BEFORE THE
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

AIR QUALITY DESIGNATIONS AND CLASSIFICATIONS FOR THE FINE PARTICLES (PM-2.5) NATIONAL AIR QUALITY STANDARDS	)	EPA-HQ-OAR-2003-0061
FINAL RULE	)	
40 CFR PART 81	)	

PETITION OF OAKLAND COUNTY, MICHIGAN, FOR RECONSIDERATION OF EPA'S PM-2.5 NONATTAINMENT DESIGNATION

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INTRODUCTION AND SUMMARY

Pursuant to Sections 107(d)(6)(A) and 307(d)(6)(B) of the Clean Air Act, 42 U.S.C. §§ 7407(d)(6)(A) and 7607(d)(6)(B), Oakland County hereby petitions for reconsideration of EPA's January 20, 2006 rulemaking decision designating the County as a non-attainment area for fine particulate matter ("PM-2.5"). The monitoring data show that Oakland County meets EPA's 24-hour and annual PM-2.5 standards. EPA, however, based its decision on the alleged failure of the State of Michigan and Oakland County to rebut EPA's "presumption" that Oakland County materially contributes to PM-2.5 non-attainment in neighboring Wayne County. In its January 20, 2006 decision denying the County's prior petition for reconsideration, EPA has attempted to defend this "presumption" by using a "wind direction vs. PM-2.5 contribution" methodology that purports to measure the amount of PM-2.5 that Oakland County "contributes" to Wayne County ("Incremental Contribution Analysis"). Yet the agency is so committed to including Oakland County in the SE Michigan non-attainment area that it has mis-applied this methodology in a biased and result-oriented manner.[1]

As explained herein and in the attached report from the Gradient Corporation ("Gradient"), EPA's Incremental Contribution Analysis rests upon several key errors. The agency's new approach attempts to measure "contribution" by comparing the PM-2.5 levels in areas upwind of Oakland County with the levels in

[1] Although OMB labeled the relevant MSA as the "Detroit-Ann Arbor-Flint" MSA, EPA dropped all of Genesee County from the non-attainment area, thereby removing Flint. For consistency, this petition refers to this MSA as the "Detroit MSA" and the PM-2.5 non-attainment areas as the "SE Michigan non-attainment area."

Oakland County and further south in Wayne County. Based upon the locations of the monitoring stations used in this analysis, however, the agency failed to use the appropriate wind direction. The agency included a wind vector from the northeast that could not possibly transport Oakland County air parcels to the monitoring stations in Wayne County that are failing to meet the agency's PM-2.5 standards. In reality, based upon the alignment of the monitoring stations, only wind from the north-northwest has the potential to carry PM-2.5 from Oakland County to the monitoring stations in Wayne County that are failing to meet the agency's PM-2.5 standards.

Furthermore, EPA has applied its methodology in an inconsistent and arbitrary manner. EPA's data show that any PM-2.5 "contribution" to Wayne County is less than that contributed by Genesee County, a County within the same Metropolitan Statistical Area ("MSA") that EPA *excluded* from the non-attainment area.

Additionally, EPA artificially inflated the "contribution" from Oakland County by ignoring the fact that the wind only occasionally blows from Oakland County to Wayne County. This is certainly not the prevailing wind direction. Air parcels above Oakland County reach the nonattaining monitors in Wayne County roughly 6.8 percent of the time based on NNW winds. In the end, when this 6.8 percent wind frequency is combined with Oakland County's unweighted PM-2.5 "increment" of 0.27 $\mu g/m^3$, the total "increment" for this County is 0.018 $\mu g/m^3$. This is almost 1000 times lower than the 15 $\mu g/m^3$ standard adopted by EPA. This "contribution" is insignificant and cannot support EPA's non-attainment designation.

Moreover, when Oakland County previously sought reconsideration, it submitted evidence showing that the composition of PM-2.5 in Oakland County was very different than the composition of PM-2.5 in the area of Wayne County that is failing to meet the ambient air standards for PM-2.5. Gradient has now reinforced this point. Relying upon speciation data from the nonattaining monitors in Wayne County, using data that EPA sponsored and reviewed, Gradient demonstrates that local sources drive the particulate problem in that County. EPA recognized this fact when it previously designated only the relevant subsection of Wayne County as the PM-10 non-attainment area.

Finally, the agency's legal analysis is flawed. EPA still refuses to acknowledge the primacy of the states in determining whether an area is "contributing" to non-attainment in another area. EPA's approach gives absolutely no deference to the recommendations made by the State of Michigan. In addition, EPA still has never specified how much "contribution" is sufficient to warrant a non-attainment designation. In the Detroit MSA, the agency excluded three counties that were found to be "contributing" only *marginally* to non-attainment in Wayne County. Yet the agency included Oakland County despite the evidence showing that its "contribution" also was marginal or insignificant. In the end, rather than specifying an objective test, such as a numerical level of "contribution" that warrants a non-attainment designation, EPA has proceeded on a completely subjective basis, purporting to "weigh" nine poorly articulated factors. The agency abandoned an independent review of PM-2.5 in favor of seeking

consistency with EPA's ozone designations. This approach does not meet statutory requirements and is irrational.

For these reasons and those specified below, Oakland County respectfully requests re-designation as a PM-2.5 attainment area.

PROCEDURAL BACKGROUND

In a June 2, 2003 letter from Regional Administrator Skinner to Governor Granholm, EPA Region 5 solicited the State of Michigan's recommendations for designating PM-2.5 non-attainment areas. *See* OAR-2003-0061-0010. Attached to that letter was an April 1, 2003 guidance memo issued by Jeffrey Holmstead, the Assistant Administrator for Air and Radiation, which outlined EPA's approach to designating PM-2.5 non-attainment areas. *See* OAR-2003-0061-0002 ("EPA Guidance"). The EPA Guidance presumed that an entire Metropolitan Statistical Area ("MSA") was non-attainment for PM-2.5 if a single violation occurred anywhere within the MSA boundaries. The EPA Guidance also adopted a vaguely defined nine-factor approach as the vehicle for the states to rebut EPA's presumption that *every* portion of the MSA was contributing to *any* non-attainment within that MSA.

On February 13, 2004, the State of Michigan submitted its recommendations, which recommended a non-attainment designation for Wayne County (which includes the City of Detroit). *See* OAR-2003-0061-0096. The State explained, within the nine-factor framework, that the data from the monitoring stations in Michigan conclusively established that PM-2.5 non-attainment was limited to a discrete area within

Wayne County with identified boundaries. *Id.* The State also reasoned that an EPA decision to create a "widespread" non-attainment area that includes areas in attainment that are not contributing to non-attainment is "inappropriate from a regulatory perspective and misleading from a public health perspective." *Id.* In addition, the State emphasized that several different legal authorities, independent of those created by a non-attainment designation for PM-2.5, already existed and provided mechanisms for addressing and reducing PM-2.5 in areas of Michigan outside of Wayne County.

Under a June 29, 2004 cover letter from Bharat Mathur, the Acting Administrator for Region 5, EPA responded to the State's recommended designations. *See* OAR 2003-0061-0278. EPA disagreed with Michigan's analysis, and instead decided to designate 7 of the 10 counties in the Detroit MSA as non-attainment areas. One of the areas designated as an attainment area was Genesee County, which is contiguous to Oakland County.

On September 1, 2004, the State of Michigan submitted comments on the EPA decision. *See* OAR-2003-0061-0397 and OAR-2003-0061-0398. The State reiterated its original recommendations, while supplementing its rationale with a series of responses to EPA's multifactor analysis. While EPA had expressed a preference for expanding non-attainment areas to include major emission sources, including area sources, the State pointed out that downwind emissions sources that are measuring in attainment for PM-2.5 should not be included because they do not contribute to non-

attainment. Imposing additional controls on those sources would have little or no effect on the conditions in the non-attainment area.[2]

The final rule first containing EPA's PM-2.5 designations was published in the Federal Register on January 5, 2005 (70 Fed. Reg. 944). The final rule referenced and relied upon a December 2004 report from EPA that, for Michigan, largely tracked EPA's prior nine-factor analysis and conclusion. *See* OAR-2003-0061-0606 *et seq.* The final rule provided states with the opportunity to incorporate 2004 data into the determinations if such data were provided to EPA by February 22, 2005. Although the State of Michigan provided the 2004 data and some additional analysis (OAR-2003-0061-0635), EPA retained its original designations when it published its final determinations at 70 Fed. Reg. 19,844 (April 14, 2005).

After the January 5, 2005 rulemaking, Oakland County, a Michigan municipal corporation, filed a petition for reconsideration on March 7, 2005, pursuant to 42 U.S.C §7407(d)(6)(A) and §7607(d)(6)(B), which was accompanied by a technical report from Gradient Corporation. *See* OAR-2003-0061-0636. In this original petition, Oakland County requested a PM-2.5 attainment designation based on a series of factors, including:

1. Section 107 of the Clean Air Act required EPA to give substantial deference to the attainment and non-attainment recommendations issued by the states,

[2] The State of Michigan also sent a November 30, 2004 letter to Bharat Mathur that reiterated some of its arguments and transmitted preliminary data for 2004 indicating that PM-2.5 levels decreased at virtually every monitoring station previously in non-attainment. *See* OAR-2003-0061-0498.

and Michigan had recommended an attainment designation for Oakland County based on its measured attainment and its lack of meaningful contribution to non-attainment in nearby areas. EPA may override such recommendations only when "necessary" based upon monitoring data for PM-2.5 or some other evidence that an attaining county was contributing to a non-attainment problem in a neighboring area.

2. The quality-assured PM-2.5 monitoring data available at the time of EPA's January 5 2005 rulemaking demonstrated that Oakland County was attaining the PM-2.5 standards. On February 22, 2005, the State of Michigan submitted new data for calendar year 2004, which again demonstrated that Oakland County was attaining EPA's PM-2.5 standards. The State reported that in Oakland County, the three-year annual average was 14.1 $\mu g/m^3$.

3. Based upon relevant PM-2.5 monitoring data and associated meteorological data, Oakland County was not contributing to non-attainment in Wayne County. Wayne County PM-2.5 levels are highest, by far, when the wind came from the south and southwest, not from Oakland County, which is located north of Wayne County. In the report attached to the original petition, Gradient established that when the wind is blowing from the north, the ambient air from Oakland County actually lowered the PM-2.5 levels in Wayne County, thereby improving ambient air quality. Thus, the data demonstrated that Oakland County was not contributing to PM-2.5 non-attainment in Wayne County.

4. The analysis used by EPA to justify designating Oakland County as a non-attainment area was flawed in many respects. From a statutory standpoint, EPA

failed to give the State's proposed designations the required level of deference. Rather than modifying the State's proposed designations only when "necessary," as required by Section 107(d)(1) of the Clean Air Act, EPA adopted a "presumption" requiring uniform designations for MSAs, including the Detroit MSA. Under this approach, EPA improperly shifted to states the burden of proving that individual counties were not contributing to non-attainment using EPA's nine-factor test. Oakland County maintained that this approach was irreconcilable with Section 107 of the Clean Air Act.

5. Even in applying its nine-factor test, EPA made a series of errors that, when corrected, demonstrated that Oakland County did not contribute to nearby non-attainment in any meaningful way.

Oakland County representatives later met with EPA officials on July 12, 2005 (in Washington, DC) and July 14, 2005 (in Research Triangle Park, NC). At those meetings, Oakland County expanded on its argument that subjectivity and bias were introduced into the PM-2.5 designation process through EPA's irrational reliance on MSAs and the nine-factor analysis. Oakland County further discussed that, just as the State of Michigan concluded, local conditions in the industrialized area of Wayne County were responsible for the PM-2.5 noncompliance. The County also noted that three compliant PM-2.5 monitors were located between that nonattaining area of Wayne County and Oakland County, which further undermined EPA's contention that Oakland County was contributing to the problem at the nonattaining monitors in Wayne County. On August 2, 2005, Oakland County submitted a letter summarizing these discussions as

well as attaching the slide presentation used at those meetings. *See* OAR-2003-0061-0724 and OAR-2003-0061-0725.

In response to issues raised by EPA at the July 12 and 14, 2005 meetings, Oakland County submitted a letter and a supplemental technical report from Gradient Corporation on September 13, 2005. *See* OAR-2003-0061-0727 and OAR-2003-0061-0741. In this submittal, Oakland County addressed EPA concerns about wind data, expanded its analysis of PM-2.5 levels in Oakland and Wayne counties, discussed the flaws of the Factor 1 emissions analysis that EPA relied upon, and noted some of the adverse impacts of a non-attainment designation in Oakland County. The County again concluded that it was not making a significant contribution to non-attainment in Wayne County.

On January 20, 2006, EPA issued its denial of Oakland County's original petition for reconsideration (the "EPA Denial"). *See* OAR-2003-0061-0740. The EPA Denial purported to respond to Oakland County's petition on a point-by-point basis, but also injected new analyses based on information not previously included in the administrative record. Much of the EPA Denial's new data and analyses came from a companion EPA memorandum titled "Analysis for Oakland County Petition for Reconsideration" (the "Region 5 Memo"). *See* OAR-2003-0061-0731. The Region 5 Memo, and by extension the EPA Denial, raised novel arguments about the completeness of 2002 monitoring data from Oakland County, a different approach to estimating rural background levels of PM-2.5 in SE Michigan, an analysis of the incremental PM-2.5 impacts of Saginaw, Genesee, and Oakland counties on PM-2.5 levels at nonattaining

monitors in Wayne County, and an analysis of the frequencies in which Oakland County air parcels are transported to Wayne County. EPA did not raise any of these issues at the meetings with Oakland County even though Oakland County had met with the agency in good faith to address the issues.

Oakland County therefore files this petition for reconsideration to respond to the new data that EPA provided in further support of its rulemaking. In fact, the new data relied upon in the EPA Denial and the Region 5 Memo support Oakland County's contention that it does not contribute to non-attainment. In addition, the attached technical report by Gradient Corporation responds to some of the new technical arguments in the EPA Denial and Region 5 Memo, and concludes that EPA's analysis contains a number of fundamental errors. Based upon this petition and the attached Gradient report, Oakland County should be designated as an attainment area for PM-2.5.[3]

ARGUMENT

I. UNDER THE CLEAN AIR ACT, AN AREA MAY BE DESIGNATED AS A NON-ATTAINMENT AREA ONLY IF THE AREA IS VIOLATING ONE OF EPA'S PM-2.5 STANDARDS OR IS CONTRIBUTING TO VIOLATIONS IN A NEARBY AREA

The Clean Air Act establishes specific standards with respect to designation of attainment and non-attainment areas. An "area" may be designated as a non-attainment area only if it does not meet the applicable ambient air quality standard *or* it "contributes" to violations of the standard in a "nearby area." 42 U.S.C. § 7407(d)(1)(A).

[3] Oakland County also reserves the right to update this petition for reconsideration if and when EPA responds to the County's FOIA request submitted February 6, 2006 (05/RIN/00579/06).

A. Under The Clean Air Act, An Area May Be Designated As A Non-Attainment Area Based Upon Its "Contribution" To A Nearby Area Only If That Contribution Is Both Significant and Causing Non-Attainment

In designating Oakland County as a non-attainment area, EPA has relied upon a "contribution" theory. Yet, the agency's analysis of "contribution" has been inconsistent. On the one hand, in its January 2006 decision, EPA implies that "any" contribution, even a contribution of one molecule of PM-2.5, is sufficient to support a non-attainment designation. On the other hand, in this same proceeding, EPA has carved out of the Detroit MSA three counties that were found to be making an insignificant "contribution" to non-attainment in Wayne Count. In light of this inconsistency, EPA's interpretation of the statute should receive no deference whatsoever.

