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

Quarterly Report for the Period

March 3, 2008 through March 31, 2008

Submitted to

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

Submitted by

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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

During Stage 1 of The Air Toxics Project the University will develop, apply, and make publicly available, neighborhood-scale air quality modeling tools for toxic air pollutants in the Corpus Christi area. After the demonstration of the modeling tools in Corpus Christi, the modeling tools will be demonstrated in the Houston Ship Channel region. The objective of Stage 1 of the Air Toxics Project is to 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. The information obtained from this Air Toxics Project will provide the communities with more knowledge of the types and quantities of

pollutants emitted from petroleum-based industries along the Corpus Christi and Houston ship channels.

B. Major Tasks

Stage 1 will be conducted through the following major tasks:

1. *Develop a conceptual model of meteorological conditions likely to lead to high concentrations of air toxics in the Corpus Christi area:*
   The data collected on air toxics concentrations and meteorology in Corpus Christi will be coupled with other meteorological and air quality data to determine meteorological conditions (seasons, temperatures, wind speeds, wind directions, frontal passages and other parameters) 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. *Develop emissions inventory and land cover input information:*
   Neighborhood scale air toxics modeling will require a much finer spatial resolution of emission sources and land covers than is currently available as inputs to air quality models. These model inputs 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. *Apply dispersion models to estimate the neighborhood-scale concentrations of air toxics in Corpus Christi:*
   Using emissions data and ground wind data, dispersion models will be used to estimate concentrations of air toxics in plumes from sources identified in the emissions inventory of Task B.2. A variety of historical meteorological conditions will be considered, based on the conceptual model identified in Task B.1. The estimated plume concentrations from individual sources will be combined to provide estimates of total air toxics concentrations in Corpus Christi. This approach represents the current best practice for estimating air toxics concentrations in urban areas, however, the complex meteorology in coastal areas will lead to uncertainties in modeled concentrations, therefore, a combined plume and gridded model, able to characterize complex meteorologies will also be developed and applied (Tasks B.4 and B.5)
4. *Develop improved meteorological models of air pollutant dispersion in the Corpus Christi area:*
   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 developed in Task B.1. The near-surface wind field in Corpus Christi is strongly affected by complex circulation features such as the land/sea and land/bay breezes. These localized circulation features are intimately linked to the interactions between the surface and the lower atmosphere; therefore, the simulation of these interactions will be carefully examined. Additional analyses will customize the model for best performance in the Corpus Christi area. For example, the available meteorological observations (e.g., wind speed and direction, humidity, temperature) will be compared to the predicted values for specific historical episodes. These comparisons may lead to modifications to the input datasets and/or the physics/parameterizations used by the meteorological model.

5. *Develop combined gridded and plume models to estimate neighborhood-scale concentrations of air toxics in Corpus Christi:*
   Gridded and plume models will be developed that predict the three-dimensional concentrations of selected air toxic pollutants throughout the Corpus Christi area. The required inputs to the gridded and plume models include the emissions inventory and land cover information summarized in Task B.2 and the results of the full meteorological modeling described in Task B.4. The gridded and plume models simulate all atmospheric processes that impact the prediction of ground-level air pollutant concentrations, including atmospheric chemistry, transport and dispersion of pollutant plumes, and the interaction of air pollutants with the land/water surfaces. The mechanisms used by the gridded and plume models to simulate the atmospheric chemistry of the specific air toxics of interest will be incorporated and/or modified as needed. An essential component of this Task will be the development of an evaluation framework to compare the predicted and observed concentrations during specific historical episodes. This evaluation process will lead to a range of analyses designed to identify and further evaluate improvements to either the input datasets (e.g., meteorological inputs, emissions) or to the model physics and/or parameterizations (e.g., chemical mechanisms, simulations of bay breezes, simulation of vertical dispersion). This evaluation will be an iterative and ongoing process to continually assess and enhance model performance, and will be coupled with the measurements planned for Stage 2 of this work.
6. *Apply 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. *Apply the model framework developed in Corpus Christi to the Houston Ship Channel region in east Harris County, Texas:*
   Apply the model framework developed for Corpus Christi to the Houston Shp Channel for periods for which intensive meteorological modeling and photochemical modeling have been performed; the goal of this Task is to demonstrate that the modeling framework developed for air toxics modeling, in Tasks B.1 through B.6 can be applied 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. During this period, a large international team of scientists made an extensive set of meteorological and chemical measurements in the Houston Ship Channel region. Meteorological modeling of the period has been performed and is currently being refined and evaluated, so that by the time this stage of the Air Toxics Project is undertaken, meteorological models will be available. In addition, detailed, hourly emission inventories from industrial facilities in the Ship Channel region have been prepared for the period.

