QUESTIONS FOR THE SCIENCE ADVISORY BOARD ON THE TITLE VI RELATIVE BURDEN ANALYSES and CUMULATIVE OUTDOOR AIR TOXICS CONCENTRATIONS AND EXPOSURE METHODOLOGY

I. Background

Title VI of the Civil Rights Act of 1964 as amended (Title VI) prohibits recipients of Federal financial assistance (such as state environmental departments) from discriminating on the basis of race, color, or national origin in their programs or activities. Title VI requires Federal agencies that provide financial assistance, including the Environmental Protection Agency (EPA), to ensure that recipients of Federal financial assistance do not discriminate on the basis of race, color, or national origin. Discrimination can result from policies and practices that are neutral on their face, but have the *effect* of discriminating. In addition to prohibiting intentional discrimination, EPA's Title VI regulations (40 C.F.R. Part 7) prohibit facially-neutral policies or practices that result in a disparate adverse impact, unless it is shown that they are justified and that there is no less discriminatory alternative.

Since 1993, EPA has received an increasing number of Title VI complaints that allege violations of EPA's discriminatory effects regulations from the issuance of pollution control permits by EPA recipients. EPA's Office of Civil Rights (OCR) currently has 15 open investigations, as well as 12 awaiting processing, of complaints which allege discriminatory effects of permitting decisions. On February 5, 1998, EPA released its *Interim Guidance for Investigating Title VI Administrative Complaints Challenging Permits* (*Title VI Interim Guidance*) which is an internal guidance document that describes how OCR will process these types of complaints. Generally, Title VI complaints are subject to the following process: 1) initial finding of disparate impact, 2) presentation of rebuttal evidence, 3) identification of legitimate justifications, and 4) identification of less discriminatory alternatives. EPA is currently focused on developing sound methods for establishing the first element of this process - the initial finding of disparate impact. OCR is interested in developing tools that can be used repeatedly with some ease so that ultimately they may be used by recipients and others as a means of identifying potential Title VI disparate impacts in the context of individual permit decisions.

The investigation and resolution of Title VI complaints regarding potential discriminatory effects of environmental permitting decisions is precedent-setting and may have implications on how recipient agencies implement their environmental permitting programs to ensure no person is discriminated against based on race, color, or national origin. As a result, the issue of how to measure disparate adverse impacts from permitted facilities has had high visibility in the news media, as well as generated interest and debate within the industrial, state/local government, and environmental justice communities.

A. Context for Assessing Title VI Violations

EPA's Title VI discriminatory effects regulations are violated if facially-neutral policies or practices result in a disparate adverse impact, unless it is shown that they are justified and that there is no less discriminatory alternative.

Most of the Title VI administrative complaints filed with OCR under the discriminatory effects standard have involved the issuance of permits for facilities ordinarily considered to be undesirable, including hazardous and municipal waste landfills and incinerators. Some complaints have involved permits for product manufacturing facilities. These activities, requiring environmental pollution control permits, may have both positive impacts (*e.g.*, economic development, necessary services, employment opportunities) and negative impacts (*e.g.*, pollutant emissions and discharges, noise, odors, accidents) upon the surrounding areas and nearby populations. OCR recognizes that positive impacts can and often do result from the operation of such facilities and that such positive impacts can be considered in the justification phase of the Title VI analysis. However, the particular methods and analytic tools discussed herein are solely to measure and analyze specific negative (undesirable) impacts on the surrounding community.

The *Title VI Interim Guidance* states that investigations will include an evaluation of permitted facilities "which together present cumulative burden or which reflect a pattern of disparate impact." OCR anticipates that many of these Title VI investigations will involve evaluating aggregated, or cumulative, impacts on population subgroups defined by race, color, or national origin. The range of permitted facilities within the scope of these investigations is potentially broad.

To determine whether the operation of permitted facilities poses, as an initial matter, a disparate adverse impact based on race, color, or national origin within surrounding populations, OCR needs a method of measuring or estimating the difference in the impact between population subgroups. First, OCR needs to determine whether population subgroups defined by race, color, or national origin are experiencing a substantial difference in impact (*i.e.*, disparity of impact). Second, OCR will determine whether the impact experienced by such population subgroups are at or above a level of concern (as opposed to *de minimis*) so as to be considered adverse (*i.e.*, the impact is harmful). The determination of whether an identified disparity is substantial and whether the impact is at or above a level of concern are policy issues. However, the methods and tools used to identify the disparity and to measure the impact used in these policy decisions *are* scientific in nature and should be subjected to peer review.

B. Approaches to Analyzing Impacts of Permitted Toxic Air Emissions

In developing the methodologies described below, EPA considered the number and types of facilities potentially involved in these complaints, regulatory time constraints for resolving Title VI administrative complaints (*i.e.*, 180 days), the type of data likely to be made available in such a time frame, as well as resource implications for OCR and recipient agencies. These considerations limit the nature and level of analysis that can be performed and preclude the conduct of detailed risk assessments.

Impacts from permitted industrial activity tend to be distributed in certain geographic patterns relative to the facilities themselves. Permitted air emissions (stack and fugitive emissions) impact surrounding populations via local wind patterns and inversely with distance from the facility. To determine whether permitted "toxic" air pollution emissions have a disparate adverse impact on population subgroups defined by race, color, or national origin, EPA has developed and applied relative burden analyses in an investigation of a Title VI administrative complaint that alleges the Louisiana Department of Environmental Quality's issuance of a Title V permit under the Clean Air Act to Shintech, Inc. for a proposed polyvinyl chloride facility will result in discriminatory effects (*i.e.,* an unjustified disparate adverse impact) on African Americans. The analyses assist EPA in determining the average burden from these combined toxicity-weighted Toxics Release Inventory (TRI) air emissions upon one population subgroup compared to another and to obtain rough estimates of cumulative risk in areas proximate to the permitted facilities.

In addition, EPA proposes to use, in the Louisiana complaint investigation, the Cumulative Outdoor Air Toxics Concentration and Exposure Methodology (COATCEM). This methodology is similar to the Office of Policy (formerly, Office of Policy, Planning and Evaluation) Cumulative Exposure Project (CEP) methodology that was reviewed by the Science Advisory Board (SAB) in 1996 (SAB, 1996). Like the CEP, the proposed COATCEM approach uses a Gaussian dispersion model to analyze outdoor air concentrations of hazardous air pollutants (HAPs) over large areas from point sources, mobile sources, and area sources in combination. Emissions estimates to be used in the model include data for approximately 115 individual HAPs from the 1996 Louisiana Toxics Emissions Data Inventory (TEDI) and, for mobile sources and area sources, from EPA's National Toxics Inventory. Modeled concentrations for individual HAPs will be compared with health benchmark concentrations for the HAPs to develop several multiple-pollutant metrics. The technical approach for COATCEM will be similar to that for CEP, but will be done on a census block level of resolution, while the CEP was conducted at the census tract level.

