STATE OF NEW MEXICO
Before the
ALBUQUERQUE-BERNALILLO COUNTY
AIR QUALITY CONTROL BOARD

IN THE MATTER OF THE PETITION FOR
A HEARING ON THE MERITS REGARDING
AIR QUALITY PERMIT NO. 3131 [Honstein Oil] No. AQCB 2014-4

SouthWest Organizing Project [SWOP]
by Juan Reynosa, Environmental Justice Organizer;
Esther and Steven Abeyta, Members of SWOP,
Petitioners

Petitioners' Notice of Intent to Present Technical Testimony

Pursuant to the Hearing Officer's December 19, 2014 Pre-hearing Order in the above-captioned matter, Petitioners' hereby submit their Notice of Intent to Present Technical Testimony at the hearing scheduled for May 13-14, 2015. Petitioners intend to offer the following technical testimony:

I. Names and Qualifications of Witnesses to be Presented

SWOP intends to offer the following witnesses:

1. Ms. Kitty Richards, MPH, M.S. Ms. Richards will testify about the socioeconomic demographics of the San Jose neighborhood, including racial and ethnic composition. Ms. Richards will also testify about the concentration of air pollution sources in and near the San Jose neighborhood. Finally, Ms. Richards will provide an overview of the incidences of disease associated with environmental pollution in the San Jose neighborhood. Ms. Richards will offer the opinion that the San Jose neighborhood is predominantly low-income and minority, and bears a higher proportion of air pollution sources than affluent, non-minority

neighborhoods in Bernalillo County. Ms. Richards' complete resume is attached as SWOP Exhibit 1. A.

2. Dr. George Thurston

Dr. George Thurston, Director of the Program in Exposure Assessment and Health Effects at the New York University School of Medicine's Department of Environmental Medicine, will testify in depth about the health effects associated with the kinds of air pollutants emitted by the Honstein bulk petroleum facility and other polluting sources in and adjacent to the San Jose neighborhood. Dr. Thurston will offer the opinion that air emissions from the Honstein facility, in combination with pollution from other sources, may create a reasonable risk of adverse health effects to residents of the San Jose neighborhood.

Dr. Thurston is qualified to offer his expert opinion because of his education and experience. Dr. Thurston holds a Ph.D. in Environmental Health Science from Harvard University. Dr. Thurston has conducted extensive research on the impacts of air pollution, particularly particulate matter and volatile organic compounds on the health of low-income and minority communities. Additionally, Dr. Thurston has published extensively on this subject in peer-reviewed journals, and has reviewed academic manuscripts on this subject from other researchers. Dr. Thurston has given presentations on the cumulative impacts of air pollution to regional, national, and international audiences. A complete account of Dr. Thurston's qualifications are in his *Curriculum Vitae*, attached as SWOP Exhibit 2.A.

3. Dr. Dana Rowangould, Affiliate Associate Professor at the University of Washington, Department of Civil and Environmental Engineering and principal in Sustainable Systems Research, LLC. Dr. Rowangould will testify about a) the socioeconomic conditions in the San Jose neighborhood based on publicly available information; b) the sources of air

pollution in and adjacent to the San Jose neighborhood based on publicly available information; and c) the potential impacts from multiple pollution sources on San Jose neighborhood residents. Dr. Rowangould will offer the opinion that air pollution from the Honstein bulk petroleum facility, when considered with the other multiple air pollution sources in and adjacent to the San Jose, may pose a reasonable risk to human health and property use to San Jose residents, and given the potential problems with cumulative air impacts in San Jose, a more in depth cumulative air impacts analysis would better illustrate the risks associated with the Honstein permit. Dr. Rowangould's complete testimony is attached hereto as SWOP Exhibit 3.

Dr. Rowangould is qualified to offer her testimony based on education and experience. Dr. Rowangould received her Ph.D. in Ecology with an emphasis in Environmental Science and Policy from the University of California, Davis. Dr. Rowangould's has measured and evaluated soil, water, and air pollution levels at industrial facilities. Her doctoral research focused on estimating greenhouse gas emissions from a variety of sources associated with urban development and on the expected emissions from urban land use policies, plans, and implementation. Her postdoctoral work (conducted with the Center for Regional Change at the University of California, Davis) involved evaluating the health and environmental justice impacts of regional land use and transportation plans in California's Central Valley. Dr. Rowangould teaches a graduate level course entitled "Health and Sustainable Transportation" in the Department of Civil and Environmental Engineering at the University of Washington.

Dr. Rowangould has conducted numerous environmental justice analyses, which entail gathering demographic information, pollution emission information and health information in a given area. Dr. Rowangould's analyses have been included in public comments submitted to Federal and state environmental administrative agencies to support opposition to (or

modification of) industrial and highway projects with impacts in environmental justice communities. A full description of Dr. Rowangould's qualifications is attached as SWOP Exhibit 3.A.

II. Exhibits

Petitioners' experts intend to offer the following Exhibits:

1. Ms. Richards:
    a. SWOP Exhibit 1, Written Testimony of Kitty Richards;
    b. SWOP Exhibit 1.A, Kitty Richards resume;
    c. SWOP Exhibit 1.B., Map 5 from *Place Matters for Health in Bernalillo County* (Joint Center for Political and Economic Studies, 2012);
2. Dr. Thurston:
    a. SWOP Exhibit 2, Written Testimony of Dr. George Thurston;
    b. SWOP Exhibit 2.A, *Curriculum Vitae* of George Thurston;
3. Dr. Rowangould:
    a. SWOP Exhibit 3, Written Testimony of Dr.Dana Rowangould;
    b. SWOP Exhibit 3.A, *Curriculum Vitae* of Dana Rowangould;
    c. SWOP Exhibit 3.B, Memorandum analyzing cumulative impacts in San Jose neighborhood.

Petitioners reserve the right to present additional demonstrative exhibits at the time of hearing.

III. Anticipated Length of Testimony

Petitioners anticipate that Ms. Richards' testimony will last approximately one hour, exclusive of cross examination. Petitioners reserve the right to call Ms. Richards as a rebuttal witness.

Petitioners anticipate that Dr. Thurston's testimony will last approximately two hours, exclusive of cross-examination. Petitioners reserve the right to call Dr. Thurston as a rebuttal witness.

Petitioners anticipate that Dr. Rowangould's testimony will last approximately two hours, exclusive of cross-examination. Petitioners reserve the right to call Dr. Rowangould as a rebuttal witness.

DATED: April 8, 2015.

NEW MEXICO
ENVIRONMENTAL LAW CENTER

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Attorneys for Petitioners

CERTIFICATE OF SERVICE

I hereby certify that on this 8th day of April, 2015, I have placed a copy of the foregoing pleading in the above-captioned case in the US Mail, First Class to the following:

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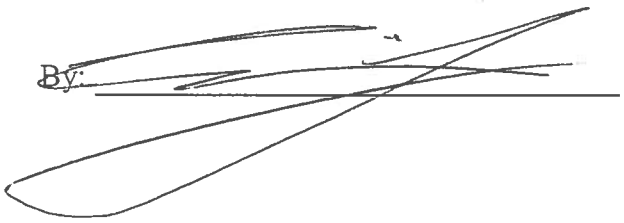
By: 

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IN THE MATTER OF THE PETITION FOR
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WRITTEN TESTIMONY OF KITTY M. RICHARDS

I, Kitty Richards, hereby swear and affirm that the following is true to the best of my knowledge. I am qualified and competent to give this declaration, and the factual statements herein are true and correct to the best of my knowledge, information and belief. The opinions expressed herein are based on my best professional judgment.

I. Name and Title

My name is Kitty M. Richards. I am an independent consultant with my own consulting business.

II. Background and Experience

I have a Bachelor of Arts degree in Geography from the University of California, Santa Barbara, a Master of Science degree in Resource Economics from New Mexico State University, and a Master in Public Health degree from the University of New Mexico. I have over twenty-five years of experience in the environmental health field.

Since September of 2014, I have been a private consultant on environmental health issues in New Mexico for various clients including New Mexico Department of Health, Santa Fe Community Foundation, and the New Mexico Voices for Children.

SWOP Exhibit 1

Prior to June of 2014, I worked for 25 years in the environmental health field for state and local government. In the 1980's I worked as an environmental scientist for the New Mexico Environment Department in the Superfund Section, from 1991 to 1994, after receiving my Master degree in Resource Economics, I again worked for the New Mexico Environment Department, District III, as an environmental scientist covering border issues along the U.S.-Mexico border and worked on the Environmental Protection Agency's Border XXI initiative.

From 1994 to 2002, I worked as an epidemiologist for the New Mexico Department of Health's Border Health Office. As an epidemiologist for the Border Health Office, I was responsible for administering a $1 million program to address community environmental health issues in the colonias, monitoring ground and surface water quality throughout Southwest New Mexico, conducting epidemiological assessments, conducting community environmental health assessments, overseeing grants, and monitoring contracts and related deliverables.

From 2002 to 2014, I worked as a program manager for Bernalillo County's Office of Health and Social Services (previously the Bernalillo County Environmental Health Department) Health Promotion Program. I was responsible for administering grants, monitoring contracts, supervising personnel, conducting health impact assessments, and providing environmental and environmental health technical services to communities throughout the unincorporated area of Bernalillo County. In addition to my role as a Program Manager, I was also responsible for leading a Bernalillo County government effort called, "Place Matters" from 2006 to 2012. As the leader of Place Matters, I was responsible for facilitating and convening monthly

meetings of health professionals and community residents to address environmental justice and health disparities issues among people of color and low-income communities, as well as developing proactive policies to address the disproportionate health and environmental burdens of these communities. The Place Matters work culminated in a report, "Place Matters for Health in Bernalillo County", which evaluated the impact of neighborhood conditions on health status. Conclusions confirmed perceptions of vulnerable communities, that they were being exposed to disproportionate environmental burdens and that they were bearing a higher health burden than for Bernalillo County as a whole.

From 2004 – 2006, I was the principle investigator for a Community Action for a Renewed Environment (CARE) grant, funded by the Environmental Protection Agency, to evaluate existing practices and promote best practices at auto salvage yards located throughout the South Valley. Air pollution monitoring and data assessment for volatile organic compounds and particulate matter at each auto salvage yard was part of the overall evaluation.

From 2002 – 2008, I was responsible for coordinating and facilitating a multi-million dollar federal National Institute for Environmental Health Sciences grant to Bernalillo County to address environmental justice issues within the unincorporated areas of Bernalillo County.

During my tenure at Bernalillo County, I conducted numerous studies throughout the South Valley of Bernalillo County on air quality, water quality, and health. Air quality studies utilized publicly accessible data through the AIRS database of the Environmental Protection Agency and well as primary data collected

via personal monitors to assess personal, outdoor and indoor air quality and human exposures. In response to community concerns regarding the cumulative impact of air emissions to their community's health, the Albuquerque-Bernalillo County Air Quality Control Board formed an Environmental Justice Task Force. I was a member of the Environmental Justice Task Force and I was also responsible for the monitoring and payment of a consultant hired by Bernalillo County to facilitate the work of the Environmental Justice Task Force and to develop recommended next steps as a result of the work.

III. Analysis and Conclusion

A. Introduction

My testimony will include an overview of the socioeconomic and demographic characteristics of the San Jose neighborhood when compared with Bernalillo County, including racial and ethnic composition. Socioeconomic and demographic data will come from the U.S. Census Bureau. I will also provide data on the concentration of air pollution sources within San Jose compared with Bernalillo County. Finally, I will provide data on age-adjusted mortality rates for the 50 leading causes of disease and life expectancy for the San Jose neighborhood, with a comparison to Bernalillo County as a whole. Mortality and life expectancy data is based on data collected from the New Mexico Department of Health's Indicator-Based Information System. I will offer the opinion that the San Jose neighborhood is predominantly low-income and minority, and bears a higher proportion of air pollution sources and disease burden, and experiences lower life expectancy than other neighborhoods in Bernalillo County.

B. Demographic and Socioeconomic Data

When comparing Bernalillo County's minority population with that of census tracts 13.00 and 40.01, Bernalillo County's Hispanic or Latino population (of any race) is comprised of 47.9%, while the percentages of Hispanic or Latino population in census tracts 13.00 and 40.01 are 88% and 71%, respectively. Further, Bernalillo County's non-Hispanic white only population percentage is 41.5%, compared with the non-Hispanic white only population percentages for census tracts 13.00 and 40.01of 6% and 24%, respectively (*see*, Figure 1).

Demographic Data for Bernalillo County, Census Tract 13.00 and Census Tract 40.01 (Source: Profile of General Population and Housing Characteristics 2010, 2010 Demographic Profile)

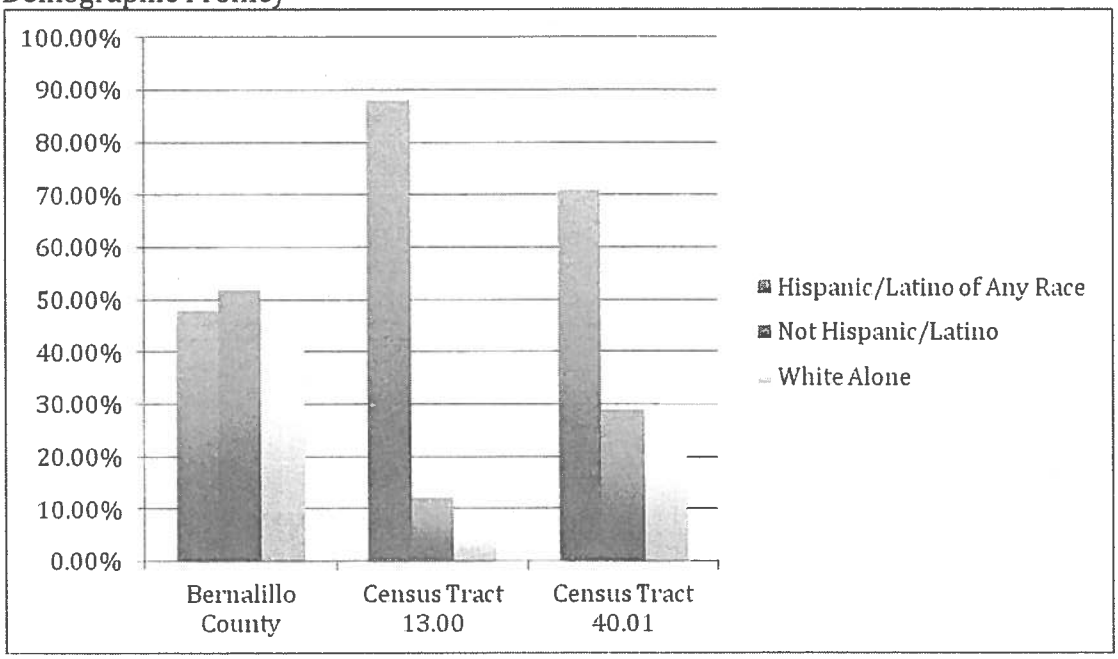


Figure 1

I reviewed the following U.S. Census data regarding the socioeconomic make-up of San Jose and Bernalillo County. When compared with Bernalillo County's unemployment rate of 5.4%, census tracts 13.00 and 40.01 that underlie the San

Jose neighborhood, exhibit an unemployment rate of 17.8% and 16.8%, respectively. When compared with Bernalillo County's percentage of people living below the Federal Poverty Level of 18%, census tracts, 13.00 and 40.01 exhibit percentages of people living below the Federal Poverty Level of 37.1% and 29.3%, respectively. Further, when compared with Bernalillo County's percentage of children under the age of 18 living below the Federal Poverty Level of 25.6%, census tracts 13.00 and 40.01 exhibit percentages of children under the age of 18 living below the Federal Poverty Level of 47.1% and 41.9%, respectively (*see*, Figure 2).

Socioeconomic Data for Bernalillo County, Census Tract 13.00 and Census Tract 40.01 (Source: 2009-2013 American Community Survey 5-year Estimates, Selected Economic Characteristics)

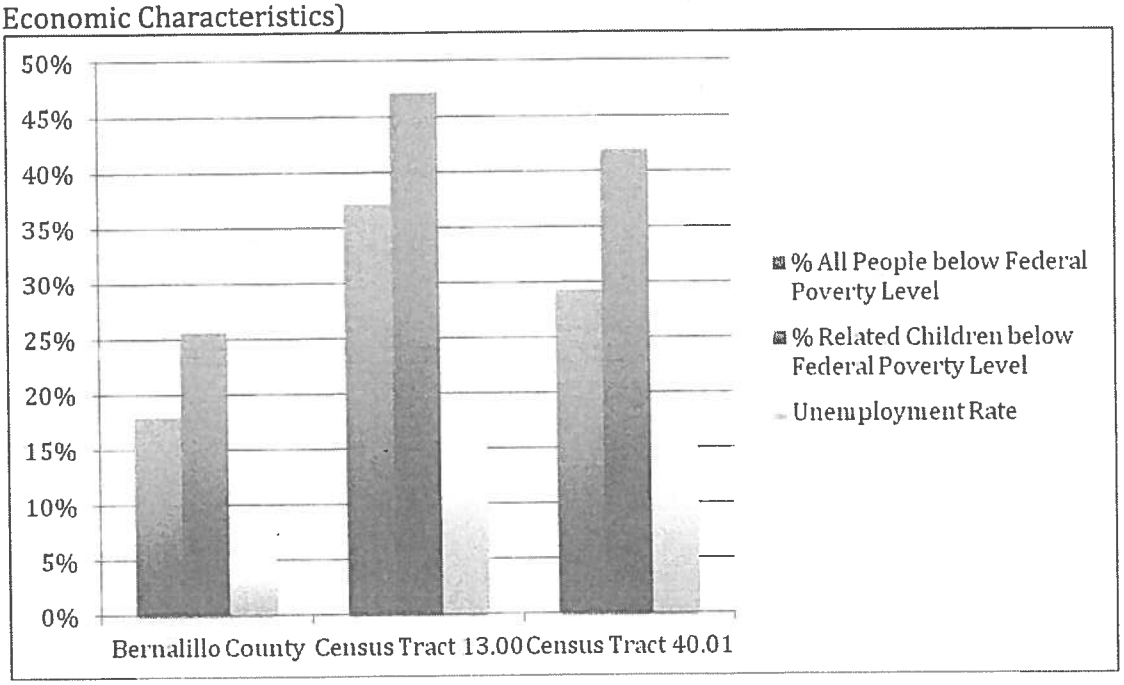


Figure 2

Based on my review of the data, I have concluded that the San Jose neighborhood has a higher proportion of low-income and minority residents than Bernalillo County.

C. Pollution Source Concentration

I reviewed the following publically available information regarding the concentration of air pollution sources in the San Jose neighborhood relative to the rest of Bernalillo County, *Pollution Permits and Sites*; available at: http://nmcdc.maps.arcgis.com/home/webmap/viewer.html?webmap=03a2f2d4e19f41378d9c5e511c7e6ffc, accessed on April 2015. The map illustrates the locations of permitted air emissions as of 2012 by the following types of air emissions: particulate matter less than 10 microns, particulate matter less than 2.5 microns, and volatile organic compounds. Based on an overlay of permitted air emissions sources and the proportion of non-Hispanic white population, it appears the census tracts underlying the San Jose neighborhood are disproportionately impacted by the number of sources of particulate matter and volatile organic compounds emissions when compared with the remainder of Bernalillo County. Further, areas having a higher percentage of families with children living in poverty appear to be more burdened with sources of air emissions than areas of Bernalillo County having a lower percentage of families with children living in poverty. Based on my review of the foregoing information, I conclude that the San Jose neighborhood contains a disproportionate number of sources of air pollution, exhibits a higher percentage of families with children living in poverty, and has a lower proportion of non-Hispanic whites when compared with the rest of Bernalillo County.

D. Disparate Health Impacts

Poverty has a strong influence on health. According to the publication, *Place Matters for Health in Bernalillo County*, nationally families living below the federal poverty level are 3.6 times more likely to report fair or poor health than those with incomes at least twice the poverty level (Joint Center for Political and Economic Studies, 2012). Map 5 on page 8 of the above report illustrates persistent poverty by census tract. A copy of that map is attached as SWOP Exhibit 1.B. Residents living in census tract 13.00, underlying the San Jose neighborhood, have experienced persistent poverty since 1970. Census tract 13.00 is one of only six of Bernalillo County's 141 census tracts that share this characteristic. The age-adjusted death rate from the 50 leading causes of death for Hispanics living in Bernalillo County was 744 persons per 100,000 persons for 2011; for residents of census tracts 13.00 and 40.01, the age-adjusted death rate from the 50 leading causes of death for Hispanics was 1,842 persons per 100,000 persons. Life expectancy from birth for Bernalillo County was 78.6 years in 2011, while for the census tracts underlying the San Jose neighborhood the life expectancy was 68.5 years in 2011.

E. Conclusions

Based on my review of the above data, I have reached the following conclusions:

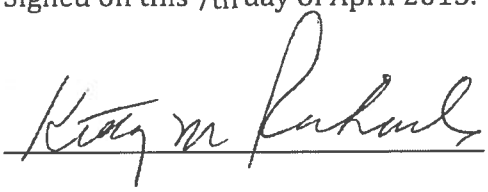
1. The San Jose neighborhood, when compared with Bernalillo County, has a significantly higher population of low-income and minority residents;

2. There are a disproportionate number of air pollution sources in the San Jose neighborhood, compared to Bernalillo County as a whole;

3. Because of the disproportionate number of air pollution sources in the San Jose neighborhood, the residents of San Jose bear a disproportionate risk of disease from air pollution.

I declare under penalty of perjury, that the foregoing is true and correct to the best of my knowledge and belief.

Signed on this 7th day of April 2015.



Kitty M. Richards, MPH, MS

Kitty M. Richards

935 Alameda Rd., NW Albuquerque, NM 87114 505-899-1483 (home)

QUALIFICATIONS

- **Over 25 years of successful work history in community land-use planning and assessment, policy analysis, and applied quantitative skills in economics and public health fields.**
- **Bachelors Geography, Masters Natural Resource Economics, Masters Public Health**
- **COMMUNITY DEVELOPMENT**
  - Conduct three independent Health Impact Assessments for Martineztown, Mountain View and San Jose neighborhoods to evaluate potential health impacts from proposed land uses prior to decision making.
  - Encourage economic development for Bernalillo County by developing strategic plan to intensify agricultural uses of County open spaces and promote agri/eco-tourism.
  - Advocate for inclusion of cumulative impacts language in Mountain View Sector Development Plan.
- **POLICY DEVELOPMENT/PASSAGE/IMPLEMENTATION**
  - Work with state legislators and community members to introduce state NEPA requiring inclusion of cumulative impact assessment in environmental assessments and environmental impact statements for local and state-issued environmental permits.
  - Work with state legislators to introduce legislation requiring Health Impact Reports, similar to Fiscal Impact Reports, for introduced bills.
  - Develop Joint Use Agreement Resolution to open school yards, after hours, to increase opportunities for physical activity.
- **QUANTITATIVE ANALYSIS**
  - Assess rates of disease to identify health burdens and life expectancy, by socio-economic and demographic status, at the neighborhood level.
  - Research and write Master's thesis optimizing Rio Grande in-stream flows for fisheries, while meeting municipality, industrial, and Rio Grande Compact flow requirements.
  - Apply willingness-to-pay economic methods to identify in-stream flow preferences among anglers.
  - Design studies, develop and administer survey instruments, and collect and analyze data using statistical software for three federally funded grant awards.
  - Provide technical assistance to vulnerable populations on air quality permits.
  - Conduct air quality monitoring for VOCs and particulate matter and assess concentrations based on health standards.
- **EDUCATIONAL OUTREACH/COMMUNICATIONS/PARTNERSHIP**
  - Foster community partnerships to identify and solve environmental health problems using innovative solutions; develop policies and plans to support community health priorities, prepare community health profiles to illustrate disease trends, and inform policy makers.
  - Engage community residents to address and resolve identified disproportionate economic, health and environmental burdens at the neighborhood level through place-based interventions focused on land-use.
  - Present to and write for diverse audience; author health impact assessments, progress reports to funding agencies, strategic plans, grant proposals, and peer-reviewed research publications.

SWOP Exhibit 1.A

PROFESSIONAL EXPERIENCE

BERNALILLO COUNTY, OFFICE OF HEALTH AND SOCIAL SERVICES [2002-Present]
Program Manager, Health Promotion Team *Albuquerque, New Mexico*
Manage County program responsible for investigating public health problems, educating and informing the public about environmental and public health issues, and evaluating the effectiveness, accessibility and quality of population based health interventions.

- ✓ *Write and receive grants relating to the impact of neighborhood conditions on health status and quality of life to: Centers for Disease Control, National Institutes for Environmental Health Sciences, Kellogg Foundation, Environmental Protection Agency, and Partnership for Sustainable Communities.*
- ✓ *Serve as environmental technical resource for community residents and staff on health status, environmental monitoring and permitting, and land-use plans.*
- ✓ *Manage Health Promotion Team staff, including recruitment, mentoring, supervision, and performance evaluation.*
- ✓ *Manage all aspects of federal grant awards, including: staffing, budgets, contracts, reporting, and study implementation as principle investigator.*

Liaison to Agriculture Special Project, County Manager's Office [2013-Present]
Develop strategic plan and coordinate across business, non-profit, and government partners to improve County's economic development and population health through increased produce production, improved distribution channels, and value-added product marketing.

Lead of Bernalillo County Place Matters Team [2006-2012]
Facilitate and manage multi-sector coalition to address health inequities at the neighborhood level through development of a strategic plan, data collection/analysis of neighborhood conditions and health, policy advocacy informed by data, and increased organizational capacity.

Coordinator of South Valley Partners for Environmental Justice NIEHS Grant [2002-2004]
Facilitate and manage multi-sector coalition to address environmental justice issues at he neighborhood level through on-going environmental monitoring, prioritizing of environmental health issues, managing National Institute for Environmental Health Sciences multi-million dollar grant, managing and mentoring community partnerships, and presenting research findings at annual Environmental Justice workshops.

NEW MEXICO DEPARTMENT OF HEALTH, BORDER HEALTH OFFICE [1994-2002]
Program Manager, Environmental Health Program *Las Cruces, New Mexico*
Managed new program with annual operating budget of $1M to monitor environmental quality and assess health status of New Mexico/Mexico border population; managed and supervised environmental health staff; conducted epidemiological investigations; managed environmental and health related contracts and approved deliverables for payment.