In the County's view, in order to classify an area meeting EPA's ambient air quality standards as a non-attainment area on the basis of "contribution" to a nearby area, the contribution: (1) must be material or significant, rather than trivial; and (2) must be causally linked or rationally connected to conditions at the monitoring stations measuring non-attainment. *First*, to support a non-attainment designation, the Act requires above all that any contribution be material or significant, rather than any contribution whatsoever (*e.g.*, a single molecule). If Congress had intended to adopt a one-molecule standard, it would not have required states, including the State of Michigan, to evaluate contribution and offer recommended designations. Under a one-molecule standard, the only issue would be whether an area was "nearby." The contribution question would not require an assessment because it would be obvious that

all nearby areas generate at least a miniscule quantity of PM-2.5 that reaches the area failing to meet EPA's standards.

Additionally, a materiality standard is consistent with the overall structure of the Act. These PM-2.5 designations are used to drive amendments to State Implementation Plans ("SIPs") that will bring areas not meeting the PM-2.5 standards into compliance. Yet if an outlying area is not making a significant contribution to non-attainment in the area failing to meet EPA's standards, corrective measures in that outlying area will not address the problem. Put differently, a State will never be able to develop or implement SIP amendments that will prevent one molecule of PM-2.5 from migrating across a metropolitan area.

As noted above, a materiality standard also is supported by EPA's own analysis. EPA excluded three counties (Genesee, Lenawee, and Lapeer) from the SE MSA despite the fact that they were found to be contributing to PM-2.5 levels. *See* OAR-2003-0061-0278 at 5; *see also* Gradient Report at 19-20. In EPA's judgment, the "low" contribution by the three excluded counties did not warrant inclusion in the non-attainment area, but the other seven counties (including Oakland) were included due to their purported "*significant* emissions and [other characteristics] at *sufficient* levels." *Id.* (emphasis added). Thus, EPA has acknowledged that a significant contribution is required for designation as a non-attainment area under this prong of the Act.

Second, the "contribution" to a nearby area must bear a causal relationship to the conditions of concern in the non-attainment area. More specifically, where an area such as Wayne County has many monitoring stations, and where non-attainment is

measured only at a sub-set of these locations, an outlying area may lawfully be designated as a non-attainment area only if and to the extent that PM-2.5 blowing from that outlying area is reaching the specific monitoring stations that are measuring in non-attainment. Unless the air quality at the nonattaining monitors is causally connected to the PM-2.5 emissions in a nearby attainment area, there is no "contribution" of PM-2.5 to be addressed. A non-attainment designation is rational under the Clean Air Act only if the application of remedial measures in the "contributing" area would significantly remedy the PM-2.5 non-attainment problem.

B. The Clean Air Act Requires EPA To Give Substantial Deference To The State's Proposed Designations

The Clean Air Act delegates substantial responsibility to the States. Each State has "primary responsibility" for "assuring air quality" within the State and for "specify[ing] the manner in which national primary and secondary ambient air quality standards will be achieved and maintained. . . ." 42 U.S.C. § 7407(a). Likewise, each State is responsible for making "initial designations" of all areas within its borders. Such areas may be designated as "non-attainment," "attainment," or "unclassifiable." *Id.* § 7407(d)(1)(A). EPA only has authority to "make such modifications" found to be "necessary" to a State's "initial designations." *Id.* § 7407(d)(1)(B)(ii). Before making such modifications, however, EPA "shall notify the State and provide such State with an opportunity to demonstrate why any proposed modification is inappropriate." *Id.* Thus, procedurally and substantively, the Act gives the States "primary responsibility" and allows EPA to override State designations only when "necessary." *See Pennsylvania*

Dept. of Environmental Protection v. EPA, 429 F.3d 1125, 1129 (D.C. Cir. 2005) (highlighting EPA's admission that deference to State ozone designations is required).

Under this statutory scheme, State findings with respect to "contribution" should not lightly be swept aside. To the contrary, if there is a close call, EPA should defer to the State agency that will ultimately be responsible for developing and implementing the necessary SIP amendments. Unless the data show that it is "necessary" to reject the State's recommendations, EPA should defer to the State. *See id.*; 42 U.S.C. § 7407(a)(1)(B). EPA should recognize that States typically have greater familiarity with local conditions than EPA.

Further, EPA usurped the states' role when, prior to receiving a single state recommendation, it presumed that PM-2.5 non-attainment areas must track MSA boundaries; EPA's MSA "presumption" applies unless a State proves a lack of contribution for an area within the MSA based on EPA's poorly articulated nine-factor analysis. This approach reverses the burden of proof by giving the State the task of proving that portions of the MSA do *not* contribute to non-attainment in another portion of the MSA. EPA has effectively asked the States to prove a negative.

Congress gave States the responsibility of recommending non-attainment areas because they are better informed of local conditions, including the conditions that must be addressed when formulating an attainment strategy. For the cluster of nonattaining monitors in Wayne County, EPA's decision to ignore the State of Michigan's expertise is especially vexing because the State described and documented the localized nature of a PM-2.5 non-attainment problem using direct evidence. Yet EPA

rejected the State's recommendations under its "presumption," which relies on OMB classifications, as well as EPA's nine-factor analysis, which relies on indirect evidence. Disregarding the State's understanding of its local conditions, EPA adopted a "one-size-fits-all" approach based on the assumption that MSAs provide a better indication of PM-2.5 contribution than monitoring, meteorological, and speciation data combined. EPA's approach simply is not permissible under the statute.

C. EPA's Approach In This Proceeding Has Violated These Statutory Requirements

1. EPA's MSA "presumption" was adopted unlawfully and is inconsistent with the statute

EPA has repeatedly tried to justify its MSA "presumption" by invoking its past practice in making attainment and non-attainment designations for ozone. Yet Congress adopted very different statutory provisions for ozone and PM-2.5 designations. Unlike the provisions applicable to PM-2.5, the ozone provisions specifically authorize designations based upon "a metropolitan statistical area or consolidated metropolitan statistical area." *Compare* 42 U.S.C. § 7407(d)(6)(A) and Historical Note (governing PM-2.5 designations) to 42 U.S.C. § 7407(d)(4)(A) (governing ozone and carbon monoxide designations).

In its January 20, 2006 decision, EPA argues that its reliance on the MSA boundary is a "patently reasonable" starting point. EPA asserts that Congress's authorization to use the MSA for the *ozone* designation process was evidence of EPA's ability to use it in the *PM-2.5* designation process as well. EPA argues that Congressional silence on the use of MSAs in the PM-2.5 designation process amounted

to tacit authorization for such use. *See, e.g.,* EPA Denial at 14, n.7. Well-established case law, however, warrants a different conclusion. The U.S. Supreme Court has squarely held that "where Congress includes particular language in one section of a statute, but omits it in another section of the same Act, it is generally presumed that Congress acts intentionally and purposefully in the disparate inclusion or exclusion." *Bates v. United States*, 522 U.S. 23, 29-30 (1997) (internal citations omitted); *see also Barnhart v. Sigmon Coal Co.*, 534 U.S. 438, 452 (2002) (quoting *Russello v. United States*, 464 U.S. 16, 21 (1983).

In its January 20, 2006 decision, EPA also seeks to defend its MSA presumption and the related "nine-factor" test. EPA argues that the Clean Air Act "did not preclude EPA from using any specific means that it might reasonably decide are necessary to evaluate more effectively the issue of contribution ...." Contrary to EPA's assertions, however, the Act does not give the agency a blank check to develop and use an approach (such as the nine-factor analysis) that bears no proven relationship to actual PM-2.5 "contribution."

Additionally, Oakland County previously explained that EPA's "presumption" has functioned as a substantive rule. That rule was adopted unlawfully, without notice and comment. EPA now argues that the agency decision adopting the MSA "presumption" was explicitly "only guidance." Certainly, however, the case law demonstrates that the courts are in no way bound by the agency's label or the agency's inclusion of boilerplate language indicating that the agency is not promulgating a substantive rule. *See General Electric Co. v. EPA*, 290 F.3d 377, 382 (D.C. Cir. 2002);

see also Appalachian Power Co. v. EPA, 208 F.3d 1015 (D.C. Cir. 2000). In this case, the fundamental question is whether the agency's adoption of the "presumption" and the "nine-factor test" imposes "rights and obligations" or genuinely leaves the agency free to exercise its discretion. *Id.*

Effectively, in this proceeding, the agency adopted a substantive rule imposing this "presumption," but EPA then considered other evidence sporadically on an *ad hoc* basis. In reality, it is as if the agency adopted a substantive rule containing the presumption and nine specified factors, but included a tenth factor identified only as "other pertinent evidence." Inclusion of this tenth factor would not in any way avoid the classification as a substantive rule; the presumption would still impose rights and obligations on the affected communities and on the States.

Finally, EPA claims that the MSA was chosen in light of EPA's focus on the "typical geographic scale of source areas that contribute to violations of the PM-2.5 standard." This statement is especially baffling as EPA has repeatedly stated that long-range transport is responsible for the vast majority of PM-2.5 measured at any particular monitoring station. The OMB MSA are based on social and cultural linkages bearing absolutely no relationship to PM-2.5. Furthermore, just because EPA has chosen to avoid regulating significant rural sources of crustal PM-2.5, this does not mean that rural sources should be ignored in favor of designating every potential urban or suburban source in the vicinity of the nonattaining monitors in Wayne County. Such an approach treats many areas that are principally downwind of the non-attainment area as "presumed" contributors to the non-attainment, contrary to the actual wind and

monitoring data. As such, EPA's approach is inconsistent with the statute and is arbitrary and capricious.

2. EPA erred by estimating contribution to non-attainment through use of the nebulous "nine-factor" analysis

Ultimately, EPA has failed to articulate what constitutes "contribution" to non-attainment. This would be somewhat less significant if EPA made a case-by-case determination of contribution based on state recommendations supported by data, but EPA has instead required states to prove the lack of contribution. At the same time, EPA did not define contribution in any meaningful way. The closest that EPA came to defining contribution was through the application of the poorly defined and nebulous nine-factor analysis. Yet many of those factors are designed only to determine whether an area has urban or suburban characteristics; those factors have no proven causal relationship to actual contribution of PM-2.5.

Nor did EPA provide any meaningful guidance on how to "weigh" the nine factors. This whole approach had the effect of ensuring that the agency's decisions would be entirely subjective.

In addition, one result of this failure to define what was "contribution to a nearby non-attainment area" was that States were left to guess about what EPA expected from them when they submitted their recommended PM-2.5 designations. Since EPA presumed non-attainment for an entire MSA, and directed states to use the nine-factor analysis if they sought to exclude any part of that MSA from the non-attainment area, the states were left to rebut a presumption without understanding what EPA expected, *e.g.*,

how the factors should be applied; how they were weighted, if at all; or whether PM-2.5 monitoring data, which is clearly the best direct evidence of PM-2.5 levels in any area, was even relevant. In effect, EPA failed to set forth a rational standard upon which a state could demonstrate that less than an entire MSA was contributing to the non-attainment.

3. In assessing "contribution," EPA failed to make adequate use of monitoring data

In its January 20, 2006 decision, EPA asserts that: "Petitioner infers that EPA may 'only' use monitor data to make designation decisions, *i.e.*, any other fact or factor cannot be part of the designations decision." EPA Denial at 3. In fact, Oakland County never took this position in its original Petition or in meetings with EPA. Rather, with respect to designations based upon ambient air conditions within an area, Oakland County has pointed to the Clean Air Act's explicit reference to use of "air quality monitoring data." The County explained that the Act requires the *exclusive* use of PM-2.5 data for directly measuring attainment or non-attainment, and it requires the *primary* use of PM-2.5 data when determining contribution to non-attainment in a nearby area. With respect to EPA's approach, Oakland County's chief objection is the virtual exclusion of PM-2.5 data from EPA's assessment of "contribution." Instead of using verifiable monitoring, meteorological and speciation data, EPA relied on a series of untested and unreliable indicators of PM-2.5 contribution, which have resulted in arbitrary and inconsistent determinations.

Oakland County recognizes that PM-2.5 monitoring data, without meteorological data evidencing transport, is insufficient to determine whether an area is "contributing" to a nearby non-attainment area. In fact, in order to properly assess the effect of air quality in an attaining area on non-attainment in a nearby area, the issue of transport generally must be addressed. For this reason, Oakland County has consistently linked PM-2.5 monitoring data with meteorological data to quantify any impacts of Oakland County on the localized non-attainment area in Wayne County.

A review of the nine factors in EPA's guidance, however, reveals the conspicuous absence of PM-2.5 monitoring data. In addition, there was no analysis combining monitoring data with meteorological data, which provides the most direct evidence of PM-2.5 transport. Instead, in justifying its initial designations, EPA relied on indirect information to predict the contribution to PM-2.5 non-attainment. In the County's view, these indirect surrogates for PM-2.5 contribution should not serve as the primary basis for making PM-2.5 designations, particularly where the direct evidence contradicts such a conclusion. In southeastern Michigan, the direct evidence shows that Oakland County is meeting EPA's PM-2.5 standards within its boundaries and is not making any significant contribution to non-attainment in the localized area of Wayne County unable to meet these standards, as set forth more fully below.

II. AS MDEQ HAS DETERMINED, OAKLAND COUNTY IS MEETING EPA'S PM-2.5 STANDARDS WITHIN ITS BOUNDARIES

In its January 20, 2006 decision, EPA confirms its reliance on a "contribution" theory for designating Oakland County as a non-attainment area. At the

same time, however, EPA attempted to cast doubt on whether the County was meeting the agency's PM-2.5 standards within its boundaries. As explained below, however, Oakland County is meeting all PM-2.5 standards for ambient air within the County.

A. Oakland County Is Measuring In Attainment Despite The Worst-Case Location Of The Oak Park Monitor

The evidence previously submitted by Oakland County shows that the monitoring station in Oakland County was placed in a "worst-case" location. For that reason, the monitoring data being collected are not representative of conditions in the County. Use of the data collected at this monitoring station tends to inflate the PM-2.5 levels, thereby inflating the "contribution" imputed to this County. Despite the location of this monitoring station, however, Oakland County is in compliance with the annual and 24-hour PM-2.5 standards. This is true for both the 2002-2004 and the 2003-2005 periods. *See* Gradient Report at 1-3.

Moreover, EPA essentially concedes that the Oak Park monitor is a worst-case location for assessing the PM-2.5 relationship between Oakland and Wayne Counties. Since the only Oakland County monitor is located in the extreme southern part of the County, just along the Wayne County border, this artificially inflates the reported PM-2.5 levels in Oakland County. Furthermore, the monitor is located in an industrial area of Oakland County, as opposed to the more common rural and suburban portions of the County. In sum, the fact that Oakland County's lone worst-case location monitor measures in attainment is strong evidence that Oakland County is meeting the PM-2.5 standards.

B. The Monitoring Data Demonstrate That Oakland County Is Meeting EPA's PM-2.5 Standards

In the Region 5 memorandum and in the January 20, 2006 decision, EPA relies on 40 CFR Part 51, Appendix N to suggest that the number of PM-2.5 measurements taken at the Oak Park monitor during the winter of 2002 undermines Oakland County's claim that it is meeting the PM-2.5 standards. Specifically, EPA states that quality-assured PM-2.5 data at Oak Park were available for 50% of the 30 scheduled sampling events in the first quarter of 2002 and for 70 percent of the 30 events in the following quarter. The agency cites to Appendix N's general requirement of 75% data completeness. EPA neglects to note, however, that incomplete data could properly be used to demonstrate compliance.

Setting aside the question of whether Appendix N is consistent with statutory requirements, Oakland County notes that Appendix N does not automatically assume noncompliance with a PM-2.5 standard when data are missing. Rather, it expressly permits the reliance of less-than-75%-complete data with the approval of the Regional Administrator. *See* 40 CFR § 50, App. N, § 2.1(c).

