Neighborhood Air Toxics Modeling Project
for
Houston and Corpus Christi
Case # 2:11-MC-00044

Phase 1B
Monitoring Network Extension

Annual Progress Report for the Period

October 1, 2014 through September 30, 2015

Submitted to

The Honorable Janis Graham Jack
United States District Court for the Southern District of Texas
Corpus Christi, Texas

Mr. John L. Jones
United States 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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ANNUAL PROGRESS REPORT
TO THE U.S. DISTRICT COURT
FOR THE
NEIGHBORHOOD AIR TOXICS MODELING PROJECT
FOR HOUSTON AND CORPUS CHRISTI
PHASE 1B: MONITORING NETWORK EXTENSION

October 1, 2014 through September 30, 2015

INTRODUCTION

On February 1, 2008, the United States District Court entered an Order (D.E. 981, Order (pp.1, 7-11)) regarding unclaimed settlement funds in Lease Oil Antitrust Litigation (No.11) Docket No. MDL No. 1206. The Court requested a detailed project proposal from Dr. David Allen, the Gertz Regents Professor in Chemical Engineering and the Director of the Center for Energy and Environmental Resources at The University of Texas at Austin (UT Austin), regarding the use of $9,643,134.80 in the Settlement Fund. The proposal was for a project titled "Neighborhood Air Toxics Modeling Project for Houston and Corpus Christi" (hereinafter "Air Toxics Project"). The Air Toxics Project was proposed in two stages. In Stage 1, UT Austin was to develop, apply, demonstrate and make publicly available, neighborhood-scale air quality modeling tools for toxic air pollutants in Corpus Christi, Texas (Phase 1A) and extend the operating life of the air quality monitoring network in Corpus Christi, Texas (Phase 1B). The ambient monitoring results from Stage 1 Phase 1A were to be used in synergy with the neighborhood-scale models to improve the understanding of emissions and the spatial distribution of air toxics in the region.

On February 21, 2008, the United States District Court for the Southern District of Texas issued an order to the Clerk of the Court to distribute funds in the amount of $4,586,014.92, plus accrued interest, to UT Austin for the purposes of implementing Stage 1 of the Air Toxics Project as described in the detailed proposal submitted to the Court by UT Austin on February 15, 2008 (D.E. 998).

Under the Order to Distribute Funds in MDL No. 1206, on March 3, 2008, at the direction of the Settlement Administrator, $4,602,598.66 was disbursed to UT Austin for Stage 1 of the Project. This amount includes the interest accrued prior to distribution from the MDL No. 1206 Settlement Fund.

In Stage 2, subject to the availability of funds, it was planned that UT Austin would extend the modeling to the Houston, Texas ship channel region, develop a mobile monitoring station that could be deployed in Corpus Christi and in other regions of Texas and/or further extend the operating life of the existing stationary network in the same or a modified spatial configuration. Based on the decision of the U.S. Court of Appeals for the 5th Circuit on June 27, 2011, UT Austin will not be receiving the Stage 2 funding at any point in the future. Further, work on the modeling portion of Stage 1 (Phase 1A) was completed June 30, 2011. Hence, all future progress reports will describe only work on Stage 1 Phase 1B.

The air quality monitoring network was originally authorized on October 1, 2003, when the United States 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 UT Austin to

implement the court ordered condition of probation (COCP) project *Corpus Christi Air Monitoring and Surveillance Camera Installation and Operation* (Project). Those funds have been expended. Funding for the air quality monitoring network originally created for the COCP Project is now provided through Stage 1 Phase 1B of the Air Toxics Project.

A. MONITORING SITES AND EQUIPMENT INSTALLED

The COCP consists of a network of six (6) continuous ambient air monitoring stations (CAMSs) as shown in the map below in Figure 1 with air monitoring instruments and surveillance camera equipment as shown in Table 1, on page 4. Sulfur dioxide (SO_2), hydrogen sulfide (H_2S), hydrocarbon species with one carbon atom to 11 carbon atoms, and meteorological parameters are measured at each CAMS. Each CAMS is identified with a number as shown in Table 1 and often shown on maps with, for example, "CAMS 633" abbreviated as "C633". Speciated hydrocarbon chemicals may be measured either by an automated chromatograph instrument (auto-GC) or sampled in canisters and quantified later in a laboratory. Methane and the total sum of all other common two carbon atom to 11 carbon atom hydrocarbons (unspeciated) – total nonmethane hydrocarbon (TNMHC) concentations – are measured at four sites.

Figure 1. Corpus Christi Monitoring Sites, "X" marks a UT site terminated in 2012, and a TCEQ site terminated in 2014

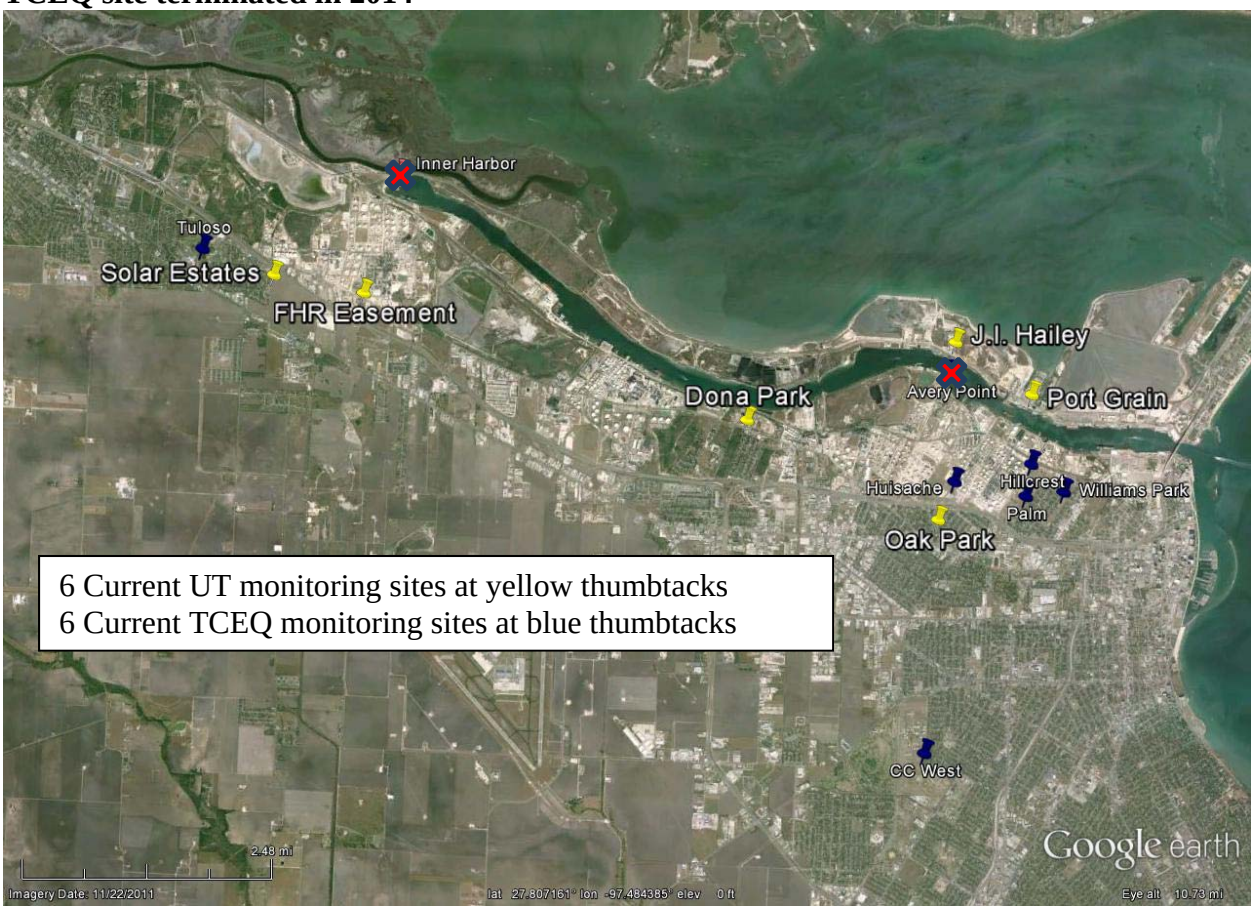

Table 1. Schedule of UT Air Monitoring Sites, Locations and Major Instrumentation

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**)	Mar 2005 to date	C: Dec 2004 to Feb 2009 T: Dec 2004 to Apr 2012		Dec 2004 to date	
629	Grain Elevator @ Port of Corpus Christi (**CCG**)		T&C: Dec 2004 to date	Dec 2004 to date	Dec 2004 to date	
630	J. I. Hailey Site @ Port of Corpus Christi (**JIH**)		T&C: Dec 2004 to date	Dec 2004 to date	Dec 2004 to date	
635	TCEQ Monitoring Site C199 @ Dona Park (**DPK**)		T&C: Dec 2004 to date	Dec 2004 to date	Dec 2004 to date	Jan 2005 to date
632	Off Up River Road on Flint Hills Resources Easement (**FHR**)		T&C: Dec 2004 to date	Dec 2004 to date	Dec 2004 to date	
633	Solar Estates Park at end of Sunshine Road (**SOE**)	Mar 2005 to date	C: Dec 2004 to Feb 2009 T: Dec 2004 to Apr 2012	Dec 2004 to date	Dec 2004 to date	Jan 2005 to date
631	*Port of Corpus Christi on West End of CC Inner Harbor (**WEH**) (site terminated)*		T&C: Dec 2004 to May 2012	Dec 2004 to May 2012	Dec 2004 to May 2012	

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

B. DATA ANALYSIS

As noted in Table 1, above, the monitoring network provides concentration measurements of hydrocarbons, sulfur dioxide, and hydrogen sulfide, and wind speed, velocity, direction, and temperature measurements. Provided below are brief findings from the monitoring network

during FY2015 (October 1, 2014 through September 30, 2015). More details are available in Appendix A, on pages 11 through 41.

Results of Canister Sampling
At four of the six monitoring sites, an ambient air sample may be collected in a canister for subsequent laboratory analysis, if a sustained level of elevated concentrations of total nonmethane hydrocarbons (TNMHC) has been measured, i.e., concentration greater than 2000 parts per billion carbon (ppbC) for longer than 15 minutes. During FY2015, a total of 31 usable canister samples were collected in the Corpus Christi network due to sustained levels of elevated concentrations of TNMHC.

Total Nonmethane Hydrocarbon Trends
Along with the use of TNMHC analyzers to trigger canister samples, the TNMHC data themselves are useful in characterizing air quality trends. However, unlike most instruments used in this project, a drawback to the TNMHC instrument is that it can "top out" at a maximum concentration, cropping values, and this can create a bias in assessing average concentrations. The alternative used by UT is to examine the frequency with which TNMHC concentrations exceed benchmark levels and assess trends in these terms.

Summary of Continuous Hydrocarbon Species Monitoring
No short-term concentrations or long-term average concentrations were measured that were greater than the State of Texas air monitoring comparison values for benzene, 1,3-butadiene, or any other hydrocarbons this fiscal year. Most species measured have lower annual averages in the most recent six years, compared to the project's first three years. However, several alkane species are showing increases in mean concentration trends over the past four years.

Trends in Benzene Concentrations in Residential Areas
Because of a high level of concern with benzene, a known carcinogen, this compound is given special attention. An analysis of the benzene data shows concentrations in FY 2015 were similar to the six previous years, and significantly lower than in FY 2005 – FY 2007.

Summary of Sulfur Species Monitoring
No exceedances of the State of Texas standards for (SO_2) and (H_2S) were measured and no exceedances of the federal SO_2 standard were measured this fiscal year. A mid-2012 change in regulations may have resulted in lowered SO_2 emission rates from one source category – ships at dockside in the Ship Channel. Overall, SO_2 concentrations have declined significantly at most sites.

C. ADVISORY BOARD

The Advisory Board for the Corpus Christi Air Monitoring and Surveillance Camera Project is a voluntary Board that consists of seven members. The members and their representation on the Board follow:

Ms. Gretchen Arnold	Local Air Quality Issues and Board Spokesperson
Dr. Eugene Billiot	Technical Support to the Board - Instrumentation

Ms. Sharon Lewis	City of Corpus Christi
Dr. William Burgin	Local Public Health - Local Air Quality Issues
Ms. Joyce Jarmon	Community Representation
Dr. Glen Kost	Community Representation
Mr. Christopher Schulz	Community Representation

Two meetings of the Advisory Board were held during this year of the project. Both meetings were held on the campus of Texas A&M University in Corpus Christi, Texas. In addition to the advisory board meetings, on January 13, 2015, Dr. Sullivan also gave two presentations about The University of Texas at Austin Monitoring Network and described tentative plans for continuing monitoring past the end of 2015 with a smaller, as-yet unfunded network. Highlights from these meetings follow:

December 4, 2014 Advisory Board Meeting

- Project Manager Vincent Torres presented an update on the financial status of the project. Barring any unforeseen circumstances, as of 9/30/2014, the project had approximately 15 months of funding (exclusive of decommissioning expenses) and could operate the network through December 2015, possibly into January 2016.

- Mr. Torres reported that UT has prepared a proposal seeking funding for continued operation of one or both of the auto-GC sites, i.e., Oak Park and Solar Estates. UT Austin is also continuing to seek funding to extend the life of the entire network.

- The proposed decommissioning schedule will follow this timeline: January 2016 – Discontinue operation of all sites and conduct final QA audits; February thru May 2016 – Decommission all sites; prepare final project report and June 2016 – Submit final project report and close out project account.

- Dr. Dave Sullivan gave a presentation on proposals seeking funding for continued auto-GC Site(s) monitoring. He reported that UT Austin is proposing continuing one or two auto-GC sites, and is seeking funding for this purpose. – If funded, the auto-GC sites proposal would keep the residential area sites: Oak Park, Solar Estates and possibly Dona Park; replace old equipment at continuing sites; add SO_2 and H_2S instruments to the continuing auto-GC sites; and make software improvements to the auto-GC sites.

- One of the issues that Dr. Sullivan raised about the potential ending of the monitoring network was how to alert the community that monitoring is now planned to end next year. Another issue was how to gauge interest in continuing operations. He listed possible stakeholders as: Federal Court, City of Corpus Christi District 1, Nueces County Precinct 1, Port Industries and others such as possible community groups.

- Dr. Sullivan gave an update on and analysis of monitoring data collected by the Project for the past 9 years. The Project has now collected 9 years of monitoring data.

- Dr. Sullivan mentioned that there was a declining trend in most species at the auto-GC sites, including benzene. However, he reported that there was an increasing trend of several alkane species. There was good news about SO_2 in Corpus Christi. New regulations on emissions from ships took effect June 1, 2012, and appear to have been effective. SO_2 emissions now appear to be in compliance with the latest SO_2 standard of 75 ppb.

- Dr. Sullivan reported a significant downward trend in benzene at the Oak Park and Solar Estates sites. He noted that there was a strong seasonal pattern which resulted in higher benzene concentrations in winter months. The wind directions associated with peak mean concentrations point back to refineries. Dr. Sullivan reported that he couldn't find an exact diesel signature to compare to motor vehicles or refineries. He will continue to look into finding a diesel signature.

- Dr. Sullivan reported sulfur species (SO_2 and H_2S) monitoring is a very important part of the monitoring network. In June 2, 2010, new rules were adopted for stricter EPA standards (NAAQS). The J. I. Hailey site did not comply with new NAAQS rules in 2012. However, the new stricter emission rules may have had an effect, and the site is now in compliance. There was a decline in SO_2 at J. I. Hailey and TCEQ's Avery Point monitors that are likely related to new sulfur-content rules for ships.

April 16, 2015 Advisory Board Meeting

- Mr. Torres gave an update on the financial status of the remaining funds. Barring any unforeseen circumstances, as of 9/30/2014, the project had approximately 15 months of funding (exclusive of decommissioning expenses) and could operate the network through December 2015, possibly into January 2016.

- The proposed schedule will follow this timeline: January 2016 – Discontinue operation of all sites and conduct final QA audits; February thru May 2016 – Decommission all sites; prepare final project report and June 2016 – Submit final the project report and close out project account.

- Dr. Dave Sullivan gave an update on the proposals seeking funding for continuing operations of the auto-GC site(s) after the project funding is exhausted. He reported that UT Austin is proposing continuing one or two auto-GC sites, and is seeking funding for this purpose. The auto-GC sites proposal would be to keep the residential area sites: Oak Park, Solar Estates and possibly Dona Park; replace old equipment at continuing sites; add SO_2 and H_2S instruments to the continuing auto-GC sites; and make software improvements to the auto-GC sites.

- Dr. Sullivan listed possible stakeholders as: Federal Court, City of Corpus Christi District 1, Nueces County Precinct 1, Port Industries and others such as possible community groups. He also suggested the Advisory Board members may wish to contact city and/or county officials about the importance of the network and its scheduled ending date.

- Dr. Sullivan gave an update on and analysis of monitoring data collected by the Project for the past 10 years.

- Dr. Sullivan mentioned that there was a declining trend in most species at the auto-GC sites, including benzene. However, he reported that there was an increasing trend in several alkane species. There was good news about SO_2 in Corpus Christi. New regulations on emissions from ships took effect June 1, 2012, and appear to have been effective. SO_2 emissions now appear to be in compliance with the latest SO_2 standard of 75 ppb.

- Dr. Sullivan reported there were a total of 27 canisters taken in 2014. He also reported that there was good agreement between the canister data and the TNMHC instrument measurements. There were 6 canister samples collected at the C. C. Grain site, which is located on the north side in an industrial area. There were 5 canisters collected at the Dona Park site, which is in a residential area. Some of the samples collected were on 7/12, 7/15, 7/16, and 10/15/14, all during the early morning with south wind. The samples were predominately propane. There were 16 canister samples collected at the J. I. Hailey site, which is across the ship channel and in an industrial area. The 27 canisters from 2014 contained several alkane species: ethane, propane, butane, isobutene, isopentane, and pentane. Alkane species are found in the exhaust from motor vehicles and in natural gas.

