Neighborhood Air Toxics Modeling Project For Houston and Corpus Christi – Stage 1

Quarterly Report for the Period

October 1, 2008 through December 31, 2008

Submitted to

The Honorable Janis Graham Jack US District Court Judge, Southern District of Texas Corpus Christi, Texas

Submitted by

David Allen, Ph.D. Principal Investigator and Elena McDonald-Buller, Ph.D. (Air Quality Modeling Team Lead) Gary McGaughey, M.S. (Meteorological Modeling Team Lead) Vincent M. Torres, M.S.E. (Ambient Monitoring Team Lead) Center for Energy and Environmental Resources The University of Texas at Austin 10100 Burnet Road, Bldg 133 (R7100) Austin, TX 78758 512/475-7842 <u>allen@che.utexas.edu</u>

February 18, 2008

I. Introduction

On February 1, 2008, the 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 will develop, apply, demonstrate and make publicly available, neighborhood-scale air quality modeling tools for toxic air pollutants in the Corpus Christi, Texas and Houston, Texas ship channel regions. In Stage 2, subject to the availability of funds, UT Austin will develop a mobile monitoring station that can be deployed in Corpus Christi and in other regions of Texas and/or extend the operating life of the existing stationary network in the same or modified spatial configuration. If a mobile monitoring station is deployed, it will be used to map the spatial distributions of air pollutant concentrations and to inform the public. All ambient monitoring results will be used in synergy with the neighborhood-scale models developed in Stage 1 to improve the understanding of emissions and the spatial distribution of air toxics in the region.

On February 21, 2008, the US District Court for the Southern District of Texas issued an order to the Clerk of the Court to distribute funds in the amount of \$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. Stage 2 funding has not been awarded by the US District Court.

This Stage 1 quarterly report has been prepared pursuant to the requirements of the Air Toxics Project and is being submitted to the US District Court.

II. Air Toxics Project – Stage 1 - Phase 1A Overview

A. Scope and Objectives

The objective of Stage I - Phase 1A of The Air Toxics Project for UT Austin and its subcontractors is to develop, apply, and make publicly available, neighborhood-scale air quality modeling tools for toxic air pollutants in the Corpus Christi area. Stage 1 – Phase 1A of the Air Toxics Project should provide significant and discernible environmental benefits to the Corpus Christi area by providing analyses of air pollutant concentrations experienced by the community, and providing post-event evaluation of pollutants emitted during a release. UT Austin is performing this work in collaboration with subcontractors at Texas A&M University and ENVIRON Corporation.

B. Major Tasks

The major tasks for Stage I include:

- Development of a conceptual model of meteorological conditions likely to lead to high concentrations of air toxics in the Corpus Christi area.
 This task will identify meteorological conditions (seasons, temperatures, wind speeds, wind directions, frontal passages and other parameters) and air quality conditions that are most likely to lead to high concentrations of air toxics in populated regions of Corpus Christi. The conceptual model will be used to identify historical periods that can be used to develop and test air toxics modeling systems for Corpus Christi.
- 2. Development of emissions inventory and land cover input information. These data will be developed at a spatial resolution that will allow the neighborhood scale air quality models to operate with a resolution of a few hundred meters.
- 3. Application of dispersion models to estimate the neighborhood-scale concentrations of air toxics in Corpus Christi.

Dispersion models represent the current best practice for estimating air toxics concentrations in urban areas. Using emissions, land cover, and meteorological data, a dispersion model will be used to estimate concentrations of air toxics in plumes from sources identified in the emissions inventory and during historical meteorological conditions identified during the conceptual model development

4. Development of improved meteorological models of air pollutant dispersion in the Corpus Christi area.

A more rigorous combined plume and gridded model able to characterize the complex coastal meteorology in the region will also be developed and applied in order to address uncertainties in predicted concentrations obtained from the dispersion model. A state-of-the-science meteorological model will be used to simulate the three-dimensional weather conditions in the Corpus Christi area, with a focus on the replication of historical weather patterns identified in the conceptual model. Simulation of local circulation features will be carefully assessed, and additional analyses will customize the model for best performance in the Corpus Christi area.