Data substitution to meet the 75% threshold also may be appropriate when data from a collocated monitor are available. *Id.*; *see also* EPA's "Guideline on Data Handling Conventions for the PM NAAQS," at 15-16 (April 1999). While data collected at a nearby monitor in Southfield in 2001-2002 were not obtained at the exact same location as the Oak Park monitor, the Southfield station was located just a few miles west and would generally represent conditions at Oak Park, and certainly reflects conditions in

the relevant SE portion of Oakland County. *See* Gradient Report at 1-3. As Gradient points out, when the available 2002 Southfield monitor data are used to replace missing 2002 Oak Park monitor data, the number of missing data points is reduced. At that point, even with use of the worst-case data for the second quarter during 2002-2004, the overall average PM-2.5 for that period still measures attainment, *i.e.*, 14.7 $\mu g/m^3$, which is less than the 15.0 $\mu g/m^3$ standard. In short, utilizing EPA's own guidance, Gradient has confirmed that Oakland County is measuring in attainment for the 2002-2004 time period.

Additionally, the 2003-2005 PM-2.5 data at Oak Park, which is quality assured and fully compliant with requirements of Appendix N clearly demonstrate that Oakland County is in attainment. Despite an uncharacteristically high annual average in 2005, which featured a notable atmospheric inversion in February 2005, the 2003-2005 three-year average was 14.3, which is less than the 15.0 $\mu g/m^3$ standard.

III. ANY OAKLAND COUNTY "CONTRIBUTION" TO THE LOCALIZED NON-ATTAINMENT AREA IN WAYNE COUNTY IS INSIGNIFICANT

In attempting to justify its non-attainment designation for Oakland County, EPA relies upon a "contribution" theory. In its January 20, 2006, the agency does not abandon the "presumption" or the "nine-factor test," but seeks to defend its conclusions with an evaluation of the PM-2.5 "contribution" from Oakland County.

As explained in the accompanying report from Gradient, however, EPA's analysis is flawed in several key respects. By using inappropriate assumptions, EPA has artificially inflated the PM-2.5 "increment" that is attributed to Oakland County. As

detailed below, the wind direction for this analysis must take into account the actual location of the monitoring station in Oakland County, the actual location of the monitoring stations north of Oakland County, and the actual location of the monitoring stations in Wayne County that are measuring in non-attainment. Based upon the alignment of these monitoring stations, the appropriate wind direction is clearly NNW. Furthermore, using the correct wind direction produces a PM-2.5 "increment" for Oakland County of 0.27 $\mu g/m^3$. When combined with the 6.8 percent NNW wind frequency, the calculated "increment" for Oakland County is 0.018 $\mu g/m^3$, which is nearly 1000 times lower than the 15 $\mu g/m^3$ standard. This "increment" is not only insignificant, but it is actually inflated due to the worst-case location of the monitoring station in Oakland County. Accordingly, any "contribution" from Oakland County is negligible.

These points are explained in greater detail below.

A. EPA's Incremental Contribution Analysis Rests Upon Incorrect Assumptions

1. EPA's aggregated north analysis is inappropriate

Given the geographic and meteorological relationship between the nonattaining Wayne County monitors, the Oak Park monitors and the upgradient monitors in Saginaw and Flint, EPA's "aggregated north analysis" cannot properly be used to evaluate any incremental contribution from Saginaw to Flint to Oak Park to the nonattaining monitors in Wayne County. While Gradient previously compared PM-2.5 measurements based on when the wind was blowing from an aggregated northern

direction versus an aggregated southern direction at one monitor, this was done primarily for purposes of demonstrating the bias at the Oak Park monitor location, which is located very near the border between Oakland and Wayne counties.[4] Such an analysis is inappropriate for the incremental contribution approach adopted by EPA. EPA's analysis properly compared the PM-2.5 monitoring data increments between the Saginaw and Flint monitors, as well as the Flint and Oak Park monitors, but improperly associated those increments with winds from every wind direction that contained a northern component. The Saginaw to Flint to Oak Park to nonattaining Wayne County monitor progression tracks a NNW wind direction, and therefore should be compared to winds from the NNW direction to analyze any incremental contributions from county to county. *See* Gradient Figure 2.

By contrast, comparing PM-2.5 levels associated with unrelated "northern" wind vectors results is an arbitrary and meaningless apples-to-oranges comparison. For example, a PM-2.5 level in Saginaw that is associated with a NE wind is completely irrelevant to PM-2.5 data associated with NE winds in Genesee or Oakland Counties because that Saginaw air parcel is traveling towards the central part of Michigan, rather than the non-attainment monitors in Wayne County. As a result, NNW winds that correspond to the geographic relationship of the Saginaw, Flint, Oak Park and nonattaining Wayne County monitors are appropriate for estimating any incremental PM-

[4] The term "aggregated north" is used to describe the practice of combining every wind direction with a northern wind component, *i.e.*, N, NE and NW, which was described as the 2-directional analysis in the EPA Denial and the Region 5 Memo (in Table 3).

2.5 contribution between these monitors. Use of any other wind direction is not rationally related to the application of the meteorological data given the geography of SE Michigan

EPA itself apparently doubted whether use of the "aggregated north" wind direction was appropriate. In fact, the arbitrary and irrational result of analyzing any Oakland County increment by use of an aggregated northern wind direction is plainly clear from Table 4 of the EPA Region 5 Memo. Table 4 isolates the NW, N, and NE wind components that were combined in the aggregated north Table 3 analysis. Specifically, EPA's NE data at the Oak Park monitor (12.78 $\mu g/m^3$) was more than double that for the N direction (6.33 $\mu g/m^3$), and far more than that of the NW direction (8.77 $\mu g/m^3$).

Moreover, a NE wind vector from the area of Oak Park could not properly be used to assess any impact at the nonattaining monitors in Wayne County. Simply put, a NE wind vector passing through the Oak Park monitor location does not rationally assess any incremental contribution to the Wayne County monitors experiencing high PM-2.5 levels. Even if one assumed that Oak Park PM-2.5 data associated with NE winds was somehow significant, those data are far more rationally connected to conditions in neighboring Macomb County than Oakland County. The Oak Park monitor is located in the SE corner of Oakland County. As a result, air parcels traveling with NE winds through Oak Park have originated in Macomb and have only passed through Oakland County for a few miles. *See* Gradient Figures.1-2. This NE analysis is not

causally related to ambient air quality in Oakland County, but more accurately reflects potential contributions by Macomb County, St. Clair County, Canada, etc.

Thus, by relying on an aggregated north in its Table 3 analysis, EPA (1) arbitrarily inflated the incremental contribution attributed to Oakland County, and (2) mischaracterized the NE data as representative of an Oakland County contribution to non-attainment (when it is properly attributable to other upwind areas such as Macomb County). As set forth below, the NNW wind vector is more rationally connected and appropriate to use in analyzing any incremental contributions from Saginaw to Flint to Oak Park to the nonattaining Wayne County monitors.

2. Region 5's NW wind analysis also is inappropriate

Although EPA in its January 20, 2006 decision did not acknowledge its misuse of an aggregated north wind analysis, it appears from the EPA Region 5 Memo that EPA Region 5 was aware of this defect. In Table 4 of its memo, EPA Region 5 focused on the NW wind direction for comparing the incremental differences between the Saginaw, Flint, and Oak Park monitors, e.g., EPA Region 5's NW analysis was highlighted in yellow and depicted in a separate graphic. Although the Region 5 Memo's choice of a NW direction is preferable to the aggregate north approach, it still is not appropriate for comparing incremental contributions across the monitors. As Gradient's Figure 1 indicates, a NW wind direction analysis fails to address the impacts of upwind PM-2.5 contribution on any of the Wayne County monitors measuring in non-attainment. *See* Gradient Figure 1. As shown by this Figure, at best, the Table 4 NW analysis measures the potential incremental impact of Oakland County air at *attaining* monitors in

Wayne County. Therefore, a NW analysis does not support EPA's assertion that Oakland County is contributing to the nonattaining monitors in Wayne County, *e.g.*, Dearborn, SW High School, Wyandotte, and Allen Park.[5]

Additionally, Table 4 of the EPA Region 5 Memo suggests an Oakland County PM-2.5 increment and contribution of 1.0 $\mu g/m^3$ greater than the upwind areas. *See* Region 5 Memo, Table 4 (8.77-7.74=1.03). This increment, however, which EPA construes as Oakland County's "incremental contribution" to non-attainment in Wayne County, is statistically the same as the 1.0 $\mu g/m^3$ attributed to Genesee County via the Flint monitor (7.74-6.74=1.00). *See id.* Yet despite equivalent contributions by two separate upwind counties, EPA arbitrarily excluded Genesee County from the non-attainment area while including Oakland County. This action confirms that EPA has not proceeded in a consistent or rational manner.

By contrast, an analysis using a NNW wind direction properly addresses both the upwind monitors (in Saginaw, Flint, and Oak Park) as well as the downwind non-attainment monitors in Wayne County. As Gradient explains, use of a NNW direction is the most appropriate and scientifically defensible way to analyze any incremental PM-2.5 contribution from Oakland County to the nonattaining area of Wayne County.

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[5] Another shortcoming of this Region 5 analysis is that the Oak Park monitor captures half of Genesee County's incremental contribution; this is because the Flint monitor is located in the center of the County, and the next monitor in the progression is Oak Park near the southern border of Oakland County.

3. The proper wind vector analysis to assess any incremental contribution from Oakland County to non-attainment in Wayne County is NNW

As Gradient's Figure 2 shows, North-Northwest ("NNW") is the only rational wind vector to use in assessing any incremental contribution in PM-2.5 levels across the Saginaw monitor, to Flint, to Oak Park, and to the nonattaining Wayne County monitors. Using the same directional increments that EPA used for its Table 4 analysis, Gradient characterized NNW by analyzing winds from the NNW, plus or minus 22.5 degrees (*i.e.*, winds from the NNW were those between 315 and 360 degrees).[6] As stated above, this approach measures the causal relationship, in terms of incremental contributions, from the upwind monitors (Saginaw to Flint to Oak Park) as well as the non-attainment monitors in Wayne County.[7]

As Gradient explains, the NNW incremental PM-2.5 contribution analysis yields results that completely undermine the conclusions that EPA obtained. As Gradient's Figure 7 shows, the PM-2.5 levels monitored at Saginaw, Flint, and Oak Park

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[6] For purposes of consistency with the EPA Denial and the Region 5 Memo, Oakland County based its analysis on the same 2002-2004 meteorological data from the Oak Park monitor that EPA used.

[7] Although Allen Park falls outside the NNW zone, it is still very close to inclusion, and much closer to inclusion using a NNW analysis than a NW one. *See* Gradient Figures 1 and 2. EPA's choice of the Allen Park site as a representative Wayne County monitor in EPA's incremental contribution analysis is irrational because it does not line up with the other monitors chosen, regardless of whether a NW or NNW approach is taken. To link the Saginaw-to-Genesee-to-Oakland progression to non-attainment in Wayne County, one should rationally link next to the Dearborn monitor, which is also measuring non-attainment. *See* Figure 2.

Use of the Dearborn monitor rather than Allen Park is also more appropriate because any incremental comparison between the Oak Park and Allen Park monitors would omit the dominating influence near the Dearborn monitor in Wayne County. As both the State of Michigan and Oakland County have shown, that area is a heavily industrialized corridor that, due to the local sources within that corridor, is driving the non-attainment levels in Wayne County.

progress from 8.59 $\mu g/m^3$ to 9.68 $\mu g/m^3$ to 9.95 $\mu g/m^3$. Thus, the resulting incremental contribution measured at each of the two downwind monitoring stations is 1.09 $\mu g/m^3$ at Flint and 0.27 $\mu g/m^3$ at Oak Park. *Thus, applying the model used in the EPA Denial and the Region 5 Memo, Genesee County's incremental PM-2.5 contribution (above rural background at Saginaw) is over four times that of Oakland County's contribution.* Yet, EPA excluded Genesee County from the SE Michigan non-attainment area. Based on the application of the subjective nine-factor analysis, EPA estimated that Genesee County's contribution to non-attainment in Wayne County was insignificant compared to that of Oakland County. Since Genesee County's contribution to non-attainment is actually more than 4 times greater than that of Oakland County, (*i.e.*, 1.09 $\mu g/m^3$ versus 0.27 $\mu g/m^3$), EPA's action is indefensible. EPA's rule designating Oakland County as a non-attainment area and Genesee County as an attainment area is scientifically unsound and inconsistent.

Gradient's analysis documents the arbitrary and capricious nature of the nine-factor analysis that EPA used to assess "contribution" to non-attainment in Wayne County. The NNW analysis employed by Gradient uses the same quality-assured PM-2.5 monitoring data as EPA, along with the same Oak Park meteorological data used by EPA. By comparison, EPA's nine-factor analysis ignored PM-2.5 monitoring data altogether, *i.e.*, direct scientific evidence, opting instead for indirect indicators of PM-2.5 emissions. The agency's approach simply is not supported by the evidence of record and, in fact, is contradicted by it.

4. Any NNW contribution across Oakland County is insignificant

The arbitrary result of EPA's methodology, which resulted in EPA designating Oakland County as non-attainment, is even more apparent when the frequency with which the NNW contribution reaches the non-attainment monitors in Wayne County is examined. Gradient, at pp.14-15 of its report, discusses and illustrates the frequency of wind the NW, NNW, and N wind vectors based on Oak Park monitoring data. While there is some overlap between NW and NNW, as well as between NNW and N, the NNW wind direction corresponds with contribution from Oakland County to the non-attainment monitors in Wayne County. Even so, as Gradient Figure 9 illustrates, the NNW frequency is less than 7%. Thus, the insignificant incremental contribution of 0.27 $\mu g/m^3$ calculated in the preceding section only reaches the nonattaining monitors 6.8% of the time. This is significant because the PM-2.5 annual limit of 15 $\mu g/m^3$ is an average of the contributions from every direction over the course of three years, and it further demonstrates that Oakland County is not significantly contributing to the nonattaining monitors in Wayne County.

5. Speciation data confirm the Wayne County non-attainment problem is localized and not causally connected to Oakland County contribution

Additionally, the speciation data demonstrate that significant local sources of elemental carbon and crustal material are driving the PM-2.5 non-attainment readings in Wayne County, and most notably at the Dearborn monitor. If non-local sources (*e.g.*, sources in Oakland County) were contributing these key PM-2.5 constituents at Dearborn, their presence would be expected at one or more of the closely clustered

Wayne County monitors nearby the Dearborn monitor. Instead, given the vastly greater presence of organic carbon and crustal PM-2.5 constituents at Dearborn, it is evident that local sources, rather than Oakland County sources, are the primary drivers of the PM-2.5 non-attainment in Wayne County. Furthermore, this conclusion is entirely consistent with the scientific analyses of the State of Michigan, SEMCOG, and Oakland County, as set forth in previous filings in this proceeding and in comments on the PM-2.5 Implementation Rule at OAR-2003-0062.

B. Gradient's Analysis Confirms That EPA's Weighted Emissions Score Is Unreliable Indicator Of "Contribution"

Although EPA's "nine-factor" test weighed nine factors, albeit in an indeterminate way, the agency typically has attributed the greatest weight to factor 1, the "composite emissions score" for an area. Gradient has now estimated the actual PM-2.5 "contribution" for several Counties by correlating PM-2.5 monitoring data with data on wind direction. *See* Gradient Report at 19-20. Gradient's analysis shows that the actual PM-2.5 "increment" for areas such as Oakland County has no relationship whatsoever to the "composite emissions score" computed by EPA. Oakland County, for example, has a composite emissions score from EPA that is 13.6, a figure that is almost double the 7.5 score assigned to Genesee County. Yet the PM-2.5 "increment" for Genesee County is actually four times higher than the "increment" for Oakland County. *Id.* These "increments" are based upon actual monitoring data, not on crude estimates of emissions for precursor chemicals. In the end, Gradient's comparison confirms that EPA's

composite emissions scores have little or no value in assigning PM-2.5 designations, and were inaccurate by several orders of magnitude.