C. Project Organization and Responsibilities

The Air Toxics Project will be lead by Dr. David Allen, who will serve as Principal Investigator on the project. The technical work of the project will be conducted by two project teams led by UT Austin personnel: a meteorology team and a modeling team. The Meterology Team will be led by Mr. Gary McGaughey and the Modeling Team will be led by Dr. Elena McDonald-Buller. Some modeling and meteorology work will be outsourced to a subcontractor under the direction of either Mr. McGaughey or Dr. McDonald–Buller as appropriate. Administrative, financial and project reporting will be the responsibility of Mr. Vincent Torres.

III. Schedule of Milestones

A. Milestones Completed this Quarter

In order to begin work on Tasks B.1 to B. 7, members of the two technical project teams needed to be finalized. Work began on the development of scopes of work and the subcontracts needing to be issued by UT Austin. During this quarter the subcontractors for the Meteorology and Modeling Teams were selected and the development of respective scopes of work were initiated. UT Austin has selected ENVIRON International Corporation (ENVIRON) as the modeling support subcontractor for this project because of ENVIRON's extensive background and recognized expertise in the area of photochemical modeling and emission inventory development. Dr. Greg Yarwood, who will be ENVIRON's Principal Investigator, and the ENVIRON team have an extensive history of working with the State of Texas on air quality modeling to support regulatory decisions for the State Implementation Plan.

For the Meteorological Team, UT Austin has selected Texas A&M University as the meteorology support subcontractor, with Dr. John Nielsen-Gammon as the Principal Investigator. The development of the neighborhood air toxics model will require the use of a state-of-the-science meteorological model to simulate the three-dimensional weather conditions in the Corpus Christi area. Particular attention will be focused on the establishment of the appropriate vertical resolution, compatibility of the vertical and horizontal resolutions, vertical and horizontal mixing parameterizations and the appropriate resolution, characterization, and modeling of the land surface. Dr. Nielsen-Gammon has unmatched experience in the application and improvements of meteorological models used in air quality studies in Texas, including responsibility for the forecast and historical simulations during both the TexAQS I and TexAQS II programs. His expertise has been recognized by the State of Texas through his role as State Climatologist. Dr. Nielsen-Gammon has employed sophisticated modeling techniques, such as satellite data assimilation and modifications to the physics and parameterizations of vertical mixing, to produce high-resolution simulations for coastal areas of Texas. Under the guidance of Dr. Nielsen-Gammon, Texas A&M University Staff has studied the impact of the land/sea and land/bay breezes on air quality within coastal areas of Texas. These localized circulation features are intimately linked to the interactions between the surface and lower atmosphere, and must be accurately captured to provide realistic simulations of the low level meteorological conditions in the Corpus Christi area. Dr. Nielsen-Gammon is a recognized expert on the linear and nonlinear

processes leading to the development and evolution of the land/sea breezes in subtropical regions such as Texas.

Work also began this quarter on the development of a project milestones schedule.

IV. Collaborative Relationships and Leveraging of the Air Toxics Project

So as to derive the most benefit for the public from this project, appropriate opportunities for collaboration and leveraging of project resources will be explored whenever possible. Some inquiries received in March may present opportunities for collaboration and/or leveraging of resources. These inquiries are being explored and will be reported on in future progress reports should they develop into beneficial collaborations for the Air Toxics Project.

V. Financial Summary

A. Budget for Year One

The budget for year one of the Air Toxics Project is under development.

B. Financial Report

On March 3, 2008 UT Austin received Air Toxics Project funds in the amount of $4,602,598.66.

1. Detailed List of the Actual Expenditures Paid from Air Toxics Project Funds
During this quarter there were no expenditures paid from the Project funds.

2. Total Interest Earned on Air Toxics Project Funds During the Quarter
The interest earned during this quarter totaled $12,134.98.

3. Balance as of March 31, 2008, in the Air Toxics Project Account
The balance in the Air Toxics Project account, including interest earned totals $4,614,733.64.

4. Expected Expenditures for the Funds Remaining in the Air Toxics Project Account
The expected expenditures for the funds remaining totals $$4,614,733.64.

Quarterly Report Distribution List:

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