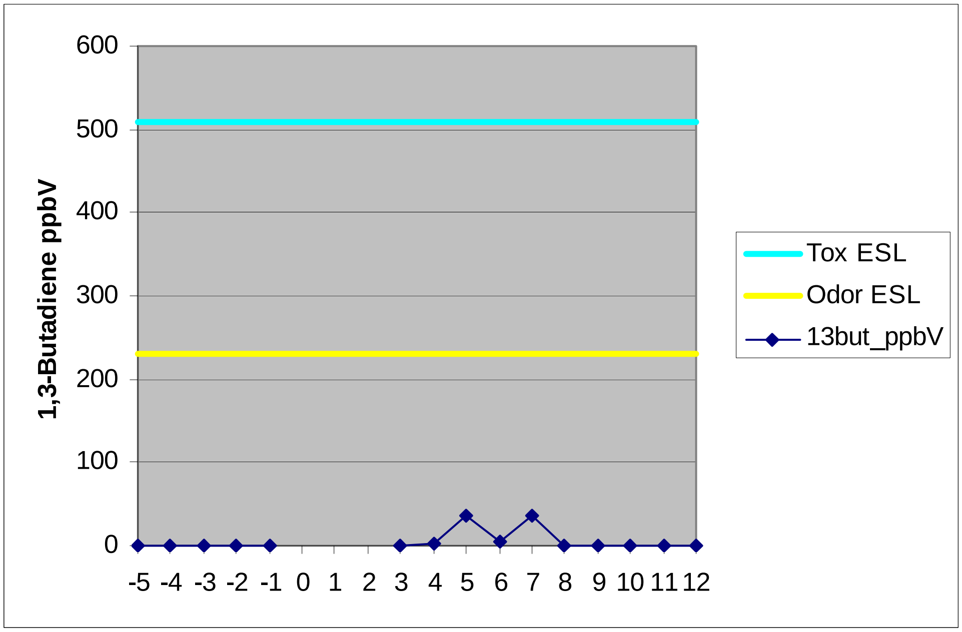


Figure 7. Time series for 1,3-butadiene in dark blue, odor ESL in yellow, toxicity ESL in light blue



Figures 8 – 17, on pages 22 to 24, show a series of surface back-trajectories for the start times 11:30 p.m. CST September 26, 12:30 a.m. CST September 27, … 8:30 a.m. CST September 27. These images show color-coded icons representing the centerline of the modeled back-trajectory path at 5-minute time steps. Color coding is white for near-zero levels (maximum value 0.06 ppbV) that were measured for the hour beginning at 11 p.m. CST September 26, assumed for the missing values from midnight – 2 a.m. CST September 27 during which daily blank and standard quality assurance tests are run, and measured for the hour beginning at 3 a.m. CST September 27. Color coding is yellow for clear detections of 2.6 ppbV at 4 a.m. and 5.4 ppbV at 6 a.m. Color coding is red for the values of 35.7 ppbV at 5 a.m. and 35.2 ppbV at 7 a.m. CST on September 27. A comparison among Figures 8 – 17, shows that the color coding is highly correlated with back-trajectory point-of-closest-approach to the Equistar facility.

The reader is cautioned to recall that the surface back-trajectories are based on data from the UT and TCEQ monitoring networks, and in moving away to the southwest of the Solar Estates site, one moves to an area of less certainty in wind conditions. However, research into the relative agreement between monitoring stations for wind direction and speed strongly suggests that estimates of wind direction and speed at Solar Estates and the TCEQ CAMS 21 Tuloso site should support surface back-trajectories to the south or west for several miles on a par in terms of accuracy to back-trajectories that stay within the Corpus Christi industrial area.

In examining the relationship of historical 1,3-butadiene measurements and wind directions at Solar Estates back to 2005, a clear directionality pattern is visible. In order to make use of similar annual periods to assess trends, the data have been separated into annual periods beginning September 1 running through August 31 for each year beginning September 2005. The rationale for selecting these start and stop dates is that uniform data analysis practices for the Corpus Christi project began in September 2005. Because September-August is also the fiscal year for the State of Texas, this annual time period category is labeled *FY*. Two approaches have been looked at: one that takes the mean concentration as a function of wind direction by *FY*, and one that performs an adjustment of the hourly concentrations based on the wind speed and then averages the resulting variable by wind direction and *FY*. The wind speed adjustment is based on the principle that all else being equal (e.g., distance downwind, emission rate), a downwind concentration is inversely proportional to the wind speed. This is important because an examination of the wind data shows that westerly winds average 4.8 miles per hour (mph), while southerly winds average 9.2 mph, and southeasterly winds average 12 mph. Thus, the same emissions may produce mean concentrations less than half as high in one location that is the same distance from the source as another location, based on the direction from the source. Other factors are present, however, that further complicate the ability to estimate concentrations away from a monitor. The stability / turbulence of the winds based on surface features and larger scale meteorological features associated with time of day are important. This is why a significant amount of effort is now going into UT's Neighborhood Air Toxics Project, which uses complex meteorological and dispersion models to estimate concentrations in and around Corpus Christi.

Figure 8. Surface back-trajectory from Solar Estates started 11:30 p.m. CST 9/26/09, 1,3-Butadiene = 0.0425 ppbV

Figure 9. Surface back-trajectory from Solar Estates started 12:30 a.m. CST 9/27/09, 1,3-Butadiene = missing value

Figure 10. Surface back-trajectory from Solar Estates started 1:30 a.m. CST 9/27/09, 1,3-Butadiene = missing value

Figure 11. Surface back-trajectory from Solar Estates started 2:30 a.m. CST 9/27/09, 1,3-Butadiene = missing value

Figure 12. Surface back-trajectory from Solar Estates started 3:30 a.m. CST 9/27/09, 1,3-Butadiene = 0.0225 ppbV

Figure 13. Surface back-trajectory from Solar Estates started 4:30 a.m. CST 9/27/09, 1,3-Butadiene = 2.640 ppbV

Figure 14. Surface back-trajectory from Solar Estates started 5:30 a.m. CST 9/27/09, 1,3-Butadiene = 36.73 ppbV

Figure 15. Surface back-trajectory from Solar Estates started 6:30 a.m. CST 9/27/09, 1,3-Butadiene = 5.443 ppbV

Figure 16. Surface back-trajectory from Solar Estates started 7:30 a.m. CST 9/27/09, 1,3-Butadiene = 35.19 ppbV

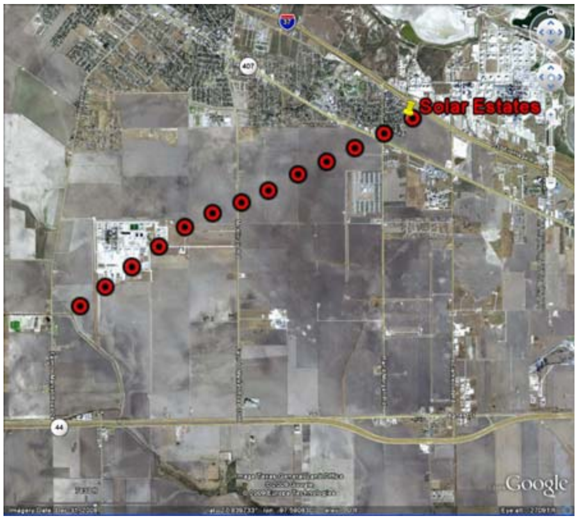


Figure 17. Surface back-trajectory from Solar Estates started 8:30 a.m. CST 9/27/09, 1,3-Butadiene = 0.0600 ppbV

