

**TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
CORPUS CHRISTI MONITORING PROJECT
MARCH 29 – APRIL 4, 2008 AND APRIL 21, 2008**



**CONDUCTED BY
MOBILE MONITORING TEAM
MONITORING OPERATIONS DIVISION**

Quality Assurance:



Date:

12/18/08

Team Leader:



Date:

12-18-08

Technical Director:



Date:

12/18/08

Section Manager:



Date:

12/19/08

TABLE OF CONTENTS
(By Area then Alphabetical by Company Name)

<u>Company Name</u>	<u>Page Number</u>
CORPUS CHRISTI AREA	
Citgo Refining and Chemicals Company (Co.) – East Refinery.....	32, 34
Citgo Refining and Chemicals Co. – West Refinery.....	22, 24
Flint Hills Resources LP – East Refinery	32, 34
Flint Hills Resources LP – West Refinery	35
Javelina Gas Co.....	25, 27, 31
Magellan Terminals Holdings LP	19, 23, 24
Valero Refining Texas LP – East Refinery.....	11, 15, 17, 20, 31
Valero Refining Texas LP – West Refinery.....	23, 24
CITY OF CORPUS CHRISTI WASTEWATER TREATMENT PLANTS	
Broadway Wastewater Treatment Plant	37
Greenwood Wastewater Treatment Plant.....	37
CORPUS CHRISTI SHIP CHANNEL AREA	
Anderson Oil Ltd – Erigan-Quiroz Lease	45
Anderson Oil Ltd – F.J. Smith Lease.....	43
Greenbriar Energy, Incorporated (Inc.) – Well #1.....	50
Gulfmark Energy, Inc.	46
Koch Pipeline Co. LP – Viola Station	46
Magnum Producing LP	47
Martin Midstream Partners LP	41
Texas Petroleum Investment Co. – Tule Lake Field.....	48
INGLESIDE AREA	
Cinco Natural Resources Corporation (Corp.) – Tank Farm Facility	53
National Oil Recovery Corp. – Falcon Refinery Superfund Site.....	51
SOUTHERN NUECES COUNTY AREA	
Carter Exploration Co. – Chapman Ranch Lease.....	58
Continental Trend Resources, Inc. – G.H. McCann Central Tank Battery.....	59
Bill H. Pearl Productions, Inc. – J.P. Luby Tank Battery #2	57
Bill H. Pearl Productions, Inc. – K.L. Shaffer Lease	56

WESTERN NUECES COUNTY AREA

Continental Trend Resources, Inc. – Gillium #1 and #2 Tank Batteries.....60

ROBSTOWN AREA

Enterprise Products61

THREE RIVERS AREA

Valero Refining Texas LP – Three Rivers Refinery63

SEADRIFT AREA

Dow Chemical Co./Union Carbide Corp.67

Texas Commission on Environmental Quality

INTEROFFICE MEMORANDUM

TO: Michael Honeycutt, Ph.D., Manager
Toxicology Section
Office of Chief Engineer (MC 168)

FROM: Tom Randolph
Air Laboratories and Quality Assurance Section
Monitoring Operations Division (MC 165)

DATE: December 18, 2008

SUBJECT: Corpus Christi Monitoring Project, March 29 – April 4, and April 21, 2008, Volatile Organic Compound (VOC), Hydrogen Sulfide (H₂S), Sulfur Dioxide (SO₂) Sampling, and Infrared (IR) Camera Imaging

Personnel from the Texas Commission on Environmental Quality (TCEQ) Mobile Monitoring Team (MMT) conducted an ambient air monitoring project in the Corpus Christi, Texas, area from March 29 – April 4, 2008, and on April 21, 2008. During this project, requested by the Corpus Christi Air Section Manager, efforts were made to conduct VOC and sulfur monitoring near the Corpus Christi Ship Channel and surrounding areas including Robstown, Ingleside, Three Rivers, and Seadrift, as well as southern and western Nueces County. Specific efforts were made to concentrate on benzene sources and sources that had been identified during previous projects through conventional sampling methodologies. Key findings from this monitoring project include the following:

- As in previous years, benzene was consistently detected during monitoring conducted downwind of the Valero Refining Texas LP - East Refinery (Valero East) Complex 8 in Corpus Christi near Cantwell Lane. Though the exact measured source(s) were not definitive, pressure relief vent emissions from Storage Tank 102 and uncombusted/partially combusted flare emissions were detected utilizing the FLIR Systems ThermoCAM GasFindIR Camera (GasFindIR camera). The maximum real-time gas chromatograph (RTGC) benzene and toluene concentrations measured were 9.4 parts per billion by volume (ppbv) and 44 ppbv, respectively. Benzene levels as high as 160 ppbv were detected downwind of the Valero East Refinery; however, due to wind direction, possible contribution to the measured levels from Magellan Terminals Holdings LP could not be ruled out.
- Vent emissions from Magellan Terminals Holding LP Storage Tank T-130 were consistently detected with the GasFindIR camera. Emissions from this storage tank, which is located just north of a residential area, were previously documented during the Spring 2007 monitoring project. Constituents measured by RTGC monitoring during the 2008 project included a variety of VOCs, including 3.8 ppbv of benzene, 68 ppbv of isobutane, 56 ppbv of n-butane, 16 ppbv of toluene, and 51 ppbv of n-pentane. Under northerly and calm/stagnant wind conditions, receptors in the neighborhood located adjacent to the storage tank would be downwind of the facility.

December 18, 2008

SUBJECT: Corpus Christi Monitoring Project, March 29 – April 4, and April 21, 2008, Volatile Organic Compound (VOC), Hydrogen Sulfide (H₂S), Sulfur Dioxide (SO₂) Sampling, and Infrared (IR) Camera Imaging

- VOC-type odors remained prevalent along Up River Road downwind of the Citgo Refining and Chemicals Company (Co.) – West Refinery (Citgo West) and Valero Refining Texas LP – West Refinery (Valero West) tank farm. Although wind directions sometimes made it difficult to delineate emissions, RTGC and canister monitoring efforts in the area detected mostly light molecular weight compounds, including 520 ppbv of propane, 170 ppbv of isobutane, 620 ppbv of n-butane, 240 ppbv of isopentane, 330 ppbv of n-pentane, 170 ppbv of n-hexane, and 30 ppbv of benzene.
- The GasFindIR camera was used to survey Javelina Gas Co. and to image consistent uncombusted/partially combusted flare emissions that were previously documented during the March 2007 project. The flare emissions and previously unidentified vent stack emissions were consistently documented throughout this 2008 project. Southeasterly wind conditions resulted in the documentation of streaming emissions that lofted over a residential neighborhood and extended over the horizon from east to west for at least 0.5 mile.
- Sulfur sampling, including SO₂ and H₂S, was conducted downwind of several industrial facilities in the Corpus Christi area; however, measured concentrations never approached regulatory levels. MMT staff also conducted monitoring downwind of two City of Corpus Christi Wastewater Treatment Plants including the Greenwood and Broadway facilities. Staff documented a maximum net H₂S 30-minute average of 0.099 parts per million by volume (ppmv) downwind of the Greenwood Plant, while the maximum net 30-minute average downwind of the Broadway Plant was 0.357* ppmv. These concentrations were above the TCEQ net ground-level standards for both residential and industrial/commercial property (0.08 ppmv and 0.12 ppmv, respectively). H₂S concentrations that were near or above the regulatory limits have been measured downwind of these two facilities during previous projects. Though contribution from other total reduced sulfur compounds were not measured during this project due to equipment malfunction, it should be noted that the Broadway Plant is located adjacent to a residential area and the Whataburger Baseball Field (AA Astros affiliate).
- While patrolling the Corpus Christi Ship Channel area with the GasFindIR camera, MMT staff detected consistent emissions from the rooftop and rim area of Martin Midstream Partners LP Storage Tank #1333. This heated storage tank contained fuel oil. Follow-up by the TCEQ Pollution Prevention and Education Section confirmed tank roof integrity issues.

*At least one measurement used in this reported concentration exceeded upper limit of instrument calibration range. However, quality control (QC) results from standards at similar concentrations indicated that the reported concentration is within established accuracy acceptance limits.

