DAR -10 / NYSDEC Guidelines on Dispersion Modeling Procedures for Air Quality Impact Analysis

New York State Department of Environmental Conservation

DEC Program Policy

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I. **Summary**: This guide provides the NYSDEC Division of Air Resources' recommended dispersion modeling procedures for conducting ambient impact analyses. These procedures essentially duplicate, in summary format, significant aspects of the Environmental Protection Agency's (EPA) approved methodologies, as incorporated in Appendix W of 40 CFR Part 51 regulations. Thus, familiarity with the latest version of EPA's *Guidelines on Air Quality Models* (EPA Guidelines) is assumed. The EPA Guideline document is available on the EPA SCRAM webpage.[1] Additional specific recommendations are provided herein to augment EPA methods or interpret New York specific regulations. For example, details are provided on: the application of the recently adopted AERMOD model during the one year transition period from ISC3; how to identify nearby sources for cumulative source analysis; and the interpretation of Subpart 231-2 (to be revised as Part 231) provisions on emission offset source location and net air quality benefit analysis.

II. Policy: Air quality dispersion modeling is sometimes required to support Prevention of Significant Deterioration (PSD), State or Title V permit applications and related actions. It is also used to support actions under the State Environmental Quality Review Act (SEQRA), such as the impacts from toxic emission sources, Environmental Justice assessments and the Department's policy on fine particulate matter (Commissioner's Policy CP-33). In performing such assessments, a set of recommended and acceptable procedures has been defined by EPA and NYSDEC to assist source applicants and their consultants to assure the proper application of the modeling analysis. The guidance is designed for use by specialists in dispersion modeling and assumes familiarity with EPA's modeling procedures. It provides a basis for the development of modeling protocols which are to be submitted for review and approval by NYSDEC prior to the submission of the modeling analysis. This step reduces the need for possible revisions to the modeling assessment and provides applicants with certain assurances on the acceptable procedures to be used in support documents for permit applications.

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[1] http://www.epa.gov/ttn/scram/

III. Purpose and Background: This guide is intended for use by source applicants, project managers and their consultants who need to conduct ambient impact analyses in support of air permit applications and other activities which require air quality impact modeling. The guide is designed for use by specialists in dispersion modeling and assumes familiarity with EPA modeling procedures. It provides a basis for the development of modeling protocols which are to be submitted for review by NYSDEC. **This program policy replaces Air Guide-26 (revised 12/9/96).**

Some of the pertinent federal and New York State regulations which provide the basis for the Division of Air Resources' ambient impact analysis requirements are summarized in Appendix A. Analysis of air quality through modeling is used in establishing compliance with ambient air quality standards, Prevention of Significant Deterioration (PSD) increments, locating monitor sites, estimating health effects from toxic pollutants, and performing visibility and Air Quality Related Value (AQRV) assessments for PSD Class I areas.

As required by the original Prevention of Significant Deterioration (PSD) regulations, EPA has reviewed and amended its original 1978 procedures for modeling ambient impacts on a regular basis. This guide assumes user familiarity with the following EPA guideline document: EPA's *Guideline on Air Quality Models (Revised)*. Revisions were made as follows: EPA 450/2-78-027R, July 1986, and Supplement A (1987, 53 Fed. Reg. 393), Supplement B (1993, 58 Fed. Reg. 38816), Supplement C (FR, August 9, 1995) and the adoption of the CALPUFF model on April 15, 2003 and the latest adoption of the AERMOD model and some of the other modifications to the Guidelines on November 9, 2005. The Guideline was incorporated as Appendix W of 40 CFR Part 51, with proper Register formatting in a direct final rule on August 12, 1996 (FR V61, No.156). The specifics of the EPA recommended models and techniques are not repeated herein, but this guide summarizes some of the important aspects. Also, NYSDEC guidance is provided on the interpretation of EPA's Guidelines as well as on other specific topics.

IV. Responsibility: The responsibility for implementation, interpretation, and maintenance of this document rests with the Impact Assessment and Meteorology Section of the Bureau of Stationary Sources, Division of Air Resources (tel. 518-402-8403).

V. Procedure: This guide recommends specific modeling procedures to be used in the analysis of source air quality impacts. However, due to unique source-receptor considerations and the continuous evolution of dispersion modeling techniques and procedures, these guidelines are not all inclusive. Thus, the submission of a modeling protocol to the Department for review and concurrence is highly recommended. It is NYSDEC policy that any proposed application of the AERMOD model must receive prior approval during the one year transition period from ISC3, that is, till December 9, 2006. To expedite this latter approval, a detailed modeling protocol with specific input data descriptions must be submitted for approval prior to an application submittal. This step will minimize delays in the application review process. In cases where the proposed modeling procedures extend beyond the requirements discussed below, a meeting to resolve the issues might be appropriate. Where the proposed modeling procedures incorporate non-guideline aspects, the descriptions and background information

should be submitted for review well in advance of the meeting.

The Department's modeling requirements for criteria versus non-criteria pollutants (e.g., toxic emissions) are at times different, due to differences in federal and State requirements in modeling toxic pollutants. The Department's approach to the control of toxic contaminants is contained in DAR-1 (formerly know as Division of Air Resources' Air Guide-1). The guide uses screening procedures and a software program as the initial step in analyzing source impacts. These methods were formulated in the early 1990s and are currently outdated in terms of recommended EPA procedures for certain source types (areas sources), source setting (complex terrain), as well as the adopted AERMOD procedures. However, for most situations, the procedures should still provide conservative (overestimated) long-term (annual) average and short-term (1-hour) impacts in relation to corresponding Annual and Short-term Guideline Concentrations (AGCs and SGCs) due to the conservative modeling assumptions incorporated in the procedures. The application of DAR-1 procedures should be limited to toxic pollutants and should not be used for criteria pollutant impact analysis, as stated in the cover memo of the 1995 release of the procedures. Furthermore, Appendix B of DAR-1 and the software program procedures should not be considered the final determination of source impacts. More refined impacts can be calculated, if necessary, using site specific data and modeling procedures provided herein.

Source analyses which must undergo both NYSDEC and EPA review (e.g. major sources) should adhere strictly to the requirements and preferred modeling procedures described in the EPA Guidelines, with the added requirements of NYSDEC on the application of AERMOD as described herein. In some instances, EPA's concurrence on a proposed modeling protocol may be sought by NYSDEC to address specific procedures which deviate from or enhance EPA's modeling procedures or policy.

In instances requiring only State review, NYSDEC may consider methods which deviate from or fill the void in specific EPA requirements. These deviations fall into two basic categories. The first includes procedures which NYSDEC staff have established as valid and technically supportable. An example of this is the method for defining nearby sources for cumulative analysis, as described below. The second category relates to deviations from established procedures which the applicant demonstrates as appropriate to the Department's satisfaction. An example of this is the application of CALPUFF for certain near-field analyses. Modeling protocols containing procedures which fall into the second category must contain full technical support documentation for review. Copies of references not easily accessible through general publications must be supplied. The acceptance of these specific modeling procedures should not be construed as blanket approval of their use, but will need to be approved on a case-by-case basis.

1. EPA Modeling Procedures

This section summarizes the basic modeling requirements from EPA's *Guideline on Air Quality Models* (Revised, November 9, 2006; FR Vol.70, No. 216) and presents the preferred EPA models and corresponding input parameters in a simple tabulated and reference format. Familiarity with EPA modeling guidelines is assumed. Further guidance on performing modeling analyses is provided in EPA's *New Source Review Workshop Manual* (Draft, October, 1990) which should be followed not only for all PSD

permit applications, but also for addressing related aspects of other modeling analysis. EPA's modeling approach relies upon screening level modeling, followed by refined analysis when necessary. Until AERSCREEN (the screening version of AERMOD) is finalized, the main EPA screening procedures are contained in the SCREEN3 model user's guide and Screening Procedures for Estimating the Air Quality Impact of Stationary Sources (EPA-450/R-92-019), October, 1992. The SCREEN3 model provides a comprehensive single source analysis. However, care should be exercised when calculating cavity impacts since the SCREEN3 cavity height formula may provide unrealistically high values (up to 2.5 times L for tall structures, i.e. $h_b/L > 1$). Thus, under these conditions, NYSDEC recommends the use of the old formula ($h_c = 1.5L_{min}$) as the upper limit to defining the cavity influence. SCREEN3 relies upon the ISC3 downwash algorithm. If it is desired to use the updated PRIME downwash algorithms for cavity and wake areas, then the AERMOD model must be used until AERSCREEN becomes available.

The models preferred by EPA for specific terrain settings, pollutants, source types, and dispersion conditions are summarized in Table 1. These models and their user's guides can be obtained from the EPA SCRAM webpage in footnote 1. The "source/condition" listed follows the grouping of the sections in the EPA Guidelines which address the specific topics. Both screening and refined modeling methods are listed. It should be noted that a number of techniques referenced require a case-by-case demonstration.

EPA's Modeling Guideline revisions of November 9, 2005 allow the substitution of AERMOD for ISC3 during the one year transition period until December 9, 2006, after which AERMOD will be the recommended refined model. The application of AERMOD and associated programs for simple and complex terrain may be used with proper input source, land use and meteorological data which must be documented in a modeling protocol. Guidances on the application of AERMOD under various conditions are provided in a document entitled *AERMOD Implementation Guide* on the SCRAM webpage. Further NYSDEC specific guidance is provided below.

The data requirements for the preferred models are discussed in the EPA Guideline and are duplicated in a checklist format in Appendix B. The checklist provides the standard set of input data and basic level of analysis required. Individual cases may need more detailed information. The various items noted in Appendix B are discussed further in appropriate sections of the EPA Guideline document. More specific data requirements are described in the user's guides for the individual models. However, a number of important items are briefly summarized below to allow for the development of an acceptable modeling protocol.

a) **Source Data -** Sections 8.1 and 8.2 and Tables 8-1and 8-2 of the EPA Guidelines describe the emission input requirements for the source under consideration. It also provides these requirements for the "nearby" and "other"sources for use in a cumulative analysis. Table 2 provides the same basic information on data inputs. In the screening phase, different load parameters should be considered to identify the worst case conditions. The worst case load and the maximum load conditions (if different) should be included in the refined analysis of short-term impacts. For annual impacts from existing sources, actual operating conditions

or design/capacity factors can be used if determined to be representative. More specific guidance on the development of a source inventory for a cumulative analysis is contained in EPA's *New Source Review Workshop Manual* and in Appendix C.

b) **Good Engineering Practice (GEP) Stack Height Regulations -** On July 8, 1985, EPA promulgated final regulations regarding Good Engineering Practice (GEP) stack height (see 40 CFR 51.100(ii)) . These regulations limit the degree to which a source can either increase the height of its stack or merge exhaust gas streams to enhance dispersion. The regulations provide a formula determination of GEP stack height which precludes the effects of aerodynamic downwash from nearby structures. The EPA technical support document (EPA-450/4-80-023R, revised 1985) should be followed to properly define the allowable stack height credit. Also, the latest version of EPA's Building Profile Input Program (BPIP with PRIME) should be used to generate wind direction specific building dimensions, as necessary for downwash calculations in the ISC3 or AERMOD models.