5. Development of combined gridded and plume models to estimate neighborhood-scale concentrations of air toxics in Corpus Christi:

The combined gridded and plume model will predict three-dimensional concentrations of selected air toxic pollutants throughout the Corpus Christi area using the meteorological modeling, emission inventory and land cover data described above. An evaluation framework will be developed to compare predicted and observed concentrations during specific historical episodes and to refine the modeling approach and performance.

6. Application of the combined dispersion and gridded modeling tools to estimate concentrations of air toxics in Corpus Christi.

The combined dispersion and gridded modeling tools will be applied to estimate concentrations of air toxics in Corpus Christi under a variety of meteorological conditions for routine emissions and when monitoring data has indicated higher concentrations of air toxics than would be expected under routine emission conditions; make spatial mappings of the estimated air toxics concentrations available on a Project website.

C. Project Milestone Schedule

UT Austin and its subcontractors had four primary objectives for the first year of the Stage 1-Phase 1A of the Air Toxics Project: (1) to develop a conceptual model of air toxics events in the Corpus Christi area; (2) to assess and compare existing point source emission inventories Nueces and San Patricio Counties; (3) to begin dispersion modeling simulations for the region using AERMOD and CALPUFF; and (4) to

initiate meteorological modeling for the region. The first three objectives have been met. The fourth objective experienced a delay due to the late arrival to Texas A&M University of Dr. Nielsen-Gammon's post-doctoral fellow. Work has now begun in earnest on this task. The team will establish objectives for the coming year following the annual report to the Court.

III. Air Toxics Project - Stage 1 - Phase 1B Overview

A. Scope and Objectives

The initial workplan for the Stage I funding called for application of the modeling tools to the Houston Ship Channel region after their demonstration in Corpus Christi with the goal of demonstrating that the neighborhood-scale air toxics modeling framework is applicable to other urban areas. The area surrounding the Ship Channel in east Harris County, Texas is to be used for this demonstration, and the period to be modeled will be August 15-September 15, 2006, which corresponds to the period of the Second Texas Air Quality Study (TexAQS II).

The initial workplan for Stage I has now been restructured and Phase 1B of the project will set aside approximately 50% of Stage 1 project funds to extend the operation of the ambient monitoring network. The modeling of the Houston Ship Channel region will be deferred pending availability of Stage 2 funds.

B. Goals

Under Phase 1B the project team would use the air quality modeling results in synergy with the data collected to date from the ambient network to recommend any future changes in the geographic configuration or instrumentation for the network that might facilitate better characterization of air toxics exposure patterns.

IV. Stage 1 – Phase 1A Project Progress Report

A. Meteorological Team

Mr. Gary McGaughey has completed the development of a conceptual model that analyses meteorological conditions associated with high measured concentrations of total nonmethane hydrocarbon (TNMHC) and benzene in the Corpus Christi area. The seasonality, day-of-week, and diurnal variability of TNMHC and benzene concentrations has also been investigated. The analyses performed in support of the conceptual model primarily used hourly air quality and meteorological measurements collected by the CCAQP monitoring network during the June 2005 through May 2008 period. Mr. McGaughey has produced a draft report that presents a site-level analysis of temporal variability patterns of TNMHC and benzene, duration of high concentration TNMHC and benzene events, and a description of the local and synoptic scale meteorological conditions during hours characterized by high TNMHC and benzene concentrations. Additionally, the conceptual model identifies the geographic areas that potentially contain industrial facility emissions sources that impact air quality at the CCAQP monitoring stations. The team anticipates that this will be a working document for the region that will be updated annually using new ambient monitoring data and will incorporate additional air toxic compounds and case studies. Mr. McGaughey has also begun a similar site-level analysis focused on 1,3-butadiene. Dr. David Sullivan performed an assessment of historic benzene and 1,3-butadiene concentrations, reported emissions, and weather to select a two month period for atmospheric dispersion modeling (October – November 2006). During Spring 2009,

Dr. Sullivan will be incorporating specific case study analyses of short term air toxics events in the Corpus Christi area into the conceptual model.