- Dr. Sullivan reported that the significant downward trend in benzene at the Oak Park and Solar Estates sites has now flattened out. He noted that there was a strong seasonal pattern, which resulted in higher benzene concentrations in winter months. The wind directions associated with peak mean concentrations point back to the refineries.

- Dr. Sullivan reported sulfur species (SO_2 and H_2S) monitoring is a very important part of the monitoring network. In June 2, 2010, new rules were adopted for stricter EPA standards (NAAQS). The J. I. Hailey site did not comply with new NAAQS rules in 2012. However, the new stricter emission rules may have had a positive effect, and the site is now in compliance. All the sites are now showing a downward trend in concentrations. However, occasional elevated SO_2 values are measured.

D. PROJECT MANAGEMENT AND PLANNING

Project Management and Planning during this period has focused on five (5) major activities.

1. Site Operations and Maintenance and Quality Assurance
   Routine operations, maintenance and quality assurance activities have become the norm at each site. These activities help to maintain high data capture and quality of data.

2. Data Analysis
   As of September 30, 2015, the project has ten years and ten months of monitoring data. The focus of data analysis has been to examine the frequency, level and direction of sources when measurements exceed trigger or warning levels and to analyze data for trends and other patterns indicated in the data collected.

3. Communication
   Information about the status of the Project has been communicated through:
   a. Advisory Board Meetings,
   b. Project Website (website statistics are included in Appendix B, on pages 42 and 43)
   c. Presentations to local community organizations and industry groups,
   d. Quarterly Technical and Financial Reports to the Court and Advisory Board and
   e. Sharing of technical data with the EPA and the Agency for Toxic Substances and Disease Registry.

4. Budget Monitoring
   Budget monitoring during this period has focused on:
   a. Actual project costs for site operation and maintenance,
   b. Administration and oversight costs incurred by the University, and
   c. Budget for future years.
   The Financial Report for the year is included in Appendix C, on pages 44 through 49.

5. Other Contributions
   The University of Texas at Austin has been awarded funding for six (6) Supplemental Environmental Projects (SEPs) through the Texas Commission on Environmental Quality since the Project began. These six SEPs total $1,239,379 plus interest earned, which has totaled $ $41,881.50. All of the SEPs are listed in Appendix D, on pages 50 through 52. No additional funding was awarded to the project during the period of this report.

6. Planning for Decommissioning and Transitioning of Sites
   Planning continued and preliminary preparations are being made for decommissioning of the sites, i.e., removal of all site improvements and restoration of the sites to pre-project conditions, once the current funding ends, which is expected to be early 2016. This plan includes contingencies should funding be identified for continuation of any sites or operation of any monitoring equipment. The timeline for decommissioning of any site or monitoring equipment for which continuation funding has not been identified is as follows:

Decommissioning Schedule

January - February 2016	Discontinue operation of sites and conduct final Quality Assurance Audits
February thru May 2016	Decommission sites and prepare project final report
June 2016	Submit project final report and close out project account

APPENDIX A

Data Analysis for Corpus Christi Annual Report
October 2014 – September 2015

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Data Analysis for Corpus Christi Annual Report

This technical report describes results of the monitoring and analysis of data under the Air Toxics Project Stage 1 Phase 1B. The primary focus is on the period October 1, 2014, through September 30, 2015, i.e., the federal Fiscal Year (FY) 2015. The monitoring network is shown earlier in this report in Figure 1, on page 3, and is described in Table 2, below. This report contains the following elements:

- A discussion of the results of canister sampling over the course of FY 2015;
- A summary of trends in TNMHC at four project sites;
- A summary of Oak Park, Solar Estates, and Palm (TCEQ) auto-GC data for FY 2015, in the context of all 11 years of the monitoring network operations;
- Information on the trends for benzene concentrations at the two project auto-GCs in residential areas, and at the TCEQ's Palm auto-GC;
- A discussion of sulfur dioxide (SO_2) and hydrogen sulfide (H_2S) measured at UT and TCEQ Corpus Christi sites.

Table 2. Schedule of air monitoring sites, locations and major instrumentation

TCEQ CAMS#	Description of Site Location	Monitoring Equipment showing month/year of operations				
		Auto-GC	TNMHC (T) / Canister (C)	H_2S & SO_2	Met Station	Camera
634	Oak Park Recreation Center (**OAK**)	3/05 to date	C: 12/04 to 2/09 T: 12/04 to 4/12		12/04 to date	
629	Grain Elevator @ Port of Corpus Christi (**CCG**)		T&C: 12/04 to date	12/04 to date	12/04 to date	
630	J. I. Hailey Site @ Port of Corpus Christi (**JIH**)		T&C: 12/04 to date	12/04 to date	12/04 to date	
635	TCEQ Monitoring Site C199 @ Dona Park (**DPK**)		T&C: 12/04 to date	12/04 to date	12/04 to date	1/05 to date
632	Off Up River Road on Flint Hills Resources Easement (**FHR**)		T&C: 12/04 to date	12/04 to date	12/04 to date	
633	Solar Estates Park at end of Sunshine Road (**SOE**)	3/05 to date	C: 12/04 to 2/09 T: 12/04 to 4/12	12/04 to date	12/04 to date	1/05 to date
631	*Port of Corpus Christi on West End of CC Inner Harbor (**WEH**) (terminated)*		T&C: 12/04 to 5/12	12/04 to 5/12	12/04 to 5/12	

Legend

CAMS	continuous ambient monitoring station
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 (pp<u>m</u>V) or ppb-volume (pp<u>b</u>V) 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 the sites that do not take continuous hydrocarbon measurements with auto-GCs (CAMS 629, 630, 632, and 635).

- **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 four active sites that do not take continuous hydrocarbon measurements with auto-GCs (CAMS 629, 630, 632, and 635).

- **Air Monitoring Comparison Values (AMCV) –** The TCEQ uses AMCVs in assessing ambient data. Two valuable online documents ("Fact Sheet" and "Uses of ESLs and AMCVs Document") that explain AMCVs are at http://www.tceq.texas.gov/toxicology/AirToxics.html (accessed April 2016). The following text is an excerpt from the TCEQ "Fact Sheet" document:

> 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. 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 12 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 EPA's Website at https://www.epa.gov/criteria-air-pollutants/naaqs-table (accessed April 2016).

One species measured by this project and regulated by a NAAQS is sulfur dioxide (SO_2). EPA set the SO_2 NAAQS to include a level of 75 ppb averaged over one hour, with a form of the three-year average of the annual 99th percentiles of the daily maximum one-hour averages. If measurements are taken for a full year at a monitor, then the 99th percentile would be the fourth highest daily one hour maximum. There is also a secondary SO_2 standard of 500 ppb over three hours, not to be exceeded more than once in any one year.

- **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 a single upwind 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. Results of Canister Sampling

Canister sampling is conducted at four CAMS sites to assess what organic compounds are present in the air when a collocated TNMHC analyzer records more than 15 consecutive minutes of concentrations above 2,000 ppbC. In FY 2015, a total of 31 canister samples were collected at the four project sites set up to do so. Canister triggering had been removed from the Solar Estates CAMS 633 and Oak Park CAMS 634 sites in 2006 (auto-GCs operate at those two sites so canister sampling is not needed).

A summary of the number of canister samples and maximum benzene concentrations in canister samples by site appears in Table 3, below.

Table 3. Summary of canister sample counts and maximum benzene concentrations FY 2015

Sites	Max of benzene ppbV	Number of canister samples
CCG C629	2.7	5
DPK C635	2.6	5
JIH C630	8.3	20
FHR C631	1.3	1

For the majority of canister samples, six compounds comprise most of the sample masses: ethane, propane, n-butane, isobutane, n-pentane, and isopentane. Below are summary case studies for three canister samples selected as representative of the data collected in FY 2015.

Case Study: November 28, 2014, J. I. Hailey (JIH), CAMS 630

Figure 2, on page 17, shows the time series of five-minute, timescale data collected at J. I. Hailey, CAMS 630, on the morning of November 28, 2014, for wind direction (WDR), TNMHC, methane, and canister pressure and mass flow. The graph has an arrow and label indicating when the canister sample was taken. The graph shows that TNMHC and methane concentrations rose rapidly around 6:00 CST with winds from the west. After sustained elevated concentrations had been measured, a canister was triggered at 6:50 CST. Figure 3, on page 18, shows a surface back-trajectory begun at JIH at 6:45 CST and extending back to the west and south. The back trajectory suggests that the air reaching the site had passed over docks and the industrial area southwest across the ship channel. The coincident increase in methane with TNMHC suggests that natural gas was a component of the species measured. Figure 4, on page 18, shows the mix

of species from the canister analysis. The mix of the most prominent species – ethane, propane, n-butane, iso-butane, n-pentane, and iso-pentane – represents the mix typically associated with natural gas. Data in this bar graph are in ppbC units, so that the concentrations can be added together to compare with the coincident TNMHC concentrations. Comparisons with air monitoring comparative values (AMCVs) are done after converting to ppbV units. No values exceeded an AMCV.

Figure 2. November 28, 2014, J. I. Hailey, CAMS 630, five-minute, timescale data

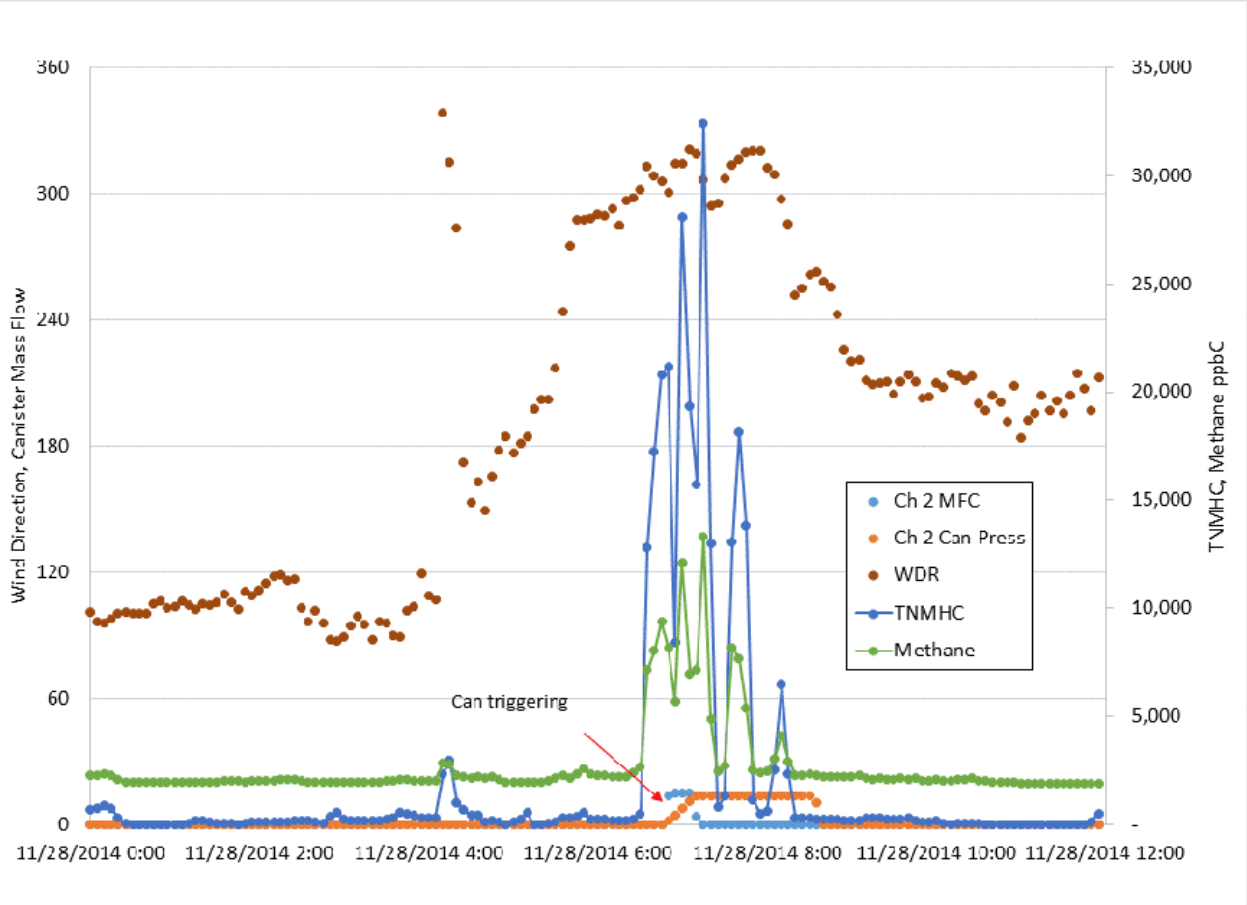


Figure 3. November 28, 2014, J. I. Hailey, CAMS 630, surface back-trajectory begun at 6:45 CST and extending back to the west and south

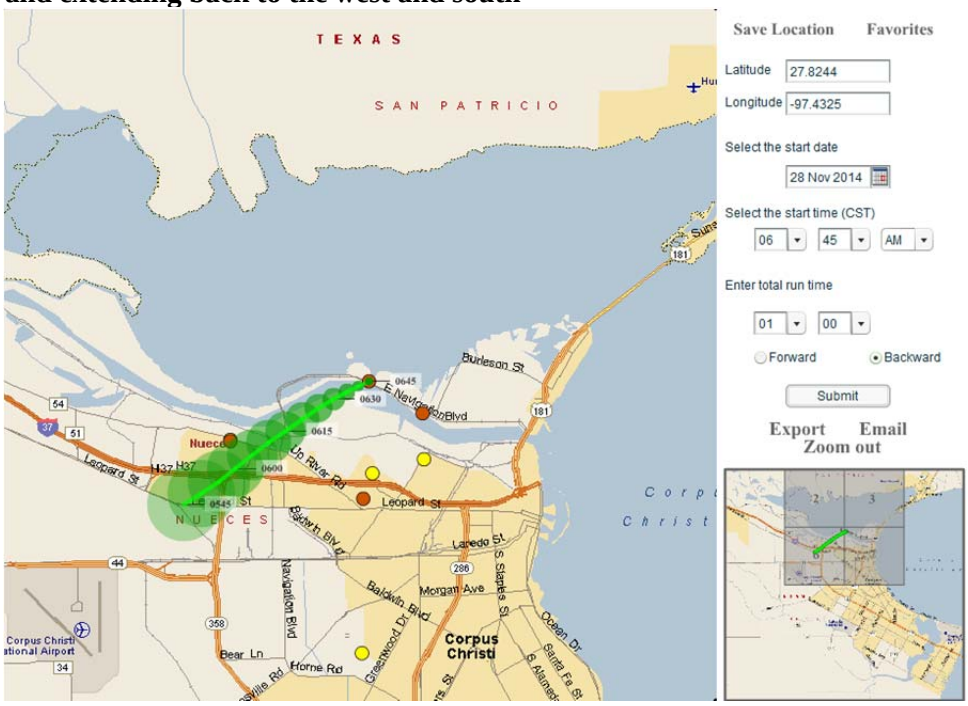
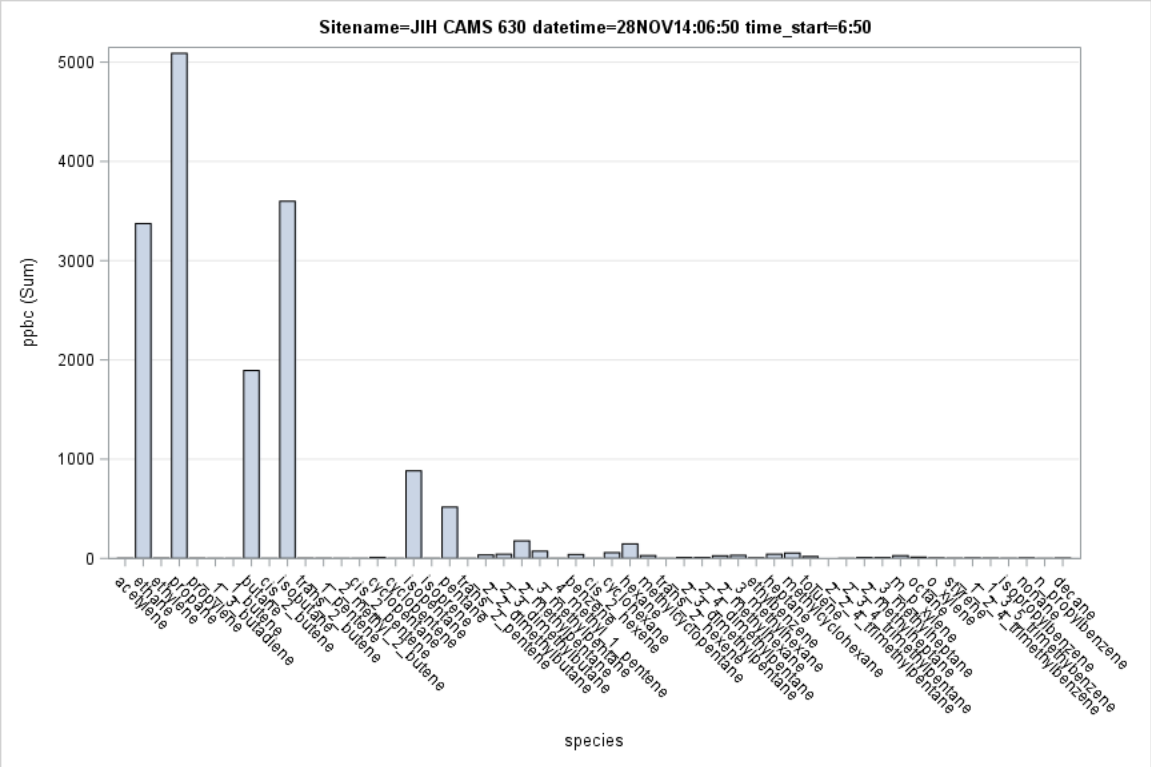


Figure 4. November 28, 2014, JIH canister mix of species from laboratory analysis



Case Study: January 18, 2015, J. I. Hailey, CAMS 630

Figure 5, below, shows the time series of five-minute, timescale data collected at J. I. Hailey, CAMS 630, overnight on January 17 – 18, 2015, for wind direction (WDR), TNMHC, methane, and canister pressure and mass flow. The graph has an arrow and label indicating when the canister sample was taken. The graph shows that TNMHC concentrations rose rapidly around 23:45 CST on January 17 with winds from the west. After sustained elevated concentrations had been measured, a canister was triggered a minute after midnight CST. Figure 6, on page 20, shows a surface back-trajectory begun at JIH at midnight CST and extending back to the west and south. The back trajectory suggests that the air reaching the site had passed over docks and the industrial area southwest across the ship channel. This trajectory looks very much like the previous case study back trajectory in Figure 3. In this case, there was not a significant coincident increase in methane with TNMHC. Figure 7, on page 20, shows the mix of species from the canister analysis. The large majority of material in the canister was the single species toluene. This was the only canister sample in FY 2015 with such a singular composition of this species. The air monitoring comparison value for toluene is 4,000 ppbV. The concentration shown in Figure 3 is 1,037 ppbC, which is 148 ppbV. However, one can observe that the canister sample was taken after the peak TNMHC concentration at 23:50 CST of 10,588 ppbC. If this were 100 percent toluene, the resulting ppbV value would be 1,513 ppbV, which is still well below the AMCV.