CONCLUSION

Oakland County requests that EPA designate the County as an attainment area for PM-2.5 because the County meets the PM-2.5 standards and does not contribute to non-attainment in Wayne County or any other nearby areas. As demonstrated by this petition, its attachments, Oakland County's previous filings, and the administrative record as a whole, EPA erroneously designated Oakland County as non-attainment for PM-2.5 for the following reasons:

- EPA has failed to provide a lawful definition or standard for assessing "contribution," and has instead designated Oakland County as non-attainment without the necessary showing that the County contributes significant PM-2.5 or any PM-2.5 causing non-attainment in Wayne County.

- EPA failed to give any deference to the recommendations of the State of Michigan. By doing so, EPA ignored the express language of the Clean Air Act as well as EPA's own policy.

- EPA's MSA "presumption," "nine-factor test," and decision to ignore PM-2.5 monitoring data when assessing "contribution" are each inconsistent with the requirements of the Clean Air Act. Additionally, to the extent that the agency has gone beyond the "presumption," it has been inconsistent (at best) in specifying the amount of "contribution" necessary to support a non-attainment designation.

- In this submission and in prior submissions, Oakland County has effectively documented its directly monitored attainment status and has rebutted the unlawful "presumption" adopted by EPA. The County has shown that if the nine-factor test were properly applied, the County would be designated as an attainment area.

- Using the same Incremental Contribution Analysis used by EPA in the EPA Denial and Region 5 Memo, including the same monitoring and meteorological data, the County also has demonstrated that any actual "contribution" of PM-2.5 to non-attainment is negligible.

  - The EPA Denial used "aggregated north" data, which assumed impossible scenarios such as NE winds transporting PM-2.5 in a NNW direction.

  - The Region 5 Memo used a NW directional analysis, but that analysis measured Oakland County's impact on attaining monitors rather than on non-attaining ones.

  - A NNW analysis properly links the upwind monitors selected by EPA (Saginaw, Flint, and Oak Park) as well as the non-attaining monitors in Wayne County.

  - Using the correct NNW set of data, Gradient showed that 0.027 $\mu g/m^3$ is contributed to Wayne County's nonattaining monitors, but this "contribution" occurs only 6.8 percent of the time. This equates to a net PM-2.5 "increment" of 0.018 $\mu g/m^3$.

  - Speciation data at the Dearborn monitor demonstrates that local sources are driving non-attainment in Wayne County, not sources in Oakland County.

- The arbitrary and capricious nature of EPA's decision to designate Oakland County as non-attainment for PM-2.5 is best evidenced by EPA's reliance on its "weighted emissions score," the driving first factor in EPA's nine-factor analysis, and the resulting disparate treatment of Genesee and Oakland counties.

  - The "weighted emissions score" predicted Oakland County PM-2.5 contributions to Wayne County non-attainment that were almost double those of Genesee County.

  - On that basis, EPA excluded Genesee County from the SE Michigan non-attainment area because EPA deemed its contribution to non-attainment in Wayne County as insignificant.

  - However, using EPA's Incremental Contribution Analysis, but with the correct NNW direction, Gradient's report demonstrates that Genesee contributes four times more PM-2.5 than Oakland does to non-attainment in Wayne County.

Accordingly, EPA should rescind its non-attainment designation for Oakland County and should designate Oakland County as an attainment area for PM-2.5.

Respectfully submitted,

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March 21, 2006

BEFORE THE
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

AIR QUALITY DESIGNATIONS AND CLASSIFICATIONS FOR THE FINE PARTICLES (PM-2.5) NATIONAL AIR QUALITY STANDARDS FINAL RULE 40 CFR PART 81	Air Docket No. OAR-2003-0061 RIN-2060-AM04

CERTIFICATE OF SERVICE

I hereby certify that on March 21, 2006, a copy of the foregoing Petition for Reconsideration was served by electronic mail and by either hand or overnight mail, on the following persons:

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Exhibit 1

REPORT OF GRADIENT CORPORATION

DR. PETER DRIVAS AND
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Analysis of EPA's January 2006 Decision Regarding $PM_{2.5}$ Non-Attainment in Oakland County, Michigan

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March 21, 2006

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1 Oakland County Shows Attainment with Data Substitution

In the January 2006 EPA response to the Oakland County petition for reconsideration (US EPA, 2006), EPA concludes that it is not possible to judge whether concentrations at the Oak Park monitoring station are above or below the $PM_{2.5}$ standard because data at this station are incomplete for the 2001-2004 period (*i.e.*, do not have at least 75% of the scheduled sampling days in every calendar quarter of the relevant period). In particular, as noted by EPA, the first two quarters of 2002 are quarters with less than 75% complete $PM_{2.5}$ data at the Oak Park monitoring station. EPA states that in cases where data are available for at least 11 days, but less than 75% of the scheduled sampling days, a "data substitution" analysis can be conducted according to the EPA guidance document, "Guideline on Data Handling Conventions for the PM NAAQS" (US EPA, 1999), to fill in missing data for comparison with the standards.

EPA further states that such a data substitution analysis would replace missing data with worst case concentrations observed at the station. EPA did not conduct any type of data substitution analysis in its response, but instead made the unsupported conclusion that "However, in Oakland County, this assessment shows a reasonable probability that a hypothetical set of data provided through data substitution would have shown the monitor to be recording concentrations above the standard, not below it."

Upon closer examination of the guidance document (US EPA, 1999) cited by EPA in its response, as well as Appendix N to 40 CFR Part 50 (62 FR 38755, July 18, 1997), it is apparent that the Regional Administrator has discretion to use less than complete data for comparison with the $PM_{2.5}$ standards. Data substitution is thus not a statutory requirement in the case of incomplete $PM_{2.5}$ data. At his or her discretion, the Regional Administrator may require data substitution, and as outlined in EPA (1999), there are two approaches for filling in missing scheduled sampling days: (1) replacing missing data with collocated data for the same year and quarter, and (2) replacing missing data with the maximum data value across all three years for the same quarter. Data substitution thus does not necessarily rely upon a "hypothetical set of

data," as suggested by EPA (2006), but instead draws upon actual measurement data representative of concentrations on the missing days.

In the case of the Oak Park monitor, the 2002-2004 three-year average based on the available measurement data is 14.1 $\mu g/m^3$, well below the standard of 15.0 $\mu g/m^3$. This three-year average relies upon $PM_{2.5}$ data for the first two quarters of 2002 that were 50% and 70% complete, respectively. As discussed above, it is within the discretion of the Regional Administrator to accept the use of these data, although incomplete for two quarters, for use in demonstrating attainment with the $PM_{2.5}$ standard.

In the event that the Regional Administrator would require data substitution for these two quarters for demonstration of attainment, a second $PM_{2.5}$ monitor was operating in Oakland County during this time period that provides representative data for some of the specific missing scheduled sampling days in first and second quarter 2002. This monitor was located in Southfield, MI, approximately 5 miles west of the Oak Park monitor, within a similar heavily trafficked portion of southern Oakland County.[1]

Using data from the Southfield monitor (for the same days as missing scheduled sampling days at the Oak Park monitor) in a data substitution exercise (8 days in total), 77% data completion is attained for first quarter 2002. This now meets the EPA definition of data completeness. For second quarter 2002, there is only one day of data available from the Southfield monitor that corresponds to a missing scheduled sampling day at the Oak Park monitor, thus only slightly increasing data completeness at the Oak Park monitor from 70% to 73%. According to the EPA guidance (US EPA, 1999), a data substitution exercise would then require that the remaining missing days be filled with the maximum data value across all three years for the same quarter. In this case, there were 8 additional missing sampling days in second quarter 2002, and these days were assigned the maximum data value of 38.4 $\mu g/m^3$, which

[1] The Southfield monitor was operated to obtain detailed $PM_{2.5}$ speciation data as part of the Detroit Air Toxics Initiative (DATI). Funded by EPA, the DATI project was conducted by Michigan DEQ, working in cooperation with a stakeholder group that included representation by EPA Region V. Although not currently either a Federal Reference Method or Equivalent Method as stipulated for data substitution in EPA (1999), the monitor operated at this site was a MetOne SASS sampler, a speciation monitor with extensive use as part of EPA's nationwide Speciation Trends Network (STN).

corresponds to the measured value on June 25, 2002. After this conservative data substitution process, data completeness at the Oak Park monitor was thus 100% for second quarter 2002, as required by the EPA guidance.

As summarized in Table 1, following the data substitution exercise discussed above, the 2002-2004 three-year average increases from 14.1 $\mu g/m^3$ to 14.7 $\mu g/m^3$. Importantly, this value of 14.7 $\mu g/m^3$ remains below the annual average $PM_{2.5}$ standard, despite a conservative data substitution process that filled in eight of the missing days in second quarter 2002 with the maximum 2002-2004 second quarter value of 38.4 $\mu g/m^3$.

Table 1. 2002-2005 $PM_{2.5}$ Data: Oak Park Monitor

Year	Actual Monitoring Data		With 2002 Data Substitution	
	Annual Ave.	3-year Annual Ave.	Annual Ave.	3-year Annual Ave.
2002	15.00	--	16.67	--
2003	14.58	--	14.58	--
2004	12.76	14.1	12.76	14.7
2005	15.46	14.3	15.46	14.3

Furthermore, Table 1 shows that the 2003-2005 three-year average is 14.3 $\mu g/m^3$. Importantly, the 2003-2005 data meet the EPA definition of completeness. Thus, regardless of whether data substitution is required for the first and second quarters of 2002, the Oak Park monitor shows attainment with the $PM_{2.5}$ annual average standard based on either the 2002-2004 or 2003-2005 measurement data.

2 Oakland County $PM_{2.5}$ "Increments"

2.1 EPA Region V Analysis

In its response to the Oakland County petition, EPA (2006) adopted the methodology employed in our previous technical analyses (Gradient, 2005a, 2005b) that used 24-hour resultant winds to segregate daily 2002-2004 $PM_{2.5}$ data into north wind and south wind concentrations. The EPA analysis relied solely on meteorological data collected at the Oak Park monitoring site, while our previous analyses relied upon meteorological data from the National Weather Service (NWS) station at Detroit City Airport. Importantly, EPA expanded the analysis to include other monitoring sites that they consider to be more indicative of background concentrations entering Southeast Michigan, namely the Saginaw (Saginaw County), Flint (Genesee County), and Bay City (Bay County) sites. EPA's further analyses are summarized in a table (Table 3) in EPA (2006) that shows 2002-2004 $PM_{2.5}$ averages for north and south wind days (*i.e.*, the results of a 2-direction wind analysis) for the Saginaw, Genesee, Oakland, and Allen Park (Wayne County) monitoring locations. An internal EPA memorandum (Compher, 2006) provides the technical back-up underlying the additional EPA analyses, and it includes not only findings based on 2-direction wind categories (*i.e.*, just north and south), but also a second set of findings based on 8-direction wind categories (*i.e.*, north, northeast, east, southeast, south, southwest, west, and northwest).

We agree with EPA's expansion of our analysis to other upwind locations more reflective of background concentrations of $PM_{2.5}$ entering Southeast Michigan and impacting Oakland County and Wayne County. We also agree with EPA's further analyses that refine the wind directional analysis from a simple 2-direction wind category analysis to a more sophisticated 8-direction wind category analysis. For calculating a $PM_{2.5}$ increment caused by emissions from a specific county, the 8-direction wind analysis is more appropriate than the 2-direction analysis, since it is important to assess only those directions that impact the set of upwind-downwind monitoring locations.

However, we strongly disagree with EPA's selected presentation of its findings as well as its interpretation of those findings. For example, it is unclear why findings from the 8-direction wind category analysis only appear in the Compher (2006) memo and do not also appear in the official EPA response (US EPA, 2006). Further, based on the maps of Southeast Michigan shown below in Figures 1 and 2, it is unclear why the Compher (2006) memo featured results for the northwest wind direction in its discussion of findings from the 8-direction wind analysis at the exclusion of other relevant results, such as for the north wind direction.

Figures 1 and 2 confirm that north-northwest is the most accurate direction for winds blowing towards Oakland County and the Oak Park monitor that are reflective of contributions from the Saginaw and Genesee County monitors. Furthermore, Figures 1 and 2 show that winds blowing from the northwest from Oak Park would not impact non-attainment monitors in Wayne County, while north-northwest winds would blow in the direction of non-attainment monitors. Thus, EPA should have stated results from both north and northwest directions as being of equivalent value in its analysis of the incremental air quality impacts of upwind counties on downwind $PM_{2.5}$ monitors.

Figure 3 below is simply a reproduction of the graph in the Compher (2006) memo that shows 2002-2004 $PM_{2.5}$ averages for winds blowing from the northwest (defined by EPA as the 24-hour resultant average direction between 292.5 to 337.5 degrees). Using the data in Figure 3, Figure 4 simply presents the $PM_{2.5}$ increments between monitors in Genesee, Oakland, and Wayne Counties. Although these figures show a $PM_{2.5}$ "increment" of approximately 1 $\mu g/m^3$ between the Flint monitor and the Oak Park monitor (based on the averages of 8.77 $\mu g/m^3$ at the Oak Park monitor and 7.74 $\mu g/m^3$ at the Flint monitor), they also show a similar $PM_{2.5}$ increment of 1 $\mu g/m^3$ between the Saginaw monitor and the Flint monitor (based on the averages of 7.74 $\mu g/m^3$ at the Flint monitor and 6.74 $\mu g/m^3$ at the Saginaw monitor). Given that the Oak Park monitor is situated on the southern boundary of Oakland County, it is important to note that a $PM_{2.5}$ increment calculated using data from the Oak Park and Flint monitors is reflective of the air quality impacts of the entirety of Oakland County, as well as a significant portion of Genesee

84°0'0"W
83°30'0"W
83°0'0"W
82°30'0"W
43°30'0"N
43°0'0"N
42°30'0"N

Huron
Bay
Bay City
26-017-0014
Saginaw
26-145-0018
Tuscola
Sanilac
Saginaw
NW
Lapeer
Genesee
Flint
26-049-0021
Shiawassee
St. Clair
Port Huron
26-147-0005
New Haven
26-099-0009
Macomb
Oakland
Livingston
N
W
E
S
Oak Park
26-125-0001
Livonia
26-163-0025
E 7 Mile
26-163-0019
Linwood
26-163-0016
Newberry
26-163-0038
Dearborn
26-163-0033
Lafayette St.
26-163-0039
SW High School
26-163-0015
Ann Arbor
26-161-0005
Wayne
Washtenaw
Ypsilanti
26-161-0008
Allen Park
26-163-0001
Wyandotte
26-163-0036
SE

L E G E N D

▲ Non-compliance Monitors Based on 2002-2004 Data

● Compliance or Incomplete Monitors Based on 2002-2004 Data

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FIGURE 1

Southeast Michigan PM2.5 Monitoring Locations: NW Wind Direction

Drawing By:	JJC	Checked By:	CML	Project No.:	205021
Date:	03/20/06	Date:	03/20/06	File:	205021-100_01.mxd

84°0'0"W
83°30'0"W
83°0'0"W
82°30'0"W
43°30'0"N
43°0'0"N
42°30'0"N

Huron
NNW
Bay
Bay City
26-017-0014
Saginaw
26-145-0018
Tuscola
Sanilac
Saginaw
Lapeer
Genesee
Flint
26-049-0021
Shiawassee
St. Clair
Port Huron
26-147-0005
New Haven
26-099-0009
Macomb
Oakland
Livingston
N
W
E
S
Oak Park
26-125-0001
Livonia
26-163-0025
E 7 Mile
26-163-0019
Linwood
26-163-0016
Newberry
26-163-0038
Dearborn
26-163-0033
Lafayette St.
26-163-0039
SW High School
26-163-0015
Ann Arbor
26-161-0005
Wayne
Washtenaw
Ypsilanti
26-161-0008
Allen Park
26-163-0001
Wyandotte
26-163-0036
SSE

L E G E N D

▲ Non-compliance Monitors Based on 2002-2004 Data

● Compliance or Incomplete Monitors Based on 2002-2004 Data

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FIGURE 2

Southeast Michigan PM2.5 Monitoring Locations: NNW Wind Direction

Drawing By:	JJC	Checked By:	CML	Project No.:	205021
Date:	03/20/06	Date:	03/20/06	File:	205021-100_02.mxd

county.[2] These figures thus indicate that Oakland County has $PM_{2.5}$ air quality impacts of a similar magnitude to those of Saginaw and Genesee counties, counties that EPA considers to be reflective of background contributions and to be in attainment of the $PM_{2.5}$ standard.