It is NYSDEC policy that proposals to construct or modify a source ensure that the associated stack be designed according to formula GEP height specifications (efforts to avoid downwash into the cavity region is especially encouraged). If such a stack height is not feasible, documented justification for the proposed stack height must be presented in the permit application. Such a justification may include aesthetic considerations, FAA and engineering or local zoning restrictions, and should not be based solely on acceptable ambient impact determinations. It is also NYSDEC policy that GEP stack height be minimized in order to reduce the impact on the area's aesthetics. This can be accomplished, for example, by lowering the height of any new nearby structures.

c) **Meteorological Data -** On-site (i.e. site-specific) meteorological data is generally preferred over National Weather Service data. This is especially true for complex terrain settings. EPA guidance requires at least one year of on-site data or five consecutive years of most recent, readily available, off-site data. EPA's guidance on the proper acquisition of site specific data is provided in the followed document: Meteorological Monitoring Guidance for Regulatory Modeling Applications, EPA-454/R-99-005, Revised, February 2000. Addition guidance is provided in NYSDEC policy guide DAR-2: *Oversight of Private Air Monitoring Networks*[2] should be followed. The method of substituting for missing data, to achieve the 100% data input requirement of most models, should follow EPA's recommended procedures on the SCRAM web site.

Care should be exercised in determining stability class from on-site data. For example, if using either the sigma-E or sigma-A methods, the details of the method should be included in the modeling procedures for review and concurrence. An adjustment for surface roughness effects on the sigmas within 1 to 3km of the source is recommended in the above EPA document, but in

[2] http://www.dec.state.ny.us/website/dar/ood/policydocs.html

NYSDEC staff's judgement, the adjustment should be limited to the roughness length within 1 km of the meteorological instrument site.

d) **Receptor Data -** Source analyses should consider both simple terrain (below stack height) and complex terrain receptor impacts. The radial receptor grids for refined analyses must be comprehensive enough to identify the maximum impacts to at least a 100m receptor spacing. For Cartesian grids, this latter spacing translates to a maximum 70m grid spacing such that the diagonal (or radial) of the grid is resolved to 100m. For the source under review, impacts must be predicted at all locations inside and outside of the plant property which are not fenced in or at which public access is not prohibited (i.e. all ambient air receptors). Additional receptors at or beyond the plant property might have to be placed to properly resolve maximum impacts. This may be done using discrete receptors or grid cells such that the radial distance between the receptors along the property line are equivalent to 10 degree increments. In addition, a denser vertical grid is necessary for certain complex terrain applications, such as the use of CTSCREEN or CTDMPLUS. EPA guidance on receptor placement for these models should be followed. Occasionally, elevated receptors in the proximity of the source (i.e., about 2 km) need to be assessed. Such receptors include rooftops, balconies and similar areas with public access, but not at open windows or air intakes, in accord with EPA policy.[3] In some instances, ground level and elevated receptors must be placed on and off the source property to which the public has access (e.g., hospitals, universities, etc.).

2. Supplemental NYSDEC Modeling Procedures

a) **Application of AERMOD -** A number of input parameters and steps in the AERMOD modeling system application require professional judgement. Interim to the development of a set of standard input parameters and more detailed guidance on certain AERMOD applications, it will be necessary for applicants to detail these input data and procedures in a modeling protocol to be submitted for NYSDEC staff review and approval prior to the submission of the modeling analysis. For the 1 year transition period until December 9, 2006, an AERMOD modeling protocol is required.

The modeling protocol must address guidance specified in EPA's *AERMOD Implementation Guide* and should detail the proposed land use and meteorological data and the sources and references for the data. NYSDEC recommends that receptor terrain data (Digital Elevation Model, DEM) be resolved to a minimum of 30m and, preferably, to 10m. For most of New York State, the 30m resolution data is not available, but 10m digital data is available for all of New York State.

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[3] http://www.epa.gov/region07/programs/artd/air/nsr/nsrpg.htm. Letter from John Seitz, dated April,13, 1992.

EPA revised the AERMAP (version 04300) program on the SCRAM webpage on December 22, 2005 which supports the use of 10m data (as well as 30m) and that version should be used with AERMOD applications. There are a number of internet sites where land use, terrain, census and meteorological data are available. Some of the governmental sites where data is available free of charge and is relatively easy to use listed below. However, this list does not preclude the use of other available data nor is it meant to be an "approved" list by NYSDEC. All data should be identified and discussed in the modeling protocol.

The governmental sites for land use, terrain and census data are:

USGS - http://edc.usgs.gov/geodata This site provides access to both Land Use/Land Cover data and 1 Deg. DEMs (90m resolution data). The latter is likely to be the only data input allowed in the AERSCREEN model when it is formally adopted by EPA. For the 7.5 minute DEMs, this site directs to other sites which provide free downloads of the terrain data in SDTS (Spatial Data Transfer Standard) format and which can be converted to DEM data by an EPA processor for use in AERMAP. These sites are: http://gisdatadepot.com/dem and http://www.mapmart.com

Cornell - http://cugir.mannlib.cornell.edu/index.jsp CUGIR (Cornell University Geospatial Information Repository) provides geospatial data for New York State. The 7.5 minute DEMs, (10m resolution), Land Use/Land Cover data, census data, and other data are available for free download.

The New York State GIS Clearinghouse - http://www.nysgis.state.ny.us provides downloads of ortho-photos of New York State.

For AERMOD applications in complex terrain settings, a demonstration of meteorological data representativeness must be made; this same level of demonstration of representativeness has been required in the past for other models. That is, if nearby or other available meteorological data sets are deemed not representative of the complex terrain features of a project site, then AERMOD/ISC3 application must be limited to the simple terrain receptors. In these cases, complex terrain impacts can be determined by the appropriate screening or refined models from EPA's Modeling Guidelines (i.e. CTSCREEN and CTDMPLUS).

For AERMOD application involving area sources, NYSDEC recommends the application of the area source algorithm in all instances. This differs from EPA's guidance in the *AERMOD Implementation Guide*. That is, instead of the simulating area sources as volume sources at receptors distant from the source boundary, the area source modeling results should be reviewed if concerns arise with maximum impacts under unrealistically low wind speed conditions. These impacts should

be demonstrated, reviewed and resolved on a case-by-case basis.

b) **Toxic Contaminants** - Screening procedures for the calculation of the annual average and short-term (1-hour) impacts of toxic air contaminants have been specifically formulated and are contained in New York State DAR-1 (Appendix B, October 15, 1995 Edition). A software program (DAR-1, Version 3.6), associated user's guide and supporting documentation are also available through the NYSDEC Webpage.[4] These procedures serve as a tool which allows the NYSDEC regional staff and source applicants to perform a first level screening analysis of predicted impacts for comparison to health-effect based annual and short term guideline concentrations (AGCs and SGCs). The use of a refined site specific analysis for a project is a preferred and acceptable substitute for DAR-1 procedures. A modeling protocol should be submitted for review in this instance.

c) **Background Concentrations for Standards Compliance** - The two components of background concentrations are the calculated nearby source impacts and a regional background level. Regional background concentrations are determined using available monitoring data. These data are available mainly from routine NYSDEC monitor locations and summaries can be obtained from the NYSDEC public webpage. More detailed data can be obtained from the Bureau of Air Quality Surveillance (518-402-8508). For conservative estimates of total concentrations, NYSDEC recommends the use of the highest-second-highest (HSH) short term and maximum annual concentrations from the last three years of most recent data. In some instances (e.g.PM_{10}) monitors have been discontinued or replaced (such as $PM_{2.5}$ for PM10) and the use of the most recent years of available data can be substituted with a showing or representativeness. If it is necessary to refine these conservative background levels to correspond to the meteorological data associated with the worst case impacts, EPA guideline procedures may be used. On-site (i.e. site specific) collected monitoring data should conform to the EPA document: *Ambient Monitoring Guidelines for Prevention of Significant Deterioration(PSD), EPA-450/4-87-007, May 1987* and DEC policy DAR-2: *Oversight of Private Air Monitoring Networks*.

For applications requiring nearby source modeling, NYSDEC Regional or Central Office staff will assist in the development of an emissions inventory to be used in a cumulative impact analysis. Detailed guidance is provided in Appendix C and NYSDEC's policy document: *Emission Inventory Development for Cumulative Air Quality Impact Analysis*. It should be noted that it is the applicant's responsibility to assure the adequacy of the source inventory data. The first step in the process is for the applicant to determine the pollutants which have maximum impacts above significant impact levels (SIL) and the

[4] http://www.dec.state.ny.us/website/dar/index.html

corresponding significant impact areas. Cumulative impact analysis is required for those pollutants for which the source under consideration has impacts above the SILs. The cumulative analysis must be performed over the entire receptor grid defined in the circular Significant Impact Area (SIA) of the source under review. SIA is defined as the circular area which extends from the source to the farthest receptor distance at which the source has a significant impact.

d) **Complex Terrain -** Based on EPA policy, the use of the EPA screening complex terrain models which require hourly meteorological data (Complex I and RTDM) should be limited to sources which have on-site meteorological data. On a case-by-case basis, NYSDEC will consider application of the Complex I model with off site, but representative data in non-PSD source applications. A detailed showing must be made by the applicant of this representativeness to NYSDEC's satisfaction. The use of Complex I for multi-source analysis using hourly data is especially useful in identifying source contributions to modeled standard exceedances. Furthermore, if there is no representative meteorological data and relatively low and/or distant isolated terrain features are of interest, a demonstration can be made that simple terrain impacts dominate those in complex terrain in all conditions (such as from SCREEN3/Valley calculations). In this case, the refined analysis can be used to calculated maximum controlling impacts in non-complex terrain areas.