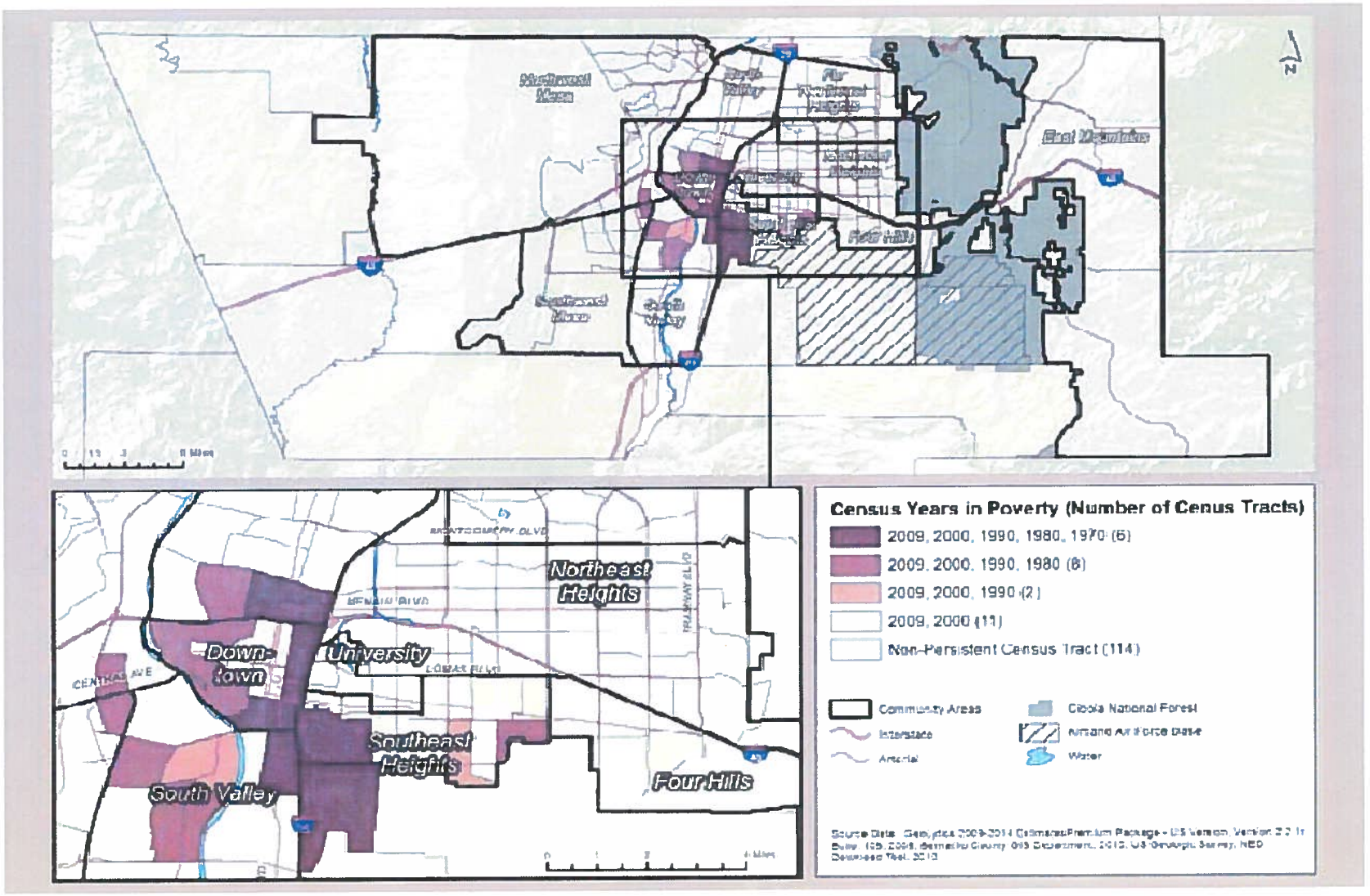
- ✓ *Responded to pesticide exposures in farm worker and migrant populations*
- ✓ *Monitored farm-based private drinking water wells for pesticides and herbicides contamination*
- ✓ *Partnered with residents of colonias to secure funding for needed water and wastewater infrastructure*
- ✓ *Provided technical assistance to community residents on environmental justice issues*
- ✓ *Served at NM Representative on US-Mexico Bi-National Commission on Migrant Health*

EDUCATION

UNIVERSITY OF NEW MEXICO / Albuquerque, NM
Master of Public Health
Concentration: *Community Health*
NEW MEXICO STATE UNIVERSITY / Las Cruces, NM
Master of Science
Concentration: *Natural Resource Economics*
UNIVERSITY OF CALIFORNIA, SANTA BARBARA / Santa Barbara, CA
Bachelor of Arts
Concentration: *Geography/Regional Planning*

BOARDS

NM Health Equity Partnership Place Matters Advisory Board, *Member*
Environmental Alliance NM, *Former Member*
NMDOT Statewide Long Range Multimodal Transportation Plan, *Public Health, Safety and Security Member*



SWOP Exhibit 1.B

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A HEARING ON THE MERITS REGARDING
AIR QUALITY PERMIT NO. 3131 [Honstein Oil]

Written Testimony of Dr. George D. Thurston

April 6, 2015

I, George D. Thurston, do hereby swear and affirm that the following is true to the best of my knowledge. I am qualified and competent to give this declaration, and the factual statements herein are true and correct to the best of my knowledge, information and belief. The opinions expressed herein are based on my best professional judgment.

I. Name and Title

My name is George D. Thurston, and I am a Professor of Environmental Medicine, and Director of the Program in Exposure Assessment and Health Effects, at the New York University School of Medicine's Department of Environmental Medicine.

II. Education and Experience

I received Bachelor's degrees in Environmental Engineering and Environmental Studies from Brown University in Providence, Rhode Island. I received my Master's and Doctorate degrees in Environmental Health Science from Harvard University in Cambridge, Massachusetts. I received post-doctoral training at the Harvard University, Kennedy School of Government, in Environmental Epidemiology. My educational experience is fully summarized in my *Curriculum Vitae*, attached as SWOP Exhibit 2.A.

SWOP Exhibit 2

I am currently a tenured professor at New York University's School of Medicine, Department of Environmental Medicine in New York City. In addition to my teaching and mentoring responsibilities, I am also Director of the Program in Exposure Assessment and Health Effects.

I conduct extensive research on the health effects of air pollution. My research has included leading a study in the South Bronx on the acute morbidity effects of particulate matter on children with asthma. I have also collected and analyzed air pollution exposure data in the wake of the World Trade Center collapse in 2001, and led the NYU School of Medicine's community outreach program that shared that information with the public.

I have published extensively in peer-review journals on the health effects of ambient air pollution. Some of my published articles include: *A multi-year study of air pollution and respiratory hospital admissions in three New York State metropolitan areas: Results for 1988 and 1989 summers*. 2 J. Exposure Anal. and Environ. Epidemiol. 429-450 (1992); *The nature and origins of acid aerosol pollution measured in Metropolitan Toronto, Ontario*, 65 Environ. Res. 254-270 (1994); *Measurement methods to determine compliance with ambient air quality standards for suspended particles: Discussant*. 45 J. Air & Waste Manage. Assoc. 667-668 (1995); *The health benefits of the U.S. EPA clean air standards*. 16 Pace Environmental Law Review 1 (1998). A complete list of my publications is in my attached CV. In addition to publishing articles, I regularly review articles for peer-review publications including: *Journal of the American Medical Association* (1996 - present); *Journal of Exposure Analysis and Environmental Epidemiology* (1993 - present); *Environmental Health Perspectives* (1995 - present). A full list of my editorial contributions is on pages 4-5 of SWOP Exhibit 2.A.

Finally, I have made numerous presentations on the health impacts of air pollution to regional, national and international governmental bodies, trade associations, and professional associations. These include invited testimony before committees of both the United States House of Representatives and Senate, presentations to the New York Department of Health, Pace Law School, the United States Environmental Protection Agency, the American Lung Association, the American Chemical Society, the International Society for Environmental Epidemiology and the World Health Organization. A complete list of my presentations is in my attached CV.

III. Materials Reviewed

In preparing the foregoing testimony, I reviewed the following materials:

1. Air Quality Authority to Construct Permit No. 3131;
2. Application materials for Air Quality Permit No. 3131 in administrative record;
3. Administrative Record, Permit No. 3131;
4. Western Refining Terminals, Permit No. 456-M4-RV2, Albuquerque Products Terminal 2012 Emissions Inventory;
5. VECENERGY Albuquerque Terminal 2011 Emissions Inventory, Permit No. 47-M1-RV2;
6. U.S. Environmental Protection Agency 2005 National Air Toxics Assessment;
7. U.S. Environmental Protection Agency Mobile Source Air Toxics master list;
8. U.S. Environmental Protection Agency Integrated Risk Information System database;

9. Health Effects Institute, Special Report #16;

10. New York State Department of Environmental Conservation, Policy DAR-1: Guidelines for the Control of Toxic Ambient Air Contaminants, Appendix C (Annual Guideline Concentrations/Short-Term Guideline Concentrations) (2014);

11. California Office of Environmental Health Hazard Assessment, Acute, 8 hour, and Chronic Reference Exposure Levels (2014); and,

12. Other materials listed in "Literature Cited" section, below.

IV. Air Quality and Health Impacts

Volatile organic compounds (VOCs) consist of a broad spectrum of chemicals in the human environment produced by various industrial processes, volatilized into the air from petroleum products (e.g., gasoline and diesel fuels), exhausted by mobile transportation sources and generated by cigarette smoking in the indoor air. Oil and natural gas storage facilities, such as the applicant Honstein facility, as well as gasoline and diesel combustion by on- and off-road mobile sources associated with such facilities, are major sources of VOCs, such as Benzene (e.g., *see* Figure 1). There is growing concern that VOC exposures, known to contribute to wide variety of cancers among exposed individuals, may also contribute to ill respiratory health by exacerbating asthma attacks and other adverse respiratory effects.

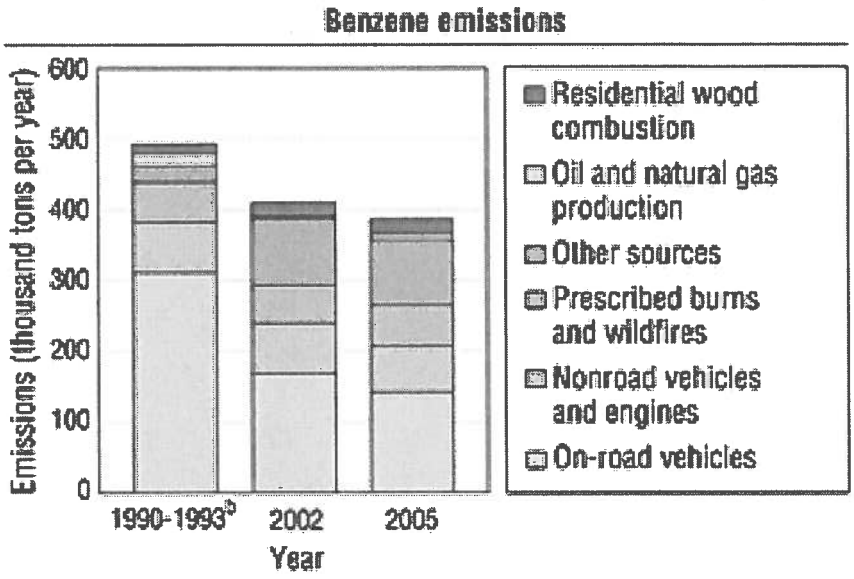

Figure 1. US Air Emissions of Benzene (from US EPA, Air Toxics Emissions)

http://cfpub.epa.gov/eroe/index.cfm?fuseaction=detail.viewPDF&ch=46&lShowInd=0&subtop=341&lv=list.listByChapter&r=216616

Exposures to VOCs

Baseline exposure information of VOCs in the U.S. population was carried out first by the Total Exposure Assessment Methodology (TEAM) studies of the U.S. Environmental Protection Agency (U.S. EPA) between 1979 and 1987. Later several population-based studies confirmed the wide-spread pattern of VOCs exposure and their ubiquitous presence in various home and workplace settings (e.g., Chan et al, 1991).

The next phase of the growing scientific evidence and understanding on how VOCs affect U.S. communities was based on the National Health and Nutrition Examination Survey 1999-2000 subsamples of 636 adults (Symanski et al., 2009). Exposure information was collected by personal VOC monitor badges and the measured values were controlled for age, gender, education, race/ethnicity, income and presence of smoking. Results demonstrated that Hispanics had significantly increased exposure to benzene, and had increased exposures to all other VOCs measured (toluene, ethylbenzene, m,p-xylene, o-

xylene) even though the differences was not statistically significant when compared them to other ethnic groups.

More recently, the U.S. EPA has conducted air modeling to estimate the ambient levels of VOCs for every Census Tract in the US, allowing an assessment of the prevailing levels of VOCs. Table 1 shows the comparative levels of key VOC's, called MSATs (Mobile Source Air Toxics) estimated by the U.S. EPA, in two different Census Tracts in Bernalillo County, New Mexico. The first Census Tract (001300) includes much of the San Jose neighborhood that will be affected by the applicant Honstein facility, and has relatively high levels of the all the various MSATs. Tract 003731, to the northeast of San Jose neighborhood, in contrast, is much wealthier, and has much lower prevailing levels of the EPA MSAT pollutants. The relative locations of these two Census Tracts are shown in Figure A1 in the Appendix to this submission. All of these EPA identified air toxics of concern are increased over the other nearby Census Tract by a factor of 2 (a doubling) or more, with the greatest increases in emissions at Census Tract 001300 being for Diesel, Particulate Matter (PM), Napthalene, and overall Polycyclic Aromatic Hydrocarbons (PAH) compounds. Clearly, based on these EPA estimates, the location for this Honstein facility is an underserved minority community that is already suffering greater exposures to ALL OF these air toxics than more advantaged areas in the very same county. Thus, in addition to health concerns, this proposal raises equity concerns, in which more environmental insult is being added to those least able to deal with them, given their limited incomes and already high prevailing air toxics burden.

Table 1, Prevailing Mean VOC Concentrations in Bernalillo County Census Tracts 1300 and 3731

Pollutant	Tract 001300	Tract 003731	1300/3731 Ratio
Acrolein (µg/m3)	0.046	0.016	2.917
Benzene (µg/m3)	1.521	0.705	2.157
1,3-Butadiene (µg/m3)	0.089	0.044	1.994
Diesel PM (µg/m3)	2.060	0.426	4.841
Formaldehyde (µg/m3)	1.901	1.161	1.638
Napthalene (µg/m3)	0.074	0.017	4.384
PAH POM (µg/m3)	0.012	0.002	6.944
Median Family Income ($)	$25,929	$132,202	0.196

Sources: USEPA NATA Database. http://www.epa.gov/ttn/atw/nata2005/
US Census: http://www.usa.com/NM001001300.html;
http://www.usa.com/NM001003731.html

DETAILED EXPOSURE AND HEALTH EFFECT INFORMATION ABOUT THE MOST IMPORTANT VOC TOXICANTS

Benzene

Benzene (C_6H_6) is a clear, colorless, volatile, highly flammable liquid with a characteristic odor. Inhalation is the primary route of exposure for general and occupational populations, and exposure to benzene in the general population occurs primarily from gasoline vapors, tobacco smoke, and automotive emissions (Wallace, 1996). Benzene is produced in extremely large quantities (14.8 million metric tonnes in 1993) worldwide (WHO, Environmental Health Criteria, 1998). Emissions arise during the processing of petroleum products, in the coking of coal, during the production of toluene, xylene and other aromatic compounds, and from its use in consumer products, as a chemical intermediate and as a component of gasoline. According to the Health Effects Institute (HEI) Special Report #16 (2007), mobile sources are an important component of overall exposure to benzene, with the highest concentrations being found at urban roadside and urban in-vehicle locations.

There is much more ambient air-monitoring data for benzene than for other priority mobile source air toxics (MSATs).

Benzene's known health effects

Benzene is a known carcinogen. Both epidemiologic studies and case studies provide clear evidence of a causal association between exposure to benzene and leukemia. Specifically, high benzene exposure is related to acute myeloid leukemia and recently, myelodysplastic syndrome has been observed at low benzene exposure levels as well (Collins et al, 2015, Schnatter et al., 2012). These human data are supported by animal studies. Based on this cumulative evidence, benzene is characterized as a known human carcinogen - EPA's strongest statement on scientific evidence to support carcinogenic risk association (AASHTO, 2007).

Experimental evidence shows the oxidation of benzene by CYP2E1 in the liver as the first step in initiation of benzene toxicity (Sammett et. al., 1979; Valentine et. al., 1996). As summarized in the EPA Integrated Risk Information System (IRIS) (2002), hematotoxicity has been consistently reported to be "the most sensitive indicator of non-cancer toxicity in humans and experimental animals, with bone marrow as the principal target organ". Among several epidemiologic (mostly occupational) studies, decrease in absolute lymphocyte count (ALC) was observed to be the most sensitive indicator of benzene exposure. Benzene-induced hematotoxicity has been well described in the literature, and the observed hematological effects are found for both short-term and long-term exposures (EPA IRIS, 2002). Acute exposure to very high concentrations of benzene is also associated with severe damage to the blood-forming elements of the bone marrow. The most sensitive effect observed in humans is decreased lymphocyte blood count (Rothman et. al., 1996). More recent studies of workers exposed to benzene at concentrations as low as 0.82

milligrams per cubic meter (mg/m^3) have also shown reductions in bone-marrow production of blood cells, including red blood cells (Qu et. al. 2002). Several epidemiological studies, mostly in occupational settings, have also shown chronic exposure to benzene results in progressive deterioration of hematopoietic function (EPA IRIS, 2002).

Non-cancer related effects of benzene exposure associated with alterations in cells of the lungs, altered functions of immune system macrophages and basophil lymphocytes known to be increased in asthma and induce atopy among sensitive humans (Triggiani et. al. 2011).

Furthermore, new molecular epidemiological research shows that human genetic material can be directly altered by benzene exposure (Terry et. al., 2011). Even low-dose benzene exposure was associated with decreased methylation of LINE-1 and Alu repeated element sequences of the white blood cell genomes that are indicative an overall downregulation known to be specific to tumor progression (Bollati et. al., 2007), indicating increased cancer risk with exposure.

Acrolein

Acrolein (C_3H_4O) is a volatile aldehyde that is also known as 2-propenal. It is an oxidizing and electrophilic chemical that is highly reactive in air, with a half-life in the atmosphere of only approximately 1 day (HEI, 2007). Acrolein is a common air pollutant that is present in high concentrations in wood, cotton, and tobacco smoke, automobile exhaust and industrial waste and emissions. Exposure to acrolein occurs through exposure to environmental pollutants such as tobacco smoke and automobile exhaust. As shown in Table A1, the EPA long-term average exposure Reference Air Concentration (RfC) for acrolein is 0.02 micrograms per cubic meter ($\mu g/m^3$) (EPA 2003), based on a human equivalent concentration lowest observed adverse effect level (LOAEL [HEC]) of 20 $\mu g/m^3$

for nasal lesions in rats exposed for 13 weeks (Feron et al. 1978). The EPA confidence level in this RfC estimate is "Medium", which is the same level of confidence as the other priority MSATs for which EPA provides an RfC. Of the five MSATs for which the EPA provides an RfC, acrolein has the lowest value by two orders of magnitude. Similarly, Table A2 shows that the New York Air Guide has the lowest (most protective) Annual Guidance Concentration (AGC) non-cancer limit for acrolein (.35 $\mu g/m^3$) as well, but by a factor of about 8 versus the next lowest (on a per mass basis) of the only other non-cancer MSAT AGC provided by New York State (i.e., naphthalene at 3 $\mu g/m^3$). Finally, the State of California is the only regulatory source that provides a long-term non-cancer guideline concentration for all seven MSATS, and it also indicates that acrolein has the greatest non-cancer risk of adverse health effects per $\mu g/m^3$, but by a factor of about 14 versus diesel particulate matter (DPM), and a factor of 25 compared with the compound with next highest risk per $\mu g/m^3$, formaldehyde. *Overall, using the various guidance limits set by the EPA, California, and New York State as indicators, acrolein has the largest of the non-cancer health risks from long-term exposure to the seven MSATS, per $\mu g/m^3$, by a factor ranging from one to two orders of magnitude.*

The short-term exposure guideline concentration for acrolein, provided by both New York State (Short-term Guidance Concentration, SGC) and California (Acute Inhalation Guideline), is 2.5 $\mu g/m^3$. As was the case for long-term exposures, of those compounds for which a guideline is provided by these two states, acrolein has the lowest guideline concentration. In the case of New York State's SGC, the next most toxic compound provided is formaldehyde, which has a 30 $\mu g/m^3$ limit, indicating a toxicity one-twelfth that of acrolein. In California, the formaldehyde Acute Inhalation guideline is 50 $\mu g/m^3$, indicating that acrolein is approximately 20 times more toxic than formaldehyde. This comparison is

especially relevant, as both of these two compounds' guideline concentrations are based on human studies.

It should be noted that DPM is a form of PM 2.5, so it's 24-hour average National Ambient Air Quality Standard (NAAQS) of 35μg/m^3 would suggest a short-term guideline of 35μg/m^3, indicating acrolein to be on the order of (35/2.5=) 14 times lower than DPM, if DPM is no more toxic than other PM. When compared to the MSAT with the highest allowable guideline concentration provided by New York State (7,900 μg/m^3 for naphthalene), acrolein would be more than 3000 times lower. Thus, assuming that the size of the allowable guideline concentrations indicate the relative toxicities of these various compounds, acrolein guideline concentration limit ranges from a factor of roughly 12 to 3000 lower than the other priority MSATs, depending on the MSAT chosen for comparison, indicating its high toxicity, relative to other MSATs.

Acrolein's known health effects

Acrolein has been linked to the activation of the coagulation and hemostasis pathways and thereby to the predisposition of thrombotic events in humans (Sithu et. al., 2010). Thrombotic events are associated with formation of blood clots within blood vessels. Blood clot formation increases the risk of stroke and heart attack.

Inhalation is the main route of exposure to acrolein in exposed communities. The inhalation of such a reactive gas can lead to severe damage of the airways and lung, compromising the function of the respiratory system. The major toxicological properties of acrolein are that it is extremely irritating to the lung, and that it binds irreversibly to the tissues of the respiratory tract when inhaled, so inhaled acrolein does not distribute efficiently to other organs. TRPA1, a TRP ion channel expressed in chemosensory C-fibers, is activated by almost all oxidizing and electrophilic chemicals, including acrolein. Sensory

channels such as TRPA1 are essential for maintenance of airway inflammation in asthma, and this may contribute to the progression of airway injury following acrolein exposure (Bessac, 2010).

Although acrolein might cause DNA damage, bioassays haven't provided evidence of carcinogenicity. As a reactive electrophile, acrolein seems likely to disrupt many biochemical pathways, but the Agency for Toxic Substances and Disease Registry (ATSDR) indicates that no studies have reported genotoxic effects of acrolein in humans or animals by any route of exposure (ATSDR 2005). However, Thompson and Burcham (2008) did find a gene transcription response to acrolein. Despite that new information, the International Agency on Research for Cancer (IARC) has stated that there is inadequate evidence available on the carcinogenicity of acrolein in laboratory animals; therefore acrolein is not currently classified as a known carcinogen in humans (e.g., IARC 2006).

1,3 Butadiene

1,3-Butadiene is a colorless gas present in gasoline. It is processed from petroleum, and according to the ATSDR Toxicology Factsheets (ToxFAQs), about 60% of the manufactured 1,3-butadiene is used to make synthetic rubber, although 1,3-butadiene is present in gasoline and its presence is not limited to rubber manufacturing. 1,3-Butadiene is also used to make plastics, including acrylics, synthetic clothing materials (ATSDR, 2007).

Given that a No Observed Adverse Effect Level (NOAEL) has not been clearly identified, no threshold can be assumed, and 1,3-butadiene may be a hazard at ambient concentrations. The specific mechanisms of 1,3-butadiene-induced carcinogenesis are unknown; however, the scientific evidence strongly suggests that the carcinogenic effects are mediated by genotoxic metabolites of 1,3-butadiene, i.e., the monoepoxide, the diepoxide, and the epoxydiol (EPA IRIS, 2002).

Epidemiological studies are unlikely to demonstrate the hazards of this air toxic, as the relevant health outcomes (e.g., reproductive endpoints) are uncommon and community exposure to 1,3-butadiene is almost always associated with co-exposure to other agents from the same sources, principally emissions from traffic and tobacco smoke. Estimates of community effect could be extrapolated from the exposure–response relationships determined for occupationally exposed cohorts (e.g., styrene-butadiene rubber workers). However, these estimates rely on a variety of assumptions about the magnitude and slope of the exposure–response relationship. The HEI Special Report #16, in its assessment, additionally suggests the possibility of subgroups that are especially sensitive to 1,3-butadiene because of age or possible genetic polymorphisms in the genes involved in 1,3-butadiene metabolism, or because of combined exposures from a number of sources.

Non-cancer risk assessments by both the U.S. EPA and California EPA have relied on the evidence of reproductive and developmental effects in mice, including testicular and ovarian atrophy (NTP, 1993). Based on this information, an inhalation reference concentration (RfC) of 2 $\mu g/m^3$ was recommended, based on a benchmark concentration of 1.94 - 103 $\mu g/m^3$ for ovarian atrophy and an uncertainty factor of 1000 (EPA 2002b,c). The overall confidence in the assessment is medium. Compared to the other priority MSATs of interest, based on mass concentration, 1,3-butadiene is found to be a health risk at relatively low concentrations.

1,3 Butadiene's known health effects

Reproductive and developmental effects have been observed in mice exposed to 1,3-butadiene by inhalation (U.S. EPA, 2002, Chapter 5). The most critical effect found among toxicological studies of 1,3-Butadiene studying chronic inhalation exposure was ovarian atrophy in female mice and testicular atrophy in male mice. However, similar effects

were not observed in rats, and there are no human data on reproductive or developmental effects. Few adverse non-cancer effects, other than reproductive and developmental effects, have been observed, except for hematological effects in mice exposed to higher concentrations (U.S. EPA, 2002, Section 6.1).

The modes of action for human leukemia and for the observed solid tumors in rodents are both likely related to the genotoxic potencies for one or more of these metabolites. A number of factors related to metabolism can also contribute to nonlinearity in the dose-response relationship, including enzyme induction and inhibition, depletion of tissue glutathione, and saturation of oxidative metabolism. The EPA IRIS identifies 1,3-Butadiene as a "known human carcinogen based on sufficient evidence of carcinogenicity in animals." The American Association of State Highway and Transportation Officials (AASHTO) Report (2007) also identifies 1, 3-butadiene as carcinogenic to humans by inhalation.

Formaldehyde

Formaldehyde, also known as methanal, is a colorless gas having a strong, irritating odor. It is ubiquitous in the environment, as a result of both natural and human processes. In rats, inhalation exposure to formaldehyde induced squamous-cell carcinomas of the nasal cavity. There are no EPA standards for acute exposures to formaldehyde. New York SGC and California acute inhalation guidelines are set at 30 $\mu g/m^3$ and 55 $\mu g/m^3$, respectively, and if these mass standards are compared with other priority MSATs with similar guidelines, the concentration standards for formaldehyde are in the mid-range (e.g., the New York SGC for acrolein is 2.5 $\mu g/m^3$ and for naphthalene is 7900 $\mu g/m^3$). According to EPA guidelines, there is limited evidence of carcinogencity.

Formaldehyde's Known health effects

Reported health effects of formaldehyde exposure are rare at concentrations below 0.36 mg/m^3 (HEI Special Report #16, 2007). More than 90% of inhaled formaldehyde gas is absorbed and rapidly metabolized to formate in the upper respiratory tract. Given that formaldehyde is highly reactive, acute exposure is known to cause irritation in tissues it that comes in direct contact, such as the eyes, nose and upper respiratory system (ATSDR, 2008). At high concentrations, formaldehyde can cause asthmatic reactions by way of an irritant mechanism. Since inhaled formaldehyde is rapidly metabolized, and mostly detoxified, on contact with the respiratory tract, it is not expected to target other distant organs (e.g., reproductive organs) and cause systemic damage. Ambient concentrations of formaldehyde are generally lower than those that cause irritation of the eyes and respiratory system. However, concentrations in certain outdoor environments, such as near roadways, can approach those at which sensitive people experience irritation.

Epidemiologic studies have reported several other possible effects (e.g., asthma, neurobehavioral effects, histological changes in the nasal epithelium), but the evidence for a causal relationship is insufficient. Effects of long term-exposures to low formaldehyde concentrations on cancer, asthma, and other endpoints are not understood. The IARC has classified formaldehyde as "an established human carcinogen" (IARC 2006). The IARC review indicated that there is "sufficient epidemiologic evidence that formaldehyde causes nasopharyngeal cancer in humans, that there is strong but not sufficient evidence of a causal association between leukemia and occupational exposure to formaldehyde, and only limited epidemiologic evidence that formaldehyde causes sino-nasal cancer in humans."

Naphthalene

Naphthalene, also known as tar camphor, is a slightly water-soluble, two-ring aromatic hydrocarbon. Fossil fuels, such as petroleum and coal, contain naphthalene. It is

the most volatile member of the polycyclic aromatic hydrocarbons, and inhalation is the principal pathway of exposure (Preuss et. al. 2003). The EPA IRIS Rfc for napthalene is 3μg/m^3, and New York AGC is likewise set at 3 μg/m^3. Compared to the EPA mass standards for the other priority MSATs, this falls in the middle of the range, but among the New York standards this represents the highest (least restrictive) mass concentration guideline. The New York SGC is extremely high and set at 7900 μg/m^3. These extreme levels are not expected in ambient settings. There are no napthalene guidelines set for cancer risk.