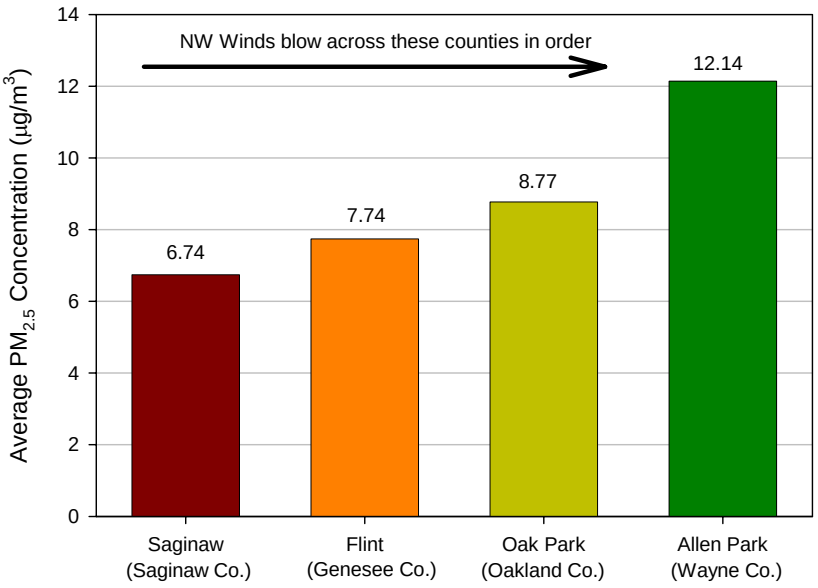

Figure 3. EPA Northwest (NW) Wind Direction Findings: Average $PM_{2.5}$ Monitor Measurements

[2] An examination of Figure 2 shows that the Genesee County monitor is in Flint, near the center of Genesee County, so that any differences between the Flint and Oak Park monitors would reflect emissions from approximately half of Genesee County, as well as the entirety of Oakland County.

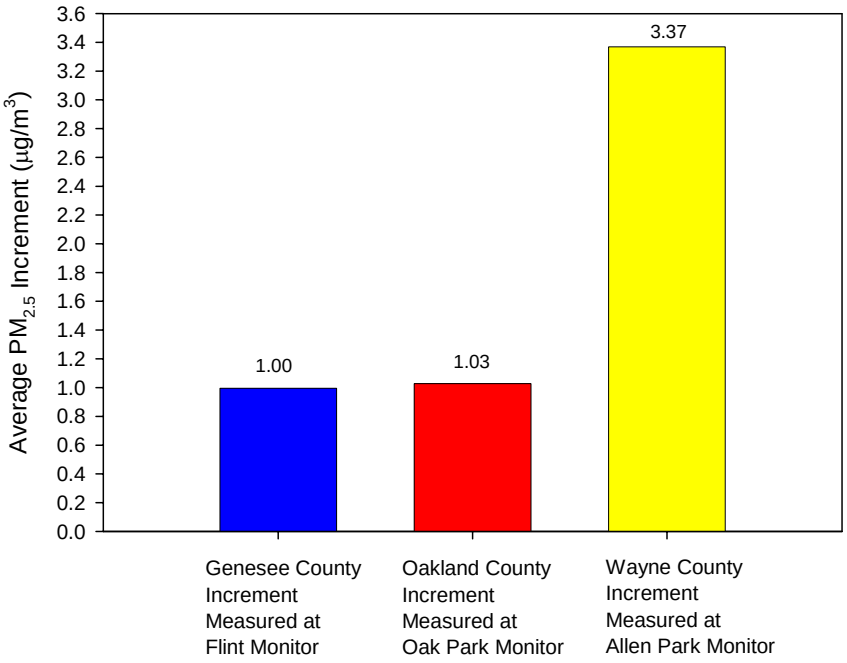

Figure 4. EPA Northwest (NW) Wind Direction Findings: Average County Increments

Although not selected for graphical depiction in the Compher (2006) memo, data in Table 4 of the Compher (2006) memo show a very different picture for winds from the north (defined by EPA as the 24-hour resultant average direction between 337.5 to 22.5 degrees). We have taken these EPA data and generated a figure analogous to the EPA figure for northwest winds (reproduced above as Figure 3). Figure 5 shows the EPA analysis of average 2002-2004 $PM_{2.5}$ concentrations for days with northerly winds at the Saginaw, Genesee, Oakland, and Wayne County (Allen Park) monitors. Figure 6 presents the $PM_{2.5}$ increments between monitors in Genesee, Oakland, and Wayne Counties. As shown in Figures 5 and 6, for winds from the north, the increment going from the Flint monitor to the Oak Park monitor is actually *negative* (based on the averages of 6.33 $\mu g/m^3$ at the Oak Park monitor and 6.54 $\mu g/m^3$ at the Flint monitor), while the increment going from Saginaw County to Genesee County is 1.5 $\mu g/m^3$ (based on the difference between the averages of 6.54 $\mu g/m^3$ at the Flint monitor and 5.03 $\mu g/m^3$ at the Saginaw monitor). For winds from the north, which is clearly as important a direction as the northwest direction based on the maps in Figures 1 and 2, EPA's analysis shows no Oakland County "increment" on $PM_{2.5}$ air quality.

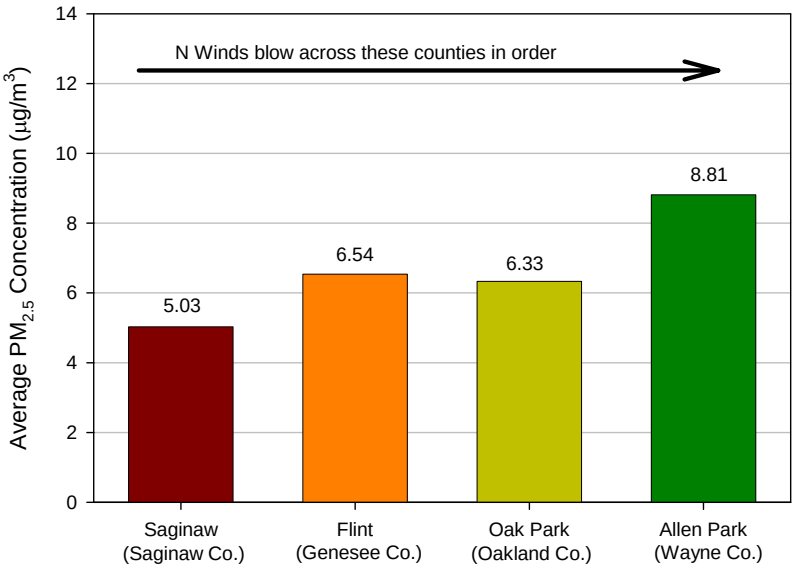

Figure 5. EPA North (N) Wind Direction Findings: Average $PM_{2.5}$ Monitor Measurements

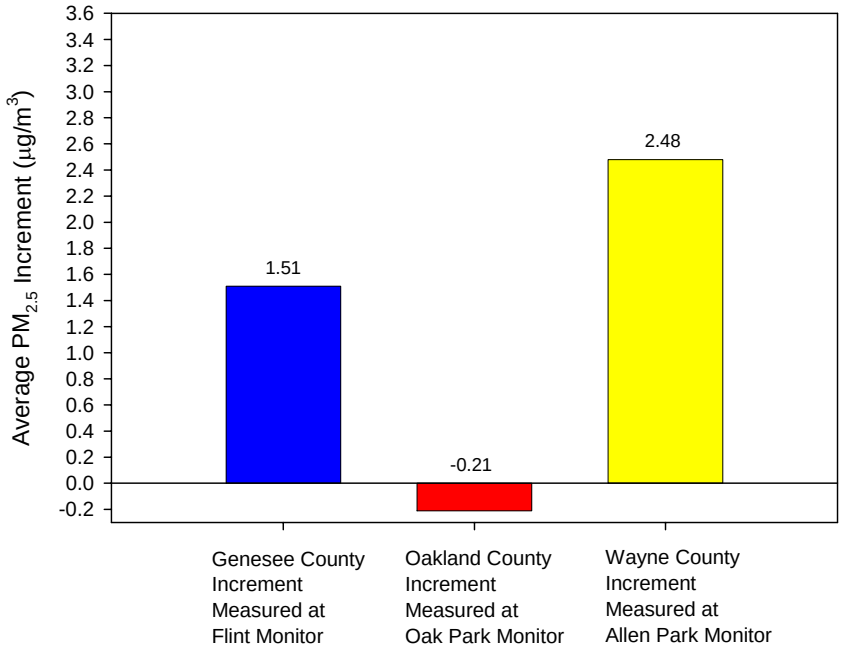

Figure 6. EPA North (N) Wind Direction Findings: Average County Increments

2.2 Gradient North-Northwest Analysis

Based on the maps in Figures 1 and 2, it is clear that a proper wind direction analysis of $PM_{2.5}$ impacts at the Southeast Michigan monitors should rely upon north-northwest winds for assessing any incremental $PM_{2.5}$ air quality impacts as one moves from Saginaw to Genesee to Oakland to Wayne Counties, especially given the monitor station locations in each county. As shown in Figure 2, with the exception of the Allen Park monitor in Wayne County, each of the non-attaining monitors of interest fall within a NNW zone and line up very well along a north-northwest line passing through the Oak Park monitoring site. Although the Allen Park monitor does not fall within this area of impact of north-northwest winds, the Dearborn monitor, also a non-attainment monitor in Wayne County, is located to the southeast of the Oak Park monitor. We have thus used the Dearborn monitor rather than the Allen Park monitor in our north-northwest wind analysis.[3]

We have conducted an analysis for north-northwest winds analogous to the EPA analysis in the Compher (2006) memo. For consistency, we used the same Oak Park meteorological data employed in the EPA analyses. We have defined north-northwest winds as those between 315 degrees and 360 degrees (*i.e.*, the classical north-northwest direction). Figure 7 shows the average 2002-2004 $PM_{2.5}$ concentrations for days with north-northwest winds for our analysis with the Oak Park meteorological data. Figure 8 summarizes the $PM_{2.5}$ increments between each of the monitors of interest.

[3] Due to its location in the central portion of Wayne County south of the Dearborn monitor, the Allen Park monitor was also not a strong choice for assessing the incremental impact of Oakland County $PM_{2.5}$ sources on Wayne County $PM_{2.5}$ air quality since it would reflect downwind contributions from the Dearborn area in addition to other Wayne County sources.

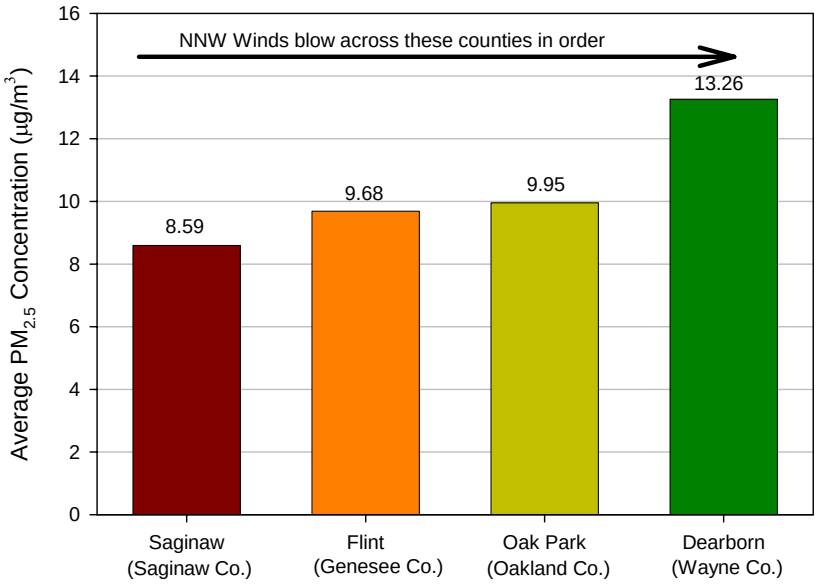

Figure 7. Gradient North-Northwest (NNW) Wind Direction Analysis: Average $PM_{2.5}$ Monitor Measurements

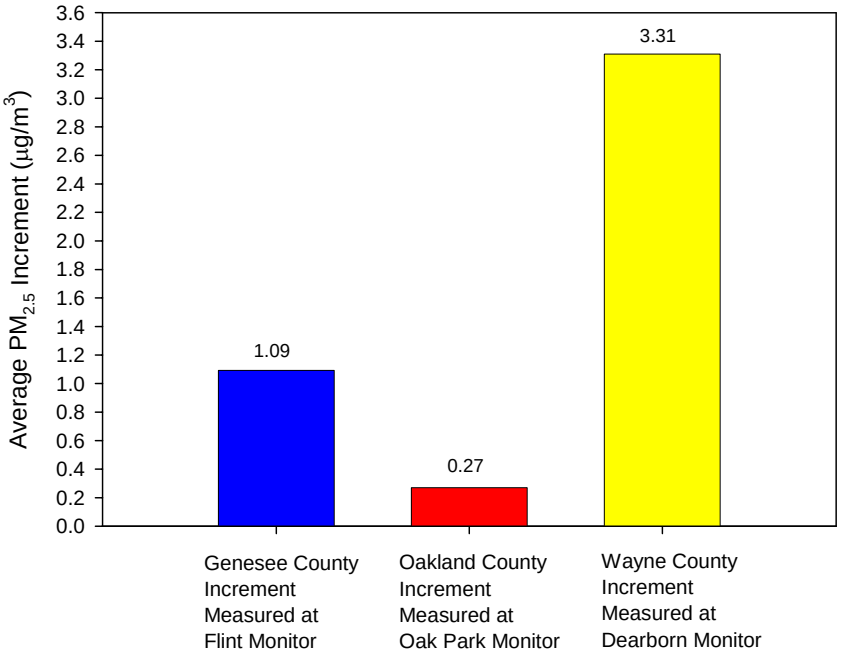

Figure 8. Comparison of $PM_{2.5}$ Increments for the North-Northwest (NNW) Wind Direction Analysis

As shown in Figures 7 and 8, average $PM_{2.5}$ measurement data for the Oak Park and Flint monitors for days with north-northwest winds indicate only a small increment of 0.27 $\mu g/m^3$ between the two monitors. This increment is reflective of the downwind impacts of Oakland County emission sources (as well as those in the southeastern portion of Genesee County), since the Oak Park monitor is located along the southern boundary of Oakland County, and NNW winds will thus blow across nearly the entire county before reaching the monitor site. A much larger increment of approximately 1.1 $\mu g/m^3$ was observed between the Genesee and Saginaw County monitors, indicating that emission sources in these "attainment" counties likely have a larger impact on downwind $PM_{2.5}$ in Southeast Michigan than sources in Oakland County. A substantial $PM_{2.5}$ increment of approximately 3.3 $\mu g/m^3$ was observed between the Dearborn and Oak Park monitors. Due to the location of the Oak Park monitor adjacent to Wayne County along the southern boundary of Oakland County, this increment predominantly reflects the impacts of Wayne County emission sources rather than Oakland County emission sources.