e) **PSD Increment Analysis -** The implementation of the Prevention of Significant Deterioration (PSD) regulations are no longer delegated to NYSDEC by EPA as of March 3, 2003.[5] NYSDEC is in the process of proposing it's own PSD regulations. Until these regulations are promulgated, all PSD permit source applications must follow the EPA Modeling Guideline procedures in addition to the requirements of this guide if NYSDEC review is also involved for associated permits. NYSDEC retains the database for the PSD permits issued to sources prior to March 3, 2003 which can assist in the cumulative analysis of increment consumption. Appendix D depicts and tabulates the Air Quality Control Regions (AQCR) where the PSD minor source baseline dates have been triggered and lists the corresponding PSD permitted sources. All PSD source analyses must consider the incremental SO_2, NO_2, and PM_{10} impacts of existing and other proposed PSD sources (i.e., an application submitted to EPA Region II thirty days prior to the source under review). Furthermore, these sources are to be included in the standards compliance analysis. In addition, PSD increments and, where applicable, Federal Land Managers' (FLM) defined Air Quality Related Values (AQRVs) must be analyzed for all Class I areas within 100km of the source. On a case-by-case basis, a larger distance cut off can be required by the FLM or EPA Region II staff.

f) **Nonattainment Area and Ozone Transport Region (OTR) Modeling:** There are

[5] Letter dated 5/24/04 from DEC Commissioner to EPA Region II

two basic modeling requirements for sources in the current nonattainment areas for ozone, PM_{10} and $PM_{2.5}$: 1) demonstration of insignificant impacts, and 2) a net air quality benefit analysis. However, no explicit single source ozone modeling is required by NYSDEC, other than the demonstration that the necessary offsetting emissions are obtained from an appropriate "contributing" area following the procedures in Appendix E. On the other hand, PM_{10} and $PM_{2.5}$ nonattainment areas require explicit modeling of insignificant impacts and a net air quality benefit analysis for the direct emissions of PM_{10} and $PM_{2.5}$. When established by EPA and promulgated in regulations, $PM_{2.5}$ precursors will have offset requirement similar to those for ozone precursors. Sources which fall under the review of Part 231 must follow the guidance in Appendix E: *Interpretation of Part 231 Provisions on Emission Offset Source Location and Net Air Quality Benefit Analysis*.

g) **Modeling Protocol Submission -** The processing of proposed projects should be initially directed to the appropriate NYSDEC Regional office. Specific guidance and recommendation on modeling procedures may be obtained from the staff of the Impact Assessment and Meteorology (IAM) Section in Central Office (Albany) in formulating an acceptable modeling protocol. A copy of the protocol should be submitted to both the NYSDEC project manager and the IAM Section. For AERMOD applications during the one year transition period ending on December 9, 2006, a modeling protocol is required prior to permit application submittal. Beyond that date, a modeling protocol is still highly recommended to avoid use of inappropriate AERMOD model input parameters and applications.

VI. Related References:

EPA's *Guideline on Air Quality Models (Revised, November 9, 2005):* as Appendix W of 40 CFR Part 51.

Emission Inventory Development for Cumulative Air Quality Impact Analysis, Revised, 2006.

EPA's *New Source Review Workshop Manual* (Draft, October, 1990).

TABLE 1

EPA Recommended Modeling Procedures for Terrain Setting, Pollutants, Source Types, and Dispersion Conditions

Source / Condition	Screening Method[7,8]	Refined Method
Simple terrain Single/Multiple or Complicated Source[6]	SCREEN3 AERSCREEN when finalized	ISC3[7] or AERMOD untill 12/9/06 AERMOD after 12/9/06
Complex Terrain (Plume Impaction)	CTSCREEN, Valley, COMPLEX I	AERMOD and CTDMPLUS
Ozone (urban applications)	OZIPR (case-by-case approval)	CMAQ, UMV or alternative model[8]
$PM_{2.5}$ and PM_{10}	Direct emission-Gaussian models SCREEN3 or AERSCREEN when finalized Secondary emissions: case-by-case approval	Direct emissions-ISC3 or AERMOD per above schedule Secondary formation or multi-source cases: REMSAD/CMAQ
Carbon Monoxide	CAL3QHC/MOBILE6	CAL3QHCR/MOBILE6 case-by-case for urban-wide basis
Nitrogen Dioxide	Two level screen: 1) Gaussian model (e.g., ISC or AERMOD) with total conversion of NOx to NO_2 2) Ambient Ratio Method of: default NO to NO_2 ratio 0f 0.75, or site specific developed ratio In multi-source urban areas, a proportional model can be used	Case-by-case analysis
Fugitive Emissions or Deposition	SCREEN3 or AERSCREEN when finalized	ISC3 or AERMOD (case-by-case), with refinement using gravitational settling and dry deposition
Lead	Source specific models (long-term)	ISC3/AERMOD/CALINE3 or urban-wide models

[6] Complicated sources are sources with special problems such as aerodynamic downwash, particle deposition, volume and areas sources, etc.

[7] BLP model can be used for buoyant line sources.

[8] Alternative Air Quality Models on SCRAM webpage(formerly Appendix B of EPA Modeling Guidelines).

Source / Condition	Screening Method[7,8]	Refined Method
Long Range Transport (beyond 50km) Models	Case-by-case models per IWAQM[9] and FLAG[10] recommendations	CALPUFF and FLAG/IWAQM recommendations
Fumigation	Radiational and Shoreline (SCREEN3 model)	SDM (sea breeze)
Valley Stagnation or Complex Winds	-----	CALPUFF
Visibility and Haze	VISCREEN	PLUVUE II, CALPUFF, CMAQ
Toxics (Dense Gas Dispersion) Risk Assessment	TSCREEN ----	DEGADIS or other alternative models Deposition from ISC3/AERMOD
Offshore Source	----	OCD Model

[9] Interagency Workgroup on Air Quality Modeling (IWAQM) Phase I and II Recommendations.

[10] FLM's Air Quality Related Values Workgroup (FLAG)

TABLE 2

MODEL EMISSION INPUT DATA FOR POINT SOURCES*

Averaging Time	Emission Limit (#/MMBtu)** X	Operating Level (MMBtu/Hr)** X	Operating Factor (e.g., Hr/yr, Hr/day)
Stationary Point Source(s) Subject to SIP Emission Limit(s) Evaluation for Compliance with Ambient Standards (Including Areawide Demonstrations)			
Annual & quarterly	Maximum allowable emission limit or federally enforceable permit limit.	Actual or design capacity (whichever is greater), or federally enforceable permit condition.	Continuous operations for proposed new or modified sources, unless permit limited. Actual operating factor averaged over most recent 2 years for existing sources.***
Short term	Maximum allowable emission limit or federally enforceable permit limit.	Actual or design capacity (whichever is greater), or federally enforceable permit condition.****	Continuous operation, i.e., all hours of each time period under consideration (for all hours of the meteorological data base).****
Nearby Background Source(s)	Same input requirements as for stationary point source(s) above.		
Other Background Source(s)	If modeled (See Section 8.2.3 of EPA's Guidelines), input data requirements are defined below.		
Annual & quarterly	Maximum allowable emission limit or federally enforceable permit limit.	Annual level when actually operating, averaged over the most recent 2 years.***	Actual operating factor averaged over most recent 2 years.***
Short term	Maximum allowable emission limit or federally enforceable permit limit.	Annual level when actually operating, averaged over the most recent 2 years.***	Continuous operation, i.e., all hours of each time period under consideration (for all hours of the meteorological data base).*****

TABLE 2 Footnotes

* The model input data requirements shown on this table apply to stationary source control strategies for SIPs, emissions trading, new source review, or prevention of significant deterioration. Refer to the policy and guidance for these programs to establish the required input data.

** Terminology applicable to fuel burning sources; analogous terminology, e.g., #/throughput may be used for other type of sources.

*** Unless it is determined that this period is not representative.

**** Operating levels such as 50 percent and 75 percent of capacity should also be modeled to determine the load causing the highest concentration.

***** If operation does not occur for all hours of the time period of consideration (e.g., 3 or 24 hours) and the source operation is constrained by a federally enforceable permit condition, an appropriate adjustment to the modeled emission rate may be made (e.g., if operation is only 8:00 a.m. to 4:00 p.m. each day, only these hours will be modeled with emissions from the source. Modeled emissions should not be averaged across nonoperating time periods.)

APPENDIX A: Legislative Mandates

1) The Clean Air Act (CAA)

The Federal Clean Air Act as amended in 1977 and 1990 provides the primary framework of the State's air pollution control program. This act called for the Environmental Protection Agency (EPA) to establish national ambient air quality standards, establish air quality control regions, and provide grants for the support of air pollution planning and control programs. The plans and programs developed through this support are commonly known as the State Implementation Plan (SIP). New York State has a plan which relies on the analysis of air quality impacts through evaluation of source characteristics and the atmospheric dispersion processes. This approach is common to all state SIPs. The analytical approaches to be followed are defined under the EPA's Modeling Guidelines (Appendix W of 40 CFR Part 51) and other support documents.

2) Article X (Rescinded)

This portion of New York State Law governs the siting of power generators greater than 50 megawatt capacity facilities in New York State. A portion of the requirements for obtaining the necessary approval (Certificate of Need and Environmental Compatibility) is a dispersion analysis of air quality impacts.

3) The State Acid Deposition Control Act (SADCA)

This act was passed by the New York State Legislature and approved by the Governor on August 6, 1984. The act requires the Department to develop a comprehensive program dealing with acid deposition impacts by programs enacted to reduce emissions of sulfur dioxide (SO_2) and oxides of nitrogen (NO_x). Both programs are based on long range transport modeling results.

4) Rules and Regulations of New York State

The rules and regulations of the Department are a reflection of the SIP noted in 1 above and as such denote some of the particular requirements of the Division's program for impact analysis. For example:

a) **Part 201 -** requires sufficient information to be submitted with an application to allow the demonstration of Ambient Air Quality Standards (AAQS) attainment and the evaluation of alternative emission and control measures.

b) **Part 212 -** requires an analysis of process source impacts as necessary to assign environmental ratings and control levels.

c) **Part 219 -** requires an analysis of the impact from municipal and infectious waste incineration.

d) **Part 225 -** requires an analysis demonstrating compliance with AAQS and impact offsets at sensitive acid deposition receptors.

e) **Part 231 -** requires sources that are subject to PSD review, emission offsets and other requirements in nonattainment areas to submit an impact analysis showing standards compliance, PSD increment consumption, Air Quality Related Value analysis, and insignificant impacts and a net air quality benefit for PM_{10} and $PM_{2.5}$.

f) **Part 257 -** sets forth the AAQSs for the criteria pollutants against which impacts are compared.

g) **Part 621 -** preparation of an Environmental Impact Statements (EIS) pursuant to Part 617 for projects deemed to have a significant environmental impact. An air quality analysis may be part of this EIS.