Together these efforts have been used to select and develop an initial historical episode for atmospheric dispersion modeling. The current best practice for air quality modeling of neighborhood-scale air toxics concentrations is based on the use of Gaussian dispersion models. In collaboration with Dr. David Strohm at ENVIRON, Mr. McGaughey obtained and processed National Weather Service surface and upper air meteorological data for the Corpus Christi area for use with the dispersion modeling. Dr. Greg Yarwood, Mr. Ed Tai, and Mr. Chris Colville of ENVIRON conducted training for the UT Austin team in the application of two dispersion models: CALPUFF and AERMOD. AERMOD is currently the regulatory model used by the U.S. EPA for air toxics studies. The UT team is currently working with AERMOD, while the ENVIRON team is conducting simulations with both models, but has focused more of their attention on CALPUFF. Both teams anticipate the selection of additional air quality modeling episodes for the region.

During this quarter, Dr. Wenfang Lei joined Dr. Nielsen-Gammon at TAMU to initiate the meteorological modeling. The TAMU team and the ENVIRON team are currently working to establish a modeling domain for the Corpus Christi area that can be used for both the meteorological modeling and future photochemical modeling. TAMU has settled on the Weather Research and Forecast (WRF) model as the meteorological model for the project. WRF is supported by the National Center for Atmospheric Research (NCAR), and is used for mesoscale forecasting by the National Weather Service. The WRF model is open-source and has a wide and growing international user base. By using WRF, the project team maximizes the ability to interact and adopt results from other research groups, making it possible to fully utilize knowledge gained from other projects in our own.

B. Modeling Team

Dr. Elena McDonald-Buller and Dr. Greg Yarwood and their teams at UT and ENVIRON, respectively, completed an analysis of existing emission inventories for point sources in the Corpus Christi area. A total of ten emission inventories were examined including the U.S. EPA's Toxic Release Inventories for 2002 through 2006, the U.S. EPA's 2002 National Emissions Inventory for Hazardous Air Pollutants, the Texas Commission on Environmental Quality (TCEQ) 2002 and 2005 submittals to the U.S. EPA National Emissions Inventory for Hazardous Air Pollutants, and the TCEQ 2000 and 2005 Photochemical Modeling Inventories. A report has been completed that describes the origins and objectives of each inventory, the methodology used to investigate and compare the inventories, the results of the study including annual trends in total air emissions and individual air toxics, and inter-comparisons of emissions of selected air toxics from the inventories. Locations of emission points with respect to facility property boundaries were also mapped and are described in the report. The UT and ENVIRON teams have selected the 2005 TCEQ Photochemical Modeling Inventory and the 2005 TCEQ submittal to the HAP NEI as the two inventories to use in the dispersion modeling studies.

ENVIRON has initiated development of similar inventories for area and mobile sources in the Corpus Christi area.

As described in the update for the Meteorological Team above, the UT and ENVIRON teams have conducted the initial dispersion modeling using the 2005 TCEQ photochemical modeling inventory. Mr. Tai and Dr. Yarwood at ENVIRON completed a report describing the methodology and results of this first round of modeling.

V. Collaborative Relationships and Leveraging of the Air Toxics Project

No new collaborative relationships were established during this reporting period. The UT team remains in contact with the U.S. EPA about potential future collaborations as the project matures. Mr. Ron Barnard, Environmental Programs Specialist, at the City of Corpus Christi, graciously provided the UT team with a CD of emissions inventory data they have been developing. The TCEQ, in particular Ron Thomas and Paul Brochi, have been very generous with their time and insights in the emission inventory development work, and we express our appreciation.

VI. Financial Summary

A. Financial Report

Details of the following financial summary information are included in Appendix A, page 7.

1. <u>Detailed List of the Actual Expenditures Paid from Air Toxics Project Funds</u> <u>through December 31, 2008</u>

Expenditures of Air Toxics Project funds during this quarter totaled \$216,614.75. The breakdown of expenditures is included in Appendix A. The activities for which these expenditures were used are detailed in Section IV, beginning on page 4 of this report.

2. <u>Total Interest Earned on Air Toxics Project Funds through December 31, 2008</u> The interest earned during this quarter totaled \$26,884.96. A report providing detailed calculations of the interest earned on the Air Toxics Project funds is included in Appendix A, page 7.

3. <u>Balance as of December 31, 2008, in the Air Toxics Project Account</u> The balance in the Air Toxics Project account, including interest earned totals \$4,218,173.36. This balance has not been reduced the encumbrances not yet charged to the Project Account.

4. <u>Expected Expenditures for the Funds Remaining in the Air Toxics Project Account</u> The expected expenditures for the remaining funds will total \$4,218,173.36.