Figure 5. January 17 – 18, 2015, J. I. Hailey, CAMS 630, five-minute, timescale data

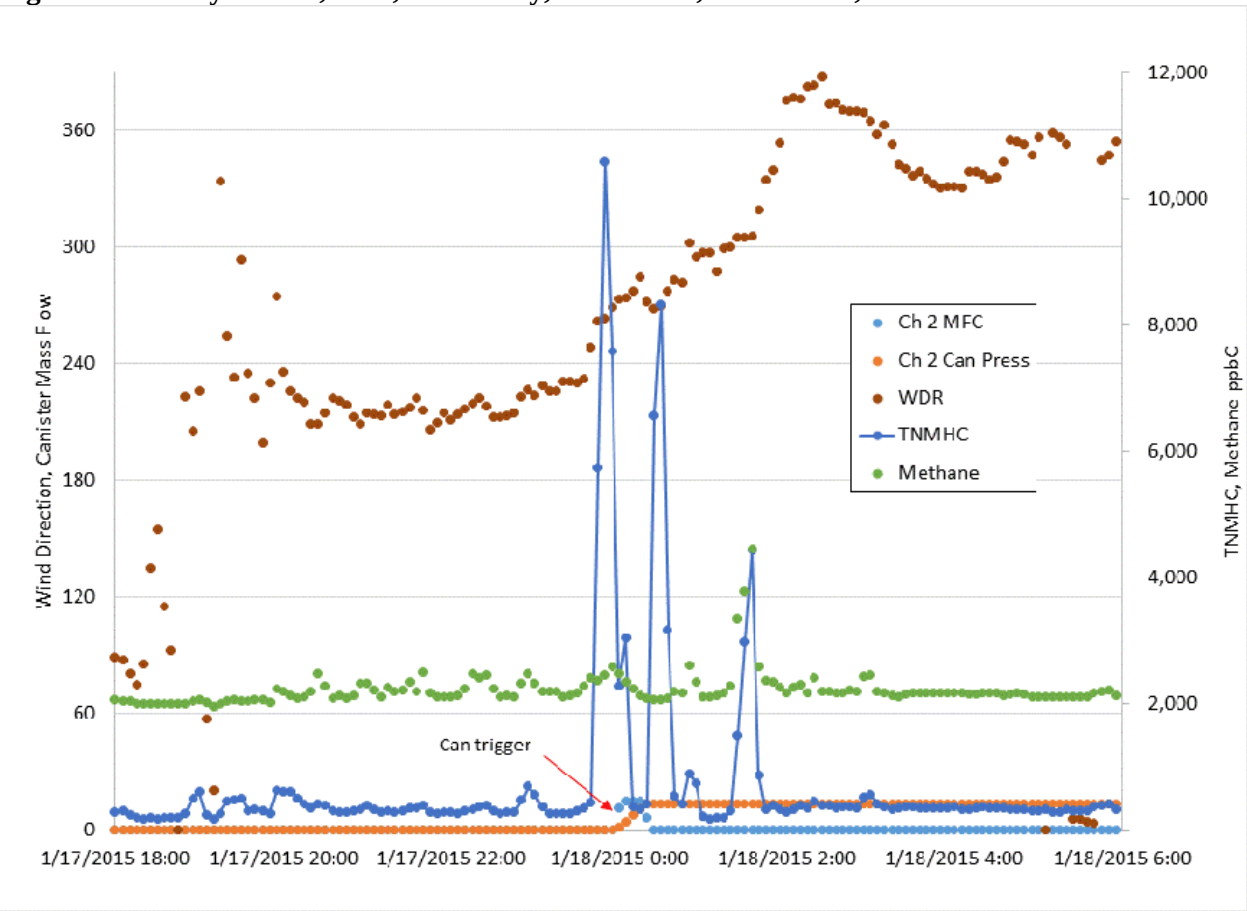


Figure 6. January 18, 2015, J. I. Hailey, CAMS 630, surface back-trajectory begun at midnight CST and extending back to the west and south

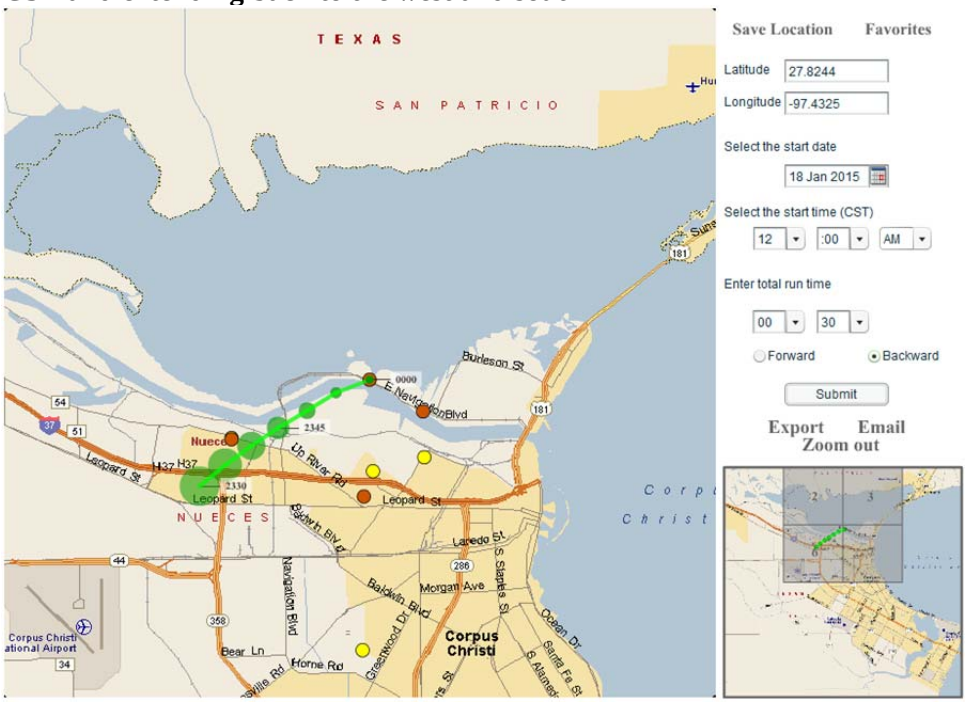
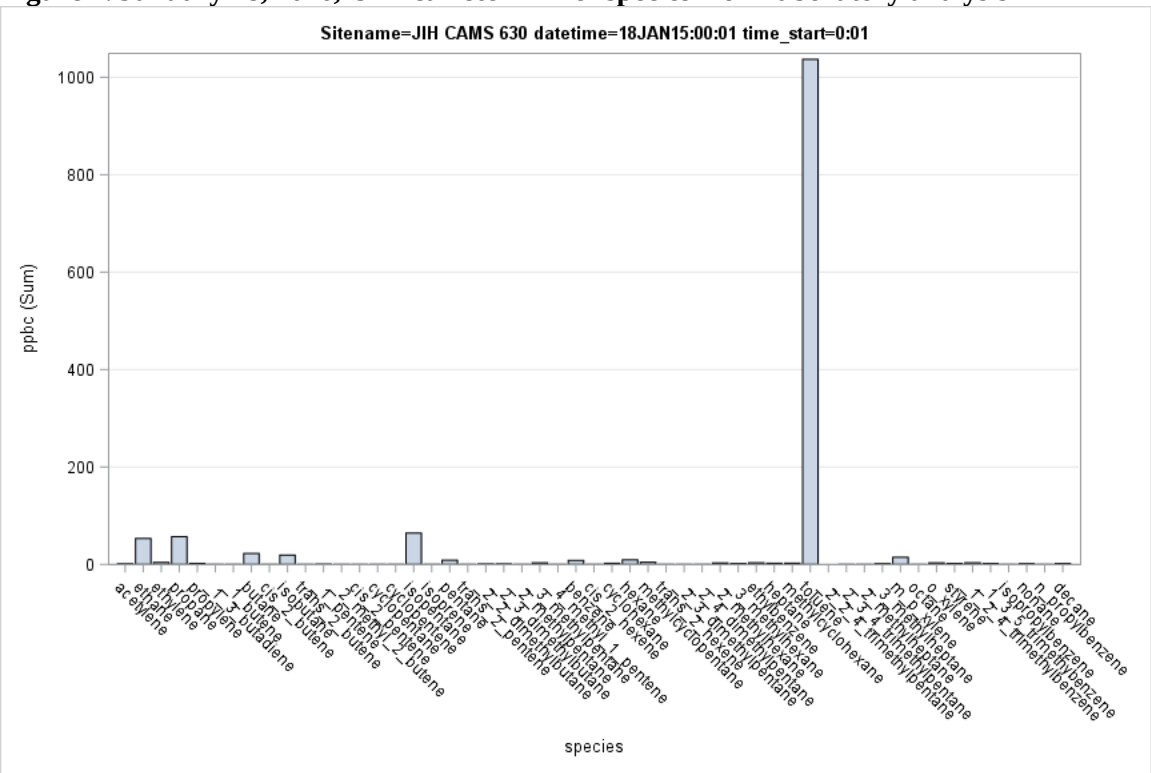


Figure 7. January 18, 2016, JIH canister mix of species from laboratory analysis



Case Study: February 14, 2015, J. I. Hailey, CAMS 630

Figure 8, below, shows the time series of five-minute, timescale data collected at J. I. Hailey, CAMS 630, overnight on February 13 – 14, 2015, for wind direction (WDR), TNMHC, methane, and canister pressure and mass flow. The graph has an arrow and label indicating when the canister sample was taken. The graph shows that TNMHC concentrations rose rapidly around 1:20 CST on February 14 with winds from the south-southwest. After sustained elevated concentrations had been measured, a canister was triggered at 1:38 CST. Figure 9, on page 22, shows a surface back-trajectory begun at JIH at 1:30 CST and extending back to the south. The back trajectory suggests that the air reaching the site had passed over dock and in the industrial area south across the ship channel. There was no coincident change in methane concentrations. Figure 10, on page 22, shows the mix of species from the canister analysis. The large majority of material in the canister was in the two butane and two pentane species, with a notable absence of ethane and propane. This was likely some petroleum product. No values exceeded AMCVs.

Figure 8. February 13 – 14, 2015, J. I. Hailey, CAMS 630, five-minute, timescale data

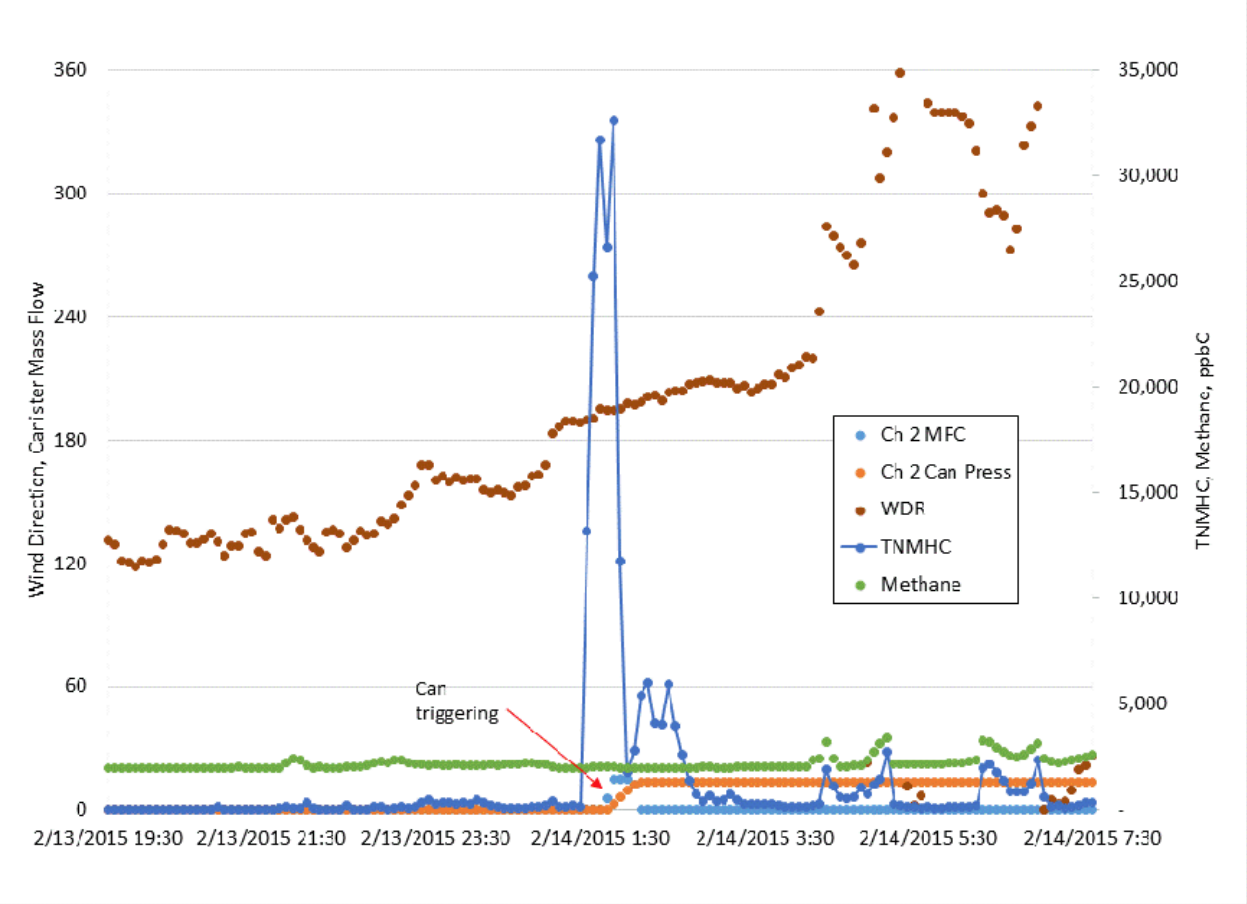


Figure 9. February 14, 2015, J. I. Hailey, CAMS 630, surface back-trajectory begun at 1:30 CST and extending south