APPENDIX B

EXAMPLE AIR QUALITY ANALYSIS CHECKLIST[11]

1. **Source location map(s) showing location with respect to:**

   - Urban areas
   - PSD Class I areas
   - Nonattainment areas[12]
   - Topographic features (terrain, lakes, river valleys, etc.)
   - Other major existing sources and other major sources subject to PSD requirements
   - NWS meteorological observations (surface and upper air)
   - Onsite/local meteorological observations (surface and upper air)
   - State/local/onsite air quality monitoring locations
   - Plant layout on a topographic map covering a 1 km radius of the source with information sufficient to determine GEP stack heights

2. **Information on urban/rural characteristics:**

   - Land use within 3 km of the source classified according to Auer, A.H. (1978): Correlation of land use and cover with meteorological anomalies, J. of Applied Meteorology, 17:636-643.
   - Population
     - total
     - density
   - Based on current guidance determination of whether the area should be addressed using urban or rural modeling methodology.

3. **Emission inventory and operating/design parameters for major sources within the region of significant impact of proposed site (see Appendix D):**

   - Actual and allowable annual emission rates (g/s) and operating rates
   - Maximum design load or allowable short-term emission rates (g/s)[13]
   - Associated emissions/stack characteristics as a function of load for maximum,

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[11] From EPA's SCRAM web site, Subsection 2.3, referenced in the Modeling Guidelines.

[12] Within 50 Km or distance to which source has a significant impact, whichever is less.

[13] Maximum allowable emissions represent the worst case permitted emissions which can occur at the source under design or full load conditions on a short term basis, or under federally enforceable permit limit conditions.

average, and nominal operating conditions. Screening analyses or detailed analyses, if necessary, must be employed to determine the constraining load condition (e.g., 50%, 75%, or 100% load) to be relied upon in the short-term modeling analysis.

- location (UTM's)
- height of stack (m) and grade level above MSL
- stack exit diameter (m)
- exit velocity (m/s)
- exit temperature (°K)

° Area source emissions (rates, size of area, height of area source)

° Location and dimensions of building (plant layout drawing)

- to determine GEP stack height
- to determine potential building downwash considerations for stack heights less than GEP

° Associated parameters

- boiler size (megawatts, maximum rated heat input (mmBtu/hr.), pounds/hr. steam, fuel consumption, etc.)
- boiler parameters (% excess air, boiler type, type of firing, etc.)
- operating conditions (pollutant content in fuel, hours of operation, capacity factor, % load for winter, summer, etc.)
- pollutant control equipment parameters (design efficiency, operation record, e.g., can it be bypassed?, etc.)

° Anticipated growth changes

4. <u>Air quality monitoring data</u>:

° Summary of existing observations for latest three years (including any additional quality-assured measured data which can be obtained from any state or local agency or company)

° Comparison with standards

° Discussion of background due to un-inventoried sources and contributions from outside the inventoried area and description of the method used for determination of background (should be consistent with the Guideline on Air Quality Models)

5. <u>Meteorological data</u>:

° One or more years of hourly sequential on-site data, or five consecutive years of the most recent representative sequential hourly National Weather Service (NWS) data.

° Discussion of meteorological conditions observed (as applied or modified for the site-specific area, i.e., identify possible variations due to differences between the monitoring site and the specific site of the source)

- Discussion of topographic/land use influences

6. <u>Air quality modeling analyses</u>:

- Model each individual year for which data are available with a recommended model or model demonstrated to be acceptable on a case-by-case basis

  - urban dispersion coefficients for urban areas
  - rural dispersion coefficients for rural areas

- Evaluate downwash if stack height is less than GEP

- Define worst case meteorology

- Determine background and document method

7. <u>Reporting of modeling result</u>:

The air quality modeling analysis should provide, at a minimum, details on the following information:

- Model input and output files, including the meteorological data, receptor height and other supporting modeling files (e.g., BPIP input and output files for building downwash).

- The listing of maximum impacts and associated receptor locations, meteorological data, and modeling scenario for each applicable averaging time and pollutant.

- Comparison to NAAQS, PSD increments, AGCs/ SGCs, AQRVs for the source under review and any cumulative sources which were modeled.

APPENDIX C

Nearby Source Determination Scheme for Cumulative Impact Analyses

In order to conduct a proper cumulative analysis for the purpose of demonstrating standards compliance and PSD increment consumption, a detailed source inventory must be developed by the applicant. A cumulative analysis will be required for pollutants and averaging times for which the source under review has significant impacts. Prior to developing a source inventory, the applicant should calculate the Significant Impact Areas (SIA) of the source under review for all pollutants (SO_2, TSP, NO_2, CO) for which the source's maximum impacts are above significant impact levels. The SIA should be determined in accordance with Chapter C of the EPA New Source Review Workshop Manual (Draft, October 1990).

For pollutants with significant impact areas, it will be necessary to develop a list of all major nearby point sources to be included in the cumulative analysis for standards compliance. For the purpose of this analysis, "major" is conservatively taken to mean all emission points with maximum allowable emissions equal to or greater than 100 ton/year (23 lb/hr). However, in order to have a manageable set of sources, this size cut-off can be increased on a case-by-case review basis. A list of all point sources meeting this criterion and which are within the annular area defined as the largest SIA plus 50km of the proposed source should be obtained from the NYSDEC permit reviewer (usually a regional staff member). A smaller inventory area than this annular area can be determined on a case by case basis for minor source projects.

As noted in Chapter C of the EPA New Source Review Workshop Manual (Draft, dated October, 1990): "When a full impact analysis is required for any pollutant, the applicant is responsible for establishing the necessary inventories of existing sources and their emissions, which will be used to carry out the required NAAQS and PSD increment analyses." The document also notes that "the permitting agency may provide the applicant a list of existing sources upon request, once the extent of the impact area(s) is known. The permitting agency should review all required inventories for completeness and accuracy."

In order to fulfill the requirements of this guidance, the applicant will be provided a listing of sources which meet the criteria noted above from NYSDEC's Air Facilities System (AFS). A request for this data should be made to the NYSDEC Division of Air staff who will review the project application. The data included in these files are incomplete and, in most cases, do not contain all of the emission parameters needed for modeling purposes. This data should serve only as a starting point for developing the needed inventory data. The applicant must ensure that all of the stack, emission, and building parameters used in the cumulative analysis are correct.

The detailed steps in obtaining the initial source list, and preparing and submitting the emission inventory is provided in NYSDEC guidance*: Emission Inventory Development for Cumulative Air Quality Impact Analysis*. The guidance notes that it is ultimately the applicant's responsibility to assure that a valid inventory is used in the modeling analysis, but it is ultimately the permitting agency's (NYSDEC) decision as to the final set of sources to be modeled for NAAQS compliance. The EPA NSR Workshop Manual (1990) and the Modeling Guidelines recognize the flexibility allocated to the permitting agency in this matter.

NYSDEC guidance references a procedure which can be used with the initial set of sources provided

to the applicant to define the subset of nearby sources to be explicitly modeled. The procedure is known as the GRAD/D^2 method which was formulated and found to be a good indicator of EPA's terms "significant concentration gradient" and "nearby" (May, 1992 NYSDEC document). It was reviewed by EPA and approved on a case-by-case application basis (OAQPS Clearinghouse Memo dated March 31, 1994).

The GRAD/D^2 method is applied to the initial set of all major sources in the SIA plus 50km area as follows:

1) Determine the concentration gradient (GRAD) between the maximum impact location(X_{max}) and 1000m downwind from this location($X_{max+1000}$) using the SCREEN3 (or equivalent) model as:

$$GRAD=(X_{max} - X_{max+1000})/1000m$$

2) Determine the distance D (in Km) from the background source to the proposed source and calculate GRAD/D^2 for each source.

3) Rank order, from highest to lowest, the sources according to the GRAD/D^2.

4) All sources equal to and above 1% of the maximum GRAD/D^2 ratio should be modeled as nearby sources.

It must be emphasized that the final set of sources to be modeled, including additional sources from the initial list, is to be based on professional judgement, as applied on a case-by-case basis. For example, in cases where the top ranked source is an "outlier" from the rest of the top few ratios, the 1% cutoff will not identify an adequate number of sources. In this instance, the proposal should use the second or subsequent sources in the GRAD/D^2 ranking to define the 1% cut-off sources.

Furthermore, for PSD applicable sources where PSD increment analysis is to be performed, all PSD permitted sources within 50 km of the SIA should be included in the modeling analysis for both increment and NAAQS analysis, unless it has been previously established that a particular source has insignificant impacts for the pollutant under consideration. This is practical, since the PSD sources list contained in Appendix D of this guide is a limited set for which emission parameter data are relatively easy to obtain.

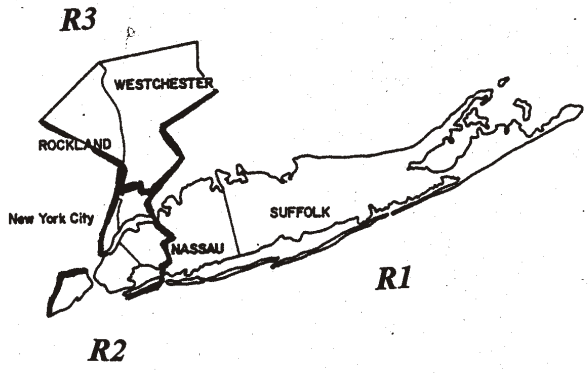
The methodology for developing a nearby source list should be identified in the modeling protocol. Once the applicant develops the nearby source list, it should be provided to Impact Assessment and Meteorology (IAM) staff for review and approval. To avoid re-modeling and other delays, the modeling analysis results that support the permit application should be submitted only after the source emission data are found appropriate by the permit reviewer and the final nearby list is approved by IAM staff.