Quarterly Report Distribution List:

U.S. District Court

Ms. Marianne Serpa, Assistant Deputy-In-Charge, District Court Operations for distribution to the Honorable Janis Graham Jack
cc: Lee Smith, UT Austin Elena McDonald-Buller, UT Austin Gary McGaughey, UT Austin Vincent M. Torres, UT Austin Advisory Board Members of the *Corpus Christi Air Monitoring and Surveillance Camera Project*

APPENDIX A

FINANCIAL REPORT of Expenditures and Interest Earned

Neighborhood Air Toxics Modeling Project for Houston and Corpus Christi - Stage 1

Accounting Report for the Quarter 10/01/2008 - 12/31/2008

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

Total Grant Amount:	\$4,602,598.66
Total Interest Earned:	\$105,427.85
Total Funds Received:	\$4,708,026.51

B. Summary of Expenditures Paid by Air Toxics Funds

	First Year	First Year	First Year	Prior Activity	Current Activity	Encumbrances	Remaining Balance
	Budget Increment	Budget Adjustment	Adjusted Budget		10/01/08-12/31/08		12/31/2008
12	\$395,025.00	0.00	\$395,025.00	(\$172,681.75)	(\$115,582.27)	(\$78,997.57)	\$27,763.41
15	\$42,745.00	0.00	\$42,745.00	(\$15,717.76)	(\$16,154.23)	(\$10,826.16)	\$46.85
14	\$96,309.00	0.00	\$96,309.00	(\$39,915.81)	(\$28,758.43)	(\$19,626.12)	\$8,008.64
50	\$53,583.83	(10,000.00)	\$43,583.83	(\$115.69)	(\$18,140.57)	\$0.00	\$25,327.57
51	\$1,246.00	0.00	\$1,246.00	\$0.00	\$0.00	\$0.00	\$1,246.00
60	\$20,000.00	0.00	\$20,000.00	\$0.00	\$0.00	\$0.00	\$20,000.00
61-63	\$300,000.00	0.00	\$300,000.00	(\$5,802.38)	(\$1,975.37)	\$0.00	\$292,222.25
67	\$34,000.00	0.00	\$34,000.00	\$0.00	\$0.00	\$0.00	\$34,000.00
71	\$9,582.00	0.00	\$9,582.00	(\$3,870.00)	\$0.00		\$5,712.00
75	\$10,000.00	0.00	\$10,000.00	\$0.00	\$0.00	\$0.00	\$10,000.00
80	\$0.00	10,000.00	\$10,000.00	\$0.00	(\$7,245.00)	\$0.00	\$2,755.00
90	\$142,936.17	0.00	\$142,936.17	(\$35,135.01)	(\$28,758.88)	\$0.00	\$79,042.28
	\$1,105,427.00	0.00	\$1,105,427.00	(\$273,238.40)	(\$216,614.75)	(\$109,449.85)	\$506,124.00
	12 15 14 50 61-63 67 71 75 80 90	First Year Budget Increment 12 \$395,025.00 15 \$42,745.00 14 \$96,309.00 50 \$53,583.83 51 \$1,246.00 60 \$20,000.00 61-63 \$300,000.00 61-63 \$300,000.00 67 \$34,000.00 71 \$9,582.00 75 \$10,000.00 80 \$0.00 90 \$142,936,17 \$1,105,427.00	First Year First Year Budget Increment Budget Adjustment 12 \$395,025.00 0.00 15 \$42,745.00 0.00 14 \$96,309.00 0.00 50 \$53,583.83 (10,000.00) 51 \$1,246.00 0.00 60 \$20,000.00 0.00 61-62 \$300,000.00 0.00 71 \$9,582.00 0.00 75 \$10,000.00 0.00 80 \$0.00 10,000.00 90 \$142,936.17 0.00 \$1,105,427.00 0.00	First Year Budget Increment First Year Budget Adjustment First Year Adjusted Budget 12 \$395,025.00 0.00 \$395,025.00 15 \$42,745.00 0.00 \$42,745.00 14 \$96,309.00 0.00 \$\$6,309.00 50 \$53,583.83 (10,000.00) \$\$43,583.83 51 \$1,246.00 