Naphalene's known health effects

The toxicity of naphthalene results from its reactive metabolites via cytochrome P450 enzymes. The toxicity of inhaled naphthalene has been shown to be greatest in the nasal cavity and in the Clara cells of the airways. These sites are also the location of high concentrations of cytochrome P450 enzymes, capable of oxidizing naphthalene to its reactive forms, and of the cellular systems with the highest rate of glutathione depletion. According to the HEI Special Report 16 assessment of Napthlene, most of the available evidence of toxicity of this MSAT is from animal studies of both cancer and non-cancer effects. Animal studies have shown that exposure to naphthalene causes damage to the respiratory tract, including chronic nasal inflammation, metaplasia of the olfactory epithelium, and hyperplasia of the respiratory epithelium. Naphthalene is metabolized to reactive intermediates.

There are no epidemiology studies of naphthalene, and human studies are therefore limited to case studies where exposure to high concentrations of naphthalene induced methemoglobinemia (changes and decrease in the amount of oxyhemoglobin in the red blood cells, which lowers available oxygen in the circulatory system) and hemolysis (this is

not seen in rodents). Hemolysis is a condition when red blood cells became damaged due to toxic compounds or certain drug exposures and release hemoglobin into the blood stream. That results in fast oxygen loss of the body as red blood cells do not transport the necessary oxygen amount to the tissues (brain, muscles, etc.). For example, hemolysis was observed in infants exposed to clothing and bedding that had been stored with naphthalene mothballs. However, no quantitative information on exposure concentrations was available in these cases, and hence they cannot be used to establish a NOAEL or LOAEL for this effect on health. There is no information available on the reproductive or developmental effects of naphthalene exposures in humans, and genotoxicity tests of naphthalene are generally not found.

In mice, naphthalene causes lung and respiratory system damage to both ciliated and Clara cells of the bronchiolar epithelium. Its toxicity is associated with naphthalene metabolism by cytochrome P450 enzymes, which is concentrated in Clara cells that are present in higher amounts in cells of mice than of rats or humans. Therefore, the respiratory tract of humans is likely to be much less sensitive to naphthalene than that of mice and rats. The genotoxic effects of naphthalene are at present unclear. Although there is little evidence for the induction of gene mutations by naphthalene, there are indications of a clastogenic (chromosome breakage) potential. There is limited evidence from animal bioassays that naphthalene can cause cancer, but it is not clear how to extrapolate these results to humans. Both the National Toxicology Program (NTP) and the IARC concluded that the evidence for naphthalene carcinogenicity in humans is inadequate. According to the HEI Special Report #16, humans might be less sensitive than rodents to toxic and carcinogenic effects of naphthalene because humans are less efficient at naphthalene oxidation.

V. Conclusions

From the above considerations, it is clear that the above noted VOCs are associated with increased risk of adverse health effects, and are emitted by the kinds of industry (and associated traffic) that is prevalent in San Jose and adjacent neighborhoods. Importantly to this proceeding, such VOC's are also associated with Honstein's operations under review. As documented here, the VOC levels in the Census Tract where this facility is operated are much higher than seen in more affluent nearby areas of the same county. Thus, the approval of this facility would add to an already higher VOC air pollution health risk to community members in this already underserved and disadvantaged community.

I declare under penalty of perjury, that the foregoing is true and correct to the best of my knowledge and belief.

Signed on this 6th day of April 2015.

George D. Thurston, Sc.D.

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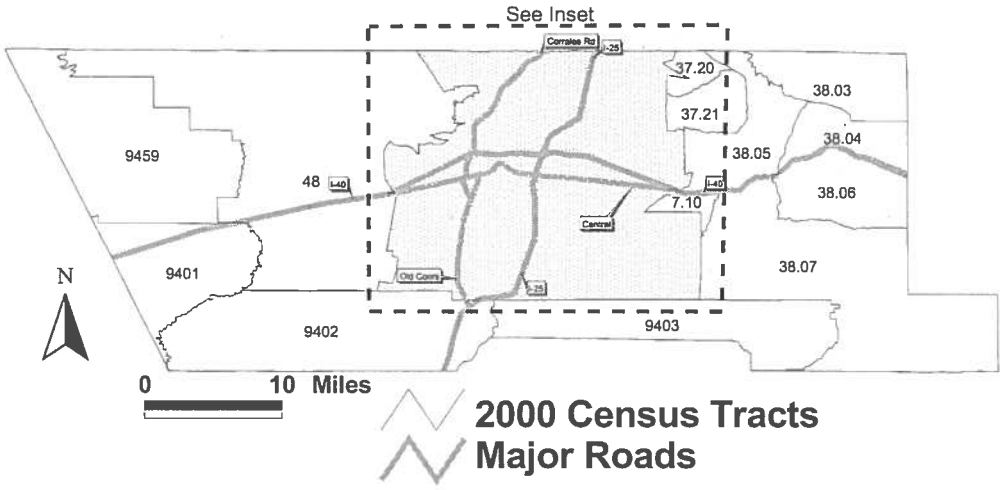
BERNALILLO COUNTY
2000 CENSUS TRACTS

Total number of tracts : 141



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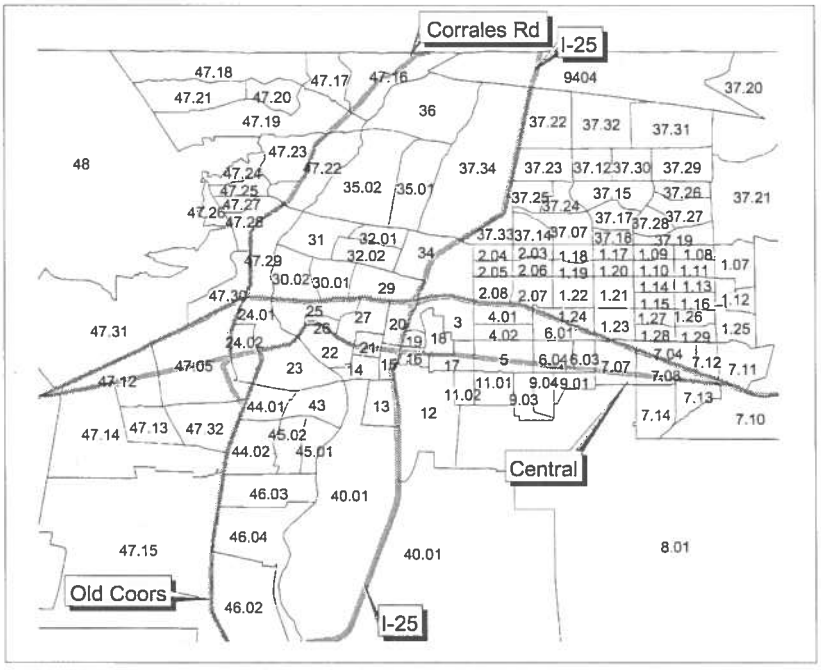

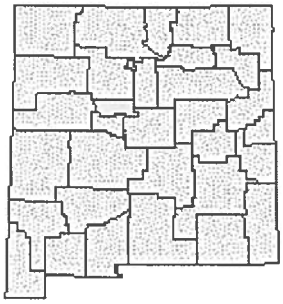

Prepared by: Bureau of Business & Economic Research, University of New Mexico, Apr. 2005.

Figure A1. Location of US Census Tracts in Bernalillo County, New Mexico

Table A1. Air Exposure Criteria – Federal Standards ($\mu g/m^3$)

MSAT Compound	U.S. Environmental Protection Agency – Integrated Risk Information System [IRIS]								
	NAAQS	RAC[a]	Health Effects	Conf.[b]	Model[c]	RsD 10^{-6} Risk[a]	Ref[d]	Incr. risk per 1 µg (lifetime exposure)	EPA Weight of evidence for human carcinogenicity
Acrolein		0.02	Nasal Legions	M	A	n.a*	1	n.a.	n.a.
Benzene		30	Decreased Lymphocyte Count	M	H	0.13 – 0.45	2	2.2 to 7.8 x 10^{-6}	"known" human carcinogen
1,3-Butadiene		2	Ovarian atrophy	M	A	0.03	3	3 x 10^{-5}	"sufficient evidence"
Diesel Particulate Matter (DPM)	For $PM_{2.5}$ mass: Acute= 35 $\mu g/m^3$ Annual= 15 $\mu g/m^3$	5	Pulmonary inflammation/ histopathology	L-H	A	NA**	4		"likely to be carcinogenic to humans"
Formaldehyde		--				0.08	5	1.3 x 10^{-5}	Limited
Naphthalene		3	Nasal effects: hyperplasia and metaplasia in respiratory and olfactory epithelium, respectively	L-M	A	Not derived***	6		Inadequate
Polycyclic Organic Matter							7		

Notes: NAAQS - National Ambient Air Quality Standard
RAC - U.S. EPA Reference Air Concentration (annual average) in $\mu g/m^3$, 40 CFR 266, Appendix IV.
RsD - Risk Specific Dose of a 10^{-5} increased cancer risk due to a lifetime exposure (70-year average) via the inhalation pathway, 40 CFR 266, App. IV.
[a] Units are in $\mu g/m^3$
[b] Level of Confidence: L= Low, M= Medium, H= High
[c] Model: A= Animal, H= Human
[d] References: 1 http://www.epa.gov/iris/subst/0364.htm 2 http://www.epa.gov/iris/subst/0276.htm 3.http://www.epa.gov/iris/subst/0139.htm 4 http://www.epa.gov/iris/subst/0642.htm 5.http://www.epa.gov/iris/subst/0419.htm 6 http://www.epa.gov/iris/subst/0436.htm
* Not applicable ** The absence of adequate data has prevented the estimation of carciongenic risk *** Not derived due to weakness of evidence

Table A2. Air Exposure Criteria – NY & CA State Standards ($\mu g/m^3$)

MSAT Compound	N.Y. Air Guide[1]		California Air Guide[2,3]							
	SGC ($\mu g/m^3$)	AGC ($\mu g/m^3$)	Acute Inhal. ($\mu g/m^3$)	Model[a]	Hazard Index Target Organs	Chronic Inhal. ($\mu g/m^3$)	Model[a]	Hazard Index Target Organs	RsD 10^{-6} Risk	Increased Cancer risk per 1 $\mu g/m^3$ (lifetime exposure)
Acrolein	2.5	0.35*	2.5	H	Eyes, Respiratory System (sensory irritation)	0.35	A	Respiratory system	n.a.	n.a.
Benzene	1300	0.13**	1300	A	Reproductive/ developmental	60	H	Hematologic and nervous systems; developmental	0.034	2.9×10^{-5}
1,3-Butadiene	n.a.	0.033**	n.a.	n.a.		20	A	Reproductive system	0.0059	1.7×10^{-4}
Diesel Particulate Matter	n.a.	n.a.	n.a.	n.a.		5	A	Respiratory system	0.0033	3.0×10^{-4} †
Formaldehyde	30	0.06**	55	H	Sensory irritation; eyes	9	H	Respiratory system	0.17	6.0×10^{-6}
Naphthalene	7900	3*	n.a.	n.a.		9	H	Respiratory system	0.029	3.4×10^{-5}
Polycyclic Organic Matter	n.a.	n.a.								

Notes: All units are in $\mu g/m^3$

[1] New York Air Guide http://www.dec.ny.gov/docs/air_pdf/agcsgc10.pdf

[2] California Acute and Chronic: http://oehha.ca.gov/air/allrels.html

[3] California Cancer: http://www.oehha.ca.gov/air/hot_spots/2009/AppendixA.pdf

SGC – Short-term Guideline Concentrations

AGC – Annual Guideline Concentrations

* Non-cancer ** Cancer

[a] Model: A= Animal, H= Human

† "Reasonable estimate" (range: 1.3×10^{-4} to 2.4×10^{-3})

March 2015

Curriculum Vitae

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Email: george.thurston@nyu.edu
http://www.med.nyu.edu/biosketch/gdt1

Education

Degree	Field	Institution
Diploma	Academic	Barrington High School, RI
Sc.B. (Honors)	Environmental Engineering	Brown University
A.B.	Environmental Studies	Brown University
S.M.	Environmental Health Sciences	Harvard Univ. Schl. of Public Health
Sc.D.	Environmental Health Sciences	Harvard Univ. Schl. of Public Health

Postdoctoral Training

Specialty	Mentor	Place of Training
Environ. Epidemiology	Dr. H. Ozkaynak	Harvard Univ., Kennedy Schl. of Gov., Camb., MA

Internships and Residencies N/A

Clinical and Research Fellowships N/A

Licensure and Certification N/A

Academic Appointments

1987-1993	Assistant Professor, Dept. of Environmental Medicine, New York University School of Medicine, New York City, NY.
1993-2006	Associate Professor (Tenured), Dept. of Environmental Medicine, New York University School of Medicine, New York City, NY.
2007-present	Professor (Tenured), Dept. of Environmental Medicine, New York University School of Medicine, New York City, NY.
2007-present	Affiliated Faculty, Environmental Studies Program, College of Arts and Sciences, New York University, New York City, NY.
2012-present	Affiliated Faculty, Marron Institute on Cities and the Urban Environment, New York University, New York City, NY
2012-present	Faculty Mentoring Champion, Dept. of Environmental Medicine, New York University School of Medicine, New York City, NY.

Hospital Appointments: N/A

Other Professional Positions and Visiting Appointments:

Oak Ridge Institute for Science and Education (ORISE) Fellow (2008-2010)

SWOP Exhibit 2.A

Major Administrative Responsibilities

Year	*Title, Place of Responsibility*
1995-2004	Director, Community Outreach and Environmental Education Program, NYU-NIEHS Center of Excellence, Nelson Inst. of Environ. Med., NYU School of Medicine, Tuxedo, NY
2002-2012	Deputy Director, NYU Particulate Matter Research Center, Nelson Inst. of Environmental Medicine, NYU School of Medicine, Tuxedo, NY
2007-2008	Director, Environmental Epidemiology Core, NYU-NIEHS Center of Excellence, Department of Environmental Medicine, Tuxedo, NY
2010-present	Co-Leader, Metals Research Focus Group, NYU-NIEHS Center of Excellence, Department of Environmental Medicine, Tuxedo, NY.
2012-present	Director, Program in Exposure Assessment and Human Health Effects, Department of Environmental Medicine, NYU School of Medicine.
2012-present	Chair, Appointments and Promotions Committee, Department of Environmental Medicine, NYU School of Medicine.
2014-present	Co-Chair, Environmental Health Research Affinity Group, NYU Global Institute of Public Health (GIPH), New York University, Washington Square.

Teaching Experience

Year	*Name of course*	*Type of Teaching/Contact Hrs.*	
1984-1994	Air Poll. Transport Modeling	(G48.2048)	Course Director
2006-present	Weather, Air Pollution, and Health	(G48.1010)	Course Director
1986-present	Aerosol Science	(G48.2033)	Course Director
1984-2010	Environmental Contamination	(G48.2305)	Lecturer
1984-present	Environ. Hygiene Measurements	(G48.2035)	Lecturer/Lab
1990-1998	Environmental Toxicology	(G48.1006)	Lecturer
1993-1995	Environmental Epidemiology I	(G48.2039)	Lecturer
2001-2003	NYU Summer Institute, Wagner School		Lecturer
2006-present	Environmental Epidemiology I	(G48.2039)	Lecturer
2006-present	Science, Health & Envir. Journalism	(G54.1017.0)	Lecturer
2009-2011	Global Environmental Health	(U10.2153.1)	Course Director
2009-2012	Global Issues in Environ. Health	(G48.1011)	Course Director
2009-present	Earth Systems Science (undergrad)	(V36.0200)	Lecturer
2011-present	Principles of Environmental Health	(G48.1004)	Course Director
2013-present	Environ. Hygiene Measurements	(G48.2035)	Course Co-Director

Awards and Honors

November 1999	Orange Environment Citizens Action Group, OE Award for Excellence in Translating Science to the Public
December 2000	NYU School of Medicine Dean's Research Incentive Award
October 2012	Recipient of the "Haagen Smit Prize" for Best Paper, Atmospheric Environment. http://geo.arc.nasa.gov/sgg/singh/winners12.html
March 2013	Recipient of the "Best Paper of the Year – Science" Award from ES&T http://pubs.acs.org/doi/full/10.1021/es400924t

Major Committee Assignments

New York University Committees

2007-present: University Sustainability Task Force
2010-2012: University Faculty Senate Alternate
2012-present: University Faculty Senator

NYU School of Medicine Departmental Committees

1992-1998:	Sterling Forest Library Committee, Member, NYU SOM Dept of Environ. Medicine
1991-1994	Health & Safety Committee, Member, NYU SOM Dept. of Environ.. Medicine
1992-2004	Community Outreach and Education Comm., Chairman, NYSOM Dept. of Environ. Med.
1999-2004	Dept. Chairman's Internal Advisory Comm., Member, NYUSOM Dept. of Environ. Med.
2005-present	Dept. Academic Steering Committee, Member, NYUSOM Dept. of Environ. Medicine
2007-2012	Dept. Appointments & Promotions Comm., Member, NYUSOM, Dept. of Environ. Medicine
2012-present	Dept. Appointments & Promotions Comm., Chair, NYUSOM, Dept. of Environ. Medicine

Advisory Committees

Regional

1983-1984	Massachusetts Acid Rain Advisory Board, Member, Mass. Dept. of Env. Protection
1984-1986	Committee on Environ. And Occup. Health. , NY State American Lung Association
1991-1996	Air Management Advisory Comm., Member of Health Effects Subcom., NY State DEC
1995-1999	Engineering Advisory Board, Member, Tuxedo, NY
1997-1998	Advisory Committee to the Mayor on the Port of Newburgh, Member, Newburgh, NY
1996-1999	CUES Asthma Working Group, Member, New York Academy of Medicine
2008-2010	New York City Community Air Study (NYCCAS) Advisory Panel

National

1995-1999	Comm. on Health Effects of Waste Incineration, Member, National Academy of Sciences
1995-1999	National Air Conservation Commission, Member, American Lung Association
2000-2004	National Action Panel on Environment, Member, American Lung Association
2005-present	National Clean Air Committee, Member, American Lung Association
2007-2010	U.S. EPA Clean Air Science Advisory Committee (CASAC) for SOx and NOx
Mar. 2012	EPA Panelist for "Kickoff Workshop to Inform EPA's Review of the Primary NO_2 NAAQS"

International

1996-1997	Sulfur in Gasoline Health and Environment Panel, Chairperson, Health Canada
Sept. 2007	Illness Cost of Air Pollution Expert Committee, Canadian Medical Association
2008-2012	Global Burden of Disease (GBD), Committee on the Human Health Effects of Outdoor Air Pollution, World Health Organization (WHO)

Grant Review Committees (National)

March 1989	EPA Air Chemistry and Physics Extramural Grants Review Panel (*ad hoc member*)
Oct. 1989	NIEHS P30 Center Special Review Panel (*ad hoc member*)
July 1992	NIH R01 Epidemiology & Disease Control Study Section (*ad hoc member*)
Nov. 1992	NIEHS P20 Center Development Grant Special Study Section, (*ad hoc member*)
June 1996	EPA Special Review Panel of the Health Effects Institute (HEI) (*ad hoc member*)
March 1997	EPA Office of Res. and Development External Grant Review Panel (*ad hoc member*)
April 1997	NIEHS Community-Based Participatory Res. R01 Special Study Sect. (*ad hoc member*)
July 1997	EPA National Environ. Research Lab Intramural Research Review Panel (*ad hoc member*)
June 1998	EPA Office of Res. and Development External Grant Review Panel (*ad hoc member*)
July 1998	EPA Climate Policy and Programs Division Grant Application Review (*ad hoc member*)
Oct. 1998	Mickey Leland Center for Air Toxics Grant Review Panel (*ad hoc member*)
April 2000	NIEHS P30 Center Special Review Panel (*ad hoc member*)
July 2001	NIEHS Community-Based Participatory Res. R01 Special Study Sect. (*ad hoc member*)
Dec. 2001	NIEHS Program Project P01 Site Visit Review Panel (*ad hoc member*)
April 2003	NIH R21 Fogarty Health, Env. and Economic Development Study Sect. (*ad hoc member*)
Nov. 2003	U.S. EPA STAR Grant Panel (Epidemiologic Research on Health Effects of Long-Term Exposure to Ambient Particulate Matter and Other Air Pollutants) (*member*)
October 2004	NIEHS Program Project P01 Review Panel (*ad hoc member*)

June 2005	NIH Special Emphasis Panel (ZRG1 HOP Q 90 S) (*ad hoc member*)
Nov. 2005	NIH Infectious Disease, Reproductive Health, Asthma/Allergy, and Pulmonary (IRAP) Conditions Study Section Review Panel (*ad hoc member*)
Feb. 2006	NIH Infectious Disease, Reproductive Health, Asthma/Allergy, and Pulmonary (IRAP) Conditions Study Section Review Panel (*ad hoc member*)
June 2006	NIH Infectious Disease, Reproductive Health, Asthma/Allergy, and Pulmonary (IRAP) Conditions Study Section Review Panel (*ad hoc member*)
Dec. 2006	NIEHS Special Emphasis Panel on Genetics, Air Pollution, and Respiratory Effects (ZES1 TN-E FG P) (*member*)
Nov. 2007	NIH Special Emphasis Panel on Community Participation in Research (ZRG1 HOP-S) (*member*)
June 2009	NIH Study Section Review Panel on Challenge Grants in Health & Science Research
March 2011	U.S. EPA Science to Achieve Results (STAR) Graduate Fellowship Review Panel – Clean Air Panel (*chair*)
Sept. 2011	NIH Special Epidemiology Study Section (ZRG1 PSE K 02 M) (*member*)
Oct. 2012	NIH Cardiac and Sleep Epidemiology (CASE) Study Section (*ad hoc member*)
June 2013	NIH Special NHLBI Dataset Study Section (ZRG1 PSEQ 56) (*member*)
July 2013	NIH "Career Awards" Study Section (ZES1 LWJ-D, K9) (*member*)
Sept. 2013	Appointed Permanent Member, NIH Cardiac & Sleep Epid. (CASE) Study Section

Memberships, Offices, And Committee Assignments In Professional Societies

Year	*Society/Committees*
1980-1996	Air and Waste Management Association (Comm. on Health Effects and Exposure,)
1992-Present	American Thoracic Society (ATS): Environmental and Occup. Health (EOH) Assembly, 1995-1999, 2012-present: ATS EOH Long Range Planning Committee; 1993-1994, 2002-2004: ATS Program Committee 2006-2007 Chairman of the ATS-EOH Nominating Committee 2010-present: ATS Environmental Health Policy Committee, member 2012-present: ATS Environmental Health Policy Committee, Vice-Chairman
1990-present	International Society of Exposure Science
1992-present	International Society for Environmental Epidemiology (Annual Meeting Program Committee: 1998, 2000, 2003, 2004, 2006) (ISEE Conference Planning Committee: 2006-present)
2007-2009	New York Academy of Sciences (membership given in appreciation for a 1/23/07 NYAS forum presentation)

Editorial Positions

Journal Board Membership

Year	*Name of Board*
1993-2008	International Society of Exposure Analysis (J. of Exp. Anal. and Environ. Epid.)

Ad Hoc Manuscript Reviewer

Years	*Journal*
1996-1998	American Journal of Epidemiology
1994	Archives of Environmental Health
1995-present	Atmospheric Environment
1995-present	Environmental Health Perspectives
1994-present	Environmental Research
2004-present	Environmental Science and Technology

2011-present	Epidemiology
1993-present	Journal of Exposure Analysis and Environmental Epidemiology
1994-present	Journal of the Air and Waste Management Association
1996-present	Journal of the American Medical Association
1997-present	Journal of Occupational and Environmental Medicine
1997-present	Journal of Respiratory and Critical Care Medicine
2006-present	Thorax

Scientific Report Reviewer

August, 1986	Reviewer for the National Academy of Sciences, Board on Environmental Studies and Toxicology report "The Airliner Cabin Environment: Air Quality and Safety"
October, 2002	Reviewer for the NAS, Board on Environmental Studies and Toxicology report "Estimating the Public Health Benefits of Proposed Air Pollution Regulations"

Mentoring of Graduate Students, Residents, Post-Doctoral Fellows in Research

Under direct supervision:

Student Name	*Type of Position*	*Time Period*	*Present Position*
Mark Ostapczuk	Masters	1984-1986	Industrial Hyg., Barr Labs, Pomona, NJ
Kazuhiko Ito	Masters/Doctoral	1984-1990	Scientist, NYC Dept. of Health, NYC, NY
Peter Jaques	Masters/Doctoral	1988-1998	Assoc. Prof., Clarkson Univ., Potsdam, NY
R. Charon Gwynn	Masters/Doctoral	1992-1999	Epidemiologist, Columbia Univ., NY
Ramona Lall	Masters/Doctoral	2000-2007	Research Sci. IV, NYC Dept. of Health, NY
Ariel Spira-Cohen	Masters/Doctoral	2003-2009	Research Sci. III, NYC Dept. of Health, NY
Kevin Cromar	Masters/Doctoral	2008-2012	Assistant Professor, NYU School Of Medicine
Lital Yinon	Doctoral	2011-present	Doctoral Candidate, NYU School of Medicine
Chris Lim	Doctoral	2012-present	Doctoral Candidate, NYU School of Medicine

In advisory function (thesis committee):

Student Name	*Advisory Role*	*Time Period*	*Student's Supervisor*
Shao-Keng Liang	Doctoral Committee member	1990-1994	Dr. J. Waldman, UMDNJ, Rutgers
Jerry Formisano	Doctoral Committee member	1997-2000	Dr. M. Lippmann, NYU SOM
Yair Hazi	Doctoral Committee member	1993-2001	Dr. B. Cohen, NYU SOM
Samantha Deleon	Doctoral Committee member	1997-2003	Dr. K Ito, NYU SOM
Chun Yi Wu	Doctoral Committee member	2000-2004	Dr. L.C. Chen, NYU SOM
Carlos Restrepo	Doctoral Committee member	2002-2004	Dr. R. Zimmerman, Wagner, NYU
Shaou-I Hsu	Doctoral Committee member	2000-2009	Dr. M. Lippmann, NYU-SOM
Steven Schauer	Doctoral Committee member	2007-2009	Dr. B. Cohen, NYU-SOM
Christine Ekenga	Doctoral Committee Chair	2009-2011	Dr. G. Friedman-Jimenez, NYU-SOM
Rebecca Gluskin	Doctoral Committee Chair	2009-2012	Dr. Kazuhiko Ito, NYU SOM
Jiang Zhou	Doctoral Committee Chair	2008-2012	Dr. Kazuhiko Ito, NYU SOM
Eric Saunders	Doctoral Committee Chair	2012-present	Dr. Terry Gordon, NYU SOM

Teaching Awards Received

N/A

Major Research Interests

1) Air Pollution Epidemiology: Real-world air pollution exposures and human health effects in the general population and study cohorts of suspected susceptible individuals (e.g., children).

2) Aerosol Science: Ambient particulate matter aerosol exposures, including designing and implementing air monitoring equipment to collect human exposures to air pollution.

3) Environmental Exposure Assessment: Methods to assess human exposures and health effects from air pollution, especially the development of source apportionment models to separate human effects on the basis of pollution source. Design of epidemiological models/methods that better incorporate potential air pollution confounders/effect modifiers (e.g. weather and genetic influences).