Figure 18, on page 25, shows the graph of mean 1,3-butadiene as a function of wind direction, with individual traces in the graph for four different FYs. Note that units in this figure are ppbC, which are four times greater for the same concentration of 1,3-butadiene in ppbV units. These ppbC units are the raw data outputs from the auto-GC. Figure 19, on page 25, shows the same type of analysis for the wind speed-adjusted concentrations. Both Figures 18 and 19, reflect higher 1,3-butadiene associated with westerly winds, with significant variability from year to year. The wind speed adjustment helps better indicate that some source to the northeast at around 50 degrees was affecting the site in FY 2006-2007. They also suggest similar source strengths in FY 2005-2006 and FY 2008-2009, despite different mean concentrations. The range of peak wind directions in Figures 18 and 19 is from 220 to 260 degrees, which suggests the Equistar facility as the principle source. The overall mean concentration for all winds in this range is 3.07 ppbC, or 0.77 ppbV. It may be appropriate to look at the reported emissions from the facility to see, through modeling, if they are likely to produce the range of concentrations observed.

Figure 18. Solar Estates mean 1,3-butadiene ppbC by wind direction by year

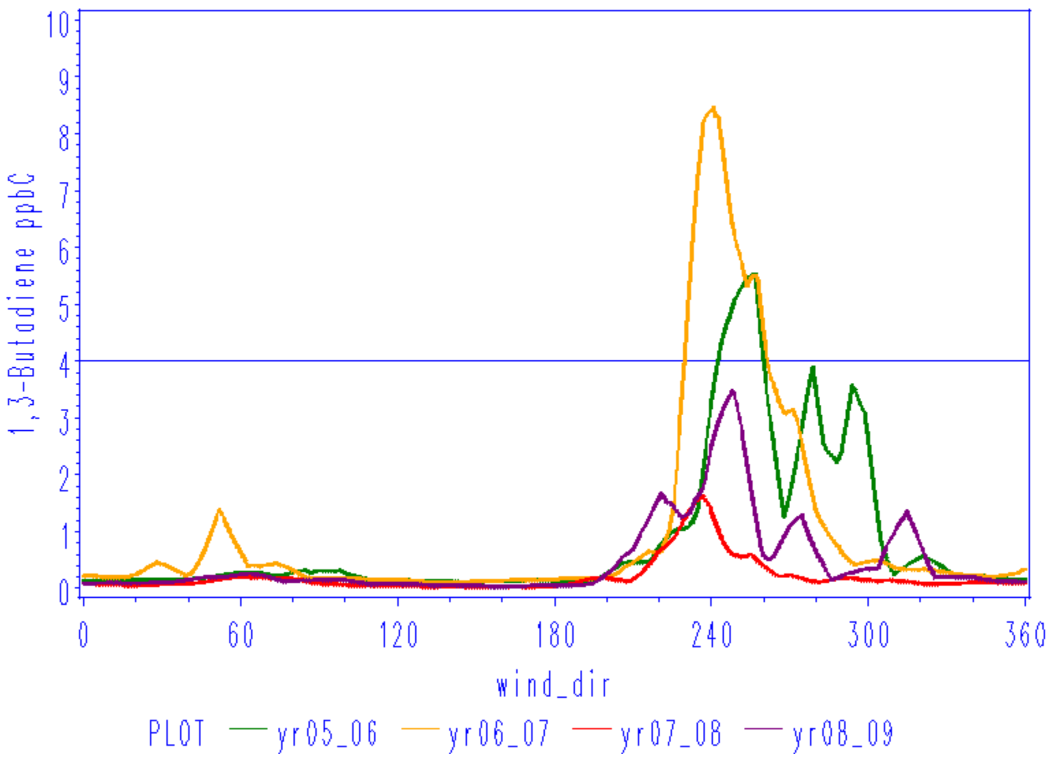
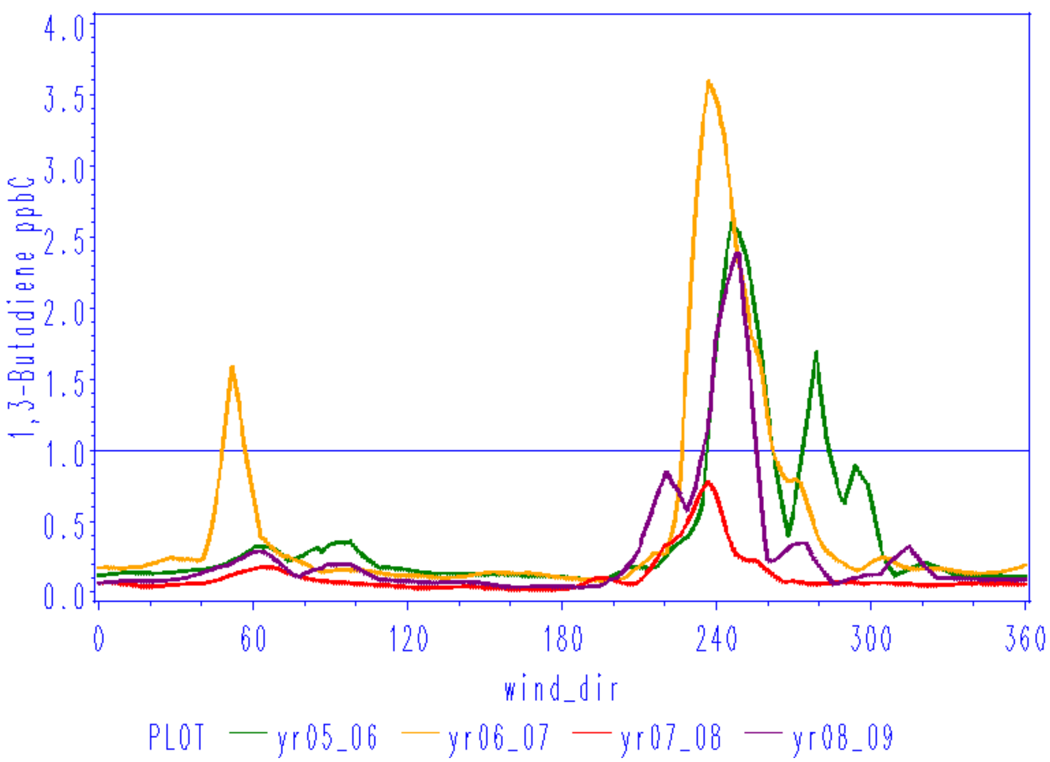


Figure 19. Solar Estates mean wind speed-adjusted 1,3-butadiene ppbC by wind direction by year



4. Changes in TNMHC Concentrations

In this section, trends in total nonmethane hydrocarbon (TNMHC) concentrations at the seven UT CAMS sites are discussed. The approach taken is to use one-hour time resolution data from each site and calculate statistics based on one year periods running from September 1 through August 31 of the following year (State of Texas FY). As was mentioned earlier in this report, the rationale for selecting these start and stop dates is that uniform data analysis practices for the Corpus Christi project began in September 2005. Special attention is devoted to the Flint Hills Resources (FHR) Easement CAMS 632 site, for which both one-hour and five-minute time scale resolution data are used.