OCR plans to use both methodologies, as appropriate, to generate information about disparity of impacts, potential harm of toxic air emissions from a variety of facilities, and estimates of the overall cumulative background levels of risk from sources in the area of concern. This information will supplement other evidence regarding other impacts gathered during the course of an investigation and will be useful to consider in making the policy-level decisions that must be made in Title VI cases.

The relative burden analyses and the COATCEM methodologies are discussed separately in the sections below. The data, provided in the enclosed materials, illustrates how the relative burden analyses would function in a case-specific context. The data were developed in the Louisiana complaint investigation. OCR has not yet generated data using the COATCEM, therefore only a description of this process is enclosed.

II. Relative Burden Analyses

Relative burden analyses focus on the allegedly discriminatory distribution of routine air emissions from stationary sources. The analyses utilized 1995 TRI emissions data (the latest year for which the data were available), and to some extent, the 1996 Louisiana TEDI. For the most part, these data are generated from facility self-reports. In these particular analyses, an effort was made to develop easily replicable analytic tools for use in identifying Title VI concerns more broadly, and accordingly, no attempt was made to collect or otherwise obtain site-specific air monitoring data. While this might limit the use of the analysis to a screening level, the methodology itself can use any number of types of data as input, so the unavailability of actual site-specific emissions monitoring data or meteorological monitoring data should not be considered a weakness of the methodology, *per se.* To the extent that site-specific monitoring data would, in any case, lead to a different conclusion than the relative burden analyses, this is information that can be introduced by a state recipient at the rebuttal stage of the Title VI process.

The population subgroups considered in this case were African Americans and non-African Americans within the state of Louisiana. Theoretically, one way to compare the impacts of industrial facilities on proximate subpopulations (African Americans and non-African Americans) is to measure or estimate and compare the absolute impacts for each subgroup, as through a site-specific risk assessment. The fact that many of the impacts measured in such a detailed risk assessment would be the same for both groups and therefore “cancel out” in a comparison, is useful to focus the analysis on those impacts that differ for the groups.

A. Disparity Analysis

There are three keys to an analysis of how negative (*i.e.*, undesirable) impacts from permitted facilities fall on populations proximate to those facilities:

1. Establishing an “intensity” measure (*i.e.*, burden);
2. Establishing how the burden is distributed geographically; and
3. Identifying the patterns of burden distribution relative to the population distribution

B. Example: Impact from Airborne Releases

The following sections describe how the approach above was used to estimate the difference in impacts on African Americans and non-African Americans from reported industrial airborne emissions.

1. Establishing an Intensity Measure

The first key to the analyses is establishing an “intensity unit” for the impact being investigated (the “burden”). In this case, airborne pollutant emissions are the impact because they are released to the atmosphere where the population can be exposed to them. Higher emissions result in higher concentrations, and therefore higher “burdens.” The burden varies geographically and should be proportional to the concentration of the airborne pollutants at a given geographic location. It is not necessary for the burden to be absolutely *equal to the impact*, just that it be proportional to it, since it will be used to compare two groups in a ratio. For example, a burden of 10 units at a given geographic point should represent twice the potential impact of a burden of 5 units at any other geographic point.

The multitude of chemicals (currently over 650) in TRI reports presents a challenge to developing an intensity measure that would be useful at a given geographic point, since chemicals differ widely in their ability to cause harm. To simplify the analysis, the relative burden analyses use a procedure which “normalizes” the toxicity of the chemicals, adds these normalized chemicals together, and treats the emissions as if they were one pseudo-chemical (called “adjusted air release”).

The Office of Pollution Prevention and Toxics (OPPT) developed a method of weighting chemicals according to their potential to cause chronic human health effects in their Risk Screening Environmental Indicators work (US EPA, 1997). This work has been reviewed by the SAB (SAB, 1998), and OPPT subsequently enhanced the methodology. (US EPA, 1998). The relative burden analyses use this method to “weight” the various reported chemical emissions according to their toxicity. Application of the toxicity weighting methodology to the emissions data allows the total mix of air emissions data to be normalized for its potential to cause chronic harm to human health.

The Environmental Indicators toxicity weights, as used in this example, work as follows. Different chemicals have differing weights ranging from less than 1 to 1,000,000. In the case of inhalation-related effects, these continuous weights are directly related to unit risk values for carcinogens and Reference Concentrations (RfCs) for non-carcinogens. Generally, chemicals with the same unit risk values or RfCs have the same weight; if the unit risk values or RfCs differ by a factor of two, the weight differs by a factor of two. The weighting system allows the relative burden analyses to apply relative toxicities for a group of chemicals and “normalize” them, after which the pounds of each can be added together as if they were all a single entity for the purpose of this analysis. If the toxicity weight of two chemicals is the same, the pounds of both can be added; if a chemical has half the weight of another, the pounds of release are adjusted to be half as much, and then the adjusted pounds can be added.

The pounds of each individual chemical from the facility is adjusted to the number of pounds it would take to equal a chemical with a weighting factor of 100,000. The actual pounds are multiplied by the chemical's weighting factor, then divided by a 100,000 factor to obtain the “adjusted” pounds of each chemical. The practical result of this adjustment is that very toxic chemicals remain at or near their actual pounds of emissions, while less toxic chemicals are “discounted” in the number of pounds released. After the adjusted pounds of each individual chemical are calculated, the adjusted pounds of all chemicals are added together to obtain the adjusted air release for each facility. Stack and fugitive emissions are totaled separately for modeling purposes. This adjusted air release, in pounds/yr, is then treated as if it were one chemical, and provides the "intensity unit" (burden) for air emissions from the facility. Since the chemicals have been normalized for toxicity, an adjusted air release of 10 lbs/yr now has twice the impact of an adjusted air release of 5 lbs/yr.

Although this method of normalizing toxicity is useful in allowing all of the emissions to be treated as one chemical, there are simplifying assumptions that need to be considered for uncertainty purposes. If the pseudo-chemical is used in an air model, heavier-than-air particulates are not considered to be different from other air pollutants. Fugitive and stack emissions must be normalized and treated separately, since they will be modeled separately. Finally, there are a number of chemicals for which no toxicity weight is available within the RSEI. (In the Title VI case for which the data was developed, these chemicals are listed in Table A-1 of the appendix.)

Charge Question #1: The Risk Screening Environmental Indicators (RSEI) toxicity weights that Office of Pollution Prevention and Toxics (OPPT) developed have been reviewed and commented upon by the SAB within the past year [EPA-SAB-EEC-98-007]. OPPT has addressed the major concerns of the SAB as to having the weights ordered on a continuous scale directly related to their toxicity values rather than in order of magnitude "bins" and avoiding truncation of the value range. The use of these weights for the specific purpose of doing relative burden analyses in the way outlined in the review document has not been commented upon by the SAB. What are the strengths and weaknesses of this approach, which applies the toxicity weights to a number of chemicals released into the air, for the purpose of developing a burden measure?