Grants Received

Prior:

Agency	Title	Grant #	Period	Total Direct Costs	Role	% Effort
USEPA	Effects of Acute Exposure to Summertime Haze Episodes on the Health of Humans	R811563	05/01/84-09/30/87	$538,586	Co-I	50%
NIH	Acid Aerosol Exposure: Effect on Respiratory Morbidity	R01 ES04612	09/25/87-08/31/92	$846,966	PI	30%
USEPA	Acid Aerosol Chamber Experiments	OD2524AEX	7/2/90-7/31/90	$5,810	PI	9%
USEPA	Analysis of Acid Aerosol Experiments	00422248NAEX	8/1/90-9/30/90	$3,364	PI	5%
USEPA	Air Pollutants and Human Health	R814023	05/18/87-05/17/91	$690,921	CO-I	50%
USEPA	Development and Field Applic. of an Automated Sequential Weekly Average H+ Sampler	Subcontract to EPA Grant CR816740-03	6/1/92-2/28/93	$13,156.	PI	15%
NIH	Acid Aerosol Exposure: Effect on Respiratory Morbidity	R01 ES04612	09/01/92-08/31/95	$377,298.	PI	30%
HEI	Retrospective Characterization of Ozone Exposures	Health Effects Institute Grant	11/1/93-10/31/94	$98,238	CO-I	10%
NIH	Temperature and Air Pollution Effects on Human Mortality	R01 ES05711	6/1/92-5/31/95	$371,993	PI	30%
NYUSOM	Environmental Effects on Human Mortality and Morbidity	Bridge Grant	9/1/95-8/31/96	$48,400	PI	-
USEPA	Effects of Exposure to Ambient Air Pollutants on Human Healt	R808325	10/1/91-09/30/96	$870,565	CO-I	50%
USEPA	Investigation of Acid Aerosol Exposures in Metropolitan Settings	Subcontract to Grant No. CR822050	11/1/93-10/31/96	$200,499	PI	10%
USEPA	An Evaluation of Potential Confounders in PM10 Mortalit Associations	R825271	11/25/96-11/24/01	$219,410	CO-I	10%
USEPA	Acidic PM and Daily Human Mortality in Three U.S. Cities	#R825264	11/25/96-11/24/00	$232,671	PI	15%
NYS-ERDA	Environmental Monitoring, Evaluation, and Protection Program	6084-ERTER-ES00	12/01/99-11/30/02	$341,926	PI	20%
HEI	Children's Asthma Incidence and Personal Exposures to		01/01/02-12/31/02	$154,800	PI	30%

	Diesel Particles and Traffic in NYC					
USEPA	Influence of Alternate Indicators of Exposure to PM and PM Components in Statistical Associations with Mortality and Hospital Admissions	R827358	03/01/99-02/28/03	$183,089	PI	30%
NIH	NIEHS Center Supplement: Health Issues Related to the World Trade Center Disaster, Outreach Project	ES00260-S1	04/01/02-03/31/03	Total=$ 936,487 Outreach=$172,031	Co-PI PI	10% 15%
NIH	Effects of Ambient Air Pollutants on Annual Mortality	RO1 ES09560	9/15/99-8/31/03	$471,408	PI	30%
USEPA	Particle Exposures of High-Ris Sub Populations	R827164	10/01/98-09/30/03	$1,327,240	Co-I	10%
USEPA	A Source Oriented Evaluation of the Combined Effects of Fin Particles and Co-pollutants	R827997	02/01/00-01/31/04	$291,407	Co-I	15%
NIH	NIEHS Center Grant: Outreach and Education Program	ES00260	04/01/00-03/31/05	Total=$5,000,000 Outreach=$240,365	Co-I PI	5% 5%
USEPA	EPA PM Health Effects Center Project 6: "A Prospective Stud of Asthma Susceptibility to PM Epidemiologic Investigations o Key PM Components and Biomarkers of Effects & Community Outreach Project	R827351	06/01/99-05/31/05	Total=$6,000,000 Project 6=$134,923 Outreach=$77,779	Co-PI PI PI	15% 10% 10%
NIH	Genetic/Epigenetic Susceptibility to Superfund Chemicals: Outreach Project	ES010344	05/08/00-03/31/06	$156,812	Co-I	5%
USEPA	Env. Issues in the South Bronx. Thurston Project: S. Bronx Backpack Study	X1982152	08/01/00-09/30/06	Total=$921,922 Project=$307,131	CO-I PI	5% 15%
NIH	NIEHS Center Supplement: Health Issues Related to the World Trade Center Disaster, Source Attribution (Project 4) & Community Outreach	ES00260-S2	04/01/02-03/31/04	Total=$660,000 Project 4=$69,999 Outreach=$172,03	Co-PI PI PI	10% 10% 15%
USEPA	The role of traffic-related pollution in PM health effects associations among inner-city children with asthma	16511	09/01/06-08/31/09	$51,516	PI	-
California Air Resources Board (CARB)	Spatio-temporal Analysis of Air Pollution and Mortality in California Based Upon the ACS Cohort (Thurston: Consulting Project)		06/01/07-5/31/10	Project=$13,634	Co-I	4%
USEPA	Real time modeling of weather, air pollution, health outcome indicators in NYC.	RD-83362301-0	12/07-11/10	$130,496	Co-I	5%
NIH	Fine Particles and Out-of-Hospital Cardiac Arrest in	R01ES014387-01A2	04/09-12/11	$200,000	Co-I	10%

	New York City					
Health Effects Institute (HEI)	Characteristics of PM Associated with Health Effects. *Thurston Project*: "Study Of PM Components and U.S. Human Mortality In The ACS Cohort.	4750	01/01/07-3/31/11	Total=$3,247,567 Project=$355,920	Co-I PI	5% 20%
NT State DOT	Mobile Source Air Toxics Mitigation Measures		09/01/10 06/31/13	SubProject=$89,062	Co-I	10%
Robert Wood Johnson Fndn.	The Effect of Peak-Shaving Regulations on the Activity, Toxic Emissions, and Health Impacts of Local Power Plants	Public Health Law Research	1/12-7/13	$151,500	Co-I	10%

Current:

Agency	Title	Grant #	Period	Total Direct Costs	Role	% Effort
NIH	Long-term Air Pollution Exposure and Mortality in the NIH-AARP Cohort.	R01ES019584-01A1	1/01/12-6/30/16	$1,221,253	MPI (Contact PI)	20%
The Public Health Research Institute of Abu Dhabi	Development of a Public Health Research Institute in Abu Dhabi. *Thurston Project*: "Air Pollution in Abu Dhabi".		3/2012-2/2017	$9,993,960	Co-I	10%
NIH	Dietary Influence on Mortality from Air Pollution Exposure in the NIH-AARP Cohort (R21)	1R21ES021194-01	7/12-6/15	$150,000	MPI (Contact PI)	8%

Patents
None

Boards and Community Organizations
1990-1995 St. Mary's Episcopal Church, Tuxedo, NY, Vestry member
1992-2008 Monroe-Woodbury Soccer Club, Coach (Board Member: 1999-2000)
1994-1999 Orange County Citizen's Foundation, Member
1999-2009 Y2CARE Monroe-Woodbury, NY School District Residents Action Group, Founder
2005-present St. Mary's Episcopal Church, Tuxedo, NY, Community Outreach Committee, Member
2006-present EPISCOBUILD-Newburgh, NY Habitat for Humanity Advisory Board, Member
2012-present St. Mary's Episcopal Church, Tuxedo, NY, Vestry member

Military Service
None

International Scientific Meetings Organized

May 28-30, 2003 "Workshop on the Source Apportionment of PM Health Effects." U.S. EPA PM Centers, Harriman, NY.

Aug. 1-4, 2004 "Sixteenth Conference of the International Society for Environmental Epidemiology," Kimmel Conference Center, Washington Square, New York University, New York City, NY.

Scientific Forums for the Public Organized

June 2001 "Science and Community Interaction Forum on the Environment." Held at Hostos Community College, Bronx, , New York City, NY.

October 2001 "Forum on Environmental Health Issues Related to the World Trade Center Disaster." Held at NYU Law School, Washington Square, New York City, NY.

October 2002 "2nd Annual Forum on the Environmental Health Issues Related to the World Trade Center Disaster." Held at Manhattan Borough Community College, New York City, NY.

October 2003 "3nd Annual Forum on the Environmental Health Issues Related to the World Trade Center Disaster." Held at NYU Lower Manhattan Campus, New York City, NY.

Invited U.S. House and Senate Congressional Testimony

Feb. 5, 1997 "Human Health Effects of Ambient Ozone Exposures" Statement before the Committee on Environment and Public Works, Subcommittee On Clean Air, Wetlands, Private Property, And Nuclear Safety, U.S. Senate, Washington, DC.
http://epw.senate.gov/105th/thurston.htm

April 16, 1997 "Human Health Effects of Ambient Ozone and Particulate Matter Exposures." Statement before the Government Reform and Oversight Committee of the U.S. House of Representatives, Washington, D.C.

May 8, 1997 "Human Health Effects of Ambient Ozone and Particulate Matter Exposures." Statement before the Subcommittee on Health and Environment, Committee on Commerce of U.S. House of Representatives, Washington,. D.C.

July 29, 1997, "The Human Health Effects of Ambient Ozone And Particulate Matter Air Pollution." Statement before the Subcommittee on Commercial and Administrative Law of the Judiciary Committee of the U.S. House of Representatives, Washington,. D.C.
http://judiciary.house.gov/legacy/commercial.htm

October 22, 1997 "Ozone and Particulate Matter Air Pollution Health Effects." Statement before the U.S. Senate Committee on Environment and Public Works Subcommittee on Clean Air, Wetlands, Private Property, and Nuclear Safety. Washington, DC.
http://epw.senate.gov/105th/thursto2.htm

July 15, 1999: "The Mandated Release of Government-Funded Research Data." Statement before the Committee On Government Reform, Subcommittee on Government Management, Information And Technology, U.S. House of Representatives

July 26, 2001 "The Human Health Effects Of Air Pollution From Utility Power Plants." Statement before the Committee on Environment and Public Works, U.S. Senate, Washington, D.C.
http://www.c-spanvideo.org/program/PlantE

Feb 11, 2002: "The Air Pollution Effects of The World Trade Center Disaster." Statement before the Committee On Environment And Public Works, Subcommittee On Clean Air, Wetlands, And Climate Change. United States Senate, New York, NY.
http://www.c-spanvideo.org/program/Qualitya

March 5, 2002 "The Use of the Nationwide Registries to Assess Environmental Health Effects." Statement before the Committee On Health, Education, Labor, And Pensions, Subcommittee On Public Health, U.S. Senate, Washington, DC.

Sept. 3, 2002 "The Clean Air Act and The Human Health Effects of Air Pollution from Utility Power Plants." Statement before the U.S. Senate Committee on Health, Education, Labor, and Pensions, Subcommittee on Public Health, Washington, D.C. http://www.c-spanvideo.org/program/AirStand

April 1, 2004 "The Human Health Benefits Of Meeting the Ambient Ozone And Particulate Matter Air Quality Standards." Statement before the Committee on Environment and Public Works, Subcommittee on Clean Air, Climate Change, and Nuclear Safety, U.S. Senate, Washington, D.C.

http://epw.senate.gov/epwmultimedia/epw040104.ram

July 19, 2006 "The Science And Risk Assessment Of Particulate Matter (PM) Air Pollution Health Effects." Statement before the Committee on Environment and Public Works, U.S. Senate, Washington, D.C.
http://epw.senate.gov/hearingstatements.cfm?id=258766

May 7, 2008 "Science And Environmental Regulatory Decisions." Statement before the Committee On Environment And Public Works of The U.S. Senate, Subcommittee on Public Sector Solutions to Global Warming, Oversight, and Children's Health Protection, U.S. Senate, Washington, D.C.

http://www.c-spanvideo.org/program/RegulatoryD

http://epw.senate.gov/public/index.cfm?FuseAction=Hearings.Hearing&HearingID=a1954f70-802a-23ad-4192-fc2995dda7f4

October 4, 2011 "The Science of Air Pollution Health Effects and the Role of CASAC in EPA Standard Setting" Statement before the Subcommittee on Energy and the Environment, Committee on Science, Space and Technology, U.S. House Of Representatives, Washington, DC.

http://science.house.gov/hearing/energy-and-environment-subcommittee---hearing-quality-science-quality-air

Other Invited Presentations

Regional Presentations

April 21, 1993 "Summertime Smog and Hospital Admissions for Respiratory Illness", Environmental and Occupational Health Sciences Institute Seminar Series Lecture, UMDNJ-Robert Wood Johnson Medical School, Piscataway, NJ.

Dec .14, 1995 "Health Effects of Acidic Aerosols", NY State Dept. of Health, Wadsworth Center Seminar, Albany, NY

Jan. 18, 1996 "Outdoor Air Pollution and Asthma in Children " American Lung Association Press Briefing, New York, NY.

June 1, 1996 "Asthma and Urban Air Pollution", WHEACT, Harlem Hospital, New York, NY.

July17, 1996 "Asthma and Outdoor Air Pollution", Making the Connection: Urban Air Toxics & Public Health. Northeast States for Coordinated Air Use Management (NESCAUM), Roxbury, MA

Feb. 11, 1997 "Outdoor Air Pollution and Asthma", Bellevue Hospital Asthma Clinic *Grand Rounds*. New York City, NY.

Feb. 26, 1998 "Scientific Research for Ozone and Fine Particulate Standards ", Pace University School of Law, White Plains, NY

Nov. 30, 1998 "Outdoor Air Pollution and Asthma", Center for Urban and Environmental Studies (CUES), NY Academy of Medicine,, New York, NY

Feb. 22, 1999	"Asthma and Air Pollution", Cornell University, Ithaca, NY
April 28, 2001	"Asthma and Air Pollution in New York City", NYC Council Environmental Candidate School, NY League of Conservation Voters, New York, NY.
Nov. 1, 2001	"Air Quality and Environmental Impacts Due to the World Trade Center Disaster", Testimony before the Comm. on Environ. Protection, NYC Council, New York, NY.
Nov. 13, 2001	"WTC Pollution Impacts in Lower Manhattan", Stuyvesant High School Parents Association General Meeting, Stuyvesant High School, New York, NY
Feb. 28, 2002	"Lung Cancer Effects of Long-Term Exposure to Ambient Fine Particulate Matter", Mailman School of Public Health, Columbia University, New York, NY.
April 5, 2002	"Air Pollution Impacts of the WTC Disaster", 23rd Annual Scientific Conference of the NY/NJ Education and Research Center: "Worker Health and Safety: Lessons Learned in the Aftermath of Sept. 11, 2001," Mt. Sinai School of Medicine, NYC, NY
April 21, 2002	"Adverse Health Effects of Power Plant Air Pollution on Children" Earth Day 2002, 14th Street Y, New York City, NY.
May 23, 2002	"Human Health Effects of Power Plant Pollution", Rockland County Conservation Association, Suffern, NY
May 31, 2002	"Environmental Health Impacts of the World Trade Center Disaster", University of Rochester Medical School, Rochester, NY.
Sept. 19, 2002	"Community Air Pollution Related to the World Trade Center Disaster". NYC Council Forum: The Environmental Health Consequences of 9/11: Where Do We Stand One Year Later? Borough of Manhattan Community College, New York City, NY.
Oct. 3, 2002	"Community Exposures to Particulate Matter Air Pollution from the World Trade Center Disaster", Mount Sinai School of Medicine *Grand Rounds*, New York City, NY.
April 11, 2003	"Environmental Impacts of the World Trade Center Disaster", NIEHS Public Interest Liaison Group, New York City, NY.
April 21, 2003	"Asthma and Air Pollution", Airborne Threats to Human Health, NIEHS Town Hall Meeting, Syracuse, NY.
May 7, 2003	"Asthma and Air Pollution in NY City" Environmental Candidate School for New York City Council Candidates, Wagner School, NYU, New York City, NY.
July 21, 2003	"Health Effects of Particulate Matter Air Pollution", Ozone Transport Commission, Philadelphia, PA.
Nov. 18, 2004	"Ambient Air Pollution Particulate Matter (PM): Sources and Health Impacts". U.S. Environmental Protection Agency, Region 2, New York City, NY.
Feb. 17, 2005	"Community Air Pollution Aspects Of The Demolition Of 9-11 Contaminated Buildings". Testimony before the Committee On Lower Manhattan Redevelopment, New York City Council, New York City, NY.
Oct. 19, 2005	Air Pollution Health Effects: Consideration of Mixtures. Fall Meeting of the Mid-Atlantic Chapter of the Society of Toxicology (MASOT), East Brunswick, NJ.
Dec.7, 2006	Asthma and Air Pollution Effects in the South Bronx. New York City Child Health Forum, The Children's health Fund, Harlem, NYC, NY.
Jan. 18, 2007	Air Pollution Effects in New York City. NYU Environmental Sciences Seminar Lecture, Washington Square, NYC, NY.
Jan. 23, 2007	The South Bronx Backpack Study: Asthma and Air Pollution in NYC. Presented at the forum "High Asthma Rates in the Bronx: What Science Now Knows and Needs to Learn." New York Academy of Sciences, 7 World Trade Center, NYC, NY.
Oct. 2, 2009	"Diesel Air Pollution and Asthma in New York City". Brown Superfund Research Program. http://www.brown.edu/Research/SRP/thurston%20oct%202.pdf , Brown University, Providence, RI.

June 19, 2012 "The Backpack Study of Asthma and Diesel Air Pollution in the South Bronx". Region 1 U.S. EPA, Citizen Science Workshop, New York City, NY.

National Presentations

Oct. 20, 1987. NIEHS Symposium on the Health Effects of Acid Aerosols: "Re-examination of London, England, Mortality in Relation to Exposure to Acidic Aerosols During 1963-1972 Winters" RTP, NC.

Aug. 13, 1991 "Kuwait Mortality Risks from SO_2 and Particles: Insights from the London Fogs"' The Kuwait Oil Fires Conf., American Academy of Arts and Sciences, Cambridge, MA.

Jan. 24, 1994 "Air Pollution Epidemiology: Is the Model the Message?" The First Colloquium on Particulate Air Pollution and Human Morbidity and Mortality". Beckman Center of the NAS, Irvine, CA.

May 23, 1994 " Epidemiological and Field Studies". American Thoracic Society Annual Meeting, Boston, MA.

May 25, 1994 "Epidemiological Evidence Linking Outdoor Air Pollution and Increased Hospital Admissions for Respiratory Ailments" American Thoracic Society Annual Meeting, Boston, MA.

May 6, 1996 "Associations Between PM_{10} & Mortality in Multiple US Cities". Second Colloquium on Particulate Air Pollution and Health. Park City, Utah.

Sept. 5, 1996 "Particulate Matter Exposure Issues for Epidemiology" U.S. EPA Particulate Matter Workshop, RTP, NC

April 3, 1997 "Health Effects of Ambient Ozone & Particulate Matter" Air and Waste Assoc. Regional Conference On Impacts of EPA's Proposed Changes to Ozone and PM Standards, Oak Brook, IL

April 22, 1998 "The New EPA Standards for Ambient PM and Ozone" American Lung Association Annual Meeting, Chicago, IL.

Dec. 21, 1999 "Global Overview of Human Death and Illness due to Air Pollution". California Air Resources, Sacramento, CA.

March 24, 2000 "Estimating Ancillary Impacts, Benefits and Costs Of Proposed GHG Mitigation Policies For Public Health" Resources for the Future, Wash., DC.

June 24, 2002 "Investigations Into the Environmental Health Impacts Related to the WTC Disaster" Air And Waste Management Annual Meeting, Baltimore, MD.

July 15, 2002 "Air Pollution and Human Health" NIEHS Built Environment Conference, RTP, NC

July 26, 2002 "The Human Health Effects of Power Plant Emissions and Associated Air Pollution", The Environment & Health Forum, Physicians for Social Responsibility, Washington, DC.

October 7, 2002 "Community Exposures to Particulate Matter Air Pollution from the World Trade Center Disaster" Plenary Speaker at the American Association for Aerosol Research, Charlottesville, North Carolina.

Nov. 11, 2002 "Characterization of Community Exposures to World Trade Center Disaster Airborne and Settled Dust Particulate Matter Air Pollution", American Public Health Association Annual Meeting, Philadelphia, PA.

Dec. 5, 2002 "Susceptibility of Older Adults to Air Pollution", EPA Workshop on Differential Susceptibility of Older People to Environmental Hazards. National Academy of Sciences, Washington, DC.

Feb. 3, 2003 "Health Effects of Particulate Matter Air Pollution", National Air Quality Conference, U.S. EPA, San Antonio, Texas

May 17, 2003 "Assessing the Influence of Particle Sources and Characteristics on Adverse Health Effects of PM", PG18 - New Tools to Evaluate the Health Effects of Air Pollution in Epidemiologic Studies. American Thoracic Society Annual Meeting, Seattle, WA.

Sep. 10, 2003	"Nature and impact of World Trade Center Disaster fine particulate matter air pollution at a site in Lower Manhattan after September 11." Annual Meeting of the American Chemical Society, New York, NY.
October 20, 2003	"Translating Air Pollution Risks to the Community" Annual Meeting of the NIEHS Center Directors, Baltimore, MD.
May 18, 2004	"The Health Imperative for Implementation of the Clean Air Act" State and Territorial Air Pollution Program Administrators/ Association of Local Air Pollution Control Officials (STAPPA/ALAPCO) National Conference, Point Clear, Alabama.
Oct. 18, 2004	"NIEHS Centers' Investigations of the World Trade Center Collapse Pollution Exposures and Effects: A Public Health Collaboration" National Institute of Environmental Health Sciences Center Directors' Meeting, Research Triangle Park, NC.
May 25, 2005	"Human Health Effects Associated with Sulfate Aerosols", American Thoracic Society Annual Meeting, San Diego, CA
Oct. 24, 2005	"The Science Behind the Particulate Matter (PM) Standards" State and Territorial Air Pollution Program Administrators/ Association of Local Air Pollution Control Officials (STAPPA/ALAPCO) National Conference, Alexandria, Virginia.
Oct. 14, 2008	"Diesel Air Pollution and Asthma Exacerbations in a Group of Children with Asthma" Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Pasadena, California.
Feb. 26, 2010	"What studies are appropriate to use to estimate health impacts from specific sources such as diesel PM?" CARB Symposium: "*Estimating Premature Deaths from Long-term Exposure to $PM_{2.5}$*". Sacramento, CA.
May 6, 2011	"Lung Cancer Risks from Exposure to Fine Particle Air Pollution" NYU Cancer Institute Symposium: "Cancer and the Environment", NYC, NY.
May 16, 2012	"The Human Health Effects of Air Pollution" The Air We Breathe: Regional Summit on Asthma and Environment at Allegheny General Hospital, Pittsburgh, PA.
June 20, 2013	"Particles in our Air: A Global Health Risk", Northeastern University, Research Seminar. Boston, MA.

International Presentations

May 1, 1987	"Acid Aerosols: Their Origins, Occurrence, and Possible Health Effects", Canadian Environmental Health Directorate Seminar, Health and Welfare Canada, Ottawa, Canada
July 2, 1987	"Health Effects of Air Pollution in the US", University of Sao Paulo, Sao Paulo, Brasil
Feb. 5, 1991	"Results from the Analysis of Toronto Summer Sulfate and Aerosol and Acidity Data", Workshop on Current Use and Future Directions of Hospital-Based Data in the Assessment of the Effects of Ambient Air Pollution on Human Health. Health and Welfare Canada, Ottawa, Canada.
April 23, 1997	"An Evaluation of the Role of Acid Aerosols in Particulate Matter Health Effects", Conference on the Health Effects of Particulate Matter in Ambient Air. Air & Waste Management Association, Prague, Czech Republic.
May 12, 1998	"The Health Effects of PM and Ozone Air Pollution", Air Pollution: Effects on Ontario's Health and Environment. Ontario Medical Association, Toronto, Canada
Nov. 1, 1999	"Climate Change and the Health Impacts of Air Pollution". The Public Health Opportunities and Hazards of Global Warming Workshop at the U.N. Framework Convention on Climate Change, Conference of Parties (COP5), Bonn, Germany.
August 31, 2000	"Particulate Matter Air Pollution and Health in three Northeastern Cities", World Congress on Lung Health, Florence, Italy
January 29, 2001	"PM Exposure Assessment and Epidemiology", NERAM International Colloquia: Health and Air Quality: Interpreting Science for Decision Makers. Ottawa, Canada.

Feb. 4-5, 2002:	"Air Pollution Exposure Assessment Approaches in U.S. Long-Term Health Studies", Workshop on Exposure Assessment in Studies on the Chronic Effects of Long-term Exposure to Air Pollution, World Health Organization, Bonn, Germany
May 2, 2002	"Health Effects of Sulfate Air Pollution" Air Pollution as a Climate Forcing Workshop, East-West Center, Honolulu, Hawaii
Sept. 24, 2003	"Identification and Characterization of World Trade Center Disaster Fine Particulate Matter Air Pollution at a Site in Lower Manhattan Following September 11." Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Perth, Australia.
Dec. 1, 2003	"Terrorism and the Pulmonary Effects of the World Trade Center Disaster Particulate Matter Air Pollution", British Thoracic Society, London, England.
Sept 14, 2005	"Results And Implications of The Workshop on the Source Apportionment of PM Health Effects", Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Johannesburg, South Africa.
Sept. 4, 2006	"A Source Apportionment of U.S. Fine Particulate Matter Pollution for Health Effects Analysis", Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Paris, France.
Sept. 4, 2007	"Applying Attributable Risk Methods to Identify Susceptible Subpopulations", Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Mexico City, Mexico.
Aug. 27, 2009	"Ischemic Heart Disease Mortality Associations with Long-Term Exposure to $PM_{2.5}$ Components", Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Dublin, Ireland.
Dec. 1, 2010	"The Hidden Air Quality Health Benefits of Climate Change Mitigation". The Energy and Resources Institute (TERI), Lodhi Road, New Delhi, India.
July 17, 2012	"Recent Findings on the Mechanisms and Health Risks of Particulate Matter Air Pollution", European Centre for Environment & Human Health, Truro, England.
Aug. 29, 2012	"Health Effects of PM Components: NYU NPACT Epidemiology Results and their Integration with Toxicology Results", Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Columbia, SC.
May 20, 2013	"Long-term $PM_{2.5}$ Exposure and Mortality in the NIH-AARP Cohort", Annual Meeting of the American Thoracic Society (ATS). Philadelphia, PA.
Oct. 27, 2013	"Human Health Effects and Global Implications of Particle Air Pollution", Center of Excellence in Exposure Science and Environ. Health, Technion University, Haifa, Israel.

Scientific Meeting Sessions Chaired

May 1, 1996	"Epidemiological Findings", 2nd Colloquium on Particulate Air Pollution & Health. Park City, UT.
May 14, 1996	"Particulate Toxicity", American Thoracic Society Annual Meeting, New Orleans, LA.
Jan. 30, 1998	"Evaluation of PM Measurement Methods". $PM_{2.5}$: A Fine Particulate Standard Specialty Conference. Los Angeles, CA.
August 18, 1998	"Communities and Airports: How to Co-Exist?", Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Boston, MA.
April 28, 1998	"Clean Air Act Update", American Thoracic Society Annual Meeting, Chicago, IL.
Oct. 21, 1998	"Health Effects and Regulatory Issues in PM", Particulate Methodology Workshop,. U.S. EPA Center, for Statistics and the Env., Univ. of Washington, Seattle, WA.
April 26, 1999	"Pulmonary Smoking and Air Pollution Epidemiology." American Thoracic Society Annual Meeting, San Diego, CA
Sept. 6, 1999	"Personal exposures to Gases and Particles", Annual Conference of the International Society for Environmental Epidemiology (ISEE), Athens, Greece.

March 31, 2000	"Epidemiology: Particles, Co-pollutants & Morbidity and Mortality", Workshop on Inhaled Environmental/Occupational Irritants and Allergens: Mechanisms of Cardiovascular Responses, American Thoracic Society, Scottsdale, AZ
Jan. 26, 2000	"Epidemiology of Particulate Matter Air Pollution", PM2000 Specialty Conference, Air & Waste Management Assoc., Charleston, SC
May 8, 2000	"Outdoor Air Pollution: Epidemiologic Studies", American Thoracic Society Annual Meeting, Toronto, Canada
Sept. 5, 2001	"Mortality Epidemiology Studies", Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Garmisch, Germany.
May 20, 2002	"After September 11: Bio-terrorism and The Environmental Health Aftermath of The World Trade Center Disaster", Plenary Session. American Thoracic Society Annual Meeting, Atlanta, GA.
April 1, 2003	"Epidemiology: Short-Term and Long-Term Health Effects", Conference on Particulate Matter: Atmospheric Sciences, Exposure, and the Fourth Colloquium on PM and Human Health, Pittsburgh, PA
May 19, 2003	"Particulate Air Pollution and Diseases in Adults", American Thoracic Society Annual Meeting, Seattle, WA.
May 21, 2003	"Air Pollution as a Cause of Childhood Asthma and Chronic Airway Disease", American Thoracic Society Annual Meeting, Seattle, WA.
Sept. 2003	"Unexplained Medical Symptoms", Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Perth, Australia.
Sept. 25, 2005	"Technology and Health", Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Johannesburg, South Africa.
June 22, 2006	"Characteristics of PM and Related Considerations", Annual Meeting of the Air and Waste Management Association, New Orleans, LA.
Sept. 3, 2006	"Air Pollution Mechanisms", Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Paris, France.
Sept. 20, 2006	"Linkage and Analysis of Air Quality and Health Data", EPA & CDC Symposium on Air Pollution Exposure and Health, RTP, NC
Sept. 5, 2007	"Radiation Exposures and Health Risks", 2007 Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Mexico City, Mexico
Aug. 26, 2009	"Exploring the Range of Methodological Approaches Available for Environmental Epidemiology." 2009 Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Dublin, Ireland
March 23, 2010	"Exposure to and Health Effects of Traffic Pollution", 2010 American Association for Aerosol Research Conference on Air Pollution and Health, San Diego, CA.
Sept. 16, 2011	"Susceptibility to Air Pollution", 2011 Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Barcelona, Spain.
Aug. 27, 2012	"Source Apportionment Of Outdoor Air Pollution: Searching For Culprits". 2012 Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Columbia, SC.
Aug. 21, 2013	"Source-specific health effects of air pollution". 2013 Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Basel, Switzerland.