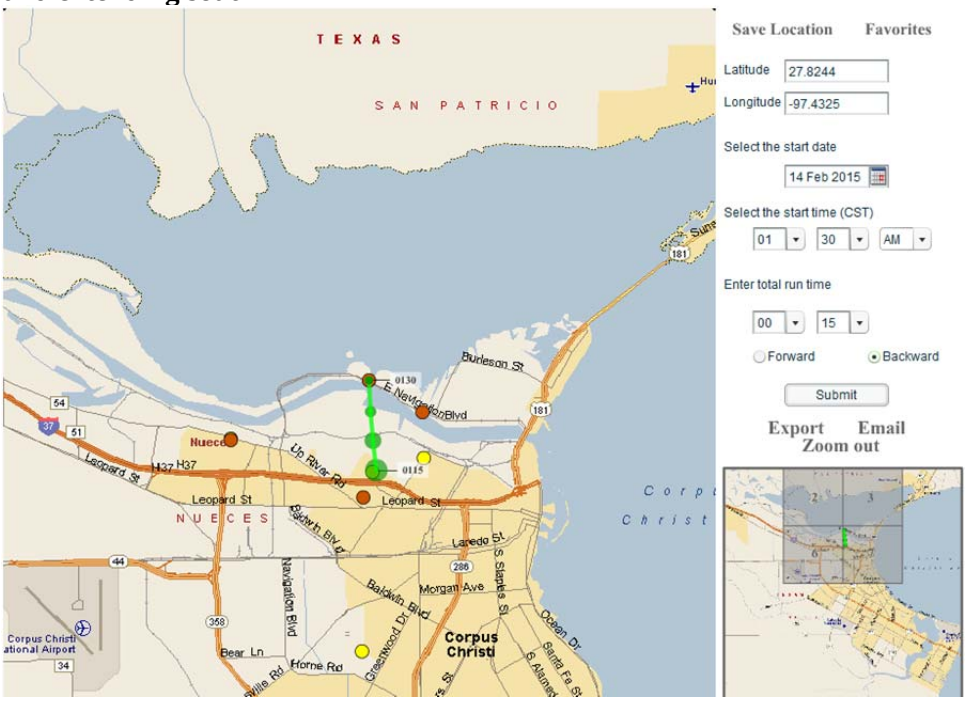
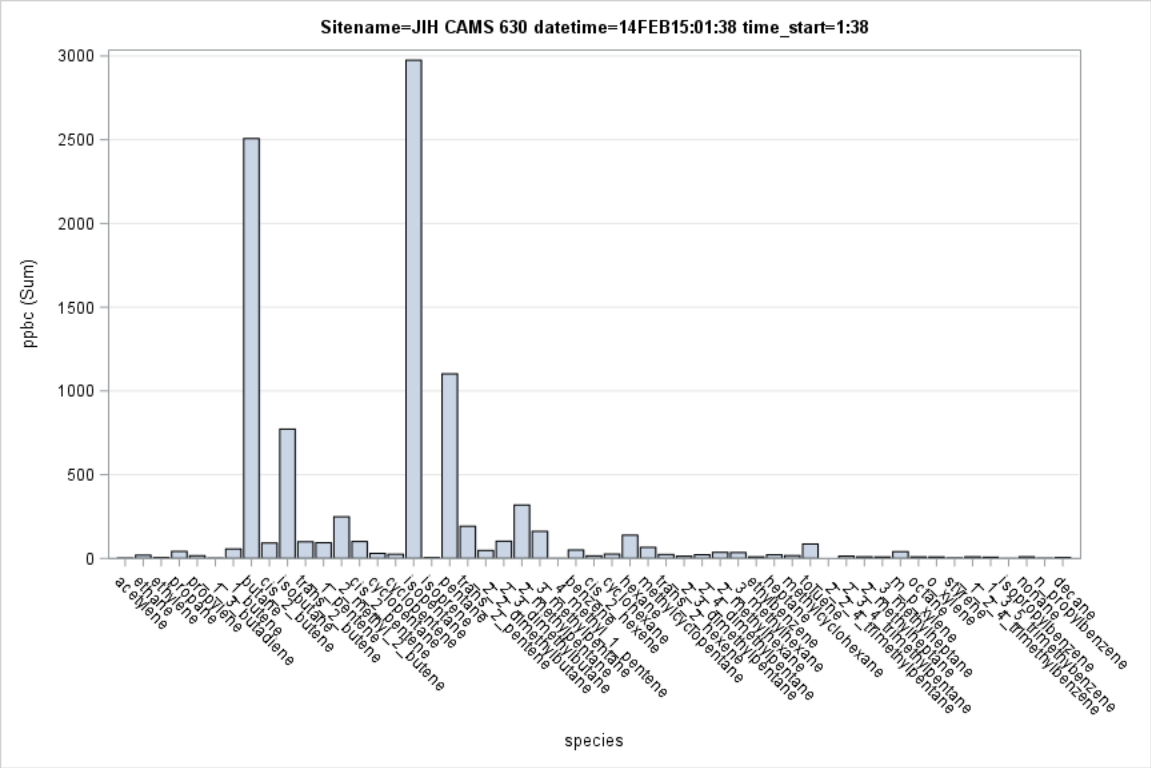


Figure 10. February 14, 2015, J. I. Hailey, CAMS 630, canister mix of species from laboratory analysis



Comparing Canister Samples to Continuous TNMHC Measurements

One method of quality assurance is to compare the measurements made simultaneously by two different instruments or by two different analysis methods. Figure 11, on page 24, shows the results of comparing the sum of all identified individually measured hydrocarbon species concentrations for each canister analyzed by the UT laboratory, with the simultaneously measured total nonmethane hydrocarbon concentration from the TNMHC analyzer quantified in real time. To illustrate how this comparison is done, Table 4, on page 24, shows several of the five-minute, timescale measurements taken at the J. I. Hailey, CAMS 630, site on June 2, 2015, a day on which a canister sample was taken. The first row in Table 4 shows that in the five-minute period from 12:55:00 a.m. CST to 12:59:59 a.m. CST (shown as 0:55 CST), the flow of air to the canister (mass flow) was close to 0.0 milliliters/minute (ml/min) and the pressure in the canister was 0.2 pound- per-square inch atmospheric (psia), or a near-vacuum. The second row in Table 4 shows that during the five-minute period from 1:00:00 a.m. CST to 1:04:59 a.m. CST, the mass flow averaged 11.2 ml/min and the pressure in the canister had risen to an average 1.2 psia. This implies that in this five-minute period, a canister sample was triggered. When a canister is filling, the instantaneous flow rate is approximately 15 ml/min, so an 11 ml/min average over 5 minutes implies the canister was filling for approximately 3 minutes and 40 seconds (5 min. × 11/15 = 3.67). This implies the canister started filling close to 1:01:20 a.m. CST (1 minute 20 seconds plus 3 minutes 40 seconds equals 5 minutes). According to the field data sheet for this canister sample, the canister was triggered at 1:01 a.m. CST, confirming this calculation.

The next three rows in Table 4 show that during the five-minute periods starting at 1:05 a.m. CST, 1:10 a.m. CST, and 1:15 a.m. CST, the mass flow averaged 14.8 (which is approximately 15) ml/min and the pressure in the canister rose ~3 psia/5-minute period. The next row in Table 4 shows that starting with 1:20 a.m. CST, the average mass flow dropped to 6.7 ml/min, implying that air flowed to the canister for approximately 2 min. 14 seconds (5 min. × 6.7/15 = 2.23). Thus, overall the air flowed into the canister from 1:01 to 1:22, approximately 20 minutes. The last two rows, with sample start times 1:25 and 1:30 CST, show mass flow has returned to 0.0 and the canister pressure is approximately unchanged at just below the standard atmospheric pressure of 14.7 psia, showing no air is flowing to the canister.

The method for estimating the average TNMHC concentration during the canister sample is to add the products of the mass flow (ml/min) and the TNMHC values, for the periods with positive mass flow, and then divide the result by the sum of the positive mass flows. This provides an average TNMHC value weighted by the mass flow. The actual sum of hydrocarbon species in the canister sample on June 2 corresponding to this example was 3,508 ppbC. The weighted mass flow derived from Table 4 is given by

$$(11.2\times4{,}958+14.8\times4{,}110+14.8\times4{,}140+14.8\times2{,}776+6.7\times1{,}314)/(11.2+14.8+14.8+14.8+6.7) = 3{,}652 \text{ ppbC}$$

The difference in this comparison, which was chosen at random from the 31 canisters, is only 4 percent. In comparison, between canister samples and the continuous TNMHC measurements in Figure 11, all 31 canisters from FY15 were used. The Figure 11 data points fall along a straight line with a statistically significant ($p < 0.001$) straight line.. The linear fit, shown in Figure 11, has a slope of 0.84, with 0 for the y-intercept. It is expected that the sum of known species would be less than the TNMHC, as the canister sum does not include unidentified species.

Overall this agreement is very good and provides confidence in both canister measurements and TNMHC measurements.

Figure 11. Comparison between the continuous TNMHC measurements with simultaneously collected total mass of known canister hydrocarbons, 31 canister samples, FY 2015

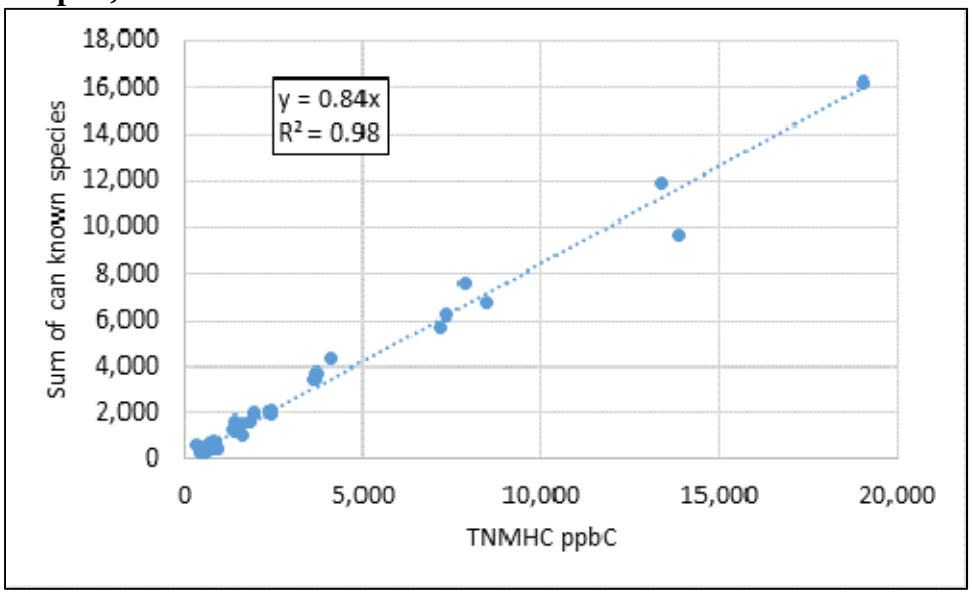


Table 4. J. I. Hailey, CAMS 630, five-minute timescale values, early on June 2, 2015

Time (CST)	Mass flow (ml/min)	Can Pressure (psia)	SO_2 (ppb)	H_2S (ppb)	TNMHC (ppbC)	Methane (ppb)	Wind speed (mph)	Wind direction (deg.
0:55	0.0	0.2	-1.3	0.9	5,914	2,433	7.8	213.2
1:00	**11.2**	1.2	-1.3	1.9	4,958	2,309	7.5	208.3
1:05	**14.8**	4.3	-1.5	2.7	4,110	2,180	7.5	207.9
1:10	**14.8**	7.5	-1.7	1.9	4,140	2,364	6.9	214.3
1:15	**14.8**	10.7	-1.7	1.7	2,776	2,389	7.9	210.8
1:20	**6.7**	13.3	-1.4	1.4	1,314	2,265	7.1	212.3
1:25	0.0	13.6	-1.7	1.2	778	2,548	7.3	213.3
1:30	0.0	13.6	-1.6	1.2	882	2,294	7.3	213.3

2. Summary of Total Nonmethane Hydrocarbon Monitoring at UT Sites

In this section, trends in total nonmethane hydrocarbon (TNMHC) concentrations at four UT CAMS sites – Port Grain, C629, J. I. Hailey, C630, Flint Hills Resources, C632, and Dona Park, C635 – are discussed. For completeness, Inner Harbor, C631, the site that closed in 2012 is also included. The data from each site, over each fiscal year from FY 2006 through FY 2015, are compared to assess trends.

All of the TNMHC hourly values were assessed. Because of concern about the frequency of elevated concentrations, the frequency (percent of measurements) of TNMHC hourly values about the 95th percentile value from the distribution of the pooled observations over 11 years of data from the five sites was used as a benchmark value. When data from all sites was pooled, 95 percent of observations were less than 503 ppbC. This value has been rounded to 500 ppbC and used as a level to count values above this mark. Figure 12, below, shows the trend for the percentage of hourly measurements of TNMHC at the Flint Hills Resources, CAMS 632, site that exceeded 500 ppbC each fiscal year. As is clear in the figure, in FY 2006 (Oct. 2005 – Sept. 2006), more than a quarter of all measurements were in excess of 500 ppbC. At the time, a tank battery and pump jack were located a few hundred meters to the south of the site, in the prevailing upwind direction. It was recognized early in the project that a relatively small leak a short distance from the monitoring station was likely the cause of the frequent elevated TNMHC concentrations recorded there. Figure 13, on page 26, shows a similar graph for J. I. Hailey, CAMS 630, which shows an upward trend since 2010 following an initial decline from 2005 to 2010. Figure 14, on page 26, shows a similar graph for Port Grain, CAMS 629, which shows an upward trend since 2011 following an initial decline from 2005 to 2011. Figure 15, on page 27, for Dona Park, CAMS 635, shows an increase in the frequency of values above 500 ppbC in 2012 followed by a drop. Lastly, Figure 16, on page 27, shows the downward and flat trend for the Inner Harbor site that ended operation in 2012.

Figure 12. Percent of hourly TNMHC values by FY above 500 ppbC at Flint Hills Resources, CAMS 632

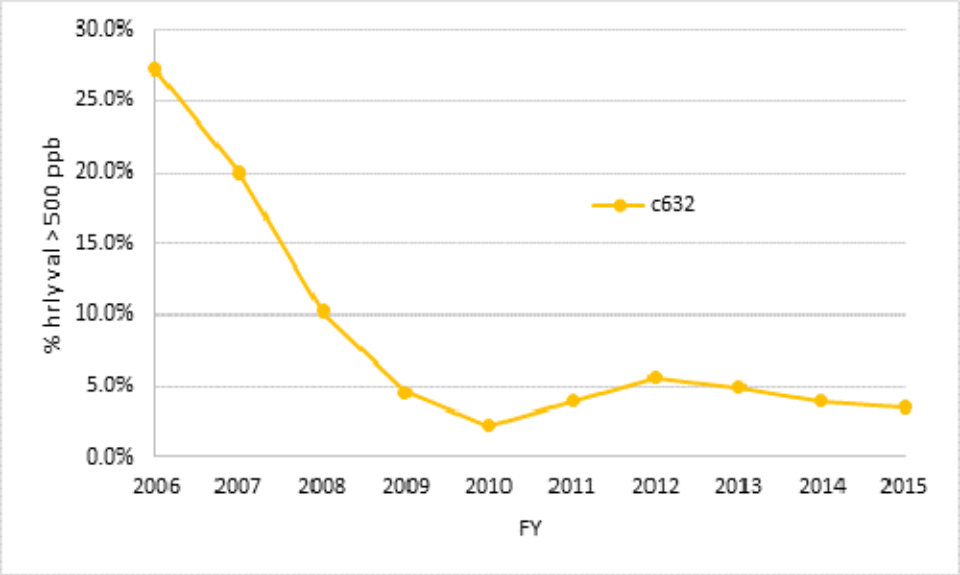


Figure 13. Percent of hourly TNMHC values by FY above 500 ppbC at J. I. Hailey ,CAMS 630

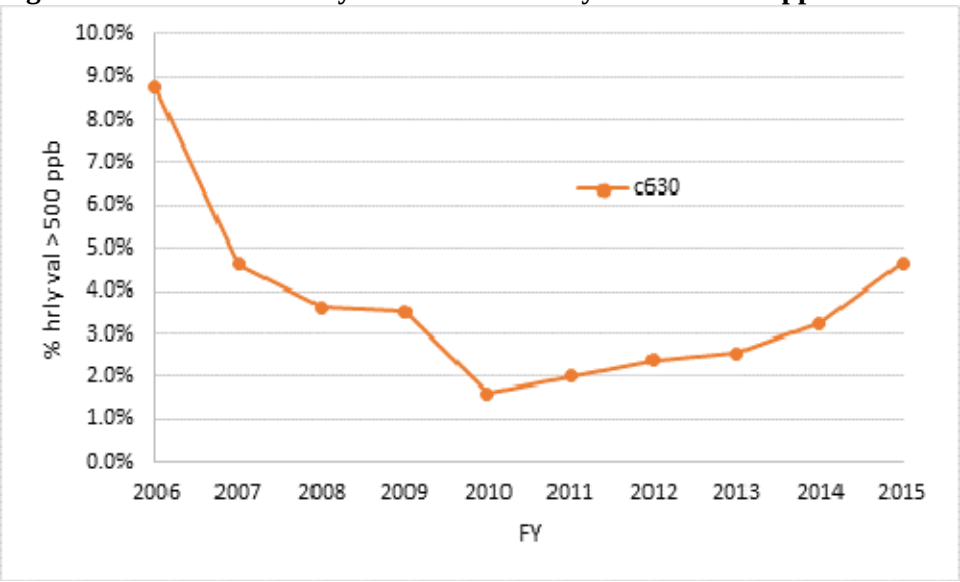


Figure 14. Percent of hourly TNMHC values by FY above 500 ppbC at Port Grain, CAMS 629

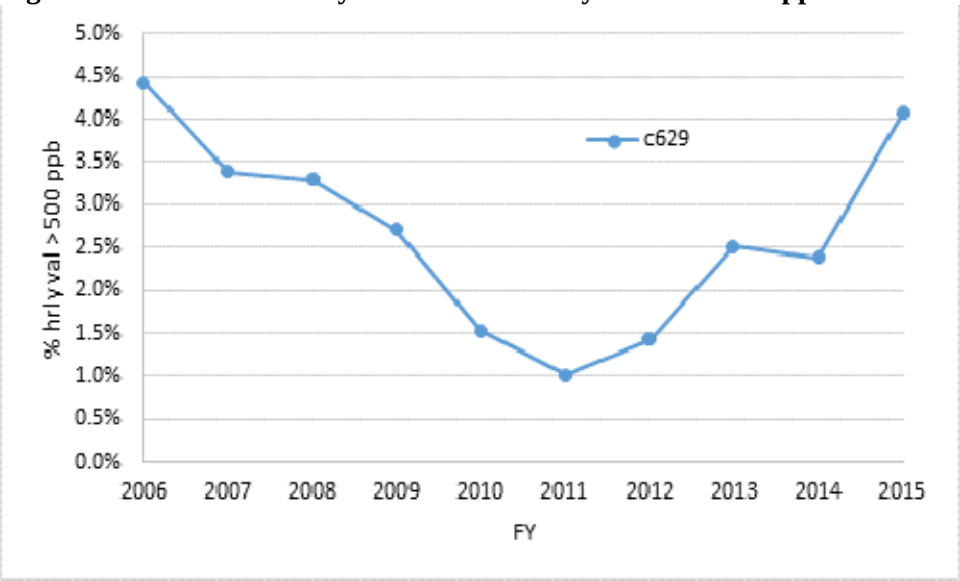


Figure 15. Percent of hourly TNMHC values by FY above 500 ppbC at Dona Park, CAMS 635