FHR CAMS 632

During the initial years of operation of the UT Corpus Christi air monitoring network, FHR CAMS 632 routinely measured the highest TNMHC concentrations in the area. An early finding was that nearly all TNMHC values high enough to trigger a canister sample were measured under southerly winds, and that two small tank batteries and a pair of pump jacks lay a short distance away in that direction. See Figure 20, below, and Figures 21 and 22, on page 27, for aerial views. The AQSI contractor reports that the easternmost pump jack in Figures 21 and 22 no longer operates but the westernmost does.

Figure 20. Location of FHR CAMS 632 site relative to some possible emission sources: large refinery to the northeast, above ground storage tanks to the northwest, two tank batteries to the south

Figure 21. Red circle is CAMS 632, black circle is tank battery 150 meters away at 164 deg. from north, blue circle is pump jack 200 meters away at 172 deg., green circle pump jack is 197 meters away at 193 deg. Tank battery on south side of IH37 from Figure 20 is 390 meters away at 184 deg.

Figure 22. Close-up of tank battery and pump jacks on north side of IH 37

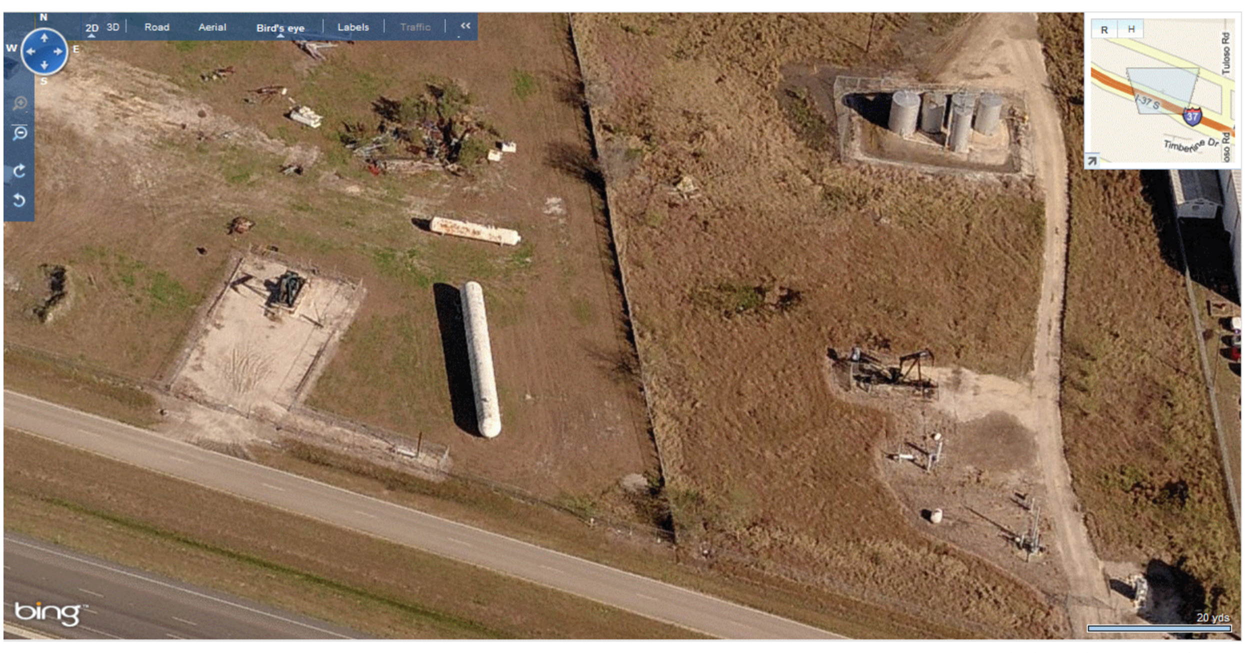
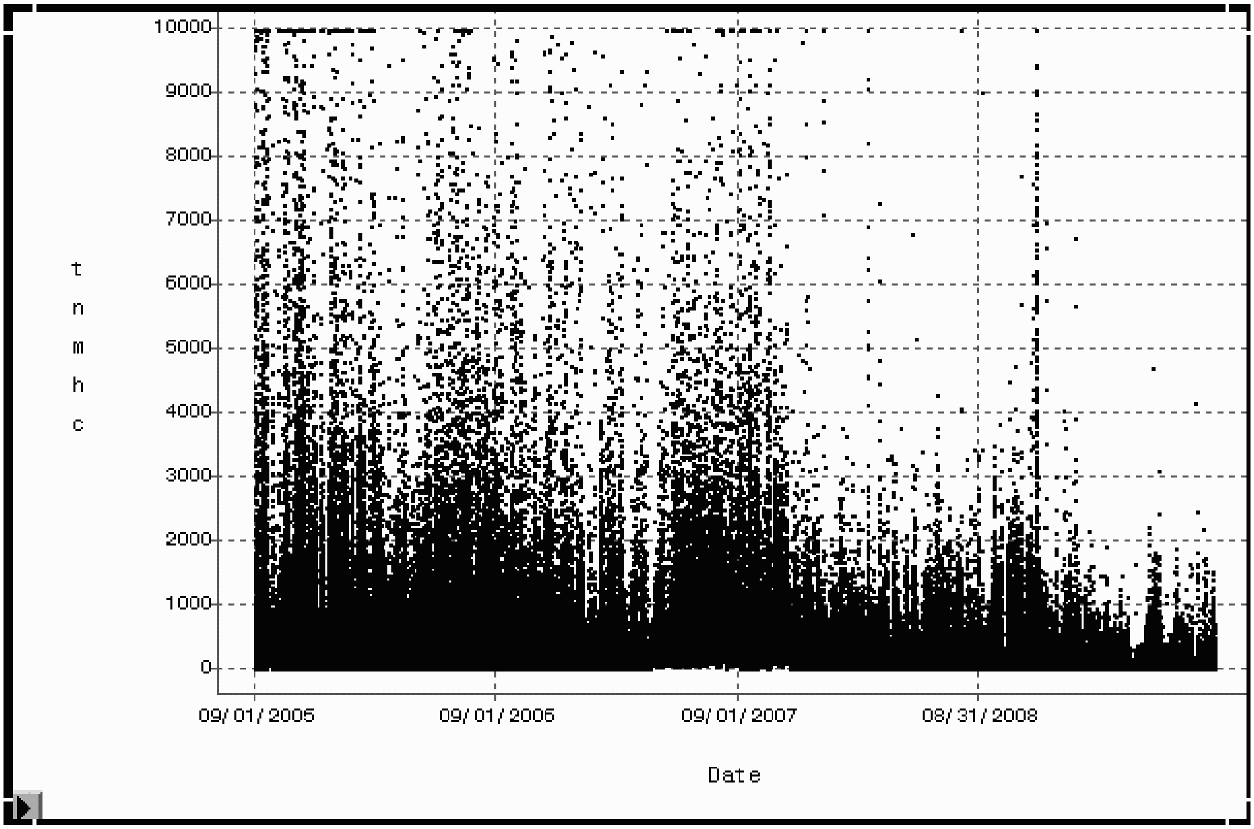


Figure 23, below, is the view from the CAMS 632 station looking southeast. The roof of a tank and the easternmost pump jack are visible and are circled in the figure.