December 18, 2008

SUBJECT: Corpus Christi Monitoring Project, March 29 – April 4, and April 21, 2008, Volatile Organic Compound (VOC), Hydrogen Sulfide (H₂S), Sulfur Dioxide (SO₂) Sampling, and Infrared (IR) Camera Imaging

- Flint Hills Resources LP - East Refinery (Flint Hills East) Flare FL-97 has been documented as an emission source since August 2006. This flare was scheduled to be replaced as an emission control device in December 2007, and during the 2008 project, the GasFindIR camera was used to document a light steam trail, but no apparent emissions were observed.
- As a follow-up to previous monitoring efforts, staff used the GasFindIR camera to image the National Oil Recovery Corporation (Corp.) (NORCO) – Falcon Refinery Superfund Site in Ingleside, Texas. As in previous trips, emissions from hatches/pressure relief vents on NORCO storage tanks were documented with the GasFindIR camera. While in the Ingleside area, the Cinco Natural Resources Corp. – Tank Farm Facility was also imaged and easily discernible and consistent emissions were documented from multiple pressure relief vents and tank hatches/roofs.
- The GasFindIR camera was used to survey multiple oil and gas gathering facilities in TCEQ Region 14. Storage tank pressure relief valve and hatch/roof emissions from seven facilities were documented in the Corpus Christi area including: Anderson Oil Ltd – F. J. Smith Lease, Anderson Oil Ltd – Erigan-Quiroz Lease, Koch Pipeline Co. – Viola Station, Gulfmark Energy, Incorporated (Inc.), Magnum Producing LP, Texas Petroleum Investment Co. – Tule Lake Field, and Greenbriar Energy, Inc. – Well #1. Similar emissions were also documented in southern Nueces County at Bill H. Pearl Productions, Inc. – K.L. Shaffer Lease, Bill H. Pearl Productions, Inc. – J.P. Luby Tank Battery #2, Carter Exploration Co. – Chapman Ranch Lease, and Continental Trend Resources, Inc. – G.H. McCann Central Tank Battery, and in western Nueces County at Continental Trend Resources, Inc. – Gillium #1 and #2 Tank Batteries.
- Staff used the GasFindIR camera to document streaming, uncombusted/partially combusted flare emissions at Enterprise Products - Shoup Plant in Robstown, Texas, and at Valero Refining Texas LP – East Refinery near the intersection of Up River Road and Navigation Boulevard in Corpus Christi.
- The GasFindIR camera was used to survey Valero Refining Texas LP – Three Rivers Refinery. Intermittent emissions were documented from pressure relief vents on heated silver storage tanks, while streaming. uncombusted/partially combusted emissions were recorded from a Valero flare. In all cases, emissions were not visible to the bare eye.
- In an effort to follow-up on previous imaging conducted in March 2007, TCEQ staff used the GasFindIR camera on April 21, 2008, to survey Dow Chemical Co./Union Carbide Corp. in Seadrift, Texas. Though previous streaming, uncombusted/partially combusted emissions had resulted in the company requesting TCEQ Audit Privilege, emissions observed during this trip were reduced from those previously recorded. Some uncombusted/partially combusted emissions were observed with the IR camera; however, the flare flame and heat signature were increased from the level previously documented.

December 18, 2008

SUBJECT: Corpus Christi Monitoring Project, March 29 – April 4, and April 21, 2008, Volatile Organic Compound (VOC), Hydrogen Sulfide (H₂S), Sulfur Dioxide (SO₂) Sampling, and Infrared (IR) Camera Imaging

Background

Field sampling efforts began in the Corpus Christi, Texas, area in 1989. Since that time, MMT has conducted 42 monitoring trips to the Corpus Christi, Robstown, Three Rivers, Bishop, Ingleside, and Seadrift areas. In response to a request from the TCEQ Corpus Christi Air Section Manager, MMT members conducted an ambient air monitoring project in the Corpus Christi, Texas, area from March 29 – April 4, 2008, and returned to the Seadrift area for an additional day of GasFindIR camera imaging on April 21, 2008.