Similar to the EPA findings for the north wind direction, our analysis for the most appropriate north-northwest direction showed a very small incremental impact (0.27 $\mu g/m^3$) for Oakland County emission sources on air parcels blowing into Wayne County. In fact, our analysis demonstrated that Genesee County, an upwind county that EPA considers to be representative of background conditions in the state as well as in attainment for $PM_{2.5}$, showed an incremental $PM_{2.5}$ air quality impact *four times* larger than Oakland County.

3 Northern Wind Frequencies

Thus, the $PM_{2.5}$ incremental contribution by Oakland County to Wayne County, based on the most appropriate NNW wind direction, is relatively small, approximately 0.27 μg/m^3. This contribution is about one-fourth of the 1.09 μg/m^3 contribution attributable to upwind counties, including Genesee County, which were excluded from the Southeast Michigan non-attainment area. In addition, the frequency of time that winds blow in this direction must be addressed to obtain an accurate estimate of the Oakland County impact. Figure 9 below presents the daily resultant wind frequencies for the NW, NNW, and N directions[4] over the three-year time period 2002-2004 for the Oak Park meteorological data.

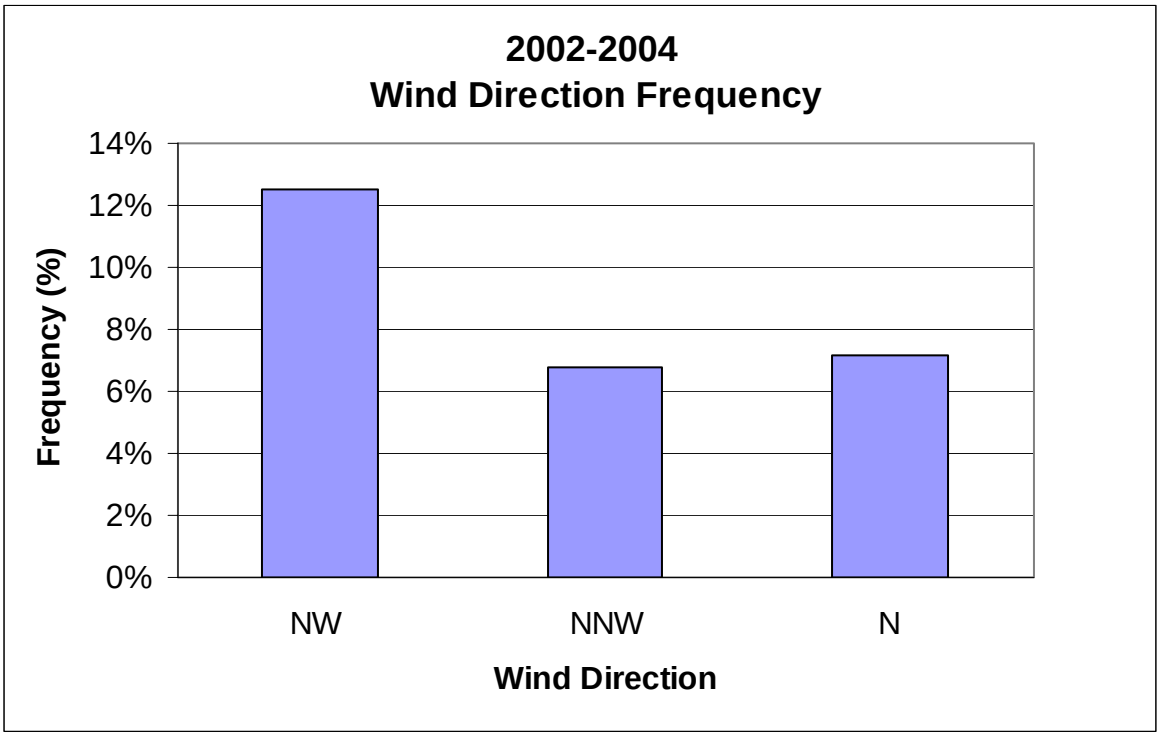

Figure 9. Northern Wind Frequencies: Oak Park Meteorological Data

[4] The frequencies represent 45° sectors (NW=292.5-337.5°; NNW=315-360°; and N=337.5-22.5°), and include all days in the 2002-2004 period, not just $PM_{2.5}$ monitoring days.

As shown in Figure 9, the frequency of winds from the NNW direction (*i.e.*, 315-360°) is only 6.8%, based on the Oak Park meteorological data. Thus, the calculated $PM_{2.5}$ "increment" due to Oakland County during NNW winds occurs less than 7% of the time. To estimate a realistic annual incremental contribution from Oakland County, the estimated contribution value of 0.27 $\mu g/m^3$ must be multiplied by the fraction of time that the wind blows from the NNW. When adjusted by the 6.8% time frequency, the overall Oakland County $PM_{2.5}$ contribution during NNW winds becomes (0.068) × (0.27 $\mu g/m^3$), or 0.018 $\mu g/m^3$, which is negligible (almost a factor of 1000 times lower) when compared with the 15 $\mu g/m^3$ $PM_{2.5}$ standard. Importantly, given that monitors upwind of the Oak Park station as well as the downwind non-attainment monitors in Wayne County are aligned in a NNW direction, NNW winds and NNW transport are of the most relevance for characterizing incremental contributions to non-attainment at the Wayne County monitors.

4 Worst-Case Location of Oak Park

As shown in Figure 1, the one $PM_{2.5}$ monitor in Oakland County is located in Oak Park, which is in the southeast corner of Oakland County and only about one mile north of the Wayne County border. The site is also located near the intersection of several major highways in a heavily industrialized portion of Oakland County. Because of its location, the Oak Park monitor will likely record the highest $PM_{2.5}$ values in Oakland County, due to nearby local sources and its proximity to Wayne County (*i.e.*, transport of Wayne County emissions during the prevailing winds from the south). As discussed, even with highly conservative data substitution, this monitor still records compliance with both the annual and 24-hour average $PM_{2.5}$ air standards.

Because of its location, the Oak Park monitor is not only a "worst-case" monitor in Oakland County to determine $PM_{2.5}$ attainment, but also a "worst-case" monitor for estimating county-wide $PM_{2.5}$ increments or contributions. Oakland County extends approximately 30 miles in the north-south direction, and winds from the NNW must traverse essentially the entire county before they reach the monitoring location, as shown in Figure 1. Thus, any calculated "increments" or contributions due to Oakland County are maximized by the location of the monitor. If the monitor were placed near the center of Oakland County, it would be about 15 miles from the Wayne County border instead of only one mile, and likely would record lower $PM_{2.5}$ concentrations and would present a much shorter travel path for any contributions caused by Oakland County itself. Also, because of the location of the Genesee monitor in Flint in the center of Genesee County (refer to Figure 2), any incremental contribution recorded by Oak Park includes the emissions from the southern half of Genesee County.

5 Speciation Data

The Lake Michigan Air Directors Consortium (LADCO) has developed an excellent summary of $PM_{2.5}$ ambient measurements, including speciation measurements, throughout EPA Region V in a number of reports. One of their reports, "$PM_{2.5}$ in Urban Areas in the Upper Midwest," dated February 12, 2004 (LADCO, 2004) discusses a number of urban areas in detail, including the Detroit area.[5] Figure 10 below is adapted from Figure 22 of LADCO (2004), and it shows $PM_{2.5}$ amounts by different speciation categories for a number of monitoring sites near Detroit, including the industrialized Dearborn area and the city of Southfield, which is in Oakland County about 5 miles west of the Oak Park monitor.

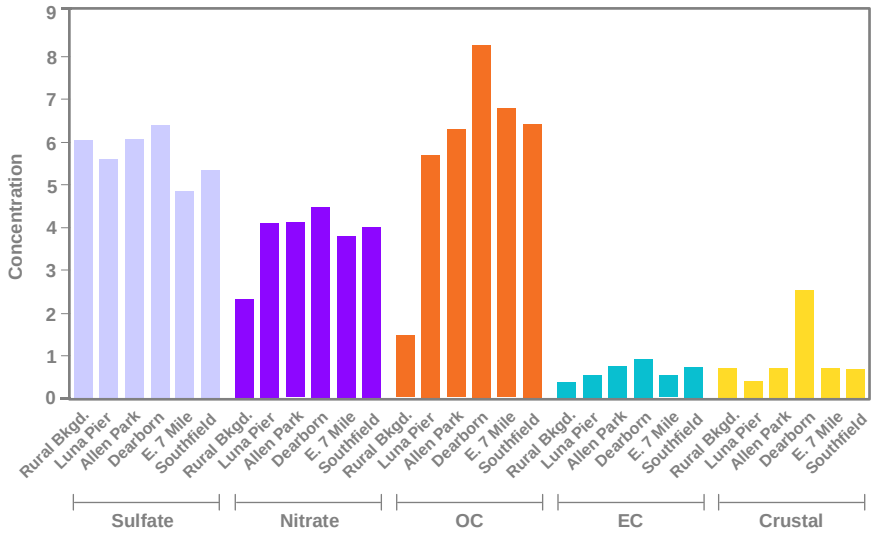

Figure 10. Annual-Average Speciated $PM_{2.5}$ Concentrations in Detroit Area (LADCO, 2004)

One striking feature of this graph is that the Dearborn monitor in Wayne County, which is the highest $PM_{2.5}$ non-attainment monitor in Southeastern Michigan, shows a very different

[5] http://www.ladco.org/reports/ladco/PM25doc-urban1.pdf

speciation pattern than other monitors in nearby cities both upwind and downwind of Dearborn. Specifically, Dearborn has a significantly higher amount of organic carbon (OC) and *three times* the soil or crustal components of any other upwind or downwind city, including Southfield in Oakland County. These data demonstrate that Dearborn is primarily affected by local emission sources, and not by transport of emissions from other counties. If regional sources of $PM_{2.5}$ were responsible for the organic carbon and crustal components, then Dearborn should be similar to the other monitoring sites, given that several of the speciation monitors in Wayne County are within close proximity of each other (refer to Figure 2).

6 Failures of EPA's "9-Factor" Analysis

In our prior reports (Gradient 2005a, 2005b), we discussed the subjective and speculative nature of the 9-factor test that EPA used to determine Oakland County's non-attainment status. We demonstrated that the 9-factor analysis is inconsistent with monitoring and meteorological data, which provide the best and most direct measurement of $PM_{2.5}$ contributions by accounting for both $PM_{2.5}$ emissions and transport.

Our previous reports focused most extensively on the Factor 1 "weighted emissions score." We previously expressed our opinion that the "weighted emissions score," which compares emission estimates of $PM_{2.5}$ precursors in Oakland County with those in other counties, is inherently an unreliable methodology for assessing "contributions" to $PM_{2.5}$ air quality due to its reliance on uncertain data inputs and questionable assumptions. Further bolstering our opinion, the results of both EPA's and our refined wind direction analyses further demonstrate that EPA's nine factor analysis, and particularly the Factor 1 "weighted emissions score", is an uncertain and flawed metric for assessing $PM_{2.5}$ attainment status.

Importantly, the wind direction analyses address several of the shortcomings of EPA's "weighted emissions score" by relying on actual air quality measurement data rather than emissions estimates and by accounting for meteorology and air transport as important determinants of downwind $PM_{2.5}$ contributions. Without transport, emissions in an attaining area cannot contribute to non-attainment elsewhere. Table 2 below compares $PM_{2.5}$ increments from the EPA and Gradient wind direction analyses with EPA's Factor 1 emission scores for Genesee, Oakland, and Wayne County.

As shown in Table 2, there is no correlation between the $PM_{2.5}$ increments calculated by wind direction and the EPA Factor 1 emission scores, which were given great weight by EPA in determining county attainment status. For example, EPA's Factor 1 analysis yielded a composite emission score for Oakland County nearly twice that of Genesee County, while our NNW wind direction analysis demonstrated that Genesee County has an incremental $PM_{2.5}$ air quality impact

four times larger than Oakland County. Thus, EPA's and Gradient's directional analyses both show just how arbitrary and unreliable EPA's 9-factor analysis, and the Factor 1 analysis in particular, were at predicting Oakland County's relative $PM_{2.5}$ contributions.

Table 2. Comparison of EPA-Gradient Wind Directional Analyses Results with EPA Factor 1 Analysis Results

County	EPA-Gradient Wind Directional Analyses			EPA Factor 1 Analysis
	NW $PM_{2.5}$ Increments: EPA Analysis	N $PM_{2.5}$ Increments: EPA Analysis	NNW $PM_{2.5}$ Increments: Gradient Analysis[1]	Composite Emission Score
Genesee	1.0	1.5	1.1	7.5
Oakland*	1.0	-0.2	0.3	13.6
Wayne	3.4	2.5	3.3	29.8

* Based on the location of the Genesee monitor in the central portion of Genesee County, the Oakland County increment reflects the impacts of emission sources in southeastern Genesee County as well as Oakland County emission sources.

[1]Gradient's analysis relied upon the same $PM_{2.5}$ and meteorological data as the EPA analysis.

7 Conclusions

In summary, the available monitoring and meteorological data strongly support an attainment designation for Oakland County because, as we have demonstrated in this report:

- Even using a highly conservative data substitution process for missing data, the monitoring data at Oak Park show attainment of the $PM_{2.5}$ standards for 2002-2004. With complete data for 2003-2005, Oak Park also demonstrates attainment during the 2003-2005 time period.

- EPA adopted a trajectory methodology for assessing incremental impacts on $PM_{2.5}$ air quality that uses actual $PM_{2.5}$ measurement and meteorological data. We used this methodology to show a 0.27 $\mu g/m^3$ "increment" due to Oakland County emission sources when winds are blowing from the most appropriate NNW direction.

- When combined with a 6.8% NNW wind frequency, the estimated Oakland County "increment" is 0.018 $\mu g/m^3$, which is negligible (almost a factor of 1000 times lower) when compared to the 15 $\mu g/m^3$ $PM_{2.5}$ standard.

- Because of the "worst-case" location of the Oak Park monitor near the Wayne County border, any trajectory "increment" analysis includes emissions encountered over the entire length of Oakland County, and also emissions from approximately half of Genesee County.

- Detailed speciation data for $PM_{2.5}$ show that the non-attaining Dearborn monitor, which records the highest $PM_{2.5}$ levels in Southeast Michigan area, is primarily affected by local sources, and not by regional transport from other counties.

- There is no correlation between the $PM_{2.5}$ increments calculated by wind direction and the EPA "Factor 1" emission scores, which were given great weight by EPA in determining county attainment status.

We remain astounded that EPA uses arbitrary and uncertain factors to rationalize a non-attainment designation for Oakland County, when monitoring data and meteorological data at Oak Park demonstrate compliance and a NNW trajectory analysis shows a negligible incremental contribution of Oakland County sources on downwind $PM_{2.5}$ air quality in Wayne County.

8 References

Compher, M. 2006. Memorandum Re: Analysis for Oakland County Petition for Reconsideration. January 10.

Gradient Corporation (Gradient). 2005a. "Oakland County $PM_{2.5}$ Attainment Analysis: Supplemental Report." March 7.

Gradient Corporation (Gradient). 2005b. "Oakland County $PM_{2.5}$ Attainment Analysis: Supplemental Report." September 9.

US Environmental Protection Agency (EPA). 1999. "Guideline on Data Handling Conventions for the PM NAAQS." Office of Air Quality Planning and Standards, EPA-454/R-99-008, April.

