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Development and Critical Evaluation of Air Pollution Emissions Inventories Representing Industrial and Commercial Facilities: A Case Study of Wilmington, California

A dissertation submitted in partial satisfaction of the

requirements for the degree

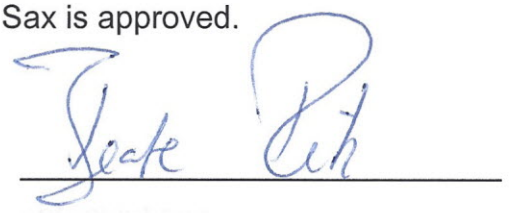
of Doctor of Environmental Science and Engineering

by

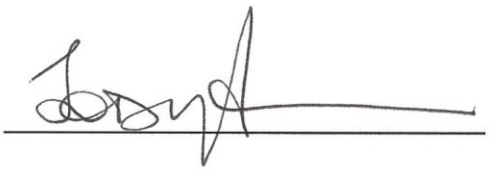
Todd Patrick Sax

2004

The dissertation of Todd Patrick Sax is approved.



Beate Ritz



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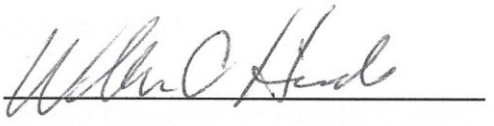

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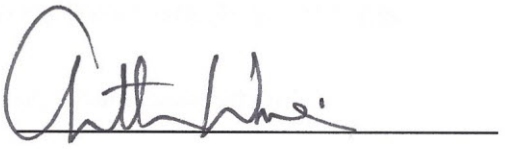

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TABLE OF CONTENTS

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PUBLICATIONS AND PRESENTATIONS

Isakov, V., Sax, T., Venkatram, A., Pankratz, D., Heumann, J., Fitz, D., (2004). Near Field Dispersion Modeling for Regulatory Applications, Journal of the Air and Waste Management Association, in press.

Sax, T., Isakov, V., (2003). A Case Study for Assessing Uncertainty in Local-Scale Regulatory Air Quality Modeling Applications, Atmospheric Environment 37(5) 3481-3489.

Sax, T., Isakov, V., Sicat, M., (2003). Wilmington Air Quality Study: Emissions Inventory and Modeling for Neighborhood Assessment, Presented to the 96th Annual Air and Waste Management Association Conference and Exhibition, San Diego, California.

Sax, T., Isakov V., (2003). Wilmington Air Quality Study: A Framework for Local Scale Uncertainty Assessment, Presented to the 96th Annual Air and Waste Management Association Conference and Exhibition, San Diego, California.

Sax, T., Sicat, M., Isakov, V., (2003). Wilmington Air Quality Study: Emissions Inventory Development and Evaluation, Presented to the 12th Annual EPA Emissions Inventory Conference, San Diego, California.

ABSTRACT OF THE DISSERTATION

Development and Critical Evaluation of Air Pollution Emissions Inventories Representing Industrial and Commercial Facilities: A Case Study of Wilmington, California

by

Todd Patrick Sax

Doctor of Environmental Science and Engineering

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Professor Arthur Winer, Chair

This dissertation describes the development and evaluation of an emissions inventory representing industrial and commercial facilities within and surrounding the community of Wilmington in Los Angeles for the California Air Resources Board's (ARB) Wilmington Air Quality Study (WAQS). The WAQS, conducted as part of the ARB's Neighborhood Assessment Program (NAP), was designed to assess the performance of models used to estimate pollutant concentrations on refined spatial scales. Specific objectives of this dissertation included evaluating statewide emissions inventories for their ability to support spatially resolved modeling, assessing uncertainty in selected source categories,

and quantifying all diesel exhaust particulate matter (DPM) emissions at industrial-commercial facilities.

To develop an inventory, multiple local, state, and federal databases were collected. Inventory data were augmented by on-site surveys, and a final inventory was developed representing each facility. This inventory was compared to the statewide inventory; emissions estimates differed by as much as an order of magnitude from the statewide inventory in some cases. Statewide inventories did not appear to contain the most recently calculated or comprehensive emissions data representing most facilities in the WAQS domain.

DPM represented 70% of cancer-potency weighted emissions generated by industrial-commercial facilities in the WAQS domain. About 80% of these emissions were generated by on-site mobile sources identified by survey. On-site mobile sources were not included in stationary source facility inventory reports, which complicated neighborhood-scale inventory development. Quantitative analysis suggested uncertainty in mobile source DPM estimates exceeded an order of magnitude.

To improve neighborhood assessments several recommendations were offered, including standardizing inventory methodologies, improving communication between local districts and ARB, balancing inventory specificity with desired modeling resolution, focusing local-scale inventories on limited pollutants, and communicating neighborhood assessment results on a relative basis. Until ARB inventory databases are improved, ARB's NAP will be

significantly limited by uncertainty, spatial-allocation of emissions, and quality control issues in California's statewide inventory.