Corpus Christi Air Monitoring and Surveillance Camera Installation and Operation Project
Case Number: 2:11-MC-00044

Quarterly Report for the Period

January 1, 2012 through March 31, 2012

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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May 30, 2012

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 March 31, 2012 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 41, and a summary of these analyses appears 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 the COCP Project monitoring sites along with TCEQ sites appears in Figure 1, below. Table 1, on page 3, identifies the location and instrumentation found at each of the COCP Project sites. TCEQ sites and some of the sites farther from the COCP area than the TCEQ sites, operated by Texas A&M at Kingsville (TAMUK) provide additional data used in these 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

CAMS	continuous ambient monitoring station
Auto GC	automated gas chromatograph
TNMHC	total non-methane hydrocarbon analyzer (all except CAMS 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 through 41. Specifically, the appendix contains the following elements:

- **Auto-GC Data Summary –** In examining the validated fourth quarter of 2011 hourly auto-GC data from Oak Park, Solar Estates, and TCEQ's Palm sites, no individual measurements were found to have exceeded a short-term air monitoring comparison value (AMCV). Also, the validated third quarter average concentrations were below each compound's long-term AMCVs. For first quarter 2012 data, the preliminary values were also below respective AMCVs. A summary of data appears in Appendix A, pages 12 through 16.

- **Benzene Summary** – A review of the almost seven years of data is presented, with focus on the quarterly means from 2005 through 2012. Details appear in Appendix A, pages 17 through 19.

- **Analysis of Sulfur Dioxide at Several Sites** – In closing out 2011, the JIH CAMS 630 site continues to measure concentrations high enough and often enough to violate the SO_2 annual National Ambient Air Quality Standards (NAAQS). The Solar Estates CAMS 633 site measured one exceedance of the SO_2 NAAQS level during the first quarter. This subject is expanded upon in Appendix A, pages 19 through 31.

- **Inner Harbor Site** – A summary of what has been learned since the beginning of monitoring at the soon-to-be-discontinued West End / Inner Harbor CAMS 631 is presented in Appendix A, pages 32 through 40.

B. Scheduled Meetings of the Volunteer Advisory Board

The Corpus Christi Project Advisory Board met on January 10, 2012. The meeting notes from that Advisory Board Meeting are found in Appendix B, pages 42 through 44.

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/).

   Termination of Inner Harbor Lease
   On March 27, 2012, UT Austin received notice from the Port of Corpus Christi Authority (POCCA) that it was terminating the lease for the use of the land at the project's Inner Harbor air monitoring site, CAMS 631. The notice required that all site improvements be removed by June 30, 2012. This lease termination is about 14 months earlier than the end of the current lease (September 8, 2013). UT Austin notified the US District Court of this development on March 28, 2012 and the project's Advisory Board on March 29, 2012. Action was taken in the latter days of this reporting quarter to assess options and develop a response to POCCA's termination notice, including scheduling a teleconference with the Honorable Judge Jack, a meeting with the project's Advisory Board and a meeting with the POCCA representative.

2. **Communication and Reporting**
   The status of the Project has been communicated through the website, which is operational with portions under continual updating, quarterly and annual reports.

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 C, pages 45 and 46.

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 C, pages 45 and 46.

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

The COCP funds received through March 31, 2012 totals $7,576,038.56. This total includes interest earned through March 31, 2012.

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

Expenditures of COCP funds during this quarter totaled $238,522.64. The detailed breakdown of the actual expenditures is included in Appendix C, page 46. The activities for which these expenditures were used are detailed in Section II, on page 2 of this report.

C. Total Interest Earned on COCP Funds during the Quarter

The interest earned during this quarter totaled $3,127.03. A report providing detailed calculations of the interest earned on the COCP funds during each month of the quarter is included in Appendix C, pages 45 and 46.

D. Balance as of March 31, 2012, in the COCP Account

The balance in the COCP account, including interest earned totals $429,640.80.

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

The projected expenditures for the funds remaining totals $429,640.80.

Quarterly Report Distribution List:

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

January 1, 2012 through March 31, 2012

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Data Analysis for Corpus Christi Quarterly Report

This technical report describes results of monitoring and analysis of data under the Corpus Christi Air Monitoring and Surveillance Camera Installation and Operation Project, with primary focus on the period January 1 through March 31, 2012. The monitoring network is shown in Figure 1, on page 2, and is described in Table 2, below. This report contains the following elements:

- A summary of Oak Park, Solar Estates, and Palm (TCEQ) auto-GC data for the third and fourth quarters of 2011;
- Information on the trends for benzene concentrations at the two project auto-GCs and the TCEQ's auto-GC in residential areas;
- A discussion of the sulfur dioxide (SO_2) data from several sites;
- A summary of what has been learned since the beginning of monitoring at the West End / Inner Harbor CAMS 631.

Table 2. 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 CAMS 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 the sample for a target list of 46 hydrocarbon species. These include benzene and 1,3-butadiene, which are air toxics, various 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. In June 2010 TCEQ began operating an auto-GC at Palm CAMS 83 at 1511 Palm Drive in the Hillcrest neighborhood.

- **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** – Electro-polished 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 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 and 12 chlorinated species. Canister samplers operate at the five sites that do not take continuous hydrocarbon measurements with auto-GCs (CAMS 629, 630, 631, 632, and 635).

- **Air Monitoring Comparison Values (AMCV) –** The TCEQ uses AMCVs in assessing ambient data. Two valuable online documents ("fact sheet" and "AMCV document") that explain AMCVs are at http://www.tceq.texas.gov/toxicology/regmemo/AirMain.html#compare (accessed April 2012). The following text is an excerpt from the TCEQ "fact sheet":

  > Effects Screening Levels are chemical-specific air concentrations set to protect human health and welfare. Short-term ESLs are based on data concerning acute health effects, the potential for odors to be a nuisance, and effects on vegetation, while long-term ESLs are based on data concerning chronic health and vegetation effects. Health-based ESLs are set below levels where health effects would occur whereas welfare-based ESLs (odor and vegetation) are set based on effect threshold concentrations. The ESLs are screening levels, not ambient air standards. Originally, the same long- and short-term ESLs were used for both air permitting and air monitoring.
  >
  > There are significant differences between performing health effect reviews of air permits using ESLs, and the various forms of ambient air monitoring data. The Toxicology Division is using the term "air monitoring comparison values" (AMCVs) in evaluations of air monitoring data in order to make more meaningful comparisons. "AMCVs" is a collective term and refers to all odor-, vegetative-, and health-based values used in reviewing air monitoring data. Similar to ESLs, AMCVs are chemical-specific air concentrations set to protect human health and welfare. Different terminology is appropriate because air permitting and air monitoring programs are different.

- **Rationale for Differences between ESLs and AMCVs** – A very specific difference between the permitting program and monitoring program is that permits are applied to one company or facility at a time, whereas monitors may collect data on emissions from several companies or facilities or other source types (e.g., motor vehicles). Thus, the protective ESL for permitting is set lower than the AMCV in anticipation that more than one permitted emission source may contribute to monitored concentrations.

- **National Ambient Air Quality Standards (NAAQS) –** U.S. Environmental Protection Agency (EPA) has established a set of standards for several air pollutions described in the Federal Clean Air Act[1]. NAAQS are defined in terms of *levels* of concentrations and particular *forms*. For example, the NAAQS for particulate matter with size at or less than 2.5 microns ($PM_{2.5}$) has a *level* of 15 micrograms per cubic meter averaged over 24-hours, and a *form* of the annual average based on four quarterly averages, averaged over three years. Individual concentrations measured above the level of the NAAQS are called *exceedances*. The number calculated from a monitoring site's data to compare to the level of the standard is called the site's *design value*, and the highest design value in the area for a year is the regional design value used to assess overall NAAQS compliance. A monitor or a region that does not comply with a NAAQS is said to be *noncompliant*. At some point after a monitor or region has been in noncompliance, the U.S. EPA may choose to label the region as *nonattainment*. A nonattainment designation triggers requirements under the Federal Clean Air Act for the development of a plan to bring the region back into compliance.

  A more detailed description of NAAQS can be found on the TCEQ's Website at http://www.tceq.texas.gov/airquality/monops/naaqs.html (accessed April 2012).

[1] See http://epa.gov/air/criteria.html accessed April 2012

One species measured by this project and regulated by a NAAQS is sulfur dioxide (SO_2). Effective June 2, 2010, EPA modified the SO_2 NAAQS to include a level of 0.075 ppm, or 75 ppb averaged over one hour, with a form of the three-year average of the annual 99^{th} percentiles of the daily maximum one-hour averages. There is also a secondary SO_2 standard of 0.500 ppm (500 ppb) over three hours, not to be exceeded more than once in any one year. The reason that there has been little attention to the SO_2 NAAQS on this project until recently is that the State of Texas's standard of 0.400 ppm or 400 ppb over 30 minutes for SO_2 was much more likely to be exceeded than the older NAAQS. With the addition of a new NAAQS for SO_2 in June 2010, however, the situation has changed.

- **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, any measured concentration greater than the level of the state residential standards, which is 80 ppb over 30 minutes, is considered "elevated." For SO_2, any measured concentration greater than the level of the NAAQS, which is 75 ppb over one hour, is considered "elevated." Note that the concentrations of SO_2 and H_2S need not persist long enough to constitute an exceedance of the standard to be regarded as elevated. 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 than 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) to be considered elevated.
    - For benzene and other air toxics in canister samples or auto-GC measurements, any concentration above the AMCV is considered "elevated." Note that 20-minute canister samples and 40-minute auto-GC measurements are both compared with the short-term AMCV.
    - 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 three Corpus Christi auto-GC sites – UT's Solar Estates CAMS 633, UT's Oak Park CAMS 634, and TCEQ's Palm CAMS 83 – are presented. These three sites are located in residential areas. Solar Estates and Oak Park are generally downwind of industrial emissions under northerly winds. Palm, located near the TCEQ's Hillcrest and Williams Park sites in Figure 1, on page 2, is generally downwind under northerly and westerly winds. In examining aggregated data one observes similar patterns of hydrocarbons at all three sites.

Table 3, on page 13, lists the data completeness from the project auto-GCs during 2011 and early 2012 for the months for which data have been validated. During two different weeks in August 2011 there were some maintenance issues (thermal desorption failure August 12 – 18, and trap failure August 27 – September 3) at the Oak Park site. Despite low return that one month, data collection for the year meets all project requirements. Since auto-GC monitoring began in March 2005, the overall data completeness has been 94 percent at Oak Park and 90 percent at Solar Estates.

Table 4, on page 14, summarizes the validated average data values from the fourth quarter of 2011. Data in this table are available to TCEQ staff at http://rhone3.tceq.texas.gov/cgi-bin/agc_summary.pl (accessed April 2012). Table 5, on page 15, summarizes the as-yet-unvalidated average data values from the first quarter of 2012.

As noted in the preceding paragraph, Tables 4 and 5 show the averages (arithmetic mean of measured values) for 27 hydrocarbon species for the periods of interest, and Table 4 also shows the maximum one-hour values and the maximum 24-hour average concentrations for the quarter's validated data. All concentration values in the tables are in ppbV units. No concentrations or averages of concentrations from the 27 species were greater than TCEQ's air monitoring comparison values (AMCV). The average data columns in Table 4 for the validated fourth quarter data and Table 5 for the as-yet-unvalidated first quarter data are shown graphically in Figures 2 and 3, respectively, on page 16. Figures 2 and 3 are plotted on the same y-axis scale, so they can be compared directly. Mean concentrations for all 27 species measured consistently above their respective method detection limits are generally comparable for the fourth and first quarters each year, and are generally higher than the second and third quarters. Increased maritime southerly flow in the spring and summer is a contributor to lower concentration in the second and third quarters.

The rows for ***benzene*** are bold-faced in Tables 4 and 5 owing to the concern that the concentrations for this species tend to be closer to the AMCV than are concentrations of other species. The benzene short-term AMCV is 180 ppbV and the benzene long-term AMCV is 1.4 ppbV.

The data at Solar Estates for the species 1,2,3-trimethylbenzene were invalidated from late September 2011 through January 31, 2012. The site operator reports that the measurements suffered from poor integration and baseline shift, which was corrected by maintenance in late January. As a result the cells in Table 4 for this species will have no entry.

Table 3. Percent data recovery by month, 2011-2012, validated data only

Date	Oak Park	Solar Estates
Jan 2011	100	96
Feb 2011	84	77
Mar 2011	100	95
Apr 2011	100	80*
May 2011	78	100
Jun 2011	69*	93
Jul 2011	95	96
Aug 2011	56	95
Sep 2011	92	78
Oct 2011	99	83
Nov 2011	97	94
Dec 2011	100	100
Jan 2012	94	99
Average	**90**	**91**

* Months with planned preventive maintenance

Table 4. Validated auto-GC statistics 4th quarter 2011

Units ppbV	Oak 4Q11			Solar 4Q11			Palm 4Q11		
Species	**Peak 1hr**	**Peak 24hr**	**Mean**	**Peak 1hr**	**Peak 24hr**	**Mean**	**Peak 1hr**	**Peak 24hr**	**Mean**
Ethane	276.8	50.56	9.69	95.74	28.51	9.62	359.6	63.69	14.16
Ethylene	31.38	5.00	0.65	9.35	1.33	0.39	28.16	4.59	0.67
Propane	220.4	43.66	7.09	75.76	19.16	6.32	188.6	55.92	9.14
Propylene	19.77	2.26	0.38	14.03	1.61	0.28	10.02	2.2	0.34
Isobutane	51.87	12.99	2.30	46.04	5.01	1.89	168.7	18.63	3.52
n-Butane	85.46	18.79	3.60	79.59	12.34	2.95	539.4	40.13	6.05
t-2-Butene	6.19	0.59	0.19	2.06	0.19	0.03	10.38	0.68	0.09
1-Butene	5.10	0.38	0.06	3.1	0.23	0.04	2.90	0.28	0.09
c-2-Butene	4.48	0.37	0.07	1.82	0.17	0.02	11.68	0.74	0.07
Isopentane	71.65	10.62	2.09	42.58	4.29	1.34	245.1	17.16	2.67
n-Pentane	72.06	7.99	1.42	15.58	2.44	0.92	78.94	9.15	1.54
1,3-Butadiene	0.87	0.10	0.03	6.91	0.47	0.04	0.47	0.11	0.03
t-2-Pentene	1.93	0.21	0.06	1.75	0.15	0.02	27.28	1.68	0.12
1-Pentene	0.93	0.11	0.03	8.46	0.40	0.02	16.05	1.00	0.07
c-2-Pentene	0.98	0.11	0.03	0.92	0.08	0.01	14.04	0.88	0.07
n-Hexane	30.43	2.81	0.62	5.35	1.00	0.36	12.08	3.16	0.54
Benzene	**16.73**	**2.00**	**0.52**	**3.69**	**0.64**	**0.20**	**6.70**	**1.33**	**0.36**
Cyclohexane	8.31	1.04	0.25	4.01	0.70	0.20	8.37	1.2	0.24
Toluene	11.62	2.4	0.58	5.01	0.69	0.25	7.19	2.07	0.42
Ethyl Benzene	1.13	0.17	0.05	0.92	0.14	0.03	0.6	0.18	0.03
mp -Xylene	4.03	0.66	0.17	7.44	0.90	0.18	2.47	0.79	0.17
o-Xylene	1.15	0.19	0.05	1.36	0.14	0.03	0.87	0.17	0.04
Isopropyl Benzene	2.08	0.26	0.04	1.75	0.12	0.01	0.36	0.08	0.01
1,3,5-Trimethylbenzene	0.63	0.08	0.02	1.02	0.19	0.02	0.28	0.02	0.01
1,2,4-Trimethylbenzene	1.3	0.17	0.05	0.95	0.16	0.03	0.91	0.20	0.06
n-Decane	1.9	0.17	0.03	1.74	0.24	0.03	0.54	0.10	0.02
1,2,3-Trimethylbenzene	0.35	0.06	0.01	*	*	*	0.17	0.03	0.01

* Data were invalidated for September 2011 through January 31, 2012.