The following table provides information concerning the primary facilities included in this monitoring project. The table also includes TCEQ Central Registry Database information associated with each facility.

Facility Name	Central Registry Regulated Entity Number	Central Registry Regulated Entity Name
Anderson Oil Ltd - Erigan-Quiroz Lease	RN 105087514	ERIGAN QUIROZ OIL LEASE
Anderson Oil Ltd - F. J. Smith Lease	Not Available	Regulated Entity information could not be confirmed in the Central Registry Database
Carter Exploration Co. - Chapman Ranch Lease	Not Available	Regulated Entity information could not be confirmed in the Central Registry Database
Cinco Natural Resources Corp. - Tank Farm Facility	Not Available	Regulated Entity information could not be confirmed in the Central Registry Database
Citgo Refining and Chemicals Co. - East Refinery	RN 102555166	CITGO CORPUS CHRISTI REFINERY EAST PLANT
Citgo Refining and Chemicals Co. - West Refinery	RN 100238799	CITGO CORPUS CHRISTI REFINERY - WEST PLANT
City of Corpus Christi Broadway Wastewater Treatment Plant	RN 101610186	BROADWAY PLANT
City of Corpus Christi Greenwood Wastewater Treatment Plant	RN 101610400	GREENWOOD PLANT
Continental Trend Resources, Inc. - Gillium #1 Tank Battery and Gillium #2 Tank Battery	Not Available	Regulated Entity information could not be confirmed in the Central Registry Database
Continental Trend Resources, Inc. - G.H. McCann Central Tank Battery	Not Available	Regulated Entity information could not be confirmed in the Central Registry Database

December 18, 2008

SUBJECT: Corpus Christi Monitoring Project, March 29 – April 4, and April 21, 2008,
Volatile Organic Compound (VOC), Hydrogen Sulfide (H₂S), Sulfur Dioxide
(SO₂) Sampling, and Infrared (IR) Camera Imaging

Facility Name	Central Registry Regulated Entity Number	Central Registry Regulated Entity Name
Dow Chemical Co./Union Carbide Corp. - Seadrift Operations	RN 102181526	UCC SEADRIFT OPERATIONS
Enterprise Products	RN 100210277	SHOUP GAS PLANT
Flint Hills Resources LP - East Refinery	RN 102534138	FLINT HILLS RESOURCES EAST REFINERY
Flint Hills Resources LP - West Refinery	RN 100235266	FLINT HILLS RESOURCES CORPUS CHRISTI WEST PLANT
Greenbriar Energy, Inc. – Well #1	Not Available	Regulated Entity information could not be confirmed in the Central Registry Database
Gulfmark Energy, Inc.	Not Available	Regulated Entity information could not be confirmed in the Central Registry Database
Javelina Gas Co.	RN 102190139	JAVELINA GAS PROCESSING FACILITY
Koch Pipeline – Viola Station	RN 105245575	KOCH PL VIOLA STATION
Magellan Terminals Holdings LP	RN 102536836	CORPUS CHRISTI TERMINAL
Magnum Producing LP	RN 105245567	STATE TRAC 691 2RUT 2RLT
Martin Midstream Partners LP	Not Available	Regulated Entity information could not be confirmed in the Central Registry Database
National Oil Recovery Corp. (NORCO)	RN 102510088	FALCON REFINERY
Bill H. Pearl Productions, Inc. - J.P. Luby Tank Battery #2	Not Available	Regulated Entity information could not be confirmed in the Central Registry Database
Bill H. Pearl Productions, Inc. - K.L. Shaffer Lease	Not Available	Regulated Entity information could not be confirmed in the Central Registry Database
Texas Petroleum Investment Co. - Tule Lake Field	RN 105204366	TULE LAKE PRODUCTION FACILITY
Valero Refining Texas LP - East Refinery	RN 100211663	VALERO CORPUS CHRISTI REFINERY EAST PLANT
Valero Refining Texas LP - West Refinery	RN 100214386	VALERO CORPUS CHRISTI REFINERY WEST PLANT
Valero Refining Texas LP - Three Rivers Refinery	RN 100542802	DIAMOND SHAMROCK REFINING VALERO