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Invited Journal Editorials

Thurston GD and Bates DM, Air Pollution as an Underappreciated Cause of Asthma Symptoms, 2003. JAMA, 290:14, pp. 1915-1916 (2003).

Thurston G.D. (2006). Hospital admissions and fine particulate air pollution. JAMA. Oct 25; 296(16):1966.

Thurston G. (2007). Air pollution, human health, climate change and you. Thorax. 2007 Sep; 62 (9): 748-9.

Thurston GD, Balmes JR; Particulate matter and the environmental protection agency: setting the right standard. Environmental Health Policy Committee of the American Thoracic Society. Am J Respir Cell Mol Biol. 2012 Dec;47(6):727-8. doi: 10.1165/rcmb.2012-0414ED.

Thurston GD. (2013). Mitigation Policy: Health Co-Benefits. Nature Climate Change. Oct. (3) 863-864.

Book Chapters

Thurston, G.D. and Leber, M. The relationship between asthma and air pollution. In: *Emergency Asthma* (ed.: B. Brenner), pp. 127-144. Marcel-Dekker, New York, NY (1999).

Thurston, G.D. and Ito, K. Epidemiological studies of ozone exposure effects. In: *Air Pollution and Health* (ed.: S. Holgate and H. Koren). Academic Press. London. pp. 485-510 (1999).

Chen, LC, Thurston, G, and Schlesinger, RB. Acid Aerosols as a Health Hazard. In: *Air Pollution and Health* (ed.: J. Ayres, R. Maynard, and R. Richards). Air Pollution reviews: Vol. 3. Imperial College Press. London. pp. 111-161 (2006).

Thurston, G.D. and Wallace, L. Air Pollution: Outdoor and Indoor Sources. In: *Environmental and Occupational Medicine*, 4th Edition (Eds.: W. Rom and S. Markowitz). Lippincott, Williams, and Wilkins, Philadelphia (2006).

Thurston, G.D. Air Pollution. In: *Encyclopedia of Public Health* (ed. K. Heggenhougen) Elsevier Press. (2007).

Thurston, G.D and Bell, M. Aerosols, global climate, and the human health co-benefits of climate change mitigation. In *Aerosol Handbook* (2nd edition) (eds.: Lev S. Ruzer and Naomi H. Harley). CRC Press (2012).

Thurston, G. and Bell, M. The Human Health Co-benefits of Air Quality Improvements Associated with Climate Change Mitigation. In. Global Climate Change and Public Health (eds. Kent E. Pinkerton and William N. Rom). Humana Press (2013).

National Academy Committee Books Co-Authored

National Research Council (NRC), *Waste Incineration & Public Health.* Committee on Health Effects of Waste Incineration. Board on Environmental Studies and Toxicology. National Academy Press, Washington, DC (2000).

International Reports Co-Authored

Health Canada, *Health and Environmental Impact Assessment Panel Report*, "Joint Industry/Government Study: Sulfur in Gasoline and Diesel Fuels". Ottawa, Canada. (1997).

World Health Organization (WHO), *Exposure assessment in studies on the chronic effects of long-term exposure to air pollution.* Report EUR/03/5039759. Geneva, Switzerland (2003).

Peer Reviewed Journal Articles/Letters

Thurston, G.D. General Discussion: Atmospheric dispersion modeling - A critical review. J. Air Pollut. Control Assoc. 29: 939 (1979).

Thurston, G.D. Discussion of multivariate analysis of particulate sulfate and other air quality variables by principal components - part I. Annual data from Los Angeles and New York. Atmos. Environ. 15: 424-425 (1981).

Thurston, G.D., J.D. Spengler and P.J. Samson. An assessment of the relationship between regional pollution transport and trace elements using wind trajectory analysis. Receptor Models Applied to Contemporary Pollution Problems, Ed. E. Frederick, Air Pollution Control Association, Pittsburgh, PA (1982).

Spengler, J.D. and G.D. Thurston. Mass and elemental composition of fine and coarse particles in six U.S. cities. J. Air Poll. Control Assoc. 33: 1162-1171 (1983).

Currie, L., R. Gerlach, C. Lewis, W.D. Balfour, J. Cooper, S. Dattner, R. DeCesar, G. Gordon, S. Heisler, P. Hopke, J. Shah and G. Thurston. Inter-laboratory comparison of source apportionment procedures: Results for simulated data sets. Atmos. Environ. 18: 1517-1537 (1984).

Thurston, G.D. and J.D. Spengler. A quantitative assessment of source contributions to inhalable particulate matter in metropolitan Boston, Massachusetts. Atmos. Environ. 19: 9-25 (1985).

Thurston, G.D. and N.M. Laird. Letters: Tracing aerosol pollution. Science 227: 1406-1407 (1985).

Thurston, G.D. and J.D. Spengler. A multivariate assessment of meteorological influences on inhalable particle source impacts. J. Clim. and Appl. Met. 24: 1245-1256 (1985).

Ozkaynak, H., J.D. Spengler, A. Garsd and G.D. Thurston. Assessment of population health risks resulting from exposures to airborne particles. Aerosols: Second U.S.-Dutch International Symposium, Lewis Publishing Co., December 1985 (Peer Reviewed).

Ozkaynak, H., A.D. Schatz, G.D. Thurston, R.G. Isaacs and R.B. Husar. Relationships between aerosol extinction coefficients derived from airport visual range observations and alternative measures of airborne particle mass. J. Air Pollut. Control Assoc. 35: 1176-1185 (1985).

Thurston, G.D. and P.J. Lioy. Receptor modeling and aerosol transport. Atmos. Environ. 21: 687-698 (1987).

Ozkaynak, H., and G.D. Thurston. Associations between 1980 U.S. mortality rates and alternative measures of airborne particle concentration. Risk Analysis 7: 449-460 (1987).

Lioy, P.J., D. Spektor, G. Thurston, N. Bock, F. Speizer, C. Hayes and M. Lippmann. The design considerations for ozone and acid aerosol exposure and health investigation: The Fairview Lake Summer Camp-Photochemical Smog Case Study. Environ. Int'l. 13: 27-83 (1987).

Spektor, D.M., M. Lippmann, P.J. Lioy, G.D. Thurston, K. Citak, D.J. James, N. Bock, F.E. Speizer and C. Hayes. Effects of ambient ozone on respiratory function in active normal children. Am. Rev. Resp. Dis. 137: 313-320 (1988).

Lippmann, M. and G.D. Thurston. Exposure Assessment - Input into risk assessment. Arch. Environ. Health 43: 113-123 (1988).

Spektor, D.M., M. Lippmann, G.D. Thurston, P.J. Lioy, J. Stecko, G. O'Connor, E. Garshick, F.E. Speizer, and C. Hayes. Effects of ambient ozone on respiratory function in healthy adults exercising outdoors. Am. Rev. Resp. Dis. 138: 821-828 (1988).

Ito, K. and G.D. Thurston. Characterization and reconstruction of historical London England acidic aerosol concentrations. Environ. Health Presp. 79: 35-42 (1989).

Thurston, G.D., K. Ito, M. Lippmann, and C. Hayes. Re-examination of London mortality in relation to exposure to acidic aerosols during 1962-1973 winters. Environ. Health Persp. 79: 73-82 (1989).

Waldman, J.M., P.J. Lioy, G.D. Thurston and M. Lippmann. Spatial and temporal patterns in summertime sulfate aerosol acidity and neutralization within a metropolitan area. Atmos. Environ. 24B: 115-126 (1990).

Echalar, E., P. Artaxo and G.D. Thurston. Source apportionment of aerosols in the industrial area of Cubatao, Brazil. In: Aerosols: Science, Industry, Health and Environment (S. Masuda and K. Takahashi, Eds.), pp. 942-945, Pergamon Press (1990).

Spektor, D.M., V.A. Hofmeister, P. Artaxo, J. Brague, F. Echelar, D.P. Nogueria, C. Hayes, G.D. Thurston and M. Lippmann. Effects of heavy industrial pollution on respiratory function in the children of Cubatao, Brazil: A preliminary report. Environ. Health Persp. 94: 51-54 (1991).

Waldman, J.M., S.K.C. Liang, P.J. Lioy, G.D. Thurston, and M. Lippmann. Measurements of sulfate aerosol and its acidity in the SO_2 source region of Chestnut Ridge, PA. Atmos. Environ. 25A: 1327-1333 (1991).

Spektor, D.M., G.D. Thurston, J. Mao, D. He, C. Hayes, and M. Lippmann. Effects of single and multiday ozone exposures on respiratory function in active normal children. Environ. Res. 55: 107-122 (1991).

Thurston, G.D. and H. Ozkaynak. Letters: Air pollution and mortality. Science 225: 382-383 (1992).

Thurston, G.D., J.F. Gorczynski Jr., P. Jaques, J. Currie and D. He. An automated sequential sampling system for particulate acid aerosols: Description, characterization and field sampling results. J. Exposure Anal. Environ. Epidemiol. 2: 415-428 (1992).

Thurston, G.D., K. Ito, P. Kinney and M. Lippmann. A multi-year study of air pollution and respiratory hospital admissions in three New York State metropolitan areas: Results for 1988 and 1989 summers. J. Exposure Anal. and Environ. Epidemiol. 2: 429-450 (1992).

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Kinney, P.L. and G.D. Thurston. Field evaluation of instrument performance: Statistical considerations. Appl. Occup. Environ. Hyg. 8: 267-271 (1993).

Ito, K., G.D. Thurston, C. Hayes, and M. Lippmann. Associations of London, England daily mortality with particulate matter, sulfur dioxide, and acidic aerosol pollution. Arch. Environ. Health 48: 213-220 (1993).

Thurston, G.D., K. Ito, M. Lippmann and D.V. Bates. Respiratory hospital admissions and summertime haze air pollution in Toronto, Ontario: Consideration of the role of acid aerosols. Environ. Res. 65: 271-290 (1994).

Thurston, G.D., J.E. Gorczynski, J.H. Currie, D. He, K. Ito, M. Lippmann, J. Waldman and P. Lioy. The nature and origins of acid aerosol pollution measured in Metropolitan Toronto, Ontario. Environ. Res. 65:254-270 (1994).

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Ozkaynak, H., Xue, J., Zhou, H., Spengler, J.D., and Thurston, G.D. Intercommunity Differences in Acid Aerosol (H^+)/Sulfate (SO_4^+) Ratios. J. Exposure Anal. and Environ. Epidemiol. 6:57-78 (1996).

Ito, K. and Thurston, G.D. Daily PM10/mortality associations: An investigation of at-risk subpopulations. J. Exposure Anal. and Environ. Epidemiol. 6:79-96 (1996).

Lippmann, M. and Thurston, G.D. Sulfate concentrations as an indicator of ambient particulate matter air pollution for health risk evaluations. J. Exposure Anal. and Environ. Epidemiol. 6:123-146 (1996).

Thurston, G. D., Lippmann, M., Scott, M.B., and; Fine, J.M. Summertime haze air pollution and children with asthma. Am. J. Respir. and Crit. Care Med. 155:654-660 (1997).

Thurston, G.D. Mandating the release of health research data: issues and implications. *Tulane Environmental Law Journal.* 11(2):331-354 (1998).

Thurston, G.D. The health benefits of the U.S. EPA clean air standards. *Pace Environmental Law Review.* 16:1 (1998)

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STATE OF NEW MEXICO
Before the
ALBUQUERQUE-BERNALILLO COUNTY
AIR QUALITY CONTROL BOARD

IN THE MATTER OF THE PETITION FOR
A HEARING ON THE MERITS REGARDING
AIR QUALITY PERMIT NO. 3131 [Honstein Oil]

WRITTEN TESTIMONY OF DANA ROWANGOULD

I, Dana Rowangould, do hereby swear and affirm that the following is true to the best of my knowledge. I am qualified and competent to give this declaration, and the factual statements herein are true and correct to the best of my knowledge, information and belief. The opinions expressed herein are based on my best professional judgment.

I. Name and Title

My name is Dana Rowangould. I am a principal in Sustainable Systems Research, LLC, a private consulting firm that specializes in environmental, public health and social equality issues. I am also an Affiliate Associate Professor with the University of Washington, Department of Civil and Environmental Engineering.

II. Education and Experience

I received my Bachelor's of Science (*cum laude*) in Civil and Environmental Engineering (with an emphasis in Environmental Engineering) in 2002 from Rice University. I received my Master's of Science in Agricultural and Resource Economics (with an emphasis in Environmental Economics) in 2009 from the University of California, Davis. I received my Ph.D. in Ecology (with an emphasis in Environmental Policy) in 2013 from the University of California, Davis.

SWOP Exhibit 3

I have conducted numerous analyses of pollution impacts on communities for local and national organizations. Those analyses have included a health impact assessment of two land use and transportation plans in California's Central Valley, mapping pollution sources and evaluating community demographics near rail facilities in Kansas City, Kansas; mapping air pollution sources and evaluating sensitive populations surrounding the port of New York and New Jersey in order to support a technical review of a Bayonne Bridge project; evaluating the demographics around an intermodal rail yard in Los Angeles; inventorying greenhouse gas emissions in the Cities of Woodland and Winters, California; and technical analysis of the air pollution impacts of a highway project in Los Angeles. I also have experience measuring and evaluating pollution levels in air, soil, and water at contaminated sites in Southeast Texas.

Additionally, I have published articles on air pollution and environmental justice in peer-reviewed journals, including *Energy Policy*, *Environmental Justice*, and *Global Environmental Change*. I also teach a graduate level course at the University of Washington which focuses on air pollution, active travel, health, and environmental justice impacts of transportation systems.

Finally, I have given presentations on air pollution and environmental justice to national organizations. A complete description of my education and experience is included in my *Curriculum Vitae*, attached as SWOP Exhibit 3.A.

III. Materials Reviewed

In preparing the foregoing testimony, I have reviewed the following materials:

1. Air Quality Authority to Construct Permit No. 3131;
2. Application materials for Air Quality Permit No. 3131;
3. Administrative Record, Permit No. 3131;
4. Honstein Air Quality Inspection Photographs and Map (dated 4/27/2012);

5. Honstein area Photographs from community members (dated 2/17/2013 and 10/25/2014)
6. City of Albuquerque ABQMaps Advanced Map Viewer;
7. Air Quality Active Stationary Source Permits (accessed via ArcGIS online map);
8. National Oceanic and Atmospheric Administration: Wind Rose Plot for Albuquerque International Airport;
9. US Census Data (including 2010 decennial Census, 2013 5-year American Community Survey data, and Quickfacts for the City of Albuquerque and Bernalillo County);
10. US EPA National-Scale Air Toxics Assessment;
11. US EPA Design Values for National Ambient Air Quality Standards;
12. Desert Research Institute, Albuquerque/Bernalillo County Community Scale Air Toxics Monitoring and Risk Assessment Project;
13. Bureau of Vital Records and Health Statistics "The New Mexico Selected Health Statistics Report 2005", August 2007;
14. Bernalillo County Place Matters, "Health Impact Assessment on NMRT's Request for Special Use Permit Prepared for the Bernalillo County Planning Commission April 6, 2011 Hearing", 3/22/2011;
15. Science for Citizens, "Ambient Air Quality in Southwest Albuquerque, San Jose Bucket Brigade Results", January 2014; and
16. Additional reference materials, as cited in SWOP Exhibit 3.B.

With the assistance of my colleagues (Dr. Deb Niemeier and Melody Eldridge), I have detailed my findings in SWOP Exhibit 3.B. Deb Neiemier and Melody's Eldridge's qualifications *Curricula Vita* are included in SWOP Exhibit 3.B.

IV. Introduction

The Honstein Oil bulk gasoline plant is located at 101 Anderson Ave. SE in the San Jose Neighborhood of Albuquerque. The facility receives gasoline by cargo tank trucks, stores the gasoline, and distributes gasoline to dispensing facilities via cargo tank trucks; throughput at the facility does not exceed 20,000 gallons per day. The City of Albuquerque Air Quality Authority to Construct Permit #3131 applies to an existing (and previously unpermitted) 6,000 gallon underground storage tank used for unleaded gasoline.

Gasoline storage and transport tanks emit volatile organic compounds (VOCs). The emissions from the permitted tank occur in the context of the San Jose neighborhood, which is home to approximately 2,500 residents, a school, and several other locations where people congregate. The neighborhood is also home to a number of industrial facilities emitting VOCs and other types of air pollution.

In this testimony I discuss the context, the state of knowledge and the conditions under which a comprehensive cumulative risk analysis may be warranted. Although data are limited, existing analyses and data sources suggest that there is potential for cumulative health risks to residents of the San Jose neighborhood. In particular, I find that:

1. The San Jose community is particularly vulnerable to incremental health effects: it is home to a greater percentage of people of color, people under age 18, and families living in poverty than the City of Albuquerque and Bernalillo County.

2. There are a number of other industrial activities occurring in the area, which likely have similar impacts on the community in terms of emissions and truck traffic. Specifically, the existing permitted stationary sources in the San Jose Neighborhood are allowed to emit over 330 tons of VOCs annually (in addition to several other air pollutants with known health impacts). When combined with mobile sources, including passenger vehicles, trucks, locomotives, helicopters, and planes, the amount of VOCs and other pollutants emitted in the San Jose neighborhood (which residents may be exposed to) is substantial.
3. The San Jose neighborhood has a substantially higher rate of permitted stationary emissions per square mile than the City of Albuquerque and Bernalillo County for seven out of eight recorded emissions categories.
4. There is limited but suggestive evidence that air quality and health impacts have been historically significant to the community. The combined impacts of the numerous pollution sources in the San Jose neighborhood (including the permitted emissions from the Honstein facility) may pose a reasonable risk to public health.
5. At least one other evaluation has pointed to cumulative impacts in this area.
6. The share of residents who are people of color or living in poverty in the neighborhood and the higher rate of emissions per land area raise serious equity and environmental justice concerns.
7. A comprehensive cumulative risk assessment could further determine and clarify the nature and extent of environmental, health, and equity impacts in the San Jose neighborhood. Such an analysis could also be used to evaluate the contribution of

various activities on those impacts and the benefits of implementing various mitigations.

V. Exposure to Permitted Emissions

Gasoline storage and transport tanks emit VOCs in a number of ways, including when they are filled and vapors are displaced, from leaks, and from breathing (venting of vapors as the tank temperature fluctuates). The rate of emissions from fuel storage tanks and tanks used to transport fuel depends on the storage conditions, the throughput of the tanks, and the nature of the transport tanks.

According to the Honstein Oil permit application, the tank age and manufacturer are unknown, although correspondence from the Environmental Health Department indicates that the tank was installed in the 1960's. The permitted tank is required to have at least a Stage I vapor recovery system, which would capture a significant portion of the gasoline vapors. The permit application indicates that estimated VOC emissions are expected to come from the tank working and breathing (0.87 tons/year), filling (0.14 tons/year), and tanker truck loading (1.24 tons/year). In total, the tank will be permitted to emit 2.26 tons of VOCs per year.

Gasoline generally contains over 150 hydrocarbons, including benzene, toluene and xylenes. Breathing gasoline vapors can cause lung irritation and induce a variety of nervous system effects, ranging from headaches and dizziness to coma or even death at high concentrations. Inhalation of benzene is of particular concern. Long term exposure to benzene (even at relatively low levels) can harm bone marrow, cause anemia, and increase the risk for infections. A lifetime of exposure to benzene concentrations of 0.13 - 0.45 micrograms per cubic meter ($\mu/m^{3)}$ (equivalent to 0.000041 - 0.00014 parts per million (ppm) at 25 °C) is expected to increase a person's lifetime risk of cancer by one in a million. Inhalation of higher concentrations

of benzene (e.g. several minutes of exposure to 1,000 – 20,000 ppm or more) can also cause acute central nervous system, cardiovascular, and respiratory impacts; in severe cases acute exposures can lead to unconsciousness or death. Inhalation of toxic chemicals can be particularly harmful for children and those engaged in outdoor activities (such as high activity work or sports).

Meteorological conditions, such as wind direction and speed and humidity, play an important role in determining the direction that emissions travel, and therefore the pollution concentrations to which people are exposed. Diagrams of the prevailing wind directions that carry emissions towards or away from potentially exposed people can be helpful in visualizing higher risk areas. Wind speed and direction in Albuquerque typically fluctuates, although in the winter the wind often blows from the north (*see* Figure 1 in SWOP Exhibit 3.B.).

When discussing emissions and their potential health impacts, it is important to examine the proximity of the Honstein Facility to locations where people might breathe emissions from the facility (or potential receptors). Locations of interest include homes and places where groups of people gather, such as schools, community centers, and places of worship. There are a number of potential receptors in the San Jose Neighborhood. The East San Jose Elementary School and the Herman Sanchez Community Center are particularly close to the facility and are locations where children congregate. There are also several potential receptors outside of the San Jose Neighborhood that are located within a half mile of the Honstein Facility. Potential receptors, distances to Honstein, and prevailing wind directions are indicated in Tables 1, 2, and Figure 2 of SWOP Exhibit 3.B).

VI. Potential Impacts of Truck Traffic

Tanker trucks can also have emissions and safety impacts in the San Jose neighborhood. Tanker trucks accessing the Honstein facility must travel on Anderson Ave SE or Thaxton Ave SE as well as on Broadway Blvd SE. These routes are adjacent to a number of homes and the East San Jose Elementary School (*see* Figure 4 of SWOP Exhibit 3.B).

The permit's VOC emissions estimate includes tanker truck loading emissions. Tanker trucks also have idling and exhaust emissions as they operate at the site and travel through the neighborhood. Trucks directly emit several pollutants that can result in health impacts: carbon monoxide (CO), nitrogen oxides (NO_X), and toxic air pollutants (some of which are VOCs); diesel exhaust also contains these pollutants and others, including particulate matter (PM). Exposure to these vehicle pollutants is associated with a number of adverse health outcomes, including a variety of respiratory and cardiovascular impacts as well as increased cancer risks. Health risks from vehicle pollution are greater for vulnerable populations such as the elderly and people with respiratory problems, and particularly for children, than for the population in general.

VII. Cumulative Health Risks and Social Equity

The incremental impacts of an action are of greater concern when the overall impact of many activities in an area is significant. The US EPA's 2003 Framework for Cumulative Risk Assessment (EPA/630/P-02/001F) defines cumulative risks as "the combined risks from aggregate exposures to multiple agents or stressors". According to the 2003 Framework, cumulative risks can result from exposure to multiple pollutants from multiple sources and may occur over a long period of time. While traditional risk assessment focuses on exposure to one chemical (often from one source), cumulative risk assessments can be helpful in settings where the effects of multiple exposures and multiple sources can result in greater risks to human health

or the environment. The evaluation of cumulative risks is not simply the addition of the risks from different chemicals or sources; it includes an assessment of how these stressors interact. Additionally, cumulative risk assessment emphasizes actual people that can be affected, rather than theoretical populations. It can also consider a wider array of stressors (including non-pollutant stressors such as a lack of health care or car crashes) and their interactive effects.

Consideration of cumulative risks (and similar concepts) has become relatively common in a number of environmental evaluation settings. "Cumulative impacts" are an important part of Environmental Impact Assessments (EIAs) of Federal projects conducted under the National Environmental Policy Act. Some states and localities have also begun to require and perform cumulative risk assessments. For example, a 2008 Minnesota statute requires that cumulative effects are evaluated and considered before air permits are issued in the Phillips Communities in South Minneapolis. The local pollution control agency now engages in modeling of cumulative emissions impacts. Similarly, under a 2009 ordinance in Cincinnati, Ohio, facilities seeking a new or expanded permit are required to show that they will not have a "cumulative adverse impact" on the environment or the community's health. Health Impact Assessments (HIAs), which have been conducted in a variety of jurisdictions and situations, often include an evaluation of cumulative risks.

The methods used to evaluate cumulative risks have developed considerably in the years since the consideration of cumulative impacts in EIAs was first required in 1979. A number of documents are available to assist with evaluations of cumulative environmental and health impacts. The following resources are a sampling of the available guidance for conducting or evaluating cumulative risk assessments:

1. EPA, "Framework for Cumulative Risk Assessment," May 2003, EPA/630/P-02/001F;
2. EPA, "Consideration of Cumulative Impacts in EPA Review of NEPA Documents," May 1999, EPA 315-R-00-002;
3. EPA, "Concepts, Methods, and Data Sources for Cumulative Health Risk Assessment of Multiple Chemicals, Exposures and Effects: A Resource Document," August 2007, EPA/600/R-06/013F; and
4. Margaret M. MacDonell, Lynne A. Haroun, Linda K. Teuschler, et al., "Cumulative Risk Assessment Toolbox: Methods and Approaches for the Practitioner," Journal of Toxicology, vol. 2013, 36 pages, 2013. doi:10.1155/2013/310904.

For example, EPA's 2007 Cumulative Health Risk Assessment guidance (EPA/600/R-06/013F) indicates that one situation which might indicate a need for a health risk assessment is the existence of multiple pollution sources or chemical releases. In that case, the first step would be to identify all the relevant (present and future) chemical releases and exposure pathways that can affect the population of concern. In particular, chemicals with high potential for health risks and similar effects are of interest. In the case of emissions from the Honstein facility, benzene and chemicals with similar health impacts might be a focus of a cumulative risk assessment. Once the sources and chemicals that will be assessed have been identified, the analysis follows exposure assessment steps of characterizing the sources, determining the spatial scope of analysis, evaluating the fate of emissions, determining who could be exposed, and quantifying their exposures.

In light of the potential for cumulative impacts associated with the chemicals emitted from the Honstein facility, chemicals emitted from other facilities in the area, and from the

emissions caused by trucks traveling in the area (from trucks traveling to and from the Honstein facility, through the area, and to and from other facilities in the area), I discuss the context, the state of knowledge and the conditions under which a cumulative risk analysis may be merited. In order to assess whether a cumulative risk assessment is warranted, I review what is known about whether the community is particularly vulnerable to incremental effects, whether several similar actions are occurring in the same area and whether those actions have similar impacts on the community, whether those impacts have been historically significant to the community, and whether other evaluations have pointed to cumulative risks. These factors are outlined in relation to NEPA document evaluation in EPA, "Consideration of Cumulative Impacts in EPA Review of NEPA Documents," May 1999, EPA 315-R-00-002.

1. Is the community particularly vulnerable to incremental effects?

Yes. In US EPA's "Framework for Cumulative Risk Assessment," (May 2003, EPA/630/P-02/001F), EPA outlines four areas of vulnerability that should be assessed in cumulative risk assessments: differential exposure, susceptibility/sensitivity, differential preparedness, and differential ability to recover. Children, the elderly, and people with existing health conditions are particularly vulnerable to inhalation of pollution. Additionally, low-income households and people of color can be more vulnerable to the effects of pollution exposure for a number of reasons, including greater rates of preexisting health conditions, greater exposure to a number of environmental hazards, greater social vulnerability (including stress), and limited access to health care.

Residents of the San Jose neighborhood are far more likely to be people of color, children, and living in poverty than residents of the remainder of the City of Albuquerque and of Bernalillo County (*see* Table 3 in SWOP Exhibit 3.B). In light of the permitted

activities' proximity to places where people live and gather (including homes, a school and community center) and the neighborhood sociodemographics, vulnerable people may be exposed to emissions from the Honstein facility.

2. Are several similar actions occurring in the same area?

Yes. A substantial number of similar activities are occurring at the Honstein facility and at other facilities in the area.