Table 5. Unvalidated auto-GC mean statistics 1st quarter 2012

Units ppbV	Oak 1Q12	Solar 1Q12	Palm 1Q12
Species	**Mean**	**Mean**	**Mean**
Ethane	9.14	9.36	10.17
Ethylene	0.67	0.37	0.52
Propane	6.07	5.84	6.87
Propylene	0.39	0.21	0.35
Isobutane	1.9	1.65	2.47
n-Butane	3.28	2.66	4.28
t-2-Butene	0.26	0.03	0.06
1-Butene	0.06	0.03	0.08
c-2-Butene	0.09	0.02	0.05
Isopentane	1.81	1.15	1.80
n-Pentane	1.15	0.79	1.09
1,3-Butadiene	0.03	0.03	0.03
t-2-Pentene	0.06	0.01	0.08
1-Pentene	0.03	0.01	0.05
c-2-Pentene	0.03	0.01	0.04
n-Hexane	0.54	0.30	0.45
Benzene	**0.47**	**0.19**	**0.46**
Cyclohexane	0.21	0.15	0.16
Toluene	0.48	0.23	0.37
Ethyl Benzene	0.05	0.03	0.03
mp -Xylene	0.14	0.15	0.15
o-Xylene	0.05	0.03	0.04
Isopropyl Benzene	0.03	0.01	0.01
1,3,5-Trimethylbenzene	0.02	0.01	0.01
1,2,4-Trimethylbenzene	0.04	0.02	0.07
n-Decane	0.03	0.03	0.02
1,2,3-Trimethylbenzene	0.01	<0.005	0.02

Figure 2. Mean ppbV for 27 species at three auto-GCs, 4th quarter 2011 (validated data)

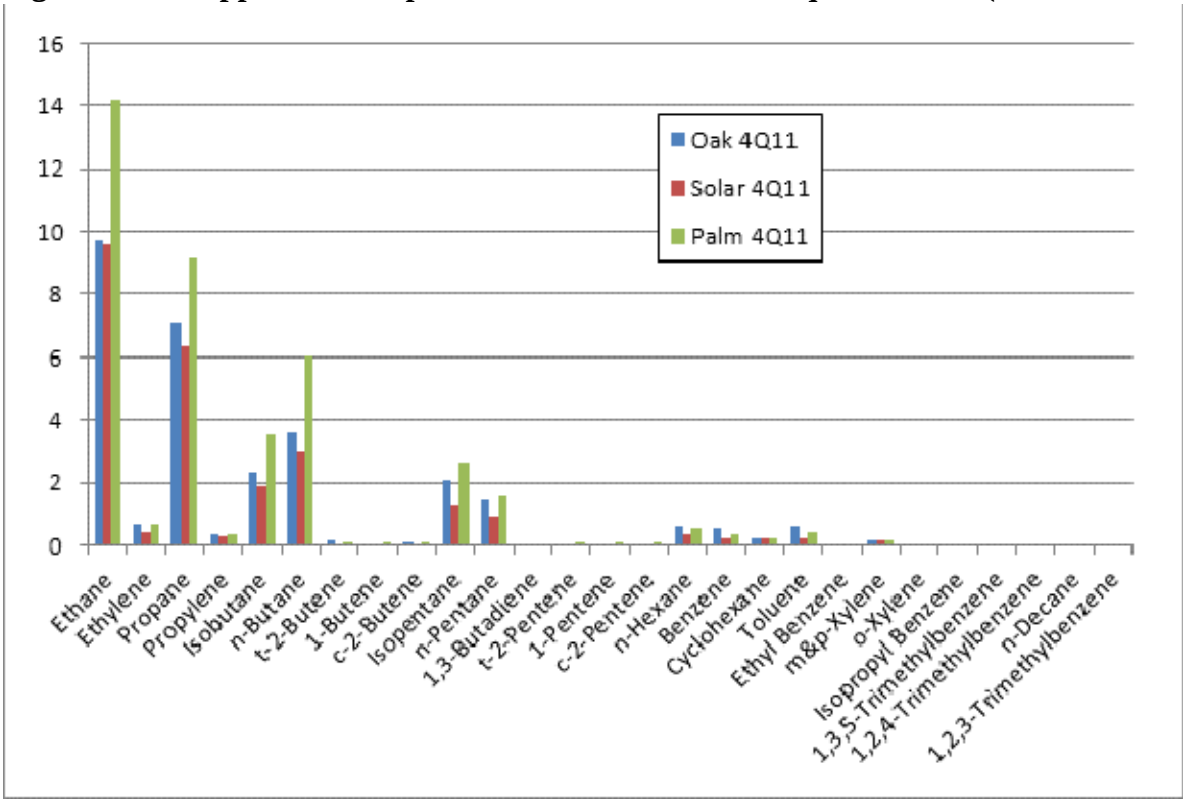
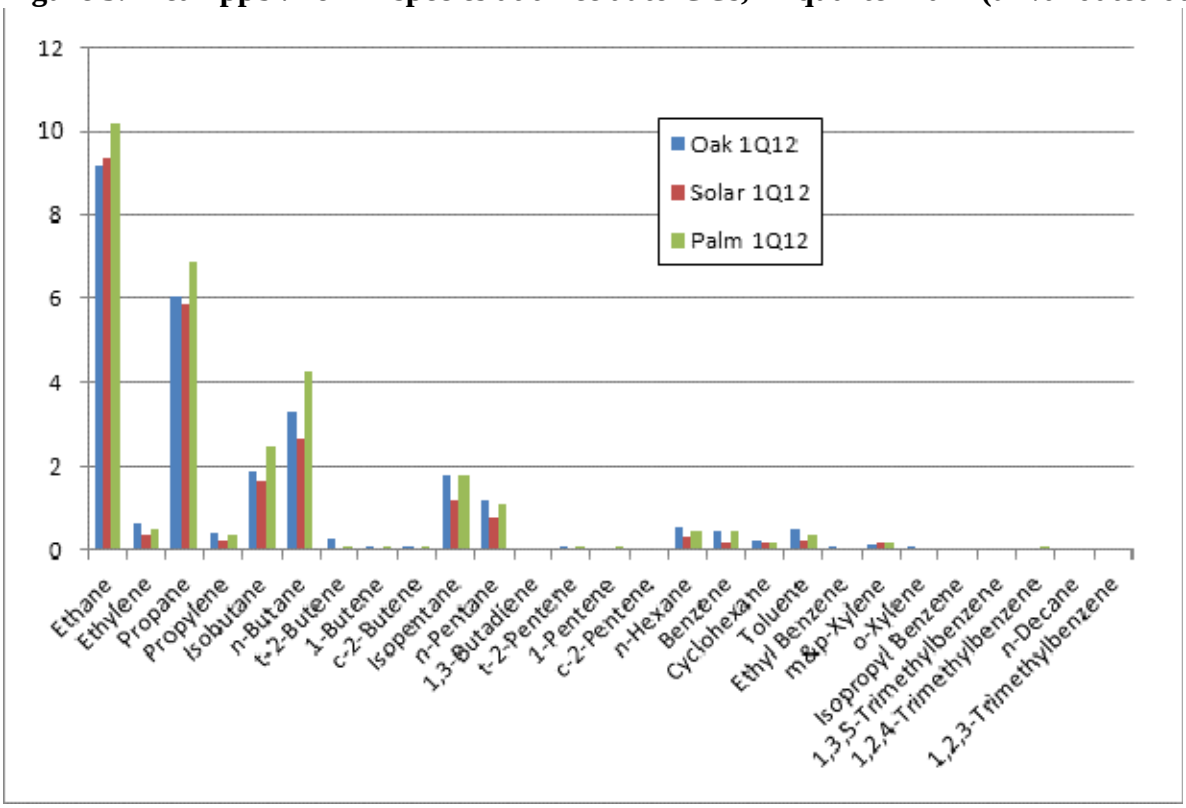


Figure 3. Mean ppbV for 27 species at three auto-GCs, 1st quarter 2012 (unvalidated data)



2. Benzene Concentrations in Residential Areas

As has been discussed in past reports, benzene concentrations have been declining at the two auto-GCs operated at Oak Park CAMS 634 and Solar Estates CAMS 633. In recent years, concentration means have generally been relatively constant. As was reported last quarter, the 2011 annual benzene concentration means at the two project auto-GCs are the lowest annual means since the beginning of monitoring. Also, no individual one-hour benzene values have been measured above the AMCV since the beginning of monitoring. A time series for hourly benzene in ppbV units with two points annotated by date appears in Figure 4, below, for Oak Park. The two points are identified as statistical outliers in that they are unusually high given the balance of the data. The same graph is reproduced without these two points in Figure 5, below. The time series for Solar Estates appears in Figure 6, on page 18. Note the different y-axis scales for the two sites, as Oak Park does tend to measure higher concentrations than Solar Estates. Figure 7, on page 18, shows the time series for the two-year old TCEQ Palm auto-GC, with two apparent outliers on January 30, 2012 indicated. Note that for all three sites, the data from the first quarter 2012 have not been validated yet.

Figure 4. Oak Park hourly benzene March 2005 – March 2012, ppbV units, individual elevated values noted, no observations greater than the TCEQ's AMCV

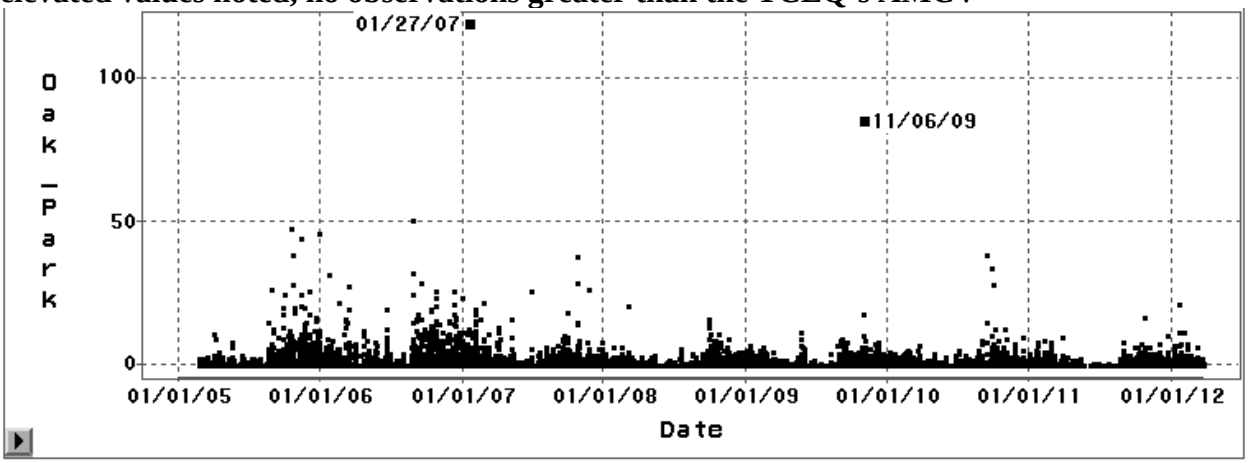


Figure 5. Oak Park hourly benzene Mar. 2005 – Mar. 2012, ppbV units, two outliers removed

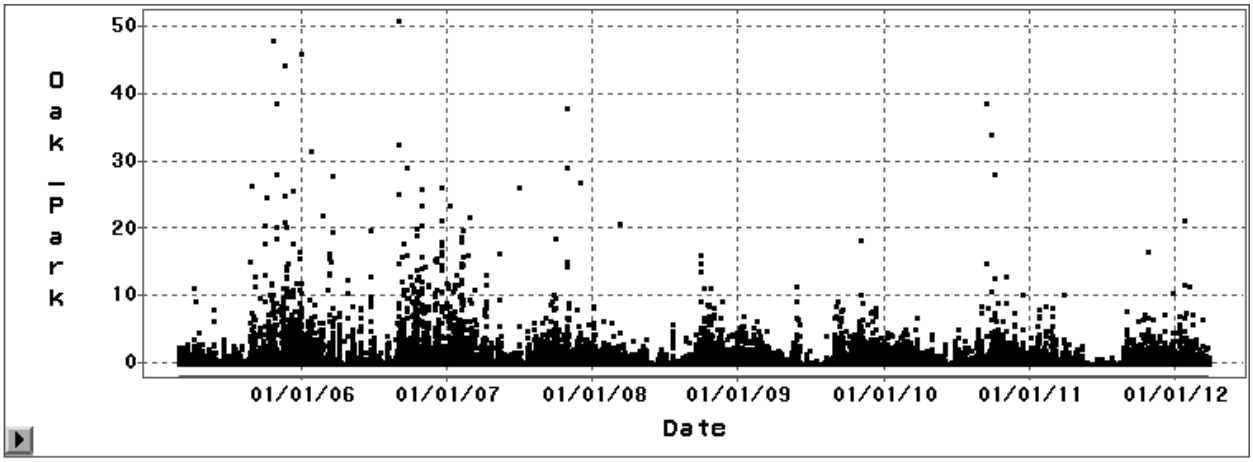


Figure 6. Solar Estates hourly benzene Mar. 2005 – Mar. 2012, ppbV units, no observations greater than the TCEQ's AMCV

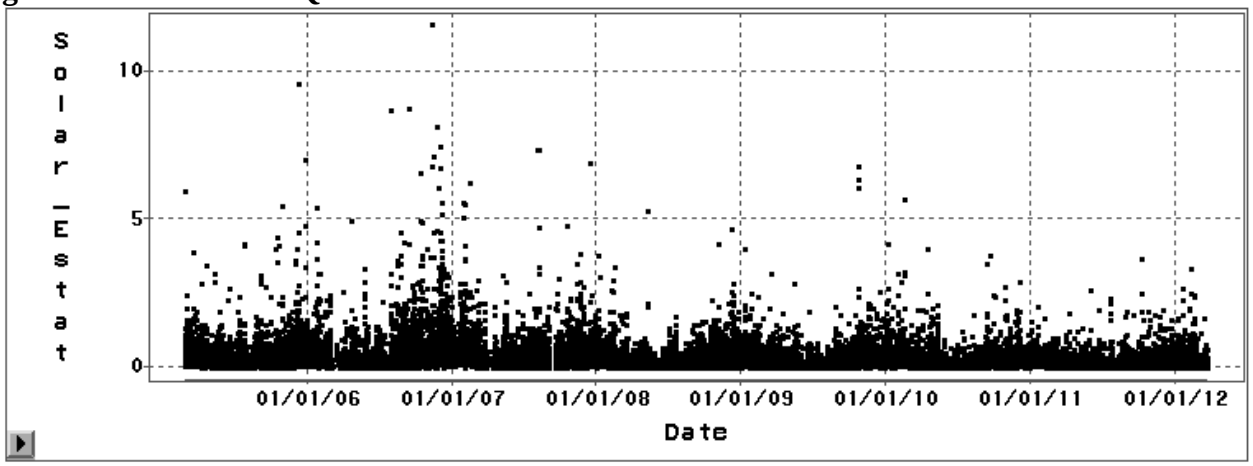


Figure 7. TCEQ Palm hourly benzene 2010 – 2011, ppbV units, individual elevated values noted, no observations greater than the TCEQ's AMCV