Figure 23. View looking southeast from the CAMS 632 roof

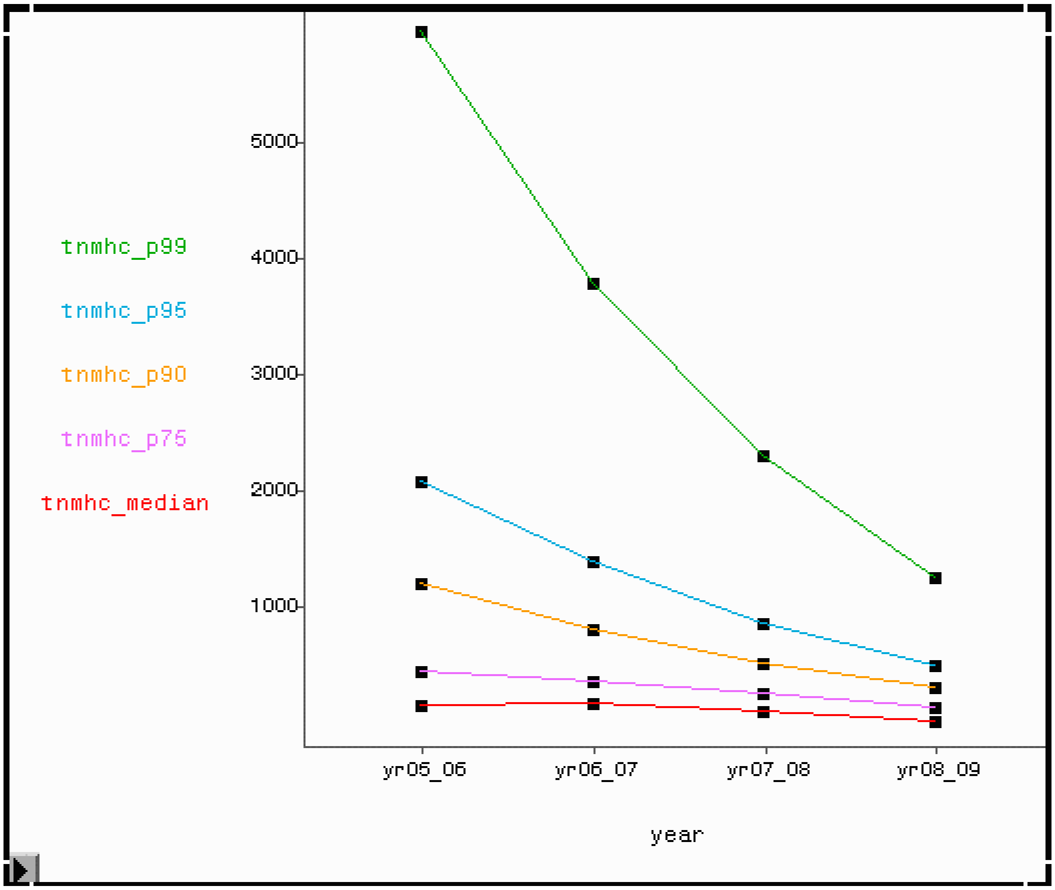
Instruments used to measure trace gases in the air have a limited range of operation based on how they are calibrated. The TECO 55C methane/nonmethane analyzer at CAMS 632 is programmed to measure TNMHC concentrations primarily in the 0 to 10,000 ppbC (10 ppmC) range. For much of its operating life, when the instrument was challenged with a concentration higher than 10,000 ppbC it cropped the result to be equal to 10,000. However, from April 2006 to March 2007 and during a short period in July 2007, the instrument operated with a greater full scale range and reported values up to 39,000 ppbC. Since October 2008 the TNMHC data are no longer being cropped. Figure 24, on page 29, shows the time series of five-minute resolution data (some 420,000 observations) on a scale of 0 to 10,000 ppbC, ignoring the 110 individual values greater then 10,000 ppbC. The cropping is clearly visible. More importantly, concentrations appear to have declined at CAMS 632. The last time a measurement met or exceeded the 10,000 ppbC threshold at CAMS 632 was December 2008.

Figure 24. Time series of five-minute TNMHC data in ppbC units at FHR CAMS 632 from September 2005 – August 2009, leaving out 110 values not cropped at 10,000 ppbC