APPENDIX D

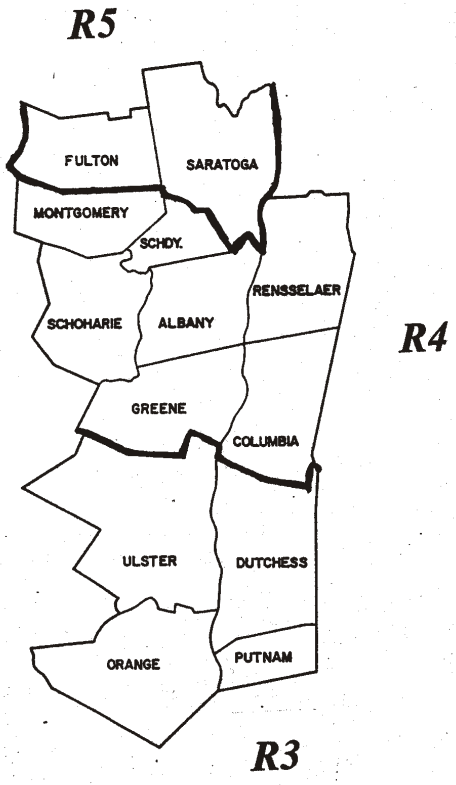
PSD Baseline Areas per Air Quality Control Regions (AQCRs) and List of PSD Permits with Corresponding Minor Source Baseline Dates

The baseline areas in New York State were defined in accord with the pre-established eight AQCRs at the time of the initial PSD regulations. These areas are depicted in the following figures. The minor source baseline dates for these areas are established by the first PSD source in the AQCR and have been triggered for all of the AQCRs and for SO_2, NO_2 and PM_{10}. The PSD source which triggered these dates and all subsequent PSD sources through April, 2006 are provided in the table which follows the figures. The emissions data for these sources can be provided by contacting DEC staff in the region in which the source is located or staff from the Bureau of Stationary Sources (BoSS). For PSD sources subsequent to the end of the PSD delegation agreement of March 3, 2003, applicants can still obtain the emissions and stack information from NYSDEC staff, with concurrence from EPA Region II staff on the PSD imposed emission limits. As DEC works to promulgate its own PSD regulations, the source data will continue to be available from our Regional offices or BoSS staff.

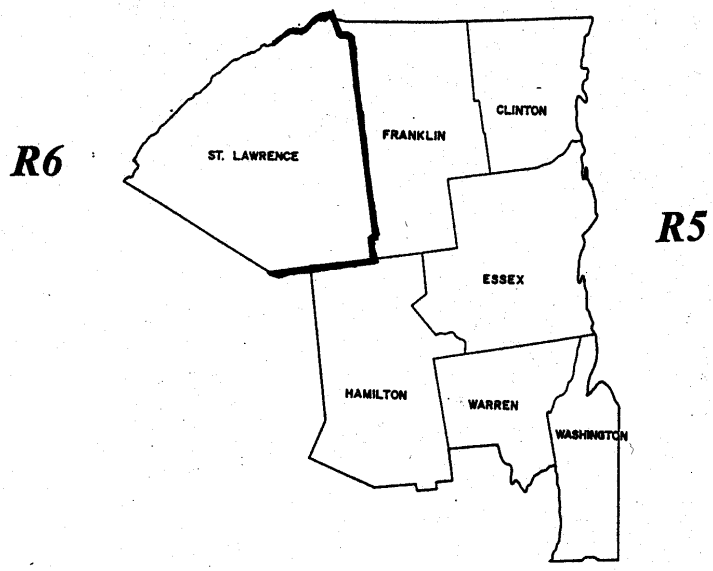
Metropolitan Air Quality Control Region



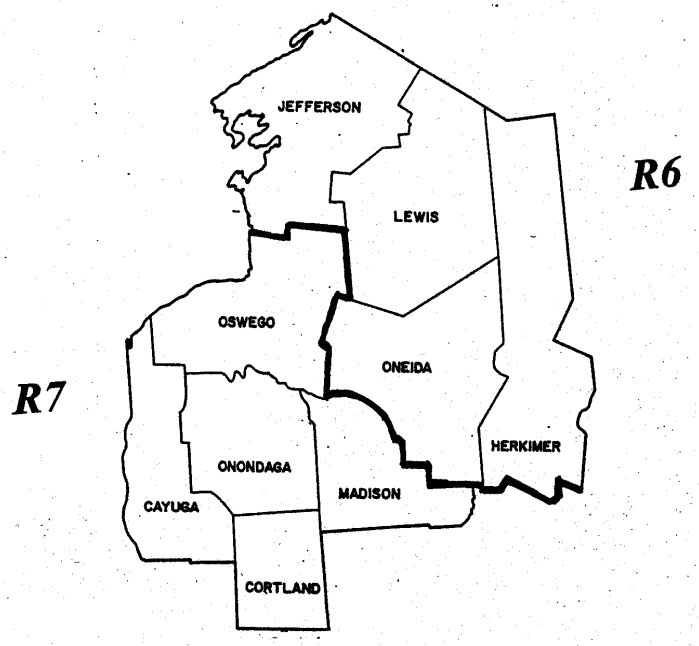
Hudson Valley Air Quality Control Region



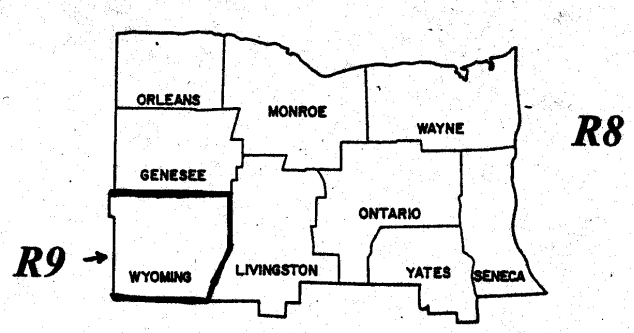
Northern Air Quality Control Region



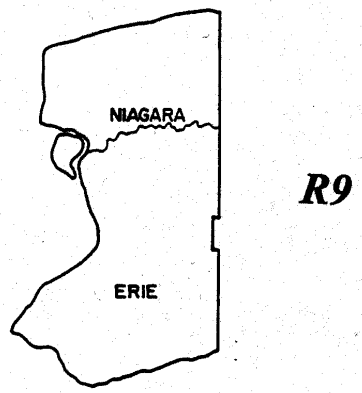
Central Air Quality Control Region



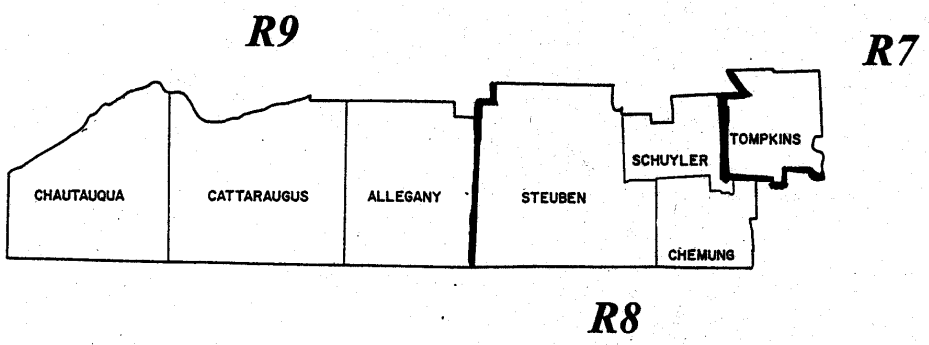
Genesee-Finger Lakes Air Quality Control Region



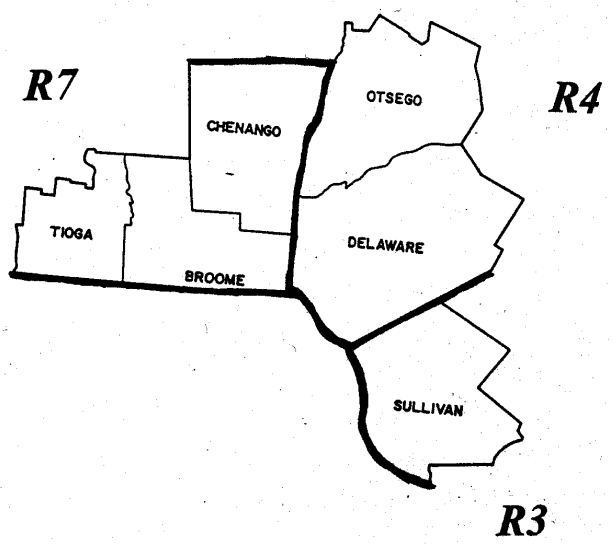
Niagara Frontier Air Quality Control Region



Southern Tier West Air Quality Control Region



Southern Tier East Air Quality Control Region



NEW YORK STATE PSD PROJECTS ACCORDING TO AQCRs
As of April 24, 2006

		PERMIT DATE	PM	SO_2	NO_2
METROPOLITAN AQCR					
1	GLEN COVE RRF [2]	11/03/78	X	X	
2	PROCTOR & GAMBLE [2]	02/25/82			
3	WESTCHESTER COUNTY RRF	02/22/82			
4	ISLIP RRF	10/03/84			
5	BABYLON RRF	09/12/85			
6	HEMPSTEAD RRF	04/16/86			
7	ALGONQUIN GAS	04/16/86			
8	HUNTINGTON RRF	04/13/88			X
9	TRIGEN COGEN	04/23/88			
10	TBG COGEN	06/01/88			
11	LILCO-BROOKHAVEN	11/16/88			
12	WYETH-AYERS T (LEDERLE LABS)	04/11/89			
13	PILGRIM ENERGY	11/11/92			
14	HOLTSVILLE/PASNY	09/01/92			
15	FRESH KILLS FLARING	9/97			
16	SCS ASTORIA ENERGY	10/31/01			
17	CON EDISON EAST RIVER	7/18/01			
18	NYPA POLETTI EXPANSION	4/29/02			
19	KEYSPAN RAVENSWOOD	8/31/01			
20	CAITHNESS ENERGY, BELLMORE	Draft, 12/19/05			
HUDSON VALLEY AQCR					
1	CIBRO PETROLEUM [2]	09/27/78		X	
2	SHERIDAN STEAM STATION [2]	11/03/78			
3	NEW ENGLAND LAMINATES	12/18/78			
4	CALLANAN INDUSTRIES [4]	03/15/79	X		
5	NEPERA CHEMICAL CO. [4]	04/14/80			
6	DUTCHESS RRF	04/20/83			
7	GE R&D CENTER	08/23/84			
8	METAL CONTAINER CORP.	02/03/88			
9	KAMINE S. GLENS FALLS	05/13/88			X