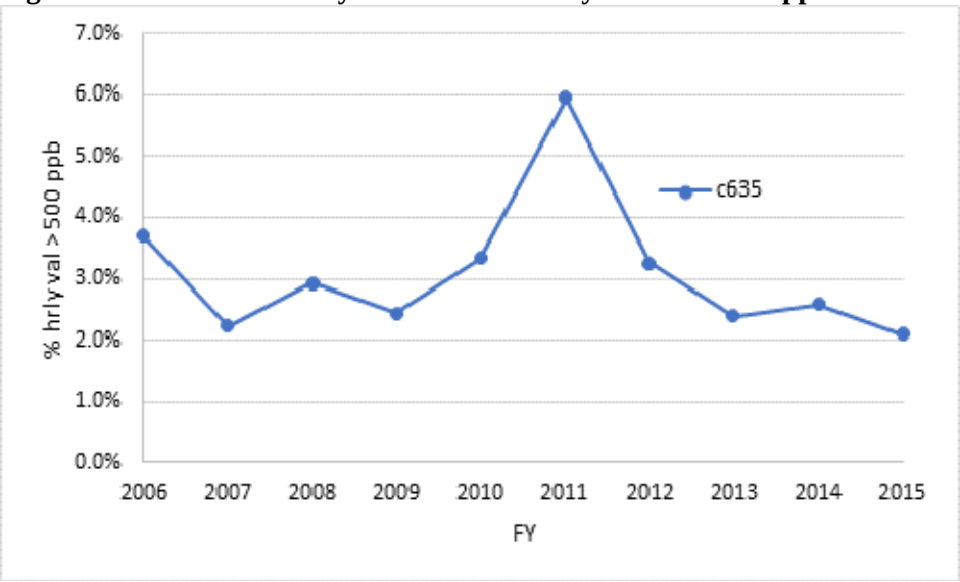
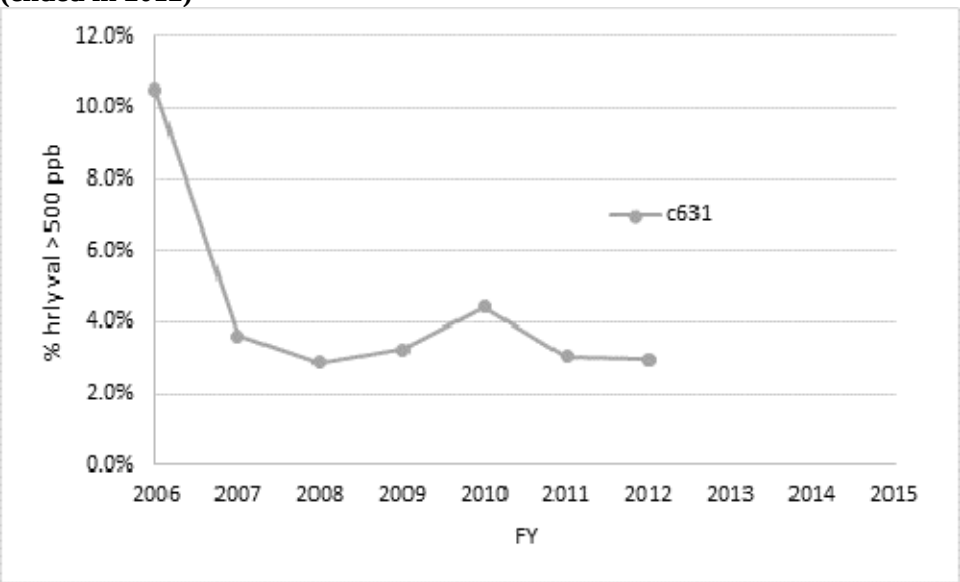


Figure 16. Percent of hourly TNMHC values by FY above 500 ppbC at Inner Harbor, CAMS 631 (ended in 2012)



3. Auto-GC Data Summaries in Residential Areas

In this section the results of semi-continuous sampling for 27 hydrocarbon species 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 3, is generally downwind of industries under northerly and westerly winds. In examining the aggregated data, one observes similar patterns of hydrocarbon species at all three sites.

Table 5, below, lists the data completeness from the two project auto-GCs for FY 2013, 2014, and 2015. When data are missing, the reason is generally owing to quality assurance steps or maintenance procedures. The project regularly exceeds the minimum 75 percent data recovery goal.

Table 5. Percent data recovery by month, FY 2013, 2014, 2015, validated data only

Month	Oak Park	Solar Est.	Month	Oak Park	Solar Est.	Month	Oak Park	Solar Est.
Oct-12	98	93	Oct-13	99	99	Oct-14	98	98
Nov-12	99	88	Nov-13	91	100	Nov-14	99	99
Dec-12	97	99	Dec-13	99	99	Dec-14	98	100
Jan-13	100	100	Jan-14	97	96	Jan-15	93	100
Feb-13	94	99	Feb-14	99	100	Feb-15	96	100
Mar-13	97	100	Mar-14	93	97	Mar-15	98	100
Apr-13	100	100	Apr-14	98	100	Apr-15	88	97
May-13	99	99	May-14	95	98	May-15	45	99
Jun-13	75*	91*	Jun-14	100	84*	Jun-15	100	100
Jul-13	98	99	Jul-14	80*	100	Jul-15	100	85*
Aug-13	87	98	Aug-14	96	99	Aug-15	99	98
Sep-13	82	99	Sep-14	99	100	Sep-15	87*	99
Average FY 13	**94**	**97**	**Average FY 14**	**96**	**98**	**Average FY 15**	**92**	**98**

* Months with planned preventive maintenance

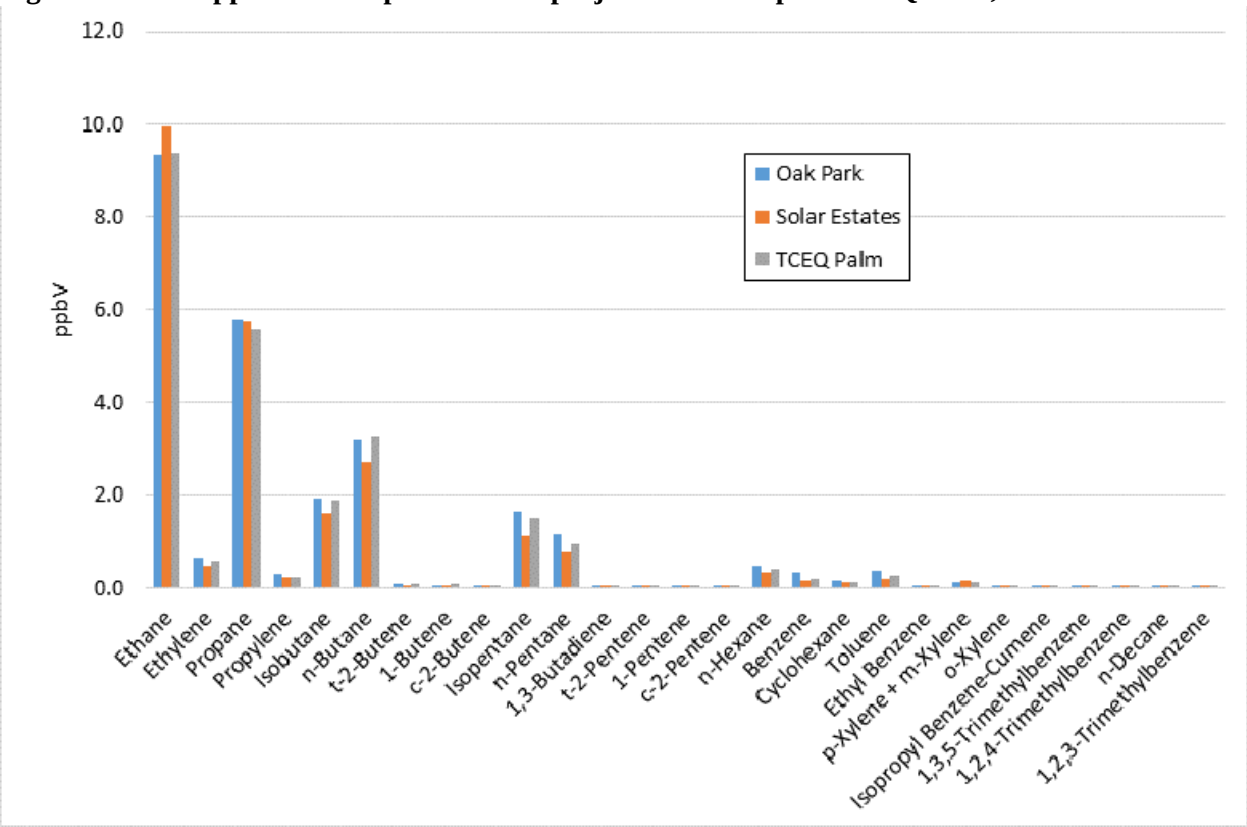
Table 6, on page 29, summarizes the statistics (maximum and average values) on FY 2015 data. Data in this table are available to TCEQ staff at http://rhone.tceq.texas.gov/cgi-bin/agc_summary.pl (accessed April 2016). All concentration values in Table 6 are in ppbV units. No concentrations or averages of concentrations from the 27 species were greater than TCEQ's air monitoring comparison values (AMCV). The average data columns in Table 6 are shown graphically in Figure 17, on page 30. For species measured consistently above their respective method detection limits at the Corpus Christi auto-GCs, average concentrations from quarter to quarter are generally lower in the second and third quarters of the year and higher in the first and fourth quarters of the year. More frequent maritime southerly flow in the spring and summer is a contributor to lower concentrations in the spring-summer second and third quarters, while lower wind speeds and more northerly wind directions contribute to higher concentrations in the fall-winter fourth and first quarters.

The rows for ***benzene*** are bold-faced in Table 6 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

Table 6. Auto-GC statistics, FY 2015

Units ppbV	Oak Park FY 2015			Solar Estates FY 2015			TCEQ Palm FY 2015		
Species	**Peak 1hr**	**Peak 24hr**	**Average**	**Peak 1hr**	**Peak 24hr**	**Mean**	**Peak 1hr**	**Peak 24hr**	**Average**
Ethane	225.53	56.29	9.32	240.10	52.13	9.95	301.81	55.33	9.36
Ethylene	56.33	7.94	0.65	13.48	2.11	0.47	43.95	5.33	0.57
Propane	509.80	39.32	5.79	119.92	36.02	5.73	188.55	40.17	5.55
Propylene	18.28	1.97	0.30	9.27	0.93	0.21	6.24	1.12	0.24
Isobutane	81.20	10.08	1.93	45.75	8.28	1.61	99.71	11.33	1.90
n-Butane	158.57	19.69	3.19	56.89	16.36	2.70	295.30	27.11	3.26
t-2-Butene	3.65	0.38	0.07	2.28	0.13	0.04	8.78	0.84	0.07
1-Butene	2.67	0.34	0.05	2.75	0.14	0.02	2.48	0.51	0.07
c-2-Butene	2.79	0.39	0.05	3.24	0.16	0.03	4.47	0.45	0.05
Isopentane	86.99	9.58	1.63	43.46	5.26	1.13	156.86	14.88	1.51
n-Pentane	50.99	6.57	1.15	16.28	4.43	0.80	56.34	6.38	0.94
1,3-Butadiene	4.89	0.27	0.03	5.02	0.66	0.01	0.53	0.10	0.02
t-2-Pentene	7.25	0.56	0.06	3.83	0.18	0.01	13.99	1.10	0.05
1-Pentene	2.19	0.21	0.03	1.53	0.07	0.01	7.35	0.62	0.03
c-2-Pentene	1.51	0.15	0.02	1.95	0.09	0.00	6.83	0.55	0.02
n-Hexane	26.81	2.67	0.47	7.66	1.40	0.34	23.72	2.22	0.39
Benzene	**18.34**	**2.56**	**0.32**	**13.87**	**1.99**	**0.15**	**12.05**	**1.34**	**0.20**
Cyclohexane	8.53	0.92	0.17	2.83	0.50	0.13	24.90	1.55	0.13
Toluene	16.97	3.99	0.36	5.66	0.87	0.18	42.68	6.78	0.26
Ethyl Benzene	1.15	0.15	0.04	0.73	0.09	0.02	2.04	0.36	0.02
m&p -Xylene	4.55	0.53	0.12	16.47	2.04	0.14	6.61	1.25	0.13
o-Xylene	1.10	0.16	0.04	1.09	0.11	0.02	2.23	0.42	0.04
Isopropyl Benzene	2.08	0.33	0.02	1.62	0.31	0.01	2.25	0.38	0.01
1,3,5-Tri-methylbenzene	0.45	0.08	0.02	0.45	0.07	0.01	0.35	0.06	0.01
1,2,4-Tri-methylbenzene	4.12	0.25	0.04	3.68	0.48	0.02	0.73	0.16	0.03
n-Decane	1.00	0.19	0.03	1.14	0.20	0.03	0.43	0.09	0.02
1,2,3-Tri-methylbenzene	0.33	0.13	0.02	0.36	0.07	0.01	0.21	0.05	0.02

Figure 17. Mean ppbV for 27 species at two project auto-GCs plus TCEQ Palm, FY 2015



As was reported in the recent quarterly reports and in the FY 2013 and FY2014 annual reports, the annual and quarterly means concentrations from Solar Estates and Oak Park are higher over the last four years under northerly winds for ethane and propane and some other light alkane species than in the preceding three years. A preliminary hypothesis is that increased natural gas emissions is a possible assignable cause for the higher mean concentrations. Figure 18, on page 31, shows graphical summaries of the mean concentrations for the years FY 2005 through FY 2015 for Solar Estates for ethane and propane, two species found in natural gas, and two butane isomers, two pentane isomers, and n-hexane, which may be in natural gas and in other fuel products. Figure 19, on page 31, shows only the pentane isomers and n-hexane to better show the change in these lower-concentration species over time at Solar Estates. The point of these two graphs is intended to show the weakening of the increasing trend in mean concentrations over FY 2011 to FY 2015 as the species become heavier[1]. Figure 20, on page 32, shows the mean concentrations of benzene, toluene, ethyl benzene, m/p-xylene, and o-xylene by fiscal year at Solar Estates. Figure 21, on page 32, shows the graph for Oak Park for ethane, propane, two butane isomers, two pentane isomers, and n-hexane. Figure 22, on page 33, shows the graph for Oak Park for just the two pentane isomers, and n-hexane. Figure 23, on page 33, shows the mean concentrations of benzene, toluene, ethyl benzene, m/p-xylene, and o-xylene by fiscal year at Oak Park. For both sites, benzene, toluene, ethyl benzene, m/p-xylene, and o-xylene show continuous downward trends. To facilitate comparing the trends at two sites to each other, the y-axis scale on Figure 18 for ethane and other species at Solar Estates is the same as on Figure 21

[1] Ethane has two carbon atoms, propane has three, butanes have four, pentanes have five, and n-hexane has six.

for ethane and other species at Oak Park. Similarly, the y-axis scale on Figure 19 for three alkane species at Solar Estates is the same as the y-axis scale on Figure 22 for Oak Park, and the y-axis scale on Figure 20 for benzene and other species at Solar Estates is the same as the y-axis scale for the Oak Park data in Figure 23.