There are additional activities at the Honstein facility that may also result in air pollution. According to the City's air quality inspection map and photographs, there appear to be a total of five tanks in addition to a number of drums and containers. These tanks and containers store what appear to be diesel, refrigerants, naptha solvent, ethyl alcohol, waste oil, and hydraulic fluids and oil (in addition to gasoline). The City has indicated that these tanks are either not required to be permitted, contain materials with low volatility, or are empty when at the Honstein facility. Activities associated with these facilities may also contribute to emissions from the Honstein Oil property (in addition to those coming from the permitted tank) and have associated truck traffic.

In addition to Honstein Oil, there are 22 other permitted stationary sources of pollution in the San Jose neighborhood and 28 more within 0.5 miles of the neighborhood boundary, for a total of 50 stationary sources in the vicinity (*see* Tables 4a and 4b and Figure 6 in SWOP Exhibit3.B).

The San Jose Neighborhood is also bordered and bisected by several major transportation corridors. A major rail corridor lies just to the west of the neighborhood. Near the northern portion of the neighborhood there appears to be a rail yard with over a dozen separate tracks. BNSF Railway's Albuquerque Intermodal Facility is also located

in the San Jose Neighborhood, further south near Woodward Road. The neighborhood is in proximity to several high volume roads. In 2013, the average weekday traffic for the portion of Avenida Cesar Chavez SE just to the North of the San Jose Neighborhood was 33,500 vehicles per day. Broadway Blvd. SE (which bisects the neighborhood from north to south and forms the eastern border of the "handle") at the point where it passes directly adjacent to East San Jose Elementary School had an estimated 14,700 vehicles per day. Gibson Road between Broadway Blvd. and Interstate 25 had 18,200 vehicles. Rio Bravo Blvd., bordering the neighborhood in the south had 27,100 vehicles per day, and 2nd Street SW, just on the other side of the railroad tracks to the west of the neighborhood had 5,900 vehicles per day. Additionally, the portion of Interstate 25 bordering the neighborhood to the east has an estimated weekday average flow of 115,500 vehicles. The Albuquerque International Sunport is less than a mile to the east of the San Jose Neighborhood, while a small private heliport, KRQE Heliport, is less than a tenth of a mile north.

In conclusion, there are a number of other activities with air pollution emissions occurring in the San Jose neighborhood. Any similar future activities would also be relevant when considering cumulative impacts.

3. Do other activities have similar effects on the community?

Yes. The activities described above result in air pollution emissions (including VOCs), which increase the health risks for exposed residents. The existing permitted stationary sources in the San Jose Neighborhood are allowed to emit over 330 tons of VOCs annually (in addition to several other air pollutants with known health impacts). When combined with mobile sources, including passenger vehicles, trucks, locomotives,

helicopters, and planes, the amount of VOCs and other pollutants emitted in the San Jose neighborhood (which residents may be exposed to) is substantial.

4. Have these impacts been found to be historically significant for the community?

Very Likely. Analyses of health data and ambient pollution levels in this area are limited but as described below, the evidence that has been evaluated suggests that health risks may be elevated in the San Jose neighborhood.

The National-Scale Air Toxics Assessments (NATA) provide coarse indications of health risks by census tracts. These data should be interpreted with caution because they are too coarse to provide a clear indication of risks at the local level, although they can be useful for identifying areas that merit additional analysis. According to the 2005 NATA, the San Jose neighborhood may have elevated respiratory risks, largely due to vehicle emissions.

Similarly, Federal monitors record air quality across the country, but do not provide localized data in most areas. The nearest active EPA air monitor is in the South Valley (at 201 Prosperity SE), over 3 miles south of the Honstein facility and 0.7 from the San Jose neighborhood's southern boundary. The South Valley monitoring site records concentrations of lead, CO, ozone, PM2.5, and PM10. Although Bernalillo County is currently designated as in attainment of National Ambient Air Quality Standards for PM10 and ground level ozone, the South Valley monitor shows PM10 and ozone values that are very close to current standards. The PM10 design value for 2011-2013 actually appears to exceed standards according to the EPA's summary. The ozone value for Bernalillo County appears to exceed proposed ozone standards and the value in the South Valley equals the high end of the range of ozone standards that is proposed.

Note that ozone is formed when VOCs and NOx combine in the presence of sunlight, and ozone levels depend more heavily on regional (rather than very localized) emissions. However for areas that are close to standards, incremental emissions of VOCs or NOx may shift ozone levels, depending on regional conditions.

Air quality monitoring of toxics was conducted for a study in Bernalillo County between 2007 and 2009, as described in the Desert Research Institute's 2010 report, "Albuquerque/Bernalillo County Community Air Toxics Monitoring and Risk Assessment Project". The study examined a range of pollutants (including VOCs) for three locations, including a single location in the South Valley. The study compared measured pollution levels to risk-based values and also evaluated the health risks of exposure to four toxic VOCs (selected if they were measured at all three sites in the majority of valid samples). The study found that the observed pollution levels do not pose a significant health risk. The study also found that there was significant variation in VOC concentrations observed across the three monitoring sites, likely due to the variation in emissions from different sources. In light of this variation, the study is too coarse to evaluate the presence or absence of localized health risks in the San Jose neighborhood. The South Valley location appears to be at or near the Federal air monitoring location at 201 Prosperity SE, which (as noted above) is over 3 miles from the Honstein facility and over 0.7 miles from the San Jose neighborhood boundary. Pollution levels in the San Jose neighborhood likely vary across the neighborhood and likely differ from the levels observed at the South Valley sampling location.

A 2011 Health Impact Assessment completed by the Bernalillo County Place Matters Team evaluated death rates for Hispanics in the San Jose and Mountain View

(located immediately South of San Jose) neighborhoods. Death rates in these areas were found to be greater than for Hispanics in the remainder of the County (*see* Figure 7 of SWOP Exhibit 3.B). This finding is consistent across nearly all causes of death, including cancer and chronic obstructive pulmonary disease (COPD). For context, the death rates for Hispanics were similar to death rates for all races combined from 1996 – 2005 in the State of New Mexico.

Additionally, some air quality data is available for the San Jose neighborhood. Between September 13th, 2012, and September 18th, 2013, trained community members collected seven air samples along the railway corridor to the west of the San Jose Neighborhood as part of the San Jose Bucket Brigade, implemented with the SouthWest Organizing Project. Samples were analyzed for VOCs (including chlorobenzene, toluene, ethanol, acetone, styrene, d-limonene), particulate matter, and elemental carbon. The results of this sampling effort were analyzed and incorporated into a January 2014 report by Mark Chernaik, Ph.D. of Science for Citizens. Notable findings included:

- All samples contained "detectable and significantly elevated levels" of chlorobenzene and detectable levels of toluene. Levels of chlorobenzene are of particular concern as they are higher than typically found in other urban areas and they exceed the US EPA's provisional Reference Concentration (RfC).
- One PM2.5 measurement exceeded the US EPA 24-hour standard for PM2.5.
- Environmental Carbon (EC) levels in samples collected at the 2500-2600 block of Williams Street were "consistently high, indicating impacts from heavy vehicle (diesel engine) emissions."

- "Moderate amounts of ethanol (4 samples), acetone (2 samples), styrene (1 sample) and d-limonene (1 sample) were detected in air samples from southwest Albuquerque, but well below short-term and long-term health-based standards for exposure to these VOCs."

5. Have other analyses identified cumulative effects similar to what is proposed?

Yes. At least one other evaluation has examined the potential for cumulative health impacts in the Mountain View and San Jose neighborhoods. The 2011 Health Impact Assessment (HIA) conducted by Bernalillo County Place Matters found that the addition of an industrial facility would increase the health risks to residents due to increased truck traffic, noise, and odors. The study indicates that these health risks, environmental conditions, and noise, comprise cumulative impacts in the community.

VIII. Potential for Equity and Environmental Justice Imapcts

The US EPA defines environmental justice as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies." Concerns about environmental justice have grown out of a number of studies that indicate that in many cases the burdens of environmental harms fall disproportionately onto people of color and low-income people, while environmental benefits often fail to serve those people. The US Executive Order 12898 and New Mexico's Executive Order 2005-056 urge U.S. and New Mexico agencies (respectively) to provide opportunities for all people to participate in the decision-making process and to avoid decisions which disproportionately harm low-income communities and communities of color.

As described above, the San Jose neighborhood is home to a greater percentage of people of color, people under age 18, and families living in poverty than the City of Albuquerque and of Bernalillo County. Additionally, the San Jose neighborhood has a substantially higher rate of permitted emissions per square mile than Bernalillo County or the City of Albuquerque as a whole for seven out of eight recorded emissions categories (there is only one permitted stationary source of lead in the region and no sources in the San Jose Neighborhood) (*See* Table 5 in SWOP Exhibit 3.B).

The combined facts of the greater share of residents who are people of color or living in poverty in the neighborhood and the higher rate of emissions per land area (when compared to the City of Albuquerque and Bernalillo County) raise serious equity and environmental justice concerns. The potential for cumulative impacts is of even greater concern in light of these environmental justice concerns.

VIII. Conclusions

The permitted Honstein Oil tank is expected to emit volatile organic compounds (VOCs), which pose an inhalation health risk. Truck trips associated with the permitted activities can also emit air pollutants and can pose safety risks due to collisions and leaks. These potential health risks occur in the context of the San Jose neighborhood, which includes residences, a school, and several other locations where residents congregate.

An in-depth cumulative risk assessment is out of the scope of our analysis. Rather, I discuss the context, the state of knowledge and the conditions under which a cumulative risk analysis may be warranted. Although data are limited, existing analyses and data sources suggest that there is potential for cumulative impacts in the area. The community is particularly vulnerable to incremental effects: it is home to a greater percentage of people of color, people

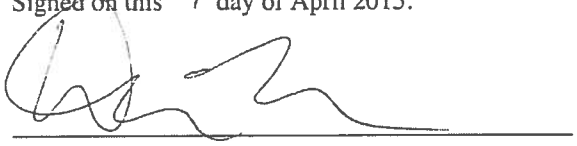
under age 18, and families living in poverty than the City of Albuquerque and Bernalillo County. Additionally, there are a number of other industrial activities occurring in the area, which likely have similar impacts on the community in terms of emissions and truck traffic. There is also limited but suggestive evidence that air quality and health impacts have been historically significant to the community. Finally, at least one other evaluation has pointed to cumulative impacts in this area.

In light of the sociodemographics of the neighborhood and the higher density of permitted emissions per land area, I also note that there are environmental justice concerns related to the potential for cumulative health risks.

A comprehensive cumulative risk assessment could determine the nature and extent of environmental, health, and equity impacts in the San Jose neighborhood. Such an analysis could also be used to evaluate the contribution of various activities on those impacts and the benefits of implementing various mitigations.

I declare under penalty of perjury, that the foregoing is true and correct to the best of my knowledge and belief.

Signed on this 7th day of April 2015.



Dana Rowangould, Ph.D.

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EDUCATION

Ph.D., **University of California, Davis**, Ecology Graduate Group (Environmental Science and Policy Emphasis), 2013.

M.S., **University of California, Davis**, Agricultural and Resource Economics, 2009.

B.S., **Rice University**, Civil and Environmental Engineering, 2002.

EXPERIENCE

Affiliate Associate Professor. Department of Civil and Environmental Engineering, University of Washington, 2013 – Present.

Principal. Sustainable Systems Research, LLC, 2012-Present

Recent SSR, LLC Consulting:

Natural Resources Defense Council, *Demographic Analysis of the Southern California International Gateway Project*, 2015.

Ecosystem Management, Inc. *Albuquerque Regional Transportation Infrastructure and Land Use: Climate Change Impacts And Adaptation*, 2014

Natural Resources Defense Council, *Review of the Air Quality Impacts of the WesPac Pittsburg Energy Infrastructure Project*, 2014.

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Save Our Creek, *Review of the City of Danville General Plan*, 2012.

East Yard Communities for Environmental Justice and Natural Resources Defense Council, *Review of the Transportation and Air Quality Analysis in the I-710 Draft EIR,* 2012

Postdoctoral Researcher. Center for Regional Change, University of California, Davis, Jan – Aug 2014

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Environmental Scientist. Groundwater Services, Inc., Houston, Texas, 2002-2004

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PRESENTATIONS

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Sustainable Systems Research, LLC
27276 Meadowbrook Dr.
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April 3, 2015

Juan Reynosa
Field Organizer
SouthWest Organizing Project
211 10th Street SW
Albuquerque, NM 87102

Dear Mr. Reynosa:

As requested, we have completed our review of the Honstein Air Permit (#3131) and documents related to cumulative risks in the San Jose neighborhood. Attached please find: 1) curricula vitae for the SSR personnel involved in the review, and 2) a draft memorandum that discusses the air permit and the potential for related cumulative risks and equity impacts.

Please contact me if you have any questions.

Sincerely,
Dana Rowangould, PhD
Principal
Sustainable Systems Research, LLC

Enclosures:

Curricula Vitae for Deb Niemeier, Dana Rowangould, and Melody Eldridge
Technical Memorandum: The Honstein Oil Air Permit, Cumulative Risks, and Equity.

SWOP Exhibit 3.B

Technical Memorandum
The Honstein Oil Air Permit: Cumulative Risks and Equity

APRIL 3, 2015

PREPARED FOR:

SOUTHWEST ORGANIZING PROJECT

PREPARED BY:

SUSTAINABLE SYSTEMS RESEARCH, LLC

Table of Contents

Executive Summary

The Honstein Oil bulk gasoline plant is located at 101 Anderson Ave. SE in the San Jose Neighborhood of Albuquerque. The facility receives gasoline by cargo tank trucks, stores the gasoline, and distributes gasoline to dispensing facilities via cargo tank trucks; throughput at the facility does not exceed 20,000 gallons per day. The City of Albuquerque Air Quality Authority to Construct Permit #3131 applies to an existing (and previously unpermitted) 6,000 gallon underground storage tank used for unleaded gasoline.

Gasoline storage and transport tanks emit volatile organic compounds (VOCs). The emissions from the permitted tank occur in the context of the San Jose neighborhood, which is home to approximately 2,500 residents, a school, and several other locations where people congregate. The neighborhood is also home to a number of industrial facilities emitting VOCs and other types of air pollution.

In this report we discuss the context, the state of knowledge and the conditions under which a comprehensive cumulative risk analysis may be warranted. Although data are limited, existing analyses and data sources suggest that there is potential for cumulative health risks to residents of the San Jose neighborhood. In particular, we find that:

- The San Jose community is particularly vulnerable to incremental health effects: it is home to a greater percentage of people of color, people under age 18, and families living in poverty than the City of Albuquerque and Bernalillo County.
- There are a number of other industrial activities occurring in the area, which likely have similar impacts on the community in terms of emissions and truck traffic. Specifically, the existing permitted stationary sources in the San Jose Neighborhood are allowed to emit over 330 tons of VOCs annually (in addition to several other air pollutants with known health impacts). When combined with mobile sources, including passenger vehicles, trucks, locomotives, helicopters, and planes, the amount of VOCs and other pollutants emitted in the San Jose neighborhood (which residents may be exposed to) is substantial.
- The San Jose neighborhood has a substantially higher rate of permitted stationary emissions per square mile than the City of Albuquerque and Bernalillo County for seven out of eight recorded emissions categories.
- There is limited but suggestive evidence that air quality and health impacts have been historically significant to the community.
- At least one other evaluation has pointed to cumulative impacts in this area.
- The share of residents who are people of color or living in poverty in the neighborhood and the higher rate of emissions per land area raise serious equity and environmental justice concerns.

- A comprehensive cumulative risk assessment could determine the nature and extent of environmental, health, and equity impacts in the San Jose neighborhood. Such an analysis could also be used to evaluate the contribution of various activities on those impacts and the benefits of implementing various mitigations.

INTRODUCTION

The Honstein Oil bulk gasoline plant is located at 101 Anderson Ave. SE in the San Jose Neighborhood of Albuquerque. According to the City of Albuquerque Air Quality Authority to Construct Permit #3131, dated June 12, 2014 (referred to here as Permit #3131), the permit applies to an existing (and previously unpermitted) 6,000 gallon underground storage tank used for unleaded gasoline. As described in Permit #3131 and the Public Notice for the Authority to Construct Permit, the facility is used to distribute gasoline to dispensing facilities. The facility receives gasoline by cargo tank trucks, stores the gasoline, and distributes gasoline via cargo tank trucks; throughput at the facility does not exceed 20,000 gallons per day.

Gasoline storage and transport tanks emit volatile organic compounds (VOCs). The emissions from the permitted tank occur in the context of the San Jose neighborhood, which is home to approximately 2,500 residents[1], a school, and several other locations where people congregate. The neighborhood is also home to a number of industrial facilities emitting VOCs and other types of air pollution. The San Jose neighborhood is composed of a greater percentage of people of color, people under age 18, and families living in poverty compared to the City of Albuquerque and Bernalillo County.

An in-depth cumulative risk assessment is out of the scope of this analysis. Instead, we discuss the context, the state of knowledge and the conditions under which a comprehensive cumulative risk analysis may be warranted. Although data are limited, existing analyses and data sources suggest that there is potential for cumulative health risks to residents of the San Jose neighborhood. In light of the sociodemographics of the neighborhood and the density of emissions permitted emissions per land area in the San Jose neighborhood (which are much greater than for the City of Albuquerque and Bernalillo County), we also note that there are serious environmental justice concerns in the San Jose neighborhood.

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[1] There were approximately 2,502 people in the San Jose Neighborhood according to the 2010 US Census. 2,498 lived in blocks that fall entirely within the neighborhood boundaries. One block (located on the northwest corner of Smith Ave SE and William St SE) had 19 residents and falls partially within the neighborhood; it's contribution to the total neighborhood population was assumed to be proportional to the land area that fell within the San Jose Area: 22%, or 4 people.

EXPOSURE TO PERMITTED EMISSIONS

Gasoline storage and transport tanks emit VOCs in a number of ways, including when they are filled and vapors are displaced, from leaks, and from breathing (venting of vapors as the tank temperature fluctuates). The rate of emissions from fuel storage tanks and tanks used to transport fuel depends on the storage conditions, the throughput of the tanks, and the nature of the transport tanks.

According to the Honstein Oil permit application (dated 10/3/13), the tank age and manufacturer are unknown, although correspondence from the Environmental Health Department indicates that the tank was installed in the 1960's.[2] The permitted tank is required to have at least a Stage I vapor recovery system, which would capture a significant portion of the gasoline vapors. The permit application indicates that estimated VOC emissions are expected to come from the tank working and breathing (0.87 tons/year), filling (0.14 tons/year), and tanker truck loading (1.24 tons/year). In total, the tank will be permitted to emit 2.26 tons of VOCs per year.

Health effects of exposure to gasoline vapors

Gasoline generally contains over 150 hydrocarbons, including benzene, toluene and xylenes. [3] Breathing gasoline vapors can cause lung irritation and induce a variety of nervous system effects, ranging from headaches and dizziness to coma or even death at high concentrations.[4] Inhalation of benzene is of particular concern. Long term exposure to benzene (even at relatively low levels) can harm bone marrow, cause anemia, and increase the risk for infections.[5] A lifetime of exposure to benzene concentrations of 0.13 - 0.45 μ/m^3 (equivalent to 0.000041 - 0.00014 ppm at 25 °C) is expected to increase a person's lifetime risk of cancer by one in a million.[6] Inhalation of higher concentrations of benzene (e.g. several minutes of exposure to 1,000 – 20,000 ppm or more) can also cause acute central nervous system, cardiovascular, and respiratory impacts; in severe cases acute exposures can lead to unconsciousness or death.[7] Inhalation of toxic

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[2] 7/16/2014 Email from the City of Albuquerque Environmental Health Department, "Re: Air Quality Permit No. 3131 ~ Honstein Oil & Distributing, LLC (Honstein) – Authority-to-Construct Permit – 101 Anderson Ave. SE". See the Appendix "Air Quality Program Response to Questions Submitted at May 22, 2014 Public Information Hearing."

[3] US Department of Health and Human Services, 1996. "Agency for Toxic Substances and Disease Registry TOXFAQs: Automotive Gasoline CAS #8006-61-9." September 1996.

[4] Ibid. & NIH US National Library of Medicine, 2009. "TOXNET Toxicology Data Network: Gasoline CASRN: 8006-61-9." Available at http://toxnet.nlm.nih.gov/cgi-bin/sis/search/r?dbs+hsdb:@term+@rn+8006-61-9. Updated 4/16/2009, Accessed on 3/21/2015.

[5] Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 2007. "Benzene – ToxFAQs"." August 2007.

[6] According to the US EPA's IRIS database, accessed at http://www.epa.gov/iris/subst/0276.htm

[7] Agency for Toxic Substances and Disease Registry, "Medical Management Guidelines for Benzene", Undated.

chemicals can be particularly harmful for children and those engaged in outdoor activities (such as high activity work or sports).[8]

Emissions Transport

Meteorological conditions, such as wind direction and speed and humidity, play an important role in determining the direction that emissions travel, and therefore the pollution concentrations to which people are exposed. Diagrams of the prevailing wind directions that carry emissions towards or away from potentially exposed people can be helpful in visualizing higher risk areas. Wind direction in Albuquerque typically fluctuates, although in the winter the wind often blows from the north. The percent of time the wind comes from each direction on an annual basis (as measured at the Sunport) can be seen in Figure 1 below. Note that when the wind speed is lower (as shown in the blue and green shading) pollution disperses less, which translates to higher pollution concentrations in closer proximity to a pollution source.

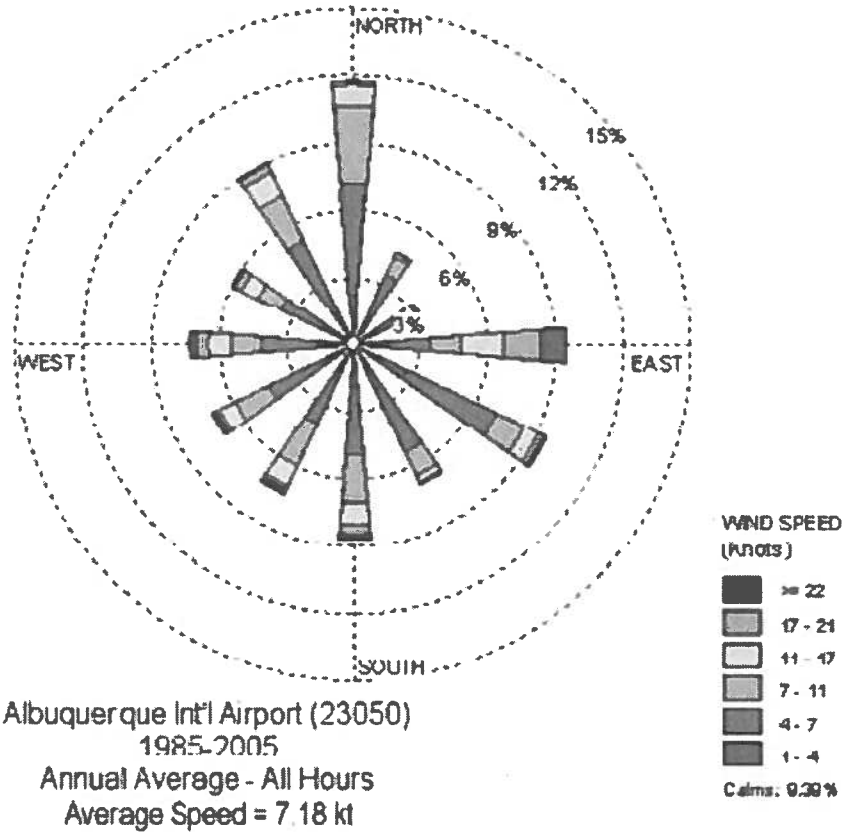

Figure 1: NOAA-produced wind rose for the Albuquerque International Airport depicting the percent of time the wind comes from each direction.[9]

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[8] See US EPA, Socoidemographic Data Used for Identifying Potentially Highly Exposed Populations. July 1999, EPA/600/R-99/060 and EPA, Exposure Factors Handbook: 2011 Edition, September 2011, EPA/600/R-090/052F.

Potential Receptors

When discussing emissions and their potential health impacts, it is important to examine the proximity of the Honstein Facility to locations where people might breathe emissions from the facility (or potential receptors). Locations of interest include homes and places where groups of people gather, such as schools, community centers, and places of worship. Table 1 lists potential receptors in the San Jose Neighborhood, as well as their distance and direction from the Honstein Oil property[10]. The East San Jose Elementary School and the Herman Sanchez Community Center are particularly close to the facility and are locations where children congregate. There are also several potential receptors outside of the San Jose Neighborhood that are located within a half mile of the Honstein Facility (Table 2). The potential receptors and prevailing wind directions are depicted in Figure 2.

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[9] National Oceanic and Atmospheric Administration. Albuquerque International Airport Wind Rose Plots: 1985 -2005. Found at http://www.srh.noaa.gov/images/abq/WindRosePlots/ABQ8505ann.pdf

[10] Distances measured using ABQMaps Advanced Map Viewer (http://www.cabq.gov/gis/advanced-map-viewer) from the nearest edge of the receptor property to the approximate tank location. The exact tank location is not indicated in the Permit Application (dated 10/13) or in Permit #3131. Based on the Air Permit Inspection photographs (dated 4/27/2012), we assume that the tank is located at the approximate midpoint of the driveway between the warehouse and the eastern fenceline. Because the exact location of the tank is unknown, we estimate that there is a margin of error of +/- 0.02 miles for the estimated receptor distances.