		PERMIT DATE	PM	SO_2	NO_2
10	JMC SELKIRK I - MOD	07/15/94			
11	JMC SELKIRK II	06/03/92			
12	HALFMOON - INTERPOWER [1]	10/26/92			
13	PG&E ROTTERDAM [1]	10/19/92			
14	ATHENS GENERATING COMPANY	06/12/00			
15	BETHLEHEM ENERGY CENTER	2/13/02			
16	EMPIRE-BESICORP ENERGY	8/04			
NORTHERN AQCR					
1	ADIRONDACK RRF	12/11/85	X	X	
2	ST.LAWRENCE CITY RRF [2]	06/15/88			
3	MEGAN-RACINE (KRAFT) [2]	11/02/88			X
4	BORALEX CHATEAUGAY - MOD	12/30/94			
5	SARANAC COGENERATION - MOD	11/23/94			
6	GM POWERTRAIN MOD [4]	12/93			
7	CORNING GLASS EXPN.-CANTON	6/24/96			
SOUTHERN TIER EAST AQCR					
1	IBM ENDICOTT	04/20/86	X	X	
2	ANITEC/BINGHAMTON COGENERATION [2]	09/12/90			X
SOUTHERN TIER WEST AQCR					
1	CONSOLIDATED GAS (BORGER STATION)	10/13/83			
2	KAMINE/BESICORP CORNING [1]	11/11/92	X	X	X
CENTRAL AQCR					
1	OSWEGO CTY. ASPHALT [3]	05/22/79			
2	ARMSTRONG CORK CO.	11/26/79	X		
3	ANHEUSER-BUSCH	01/31/80			
4	GRIFFISS AFB [4]	12/20/82			
5	AUBURN STEEL CO.	09/27/83			
6	FORT DRUM COGEN	04/01/87		X	
7	KAMINE - CARTHAGE	08/17/88			X
8	MORRILL PRESS	10/05/88			
9	L & J ENERGY SYSTEMS (KRAFT-LOWVILLE) [1]	11/02/88			
10	INDECK ENERGY SYSTEMS HAMMERMILL	03/08/89			

		PERMIT DATE	PM	SO_2	NO_2
11	GAS SYRACUSE	09/20/89			
12	KAMINE SYRACUSE - MOD	12/20/94			
13	ONONDAGA RRF	07/15/92			
14	CNG TRANSMISSION	11/01/92			
15	KAMINE/BESICORP BEAVER FALLS	11/06/92			
16	SITHE - INDEPENDENCE - MOD	06/29/94			
17	FULTON COGEN - MOD	10/13/93			
18	NUCOR STEEL, AUBURN	8/03			
GENESEE-FINGER LAKES AQCR					
1	IRIQUOIS ROCK	03/26/79			
2	NYSEG SOMMERSET	05/23/79		X	
3	ROCHESTER ASPHALT	06/07 79			
4	KODAK - KP44	09/22/82	X		
5	KODAK - BOILER	09/22/82			
6	GUARDIAN GLASS, GENEVA	4/1/97			X
NIAGARA FRONTIER AQCR					
1	HOOKER - EFW [4]	12/22/78		X	
2	NYSEG - SOMMERSET	05/23/79	X		
3	BUFFALO CRUSHED STONE	07/24/79			
4	ERIE COUNTY SOUTHTOWNS	10/11/79			
5	NABISCO [2]	12/05/79			
6	AIRCON (CARBON/GRAPHITE)	04/30/82			
7	INDECK ENERGY -YERKES	10/13/88			X
8	UDG - NIAGARA	10/14/88			
9	EMPIRE ENERGY - HARRISON	02/22/89			
10	INDECK SILVER SPRINGS - MOD	10/01/93			

NOTES:

X denotes minor source baseline dates

1 Facility not built

2 Facility removed from operation

3 PSD permit rescinded

4 Facility modified (e.g., fuel switch, physical replacement, capped). Contact appropriate NYSDEC Region for details

APPENDIX E

Interpretation of Subpart 231-2 Provisions on Emission Offset Source Location and Net Air Quality Benefit Analysis

NOTE: ***The procedures outlined below were originally formulated based on the 1994 version of Subpart 231-1. Several amendments were made to Subpart 231-2 since the 1994 version and this appendix has been updated to reference the correct sections of current Subpart 231-2, adopted on 5/3/00. This regulation is currently under revision to address federal NSR regulations. When the revised pertinent sections are finalized, the guide will be revised to reflect the new sections. In addition, any revision to the specific requirements for the $PM_{2.5}$ standards will be addressed at that time. Furthermore, it should be noted that the 8-hour ozone standard became effective on 6/15/04 in New York and the 1-hour standard was revoked by EPA on 6/15/05. However, until the regulatory requirements and nonattainment area definitions of Parts 200 (referenced in Subpart 231-2) are modified to correspond to this change, the procedures outlined below for nonattainment areas based on the 1-hour ozone standard should be used to determine appropriate offset source areas. Lastly, recommendations for the $PM_{2.5}$ nonattainment area requirements are based on the approach previously developed for PM_{10} and EPA's regulations at Appendix S of 40 CFR, Part 51.***

This appendix provides clarification and guidance on impact analysis terms and requirements for proposed projects in ozone and PM_{10} nonattainment areas and the Ozone Transport Region (OTR), as contained in Part 200 and Subpart 231-2. In particular, the "contribution" test for the area of the VOC and NO_x offsetting sources in Section 231-2.9 and the PM_{10} "net air quality benefit, on balance," test of Section 231-2.9 will be described using current nonattainment classification areas, and EPA guidance documents and policy determinations.

The requirements for the location of offset sources and the performance of an air quality analysis are different for ozone nonattainment areas in the OTR versus the PM_{10} nonattainment areas. Thus, these will be described separately with reference to pertinent sections of Subpart 231-2.

I. **Ozone Nonattainment Areas and OTR:** The New Source Review requirements for the emission offset provisions of the Clean Air Act are contained in Section 173(c) with respect to the location of the offset source and in Section 184(b)(2) with respect to special considerations for nonattainment areas in the Ozone Transport Region (OTR). The corresponding New York State provisions are provided in Subdivision 231-2.9(e). Specifically, in terms of emission trades between different nonattainment areas for the "equal or higher" class criterion (as required in Section 173(c)(1)(A)) and the requirement to show a "contribution" test between the different nonattainment areas (Section 173(c)(1)(B)), initial guidance for the Northeast states was detailed in an EPA OAQPS letter (John Seitz, Director EPA OAQPS), dated March 31, 1993, to the Ozone Transport Commission (Bruce Carhart, Director). In a September 12, 1995 letter from John Seitz to Bruce Carhart, EPA provided a more flexible policy guidance on the "equal or higher" provision which allows the offset trades between "moderate-to-below" nonattainment areas of the OTR as long as the contribution test is met. The policy was further clarified by EPA Region II (letter from Conrad Simon to Arthur Fossa) by extending the NO_x offset policy to VOCs and reiterates EPA's willingness to review "up front" contribution test demonstrations which would eliminate the need for case-by-case demonstrations and would allow for timely

processing of offset trades.

Subpart 231-2 reflects the EPA requirements as follows (refer to attached Figure 1a for the 1-hour ozone nonattainment area classifications):

1) For proposed sources to be located in attainment areas, EPA regulation and Paragraph 231-2.9(e)(2) allow the VOC and NO_x offsets to be obtained from any location within the State or OTR (attainment or nonattainment).

2) For proposed sources which obtain offsets from sources within the same nonattainment area, there is no further location condition. This is reflected in Paragraph 231-2.9(e)(1).

3) When the offsets are obtained from a source in a different nonattainment area from that of the proposed sources', then the "equal or higher" and "contributing area test" conditions apply to serious (none in NY) and severe nonattainment areas, but only the "contribution" test must be demonstrated for the moderate-to-below areas per EPA's newer guidance. These are identified in Paragraph 231-2.9(e)(1).

The clarification that is provided herein is with respect to the general "contributing area" test which has been demonstrated to EPA Region II's satisfaction. EPA policy (defined in the March 31, 1993 OAQPS letter and referenced in the September 12, 1995 letter) had proposed a default distance or a case specific test to be made. That is, if the offset source area is within a default upwind distance of 200km (120 miles) from the proposed source location, then the contribution test is met. Alternately, a case-by-case source demonstration is allowed where the offsetting source area is shown to be within two days transport time upwind of the proposed source location. EPA recognized, however, that it has broad discretion in defining the contribution test as long as it is technically supportable.

We formulated one such technique, which recognized the limitations of the EPA default distance, and which resulted from a study of ozone data in the OTR by Rao, et.al, *Determining Temporal and Spatial Variations in Ozone Air Quality*, Journal of Air and Waste Management Association, 1995, V45, pp 57-61) and known wind conditions associated with ozone transport in the Northeast. This alternative scheme (incorporated in previous Air Program Memo 95/94-AIR-52) was submitted to EPA and was determined to be in accord with their requirements. With the new EPA policy guidance on Section 173(c)(1)(A), the technical support document was augmented, in a March 26, 1996 submission to EPA Region II, to demonstrate that the moderate-to-below nonattainment areas of New York can be treated as a "free trade" zone similar to the NO_x Budget process for the Northeast states.

Specifically, the technical documentation included Rao, et. al., study's conclusion that the time scale of ozone transport in the Northeast is two to three days and the spatial scale of the elliptical "ozone cloud" is at least 300 miles in the major axis orientation (SW to NE) and 250 miles in the minor axis orientation (SE to NW). This result was supplemented with "ozone cloud" depictions for specific monitor sites in New York and in neighboring states which indicated that the "ozone clouds" over New York covered the whole State and overlapped with "clouds" centered at other states' monitor sites.

In addition, an analysis of wind direction and speed associated with all ozone episodes in New York from 1988 to 1994 was conducted by NYSDEC Meteorology staff. The analysis indicates a predominant south to west flow pattern, but ozone episodes were also associated with all other general wind direction quadrants. Furthermore, supporting documentation from the 1995 ICF Kaiser Resources study for EPA for the NO_x Budget was cited as a very cost effective means of ozone precursor reductions. Lastly, it was noted that the Upstate New York marginal nonattainment areas were noticed in the Federal Register (40 CFR Part 81, Vol. 59, No. 193, pp 50848-9) as clean air areas and, thus, should be treated the same as attainment areas. A small modification to our proposal for VOC offset trades from the moderate nonattainment area was submitted to EPA Region II in an April 25, 1996 letter (Leon Sedefian to Rick Ruvo).

In a June 3, 1996 letter EPA Region II acknowledged that the complete technical package satisfied the "contribution to a violation" test of Section 173(c)(1)(B) and, thus, any source in Upstate New York can obtain offsets from any part of the State, with a limitation on VOC offsets from the moderate area. Combining this conclusion with our previous approach to offset trades for the severe nonattainment area, resulted in the following guidance:

a) Table 1 identifies all default areas in New York State, by county or attainment status, where a proposed source can obtain NO_x and VOC emission offsets without having to demonstrate the "contribution test"; or, if desired,

b) A case-by-case demonstration can be made that the offset source nonattainment area is within two to three days transport time upwind of the proposed source location during ozone episodes in the latter's nonattainment area. Part of that demonstration could rely on the "ozone cloud" depiction in Figure 2 (with proper scaling) which resulted from the aforementioned study by Rao et. al., and was used in our previous guidance document. Prior to submission of an alternate technical demonstration package consistent with other Subpart 231-2 submission requirements, a protocol must be submitted for review and concurrence.