Figure 18. Mean concentrations of ethane, propane, butane and pentane isomers, and n-hexane by FY at Solar Estates

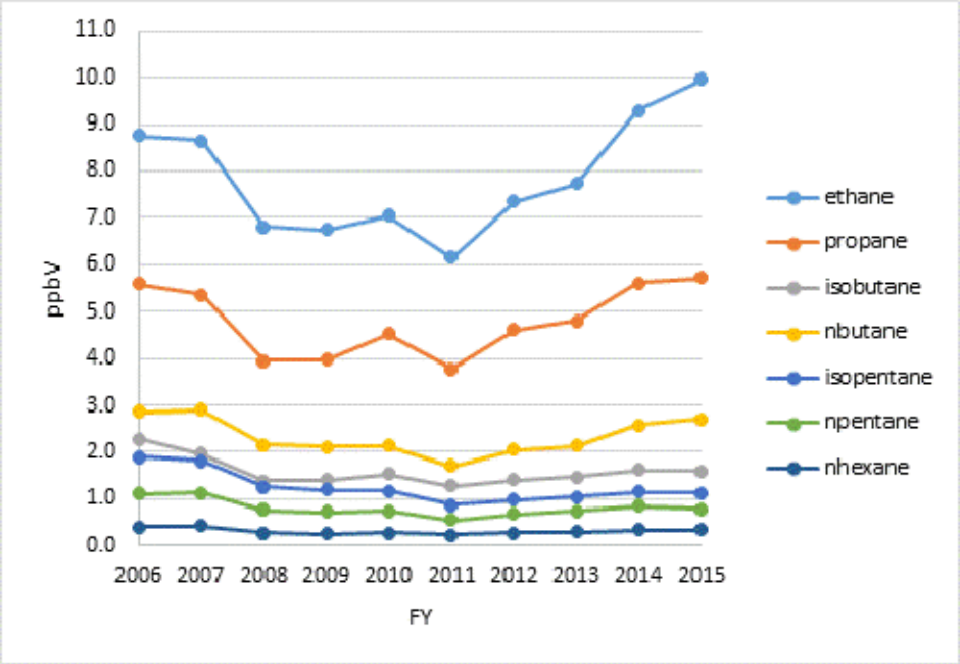


Figure 19. Mean concentrations of pentane isomers and n-hexane by year at Solar Estates showing the weakening of the upward trend with heavier species from 2011 to 2015

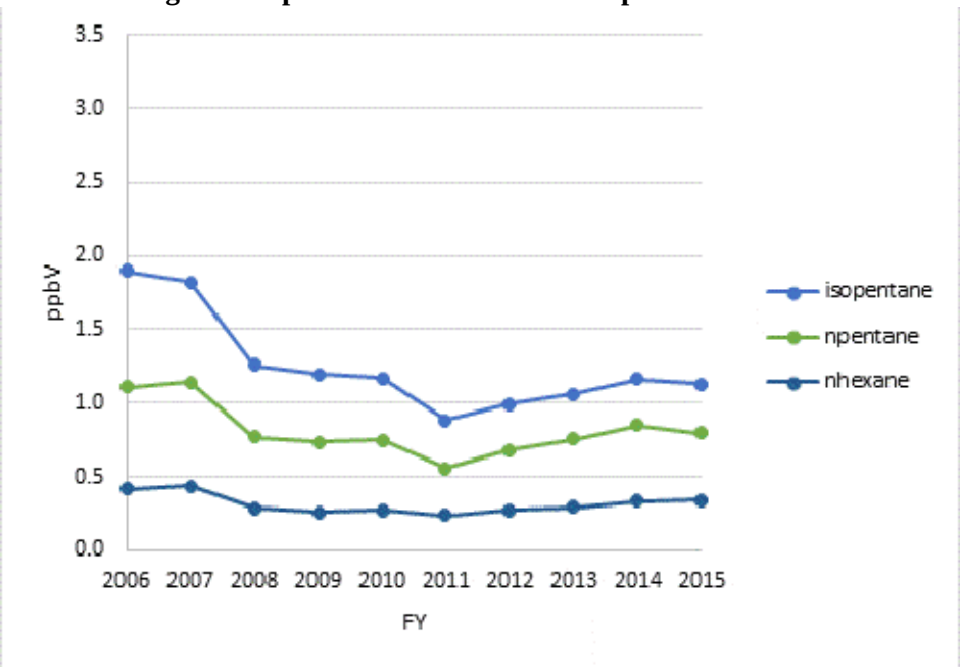


Figure 20. Mean concentrations of benzene, toluene, ethyl benzene, m/p-xylene, and o-xylene by FY at Solar Estates

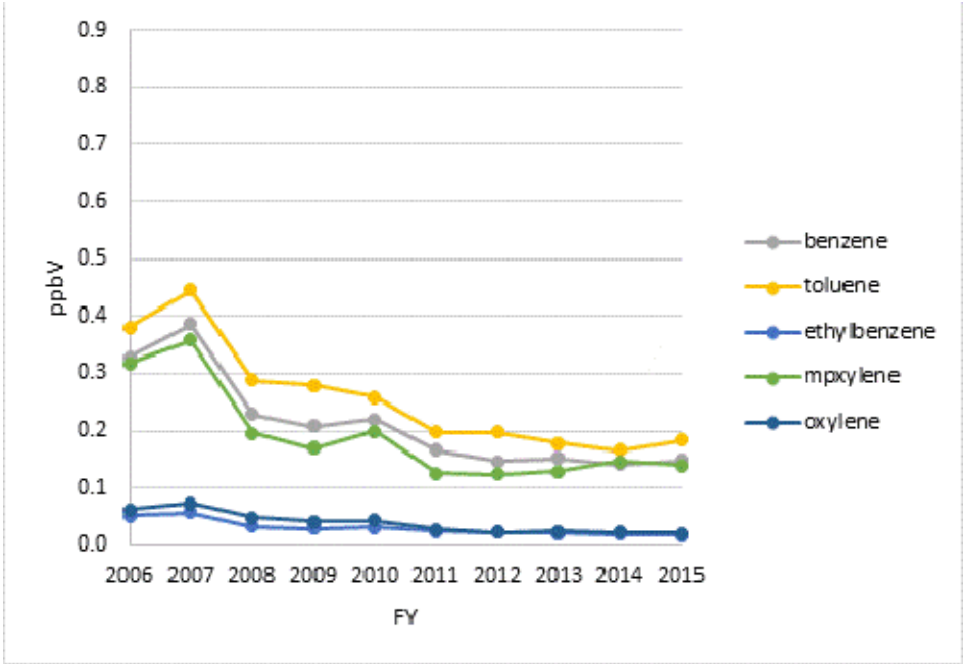


Figure 21. Mean concentrations of ethane, propane, butane and pentane isomers, and n-hexane by FY at Oak Park

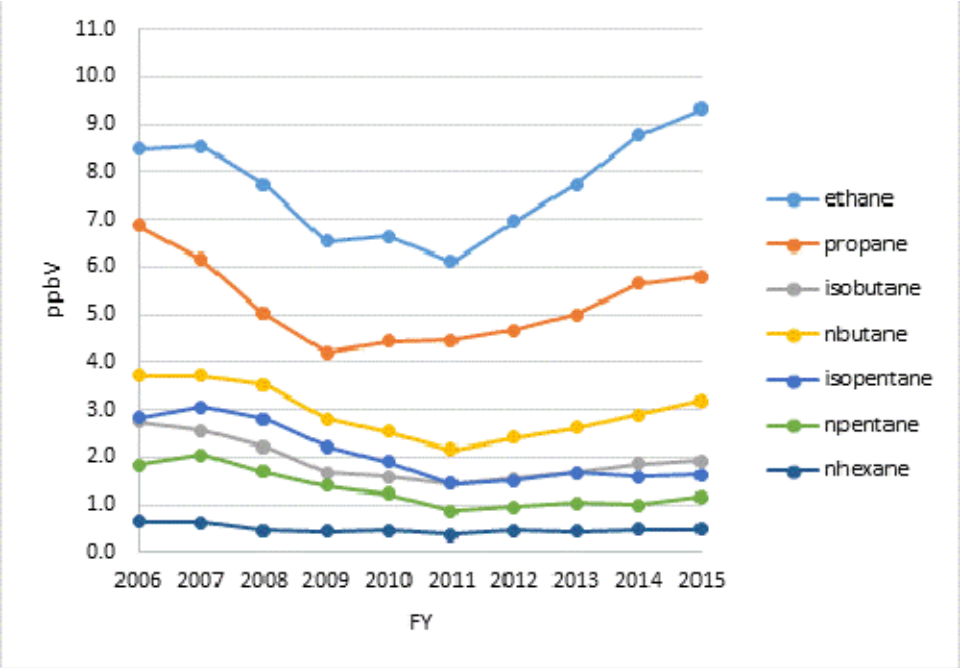


Figure 22. Mean concentrations of pentane isomers and n-hexane by FY at Oak Park

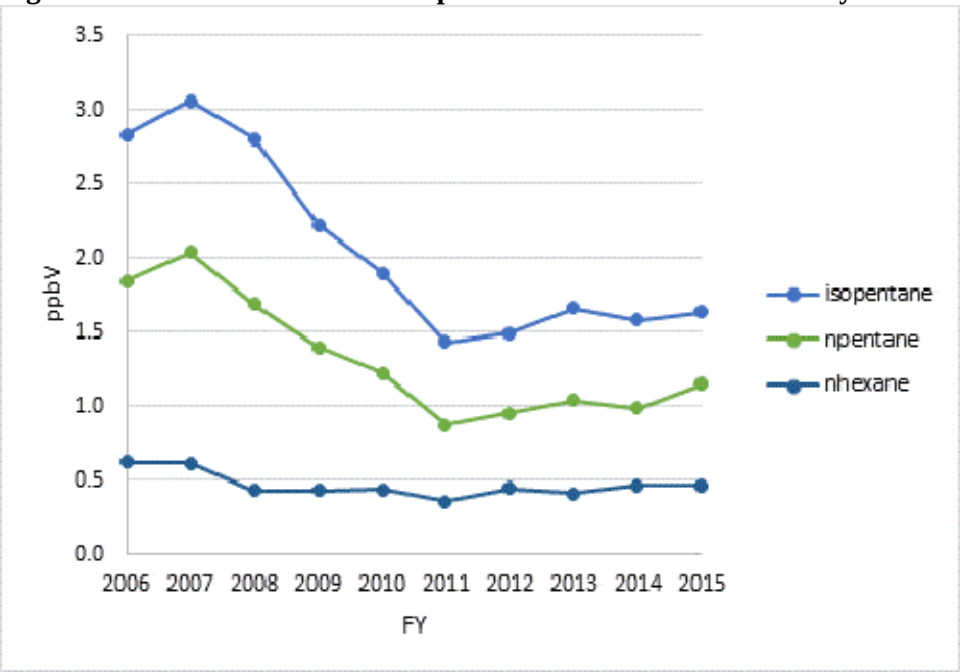
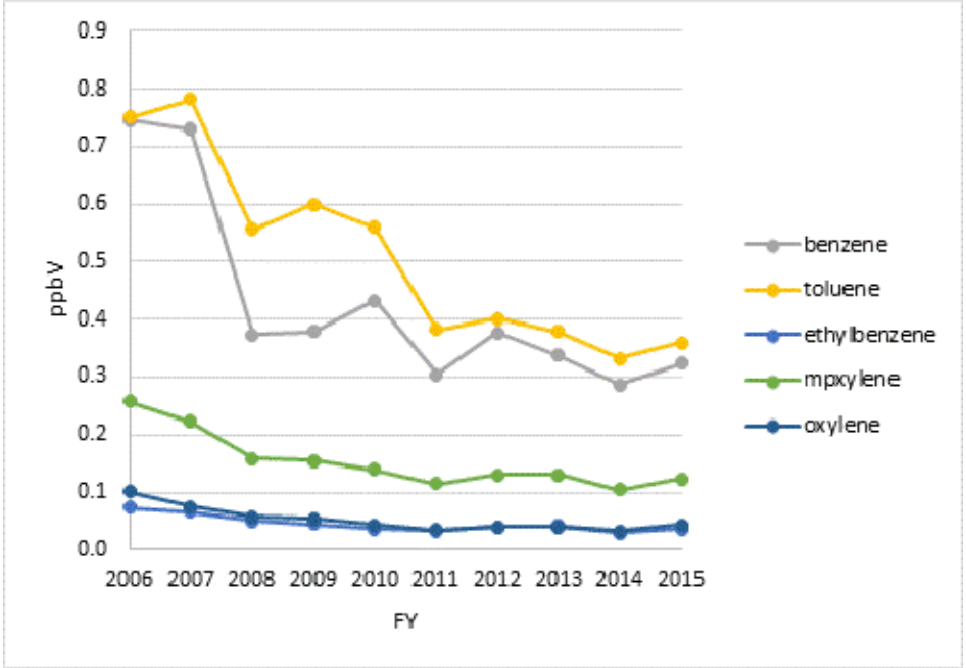


Figure 23. Mean concentrations of benzene, toluene, ethyl benzene, m/p-xylene, and o-xylene by FY at Oak Park



4. Benzene Concentrations in Residential Areas

As has been discussed in past reports, benzene concentrations in the recent years are lower than in the first three years of operation at the two auto-GCs operated at Oak Park, CAMS 634, and Solar Estates, CAMS 633. Also, in recent years (2008 through 2015), concentration averages have generally shown relatively little variation compared to earlier years. No individual one-hour benzene values have been measured above the AMCV since the beginning of monitoring. A time series for Oak Park hourly benzene in ppbV units from March 1, 2005, through September 30, 2015, with two points circled as outliers appears in Figure 24, below. The two points from 6:00 CST Saturday, January 27, 2007, and 4:00 CST Friday, November 6, 2009, measured under northerly winds, are identified as statistical outliers in that they are unusually high given the balance of the data. The same graph is reproduced without the two outlier points in Figure 25, below. The time series for Solar Estates appears in Figure 26, on page 35. Note the different y-axis scales for the two sites, as Oak Park does tend to measure higher benzene concentrations than Solar Estates. Figure 27, on page 35, shows the time series for the TCEQ Palm auto-GC.

Figure 24. Oak Park hourly benzene March 1, 2005 – September 30, 2015, ppbV units, no observations greater than the TCEQ's AMCV

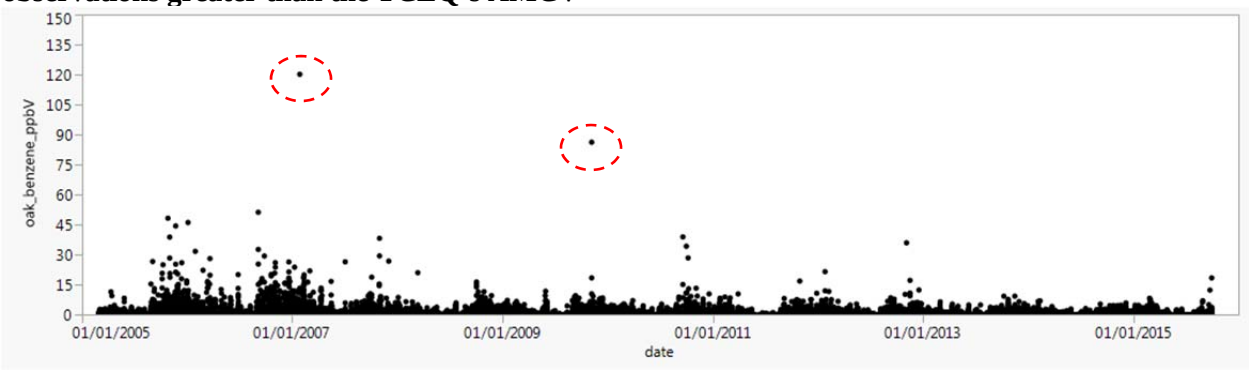


Figure 25. Oak Park hourly benzene March 1, 2005 – September 30, 2015, ppbV units, two outliers from January 27, 2007 and November 6, 2009 removed

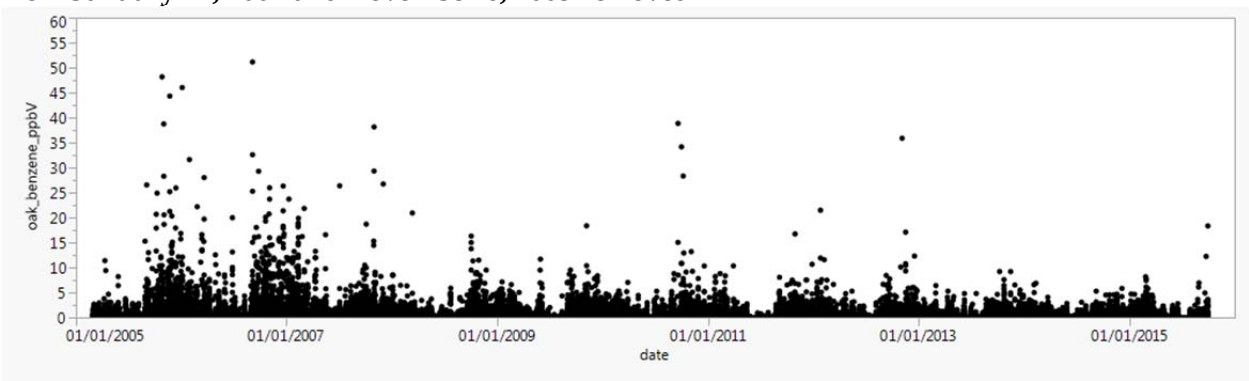


Figure 26. Solar Estates hourly benzene Mar. 2005 – September 30, 2015, ppbV units, no observations greater than the TCEQ's AMCV

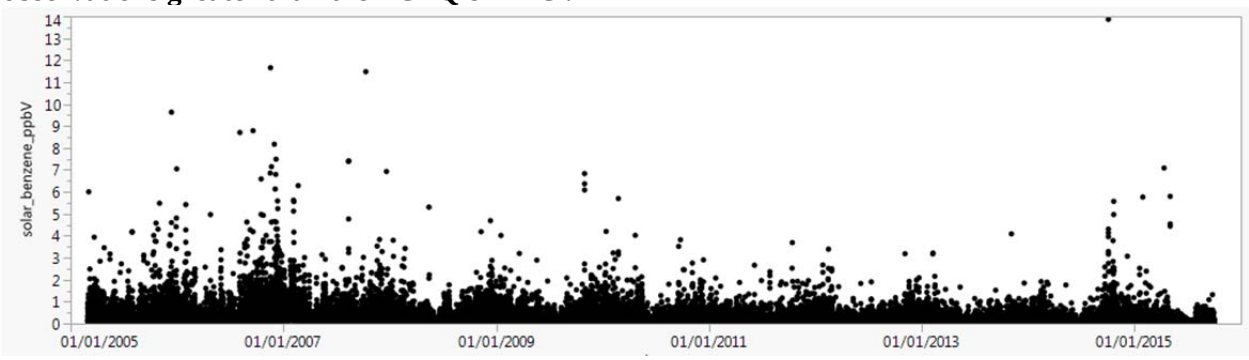


Figure 27. TCEQ Palm hourly benzene June 1, 2010 – September 30, 2015, ppbV units, individual elevated value noted, no observations greater than the TCEQ's AMCV