2. Establishing Geographic Distribution of Burden.

The second part of the analysis determines or estimates how the burden, is distributed geographically around each facility. Two different approaches were used in the development of the relative burden analysis. The first, "basic" method, distributed the burden evenly within a circle of certain radius from the facility, which is treated as a point source. This simple method requires no air modeling and provides a "rough cut" estimate. This Basic Relative Burden Analysis (BRBA) was developed before the particular air modeling tool (The Ecological Sensitivity Targeting and Assessment Tool (ESTAT) Version 1.0, Science Applications International Corporation, November, 1996) was available for use in the Enhanced Relative Burden Analysis (ERBA). The "enhanced" method, used ESTAT's standard dispersion model to estimate distribution of the burden within the proximate area of the facilities.

a. Basic Relative Burden Analysis Method

The BRBA method obtains a burden value by taking the adjusted air releases, in lbs/yr, divided by the circular area proximate to the facilities (*e.g.*, 2 or 4 mile radius), in square miles. The resulting burden values (in lbs/mi^2 (per year)) are assigned to any person living within the circular area being evaluated. All persons living within the circular area, would be assigned the same burden from the corresponding facility.

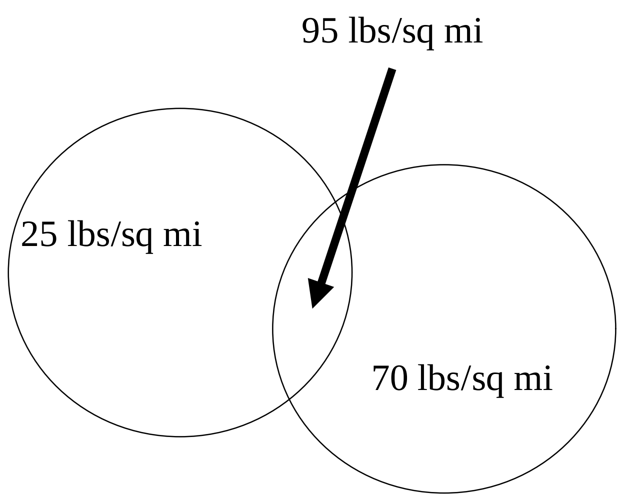

Figure 1. Overlapping facilities

As long as the circular areas have the same radius, multiple facilities can be evaluated using this method, and where those circles overlap, the burdens are added in the area of overlap. For example, if Circle A has a burden of 25 in lbs/mi^2 and overlapping Circle B has a burden of 70 lbs/mi^2, the persons living in the overlap area would be assigned both burdens, or 95 lbs/mi^2 (See Figure 1).

The BRBA is primarily used to calculate the average burden for the two population subgroups (*e.g.*, African Americans and non-African Americans) residing in proximity to the permitted facilities. Whenever multiple facilities with different adjusted air emissions values exist, or overlap of the circular areas occurs, persons residing in various locations within those circular areas will be assigned different burdens. If persons of one population subgroup live near facilities with higher adjusted air emissions, or in areas where facility circles overlap, then the average burden for that population subgroup will differ from that of the study area as a whole.

There are advantages and disadvantages to the BRBA method of distributing burden evenly within circular areas surrounding the permitted facilities. Some obvious advantages are that the method is simple, easy to understand and explain, uses only facility location, emissions volume and chemical toxicity ranks, and provides information at a rough screening level. Obvious disadvantages are that it does not utilize meteorological conditions, including prevailing wind speed and direction, and does not consider stack parameters such as height and temperature.

Another disadvantage is that is assumes that every person residing within the circular area is allocated the burden equally and fully, while persons residing on the outskirts of the circle are not burdened. This assumption in the BRBA also creates a degree of uncertainty that the ERBA does not. With the BRBA, the average burden for everyone within a single circle will be the same. Therefore, if a ratio is constructed between the average burden of one subpopulation versus another for a single facility circular area with no overlaps, the ratio will always be 1.0. The ERBA method described below, will not have such a result since modeling that takes into account meteorological conditions is used to distribute the burden within the circular areas. Table A-2 shows the Relative Burden Ratios for the 2-mile and 4-mile circles for the facilities with TRI air emissions using both the BRBA and ERBA methodologies. Comparing these ratios with each other and a value of 1.0 should provide some indication of the effect of the BRBA method's "equal burden within the circle" simplification.

Charge Question #2: The Basic Relative Burden Analysis (BRBA) method is relatively simple and may not consider important parameters such as relative proximity, weather, and stack height. Please provide comment on the strengths, weaknesses, and utility of the "basic" method in estimating the distribution of burden to areas proximate to facilities with air emissions.

b. Enhanced Relative Burden Analysis Method

The enhancement of the BRBA method based on the ESTAT GIS (The Ecological Sensitivity Targeting and Assessment Tool) uses a standard air model (the Industrial Source Complex - Long Term, Version 2, or ISCLT2) to distribute the adjusted air emissions from permitted facilities. ESTAT is a Geographic Information System (GIS) tool for modeling, analyzing, and mapping contaminant releases from EPA and state regulated facilities. ESTAT performs airborne concentration dispersion modeling, as well as downstream dilution modeling of water contaminants for any area of the conterminous United States. ESTAT, programmed in ARC/INFO, analyzes and maps facility and pollutant data from EPA's Envirofacts data base, together with spatial information from the EPA Spatial Data Library. ESTAT and these two data bases are maintained on a Unix server at Research Triangle Park, North Carolina. EPA staff anywhere in the country can be set up to access ESTAT from their desktop computers.

The model treats fugitive and stack emissions separately, and accounts for prevailing winds and other meteorological conditions. The output of the model is a ground-level concentration map of the adjusted air emissions. Rather than measuring burden in lbs/mi^2, as in the BRBA methodology above, the concentrations of the adjusted air emissions – in micrograms per cubic meter ($\mu g/m^3$) – become the burden value. As with the BRBA burden values, the ERBA values are additive for areas which are within the circular areas of multiple facilities. The ERBA method is not as simple as the BRBA method, but is likely to be more accurate, if appropriate meteorological information and stack parameters are available.

The burden values, whether lbs/mi^2 (BRBA method) or μg/m^3 (ERBA method), are assigned to each person in the census block within the circular area analyzed. Blocks which are in proximity to more than one facility receive a burden value from each which is summed.