Table 1: Potential receptors (homes and places where people gather) in the San Jose neighborhood[11]

Location Name	Address	Distance[12](Miles) and Direction
Schools		
East San Jose Elementary School	415 Thaxton Ave SE	0.14 Miles East of Honstein Oil
Community Centers and Parks		
Herman Sanchez Community Center (which hosts both before and after school youth programs and an Early Education Program for 3-5 year olds[13]) and East San Jose Park and Pool	1830 William St SE	0.12 Miles Northeast of Honstein Oil
Jack Candelaria Community Center (which hosts before and after school youth programs[14]) and South San Jose Park	400 San Jose Ave SE	0.54 Miles South of Honstein Oil
Healthcare Services		
Community Dental Services, Inc.	2116 Hinkle St SE	0.14 Miles Southeast of Honstein Oil
Religious Centers		
Church of God Seventh Day	326 Bethel Ave SE	0.70 Miles Southeast of Honstein Oil
San Jose Parish	2401 Broadway Blvd SE	0.37 Miles Southeast of Honstein Oil
Nearest Residential Homes		
Single Family Residences along Commercial Street SE	Homes between 2001 William St SE and 109 Thaxton Ave SE	0.02 – 0.04 Miles (approx. 100 to 200 feet) east of Honstein Oil

Table 2: Potential receptors (places where people gather) outside of the San Jose Neighborhood that are within 0.5 mile from the Honstein Facility[15]

Location Name	Address	Distance[16] (Miles) and Direction
Iglesia Congregacional Unida	1701 Broadway Blvd SE	0.37 Miles Northeast of Honstein Oil
National Hispanic Cultural Center	1701 4th St SW	0.42 Miles Northwest of Honstein Oil
Bethesda Seventh Day Adventist	1800 Arno St SE	0.42 Miles Northeast of Honstein Oil
First Choice Community Healthcare	1401 William St SE	0.45 Miles North of Honstein Oil

[11] Receptor information is from ABQMaps Advanced Map Viewer, the US EPA's EJView mapping tool, and Google Maps.
[12] Margin of error is +/-0.02 miles, see note 10.
[13] "Herman Sanchez Community Center information -- City of Albuquerque", accessed via http://www.cabq.gov/family/facilities-centers/community-center-locations/southeast/herman-sanchez-community-center/
[14] "Jack Candelaria Community Center -- City of Albuquerque", accessed via http://www.cabq.gov/family/facilities-centers/community-center-locations/southeast/jack-candelaria-community-center
[15] Ibid. 11
[16] Ibid. 12

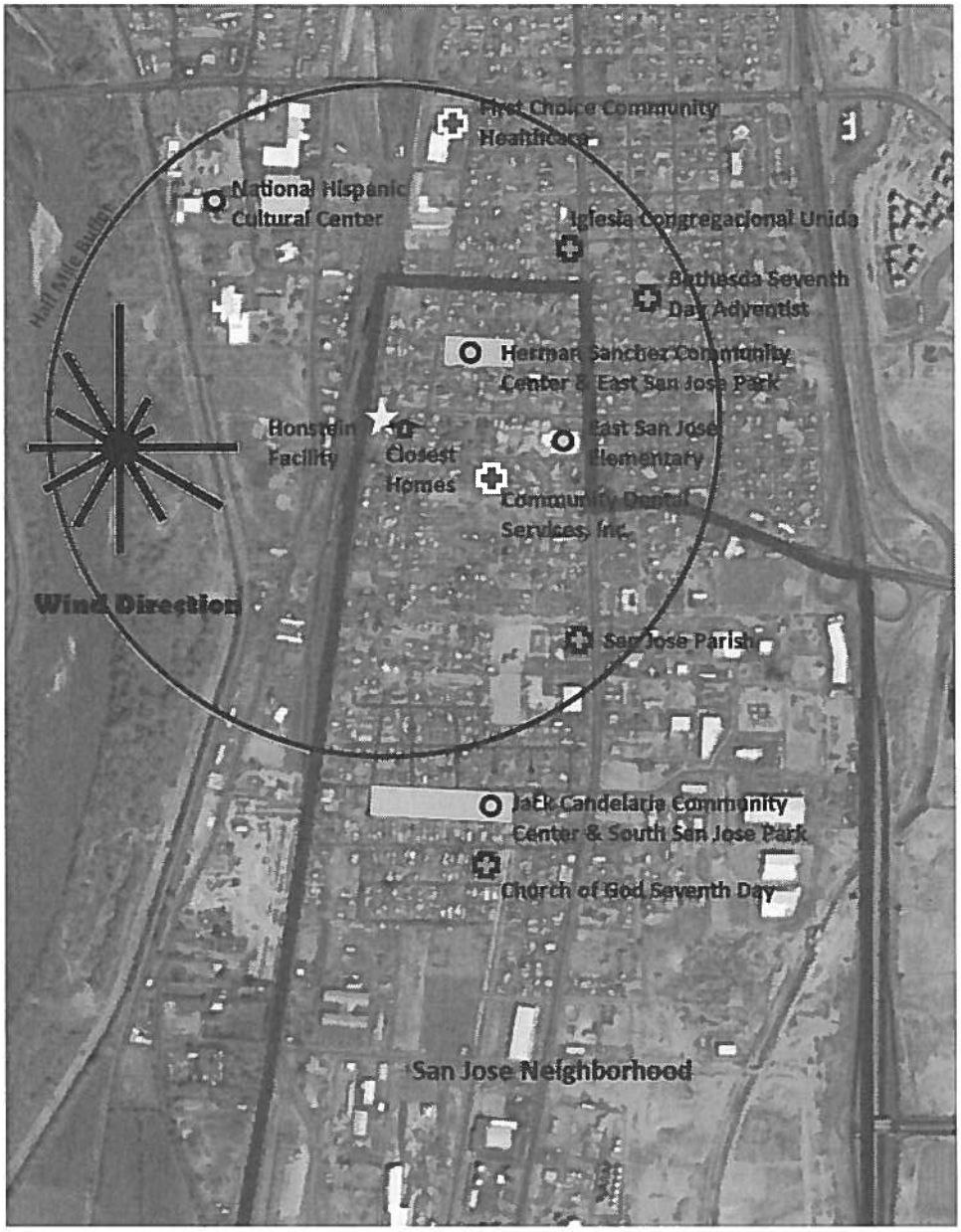

Figure 2: Potential receptors (homes and places where people gather) in the vicinity of the Honstein Facility[17] and prevailing wind directions (showing direction wind travels from)[18].

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[17] Background imagery courtesy of ESRI. Receptor information derived from ABQMaps Advanced Map Viewer, the US EPA's EJView mapping tool and Google Maps. The San Jose neighborhood boundary is shown in blue and the half mile buffer is shown in dark green. The southern portion of the San Jose Neighborhood has no receptors of this type and was excluded from the figure to show greater detail in the northern portion.

[18] Wind rose derived from: National Oceanic and Atmospheric Administration. Albuquerque International Airport Wind Rose Plots: 1985 -2005. From http://www.srh.noaa.gov/images/abq/WindRosePlots/ABQ8505ann.pdf

POTENTIAL IMPACTS OF TRUCK TRAFFIC

Tanker trucks can also have emissions and safety impacts in the San Jose neighborhood. Figure 3 shows trucks photographed at the Honstein facility during the City's air quality inspection and by a community member. Tanker trucks accessing the Honstein facility must travel on Anderson Ave SE or Thaxton Ave SE as well as on Broadway Blvd SE. These routes are adjacent to a number of homes and the East San Jose Elementary School (see Figure 4).

The permit's VOC emissions estimate includes tanker truck loading emissions. Tanker trucks also have idling and exhaust emissions as they operate at the site and travel through the neighborhood. Trucks directly emit several pollutants that can result in health impacts: carbon monoxide (CO), nitrogen oxides (NO_X), and toxic air pollutants (some of which are VOCs); diesel exhaust also contains these pollutants and others, including particulate matter (PM). Exposure to these vehicle pollutants is associated with a number of adverse health outcomes, including a variety of respiratory and cardiovascular impacts as well as increased cancer risks.[19] Health risks from vehicle pollution are greater for vulnerable populations such as the elderly and people with respiratory problems[20], and particularly for children[21], than for the population in general.

There is also a possibility of spills and leaks at the site and from tanker trucks (for example see Figure 5). Trucks can also pose safety risks to pedestrians, particularly if they travel at times when children are out of school. According to the permit application (dated 10/3/13), the permitted facility is in operation between 6am and 5pm, which overlaps with the elementary school's start and end times.

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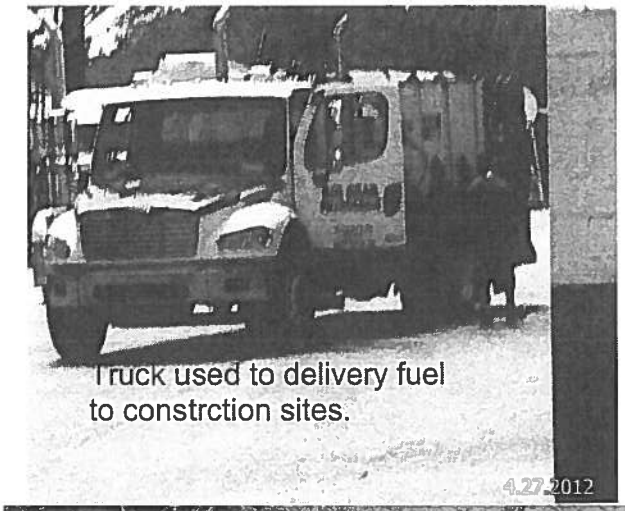
[19] See http://www.epa.gov/oaqps001/nitrogenoxides/health.html; http://www.epa.gov/airquality/carbonmonoxide/health.html; http://www.epa.gov/airquality/particlepollution/health.html; HEI Air Toxics Review Panel, 2007. Mobile-Source Air Toxics: A Critical Review of the Literature on Exposure and Health Effects. HEI Special Report 16. Health Effects Institute, Boston, Mass. Available at http://pubs.healtheffects.org/getfile.php?u=384; and US EPA, 2002. "Health assessment document for diesel engine exhaust." Prepared by the National Center for Environmental Assessment, Washington, DC, for the Office of Transportation and Air Quality; EPA/600/8-90/057F. Available at http://www.epa.gov/ttn/atw/dieselfinal.pdf

[20] Ibid.

[21] See Kim, Janice J., Svetlana Smorodinsky, Michael Lipsett, Brett C. Singer, Alfred T. Hodgson, and Bart Ostro, 2004. "Traffic Related Air Pollution Near Busy Roads: East Bay Children's Respiratory Health Study", *American Journal of Respiratory and Critical Care Medicine*, Vol. 170, No. 5 (2004), pp. 520-526; Brunekreef, Bert, Nicole A. H. Janssen, Jeroen de Hartog, Hendrik Harssema, Mirjam Knape and Patricia van Vliet. "Air Pollution from Truck Traffic and Lung Function in Children Living near Motorways." *Epidemiology,* Vol. 8, No. 3 (May, 1997), pp. 298-303; Krämer, Ursula; Koch, Thilo; Ranft, Ulrich; Ring, Johannes; Behrendt, Heidrun "Traffic-Related Air Pollution is Associated with Atopy in Children Living in Urban Areas." *Epidemiology*, Vol. 11, No. 1 (2000), pp. 64-70; M Wjst, P Reitmeir, S Dold, A Wulff, T Nicolai, E F von Loeffelholz-Colberg, E von Mutius. "Road traffic and adverse effects on respiratory health in children." *British Medical Journal*. 1993 September 4; 307 (6904): 596–600.



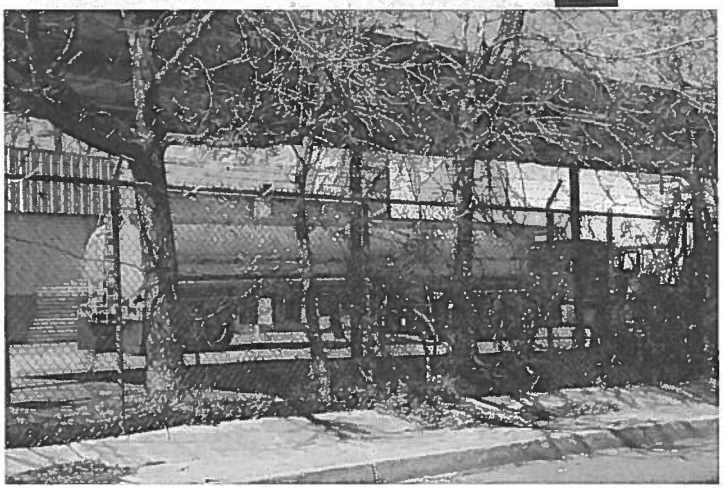


Figure 3: Top: Image of a truck from photographs taken during the City air quality inspection of the Honstein facility.[22] Bottom: Image of a tanker truck at the Honstein property (as viewed through the fence).[23]

Figure 4: The Two Primary Routes for Trucks accessing the Honstein Facility.[24]

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[22] City of Albuquerque Air Quality Inspection Photographs and Map, obtained from SouthWest Organizing Project on 3/18/2015.

[23] Photographed by a community member on 2/17/2013. Photograph obtained from Esther Abeyta.

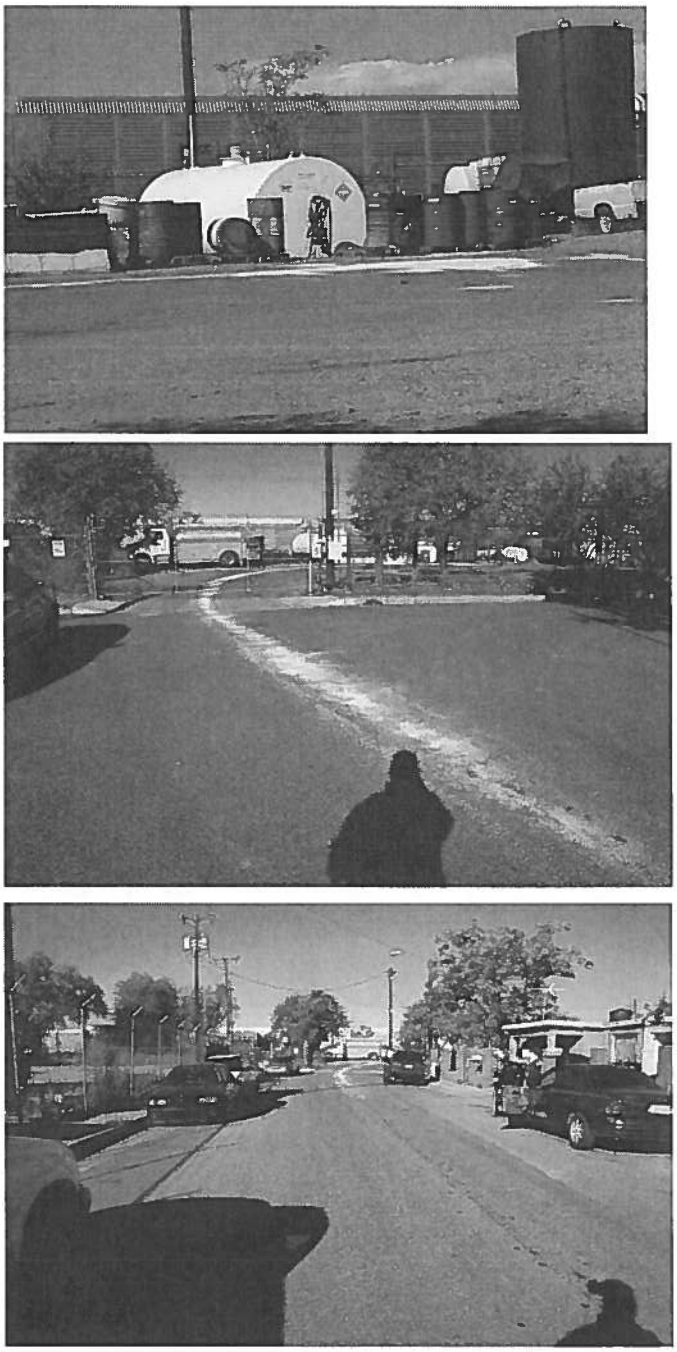

Figure 5: Potential fuel leakage near an above ground tank labeled as gasoline (top), at the entrance/exit from Honstein facility (center) and continuing down the road (bottom) as photographed in October 2014.[25] The white powder may be an absorbent material or other spill control measure.

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[24] Aerial imagery courtesy of Google Maps.
[25] Photographed by a community member on 10/25/2014. Photographs obtained from SouthWest Organizing Project.

CUMULATIVE HEALTH RISKS AND SOCIAL EQUITY

As described above, Permit #3131 may result in health impacts to the San Jose community in the form of exposure to air pollution and safety risks. These impacts would be ongoing (rather than temporary). Furthermore, the permitted activities are occurring in the context of many other heavy industrial activities that may have similar impacts on the San Jose community. In this section, we discuss the potential for cumulative health risks in the San Jose community. The purpose of this memo is not to conduct a comprehensive cumulative risk analysis. Rather, we examine the context, the state of knowledge and the conditions under which such an analysis may be merited.

What are Cumulative Risks?

The incremental impacts of an action are of greater concern when the overall impact of many activities in an area is significant. The US EPA's 2003 Framework for Cumulative Risk Assessment defines cumulative risks as "the combined risks from aggregate exposures to multiple agents or stressors".[26] According to the 2003 Framework, cumulative risks can result from exposure to multiple pollutants from multiple sources and may occur over a long period of time. While traditional risk assessment focuses on exposure to one chemical (often from one source), cumulative risk assessments can be helpful in settings where the effects of multiple exposures and multiple sources can result in greater risks to human health or the environment. The evaluation of cumulative risks is not simply the addition of the risks from different chemicals or sources; it includes an assessment of how these stressors interact. Additionally, cumulative risk assessment emphasizes actual people that can be affected, rather than theoretical populations. It can also consider a wider array of stressors (including non-pollutant stressors such as a lack of health care or car crashes) and their interactive effects.

Consideration of cumulative risks (and similar concepts) has become relatively common in a number of environmental evaluation settings. "Cumulative impacts" are an important part of Environmental Impact Assessments (EIAs) of Federal projects conducted under the National Environmental Policy Act. Some states and localities have also begun to require and perform cumulative risk assessments. For example, a 2008 Minnesota statute requires that cumulative effects are evaluated and considered before air permits are issued in the Phillips Communities in South Minneapolis.[27] The local pollution control agency now engages in modeling of cumulative emissions impacts. Similarly, under a 2009 ordinance in Cincinnati, Ohio, facilities seeking a new or expanded permit are required to show that they will not have a "cumulative adverse impact" on the environment or the

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[26] EPA,2003. "Framework for Cumulative Risk Assessment," May 2003, EPA/630/P-02/001F

[27] See EPA, "Cumulative Risk Webinar Series: What We Learned," July 2014, EPA/600/R-14/212.

community's health.[28] Health Impact Assessments (HIAs), which have been conducted in a variety of jurisdictions and situations, often include an evaluation of cumulative risks.[29]

The methods used to evaluate cumulative risks have developed considerably in the years since the consideration of cumulative impacts in EIAs was first required in 1979. A number of documents are available to assist with evaluations of cumulative environmental and health impacts. The following resources are a sampling of the available guidance for conducting or evaluating cumulative risk assessments:

- EPA, "Framework for Cumulative Risk Assessment," May 2003, EPA/630/P-02/001F;
- EPA, "Consideration of Cumulative Impacts in EPA Review of NEPA Documents," May 1999, EPA 315-R-00-002;
- EPA, "Concepts, Methods, and Data Sources for Cumulative Health Risk Assessment of Multiple Chemicals, Exposures and Effects: A Resource Document," August 2007, EPA/600/R-06/013F; and
- Margaret M. MacDonell, Lynne A. Haroun, Linda K. Teuschler, et al., "Cumulative Risk Assessment Toolbox: Methods and Approaches for the Practitioner," Journal of Toxicology, vol. 2013, 36 pages, 2013. doi:10.1155/2013/310904.

For example, EPA's 2007 Cumulative Health Risk Assessment guidance (EPA/600/R-06/013F) indicates that one situation which might indicate a need for a health risk assessment is the existence of multiple pollution sources or chemical releases. In that case, the first step would be to identify all the relevant (present and future) chemical releases and exposure pathways that can affect the population of concern. In particular, chemicals with high potential for health risks and similar effects are of interest. In the case of emissions from the Honstein facility, benzene and chemicals with similar health impacts might be a focus of a cumulative risk assessment. Once the sources and chemicals that will be assessed have been identified, the analysis follows exposure assessment steps of characterizing the sources, determining the spatial scope of analysis, evaluating the fate of emissions, determining who could be exposed, and quantifying their exposures.

Potential for Cumulative Health Risk in the San Jose Neighborhood

In this memo we examine the context, the state of knowledge and the conditions under which a cumulative risk assessment of the San Jose neighborhood is merited. We discuss

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[28] Rachel Morello-Frosch, Miriam Zuk, Michael Jerrett, Bhavna Shamasunder and Amy D. Kyle. Understanding The Cumulative Impacts Of Inequalities In Environmental Health: Implications For Policy. Health Affairs, 30, no.5 (2011):879-887.

[29] For more information about Health Impact Assessments, see http://www.cdc.gov/healthyplaces/hia.htm

the potential for cumulative impacts associated with the chemicals emitted from the Honstein facility, chemicals emitted from other facilities in the area, and from the emissions and safety risks caused by trucks traveling in the area (from trucks traveling to and from the Honstein facility, through the area, and to and from other facilities in the area).

In order to assess whether a cumulative risk assessment is warranted, we review what is known about whether the community is particularly vulnerable to incremental effects, whether several similar actions are occurring in the same area and whether those actions have similar impacts on the community, whether those impacts have been historically significant to the community, and whether other evaluations have pointed to cumulative risks.[30]

1. Is the community particularly vulnerable to incremental effects?

Yes. EPA outlines four areas of vulnerability that should be assessed in cumulative risk assessments: differential exposure, susceptibility/sensitivity, differential preparedness, and differential ability to recover.[31] Children, the elderly, and people with existing health conditions are particularly vulnerable to inhalation of pollution[32] [33]. Additionally, low-income households and people of color can be more vulnerable to the effects of pollution exposure for a number of reasons, including greater rates of preexisting health conditions, greater exposure to a number of environmental hazards, greater social vulnerability (including stress), and limited access to health care.[34] [35]

Residents of the San Jose neighborhood are far more likely to be people of color, children, and living in poverty than residents of the remainder of the City of Albuquerque and of Bernalillo County (see Table 3). In light of the permitted activities' proximity to places where people live and gather (including homes, a school and community center) and the neighborhood sociodemographics, vulnerable people may be exposed to emissions from the Honstein facility.

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[30] These factors are outlined in relation to NEPA document evaluation in EPA, "Consideration of Cumulative Impacts in EPA Review of NEPA Documents," May 1999, EPA 315-R-00-002.
[31] EPA, "Framework for Cumulative Risk Assessment," May 2003, EPA/630/P-02/001F; "Concepts, Methods, and Data Sources for Cumulative Health Risk Assessment of Multiple Chemicals, Exposures and Effects: A Resource Document," August 2007, EPA/600/R-06/013F
[32] Ibid. 28
[33] "Concepts, Methods, and Data Sources for Cumulative Health Risk Assessment of Multiple Chemicals, Exposures and Effects: A Resource Document," August 2007, EPA/600/R-06/013F.
[34] Ibid. 28
[35] Ibid. 33

Table 3: Race/Ethnicity, Age, and Income Demographics for the San Jose Neighborhood, the City of Albuquerque, and Bernalillo County.[36]

	San Jose Neighborhood	City of Albuquerque	Bernalillo County
Percent People of Color[37]	95.2%	57.9%	58.5%
Percent Under 18	29.2%	24.0%	24.0%
Percent 65 and Older	9.7%	12.1%	12.2%
Percent of Families with Income Below Poverty Level	38.0%	14.1%	14.1%

2. Are several similar actions occurring in the same area?

Yes. A substantial number of similar activities are occurring at the Honstein facility and at other facilities in the area.

There are additional activities at the Honstein facility that may also result in air pollution. According to the City's air quality inspection map and photographs[38], there appear to be a total of five tanks in addition to a number of drums and containers. These tanks and containers store what appear to be diesel, refrigerants, naptha solvent, ethyl alcohol, waste oil, and hydraulic fluids and oil (in addition to gasoline). The City has indicated that these tanks are either not required to be permitted, contain materials with low volatility, or are empty when at the Honstein facility[39]. Activities associated with these facilities may also contribute to emissions from the Honstein Oil property (in addition to those coming from the permitted tank) and have associated truck traffic.

In addition to Honstein Oil, there are 22 other permitted stationary sources of pollution in the San Jose neighborhood and 28 more within 0.5 miles of the neighborhood boundary, for a total of 50 stationary sources in the vicinity (see Tables 4a and 4b and Figure 6).

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[36] Data for the San Jose neighborhood are from Census Block Groups 1 and 4 of Census Tract 13 in Bernalillo County, as those block groups make up almost the entirety of the residential areas of San Jose Neighborhood (less than 1% of the population is excluded). All age and race demographics are from the 2010 US Census, while all income information is from the 2013 5-year ACS survey. All Census data are obtained from the US Census Bureau American Fact Finder (http://factfinder.census.gov/)

[37] Percent of all residents except for non-Hispanic white residents.

[38] City of Albuquerque Air Quality Inspection Photographs and Map, obtained from SouthWest Organizing Project on 3/18/2015. Photographs are dated 4/27/2012.

[39] Ibid 2.

Table 4a: Permitted Stationary Sources located within the San Jose Neighborhood and their permitted emissions.[40]

Permit #	Facility Name	Permit Category	Address	Permitted Emissions (Tons per Year)[41]							
				CO	NOX	SOX	TSP	VOC	HAPS	PM10	PM2.5
Facilities within the San Jose Neighborhood											
3131	HONSTEIN OIL CO	Bulk Gasoline Plant	101 ANDERSON					2.26			
0703-M1	7-ELEVEN	Gas Service/Fleet Stations	2120 BROADWAY BLVD SE	0	0	0	0	8.13	0	0	0
2161	A&E AUTO SALES	Paint and Body	2945 BROADWAY SE	0	0	0	0	0	0	0	0
1865	ABQ RAIL ROAD	Emergency Generators	515 WHEELER AVENUE, SE	0.321	0.585	0.044	0.047	0.043	0	0.047	0.047
0456-M5-RV2	ALBUQUERQUE PRODUCTS TERMINAL	Petroleum Bulk Terminal	3209 BROADWAY SE					73	12		
3194	AT&T - RIO BRAVO & I-25 CELL TOWER	Emergency Generators	601 RIO BRAVO BLVD SE	0.16	0.14	0.04	0.013	0.0076	0.013	0.013	0.013
1269-RV2	BERNALILLO COUNTY MAINTENANCE FACILITY	Emergency Generators	2400 BROADWAY SE	0.28	1.29	0.09	0.09	0.1	0	0.09	0.09
2164	CASA	Emergency Generators	2540 KARSTEN SE	0.23	2	0.003	0.02	0	0	0.02	0.02
1931	CEI ENTERPRISES	Manufacturing	245 WOODWARD ROAD SE	1.66	2.03	0.54	0.17	18.9	13.13	0.16	0.15
0773-RV1	CMH MANUFACTURING WEST, INC. D/B/A	Chemical Storage/Handling	2700 KARSTEN COURT SE	0	0	0	0	18.4	0	0	0

[40] Permit data restricted to the San Jose Neighborhood boundary and retrieved from ABQMaps Advanced Map Viewer v1.1 on March 31, 2015. Accessed via http://www.cabq.gov/gis/advanced-map-viewer

[41] CO = Carbon Monoxide; NO_X = Nitrogen Oxides; SO_X = Sulfur Oxides; VOC = Volatile Organic Carbon; TSP = Total Suspended Particulate; PM10 = Particulate Matter (less than 10 micrometers in diameter); PM2.5 = Particulate Matter (less than 2.5 micrometers in diameter); HAP = Hazardous Air Pollutant.

Permit #	Facility Name	Permit Category	Address	Permitted Emissions (Tons per Year)[41]							
				CO	NOX	SOX	TSP	VOC	HAPS	PM10	PM2.5
	KARSTEN HOMES										
1207	DUKE CITY DISTRIBUTING CO. INC.	Gas Service/Fleet Stations	3203 BROADWAY SE	0	0	0	0	0.9	0	0	
1326	EAST SAN JOSE ELEMENTARY SCHOOL	Boilers	415 THAXTON AVE SE	1.84	2.19	0.015	0.17	0.12	0	0.17	
1752-M2	ECLIPSE AVIATION CORPORATION (MULTIPLE FACILITES)(3 TOTAL)[42]	Manufacturing	2800 KARSTEN CT. SE	21.33	25.09	2.5	2.63	74	20	2.63	2.63
1550	FRANKLIN'S EARTHMOVING, INC.	Aggregate Processing	2811 KARSTEN COURT SE	1.8	8.4	0.6	13.9	0.7	0	5.1	
3044	HINDI/SHOATS, NM #75183	Emergency Generators	700 TORREON SE	0.02	0.078	0.027	0.0035	0.003		0.0035	0.0035
2089	JTC, INC.	Manufacturing	248 Woodward Avenue SE	2.3	2.74	0.02	0.211	18.87	11.21	0.211	0.211
1682	MANHEIM'S ALBUQUERQUE AUTO AUCTION[43]	Paint and Body	3411 BROADWAY BLVD SE	0	0	0	0	24	0	0	

[42] Eclipse Aviation has closed or relocated (Esther Abeyta, personal communication, March 30, 2015), resulting in the following emissions estimates:

	CO	NOX	SOX	TSP	VOC	HAPS	PM10	PM2.5
Subtotal - Permitted Emissions in the San Jose Neighborhood	1227.81	883.45	85.48	93.66	332.53	61.25	84.85	76.53
Total - Permitted Emissions in and within a half mile of the San Jose Neighborhood	1291.15	943.19	87.34	175.18	473.20	75.25	130.34	106.26

[43] Note that Manheim's Auto Auction at 3411 Broadway Blvd. SE is not depicted in the San Jose neighborhood using ABQMaps, but the address listed in the permit data indicates that it is located in the San Jose neighborhood.