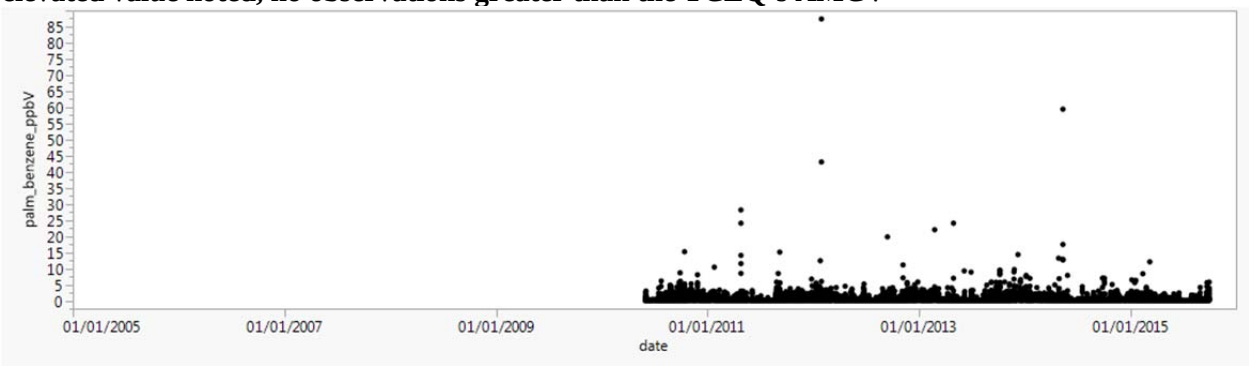
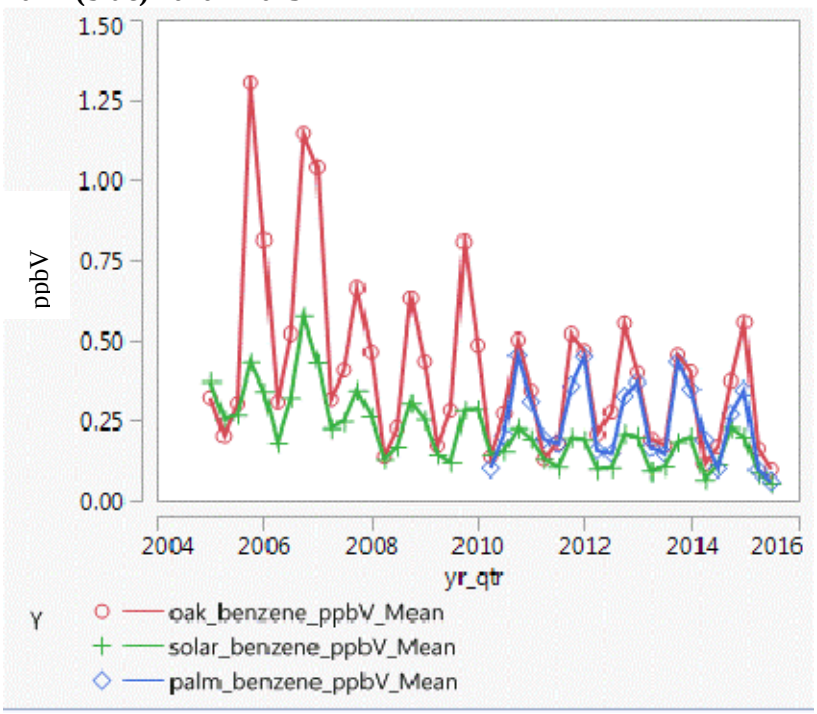


Table 7, on page 36, shows mean statistics for benzene at Oak Park and Solar Estates, by quarter 2005 – 2015, and at TCEQ Palm 2010 – 2015, ppbV units. The project now has more than eleven years of complete data. Figure 28, on page 37, shows the quarterly means for the three sites since each started operation. This figure shows the strong seasonal effects, the early downward trend and subsequent flattening out in the trends at Oak Park and Solar Estates, and similarity in most quarters between the Oak Park and TCEQ Palm benzene concentration means.

Table 7. Mean statistics for Benzene at Oak Park and Solar Estates, by quarter 2005 – 2015, Palm 2010 – 2015, ppbV units (1st quarter 2005 was March 2005 only)

Year	Quarter	Oak Park	Solar Estates	TCEQ Palm	Year	Quarter	Oak Park	Solar Estates	TCEQ Palm
2005	1	0.32	0.37		2011	1	0.34	0.19	0.31
2005	2	0.20	0.25		2011	2	0.13	0.13	0.19
2005	3	0.30	0.27		2011	3	0.18	0.11	0.18
2005	4	1.30	0.41		2011	4	0.52	0.20	0.36
2006	1	0.81	0.34		2012	1	0.47	0.19	0.45
2006	2	0.31	0.18		2012	2	0.21	0.10	0.16
2006	3	0.52	0.32		2012	3	0.28	0.10	0.15
2006	4	1.14	0.58		2012	4	0.55	0.21	0.32
2007	1	1.04	0.43		2013	1	0.40	0.20	0.37
2007	2	0.32	0.23		2013	2	0.19	0.09	0.17
2007	3	0.42	0.25		2013	3	0.17	0.11	0.15
2007	4	0.68	0.37		2013	4	0.46	0.18	0.43
2008	1	0.46	0.26		2014	1	0.40	0.20	0.35
2008	2	0.14	0.13		2014	2	0.11	0.07	0.19
2008	3	0.23	0.17		2014	3	0.17	0.11	0.10
2008	4	0.63	0.31		2014	4	0.37	0.23	0.27
2009	1	0.43	0.25		2015	1	0.56	0.20	0.34
2009	2	0.17	0.14		2015	2	0.16	0.09	0.09
2009	3	0.28	0.12		2015	3	0.17	0.07	0.12
2009	4	0.81	0.28						
2010	1	0.48	0.29						
2010	2	0.14	0.15	0.10					
2010	3	0.27	0.16	0.20					
2010	4	0.50	0.23	0.45					

Figure 28. Mean concentrations of benzene ppbV by quarter of each year at Oak Park (red) and Solar Estates (green), 2005 – 2015 with lower values in 2008 – 2015 compared with 2005 – 2007, and Palm (blue) 2010 – 2015



5. Sulfur Dioxide Measurements at Corpus Christi Monitors

As was mentioned earlier in this report, SO_2 ambient concentrations are regulated by the National Ambient Air Quality Standards (NAAQS) established in 2010. EPA set the SO_2 NAAQS to include a level of 75 ppb averaged over one hour, with a form of the three-year average of the annual 99th percentiles of the daily maximum one-hour averages. If measurements are taken for a full year at a monitor, then the 99th percentile would be the fourth highest daily one hour maximum. Individual hourly concentrations measured above the SO_2 75 ppb level of the NAAQS are called *exceedances*. The average of the three years 99th percentile daily maxima at a monitoring site is that site's *design value*. There is also a secondary SO_2 standard of 500 ppb over three hours, not to be exceeded more than once in any one year; however, concentrations this high have not been measured by TCEQ or UT monitors. The TCEQ also has a shorter 30-minute rolling average net ground level standard of 400 ppb that may not be added by an individual emission source on top of a background concentration. Concentrations this high have not been measured by TCEQ or UT monitors in Corpus Christi.

Over time, regulatory efforts have reduced the amount of sulfur in fuels, leading to reduced SO_2 in ambient air. Recent reports on this project have shown that the reductions in sulfur content in fuel used in ships in the Corpus Christi ship channel have led to reduced concentrations measured at specific monitors. Sulfur reductions have also been made in diesel fuel used by some motor vehicles and in the coal used in some power plants.

In this section all long term SO_2 design value trends are reported, with the recent fourth quarter of 2015 added in to complete calendar year 2015 and three year 2012-2015 periods. The overall conclusion is that there have been significant declines in the design values at all sites in Nueces County since monitoring for SO_2 began at all sites, with one exception. That one exceptional site, Solar Estates, CAMS 633, is hypothesized to have been affected by a chemical interferent. The interferent problem is no longer being observed and the Solar Estates site has its second lowest design value to date in 2015. Table 8, below, shows a compilation of monitoring site SO_2 design values going back to 2000 for TCEQ sites and 2006 for UT sites. The 2006 design value uses only two-years of data. What one observes from Table 8 is that the most recent design values are the lowest measured since each monitor began (except for Solar Estates, C633). Note that in the header row in Table 8 each site is identified with a "C" for CAMS and the site number. The TCEQ's West site is CAMS 4, TCEQ's Tuloso Middle School site is CAMS 21, and TCEQ's Huisache site is CAMS 98.

Table 8. Three-year SO_2 design values for three TCEQ sites and six UT sites

3-yr period	C4	C21	C98	C629	C630	C631	C632	C633	C635
1998-2000	34.5	28.3	66.6						
1999-2001	33.6	26.2	67.0						
2000-2002	29.7	20.4	77.9						
2001-2003	31.7	18.8	81.3						
2002-2004	35.5	14.3	73.4						
2003-2005	37.0	14.0	60.5						
2004-2006*	31.5	10.0	47.6	35.7	145.6	35.3	19.3	56.2	41.6
2005-2007	23.9	8.3	36.1	33.6	118.7	38.0	20.6	50.5	34.4
2006-2008	20.9	8.3	32.5	30.6	131.2	32.8	19.1	31.4	31.0
2007-2009	17.6	8.6	27.7	29.8	88.9	32.4	16.6	20.9	22.7
2008-2010	17.2	9.4	33.1	26.4	102.7	21.2	12.9	10.6	22.3
2009-2011	12.3	9.0	27.0	18.7	79.9	15.2	12.8	29.9	19.9
2010-2012	9.8	7.7	23.3	15.3	76.2	8.4	12.0	39.9	11.7
2011-2013	6.6	6.2	10.2	11.3	47.0		12.1	51.0	7.9
2012-2014	5.0	4.4	5.6	11.3	33.2		12.5	28.4	6.5
2013-2015	4.4	3.9	4.1	6.1	15.8		10.4	15.7	5.2

*only 2005 & 2006 for 2006 design value for six UT sites

The data in Table 7 are graphed over time in Figure 29, on page 39, using the end year of each 3-year period as the x-axis and design values on the y-axis. A line is provided where appropriate to indicate the level of the NAAQS. Solar Estates, C633, is excluded from this graph. Figure 30, on page 40, shows the trend for four UT sites, which have operated since 2005 with the CAMS 631 site having ended in 2012. The two UT sites not shown in Figure 30 are the J. I. Hailey, CAMS 630, site that dominates in Figure 29, and the interferent-affected Solar Estates, CAMS 633, site.

Figure 29. SO_2 design values under current 2010 NAAQS in Nueces County

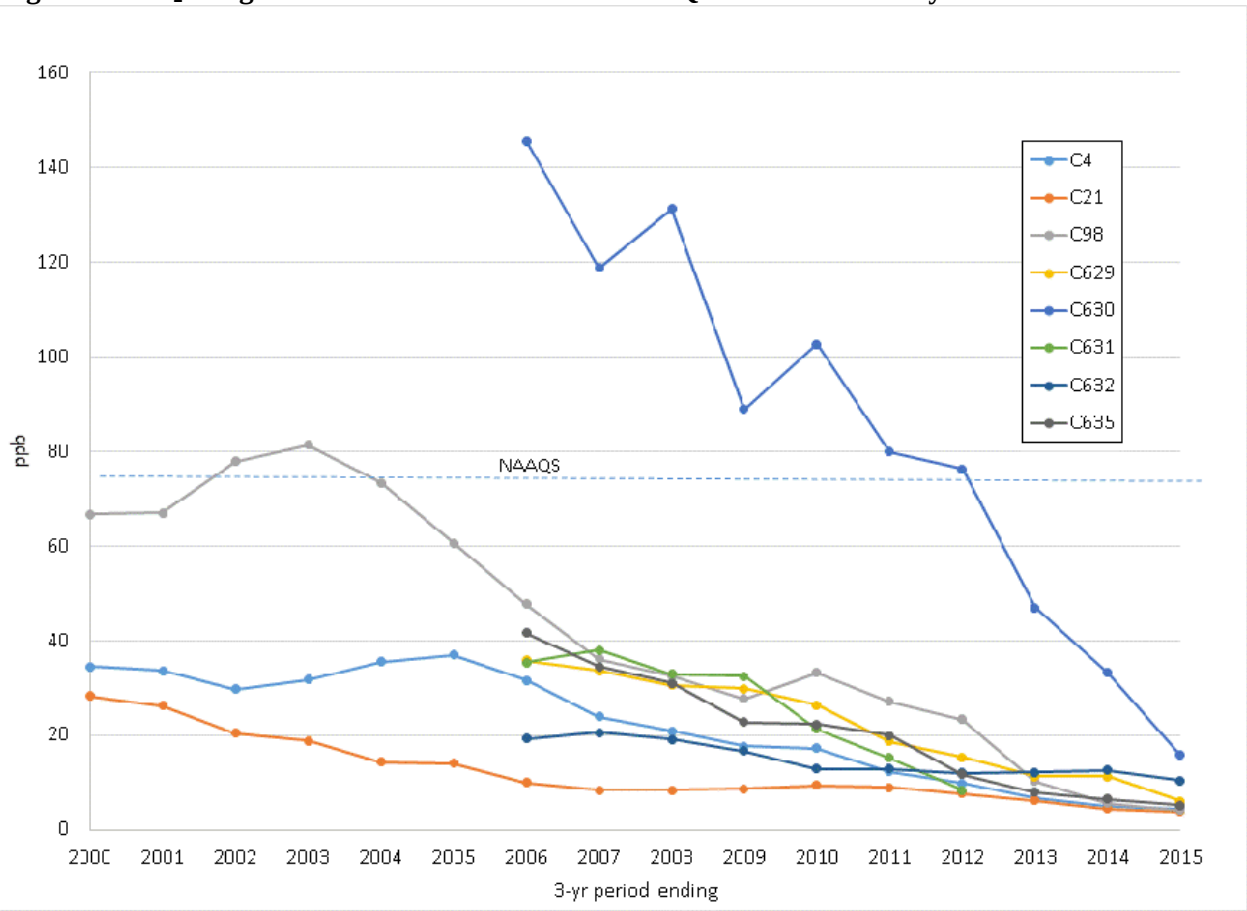
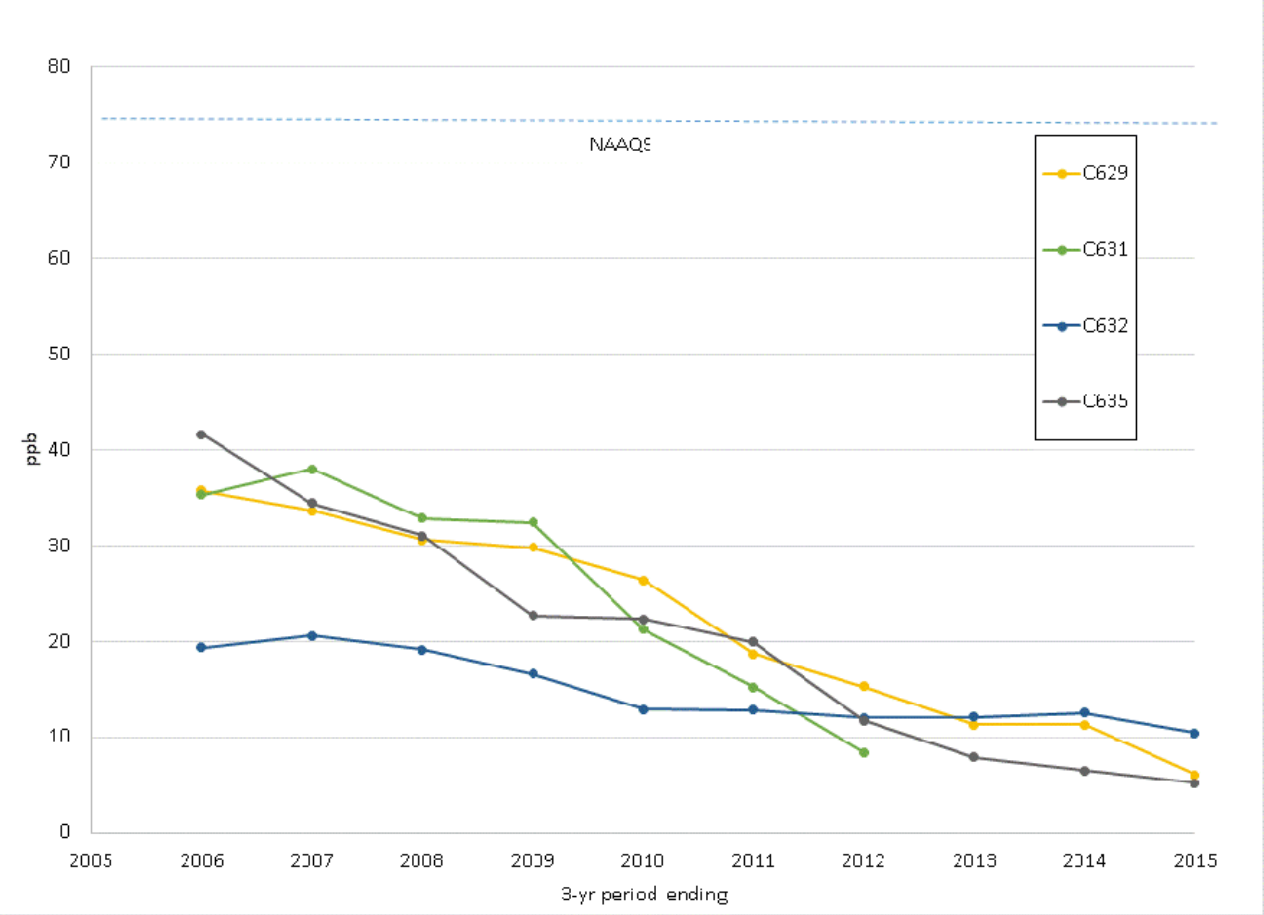


Figure 30. SO_2 design values under current 2010 NAAQS at four UT sites in Nueces County



From the 2005 start of monitoring at J. I. Hailey, C630, the data from the site had shown noncompliance with the 2010 SO_2 NAAQS up through the three year period ending in 2012. Beginning with the three-year period ending in 2013, the J. I. Hailey, C630, SO_2 concentrations show compliance with the NAAQS. However, there are still occasional short-term elevated concentrations measured at the site. In both the first quarter of 2015 and second quarter reports for this project in 2015, case studies were presented regarding short term (5-minute, timescale) values of SO_2 above background levels at J. I. Hailey, CAMS 630.