US Environmental Protection Agency (EPA). 2006. Letter and enclosures from Stephen L. Johnson Re: Petition of Oakland County, Michigan for Reconsideration of EPA's $PM_{2.5}$ Non-Attainment Designation.

Lake Michigan Air Directors Consortium (LADCO). 2004. "$PM_{2.5}$ in Urban Areas in the Upper Midwest." February 12.

Appendix A

Qualifications of Authors

Peter J. Drivas, Ph.D.
Principal Consultant

Dr. Drivas has over 20 years experience in the fields of air quality modeling, pesticide drift, reactive chemical modeling, hazardous spill assessments, and indoor air pollution. He has managed numerous air quality and multimedia modeling programs; has been an expert witness on air quality modeling; and has developed many innovative environmental models, which can predict ozone and photochemical smog formation, soil gas infiltration from buried liquid chemicals into houses, evaporation from oil spills, and the consequences of hazardous spills of toxic materials. He is an expert on numerous Agency-approved and industry standard models including ISC, CALPUFF, AERMOD, RPM-IV, PLUVUE-II, and others. He has published two books and over 30 technical articles in the environmental field.

Practice Areas & Expertise:

Air Quality Modeling

Emission Source Characterization

Soil-Gas Modeling

Chemical Engineering Processes

Accidental Releases

Education:

Ph.D., Chemical Engineering, California Institute of Technology

M.S., Chemical Engineering, Massachusetts Institute of Technology

B.S., Chemical Engineering, Massachusetts Institute of Technology

Christopher M. Long, Sc.D.
Senior Project Manager

Dr. Long is an environmental health scientist with experience in the areas of exposure assessment, indoor air pollution, human health risk assessment, and statistical data analysis. Dr. Long has several years consulting experience in the risk assessment field. At Gradient, Dr. Long has been involved in fate and transport analyses, litigation support, and exposure modeling. Prior to joining Gradient, Dr. Long completed his doctorate in environmental science and engineering at the Harvard School of Public Health. While at Harvard, Dr. Long conducted a comprehensive study investigating the sources and toxicity of indoor particulate matter in residential homes. He received a U.S. EPA graduate fellowship for this work, and he is first author on several recent papers on indoor and outdoor particulate matter.

Practice Areas & Expertise:

Indoor/Outdoor Air Quality

Airborne Toxicants

Exposure Assessment/Modeling

Human Health Risk Assessment

Epidemiology

Education:

Sc.D., Environmental Science & Engineering, Harvard School of Public Health

M.S., Environmental Engineering, MIT

A.B., Chemistry and Environmental Studies, Bowdoin College

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Peter J. Drivas, Ph.D.
Principal Consultant

Areas of Expertise

Air quality modeling, chemically reactive pollutants, accidental releases, multi-media modeling, chemical process analysis, visibility, indoor air pollution, program management.

Education

Ph.D., Chemical Engineering, California Institute of Technology, 1974.

S.M. and S.B., Chemical Engineering, Massachusetts Institute of Technology, 1970.

Professional Experience

1996 – present GRADIENT CORPORATION, Cambridge, MA
Principal Consultant. Chief scientist for air quality modeling, multi-media modeling, indoor air modeling, hazardous spill assessments, modeling of reactive pollutants, emissions characterization, and chemical process analysis.

1989 – 1996 GRADIENT CORPORATION, Cambridge, MA
Principal. Chief scientist for air quality modeling practice, hazardous spill assessments, modeling of reactive pollutants, and chemical process analysis. Director of multi-media modeling, emissions characterization, and indoor air pollution studies.

1983 – 1989 THERMO ELECTRON CORPORATION, Waltham, MA
Environmental Director. Consultant to all Thermo Electron divisions on air quality monitoring and modeling, including the use of EPA dispersion models, photochemical models, and hazardous spill models.

1982 – 1983 ENERGY RESOURCES COMPANY, La Jolla, CA
Principal Scientist. Directed development of accidental release models and managed air quality modeling activities related to permitting. Designed fluidized bed reactors to minimize emissions.

1979 – 1981 ENVIRONMENTAL RESEARCH & TECHNOLOGY, Concord, MA
Senior Consultant. Directed air quality modeling studies, including the use of EPA UNAMAP and photochemical models for permitting of new sources. Developed visibility degradation models for compliance with PSD regulations.

1975 – 1978 PACIFIC ENVIRONMENTAL SERVICES, Santa Monica, CA
Manager, Atmospheric Modeling Division. Responsible for model development, group management, and business development. Project manager for environmental permitting and research studies, including ozone and mobile source modeling.

1974 – 1975 CALIFORNIA INSTITUTE OF TECHNOLOGY, Pasadena, CA
Research Fellow. Studied indoor air pollution and infiltration rates in buildings by means of a tracer gas technique.

Professional Activities

- Chairman of AWMA national technical committee on accidental releases.
- Expert witness testimony experience for air quality modeling topics.
- Author of approximately 30 journal articles, books, and conference presentations.

Professional Affiliations

American Institute of Chemical Engineers, Consultant to Environmental Division • Air and Waste Management Association, Chairman of AT-4 Accidental Release Committee • American Chemical Society • American Meteorological Association

Projects

Martin Marietta Energy Systems: Technical consultant on reactive chemistry modifications to the HGSYSTEM model to account for UF_6 chemistry and thermodynamics. The chemistry involved UF_6 flashing to a mixture of vapor and solid particles if accidentally released, reacting with water vapor to form HF and UO_2F_2, and the HF continuing to react with water vapor. UF_6 chemistry and thermodynamic algorithms were combined with the HF chemistry and algorithms in HGSYSTEM. The solutions were obtained by solving a set of 14 simultaneous differential equations involving chemistry, dispersion, and thermodynamics.

American Institute of Chemical Engineers, Center for Chemical Process Safety: Co-authored a guideline book describing the latest techniques to calculate the source emissions, transport, and dispersion of hazardous vapor clouds. Source emission techniques that were described included gas and liquid jet releases, pool evaporation, pipeline breaks, and cryogenic releases. Topics included two-phase flow, reactive components, and calculation of multi-component releases.

State of Alaska, Department of Environmental Conservation: Managed study to evaluate health and environmental impacts on animals and plants in Prince William Sound, Alaska, caused by hydrocarbon evaporative emissions from the Exxon Valdez oil spill. Developed evaporative emission model for individual air toxics such as benzene, toluene, and xylene from oil spills. Air concentrations resulting from the evaporative emissions were used to assess the risk of adverse environmental impacts in the vicinity of Prince William Sound.

Amoco Corporation: Managed study to determine impacts of a proposed chemical plant expansion on ozone concentrations and visibility in a nearby national park, in support of a Prevention of Significant Deterioration (PSD) operating permit. A reactive plume model was used to evaluate ozone concentrations, and a visibility screening technique was used to determine the worst-case visibility impairment caused by the plant emissions.

Browning-Ferris Industries: Developed a health risk exposure assessment of stack emissions from a proposed medical waste incinerator. Estimated emission rates of possible hazardous substances released into the air from the incinerator stack, including metals, dioxins, furans, acid gases, pathogens, hydrocarbons, and radioisotopes. Conducted air dispersion modeling using the ISCST model for five years of meteorological data to predict short-term and long-term concentrations and resulting health risks at nearby resident receptor sites.

State of California, Air Resources Board: Managed an improved emission inventory for oil production and refining emission sources in the San Joaquin Valley in California, for use as input to a photochemical grid model. All available emission factor models and equations applicable to oil production facilities and refineries were reviewed and compared, and an estimate was made of the statistical accuracy of the most appropriate emission factor. Hydrocarbon emissions were apportioned into individual chemical species for use in photochemical modeling.

Major Oil Company: Developed a mathematical model for the prediction of air quality concentrations resulting from the accidental releases of hazardous components. A new algorithm was developed for multicomponent evaporation from a liquid spill mixture. Also, techniques for calculating the evaporation heat balance were evaluated, and a method was developed to determine the phase partitioning of boiling compounds.

Insurance Company: Directed scientific investigation into historical chemical manufacturing and waste disposal processes. Relevant patents and process flow sheets were reviewed to determine the basic process chemistry and the amount and type of waste material created. Based on the process chemistry, chemical reaction calculations were performed to determine the composition of the waste stream by-products.

Thermo Electron: Developed a mathematical model to predict evaporation and transport of pollutants at high temperatures through porous media. The model included the effects of cylindrical as well as rectangular geometry, considered the addition of a layer that inhibits diffusion, and included the effects of variable pore size and geometry in the porous medium.

EPA Region II: Evaluated potential human risks due to implementation of recommended remedial actions at a hazardous waste site. Calculated emissions and air concentrations resulting from five different remedial activities, including soil excavation, incineration, site capping, and sediment dredging. Exposure and resulting health risks due to emission of PCB vapors and dust were examined using EPA-recommended air quality dispersion and deposition models.

Major Chemical Company: Developed an innovative model for evaluating the air emissions from buried hazardous waste material, resulting in a presentation at the 1990 Air and Waste Management Association meeting. The new model showed that typical techniques used to calculate buried waste emissions may overpredict air concentrations by an order of magnitude. Conducted air quality dispersion modeling to estimate downwind exposures and concentrations.

Browning Ferris Industries: Investigated air quality issues associated with the expansion of a landfill in Minnesota. Calculated the air exposures of nearby populations to potential releases of air toxics emissions from the site by using EPA-recommended air quality models. Investigated the effects on the air quality modeling results of variability in terrain, year-to-year changes in site meteorology, and the use of rural vs. urban dispersion coefficients.

Law Firm: Developed a general indoor air pollution model that can predict indoor concentrations, as a function of time, of gases, particulates, or fibers such as asbestos. A Gaussian puff dispersion model was combined with a flow field and general building decay parameters for a comprehensive model of indoor air transport and dispersion of a point source of emissions.

General Electric: Provided chemical process analysis development for the manufacture of a solid-state energy conversion device. Developed time and temperature process parameters for manufacturing, both theoretically and experimentally, and calculated chemical formation and degradation rates as a function of temperature.

Government of China: Trained representatives from Beijing and Lanzhou, China, on the theory, operation, and practical application of Gaussian and photochemical air quality models. Developed a microcomputer version of the OZIPM-2 photochemical model to determine ozone control strategies in China.

Consortium of Oil Companies: Developed numerical modeling techniques for predicting the air quality impact of spills of cryogenic materials from storage tanks and pipelines, and two-phase (gas and liquid) flow from high-pressure liquid pipelines. A comprehensive modeling system was developed for handling any type of hazardous spill.

U.S. Department of Energy: Designed a fluidized bed combustion reactor to minimize air pollutant emissions of SO_2 and NO_x. A numerical model was developed to calculate fluid flow, mixing, and chemical reactions inside a fluidized bed reactor, and the results of the calculations were used to guide pilot plant experimental development.

Texaco: Managed the successful air quality permitting of an expansion of oil production operations in California. Met with state and local representatives and conducted emissions and air dispersion modeling to demonstrate compliance with current regulations.

Consolidated Edison of New York: Directed the successful air quality permitting of a change in power plant fuel from oil to coal, involving very detailed air dispersion modeling that considered "street canyon" effects in New York City. Also, developed environmental and economic analyses of currently available and possible future types of burners and control equipment for reducing pollutants from coal-fired power plants.

State of Maine, Department of Environmental Protection: Developed a liquid spill evaporation model to predict time-dependent multicomponent air pollution concentrations resulting from oil spills. Results of the model were used to analyze the health risks to residents near a liquid spill waste facility.

Northern Tier Pipeline Company: Developed an improved visibility degradation model, and used this model to predict the impact of a proposed marine terminal on visibility impacts in Washington's Olympia National Park. Ten scenic views, selected by the National Park Service, were modeled to determine the amount of visibility impairment due to emissions from the proposed marine terminal.

EPA, Office of Air Quality Planning and Standards: Directed a major atmospheric tracer study to develop basic experimental data on dispersion in complex terrain. Dual atmospheric tracers (SF_6 and Freon-11) were released from different heights over a small hill with over 50 sampling locations. Responsible for the experimental analysis and database development for thousands of air samples. Results from this study were used to develop EPA's Complex II air quality model.

Aluminum Association: Managed a comprehensive SF_6 tracer study at an aluminum plant to develop basic experimental data for the line-source type of releases characteristic of aluminum plants. Results from this study were used to develop EPA's Buoyant Line and Plume (BLP) model.

EPA, Region I: Used the city-specific version of the OZIPP photochemical model to estimate hydrocarbon emission reductions necessary to attain the ozone air quality standard in Massachusetts, Connecticut, and Rhode Island. The city-specific ozone model was run with the specific UV intensity, transported ozone, dilution rate, and emission parameters for each of five major urban areas to determine the emission reductions necessary in each area to attain the ozone standard.

EPA, Office of Air Quality Planning and Standards: Developed procedures for the acquisition and compilation of emission information into the form required for input into photochemical air quality simulation models. Emission methods were applicable to both grid and trajectory photochemical models. Techniques were developed for obtaining the necessary spatial and temporal resolution, and for segregating hydrocarbon emissions into the reactive species required by the photochemical model.

State of Arizona, Highway Department: Used a photochemical trajectory model to analyze the impact on ambient ozone levels of a proposed new highway in Phoenix. Nine worst-case air trajectories were modeled that would maximize the ozone impact of the new highway in major residential communities in and near Phoenix. The highway was built after our study concluded that there would be only minor ozone impacts.

Zinc Galvanizing Company: Directed an emissions monitoring and air quality dispersion modeling study for a zinc galvanizing facility in Los Angeles. The basic galvanizing process was studied to determine emission parameters, stack testing was conducted, and the emission results were used as input to an air quality model. Provided expert witness testimony on emissions and air modeling.

United Airlines: Performed an air quality dispersion modeling study for a proposed United Airlines food waste incinerator at Los Angeles International Airport. Provided expert witness testimony on air quality modeling and the impact of the incinerator on nearby residents. The incinerator was successfully permitted and is currently operating.

ASARCO: Monte Carlo air modeling and risk assessment at operating smelter.

Publications & Presentations

Brody, J.G., D.J. Vorhees, S.J. Melly, S.R. Swedis, P.J. Drivas, and R.A. Rudel. 2002. "Using GIS and Historical Records to Reconstruct Residential Exposure to Large-Scale Pesticide Application." *Journal of Exposure Analysis and Environmental Epidemiology,* 12: 64-80.

Drivas, P.J., P.A. Valberg, B.L. Murphy, and R. Wilson. 1996. " Modeling Indoor Air Exposure from Short-term Point Source Releases." *Indoor Air* 6:271-277.

Valberg, P.A., P.J. Drivas, S.M. McCarthy, and A.Y. Watson. 1996. "Evaluating the Health Impacts of Incinerator Emissions." *J. Hazardous Material,* 47:205-227.

Hanna, S.R., P.J. Drivas, and J.C. Chang. 1996. *Guidelines for Use of Source Emissions and Atmospheric Dispersion Models for Accidental Releases*. Center for Chemical Process Safety, American Institute of Chemical Engineers, New York.

Drivas, P.J. 1995. "A Review of Source Emission Models for Accidental Releases." Paper No. 95-TP54A.03. *Proceedings: The 88th Annual Meeting of the Air and Waste Management Association*, San Antonio, TX, June 19-23.

McCarthy, S.M., P.J. Drivas, and R.J. Yamartino. 1994. "The Design and Evaluation of Oil Production Emission Database Files for Input to the SARMAP Modeling System." *Proceedings: Regional Photochemical Measurement and Modeling Studies Conference*, San Diego, CA, November 8-12.

Murphy, B.L. and P.J. Drivas. 1993. "Migration of Volatile Contaminants into Buildings." *Proceedings: Eighth Annual Conference on Contaminated Soils,* Amherst, MA.