Charge Question #3: The Enhanced Relative Burden Analysis (ERBA) method was an extension of the BRBA by using the Industrial Source Complex - Long Term, Version 2 (ISCLT2), a standard air model, to model the toxicity-weighted air emissions from each facility. The toxicity-weighted air emissions are modeled as if they were one "pseudo-chemical," although stack and fugitive emissions were treated separately for each facility. This approach has been adopted in order to make more manageable the screening evaluation of potentially hundreds of chemicals and multiple sources. Please provide comment on the utility and limitations of modeling several chemicals simultaneously as one pseudo-chemical with the model. If individual chemical properties would make this modeling method problematic, which classes of air release chemicals are likely to need to be modeled separately? Within the relatively small geographic areas analyzed, will atmospheric degradation play a major factor in the analysis?

Charge Question #4: In the ERBA method, modeling of the air emissions was truncated at 2, 4, or 6 miles. For example, in the 4-mile run, burden was added to census blocks within 4 miles from each facility, but not beyond that, and correspondingly for the 2- and 6-mile runs. Computationally, the number of census blocks potentially affected increases dramatically with increasing radius from the facility and the burden values drop off as the radius increases. (For example, with 314 facilities in Louisiana, the total number of census block-facility combinations within 6 miles of any facility was over 300,000). What are the strengths and weaknesses of limiting the modeling to a certain radius from the facility for the purpose of evaluating burden, and specifically, 2, 4, or 6 miles?

3. Analyzing the Relative Burden for Various Groups

The 1990 Census of Population counts by race, age, and sex are tabulated by blocks, which are also associated with estimated burden values. The burdens for African Americans, for example, can be totaled over many such census blocks in proximity to multiple facilities, and an average burden value determined. When a census block is bisected by the circle, the block population is adjusted to use a fraction of the population of the block that corresponds to the fraction of the area within the circle, preserving the racial proportions within the block. Although this is simple arithmetically, obtaining the information to analyze large areas usually requires the use of Geographic Information Systems (GIS), and obtaining the total number of people in a subgroup without double-counting due to overlapping facility circles needs to be done with some care. Although the math is straightforward, the process can be computationally intense.

Whether the BRBA or ERBA method is used, the initial approach to analyzing the burden for different subgroups within the population is the same: find the average burden for all the people in one particular subgroup (in this case African Americans or non- African Americans), and compare it to the average burden for the persons in another subgroup. This is done with a simple mathematical ratio ("Relative Burden Ratio"):

Relative Burden Ratio = (Avg. Burden for Group A) / (Avg. Burden for Group B)

The average burden for a subgroup is calculated by adding the burden values for each member of the subgroup (*i.e.*, the concentrations or lbs/mi^2 in the census block in which they live) and dividing by the total number of people in the subgroup.

Charge Question #5: Please provide comment on the strengths and weaknesses of the ERBA methods for analyzing the relative burdens from airborne emissions from nearby facilities for one population subgroup versus another in populations proximate to fixed air emissions sources?

4. Facility-Based Analysis vs. Community-Based Analysis.

To this point, the permitted facilities reporting chemical emissions have been the starting point for the focus of the analysis. Once the burden values have been assigned to each census block, several other types of analysis are possible. Unlike the process of distributing the burden for a single facility, the census blocks now contain burden information for all facilities in the area (given the limits of the 2, 4, or 6-mile circles), so the analysis can be done on a census block basis rather than a facility basis. (This is an estimate of cumulative burden from all the facilities in the area for people within the census block.) The burden of a particular area (*e.g.*, a 4-mile area around a proposed site) can be compared to the burden of other such 4-mile areas around other facilities by looking at the collection of census blocks within the 4-mile circles. Census blocks within a large area of study (*e.g.,* all blocks within 4 miles from any of several hundred facilities) can be evaluated and ranked, using percentiles.

Possible extensions to this analysis include comparing the population characteristics at the upper and lower end of the spectrum of estimated burden (*e.g.*, for the highest and lowest 20th percentiles). This approach would allow examination of the characteristics of the most and least-impacted populations, respectively. Alternatively, the population characteristics at or above some threshold of interest in the burden levels could be examined and compared to the entire proximate population and/or the general population.

Charge Question #6: The average toxicity-weighted concentration, or burden, for each census block has been calculated. Please provide comment on the strengths and weaknesses of additional information which can be derived from the BRBA and ERBA methods, such as ranking census blocks in the state or smaller geographic area by average burden value or comparing the average burden in blocks near one facility to those near another for the purpose of identifying potential problem areas.

C. Specific Relative Emissions Burden Analyses

Both the BRBA and ERBA methods were applied in an analysis as part of the current investigation in Louisiana. The analysis considered the air emissions from permitted industrial facilities within Louisiana that reported to the EPA Toxic Release Inventory (TRI), and also those facilities which report to Louisiana's Toxic Emissions Data Inventory (TEDI) system. There were 314 facilities that reported to TRI in 1995 (the latest year for which data were available at that time), and 226 facilities reporting to TEDI in 1996 (the latest year for which data were available). About half of the TEDI facilities also report to TRI. Since both databases contained facilities with zero air emissions, an analysis was also done on facilities that had air emissions (TRI>0), and facilities with emissions in excess of 100,000 pounds/yr (TRI>100K, TEDI>100K).

In addition, an analysis was done on the facilities within the 12 parishes known as the Lower Mississippi Industrial Corridor[1], and also on the facilities within St. James Parish, where the proposed site was located. In all, there were 15 “universes” of facilities which were analyzed with a varying number of facilities (a “universe” is defined by the type of facilities included (*e.g.*, TRI) and the geographic area considered (*e.g*., State)). The second number in the St. James Parish column, below, indicates the number of facilities outside the parish which are within 4 miles of the parish and add burden to blocks within the parish:

1 Ascension Parish, East Baton Rouge Parish, Iberville Parish, Jefferson Parish, Orleans Parish, Plaquemines Parish, St. Bernard Parish, St. Charles Parish, St. James Parish, St. John the Baptist Parish, West Baton Rouge Parish, West Feliciana Parish

Facility Universe	Statewide	Industrial Corridor	St James Parish
All TRI	314	141	9/9
TRI>0	246	116	7/9
TRI>100K	81	48	4/8
All TEDI	226	106	4/8
TEDI>100K	80	46	3/6

An additional analysis was conducted of all facilities which were within 6 miles of any of the census blocks located within 6 miles of the proposed site of the Shintech facility (largest possible distance from Shintech site=12 miles). There were 21 facilities within St. James and Ascension Parishes which met these criteria.

Basic Relative Burden Ratio Methodology Procedure. The calculations proceeded in several steps:

1. The 1995 TRI and 1996 TEDI information was obtained and the chemicals weighted according to the method outlined above. The chemicals for which no toxicity weights were available were not included in the analysis. A list of the chemicals involved and the number of pounds of each is included in Table A-1 in the Appendix. Of the approximately 85 million pounds of TRI emissions in Louisiana 1995, about 83 million pounds (almost 98%) were accounted for with toxicity weights. Of the remaining chemicals in Table A-1, about 1.6 million pounds were CFCs, which are expected to have low chronic human toxicity weights, so their exclusion is not expected to have a significant effect on the analysis. If these are included with those chemicals for which weights are established, about 99.5% of the total emissions are accounted for in the analysis.