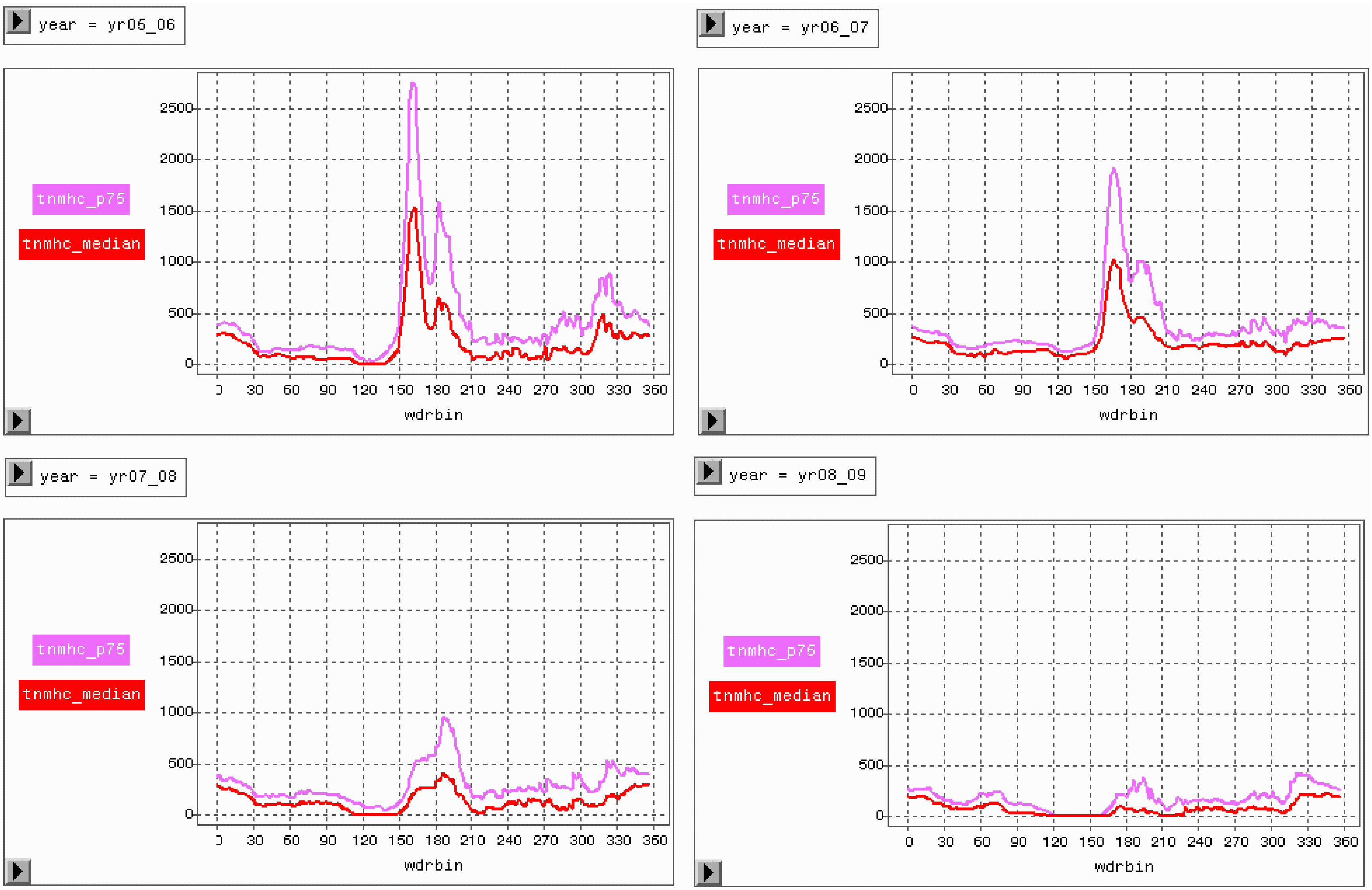
The fact that some 360 five-minute values were cropped at 10,000 ppbC over three years means that it is impossible to accurately estimate the maximum one-hour average, and the ability to calculate any longer term averages is also compromised, but to a lesser extent. The level of compromise becomes smaller as the averaging time grows, but this concern can be avoided completely if so-called "nonparametric" statistics such as the *median* and other *percentiles* are used. Since the median is the value for which half of all observations are greater and half are lesser, then it does not matter how large the greatest values are in the distribution. The median is also referred to as the 50th percentile value. The approximately 360 cropped values comprise less than 1/10th of one percent of the data, and the maximum occurrence in any one month was 63 observations (out of roughly 8,000 monthly observations), so in no event could a cropped value affect a 99th percentile or lower percentile calculation. Because of the robustness of these statistics, they are used to track the trends for TNMHC at CAMS 632. Consider Figure 25, on page 30, which shows the median, 75th, 90th, 95th, and 99th percentiles at CAMS 632 calculated from the five-minute resolution data for the September – August annual periods described earlier. Except for the medians in FY05-06 compared to FY06-07, which appear to be the same, there is a remarkably consistent downward trend in each statistic from each year to the next.

Figure 25. FHR CAMS 632 Sept. – Aug. annual median, 75th, 90th, 95th, and 99th percentiles for TNMHC at five-minute resolution



As was noted above, the small emission sources south of the site have been thought to be the cause of elevated TNMHC concentrations at the CAMS 632. It is instructive then to examine the TNMHC concentrations as a function of wind direction. By merging coincident five-minute data for wind direction and TNMHC, and then summarizing the TNMHC concentrations by two degree direction bins, clear "directionality" appears as a factor. In Figure 26, on page 31, the median and 75th percentile TNMHC concentrations by two-degree wind direction bins are shown by September – August annual periods for four years. Starting in 2005 – 2006, concentration peaks are associated with 161 – 165 degrees and 183 – 185 degrees directions, and to a lesser extent with 319 – 321 degrees directions. The 319 – 321 degrees direction may be associated with the above-ground storage tanks in Figure 21, on page 27. The 161 – 165 degrees and 183 – 185 degrees directions may be associated with the two tank batteries, and also with the two pump jacks. In 2006 – 2007, concentrations declined in all three directions just mentioned, but in 2007-2008 the concentrations dropped significantly from the 161 – 165 degrees direction, with the 183 – 185 degrees direction unchanged, followed by a drop in both off these directions in 2008 – 2009. At this point the scale used in the four graphs and the median and 75th percentile statistics no longer indicate strong "directionality", although one might note the relatively clean air with median = 0.0 ppbC around 120 – 150 degrees.

Figure 26. TNMHC median and 75th percentile concentrations in ppbC units by two-degree wind direction bins, by September – August annual periods



Trends in TNMHC in the Corpus Christi Network

As was noted earlier, the trend approach taken in this report is to use one-hour time resolution data from each site and calculate statistics based on one year periods running from September 1 through August 31 of the following year.

In the discussion of the trend at FHR CAMS 632 it was mentioned that cropping of some concentrations above a 10,000 ppbC threshold had occurred, and this practice affected other sites as well. The frequency of cropping has not been examined for all sites, so it is not clear what higher percentiles of concentrations may be affected, so in this section the median, 75th, and 90th percentiles are examined. The annual values for these statistics appear in Table 7, below, and are graphed in Figures 27 – 33, on pages 33 to 36.

Table 7. Corpus Christi TNMHC ppbC hourly statistics by State Fiscal Year

C629	Median	75th p-tile	90th p-tile	C633	Median	75th p-tile	90th p-tile
FY05_06	36.4	126.4	293.1	FY05_06	65.3	147.9	264.8
FY06_07	24.7	110.6	251.4	FY06_07	23.4	132.8	240.0
FY07_08	20.7	95.9	226.3	FY07_08	1.1	52.0	174.7
FY08_09	22.0	92.7	221.9	FY08_09	2.5	65.9	191.8
C630	**Median**	**75th p-tile**	**90th p-tile**	**C634**	**Median**	**75th p-tile**	**90th p-tile**
FY05_06	118.7	266.5	480.0	FY05_06	18.7	138.7	438.4
FY06_07	37.2	132.4	299.1	FY06_07	20.1	180.5	387.4
FY07_08	39.7	123.6	246.1	FY07_08	4.2	111.2	277.8
FY08_09	35.8	109.1	256.8	FY08_09	5.1	116.8	277.8
C631	**Median**	**75th p-tile**	**90th p-tile**	**C635**	**Median**	**75th p-tile**	**90th p-tile**
FY05_06	116.3	278.0	513.1	FY05_06	90.1	192.5	318.4
FY06_07	57.9	152.9	300.3	FY06_07	86.0	174.9	285.4
FY07_08	61.7	144.1	266.1	FY07_08	43.4	142.6	265.0
FY08_09	83.0	167.4	294.6	FY08_09	4.2	75.1	234.2
C632	**Median**	**75th p-tile**	**90th p-tile**				
FY05_06	209.3	554.0	1312.0				
FY06_07	210.5	417.9	921.4				
FY07_08	121.9	284.6	556.6				
FY08_09	29.7	160.0	324.1				

There is a generally downward trend for each CAMS site. CAMS 631 sees a slight increase in going from 2007 – 2008 to 2008 – 2009, but the change from 2005 – 2006 is still downward (See Figure 29, on page 34).