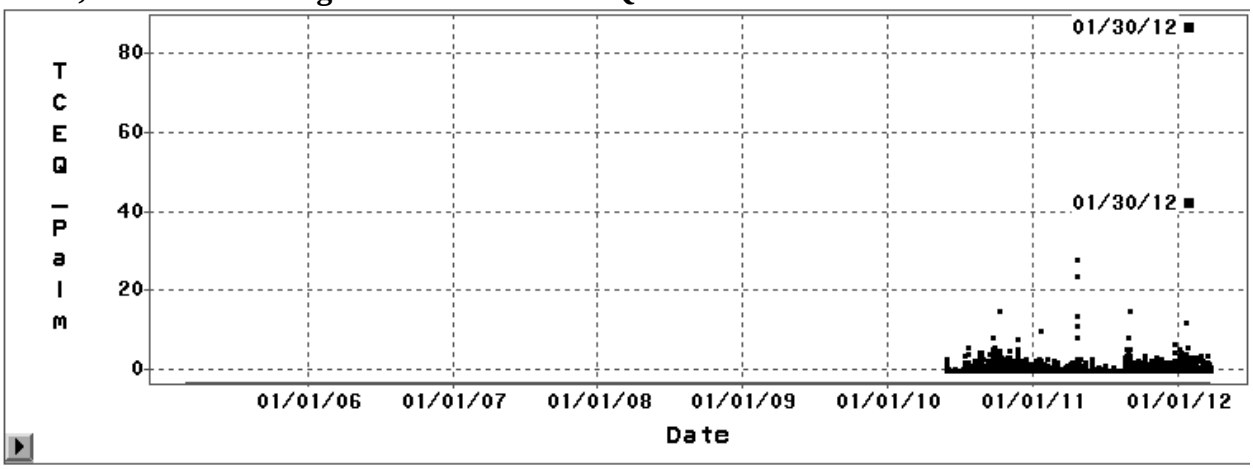


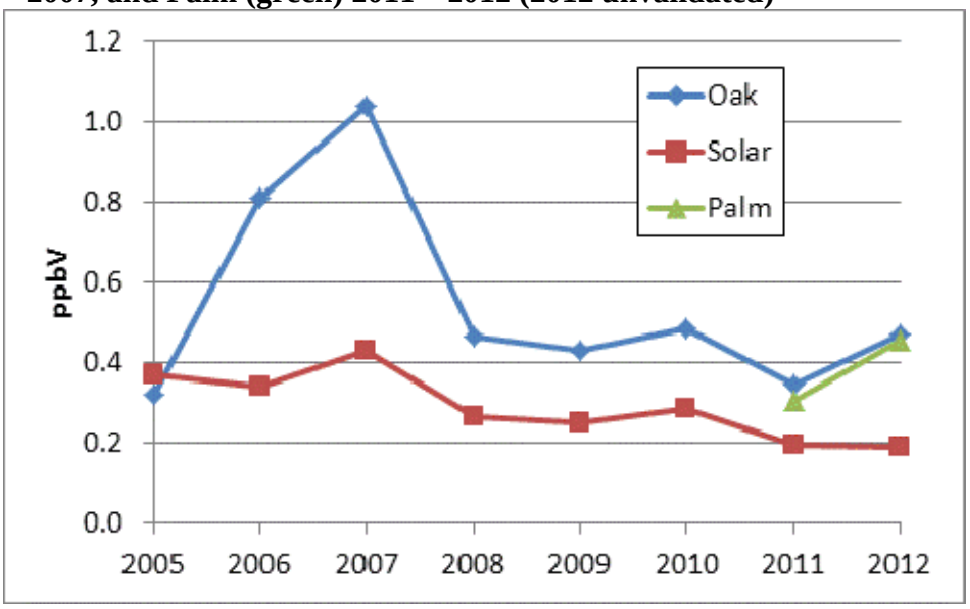
Table 6, on page 19, shows the first quarter summary statistics from the auto-GCs for benzene from 2005 – 2012 (2012 unvalidated). The first quarter means are graphed in Figure 8, on page 19. The means for TCEQ's Palm site are shown for 2011 and 2012. The first quarter means from 2008 through 2012 are statistically significantly lower than in the first quarters of the preceding three years, and this finding is similar to findings for other quarters in recent reports on this project.

Table 6. Mean statistics for Benzene at Oak Park and Solar Estates, 1st quarter 2005 – 2012 Palm 2011 – 2012, ppbV units (2012 unvalidated)

1st qtr/yearr	Oak	Solar	Palm
2005*	0.323	0.371	
2006	0.813	0.342	
2007	1.040	0.432	
2008	0.464	0.264	
2009	0.433	0.253	
2010	0.485	0.287	
2011	0.344	0.195	0.308
2012	0.473	0.193	0.456

* one month only in 1st quarter 2005

Figure 8. Mean concentrations of benzene during 1st quarters by year at Oak Park (blue) and Solar Estates (red), 2005 – 2012, with lower values in 2008 – 2012 compared with 2005 – 2007, and Palm (green) 2011 – 2012 (2012 unvalidated)



3. Sulfur Dioxide Measurements at Corpus Christi Monitors

As has been discussed in recent reports, the JIH CAMS 630 site measures SO_2 concentrations that do not comply with the EPA's SO_2 NAAQS. One hour concentrations above 75 ppb are considered to be individual exceedances of the level of the NAAQS. The maximum one hour value for each day at a site is logged, and at the end of the year the 99th percentile daily maximum is selected. This value is averaged with the same statistic from the previous two years, and the resulting three-year average is compared with 75 ppb to determine compliance. If a site collects a full year of data, then the 99th percentile value would be the 4th highest daily maximum for the year. The resulting statistic is called the *design value* for a monitoring site. Table 7, on page 20, contains the design values for Corpus Christi monitors (TCEQ and UT) for recent three-year periods. The JIH CAMS 630 site shows noncompliance in each three-year period to date. The site with the second highest design value over the entire seven year monitoring period is the

Solar Estates CAMS 633 site with 51 ppb over the 2005-2007 period. Solar Estates also had the second highest design value (30 ppb) among nine sites for the most recent three year period. Details about the emissions sources upwind of the JIH CAMS 630 site and the Solar Estates CAMS 633 site appear below.

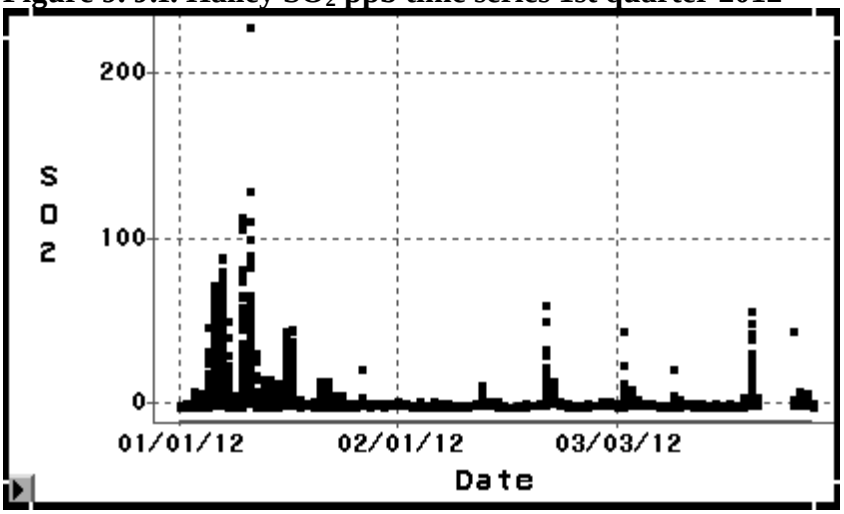
Table 7. SO_2 NAAQS design values for Corpus Christi area sites, ppb units, values greater than 75 ppb represent noncompliance

Years	C21	C4	C629	C630	C631	C632	C633	C635	C98
2005-2007	8	24	34	**119**	38	21	51	34	36
2006-2008	8	21	31	**131**	33	19	31	31	32
2007-2009	9	18	30	**89**	32	17	21	23	28
2008-2010	9	17	26	**103**	21	13	11	22	33
2009-2011	9	12	19	**80**	15	13	30	20	27

J.I. Hailey CAMS 630 and TCEQ Avery Point CAMS 6603

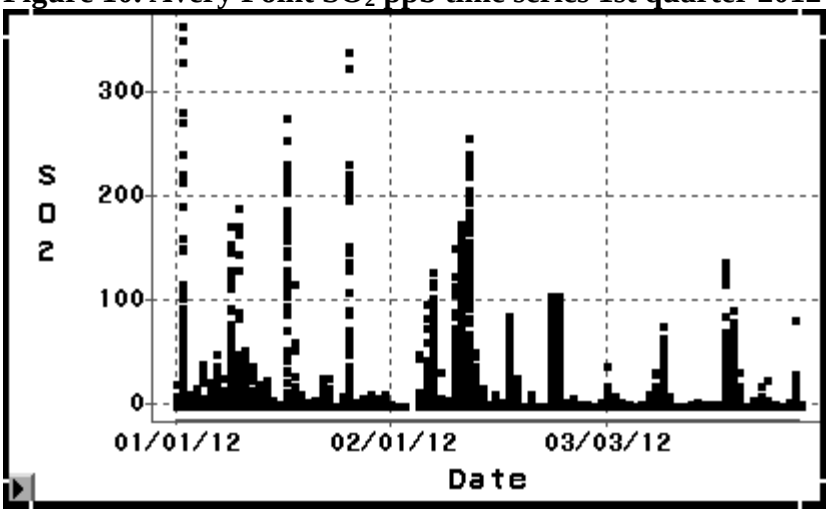
The time series for five-minute time scale data from the first quarter 2012 from the J.I Hailey CAMS 631 site appears in Figure 9, below. There were no one-hour exceedances in this quarter, but the maximum observed daily maximum was 73 ppb on January 7, 2012.

Figure 9. J.I. Hailey SO_2 ppb time series 1st quarter 2012



In late December 2011 the TCEQ began operating an SO_2 monitor on the south side of the ship channel across from JIH. The site, Avery Point CAMS 6603 (mapped in Figure 15, page 23), is operated by a contractor and wind speed and direction are also measured at the site. The time series for five-minute time scale data from the first quarter 2012 from the site appears in Figure 10, on page 21. Because this site is much closer to suspected emission sources (ships at docks), higher concentrations have been measured there. During the first quarter, there were nine SO_2 exceedance days.

Figure 10. Avery Point SO_2 ppb time series 1st quarter 2012



As has been the practice on this project, the pollutant measurements have been merged with coincident wind data and average concentrations as a function of wind direction bins (2 degrees wide) have been calculated and graphed. Figure 11, below, shows the result using 1st quarter 2012 data for JIH. Two key directions emerge in the figure and are labeled: 178 and 246 degrees. Figure 12, on page 22, shows a different approach for directionality analysis, this known as conditional probability function (CPF) analysis. If a given wind direction bin has a relatively small number of observations in it, then a statistical outlier can have a major effect on the average value in that cell. In CPF a so-called non-parametric approach is taken, where a concentration level of significance is selected (e.g., the 95th percentile of all observations), and the fraction of all observations in a cell greater than the level of significance is calculated. The result of applying this method to the five-minute time scale data from the first quarter 2012 from the JIH site appears in Figure 12. The results are very similar to the means by direction graph. In this report, in order to produce results directly comparable to the new Avery Point site, only the first quarter 2012 data were used in this assessment, and more data from the recent past will be employed for consistency assessment and to develop more statistically robust directionality assessments in the future.

Figure 11. J.I Hailey mean SO2 ppb by wind direction (2° wind bin) 1st quarter 2012

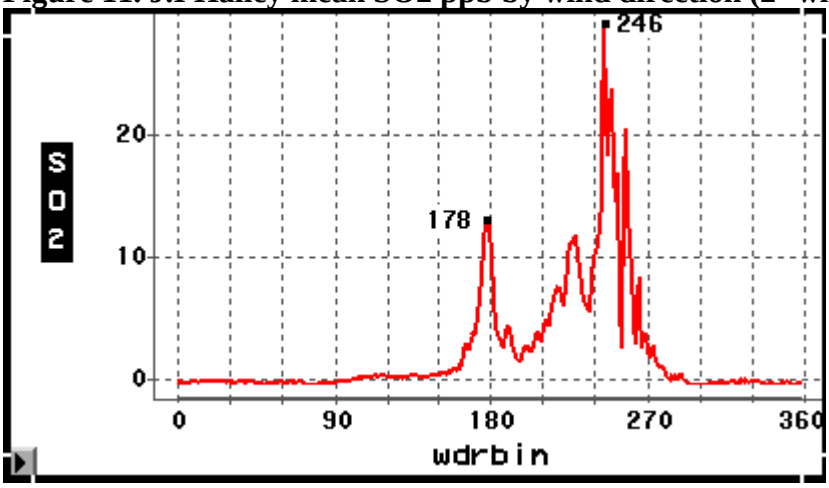
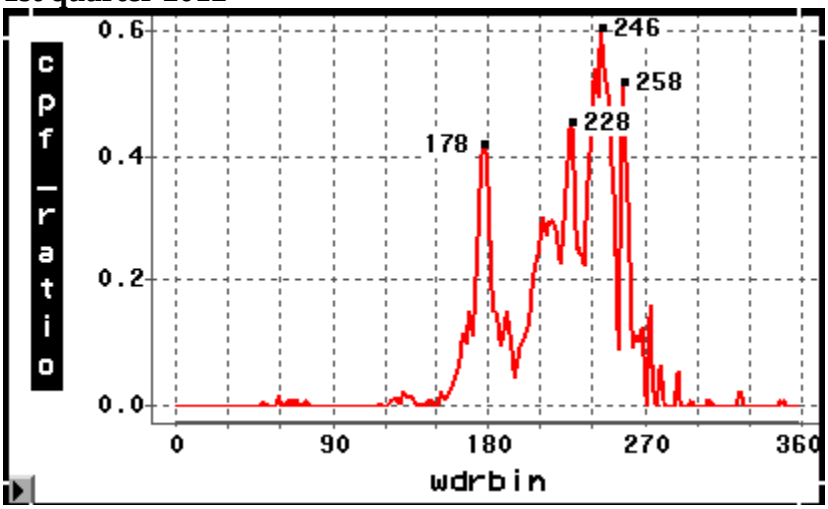


Figure 12. J.I Hailey probability SO_2 > 95th percentile value by wind direction (2° wind bin) 1st quarter 2012



First quarter 2012 directionality analyses for TCEQ Avery Point are shown in Figure 13, below, for the mean by direction and in Figure 14, on page 23, for the CPF analysis. Two or three key directions emerge in Figure 13 and are labeled: 30, 306, and 342 degrees. A few more points have been labeled in Figure 14. The 200 degree point mostly likely is associated with the land-based refinery-related emission points to the south. The two most significant directions are 30-32 degrees and 304 – 316 degrees.

Figure 15, on page 23, is a Google Earth Pro aerial map showing the JIH and Avery Point monitors with rays drawn corresponding to the 178 and 246 degrees from JIH and 30 and 306 degree from Avery Point. In Figure 15 these pairs of rays have intersections close to Oil Docks 11 and 3. The other labeled points in Figure 14 appear to point to other Oil Docks 7 and 4.