The remaining adjusted chemical amounts were added, and a total for each facility determined (See, Table A-3 in the Appendix).

2. The verified point locations were obtained from EPA's Region VI for facilities in the TRI and TEDI databases. These locations were input to a GIS which also contained census block locations and 1990 census data for each census block. Two- and four-mile radius circles were drawn around all facilities and the total population within the circles determined and broken out by African American and non-African American. The data for the 314 TRI facilities is shown in Table A-4 in the Appendix. The 6-mile analysis was done primarily for the purpose of evaluating the circle around the proposed facility, and to look for consistency with the 2- and 4-mile estimates statewide.

3. The total population within the 2- and 4-mile radius circles for the various groups of facilities, avoiding double-counting due to overlapping circles, was determined by GIS analysis performed by US EPA's Region VI. The totals for the 15 “universes” are given in Table A-5 in the Appendix.

4. The burden values were calculated by dividing the adjusted air emissions values for each facility by the appropriate area for a 2- or 4-mile radius circle. The resulting burden values were applied to all persons within the circles as determined in step 2 by multiplying the burden values (lbs/mi^2 per yr) times the number of African-American or non-African American persons within the circle. This results in a cumulative burden subtotal (in person-lbs/sq mi per year). It is the same as adding the burdens for each person in each group in the circle, for a total burden for each group.

5. The cumulative burden subtotals for each racial group calculated in Step 4 for all facilities in the particular “universe” are added, then divided by the total number of persons (African American and non-African American) in that particular “universe's” 2- or 4-mile radius circles, found in Step 3. This results in two numbers, an average burden value for African Americans in the facility “universe,” and an average burden value for the non-African Americans in the same “universe.”

6. The average burden for African Americans is divided by the average burden for non-African Americans to yield the Relative Burden Ratio. The ratio is interpreted as follows. A ratio of 1.0 means that the average burden for African Americans within the 2- or 4-mile radius circles around the facilities in the “universe” being studied is equal to that of non-African Americans. If the resulting ratio is 1.5, it means that the average burden for African Americans within the 2- or 4-mile radius circles around the facilities in the “universe” being studied is 50% higher than non-African Americans. Likewise, if the value is 0.7, it means the average burden for African Americans within the 2- or 4-mile radius circles around the facilities in the “universe” being studied is 30% lower than non-African Americans (or only 70% of the burden of non-African Americans).

Charge Question #7: What are the strengths and weaknesses of the BRBA methodology for assessing relative impacts on population subgroups?

7. The average burden for each census block in the 2-mile and 4-mile radius circles was also calculated. There were over 28,000 blocks within two miles of a TRI facility statewide, and over 48,000 census blocks within four miles of a facility statewide, disregarding census blocks with zero population. These were ranked using percentiles.

Enhanced Relative Burden Analysis Methodology Procedure. The calculations proceeded in several steps analogous to the basic methodology. The major change was in Steps 3-5.

1. The 1995 TRI information was obtained and the chemicals weighted according to the method outlined above. This was done in the same manner as for the BRBA method, above.

2. The verified point locations as in the basic method, above, were used for all the facilities in the TRI and TEDI data bases. These locations were put into a GIS which also contained census block locations and 1990 census data for each census block. Two- and four-mile radius circles were drawn around all facilities and the total population within the circles determined, broken out by African American and non-African American. The population data for the 314 TRI facilities is shown in Table A-4 in the Appendix.

3. The ISCLT2 model, within the ESTAT GIS, calculated concentrations over the 6-mile area for each facility using a 50 meter by 50 meter grid system. The totals for the 15 “universes” are given in Table A-5 in the Appendix. The total population within the 6-mile circles was calculated analogously.

4. The burden values were calculated by using ISCLT to model the emissions over a 6-mile area. The stack parameters (height, exit velocity, temperature, etc.) for stack emissions were defaults, as actual data were not available for stack parameters in the area. The defaults were the average stack parameters for facilities of the same primary SIC codes of each facility. Fugitive emissions were modeled as area sources at ground level.

The ESTAT model calculated concentrations over the 6-mile area for each facility using a 50 meter by 50 meter grid system. In most cases, these grid cells were smaller than the size of a census block. The average concentration of all the grid cells within the census block was used as a burden value for that census block. The resulting block burden values were applied to all persons within the block. The total burden values for each block were determined by adding all burden contributions from facilities which impacted a particular block. Cumulative burden values were calculated on a block-by-block basis by multiplying the total burden values ($\mu g/m^3$) times the number of African-American or non-African American persons within the block. This results in a cumulative block burden subtotal (in total $\mu g/m^3$) for each subgroup.

5. The cumulative block burden subtotals by racial group calculated in Step 4 for all facilities in the particular “universe” are added on a block-by-block basis. Total cumulative block burdens for blocks within the 2-, 4-, or 6-mile radius circles for the particular analysis are then divided by the total number of persons (African American and non-African American) in that particular “universe's” 2-, 4-, or 6-mile radius circles, found in Step 3. This results in two numbers, an average burden value for African Americans in the facility “universe,” and an average burden value for the non-African Americans in the same “universe.”

6. The average burden for African Americans is divided by the average burden for non-African Americans to yield the Relative Burden Ratio (African-American/non-African American). The ratio is interpreted as discussed above.

7. An analysis of the 2, 4, and 6-mile radius circles around the proposed facility was performed.

Charge Question #8: What are the strengths and weaknesses of the ERBA methodology for assessing relative impacts on population subgroups?

D. Estimation of Risk and Hazard Index

Once the relative burden ratios are calculated, this information can be used to help decision-makers determine whether the relative difference is significant. The second part of the Title VI analysis questions whether the identified burdens represent a level of concern considered harmful as opposed to *de minimis* levels.

With certain assumptions, once the block-by-block concentrations of the pseudo-chemical have been calculated, they can be used to back-calculate a rough estimate of risk or hazard index since the pseudo-chemical has been normalized to a toxicity weight of 100,000. Since the RSEI uses inhalation weights that are proportional to unit risk values and RfCs, if the cancer and non-cancer portions of the emissions are kept track of separately (for both fugitive and stack emissions, since the percentage will differ), each census block will now have a total burden concentration that is made up of a cancer part and a non-cancer part. These sub-burdens can be related back to risk numbers and hazard indices.

There are several reasons to be cautious with these risk numbers and hazard indices, using them only as a rough indication of whether the levels of potential harm in an area are high enough to avoid being classed as *de minimis.* Looking at burden (defined here as the availability of air emissions impacts in an area where people reside) in a relative way between two population subgroups does not necessarily get into the questions of exposure scenarios, sensitivity, additivity of risk, or the interpretation of hazard indices greater than one. When taking the step into looking at possible harm, many factors enter the issue that will preclude the risk estimates from being more than screening level estimates.