Figure 27. Port Grain (CCG) CAMS 629 TNMHC median, 75th, and 90th percentile statistics using one-hour data by Fiscal Year

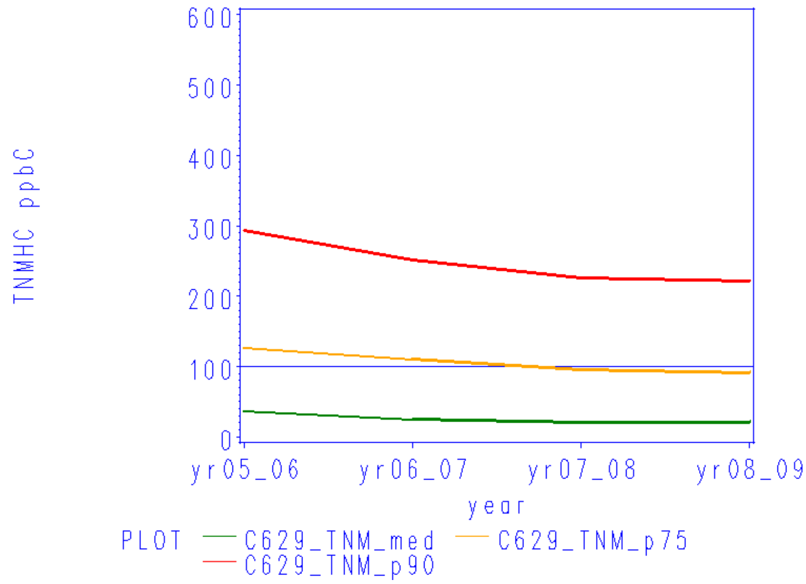


Figure 28. J.I. Hailey (JIH) CAMS 630 TNMHC median, 75th, and 90th percentile statistics using one-hour data by Fiscal Year

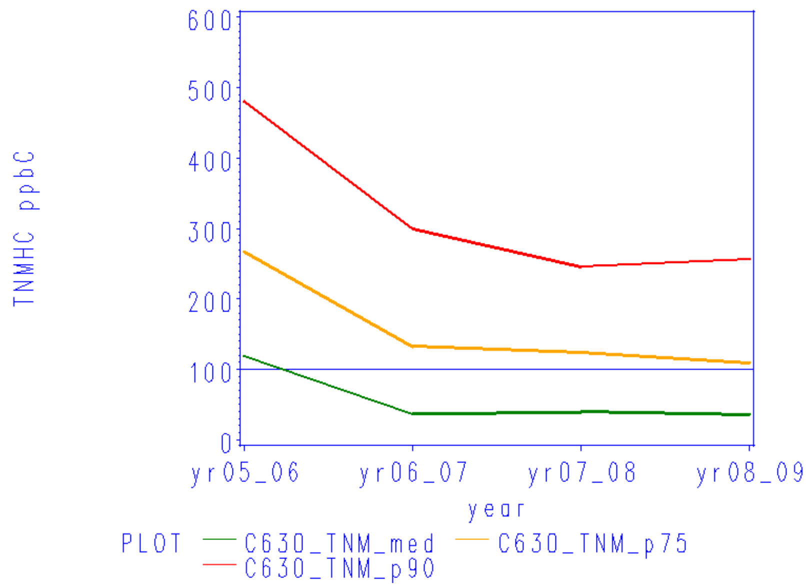


Figure 29. Inner Harbor (WEH) CAMS 631 TNMHC median, 75th, and 90th percentile statistics using one-hour data by Fiscal Year

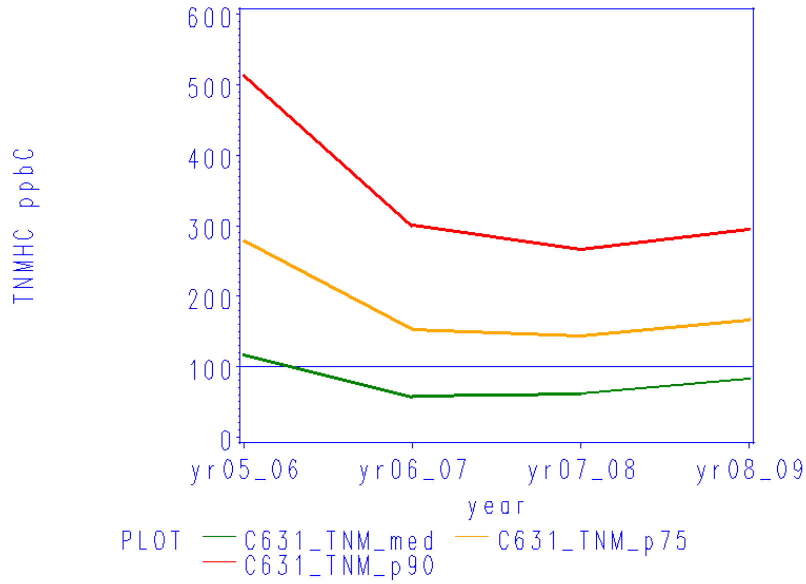


Figure 30. Flint Hills (FHR) CAMS 632 TNMHC median, 75th, and 90th percentile statistics using one-hour data by Fiscal Year

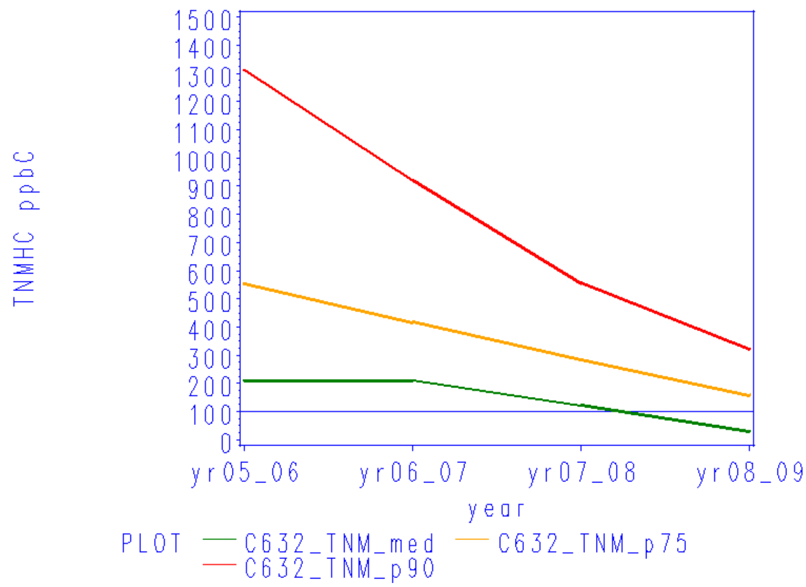


Figure 31. Solar Estates (SOE) CAMS 633 TNMHC median, 75th, and 90th percentile statistics using one-hour data by Fiscal Year