0.00 \$\$20,000.00 60 \$20,000.00 0.00 \$\$300,000.00 61-63 \$\$300,000.00 0.00 \$\$300,000.00 71 \$\$9,582.00 0.00 \$\$10,000.00 75 \$10,000.00 0.00 \$\$10,000.00 80 \$0.00 \$\$10,000.00 \$\$10,000.00 90 \$\$142,936.17 0.00 \$\$142,936.17 \$\$1,105,427.00 0.00 \$\$1,05,427.00 \$\$10,000.00	First Year Budget Increment First Year Budget Adjustment First Year Adjusted Budget Prior Activity 12 \$395,025.00 0.00 \$395,025.00 (\$172,681.75) 15 \$42,745.00 0.00 \$42,745.00 (\$15,717.76) 14 \$96,309.00 0.00 \$42,745.00 (\$15,717.76) 14 \$96,309.00 0.00 \$42,746.00 (\$39,915.81) 50 \$53,583.83 (10,000.00) \$43,583.83 (\$115.69) 51 \$1,246.00 0.00 \$20,000.00 \$0.00 60 \$20,000.00 0.00 \$300,000.00 \$0.00 61-62 \$300,000.00 0.00 \$34,000.00 \$0.00 71 \$9,582.00 0.00 \$9,582.00 \$34,000.00 \$0.00 75 \$10,000.00 \$0.00 \$10,000.00 \$0.00 80 \$0.00 10,000.00 \$10,000.00 \$0.00 90 \$142,936.17 0.00 \$142,936.17 \$35,135.01 \$1,105,427.00 0.00 \$142,936.17	First Year Budget Increment First Year Budget Adjustment First Year Adjusted Budget Prior Activity Current Activity 10/01/08-12/31/08 12 \$395,025.00 0.00 \$395,025.00 (\$172,681.75) (\$115,582.27) 15 \$42,745.00 0.00 \$42,745.00 (\$15,717.76) (\$16,154.23) 14 \$96,309.00 0.00 \$96,309.00 (\$39,915.81) (\$28,758.43) 50 \$55,583.83 (10,000.00) \$43,583.83 (\$115.69) (\$18,140.57) 51 \$1,246.00 0.00 \$20,000.00 \$0.00 \$0.00 60 \$20,000.00 0.00 \$300,000.00 \$0.00 \$0.00 61-62 \$300,000.00 0.00 \$34,000.00 \$0.00 \$0.00 71 \$9,582.00 0.00 \$9,582.00 \$0.00 \$0.00 75 \$10,000.00 0.00 \$10,000.00 \$0.00 \$0.00 75 \$10,000.00 \$0.00 \$0.00 \$0.00 \$0.00 75 \$10,000.00 \$0.00 \$10,000.00	First Year Budget Increment First Year Budget Adjustment First Year Adjusted Budget Prior Activity 10/01/08-12/31/08 Encumbrances 12 \$395,025.00 0.00 \$395,025.00 (\$172,681.75) (\$115,582.27) (\$78,997.57) 15 \$42,745.00 0.00 \$42,745.00 (\$16,154.23) (\$10,826.16) 14 \$96,309.00 0.00 \$86,309.00 (\$39,915.81) (\$28,758.43) (\$19,626.12) 50 \$53,583.83 (10,000.00) \$43,583.83 (\$115.69) (\$18,140.57) \$0.00 51 \$1,246.00 0.00 \$1,246.00 \$0.00 \$0.00 \$0.00 60 \$20,000.00 0.00 \$300,000.00 \$0.00 \$0.00 \$0.00 61 \$300,000.00 0.00 \$34,000.00 \$0.00 \$0.00 \$0.00 71 \$9,582.00 0.00 \$10,000.00 \$0.00 \$0.00 \$0.00 75 \$10,000.00 0.00 \$10,000.00 \$0.00 \$0.00 \$0.00 75 \$10,000.00 \$10,000.00

C. Interest Earned by COCP Funds as of 12/31/08

Prior Interest Earned:	\$78,542.89
Interest Earned This Quarter:	\$26,884.96
Total Interest Earned to Date:	\$105,427.85

D. Balance of COCP Funds as of 12/31/08

Total Grant Amount:	\$4,602,598.66
Total Interest Earned:	\$105,427.85
Total Expenditures:	(\$489,853.15)
Remaining Balance:	\$4,218,173.36 *includes interest

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

Accounting Certification

8