Figure 13. Avery Point mean SO2 ppb by wind direction (2° wind bin) 1st quarter 2012

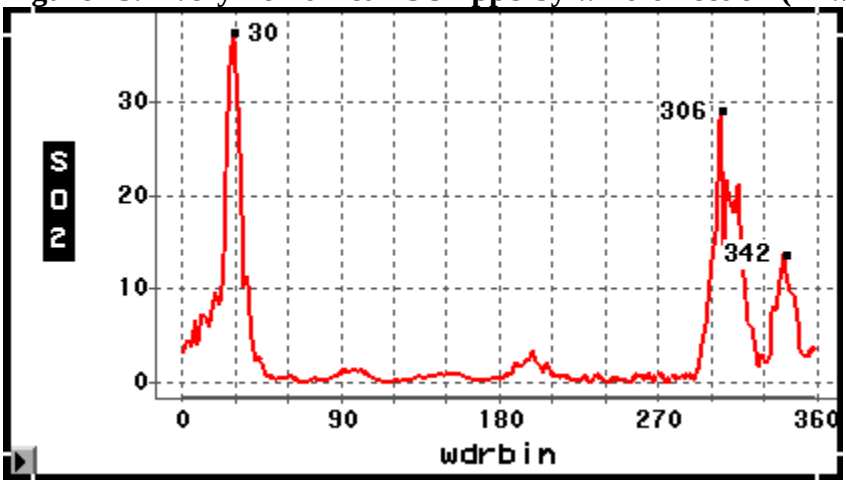


Figure 14. Avery Point probability SO_2 > 95th percentile value by wind direction (2° wind bin) 1st quarter 2012

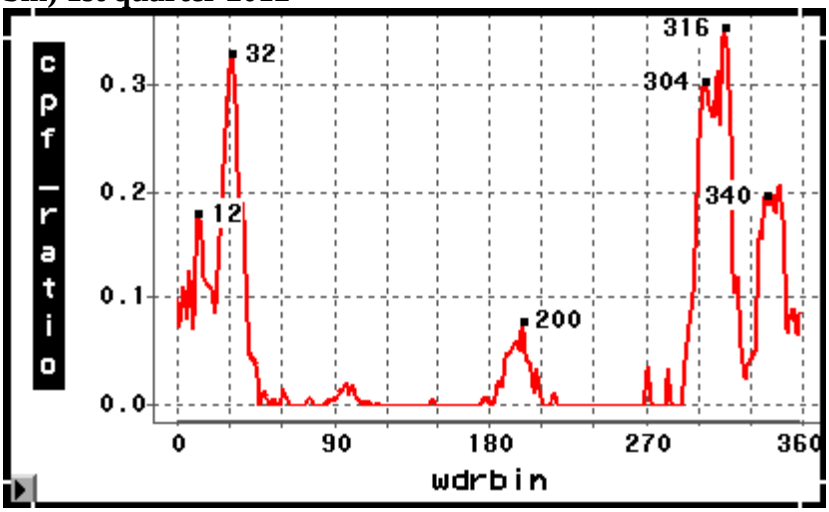


Figure 15. Rays drawn in key directions associated with highest SO_2 concentrations at two CAMS sites: JIH (178° and 246°), TCEQ Avery Point (30° and 306°)

Solar Estates CAMS 633 and Flint Hills Resources CAMS 632

The recent history of SO_2 monitoring at Solar Estates is that elevated concentrations that would have been exceedances under the current NAAQS had been measured in 2005 and 2006, after which none were measured until July 14, 2011. A time series of the hourly SO_2 data at Solar Estates from the start of monitoring appears in Figure 16, on page 24. As is clear in this figure, there have been three distinct periods of elevated SO_2 being measured at Solar Estates. Using the

five-minute time resolution data and a close examination of the SO_2 and wind directions, a fine time resolution estimate for the onset and turn-off of SO_2 at the Solar site can be made. The precision of the estimate is based on the frequency of southeast winds around the start//end points.

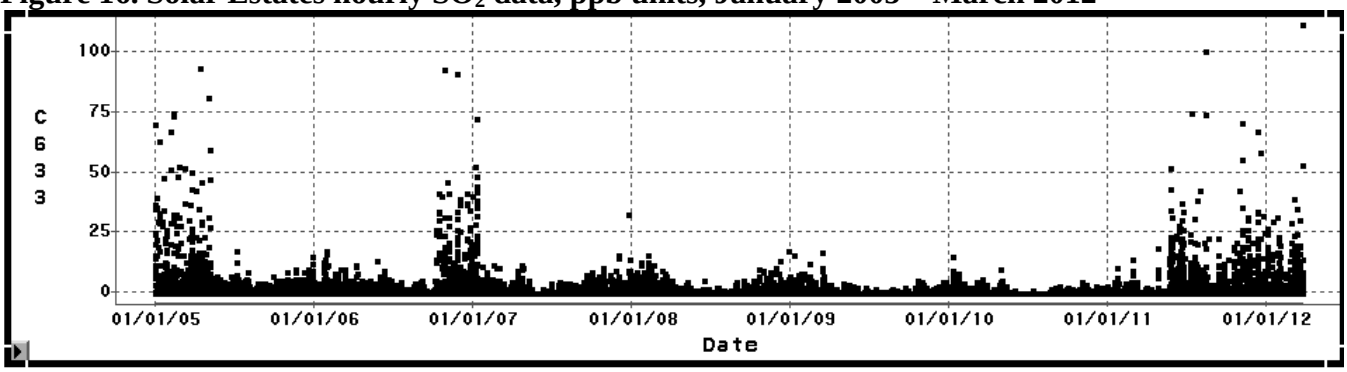
- Period 1: Beginning before mid-Dec. 2004 (start of monitoring program) // Ending May 11, 2005, 2 pm CST

- Period 2: Beginning between Oct. 5, 2006, 9 pm CST and Oct. 6, 2006, 6:45 pm CST // Ending between Jan. 12, 2007, 4 pm CST and Jan. 13, 2007, 2 am CST

- Period 3: Beginning May 25, 2011, 11:50 am CST

Elevated observations persist through the first quarter of 2012 and into April. One NAAQS exceedance was measured on March 26, 2012 at 7:00 am CST.

Figure 16. Solar Estates hourly SO_2 data, ppb units, January 2005 – March 2012



To further characterize the SO_2 at Solar Estates, several forms of analysis are presented below, augmenting the analyses done in the last quarterly report. Figure 17, on page 25, shows the mean concentration of SO_2 as a function of wind direction using data since May 25, 2011 through April 21, 2012 ("Period 3"). Because the southeast winds are the most frequent winds in the area, and this is also the peak upwind concentration direction, a high resolution directionality analysis using 1-degree wind bins is possible. The result is a very sharp peak in the mean, suggesting the emission source lies in a narrow upwind angular sector close to 158 degrees bearing from the CAMS site. It should also be noted that wind direction accuracy is generally specified to be ±5 degrees, 95 percent confidence level. In compiling an ensemble of data over several months, comparisons among other monitors and persistent measurement of similar concentrations in a particular direction suggest that random error in direction measurements at Solar Estates is actually less than ±5 degrees, 95 percent confidence level. A CPF directionality analysis is presented in Figure 18, on page 25. In Figure 18, the y-axis is the fraction of SO_2 observations in a wind direction that were greater than the 95^{th} percentile value of all observations. The figure shows a highly disproportionate number (greater than 0.2 or 20 percent) for directions from 154 to 161 degrees were in the top five percent of all observations.

Figure 17. Mean Solar Estates SO_2 concentration ppb by wind direction May 25, 2011 – April. 24, 2012, 1-degree wind bins

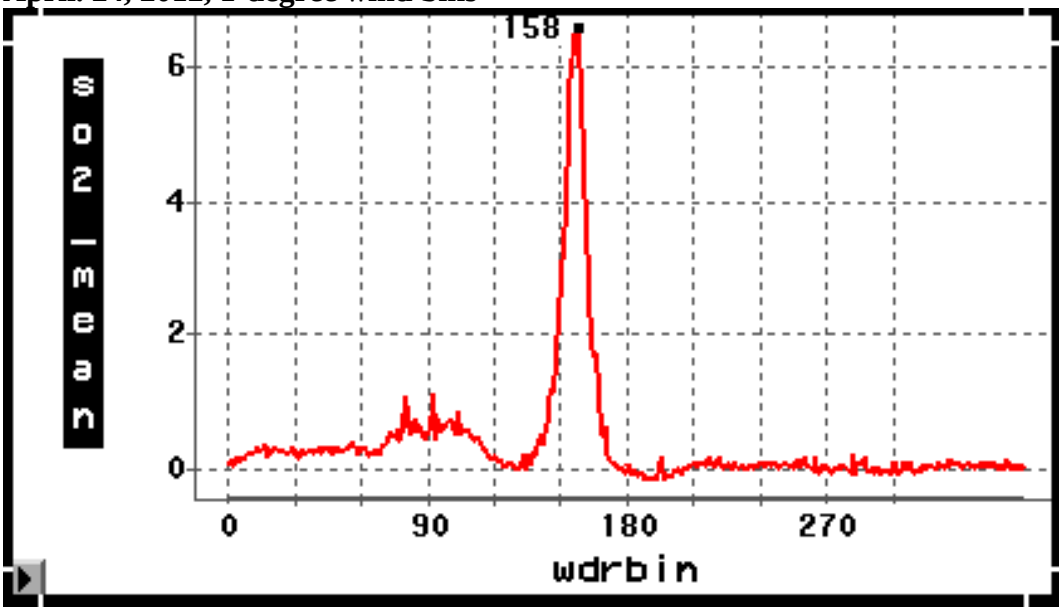
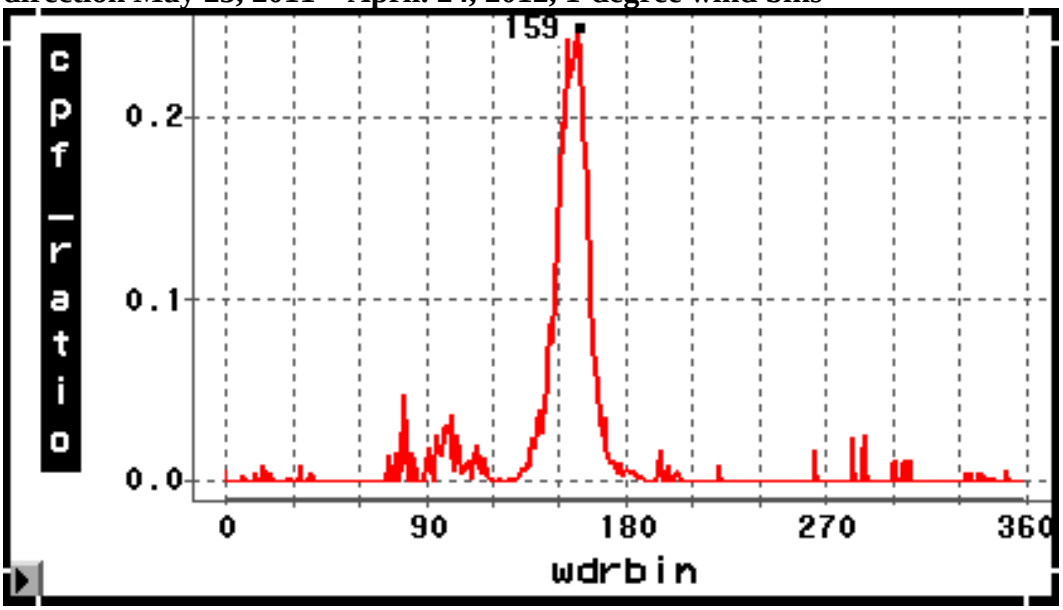


Figure 18. Fraction of Solar Estates SO_2 concentration > 95th percentile value by wind direction May 25, 2011 – April. 24, 2012, 1-degree wind bins



Five-minute values with the resultant wind in the 30 degree range between 145 and 175 degrees from May 25, 2011 through April 21, 2012 represent 30,892 observations out of 96,579 total observations, which is 32 percent of all 5-minute observations over the this period. Using observations with winds in the 145 – 175 degree direction range, the mean concentrations by day of the week were calculated, and it was clear that concentrations on Mondays through Fridays were much higher than on weekends. The next step was to calculate the average concentration by time of day ("diurnal pattern") using only data with coincident winds between 145 and 175 degrees separately for weekdays and weekends to contrast the results. Separate analyses were conducted for periods of Central Daylight-Savings Time (CDT) and Central Standard Time (CST). *Recall that all data measured in this project is time tagged in CST, regardless of when*

they are collected. Over the May 25, 2011 through April 21, 2012 period, CST was in effect November 6, 2011 – March 10, 2012, and CDT was in effect outside this range. Figure 19, below, shows these results for CDT and Figure 20, below, shows the results for CST. Notice a nearly exact starting point of the rise in mean concentrations at 4 CST during CDT (which is 5 a.m. CDT), and a nearly exact starting point of the rise in mean concentrations at 5 a.m. during CST. This is consistent with hypothesis that an industrial source operating Monday through Friday with a shift starting at 5 a.m. local time and ending sometime around 6 or 7 p.m. local time is the source of the elevated concentrations.

The weekday vs. weekend diurnal patterns for Solar Estates "Period 3" SO_2 under southeast winds appear in Figure 19, for the CDT period. Figure 19 shows mean SO_2 ppb above background levels after 5 a.m. local time (4 CST) and ending late afternoon. In Figure 20, the same comparison is presented for the CST period, and again, mean SO_2 ppb above background levels after 5 a.m. local time (5 CST) and ending late afternoon.

Figure 19. Solar Estates mean SO_2 ppb by time (5-minute resolution), with winds between 145 and 175 degrees, during period with Central *Daylight Savings* Time (May 25, 2011 – November 5, 2011 and March 11, 2012 – April 21, 2012), weekdays and weekends

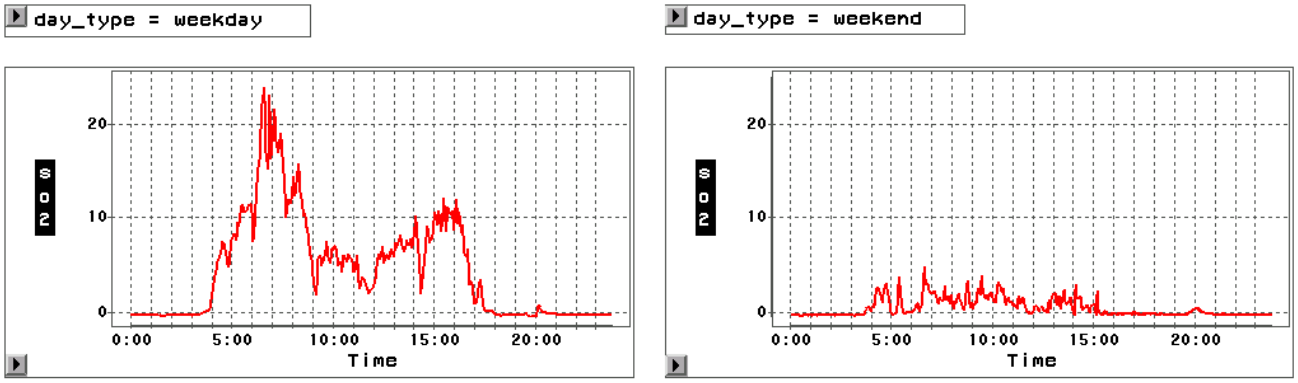
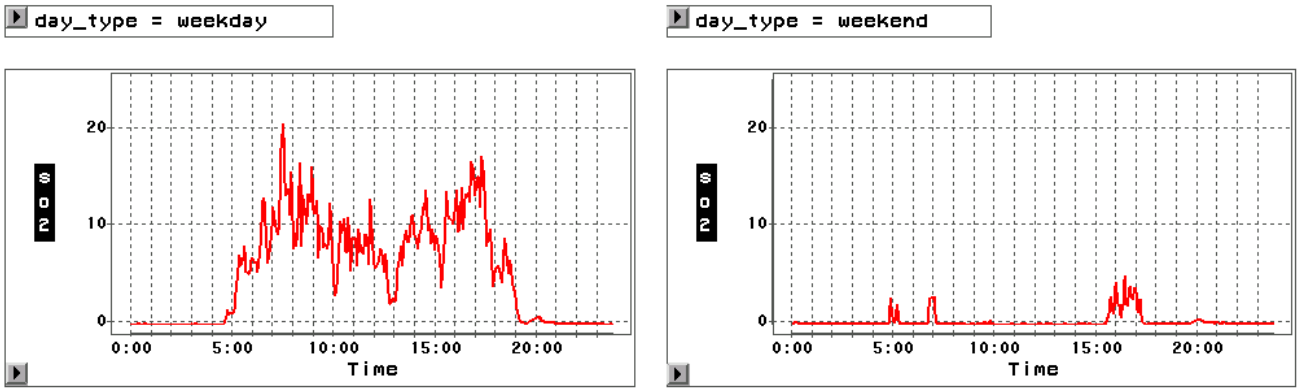


