

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

Quarterly Report for the Period

July 1, 2008 through September 30, 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)
Center for Energy and Environmental Resources
The University of Texas at Austin
10100 Burnet Road, Bldg 133 (R7100)
Austin, TX 78758
512/475-7842
allen@che.utexas.edu**

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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. The mobile monitoring station will be used to map the spatial distributions of air pollutant concentrations; these maps of air pollutant concentrations will be used to inform the public about the spatial distributions of air pollutants and to evaluate and improve the performance of the neighborhood-scale models developed in Stage 1.

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 Overview

A. Scope and Objectives

The objective of Stage I 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. After demonstration of the modeling tools in Corpus Christi, the modeling tools will be applied in the Houston Ship Channel region. Stage 1 of the Air Toxics Project should provide significant and discernible environmental benefits to the Corpus Christi and Houston areas by providing analyses of air pollutant concentrations experienced by the community, and providing post-event evaluation of pollutants emitted during a release.

B. Major Tasks

The major tasks for Stage I include:

1. *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.

7. *Application of the model framework developed in Corpus Christi to the Houston Ship Channel region in east Harris County, Texas:*

The model framework developed for Corpus Christi will be applied to the Houston Ship Channel with the goal of demonstrating that the neighborhood-scale air toxics

modeling framework is applicable in other urban areas. The area surrounding the Ship Channel in east Harris County, Texas will 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).

C. Project Milestone Schedule

The development of a project milestone schedule has been under development during this quarter. The project milestone schedule will be completed by UT Austin and the Project subcontractors.

III. Project Progress Report

A. Meteorological Team

Mr. Gary McGaughey and Dr. David Sullivan are leading the development of a conceptual model to describe the frequency of occurrence, spatial scale and duration of air toxic pollutant events in the Corpus Christi area using integrated analyses of the ambient monitoring data, emissions, and meteorological observations. Mr. McGaughey has produced a draft report that presents a site-level analysis of the seasonality, day-of-week, and diurnal patterns of total nonmethane hydrocarbon (TNMHC) concentrations in the Corpus Christi area, duration of TNMHC events, local and synoptic scale meteorological patterns during high TNMHC concentrations, and identification of industrial facilities located upwind of monitoring stations prior to high TNMHC events. Mr. McGaughey has also begun a similar site-level analysis focused on benzene and 1,3-butadiene. Dr. Sullivan has begun a case study analysis of air toxics events in the Corpus Christi area.

Together these efforts have been used to select an initial historical episode for atmospheric dispersion modeling, which is anticipated to be initiated in late November 2008. 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 ENVIRON, Mr. McGaughey has ordered National Weather Service surface and upper air meteorological data for the Corpus Christi area from the National Climatic Data Center, with the eventual goal of creating a multi-year archive of meteorological data for the region. These data will be processed and used in the dispersion modeling. Dr. Greg Yarwood and Dr. David Strohm at ENVIRON have developed a modeling domain that includes Nueces and San Patricio Counties as well as much of Nueces Bay. ENVIRON will be conducting 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. ENVIRON has extensive experience with the application of both models for air quality analyses.

During this quarter, TAMU initiated a search for a suitable research scientist for the project. Dr. Wenfang Lei, who holds a Ph.D. from Texas A&M University and more recently has been working as a postdoc under Prof. Luisa Molina at the University of California at San Diego, was offered and accepted the position. Dr. Lei will begin work remotely around the beginning of next year and will arrive at TAMU to work full-time in the spring of 2009. Also, in August, Dr. Nielsen-Gammon accepted a one-year appointment as Acting Executive Associate Dean for the College of Geosciences,

so his role in the project will be primarily oversight, coordination, and reporting. As a result of these developments, TAMU anticipates incurring no expenses under this subcontract until January, when work on this project will commence in earnest with the arrival of Dr. Lei.

The TAMU team's primary task for the beginning of the project was the identification of an appropriate meteorological model. TAMU has settled on the Weather Research and Forecast (WRF) model. WRF is supported by the National Center for Atmospheric Research (NCAR), and is used for mesoscale forecasting by the National Weather Service. The model itself is a state-of-the-art model designed for high-resolution (1 km to 10 km) simulations. It includes a wide variety of physical parameterizations, including some designed specifically for air quality purposes, and it includes the capability of running photochemical and transport models in fully-coupled mode. (Most earlier-generation meteorological models were uncoupled from photochemical models, resulting in an update frequency for meteorological conditions of about once per hour. A fully coupled model updates the meteorological conditions every time step, potentially hundreds of times per hour). 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 are leading an analysis of existing emission inventories for point sources in the Corpus Christi area. These inventories include 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 State of Texas 2005 submittal to the U.S. EPA National Emissions Inventory for Hazardous Air Pollutants, and the State of Texas 2005 air quality modeling inventory. Annual variability in reported emissions is being examined using the TRI data, as well as differences in emissions by facility between the various inventories. The locations of emission points with respect to facility property boundaries are also being mapped. Selected emission inventories will be processed and used in the dispersion modeling efforts.