Furthermore, if an approved interstate agreement for offset trading is established, then the guidance above can also serve to identify the contributing areas with equal or higher nonattainment classification. To that end, a scaled Figure 2 can be applied to the centroid of the nonattainment area of the proposed source to identify the acceptable offset source nonattainment areas.

For the 8-hour ozone standards, Table 2 was generated following the same procedures accepted by EPA for the Table 1 areas. This was possible because of the similarity in the areas which remain in nonattainment of the 8-hour standards. Table 2 should be used instead of item (a) above when the 8-hour NAAQS are promulgated in NYS regulations. Item (b) and the application of Figure 2 for any interstate agreements will still be applicable for the 8-hour NAAQS.

II. ***PM_{10}* and $PM_{2.5}$ Nonattainment Areas:** The nonattainment area for PM_{10} is confined to Manhattan (New York County) which is not depicted here. The $PM_{2.5}$ nonattainment areas identified by EPA on 4/5/05 are depicted in Figure 3, with all areas having the same

classification. Thus, the location conditions defined in Subdivision 231-2.9(d) reduce simply to the need to obtain emission offsets from these same nonattainment areas. However, for $PM_{2.5}$ offsets, a distinction has to be made between direct emissions of $PM_{2.5}$ and its precursors. EPA has proposed SO_2 and NO_x as national "default" precursors to $PM_{2.5}$ formation, but a final determination has yet to be made. For any $PM_{2.5}$ precursors promulgated by EPA or New York, the offset requirements will be deemed satisfied by obtaining emission reductions of the same precursor from sources in any portion of the New York nonattainment area depicted in Figure 3. In addition and similar to item (b) above for the ozone precursors, a case-by-case demonstration can be made by an applicant for precursor emission offsets from sources outside of New York State following procedures to be reviewed and approved by NYSDEC staff.

For the direct PM_{10} and $PM_{2.5}$ emissions and in addition to the location condition, Section 231-2.9 requires (for PM_{10} and, thus, for $PM_{2.5}$) that a modeling analysis be conducted to demonstrate a "net air quality benefit" by the emission offsets using two criteria: first, the net impacts from the proposed source, minus the offset source impacts, provide a benefit, on balance, in the area affected by the proposed source; and second, the net impacts are below applicable significance levels of Table 1 of Section 231-2.11 for PM_{10} **(for $PM_{2.5}$, EPA is in the process of formulating similar levels which can be used when adopted).**

The concepts to be clarified here for identifying proper direct PM_{10} and $PM_{2.5}$ offsets are "net impacts," "on balance," and "the affected area". General guidance on these criteria are taken from 40CFR51, Appendix S and EPA's *Draft 1990, New Source Review Workshop Manual*. It should be recognized that, in accord with Appendix S criteria, the net air quality benefit analysis is met, by default, in instances where the offset source and the proposed source have the same effective stack height and are in proximity of each other.

To provide a showing of net air quality benefit, it is recommended that the proposed source first submit a modeling protocol to the Impact Assessment and Meteorology staff for concurrence before a model demonstration is undertaken. The protocol should address the specific items discussed below, incorporating other applicable guidance on modeling procedures. This procedure will assure that the case-by-case showing of net air quality benefit proceeds objectively. The emissions data to be used in the modeling have to be reviewed and accepted by the regional staff before the modeling exercise is finalized and an analysis report submitted for review.

1) Net Impact Calculations: For permitting purposes, sources in the nonattainment areas must address the 24-hour and annual PM_{10} and/or $PM_{2.5}$ averages, as applicable to the case. Thus, net impacts have to be calculated for these pollutants and the above averaging times using the maximum allowable emission rate for the proposed source, and the actual emission rate for the offsetting source. For the proposed source, the annual rate can be a federally enforceable long term limit. For the offsetting sources, the average emission rate for annual impacts is calculated the same way as the annual average for the emission offset requirements. However, for the 24-hour impacts, the annual average emissions will likely underestimate the "impact credit" provided by the offsetting source. Thus, a maximum actual emission rate should be used in these averages. This is defined as the most common (or normal) maximum operating level for the averaging time, as documented for the offset source over the period of the last two years of representative operations data.

The net impact is then calculated simply as the proposed source's impact minus the offset source's impact at each receptor for the appropriate pollutant and averaging times.

2) Net Benefit, On Balance, and Affected Area (Section 231-2.9): These criteria are interrelated since the net benefit in impacts has to be demonstrated over the area affected by the proposed source. This area should include all locations where the proposed source has a significant impact, as defined in Table 1 of Section 231-2.11 for PM_{10} and levels yet to be developed by EPA for $PM_{2.5}$. In many instances the proposed source may not have significant impacts or a larger area than the significant impact area (SIA) is desirable for the net benefit analysis. For example, receptors should also be placed around the offset source, as well as in areas on monitored standard violations. In all instances, the receptor areas should be explained and included in the modeling protocol.

Once the receptor grid is defined, the net air quality benefit demonstration should be achieved, on balance, over this area. This means that net impacts must be less than zero generally over the portion of the grid that is most affected by the proposed source (e.g., its SIA). However, the net impacts need not be less than zero at all receptors, nor over a majority of the total set of receptors. A further criterion for net benefit in the latter situation could be that the average net impact over the grid is less than zero.

In addition to the net benefit analysis, Paragraph 231-2.9(d)(2)(ii) requires that the net PM_{10} impacts be less than significance levels of Table 1 at all of the receptors over the grid chosen **(Note: EPA is yet to develop and adopt significance levels for $PM_{2.5}$)**. This requirement is a carryover from the previous Part 231 regulations.