Figure 20. Solar Estates mean SO_2 ppb by time (5-minute resolution), with winds between 145 and 175 degrees, during period with Central *Standard* Time (November 6, 2011 – March 10, 2012), weekdays and weekends



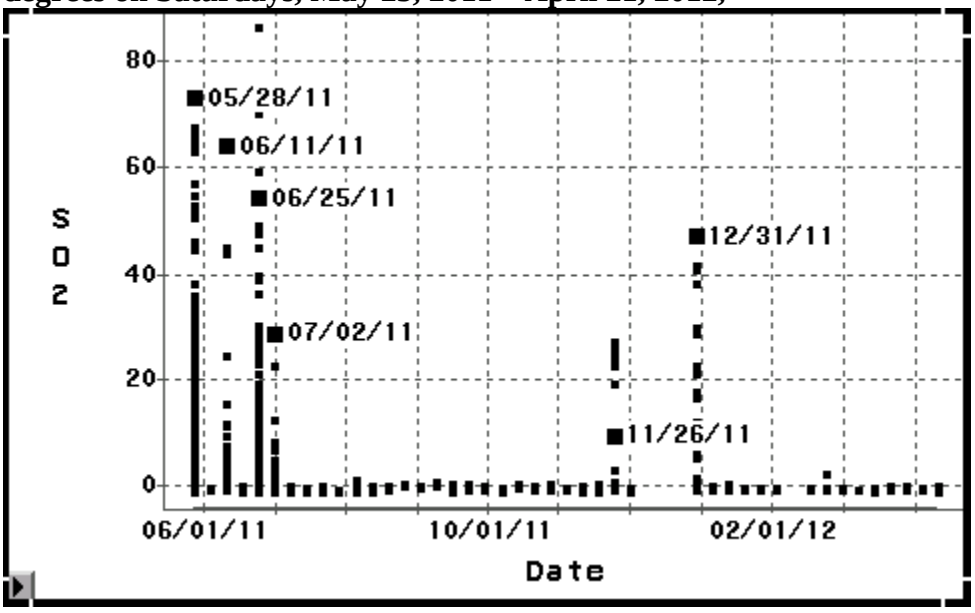
In Figure 19 there are statistically significant levels above background of SO_2 on weekends, although much lower than weekday mean concentrations. A close examination of the data shows no significant concentrations on any Sundays, but some on Saturdays. Figure 21, on page 27, shows the time series of 5-minute time resolution SO_2 with winds in the 145 – 175 degree direction range for Saturdays from May 25, 2011 – April 21, 2012. For the large majority of

Saturdays, concentrations were close to 0, and on a few Saturdays there were no winds in the 145 – 175 degree direction range. But on six Saturdays, concentrations were elevated and the dates are labeled in Figure 12. Of these dates, four out of six are close to holidays:

- May 28, 2011 – Saturday before Memorial Day, Monday May 30, 2011
- July 2, 2011 – Saturday before Independence Day, Monday July 4, 2011
- November 26, 2011 – Saturday after Thanksgiving Day, Thursday November 24, 2011
- December 31, 2011 – Saturday before New Year's Day, Sunday January 1, 2012

This pattern suggests that a business may have been operating on some weekends in preparation for being closed on some holidays. This is a speculative observation based on a relatively small amount of data.

Figure 21. Solar Estates SO_2 (5-minute resolution), with winds between 145 and 175 degrees on Saturdays, May 25, 2011 – April 21, 2012,



The nearest UT site to Solar Estates is the Flint Hills Resources CAMS 632 site. A CST vs. CDT and weekend vs. weekday directionality assessment for this site using "Period 3" data is shown in Figure 22, on page 28, for mean SO_2 and Figure 23, on page 29, for CPF analysis. In the case of FHR and its location relative to the hypothesized emission source, a plume would have to be carried by a net southwest wind to be detected at FHR. South through west is the lowest frequency wind direction quadrant in the general area. Also, southwesterly winds are more frequently light and variable than most other directions. As a result, a wider wind direction bin of 20 degrees has been employed in the directionality assessments. The results are in concert with the results discussed above for Solar Estates. Only on weekdays during the hours 5 CST to 17 CST (no adjustments made for daylight savings time) does there appear a peak in the mean SO_2 by direction and CPF graphs, both peaking at 240 (230 – 250) degrees.

Using a ray from FHR at 240 degrees and one at Solar Estates at 159 degrees produces an intersection near a facility on Leopard St. An aerial representation of the directionality appears in Figure 24, on page 30, which is a reprint from an earlier report including some representative back-trajectories produced by the UT CEER Corpus Christi trajectory tool.

Figure 22. FHR mean SO_2 ppb by wind direction (20° bins) and time period: 5CST to 17CST = "day", other = "eve"

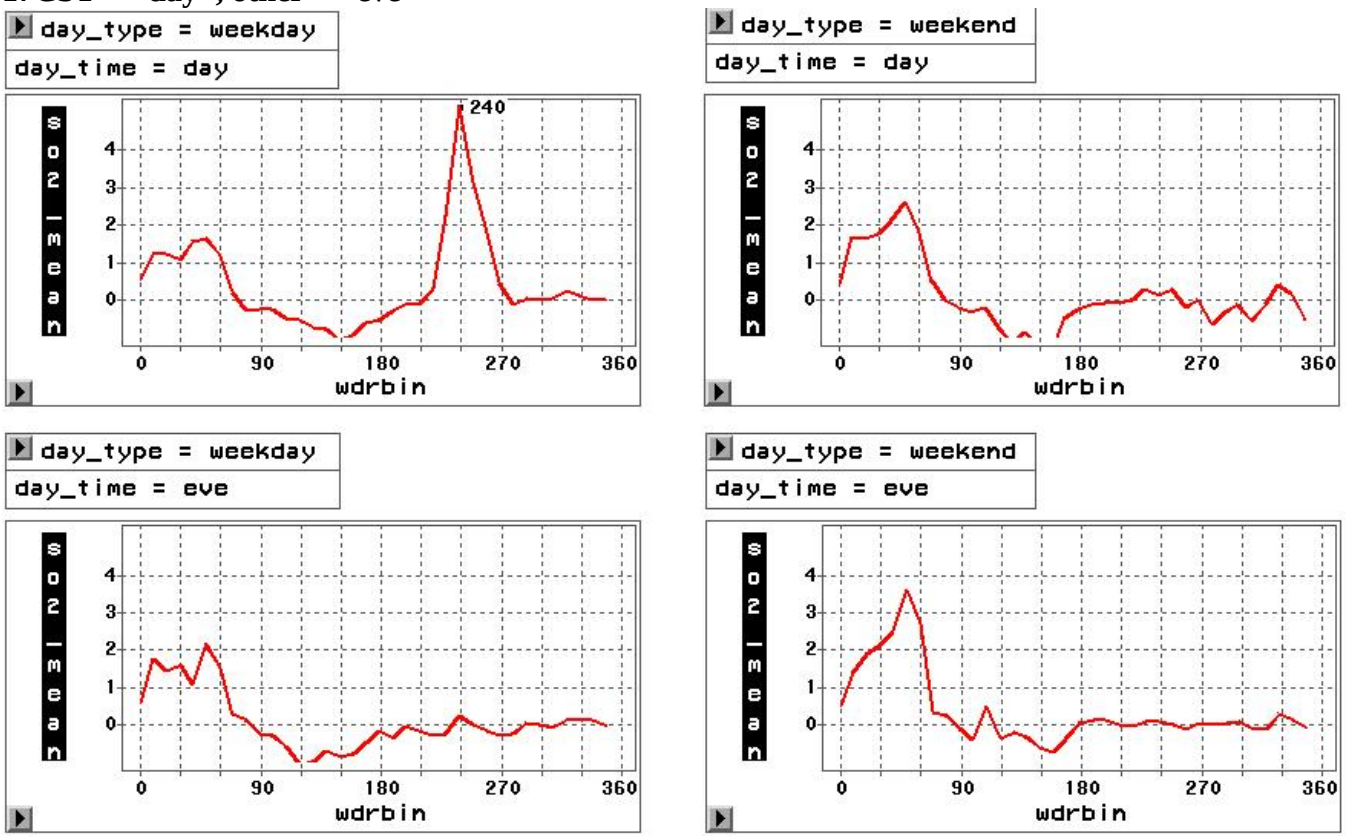


Figure 23. FHR fraction of SO_2 > 95th p-tile by wind direction (20° bins) and time period: 5 CST - 17 CST = "day", other = "eve"

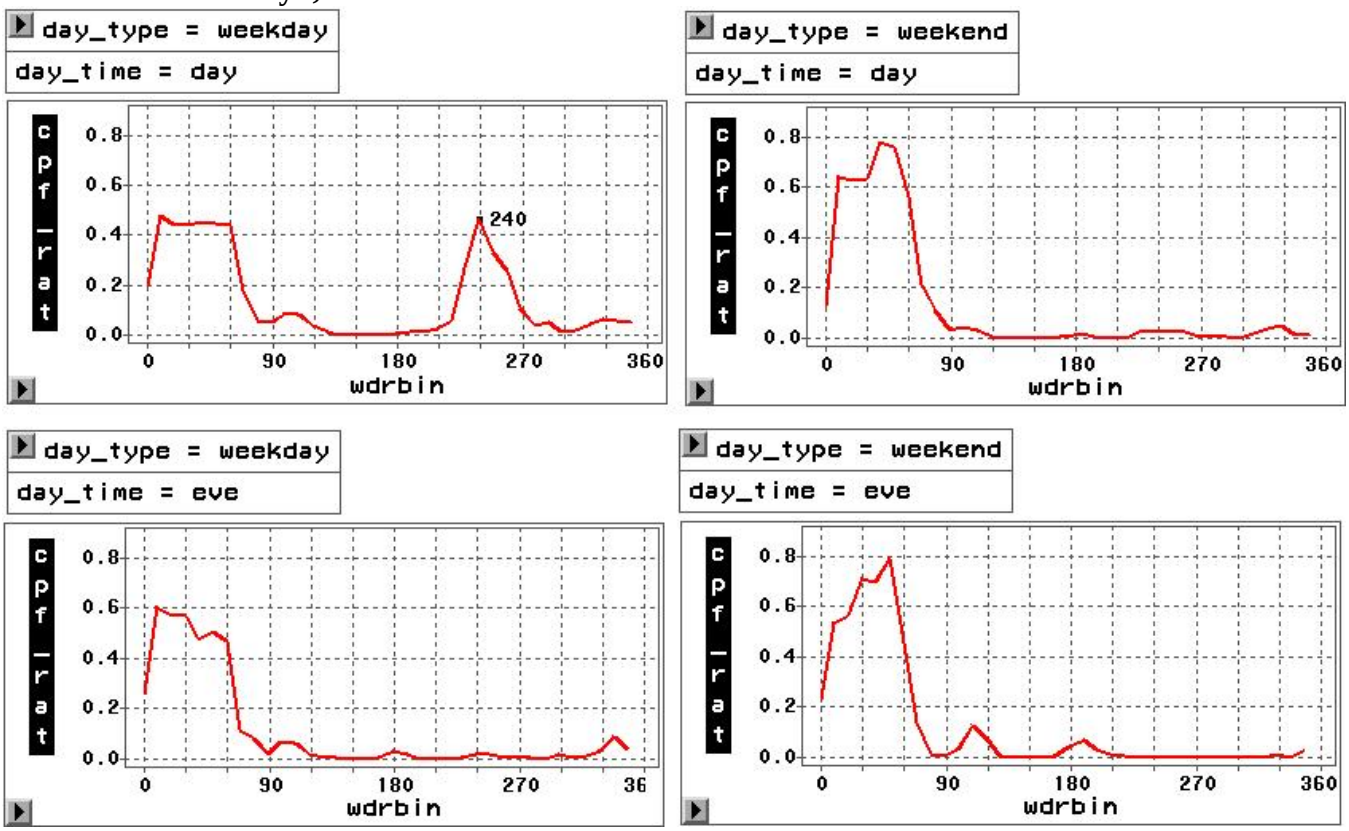
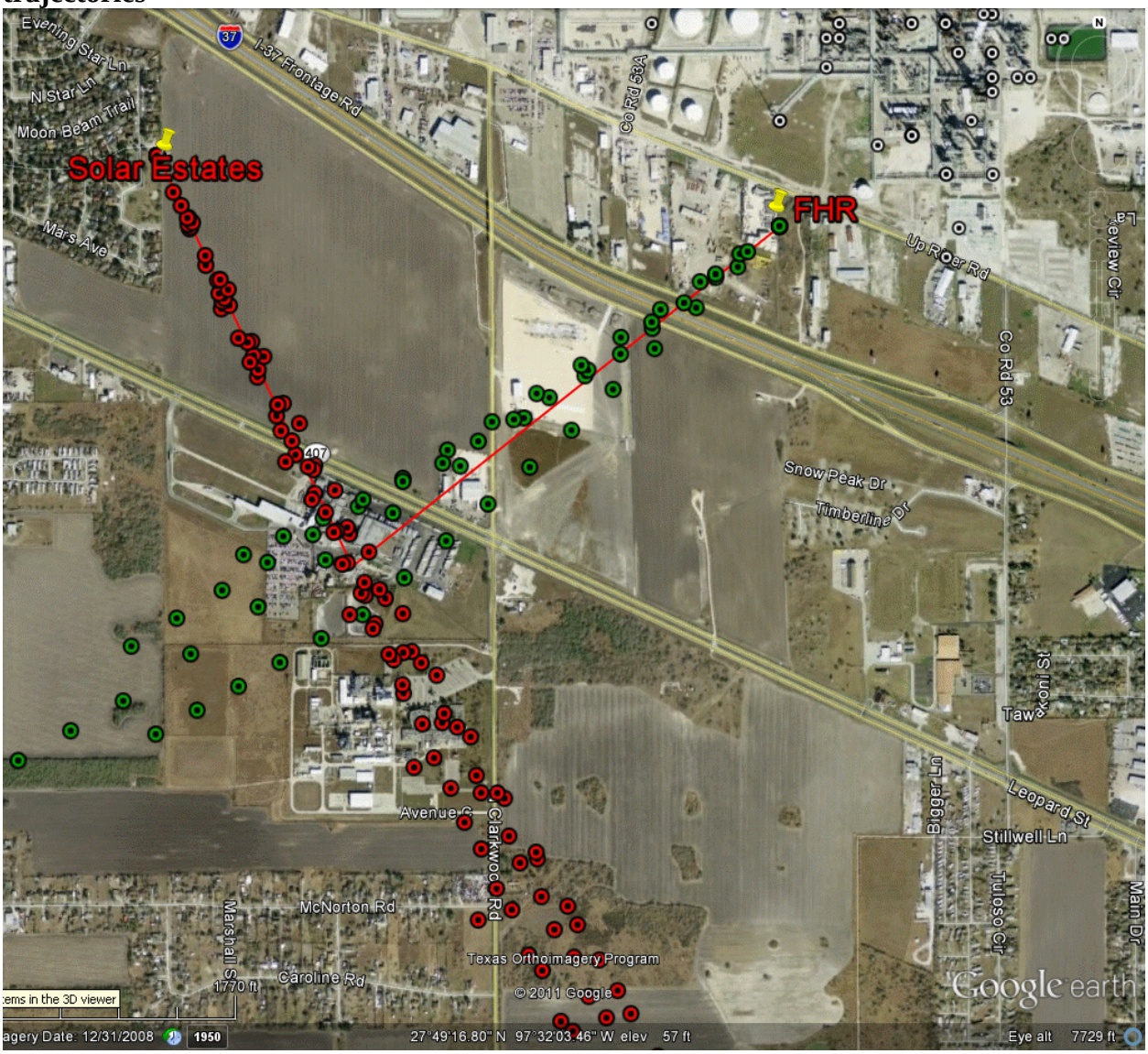


Figure 24. Rays drawn in key directions associated with highest SO_2 concentrations at two CAMS sites: Solar Estates (158°), FHR (240°), plus several representative surface back trajectories



Avery Point Quality Assurance

On April 3, the TCEQ LEADS *CAMS Data Printout* (CDP) for CAMS 6603 was run at 5:25 pm C**D**T, and it appeared to have returned data up to 16:25 CST, which is 5:25 p.m. C**D**T and which is not possible given the system design. A UT staff-person created a screen capture to show the last few CDP records and the clock time on the staff-person's PC in the lower right-hand corner. The staff-person downloaded a *Quicklook* report transposed for Nueces County sites, showing CAMS 6603 returning much more recent data than any other site. A preliminary conclusion was that the site was reporting in CDT, not CST, the TCEQ reporting requirement, and this was reported to the TCEQ.