Maps of population density by U.S. Census block groups and susceptible locations of interest, such as schools, have been developed for the Corpus Christi area. These data will be used to create a grid of receptor locations for the dispersion modeling.

IV. Collaborative Relationships and Leveraging of the Air Toxics Project

In August 2008, Dr. Allen and Dr. McDonald-Buller briefed the TCEQ on the project objectives and plans. They conducted a similar briefing at a meeting of the Science Advisory Committee of the Texas Environmental Research Consortium. Representatives of the Mickey Leland National Urban Air Toxics Research Center and the Houston Advanced Research Center were in attendance. Dr. McDonald-Buller briefed the U.S. EPA on the project in October 2008 and discussed opportunities for collaboration.

V. Financial Summary

A. Financial Report

Details of the following financial summary information are included in Appendix A, page 8.

1. Detailed List of the Actual Expenditures Paid from Air Toxics Project Funds through September 30, 2008

Expenditures of Air Toxics Project funds during this quarter totaled \$172,420.42. The breakdown of expenditures is included in Appendix A. The activities for which these expenditures were used are detailed in Section III, beginning on page 3 of this report.

2. Total Interest Earned on Air Toxics Project Funds through September 30, 2008 The interest earned during this quarter totaled \$31,952.04. A report providing detailed calculations of the interest earned on the Air Toxics Project funds is included in Appendix A, page 8.

3. Balance as of September 30, 2008, in the Air Toxics Project Account

The balance in the Air Toxics Project account, including interest earned totals \$4,407,903.15.

4. Expected Expenditures for the Funds Remaining in the Air Toxics Project Account

The expected expenditures for the remaining funds will total \$4,407,903.15.

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

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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
07/01/2008 - 09/30/2008**

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

Total Grant Amount: \$4,602,598.66
 Total Interest Earned: \$78,542.89
 Total Funds Received: **\$4,681,141.55**

B. Summary of Expenditures Paid by Air Toxics Funds

		First Year Budget Increment	First Year Budget Adjustment	First Year Adjusted Budget	Prior Activity	Current Activity 7/1/08 - 09/30/08	Encumbrances	Remaining Balance 9/30/2008
Salaries-Prof	12	\$419,129.00	(24,104.00)	\$395,025.00	(\$66,716.24)	(\$105,965.51)	(\$19,742.82)	\$202,600.43
Salaries-CEER	15	\$18,641.00	24,104.00	\$42,745.00	(\$6,218.69)	(\$9,499.07)	(\$11,015.99)	\$16,011.25
Fringe	14	\$96,309.00	0.00	\$96,309.00	(\$14,711.84)	(\$25,203.97)	(\$8,423.54)	\$47,969.65
Supplies	50	\$61,916.00	(8,332.17)	\$53,583.83	(\$21.04)	(\$94.65)	\$0.00	\$53,468.14
Contingency	51	\$1,246.00	0.00	\$1,246.00	\$0.00	\$0.00	\$0.00	\$1,246.00
Consultants	60	\$20,000.00	0.00	\$20,000.00	\$0.00	\$0.00	\$0.00	\$20,000.00
Subcontracts	61-63	\$300,000.00	0.00	\$300,000.00	\$0.00	(\$5,802.38)	\$0.00	\$294,197.62
Modeling/Computer Svs	67	\$34,000.00	0.00	\$34,000.00	\$0.00	\$0.00	\$0.00	\$34,000.00
Tuition	71	\$0.00	9,582.00	\$9,582.00	\$0.00	(\$3,870.00)	\$0.00	\$5,712.00
Travel	75	\$10,000.00	0.00	\$10,000.00	\$0.00	\$0.00	\$0.00	\$10,000.00
Equipment	80	\$0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Indirect Costs	90	\$144,186.00	(1,249.83)	\$142,936.17	(\$13,150.17)	(\$21,984.84)	\$0.00	\$107,801.16
TOTALS		\$1,105,427.00	0.00	\$1,105,427.00	(\$100,617.98)	(\$172,420.42)	(\$39,182.35)	\$793,006.25

C. Interest Earned by COCP Funds as of 9/30/08

Prior Interest Earned: \$46,590.85
 Interest Earned This Quarter: \$31,952.04
 Total Interest Earned to Date: **\$78,542.89**

D. Balance of COCP Funds as of 09/30/08

Total Grant Amount: \$4,602,598.66
 Total Interest Earned: \$78,542.89
 Total Expenditures: (\$273,238.40)
 Remaining Balance: **\$4,407,903.15** *includes interest

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



Accounting Certification