One set of cautions involves the exposure scenarios implicit in the unit risks and RfCs. Both of these derived numbers make certain assumptions about duration of exposure and certain standard assumptions about activities including respiration rates. If the scenarios do not match the conditions in a particular analysis, this will introduce uncertainty in the analysis. The biggest assumption in back-calculating risks and hazard indices is the assumption that people remain where they live, and breathe the air at that point all the time. We know that people move from place to place during the day, and that in many cases are in environments that are indoors rather than outdoors where the burden is calculated. Although some relatively small segment of the population may remain in areas with reasonably constant average burdens, this simplifying assumption will introduce uncertainty into the estimate.

Another set of cautions involves the methods used to normalize chemical toxicities. First, the RSEI weights have in some cases been derived or estimated from data on other routes of exposure, so there is some uncertainty inherent in this method. This may lead to either underestimated or overestimated risks. Second, there may be chemicals for which there are no available weights (See, discussion above and Table A-1), which would lead to an underestimate of risk. The alternative to backing out the risk estimates from the normalized pseudo-chemical concentrations would be to model run each chemical separately.

A third set of cautions involves the additivity of potential effects, both on the unit risk and the hazard index sides. The procedure of adding hazard index values for various chemicals, regardless of similarity of effect, has been generally viewed as conservative. Likewise, the possibility exists for synergism or antagonism for various chemicals which would introduce uncertainty into adding cancer risks over several chemicals. In viewing the data for the Louisiana study area, however, it appears that often when a high burden value is found in a particular census block, this is mostly the result of one chemical, or at most a few chemicals. For that reason, the procedure may not be as conservative as it would initially appear, as it is often possible to calculate risks or hazard indices using unit risk values or RfCs directly for a single chemical and get risk values approximating the ones back-calculated using this method.

Charge Question #9: Please provide comment on the appropriateness of the review document's interpretation of the Relative Burden Ratio, given the methodology and data used.

Charge Question #10: Please provide comment on the strengths and weaknesses of the ERBA method of estimating general risk and hazard numbers from concentration burdens and its utility for screening out *de minimis* burdens.

IV. Proposed Cumulative Outdoor Air Toxics Concentration and Exposure Methodology (COATCEM)

A. Background

This project may be conducted to estimate cumulative exposures and indicators of potential impact by race and location in Louisiana as part of the Title VI investigation of the proposed Shintech facility. It will rely upon several data bases and analytical models to perform these estimates.

The effort will be divided into five components:

1. compilation of input data from all available source categories;
2. use of models to estimate outdoor atmospheric concentrations;
3. comparison of modeled and monitored concentrations;
4. linking of modeled concentrations with residential population to estimate exposures; and
5. comparison of exposure levels with health risk benchmarks to estimate potential health impacts.

The first three components are to be performed by the EPA Office of Air Quality Planning and Standards (OAQPS), while the remaining components will be performed by the Office of Policy (OP). A key data set which will be used in the effort is Louisiana's Toxic Emissions Data Inventory (TEDI) for 1996.

Promulgated in 1991, Louisiana's TEDI[2] is an annual reporting requirement, similar to the national Toxics Release Inventory (TRI), for toxic air pollutants. Despite its similarities to the TRI, TEDI includes several pollutants which are not currently subject to TRI reporting requirements (*e.g.*, hydrogen sulfide) or listed as Clean Air Act hazardous air pollutants (HAPs) (*e.g.*, ammonia). Compared to TRI, TEDI expands the range of facilities required to report toxic emissions, but lists a smaller set of chemicals.

TEDI covers approximately 100 air pollutants and classifies them by toxicity. Specifically, TEDI recognizes three classes of pollutants: Class I includes all "known and probable human carcinogens," Class II is comprised of "suspected human carcinogens and human reproductive toxins," and Class III lists "acute and chronic toxins." Under TEDI, facilities, including those classified as "majors,"[3] must provide an annual report, by July 1, on each listed toxic air pollutant. TEDI reports have been received for calendar years 1991 through 1996.

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[2] Chapter 51 of the Louisiana Administrative Code (LAW 33.III.51).

[3] A "major source" is a one with the potential to emit 10 or more tons per year of one pollutant or 25 or more tons per year of a combination of pollutants.

B. Emissions Inventory and Ambient Air Modeling

1. Purpose

The purpose of the ambient air modeling activity is to provide dispersion modeling estimates for a subset of hazardous air pollutants (HAPs) to assess baseline ambient concentrations in three areas:

- Twelve (12) Louisiana parishes that make up the Industrial Corridor, including St. James Parish, where the Shintech polyvinyl chloride plant is proposed to be located;
- If feasible, for the entire state of Louisiana;
- If feasible, including the proposed Shintech facility's expected contributions to the baseline in the area near the site (2 or 4 mile radius, and/or St. James Parish).

2. Toxic Emissions Inventory Development

a. Point Source Emissions

The point source emissions will be obtained from the 1996 Louisiana TEDI, supplemented by the TRI for those sources of HAPs not in the TEDI. Stack parameters from Aerometric Information Retrieval System (AIRS) will be matched to the sources using a TEDI- AIRS crosswalk provided by the Louisiana Department of Environmental Quality (LDEQ). The Aerometric Information Retrieval System (AIRS) and, in particular, the AIRS Facility Subsystem (AIRS/AFS) is a computer-based repository of information about airborne pollution. General information about the AIRS database is available at the Internet website: **http://www.epa.gov/airs/airs2.html.** Although some hazardous air pollutant data are included, AIRS/AFS primarily houses data for criteria pollutants submitted by the States. The facility information includes data on emissions, process, control, stack, and location. However, it can also be accessed to provide information on physical characteristics for facilities that emit pollutants not contained in AIRS. For the COATCEM modeling effort, emissions from the Louisiana TEDI inventory data base will be cross referenced with AIRS/AFS data to complete a model ready emissions inventory. Data gaps related to facility specific processes will be filled, as appropriate, with information from the AIRS/AFS data base. Source Classification Code (SCC) or Standard Industrial Classification (SIC) code default stack parameters will be used for those sources with no match in AIRS.

Point source locations have been verified using geographic information systems (GIS) by EPA's Region 6 office in consultation with LDEQ. Questionable locations were identified and large emission sources (greater than 100,000 lb) were verified where possible. This analysis will use the location data from the demographic analysis conducted for the relative burden analyses.

b. Area Source Emissions

The county-level area source emissions data are from the Environmental Protection Agency:’s (EPA:s) National Toxics Inventory (NTI) Version 9702 (1993 base year). EPA has not yet developed area source HAP emissions estimates for 1996. In EPA's judgment, little change in area source emissions are likely to have occurred from 1993 to 1996; for this analysis, 1996 area source emissions are assumed to be equal to 1993 area source emissions estimates, except for dry cleaners. Emissions estimates for dry cleaners from 1993 have been adjusted to reflect the implementation of the maximally achievable control technology (MACT) emissions standard for this category.