The UT staff-person took the additional step of seeing whether the possible time tagging mistake could be detected in the meteorological data. Using the 5 minute data from March 1, 2012 through April 2, 2012, from J I Haley CAMS 630 and Avery Point CAMS 6603, the staff-person calculated the correlations between east-west (u), and north-south (v) wind components from

"coincident" pairs of observations at the two sites, and then shifted the correlation by 5 minutes on one site. Before the March 11 daylight savings time onset, the peak correlation occurred for "Lag 0". After March 11, the peak correlation was offset by exactly 1 hour, consistent with Avery Point reporting CDT instead of CST. Identical conclusions were reached using the u-component and v-component data. Graphs of the correlations by lag appear in Figure 25, below, for "before" and Figure 26, below, for "after." An additional clue was that Avery Point was in "preventive maintenance" mode during the hour of the time slip (2 a.m. March 11).

Figure 25. Correlation in u-components between JIH and Avery Pt. before March 11 vs. lag, where lag=0 means coincident, lag=1 means 5-minutes apart, and lag=12 means one hour apart.

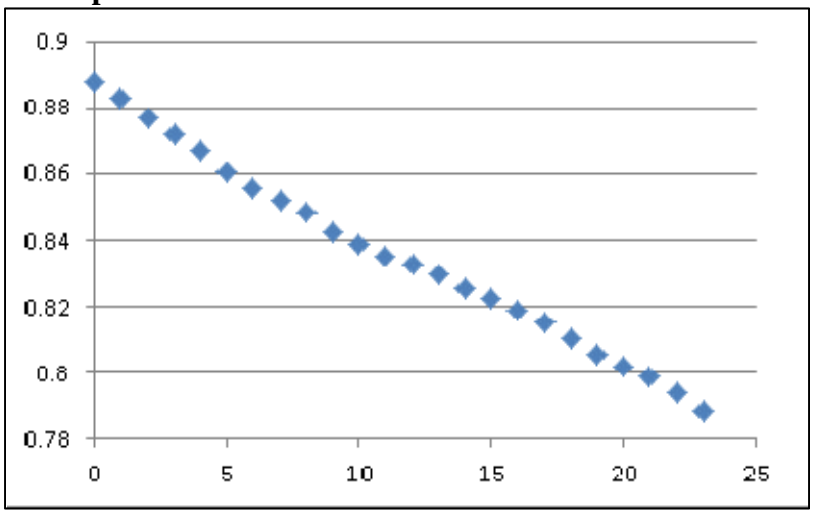
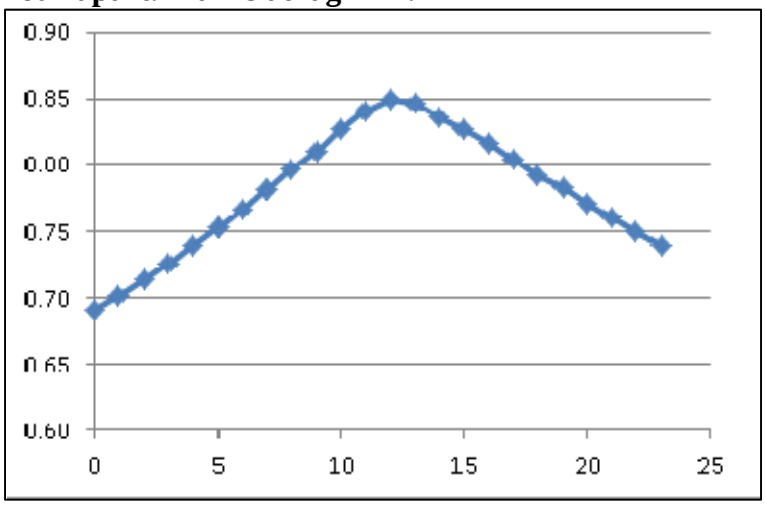


Figure 26. Correlation in u-components between JIH and Avery Pt. March 11 and after vs. lag, where lag=0 means coincident, lag=1 means 5-minutes apart, and lag=12 means one hour apart. Max is at lag = 12.

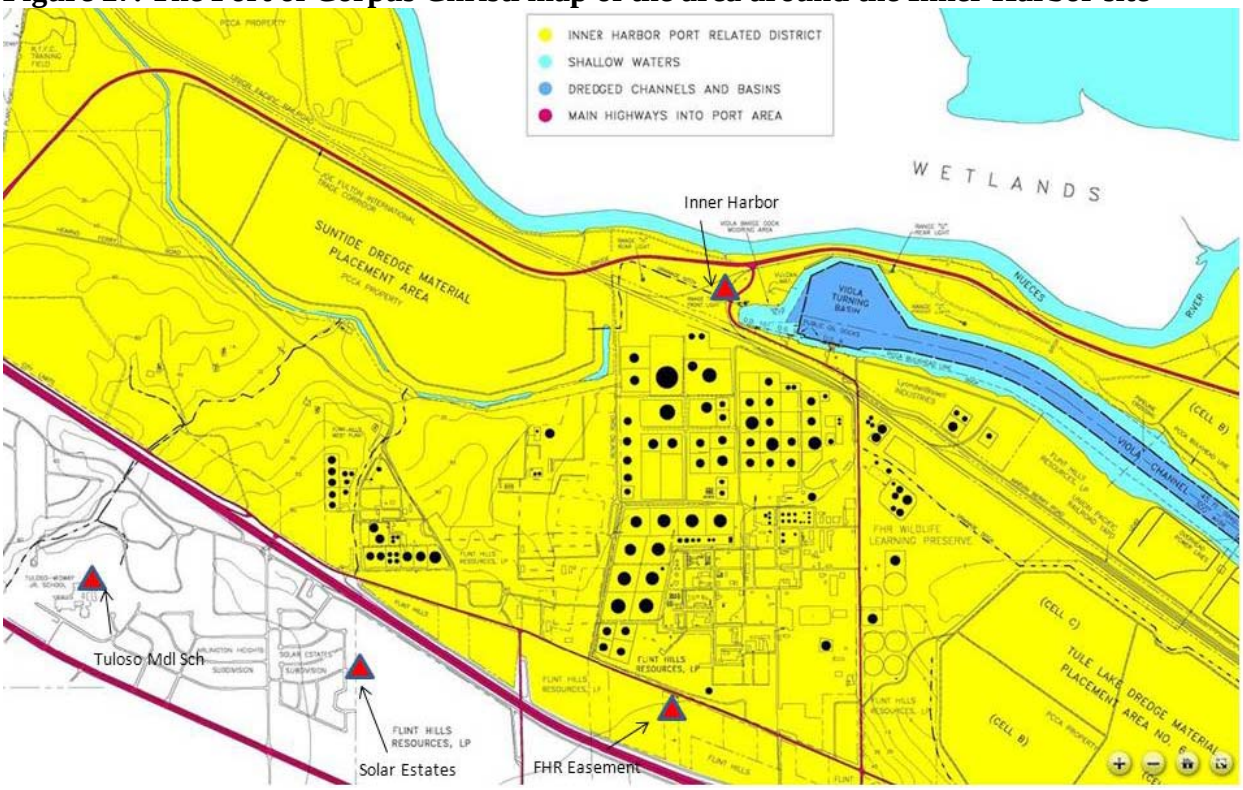


4. What has been learned from the CAMS 631, Inner Harbor site

The purpose of this section is to discuss what knowledge has been created from the monitoring at the CAMS 631 Inner Harbor site on the Corpus Christi Ship Channel. Owing to changes in nearby land use, air monitoring operations will be suspended on April 30, 2012.

Figure 27, below, is a map of the Port of Corpus Christi and industrial property, residential areas, and wetlands in the area around the Inner Harbor site. The Flint Hills Resources refinery lies directly south of the site and Oil Docks 10, 9, and 8 (running west to east) lie southeast of the site. In general, the highest total nonmethane hydrocarbon (TNMHC) concentrations measured at the current site are associated with southeast winds and are hypothesized to be related to dockside activities. The frequency of high (>= 2000 ppb) TNMHC is largely owing to the combination of the location of sources in the prevailing upwind direction. The highest mean concentration of TNMHC is associated with southerly winds and is hypothesized to be related to the Flint Hills Refinery. Figure 27, also shows the locations of three other monitoring sites, TCEQ's CAMS 21 Tuloso, UT's CAMS 633 Solar Estates and CAMS 632 FHR Easement.

Figure 27. The Port of Corpus Christi map of the area around the Inner Harbor site



The wind measurements at Inner Harbor are often affected by large piles of earth located east of the site. Figure 28, on page 33, shows a composite wind rose using data from the other three sites from 2011. Prevailing winds are from the south-southeast. The ensemble in Figure 28 is meant to represent a less biased picture of the distribution of winds in the area, as it merges data from multiple sites, each of which may have some biasing factor. For example, FHR is believed to have an obstruction to the northeast, so more winds are channeled to NNW. Tuloso has trees to the south through east to north, resulting in slower wind speeds. Solar Estates is one of the best exposed sites in the area. Figures 29 through 32, on page 34, are the individual four wind roses for 2011 for the four monitors shown in Figure 27. The overall effect of the piles of dirt is that

southeasterly winds seem to be channeled more to the south. The mean wind speeds for 2011, an indicator for overall site exposure, are shown in Table 8, on page 34. Inner Harbor shows relatively high mean winds, indicating generally good exposure, despite the compromised southeast direction.

Figure 28. Surface wind rose combining 2011 data from three sites around the western end of ship channel, not including Inner Harbor