Drivas, P.J., K. Raabe, L.C. Daly, and L.K. Zuke. 1993. "Air Toxics Modeling of Excavation and Landfilling Activities." Paper 93-RA-114A.03, 86th Annual Air and Waste Management Association Meeting, Denver, Co.

Hanna, S.R. and P.J. Drivas. 1993. "Modeling VOC Emissions and Air Concentrations from the Exxon Valdez Oil Spill." *Journal of the Air and Waste Management Association*, 43:298-309.

Drivas, P.J., B.L. Murphy, and P.A. Valberg. 1992. "Exposure Modeling of Indoor Sources of Particulates or Fibers." *Proceedings: Society for Risk Analysis - 1992 Annual Meeting*, San Diego, CA.

Drivas, P.J., P.A. Valberg, and T.D. Gauthier. 1991. "Health Assessment of Air Toxics Emissions from Alternative Fuels." Paper 91-107.6, 84th Annual Air and Waste Management Association Meeting, Vancouver, BC.

Drivas, P.J. and L.C. Daly. 1991. "Calculation of Evaporative Emission Rates of Air Toxics from a Multicomponent Liquid Spill." Paper 91-84.7, 84th Annual Air and Waste Management Association Meeting, Vancouver, BC.

Drivas, P.J. 1991. "Validation of Hazardous Spill Emission Models." Invited Paper, International Conference and Workshop on Mitigating the Consequences of Accidental Releases of Hazardous Materials, New Orleans.

Drivas, P.J., A.P. Toole, and S.C. Gnewuch. 1990. "The Effects of Global Warming and Increased UV Radiation on Urban Ozone Concentrations." Paper 40C, American Institute of Chemical Engineers, Summer National Meeting, San Diego, CA.

Drivas, P.J., D.H. Bass, and B.L. Murphy. 1990. "Atmospheric Emissions from Buried Hazardous Waste." Paper 90-74.4, 83rd Annual Air and Waste Management Association Meeting, Pittsburgh, PA.

Hanna, S.R., and P.J. Drivas. 1987. *Guidelines for Use of Vapor Cloud Dispersion Models.* Center for Chemical Process Safety, American Institute of Chemical Engineers.

Drivas, P.J. 1986. "Two-dimensional Resistance Analysis in a Thermoelectric Multicouple." *Proceedings: 21st Intersociety Energy Conversion Engineering Conference*, San Diego, CA, pp. 1353-1356.

Drivas, P.J. 1985. "Prediction of Multicouple Performance." *Proceedings: Fifth Working Group Meeting on Thermoelectrics*, Pasadena, CA.

Drivas, P.J., J.S. Sabnis, and L.H. Teuscher. 1983. "Simulation of Pipeline and Tank Storage Failures." *Oil and Gas Journal*: 162-169 (September).

Drivas, P.J. 1982. "Calculation of Evaporative Emissions from Multicomponent Liquid Spills." *Environmental Science and Technology*, 16:726-728.

Heinold, D.W., P.J. Drivas, D.A. Hansen, and T.F. Lavery. 1982. "Acid Rain Impact Assessment: From Stack to Stream." *Proceedings: AMS/APCA Third Joint Conference on Applications of Air Pollution Meteorology*, San Antonio, TX.

Drivas, P.J. and D.W. Heinold. 1981. "Visibility Impact Analysis of a Marine Oil Terminal." *Proceedings: Fifth Symposium on Turbulence, Diffusion, and Air Pollution.* Atlanta, GA.

Drivas, P.J., A. Bass, and D.W. Heinold. 1981. "A Plume Blight Visibility Model for Regulatory Use." *Atmospheric Environment* 15:2179-2184.

Drivas, P.J., K.H. Wilson, and L.W. Wayne. 1979. "A Case Study: Use of City-Specific EKMA in Massachusetts, Connecticut, and Rhode Island." *Proceedings: Specialty Conference on Ozone/Oxidants*, Houston, TX.

Drivas, P.J. 1978. "Emission Inventory Requirements for Photochemical Air Quality Simulation Models." *Proceedings: Specialty Conference on Emission Factors and Inventories*, Anaheim, CA.

Wayne, L.W. and P.J. Drivas. 1978. "Sensitivity of the Empirical Kinetic Modeling Approach to Input Data and Local Conditions." Paper 78-72.2, 71st Annual APCA Conference, Houston, TX.

Drivas, P.J. and L.W. Wayne. 1977. "Sensitivity Tests of a Lagrangian Photochemical Air Quality Simulation Model." Paper 78-10.3, 71st Annual APCA Conference, Houston, TX.

Drivas, P.J., M. Chan, and L.W. Wayne. 1977. "Validation of an Improved Photochemical Air Quality Simulation Model." *Proceedings: AMS/APCA Joint Conference on Applications of Air Pollution Meteorology*, Salt Lake City, UT.

Drivas, P.J. 1976. *Emissions from Hot-Dip Galvanizing Processes.* EPA Report No. EPA-905/4-76-002, USEPA, Region V, Chicago, IL. Available as Document PB251910, U.S. Dept. of Commerce, National Technical Information Service, Springfield, VA. March.

Drivas, P.J. 1975. "On the Measurement of Ambient Halogenated Hydrocarbons." *Proceedings: Caltech Air Quality Symposium*, Pasadena, CA.

Drivas, P.J. and F.H. Shair. 1974. "Probing the Air Flow Within the Wake Downwind of a Building by Means of a Tracer Technique." *Atmospheric Environment* 8:1165-1175.

Drivas, P.J. and F.H. Shair. 1974. "A Tracer Study of Pollutant Transport and Dispersion in the Los Angeles Area." *Atmospheric Environment* 8:1155-1163.

Griffith, G.A., P.J. Drivas, and F.H. Shair. 1974. "An Inexpensive Remote Sequential Air Sampler." *Journal of the Air Pollution Control Association* 24:776-777.

Drivas, P.J. and F.H. Shair. 1974. "Dispersion of an Instantaneous Crosswind Line Source of Tracer Released from an Urban Highway." *Atmospheric Environment* 8:475-484.

Drivas, P.J., P.G. Simmonds, and F.H. Shair. 1972. "Experimental Characterization of Ventilation Systems in Buildings." *Environmental Science and Technology* 6:609-614.

Patent

Shair, F.H., P.G. Simmonds, R.B. Leighton, and P.J. Drivas. 1975. "Technique and System for Coding and Identifying Materials."

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Christopher M. Long, Sc.D.
Environmental Scientist
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Areas of Expertise

Public health and exposure assessment, with expertise in indoor/outdoor air pollution and particulate matter; air dispersion modeling; epidemiology; human health risk assessment; risk communication; statistical data analysis.

Education

Sc.D., Environmental Science & Engineering, Harvard School of Public Health, 2000.

M.S., Environmental Engineering, Massachusetts Institute of Technology, 1995.

A.B., Chemistry and Environmental Studies, *summa cum laude*, Bowdoin College, 1993.

Professional Experience

2000 – Present GRADIENT CORPORATION, Cambridge, MA
Senior Project Manager. Evaluate human exposure and health effects of environmental pollutants, specializing in airborne gases and particles. Investigate indoor and outdoor air quality problems, and perform air dispersion and exposure modeling. Conduct human health risk assessments and worker safety evaluations, and review and interpret epidemiological and toxicological studies. Prepare technical analyses, expert reports, and risk communication materials.

1997 – 2000 HARVARD SCHOOL OF PUBLIC HEALTH, Boston, MA
Research/Teaching Assistant. Designed and conducted indoor air particle characterization study of nine Boston-area homes. Also served as teaching assistant for two graduate courses: Seminar in Risk Analysis, Management, and Communication and Air Pollution: Particles and Gases.

1995 – 1997 MENZIE-CURA & ASSOCIATES, INC., Chelmsford, MA
Environmental Scientist/Risk Assessor. Conducted human health and ecological risk assessments for state and federal hazardous waste sites. Modeled fate and transport of organic and inorganic contaminants in all environmental media. Responsibilities also included project management, proposal writing, and litigation support. Participated in environmental site assessments and field sampling activities of aquatic and terrestrial habitats. OSHA-certified 40-hour training.

1993 – 1995 MASSACHUSETTS INSTITUTE OF TECHNOLOGY, Cambridge, MA
Research Assistant. Conducted research in trace organic pollutant laboratory. Modeled the fate and transport of sewage-derived linear alkylbenzenes (LABs) in the Gulf of Maine.

1992 NASA GODDARD SPACE FLIGHT CENTER, Greenbelt, MD
Research Assistant. Selected as summer intern in Summer Institute on Atmospheric and Hydrospheric Sciences; worked with atmospheric scientists in GSFC's Atmospheric Chemistry and Radiation Branch. Used a photochemical box model to explore the potential for ozone depletion in the Northern Hemisphere stratosphere at middle and low latitudes.

Professional Activities

- Invited technical peer reviewer for the *Journal of the Air & Waste Management Association*, *Environmental Science & Technology*, *Environmental Health Perspectives*, and *Journal of Exposure Analysis and Environmental Epidemiology*.

Awards/Honors

- U.S. EPA STAR Graduate Fellow, 1998-2000
- *Phi Beta Kappa*
- Student abstract/presentation award at 1999 ISEA/ISEE Annual Conference in Athens, Greece

Professional Associations

American Chemical Society (ACS) • International Society of Exposure Analysis (ISEA) • Air & Waste Management Association (AWMA) • Boston Risk Analysis Group

Projects

State of Maine: Assisted in the development of a trial guideline for protecting residents from inhalation exposure to indoor petroleum vapors released from home fuel oil spills. Wrote indoor sampling guidance.

Metropolitan District Commission (MDC): Performed mass balance calculations for mercury in Wachusett and Quabbin Reservoirs. Conducted extensive literature review on environmental Hg cycling. Wrote technical report.

Private Client: Provided technical analysis of fate and transport of zinc and fluoride emissions in subsurface environment for an aluminum manufacturing facility. Evaluated fluoride toxicity to aquatic organisms and livestock and developed ambient water quality criteria based on U.S. EPA guidelines.

Law Firm: Reviewed extensive body of epidemiological studies of ozone health effects and helped develop technical document for litigation support.

Private Client: Managed and conducted MCP Method 3 risk characterizations for a chain of Massachusetts gas stations. Contaminants of interest included BTEX and MTBE. Modeled indoor air concentrations and collected indoor VOC samples using Summa canisters to validate model findings. Conducted wetland sampling and performed screening-level ecological risk assessments

Private Client: Wrote scope of work, managed, and performed MCP Method 3 human health risk assessment for a former electronics manufacturer with subsurface dissolved-phase chlorinated hydrocarbon contamination. Indoor air modeling performed using vapor intrusion model. Risk to town drinking water wells assessed.

Private Client: Developed risk-based soil cleanup levels for BTEX and PAH compounds at a site with pervasive asphalt contamination. Provided technical support during site remedial actions.

Massachusetts Bays Program: Assisted in a project designed to quantify point and nonpoint sources of nitrogen to Massachusetts harbors and coastal embayments and to evaluate the potential for eutrophication. Delineated watersheds and subwatersheds using topographic maps.

ASTM Committee E-50: Authored sections on chemical properties and contaminant behavior in ASTM Standard Provisional Guide for Risk-Based Corrective Action (PS 104-98).

Private Client: Performed U.S. EPA screening-level ecological risk assessments for two former submarine manufacturing facilities. Extensive list of contaminants of concern including metals, PAHs, and PCBs.

Publications

Long, C.M. and J.A. Sarnat. 2003. Assessing Indoor-Outdoor Relationships and Infiltration Behavior of Elemental Components of Ambient PM2.5. Manuscript submitted to Aerosol Science & Technology.

Sarnat, J.A., C.M. Long, P. Koutrakis, B.A. Coull, J. Schwartz, and H.H. Suh. 2002. Using Sulfur as a Tracer of Outdoor Fine Particulate Matter. *Environ. Sci. Technol*. 36: 5305-5314.

Long, C.M., H.H. Suh, L Kobzik, P.J. Catalano, Y. Ning, and P. Koutrakis. 2001. A Pilot Investigation of the Relative Toxicity of Indoor and Outdoor Fine Particles: In-vitro Effects of Endotoxin and Other Particulate Properties. *Environ. Health Perspect.* 109: 1019-1026.

Long, C.M., H.H. Suh, and P. Koutrakis. 2001. Using Time- and Size-Resolved Particulate Data to Quantify Penetration and Deposition Behavior. *Environ. Sci. Technol.* 25: 2089-2099.

Gustafsson, Ö, C.M. Long, J. MacFarlane, and P.M. Gschwend. 2001. Fate of Linear Alkylbenzenes (LABs) Released to the Coastal Environment near Boston Harbor. *Environ. Sci. Technol.* 25: 2040-2048.

Long, C.M., H.H. Suh, and P. Koutrakis. 2000. Characterization of indoor particle sources using continuous mass and size monitors. *J. Air & Waste Manage. Assoc.* 50: 1236-1250.

Menzie, C.A., J.S. Freshman, and C.M. Long. 1997. Developing Environmentally Acceptable Endpoints for Soil Based on Ecological Considerations. In *Proceedings for the Air & Waste Management Association's 90th Annual Meeting & Exhibition, Toronto, Ontario,* June 8-13.

Presentations

Long, C.M. and B.D. Beck. 2002. An Evaluation of Potential Human Exposures to Trace Metals and Radionuclides in Construction and Building Materials Containing Coal Combustion Products. Poster presentation at 2002 International Society of Exposure Assessment (ISEA)/International Society of Environmental Epidemiology (ISEE) Annual Conference, Vancouver, August 11-15, 2002.

Long, C.M., H.H. Suh, and P. Koutrakis. 2001. Understanding Indoor Exposures to Ambient Particulate Matter: Estimates of Penetration Efficiencies and Deposition Rates for Residential Homes. Poster Platform Presentation at the 2001 Society for Risk Analysis Annual Meeting, Seattle, WA, December 2-5, 2001.

Sarnat, J.A., C.M. Long, P. Koutrakis, and H.H. Suh. 2001. Evaluating Tracers of Ambient $PM_{2.5}$. Platform Presentation at the ISEA 2001 Conference, Charleston, SC, November 4-8, 2001.

Long, C.M., H.H. Suh, and P. Koutrakis. 2000. Using Time- and Size-resolved Particulate Data to Investigate Infiltration and Deposition Behavior. Platform presentation at the ISEA 2000 Conference, Monterey Peninsula, CA, October 24-27.

Long, C.M., H.H. Suh, and P. Koutrakis. 2000. Using Time- and Size-resolved Particulate Data to Investigate Infiltration and Deposition Behavior. Platform presentation at the AWMA PM2000 Specialty Conference, Charleston, SC, January 24-28.

Long, C.M., H.H. Suh, and P. Koutrakis. 2000. Characterization of Indoor Particle Sources Using Continuous Mass and Size Monitors. Poster presentation at the AWMA PM2000 Specialty Conference, Charleston, SC, January 24-28.

Long, C.M., H.H. Suh, and P. Koutrakis. 1999. Characterization of Indoor Particulate Source Strengths Using Continuous Mass and Size Monitors. Platform presentation at 1999 Annual ISEE/ISEA Conference, Athens, Greece, September 5-8.

Bernays, W.H., D.J. Vorhees, C.M. Long, and P. Eremita. 1997. Trial Guideline for Protecting Residents from Inhalation Exposure to Petroleum Vapors. Poster presentation at 1997 Annual Meeting of the Society for Risk Analysis, Washington, DC, December 7-10.

Invited Talks

Long, C.M. and J.A. Sarnat. 2003. Infiltration Behavior of $PM_{2.5}$ Chemical Components: Implications for Exposure Assessment and Epidemiological Associations. Platform Presentation at the Particulate Matter: Atmospheric Sciences, Exposure and the Fourth Colloquium on PM and Human Health, Pittsburgh, PA, March 31-April 4, 2003.