County-level area source emissions will be apportioned to 2 kilometer (km) grid cells within each county using surrogate distribution data, such as residential population and housing. The emissions-surrogate relationship will be derived from the tables used in the Ozone Transport Assessment Group (OTAG) emissions processing. The 2 km grid will be overlaid on to the counties (parishes) and county-wide emissions will be allocated to the grids based on the proportion of each cell’s surrogate value of the total county surrogate. Tables and maps will be produced and reviewed to ensure that the allocation was performed properly.

c. Mobile Emissions

The county-level mobile source emissions data are from the current version of the EPA:s NTI which is under construction (1996 base year). The EPA:s Office of Mobile Sources has reviewed and approved these estimates.

County-level mobile emissions will be allocated to 2 km grid cells using either the presence and length of interstate and other primary roads or population as surrogates. The 2 km grid will be overlaid on to the counties (parishes) and county-wide emissions will be allocated to the grids based on the proportion of each cell’s surrogate value (proportion of total length of road by type) of the total county surrogate. Tables and maps will be produced and reviewed to ensure that the allocation was performed properly.

3. Concentration Modeling Methodology

a. Model Selection and Options

The use of the Industrial Source Complex (ISC3) model is planned. This approach will use the regulatory default options and will not consider atmospheric deposition or chemical transformations (which usually provides conservative estimates of concentrations, except in cases such as formaldehyde, whose concentrations may increase as a result of atmospheric reactions). The model will use rural dispersion parameters in most cases. As currently planned, there will be approximately 115 chemicals modeled for which both emissions estimates and benchmark health values are available.

b. Receptor Locations

Receptor locations will be modeled at census block centroids. Blocks are the smallest geographic unit in which Census data are compiled with population data by race, and usually contain about 100 persons. Block-level data will be used in the demographic estimates performed in the COATCEM analysis.

Approximately 52,000 blocks are located in the following 12 Louisiana parishes in the Industrial Corridor:

Parish (County) FIPS Code	Parish Name
005	Ascension Parish
033	East Baton Rouge Parish
047	Iberville Parish
051	Jefferson Parish
071	Orleans Parish
075	Plaquemines Parish
087	St. Bernard Parish
089	St. Charles Parish
093	St. James Parish
095	St. John The Baptist Parish
121	West Baton Rouge Parish
125	West Feliciana Parish

c. Meteorological Data Selection

Four weather stations data sets are available for Louisiana from the EPA Support Center for Regulatory Air Models (SCRAM) data base.

Station #	City/Airport	Location
03937	Lake Charles/Municipal	30.117, -93.217
12916	New Orleans/International	29.983, -90.250
13957	Shreveport/Regional	32.467, -93.817
13970	Baton Rouge/Ryan	30.533, -91.133

Data will be used from the most recent available data period, 1987-1991, obtained from the SCRAM web site. For the initial runs for the Industrial Corridor facilities, the modeling will use the Baton Rouge and New Orleans stations, based on proximity.

d. Air Quality Data Analysis

Compare ambient concentrations with approximately five monitoring stations in three parishes of the Industrial Corridor, and if feasible, two others in the state.

e. Study Limitations

Some of the more important limitations are that wind flow for receptors near the Gulf or other large water bodies are not being considered, and the ISC3 model provides concentration estimates up to 50 kilometers.

Charge Question #11: The ambient concentration modeling methodology associated with COATCEM is similar to that used in several previous studies conducted by EPA and reviewed by the SAB (e.g., SAB, 1996, EPA-SAB-IHEC-96-004; SAB, 1998, EPA-SAB-EEC-98-007). Are there any assumptions or input data involved in the COATCEM approach which would change the SAB's earlier judgements? Please provide comment on the strengths and weaknesses of the approach for assessing concentrations for the Title VI disparate impact analysis given the large number of sources and chemicals considered in the analysis?

C. Analysis of Disparate Impacts

1. Analysis of Potential Disparate Impacts Using Modeled Concentrations

The modeled concentrations developed with ISC will be analyzed for potential disparate impacts by combining the model outputs with two other data sets: a set of "benchmark concentrations" that represent the potential hazard posed by the HAPs; and a set of demographic data, from the U.S. Census, that represents the racial composition of each census block in the modeling domain.

2. Benchmark Concentrations and Impacts Metrics

Hazard characterization of HAPs for this analysis used benchmark concentrations defined by Caldwell et al. (1998). For cancer, benchmark concentrations are the concentrations posing a one-in-a-million cancer risk for lifetime exposure. For other human health effects, EPA's inhalation reference concentrations (RfCs) or similar values developed by other Federal and state agencies were used to represent levels below which long-term exposure is not expected to result in any adverse effects. Selection of the benchmark concentrations for each HAP placed highest priority on hazard values developed by U.S. EPA; supplementary values were obtained from California EPA and the Agency for Toxic Substances and Disease Registry, as described in Caldwell et al. (1998).

Three different metrics of the distribution of modeled HAP concentrations across census blocks will be calculated. The metrics were constructed as a means to address different considerations in applying hazard data to develop indicators of the combined impacts of multiple pollutants. The total benchmark exceedances metric provides an initial estimate that takes into account both cancer and non-cancer health effects. It provides a measure of the number of HAPs with modeled concentrations that exceed their benchmark concentrations, and incorporates the broadest number of HAPs (*i.e.*, all modeled HAPs with cancer and non-cancer benchmarks). However, it does not provide any information about the degree of exceedance between a modeled and corresponding benchmark concentration. In addition, it does not take into account the potential aggregate effect of multiple air toxics that may have concentrations just below their benchmark concentrations.

Two other metrics are used to provide more information about the potential hazard, the cancer risk metric and the non-cancer toxicity hazard ratio metric. The cancer risk metric incorporates data for those HAPs with cancer benchmark concentrations. The non-cancer toxicity hazard ratio metric incorporates data for those HAPs with non-cancer chronic toxicity benchmark concentrations. These two metrics both provide a continuous measure of the potential hazard, while separating the potential carcinogenic and the non-carcinogenic health effects.