Permit #	Facility Name	Permit Category	Address	Permitted Emissions (Tons per Year)[41]							
				CO	NOX	SOX	TSP	VOC	HAPS	PM10	PM2.5
0542-M1	PUBLIC SERVICE COMPANY OF NEW MEXICO	Emergency Generators	701 ELECTRIC AVENUE	0.2	1	0.1	0.04	0.1	0	0.04	
3154	PUEBLO METALS RECYCLING	Metal Recycling	3800 BROADWAY BLVD SE								
0694-M1-RV2	RIO BRAVO GENERATING STATION	Electrical Generation	725 ELECTRIC AVE	512	333	11	22	22	0	22	22
2093-RV1	RIO BRAVO GENERATING STATION	Electrical Generation	725 ELECTRIC AVE SE	707	530	73	57	34	0	57	54
3003-RV1	VALERO CORNER STORE #1252	Gas Service/Fleet Stations	555 RIO BRAVO BLVD SE					46			
0047-M2	VECENERGY ALBUQUERQUE TERMINAL	Petroleum Bulk Terminal	3200 BROADWAY SE					65	24.9		
Subtotal - Permitted Emissions in the San Jose Neighborhood				1249.14	908.54	87.98	96.29	406.53	81.25	87.48	79.16

Table 4b: Permitted Stationary Sources located within 0.5 mile of the San Jose Neighborhood (not including sources within the neighborhood listed in Table 4a). [44]

Permit #	Facility Name	Permit Category	Address	Permitted Emissions (Tons per Year) [45]							
				CO	NOX	SOX	TSP	VOC	HAPS	PM10	PM2.5
1829-RV1-R8	ALBUQUERQUE ASPHALT INC	Crushing	167 HILL ST. SW								
0051-M1-RV1	ALBUQUERQUE ASPHALT TERMINAL	Asphalt Production	2040 2ND ST SW	13.43	15.99	0.1	1.22	11.75	0	1.22	1.22
1529-M2	ALBUQUERQUE METALS RECYCLING, INC.	Recycling	3339 SECOND ST. SW	0	0	0	9.61	0	0	4.36	2.7
1523-M1	ALBUQUERQUE TERMINAL	Aggregate Processing	100 TRUMBULL SW	2.2	6.4	0.15	20.1	2.9	0	8.7	1.9
2069	ATLAS OIL PRODUCTS TERMINAL	Chemical Distributor	2250 2ND STREET SW	0	0	0	0	9.3	0	0	0
1756	BERNALILLO COUNTY FIRE AND RESCUE STATION #8	Emergency Generators	3610 PRINCE SW	0.05	0.22	0.01	0.02	0.02	0	0.02	0.02
2079	BRIGIDOS BODY SHOP	Paint and Body	2345 SECOND STREET SW	0	0	0	0	0	0	0	0
0184-RV1	BROADWAY PROPERTY, LLC	Gas Service/Fleet Stations	1401 BROADWAY BLVD					4.8			
1596	BUENO FOODS	Manufacturing	2001 4TH STREET S.W.	6.7	8	0.04	1.8	0.4	0	0	
0490-RV1	CENTER FOR HIGH TECHNOLOGY MATERIALS (SOUTH CAMPUS)	Emergency Generators	100 GODDARD SE	2.6	4	0.1	0.3	0.3	0	0.3	
0359-	CORESLAB	Concrete	2800 2ND ST. SW	2.3	2.7	0.01	2.2	0.15	0	0.8	0

[44] Permit data retrieved from ABQMaps Advanced Map Viewer v1.1 on March 31, 2015. The San Jose Neighborhood boundary was buffered 0.5 miles using the advanced map viewer, and permit data clipped to the buffered shape.

[45] CO = Carbon Monoxide; NO_X = Nitrogen Oxides; SO_X = Sulfur Oxides; VOC = Volatile Organic Carbon; TSP = Total Suspended Particulate; PM10 = Particulate Matter (less than 10 micrometers in diameter); PM2.5 = Particulate Matter (less than 2.5 micrometers in diameter); HAP = Hazardous Air Pollutant.

Permit #	Facility Name	Permit Category	Address	Permitted Emissions (Tons per Year)[45]							
				CO	NOX	SOX	TSP	VOC	HAPS	PM10	PM2.5
M2-RV1	STRUCTURES (ALBUQUERQUE) INC.	Production									
0732-M1-RV1	CORNER STORE #1226	Gas Service/Fleet Stations	511 BRIDGE BLVD SW					26			
0803-M2	DPC Industries, Inc.	Chemical Distributor	3501 2nd Street SW	0.55	0.66	0.004	0.05	4.9		0.05	0.05
0002-M2	EL REY STUCCO PLANT	Manufacturing	4100 1/2 BROADWAY BLVD. SE	0	0	0	6.74	0	0	1.96	0.76
0169-M7	ETHICON ENDO-SURGERY, INC.	Manufacturing	3801 UNIVERSITY BLVD. SE	9.36	8.17	0.97	17.09	18.02	14	17.09	17.09
3022	FIRE STATION #2	Emergency Generators	2401 Alumni Drive SE	0.46	0.49	0.17	0.03	0.04		0.03	0.03
0598-M1	GIANT INDUSTRIES ARIZONA, INC.	Gas Service/Fleet Stations	201 RIO BRAVO SW	0	0	0	0	16.2	0	0	
0505-M1-RV2	HOLLYWOOD CONCRETE BATCH PLANT	Concrete Production	6001 CHAPPEL RD NE	1.3	1.5	0.009	4.1	0.2	0	2.4	
0505-M1-RV3	HOLLYWOOD CONCRETE BATCH PLANT	Concrete Production	6001 CHAPPEL RD NE	1.3	1.5	0.009	4.1	0.2	0	2.4	
1183	ILIES PLATEAU	Gas Service/Fleet Stations	1301 BROADWAY SE	0	0	0	0	2.25	0	0	
1665	NATIONAL HISPANIC CULTURAL CTR OF NM	Emergency Generators	1701 4TH STREET	1.4	3.1	0.1	0.2	0.3	0	0.2	
1817	OTN F	Emergency Generators	1824 BROADWAY SE	0.07	0.31	0.02	0.022	0.03	0	0.022	0.022
0501-M3-RV1	QUIKRETE NEW MEXICO	Concrete Production	2700 2ND STREET	21	6.2	0.02	13.9	0.2	0	5.9	5.9
2078	REFLECTIVE AUTO COLLISION	Paint and Body	813 GIBSON BLVD. SE	0	0	0	0	0	0	0	0

Permit #	Facility Name	Permit Category	Address	Permitted Emissions (Tons per Year)[45]							
				CO	NOX	SOX	TSP	VOC	HAPS	PM10	PM2.5
2061	REYNOLDS AUTO	Paint and Body	120 WOODWARD ROAD SW	0	0	0	0	0	0	0	0
0514	ROBERTS OIL COMPANY	Gas Service/Fleet Stations	1517 GIBSON BLVD SE	0	0	0	0	42.71	0	0	
1955-R6	SGP'S CONSTRUCTION YARD	Asphalt Production	167 HILL ST. SW								
2149	U.S. FOODSERVICE INC. ALBUQUERQUE DIVISION 8V	Emergency Generators	3700 PRINCE ST. SE	0.62	0.5	0.15	0.03	0	0	0.03	0.03
Subtotal - Permitted Emissions within a half mile of the San Jose Neighborhood				63.34	59.74	1.86	81.51	140.67	14.00	45.48	29.72
Total - Permitted Emissions in and within a half mile of the San Jose Neighborhood (total of Tables 4a and 4b)				**1312.48**	**968.28**	**89.84**	**177.81**	**547.20**	**95.25**	**132.97**	**108.89**

The San Jose Neighborhood is also bordered and bisected by several major transportation corridors (see Figure 6).

A major rail corridor lies just to the west of the neighborhood. Near the northern portion of the neighborhood there appears to be a rail yard with over a dozen separate tracks[46]. BNSF Railway's Albuquerque Intermodal Facility is also located in the San Jose Neighborhood, further south near Woodward Road[47].

The neighborhood is in proximity to several high volume roads. In 2013, the average weekday traffic for the portion of Avenida Cesar Chavez SE just to the North of the San Jose Neighborhood was 33,500 vehicles per day. Broadway Blvd. SE (which bisects the neighborhood from north to south and forms the eastern border of the "handle") at the point where it passes directly adjacent to East San Jose Elementary School had an estimated 14,700 vehicles per day. Gibson Road between Broadway Blvd. and Interstate 25 had 18,200 vehicles. Rio Bravo Blvd., bordering the neighborhood in the south had 27,100 vehicles per day, and 2nd Street SW, just on the other side of the railroad tracks to the west of the neighborhood had 5,900 vehicles per day. Additionally, the portion of Interstate 25 bordering the neighborhood to the east has an estimated weekday average flow of 115,500 vehicles.[48]

The Albuquerque International Sunport is less than a mile to the east of the San Jose Neighborhood, while a small private heliport, KRQE Heliport, is less than a tenth of a mile north.

In conclusion, there are a number of other activities with air pollution emissions occurring in the San Jose neighborhood. Any similar future activities would also be relevant when considering cumulative impacts.

3. Do other activities have similar effects on the community?

Yes. The activities described above result in air pollution emissions (including VOCs), which increase the health risks for exposed residents. The existing permitted stationary sources in the San Jose Neighborhood are allowed to emit over 330 tons of VOCs annually (in addition to several other air pollutants with known health impacts). When combined with mobile sources, including passenger vehicles, trucks, locomotives,

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[46] Aerial photography from Google Earth. Image dated March 8, 2014.

[47] http://www.bnsf.com/customers/where-can-i-ship/facility-hours-directions/albuquerque.html

[48] MRCOG 2013 Traffic Flow Map for Greater Albuquerque Area accessed via http://www.mrcog-nm.gov/transportation/metro-planning/traffic-counts

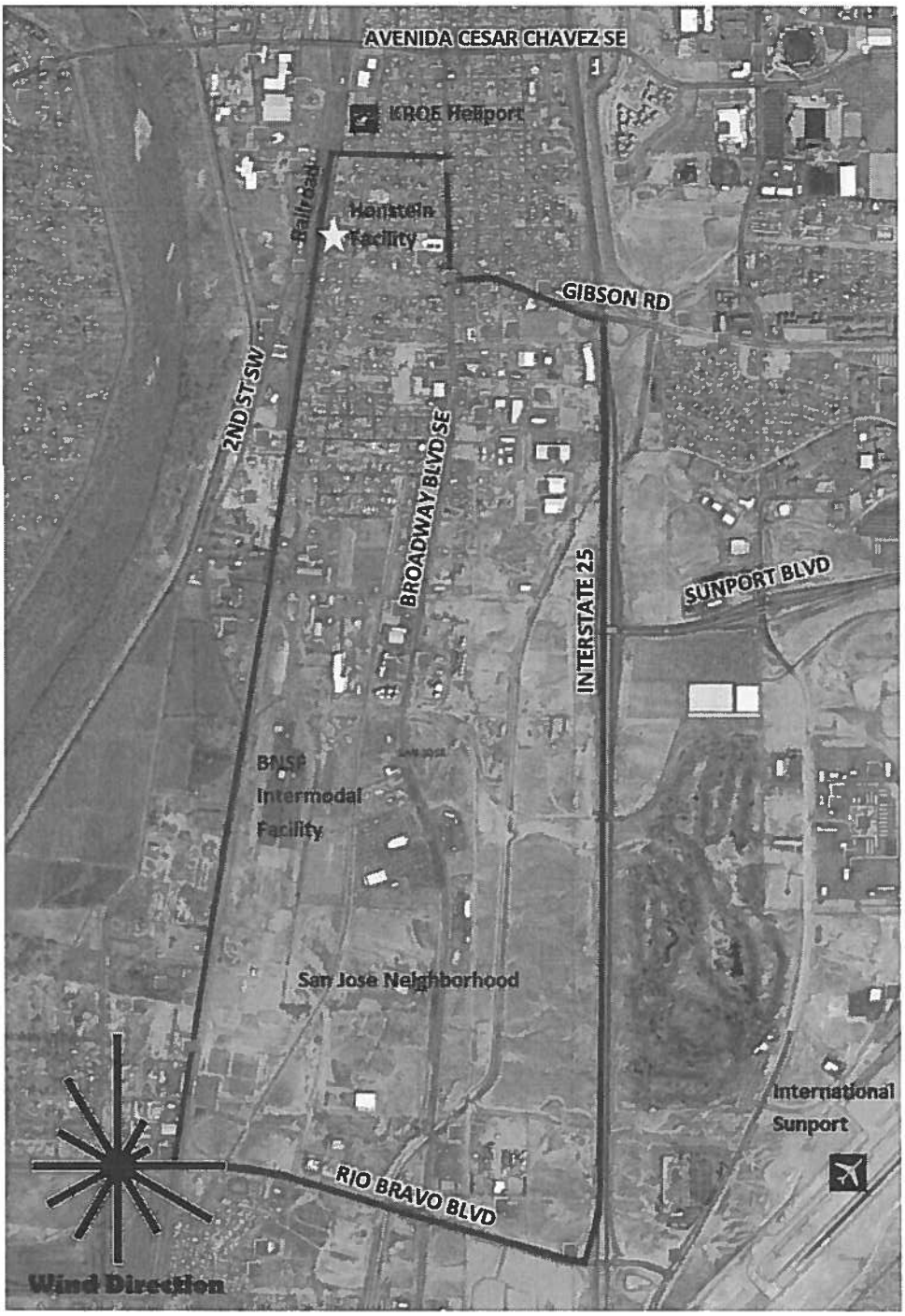

Figure 6: Active Permitted Stationary Air Pollution Sources and Major Transportation Facilities in the Vicinity of the San Jose Neighborhood[49].

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[49] Map developed using the Albuquerque Air Quality Active Stationary Source Permits as of December 12, 2014 ArcGIS online map. Accessed via http://www.arcgis.com/home/webmap/viewer.html?webmap=5902322c1f6446efaf8ef409c9832b05&extent

helicopters, and planes, the amount of VOCs and other pollutants emitted in the San Jose neighborhood (which residents may be exposed to) is substantial.

4. Have these impacts been found to be historically significant for the community?
Probably. Analyses of health data and ambient pollution levels in this area are limited but as described below, the evidence that has been evaluated suggests that health risks may be elevated in the San Jose neighborhood.

Regional Health and Air Quality Analyses
The National-Scale Air Toxics Assessments (NATA) provide coarse indications of health risks by census tracts.[50] These data should be interpreted with caution because they are too coarse to provide a clear indication of risks at the local level, although they can be useful for identifying areas that merit additional analysis. According to the 2005 NATA, the San Jose neighborhood may have elevated respiratory risks, largely due to vehicle emissions[51].

Similarly, Federal monitors record air quality across the country, but do not provide localized data in most areas. The nearest active EPA air monitor is in the South Valley (at 201 Prosperity SE), over 3 miles south of the Honstein facility and 0.7 from the San Jose neighborhood's southern boundary.[52] The South Valley monitoring site records concentrations of lead, CO, ozone, PM2.5, and PM10. Although Bernalillo County is currently designated as in attainment of National Ambient Air Quality Standards for PM10 and ground level ozone, the South Valley monitor shows PM10 and ozone values that are very close to current standards[53]. The PM10 design value for 2011-2013 actually appears to exceed standards according to the EPA's summary.[54] The ozone value for Bernalillo County appears to exceed proposed ozone standards and the value in the South

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=-107.1519%2c34.8292%2c-106.1377%2c35.3192. Wind rose information from: National Oceanic and Atmospheric Administration. Abuquerque International Airport Wind Rose Plots: 1985 -2005. Found at http://www.srh.noaa.gov/images/abq/WindRosePlots/ABQ8505ann.pdf. Note that Manheim's Auto Auction at 3411 Broadway Blvd. SE is not depicted but is located in the San Jose neighborhood; it is mapped incorrectly in ABQMaps.

[50] See http://www.epa.gov/ttn/atw/nata2005/05pdf/nata2005_factsheet.pdf

[51] Census Tract 13, which covers nearly all of the residences in the San Jose Neighborhood, has an average total respiratory health index (HI) of 2.5. An HI of less than 1 indicates that adverse effects are unlikely. An HI greater than 1 may or may not indicate that adverse effects could occur – the HI is case specific. 14 of 153 Census Tracts in Bernalillo County (largely near the interstate highways in Albuquerque) also have an HI of 2.5 or higher.

[52] ABQMaps Advanced Map Viewer v1.1 found at http://www.cabq.gov/gis/advanced-map-viewer

[53] See design values and statements about attainment of those values in the data posted at http://www.epa.gov/airtrends/values.html.

[54] Ibid.

Valley equals the high end of the range of ozone standards that is proposed.[55] Note that ozone is formed when VOCs and NOx combine in the presence of sunlight, and ozone levels depend more heavily on regional (rather than very localized) emissions. However for areas that are close to standards, incremental emissions of VOCs or NOx may shift ozone levels, depending on regional conditions.

Air quality monitoring of toxics was conducted for a study in Bernalillo County between 2007 and 2009.[56] The study examined a range of pollutants (including VOCs) for three locations, including a location in the South Valley. The study compared measured pollution levels to risk-based values and also evaluated the health risks of exposure to four toxic VOCs (selected if they were measured at all three sites in the majority of valid samples). The study found that the observed pollution levels do not pose a significant health risk. The study also found that there was significant variation in VOC concentrations observed across the three monitoring sites, likely due to the variation in emissions from different sources. In light of this variation, the study is too coarse to evaluate the presence or absence of localized health risks in the San Jose neighborhood. The South Valley location appears to be at or near the Federal air monitoring location at 201 Prosperity SE, which (as noted above) is over 3 miles from the Honstein facility and over 0.7 miles from the San Jose neighborhood boundary. Pollution levels in the San Jose neighborhood likely vary across the neighborhood and likely differ from the levels observed at the South Valley sampling location.

Local Health and Air Quality Analyses

A 2011 Health Impact Assessment completed by the Bernalillo County Place Matters Team evaluated death rates for Hispanics in the San Jose and Mountain View (located immediately South of San Jose) neighborhoods. Death rates in these areas were found to be greater than for Hispanics in the remainder of the County (see Figure 7). This finding is consistent across nearly all causes of death, including cancer and chronic obstructive pulmonary disease (COPD). For context, the death rates for Hispanics were similar to death rates for all races combined from 1996 – 2005 in the State of New Mexico.[57]

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[55] The proposed ozone standard is available at http://www.epa.gov/airquality/ozonepollution/pdfs/20141125proposal.pdf

[56] See Desert Research Institute, Albuquerque/Bernalillo County Community Scale Air Toxics Monitoring and Risk Assessment Project, February 2010.

[57] According to The Center for Vital Health Statistics (Bureau of Vital Records and Health Statistics, "The New Mexico Selected Health Statistics Annual Report 2005", August 2007: Age-adjusted death rates per 100,000 U.S. standard population are reported for All Races and for Hispanics from 1996 – 2005 as follows: 1996: 834.8 (All Races), 833.3 (Hispanic); 1997: 817.5, 817.1; 1998: 813.8, 819.8; 1999: 827.6, 826.9; 2000: 802.5, 804.3; 2001: 814.5, 814.9; 2002: 797.5, 796.6; 2003: 796.6, 801.1, 2004: 764.7, 751.5; and 2005: 770.3, 763.6.

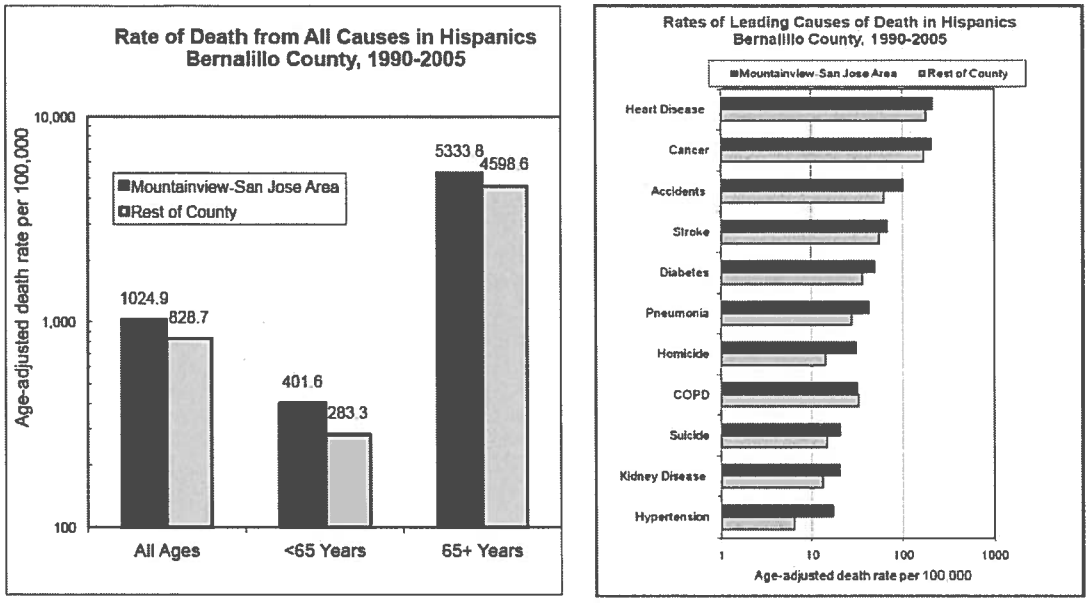

Figure 7: Death Rates for San Jose area versus Bernalillo County. Figure is from the 2011 Health Impact Assessment (HIA)[58], page 8. This part of the HIA analysis is based on data from the New Mexico Department of Health Vital Records Bureau.

Additionally, some air quality data is available for the San Jose neighborhood. Between September 13th, 2012, and September 18th, 2013, trained community members collected seven air samples along the railway corridor to the west of the San Jose Neighborhood as part of the San Jose Bucket Brigade, implemented with the SouthWest Organizing Project. Samples were analyzed for VOCs (including chlorobenzene, toluene, ethanol, acetone, styrene, d-limonene), particulate matter, and elemental carbon. The results of this sampling effort were analyzed and incorporated into a January 2014 report by Mark Chernaik, Ph.D. of Science for Citizens. Notable findings included:

- All samples contained "detectable and significantly elevated levels" of chlorobenzene and detectable levels of toluene. Levels of chlorobenzene are of particular concern as they are higher than typically found in other urban areas and they exceed the US EPA's provisional Reference Concentration (RfC).
- One PM2.5 measurement exceeded the US EPA 24-hour standard for PM2.5.
- Environmental Carbon (EC) levels in samples collected at the 2500-2600 block of Williams Street were "consistently high, indicating impacts from heavy vehicle (diesel engine) emissions."
- "Moderate amounts of ethanol (4 samples), acetone (2 samples), styrene (1 sample) and d-limonene (1 sample) were detected in air samples from southwest

[58] Bernalillo County Place Matters, "Health Impact Assessment on NMRT's Request for Special Use Permit Prepared for the Bernalillo County Planning Commission April 6, 2011 Hearing," 3/22/2011.

Albuquerque, but well below short-term and long-term health-based standards for exposure to these VOCs."

5. Have other analyses identified cumulative effects similar to what is proposed?
Yes. At least one other evaluation has examined the potential for cumulative health impacts in the Mountain View and San Jose neighborhoods. The 2011 Health Impact Assessment (HIA) conducted by Bernalillo County Place Matters found that the addition of an industrial facility would increase the health risks to residents due to increased truck traffic, noise, and odors.[59] The study indicates that these health risks, environmental conditions, and noise, comprise cumulative impacts in the community.

Potential for Equity and Environmental Justice Impacts

The US EPA defines environmental justice as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies."[60] Concerns about environmental justice have grown out of a number of studies that indicate that in many cases the burdens of environmental harms fall disproportionately onto people of color and low-income people, while environmental benefits often fail to serve those people.[61] The US Executive Order 12898 and New Mexico's Executive Order 2005-056 urge US and New Mexico agencies (respectively) to provide opportunities for all people to participate in the decision-making process and to avoid decisions which disproportionately harm low-income communities and communities of color.

As described above, the San Jose neighborhood is home to a greater percentage of people of color, people under age 18, and families living in poverty than the City of Albuquerque and of Bernalillo County. Additionally, the San Jose neighborhood has a substantially higher rate of permitted emissions per square mile than Bernalillo County or the City of Albuquerque as a whole for seven out of eight recorded emissions categories (there is only one permitted stationary source of lead in the region and no sources in the San Jose Neighborhood) (See Table 6).

The combined facts of the greater share of residents who are people of color or living in poverty in the neighborhood and the higher rate of emissions per land area (when compared to the City of Albuquerque and Bernalillo County) raise serious equity and environmental justice concerns. The potential for cumulative impacts is of even greater concern in light of these environmental justice concerns.

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[59] Ibid.
[60] See http://www.epa.gov/environmentaljustice/.
[61] Ibid. 29

Table 5: Permitted Stationary Source Emissions for Bernalillo County, the querque and the San Jose Neighborhood.[62].

	Bernalillo County		City of Albuquerque		San Jose Neighborhood[63]	
	Emissions (tons/year)	Density of Emissions (tons/ (year*mile^2))	Emissions (tons/year)	Density of Emissions (tons/ (year*mile^2))	Emissions (tons/year)	Density of Emissions (tons/ (year*mile^2))
CO	10,260.06	8.84	5,696.07	30.34	1,249.14	518.32
NO_X	10,775.57	9.28	6,404.05	34.11	908.54	376.99
SO_X	2,318.80	2.00	405.63	2.16	87.98	36.51
TSP	4,316.23	3.72	1,141.32	6.08	96.29	39.96
VOC	5,933.31	5.11	4,113.66	21.91	406.53	168.69
HAPS	392.47	0.34	236.32	1.26	81.25	33.71
PM10	1,803.45	1.55	598.15	3.19	87.48	36.30
PM2.5	806.54	0.69	375.79	2.00	79.16	32.85
Lead	0.37	0.00	0.37	0.00	0.00	0.00

[62] Source emissions permit information and the San Jose Neighborhood land area (equal to 2.41 miles^2) retrieved from ABQMaps Advanced Map Viewer v1.1 on March 31, 2015. All geospatial data was obtained from ABQMaps. Permits for the entire Albuquerque region were clipped to 1) the City of Albuquerque boundary (571 permits) and 2) the San Jose Neighborhood boundary (23 permits) using ABQMaps' Advanced Query function. Information for all of the permits within the target areas was then exported for analysis. The land area of the City of Albuquerque (187.73 miles^2) was obtained from the US Census (http://quickfacts.census.gov/qfd/states/35/3502000.html). Permits for Bernalillo County (1190 permits) were downloaded from ABQMaps. The land area of Bernalillo County (1,160.83 miles^2) was obtained from the US Census (http://quickfacts.census.gov/qfd/states/35/35001.html).

[63] Eclipse Aviation has closed or relocated (Esther Abeyta, personal communication, March 30, 2015). Omitting Eclipse Aviation's San Jose location results in the following emissions estimates:

	Bernalillo County		City of Albuquerque		San Jose Neighborhood	
	Emissions (tons/year)	Density of Emissions (tons/ (year*mile^2))	Emissions (tons/year)	Density of Emissions (tons/ (year*mile^2))	Emissions (tons/year)	Density of Emissions (tons/ (year*mile^2))
CO	10,238.73	8.82	5,674.74	30.23	1,227.81	509.47
NO_X	10,750.48	9.26	6,378.96	33.98	883.45	366.58
SO_X	2,316.30	2.00	403.13	2.15	85.48	35.47
TSP	4,313.60	3.72	1,138.69	6.07	93.66	38.86
VOC	5,859.31	5.05	4,039.66	21.52	332.53	137.98
HAPS	372.47	0.32	216.32	1.15	61.25	25.42
PM10	1,800.82	1.55	595.52	3.17	84.85	35.21
PM2.5	803.91	0.69	373.16	1.99	76.53	31.76
Lead	0.37	0.00	0.37	0.00	0.00	0.00

CONCLUSIONS

The permitted Honstein Oil tank is expected to emit volatile organic compounds (VOCs), which pose an inhalation health risk. Truck trips associated with the permitted activities can also emit air pollutants and can pose safety risks due to collisions and leaks. These potential health risks occur in the context of the San Jose neighborhood, which includes residences, a school, and several other locations where residents congregate.

An in-depth cumulative risk assessment is out of the scope of our analysis. Rather, we discuss the context, the state of knowledge and the conditions under which a cumulative risk analysis may be warranted. Although data are limited, existing analyses and data sources suggest that there is potential for cumulative impacts in the area. The community is particularly vulnerable to incremental effects: it is home to a greater percentage of people of color, people under age 18, and families living in poverty than the City of Albuquerque and Bernalillo County. Additionally, there are a number of other industrial activities occurring in the area, which likely have similar impacts on the community in terms of emissions and truck traffic. There is also limited but suggestive evidence that air quality and health impacts have been historically significant to the community. Finally, at least one other evaluation has pointed to cumulative impacts in this area.

In light of the sociodemographics of the neighborhood and the higher density of permitted emissions per land area, we also note that there are environmental justice concerns related to the potential for cumulative health risks.

A comprehensive cumulative risk assessment could determine the nature and extent of environmental, health, and equity impacts in the San Jose neighborhood. Such an analysis could also be used to evaluate the contribution of various activities on those impacts and the benefits of implementing various mitigations.

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