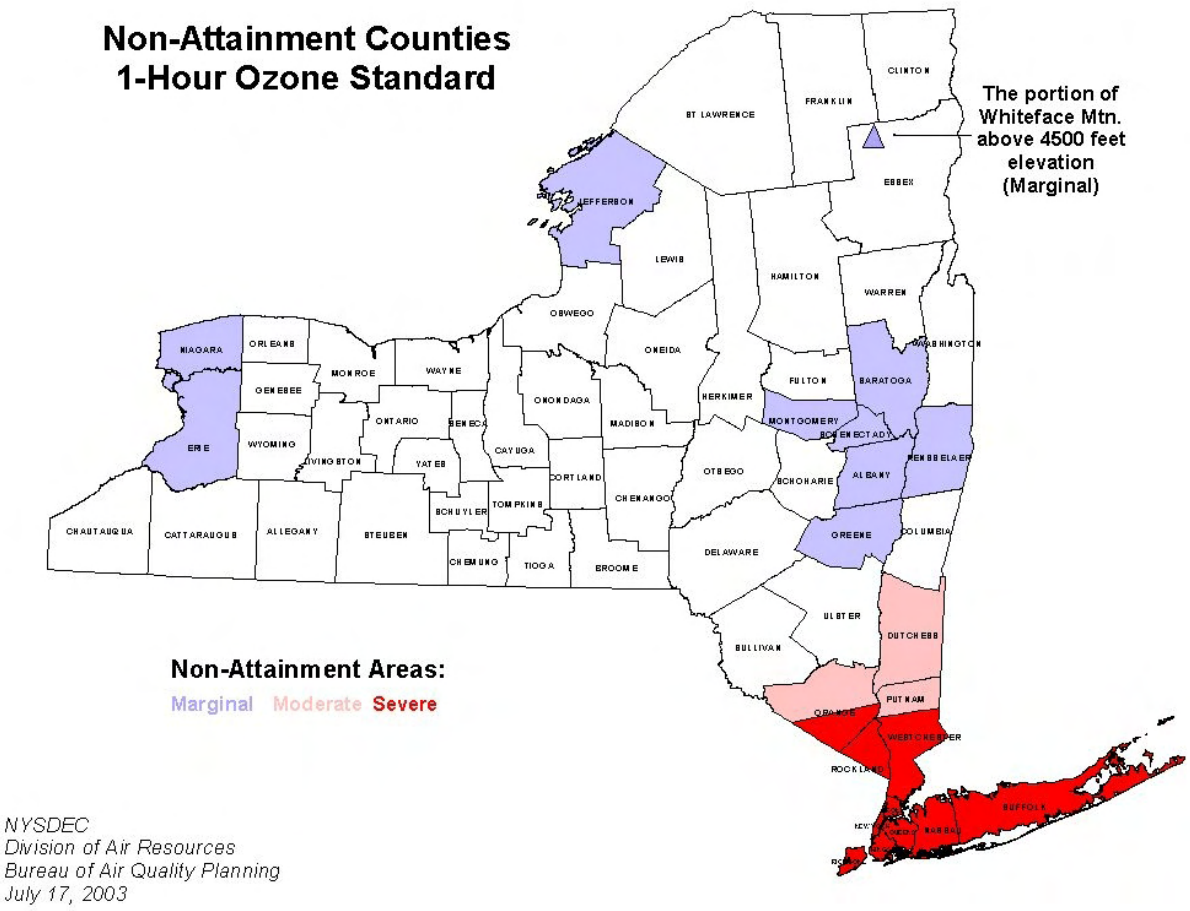


Figure 1a--Ozone Attainment Status Based on the 1-Hour Standard

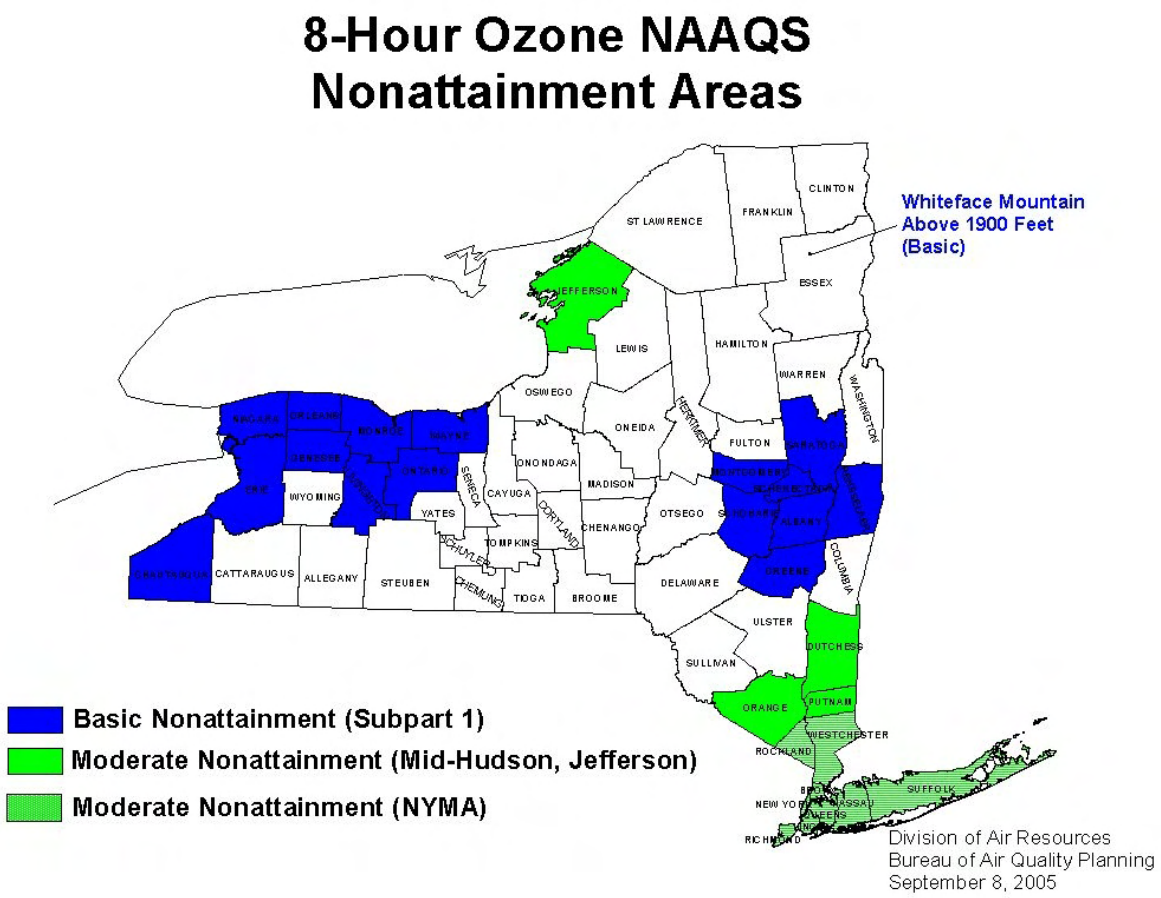


Figure 1b--Ozone Attainment Status Based on the 8-Hour Standard

Table 1

Default Acceptable NO_x and VOC Offset Source Areas for Proposed Sources in New York State Based on the 1-Hour Ozone Nonattainment and Attainment Areas (for OTR)

Proposed Source's location in a Nonattainment or Attainment Area	Appropriate NO_x Offset Source Locations	Appropriate VOC Offset Source Locations
Attainment Area	All of New York State	All of New York State
Marginal nonattainment areas in Niagara-Erie Counties, Jefferson County, and Capital District Counties	All of New York State	All of New York State
Moderate Nonattainment area in Dutchess, Putnam and Orange Counties (excluding LOCMA)	All of New York State	All counties and areas in New York State with Moderate and Severe Nonattainment Classification
Severe nonattainment areas in Rockland, Westchester, LOCMA, New York City, Nassau, and Suffolk Counties	All counties and areas in New York State with Severe Nonattainment Classification	All counties and areas in New York State with Severe Nonattainment Classification

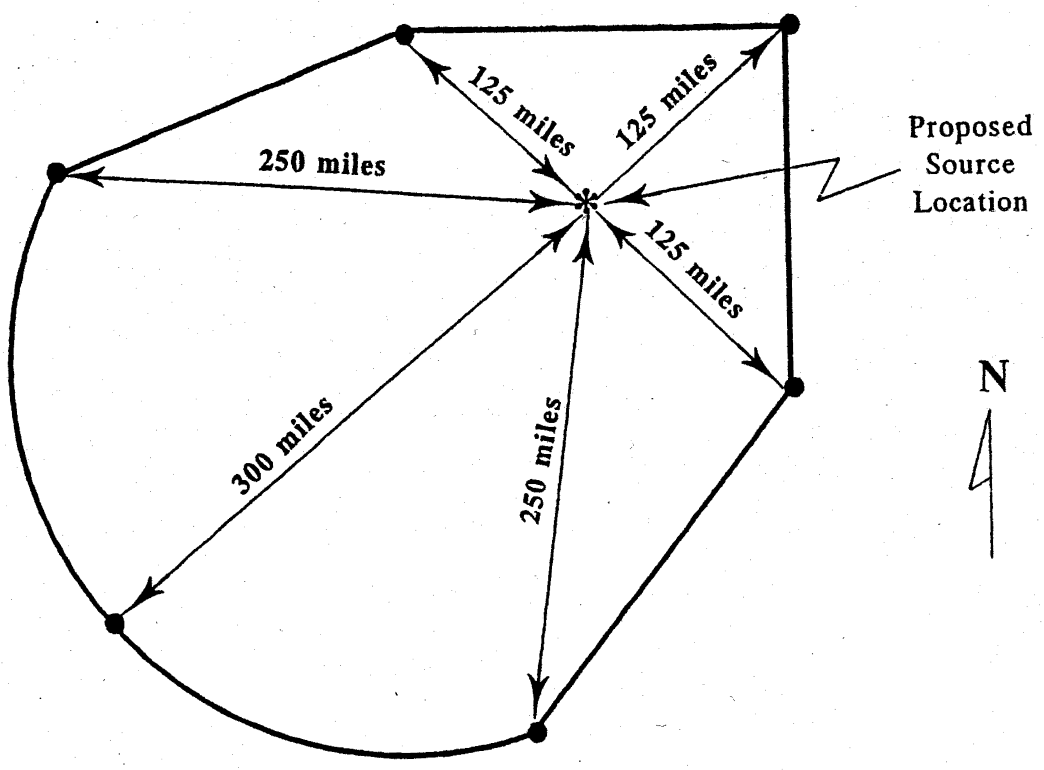
TABLE 2

Default Acceptable NOx and VOC Offset Source Areas for Proposed Sources in New York State Based on the 8-Hour Ozone Nonattainment and Attainment Areas (for OTR)

Proposed Source's Location in a Nonattainment or Attainment Area	Appropriate NO_x Offset Source Location	Appropriate VOC Offset Source Locations
Attainment Area	All of New York State	All of New York State
Basic nonattainment areas in Capital District, Buffalo-Niagara Falls, Essex County, Jamestown and Rochester Areas	All of New York State	All of New York State
Moderate Nonattainment areas in Mid Hudson-Poughkeepsie areas	All of New York State	All counties and areas in New York State with Moderate Nonattainment Classification, except Jefferson County
Moderate nonattainment areas in Rockland, Westchester, New York City Boroughs, Nassau, and Suffolk Counties	All of New York State	All counties and areas in New York State with Moderate Nonattainment Classification, except Jefferson County
Moderate nonattainment areas in Jefferson County	All of New York State	All counties and areas in New York State with Moderate Nonattainment Classification

Figure 2

Area Around Proposed Source Where Offset Can Be Located



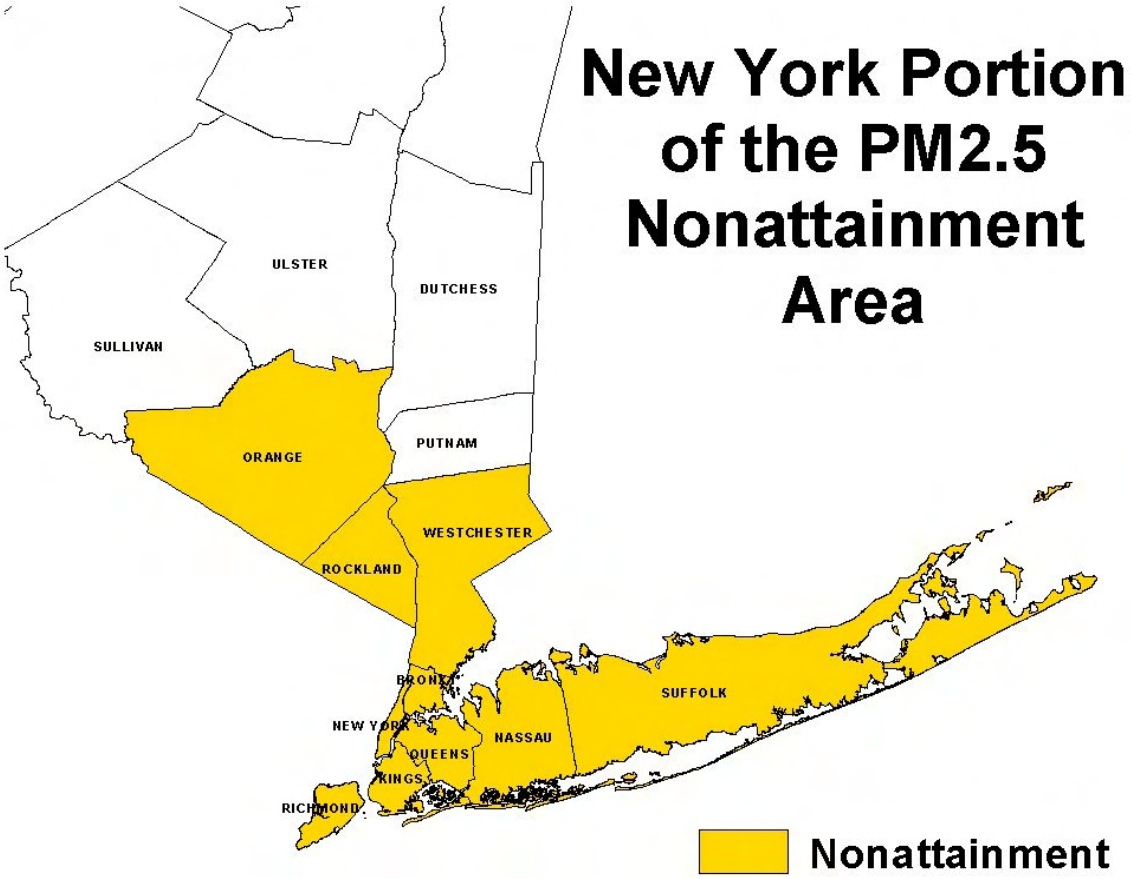


Figure 3–$PM_{2.5}$ Nonattainment Areas in New York