There are a number of uncertainties in the interpretation of these metrics, including: 1) several HAPs do not have available benchmark concentrations and are therefore not included in the analysis; 2) only HAPs that were modeled in the analysis are considered in the metrics; 3) absolute levels of hazard may be underestimated because of the potential, seen in previous uses of Gaussian dispersion models, for underestimation of pollutant concentrations; 4) this analysis assumes that the hazard for the individual HAPs are additive, and does not consider potential synergistic or antagonistic interactions; and 5) this analysis assumes that an individual's exposure is equal to the outdoor concentration in the census block where they reside.

a. Total Benchmark Exceedances Metric

Benchmark exceedances will be calculated as the total number of cancer and chronic toxicity benchmark concentrations exceeded by modeled concentrations in each census block. Approximately 115 HAPs with benchmark concentrations will be used in calculating this metric. Each block has the potential to exceed both cancer and non-cancer benchmarks for a particular chemical.

b. Cancer Risk Metric

This value is the number of excess cancer cases estimated to occur in a population of 1,000,000 people continually exposed to the modeled concentrations over a 70-year lifetime, in each census block. An estimated risk is calculated separately for each HAP and summed across the HAPs in each census block to estimate total cancer risk. Approximately 90 HAPs with cancer inhalation unit risk values will be used in calculating this metric.

c. Non-cancer Toxicity Hazard Ratio Metric

The sum of modeled concentration/non-cancer benchmark concentration across all HAPs with non-cancer benchmarks will be calculated in each census block. Approximately 90 HAPs with non-cancer chronic toxicity benchmarks will be used in calculating this metric.

3. Demographic Data and Disparate Impacts Analysis

Data from the 1990 U.S. Census will be used to characterize the demographic composition of each census block modeled. The number of African Americans and non-African Americans in each census block will be combined with the concentration data from the block centroid.

To evaluate potential disparate impacts, several measures will be used. A weighted average value for each metric for African Americans and non-African Americans will be calculated across all census blocks. The weighted average for African Americans will be calculated by multiplying the value of the metric in each census block by the number of African Americans in each census block; summing this product across census blocks; and then dividing by the total number of African Americans. A weighted average will be calculated for non-African Americans in the same manner. Finally, for each metric, a ratio of the weighted average for African Americans to the weighted average for non-African Americans will be calculated. Ratios greater than one indicate, for the metric in question, a greater impact on African Americans than on others; while ratios less than one indicate greater impacts on non-African Americans than on African Americans. This approach has been previously described in Perlin et al. (1995).

Additional comparisons will be made of populations exposed above one or more thresholds of interest (*e.g.*, the 90th percentile for modeled blocks; total cancer risks greater than 10^{-4} and/or 10^{-5}; and total hazard ratio greater than 1 or 10)

This type of analysis may be applied to any geographic area of interest with modeling data (*e.g.*, the Industrial Corridor as a whole as well as subdomains within the Industrial Corridor). It may also be applied to total modeled concentrations, as well as categories of source types (*e.g.*, major sources, area sources, mobile sources).

Charge Question #12: Please provide comment on the strengths and weaknesses of the COATCEM method for: 1) evaluating the relative burdens from airborne emissions from nearby facilities for one group versus another in a population proximate to fixed air emissions sources, and 2) its utility in screening out *de minimis* burdens.

Charge Question #13: The BRBA, ERBA, and COATCEM approaches described in the review document may be applied to various geographic scales (*e.g.*, national, regional, state, basin, county, place) and collections of sources. Given the inherent uncertainties described in the review document, please comment on how the results of the analysis relate to the resolution of the input data, the varying geographic scales, and numbers of sources being analyzed.

Charge Question #14: Overall, what are the other major uncertainties involved in using the BRBA, ERBA, and COATCEM methods? Are there situations where these methods would have to be modified because the models or approaches used are not suitable? What research or improvements in the methodologies would be most helpful to focus upon in the next few years?

V. References

Caldwell, et al. 1998. Application of Health Information to Hazardous Air Pollutants Modeled in EPA's Cumulative Exposure Project. *Toxicity and Industrial Health*, Vol. 14, No. 3, 1998.

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User Guide for The Ecological Sensitivity Targeting and Assessment Tool (ESTAT) Version 1.0, Science Applications International Corporation, November, 1996.

VI. Appendices

A-1. TRI Chemicals for Which No Toxicity Weights Were Available

A-2. Relative Burden Ratios for 2- and 4-Mile Circles (Basic vs. Enhanced)

A-3. Toxicity-weighted Emissions by Facility (lbs/yr)

A-4. Population Size and Composition for 314 TRI Facilities in Louisiana.

A-5. Total Proximate Populations and Relative Burden Ratios for 15 Facility Universes.

VII. Glossary of Terms and Acronyms

AIRS	Aerometric Information Retrieval System
AFS	AIRS Atmospheric Facility Subsystem
ARC/INFO	A commercially available Geographic Information System
BRBA	Basic Relative Burden Analysis
CEP	Cumulative Exposure Project
Census Block	The smallest Census Bureau geographic unit (7,020,924 in 1990 in U.S.). Generally an area bounded by streets, streams, and the boundaries of legal and statistical entities, containing about 50-250 people. In the 1990 Census, the minimum size of a census block was 30,000 square feet (0.69 acre) for polygons bounded entirely by roads, or 40,000 square feet (0.92 acres) for other polygons. There was no maximum size for a census block.
Census Block Group	Block groups (BGs) are the next level above census blocks in the geographic hierarchy (229,192 in 1990 in U.S.), and contain about 800 -1500 people. A grouping of census blocks having the same first digit in their identifying number within a census tract or BNA. The BG is the smallest geographic entity for which the decennial census tabulates and publishes sample data.
Census Tract	A statistical subdivision of selected counties**C**established by a local committee of data users**C**that is a relatively stable basis for tabulating decennial census data (62,276 in 1990 in U.S.). Generally, census tracts have between 2,500 and 8,000 residents and boundaries that follow visible features. For the 1990 census, a Block Numbering Area (BNA) is a statistical subdivision of counties without census tracts, with the difference between census tracts and BNAs generally being the type of organization doing the delineation.
COATCEM	Cumulative Outdoor Air Toxics Concentration and Exposure Methodology
EPA	Environmental Protection Agency
ERBA	Enhanced Relative Burden Analysis
ESTAT	Ecological Sensitivity Targeting and Assessment Tool
GIS	Geographic Information System
HAP	Hazardous Air Pollutant
ISC	Industrial Source Complex
ISCLT	Industrial Source Complex - Long Term
ISCST	Industrial Source Complex - Short Term
LDEQ	Louisiana Department of Environmental Quality
MACT	Maximally Achievable Control Technology
NTI	National Toxics Inventory
OCR	Office of Civil Rights
OP	Office of Policy, formerly OPPE
OPPE	Office of Policy Planning and Evaluation, now Office of Policy
OPPT	Office of Pollution Prevention and Toxics
OTAG	Ozone Transport Assessment Group
RfCs	Reference Concentrations for non-carcinogens
RSEI	Risk Screening Environmental Indicators
SAB	Science Advisory Board

SCC	Source Classification Code
SCRAM	Support Center for Regulatory Air Models
SIC	Standard Industrial Classification
TEDI	Toxic Emissions Data Inventory
TRI	Toxic Release Inventory