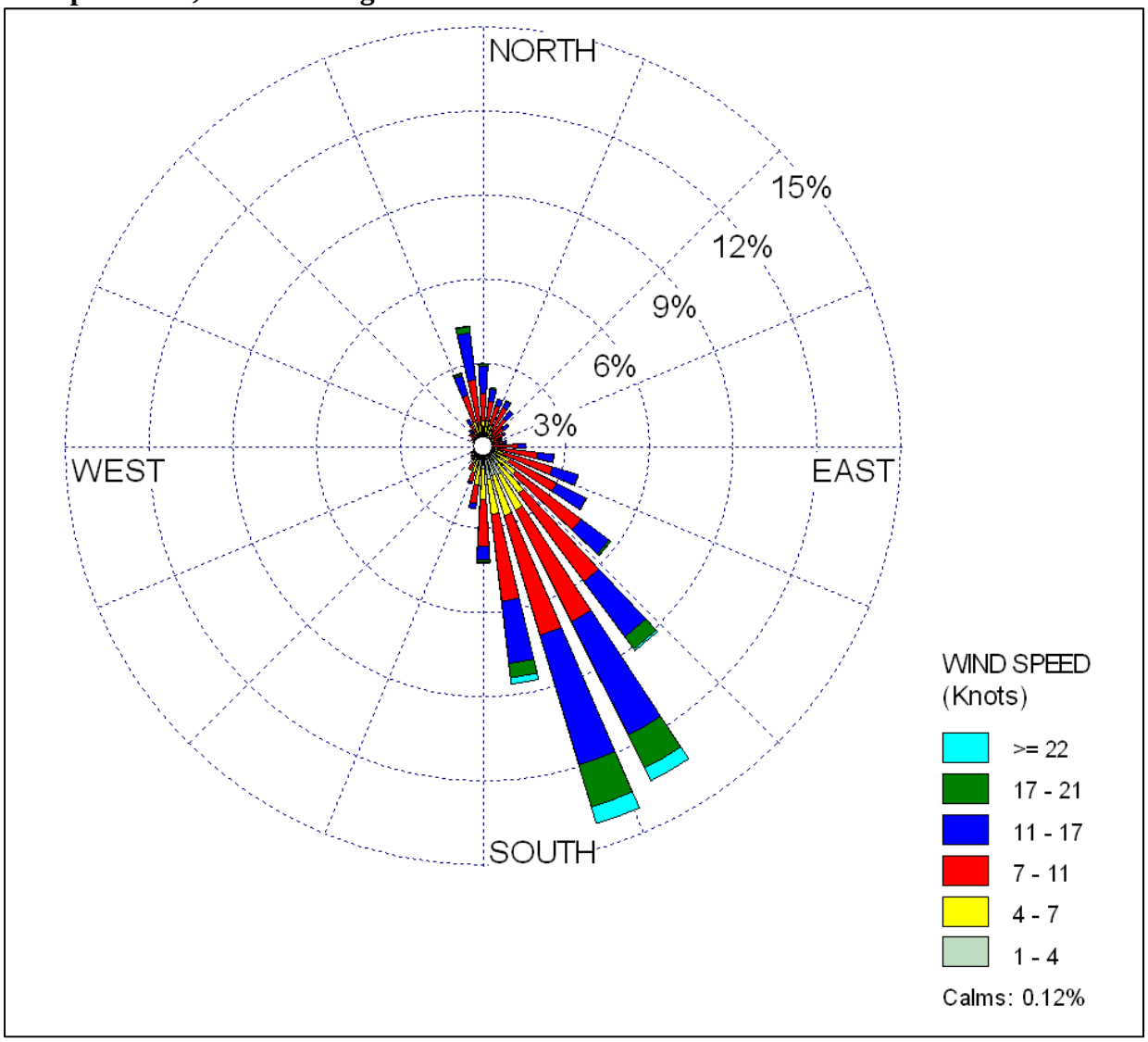


Figure 29. Inner Harbor 2011 winds

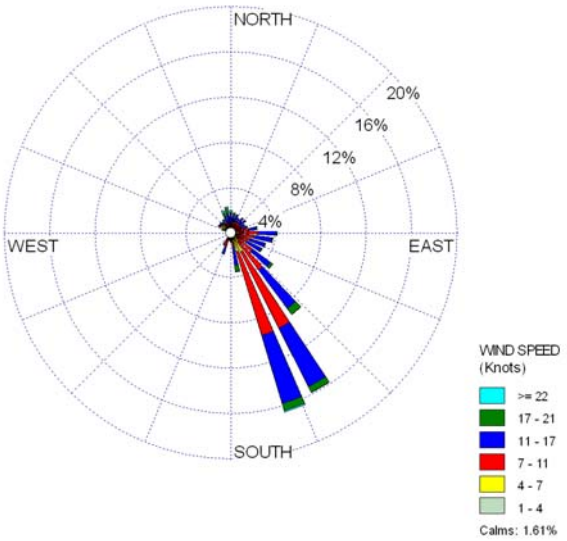


Figure 30. FHR 2011 winds

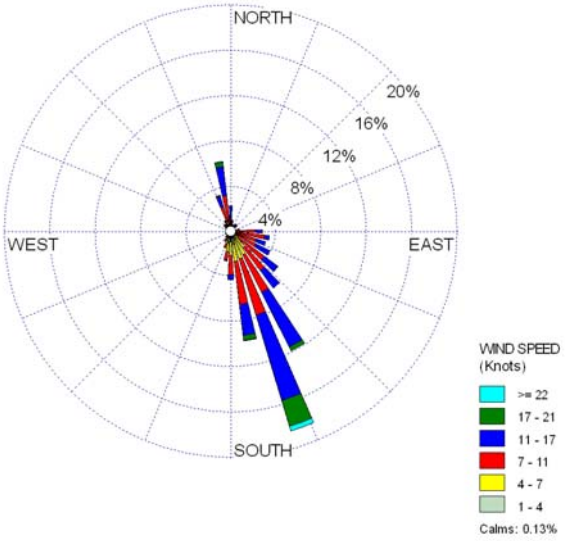


Figure 31. Tuloso 2011 winds

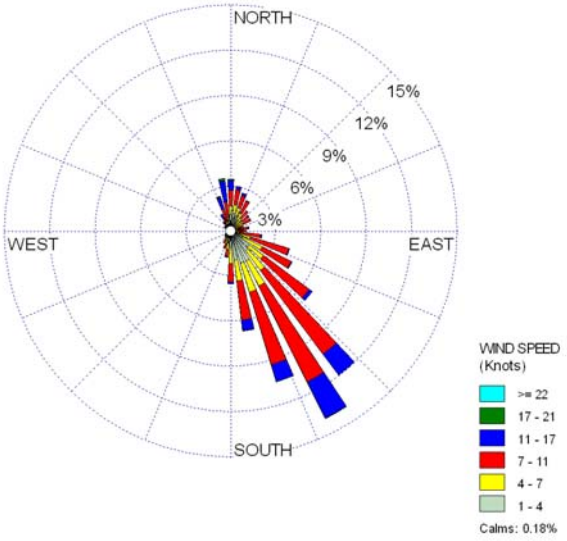


Figure 32. Solar Estates 2011 winds

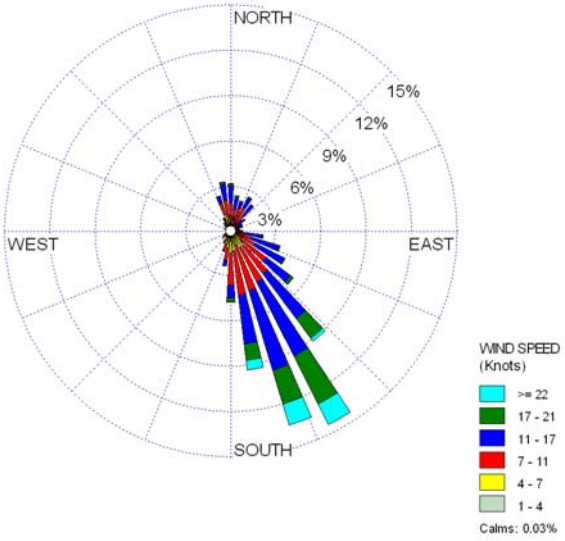


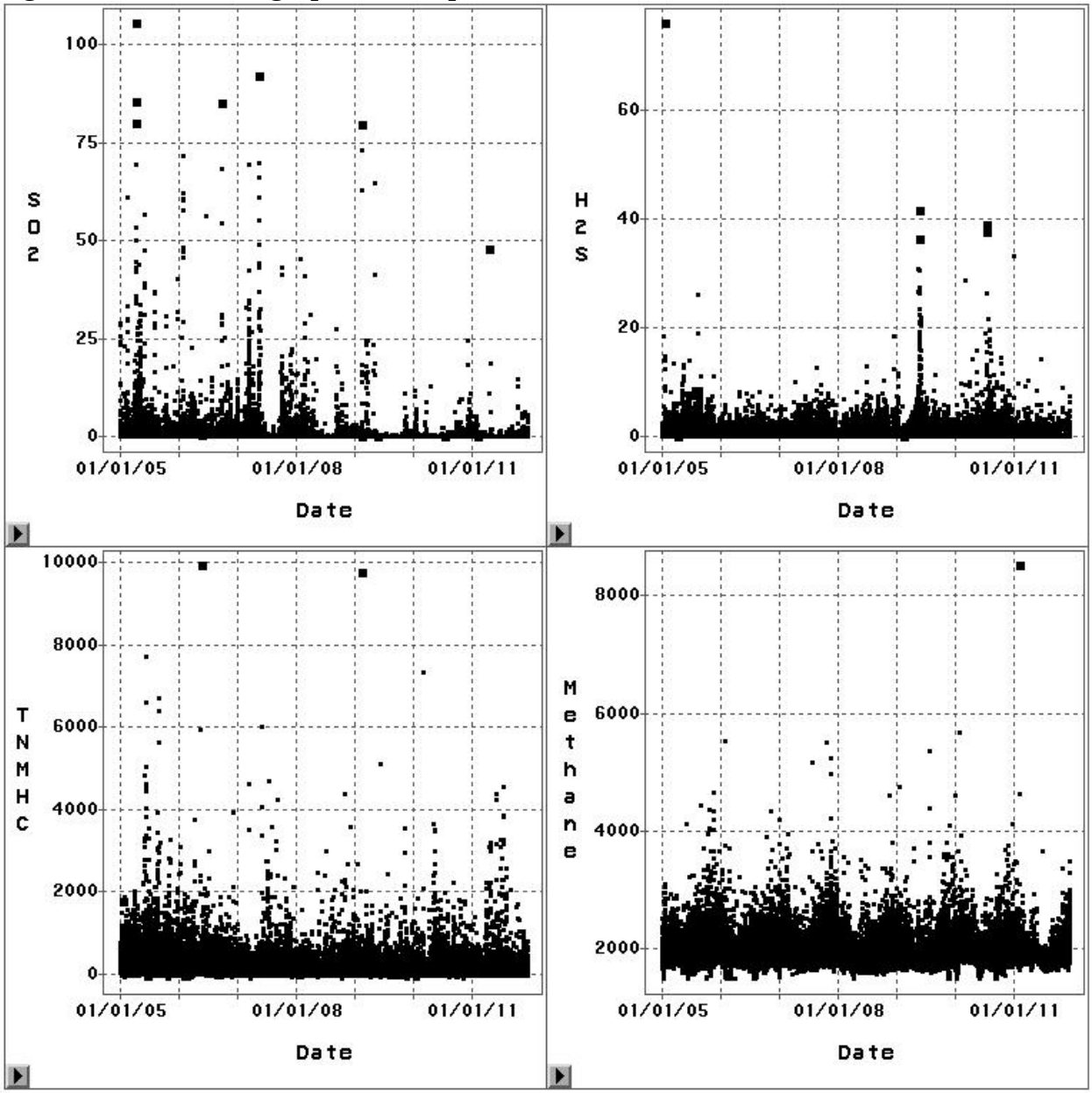
Table 8. Mean 2011 Wind Speed mph

Site	mph
Inner Harbor	10.32
Solar Estates	11.41
FHR Easement	9.62
Tuloso	7.22

History of Measurements

Figure 33, below, shows time series for four pollutants measured at the Inner Harbor site from 2005 through 2011. Certain points in the graphs are bolded for discussion. In the upper left corner, exceedances of the new SO2 NAAQS are highlighted. Three values were measured above 75 ppb on one date in 2006, and three others have been measured on separate dates since then. The highest value since 2009 is also highlighted. Wind directions for the highlighted points were southeast, and back trajectories in most cases ran directly down the ship channel. These elevated concentrations are hypothesized to be attributable to emission from ships burning heavy oil for fuel. There have not been enough elevated SO_2 concentrations to cause noncompliance with NAAQS concerns.

Figure 33. Time series graphs of four pollutants measured at Inner Harbor, 2005 - 2011



New Emission Source Found

Several email alerts were generated in March 2012 on TNMHC concentrations above 2000 ppbC under northerly winds at the Inner Harbor site. Few if any alerts of this nature had been received prior to this. Coincident with the elevated TNMHC were elevated methane levels. A time series graph of 5-minute methane values for 2012 is shown in Figure 34, below. In order to assess the behavior of methane concentrations at Inner Harbor, the measurements from the month of March for each year were examined. Figure 35, on page 37, is a collection of graphs of methane by wind direction at 5-minute time scale for months of March from 2005 – 2012. Only in 2012 and only from northeast winds have levels over 5000 ppbC been measured. Coincident TNMHC and methane generally means natural gas has been emitted upwind. Figures 36 and 37, on page 38, show the mean methane and mean TNMHC by wind direction, respectively. Both graphs show the same direction peak at 30 degrees. Figures 38 and 39, on page 39, show the CPFs for methane and TNMHC by wind direction, respectively. Both graphs show the same range of direction peak from 30 to 50 degrees. These directions were places on an aerial map and an exposed gas pipeline service outlet was identified 130 meters away in the key upwind direction. UT CEER contacted the contractor for site operations on April 6, 2012 to ask if any unusual activity could be observed northeast of the site. The contractor responded that one operator stated "I can hear the gas blowing out the top clamp on the top of the riser. I notified Enterprise (the pipeline owner)." A second operator's response was: "I heard it the other day when I was doing LCCs. May be coming out of the pressure release valve." A photo of the service outlet appears in Figure 40, on page 40. The elevated methane and TNMHC were not observed after the pipeline operator was notified.

Figure 34. Methane five-minute ppbC concentrations increased in March 2012

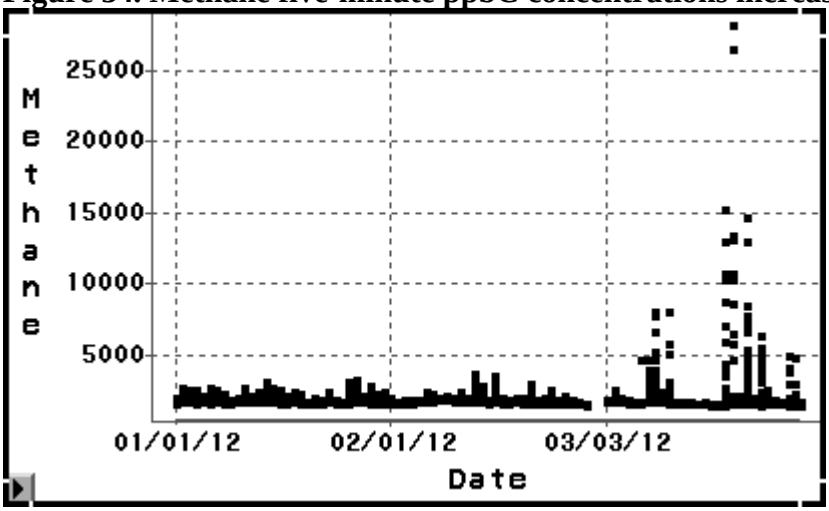


Figure 35. Methane vs. wind direction at 5-minute time scale for the month of *March* by year