December 18, 2008

SUBJECT: Corpus Christi Monitoring Project, March 29 – April 4, and April 21, 2008, Volatile Organic Compound (VOC), Hydrogen Sulfide (H₂S), Sulfur Dioxide (SO₂) Sampling, and Infrared (IR) Camera Imaging

During this project, frequent patrols were conducted throughout the different areas of interest using various survey tools to search for maximum ground-level concentrations of the target compounds and also to determine the most suitable sampling locations. Though no quantitative samples were collected, several additional facilities were surveyed including: City of Corpus Christi Allison, Laguna Madre, Oso, and Whitecap Wastewater Treatment Plants, ConAgra International Fertilizer Co. and NuStar Energy LP in Corpus Christi; DuPont Occidental Chemical Co. in Ingleside; Ineos USA LLC, Green Lake Complex in Seadrift; Ticona Polymers, Inc. in Bishop; and Equistar Chemicals LP in Robstown.

Sampling and Analysis

VOC sampling and analysis was conducted by fixed-loop injection of ambient air (real-time) into Agilent 6890 gas chromatographs (GCs) equipped with flame ionization detectors (FIDs). RTGCs in Vans 219 and 754 were calibrated for a wide range of target compounds. RTGC concentrations were confirmed by whole-air samples collected in passivated stainless steel canisters that were later analyzed in the TCEQ MMT Laboratory in Austin. Organic analysis of the canister samples was performed by cryogenic preconcentration followed by thermal desorption into an Agilent GC/mass spectrometer (MS).

Two sampling vans (Vans 151 and 088) were configured for the collection of real-time measurements of H₂S and SO₂. SO₂ concentrations were measured using a Monitor Labs (ML) SO₂ continuous emissions monitor (CEM), and H₂S concentrations were measured using a Dasibi H₂S-to-SO₂ converter in conjunction with an ML SO₂ CEM. Van 088 was also equipped with a real-time Agilent GC interfaced with a Sievers Sulfur Chemiluminescence Detector (Sievers). The Sievers detector was used to confirm or deny the presence of reduced sulfur compounds and to estimate potential contributions of reduced sulfur compounds to H₂S CEM measurements. Four 30-minute H₂S impinger samples were also collected for confirmational purposes and were later analyzed in the TCEQ Organic Analysis Laboratory in Austin.

Several different survey instruments were utilized during patrols throughout the areas of interest to search for maximum ground-level concentrations and to determine the most suitable sampling locations for RTGC and canister sampling. A GasFindIR camera was used during patrols to identify potential VOC emission sources and when possible to identify sampling locations in the area of anticipated maximum concentration. The GasFindIR camera is a hand-held, battery-operated, passive infrared imaging system designed specifically for real-time detection of multiple hydrocarbon gases, including some highly reactive VOCs (HRVOCs), using high resolution images. The camera is compatible with a video recording system for video documentation, and still images are clipped from the videos for reporting purposes. Moreover, when emission sources and appropriate imagery conditions are present, additional split screen images are collected using both the GasFindIR camera and a conventional video camera to provide a side-by-side comparison. In addition to its VOC detection capabilities, the GasFindIR camera is also a thermal imagery device. A portable PetroPro GC and a toxic vapor analyzer (TVA) were utilized to provide detection and estimation of organic vapor concentrations and to

Michael Honeycutt, Ph.D., Manager

Page 7

December 18, 2008

SUBJECT: Corpus Christi Monitoring Project, March 29 – April 4, and April 21, 2008, Volatile Organic Compound (VOC), Hydrogen Sulfide (H₂S), Sulfur Dioxide (SO₂) Sampling, and Infrared (IR) Camera Imaging

identify possible sampling sites. Also, for the detection of H₂S, a portable Jerome 631X H₂S analyzer was utilized to patrol areas where sulfur CEMs were not available or accessible and to assist in identifying sampling locations in the area of anticipated maximum downwind concentrations.

Additionally, all sampling vans were equipped to collect wind direction, wind speed, and temperature data on a real-time basis.

The primary analytical target compounds for this monitoring project were SO₂, H₂S, and benzene.