Conclusions from the FY 2015 Data

In this annual report, several findings have been made:

- No exceedances of the EPA SO_2 NAAQS level were measured in FY 2015 at a UT site. Dockside ship emissions that had affected the UT J. I. Hailey, CAMS 630, site appear to have diminished since June 2012, which is likely relatable to new federal rules on marine fuel. All Corpus Christi sites show a long term downward trend in SO_2 NAAQS design values.
- FY 2015 concentrations at the auto-GCs remain well below the TCEQ's AMCVs for all species tracked for this project. Trends in quarterly average benzene concentrations remain relatively flat in recent years. Mean concentrations for several hydrocarbon species, possibly associated with natural gas, have increased in the past four years.
- Periodic air pollution events continue to be measured on a routine basis.

Further analyses will be provided upon request.

APPENDIX B

Web Site Statistics

Corpus Christi Air Monitoring and Surveillance Camera Installation and Operation Project
Web Site Statistics

	Calendar Year 2010			Calendar Year 2011			Calendar Year 2012			Calendar Year 2013			Calendar Year 2014			Calendar Year 2015		
	Hits	Views	Visits	Hits	Views	Visits	Hits	Views	Visits	Hits	Views	Visits	Hits	Views	Visits	Hits	Views	Visits
The University of Texas at Austin Corpus Christi Web Sites:																		
Main Web Site (All Pages)	45,469	***		115,823	***		189,526	***		336,946	***		44,970	***		46,072	***	
Trajectory Tool Web Site ("ceer_trajectory" directory)	39,388		9,292	29,154		9,285	26,083		9,179	22,321		8,815	42,245		11,513	32,142		12,041
SubTotal - UT Web Sites	**84,857**	**0**	**9,292**	**144,977**	**0**	**9,285**	**215,609**	**0**	**9,179**	**359,267**	**0**	**8,815**	**87,215**	**0**	**11,513**	**78,214**	**0**	**12,041**
TCEQ Web Sites:																		
Monitoring Operations Corpus Christi AutoGC Page		1,324			2,015			1,077			1,051			27,113			94,295	
SubTotal - TCEQ Web Sites	**0**	**1,324**	**0**	**0**	**2,015**	**0**	**0**	**1,077**	**0**	**0**	**1,051**	**0**	**0**	**27,113**	**0**	**0**	**94,295**	**0**
Total - Both Institutions	**84,857**	**1,324**	**9,292**	**144,977**	**2,015**	**9,285**	**215,609**	**1,077**	**9,179**	**359,267**	**1,051**	**8,815**	**87,215**	**27,113**	**11,513**	**78,214**	**94,295**	**12,041**

	Denotes this count not collected.
***	Views are no longer available on UT's Urchin Weblog system since 2008.
	According to UT-ITS the "Hit Count" from 2011 thru 2014 were being inflated by an erratic or misconfigured Google Search Application. The 2014 "Hits" were manually recounted and represent a more accurate assessment
	TCEQ opened all 32 AGC site's to the public, since there are 2 Corpus Christi AGC sites, we use this formula ((Total Daily Views / 32) * 2) to estimate the Views for this report. TCEQ Information Resources reports the stats are inflated in 2014 and 2015 because a new web server and a new webstats program were installed and the inflated numbers are due to something being counted differently, including multiple security scans from the DIR.

Definition of Terms:

Hit - A request for a file from the web server. Available only in log analysis. The number of hits received by a website is frequently cited to assert its popularity, but this number is extremely misleading and dramatically over-estimates popularity. A single web-page typically consists of multiple (often dozens) of discrete files, each of which is counted as a hit as the page is downloaded, so the number of hits is really an arbitrary number more reflective of the complexity of individual pages on the website than the website's actual popularity. The total number of visitors or page views provides a more realistic and accurate assessment of popularity.

Page View - A request for a file whose type is defined as a page in log analysis. An occurrence of the script being run in page tagging. In log analysis, a single page view may generate multiple hits as all the resources required to view the page (images, .js and .css files) are also requested from the web server.

Visit / Session - A series of requests from the same uniquely identified client with a set timeout. A visit is expected to contain multiple hits (in log analysis) and page views.

APPENDIX C

Financial Reports

ANNUAL PROGRESS REPORT
TO THE U.S. DISTRICT COURT
FOR THE
CORPUS CHRISTI NEIGHBORHOOD AIR TOXICS PROJECT

Financial Summary

As of September 30, 2015

Total Settlement Fund Allocation & Interest Earned		**$9,665,572.78**
Stage 1 – Settlement Fund Allocation	$4,586,014.92	
Interest earned by the U.S. District Court	$ 16,583.74	
Additional interest earned by U.S. District Court	$ 5,854.24	
(Distributed by the Garden City Group in May 2010)		
Stage 1 Funds Total	**$4,608,452.90**	
Stage 1 Phase 1A - Modeling	$2,277,564.00	
Stage 1 Phase 1B – Monitoring Extension	$2,330,888.90	
Stage 2 Funds - Undistributed pending appeal	**$5,057,119.88**	
(UT was notified by the Court that due to the outcome of the appeal, these funds would not be distributed to UT.)		
Less Stage 2 Funds		**($5,057,119.88)**
Total Interest Earned at UT-Austin as of 9/30/2015		**$ 392,341.15**

Project Expenditures

Stage 1, Phase 1A		
First Year Paid Expenditures	(3/3/2008 – 12/31/2008)	$ 489,853.15
Second Year Paid Expenditures	(1/1/2009 – 12/31/2009)	$ 786,455.98
Third Year Paid Expenditures	(1/1/2010 – 12/31/2010)	$ 516,101.84
Fourth Year Paid Expenditures	(1/1/2011 – 12/31/2011)	$ 70,670.25
Total Project Expenditures	(3/3/2008 – 12/31/2011)	$1,863,081.22
Stage 1, Phase 1B		
First Year Paid Expenditures	(1/1/2012 – 9/30/2012)	$ 9,480.44
Second Year Paid Expenditures	(10/1/2012 – 9/30/2013)	$ 610,512.57
Third Year Paid Expenditures	(10/1/2013 – 9/30/2014)	$ 867,664.03
Fourth Year Paid Expenditures	(10/1/2014-9/30/2015)	$ 841,325.40
Total Project Expenditures	(1/1/2012 – 9/30/15)	$2,328,982.44
		($4,192,063.66)
Balance Remaining as of 9/30/15		**$ 808,730.39**

Exhibit A

CORPUS CHRISTI NEIGHBORHOOD AIR TOXICS PROJECT

Stage 1 Phase 1A – Modeling Funding Summary

Total Funding - Years 1 through 4	$2,277,564.00
Project Expenditures through 12/31/2011	$1,863,081.22
Stage1 Phase 1A Funds Remaining	$ 414,482.78
Stage 1 Phase 1A Funds Transferred to Phase 1B	($ 414,482.78)
Stage 1 Phase 1A Funds Final	$ 0.00

Expenditure Summary for the Project Period March 3, 2008 through December 31, 2011

Description	Budget Allocation Phase 1A Years 1 - 4	Years 1- 3 paid Expenditures	Year 4 paid Expenditures	Total Expenditures	Balance Available
Salaries and Wages	$845,390.00	($745,502.74)	($3,984.00)	($749,486.74)	$95,903.26
Fringe Benefits	$205,037.00	($180,836.43)	($1,531.47)	($182,367.90)	$22,669.10
CEER Admin Salaries	$90,825.00	($76,373.30)	($3,015.89)	($79,389.19)	$11,435.81
Supplies	$56,160.00	($34,370.63)	($156.01)	($34,526.64)	$21,633.36
Contingency	$34,551.00	$0.00	$0.00	$0.00	$34,551.00
Consultants	$25,000.00	$0.00	$0.00	$0.00	$25,000.00
Subcontract					
Environ Corp.	$400,000.00	($319,985.42)	($40,980.38)	($360,965.80)	$39,034.20
Texas A&M Univ.	$195,763.00	($172,305.78)	($11,784.64)	($184,090.42)	$11,672.58
Holding	$4,237.00	$0.00	$0.00	$0.00	$4,237.00
Modeling/Computer Services	$59,000.00	$0.00	$0.00	$0.00	$59,000.00
Computation Center	$1800.00	($1800.00)	$0.00	($1,800.00)	$0.00
Tuition	$17,727.00	($17,602.00)	$0.00	($17,602.00)	$125.00
Travel	$20,000.00	($2,596.97)	$0.00	($2,596.97)	$17,403.03
Equipment	$25,000.00	($7,245.00)	$0.00	($7,245.00)	$17,755.00
Total Direct Costs	$1,980,490.00	($1,558,618.27)	($61,452.39)	($1,620,070.66)	$360,419.34
Indirect Costs (15% TDC)	$297,074.00	($233,792.70)	($9,217.86)	($243,010.56)	$54,063.44
Total	**$2,277,564.00**	**($1,792,410.97)**	**($70,670.25)**	**($1,863,081.22)**	**$414,482.78**

In October 2011, all Phase 1A budget categories were rebudgeted to match total expenditures and leave a $0.00 balance. The remaining funds of $414, 482.78 were reallocated to Phase 1B.

Stage 1 Phase 1B – Air Monitoring Extension

Funding Allocation	$2,330,888.90
Funds Transferred from Phase 1A	$ 414,482.78
Total Funding Allocation	$2,745,371.68
Interest Earned through 9/30/2015	$ 392,341.15
Total Funding Available	$3,137,712.83
Project Expenditures through 09/30/2015	($2,328,982.44)
Funds Remaining	$ 808,730.39

Expenditure Summary for the Project Period January 1, 2012 through September 30, 2014

Description	Year 1 - 3 1/1/12-9/30/14 Expenditures	Year 4 10/01/14-9/30/15 Expenditures	Total Expenditures as of 9/30/15
Salaries and Wages	($170,171.49)	($128,184.96)	($298,356.45)
Fringe Benefits	($48,659.16)	($37,118.70)	($85,777.86)
CEER Admin Salaries	($39,373.44)	($28,080.64)	($67,454.08)
Salary Holding	$0.00	$0.00	$0.00
Quality Assurance	$0.00	$0.00	$0.00
Cell Phone Allowance	($720.00)	($360.00)	($1,080.00)
SEP Reserve	$0.00	$0.00	$0.00
Contingency	$0.00	$0.00	$0.00
Monthly M&O	($42,255.01)	($19,271.45)	($61,526.46)
Equip. & Spare Parts	($27,532.10)	($17,872.63)	($45,404.73)
Communications	($17,221.78)	($8,839.18)	($26,060.96)
Electric	($44,157.46)	($19,798.55)	($63,956.01)
Gases	($23,392.78)	($6,218.43)	($29,611.21)
Consultant-Holding	$0.00	$0.00	$0.00
Consultant Services	$0.00	$0.00	$0.00
ORSAT	($361,473.81)	($171,435.21)	($532,909.02)
TMSI	($411,154.77)	($250,319.10)	($661,473.87)
Analytical	($60,970.00)	($43,111.00)	($104,081.00)
Travel	($2,833.00)	($1603.54)	($4,436.54)
Equipment	($43,700.00)	$0.00	($43,700.00)
Total Direct Costs	($1,293,614.80)	($732,213.39)	($2,025,828.19)
Indirect Costs (15% TDC)	($194,042.24)	($109,112.01)	($303,154.25)
Total	**($1,487,657.04)**	**($841,325.40)**	**($2,328,982.44)**

CORPUS CHRISTI AIR MONITORING AND SURVEILLANCE CAMERA PROJECT

University of Texas at Austin
Annual Audit Report Results

The University's Annual Reports and Audit Statements are made available for public review at the following website:

http://www.sao.texas.gov/reports/main/15-313.pdf

Attached is a copy of The University of Texas at Austin's Certification Statement for the Office of Management and Budget (OMB) Circular A-133 Audit conducted during the 2013/2014 fiscal year. The OMB Circular A-133 Audit for the 2013/2014 fiscal year is currently being conducted. The results of the 2012/2013Audit will be made available at the above website. It is anticipated the audit results will be posted in late Spring 2016.

SUBRECIPIENT AUDIT FORM

(including financial reports and internal controls)

FOR FISCAL YEAR
ENDING AUGUST 31, 2014

SUBRECIPIENT'S LEGAL ENTITY NAME AND ADDRESS

The University of Texas at Austin
Office of Sponsored Projects, Suite 4.300
101 E. 27th Street, Stop A9000
Austin, TX 78712-1539

☒ Our audit report for the subject fiscal year has been completed.

The A-133 Audit for The University of Texas at Austin is issued as part of the statewide audit conducted by the State Auditor's Office. A complete copy of the audit report is available at:

http://www.sao.state.tx.us/reports/main/15-313.pdf Federal Portion

Or at http://www.sao.state.tx.us/reports/; select the Statewide Single Audit Reports link.

The report contains the finding, corrective action plan and anticipated implementation dates. Findings for The University of Texas at Austin begin on page 344. Prior year findings are addressed beginning on page 603.

Authorizing Signature:_____ **Date:** 3/4/15

Jason Richter
Associate Director, Office of Sponsored Projects

APPENDIX D

Supplemental Environmental Projects

SEP Project List

APPENDIX D

Supplemental Environmental Projects (SEP) awarded to The University of Texas at Austin

No.	SEP (Name)	Docket No.	Period of Performance	Award Amount	Interest Earned as of 9/30/12	UT Account Number	Project Description - Notes
1	CITGO Regfining and Chemicals Company, L.P.	2001-1469-AIR-E	7/2004-7/2006	$680,000.00	$19,978.03	26-7690-94	Task 1 - Extend the operation of the air monitoring network in Corpus Christi for an additional year.
				$190,000.00	$7,956.39	26-7690-95	Task 2 - Development of the Trajectory Tool
2	Duke Energy Field Services	2003-1122-AIR-E	2/2005-8/2005	$5,187.00	$100.15	26-4254-75	Purchase additional canisters for the Corpus Christi monitoring sites.
3	El Paso Merchant Energy Petroleum Company	2001-1023-AIR-E	2/2006-6/2008	$46,004.00	$1,264.83	26-7693-36	Task 1 - Enchancement to the Automated Trajectory Tool.
				$90,044.00	$5,790.85	26-7692-88	Task 2 - Additional Canister Analysis, Power Loss Hardware and Software and Wind Direction Filter.
4	Sherwin Aluminia	2004-1982-IR-E	10/2007-12/2009	$10,244.00	$557.00	26-7695-56	Used for canister analyses.
5	Texas Molecular Corpus Christi Services, Limited	D1-GV-07-001054	2/2009-9/2011	$67,900.00	$6,119.69	26-7697-82	Used for the repair and refurbishment of ageing equipment at the active Project sites. Items purchased include 8 computers and 3 multi-gas calibrators. Also, the Auto GC systems at Oak Park and Solar Estates were refurbished. * See note below.
6	Equistar Chemicals, LP	D1-GV-06-002509	5/2012-5/2013 **See note below	$150,000.00	$114.56	26-7701-70	Funds will be used to extend and enhance the life of the Project Network. ** See note below
	TOTAL			**$1,239,379.00**	**$41,881.50**		

* Originally the Texas Molecular and Equistar funds were to be used to purchase a FLIR ThermaCAM GasFindIR-HS (IR camera) and accessories, to train subcontractor personnel in use of camera,and to conduct video taping recording in the Corpus Christi refinery row area. When the Equistar funds were reduced (see note below) it was determined that the funding necessary for the camera was not available, and there were other ways the funds could be put to use to benefit the extension of the life of the network.

APPENDIX D

Supplemental Environmental Projects (SEP) awarded to The University of Texas at Austin

** A check in the amount of $400,000 was received by UT Austin 12/08/08 and was deposited in a holding account pending approval by the TCEQ of a UT Austin SEP Proposal. Subsequent to the March 31, 2009 Quarterly Report to the Court, the TCEQ notified UT Austin that Equistar Chemicals (a subsidiary of LyondellBasell Industries and US affiliate Loyondell Chemical Co.), filed for Chapter 11 bankruptcy on January 6, 2009 and that the $400,000 ordered to be paid by Equistar for this project might be subject to a collection effort in that proceeding on behalf of the creditors. As a consequence, the funding for the Equistar SEP award was placed on indefinite hold. Subsequently the Bankruptcy Trustee filed a lawsuit against UT to recover the $400,000 as a "preferential transfer" which can void transfers that take place within certain time limits of filing for bankruptcy.	
The Texas Attorney General represented UT in that lawsuit. On February 7, 2011, UT was notified that the Assistant Attorney General handling the case, with the agreement of the TCEQ, succeeded in getting an agreed settlement under the terms of which UT paid $250,000 to the Bankruptcy Trustee and UT retained the remaining balance free and clear. On February 14, 2011, a payment in the amount of $250,000 was mailed to the Bankruptcy Trustee.	
Due to the reduction of the award amount and that a notice to proceed was never issued for the Equistar funds, UT contacted the TCEQ to determine the procedures UT should follow to move forward in utilizing the funds. On March 18, 2011, UT was asked to submit a new Third-Party Application to the SEP Program by June 1, 2011. This would allow UT to transition the Equistar funds to a new SEP Agreement, as the term of the older agreement has ended. UT submitted a new Third-Party Application to receive SEP funding on June 1, 2011. A contract for this new SEP Agreement was received on April 29, 2013 and was fully executed on July 10, 2013.	
On April 26, 2012, UT was contacted by Ms. Sharon Blue of the TCEQ regarding UT's participation in the SEP program. Since the Third-Party Application is still under review, it was agreed that UT should issue a request to extend the prior SEP Agreement and move forward with utilizing the SEP funds. The extension request along with a project plan for utilizing the Equistar SEP funds was submitted to TCEQ in parallel with the March 31, 2012 Quarterly Report on May 7, 2012. On May 8, 2012, a No Cost Extension was granted until May 31, 2013.	