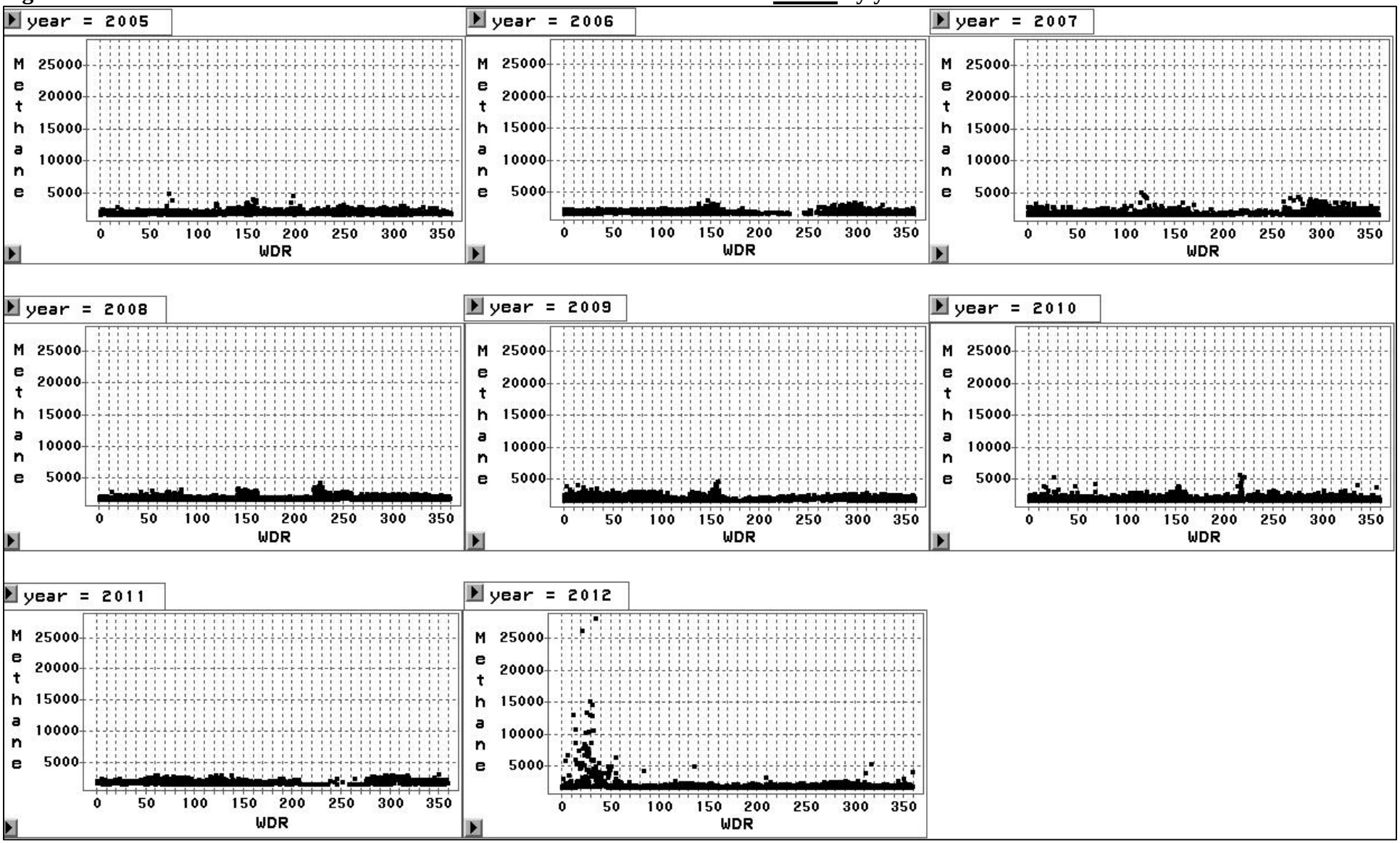


Figure 36. Mean ppb methane by wind direction, March 2012, Inner Harbor

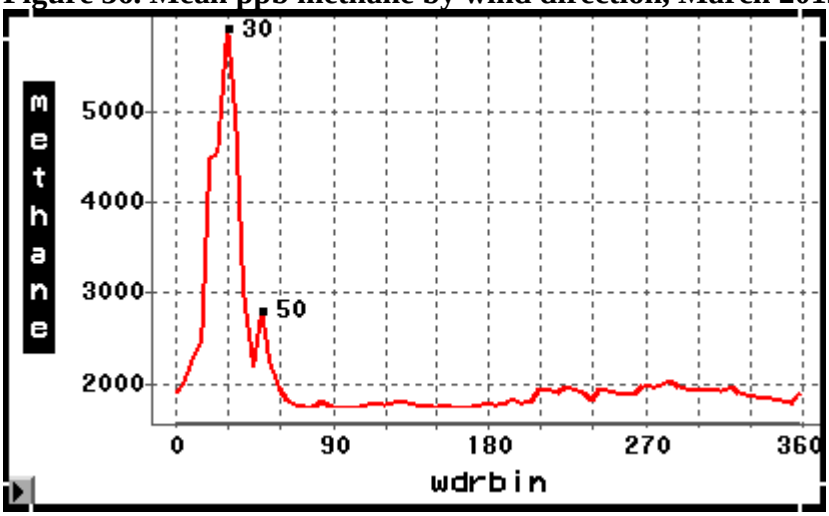


Figure 37. Mean ppbC TNMHC by wind direction, March 2012, Inner Harbor

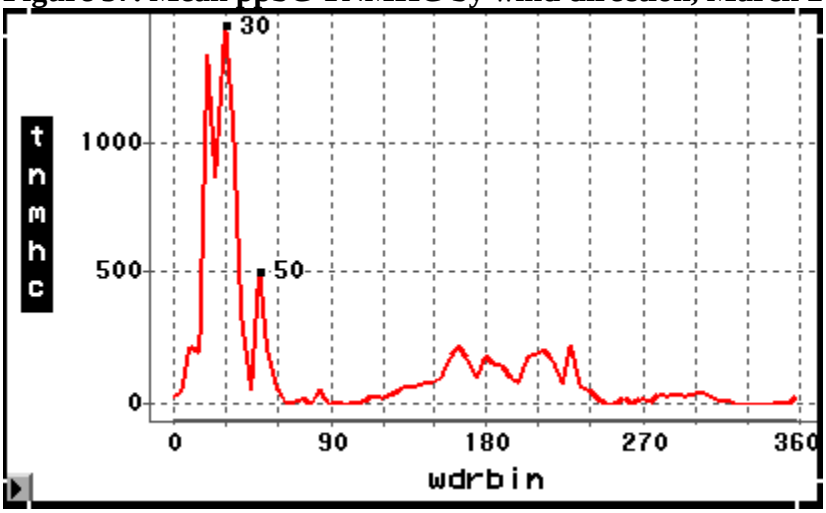


Figure 38. Conditional probability function for methane, March 2012, Inner Harbor. Interpretation: > 80% chance a 95th percentile value of methane measured in 40 deg. wind bin.

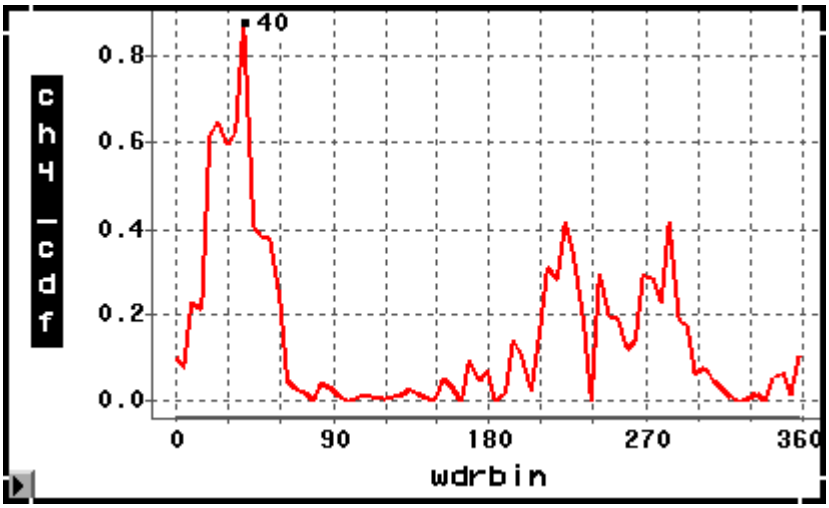


Figure 39. Conditional probability function for TNMHC, March 2012, Inner Harbor. Interpretation: > 50% chance a 95th percentile value of TNMHC measured in 30 deg. wind bin

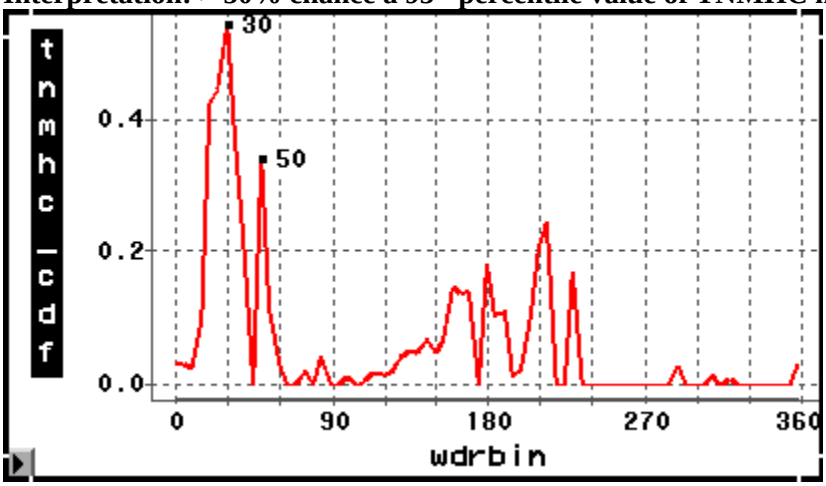


Figure 40. Enterprise pipeline service outlet believed to have been the source of elevated methane and TNMHC in March 2012.

Conclusions from the First Quarter 2012 Data

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

- Fourth quarter 2011 and first quarter 2012 benzene concentrations at the auto-GCs remain well below the TCEQ's AMCVs.
- Periodic air pollution events continue to be measured on a routine basis, but no auto-GC hydrocarbon values were observed above the TCEQ AMCV levels this quarter for the 27 species tracked for this project.
- No exceedances of the EPA SO_2 NAAQS level were measured this quarter at JIH CAMS 630. However, the JIH CAMS 630 site finished 2011 with an SO_2 design value that is greater than the 75 ppb level of the NAAQS. The addition of the nearby Avery Point CAMS 6603 has assisted in triangulating on which docks were the source of emissions that created the highest on-shore concentrations recently.
- An examination of SO_2 data at the Solar Estates and the FHR CAMS 632 site continues to suggest that an industrial facility on Leopard St may be producing unreported SO_2 emissions. One exceedance was recorded this quarter.
- A source of elevated methane and TNMHC was detected in March 2012 at the Inner Harbor site. This site has taken measurements since 2005 recording emissions from the Flint Hills Refinery and ship emissions and emissions from dock activities from several West End Oil Docks.

Further analyses will be provided upon request.

APPENDIX B

January 10, 2012
Advisory Board Meeting Notes

ADVISORY BOARD MEETING

Corpus Christi Air Monitoring and Surveillance Camera Installation and Operation Project

Texas A&M University - Corpus Christi

Room 1009, NRC Building

11:30 pm – 1:30 pm

January 10, 2012

Advisory Board Members Present:

Ms. Gretchen Arnold	Corpus Christi Pollution Prevention Partnership TAMUCC
Ms. Joyce Jarmon	Corpus Christi Community Council
Dr. Glen Kost	Public Health Awareness
Ms. Pat Suter	Coastal Bend Sierra Club
Mr. James Bowman	City of Corpus Christi
Dr. Eugene Billiot	Community Volunteer

Ex-Officio Members of the Board

Mr. James Martinez	Probation Office - US District Court
Ms. Rosario Torres	TCEQ – Region 14
Mr. Chris Owen	TCEQ – Region 14

Project Personnel Present:

Dr. David Allen	The University of Texas at Austin
Mr. Vince Torres	The University of Texas at Austin
Dr. Dave Sullivan	The University of Texas at Austin

I. Call to Order and Welcome

Mr. Vince Torres called the meeting to order at 11:35 pm.

II. Project Overview and Status

Dr. Dave Sullivan gave an update on monitoring data for the 4th calendar quarter ending 12/31/11 and federal fiscal year ending 9/30/11. A question was raised as to the demolition across from Dona Park affecting data. Ms. Joyce Jarmon wanted to know the effects of those emissions. Mr. Torres explained that most of the contaminants are probably particulate emissions from the demolition and therefore not measured by any of the instruments on the project. He added that the TCEQ does make particulate measurements at Dona Park. Mr. James Bowman added that a contractor is supposed to be monitoring contaminant emissions from the demolition work.

Mr. Torres said that he would take as an action item, to look at the particulate data from Dona Park and the contractor, who has been hired to monitor emissions, and work with Dr. Sullivan to prepare analyses of those measurements for the next meeting. **ACTION ITEM**

Dr. Glen Kost asked what the effects of the wind turbines have on the meteorology in the area and the effect on the air quality measurements. Dr. Sullivan and Dr. David Allen indicated that there is a negligible impact of the wind turbines on the meteorology or air quality measurements and said they would provide information on studies conducted that show this. **ACTION ITEM**

In response to a question about the SO_2 measurements in the Port area, Mr. Chris Owen, from the TCEQ, explained that the TCEQ has been following up on the elevated SO_2 measurements and have added a new portable SO_2 monitor along the south side of the port. They will be using data from this monitor to conduct further investigations of elevated SO_2 measurements that are believed to be coming from combustion of bunker fuel from the ships. He said, TCEQ in partnership with the Coast Guard now are obtaining good cooperation from the Port Authority in providing data on ship activity in the Port. It has been determined that the Coast Guard has authority to oversee air quality emissions from the Port area and will be working closely with TCEQ

on this enforcement activity. He also pointed out that some rule changes may be forthcoming that will reduce the sulfur content in ship fuel.

III. Follow up to Old Business/Action Items

Mr. Torres informed the Advisory Board that the request for installing a surveillance camera at the Port of Corpus Christi from The University of Texas at Austin was denied and that a similar request by the TCEQ was also denied.

However, as explained by Mr. Owen, of the TCEQ, other cooperation by the Port with the Coast Guard and the TCEQ is resulting in providing the data on ship activities that is needed for analyses. Therefore, the need for a surveillance camera has been circumvented for the moment.

Mr. Torres gave an update on the budget for the SEP monies and Neighborhood Air Toxics Project. He also provided an update on the Annual Presentation to the Court and the budget and network modifications approved by the Court on March 1, 2011.

IV. New Business

Ms. Gretchen Arnold provided a summary of the EPA Summit Meeting held in November 2011 and the purpose for a follow up meeting to be held on January 19, 2012. The purposes of those meetings were to list and describe the monitoring sites and measurements at these monitoring sites as well as the availability of the data and how it is being used. The primary purpose of these meetings is help with the Corpus Christi Community understand all of the air quality measurements being made in the Corpus Christi area and what the data mean.

Ms. Arnold also provided a summary of a request made of the Project Staff by the prosecutors in the CITGO Criminal case. This request included providing estimates of costs to continue operations of the network through 2020 and the possible addition of a new site.

V. Advisory Board

Mr. Torres said that the timing for the next meeting could be in April when the request by the prosecutors in the CITGO Criminal Case might be resurrected. If so, a summary of the information provided to the prosecutors will be shared with the Board.

VI. Adjourn

The meeting adjourned at 1:15pm.

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
01/01/2012 - 03/31/2012

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

Total Grant Amount:	$6,761,718.02
Total Interest Earned:	$814,320.54
Total Funds Received:	**$7,576,038.56**

B. Summary of Expenditures Paid by COCP Funds

		Year 3 Budget	Year 4 Budget	Year 5 Budget	Year 6 Budget	Year 7 Budget	Yrs 1-7 Adjusted Budget	Prior Activity	Current Activity 01/01/12 - 03/31/12	Encumbrances	Remaining Balance 3/31/2012
Salaries-Prof	12	$216,128.63	$160,652.00	$286,279.40	$299,633.00	$318,499.00	$1,218,732.94	($1,205,080.88)	$0.00		$13,652.06
Salaries-CEER	15	$19,606.37	$15,636.00	$33,123.00	$30,948.00	$29,880.00	$162,071.37	($162,071.38)	$0.00		-$0.01
Fringe	14	$47,984.00	$38,783.00	$58,333.00	$72,728.00	$76,643.00	$285,059.91	($292,023.89)	($15,740.98)	($5,574.65)	-$28,279.61
Communication	42	$0.00	$0.00	$0.00	$0.00	$0.00	$1,845.00	($1,575.00)	($90.00)		$180.00
Other/C-Analysis	47/68	$60,474.00	$73,500.00	-$8,656.40	$73,500.00	$14,219.00	$114,455.00	($114,455.00)	$0.00		$0.00
Supplies	50	$86,844.00	$33,500.00	$68,676.00	$122,682.00	$72,797.32	$512,178.19	($508,840.81)	($64.60)		$3,272.78
Quality Assurance	51	$0.00	$20,300.00	$8,000.00	$0.00	$7,070.00	$16,640.00	($16,640.00)	$0.00		$0.00
Subcontract	62-65	$1,965,693.00	$314,022.00	$286,734.00	$346,289.00	$591,523.00	$3,538,580.91	($3,526,943.22)	($11,637.69)		$0.00
Program Income	66*	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	($207,520.04)	($206,823.22)	($15,676.61)	-$430,019.87
Travel	75	$2,300.00	$2,000.00	$7,719.00	$9,000.00	$6,712.00	$30,191.00	($30,103.73)	$0.00		$87.27
Equipment	80	$0.00	$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	$167,601.70	$881,963.70	($842,621.17)	($4,166.15)		$35,176.38
TOTALS		**$2,758,885.00**	**$757,152.00**	**$862,739.00**	**$1,097,997.00**	**$1,284,945.02**	**$6,761,718.02**	**($6,907,875.12)**	**($238,522.64)**	**($21,251.26)**	**($405,931.00)**

B.1. Summary of Program Income (66) Expenditures

Salaries-Prof	66	($59,965.38)
Salaries-CEER	66	($8,215.56)
Fringe	66	$0.00
Communication	66	$0.00
Other/C-Analysis	66	($48,897.00)
Supplies	66	($30,044.75)
Quality Assurance	66	$0.00
Subcontract	66	($58,544.95)
Program Income	66	$0.00
Travel	66	($1,155.58)
Equipment	66	$0.00
TOTAL		($206,823.22)

C. Interest Earned by COCP Funds as of 03/31/12

Prior Interest Earned:	**$811,193.51**
Interest Earned This Quarter:	$3,127.03
Total Interest Earned to Date:	**$814,320.54**

D. Balance of COCP Funds as of 03/31/12

Total Grant Amount:	$6,761,718.02
Total Interest Earned:	$814,320.54
Current Q. Expenses	($238,522.64)
Total Expenditures:	($6,907,875.12)
Remaining Balance:	**$429,640.80**

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

Michael A Martinez

Accounting Certification