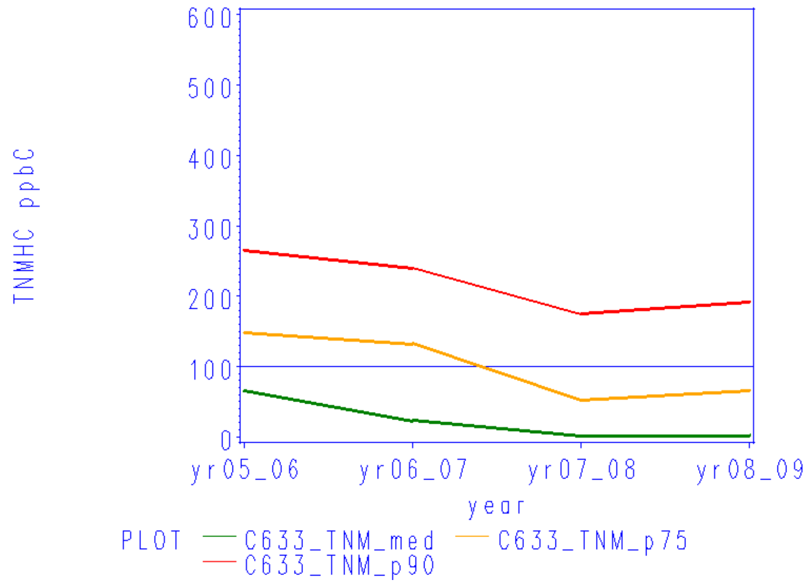


Figure 32. Oak Park (Oak) CAMS 634 TNMHC median, 75th, and 90th percentile statistics using one-hour data by Fiscal Year

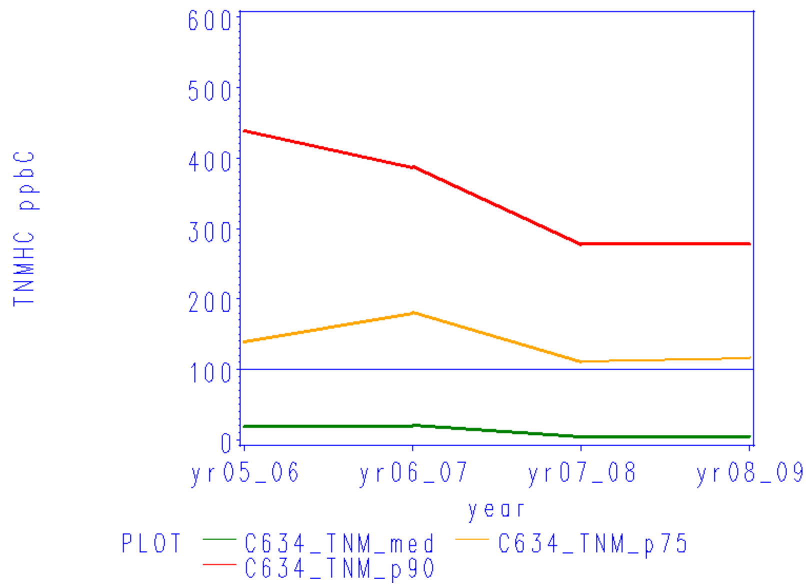
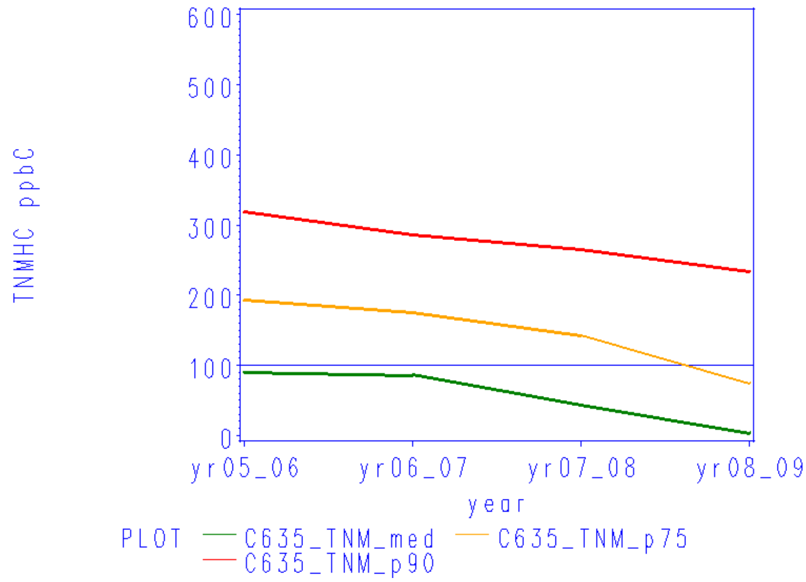


Figure 33. Dona Park (DPK) CAMS 635 TNMHC median, 75th, and 90th percentile statistics using one-hour data by Fiscal Year



5. Case Studies of Pollution Events

Only three canister samples were taken in the third quarter of 2009, all at the JIH CAMS 630 site. As was reported last quarter, the rate at which canisters have been sampled has slowed down over the past three years since the frequency of concentrations above 2000 ppbC has decreased. Table 8, below, shows the counts for the number of canister samples since April 2006 by quarter. The table shows that the fourth quarter of each year has had the most canister-triggering activity, and the second quarter has had the least. The last row is highlighted because it is the most recently concluded quarter.

Table 8. Total number of canister samples at 5 sites by quarter

Quarter/year	Num of samples
2Q06	7
3Q06	4
4Q06	23
1Q07	10
2Q07	6
3Q07	9
4Q07	40
1Q08	3
2Q08	2
3Q08	6
4Q08	22
1Q09	15
2Q09	2
3Q09	***3***

The location and date-time for the three third quarter 2009 canisters are in Table 9, below. Under "Site name" the label for the back-trajectory in Figure 34, on page 38, is listed. The table also shows the comparison between adding up the individual identified chemical species mass (Canister sum identified species ppbC) compared to the approximate coincident 20 minute TNMHC average. Recall that TNMHC is measured in five-minute integrated samples, so in comparing a canister sum taken from 12:12 p.m. to 12:22 p.m. CST on August 29 at JIH to the 12:10 to 12:20 continuous TNMHC analyzer weighted average, some accuracy in the comparison is lost. Nevertheless, the agreement (within 7.6 to 10.6 percent) is excellent for each canister in Table 9.

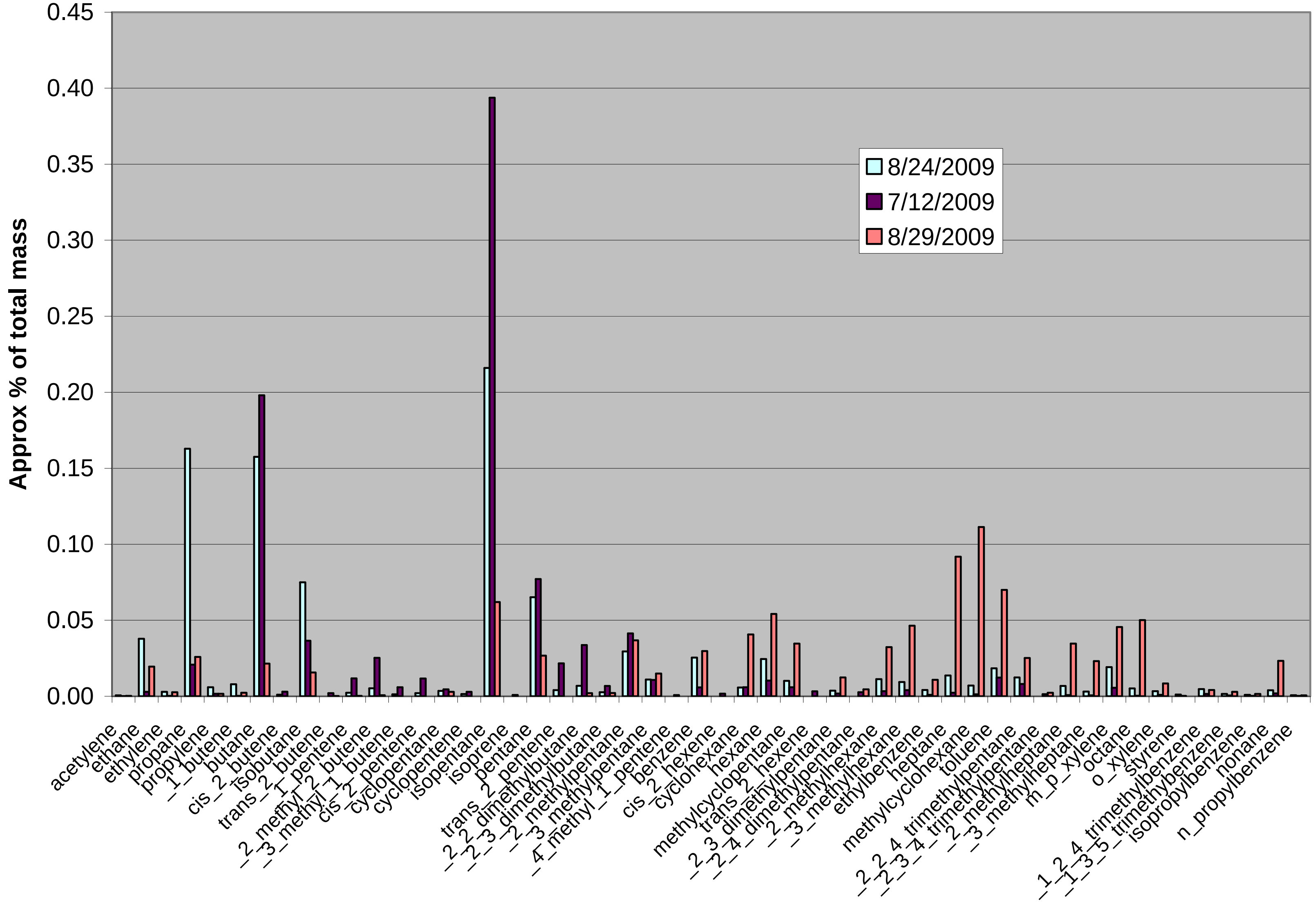
Table 9. Canister samples summary

Site name	Date-time CST	Canister sum identified species ppbC	Coincident TNMHC ppbC
JIH (trajectory A)	7/12/2009 23:53	6,055.09	6,533.42
JIH (trajectory B)	8/24/2009 23:52	886.74	797.84
JIH (trajectory C)	8/29/2009 12:12	2,826.10	3,129.43

The short-term back-trajectory 5-minute time steps corresponding to the three events appear in Figure 34, on page 38, placed on a Google Earth map. Two trajectories (A &B) pass over CITGO Dock 7 and the CITGO Refinery. Trajectory C passes over Avery Point Public Oil Docks 7 and 11, and then generally follows the Ship Channel. The patterns of hydrocarbon species from the three canisters appear side-by-side in Figure 35, on page 39. Note the clear differences in canister make-up, with a predominance of butanes and pentanes on 7/12, a range of light alkanes on 8/24, and heavier six-carbon – eight-carbon species on 8/29.

Figure 34. Three back-trajectories at 5-min, time steps back from JIH CAMS 630 (A=7/12/09, B=8/24/09, C=8/29/09)

Figure 35. Three canister samples at JIH CAMS 630 from 3rd qtr 2009, shown in terms of percent carbon mass by species



Conclusions from the Third Quarter 2009 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 this quarter in the auto-GC data.
- Benzene concentrations at the auto-GCs show an overall significant downward trend since 2005.
- 1,3-Butadiene bears watching at Solar Estates, as values measured well below the ESLs are still indicators concentrations are higher elsewhere.
- TNMHC concentrations are coming down across the network, with significant declines at the FHR site, which are most likely related to reduced emissions at nearby tank batteries and pump jacks.

Further analyses will be provided upon request.

APPENDIX B

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
07/01/09 - 09/30/09

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

Total Grant Amount:	$6,761,718.02
Total Interest Earned:	**$726,125.61**
Total Funds Received:	**$7,487,843.63**

B. Summary of Expenditures Paid by COCP Funds

		Year 3 Budget	Year 4 Budget	Year 5 Adjustments	Year 6 Budget	Yrs 1-6 Adjusted Budget	Prior Activity	Current Activity 07/01/09 - 09/30/09	Encumbrances	Remaining Balance 9/30/2009
Salaries-Prof	12	$216,128.63	$160,652.00	286,279.40	299,633.00	$962,693.03	($856,183.61)	($58,289.28)	($23,120.00)	$25,100.14
Salaries-CEER	15	$19,606.37	$15,636.00	33,123.00	30,948.00	$99,313.37	($81,860.58)	($9,258.99)	($7,871.76)	$322.04
Fringe	14	$47,984.00	$38,783.00	58,333.00	72,728.00	$217,828.00	($188,962.96)	($12,573.34)	($20,627.35)	-$4,335.65
Other/C-Analysis	47/68	$60,474.00	$73,500.00	(8,656.40)	73,500.00	$198,817.60	($52,010.00)	($2,756.00)	$0.00	$144,051.60
Supplies	50	$86,844.00	$33,500.00	68,676.00	122,682.00	$314,719.73	($273,216.15)	($17,701.06)	($31,767.51)	-$7,964.99
	51		$20,300.00	8,000.00		$22,822.27	($16,585.02)	($9.98)	($595.56)	$5,631.71
Subcontract	62-64	$1,965,693.00	$314,022.00	296,734.00	346,289.00	$2,922,738.00	($2,706,703.99)	($81,540.11)	$0.00	$134,493.90
Travel	75	$2,300.00	$2,000.00	7,719.00	9,000.00	$23,479.00	($20,083.25)	($581.60)	$0.00	$2,814.15
Equipment	80	$0.00	$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	143,217.00	$714,362.00	($593,338.11)	($27,406.55)	$0.00	$93,617.34
TOTALS		**$2,758,885.00**	**757,152.00**	**862,739.00**	**1,037,501.00**	**$5,476,773.00**	**($4,788,943.67)**	**($210,116.91)**	**($83,982.18)**	**$393,730.24**

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

Prior Interest Earned:	**$707,708.27**
Interest Earned This Quarter:	$18,417.34
Total Interest Earned to Date:	**$726,125.61**

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

Total Grant Amount:	$6,761,718.02	
Total Interest Earned:	$726,125.61	
Current Q. Expenses	($210,116.91)	
Total Expenditures:	($4,788,943.67)	
Remaining Balance:	**$2,488,783.05**	Includes Interest Sept'09

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

Accounting Certification